Burroughs
C 7200
PROGRAMMABLE
PRINTING CALCULATOR

Reference Manual

PREFACE

This manual may be used in two ways:

1. as a textbook from which to learn how to use and program your calculator. The manual progresses in a learning sequence which anticipates no previous experience with programming or this type of calculator.

2. as a "quick-reference" to determine what a particular key or switch will do and the purpose for which it may be used. The keyboard layout chart at the back of this manual is used to locate the required key or switch referred to in the text. The numbers in connection with the keys or switches refer to page numbers where detailed explanations can be found.

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Your Burroughs C 7200 calculator is an easy-to-use yet powerful printing calculator.

It is capable of performing operations ranging from the very simple to the very complex such as are encountered in business, educational, scientific and engineering environments.

The C 7200 is programmable; its memory enables the calculator to store instructions and data for repetitive routines. Conditional branching, which allows the calculator to automatically make decisions while performing a program, and the use of sub-routines provide complete programming capability. Knowledge of a special "machine language" is not required in order to program your calculator.

Programs are recorded on magnetic cards. Recorded programs can be reintroduced into the calculator at a later date, greatly reducing the time for loading programs.

The following material is supplied with each Burroughs C 7200:

- a ribbon
- a paper roll and a paper roll shaft
- an envelope containing:
  - ten program cards
  - one cleaning card
  - one test card
- a dust cover
- a program index card
- a reference manual

PROGRAMMING CARDS

Additional programming cards are available from your local Burroughs Sales/Service office and are packed in quantities of 10 in each carton. The Part Number for ordering C 7200 magnetic programming cards is: 70-1002-719.

PROGRAMMING FORMS

Programming Coding Forms, Form No. 2006060, are available from your local Burroughs Sales/Service office. These forms should be used for programming your C 7200 and provide you with proper documentation of your programs.

MODULARITY

Your Burroughs C 7200 has a modular programming area memory. The number of programming steps stored in your C 7200 can be upgraded from 204 to 408 and to 816, greatly enhancing the capabilities of your calculator in solving complex and sophisticated calculating problems. For further information contact your local Burroughs Sales/Service office.

REPLACEMENT RIBBONS AND PAPER ROLLS

Replacement ribbons and paper rolls are available from your local Burroughs office.

MAINTENANCE AGREEMENT

It is recommended that you place your Burroughs C 7200 under a Maintenance Agreement to keep it in top working order and avoid unnecessary costs, should any fault occur. For further information contact your local Burroughs Sales/Service office.

POWER REQUIREMENTS

The Burroughs C 7200 calculator requires 20 watts.

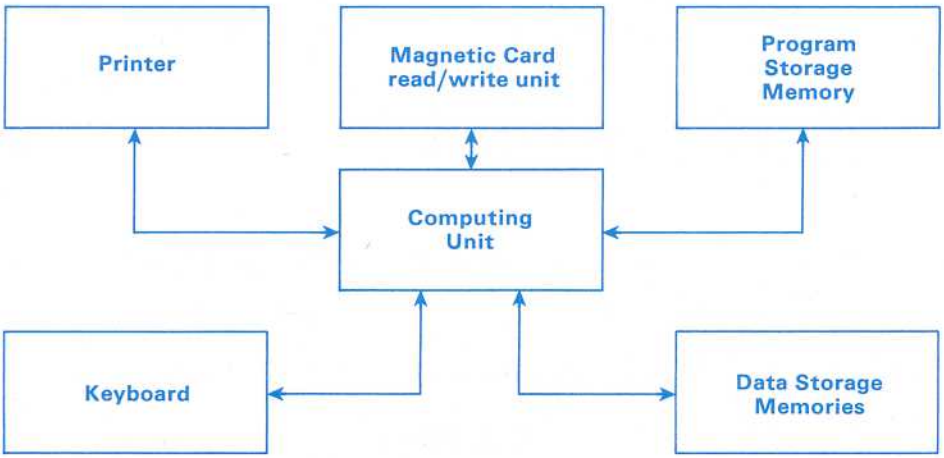
To protect operating personnel it is recommended that the calculator be grounded. The machine is supplied with a three-conductor power cable, which, when plugged into an appropriate receptacle, grounds the calculator.

TEST PROGRAM

A magnetic card, containing the Test Program, is packed with the calculator in an envelope marked: P90 (Test A) P 91 (Test B). The program recorded on the card completely tests the arithmetic and programming functions of your C 7200. For further information please refer to the instructions packed with your calculator.

This section contains general information about the Burroughs C 7200 to help you operate your calculator effectively.

The C 7200 consists of six main components as illustrated below:



The keyboard is used to enter data into your calculator and to program the machine.

Keyboard entries are routed through the computing unit to:

a. The Printer, a high precision drum printer with a printing speed of up to 40 characters per second.

b. The Program Storage Memory to program your calculator to automatically execute routines.

c. The Data Storage Memories, consisting of 16 registers, each with a capacity of 14 whole number digits plus sign.

The Magnetic Card Read/Write Unit encodes magnetic cards from the Program Storage Area, enabling you to permanently store programs for future use. Programs stored on magnetic cards can be read into the Program Storage Area.

Information can also be recorded on magnetic cards from the Data Storage Memories. This capability allows you to store calculated data for future use; for example earnings to date and tax withheld to date in a payroll application. The information recorded on magnetic cards can be read into the Data Storage Memories to provide for year-to-date data in the next run of the application.

KEYBOARD C7200

INTRODUCTION

This section describes functions of all keys and switches with the exception of those used only for programming.

The fold out keyboard presentation on the last page of this manual is an index of the pages where the functions of each key are described.

ON/OFF SWITCH

The ON/OFF SWITCH, located at the rear of the right side of the calculator, applies AC power to the machine.

When your C 7200 is switched on, the red pilot light ON indicates that the calculator is "on".

WARNING

To avoid damage to the electronic components:

1. **Before removing the cord from AC power supply always switch the machine OFF.**
2. **Do not switch the calculator OFF in the middle of a printing or computing operation.**

Since your calculator has the latest MOS (Metal Oxide Semiconductor) type of memories for high speed and optimum price/performance ratio, switching the power off causes the contents of the Data and Program Storage Memories to be reset to zero. Do not switch your C 7200 off in the middle of an application if you desire the contents of the Data and Program Storage Memories to be retained.

MODE SELECTOR

The MODE SELECTOR has five settings:

1. LEARN
2. CHECK
3. DEBUG
4. AUTO
5. MANUAL

The Mode Selector Lever determines in which mode your C 7200 is to operate. When the calculator is switched on or when the Mode Selector Lever is moved from one setting to another automatic printing of mode selected takes place as follows:

LEARN	····LEARN·····	Used to enter programs.
CHECK	CHECK·····	For step by step audit of programs.
DEBUG	·····DEBG··	Used to test programs.
AUTO	·····AUTO·	Executes a stored program.
MANUAL	·····MAN·····	Calculator works as a multiplex printing calculator.

When the MODE SELECTOR is in the MANUAL position your C 7200 functions as a multiplex printing calculator. Any of the 16 Data Storage Memories can be used when your calculator operates in this mode.

The Program Select Key P( ) and Subroutine Select Key R( ), however, are active and permit you to make intermittent use of programs stored in the programming area; for example, logarithmic and trigonometric functions. For further information please refer to the section on PROGRAMMING.

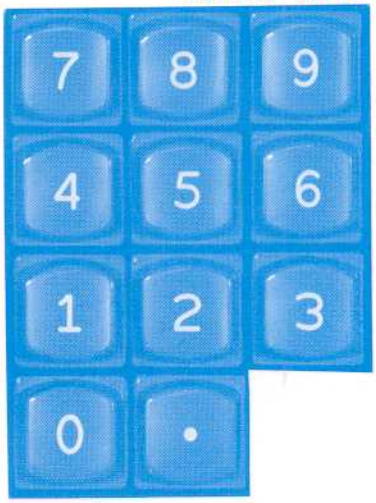
MANUAL MODE

A single depression of the Paper Feed Key feeds the paper ⅛". Holding the key down causes continuous paper feeding.

PAPER FEED KEY

The Entry Keys, digits 0 to 9 and decimal point are used to enter numbers into your calculator in combination with the Computing Unit Control Keys or Memory Control Keys. Your C 7200 is extremely simple to use; just index numbers as you say them.

ENTRY KEYS



COMPUTING UNIT CONTROL KEYS

EXAMPLE:

Mode Selector: Manual

PROBLEM	ENTRIES	PRINT-OUT
1 + 60 + 175 − 10 = ?	1 [+] 60 [+] 175 [−] 10 [=]	1 • + 60 • + 175 • − 10 • = 226 • ✲

You have now learned how to use the Computing Unit in your calculator for addition and subtraction.

Multiplication, division and mixed calculations are equally simple.

EXAMPLE:

Mode Selector: Manual

PROBLEM	ENTRIES	PRINT-OUT
175 × 15 = ?	175 [×] 15 [=]	175 • × 15 • = 2625 • ✲
144 ÷ 12 = ?	144 [÷] 12 [=]	144 • : 12 • = 12 • 000000000000 ✲
2 × 6 × 3 ÷ 9 = ?	2 [×] 6 [×] 3 [÷] 9 [=]	2 • × 6 • × 3 • : 9 • = 4 • 000000000000 ✲
5 + 7 × 4 = ?	5 [+] 7 [×] 4 [=]	5 • + 7 • × 4 • = 48 • ✲
27 − 3 ÷ 6 = ?	27 [−] 3 [÷] 6 [=]	27 • − 3 • : 6 • = 4 • 000000000000 ✲

The first factor in multiplications and the second factor in divisions are always available for constant factor calculations.

EXAMPLE:

Mode Selector: Manual

PROBLEM	ENTRIES	PRINT-OUT
$3 \times 12 = ?$	3 [X] 12 [=]	3 • X 12 • = 36 • ✲
$3 \times 24 = ?$	24 [=]	24 • = 72 • ✲
$3 \times 5 = ?$	5 [=]	5 • = 15 • ✲
$36 \div 12 = ?$	36 [÷] 12 [=]	36 • : 12 • = 3 • 000000000000 ✲
$24 \div 12 = ?$	24 [=]	24 • = 2 • 000000000000 ✲
$48 \div 12 = ?$	48 [=]	48 • = 4 • 000000000000 ✲

You can easily raise an amount to a power by indexing it with the multiply and equals keys.

EXAMPLE:

Mode Selector: Manual

PROBLEM	ENTRIES	PRINT-OUT
5^2	5 [X] [=]	5 • X 5 • = 25 • ✲
5^4	5 [X] [X] [X] [=]	5 • X 5 • X 5 • X 5 • = 625 • ✲

Square root capability is also available; just enter the number with the divide and equals keys.

EXAMPLE:

Mode Selector: Manual

PROBLEM	ENTRIES	PRINT-OUT
$\sqrt{5}$	5 [÷] [=]	5 •÷ 5 •= 2•236067977499*
$\sqrt[4]{5}$	5 [÷] [÷] [=]	5 •÷ 5 •÷ 2•236067977499= 1•495348781221*

COMPUTING UNIT

All printing in the previous examples took place from the X-register which is a part of the computing unit.

When a number has been printed by your calculator, it is retained in the X-register enabling you to make repeat addition without re-entering the amount.

EXAMPLE:

Mode Selector: Manual

PROBLEM	ENTRIES	PRINT-OUT
1.87 + 1.87 + 1.87 = ?	1 [•] 87 [+] [+] [=]	1•87+ 1•87+ 1•87= 5•61*

As soon as you start indexing numbers or get a result from the calculator, the previous contents of the X-register are automatically cleared.

EXAMPLE:

ENTRIES	CONTENTS OF X-REGISTER	PRINT-OUT
12345	12345	
[+]	12345	12345 +
6	6 (previous contents 12345 automatically cleared as soon as 6 is indexed)	
[=]	6	6 =
	12351 (result of calculation transferred to and retained in X-register)	12351 *

Depression of the Clear Key [C] after indexing an amount on the keyboard clears the X-register in the computing unit which enables you to correct keyboard indexing errors.

CLEAR KEY

The Clear Key is also used to release an Error Condition; for further information refer to page 16, Protective Features.

DATA STORAGE MEMORY CONTROL KEYS

These keys control the arithmetic in the Data Storage Memories of your C 7200.

To select one of the 16 memories, these keys must always be followed by a memory number (label).

The memories may be used in several ways:

a. an amount listed on the Entry Keys can be added directly to a memory.

b. the contents of the X-register can be added to a memory. This could be a previous entry or a result of a calculation in the Computing Unit.

c. the result of a multiplication or division can be directly added to a memory.

EXAMPLE:

Mode Selector: Manual

PROBLEM	ENTRIES	
1243 × 3 = ?	1243 [X] 3 [+M]	1
156 ÷ 12 = ?	156 [÷] 12 [+M]	1
+ 178	178 [+M]	1
?<>	[<>M]	1
+ 14	14 [+M]	1
?*	[*M]	1

PRINT-OUT

```
1243•X
     3•=
3729•+ 1
 156•:
    12•=
13•0000000000+ 1
178•0000000000+ 1
3920•0000000000 1
14•0000000000+ 1
3934•0000000000* 1
```

The memories are numbered from 0 to 15 and are split in two areas. The labels to identify Area I in the memory (memories 0-11) are easy to remember:

MEMORY	LABEL
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	[•]
11	[+/−]

Area II of the Data Storage Memories, memories 12-15, are normally used for storage of constants and intermediate results in a calculation.

The labels for Area II are:

MEMORY	LABEL
12	[+]
13	[−]
14	[X]
15	[÷]

The Transfer Key [X→M], followed by a label, transfers the contents of the X-register to the selected memory. The receiving memory is automatically cleared before the number in the X-register is transferred. The sign of the X-register is also automatically transferred regardless of the previous sign in the memory.

EXAMPLE:

Contents of the X-register: 125 —
Contents of Memory 3 10 +

Keyboard entries: [X→M] 3

Contents of X-register: 125 —
Contents of memory 3: 125 —

Using the Transfer Key ensures that a memory is cleared before transferring an amount; therefore, your first entry to the memory should be made with the Transfer Key.

CLEAR MEMORY KEY

The Clear Memory Key makes it possible for you to clear a number of memories with only one key depression.

The Clear Memory Key, followed by any of the labels previously described, clears all memories starting with 15, down to and including the memory selected. Contents of the memories are not printed.

EXAMPLE:

CM 9 Clears memories 15, 14, 13, 12, 11, 10 and 9

A depression of the Total Memory Key *M, followed by the Clear Memory Key CM, *prints* and clears the contents of memories 0-11 automatically. The Subtotal Memory Key ⇾M followed by the Clear Memory Key CM, prints the contents of memories 0-11 *without* clearing.

In any multi-total application, this feature permits you to print out all totals with just two key depressions.

Because of this feature and the simplicity of addressing memories 0-11, the best memory usage is:

0-11 Accumulation 12-15 Storage of constants and intermediate results

DECIMAL SELECTOR KEY

In all the previous examples your C 7200 has been operating in floating decimal mode; i.e., the calculator has been working with the maximum number of decimals.

EXAMPLE:

$1.25 \times 2.37 = 2.9625$

This operating mode is automatically selected when you switch your calculator ON.

Should the number of decimals exceed the capacity of the print memory, automatic underflow will take place.

EXAMPLE:

20 ÷ 3 = 6.666666666666

To select decimal settings other than floating, simply depress the Decimal Selector Key [DS] and enter the desired number of decimals, 0-9, on the Entry Keys.

Floating mode can also be selected from the keyboard; just depress the Decimal Selector Key [DS] and then the Decimal Point Key [.] .

EXAMPLE:

Desired number of decimals: 2

Entries: [DS] 2

Your C 7200 will now print *final* results aligned and rounded to 2 decimals; intermediate results will, however, still be calculated to the maximum number of decimals for accuracy.

EXAMPLE:

Mode Selector: Manual

Decimal selector: 2

PROBLEM	ENTRIES	PRINT-OUT
1.25 × 2.37 × 198 = ?	1.25 [X] 2.37 [X] 198 [=]	1•25X 2•37X 198•00= 586•58*

CHANGE SIGN KEY

The Change Sign Key changes the sign of the X-register.

This is the key to use when you want to calculate with negative factors or enter minus amounts into the Data Storage Memories. All calculations and transfers to memories in your C 7200 are algebraic.

When the contents of the X-register are negative, your calculator prints in red.

EXAMPLE:

Mode Selector: Manual

Decimal selector: 2

PROBLEM	ENTRIES	PRINT-OUT
$-4.7 \times 3.45 = ?$	4.7 [+/-] [X] 3.45 [=]	4.70X (-) 3.45= 16.22*
$-3.24 \times (-0.75) = ?$	3.24 [+/-] [X] [.] 75 [+/-] [=]	3.24X (-) 0.75= (-) 2.43*

PROTECTIVE FEATURES

To facilitate your operating the C 7200 and to ensure accurate results, the calculator has been provided with a number of protective features.

An "Error Condition" occurs, locking all keys and illuminating the red "E" Lamp when:

1. Too many whole numbers are indexed on the keyboard.
   Maximum number allowed is 14.
2. Too many decimals are indexed on the keyboard.
   Maximum number allowed is 13.
3. The whole number result of a calculation exceeds 14 digits.
4. Two keys are depressed simultaneously.

A depression of the clear key [C] releases the Error Condition.

C 7200 PROGRAMMING

INTRODUCTION

This section describes the programming keys and explains how to program your C 7200.

Programming the C 7200 is simple because the keyboard instructions are the program instructions and no special programming language needs to be learned. To be able to program the calculator, however, it is essential that you know in detail the functions of each individual key, including those described in the previous section, and that you give precise instructions to your C 7200. Should you make a programming mistake, it is easily corrected while the program is in the machine.

PROGRAM WRITING

A program is nothing more than a sequence of instructions telling the calculator what it must do to solve a particular problem. In the previous sections of this manual, whenever an example was to be performed, you, the operator, were "programmed". You were asked to press keys in a given sequence to arrive at a particular result. If the sequence was not followed correctly, the result was not correct. In a similar manner, the calculator must be given correct instructions in a program to help you arrive at a correct final result.

Program writing may be divided into five main steps:

I. Define the problem

II. Decide how the problem is to be solved

III. Write the steps (instructions) sequentially for the calculator.

IV. Enter the program steps into the calculator

V. Test the program

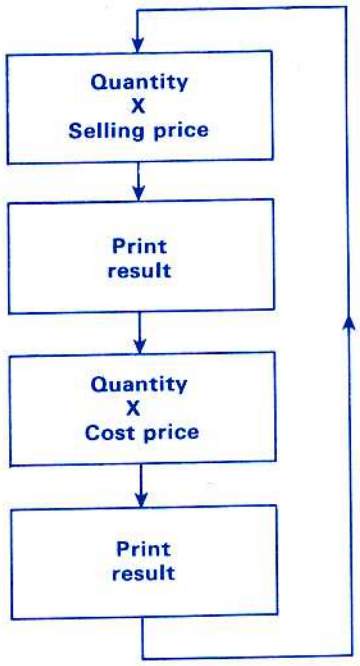
I. Define the problem

The usual way to approach this is by means of a flow-chart. The initial flow-chart should be as simple as possible.

EXAMPLE:

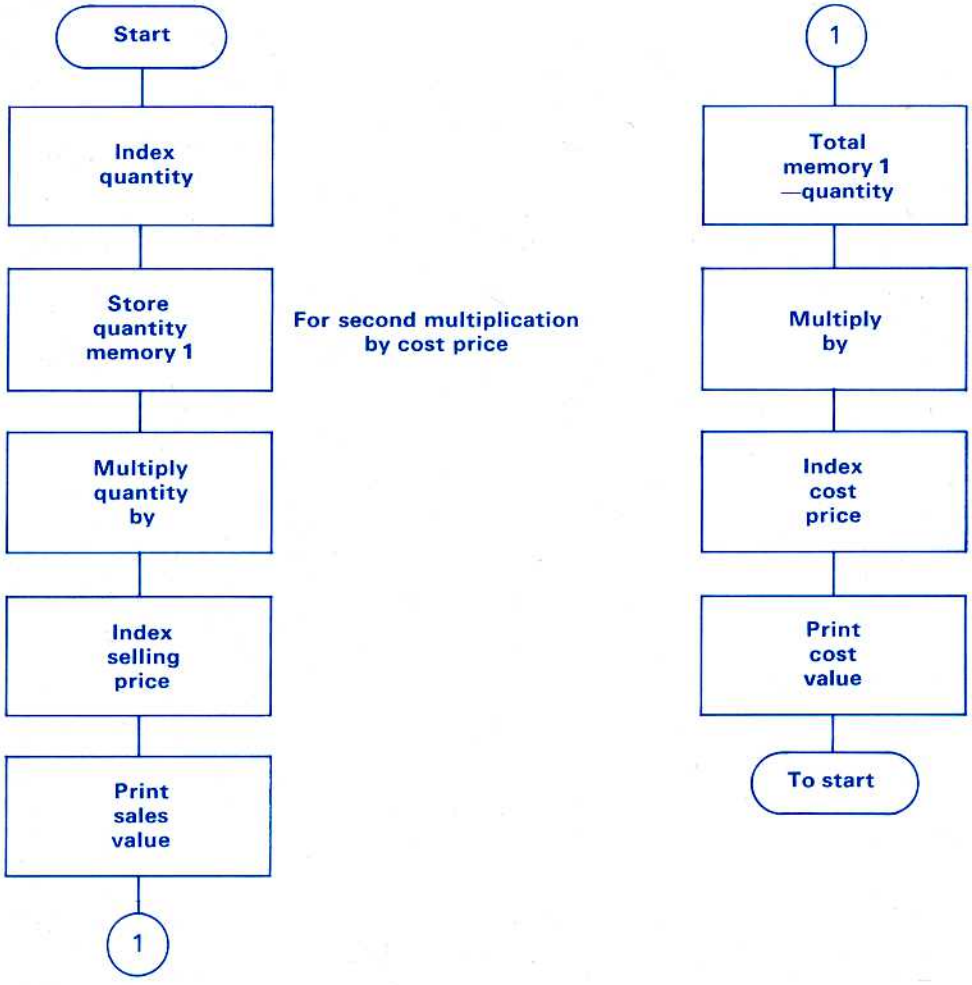
> Inventory is to be calculated at sales and cost value; i.e., the quantity of an article is to be multiplied by selling price and cost price.

Initial flow-chart:



Next, draw the "flow chart" in greater detail and then add specific notes, such as in which memories numbers are to be stored, etc.

The detailed flow chart should reflect the keys depressed if the operations were to be performed manually:



When you have completed your detailed flow chart, the logic and sequence of operation should be transferred to a Program Form, form No. 2006060. These forms are available from your local Burroughs Sales/Service Office.

The Program Form is used when you enter your program in the C 7200 and provides detailed documentation of programs written.

One of the columns of the form is headed "STEP NUMBER". When you enter a program through the keyboard, or when the calculator executes a program, it automatically keeps track of the step number in a step counter register.

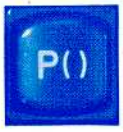
This capability allows your C 7200 to make decisions and to solve problems in various ways, depending upon these decisions. This is explained further in the section on Testing and Branching techniques, page 48.

Your C 7200 calculator can store up to 100 programs at the same time which enables you to have instant access to a large number of applications.

To enable the C 7200 to find each program stored, a program number has to be assigned to each individual program, from 00 to 99.

Consequently, when you write a program you must always start your program with the Program Select Key and a number from 00 to 99.

PROGRAM SELECT KEY



STEP NUMBER	PROGRAM INSTRUCTION	COMMENTS SAMPLE ENTRY
1	P 01	START
17	P	END

The C 7200 must also know when your program ends; therefore, you should always end your program with the Program Select Key (step 17 above).

If you wish to continue writing another program after your first one, the Program Select Key can serve to end one program and start another. In this case, a number has to be assigned to your second program.

EXAMPLE:

20	×	
21	=	
22	P 02	END PROGRAM 1 START PROGRAM 2
25	÷	
26	=	

Note: You will notice that step 25 follows step 22. This is because each key depression requires one step of program. Therefore, although the complete instruction is written on one line (step 22), three steps are required:

Step 22-P

Step 23-0

Step 24-2

HALT KEY

When operating under program control, the C 7200 automatically executes instruction after instruction in sequence. To be able to enter numbers into your calculator, you must instruct the C 7200 to stop program execution temporarily; this is made in your program by the Halt Key [HALT] .

This instruction in a program enables you to index numbers on the Entry Keys. When numbers are indexed with an Operation Control Key at a Halt instruction, automatic printing takes place.

Normally a Halt instruction is required to stop the program execution to allow a number to be indexed. **However, for the first entry in a program no Halt instruction is required.**

To ensure that your program will operate with the correct number of decimals in calculations, you should always program the desired decimal setting. Since you want to compute and print values you should program a decimal setting of 2:

STEP NUMBER	PROGRAM INSTRUCTION	COMMENTS SAMPLE ENTRY
1	P 01	START
4	DS 2	DECIMAL SETTING INDEX QUANTITY

TRANSFER KEY

The Transfer Key, followed by a memory number label, transfers the contents of the X-register to the selected memory as described under the section Keyboard:

STEP NUMBER	PROGRAM INSTRUCTION	COMMENTS SAMPLE ENTRY
1	P 01	START
4	DS 2	DECIMAL SETTING INDEX QUANTITY
6	X→M 1	STORE QUANTITY

The quantity indexed is to be multiplied by the selling price.

After you have stored the quantity in memory 1 a multiplication instruction should be programmed :

STEP NUMBER	PROGRAM INSTRUCTION	COMMENTS SAMPLE ENTRY
1	P 01	START
4	DS 2	DECIMAL SETTING INDEX QUANTITY
6	X→M 1	STORE QUANTITY
8	X	TIMES

To enable you to index the selling price, you must instruct your calculator to temporarily stop program execution. This is done by the Halt [HALT] command :

STEP NUMBER	PROGRAM INSTRUCTION	COMMENTS SAMPLE ENTRY
1	P 01	START
4	DS 2	DECIMAL SETTING INDEX QUANTITY
6	X→M 1	STORE QUANTITY
8	X	TIMES
9	HALT	INDEX SELLING PRICE

Now you want your calculator to give you the result of the multiplication of quantity times selling price ; simply use the Equals Key [=] :

STEP NUMBER	PROGRAM INSTRUCTION	COMMENTS SAMPLE ENTRY
1	P 01	START
4	DS 2	DECIMAL SETTING INDEX QUANTITY
6	X→M 1	STORE QUANTITY
8	X	TIMES
9	HALT	INDEX SELLING PRICE
10	=	SALES VALUE

When executing a program, the C 7200 prints automatically only at Halt instructions; all other operations are basically non-print.

PRINT KEY

By programming the Print Key, you will cause the contents of the X-register to be automatically printed when executing a program, enabling you to format your print-out and print relevant information only.

The PRINT instruction in step 11 will cause the sales value to be printed automatically:

STEP NUMBER	PROGRAM INSTRUCTION	COMMENTS SAMPLE ENTRY
1	P 01	START
4	DS 2	DECIMAL SETTING INDEX QUANTITY
6	X→M 1	STORE QUANTITY
8	×	TIMES
9	HALT	INDEX SELLING PRICE
10	=	SALES VALUE
11	PRINT	PRINT SALES VALUE

The quantity was previously stored in memory one. To be able to multiply the quantity by the cost you must first total memory one:

STEP NUMBER	PROGRAM INSTRUCTION	COMMENTS SAMPLE ENTRY
1	P 01	START
4	DS 2	DECIMAL SETTING INDEX QUANTITY
6	X→M 1	STORE QUANTITY
8	×	TIMES
9	HALT	INDEX SELLING PRICE
10	=	SALES VALUE
11	PRINT	PRINT SALES VALUE
12	*M 1	QUANTITY

And then enter it into the computing unit to multiply:

STEP NUMBER	PROGRAM INSTRUCTION	COMMENTS SAMPLE ENTRY
1	P 01	START
4	DS 2	DECIMAL SETTING INDEX QUANTITY
6	X→M 1	STORE QUANTITY
8	×	TIMES
9	HALT	INDEX SELLING PRICE
10	=	SALES VALUE
11	PRINT	PRINT SALES VALUE
12	*M 1	QUANTITY
14	×	TIMES

To be able to enter the cost price, you must stop the execution of the program by the Halt instruction [HALT] :

STEP NUMBER	PROGRAM INSTRUCTION	COMMENTS SAMPLE ENTRY
1	P 01	START
4	DS 2	DECIMAL SETTING INDEX QUANTITY
6	X→M 1	STORE QUANTITY
8	×	TIMES
9	HALT	INDEX SELLING PRICE
10	=	SALES VALUE
11	PRINT	PRINT SALES VALUE
12	*M 1	QUANTITY
14	×	TIMES
15	HALT	INDEX COST PRICE

Now you want to get the result of the multiplication, quantity X cost, so you simply program the Equals Key [=] .

Since the result is to be printed, you enter a PRINT instruction.

To enable the calculator to return to step 1 for calculation of the next line of data you program [P( )] . You have now completed your program.

STEP NUMBER	PROGRAM INSTRUCTION	COMMENTS / SAMPLE ENTRY
1	P 01	START
4	DS 2	DECIMAL SETTING INDEX QUANTITY
6	X→M 1	STORE QUANTITY
8	×	TIMES
9	HALT	INDEX SELLING PRICE
10	=	SALES VALUE
11	PRINT	PRINT SALES VALUE
12	*M 1	QUANTITY
14	×	TIMES
15	HALT	INDEX COST PRICE
16	=	COST VALUE
17	PRINT	PRINT COST VALUE
18	P	END PROBLEM

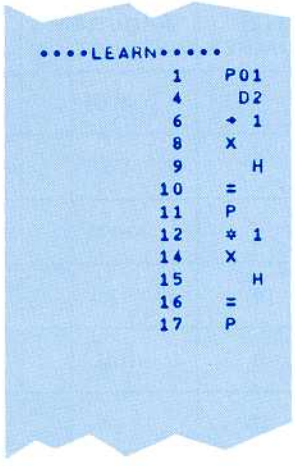
ENTERING PROGRAM FROM KEYBOARD C7200

LEARN MODE

When you have completed the Program Form you are ready to enter your program. Move the Mode Selector Lever to LEARN; mode identification will be printed automatically and the green L light will be illuminated.

To enter this program, index as follows:

ENTRIES		PRINT-OUT
P()	01	
DS	2	
X→M	1	
X		
HALT		
=		
PRINT		
*M	1	
X		
HALT		
=		
PRINT		
★ P()		



*DOES NOT PRINT

Your program is now stored in the calculator and you should carefully check your print-out against the Program Form to ensure that all instructions have been entered correctly.

If you make an indexing error when entering your program:

A. The mistake is discovered immediately after the instruction step is entered but before the next instruction step is indexed. Simply depress the Clear key [C] and re-enter the instruction.

Note:

> In a multiple step instruction only the *last entered step* can be corrected this way.

B. The mistake is discovered later than (A) above. Please refer to the section on Changing a Program, page 31.

When you have carefully checked that all instructions in your program have been entered correctly, you should verify that your program works correctly.

Make a set of simple, relevant sample figures with end results to test your program.

EXAMPLE:

QUANTITY	SELLING PRICE	SALES VALUE	COST PRICE	COST VALUE
1	10.00	10.00	5.00	5.00
5.25	100.00	525.00	50.00	262.50

AUTO MODE

Now move the Mode Selector lever to the Auto position, depress the Program Select Key, Index Program Number, and index your test figures on the C 7200 using the Equals Key only [=]

The Auto Mode is the program execution mode in which you take full advantage of the capabilities of your C 7200. All operations are performed automatically and the calculator stops only at Halt instructions to enable you to index numbers with the Equals Key [=]

EXAMPLE:

Mode Selector: Auto

ENTRIES			PRINT-OUT
[P()] 01			·····AUTO·
			P01
1 [=]	10 [=]	5 [=]	1·=
			H
5.25 [=]	100 [=]	50 [=]	10·00=
			10·00◊
			H
			5·00=
			5·00◊
			P01
			5·25=
			H
			100·00=
			525·00◊
			H
			50·00=
			262·50◊
			P01

Check carefully that your precalculated test figures agree with those computed by your C 7200.

If they do not, ensure that you have programmed the correct decimal setting.

Should the decimal setting used be correct, you have a mistake in your program.

In analyzing a programming error, the detailed flow-chart, from which the Program Form is produced, should be used. Check carefully the logic and sequence of the flow-chart and compare it with your written program to ensure that no omissions have been made when transferring the logic of your flow-chart to machine instructions.

Your C 7200 can help you in this analysis; please refer to the sections on Debug Mode and Check Mode below.

DEBUG MODE

In the DEBUG MODE the calculator operates as in Auto Mode, stopping only at Halt instructions to enable keyboard input. The important difference is that printing occurs in Auto Mode only at Print and Halt instructions, while in the Debug Mode each individual instruction is printed with indexed and calculated data, helping you in analyzing each step of your program in detail.

The following example assumes that your program is stored in the calculator:

Mode Selector: DEBUG

ENTRIES	PRINT-OUT
P() 01	••••••••DEBG••
	P01
1 =	1•=
	1•→ 1
	1•00X
	H
10 =	10•00=
	10•00=
	10•00✲
	10•00◊
	1•✲ 1
	1•00X
	H
5 =	5•00=
	5•00=
	5•00✲
	5•00◊
	P01

CHECK MODE

In some programs in which long calculations are made, it may sometimes be desirable to interrupt the execution and printing of each individual result.

To do so, simply move the Mode Selector lever to a position other than DEBUG. The C 7200 will stop program execution immediately.

To start machine operation again move the Mode Selector lever to the desired position and continue.

The Check Mode is used when testing a program and when a print-out of all instructions in a program is desired.

To print the instructions in a program loaded in the calculator:

1. Set Mode Selector to CHECK.
2. Index the starting step number of the program on the Entry Keys with the Equals Key [=] .
3. Depress the Print Key [PRINT] .
4. Depress the Print Key [PRINT] .

The calculator will print all instructions, starting at the step number indexed on the keyboard. It will automatically stop printing when the first Program Select Key code is reached (indicating end of program).

Note:

> If you wish to interrupt the program print-out, hold the Paper Feed Key [↑ PAPER] down until printing is terminated.

The following example assumes that your program on page 26 is stored in the calculator:

Mode Selector: CHECK

ENTRIES	PRINT-OUT
1 [=]	CHECK••••••••
[PRINT]	1 P01
[PRINT]	4 D2
	6 → 1
	8 X
	9 H
	10 =
	11 P
	12 ✱ 1
	14 X
	15 H
	16 =
	17 P
	18 P H

The Check Mode is also used for checking a program.

A depression of the Equals Key [=] for each step will cause the step number and instruction to be printed, enabling sequential analysis of a program.

Note:

> To print a multiple step instruction it is necessary to depress the Equals Key as many times as there are steps in the instruction before printing occurs.

If just a section of a program is to be checked, you can instruct your C 7200 to bypass steps prior to the ones you want to check.

The following example assumes that your program on page 26 is stored in the calculator:

> Instructions starting at step No. 12 only need to be checked.

Mode Selector: CHECK

ENTRIES	PRINT-OUT
12 [=]	CHECK•••••••••
[=]	12 ÷ 1
[=]	14 X
[=]	15 H
[=]	16 =
[=]	17 P
[=]	18 P H
[=]	
[=]	

CHANGING INSTRUCTIONS

If one or several steps have to be changed to make a program work correctly, this may be done easily, without re-entering your entire program.

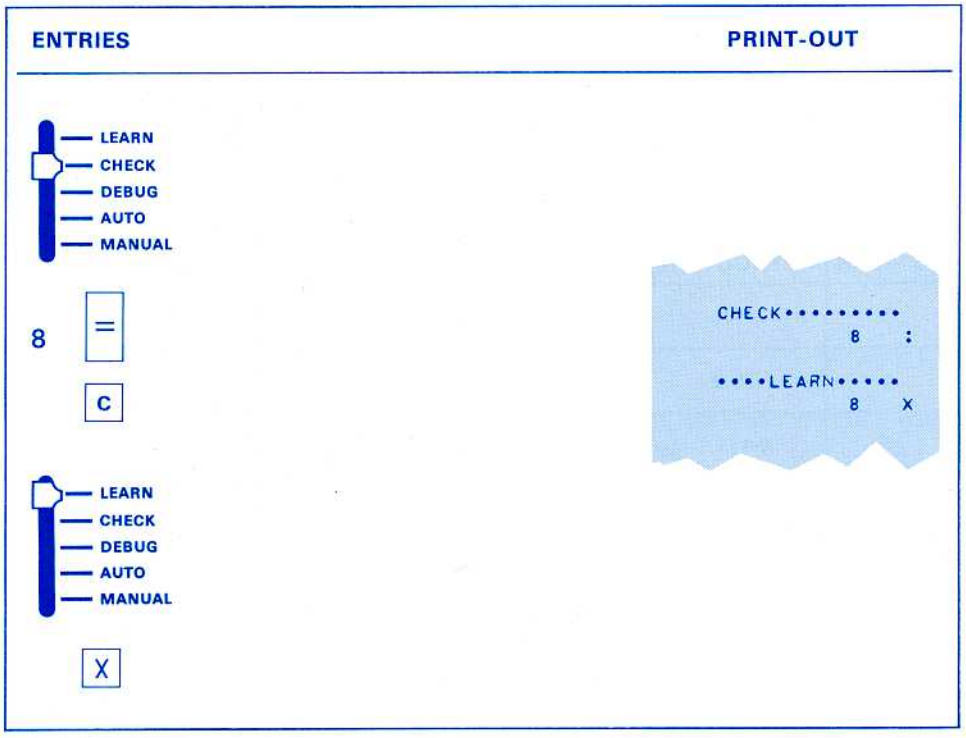
The following example assumes that a programming mistake was made in your previous program: in step 8 a division instruction was used instead of multiply; and that the following program is loaded in your calculator:

STEP NUMBER	PROGRAM INSTRUCTION	COMMENTS / SAMPLE ENTRY
1	P 01	START
4	DS 2	DECIMAL SETTING / INDEX QUANTITY
6	X→M 1	STORE QUANTITY
8	÷	
9	HALT	INDEX SELLING PRICE
10	=	SALES VALUE
11	PRINT	PRINT SALES VALUE
12	* M 1	QUANTITY
14	X	TIMES
15	HALT	INDEX COST PRICE
16	=	COST VALUE
17	PRINT	PRINT COST VALUE
18	P	END PROGRAM

To change this instruction, move the Mode Selector Lever to CHECK. In this mode, you can bypass instructions you do not want to change by indexing the step number of the incorrect instruction (8) with the Equals Key. Depress the Clear Key [C] once.

Now move the Mode Selector Lever to LEARN to enter the correct instruction into the Program Storage Memory. Just depress the Multiply Key and you have corrected the programming mistake.

The following example assumes that the program on page 31 is loaded in the machine:



When steps are changed in a program you should always change the entire instruction; i.e., if the instruction to be changed is a multiple step instruction, change all steps of it even if some of them are correct. This will give you a proper print-out of all instructions changed.

Do not forget to change the Program Coding Form so that it reflects the current contents of your program.

You should also print-out the contents of the program immediately after a program change. For further details please refer to Check Mode, page 29.

INSERTING INSTRUCTIONS

If you have forgotten to program some instructions on the Program Coding Form, or if you have omitted to index one or several instructions when entering your program into the Program Storage Memory, this can also easily be corrected without re-entering the entire program.

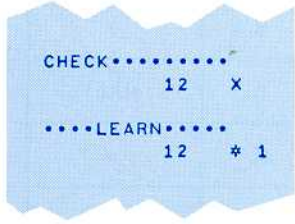
This example assumes that steps 12 and 13 were omitted in the previous program and that the following program is loaded in your calculator:

STEP NUMBER	PROGRAM INSTRUCTION	COMMENTS SAMPLE ENTRY
1	P 01	START
4	DS 2	DECIMAL SETTING INDEX QUANTITY
6	X→M 1	STORE QUANTITY
8	X	TIMES
9	HALT	INDEX SELLING PRICE
10	=	SALES VALUE
11	PRINT	PRINT SALES VALUE
12	X	TIMES
13	HALT	INDEX COST PRICE
14	=	COST VALUE
15	PRINT	PRINT COST VALUE
16	P	END PROGRAM

To make your program work correctly, you obviously have to insert steps 12 and 13, [*M] and 1 respectively.

Move the Mode Selector Lever to CHECK. Index the first step number, 12, where you wish to insert the above instructions, with the Equals Key. Depress the Clear Key twice, which in the Check Mode enables insertion of additional instructions, and move the Mode Selector Lever to LEARN. Now enter the omitted steps [*M] and 1.

EXAMPLE:

ENTRIES	PRINT-OUT
	
12 [=]	
[C] [C]	
	
[*M] 1	

The C 7200 has now automatically relocated the Program Memory Area for you in the following manner:

Contents of memory before insertion:

STEP NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
INSTRUCTION	P	0	I	DS	2	X→M	1	X	H	=	PRINT	X	H	=	PRINT	P

Instructions to be inserted: *M 1

Contents of memory after insertion:

STEP NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
INS.	P	0	I	DS	2	X→M	1	X	H	=	PRINT	*M	1	X	H	=	PRINT	P

Any number of steps can be inserted as described above, providing you do not exceed the total capacity of your Program Memory Area.

After you have inserted instructions in a program, ensure that the Program Coding Form is corrected to reflect the contents of your program. You should also print-out the contents of your program immediately after a program change. For further details, please refer to Check Mode, page 29.

DELETING INSTRUCTIONS

For information regarding removal of instructions please refer to the section on Patching a Program, page 52.

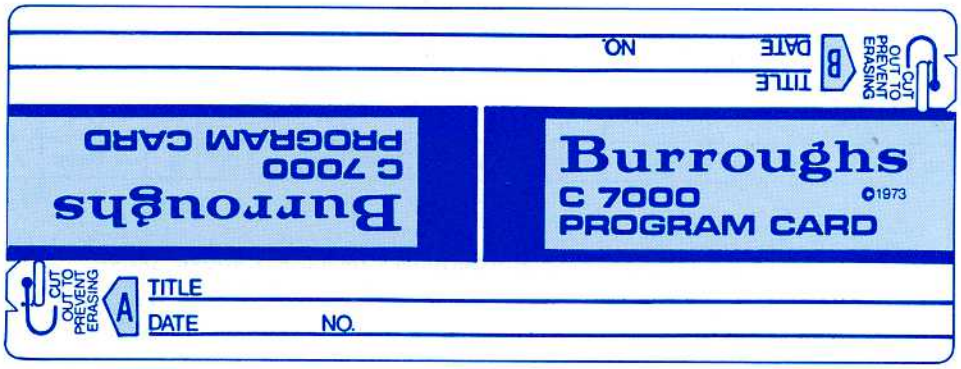
RECORDING PROGRAMS ON MAGNETIC CARDS C 7200

When your program is functioning properly, you should record it on a Magnetic Card. This will enable you to load the program into your calculator quickly and easily next time you want to use it.

An initial supply of Magnetic Cards is packed with each C 7200. For information on how to order additional cards, please refer to Introduction, page 4.

Each card is packed in an envelope to protect it from damage, and it is recommended that you always store your program card in the envelope. The magnetic card has one A-part and one B-part. Each part stores 204 steps.

Space is provided on the envelope and card for you to identify each program with date, program number and title.



RECORD KEY

Recording of programs always takes place in CHECK Mode. This enables you to start recording from any step in the Program Memory Area.

The following example assumes that the program example is stored in the Program Memory Area:

ENTRIES

A. 

B. Enter the Magnetic Card in the reader with the arrow for the part you wish to record on (A or B) pointing into the calculator and the printed side of the card upwards.

C. RECORD

The program card is fed into the machine and the program is recorded. Your program is still stored in the calculator.

Note:

> If recording is to begin at a step number other than 1, after moving the Mode Selector to CHECK: Index the desired step number, *less 1,* and depress the Equals Key. Continue from B above.

As you will be using the program recorded on the magnetic card many times in the future, it is essential to ensure that it has been encoded correctly. To enable you to check the encoding, your C 7200 has been provided with a VERIFY routine.

VERIFY KEY

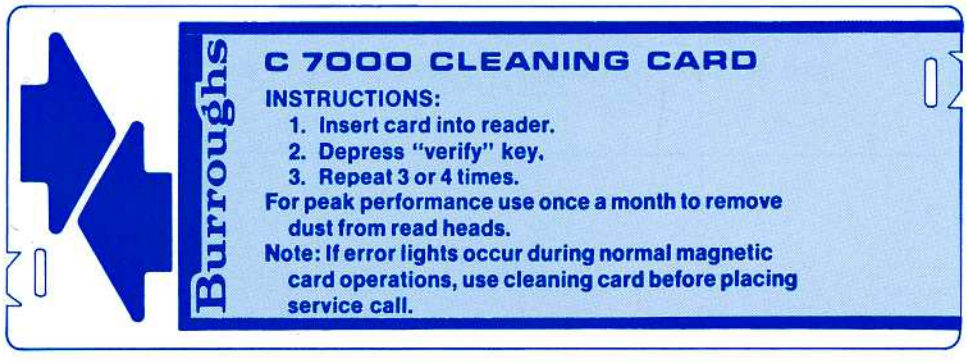
To verify the contents of the magnetic card, insert it again, after recording as described above, and depress the Verify Key [VERIFY].

Your C 7200 will now compare the encoding of the card with the contents of the Program Memory Area, starting automatically at the step where recording commenced.

If the Error lamp illuminates during the verify routine, your calculator has discovered that the contents of the program card and the Program Storage Area do not agree.

Depress the Clear Key [C], re-record the program onto the magnetic card as described on page 36 and verify the card again.

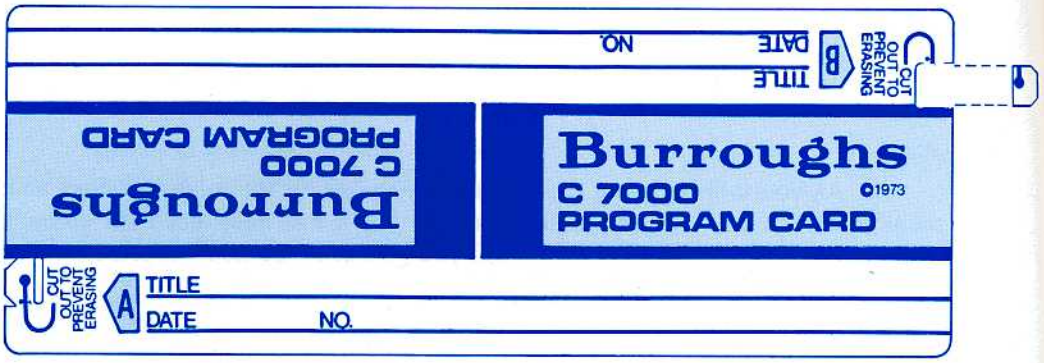
If the Error Lamp illuminates again, use the Cleaning Card supplied with your calculator to clean the read/write heads for improved encoding and reading of magnetic cards:



PROTECTING RECORDED MAGNETIC CARDS C7200

The magnetic cards can be used over and over again for new programs, since the previous contents of a card are destroyed when you record on it.

Should you desire the contents of either part of a magnetic card (A or B) to be protected so that no further encoding can be made on that part of the card, simply cut the relevant section as illustrated :



ENTER KEY

Program Loading from magnetic cards always takes place in CHECK Mode. This allows you to enter a program starting at any step in the Program Memory Area.

The following example assumes that the previous program is stored on a magnetic card:

ENTRIES

A. 

B. Enter the magnetic card in the reader with the arrow of the selected part of the card (A or B) pointing into the calculator and the printed side of the card upwards.

C. ENTER

D. Reinsert card

E. VERIFY

You have now loaded your program in the C 7200.

Note:

If loading is to begin at a step number other than 1, after moving the Mode Selector to CHECK: Index the desired step number, *less 1,* and depress the Equals Key. Continue from B above.

If your C 7200 has the increased Program Memory Area of 408 or 816 steps and your program is so large that you have to store it on two or more magnetic cards, you must ensure that you index the starting step for each magnetic card correctly with the Equals Key.

The following example assumes that a 408 step program, recorded on 2 parts of a magnetic card, is to be loaded:

ENTRIES

A. 

B. Enter the part of the magnetic card which contains the first 204 steps of your program in the reader.

C. [ENTER]

D. Reinsert the card

E. [VERIFY]

F. Index the starting step of the second part of your magnetic card, 205, *minus 1,* and depress the Equals Key:
204 [=]

G. Enter the part of the magnetic card which contains the remaining steps of your program into the reader.

H. [ENTER]

I. Reinsert card

J. [VERIFY]

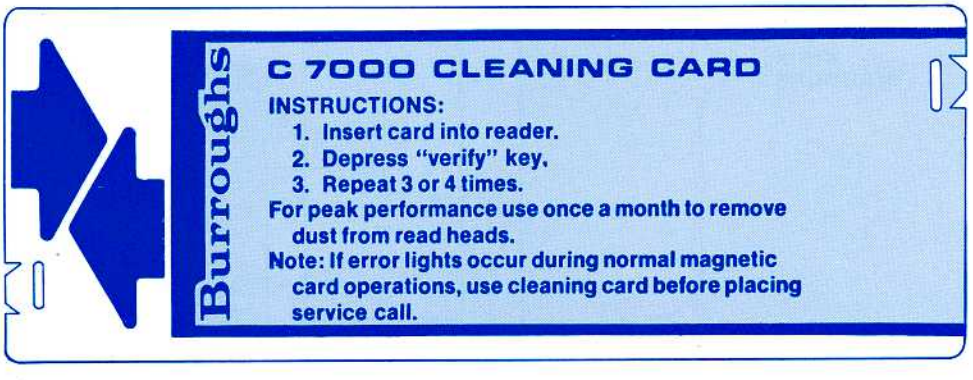
In many applications it is desirable to record data on magnetic cards so that your calculator can later read the data into the Data Storage Memories for further calculations. Payroll routines with earnings and tax withheld year to date stored on one magnetic card per employee is an example of this use.

When you are at a Halt instruction in Auto or Debug mode, insert a magnetic card into the reader and press the Record Key [RECORD]. The contents of all Data Storage Memories are now written onto the card.

After writing the data onto the card, you can verify that it has been properly encoded by reinserting the card and pressing the Verify Key [VERIFY] and the Total Memory Key [*M]. The calculator will now check whether the contents of the magnetic card agree with what is stored in the Data Storage Memories.

If the Error Lamp illuminates, you should re-record the card and verify it again.

If the Error Lamp illuminates again, use the Cleaning Card supplied with your calculator to clean the read/write heads for improved encoding and reading of magnetic cards:



READING DATA FROM MAGNETIC CARDS C7200

At a Halt instruction in Auto or Debug mode, all information read into your calculator is considered as data and is automatically stored in the Data Storage Memories.

Insert the magnetic card into the reader and depress the Enter Key [ENTER] and a label :

A. Total Memory Key [*M] . The contents of all Storage Memories are automatically cleared and then the data stored in the card is transferred to memories 0-15.

B. Subtotal Memory Key [-M] . The contents of memories 0-4 are automatically cleared and then data stored in the card is transferred to memories 0-4.

This label enables you to retain accumulations in memories 5-15 while reading in data from magnetic cards.

C. Memory Label 0-9 [.] [+/-] [+] [−] [X] [÷]. (For further information about the labels please refer to page 11.)

The contents of the selected memory are cleared and data stored in the card is transferred to the memory addressed.

C 7200 SUBROUTINES

SUBROUTINE KEY

R( )

Your C 7200 has subroutine capability. A subroutine is a sequence of program steps which is used many times in a program, but is stored in the Program Area Memory only once.

You may cause your calculator to branch to a subroutine at any point in a program by inserting the instruction Subroutine R( ) and a label, 00-99.

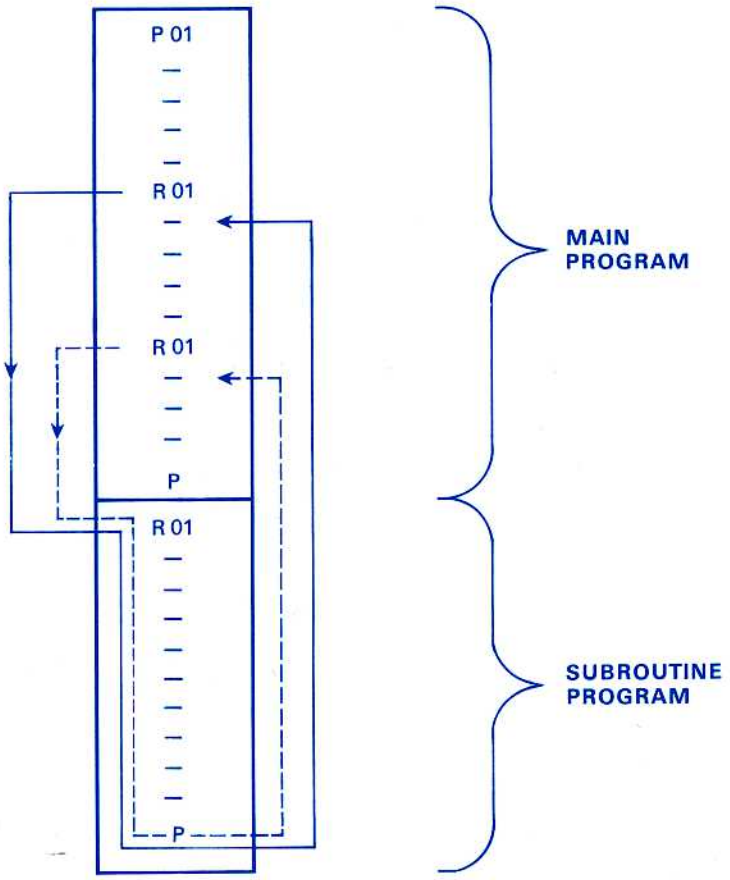
When the subroutine is completed the calculator automatically returns to the program step following the step from which you "called" the subroutine.

The actual subroutine program always begins with the instructions:

1. P( )
2. R( )
3. Label 00-99

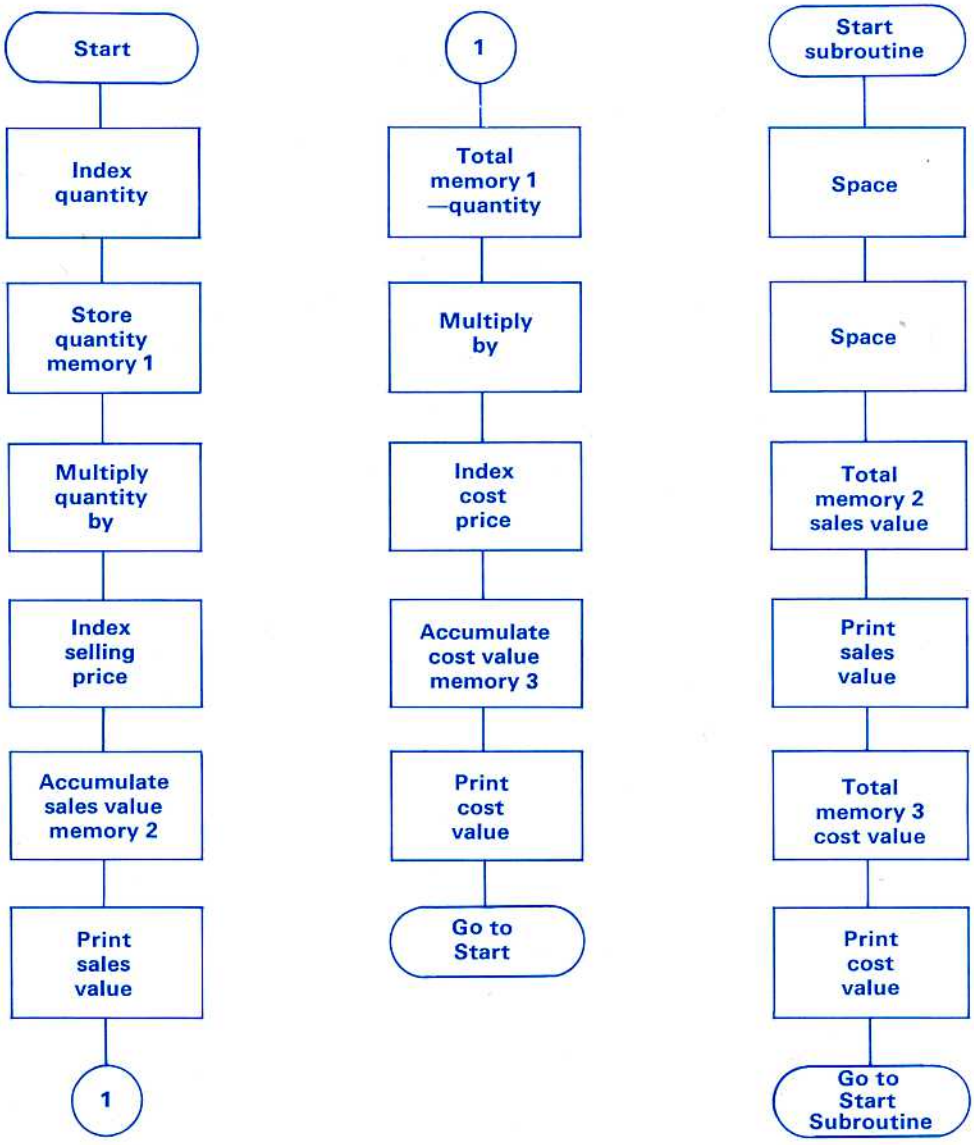
The Program Select Key instruction P( ) above can serve to both end a program and start a subroutine.

EXAMPLE:



You can also select a subroutine manually by depressing the Subroutine key [R()] and label 00-99, both in AUTO and MANUAL modes.

An example of this use of the subroutine function is the printing of totals accumulated in a program. Assuming that you wish to print totals of calculated sales and cost values at the end of the run of your earlier program, your detailed flow-chart would look as follows:



Note:

1. When you select a Subroutine Program in Auto mode by depressing the Subroutine Key plus label, the calculator executes the Subroutine and *returns to the first step of your Subroutine*. To start operation of your Main Program after a manually selected Subroutine Program execution, depress the Program Select Key [P( )] and a label.

2. When you are at a Halt instruction in a program and select a Subroutine Program (or *another* Main Program), the calculator *executes the subroutine (or program) selected, then returns to the step following the Halt instruction and continues execution.*

3. When you select a Subroutine or a Main Program in the Manual mode, the calculator *returns to the Manual mode after program execution.*

The programming steps to solve this application are:

STEP NUMBER	PROGRAM INSTRUCTION	COMMENTS SAMPLE ENTRY
1	P 01	START PROGRAM
4	DS 2	DECIMAL SETTING INDEX QUANTITY
6	X→M 1	STORE QUANTITY IN MEMORY 1
8	X	TIMES
9	HALT	INDEX SELLING PRICE
10	+M 2	ACCUMULATE SALES VALUE
12	PRINT	PRINT SALES VALUE
13	*M 1	QUANTITY
15	X	TIMES
16	HALT	INDEX COST
17	+M 3	ACCUMULATE COST VALUE
19	PRINT	PRINT COST VALUE
20	P	END MAIN PROGRAM
21	R 01	START SUBROUTINE
24	PAPER	PAPER SPACE
25	PAPER	PAPER SPACE
26	*M 2	
28	PRINT	PRINT TOTAL SALES VALUE
29	*M 3	
31	PRINT	PRINT TOTAL COST VALUE
32	P	END SUBROUTINE

To enter this program into your C 7200, move the Mode Selector Lever to LEARN and index as follows:

ENTRIES		PRINT-OUT
P( ) 01		••••LEARN•••••
DS 2		1 P01
X→M 1		4 D2
X		6 → 1
HALT		8 X
+M 2		9 H
PRINT		10 + 2
*M 1		12 P
X		13 ✲ 1
HALT		15 X
+M 3		16 H
PRINT		17 + 3
P( )		19 P
R( ) 01		20 S01
↑ PAPER		24
↑ PAPER		25
*M 2		26 ✲ 2
PRINT		28 P
*M 3		29 ✲ 3
PRINT		31 P
★ P( )		

*DOES NOT PRINT

When you depress the Subroutine Key plus label at the very beginning of your program and depress the Equals Key, the C 7200 will automatically space twice and then print the accumulated totals of sales and cost value from memories 2 and 3.

After execution of the Subroutine Program the calculator returns to the first step of the Subroutine. To start execution of your Main Program index: P( ) 01.

TESTING AND BRANCHING TECHNIQUES C 7200

You can instruct your C 7200 to make automatic decisions. The decisions are always based on the content of the x-register and the calculator can determine whether it is:

a. non-clear
b. positive
c. negative

JUMP KEY

The above testing possibilities are combined with JUMP instructions so that you can program your calculator to depart from the normal step by step execution and go to a selected point in the program if one of the above conditions is met.

The following instructions are available for automatic decision making:

	INSTRUCTION		RESULT
a.	JUMP 0	and label 1-9	Jumps out of your program if the x-register is non-clear
b.	JUMP +	and label 1-9	Jumps out of your program if the x-register is positive
c.	JUMP −	and label 1-9	Jumps out of your program if the x-register is negative

In any one program you can use 27 test commands, since there are nine labels (1-9) available for each type of test.

END KEY

When the calculator jumps out of the program it ignores all steps until it finds an End jump instruction [END] and test identification (0, [+] or [−]) and label (1-9) matching that which initiated the jump.

In addition to the above Jump instructions which test the arithmetic status of the x-register, you have an unconditional Jump instruction available:

JUMP and label 1-9

This instruction branches out of the program regardless of the contents of the x-register and ignores all steps until it finds the equivalent End Jump instruction:

END and label 1-9

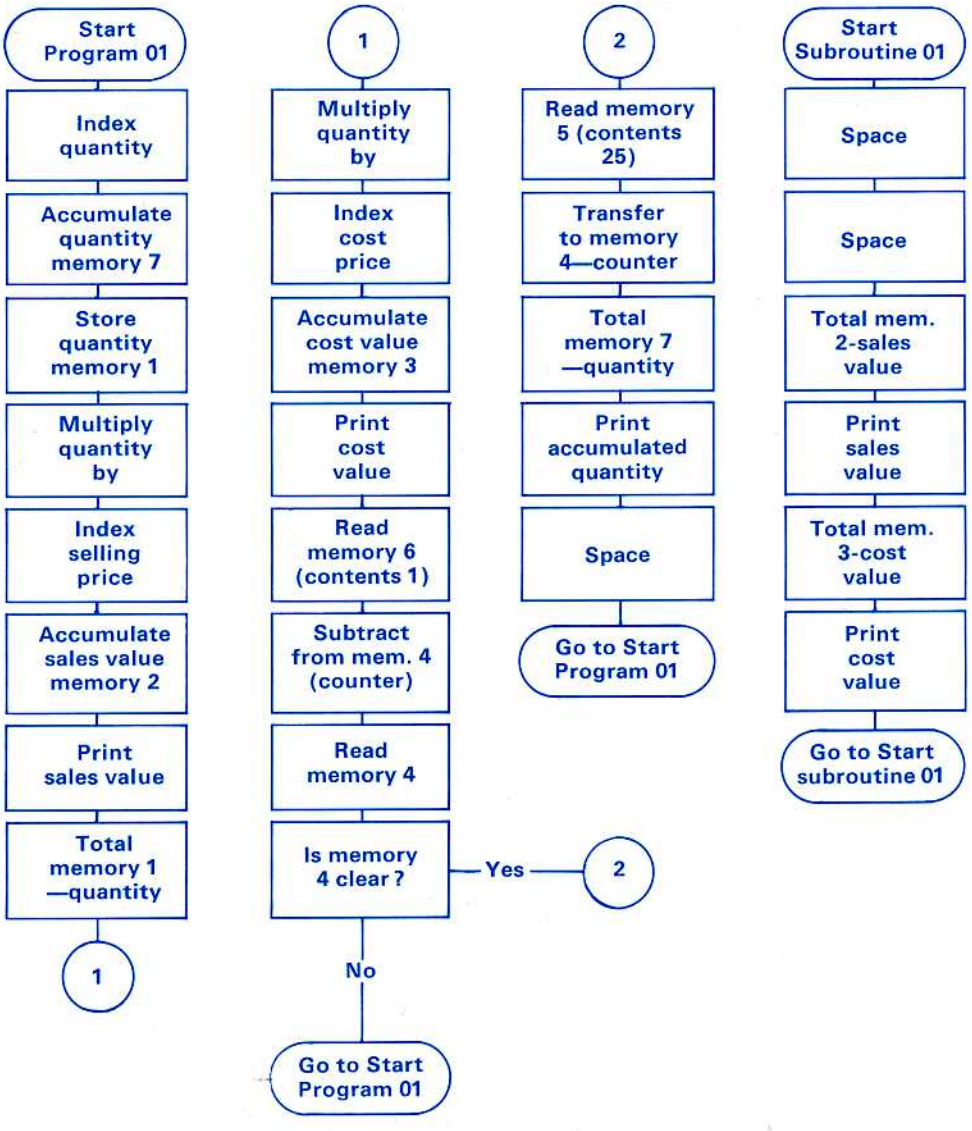
COUNTERS

When you want to execute a program or a part of a program a predetermined number of times, load one of the Data Storage Memories with that number. Each time the program is executed deduct 1 from the memory and test whether you have reached the predetermined level or not.

In the previous application exercise, assume you want the quantities accumulated and that you want a total of the quantities printed automatically after every 25 lines for proof purposes.

At the beginning of the routine load 25 into memories four and five and 1 into memory six.

Your detailed flow chart for this application would appear as follows:



Your programming form would be as follows:

STEP NUMBER	PROGRAM INSTRUCTION	COMMENTS SAMPLE ENTRY
1	P 01	START PROGRAM
4	DS 2	DECIMAL SETTING INDEX QUANTITY
6	+M 7	ACCUMULATE QUANTITY
8	X→M 1	STORE QUANTITY
10	X	
11	HALT	INDEX SELLING PRICE
12	+M 2	ACCUMULATE SALES VALUE
14	PRINT	PRINT SALES VALUE
15	*M 1	
17	X	
18	HALT	INDEX COST PRICE
19	+M 3	ACCUMULATE COST VALUE
21	PRINT	PRINT COST VALUE
22	<> M 6	READ CONSTANT (1)
24	+/−	CHANGE SIGN OF CONSTANT
25	+M 4	SUBTRACT FROM COUNTER MEMORY
27	<> M 4	
29	JUMP 0 1	TEST IF COUNTER IS NON-CLEAR
32	<> M 5	READ CONSTANT (25)

STEP NUMBER	PROGRAM INSTRUCTION	COMMENTS SAMPLE ENTRY
34	X→M 4	TRANSFER CONSTANT TO MEM. 4
36	*M 7	TOTAL ACCUMULATED QUANTITY
38	PRINT	
39	PAPER	SPACE ONE LINE
40	END 0 1	
43	PR 01	SUBROUTINE FOR TOTALS
47	PAPER	SPACE ONE LINE
48	PAPER	SPACE ONE LINE
49	*M 2	'TOTAL ACCUMULATED SALES VALUE
51	PRINT	
52	*M 3	TOTAL ACCUMULATED COST VALUE
54	PRINT	
55	P	

Testing if 25 times have been calculated takes place automatically on each line. When the C 7200 recognizes that you have entered 25 lines it automatically prints the total of the accumulated quantity and spaces. The calculator automatically reloads 25 in the counter memory, 4, so that the C 7200 will be able to print a new total after the next 25 lines.

CONSTANTS

Constants are normally stored in the Data Storage Memories and are loaded by a magnetic card at the beginning of a run.

If the application requires many Data Storage Memories you can save memories by storing constants in the Program Storage Area. Each digit of the constant and the decimal point require one step.

The following example assumes that the content of the X-register is to be multiplied by a factor of 112.768:

STEP	INSTRUCTION	COMMENTS
1	P 01	
4	[X]	
5	1	CONSTANT
6	1	
7	2	
8	[.]	
9	7	
10	6	
11	8	
12	[=]	

PATCHING A PROGRAM

Testing a program and changing incorrect instructions are described in sections DEBUG and CHECK modes and CHANGING A PROGRAM.

Sometimes it is necessary to eliminate one or more steps to make a program function correctly. If the program is long, you should "patch" it, a method which eliminates re-entering the steps in your program.

Patching is possible on the C 7200, because when a magnetic card is read into the calculator, the previous contents of the memory are cleared and replaced by information from the magnetic card.

The following example assumes that you have a 180 step program in your C 7200, and that you have to remove steps 11, 12, 13 and 14 to make the program work properly.

EXAMPLE:

Step No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	177	178	179	180
Instruction	P	0	I	X	X→M	I	X	H	=	PR	*M	1	X	÷	*M	H	=	PR	P

You need to eliminate steps 11, 12, 13 and 14 and to move step 15 and all subsequent instructions four steps forward. The procedure is as follows:

ENTRIES

First load steps 15-180 onto a new "carrier" magnetic card.

A. 

B. 14 [=]

C. Enter a magnetic card into reader

D. [RECORD]

You have now recorded steps 15-180 on a magnetic card. To ensure that your recording is correct you should verify the encoding:

E. Re-enter the magnetic card into reader

F. [VERIFY]

Steps 15-180 of your program are now recorded on the magnetic card and you have ensured that the encoding of the card is correct.

The contents of the "carrier" card (steps 15-180) are now transferred to the Program Area Memory starting at step 11, overlaying the previous steps stored.

G. 10 [=]

H. Enter the magnetic card containing steps 15-180 into the reader.

I. [ENTER]

By simply loading the contents of this card into the Program Area Memory *starting at step 11* you have achieved what you wanted to do, and eliminated the previous steps 11, 12, 13 and 14 of your program.

Since you now have moved steps 15-180 four steps forward your program actually ends at step 176. Do not forget to change your program documentation to reflect a program change and to record your modified program on a new magnetic card after patching a program.

EXCHANGE KEY

The computing unit, briefly described earlier on page 10 actually consists of two registers, X and Y.

A proper understanding of the functions of these registers will enable you to save programming steps when writing complex programs and to make full use of your calculator.

X-Register

The C 7200 prints from the X-register. Numbers printed are generated from one of the following:

1. A keyboard entry
2. A result of an addition or subtraction
3. A result of a multiplication or division
4. Contents of one of the Data Storage Memories when subtotalled or totalled.

Y-Register

The Y-register contains:

1. The last figure entered after a result of an addition or subtraction.
2. The total to date after indexing a number on the keyboard in addition or subtraction prior to depression of an operation control key.
3. The first factor after the result of a multiplication.
4. The second factor after the result of a division.
5. After subtotalling or totalling one of the Data Storage Memories, the above rules apply.

EXAMPLE:

	OPERATION	X-REGISTER	Y-REGISTER
	10	10	0
ADD	+	10	10
	9	9	10
	+	9	19
and			
	8	8	19
SUBTRACT	−	8	27
	7	7	27
	=	20	7
	6	6	7
MULTIPLY	×	6	6
	5	5	6
	=	30	6
	6	6	6
DIVIDE	÷	6	6
	2	2	6
	=	3	2

The Exchange Key is used to switch the contents of the X and Y registers to save programming steps and memories.

EXAMPLE:

Mode Selector: MANUAL

Decimal Selector: 2

PROBLEM	ENTRIES	PRINT-OUT
$\frac{24}{2+10} = ?$	2 [+] 10 [=] [÷] 24 [X⇄Y] [=]	•••••MAN•••••• D2 2•00+ 10•00= 12•00* 12•00: 12•00XY 12•00= 2•00*

Contents of the X and Y register in the above example:

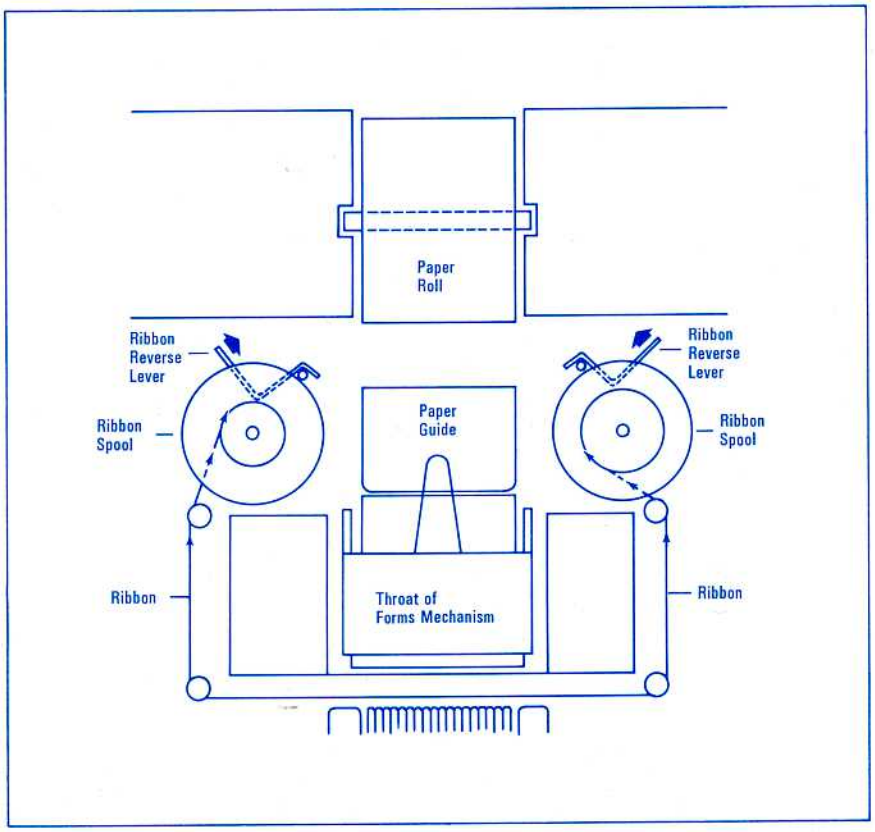
ENTRIES	X	Y
2	2	0
+	2	2
10	10	2
=	12	10
÷	12	12
24	24	12
x⇄y	12	24
=	2	12

PAPER ROLL REPLACEMENT

1. Remove ribbon cover.
2. Tear or cut paper roll from old spool.
3. Press paper feed key to eject old paper roll.
4. Insert shaft into new paper roll and place tips of shaft into slots of holder with the paper feeding from the bottom of the roll.
5. Feed paper supply over black paper guide and into throat of forms mechanism.
6. Press paper feed key to grip paper slightly.
7. Replace ribbon cover.
8. Press paper feed key to feed paper roll under tear-off blade.

RIBBON REPLACEMENT

1. Switch the C 7200 off.
2. Remove ribbon cover.
3. Lift ribbon spools vertically after first pulling back ribbon reverse levers.
4. Install new ribbon spools with the red portion of the ribbon at the bottom. See diagram.
5. Check that all slack is taken up by manually winding one spool if necessary.
6. Replace ribbon cover, taking care to insert paper tape under the transparent tear-off blade.



PROGRAM INSTRUCTION PRINT-OUT TABLE

C 7200

The following table illustrates the paper tape print-out of instructions loaded into your calculator through the keyboard in Learn mode or printed out from the Program Storage Memory in Check mode.

KEY		NOTES	PRINT-OUT
+			+
−			−
X			X
÷			:
=			=
*M	1	Requires label.*	* 1
◇M	1	Requires label.*	◇ 1
+M	1	Requires label.*	+ 1
X→M	1	Requires label.*	→ 1
CM	0	Requires label.*	C 0
DS	2	Requires label 0-9 or decimal point key [.] for floating decimal.	D 2
+/−			(-)
P( )	01	Requires label 00-99.	P 0 1

KEY			NOTES	PRINT-OUT
HALT				H
PRINT				P
PAPER			No print on paper tape.	
R( )	01		Requires label 00-99. In a main program, this instruction causes a branch to the subroutine program with the same label.	JS01
P( )	R( )	01	Requires label 00-99. Starts an actual subroutine program.	S01
JUMP	0	1	Requires label 1-9.	JC1
JUMP	+	1	Requires label 1-9.	J+1
JUMP	−	1	Requires label 1-9.	J−1
END	0	1	Requires label 1-9.	EJC1
END	+	1	Requires label 1-9.	EJ+1
END	−	1	Requires label 1-9.	EJ−1
X⇄Y				XY

*MEMORY SELECTION LABELS

MEMORY	LABEL	MEMORY	LABEL	MEMORY	LABEL
0	0	8	8	12	+
1	1				
2	2	9	9	13	−
3	3				
4	4	10	.	14	X
5	5				
6	6	11	+/−	15	÷
7	7				

APPENDIX C7200

COMMAND	KEY	FUNCTION
Plus	+	Addition
Minus	−	Subtraction
Multiply	X	Multiplication
Divide	÷	Division
Equals	=	Gives final result of a calculation
Clear (*not programmable*)	C	a. After a keyboard entry, but before depression of any operation control key: clears the computing unit. b. After a depression of the multiply or divide keys: clears the computing unit *and* the computing mode.
Total Memory	*M	The Total Memory Key and label reads and clears selected memory.*
Subtotal Memory	◇M	The Subtotal Memory Key and label reads selected memory.*
Plus Memory	+M	The Plus Memory Key and label adds contents of the X-register to selected memory.*
Transfer	X→M	The Transfer Key and label transfers contents of the X-register to selected memory,* with sign. Previous contents of the selected memory are automatically cleared before transfer.
Clear Memory	CM	a. The Clear Memory Key and label clears memories starting from 15 and down to and including selected memory.* b. The Total Memory Key, followed by the Clear Memory Key, prints and clears memories 0-11. (*not programmable*) c. The Subtotal Memory Key, followed by the Clear Memory Key, prints memories 0-11 without clearing. (*not programmable*)
Decimal Selection	DS	a. The Decimal Selection Key, followed by a label 0-9, will round final results to decimal setting. b. The Decimal Selection Key, followed by the Decimal Point Key, will set floating mode.

COMMAND	KEY	FUNCTION
Change Sign	[+/−]	Changes the sign of the X-register.
Program Selection	[P( )]	The Program Selection Key followed by a label 00-99 is used to start a program, and without a label to end a program.
Halt	[HALT]	Stops program execution to allow for keyboard entry.
Print	[PRINT]	Prints the contents of the X-register
Feed	[↑ PAPER]	Feeds paper 1/6" with each depression. Can also be held down in Manual mode for continuous feeding.
Subroutine	[R( )]	a. The Program Selection Key followed by the Subroutine Key and label 00-99, starts an actual subroutine program. b. The Subroutine Key and a label 00-99 in a main program, causes a branch to the subroutine program with the same label.
Jump	[JUMP]	a. The Jump Key followed by a label 1-9 causes an unconditional branch to an End Jump instruction with the same label (see End Jump below). b. There are three conditional Jump Key commands, which will cause branching to an equivalent End Jump instruction if the X-register is non-clear, positive or negative. The commands are: 1. Branch if non-clear: [JUMP] 0 and label 1-9 2. Branch if positive: [JUMP] [+] and label 1-9 3. Branch if negative: [JUMP] [−] and label 1-9
End Jump	[END]	a. The End Jump Key followed by a label 1-9 terminates an unconditional branch (see Jump a. above). b. There are three End Jump instructions to terminate the equivalent conditional branches as described in Jump b. above. They are: 1. [END] 0 and label 1-9 2. [END] [+] and label 1-9 3. [END] [−] and label 1-9
Record (*not programmable*)	[RECORD]	Encodes, on a magnetic card, information from: a. Program Storage Memory when in Check mode. b. Data Storage Memories in Manual Mode or on a Halt instruction in Auto or Debug Modes.
Verify (*not programmable*)	[VERIFY]	Verifies contents of a magnetic card against: a. Contents of the Program Storage Memory in Check mode. b. Contents of the Data Storage Memory in Manual mode or on a Halt instruction in Auto or Debug modes. Operation: [VERIFY] [*M]

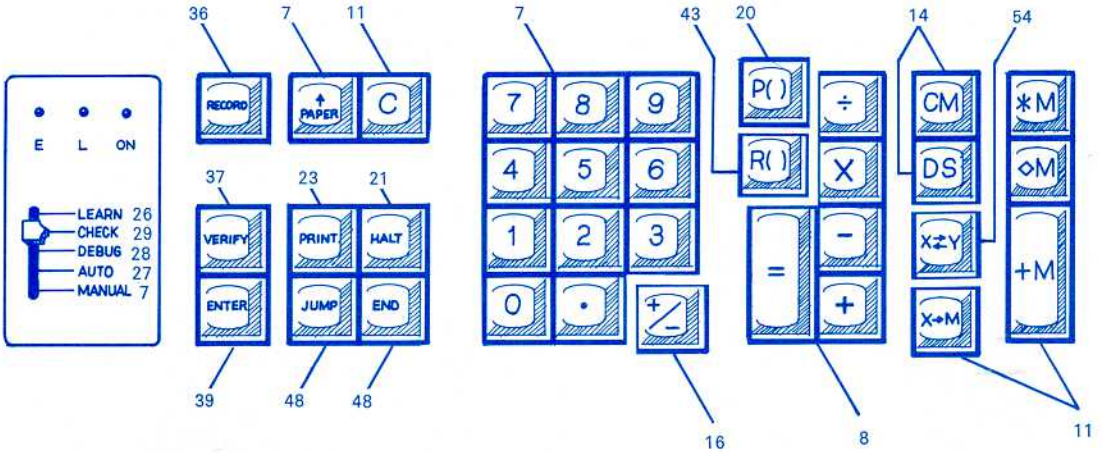
COMMAND	KEY	FUNCTION
Enter (*not programmable*)	[ENTER]	Enters information from a magnetic card to: a. The Program Storage Memory in Check mode. b. The Data Storage Memories in Manual mode and on a Halt instruction in Auto and Debug modes. Operation: 1. [ENTER] [*M] transfers data to memories 0-15. 2. [ENTER] [<>M] transfers data to memories 0-4. 3. [ENTER] plus memory label* transfers data to selected memory only.
Exchange	[X⇄Y]	Exchanges contents of the X and Y registers.

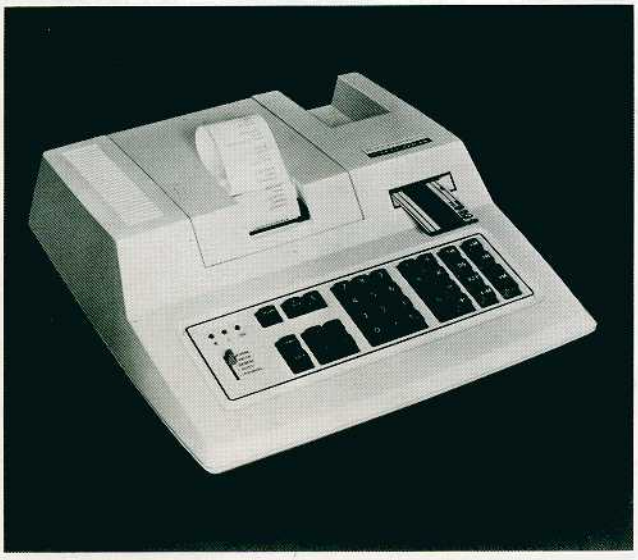
* *Memory selection labels:*

MEMORY	LABEL
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	[.]
11	[+/−]
12	[+]
13	[−]
14	[X]
15	[÷]

KEYBOARD ILLUSTRATION: SERIES C 7200 PRINTING PROGRAMMABLE CALCULATOR.

KEYBOARD REFERENCE CHART: NUMBERS REFER TO THOSE PAGES WHERE MORE DETAILED INFORMATION CONCERNING KEY FUNCTIONS MAY BE FOUND.





The C 7200 Series is designed, manufactured, and serviced by Burroughs. We also produce a complete high quality range of printing, display, and pre-programmed office electronic calculators.

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