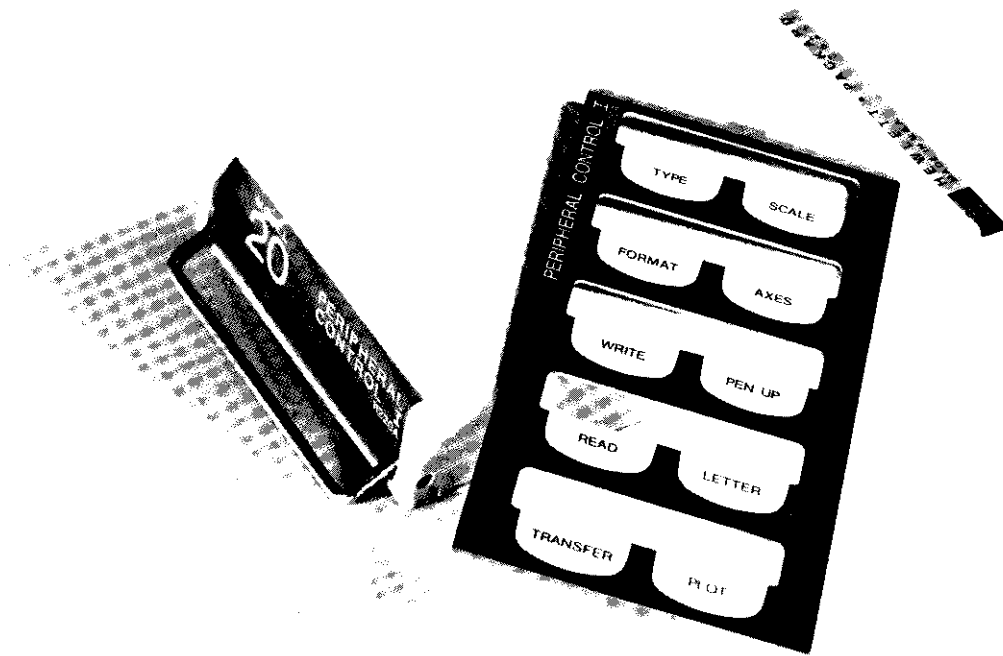


TECHNICAL DATA DECEMBER 1972



The Peripheral Control I Block provides general purpose control of most peripherals for the Model 20 Calculator, and features an especially powerful control of the Model 9861A Typewriter and the Model 9862A Option 20 Plotter.

This block is divided into three groups: the plotter group, the typewriter group, and the systems group.

PLOTTER GROUP

The plotter group is composed of the five right-hand keys.



SCALE, SCL scales the plotter area in user units, such as dollars, feet, or meters. This eliminates manual conversions and simplifies specification of X, Y coordinates.



AXE enables the plotter to quickly draw X and Y axes with optional tic marks.



PEN UP, PEN lifts the pen from the plotting surface.



SPACE, PLT works in one of three ways. It causes the plotter pen to move to specified X, Y coordinates and lower, or if the pen is already down, to draw a straight line from its starting position to the specified coordinates; to plot a message contained in quotations; or to plot the result of an arithmetic expression.



LETTER, LTR allows you to specify the starting coordinates, size, and plotting direction for an alphanumeric message.

Figures 1 and 2 show a program and the resulting plot of $\sin x/x$, using the Model 20 Calculator and Model 9862A Option 20 Plotter with the Peripheral Control I and the Math block.

```

0:
SCL -4π,4π,-.3,1
↑
1:
RXE 0,0,π/2,.1↑
2:
-4π+X;TBL 2↑
3:
PLT X,SIN X/X↑
4:
X+π/16+X;IF X>4π
;JMP 2↑
5:
JMP -2↑
6:
PEN ;LTR π/2,.8,
321↑
7:
PLT "PLOT OF SIN
X/X"↑
8:
END ↑

```

FIG. 1 PROGRAM TO PLOT SIN X/X

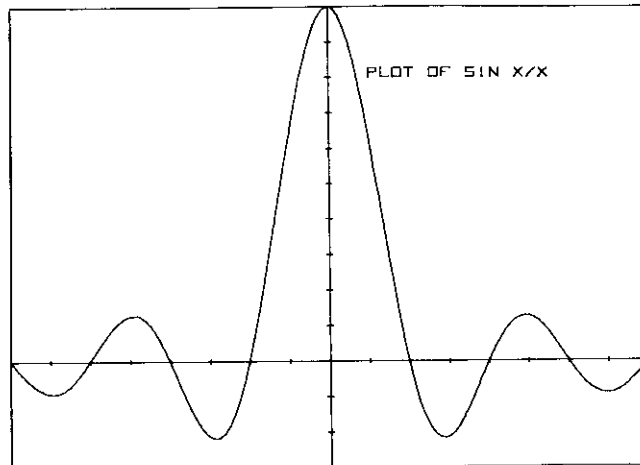


FIG. 2 PLOT OF SIN X/X

TYPEWRITER GROUP

The Peripheral Control I Block's typewriter group enables the Model 9861A Typewriter to print out complete alphanumeric tables and forms. Examples are shown in Figs. 3 and 4.



, TYP by itself provides a simple four-column output, (Fig. 3) so you do not have to include formatting specifications in your program.

This is free-field formatting. It is easy to use, with only three rules to remember:

1. The existing FIXED N, FLOAT N settings determine the numerical format.
2. Four 18-character columns are available in each line.
3. Columns are right-justified; any extra spaces appear at the left.

SIN X/X VALUES

NO.	X	SIN X/X
1.000	-12.566	0.000
2.000	-11.781	-.060
3.000	-10.996	-.091
4.000	-10.210	-.069
5.000	-9.425	0.000
6.000	-8.639	.082
7.000	-7.854	.127
8.000	-7.069	.100
9.000	-6.283	0.000
10.000	-5.498	-.129
11.000	-4.712	-.212
12.000	-3.927	-.180
13.000	-3.142	0.000
14.000	-2.356	.300

FIG. 3 EXAMPLE OF FREE-FIELD FORMATTING



FMT, used in conjunction with TYP,

makes available the typewriter's complete formatting capability. Formatting statements may include conversion specifications and/or editing specifications, as explained below, followed by instructions to the typewriter or other peripheral. Here is a sample line and the resulting type-written output:

```

LINE
FMT "X="; FXD 9.5; TYP π
OUTPUT
X= 3.14159

```

Conversion specifications convert input data or stored data to the desired floating point, fixed point, or integer format, using these statements:

```

FMT R FLT W.d (Floating)
FMT R FXD W.d (Fixed)
FMT R FXD W.O (Integer)

```

where

R = number of times the same format is to be used sequentially;

W = number of spaces in the column;

d = number of digits to the right of the decimal.

Here are some examples of format statements and typed output. Note that digits are right justified within the specified field.

```

STATEMENT
FMT FLT 18.3; TYP π
FMT 2 FXD 9.3; TYP 199,199
FMT 3FXD 3.0; TYP 2, 3, 4

```

TYPED OUTPUT

3.142E 00

199,000 199,000

2 3 4



Fig. 4 shows an example of fully-formatted typewriter output, with a variety of column widths and numerical formats. The alpha headings were specified as shown below. The numeric columns in this figure were specified as FMT FXD 3.0, FXD 9.3, FXD 6.1, FLT 9.1, FLT 18.9

Editing specifications are specifications in a FMT statement other than conversion specifications. For instance, the headings in Fig. 4 were specified FMT 1X, "NO.", 2X, "INPUT", 3X, "EFF.", 2X, "Q FACTOR", 5X, "DISTANCE"; TYP. The typewriter inserts the number of blank spaces specified by NX, then types the characters in the quote field.

Two other frequently-used editing specifications are n (/), used to space n lines, and (Z), which suppresses carriage return and line feed after typing. The other available editing specifications are:

1. Tabulate
2. Tab set
3. Tab clear
4. Select red/black ribbon
5. Back space
6. Carriage return without line feed
7. Line feed without carriage return
8. Lower case alpha

BALLISTIC PARAMETERS

NO.	INPUT	EFF.	Q FACTOR	DISTANCE
1	11.000	12.0	1.3E 01	4.500000000E 01
2	16.000	17.0	1.8E 01	3.141592654E 00
3	1.414	3.3	1.0E 00	2.000000000E 00
4	199.000	36.0	1.7E 00	7.700000000E 01

FIG. 4 FULLY-FORMATTED TYPEWRITER OUTPUT

SYSTEMS GROUP

The systems group controls input and output peripherals. In addition to inputting data from peripherals and outputting to them, the Peripheral Control I Block allows data transfer between peripherals without intermediate calculator storage. The standard ASCII code is used in all data transmission.

Select Codes

Since all peripherals can be used in the Model 20 system at the same time, the user must be able to call any of them uniquely. This is done with select codes. Each peripheral has its own select code, a number between 0 and 15, which calls it to transmit or receive information. For example, select code (SC) 15 addresses the Model 9861A Typewriter.



READ enables the calculator to input data from the selected peripheral and store it in designated registers. The form of statement used is:

```
READ SC, REG 1, REG 2,..... REG N
```

The following program selects the Model 9864A Digitizer (Select code 3), inputs its data readings to the calculator's X and Y registers, and plots the data on the Model 9862A Option 20 Plotter.

```
0:  
SCL 0,15,0,10F  
1:  
RED 3,X,Y;PLT X;  
Y;GTO 1F  
2:  
END F
```



WRITE outputs data from the Model 20 to the selected peripheral. **WRITE** statements use the same **FMT** statements and rules as **TYP** described above, and are of the general form:

```
WRITE SC, DATA 1, DATA 2,..... DATA N
```

For example, the following statement will output the contents of registers A, C, X, R12, and the number 2.137 to a peripheral whose select code is 7:

```
WRITE 7, A, C, X, R12, R13, 2.137
```



TFR is used to transfer data from one peripheral to another. The data are not stored in the calculator, but pass through a special I/O register to accomplish the transfer. **TFR** statements are of the form:

```
TFR SCi, SCo
```

where SC_i and SC_o are the input and output peripherals' select codes, respectively. The following statement could cause data to be transferred from the Model 9864A Digitizer to the Model 9861A Typewriter:

```
TFR 3, 15 EXECUTE
```

GENERAL SPECIFICATIONS

Temperature: 0° – 45°C

Power: Supplied by Model 20 Calculator

Weight: 3oz. (85 g)

Dimensions: 2.56" (6,5 cm.) wide,
4.8" (12,2 cm.) long,
0.81" (2,05 cm.) deep.

PURCHASE PLANS

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