

ERRATA SHEET TO MODEL 514/614/714 MARKED SENSE CARD READER REFERENCE MANUAL

ERRATA: On page 3, in the section titled "Addressing the 700 Calculator", make the following changes:

1. The items	700	GROUP 1 MARK	600	GROUP 1 MARK
should be changed to read	700	GROUP 1 0408	600	GROUP 1 0408
2. The items	700	GROUP 2 MARK	600	GROUP 2 MARK
should be changed to read	700	GROUP 2 0408	600	GROUP 2 0408



LABORATORIES, INC.

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700-0823A
1-73-SC

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WANG

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PLEASE NOTE

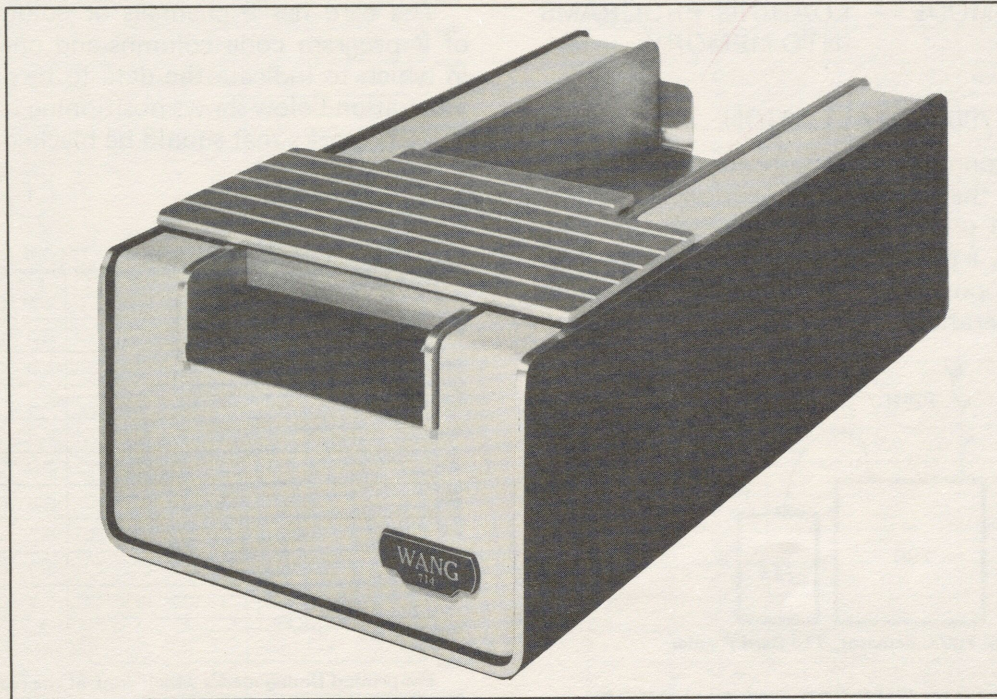
The description of the GO code on page two is in error and should be as follows: The GO command must not be the last instruction on the card. Data or program steps cannot follow a GO command on the same card. If you wish more data or program steps after a GO command use a new card.

The Wang calculators can either "learn" program steps into memory or they can execute them directly from the card reader.

Caution should be exercised when directly executing program steps; that is, the skip column may be needed to compensate for the executing time required by the mathematical functions.

Typical time to read a code on the card is 20 ms. Hence all executable codes must be less than that time. In general number entries and storage are usually below the 20 ms calculation.

WANG MODELS 514, 614, AND 714 MARKED SENSE CARD READER



Wang's new Models 514, 614 and 714 Marked Sense Card Readers add a new dimension to the overall calculating flexibility of the 500, 600 and 700 Series Electronic Calculators.

These attractive, easy-to-install units are very useful for preparing programs off-line. Thus, while programs are being developed, the calculator is free for other calculating applications.

The Marked Sense Card Readers, Models 514, 614 and 714, are designed for use with the 500, 600 and 700 Series calculators. The Marked Sense Card Reader optically reads the darkened areas inscribed on a card. These darkened areas correspond to the key codes on the calculator. (See example illustrated in the Card Format Section.)

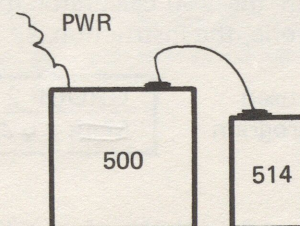
The card readers can also read punched tab cards for more standardized programming applications. Thus allowing greater flexibility in off-line programming.

The card is designed to handle up to 40 instructions and reads at the rate of 8/10 of a second per card. Depending on the calculator configuration, any number of cards can be used limited only by the programming capacity of the calculator. (See Program Capacity.)

The card readers are very beneficial for those applications where many different users must share the same calculator. Schools, colleges, large engineering departments and laboratory testing sites are just some of the many areas where off-line programming is essential. This system allows software development without tying up the calculator keyboard.

500 INSTALLATION

A simple cable connection of the 514 card reader cable to the rear panel of the 500 calculator is all that is needed to prepare the 514 for operation. Power for the 514 card reader is supplied by the 500 calculator.



Model 500 Calculator, 514 Card Reader

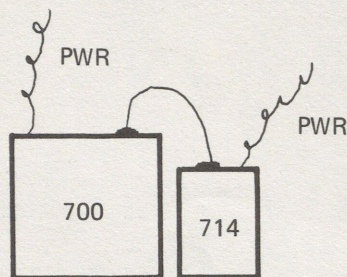
ADDRESSING THE 500 CALCULATOR

After installation has been completed, select your mode of operation. The 514 card reader will function in both the Run and Learn Modes.

1. RUN MODE — DATA ENTRY
2. LEARN MODE — LOADING PROGRAMS INTO MEMORY.

700 INSTALLATION

The same connection is made to the 700 as is the case with the 500. If other peripheral devices are being used on the 700, a T-connector may be required. Also, a power cord from the 714 must be plugged into a power outlet before the card reader is ready for operation.



Model 700 Calculator, 714 Card Reader

ADDRESSING THE 700 CALCULATOR

Once the connections are made between the 500 calculator and the 514 card reader and the mode of operation is selected, the 500 system is ready for operation in either the Run or Learn Mode. However, on the 700/714 configuration where many peripheral devices can be installed, a 700 instruction must be given to condition the calculator to accept data from the 714. Like the 500 system, the 700 can also function in the Run or Learn Modes.

To condition the 700 calculator to accept data in the Run Mode, the instruction is:

Run Mode is used
for data entry.

GROUP 1
Mark 0408

To condition the 700 calculator to accept data in the Learn Mode, the instruction is:

Learn Mode is used
for loading a program
into memory.

GROUP 2
Mark 0408

Installation and Addressing of the 600 Series is similar to the 700 Series calculator. A two-step instruction is needed for addressing purposes.

CARD FORMAT

The cards used for this system are similar to most data processing cards, containing up to 40 instructions indicating where on the card the data should be placed.

The card has 9 channels or columns consisting of 8 program code columns and one skip column in which to indicate the data to be processed. The illustration below shows positioning of the columns and the blocks that should be blacked out.

Pre-printed timing marks which control the reader operation.

① The blocks with the numbers on them reading 8 4 2 1 8 4 2 1 are the blocks used for indicating the data to be read and transferred to the calculator.

All codes for the 500, 600 and 700 Series calculators are four-digit codes. The first two digits are the high-order code, the second two digits are the low-order code.

The numeric code for the x^2 function on the 500 is 0812, 08 being the high-order code, 12 being the low-order code. This instruction will appear on the card as follows:

Note:

Different codes exist between the 500/600 and the 700 Series calculators. See instruction manual for the appropriate codes for your system.

② The left most block is the Skip block. If this column is blacked out, it will instruct the calculator to skip the entire row of data.

SPECIFICATIONS

Line Width:	Minimum .040 inch pencil mark required for reliable sensing.
Reading Rate:	8/10 second for a complete card.
Weight:	6 lbs.
Power Dissipation:	5.5 watts
Power (514): (614 & 714)	Power is obtained directly from the 500 calculator. Power is obtained by means of a separate power cord connected to the 714.
Temperature Range:	25°C ±10°C 59°F to 95°F
Humidity:	20 to 80% relative humidity
Dimensions:	3.25" high - 5.33" wide - 11.25" deep
Cards:	100 program cards are supplied with the unit.

PROGRAM CAPACITY:

The cards can be introduced into the card reader one after the other in a continuous and uninterrupted fashion. They are stacked in the 514 or 714 card receiver after being read.

The programming or card capacity is dictated only by the programming capability of the calculator. There are a number of different 500, 600 and

700 Series calculators. Their programming capacities are listed below:

500 Series		600 Series	
Models	Program Step Capacity	Models	Program Step Capacity
500-0	64	600-2	314
500-1	192	600-6	824
500-2	320	600-14	1848
520-2	312	700 Series	
520-6	824	Models	Program Step Capacity
520-14	1848	700C	960
		720C	1984
		700B	960
		720B	1984

EXAMPLE: 500 Calculator and 514 Marked Sense Card Reader

The following program illustrates the procedures required to "learn" a program into memory, and then run the program to calculate the Mean, Variance and Standard Deviation of the data entered into the system.

Operating Procedures:

1. 500 Calculator in Learn Mode
2. Load card number 1 into 514 Card Reader (Program is now in the calculator)
3. Switch to Run Mode.
4. Key f (00)
5. Load data cards 2, 3, 4, and 5 into 514 Card Reader. (Repeat Step 5 for all data cards.)
6. Key f (01)

PROGRAM PADS

Program worksheets should be used to develop and record programs. The worksheets contain 80

steps corresponding to two marked sense cards. Each step has space for the command, code, and comment. Additional space is provided for program description and special instruction.

MODEL	PROGRAM	TITLE:	NO.					
(THIS SPACE FOR INSTRUCTIONS AND NOTES)	No.	Cmd	Code	Comment	No.	Cmd	Code	Comment
	00				40			
	01				41			
	02				42			
	03				43			
	04				44			
	05				45			
	06				46			
	07				47			
	08				48			

PROGRAM LISTING

This program will print the Mean, Variance, and Standard Deviation.

```

000 09 00 * M
001 10 00 f 0
002 00 14 E14
003 09 00 * M
004 15 15 D15
005 09 03 * SP
006 08 02 * W
007 00 10 E10
008 06 14 ST14
009 08 12 * x2
010 02 00 + 0
011 07 14 RE14
012 02 01 + 1
013 00 01 E 1
014 02 02 + 2
015 08 00 * S
016 15 15 D15
017 09 00 * M
018 10 01 f 1
019 07 02 RE 2
020 08 02 * W
021 15 15 D15
022 08 02 * W
023 11 10 F10
024 05 01 ÷ 1
025 08 02 * W
026 15 10 D10
027 04 01 × 1
028 07 02 RE 2
029 04 01 × 1
030 03 00 - 0
031 00 01 E 1
032 03 02 - 2
033 05 00 ÷ 0
034 08 02 * W
035 01 10 T10
036 08 13 * √x
037 08 02 * W
038 02 10 + 10
039 09 15 * RT

```

CARD NO. 1

Program
Mean — Variance — Std. Dev.

$$\text{MEAN } \bar{X} = \frac{\sum x}{N}$$

$$\text{VARIANCE } \sigma^2 = \frac{\sum x^2 - N(\sum x/N)^2}{N-1}$$

$$\text{STANDARD DEVIATION } \sigma = \sqrt{\frac{\sum x^2 - N(\sum x/N)^2}{N-1}}$$

INSERT THIS END IN READER -- THIS SIDE UP

P.G.M. CODE	SKIP	8	4	2	1	8	4	2	1
09 00	0								
10 00	1								
00 14	2								
09 00	3								
15 15	4								
09 03	5								
08 02	6								
00 10	7								
06 14	8								
08 12	9								
02 00	0								
07 14	1								
02 01	2								
00 01	3								
02 02	4								
08 00	5								
15 15	6								
09 00	7								
10 01	8								
07 02	9								
08 02	0								
15 15	1								
08 02	2								
11 10	3								
05 01	4								
08 02	5								
15 10	6								
04 01	7								
07 02	8								
04 01	9								
03 00	0								
00 01	1								
03 02	2								
05 00	3								
08 02	4								
01 10	5								
08 13	6								
08 02	7								
02 10	8								
09 15	9								

USE NO. 2 PENCIL

MEAN - VARIANCE - STD. DEV.

700-1221
TITLE/NO. 5 OF 5

WANG LABORATORIES INC; TEWKSBURY, MASS. U.S.A.

CARD NO. 2

INSERT THIS END IN READER -- THIS SIDE UP

P' G' M CODE	SKIP	8	4	2	1	8	4	2	1
00 01	0								
00 02	1								
00 03	2								
00 11	3								
	4								
	5								
	6								
	7								
	8								
	9								
	0	SKIP	8	4	2	1	8	4	2
	1								
	2								
	3								
	4								
	5								
	6								
	7								
	8								
	9								
	0	SKIP	8	4	2	1	8	4	2
	1								
	2								
	3								
	4								
	5								
	6								
	7								
	8								
	9								
	0	SKIP	8	4	2	1	8	4	2
	1								
	2								
	3								
	4								
	5								
	6								
	7								
	8								
	9								
08 03	9								

USE NO. 2 PENCIL

CARD 2 OF 5

700-1221
TITLE/NO: DATA ENTRY 133

18M N87829 N87830

WANG LABORATORIES INC; TEWKSBURY, MASS. U.S.A.

CARD NO. 3

INSERT THIS END IN READER -- THIS SIDE UP

P' G' M CODE	SKIP	8	4	2	1	8	4	2	1
00 01	0								
00 03	1								
00 02	2								
00 11	3								
	4								
	5								
	6								
	7								
	8								
	9								
	0	SKIP	8	4	2	1	8	4	2
	1								
	2								
	3								
	4								
	5								
	6								
	7								
	8								
	9								
	0	SKIP	8	4	2	1	8	4	2
	1								
	2								
	3								
	4								
	5								
	6								
	7								
	8								
	9								
	0	SKIP	8	4	2	1	8	4	2
	1								
	2								
	3								
	4								
	5								
	6								
	7								
	8								
	9								
08 03	9								

USE NO. 2 PENCIL

CARD 3 OF 5

700-1221
TITLE/NO: DATA ENTRY 133

18M N87829 N87830

WANG LABORATORIES INC; TEWKSBURY, MASS. U.S.A.

CARD NO. 4

CARD NO. 5

INSERT THIS END IN READER -- THIS SIDE UP

P'G'M CODE	SKIP	8	4	2	1	8	4	2	1
00 01	0								
00 02	1								
00 00	2								
00 11	3								
	4								
	5								
	6								
	7								
	8								
	9								
	0	SKIP	8	4	2	1	8	4	2
	1								
	2								
	3								
	4								
	5								
	6								
	7								
	8								
	9								
	0	SKIP	8	4	2	1	8	4	2
	1								
	2								
	3								
	4								
	5								
	6								
	7								
	8								
	9								
	0	SKIP	8	4	2	1	8	4	2
	1								
	2								
	3								
	4								
	5								
	6								
	7								
	8								
	9								
	0	SKIP	8	4	2	1	8	4	2
	1								
	2								
	3								
	4								
	5								
	6								
	7								
	8								
	9								
	0	SKIP	8	4	2	1	8	4	2
	1								
	2								
	3								
	4								
	5								
	6								
	7								
	8								
	9								
00 03	9								

USE NO. 2 PENCIL

1 / 17

CARD 4 OF 5

DATA ENTRY 130

700-1221
TITLE / NO:

WANG LABORATORIES INC.; TEWKSBURY, MASS. U.S.A.

INSERT THIS END IN READER -- THIS SIDE UP

P'G'M CODE	SKIP	8	4	2	1	8	4	2	1
00 01	0								
00 02	1								
00 05	2								
00 11	3								
	4								
	5								
	6								
	7								
	8								
	9								
	0	SKIP	8	4	2	1	8	4	2
	1								
	2								
	3								
	4								
	5								
	6								
	7								
	8								
	9								
	0	SKIP	8	4	2	1	8	4	2
	1								
	2								
	3								
	4								
	5								
	6								
	7								
	8								
	9								
	0	SKIP	8	4	2	1	8	4	2
	1								
	2								
	3								
	4								
	5								
	6								
	7								
	8								
	9								
	0	SKIP	8	4	2	1	8	4	2
	1								
	2								
	3								
	4								
	5								
	6								
	7								
	8								
	9								
	0	SKIP	8	4	2	1	8	4	2
	1								
	2								
	3								
	4								
	5								
	6								
	7								
	8								
	9								
	0	SKIP	8	4	2	1	8	4	2
	1								
	2								
	3								
	4								
	5								
	6								
	7								
	8								
	9								
	0	SKIP	8	4	2	1	8	4	2
	1								
	2								
	3								
	4								
	5								
	6								
	7								
	8								
	9								
	0	SKIP	8	4	2	1	8	4	