

TEKTRONIX®

923

CARD READER

OPERATORS MANUAL

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Fig. 1-1. The 923 Card Reader.

OPERATING INSTRUCTIONS

General

The TEKTRONIX Card Reader 923 card reader is used with the 909 or 911 calculator. The card reader may be used with the calculator alone, or together with other peripheral equipment. Input information for operating the calculator is read from punched cards by the card reader.

Functions or operations performed by any of the Calculator (909 or 911) keys or any of the Programmer 926 keys can be performed using a properly punched card. Programs punched on cards can be used directly, stored in the calculator, or stored in the programmer and later transferred to one of the blocks of the magnetic tape cassette.

The keyboards of the TEKTRONIX 909 and 911 calculators are identical except for four of the keys. Since either 909 or 911 keys can be programmed using the card reader, the effect is that of adding four keys to your calculator keyboard. An additional two keys are effectively added by two operations available through the card reader, but not from either calculator keyboard. The additional calculator functions available only through the card reader are:

$$K_{03} \times (-.1) = K_{03} \text{ (an incrementer)}$$

$$\text{DISPLAY} \times K_{04} = K_{04} \text{ (a multiplier)}$$

Filed cards act as a bulk storage of programs that are available for future use.

NOTE

If the Card Reader 923 is being used in a system which also has a TEKTRONIX Printer 941 as one of the peripherals, the Printer can not be operated in AUTO Mode.

on the junction box. The card reader is connected to receptacles on the junction box receptacle.

Using 115 V Line Power. Connect the line cord of the card reader directly into the source of 115 V line voltage.

Interconnections

Interconnecting Cable. An interconnecting cable and a line cord are permanently attached to the rear of the card reader. The interconnecting cable connects to the 50 pin connector on the rear of the calculator. If peripheral equipment in addition to the card reader is used with the calculator, a Junction Box 905 must be used. The junction box is plugged into the 50 pin calculator connector, and all peripheral equipment is connected to receptacles

Using 230 V Line Power. Do not connect the card reader to a 230-volt source. An autotransformer that will reduce the 230 V line to 115 volts must be used. A suitable transformer, TEKTRONIX CPD Part No. 5600-06, is furnished with card readers ordered for use from a 230 V line. Connect the autotransformer input to the 230 V line, and plug the card reader line cord into the autotransformer output.

Program Cards

Properly prepared cards can be used to transfer programs into the calculator or the Programmer 926 memory. After connecting the card reader and applying power to the calculator and any other peripherals, the card is fed into the slot in the front of the card reader (see Fig. 1-2). The card should be fed in face up with the black arrow facing forward. Entry of the card at the front of the card reader starts a motor that pulls the card over the photosensitive Read Head. The entire card is scanned, column by column, and data on the card is strobed into the card reader memory. A pre-punched row along the bottom of the card synchronizes the transfer of data from the card to the card reader memory. After the card passes through the card reader, the card is deposited in the card reader tray and the motor stops. If the calculator display

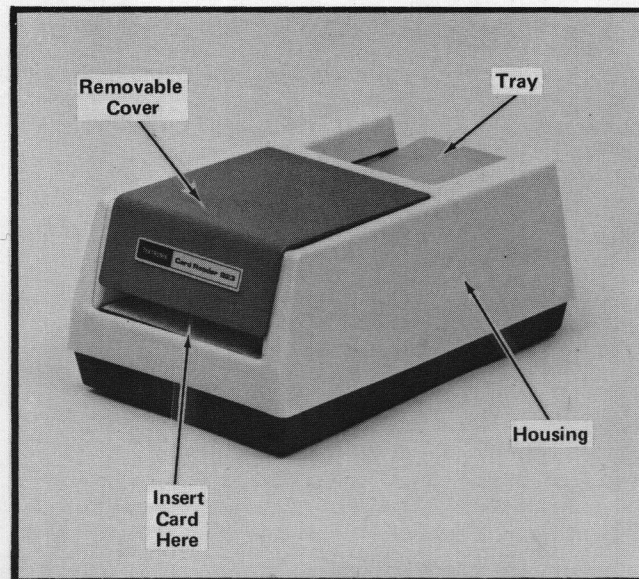


Fig. 1-2. Parts of the card reader.

is normal, the card reader is ready to accept the next program card.

Reading time is approximately one second per card, and execution of the program begins after the entire card is scanned. The execution time depends on the nature of the punched data.

The program card has 32 columns (each column represents a keystroke) and 8 rows into which data can be punched (see Fig. 1-3). The top seven rows contain the key codes for up to 32 keys.


KEY	DEF																DEF															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1																																
2																																
4																																
10																																
20																																
40																																
100																																

Key Codes

CARD 1 OF 1

PROGRAM:

$x^2 + 2x + 3 = Y$

1. Run card through card reader.
2. Put value of x in calculator display.
3. Press  key.
4. Repeat steps 2 and 3 for additional values of x.

← "Skip" Row

← Synchronizing or "strobe"

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Fig. 1-3. Data assignment of rows on the card.

The eighth or "skip" row is used only if data in a column is to be ignored. If a mistake is made while punching a key code into a column, punching "skip" for the column prevents transfer of data in that card column out of the card reader. The skip row for columns not used (those at the end of a program) can be punched to prevent the unpunched columns from causing zeros to be displayed at the end of a program. The key code for zero is 000.

Key Codes. Functions or operations performed by any keys of the Scientist 909 or Statistician 911, or the Programmer 926 can be performed by punching the proper key code into columns of the program card. The key codes assigned to these keys, as well as two functions not available by pressing a Calculator or Programmer key, are listed in Appendix A at the rear of this manual.

Each key code is composed of three digits. To punch a key code into a column of the card, punch holes into the card column so that the sum of the numbers represented by the punched holes is equal to the desired key code. For example, to enter the key code for the Programmer 926 CONTINUE key, refer to Appendix A for the proper key code. Appendix A shows that the key code for CONTINUE is 111.

Key code 111 can be entered into column 1 of the program card by punching holes in the first card column for rows labeled 100, 10, and 1. To program $K_{()}$ (key code 053) punch card rows labeled 40, 10, 2, and 1.

Preparing Program Cards. Program cards (see Fig. 1-3) are supplied with your card reader. Additional cards may

be ordered from Tektronix Inc. Order TEKTRONIX Part Number 2000-10.

A manual card punch (TEKTRONIX Part Number 2000-09) is available from Tektronix Inc. as an optional accessory (see Fig. 1-4).

An example of how to punch a program on a card (y as a function of x) is given below:

Example for $y = x^2 + 1$

1. Write out the program (show all keys in proper sequence) or use a program that is already written.

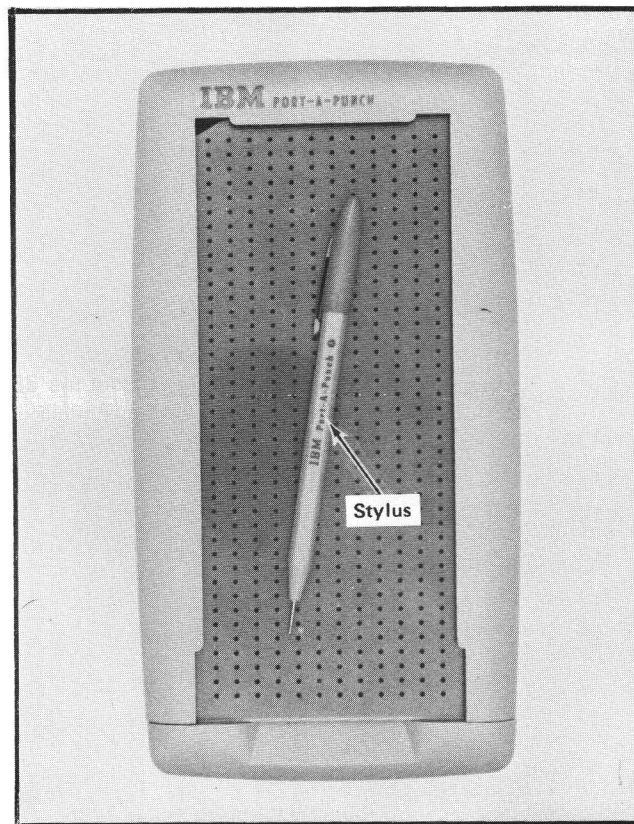
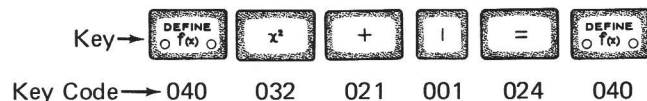


Fig. 1-4. Card punch (optional accessory).



2. Consult the key code (Appendix A) and write the key code under each key of the program as shown above.

3. Transfer the program to the program card. The program is written along the top row (labeled KEY) of the card as shown in Fig. 1-3. With experience, steps 1 and 2 of this procedure may be eliminated.

4. Transfer the key code to the card by using the card punch stylus to punch the proper number into each column.

5. Punch the "skip" row for the remaining unused card columns.

Blank space is provided at the right side of the card as a convenient place for writing notes and formulas.


Program Library

Cards may be punched using programs you prepare, or using programs already prepared.

The card shown in Fig. 1-5 was prepared from Program Me 001 of the Program Library (shipped with TEKTRONIX Calculators).

KEY	C	D	=	K	0	0	D	+	K	0	0	=	K	0	0	C	D																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32			
1																																			
2																																			
4																																			
10																																			
20																																			
40																																			
100																																			

CARD 1 OF 1
 PROGRAM: Me 001 of Program Library (running sum)

- Run card through the card reader.
- Enter 'x', in calculator display and press 
- Repeat step 2 for x₂, x₃, etc.

Running sum of $x_1 + x_2 + \dots + x_n$ is stored in K₀₀.

S																																				

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Fig. 1-5. Card prepared from program Me 001 of Program Library.



This clears the calculator display and places zero in K₀₀.

This places instructions in the f(x) memory to add the number displayed by the calculator to the contents of K₀₀.





This stores the sum determined above in K_{00} .




Clears the calculator display and ends the program.

Punch the keys listed above on the card as shown in Fig. 1-5 and proceed as follows:

1. Run the punched card through the card reader.
2. Key the first number to be added into the calculator display and press the  key.

3. Key the next number to be added into the calculator display and press the  key.

Each time a number is put into the calculator display and  is pressed, the displayed number is added to the previous sum that is stored in K_{00} , and the display is cleared.

The punched cards form a ready-to-use source of stored programs. Since key codes for all Programmer 926 keys can be punched on the Program Cards, the Programmer can be instructed to learn the card program or store it in a certain block of the Programmer magnetic tape. Peripheral equipment, such as the Printer, may be addressed from the card via the Programmer.



SUPPLEMENTAL INFORMATION

Maintenance

No operator maintenance of the Card Reader 923 is required other than occasional cleaning of the outer surfaces.

WARNING

Disconnect the line cord and the interconnecting cable before cleaning.

Wipe the outer surfaces with a damp cloth. Lift up on the lower front edge of the removable cover (Fig. 1-2), and clean the exposed surfaces. Avoid wiping the phototransistors of the reading head (Fig. 2-1). The reading

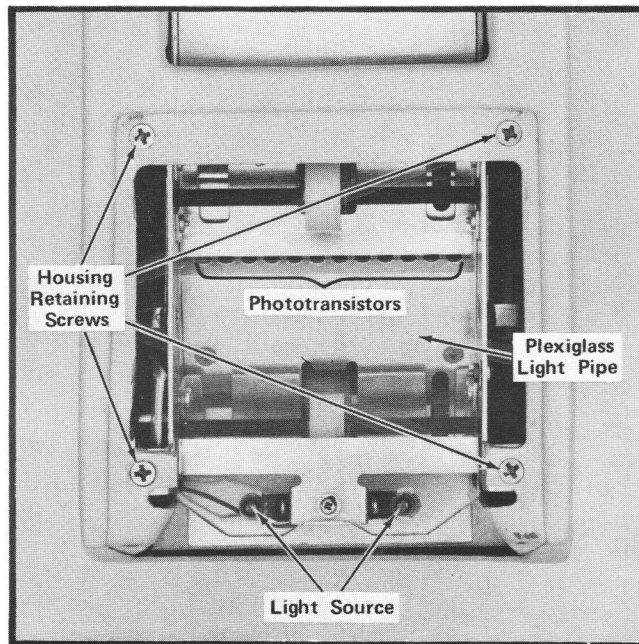


Fig. 2-1. Card reader phototransistors.

head area can be cleaned using a soft brush, such as is used for cleaning photographic lenses.

Card Reader Problems

Some causes of improper card reader operation can be corrected by the operator. Always be sure to insert the card with the printed side up and with the arrow on the card pointing toward the card reader.

If the card is being used for the first time, recheck the program and check that the key code punched into the card agrees with the program.

Check that the phototransistors of the read head (Fig. 2-1) are not covered by paper or other material.

Table 2-1 lists some problems that the operator can correct. For further assistance, contact your Tektronix, Inc. Field Engineer or Representative.

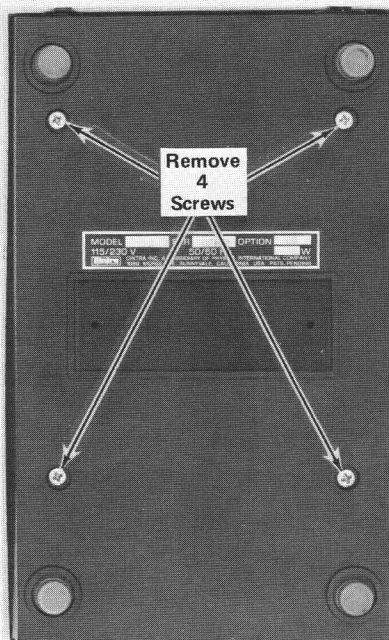
TABLE 2-1

Card Reader Troubleshooting

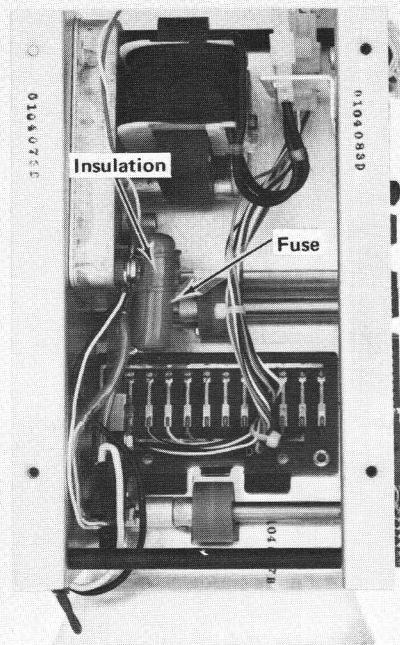
Symptom	Possible Reason	Remarks
Card is not pulled through Card Reader.	Motor not running.	Check that the Card Reader line cord is plugged into a 115 V source.

TABLE 2-1 (cont)

Symptom	Possible Reason	Remarks
Card is not pulled through Card Reader.	Motor not running.	<p>Connect another device requiring 115 V into the same receptacle, and check for operation, to determine that line voltage is available.</p> <p>Fuse has opened (see Fig. 2-2B for location). Refer to fuse changing procedure.</p>
Motor runs but no light is delivered to photocells.	Card Reader is not connected to Calculator or Junction Box.	Check connection of the interconnecting cable.
Unwanted zeros are displayed at the end of the program.	Unused columns are being read as zeros by the Card Reader.	Punch the skip row for the unused columns at the end of a program.



(A) Removing the bottom cover.



(B) Location of Line Fuse.

Fig. 2-2. Changing the line fuse.

Changing the Line Fuse

WARNING

Be sure that the line cord of the Card Reader is disconnected from the power line before removing the bottom cover or attempting to change the fuse.

The bottom cover is removed by taking out the four (4) screws indicated in Fig. 2-2A. The fuse location is shown in Fig. 2-2B. Fold back the fishpaper insulation that covers the fuse. The fuse is a 1/4 amp, slow blow type (size 3 AG) and may be obtained locally, or by ordering TEKTRONIX Part Number 5100-07.

For further information or assistance, contact your Tektronix, Inc. representative.

Instrument Characteristics

Power Requirements:

Line Voltage—An input voltage of $115\text{ V} \pm 10\%$ is required by the Card Reader. For use from a 230 V power line, a stepdown autotransformer (such as STANCOR Model GSD-75) is available.

Line Frequency—50-60 Hz.

Power Consumption—Approximately 30 watts.

Dimensions—(approximate) 4 1/8 inches (10.5 cm) high, 5 3/4 inches (14.6 cm) wide, and 9 3/4 inches (24.8 cm) deep.

Weight—Card Reader ≈ 5 pounds (2.27 kg) [≈ 6 pounds (2.73 kg) when packed for shipping]¹.

¹Autotransformer (for operation from 230 V) ≈ 3 pounds (1.26 kg).

APPENDIX A (Key codes and abbreviations)

Code	Key	Abbrev	Code	Key	Abbrev	Code	Key	Abbrev
000	0		022	$(x)^y$		036	$\sin x$	sin
001	1		023	\times		040	DEFINE ● f(x) ●	Def
002	2		024	=		041	—	
003	3		025	.		042	$\sqrt{x^2+y^2}$	$\sqrt{\bullet \bullet}$
004	4		026	(043	\div	
005	5		027	$\ln x$	ln	044	arc	
006	6		030	REMOTE	R	045	\pm/\mp	\pm/\mp
007	7		031	\sqrt{x}		046	$\cos x$	cos
010	8		032	x^2		047	CLEAR DISPLAY	CD
011	9		033	$\frac{1}{x}$	1/x	050	$\tan x$	tan
020	DEG ● RAD	D/R	034	e^x		051	π	
021	+		035	$\log x$	log	052	f(x)	

APPENDIX A (Key codes and abbreviations)

Code	Key	Abbrev	Code	Key	Abbrev	Code	Key	Abbrev
053		K	101		+	115		St
054		hyp	102		0	116		
055		int	103		-	132		
056		x10	104		G	133		
057		C	105		F	135		
060			106		Sf	136		
064		Σ ₀	107		R	137		
065		Σ ₁	110		P	177		S
066		Σ	111		Co			
067	$K_{03} \times (-.1) = K_{03}$	Δ	112		I			
070	Display X $K_{04} = K_{04}$	Π ₄	113		Sp			
071			114		E			

Note: Where no abbreviation is indicated, the key symbol itself is used.

