



Rockwell

R6500 Microcomputer System

DATA SHEET

SINGLE-CHIP PRINTER CONTROLLER

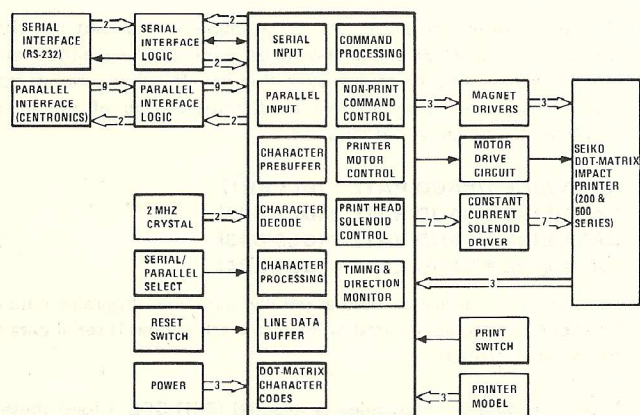
INTRODUCTION

The Rockwell R6592 is a single-chip printer controller for eight different Seiko* dot-matrix impact printers, models 210, 220, 240, 511L, 512, 522, 541L, and 542. The R6592 offers the flexibility to support any of these models with a minimum of circuitry. Generation of 96 standard ASCII upper and lower case characters and 6 special characters is provided. In addition, up to 10 ASCII control commands are accepted, depending upon the printer. Logic is included in the R6592 to print up to 26 columns on the 210, 220, and 240 models, and up to 40 columns on the 511L, 512, 522, 541L, and 542 models.

Input data may be selected to be in the RS-232 serial format with selectable baud rate from 50 to 7200 bits/second or the parallel format. External circuitry is required to convert RS-232 logic levels to R6592 interface logic levels. An external latch may be required for the R6592 to sample parallel data. If both selectable serial and parallel data interface capability is desired, two external multiplexers are required; one to combine four serial baud select lines and four parallel data interface lines into four R6592 input lines and the other to combine two serial data/control lines and two parallel control lines into two other R6592 input lines.

This data sheet summarizes the interface specifications of the R6592. Product Description 29650N56 describes the operation of the R6592 in detail.

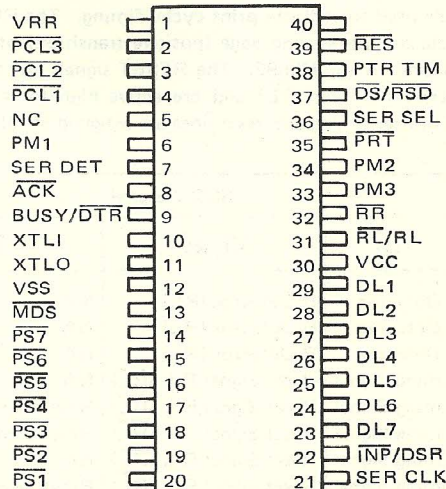
*Seiko Printers are manufactured by EPSON, a subsidiary of Shinshu Seiki Co., Ltd. and are distributed in the United States by C. Itoh Electronics, Inc. The R6592 meets the printer specifications as listed in this data sheet.



R6592 Interface Diagram

FEATURES

- Controls Seiko Dot-Matrix Impact Printers:
 - Model 210
 - Model 220
 - Model 240
 - Model 511L
 - Model 512
 - Model 522
 - Model 541L
 - Model 542
- Minimal Support Circuitry Required
- On-Chip 5 x 7 Dot-Matrix Character Generation
- 96 Standard Upper and Lower Case ASCII Characters (7 Bit Code)
- 6 Special ASCII Characters (7 Bit Code)
- Up to 10 ASCII Commands Accepted (Printer Dependent)
- Selectable Serial or Parallel Input Data Operation
- Centronics Standard Parallel Interface
 - Seven Data Lines Plus Data Strobe and Input Drive Input
 - Busy and Acknowledge Output
- RS-232C Serial Interface
 - Baud Rate from 50 to 7200 Bits per Second
 - Received Data and Data Set Ready Input
 - Data Terminal Ready Output
- Single +5V $\pm 10\%$ power supply
- 40 pin plastic or ceramic DIP
- 1 MHz operation (2 MHz external crystal)



R6592 Pin Configuration

INTERFACE SIGNALS

PRINTER SOLENOID 1 ($\overline{PS1}$)
PRINTER SOLENOID 2 ($\overline{PS2}$)
PRINTER SOLENOID 3 ($\overline{PS3}$)
PRINTER SOLENOID 4 ($\overline{PS4}$)
PRINTER SOLENOID 5 ($\overline{PS5}$)
PRINTER SOLENOID 6 ($\overline{PS6}$)

Active low output signals used to command seven constant current print head solenoid drivers. When low, the respective solenoid will be energized to print a dot; and when high, the solenoid will be de-energized to not print a dot. Each solenoid line corresponds to a dot position on the seven row print head. Line $\overline{PS1}$ corresponds to the top dot and $\overline{PS7}$ corresponds to the bottom dot. The output lines are activated by the positive edge of the timing signal (TIM). The TIM signal should also be used to gate $\overline{PS1}$ through $\overline{PS7}$ to the current drivers and to de-energize the current driver inputs within $600 \pm 20 \mu\text{sec}$ of the start of the TIM signal by means of a one-shot flip-flop.

PRINTER CONTROL 1 ($\overline{PC1}$)
PRINTER CONTROL 2 ($\overline{PC2}$)
PRINTER CONTROL 3 ($\overline{PC3}$)

Active low output control lines used to issue various non-print commands to the printer. These lines are inputs to +24V drivers. When low, these lines cause magnets to be energized in the printer; when high, the magnets are to be de-energized. These lines are assigned to specific signals depending upon printer model:

Printer Model	R6592 Signal Name		
	PCL1	PCL2	PCL3
210	NA	Paper Feed	Change Color
220	Paper Feed (R)	Paper Feed (L)	
240	NA	Paper Feed	Slip Release
511L	NA	Paper Feed	NA
512	NA	Paper Feed	NA
522	Paper Feed (R)	Paper Feed (L)	Stamp & Cut Paper
541L	NA	Paper Feed	Paper Release
542	NA	Paper Feed	Paper Release

NA = Not Assigned

TIMING (TIM)
RESET LEFT (\overline{RL} / \overline{RL})
RESET RIGHT (\overline{RR})

Input signals used to indicate print cycle Timing. The R6592 initiates a print cycle on the leading edge (positive transition) of the TIM signal information to the R6592. The RESET signals are active low for the 500 series (\overline{RR} and \overline{RL}) and are active high for the 200 series (\overline{RL}). The printer timing and reset lines are assigned as follows:

Printer Model	R6592 Signal		
	TIM	$\overline{RL}/\overline{RL}$	\overline{RR}
210	T Detector	R Detector (\overline{RL})	NA
220	T Detector	R Detector (\overline{RL})	NA
240	T Detector	R Detector (\overline{RL})	NA
511L	Timing Signal	Reset Signal R-L (\overline{RL})	NA
512	Timing Signal	Reset Signal R-L (\overline{RL})	Reset Signal R-R (\overline{RR})
522	Timing Signal	Reset Signal R-L (\overline{RL})	Reset Signal R-R (\overline{RR})
541L	Timing Signal	Reset Signal R-L (\overline{RL})	NA
542	Timing Signal	Reset Signal R-L (\overline{RL})	Reset Signal R-R (\overline{RR})

See Detail Timing Diagrams in Printer Specifications.

MOTOR DRIVE SIGNAL (\overline{MDS})

Active low output signal used to control application of power from a driver circuit to the printer motor. When high, the motor drive is turned off and when low, the motor drive is turned on. The driver circuit for the 500 series must supply 10 to 30 ma at TTL levels. The driver circuit for the 200 series must additionally provide motor braking.

PRINTER MODEL 1 (PM1)
PRINTER MODEL 2 (PM2)
PRINTER MODEL 3 (PM3)

Encoded input lines used to determine which printer model is connected to the R6592. A connection to GND (low) causes "0" to be read. An open input (high) causes logic "1" to be read. The encoding for the printer model is:

Printer Model	Printer Model Line		
	PM3	PM2	PM1
210	0	0	0
220	0	0	1
240	0	1	0
511L	0	1	1
512	1	0	0
522	1	0	1
541L	1	1	0
542	1	1	1

PRINT (\overline{PRT})

Active low input line used to command R6592 to print a line. When low (GND) print commands will continue to be issued. If the print buffer is partially filled, a line will be printed. Line feeds will subsequently be issued while \overline{PRT} is low. When high (open), print commands will not be issued.

SERIAL SELECT (SER SEL)

Active high input line used to indicate the desired data transmission mode to the R6592. When high (open), input data will be received and processed from the serial interface (RS-232C). When low (GND), input data will be received and processed from the parallel interface (Centronics).

If both transmission modes are to be implemented (but not simultaneously), the SER SEL line should be used to select either serial or parallel signals through multiplexer circuits. If either serial or parallel data transmission is exclusively used, multiplexing of the indicated serial/parallel signals is not required.

DATA LINE 1/BAUD RATE 1 (DL1/BR1)
DATA LINE 2/BAUD RATE 2 (DL2/BR2)
DATA LINE 3/BAUD RATE 3 (DL3/BR3)
DATA LINE 4/BAUD RATE 4 (DL4/BR4)

Active high input signals used as parallel data lines if parallel data transfer mode is selected, or used as baud rate select lines if serial data transfer mode is selected.

If parallel data transfer mode is selected (SER SEL = low) these lines represent four of the seven total data lines (see below). DL1/BR1 represents the least significant bit when ASCII characters are decoded.

If serial data transfer mode is selected (SER SEL = high), the data transfer baud rate in bits per second is:

Baud	Data Line/Baud Rate Line			
	DL4/BR4	DL3/BR3	DL2/BR2	DL1/BR1
50	0	0	0	0
75	0	0	0	1
110	0	0	1	0
135	0	0	1	1
150	0	1	0	0
300	0	1	0	1
600	0	1	1	0
1200	0	1	1	1
1800	1	0	0	0
2400	1	0	0	1
3600	1	0	1	0
4800	1	0	1	1
7200*	1	1	0	0

Note: 1 = High (open), 0 = Low (GND).

*Data cannot be sent to the R6592 while the print head is moving.

DATA LINE 5 (DL3)

DATA LINE 6 (DL4)

DATA LINE 7 (DL7)

Active high input signals used as data lines when parallel data transfer mode is selected (SER SEL = low). DL7 represents the most significant bit (MSB) when ASCII characters are decoded. Not used when serial data transfer mode is selected (SER SEL = high).

INPUT PRIME (IP)/DATA SET READY (DSR)

Input line multiplexed between a parallel communications control line (INPUT PRIME) and a serial communications control line (DATA SET READY).

If the parallel data transfer mode is selected (SER SEL = low), this line is assigned to INPUT PRIME (IP). When IP/DSR is high, the R6592 issues prints commands to the printer in a normal fashion. When IP/DSR is low, the R6592 will disable printing. This line can, therefore, be used as a print disable line to selected printers in a multiprinter system.

If the serial data transfer mode is selected (SER SEL = high), the line is assigned to DATA SET READY (DSR). When high, DSR indicates that the transmitter is operative and the R6592 will accept data. When low, DSR indicates that the transmitter is not ready to operate and the R6592 will not accept serial data.

DATA STROBE (DS)/RECEIVED SERIAL DATA (RSD)

Input line multiplexed between a parallel communications control line (DATA STROBE) and the serial communications data line (RECEIVED SERIAL DATA).

If the parallel data transfer mode is selected (SER SEL = low), this line is assigned to the DATA STROBE (DS). When DS goes low, the R6592 detects the negative transition, and samples the data on the parallel data lines. The data must be present on the data lines for at least 50 μ sec after DS goes low.

If the serial data transfer mode is selected (SER SEL = high), the line is assigned to RECEIVED SERIAL DATA (RSD). The data is processed in accordance with the selected baud rate. The data must be converted from RS-232 logic levels to R6592 logic levels. The R6592 logic state is inverted from RS-232 logic state.

BUSY/DATA TERMINAL READY (BUSY/DTR)

Output line multiplexed between a parallel communication control line (BUSY) and a serial communication control line (DATA TERMINAL READY).

If the parallel data transfer mode is selected (SER SEL = low), this line is assigned to BUSY. When high, BUSY indicates that the R6592 cannot receive data. When low, BUSY indicates that the R6592 is ready to receive data. BUSY is switched low during character print and while LF and DC1 commands are being processed.

If the serial data transfer mode is selected (SER SEL = high), this line is assigned to DATA TERMINAL READY (DTR). When high, DTR indicates that the R6592 cannot receive data. When low, DTR indicates that the R6592 is ready to receive data. DTR is switched low during character print and while LF and DC1 commands are being processed.

ACKNOWLEDGE (ACK)

Active low output signal used to inform the parallel data transmitter that an input character has been received. ACK is switched low for 5 μ sec to indicate receipt of a character.

SERIAL CLOCK (SER CLK)

A bi-directional line used to detect the start of the received serial data and to then clock in the serial data bits. When DET ENA is low, this line monitors the input serial data stream for the start bit. When the leading (falling) edge of the start bit is detected, the DET ENA is switched high and this line is switched to an output. Output pulses are generated on this line to clock the received serial data into the R6592 at the selected baud rate.

SERIAL DETECT ENABLE (DET ENA)

Active high output used to enable the received serial data onto the SER CLK line. Upon detection of the received serial start bit, this line is switched low to disable the received serial data from being placed on the SER CLK line.

PRIMARY POWER (VCC)

R6592 primary power supply: +5V \pm 10%. Supplies power to CPU, I/O, timer and supporting circuitry.

RAM

POWER (VRR)

R6592 RAM power supply: +5V \pm 10%. Supplies power to the internal R6592 RAM. This line should be connected to VCC power supply.

SIGNAL GROUND (VSS)

R6592 power and signal ground.

XTLI

Input from 2 MHz crystal.

XTLO

Output to 2 MHz crystal.

RESET (RES)

Active low signal used to reset and initialize the R6592. Must be held low for at least 8 μ sec after VCC reaches operating voltage and the clock frequency on XTLO has stabilized.

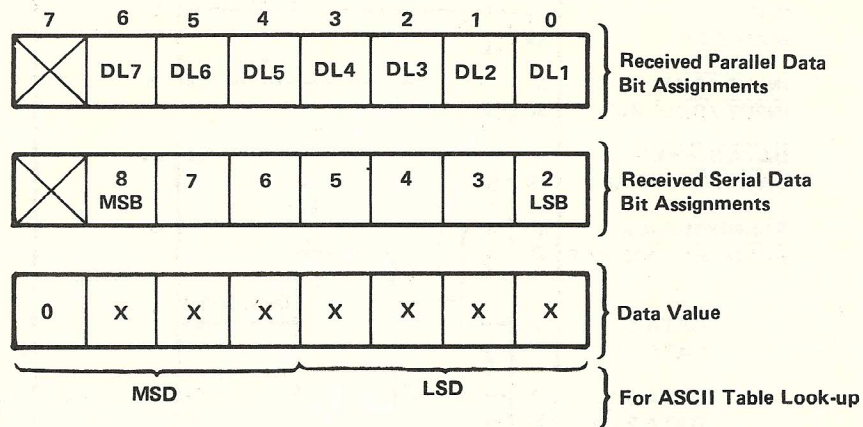
Standard 96 Character 5x7 Matrix Dot Patterns

20	21	22	23	24	25	26	27
28	29	2A	2B	2C	2D	2E	2F
30	31	32	33	34	35	36	37
38	39	3A	3B	3C	3D	3E	3F
40	41	42	43	44	45	46	47
48	49	4A	4B	4C	4D	4E	4F
50	51	52	53	54	55	56	57
58	59	5A	5B	5C	5D	5E	5F
60	61	62	63	64	65	66	67
68	69	6A	6B	6C	6D	6E	6F
70	71	72	73	74	75	76	77
78	79	7A	7B	7C	7D	7E	

Special 6 Character 5x7 Matrix Dot Patterns

5A	5B	5C	5D	5E	5F
YEN	POUND	ONE-HALF	CENT	NO TAX	TAX

R6592 Internal Data Format for 7-Bit ASCII Table Character Look-up



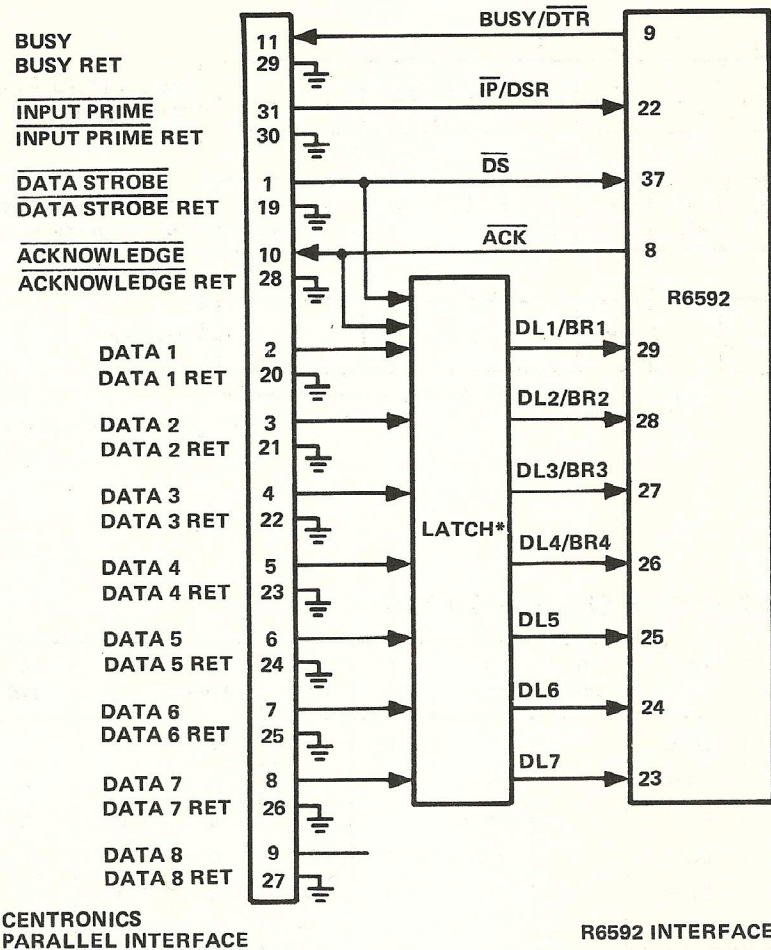
ASCII 7-Bit Code Character Set Table

LSD	MSD	0 000	1 001	2 010	3 011	4 100	5 101	6 110	7 111
0	0000			SP	0	@	P		p
1	0001		DC1	!	1	A	Q	a	q
2	0010		DC2	"	2	B	R	b	r
3	0011		DC3	#	3	C	S	c	s
4	0100		DC4	\$	4	D	T	d	t
5	0101			%	5	E	U	e	u
6	0110			&	6	F	V	f	v
7	0111			'	7	G	W	g	w
8	1000		CAN	(	8	H	X	h	x
9	1001			)	9	I	Y	i	y
A	1010	LF	¥	*	:	J	Z	j	z
B	1011	VT	t	+	;	K	[	k	{
C	1100	FF	1 ₂	,	<	L	\	l	|
D	1101	CR	¢	—	=	M	]	m	}
E	1110		N T	•	>	N	↑	n	~
F	1111		T X	/	?	O	←	o	DEL

- LF — Line Feed
- VT — Vertical Tabulation
- FF — Form Feed
- CR — Carriage Return
- DC1 — Device Control 1
- DC2 — Device Control 2
- DC3 — Device Control 3
- DC4 — Device Control 4
- CAN — Cancel
- ¥ — Yen
- t — Pound
- ¢ — Cent
- 1₂ — One-Half
- N
T — Not Tax
- T
X — Tax

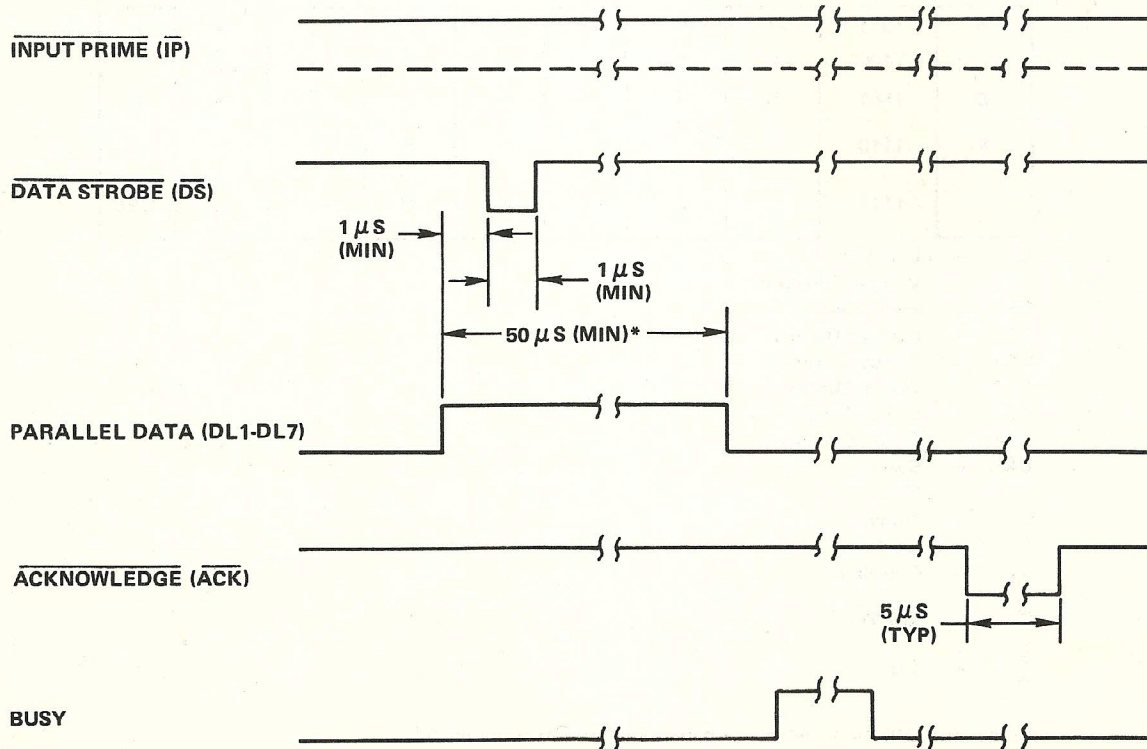
Note: Valid control commands are dependent upon printer model.

Parallel Data Interface



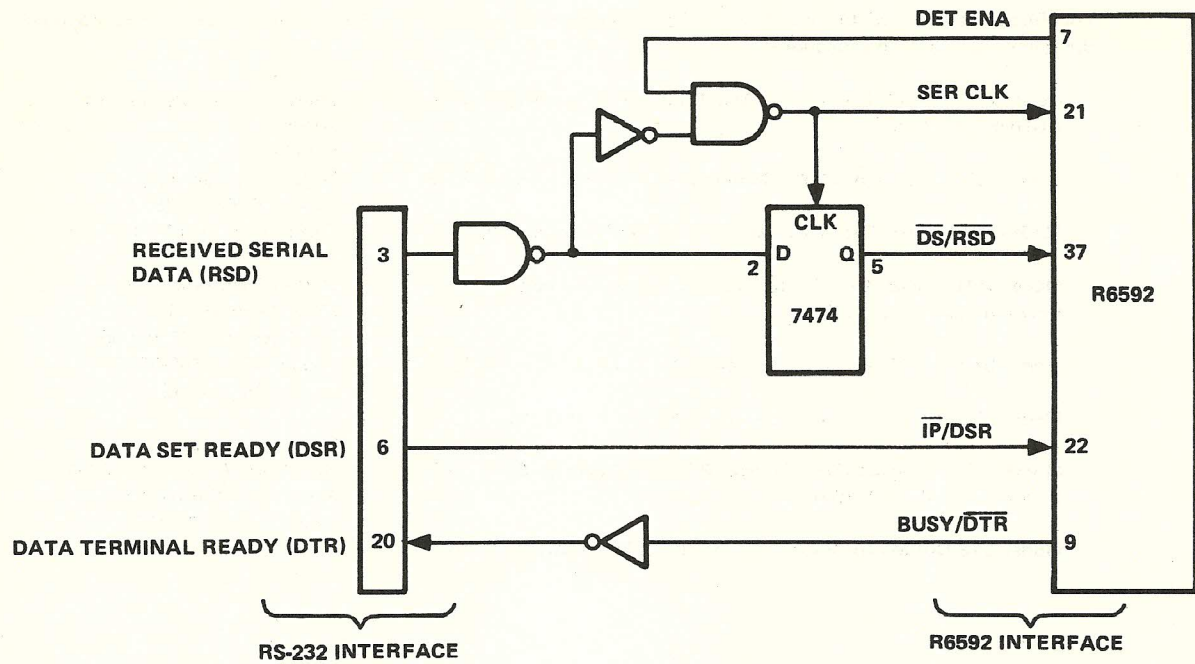
*NOT REQUIRED IF PARALLEL DATA IS HELD FOR $\geq 50\mu\text{s}$ AFTER LEADING EDGE OF $\overline{\text{DS}}$ OR UNTIL $\overline{\text{ACK}}$ IS RECEIVED.

Parallel Data Timing

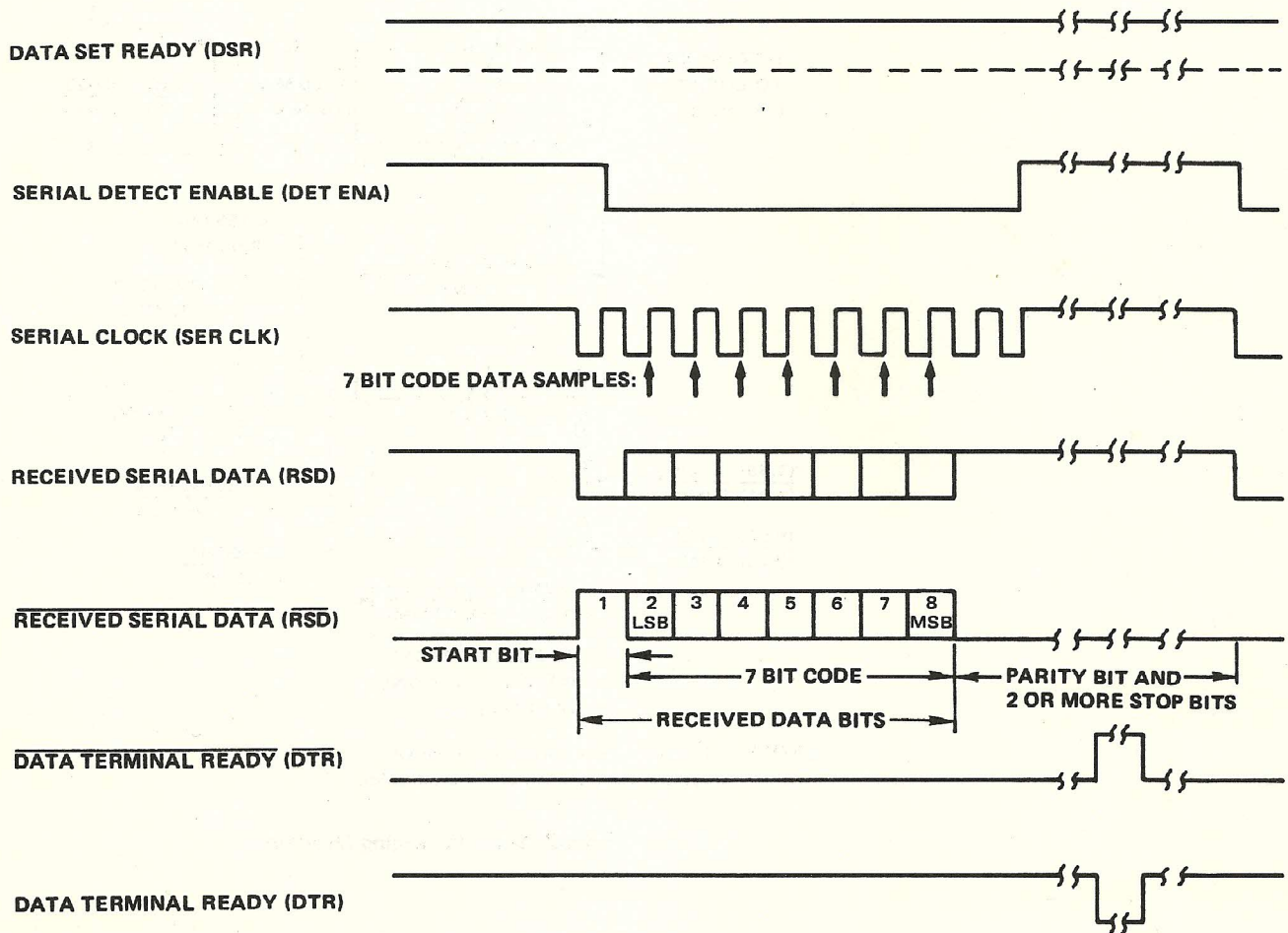


*OR UNTIL $\overline{\text{ACK}}$ IS RECEIVED.

Serial Data Interface



Serial Data Timing



PRINTER INTERFACE SPECIFICATIONS

The R6592 is designed to meet the interface requirements stated in the following printer specifications:

Model-210 Impact Dot Matrix Mini-Printer (Preliminary) Rev. 4, AUGUST 30, 1978

Model-220 Impact Dot Matrix Mini-Printer, SEPTEMBER 18, 1978

Model-240 Impact Dot Matrix Mini-Printer, SEPTEMBER 18, 1978

Model-511L Impact Dot Matrix Printer (Enlarged Character) Revision 1, JULY 13, 1978

Model 512 Dot-Matrix Impact Printer (P512DF), APRIL 10, 1978

Model 522 Dot-Matrix Impact Printer (P522DF), MARCH 1, 1978

Model 541L Impact Dot Matrix Printer (Enlarged Character), Revision 1, JULY 19, 1978

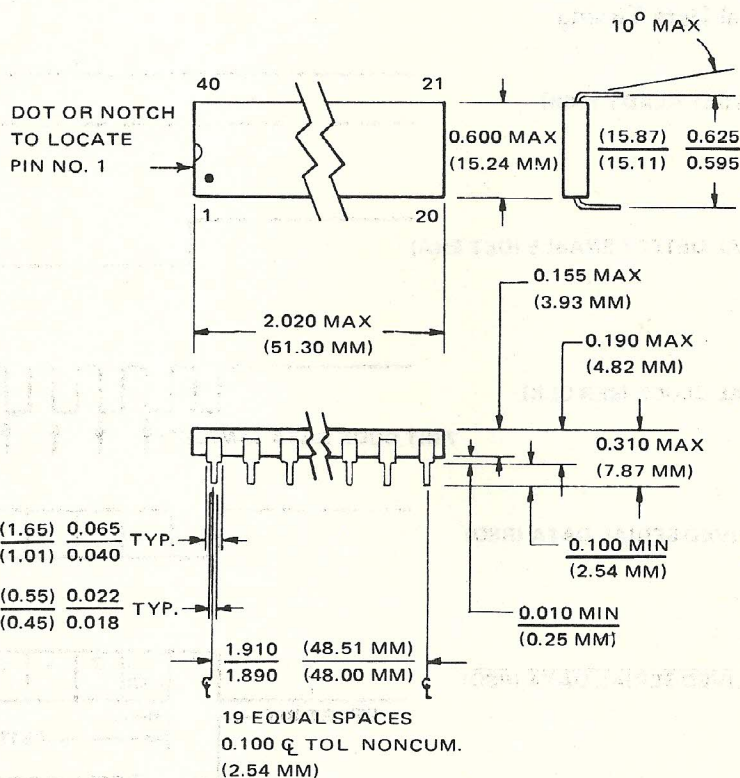
Model 542 Dot-Matrix Impact Printer (P542DF), MARCH 1, 1978

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NOTE: Pin No. 1 is in lower left corner when symbolization is in normal orientation

R6592 Plastic Packaging Diagram

SPECIFICATIONS

Maximum Ratings

Rating	Symbol	Value	Unit
Supply Voltage	V_{CC}	-0.3 to +7.0	Vdc
Input Voltage	V_{in}	-0.3 to +7.0	Vdc
Operating Temperature Range	T	0 to +70	°C
Storage Temperature Range	T_{stg}	-55 to +150	°C

This device contains circuitry to protect the inputs against damage due to high static voltages, however, it is advised that normal precautions be taken to avoid application of any voltage higher than maximum rated voltages to this circuit.

Static D.C. Characteristics $V_{CC} = 5V \pm 10\%$

Characteristic	Symbol	Min	Typ	Max	Unit
Power Dissipation (Outputs High)	P_D	—	500	—	mW
Input High Voltage (Normal Operating Levels)	V_{IH}	+2.0	—	V_{CC}	Vdc
Input Low Voltage (Normal Operating Levels)	V_{IL}	-0.3	—	+0.8	Vdc
Input Threshold Voltage	V_{IT}	0.8	—	2.0	Vdc
Input Leakage Current $V_{in} = 0$ to 5.0 Vdc RES	I_{IN}	—	± 1.0	± 2.5	μA_{dc}
Input High Voltage (XTLI)	V_{IHXT}	+3.0	—	V_{CC}	Vdc
Input Low Voltage (XTLI)	V_{ILXT}	-0.3	—	+0.8	Vdc
Input Low Current ($V_{IL} = 0.4$ Vdc)	I_{IL}	—	-1.0	-1.6	mA_{dc}
Output High Voltage ($V_{CC} = \min$, $I_{Load} = -100 \mu A_{dc}$)	V_{OH}	2.4	—	—	Vdc
Output Low Voltage ($V_{CC} = \min$, $I_{Load} = 1.6 mA_{dc}$)	V_{OL}	—	—	+0.4	Vdc
Output High Current (Sourcing) ($V_{OH} = 2.4$ Vdc)	I_{OH}	-100	—	—	μA_{dc}
Output Low Current (Sinking) ($V_{OL} = 0.4$ Vdc)	I_{OL}	1.6	—	—	mA_{dc}
Input Capacitance ($V_{in} = 0$, $T_A = 25^\circ C$, $f = 1.0$ MHz) Pins 2-9, 13-21, 22-29 and 31-38 XTLI, XTLO	C_{in}	—	—	10 50	pF
Output Capacitance ($V_{in} = 0$, $T_A = 25^\circ C$, $f = 1.0$ MHz)	C_{out}	—	—	10	pF

NOTE: Negative sign indicates outward current flow, positive indicates inward flow.

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