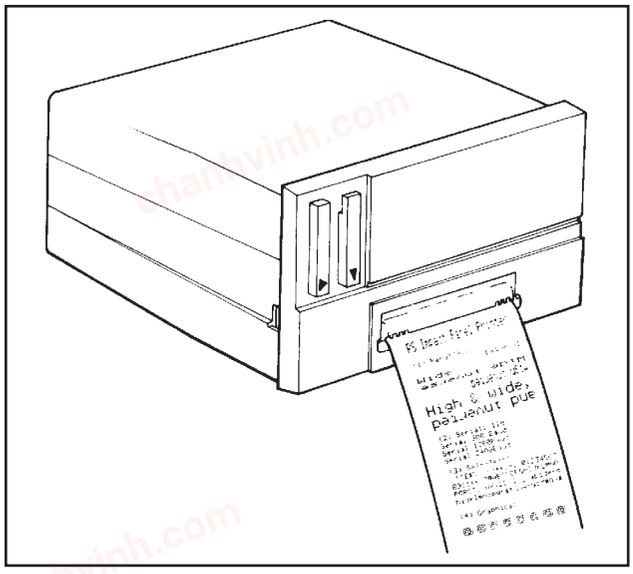
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Data Sheet

Panel printer

RS **stock no. 260-139**

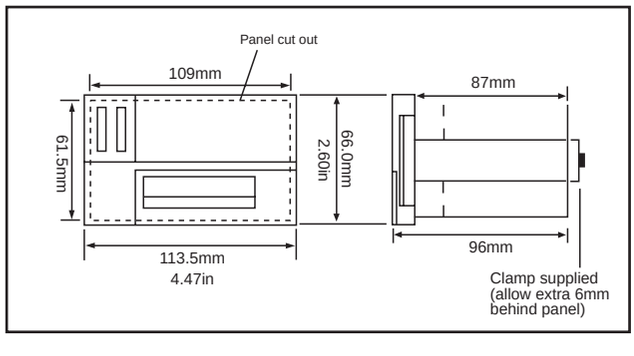


The **RS** impact panel printers are microprocessor controlled, incorporating reliable Epson®* miniature printer mechanisms. The polycarbonate case is designed to suit a wide range of panel thicknesses, requiring only a 109mm by 62mm panel cut-out and less than 100mm of depth behind the panel when installed. The hinged front opening allows easy access to the mechanism simplifying paper and ribbon changes.

These printers are ideal for a wide variety of applications including; automatic test equipment, instrumentation and control, data logging, alarm and security equipment, and many others.

Features

- ASCII character set with 96 printable codes including lower case characters with true descenders
- Double width, double height and combined modes
- Inverted print mode; can be read without tearing off paper
- Full dot addressable graphics capability
- Front opening for easy paper and ribbon change
- Accepts both serial and parallel data
- Durable polycarbonate case designed for easy panel fixing



Specifications

	Standard
Number of columns	24
Print speed (lines per second) - typical	0.7
Character set (mm) - W 3 H	1.7 3 2.4
Dots per line (graphics)	144
Fonts (dots)	5 3 7 (5 3 8 for
	descending characters)
Data input	Parallel or serial TTL
Baud rate (serial)	110, 300, 1200, 2400, pin selectable
Power supply	Single or twin +5Vdc @ 100mA (quiescent) and up to 1.5A (printing), 3A (peak)
Panel cut-out (mm) - W 3 H	109 3 61.5 ± 0.5
Weight, including full paper roll (g)	380
Temperature range (operating)	0°C - +50°C
Reliability - MTBF (lines)	500,000
Case material	Black polycarbonate

*Epson is a registered trade mark of Epson UK Ltd.

Power supply requirements

These printers require a +5Vdc power supply with a tolerance of ±10% (±0.5V). For best printing quality it should be regulated to better than ±5% (0.25V). The current required varies with the printing density. **It is vitally important for correct initialisation and operation that the power supply can deliver sudden peak currents during operation and switch-on of at least 3A.** 10ms is the maximum recommended rise time.

It is particularly important that the **initial rise time of the supply is short enough to give a valid reset to the controller.** The mean current will typically be 1A.

These panel printers have a split 5V supply to the mechanism and controller and it is strongly recommended that these be fed from separate regulators. The power to the controller must then be applied first, and removed last, if there is a significant difference in timing. The controller supply current will be a maximum of 100mA, but the mechanism supply must be capable of 3A; use of a separate supply for the controller may reduce the current demand of the mechanism during initialisation.

In considering the power supply arrangements, attention should be paid to the wiring and connections, as significant voltage drops may otherwise occur. The printing performance and reliability may be seriously affected by inadequate supply arrangements. For the best results, use at least a 5A rated supply. Since the printer has direct inputs to the controller chip, **do not apply low impedance inputs until the power supplies are established.** (This is particularly important in applications where the printer is switched off to conserve external battery power.)

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Momentary interruptions to, or reductions in voltage of the power supply to the controller can result in a fault condition from which it cannot recover until the power is completely removed and correctly restored. Under these conditions, the printer solenoids may be energised continuously and **burned out in a matter of seconds.** The user must ensure that the supply will not be teased in this way, or else protect the system from such effects.

The provision of external supply supervisors, or use of regulators with internal reset generators is strongly recommended. The power supply must not be taken above 6V (5V + 20%), or reversed, even under transient conditions. Particular attention should be paid to the power arrangements in vehicle or battery-operated applications, where load dump transients or reversal of replaceable batteries might occur.

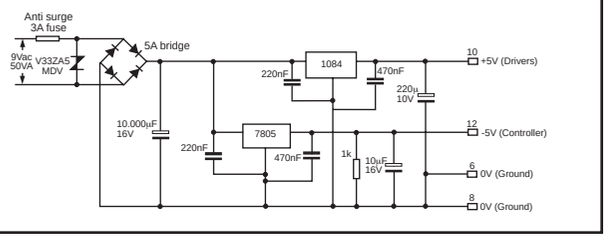
Please note that these warnings may seem severe, but what few problems occur are almost invariably related to power supply faults.

See Figure 1 for a recommended power supply circuit.

External reset

An external reset input is provided. Although the printer has internal reset circuitry, **it is strongly recommended that the user also applies a reset signal during system initialisation, if one is available on the host system.** This product incorporates a special power supply supervisor IC (type TL7702ACP) which generates the power-on reset, and also forces a reset in response to momentary reductions in supply voltage. This can result in interruptions to printing if the supply is inadequate.

Figure 1



* This 7805H regulator to be fitted with a 6.8°C/W heatsink.

** Heatsink is required if other 5V circuits are to be provided with this regulator.

Note: Power input requirements depend upon duty cycle of mechanism drivers.

Host connections

Either parallel or serial 7-bit data may be sent, as ASCII-coded characters or graphics bit patterns, in a wide variety of printing modes. (8-bit data can be sent, but the eighth bit is ignored.)

Parallel mode

In parallel mode, D6 to D0 are the seven data bits, with D6 most significant and D0 least significant. Positive true ASCII codes are accepted at TTL or 5V CMOS levels. The data inputs are not latched and must be static during the handshake sequence (see below). The data strobe input times the incoming data transfer: when the busy output is low, and the input data bits static, the data input strobe should be taken low, until the busy output goes high to indicate that the input data has been taken.

The data strobe must then be taken high again **immediately** to prevent multiple entry of the same code. Refer to Figures 2 and 3 for further information. In some cases, a simple additional logic circuit may be used to assist handshake timing (Figure 5). For some examples on parallel data interface connections see Figure 4.

Figure 2 **Parallel data timing**

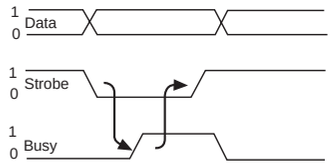


Figure 3 **Parallel data input flow chart example**

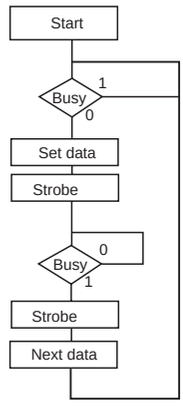


Figure 4 **Data interface circuits**

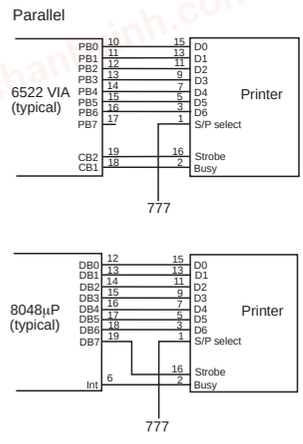
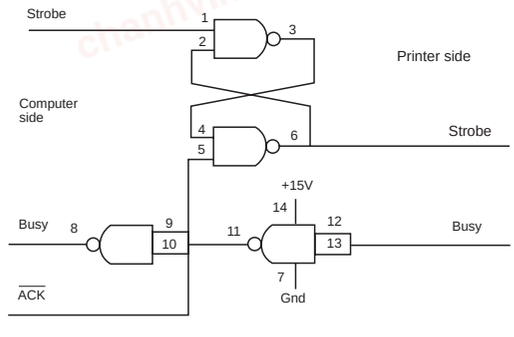


Figure 5



Additional circuitry to simulate industry standard parallel interface timing.

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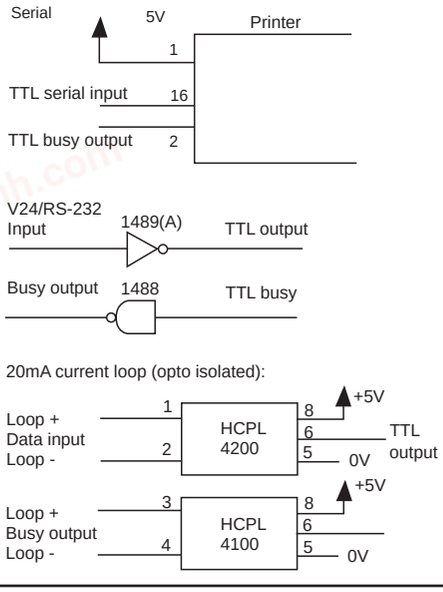
Serial mode

In serial mode, selected by taking serial/parallel select input high. D6 and D5 encode the baud rate. **D4 to D0 are not used but must be terminated, preferably to V_{CC} (+5V) via a 100k resistor.** The baud rate inputs may be changed at any time, but must always be set to match the incoming data rate. The data strobe input becomes the serial data input, accepting a TTL or 5V CMOS signal. The data is positive true, to suit the output from standard line receiver chips such as the 1489. **Do not apply ± voltages such as V24 data directly to this pin or damage may result.**

The busy output will be logical low when ready to accept data, and goes high after each character is received, staying high during printing or paper feed operations. Again, this signal must be buffered (for example by a 1488 line driver) in order to provide full V24 handshaking.

It is important that the host system can monitor the busy output, in either parallel or serial mode, to avoid sending data when the printer is not ready for it, and to time the parallel handshaking correctly.

Figure 6



Printing

Character printing

Characters are formed in a 5 3 7 matrix, except for some with descenders which use a 5 3 8 matrix. In all cases a standard capital letter is 7 dots high and there is a one-dot space between columns and a two-dot space between rows, making up a 10-dot vertical character row pitch.

Text mode prints left to right like a typewriter, with the first printed line at the top.

Data mode (reversed/inverted printing) has the paper flowing downwards, where the user needs to see the printout as it emerges from the printer, without lifting up and turning over the paper.

Graphics printing

The printer is programmed to take advantage of the graphics printing capability of the mechanism. Graphics codes are received as 6-bit dot groups when the control bit 1 has been set by the appropriate 'ESC' sequence, for example 'ESC and HO2'. Since the graphics mode is cleared after every dot line, this sequence must be sent each time. Graphics patterns are built up as a succession of dot lines across the paper, rather like a TV picture. The printers have 144 dots per line in 24-dot groups.

The most significant bit of each group of 6 dots is always printed first (ie. at the left hand end in text mode). The printer must always receive a full dot line's worth of code, even if some are blank, before it will print. The eight combinations of orientation, width and height are all available. Large areas of solid dots are not recommended as they cause overheating and shorten ribbon life - try shading instead. **Heavy graphics printing may also require a higher current power supply.**

Host programming

The single-chip microcomputer used in these products provides complete data interface and mechanism control. The chip has been programmed to accept a wide range of commonly-used data formats and has a single line buffer of 24 characters. The buffer contents will be printed out automatically when it is full. The buffer is cleared by a hardware and software reset. A partially full line will be printed on receipt of an appropriate control code. Alternative printing modes, including graphics, are invoked by 'escape' sequences. The printable character set consists of 96 ASCII codes. Codes from 20 to 7F Hex are treated as printable. Closed from 00 to 1F Hex are reversed for control functions as follows:

LF (0A Hex)	Causes printout of buffer contents in selected print mode, with automatic paper feed. If the buffer is empty, just a paper feed results.
CR (0D Hex)	Behaves exactly like LF. Note that if both CR and LF are received, in either order, an extra line feed will result.
ESC (1B Hex)	Causes the controller to expect the next code as a special parameter, with bits uniquely coded, as follows:

When bits 5 and 6 are zero:

Bit 0 (LSB)	0 for text mode	1 for data mode (inverted or inverted reversed) printing
Bit 1	0 for characters	1 for graphics printing
Bit 2	0 for single width	1 for double width printing
Bit 3	0 for single height	1 for double height printing
Bit 4	0 (except for self-test, see below)*	

The special combination "ESC ESC" is used to initiate a self-test sequence, which results in a printout of the character set.

The graphics bit is cleared to zero after each dot line.

The print modes may be combined as required, for example double height and double width inverted printing is perfectly possible, but modes may not be mixed on one line.

*When bit 5 is set, bits 4-0 take on different functions, by encoding the number of steps of 3 dot pitches the paper is to be fed.

Bit 5 = '0' for no fast feed '1' for fast feed

Bits 4-0 = binary count of number of steps.

E.g. By sending 'ESC 4 2A HEX (binary 0010 1001) the printer will feed nine fast feed steps each of three dot line pitches.

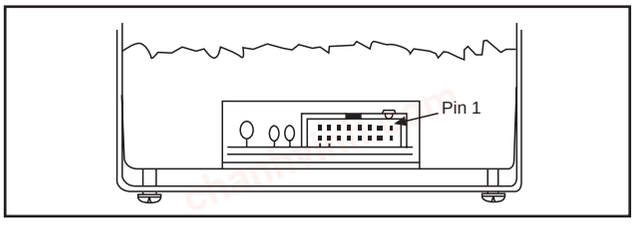
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Connection data

The printers have a 16-way IDC header with pin connections as follows:

Pin	Function	Pin	Function
1	Serial/Parallel select input	2	Busy output
3	Data input 6 (MSB)	4	Inverted (reverse) mode input
5	Data input 5	6	Ground (0V)
7	Data input 4	8	Ground (0V)
9	Data input 3	10	+5Vdc power input (mechanism)
11	Data input 2	12	+5Vdc power input (controller)
13	Data input 1	14	+Reset input
15	Data input 0 (LSB)	16	+Data strobe/Serial data input



The mating connector and cable assembly provided as standard with the printer has a colour stripe at pin 1.

Pin 1 should be low to select parallel data mode, and then pins 3 to 15 will be the seven data input bits (pin 3 is the most significant bit). Pin 1 should be high to select serial data input mode, and then pins 3 and 5 are used to select the baud rate as follows:

Pin 3	D6	0	0	1	1
Pin 5	D5	0	1	0	1
Baud rate	–	110	300	1200	2400
Bit period (µs)		9091	3333	833	417

The mode may be changed at any time between characters.

Unused data input lines

Any unused data input lines must be terminated high or low. All input and output voltages must be between 0V and 5V and never greater than the applied supply voltage.

Sample printout



The above printout is shown actual size and includes a self test printout showing the printer's full character set.

*ASCII character code

Character	Binary code	Hexadecimal code	Character	Binary code	Hexadecimal code
Space	0100000	20	P	1010000	50
!	0100001	21	Q	1010001	51
" (dbl quote)	0100010	22	R	1010010	52
£	0100011	23	S	1010011	53
$	0100100	24	T	1010100	54
%	0100101	25	U	1010101	55
&	0100110	26	V	1010110	56
'(sgl.quote)	0100111	27	W	1010111	57
(	0101000	28	X	1011000	58
)	0101001	29	Y	1011001	59
*(asterisk)	0101010	2A	Z	1011010	5A
+	0101011	2B	[	1011011	5B
,(comma)	0101100	2C	/	1011100	5C
–(minus)	0101101	2D	]	1011101	5D
.(period)	0101110	2E	Δ	1011110	5E
/	0101111	2F	—(underline)	1011111	5F
0	0110000	30	/	1100000	60
1	0110001	31	a	1100001	61
2	0110010	32	b	1100010	62
3	0110011	33	c	1100011	63
4	0110100	34	d	1100100	64
5	0110101	35	e	1100101	65
6	0110110	36	f	1100110	66
7	0110111	37	g	1100111	67
8	0111000	38	h	1101000	68
9	0111001	39	i	1101001	69
:	0111010	3A	j	1101010	6A
;	0111011	3B	k	1101011	6B
<	0111100	3C	l	1101100	6C
=	0111101	3D	m	1101101	6D
>	0111110	3E	n	1101110	6E
?	0111111	3F	o	1101111	6F
@	1000000	40	p	1110000	70
A	1000001	41	q	1110001	71
B	1000010	42	r	1110010	72
C	1000011	43	s	1110011	73
D	1000100	44	t	1110100	74
E	1000101	45	u	1110101	75
F	1000110	46	v	1110110	76
G	1000111	47	w	1110111	77
H	1001000	48	x	1111000	78
I	1001001	49	y	1111001	79
J	1001010	4A	z	1111010	7A
K	1001011	4B	°(degrees)	1111011	7B
L	1001100	4C	#	1111100	7C
M	1001101	4D	Ω	1111101	7D
N	1001110	4E	~	1111110	7E
O	1001111	4F	:::	1111111	7F

•**Note:** The printers differ from the standard ASCII character set in that they include useful characters after 'Z'.

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