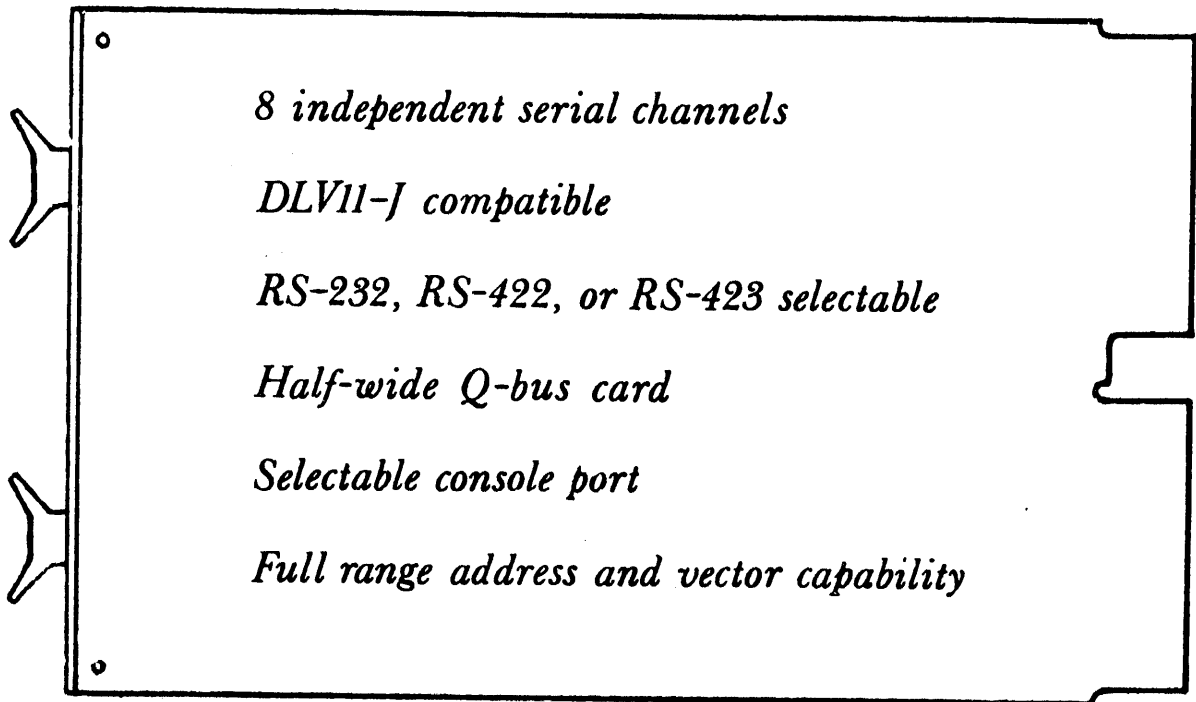


8S

Owner's Manual



TECHNICAL MAGIC

8S USER'S MANUAL

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TECHNICAL MAGIC 8S USER'S MANUAL
Functional Description

Functional Description

The Technical Magic 8S board is a half wide LSI-11 compatible interface containing eight standard, full-duplex serial ports. Each serial port can be independently configured for use with RS-232C, RS-422, or RS-423 as desired. Baud rates may be independently selected by jumpers for operation from 75 to 153.6K baud. Jumpers may also be used to select: number of data bits, number of stop bits, parity checking, and parity sense. All eight ports unless the console option is selected occupy one continuous 32 word long block of memory space. The base address and the base vector of this block are both jumper selectable over the full standard range. One of the serial ports may be used as the console port. 8S is fully hardware and software compatible with the LSI-11 Q-bus.

Theory of Operation

General

This module contains eight serial ports that transmit and receive asynchronous serial data. Each serial port is implemented with a univierial asynchronous receiver and transmitter (UART) with associated transceivers for various EIA standard interfaces. The bus interface which decodes addresses, forces vectors, and generates control signals is implemented with a DEC Chipkit, multiplexers, and gates.

Interface

The Q-bus interface uses a DEC Chipkit to: buffer the address and data lines; compare against user assigned address and console address; and generate signals to the error selector and the port decoder. The interrupt vector assigned by the user is forced when an interrupt request is received from the interrupt encoder.

Input and output

Each serial port is implemented with a universal asynchronous receiver and transmitter (UART) which converts incoming serial data to parallel data, converts parallel data to outgoing serial data, generates error data, and sends interrupt request signals. Serial data is received or transmitted through an EIA receiver or driver. The eight serial ports are individually selected by the port decoder to output or input parallel data to or from the Chipkit. Port decoding is accomplished by two decoders. Error data for the selected port is routed by an error selector implemented with three tri-state data selectors.

Interrupt

Interrupt service on the Q-bus is handled by an interrupt encoder consisting of two priority encoders, a vector PROM, and several gates. When an interrupt occurs in one of the eight serial ports, an interrupt request is sent by the priority encoders and the interrupt vector is sent by the vector PROM to the Chipkit.

Configuration

Device Address

The 8S is shipped with the device base address set to 176500. The eight serial ports are located sequentially after the base address occupying addresses 176500 through 176576, unless the console is enabled. These are standard addresses used by DEC software for extra serial ports and may be altered if desired by changing the base address jumpers. Bit definitions are silkscreened on the component side of the board. Address bits 6-12 may be changed to allow the 32 words of the interface to be placed anywhere in the top 4K words of memory (the IO space). An installed jumper wire in a bit position causes the address match logic to match on a one (TTL high level) at that bit. A missing jumper matches on a zero (TTL low level).

Interrupt Vector

The interrupt vectors of the 8S are shipped set to 300 through 376. These are standard interrupt vectors used by DEC software for extra serial ports. The vectors can be changed by changing the base vector jumpers. Bit definitions are silkscreened on the component side of the board. Vector bits 6-9 may be changed to allow the interrupt vectors to be placed anywhere in the bottom 512 words of memory. An installed jumper wire in a bit position causes a one to be forced onto the Q-bus at that bit when an interrupt occurs. An missing jumper makes that bit of the interrupt vector a zero.

Console

The 8S is shipped with the console enabled. To disable the console, install the console jumper. This also automatically disables the Boot/Halt jumper, so that jumper does not need to be removed. Note that when the console is selected, the channel S7 will not respond, since this hardware is used as the console. Also, note that if the base address is 177500, the console will overlap S6 if enabled, which would make one serial port (S6) unusable.

Boot/Halt

If the console is enabled, the Boot/Halt jumper may be used. If this jumper is in the Boot position (center to left), the system will re-boot when a break is received from the console. If the jumper is in the Halt position (center to right), the system will halt when a break is received from the console. If the jumper is removed, a break from the console is ignored. If the console is disabled, this jumper has no effect.

Parity, Data Bits, Stop Bits

The standard factory configuration for these bits is no parity, eight data bits, and one stop bit. Each channel has four parameter jumpers that control parity, number of data bits, and number of stop bits. This is shown in Table 1.

Table 1 Serial Communication Format

<u>Jumper</u>	<u>Description</u>	
OP	I=Odd Parity	R=Even Parity
7B	I=7 Data Bits	R=8 Data Bits
1S	I=1 Stop Bit	R=2 Stop Bits
PE	I=Parity Enable	R=Parity Disable
	I=Inserted	R=Removed

Baud Rate

Baud rates for each channel may be independently set. All baud rates are normally set to 9600 when shipped. To set a particular channel to run at a particular baud rate, connect that UART's clock pin to the desired baud rate source pin. Each UART clock connection has two pins which are wired together to allow multiple channels to be easily daisy-chained to the same baud rate. Each channel also has the capability to be run from an external clock by connecting the clock pin for that channel to the external pin for that channel. An user supplied external clock may connected to the board via pin 10 of the connector for that channel. Be sure that no internal clock gets tied to an external clock (unless this channel is used to supply clock to external world).

Communication Protocol

The standard configuration is RS-232C for all channels. This protocol can be individually changed for each channel to RS-422 or RS-423 by changing the protocol jumpers and the resistors as shown in Table 2.

Table 2 Serial Communication Protocol

<u>Jumpers</u>		<u>Resistor</u>	<u>Protocol</u>
+	-		
L to C	C to R	680 OHM	RS-232C
L to C	C to R	none	RS-423
C to R	L to C	100 OHM	RS-422

L=Left R=Right C=Center

Device Register Format

The device register format for all eight channels is identical. Each device has four words (i.e. four registers). The registers for each channel follow immediately after the previous channel, except in the case where the console is enabled, in which case the console is completely independent and located at 177560-177566 with the vector 60-66.

The four words for each channel are: input status, input data, output status, and output data, in that order. The format for each of these words is shown in Figure 1.

Figure 1 Serial Port Register Format

0	0	0	0	0	0	0	0	RD	RIE	0	0	0	0	0	0
---	---	---	---	---	---	---	---	----	-----	---	---	---	---	---	---

Bits	Code	Input Status Register Function	Access
8-15	0	not used	read as zero
7	RD	Receiver Done	read only
6	RIE	Receiver Interrupt Enable	read/write
0-5	0	not used	read as zero

IE	OE	FE	PE	0	0	0	0	D7	D6	D5	D4	D3	D2	D1	D0
----	----	----	----	---	---	---	---	----	----	----	----	----	----	----	----

Bits	Code	Input Buffer Register Functions	Access
15	IE	Input Error	read only
14	OE	Overrun Error	read only
13	FE	Framing Error	read only
12	PE	Parity Error	read only
8-11	0	not used	read as zero
0-7	D	Data	read only

0	0	0	0	0	0	0	0	TR	TIE	0	0	0	0	0	TB
---	---	---	---	---	---	---	---	----	-----	---	---	---	---	---	----

Bits	Code	Output Status Register Functions	Access
8-15	0	not used	read as zero
7	TR	Transmit Ready	read only
6	TIE	Transmit Interrupt Enable	read/write
1-5	0	not used	read as zero
0	TB	Transmit Break	read/write

0	0	0	0	0	0	0	0	D7	D6	D5	D4	D3	D2	D1	D0
---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----

Bits	Code	Output Buffer Register Functions	Access
8-15	0	not used	read as zero
0-7	D	Data	write only

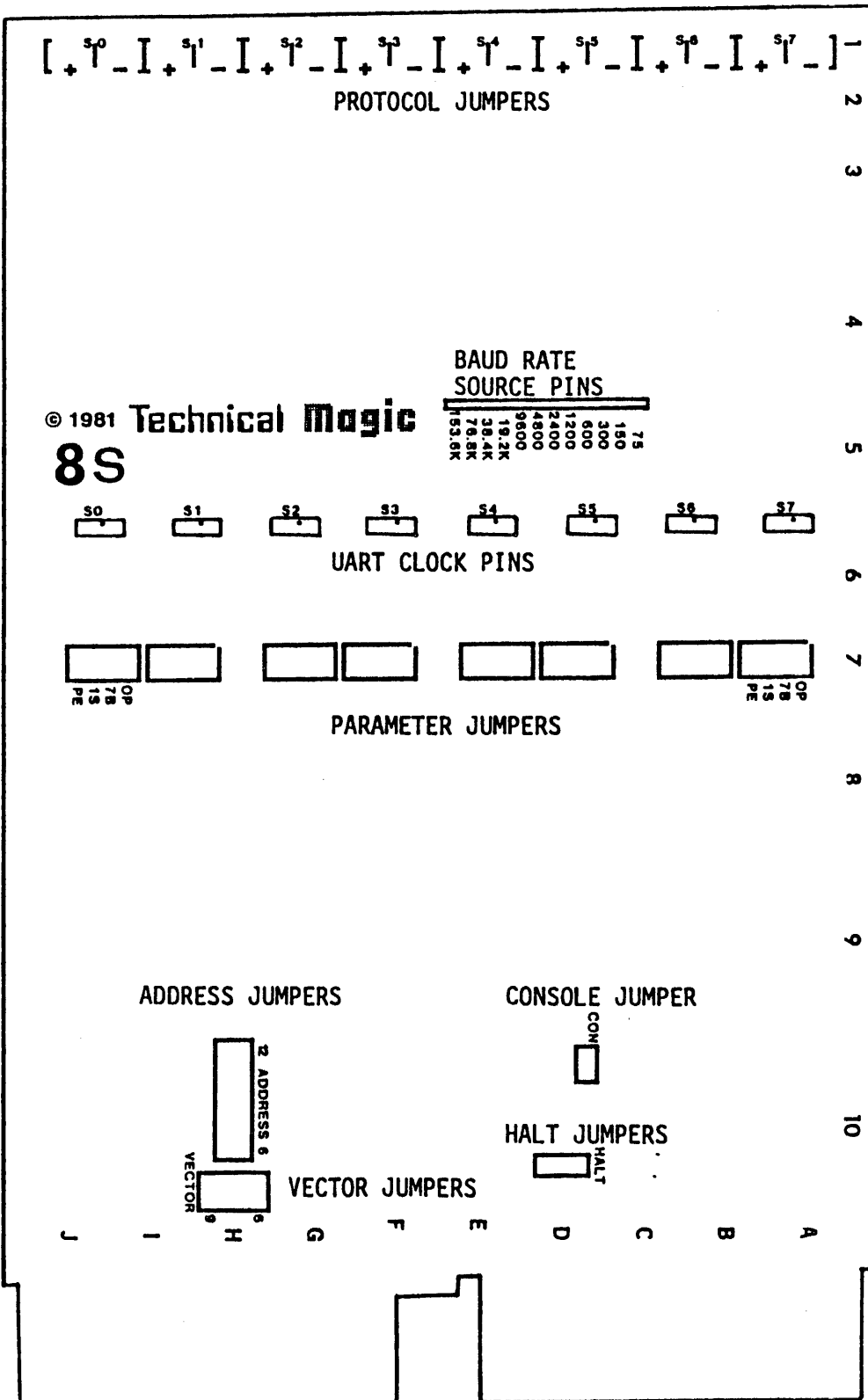
Parts List

<u>Quantity</u>	<u>Part Number</u>	<u>Description</u>
10	0.047UF	bypass capacitor
1	3.3UF	filter capacitor
3	39UF	filter capacitor
1	470PF	timing capacitor
2	0.47UF	charge pump capacitor
10	680 OHM	resistor
4	22K OHM	resistor
4	1K OHM x 8	resistor network
1	12K OHM x 8	resistor network
3	1N914B	diode
1	9.8304MHZ	oscillator module
1	0.5A @ 12V	fuse
4	74LS00	quad NAND gate
2	74LS02	quad NOR gate
2	74LS08	quad AND gate
2	74LS32	quad OR gate
1	74LS133	13-input NAND gate
2	74LS138	3-to-8 line decoder
1	74LS175	quad flip-flop
2	74LS240	octal buffer
8	74LS251	multiplexer
3	74LS259	addressable latch
2	74LS348	8-to-3 priority encoder
2	74LS393	dual binary counter
1	75452	open-collector AND gate
4	9636	RS-422 driver
4	9636	RS-422/423/232C receiver
4	9638	RS-423/232C driver
8	03-6402C-9	UART
1	DS0026	charge pump driver
1	6330	32x8 tri-state PROM
1	6331	32x8 open-collector PROM
1	DC003	DEC interrupt logic chip
1	DC004	DEC protocol logic chip
4	DC005	DEC transceiver logic chip
2	40-PIN	40-pin edge connector
91	JUMPER	jumpers and shorting bars
1	HANDLE	handle

Connector Pinout

<u>Pin</u>	<u>Signal</u>
1	External clock
2	GND
3	Transmit+
4	Transmit-
5	GND
6	No Pin
7	Receive- (*)
8	Receive+
9	GND
10	+12V

* Pin 7 should be grounded externally for RS-232C and RS-423
but not for RS-422



Specifications

Product identification	8S
Dimensions	Dual-width card 5.187x8.5" (13.18x21.6cm)
Weight	7.5oz
Power requirements	2A @ 5V 0.5A @ 12V
Operating temperature	0 to 50 Celsius 32 to 122 Fahrenheit
Storage temperature	0 to 50 Celsius
Serial interfaces	RS-232C, RS-422, or RS-423
Baud rates	75, 150, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 76800, and nominal speed of 153600 (*) with external clock capability
Number of serial ports	8
Base address range	160000-177700
Base vector range	0-1700
Console address	177560
Console vecotr	60
Compatibility	DEC standard including DLV-11J
Number of data bits	Selectable 7 or 8
Number of stop bits	Selectable 1 Or 2
Parity options	Even, odd, none
Bus load	1
Construction	4 layer epoxy glass

* It can be guaranteed if special ordered

Warranty

Technical Magic Incorporated (TMI) warrants to the original purchaser (Customer) of this Product that it is free from defects in materials and workmanship and that it meets the specifications applicable at time of manufacture. Should any failure to meet specifications occur within one (1) year from date of original purchase Customer should contact TMI by mail or telephone. TMI will, upon verification of purchase date, issue to Customer a Repair Number. Customer should then return Product, shipping prepaid, to Technical Magic. The shipping container should bear the Repair Number prominently displayed on the shipping label. Units should returned to:

Technical Magic
17742A Mitchell N.
Irvine, California 92714

Technical Magic will either repair or replace, at TMI's option and expense, any defective Product under this warranty at Technical Magic's expense and promptly return product, shipping prepaid, to Customer. The maximum liability of Technical Magic, to the extent allowed by law, shall be limited solely to replacement of Product, and this Warranty does not apply to any Product that has been abused, misused, or damaged nor does it apply to consequential damages or losses caused by any failure of this product.

Technical Magic Incorporated reserves the right to make improvements and changes in materials and specifications without notice or obligation and assumes no responsibility to modify or alter units to meet current specifications.

Any Product not covered above may be returned to Technical Magic for prompt repair or refurbishment at our current Service Rate. Contact Technical Magic for further information.