Dragon Data Ltd.

DRAGON 64 SUPPLEMENT

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DRAGON 64 Supplement

The Dragon 64 has been designed to ensure upward compatibility with the Dragon 32 and yet provide a machine with enhanced facilities. These extra facilities are:

1.   An additional 32K of RAM.

2.   An RS232 (serial) interface.

3.   Auto-repeating keys.

As the Dragon 64 is virtually identical to the Dragon 32 in most other respects this supplement shall describe only those extra features.

1.   Using the Extra RAM

When first switched on the Dragon 64 is configured like a Dragon 32, so that existing software, both tape and cartridge based, may be used as before. The extra 32K of RAM can be 'switched' into the machine by invoking a 'bootstrap' routine which enables the extra RAM and copies the BASIC interpreter into the top of the 64K RAM address space. This 64K mode bootstrap is invoked by typing:

> EXEC

if no other EXEC's have been used, or by:

> EXEC 48000

if a previous EXEC address needs to be over-ridden.

The 64K mode can be distinguished from the 32K mode by the fact that the cursor flashes blue rather than black.

The extra 32K of RAM overlays the normal BASIC and cartridge ROM addresses, which means that cartridge software cannot be used in the 64K mode. However, tape-based software, both BASIC and machine code, can make use of the extra RAM available. Because the BASIC interpreter is RAM resident in this mode, and occupies the top of RAM, 48K remains free for system and user use with the normal amount of RAM available to the BASIC programmer being 41241 bytes although this can, of course, be increased by an appropriate PCLEAR statement. If the BASIC interpreter is not required, for example, when running a machine code only program, the full 64K RAM space is available.

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The memory map of the Dragon 64 in 64K mode is shown at the end of this supplement.

2. Using the RS232 Interface

An RS232 serial interface is provided with the Dragon 64 and can be used in both the 32K mode and the 64K Mode. This interface is used by the following extra BASIC commands:

DLOAD "filename", <baud rate select>

and

DLOADM "filename", <baud rate select>, <load offset>

DLOAD and DLOADM download ASCII format BASIC programs and machine code programs, respectively, from a host computer. Like their cassette equivalents, CLOAD and CLOADM, the parameters to these commands are optional.

The <baud rate select> value, as its name suggests, is used to select the inter-computer communication baud rate. The permissible values for this parameter are given below.

baud rate select value	resultant baud rate
0	110
1	300
2	600
3	1200
4	2400
5	4800
6	9600

If this parameter is omitted the last stated value is used and if no previous value has been stated then the rate defaults to 1200 baud.

The baud rate of the RS232 interface may be altered by an appropriate POKE statement in BASIC. For example:

POKE &HFF07, (PEEK(&HFF07) AND &HF0) OR B

where variable B holds a value which specifies one of the baud rates supported by the device.

B	Baud Rate
1	50
2	75
3	110
4	135
5	150
6	300
7	600
8	1200
9	1800
10	2400
11	3600
12	4800
13	7200
14	9600
15	19200

The serial data is transmitted and received as 1 start bit, 8 data bits, 2 stop bits and no parity bit, so devices connected to his interface, such as serial printers, should conform to this specification.

2.1 Using a Serial Printer

The RS232 interface can also be used as the standard printer interface instead of the normal Centronics (parallel) interface. To select the serial option the following statement can be used:

POKE &H3FF,1

and to select the parallel option (default)

POKE &H3FF,0

In addition to the printer select byte, there are two other bytes (&H3FD and &H3FE) which specify a 16 bit end-of-line delay period since some printers require this. The time delay period is in increments of 10 milliseconds. Thus:

POKE &H3FE,50

will provide a delay of half a second.

Once the serial printer option has been selected, the BASIC commands LLIST and PRINT#-2 will output characters via the RS232 interface rather than via the Centronics interface.

2.2 Using the RS232 Interface from BASIC.

It is possible to manipulate the RS232 interface directly from BASIC by PEEKing and POKEing appropriate registers in the device.

E.g. The following program allows you to transmit characters:

```
100 REM WAIT UNTIL TX DATA REGISTER IS EMPTY
110 IF (PEEK(&HFF05) AND 16) =0 THEN 110
120 REM SEND CHARACTER GOT FROM KEYBOARD
130 CH$=INKEY$:IF CH$=" " THEN 130
140 PRINT CH$;:REM ECHO CHARACTER
150 POKE &HFF04,ASC(CH$)
160 GOTO 110:REM REPEAT
```

By using a similar technique to receive characters, communication is possible between two DRAGON 64's

```
200 REM SEND DTR LOW AND ENABLE RECEIVER
210 POKE &HFF06,PEEK(&HFF06) OR 1
220 REM NOW WAIT UNTIL RX DATA REGISTER IS FULL
230 IF (PEEK(&HFF05) AND 8)=0 THEN 230
240 REM RETURN DTR HIGH AND DISABLE RECEIVER
250 POKE &HFF06,PEEK(&HFF06) AND &HFE
260 REM NOW ACCEPT THE CHARACTER
270 CH$=CHR$(PEEK(&HFF04))
280 REM AND PRINT IT
290 PRINT CH$;
300 GOTO 210:REM REPEAT
```

Typical RS232 Connection

DRAGON 1	DRAGON 2
1. GND	1. GND
2. RX DATA	6. TX DATA
4. DTR	5. CTS
5. CTS	4. DTR
6. TX DATA	2. RX-DATA

The +12V and −12V lines, on pins 3 and 7 respectively, give standard RS232 voltage levels and can be used, for example, to keep CTS low rather than connecting it to DTR.

The pin-out of the RS232 is included at the end of this supplement.

3.   The Keyboard Auto-Repeat Facility

To avoid incompatibility with existing Dragon 32 software the
keyboard auto-repeat facility is only provided as standard in the 64K
mode. However, it is possible to incorporate this facility into the 32K
mode in the following way:

        POKE &HFF03,(PEEK(&HFF03)AND&HFE)
        POKE &H10D,&HBF
        POKE &H10E,&H20
        POKE &HFF03,(PEEK(&HFF03)OR1)

The timing reference for the repeat rate is derived from the mains
cycle frequency (50Hz) and a memory location in RAM (&H11F)
contains the inter-repeat delay value. This location contains a default
value of 5 which gives an auto-repeat of 10 characters per second. This
same value is also used to control the delay before starting the repeat
but, in this case, its value is multiplied by a factor of 8 giving a default
delay of 0.8 seconds before auto-repeat starts.

4.   BASIC Differences Between the Dragon 32 and Dragon 64

The most important differences between these two machines have
already been described in the previous sections of this supplement.
However, there are a few amendments to the BASIC and these are
described below:

4.1   USR Calls

In the Dragon 32 all USR calls defaulted to USR0. In the Dragon 64
USR calls are treated correctly in both the 32K mode and the 64K
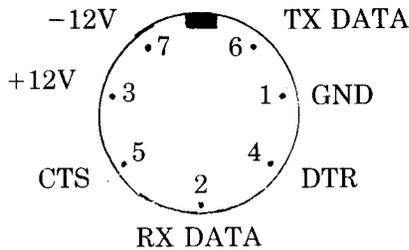mode.

4.2   MEM and VARPTR calls

Because there is more than 32K of RAM available in the 64K mode the
VARPTR and MEM functions have been altered so that they treat
their 16-bit result as an unsigned number. This means that they don't
return negative numbers for values in the range 32768 to 65535.

DRAGON 64 MEMORY MAP IN 64K MODE

Decimal Address	Contents	Hex Address
0-1023	System use	0-3FF
255	Direct Page RAM	0FF
1023	Extended Page RAM	3FF
1024-1535	Text Screen Memory	400-5FF
	Graphic Screen Memory	
1536-3071	Page 1	600-BFF
3072-4607	Page 2	C00-11FF
4608-6143	Page 3	1200-17FF
6144-7679	Page 4	1800-IDFF
7680-9215	Page 5	1E00-23FF
9216-10751	Page 6	2400-29FF
10752-12287	Page 7	2A00-2FFF
12288-13823	Page 8	3000-35FF
13824-49151	Program and Variable Storage	3600-BFFF
49152-65279	BASIC Interpreter	C000-FEFF
65280-65375	Input/Output	FF00-FF5F
65376-65503	SAM Control bits	FF60-FFDF
65504-65535	MPU vectors	FFE0-FFFF

PIN-OUT OF DRAGON 64 RS232 CONNECTOR

−12V · 7   6 · TX DATA
+12V · 3   1 · GND
CTS · 5   4 · DTR
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RX DATA

Decimal Address	Contents	Hex Address
0-1023	System use	0-3FF
255	Direct Page RAM	0FF
1023	Direct Page	3FF
1024-1535	Text Screen	400-5FF
	Graphics Memory	
1536-3071	Page 1	600-BFF
3072-4607	Page 2	C00-11FF
4608-6143	Page 3	1200-17FF
6144-7679	Page 4	1800-1DFF
7680-9215	Page 5	1E00-23FF
9216-10751	Page 6	2400-29FF
10752-12287	Page 7	2A00-2FFF
12288-13823	Page 8	3000-35FF
13824-49151	Program and Variable Storage	3600-BFFF
49152-65279	BASIC Interpreter	C000-FEFF
65280-65375	Input/Output	FF00-FF5F
65376-65503	SAM Control Lines	FF60-FFDF
65504-65535	MPU vectors	FFE0-FFFF

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PIN-OUT OF DRAGON 64 RS232 CONNECTOR

-12V   TX DATA

+12V   2   1   GND

CTS   3   DTR

RX DATA