



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.

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

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

DRAGON 2

1. GND
6. TX DATA
5. CTS
4. DTR
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.

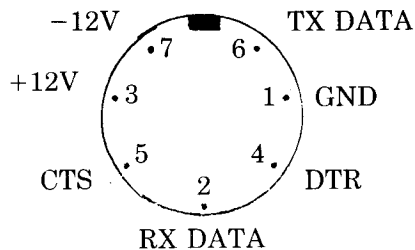
4.2 MEM and VARPTR calls

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



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DRAGON 31 MEMORY MAP IN HEX MODE

Decimal Address	Contents	Hex Address
0-1023	Current User	0-FFF
255	Dragon Page Base	0FF
1024	Dragon Page Base	3FF
1024-1535	Dragon Page Base	400-5FF
1536-2047	Page Base	600-8FF
2048-2559	Page Base	900-11FF
2560-3071	Page Base	1200-13FF
3072-3583	Page Base	1400-15FF
3584-4095	Page Base	1600-17FF
4096-4607	Page Base	1800-19FF
4608-5119	Page Base	1A00-1BFF
5120-5631	Page Base	1C00-1DFF
5632-6143	Page Base	1E00-1FFF
6144-6655	Page Base	2000-21FF
6656-7167	Page Base	2200-23FF
7168-7679	Page Base	2400-25FF
7680-8191	Page Base	2600-27FF
8192-8703	Page Base	2800-29FF
8704-9215	Page Base	2A00-2BFF
9216-9727	Page Base	2C00-2DFF
9728-10239	Page Base	2E00-2FFF
10240-10751	Page Base	3000-31FF
10752-11263	Page Base	3200-33FF
11264-11775	Page Base	3400-35FF
11776-12287	Page Base	3600-37FF
12288-12799	Page Base	3800-39FF
12800-13311	Page Base	3A00-3BFF
13312-13823	Page Base	3C00-3DFF
13824-14335	Page Base	3E00-3FFF
14336-14847	Page Base	4000-41FF
14848-15359	Page Base	4200-43FF
15360-15871	Page Base	4400-45FF
15872-16383	Page Base	4600-47FF
16384-16895	Page Base	4800-49FF
16896-17407	Page Base	4A00-4BFF
17408-17919	Page Base	4C00-4DFF
17920-18431	Page Base	4E00-4FFF
18432-18943	Page Base	5000-51FF
18944-19455	Page Base	5200-53FF
19456-19967	Page Base	5400-55FF
19968-20479	Page Base	5600-57FF
20480-20991	Page Base	5800-59FF
20992-21503	Page Base	5A00-5BFF
21504-22015	Page Base	5C00-5DFF
22016-22527	Page Base	5E00-5FFF
22528-23039	Page Base	6000-61FF
23040-23551	Page Base	6200-63FF
23552-24063	Page Base	6400-65FF
24064-24575	Page Base	6600-67FF
24576-25087	Page Base	6800-69FF
25088-25599	Page Base	6A00-6BFF
25600-26111	Page Base	6C00-6DFF
26112-26623	Page Base	6E00-6FFF
26624-27135	Page Base	7000-71FF
27136-27647	Page Base	7200-73FF
27648-28159	Page Base	7400-75FF
28160-28671	Page Base	7600-77FF
28672-29183	Page Base	7800-79FF
29184-29695	Page Base	7A00-7BFF
29696-30207	Page Base	7C00-7DFF
30208-30719	Page Base	7E00-7FFF
30720-31231	Page Base	8000-81FF
31232-31743	Page Base	8200-83FF
31744-32255	Page Base	8400-85FF
32256-32767	Page Base	8600-87FF
32768-33279	Page Base	8800-89FF
33280-33791	Page Base	8A00-8BFF
33792-34303	Page Base	8C00-8DFF
34304-34815	Page Base	8E00-8FFF
34816-35327	Page Base	9000-91FF
35328-35839	Page Base	9200-93FF
35840-36351	Page Base	9400-95FF
36352-36863	Page Base	9600-97FF
36864-37375	Page Base	9800-99FF
37376-37887	Page Base	9A00-9BFF
37888-38399	Page Base	9C00-9DFF
38400-38911	Page Base	9E00-9FFF
38912-39423	Page Base	A000-A1FF
39424-39935	Page Base	A200-A3FF
39936-40447	Page Base	A400-A5FF
40448-40959	Page Base	A600-A7FF
40960-41471	Page Base	A800-A9FF
41472-41983	Page Base	AA00-ABFF
41984-42495	Page Base	AC00-ADFF
42496-43007	Page Base	AE00-AFFF
43008-43519	Page Base	B000-B1FF
43520-44031	Page Base	B200-B3FF
44032-44543	Page Base	B400-B5FF
44544-45055	Page Base	B600-B7FF
45056-45567	Page Base	B800-B9FF
45568-46079	Page Base	BA00-BBFF
46080-46591	Page Base	BC00-BDFF
46592-47103	Page Base	BE00-BFFF
47104-47615	Page Base	C000-C1FF
47616-48127	Page Base	C200-C3FF
48128-48639	Page Base	C400-C5FF
48640-49151	Page Base	C600-C7FF
49152-49663	Page Base	C800-C9FF
49664-50175	Page Base	CA00-CBFF
50176-50687	Page Base	CC00-CDFF
50688-51199	Page Base	CE00-CFFF
51200-51711	Page Base	D000-D1FF
51712-52223	Page Base	D200-D3FF
52224-52735	Page Base	D400-D5FF
52736-53247	Page Base	D600-D7FF
53248-53759	Page Base	D800-D9FF
53760-54271	Page Base	DA00-DBFF
54272-54783	Page Base	DC00-DDFF
54784-55295	Page Base	DE00-DEFF
55296-55807	Page Base	DF00-DFFF
55808-56319	Page Base	E000-E1FF
56320-56831	Page Base	E200-E3FF
56832-57343	Page Base	E400-E5FF
57344-57855	Page Base	E600-E7FF
57856-58367	Page Base	E800-E9FF
58368-58879	Page Base	EA00-EBFF
58880-59391	Page Base	EC00-EDFF
59392-59903	Page Base	EE00-EEFF
59904-60415	Page Base	EF00-EFFF
60416-60927	Page Base	F000-F1FF
60928-61439	Page Base	F200-F3FF
61440-61951	Page Base	F400-F5FF
61952-62463	Page Base	F600-F7FF
62464-62975	Page Base	F800-F9FF
62976-63487	Page Base	FA00-FBFF
63488-63999	Page Base	FC00-FDFF
64000-64511	Page Base	FE00-FFFF
64512-65023	Page Base	
65024-65535	Page Base	
65536-66047	Page Base	
66048-66559	Page Base	
66560-67071	Page Base	
67072-67583	Page Base	
67584-68095	Page Base	
68096-68607	Page Base	
68608-69119	Page Base	
69120-69631	Page Base	
69632-70143	Page Base	
70144-70655	Page Base	
70656-71167	Page Base	
71168-71679	Page Base	
71680-72191	Page Base	
72192-72703	Page Base	
72704-73215	Page Base	
73216-73727	Page Base	
73728-74239	Page Base	
74240-74751	Page Base	
74752-75263	Page Base	
75264-75775	Page Base	
75776-76287	Page Base	
76288-76799	Page Base	
76800-77311	Page Base	
77312-77823	Page Base	
77824-78335	Page Base	
78336-78847	Page Base	
78848-79359	Page Base	
79360-79871	Page Base	
79872-80383	Page Base	
80384-80895	Page Base	
80896-81407	Page Base	
81408-81919	Page Base	
81920-82431	Page Base	
82432-82943	Page Base	
82944-83455	Page Base	
83456-83967	Page Base	
83968-84479	Page Base	
84480-84991	Page Base	
84992-85503	Page Base	
85504-86015	Page Base	
86016-86527	Page Base	
86528-87039	Page Base	
87040-87551	Page Base	
87552-88063	Page Base	
88064-88575	Page Base	
88576-89087	Page Base	
89088-89599	Page Base	
89600-90111	Page Base	
90112-90623	Page Base	
90624-91135	Page Base	
91136-91647	Page Base	
91648-92159	Page Base	
92160-92671	Page Base	
92672-93183	Page Base	
93184-93695	Page Base	
93696-94207	Page Base	
94208-94719	Page Base	
94720-95231	Page Base	
95232-95743	Page Base	
95744-96255	Page Base	
96256-96767	Page Base	
96768-97279	Page Base	
97280-97791	Page Base	
97792-98303	Page Base	
98304-98815	Page Base	
98816-99327	Page Base	
99328-99839	Page Base	
99840-100351	Page Base	
100352-100863	Page Base	
100864-101375	Page Base	
101376-101887	Page Base	
101888-102399	Page Base	



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