

ACORNUSER

UserDUMP

**Screen dump and printer control ROM
for the BBC Micro with
Epson, Star, Canon, Kaga
and other dot matrix printers**

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and
printer control
ROM

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Epson, Star, Kaga and Canon
printers

by GEORGE HILL

WARNING

UserDUMP is supplied on an EPROM chip which can be damaged by static electrical discharge. Take care to 'earth' yourself by touching a large metal object before handling the chip, and do not work on surfaces which build up static charges, such as nylon carpets, or wear nylon clothing. The ideal surface is a dry metal kitchen sink. Hold the chip by its ends, rather than by the metal legs.

UserDUMP is one of a series of products tested and supported by Acorn User, a monthly magazine for users of Acorn computers including the BBC micro and Electron. Look out for details of other products in Acorn User, or write to the address given below.

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UserDUMP and the UserDUMP manual were written by George Hill. Edited by Tony Quinn and Bruce Smith.

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RESTRICTIONS

Operating system

For UserDUMP to work properly the BBC micro must be fitted with operating system 1.2. UserDUMP is NOT compatible with version 0.1, and version 1.0 has some vagaries in its handling of printers which might cause minor anomalies. The version of the operating system on your micro is displayed when you type *FX0

Suitable printers

UserDUMP will work with any printer which has single density and double density bit-image graphics, using the ESC K n1 n2 and ESC L n1 n2 formats. This includes all EPSON (MX,RX and FX) printers, STAR Gemini and Delta, SG,SD and SR, CANON and KAGA NLQ, and many others. These printers have 480 and 960 dots per line in the two densities. The Shinwa, and other CP80 printers have 640 and 1280 dots per line. A specially-adjusted process is available for these printers.

Second processor

UserDUMP is fully compatible with the BBC 6502 second processor, and is in fact enhanced by it.

FITTING THE CHIP

NB Before fitting UserDUMP it is important to switch off and unplug the computer. Then proceed as follows:

- 1) Remove the four fixing screws which secure the computer lid, and remove the lid.
- 2) Remove the screws and nuts which secure the keyboard to the chassis.
- 3) Unplug the keyboard from the chassis, and unplug the loudspeaker connection. Lay the keyboard aside carefully.
- 4) Insert the chip in one of the vacant ROM sockets at the bottom right of the main BBC circuit board. Note that the notch in the chip MUST be at the back (ie pointing away from the keyboard). Care must be taken that all pins are engaged in the socket holes. Press home firmly, but DO NOT FORCE THE CHIP AND BEND THE PINS.
- 5) Replace the loudspeaker plug.
- 6) Replace the keyboard and its fixing screws.
- 7) Replace the keyboard plug.
- 8) Replace the lid and its fixing screws.

TESTING THE ROM

When correctly installed, typing *HELP should cause a listing of the ROM titles. USERDUMP, followed by a version number should appear in the list.

Typing *HELP USERDUMP should list the available commands and give brief summaries of their use.

SCREEN DUMP

All you need to know about UserDUMP is that a screen image is reproduced on the printer by using the command *SDUMP. There are three ways to do this.

1) By interrupting the graphics program. BEFORE running your graphics program type *C@ followed by the RETURN key. Now the current screen will be dumped when you press <CTRL @> (ie hold down the CTRL key, strike the @ key once and release CTRL key).

NB This setting is destroyed by the action of the <BREAK> key, including the use of <SHIFT BREAK> to auto-run a disc. If the method is to be used on an auto-run disc the command *C@ must be included as part of the !BOOT program. This method has other limitations described in sections 4 and 7.

2) From the keyboard. Type <CTRL Z> (ie hold down CTRL, strike the Z key once, and release the CTRL key). Now type *SDUMP followed by the RETURN key, and the printer will start its operations. (Allow a second or two for any necessary calculations.)

This method has the disadvantage that the command *SDUMP will appear as part of the picture, at the top left. If it is critical that the *SDUMP does NOT appear, it is better to use method 1 or method 3.

The minimum disturbance using method 2 from the keyboard is one blank space at the top left. This is obtained by the following laborious sequence:

<CTRL Z>* <CTRL H>S<CTRL H>D<CTRL H>U<CTRL H>M<CTRL H>P<CTRL H>
<SPACE><RETURN>

3) The third method of use is as part of a Basic program. An extra line, consisting of the single command *SDUMP may be inserted in any program at any point where a screen dump is required. If the program is a simple graphics program this is frequently at its END. In other cases some knowledge of Basic may be necessary to spot the correct line for the insertion. Nothing is lost by experimenting, however.

Holding down the ESCAPE key will abort the dump at any time.

If you wish to 'reverse' the picture (the same relationship as a photographic negative and positive), use *SDUMP+ instead of *SDUMP in methods 2 and 3, or see the section on *C@ in section 4

OTHER COMMANDS

There are a number of other commands available, and many more sophisticated methods of use are possible. The full command set is listed in section 3, and a more detailed description, with program suggestions is in section 4.

FACILITIES

UserDUMP gives the following extra commands, either typed from the keyboard, or included as part of a program.

- *SDUMP - complete screen-dump in any mode.
- *WDUMP - dump of graphics window only in any graphics mode.
- *CDUMP - character dump in black and white of the whole screen. The computer's character definitions are used.
- *ZDUMP - for selected printers only, a distortion-free dump of the mode 0 screen using plotter graphics. This also operates in other graphics modes.
- *TDUMP - dump of text window in any mode.
- *JDUMP - colour dump for JX80 printer only.
- *WINDOW - define a graphics window from the keyboard.
- *TRANSTI - translate teletext (mode 7) screen into mode 1.
- *RTI - restores teletext screen after TRANSTI
- *LPRINT - after the issue of this command all PRINT commands are treated as LPRINT, and output is directed to the printer only. The command is cancelled by
- *LPOFF.
- *C@ - set up the computer to dump the screen (using *SDUMP) each time <CTRL @> is pressed.
- *SET <argument> - sets the printer text mode. The argument indicates the style required.
- *RESET <argument> - turns off the text mode selected by *SET.
- *MAR <side> <column> - set left or right printer margin.
- *SHIFT <argument list> shift an area of memory from one place to another.
- *CP80 - select CP80 printer.
- *IBM - select IBM style printer.
- *Epson - cancel CP80, and IBM printer.
- *BDUMP <argument> - merge a basic dump on to another program.

If a + sign is added to the *SDUMP, *WDUMP, *CDUMP, *ZDUMP or *JDUMP commands the dump is converted to 'photographic positive' form, where black appears black and white appears white.

If a - sign is added to the *SDUMP or *WDUMP commands the colour shading is turned off, and any colour other than background is printed as black.

Both + and - may be used in a single command (eg *SDUMP +-).

HELP

*HELP USERDUMP - causes an abbreviated form of the list above to appear on the screen.

GENERAL POINTS

Detailed descriptions of the use of the facilities are listed below. Example programs on using the commands are given at the end of section 4.

The commands *WINDOW, *LPRINT, *SET, *MAR and *SHIFT should NOT be used without reading the explanations below. The others could be used with common sense without reading the detailed explanation.

The ESCAPE key interrupts all the dumps, but must be held down until the printer reaches the end of a line of dots.

ERROR MESSAGES

Any attempt to use one of the commands in a mode for which it is not suited results in the appearance of the message: *** Not a suitable mode. ***

An attempt to pass an incorrect argument, or series of arguments to SET, RESET, SHIFT, BDUMP or MAR results in the message: *** Argument error ***

An attempt to restore a mode 1 screen to teletext by *RTT when it was not derived from a mode 7 screen, gives *** Can't Restore ***

PRINTER SELECTION

*CP80, *IBM and *EPSON

UserDump is in 'Epson' mode when switched on, or after BREAK is pressed, ie it expects 480 dots per line for single density, and 960 dots per line for double density graphics, as on most printers.

*CP80 sets a 'flag' which causes the necessary adjustments to the SDUMP and WDUMP routines for CP80 type printers, having 640 and 1280 dots per line.

*IBM sets a flag which causes adjustment to the linefeed setting for Star SG, SD and SR printers when in 'IBM' mode. This is also needed for the oldest MX series printers. The flag must be set for all the dumping commands.

*EPSON clears both these flags, which are also cleared by any BREAK.

NB Other software might use the same flag, so it may be necessary to enter *CP80 or *IBM again if another ROM has been activated during a session of use.

SCREEN DUMPING COMMANDS***SDUMP and *SDUMP+**

This command has different effects in different screen modes and may be used in any mode.

In all modes it causes the current text and graphics windows to be reset to their default values (ie the whole screen) and an image of the whole screen is produced.

Normally a blank area of the screen is printed blank (ie appears white), and a white area is printed black.

If a + sign is added the dump is reversed so that the black areas of the screen appear black, and the white appear white.

In modes 0,1,4 and 5 the screen is dumped according to 'logical' colour, and no attempt is made to account for changes made using VDU19. In mode 2 the screen is dumped in 'physical' colour, taking account of any changes made by VDU19. This technique gives more contrast between shades in the modes with four (or fewer) colours. The use of 'equivalent colours' particularly in games and other animation sequences makes the physical colour more important in mode 2.

Mode 3 and 6 text are dumped to the printer in 'character mode' - ie using the computer's character definitions either by default, or as defined by VDU23 statements.

Mode 7 (teletext) is first translated into mode 1 and then dumped in four colours. Double-height text and graphics are accounted for. The mode 7 screen is restored after the dumping process, and on an escape, but the contents of memory are corrupted unless the second processor is in use.

Program 1 is an example of the use of *SDUMP in a brief graphics program.

A - sign (on the same key as '-') will cause the distinction between shades to disappear. This can be useful in dumping mode 7 text screens.

***WDUMP and *WDUMP+**

The 'graphics window' is defined by a VDU24 command or by the *WINDOW command (see below). *WDUMP reads the defined window and dumps only that area of the screen. The current text window is not affected.

This dump is not available in modes 3,6 and 7 (the text modes).

Program 2 illustrates the use of *WDUMP

A + sign reverses the dump.

A - sign removes the patterns.

***CDUMP and *CDUMP +**

The screen is decoded by reading the definitions of the characters at the normal character positions. These are translated into bit image graphics and dumped in black and white. This dump will take account of all special character definitions produced by VDU23. It takes no account of colour in the colour modes.

Please note that:

- 1) Any graphics commands used will be ignored.
- 2) Graphics characters and colour changes in mode 7 are ignored.
- 3) Characters plotted at the graphics cursor (using VDU5) will be ignored, unless they happen to coincide with the normal character positions.

Program 3 illustrates the use of *CDUMP.

A + sign reverses the dump.

***ZDUMP and *ZDUMP +**

THIS DUMP IS NOT SUITABLE FOR ALL PRINTERS.

All systems of dumping are subject to some distortion, except those based on 'plotter' graphics. A number of printers (eg the Epson FX80, the Canon PW1080A, the Smith-Corona Fasttext 80) have a command to produce distortion-free dumps. This uses the code ESC * 5 n1 n2. *ZDUMP produces a black/white only dump for modes 0,1,2,4 and 5. Its main use is likely to be in dumping graphs in mode 0 where accuracy is essential. The dump operates 'sideways', the left-hand side of the screen being reproduced first. The use of this dump sets the screens windows to their default values, and resets the graphics origin (ie performs the equivalent of VDU26,29,0;0;).

NB Any attempt to use this dump on a printer without the ESC * facility will lead to unpredictable results.

A + sign reverses the dump.

***TDUMP**

The 'text window' as defined by a VDU28 command is read from the screen. The whole screen will be read if no VDU28 command has been issued. The printer's own character set is used to produce a quick translation. No account is taken of the screen appearance of the characters.

*JDUMP and *JDUMP +

THIS DUMP IS NOT SUITABLE FOR ALL PRINTERS.

This dump is for use with the Epson JX80 colour printer. It gives a full screen dump in physical colour (ie actual screen colour) for GRAPHICS MODES ONLY (ie 0,1,2,4 and 5). The dump is in the 'no distortion' mode using plotter graphics, and is printed sideways.

NB It is essential that the AUTO LINEFEED DIP switch (2,4) is in the OFF position for this dump to work properly.

The dump will not operate on printers without the ESC * 5 facility, and may cause problems on any printer other than the JX80.

A + sign swaps black with white.

*BDUMP <n>

If you want to add a screen dump to a Basic program, for possible use on a micro which does NOT contain the UserDump chip, this command makes this possible.

The command *BDUMP n (where n is 0,1 or 2) will merge a suitable short dump on to a Basic program. The dumps are 'one-liners' written in Basic (so you can change them if you wish).

The three possibilities are:

- *BDUMP 0 - merge on a dump suitable for modes 0 or 4.
- *BDUMP 1 - merge on a dump suitable for modes 1 or 5.
- *BDUMP 2 - merge on a dump suitable for modes 2 (or 5).

The dumps are written as procedures, and may be called up by the command PROCdump inserted in the program at a suitable point. They are numbered starting at line 30000, so should not interfere with the numbering of most programs.

GRAPHICS COMMANDS***WINDOW**

This command allows a graphics window to be defined from the keyboard. A flashing 'frame' is drawn on the screen and the lines are the edges of the current graphics window. The frame may be altered using the cursor control keys. The cursor keys act as 'pointers' to the four frame edges. Thus the left arrow refers to the left edge, the up arrow to the top edge, etc. To move an edge press and hold down the relevant cursor key. Now keys I and O will move that edge in or out.

When the window is positioned to your satisfaction there are four possible courses of action.

1) Press the RETURN key until the window disappears. This will set the graphics window as the area bounded by the screen rectangle. The window should disappear. It may now be dumped by *WDUMP or *WDUMP + as described above.

2) Press the D key (for a dump). This will cause the window to be set, and immediately dumped to the printer.

3) Press the U key (for coordinates on the VDU). This causes the current graphics window coordinates to be displayed on the screen in the form needed by a VDU24 command. The values are in hexadecimal, but can be typed in exactly as shown on the screen.

4) Press the P key (for coordinates on the printer). This causes the current graphics window coordinates to be output on the printer in the form needed by a VDU24 command.

The ESCAPE key will abort the windowing operation. When it does so, a default (whole screen) graphics window is in operation.

No attempt is made to restrict the movement of the edges, but if you position them off the screen, or allow them to 'cross' one another, the computer will ignore the window. This is exactly what happens if you issue a faulty VDU24 command.

When entering *WINDOW from the keyboard, strike the RETURN key sharply, and do not allow a finger to dwell on it. Otherwise the *WINDOW routine may interpret it as a terminating RETURN.

***TRANST and *RTI**

This translates a mode 7 screen to mode 1. It is part of the normal process for *SDUMP, but has been included to enable the production of a dump of part of the mode 7 screen.

*RTI reverses the translation process.

Section 5 contains suggestions as to the handling of mode 7 screens and sets out the limitations of the translation.

PRINTER CONTROL COMMANDS***LPRINT and *LPOFF**

One of the main problems in using printer manuals is that they all assume the existence of LPRINT commands in Basic. The BBC micro has no such command.

*LPRINT intercepts characters before they can be sent to the screen, and re-directs them to the printer. It is designed principally for use in Basic programs. It has disadvantages when used from the keyboard directly. After the issue of a *LPRINT command all PRINT commands are interpreted as if they were LPRINT.

*LPOFF causes the computer to revert to normal.

NB

1) Every *LPRINT must be cancelled by a *LPOFF before another *LPRINT is issued, otherwise a fatal crash may occur.

2) The linefeed/carriage return situation is somewhat complicated. Following a *LPRINT the command PRINT causes the sending of BOTH linefeed and carriage return characters after the text. If your printer is set up with the auto-linefeed on, then double spacing will result. The command PRINT CHR\$10 might well result in a triple linefeed, whereas PRINT CHR\$10; (note semi-colon) will result in a single one.

***SET and *RESET**

These commands allow the printing style to be changed easily.

They require an 'argument'. This is in the form of a letter, or series of letters, added to the Basic command.

eg *SET I sets the italic style

or *RESET MU cancels emphasised and Underlined printing.

The argument determines the action to be taken. If a wrong argument or series of arguments is sent then the error message *** Argument error *** is issued.

The table below indicates the argument, its effect, and the codes which are sent by the SET and RESET routines.

Argument	Style	Setting code	Cancelling code
E	Elite (Epson)	ESC M	ESC P
e	elite (Star)	ESC B 2	ESC B 1
C	Condensed	SI	DC2
W	Enlarged (Wide)	ESC W 1	ESC W 0
Q	NLQ (Canon/Taxan)	ESC (ESC P
q	NLq (Star)ESC B 4	ESC B 5	
M	eMphasised	ESC E	ESC F
D	Double Strike	ESC G	ESC H
I	Italic (Epson)	ESC 4	ESC 5
i	italic (Star/IBM)	ESC I 1	ESC I 0
U	Underline	ESC - 1	ESC - 0
S	Superscript	ESC S 0	ESC T
s	subscript	ESC S 1	ESC T
A	American (Epson)	ESC R 0	ESC R 3
a	american (Star)	ESC 7 0	ESC 7 1
B	British (Epson)	ESC R 3	ESC R 0
b	british (Star)	ESC 7 1	ESC 7 0
P	Proportional	ESC p 1	ESC p 0
K	sKip perforation	ESC N 4	ESC 0

The commands do not alter the printer status (ie whether enabled or not).

*SET with no argument has no action.

*RESET with no argument sends the 'master reset' code ESC @, which sets the printer back to its normal printing mode.

*SET A (or B or a or b) and the corresponding *RESETs allow the national character set to be altered. The American set has the # sign printed in response to the keyboard # (<SHIFT 3>). The British set has the f sign in this position.

The proportional spacing options are only available on the Epson FX series printers, and later Star printers.

The Star printers in IBM mode are almost Epson compatible. One difference is that the NLQ mode is SET and RESET by the Epson ITALIC mode command I.

Up to six arguments may be passed in one go without an argument error, though it is difficult to see why that many might be needed at once!

No combinations of arguments are forbidden by UserDUMP, but the printers cannot respond correctly to all combinations of codes. Those involving Elite and Proportional modes need most care.

NB When using the Star printers the Elite, American and British commands must be in lower case. Odd results are experienced otherwise, particularly as the Elite command (ESC M) on the Epson corresponds to the margin setting command on the Star! Program 6 illustrates the use of *SET and *RESET.

NB *SET and *RESET must not be used after a *LPRINT command has been issued and will have peculiar effects if the printer has been enabled by a *FX3 command.

MARGIN SETTING COMMAND

*MAR <side> <column>

This command may be used to set the printer's left or right margin. Thus *MAR R 50 will set the right printer margin to column 50.

The <side> argument is as follows:

L	Epson Left margin
l	Star left margin
R	Epson Right margin
r	Star right margin

The <column> argument will accept decimal numbers of up to three digits. Numbers over 255 will be interpreted as column MOD 256.

If the column number is unacceptable to the printer then the command will be ignored (eg *MAR R 100 is impossible when in normal print mode with a max of 80 columns).

The left hand column is column 1. Thus

*MAR L (or l) 0 has no effect. To reset the left margin use

*MAR L (or l) 1

All margin settings are cancelled by a *RESET.

Program 7 illustrates the use of *MAR.

MEMORY SHIFTING COMMAND

*SHIFT <from> <to> <length>

This command has been included as a bonus to assist in the manipulation of screens. It may also be used to restore memory 'lost' to the disc filing system. The command requires three arguments, which are hexadecimal numbers, separated from each other and the I of *SHIFT by spaces. The three numbers are the address to move from, the address to move to, and the number of bytes to move. Thus to move a program of length 2000(hex) bytes, from &1900 to &E00, the command is
*SHIFT 1900 E00 2000

Before running the program it would be necessary to change PAGE to &E00 by the command
PAGE=&E00

To display a number of mode 7 screens in turn, you can load them into memory, say from address &6000 up, and use commands such as
CLS

*SHIFT 6000 7C00 400
to display them.

SINGLE KEY COMMAND

*C@

This command sets the computer up in exactly the way described in section 7. The screen will be dumped when <CTRL @> is pressed. The dump used is the *SDUMP one.

If you wish to use a different dump, initiated by the <CTRL @> key press, then either amend program 6 as indicated, or alter the dumping string as indicated below.

eg to obtain a *WDUMP+ dump on <CTRL @>

type

*C@<RETURN>

\$89FO="*WDUMP+"<RETURN>

Limitations

- 1) Any BREAK will destroy the setting, in particular the use of <SHIFT BREAK> to auto-run a disc program. The command *C@ must be included as part of the !BOOT program if the facility is required on an auto-run disc.
- 2) The limitations stated in section 7 about programs with their own event handling routines, or which use the speech buffer, apply.

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- 2) The limitations stated in section 7 about programs with their own event handling routines, or which use the speech buffer, apply.

Program 4. Illustrates use of *ZDUMP.

```
10 REM WHEEL
20 MODE0
30 PROCSPOKES(400,512,400,1)
40 PROCCIRCLE(400,512,400,3)
50 *ZDUMP
60 END
70 :
80 REM **PROCEDURES**
90 :
100 DEF PROCCIRCLE(X,Y,R,C)
110 GCOL0,C
120 MOVE X+R,Y
130 FOR th =0 TO 360 STEP 8
140 X1=X+R*COS(th*PI/180)
150 Y1=Y+R*SIN(th*PI/180)
160 DRAW X1,Y1
170 NEXT
180 ENDPROC
190 :
200 DEF PROCSPOKES(X,Y,R,C)
210 GCOL0,C
220 FOR th=0 TO 360 STEP 22.5
230 X1=X+R*COS(th*PI/180)
240 Y1=Y+R*SIN(th*PI/180)
250 MOVEX,Y
260 DRAW X1,Y1
270 NEXT
280 ENDPROC
```

Program 5. Using *LPRINT.

```
10 REM LPRINT TEST
20 *LPRINT
30 PRINT CHR$27"A"CHR$8:REM set linefeed
40 FOR J=1 TO 5
50 PRINT CHR$27"K";CHR$50;CHR$0;REM print 50 dots in single
density graphics.
60 FOR I=1 TO 50
70 PRINT CHR$255;
80 NEXT
90 PRINT CHR$10;:REM linefeed
100 NEXT
110 PRINT CHR$27"2":REM restore default linefeed
120 PRINT "FINISHED."
130 *LPDFF
140 END
```

Program 6. *SET and *RESET

```
10 REM SET/RESET
20 *RESET
30 VDU2
40 PRINT"NORMAL STYLE"
50 *SET WU
60 PRINT"Enlarged Underlined"
70 *RESET W
80 *SET I
90 PRINT"Underlined Italic"
100 *RESET U
110 *SET M
120 PRINT"Emphasised Italic"
130 *RESET
140 PRINT"On one line ";
150 *SET D
160 PRINT"Double Strike ";
170 *RESET D
180 *SET CS
190 PRINT"Condensed superscript."
200 *RESET
210 VDU3
```

Program 7. Margin setting.

```
10 REM MARGIN
20 REM Sets margins to print programs for Acorn User in 40
column width, emphasised, using the # sign.
30 REM Version for Star printers.
40 *RESET
50 *MAR l 20
60 *MAR r 60
70 *SET Ma
```

WORKSPACE CLAIM

UserDUMP does not claim any workspace in memory, thus the value of PAGE will not be altered.

MEMORY CORRUPTION

The added * commands are self contained, except in the following ways.

Zero page use

All the commands use the zero page locations &70 to &BF stated by Acorn to be 'available to user programs'. These are not corrupted, as UserDUMP saves and restores this area of memory.

A program which makes extremely heavy use of the system stack might conceivably interfere, but this is most unlikely.

The user flag

UserDUMP changes the 'user flag' at &281. This normally causes no problems, but other ROMs which use it might alter a preset value. This is only important in the case of the CP80 printer flag, and may result in the need to use the commands *CP80 or *EPSON at the start of each dumping session.

Other memory use

*SDUMP, when used on mode 7 screens and *TRANSIT cause the 'explosion' of the character definitions, and translate the screen to mode 1. This has no adverse effects at all if the second processor is fitted. It is otherwise almost inevitable that a mode 7 program will be corrupted by this process. The only way this can be avoided is if the user program is very small, and PAGE is set to PAGE+&600 before the program is loaded and RUN.

*LPRINT and *CE routines occupy the speech buffer at &9C0, and will be destroyed by any programs using that area.

MODE 7 or TELETEXT USE

Mode 7 (or teletext) screens are translated into mode 1 before dumping. They are restored automatically after dumping, but the re-appearance of the cursor will inevitably cause at least a small corruption on restoration. It is therefore advisable to save the screen to disc or tape before dumping if you want to recover it. This is best accomplished within a Basic program by inserting the lines

VDU26

*SAVE picture 7C00 +400

The Teletext Adaptor has a built-in capability to save its pictures in this form. This is described fully in the Teletext Adaptor User Guide.

Any mode 7 picture can be dumped after such a save, by running the following short program, which should be saved on disc or tape as "DUMPER".

```
10 MODE 7
20 IF PAGE<>&2100 THEN PAGE=&2100:CHAIN"DUMPER"
30 *LOAD picture 7C00
40 *SDUMP
50 END
```

Line 20 ensures that this program will not be corrupted by the *SDUMP or *TRANSTI commands. It is probably best omitted by tape users, who should set PAGE manually to &2100 before LOADING the program.

If only a section of the teletext screen is required then translate it to mode 1 by *TRANSTI. The graphics window can now be defined, and dumped using *WINDOW, and pressing D (for dump) after the window has been selected.

Alternatively the modified 'DUMPER' program below can be used.

```
10 MODE 7
20 IF PAGE<>&2100 THEN PAGE=&2100:CHAIN"DUMPER"
30 *LOAD picture 7C00
40 *TRANSTI
50 *WINDOW
60 REM Press RETURN when window selection is complete
70 *WDUMP
80 *RTT
90 END
```

LIMITATIONS

As eight colours are converted to four, there is inevitably some confusion on pictures using more than four colours. As over-colouring is now regarded as bad design, this problem is of little importance in most cases.

The algorithm does its best, but cannot be perfect! It attempts to ensure that all characters visible on the picture are visible in the translation. The translation is consistent on a single line, but translations of a single colour might differ on adjacent lines when a lot of colours are being used.

The mode 1 colours used are

- 0 - black
- 1 - blue
- 2 - yellow
- 3 - white

Changes in these colours by VDU19 will not affect the printout by SDUMP or WDUMP. If other colours are desirable for a JDUMP, the following program, which should be run with PAGE=82100, indicates how to make the desired changes.

```
10 MODE 7
20 *LOAD picture 7C00
30 *TRANSTT
40 VDU19,0,4,0,0,0:REM black=blue
50 VDU19,1,6,0,0,0:REM blue=cyan
60 VDU19,2,2,0,0,0:REM yellow=green
70 VDU19,3,3,0,0,0:REM white=yellow
80 *JDUMP
```

Conceal and flash/steady characters are ignored.

INTERRUPT DRIVEN DUMP

Program 8 (on the next page) is similar to that employed by the *C@ command. It is included to give increased flexibility in cases where *C@ will not operate for reasons which are explained below.

It will set your computer up to dump the screen when a given key is pressed. Simply type it in, SAVE it on tape or disc, and CHAIN it BEFORE the graphics program.

It works by causing an 'event' when a key is pressed. A routine is called which checks which key it was, and if the selected key is detected the command *SDUMP is passed to the command line interpreter.

CUSTOMISING

By altering line 120 you can change the selected key. A suggested alternative is the <TAB> key - ASCII number 9.

By altering line 100 you can choose a different dump (eg *SDUMP+, *WDUMP, *CDUMP etc)

NON-OPERATION

Some programs which have their own 'event handling' routines (including many games) may prevent this program from working.

Any program which uses the speech processor buffer (&9C0 to &9FF) will corrupt the machine code routine, as will any cassette SAVE. This can only be avoided by installing the code at a different address. To do this it is only necessary to alter the value of 'base' at line 80.

The program is on the next page.

USE FROM MACHINE CODE

The UserDUMP commands may only be used indirectly from machine code. The method is indicated on lines 230 and 240 of the single key dumping program.

The command string is deposited in a memory 'buffer'. X and Y registers are used as address pointers to the buffer (X=low byte, Y=high byte), and the Command Line Interpreter (OSCLI at &FFF7) is called.

PROGRAM TO DUMP SCREEN WHEN <CTRL-Q> IS PRESSED

```
10 REM C@DUMP
20 REM G.B.Hill (c) JULY 1985
30 REM To cause any graphics screen to be dumped when <CTRL-Q>
is pressed.
40 REM This routine occupies the speech processor buffer.
50 REM It will be overwritten by any speech processing, and by
any cassette SAVE.
60 oscli=&FFF7
70 osbyte=&FFF4
80 base=&9C0
85 REM This is the speech buffer. Alter the address if it gets
corrupted. Possibilities are &A00, &BC0 etc.
90 string=base+&30
100 $string="SDUMP"
110 REM This string may be changed to "SDUMP+" or any other
dumping command if required.
120 keynumber=0
130 REM this is the ASCII value of the key being checked
(<CTRL-Q>). Change it if required.
140 FOR opt=0 TO 2 STEP 2
150 P%=base
160 [OPT opt
170 .entry
180 PHP
190 CPY #keynumber
200 BEQ dumpit
210 PLP:RTS
220 .dumpit
230 LDX #string MOD 256:LDY #string DIV 256
240 JSR oscli
250 PLP:RTS
260 J
270 NEXT
280 #FX14,2
284 REM Write new vector
290 ?&220=base MOD 256
300 ?&221=base DIV 256
310 END
```


NOTES

