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# PRODUCT APPLICATION NOTE PS1.1

## ZX SPECTRUM SOUND AND GRAPHICS WITH HISOFT PASCAL 4T

This note gives details on controlling the sound and graphics capabilities of the ZX SPECTRUM using Pascal procedures from within Hisoft Pascal 4T.

#### 1. Sound.

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The following two procedures (defined in the order given below) are required to produce sound with HP4T.

(This procedure uses machine code to pick up its parameters and then passes them to the BEEP routine within the SPECTRUM ROM.)

PROCEDURE BEEPER (A, B : INTEGER);

BEGIN									
INLINE (£DD,	£6Ε,	2,	£DD,	£66,	з,	۵ ک	L,(IX+2)	÷Ш	H,(IX+3) )
£DD,	£5E,	4,	£DD,	£56,	5,	۵0)	E,(IX+4)	ះច	D,(IX+5) )
£CD,	£B5,	з,	£F3)			< CAL	L £385	: DI	>
END;									

(This procedure traps a frequency of zero which it converts into a period of silence. For non-zero frequencies the frequency and length of the note are approximately converted to the values required by the SPECTRUM ROM routine and this is then called via BEEPER.)

PROCEDURE BEEP (Frequency : INTEGER; Length : REAL);

VAR I : INTEGER;

BEGIN IF Frequency=0 THEN FOR I:=1 TO ENTIER(12000×Length) DO.

ELSE BEEPER( ENTIER(Frequency=Length), ENTIER(437500/Frequency - 30.125))

FOR I:= 1 TO 100 DO (short delay between notes) END:

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Example of the use of BEEP:

BEEP ( 262, 0.5 ); BEEP ( 0, 1 ); (sounds middle C for 0.5 seconds followed by a one second silence.)

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### 2. Graphics.

Three graphics procedures are given: the first plots a given (X,Y) co-ordinate whilst the second and third are used to draw lines from the current plotting position to a new position which is defined relative to the current plot position and which then becomes the current plot position.

Both PLOT and LINE take a BOOLEAN variable, ON, which, if TRUE, will cause any point to be plotted regardless of the state of the pixel in that plot position or, if FALSE, will cause any pixel already present at the plot position to be flipped i.e. if on it becomes off and vice versa. This effect is identical to that caused by the SPECTRUM OVER command.

(A procedure that mirrors the BASIC PLOT command. Simply plots the point X,Y ON or OFF depending on whether the first parameter is TRUE or FALSE.)

PROCEDURE PLOT( ON : BOOLEAN; X, Y : INTEGER);

BEGIN	
IF ON THEN WRITE( CHR(21), CHR(0))	
ELSE WRITE( CHR(21), CHR(1));	
INLINE(#FD, #21, #3A, #5C,	(LD IY, 25C3A)
£DD, £46, 2, £DD, £4E, 4,	(LD B,(IX+2) : LD C,(IX+4) )
£CD, £E5, £22);	{ CALL £22E5 ;ROM PLOT routine}
END;	

(Called by the LINE procedure, LINE1 is used to pass the correct arguments to the DRAW routine in the SPECTRUM ROW,)

PROCEDURE LINE1( X,Y,SX,SY :INTEGER);

 BEGIN
 CLD
 IY,25C3A >

 fD0, f56, 2, fD0, f5E, 4,
 CLD
 D,(IX+2) : LD
 E,(IX+4) >

 fD0, f46, 6, fD0, f4E, 8,
 CLD
 B,(IX+6) : LD
 C,(IX+8) >

 fCD, fBA, f24)
 CALL
 £24BA ;ROW DRAH routine.>

END;

CLINE draws a line from the current plot position (x,y) to (X+x,Y+y). The line may be 'on' or 'off' depending on the value of the BOOLEAN parameter ON.)

PROCEDURE LINE( ON ; BOOLEAN; X, Y ;INTEGER);

#### var

SGNX, SGNY : INTEGER;

### BEGIN

IF ON THEN WRITE( CHR(21), CHR(0)) ELSE WRITE( CHR(21), CHR(1)); IF X<0 THEN SGNX:=-1 ELSE SGNX:=1; IF Y<0 THEN SGNY:=-1 ELSE SGNY:=1; LTNE1( ABS(X), ABS(Y), SGNX, SGNY) END: Che DRAW routine that is to be called (within LINE1 needs the absolute values) (of X and Y and their signs.) CPlot the line.) Example of the use of PLOT and LINE:

PLOT( ON, 50, 50 ); LINE( ON, 100, -50 ); (draws a line from (50, 50) to (150, 0).)

3. Output through the ROM.

There are occasions where it is useful to output directly through the SPECTRUM ROM RST  $\pounds 10$  routine rather than use WRITE(LN). For example, when using the PRINT AT control code – this code should be followed by two 8 bit values giving the (X,Y) co-ordinate to which the print position is to be changed. However, if this is done using a Pascal WRITE statement then certain values of X and Y (e.g. 8 which is interpreted by HP4T as BACKSPACE) will not be passed to the ROM and thus the print position will not be correctly modified.

You can overcome this problem by using the following procedure:

(SPOUT outputs the character passed as a parameter directly through the SPECTRUM ROM RST £10 routine and thus avoids any trapping by HP4T of the value output.)

PROCEDURE SPOUT ( C : CHAR );

BEGIN		
INLINE(£FD, £21, £3A, £5C,	(LD)	IY,£5C3A )
£DO, £7E, 2,	<u>د ا</u> ل	A,(IX+2) )
£07)	C RST	£10 >
END:		

Example of the use of SPOUT:

SPOUT ( CHR(22) ); SPOUT ( CHR(8) ); SPOUT ( CHR(13) ); (sets the print position to line 8, column 13.)

Hisoft hope that you will find the above routines useful and that they will enhance the way in which you use Hisoft Pascal 4T. As usual, we welcome any comments regarding the information given in this sheet.

Remember that the 'f' sign used to denote hexadecimal numbers is assumed to have the value CHR(35) i.e. SHIFT 3 on your keyboard. On some machines, e.g. the SPECTRUM, this is marked as '#'.