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74470 65945

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Have a Ball with Bally

When a leading maker of pinball machines turns its attention to microcomputers, the result is a very unusual machine.

The Bally Manufacturing Corporation, producer of the Bally Professional Arcade, began making delivery of their much-awaited plug-in ROM Bally BASIC in autumn, 1978. As many of you already know, the Bally Arcade is a TV video game with a Z-80-based microprocessor unit utilizing plug-in cartridges for instant game changes. Included with the base unit are two multifunction remote hand controllers, each with an 8-position joystick, a trigger and a rheostat-type knob for analog input.

The Arcade attaches to any TV set, preferably color, through a TV/game switch box. A slide switch on the side of the main console permits use of either channel 3 or 4. The main on-off switch is located rather inconveniently on the back of the set alongside the four hand-controller sockets, the audio tape interface socket and the future expansion bus.

A 24-key calculator with ten memory registers is built into the front deck. This keypad is used to select the built-in games, perform typical five-function calculations and enter programs with the Bally BASIC. Remote game selection is also obtained with the No. 1 controller.

Adjacent to the keypad is the cartridge slot where the pre-programmed games or the BASIC ROM is inserted. Your extra cartridges or recorded BASIC program cassettes can be stored in the clear plastic-covered 12-slot holder located on the top of the Arcade. A non-detachable ac power adapter provides the power to the Arcade. It works, but I can't help thinking of similar types of adapters that have quickly failed.

The console is constructed of wood-grained plastic, so the usual precautions to prevent excessive heat and sunlight should be observed. The built-in games and the optional game cartridges are colorful, imaginative and downright fun. However, the real reason I bought the Arcade was the exciting prospect of programming my own audio-video games.

Bally BASIC is a version of Palo Alto Tiny BASIC and was written by Jay Fenton. In addition to the normal Tiny BASIC commands, Bally has included commands to control graphics, color, sound and also to address each function of the pistol-grip hand controls.

Fig. 1. Bally's 24-key calculator keyboard.

Once the ROM cartridge is inserted and the reset button depressed, you are able to enter your own program of up to 1800 bytes via the console's 24-key calculator keyboard. Four different shift keys expand the 24-key layout to provide access to 103 separate letters, numbers, punctuations, operators and commands (see Table 1). A plastic color-coded keypad overlay allows input of three separate kinds of information: numbers, alphanumerics and command words (see Fig. 1).

Numbers and operators are

Commands		Standard Statements		Special-Purpose Statements	
Reset	Pause	For	Return	Clear	SZ
Run	Halt	To	Random	Line	TV
List	Go	Step	If	Box	KP
Erase	Stop	Next	Goto	FC	Print #A
		Gosub	Input	BC	KN ( )
		. (period)	Print	MU	TR ( )
				NT	JX ( )
				CX	JY ( )
				CY	PX (X,Y)

String Function – @ ( )
Operators – +, −, ×, ÷, <, >, #
Note: You must use the × and ÷ for arithmetical calculators, not * and /.
Punctuation – The . (period) is equivalent to a remark. The ; (semicolon) permits multiple statement lines. If a semicolon follows an IF statement and the IF condition is false, nothing after the semicolon will be performed.

```
90  B = 2 × A
100 If B = 30 Print "GOOD"; GOTO 20
110 GOTO 30
```

Therefore, if B ≠ 30 the program will go to statement 30, not 20. IF statements can be set up as multiple conditions, i.e., IFA = 3IFB = 4GOTO20 means that only if A = 3 *and* B = 4 will the program go to statement 20.

Table 1.

ng the appropriate keys. Letters, punctuation, symbols, etc., are accessed by first depressing one of the three colored (green, red, blue) shift keys and then the key under the desired letter. A fourth shift key is colored gold and permits you to enter an entire command word such as PRINT, GOTO, LINE, etc., in a similar fashion. When a colored shift key is depressed, the TV screen displays the corresponding color.

Initially, it is all very confusing, but, surprisingly, becomes second nature after a couple of hours. Unfortunately, the keypad does not have a distinctive click to indicate key depression, but Bally was nice enough to include musical tones to indicate contact completion. These tones can be deleted if desired.

Color Graphics

256 colors are accessible to you, but only two are permitted on the screen at one time. These are selected by the variables BC (background color) and FC (foreground color).

Screen resolution is 159 points wide and 87 points high, with each point capable of being individually addressed. Coordinate point 0,0 is in the center of the screen. Line X,Y,Z draws a line from the end of the last line (or from 0,0 if no line has been drawn) to the coordinates X,Y. Z designates whether the line is to be drawn in the foreground color, the background color, a reverse color... or no line at all (Z = 1, 2, 3 or 4). Box X,Y,A,B,Z places a box of A width and B height with its center at coordinates X,Y. Z permits the same color designation as the Z in LINE. A single point is plotted at X,Y coordinates with this command by setting A and B equal to 0. PX (X,Y) is used to determine the color (background or foreground) of a particular given coordinate.

Controllers

PDL (A) produces a number between −128 and +127, depending on the position of the A game controller rheostat knob.

The Bally Computer System, Model ABA-1000.

```
10 Clear; CY=16; NT=1
20 Print "        Battlestar"
30 Print "        Galactica!"; Print
40 Print "              Oct 1978"
50 Print "       By R.J.Nitto"
60 For T=1 to 1000; Next T; R=1; NT=1
70 For C=1 to 9; S=3; If R<1 R=1
80 Clear; BC=248; FC=7                          /Blue background - white foreground.
90 For T=1 to 100; X=Rnd(159)-80
100 Y=Rnd(88)-44; Box X,Y,1,1,1; Next T         /Plot starry background.
110 Print "    Ceylon Warship #",#2,C
120 X=Rnd(50)-25; Y=Rnd(30)-15
130 CY=-40; Gosub R x 10 +330
140 Line -10,-10,0; Box H,V,31,6,2
150 Box X,Y,19,3,1; Box X,Y,31,1,1
160 Box X,Y+1,7,6,1; Box X+7,Y,1,1,1            /Plot target.
170 Box X-7,Y,1,1,1; Line 10,10,1
180 Line 10,-10,0; Line -10,10,1; H=X; V=Y      /Crosshairs
190 If TR(1)=1 S=S-1; G=0; Goto 230             /Did we shoot?
200 If X=0 If Y=0 Gosub 440; Goto 330           /If not & target is centered, we're dead.
210 X=X+Rnd(5)-3; Y=Y+Rnd(5)-3                  /If not,target moves again.
220 X=X-2 x JX(1); Y=Y-2 x JY(1); Goto 140      /Attempt to bring target into crosshairs.
230 For Z=1 to 6; Line -75,-40,0; MU=80
240 Line 0,0,3; MU=85; Line 75,-40,0; MU=80     /Laser display and sound effects.
250 Line 0,0,3; MU=85; Next Z
260 If X<2 If X>-2 If Y<2 If Y>-2 Goto300       /Is target lined up with crosshairs(±1)?
270 Gosub 440; If     Goto 330                  /If not, goto warship's return fire.
280 If S=0 R=R+   Goto330                       /Are we out of ammo?
290 Goto210
300 For Z=1 to 6; Box X,Y+1,33,10,3
310 For W=55 to 65; MU=W                        /Display direct hit sequence w/sounds.
320 Next W; Next Z; R=R+2
330 R=R-1; Next C; Goto 540                     /This round is over
340 Print "     Novice - Grade 1",; Return
350 Print "   Technician - Grade 2",; Return
360 Print "      Scout - Grade 3",; Return
370 Print "      Cadet - Grade 4",; Return
380 Print "     Ranger - Grade 5",; Return      /Titles and rank
390 Print "    Sergeant - Grade 6",; Return
400 Print "     Captain - Grade 7",; Return
410 Print "      Major - Grade 8",; Return
420 Print "     Warrior - Grade 9",; Return
430 Print "      Fleet Commander",; Return
440 If X<3 If X>-3 If Y<3 If Y>-3 A=520; G=1; Goto 460 /Did target's lasers hit us?
450 A=530
460 For W=80 to 62 Step -3
470 Box X+7,Y,83-W,83-W,3; MU=W
480 Box X-7,Y,83-W,83-W,3; MU=W-1               /Target's laser display & sound effects.
490 Next W; Box X,Y,35,21,2
500 Gosub 510; Gosub A; Return
510 CY = 32
515 Print "    26 spaces"; CY =32; Return
520 Print " You have been terminated!"; Return
530 Print "        He missed!"; Return
540 Clear; Print; Print "     Congratulations!"
550 Print; Print "     You made rank of"         /Display final ranking.
560 Gosub R x 10 + 330
570 CY = -32; Gosub 515; CY = -32
580 NT=0; Print " Press trigger to go again"    /Strobe effect
590 If TR(1)=0 Goto 570
600 Goto 60
```

Program listing.

TR(A) produces a number, either 0 or 1, depending on the position of the A hand-control trigger. JX(A) produces a number, −1,0 or 1, depending on whether the A knob is left, center or right. JY(A) is similar but is dependent on whether the A knob is back, center or forward.

A print command preceding the above will display the number being generated by that command (i.e., print JX(A)). All controller functions can be used to vary color, motion, sound and graphics. Typical commands might include:

IF TR(1) = 1 MU = A—If trigger 1 is pulled, sound the musical tone A.

BC = KN(2) + 127—Set background color according to the knob 2 position.

LINE X,Y,JX(1) + 1—Draw a line of background color, or foreground color, dependent on joystick 1 position.

Music

Musical tones are produced with either the PRINT command or the MU = command. Setting MU equal to numbers between 33 and 88 will produce a full range of tones. However, music is more easily programmed with the PRINT command.

PRINT operates in the normal BASIC fashion, except that musical tones accompany each printed character. The duration of these tones is controlled by the command NT (note time), with NT = 0 producing zero duration. As NT increases, so does the duration of the tones. NT can be changed at any time. The tones span three octaves and are complete with flats and sharps.

Text

Print formatting is accomplished by the use of Print # A,B. (In a field of A spaces, print the number in the B register.) CX is the horizontal tab cursor control (i.e., CX = 10). CY is the vertical tab cursor control (i.e., CY = 20). Print SZ will display the number of unused memory locations.

Characters may be placed on the screen with the use of the TV = command. Only numbers are recognized, and they are identical to the ASCII character representations for decimal numbers between 32 and 94. Other numbers up to 119 designate other characters and command words such as GOSUB, LIST, etc.

Recognition of any depressed key is accomplished with the KP command. Normal use would be A = KP. The number of the pressed key is stored in the A register. It can also be used in other statements (i.e., IF KP = 116 GOTO 320: If the PRINT key was pressed, go to 320).

String Functions

Individual subscripted variables are accessed via the @ (X) command, where X is a number between 1 and 900. Letters and other characters may be stored and recalled with this command. For example, the following program will produce and display the complete alphabet.

```
10 For A = 1 to 26
20 @ (A) = A + 64
30 TV = @ (A)
40 Next I
```

Characters stored via strings are supposedly stored in a separate memory bank and do not affect program storage. However, mine seems to have 900 variables with no program in memory and less than 900 with a stored program.

Processing Speed

The timing benchmarks in the October 1977 *Kilobaud* ("BASIC Timing Comparisons," p. 20) were run on the Bally BASIC with the following results:

Benchmark#	1	2	3	4	5	6	7
Time in sec.	3.2	39	66	67	86	117	201

This is not fast in comparison to other published results, but it is certainly respectable. A converted Shell Sort program with 100 random numbers consistently gave results under two mintues.

All arithmetical operations are performed in [illegible] BASIC, somewhat limi[illegible] calculations, but adequ[illegible] programming games.

Conclusion

All in all, the Bally [illegible] with the BASIC ROM ha[illegible] en to be a fun machine[illegible] chased mine at Mont[illegible] Ward for $269 plus $50 [illegible] BASIC cartridge. Althou[illegible] first Arcade suffered fro[illegible] heating problems (quick[illegible] changed by Ward's pers[illegible] my second has given u[illegible] performance. Of course[illegible] looking forward to havi[illegible] full-blown processor (Ba[illegible] promises delivery of the[illegible] size keyboard in early spr[illegible] 1980), but for now the Tiny B[illegible] will suffice.

I must give praise to [illegible] Ainsworth for his well-w[illegible] instruction manual. It [illegible] easy-to-follow guide to [illegible] BASIC and includes a nu[illegible] of sample programs det[illegible] the capacity of the Arcade[illegible]

I have included one o[illegible] family's favorite programs [illegible] the program listing) to give[illegible] an idea of the diversity [illegible] creative use of the special B[illegible] commands. It is based on[illegible] TV show "Battlestar Galac[illegible] and utilizes one joystick[illegible] operation. It is both challeng[illegible] and fun. Be the first on [illegible] block to become a fleet co[illegible] mander. ■

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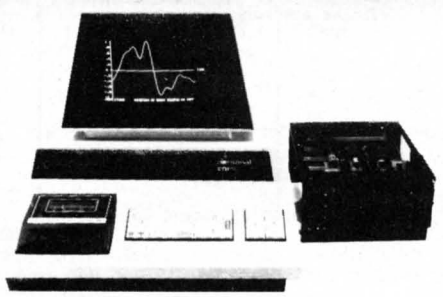

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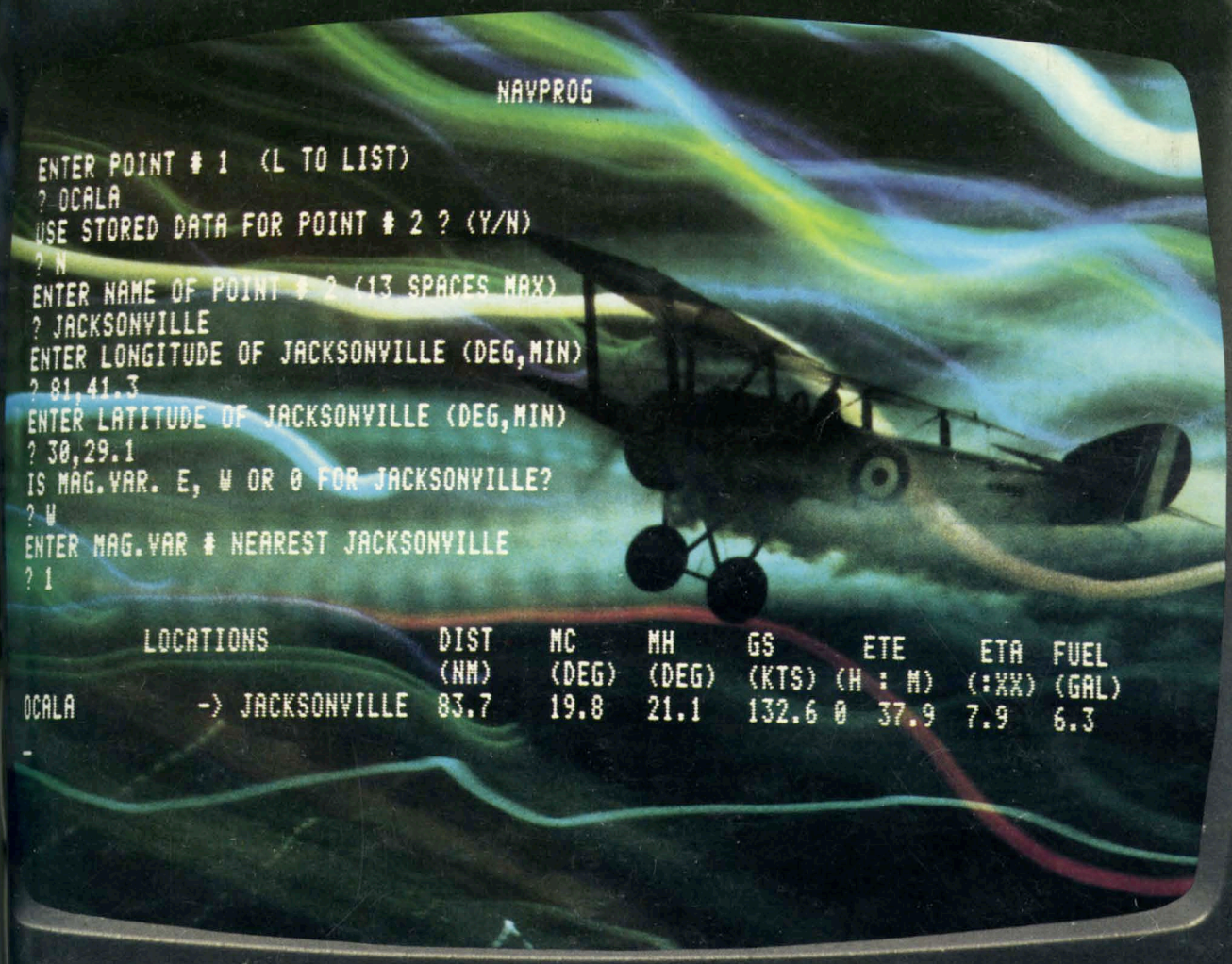

Computerized Flight Program for the H8

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CORRECTIONS

Please note the following correction for the UART schematic for Fig. 1 of my article, "Elfish Ideas," Oct. '79, p. 154. The UART pin where $\overline{\text{TX DEVICE SELECT}}$ comes in is not labeled. It should be marked pin 23, which corresponds to the UART internal signal of $\overline{\text{TBRL}}$ (TX BUFFER LOAD). Thanks to Bill Casmaer for bringing it to my attention.

—Glen A. Popiel—

Somewhere between the corrected proof and the published article, "Have a Ball with Bally," in the November 1979 issue, p. 142, a couple of important program segments were lost. The corrected lines are as follows:

```
270  GOSUB 440; IF G = 1 GOTO 330
280  IF S = 0 R = R + 1; GOTO 330
```

To those who asked for an easier version, substitute the following lines:

```
260  IF X<3 IF X>-3 IF Y<3 IF Y>-3 GOTO 300
440  IF X<4 IF X>-4 IF Y<4 IF Y>-4 A=520; G=1; GOTO 460
```

My thanks to everyone who telephoned and wrote to me. Your compliments were appreciated.

—Richard J. Nitto—

Also Note: Originally the short four-line program that displays the complete alphabet has line 40 as: 40 NEXT I. It should be: 40 NEXT A