



**DELAYED NEWSLETTER** this time to give us the chance to report on whatever we could find out at CES (the semi-annual Consumer Electronics Show). Well, nothing about the Astrocade situation - we are all still waiting to see if anyone will step in and buy the company and get production going again. Distributors are falling by the wayside as there is no product to sell, and dealers are hard to find. Until something does turn up, owners will have to look to the third-party suppliers for their games, etc.

**ATTENDEES AT CES** included ESOTERICA and VIPER principals - both companies are working hard to produce their respective products, namely Spectrecade cartridge games and the Zgrass addition. The treasure cove cartridge is starting to show up at the stores, and the next game, BLAST DROIDS, will be following close behind. This new game is for the Asteroid buff who wants more challenge.

On the Zgrass front, the Viper people report that they are now in somewhat of a waiting mode, for all the thousands of parts to show up. Yes, they are ready to put the machine together. They had the production outer shell, that is, the case and keyboard, with them. I am certain that this keyboard will please the most finicky of typists, such as an electronic debounce feature built into its 4048 microprocessor to prevent multiple entryssss.

**NEW CARTRIDGES COMING** Yes, three new cartridges will be out very soon, plus additional copies of Artillery Duel. The new games are: Soccer; Solar Conqueror; and Cosmic Raider. Apparently the owners of the games, action graphics, were allowed by the court to release these games. For those of you who cannot find them at your local store, we will have a small stock for mail order. Pricing data is expected next month.

**ARTILLERY DUEL** in another form. Designer John Perkins has revamped his popular game for a company called XONOX, who produce novel cartridges with a connector at each end, to allow for two games in each box. At any rate, they make games for Atari and other machines, so you are liable to see those little guys marching out on almost anybody's screen.

**HISTORICAL PROGRAMS** are presented on pages 124 and 126. When the original Bally Basic cartridge came out, it required a separate 'black box' to allow interfacing with the cassette recorder. Along with that box was a tape of sample programs, which we have reproduced here. The significance of the tape was the inclusion of numerous commands which had not been mentioned in the Bally Basic Manual. A whole new world was opened up for us in seeing new effects and techniques. Note how there is a menu, and how the separate programs are tied together into a nice package. The primary author of these was Dick Ainsworth, who also contributed to the manual that comes with the current Basic.

# PUTTING THINGS TOGETHER

BY DON GLADDEN

WE HAVE NOW COVERED MOST OF THE FUNCTIONS OF ASTRO-BASIC, (COMMAND WORDS & TWO LETTER VARIABLES), AND WE'VE SEEN WHAT THEY DO INDIVIDUALLY. THIS IS VERY GOOD, BUT THE SECRET TO PROGRAMMING WELL IS TO BE ABLE TO USE THESE FUNCTIONS IN CONJUNCTION WITH EACH OTHER. THIS CAN HELP US TO SAVE MEMORY AND MAKE OUR PROGRAMS RUN FASTER, SMOOTHER, AND MORE EFFICIENT. REMEMBER, OUR COMPUTER IS VERY VERSATILE, AND USUALLY CAN PERFORM ANY CERTAIN JOB MANY DIFFERENT WAYS. IT IS UP TO US TO FIND THE BEST WAY. USE YOUR IMAGINATION!!! MANY PROGRAMMERS WHO HAVE WRITTEN PROGRAMS FOR YEARS STILL FIND NEW AND BETTER WAYS TO DO THINGS BY JUST LOOKING AT THE PROBLEM AND "PUTTING THINGS TOGETHER" IN A DIFFERENT WAY.

LISTED BELOW ARE A FEW EXAMPLES OF USING SOME OF THESE FUNCTIONS TOGETHER TO ACCOMPLISH OUR GOALS.

PROBLEM: HOW CAN WE STORE A "STRING" OF LETTERS SUCH AS A NAME, ETC. WHILE THE PROGRAM IS RUNNING?

FUNCTIONS USED TOGETHER: FOR-NEXT LOOPS, ASCII FUNCTIONS, (TV & KP), AND STRING ARRAYS.

HERE'S HOW:

```
>10 CLEAR
>20 INPUT " #PLAYERS?"P
>30 B=0
>40 FOR A=1 TO P
>50 *(A)=B
>60 C=0
>70 PRINT " PLAYER#",#0,A," NAME?
>80 TV=32
>90 K=KP
>100 TV=K
>110 IF K=13*(A+P)=C-1;NEXT A;GOTO 160
>120 C=C+1
>130 @(B)=K
>140 B=B+1
>150 GOTO 90
>160 CLEAR
>170 PRINT
>180 INPUT " PLAYER#?"A
>190 PRINT " PLAYER#",#0,A," IS ",
>200 FOR Z=*(A) TO Z+*(A+P)
>210 TV=@(Z)
>220 NEXT Z
>230 PRINT " (PLAID)
>240 GOTO 180
```

EXPLANATION: INPUT ROUTINE-LINES 10-150  
LINES

10-20 CLEARS THE SCREEN AND ASKS FOR HOW MANY PLAYERS. (STORED IN VARIABLE "P").  
30 SETS "B" TO ZERO. B IS USED AS A COUNTER AND POINTER TO SET STRING ARRAYS TO THE ASCII VALUES OF THE LETTERS IN OUR NAMES.  
40 STARTS A LOOP TO ENTER EACH PLAYERS NAME.

```
50 SETS *(A) (*(1) FIRST TIME AROUND) TO THE VALUE IN "B". (OUR POINTER & COUNTER). (ZERO THE FIRST TIME). THIS IS THE STARTING ARRAY LOCATION (FIRST LETTER) FOR EACH OF OUR NAMES.
60 SETS "C" TO ZERO. C IS USED TO COUNT THE LETTERS IN EACH NAME. ASKS FOR PLAYERS NAMES.
70 PRINTS A SPACE.
80 GET A LETTER, SHOW IT ON SCREEN.
90-100 CHECKS TO SEE IF KEY WAS "GO" (13) IF IT WAS, SET *(A+P) TO ONE LESS THAN "C". (NUMBER OF LETTERS IN THE NAME). THEN GO BACK AND GET THE NEXT PLAYERS' NAME. IF IT WAS THE LAST PLAYER, GOTO 160 TO OUTPUT ROUTINE.
120-150 IF KEY WAS NOT "GO", ADD ONE TO OUR LETTER COUNTER (C), SET @(B) TO "K", (ASCII VALUE), ADD ONE TO "B", THEN GO BACK FOR ANOTHER LETTER.
OUTPUT ROUTINE-LINES 160-240
160-180 CLEAR SCREEN, PRINT A BLANK LINE, AND FIND OUT WHICH PLAYERS NAME IS WANTED. (A).
190 PRINT PLAYER NUMBER.
200-230 SHOW LETTERS STORED FROM *(A), (BEGINNING OF NAME), TO Z+*(A+P), (END OF NAME. Z-BEGINNING, *(A+P) IS NO. OF LETTERS, SO Z+*(A+P)=END) PRINT A PERIOD AFTER THE NAME.
240 GO BACK AND ASK FOR ANOTHER.
```

WITH THIS METHOD, (WHICH, BY THE WAY, CAN BE SHORTENED CONSIDERABLY BY CONDENSING, ETC., WE SHOW IT THIS WAY TO HELP FACILITATE EASE OF UNDERSTANDING), YOU CAN MAKE YOUR GAMES TALK BACK TO YOU USING PLAYERS NAMES INSTEAD OF JUST NUMBERS. IN OUR NEXT LESSON, WE WILL INSTALL THIS ROUTINE INTO OUR "SPIDER" GAME.

ANOTHER NIFTY WAY TO COMBINE THINGS THAT CAN SAVE MEMORY AND IMPROVE EFFICIENCY IN A PROGRAM IS TO USE FORMULAS TO CALCULATE "GOTOS" AND "GOSUBS" INSTEAD OF "IF" STATEMENTS. FOR AN EXAMPLE, LET'S TAKE THE "COIN TOSS" GAME FROM THE ASTRO BASIC MANUAL AND MODIFY IT.

```
ORIGINAL: >10 A=RND (2)
>20 IF A=1PRINT "HEADS
>30 IF A=2PRINT "TAILS
>40 GOTO 10
```

THIS IS PRETTY SIMPLE TO UNDERSTAND, BUT NOW LET'S ELIMINATE THE "IF" STATEMENTS AND ALSO FREE UP THE VARIABLE "A" AS FOLLOWS:

```
>5 GOTO RND (2)+6
>7 PRINT "HEADS";RUN
>8 PRINT "TAILS";RUN
```

WE HAVE SAVED SEVEN BYTES OF MEMORY. (16%)! ONE VARIABLE, AND ELIMINATED BOTH "IF" STATEMENTS. NOW, THE COMPUTER DOES NOT HAVE TO CHECK THEM EACH TIME THROUGH. IF YOU ARE CHECKING MORE THAN TWO POSSIBILITIES, YOU'LL SAVE EVEN MORE IN MEMORY, AND GAIN MORE SPEED.

NEXT MONTH WE'LL LOOK AT BOOLEAN FORMULAS AND HOW TO USE THEM.



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June 17, 1983

```

1 .
2 .
3 .
4 .
10 .APC#7001(A)
20 :RETURN
30 CLEAR
35 NT=0
37 FC=7;BC=8
40 PRINT
50 PRINT "    a BALLY BASIC "
55 PRINT "    PROGRAM SAMPLER (A)"
60 PRINT
70 PRINT " 1 ELECTRIC DOILY"
80 PRINT " 2 LINE GRAPH"
90 PRINT " 3 MONTHLY RECORDS"
100 PRINT " 4 ELECTRONIC MUSIC"
110 PRINT " 5 NUMBER MATCH"
130 PRINT
150 PRINT "    (C) 1978 BALLY MFG.",
152 NT=3
155 FOR A=1TO 2400
157 IF &(22)=16 GOTO 10
160 IF &(23)=8 GOTO 1000
170 IF &(22)=8 GOTO 2000
180 IF &(21)=8 GOTO 3000
190 IF &(23)=4 GOTO 4000
200 IF &(22)=4 GOTO 5000
210 NEXT A
220 FC=9;GOTO 155
1000 .ED
1010 CLEAR
1020 X=0;Y=0
1030 FC=RND (32)*8+4
1031 X=X+RND (13)-5
1032 BC=FC+4
1040 Y=Y+RND (13)-6
1050 A=5
1060 B=5
1070 C=3
1080 M=X
1090 N=Y
1100 GOSUB 1500
1110 M=-X
1120 GOSUB 1500
1130 N=-Y
1140 GOSUB 1500
1142 M=X
1144 GOSUB 1500
1150 M=Y
1160 N=X
1170 GOSUB 1500
1180 M=-Y
1190 GOSUB 1500
1200 N=-X
1210 GOSUB 1500
1220 M=Y
1230 GOSUB 1500
1240 IF X>50 GOTO 1020
1250 IF Y>50 GOTO 1020
1260 GOTO 1030
1500 BOX M,N,A,B,C
1502 IF &(22)=16 GOTO 10
1510 MU=M
1520 RETURN
2000 .LG
2010 FC=255;BC=232
2020 CLEAR ;PRINT
2030 INPUT " HOW MANY ITEMS?"A
2033 IF A=0 GOTO 10
2034 IF A>1 IF A<51 GOTO 2040
2036 GOTO 2030
2040 B=150*(A-1)
2050 FOR N=1TO A
2060 PRINT N,
2070 INPUT "?*(N)
2080 IF @(N)>87 PRINT "TOO BIG";GOTO 2060
2090 NEXT N
2100 X=-80
2110 CLEAR
2120 LINE X,@(1)-44,0
2130 FOR N=1TO A
2140 LINE X,@(N)-44,1
2150 BOX X,-42,1,2,3
2160 X=X+B
2170 NEXT N
2180 IF &(22)=16 GOTO 10
2190 GOTO 2180
3000 .MR
3010 CLEAR
3015 FC=7;BC=128
3020 INPUT "JAN" > @(1)
3030 INPUT "FEB" > @(2)
3040 INPUT "MAR" > @(3)
3050 INPUT "APR" > @(4)
3060 INPUT "MAY" > @(5)
3070 INPUT "JUN" > @(6)
3080 INPUT "JUL" > @(7)
3090 INPUT "AUG" > @(8)
3100 INPUT "SEP" > @(9)
3110 INPUT "OCT" > @(10)
3120 INPUT "NOV" > @(11)
3130 INPUT "DEC" > @(12)
3140 PRINT "THANK YOU"
3150 CLEAR
3155 CY=-39
3160 PRINT " J F M A M J J A S O N D"
3170 X=-66
3180 FOR A=1TO 12
3188 IF @(A)>86 @(A)=86
3190 BOX X,-43+(@(A)+1)*2,7,(@(A)+1,3
3200 X=X+12
3210 NEXT A
3222 IF &(22)=16 GOTO 10
3230 GOTO 3222
4000 .EM
4010 NT=5
4020 CLEAR
4025 PRINT "50500000506050+40503000500",
4027 PRINT "5500000050",
4030 PRINT "500000506050+40502000500550",
4032 PRINT "40302010003000",
4040 PRINT "5000b1000b20b1070b1060",
4041 PRINT "00006070",
4042 PRINT "00007070506070b100000000"
4050 GOTO 10
5000 .NM
5010 FC=7;BC=8;NT=3
5015 CLEAR
5020 LIST 5030,10;PRINT
5030 " a NUMBER MATCH _
5040 A=RND (10)
5050 INPUT "YOUR GUESS:"B
5060 IF B=0 GOTO 10
5070 IF B=A GOTO 5110
5080 IF B>A PRINT "LESS"
5090 IF B<A PRINT "MORE"
5100 GOTO 5050
5110 PRINT B," IS RIGHT!"
5120 CLEAR ;GOTO 5040
5130 .AINSWORTH/ETC.
>

```

## "FILE SEARCH" IN ASTRO BASIC BY MICHAEL WHITE

"WHAT IS 'FILE SEARCH'?", SOME OUT THERE MAY ASK. WELL, IN COMPUTER LINGO, A FILE IS A MEMORY DEVICE THAT STORES INFO IN SEQUENTIAL SEGMENTS. IT'S LIKE A CARD FILE IN A LIBRARY. EACH CARD CONTAINS INFORMATION ON WHERE TO FIND A PARTICULAR BOOK. ON A LONG TAPE, THE 'FILE' SYSTEM TELLS THE COMPUTER WHERE TO FIND A PARTICULAR PROGRAM AND/OR DATA.

MOST COMPUTER SYSTEMS HAVE A BUILT-IN FILE SEARCH THAT CAN "CALL UP" A PROGRAM, ETC., BY INPUTTING A CODE WORD OR NUMBER. THIS WORD OR NUMBER IS STORED ON THE DISK OR TAPE IMMEDIATELY BEFORE THE DESIRED DATA. THE COMPUTER THEN RUNS THE TAPE OR DISK, SEARCHING FOR THE CODE. WHEN IT IS FOUND, THE PROGRAM FOLLOWING WILL LOAD.

FIVE YEARS AGO, WHEN THE OLD BALLY BASIC FIRST CAME OUT, THIS WAS AN INCLUDED FEATURE. (ED. NOTE-MIKE HAS DONE SOME EXTENSIVE WORK WITH THE OLD BASIC AND IT'S FEATURES, HOWEVER, WE HAVE DECIDED NOT TO INCLUDE THE INFORMATION HERE, AS MOST OF US USE THE NEW ASTRO-BASIC EXCLUSIVELY NOW. IF YOU DESIRE MORE INFORMATION ON THE OLD BASIC, CONTACT MIKE DIRECTLY. TO READ MORE ABOUT THIS FEATURE, SEE THE ARCADIAN, VOL. 3, PAGE #4.) THE OLD BALLY BASIC FILE SEARCH, HOWEVER, HAD SOME SERIOUS DRAWBACKS. THE MOST OBVIOUS IS THAT IT TOOK UP TO THREE OR FOUR MINUTES TO LOAD A SINGLE PROGRAM, WHICH MEANT A 30 OR 40 MINUTE WAIT TO GET TO PROGRAM NUMBER #10 ON YOUR TAPE. THIS MADE IT HARDLY WORTH THE EFFORT TO FILE YOUR PROGRAMS ON TAPE.

WHEN THE NEW ASTRO BASIC CAME OUT, THE FILE SEARCH, ALONG WITH A FEW OTHER ROUTINES WERE TAKEN OUT TO MAKE ROOM FOR SOME NEW FEATURES. (EDITING, \*() ARRAY, 2000 BAUD, & OTHER GOODIES). GETTING THE EDITOR AND 2000 BAUD TAPING ALONE WAS WORTH THE SACRIFICE, BUT NOW THAT WE HAD A MACHINE THAT COULD TAPE FAST ENOUGH TO EFFICIENTLY USE FILE SEARCHING, WE NO LONGER HAD IT!!! BUT THAT NEVER STOPS A TRUE PIONEER AND INVENTOR. WHO WAS IT THAT SAID, "IF IT CAN BE DONE, IT HAS! IF IT CAN'T, IT WILL BE!"? WELL, I'M READY TO BELIEVE THAT ANYTHING CAN AND WILL BE DONE ON THE ARCADE, GIVEN TIME. THINGS THAT WE THOUGHT COULDN'T BE DONE ARE BEING DONE EVERY DAY!

FILE SEARCH IN AB USES A DIFFERENT PRINCIPLE THAN THAT OF OLD BB. BB LOOKED AT EVERY BYTE COMING IN FROM THE TAPE. AB LOOKS AT ONE VALUE, (TWO BYTES), THEN "STEPS OVER" ANY UNWANTED DATA. THE KEY TO THIS FEAT IS TIMING. AB PROGRAMS VARY IN LENGTH FROM 21 SEC. FOR A NORMAL ':PRINT' DUMP, TO 24 SEC. FOR A DUMP INCLUDING THE L.I. BUFFER. (SELF-START) NOT MUCH DIFFERENCE, SO IT IS EASY TO 'STEP OVER' A PROGRAM ON TAPE. SIMPLY SET UP A DELAY LOOP TO TIE THE COMPUTER UP LONG ENOUGH FOR THE UNWANTED PROGRAM TO PASS. I HAVE

FOUND THAT:  
FOR D=0 TO 11000;NEXT D  
TAKES ABOUT 25 SECONDS TO EXECUTE. THIS GIVES ENOUGH TIME TO "STEP OVER" THE UNWANTED DATA AND ANY GLITCHES ON THE TAPE. NOW, THE ONLY PART LEFT IS TO TELL THE COMPUTER WHICH PROGRAM TO INPUT AND WHICH TO "STEP OVER". THIS CAN BE DONE WITH AN 'IF' STATEMENT. SINCE THIS USES TWO LINES, WE'LL NUMBER THEM 60 & 70 FOR NOW, AND PUT THEM IN OUR "MENU" PROGRAM.

```
>60 IF Y=G:INPUT ;RUN
>70 FOR D=0 TO 11000;NEXT D;GOTO 60
```

NOW WHEN WE PLAY THE TAPE, THE MENU PROGRAM WILL ENTER FIRST, THEN WE STOP THE RECORDER AND A MENU IS SHOWN. WE THEN MAKE A SELECTION AND PRESS "PLAY" ON THE RECORDER. NOW, OUR "CODE" IS STORED IN THE VARIABLE 'G'. (SEE LINE #60 ABOVE). THE VARIABLE 'Y' WILL BE INPUT FROM THE TAPE. IF THEY ARE THE SAME, OUR PROGRAM WILL LOAD AND RUN. IF NOT, THE LOOP STEPS OVER THE UNWANTED PROGRAM, AND SETS UP TO TRY AGAIN.

TO INPUT THE VARIABLE FROM TAPE, WE MUST FIRST KNOW TWO THINGS: ":PRINT" CAN BE USED TO DUMP ANY LENGTH DATA RUN AT ANY LOCATION BY ADDING THE ADDRESS OF DATA IMMEDIATELY AFTER, THEN A COMMA, THEN # OF WORDS OF DATA TO DUMP. (1 WORD=2 BYTES). AN EXAMPLE OF THIS WOULD BE: :PRINT %(-24576),500. IT THEN WOULD BE LOADED USING :INPUT %(-24576). USING THIS METHOD WE CAN DUMP ONE VALUE, (OUR PROGRAM CODE NO.), AHEAD OF EACH PROGRAM ON OUR TAPE. CHANGE LINE #60 TO INCLUDE THE :INPUT STATEMENT:  

```
>60 :INPUT Y;IF Y=G:INPUT ;RUN
```

THIS WILL LOAD OUR ONE VALUE INTO 'Y', COMPARE IT TO 'G' (OUR DESIRED PROGRAM), AND REACT ACCORDINGLY. TO DUMP OUR PROGRAMS ONTO TAPE, FIRST SET 'Y' TO THE CODE, THEN USE:  

```
:PRINT Y.1;:PRINT
```

LEAVE ABOUT 5-10 SECONDS IN BETWEEN PROGRAMS TO ALLOW FOR THE DELAY LOOP TO FINISH EACH TIME. HERE IS A MENU PROGRAM FOR THE BEGINNING OF THE TAPE.

## FILE SEARCHER BY MIKE WHITE

```
>10 CLEAR ;NT=0;CX=-24;CY=0;PRINT "STOP TAPE"
>20 FOR D=0 TO 999;NEXT D;CLEAR ;FOR G=1 TO
    % (20111) ÷ 10-8;PRINT #3,G;;GOSUB 80
>30 NEXT G;PRINT " YOUR CHOICE?"
>40 G=KP-48;IF (G<1)+(G>% (20111) ÷ 10-8)GOTO
    40
>50 CLEAR ;CY=0;CX=-30;PRINT "START TAPE"
>60 :INPUT Y;CLEAR ;CY=4;IF Y=G CX=-18;PRINT
    "LOADING";GOSUB 80;:INPUT ;RUN
>70 CX=-36;PRINT "SEARCHING FOR";GOSUB 80
    FOR D=0 TO 11000;NEXT D;GOTO 60
>80 IF G=1CX=17;PRINT " (TITLE OF PROG#1)"
>90 THRU >170 IF G=2, ETC. AS NEEDED.
>180 RETURN
```

IF YOU WOULD LIKE TO SEE "FILE SEARCH" DEMONSTRATED TO THE FULLEST, SEND \$15.95 TO: MICHAEL D. WHITE  
 R.D. #1 BOX 258 GREEN RD.  
 WAKEMAN, OHIO 44889  
 AND ASK FOR "QUADRA!" YOU MAY BE SURPRISED!!!

```

2 .
3 .
4 .
10 .APC#7001(B)
20 :RETURN
25 FC=7;BC=8
27 CLEAR
28 NT=0
30 PRINT ;PRINT ;PRINT
40 PRINT "      a BALLY BASIC _"
45 PRINT "    PROGRAM SAMPLER (B)"
50 PRINT ;PRINT
60 PRINT "  1 LUNAR LANDER"
70 PRINT "  2 GRAVITY GAME"
75 PRINT "  3 NEWTONA '500'"
80 PRINT
90 PRINT
100 PRINT "    (C) 1978 BALLY MFG."
105 FOR A=1 TO 2400
110 IF &(22)=16 GOTO 10
120 IF &(23)=8 GOTO 900
130 IF &(22)=8 GOTO 7000
140 IF &(21)=8 GOTO 9000
150 NEXT A
160 FC=9;GOTO 105
900 T=0
910 &(23)=255
920 CLEAR
930 BC=0;FC=126
940 NT=0
1000 FOR A=-80 TO 80
1010 T=T+RND (4)-3
1020 IF T<0 T=0
1030 LINE A,-44,0
1040 LINE A,T-44,1
1050 NEXT A
1060 FOR A=1 TO 51
1070 BOX RND (160)-80,RND (88)-44,1,1,1
1080 NEXT A
2000 .GO
2030 G=0
2035 F=30
2040 X=-78
2050 Y=43
2060 BOX X,Y,3,3,3
2061 IF U BOX X,Y-2,1,3,3
2500 .MORE
2505 BOX X,Y,3,3,3
2506 IF U BOX X,Y-2,1,3,3
2508 IF F>0 U=TR(1)
2509 IF F<1 U=0
2510 IF U&(21)=255
2512 IF U=0&(21)=0
2518 G=G+8-20bU
2520 Y=Y-Gc25
2525 IF Y<-42 GOTO 3000
2530 X=X+1
2532 IF F<1 U=0
2533 IF U=1 F=F-1
2535 BOX X,Y,3,3,3
2536 IF U BOX X,Y-2,1,3,3
2560 CX=-20
2570 CY=44
2575 PRINT #3,F,#4,Y+42,#4,-Gc10
2590 GOTO 2500
3000 .LAND
3005 Y=-42
3010 CY=44
3011 CX=-20
3012 PRINT #3,F,#4,Y+42,#4,-Gc10
3020 &(21)=0
3030 BOX X,Y,3,3,3
3031 IF U BOX X,Y-2,1,3,3
4000 .END
4010 IF &(22)=16 GOTO 10
4020 IF &(23)=8 GOTO 2000
4030 GOTO 4010
7000 .GG
7005 A=11
7006 S=0
7007 T=8
7010 CLEAR
7020 FC=7;BC=128
7070 T=T-1
7080 IF T<1 GOTO 7400
7090 IF A<1 A=1
7095 CY=37
7100 PRINT "    SKILL:",#1,12-A,
7101 PRINT "    SCORE:",#1,S
7110 X=-80
7120 Y=44
7130 G=0
7180 BOX 0,0,160,88,3
7190 BOX 0,0,158,86,3
7200 X=X+2
7210 G=G+10-20bTR(1)
7220 Y=Y-GcA
7230 BOX X,Y,1,1,1
7240 IF X=84 S=S+12-A
7250 IF X=84 A=A-2;GOTO 7010
7260 IF Y>150 A=A+1;GOTO 7010
7265 IF Y<-44 IF &(22)=16 GOTO 10
7270 IF Y<-44 A=A+1;GOTO 7010
7280 GOTO 7200
7400 CLEAR ;CY=37
7410 PRINT "    a FINAL SCORE:",#2,S
7420 PRINT
7450 IF &(22)=16 GOTO 10
7460 IF &(23)=8 GOTO 7006
7480 GOTO 7450
9000 .NS
9010 CLEAR
9015 &(23)=255
9020 BC=128;FC=7
9030 X=0;Y=0;M=0;N=0
9100 BOX X,Y,3,3,2
9110 X=X+M;Y=Y+N
9120 IF X>77 X=77
9130 IF X<-78 X=-78
9140 IF Y>41 Y=41
9150 IF Y<-42 Y=-42
9152 F=TR(1)
9155 IF F GOTO 9170
9160 BOX X,Y,3,3,1
9170 BOX X-D,Y-E,1,1,3
9180 D=JX(1);E=JY(1)
9190 M=M+D;N=N+E
9200 IF D#0 &(21)=255
9210 IF E#0 &(21)=255
9220 IF D=0 IF E=0 &(21)=0
9230 IF F GOTO 9110
9235 IF &(22)=16 GOTO 10
9237 IF &(23)=8 GOTO 9000
9240 GOTO 9100
9250 .AINSWORTH/ETC.
>

```

## THE GAME PLAYER

by Michael Prosise

shoots 'em down in ...

- 1) GAMMA WARS  
Tiny Arcade
- 2) NAUTILUS  
L&M Software

### GAMMA WARS

From Tiny Arcade comes another shoot-em-up-knock-em-down science fiction game. In this space game, the player protects his planet from invaders with his surface cannon. The cannon can be moved left and right with the knob, and shots fired with the trigger. The game is for one or two players, with each having three chances.

The graphics in GAMMA WARS are very nice, illustrating a planet's surface, bathed in a light blue color. Sound effects are well done, also, except for a constant high-frequency buzz that appears to be a programming error, and not an intentional sound, since it is present even after the game has ended.

Overall, this is a rather simple type of game, one that could not be described as exciting. However, our players did find it on the difficult side, and we thus recommend GAMMA WARS only to those gamers who thrive on fast-paced, quick-thinking types of games that require a high degree of hand and eye coordination.

Those who played it all found the game to be satisfactory, but in fairness to the consumer, I'll have to add that GAMMA WARS did not hold their interest for too long.

SIDE TWO of the tape contains ABSURD WORD PROCESSOR, which is not a game, but something for you to sit back and watch, or in this case, to read.

The computer has been instructed to put together certain nouns (person, place or thing), verbs (words which show action), and adjectives (words which describe), in a random fashion to produce amusing statements such as, (and I quote), "Brook Shields roasts hot and juicy politicians". These sentences will scroll up your screen endlessly, each one different from the others.

### NAUTILUS

Advertised as the sequel to EXITOR'S REVENGE, this sea-faring adventure is another good game from L&M. The similarity to the EXITOR game is that here again you control a cannon that shoots up at Exitor, who is moving back and forth across the screen.

The machine language graphics depict an ocean with several stationary ships afloat and a land mass to the right. In the sky is Exitor, who releases small drone ships one at a time, for you to try and blast out of the sky. You are a small submarine, which can move left and right.

NAUTILUS is a one player game, and a surprisingly easy one at that. On my third try, I shot down all 45 drones, and lost only one of four subs, for a total score of 31,500. (The game is over when you destroy 45 drones or lose all of your subs.) It is unusual to receive such an unchallenging game from L&M. On the other hand, it's nice to beat the computer, and all of us liked the game.

ON SIDE TWO is the game 3-D TIC TAC TOE, the very best tic-tac-toe game you'll find for the Astrocade. We are very impressed with it, both as a tic-tac-toe game because it's 3-D (3 boards/levels at once) and the cartridge quality. It is a two player game only. And that get's the "boo-of-the-month". Why should such a fine tic-tac-toe game be inaccessible to the single player? Surely a programming adjustment can be made to allow the single player to play against the computer. How about it L&M?

Both GAMMA WARS and NAUTILUS are the shoot-em-up type of game, based on the classic mother of them all, SPACE INVADERS. There certainly is nothing negative about this, but it seems the market is quite saturated with these type of games. My sense is that there is a growing hunger for non shoot-em-up type of games. I write this in hopes that our software manufacturers will look at what's popular in the Arcades and start churning out some of these. The June issue of ELECTRONIC GAMES reveals in their reader's poll that of the top ten coin-ops, only two of the ten favorites are shoot-em-up games. (Zaxxon & Centipede) Favorites include such games as Q-Bert, Ms. Pac Man, Tron, Dig-Dug, Donkey Kong, Lady Bug, and Frogger. Astrocade owners probably have the same tastes. Let's hope we see games like these soon, and other games such as Rally X, Qix, Pepper II and Battlezone. (A good tank maze game would be really nice!) The Game Player and his panel of players urge you to write to our software "game-makers" and let them know what you want. They would appreciate it greatly, I am certain.

And Finally . . .

The Game Player welcomes letters from readers. We would appreciate hearing what you think about the game reviews. What do you like or dislike? Do you want this game review column to continue? Do you think more than two cassettes should be reviewed each month? Less? What kinds of info do you want to find out in these reviews?

I will gladly answer any letter that arrives, provided you enclose a stamp. Also, if you would like to tell me your highest score on a particular game, (cartridge or tape), I will print it along with your name in THE GAME PLAYER.

Individual questions about particular games, software manufacturers, and related questions are welcome and will be answered personally.

To communicate with the Game Player, send your questions and comments (and 20¢ stamp if you want a reply) to: Michael Prosise, 48-G Ridge Road, Greenbelt, Maryland 20770.

## HOW TO USE THE BLUE RAM BASIC "PLAY%" COMMAND. A TUTORIAL BY GEORGE MOSES

WE UNDERSTAND THAT THE FIRST THING MOST NEW OWNERS OF BLUE RAM EXTENDED BASIC DO IS READ THEIR MANUAL AND THEN CALL PERKINS ENGINEERING AND EXCLAIM "WHAT IN THE HECK IS THE "PLAY" COMMAND ANYWAY?" I CAN TELL YOU THAT I WAS ONE OF THOSE PEOPLE MYSELF. WHAT FOLLOWS IS AN EXPOSE (IN SIMPLE TERMS) ON HOW TO USE THE PLAY COMMAND TO PLAY MUSIC, MAKE NEAT SOUND EFFECTS, AND AT THE SAME TIME DO GRAPHICS, SCROLLING AND ANIMATION WITH NEITHER OPERATION AFFECTING THE OTHER.

THE PLAY COMMAND IS USED TO INITIATE A SOUND STRING BEGINNING AT A SPECIFIED ADDRESS. THE FORMAT IS AS FOLLOWS:

**PLAY%(<18000>)**  
OR **PLAY%(<26375>)** OR **PLAY%(<100>)** AS THREE GOOD EXAMPLES. AS LONG AS THE ADDRESS IMMEDIATELY FOLLOWING **PLAY** IS THE FIRST ADDRESS OF THE MUSICAL SCORE IN MEMORY.

LET'S LEARN HOW TO SET UP A MUSICAL SCORE. IT'S VERY SIMILAR TO THE FORMAT THAT WAS PRESENTED IN THE THREE VOICE BALLY BASIC MUSIC TUTORIAL THAT RAN IN THE ARCADIAN LAST YEAR EXCEPT THAT WITH THE PLAY COMMAND THE DURATION GOES FIRST, FOLLOWED BY 3 VOICE INPUTS. THE FOLLOWING SCORE CAN MOST EASILY BE INPUT USING PERKINS' NEW BLUE RAM UTILITY (ONLY \$5.00) WHICH ALLOWS YOU TO TYPE IT IN JUST AS IT IS. THEN PLAY IT. HERE IS A SAMPLE SCORE IN HEX:

### MUSIC SCORE:

| HEX CODE    | COMMENTS:                       |
|-------------|---------------------------------|
| 90 31       | SET MASTER OSCILLATOR TO 31H.   |
| BA 66 06    | SET PORTS 22 & 21 VOLUMES TO 6. |
| 90 FC       | SET 3 VOICE PER ENTRY FORMAT.   |
| 0F 2C 32 47 | DURATION 0FH PLUS 3 VOICES.     |
| 0F 32 47 2C | YOU'LL NOTICE ALL DURATIONS IN  |
| 0F 47 2C 32 | THIS SCORE HAPPEN TO BE "15"    |
| 0F 2C 32 47 | OR (0F HEX), WITH DURATIONS     |
| 0F 32 2C 47 | COUNTED IN 60THS OF A SECOND.   |
| 0F 2C 32 47 | WE ARE THEREFORE USING CHORDS   |
| 0F 35 2C 43 | WHICH LAST 15/60 OR 1/4 SECOND. |
| 0F 2C 43 35 | WHEN YOU PLAY THIS SOUND STRING |
| 0F 43 35 2C | YOU'LL HEAR IT IN STACCATO. A   |
| 0F 35 2C 43 | PROCESS WHERE THE MUSIC PROCES- |
| 0F 2C 35 43 | SOR GIVES YOU 1/60TH SECOND OF  |
| 0F 35 2C 43 | SILENCE BETWEEN CHORDS. IF YOU  |
| F0          | WISH TO CHANGE THAT TO A SLUR   |
|             | WHERE ONE CHORD BLENDS INTO THE |

NEXT, YOU MUST INSERT THE "SLUR INDICATOR" WHICH IS AN E0 (HEX). PUT THE E0 ANYWHERE IN THE SCORE. AT THE BEGINNING, OR JUST BEFORE OR AFTER ANY COMPLETED COMMAND OR CHORD. (NEVER IN THE MIDDLE!). AND THE MUSIC PROCESSOR WILL TOGGLE ITSELF TO THE OPPOSITE STATE. NOTICE THAT THE LAST ENTRY IN THE SCORE IS "F0". THIS IS THE COMMAND TO END THE SOUND STRING. IT QUIETS THE MUSIC PROCESSOR AND STOPS ALL BACKGROUND OPERATION.

IF YOU HAVE THE BLUE RAM UTILITY YOU MAY INPUT THE SCORE I GAVE YOU BYTE FOR BYTE JUST AS YOU SEE THEM. IF YOU DON'T HAVE THE UTILITY, (POOR DEPRIVED PROGRAMMER), THEN YOU WILL NEED THE FOLLOWING SHORT PROGRAM TO HELP YOU. THIS WORKS IN BLUE RAM BASIC ONLY.

```
>5 CLEAR :NB=16
>10 NT=0:A='607F
>20 PRINT #1," %("A,")="",;INPUT"B
>22 IF B=100PLAY%('607F);GOTO 20
>23 %("A)=B
>30 A=A+1;%("A)='F0 (TO STOP THE SOUND.)
>40 GOTO 20
```

WHEN YOU RUN THIS PROGRAM YOU MAY TYPE THE MUSIC SCORE IN BYTE FOR BYTE AS SHOWN HERE. BUT YOU MUST PRECEDE EACH HEX NUMBER WITH AN EXCLAMATION POINT SO THE COMPUTER DOESN'T TAKE IT AS A DECIMAL NUMBER. EACH NUMBER MUST ALSO BE FOLLOWED BY A CARRIAGE RETURN (GO). AN EXAMPLE OF INPUT FOLLOWS:

```
!90
!FC
!80
!31
!B0
!66
!06
```

AND SO ON. IF AT ANY TIME YOU WISH TO HEAR THE SCORE UP TO YOUR LAST INPUT JUST TYPE THE NUMBER 100 (GO) AND IT WILL PLAY. THEN YOU MAY CONTINUE INPUTTING WHERE YOU LEFT OFF. OR YOU CAN HALT THE PROGRAM AND TYPE **PLAY%('607F)** SINCE '607F IS THE BEGINNING ADDRESS OF THE SCORE WITH THIS ROUTINE. YOUR SCORE CAN BE AS LONG AS MEMORY PERMITS. YOU CAN PLAY IT FROM WITHIN YOUR BASIC PROGRAM USING THE **PLAY%(! )** COMMAND AND IT WILL PLAY IN BACKGROUND MODE WHILE YOUR REGULAR BASIC PROGRAM CONTINUES TO OPERATE NORMALLY.

AS I PROMISED, THIS INTRODUCTION TO THE PLAY COMMAND WAS KEPT AS SIMPLE AS POSSIBLE. IT IS RECOMMENDED THAT YOU PUT IN A FEW SCORES AND PRACTICE WITH SHEET MUSIC OR MAKE WEIRD SOUND EFFECTS FOR YOUR GAMES.

VERY SHORTLY THIS TUTORIAL WILL BE FOLLOWED BY ANOTHER ONE WHICH WILL EXPLORE THE MANY MUSIC PROCESSOR COMMANDS WHICH EXIST IN YOUR ON BOARD ROM WHICH WILL ALLOW YOU TO JUMP (CONDITIONALLY OR UNCONDITIONALLY) FROM ONE SCORE TO ANOTHER, COMMANDS TO ALLOW REPEATS OF SPECIFIED PORTIONS OF YOUR SCORE, HOW TO CHANGE THE INPUT FORMAT FROM THE 3-VOICE INPUT SHOWN HERE TO 1-VOICE, 2-VOICES, NOISE, VIBRATO, CALLS AND RETURNS.

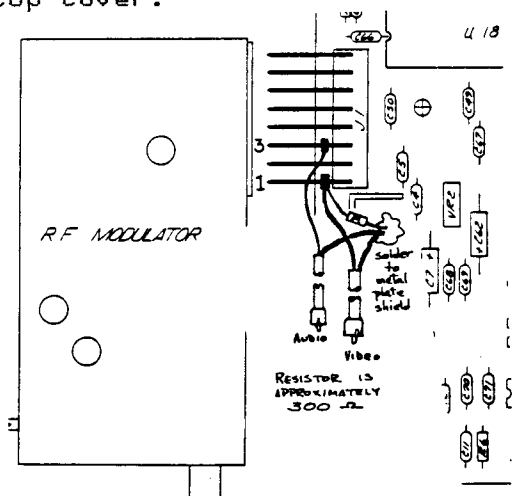
IN CLOSING, LET ME GIVE YOU 4 ADDRESSES IN YOUR ON-BOARD ROM THAT CONTAIN SCORES IN THE GUNFIGHT GAME. THE ADDRESSES ARE:

|              |                   |
|--------------|-------------------|
| PLAY%(!1F9F) | HOME ON THE RANGE |
| PLAY%(!1FAD) | TAPS              |
| PLAY%(!1FBD) | FUNERAL MARCH     |
| PLAY%(!1FD7) | GUNSHOT SOUND     |

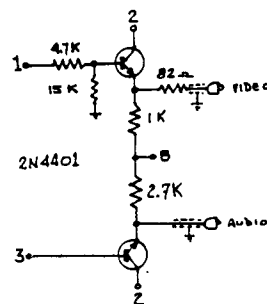
THESE ADDRESSES ARE FOR THE NEWER SET OF ROMS. IF THEY DON'T WORK WITH YOUR ARCADE TRY ADDING 5 TO EACH ADDRESS.

**MONITOR CONNECTION** The latest TV's now on the market are including a set of 'MONITOR' input jacks (TV and Audio) for direct attachment of a VCR and such. You can connect your Astrocade here and take advantage of the clearer graphics that result. The changes in the Arcade unit are minimal. (This addition was originally printed in Vol. 4, p.62)

Remove the screws on the bottom so that the upper plastic cover can be removed. At the lower left you will see a large metal box with a number of heavy pins at its upper right. Temporarily remove the box by pulling up at the left side until the box is clear of its mount and then pull the box to the left, off the big pins. You have to make three solder connections to two of the pins and the flat metal shield, as shown in the diagram. When complete, push the box back onto the pins until it can be pressed down into the lower cover. Lead the new wires out the back of the unit. Replace the top cover.



I experimented to find the value of the 300 ohm resistor. This scheme is working with my NEC, but you might want to try the buffer circuit shown →



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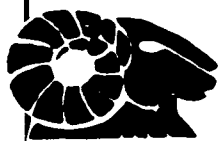
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# ASTRO-BUGGY

BY PEGGY GLADDEN - MICHIGAN ASTROBUGS

I'VE DECIDED TO TAKE SOME TIME TO GIVE SOME PLUGS FOR OUR USER GROUPS OUT THERE. AS YOU PROBABLY KNOW, OUR CLUB RUNS THE NATIONWIDE HEADQUARTERS FOR ASTROCADE USER GROUPS. THROUGH THIS WE GET TONS OF MAIL, INCLUDING LETTERS FROM PEOPLE WHO ARE STARTING USER GROUPS EVERYWHERE.

IF YOU DON'T BELONG TO A USER GROUP, YOU'RE REALLY MISSING A LOT. OUR GROUP, MICHIGAN ASTROBUGS, ALREADY HAS PRODUCED 2 CLUB TAPES WE OFFER CLASSES FOR BASIC AND MACHINE LANGUAGE. WE HAVE A BI-MONTHLY NEWSLETTER, WE HAVE GUEST SPEAKERS, AND MOST OF ALL, WE HAVE A DARN GOOD TIME AT OUR MEETINGS.

IF YOU WOULD LIKE A COPY OF THE NAMES AND ADDRESSES OF THE USER GROUPS, SEND A S.A.S.E TO THE MICHIGAN ASTROBUGS, AND WE'LL GET ONE OUT TO YOU RIGHT AWAY.

ALSO, IF YOU HAVE A GROUP GOING, AND YOU'VE NEVER WRITTEN TO THE BUGS, PLEASE LET US KNOW WHO AND WHERE YOU ARE. THAT WAY WE CAN KEEP OUR LIST UPDATED, AND KEEP USER GROUPS ALIVE AND KICKING!

LET ME JUST GIVE YOU A SMALL RUNDOWN OF OUR MAY 22 MEETING:

WE HAD SEVERAL NEW GAMES TO SHOW THE CLUB, WHICH GAVE A SNEAK PREVIEW ON SOFTWARE. WE SHOWED OUR NEW CLUB TAPE, WAVE-MAKERS NEW "GATE ESCAPE", L&M'S "CANDY MAN" NEW IMAGE'S UP AND COMING "ASTEROID-ZAP", AND THE ONE AND ONLY PAC-MAN (MUNCHER).

WE ALSO HAD A GUEST VISIT US THIS MONTH, JAY FENTON. JAY WROTE THE ARCADE GAMES GOLF AND ROBBY-ROTO. HE HAD A BIG PART IN DESIGNING THE ASTROCADE SYSTEM. HE ALSO DESIGNED ALL 3 BASIC CARTRIDGES FOR THE ASTROCADE.

ONE OF THE MOST HECTIC EVENTS OF OUR MEETING WAS OUR GAME TOURNAMENT. WE CHARGED 25 CENTS A GAME TO PLAY THE INCREDIBLE WIZARD, BALLY PIN, GALACTIC INVASION AND MUNCHER. THE TOP THREE SCORES FOR EACH GAME WON PRIZES. HOWEVER, IF ANY OF YOU WANT TO HOLD THIS TOURNAMENT, TAKE A WORD FROM US... SPLIT THE TOURNAMENT INTO TWO DIVISIONS - KIDS AND ADULTS. IF YOU DON'T, NOT TOO MANY ADULTS WILL HAVE A CHANCE!!! ALSO, PLAY ON THE HIGHEST LEVELS, WITH ONLY 3 TURNS. IT GIVES EVERYONE A BETTER CHANCE. I MEAN, LOOK AT IT THIS WAY, I PLAYED WIZARD IN THE TOURNAMENT (I'VE ONLY PLAYED THE GAME A FEW TIMES) AT HARD LEVEL. WHAT A JOKE! BELIEVE IT OR NOT, I WON THE ADULT DIVISION, WITH A SCORE TOO SMALL TO MENTION.

TAKE A MINUTE TO HEAR THIS: THE KIDS DIVISION, FOR GALACTIC INVASION, TOOK FIRST PLACE WITH A SCORE OF 1790. THE ADULT DIVISION TOOK FIRST WITH A 215! MARK MY WORD, AND KEEP THOSE KIDS AWAY FROM YOUR SCORES. IT'S YOUR ONLY CHANCE!

IF YOU'RE INTERESTED IN JOINING THE MICHIGAN ASTROBUGS, JUST SEND A CHECK (\$5.00 U.S. FUNDS), TO THE ADDRESS BELOW. ALSO, OUR FIRST TWO CLUB TAPES ARE READY FOR SALE, FOR ONLY \$4.50 EACH, TO MEMBERS (PRICE INCLUDES POSTAGE). CLUB TAPE #1 INCLUDES 12 PROGRAMS AND CLUB TAPE #2 INCLUDES 8. ALL PROGRAMS WERE WRITTEN AND DONATED BY OUR CLUB MEMBERS. BOTH TAPES ARE A GREAT BUY, AND WE HAVE PLENTY IN STOCK.

DON'T FORGET TO WRITE TO US ABOUT YOUR USER GROUPS. I'D LOVE TO HEAR ABOUT YOUR MEETINGS. IN FACT, THE MORE I HEAR FROM YOU, THE BETTER CHANCE WE HAVE OF KEEPING A COLUMN HERE IN THE ARCADIAN. I'LL BE HAPPY TO HEAR FROM ANY AND EVERYBODY. WE CAN'T BE THE ONLY ONES HAVING SO MUCH FUN!

YOU CAN ALSO FEEL FREE TO CALL OR WRITE TO US ANYTIME, WITH ANY QUESTIONS ABOUT THE USER GROUPS.

HAVE A GOOD DAY AND KEEP 'BUGGIN'!!!

PEGGY GLADDEN  
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At long last, the much-heralded Z-GRASS COMPUTER EXPANSION UNIT for the ASTROCADE system is to be made available. ESOTERICA LTD. (makers of the new TREASURE COVE game cartridge) will be marketing the system, as designed by ALTERNATIVE ENGINEERING. Naturally, ABC Hobbycraft will carry this fine system IN STOCK for all its eager ASTROCADE customers.

Watch for Z-GRASS updates coming soon from ABC Hobbycraft, your ASTROCADE/Z-GRASS connection!

COSMIC RAIDERS and SOLAR CONQUEROR, ASTROCADE's new VIDEOCADE game cartridges, will be shipped from ASTROCADE very soon now, and ABC Hobbycraft is now taking orders for these new cartridges at \$34.95 each! Order now for earliest shipment! Also expected soon is ESOTERICA's second independent cartridge game for ASTROCADE, called BLASTEROIDS, and selling for \$32.95! Order now!

And don't forget that ESOTERICA's first independent ASTROCADE cartridge game, TREASURE COVE, is available NOW for \$32.95 from ABC Hobbycraft! TREASURE COVE, for 1-4 players, is a colorful and exciting game with full-color animated graphics and a continuous three-tone music track. It ranks among the BEST cartridge games for the ASTROCADE! Order today!

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TAKING A PEEK INSIDE  
BY  
ANDY GUEVARA

I'm sure by now that a lot of you have gotten some of the "inside" information on the ARCADE's on-board subroutines. It was one of the first things I sent away for. The question is, how many of you were able to make heads or tails of the information?

Well, that's what the aim of this column is: explanation of some of the routines and how they are used.

This all assumes, of course, that you have a working knowledge of Z-80 machine code. If you have that much, then experimenting using BASIC or the Machine Language Manager should be easy for you.

Probably the most informative of the documents put out by the ARCADIAN was the on-board ROM description written by Dave Nutting & Associates. It was almost written in English. I say "almost" because some things were assumed to be common knowledge, and others had missing information or explanations that fell short.

Since this is the heart of the ARCADE, we'll be covering the subroutines in a little more detail than the Nutting manual. Hopefully, we won't have to dig into the source code to find all the answers.

First, some preliminaries. All of the on board subs have to be called by using the code "FF". The ARCADE is designed to recognize this value as a system call. For my own use, in the assembler that I use, I've defined the labels "SYSTEM" and "SYSSUK" to be the value FF (255 Decimal). The Nutting manual uses these two labels in describing each of the subroutines. The two labels indicate how the arguments (additional information) are to be delivered to the subroutine.

In all cases, the subroutine number refers to the "SYSTEM" convention. The subroutine number is what the ARCADE operating system uses to get to the right subroutine. The method used here is to first load the registers with the right arguments, then issue the system call sentinel, SYSTEM (that is, FF), then the number of the subroutine.

For instance, to call subroutine number 1A (Hexadecimal for 26), using the SYSTEM convention, we would first load all the pertinent information into the registers, then put FF as the op-code, followed by the value 1A. It assembles thusly:

```
11 00 4A    LD    DE,4A00H
01 00 11    LD    BC,1100H
3E 00       LD    A,0
FF          DEFB  SYSTEM
1A          DEFB  FILL
```

The Hex object code is shown on the right. With these

instructions the subroutine "FILL" is called, with execution returning to the very next instruction after the subroutine number. We'll get to what this specific subroutine does later.

The SYSSUK version of this same call looks like this:

```
FF          DEFB  SYSSUK
1B          DEFB  FILL+1
00 4A       DEFW  4A00H
00 11       DEFW  1100H
00          DEFB  0
```

Notice that you don't have to go through the expense of loading the arguments individually. They are "sucked" into the proper registers by the ARCADE operating system. The order that they are put in is therefore very important. Also notice that the subroutine number is 1 greater than before. This will always be true, and is how the operating system knows the difference between SYSSUK and SYSTEM. SYSSUK requires the subroutine number to be one more than its usual value. And SYSSUK will always use an ODD subroutine number.

The advantage of the SYSSUK structure is more compact code. The disadvantage is the inflexibility. It is better used for absolute cases than for iterative loops. Like for borders that will always be in the same place, rather than objects that will move across the screen.

A last important point. When returning from a system subroutine, unless otherwise stated, the registers will be set to the loaded values. That is, the values that were loaded before a SYSTEM call, or the values picked up by a SYSSUK call. The exception is when a specific result is to be returned in a register or registers.

So, now that that's out of the way, let's begin. The very first subroutine, 00, is pretty interesting. This is the system interpreter, not to be confused with the BASIC interpreter. What this routine does is allow the stringing together of several subroutines under one "call". There are no arguments associated with this routine. It looks like this:

```
FF          DEFB  SYSTEM
00          DEFB  INTPC
```

The subroutines you want to string together then follow the above without using the FF sentinel. For instance, using the FILL example from above, we could fill three different areas of the screen like so:

```
FF          DEFB  SYSTEM
00          DEFB  INTPC

1A          DEFB  FILL
```

```

00 40  DEFW 4000H ;WHERE TO START
10 00  DEFW 10H   ;HOW MANY
00     DEFB 0     ;WITH WHAT

```

```

1A     DEFB FILL
20 40  DEFW 4020H
10 00  DEFW 10H
11     DEFB 11H

```

```

1A     DEFB FILL
30 40  DEFW 4030H
50 00  DEFW 50H
FF     DEFB 0FFH

```

```

02     DEFB EXIT

```

The last byte is the subroutine for leaving the interpreter and returning to normal machine language. There are no arguments associated with EXIT either.

To allow the interpreter to work a little more efficiently, there are subroutines for jumping and calling from within the interpreted string.

Subroutine 04, RCALL, is for calling a standard machine language subroutine from within an interpreted string. For instance,

```

04     DEFB RCALL
20 4E  DEFW 4E20H

```

would call a machine language subroutine at address 4E20H. That subroutine would end with a standard RET (C9), and control would return to the next subroutine in the string.

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Subroutine 06, MCALL, is similar to RCALL, except that the call is to another interpreted string of subroutines. If we had an interpreter string at address 4E20H, then the call would look like:

```

06     DEFB MCALL
20 4E  DEFW 4E20H

```

The called string would have to end with subroutine 08, MRET. This would make sure the return was to the correct place.

The final interpreter-related subroutine is number 0AH, 10 for you Decimal types. This is the MJUMP routine, which does a direct jump out of one interpreter string into another. The form is,

```

0A     DEFB MJUMP
20 4E  DEFW 4E20H

```

and, of course, the target of the jump has to be an interpreted string itself.

Well, that about wraps it up for now. I don't intend to take all the routines numerically down the line like today. Instead, I'll skip around and try to explain how groups of subroutines work together. This way we'll take some of the mystery out of animation, joystick control, and interrupts and such.

By the way, for those of you who don't recognize some of the assembler directives I use:

DEFB stands for "Define Byte"

DEFW stands for "Define Word"

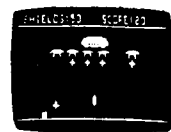
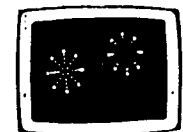
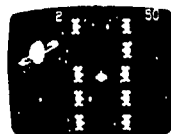
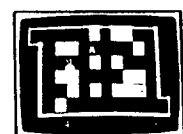
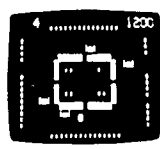
DEFM stands for "Define Message"

DEFS stands for "Define Storage".

We'll use the last two in examples in upcoming articles. See you next time.

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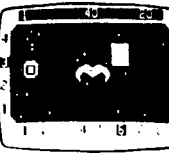
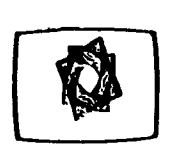
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