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The address for TI is: Texas Instrument, P.O. Box 53, Lubbock, TX 79408, Attn: Dealer Parts.

## FAIRWARE

by John Creviston

This is an incomplete listing of FreeWare programs available for the TI 99/4A Home Computer. Send an already initialized disk and a stamped and self-addressed mailer for return of your disk. Then, if you use and like the program, send a monetary payment to the author. To send for the disks entails a responsibility to pay the author if you use the program. (Editor's Note: For your convenience, many of the fairware programs are available for download from either our FIDO or ROS board. Where this is the case, we have referenced the listing. Even though downloading is much more convenient, i.e. no need to secure disks and mailers, no need for trips to the Post Office, no waiting for the program to come back in the mail, please note that the fairware authors are still entitled to the contribution mentioned. Obey the fairware rules: If a program is good enough for you to use it, then BE FAIR ENOUGH TO PAY FOR IT!!!)

(1) DM1000--Bruce Caron / Send request to: Bob Boone ,Ottawa U.6.,P.O. BOX 2144,STATION 'D' OTTAWA,ONTARIO K1W-5W3... "THE" Ultimate replacement for DMII. Version 3.1 now features the ability to change screen colors and read DV/8V files, plus many, many more nice features, too. Send \$5 or one SS/SD disk and mailer. (Latest version 3.5 available on ROS)

(2) MASSCOPY--Steve Lawless 2514 Maple Avenue, Wilmington, Delaware 19808 EXCELLENT disk cloner; features ability to copy to 2 drives at once and uses the Foundation 128K card to copy a disk in ONE PASS! (Available as part of PRBASE on FIDO)

(3) X\_DISASM--Fred Hawkins 1020 North 6th Street, Allentown, PA. 18102 An XB disassembler with many unique features and terrific documentation for those that PAY!

(4) SUPER DISK DUPLICATOR--Tom Knight 7266 Bunion Drive, Jacksonville, FL. 32222 Allows inputting start and stop sector number for copying disks.

(5) TK WRITER--Tom Knight (See Above) Loads TI WRITER from XB or E/A. No TI-Writer cartridge needed!

(6) NEATLIST--Danny Michaels Route 9, Box 460 Florence, AL. 35630 XB utility to list multi-statement lines to printer or disk for easy reading and references program variables to line number used. (FIDO)

(7) SCREENDUMP--Danny Michaels (See Above) Screen dump to EPSON compatible printer with double or single size and vertical or horizontal page printout. (FIDO)

(8) TIBBS VERSION 5--Ralph Fowler P O Box 383 Kennecaw Ga. 30144. A Bulletin Board operating system for the 99/4A. Full featured.

(9) FAST TERM--Paul Charlton 1110 Pinehurst Court Charlottesville, VA 22901 Simply, THE BEST TERMINAL EMULATOR IN THE WORLD! Now up to Version 1.16 which gives you the ability to catalog a disk while online. (FIDO)

(10) SPRITE BUILDER--John Taylor 2170 Estaline Drive Florence, AL. 35630 XB graphics generating program with assembly language routines for speed at crucial places. Includes a full disk of pretormed graphics.

(11) PILOT 99--Thomas Weithofer (Deceased) ENTIRE language for the TI that is the simplest programming language known to us (or anyone else!) \*\*\*\*\*TWO SSSD DISKS REQUIRED\*\*\*\*\* Send payment to: 1000 Harbury Drive Cincinnati OH, 45220. The family will still mail the program, with all proceeds going to : The CYSTIC FIBROSIS FOUNDATION. (FIDO)

(12) MASTER CATALOG--Mack McCormick 215 A Yorktown, Ft. Lee, Virginia 23801 A 100% assembly language disk catalog program that is super fast; handles up to 2000 different disk files.

(13) EASYSprite--Tom Freeman 515 Alma Real Dr., Pacific Palisades, CA 90272 An extremely fast XB program with assembly routines to create graphics sprites with easy cursor control saving for program insertion.

(14) DISASSEMBLER--Marty Kroll 218 Kaplan Avenue Pittsburg, P. 15227 Super-fast disassembler, 100% assembly and full featured.

(15) TECHIE BBS--Monty Schmidt 525 Wingra St. Madison, WI. 53714 Freeware BBS system for the 99/4A. Version 4.0 now includes Xmodem Transfers by Paul Charlton, and also has 1200 baud capability. Send four ss/sd disks and mailer

(16) COMPACTOR--Monty Schmidt (see above) Assembly language program that takes an uncompressed D/F80 AL program and will compress to about 2/3 the disk space and yield faster load times.

(17) UNCOMPACTOR--Monty Schmidt (see above) Opposite of above.

(18) PRO 99er--BBS Mark Hoogendoorne 21 Long Street, Burlington, MA. 01803 TI BBS system with TRUE IE2 transfer capabilities.

(19) DISK MANAGER--Todd Kaplan, 5802 N. Western Apt. 3S, Chicago, IL. 60659 INCREDIBLE Disk Manager on disk; forget TI'S DM2 !

(20) TOMB OF DEATH--John Behnke, 5755 W. Grace, Chicago, Ill. 60634. New game for use with the TUNNELS OF DOOM cartridge.

(21) ASSAULT THE CITY--John Behnke (see above). XB D and D game.

(22) FAST FORTH--Tim Curran, 4153 Four Pole Road, Huntington, WV 25701. XBasic Loader, fast editor, fast editor locator, 40 column auto-repeat.

(23) C COMPILER--Clint Pulley, 38 Townsend Ave., Burlington, Ontario Canada L7T 1Y6--A TRUE COMPILER for the C language for the TI 99/4A!! Based on the "small c" language. Its speed is even faster than FORTH in benchmark tests. Send one SS/SD disk, mailer, and \$1 for canadian postage. (Latest version 2.1 FIDO)

(24) SUPER COPY--Clint Pulley,(address above)-- disk copier.

(25) 9900 BREAKTHRU--Clint Pulley,(address above)--a fast action game in FORTH.

(26) FILEREADER--Martin Sooley-6149 Bryson Dr., Mentor, OH 44060--reads and prints I/F etc. files.

(27) WEATHER FORECASTER--Gary Cox--3174 Melbourne, Memphis TN 38127--will forecast the weather in any part of the US with a 'fair' degree of accuracy.

(28) LAWNMOWER--Gary Cox-(see above)-xb game--send SS/SD disk, mailer and postage for both programs.

(29) AMNION HELPLINE--116 Carl St., San Francisco, CA 94117-- Run by Dr. Guy-Stefan Romano, this is 'the' library of public domain software for the 99/4a. He has over 100 volumes (disks-ss/sd) covering everything from games to business to utilities to music, learning aids, technical, home use, and even FORTH and PASCAL disks. Send for an order form listing all programs. Costs are \$5, he supplies disk and mailer. RECOMMENDED!!!

(30) ENHANCED XB FORTH--Rene LeBlanc, 8719 e.San Lucas Dr., Scottsdale, AR 85258--includes an improved random number generator, generalized words that access disk functions, booting to allow for treating two SS/SD diskettes as if a 180-screen diskette was being used, sound and graphics applications included as extra screens with menu, and inclusion of extension words

suggested by Leo Brodie in 'THINKING FORTH'. Send two SS/SD disks, mailer, and return postage.

(31) MAIL CALL--Garv D. Watts, 1739 Burning Tree Dr., Vienna, VA 22180--mail list program that allows users to create, maintain, and print mailing lists. It includes a program to allow use of ti/writer mailing lists. Runs in XB. Send disk and return postage.

(32) TOOLKIT--Stephen J. Trencansky, 621 Lacey Dr., Endwell, NY 13760-- a package of 11 utility programs that run in extended basic. Included are : df/80 to dv/163 comparisons with differences reported, df/80 file dump to printer in integer of HEX, program that prints information from uncompressed object files, program that generates listings of files from multiple disks, label maker, object file conversions--double compressed,uncompress compress to load faster. Send SS/SD disk, mailer, postage, and \$5.

(33) SPREADSHEET--Peter Chalamish, 110 Post Ave., Apt. 104, New York City, NY 10034--XB spreadsheet program that has 26 rows by 14 columns. Also available is a basic program that simulates the landing of a 747 jet. Send disk, mailer, and return postage.

(34) DIRECTOR '99'--Robert Neal and Ed Burt, P.O. BOX 216R, Romeoville, IL 60441--Library program that reads disk files, updates the directory, and allows the user to ENTER A DESCRIPTION of each file(up to 48 characters). Up to 200 disks may be entered. Send initialized disk with stamped mailer.

(35) PRBASE--Fast access data management system, featuring global search,field search, and memory index search. Data sorts in seconds. Two diskettes,Xbasic,MMM,E/A, or TIWriter, expansion memory required. Printer,2nd drive recommended. William Warren,2373 Ironton St. Aurora, CO 80010 (F100)

(36) 42 PROGRAMS--10 xbasic graphics programs of transformer toys, 7 misc. graphics, 10 xbasic games, 3 basic games, 11 utility, 1 educational. Send \$2, blank disk, and stamped,return mailer. Steve Paterson, 2351 Ragan Woods, Toledo OH 43614

(37) UNIVERSAL DISASSEMBLER-- Offers capability to analyze diskettes and disassemble files directly from the diskette as well as from memory. Handles all standard TI object file formats. Requires disk system and memory expansion Rene LeBlanc, 8719 E. San Lucas Dr., Scottsdale, AZ 85258

(38) RAPID SCROLL--100 percent assembly program reads DV80 files and allows users to rapidly window left or right on character at a time or up and down one line at a time. Displays current line and column positions. Allows previewing of formatting from TI Writer without printing and eliminates 20 column "hop" of TI Writer windowing. Requires memory expansion,disk system, and EA,MMM,or XB. Send stamped return mailer and \$3-5 to Jurgen Switalski, 218 Lake St., Northville, MI 48167

(39) TAXMASTER--Tax calculating and printing program to aid in preparation of this years taxes. XB, memory exp., and disk system required. Printer helpful. Prints final tax return on governments own form. Send \$5 for disk, postage and handling. Howard Arnold, 210 Beech Valley Rd., Lewisville, NC 27023

(40) TE4TH--terminal emulator for the Forth user who wants to download text or Forth screens. Requires EA, expansion memory, and disk system. Includes source and other Forth programs. Send SSSD diskette and stamped, return mailer (or \$ 5) to Ken Caruthers, 3537 Faberge Way, Sacramento, CA 95826

(41) DISK UTILITIES--multiple use disk utility. Has sector editor,string search, catalog to printer, many other features. E/A, expansion memory, and at least one disk drive required. From John Birdwell, 501 S. Edson Ave., Lombard IL 60148.

(42) SUPER DISK CATALOGER UTILITY-- Larry Duke and Scott Beeker 4704 Palo Duro NE Albuquerque , NM 87110. Runs in EXB or E/A. Very fast disk cataloger. Sorts by file name and disk name and prints lists of each. Can save data file to disk for later updates; deletions; etc.

(43) BACKUP-- Michael A. Ballman 271 NW. 43rd St. Apt. #3 Oakland Park, Fl 33309. Backup disk copier. Will copy almost any disk for backup. Requires use of TI disk controller card, E/A module and Exp. Mem.

(44) COPY MASTER-- Barry Boone Box 1233 Sand Springs OK 74063 . Send \$15 for program . One of the fastest disk copiers to un-initialized disk.

(45) CATALOGING LIBRARY-- Martin Kroll Jr. 218 Kaplan Ave. Pittsburg PA 15227. Excellent library program for your disks. All features included and menu driven for ease of use. 100% Assembly so it is very fast. (FIDO)

(46) MASSTRANSFER-- Stuart Olson 25322 W Wayside Place Lake Villa , IL 60046. A terminal emulator with X-MODEM that will transfer an entire disk of files uninterrupted to another TI 99/4A using the same program. (FIDO)

(47) MISC MACH. LANG. UTILS-- Art Green , same address as DM1000. Disk includes documentation. Programs include - disk copier, terminal emulator, ART-COPY, and 7 more plus 2 examples for the printer init program.

(48) 2D GRAPHICS-- Jean Pierre Marin, Same address as DM1000. A excellent graphics drawing program with music while you draw. Program comes with doc's and a great demo. 2 single sided or one double sided disks are required.

(49) TI99-OPOLY-- Ross Mudie 47 Berowra Waters Rd. Berowra , NSW. 2081. A XB load game patterned after the Parker Brothers original. The load takes over 3 minutes, but the game plays very fast. Joysticks can be used as well as the keyboard to play the game . The graphics are very good, and the computer keeps the balance of your money, even ending your play when you go bankrupt. (FIDO)

(50) TESC-Joe Freeman---- Engineering Dept. of University of Florida is so superior to TI's TERMINAL EMULATOR 2 that there is no comparison. It permits downloading of 20 times as much info from bulletin boards and instantaneously! It'll sure save you phone time on the big boards like COMPUSERVE and THE SOURCE.

(51) TI-WRITER MANUAL REWRITE-Dick Altman ---- 1033 Shrader St., San Francisco, CA 94117. This cuts the manual down to 6 five pages, plus it contains all the control' commands I have been able to find.

(52) THE DIRECTOR--Ron Rutledge ---1020 3rd St., Waukegan, IA 50363. This is a very good multi-function XB disk cataloger that includes a disk labeling program.

(53) SPRITE BUILDER--another good one (see #10 and 13 above). This one is by Marty Kroll whose address is in #19 above. This one will write CHAR codes to your disk in merge format so that you can use it in XB programs. has a lot of pre-defined graphics, and speech is optional.

## A/L LOADER

by Bob Carmany

Here is a loader that can be used with A/L programs (either ATARI or TI). The instructions for changing the program are in the source code file. Simply make the changes and then run the source code file through the Assembler in the E/A package or FUNLWRITER and you are all set to go!

```
* To change this routine for your own use, simply change the TEXT 'DSK1.+name' *
* and in the DATA statement above that change >000B to the length of your *
* fname. Simply copy the first line of TDATA or CDATA followed by 'DSK1.+name *
* the length of the fname and an EVEN statement. Two lines after the KPRER *
* symbol you will see LI R4,>3100 (ASCII for "1"). You will have to load *
* registers 7-15 with the codes for 3-9. Next you will have to put a CB R7,R1 *
* R8 R1 followed by a JEW to a symbol you create. It should be like SYMBOLS *
* TLOAD CLOAD then a MOV R11,@SAVRTN and JMP CLOSEF *
*
```

```
REF DSRLNK, YMBW, YSBW, LOADER
REF KSCAN
DEF BEGIN
PABBUF EQU >1000
PAB EQU >F80
STATUS EQU >837C
ATR EQU >8356
SAVRTN DATA 0
TDATA DATA >0005, PABBUF, >5000, >0000
DATA >000B
TEXT 'DSK1.TENNIS'
```

```

EVEN
CDATA DATA >0005,PABBUF,>5000,>0000
DATA >000E
TEXT 'DSK1.CENTIPEDE'
EVEN
CLOSE BYTE >01
MYREG BSS >20
TEN TEXT '1. TENNIS'
CEN TEXT '2. CENTIPEDE'
BEGIN LI R0,34
LI R1,TEN
LI R2,9
BLWP @VMBW
LI R0,98
LI R1,CEN
LI R2,12
KPREP CLR R0
MOVB R0,@>B374
LI R4,>3100
LI R2,>3200
LI R3,>2000
KCHECK CLR R1
MOVB @STATUS,R5
COC R3,R5
JNE KCHECK
MOVB @>B375,R1
CB R1,R4
JEQ TLOAD
CB R1,R2
JEQ CLOAD
JMP KPREP
TLOAD MOV R11,@SAVRTN
LWPI MYREG
LI R0,PAB
LI R1,TDATA
LI R2,>20
BLWP @VMBW
LI R6,PAB+9
MOV R6,@PNTR
BLWP @LOADER
JMP CLOSEF
CLOAD MOV R11,@SAVRTN
LWPI MYREG
LI R0,PAB
LI R1,CDATA
LI R2,>20
BLWP @LOADER
CLOSEF MOV R6,@PNTR
MOVB @CLOSE,R1
LI R0,PAB
BLWP @VSBW
MOV R6,@PNTR
BLWP @DSRLNK
DATA B
CLR R0
MOVB R0,@STATUS
MOV @SAVRTN,R11
RT

```

END

## MODEM TALK

by Herman Geschwind

As was mentioned in our last newsletter, we are indeed fortunate to have now two bulletin board systems available to use for downloads. One is the FIDO board (274-5760), the other ROS (855-3088). This is not only convenient in case one or the other happens to be busy but moreover it gives us a chance to have a wide selection of downloads without hogging too much disk space on any one system. So, remember to check both boards since as a rule we will not duplicate uploads, i.e. the selection of downloadable files will be different on both boards. Both boards can also be used for messages. The FIDO messages will be in the "General" section, ROS has a special message section for our use "TI". The downloads are in File Section 12 (FIDO) and TI99 (ROS). Here is a brief rundown of what is new since our last newsletter:

### FIDO(274-5760):

GMS6.ARC 69760 Another disk in our collection of E/A games.

MACRO1.ARC 88448

MACRO2.ARC 84096 by R. A. Green. This is not only a replacement for the Editor/Assembler but adds a number of new capabilities. Documentation is included.

AMON.ARC 60800 A variation on the popular Monopoly game by our friends in Australia. More sophisticated than MONO.ARC

DK1.ARC 30336

DK2.ARC 70784 This is an adventure game. Has XD loader. C99R3.ARC 05000 An updated version of Clint Pulley's popular "c" compiler.

### ROS(855-3088):

CHESS.ARC 37k This is an adaptation of the famous SAR60N micro chess program for the TI. Somewhat slow but powerful.

GMS10.ARC 43k E/A Games with XB loader.

DM1000.ARC 23k Version 3.5, the latest revision of this popular disk and file management program.

GMS7.ARC 85k As the title says, more E/A games with XB loader.

FTDIAL.ARC 69k FastTerm with Autodial. Useful only if your modem has autodial capability.

GMS8.ARC 84k You guessed, another E/A games disk. XB load.

GEN1.ARC 64k A disk with popular E/A programs with XB loader.

GMS9.ARC 60k More games with XB loader.

GEN2.ARC 58k E/A programs with XB loader.

MCG1.ARC 51k A collection of very interesting XB utilities by Will McGovern, the co-author of FUNLWRITER. See for yourself what a 16 year old can do with XB and A/L subroutines!

GEN4.ARC 73k More E/A programs, load with XB.

MONO.ARC 43k The popular game of monopoly. This is a simpler version.

For those that are still mystified by "xmodem" and "uploads" and "downloads", following is a real nice summary (courtesy of the ROS board):

Several times a day, as I pass the system and take a quick glance just to make sure that all is well, I see some messages pertaining to file transfers and that someone is having a problem or two getting the Xmodem routines to run. So perhaps a quick review of what's SUPPOSED to happen will help those that haven't used Xmodem file transfers much.

First, two definitions: Sender: the computer system which will transmit information to the receiver, much like a radio station sends a signal to the radio receiver in our car. Receiver: the computer system which will accept or receive information from the sender.

Using these definitions, then, when you ask ROS, which is running on THIS system, to send a file, ROS becomes the sender and your computer becomes the receiver. To make a file available or others, such as those in the NEWIN section, you will need to make YOUR machine the sender and ROS the receiver.

The Xmodem (or Christensen) protocol is designed to produce error free file transfers by locking the sending and receiving machines together in such a way that any errors in a block or record are detected. When an error is found in this way, the receiving machine asks the sending machine to try again. This may happen several times in a single block, but

usually the reason for the error is noise on the phone line that is gone when the block is re-sent. Consequently, the limit of 10 errors in a single block rarely causes a premature termination. In fact, most terminations occur in the first block, usually because the two machines never got synchronized.

That interlock, so critical to the success of the protocol, is established when the receiving machine tells the sender that it is ready, but the sender MUST ALREADY BE WAITING FOR THAT ACKNOWLEDGEMENT.

So, to get a file from ROS to your system, follow these steps:

1. Tell ROS to <S>end (from the Files sub-system).
2. Tell ROS which file you want.
3. ROS will verify that the file does exist and that you have enough access time to complete the transfer. If all goes well, ROS will announce the approximate time the transfer will take, and then say that it is ready for the transfer to begin.
4. Tell YOUR COMPUTER that you want it to RECEIVE a file. This usually involves some commands which include the file name and maybe the type of protocol (Xmodem) that will be used. The exact form of the command can be found in your documentation.
5. Your computer will then do some checking of its own. If all goes well, your computer will tell ROS that it's ready to receive and the transfer will proceed.
6. After the transfer is complete, ROS will return to normal command mode for your next instruction.

To get a file from your system to ROS, follow these steps:

1. Tell ROS to <R>eceive (from the Files sub-system).
2. Tell ROS the name of the file you intend to send it.
3. ROS will make sure the file doesn't already exist and that the name is valid. If all goes well, ROS will announce the amount of disk space available, and then say that it is ready for the transfer to begin.
4. Tell YOUR COMPUTER that you want it to SEND a file. This usually involves some commands which include the file name and maybe the type of protocol (Xmodem) that will be used. Again, the exact form of the command will be found in your documentation.
5. Your computer will then try to find the file. If it does, it starts waiting for ROS to say it's ready to receive. WHAT? ROS already said it was ready, right? Partially. ROS told YOU it was ready, but while you were telling your machine to send a file, ROS was counting to itself. About 4 seconds after ROS tells you it is ready, it starts sending a code that your computer will interpret as a ready signal. ROS will send this code several times before it finally gives up.
6. When your computer detects that ROS is ready, it starts sending the file.
7. When the transfer is complete, ROS will ask for a short description of the file you sent for the benefit of other users. That's where the information in the <N>ewin function comes from.

While the terms "upload" and "download" aren't usually used in ROS, they correspond to <R>eceive and <S>end respectively, i.e. "upload" means to send a file from a remote system to a host (from you to ROS, so ROS is receiving), and "download" means to send a file from a host to a remote system (from ROS to you, so ROS is sending). In both cases, ROS is acting as the host system. For those interested in the technical aspects of the error checking, I'll just say that ROS will automatically detect cyclic redundancy code (CRC) or checksum modes during send operations (as requested by your machine), and that during receive operations, ROS will try both modes until something works or it times out (preference is given to CRC for accuracy).

## FORTH FORUM

by Bob Carmany

Here is a series of Forth screens that utilize the graphics capabilities of TI Forth. The first two screens require -GRAPH, -GRAPH2, and -VDPMODES to be loaded before you run the screen. The last screen requires -PRINT to be loaded and will perform a screen dump to any Epson-compatible printer. All three of these screens were authored by Mike Swiridenko of the Winnipeg TI994A Users Group.

SCR #26

```
0 ( LINES DEMO ) : WAIT 20000 0 DO LOOP ; : NEG 0 SWAP - ;
1 0 VARIABLE X0 0 VARIABLE Y0 0 VARIABLE X1 0 VARIABLE Y1
2 0 VARIABLE XD0 0 VARIABLE YD0 0 VARIABLE XD1 0 VARIABLE YD1
3 RANDOMIZE : R2 4 RND 1+ 2 RND IF NEG THEN ; : ND R2 R2 ;
```



```

4 : SI ND YD0 ! YD1 ! ND XD0 ! XD1 ! ; ; RY 100 - RND 50 + ;
5 : SET S1 256 RY X0 ! 256 RY X1 ! 192 RY Y0 ! 192 RY Y1 ! ;
6 : MVENDS X0 @ XD0 @ + DUP 0< SWAP 255 > OR IF XD0 @ NEG XD0 !
7 THEN Y0 @ YD0 @ + DUP 0< SWAP 191 > OR IF YD0 @ NEG YD0 !
8 THEN X1 @ XD1 @ + DUP 0< SWAP 255 > OR IF XD1 @ NEG XD1 !
9 THEN Y1 @ YD1 @ + DUP 0< SWAP 191 > OR IF YD1 @ NEG YD1 !
10 THEN X0 @ XD0 @ + X0 ! Y0 @ YD0 @ + Y0 ! X1 @ XD1 @ + X1 !
11 Y1 @ YD1 @ + Y1 ! ; ; HCLR -1 - 31786 ! 8192 6144 0 VFILL !
12 : DOLINE X0 @ Y0 @ X1 @ Y1 @ LINE ;
13 : DOLINES 100 0 DD MVENDS DOLINE ?KEY -DUP IF 6 = IF LEAVE ELSE
14 PAUSE IF TEXT ABORT THEN THEN THEN LOOP ?KEY 0= IF WAIT THEN ;
15 : LINES GRAPHICS2 BEGIN SET DOLINES WAIT HCLR AGAIN ; LINES

```

SCR #27

```

0 ( CIRCLE DRAW PROGRAM)
1 0 VARIABLE A 0 VARIABLE B 0 VARIABLE X1 0 VARIABLE RADIUS
2 0 VARIABLE Y1 0 VARIABLE PX 0 VARIABLE PY 0 VARIABLE PH
3 : CIRCLE ( X Y R) DUP RADIUS ! X1 ! B ! A ! 0 0 Y1 ! PH !
4 BEGIN X1 @ Y1 @ < 0= WHILE
5 PH @ Y1 @ DUP + + 1+ PY ! PY @ X1 @ DUP + - 1+ PX !
6 A @ X1 @ + B @ Y1 @ + DOT A @ Y1 @ + B @ X1 @ + DOT
7 A @ X1 @ - B @ Y1 @ + DOT A @ Y1 @ - B @ X1 @ + DOT
8 A @ X1 @ + B @ Y1 @ - DOT A @ Y1 @ + B @ X1 @ - DOT
9 A @ X1 @ - B @ Y1 @ - DOT A @ Y1 @ - B @ X1 @ - DOT
10 PY @ PH ! Y1 @ 1+ Y1 !
11 PX @ ABS PY @ ABS < IF PX @ PH ! X1 @ 1 - X1 ! THEN REPEAT ;
12 : CTEST GRAPHICS2
13 126 95 30 CIRCLE 140 75 40 CIRCLE
14 KEY DROP TEXT ;
15 CTEST

```

SCR #41

```

0 ( HI-RES SCREEN DUMP)
1 0 VARIABLE VA 0 VARIABLE X
2 0 VARIABLE PZ 0 VARIABLE PW 0 VARIABLE CD 14 ALLOT
3 : P-CODE 0 64 75 27 4 0 DD EMIT LOOP ;
4 : CR-CODE 0 65 27 3 0 DD EMIT LOOP CR ;
5 : ?BREAK ?TERMINAL IF TEXT UNSWCH ABORT THEN ;
6 : CNVRT VA ! 256 PZ ! 0 X ! 0 0 DD 0 CD 1 2 * + ! LOOP
7 8 0 DD VA @ 1 + VSRR 1 ! PZ @ 2 / PZ ! 256 PW !
8 -1 7 DD VA PW @ 2 / PW ! X @ PW @ / 0 > IF
9 X @ PW @ - X ! CD ! 2 * + DUP @ PZ @ + SWAP ! THEN
10 -1 +LOOP LOOP -1 7 DD CD ! 2 * + @ EMITB -1 +LOOP ;
11
12 : HDUMP SWCH 24 0 DD 4 0 DD J 256 * I 64 * + P-CODE
13 8 0 DD DUP I 8 * + 8192 + CNVRT ?BREAK
14 LOOP DROP LOOP CR-CODE LOOP UNSWCH ;
15

```