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hardcore

for the serious Apple user and hard-core **computist** 4

DELVING INTO ULTIMA II

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ULTIMA MAPS
SOFTKEYS
ADVENTURE TIPS**

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PEST PATROL**

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PARAMETERS**

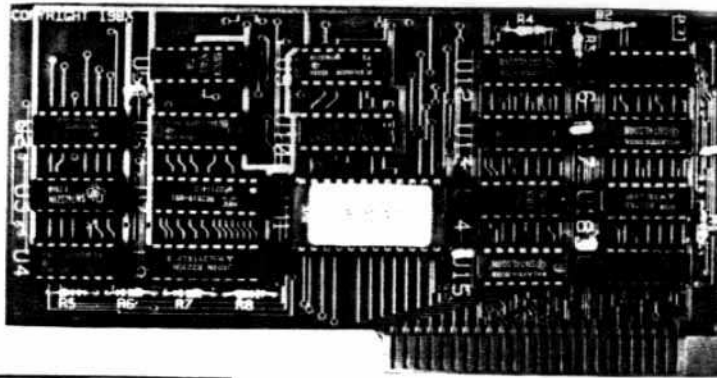


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REPLAY II is intended to be used as an analysis tool, for program development, and for making archival backup copies.

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REPLAY II is an interface card that is slot independent. Users can stop a program, examine and change memory, or copy the program, and restart. Control of the APPLE is obtained by pressing the remote switch which comes on an 18 inch cord outside the APPLE. REPLAY II does not copy the original disk, rather it copies the program executing in memory. If a copy is desired a blank disk is inserted in drive 1 and the options on the menu are contained in the eeprom on the REPLAY II card, no other disk needs to be booted for copying, unlike other copy cards. The very act of booting another disk alters memory which is detectable by some protected software.

REPLAY II does not change ANY memory. Extra memory is buffered to allow copying and analysis without altering the original memory contents. Other copy cards always change specific points in the original memory. REPLAY II faithfully reproduces the lower 48K of memory in a fast load format. The upper 16K can also be copied for a 64K copy. Standard DOS 3.3 files are created automatically for storage on floppy or hard disks. A RAM card is needed for this.

REPLAY II is fully documented in a 60 page manual. Utility programs supplied with the REPLAY II card include Program Analysis, Comparisons, Packing and Compression. A language card is not needed to run packed program copies.

Because most programs are written in Assembly language, the user should be familiar with Assembly in order to fully utilize the advanced Analysis and Packing programs. Users can now freeze a binary program and perform a transparent step or trace while continuous disassembly is shown. View text or hires during trace.

REPLAY II can automatically move protected APPLESOFT programs to a standard DOS 3.3 disk for listing or modification.

Now game players can save a game at any level and QUICKLY restart with the REPLAY II card. Users can freeze games, change variables to obtain unlimited ships or power, etc., then restart the program. Saving high scores is easy!

Minimum requirements are an APPLE II and a single disk drive.

hardcore

for the serious Apple-user and hard-core **Computist 4**

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Checksums for binary listings are found alongside the hexadecimal dumps, to the right of a dotted line. Checksums for Applesoft are listed separately. More information on SoftKey's Checksums can be found in *HARDCORE COMPUTIST #1*. To order back issues, send \$2.50 (plus \$1.00 for postage in North America; \$2.00 for all others) to *HARDCORE COMPUTIST, P.O. Box 44549, Tacoma, Washington 98444*.

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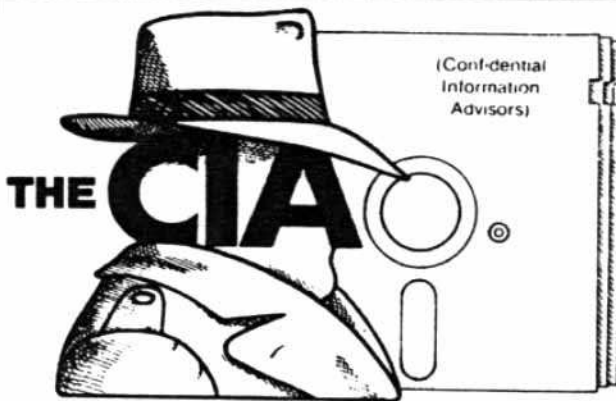
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TRICKY DICK THE LINGUIST BY T TSE

```

D596AA Y AADE  DOS  SL=6 T=23  <00> VOL
D6ABAE N 0000  3.3  DR=1 S=0F  <-> 254
D5AAAD 0 DEAAE  PR=0 <AL> <62> <H>
    
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INPUT INPUT INPUT

From Geneva (Ill.) . . .

I see in your letters column that Martin Halpern makes mention of the fact that our applications software is unprotected and that our games are protected (Hardcore Computist 2). He goes on to say that "too bad Mark Pelczarski's faith in the end user pertains only to his more expensive software . . . of course games are where the fast money is." Talk about biting the hand . . . ! We were the first ones to take the stand that applications software should be unprotected, and believe me, at that time we really felt like we were taking a big risk by taking the side of the end user on it. A lot of people thought that we would be out of business in no time. Now, I'm happy to say, we're still doing just fine, and a lot of companies are going along with the idea and leaving the copy-protection off applications software.

But tell me, why *should* games be unprotected? When we were making the decision concerning applications software, we came up with dozens of reasons. When we look at the same decision with games, none of those reasons remain. You don't have situations where you need to modify it . . . even so, with the game programs, the coding tends to get very obscure so as much as possible could be packed into RAM. Games certainly can't be considered critical data, and you're not going to have situations where if a game disk gets blown, a week's wait for a replacement is going to shut down the office or a project.

Unless you're blind, we all know that kids are trading copies of game programs like we used to trade baseball cards. Except we used to buy the baseball cards. I haven't seen many parents discourage it. In fact some of them are just as much part of it as the kids. It's not a matter of trust; it's a matter of reality. I'm willing to take the risk with the applications software, because I think people understand the intent and benefits of having it unprotected. But I ask again, why *should* games be unprotected?

Back to the letter, your logic seems a little backwards. "Profit-wise," would it make sense to have the expensive software unprotected and the inexpensive software protected? Shouldn't it be the other way around if we were worried about the dollars? And you make no mention that we are the only ones who've lowered game prices to \$19.95. I'm willing to do as much as I can to help the consumer, but I don't want to give the company away. Perhaps what you are suggesting is that we should take the protection off the games and sell them for \$50?

Furthermore, your assertion that "games are where the fast money is" is quite wrong. A couple years ago it may have been true, but not anymore. Take a look at the monthly Softalk poll to see the relative sales between applications and games. Surprised? We publish

games because we like them, and they give us a balance (inside and outside) with the applications software. Our authors are the ones making most of the money on the games; we still rely mostly on the applications.


Mark Pelczarski
President
Penguin Software

To Mt. Kisco . . .

To unlock the disk Casino so it can be accessed and backed up with COPYA, use the same method printed in **HARD-CORE COMPUTIST #1** for Zork. No changes in the sector mode are necessary!

Leonard Nadel, D.D.S.
Mount Kisco, NY

continued on page 19



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REWARD

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Hardcore Computist will pay \$50 to the first person to submit a clearly explained and neatly formatted Softkey for a commercial program. A Softkey shows how to unlock commercial software for modification and improvement, not just how to copy it.

Interested readers should send their Softkeys via certified or registered mail and must enclose the original commercial disk with their article so that the method can be authenticated by our staff. Hardcore Computist guarantees return of the original within six weeks and will not use it to create back-ups for company or personal use.

Softkeys submitted without the original will also be considered for publication and authors will receive \$20 for each published article.

Programmers who submit original modifications to commercial software will receive additional compensation, depending upon the quality and scope of the improvements.

For more information on format and standards, send a stamped, self-addressed envelope for our *Writer's Guide to Hardcore Computist*, P.O. Box 44549, Tacoma, Washington 98444.

WE HAVE NOT FORGOTTEN

For all the avid readers who have patiently (and impatiently) awaited the arrival of the phantom "Best of Hardcore," please bear with us a while longer.

The staff of SoftKey Publishing has encountered substantial production problems that have impeded publication of *The Best of Hardcore*, a compilation of the finest articles and programs from the first three issues of *Hardcore Computing*, plus the four update newsletters.

If you simply can't wait, contact us and we will send a full refund.

SoftKey Publishing has changed the order of release of the next several issues of **HARDCORE COMPUTIST** and **CORE**. The contents of the magazines will be the same, but the new order of release will be:

CORE GAMES
HARDCORE 5
HARDCORE 6

CORE DATA BASES
HARDCORE 7
HARDCORE 8



Advertising Index

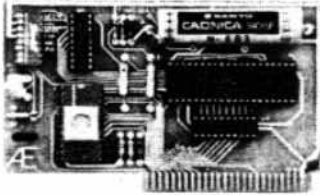
Applied Engineering	5
Ardath, Inc.	back cover
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Fully PRO-DOS compatible

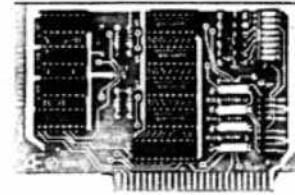
- Just plug it in and your programs can read the year, month, date, day, and time to 1 millisecond! The only clock with both year and ms.
- A rechargeable NiCad battery will keep the TIMEMASTER running for over ten years.
- Powerful 2K ROM driver — No clock could be easier to use.
- Full emulation of most other clocks, including Mountain Hardware's Applock (but you'll like the TIMEMASTER mode better).
- Basic, Machine Code, CP/M and Pascal software on 2 disks!
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If you want the most powerful and the easiest to use clock for your Apple, you want a TIMEMASTER.

PRICE \$129.00

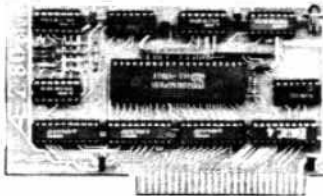
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SUPRTERM	MORE	NO	YES	NO	NO	NO	NO	YES	YES
WIZARD80	MORE	NO	NO	NO	NO	YES	NO	YES	YES
VISION80	MORE	YES	YES	NO	NO	YES	NO	NO	NO
OMNIVISION	MORE	NO	YES	NO	NO	NO	NO	YES	YES
VIEWMAX80	MORE	YES	YES	NO	NO	YES	NO	NO	YES
SMARTERM	MORE	YES	YES	NO	NO	NO	YES	YES	NO
VIDEOTERM	MORE	NO	NO	YES	NO	YES	YES	NO	YES

The VIEWMASTER 80 works with all 80 column applications including CP/M, Pascal, WordStar, Format II, Easywriter, Apple Writer II, VisiCalc, and all others. The VIEWMASTER 80 is THE MOST compatible 80 column card you can buy at ANY price!

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- Expands your Apple IIe to 192K memory.
- Provides an 80 column text display.
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- Can be used as a solid state disk drive to make your programs run up to 20 times FASTER (the 64K configuration will act as half a drive).
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- Automatically expands Visicalc to 95 K storage in 80 columns! The 64K config. is all that's needed, 128K can take you even higher.
- PRO-DOS will use the MemoryMaster IIe as a high speed disk drive.

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- Lowest power consuming 128K card AVAILABLE.
- Complete documentation included, we show you how to use all 128K.

If you already have Apple's 64K card, just order the MEMORYMASTER IIe with 64K and use the 64K from your old board to give you a full 128K. (The board is fully socketed so you simply plug in more chips.)

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Generating Your Super Character

Program By
Dave Thompson
(Hardcore Staff)

and
Mark Cal
Rocky Giovinazzo
Richard Kahn

Article By
Gary Peterson

Requirements:

Apple II+ or compatible
One disk drive
Ultima II Player Master copy which can be cataloged
One blank disk



The Swiss psychologist Carl Jung coined the term "synchronicity" to apply to related, yet independent, events which occur more or less simultaneously. The concept of synchronicity is quite frequently related to scientific advances (like discovering celestial phenomena or cures to diseases) and theories (the theory of evolution is a widely-known case). Although Jung never had a chance to play Donkey Kong or Zaxxon (he died in 1961), he probably would have found it intriguing that synchronicity also occurs in the world of computer games.

Whether due to synchronicity or to the popularity of Ultima II, three explanations of how to enhance the attributes of players in Ultima II were received by SoftKey Publishing within a relatively short time this summer. Although the submissions varied slightly in technique, the idea was the same: generating a super character for Lord British's second game.

To offer **HARDCORE COMPUTIST** readers the best possible character generator, the authors allowed their ideas to be combined by our staff into one comprehensive program. The result is a character generator powerful enough to allow convenient manipulation of any attribute of an Ultima II character.

Storage of Character Traits

The traits of each character are stored on the Ultima II Player Master disk in the file "Player." This file is \$100 (256) bytes long and loads at address \$4E00.

The chart on page 14 shows where the various characteristics are placed when the file is loaded. Values in most locations are stored in BCD (Binary Coded Decimal), which limits the various traits to values of 0-99 (1 byte) or 0-9999 (2 bytes). The name of the character and its sex are stored in standard ASCII.

Using the Ultima II Character Generator

Before using the program to create your super character, the Ultima II Player Master must be moved to a disk which can be cataloged. Refer to the Ultima II Softkey on page 28 if necessary.

To begin, type in the Ultima II Character Generator Applesoft listing on page 8 and save it. Now run the program, and you'll find out how easily your character can become invincible.

The program is self-prompting, but an example will give you some idea of what to expect.

Need A Dagger?

No problem. When the program first runs, you will be confronted with a main menu which corresponds to the

headings in the "Changing Your Ultima II Character" chart. "Daggers" is listed under "Weapons."

1) Select "2" from the main menu, for "Weapons."

2) "Ready Weapons =>" will appear first, with the name of your Ready Weapon following the arrow. (If you would like to change this, type your preference over the existing word.) To reach the "Daggers" selection, press return.

3) "Daggers =>" will be followed by the number of daggers your character currently possesses. To the right will be the limitations (0-99) on the new number of daggers. Enter the desired number, for example 90, and press return.

Now that your character has 90 daggers, you will be confronted with each of the remaining items on the weapons list, and you may be tempted to make more changes. Remember, cheating is a terrible thing, but so is guilt. Since you have already cheated, you might as well forget about the guilt and do whatever's necessary to win the game. The program will return to the main menu after you press return for the final Weapons selection. You then will be free to explore the other menu choices.

A special warning should be heeded when changing gold and experience. An upward limit of 9999 is indicated for each by the Character Generator program, and this number may be entered. However, the price of avarice is that when you acquire more gold in the course of the game, that number will turn over and leave you at 0. To avoid this, simply use a little moderation when increasing your gold and experience. Safe numbers are 9000 or less.

4) Once you are satisfied with the traits you have given your character, select "6" from the main menu to save the new "Player" file to disk.

Take That, You Pesty Devil!

Now you can begin your search for the Enchantress of Evil, confidently challenging those pesty devils, daemons and balrons who used to give you so much trouble.



Changing Your Ultima II Character

PERSONAL TRAITS

Agility
Class
Charisma
Experience
Hit Points
Intelligence
Race
Sex
Stamina
Strength
Wisdom

WEAPONS

Axes
Bows
Daggers
Great Swords
Light Sabers
Maces
Phasers
Quickwords
Ready Weapon
Swords

ARMOUR

Armour Worn
Chain Suits
Cloth Armor
Leather Suits
Plate Suits
Power Suits
Reflect Suits

SPELLS

Blink
Kill
Ladder Down
Ladder Up
Light Spells
Magic Missile
Passwall
Prayer
Ready Spells
Surface

ITEMS

Ankhs
Blue Tassles
Boots
Brass Buttons
Cloaks
Food
Gems
Gold
Green Gems
Green Idols
Helms
Keys
Red Gems
Rings
Skull Keys
Staff
Strange Coins
Tools
Torches
Tri-Lithiums
Wands

CHARACTER NAME

ULTIMA II

CHARACTER EDITOR

Character Editor Program

```

10 REM
15 REM *****
20 REM **
25 REM **      ULTIMA II      **
30 REM ** CHARACTER EDITOR **
35 REM ** BY DAVE THOMPSON **
40 REM **
45 REM **      -----      **
50 REM **
55 REM **      INFORMATION    **
60 REM **      COLLATED BY   **
65 REM **      DAVE THOMPSON **
70 REM **
75 REM *****
80 REM
100 NOTRACE : TEXT : HOME : NORMAL
    : VTAB 3: PRINT "INSERT ULTI
    MA II PLAYER DISK, THEN": PRINT
    : PRINT "PRESS ANY KEY.": WAIT
    - 16384,128: POKE - 16368,
    0: LOMEM: 16385:SV = 1
110 PRINT CHR$(4)"BLOAD PLAYER
    "
120 NA$ = "": FOR D = 19968 TO 19
    983: IF PEEK (D) < > 0 THEN
    NA$ = NA$ + CHR$( PEEK (D)
    ): NEXT
130 HOME : VTAB 2: HTAB 20 - ( LEN
    (NA$) / 2 + 5): PRINT "CHARA
    CTER=>";NA$: POKE 34,3: IF N
    D THEN 150
140 DIM SX$(1),CL$(3),RC$(3),WP$(
    9),AR$(6),SP$(9): READ SX$(
    0): READ SX$(1): FOR D = 0 TO
    3: READ CL$(D): NEXT : FOR D
    = 0 TO 3: READ RC$(D): NEXT
    : FOR D = 0 TO 9: READ WP$(D
    ): NEXT : FOR D = 0 TO 6: READ
    AR$(D): NEXT : FOR D = 0 TO
    9: READ SP$(D): NEXT
150 VTAB 5: PRINT "ALTER WHAT SE
    T OF STATS?": PRINT : PRINT
    "1) PERSONAL TRAITS.": PRINT
    : PRINT "2) WEAPONS.": PRINT
    : PRINT "3) ARMOUR."
160 PRINT : PRINT "4) SPELLS.": PRINT
    : PRINT "5) ITEMS.": PRINT :
    PRINT "6) SAVE CHARACTER.":
    PRINT : PRINT "7) CHANGE NA
    ME.": PRINT : PRINT "8) QUIT
    .": PRINT : PRINT "SELECT NU
    MBER: ";
170 GET A$:A = VAL (A$): IF A <
    1 OR A > 8 THEN 170
180 ON A GOTO 200,430,580,700,85
    0,1080,1100,1130
190 REM ** ALTER TRAITS **
200 SV = 0: HOME : PRINT "SEX=>";
    SX$( PEEK (19984) = 205)
210 HTAB 6: VTAB 4: INPUT "":A$:
    IF A$ = "" THEN HTAB 6: VTAB
    4: PRINT SX$( PEEK (19984) =
    205): GOTO 250
220 IF A$ < > SX$(0) AND A$ < >
    SX$(1) THEN PRINT CHR$( 7)
    : GOTO 210
230 IF A$ = SX$(0) THEN POKE 19
    984,198: GOTO 250
240 POKE 19984,205
250 PRINT : PRINT "RACE=>";RC$( PEEK
    (19986))
260 HTAB 7: VTAB 6: INPUT "":A$:
    IF A$ = "" THEN HTAB 7: VTAB
    6: PRINT RC$( PEEK (19986)):
    GOTO 290
270 FOR D = 0 TO 3: IF A$ < > R
    C$(D) THEN NEXT : PRINT CHR$(
    7): GOTO 260
280 POKE 19986,D
290 PRINT : PRINT "CLASS=>";CL$(
    PEEK (19985))
300 HTAB 8: VTAB 8: INPUT "":A$:
    IF A$ = "" THEN HTAB 8: VTAB
    8: PRINT CL$( PEEK (19985)):
    GOTO 330
310 FOR D = 0 TO 3: IF A$ < > C
    L$(D) THEN NEXT : PRINT CHR$(
    7): GOTO 300
320 POKE 19985,D
330 PRINT :A$ = "STRENGTH=>":HT =
    11:VT = 10:X = 19989: GOSUB
    1240
340 PRINT :A$ = "AGILITY=>":HT =
    10:VT = 12:X = X + 1: GOSUB
    1240
350 PRINT :A$ = "STAMINA=>":HT =
    10:VT = 14:X = X + 1: GOSUB
    1240
360 PRINT :A$ = "CHARISMA=>":HT =
    11:VT = 16:X = X + 1: GOSUB
    1240
370 PRINT :A$ = "WISDOM=>":HT =
    9:VT = 18:X = X + 1: GOSUB 1
    240
380 PRINT :A$ = "INTELLIGENCE=>"
    :HT = 15:VT = 20:X = X + 1: GOSUB
    1240
390 PRINT :A$ = "HIT POINTS=>":H
    T = 13:VT = 22:X = 19995: GOSUB
    1300

```

Character Editor Program

```
400 POKE 35,25:A$ = "EXPERIENCE=
>":HT = 13:VT = 24:X = 20000
: GOSUB 1300
410 POKE 35,24: HOME : GOTO 150
420 REM ** WEAPONS **
430 SV = 0: HOME : PRINT "READY W
EAPON=>";WP$( PEEK (20011))
440 HTAB 15: VTAB 4: INPUT "":A$
: IF A$ = "" THEN HTAB 15: VTAB
4: PRINT WP$( PEEK (20011)):
GOTO 470
450 FOR D = 0 TO 9: IF A$ < > W
P$(D) THEN NEXT : PRINT CHR$(
7): GOTO 440
460 POKE 20011,D
470 PRINT :A$ = "DAGGERS=>":HT =
10:VT = 6:X = 20033: GOSUB 1
240
480 PRINT :A$ = "MACES=>":HT = 8
:VT = 8:X = X + 1: GOSUB 124
0
490 PRINT :A$ = "AXES=>":HT = 7:
VT = 10:X = X + 1: GOSUB 124
0
500 PRINT :A$ = "BOWS=>":HT = 7:
VT = 12:X = X + 1: GOSUB 124
0
510 PRINT :A$ = "SWORDS=>":HT =
9:VT = 14:X = X + 1: GOSUB 1
240
520 PRINT :A$ = "GREAT SWORDS=>"
:HT = 15:VT = 16:X = X + 1: GOSUB
1240
530 PRINT :A$ = "LIGHT SABERS=>"
:HT = 15:VT = 18:X = X + 1: GOSUB
1240
540 PRINT :A$ = "PHASERS=>":HT =
10:VT = 20:X = X + 1: GOSUB
1240
550 PRINT :A$ = "QUICKSWORDS=>":
HT = 14:VT = 22:X = X + 1: GOSUB
1240
560 HOME : GOTO 150
570 REM ** ARMOUR **
580 SV = 0: HOME : PRINT "ARMOR W
ORN=>";AR$( PEEK (20012))
590 HTAB 13: VTAB 4: INPUT "":A$
: IF A$ = "" THEN HTAB 13: VTAB
4: PRINT AR$( PEEK (20012)):
GOTO 620
600 FOR D = 0 TO 6: IF A$ < > A
R$(D) THEN NEXT : PRINT CHR$(
7): GOTO 590
610 POKE 20012,D
620 PRINT :A$ = "CLOTH ARMOR SUI
TS=>":HT = 20:VT = 6:X = 200
65: GOSUB 1240
630 PRINT :A$ = "LEATHER SUITS=>"
:HT = 16:VT = 8:X = X + 1: GOSUB
1240
640 PRINT :A$ = "CHAIN SUITS=>":
HT = 14:VT = 10:X = X + 1: GOSUB
1240
650 PRINT :A$ = "PLATE SUITS=>":
HT = 14:VT = 12:X = X + 1: GOSUB
1240
660 PRINT :A$ = "REFLECT SUITS=>"
:HT = 16:VT = 14:X = X + 1:
GOSUB 1240
670 PRINT :A$ = "POWER SUITS=>":
HT = 14:VT = 16:X = X + 1: GOSUB
1240
680 HOME : GOTO 150
690 REM ** SPELLS **
700 SV = 0: HOME : PRINT "READY S
PELL=>";SP$( PEEK (20013))
710 HTAB 14: VTAB 4: INPUT "":A$
: IF A$ = "" THEN HTAB 14: VTAB
4: PRINT SP$( PEEK (20013)):
GOTO 740
720 FOR D = 0 TO 9: IF A$ < > S
P$(D) THEN NEXT : PRINT CHR$(
7): GOTO 710
730 POKE 20013,D
740 PRINT :A$ = "LIGHT SPELLS=>"
:HT = 15:VT = 6:X = 20097: GOSUB
1240
750 PRINT :A$ = "LADDER DOWN=>":
HT = 14:VT = 8:X = X + 1: GOSUB
1240
760 PRINT :A$ = "LADDER UP=>":HT
= 12:VT = 10:X = X + 1: GOSUB
1240
770 PRINT :A$ = "PASSWALL=>":HT =
11:VT = 12:X = X + 1: GOSUB
1240
780 PRINT :A$ = "SURFACE=>":HT =
10:VT = 14:X = X + 1: GOSUB
1240
790 PRINT :A$ = "PRAYER=>":HT =
9:VT = 16:X = X + 1: GOSUB 1
240
800 PRINT :A$ = "MAGIC MISSLE=>"
:HT = 15:VT = 18:X = X + 1: GOSUB
1240
810 PRINT :A$ = "BLINK=>":HT = 8
:VT = 20: GOSUB 1240
820 PRINT :A$ = "KILL=>":HT = 7:
VT = 22:X = X + 1: GOSUB 124
0
830 HOME : GOTO 150
840 REM ** ITEMS **
850 SV = 0: HOME : PRINT :A$ = "N
O. OF RINGS=>":HT = 15:VT =
4:X = 20128: GOSUB 1240
860 PRINT :A$ = "NO. OF WANDS=>"
:HT = 15:VT = 6:X = X + 1: GOSUB
1240
870 PRINT :A$ = "NO. OF STAFFS=>"
:HT = 16:VT = 8:X = X + 1: GOSUB
1240
880 PRINT :A$ = "BOOTS=>":HT = 8
:VT = 10:X = X + 1: GOSUB 12
40
890 PRINT :A$ = "CLOAKS=>":HT =
9:VT = 12:X = X + 1: GOSUB 1
```

Character Editor Program

```

240
900 PRINT :A$ = "HELMS=>":HT = 8
:VT = 14:X = X + 1: GOSUB 1240
910 PRINT :A$ = "GEMS=>":HT = 7:
VT = 16:X = X + 1: GOSUB 1240
920 PRINT :A$ = "ANKHS=>":HT = 8
:VT = 18:X = X + 1: GOSUB 1240
930 PRINT :A$ = "RED GEMS=>":HT =
11:VT = 20:X = X + 1: GOSUB
1240
940 PRINT :A$ = "SKULL KEYS=>":H
T = 13:VT = 22:X = X + 1: GOSUB
1240
950 HOME : PRINT :A$ = "GREEN GE
MS=>":HT = 13:VT = 4:X = X +
1: GOSUB 1240
960 PRINT :A$ = "BRASS BUTTONS=>
":HT = 16:VT = 6:X = X + 1: GOSUB
1240
970 PRINT :A$ = "BLUE TASSLES=>"
:HT = 15:VT = 8:X = X + 1: GOSUB
1240
980 PRINT :A$ = "STRANGE COINS=>
":HT = 16:VT = 10:X = X + 1:
GOSUB 1240
990 PRINT :A$ = "GREEN IDOLS=>":
HT = 14:VT = 12:X = X + 1: GOSUB
1240
1000 PRINT :A$ = "TRI-LITHIUMS=>
":HT = 15:VT = 14:X = X + 1:
GOSUB 1240
1010 PRINT :A$ = "TORCHES=>":HT =
10:VT = 16:X = 20014: GOSUB
1240
1020 PRINT :A$ = "KEYS=>":HT = 7
:VT = 18:X = X + 1: GOSUB 1240
1030 PRINT :A$ = "TOOLS=>":HT =
8:VT = 20:X = X + 1: GOSUB 1240
1040 PRINT :A$ = "FOOD=>":HT = 7
:VT = 22:X = 19997: GOSUB 1300
1050 PRINT : POKE 35,25:A$ = "GO
LD=>":HT = 7:VT = 24:X = 200
02: GOSUB 1300
1060 POKE 35,24: HOME : GOTO 150
1070 REM ** SAVE THE CHARACTER *
*
1080 PRINT : PRINT CHR$(4);"BS
AVE PLAYER,A$4E00,L$100":SV =
1: GOTO 150
1090 REM ** CHANGE PLAYERS' NAME
**
1100 SV = 0: HOME : VTAB 12: PRINT
"NAME=>";NA$;: HTAB 7: INPUT
";A$: IF A$ = "" OR LEN (A
$) > 14 THEN 1100
1110 FOR D = 1 TO LEN (A$): POKE

```

```

19967 + D, ASC ( MID$( A$,D,
1)) + 128: NEXT : FOR D1 = D
- 1 TO 15: POKE 19967 + D,0
: NEXT : POKE 34,0:ND = 1: GOTO
1200
1120 REM ** LEAVE PROGRAM **
1130 POKE 34,0: HOME : VTAB 10: HTAB
1: IF SV THEN HOME : END
1140 PRINT "YOU HAVEN'T SAVED YO
UR NEW CHARACTER!": PRINT : HTAB
4: PRINT "ARE YOU SURE YOU W
ANT TO QUIT?": PRINT : VTAB
18: HTAB 10: PRINT "HIT <ESC
> TO QUIT": PRINT : HTAB 4: PRINT
"HIT <RETURN> TO SAVE CHARAC
TER"
1150 K = PEEK ( - 16384): IF K <
128 THEN 1150
1160 POKE - 16368,0: IF K = 155
THEN HOME : END
1170 HOME : VTAB 2: HTAB 20 - ( LEN
(NA$) / 2 + 5): PRINT "CHARA
CTER=>";NA$: POKE 34,3: GOTO
1080
1180 END
1190 REM ** POKE 1 BCD BYTE **
1200 POKE X,( INT (HX / 10) * 16
) + (HX - INT (HX / 10) * 1
0): RETURN
1210 REM ** POKE 2 BCD BYTES **
1220 POKE X, INT ( INT (HX / 100
) / 10) * 16 + INT (HX / 10
0) - ( INT ( INT (HX / 100) /
10) * 10): POKE X + 1,( INT
((HX - ( INT (HX / 100) * 10
0)) / 10) * 16) + (HX - ( INT
(HX / 100) * 100) - INT ((H
X - INT (HX / 100) * 100) /
10) * 10): RETURN
1230 REM ** 1 BYTE INPUT **
1240 VTAB VT: HTAB 25: PRINT "(0
-99)";: HTAB 1: PRINT A$;: HTAB
HT: GOSUB 1280: HTAB HT: INPUT
";HX$: IF HX$ = "" THEN VTAB
VT: HTAB HT: GOTO 1280
1250 HX = VAL (HX$): IF HX > 99 OR
HX < 0 THEN POKE 34,VT - 1:
HOME : GOTO 1240
1260 POKE 34,VT - 1: HOME : POKE
34,3: HTAB 1: VTAB VT: PRINT
A$;: GOSUB 1200: HTAB HT: VTAB
VT: GOTO 1280
1270 REM ** 1 BYTE BCD CONVERT *
*
1280 PRINT INT ( PEEK (X) / 16)
* 10 + ( PEEK (X) - INT ( PEEK
(X) / 16) * 16);: RETURN
1290 REM ** 2 BYTE INPUT **
1300 VTAB VT: HTAB 25: PRINT "(0
-9999)";: HTAB 1: PRINT A$;:
HTAB HT: GOSUB 1340: HTAB H
T: INPUT ";HX$: IF HX$ = ""
THEN VTAB VT: HTAB HT: GOTO

```

Character Editor Program

```

1340
1310 HX = VAL (HX$): IF HX > 999
9 OR HX < 0 THEN 1300
1320 GOSUB 1220: HTAB HT: VTAB V
T: GOTO 1340
1330 REM ** 2 BYTE BCD CONVERT *
*
1340 HB = INT ( PEEK (X) / 16) *
10 + ( PEEK (X) - INT ( PEEK
(X) / 16) * 16):LB = ( INT (
PEEK (X + 1) / 16) * 10) +
( PEEK (X + 1) - ( INT ( PEEK
(X + 1) / 16) * 16)): PRINT
HB * 100 + LB;: RETURN
1350 REM ** DATA **
1360 DATA "FEMALE", "MALE", "FIGH
TER", "CLERIC", "WIZARD", "THIE
F", "HUMAN", "ELF", "DWARF", "HO
BBIT", "HANDS", "DAGGER", "MACE
", "AXE", "BOW", "SWORD", "GREAT
SWORD", "LIGHT SABER", "PHASE
R", "QUICKSWORD"
1370 DATA "SKIN", "CLOTH", "LEA
THER", "CHAIN", "PLATE", "REFLE
CT", "POWER", "NONE", "LIGHT", "
LADDER DOWN", "LADDER UP", "PA
SSWALL", "SURFACE", "PRAYER", "
MAGIC MISSLE", "BLINK", "KILL"

```

INTRODUCING

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10 - \$BADD					1090 - \$B143
15 - \$F628					1100 - \$2BC4
20 - \$DA85	250 - \$BD89	530 - \$270C	810 - \$72CD		1110 - \$587D
25 - \$965F	260 - \$F5C8	540 - \$DE9E	820 - \$B558		1120 - \$71EF
30 - \$599A	270 - \$4519	550 - \$7242	830 - \$040B		1130 - \$5B14
35 - \$0587	280 - \$5E80	560 - \$9513	840 - \$926C		1140 - \$7C30
40 - \$A182	290 - \$2F3C	570 - \$A855	850 - \$A2AD		1150 - \$77C7
45 - \$85B4	300 - \$84CB	580 - \$9018	860 - \$AED0		1160 - \$14AD
50 - \$365D	310 - \$CA55	590 - \$F05E	870 - \$838D		1170 - \$FDDF
55 - \$F6F8	320 - \$542D	600 - \$E51F	880 - \$1576		1180 - \$B185
60 - \$EA61	330 - \$C4B3	610 - \$BEB0	890 - \$2960		1190 - \$39BD
65 - \$02FB	340 - \$A89C	620 - \$7BB9	900 - \$5AA1		1200 - \$5AB9
70 - \$AD8A	350 - \$503E	630 - \$E847	910 - \$E0E5		1210 - \$DDB4
75 - \$5567	360 - \$5B2C	640 - \$AEEC	920 - \$4469		1220 - \$38ED
80 - \$A19E	370 - \$BF97	650 - \$605A	930 - \$FB91		1230 - \$1924
100 - \$01CC	380 - \$5EAA	660 - \$A168	940 - \$7A53		1240 - \$D397
110 - \$5D6D	390 - \$7FB9	670 - \$A9B6	950 - \$6F24		1250 - \$A235
120 - \$9DFD	400 - \$DFD8	680 - \$B227	960 - \$14D1		1260 - \$2CFA
130 - \$5C82	410 - \$0EA6	690 - \$54D2	970 - \$381E		1270 - \$1222
140 - \$E2BA	420 - \$6EB8	700 - \$BA8D	980 - \$9FFF		1280 - \$BB12
150 - \$7740	430 - \$6566	710 - \$6CA0	990 - \$949A		1290 - \$10BE
160 - \$7F84	440 - \$9298	720 - \$B35A	1000 - \$3360		1300 - \$F882
170 - \$518A	450 - \$71A4	730 - \$13B3	1010 - \$53A4		1310 - \$EFB4
180 - \$1444	460 - \$294B	740 - \$5A8E	1020 - \$5083		1320 - \$E301
190 - \$BE36	470 - \$342A	750 - \$A8DA	1030 - \$95DD		1330 - \$6FCC
200 - \$B46F	480 - \$2FE8	760 - \$24FB	1040 - \$9D91		1340 - \$D0C6
210 - \$E41A	490 - \$8F74	770 - \$9065	1050 - \$48F2		1350 - \$FC6F
220 - \$5927	500 - \$9783	780 - \$EB4C	1060 - \$243B		1360 - \$BE90
230 - \$7DA2	510 - \$E2DC	790 - \$7D56	1070 - \$F754		1370 - \$1F48
240 - \$2071	520 - \$6494	800 - \$8E7F	1080 - \$D5DD		

Ultima II

Softkey

and

A.P.T.



By Brian Burns and Dan Rosenberg

Requirements:

48K Apple II Plus or IIe
One disk drive with DOS 3.3
Ultima II: Program Master, Player Master, and Galactic disk
COPYA or similar disk copy program
Three blank disks

Owners of Ultima II may know how hard it is to back up. The copy-protection is tough to break because the data is stored differently than on normal DOS disks. Unlocking disks like Ultima is frustrating, mostly because it is often impossible. But there are shortcuts.

Because Sierra On-Line left a big hole in the copy protection of this adventure game, the disks are COPYA-able with only slight modification to DOS. Programs like Locksmith and Nibbles Away usually have a hard time copying Ultima II. But they will do the job if you prevent DOS from reading the VTOC's from the disks. The VTOC is a sector on every normal DOS disk that tells on which track and sector the catalog starts (the catalog contains all the file names on the disk), and which version of DOS is on disk (3.2 or 3.3). It also contains a table that tells which sectors are being used to store programs and which are empty.

The VTOC's on the Ultima II disks have been filled with hex \$FF's, which is why DOS gives an I/O error (it thinks the catalog starts at track \$FF, sector \$FF). You do know, of course, that track \$FF, sector \$FF doesn't exist, don't you? Ultima II doesn't get errors when it is reading from its own disks because its Disk Operating System is modified and doesn't need the VTOC to load programs.

After the Softkey, there is an Advanced Playing Technique for Ultima II which allows you to change a character's strength, wisdom, armor, weapons, race, hit points, etc. in the middle of the game. First complete the Softkey, because it modifies the program so it can be used with the A.P.T.

How to Copy

1) Boot your system master or any regular DOS 3.3 disk.

2) Enter the monitor

CALL -151

3) Type

AFF7G

This allows the reading of the VTOC from the normal DOS 3.3 disk into memory.

4) After the drive stops, enter

AFF7:60

AFFD:60

This keeps DOS from writing or reading the altered VTOC from the Ultima II disks and thus prevents errors when copying the disks.

5) Run COPY or COPYA. Copy all three Ultima II disks as you would normally (yes, copy the Player Master disk this way, even though it is normally COPYA-able). If you have a character disk you want to keep, also copy it.

6) Boot your System Master or any regular disk and enter the monitor again by typing

CALL -151

7) Enter the following short program.

300:20 F7 AF 20 0C FD 20 FD AF 60

This program will copy the normal VTOC from the System Master to the copied Ultima II disks.

Put in the System Master and type

300G

DOS then will read the normal VTOC into memory. When a cursor appears, insert a copied Ultima II disk and push a key. If the Apple beeps or nothing happens, start over from step 6. When you push a key, the drive should whirl and write the normal VTOC in memory to the copied Ultima II disk. Repeat the procedure by putting in another of the copied disks and typing

303G

Also do this for the last Ultima II disk. If you also have a copied character disk, insert it and type

303G

It will put a normal VTOC on that disk, as well.

8) Now insert your copied Ultima II Program Master and type

BLOAD HELLO

(Yes, you can do this from the monitor.) Make the following changes:

**72E0: A9 4C 8D F8 03 A9 79 8D F9 03 A9 50 8D FA
03 60**

Now type

UNLOCK HELLO

BSAVE HELLO, A\$6000 ,L\$1420

LOCK HELLO

This modification keeps Ultima II from testing the disk to see if it is a copy (if it is, Ultima will crash), prevents it from booting the disk when reset is pushed, and sets up a ctrl-Y jump back into the program for use when you alter your character in the following A.P.T.

Your Ultima II is now copied and ready to be played.

Ultima A.P.T.

Now that you can push reset in the middle of the game without booting the disk, you can edit your character to your heart's content. For example, if you have only one unit of food and you are stranded in the middle of nowhere, miles and years away from a town, push reset. (If you are on a horse or frigate, do not push reset, since you will lose whatever transportation you are using. You first should get off whatever it is by pushing X for Exit and then reset. When you come back to the game, just hit B for Board.)

Hitting reset should leave you in Applesoft. Enter the monitor with

CALL -151

Now you can change your character's food, hit points, or whatever else you need, by just entering the appropriate address from the chart on page 14, a colon (:) and the value you wish to have in decimal (00-99). You should only enter values in hexadecimal where noted in the list of addresses. If you ever need to know a value, type in the address and hit return. For example, to gauge your strength, enter

4E15

You should see "4E15- 16" or whatever your strength may be.

You do not necessarily have to be in the middle of a game to edit your character. Simply insert the character disk, type **BLOAD PLAYER, CALL-151**, and you are ready to change your character. Since your character is stored in memory \$4E00 to \$4EFF, when you are done you should enter **BSAVE PLAYER, A\$4E00,L\$100**.

NOTE: If the address is two bytes, as food and hit points are, put the first two digits (in decimal), a space, and then the last two digits (in decimal, also). Say, for example, you wanted to change your food to 487. You would push reset, **CALL -151**, and **4E1D:04 87**. To get back into the game, enter ctrl-Y.

It is important never to save a new file onto one of the copied Ultima II disks, since this may write over the other programs on the disk. A new program means one which is not already on the disk. It is all right to save your character (file name **PLAYER**) to your character disk, since that file has always been there. Accidentally saving a new file on the disk may necessitate making a new copy from scratch.

The address list contains all the addresses we have found. The ones with question marks are unknown, but their purposes may be revealed by further experimentation. You can do this by changing the unknown value and seeing how it affects your location and/or status. Some of the effects are strange, and it would be advisable to turn off the computer if it gets bizarre to avoid accidentally storing jumbled data on your disk.

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HC4

ULTIMA II ADDRESSES

Location	Item or characteristic	Each byte of this section represents how many of each item you have. (IE. a \$15 at location \$4E41 means you have 15 daggers, a \$78 at location \$4E43 means 78 axes, etc. See \$4E2B.)	
\$4E00-\$4E0F	Name. (Up to 15 letters)		
\$4E10	Sex. M is male, F is female.		
\$4E11	Class of character. 0-Fighter 1-Cleric 2-Wizard 3-Thief		
\$4E12	Race of character. 0-Human 1-Elf 2-Dwarf 3-Hobbit		
\$4E13-\$4E14	??		
\$4E15	Strength.	LOC.	ITEM
\$4E16	Agility.		
\$4E17	Stamina.		
\$4E18	Charisma.	----- WEAPONS -----	
\$4E19	Wisdom.	\$4E41	dagger
\$4E1A	Intelligence.	\$4E42	mace
\$4E1B-\$4E1C	Hit Points.	\$4E43	axe
\$4E1D-\$4E1E	Food.	\$4E44	bow
\$4E1F	??	\$4E45	sword
\$4E20-\$4E21	Experience points. Location \$4E20 is also the level of your character.	\$4E46	great sword
\$4E22-\$4E23	Gold pieces.	\$4E47	light saber
\$4E24-\$4E25	Location of player on map. This is an X, Y value. For example, change these bytes when you are stuck on an island to move to the nearest land mass. (Use hex values for X and Y.)	\$4E48	phaser
\$4E26-\$4E2A	??	\$4E49	quicksword
\$4E2B	Weapon in hand. This is the weapon you are using. You don't have to own the weapon to use it. For instance, you may change this to "Phaser" without having a phaser in your possession or even being able to wield it. 0-Hands 1-Dagger 2-Mace 3-Axe 4-Bow 5-Sword 6-Great sword 7-Light sword 8-Phaser 9-Quick sword	----- ARMOUR -----	
\$4E2C	Type of armour that you are wearing. The same applies to armour as to weapons. 0-Skin 1-Cloth 2-Leather 3-Chain 4-Plate 5-Reflect 6-Power	\$4E61	cloth
\$4E2D	Spell. This is the spell you are ready to cast. Unfortunately, you must own the spell in order to cast it, but you can change that! 0-None 1-Light 2-Ladder down 3-Ladder up 4-Passwall 5-Surface 6-Prayer 7-Magic Missile 8-Blink 9-Kill	\$4E62	leather
\$4E2E	Torches	\$4E63	chain
\$4E2F	Keys	\$4E64	plate
\$4E30	Tools	\$4E65	reflecting
\$4E31-\$4E40	??	\$4E66	power
		----- SPELL -----	
		\$4E81	light
		\$4E82	ladder down
		\$4E83	ladder up
		\$4E84	passwall
		\$4E85	surface
		\$4E86	prayer
		\$4E87	magic missile
		\$4E88	blink
		\$4E89	kill
		----- MISC. -----	
		\$4EA0	ring
		\$4EA1	wand
		\$4EA2	staff
		\$4EA3	boots
		\$4EA4	cloak
		\$4EA5	helm
		\$4EA6	gem
		\$4EA7	ankh
		\$4EA8	red gem
		\$4EA9	skull key
		\$4EAA	green gem
		\$4EAB	brass button
		\$4EAC	blue tassel
		\$4EAD	strange coin
		\$4EAE	green idol
		\$4EAF	tri-lithium



Readers' Copy Exchange



Softkey for Witness

TOTO
San Jose, CA

Infocom, Inc.
55 Wheller Street
Cambridge, MA 02138
\$49.95

Requirements:
48K Apple, Applesoft in ROM
COPYA
Disk editing program
One blank disk

Witness is a fairly good detective text adventure. Unfortunately, the disk is protected, therefore not allowing the art of A.P.T. So I decided to find a way to unlock the disk. The following method also works for Deadline, another game distributed by Infocom.

- 1) **RUN COPYA**
- 2) Once loaded, stop the program with ctrl-C.
- 3) Delete line 70 so the copy routine will not reload.
- 4) From the Monitor (CALL -151), type the following:

B925:18 60 (return)
B988:18 60 (return)
BE48:18 (return)
B8FB:29 00 (return)
3D0G (return)

- 5) Run the copy program (RUN).
 - 6) After the disk is copied, use a disk editing program (like The Inspector) to read track 0, sector 2.
 - 7) Change:
5D from BC to AD
FB from C9 to 29
FC from BC to 00
- You now have an unprotected disk that can be copied with various copy programs, including COPYA.

Unlocking Prisoner II

David Kirsch
Lompoc, CA

Eduware
P.O. Box 22222
Agoura, CA 91301

Requirements:

48K Apple with Applesoft in ROM
One disk drive
COPYA or similar program
One blank disk

Prisoner II uses standard DOS 3.3 for tracks 0-34 (the normal full-disk usage). The game also uses track 35, which contains some special data for copy-protection (none of the data is needed for running the program).

- 1) Copy the disk using COPYA or a similar copy program.
- 2) **UNLOCK IF.SHAPE**
- 3) **BLOAD IF.SHAPE**
- 4) **CALL -151**
- 5) **57B4:BD 8C** (old values are FE and 57)
- 6) **BSAVE IF.SHAPE,AS5600,LS026E**
- 7) **LOCK IF.SHAPE**

This bypasses the portion of the machine code that checks track 35, then jumps to the "passed test" section of code to continue loading and playing of the game.

continued on page 29

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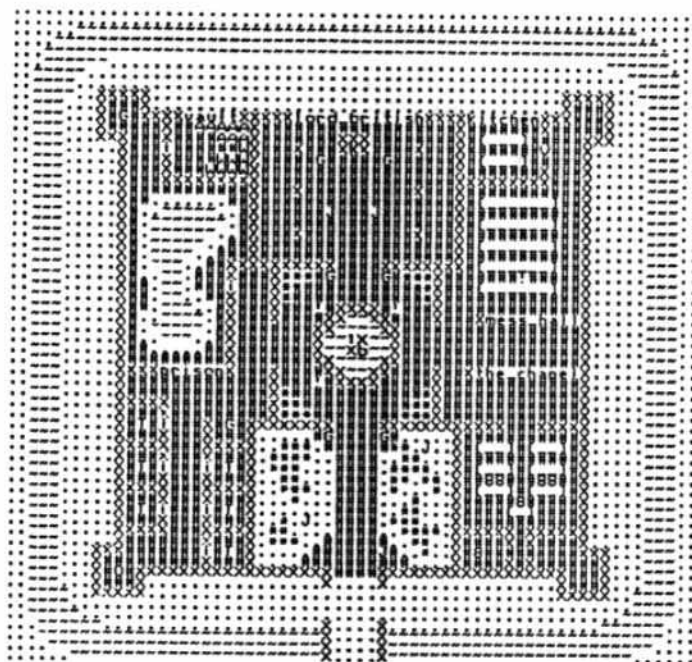
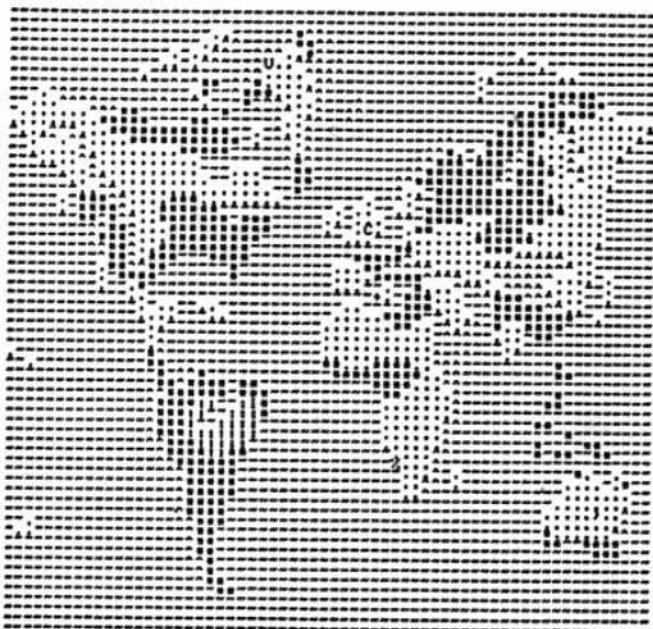
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Plan Your Ultima II Adventure With

Ultimap



Article By
Gary Peterson

Program By
Dave Thompson

Requirements:

Apple II or compatible, 48K
One disk drive
Printer
Ultima II Player disk which can be cataloged by normal DOS

Before journeying to an unfamiliar place, most people like to consult a map; adventure game journeys are no exception. Wouldn't it be nice if there were an AAA (American Automobile Association) of adventure games to help you plan the most scenic and time-saving route, especially for a trip through the bizarre world of the popular fantasy, Ultima II?

HARDCORE COMPUTIST can help you plan your Ultima II adventure trip and create the first Adventure AAA by allowing you to print out any map stored in the Ultima II program.

Reproducing the Images

Ultima II uses a hi-res character generator to display its terrains, inhabitants, vehicles, etc. Ultimap does not try to reproduce the character set used by Ultima II. Instead, it translates the character codes used by Ultima into standard ASCII characters. As a result, the characters used by Ultimap to represent the various game maps are different from the characters used when Ultima II is played, although the scale is the same.

The ASCII characters used by Ultimap are contained in the data statements in lines 130 and 140. A listing of these characters and what they represent is shown in the "Character Representation" table.

Using Ultimap

The Ultimap program is simple to use, but does require that the Ultima II Player disk have a catalog which can be read by DOS 3.3 (refer to the Ultima II Softkeys in this issue if necessary).

Type in the Ultimap Applesoft program and save it. When run, the program will ask if you would like a catalog of the disk as an aid in choosing which map to print.

The various maps are stored on the Ultima II Player disk as MAP 00, MAP 25, MAP 12, etc., and will be listed in this manner in the catalog. When a map has been chosen, it is loaded into RAM starting at address 4096 (\$1000 hex). The program converts the character code used by Ultima into one of the standard ASCII characters used by Ultimap, and sends it to the printer (the printer interface card is assumed to reside in slot 1). The resulting print-outs of MAP 03 and MAP 20 can be seen above.

These maps were printed on a C. ITOH 8510A Prowriter printer with the line feed pitch set to 14/144 inches. This prevents elongation of the maps by compressing the lines together as much as possible. Refer to your printer manual to find the control codes which allow this compression.

Readers who don't have a printer might wish to modify the program so the map is sent only to the video screen. Since each map contains four full screens of information, a program modified for use without a printer must pause after each screen of the map has been displayed. If your computer doesn't have lower case, remember that the characters shown on screen will not completely correspond to the characters shown in the "Ultima Characters" table.

I won't tell you all of the fascinating information we have discovered by printing out the various Ultima II maps, because that would spoil your fun. But just as a hint, try printing out MAP 00 and MAP 41. The AAA was never this good.



Character Representation

Dec Code	ASCII Char	Figure Represented	Dec Code	ASCII Char	Figure Represented
126	-	Water	64	@	Time Door
58	:	Swamp	114	r	R
46	.	Grass	115	s	S
42	*	Forest	116	t	T
94	^	Mountains	117	u	U
37	&	Village	118	v	V
43	+	Town	119	w	W
73	I	Tower	120	x	X
67	C	Castle	121	y	Y
85	U	Dungeon	122	z	Z
62	>	Sign	93]	Delimiter
48	0	Sea Monster	91	[Delimiter
79	O	Orc	33	!	Fighter
68	D	Daemon	56	8	Cleric
69	E	Devil	90	Z	Wizard
66	B	Balron	84	T	Thief
77	M	Minax			
72	H	Horse			
70	F	Frigate			
80	P	Airplane			
82	R	Rocket			
65	A	Armour			
87	W	Weapon			
47	/	Force Field			
71	G	Guard			
74	J	Jester			
86	V	Merchant			
75	K	King			
35	#	Cobblestone			
32		Nothing			
88	x	Wall			
95		Space			
97	a	A			
98	b	B			
99	c	C			
100	d	D			
101	e	E			
102	f	F			
103	g	G			
104	h	H			
105	i	I			
106	j	J			
107	k	K			
108	l	L			
109	m	M			
110	n	N			
111	o	O			
112	p	P			



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(postage and handling complimentary)

Slay Your Dragons

ULTIMAP PROGRAM

```

10 REM *****
20 REM *
30 REM *          ULTIMAP          *
40 REM *          BY              *
50 REM *          DAVE THOMPSON   *
60 REM *
70 REM *****
80 REM
90 LOMEM: 16385: DIM CH$(63): FOR
  D = 0 TO 63: READ CH:CH$(D) =
  CHR$(CH): NEXT : ONERR GOTO
  250
100 REM          ** CATALOG? **
110 HOME : PRINT "CATALOG ?
  (Y/N)";: HTAB 9: GET A$:
  IF A$ < > "N" AND A$ < >
  "Y" THEN 110
120 INVERSE : PRINT A$: NORMAL :
  IF A$ = "Y" THEN PRINT CHR$(
  4)"CATALOG"
130 REM          ** GET FILE NAME **
140 PRINT : PRINT : PRINT : INPUT
  "FILE TO LOAD =>";NA$: IF NA
  $ = "" OR LEFT$(NA$,1) < "
  " THEN 140
150 REM          ** LOAD FILE? **
160 PRINT CHR$(4)"BLOAD"NA$,A
  4096"
170 REM          ** PRINT MAP **
180 PR# 1: REM PUT YOUR PRINTER
  CONTROL CHARATERS HERE
190 FOR Y = 0 TO 63: FOR X = 0 TO
  63
200 CH = PEEK (4096 + (64 * Y) +
  X) / 4: PRINT CH$(CH);: NEXT
  X: PRINT : NEXT Y: PRINT : PR#
  0: GOTO 110
210 REM          ** DATA FOR MAP **
220 DATA 126,58,46,42,94,37,4
  3,73,67,85,62,48,79,68,69,66
  ,77,72,70,80,82,65,87,47,71,
  74,86,75,35,32,88,95,97,98,9
  9,100,101,102,103
230 DATA 104,105,106,107,108
  ,109,110,111,112,64,114,115,
  116,117,118,119,120,121,122,
  93,91,33,56,90,84
240 REM          ** FILE NOT FOUND? **
250 IF PEEK (222) = 6 THEN PRINT
  CHR$(7);"FILE NOT FOUND";:
  FOR PA = 1 TO 400: NEXT : GOTO
  140
260 POKE 216,0: RESUME

```



Ultimap Checksums

10	-	\$BADD
20	-	\$9B13
30	-	\$4D3B
40	-	\$AD92
50	-	\$C899
60	-	\$FF65
70	-	\$A3BF
80	-	\$A900
90	-	\$D2DD
100	-	\$1B03
110	-	\$6E83
120	-	\$AE39
130	-	\$17F8
140	-	\$B832
150	-	\$D082
160	-	\$FE9D
170	-	\$03E4
180	-	\$DE17
190	-	\$5A34
200	-	\$3302
210	-	\$68EF
220	-	\$7EC7
230	-	\$4908
240	-	\$123C
250	-	\$3B93
260	-	\$8B6A



INPUT

continued from page 3

From Montreal . . .

It's good that Bobby teaches us how to unprotect programs like Zork and Multiplan, but . . . teach us some general ways to unprotect programs. Telling us how to unprotect certain programs is like letting someone at school copy your answers, without telling them how and why the answers were reached. Boot code tracing is a very good method, but that only applies to some single-load programs. Is there some way to unlock "always go back to the disk" programs, like Olympic Decathlon, Aztec, etc.?

I will share with you what I have observed: the "Open-Heart Surgery" and "Demuffin" methods [HARD-CORE COMPUTING #1, old series] are only good for some older programs. Newer programs like Olympic Decathlon and Aztec have a totally different DOS; you cannot find a start address and length for some binary files. I got into Olympic Decathlon, but when I typed "list" it caused the program to rerun. I checked location \$D6, and the locations before and after, and found them to be filled with 12's. Locations AA72, AA73, AA60, and AA61 also contained some 12's. What I want to know is how to play against this kind of protection.

Suggestion: tell us how to do more advanced protection. It's funny, one thing I found is that if you know how to protect a program, you will know how to unprotect it; but if you know how to crack a program, you may not know how to protect it. Tell us more on protected disk formats! And more concentration on disk protection; how to do and un-do advanced copy-protection.

Nhieu Duy-Minh
Montreal, Quebec

To Kenya . . .

If you think that copy-protection is a nuisance in the United States, you should face it in the developing world! Here in Nairobi we have seen the number of Apple users grow from one or two to more than 40 in just two years. We even have a new Apple users group.

But we don't have computer dealers with large selections of software to check out in the store and helpful salespersons to tell us whether a package will run on a particular system and meet a particular need. We don't have toll-free numbers to contact software retailers and developers; the toll is \$8.00 for the first three minutes.

continued on page 30

BEEP! LOST YOUR PROGRAM?

BUS RIDER LOGIC ANALYZER FOR THE APPLE II

The Bus Rider is a self diagnostic development tool that allows real time analysis of software and hardware in the Apple II computer.

The Bus Rider provides:

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- 4 external inputs with variable threshold reference.
- Display cycle by cycle execution or 6502 disassembled code.

The Bus Rider comes complete with Bus Rider circuit card, reference manual, Bus Rider software diskette, and 10 easy hook external input cable.
The total system price is **\$395.00**

ADDR	DATA	INT	EXT	MNEMONIC	
0001	1000	4C2040	1111	0000	JMP #4000
0002	4000	800C50	1111	0000	LDA #5000,X
0003	4000	000C50	1111	0000	ENE #4000
0004	4000	4C1063	1111	0000	JMP #6310
0005	4000	450F	1111	0000	LDA #0F
0006	4000	00	1111	0000	#3
0007	4000	00	1111	0000	#3
0008	4000	00	1111	0000	#3
0009	4000	00	1111	0000	#3
0010	4000	00	1111	0000	#3
0011	4000	00	1111	0000	#3
0012	4000	00	1111	0000	#3
0013	4000	00	1111	0000	#3
0014	4000	00	1111	0000	#3
0015	4000	00	1111	0000	#3
0016	4000	00	1111	0000	#3
0017	4000	00	1111	0000	#3
0018	4000	00	1111	0000	#3

P-PASSIVE A-ACTIVE ESC-QUIT H-HELP

Bus Rider - Disassembled Display

RC Electronics Inc.

5386 Hollister Avenue, #D
Santa Barbara, CA 93111
(805) 964-6708 TELEX 295281





Boot Code Tracing Pest Patrol

By Ray Darrah

Pest Patrol
Sierra On-Line Inc.
36575 Mudge Ranch Road
Coarsegold, CA 93614
\$39.95

Requirements:

- Pest Patrol disk
- One initialized slave disk with Hello program deleted
- One disk drive
- Some knowledge of machine language

Pest Patrol is an outerspace shooting gallery with many diverse levels, each employing its own enemy attack patterns. Built-in options help configure the game to your machine and ability level. For example, Pest Patrol may be played with the keyboard, paddles, rheostatic joystick, or Atari joystick. Although each game is somewhat different, they are all quite fun.

Unfortunately, the protection scheme used on Pest Patrol is such that it will continually reboot on a computer with a language card. That just about washes out all the Apple IIe and Franklin Ace users.

Never fear, for **HARDCORE COMPUTIST** has a solution to both the back-up problem and the language card problem: convert Pest Patrol into a normal binary file. This will omit the booting sequence, where the check for the language card resides (and the reboot subroutine). Once this is done, Pest Patrol will work on an Apple IIe or Franklin Ace just like the computer was an Apple II without a language card.

Where To Begin?

The first step I took in breaking Pest Patrol was checking for simple prologue or epilogue alterations. If these alterations were the problem, I easily could have made a Softkey to do the job of back-up, and my problem would have been solved (although the program still wouldn't run on a computer with a language card). But there were no alterations.

I soon noticed that the data on this disk was in no way like normal data stored by DOS, so I decided to boot code trace the program.

Boot Code Tracing: The Concept

In order to boot a disk, the computer must be able to load track 0, sector 0. This is the where the first in a sequence of programs responsible for loading the main program into memory is written.

The boot code trace disk-breaking method depends on the fact that track 0, sector 0 must always be loaded for any disk to boot. It works by tracing the steps which the computer follows during the entire process of booting a disk. First a small program in the disk controller card loads a 256-byte program stored on the disk's track 0, sector 0. This program is loaded into memory beginning at \$0800 and is responsible for loading the next program in the boot process. There may be several of these boot programs (each usually longer than the one before it) leading up to the actual loading of the main program stored on the disk. While tracing, this process is halted to examine each program before executing each step.

The second short program (on track 0, sector 0 of the Pest Patrol disk) immediately loads a third, larger program into memory. This third program checks for a language card and, if none is present, loads the main part of the game program. If a language card is discovered, the computer is instructed to reboot endlessly.

How To Boot Code Trace

This article is an account of how I boot code traced Pest Patrol. Since the text follows the order of my actions, a complete list of steps for copying the disk is not found until near the conclusion. This organization will help those trying to learn boot code tracing. Refer to the procedure listed under the "The Whole Thing" subtitle for a complete set of instructions for copying Pest Patrol.

Beginning a Boot-Code Trace

I started with the usual boot tracing preliminary steps:

- 1) Turn on your Apple (or Apple-compatible).
- 2) Press reset before the computer has a chance to boot.

3) Enter the monitor.

CALL-151

- 4) Put zeros in all memory locations from \$0800 to \$BFFF, inclusive.

800:00

801 < 800.BFFFF

Placing zeros in all RAM higher than \$07FF makes it easier to discover where in memory the programs load. Look for locations where the zeros have been replaced by other code; a program has been loaded there.

- 5) Move the boot code from \$C600 (slot 6) to \$9600.

9600 < C600.C6F7M

Only the part of the boot code responsible for loading track 0, sector 0 into \$0800 is transferred. The move command is halted just before the JMP to \$0801 (contained in the controller card) by indicating location \$C6F7, instead of the normal \$C6FF, which would have included the JMP command. Since the memory has been zeroed, the boot process is halted by a BRK instead of a JMP at location \$CF68, which occurs right after loading the sector. This results in the partial boot of step 7.

- 6) Insert the Pest Patrol disk.

- 7) Execute the partial boot.

9600G

After completing this last step of the beginning boot procedure, the computer will beep and display the message:

96FA- A=01 X=60 Y=00 P=31 S=F0

The disk drive will keep spinning, but that is to be expected because the program has been halted at an early stage, due to the partial boot. You must let it continue to spin while performing the boot code trace, but opening the drive door will prevent wear on the disk.

At this point, the boot process has been halted just before executing location \$0801 in memory, where the short boot program on track 0, sector 0 always is loaded.

This is the time to start the dirty work; examining the machine language code starting at \$0801 (\$0800 holds the total number of consecutive sectors to be read) to find out where the next stage of the boot process resides.

Searching the Machine Code

At first glance, the Pest Patrol machine code looked like a valid program. However, upon closer examination, I found many things that didn't look right. For example, statements such as these:

```
0809- 90 78      BCC $0883
080B- D0 01      BNE $080E
080D- AD 20 9C   LDA $9C20
0810- 08         PHP
0811- A0 3F      LDY #3F
```

Hidden Commands

I noticed the LDA \$9C20, followed by a PHP. I thought, why would anyone care what was in location \$9C20? This is what I call an irrational command.

Then I saw the preceding BNE, which branched to the middle of the LDA command (20), rather than to the beginning (AD). This tipped me that the BNE might always be taken (skipping the first byte in this manner). Sure enough, when the code was disassembled and the confusing byte at \$080D excluded, a hidden rational command was revealed at \$080E.

```
0809- 90 78      BCC $0883
080B- D0 01      BNE $080E

080E- 20 9C 08   JSR $089C
0811- A0 3F      LDY #3F
```

This made me dread looking at more code. What if I missed a hidden command? How long would it take to find them all? Well, it wasn't too long before I stumbled across this wondrous piece of machine language.

```
085E- 8C 0B AA   STY $AA0B
0861- 10 01      BPL $0864
0863- 4C 20 D8   JMP $D820
0866- B6 AD      LDX $AD,Y
0868- 08         PHP
0869- 03         ???
086A- F0 03      BEQ $086F
086C- D0 15      BNE $0883
```

The first thing I noticed was the ????. Whenever I see a ??? surrounded by what appears to be irrational code, I immediately think it could be a data table of some kind. But this one looked like it was right in the middle of rational code. Stepping backward, I saw JMP \$D820. This and the two following statements certainly looked fishy. Then I found it: a "branch on result plus" (BPL) to the second byte in the jump instruction (20).

This is what it looks like when the byte at \$0863 is eliminated.

```
085E- 8C 0B AA   STY $AA0B
0861- 10 01      BPL $0864

0864- 20 D8 B6   JSR $B6D8
0867- AD 08 03   LDA $0308
086A- F0 03      BEQ $086F
086C- D0 15      BNE $0883
```

Once again a hidden rational command was revealed, this one at \$0864.

Finding these wasn't easy, but it was worth the effort. The other byte inserted to confuse the issue was at \$086E (right after the preceding example). The best way to find these hidden commands is to look at the branches, and other flow-related commands in the program. Spotting these only becomes easier with practice.

There are also two 11-byte data tables starting at \$0881 and \$089A. Data tables are much easier to find because they are usually referenced by another part of the program. The only tricky part is trying to determine their lengths (this isn't as tricky as you might think).

Five Subroutines

After spending quite some time scrutinizing this mad program, I concluded that it was comprised of five subroutines. The backbone of the program is the subroutine starting at \$089C, which loads three sectors into memory starting at \$B500. Other subroutines include a translate-table builder at \$0817, a routine to get one byte of data from the disk starting at \$0872, and a reboot subroutine starting at \$0883. This second program has a somewhat obvious exit to \$B800 at \$086F. The next step was to alter the program to stop just short of exiting.

Stopping Before the Exit

To make the sector safe to execute, I typed

86F:00

I shut the drive door, crossed my fingers, and typed

801G

(It was very hard to type this with my fingers crossed.) The disk made a strange noise, and the computer responded with a beep and the message:

```
0871-      A=00 X=0B Y=FF P=33 S=EE
```

The boot process again was halted.

I then had a very large program in memory (many of the higher addresses no longer contained zeros), with an entry point of \$B800. This was the third boot program, which contained the language card check. The disk was still spinning, so I once again opened the drive door to prevent unnecessary wear and tear on my expensive Pest Patrol disk.

Yes, more code tracing was ahead!

I knew I was getting closer to having the entire Pest Patrol program in memory because the number of hidden commands steadily increased. There were too

many to list here, but if you're interested, you'll be able to find them.

Careful tracing of the program starting at \$B800 revealed that it decodes a lot of memory and moves it into its proper location. It then exits at \$B8A4 if you have a language card or \$B8A7 if everything is okay (it also clears the text screen). From \$B8A7, the program was supposed to go to \$B2E0, so I placed two more breaks by typing

B8A4:00

B8A7:00

I then executed the modified program with

B800G

The screen cleared and so did my mind. I didn't feel like tracing the code starting at \$B2E0, so I listed it until I found an exit. After a few screens, I found this:

```
B375- A9 B4      LDA #$B4
B377- 48          PHA
B378- A9 BD      LDA #$BD
B37A- 48          PHA
B37B- 4C 7A B4   JMP $B47A
B37E- 00          BRK
```

It looked like the programmer who wrote Pest Patrol wished to execute a subroutine at \$B47A, and then intended program execution to continue at location \$B4BE.

My hunch was correct, for when I shut the drive door and typed the following (after some funny disk noises followed by a beep) the disk drive stopped. This is what I typed:

B375:00

B2E0G

(wait for drive to stop)

B47AG

This was it. I knew that one of two things had happened: either I had the entire Pest Patrol program in memory or things were messed up pretty badly.

Then I remembered the code starting at location \$B4BE. Some quick listings revealed (among the hidden statements and other sneaky stuff) that this program did a large amount of memory manipulation. After making this discovery, I found the equivalent of a JMP to location \$0800 at \$B466. Trace this one for yourself. It's a nightmare!

Luckily, I found no access to the disk in this subroutine, which was a load off my mind. You only live once, was my only thought as I typed:

B466:00

B4BEG

Once again the monitor awaited my next command. This was the big moment. Was there going to be valid code at \$0800 or was there an error in my painful tracing? I typed:

800L

I was amazed at the absence of hidden commands. Instead, I found a little routine to set all the vectors at the end of page 3 to \$4000. This was followed by a number of STAs to consecutive locations, starting at \$0000. The program then JSRs to that location. This is followed by the usual strange stuff (messing around with pointers

and the like). Finally, after breaking the program in several places and examining various locations, I surmised that the main part of this program moves \$0900-\$8700 into \$4000-\$BE00. Then it jumps to location \$4003. If you wish to find this out for yourself, it is best to NOP both of the STA \$03F0,Y commands. Otherwise, the BRK vector, as well as the reset vector, will be overwritten.

I observed that an 800G at this stage would start Pest Patrol. Unfortunately, once executed, I couldn't escape from it. I decided to follow my notes from the beginning to the point where I typed 800G.

The Whole Thing

Assuming the disk controller is in slot 6, the following is a brief overview of my procedure.

1) Turn on your Apple (or Apple-compatible) without a disk in the drive.

2) Hit reset.

3) Enter the monitor.

CALL-151

4) Put zeros in all memory locations from \$0800 to \$BFFF, inclusive.

800:00

801 < 800.BFFF

5) Move the bootcode from \$C600 (slot 6) to \$9600.

9600 < C600.C6F7M

6) Insert the Pest Patrol disk in the drive.

7) Execute the partial boot.

9600G

Don't press reset to stop the spinning of the drive; let it turn as you complete the remainder of the procedure.

8) Type the following:

86F:00

801G

B8A4:00

B8A7:00

B800G

B375:00

B2E0G

B47AG

B466:00

B4BEG

After reviewing the preceding steps, I made two modifications.

9) Type

805:A9 00 8D

808:F2 03 A9 E0 8D F3 03 49

810:A5 8D F4 03 D0 0D

8DC:4C 00 40

These modifications enable reset to stop the program (you will be without DOS). They also relieve the program of its boring title page, which lasts about 20 seconds too long. In addition, they eliminate a little routine which performed some memory verification, printing "CHECKSUM ERROR" and making an awful noise if something was wrong.

All that was left, then, was saving this modified version. A few seconds of thought and I had it. I decided to boot with a 48K slave disk (saving page 8 first, of course). Then I would restore page 8 and BSAVE the file.

10) Save page 8 on page 96.

9600 < 800.8FFM

11) Insert a 48K slave disk WITH NO HELLO PROGRAM. Make sure this is a slave disk (using a master will wipe out the code).

12) Boot the disk.

C600G

13) Return to the monitor (if it doesn't work the first time, try again).

CALL-151

14) Move page 8 from page 96 back to its original location.

800 < 9600.96FFM

15) Insert the initialized diskette on which you wish to have the Pest Patrol back-up. (The game uses 131 sectors, so it should be a relatively empty one.)

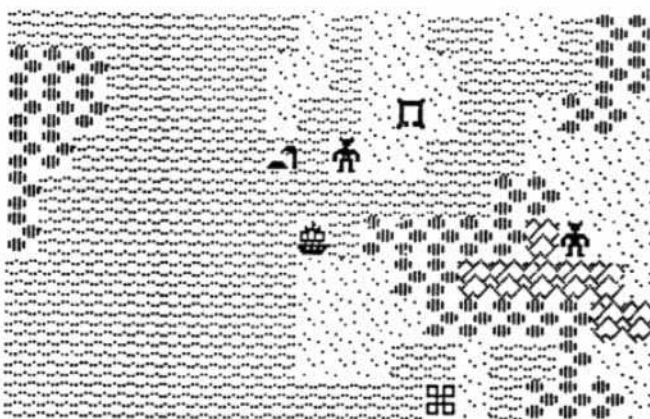
16) BSAVE the entire program (it takes about 42 seconds).

BSAVE PEST PATROL,AS800,LS7FFF

17) You now can BRUN Pest Patrol after booting normal DOS.

True Confession Time

To be honest with you, this was my first attempt at breaking a copy-protected disk. I found it to be much easier than I anticipated. The entire job took me only about 15 hours. I am sure the process will take less time as I become more experienced. For now, have fun with your back-up of Pest Patrol. I suggest storing the original Pest Patrol game and all of your other original disks in a dark, cool place.





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Important Notice: **COPY MASTER** has many uses. However, **THE COPYING ABILITIES OF COPY MASTER SHALL BE USED SOLELY FOR ARCHIVAL PURPOSES.** Any other copying use may be illegal.

ALGEBRA ONE & TWO (EW)
0-22

M O P PARAMETERS E

LE CHOMEUR (LOD)
0-23 10-96



QUICK FILE (UNK)
0-22

Copy II Plus

Central Point Software
P.O. Box 19730-203
Portland, OR 97219
(503) 244-5782
\$39.95

Our latest list of Copy II Plus parameters includes many new programs, as well as some new methods for old programs. Where a new method is described, any older methods also are presented so that if one doesn't work, the others may be tried.

Parameters on the list were submitted by users to Central Point Software and by **HARDCORE COMPUTIST** readers, so most have not been tested by our staff. Any corrections to the list would be appreciated.

When making a back-up, it is important to follow the steps in order. Often a parameter will not be relisted if it is set for a prior range of tracks.

To back-up a program, first examine the parameters listed below the title. If the word "step" is used, set the track increment to the value that follows. Use the default increment of 1 if no other figure is given.

When "sectmod" appears, a sector should be changed using the Track Sector-Editor. Be sure to patch the read/write routines if the listing shows "patched" and

to use the correct DOS. Place the destination disk in drive 1, then perform the changes listed.

The command format is:

SECTMOD = n, S = DOS 3.n PATCHED
CHANGE ADDRESS A1 FROM A2 TO A3

The meaning of each variable is explained below:

- S** Sector to be read.
- T** Track to be read.
- A1** Location to be changed in the buffer.
- A2** Old value.
- A3** New value.

Some disks can be duplicated using the default parameters (select the Bit Copy option from the main menu). If the disk you wish to back up is not listed, don't give up until you've tried the default settings.

The company name is abbreviated to the right of the program name. Refer to the "Abbreviations of Publishers" table to locate the name in full.

HARDCORE COMPUTIST encourages readers to send parameters for any program not on this list. We also welcome parameters for other copy programs, such as Nibbles Away and Back-it-Up. As you may know, Locksmith parameters have been especially hard to find.

Abbreviations of Publishers

AC Apple Computer	EW Eduware	SL Sub Logic
AG Avante Garde	HAL HAL	SOL Sierra On-Line
ARN Action-Research Northwest	HOWHowardsoft	SPC Software Publishing Corp.
ART ARTSCI	KL Krell	SPN Spinnaker Software
AVH Avalon Hill	KN Kensington	SPT Spectrum
BC Budgeco	LOD Logidisque	SRS Sirius Software
BS Broderbund Software	MF Micro Fun	SSI Strategic Simulations
CES CE Software	MIS Microsoft	SW Stoneware
CP California Pacific	ML Micro Lab	SY Synergistic Software
CTS Continental Software	MS Mind Systems	TKS Turnkey Software
DAT Data Transforms	MU Muse	UNK Unknown
DM Data Most	PEN Penguin Software	VCP Visicorp
DS Datasoft	QS Quality Software	VX Videx
EP Epyx	SEN Sensible Software	

PARAMETERS

A

A2-PB1 (PINBALL) -- (SL)
0 10=96
1-15 A=3, E=DB, F=AB, 10=BF,
44=1, 45=D, 46=F

ADDRESS BOOK (MS)
0-22 D=1, 10=96, 24=96

ADVANCED VISICALC FOR THE APPLE /// (AC)
Same as Visicalc ///.

ADVENTURE TO ATLANTIS (SY)
0-22 10=96, 24=96, 9=0, 31=0,
D=1

ALGEBRA ONE & TWO (EW)
0-22

ALIEN RAIN & TYPHOON (BS)
0-5 9=0, 31=0, D=D5, F=0
6-E E=DE

ALPHA BYTES (EW)
0-22 9=0

APPLE ADVENTURE (UNK)
0-22 D=1, 10=96, 24=96

APPLE BUSINESS GRAPHICS (AC)
0-22 D=1, 10=96, 24=96

APPLE LOGO (AC)
0-22
1 A=1, 4B=1, 50=1, E=FC,
19=FD, 1C=AA, 1F=EE

Alternative Method
0-22
1 A=1, 4B=1, 50=1, E=AA,
1C=AA

Alternative Method
0-22
1 A=1, 4B=1, 50=1, 3B=1,
4D=8

Alternative Method
2-22
0 D=1, 24=96, 10=96
1 A=1, 50=1, 4B=1, E=AA,
F=D6, 10=EE (ERROR 6 OKAY)

NOTE: We have been told that Apple Logo requires persistence! Keep trying track 1 until the disk works.

APPLE VISISCHEDULE /// (UNK)
Copy disk from main menu.

APPLEWRITER II AND //e (AC)
0-22 10=96

APPLEWRITER //E Alternate
0-22 D=1, 10=96, 24=96, 3F=1

APPLEWRITER II PRE-BOOT (VX)
0-22 10=96, 9=0

Alternative Method
0-23 10=96, 9=0, 3F=1

APPLEWRITER /// (AC)
0-22 D=1, 10=96, 24=96

APPOINTMENT HANDLER (UNK)
0-22

ARSENE LARCIN (LOD)
0-23 10=96

AZTEC (DM)
0-22 D=1, 10=96, 24=96

B-O

BAG OF TRICKS (QS)
0-15 0E=D6, 3E=2, 34=1 35=DF

BASIC FRANCAIS (LOD)
0-23 10=96

BEER RUN (SRS)
0 9=0
1.5-D.5 ... D=1, 3B=40

BEST OF MUSE (MU)
0-22

BILL BUDGE'S 3-D SYSTEM (CP)
0-8
11-12
15-17

BORG (SRS)
0 10=96, 9=0
1.5-B.5 ... D=1, 24=96, A=3, E=DD,
F=AD, 10=DA, 3B=40
D=20

Alternative Method
0 E=DD, F=AD, 10=DA, D=1,
22=00, 23=00, 24=00

C-DEX TRAINING PROGRAM (UNK)
0-22 E=D6, F=AB, 10=96, 1A=AB,
1D=AB, 20=AB

CANNONBALL BLITZ (SOL)
0-22 10=96
SECTMOD [T=17, S=0E] DOS 3.3
CHANGE ADDRESS CD FROM 49 TO 60

CARAIBES (LOD)
0-23 10=96

CEILING ZERO (TKS)
0-2
3-11 9=0, E=D6, 1C=D6, 34=1,
38=F9, 4F=1

CELLS (UNK)
0-22

LE CHOMEUR (LOD)
0-23 10=96

CHOPLIFTER (BS)
0 A=3, 44=1, 45=D, 9=0, 0=F,
50=3
1-8 A=FD, 31=0, 43=0, 45=10,
4F=1, 46=12
9 45=8, 46=D
A-B 45=2
C-1E.5 STEP .5 .. A5=8, 10=D4, 51=1,
D=1
20 45=6, D=0, 4F=0
See note for Seawolf.

COLOSSAL CAVE ADVENTURE (AC)
0-22

COMPUTER AMBUSH (SSI)
0-22 E=D4, 10=B7, 34=1, 37=6E,
38=FE

COMPUTER BASEBALL (SSI)
0-22 E=D4, 10=B7, 34=1

COMPUTER QUARTERBACK (SSI)
0-22 34=1, 37=6E, 3E=2, 9=0,
0E=D4, 10=B7

COMPUTER STOCKS & BONDS (AVH)
0-22

COUNTING BEE (EW)
0-22

CRANSTON MANOR (SOL)
0-22
18 3B=1, A=1, 4B=1, 4D=8,
50=1 (ERROR 6 OKAY)

CRISIS MOUNTAIN (SY)
0-22 10=96, 24=96, 9=0, 31=0,
D=1

CROSSFIRE (SOL)
0-B 9=0
1 3B=1, A=1, 4B=1, 4D=8,
50=1 (ERROR 6 OKAY)

DATESTONES OF RYN (EP)
0-22 A=3, 10=96

DAVID'S MIDNIGHT MAGIC (BS)
0 A=3, 44=1, 45=D, 9=0,
0=F, 50=3
1-A 44=0
B 44=1, 31=0, 43=0, 45=8
C-19 STEP.5 .. 10=F5, F=FD, 51=1,
4F=1, D=1
See note for Seawolf.

DB MASTER (OLD) -- (SW)
0-5 10=96, 24=96, D=1
6.5-22.5 .. D=0

DB MASTER UTILITY PAKS 1 & 2 (SW)
0-5 10=96, 24=96, D=1
6.5-22.5 .. D=0

DESKTOP PLAN II (VCP)
0-22 10=96, 34=1, 36=2A

Alternative Method
Same as Visifile.

DICTIONARY 2.1 (SOL)
COPY DISK FROM MAIN MENU
SECTMOD [T=8, S=F]
CHANGE ADDRESSES:
13 TO 4C
14 TO 24
15 TO 6E

DISK ORGANIZER (SEN)
0
1 3B=1, A=1, 4B=1, 4D=8,
50=1 (ERROR 6 OKAY)
2-4 D=1
A-B

E-L

ESCAPE (SL)
0-22

ESCAPE FROM ALCATRAZ (UNK)
0-22 10=96, 9=0, 31=0, 8=1

ESCAPE FROM RUNGISTAN (SRS)
0-2 10=96
3-22 10=F7

Alternative Method
0-21

EXECUTIVE SECRETARY (UNK)
0-22 9=0, 8=1, 10=96

Alternative Method
0-22 8=0, 10=96, 31=0, 9=0

EXPEDITOR (SOL)
0-22 10=96
3 & 1F 3B=1, A=1, 4B=1, 4D=8,
50=1 (ERROR 6 OKAY)

FACEMAKER (SPN)
FIRST: Use COPYA from DOS 3.3 system
master
THEN: Use COPY II Plus
0 34=01, 36=2A, 37=1B, 38=FC,
3E=02

FLIGHT SIMULATOR (SL)
0 10=96
1.5-21 STEP 1.5 .. E=DB, F=AB, 10=BF,
A=3, 4E=1
7-8
9.5

FORMAT II (KN)
COPY DISK FROM MAIN MENU.

FRAZZLE (MU)
0-22

GORGON (SRS)
0 10=96, 9=0
1.5-E.5 ... D=1, 24=96, A=3, E=DD,
F=AD, 10=DA, 3B=40

GRAPHTRIX (DAT)
0-22

GUADALCANAL CAMPAIGN (SSI)
0-22 E=D4, 10=B7, 34=1, 37=6E,
38=FE

HEART LAB (EW)
0-22

HI-RES COMPUTER GOLF (AG)
0-22 (both sides)

Alternative Method
0-22 19=DF, D=1, 34=1

HI-RES COMPUTER GOLF VERSION 2 (AG)
Copy both sides.
0-22 10=96

HI-RES SECRETS (AG)
0-22 10=96, 4=FB, 19=DF, 1F=DF,
A=1

Alternative Method
0-22

HYPERSPACE WARS (CTS)
0-22 9=0

INVENTORY OF EQUIP. (EW)
0-22

JAW BREAKER (SOL)
0-22 9=0
3 3B=1, A=1, 4B=1, 4D=8,
50=1 (ERROR 6 OKAY)

JIGSAW (ML)
0
1-17 D=1, 24=96, E=D3, F=96,
10=F2, 9=0, 31=0

Alternative Method
0 10=96, 9=0, 31=0
A-17 10=96, 9=0, 31=0
1-9 E=D3, F=96, 10=F2, 9=0,
31=0

KNIGHT OF DIAMONDS (SIR)
(Both Sides)
0-22 10=96, 24=96, D=1
Write-protect disk before using.

Alternative Method
Boot Side:
0-22 D=1, 10=96, 24=96, 34=01,
37=00

Be sure to write-protect side one.
Scenario Side:
0-22
0-9 D=1, 10=96, 24=96, 4B=1
(ERROR 6 OKAY)

KRELL LOGO (New) -- (KL)
0-22 10=96
SECTMOD [T=2, S=3]
CHANGE ADDRESSES:
5B FROM D0 TO EA
5C FROM 03 TO EA

Alternative Method
0-22

M-R

MAGIC WINDOW II (ART)
 0-23 (ERROR 2 ON TRACK 23 OKAY.
 TRY 3C=4 IF PROBLEMS.)

MAILING LIST (EW)
 0-22

MICROBE (UNK)
 0-22 10=96, 9=0, 31=0

Alternative Method
 0-22 10=96, 24=96, 9=0, 31=0,
 D=1

MINER 2049er (MF)
 0 4B=1, 10=96
 1-22 4B=0, E=D3, F=96, 10=F2,
 A=3, 9=0, 31=0, 8=1, D=1,
 24=96, 6=6

Alternative Method
 0 4B=1, 10=96
 1-3 E=D3, F=96, 10=F2, A=3,
 9=0, 31=0, 8=1, D=1,
 24=96, 6=6, 1C=96, 1D=D3,
 1E=E5, 19=D3

4-22 4B=0

MISSION: ESCAPE (CES)
 0-1D

MOUSKATTACK (SOL)
 0-22 10=96
 SECTMOD [T=18, S=03] DOS 3.3 PATCHED
 CHANGE ADDRESS B1 FROM 49 TO 60

MULTIPLAN (MIS)
 0-22 10=96

OLYMPIC DECATHLON (MIS)
 0-22 9=0

Alternative Method
 0-22

PARTS OF A MICROSCOPE (EW)
 0-22

PFS FILE & PFS REPORT (SPC)
 Copy Disk from main menu.
 Write protect copy!

PFS GRAPH //e (SPC)
 Same as PFS File & PFS Report

PHANTOMS FIVE (SRS)
 0 9=0
 2-1C 3A=0, 50=20

PRESIDENT ELECT (SSI)
 0-22 E=D4, 10=B7, 34=1

LE PROPIO (LOD)
 0-23 10=96

PULSAR II (SRS)
 0
 1C.5-1D.5 .. D=1
 2-C E=DD
 13-19
 1A.5-1B.5

QUICK FILE (UNK)
 0-22

RASTER BLASTER (Old & New) -- (BC)
 0 10=96
 5-11 STEP 4 .. D=1, 9=0, 31=0, A=2,
 E=AD, F=DE, 3B=40

6-12 STEP 4
 7.5-F.5 STEP 4
 1.5-3.5 STEP 2

READABILITY INDEX (EW)
 0-22

RESUCE AT RIGEL (EP)
 0-22 A=3, 10=96

S-T

SABOTAGE (SOL)
 0-22
 3 3B=1, A=1, 4B=1, 4D=8,
 50=1 (ERROR 6 OKAY)

SEAFOX (BS)
 0 A=3, 44=1, 45=D, 9=0, 0=F,
 50=3
 1-8 4=PD, 31=0, 43=0, 45=10,
 4F=1, 46=12
 9 45=8, 46=D
 A-B 45=2
 C-1E.5 step .5 45=8, 10=D4, 51=1,
 D=1
 20 45=6, D=0, 4F=0

NOTE: Seafox, Spider Raid, Choplifter,
 Serpentine, David's Midnight Magic, and
 Star Blazer use track arcing and are
 very sensitive to drive speed. If you
 have problems, try switching source and
 destination drives.

SERPENTINE (BS)
 Same as Seafox.

SNEAKERS (SRS)
 0 9=0, 10=96, 44=1, 45=10,
 D=1
 1.5-C.5 ... 44=0
 D.5

Alternative Method
 0 9=0, 10=96, 44=1, 45=10,
 D=1
 1.5-C.5 ... 44=0
 D.5 44=1

SOFTPORN ADVENTURE (SOL)
 0-22 9=0
 3 3B=1, A=1, 4B=1, 4D=8,
 50=1 (ERROR 6 OKAY)

SPACE EGGS (SRS)
 0 9=0
 2-6
 11-1A

SPY'S DEMISE (PEN)
 1-11 STEP 2 9=0, 10=96, E=D4
 0-12 STEP 2 6=4, 31=0 (ERROR 2 ON
 TRACK 12 OKAY)

Alternative Method
 0-10 STEP 2 .. 9=0, 10=96
 1-11 STEP 2 .. E=D4

STARBLASTER (BS)
 0 10=96, 9=0
 7-20 STEP 1.5 .. E=DF, F=AD, 10=DE

STARBLAZER (BS)
 Same as Seafox.

STATE OF THE ART ACCOUNTING (UNK)
 0-22 3C=4
 Write-protect copy!

SUPER GRAPHISME /// (LOD)
 0-23 10=96

SUPER PILOT (AC)
 0 10=96
 2-22
 SECTMOD [T=0, S=A] DOS 3.3 PATCHED
 CHANGE ADDRESSES:
 79 FROM 43 TO EA
 7A FROM 41 TO EA
 7B FROM C6 TO EA

Alternative Method
 0-22 10=96, 24=96, D=1
 (MAIN DISK ONLY)
 Use Copy Disk for lesson and Super
 Co-Pilot.

SUPER TAXMAN II (HAL)
 0-22
 Write protect copy!

continued on page 31

Version 4.0

The Ultimate APPLE® Utility Program COPY II PLUS

Now you can back up your protected software. Copy II Plus is the most sophisticated bit copy program available. It handles synchronized tracks, half tracks, nibble counting, bit insertion and other protection schemes. It also includes a comprehensive discussion of disk format and protection techniques, and instructions on how to back-up dozens of popular programs. A disk system and speed check assure your drives are running in top condition and a nibble editor will allow you to repair damaged diskettes, analyze protection schemes, etc.

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Copy and Catalog Ultima II

By Pat Tilsworth

Ultima II
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\$59.95

Requirements:

Ultima II, 3 disks
One disk drive
COPYA (on 3.3 System Master)
Sector editing program, such as DiskEdit
3 blank disks

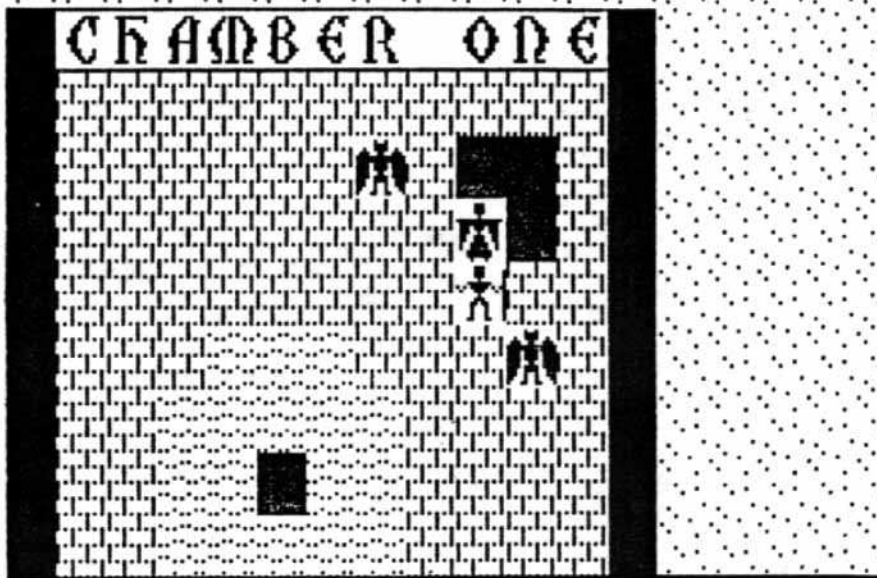
Ultima II, from Sierra On-Line, is the second of the three great fantasy adventures written by Lord British. Faster play, less disk flipping and greater length make this game a tremendous improvement over the first Ultima.

When trying to back-up Ultima II, the Program Master seemed to copy easily with COPYA. When booting the duplicate, however, I found that the HELLO program seemed to be checking for a nibble count.

This protection scheme relies on the slight difference in speed between the original copying drive and any other drive (i.e., yours). The unique number of nibbles copied at the original drive speed is stored on the Ultima II disk and accessed by the HELLO program when Ultima II is booted. When the HELLO program compares nibble counts, the count of the duplicate will always differ from the count the program requires to run, because the duplicate was copied at another speed.

Copying Ultima II

I wasn't about to nibble-count every track of the Player Master with a nibble copier, so I set off to unprotect it. The necessary modification was to prevent the HELLO program from checking for the nibble count. This Softkey also allows each Ultima II disk to be cataloged, enabling them to be used with the Ultima II Character Editor elsewhere in this issue.



- 1) Boot the 3.3 system master disk.
- 2) Run COPYA.
- 3) Copy all three disks of Ultima II with COPYA.
- 4) When finished, boot your disk editor. It will be used to modify each Ultima II disk.
- 5) Insert the copy of the Ultima II Program Master into your disk drive.
- 6) Read track \$11 (17 decimal), sector \$00.
- 7) Modify the bytes found at the following locations (the first byte of the sector is location 00). Change byte:
\$01 from \$FF to \$11
\$02 from \$FF to \$0F
This modification allows the disk to be cataloged by pointing to track \$11, sector \$0F.
- 8) Write the sector back to the disk.
- 9) Perform steps 6-8 on the copies of the Player Master and Galactic disks.
- 10) Place the copy of the Program Master into your drive.
- 11) Read track 3, sector C.
- 12) Modify the following values. Change Location:
\$84 from \$20 to \$EA
\$85 from \$E0 to \$EA
\$86 from \$72 to \$EA

This final modification prevents the HELLO program from performing the nibble-count check routine at \$72E0. (Location \$84 was a JSR to the nibble-count check.)

- 13) Write the sector back to the disk.

You now possess an unprotected version of Ultima II, and the Player Master can be cataloged for use with the Ultima II Character Generator. Files created under normal DOS 3.3 should not be saved to these disks, since DOS 3.3 does not know where the real Ultima VTOC exists. However, a program such as FID can be used to copy all the Ultima files onto normal 3.3 disks.

In addition, since the nibble count has been bypassed, the three unprotected Ultima disks will now boot when duplicated with any program which copies an entire disk.



Legacy of Lyligamyn Softkey

Roger Carlson
New Britain, CT

Requirements:

- 48K Apple with Applesoft in ROM
- One disk drive
- COPYA from the System Master disk
- A disk editing program
- One blank disk

- 1) Using COPYA, copy both sides of the disk.
- 2) Use your disk editing program on the boot side. On track 1A, sector D, byte AD, change 04 to 00.
- 3) Write-protect the boot side before running the copy. The only difference between the master scenario and the duplicate is the write-protect notch (the master is protected; the duplicate unprotected!).

IOB for 3 TSR Games

Richard B. Fabbre
Altus, OK

Requirements:

- 48K Apple with Applesoft in ROM
- Two disk drives
- One blank disk

[The following is a special IOB for the TSR games *Dawn Patrol*, *Dungeons*, and *Theseus and the Minotaur*. The program is self-prompting.

An IOB is a copy program used for disks which have been protected by either changing the address and data marks from track to track or by using standard DOS marks but changing the sector numbers. The program calls the RWTS (Read or Write a Track/Sector) directly and uses its own Input/Output Block (IOB). A copy is created by performing a sector-by-sector duplication of each track. See *HARDCORE COMPUTING #3*, old series, for more information.—Ed.]

TSR I.O.B. Program

```

2  REM *** IOB FOR TSR GAMES ***
3  REM
10 TEXT : HOME : LOMEM: 16385: GOSUB
   63000: GOTO 100
20 HOME : VTAB 12: HTAB 12: PRINT
   "TRACK "TK" SECTOR "ST: RETURN

30 HTAB 20 - ( LEN (A$) / 2): PRINT
   A$;: RETURN
40 HOME : VTAB 12: GOSUB 30: VTAB
   14:A$ = "PRESS ANY KEY TO CO
   NTINUE ": GOSUB 30: GET AN$:
   RETURN
50 POKE BUF,32: POKE CMD,CD: POKE
   TRK,TK: POKE SCT,ST: POKE DR
   V,DV: POKE VOL,VL: RETURN
60 READ D3
70 POKE 47356,D3: RETURN

```

```

80 FOR ST = 0 TO DOS: POKE SCT,S
   T: GOSUB 20: CALL IO: POKE B
   UF, PEEK (BUF) + 1: NEXT : RETURN

85 FOR S = 0 TO DOS * 2 STEP 2: POKE
   SCT,ST: GOSUB 20: CALL IO: POKE
   BUF, PEEK (BUF) + 1: NEXT : RETURN

90 POKE 47445,213: POKE 47455,17
   0: POKE 47466,150: POKE 4733
   5,213: POKE 47345,170: POKE
   47356,173: RETURN

100 A$ = "INSERT ORIGINAL DISK IN
   DRIVE 1. ": GOSUB 40

110 CD = RD:DV = 1: GOSUB 50: CALL
   IO

120 VL = PEEK (OVL):DV = 2:CD =
   IN: GOSUB 50

130 A$ = "INSERT BLANK DISK IN DR
   IVE 2. ": GOSUB 40: CALL IO:
   VL = 0

1000 FOR TK = 3 TO 34
1010 DV = 1:CD = RD: GOSUB 50: GOSUB
   60: GOSUB 80
1020 DV = 2:CD = WR: GOSUB 50: GOSUB
   90: GOSUB 80

1030 NEXT
62990 A$ = "COPY COMPLETED": GOSUB
   40: END
63000 FOR X = 768 TO 796: READ A
   : POKE X,A: NEXT

```

continued next page

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HC4

continued from page 19

Purchasing software from here is expensive and difficult. By the time one has paid international airmail postage, and perhaps very high customs duties, the cost can double. In this situation no one wants to rely on the supplier for a back-up copy.

Even if the back-up is available for a reasonable cost, which it often is not, that cost becomes unreasonable when postage and customs are taken into consideration. And if the original disk has to be returned, one could be without a very important program for two to three months!

I am not a pirate. I think that taking a copy of a program instead of buying it is stealing. Most of the arguments to justify pirating that I have seen are fallacious and self-serving.

But I do need back-up copies for my own programs. There is no one here to make them for me or to help me learn to do it myself.

Locksmith 4.1 no longer seems to be able to cope automatically with copy-

protection schemes. What's worse, Omega Microware publishes very few parameters. Try to find the parms for an educational program, for example, even though children are more likely to trash a disk than adults. And Omega's policy about hiding the parms for programs that provide replacement disks for under \$6.00 is useless here, for the reasons explained above.

So, one very important service that HARDCORE can provide for me is to publish the most extensive list of Locksmith parms possible, including those parms which Omega does not provide. Couldn't your more experienced readers help with this job? It could be a cumulative list which appears in every issue.

It seems that the ideal would be a series of articles explaining from scratch how copy-protection works and how to defeat it.

Philip R. Christensen
Nairobi, Kenya

We couldn't have said it better ourselves...

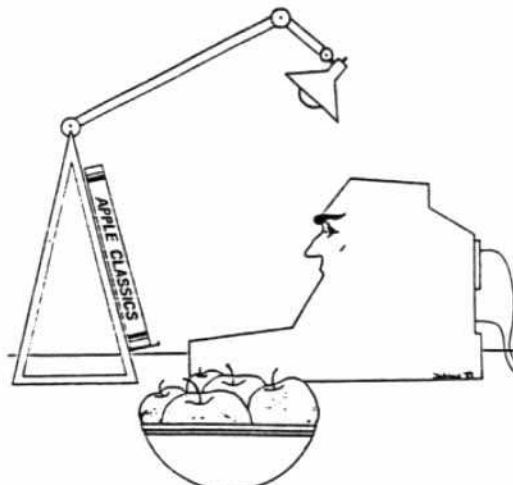
continued on page 31

TSR I.O.B. Checksums

2	-	\$9AC9
3	-	\$82BE
10	-	\$C38A
20	-	\$A02F
30	-	\$36EC
40	-	\$90AD
50	-	\$F44C
60	-	\$AC92
70	-	\$E44E
80	-	\$EB52
85	-	\$BFF5
90	-	\$345A
100	-	\$9630
110	-	\$286B
120	-	\$88F3
130	-	\$B688
1000	-	\$25F7
1010	-	\$8BDD
1020	-	\$7C8D
1030	-	\$C9DC
62990	-	\$CFE9
63000	-	\$7EB7
63010	-	\$F513
63020	-	\$139A
63030	-	\$5CFB
63035	-	\$B2B8
63040	-	\$EE04
63050	-	\$E26C

TSR I.O.B. Program

```
63010 DATA 169,3,160,8,32,217,3
,96,1,96,1,0,0,0,25,3,0,32,0
,0,1,0,0,96,1,0,1,239,216
63020 TK = ST = VL = CD = DV
63030 TRK = 780:SCT = 781:CMD = 7
88:RD = 1:WR = 2:SLT = 777:D
RV = 778:BUF = 785:ERR = 789
:VOL = 779:IO = 768:INIT = 4
:OVL = 790
63035 DOS = 15
63040 RETURN
63050 DATA 173,173,247,247,183
,247,183,245,245,247,183,247
,183,245,247,247,183,245,183
,247,183,245,247,247,245,245
,247,247,247,245,247,183
```



continued from page 27

SUPERSCRIBE II (UNK)
 0-22 10=96
 3 3B=1, A=1, 4D=8, 5D=1
 (ERROR 6 OKAY)
 1F 3B=1, A=1, 4D=8, 5D=1
 (ERROR 6 OKAY)

SWASHBUCKLER (DM)
 0-22
 SECTMOD [T=0, S=3] DOS 3.3 PATCHED
 CHANGE ADDRESS 42 FROM 38 TO 18

Alternative Method
 0-22 D=1, 10=96, 24=96

Alternative Method
 0-22

TAWALA'S LAST REDOUBT (BS)
 0-22 D=1

TAXMAN (HAL)
 0-22

Alternative Method
 0-B

Alternative Method
 0 10=96
 1-B 10=DA
 11-12 10=B5
 13 10=96

TAX PREPARER (HOW)
 Use Copy Disk from main menu

Alternative Method
 0-22

THRESHOLD (SOL)
 0-22
 1-23 STEP 22 .. 3B=1, A=1, 4B=1, 4D=8,
 50=1 (ERROR 6 OKAY)

TYPE ATTACK (SRS)
 0 10=96
 1-DE E=AD, F=DA, 10=DD, 24=96,
 A=3, D=1

TYPING TUTOR (MIS)
 Use Copy Disk from main menu.

U-2

U-BOAT COMMAND (SY)
 0-22 10=96, 9=0, 31=0, D=0,
 24=96, (Ignore Errors)

U-DRAW II (MU)
 0-22 D=1, 31=0

ULTIMA II (SOL)
 Use Copy Disk, then
 SECTMOD [T=3, S=0C]
 CHANGE ADDRESSES 84, 85, 86 ALL TO EA.

Alternative Method
 0-22 10=96, 9=0, 34=1, 31=0

Alternative Method
 0-23

VISICALC (VCP)
 0-16

VISICALC PRE-BOOT (VX)
 0-22 9=0, 10=96

Alternative Method
 0-23 10=96, 9=0, 3F=1

VISICALC FOR THE APPLE ///
 (Advanced) -- (VCP)
 0-22 10=96, 24=96, D=1

VISISCHEDULE /// (VCP)
 Copy disk from main menu.

VISIFILE (VCP)
 0-22 10=96, 34=1, 36=2A, 37=1
 3E=2

WARP FACTOR (SSI)
 0-22

Alternative Method
 0-22 E=DB, F=D5, 10=DE

Alternative Method
 0
 1-22 E=DB, F=D5, 10=DE, 8=1

Alternative Method
 0-22
 20 9=0
 Write protect back-up before using.

ZARDAX (ARN)
 0-22 D=1, 10=96, 24=96

ZAXXON (DS)
 1-12
 0 4B=1, 9=0 (ERRORS OKAY)
 13

Alternative Method
 0-13 4B=1, D=1, 10=96, 24=96

Alternative Method
 0-13 4B=1, 9=0, 10=96, 24=96,
 19=CC, 3C=1

Alternative Method
 1-12 10=96
 0 4B=1 (ERRORS OKAY)
 13



continued from page 30

To Hong Kong ...

As you are probably aware, piracy is rife both here and in Taiwan, but unfortunately these pirates are very reluctant to share their secrets with those of the fairer skin.

While they willingly copy software for you for \$7-\$10 (games) and \$15-\$20 (business), they will not reveal readily such niceties as parameter changes, etc. Since my substantive library also needs backups (albeit my "originals" are somewhat cheaper than most, but of course are without warranty), I applaud you in your efforts to rectify this situation.

David Haworth
 Hong Kong

David—We don't condone piracy of any disk, as most programs resulted from much toil and more than a little genius. However, we do sympathize with computerists who somehow mangle an expensive original disk, then must pay the original price—which is often tantamount to extortion—to replace it. We try to make it easier for serious Apple users to protect their investments.



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Hardcore Computist #3 Corrections

Reader's Softkey and Parameter Exchange, "Copy Tip for Sneakers," page 6.

Due to a production error, parts of the requirements list and first paragraph were not visible. They should read:

Requirements:

- 48K with Applesoft in ROM
- One disk drive
- Snapshot Card
- One blank disk

I used Snapshot to make a non-protected file of Sneakers. The problem is that during portions of the running game the disk is accessed via copy-protected data to verify the original disk's presence.

"Softkey for Bag of Tricks," page 8.

- 1) In the procedure for INIT, step 11 should be 13, and therefore should follow step 12.
- 2) In the HELLO program, a D\$ is omitted in line 50 (the last line). The line should read
PRINT D\$"BRUN TRAX, A\$800"
- 3) Again in the HELLO program, but in line 60, the Z\$ variable should be an A\$.

"Map Maker," page 26.

The Make Tables program needed revisions to run correctly. Here is the fixed version.

```
1 HOME
4 IF PEEK (103) < > 1 OR PEEK
  (104) < > 64 THEN POKE 163
  84,0: POKE 103,1: POKE 104,6
  4: PRINT CHR$(4)"RUN MAKE
  TABLES"
6 DEF FN MOD(A) = INT ((A / 8 -
  INT (A / 8)) * 8 + .05) * SGN
  (A / 8)
8 YL = 2306:YH = YL + 192
9 FOR Y = 0 TO 191
10 A = FN MOD(Y)
20 B = FN MOD(Y / 8)
30 C = INT (Y / 64)
40 YA = A * 1024 + B * 128 + C *
  40
50 POKE YH + Y,YA / 256
60 POKE YL + Y,YA - INT (YA / 2
  56) * 256
65 VTAB 12: HTAB 10: PRINT Y" "
70 NEXT
75 HOME
80 FOR Y = 0 TO 23: POKE 2250 +
  Y,Y * 8: VTAB 12: HTAB 10: PRINT
  Y" ": NEXT
85 YL = 2274:YH = YL + 16
```

```
90 FOR Y = 0 TO 15
95 IF Y > 7 THEN T = 12
100 A = INT ((Y * 32 + 2816) / 2
  56):B = (Y * 32 + 2816) - A *
  256
102 POKE YL + Y,B: POKE YH + Y,A
105 VTAB 12: HTAB 10: PRINT Y" "
110 NEXT
120 PRINT CHR$(4)"BSAVE TABLES
  ,A$8CA,L$1B8"
```

HARDCORE COMPUTIST would like to thank the readers who wrote and called to let us know about the bugs in issue 3.

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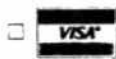
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#20 The Black Death

#21 The Quest for Marron

#22 The Senator's Chambers

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