ENHANCING YOUR APPLE II®
VOL. 1

BY DON LANCASTER

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VOLUME 1

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by Don Lancaster

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INTRODUCTION

If you use your Apple II personal computer often enough, long enough, and late enough, eventually your Apple may decide to reveal "IT" to you.

"IT" is a series of revelations on where we came from, where we are, and where we are heading. Most often, your Apple will reveal "IT" to you very early on some morning in your second or third year of Apple use.

The "IT" revelation is for real. Just ask anyone who has worked with an Apple long enough. The wry smile and knowing nod tells all.

If my Apple will forgive me, I'd like to reveal some of the present "IT" messages to you, for they say a lot . . .

- ♦ ♦ ♦ -

The Apple II is far and away the single most powerful tool **ever** put in the hands of many individuals on an uncontrolled and unregulated basis. The new personal freedoms and the potential opportunities that result from this are almost beyond belief. It's now a whole new ball game, a jump into hyperspace from where we are. The Apple II is far more significant and it will have a vastly greater impact than such short term frivolities as the automobile and television—and, possibly, even more than the printed word itself. Even time may eventually be measured as "BA" and "AA," split at that magic date in the spring of 1977.

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The Apple experience is absolutely and totally unique. There is no other product available anywhere, at any price, that adapts itself as easily, as well, and as conveniently to whole new worlds of strongly user-oriented applications. The unbridled potential of Apple's sixteen I/O sockets is utterly awesome.

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Future historians will recognize the Apple II as the DC-3 of the microcomputer revolution.

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There are several reasons for Apple's success. The first is simply being in the right place at the right time. The second is blind luck. But, the third and most important reason is that Apple has lacked "us-versus-them."

Apple has always treated its users like they were friends and not the enemy. They didn't seal the works up, or keep you out of the system monitor, or hide their documentation under an armadillo somewhere, or try to prevent you from doing easy add-ons, enhancements, or expansions. Apple didn't force software people to buy an expensive development system. Instead, the Apple II itself is its own superb development tool. There's no fancy modules or other restraints that keep anyone from getting into the Apple support business. In fact, the widest possible number of Apple hardware and software suppliers was encouraged from the start. And the "our engineering department not only knows best, but they are God" attitude of other manufacturers is simply not there with Apple.

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The garbage-to-good ratio of Apple software is skyrocketing. The quantity of truly astoundingly atrocious Apple software is now running at least a thousand times ahead of the useful and reasonable stuff. And, it's getting worse.

Garbage software fails to use the unique Apple resources to the utmost. This type of software may be as snotty as most of the dino stuff. It may use fancy packaging and/or expensive promotion to try and make up for sloppy and poorly thought-out coding. Garbage software is usually locked, so that the user cannot back up or modify the program to suit his own needs. It is usually slow and awkward to boot. Garbage software also usually demands oddball codings and disk formats that guarantee incompatibility with everything else.

Garbage software is caused by people who are greedy, sloppy, dumb, inexperienced, in a hurry, or all five. Garbage software is not user oriented. It is overpriced. It has miserable error recovery. It tries to solve some small specific problem, rather than being a generalistic tool that can handle a broad class of problems. Garbage software steals the ideas of others, but can only come up with a second-rate result at best. It attacks problems that not only do not need solving, but which shouldn't be solved at all with a computer.

Please, if you are going to write this sort of trash, go get yourself a different brand of personal computer. We don't need you and we definitely don't want you.

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Any attempt whatsoever at copy protection will hack off and inconvenience your legitimate users and it will dramatically increase the number of bootleg copies of your program in circulation. It will also price your program out of the market.

A user of software **demands** the absolute right to make backup copies of everything he buys, and **must** have the right to examine and modify all coding in that software so he can meet his own needs. These are mandates.

The big thing about copy protection is that it doesn't. A year's effort by a crackerjack military cryptography team can usually be undone in fifteen minutes, between klingon zappings, by your average fourteen-year-old. And, morality and economics aside, one fact stands out . . . .

Undoing copy protection is fun!

Not only is it fun, but cracking the uncopyable is about the most challenging and most rewarding thing that you can possibly do with your Apple. And, the things you learn along the way are exactly the skills that you will need to become a really great programmer. So, I guess we should all be thankful for the copy-protection people since they are giving us all this fascinating entertainment and superb training at an unbeatable price.

- ♦ ♦ ♦ -

Today's best and brightest Apple programmers are stumbling around in the dark. Proof of this is that a program with a *Peelings* rating of "AA" today barely earns a "B" next year, and drops to a "D" or unfit-for-use "F" the next.

Surely, by now, the message is in: it is absolutely impossible to write a great program in BASIC. Pascal, of course, is so bad that it is beyond the pale. Great programs **must** be written either wholly or in part in machine language so they can use Apple's resources to the utmost, at the fastest possible speed. Check *Softtalk's* top thirty. At this writing, thirty out of thirty are either written totally in machine language or make extensive use of machine-language sequences.

It's scary to think of what a really good programmer, who truly understands his Apple, will be able to do with this machine. It hasn't happened yet, but watch out. It is only a matter of time.

- ♦ ♦ ♦ -

We are only now beginning to find out about some secrets of the Apple that everybody should have known about way back in 1977. For instance, we know now that we can have many different fonts of upper- and lower-case characters without using special hardware. We know that we can easily do an 80-character line with zero additional hardware, and that lines above a hundred characters are possible. We know that it is easy to quadruple the HIRES virtual resolution of the Apple.

We know, of course, that there are hundreds of colors available either in HIRES (high resolution) or LORES (low resolution). We also know that we can mix and match HIRES, LORES, and text anyway that we like—anywhere on the screen. We know that we can do an exact, jitter-free, software lock to video timing for video wipes and precision light pens. Once again, these require no special hardware. And, of course, we know we can gently and legibly scroll the characters up the screen. We know that the early graphics mappings were much slower than necessary. And, we know our Apple can directly interface robotics and appliance controls—again, without special hardware.

The big question is: "How much **don't** we know that we should have known back in 1977?"

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This *Enhancing Your Apple II* ® series is intending to try and bring everybody up to 1977. We want to try and understand what we really have in the Apple II, and what its **real** capabilities and limits are.

Each enhancement is designed to show you something about some small corner of your Apple. While a typical enhancement will combine some simple new hardware with a machine-language driver or two, just about anything at all is likely to crop up. We have tried to mix simple and advanced enhancements together, so there will be something here for you, regardless of how much Apple experience and expertise you now have.

We also have "unbundled" everything for your convenience and cost savings. Each enhancement is in four pieces. The first part of an enhancement is the complete story and listings here in this volume. Secondly, there is a companion diskette you can order using one of the cards in the back of the book. This diskette includes copies of all the code used in this volume and more. Machine-language codings include full source documentation under both EDASM and the S-assembler while BASIC Programs include full documentation. Naturally, you are free to copy, adapt, and modify this standard DOS 3.3 diskette to your heart's content, so long as you do so only for your own use.

Thirdly, there is a parts kit you can order that includes everything you will need to make all of the hardware modifications involving all the enhancements in the entire book. Lastly, and most important, there is also a feedback card. This card is needed for your participation in some of the enhancements. It also registers your name for updates and corrections, and it "closes the loop" so we can offer the best possible Apple enhancements in future volumes.

Should you be interested, we will add an on-line update and bulletin board service to this feedback process. Let us know if you have a modem and want to participate.

Taking a quick look at this volume, we start out with a pair of simple *glompers* that anyone can build. These solve completely the video changeover-switch hassles that you might have when using an rf modulator. Enhancement 2 is a software *color killer.* A plug-in reversible hardware mod lets you eliminate all color fringes from black and white high resolution (HIRES) displays under software control. You can now combine color and black and white displays in the same program without any set adjustments.

The real heavy of this volume is Enhancement 3. Here we find a method for tearing apart someone else's machine-language program that is astonishingly fast and super easy. It may take you years to fully explore and fully comprehend the implications of this single enhancement.

Another heavy appears in Enhancement 4. We add a lone wire here to give you a way to exactly lock your programs to video timing. And, we mean exact. The locking is done jitter free, which opens up bunches of new applications, such as video wipes and precision hardware-free light pens.

Want to mix and match HIRES, LORES, and text anywhere on your Apple screen? This is trivially easy once you master Enhancement 5. We also see how to tap the hundreds of available LORES colors in this enhancement. A companion hardware mod called a *glitch stomper* appears as Enhancement 6. This one makes displays that switch modes on screen operate even better.

How about a *gentle scroll,* where the characters move smoothly up the screen rather than jumping up illegibly like they do now? This one's done in Enhancement 7. It's super smooth, and completely glitch free. The final enhancement in this volume shows us how to pick up hundreds of different HIRES background colors, and how to put them down seven times faster than you might think possible.

That's about it for Volume 1. But, we have some really great stuff on tap for future volumes. A sneak preview appears at the end of this volume. This series is open-ended. As long as there are new things to learn about your Apple® and new ways to do them, we will try and show you how to do them.

Oh, yes. Some legal beagle somewhere will probably get bent out of shape if I don't tell you that Apple is a registered trademark of some outfit in California whose name I don't recall just now, and that everything here is pretty much my own doing, and is done without Apple's knowledge or consent.

DON LANCASTER
Summer 1982

This book is dedicated to "IT"

Enhancement
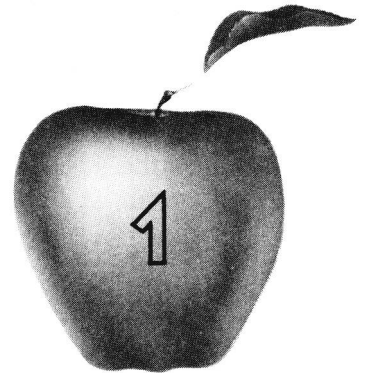
TWO GLOMPERS

Here's two different ways to eliminate the hassles caused by the changeover switches on rf modulators. One glomper is portable. The other is more or less permanent.

TWO GLOMPERS

Have you ever been infuriated by that #$%#& changeover switch on your Apple's rf modulator?

If you can find a flat place to stick it on the back of your tv, it's stuck there for good. If you can't, the switch quickly does a *Kamakazi* act, strangling itself on its own leads. And, this switch is very difficult and inconvenient to move from tv to tv.

This changeover switch is totally useless. It doesn't even do what it is intended to do, since you can easily leave a built-in antenna in place and radiate your video all over everywhere.

Here are two much saner antenna *glompers* that you can use instead. Either glomper version will quickly and easily fit any tv. They are cheap and simple enough that you can build lots of them.

Most rf modulators provide a phono plug input to the changeover switch. This phono plug fits a standard RCA phono jack. Both glompers start with an RCA phono jack and adapt it so that it is super easy to connect to your tv.

Our glomper of the first kind is shown in Fig 1-1. This one mounts a phono jack on a clothespin tv antenna connector. This style glomper is best when you are using your Apple on lots of different tv sets at different times, or if you want to quickly switch between sets.
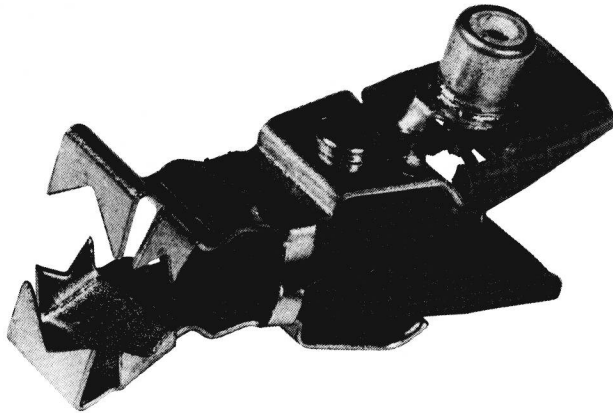
Glomper of the first kind is made from a phono jack and a clothespin connector. Use it if you often change or test different tv's.

Fig. 1-1.   A glomper of the first kind.

The glomper of the first kind is also very useful if you are buying a color tv and want to take your Apple to the store in order to compare lots of models to see which handles Apple video the best.

Here are the parts you will need for a glomper of the first kind . . . .

PARTS LIST FOR A GLOMPER OF THE FIRST KIND

( ) Clothespin-style tv
   antenna connector.

( ) RCA phono jack,
   vertical pc-mount style.

( ) No. 22 stranded
   hookup wire, insulated,
   2 inches long.

( ) Solder flux (optional).

( ) Short piece of
   electronic solder.

And here is how to build one . . . .

INSTRUCTIONS FOR BUILDING A GLOMPER OF THE FIRST KIND

1. Try to fit a RCA upright pc phono jack to the two holes in the clothespin antenna connector as shown. One hole is in the metal and one is in the plastic.

If the center connection of the phono jack interferes with the plastic handle, remove some of the plastic as shown. Use a knife, a file, or simply melt the plastic with a soldering iron as needed.

2. Strip 1/4 inch of insulation from both ends of a 2-inch-long piece of No. 22 stranded wire.

Solder one end of this wire to the center conductor of the phono jack. Make sure the phono plug fits after soldering.

3. Carefully and throughly clean both the phono jack and the clothespin connector at the point where they are to be soldered together. Add a drop of super-safe electronic solder flux if it is available.

Solder the phono jack to the antenna clothespin connector as shown. Use a soldering gun or a medium (100 watt) soldering iron.

4. Gently crimp the unsoldered ear of the phono jack against the plastic of the clothespin connector.

Be sure the jack has cooled before you do this.

5. Carefully clean the other side of the clothespin connector. Add a drop of super-safe solder flux if it is available.

Solder the free end of the stranded wire to this side of the clothespin connector.

6. Flex the clothespin a few times to be sure it works smoothly. Remove any remaining solder flux.

This completes your assembly.

7. To use your glomper, plug the pin plug on the rf modulator cable into the jack on the glomper, and clip the glomper on the proper antenna terminals.

ALWAYS REMOVE ALL OTHER OUTSIDE AND INTERNAL ANTENNA CONNECTIONS WHEN USING THIS GLOMPER!
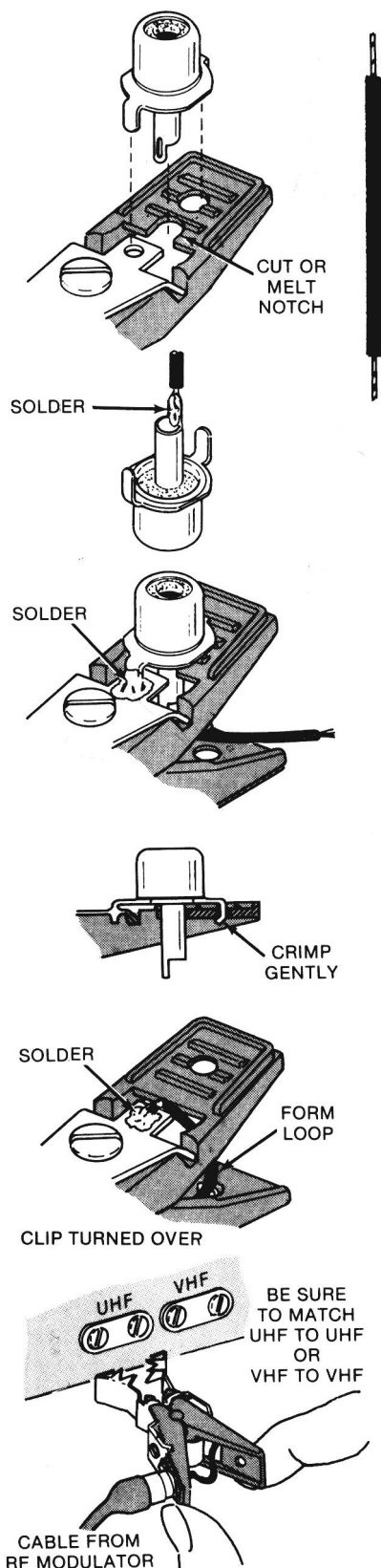
CUT OR MELT NOTCH

SOLDER

SOLDER

CRIMP GENTLY

SOLDER

FORM LOOP

CLIP TURNED OVER

UHF   VHF

BE SURE TO MATCH UHF TO UHF OR VHF TO VHF

CABLE FROM RF MODULATOR

Fig. 1-2. How to build a glomper of the first kind.

Using these tools . . . .

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┌─────────────────────────────────┐
│                                 │
│  TOOLS NEEDED TO BUILD          │
│  EITHER STYLE GLOMPER           │
│                                 │
├─────────────────────────────────┤
│                                 │
│  ( ) Needle nose pliers         │
│  ( ) Diagonal-cutting pliers    │
│  ( ) Wire stripper              │
│  ( ) Soldering gun or           │
│        medium soldering iron    │
│  ( ) Ink eraser or steel wool   │
│  ( ) Terminal crimper           │
│        (optional)               │
│  ( ) Small vise or clamp        │
│                                 │
└─────────────────────────────────┘
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Construction details are shown in Fig. 1-2. You mount the phono jack on the plastic handle of the clothespin connector. Be sure to use a stranded wire between the center of the phono jack and the other arm of the clothespin. Solid hookup wire will soon break if you flex it too often.

You will also want to carefully clean both the phono jack and the clothespin connector before soldering. This can be done with an ink eraser or steel wool. If you have some, a drop of "super-safe" electronic solder flux will make things much easier. *Do NOT use any other type of flux!*
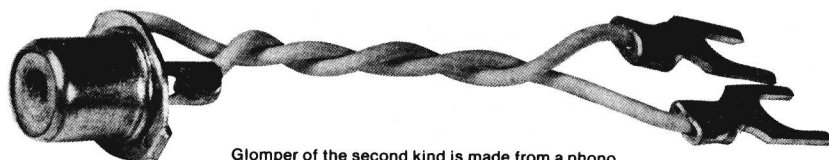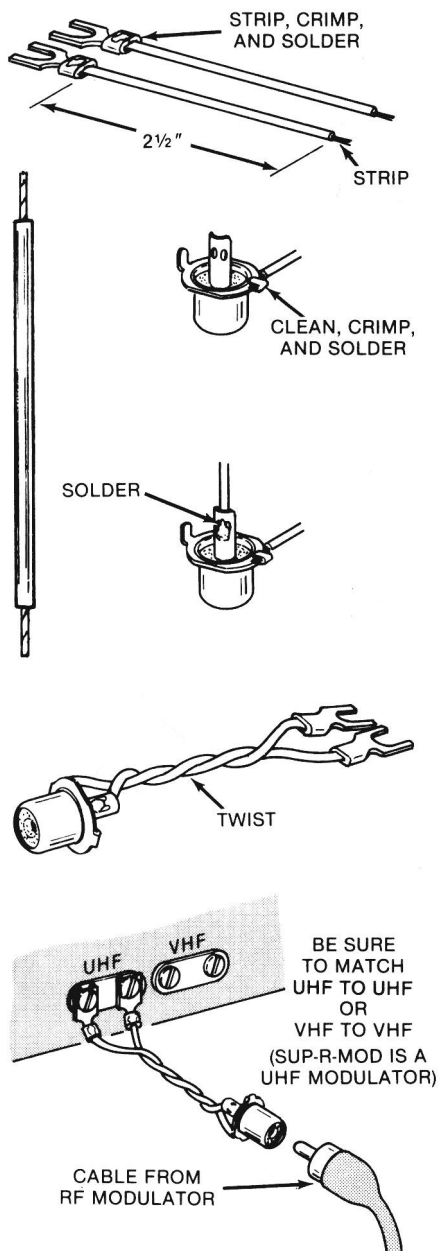

Glomper of the second kind is made from a phono jack and spade lugs. Use this glomper for more permanent connections.

Fig. 1-3.   A glomper of the second kind.

Our glomper of the second kind is shown in Fig. 1-3. This one is designed to be permanently connected to a tv. It is nothing but an RCA phono jack and two stranded wires ending in spade lugs. Here's the parts you will need . . . .

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┌─────────────────────────────────────────────┐
│                                             │
│            PARTS LIST FOR A                 │
│         GLOMPER OF THE SECOND               │
│                 KIND                        │
│                                             │
├─────────────────────────────────────────────┤
│  ( ) RCA phono jack,      ( ) No. 22 stranded│
│        vertical pc-mount style.   hookup wire, insulated, │
│  ( ) Crimp-on spade lugs (2       5 inches long. │
│        needed).                             │
│                            ( ) Short piece of │
│  ( ) Solder flux (optional).    electronic solder. │
│                                             │
└─────────────────────────────────────────────┘
```

STRIP, CRIMP, AND SOLDER

2½"

STRIP

CLEAN, CRIMP, AND SOLDER

SOLDER

TWIST

UHF   VHF

BE SURE TO MATCH UHF TO UHF OR VHF TO VHF (SUP-R-MOD IS A UHF MODULATOR)

CABLE FROM RF MODULATOR

INSTRUCTIONS FOR BUILDING A GLOMPER OF THE SECOND KIND

1. Cut two pieces of No. 22 stranded hookup wire 2½ inches long and strip ¼ inch of insulation from each end.

Crimp and then solder one spade lug to one end of each wire.

2. Carefully polish the inside of one leg of an upright pc phono jack. Then roll this leg over onto the free end of one of the wires.

Add a drop of super-safe solder flux if available and solder wire to jack as shown.

3. Solder the free end of the remaining wire to the center conductor of the phono jack.

4. Carefully inspect the wiring to be sure there is no short between the outside and the inside of the phono jack.

You might like to bend the remaining leg of the phono jack inward for better appearance.

5. Twist the two leads together four or five times and arrange the lugs as shown.

This completes your assembly.

6. To use your glomper, connect the spade lugs to the tv's antenna terminals. Plug the pin plug on the rf modulator cable into the jack on the glomper.

ALWAYS REMOVE ALL OTHER OUTSIDE AND INTERNAL ANTENNA CONNECTIONS WHEN USING THIS GLOMPER!

Fig. 1-4. How to build a glomper of the second kind.

Complete construction details are shown in Fig. 1-4. Again, be sure to use stranded wire, carefully clean before soldering, and use a drop of ''super-safe'' flux, if you have it available.

If you have several of your own tv sets in use, put a glomper of the second kind on each one.

Be sure to connect the output of a uhf rf modulator (such as the SUP-R-MOD) to the uhf antenna terminals, or the output of a vhf modulator (some others) to the vhf antenna terminals.

Note also that there are two RCA jacks on the SUP-R-MOD. The one you want goes down into the rectangular shielded box. The other one is not normally used and does *not* output any rf signal. It pays to label these two jacks ''RF OUT'' and ''VIDEO THRU'' by writing on the inside wall of your Apple with a *Sharpie* or similar heavy pen.

Regardless of which style glomper you use, please obey this rule . . . .

> **DO NOT EVER CONNECT THE RF OUTPUT OF AN APPLE SYSTEM TO A BUILT-IN ANTENNA, AN OUTDOOR ANTENNA, OR A CABLE TV LINE.**

If you are using both an outside antenna and a glomper, you should put the outside antenna line on a clothespin connector as well. If you have cable service, always unscrew the cable connector before using your Apple.

A glomper of either style *must* be used with an rf modulator. Just because the Apple's baseband video output jack is also a phono jack, don't expect any useful results if you try to feed raw video into the antenna terminals of a tv set. While you might actually get something on the low channels if you try this, in no way will the display be stable or useful.

There is one other minor use for your glompers. Many of the music synthesizer cards output via a phono jack but can directly drive a speaker. If your speaker enclosure has a pair of screw terminals on the back, just use either style glomper to get from the music card to the speaker

> **A complete set of all parts needed to build two glompers of each style is included in the companion parts kit to this volume.**