

THE MISOSYS QUARTERLY

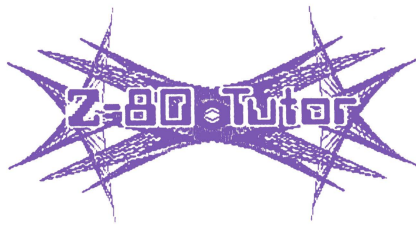
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- ☞ 300 Dots on the TRS-80, by Gary W. Shanafelt
- ☞ Tandy 16/6000 Hard disk drives, by Frank Durda, IV
- ☞ NXWAM - A PRO-WAM Application, by Danny C. Mullen
- ☞ A review of M.A.D.'s XROM, by Fred Oberding

☞ and **MIDI your TRS-80,**
by Gary Lee Phillips



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January 2nd**



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THE MISOSYS QUARTERLY

subscription rate information

Each issue of TMQ has information on MISOSYS products, programs and utilities, patches, significant messages from our CompuServe forum, and articles on programming. Not only that, TMQ will keep you up to date with information, news, and announcements concerning our entire product line and related machine environments. Subscription cost varies by rate zone as follows:

A = \$25; United States via 3rd class bulk mail
 B = \$30; Canada, Mexico, via 1st Class
 C = \$32; Colombia, Venezuela, Central America via AO Air
 D = \$35; South America, Europe, & North Africa via AO Air
 E = \$40; Asia, Australia, Africa, Middle East via AO Air

TMQ Toolbox

The MISOSYS Quarterly is published using the following facilities:

The hardware used for development of the "camera ready" copy consists of an AST Premium/386 computer (20 MHz) equipped with 5 Megabytes of RAM, a Seagate ST4096 80-Megabyte hard drive, a Colorado Memory Systems DJ10 tape backup device, a NEC Multisync II color monitor driven by a Video Seven VGA card, an AST TurboScan scanner (Microtek MS300), and a NEC LC-890 PostScript laser printer.

Text is developed, edited, spell-checked, and draft formatted using Microsoft WORD Version 5.0; Submissions on paper and letters are scanned and converted to text using Read-Right optical character recognition software by OCR Systems. Final page composition is developed using PageMaker 3.0 by Aldus. Cover art and clip art comes from CLIPPER, a product of Dynamic Graphics.

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Points to Ponder

Starving Jon A. Shirley: You remember Shirley, the former head of Tandy's computer department you was hired by Bill Gates to be the head of Microsoft. Well Jon recently retired after directing Microsoft to become one of the biggest players in the software market. Heads of corporations usually are provided the kinds of benefits, like stock options, that mere mortals such as you or I pay for with our product purchases. Seems like Shirley recently exercised a stock option to purchase 439,378 shares of Microsoft common at \$1.38 each; you read that right, one dollar and thirty eight cents. Since Microsoft stock sells in the neighborhood of \$60-70 per share, Jon just realized a paper windfall of over \$25 million smackeroos. Not baaaaad! That's a lot of copies of WINDOWS 3.0 needed to pay for that.

Credit Card Orders: Just a reminder to anyone submitting an order using a credit card, I need the expiration date! Also, don't forget to include all of the digits: MasterCard account numbers are 16-digits in four groups of four; the last four digits are usually in the position of the hologram and sometimes hard to see, but they're there. VISA account numbers are either four groups of four or one group of four followed by three groups of three. Errors in account numbers usually delay your order. Also, please include a daytime telephone number (that's daytime referenced to Eastern Time). Phone numbers are absolutely essential for foreign hard drive orders.

Tandy Software Products: There was an old adage that said, "no news is good news". Right now I'm not sure if that applies. Tandy *appears* to be getting no closer to a distribution procedure for the "discontinued" software for which they own rights than they were a few months back. So if they get their act together one day, you all may get some news. For now, it's just sit and wait...

Metric update: In *TMQ* issue IV.ii's "Points to Ponder" column, I predicted that by the turn of the century, "Americans will be buying our gasoline measured in liters (or half liters) - assuming we still have any of the stuff left!" With the

Persian Gulf hot spots these days, that statement rings an element of truth. But I'm here to re-iterate the concept of metric measurements. According to an article in the August 20th issue of *Electronic Engineering Times*, "Jedec's JC-11 committee said that, starting in 1992, all new IC packages must be in metric measurements." In other developments, "Futurebus, an emerging board specification supported by system makers, shifted to hard metrics last spring. And the Defense Electronics Supply Center, which buys parts for all military branches, is making its cautious move toward the metric system." In the case of electronics, it means the coming of the end of the 0.1 inch spacing common on all sorts of connectors and IC leads, and the introduction of 0.5mm spacing. According to the article, companies are beginning to lose international sales because the American components are not metric. I recollect reading not too long ago that General Electric lost a large contract for washing machines with Saudi Arabia because the AC power cords were six feet long instead of two meters - that's about six inches too short. About a year ago I tried to find some printed circuit board standoffs using a metric thread; totally nonexistent here in the States. Wake up America, say goodbye to inches, feet, yards, quarts, gallons, tons, and slugs.

Winter vacation reminder

MISOSYS closes up between Christmas and New Year's. That means this year, we will be closed from Saturday December 22nd until Wednesday January 2nd, 1991. Boy the year sure goes by fast when you're having fun!

TMQ Schedule

Our target for mailing the *THE MISOSYS QUARTERLY* is the last week of the respective month as follows: Spring issue in February, Summer issue in May, Fall is-

The Blurb by Roy Soltoff

sue in August, and Winter issue in November. Due to the lateness of the last issue, this issue is not on target, but it was mailed less than three months since the last mailing! Also, because over 400 readers had expired subscriptions, I had to wait a bit before sending this issue to my printer. I typically order only a few hundred more copies than I need for mailing; were I to specify my printing quantity right now, perhaps a hundred or so folks who renew late would not get the issue.

Note that your mailing label usually has the expiration date of your subscription. For instance, **those with "90/11" complete their subscription with this issue.** If you want to save me the cost of mailing a renewal notice, send in your renewal fee quickly. I usually wait about a month after *TMQ* is mailed before sending out renewal notices. It is best to just extend your 90/11 subscription for **three additional issues** for three-fourths of the normal price: A=\$18.75; B=\$22.50; D=\$26.25; E=\$30. That will adjust your expiration date to 91/08, good through issue V.iv.

As I write this sentence, it's Thursday the 6th of September. This issue will be off to the printers early next week. If all goes as it should, you should start seeing it in your mailboxes in late September or early October. That's not bad!

TMQ advertising

If you are interested in reaching a **dedicated** TRS-80 audience, consider *THE MISOSYS QUARTERLY*. If you have a TRS-80 Model III or 4 related product to sell, you can reach these buyers by placing your advertisement in our publication. *TMQ* is read world-wide. Our subscribers are predominantly in the United States; however, we do have a significant number in Canada, Europe, and Australia.

Current space rates are as follows:

Full page	\$125
Half page	\$75
Quarter page	\$50
Ninth page	\$20

I compose the ninth-page ad layout so you have no artwork charge. Just submit your text. We accept only black & white ads; however, ads for our inside covers are printed in the same color as the cover (TMQ alternates between PMS colors: green 354, purple 266, blue 293, and red 199). If you would like to place your ad in *THE MISOSYS QUARTERLY*, give me a call.

PD Software Librarian

Vic McClung has volunteered to be the librarian for the collection of TRS-80 public domain diskettes. Henceforth all requests and contributions be directed directly to him at:

Vic McClung
914 Crescent
Sikeston, MO 63801
USA

Note that if you upload a "public domain" file to our CompuServe forum [PCS-49], and want it to receive general distribution, please also mail a copy on disk to Vic. There is no legal provision for downloading files from Compuserve and re-distributing them, unless you were the uploader. Some of our readers who do not have access to our forum have an interest in those submissions. So if you want to help out the most numbers of fellow users, don't limit your submissions to just one source.

Correction

In a previous issue, I apparently provided an incorrect telephone number for Guy Omer's bulletin board. The correct number is 904-377-1200. Guy has megabytes of public domain files on that board lo-

cated in Gainesville Florida. Give it a try.

MISOSYS Forum

In case you have been off the planet for some time now and just returned, don't forget that MISOSYS sponsors a forum on CompuServe. You can reach many "experts" on TRS-80 and MS-DOS subjects by dialing in. The forum is reached via GO PCS49, or GO LDOS. The forum name is the LDOS/TRSDOS 6 forum. MISOSYS took it over from Logical Systems over five years ago. If you have any questions concerning access, get on and leave a message to SYSOP. Joe Kyle-DiPietropaolo will get to you. Please don't call me here at MISOSYS because I cannot answer any questions as to its operation.

The forum contains a great deal of programs which you can download, as well as enter into the lively discussions which thread through the message system. If you do programming on a PC, the forum also contains the listings from *Programmer's Journal*. If you want to direct a message to me, my user ID is 70140,310. Post a message in private if you don't want it "broadcast"; some folks even send me orders via a PRIVATE message.

DISK NOTES 5.1

Each issue of *THE MISOSYS QUARTERLY* usually contains program listings, patch listings, and other references to files we have placed onto a disk. DISK NOTES 5.5 corresponds to this issue of TMQ. If you want to obtain all of the patches and all of the listings, you may conveniently purchase a copy DISK NOTES is priced at \$10 Plus S&H. The S&H charges are \$2 for US, Canada, and Mexico, \$3 elsewhere.

Out of print TMQ's available

For out of print issues, we are providing back issues of *THE MISOSYS QUARTERLY* via copier reprint. The price is \$12.50 plus \$2.75 S&H in the U.S. and CANADA. For foreign zone D, the S&H rate is \$5.50; zone E is \$6.50. The price for regular back issues still in print is \$10 + S&H. We are currently out of print on all issues of Volume I and Volume II. **Special deal now in effect for either all four issues of Volume III, or all four issues of Volume IV: just \$24 per set + S&H \$5 (US), \$6 (CAN), \$14) ZoneD, \$20 (ZoneE).** Here's a synopsis of past issues:

Volume I See the index in issue III.i.

Volume II See the index in issue III.iii.

III.i Reading NEWDOS/80 disks; An LB archival utility; Popup Application Window; XMODEM in C; Getting into computer math, part I; TMQ Volume I index.

III.ii Getting into computer math Part2; Writing interactive RATFOR/FORTRAN programs; PRO-EnhComp: a review; Desktop publishing and the Model 4; A better TERM/APP; adding floppy drives; and a new XLR8er interface.

III.iii The CRC program; PG: a page display program; Locating high memory routines; FIXMA3; Jumbo tape backup for PC clones; New style for TMQ using Pagemaker; and an Index to Volume II.

III.iv Checking for a file from Model 4 BASIC; Surviving the Hard Disk crash; An "interview" with Niklaus Wirth; Keep your printer clean and oiled; On-line HELP with PRO-WAM; MISOSYS announces availability of Hard Drives; Logic in the C language.

IV.i Cataloging files with a word processor; Page display PRO-WAM application; File undating with FUNDAT; Array load routine for BASIC; XLR8er and the GT-180 graphics board.

IV.ii Printing from BASIC without cutting words; LOAD100 for Model 100; Generating date/time stamp; Favorite recipes; Some BASIC routines.

IV.iii Fast in-memory sort using XLR8er RAM; Using XLR8er RAM as graphics video RAM; Upgrade your 4P with external floppy drives; Doubling of files solved; SuperScripts document file format; FELSWOOP PRO-WAM export utility.

IV.iv Five Twelve K: A better way; Multi-Command; Touch/ccc; Fixes for LS-DOS 6.3.1; DoubleDuty Version 2.6.0 released.

XLR8er boards in short supply

I am down to my last twenty-three XLR8er boards as of this writing (September 6th). I also have only two replacement shields which are needed to install a board in a 26-1069 (non-gate array) Model 4. Folks with a gate array model 4 (26-1069A or 26-1070 4D) can install an XLR8er board using the "graphics card" method which is behind the motherboard. Since we need to archive a few boards for warranty replacement purposes, if you want to purchase a board, now is the time to do it.

Product News

IIT Math Coprocessors

For you folks who follow the MS-DOS world, you must have learned by now that Intel is not the only company which makes math coprocessors for the 80x86 processors. One of the hot alternate silicon houses is Integrated Information Technologies, Inc. IIT provides CMOS coprocessors compatible with Intel's coprocessor instruction set; these processors use less power - great for lap-top application, execute faster, support 4 x 4 matrix transformation, have thirty-two 80-bit numeric registers, come with a factory 5-year

warranty, and cost less! My 386-20 AST now sports an IT-3C87-20. If you use your MS-DOS machine for numeric work (spreadsheets, desktop publishing, CAD, etc.) and don't have a coprocessor installed, consider an IIT coprocessor from MISOSYS. Here's the skinny on pricing:

•••••	•
•IT-2C87-100	10 MHz AT \$237 •
•IT-2C87-125	12.5 MHz AT \$289 •
•IT-2C87-200	20 MHz AT \$307 •
•IT-3C87-20	20 MHz 386 \$349 •
•IT-3C87-25	25 MHz 386 \$447 •
•IT-3C87-33	33 MHz 386 \$545 •
•IT-3C87SX-16	16 MHz SX \$354 •
•IT-3C87SX-20	20 MHz SX \$385 •
•••••	•

2C87 parts are for AT-class machines using an 80286 processor; 3C87 parts are for 386 machines using an 80386 processor; 3C87SX parts are for machines using an 80386SX processor. S&H is \$5 in U.S. If you want genuine Intel coprocessors, I can obtain them for about 30% more. But why pay more for less?

LSI Binders

I've been cleaning out the MISOSYS warehouse - to make room for some other stuff - and came across three boxes of LSI 1" 3-ring binders. These are the two tone (beige on the inside, brown on the outside) slant D-ring which have an inside pocket and a plastic spine which accepts a "spine card" label. The front and rear cover are imprinted with the Logical Systems logo. Here's your chance to grab a bit of nostalgia for a modest outlay. I'm able to put three of these binders in a standard binder shipping box; a box of three are priced at \$10 - which includes UPS ground shipping. Sorry but due to weight limitations, these will be offered for sale only within the continental 48 states where UPS offers ground transportation. There are only 96 binders total; thus, at three per order, I have stock to supply only 32 orders. It's first come first served. For even more nostalgia, I have one dozen Galactic Software 3-ring binders. These are the thick-padded yellow covered binders with Galactic Software's logo. Those of you old-timers may remember Galactic as predating Logical Systems; it was one of the first companies

in the TRS-80 software business back in the 1977/78 time frame. Same offer: \$10 for three to four lucky folks!

Plastic disk holders

I was cleaning out the MISOSYS warehouse recently, and came upon about ten boxes of the dual-floppy plastic diskette holders for 3-ring binders which Logical Systems used with the old LDOS binders. They either get tossed, or you can purchase twenty for \$5 delivered to the Continental U.S. Need more? You can have 50 holders for \$7.50 delivered.

Ribbon Cable Assemblies

MISOSYS uses a Cirris Systems cable tester for testing custom manufactured ribbon cables. This interesting piece of equipment performs a 100% test for shorts and opens on cables. It handles many different kinds of connectors based on switchable test assemblies.

I have acquired an assortment of test assemblies to support the kinds of connectors typically associated with the TRS-80 microcomputer. Thus, I'm custom fabricating low-volumes of cables according to your specifications, as well as providing standard replacement cables for your needs. These are all using unshielded ribbon cable. I can provide cables using DB-25 M/F, 20-pin header; 34-pin edgcard M/F, 36-pin printer, 50-pin edgcard F, 50-pin SCSI M/F, 34-pin Header M/F, as well as DB9 Male.

Need a replacement RS232 or printer cable? Probably about \$10-\$20 depending on the connectors used. This includes such things as replacement FDC-Floppy cables @ \$15 for all TRS-80 Model 4's (4, 4D, 4P); printer cables @ \$15 for Model III/4 or II/12/16/6000; RSHD primary-secondary interconnect cables @ \$15/set; RSHD host cable @ \$15.

Kel-AM 34-pin male edgcard @ \$8
Kel-Am 34-pin female edgcard @ \$5

Letters to the Editor

Model II/12 hard disk

Fm Mike Djirdjirian [CIS 71036,1044]:

I recently obtained an 8 Meg hard disk drive [26-4150] for a TRS-80 model 2/12 computer at a local Hamfest. From the outside, the drive has a 50 pin I/O connector (similar to the one for the model 1/3/4). Connecting the hard disk to my Model 4 causes it to 'crash'. From what I can see, the I/O pins are not compatible between the two units.

Can someone supply me with the I/O pin outs and their functions for the model 2/12 computer? Can anyone supply me with any information regarding the modification of this unit?

Fm Bernie Skoch: Mike, There are many here wiser than I, but I am unaware of any way to modify the 8" Tandy hard drive to run with the Model I/3/4 systems. I have one running on a Model 12, but I haven't been able to get it going on a I/3/4. You might ziggy over to TRS80PRO forum and ask your question there. Both Bob Snapp and Dave Campbell who frequent our forum have extensive 2/12/16 experience.

Fm Roy Soltoff/MISOSYS, Inc: I believe the HDC within the 8-Meg box is fixed at 512-byte sector format. The bus interface is also different.

The 8 Megabyte HD was the first Tandy introduced to the Model II; in fact, it was the first introduced to any of their "TRS-80" computers. But it was designed with the Model II bus in mind. When they introduced the 5 Megabyte drive for the Model III (and I), the controller was designed to work directly with the Model III bus; the "host adaptor" was built onto the controller board.

Tandy subsequently designed a "bus adaptor" board for the Model II card cage which provided a 50-pin edgcard connector which was bus compatible with the Model III. Using that adaptor card, any Model III Radio Shack hard drive could plug into the Model II; but the 8 megabyte could only be used in the Model II (and 12,...) without the adaptor card.

It is interesting to note that a Model II/12/16/6000 equipped with that adaptor card could then accept any peripheral which could be plugged into a Model III or 4. More information on this subject matter may be found in Frank Durda's article entitled "Hard Disk Drives and your Tandy 16/6000 Computer System" [in this issue].

Model II/12 LS-DOS 6.3.1

Fm Lamar Owen, Rosman NC: Roy, I have a couple of suggestions on the improvement of LS-DOS 6.3.1 on the model 12. First, is there a patch I can apply to change the BREAK keystroke to something different? I have 2 hard disks connected to it, one for Xenix and one for LS-DOS. I normally want to boot from the Xenix HD. However, when I boot from floppy I have to press and hold REPEAT-BREAK. This, of course, disables both AUTO and SYSGEN. Thus, I have to type in the configuration commands each time I boot. I want to be able to boot the floppy and switch to the HD like the model 4 does.

Next, each time a floppy disk is accessed on the 12, a long pause occurs. I assume this is @CKDRV reading the BOOT record. However, on a system disk, the BOOT track is single density. Thus, the driver has to switch density.

My suggestion is to just record the BOOT SECTOR in single density, then duplicate it and have the rest of the track in double density. There should be enough room on the boot track to do this. Xenix formats 32 256 byte sectors per track, I believe. Either that or formats 16 512 byte sectors per track. Anyway, under Xenix a double sided 8 will hold 1.25 Meg, whereas under LS-DOS it will hold a little over 1 meg. If sector 0 is recorded twice, there is no problem, as long as it is in different densities. Zaxxon is recorded this way, with two sector 1's. It was designed for both model 1 and model 3, so the balance of the disk is in single density. The only double density sector is sector 1. There is also a single density sector 1.

On memory upgrading, on the model 12 there is another way to get 128K. A set of jumpers on the motherboard must be moved and a bank of 64K put in where the bank of 16K chips are now. If you would like this information, I will either fax it or mail it to you, or you can obtain a model 12/16B/6000 (any of these will work) service manual. Also, on the 16B/6000, how about a driver to access the 68000 memory under LS-DOS? All of the Meg is accessible. I am going to write one for my own use, but I feel that if you wrote one it would be substantially better and much more compact. Also, it would have a higher probability of working due to your intimate knowledge of the internal's of LS-DOS. In fact, a routine could be added to the BOOT initialization to activate one of the two memory models depending on a test of the presence of the 68K.

Also, hard disk booting would be nice... I couldn't (or wouldn't) use it, but other people without the 68K would applaud it.

That's all I have for now. I applaud your continued support of all the Z80 based TRS-80 models. Keep up the good work.

Fm MISOSYS, Inc: Dear Lamar, . The initialization portion of SYS0/SYS for the Model II/12 LS-DOS 6.3.1 checks for the BREAK key via a CP 3 instruction at address X'2034' in order to suppress any AUTO command. It also checks for BREAK at X'2070' via a similar instruc-

tion for suppression of any SYSGEN. To change the detection for BREAK to suppress any AUTO, change the 03 at 2035H to another character value. You can also change the value at 2071H from 03 to something else to keep BREAK from suppressing the SYSGEN. I believe these two locations could be patched with D-verbs using:

```
PATCH SYS0/SYS.SYSTEM6
(D0E, 98=XX:D0E, 98=03)
```

```
PATCH SYS0/SYS.SYSTEM6
(D0E, D4=XX:D0E, D4=03)
```

At the moment, I have only a working Model II machine. You may be aware that I recently acquired a 6000HD which has an inoperative hard disk. So far, I have been unable to resolve the difficulty, but I suspect that the problem may be associated with an incomplete modification to the motherboard or other problem associated with mode 2 interrupt processing. Perhaps when I eventually get that isolated and fixed, I'll explore additional enhancements to the 6.3.1 release for the Model II/12. I do have a 6000HD service manual.

Incidentally, CKDRV is only exercised when a disk file is OPENed; and then, it only reads the GAT sector of the directory. If you have what appears to be a large delay, you may want to try adjusting the DELAY parameter of SYSTEM to OFF (0.5 seconds).

Model III Password

Fm Naaman Haddad: I have a Model III and use LDOS 513 and SuperScripsit. A long time ago I had created a document with a password. Recently I needed to get that document back but cannot remember the password. Does anybody know if there is a way to remove a password from a document? (ATTRIB requires the old PW before it will proceed). Any help will be greatly appreciated.

Fm Bob Haynes: Naaman, LDOS 5.1.3 accepts a universal password, RSOLTOFF, in place of any other password. You can use that to ATTRIB protected files. Be sure to use zeroes and not "oh"s to spell the password.

MSCSI6 and Passwords

Fm Ralf Folkerts: Roy, following is a small patch-file I've written to correct the password-problems [i.e. the programs as released reference system passwords of "LSIDOS" as used in LS-DOS 6.3.0 whereas LS-DOS 6.3.1 uses ".SYSTEM6"] for SDFORM6 and MSCSIF6 when using LS-DOS 6.3.1 ...

```
. MSCSI631/JCL - 06/09/90
. Correct the passwords for
DIR/SYS and BOOT/SYS for use
with LS-DOS 6.3.1
. Apply via: DO MSCSI6 (d=n)
where n = drive to patch
. use for LS-DOS 6.3.1
O N L Y !
//if -d
//. You must enter DRIVE to
patch !
//quit
//end
patch sdform6/cmd:#d# sdform6
patch mscsif6/cmd:#d# mscsif6
//exit
=====
. SDFORM6/FIX - 06/06/90
. Corrects password for DIR/
SYS and BOOT/SYS for LS-DOS
6.3.1
. Apply ONLY when using LS-
DOS 6.3.1
d03,93=f4 71
f03,93=f6 37
d03,b3=f4 71
f03,b3=f6 37
. EOP
=====
. MSCSIF6/FIX
. Corrects password for DIR/
SYS and BOOT/SYS for LS-DOS
6.3.1
. Apply ONLY when using LS-
DOS 6.3.1
d0b,e8=f4 71
f0b,e8=f6 37
d0c,0c=f4 71
f0c,0c=f6 37
. EOP
```

You may put this patch in the LIB or

whatever you want: I've tested it and it works fine on my versions (1.0.0)!

RSFORM6/TRSFORM6

Fm Fred Oberding: Roy, Thanks to Ralf Folkerts' juggling my grey cells, here is a patch to RSFORM6/CMD to correct password for DIR/SYS and BOOT/SYS when using LSDOS 6.3.1

```
.RSFORM6/FIX
.Changes password for DIR/SYS
and BOOT/SYS for LS-DOS 6.3.1
.Apply ONLY when using LS-DOS
6.3.1
.PATCH RSFORM6/CMD using
RSFORM6/FIX
D0C,FB=F4 71
F0C,FB=F6 37
D0D,1B=F4 71
F0D,1B=F6 37
.EOP
```

I guess while we are at it here is the patch for TRSFORM6/CMD for those of you who aren't using RSHARD6:

```
.TRSFORM6/FIX
.Changes password for DIR/
SYS and BOOT/SYS for LS-DOS
6.3.1
.Apply ONLY when using LS-
DOS 6.3.1
. PATCH TRSFORM6/CMD.UTILITY
using TRSFORM6/FIX.
D0D,31=F4 71
F0D,31=F6 37
D0D,51=F4 71
F0D,51=F6 37
.EOP
```

Roy, for your perusal. Have used the patch to RSFORM6/CMD and it checks out ok.

Fm MISOSYS, Inc: I read you. Although I would suggest that the patch read, "Changes..." rather than "Corrects..." The word "corrects" implies fixing something that is wrong or bad. That's not the case. I've made the change for TMQ publication.

PowerSoft's WDHDBTIN/CMD

Fm Robert Beaubien: Roy, I'm having a problem with LS-DOS 6.3.1. WDHDBTIN/CMD will not work to set my harddrive up for autoboot on my 4P. Is there a patch for this?

Hmmmm.... Do you know what WDHDBTIN/CMD is? Makes it so 4P boots directly off of hard drive [when using PowerSoft's WD driver]. It works under 6.3.0 but not under 6.3.1. How do I get 6.3.1 to boot directly off the hard drive? What files or commands do I need?

Fm MISOSYS, Inc: I believe that WDHDBTIN is a command file on the RS WDdriver package that PowerSoft sold (we have it now). It does a patch of the DOS. What happens when you try to run it? Do you get "Illegal access attempted to protected file"? If so, then it is trying to open one of the system files - either SYS0/SYS or BOOT/SYS. You can easily counter that with 6.3.1 by "temporarily" ATTRIB-ing the password back to "LSIDOS" from "SYSTEM6" for the duration of the "patch". If you get something else, you'll have to provide DETAILS - don't just say "it doesn't work under 6.3.1".

Fm Robert Beaubien: Roy, When trying to run it to set the HD for autoboot under 6.3.1, it comes back with "OPERATION ABORTED". I had already thought of the password problem, so I patched WDFORMAT/CMD to create boot/sys and dir/sys with the proper passwords. Thanks for your assistance!

Fm MISOSYS, Inc: Robert, it has nothing to do with BOOT/SYS or DIR/SYS. I have investigated the code of WDHDBTIN Version 1.3 - which is needed for installation under LS-DOS 6.3.x. As far as the "patching" code in WDHDBTIN, there is no change whatsoever between release 6.3.0 and 6.3.1 LS-DOS.

The problem comes when WDHDBTIN attempts to open the SYS0/SYS file to

install a patch. It adds a JP instruction so that SYS0 initialization will bypass the updating of the drive :0 DCT (see THE SOURCE, Volume I page 107, line 20940).

Since the password of system (/SYS) files changed from "LSIDOS" used in releases 6.0.0 through 6.3.0 to "SYSTEM6" used in release 6.3.1, WDHDBTIN gets a "File access denied" error on the @OPEN service call. WDHDBTIN is quite primitive in its error reporting and displays "Aborted" for any error [note that the message is not "OPERATION ABORTED" - I am a stickler for accurate reporting]. As far as I am concerned, all you need to do to install WDHDBTIN under LS-DOS 6.3.1 is to do what I previously noted; temporarily change the password to SYS0/SYS back to "LSIDOS", invoke WDHDBTIN, then restore the password. A command such as:

```
ATTRIB SYS0/SYS.SYSTEM6
(O=LSIDOS)
```

will do the former; swap the passwords to do the latter.

Incidentally, WDHDBTIN does access the BOOT/SYS file to modify the boot code and to write the memory image of the WD driver to track 0, but only through absolute disk I/O service calls; thus, the password is irrelevant in that case. It also accesses the Granule Allocation Table (GAT) stored in the first sector of the DIR/SYS file; again, record access is done via directory I/O service calls which do not utilize file access password protection.

HiRes Graphics and the XLR8er card

Fm John G. Gelesh: In the last TMQ, mention was made of soldering a resistor onto the XLR8er board. Is this 150 ohm resistor 1/2 or 1/4 watt? Or does it matter? Where exactly does it go? What "side effects" can installation of this resistor cause? Anyone tried it yet? I want to use the XLRHR program. What can I expect after this modification?

Fm Mike Harrow: Hi John, So you're thinking of attacking your XLR8er with soldering iron in hand are you? You've put forth a loaded question - "side effects?" and "what can I expect after this modification?". Valid questions but still loaded.

"side effects?" - The DMA Controller 1 will properly execute memory to I/O or I/O to memory transfers when set up to do so. Theoretically there should be no adverse effect. With that said someone will come up with a horror story to tell. All hardware tampering is subject to Murphy's law.

"what can I expect?" - Try XLRHR first [download XLRHR/ARC from Lib 0 of CIS PCS49 for more information] - If it doesn't display the /HR file then do the modification. When complete XLRHR will be able to transfer HR files to the graphics board using DMAC1. Not spectacular but if you enjoy programming such weird and wonderful things (I do) you'll have a new gadget to play with.

Perhaps a few other users will answer your message. Always seek a second opinion when you are uncomfortable. That goes for Hardware and Health.

Use either a 150 ohm 1/4 W or 220 ohm 1/8 W for the mod.

PC Resource Folded

Fm Hardin Brothers: PCR folded (actually, it was "sold" to PC World, which is also owned by IDG) officially on June 22. The announcement was made, to a very surprised staff, on Monday, June 11, and the press releases went out the same day.

Yes, there are probably subscription cards even in the last issue, which is/will be August and possible direct-mail ads that still are waiting to be delivered. When things happen this quickly, it is difficult to stop all the advertising, etc., in mid-stream.

Nomad 4000A telephone

Fm MISOSYS, Inc: Does anyone have information on how to open up an AT&T Nomad 4000A telephone so I can get at the battery? So far I have found only one screw which is under the plastic label which covers the phone number tag. Otherwise, I see no visible means. Hate to break out the sledge...

I have a source for portable phone batteries which should be infinitely cheaper than taking it in to AT&T. But how do you get the darned thing open?

Trouble with DO *

Fm Robert F. Winn, Kansas City, Mo: Dear Roy, I have just received my new version of LSDOS 6.3.1 and I am in the process of converting all my disks to the new version. I have run into a slight problem though. It was such a small thing that I was not sure whether to write or not because I know you are such a busy person. And by the time I send this letter you may already know about the problem and if this is the case please disregard this letter.

When you enter <DO *> or if a program executes <DO *> the system only searches drive :0 for the file SYSTEM/JCL. If it is not on drive :0 it generates an error. With the new system being able to place the SYSTEM/JCL file on any drive now if drive-0 is write-protected shouldn't <DO *> search all drives for the SYSTEM/JCL file. When I tried to use WC/CMD with drive-0 write-protected that is when I discovered this problem.

I came up with this small patch to SYS6/SYS so that <DO *> would search all drives for SYSTEM/JCL. WC/CMD uses <DO *> command I know of for sure and I am not sure if other programs use it or not.

I have not talked with you about this so if there is a better way of handling it or if this is a bad idea would you please advise me this best way of handling it.

What I found in SYS6/SYS was the data statement <SYSTEM/JCL:O>. What this patch does is remove <:O> from the statement. After the patch it is changed to <SYSTEM/JCL> and when <DO *> gets executed it searches all drives for the file SYSTEM/JCL.

If this hurts anything or is a bad idea please let me know. Thank you for your time. I really like the new release of LSDOS.

Fm MISOSYS, Inc: Dear Robert, You are right that DO * will not look any further than drive :0 for the SYSTEM/JCL file, specifically because of the drive specification within the DO library command. Your patch deletes the drivespec thereby enabling DO * to search all drives.

On the other hand, your patch also defeats the facility of searching for the first drive which is not write protected in order to generate the SYSTEM/JCL file on a normal DO command. That's because the search process alters only the number of the drive in the file specification. With the string terminated immediately following "/JCL", any alteration to the drive spec is non-functional.

What is needed is to have either DO * dynamically terminate the string following "/JCL" or the routine which alters the drive spec needs to also insert a colon separator.

I have examined the code to the point of ascertaining that no easy fix can be introduced; DO is very tight. I will continue to examine it in the future to accommodate some solution. Thank you for pointing this bug out to me.

Fm Rick D. Jones: Dear Roy, I have noticed a small but inconvenient mishap in LS-DOS 6.3.1 using the command 'DO *' to repeat the compiled SYSTEM/JCL file. I get an error like 'File Not In Directory'. I have a 128K Mod IV gate array running LS-DOS 6.3.1 level 1F on a six partition 15meg hard drive. The drive 0 partition is DOS write protected to help

secure my application programs from being deleted.

When I compile a JCL file (i.e. DO MC (n=dollar,k)) it is created on drive 1 as it was in DOS 6.3.0. Even the 'DO *' worked properly. What I would like to know, is there a fix? I waited for the current issue of TMQ IV,iv, but no mention of this. HELP! I don't like typing 'DO = SYSTEM' all the time!

Fm MISOSYS, Inc: I just fixed that up yesterday based on an earlier report. The problem materializes if the SYSTEM/JCL file is not on drive :0; it has to do with the code added to search for the 1st available non-write-protected drive for a normal DO. The filespec string in the library command is "SYSTEM/JCL:0", where the "0" gets updated by the search code which searches for the drive. But DO * does not utilize any additional code. See the following dialog.

Fm Lawrence C. Minder, North Babylon, NY: Dear Roy, I have received and been using your LS-DOS 6.3.1 upgrade software and your LS-diskDISK software. Unfortunately, I have encountered several problems with these software packages. The attachments to this letter will attempt to document the problems that I am experiencing. I have also enclosed four diskettes, Two of the diskettes are related to the problems I am having with LS-DOS 6.3.1, while the other two diskettes are the original software diskettes mailed to me. I am enclosing the original diskettes with the hope that maybe something went wrong WHILE these diskettes were being created, thus resulting in the problems I am experiencing.

Realistically though, I think I have run across legitimate software bugs, so I am hoping that the patches for these bugs can be applied to my original diskettes, which would then be returned to me for use. Additionally, and along the same line, I suspect that the diskDISK diskette does not reflect ANY of the software patches previously published in the *The MISOSYS Quarterly*, one of which may correct the

problem I am reporting. Since I have purchased MANY of your software products in the past, whose diskettes did reflect any published maintenance up to the point in time of my order, I thought this lack of maintenance to the diskDISK diskette was in itself indicative of a problem. Thus, another reason for enclosing the original diskette for your analysis.

Now, let me try to summarize the problems that I am experiencing.

Basically, I have two problems that deal with JCL processing. I try to use JCL quite a bit to somewhat automate some of the more complex jobs that I need done. Both problems were found while trying to set-up and re-format my 15Meg Radio Shack hard drive, in preparation to move the LS-DOS 6.3.1 software onto it. Please note that I split this hard drive between LS-DOS and LDOS, but re-format all partitions under LS-DOS when re-formatting is required. This may help to EXPLAIN some of the 'why' of what I am doing. Also, please note that this JCL does work, in all ways, under LS-DOS 6.3.0 (Level L), so these are not first time usage type of problems.

My JCL consists of several steps/phases and is structured such that I will be displayed a 'menu' of these phases at start-up time, from which I can select at which point/step do I want to start. Unfortunately, the problem I now have is that I can only select Phase 1. Any other Phase yields a 'Bad JCL, Job Aborted' error. Please note that I am using the '//KEYIN' JCL statement in order to do my selection processing.

When executing Phase 1, which means that all six of the defined steps/phases will be executed, the JCL execution fails in Phase 4 due to what appears to be a problem with reading the compiled SYSTEM/JCL file. Suddenly, while processing, it appears that SEVERAL lines are skipped over, with processing resuming in the middle of a line, and thus encountering a 'Program not found' error due to the incomplete data (i.e., whatever is in the middle of that line) being processed.

The problem encountered with diskDISK is not with its usage, but with the informa-

tion displayed when issuing the LS-DOS 'DIR' command. I used LS-DOS 6.3.0 (Level L) to do my testing with.

Simply stated, when defining a diskDISK using type '1' or '2', the output from the 'DIR' command shows the total diskette space to be a number smaller than what it actually should be. It appears that the space occupied by the DIR/SYS file is not included in the disk space statistics shown by the 'DIR' command. However, when issuing the 'FREE' command, the disk space statistics are shown correctly. Please note that this problem does not appear when using a type '5' diskDISK. Also note that this problem does not exist with the Model 3 version of the diskDISK program, as all disk space statistics are correctly shown, regardless of the diskDISK type selected.

Roy, I have spent considerable time verifying that I really do have a problem versus it being a user type mistake on my part. I hope the attached documentation is adequate.

I am also concerned that you may not be able to reproduce my JCL related problems, as they do imply that you have a 15Meg hard drive available in order to execute them. My gut feeling, however, is that my problem is not so much with the 'what' of what I am doing (since it does work on LS-DOS 6.3.0), but rather with the length/amount of JCL that I am using. Maybe LS-DOS 6.3.1 is just having a problem with processing that long of a JCL stream, which results in both problems. I sincerely hope that this is fixable, as this use of JCL really does help me to do these complex tasks, as well as tasks that you do rather infrequently and do not want to have to spend the time re-learning how to do, each time the need for them comes along.

Also, please explain why MEMORY provides the status of available banks in a 128K machine as,

32K Bank avail = 03/03, In use = <—>

My understanding is that in a 128K Model 4, my 'bank' memory is the base 64K consisting of the system bank (32K) and bank 0 (32K), and the extended 64K

memory consisting of bank 1 (32K) and bank 2 (32K). I would assume, since I did not have MEMDISK installed nor was I running an application that uses the extended memory, that I should show 64K available; with 2 banks out of 3 being available (assuming the system bank doesn't count) and with one bank (i.e. bank 0) in use (for base 64K machine).

Fm MISOSYS, Inc: Lawrence, There was a minor change in SYS11/SYS of 6.3.1 which impacted your JCL. All previous versions of LS-DOS (nee TRSDOS 6.x) had no test in the //KEYIN processing for line length; it was possible to fetch a line which was longer than the input buffer [see *THE SOURCE*, Volume I, page 252, lines 2680-2720]. I added a test to ensure that would not happen. Unfortunately, I was testing for 79 characters including the terminating ENTER; what I should have tested for was 80 characters including the ENTER or 79 characters excluding the ENTER.

In your JCL, a few lines have 79 characters prior to the ENTER character. It was these lines which caused the "Bad JCL" error abort. The solution to your problem is FIX631F/JCL shown below. This allows a full 79-character line for //KEYIN.

Note also that on closer examination of the JCL execution module (SYS11/SYS), I also realized that the routine which copies command lines from the JCL into the input buffer had the same problem [see *THE SOURCE*, Volume I, page 250, lines 1700-1760]! That code - which I believe has been in SYS11/SYS since the release of TRSDOS 6.0.0 will report a "Bad JCL" error if a command line consisted of 79 characters with the ENTER as the eightieth character. To this date, and that's about seven years, no one has stumbled upon that restriction. My patch corrects that portion also to allow the full 80-character command line.

On your DiskDISK problem, some unique idiosyncrasies are at play; I had to dig into the code to understand why you were getting those results, but they corresponded to code-documented results so I have to assume that the result is as intended by LSI.

Type 1 and type 2 DiskDISKs are special cases. DiskDISK allows a type 2 to be a DOS system drive; even though it is constructed logically as if it were a 2-sector per granule, 8 granules per cylinder diskette. Model 4 system disks have a 16-sector BOOT/SYS file; thus, when LS-DiskDISK creates the BOOT directory entry for a type 2 disk, it sets the Ending Record Number (ERN) at 16D. The Model III version doesn't do this since the BOOT/SYS file on a Model III LDOS system disk only uses the first granule; that's why a directory shows different BOOT/SYS sizes for a type 2 DiskDISK versus a type 2 LS-DiskDISK.

Next, DiskDISK fools BACKUP into inhibiting a mirror-image backup on both type 1 and type 2 DiskDISKs by setting bit-0 of the cylinder 0 lockout byte. That doesn't impair operation since that first granule has already been allocated.

Okay, so why does LDOS show the same total space for a type 1 or 2 DiskDISK using FREE and DIR whereas LS-DOS shows different values? That's because the code calculates things differently. In the DIR command of LS-DOS, total space is reduced by the amount of space on locked out cylinders; FREE calculates no such reduction. Also, since DIR is relying on FORMAT's use of the lockout table, and FORMAT will lockout an entire cylinder if one sector is found bad, DIR takes a shortcut and tests only bit-0 of a lockout byte. So for the type 1 and 2 DiskDISKs, DIR thinks the entire cylinder 0 has been locked out; it reduces the total available space by one cylinder - 16 sectors or 4K. DiskDISK's fooling the DOS by showing an in-use granule locked out created the situation for different calculation. That's why your type 2 60-Cylinder DiskDISK shows 236K from DIR yet 240K from FREE. Puzzling, but explainable!

Don't feel too bad, though, as I had to check out the code to find out all of the reasons why it behaved as it did.

Finally, the LS-DOS 6.3.1 MEMORY display of banks shows what is known to the DOS. In a normal 128K Model 4, there should be three hyphens shown if no banked memory is in use. Note that although conceptually bank 0 is always

utilized, the DOS does not show it reserved. No program should ever check to see if bank 0 can be used for bank switching as it is not considered the extended memory. But it has to have a number so that it can be switched in and out of the upper 32K address space. Just consider it as the system memory swap space.

```
. FIX631F/JCL - 07/16/90 -
Corrects three minor problems in 6.3.1F
. //KEYIN of JCL now accepts
79 cpl + CR instead of 79
cpl including CR.
. DIR now displays header of
disk formatted when DATE was
not set
. DO * now finds a SYSTEM/
JCL file on a drive other
than :0
. Apply via, DO FIX631F
(D=d) where "d" is drive to
patch
//if -d
//. Must enter drive to
patch!
//quit
//end
PATCH SYS11/SYS.SYSTEM6:#D#
(D01,2A=50:F01,2A=4F)
PATCH SYS11/SYS.SYSTEM6:#D#
(D01,CE=50:F01,CE=4F)
PATCH SYS6/SYS.SYSTEM6:#D#
(D07,F3=7A:F07,F3=3C)
PATCH SYS6/SYS.SYSTEM6:#D#
USING D01/FIX
PATCH BOOT/SYS.SYSTEM6:#D#
(D02,1F=47:F02,1F=46)
//exit
```

```
. D01/FIX - 07/16/90 - Patch
to LS-DOS 6.3.1 DO command
. Allows DO * to find a
SYSTEM/JCL file on a drive
other than :0
. Apply via DO FIX631F
D2D,AB=CD AC 2A;F2D,AB=32 EB
29
D33,0B=03;F33,0B=3A
D33,AD="Bad JCL format,
process aborted"
F33,AD="Invalid JCL format,
processing "
D33,CC=0D 67 2E 3A 22 EA 29
C9
F33,CC=61 62 6F 72 74 65 64
0D
. Eop
```

GO:MTC; Joystick; etc.

Fm Ralf Folkerts: I got the Joystick & GO:MTC ... seems it needs some time till I can use the joystick as good as the arrow-keys on the 'old' keyboard !

DIRCHECK problems: I have a 'granule re-allocation error' when I use DIRCHECK on my HD. I remembered a discussion on this in TMQ and found it in TMQ IV.ii, pp. 55. You advise to invoke DIRCHECK with the (H=nn) parameter where nn is dir-cyl. I've tried it but still get the error on all partitions.

The HEX-portion of DIRCHECK for the re-allocation error is not working correct. Seems like it leaves 2 'h's from a mask in the display-string. I've enclosed a IMPORTED sample-line from it.

```
dircheck :0 (h=76)
```

DIRCHECK - Version 2.0.0 - Directory Checker

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```
DIR/SYS - GAT Re-allocation ->
Cylinder 76 (hh4C Gran 0)
DIR/SYS - GAT Re-allocation ->
Cylinder 76 (hh4C Gran 1)
DIR/SYS - GAT Re-allocation ->
Cylinder 76 (hh4C Gran 2)
DIR/SYS - GAT Re-allocation ->
Cylinder 76 (hh4C Gran 3)
```

— continues for a total of 16 errors —

MAPPER displays several grans as ** error **. Where does it come from? The granule is assigned to a file and the 'old' mapper (Mark IV) does display the files names instead of ** error **.

New TMQ is great. The idea to put a 'list of patches' on the first page is good. You can find all patches with one look.

Thank you for the MSCSI patches. They work OK and I haven't found anything else malfunctioning.

Your SCARFMAN (serial no. 000001) doesn't produce sound on my new 4d (like almost all other Model III-mode-sw). I've zapped all OUT OFFh,A to OUT 90h,A and now it works 1 A; is it OK that the 'new' 4D does output sound only via

the SEN port? Or is there a gate not working as it should?

Fm MISOSYS, Inc: It sounds like MAPPER on that disk may not have the patch, GMAP01/FIX, in TMQ IV.iv; that would cause MAPPER to incorrectly show errors on drives where the directory extends to 34 sectors.

Game programs designed to produce sound through the cassette port (FF) will never produce sound on any Model III or 4 except the 4P; that has hardware which automatically uses the sound port for FF.

I finally took the bull by the horns and dug into DIRCHECK. The original problem was that the "H" parameter did not function as intended. I worked up a patch to permit proper operation: invoking DIRCHECK :d (H) allows checking of a hard drive without any reserved cylinder; invoking DIRCHECK :d (H=ccc) allows checking of a hard drive with cylinder ccc reserved. My patch also fixes up the "Gat reallocation" error message. The problem is that message was the only one which displays a cylinder number in hex without the surrounding "X'" and "" notation; thus, the index for the hexadecimal conversion should have been string+5, not string+7 as all the other error messages. Personally, I haven't the foggiest idea why that one message is different. But here's the patch for DIRCHECK version 2.0.0 which is on the GO:MTC disk.

```
. GODCK01/FIX - 08/28/90 -
Patch to GO:MTC DIRCHECK/CMD
ver 2.0.0
. Fix corrects handling of
"H" parameter and hex con-
version
. display in one diagnostic
error message.
. Apply via PATCH DIRCHECK
GODCK01
D01,7E=00 C3 28 3B;F01,7E=FF
04 05 20
D01,9C=00 00;F01,9C=0E 4D
D06,2B=AB;F06,2B=AD
D07,07=31;F07,07=30
D0B,60=78 B1 CA 81 31 78 A1
3C CA 95 31 C3 73 31
F0B,60=24 24 24 24 24 24
24 24 24 24 24 24
. Eop
```

MISOSYS HD parts; 6.3.1G?

Fm Hans G. Bongartz, Federal Republic of Germany: Dear Roy, The statements in your letter of May 7th concerning your hard drive and its shipping cost to me are clear. The suggestion of piece parts seems to be the way to go. Is it mandatory to have a 65 watt power source in a one drive unit or may I use a 40 watt type as R/S did for the 26-1067 cassette M4? There is one spare part on hand. Is it enough for HD motor startup?

At this time I'm interested in the new LSDOS 6.3.1 release. There is no statement, if it is available for my foreign German keyboard too? If not, do you encourage me to replace the BOOT file with my current version 6.3.0-G BOOT file containing a GERMAN keyboard lookup table? In the past, I did already some work inside my DOS to adapt your ATMEM patches for the German version. THE SOURCE did help me to finish this project. In every case, I'm interested to get this new release.

Does the LS-DOS 6.3.1 have a larger MEMDISK? The 'SUPERDRIVE' from Anitek has some drawbacks: no standard tracks, DOS-occupied banks from bank=3 upwards will not be honored, SUPERDRIVE as SYSTEM drive locks my machine if there is not always a disk inside the physical drive zero just as known with unpatched SWAP/CMD, and drive swapping with the SYSTEM command will not be reliable. The same is true with Anitek's last offer of a new 'HYPERDRIVE' accompanied with their new HYPERMEM memory expansion, which is done with a new GAL chip as U72 to control the memory. A 512k arrangement of two rows of 41256's is running properly however. Only they did leave the formerly used port 43H for switching. The GAL chip uses physically not as much room as the ALFABOARD did. You can install a Hires board at the same time. But everything needs a patch again, even Anitek's own LESCRIPT! Did you already hear from the new memory expansion scheme?

Is there any chance to get the 'RAMDRIV.LQR' from the MISOSYS forum on Compuserve which I have no access to from Europe? (TMQ IV.i p.35

2nd column first chapter on top of page) Can you suggest any help? I'm hopeful that some problems are related to a pure 'DISKSYSTEM' and they will vanish by installing the hard disk soon, as intended.

With my best wishes to you, your family and MISOSYS!

Fm MISOSYS, Inc: Dear Hans, Shipping weight for a host adaptor, controller, manuals, disk, and interconnecting cables would squeak in at 2 pounds. The cost for S&H at Air Parcel Post insured rates to FRG would be \$18.65. Starting in July, I'm expecting a little sale on completed hard drive packages; I'm including the host cable and providing a free choice of either the clock or joystick options. For folks getting just the host adaptor and controller, I am going to offer the clock or joystick option at no charge. So just consider that you would need to cover the \$75 for the H/A, \$95 for the HDC, and \$18.65 for the freight.

I would expect that a 40-watt supply should be able to handle one drive and the H/A-HDC circuit boards. A 20-Megabyte ST-225 hard drive, for instance, typically consumes 15 watts when running; on power up, the motor draws an additional 13.2 watts at 12V for about 10 seconds until it reaches idle speed. Here's some figures:

Supply	HDC	ST-225	ST-225 at P/U
12VDC	1 ma	0.9A	2.2A
5VDC	2A	0.8A	0.8A

I compared the BOOT/SYS file of 6.3.1 against 6.3.0; the only difference other than the pack name and date, is the patch applied to the floppy driver which was printed in TMQ IV.iii; thus, you should be able to copy your existing BOOT/SYS file from 6.3.0 to 6.3.1.

The Memdisk which comes with LS-DOS is the same. I suggest you consider using PEXMEM and ERAMDISK which was implemented by Michel Houdé. That was covered in TMQ III.ii and was on the corresponding DISK NOTES. Even though it was discussed as part of the XLR8er interface, it can be used with any extra memory implementation known to the

DOS. That last phrase is key - the memory must be available via the @BANK svc. I have heard about Anitek's new hypermem board but have not seen it. I am aware that it uses a different accessing scheme than did the Alpha Tech memory board which they used to sell. I am not providing any patches to the DOS for their board; that's for Anitek to do.

Incidentally, the reason why your system will hang on a global search if the original boot drive switched by supermem contains no disk is because their switch probably does not handle the "disable CKDRV" bit in the DCT. That's the problem that SWAP had. You can manually deal with that by issuing the command, SYSTEM (DRIVE=d,CKDRV), where "d" references the drive number after the swap.

Fm Hags G. Bongartz: Dear Roy, Many thanks for HD-parts which you shipped 06/27/90. Everything did arrive in safe condition on 07/04/90. A few days later the TMQ IV.iv issue was in the mail input. I'm glad to see that it is continued to Volume V and my zone D subscription is enclosed with this letter.

It is absolutely fantastic - after one day of mechanical assembling and buying parts - my HD unit awoke to life with a Seagate ST 251-1. At the time the parts arrive, I had successfully finished to adapt your famous LS-DOS 6.3.1 for German keyboard Model 4. The details on this will be covered inside some material separately sent to you on a disk after the textual work around this object is finished.

I am fully satisfied with the HD environment which you created. Both the hardware and the software didn't cause any trouble during its first installation. Especially with the CLOCK option, the model 4 is a comfortable new machine. Again many thanks for supporting model 4.

My respect to your HD project is not only limited to some statements inside this letter! My following order may express this much better. I want to order a second set of HA/HDC piece parts with software drivers for model 3 (=MSCSI5) including interconnecting cables :

I have a question about the daylight saving time switch back in the DS 1287, programmed on last Sunday in October: Can this point of the switch back be altered to last Sunday in September as used here? In Europe, only Eireland and Portugal will remain until October. I will confirm, it is a cosmetic change not a complaint!

By the way - daylight saving time, here [is] called 'Sommerzeit' which is verbal translated 'summer time'. This may sound to you as the summer vacation time where you shut down. I wish from heart that it may be a good time for you with your wife and your children far away from business as usual!

Until next time, many thanks and have a nice time !

Fm MISOSYS, Inc: I'm pleased to see your success with our parts. But I can't help you with the clock module. The date at when the DS1287 clock module alters its time for "daylight saving time" adjustments is not user-programmable. Software has control only of engaging or disengaging the clock's treatment of any alteration; clock firmware is encoded with the specific date an adjustment will occur.

Although the DS1287 is functionally the same type clock as used in AT-class MS-DOS machines, I don't think AT machines use the daylight saving time flag. I also am unaware of other iterations of the chip which support other dates for the "sommerzeit". Incidentally, I took three years of German in high school, so I can still pick up a few words here and there. But that was 30 years ago; one forgets...

Snag in LB 1.2.2 Beta

Fm Richard R. King: Regarding LB 1.2.2, I've hit two more snags in the code.

The first occurs on the DEFINE PRINT FORMAT option, when the format

SCREEN is being edited. With some text on several lines, hold the <CLEAR> key down and press the <RT ARROW> key. This will randomly choose between deleting one or more characters at and to the right of the cursor, or putting trash characters on the screen.

The second is more severe. Going into the PRINT option, I select a format which has a header and a body defined, but no footer. The layout will cause one header and 9 body records to print per page. If I do a <BREAK> while the 9th body record is printing, I would expect that printouts would cease after the printing of that record (assuming no buffer in the printer). What really happens is that the 9th body record prints, the paper advances to the new sheet, the header prints, AND THEN THE PRINTER FINALLY COMES TO A HALT. This is not goodness because it gives me no chance to insert a new single sheet or continuous forms sheet (at the end of a box, for example) and have that sheet print out properly. I would expect the sheet to advance to a new page (if that is where the break was requested) and then LB should halt right then and there.

I've hopefully put the correct print format file on this diskette so that you can see how I've defined the print format. It's the OHSCTEMP file.

Fm MISOSYS, Inc: Dear Richard, I researched the problem of spurious characters generated when simultaneously depressing <CLEAR> with other keys during PRINT DEFINITION screen editing. The problem rears itself because of the following scenario:

The screen editing function first tests the keystroke for any of the acceptable LB command keys currently applicable; it then disposes of the command, if any. If no acceptable command key was entered, the character is passed through a series of functions to the character display function only if the character value is not a "cntrl" - using the iscntrl() C function. But that function returns TRUE only for values 0x-1fx and 7fx. So what happens is that values of 80H-0FFH, as can be generated via <CLEAR> + key, get passed to

the display function. The LB display function strips the high bit (bit-7) from all character values. Thus, any character value greater than 127 generated via CLEAR will be converted to its 7-bit value and passed to the DOS. CLEAR+ARROWx winds up as @DSP control code values. That's what's causing the problem.

You'll have to live with that as we are no longer working on 1.2.x beta versions; we are working on version 2.0 which is expected to be available late this year. Work is progressing quite well. Rich has already implemented many of the features such as new data types [edit protected field, must fill fields, date of last update], printout redirection, printer initialization and deinitialization strings (you will want those two), duplicate previous record on add, testing for ESCAPE after every output line [fixes up your second snag], skip to previous/next field in ADD/EDIT via ARROWS, and use of record range with index file in print module.

Rich is coming along so well with the code that I have to now shift over to the manual from other projects I am working on.

Note that I am not going to normally be releasing beta copies of 2.0 for testing until all features which have been targeted for LB 2.0 are in place.

Porting PROFILE data to MSDOS

Fm Jan Edwards, Qualicum Beach, BC: Hi Roy, Very many thanks for your excellent series of "TMQ's". Due to the fact that I have now sold my Model IV, I regret I shall not be renewing my subscription. However in your latest edition on page 39, a letter from Peter P Klemchuk [was] asking for information on transferring files from Profile 4 Plus to IBM.

Please advise him to examine the data files and he should find the data is stored on files with suffix /KEY; /DAT; /DA1; /DA2; /DA3 if my memory is correct the KEY file holds the headings for the data

and the DA files hold the information. These files are all sequentially stored information and require re-filing by taking the first record from each file and putting them together in a new file, and then repeating again until the new file is formed; this can be done with a simple BASIC program. The file would then be simply transferred to IBM format with TRSCROSS or similar software as an ASCII file. It only then requires the headings for all the information that was used in PROFILE 4 Plus and the IBM data base can very easily set up. I hope this might be of use to Peter and in a way of saying thank you for all the information that you have given me over the last four years. Good luck for the future.

Sharp eyes!

Fm Lawrence Rossiter, Victoria, BC: Dear Roy; I am extremely pleased to read that you will continue to publish TMQ for another year, best news I've had in some time!

I used to find it somewhat boring reading through the CompuServe extracts but now that they aren't there I miss them!

You mentioned in Vol.IV.iii that no one had noticed your reference to the 17 sections of your forum when there were actually 18; well I noticed but did not think it was worth a letter. Did you notice the first 5 pages of IV.iii are headed IV.ii? I spent 28 years of my life at a job where one of the duties was watching for various kinds of errors in publications and on-the-air communications so I tend to notice other people's mistakes quite quickly, however never seem to spot my own errors!!

Thanks again for all your efforts for the TRS-80 gang, they are much appreciated.

Fm MISOSYS, Inc: Actually I did notice the that "The Blurb" headings in Volume IV issue iii did have the wrong issue number printed; but obviously I noticed that after getting the issue back from the

printer. It came about because I make up each new issue of TMQ from two sources: one source is a master chapter template in which I update the header and footer on the template to start; the other source is the old "The Blurb" chapter used to avoid reconstructing the title page.

When you open a Pagemaker document, you utilize one or two master pages followed by composed pages. The master pages are used to insert any material you want to have appear on every page. Thus, the headers and footers as well as column division lines are composed on the master pages. I forgot to go back to The Blurb's master pages to edit the heading to show "IV.iii".

Okay, I'll accept the fact that some folks do indeed notice my blunders!

Feedback on M.A.D.'s XROM

Fm Arthur N. McAninch, Jr., Borger, TX: Dear Roy, Thank you for continuing TMQ! Although I haven't written to you in quite a while, please know that I eagerly look forward to the arrival each quarter of your magazine. I continue to glean valuable information from each issue. I do miss the reprints of the CompuServe forum discussions, but I can appreciate the excess time required to edit, condense, and format it for printing. Believe me, I would much rather have TMQ without the forum discussions than to be without TMQ!

My primary Model 4 is a pre-revision A board machine that I purchased when they were first released as a replacement for a Model I. I now have 5 other Model 4's, and I've since purchased 10 Model I's. Just last week I installed M.A.D. Software's XROM in this early Model 4 along with a new "A" ROM and a new character generator. Boy! What a joy to boot directly from my R/S 12 meg hard disk! Just turn on the power strip, and SHAZAM! — the boot screen literally leaps on to the screen! With the software they include several helpful utilities such as FORCEHI which can reserve LOW

MEMORY for those drivers that must have it. The installation took a total of 30 minutes from first unplugging the peripherals to reconnecting and booting back up with absolutely no difficulties. The documentation from M.A.D. is superb, and the ability to boot my desktop '4 directly from the HD is an absolute joy.

Have a great vacation! Do drive carefully, for you are too valuable to the TRS-80 community to lose!

DoubleDuty and Extra Memory

Continued...

Fm Danny Mullen, Fort Polk, LA: [see TMQ IV.iv, pp 5-6, 37-39] Roy, THANK YOU FOR DOING THIS CHANGE TO DDUTY!!!! Did my 'beta' testing of the patches and DDUTY and all is well as far as I can tell. Some notes follow:

SUPERDRV, as is, doesn't recognize/update the BAR/BUR scheme you developed and I'm challenging myself to patch it to do so.

The values you mentioned for a 512K AT at locations 414h - 417h should read 00 80 FF FF, not FF 7F 00 00 as your letter stated - this will give the correct count (15/15) during the MEMORY command.

BANKER shows correct count of banks after changing the values in 414h-417h as stated above. Will continue testing the combo and will keep you informed.

An unrelated question — am trying to use SUPERDRIVE (came with AT board) in a JCL startup, but after installation, it (JCL) ends with JOB DONE even though there are more commands to follow in JCL. Tried everything I can think of - do you have any ideas? Do you use SUPERDRIVE? The @EXIT SVC is executed upon completion of SUPERDRIVE with HL = 0000 - is there a problem with that value?

Example:

```
.ML/JCL to do DDUTY, ALDS,
SUPERDRV
SUPERDRV 0,11
DDUTY
COPY ALDEDIT/CMD:1 :0
COPY ALASM/CMD:1 :0
/EXIT
```

This will exit to DOS after doing SUPERDRV command. This example lets me run from drive :0 for speed. I know I can get around it by doing an AUTO SUPERDRV command from DOS, but just trying to automate some...

Again, thanks for doing the changes AND sending them to me!

Fm MISOSYS, Inc: If SUPERDRIVE is switching the SYSTEM drive number when it loads, then that is the culprit. You can't do that without some careful control over an executing Job Control Language file as was put into 6.3.1's SYSTEM (SWAP).

On another issue, closely but not directly related, I have received an inquiry as to why DoubleDuty aborts the execution of a JCL stream, which it does. So even if SUPERDRIV handled the JCL drive swap, your example JCL would terminate once DDUTY was installed.

The fact that DDUTY does abort a JCL is not in itself a bug! DDUTY terminates via @EXIT without regard to the state of register HL - which must contain a zero value to prevent JCL from aborting. But look at what has happened to the system as DDUTY was installed from a JCL file. DDUTY establishes a second partition which contains the state of the JCL active as of the completion of the DDUTY command line. Were the JCL to remain active in partition 1, when you switched to partition 2, the JCL would continue AGAIN at the command line immediately following "DDUTY". I don't think that is necessarily desirable. But one customer insisted that I come up with a patch to DDUTY so that it doesn't abort JCL if installed that way. Here's that patch for two versions of DoubleDuty.

```
. DDUTY251/FIX - Patch to
DoubleDuty V 2.5.1 - 07/05/
90
. Patch to set normal exit
to NO ERROR
. Apply via, PATCH DDUTY
DDUTY251
X'34BC'=C3 4F 39
X'394F'=21 00 00 3E 16 EF
. Eop
```

```
. DDUTY261/FIX - Patch to
DoubleDuty V 2.6.0 - 07/05/
90
. Patch to set normal exit
to NO ERROR
. Apply via, PATCH DDUTY
DDUTY261
X'34EE'=C3 7C 39
X'397C'=21 00 00 3E 16 EF
. Eop
```

Fm Danny Mullen: Roy, Have some updated information regarding LS-DOS 6.3.1 as patched for use with the ALPHA TECH SUPERMEM board. I last stated that the values for ram locations 414h - 417h for a 512K setup (mine) should read: 0080 FFFF and this is correct for showing,

15/15 Banks Avail, IN USE <—————
—————>

when using the MEMORY command from DOS with nothing else installed in the banks. However, a question arises: If I install DDUTY (no parameters), then do the MEMORY command I see,

12/15 Banks Avail, IN USE <+++———
—————>

which leads me to believe that the '+' marks indicate banks 0, 1, and 2 are used for DDUTY (which is correct according to the manual); if this is correct, then the CORRECT display from MEMORY command should be

16/16 Banks Avail, In use <—————
—————>

if nothing is using the other banks, or if only DDUTY is installed as before,

13/16 Banks Avail, In use <+++———
—————>

(10% disk access) on the internal batteries. The whole unit is 6.4 pounds. The internal PROM (drive C:) contains TANDY's DESKMATE kernel and COMMAND.COM plus some windowing stuff. I use it as an ELECTRONIC notebook at work. I compared the specs to my FIRST 4P purchased a scant 5 years ago. Take a LOOK!

	4P	1100FD
CPU	Z80A	V-20 (8088)
SPEED	4MHZ	8MHZ
MEMORY	64K(128K opt)	640K
HI-RES	opt 640x400	640x200
DISPLAY	Mono CRT	Mono LCD
DISKS	2/180K	1/720K
MODEM	300/1200 opt	2400 opt
POWER	AC	BATT/AC
WEIGHT	29 LBS	6.4 LBS
SIZE	16x10x14"	12x2.5x9"
MFG YEAR	1985	1990
COST	\$1799	\$999

There it is, 5 years, twice the speed, ten times the memory, twice the disk storage capacity, HI-RES standard, optional modem twice the speed, 22% of the weight, 12% of the size, runs on batteries and 55% of the cost (excluding inflation)!

It is interesting to note that the 1100FD is a Panasonic built to TANDY specs, which amounts to the C: disk ROM, I expect. Really, not a bad buy!

Since the NEW TMQ is here, I have naturally read it several times, and would like to say the you, Roy, have done a remarkable job of encapsulating the history of part of the telecommunications as relating to the CARTERPHONE situation, which spelled the end of the telecommunication monopoly.

Now if I order the new Xlr8er patches from M.A.D., I should be able to get PROWAM, OVERDRIVE, and Z-SHELL in all at once! At last count I think that I was 3-5 bytes too long!

I don't know when your vacation is, and this will probably get there while you are away, but YOU AND BRENDA AND THE KIDS HAVE A GREAT ONE!

Wish list for MISOSYS

Fm Lee C. Rice, Marquette University:

Dear Roy, TMQ 4#4 arrived earlier this week, and with it the particularly welcome news of the continuance of the quarterly into Volume 5. I am enclosing herewith a cheque for renewal, and would like to personally congratulate you on your decision to continue this form of support for the Model 4 user community. I subscribe to CN80 and support it actively, but it does not and should not try to meet the needs which TMQ has so wonderfully served throughout the past four years.

At the same time, I applaud your decision to make the journal more compact in size in order to free up more of your time for programming and other efforts. I'm sure that you'll be receiving many congratulatory letters, so don't try to answer this one. I am enclosing a disk of it, just in case you want to include a piece or two from it in the next issue of TMQ. And so, I might just as well include my wish list - especially since you brought up some future projects in the editorial of the last issue of Volume 4.

I have been hoping for some years that you would make some move to enable tape backups from Model 4 hard drives, via the tape system you are currently selling, and you indicative tentative plans for this in the current issue. While it is only natural that you should make such a system first available for your own MISOSYS hard disk setup, I hope that you will consider a general card-cum-software for the existing family of Model 4 hard drives (including Tandy and Aerocomp).

As you probably know, I own a Model 3, Model 4, Model 4P, MSDOS 286 system, and MSDOS 386 system. I have been planning on adding your tape backup (i.e., two cards, with one external tape system) to the MSDOS family for some time. The only thing that has slowed me down is the thought of leaving the Model 4 family out of the picture. Backing up a hard drive to floppies is yesteryear's technology: the Model 4 systems need something better.

While I'm fantasizing, how about hard

disk drivers also? You mentioned some time ago that you were considering a driver compatible with the Megadisk Hard Drives. The company which produced these went belly up some time ago, the hardware is quite good (we have four of them at Marquette), but the driver is horrendous. It is very large and also cannot relocate to high memory, which means that it is incompatible with the XLR8 board! I have an XLR8 in my 4P, which is on line to a Megadisk, and two different boot configurations: one for the XLR8 with no hard drive, the other for the hard drive with no XLR8. I'm sure that my situation is not unique, and even if there are not many people with Megadisks and XLR8 boards, there are plenty of Megadisks out there - all with overly large and clumsy drivers.

At home I have a 15meg Tandy hard drive, which I'm running with your RSHARD package (it runs beautifully). We have ten Aerocomp drives at school. They are good quality drives, but the hard drivers are quite large, and quite kludgy. I'd certainly pay a fair price for new drivers to bring the Aerocomp hardware up to its true potential.

All of these are just suggestions. The adaptable tape backup system is a great idea. Although I love my Model 4 systems, and would not consider parting with them, I also enjoy working under MSDOS. I am sure that there are many readers enjoying several computer systems. For these the idea of software and hardware which can serve both systems would be most attractive.

Fm MISOSYS, Inc: You are not the first person to inquire about new hard disk drivers for the old Megadisk and Aerocomp drives. I can't make any promises there; one rule I have long established is the reluctance to write software for hardware we don't have.

As far as the tape drive is concerned, I still intend to pursue that project but haven't made much headway. There is little problem with using the CMS drive with any hard drive; that's not the factor. The CMS drive connects to a floppy disk controller;

the FDC in Model III/4 machines is usable. But the command set used to intelligently interface the drive via software and the tape directory structure is necessarily complex. I haven't as yet been able to partition my time to the task. One day...

Shortening Model 4 BASIC

Fm Lloyd Evans, Arlington, TX: Roy, The replacement disk for 6.3.1, that the post office ate, did arrive in a timely manner. It is version 1F and I think that it still has a minor bug. The DIR command will lose the directory header on a disk that has 00 in the month field of the directory sector.

The enclosed disk was formatted with no date in the system. The directory sector has L63XDATA00/00/00 in the Pack ID field. Before any files were put on this disk everything appeared normal. When you do a DIR on it you will see what I mean.

The GRAFDISK/DCT program mentioned in the TMQ that wouldn't work under 6.3.1 was patterned after MEMDISK. Whoever wrote MEMDISK did not follow the rules either. GRAFDISK was written by SVP Enterprises and reworked by one of MCTRUG's members. It then appeared in TrsLink # 26. TrsLink # 31 cures everything but the password code for boot and dir sys.

I understand why you don't want to change BASIC/CMD but for Adam Rubin who wanted to shorten it a little there is a way to shorten it a lot. Here is a PD program called BASICA/BAS and a data file called BASICA/DAT that will cut 8 records out of it. It takes out 1100+ direct loads of X'00' and uses a LDIR to put them in place. The overlay code is put in the proper place and discarded. The new BASIC/CMD is also on this disk. I have been using it for over a year and believe it functions the same as the longer version. I will try to get it put in TrsLink # 34 as the data file is much to long for a paper publication.

My 'wish lists' are just that. A young man with a lot of girl friends usually has one, or can con his main one, into fulfilling any of his needs. The problem occurs when he moves. He often forgets to take some of the lesser needed ones with him. How nice it would be if one lady could do it all. I am pleasantly aware LDOS and LSDOS have more features included than any system that I have heard about. Maybe this is why these machines refuse to die.

One 'wish' for LDOS 5.3.1 that I forgot to mention is change the default in FOR-MAT for the disk name to L531DATA.

Fm MISOSYS, Inc: Lloyd, Thanks for the program input. Due to its length, I'll put in on DISK NOTES for this issue so folks will have another chance to utilize it.

The rare problem with DIR losing the header display when the referenced disk has no date is fixed up by the FIX631F/JCL appearing in this issue.

As far as whether the author of Memdisk did or did not "follow the rules", I commend to your attention the fact that Memdisk is a system-supplied utility. A DOS version is never supplied without a version-specific portfolio of utilities. Perhaps it would have been better for previous versions of Memdisk to stay out of the library overlay region, but there was not a necessity to do so. Standalone programs which must work across many different versions of a DOS must strive to be as version independent as possible; that means following every rule or adapting to versions - still fraught with problems as new versions of the DOS are released.

Enhancing Model 4 BASIC

Fm John Grindey, Great Britain: Dear Roy, First THANK FOR CONTINUING TO PUBLISH TMQ FOR AT LEAST ONE MORE VOLUME.

Enclosed are a few patches that may be useful.

```
. BAS/FIX, Enhancements to Basic supplied with LS-DOS 6.3.x
. 11-JUL-90 John Grindey
. apply via PATCH BASIC.BASIC BAS/FIX
. These patches add the default /BAS to Load and Save
. and extra single letter commands listed below
. L" - LOAD, . K - KILL, . N - NEW, . P - LIST
. R - RUN, . V - SAVE, . Z - CLS
. They can be altered and there is space for 3 more, pages A-82 A-83
. in (my) Model 4 manual lists the internal codes for Basic
. any code less than 255 can be used. As an example the line starting
. X'8604' = 56 is hex for ASCII V, and CB is hex for 203 the internal
. code for SAVE. As another example G = GOTO would be 47 89
. Do not use any letter twice, and A C D E F L M S ! are existing
. commands
. hence V for SAVE and Z for CLS. ( L" is a special case )
.
X'51DD' = CD C7 83
X'8225' = C3 ED 83
X'51F0' = CD CB 83
X'83FD' = E2 86
X'8480' = 2A 84
X'81F3' = 05 84
X'8509' = C3 17 86
X'83C7' = 3E 3A 18 02 3E 3B F5 C5 E5 21 47 7F 3E 4F EF E1 C1 F1 EF C9
X'85DA' = F5 3E 4C B9 20 0B F1 F5 20 04 3E 93 18 02 3E C4 12 F1 C8 FE 22
C3 28 82
X'85F2' = 41 AB 43 05 44 AA 45 A7 46 04 4C 93 4D 02 53 03 21 BD
.
. V P N K R Z [ 3 SPARE ]
X'8604' = 56 CB 50 9E 4E 94 4B C8 52 8A 5A 9F 00 00 00 00 00
.
X'8616' = 00 01 3E 00 11 ED 83 21 DA 85 ED B0 C3 28 80
. eop
```

BAS/FIX adds the /BAS extension to basic programmes and 7 more single letter commands.

LSFEDIIA/FIX is an update on a previous patch for LSFEDII this modifies it for 6.3.1 library password (SYSTEM6) and the "U" command in now good to 2011.

MEMORY/FIX you may have already done this patch; it's for the memory library command if there's more than one screen displayed.

ALTRES/FIX Adds the BANK parameter so it can use any available bank in the range 1 to 31.

.FIX FOR ALTRES/CMD (part of the PRO - ESP package)
to use extra memory banks.

. John Grinday July 1990

.The parameter BANK=n (n=1-31) has been added abbr: B=n

. Use PATCH ALTRES/CMD ALTRES/FIX to apply

```
X'300E'=C3 7D 38
X'30C5'=CD B1 38
X'387D'=3E 11 EF C2 2C 33
X'3883'=01 07 00 79 FE 20 D2 2C 33 FE 00 CA 2C 33 32 46
X'3893'=31 32 C7 31 32 D0 31 32 23 33 32 92 33 32 2F 37
X'38A3'=32 C2 37 32 E0 37 CB FF 32 7C 37 C3 14 30 06 01
X'38B3'=DD 4E 0E C9
X'333D'=63 36
X'3663'="Requested"
X'36BC'=80 F6 53 59 53 52 45 53 00 7F 31 55 43 48 45 43
X'36CC'=4B 00 11 31 94 42 41 4E 4B 00 84 38 53 4F 46 46
X'36DC'=00 15 30 52 4E 4F 00 15 30 00
.EOP
```

```
.LSFEDIIA/FIX -04/05/90- Patches to LSFEDII/CMD
.Patch to LSFEDII/CMD to make the "U" command work with 6.3.1 date up
to 2011
.Alters library commands password to suit 6.3.1
.Set's date to system date and time to 12.00am
.use PATCH LSFEDII/CMD LSFEDIIA/FIX (O=N) will not work
.without the (O=N) on a BACKUP copy.
.alter message pointer
D00,2E=8D 64;F00,2E=03 41
.CALL EXTRA ROUTINE
D04,16=CD 90;F04,16=3E 58
D04,1C=42;F04,1C=EF
.ALTER VERSION NO.
D10,BD=33;F10,BD=30
.EXTRA CODE
D12,77=4E 6F 20 4D 65 6D 6F 72 79 20 74 6F 20 6D 61 70
F12,77=49 6E 73 75 66 66 69 63 69 65 6E 74 20 4D 65 6D
D12,87=20 6C 6F 61 64 20 6D 6F 64 75 6C 65 20 66 69 6C
F12,87=6F 72 79 20 74 6F 20 6D 61 70 20 6C 6F 61 64 20
D12,97=65 03 4E 6F 20 4D 65 6D 6F 72 79 20 74 6F 20 6D
F12,97=6D 6F 64 75 6C 65 20 66 69 6C 65 03 49 6E 73 75
D12,A7=61 70 20 64 69 72 65 63 74 6F 72 79 03 D5 11 10
F12,A7=66 66 69 63 69 65 6E 74 20 4D 65 6D 6F 72 79 20
D12,B7=00 19 36 00 23 3E 00 77 D1 3E 58 EF C9 00 00 00
F12,B7=74 6F 20 6D 61 70 20 64 69 72 65 63 74 6F 72 79
.END OF DATE ROUTINE
D1C,30=32 FD 33 7E C3 03 41 00 00 00 00
F1C,30=4F 7E D6 50 30 01 AF B1 32 FD 33
.extra routine for 6.3.1 at 4103H
D11,23=FE 0C 30 04 C6 14 18 02 D6 50 32 99 42 C9
F11,23=49 6E 73 75 66 66 69 63 69 65 6E 74 20 4D
.CHANGE MESSAGE ADDRESS
D1E,58=75;F1E,58=7F
.patch below changes password for system library files
. old = db0 new = vza
D26,E2=76 7A 61;F26,E2=64 62 30
.Message below only needed at start of program if there
.is not enough memory to run
.original space used as patch space
D32,D5=43;F32,D5=23
D32,F9=49 6E 73 75;F32,F9=02 02 0A 30
.The Fxx,xx for the following lines will differ disk to disk
.as these extend the programme (O=N) has to be used
D32,FD="efficient memory to load FED"
F32,FD="
D33,18=0D 02 02 0A 30;F33,18=00 00 00 00 00
.EOP
```

Fm MISOSYS, Inc: Thanks for all the fixes, especially the MEMORY command fix, as it saved me a little bit of work. No one ever reported that cosmetic error which would occur if the MEMORY display used more than one video screen; that's a lot of installed filters! But there were two things about it which I didn't like. First, there is a 32-byte data space starting at X'2984' which you would not necessarily have known about without looking at the source code. Your patch with the FIX code at X'29A0' could have been overwritten when that data space was used. I also like to spend more time squeezing a patch in by direct overwrite than by extending a library module with L-verb patch code. Fortunately, I was able to reduce the patch length by putting some of it in the "No memory space..." message. Here's the official patch.

```
. FIX631G/JCL - 08/27/90 -
Corrects MEMORY command
display when the
. information uses more than
one screen.
. Apply via, DO FIX631G
(D=d) where "d" is drive to
patch
//if -d
//. Must enter drive to
patch!
//quit
//end
PATCH SYS6/SYS.SYSTEM6:#D#
USING MEMORY1/FIX
PATCH BOOT/SYS.SYSTEM6:#D#
(D02,1F=48;F02,1F=47)
//exit
```

```
. MEMORY1/FIX - 08/27/90 -
Patch to LS-DOS 6.3.1 SYS6/
SYS
. Patch cleans up video
screen when data goes to 2nd
screen.
. Apply via DO FIX631G (D=d)
... see FIX631G/JCL
D04,63=18;F04,63=17
D04,6E=7F;F04,6E=0C
D04,DB=15;F04,DB=0F
D04,F2=CD 9C 27 C3 6A 27
F04,F2="No mem"
D04,F8="No memory"
F04,F8="ory space"
. Eop
```

Now to meld your BAS/FIX with Lloyd's BASICA compacting program to ensure they both are in sync.

Can TRSCROSS do this?

Fm Drew Panko, Hartsdale, NY: I have many files written using TRSDOS (v 1.3 and dated Sat May 2, 1981) on 5.25 disks using a Tandy Model III. I would like to purchase your TRSCROSS program if:

a) I will be able to read and translate TRS80 disks with my IBM Model 60 with a hard disk, 2 3.5 inch drives and an external Sysgen 5.25 inch high density drive. (Using DOS 3.3)

b) I will be able to read data on the TRS80 disks written by basic programs with lines such as: PRINT #2,F\$, (in a loop) PRINT #2,H(R,C); and PRINT #2, CHR\$(34)W\$(R) CHR\$(34)CHR\$(34)W\$(R)CHR\$(34)

c) I will then be able to import this data into Lotus 123 &/or Excel worksheets.

Will I be able to do all these with my equipment and with your program?

Fm MISOSYS, Inc: Dear Drew, concerning detailed specifications of TRSCROSS' requirements for conversion of your existing software, see our brochure on TRSCROSS. What follows

is an attempt to respond to your specific queries.

TRSCROSS should run on your PS/2 machine; however, since I have no experience with the external SYSGEN 5.25" drive, I cannot guarantee that TRSCROSS will be able to read and write using that drive. All MISOSYS software products can be returned within 30 days of purchase for a full refund of the product purchase price; S&H charges are not refundable. Thus, if you ascertain that TRSCROSS could not do the job you expect of it, simply return it in a "like new" condition.

TRSCROSS converts BASIC programs to ASCII so that they can be loaded into GW-BASIC or other BASICs for final editing of differences in dialect which cannot be automatically performed. TRSCROSS will do no translation whatsoever for data files; TRSCROSS will convert end-of-line character from CR to CR-LF for ASCII files. As far as data files generated by the typical BASIC statements you posed, such files are indeed ASCII files; if 123 or Excel provides a means to import space delimited data, then it should be obvious to you whether your existing data files are importable [I know that Excel can import line terminated data fields into a single column with a subsequent parsing of "fields" into multiple columns].

Again, note that TRSCROSS is returnable within 30 days if it cannot do the job for you.

TRSCROSS's command line invocation

Fm Gordon. D. Hercus, Saskatchewan: I have received the TRSCROSS programme which I ordered from you. Thank you very much. Unfortunately it has been unusable to me so far. I have a TANDY 3000HL. The "A" drive is a 5.25, the "B" drive is a 3.5 and the "C" drive is a 20 Meg hard drive. I copied TRSCROSS onto the hard drive into a directory "C:\Model4\trscross" and created a TRS.bat

file with the commands "Trscross /rf /1". I then started up the "TRS" file. I am converting Superscript and Visicalc files created on a Model 4P. I will then be using Wordperfect 4.2 on my PC.

From the menu, I choose either 1 or 5. In either case, when I enter the drive number (0 for drive A) the programme does not show my letter and jumps right into the programme. The message I receive is "reading system information". The next message is "trscross: disk error reading boot or GAT, strike any key". Striking another key takes me back to the menu. On occasion I have also received the message 'error 2800: stack overflow'. I cannot find this message explained in your manual or in my DOS manual.

I gather that part of the solution would be the GAP-PATCH. I would appreciate any and all information on this patch, as soon as Possible. Any other suggestions would also be appreciated.

Fm MISOSYS, Inc: Dear Gordon, Your problem report is not necessarily complete so I have to make some assumptions.

When you launch TRSCROSS with the command, "TRSCROSS /RF/1", you are setting the flag to utilize revisable form text for SuperScript conversion, and to initiate menu item 1 - Copy from TRS-80 diskette. That *automatic* operation copies files from drive 0 (which is the A: drive of MS-DOS) to the default path (current MS-DOS drive and subdirectory). To begin with, this command will certainly cause TRSCROSS to "jump right into the program"; that's what it is supposed to do. Was the current path C:\MODEL4? I suggest that you first refrain from using the "/1" command string because that forces automatic COPY operation. I don't think you want that - yet!

The "error 2000: stack overflow" is not a message which is explicitly displayed by the TRSCROSS program; rather, it is a message generated by a Microsoft C library subroutine linked with TRSCROSS during its generation. That will typically be generated by high-level language pro-

grams under certain conditions if you are using MS-DOS's default stack size. I suggest you read about "STACKS" in your DOS manual under a section on CONFIG.SYS, or *How to configure your system*. You should probably set a higher stack size.

I don't know the exact speed of a Tandy 3000HL; however, if it is much faster than a standard AT-class machine [somewhat doubtful], you may want to reduce its operating speed while attempting to read TRS-80 disks. Some machines have trouble with certain floppy I/O if they are running fast. DOS may automatically slow down such a machine when DOS is performing the floppy I/O; however, TRSCROSS must go "below DOS" to be able to read/write TRS-80 disks.

If you continue to have problems after following this advise, then get back in touch with us. Please make your report as complete as possible.

TRSCROSS and GAT Error

Fm Dennis Allen: I have version 2.00 TRSCROSS. Every time it tries to read a TRSDOS 6.3 disk (or any TRSDOS disk for that matter), it comes back with a error reading file/GAT... When I format a TRSDOS 6.x disk, my sister's model 4 says there's no disk in the drive. It's been about 3-1/2 years (and two computers) since I last used it. It's very possible it got corrupted in transition.

Fm David Arcand: Dennis, Sometimes you need to read the 40 track TRS-80 floppy disk twice in the MS-DOS 1.2meg drive. The first time will fail, the second time it will work fine. It has something to do with MS-DOS having to set which mode it is working in. This was an older copy of TRSCROSS through....

Fm Roy Soltoff/MISOSYS, Inc: Dennis, One thing you may try if you are trying to

run TRSCROSS on a FAST machine, is to manually set the speed lower. I have heard from some folks running TRSCROSS on fast 386 machines which do not automatically slow down during certain I/O operations, that TRSCROSS gave exactly that result until they stepped back to AT-speed (6-8 MHz). Something to try. I'll do a disk refresh for \$10+\$2S&H, if you need it.

Switch 286's Real/Protected mode

Fm Jim Beard: Microsoft figured a way to reset the '286 to the real mode without resetting, so OS/2 could be run on '286 machines. There exist several protected mode compilers which run under DOS. Anyhow, it is possible, if difficult. I do need a symbolic debugger occasionally, and if I use assembly language, I will need it a lot more often. The profiler is another matter entirely; it can help anyone who has a speed problem with a program.

Fm Shane Dawalt: Indeed, Microsoft did figure out a way to reset the '286 without rebooting DOS, and I have found how they do it. The AT was designed with the expectation that the 286 would be used in protected mode. The AT BIOS has an interrupt dedicated specifically to protected mode. To set the 286 into protected mode, you invoke this interrupt with the registers set in a certain way. The BIOS generates the GDT (Global Descriptor Table) plus an IDT (Interrupt Descriptor Table) interrupts vectors into protected mode. The initialization is, of course, allowed to expand upon the IDT as well as the GDT.

When the software wants to exit from protected mode, the machine must be reset since, as you noted, the 286 cannot be kicked out of protected mode without resetting. This is done by sending an instruction to the 8024 keyboard chip. This instruction causes the internal reset line to be activated just as if a power-up reset was taking place. But before this is exe-

cuted, a special code is inserted into a protected-mode storage area in CMOS. The location where to begin execution from in real-mode is also placed in the CMOS. After the hardware reset is performed, the BIOS checks this "special code" in CMOS and if set to a certain value, the BIOS picks up the real-mode execution startup address and jumps to that location. MSDOS regains control after the program terminates. BIOS memory testing and MSDOS bootup are bypassed.

Fm LDOS Support: There are (I believe) three ways back out of protected mode to real mode: (1) Reset the processor; (2) The infamous LOADALL instruction; (3) The even more infamous "Triple-Fault".

The first method was the first discovered. As a matter of fact, IBM implemented this from day one on the AT. Basically, you tell the keyboard controller (an 8042, I believe) to reset the cpu by remote control, after setting up memory flags. The cpu literally re-boots, but as part of the boot process it checks these flag and data areas, and resumes in real mode if appropriate.

The second method I'm not too sure about, have merely heard about it as available as an undocumented "test" instruction on all known masks of the 80286.

The last method is the most fiendish, and was discovered as an alternative to method #1 when the penalty, ah, DOS compatibility box was being developed for OS/2. Basically, you set up the protected mode control registers in a special way, then invoke an instruction fault. You have set it up so that attempting to execute the instruction fault handler creates a protection violation which then results in a protection fault. You have also toasted the protection handler so that then generates a third fault. The results so confuse the CPU that it has no where else it can go in protected mode, and it drops into real mode. I'm sure I have the sequence of faults and the exact combo wrong (there's only one set that works), but you get the idea.



MIDI Your TRS-80

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So you'd like to get into computerized MIDI, but you already own a computer and there's no commercial interface or software for your favorite machine? If that's been holding you back, this project is for you. Although the parts are not exactly dime-store items, you can get them by mail order for less than \$50 (see references for supplier list) and no fancy hardware knowledge is required. You will need to be able to use a soldering iron or a wire-wrap tool, and read a circuit diagram. A digital or analog multi-function meter is necessary, and a logic probe or oscilloscope will help if you have to debug your board after building it.

This hardware interface is designed to provide IMA standard MIDI in, out, and thru for a Radio Shack TRS-80 model 3, 4, 4D, or 4P. Other Z-80 based systems, including the model 1, 2, and 12, Kaypro Z-80 machines, Heath/Zenith Z-80 equipment, and S-100 systems should be able to use this interface after some adaptation of the bus interface portions.

What about software? No commercial software is available, but you can write your own simple programs from scratch in assembly language, C, or another compiled language (Fortran anyone?) and I will provide a reference for some excellent C code that can be adapted without too much trouble. Sure, your TRS-80 won't generate flashy graphics and colored windows, but it can function as an efficient patch librarian and a decent multitrack sequencer if you are able to work up the right software combination from sample routines in C and the assembly language interrupt module provided here.

Construction Details

I chose LS-TTL devices because they are readily available, inexpensive, and use relatively little power. The circuit could be quickly adapted to high-speed CMOS if you are familiar with the requirements of the latter. The only chip used that is difficult to obtain is the PC-900 optocoupler. I bought several from the Sequential Circuits parts department, since I own a Six-Trak. Check with keyboard repair operations in your area or call the manufacturer of your MIDI instruments for optocoupler availability. With appropriate pin changes, other chips may work in place of the PC-900.

You will need a source of steady DC current at about 9 volts and 400 milliamps to power the interface. I used a surplus power adapter from a calculator. The on-board 7805 regulator adjusts the power to exactly 5 volts for the TTL circuitry.

I used wire-wrap construction on a piece of experimenter's perfboard to build my prototype, and after initial debugging I soldered the wires in place. It looks a little funky, but it's still working fine after two years. You can use whatever construction methods you feel comfortable with, but make sure you do a neat job, and keep the length of connecting wires as short as possible. Use sockets for the chips so you can replace them or rewire any mistakes without handling the IC's themselves.

Build the power regulator section of the circuit first, and test it before continuing. A simple voltmeter reading is adequate. You should see a steady voltage at the 7805 output pin between 4.9 and 5.1 volts DC. If the reading varies from this level, try another 7805 and/or check your wiring. Don't feed incorrect voltages to your TTL chips, or you will destroy them. Connect a 220 ohm 1/2 watt resistor from the 7805 output to ground, and check the voltage again. Still 5 volts? Good, it's safe to proceed.

Use wire-wrap sockets with long pins, and attach them to the perfboard with a drop of glue. If your experimenter's board has printed circuit bus lines for the power supply, wire these and use them. If not, position several soldering pins along the middle of the board for the +5 and ground connections, and solder these to a supply wire, preferably no. 18 or larger. Color-coded insulation is helpful but not necessary. Just make sure you can tell which supply points are live and which ones are grounded, so you don't connect any chips backwards. If you make that mistake, after the smoke clears you'll have to start all over.

Install several 0.1 microfarad disk capacitors along the power bus, between the +5 volt line and the ground. These bypass caps will help absorb the spikes created when the gate voltages switch rapidly during operation.

Now install the IC sockets and remaining parts. Make each connection carefully, then double check it for correct location. Finally, check it off on the diagram with a small tick. Connections to +5 volts or ground are indicated in table 1 and most are omitted from the diagram to keep the picture simple. After all the wiring is complete, and you are sure it is correct, power up the board again and test the voltage at each socket. If it still shows a steady +5 volts on each supply pin, you are ready to install the chips.

You can use a grounding wrist strap from Radio Shack for this operation, or just work on a sheet of foil or a cookie sheet. Avoid static electricity, which can damage the chips. Don't work in a carpeted room or under very dry conditions if you can avoid it. Be careful not to bend pins, and be sure to match pin one of each chip to pin one of the socket. The end of the chip with pin one is usually marked with a white dot, or has a curved notch in it.

An interface cable is required to connect the board to the I/O bus (the one normally

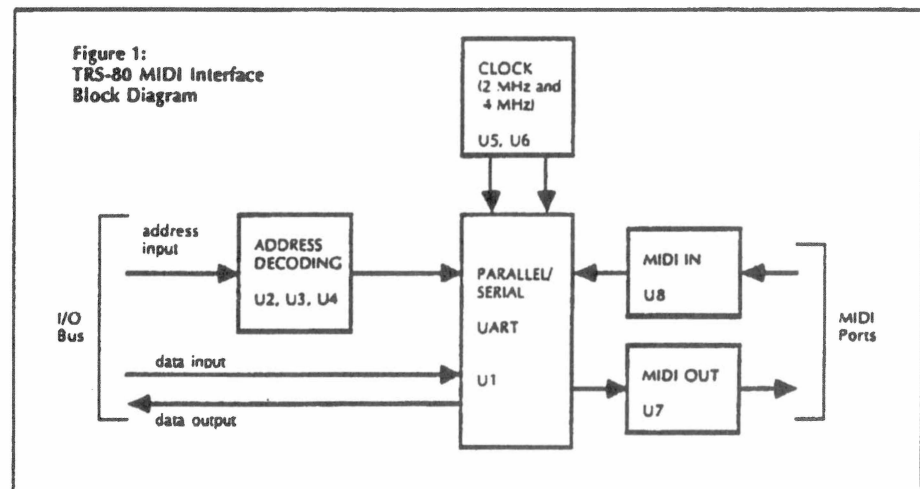
used for a hard disk drive) on the TRS-80. If you have a hard disk installed and want to use it for program and data storage with the MIDI interface, you will need a "Y-connector" for the port, available from Alpha Products (see references).

By using a male 50-pin dual header on the interface board, I was able to wire a straight-through cable from 50-conductor flat ribbon cable, using a female dual header on one end, and a 50-conductor female card edge connector on the other end. Shorter lengths (under 36 inches or so) will be most reliable. Radio Shack sells a cable intended for their 5-megabyte hard disk that can be used, but you can build your own for less money.

After chips are installed, and you check once again for accuracy, apply power to the board. If there's no smoke, and nothing gets hot (warm is OK), you are ready for a functional test. Turn power off, and attach the interface cable to the 50-pin header. Attach the other end of the cable to the 50-pin card edge of your computer (with the computer turned off, please). Be sure you orient the card edge connector correctly, pin one to pin one. Each model of TRS-80 is different in this respect, so check your technical manual for accuracy. Power up the interface first, and if no immediate problem appears, turn on the computer. If the computer does not initialize normally, shut it off immediately, and recheck all connections to the bus at both ends of the cable. The computer does work when the interface is not attached, right? Try it to be sure, and then examine your cable and board for bad connections or shorts.

Once you get both the computer and the interface operating without apparent problems, turn off the power again and add MIDI cables between the interface and your keyboard. MIDI In on the interface connects to MIDI Out on the synth and vice-versa, OK?

Enter the Basic test program from listing 1, and run it. If everything has gone well, you will hear the synth play a scale and then stop. It worked? Good, that means that the output circuitry and bus interface are functioning. If it didn't do anything, or you got strange results ("stuck" notes, weird noises) then immediately turn even-



rything off and recheck all steps up to this point. If you can't find the problem, proceed to the debugging discussion at the end of this article.

Testing the MIDI In port is more difficult. Basic isn't fast enough to trap the codes generated by key presses on your synth unless it is assisted by a routine in assembly language. If you have an assembler, you can assemble the small test routine in listing 2 and run it. Press a few keys slowly (no, this won't handle any fast riffs) and you should see the MIDI codes appear on your screen. If that works, you are ready for software development.

How it Works

The block diagram in figure 1 shows the four main subassemblies of the interface. The Z-80 bus is a parallel bus. That means that all eight data bits or eight port address bits are transferred simultaneously over eight separate conductors. MIDI is a serial communication system, in which each bit is transferred sequentially over the same wire. The Z-80 SIO chip at the heart of the interface performs translations from the computer's parallel bus to MIDI's serial bus and back. The address decoding circuitry keeps the interface from responding to I/O requests destined for other internal or external devices.

The clock uses a crystal to generate square waves at 4 MHz to drive the SIO. A dual flip-flop (U6) divides this frequency by two, generating a 2 MHz signal to set the appropriate baud rate for MIDI. The SIO will internally divide this frequency by 64

when it is properly initialized by the software, thus yielding the standard 31.25 kilobaud rate of MIDI.

Power supply regulation by the 7805 guarantees a steady 5 volts DC to power the other parts of the interface. By feeding 9-12 volts into the 7805, we provide a little extra protection against undervoltage if the AC line voltage droops.

Writing the Software

This is the hard part of the project, I'm afraid. If all you know is Basic, you're going to have to do some studying. If you already know C and have a good compiler, you're practically home free. You can write MIDI applications for the TRS-80 in any language that is fast enough to keep up with your intended operations.

Suitable C compilers are available from MISOSYS or Manx Software Systems. The Microsoft Fortran available through Radio Shack also works very well if you like Fortran. Turbo Pascal is suitable, if you run CP/M rather than TRSDOS, and some sample code by Donald Swearingen is available (see references).

Jay Kubicky's article in *Byte* (again, see references) has complete C source for a simple sequencer. A patch librarian does not demand as much speed as an eight track sequencer, and will be easier to design and write, as well. If you must use Basic, get a Basic compiler because interpreted Basic just isn't fast enough on these machines.

The SIO control and data ports are mapped as shown in table 2. Channel A is the MIDI In channel, and also the MIDI Out channel. If the jumper is installed for alternate MIDI Out, then Channel B can be used to provide a totally separate MIDI output to the MIDI Thru connector. With the jumper in the position shown on figure 2, however, Channel B cannot be used at all and the MIDI Thru connector will "echo" whatever is received at the MIDI In port. If you wish to change the base port assignment to something other than port address 64, you can do so by rewiring the sections of the 74LS04 (U2) appropriately. The address I used is not in conflict with any internal or typical external TRS-80 device of which I am aware.

Listing 3 is a simple device driver for TRSDOS or LS-DOS that provides unbuffered I/O with time-stamping of received data. This driver supports the same operations that are provided by the DOS standard serial port driver, including use of the "wake-up" vector to permit immediate buffering of input by your application program. See the technical documentation for your DOS version for details on use of standard device I/O.

The SIO can be programmed using the standard techniques described by Coffree or Zilog (see references). This sample driver merely presents one of many viable approaches.

Patch librarians do not generally require timing information, but sequencers do. The internal clock interrupt of the TRS-80, running as it does at 60 Hz, can be used to time input and output information for several tracks in a sequencer. Software timers driven by this interrupt can be linked through the task controller of the LDOS, TRSDOS, or LS-DOS operating systems. Alternatively, a Z-80 CTC or similar independent timer could be added to the interface design.

If you have a model 4 computer, by far the most common TRS-80 these days, you may also wish to look into a speed-up and memory expansion board. I use the XLR8er board from H. I. Tech, which gives the equivalent of an 8 MHz CPU speed and an added 256K of memory with a fast RAMdisk driver. The XLR8er has a Z-80 compatible CPU replacement, the Hitachi HD64180, which includes additional serial ports and two built-in timers that can be used in your MIDI software.

While the TRS-80 may not be suitable for high-powered professional studios or stage performers, it is entirely adequate for use by any intermediate or advanced amateur or hobbyist in the MIDI music field. Developing your own software takes a while, but when you finish you will have a more thorough understanding of the internals of MIDI and the hardware underpinnings of your music. After all, Wendy Carlos designs her own hardware

and writes her own software, and still finds time to create beautiful musical compositions, so why should you feel forced to buy canned software and commercial hardware? The feeling of satisfaction at creating your own interface and working software can be very rewarding in its own right.

Debugging Clinic

So you built it but it doesn't work? This may sound monotonous, but the first thing to do is go back over the instructions and check every step. Be absolutely sure your circuit matches the diagram.

Use the voltmeter to check supply voltages at each chip. Test the interface cable for shorts or open circuits. Is your computer working correctly? Are you sure the synthesizer is enabled to accept MIDI input? (Some equipment requires a console command sequence before it "listens" to MIDI commands. Check your manuals.)

If it still doesn't work, you are going to need a logic probe or an oscilloscope to check things out. Get help from someone with a little experience if you don't know how to use these tools.

Make sure the 4 MHz clock is cycling on your interface. Then be sure the divide-by-two flip-flop is supplying 2 MHz to the Z-80 SIO.

Test the bus interface on your computer by attaching some other known working device, such as an Orchestra 90. If MIDI output works, but not input, check the *EXTIOSEL signal to be sure it is being pulled low when input is requested from the SIO.

If replacement chips are available, try swapping them. You can occasionally get a bad chip from a dealer, or may have bent or broken a pin while installing it.

Above all, persevere. I had some trouble getting the 4 MHz clock working at first, but replacing the parallel capacitor did the job. Other than that, it worked right from the beginning, and I'm not an advanced technician or designer.

Table 1: IC Power Connections

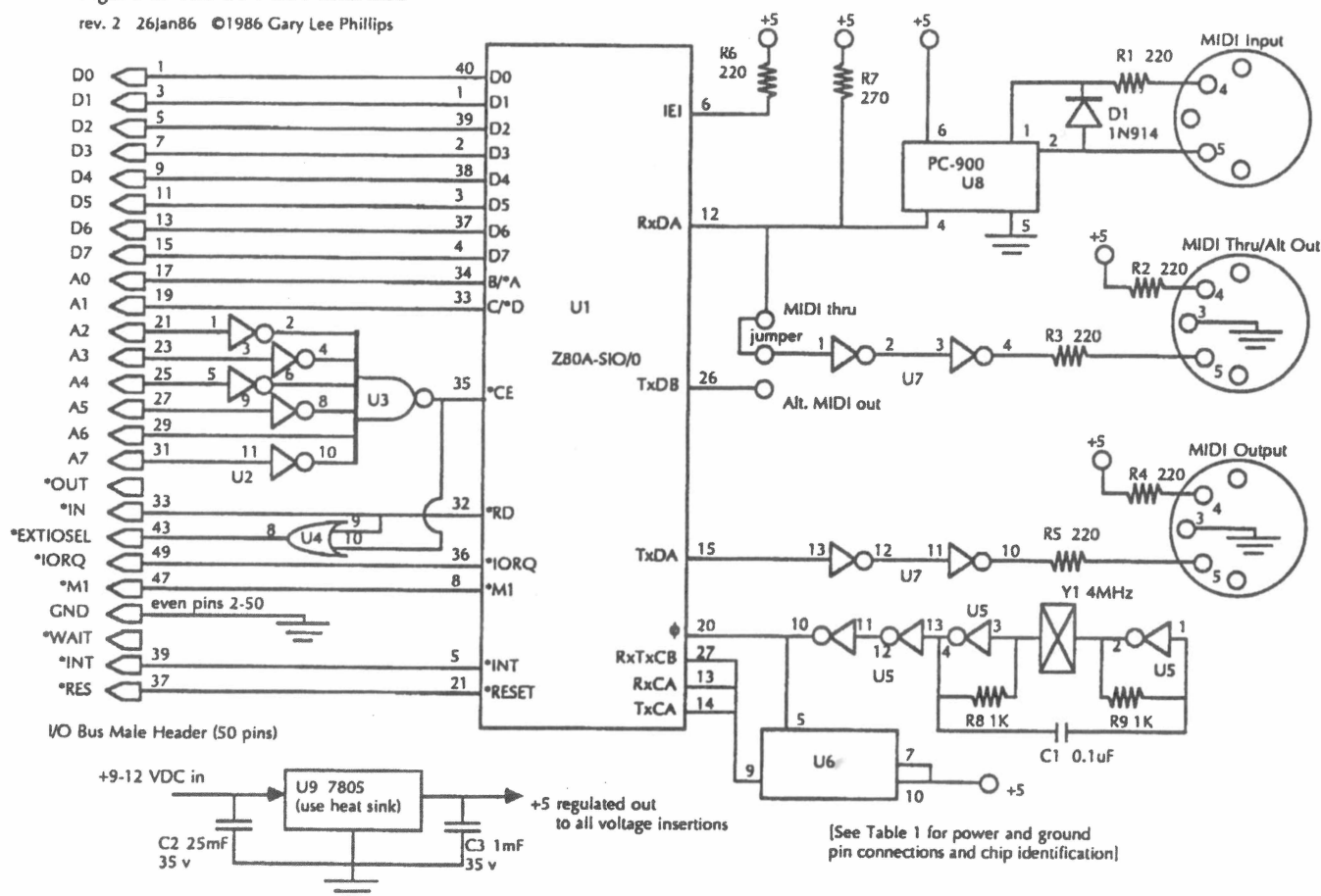
	<u>+5 volts</u>	<u>Ground</u>
U1 Z-80A SIO	pin 9	pin 31
U2 74LS04	pin 14	pins 7,13
U3 74LS30	pins 11,12,14	pin 7
U4 74LS32	pins 1,4,12,14	pin 7
U5 74LS14	pin 14	pins 7,5,9
U6 74LS73	pins 4,7,10	pin 11
U7 74LS05	pin 14	pins 5,7,9
U8 PC-900	pin 6	pin 5

Table 2: Port Address Decoding

<u>Address</u>	<u>Port Identification</u>
64 (40H)	SIO Channel A data
65 (41H)	SIO Channel B data
66 (42H)	SIO Channel A control/status
67 (43H)	SIO Channel B control/status

Figure 2: TRS-80 MIDI Interface

rev. 2 26Jan86 ©1986 Gary Lee Phillips

**References: Parts suppliers:**

Alpha Products, 242-B West Avenue, Darien, CT 06820—bus cables and interfaces.

Radio Shack, 1 Tandy Center, Ft. Worth, TX 76102: perfboards, tools, capacitors, connectors, sockets, resistors, cables.

JDR Microdevices, 2233 Branham Lane, San Jose, CA 95124, 800-538-5000: stocks all IC's and parts except the PC-900.

Jameco Electronics, 1355 Shoreway Rd., Belmont, CA 94002, 415-592-8097: stocks all IC's and parts except the PC-900.

References: Printed data:

Coffree, J. *Z80 Applications*, Sybex, 1983.

Good explanation on use of Z-80 SIO for serial I/O.

Kubicky, J. "A MIDI Project." *Byte*, June, 1986, p.199. Programs available on diskette from *Byte Listings*.

Soltoff, R. *The Programmer's Guide to LDOS/TRSDOS Version 6*, 1983. Available from MISOSYS, Inc. (see below)

Swearingen, D. "MIDI Programming." *Byte*, June, 1986, p.211. Programs available on diskette from *Byte Listings*.

Zilog, Inc. *Z-80 SIO Technical Manual*, 1978.

References: Compiler vendors:

Borland International, 4585 Scotts Valley Dr., Scotts Valley, CA 95066—Turbo

Pascal for CP/M-80 operating system.

Manx Software Systems, 1 Industrial Way, Eatontown, NJ 07724 — Aztec C for CP/M-80 and TRSDOS operating systems.

MISOSYS, Inc., P.O. Box 239, Sterling, VA 22170—C, RATFOR, macro assembler for TRSDOS. Also sells the XLR8er enhancement board.

Radio Shack, 1 Tandy Center, Ft. Worth, TX 76102—Microsoft Fortran for TRSDOS, model 4 version includes macro assembler.

Note: TRS-80 and TRSDOS, CP/M, Z-80, Turbo Pascal, XLR8er, LS-DOS, Six-Trak, and Orchestra 90 are registered trademarks of Tandy, Digital Research, Zilog, Borland International, MISOSYS, Sequential Circuits, and Software Affair respectively.

Listing 1

```

10 REM - Sample program to test MIDI output
20 REM - Should play a major scale on C
30 REM - Copyright 1988 Gary Lee Phillips
40 REM - First initialize the interface
50 REM - Polled mode, no interrupts
60 A% = 64 : REM - Set base address
70 RESTORE
80 FOR I% = 1 TO 11
90 READ N% : OUT A% + 2, N% : OUT A% + 3, N%
100 NEXT I%
110 REM : Now send commands to play 8 notes
120 C% = 3 : REM - Set base channel (1-16)
130 FOR I% = 1 TO 8
140 REM - Turn on a note
150 READ N%
160 OUT A%, 143 + C% : REM - note on
170 OUT A%, N% : REM - pitch
180 OUT A%, 64 : REM - velocity
190 REM - Let note sound for a while
200 FOR J% = 1 TO 300 : NEXT J%
210 REM - Turn same note off
220 OUT A%, 128 + C% : REM - note off
230 OUT A%, N% : REM - pitch
240 OUT A%, 64 : REM - velocity
250 REM - Wait a while before next note
260 FOR J% = 1 TO 75 : NEXT J%
270 NEXT I% : REM - Play next note
280 END
290 REM - Initialization code values
300 DATA 24, 20, 196, 19, 193, 21, 104, 18, 255, 17, 0
310 REM - Major scale pitches
320 DATA 48, 50, 52, 53, 55, 57, 59, 60

```

Listing 2

```

; TESTINP - brief test for SIO MIDI input
; Be sure synthesizer MIDI output from keyboard
; is enabled. Assemble and run program, and
; MIDI codes will be displayed on screen as
; keys are pressed or released.
; Copyright 1988 Gary Lee Phillips
ORG 3000H
TESTINP LD A, 69H ; Clear screen
RST 28H
LD HL, SINON
LD A, 0AH ; Display message
RST 28H
; Initialize for polled mode receive
LD B, ICNT ; No. of bytes
LD HL, IDAT ; Initialization data
INIT LD A, (HL) ; Send init codes
OUT (42H), A
OUT (43H), A
INC HL ; Point to next
DJNZ DJNZ INIT ; Loop till done
TEST LD A, 6AH ; Test Break key
RST 28H
JR Z, READ
LD A, 16H ; Normal exit
RST 28H
READ IN A, (42H) ; Get status
AND 01H ; Data ready?
JR Z, TEST ; No, try again
IN A, (40H) ; Yes, read it
LD C, A
LD HL, BUFF
PUSH HL
LD A, 62H ; Convert to hex
RST 28H
POP HL
LD A, 0AH ; Display value
RST 28H
JR READ ; Try next
SINON DB 'MIDI Input Test.'
DB 'BREAK to quit.', 0AH, 0DH
BUFF DB ' ', 20H, 03H
IDAT DB 18H, 14H, 0C4H, 13H, 0C1H
DB 15H, 68H, 12H, 0FFH, 11H, 00H
ICNT EQU $-IDAT
END TESTINP

```

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TRS-80'S and Laser Printers

You probably remember the television ad that Apple ran a few years ago which involved several businessmen with IBM computers seeing things produced by their competition on a Mac. They were tearing their hair out with the complaint, "Why can't WE do that?" No doubt, a lot of TRS-80 owners have felt the same way as they've seen the beautiful things produced by laser printers on other people's computers, including, perhaps, this publication. Well, you can do it - at least some of it. You may have to reflect whether you're not a deep-down masochist to want to do it on a TRS-80 when prices of IBM clones are so cheap, but people with TRS-80's ARE doing it. In this article, I'll try to explain what's involved.

First of all, using a laser printer is not easy, contrary to everything you may have heard. Scripsit on a Model I was easy (assuming your expansion interface cable didn't cause the computer to reset in the middle of a document). There weren't a lot of commands to keep track of; Scripsit wouldn't even allow you to do underlining. Word processors with non-laser printers generally don't involve much more than what you would be doing on a typewriter, only the computer allows you to automate the process. With Scripsit, you could use either pica or elite type, which are mono-spaced: all the letters are the same width. Later-generation word processors supported proportional type (an "m" will be wider than an "i"), but the faces were still about the same overall size as pica or elite. Precisely because 300 dot-per-inch printers are so versatile, you have to deal with a lot more commands and considerations in printing something.

You are really doing typesetting rather than word processing. Type sizes can range from 6 points, which you can barely see without a magnifying glass, to letters over an inch tall. Every time you change typefaces, your word processor has to change width tables, and you may also have to change the number of lines per inch. Moreover, with a simple mono-spaced printer, what you see on your screen is pretty close to what your print-out will actually look like - but since a TRS-80 screen can't display multiple typefaces in multiple sizes, what you see when you use a laser printer may be entirely different from what you get when you print it. And if you have many type fonts, a hard disk becomes a very nice thing to have (though not absolutely necessary). In short, if you want to get a laser printer, you should be pretty familiar with your software, or know someone else who is. For you'll have to spend a lot more time configuring your system and formatting documents than you are probably now used to. You may even have to read the manuals that came with your word processor and your printer!

You also need to be clear about what you can and can't do with a TRS-80 and a laser printer. By and large, you will be printing text. There are no programs like PageMaker or First Publisher available for the TRS-80 which allow you to display text and graphics together on your computer screen, move them around at will, and then print it all out. What you'll see on your screen will be text interspersed with a lot of embedded printer commands, and it will probably look nothing at all like the printout. You are not going to design a magazine cover on your TRS-80 (at least not an elaborate one). On the other hand, for resumes, business letters, pamphlets, or complete books, the TRS-80 can produce printed material just as good as the stuff systems costing hundreds of dollars more put out. And precisely because it doesn't have to reproduce it all in fancy graphics on your

screen, it can often format and print it faster.

LASER PRINTERS, FONTS, AND WIDTH TABLES

How, exactly, do laser printers work? They have been around for several years, now, and two general standards have emerged. The first has been set by the Hewlett Packard line of printers, using Hewlett Packard's Printer Control Language (PCL). PCL is simply a series of escape sequences or codes to get the printer to do various things, so "language" is a rather fancy description of it. There is no PCL command, for example, to print a circle. The HP printers and their compatibles are the least expensive in the laser printer market. The HP LaserJet IIP is being sold at discount for under \$1000. The compatibles are generally cheaper than the HP machines, but a caveat emptor is in order here: some are more compatible than others, and you never seem to know how compatible a machine is until after you buy it (when it may be too late). The other group of printers are those using the PostScript page description language created by Adobe Systems. These are more versatile than the HP-standard printers; PostScript can scale a typeface to any size you want as well as handle a wide range of graphics. Understandably, these printers are also more expensive. And since no TRS-80 software supports them, you can forget them unless you want to buy a whole new computer. When you talk about interfacing a TRS-80 with a laser printer, you're talking about the HP and compatible printers. So, unless I specifically say otherwise, when I discuss printers here I will be discussing the Hewlett Packard family of printers, not the PostScript one.

When you print with a HP printer, you have to choose a font or style of type for your document. Type comes in families, and within each family there are different sizes and styles. If you are using Times

Roman, you have to contend with normal upright letters of various sizes; then there are *Times Roman italic*, in the same sizes; **Times Roman bold**; and finally *Times Roman bold italic*. There may also be expanded or condensed versions of the typeface. Each style and size comprises a font. 10 point Times Roman is one font; 10 point Times Roman italic is another. (10 point type is the size of the text in most books [and in this Quarterly -ed]). There are also two different font orientations. Most fonts are called portrait fonts; they print across the width of a sheet of paper as with a business letter. If you want to print the length of a sheet, you use a font in landscape orientation. (With old-style printers, you got the same effect by inserting the paper either upright or sideways; laser printers accept paper only one way, so in effect for landscape mode you turn the font sideways instead of the paper). Each font has to be in the memory of the printer before it can be printed. Fonts can take up a lot of memory. A 10 point font might be only 15K long, but a 30 point font with the extended character set (ASCII 32-255 rather than 32-126) can be well over 100K. Luckily, as noted above, we're talking about PRINTER memory. You don't need a TRS-80 with 2 meg of memory to print with a LaserJet printer. 64K will work fine, though 128K is more comfortable (programs with the code to handle a laser printer generally require more memory than those without it). You may, however, need a printer with a lot of memory if you want to use a lot of fonts or graphics at the same time.

Fonts for the LaserJet come in three forms. A few fonts are built into the ROM of the printer itself when you buy it, usually mono-spaced Courier (the standard typewriter face) and some variations on it. Non-HP printers seem to offer more built-in fonts to compete with HP, but often they are just more variations on Courier. The second form is in plug-in cartridges. These fit in slots in the printer just like Super Mario Brothers II fits into a slot in your kid's video game system, but instead of a video game you get different sizes of (say) Times Roman in normal and italic faces. Cartridges have both advantages and disadvantages. Their main advantage is that they are almost immediately accessible. You turn on the printer

```

TITLE    <MIDI/DVR 1.0>
; MIDI interface driver to handle I/O to the Z80A-SIO.
; This module is interrupt driven and supports the
; @GET, @PUT, and @CTL macros. The following @CTL
; functions are implemented:
;
;           @CTL 00HReturn status image (RR0 A)
;           @CTL 01HSend Break (MIDI Reset)
;           @CTL 02HInitialize SIO hardware
;           @CTL 04HSet Wake-Up vector
;
; Gary Phillips, Chicago, IL
; March 21, 1986
;
COM       '<Copyright (c) 1986 Gary Lee Phillips>'
ASEG
ORG       3000H
MOD00    EQU    $                ;Entry point for SET
LD        A,106                  ;@CKBRKC SVC
RST       28H
JR        Z,MOD10                ;No Break so go
LD        HL,0FFFFH              ;Break pressed so
RET       ; abort the install
MOD10    EQU    $
LD        (MODDCB),DE            ;DCB ptr in place
PUSH      DE
POP       IX                     ; also into IX
LD        HL,SINON               ;Display banner
LD        A,10                   ;@DSPLY SVC
RST       28H
LD        A,101                  ;@FLAG$ SVC
RST       28H
LD        A,(IY+'C'-'A')         ;Is this a SET?
AND       08H
JP        Z,MOD95                ;No, so error
LD        DE,MODNAM              ;Ptr to module name
LD        A,83                   ;@GTMOD SVC
RST       28H
JR        NZ,MOD20 ;Not found
SPACE    1
SUBTTL   CHECKING INSTALLATION ENVIRONMENT
EX        DE,HL                  ;Found so must test
LD        C,(HL)                 ; for reinstall
INC       HL
LD        B,(HL)
LD        HL,0006H               ;Offset DCB by 6
ADD       HL,BC
LD        A,(HL)                 ;Get device name
INC       HL
LD        H,(HL)                 ; in DE, and
LD        L,A                    ; put into msg
LD        (ERRDEV),HL            ; for error
LD        HL,(MODDCB)            ;Get our DCB ptr
XOR       A                      ;Clear carry flg

```

```

SBC    HL,BC                ;Compare ptrs
JP     NZ,MOD80 ;No match so error
JP     MOD50                ;Match, is reinstall
SPACE  2
MOD20  EQU    $              ;Install first time
PUSH   IY                  ;FLAGS$ ptr
POP    BC                  ; also in BC
LD     HL,3*2-44            ;Offset of INTVC$(3)
ADD    HL,BC                ;Find location
LD     (INTV@),HL           ; and save ptr
LD     HL,'M'-'A'           ;Offset of MFLAG$
ADD    HL,BC                ;Find location
LD     (MFLG@),HL           ; and save ptr
LD     HL,'W'-'A'           ;Offset of WFLAG$
ADD    HL,BC                ;Find location
LD     (WFLG@),HL           ; and save ptr
LD     A,(IY+1CH)           ;Opcode of @ICNFG
LD     (ICNFG$),A           ; save it
LD     L,(IY+1DH)           ;Get vector and
LD     H,(IY+1EH)           ; save it
LD     (ICNFG$+1),HL
SPACE  1
SUBTTL  FIND APPROPRIATE LOCATION
;
; Try to install in low memory I/O driver area
;
LD     DE,'IK'              ;Find *KI DCB
LD     A,82                 ;@GTDCB SVC
RST    28H
JP     NZ,MOD85             ;No *KI device?
DEC    HL                   ;MSB of DVRHI$
LD     B,(HL)
DEC    HL                   ;LSB
LD     C,(HL)
LD     (MODRS@),HL          ;Save ptr
LD     HL,RESLEN-1          ;Take length of the
ADD    HL,BC                ; resident code, add
LD     (NEWHI$),HL          ; to get new DVRHI$
LD     DE,1300H             ;Max permitted DVRHI$
XOR    A                   ;Clear carry flag
SBC    HL,DE                ;Compare to max
JR     C,MOD40              ;OK, install here
;
; Didn't fit in low memory, so must try high
;
LD     A,(IY+'C'-'A')       ;CFLAG$ says ok to change
AND    01H                  ; HIGH$ value?
JP     NZ,MOD90             ;No, must abort
LD     HL,0000H             ;Yes, so get HIGH$
LD     B,L
LD     A,100                ;@HIGH$ SVC
RST    28H
LD     (NEWHI$),HL          ;Will be end of module
XOR    A                   ;Clear carry flag

```

and you can start printing with whatever fonts you've plugged in. Their disadvantage is that they aren't very flexible; you may not like the combination of fonts the manufacturer has included in a cartridge, but you have to buy all or nothing. Further, if they are proportional typefaces, you may need width tables for the letters, and these are not always easy to get from the manufacturer. I've actually seen manufacturer-supplied width tables that were inaccurate. It is possible to compute a width table yourself by printing lines of all the characters in a font and then measuring them, but it is not a very pleasant way to spend an afternoon. Finally, cartridge fonts are generally more expensive than the third type of font, the download or soft font.

Soft fonts come on disk. There are literally hundreds of them available on the market, and many of them are in the public domain (i.e., free). You can download the latter from BBS's. Some font disks sell for as little as \$15 each. The way these work is as follows: when you want to use one, you transfer or download it from the disk into the printer memory. The big advantage of soft fonts is their flexibility; you can use any combination of typefaces you want. They are also easy to examine or even modify, being on disk. There are a number of Model 4 utilities which will read a soft font and compute all the character widths or even correct simple errors in the font header. Their disadvantage is convenience. You always have to download them into the printer before you print with them, and the more fonts you want to use, the more time you have to wait getting them downloaded. And while you CAN download soft fonts one at a time from floppy disks (I do), real aficionados prefer a hard disk so they can set up a JCL file and download ten or fifteen all at once while they do something else.

HP has defined what a soft font file looks like; it has a header with various information followed by raster code for the combination of dots that will produce each letter. A soft font file is a normal data file, and it is the same regardless of what kind of computer disk it might be found on. It is not specific to any particular operating system, like a CMD file or an EXE file in

MS-DOS. This is fairly important, for otherwise you couldn't use a laser printer with a TRS-80. Most soft fonts come on IBM disks, but the printer is perfectly happy if one is loaded into it from a TRS-80 disk. Before you buy a laser printer, though, you need to reflect a little how you intend to GET the fonts from IBM to TRS-80 disks. Of course, if you plan to use only cartridge fonts, this isn't a problem. But for soft fonts it's critical. Manufacturers of soft fonts generally give you the option of ordering 5 1/4 or 3 1/2 inch disks, but they are all in IBM disk format. One option is to have access to an IBM-compatible machine and then transfer the fonts from it to your TRS-80 with a null modem cable. Another is to limit yourself to fonts in the public domain and assume you can find everything you want on local BBS's waiting for you to download them to your system. The simplest option is to use HyperCross PC, sold by Hypersoft of Raleigh, North Carolina. This program allows you to read MS-DOS disks on a TRS-80 and to transfer files from one format of disk to the other. It helps if you have double-sided drives, because otherwise you can read only single-sided IBM disks, which few people use anymore. And you would have to contact the font manufacturers to find out if they would be willing to supply their fonts in single-sided IBM format: some will, some won't. If you want to use soft fonts, which will give you the most variety of type styles, you really need some way of accessing IBM disks. HyperCross is a must for this.

In the long-term, both cartridge and soft fonts may be obsolete. Font manufacturers now seem to be striving to produce programs that output letters in the style and size you want directly into the printer without worrying about a discrete font of letters. Or if they do involve fonts, you buy a program which produces them at command rather than buying a collection of fonts already created for you. These programs are trying to emulate some of the features that are automatic with a PostScript printer. You may be familiar with the names of some of them if you've browsed around much in the literature on laser printers: Glyphix by SWFTE International, Fontware by Bitstream. The programs, though not the font files produced by them, are specific to the IBM

```

LD      BC,RESLEN      ;Calculate new HIGH$
SBC     HL,BC
LD      B,00H          ;And reset HIGH$
PUSH    HL              ; (save it, too)
LD      A,100          ;@HIGH$ SVC
RST     28H
POP     HL              ;Get HIGH$ back
INC     HL              ;Now ptr to start of module
LD      (DVRHI@),HL    ;Save that value
LD      HL,DVRHI@      ;And set ptr to it
LD      (MODRS@),HL
SPACE   1
SUBTTL  RELOCATION OF ADDRESSES

;
; Perform address translation for relocation
;
MOD40 EQU $
PUSH    IX              ;Save DCB ptr
LD      IX,RELTAB      ;Ptr to relocation tbl
LD      HL,NEWHI$      ;Ptr to last byte of
NEWHI$ EQU $-2          ; resident code
LD      (MODEND),HL    ;Save in memory hdr
LD      BC,RESEND      ;Ptr to unrellocated end
XOR     A               ;Clear carry flag
SBC     HL,BC          ;Get offset
PUSH    HL
POP     BC              ; put in BC
LD      A,RELLEN/2     ;# of entries in RELTAB
MOD45 EQU $
LD      L,(IX+00H)      ;Get next tbl entry in HL
LD      H,(IX+01H)
LD      E,(HL)         ;Get const into DE
INC     HL
LD      D,(HL)
EX      DE,HL          ;Swap for add
ADD     HL,BC           ;Do offset
EX      DE,HL          ;Swap back
LD      (HL),D         ;And save new value
DEC     HL
LD      (HL),E
INC     IX              ;Point to next entry
INC     IX              ; in RELTAB
DEC     A               ;Decrement counter
JR      NZ,MOD45       ;Repeat until done
POP     IX              ;Get back DCB ptr

;
; Linkage for @ICNFG vector in case we get SYSGENed
;
LD      HL,INIT        ;Ptr to resident init rtn
RESINI EQU $-2
LD      (IY+1DH),L      ;Save address in system
LD      (IY+1EH),H      ; @ICNFG vector
LD      A,0C3H         ;Set opcode to JP
LD      (IY+1CH),A

```

```

SPACE 1
SUBTTL MOVE RESIDENT CODE TO NEW SITE
;
; Now do the actual relocation of the code
;
LD HL,MODRS@ ;Ptr to ptr to start
MODRS@ EQU $-2 ; of relocation area
LD E,(HL) ;Destination in DE
INC HL
LD D,(HL)
PUSH DE
LD HL,RESMOD ;Ptr to start of code
LD BC,RESLEN ;Length of code
LDIR ;Do it!
LD HL,(MODRS@) ;Get ptr to DVRHI$ or
LD (HL),E ; our own word if high
INC HL ; mem install update
LD (HL),D ; DVRHI$ if needed
;
; Activate the relocated driver routine
;
DI ;Interrupts off
CALL INIT ;Call the @CTL 02H code
RESIN2 EQU $-2
EI ;Interrupts on
;
; Finish up install and report completion
;
POP DE ;Ptr to relocated module
MOD50 EQU $ ;Come here on reinstall
LD (IX+00H),07H ;Stuff flags & vector
LD (IX+01H),E ; into DCB
LD (IX+02H),D
LD HL,OKMSG ;Ptr to completion msg
LD A,12 ;@LOGOT SVC
RST 28H
LD HL,0000H ;Return code of 0
RET ;Finished
SPACE 1
SUBTTL ERROR HANDLING AND DATA AREA
;
; Error message routines follow
;
MOD80 EQU $ ;Device already installed
LD HL,DEVERR
JR MOD99
MOD85 EQU $ ;Didn't find *KI device
LD HL,NOKI
JR MOD99
MOD90 EQU $ ;Insufficient memory
LD HL,NOMEM
JR MOD99
MOD95 EQU $ ;Must use SET cmd
LD HL,NOTSET

```

world. They won't run on a TRS-80 any more than Big Five's Galaxy Invasion will run on a PC-XT. The same applies to the scaleable fonts in HP's new LaserJet III. To scale a font on the fly from within a given word processor, you need a program to automatically transmit to the word processor all the character widths of whatever font scale you've selected: and such interfacing programs are available for only a few big-market MS-DOS programs. (The LaserJet III will, however, handle all old-style non-scaleable fonts; and you can use the scaled fonts as long as you have a pre-defined width table to go with each font and size that you select). When you start thinking of buying MS-DOS software for your TRS-80/laser printer system, remember that it is only discrete fonts that can be transferred over and used on a TRS-80, not font generators, font editors, and the like.

I've now mentioned width tables several times. These deserve closer scrutiny since they are one of the things that set the laser printers apart from most of their predecessors. Width tables are really necessary only for proportionally-spaced fonts, where the letters are of different widths. For a word processor - or, in fact, any program - to create even margins on a page of text, it has to know the exact widths of all the characters in the typeface it is using. It puts just enough words and just enough spaces between the words and letters for the right-hand margin to come out even on a printout. To do that, the program has to have a width table for the typeface built into its printer driver, so that it can make accurate spacing calculations based on the widths of all the letters. Before laser printers, most proportional fonts a printer might use were about the same size, so one or two width tables were all a program might ever need. They were simply built into the program and the user never worried about them. Since there are literally hundreds of fonts available for laser printers, though, with phenomenal ranges in character size, a program for a laser printer must be able to access hundreds of width tables. If you have a proportionally-spaced font for which your word processor doesn't have a width table, you are not going to be able to get fully justified margins in your printing even if you can print all the font's characters. There is

no way even the big-name MS-DOS word processors can have that many width tables built in. They generally include width tables for the fonts of the best-established manufacturers in special data files, and you have to go through a complicated installation process to incorporate the ones you actually want to use into your printer driver. For fonts for which no width table is provided, there is usually a utility to allow a user to customize his own width table from scratch.

LASERJET OR DESKJET?

When you begin considering what HP-compatible printer to buy, you have a number of options. The safest option is to buy a laser printer with Hewlett Packard's name on it. HP is the standard everyone else - even IBM - emulates; you don't have to worry about compatibility problems. And HP is a class act, not a Taiwanese start-up that may not be around when you need to replace a broken part. But the HP nameplate brings a quality price. The compatibles are generally cheaper and often include features not available in the HP machine itself. Note, by the way, that the advertised price for all laser printers is generally LESS than what you'll actually pay for them. The price usually excludes any fonts besides what is built into the machine, which means that what you print on your \$1000 laser printer may look just like what you print on your \$100 electric typewriter unless you sink MORE money into some extra fonts of real letters. And often people discover they need more memory. Laser printers print a page at a time, not a line at a time; they need enough memory to format all the dots on a potential page at once before they start printing. At 300 dpi, that's a lot of dots and a lot of memory. Fonts don't take up too much memory here, but any kind of graphics devours it. (This is more a problem for MS-DOS programs than TRS-80 ones, for there are no graphics-intensive programs at the moment for the latter). Many printers provide envelope feeders or even large paper bins only as optional equipment. Finally, maintenance costs are still relatively high. Replacing toner and toner cartridges is considerably more expensive than replacing the ribbon on a dot matrix printer.

```

MOD99 EQU $
LD A,12 ;@LOGOT SVC
RST 28H
LD A,106 ;@CKBRKC SVC
RST 28H ; Clear Break
LD HL,0FFFFH ;and abort install
RET
;
; Data and literals for installation code
;
DVRHI@ DW 0000H ;Ptr to DVRHI$
MODNAM DB '$MIDI',03H ;Module name for @GTMOD
SINON DB 'MIDI Interface Driver version 1.0 -'
DB 'Copyright 1986 by Gary Phillips.',0AH
DB ' All Rights Reserved.',0AH,0DH
NOKI DB 'Could not locate *KI DCB!!',0DH
NOTSET DB 'Must install via SET command!!',0DH
NOMEM DB 'No memory available!!',0DH
DEVERR DB 'Already installed as *'
ERRDEV DB 'xx device!!',0DH
OKMSG DB 'MIDI Driver now resident.',0DH
SPACE 1
SUBTTL RESIDENT PORTION OF MIDI/DVR
;
; Actual memory-resident module starts here. This
; code has to be relocated before execution.
;
RESMOD EQU $
JR START ;TRSDOS memory header
MODEND DW RESEND+1 ;Ptr to next module
DB 05H ;Length of name
DB '$MIDI' ;Name of module
MODDCB DW 0000H ;Ptr to DCB
DW 0000H ;Reserved for TRSDOS
;
; Driver data area here
;
MSTAT DB 00H ;Buffer status
MBUFF DB 00H ;Receive buffer
;
; This is the @ICNFG routine
;
INIT EQU $
LD HL,INTRPT ;Ptr to int svc rtn
R010 EQU $-2
LD (INTV@),HL ;Store in INTVC$(3)
INTV@ EQU $-2 ; (I/O BUS INT)
LD HL,WFLG@ ;Ptr to WFLAG$
WFLG@ EQU $-2
LD A,(HL)
OR 08H ;Enable Bus Int
LD (HL),A
OUT (0E0H),A
LD HL,MFLG@ ;Ptr to MFLAG$

```



```

MFLG@ EQU    $-2
      LD      A, (HL)
      OR      10H          ;Enable I/O Bus
      LD      (HL), A
      OUT     (0ECH), A
      CALL    CTL02        ;Do @CTL 02H
R020 EQU    $-2
ICNFG$ EQU    $          ;Prev @ICNFG here
      RET
      DW      0000H

;
;   Hardware initialization for @CTL 02H
;
CTL02 EQU    $
      LD      B, ICNT      ;Length of init
      LD      HL, IDAT     ;Ptr to data
R030 EQU    $-2
CTL02A EQU    $
      LD      A, (HL)      ;Get SIO cmd
      OUT     (42H), A     ;Do ch. A
      OUT     (43H), A     ;Do ch. B
      INC     HL
      DJNZ    CTL02A       ;Loop till done
      XOR     A            ;Clear A
      LD      (MSTAT), A   ;Reset buffer status
R040 EQU    $-2
      RET
IDAT DB      18H, 14H, 0C4H, 13H, 0C1H
      DB      15H, 68H, 12H, 0FFH, 11H, 0F8H
ICNT EQU    $-IDAT

;
;   Start of byte I/O driver
;
START EQU    $
      LD      IX, MSTAT ;Data ptr
R050 EQU    $-2
      JR      C, GET       ;@GET if carry
      JR      Z, PUT       ;@PUT if zero
      XOR     A            ;@CTL so what one?
      CP      C            ;Is it 00H?
      JR      Z, CTL00     ; Yes, do it
      INC     A            ;No, try 01H
      CP      C
      JR      Z, CTL01
      INC     A            ;No, try 02H
      CP      C
      JR      Z, CTL02
      LD      A, 04H       ;No, try 04H
      CP      C
      JR      Z, CTL04
      XOR     A            ;Invalid so
      RET                ; give up

;
;   Handle @CTL 04H wake up vector request

```

For all these reasons, enough people have bought HP's DeskJet or DeskJet Plus printer to award it the title of the "poor man's laser." This is the printer I have, by the way. While the price is not that much lower than that of the new LaserJet IIp, maintenance costs are cheaper. Ink cartridges list for \$18, nowhere near the price of a toner cartridge. And, being a line rather than a page printer, the DeskJet does not demand the masses of memory its larger relative requires (though you must purchase an optional 128K or 256K memory cartridge if you intend to use soft fonts with it). Of course, there is a trade-off. The DeskJet will not print in landscape mode with proportional fonts. If you want to print something lengthways across a sheet of paper, it will be in Courier. Though the DeskJet prints at 300 dots per inch just like the LaserJet, the letters are slightly fuzzier because the ink tends to soak into the paper. And that ink is highly water soluble. You can smudge a page just by touching it with sweaty fingers. You are also limited in type size. The original DeskJet would not print letters larger than 24 points (a little over 1/4 inch high). The DeskJet Plus goes up to 30 points. Finally, while the DeskJet uses the same PCL commands as the LaserJet, it does not have the full command set.

If you want to use a lot of fonts on a DeskJet, there is a further item to keep in mind. DeskJet fonts are incompatible with LaserJet fonts, and there are not a lot of fonts available designed specifically for the DeskJet. Luckily, there are a number of conversion programs which will take a LaserJet soft font and convert it to DeskJet (or DeskJet Plus) format. None of them run on the TRS-80, though; they are strictly MS-DOS programs. The best is a package of conversion utilities called LJ2DESK, created by S.H. Moody and Associates of South Pasadena, California. I've used it to convert over a hundred LaserJet fonts to work on my DeskJet, without a hitch. But you have to have access to an IBM-compatible computer to use it.

TRS-80 PROGRAMS AND LASER PRINTERS

So much for the major components of the LaserJet family and how they work. What about the software to link up your TRS-80

with one of these printers? Most TRS-80 programs were written before the LaserJet even existed, so they have no specific printer drivers for it. This is not to say, however, that you can't use them to print on a laser printer. You can. There are certain commands which have become standard throughout the industry, and these work on any printer. Sending a code 33 (decimal) makes the printer print an exclamation point. A space is a 32. A form feed is a 12. But beyond that, each printer has its own way of doing things. The code for underlining on one printer may cause superscripting on another. Hence the need for a specific printer driver to access all the special features of a particular printer. But as long as your current program is not trying to use any of those special features, the printer will work just like any other printer. Your current programs won't suddenly be unusable on one of these new machines. I print spreadsheets all the time on my DeskJet with Model 4 Visicalc. I regularly list files or directories to the printer. I just can't use any of my DeskJet's special features or proportional fonts. All my Visicalc spreadsheets are in mono-spaced type, usually Courier. The same might be said about good old Scripsit: it, also, can output to a laser printer - as long as you try to print in nothing but mono spacing. You have to remember to set the dip switches to add a linefeed after a carriage return (CR+LF); otherwise, your printout will all be on the same line. But you must do that with just about any new printer you buy nowadays if you have a TRS-80. The only other difference between the printer you're now using and a LaserJet or DeskJet is that your current printer probably defaults to 66 lines per page, whereas the LaserJet/DeskJet family defaults to 60. If this causes compatibility problems with your TRS-80 software, you can fix it (at least on the Model 4) with the LS-DOS FORMS/FLT command.

There are two major TRS-80 programs with the printer drivers to access the commands of the PCL command set, and thus to use all the LaserJet's special features. They are both word processors: LeScript and the Allwrite Laser Support Package. Only LeScript is still being actively marketed by its creator, Anitek Software. Limited laser support is also

```

;
CTL04 EQU $
      PUSH    IY           ;Vector into HL
      POP     HL
      LD      A,H          ;Check for 0000H
      OR      L
      LD      A,0C9H       ;Use RET if so
      EX      DE,HL
      LD      HL,(WKUP$)    ;Current in HL
R060 EQU $-2
      JR      Z,CTL04A
      LD      A,0C3H       ;Use JP
CTL04A EQU $
      LD      (WKUP$-1),A   ;Store opcode
R070 EQU $-2
      LD      (WKUP$),DE    ;Store vector
R080 EQU $-2
      PUSH    HL           ;Return
      RET
;
;      Handle @CTL 00H (return status image):
;
CTL00 EQU $
      IN      A,(42H)       ;Get RR0
      AND     07H          ;Keep low nybble
      LD      B,A
      LD      A,(11H)       ;Get RR1
      OUT     (42H),A
      IN      A,(42H)
      AND     060H         ;Keep hi nybble
      OR      B            ;Add lo nybble
      CP      A            ;Set Z flag
      RET
;
;      Handle @CTL 01H (perform RESET)
;
CTL01 EQU $
      LD      C,0FFH       ;MIDI reset
      CALL   PUT
R100 EQU $-2
      LD      A,18H        ;Reset SIO
      OUT     (42H),A
      OUT     (43H),A
      RET
;
;      @PUT (output char from C)
;
PUT EQU $
      IN      A,(42H)       ;SIO status
      AND     04H          ;Tx empty?
      JR      Z,PUT        ;No so wait
      LD      A,C
      OUT     (40H),A       ;Write char
      RET

```

```

;
; @GET (return char in A)
;
GET00 EQU $
CALL INT50 ;Try a receive
R110 EQU $-2
JR NZ,GET ;If NZ, got char
CP OFFH ; else RET w/NZ
RET
GET EQU $
SLA (IX+00H) ;Char ready?
JR NC,GET00 ;No, try receive
LD A,(IX+01H) ;Yes, return it
CP A ; with Z set
RET
;
; Interrupt service routine here
;
INTRPT EQU $
CALL INT50 ;Attempt receive
R890 EQU $-2
LD A,B ;Status in A
RET ;JP to Wakeup
WKUP$ DW 0000H ; vector if any
INT50 EQU $
IN A,(42H) ;Get SIO status
LD B,A ; save in B
AND 01H ;Data available?
JR Z,INT99 ; no, so quit
IN A,(40H) ;Get byte
LD C,A ; save in C
LD (MBUFF),A ;Into buffer
R900 EQU $-2
LD A,(MSTAT) ;Set flag
R910 EQU $-2
OR 80H
LD (MSTAT),A
R920 EQU $-2
INT99 EQU $
LD A,38H ;Fake a RETI for SIO
OUT (42H),A
RESEND EQU $ ;Last byte of resident code
RET
RESLEN EQU $-RESMOD ;Length of resident code
;
; Relocation table
;
RELTAB EQU $
DW RESINI,RESIN2,R010,R020
DW R030,R040,R050,R060,R070,R080
DW R100,R110,R890,R900,R910,R920
RELLEN EQU $-RELTAB
END MOD00

```

available for the former Radio Shack flagship SuperScript, though not from Radio Shack (needless to say). None of these programs is the kind of what-you-see-is-what-you'll-get program available in the IBM or Macintosh world which allows you to integrate both text and graphics on your screen, but they give you a wide range of text options and have a long history of successful use with non-laser printers.

LESCRIPT

LeScript's outstanding virtue is its user interface. It is probably the easiest to learn and use of any TRS-80 word processor. The commands are logical and simple, requiring a minimum of keystrokes. To print something, you type <CLEAR><P>. To see a disk directory, you type <CLEAR><D>. It will run on the Model I, III, or 4. Moreover, in its Model 4 incarnation, LeScript takes full advantage of the Model 4's special features. On a 128K machine, it uses the DOS's memory banking ability to give you a text buffer of about 78K. If you have add-on memory boards (Anitek, the producer of LeScript, sells one itself), you can have even more memory available for a file. (If you have only the standard 64K, though, the text buffer is just 13K: LeScript is a big program, and the extra memory is very nice to have). LeScript can also process several files in memory at the same time and use its block command to shift text from one to the other - an immense convenience. It comes with its own built-in spelling checker. There are pop-down help windows. The program goes about as far as it's possible to go on a TRS-80 in displaying text on the screen the way it will look when it's printed. If you are using hanging indents, for example, you will see the hanging indents even as you type in your text. Finally, LeScript is an ongoing program. It is the only TRS-80 word processor still being actively supported by its author. Some releases have had bugs, but new releases have corrected them. The program continues to evolve as problems are fixed or new features added. Anitek bends over backwards to provide assistance to its users and it follows a very liberal policy for upgrades from old to new releases of the program.

If you want a laser printer so that you can print professional-looking text in a few basic formats without a lot of hassle, then this is your word processor. LeScript has commands to evoke typescripts in point sizes ranging from 6 to 14. These can be of normal configuration, italic, bold, etc. That's enough for most any standard text. LeScript also has commands to allow you to print lines, borders, shading, and various patterns supported by the LaserJet PCL commands. It will even take advantage of the hi-resolution board, if you have one in your computer, to display line draw characters. This is all built in to the program: you don't have to spend hours trying to "configure" it to your system. In sum, LeScript gives you a single, solid package of options. All a user has to do is turn on his printer and start printing.

Something should be said, however, about what LeScript WON'T do, at least the current release. If you want to use a proportional font not included in LeScript's width tables, you're out of luck. While the command set will allow a wide range of styles, there are built-in width tables for only Hewlett Packard's USASCII cartridge Times Roman and Helvetica fonts, and the same faces on Pacific Data's 25-In-One cartridge. Their maximum size is 14 points. This means that while you can type with other proportionally-spaced fonts, you will not be able to right-justify the lines. (Of course, you can still right-justify any mono-spaced font). If you are using Times Roman or Helvetica from some other source, it needs to be a pretty good clone of these, for even a difference of one or two dots in a letter width will make it incompatible with LeScript's width tables (and even Hewlett Packard makes different versions of the "same" sizes of these type styles). LeScript's manual mentions use of soft fonts, but the program seems designed for maximal use with a LaserJet equipped with these cartridge typefaces. Nor does LeScript currently support the proportional fonts of the DeskJet.

How serious are these limitations? The answer depends on your needs. Times Roman and Helvetica are the only proportional typefaces many people ever use, even those with big-name MS-DOS systems costing hundreds of dollars. If you

fall in this category, LeScript should be more than adequate to do what you want. Those who wish to print in a font larger than 14 points or in a style not supported by LeScript's built-in width tables (say 20 point Zapf Chancery) have several options. The same options apply if you want to buy a DeskJet instead of a LaserJet. First, you can wait for the next release of LeScript and hope it supports your font. Anitek is currently working on adding width tables for Pacific Data Products' Headlines in a Cartridge fonts and some of the more common DeskJet fonts. Second, you can ask Anitek to customize a width table for you, which they will do for a fee. If you're not sure whether LeScript will handle a typeface you really want to print with, your best bet is to contact Anitek and find out for sure before you invest in either the program or a new printer. Third, you can try Prosoft's AllWrite Laser Support Package.

ALLWRITE

I use the word "try" deliberately here, for Prosoft is in the process of disbanding its operations. At last report, mail orders for its word processor, AllWrite, were still being filled on an "as-is" basis (meaning a buyer gets no after-sale support for the program). AllWrite by itself will not work with laser printers. To make it do this, Prosoft sold a separate group of utilities, the Laser Support Package. That package has been completely discontinued. However, a number of users are working on their own utilities which basically duplicate the functions of the original package and in some cases add enhancements to it. Lee Rice of Marquette University is the most notable of these. This package will be distributed by COMPUTER NEWS 80 and should be ready by the time this article is in print.

As an editor, AllWrite is competent, but it can't compare to the features or ease of use of LeScript. Nearly everything takes more keystrokes. To see a directory, you hit <BREAK>, then type DIR, then press <ENTER>. And printing is a major operation, for AllWrite prints from disk rather than memory. To print something, you press <CLEAR><SHIFT><1>. You are prompted to save your text to disk. Then, the editor loads in the formatter (printer),

which loads in the text from the disk and sends it to the printer. When printing is complete, the formatter reloads the editor which reloads the text. This is obviously a more disk-intensive program than LeScript, and each disk access takes time. If you have a Model 4 with 128K of memory, you can edit three files in memory at once, but you can't exchange text among them. Nor can you use all the extra memory as a text buffer as with LeScript; AllWrite files can be no longer than about 30K - period (though they can be chained together for printing). There is no spelling checker included in the program.

Of course, that is not all of the story. Where AllWrite shines is in its text formatter. Once you get your text edited, you have a tremendous amount of options as to how you want to print it. A major plus is that AllWrite, unlike LeScript, measures lines in inches rather than characters. This is a feature even WordPerfect in the MS-DOS world didn't implement until its recent version 5. What this means in practice is that you can mix different sizes of type in a document, or even on the same line, without having to readjust the margins - the formatter compensates automatically for all of your changes. On word processors without this feature, just switching from mono-spaced pica to elite type will throw off the margins. There are print commands to allow the user to do just about anything, including selecting whether to microspace a justified line only between words or between both letters and words.

The Laser Support Package (and the independent users utilities) do not just add a printer driver with Hewlett Packard's PCL commands to AllWrite. They have the capacity to incorporate width tables for ANY font you might want to use, assuming you know the widths of the letters in the font. One new utility will, in fact, automatically calculate the widths for soft fonts on disk. So if you have that font of 20 point Zapf Chancery, you can create your own width table for it and then incorporate those widths into a new AllWrite printer driver. Moreover, you can print letters in almost any size the printer will accept. Fonts as large as 48 points (which is about 5/8 inches high) have been printed with AllWrite without

difficulty. In theory, it should be possible to print letters up to 255 dots in width, though no one to my knowledge has ever attempted it. All these are both left and right justified, of course. And AllWrite integrates with the DeskJet as well as the LaserJet, for you simply create your own width tables and printer drivers to handle the DeskJet fonts. Setting up AllWrite and its Laser Support Package to do what you want is obviously a more complicated process than is the case with LeScript: it can be pretty intimidating, in fact, unless you know what you're doing. The flip side is that if you want to handle a large variety of type styles and sizes, you have the flexibility to accommodate just about anything.

SUPERSCRIPSIT

A lot of people bought SuperScripsit from Radio Shack when they purchased their computers. Though the average Radio Shack salesman today will probably tell you he never heard of it, many people still use it and don't want to have to relearn a whole new system just to take advantage of a laser printer. If you're in that situation, you have a number of options, though they are more limited than what is possible from LeScript or AllWrite. At the moment, ALPS of Colorado markets a laser printer driver for SuperScripsit. With it, you can access the main PCL commands, but you can't right-justify most text because of limited width table support.

Nor is this all. COMPUTER NEWS 80 has announced that David Goben is working on a "generic" printer driver that will support a number of TRS-80 word processors as well as download soft fonts into the printer. Goben is an outstanding programmer and was a frequent contributor to 80 MICRO back in its heyday. It is not yet clear whether this driver will - or can - include the kind of width table support necessary for full left and right justification of text, but it should be another option if you don't want to purchase LeScript or AllWrite.

GRAPHICS

A lot less is available if you want to use your TRS-80 to print graphics on a laser

printer. In fact, not much of anything is available. A number of drawing programs have been written for the TRS-80's standard low resolution screen; they typically include drivers for some Radio Shack dot matrix printers and the Epson MX-80. There are a number of drawing programs for the hi-res board, but again they support only the dot matrix printers (though xT.CAD also supports a number of plotters). And then there is Prosoft's Dotwriter, a program which takes text and prints it in many different type styles, using the graphics mode of the printer to produce the letters. It, also, supports only dot matrix printers. Since these programs all use commands specific to specific printers, without the right printer driver they simply won't work.

The reason for the dearth of laser support in graphics is not hard to find. Most of these programs were written before anyone had heard of a LaserJet, and even when a program is still being actively supported by its creator, there hasn't been enough demand to justify adding a LaserJet printer driver. Luckily, though, you're not doomed if you own Dotwriter, or PowerDraw, or similar programs, and want to run them on a laser printer. All these programs have drivers for the Epson dot matrix printer, and there are a number of Epson-emulation options available in the laser printer world. Many LaserJet compatibles offer not only more built-in fonts than the LaserJet; they also offer Epson emulation as a standard feature. Hewlett Packard sells an Epson emulation cartridge for the DeskJet. (It does not, by the way, market such a cartridge for the LaserJet). If you run a program in Epson emulation, you will NOT get printout at 300 dots per inch. You will get printout in standard Epson resolution, which is about 75 dots per inch. Your printout, in fact, will look just like the printout from an Epson printer, except that the print will probably be blacker and the dots will be square instead of round. But Dotwriter WILL print with it.

There is one graphics program with a driver for the LaserJet or DeskJet printer. It is HPPRINT/BAS, written by yours truly in MicroLab's GBASIC. (No, this is not a commercial in disguise: the program is in the public domain and thus free

to anyone who wants it on various bulletin boards). HPPRINT/BAS dumps the standard Model 4 hi-res screen (640 x 240 dots) to either of these two printers. It allows you to choose from three resolutions of dots and to position the screen printout anywhere you want on a standard sheet of paper. Of course, the nature of bit-mapped graphics means that if you print the screen at 300 dpi, the resulting picture will be about 2 inches across. Lower resolutions give you bigger pictures. The code can easily be modified to run under Radio Shack's BASICG.

A second program is GIF4HP/CMD. It is a print utility for GIF (CompuServe graphics interchange format) picture files from J.F.R. Slinkman, a real graphics wizard. Slinkman has authored a number of outstanding hi-resolution programs for the Model 4, including a utility to display GIF images on the hi-res screen. GIF4HP/CMD will automatically dither (that is, adjust the shading when converting from a color image to a black-and-white printout) and print a standard GIF file on both the LaserJet and DeskJet printers at 300 dots per inch. And we're talking here of stunning printouts which fill half the page, not a 2-inch square. The program is one of a number of utilities included in a package Slinkman has authored called GIF4MOD4.

More programs may be in the works. For as TRS-80 owners buy LaserJet or DeskJet printers, and want to do things the current software won't allow them to do, they are likely to end up writing their own utilities to get the job done. In any case, quite a bit is already possible. And even more is possible if you have access to IBM-compatibles to use programs like Moody's conversion utility. So if you feel left out in the cold in the 300-dot-per-inch world because you own a TRS-80, don't - because you aren't. Rather, be thankful you bought a Radio Shack computer Way Back When instead of an Atari or a CP/M machine, because then you WOULD be out in the cold!

Feel free to write me if you have any questions.

For further reading:

Steve Cummings, *DESKJET UNLIMITED*, Berkeley: Peachpit Press, 1990.

Ted Nace and Michael Gardner, *LASERJET UNLIMITED*, Berkeley: Peachpit Press, 1988.

Lee C. Rice, "Desktop Publishing & the Model 4, Some Personal Reflections," *THE MISOSYS QUARTERLY*, Vol. III no. 2, Fall 1988, pp. 31-33.

Commercial laser printer-related software mentioned here:

ALLWRITE word processor: Prosoft, P.O. Box 560, North Hollywood, CA 91603. \$69.95 for AllWrite plus \$3.00 for shipping and handling. Check *COMPUTER NEWS 80* for the additional laser utilities.

GIF4MOD4 GIF file display and printer utilities: J.F.R. Slinkman, 4108C Fairlake Lane, Glen Allen, VA 23060. Phone (804) 273-0937. \$37.95. GIF4HP/CMD does not require a hi-res board, but you do need one to use some of the other programs in the package.

HYPERCROSS 3.0 PC file transfer utility from MSDOS to TRS-80 disk formats: Hypersoft, P.O. Box 51155, Raleigh, NC 27609. Phone (919) 847-4779. \$49.95.

LESCRIPT word processor: Anitek Software Products, P.O. Box 361136, Melbourne, FL 32936. Phone (407) 259-9397. \$129.00.

LJ2DESK — LaserJet-DeskJet soft font conversion package (WORKS ONLY ON AN IBM-COMPATIBLE): S.H. Moody and Associates, 1810 Fair Oaks Avenue, South Pasadena, CA 91030. Phone (818) 441-2260. \$52.00.

SUPERSCRIPSIT LASER PRINTER DRIVER — ALPS, 1502 County Road 25, Woodland Park, CO 80866. Phone (800) 232-ALPS. \$49.00.

BOOT YOUR MODEL 4 HARD DRIVE WITHOUT A BOOT DISKETTE

A review by

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How would you like to boot your hard drive-equipped Model 4 or 4P from the HD without using a boot diskette? You can, with a special program and ROM from M.A.D. Software of Ft. Worth, which will allow you to keep your HD boot diskette in the file box indefinitely.

M.A.D. have produced a number of ROM's to cover both the gate-array and non-gate-array Model 4's, as well as both versions of the 4P. The 4P, using a Radio Shack controller and TRSHD6, RSHARD6, or Powersoft RS drivers does not require a new ROM to boot from the HD, only the HBUILD6 software. A new ROM is required with MISOSYS's new Hard Drive system & certain non-Radio Shack WD controllers that work with Powersoft Series I drivers. Also, the new 4P ROM provides several enhanced feature over the stock R/S ROM, such as:

- 1) The Model 3-mode ROM-image loads from floppy in less than six seconds.
- 2) Floppy booting (including ROM-image loading) is much more reliable.
- 3) Built-in diagnostics include a full 64K RAM test, disk test and video diagnostics.
- 4) New French and German error messages.
- 5) Hard disk boot-interlock is provided. The system will not try to boot from a hard disk unless the hard disk contains a valid boot track. No more holding the F2 key.
- 6) Hard disk booting is available for several types of disk controllers and drivers. (see below)
- 7) Hard disk booting will wait for slower drives to come on-line. This is useful if

you expect your system to power-up unattended.

8) A fully programmable 6845 CRT controller can be used in place of the 68045.

9) Handles gate-array and non-gate-array systems properly. The original R/S ROM does not handle the floppy disk controller on gate-array systems correctly.

10) For an additional charge of \$10.00 a customized display of up to 92 characters may be added to the ROM, for display on demand or when a boot fails, (when there is no diskette in the drive.) This was originally intended to be used as a difficult-to-remove property-ID tag.

For the desktop Model 4's the following new ROM features apply:

- 1) In Model 3-mode the keyboard produces all 128 ASCII characters and handles key rollover, and performs "debouncing" correctly at 2 and 4 MHz.
- 2) The keyboard repeat rate is adjustable.
- 3) The time-of-day clock keeps correct time even when the system is running at 4 MHz. The cursor also blinks at the same rate regardless of the CPU speed.
- 4) A fully programmable 6845 CRT controller can be used in place of the 68045.
- 5) Hard disk booting is available for several types of disk controllers and drivers.
- 6) Hard disk booting will wait for slower drives to come on-line.
- 7) Gate-array ROM includes tests for memory, video, floppy drive and printer (via a factory-test hardware strap.)

HBUILD6/CMD is the software provided that replaces the boot track on logical drive 0 with one that contains code capable of booting from the hard disk drive. This original boot track was placed on the

hard disk by the BACKUP utility, and that code only knows how to boot from a floppy.

HBUILD6 comes configured for one of the following drivers (the presence of a controller that works with that driver is assumed):

1. TRSHD6 (Radio Shack) or RSHARD6 (Misosys) running on a WD 8x300 controller board from Radio Shack with write-protect support or a Western Digital TB-1 controller board (1010/2010).

2. MSCSI6 (Misosys) running on a XEBEC or ADAPTEC controller with a Misosys host-to-SCSI interface.

3. Powersoft Series RS running on a WD 8x300 controller from Radio Shack with write-protect support.

4. Powersoft Series I running on a WD100x series controller, port mapped at 0x7*, with no write-protect support.

The current version of HBUILD6 supports the hard disk drive in either high or low memory. The original version only supported the driver in low memory and it was one of the first suggestions I passed on to M.A.D. To allow high memory drivers, HBUILD6 is only supported under LS-DOS 6.3.0 or 6.3.1. Earlier versions of the operating system may work but are not supported. Since I use LS-DOS 6.3.1 I haven't bothered to try one of the earlier versions, to see if it would work, I figure its just another good reason to upgrade your DOS!

To help load your HD driver into high memory, M.A.D. provides FORCEHI/CMD which allows you to artificially fill low memory and then re-claim it once you have placed all your desired drivers/filters, etc. in high memory. I had been using LOMEM/CMD from one of the LIB's on the LDOS SIG to do this, but I now find that FORCEHI is more efficient to use.

One other problem I found in an earlier version of HBUILD6, was that it overwrote the HOUE XLR8er patches to BOOT/SYS and SYS0/SYS. This coupled with the inability to allow drivers in high

Assembler listing for NXWAP/APP

```

NOLOAD                                ;Core image directive for ALDS
;                                     ; & must be on first line
;NXWAM - a PROWAM application that sends a string of
;control codes to a printer to set it up for various
;print effects. Codes are for the STAR NX-10 as supplied,
;but can be changed for your printer's particular codes.
;Keep them in a 4 byte string as shown - use 0's to fill
;unneeded space.
;EQUATES
@CTL EQU 5
@GTDCB EQU 82
@PRT EQU 6
@SOUND EQU 104
@WINDOW EQU 124
;SVC MACRO #1 ;Use this macro if not using ALDS
;LD A,#1 ; (remove the ';' at be-
;ginning of lines)
;RST 40H
;ENDM

PSECT 2700H ;ALDS uses PSECT - you may
need ORG

DEFM 'PROWAM' ;PROWAM header protocol
DEFM 'NXWAM' ;Application name
DB 3
DB .HIGH $.SHL.8-$.+256%0
IFF $.EQ.2800H ;PC must be at 2800H here
QUIT ; or an error occurred
ENDIF

;-----
; Program starts here
;-----
START LD B,7 ;Open window if possible
LD HL,0001H
LD DE,1229H
SVC @WINDOW
JR Z,ST1 ;Go if OK
LD B,0.SHL.4+2 ;Else sound error
SVC @SOUND
RET ; and return
ST1 CALL HOME ;Hot start location
CALL CLS
LD B,10
LD HL,MENU ;Point to first screen....
SVC @WINDOW ; and display it
CALL HOME
LD HL,BITS ;Point to first table
JR PUTIT ;Skip over
STRT1 CALL HOME
CALL CLS
LD B,10
LD HL,MENU2 ;Point to second screen
SVC @WINDOW ; and display it
CALL HOME
LD HL,BITS1 ;Point to second table
PUTIT LD (BUFF1),HL ;Put address in buffer
CALL BUFLD ;Put codes in buffer
GETIT LD C,0 ;Get a keypress
LD B,0
SVC @WINDOW
JP C,FINI ;Break/export pressed

```

```

CP      1AH      ;<SHIFT> down arrow ?
CALL   Z,DWN    ;If yes, increment pointers
CP      1BH      ;<SHIFT> up arrow ?
CALL   Z,UP     ;If yes, decrement pointers
CP      19H      ;<SHIFT>→ key ?
JR      Z,STRT1  ; If yes, second screen
CP      18H      ;<SHIFT>← key ?
JR      Z,ST1    ; If yes, first screen
CP      'Q'      ; 'Q' ?
JP      Z,FINI   ; If yes, exit
CP      0DH      ;Enter ?
JP      Z,OWT    ;If yes, send it out to printer
JR      GETIT    ;Must have one of these responses

;
; Messages
;
MSG2    DEFM     'Another code?'
        DB       0AH
        DEFM     '<ENTER>=YES <Q>=QUIT '
        DB       03H ;Put cursor at end of message line
PRMSG   DEFM     '>> PRINTER NOT READY <<'
        DB       0AH
        DEFM     ' Hit any key when ready'
        DB       0DH

;
; Buffers
;
BUFF    DW       0,0      ;Code buffer
BUFF1   DW       0      ;Address buffer

;
; Subroutines
;
BUFLD   LD       BC,4      ;Buffer load routine
        LD       HL,(BUFF1) ;Point to origin
        LD       DE,BUFF   ;Point to destination
        LDIR      ; and load it in
        RET

HOME    LD       C,1CH     ;Home cursor in window
        LD       B,9
        SVC      @WINDOW
        RET

CLS     LD       C,1FH     ;Clear to end of window
        LD       B,9
        SVC      @WINDOW
        RET

DWN     LD       B,4      ;Cursor down routine
        SVC      @WINDOW  ;Get cursor location
        LD       A,10     ;Is it at line 11?
        CP       H       ;(H contains row number)
        RET      Z       ;If so, don't move cursor
        INC      H       ;If not, move it down
        LD       B,3
        SVC      @WINDOW
        LD       HL,(BUFF1) ;Get old address
        INC      HL       ;Increase
        INC      HL       ; address
        INC      HL       ; of pointer
        INC      HL       ; by four
        LD       (BUFF1),HL ;Put address in buffer
        CALL    BUFLD     ;Put codes in buffer
        RET

UP      LD       B,4      ;Cursor up routine
        SVC      @WINDOW  ;Get cursor location
        LD       A,0      ;Is it at line 0?

```

memory, effectively eliminated the use of M.A.D.'s ROM & HBUILD6 for XLR8er users. Well, the guys at M.A.D. came to the rescue again, and produced XLR8SET/CMD which eliminates the need for the HOUE patches to BOOT/SYS and SYS0/SYS (you still need the SYS2,SYS12 & BACKUP patches.) A big PLUS with XLR8SET, is that it only uses 33 bytes of low memory, where the Houde code uses 127 bytes.

XLR8SET loads as an AUTO command and dynamically applies the Houde patches to SYS0/SYS and BOOT/SYS each time the system boots. XLR8SET also allows you to tag on a startup JCL file that you normally would have used as an AUTO command as:

```
AUTO XLRSET-Q DO=STARTUP/
JCL
```

XLR8SET sets the HD64180 at M=1, I=1, R=40 as does the Houde patches. If your Model 4 can handle it, here are the patches to XLR8SET/CMD to increase the speed of the 64180, and are based on Frank Slinkman's earlier work with the Houde code:

(Patches are valid for version 1(3) of XLR8SET only and are written assuming that you are starting with an unmodified copy of XLR8SET.)

```
.Run at 0,1,80 with 2T re-
fresh cycle (NOT recom-
mended!!!)
D01,EE=00
F01,EE=40
D01,F6=BC F6 03
F01,F6=FC F6 02
.EOP
```

```
.Run at 1,1,80 with 2T
refresh cycle (use CAU-
TION!)
D01,F6=BC F6 03
F01,F6=FC F6 02
.EOP
```

```
.Run at 1,1,40 with 2T
refresh cycle (this is the
only 100% safe patch)
D01,F6=BC
F01,F6=FC
.EOP
```


If all this is not enough, M.A.D. also provide OOPS/CMD, a command line editing utility which provides a convenient method of correcting a mistyped command, without retyping the entire command.

Complete instructions are included to help you, from opening up your computer to install the new ROM, to step by step documentation to install the various pieces of software. I don't see how anyone can make a mistake with M.A.D.'s instructions, but I guess there are those who have a hard time getting out of bed in the morning, without explicit instructions.

There are a few caveats. If you have an older model 4, you may need a new "A" ROM to use HBUILD6. To test your machine, boot your system into ROM BASIC by holding down the BREAK key and pressing RESET. Once in BASIC, type the following statement and a single character will be displayed:

```
PRINT CHR$(PEEK(1490))
```

If the character that was displayed is the letter "O" then you have the old "A" ROM and must replace it to be able to use the new "X" ROM. M.A.D. has the correct ROM's available and they will continue to stock them as long as they can still get them.

The XLR8er board is supported, provided that it worked with the system prior to the installation of the XROM or XDROM, and your system has not been modified to defeat the wait-state generation for ROM accesses.

I also use a SmartWatch, which works flawlessly in my gate-array Model 4, with XLR8er adapter, and the M.A.D. XDROM and software. For those curious souls, my hard drive is a 20 meg Seagate ST-225 sitting in an old R/S 15 meg box with the short WD controller (1010 TB-1).

I have had the M.A.D. ROM and software since the first of the year, but it has only been slightly over two months since I received the latest version of

```

CP      H      ; (H contains row number)
RET     Z      ; If so, don't move cursor
DEC     H      ; If not, move it up
LD      B,3
SVC     @WINDOW
LD      HL,(BUFF1) ; Get old address
DEC     HL      ; Decrease
DEC     HL      ; address
DEC     HL      ; of pointer
DEC     HL      ; by four
LD      (BUFF1),HL ; Put address in buffer
CALL    BUFLD   ; Put codes in buffer
RET

;-----
;      Send to printer
;-----
OWT     CALL    PRTEST      ; Test if printer on line
LD      HL,BUFF ; Get address of string of bytes
LD      B,4      ; Four bytes to send
OWT1    LD      C,(HL)      ; Send it out
SVC     @PRT      ; to printer
INC     HL
DJNZ    OWT1      ; Loop until done
AGAIN   CALL    HOME      ; Home cursor in window
CALL    CLS      ; Clear window
LD      B,10
LD      HL,MESG2 ; Need to see menu again?
SVC     @WINDOW
LD      B,0      ; Get a key from keyboard
LD      C,0      ; Make like @KEY SVC
SVC     @WINDOW
JP      C,FINI ; CF=<BREAK>/EXPORT pressed - end
AND     0DFH      ; Make LC to UC
CP      'Y'      ; If yes, start over
JP      Z,ST1
CP      0DH      ; <ENTER> = yes
JP      Z,ST1
CP      'Q'      ; If no, end
JP      Z,FINI
CP      'N'
JP      Z,FINI ; Must have one of
JR      AGAIN    ; these responses

;-----
;      Printer on-line test
;-----
PRTEST  LD      DE,'RP' ; Point to *PR DCB
SVC     @GTDCEB
JR      NZ,PT1 ; NZ = can't find device
EX      DE,HL ; DE ==> *PR DCB
LD      C,0      ; Get status
SVC     @CTL
RET     Z      ; Printer available
PT1     CALL    HOME
CALL    CLS
LD      B,10
LD      HL,PRMSG ; Turn on printer error msg
SVC     @WINDOW
LD      B,2      ; Tone
SVC     @SOUND ; ...to alert user
LD      C,0
LD      B,0
SVC     @WINDOW ; Must get a key
CALL    HOME
CALL    CLS

```



```

POP      HL      ;Clear stack
JP       ST1     ;Jump to hot start

;
;      Exit
;
FINI     LD       B,8      ;Close window
          SVC     @WINDOW
          RET

;
;      Menus
;
MENU     DEFM     '      1) Print slashed zero'
          DB       0AH
          DEFM     '      2) Print normal zero'
          DB       0AH
          DEFM     '      3) Compressed Print'
          DB       0AH
          DEFM     '      4) Cancel Compressed'
          DB       0AH
          DEFM     '      5) Line Feed (1/8")'
          DB       0AH
          DEFM     '      6) Line Feed (7/72")'
          DB       0AH
          DEFM     '      7) Line Feed (1/6")'
          DB       0AH
          DEFM     '      8) Italics'
          DB       0AH
          DEFM     '      9) Cancel Italics'
          DB       0AH
          DEFM     '     10) Reinitialize Printer'
          DB       0AH
          DEFM     '     11) Set to 10 CPI'
          DB       0AH,0AH
          DEFM     ' <SHIFT>-> key to view next screen'
          DB       0AH
          DEFM     '                NXWAM ver 5/31/90'
          DB       0AH
          DEFM     ' Use shift arrow keys to select'
          DB       0AH
          DEFM     ' then <ENTER>. <Q> = quit
          DB       0DH
MENU2    DEFM     '     12) Set to 12 CPI'
          DB       0AH
          DEFM     '     13) Double Wide Print'
          DB       0AH
          DEFM     '     14) Set form to 60 lines'
          DB       0AH
          DEFM     '     15) Set form to 11 inches'
          DB       0AH
          DEFM     '     16) Emphasized print'
          DB       0AH
          DEFM     '     17) Cancel emphasized'
          DB       0AH
          DEFM     '     18) Double-strike mode'
          DB       0AH
          DEFM     '     19) Cancel double-strike'
          DB       0AH
          DEFM     '     20) Skip-over 4 lines'
          DB       0AH
          DEFM     '     21) Letter quality mode'
          DB       0AH
          DEFM     '     22) Cancel letter quality mode'
          DB       0AH,0AH
          DEFM     ' <SHIFT>-<- key to view first screen'

```

HBUILD6 that supported high and low memory drivers and came with XLR8SET. Everything is working perfectly and I can't imagine anyone with a Model 4 and hard drive, who wouldn't want the convenience of booting their HD without a boot diskette. The cost is only \$35.00 for the ROM and software for a gate-array 4 or either version of the 4P, \$30.00 for the non-gate-array 4 and \$15.00 for just the software for the 4P.

For more information on the products reviewed, contact:

M.A.D. Software
P.O. Box 331323
Ft. Worth, TX 78163-1323

I have no connection with, nor do I have any interest in M.A.D. Software. I'm just a satisfied customer, that would like to pass the word around, about a firm that is still supporting our computer and going all out to make sure their products work correctly. If you have any questions you can contact me on the LDOS Forum (PCS-49) or through Email on CompuServe, my PPN is 72177,1106 - Fred Oberding.

PRO-WAM Programmers' Toolkit



The Programmers' Toolkit provides what you need to know to write programs for the PRO-WAM environment. This includes documentation in a convenient 5.5" by 8.5" format; the same as PRO-WAM release 2. The included WIN-LINK device driver supports programmed invocation of applications from any programming language environment which supports device I/O. You also get the WINDOW/CCC function library for MC, and an assembler source code file for the PHRASE application to illustrate how to write a PRO-WAM application.

Programmers' Toolkit \$29.95 + \$3S&H

MISOSYS, Inc.
P.O. Box 239
Sterling, VA 22170-0239
800-MISOSYS

NXWAM

A PRO-WAM Application

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NXWAM is an application that will allow you to set up your printer on the fly from PRO-WAM. The reason this is application is helpful, is to get some desired printing effects without having to leave your presently running program to set printer control codes. Now some printers have control panels on the outside that allow several enhancements to be set, but there are always a few that may not be accessible by the panel switches. Here comes NXWAM to the rescue!

NXWAM will send up to 22 different codes to turn on or off several commands. Some of the codes in the menu lines are available from the panel on the STAR NX-10, and you could change these to suit your needs. Just keep in mind to use 4 bytes of data in the codes area to keep NXWAM happy, or you'll surely crash the program.

Some of the codes listed will work in conjunction with others, while some may over-ride them, or be ineffective. You must consult your printer manual to see which ones work together.

Technical notes:

I learned much about PRO-WAM from re-writing the code for this application - and I couldn't have done it without the PRO-WAM PROGRAMMER'S TOOLKIT from MISOSYS. While not very complicated, you must be sure to read each detail listed under the various @WINDOW SVC functions; sometimes twice!

Since I used Radio Shack's ALDS editor/ assembler package to do the coding, I had to adapt some of the assembler directives shown in the 'TOOLKIT' to the ALDS format. For example, the NOLOAD

```

DB      0AH
DEFM    '                NXWAM ver 5/31/90'
DB      0AH
DEFM    ' Use shift arrow keys to select'
DB      0AH
DEFM    ' then <ENTER>. <Q> = quit
DB      0DH

;-----
;      These are the codes
;      to be sent to printer
;-----
BITS    DB      00,27,126,1      ;PRINT SLASHED ZERO
        DB      00,27,126,0      ;PRINT NORMAL 0
        DB      00,00,00,15      ;COMPRESSED
        DB      00,00,00,18      ;CANCEL COMPRESSED
        DB      00,00,27,48      ;LINE FEED = 1/8"
        DB      00,00,27,49      ;LINE FEED = 7/72"
        DB      00,00,27,50      ;LINE FEED = 1/6"
        DB      00,00,27,52      ;ITALICS
        DB      00,00,27,53      ;CANCEL ITALICS
        DB      00,00,27,64      ;REINITIALIZE
        DB      00,00,27,80      ;10 CPI
BITS1    DB      00,00,27,77      ;12 CPI
        DB      00,27,87,1      ;DOUBLE WIDE
        DB      00,27,67,60      ;FORM LENGTH = n LINES ;60 lines
        DB      27,67,0,11      ;FORM LENGTH = n INCHES ;11 inches
        DB      00,00,27,69      ;EMPHASIZED
        DB      00,00,27,70      ;CANCEL EMPHASIZED
        DB      00,00,27,71      ;DOUBLE STRIKE
        DB      00,00,27,72      ;CANCEL DOUBLE STRIKE
        DB      00,27,78,4      ;SKIP-OVER n LINES ;4 lines
        DB      00,27,120,1      ;LETTER QUALITY MODE
        DB      00,27,120,0      ;CANCEL LETTER QUALITY MODE

;-----
;      Check for memory overflow
;-----
IFT      $.GT.2FFFFH
ADISP    'MEMORY OVERFLOW ^$'      ;Use your assembler's
QUIT     ;error directive
ENDIF

;-----
;      Zero last sector of application
;      for patch space - not mandatory
;-----
IFT      $.LT.3000H
DB        .HIGH.$ .SHL.8-$+256%0
ENDIF
END      START

```

command in the first line is mandatory under ALDS in order to get the core image necessary for the PRO-WAM protocol. In other assembler packages, the CI directive is used to do the same. Another point in ALDS's core image processing is that you can't use the DEFS or DS directive unless you have the FILL directive on - else your program will have loading codes inserted in the object file and that makes it incompatible with PRO-WAM's requirements; and don't use ORG to adjust locations either, for the same reason.

If your assembler isn't ALDS you may have to use the SVC MACRO shown or expand it manually each time - just delete the ';' characters at the beginning of each of the four lines to activate it. Again, under ALDS, the PSECT command must be used at the beginning to indicate the start of code whereas others use ORG.

I believe the commented code should explain the rest of the operation of NXWAM. It's simple to use and, for me, quite handy to have when needed.

Hard Disk Drives and your Tandy 16/6000 Computer system

Copyright (c) 1989 by Frank Durda IV

This article discusses how the different disk controllers and interfaces used by Radio Shack on the Model II/16/12/16B/16BHD/6000/HD systems work, what their limits are, and how you can add more and faster drives to your system.

ST506 - A Drive That Became An Interface Standard

The disk drives used by the Model II/16/12/16B/16BHD/6000/6000HD are ST506-type drives. The ST506 was a disk drive which had an interface that has been duplicated on dozens of different drives over the years. Over time that interface has taken on the name of the ST506 drive. The ST506 drive was a very low capacity drive by today's standards but the interface had enough flexibility to allow more growth. (The ST506 interface was also called the "S" interface by some manufacturers for a time but that name is not commonly used today.)

The ST506 interface itself consists of two cables which carry data and control signals to and from the drives that are attached. The "Data" cable has 20 pins that carry the actual serial data stream to and from the write/read heads along with timing information used only in older drives. Although it can be wired in other ways, most systems run a separate "Data" cable to each drive to reduce the possibility of noise and line loss affecting the data stream.

The "Control" cable has 34 pins and these are used to instruct the selected drive as to where the heads should be positioned and which surface is to be read or written at this time. The drive also reports its status on other lines in the "Control" cable. (Drives compatible with the SA1000 series drives used a 50 pin "Control" cable which had the same signals as the 34 pin cable.) A single "Control" cable is attached to all of the ST506 drives on a single controller.

The "Control" cable is terminated in the drive furthest (electrically) from the disk

controller. Most drives use a resistor pack that can be removed to provide this termination. In systems where a separate "Data" cable is used for each drive, signals in this cable are also terminated in the drive. Some drives assume separate "Data" cables and do not have a way to disable its termination. Others use a single jumper to enable or disable the "Data" cable termination. For all Radio Shack configurations, the "Data" cable must be terminated.

The ST506 interface makes two size limitations on the drives that are attached to it. A maximum of eight (8) heads may be present on any drive on the ST506 bus and a maximum of four (4) drives can be attached at any one time. All the other size limitations or restrictions that exist in a given system are due to the type of controller, support circuitry or software that is present. (If a drive has more than 8 heads, it is not a ST506 drive. This is discussed in more detail later.)

Controllers and Host Interfaces

Radio Shack used four different disk controllers and two host interface boards during the production of the Model II/16/12/16B/16BHD/6000/6000HD systems. Here is a discussion of each.

1. The original hard disk controller was only used with the 8" 8 Megabyte hard disk drives. It was based on the 8x300 processor. This card can be identified by the presence of an edge connector for the host interface cable. The 8X300 CPU was being used to emulate the 1000 disk controller chip-set that Western Digital had under development at that time. The firmware on most of these controllers only allowed 512 byte sectors, which prevented them from being used directly with the Model III/4 operating systems. This adapter provided connections for 34 and 50 pin "Control" cables so that SA1000-compatible drives

could be used. The 8 Meg drive is a Shugart SA1004, which requires a 4.34 Mbits/sec transfer rate. This rate is incompatible with the 5.0 Mbits/sec rate used by all ST506/ST412 drives.

The host interface adapter (the card that goes in the CPU card cage) that was used with this controller can be identified use of power strips, which appear as red strips of plastic-coated metal running under the integrated circuits.

2. A modified version of the first controller. First designed to be used with 5" TM602 (5 Megabyte) ST506 hard disk drives on the Model III. This board also used the 8X300 controller but had newer firmware that would allow both 256 and 512 byte sectors. This and all subsequent controller boards only provided a 34 pin "Control" connector and the transfer rate was changed to be 5.0 Mbits/sec.

A 50 pin vertical header connector is used on this controller for the host interface cable. The host interface cable pin-out was modified so that the cable could be plugged directly into the expansion interface on a Model III and the then-under-development Model V (later renamed IV and then just 4). A small interface box was required to attach this controller to a Model I.

When a 12 Megabyte drive (TM603) became available, a new host interface board was designed for the Model II/16/12/16B systems which produced signals that looked like those produced by a Model III/4 EI. This host interface card is incompatible with the original disk controller (#1). The newer interface card can be identified by the lack of the red power strips.

Because the interface signals look just like the output of the Model III/4/4P/4D, add-on devices for these systems could be attached to II/12/16/6000 systems. For example, a Network 4 board can be attached to a Model 16 by using this interface card. The interface card can be jumpered so its Counter-Timer-Chip (CTC) can respond at different port ranges. The disk controller has similar jumpers so that the ports numbers that it uses can also be changed, allowing a system to have more than one interface card installed at a time. This capability was never used by Radio Shack.

3. A new half-sized disk controller board was created when the 1010 chip set became available. Although the 1010 controller was initially advertised as software compatible with the 8x300 emulation, new releases of all operating systems were required to deal with the differences between the two designs. This controller used the same host interface board as controller #2.
4. A special disk controller board was developed for the 16B HD and was used later in the 6000 HD. This controller fit into a slot in the 16B/6000 and contained the host interface and disk controller on a single board. This board also used the 1010 controller. Due to the limited space on the board, it was decided that only two drives would be allowed to be attached to this controller. The extra "Data" connectors and line drivers were omitted from the design. Apart from the number of drives, this controller was designed to be programmed the same as controller #3. Slight timing differences and hardware race-conditions resulted in another round of operating system updates to support this controller.

Table I summarizes the above controllers and what they allow. Note that on controllers #2, #3 and #4, marketing reasons caused subsets of these drives to be supported by certain controllers although all were hardware-capable of being used.

Table I

Name	Cntrl type	Max Drives	Host Interface type	Radio Shack Drives allowed
#1 WD1000	8x300 CPU emulation	4	Incompatible	8 Meg
#2 8X300	8x300 CPU emulation	4	Model III/4	5, 12, 15, 35, 70 Meg
#3 WD1000-TB1	1010 state-machine	4	Model III/4	5, 12, 15, 35, 70 Meg
#4 8898798	1010 state-machine	2	Combined in HDC	5, 12, 15, 35, 70 Meg

For example, Radio Shack only offered a TM503 (15 Meg) drive as the internal drive on the 16B HD/6000 HD (which used the internal controller #4), although larger drives could certainly have been used and probably would have reduced power requirements, noise levels and seek times, resulting in more reliable and faster systems.

Hard Disk Drives

Tables II-A and II-B contain information that will be useful in comparing performance and power requirements of the various drives. Fields that are blank were not published by the manufacturer.

Incompatibilities and other Strangeness

Starting with controller #2, Radio Shack changed the "Cable Open" signal (line 7) in the "Data" cable into a signal to activate the power supply in the secondary drive cabinets. When +12 VDC is present on this line, the secondary power supplies are activated. The reason this was implemented was that the old 8" system required the user to turn a keyswitch on all the drives (up to four) to start the system and this was considered a nuisance. This local variation of the ST506 standard can be found in all subsequent Radio Shack disk controllers, even on the latest ones built for the IBM AT-compatible line. Not all disk drives handle this deviation from the ST506 standard; some have line 7 grounded, which can cause a resistor on the disk controller to burn out. Some use line 7 for factory diagnostic control or some other test signal. Many start-up failures are caused by connecting one or more of the data cables upside down, which will short +12 to ground via that resistor. On the IBM AT-style controllers that Tandy sells, this resistor is usually strapped across the solder side of the

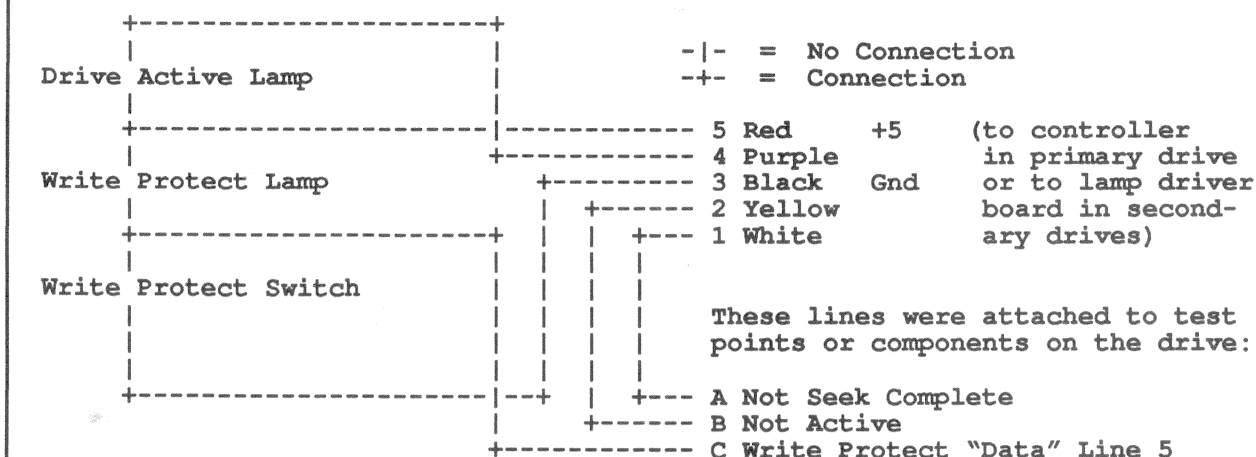
board. The "Data" cable for the primary drive (drive 0) does not have +12 on line 7 since that unit has the keyswitch or is mounted inside the computer.

So if you buy a drive that was not sold by Radio Shack and you use it as a primary, it will probably work fine. If a second drive of the same type is bought and attached as a secondary, then the smoke may start pouring out. To avoid this possibility when adding an additional drive, peel line 7 out of the "Data" cable and run that wire over to the control relay in each secondary cabinet. Then the drive will not have to contend with this non-compliance with the ST506 standard but the remote power-up feature will work.

Radio Shack also implemented some other features that are really nice but are literally tacked onto the drive with bits of wire. In all but the internal drives on the 16B HD and 6000 HD, it is possible to write protect an individual drive and get a visual indication of which drive is currently selected.

The connections are shown in Figure I. Signals "A", "B" and "C" are attached to points on the disk drive electronics and these points change from drive to drive. Signal "C", or Write Protect, is attached to line 5 which on most drives is listed as "Reserved", although some Tandon drives listed it as "Test/PK". The ST506/ST412 drives themselves use the Write-Fault signal (Control cable, line 12) to alert the controller to problems when attempting to write to media. The write protect signal is held high by using the lamp as a pull-up resistor, but so little current is drawn, the lamp never illuminates. When the write protect switch is closed, the write protect lamp is lit and the signal line is pulled low. All four disk controller boards monitor line 5 in the "Data" cable. The state of this signal can be normally be read in

Figure I



port 0xc0. This port is not a part of the 1010/2010 controller chip and is implemented with external components. All four drives' write-protect status is in the upper bits. Bit 7 is for Drive Select 1, Bit 6 is DS2, Bit 5 is DS3 and Bit 4 is DS4. As suggested for line 7, you may want to peel line 5 out of the cable in case the drive you have has it tied to ground.

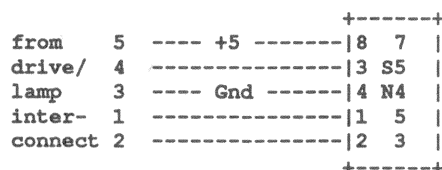
Signals "A" and "B" are combined and when the drive is Active and Seek Complete is true, the Active light is lit. The light goes out briefly during seeks (Seek Complete false) and would stay off when another drive was selected. Many drives provide a similar output capable of driving a LED, but a marketing decision selected the incandescent lamps and a lamp driver became necessary. The lamp driver consists of a 75453 or a 75452 with an additional gate from a 7414. See sketches at right.

Some users who have installed their own drives have removed the incandescent lamp and installed the LED from the drive in the ACTIVE socket. Then the light defuser is removed and the old wiring is replaced with a direct connection to the lamp contacts on the drive. Some of these arrangements only indicate that the drive is selected (won't blink while seeking), but they are simple to install.

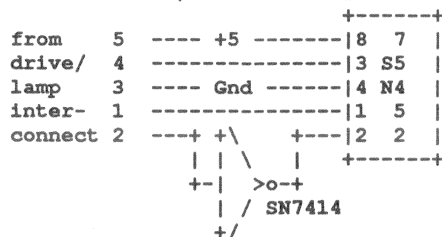
The Other Limits

As mentioned earlier, the ST506 interface limits the number of drives and heads.

Circuit, controllers #1 & #2

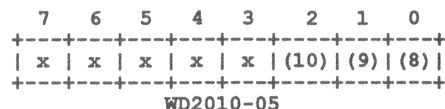
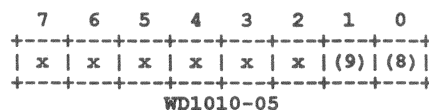


Circuit, controller #3



The 8X300 and 1010 controllers used by Radio Shack limit the number of cylinders to 1024 that can be accessed on an attached drive.

However, the owner of controller #3 or #4 can use drives with up to 2048 cylinders by replacing the 1010 controller with a 2010 controller. On some of these boards, the 1010 is even socketed, making the upgrade even easier. The difference between the 1010 and the 2010 that makes this possible is an additional bit in the Cylinder Number High register:



XENIX 3.2 supports the 2010 controller. (If you are still running TRSDOS-II, don't bother getting a 2010, just keep using the Dumont.) The following patch must be made to the diskutil utility so it will allow formatting of drives larger than 1024 cylinders. DO NOT apply this patch if the 2010 controller is not installed. Entering a cylinder count greater than 1024 if a 1010 controller is installed will result in unusable media. (Reformatting will recover if you attempt to do this anyway.)

This patch is only valid for the version of diskutil that came with XENIX 3.2.0. The version message in diskutil must say: 3(42) 3-Mar-87

```
# patch /diskutil
byte offset (<ENTER> to exit) ?
16be [ENTER]
16be: 04 |.| > 08 [ENTER]
16bf: b7 |.| > q [ENTER]
byte offset (<ENTER> to exit)
? [ENTER]
#
```

The WD2010-05 controller is available in single quantities from Hallmark in Dallas Tx. The phone number is 214-553-4300. It is not cheap; it runs about \$85 (and Hallmark has a \$100 minimum order requirement), although the ability to increase total disk space may make it worth

Table II-A

Model Manufacturer	SA1004 Shugart	TM602 Tandon	TM503 Tandon	TM603 Tandon	Q540 Quantum	1325 Micropolis
Sold by R/S	Yes	Yes	Yes	Yes	Yes	Yes
Formatted Size	8 Meg	5 Meg	15 Meg	12 Meg	35 Meg	70 Meg
Media Size	8"	5.25"	5.25"	5.25"	5.25"	5.25"
Cylinders	256	153	306	230	512	1024
Heads	4	4	6	6	8	8
Seek TK to TK	19msec	18msec	18msec	18msec	10msec	6msec
Seek Full Strk*	150msec	(336msec)	(170msec)	(450msec)	80msec	62msec
Seek Average	70msec	168msec	85msec	225msec	45msec	28msec
Latency Avg.	9.6msec	8.34msec	8.33msec	8.34msec	8.5msec	8.33msec
Interface	SA1000	ST506	ST506	ST506	ST412	ST412
RWC from host	128	128	No	128	No	No
Write Precomp	128	128		128	256	No
Rotational Spd	3125	3600	3600	3600	3600	3600
MTBF (in hrs)	8,000		11,000		10,000	20,000

Power Requirements in Amperes

Model Manufacturer	SA1004 Shugart	TM602 Tandon	TM503 Tandon	TM603 Tandon	Q540 Quantum	1325 Micropolis
5VDC Start			1.2			0.9
5VDC Run	2.0	0.8	0.8	0.8	0.7	0.9
5VDC Max	3.6		1.2		1.0	0.9
12VDC Start	—	5.0	5.0	5.0	4.5	3.9
12VDC Run	—	1.5	1.5	1.5	2.0	2.1
12VDC Max	—		2.0		2.4	3.3

The SA1000 drives did not use 12VDC, but did require these additional voltages:

24VDC Run	0.2	—	—	—	—	—
24VDC Step	2.8	—	—	—	—	—
-5VDC Run	0.2	—	—	—	—	—
115VAC 60Hz (spindle motor)	.75	—	—	—	—	—

Typical Watts**	(102)	(22)	(22)	(22)	23	10
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it. Hopefully there is a cheaper source out there. It may be cheaper to get a used WA2 AT disk controller and take the 2010 off of it. Many of these use the 2010. Then put the 1010 on the WA2 and sell it to someone who doesn't need drives that big.

Another factor in favor of buying a 2010: the 1010 and 8X300 controllers limit the top seek speeds to a rate lower than the speeds high performance drives available today can provide. In other words, a 19 msec drive will probably not actually run that fast if driven by a 1010 or 8X300 controller. Even drives as slow as 28 msec can be slightly inhibited by the speed of these controllers. The 2010 allows the

higher seek rates to be achieved if software changes are also made. These changes will be discussed in detail in a future article.

ST412 And The Death of Reduced Writing Current

The big difference between the ST506 and the ST412 is that the ST412 drive does not have to be told by the disk controller when it should use a lower writing current. Reduced writing current is used on the inner tracks of drives because the bits are spaced closer together and if the writing current is too high, the resulting magnetic field from the write head may alter bits that were just written

in addition to the bit that is supposed to be written at a given instant. The host indicates when to use reduced writing current (RWC) by setting line 2 on the "Control" cable to true (LOW).

All four controllers above use the "Write Precompensation Register" to control both precompensation and reduced-write current. The assumption these controllers made was that if the drive required precompensation, the write current should be reduced at the same point. On most drives, this was usually not the case.

A few ST506 and all ST412 drives use their on-board electronics to monitor the head position and reduce the write current

Table II-B

Model Manufacturer	ST225 Seagate	ST251 Seagate	ST251-1 Seagate	ST4096 Seagate	94205-51 CDC	ST151 Seagate
Sold by R/S	No	No	No	No	Yes	No
Formatted Size	20 Meg	40 Meg	40 Meg	80 Meg	40 Meg	42.5 Meg
Media Size	8"	5.25"	5.25"	5.25"	5.25"	3.5"
Cylinders	615	820	820	1024	989	977
Heads	4	6	6	9	5	5
Seek TK to TK	20msec	8msec	8msec	6msec	5msec	8msec
Seek Full Strk*	190msec	95msec	70msec	55msec	65msec	44msec
Seek Average	85msec	40msec	28msec	28.0msec	28msec	24msec
Latency Avg.	8.33msec	8.33msec	8.33msec	8.33msec	8.33msec	8.33msec
Interface	ST412	ST412	ST412	ST412	ST412	ST412
RWC from host	No	No	No	No	No	No
Write Precomp	300	No	No	No	128	No
Rotational Spd	3600	3600	3600	3600	3600	3600
MTBF (in hrs)	50,000+	50,000+	50,000+	30,000+	30,000	45,000+

Power Requirements in Amperes

Model Manufacturer	ST225 Seagate	ST251 Seagate	ST251-1 Seagate	ST4096 Seagate	94305-51 CDC	ST151 Seagate
5VDC Start	1.2			1.5	1.0	
5VDC Run	0.8	1.0	1.2	1.5	0.4	0.5
5VDC Max				1.5	0.6	
12VDC Start	2.6			4.0	4.5	
12VDC Run	0.9	0.5	0.5	1.5	1.5	0.45
12VDC Max	2.4	2.0	2.5	2.5	2.0	2.0
Typical Watts**	14.8	11	12	23	(20)	8

* Maximum seek rates in parentheses were not published and have been computed as twice the average access. Note that some manufacturers compute the average access time as the time it takes to seek 1/3rd the distance across the drive, which means the actual maximum seek time could be higher.

** Typical watts values in parentheses were not published and have been computed with the formula $W = V \times I$ summed for each voltage used by the drive.

+ MTBF values for these drives have increased since they originally became available. Values shown are as of Seagate Pub 1000-002, March 1989.

at the point that is correct for that drive. Line 2 on the "Control" cable is ignored. In newer drives, the controller need only get the write precompensation starting point right, and in some of the latest drives, write precompensation is not needed either. (See ST251, ST251-1 and ST4096 in Table II-B.)

Lose write current, Gain a head select

When the hard disk drives started handling the reduced write current management, line 2 in the "Control" cable could be used for something else. On the larger drives line 2 has been designated as the

fourth head select (2[^]3), which will allow up to 16 heads to be present in the drive. An example of this usage is the Seagate ST4096 which has 1024 cylinders and 9 heads. This drive provides a formatted disk capacity of 80 Megabytes.

If you attempted to use a drive like the ST4096 on your existing system or after you upgrade to the 2010, you are still limited to eight heads. But because this drive uses line 2 of the "Control" cable, you must disconnect (or tape over) that pin. Otherwise when you reach cylinder 512 and the reduced write current signal is asserted, the drive will attempt to access heads 9 through 15, which will fail,

resulting in 7 out of every 8 tracks being flawed-out. Covering the pin with a small piece of electrician's tape will work fine unless you unplug and reconnect the cables frequently.

If you have questions about this article, please send email to:

Frank Durda IV @ <trsvax!uhclem>
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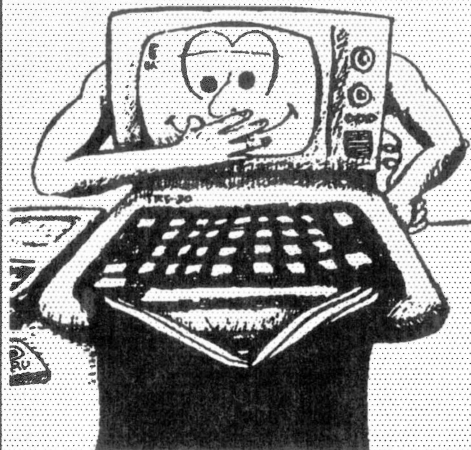
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