(092)8704

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225 S. Wheeling
Oregon, OH 43616
(419) 693-7934

Meeting; 10 Apr.'87 Fri
Oregon #2 Fire Station

```
!///////////////\\\\\\\\\\\\\!
!     (419)   385-7484       !
!        TICOMM BBS          !
! >>>      24-HRS      <<<   !
!                            !
!           SYSOP            !
!  > MILLS - TURNER <        !
!\\\\\\\\\\\\\\\///////////////!
```

Don Turner
President, New Horizons
5533 Fleet Street
Toledo, OH 43615
(419) 537-1454
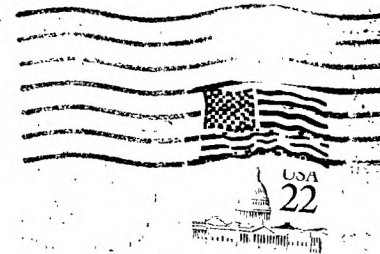
Meeting; 11 Apr.'87 Sat
Unity Church   Secor Road

THE NEWSLETTER STAFF

Bill Tiep   Kent Sheets
Phil Bennis   Marilyn Schafstall
Dave Burkette   Earl Hoffsis

LOCAL CONTRIBUTIONS BY;

BOB PETERS   KENT SHEETS KENT SHEETS   KENT SHEETS

NORTHWEST OHIO 99ER NEWS

Bill Sager
612 Meadow Springs.
Maumee 43537
  OHIO

Edmonton 99'ers Computer
PO Box 11983   Users
Edmonton, Alberta
Canada T5J 3L1

USA 22

PRESIDENT'S CORNER

by BOB PETERS
OH-MI-TI

First of all, for you *members that weren't* at the last meeting , the board would like some ideas on what you want to see demonstrated at the meetings. We will try to get the software or hardware if it doesn't bankrupt the club. We would also like to have some volunteers to give the demos and write an article for the newsletter on what the demo will consist of or a review of the software or hardware.

This month's demos will be by Bud Mills and myself. Bud will demonstrate the icreased speed of his 16-bit bus Turbo console. I will show how to setup a systems disk for small-C, a look a couple of example programs and a look at High Gravity a game written in small-C.

We will have some QUALITY programs for sale this month. 1. FunnelWeb 3.4 This is the latest version of this fine set of programs. It contains DM1000 V.3.5, space for at least 18 different menu selections on the Main Menu, an option to return to FunnelWeb from DM1000, Myarcs DM, and at least two other menus to choose from. 2. RagLinker This program is supposed to be able to change EA Option 3 files to EA Option 5 Program Image files. I haven't had the time to try it yet, but there will be a review of it in the next newsletter. 3. Disk Utility Ver.3.2-2 This program is loadable into a SuperCart. It allows you to compare sectors on two different disks among other things. 4. EA Subroutines This is 850 sectors worth of all different kinds of subroutines that you can use in your programs. The documents on this set of disks are worth having by themselves. 5. C99 or small-C for the TI This is four disks worth of the various subprograms and the compiler that make up the operating language. All of the available documents are included.

All of the above programs include all of the documentation on the disk.

Please give some thought to buying some or all of the above programs as it our only source of funds to keep the club operating.

Don Turner and I have discussed having a joint meeting in June. We thought we would have a potluck and swap meet for that meeting. If you have any ideas, we will discuss them and get it set up as soon as possible.

The next meeting is on April 10, 1987 at 7 P.M. at Oregon #2 Firestation. Plan on attending. See you there.

NEW HORIZONS

by Don Turner

Last months meeting was quite a meeting, John Clulow demonstrated Monty Schmidt's DOS 99. Judging from the attention given to this particular demonstration it looks like a fantastic piece of software. John will keep us informed on the progress of DOS 99. It was mentioned that in a month or so that it would be available on disk for the super cart owners and if demand is large enough, it will be put in a command module. Steve Patterson is our new Vice President replacing Phil Bennis. Steve also demo'd a few of the newest club disks that were available. Many many thanks to John and Steve for their splendid demonstrations.

I would like to thank Bill Tiep and Bill Sager for taking their time to sit at the club table during the '87 computerfest. I seen several members of both clubs there. The most important discovery was a few TI owners that found our table and became members of New Horizons or OH-MI-TI. I would like to welcome the new members and hope that they enjoy the up coming meetings as well as share the special fellowship that TI owners have.

Burr Mallory has reorganized the newsletters we receive from other TI users groups into several binders. It is now much easier to find a spe'ific newsletter and also you can read the log in the front to see wich newsletters you have seen. Burr has done a splendid job for us, many thanks to him. Burr also mentioned at the meeting that the video tapes were out, if you have one and have finished using it please return it at the April

meeting. If you are stil using it please let him know. Chris Dewy has set the club library up and has it running well !! For the first time since December it is now available to the members. I am confident that Chris will do a splendid job as libriarian. There were 23 members present last month. There was 4 prizes won by the members with the winners being

PRIZE # 1 WAS WON BY PAUL MARTIN

PRIZE # 2 WAS WON BY CHRIS JOHN DEWEY

PRIZE # 3 WAS WON BY RICH CHERRY

PRIZE # 4 WAS WON BY STEVE PATTERSON

This month Bud Mills is going to demonstrate his TI-99/4A turbo. This is a modified 994A console that has the 32K mounted on a 16 bit bus. This modification enables the console to perform about 40% faster than a normal console. Bud is planning to use DISPLAY MASTER for his demo. Actually your going to get two demos in one ! ALSO Multiplan will be Demo'd by yours truly.

There is going to be three new club disks this month , one is the S.T.A.R. software that was demo'd by Mark Lamb a few months back and there is a diskaid program from down under. Please plan to attend and get there early ! Also the Basic S.i.G. will start at 1:00 pm for those who are intrested. This month the FOR NEXT loop will be put to use with the READ and DATA statements.

PRESENTATIONS.

Kent Sheets 4/87

OH-MI-TI

As was stated at the last user group meeting, "What do you want to see presented?" It is your computer, your time, your meeting. What items of interest would get you to the user group meeting? If the software is not available in northwest Ohio, the user group officers have decided that the user group will order any software required for a presentation if need be.

There is a verse that goes like this:

"If you haven't got it....
You havene't asked for it."

One of the main reasons for the TI Users Group is to help you get the most out of your TI99/4A.

If there is something YOU would like to see presented, call or write or leave a message on TICOMM(385-7484) BBS to any of the TI user group officers.

If no one makes any requests, I will be showing Magic Tricks at the next meeting!!!!!

TC—MAIL REPLY

Kent Sheets 4/87

OH-MI-TI

A special thanks to whomever left a reply to my request about TC-MAIL with my wife.

The following address and phone number was left:

RAM SOFT ENTERPRISES
1501 E. CHAPMAN AVE 338
FULLERTON, CA 92631
714-738-5665

I gave Ram Soft a call about TC-MAIL. According to them there have been no updates or revisions to TC-MAIL.

FOR SALE

Kent Sheets 4/87

OH-MI-TI

****
TI99/4A ITEMS 4-SALE

TI99/4A COMPUTER
TI SPEECH SYNTHESIZER
SONY CASSETTE RECORDER
with TI CABLE
USED CASSETTES
CASSETTES WITH BASIC XB PGM

TI COMMAND MODULES:

PHM3006 HOME FINANCIAL DECISIONS
PHM3007 HOUSEHOLD BUDGET MGM
PHM3013 PERSONAL RECORD KEEPING
PHM3041 ADVENTURE MODULE
PHM3052 TOMBSTONE CITY: 21ST
PHM3053 TI INVADERS
PHM3111 TI-WRITER WORD PROCESSOR
with MANUAL
PHM3112 PARSEC
PHM LOGO I

ATARISOFT MODULES:

PICNIC PARANOIA
DEFENDER

ALSO HAVE A TI99/4 4-SALE

****

Now if anyone out there is interested in a great project, using forth, how about trying to revise TC-MAIL so that it can use double sided disk drives. Or even more, it is a great mailing program.

Again thanks to that unknown caller.

ORPHAN SUPPORT

Kent Sheets 4/87

OH-MI-TI

ORPHAN SURVIVAL HANDBOOK by Dr. Ron Albright.

I recently received a copy of the above manuel. It is a fantastic collection of important old information, reprinting some of the great articles that have appeared in user group newsletters accross the country, along with teriffic new material for the TI99/4A users. This is a must source of information for the serious TI99/4A user.

Copies were available at our last user group meeting for your review. If you were unable to attend or get a good look at the copies at the meeting, just contact one of the user group officers to make arrangements to preview it.

There are too many articles to list here but here are the titles of the sections covered:
1-BASIC/XB/TIPS + more
2-ASSEMBLY LANGUAGE
3-C99 (9 Tutorials plus)
4-FORTH
5-PASCAL, PILOT
6-HARDWARE
7-TELECOMMUNICATIONS
8-TI WRITER
APPENDICES (Books, User Groups, Peeks, Pokes, Disk specs, Error Code, and lots more.

FROM THE LONG ISLAND 99'ER, AUGUST 1986
RAndY's RumOR RaG by Randy Ainsworth

WARNING!!!!!!!

Beware of a program which may be floating around the country's BBS's called SUPERTRACK. At first appearance, it seems to be a track copier, but in reality is a disk eater.

This program was uploaded to my BBS recently and I suspect that it will show up around the country.

I was suspicious at the first because the program tells you to remove the write-protect tape from your master disk. I could not understand why this would be necessary so I stuck two junk disks in my drive.

When the program starts, BOTH drives come on and the heads chatter like crazy. Whatever was on your disks is now in byte ▨ ▌·▔ ▊_£. Your disks are zapped and I doubt that the action the heads are getting is doing them any good also. The noise is quite loud.

I have heard of similar programs for IBM which will zero-out a hard drive, but this is the first one I've seen for the TI.

I just wanted to warn everyone so that no valuable program or data will be lost.

- GRAPHICS COMPATABILITY -

by Don Macclellan
BLUEGRASS 99 COMPUTER SOCIETY, INC.

The multitude of Graphics programs available for use with the TI-99/4A computer and their compatability with word processing programs has prompted a request for some description of the available programs. This will be an attempt to clarify compatability among most of the later programs. The diagram on the right does not cover everything available, but does cover all of the programs which have been sold through the Society or which are available in the Society library. This discussion is not an attempt to provide a tutorial or review of such a multitude of software, only to give you a perspective and hint of what might suit your needs.

TI-WRITER is the only prudent choice for a word processing program for those having 32K & Disk drive. There are no others which come close to providing the features and versatility. 'Companion' is probably the logical alternate if WRITER were not so available. All versions currently available (and there are several) still use TI's WRITER program files. The best and least costly is FUNNELWEB's version which in addition to freeing E/A & WRITER from their respective modules, includes -C, DISKO, FORTH, FASTTERM, and your choice of any others in a disk-based program which really begins to shine when installed on a RamDisk. Almost all of the programs which we will discuss will be used either with Text from TI-WRITER or through TI-WRITER.

The CSGD Series of Graphics programs written by Dave Rose has been more widely accepted by our members and is shown at the top of the diagram. It is compatable with both Prowriter and Epson-Gemini printers but you must purchase the correct version for your printer. The Keyboard or the JoyStick may be used in any of the Editors. The Message printing program is common to CSGD-1,11, & 111.

CSGD-1 contains the EDITOR programs for creating your own (1) Character Sets, (2) 5x5 Graphics, and (3) Pictures. The Editors, primarily the Character Editor, have undergone 4 revisions including the most recent which was in response to suggestions by our members. Provisions are also made to jockey graphics around to convert between alternate printer types.

CSGD-11 is basically a banner program which prints the message sideways and 8 times magnified. It also contains the Graphic Editor but not the other editors. It has gone through three revisions including the latest which now allows printing lower case in the Banner mode.

CSGD-111 is primarily a Label program which produces multi-width labels in 3 heights. It also contains the Message program and a 'easier to operate' Letterhead program. ALL OF THE FILES CREATED IN CSGD ARE I/V 254 and are not compatable with TI-WRITER. The Docuprinter is compatable with WRITER and will produce 1 or 2 column texts using a choice of 6 type fonts and D/V 80 files through the Formatter. It will not presently handle fonts of greater height than 1 row.

The CSGD programs are supported by a multitude of graphics, pictures, and over 188 fonts written by Dave Rose and contributors who use and enjoy his programs. Three of our members have contributed Character Fonts. These have been issued as UD1(1), UD2(2), UD3(2). UD4(2) will be available at the meeting !!!

TI-ARTIST is an extremely versatile drawing program written by a talented young man, Chris Faherty, which many of the Society members have purchased. It allows creating, loading and modifying, size changes and many other features using the Keyboard or a combination of the Keyboard and Joystick.

NONE OF THE PROGRAMS DESCRIBED IN THIS DISCUSSION CAN BE LEARNED READING THE MANUAL. You must use them and make your mistakes: It helps you to remember. TI-ARTIST is in its second revision which now includes Prowriter as well as Epson-Gemini versions. The 2.01 RamDisk configured version is also now available.

The only Files that were available with ARTIST were ART-EXTRAS however, Dave Rose has converted his I/V 254 files to D/V 80 files which can be loaded as 'Instances' and they have been released as the COMPANION I-III series. IV should follow soon since UD4 has now been released. In addition, TI-ARTIST allows the loading of GRAPHX files so that a rather large base of graphics is available to use and modify or create you own.

GRAPHX is a program with quite a few similarities to ARTIST; was written in Australia and introduced in the USA in 1984. It allows use of the Joystick ONLY, and is not compatible with any but the Epson printer. It is a quite versatile drawing board in the hands of an experienced user.

The support graphics available consist of GRAPHX COMPANION-1 thru III and GRAPHX PICTURES. They are all well done though I personally have not purchased the program because of the printer limitation and my distaste for the Joystick. The availability of additional graphics is made possible through TI-ARTIST which will load and save to the Image (PGM) format. Several of our members prefer to do their creative work with GRAPHX and use ARTIST only as a transport.

JOYPAINT & JP PAL are Graphics Drawing Boards well spoken of by their owners. I am not aware of any Society members who own this 'Joystick' only Program. It does have options which allow loading from and saving to ARTIST &/or GRAPHX filetypes. It is currently only compatible with the EPSON printer.

ARTCONVERT is a Program which we purchased in Chicago that converts TI-ARTIST files to TI-WRITER files. It is supported by 4 diskettes of files; ARTDATA-I thru IV. This permits anyone with TI-WRITER to have the ability to print graphics. It will also merge and print two graphics but there are no provisions to include text in the graphic file to complete a document.

One unique feature of ARTCONVERT allows the user to convert one row high TI-ARTIST fonts for use thru TI-WRITER. This would allow conversion of all of Rose's 1 row high fonts in Companion I-III to be used though they contain only 78 of 96 Typewriter keys if you do not have the COMPANION series. Compatible with Prowriter and Epson-Gemini.
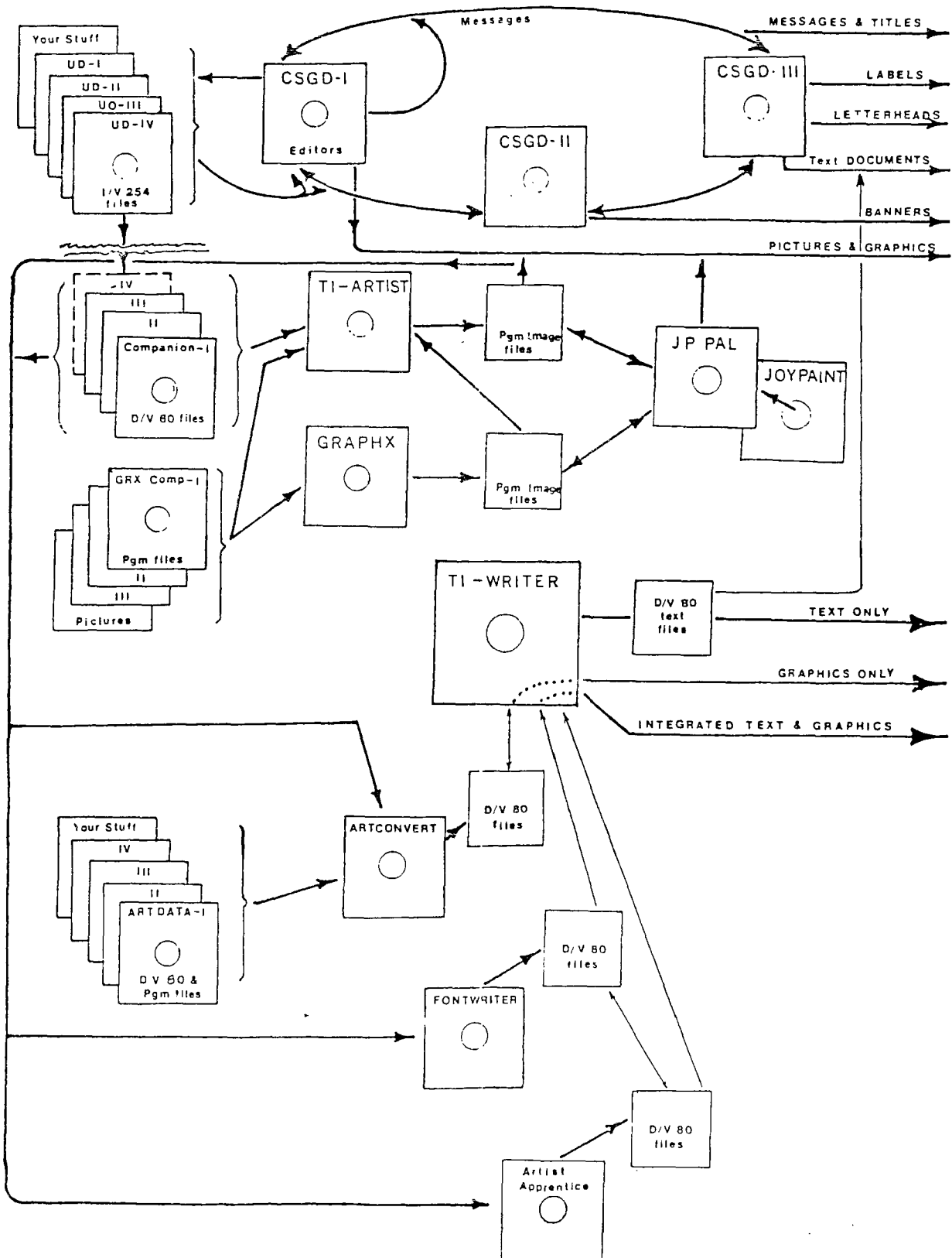
FONTWRITER by Peter Hoddie is really the first graphics program which is compatable with TI-ARTIST and TI-WRITER. With this program you can create your own type fonts, revise TI-ARTIST and CSGD fonts and use TI-ARTIST Instances mixed in printed documents even on the same line.

Although I bought it in Chicago based on Asgard's assurance that it would work on the Prowriter, the second paragraph of the documentation states that it strictly for Epson-Gemini owners. In a late note Hoddie added a brief text to the diskette which told of the location of the printer codes and I think it can easily be made to work with the better printers. The resources for this program are as broad as all of the ARTIST files plus all of those I have indicated earlier which can be converted through ARTIST.

ARTIST APPRENTICE is similar in several ways to FONTWRITER. It allows use of TI-ARTIST type files, fonts and graphics to produce files which are printed according to a 'Scheduler'. It is limited in being compatable only with the EPSON printer.

SOME POPULAR GRAPHICS PROGRAMS

Messages

MESSAGES & TITLES

LABELS

LETTERHEADS

Text DOCUMENTS

BANNERS

PICTURES & GRAPHICS

Your Stuff
UD-I
UD-II
UO-III
UD-IV
I/V 254 files

CSGD-I
Editors

CSGD-III

CSGD-II

-IV
III
II
Companion-I
D/V 80 files

TI-ARTIST

Pgm Image files

JP PAL

JOYPAINT

GRX Comp-I
Pgm files
II
III
Pictures

GRAPHX

Pgm Image files

TI-WRITER

D/V 80 text files

TEXT ONLY

GRAPHICS ONLY

INTEGRATED TEXT & GRAPHICS

ARTCONVERT

D/V 80 files

Your Stuff
IV
III
II
ARTDATA-I
D V 60 & Pgm files

D/V 80 files

FONTWRITER

D/V 80 files

Artist Apprentice

Disk Controllers - from TI to MYARC

Copyright Jerry Coffey, January 1987

The views expressed in this article reflect the author's personal experience
with TI, Corcomp, and Myarc disk controllers. Technical data has been
verified wherever possible, but is not publicly documented in some instances.
Please bring any errors to the attention of the author.

The disk capacity of the TI99 has increased in just a few years from less
than 80K (a single one-sided 35 track drive) to almost 2.9 megabytes (four
double-sided, double-density, 80 track drives). The early standalone was
replaced by the PEBox system which would support three double-sided 40 track
drives (540K). Corcomp introduced their four drive double-density system
(1440K), followed by Myarc's similar system with two double-density formats
(1280K and 1440K). Then in 1986, Myarc offered its 80 track upgrade which
doubled capacity again. Even as capacity was increasing rapidly, the TI and
Corcomp controllers differed only modestly in I/O speed. When MYARC
introduced its fast DSDD controller, few reviewers did justice to its speed
advantage. Early comparisons were done at the standard TI or Corcomp
interlace, but the big speed gains required taking advantage of the much
tighter sector interlace possible with the high-speed MYARC card. To
understand how this works we need to take a look at the way a disk drive
performs.

Disk Drive Fundamentals

A floppy disk drive writes information in concentric rings called "tracks" on
a thin plastic disk coated with a film of magnetic particles. Each track in
turn is divided into blocks of information called sectors. A blank disk has
one (or more) index holes used to synchronize the process of writing to and
reading from the disk. The type with many holes are called "hard sectored"
since each sector has its position fixed by an index hole. The type of disks
used by most computers have only one hole and are called "soft sectored". In
this system the computer must write magnetic signposts on the disk to mark
out each sector in a process called "formatting" or "initializing" a disk.
These signposts take up a subtantial fraction of the space on a track since
they include not only sector numbers but buffers (filler bytes) that allow
the computer to get into synchronization to read or write sectors of data and
to prevent the sector identifier from being overwritten by a drive operating
at a slightly different speed from the drive that formatted the disk.

The typical 5.25 inch disk drive has a "stepper motor" capable of moving the
drive's read/write head(s) in or out along a radius of the disk in steps of
1/48 of an inch (thus the terminology "48 tpi" = 48 tracks per inch). Since
the inner tracks have a smaller circumference, they crowd the bits of
information together. Magnetic coatings on a floppy disk are rated by their
capacity in bits per inch at standard magnetic flux for the write head. This
figure is usually over 5000 bpi for modern floppies, but was somewhat lower a
few years ago. The circumference of the inner track of a 40 or 80 track
disk is about 10 inches -- which allows about 6250 bytes to be written on the
track without exceeding 5000 bpi. For comparison, the Corcomp double density
format requires over 6400 bytes per track. Media limitations were the reason

that some early 5.25 disk drives only used the outer 35 tracks. The 16
sector (by 256 bytes/sector) format recommended by most drive makers requires
only 6250 bytes per track and includes several hundred additional "buffer"
bytes to compensate for differences in drive timing.

Timing is EVERYTHING

With soft-sectored disks, the integrity of the read/write processes require
critical timing. The disk rotates at 300 rpm within a small margin. This
means there are about 250 thousand magnetic pulses (bits) passing beneath the
head each second. In single density format, the majority of these *pulses are*
timing or filler bits -- in double density, many of the timing bits are
suppressed in order to double the rate of data bits. In a typical sector
read the drive must bring the disk up to speed, recognize the index hole,
step out to track zero (to get its bearings), determine single or double
density, verify its position, step in to the target track, verify the track
number (written in the format operation), detect the sector identifier as it
flies past, then immediately read the 256 data bytes into memory. Five of
these operations require accurate reading of the magnetic pulses whizzing by
at over 250K bits per second.

If you do some quick arithmetic (256 bytes/sector = 2048 bits/sector into
250k bits/second)... hmmm... Why can't the drive read a 125 sector file in
one second? Well first many of those bits are not data bits, they are
overhead to keep things synchronized and allow for timing variation between
drives. Second, some time is used moving the head from one track to the next
when more than one track must be read. Third, 250K is the instantaneous read
rate and the computer must take time to do other things like move the last
sector out of its buffer to make room for the next one. In the standard TI
protocol for reading a disk, the data is moved into VDP ram (so the drive
could be used without the memory expansion) before it goes to the expansion
memory. All this thrashing eats great chunks of the time available for
reading data. By the time one sector is safely tucked away in the 32K card,
several sectors have already passed by the drive's read head. If the sectors
were written consecutively on the disk, we would have to wait a full
revolution (0.2 seconds) before the next sector would pass under the head.
To avoid this inefficiency, the consecutively numbered sectors are spaced out
around the disk so that they are separated by just enough time to take care
of other business. The actual pattern in which the sectors are scattered is
called the "interlace". The idea of the interlace is to spread the sectors
out to match the timing needs of the hardware -- both the time needed to
stash each sector and the time needed to step from one track to the next and
get the the head settled down for some serious (250K bps) reading.

Interlace and Head Step Times

Life was simple with the TI disk controller. Both the interlace and the head
step time were locked into the controller's PROM (that's the programmable
chip that contains the control programs for the card). The head step time is
the built-in delay between step signals to allow the stepper motor to move
the head one "click" in or out. The TI settings are very conservative (read
"slow") to allow for slow drives. The step time is 20ms -- if you step from
track zero to track 39, it takes 20x39=780ms, almost four revolutions of the
drive. The TI interlace lays the sectors down on a track in the order
075318642. This allows all sectors to be read in four revolutions of the
disk though the slow head step lets another revolution go by between tracks.

Thus the maximum read rate is about 9 sectors per five revolutions (= one second) or 2304 bytes per second.

When Corcomp designed its double density disk controller, allowances were made for the increased speed of later drives by permitting the step rate to be set with DIP switches for each drive. The step rates available are 30, 20, 12, and 6ms (the faster values quoted in the CC manual are referenced to the wrong clock speed). They also provided a choice of interlace options, though only a couple of them are practical. The default interlaces are labeled "7" for single density and "10" for double density. The single density interlace is the same as TI's, but with a faster step setting the head be can moved without losing a revolution and thus reads 20% faster than the TI controller. The double density interlace allows 18 sectors to be read in five revolutions, but it doesn't leave enough margin to stash the last sector and step the head in time to catch the zero sector of the next track (that's why the sector number "hangs" for 0.2 seconds each 18 sectors while verifying a formatted disk -- you are seeing the extra revolution needed to acquire the first sector of the next track). Thus the maximum read rate is 18/1.2 or 15 sectors per second, about 67% faster than the TI controller. Users of the CC controller have probably noticed that it loads its own MANAGER program faster than this. In this case a special loader bypasses VDP and loads directly to CPU RAM -- this faster handling of the data allows the stepper motor to be activated sooner and saves one revolution per track (so the 98 sector file can be read in about 5.5 seconds). This provided a foretaste of the speed that MYARC would achieve with its double density controller.

The MYARC controller bypasses VDP RAM to load directly to CPU RAM. This technique coupled with a buffer RAM chip on the controller card provided a quantum jump in disk I/O speed. The MYARC card reads the TI single density interlace at 11.25 sectors/second (the same as Corcomp) and reads the CC 18 sector/track interlace at 18 sectors/second (the same speed Corcomp reads its MANAGER program), but this is only the beginning. Since the hardware empties its sector buffer faster, consecutive sectors can be placed closer together allowing a track to be read in fewer revolutions, i.e., it supports a faster interlace. With fast drives, the 9 sector/track single density format can be read at interlace "2". (NOTE: In the MYARC terminology, the interlace number represents the number of disk revolutions required to read a track.) This works out to 22.5 sectors/second compared to 9 for the TI and 11.25 for the CC controller. The MYARC 16 sector format can be read at interlace "3", 26.67 sectors/second -- 3 times as fast as the TI controller and almost twice as fast as Corcomp double density. The Corcomp 18 sector format can be read at interlace "3" or "4", but the data rate is the same in either case, 22.5 sectors/second. Interlace "4" is smooth but requires a very quick head step, interlace "3" reads the track in 3 revolutions but forces an extra revolution for the step from track to track because sectors 17 and 0 are adjacent on the disk. Though both interlaces have the same data rate, interlace "3" is safer if you are uncertain about the speed of your stepper motor.

In order to read and write both double density formats, the MYARC system must insert an additional step in some I/O operations -- sector zero must be read to determine whether a double density disk has 16 or 18 sectors per track. This datum is needed to convert the the logical sector numbers used by the TI operating system into track and sector-within-track addresses for the floppy disk controller chip. The TI and Corcomp controllers do not need this step because they do not use the full potential of the TI disk I/O protocol. Once this step, accessing sector zero, is added to the various disk operations, it opens the system up for using more than two formats -- including 80 track

formats.

Beyond Double Density

—————————————————

A two format system can be managed using only the floppy disk controller's
inherent ability to sense single and double density recording patterns. To
get beyond this limitation, the additional data stored in sector zero must be
read, stored, and used to modify the special binary commands sent to the FDC
(floppy disk controller) chip. Fortunately the TI99/4A system design already
provides for such innovations through the Device Service Routine concept and
standard "GPL" calls. The system doesn't care what hardware is attached as
long as it plays by the rules -- an interface program stored in a *memory chip*
(PROM) on the peripheral device does the trick. This program handles calls
for I/O operations from other programs such as TI Writer or the Basic
Interpreters. Another set of rules controls the way disk and file
information are saved on a disk. Disk parameters are stored in sector 0,
while sector 1 must have a two byte "pointer" (a hexadecimal sector address)
for each block (one sector) containing the bookkeeping data for a file. It
is these blocks that are scanned in order to display the disk directory.

Since the Myarc controller must read sector zero to determine the number of
sectors per track, the other parameters in that sector are available to
control other variables such as number of tracks. But there were other
limitations to overcome. The number of files on a disk is limited by the
space available for pointers. 256 bytes at 2 bytes per pointer would give
128 files -- except the pointer list must end with a null word (>0000) so
directory routines know where to stop -- so we get 127 files per disk. The
pointer itself can address sector numbers as high as 65535, so this is no
problem. The real limitation is the bit map in sector 0. It begins at byte
56 leaving only 200 bytes or 1600 bits available to map the disk. Since a
bit must be turned on for each sector used, the 1440 sector DSDD 40 track
disk is already near the limit. The answer devised for the 80 track DSDD
system is to map two consecutive sectors with each bit. It wastes some space
but no more than systems that use a standard 512 byte sector.

Making the Quad System Work

—————————————————————————————

So now lets say we have new code in the disk controller EPROM (an "erasable"
version of the PROM chip used by TI) that does all the proper tricks with the
bit map and has the FDC commands to control the new 80 track drives we have
added to the system. We still have to tell the controller which drives are
80 track and find a disk manager program that can use the new commands. The
selection problem can be taken care of using the DIP switches on the card
(but in the process you lose their original function -- setting step speed).
Since the Eprom responds to standard GPL calls, most functions can be handled
by the TI Disk Manager 2 cartridge. The exception is the disk formatting
process -- the formatting works OK, but the initial data written into sector
zero is for the standard bit map. (This can be fixed by changing byte 56
from >03 to >01 with a sector editor.) Read/write operations from XB or TI
Writer work fine since they use the GPL protocols. Myarc has an excellent
disk manager program that works beautifully with 40 track drives, but it has
suffered from a number of subtle bugs in 80 track mode. This program, like
many others designed for high speed I/O, uses assembly language code to
handle the FDC -- bypassing some of the routines in the EPROM. Differences
in bit map handling, even slight differences in execution times can affect

the performance of 80 track drives. The code in the 80 track EPROM has had a lot of attention to proper timing -- the price you pay for higher performance.

Fine Tuning the Myarc Disk System

Before you start using the Myarc system routinely, there are some experiments that can get maximum performance from your drives. Use the Myarc disk manager to try different interlace settings -- first with your 40 track drives, then with the 80 track drives. Watch for hesitations as each formatted disk is verified, then use the Test option to read the sectors you have layed down. Look and listen for "retries" -- when the sector number pauses with a head seek noise. Use the best disks you have and note the combinations that test smoothly. With fast drives in good condition, you should be able to run 9 sector (single density) format at interlace 2 and 16 or 18 sector double density format at interlace 3. Don't worry if 18/3 pauses at the end of each track -- this is just the extra revolution forced by having sectors 17 and 0 adjacent on the disk.

When you try this with 80 track drives, don't be surprised if the results are different. The time required for the head to settle into a wide standard track may not be adequate to get it reading properly from the narrow tracks on the quad drive. Such subtleties as erase delays and disk quality are also more critical on the skinny, low power tracks. My Mitsubishi 4853s (96 tpi) will support both 16/3 and 18/3 but are unreliable at 18/4, while my TEAC 55Bs support all three at 48 tpi. Don't take chances with any setup that is marginal. The error rate may be low, but it always seems to happen to a file that isn't backed up.

Hot Rodding

If you want to try for a little more speed, there are two more tricks you can use. The faster WD1772 FDC chip is pin compatible with the standard WD1770 supplied by Myarc. It will try to step the head at 2ms rather than the 6ms setting of the standard chip. (The 80 track EPROM automatically uses the fastest step speed available.) Many of the latest drives can step at 2ms or 3ms even though they are conservatively rated at 4ms or 5ms. The change is noticeable but may not be worth the high price of the WD1772 (it is not a commonly used chip and is rarely discounted). The second fix is cheap and very useful for producing large quantities of copies. The FDC chip's automatic "write verify" function can be defeated by shorting one pin on the controller card to ground. This is best done with a switch so the verify can be enabled for normal operations. The effect of this modification is equivalent of the "turbo" option on the Corcomp controller and should be used only after testing.

Interlace Patterns

Note: The configurations marked * and ** are the standard interlace patterns for TI and Corcomp formats. The end-of-track intervals are only approximate since the 9 and 16 sector formats include more buffer space than the 18 sector format.
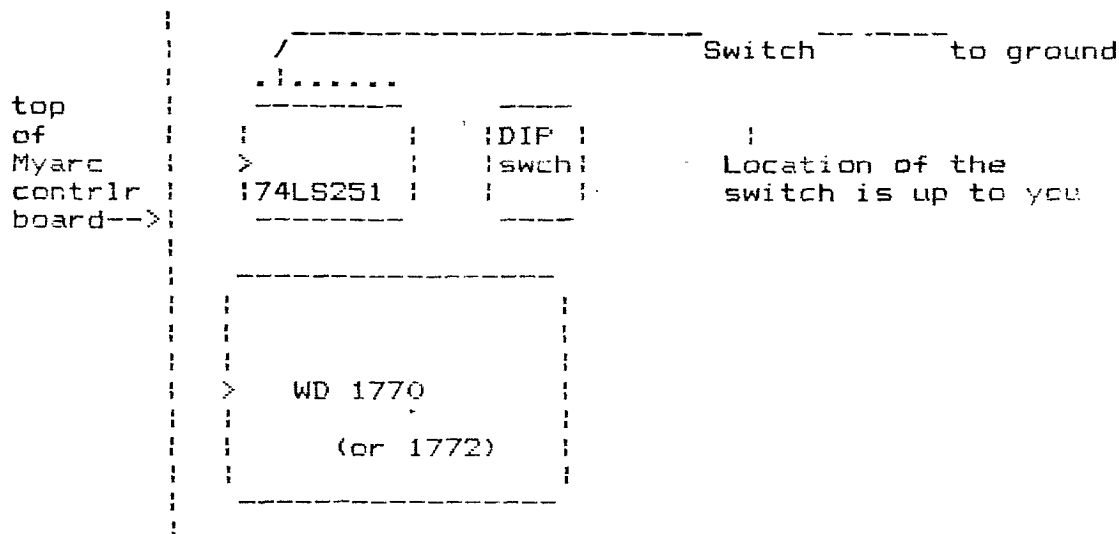
```
Sect/trk    Interlace   Pattern (dashed line is time available for head step)
_____    _____   _____

   9        4 *         0    7    5    3    1    8    6    4    2
                                                      _____

   9        2           0    5    1    6    2    7    3    8    4
                                                                _____

  18        5 **        0 11 4  8 15 1 12 5  9 16 2 13 6  10 17 3  14 7
                                                            _____

  18        4           0 9  5 14 1 10 6 15 2 11 7 16 3  12 8  17 4  13
                                                                  _____

  18        3           0 6 12 1 7 13 2 8 14 3 9 15 4 10 16 5  11 17
                                                                     none

  16        5           0 13 10 7 4 1  14 11 8 5 2  15  12 9  6  5
                                                     _____

  16        3           0 11 6 1 12 7 2 13 8 3  14 9  4  15  10  5
                                                                 _____
```

                 16-sector patterns are not precisely to scale

Disk Controllers -- an Addendum   March, 1987
I mentioned a "turbo" modification to lock out the "read after write"
(write verify) routine usually performed by the controller. Here are
the details:
     Find the 74LS251 chip at the top center of the controller board,
above the DIP switches and beside the large FDC chip (marked WD1770).
Solder a wire from the number 2 pin of the 74LS251 through a switch to
ground (e.g. the wide trace of the DIP switches or any trace connected
to that wide trace). It looks about like this from the bottom (non-
component side) of the board.

```
           :
           :    /--------------------------\      Switch -- ----- to ground
           :    .:.......
 top       :    --------          ----
 of        :    :       :         :DIP :         :
 Myarc     :    >       :         :swch:   -     Location of the
 contrlr   :    :74LS251 :        :    : :       switch is up to you
 board-->: :    --------          ----
           :
           :    ----------------
           :    :               :
           :    :               :
           :    :               :
           :    >   WD 1770     :
           :    :               :
           :    :   (or 1772)   :
           :    :               :
           :    ----------------
           :
```

As always you proceed at your own risk. (One person has told me this
did not work om his 40 track system, but I haven't verified that.) You
can tell it is working if your controller writes as fast as it reads
(normally the write takes twice as long).

Since I wrote the article on disk controllers, I have discovered some
surprising facts about my own system. All of the Myarc timings in the
article were done on an 80 track system with the fast WD1772 controller
chip (stepping at 2ms). With some help from Paul Charlton and Richard
Roseen, I recently customized Paul's Eprom to step at 3ms using the
WD1772. (Richard's drives were making errors at the faster speed.) I
used a Mechatronics Eprom programmer to download the Eprom code to
disk, changed the FDC commands with a sector editor, and wrote the
altered code back to a fresh Eprom. The process is simple (and cheap)
once you decide what code you need in the Eprom.
The slower step speed made it possible to notice some slight
differences in the performance of the WD1772. The first thing I
noticed was that interlace 4 on 18 sector tracks was no longer smooth
-- it was missing the first sector after a track seek and forcing an
extra revolution of the disk. This was the first clear indication of
how close this format is to the "ragged edge". The reaction to the
small change in step speed implies that this interlace comes within 5%
of the minimum time required to step and settle the head. Thus the
likelihood of read/write errors is relatively high with this interlace.
It will occasionally detect the sector ID and begin to read or write
before the head has completely settled. This interlace should
definitely be avoided -- 18/3 is both faster and more reliable.
The Eprom modification itself was an interesting experience. I patched
the new FDC commands into some unused text bytes and patched addresses
into the code to point to the new locations. The Mechatronics Eprom
Programmer is an excellent piece of equipment. It will burn (program)
a 2764 (8k) in about 90 seconds using the fast algorithm. I have
talked to Jim Horn and Jeff Guide about offering an Eprom service to
the customers of Disk Only Software. There are many possibilities this
technique opens up. There is the 80 track modification for the TI
controller worked out by Andy Cooper. And many Myarc owners are still
using old Eproms that have never been upgraded (though this situation
has improved since Lou Phillips increased his production capacity).
The fix we developed for Richard's controller can provide the optimum
step speed (3ms or 5ms) for different disk drives using the WD1772 FDC
chip. And any enterprising programmer can get his tailor-made code
installed in nonvolatile memory.
    Jerry Coffey [74716,3525]

FAST-TERM QUICK-REFERENCE CARD.

KEYTOPS REQUIRE "FCTN";
KEYBOTTOMS REQUIRE "CTRL".