CP/M2 ON NORTH STAR DISK
DOUBLE DENSITY - QUAD CAPACITY
USER'S NOTES
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1651 THIRD AVENUE, NEW YORK,N.Y.10028

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NOTE

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TABLE OF CONTENTS

CP/M2 ON DOUBLE DENSITY - QUAD CAPACITY NORTH STAR DISK.

INTRODUCTION.

GENERAL INFORMATION.

   Thank you for buying CP/M Software from Lifeboat Associates.
You have purchased the most useful software system ever written for
the 8080 and Z80 microcomputers and at the same time, you have joined
the largest group of disk operating system users in the world!

   We have been very careful to supply you with all of the
information you need to get CP/M running on your computer and to
enable you to understand the system.   CP/M however, like many
worthwhile things will not be mastered without effort on your part.
Read all of the manuals several times. Sit down at your terminal and
try all of the features so that you can see what they do.

   Exploring CP/M is a little like landing on the shore of a
strange new land. You will first become familiar with the simple
features that you will often use. Then you will penetrate the
interior and use the more complex features that make this software
system so powerful, but you must understand before you appreciate
these features. That will come in time.

   In order to help you, Lifeboat Associates has prepared this
manual and maintains a staff at it's New York headquaters. Call them
at (212) 860-0300 if you need help with a problem.   In addition,
Lifeboat Associates has a huge stock of software that runs under
CP/M. Refer to the sheet supplied with this manual for a listing, and
regularly consult the current advertising in the various computer
magazines.

CP/M AND THE NORTH STAR SYSTEM.

   The Horizon Computer and the North Star Micro Disk System are
designed to be an integrated combination of a mini- floppy disk
hardware system and the software needed to operate it. This system is
expertly described in the "North Star System Software Manual,-
SOFT-DOC Revision 2.1" published by North Star Computers in 1979. If
you have an older disk system, or Horizon Computer and you do not
have this manual, by all means get it.   All of the information
regarding the HARDWARE is applicable to the North Star CP/M System.

   The North Star DOS (Disk Operating System) and North Star BASIC
and PASCAL are designed to run on North Star hardware and no other.
Therefore they are called "machine dependent". You will still be
able to run your DOS programs by simply booting up North Star DOS at
any time.

   However, by booting up CP/M instead of DOS you will have
available another large body of software written on many different
machines. This is possible since CP/M is designed in such a way as
to be "machine independent". Programs written for CP/M communicate
only with the CP/M operating system which in turn communicates with
the North Star harware.   In this way, CP/M programs are completely
isolated from the actual hardware in use. This is why the exact same
CP/M program written for another computer will run on your North Star

in the same way. Once the user adds CP/M to the North Star system, he has made a vast amount of computer languages and applications operable on the system.

WHAT IS CP/M ?

CP/M (Control Program / Microprocessors) is a software system designed to record and retrieve programs and data on floppy disks. Like all software systems, it is a collection of programs that are inter-related and are designed to accomplish specific tasks within the system. CP/M operates with 8080 and Z80 microprocessors and is largely independent of the design of the computer and floppy disk system. It has therefore been adopted for use with almost all computers using the 8080 and Z80 families of microprocessors. CP/M has become a de facto "standard" and a large group of high level languages and application software systems have been designed to run under it's control.

A BRIEF HISTORY OF CP/M.

The 8080 microprocessor was designed by Intel Corporation as an improvement over their earlier 8008 microprocessor. This chip became the basis for the INTEL MDS Development System which was designed to operate with floppy disks. Gary Kildall of Digital Research designed the CP/M system to be "machine independent" as long as the microprocessor used the 8080 machine language instruction set.

In 1976, Digital Systems (later Digital Microsystems) was formed to supply floppy disk systems for use with microcomputers. The CP/M system was adopted for use with this popular floppy disk. IMSAI one of the largest manufacturers of microcomputer equipment also adopted a form of CP/M for it's disk operating system. CROMEMCO and other manufacturers followed suit. Many computer owners selected disk systems for their computers that ran CP/M, rather than the non CP/M systems supplied by their computer manufacturers.

Most microcomputer owners could not afford the 8-inch floppy disk systems that were the only ones available at first. With the introduction of the Shugart SA400 minifloppy, thousands of microcomputer owners were introduced to floppy disk systems.

North Star (a non-CP/M system) became the most popular mini-floppy system because it was inexpensive, easy to interface and it worked with every S-100 bus computer. The North Star system had a simple DOS (Disk Operating System) with few features, but it supported a good BASIC and a primitive disk file system. Larry Alkoff, of Lifeboat Associates adapted CP/M to the North Star floppy disk system and thousands of North Star owners adopted CP/M as their operating system.

GETTING STARTED.

YOUR CP/M PACKAGE.

The contents of the CP/M package you have received from your dealer should contain the following:

a. This manual "CP/M on North Star Disk User's Manual"

b. The Lifeboat Associates edition of the Digital Research CP/M Manuals composed of the following sections:

* CP/M 2.0 Users Guide for CP/M 1.4 Owners
* An Introduction to CP/M Features and Facilities.
* ED: A Context Editor For The CP/M Disk System.
* CP/M Assembler (ASM) User's Guide
* CP/M Dynamic Debugging Tool (DDT) User's Guide.
* CP/M 2.0 Interface Guide.
* CP/M 2.0 System Alteration Guide.

c. A 5 1/4-inch Diskette containing your CP/M System.

d. License Agreement and Registration Card.

ACTION: Check that you have received all of the above material, if there is anything missing, contact your dealer or Lifeboat Associates. Check that the diskette is in good condition. It should not be bent or damaged in any way. Every CP/M software system has an unique serial number. It is shown on your distribution copy of the diskette and the same number is embedded in the software for identification purposes. Record this number and use it when corresponding with Lifeboat Associates regarding your software. When you copy your system disk for your own use, put the copyright notice and serial number on the copy.

CP/M2 ON DOUBLE DENSITY - QUAD CAPACITY NORTH STAR DISK.

MEMORY REQUIREMENTS AND ADDRESS.

In order to run CP/M, you must have at least 24K of continuous RAM memory starting at address zero.   For most practical purposes between 32K and 48K will be desirable.

The North Star DOS System has been configured to start at memory location 2000 Hex (8K) in the standard version. Most computer systems using the North Star Disk System have their memory addressed to start at that location because no memory is required below 2000 Hex.

CP/M requires that memory boards be addressed at zero 0000 Hex. Therefore before attempting to run CP/M re-address your memory boards to provide contiguous memory from 0000 hex to the limit of your memory. If you have North Star RAM 16 or RAM 32 memory boards, the address switches each represent 8K. If you have another type of memory board, consult the applicable manual.

FIRST BOOT PROCEDURE.

This procedure will only work with your distribution copy of the CP/M System disk, or a direct, unmodified copy. It is intended for a Horizon Computer or any North Star Disk System (MDS) with the North Star DOS running at 2000 Hex. Either a system with a standard PROM set at E800 hex, or a non-standard PROM will work with your CP/M disk.

STEP 1: Insert your North Star DOS System disk in Drive #1 and boot the system by running the computer from E800 hex. On the Horizon computer, press the RESET switch on the upper right-hand rear panel.

RESULT: The North Star DOS will sign-on with this message:

NORTH STAR DOS x.xxx   (x.xxx is the version number)
+   (Double density prompt)

STEP 2: Enter the copy disk program as follows:

+GO CD<CR>
Note: All through this manual <CR> means press carrige return.

DOS will respond with:

COPY FROM DRIVE: 2<CR>   (In this case you enter 2.)
TO DRIVE: 1<CR>   (In this case you enter 1.)

COPY BOTH SIDES (Y OR N)? N<CR> (In this case enter N)

TO COPY SIDE A ONLY,
LOAD DISKETTES AND PRESS RETURN WHEN READY.

CP/M2 ON DOUBLE DENSITY - QUAD CAPACITY NORTH STAR DISK.

CAUTION BE SURE THAT YOUR CP/M DISK HAS A WRITE PROTECT TAB COVERING THE NOTCH ON THE UPPER RIGHT EDGE OF THE DISK. IF IT DOES NOT HAVE ONE, PUT ONE THERE.

STEP 3: Place your CP/M master disk in drive 2.

STEP 4: Remove the DOS disk and place a new blank disk in drive 1. Now press <CR>. The copying process will start, upon completion DOS will report:

COPY COMPLETED
+

STEP 5: You now have a "working copy" of your CP/M disk in drive 1. Put the master copy away for safe keeping. You will use the working copy for the configuration process.

STEP 6: Type "GO CPM<CR>" next to the " + " prompt.

RESULT: The drive motor will start, the LED on the drive will come on, and CP/M will sign-on with the following message:

CP/M on North Star disk
Double density - Quad capacity
24K Version 2.01
Copyright (C) 1979 Lifeboat Associates

A>

*** NOTE ***
If the CP/M system signs-on, but the CP/M prompt " A> " does not appear, the memory has not been re-addressed to 0000 hex. If this happens, remove the disk, turn off the computer and re-address the memory boards to provide continuous memory from 0000 Hex to the upper limit of your memory boards. Then power up and re-start from Step 1.

STEP 7: Next to the A> type:

A>DDT CONFIG.COM<CR>

RESULT: The Dynamic Debugging Tool (DDT) will sign on as follows:

DDT VERS 1.4
NEXT PC
0B00 0100
-                              (The dash is the DDT prompt)

-S120<CR>   Enter "S120" after the DDT prompt.
-120 FF   DDT shows the contents of addr 120

STEP 8: Enter correct byte from following table:

LIST OF STANDARD TERMINALS.

		Status,Data
0	- ALTAIR 88-2SIO	Ports 10H,11H
1	- IMSAI SIO2	Ports 3,2
2	- ALTAIR SIO (REV NON-ZERO)	Ports 0,1
3	- ALTAIR SIO (REV ZERO)	Ports 0,1
4	- PROCESSOR TECHNOLOGY 3P+S	Ports 0,1
5	- IMSAI MIO	Ports 43H,42H
6	- ALTAIR 88-4PIO	Ports 10H,11H
80	- COMPAL 80	
81	- PROCESSOR TECHNOLOGY SOL	
82	- XITAN SMB (ZAPPLE MONITOR)	
83	- NORTH STAR HORIZON	Ports 3,2
84	- VECTOR GRAPHIC MZ Computer	

In this case we will consider that we have a Horizon Computer.
-120 FF 83<CR>
-121 FF

STEP 9: Enter 2<CR> if you have a Horizon computer or Altair 88-2SIO
card that requires 2 stop bits. Otherwise, just enter <CR>.
121 FF 2<CR>
122 FF

At this point enter a period followed by <CR>. This allows DDT to
exit this mode and return to command level.

Now enter a control C (^C).

RESULT: The system returns to the A>. The configuration program is
now patched for the Horizon computer. Save the patched version of
CONFIG on disk by entering the following:

A>SAVE 10 CONFIG.COM<CR>

STEP 10: Perform a cold boot (reset) similiar to Step 1 but using
the CP/M disk already in drive 1.

RESULT: The CONFIG program will sign-on followed by the normal CP/M
sign-on ending with A>.

CONFIG   Version 2.0
Copyright (C) 1979 Lifeboat Associates
Your CP/M System is now configured.
Type SAVEUSER to permanently save on disk.

CP/M on North Star disk
Double density - Quad capacity
24K Version 2.01
Copyright (C) 1979 Lifeboat Associates

A>

STEP 11: Enter the SAVEUSER program as follows:

A>SAVEUSER<CR>

RESULT: The SAVEUSER program will sign-on with the following message:

SAVEUSER Vers 2.0 for North Star quad capacity.
Saves MODE BYTE sector plus 4 sectors of USER AREA.
Copyright (C) 1979 Lifeboat Associates.
Place CP/M SYSTEM DISK into drive A and
type to patch (or ^C to not patch) <CR>

Now type <CR> and SAVEUSER will respond:

User area patching completed.

A>

STEP 12: Remove the disk from drive A and turn off power to the computer. Then re-energize the computer, insert the CP/M disk and perform a cold boot. This will test the cold boot process and eliminate the possiblity of material still in memory giving a false indication of proper configuration.

RESULT: CP/M will come up with it's sign-on message. The A> will be displayed.

RE-SIZING YOUR SYSTEM.

The distribution system you have received from Lifeboat Associates contains a 24K CP/M system and is designed to run in 24K of memory. This is not a large enough system to run some high level languages or large programs. You will want to use a system that takes advantage of all the memory in your computer. If you attempt to run a program that is too large for the current CP/M system, you will get an ERROR MESSAGE "LOAD ERROR ". The fix for this is to extend your CP/M system to the fullest extent of your RAM memory. This may be done by running the MOVCPM.COM program provided on your system disk.

*** NOTE ***
A new system created with MOVCPM.COM is an unconfigured system. CONFIG.COM must be on the disk when attempting to boot up any unconfigured system. Additionally, CONFIG.COM should have been patched at 120 hex for your specific terminal from the table of standard configurations. For example, CONFIG.COM should have been patched with an 83 hex at address 120 hex if you have a Horizon computer.

This example takes you through running MOVCPM.COM to create a 48K system and putting the new system on a disk ready to boot up.

```
A>MOVCPM 48<CR>

Constructing 48K CP/M Version 2.01
for quad North Star disk.

New CP/M in memory at 900H (sysgen image)
is ready for "SYSGEN" or "SAVE 40 CPM48.COM"
A>SYSGEN<CR>

SYSGEN Version 2.4
Distributed by Lifeboat Associates
for CP/M 2.0 on quad North Star.

Source drive NAME (or RETURN to skip) <CR>

CP/M image in RAM at 900H is ready to write
or reboot and "SAVE 40 CPMxx.COM"

Destination drive NAME (or RETURN to reboot) B<CR>
Place DESTINATION disk on B, then type RETURN <CR>
Function complete

Destination drive NAME (or RETURN to reboot) <CR>

A>
```

The disk in drive B is now ready to be placed in drive A and booted up. Remember CONFIG.COM must be patched and on the disk. Run SAVEUSER after the system signs on to permanently configure the disk.

CONFIG OPTIONS

If you have a Horizon computer there are several options in CONFIG.COM. You must always have a patched version of CONFIG on your disk when booting up an unconfigured system such as that produced by MOVCPM.COM. These options are more fully described in Appendix B SAMPLE USER AREA. Here is a list of the available options for a Horizon computer with the address in CONFIG:

Addr 120H set to 83H selects Horizon computer.

Addr 121H set to 2 selects two stop bits. ?
Default if 121H unchanged selects one stop bit. ·

~~Addr 122H set to 0 selects printer on left serial port,~~
Addr 122H set to 2 selects printer on parallel port.
Default if 122H unchanged selects right serial port.

Addr 123H set to 1 enables parity checking of memory. ?
Default 123H unchanged ignores parity checking.

Addr 124H should be set to page address of your disk
    controller if it is both NOT the standard E8 hex
    AND you have set the parity option at 123H.

In order to set these bytes in CONFIG.COM type the command "DDT CONFIG.COM<CR>" and when DDT signs on, use the "S" command to make the changes. Please note that leaving the original values of 0FF hex at addresses 121H thru 124H will produce the default conditions. Then type a control C to reboot and when system returns to "A>" type "SAVE 10 CONFIG.COM<CR>" to save the patched CONFIG on disk. It will now be ready to automatically patch an unconfigured system, after which you would normally run SAVEUSER.

DOUBLE SIDED AND FAST SEEKING DRIVES

The CP/M system MUST be informed whether your drives are physically capable of two sided or fast stepping operation. The system as shipped is set for one sided and normal seeking operation. This is easily changed by inserting a CONFG byte at location 59F8 hex in the standard 24K system (26F8 in sysgen image). This byte is exactly the same as that defined for the North Star DOS and is located in DOS at 2034 hex.

In particular, the byte is defined as follows:
Bits 7,6,5,4 high set two sided for drives A,B,C,D.
Bits 3,2,1,0 high set fast seeking for drives D,C,B,A.

For example, a value of 11010111B (0D7H) indicates:

Drive A is double sided and fast stepping.
Drive B is double sided and fast stepping.
Drive C is single sided and fast stepping.
Drive D is double sided and normal stepping.

Remember, the distribution system is shipped with these features disabled. The CONFG byte is zero. This will cause STAT to report 162K available on a newly formatted, empty disk. After setting two sided operation on those drives capable of it as explained in the next section, STAT will then report 338K which more than doubles the capacity of CP/M.

SETTING UP FOR TWO SIDED DRIVES

This procedure will change your system to operate with two sided drives.

1. Pick the proper CONFG byte for your drives. In the example above, drives A, B and D are set for two sided operation so bits 7, 6 and 4 are set to 1.

2. Use DDT to set this byte at location 59F8 hex in the standard 24K system (26F8 in sysgen image).

3. After the CONFG byte has been changed and is working satisfactorily, it may be permanently saved on disk by SAVEUSER.

4. Now run the FORMAT program and follow the prompts to format a disk to CP/M 2.0 double sided format. Note: IF the CONFG byte has not been properly set for double sided operation on the drive being used to format, the FORMAT program will not permit double sided formatting.

5. Files may now be transferred to your double sided disk with the PIP program by placing the single sided disk containing files in drive A, the newly formatted double sided disk in B, typing control C to login the disks and then the command:
PIP A:=B:*.*[VO]<CR>
The files will transfer one by one informing you of each named file transferred.

Run STAT after this process and you should find the B drive has much more space left than A, even though both disks contain the same files.

If you have a one drive system, use FILECOPY to transfer each file individually to the double sided disk.

6. Once files are placed on a double sided formatted disk for the first time with PIP or FILECOPY, the COPY program may be used to copy all the data from one double sided disk to another.

Final note: It is important to understand that merely changing the CONFG byte will not in itself increase the capacity of a disk. This simply tells CP/M that your drives will physically access both sides. You must in addition use disks that have been properly formatted with FORMAT.COM for 2.0 double sided operation.

MODE BYTE OPTIONS

There are several user selectable options available in your CP/M system. These options are:

1. Read After Write.
2. Enable Interrupts after Disk Access.
3. Run AUTO after Warm or Cold Boot.
4. Set System for a Single Drive.

The choice of these functions is controlled by the state of the bits in one byte referred to as the MODE byte. The MODE byte is located at the address immediately before the USER AREA and is at 59FF hex in the 24K running system (26FF hex in the SYSGEN IMAGE). Programs may reference the MODE byte to manipulate it.

If you wish to use any of these options the best way to implement them is to change the MODE BYTE with DDT. When you are sure the option is doing what you want, run SAVEUSER and permanently save the MODE BYTE on disk.

The following paragraphs describe the controlled functions and indicate the trade-offs implied by selecting the use or suppression of each feature. Also explained are the position of each bit, the sense of the bit for invoking or disabling the function and the default value used in distribution systems. In general, the bit involved must be HIGH for the feature to be ACTIVE.

Option 1. READ AFTER WRITE

Use of Read After Write causes the system to read and verify the data on the disk after each sector is written. Any read error would result in repeated re-tries of the write and subsequent verification until the data is correctly written onto the disk. Use of this feature will cause no degredation in the speed of disk reading, but will slow disk writing by a factor of about four times.

The position of this bit is value 40 hex (bit 6). The distribution system is shipped with this bit LOW which causes this feature to be NOT active.

Option 2. ENABLE INTERRUPTS AFTER DISK ACCESS

The drivers of this system disable interrupts during a disk

access, since the code is real time dependent. Otherwise, an interrupt during disk access would cause an error. Since the 8080 and 8085 processors are not able to read the status of the interrupt flag, the status cannot be restored to its original condition. This feature permits the user, either in general or under program control, to exit from disk accesses with interrupts either enabled or disabled.

The position of this bit is value 10 hex (bit 4). The distribution system is shipped with this bit HIGH and thus this feature is ACTIVE. That is, interrupts are ENABLED on exit from a disk access.

Option 3. RUN AUTO AFTER A COLD OR WARM BOOT

CP/M includes a feature allowing execution of a command upon startup. This has applications in loading monitors into memory, initializing peripheral drivers, or causing the system to automatically load BASIC and enter an applications program for unskilled users. Your system has the command: AUTO set into it which will cause a file AUTO.COM to be executed if the feature if invoked. The user must provide the program AUTO.COM or re-name a program to that name.

Alternatively, you may insert a command line of your choice in the CCP of up to 128 characters using the SYSGEN PROCEDURE. An example of such a command line would be:
```
      ORG     CCP+7           ;Start of this patch
      DB      13              ;Length of command line
      DB      'MBASIC B:PROG' ;13 character command
```

This example would load Microsoft BASIC from drive A and then cause BASIC to load and immediately run the program PROG.BAS from drive B.

You may activate the AUTO feature on each warm boot, cold boot or both. The position of this bit is value 2 (bit 1) for activation on warm boots and value 1 (bit 0) for activation on cold boots. This distribution system is shipped with these bits set LOW and thus this feature is NOT active.

Option 4. Set System for a Single Drive.

This option should be selected by users of a single drive CP/M system. Its use will cause the system to prompt you to change disks each time a different drive is selected. In this way, a four drive system can be simulated with only a single physical drive so the features of CP/M which use multiple drives can be used.

The position of this bit is value 80 hex (bit 7). The distribution system is shipped with this bit LOW and thus this feature is NOT ACTIVE.

When using this option do not attempt to use COPY.COM which requires two drives. Instead, FILECOPY.COM and PIP.COM will work

normally to allow you to transfer files between disks.

CHANGING THE I/O CONFIGURATION.

Once your CP/M is up and running, you may find the need to make changes in your I/O, to add a different printer, or you may find a need to have more that one console. There are many possible variations on the basic console I/O that you began with. There are two methods of doing this. The SAVEUSER program is provided as a quick and easy way of making short patches. The SYSGEN PROCEDURE is a comprehensive method of making system changes.

PATCHING WITH SAVEUSER

Running the SAVEUSER program at any time will write a portion of the then running CP/M system onto the disk in drive A. The specific portion written consists of the entire USER AREA (512 bytes or two pages starting at BIOS+700 hex) and the MODE AREA which is the 128 bytes immediately before the USER AREA. In the distribution 24K system the MODE AREA starts at 5980 hex and the USER AREA starts at 5A00 hex and ends at 5BFF hex.

Normal changes in the MODE AREA would be modifying the CONFG byte at 59F8 hex for two sided or fast stepping drives or making a permanent change in the MODE BYTE. Complete definitions of these are in Appendix A. Any changes in the USER AREA would be for the purpose of making a quick patch to your CONSOLE, LIST, PUNCH or READER routines. These patches could be made with DDT and if they prove satisfactory, permanently saved on the system disk with SAVEUSER.

To run the program, simply type "SAVEUSER". It will sign on and ask for confirmation that you really wish to write onto the disk in drive A. A <CR> response will begin the write. You may also abort without writing anything by entering control C.

SYSGEN PROCEDURE.

The SYSGEN PROCEDURE is an advanced method of changing your system configuration. It should only be used when your system is running properly and you have become completely familiar with the features of CP/M. This procedure uses the ED.COM editor, the ASM.COM assembler, the DDT.COM debugger, and the SYSGEN.COM program. Familiarize yourself with the use of these programs before attempting to change your system configuration in this way.

This procedure uses the facilities of CP/M to create an assembly language file containing your customized I/O. Use as a starting point USER.ASM which contains the proper equates and jump table. Modify USER.ASM using ED to suit your own purposes. Be sure to change the equate for MSIZE in the file to the desired memory size of your CP/M. Next, assemble your modified file with ASM.COM to produce USER.HEX which will be used to overlay and modify your existing system.

The existing system is then brought into memory at location 900H

(hex) using the SYSGEN program. This is the standard and most convenient memory location for making changes in the CP/M system. The copy of CP/M starting at 900H is usually called the SYSGEN IMAGE. Save the SYSGEN IMAGE as a disk file by the command "SAVE 40 CPM.COM<CR>".

CPM.COM is then brought back into memory under the control of DDT with the command "DDT CPM.COM<CR>" The SYSGEN IMAGE at 900H is then overlaid with USER.HEX using the "I" insert and "R" read commands of DDT.

Note that USER.HEX is read in with an offset so that the hex file will be placed at 2700H. The offset changes for each different CP/M system size and is equal to 2700 hex minus wherever your USER AREA begins in memory (5A00 hex in standard 24K system). The proper offset is automatically calculated for each MSIZE by the OFFSET equate in USER.ASM or the DDT "H" hex calculator may be used as in the example.

At this point, the new system has been patched with your custom I/O and may be directly put on the system tracks with SYSGEN or saved again as a disk file for later use.

The dialog below is an example of using the above procedure and was actually run on a CP/M on North Star system just as you see it. We begin after you have edited USER.ASM for your specific requirements.

```
A>ASM USER.AAZ<CR>
CP/M ASSEMBLER - VER 2.0
5AC7
009H USE FACTOR
END OF ASSEMBLY

A>SYSGEN<CR>

SYSGEN Version 2.4
Distributed by Lifeboat Associates
for CP/M 2.0 on quad North Star.

Source drive NAME (or RETURN to skip) A<CR>
Place SOURCE disk on A, then type RETURN <CR>
Function complete

CP/M image in RAM at 900H is ready to write
or reboot and "SAVE 40 CPMxx.COM"

Destination drive NAME (or RETURN to reboot) <CR>

A>SAVE 40 CPM24.COM<CR>
A>DDT CPM24.COM<CR>
DDT VERS 2.0
NEXT  PC
2900  0100
-H2700,5A00<CR>
8100  CD00
```

```
-IUSER.HEX<CR>
-RCD00<CR>
NEXT   PC
2900 0000
-^C
A>SYSGEN<CR>

SYSGEN Version 2.4
Distributed by Lifeboat Associates
for CP/M 2.0 on quad North Star.

Source drive NAME (or RETURN to skip) <CR>

CP/M image in RAM at 900H is ready to write
or reboot and "SAVE 40 CPMxx.COM"

Destination drive NAME (or RETURN to reboot) B<CR>
Place DESTINATION disk on B, then type RETURN <CR>
Function complete

Destination drive NAME (or RETURN to reboot) <CR>

A>
```

CP/M2 ON DOUBLE DENSITY - QUAD CAPACITY NORTH STAR DISK.

DEFINITIONS OF CP/M PROGRAMS.

MOVCPM.COM - This program permits the user to reconfigure the system for any particular memory size. CP/M on North Star is supplied with a 24k system. In most cases a user will have a larger memory capacity. If the system is not reconfigured for the larger ammount of memory, it will not recognize that it exists. REFERENCE:AN INTRODUCTION TO CP/M FEATURES AND FACILITIES MANUAL PAGE 30.

SPECIAL NOTE

WITH THE LIFEBOAT VERSIONS OF CP/M, THE PROGRAM "CONFIG.COM" MUST ALWAYS BE ON THE DISK WHEN USING MOVCPM.COM AND SHOULD BE PATCHED FOR YOUR TERMINAL OR COMPUTER.

ASM.COM -- This file contains the complete CP/M two-pass assembler. The ASM command loads and executes the CP/M 8080 assembler. It is used with the name of a source file containing assembly language statements and contains parameters directing the assembler where to get the input file and direct the output files. The following example will assemble TEST.ASM taking the source from drive A, writing the output hex file TEST.HEX to drive B and the output print file TEST.PRN to drive C.
A>ASM FILENAME.ABC<CR>
REFERENCE: AN INTRODUCTION TO CP/M FEATURES AND FACILITIES MANUAL PAGE 16 and CP/M ASSEMBLER (ASM) USER'S GUIDE.

DDT.COM -- This file contains the CP/M Dynamic Debugging Tool a very powerful monitor plus a tool for analyzing software problems. It can perform common monitor program functions such as dumping memory in HEX, or ASCII. It can also disassemble 8080 machine code into assembly language mnemonics, and assemble individual instructions. It is called by typing:
A>DDT<CR>
RESULT: DDT will sign-on with it's version number and then the DDT prompt, a minus sign (-).

A>DDT FILENAME.COM<CR> - A filename can also be specified which will cause DDT to automatically load FILENAME.COM at 100 hex. In this case, DDT will display a hex number under "NEXT" is the next address after the highest byte of FILENAME. This may be used to calculate the program size or the number of pages needed to SAVE the program on disk. REFERENCE: CP/M MANUAL- CP/M DYNAMIC DEBUGGING TOOL USER'S GUIDE.

DUMP.COM -- This program types the contents of a specified disk file in hexadicimal form with the HEX address listed at the left of each 16 bytes line. REFERENCE: AN INTRODUCTION TO CP/M FEATURES AND FACILITIES MANUAL PAGE 30.

ED.COM -- This file contains the CP/M Editor. It permits creation and alteration of text files in ASCII under CP/M. In addition, programs in the compiled versions of high-level languages such as BASIC and FORTRAN can be entered through the ED context editor. REFERENCE: AN INTRODUCTION TO CP/M FEATURES AND FACILITIES MANUAL

PAGE 25. PAR 6.5 and CP/M MANUAL- ED: A CONTEXT EDITOR FOR THE CP/M DISK SYSTEM - USER'S MANUAL.

LOAD.COM -- This program reads a file that contains HEX machine code such as produced as output by the assembler and creates a file called FILENAME.COM i.e
A>LOAD TESTFILE<CR>
REFERENCE: AN INTRODUCTION TO CP/M FEATURES AND FACILITIES MANUAL PAR 6.3 PAGE 17.

PIP.COM --This is the Peripheral Interchange Program which is used to transfer files from disk to disk. It also does such things as media conversion necessary to load, print, punch, copy and combine disk files. Study all the uses and forms of the PIP program very carefully. You will use it a lot. REFERENCE: AN INTRODUCTION TO CP/M FEATURES AND FACILITIES MANUAL - PAR 6.4 PAGE 18.

STAT.COM -- Another one of the important CP/M programs. This one provides statistical information about the file storage and the device asignment. REFERENCE: AN INTRODUCTION TO CP/M FEATURES AND FACILITIES MANUAL - PAR. 6.1 PAGE 13.

SUBMIT.COM -- This program allows CP/M commands to be "batched" together for automatic processing.
XSUB.COM--Used with SUBMIT. REFERENCE: AN INTRODUCTION TO CP/M FEATURES AND FACILITIES MANUAL PAR. 6.7 PAGE 28.

SYSGEN.COM -- This program allows the CP/M operating system to be moved from disk to disk. REFERENCE: AN INTRODUCTION TO CP/M FEATURES AND FACILITIES MANUAL - PAR. 6.6 PAGE 27.

DUMP.ASM - This is a sample .ASM file which shows how CP/M programs are written in assembly language.

SPECIAL NOTE
THE FOLLOWING PROGRAMS ARE SPECIALLY DESIGNED TO BE USED WITH THE NORTH STAR CP/M SYSTEM. THEY ARE ALL TUTORIAL AND WILL PROMPT YOU AT EACH STEP.

LIST.COM -- Lists the directory and number of records for each program on your disk.Its forms are:
A>LIST<CR> or
A>LIST B:<CR>

FORMAT.COM -- This program will format a raw diskette for single or double density. It will format a double sided disk when the special double sided byte is set as described in para 4 of ERRATA AND ADDITIONAL INFORMATION FOR SYSTEM SOFTWARE MANUAL, REVISION 2.1 DATED JULY 27, 1979 BY NORTH STAR COMPUTERS, INC. This byte which is in North Star DOS at 2034 hex should be placed in CP/M at 59F8 hex (in a 24K system) and will cause CP/M to operate in double sided mode and/or fast stepping mode.

CP/M2 ON DOUBLE DENSITY - QUAD CAPACITY NORTH STAR DISK.

It is possible to format a CP/M on North Star diskette into one of four possible formats. The available formats are:

Double density CP/M Vers 2.0 - Type D 48 (Single sided)
Quad capacity CP/M Vers 2.0 - Type D 240 (Double density/sided)
Single density CP/M Vers 1.4 - Type S 16
Double density CP/M Vers 1.4 - Type D 16 (Old Vers 1.45)

Note: Only quad capacity does double sided disks. You should always use D 48 if your drives are single sided, or D 240 if double sided. The D 16 formats are provided so you can read and write disks in older formats.

The format program will produce a directory entry called "FORMAT" which may be read by the North Star DOS "LI" command. This entry will be in the sixth directory position and will contain the type information above. This is one way to see if a diskette is properly formatted for CP/M. If a disk has not been formatted with FORMAT.COM, CP/M will assume that it is type 16. Any information previously on a diskette will be destroyed by the format process.

COPY.COM -- This program copies the entire disk using the A (ALL) option to a new (may be unformatted) disk in another drive. The resulting format will be the same as the source disk. It may also be used to copy a disk until it detects an empty track using the M (MOST) option. The M option saves time but should only be used on a previously formatted target disk. COPY will prompt you at each step on exactly what to do. Do not use COPY if you have a single drive system. Use FILECOPY as explained next instead.

FILECOPY.COM --This program will transfer files between disks using only a single disk drive. It loads a single file at a time from the source disk into memory, instructs the user to change disks, and writes the file onto the new disk. To transfer a file named "TEST.HEX" simply type the command:
                    FILECOPY TEST.HEX<CR>
and the program will prompt you which disks to insert at the proper time.

SAVEUSER.COM --This program quickly writes BIOS "patches" to the disk by writing the USER AREA of the running system plus 128 bytes immediately prior (containing MODE byte) on to the disk. This is a total of 640 bytes (2 1/2 pages).

CONFIG.COM --This program sets up the USER AREA for the currently used I/O. It is possible to configure the system for many I/O configrations. This program must be on the disk properly patched for your terminal when the MOVCPM.COM program is run.

USER.ASM --This is a sample USER AREA source file which may be used as a basis for modifying the I/O of your system. See the listing in Appendix B.

MEMR.COM --This program is a memory test program that performs a battery of different tests. Its possible forms are "MEMR<CR>" for

normal testing, "MEMR T<CR>" for finding the top of memory, and "MEMR R<CR>" to do a random number test only. The test will cycle continously and report the location of any errors found.

NORMAL OPERATION

DISKETTE COMPATABILITY

As discussed in the section on the FORMAT.COM program, it is possible format a disk into one of four different CP/M modes. These are 1.4 CP/M single or double density mode and 2.0 CP/M single or double sided mode.

Your QUAD CP/M will automatically switch into the proper format mode no matter what kind of disk you insert so long as you make sure to do a "warm boot" when changing disks. A "warm boot" means typing "control C". This will cause the system to reset, examine the format of each disk when accessed for the first time since the last warm boot, and make the necessary adjustments. If you fail to do this you may get an error message like "BDOS ERROR" or "BAD SECTOR" or you may have scrambled files and programs that won't run properly.

CP/M requires a copy of itself on the system tracks (0 and 1) of the disk in drive A (only) in order to do a warm boot. This is normally done with SYSGEN.COM, which moves the system from one disk to another. It is impossible to place a quad system on the system tracks of a single density disk so use ONLY drives B, C or D for single density disks.

Remember, do a warm boot whenever you change disks and the system will do the rest. If in doubt at any time, type "control C".

USING MASTER COM DISKS.

In "normal" day-to-day operation, using CP/M with a two drive system, you should keep one disk with your CP/M system and all of your frequently used disks with the extension ".COM", in drive A. This is refered to as the Master COM file disk, or MASCOM. You should have several of these MASCOM disks, and you should replace one when it looks worn or "glassy". Keep the old disk as you never can tell when you want a program that you haven't used in a long time.

Disks containing the ASCII or BASIC files you are working on should be placed in drive B. Generally you will not need to use SYSGEN to put CP/M systems on most of your file disks since they will only be used in drive B. You may find it most convenient to log in on drive B after doing a cold boot by typing "B:<CR>". CP/M will automatically return to B after each warm boot.

CP/M2 ON DOUBLE DENSITY - QUAD CAPACITY NORTH STAR DISK.

APPENDIX A - DISK TECHNICAL INFORMATION


```
;************************************************
;;;     DISK STRUCTURE AND SYSGEN IMAGE
;************************************************
;
;       TRACK   SECTOR  SYSGEN  24K       DISK ADDR
;FORMAT 0       1       N/A     N/A       00
;BOOT   0       17      0900H   3C00H     04
;CCP    0       19      0A00H   3D00H     04+100H
;BDOS   0       35      1200H   4500H
;MSG    1       22      1F80H   5280H
;BIOS   1       23-36   2000H   5300H
;MODE   1       36      26FFH   59FFH
;USER   1       37-40   2700H   5A00H     19
;BUFFER 1       N/A     2900H   5C00H
;DATA   N/A     N/A     2B00H   5E00H
;TOP OF SYSTEM IS        2CFFH   5FFFH
;
;************************************************
;;;     FORMAT INFORMATION
;************************************************
;
;FORMAT BYTE AT TRACK 0, SECTOR 0, BYTE 5CH
;CP/M   DEN     SIDES   FORMAT  BYTE            DOS
;1.4    SD      1X      10H     00010000B       S 16
;1.4    DD      1X      90H     10010000B       D 16
;2.0    DD      1X      0B0H    10110000B       D 48
;2.0    DD      2X      0F0H    11110000B       D 240
;AN "LI" COMMAND UNDER NORTH STAR DOS
;WILL DISPLAY A DIRECTORY ENTRY NAMED "FORMAT"
;WITH THE TYPE FILE AS UNDER THE DOS COLUMN.
;
;************************************************
;;;     SKIP TABLES
;************************************************
;
;DOUBLE DENSITY SKIP TABLE WITH NORTH STAR 0-9 SECTORS
;       DB      0,5,1,6,2,7,3,8,4,9
;
;DOUBLE DENSITY SKIP TABLE - CP/M TYPE SECTORS
;EACH 512 BYTE SECTOR IS 4 CP/M TYPE SECTORS
;512 BYTE SECTOR 0 IS CP/M SECTOR 1,2,3,4
;       DB       1, 2, 3, 4, 21,22,23,24
;       DB       5, 6, 7, 8, 25,26,27,28
;       DB       9,10,11,12, 29,30,31,32
;       DB      13,14,15,16, 33,34,35,36
;       DB      17,18,19,20, 37,38,39,40
;
```

```
;************************************************
;;;       MODE AREA - MISC DATA
;************************************************
;
          ORG       59EDH             ;IN 24K SYSTEM
;         PATCH LOCATIONS FOR YOUR OWN ROUTINES
UWINIT:   RET ! NOP ! NOP             ;CALLED ON WARM BOOT
JOFTEN:   RET ! NOP ! NOP             ;LIKE DOS
          DB        0                 ;RESERVED
TYPERR:   DB        0                 ;TYPE OF DISK ERROR
GLBERR:   DB        0                 ;GLOBAL ERROR COUNT
NTRKS:    DB        35                ;TRACKS PER DRIVE
          DB        0                 ;RESERVED
;
;************************************************
;;;       DRIVE CONFG BYTE
;************************************************
;CONFG BYTE AT 59F8H IN 24K SYSTEM IS SAME USED BY DOS
;TO TELL SYSTEM IF DRIVE IS DOUBLE SIDED OR FAST STEPPING
;BITS 1,2,3,4 SET INDICATE FAST STEPPING IN ORDER A,B,C,D.
;BITS 7,6,5,4 SET INDICATE DOUBLE SIDED IN ORDER A,B,C,D.
CONFG:    DB        0F0H              ;DBL SIDED
          DB        0                 ;RESERVED
;
;************************************************
;;;       DRIVE PARAMETERS
;************************************************
;THESE DRIVE PARAMETERS ARE SET THE FIRST TIME
;A DISK IS ACCESSED AFTER A WARM BOOT.
;CP/M READS THE FORMAT INFORMATION ON TRACK 0
;AND TRANSFERS IT TO THE CORRECT TABLE LOCATION.
DRVPAR:                               ;AT 59FAH IN 24K SYSTEM
          DB        0F0H              ;A: = 2.0 DD/DS
          DB        0B0H              ;B: = 2.0 DD/SS
          DB        090H              ;C: = 1.4 DD/SS
          DB        10H               ;D: = 1.4 SD/SS
          DB        0                 ;RESERVED
;THE ABOVE EXAMPLE DRIVE PARAMETERS ARE THE 4 POSSIBLE FORMATS
DSTY      EQU       80H               ;BIT7=DENSITY 0=SD, 1=DD
SIDED     EQU       40H               ;BIT6=NR SIDES 0=1 SIDE, 1=2 SIDE
V20FLG    EQU       20H               ;BIT5=FORMAT 1=2.0, 0=1.4
RDYFLG    EQU       10H               ;1=DRV RDY, 0=NOT RDY
;
;************************************************
;;;       MODE BYTE
;************************************************
;
MODE1:    DB        EIBIT             ;59FFH IN 24K SYSTEM
;         MODE FUNCTIONS - ALL DONE IF BIT=1
ONEDRV    EQU       80H               ;BIT7=1 INDICATES 1 DRIVE
RAW       EQU       40H               ;SET READ AFTER WRT
EIBIT     EQU       10H               ;ENABLE INTS AFTER DISK ACCESS
NMOUNT    EQU       8                 ;USE DRVPAR PARAMETERS
WAUTO     EQU       2                 ;WARM BOOT AUTO FUNCTION
CAUTO     EQU       1                 ;COLD BOOT AUTO FUNCTION
```

22

APPENDIX B - HORIZON USER AREA LISTING

```
;USER.ASM                DEC 4, 1979
;SAMPLE USER AREA I/O ROUTINES
;
;THIS EXAMPLE USER AREA IS SET UP FOR
;THE 24K DISTRIBUTION SIZE
;CP/M ON QUAD NORTH STAR SYSTEM
;AND FOR THE HORIZON COMPUTER
;
;IT IS IDENTICAL TO THE USER AREA
;PRODUCED BY CONFIG.COM VER 2.1
;WHEN AN 83H FOR HORIZON IS INSERTED AT 120H.
;
;IT IS SUPPLIED AS A PROTOTYPE FOR MODIFICATION
;BY USERS WHO WISH TO MODIFY THEIR SYSTEMS
;
;THE FOLLOWING OPTIONS ARE AVAILABLE WHEN USING CONFIG
;TO PRODUCE THIS USER AREA FOR A HORIZON.
;NO CHANGES AT 121H THRU 124H WILL PRODUCE DEFAULT VALUES
;        OF 1 STOP BIT, PRINTER ON RIGHT SERIAL PORT,
;        AND NO PARITY INITIALIZATION.
;
;ADDRESS 120H SELECTS TYPE OF COMPUTER
;        SET TO 83H FOR HORIZON COMPUTER
;
;ADDRESS 121H SELECTS NUMBER OF CONSOLE STOP BITS (AT HSBIT)
;        DEFAULT IS 1 STOP BIT
;        SET TO 2 IF 2 STOP BITS NEEDED
;
;ADDRESS 122H CHANGES LIST DEVICE TO EITHER OF
;LEFT SERIAL PORT (HOROUT0), RIGHT SERIAL PORT (HOROUT1)
;OR PARALLEL PORT (HOROUT2)
;        DEFAULT IS PRINTER ON RIGHT SERIAL PORT
;        IE: HLIST WILL JMP TO HOROUT1
;        SET TO 0 IF PRINTER ON LEFT SERIAL PORT
;        SET TO 2 IF PRINTER ON PARALLEL PORT
;
;ADDR 123H SELECTS PARITY OPTION ON MEMORY BOARDS.
;        SET TO 1 IF PARITY IS BEING USED WHICH
;        WILL CAUSE HCINIT TO JMP TO TINIT
;        DEFAULT WILL CAUSE HCINIT TO JMP TO NOPAR
;        WHICH IGNORES PARITY INITIALIZATION.
;
;ADDR 124H CHANGES THE PAGE ADDRESS IN TINIT
;        IF YOUR CONTROLLER BOARD ADDRESS IS NOT E800H
;        AND MEMORY PARITY IS USED (SET AT ADDR 123H).
;        SET 124H EQUAL TO PAGE ADDRESS OF YOUR BOARD.
;        DEFAULT IF NOT SET IS STANDARD 0E8H IN TINIT.
```

```
                        ;
                        ;CHANGE MSIZE TO THE NOMINAL SYSTEM SIZE DESIRED
0018 =                  MSIZE   EQU     24                      ;DISTRIBUTION SYSTEM
                        ;
5300 =                  BIOS    EQU     5300H+(MSIZE-24)*1024
5A00 =                  USER    EQU     BIOS+700H
CD00 =                  OFFSET  EQU     2700H-USER              ;TO OVERLAY SYSGEN IMAGE
                        ;
5A00                            ORG     USER                    ;ORIGIN OF THIS PROGRAM
                        ;
                        ;THE JUMP TABLE FOLLOWING MUST BE PRESENT
                        ;THE SEQUENCE OF JUMPS MAY NOT BE CHANGED
5A00 C38A5A             HCINIT  JMP     TINIT           ;INIT I/O PORTS AND PARITY
5A03 C3785A             HCONST  JMP     HORST0          ;CONSOLE STATUS
5A06 C31D5A             HCONIN  JMP     HORIN0          ;CONSOLE INPUT
5A09 C3475A             HCONOUT JMP     HOROUT0         ;CONSOLE OUTPUT
5A0C C3525A             HLIST   JMP     HOROUT1         ;PRINTER RIGHT SERIAL PORT
5A0F C3475A             HPUNCH  JMP     HOROUT0         ;PUNCH=CONS OUTPUT
5A12 C31D5A             HREADER JMP     HORIN0          ;READER=CONS INPUT
5A15 C3885A             HPRST   JMP     HORPRST         ;PRINTER STATUS NOT IMPLEM
5A18 000000                     DB      0,0,0           ;RESERVED
5A1B DB00                       DW      HORLEN          ;LENGTH OF THIS PROGRAM
                        ;
                        ;       INPUT ROUTINES
                        ;
                        HORIN0:                         ;LEFT SERIAL PORT
5A1D DB03                       IN      3
5A1F E602                       ANI     2
5A21 CA1D5A                     JZ      HORIN0
5A24 DB02                       IN      2
5A26 E67F                       ANI     7FH
5A28 C9                         RET
                        HORIN1:                         ;RIGHT SERIAL PORT
5A29 DB05                       IN      5
5A2B E602                       ANI     2
5A2D CA295A                     JZ      HORIN1
5A30 DB04                       IN      4
5A32 E67F                       ANI     7FH
5A34 C9                         RET
                        HORIN2:                         ;PARALLEL PORT
5A35 DB06                       IN      6               ;MOTHERBOARD STATUS
5A37 E602                       ANI     2
5A39 CA355A                     JZ      HORIN2
5A3C DB00                       IN      0               ;READ KEYBOARD
5A3E F5                         PUSH    PSW             ;SAVE CHAR
5A3F 3E30                       MVI     A,30H
5A41 D306                       OUT     6               ;RESET PI FLAG
5A43 F1                         POP     PSW
5A44 E67F                       ANI     7FH
5A46 C9                         RET
                        ;
                        ;       OUTPUT ROUTINES
                        ;
                        HOROUT0:                        ;LEFT SERIAL PORT
5A47 DB03                       IN      3
5A49 E601                       ANI     1
```

```
5A4B CA475A                JZ      HOROUT0
5A4E 79                    MOV     A,C
5A4F D302                  OUT     2
5A51 C9                    RET
                 HOROUT1:                              ;RIGHT SERIAL PORT
5A52 DB05                  IN      5
5A54 E601                  ANI     1
5A56 CA525A                JZ      HOROUT1
5A59 79                    MOV     A,C
5A5A D304                  OUT     4
5A5C C9                    RET
                 HOROUT2:                              ;PARALLEL OUTPUT
5A5D DB06                  IN      6             ;MOTHERBOARD STATUS
5A5F E601                  ANI     1
5A61 CA5D5A                JZ      HOROUT2
5A64 3E20                  MVI     A,20H         ;RESET PO FLAG
5A66 D306                  OUT     6             ;OUTPUT CHAR
5A68 79                    MOV     A,C           ;LOAD ACCUMULATOR
                 TIN1:
5A69 F680                  ORI     80H           ;SET STROBE FALSE
5A6B D300                  OUT     0             ;SEND CHARACTER
5A6D EE80                  XRI     80H           ;TOGGLE STROBE
5A6F D300                  OUT     0
5A71 EE80                  XRI     80H           ;TOGGLE STROBE AGAIN
5A73 D300                  OUT     0
5A75 E67F                  ANI     7FH           ;MASK TO ASCII
5A77 C9                    RET
                 ;
                 ;       STATUS ROUTINES
                 ;
5A78 DB03        HORST0:   IN      3             ;LEFT SERIAL PORT
5A7A E602                  ANI     2
5A7C C8                    RZ                    ;NO KEY
5A7D 3EFF                  MVI     A,0FFH
5A7F C9                    RET                   ;KEY
5A80 DB05        HORST1:   IN      5             ;RIGHT SERIAL PORT
5A82 E602                  ANI     2
5A84 C8                    RZ                    ;NO KEY
5A85 3EFF                  MVI     A,0FFH
5A87 C9                    RET                   ;KEY
                 HORPRST:
                 HORWINIT:
5A88 AF                    XRA     A
5A89 C9                    RET                   ;NOT IMPLEMENTED
                 ;
                 ;TINIT REWRITES ALL RAM TO SET PARITY CORRECT
                 ;
00E8 =           PROMLOC EQU     0E800H/256 AND 0FFH    ;ADDR OF PROM
                 TINIT:
                             ;COME HERE IF PARITY OPTION (CONFIG 123H=1)
5A8A 210000                LXI     H,0
                             ;CONFIG 124H SETS PROMLOC, DEFAULT IS 0E8H
5A8D 16E8                  MVI     D,PROMLOC
5A8F 7C          TINKL:    MOV     A,H
5A90 BA                    CMP     D
5A91 C29A5A                JNZ     TINCP
```

```
5A94 C604             ADI     4               ;SKIP 400H OVER PROM
5A96 67               MOV     H,A
5A97 CAAD5A           JZ      TINU
5A9A 7E      TINCP:   MOV     A,M             ;READ ALL MEMORY
5A9B 77               MOV     M,A             ;PUT BACK WITH PARITY SET
5A9C 2C               INR     L
5A9D C29A5A           JNZ     TINCP
5AA0 24               INR     H
5AA1 CAAD5A           JZ      TINU
5AA4 7C               MOV     A,H
5AA5 E603             ANI     3
5AA7 C29A5A           JNZ     TINCP
5AAA C38F5A           JMP     TINKL
5AAD 3E41    TINU:    MVI     A,41H
5AAF D3C0             OUT     0C0H
                      ;NOW INIT MOTHERBOARD AND SET UP SERIAL PORTS
             NOPAR:
                      ;HERE IF NO PARITY OPTION (CONFIG 123H=DEFAULT)
5AB1 AF               XRA     A
5AB2 D306             OUT     6
5AB4 D306             OUT     6
5AB6 D306             OUT     6
5AB8 D306             OUT     6
5ABA 3EC1             MVI     A,0C1H
5ABC D3C0             OUT     0C0H
             HSBIT:                           ;SET STOP BITS HERE
                      ;CONFIG 121H=DEFAULT PRODUCES 1 STOP BIT
                      ;CONFIG 121H=2 PRODUCES 2 STOP BITS
                      ;
                      ;0CEH SETS 2SBITS, 16X CLOCK, 8BITS, NO PAR
                      ;04EH SETS 1SBIT, 16X CLOCK, 8BITS, NO PAR
                      ;MVI     A,0CEH          ;FOR 2 STOP BITS
5ABE 3E4E             MVI     A,4EH           ;FOR 1 STOP BIT
5AC0 D303             OUT     3               ;TO FIRST SERIAL PORT
5AC2 D305             OUT     5               ;TO SECOND SERIAL PORT
5AC4 3E37             MVI     A,37H           ;CMMD: RTS ER RXF DTR TXEN
5AC6 D303             OUT     3               ;FIRST PORT
5AC8 D305             OUT     5               ;SECOND PORT
5ACA DB02             IN      2               ;CLEAR INPUT BUFFERS
5ACC DB04             IN      4               ;ON BOTH SERIAL PORTS
5ACE 3E30             MVI     A,30H
5AD0 D306             OUT     6               ;RESET PARALLEL PORT PI FLAG
5AD2 3E60             MVI     A,60H           ;CODE TO SET PO FLAG
5AD4 D306             OUT     6
5AD6 3E0D             MVI     A,0DH           ;OUTPUT CARRIAGE RETURN
5AD8 C3695A           JMP     TIN1            ;TO PARALLEL PORT
             ;
00DB =       HORLEN   EQU     $-USER          ;LENGTH
```

LIFEBOAT ASSOCIATES
SOFTWARE PROBLEM REPORT

Please use this form to report errors or problems in software supplied by Lifeboat Associates. This form is designed to act as a transmittal sheet, and problem details can be described on additional pages.

Date:_____

Software Product Name:_____ Version No. _____

Disk Format:_____ Serial Number:_____

Computer Type:_____ CPU Type:_____

Operating System:_____ Serial Number:_____ Version:_____

Memory Size:_____ Number of Disk Drives:_____

Please describe the problem you have encountered. Include references to the manual if appropriate. Try to reduce the problem to a simple test case. Enclose any appropriate listings. If you have discovered a patch or interim solution please describe it.

This form may also be used to suggest enhancements to our software products.

Information on product changes and current version numbers are published in Lifelines, our software newsletter.

PROBLEM DESCRIPTION:

Name:_____ Phone:_____

Address:_____

City:_____ State:_____ Zip:_____

Return to: Lifeboat Associates
            1651 Third Avenue
            New York, New York   10028

lspr-08/01/80