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                  ADDING INTERSYSTEMS BIOS TO EXISTING CP/M 2.2  
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These notes are provided for the user who previously owned a CP/M 2.2 operating system and wish to upgrade to InterSystems' hardware. These people may purchase InterSystems' BIOS and add it to their present CP/M 2.2, thus avoiding the expense of purchasing CP/M 2.2 twice.

The user should receive the following documentation from InterSystems to assist in the understanding of these notes.

Notes for using CP/M 2.2 with Intersystems BIOS ver. 3.d  
pico.lst (tiny bios)  
xbios.lst (bios)  
boot.lst  
IASM - A Source code assembler

When purchasing the BIOS only ( not including CP/M 2.2 ), the user should receive a diskette with the following files.

STARTUP.COM  
PICO.SRC  
XBIOS.SRC  
BOOT.SRC  
ISYS.COM  
IFOR2.COM  
IASM.COM

These files are explained in the "Notes ..." literature described above.

The main purpose of the following discussion is to enable the user to correctly place the InterSystems tiny BIOS on the system tracks of a single density diskette to allow a cold boot with InterSystems hardware. This is not really difficult, but should be done slowly and carefully to avoid hassle ( unless you are one of those software superstars who translated Hamlet into FORTRAN in the third grade ).

The assumptions made here are the followings:

1. You have a presently operating CP/M 2.2 system. ( 2.0 is probably acceptable, but no CP/M 1.4 )
2. You are familiar with the operation of DD7.COM .
3. You have a text editor that you are familiar with.

## Initial System Development

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The following procedure is easy to explain. The user is going to create a CP/M file which contains the CP/M system program plus a complete system image modified to be compatible with InterSystems hardware. Then the user can use this file to write the modified system image directly to the system tracks of a new diskette which will be the new system diskette. This diskette should allow the user to boot up the InterSystems system.

1. Generate an initial system image using your own MOVCPM.COM . Choose your favorite system size. Save the resulting file. We will refer to this file as CPMxx.COM . NOTE: With InterSystems BIOS the maximum CP/M system size is 62k. This system size results in a BIOS starting location at F200h. If a system size any greater is chosen, the main InterSystems BIOS will overrun the top of memory ( FFFFh ).
2. Using your favorite text editor, set the MSIZE equate in PICO.SRC to be 2 greater than the system size generated by the MOVCPM operation. Save this altered PICO which we'll refer to as PICOxx.SRC . For example, if you've created a CPM62.COM then you will want to set MSIZE equal to 64, indicating that the end of the BIOS must be below 64k in memory. You would then save PICO62.SRC, to maintain consistency in notation .
3. Similarly to step 2., edit the MSIZE equate in XBIOS.SRC to match the MSIZE in PICOxx.SRC . Save this new BIOS source as XBIOxx.SRC ( IASM.SRC will not handle file names with more than six characters ).
4. Assemble PICOxx.SRC and XBIOxx.SRC using IASM.COM . To invoke IASM.COM observe following example:

```
IASM PICOxx      <-- assembles PICOxx.SRC and creates PICOxx.HEX
                  all on default drive.
```

or

```
IASM PICOxx.AAA  <-- assembles PICOxx.SRC and creates
                  PICOxx.HEX and PICOxx.LST all on
                  drive "A".
```

The user might prefer to set the .LST file to assist in determining the BIOS location for subsequent steps.

5. Run the CP/M LOAD.COM program on XBIOxx.HEX to set XBIOxx.COM .
6. Run DDT.COM on CPMxx.COM .
7. While in DDT insert and read standard CP/M SYSGEN.COM .
8. While still in DDT, insert and read PICOxx.HEX with a bias such that PICOxx.HEX will load at 1E80h, the correct position for the BIOS code in the SYSGEN buffer. PICOxx.HEX will normally load at the BIOS location in PICOxx.LST. To compute the read bias required use the DDT "h" function to find the difference between the value of the BIOS location and 1E80h.

9.

While still in DDT, modify the Autoload locations at the beginning of the CCP image to create an autoload for "STARTUP". To do this use the DDT "s" function starting at location 987h ( the 7th byte of the CCP ) and insert the following data:

07 53 54 41 52 54 55 50

This data is the hex number 7 standing for a seven character command file name and then the 7 ascii characters of the word "STARTUP".

10.

Setup InterSystems bootstrap parameters at location 900h. The first parameter is the bootstrap load location. This should be two bytes which create a pointer to the location 80h below where the CCP should be loaded to run. The CCP location may be found in FICOxx.LST . For example, one will find that the CCP location for CPM62.COM is DC00h. In this case the load location will be DB80h and the corresponding bytes will be 80,DB . The second parameter is the bootstrap jump location. This should be two bytes which create a pointer to the BIOS location. For example, one will find that the BIOS location for CPM62.COM is F200h. In this case the corresponding bytes will be 00,F2 . The next parameters are consecutively; the first boot sector on track 0, the last boot sector on track 0, then the first and the last boot sectors on track 1. These may simply be set to 01,1A,01,1A . Therefore, in the case of setting up a CPM62.COM for a 64k system, the following bootstrap parameters are inserted at 900h using the DDT "s" function:

80 DB 00 F2 01 1A 01 1A

11.

Leave DDT by typing control "C". Immediately after the system reboots save this new SYSGEN image by typing:

SAVE 50 SYSGENxx.COM

For your reference, this file's internal structure should now be as follows:

```

      (top of BIOS)
-----
      BIOS (from FICOxx.HEX)
1E80-----
      BIOS
      CCP
987   7,"STARTUP"
980-----
904   01,1A,01,1A
902   Boot Jump location
900   Boot load location
-----beginning of SYSGEN storage buffer
      SYSGEN.COM
100-----beginning of TPA

```

12. Run SYSGENxx.COM . Using no source disk ( SYSGENxx.COM should come up with a preloaded buffer so just hit return for source drive ), put the system on a fresh single density, single sided diskette.
13. Using PIP.COM, move XBIOSxx.COM over to the new diskette renaming it to STARTUP.COM . It might also be convenient at this time to move the rest of the files (except STARTUP.COM) from the InterSystems BIOS diskette to the new diskette. The new diskette should now be your first new system diskette.
14. At this point the user should assemble the InterSystems hardware into the system. The system should be able to boot up off of the new diskette after reset and run.

With the system up and running on InterSystems hardware, the user should be able to propagate the new system using ISYS.COM instead of SYSGEN.COM . ISYS.COM will adjust the bootstrap parameter area to accommodate single or double density. IFOR2.COM can be used to create new single or double density diskettes, as well as double density, double sided.

If the system will not boot up and the system hardware setup has been double checked for problems, then the user might find it helpful to go back to the original system and use SYSGEN.COM to read back the system tracks from the new diskette. If the memory image is saved immediately after warm boot by typing

SAVE 50 OBSERVE

then the user may DDT the file "OBSERVE" to see what was placed on the system tracks of the new diskette. This file should be identical to the previously created file SYSGENxx.COM . If not, repeat the procedure more carefully. If it is identical, a correct system image is indicated and more attention should be placed on problems with the hardware setup.

Running the new BIOS with your CP/M 2.2

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Once the new system is running, the user may follow the "Notes for using CP/M 2.2 with InterSystems BIOS ver. 3.d" with one exception.

The exception concerns system relocation, the last section of the notes. The user who has added the InterSystems BIOS to their own previously owned CP/M 2.2 will not receive InterSystems modified MOVCPM.COM file. The modified MOVCPM.COM contains a relocatable image of FICO, CCP "STARTUP" code, and relocating bootstrap load and jump vectors. These features will not be found in the users previously owned MOVCPM.COM . Therefore, when the user wishes to relocate the system, they must install these features during the relocating process. This is done in a similar manner to what is described above as "Initial System Development". The only difference is that ISYS.COM should be used instead of SYSGEN.COM . The sysgen buffer for ISYS.COM starts at 1000h instead of 900h and all system image manipulations should reflect this offset. For instance; the CPMxx.COM will need to be loaded with a 700h offset instead of no offset, The CCP will be found at 1080h instead of 980h, and the BIOS will be located at 2680h instead of 1E80h.

ERRATA FOR CP/M AND BIOS NOTES

"Adding InterSystems BIOS to Existing CP/M 2.2" has the following mistakes:

1. Page 2 number 8 should have you insert and read PICOxx.HEX with a bias such that PICOxx.HEX will load at 1F80HEX, and
2. The map on page 3 number 11 should be amended to show the bottom of the BIOS at 1F80HEX.