

5a) (if all essential table entries or defaults were found)

<----- logack(ack,userno,time,binary serial)
(to user 253)

5b) (if a crucial table lookup failed so no Boot Phase 2 can be sent)

<----- logdeny(deny,userno,time,binary serial)
(to user 253)

6) If binary serial doesn't match the one we sent, or if the "reply" is really a poll, our request was missed. Return to Step 2.

If message is a logdeny, we are in serious trouble and should dump serial # (and product type if possible) to screen, with "login denied" message. Die here.

If message is a logack, prepare to get Boot Phase 2 under the new user number.

7) <----- Boot Phase 2 (to new user number)

The first byte of Boot Phase 2 is the number of 1024-byte blocks it contains. The station reads the first block, then looks at this length to determine whether there are more coming; if so, it reads them. The station executes Boot Phase 2 by jumping to the address following the length byte, i.e. the second byte of Boot Phase 2.

8) Boot Phase 2 is a loader for a series of programs and contains their addresses, lengths, etc. When run, it will load at least one program (by ordinary HiNet reads). It will transfer control to one of the programs it loads, as determined by the particular Boot Phase 2 code and by the data inserted into it when it was configured by the Master. The outcome of this loading process will be one of the following:

9a) . If the program we loaded is a BIOS, it will run its cold-boot code.
IF WE EVER GET HERE, WE'RE DONE. *****

9b) . If we've actually loaded a "Login Please" program, it will respond to the next poll of our user number with a request to log us out; thereafter it will answer no polls of that user number. It will then ask the user for a name and password, which it uses to construct a new login request.
RETURN TO STEP 2. ****

9c) . If we have an "OS menu" program, it will ask the user to choose among the possible OS's for this machine, and to choose default partition assignments compatible with the selected OS. The program will then reconfigure Boot Phase 2 to load the selected OS.
RETURN TO STEP 8. ****

System Directory Layout

Up to 128 entries.

Each entry is 24 bytes:

8 bytes	filename (ASCII)
5 bytes	disk address (v,p,t,s)
2 bytes	length (in 128-byte sects)
4 bytes	load address
2 bytes	offset to execution address
1 byte	prog/data flag
2 bytes	reserved

128 entries of 24 bytes each: 3k bytes total.

The System Directory describes storage allocation within a large contiguous area; i.e. a portion of Unit 0 is reserved for the exclusive use of files pointed to by this directory.

For simplicity the 8-character name should correspond to the name of the .COM file created under CP/M.

The disk address contains fields for volume and partition number and these should be filled in even though as of 9/13 we have decided to put all system files in Unit 0.

The length field allows programs to load files using this directory and allows utilities to determine disk usage.

The load address is the address in the host's memory where the program expects to be loaded, and the 2-byte offset is the distance from that point (always non-negative) where execution is to begin.

The prog/data flag has low bit 0 for tables or other data files or 1 for executable code.

A utility which alters or erases any directory entries is responsible for moving the remaining files so that there are no holes in the disk storage area except the one after the last file. This allows the use of a high-water mark entry whose name field is filled with nulls.

Each file has one entry in the System Directory and each entry refers to one file. In the future it may be permissible to have two or more directory entries that differ only in the load address and name fields, as in the case of relocatable 86 code.

Product Type Table Layout

Up to 40 entries.

Each entry is 25 bytes:

1 byte	Product Type (0 for end)
8 bytes	name of Boot Phase 2 program for this product type
8 bytes	name of "Login Please" program
8 bytes	name of "OS menu" program

40 entries of 25 bytes each: 1000 bytes (1k allocated.)

Search routines are expected to find a match for seven bits of the Product Number, i.e., they are to ignore the high bit which in some implementations identified a serial or parallel console. The programs which can be found through this table all use PROM console drivers and so are oblivious to the console type.

The names of programs in this table correspond to names in the System Directory.

Machine Table Layout

Up to 128 entries.

Each entry is 12 bytes:

4 bytes	Serial Number (binary form)
1 byte	Product Number
6 bytes	Option Map
1 byte	IOBYTE

128 entries of 12 bytes each: 1.5 k.

Option map will have one bit assigned to each possible device driver, e.g. 5-inch HD with Xebec controller, Port 3 type-ahead, spooler, etc.

Machine table search routines will return the product number if the machine is found, or zero if the machine's serial number is not in the table.

OS Table Layout

Up to 128 entries.

Each entry is 96 bytes:

1 byte	OS Number
16 bytes	Product Map
6 bytes	Option Map
64 bytes	load list (up to 8 fields, each being an 8-character name; list is terminated by nulls)
2 bytes	Length (in 128-byte records)
7 bytes	reserved

128 entries of 96 bytes each: 12k.

For an OS to be selected, the bit in the Product Map corresponding to the Product Number from the Machine Table must be "1".

To be selected, the upper nibble of the BIOS' OS number must match its counterpart in the User Option Table. The lower nibble of the BIOS' OS number must also match its counterpart in the User Option Table if the latter is non-zero. If the lower nibble in the User Option Table is zero, no test will be made on the lower nibble of the BIOS OS number.

(Thus, as a minimum, the BIOS must run the OS the user requested on the machine the user is using. By allowing a degree of defaulting on the OS type, we allow the automatic selection of the version of the specified OS which will run on the specified machine.)

If the User Table entry shows that a "full-service" BIOS is desired, the Option Map from the Machine Table will be matched against the Option Maps in the OS table. If an exact match is found this is the OS that will be sent. If no exact match is found, or if the user has requested a "high-TPA" BIOS, then the smallest BIOS matching the OS and machine requirements will be sent.

The "load list" contains the names of any system programs that must be loaded in booting this OS, in the order they are to be loaded, starting with the name of the OS itself. For example, a CP/M 2.2 BIOS would have the name of the BIOS first, then the name of the file containing the CCP and BDOS (to be loaded on each warm-boot.) There can be up to eight files specified in this way (i.e. the file to which this table entry specifically corresponds, plus up to seven others.)

(If there is no BIOS that matches the OS and machine conditions at all, an "OS menu" program for the appropriate machine will be sent instead.)

User Name Table Layout

Up to 128 entries.

Each entry is 16 bytes:

8 bytes	User Name
6 bytes	Password
1 byte	OS number (upper nibble is the "generic" OS type, lower nibble is specific -- CP/M-80, 86 etc; lower nibble 0 means don't care)
1 byte	OS size flag. lower bit 0 for full-service OS, 1 for smallest available OS.

128 entries of 16 bytes each: 2k.

This is the same layout as in pre-Separated Boot versions of HiNet, except that the two bytes in each entry previously "reserved" are now used.

User Configuration Table Layout

Up to 128 entries.

Each entry is 64 bytes:

8 bytes	default A drive
8 bytes	default B drive
8 bytes	default C drive
8 bytes	default D drive
1 byte	length of typeahead
31 bytes	typeahead

128 entries of 64 bytes each: 8k.

BOOT PHASE 2 program

Boot Phase 2 is the loader for the OS to follow.

Its first byte will be the number of 1024-byte blocks the Boot Phase 2 program occupies, enabling the receiving station to set up for another network transfer if necessary.

The next three bytes enable the host to jump to the beginning of the Boot Phase 2 code. In a Z80 this will simply be a jump instruction. In an 86 the first of these bytes will be null and the next two will be the offset from the beginning of Boot Phase 2 to the beginning of the executable code.

Next comes a data block, always in the following format:

Default partition assignments (four names of eight characters)	32 bytes
IOBYTE	1 byte
Default type-ahead buffer and pointer	32 bytes
Honor Flag (see description below)	1 byte
Load List (up to eight partial directory entries each 16 bytes, of the form: Disk Address (v,p,t,s) 5 bytes length (128-byte sects) 2 bytes RAM Load Address 4 bytes Relative Start Address 2 bytes Reserved 3 bytes)	
	total: 128 bytes
Product Type	1 byte

total length of data block	195 bytes

This data block is initialized by the Master before Boot Phase 2 is sent out. A description of each field follows:

Default partition assignments:

These are the assignments specified in the User Configuration Table entry (created by USERS), if a BIOS is to be loaded. If a Login Please or OS Menu is to be loaded, these fields are undefined.

IOBYTE:

This comes from the Machine Table entry for this machine. If there is no Machine Table entry, the IOBYTE will be 00 and the Boot Phase 2 program should attempt to determine the console type and set this field correctly. If this is done then a BIOS loaded by this Boot Phase 2 will be able to run in at least a minimal fashion, enabling the user to run MACHINE and put the machine in the Machine Table.

(Boot Phase 2, continued)

Default type-ahead buffer:

As specified in the User Configuration Table (set up by USERS), if the user name/password is found. Otherwise, undefined.

Honor Flag:

This flag is set to show the extent to which the login request was honored, i.e. what sort of program will be loaded next. The lower nibble will be:

- 0 - An OS exactly matching the request will be sent, i.e. its Option Map will match the machine's (unless a high-TPA BIOS was requested.)
- 1 - A default OS will be sent, of the general type as the requested one but with a different option map. Implies that there is no OS available with the exact option configuration of the machine.
- 2 - A "login please" program will be sent. Implies that the name/psw were not found in the User Table.
- 3 - An "OS Menu" program will be sent. Implies that no OS of the requested type could be found that would stand a chance of running on the machine logging in. In the initial release this will probably be a tough-luck message rather than a real menu.
- 4 - Total failure, no program will be loaded.

The high bit of the honor flag is used to show whether the machine is in the Machine Table, viz.:

- 0 - Normal (the machine is in the Machine Table.)
- 1 - Not found. Without a Machine Table entry, Boot Phase 2 will have to try to figure out the correct IOBYTE for this machine, probably by examining the PROM.

Depending on the value of the Honor Flag, Boot Phase 2 may print a message (using PROM I/O routines) notifying the user of an unusual situation (e.g. a default OS or a Machine Table lookup failure.)

Load List:

This list consists of entries from the System Directory, with the eight-byte names removed, making each entry sixteen bytes long. Each entry describes a file to be read from the net, including information as to where it is to be loaded and where to begin executing it. If fewer than eight files are specified (actually two will be a more common number), the length field in the entry after the last one used is set to zero by the master (in fact, the block is filled with zeros on the end, but these might be legal values in other fields.)

Product Type:

Included in Boot Phase 2 because Z80 machines do not know their own product type and so must find out from the Master.

Thus there are at least 199 bytes in Boot Phase 2 before the real executable code.

"LOGIN PLEASE" program

This program will be loaded in lieu of an OS if the name/psw in the login request do not match any entry in the User Table. (This will often be true on auto-login by serial number.) Its first action will be to request an "instant logout" of the current user number. The program will then ask the user for a name and password. After appending the binary serial number, product type and HiNet user number, the program will wait for a poll of the login pseudo-user (253), issue a login request, and prepare for the log-ack.

The Master's response will be handled the same by this program as it would be in Step 6 of the above boot procedure; i.e., the serial number in the response will be matched against our own, and the login request will be retried if the serial numbers don't match.

If they do match, and the response is an ack, the program notes the new HiNet user number and waits for a new Boot Phase 2 to be sent to that user number. It then executes Boot Phase 2.

If the serial number matches but the response is a deny, there is a major bug. A diagnostic message will be sent to the screen.

The login program will have access to the PROM I/O facilities, to the information passed in Boot Phase 2, and to the HiNet user number.

"OS MENU" program

This program loads in lieu of an OS. It uses PROM I/O facilities and has access to the information passed in the Boot Phase 2 code and to the HiNet user number.

The program reads the OS table from the master and presents to the user a menu of the OS's capable of running on the machine logging in. (Presenting the option map in a reasonable way may be difficult.) When the user selects one, the program loads it -- probably by re-initializing the still-resident Boot Phase 2 with the address of the selected OS, and re-running Boot Phase 2.

Since appearance of the "OS MENU" program implies that no system of the type specified in the User Option Table could be found for the machine, it is unlikely that the default partitions will be suitable for the OS eventually selected. Therefore the re-initialization of Boot Phase 2 must include new default partitions as specified by the user from the console. Program must check that the requested partitions can be used under the requested OS. Any TPA utility version of this program will also have to ask for the default partitions, for the same reason.

Note that this program is required to know the location of the OS table in the master.

Until completion of the OS menu program, the system would benefit from a skeletal program that tells the user why the login request could not be honored.

OS numbers

0 not to be used - can be returned if search fails, etc.

1 CP/M

11 = CP/M 2

12 = CP/M 86

13 = HiDOS

14 through 1F = other CP/M compatible OS's

2 MS-DOS

21 = MS-DOS vers. 2.0

22 = MS-DOS vers. 2.x

23 = MS-DOS vers. 3.x

24 through 2F = other MS-DOS compatible OS's

3 Unix

31 through 3F = Unix-compatible OS's

4 HOST

41 through 4F = HOST-compatible OS's

5 through F not yet assigned

Product Numbers

The Product Number specifies the general CPU board design without regard to peripherals. Therefore some Product Numbers refer to several models.

In some implementations the highest bit of the Product Number some tables has been used to distinguish a serial versus parallel console, a role now handled entirely by the IObyte. Because of the previous usurping of this bit the number of Product Types is limited to 127, not 255.

- 0 Not to be used

- 1 ZSBC-3 CPU's:
 - DMS-3 "DSC-3"
 - DMS-3/A25 "Smart ADDS"
 - DMS-3/4004
 - DMS-3/4008
 - DMS-3/101
 - DMS-3/102
 - DMS-3/103
 - DMS-3/B
 - DMS-3/F "Fox"
 - DMS-15
 - DMS-5080

- 2 DMS-4 "DSC-4"
- 3 DMS-1280
- 4 DMS-3/C "Killer Bee"
- 5 DMS-5086
and HNS-86
- 6 DMS-5016
- 7 DMS-816
- 8 PC Adapter
- 9 DMS-16B
- 10 DMS-808
- 11 Apricot Adapter
- 12 Hex-29 Adapter
- 13 DMS-200

(Product numbers 14 through 127 not yet assigned)

Optional Device Drivers

This is a bit-map with the exception of the block describing the number of logical drives supported. This is permissible because as of 9/13/83 we have done away with the logical ANDing of two bit maps, requiring instead an exact match with the Machine Table version. Since we have agreed to give England an arbitrary number of logical drives (up to 16), the only bit-mapped way of doing it would use 16 bits or one-third of the bit map.

N.B. We are going to have to change the way we offer "custom" printer drivers since there is no way of knowing, a priori, whether a driver named "custom printer" will run on a given machine.

bit	device driver
----	-----
0	8-inch floppies (SD and DMS DD)
1	5-inch Fox-floppies
2	5-inch IBM-format floppies
3	8-inch HD with DMS controller
4	5-inch HD with Xebec controller
5	5-inch HD with Adaptec controller
6	Port 0 type-ahead (console)
7	Port 0 polled (")
8	Port 2 polled (printer)
9	Port 3 type-ahead (aux comm.)
10	Port 3 polled (" ")
11	Parallel Port 1 (console)
12	Parallel Port 1 (printer)
13	Parallel Port 2 (Fox printer)
14	Console/Printer Mux (ADDS, 1280, 5000)
15	Spooler
16	Net Buffer (1k)
17	Real-Time Clock
18	Front-Panel Interrupt
19	Number of logical drives (bit 0)
20	Number of logical drives (bit 1)
21	Number of logical drives (bit 2)
22	Number of logical drives (bit 3)
23	Memory-mapped console (i.e. 816 console)

----- Hard Disk Control Area Layout -----
(Partition 0)

Logical Address	Contents
track 0, sectors 01-1F	Controller Program (unchanged)
track 0, sectors 20-28	reserved for expansion of controller program
track 0, sectors 29-38	HiNet User Name Table
	Up to 128 16-byte entries: 8 bytes: user name or stn serial # 6 bytes: password 1 byte: OS code 1 byte: flags (incl big/small request)
track 0, sectors 39-78	HiNet User Configuration Table
	Up to 128 64-byte entries: 8 bytes: default A drive 8 bytes: default B drive 8 bytes: default C drive 8 bytes: default D drive 1 byte: length of typeahead 31 bytes: typeahead buffer
track 0, sectors 79-80	Disk Allocation Table (unchanged)
track 1, sectors 01-08	Bad Sector Table (unchanged)
track 1, sectors 09-14	Machine Table
	Up to 128 12-byte entries: 4 bytes: Serial Number 1 byte: Product Number 6 bytes: Option Map 1 byte: IOBYTE
track 1, sectors 15-16	Write Mode Table
track 1, sector 17	reserved
track 1, sector 18	Password Table
track 1, sectors 19-20:	Product Type Table
	Up to 40 25-byte entries: 1 byte: Product Type 8 bytes: Boot Phase 2 program name 8 bytes: Login Please program name 8 bytes: OS Menu program name
track 1, sectors 21-80:	OS Table
	Up to 128 96-byte entries: 1 byte: OS number 16 bytes: Product Map 6 bytes: Option Map 64 bytes: Load List (8 names of 8 bytes) 9 bytes: --reserved--

(continued next page)

track 2, sectors 01-02 Cold Boot Loader (unchanged)
track 2, sectors 03-08 reserved for use of Cold Boot Loader

track 2, sectors 09-20 System Directory

Up to 128 24-byte entries:
8 bytes: File Name
5 bytes: Disk Address
2 bytes: Length (128-byte records)
4 bytes: Load Address
2 bytes: Execution Address Offset
1 byte: Program/Data flag
2 bytes: --reserved--

track 2, sectors 21-80 --reserved--

remainder of disk allocated according to contents of the System Directory