

# **New Users of Hercules Wanting a VM/CMS Environment**

by Greg Hartwig (greg at hartwig dot com), 2004-08

I've just gotten through setting up a VM/CMS environment using Hercules as a new user and I found that there seems to be some holes in the documentation. Maybe it was just me, but much of the documentation assumed that I knew stuff that I didn't. So I wanted to write this guide to help others go through this. I hope this is helpful.

## **Installation and setup**

### **Installation**

The first step would be to install Hercules. This will give you a big, empty (fake) IBM mainframe on your desktop but no software for it whatsoever. The next step is to get some software! Several operating systems are available (VM, MVS, MVT, Linux), but I'm concerned with VM/CMS here.

The good news is that when you're done, you will have a functioning VM and CMS operating system to play with! The bad news is that it's VM/370 R6 from around 1977. That means no XEDIT, no REXX, no EXEC2 even. You will have to become familiar with the EDIT editor and the original EXEC language.

Besides Hercules, you will need a 3270 terminal emulator. These are available for every platform (tn3270, x3270, etc.). You will need this to connect to your mainframe. You will probably also need a telnet program. I've gotten by without using telnet but it's a good idea to get that set up also while you're at it.

3270 emulators are available here (as of this writing):

Freeware for Mac:

<http://www.brown.edu/Facilities/CIS/tn3270/>

Freeware for Unix:

<http://www.geocities.com/SiliconValley/Peaks/7814/>

Shareware for Windows, Palm, Mac, etc:

<http://www.mochasoft.dk/tn3270.htm>

List of all known 3270 emulators (and more!):

<http://www.planetmvs.com/tn3270/>

I understand that recent versions of Cygwin (which you need to run Hercules under Windows) comes with x3270, so if you're a Windows user, you may already have all you need. I'm a Mac user, so I don't know details.

So far, you should have these installed:

- 1) Hercules from <http://www.conmicro.cx/hercules/>
- 2) 3270 terminal emulator (tn3270, x3270, etc.)
- 3) Telnet (probably comes with your system)

## About Hercules

Before we get into the details of getting and installing VM, let's take a look at Hercules itself first.

There are some front-ends, but basically the Hercules package provides you with a console command called "hercules" and a variety of utility commands for working with disks. That's about it!

To start Hercules, open a console window and type

```
hercules
```

If your paths aren't set up right (like on my system!), you may need to type something like this:

```
/usr/local/bin/hercules
```

Check the Hercules instructions for specifics about this.

Hercules uses a control file to describe the type of machine you want to emulate. By default, it will try to load "hercules.cfg" if you don't give it a different file. An example of using a different control file:

```
/usr/local/bin/hercules -f vmsys.cnf
```

Besides a control file, there's a file like a PROFILE EXEC that will run when Hercules starts up. This is called hercules.rc and can contain an IPL statement (among other things) to start your operating system automatically.

Each virtual disk pack (DASD) is stored in a separate file on your system. Part of the configuration tells Hercules what files to use for what disk packs. Tapes work about the same way. An image of a tape is stored in a .aws or .het file and is fed to Hercules.

After Hercules is started, you will need to connect terminals to it. To do this, have your 3270 emulator connect to YOUR machine ("localhost") at port 3270. Connect several sessions so you'll be able to log on to several accounts at once. Also, telnet to localhost at port 3270 in one session. The operator console seems to like this type of connection, but I've also gotten it to work as a 3270 terminal.

So we will have this:

#### **HERCULES**

```
| | | |
| | | +--- telnet session for OPERATOR console
| | +----- 3270 terminal (several)
| +----- several files representing disk packs
+----- several files representing tapes (optional)
```

Actually, you will also have some text files attached to the system that will represent a card punch, card reader, and printer. You can, of course, have more than one of each of these if you wish.

There's one other interesting thing that isn't documented well. You can connect your web browser to Hercules and control (to some degree) it from there! To do that, open a browser window and connect to

```
http://localhost:8081/
```

The "8081" is the port number and that's given inside the `.cnf` file when you start Hercules, but 8081 seems to be the commonly-used port.

OK, I've gotten a bit ahead of myself. I've just described how you will be running Hercules when you're ready to do so. But we're not quite there yet!

## System Setup

You should now set up a place for your operating systems. I've set mine up like this:

```
/herc370/vm1  
/herc370/vm2  
/herc370/mvs
```

If you're a Windows user, add `c:` in front of these paths and change the slashes to backslashes.

There are currently two different VM distributions available. I put one into the `vm1` directory and another in the `vm2` directory. An MVS distribution can be put into the `mvs` directory, etc. This is just an example so you can keep things straight. You could put the files anywhere that makes sense to you.

## VM/CMS Distributions

There are currently two choices if you want to have VM/CMS.

The first choice (by **Bob Abeles**) is a startup system as described below that has had some service and some add-ons applied to it. It's probably a better place for most people to start, unless you want to experience the WHOLE thing from scratch. Hey, that can be fun too!

The second choice (by **Andy Norrie**) is a bit of a do-it-yourself setup. You will be provided with some tapes and instructions on creating disk packs to install them on. This will give you a clean (but empty) starter system as one would get it directly from IBM. You must take it from there and do what you want with it. And since it's from 1977, there are a few things you DEFINITELY will want to do to make it a more livable environment.

Both systems can be downloaded here:

<http://www.cbttape.org/vm6.htm>

Why not install both?

### The First Choice VM (by Bob Abeles)

Your first choice (pre-rolled system) was prepared by **Andy Norrie**. It is known as the "**VM 4 Pack System**" system because it comes with four disk packs for VM. In fact, it even stamps that on printouts! It also comes with two more for DOS/VSAM and an additional download file for configuration and information files.

To set up the VM system, do the following:

1. Download each of these files and unpack them. Most of them are quite

large.

2. Put all the DASD files into the `/herc370/vm1` directory I mentioned above:

```
vm3350-1-cckd
vm3350-2-cckd
vm3350-3-cckd
vm3350-4-cckd
sysres.3350.cckd (optional)
mcat01.3350.cckd (optional)
```

You only need the last two if you will be using DOS or VSAM. They aren't needed for the basic VM/CMS system. I can't help you with those.

3. Put the control files from the "essentials" package into that directory also.

```
hercules.cnf
hercules.rc
vmsys.cnf
```

I don't know why there's a `hercules.cnf` and also a `vmsys.cnf` file. They're similar but not the same. I'm using the `vmsys.cnf` file myself but you could probably use either.

4. Customize the configuration file (`vmsys.cnf`).

You will at least want to set the time zone offset to your local setting. The rest of the basic setup at the top can be left alone.

Change the path to the disk packs and other files to `/herc370/vm1/` if they aren't there already.

Notice that 249-24c are the addresses for the four disk packs we'll be using. You may want to comment out the DOS/VSAM packs if you won't be using them. Also comment out the MVS section if you won't be using that either. You don't HAVE to comment these out—they will just cause errors on the Hercules console if they're not there. It's not a problem to leave them, though.

5. Customize the `hercules.rc` file.

You can comment out whatever doesn't apply to you by adding "#" to the start of the lines. The "`IPL 249`" at the end is the important part. Remember that the first disk pack was at address 249 above? That's how our system will be started, but you can also type the IPL command in the Hercules console if you don't want to use the `hercules.rc` file or need to re-IPL the system later.

Now you should be ready to run!

1. In a fresh command window, change your directory over to `vm1`:

```
cd /herc370/vm1/
```

(Of course, use backslashes on Windows)

2. Start Hercules as described above, giving it the `vmsys.cnf` configuration file:

```
/usr/local/bin/hercules -f vmsys.cnf
```

3. Connect a few 3270 terminals. One of the terminals should become the OPERATOR console. If not, try using telnet to connect to localhost at port 3270 and see if that session becomes the OPERATOR.

4. On the OPERATOR console, you will be prompted to change the time. If you see that, you're IN!

Say `NO` to changing the time (TOD) and "`COLD`" to the next question. A `COLD` start will purge all reader files, so in the future, you may want to say `WARM` if you want to preserve them. `CKPT` can be used when `WARM` fails to recover the spool files that can be recovered. The system is now up. Type "`ENABLE ALL`" to make sure all the 3270 terminals are enabled. The `VM/370` logo should appear on all of them.

5. On one of the 3270 terminals, log on to the MAINT userid:

```
L MAINT CPCMS
```

Press return at `VM READ`.

## The Second Choice VM (by Andy Norrie)

Your second choice (roll-your-own) was prepared by **Andy Norrie**. It comes with

- 1) `base-source.aws` — the base source tape,
- 2) `ptf-616.aws` — a PTF service tape, and
- 3) `waterloo.aws` — a tape of patches and utilities from Waterloo University.

You could use these to build your own system from scratch, but also included is two DDR tapes (tape dumps) of two disk packs that have already had the system installed on them:

- 4) `VMREL6.ddr.aws` — VMREL6 disk pack DDR tape
  - 5) `CPR6L0.ddr.aws` — CPR6L0 disk pack DDR tape
- So this system doesn't ENTIRELY have to be do-it-yourself.

Also, it has:

- 6) `starter-3330` DDR tape

This should be the VM/370 R6 tape that IBM would provide. One would use this to tape if you wanted to build a system from scratch. This should be the tape that you would IPL in order to build a system from scratch. The first file on the tape should be the stand-alone Format/Allocate program. The next should be the stand-alone DDR program. These are also provided as `IPL FMT` and `IPL DDR` on the 190 S-disk if you need to use them from the `MAINT` userid. To use the versions on the S-disk, you would punch them to your reader, then IPL the reader. But that's another story...

See p. 229 in the VM/370 System Generation Guide

[http://bitsavers.org/pdf/ibm/370/GC20-1801-10\\_VM370sysgen.pdf](http://bitsavers.org/pdf/ibm/370/GC20-1801-10_VM370sysgen.pdf)

You can follow the directions there to install a system entirely from scratch using this tape! Someday, I'll give that a try, but I've read through it all and looks like fun.

Finally, there's

- 7) `vm370r6-essentials`  
which contains control files and other information about the system.

This version is configured on 3330 DASD while the other choice uses 3350 DASD. Not a big deal, but 3350 DASD is larger than 3330 so it will hold more per disk pack.

By the way, the PTF 616 tape is for product 5749-010 (VM/SP6) PLC 16. It contains lots of important fixes (I've read through them!). You will want to install this onto any system that doesn't already have it (the 4 Pack system does).

Refer to the README that comes with the package, but these notes may help you understand what's happening there.

1. Copy the tape files into the `/herc370/vm2/` directory  
    `VMREL6.ddd.aws`  
    `CPR6L0.ddd.aws`

These are the disk image files that you will need to restore. To do that, you will also need to copy over the DDR "boot tape" file

`dmkddd.aws`

from the "essentials" package. We'll discuss the other tape files (`.aws`) later. They're only needed if you're going to install from scratch.

2. Create empty disk pack files (DASD) that you will restore the DDR tapes to.

You will be using one of those disk utility commands that came with Hercules. If you're on a Unix-type system, they should be installed into `/usr/local/bin` along with Hercules. Open a console window and type the following:

```
dasdinit CPR6L0.3330-1 3330 CPR6L0 (those 0 are all zeroes)
dasdinit VMREL6.3330-1 3330 VMREL6
```

3. Edit the `vm370r6.cnf` configuration file

Change the paths to match your system. As described here, set the paths of the files mentioned in the configuration file to `/herc370/vm2/`. Notice the 3420 tape drives 580-582. These are the tapes we'll be using shortly. The DASD at 131-132 is where we will be restoring the tapes to.

#### 4. Restore the disk packs from tape

a. In a fresh command window, change your directory over to `vm2`:

```
cd /herc370/vm2/
```

(Of course, use backslashes on Windows)

b. Start Hercules as described above, giving it the `vmsys.cnf` configuration file:

```
/usr/local/bin/hercules -f vm370r6.cnf
```

c. Telnet to localhost at port 3270

```
telnet localhost 3270
```

d. On the Hercules console, IPL the system from the DDR boot tape:

```
IPL 580
```

e. The stand-alone DDR program should now be running and communicating in the telnet window. Enter the following DDR statements:

```
input 581 3420
output 131 3330 VMREL6
restore all
```

This will restore the first disk pack. When it completes, type in these additional statements:

```
input 582 3420
output 132 3330 CPR6L0
restore all
```

Now, unfortunately, on my system the packs restored in less than a minute, but the system never returned. The Hercules console continued to update and my CPU usage remained high, but without the disk I/O that I saw in the beginning. I waited about four hours without change before I figured out that it had really finished. So what I had to do is, after restoring the first tape, restart the DDR process for the second tape.

Read more about DDR on p. 54 of the CMS Command and Macro Reference Manual

[http://bitsavers.org/pdf/ibm/370/GC20-1818-0\\_cmsCmdRef\\_Mar76.pdf](http://bitsavers.org/pdf/ibm/370/GC20-1818-0_cmsCmdRef_Mar76.pdf)

On the Hercules console, type

```
stopall  
ipl 580
```

then enter the statements above to restore the second tape. After a few minutes when disk activity stops, type

```
stopall  
quit
```

to stop the emulated system and quit Hercules. (You can skip the `quit` and jump to step 5b below if you wish).

5. Start the system.

a. Start Hercules.

Follow the directions given above for starting Hercules except change to the `vm2` directory and start Hercules like this:

```
/usr/local/bin/hercules -f vm370r6.cnf
```

to use the control file for this distribution.

b. Start the VM system

The bootable disk pack for this system is 131 (the first disk pack we restored). So to start the system, type this on the Hercules console:

```
ipl 131
```

c. Connect 3270 terminals and answer the questions on the OPERATOR console, as described above.

# Other Tasks

## Getting data out of the system

First, direct your virtual punch and/or printer to the system queue:

```
cp SPool PUN TO SYSTEM CLass P
cp SPool PRT TO SYSTEM CLass A
```

Type `cp Query UR` on the OPERATOR console and you'll see that these classes match the output classes of the devices there.

Now, punch the data to your punch. There are two main ways to do this —with the `PUNCH` command or with the `DISK DUMP` command. Punch is best because the output will be readable but only works for data 80 columns wide or less. Anything past that and you'll need to use `DISK DUMP`. But `DISK DUMP` "compresses" the data so it won't easily be usable outside of CMS. You can also use the printer.

Examples:

```
PUNCH PROFILE EXEC A
DISK DUMP MY MODULE A
PRINT USER LISTING A
```

To dump multiple files, there's a bit of a trick. The `Listfile` command can be used to make an `EXEC` that you can use to issue a command on all the files in the list.

1. First, issue:

```
cp SPool PUN Cont
```

to keep the punch from closing after each file

2. Create the CMS `EXEC` using `Listfile`:

```
Listfile * EXEC A (EXEC
```

3. Issue the command for each of the files:

```
CMS PUNCH
```

#### 4. Close the punch

```
cp CLOSE PUN
```

#### Other examples:

```
Listfile * LISTING A (EXEC  
CMS PRINT  
cp CLOSE PUN
```

```
L * * A (EXEC  
CMS DISK DUMP  
cp CLOSE PUN
```

#### NOTES:

Your punch file will probably just sit there in your PUN queue until the OPERATOR turns on the system card punch. And **YOU** are the operator! So go to the OPERATOR console and type

```
cp START PUN  
cp START PRT
```

These will start all the printers and punches. You can also start by address. If you have a punch at 00D and another at 01D:

```
cp START 1D
```

will start the second one. You may want to do this so you have one that outputs in ASCII and one in binary (or EBCDIC since there is no translation).

This will start the system punch and printers. If anything is queued for them, the files will be output to your computer as specified in the Hercules configuration file you're using. For example:

```
000D    3525    /herc370/vm2/punch00d.txt ascii  
000E    1403    /herc370/vm2/print00e.txt crlf
```

## Getting data into your system

1. Add a record to the start of the file you want to transfer showing what userid it should be sent to:

```
USERID CMSUSER
```

2. Attach the file you want to import to your system's card reader. Type this on the Hercules console:

```
devinit 000c myfile.txt
```

```
HHCPN098I Device 000C initialized
```

(This assumes the file is in the same path from where you started Hercules. If not, give the entire path in the above command.)

The file should be delivered to the user you specified. There should be a message about this on the OPERATOR console

```
RDR 00C INPUT FOR CMSUSER FILE = 0051
```

as well as on the console of the receiving user

```
RDR FILE 0051 HAS BEEN READ
```

If the file is **NOT** sent, the reader is probably drained. You will need to start it up! On the operator console, type:

```
cp START RDR
```

```
RDR 00C STARTED SYSTEM
```

3. On the receiving user, read in the file. If you have more than one file, ORDER the one you want to the top. Example:

```
q r all
```

```
ORIGINID FILE CLASS RECDS CPY HOLD DATE TIME NAME TYPE DIST
CMSUSER 0053 A RDR 000008 01 NONE 08/26 05:17:17
CMSUSER 0051 A RDR 000008 01 NONE 08/26 05:13:20
```

```
R;
```

```
order rdr 51
```

```
0001 FILE ORDERED
```

```
R;
```

```
read my file a
```

```
R;
```

Notice that the files have no name. You could have given it one by adding an additional card after the USERID card in step 1:

```
USERID CMSUSER
:READ MY FILE A
```

I've seen evidence that you can shorten the first record to "ID CMSUSER" but I haven't tested this. You can probably find a way to automate this on your system. This page has some samples:

[http://open360.copyleft.de/VM370/SysOpas\\_little\\_Helpers.html](http://open360.copyleft.de/VM370/SysOpas_little_Helpers.html)

Or another way is to create a small file with just the header information in it:

```
USERID CMSUSER
:READ MY FILE A
```

and save it as something like `usercms.txt`. Then issue the `devinit` statement like this:

```
devinit 00c usercms.txt myfile.txt ascii multifile
```

The "multifile" part means the files should be read as if they were one.

To transfer EBCDIC files this way (or binary files), you'll need to carefully create your header file in EBCDIC with exactly 80 bytes for each line and no line-end characters and name it something like `usercms.ebcdic`. Then issue the `devinit` statement like this:

```
devinit 00c usercms.ebcdic mybinary.data ebcdic multifile
```

VMARC is a file compression/decompression tool used to pack many of the VM/CMS downloads you may find on the internet. It is installed on the four-pack system on the MAINT 19E disk as VMARC370 MODULE.

After all this experience, here's a sample PROFILE EXEC file for OPERATOR to make our lives easier:

```
&CONTROL OFF
CP SET PF12 RECALL
CP SET EMSG ON
CP TERM MODE VM
CP ENABLE ALL
CP START PUNCH
CP START PRINT
CP START READER
```

If you don't set `TERM MODE VM`, the `OPERATOR` console seems to only accept CP commands. Another thing is that `OPERATOR` won't IPL CMS automatically, so you'll need to do that on startup, then let its `PROFILE EXEC` run. Oh well.

## Reading tapes

1. Place the tape image files into the `vm1` directory (with the other VM system files).

2. Attach a tape image file to the system.

From the Hercules console, type (for example):

```
devinit 480 vmgames.aws
```

3. Attach the tape drive to a user.

From the `OPERATOR` console, example:

```
cp ATTach 480 MAINT 181
```

This would attach the tape drive at 581 to user `MAINT` as `MAINT`'s 181 device

4. Scan the tape

From `MAINT`, type

```
VMFPLC2 SCAN
```

A listing files before the next tape mark are shown. Repeat until you get an empty list.

5. Rewind the tape

```
REWIND 181
```

6. Create a temp disk to hold the data (optional)

```
CP DEFINE T3350 AS 123 CYL 10
DASD 123 DEFINED 010 CYL
R;
FORMAT 123 B
DMSFOR603R FORMAT WILL ERASE ALL FILES ON DISK
'B(123)'. DO YOU WISH TO CONTINUE? (YES|NO):
yes
DMSFOR605R ENTER DISK LABEL:
TMPDSK
FORMATTING DISK 'B'.
'10' CYLINDERS FORMATTED ON 'B(123)'.
R;
```

You may want to create a quick TDISK EXEC to do this (for future use):

```
&CONTROL OFF
&IF &1 NE ? -SKIPHELP
&TYPE FORMAT: TDISK [cuu [mode [size]]]
&TYPE DEFAULT: TDISK 123 B 10
&EXIT 1
-SKIPHELP
&IF .&1 EQ . &1 = 123
&IF .&2 EQ . &2 = B
&IF .&3 EQ . &3 = 10
CP DEFINE T3350 AS &1 CYL &3
&IF &RETCODE NE 0 &EXIT &RETCODE
&STACK YES
&STACK TMPDSK
FORMAT &1 &2
&EXIT &RETCODE
```

(Sorry, I couldn't resist making it a little /ess "quick.")

**Note:** You may need to change T3350 to T3330, depending on your DASD type.

## 7. Load the tape files

```
VMFPLC2 LOAD * * B
```

## 8. Copy files to your A-disk

```
COPYfile * * B == A (NEWDate
```

I've found some tape files load with blank dates. This could be a Y2K issue. In any case, the `NEWDATE` option fixes this. Copying the files also seems to fix some other problems I've seen with files loaded from tapes. Modules that wouldn't run now run after copying. Files that could be `TYPED` but not edited can now be edited.

## 9. Detach the tape drive

```
cp DETach 181
```

**NOTE:** If you get errors using the `VMFPLC2` command, rewind the tape and try it again using `TAPE` instead of `VMFPLC2`. `TAPE` is the "supported" command for handling tapes and `VMFPLC2` is the maintenance version that's not supported outside of system maintenance use. But it has more features, so most people use it instead. But some don't!

## Saving the CMS system

If you change a file on the S-disk, you then need to re-save the `CMSSEG` shared segment. There's also a CMS shared segment (`DCSS`). There may be times where you can save just one or the other, but it's probably best to re-save them together. Here's how to do that. Do the following from the `MAINT` userid:

## 1. Save the CMSSEG segment

```
cp DEFine STOrage 16M
CP ENTERED; DISABLED WAIT PSW '00020000 00000000'
Ipl 190 PARM SEG=NULL
CMS SYSTEM - BUILT 2003/10/15
(press RETURN at VM READ)
R;

ACCess 190 B/A
DMSACC723I B (190) R/O
DMSACC725I 190 ALSO = S-DISK
R;

CMSXGEN 400000 CMSSEG      (address of the CMS segment at 4MB)
SYSTEM SAVED
CMSXGEN COMPLETE
R;
```

## 2. Save the CMS segment

```
Ipl 190
CMS SYSTEM - BUILT 2003/10/15
savesys cms      (type at VM READ)
SYSTEM SAVED
CMS SYSTEM - BUILT 2003/10/15
R;
```

For complete instructions, read

p. 356 of GC20-1801-10 VM/370 System Generation Guide

[http://bitsavers.org/pdf/ibm/370/GC20-1801-10\\_VM370sysgen.pdf](http://bitsavers.org/pdf/ibm/370/GC20-1801-10_VM370sysgen.pdf)

Also

p. 364 of GC20-1807-4 VM/370 Systems Programmer manual 2-76

[http://bitsavers.org/pdf/ibm/370/GC20-1807-4\\_VM370syPgm\\_2-76.pdf](http://bitsavers.org/pdf/ibm/370/GC20-1807-4_VM370syPgm_2-76.pdf)

## Additional Setup

A few things that aren't obvious.

When I found the four-pack system, there was a new copy of LISTFILE MODULE on the A-disk. I think it's a version that fixes Y2K problems. The version on the S-disk was not working due to disk errors. I believe the segment just needed resaving. Here's what I did on the MAINT machine to fix it:

```
ACcEss 190 B
Copyfile LISTFILE MODULE A = = B (OLDDate REPlace
RELEase B
```

Then I re-saved CMS so the S-disk directory would be updated in the shared segment. See the section on "**Saving the CMS system**" for details.

1. Make a "general user" userid for yourself to play with. It's not considered safe to "live" on the MAINT userid because it isn't a class G user and has additional authority that might get you into trouble.

a. On the MAINT userid, add an entry to VM50 DIRECT A:  
Type **EDIT VM50 DIRECT, BOTTOM, INPUT**, then type each of the following and press enter.

When done, press ENTER again, then type **FILE**.

```
USER CMSUSER CMSUSER 2M 16M G
IPL CMS PARM AUTOOCR
CONSOLE 01F 3215
SPOOL 00E 1403 A
SPOOL 00C 2540 READ *
SPOOL 00D 2540 PUNCH A
MDISK 191 3350 302 115 VM50-3 MR READ WRITE ALL
LINK MAINT 190 190 RR
LINK MAINT 19D 19D RR
LINK MAINT 19E 19E RR
```

The userid and password is CMSUSER.

Notice the 19D and 19E links above. Useful stuff is there (see below).

Be careful! I discovered that on disk pack VM50-3 that cylinders 302-416 were free. Make sure that's true on your system also or there will be big trouble! 115 cylinders of 3350 DASD is the maximum size you can use on this version of CMS, by the way (65536 blocks at 800K/block).

b. Type `DIRECT VM50 DIRECT` to make your changes active.

c. When you first log on, you'll need to format the 191 disk:

```
FORMAT 191 A
DMSFOR603R FORMAT WILL ERASE ALL FILES ON DISK
'A(191)'. DO YOU WISH TO CONTINUE? (YES|NO):
yes
DMSFOR605R ENTER DISK LABEL:
USR191
FORMATTING DISK 'A'.
'115' CYLINDERS FORMATTED ON 'A(191)'.
R;
```

d. Create a PROFILE EXEC, similar to this sample:

```
&CONTROL OFF
CP SET PF7 IMMED UP 8
CP SET PF8 IMMED DOWN 8
CP SET PF12 RECALL
CP SET RUN ON
SET RDYMSG SMSG
ACCESS 19D Z
ACCESS 19E Y/S
CLRSCRN
&TYPE === READY ===
```

Now you can use PF7 and PF8 to scroll while in EDIT. Several utilities and languages are on the 19E Y-disk. There is a simple HELP command on the 19D z-disk (in place of the more elaborate one that shipped there in the future). Try something like `HELP LISTFILE`. Explore the Y disk!

## Compressing the distribution tapes

The tape images provided by the distributions are uncompressed `.aws` files. You can easily convert them to `.het` compressed tapes which will take up much less space and will operate the same. Here's how...

1. Start up your VM/CMS system
2. Log on to MAINT
3. Attach two tape drives to the MAINT userid.

From the OPERATOR console, type:

```
cp attach 480 maint 181
cp attach 481 maint 182
```

4. Mount the tape files.

From the Hercules console, type:

```
devinit 480 /herc370/vm2/VMREL6.ddd.aws
Mounted tape VMREL6.ddd.aws
HHCTA998I Device 0480 : VMREL6.ddd.aws is a AWS Format
tape file
HHCPN098I Device 0480 initialized

devinit 481 /herc370/vm2/VMREL6.het compress=1
Mounted tape VMREL6.ddd.het
HHCTA998I Device 0481 : VMREL6.ddd.het is a Hercules
Formatted Tape
XXXXXXXXXX Device 0481 : parameter: 'compress=1'
HHCPN098I Device 0481 initialized
```

5. Copy the tape.

From the MAINT console, use DDR to copy the tape:

```
cp SPool PRT *
ddr
ENTER:
sysprint 009
ENTER:
input 181 3420
```

```
ENTER:
output 182 3420
ENTER:
copy all
COPYING   VMREL6
END OF COPY
ENTER:
```

6. Mount a new set of tapes on the Hercules console:

```
devinit 480 /herc370/vm2/CPR6L0.ddd.aws
Mounted tape CPR6L0.ddd.aws
HHCTA998I Device 0480 : CPR6L0.ddd.aws is a AWS Format
tape file
HHCPN098I Device 0480 initialized

devinit 481 /herc370/vm2/CPR6L0.ddd.het compress=1
Mounted tape CPR6L0.ddd.het
HHCTA998I Device 0481 : CPR6L0.ddd.het is a Hercules
Formatted Tape
XXXXXXXXXX Device 0481 : parameter: 'compress=1'
HHCPN098I Device 0481 initialized
```

7. Copy the second tape:

From the MAINT userid:

```
copy all
COPYING   CPR6L0
END OF COPY
ENTER:
(press enter)
END OF JOB
R;
```

The tapes will automatically rewind and unload (detach from Hercules).

8. Detach the tape drives.

From the MAINT console:

```
cp DETach 181
cp DETach 182
```

A print file will be sent to your reader showing the results of the DDR.  
Read it in and display it if you want to see it:

READcard DDR LISTING A

Type DDR LISTING A

**Note:** You can only copy DDR tapes. Tapes in other formats can not be copied this way, such as the starter-3330.aws tape.

# Reference

## Useful Hercules console commands

IPL cuu

DEVINIT cuu fileid

STOPALL

EXIT

ESC key — View devices, etc. ESC to return.

## Useful CP/CMS commands

(Capitals are the shortest abbreviation—Case doesn't matter when typing commands in CP/CMS)

Examples:

Query Disk *	or Q DISK *	
cp Query Virtual DASD	or Q V DASD	
cp Query Virtual UR	or Q V UR	
cp Query Virtual ALL	or Q V ALL	
cp Query RDR All	or Q RDR ALL	
Listfile (Label	or L (L	(It's about all we've got!)
TYPE PROFILE EXEC A		
EDIT PROFILE EXEC A		(your editor)
Msg * M	or M * M	(quickly shows you what userid you're on)

The "virtual" keyword is needed with many CP commands when you're on priveleged userids like MAINT and OPERATOR, otherwise you'll be querying the "real" devices attached to the system rather than the devices in your Virtual Machine.

**TIP:** The PA2 key is a useful way to clear the screen. It's faster than the CLEAR key and also doesn't clear the input area.

## **USERID reference**

The OPERATOR id/console controls the devices in the system. It is used to turn the consoles on or off, attach tape drives and disk drives to users, and control the system printers, punch, and card readers.

MAINT is used to apply maintenance to the system, rebuild both VM and CMS, add users to the system, and basically maintain the system in general.

## **VM vs. CP vs. CMS**

You'll see the term "VM/CMS" a lot, but what do all these terms mean and where does CP fit in? VM, as you might know, is the main software that runs on the hardware. It is creating an environment where you can have separate Virtual Machines that each act pretty much like a complete hardware machine of it's own. Each of these userids can use Control Program commands (CP) to manage the "fake" machine that was created for it.

CMS is the actual operating system that each virtual machine runs, so that's why the system is often called VM/CMS, but instead of CMS you could also run another copy of VM (for testing) or an MVS system or anything else that runs System/360, S/370, or S/390 instructions. Or whatever they're calling the latest version.

From the point-of-view of each userid, they only see CP commands and can run CMS from there (or MVS or whatever). But the actual hardware is running VM.

This is like Hercules! Hercules is like VM in that it's what provides the environment that you can use to run commands. The Hercules console commands are like the CP commands that you can use to define devices and start up an operating system. From Hercules you can IPL a VM system and then start CMS or MVS, or you could also run a Unix system.

## Device Type Refresher Course (for devices of the era)

### DASD (Direct Access Storage Device)

3330, 3350

### Tape drives

3420

### Others

1403 Line printer

3505 Card reader

3525 Card punch

2540 Card reader/punch <http://www.staff.ncl.ac.uk/roger.broughton/iomedia/images/pc7.jpg>

3215 Printer/Keyboard Console

3270 Full-screen-type terminal (3277, 3278)

### Standard virtual machine device addresses (CUU)

009 3215 Console

00C 2540 Card Reader

00D 2540 Card Punch

00E 1403 Printer

181 Tape drive

190 S-disk (system disk)

191 A-disk (DASD)

## Reference Information and IBM Manuals

Here are some brief instructions to guide you with Hercules and VM a bit:

<http://open360.copyleft.de/VM370/VM370.html>

### Introduction to VM/CMS

<http://www.damos.dircon.co.uk/assets/multimedia/VMCMS.pdf>

You can find VM/CMS manuals you'll need online here:

<http://bitsavers.org/pdf/ibm/370/>

Follow this link and alt-click (option-click) on the files you want, to download them. These PDF files are all scans of the manual pages. Each page is a picture, not text, so you can't search for keywords, unfortunately.

Here are the important ones:

Introduction to VM/370 (for people new to VM/CMS)

[http://bitsavers.org/pdf/ibm/370/GC20-1800-6\\_VM370intr\\_Oct76.pdf](http://bitsavers.org/pdf/ibm/370/GC20-1800-6_VM370intr_Oct76.pdf)

VM/370 System Generation Guide

This is the book used to configure a system from scratch.

If you will be making changes to the system, you'll need this.

You will also use this if you're installing from scratch using the second distribution described above.

[http://bitsavers.org/pdf/ibm/370/GC20-1801-10\\_VM370sysgen.pdf](http://bitsavers.org/pdf/ibm/370/GC20-1801-10_VM370sysgen.pdf)

System Programmer's Guide

[http://bitsavers.org/pdf/ibm/370/GC20-1807-4\\_VM370syPgm\\_2-76.pdf](http://bitsavers.org/pdf/ibm/370/GC20-1807-4_VM370syPgm_2-76.pdf)

VM/370 Operations Guide

[http://bitsavers.org/pdf/ibm/370/GC20-1806-9\\_VM370oper\\_Mar79.pdf](http://bitsavers.org/pdf/ibm/370/GC20-1806-9_VM370oper_Mar79.pdf)

CMS User's guide, command reference, and CP command reference

[http://bitsavers.org/pdf/ibm/370/GC20-1819-0\\_cmsUG\\_Feb76.pdf](http://bitsavers.org/pdf/ibm/370/GC20-1819-0_cmsUG_Feb76.pdf)

[http://bitsavers.org/pdf/ibm/370/GC20-1818-0\\_cmsCmdRef\\_Mar76.pdf](http://bitsavers.org/pdf/ibm/370/GC20-1818-0_cmsCmdRef_Mar76.pdf)

[http://bitsavers.org/pdf/ibm/370/GC20-1820-0\\_cpCmdRef\\_Feb76.pdf](http://bitsavers.org/pdf/ibm/370/GC20-1820-0_cpCmdRef_Feb76.pdf)