AJR 11/1/2019

Controller Re-Flashing Procedure for Direct Drive Systems

Important Note:

1. If you are unable to write to boot.ini or you cannot copy a file to the flash, the flash will need to be reformatted and possibly needs to be unlocked. This is covered in Appendix F "Repairing the Flash filesystem"

Applicability:

The manual procedure below is to be used when the new automatic procedure with the script cannot be used such as when the vxWorks and/or boot.ini files are missing or corrupted. The procedure below applies to ProPulse systems, VnmrS/400MR, and any DD2 system.

Background Info:

A null modem cable is required to follow this procedure when creating or editing the boot.ini file or copying vxWorks. If you want to delete or copy files in the flash, except boot.ini, but you do not have a null modem cable, skip to the procedure at the end of this document called "How to delete and copy files into flash without a null-modem cable".

See appendix D for information on setacq before proceeding

DS1 –DS5 LEDs:
If the 5 yellow LEDs DS1-DS5 do not scroll or the "cpu_err" red LED is lit, the controller did not boot. Use this procedure to look at the bootup and to re-flash the controller.

Appendices in the back include the master1 & DDR1 bootup messages after the procedure.

Enabling tftp and rsh:

Background Info:

To download files or boot from /tftpboot via a master reset, the service rsh must be enabled.

The bootup messages, display of files with "dir", file deletion, and creation of boot.ini are all occurring via the serial cable. The "copy" command and "ls" output occurs via the Ethernet connection. To transfer files from /tftpboot using the "copy" command in the terminal window, the following must be set because the copying is done via the Ethernet, not the serial cable or else you may see error 1209A0: ARP timeout".

1) Make sure that:

- information in boot.ini must be correct
- host is connected to the console via the Ethernet cable
    - console must be on eth1 (use the "ethtool" command to verify correct port)
- the /etc/host file exists with the controller IP address
- the Ethernet connection on controller is good (check green LED is on)

2) If you get "error 1209A4: no response from server" …make sure:
a) tftp must be running/enabled (see below)
b) the /etc/hosts.deny is not blocking access. If you modify it, reboot the PC
c) the firewall is disabled

d) the Ethernet switch may be an issue. To test, connect the Ethernet cable directly from the controller to the Host. If the controller firmware can be installed/copied via a direct connection but not via the Ethernet switch, then the issue is obviously the Ethernet box.
e) Make sure the console is connected to the correct Ethernet card eth1. Make sure to confirm using the *ethtool –p eth1 20* command as root.

Steps to enable tftp & rsh:
To check your OS version, go to /etc and type: more redhat-release
On Linux 6.1/6.3:
To check if tftp & rsh are running, click system, administration, services…then click on the service then click on "enable".

On Linux 5.3 and 5.1
To check if tftp & rsh are running, click system, administration, server settings, services…then click the "On Demand Services" tab. Ensure that tftp and rsh are checked. Then save & exit.

On Linux 4.3
To check if tftp & rsh are running, click applications, systems settings, server settings, services and make sure they are checked on the list at the left (setacq will always enable tftp as well as rarpd).

Set Up communication terminals:

1. For Linux 4.3, 5.1, 5.3, 6.1 and 6.3, use **minicom** as shown in appendix G or use the **screen** command as shown below

2. For Solaris software or for using a windows hyper-terminal, see appendix A

Screen command:
This command will set up a terminal window to connect to the controllers over the serial null modem cable using a baud rate of 115200

1. Open a terminal window and become root
2. Type: chmod 666 /dev/ttyS0
3. Open a terminal as vnmr1
4. Type: screen /dev/ttyS0 115200

NULL modem cable connection and board reset:

1) Attach a NULL-modem (with loop back handshaking) cable from controller's 9-pin diagnostic port to host computer serial port. For pinout see Appendix B.

   If the cable is bad or not a null modem, you may have issues with seeing any output or typing in commands (such as "dir" or "shell")

2) Reset board (or hit control X) & hit space bar within 4 sec (note that LEDS DS 1-5 will all light up) to stop the bootup & get the BCP prompt. Now you can reflash a controller.

3) You will see only the **header** below when the board has no files due to a hidden boot loader file in flash memory:

Varian visionWARE v2.1 PPC405GPR Controller Board
Build #31, 10/04/04 09:06:55
MAC : 00-60-93-03-00-01 IP : 172.16.0.5
Type "shell" to set IP and/or MAC addresses
Type "help" to see available commands

Note:
If no messages show up, the issue may be an issue with the 3.3 or 5V on the controllers. Ensure DC power is as indicated on the Knowledge Base:

On VnmrS/DD2:
The 5V and 3.3V have been measured on several systems and found to be in the range of 5.0 - 5.25V, and 3.3 - 3.46V (loaded), respectively.

On 400MR/400MRDD2:
Ensure the 3.3V is at least 3.57V and the 5V is at least 5.35V UN-loaded.

The 3.3V line must not drop below 3.28V and the 5V must not drop below 4.95V at the controller board connector.

If power is correct, the controller cannot be re-flashed in the field because the boot loader may have been corrupted & needs to be replaced, but first make sure the minicom and null modem setup are ok by using a working controller.

How to re-flash a controller or multiple controllers simultaneously:

Background Info:

With VJ 4.1, all controllers will have 2 new ones, lpfgexec and rf_amrs.4th, bringing the total to 14 for RF controllers and 13 for all other controllers.

With VJ 3.1, RF controllers had 14 files (3 extra ones for iCATs on both VnmrS/DD2/400MR DD2) while all other controllers still have 11 files.

*With 2.3A and later, all controllers will have 11 files in the flash memory, but nddslib.o is a **huge** file in megabytes. This is the indication that it contains 2.3A or later firmware.*

*With 2.2C and the 104 patch or higher, all controllers will have 11 files in the flash memory, but nddslib.o will be a **small** file in kilobytes. Prior to 2.2C/104 patch, controllers had 10 files in flash (no nddslib).*

Procedure:
1) Reset the controller
2) Hit the space bar to stop boot up
3) On the ***BCP*** prompt, type **dir** (to display files in flash)
4) On the BCP prompt, delete each file by typing: **del** *filename*
5) *Reset the controller*
6) View the boot.ini file

At the BCP> prompt type: **shell** (to view the boot.ini file)

Now hit enter many times until you get back to the BCP prompt.
You should now see a series of lines as shown below. This info is what is contained in the default boot.ini file.

Shell is a script that allows you to view or change the info of the boot.ini file. If no boot.ini exists, shell will create one.

Default boot.ini:

If master1 controller's flash is blank, you should see this default boot.ini info after hitting enter after each line:

Command Channel = 0: serial >
Boot Delay (seconds) = 0 >
Boot Script = >
Prompt String = BCP >
MAC Address = 00-60-93-03-00-01 >
IP Address = 172.16.0.5 >
(this is a default IP when first reflashing a board)
Subnet Mask = 255.255.0.0 >
Default Gateway = 0.0.0.0 >
Remote System 1 Name = wormhole >
Remote System 1 IP = 172.16.0.1 >
Remote System 2 Name = >
Remote System 3 Name = >
Remote System 4 Name = >

7) **Create or modify the boot.ini file:**

a) At the BCP> prompt, type **shell**
b) For each line hit enter if the info is already correct.
c) You need to enter only 4 pieces of info (shown below in blue italics) :

boot delay
boot script
IP address
Remote System 1 IP

Note: ***DO NOT*** *type in the ">" at the end of any line. The ">" will automatically appear when you view the boot.ini file.*

Below is the boot.ini with the required info for master1:

Command Channel = 0: serial >
Boot Delay (seconds) = ***4***
Boot Script = ***load vxWorks405gpr.bdx!launch 10000***
Prompt String = BCP >
MAC Address = 00-60-93-03-00-01 >
(this address is different for each controller & should match the MAC # displayed on the header at bootup or as shown in /etc/ethers)

IP Address = ***172.16.0.10***

(this should match the controller IP as shown in /etc/hosts)

Subnet Mask = 255.255.0.0 >
Default Gateway = 0.0.0.0 >
Remote System 1 Name = wormhole >
Remote System 1 IP = ***172.16.0.1***
(this should match the IP of wormhole as shown in /etc/hosts)

It is important to set the correct controller IP and wormhole IP in the boot.ini file in order to re-flash it. Once the controller boots up, this IP is not important.

Remote System 2 Name = >
Remote System 3 Name = >
Remote System 4 Name = >

Making any changes will prompt you with:
Save changes? … so type y

You will get the message
"hardware does not support software controlled hard reset; please recycle power to board"…so press the RESET on the controller and ignore any error message about not finding vxWorks (it is not on flash so an error tells you)

If you now type "dir" , you should now see a new boot.ini file:

boot.ini	xxxx bytes
1 file(s)	xxxx bytes
	xx,xxx,xxx bytes free

NOTE:
If the boot.ini file cannot be saved to the flash, the flash may need formatting and possibly unlocking. Refer to the Appendix F and then return to the above section on creating the boot.ini file.

7) **Manually download files into flash:**
a) Open a terminal window
b) Become root by typing "su"
c) Copy files from /vnmr/acq/download to /tftpboot by doing the following:

NOTE:
In Linux 6.1 and higher, the tftpboot directory does not exist in / . In Linux 6.1 and higher, tftpboot is located under /var/lib/tftpboot:

As root, create the tftpboot directory under /:

#mkdir /tftpboot

In Linux 6.3 (or lower), do the following:
cp /vnmr/acq/download/vxWorks405gpr.bdx /tftpboot
cp /vnmr/acq/download/*.o /tftpboot

cp /vnmr/acq/download/nvScript.rd /tftpboot/nvScript

In Linux 6.1 (or higher) and CentOS, ALSO DO THE FOLLOWING:

[the "copy" command used at the BCP prompt in the step E below will copy out of /var/lib/tftpboot (not /tftpboot as it used to in Linux 5.3/lower), but the controllers still boot out of /tftpboot, so files need to be in both tftpboot directories in Linux 6.1/higher and CentOS]

cp /vnmr/acq/download/vxWorks405gpr.bdx /var/lib/tftpboot
cp /vnmr/acq/download/*.o /var/lib/tftpboot
cp /vnmr/acq/download/nvScript.rd /var/lib/tftpboot/nvScript

Background Info:
What is the difference between nvScript and nvScript.rd ?
nvScript instructs the controller to boot from flash memory
nvScript.rd instructs the controller to boot from the /tftpboot in the host

For 400MR/400MR DD2/ ProPulse ONLY:
In /tftpboot, change the last line in nvScript from
systemInit("/tftpboot",1,-2, 0, 0)
to
systemInit("/tftpboot",1,-2, 1, 0)

d) Go to the minicom terminal
e) At the BCP prompt type the following (to copy files to flash). Please note that iCAT files are only for systems with iCATs and the rf_amrs is for ProPulse.

copy \\wormhole\vxWorks405gpr.bdx
copy \\wormhole\ icat_top.bit
copy \\wormhole\icat_top01.bit
copy \\wormhole\icat_config.4th
copy \\wormhole\ rf_amrs.4th

Allow 1 min to get message that copy was done for vxWorks

For copy to work, tftp must be enabled. If an **error** occurs in trying to copy from /var/lib/tftpboot, ensure that tftp is enabled as stated in the "Enabling tftp & rsh" section OR check for possible issues with Ethernet switch or Ethernet cables

8) Reset the controller
You should now see the controller bootup as shown by its DS1 – DS5 scrolling (except lock as only 3 LEDs blink in a pattern). For iCATs, these should also bootup as shown by all its yellow LEDs quickly blinking off then on right after the RF controller boots up.

Backgorund Info:

Since the flash contains only vxWorks & boot.ini, there is no nvScript. The controller then looks for nvScript in /tftpboot, which actually contains nvScript.rd, which instructs the controller to boot from /tftpboot. The controller will boot from files running in RAM, but the flash still has only 2 files at this point.

For the reset to work properly, rsh must be enabled:

If the controller did not boot, rsh might be disabled or the host computer is not connected to the console properly. For this transfer to occur via the reset from /tftpboot, rsh must be enabled. To check if rsh is enabled, at the "->" prompt type "ls":

- if enabled, you'll see many files
- if not enabled, you see: value = -1 = oxffffff
  - To enable rsh see the section "Enabling tftp & rsh" beginning of this document

(enabling will change /etc/xinetd.d/rsh with a "disable=no" line)

If the controller did bootup, the FPGA LED should now be lit green & DS1-5 yellow LEDs should now be scrolling

Firmware is NOT yet installed in flash until you run setacq

The bootup in minicom should show "network files" being opened from /tftpboot as opposed to "flash files"

-- note if /etc/hosts.deny file exists, then make sure controller IP addresses are in the /etc/hosts.allow or else cannot boot from /tftpboot after a reset

9) **Run setacq**

ALL files will be written into flash memory then executed into RAM & to configure the FPGA.
(See Appendix C if setacq fails)

Background Info on New firmware files:

With VJ 3.1 and higher, setacq will copy 3 additional files for a total of 13 files downloaded to the RF controllers (14 in flash memory with boot.ini already existing) only on VnmrS and DD2 systems, so you do not need to manually copy these files to /tftpboot. All other controllers still have 11 files. The additional files are called:

icat_top.bit in VJ3.2 (or newer) or icat_top00.bit in VJ 3.1
icat_top01.bit
icat_config.4th

With VJ 4.1 and higher, setacq will download 2 additional files (*rf_amrs.4th and lpfgexec.o , but pfgexec and lockexec are no longer downloaded*) for a total of 13 files downloaded (14 in flash memory including boot.ini already existing) to the RF and lock controllers only on ProPulse/400MR DD2 systems/400MR. All

other controllers will have 11 files (may have 13 if lockexec and pfgexec are already existing from factory). The additional files are:

rf_amrs.4th [the RF controller uses this file to detect if an AMRS is attached to the channel and if so, to read the attenuation table /characterization data set by CM to keep the output within specified limits of 11 dBm]

lpfgexec.o [files used by the lock controller to operate as both a lock and PFG; the original lockexeco.o and pfgexec.o files are still present but not used. This board now uses the IP 172.16.0.46 and boots up as "t6undefined1"

Once a controller is running vxWorks, you can rlogin or ping it even if the IP addresses in the boot.ini file do not match the IP in /etc/hosts.

The bootup should look like the messages in the "Master bootup" or "DDR bootup" sections below. If setacq fails, see notes below.

What happens after pressing the RESET button?

Any time the reset button is pressed on a controller, the following happens:

a) All DS1 – DS5 LEDs light up & PS OK stays lit
b) The PRGM flashes after 20 sec then the FPGA LED turns ON
c) The DS1 –DS5 start to scroll on all generic controllers. The lock only has DS2, DS4, & DS5 blink while the DDR's top LED flashes fast.

For the DD2 & DD2 400MR (silk) [see next section for ProPulse]:

Do the following to ensure the RF controllers and iCATs will function properly:

1. Immediately after the RF controllers boot up, the iCAT's yellow LEDs (prog done, main out, LO out) will blink off then on to indicate that the iCAT FPGA has been programmed.

2. Make note of the following LEDs on the iCAT:
   a. The "DC PWR OK" green led should be on
   b. The "PROG DONE" yellow led should be on
   c. The "RF ON" yellow LED is on ONLY when RF is generated

3. Perform the following checks to ensure the iCATs are recognized and configured by logging into EACH RF controller, typing the indicated command (**case-sensitive**), and expecting to see the indicated results in bold:

   a. ffdir [displays all files in the controller flash memory (FFS)];
      All rf controllers have 4 additional files (for a total of 15) when compared to master, ddr, lock, and pfg (these have 11) in VJ 4.1A.
      The 4 extra files are:
      icat_top00.bit

icat_top01.bit
icat_config.4th
rf_amrs.4th

b. isfdir [displays the 2 boot image files (.bit files) and possible configuration files (.4th files) stored in the iCAT flash memory]:
   i. **icat_top.bit (pri) xxx bytes md5: xxxx**
   ii. **icat_top01.bit (sec) xxx bytes md5: xxxx**
   iii. **ampgainnom.4th, ampnullnom.4th, atten_delay.4th, sinegainnom.4th**

   If no files show up, this may be an issue with 80 MHz into the iCAT from the backplane OR the iCAT flash memory has been erased which requires a new board. Both issues will cause the heart beat LED to be steady ON instead of fading On & Off as is the case when it is working.

c. RfSettings:
   i. **Transmitter mode = 0x1** (for iCAT) or **0x0** (for the standard transmitter)
   ii. **Console type = 0x1** (for 400MR) or **0x0** (for VnmrS)

d. RfType:
   i. **Value = 1 = 0x1** (for iCAT) or (**value=0=0x0** for VnmrS/400MR std transmitter)

e. setupRfType (shows 6 lines):
   i. shows a checksum number
   ii. **FPGA is iCAT enabled**
   iii. **iCAT ID: 0xa**
   iv. **iCAT attached**
   v. **iCAT DNA: shows a number unique to each iCAT**
   vi. **Setting for VnmrS console or 400-MR console**

f. ffmd5"file_name"
   i. ffmd5”icat_top01.bit”
   this is used to do a checksum. A long string of characters will be displayed. Check this string against the one shown when doing isfdir. If the same, it means the file in the controller is the same as the one in the iCAT.
   ii. You can also check the string of files such as masterexec.o with ffmd5”masterexec.o”. Compare the string displayed with what is in /vnmr/acq/download (you can do this with all files)

4. Login to master1 and type:
   g. prtConsoleID

i. **console ID: 'Silk 400-MR'** or **console ID:'Silk VNMRS'**

5. On the command line type: "su" and expect to see "setup complete"
6. An "su" will also turn on "aux in" LED on all iCATs and the "LO out" LED of the iCAT used to observe.

For ProPulse systems:

Do the following to ensure the Agilent Magnetic Resonance Synthesizer (AMRS) is functioning properly:

1. In a terminal type: rlogin rf1 or rf2
2. At the arrow prompt type: simon [this puts you into the simon 4th interpreter]
3. At the OK> prompt type:
   a. amrs-status [this will display the model #, CM test date, serial #, operating freq, atten-lockout-off ATTEN: #]
   b. amrs-heartbeat-on [this should make the yellow LED on the Ethernet cable blink indicating that the FPGA is ok and also the 80 MHz from the Ref Gen is present; if absent, LED will be off]…Note Yellow LED should flicker after an "su" command.
   c. amrs-board-rev . [shows the revision 1 or later]
   d. bye [to get out of the simon interpreter]
   e. logout [to exit rlogin]

4. Other commands at the OK> prompt (these are extra):
   a. amrs-channel-id . [shows 1 or 2 depending on which is RF controller is connected]
   b. 620E6 sfrq
      amrs-atten-lockout-on
      amrs-status [these commands set the output freq to 620 MHz & internal attenuator is locked…..ATTEN shows A]
   c. 520E6 sfrq
      amrs-atten-lockout-off
      amrs-status [these commands set the output freq to 520 MHz & internal attenuator is NOT locked in order to set the output @ 11 dBm based on attenuation/calibration tables from the CM…ATTEN shows a number from 01 thru 3F]
   d. 663 40 swp-freq [sweeps the synthesizer from 40 MHz to 663 MHz to verify its output across all operational freqs]

How to delete and copy files into the flash WITHOUT a null-modem cable:

Requirements:
a) The /etc/hosts.equiv file must be present with all controller names
b) The services rsh and tftp must be running or enabled (if type ls and you can see files in the rlogin window, then these are already enabled)
c) vxWorks must already be running (required to rlogin). All files can be missing except vxWorks (and boot.ini) when starting this procedure.
d) No null modem cable required to delete or copy files in flash memory but is required to edit or create the boot.ini file into flash memory

Procedure:
Make sure the controller is booted and idle (the 5 yellow LEDs ds1 – ds5 scroll up and down) or that it has at least gone past the vxWorks. Using the ffdel command, you can delete any file (nvScript, nvlib, nddslib.o, vxWorks405gpr.bdx, etc) EXCEPT boot.ini and re-install it using the following procedure. DO NOT delete boot.ini !!

The following is **AN EXAMPLE** on how to overwrite a file (rfexec.o):
In a terminal window type:
rlogin *controller_name* (such as master1, ddr1, lock1, pfg1, or rf3). Ignore the "connection refused" messages. Type the following at the arrow prompt:

→ffdir
will display files in flash (VJ 3.1A and higher must have 14 files for all RF controllers and 11 files for the rest)

→cp2ffw("/vnmr/acq/download/rfexec.o")
will over write the file rfexec.o in flash with the file from /vnmr/acq/download on the host computer

"…copy successful" … should be displayed once the file is written to flash

Please note that large files like nddslib will take 4-5 min to show "copy successful" while small files like rfexec.o will take a few seconds.

Use the above procedure to overwrite all files (except boot.ini) in the controller. After overwriting all the files, then RESET the board.

NOTE for iCAT systems:
If using the master or pfg controller as an RF controller, you must copy the 3 extra iCAT related files into the RF controller flash needed by the iCAT or else the iCAT will not have an output. You can use the cp2ff command to copy the files.

Notes:
Machine Check:
If you get the message "Machine check" followed by a string of code after bootup, then the board is defective and needs replacement.

Boot cycle:
During the boot cycle, the controller requests its IP address and host name via the net

(RARP). Then it boots vxWorks, executes nvScript, followed by nddslib, nvlib.o and 'flavor'exec.o. At this point you can ping it and rlogin to it, no matter what IP addresses are in the 'shell'. Once it boots, you can use setacq to load the *latest* files into flash and forget those "copy \\wormhole...." commands.

Appendix A: Setting up minicom on Solaris or Linux 3 & 4 or using a windows hyper-terminal:

For Solaris 9:
In /etc/remote change the baud rate in the hardwire line from 9600 to 115200:

hardwire:\
:dv=/dev/term/a:br#115200:el=^C^S^Q^U^D:ie=%$:oe=^D:

In terminal type: tip hardwire (uses a faster baud rate of 115200 & shows more info)

For Linux 3 & 3.2 only:

In a terminal type the following:

cu -s 115200 -l /dev/ttyS0 > `tty` (note the backward commas)

[-s is speed; -l is line device; ttyS0 (capital S zero) is serial port]

For Linux 4:

In Linux 4 you can view the bootup messages but cannot abort the bootup by hitting the space bar; therefore, you cannot re-initialize a controller with the "cu" command---must use minicom or laptop terminal)

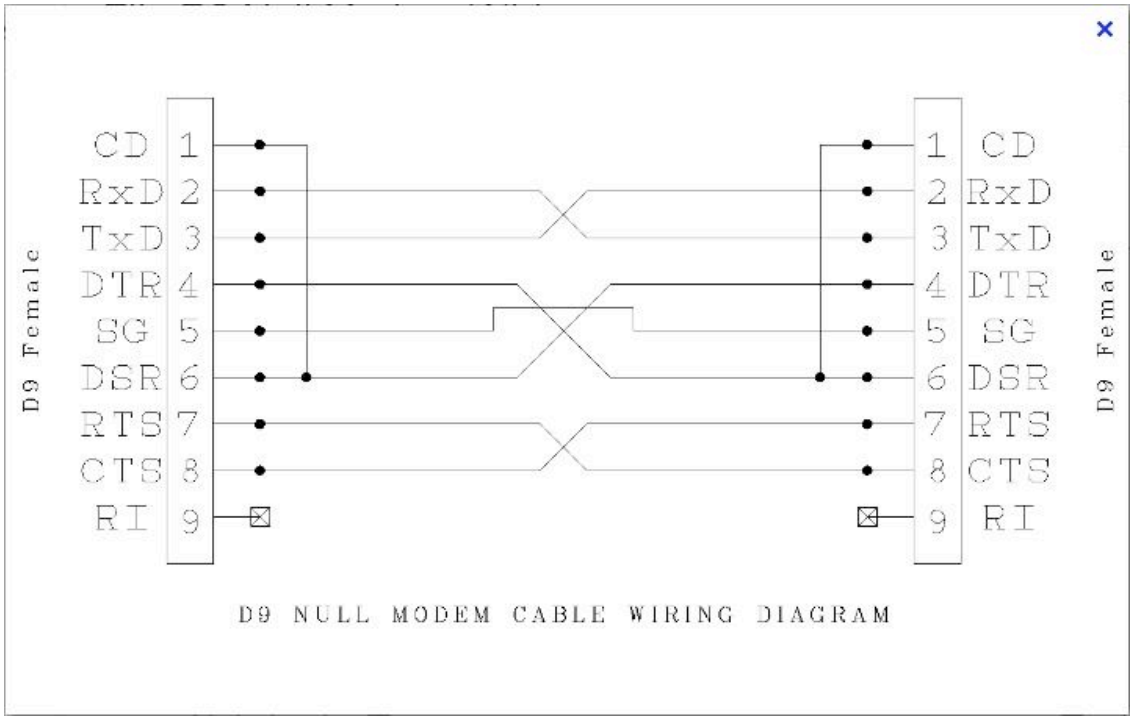
Using a Windows hyper-terminal:
You can also view controller bootup using a laptop running a ***windows hyper-terminal*** after setting it up with 115200 baud rate, 8 data bits, no parity, 1 stop bit, and no hardware flow control.

Appendix B: Null Modem Cable Pin Out:

If using a 9F – 9F serial null modem (pin 1 is top left & pin 5 is at the bottom left on the longer edge…..6 is top right…9 is bottom right on the short side), then the following pins are tied:

2 to 3; 4 to 6; 4 to 1; 5 to 5; 7 to 8; 9 to 9 (end to end)

Also 1 to 6 on same side of connector on both ends of the cable for Data Carrier Detect



Appendix C: Setacq failures

Note 1: On 400MR if setacq fails ("unable to open nvScript"), do the following:

- as root type:
cd /vnmr/acq/download
cp nvScript.ls /tftpboot/nvScript
- reset the controller and abort bootup to get the BCP prompt
- in the BCP prompt type:
copy \\wormhole\nvScript
- reset the controller
- re-run setacq

Note 2: VJ 2.2C/107 patch bug on 400MR "download failed" message:

setacq - Fails on file 9 with patch 2.2CallLNXall107
Bug-ID: **setacq.j2204 (++)**

Summary:
The patch 2.2CallLNXall107 copies the file nvScript.std to nvScript. This is fine for VNMRS liquids systems, however, it produces an error for VNMRS solids and 400-MR systems when one runs /vnmr/bin/setacq. The error message is harmless if the failure is on file 9, no problem exists unless controller cards are swapped because of a service call. We therefore highly recommend that you perform the workaround below.
Category: general
Patch level: 107

Bad versions: VnmrJ 2.2C / RHEL 4.0.3/5.1 / DirectDrive/400-MR
Reported by: Frits Vosman, Varian *(2008-09-30)*
Priority rating: *P3 (medium)*
Status: *Resolved*
Workaround:

On Varian NMR Systems, as vnmr1, type
cd /vnmr/acq/download
cp nvScript.std.md5 nvScript.md5
vnmr/bin/setacq

On a 400-MR system, as vnmr1, the commands are
cd /vnmr/acq/download
cp nvScript.ls nvScript
cp nvScript.ls.md5 nvScript.md5
/vnmr/bin/setacq

Appendix D: Background Info on Setacq

1) Setacq cannot load files into a blank controller or a controller that has not booted up. A controller needs 2 files minimum in flash (boot.ini and vxWorks405gpr.bdx) and must bootup from either flash memory or /tftpboot for setacq to reflash a controller as described here.

2) Setacq will not re-flash a controller a second time if it has been done once on the same system and patch level. Re-running setacq will only check if the firmware is already present in flash memory (only DS5 led flashes for each download).

3) When upgrading to VJ 2.3A or higher software, keep this in mind:
If the controllers have booted, and you have at least VJ 2.2C/104 patch (or higher patch like 107) and you are trying to upgrade to VJ 2.3A or higher, setacq will run & update the flash.

4) If you upgrade from VJ 2.1B up through VJ 2.2C before the 104 patch, setacq should update the flash of the controllers, but it may fail the first time and requires that you reset the master and re-run setacq. When doing rlogin you may see the message "**NDDS MANAGER : received 2.1"…**indicating that a controller has different versions of firmware. VJ2.2C will have a very small nddslib.o file in all controllers & is needed when upgrading to newer software.

It should work the second time, but if setacq does fail, you may need to re-flash manually in one of the following ways:
a) Install 2.2C, install the VJ2.2C 107 patch, run setacq, and install Vj 2.3A/patch
OR
b) As described below in this document.

5) With VJ 3.1 for DD2 systems:
The RF controllers will have 14 files in their FFS, not 11 files, because 3 more files are downloaded (13 are now downloaded ONLY to the RF controllers). The rest of the controllers still have only 11 files in their FFS.

Appendix E: Basic commands for the ProPulse AMRS:

app600b:vnmr1 1>**rlogin rf1**
connect to address 172.16.0.20 port 543: Connection refused
Trying krb4 rlogin...
connect to address 172.16.0.20 port 543: Connection refused
trying normal rlogin (/usr/bin/rlogin)

-> **simon** [*this gets you into the 4th interpreter*]

ok> **amrs-status** [*use status to display current state of the synthesizer*]

G5239-60800-13OCT17FVT12:10-79-340-002298
FREQ:619000000.000000
FTW1:19E63B1D0000 FTW2:2D000000 RFSW:1A65A6 ATTEN:12
amrs-heartbeat-off amrs-alt-power-up amrs-atten-lockout-off

The command below will make the yellow LED flash on the synthesizer board next to the Ethernet port indicating that the FPGA is ok and also the 80 MHz from the Ref Gen is present; if absent, LED will be off; the normal status is ON

ok> **amrs-heartbeat-on**
ok**> amrs-heartbeat-off**

The command below will display the revision of the synthesizer board

ok> **amrs-board-rev .**
1 ok> **bye**
value = 0 = 0x0

-> **logout**
rlogin: connection closed.
app600b:vnmr1 2>

Appendix F: Repairing the flash filesystem:

Formatting the flash may be required when:

1. Being unable to write the boot.ini file to flash
2. Being unable to copy a file to the flash

To format the flash:

1. In the >BCP prompt type: *format*
   "file system formatted" should appear in a few minutes

2. Type *dir* to see if any files exist. If none, recreate the boot.ini using the shell command as described in this document

To unlock the flash:

If formatting fails, we need to unlock the flash. To unlock the flash, do the following from the BCP prompt:

>BCP> format
"error 120BC2: flash error while writing to the file system" [this means the flash is locked]

>BCP> sm fffffffc 60 [note there are seven (7) f's]
>BCP> sm fffffffc d0 [these 2 commands clear the flash write protection]
>BCP> sm fffffffc ff [this command returns the flash to normal operation]
>BCP> format
"file system formatted"

At this point you should be able to create the boot.ini file and save it to the flash as described early in this document

Note:

- format: deletes all the files in the controller flash EXCEPT boot.ini
- ffdel("lockexec.o") : this deletes the specified file off the controller flash (FFS)
- isfdel("name") : this deletes the specified file off the ICAT flash (ISF)…the boot images CANNOT be deleted, only the other 4 files installed by the vendor. We have no copy of these, so save them before removing them using the pcp command.
- See examples below….

Deleting files on the controller flash (ffs):

```
vnmr1 301>rlogin pfg1
connect to address 172.16.0.40 port 543: Connection refused
trying normal rlogin (/usr/bin/rlogin)

-> ffdir
               boot.ini                1384 bytes
        vxWorks405gpr.bdx              1320720 bytes
              nddslib.o                5844541 bytes
               nvlib.o                  776297 bytes
          gradientexec.o                504389 bytes
            rf_amrs.4th                  35731 bytes
              rfexec.o                  696450 bytes
              ddrexec.o                 698647 bytes
              pfgexec.o                 477279 bytes
               nvScript                   1025 bytes
             masterexec.o               1028427 bytes
              lpfgexec.o                482207 bytes
              lockexec.o                240954 bytes

     13 file(s)                        12108051 bytes
                                        3489517 bytes free
          FFS size: 15597568
value = 0 = 0x0
-> ffdel lockexec.o
invalid number: .o
-> ffdel "lockexec.o"
Deleting file: 'lockexec.o'.
 1 files deleted
value = 0 = 0x0
-> cp2ff("/vnmr/acq/downlod?
invalid string: "/vnmr/acq/downlod□
-> cp2ff("/vnmr/acq/download/lockexec.o"
syntax error
-> cp2ff("/vnmr/acq/download/lockexec.o")
Coping file '/vnmr/acq/download/lockexec.o' of 240954 bytes to Flash file 'lockexec.o'
Copy Successful, CRC match: 0x38abf54f
Complete.
value = 0 = 0x0
->
```

Managing the files on the iCAT flash (isf):

vnmr1 301>rlogin rf3
connect to address 172.16.0.22 port 543: Connection refused
trying normal rlogin (/usr/bin/rlogin)

To list the iCAT flash files:

```
-> isfdir
Directory of icat ISFlash   [ FFS Version 2, Max. Files: 58 ]
       icat_top.bit (pri)       341657 bytes md5: 6c0882032f83449b6ab91bd4970547b9
     icat_top01.bit (sec)       341657 bytes md5: 6c0882032f83449b6ab91bd4970547b9
     ampgainnom.4th [ 0]                 26 bytes     md5: a69b2a2207f83824d821a488dcf2ed06
    sinegainnom.4th [ 1]         26 bytes     md5: 2357d2efa84d96fd2626d0dd1fba5ff9
     ampnullnom.4th [ 2]         24 bytes     md5: 1d756d54ebcd614c1af731ee8209aac0
    atten_delay.4th [48]       3238 bytes   md5: e6fc7afa59da77f67084a1b338031648

      6 file(s)                 686628 bytes
value = 36 = 0x24 = '$'
```

The boot images cannot be deleted:

```
-> isfdel("icat_top01.bit")
value = 0 = 0x0
-> isfdir
Directory of icat ISFlash   [ FFS Version 2, Max. Files: 58 ]
       icat_top.bit (pri)       341657 bytes md5: 6c0882032f83449b6ab91bd4970547b9
     icat_top01.bit (sec)       341657 bytes md5: 6c0882032f83449b6ab91bd4970547b9
     ampgainnom.4th [ 0]                 26 bytes     md5: a69b2a2207f83824d821a488dcf2ed06
    sinegainnom.4th [ 1]         26 bytes     md5: 2357d2efa84d96fd2626d0dd1fba5ff9
     ampnullnom.4th [ 2]         24 bytes     md5: 1d756d54ebcd614c1af731ee8209aac0
    atten_delay.4th [48]       3238 bytes   md5: e6fc7afa59da77f67084a1b338031648

      6 file(s)                 686628 bytes
value = 36 = 0x24 = '$'
```

Other 4 vendor files can be deleted BUT don't have copies of these SO make copies using the pcp command:

pcp(“source_device:file”,”destination_dev:file”)
device can be: icat for icat flash, ffs for controller flash, rsh for pc directory

To copy from icat to controller:

```
-> pcp("icat:ampgainnom.4th","ffs:ampgainnom.4th")
Copy Successful.
value = 0 = 0x0
-> ffdir
            boot.ini                  1384 bytes
      vxWorks405gpr.bdx                1320720 bytes
```

```
          nddslib.o              5844541 bytes
       ampgainnom.4th               26 bytes
          nvlib.o                 776297 bytes
        rf_amrs.4th                35731 bytes
          ddrexec.o                698647 bytes
         lpfgexec.o                482207 bytes
         lockexec.o                240954 bytes
       icat_config.4th             121230 bytes
          nvScript                  1025 bytes
       icat_top01.bit              341657 bytes
          rfexec.o                 696450 bytes
        icat_top.bit               341657 bytes
          pfgexec.o                477279 bytes
       gradientexec.o              504389 bytes
         masterexec.o             1028427 bytes

    17 file(s)                   12912621 bytes
                                          2684947 bytes free
        FFS size: 15597568
value = 0 = 0x0
```

To delete a file on icat flash:

```
-> isfdel("ampgainnom.4th")
Deleting: 'ampgainnom.4th'
value = 0 = 0x0
-> isfdir
Directory of icat ISFlash   [ FFS Version 2, Max. Files: 58 ]
      icat_top.bit (pri)       341657 bytes md5: 6c0882032f83449b6ab91bd4970547b9
    icat_top01.bit (sec)       341657 bytes md5: 6c0882032f83449b6ab91bd4970547b9
   sinegainnom.4th [ 1]          26 bytes    md5: 2357d2efa84d96fd2626d0dd1fba5ff9
    ampnullnom.4th [ 2]          24 bytes    md5: 1d756d54ebcd614c1af731ee8209aac0
   atten_delay.4th [48]        3238 bytes   md5: e6fc7afa59da77f67084a1b338031648

     5 file(s)                  686602 bytes
value = 36 = 0x24 = '$'
```

<u>To copy a file from controller to iCAT:</u>

```
-> pcp("ffs:ampgainnom.4th","icat:ampgainnom.4th")
Copy Successful.
value = 0 = 0x0
-> isfdir
Directory of icat ISFlash   [ FFS Version 2, Max. Files: 58 ]
      icat_top.bit (pri)       341657 bytes md5: 6c0882032f83449b6ab91bd4970547b9
    icat_top01.bit (sec)       341657 bytes md5: 6c0882032f83449b6ab91bd4970547b9
    ampgainnom.4th [ 0]             26 bytes    md5: a69b2a2207f83824d821a488dcf2ed06
   sinegainnom.4th [ 1]          26 bytes    md5: 2357d2efa84d96fd2626d0dd1fba5ff9
    ampnullnom.4th [ 2]          24 bytes    md5: 1d756d54ebcd614c1af731ee8209aac0
   atten_delay.4th [48]        3238 bytes   md5: e6fc7afa59da77f67084a1b338031648
```

```
      6 file(s)                   686628 bytes
value = 36 = 0x24 = '$'
->
```

Copying an iCAT flash file to PC vnmr1 directory:

```
vnmr1 301>rlogin rf1
connect to address 172.16.0.20 port 543: Connection refused
trying normal rlogin (/usr/bin/rlogin)

-> isfdir
Directory of icat ISFlash   [ FFS Version 2, Max. Files: 58 ]
       icat_top.bit (pri)       341657 bytes md5: 6c0882032f83449b6ab91bd4970547b9
      icat_top01.bit (sec)      341657 bytes md5: 6c0882032f83449b6ab91bd4970547b9
      ampgainnom.4th [ 0]                26 bytes     md5: 495524155e916e5659fe5489ac4978ce
     sinegainnom.4th [ 1]         26 bytes     md5: 161e2fdb9e81f272f430f6c44900c1af
      ampnullnom.4th [ 2]         24 bytes     md5: ae6991fdc1e2b1d95c5a6c1952f2b5dd
     atten_delay.4th [48]       3238 bytes   md5: e6fc7afa59da77f67084a1b338031648

      6 file(s)                   686628 bytes
value = 36 = 0x24 = '$'
```

Cannot copy to vnmr1 desktop:

```
-> pcp("icat:ampgainnom.4th","rsh:/home/vnmr1/DESKTOP/ampgainnom.4th")
rsh: '/home/vnmr1/DESKTOP/ampgainnom.4th', could not be open
Copy failed.
value = -1 = 0xffffffff


-> pcp("icat:ampgainnom.4th","rsh:/home/vnmr1/ampgainnom.4th")
Copy Successful.
value = 0 = 0x0
->
```

Appendix G: Set Up Minicom:

For Linux 4.3, 5.1, 5.3, and 6.1 use minicom or windows hyper-terminal:
(for earlier software or using a windows hyper-terminal, see appendix A)

Minicom is a serial communication program used to view the digital controller output.

To set up minicom do the following:

1) **In a terminal as root type:**

minicom -s (setup option will edit/create the defaults in /etc/minirc.dfl)
hit enter (ignore any warning message)

In the configuration window, scroll to "serial port setup" & hit enter
In the new window:
Select "A" to change the serial device to /dev/ttyS0 (zero, not the letter O) then hit enter
Select "E" to change the "comm parameters"
In the new window:
Select "I" to set speed to 115200
Select "L" to set parity to none
Top line should now read "current: 115200 8N1"
(If not then also
Select "V" to set data bits to 8
Select "W" to set stop bits to 1)
Hit enter to exit this window
Select "F" to toggle hardware flow control to NO
(if set to yes, then hitting the space bar after resetting a controller will NOT abort the bootup…you will NOT get the BCP prompt)
Select "G" to toggle software flow control to NO
Hit enter to exit
Scroll to "modem & dialing" then hit enter
In the new window:
Select "A" & delete all characters to the left of the cursor and hit enter

Scroll to "save setup as dfl" and hit enter (get "configuration saved" message)
[creates /etc/minirc.dfl……d f & 1 (lower case L)]
Scroll to "exit from minicom" and hit enter to get the root prompt

At the root prompt type in:
chmod 666 /dev/ttyS0 (zero)
(This enables any user to run minicom by accessing the serial port ttyS zero.
This should also be typed any time the host computer is rebooted)

2) **In a terminal as any user type:** minicom -o then hit enter

to get the "welcome to Mincom" screen. Hit enter again to get the arrow prompt.
No arrow indicates no connection or null modem is not being used.

If minicom is not working properly, delete the /etc/minirc.dfl file and recreate it with minicom –s as root

Appendix H: Bootup Examples

Example of the controller files with VJ 4.1A on a ProPulse System:

Firmware Files of RF1

```
app600b:vnmr1 1>rlogin rf1
connect to address 172.16.0.20 port 543: Connection refused
Trying krb4 rlogin...
connect to address 172.16.0.20 port 543: Connection refused
trying normal rlogin (/usr/bin/rlogin)

-> ffdir
                 boot.ini                      1384 bytes
                 nvScript                      1071 bytes
                nddslib.o                   5844541 bytes
        vxWorks405gpr.bdx                   1320720 bytes
                  nvlib.o                    776297 bytes
                ddrexec.o                    696031 bytes
               lockexec.o                    186887 bytes
             masterexec.o                   1021367 bytes
                lpfgexec.o                   479539 bytes
                 pfgexec.o                   343387 bytes
            gradientexec.o                   501569 bytes
            icat_top01.bit                   341657 bytes
                rf_amrs.4th                   35731 bytes
              icat_top.bit                   341657 bytes
          icat_config.4th                    121230 bytes
                 rfexec.o                    688297 bytes

      16 file(s)                          12701365 bytes
                                           2896203 bytes free
        FFS size: 15597568
value = 0 = 0x0
->
```

iCAT files

```
-> isfdir
Directory of icat ISFlash   [ FFS Version 2, Max. Files: 58 ]
        icat_top.bit (pri)          341657 bytes        md5:
6c0882032f83449b6ab91bd4970547b9
      icat_top01.bit (sec)          341657 bytes        md5:
6c0882032f83449b6ab91bd4970547b9
      ampgainnom.4th [ 0]              26 bytes        md5:
b9202471ec4e078a3a806bd7c8647ba6
     sinegainnom.4th [ 1]              26 bytes        md5:
95fe90568d15d3ba411d8036e7604f1c
      ampnullnom.4th [ 2]              24 bytes        md5:
50540100f04529688a9322925b0c4d28
     atten_delay.4th [48]            3242 bytes        md5:
8784630b752744cccf410322900aff3e
```

Firmware Files of Master1 (same for DDR1 & lock/PFG):

```
app600b:vnmr1 1>rlogin master1
connect to address 172.16.0.10 port 543: Connection refused
Trying krb4 rlogin...
connect to address 172.16.0.10 port 543: Connection refused
trying normal rlogin (/usr/bin/rlogin)

-> ffdir
                 boot.ini                      1384 bytes
                 nvScript                      1071 bytes
                  nvlib.o                    776297 bytes
                nddslib.o                   5844541 bytes
        vxWorks405gpr.bdx                   1320720 bytes
                ddrexec.o                    696031 bytes
             masterexec.o                   1021367 bytes
               lockexec.o                    186887 bytes
                pfgexec.o                    343387 bytes
               lpfgexec.o                    479539 bytes
               rf_amrs.4th                    35731 bytes
                  rfexec.o                   688297 bytes
           gradientexec.o                    501569 bytes

      13 file(s)                           11896821 bytes
                                            3700747 bytes free

        FFS size: 15597568
value = 0 = 0x0
->
```

Bootup messages for master1 with VJ 4.1A on a ProPulse System:

```
Welcome to minicom 2.1

OPTIONS: History Buffer, F-key Macros, Search History Buffer,
I18n
Compiled on Jul 26 2006, 06:38:12.

Press CTRL-A Z for help on special keys

0x1e937e8 (tExcTask): ibmEmacStop
Say Bye-Bye........
GPIO IR: 0x21040000
GEO: Type 0, (0x0), Address: 0, (0x0)


Varian visionWARE v2.1 PPC405GPR Controller Board
Build #32, 01/20/05 16:10:00

MAC : 00-60-93-03-00-01 IP : 10.190.50.171
Type "shell" to set IP and/or MAC addresses
Type "help" to see available commands

Press a key in the next <4> seconds to preempt boot script
Booting from script...

load vxWorks405gpr.bdx !launch 10000

CPC0_CR0: 0x383a
CPC0_CR0: 0x83a
CPC0_CR0: 0x383a
OsParams Address: 0x3e57964
Signature: 'vWARE', Version: 2
pVwareEntry: 0x3e22710, Func Table Addr: 0x3e032c8
sysLanIbmEmacEnetAddrGet: Vware started
Attached TCP/IP interface to emac unit 0
Attaching network interface lo0... done.
sysResolveIpAddr(); MAC: 00:60:93:03:00:01:
sysResolveIpAddr(); RARP request sent, waiting for reply


++++++++++++++++++++++++ rarpInputHook
++++++++++++++++++++++++++++
packet length: 146
EtherHeader Source MAC:  00:60:93:03:60:01
EtherHeader Destination MAC:  00:60:93:03:00:01
EtherHeader type: 0x800 (0x8035-rarp, 0x806-arp, 0x800-ip
Not REVARP.

++++++++++++++++++++++++  ++++++++++++++++++++++++++++++
```

```
++++++++++++++++++++++ rarpInputHook
++++++++++++++++++++++++++
packet length: 60
EtherHeader Source MAC:  00:24:e8:31:74:95
EtherHeader Destination MAC:  00:60:93:03:00:01
EtherHeader type: 0x8035 (0x8035-rarp, 0x806-arp, 0x800-ip
ARP Type: 4 (ARP_REQUEST=1, ARP_REPLY=2 RARP_REQUEST=3
RARP_REPLY=4)
Src MAC:  00:24:e8:31:74:95
Src IP: 172.16.0.1
Target MAC:  00:60:93:03:00:01
target IP: 172.16.0.10
Target MAC:  00:60:93:03:00:01
Local MAC:  00:60:93:03:00:01
resolved IP: 172.16.0.10

++++++++++++++++++++++  ++++++++++++++++++++++++++
sysResolveIpAddr(); MAC: 00:60:93:03:00:01:
sysResolveIpAddr(); RARP request sent, waiting for reply
sysResolveIpAddr(); MAC: 00:60:93:03:00:01:
sysResolveIpAddr(); RARP request sent, waiting for reply
sysResolveIpAddr(); RARP Reply IP: '172.16.0.10'
Target: 'master1', IP: '172.16.0.10'
  Host: 'wormhole', IP: '172.16.0.1'
Skip DHCP Request.

Adding 4317 symbols for standalone.
                                CPU: IBM PowerPC 405GPr Varian
Controller.  Processor #0.
                               Memory Size: 0x2000000.  BSP
version 1.2/7.
                              WDB Comm Type: WDB_COMM_END
                             WDB: Ready.

FFS file 'nvScript' opened, 1071 bytes
Executing FFS startup script 'nvScript' ...
#
#
nvld  "/tftpboot/nddslib.o"
FFS file 'nddslib.o' opened, 5844541 bytes
value = 20552480 = 0x1399b20
nvld  "/tftpboot/nvlib.o"
FFS file 'nvlib.o' opened, 776297 bytes
value = 25620688 = 0x186f0d0
nvrdate("wormhole")
value = 0 = 0x0
date
WED NOV 06 22:08:41 2013
value = 25 = 0x19
#
```

```
# systemInit(NetworkDisk_BasePath, BringUp_Level, DebugLevel,
ConsoleType, Flags)
#
# NetworkDisk_BasePath - if NULL then the bit and exec files are
loaded from flash
#                      Otherwise used as the directory on the
network drive to load from.
#  e.g. NetworkDisk_BasePath = /tftpboot    /tftpboot/xxxexec.o
are loaded
#
#       systemInit("/tftpboot",0,1,0,0)  load bit and exec.o from
/tftpboot
#
# BringUp_Level - level of software service, etc.  started
#    0 = only dma drivers initialized.
#    1 = DMA, NDDS, initialized
#        Bringup is called.
#    2-9 Reserved for future use.
#
# DebugLevel - Level of Diagnostic Output, 0 = None, 1 - minimum,
#                                          2 - NDDS output,  3-10
more output
#
# ConsoleType - Type of console , used to load proper varient of
FPGA
#    0 = VNMRS (a.k.a. Nirvana)
#    1 =
#
# Flags - reserved for special purposes
#    0 = default
# 0x20 = special Solids Amp mode
#
systemInit(0,1,-2,1,0)
emac0 previous queue length was 50
Queue length set at: 200
IP input maximum queue length = 50
Arp input maximum queue length = 50
New IP input maximum queue length = 200
New Arp input maximum queue length = 50
GPIO IR: 0x23043e00
GEO: Type 0, (0x0), Address: 0, (0x0)
-------  systemInit  createDomain
hostname : 'master1'
IP val: 0xac10000a
Local IP: '172.16.0.10'

=========>>>>> 1

=========>>>>> 2

=========>>>>> 3
File: 'magmaster_top.bit' not found on FFS.
```

```
=========>>>>> 4
22:08:41++++++ Loading  Exec file: 'masterexec.o'
FFS file 'masterexec.o' opened, 1021367 bytes

=========>>>>> 5

=========>>>>> 6
Sending configuration data to FPGA
FPGA Configuration Successful.
Reseting FPGA via GPIO line.

=========>>>>> 7
22:08:44  FPGA ID: 0, Rev: 0, Chksum: 21257;  nvacq/42x/master.c
Chksum: 21257, Compiled: Oct 23 2013

=========>>>>> 8
22:08:44  FPGA ID: 0, Rev: 0, Chksum: 21257;  nvacq/42x/master.c
Chksum: 21257, Compiled: Oct 23 2013

=========>>>>> 11
22:08:44FPGA interrupt vector 0x19 interrupt 25 isr 0x14bba5c
installed
 ------------  Registered fpgaBaseISR ISRs slice 0 ---------
 ------------  FPGA Interrupt Register Addresses  ---------
 Status = 0x70000060
 Enable = 0x70000064
 Clear  = 0x70000068

 ------------  Registered fpgaBaseISR ISRs ---------
 fpgaBaseISR[0]: no ISRs registered.
 -----------------------------------------------

reg ptr: 0x155ceb4, Int mask: 0x130f, instr fifo size: 1024
22:08:44  'nvacq/42x/cntrlFifoBufObj.c' line: 100,
fifoBufCreate():  Creating msgQs of 64 entries

=========>>>>> 12
readEE14 shows -1
readEE40 shows 4
22:08:45  'nvacq/42x/masSpeed.c' line: 656, Timed Out trying to
read the CM speed controller
22:08:46  'nvacq/42x/masSpeed.c' line: 656, Timed Out trying to
read the CM speed controller
22:08:46  'nvacq/42x/masSpeed.c' line: 155, *** MAS Controller
Not Ready, Aborting
0x19344c8 (tShell): vtGetSW:
', value: 0350-A
0x19344c8 (tShell): sibGetId:
'', value: -1
22:08:50  'nvacq/42x/sibFuncs.c' line: 351, sibGetId: failed.
```

```
22:08:50  'nvacq/42x/sibFuncs.c' line: 281, sibCreate: Could not
get Sib ID:
22:08:50  'nvacq/42x/master.c' line: 191, wait4MinCntlrs: 5
cntlrd, cntlr(s): 'master1 rf1 rf2 pfg1 ddr1'
22:08:50  'nvacq/42x/master.c' line: 193, wait4MinCntlrs: 0
missing, cntlr(s): ''
22:08:50  'nvacq/42x/master.c' line: 253, cntlrs: 5,  'master1
rf1 rf2 pfg1 ddr1'
22:08:50  'nvacq/42x/master.c' line: 257, Unset RFs: 0, list: ''
22:08:50  'nvacq/42x/master.c' line: 198, wait4MinCntlrs: 0 Unset
RF(s)
22:08:51  'nvacq/42x/master.c' line: 267, cntlrs: 5,  'master1
rf1 rf2 pfg1 ddr1'
22:08:51  'nvacq/42x/master.c' line: 270, iCAT RFs: 2, list: 'rf1
rf2'
22:08:51  'nvacq/42x/master.c' line: 281, cntlrs: 5,  'master1
rf1 rf2 pfg1 ddr1'
22:08:51  'nvacq/42x/master.c' line: 284, VNMRS RFs: 0, list: ''
22:08:51  'nvacq/42x/master.c' line: 314, consoleID = 3 (0-
VNMRS,1-400-MR,2-SILK_VNMRS,3-SILK_400-MR)
22:08:53  'nvacq/42x/master.c' line: 147, consoleID = 3 (0-
VNMRS,1-400-MR,2-SILK_VNMRS,4-SILK_400-MR)

=========>>>>> 13
22:08:53++++++ BringUp Complete..
22:08:53 - System Version: 1
22:08:53 - Interpreter Version: 1
22:08:53 - Bootup Complete.
value = 61762816 = 0x3ae6d00


Done executing startup script /tftpboot/nvScript
sysVwareParamsGet: ulp: 0x12fbc0, *ulp: 0x1badc0de
(global environment)
0: NDDS_PEER_HOSTS=wormhole
BootLine: 'emac(0,0)wormhole:vxworks h=10.190.50.49
e=10.190.50.171:ffff0000  u=vnmr1 f=0x040 tn=master1'
VxWorks (for IBM PowerPC 405GPr Varian Controller) version 5.5.2.
Kernel: WIND version 2.6.
Made on Jan 21 2008, 12:42:32.
Boot line:
emac(0,0)wormhole:vxworks h=10.190.50.49 e=10.190.50.171:ffff0000
u=vnmr1 f=0x040 tn=master1
->
 CTRL-A Z for help |115200 8N1 | NOR | Minicom 2.1    | VT102 |
Online 00:01
```

Bootup messages for DDR1 with VJ 4.1A on a ProPulse System:

```
GPIO IR: 0x21068000
GEO: Type 5, (0x5), Address: 0, (0x0)


Varian visionWARE v2.1 PPC405GPR Controller Board
Build #32, 01/20/05 16:10:00

MAC : 00-60-93-03-50-01 IP : 10.190.50.171
Type "shell" to set IP and/or MAC addresses
Type "help" to see available commands

Press a key in the next <4> seconds to preempt boot script
Booting from script...

load vxWorks405gpr.bdx !launch 10000

CPC0_CR0: 0x383a
CPC0_CR0: 0x83a
CPC0_CR0: 0x383a
OsParams Address: 0x3e57964
Signature: 'vWARE', Version: 2
pVwareEntry: 0x3e22710, Func Table Addr: 0x3e032c8
sysLanIbmEmacEnetAddrGet: Vware started
Attached TCP/IP interface to emac unit 0
Attaching network interface lo0... done.
sysResolveIpAddr(); MAC: 00:60:93:03:50:01:
sysResolveIpAddr(); RARP request sent, waiting for reply


++++++++++++++++++++++++ rarpInputHook
++++++++++++++++++++++++++++
packet length: 60
EtherHeader Source MAC:  00:24:e8:31:74:95
EtherHeader Destination MAC:  00:60:93:03:50:01
EtherHeader type: 0x8035 (0x8035-rarp, 0x806-arp, 0x800-ip
ARP Type: 4 (ARP_REQUEST=1, ARP_REPLY=2 RARP_REQUEST=3
RARP_REPLY=4)
Src MAC:  00:24:e8:31:74:95
Src IP: 172.16.0.1
Target MAC:  00:60:93:03:50:01
target IP: 172.16.0.50
Target MAC:  00:60:93:03:50:01
Local MAC:  00:60:93:03:50:01
resolved IP: 172.16.0.50

++++++++++++++++++++++  ++++++++++++++++++++++++++++
sysResolveIpAddr(); MAC: 00:60:93:03:50:01:
sysResolveIpAddr(); RARP request sent, waiting for reply
sysResolveIpAddr(); MAC: 00:60:93:03:50:01:
```

```
sysResolveIpAddr(); RARP request sent, waiting for reply
sysResolveIpAddr(); RARP Reply IP: '172.16.0.50'
Target: 'ddr1', IP: '172.16.0.50'
  Host: 'wormhole', IP: '172.16.0.1'
Skip DHCP Request.

Adding 4317 symbols for standalone.
                                CPU: IBM PowerPC 405GPr Varian
Controller.  Processor #0.
                               Memory Size: 0x2000000.  BSP
version 1.2/7.
                              WDB Comm Type: WDB_COMM_END
                             WDB: Ready.

FFS file 'nvScript' opened, 1071 bytes
Executing FFS startup script 'nvScript' ...
#
#
nvld  "/tftpboot/nddslib.o"
FFS file 'nddslib.o' opened, 5844541 bytes
value = 20552480 = 0x1399b20
nvld  "/tftpboot/nvlib.o"
FFS file 'nvlib.o' opened, 776297 bytes
value = 25620688 = 0x186f0d0
nvrdate("wormhole")
value = 0 = 0x0
date
WED NOV 06 22:13:59 2013
value = 25 = 0x19
#
# systemInit(NetworkDisk_BasePath, BringUp_Level, DebugLevel,
ConsoleType, Flags)
#
# NetworkDisk_BasePath - if NULL then the bit and exec files are
loaded from flash
#                       Otherwise used as the directory on the
network drive to load from.
#  e.g. NetworkDisk_BasePath = /tftpboot    /tftpboot/xxxexec.o
are loaded
#
#       systemInit("/tftpboot",0,1,0,0)  load bit and exec.o from
/tftpboot
#
# BringUp_Level - level of software service, etc.  started
#    0 = only dma drivers initialized.
#    1 = DMA, NDDS, initialized
#        Bringup is called.
#    2-9 Reserved for future use.
#
# DebugLevel - Level of Diagnostic Output, 0 = None, 1 - minimum,
#                                          2 - NDDS output,  3-10
more output
```

```
#
# ConsoleType - Type of console , used to load proper varient of
FPGA
#    0 = VNMRS (a.k.a. Nirvana)
#    1 =
#
# Flags - reserved for special purposes
#    0 = default
# 0x20 = special Solids Amp mode
#
systemInit(0,1,-2,1,0)
emac0 previous queue length was 50
Queue length set at: 200
IP input maximum queue length = 50
Arp input maximum queue length = 50
New IP input maximum queue length = 200
New Arp input maximum queue length = 50
GPIO IR: 0x2306be00
GEO: Type 5, (0x5), Address: 0, (0x0)
-------  systemInit  createDomain
hostname : 'ddr1'
IP val: 0xac100032
Local IP: '172.16.0.50'

=========>>>>> 1

=========>>>>> 2

=========>>>>> 3
File: 'magddr_top.bit' not found on FFS.

=========>>>>> 4
22:13:59++++++ Loading  Exec file: 'ddrexec.o'
FFS file 'ddrexec.o' opened, 696031 bytes

=========>>>>> 5

=========>>>>> 6
loadFpgaArray(): addr: 0x15cfea0, size: 510398
Sending configuration data to FPGA
FPGA Configuration Successful.
Reseting FPGA via GPIO line.

=========>>>>> 7
22:14:02  FPGA ID: 5, Rev: 0, Chksum: 61213;  nvacq/42x/ddr.c
Chksum: 61213, Compiled: Oct 23 2013

=========>>>>> 8
22:14:02  FPGA ID: 5, Rev: 0, Chksum: 61213;  nvacq/42x/ddr.c
Chksum: 61213, Compiled: Oct 23 2013

=========>>>>> 11
```

```
22:14:02FPGA interrupt vector 0x19 interrupt 25 isr 0x153ea38
installed
 ------------  Registered fpgaBaseISR ISRs slice 0 ---------
 ------------  FPGA Interrupt Register Addresses  ---------
 Status = 0x70000074
 Enable = 0x70000078
 Clear  = 0x7000007c

 ------------  Registered fpgaBaseISR ISRs ---------
 fpgaBaseISR[0]: no ISRs registered.
 -----------------------------------------

reg ptr: 0x159890c, Int mask: 0x130f, instr fifo size: 1024
22:14:02  'nvacq/42x/cntrlFifoBufObj.c' line: 100,
fifoBufCreate():  Creating msgQs of 128 entries

=========>>>>> 12
File: 'boot.bin' not found
File: 'ddr.bin' not found
22:14:03  'nvacq/42x/DDR_Init.c' line: 642, MULT:11 DIV1:2
CPU:1080786944 MHz
22:14:03  'nvacq/42x/DDR_Init.c' line: 659, MULT:11 DIV3:5
EMIF:1079377920 MHz

=========>>>>> 13
22:14:03++++++ BringUp Complete..
22:14:03 - System Version: 1
22:14:03 - Interpreter Version: 1
22:14:03 - Bootup Complete.
value = -278919424 = 0xef600700 = ExitFlag + 0xedd9f568


Done executing startup script /tftpboot/nvScript
sysVwareParamsGet: ulp: 0x12fbc0, *ulp: 0x1badc0de
(global environment)
0: NDDS_PEER_HOSTS=wormhole
BootLine: 'emac(0,0)wormhole:vxworks h=10.190.50.49
e=10.190.50.171:ffff0000  u=vnmr1 f=0x040 tn=ddr1'
VxWorks (for IBM PowerPC 405GPr Varian Controller) version 5.5.2.
Kernel: WIND version 2.6.
Made on Jan 21 2008, 12:42:32.
Boot line:
emac(0,0)wormhole:vxworks h=10.190.50.49 e=10.190.50.171:ffff0000
u=vnmr1 f=0x040 tn=ddr1
->
 CTRL-A Z for help |115200 8N1 | NOR | Minicom 2.1    | VT102 |
Online 00:00
```

Bootup messages for the RF1 controller with VJ 4.1A on a ProPulse system:

```
GPIO IR: 0x21060000
GEO: Type 1, (0x1), Address: 0, (0x0)


Varian visionWARE v2.1 PPC405GPR Controller Board
Build #32, 01/20/05 16:10:00

MAC : 00-60-93-03-10-01 IP : 10.190.50.171
Type "shell" to set IP and/or MAC addresses
Type "help" to see available commands

Press a key in the next <4> seconds to preempt boot script
Booting from script...

load vxWorks405gpr.bdx !launch 10000

CPC0_CR0: 0x383a
CPC0_CR0: 0x83a
CPC0_CR0: 0x383a
OsParams Address: 0x3e57964
Signature: 'vWARE', Version: 2
pVwareEntry: 0x3e22710, Func Table Addr: 0x3e032c8
sysLanIbmEmacEnetAddrGet: Vware started
Attached TCP/IP interface to emac unit 0
Attaching network interface lo0... done.
sysResolveIpAddr(); MAC: 00:60:93:03:10:01:
sysResolveIpAddr(); RARP request sent, waiting for reply


++++++++++++++++++++++++ rarpInputHook
++++++++++++++++++++++++++
packet length: 60
EtherHeader Source MAC:  00:24:e8:31:74:95
EtherHeader Destination MAC:  00:60:93:03:10:01
EtherHeader type: 0x8035 (0x8035-rarp, 0x806-arp, 0x800-ip
ARP Type: 4 (ARP_REQUEST=1, ARP_REPLY=2 RARP_REQUEST=3
RARP_REPLY=4)
Src MAC:  00:24:e8:31:74:95
Src IP: 172.16.0.1
Target MAC:  00:60:93:03:10:01
target IP: 172.16.0.20
Target MAC:  00:60:93:03:10:01
Local MAC:  00:60:93:03:10:01
resolved IP: 172.16.0.20

++++++++++++++++++++++  ++++++++++++++++++++++++++
sysResolveIpAddr(); MAC: 00:60:93:03:10:01:
sysResolveIpAddr(); RARP request sent, waiting for reply
sysResolveIpAddr(); MAC: 00:60:93:03:10:01:
```

```
sysResolveIpAddr(); RARP request sent, waiting for reply
sysResolveIpAddr(); RARP Reply IP: '172.16.0.20'
Target: 'rf1', IP: '172.16.0.20'
  Host: 'wormhole', IP: '172.16.0.1'
Skip DHCP Request.

Adding 4317 symbols for standalone.
                                CPU: IBM PowerPC 405GPr Varian
Controller.  Processor #0.
                               Memory Size: 0x2000000.  BSP
version 1.2/7.
                              WDB Comm Type: WDB_COMM_END
                             WDB: Ready.

FFS file 'nvScript' opened, 1071 bytes
Executing FFS startup script 'nvScript' ...
#
#
nvld  "/tftpboot/nddslib.o"
FFS file 'nddslib.o' opened, 5844541 bytes
value = 20552480 = 0x1399b20
nvld  "/tftpboot/nvlib.o"
FFS file 'nvlib.o' opened, 776297 bytes
value = 25620688 = 0x186f0d0
nvrdate("wormhole")
value = 0 = 0x0
date
WED NOV 06 22:11:16 2013
value = 25 = 0x19
#
# systemInit(NetworkDisk_BasePath, BringUp_Level, DebugLevel,
ConsoleType, Flags)
#
# NetworkDisk_BasePath - if NULL then the bit and exec files are
loaded from flash
#                       Otherwise used as the directory on the
network drive to load from.
#  e.g. NetworkDisk_BasePath = /tftpboot    /tftpboot/xxxexec.o
are loaded
#
#       systemInit("/tftpboot",0,1,0,0)  load bit and exec.o from
/tftpboot
#
# BringUp_Level - level of software service, etc.  started
#    0 = only dma drivers initialized.
#    1 = DMA, NDDS, initialized
#        Bringup is called.
#    2-9 Reserved for future use.
#
# DebugLevel - Level of Diagnostic Output, 0 = None, 1 - minimum,
#                                          2 - NDDS output,  3-10
more output
```

```
#
# ConsoleType - Type of console , used to load proper varient of
FPGA
#    0 = VNMRS (a.k.a. Nirvana)
#    1 =
#
# Flags - reserved for special purposes
#    0 = default
# 0x20 = special Solids Amp mode
#
systemInit(0,1,-2,1,0)
emac0 previous queue length was 50
Queue length set at: 200
IP input maximum queue length = 50
Arp input maximum queue length = 50
New IP input maximum queue length = 200
New Arp input maximum queue length = 50
GPIO IR: 0x23063e00
GEO: Type 1, (0x1), Address: 0, (0x0)
-------  systemInit  createDomain
hostname : 'rf1'
IP val: 0xac100014
Local IP: '172.16.0.20'

=========>>>>> 1

=========>>>>> 2

=========>>>>> 3
File: 'magrf_top.bit' not found on FFS.

=========>>>>> 4
22:11:16++++++ Loading  Exec file: 'rfexec.o'
FFS file 'rfexec.o' opened, 688297 bytes

=========>>>>> 5

=========>>>>> 6
Sending configuration data to FPGA
FPGA Configuration Successful.
Reseting FPGA via GPIO line.

=========>>>>> 7
22:11:19  FPGA ID: 1, Rev: 4, Chksum: 15217;  nvacq/42x/rf.c
Chksum: 15217, Compiled: Oct 23 2013

=========>>>>> 8
22:11:19  FPGA ID: 1, Rev: 4, Chksum: 15217;  nvacq/42x/rf.c
Chksum: 15217, Compiled: Oct 23 2013

=========>>>>> 11
```

```
22:11:19FPGA interrupt vector 0x19 interrupt 25 isr 0x151d868
installed
 ------------  Registered fpgaBaseISR ISRs slice 0 ---------
 ------------  FPGA Interrupt Register Addresses  ---------
 Status = 0x7000005c
 Enable = 0x70000060
 Clear  = 0x70000064

 ------------  Registered fpgaBaseISR ISRs ---------
 fpgaBaseISR[0]: no ISRs registered.
 -----------------------------------------------

reg ptr: 0x1580290, Int mask: 0x130f, instr fifo size: 8192
22:11:19  'nvacq/42x/cntrlFifoBufObj.c' line: 100,
fifoBufCreate():  Creating msgQs of 128 entries

=========>>>>> 12
22:11:19  FPGA ID: 1, Rev: 4, Chksum: 15217
22:11:19 FPGA is iCAT enabled
22:11:19  FPGA ID: 1, Rev: 4, Chksum: 15217
22:11:19 FPGA is iCAT enabled
22:11:19 ICAT ID: 0xa
22:11:19iCAT Attached
22:11:19 ICAT DNA: 0x154e14f035f7075
22:11:19 Setting for 400-MR Console
22:11:19  'nvacq/42x/icatFuncs.c' line: 552,
removeFailFiles()  found: 0, names: ''
22:11:20  FPGA ID: 1, Rev: 4, Chksum: 15217
22:11:20 FPGA is iCAT enabled
22:11:20 ICAT ID: 0xa
22:11:20iCAT Attached
22:11:20 ICAT DNA: 0x154e14f035f7075
22:11:20 Setting for 400-MR Console
loading CORE EXT words
loading SEARCH & SEARCH-EXT words
loading Johns-Hopkins locals
loading MARKER
loading ficl O-O extensions
loading ficl utility classes
loading ficl string class
loading iCAT Validation routines
Loading default atten/delay settings.
configuring iCAT board
Loading default FIR coefficients
Loading TSA7p5.csv settings.
iCAT capable RF controller revision: 4 checksum: 15217
Compiled:2012/3/27 21:27:12

=========>>>>> 13
22:11:23++++++ BringUp Complete..
22:11:23 - System Version: 1
22:11:23 - Interpreter Version: 1
```

```
22:11:23 - Bootup Complete.
value = 252 = 0xfc


Done executing startup script /tftpboot/nvScript
sysVwareParamsGet: ulp: 0x12fbc0, *ulp: 0x1badc0de
(global environment)
0: NDDS_PEER_HOSTS=wormhole
BootLine: 'emac(0,0)wormhole:vxworks h=10.190.50.49
e=10.190.50.171:ffff0000  u=vnmr1 f=0x040 tn=rf1'
VxWorks (for IBM PowerPC 405GPr Varian Controller) version 5.5.2.
Kernel: WIND version 2.6.
Made on Jan 21 2008, 12:42:32.
Boot line:
emac(0,0)wormhole:vxworks h=10.190.50.49 e=10.190.50.171:ffff0000
u=vnmr1 f=0x040 tn=rf1
-> 22:11:42 960 AMRS synthesizer table entries loaded
22:11:42 AMRS lockout off

 CTRL-A Z for help |115200 8N1 | NOR | Minicom 2.1    | VT102 |
Online 00:01
```

Bootup messages for the lock/PFG controller with VJ 4.1A on a ProPulse system:

```
GPIO IR: 0x21058000
GEO: Type 6, (0x6), Address: 0, (0x0)


Varian visionWARE v2.1 PPC405GPR Controller Board
Build #32, 01/20/05 16:10:00

MAC : 00-60-93-03-60-01 IP : 10.190.50.171
Type "shell" to set IP and/or MAC addresses
Type "help" to see available commands

Press a key in the next <4> seconds to preempt boot script
Booting from script...

load vxWorks405gpr.bdx !launch 10000

CPC0_CR0: 0x383a
CPC0_CR0: 0x83a
CPC0_CR0: 0x383a
OsParams Address: 0x3e57964
Signature: 'vWARE', Version: 2
pVwareEntry: 0x3e22710, Func Table Addr: 0x3e032c8
sysLanIbmEmacEnetAddrGet: Vware started
Attached TCP/IP interface to emac unit 0
Attaching network interface lo0... done.
sysResolveIpAddr(); MAC: 00:60:93:03:60:01:
sysResolveIpAddr(); RARP request sent, waiting for reply


++++++++++++++++++++++++ rarpInputHook
++++++++++++++++++++++++++++
packet length: 60
EtherHeader Source MAC:  00:24:e8:31:74:95
EtherHeader Destination MAC:  00:60:93:03:60:01
EtherHeader type: 0x8035 (0x8035-rarp, 0x806-arp, 0x800-ip
ARP Type: 4 (ARP_REQUEST=1, ARP_REPLY=2 RARP_REQUEST=3
RARP_REPLY=4)
Src MAC:  00:24:e8:31:74:95
Src IP: 172.16.0.1
Target MAC:  00:60:93:03:60:01
target IP: 172.16.0.46
Target MAC:  00:60:93:03:60:01
Local MAC:  00:60:93:03:60:01
resolved IP: 172.16.0.46

++++++++++++++++++++++  ++++++++++++++++++++++++++++
sysResolveIpAddr(); MAC: 00:60:93:03:60:01:
sysResolveIpAddr(); RARP request sent, waiting for reply
sysResolveIpAddr(); MAC: 00:60:93:03:60:01:
```

```
sysResolveIpAddr(); RARP request sent, waiting for reply
sysResolveIpAddr(); RARP Reply IP: '172.16.0.46'
Target: 't6undefined1', IP: '172.16.0.46'
  Host: 'wormhole', IP: '172.16.0.1'
Skip DHCP Request.

Adding 4317 symbols for standalone.
                                CPU: IBM PowerPC 405GPr Varian
Controller.  Processor #0.
                               Memory Size: 0x2000000.  BSP
version 1.2/7.
                              WDB Comm Type: WDB_COMM_END
                             WDB: Ready.

FFS file 'nvScript' opened, 1071 bytes
Executing FFS startup script 'nvScript' ...
#
#
nvld  "/tftpboot/nddslib.o"
FFS file 'nddslib.o' opened, 5844541 bytes
value = 20552472 = 0x1399b18
nvld  "/tftpboot/nvlib.o"
FFS file 'nvlib.o' opened, 776297 bytes
value = 25620680 = 0x186f0c8
nvrdate("wormhole")
value = 0 = 0x0
date
WED NOV 06 22:16:16 2013
value = 25 = 0x19
#
# systemInit(NetworkDisk_BasePath, BringUp_Level, DebugLevel,
ConsoleType, Flags)
#
# NetworkDisk_BasePath - if NULL then the bit and exec files are
loaded from flash
#                       Otherwise used as the directory on the
network drive to load from.
#  e.g. NetworkDisk_BasePath = /tftpboot    /tftpboot/xxxexec.o
are loaded
#
#       systemInit("/tftpboot",0,1,0,0)  load bit and exec.o from
/tftpboot
#
# BringUp_Level - level of software service, etc.  started
#    0 = only dma drivers initialized.
#    1 = DMA, NDDS, initialized
#        Bringup is called.
#    2-9 Reserved for future use.
#
# DebugLevel - Level of Diagnostic Output, 0 = None, 1 - minimum,
#                                          2 - NDDS output,  3-10
more output
```

```
#
# ConsoleType - Type of console , used to load proper varient of
FPGA
#    0 = VNMRS (a.k.a. Nirvana)
#    1 =
#
# Flags - reserved for special purposes
#    0 = default
# 0x20 = special Solids Amp mode
#
systemInit(0,1,-2,1,0)
emac0 previous queue length was 50
Queue length set at: 200
IP input maximum queue length = 50
Arp input maximum queue length = 50
New IP input maximum queue length = 200
New Arp input maximum queue length = 50
GPIO IR: 0x2305be00
GEO: Type 6, (0x6), Address: 0, (0x0)
-------  systemInit  createDomain
hostname : 't6undefined1'
IP val: 0xac10002e
Local IP: '172.16.0.46'

=========>>>>> 1

=========>>>>> 2

=========>>>>> 3
File: 'maglpfg_top.bit' not found on FFS.

=========>>>>> 4
22:16:16++++++ Loading  Exec file: 'lpfgexec.o'
FFS file 'lpfgexec.o' opened, 479539 bytes

=========>>>>> 5

=========>>>>> 6
Sync word (0xAA995566) found: 0xaa995566

 CS4 - access to VirtexII, CS1 & CS2 VirtexII DDR SDRAM
 IRQ4 - VirtexII interrupt line to 405

GPIO usage: 2 - FPGA Configuration enable 0-configure FPGA 1-when
not
            3 - FPGA Conf_Done line
            4 - FPGA Conf_Prog line
            5 - FPGA Conf_CLK line
            6 - FPGA Conf_D0 line
            7 - FPGA Conf_INIT line
```

24 - Quick Switch to allow reading of Type & Board Address, 0-to read, 1-when not
16:14 - Type 0-master,1-rf,2-loc,3-pfg,4-gradient,5-ddr
12:8 - Board Ordinal Number 0-31

Bit Type: CPC0_CR0: 0x383a
1-9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
GP1-9 CS-1 CS-2 CS-3 CS-4 CS-5 CS-6 CS-7 IRQ0 IRQ1 IRQ2 IRQ3 IRQ4 IRQ5 GP23 GP24

Line Direction: I-Input, O-Ouput
Line Direction Reg (0xef600704): 0x180
GPIO: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
I I I I I I I I I I I I I I I I I I I I I O O

Output Register Setting: H-High(1), L-Low(0), i-input i.e. n/a
Output (write) Register(0xef600700): 0x80
GPIO: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
i i i i i i i i i i i i i i i i i i i i i L H

Input Register: H-High(1), L-Low(0), o-output i.e. n/a
Input (read) Register(0xef60071c): 0x233fbe80
GPIO: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
L H L L L H H L L H H H H H H H L H H H H o o
Line Direction: I-Input, O-Ouput
Line Direction Reg (0xef600704): 0x2e000100
GPIO: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
I O I O O O I I I I I I I I I I I I I I I O I

Output Register Setting: H-High(1), L-Low(0), i-input i.e. n/a
Output (write) Register(0xef600700): 0x80
GPIO: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
i L i L L L i i i i i i i i i i i i i i i L i

Input Register: H-High(1), L-Low(0), o-output i.e. n/a
Input (read) Register(0xef60071c): 0x3ffe80
GPIO: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
L o L o o o L L L H H H H H H H H H H H H o H
GPIO OR: 0x80, IR: 0x3ffe80

```
 CPC0_CR0: 0x383a
 GPIO ODR: 0x0, OR: 0x80, TCR: 0x2e000100, IR: 0x3ffe80
Toggle PROG line High to Low to High
waiting for FPGA INIT to go High
cnt: 0,  GPIO OR: 0x8000080, IR: 0x93ffe80
Output Register Setting: H-High(1), L-Low(0), i-input i.e. n/a
Output (write) Register(0xef600700): 0x8000080
GPIO: 1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20
21 22 23 24
      i  L  i  H  L  L  i  i  i  i  i  i  i  i  i  i  i  i  i  i
i  i  L  i

Input Register: H-High(1), L-Low(0), o-output i.e. n/a
Input (read) Register(0xef60071c): 0x93ffe80
GPIO: 1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20
21 22 23 24
      L  o  L  o  o  o  H  L  L  H  H  H  H  H  H  H  H  H  H  H
H  H  o  H


Sending configuration data to FPGA
Sending sync word: 0xaa995566
Sending CRC load CMD: 0x30000001, value: 0x804000 (8404992)
Sending CRC load CMD: 0x30000001, value: 0x64a7 (25767)
GPIO_OR: 0x1f3fbf80, INIT: 1, DONE: 1
GPIO_IR: 0x1f3fbe80, INIT: 1, DONE: 1
FPGA Configuration Successful.
Reseting FPGA via GPIO line.
GPIO_IR: 0x1f3fbe80, INIT: 1, DONE: 1
GPIO_IR: 0x233fbe80, INIT: 1, DONE: 0

=========>>>>> 7
22:16:19  FPGA ID: 13, Rev: 0, Chksum: 32650;  nvacq/42x/lpfg.c
Chksum: 32650, Compiled: Oct 23 2013
22:16:19  FPGA ID: 13, Rev: 0, Chksum: 43156;  nvacq/42x/lpfg.c
Chksum: 43156, Compiled: Oct 23 2013

=========>>>>> 8
22:16:19  FPGA ID: 13, Rev: 0, Chksum: 32650;  nvacq/42x/lpfg.c
Chksum: 32650, Compiled: Oct 23 2013
22:16:19  FPGA ID: 13, Rev: 0, Chksum: 43156;  nvacq/42x/lpfg.c
Chksum: 43156, Compiled: Oct 23 2013

=========>>>>> 11
22:16:19FPGA interrupt vector 0x19 interrupt 25 isr 0x1574124
installed
 ------------  Registered fpgaBaseISR ISRs slice 0 ---------
 ------------  FPGA Interrupt Register Addresses  ---------
 Status = 0x7000005c
 Enable = 0x70000060
 Clear  = 0x70000064
```

```
 ------------  Registered fpgaBaseISR ISRs ---------
 fpgaBaseISR[0]: no ISRs registered.
 -----------------------------------------

reg ptr: 0x15baf28, Int mask: 0x130f, instr fifo size: 1024
22:16:19  'nvacq/42x/cntrlFifoBufObj.c' line: 100,
fifoBufCreate():  Creating msgQs of 128 entries

=========>>>>> 12
22:16:19FPGA slice base ISR already installed
rep tick=40000   rof=400  pw=4000 npairs=3, dwell=12500 spares=0
1891d14e3c4e ..
rep tick=80000000   rof=800000  pw=8000000 npairs=700,
dwell=12500 spares=61662500
22:16:19****** Error: -1, simonet failed to start

=========>>>>> 13
22:16:19++++++ BringUp Complete..
22:16:19 - System Version: 1
22:16:19 - Interpreter Version: 1
22:16:19 - Bootup Complete.
value = -278919424 = 0xef600700 = ExitFlag + 0xedd9f570


Done executing startup script /tftpboot/nvScript
sysVwareParamsGet: ulp: 0x12fbc0, *ulp: 0x1badc0de
(global environment)
0: NDDS_PEER_HOSTS=wormhole
BootLine: 'emac(0,0)wormhole:vxworks h=10.190.50.49
e=10.190.50.171:ffff0000  u=vnmr1 f=0x040 tn=t6undefined1'
VxWorks (for IBM PowerPC 405GPr Varian Controller) version 5.5.2.
Kernel: WIND version 2.6.
Made on Jan 21 2008, 12:42:32.
Boot line:
emac(0,0)wormhole:vxworks h=10.190.50.49 e=10.190.50.171:ffff0000
u=vnmr1 f=0x040 tn=t6undefined1
->
 CTRL-A Z for help |115200 8N1 | NOR | Minicom 2.1    | VT102 |
Online 00:01
```

Bootup messages for the RF1 controller with iCAT attached using VJ 3.1A on a DD2 and 400MR DD2 system:

```
Welcome to minicom 2.1

OPTIONS: History Buffer, F-key Macros, Search History Buffer, I18n
Compiled on Jul 26 2006, 06:38:12.

Press CTRL-A Z for help on special keys

0x1e937e8 (tExcTask): ibmEmacStop
Say Bye-Bye........
GPIO IR: 0x21c60000
GEO: Type 1, (0x1), Address: 3, (0x3)


Varian visionWARE v2.1 PPC405GPR Controller Board
Build #32, 01/20/05 16:10:00

MAC : 00-60-93-03-10-04 IP : 172.16.0.20
Type "shell" to set IP and/or MAC addresses
Type "help" to see available commands

Press a key in the next <4> seconds to preempt boot script
Booting from script...

load vxWorks405gpr.bdx !launch 10000

CPC0_CR0: 0x383a
CPC0_CR0: 0x83a
CPC0_CR0: 0x383a
OsParams Address: 0x3e57964
Signature: 'vWARE', Version: 2
pVwareEntry: 0x3e22710, Func Table Addr: 0x3e032c8
sysLanIbmEmacEnetAddrGet: Vware started
Attached TCP/IP interface to emac unit 0
Attaching network interface lo0... done.
sysResolveIpAddr(); MAC: 00:60:93:03:10:04:
sysResolveIpAddr(); RARP request sent, waiting for reply


++++++++++++++++++++++++ rarpInputHook ++++++++++++++++++++++++++++
packet length: 60
EtherHeader Source MAC:  b8:ac:6f:97:9a:5a
EtherHeader Destination MAC:  00:60:93:03:10:04
EtherHeader type: 0x8035 (0x8035-rarp, 0x806-arp, 0x800-ip
ARP Type: 4 (ARP_REQUEST=1, ARP_REPLY=2 RARP_REQUEST=3 RARP_REPLY=4)
Src MAC:  b8:ac:6f:97:9a:5a
Src IP: 172.16.0.1
Target MAC:  00:60:93:03:10:04
target IP: 172.16.0.23
Target MAC:  00:60:93:03:10:04
Local MAC:  00:60:93:03:10:04
resolved IP: 172.16.0.23

++++++++++++++++++++++++  ++++++++++++++++++++++++++++
```

```
sysResolveIpAddr(); MAC: 00:60:93:03:10:04:
sysResolveIpAddr(); RARP request sent, waiting for reply
sysResolveIpAddr(); MAC: 00:60:93:03:10:04:
sysResolveIpAddr(); RARP request sent, waiting for reply
sysResolveIpAddr(); RARP Reply IP: '172.16.0.23'
Target: 'rf4', IP: '172.16.0.23'
  Host: 'wormhole', IP: '172.16.0.1'
Skip DHCP Request.

Adding 4317 symbols for standalone.
                                CPU: IBM PowerPC 405GPr Varian
Controller.  Processor #0.
                               Memory Size: 0x2000000.  BSP version
1.2/7.
                              WDB Comm Type: WDB_COMM_END
                             WDB: Ready.

FFS file 'nvScript' opened, 1025 bytes
Executing FFS startup script 'nvScript' ...
#
nvld  "/tftpboot/nddslib.o"
FFS file 'nddslib.o' opened, 5844541 bytes
value = 20552520 = 0x1399b48
nvld  "/tftpboot/nvlib.o"
FFS file 'nvlib.o' opened, 768617 bytes
value = 25628408 = 0x1870ef8
nvrdate("wormhole")
value = 0 = 0x0
date
WED JAN 19 23:32:20 2011
value = 25 = 0x19
#
# systemInit(NetworkDisk_BasePath, BringUp_Level, DebugLevel,
ConsoleType, Flags)
#
# NetworkDisk_BasePath - if NULL then the bit and exec files are loaded
from flash
#                      Otherwise used as the directory on the network
drive to load from.
#  e.g. NetworkDisk_BasePath = /tftpboot    /tftpboot/xxxexec.o are
loaded
#
#       systemInit("/tftpboot",0,1,0,0)  load bit and exec.o from
/tftpboot
#
# BringUp_Level - level of software service, etc.  started
#    0 = only dma drivers initialized.
#    1 = DMA, NDDS, initialized
#        Bringup is called.
#    2-9 Reserved for future use.
#
# DebugLevel - Level of Diagnostic Output, 0 = None, 1 - minimum,
#                                          2 - NDDS output,  3-10 more
output
#
# ConsoleType - Type of console , used to load proper varient of FPGA
#    0 = VNMRS (a.k.a. Nirvana)
```

```
#
# Flags - reserved for special purposes
#    0 = default
#
systemInit(0,1,-2,0,0)
emac0 previous queue length was 50
Queue length set at: 200
IP input maximum queue length = 50
Arp input maximum queue length = 50
New IP input maximum queue length = 200
New Arp input maximum queue length = 50
GPIO IR: 0x23c63e00
GEO: Type 1, (0x1), Address: 3, (0x3)
-------  systemInit  createDomain
hostname : 'rf4'
IP val: 0xac100017
Local IP: '172.16.0.23'
File: 'rf_top.bit' not found on FFS.
23:32:20++++++ Loading  Exec file: 'rfexec.o'
FFS file 'rfexec.o' opened, 630639 bytes
Sending configuration data to FPGA
FPGA Configuration Successful.
Reseting FPGA via GPIO line.
23:32:22  FPGA ID: 1, Rev: 4, Chksum: 48047;  rf.c Chksum: 48047,
Compiled: Nov 24 2010
23:32:22  FPGA ID: 1, Rev: 4, Chksum: 48047;  rf.c Chksum: 48047,
Compiled: Nov 24 2010
reg ptr: 0x1599820, Int mask: 0x130f, instr fifo size: 8192
23:32:22  'cntrlFifoBufObj.c' line: 98, fifoBufCreate():  Creating
msgQs of 128 entries
mask: 0xf0
23:32:22  FPGA ID: 1, Rev: 4, Chksum: 48047
23:32:22  'icatFuncs.c' line: 64
23:32:22  'icatFuncs.c' line: 92, ICAT ID: 0xa, FPGA is iCAT enabled
23:32:22  FPGA ID: 1, Rev: 4, Chksum: 48047
23:32:22  'icatFuncs.c' line: 64, FPGA is iCAT enabled

23:32:22  'icatFuncs.c' line: 102, iCAT Attached
23:32:22  'icatFuncs.c' line: 109, ICAT DNA: 0x1586dde408323a0
23:32:22  'icatFuncs.c' line: 113, Setting for VNMRS Console
23:32:22  'icatFuncs.c' line: 570,
removeFailFiles()  found: 0, names: ''
23:32:22  'icatFuncs.c' line: 497,
transferIcatFiles()  found: 2, names: 'icat_top.bit,icat_top01.bit,'
23:32:22  'icatFuncs.c' line: 284, transferFile2Icat: File:
'icat_top.bit', Bytes: 341657
23:32:22  'icatFuncs.c' line: 382, transferFile2Icat: File already
Present on Icat ISFlash

23:32:22  'icatFuncs.c' line: 284, transferFile2Icat: File:
'icat_top01.bit', Bytes: 341657
23:32:22  'icatFuncs.c' line: 382, transferFile2Icat: File already
Present on Icat ISFlash

23:32:22  'icatFuncs.c' line: 684, Rebooting iCAT
23:32:23  'icatFuncs.c' line: 699, Reboot Successful
23:32:23  FPGA ID: 1, Rev: 4, Chksum: 48047
```

```
23:32:23  'icatFuncs.c' line: 64, FPGA is iCAT enabled
23:32:23  'icatFuncs.c' line: 92, ICAT ID: 0xa
23:32:23  'icatFuncs.c' line: 102, iCAT Attached
23:32:23  'icatFuncs.c' line: 109, ICAT DNA: 0x1586dde408323a0
23:32:23  'icatFuncs.c' line: 113, Setting for VNMRS Console
loading CORE EXT words
loading SEARCH & SEARCH-EXT words
loading Johns-Hopkins locals
loading MARKER
loading ficl O-O extensions
loading ficl utility classes
loading ficl string class
loading iCAT Validation routines
Loading default atten/delay settings.
configuring iCAT board
Loading default FIR coefficients
Loading TSA5p5.csv settings.
iCAT capable RF controller revision: 4 checksum: 48047
Compiled:2010/11/7 21:8:0
23:32:26++++++ BringUp Complete..
23:32:26 - System Version: 1
23:32:26 - Interpreter Version: 1
23:32:26 - Bootup Complete.
value = 0 = 0x0


Done executing startup script /tftpboot/nvScript
sysVwareParamsGet: ulp: 0x12fbc0, *ulp: 0x1badc0de
(global environment)
0: NDDS_PEER_HOSTS=wormhole
BootLine: 'emac(0,0)wormhole:vxworks h=172.16.0.1
e=172.16.0.20:ffff0000  u=vnmr1 f=0x040 tn=rf4'
VxWorks (for IBM PowerPC 405GPr Varian Controller) version 5.5.2.
Kernel: WIND version 2.6.
Made on Jan 21 2008, 12:42:32.
Boot line:
emac(0,0)wormhole:vxworks h=172.16.0.1 e=172.16.0.20:ffff0000  u=vnmr1
f=0x040 tn=rf4
->
 CTRL-A Z for help |115200 8N1 | NOR | Minicom 2.1    | VT102 | Online
00:00
```

Bootup messages for the RF1 controller WITHOUT an iCAT using VJ 3.1A on a DD2 and 400MR DD2 system:

```
Welcome to minicom 2.1

OPTIONS: History Buffer, F-key Macros, Search History Buffer, I18n
Compiled on Jul 26 2006, 06:38:12.

Press CTRL-A Z for help on special keys

GPIO IR: 0x21060000
GEO: Type 1, (0x1), Address: 0, (0x0)


Varian visionWARE v2.1 PPC405GPR Controller Board
Build #32, 01/20/05 16:10:00

MAC : 00-60-93-03-10-01 IP : 172.16.0.20
Type "shell" to set IP and/or MAC addresses
Type "help" to see available commands

Press a key in the next <4> seconds to preempt boot script
Booting from script...

load vxWorks405gpr.bdx !launch 10000

CPC0_CR0: 0x383a
CPC0_CR0: 0x83a
CPC0_CR0: 0x383a
OsParams Address: 0x3e57964
Signature: 'vWARE', Version: 2
pVwareEntry: 0x3e22710, Func Table Addr: 0x3e032c8
sysLanIbmEmacEnetAddrGet: Vware started
Attached TCP/IP interface to emac unit 0
Attaching network interface lo0... done.
sysResolveIpAddr(); MAC: 00:60:93:03:10:01:
sysResolveIpAddr(); RARP request sent, waiting for reply


++++++++++++++++++++++++ rarpInputHook ++++++++++++++++++++++++++++
packet length: 60
EtherHeader Source MAC:  00:24:e8:35:0c:39
EtherHeader Destination MAC:  00:60:93:03:10:01
EtherHeader type: 0x8035 (0x8035-rarp, 0x806-arp, 0x800-ip
ARP Type: 4 (ARP_REQUEST=1, ARP_REPLY=2 RARP_REQUEST=3 RARP_REPLY=4)
Src MAC:  00:24:e8:35:0c:39
Src IP: 172.16.0.1
Target MAC:  00:60:93:03:10:01
target IP: 172.16.0.20
Target MAC:  00:60:93:03:10:01
Local MAC:  00:60:93:03:10:01
resolved IP: 172.16.0.20

++++++++++++++++++++++++  ++++++++++++++++++++++++++++
sysResolveIpAddr(); MAC: 00:60:93:03:10:01:
sysResolveIpAddr(); RARP request sent, waiting for reply
```

```
sysResolveIpAddr(); MAC: 00:60:93:03:10:01:
sysResolveIpAddr(); RARP request sent, waiting for reply
Target: 'rf1', IP: '172.16.0.20'
  Host: 'wormhole', IP: '172.16.0.1'
Skip DHCP Request.

Adding 4317 symbols for standalone.
                                CPU: IBM PowerPC 405GPr Varian
Controller.  Proc.
                               Memory Size: 0x2000000.  BSP version
1.2/7.
                             WDB Comm Type: WDB_COMM_END
                            WDB: Ready.

FFS file 'nvScript' opened, 1025 bytes
Executing FFS startup script 'nvScript' ...
#
nvld  "/tftpboot/nddslib.o"
FFS file 'nddslib.o' opened, 5844541 bytes
value = 20552552 = 0x1399b68
nvld  "/tftpboot/nvlib.o"
FFS file 'nvlib.o' opened, 768721 bytes
value = 25628336 = 0x1870eb0
nvrdate("wormhole")
value = 0 = 0x0
date
THU JAN 27 01:52:36 2011
value = 25 = 0x19
#
# systemInit(NetworkDisk_BasePath, BringUp_Level, DebugLevel,
ConsoleType, Flag)
#
# NetworkDisk_BasePath - if NULL then the bit and exec files are loaded
from flh
#                      Otherwise used as the directory on the network
drive to .
#  e.g. NetworkDisk_BasePath = /tftpboot    /tftpboot/xxxexec.o are
loaded
#
#       systemInit("/tftpboot",0,1,0,0)  load bit and exec.o from
/tftpboot
#
# BringUp_Level - level of software service, etc.  started
#    0 = only dma drivers initialized.
#    1 = DMA, NDDS, initialized
#        Bringup is called.
#    2-9 Reserved for future use.
#
# DebugLevel - Level of Diagnostic Output, 0 = None, 1 - minimum,
#                                          2 - NDDS output,  3-10 more
output
#
# ConsoleType - Type of console , used to load proper varient of FPGA
#    0 = VNMRS (a.k.a. Nirvana)
#
# Flags - reserved for special purposes
#    0 = default
```

```
#
systemInit(0,1,-2,0,0)
emac0 previous queue length was 50
Queue length set at: 200
IP input maximum queue length = 50
Arp input maximum queue length = 50
New IP input maximum queue length = 200
New Arp input maximum queue length = 50
GPIO IR: 0x23063e00
GEO: Type 1, (0x1), Address: 0, (0x0)
-------  systemInit  createDomain
hostname : 'rf1'
IP val: 0xac100014
Local IP: '172.16.0.20'
File: 'rf_top.bit' not found on FFS.
01:52:36++++++ Loading  Exec file: 'rfexec.o'
FFS file 'rfexec.o' opened, 631127 bytes
Sending configuration data to FPGA
FPGA Configuration Successful.
Reseting FPGA via GPIO line.
01:52:38  FPGA ID: 1, Rev: 4, Chksum: 48047;  rf.c Chksum: 48047,
Compiled: Jan1
01:52:38  FPGA ID: 1, Rev: 4, Chksum: 48047;  rf.c Chksum: 48047,
Compiled: Jan1
reg ptr: 0x1599638, Int mask: 0x130f, instr fifo size: 8192
01:52:38  'cntrlFifoBufObj.c' line: 98, fifoBufCreate():  Creating
msgQs of 128s
mask: 0xf0
01:52:38  FPGA ID: 1, Rev: 4, Chksum: 48047
01:52:38  'icatFuncs.c' line: 64, FPGA is iCAT enabled
01:52:38  FPGA ID: 1, Rev: 4, Chksum: 48047
01:52:38  'icatFuncs.c' line: 64, FPGA is iCAT enabled
01:52:38  'icatFuncs.c' line: 92, ICAT ID: 0x0
01:52:38  'icatFuncs.c' line: 95, iCAT NOT Attached
01:52:38  'icatFuncs.c' line: 113, Setting for VNMRS Console
01:52:38++++++ BringUp Complete..
01:52:38 - System Version: 1
01:52:38 - Interpreter Version: 1
value = 01:52:38 - Bootup Complete.
0 = 0x0


Done executing startup script /tftpboot/nvScript
sysVwareParamsGet: ulp: 0x12fbc0, *ulp: 0x1badc0de
(global environment)
0: NDDS_PEER_HOSTS=wormhole
BootLine: 'emac(0,0)wormhole:vxworks h=172.16.0.1
e=172.16.0.20:ffff0000  u=vnm'
VxWorks (for IBM PowerPC 405GPr Varian Controller) version 5.5.2.
Kernel: WIND version 2.6.
Made on Jan 21 2008, 12:42:32.
Boot line:
emac(0,0)wormhole:vxworks h=172.16.0.1 e=172.16.0.20:ffff0000  u=vnmr1
f=0x040 1
->
```

Bootup messages for the master1 controller using VJ 3.1A on a DD2 and 400MR DD2 system:

```
Welcome to minicom 2.1

OPTIONS: History Buffer, F-key Macros, Search History Buffer, I18n
Compiled on Jul 26 2006, 06:38:12.

Press CTRL-A Z for help on special keys

GPIO IR: 0x21040000
GEO: Type 0, (0x0), Address: 0, (0x0)


Varian visionWARE v2.1 PPC405GPR Controller Board
Build #32, 01/20/05 16:10:00

MAC : 00-60-93-03-00-01 IP : 172.16.0.10
Type "shell" to set IP and/or MAC addresses
Type "help" to see available commands

Press a key in the next <4> seconds to preempt boot script
Booting from script...

load vxWorks405gpr.bdx !launch 10000

CPC0_CR0: 0x383a
CPC0_CR0: 0x83a
CPC0_CR0: 0x383a
OsParams Address: 0x3e57964
Signature: 'vWARE', Version: 2
pVwareEntry: 0x3e22710, Func Table Addr: 0x3e032c8
sysLanIbmEmacEnetAddrGet: Vware started
Attached TCP/IP interface to emac unit 0
Attaching network interface lo0... done.
sysResolveIpAddr(); MAC: 00:60:93:03:00:01:
sysResolveIpAddr(); RARP request sent, waiting for reply


++++++++++++++++++++++++ rarpInputHook ++++++++++++++++++++++++++++
packet length: 60
EtherHeader Source MAC:  00:60:93:03:20:01
EtherHeader Destination MAC:  ff:ff:ff:ff:ff:ff
EtherHeader type: 0x8035 (0x8035-rarp, 0x806-arp, 0x800-ip
ARP Type: 3 (ARP_REQUEST=1, ARP_REPLY=2 RARP_REQUEST=3 RARP_REPLY=4)
Src MAC:  00:60:93:03:20:01
Src IP: 255.255.255.255
Target MAC:  00:60:93:03:20:01
target IP: 255.255.255.255
Not RARP_REPLY

++++++++++++++++++++++++  ++++++++++++++++++++++++++++


++++++++++++++++++++++++ rarpInputHook ++++++++++++++++++++++++++++
packet length: 60
```

```
EtherHeader Source MAC:  00:60:93:03:20:01
EtherHeader Destination MAC:  ff:ff:ff:ff:ff:ff
EtherHeader type: 0x806 (0x8035-rarp, 0x806-arp, 0x800-ip
Not REVARP.

++++++++++++++++++++++++  ++++++++++++++++++++++++++++

++++++++++++++++++++++++ rarpInputHook ++++++++++++++++++++++++++++
packet length: 60
EtherHeader Source MAC:  00:60:93:03:10:03
EtherHeader Destination MAC:  ff:ff:ff:ff:ff:ff
EtherHeader type: 0x8035 (0x8035-rarp, 0x806-arp, 0x800-ip
ARP Type: 3 (ARP_REQUEST=1, ARP_REPLY=2 RARP_REQUEST=3 RARP_REPLY=4)
Src MAC:  00:60:93:03:10:03
Src IP: 255.255.255.255
Target MAC:  00:60:93:03:10:03
target IP: 255.255.255.255
Not RARP_REPLY

++++++++++++++++++++++++  ++++++++++++++++++++++++++++

++++++++++++++++++++++++ rarpInputHook ++++++++++++++++++++++++++++
packet length: 60
EtherHeader Source MAC:  00:60:93:03:40:01
EtherHeader Destination MAC:  ff:ff:ff:ff:ff:ff
EtherHeader type: 0x8035 (0x8035-rarp, 0x806-arp, 0x800-ip
ARP Type: 3 (ARP_REQUEST=1, ARP_REPLY=2 RARP_REQUEST=3 RARP_REPLY=4)
Src MAC:  00:60:93:03:40:01
Src IP: 255.255.255.255
Target MAC:  00:60:93:03:40:01
target IP: 255.255.255.255
Not RARP_REPLY

++++++++++++++++++++++++  ++++++++++++++++++++++++++++

++++++++++++++++++++++++ rarpInputHook ++++++++++++++++++++++++++++
packet length: 60
EtherHeader Source MAC:  00:10:18:53:a0:50
EtherHeader Destination MAC:  00:60:93:03:00:01
EtherHeader type: 0x8035 (0x8035-rarp, 0x806-arp, 0x800-ip
ARP Type: 4 (ARP_REQUEST=1, ARP_REPLY=2 RARP_REQUEST=3 RARP_REPLY=4)
Src MAC:  00:10:18:53:a0:50
Src IP: 172.16.0.1
Target MAC:  00:60:93:03:00:01
target IP: 172.16.0.10
Target MAC:  00:60:93:03:00:01
Local MAC:  00:60:93:03:00:01
resolved IP: 172.16.0.10

++++++++++++++++++++++++  ++++++++++++++++++++++++++++
sysResolveIpAddr(); MAC: 00:60:93:03:00:01:
sysResolveIpAddr(); RARP request sent, waiting for reply
sysResolveIpAddr(); MAC: 00:60:93:03:00:01:
sysResolveIpAddr(); RARP request sent, waiting for reply
```

```
Target: 'master1', IP: '172.16.0.10'
  Host: 'wormhole', IP: '172.16.0.1'
Skip DHCP Request.

Adding 4317 symbols for standalone.
                                CPU: IBM PowerPC 405GPr Varian
Controller.  Proc.
                              Memory Size: 0x2000000.  BSP version
1.2/7.
                             WDB Comm Type: WDB_COMM_END
                            WDB: Ready.

FFS file 'nvScript' opened, 1025 bytes
Executing FFS startup script 'nvScript' ...
#
nvld  "/tftpboot/nddslib.o"
FFS file 'nddslib.o' opened, 5844541 bytes
value = 20552552 = 0x1399b68
nvld  "/tftpboot/nvlib.o"
FFS file 'nvlib.o' opened, 768721 bytes
value = 25628336 = 0x1870eb0
nvrdate("wormhole")
value = 0 = 0x0
date
TUE SEP 27 20:21:01 2011
value = 25 = 0x19
#
# systemInit(NetworkDisk_BasePath, BringUp_Level, DebugLevel,
ConsoleType, Flag)
#
# NetworkDisk_BasePath - if NULL then the bit and exec files are loaded
from flh
#                      Otherwise used as the directory on the network
drive to .
#  e.g. NetworkDisk_BasePath = /tftpboot    /tftpboot/xxxexec.o are
loaded
#
#       systemInit("/tftpboot",0,1,0,0)  load bit and exec.o from
/tftpboot
#
# BringUp_Level - level of software service, etc.  started
#    0 = only dma drivers initialized.
#    1 = DMA, NDDS, initialized
#        Bringup is called.
#    2-9 Reserved for future use.
#
# DebugLevel - Level of Diagnostic Output, 0 = None, 1 - minimum,
#                                          2 - NDDS output,  3-10 more
output
#
# ConsoleType - Type of console , used to load proper varient of FPGA
#    0 = VNMRS (a.k.a. Nirvana)
#
# Flags - reserved for special purposes
#    0 = default
#
systemInit(0,1,-2,0,0)
```

```
emac0 previous queue length was 50
Queue length set at: 200
IP input maximum queue length = 50
Arp input maximum queue length = 50
New IP input maximum queue length = 200
New Arp input maximum queue length = 50
GPIO IR: 0x23043e00
GEO: Type 0, (0x0), Address: 0, (0x0)
-------  systemInit  createDomain
hostname : 'master1'
IP val: 0xac10000a
Local IP: '172.16.0.10'
File: 'master_top.bit' not found on FFS.
20:21:01++++++ Loading  Exec file: 'masterexec.o'
FFS file 'masterexec.o' opened, 998950 bytes
Sending configuration data to FPGA
FPGA Configuration Successful.
Reseting FPGA via GPIO line.
20:21:03  FPGA ID: 0, Rev: 0, Chksum: 16361;  master.c Chksum: 16361,
Compiled:1
20:21:03  FPGA ID: 0, Rev: 0, Chksum: 16361;  master.c Chksum: 16361,
Compiled:1
reg ptr: 0x1572e4c, Int mask: 0x130f, instr fifo size: 1024
20:21:03  'cntrlFifoBufObj.c' line: 98, fifoBufCreate():  Creating
msgQs of 64 s
mask: 0xf0
readEE14 shows -1
readEE40 shows 4
20:21:04  'masSpeed.c' line: 654, Timed Out trying to read the CM speed
controlr
20:21:05  'masSpeed.c' line: 654, Timed Out trying to read the CM speed
controlr
20:21:05  'masSpeed.c' line: 154, *** MAS Controller Not Ready,
Aborting
0x1934510 (tShell): vtGetSW:
', value: 0901 J
0x1934510 (tShell): sibGetId:
'', value: -1
20:21:09  'sibFuncs.c' line: 344, sibGetId: failed.
20:21:09  'sibFuncs.c' line: 274, sibCreate: Could not get Sib ID:
20:21:09  'master.c' line: 189, wait4MinCntlrs: 7 cntlrd, cntlr(s):
'master1 rf'
20:21:09  'master.c' line: 191, wait4MinCntlrs: 0 missing, cntlr(s): ''
20:21:09  'master.c' line: 251, cntlrs: 7,  'master1 rf1 rf2 rf3 pfg1
lock1 ddr'
20:21:09  'master.c' line: 255, Unset RFs: 0, list: ''
20:21:09  'master.c' line: 196, wait4MinCntlrs: 0 Unset RF(s)
20:21:10  'master.c' line: 265, cntlrs: 7,  'master1 rf1 rf2 rf3 pfg1
lock1 ddr'
20:21:10  'master.c' line: 268, iCAT RFs: 3, list: 'rf1 rf2 rf3'
20:21:10  'master.c' line: 279, cntlrs: 7,  'master1 rf1 rf2 rf3 pfg1
lock1 ddr'
20:21:10  'master.c' line: 282, VNMRS RFs: 0, list: ''
20:21:10  'master.c' line: 312, consoleID = 2 (0-VNMRS,1-400-MR,2-
SILK_VNMRS,3-)
20:21:12  'master.c' line: 145, consoleID = 2 (0-VNMRS,1-400-MR,2-
SILK_VNMRS,4-)
```

```
20:21:12++++++ BringUp Complete..
20:21:12 - System Version: 1
20:21:12 - Interpreter Version: 1
20:21:12 - Bootup Complete.
value = 0 = 0x0


Done executing startup script /tftpboot/nvScript
sysVwareParamsGet: ulp: 0x12fbc0, *ulp: 0x1badc0de
(global environment)
0: NDDS_PEER_HOSTS=wormhole
BootLine: 'emac(0,0)wormhole:vxworks h=172.16.0.1
e=172.16.0.10:ffff0000  u=vnm'
VxWorks (for IBM PowerPC 405GPr Varian Controller) version 5.5.2.
Kernel: WIND version 2.6.
Made on Jan 21 2008, 12:42:32.
Boot line:
emac(0,0)wormhole:vxworks h=172.16.0.1 e=172.16.0.10:ffff0000  u=vnmr1
f=0x040 1
->
```

Bootup messages for the DDR1 controller using VJ 3.1A on a DD2 and 400MR DD2 system:

```
-> GPIO IR: 0x21068000
GEO: Type 5, (0x5), Address: 0, (0x0)


Varian visionWARE v2.1 PPC405GPR Controller Board
Build #32, 01/20/05 16:10:00

MAC : 00-60-93-03-50-01 IP : 172.16.0.50
Type "shell" to set IP and/or MAC addresses
Type "help" to see available commands

Press a key in the next <4> seconds to preempt boot script
Booting from script...

load vxWorks405gpr.bdx !launch 10000

CPC0_CR0: 0x383a
CPC0_CR0: 0x83a
CPC0_CR0: 0x383a
OsParams Address: 0x3e57964
Signature: 'vWARE', Version: 2
pVwareEntry: 0x3e22710, Func Table Addr: 0x3e032c8
sysLanIbmEmacEnetAddrGet: Vware started
Attached TCP/IP interface to emac unit 0
Attaching network interface lo0... done.
sysResolveIpAddr(); MAC: 00:60:93:03:50:01:
sysResolveIpAddr(); RARP request sent, waiting for reply


++++++++++++++++++++++++ rarpInputHook ++++++++++++++++++++++++++++
packet length: 60
EtherHeader Source MAC:  00:10:18:53:a0:50
EtherHeader Destination MAC:  00:60:93:03:50:01
EtherHeader type: 0x8035 (0x8035-rarp, 0x806-arp, 0x800-ip
ARP Type: 4 (ARP_REQUEST=1, ARP_REPLY=2 RARP_REQUEST=3 RARP_REPLY=4)
Src MAC:  00:10:18:53:a0:50
Src IP: 172.16.0.1
Target MAC:  00:60:93:03:50:01
target IP: 172.16.0.50
Target MAC:  00:60:93:03:50:01
Local MAC:  00:60:93:03:50:01
resolved IP: 172.16.0.50

++++++++++++++++++++++++  ++++++++++++++++++++++++++++
sysResolveIpAddr(); MAC: 00:60:93:03:50:01:
sysResolveIpAddr(); RARP request sent, waiting for reply
sysResolveIpAddr(); MAC: 00:60:93:03:50:01:
sysResolveIpAddr(); RARP request sent, waiting for reply
Target: 'ddr1', IP: '172.16.0.50'
  Host: 'wormhole', IP: '172.16.0.1'
Skip DHCP Request.
```

```
Adding 4317 symbols for standalone.
                                CPU: IBM PowerPC 405GPr Varian
Controller.  Processor #0.
                               Memory Size: 0x2000000.  BSP version
1.2/7.
                              WDB Comm Type: WDB_COMM_END
                             WDB: Ready.

FFS file 'nvScript' opened, 1025 bytes
Executing FFS startup script 'nvScript' ...
#
nvld  "/tftpboot/nddslib.o"
FFS file 'nddslib.o' opened, 5844541 bytes
value = 20552552 = 0x1399b68
nvld  "/tftpboot/nvlib.o"
FFS file 'nvlib.o' opened, 768721 bytes
value = 25628336 = 0x1870eb0
nvrdate("wormhole")
value = 0 = 0x0
date
TUE SEP 27 19:21:17 2011
value = 25 = 0x19
#
# systemInit(NetworkDisk_BasePath, BringUp_Level, DebugLevel,
ConsoleType, Flags)
#
# NetworkDisk_BasePath - if NULL then the bit and exec files are loaded
from flash
#                      Otherwise used as the directory on the network
drive to load from.
#  e.g. NetworkDisk_BasePath = /tftpboot    /tftpboot/xxxexec.o are
loaded
#
#       systemInit("/tftpboot",0,1,0,0)  load bit and exec.o from
/tftpboot
#
# BringUp_Level - level of software service, etc.  started
#    0 = only dma drivers initialized.
#    1 = DMA, NDDS, initialized
#        Bringup is called.
#    2-9 Reserved for future use.
#
# DebugLevel - Level of Diagnostic Output, 0 = None, 1 - minimum,
#                                          2 - NDDS output,  3-10 more
output
#
# ConsoleType - Type of console , used to load proper varient of FPGA
#    0 = VNMRS (a.k.a. Nirvana)
#
# Flags - reserved for special purposes
#    0 = default
#
systemInit(0,1,-2,0,0)
emac0 previous queue length was 50
Queue length set at: 200
IP input maximum queue length = 50
```

```
Arp input maximum queue length = 50
New IP input maximum queue length = 200
New Arp input maximum queue length = 50
GPIO IR: 0x2306be00
GEO: Type 5, (0x5), Address: 0, (0x0)
-------  systemInit  createDomain
hostname : 'ddr1'
IP val: 0xac100032
Local IP: '172.16.0.50'
File: 'ddr_top.bit' not found on FFS.
19:21:17++++++ Loading  Exec file: 'ddrexec.o'
FFS file 'ddrexec.o' opened, 679702 bytes
loadFpgaArray(): addr: 0x15db820, size: 510398
Sending configuration data to FPGA
FPGA Configuration Successful.
Reseting FPGA via GPIO line.
19:21:19  FPGA ID: 5, Rev: 0, Chksum: 61213;  ddr.c Chksum: 61213,
Compiled: Mar 22 2011
19:21:19  FPGA ID: 5, Rev: 0, Chksum: 61213;  ddr.c Chksum: 61213,
Compiled: Mar 22 2011
reg ptr: 0x15a86e4, Int mask: 0x130f, instr fifo size: 1024
19:21:19  'cntrlFifoBufObj.c' line: 98, fifoBufCreate():  Creating
msgQs of 128 entries
mask: 0xf0
File: 'boot.bin' not found
File: 'ddr.bin' not found
19:21:20  'DDR_Init.c' line: 642, MULT:11 DIV1:2 CPU:1080786944 MHz
19:21:20  'DDR_Init.c' line: 659, MULT:11 DIV3:5 EMIF:1079377920 MHz
19:21:20++++++ BringUp Complete..
19:21:20 - System Version: 1
19:21:20 - Interpreter Version: 1
19:21:20 - Bootup Complete.
value = 0 = 0x0


Done executing startup script /tftpboot/nvScript
sysVwareParamsGet: ulp: 0x12fbc0, *ulp: 0x1badc0de
(global environment)
0: NDDS_PEER_HOSTS=wormhole
BootLine: 'emac(0,0)wormhole:vxworks h=172.16.0.1
e=172.16.0.50:ffff0000  u=vnmr1 f=0x040 tn=ddr1'
VxWorks (for IBM PowerPC 405GPr Varian Controller) version 5.5.2.
Kernel: WIND version 2.6.
Made on Jan 21 2008, 12:42:32.
Boot line:
emac(0,0)wormhole:vxworks h=172.16.0.1 e=172.16.0.50:ffff0000  u=vnmr1
f=0x040 tn=ddr1
->
 CTRL-A Z for help |115200 8N1 | NOR | Minicom 2.1    | VT102 | Online
00:00
```

Revision Summary

Document Number:		TS-AJR003-RevA0408	
Document Title:		**Controller Initialization**	
#	**Date of Change**	**Owner of Change**	**Changes Made**
1	4/15/08	AJR	Added doc number
2	1/29/09	AJR	Added info relating to 400MR
3	4/21/09	AJR	Added rsh & tftp info for Linux 5.1
4	7/28/09	AJR	Added note to setp 5b on nddlib.o
5	9/17/09	AJR	Added 107 patch info, bootup messages on VJ2.3A, & simplified content
6	9/28/09	AJR	Added procedure on loading files without a null modem cable
7	10/5/09	AJR	Re-wrote note on nddslib.o sizes
8	3/3/10	AJR	Expanded tftp & rsh info
9	11/2/10	AJR	Updated info relating to VJ 2.1B upgrades to VJ 2.3A
10	1/27/2011	AJR	Added info on RF controller bootup sequence with VJ 3.1A and iCAT
11	4/13/11	AJR	Added note about the message NDDS manager
12	9/20/11	AJR	Simplified the loading of iCAT files
13	9/27/11	AJR	Added master1 & ddr1 bootup process
14	12/6/11	AJR	Added references to /var/lib/tftpboot in Linux 6.1
15	1/27/2012	AJR	Added reference to the icat_top.bit file in VJ 3.2
16	2/21/2012	AJR	Clarified procedure when using the cp2ff command
17	2/29/2012	AJR	Added checksum command ffmd5”file_name” info
18	3/2/2012	AJR	Added note on the need for copying files to /tftpboot & /var/lib/tftpboot in Linux 6.1
19	3/14/12	AJR	Reformatted pages & added pg #
20	6/22/12	AJR	Added info on controller voltages
21	10/20/12	AJR	Added info on the Ethernet box issues
22	9/30/13	AJR	Clarified info on the tftpboot directory in Linux 6.3
23	11/1/13	AJR	Added info on VJ4.1 having an extra

			file for the AMRS and one for the lock-pfg controller
24	11/21/13	AJR	Added bootup of master, RF, lock/pfg, and DDR and information on AMRS commands
25	4/4/14	AJR	Added repairing the flash filesystem appendix
26	10/2/14	AJR	Added step 2e on page 3
27	11/17/14	AJR	Added a couple AMRS troubleshooting commands
28	7/9/2015	AJR	Moved minicom setup to appendix G and replaced with the screen command setup
29	11/1/2019	AJR	Added info on deleting ffs files and isf files