Chapter 2
VAX88x0/8700/85x0

This chapter by Dave Bazley.....

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2.1 Introduction

This chapter contains information on the following CPUs: 88x0, 8700 and 85x0. The generic code names for these systems are NAUTILUS and POLARSTAR. A Nautilus is a shellfish belonging to the squid family which lives in the South Pacific and Indian oceans. A Polarstar, or Polar Sea Star, is a six armed starfish which lives in the North Atlantic.

The chapter starts with a brief description of the systems, including a "who's who". This is followed by a brief description of the console, including how to drive it. This is designed to save your life on a dark night, it is not a substitute for proper training.

After this, various topics are described in greater detail. In these sections it is assumed that the reader has some knowledge of the 88xx range. The rest of the chapter is concerned with general trouble-shooting issues.

Since the POLARSTAR is essentially a "go faster" version of a NAUTILUS and there are only a few of them in the field, all the difference type information is grouped in a separate POLARSTAR section at the end.

2.2 Description of 8800

The basic NAUTILUS is the 8800. This has the following configuration:

2.2.1 Logic

(See Figure 2–1)

- Two CPUs each consisting of 8 modules. They communicate over the Nautilus Memory Interconnect or NMI. They are known as the "left" and "right" CPUs (usually from the front).
- A 1 module memory controller which supports up to 8 arrays on a seperate bus called the Nautilus Array Bus or NAB.
- One or two BI adapters supporting up to 2 BIs each. These consist of 1 module on the NMI and 1 module on each BI connected by Data Bus cables.
- A clock module which also provides the console interface.
- A console in the shape of a seperate PRO380 PC which connects to the clock module via the Programmable Peripheral Interface or PPI bus cable. Here lies everything which makes the Nautilus into a VAX: ucode, boot files, VMB etc.

Note

Unlike other VAXes the 8800 has no lights or switches on its "front panel". It has no front panell Everything, including powering on/off or seeing if it's running, is done from the PRO380 console.

2.2.2 Power

Power is supplied by a modular system similar to that of the VAX8600. It consists of 2 bulk regulators driving 3 x 300v DC buses. A variety of low voltage regulators reside on these buses and all is controlled by an Environment Monitoring Module or EMM. The EMM also takes care of airflow and temperature conditions in the cabinet. The console has control of the power system via the EMM.

Additional control and monitoring logic is housed in the New Box Translator or NBT and Interface Logic Module or ILM. Power for these and the EMM is supplied by the Control Startup Power module or CSP and not derived from the bulk regulators. The optional Battery Backup Unit or BBU provides approximately 300v DC to the memory regulators only during powerfail.

2.2.3 Packaging

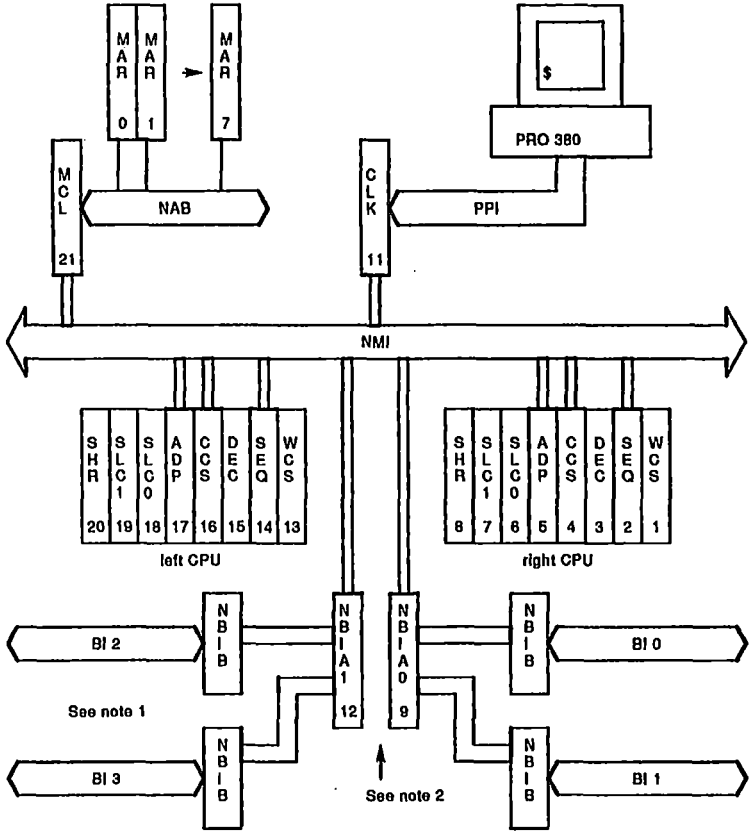
(See Figure 2–2)

Most of the above fits in a double width CPU cabinet. All 8800s also have a front end expansion cabinet which houses up to 2 expander boxes and (in Europe) a Mains transformer. (The 8800 needs a 208 VAC 3 phase supply). Only two BIs fit in CPU cabinet so may also have one or two additional expansion cabinets depending on I/O configuration.

2.2.4 Other Systems

All other Nautilii are variations of the 8800 and are described in Section 1.3.

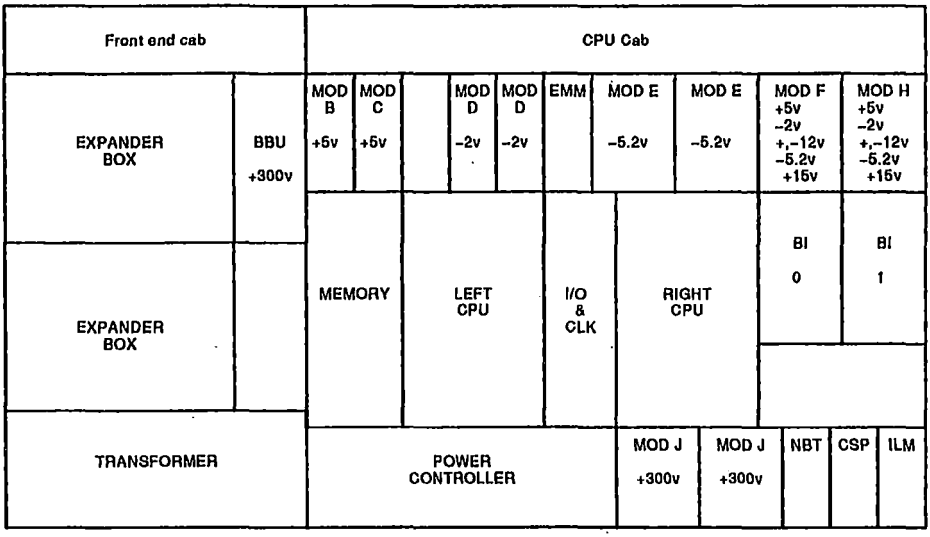
Figure 2–1: 88xx Block Diagram



NOTES:

1. This shows full I/O configuration. Often only have NBIA0 and BIs 0 and 1. Slot 12 then contains NMLD load module.
2. Slot 10 is reserved.
3. Slot numbering assumes front view.

Figure 2–2: 88xx Cabinet Layout



Front view

2.3 NAUTILUS who's who

8800	2 CPUs. Up to 4 BIs. 2 to 4 cabinet system described in Section 2.2. 12 VUPs.
8820N	More recent designation for 8800. †
8700	1 CPU system, same as 8800 but with only left CPU. Can be upgraded to 8800. 6 VUPs.
8810N	More recent designation for 8700. †
8500	1 CPU system in single width cabinet. No front end cabinet. 1 BI (another can be added with an expansion cabinet). Only 5 memory slots. Has different Decoder module (F1015 instead of F1007). Smaller power system. Can be upgraded to 8530 or 8550 but not 8700 or 8800. (Most 8500s have been upgraded to 8530s). 3 VUPs.
8530	Same as 8500 except faster ucode. Can be upgraded to 8550 but not to 8700 or 8800. 4 VUPs.
8550	Same as 8500 except original Decoder module (F1007) and different CPU backplane. 6 VUPs.

†**BEWARE:** 8810, 8820, 8830 and 8840 are designations for the POLARSTAR range. An 8810N is not the same as an 8810. Nor is an 8820N the same as an 8820. The "N" often gets lost so this can be confusing! More details in POLARSTAR section.

2.4 CONSOLE

The console for the Nautilus is a separate freestanding PRO380 PC. It has two connections to the CPU. One is an RS232 link to the EMM which allows it to control and monitor the power system and cabinet environment. The other is the PPI link to the system clock module over which all the normal VAX operator functions take place. A special module in the PRO380 called the Real Time Interface or RTI provides the connection to the PPI. Also contained in the PRO380 is an RD52 (or RD32) and dual RX50 drives. The following software and firmware lives on the RD52:

1. P/OS V3.x Operating System
2. CONSOLE application
3. EMM setup files
4. CPU micro-code and SYSINIT files
5. Boot command files
6. VMB and CI ucode
7. Microdiagnostics
8. Diagnostic Supervisor and Macrodiagnostics

The RX50s are only used for updating.

In normal operation when the PRO380 is powered up the POS operating system is booted and the CONSOLE application runs. This gives the >>> prompt which, from an operators point of view, is just like the >>> on any VAX. There's just an awful lot of commands he/she can issue, thats all!

The communications port on the PRO380 provides the connection for RDC and VCS if present.

2.4.1 Using the CONSOLE

As mentioned before ALL control and monitoring of the CPU(s) is done via the Console PRO380. This means you have to be a bit careful about what you type. Like all VAX consoles it has two modes, program and console. Normally with VMS up and running the console would be in Program Mode. IE: What you type goes to the VAX. You would log in from here. To change to Console Mode, type ^P, this gives you the >>> prompt. (The CPU(s) will not HALT unless you type >>> H). Now what you type goes to the Console PRO380. To return to Program Mode type >>> SET TERMINAL PROGRAM.

2.4.2 Console Commands

There are many Nautilus console commands and all are explained in the Console Users Guide. Those listed here are some you need for basic trouble-shooting:

Table 2–1: Nautilus Console Commands

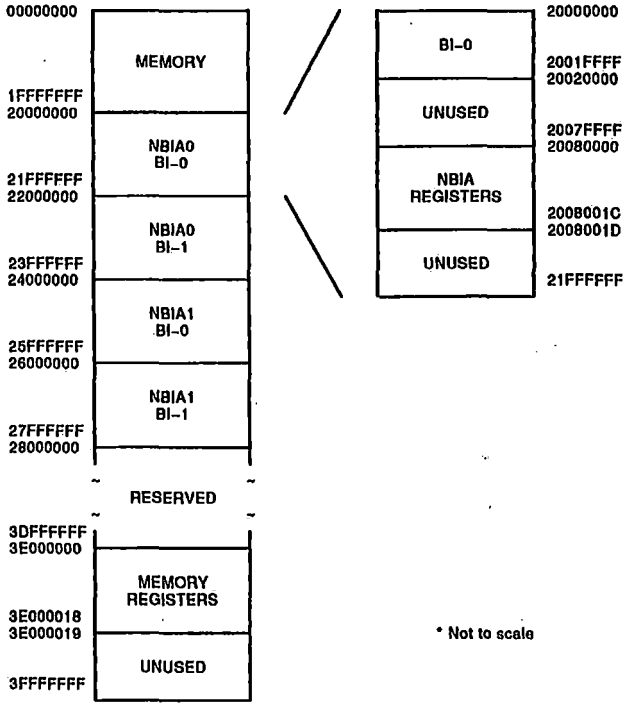
Command	Description
@SYSINIT	Inits CPU(s), loads ucode and configures memory
BOOT	Causes DEFBOO.COM to run
CONTINUE	Continues VAX after Halt
EXIT	Stops CONSOLE application and gives PRODCL prompt. (RUN CONTROL or CONSOLE to return to >>>)
HALT	Halts VAX
HELP	When all else fails. (Type in full)
POWER ON	Applies power to CPU logic
POWER OFF	Removes power from all CPU logic †
POWER STANDBY	Removes power from all CPU logic except memory
SET TERMINAL PROG	Returns Console to Program Mode
SHOW LOG	Displays Console Log. (Use NEXT/PREV to scroll up and down. ^Z to return to >>>)
SHOW POWER	Displays status of regulators and temperature sensors etc.
SHOW STATUS	Displays state of CPU(s) and flags
TEST	Calls MICMON and runs udiagnostics. (Takes ?? mins on 8800)

†WARNING: All logic is dead but EMM,NBT,CSP and ILM still have power. (See Section 2.6.2).

2.5 Physical Addressing

The Nautilus range support 30 bit physical addressing. This gives 512 MB of Memory space and 512 MB of I/O space. In common with other VAXes most of the I/O space is not used. The layout of the address space is shown below:

Figure 2–3: Nautilus Address Space



Note that 85xx CPUs have only NBIA1. This means that the address space of the *first* BI (BI-0) starts at 24000000 instead of 20000000 as you might expect. (87/8800s with only 1 NBIA have NBIA0 so their first BI address space *does* start at 20000000). You need to know this to correctly set R1 in the Boot Command files.

See the Maintenance Guide for individual node and register addresses.

2.6 Troubleshooting Philosophy

The Level 1 Maintenance Philosophy for Nautilus systems should be adhered to under all circumstances. Where a microdiagnostic failure occurs on a system and the error message indicates a failing module or list of modules then the Level 1 engineer may exchange modules from the swap kit up to a maximum of three. This should be qualified by the following points :-

1. Only modules which are specifically cited in an error printout should be exchanged unless you are advised by a Remote/Support/Level 2 engineer.

2. Always continue from the first microdiagnostic failure and observe carefully any subsequent failure. Should any subsequent failure be logically far removed from the first, consult a Remote/Support/Level 2 engineer.
3. Run the failing diagnostic after module change.
4. If the fault is not rectified by any or all of the modules changed, do not change any further modules until a Remote/Support/Level 2 engineer is consulted.
5. Modules cited in an error printout should be exchanged from the swap kit and NEVER , in the case of an 8800, from the other CPU. New modules should be contact cleaned before insertion using the correct cleaning wipes. (See below).
6. Always adhere to all ESD procedures, including the correct use of the module case seals. See Chapter 8 "VAXBI Module Handling and Packaging" for latest details.

2.6.1 Module and backplane cleaning procedure

When changing a CPU or BI module ALWAYS clean the contact fingers with a Goldclean. Only clean the backplane if you have a contact problem which cannot be cleared by module cleaning. See Chapter 8 "Backplane and edge connector cleaning" for the latest information about cleaning and part numbers.

2.6.2 Power Safety

As stated earlier the logic power in the VAX is controlled by the PRO380. Typing >>> Power Off removes all power from the logic modules. They can now be changed safely. However, certain parts of the power supply system still have power. The CSP is providing logic and reference voltages to the EMM, ILM, NBT and the regulators. To change ANYTHING other than the logic all power must be removed by setting the rear breaker (CB1) to "off". You should then wait 5 minutes for the voltages to discharge. Note that this will also remove power from the PRO380, if it is cabled (correctly!) to the 876 power controller.

As with all these things, if in doubt, hit the main breaker.

2.7 CONSOLE - Special Considerations

As someone once said:

"Using a PRO380 as a console seems like a pretty neat idea, until...."

Despite many advantages using a separate PC as a console does introduce some complications to ordinary console maintenance procedures. Like, for instance, upgrading VMB or the CI ucode. The following notes should help. More details can be found in the Console Release Notes and Console Users Guide.

2.7.1 Console Issues

2.7.1.1 The PPI Cable

This cable carries a parallel bus and because of this it cannot be extended. Therefore the console cannot be moved away from the VAX. If your customer wants a remote console there are two ways of doing it: Sell him a VCS or, use the RDC port. (See Section 2.7.5.4)

2.7.1.2 Console floppies not seen

If the RX50s contain floppy discs when the console is powered on, devices DZ1 and DZ2 become owned by the P/OS operating system. When this happens the CONSOLE application and VMS cannot see them. Make sure they are empty at power up. Once the CONSOLE banner is displayed floppy discs may be inserted.

2.7.1.3 EXITing to PRODCL or powering Console

It IS possible to enter Console Mode, and EXIT the CONSOLE application, to get to the PRODCL prompt, whilst VMS is running on the VAX. The console can even be powered off. BUT, to avoid VMS crashing, OPCOM messages must be redirected as follows:

1. Choose a target terminal and type:
   $ REPLY/ENABLE
2. Log in on the console (if not logged in already) and type:
   $ REPLY/DISABLE
   $ SET TERMINAL/NOBROADCAST

Now you can manipulate files etc. on the PRO380 or power it off safely. On power up the PRO380 will return to the same state as before power down. It can be returned to normal operation by reversing the above steps.

Note

The REMOTE flags may need resetting. (See Section 2.7.5.2.2)

2.7.1.4 SYSGEN> Connect Console

This command can cause crashes with some versions of VMS. See Section 2.11.1.

2.7.2 CONSOLE Directory Structure

Currently there are three major versions of CONSOLE software in the field. They are 8.x, 9.x and 10.x The directory structure on the RD52 is different between versions:

Table 2–2: CONSOLE version 8.x directory structure

[CONSOLE]	This is the default directory and contains all the files which are common to the whole range of CPUs. EG: Generic boot files, VMB, diagnostics, CI ucode. †
[8800]	These contain files
[8700]	which are specific
[8550]	to each type of CPU
[8500]†	EG: EMM setups, DEFBOO.COM.
[USERFILES]	This contains files used by VMB. EG: CI ucode.

†8530 uses [8500] directory. CI ucode has to be in [CONSOLE] as well as [USERFILES] for diagnostic use.

The console determines which type of CPU it is connected to by reading some jumpers on the MPS backplane via the EMM. (See Table 2–4). When searching for a file the console looks first in the CPU specific directory and then in [CONSOLE]. The idea of this is to allow the console to be transportable between CPU types. It also explains why you usually get away with putting everything in the [CONSOLE] directory. Your problem comes when you "borrow" a console from one type of CPU and connect it to another.

Table 2–3: CONSOLE versions 9.x and 10.x directory structure

[CONSOLE]	Now contains all files. The specific directories are no longer used. EMM files are optional.
[USERFILES]	Contains CI ucode as before.

This structure is obviously simpler to use, but see "Upgrading" for implications.

Table 2–4: MPS jumpers

CPU type	R12	R13	R14	Layout
8800	out	out	out	o—o R12
8700	out	out	in	o—o R13
8550	in	in	out	o—o R14
8530	in	in	in	

Jumpers R12, R13 and R14 can be found next to J16 on 85xx MPS backplane, and J56 on 88/8700 MPS2 backplane. R12 is the top one.

2.7.3 Differences between console versions 8.x, 9.x and 10.x

The majority of consoles on systems in the Welwyn/Newmarket patch at present are either version 8.x or 9.x. Some sites have been upgraded to version 10.x, but this upgrade is not an FCO, and the differences between 9.x and 10.x do not usually justify the cost/risk.

This section lists differences between versions 8.x and 9.x. The main extra difference with version 10.x is the Remote Terminal setup. See Console Users Guide, version 10.0 and Release Notes (in text files on the RD), if you meet a version 10.x console.

1. The release notes are now so big they have been divided into four files called RELSECTx.40, where x = 1 to 4. They live on the RD52 in [CONSOLE]. The first one tells you about the rest. The "bottom line" to most questions about the console is contained in them.
2. Revision calculation is now enabled. Your SID WILL change.
3. RESTAR.COM and LOADNBOOT.COM are now invoked by PRIHALTxx.COM and SECHALTxx.COM, where xx is the halt code. You can edit these if you want to capture register information etc. about specific halts.
4. MEMCONFIG.DAT is compared with actual memory by SYSINIT and a new file is created if there is any difference.
5. A SECURE_P feature can be enabled for the LOCAL console and a PASSWORD for the REMOTE one.
6. Lots of minor bugfixes, including improved handling if Logfiles, Airflow and Power faults. See release notes for more details.

2.7.4 Upgrading CONSOLE

2.7.4.1 Entire Console

The easiest way to upgrade the whole console system on site is to replace the RD52/32. At Welwyn new console discs are produced in the office, using a copy station, consisting of two PRO350s. See factflash "Nautilus Consoles at Welwyn" for latest details. To successfully upgrade the console it is necessary to observe the following:

Note

There is a Console Help file on the RD52 which discusses the following topics in greater detail. Just type HELP CONSOLE at >>> to read it.

Before you remove the old console disc:

- Explain to the customer that his/her SID WILL change. Any third party application software may not run. (See Help file).

- Make sure the customer has copies of any files he has altered or added.
- Note the state of AUTO RESTART, AUTO BOOT and AUTO POWERON flags.
- Obtain a hard copy of all the boot command files the customer uses. Don't forget to look in the CPU specific (EG: [8800]) directory as well.
- Check and note the setup of the RDC comms. port. Most are standard but yours may be different. (See Section 2.7.5.2.1)
- Check and note the versions of VMB and CI ucode files that are in use.

Of course, one reason for replacing the console disc is that the old one is broken. In that case you will not be able to get the above information from the old disc! Therefore, it is a very good plan to keep it written down somewhere. The SMG would seem the obvious place.

After you have obtained all you want from the console, power down the VAX (Yes, you do have to take the system), power down the console and replace the RD52/32. Power up the console, then:

- Set console flags as per the old ones.
- Edit the boot command files as per the old ones. (All in the [CONSOLE] directory now). You CANNOT just copy the old ones as the format may be different. you may need to create a file to boot Standalone Backup. (See Help file).
- Check the keyboard is set correctly. (IE: Using the Shift key gives the right character). EXIT to P/OS Main Menu and hit SETUP key to change.
- Setup RDC comms. port and if possible, do a link test to make sure it works.
- Make sure the new VMB and CI ucode are compatible with your system. (See Help file and Section 2.11.6).
- Explain to the customer where the release notes are. He/She can now copy any special files back onto the console disc.
- Run microdiagnostics to make sure the new ones run on your system. (Do @SYSINIT first).
- You can now cross your fingers and Boot the system.

Table 2–5: Console device names

Device	POS	VMS
RD52/32	LB0	CSA3
RX50 (top/left)	DZ1	CSA1
RX50 (bottom/right)	DZ2	CSA2

2.7.4.2 Individual Files

Sometimes it is necessary to upgrade certain files on the console disc. For instance CI ucode or VMB. Currently there is no way to go directly from VMS to the console RD52/32. However, the following procedure can be used to copy files on and off the disc. (See Section 2.11.1 and Section 2.11.2 if VMS V4.x).

2.7.4.2.1 From CSA3: to VMS

1. Connect the Console using SYSGEN.
   $ MC SYSGEN
   SYSGEN CONNECT CONSOLE
   SYSGEN EXIT
2. Mount CSA3 using one of the following commands.
   $ MOUNT/NOWRITE/OVERRIDE=IDENT CSA3:
   or
   $ MOUNT/NOWRITE CSA3: PROVOLUME
3. Copy the desired file from CSA3: into your directory.
   $ COPY/LOG CSA3:[directory]filename.xxx *.*
4. Dismount CSA3.
   $ DISMOUNT CSA3:

2.7.4.2.2 From VMS to CSA3:

1. Install a floppy disc into either floppy disc drive.
2. Mount the floppy disc.
   $ MOUNT CSAx: diskname. (For "x" see Table 2–5)
   Make sure you put an ODS1 structured floppy into CSAx. The way to tell if it's ODS1 or ODS2 is to find out what queue processor is being used by VMS to handle the CSAx device. The following command will tell you:
   $SHO DEV CSAx/FULL
   Look at the output, if it has XQP within the "CACHE NAME", it's ODS2 structured, if it has ACP within the "ACP Process Name", it's ODS1 structured.
3. Copy the updated file onto the floppy disk.
   $ COPY/LOG filename.xxx CSAx:[directory]filename.xxx
   Use /CONTIG for ucode files.
4. Dismount the floppy disc.
   $ DISMOUNT CSAx:
5. Exit to CONSOLE Mode.
   ^P
6. Exit to PRODCL Mode.
   >>> EXIT
7. Copy the file from the floppy disc to the RD52/32.
   $ COPY DZx:[directory]filename.xxx LB0:[directory]filename.xxx
   Use /CONTIG for ucode files.
8. Return to CONSOLE Mode.
   $ RUN CONTROL (or CONSOLE)

   Note

   The REMOTE flags may need resetting. (See Section 2.7.5.2.2)

9. Return to Program Mode.
   >>> SET TERMINAL PROGRAM
10. Remove the floppy disc and your done.

Note that different revisions of code and diagnostics can give you a problem here. Specifically when updating CI ucode. See Section 2.10.2.3.

2.7.5 Using the REMOTE port

The COMM1 port on the PRO380 is used for connecting RDC, VCS or a local (ish) terminal.

2.7.5.1 RDC - Hardware Setup

The connection between the PRO380 and the RDC modem is made via an MDS01 box (AKA RSC or Remote Services Console). See Figure 2–4 for connections. The MDS01 front panel switches are used as follows:

The keyswitch has four positions:

Remote	Allows remote (RDC) access to the system via the console
Lock Out	Prevents any connection
User Port	Allows access via a Timeshare port (any DZ type port) connected to B1
Remote User	As User Port except RDC protocol invoked. IE: Only RDC can get in

The Local Copy switch should be off (green light off). This feature is forced from the remote end and only works if you have a hard copy terminal connected to A1.

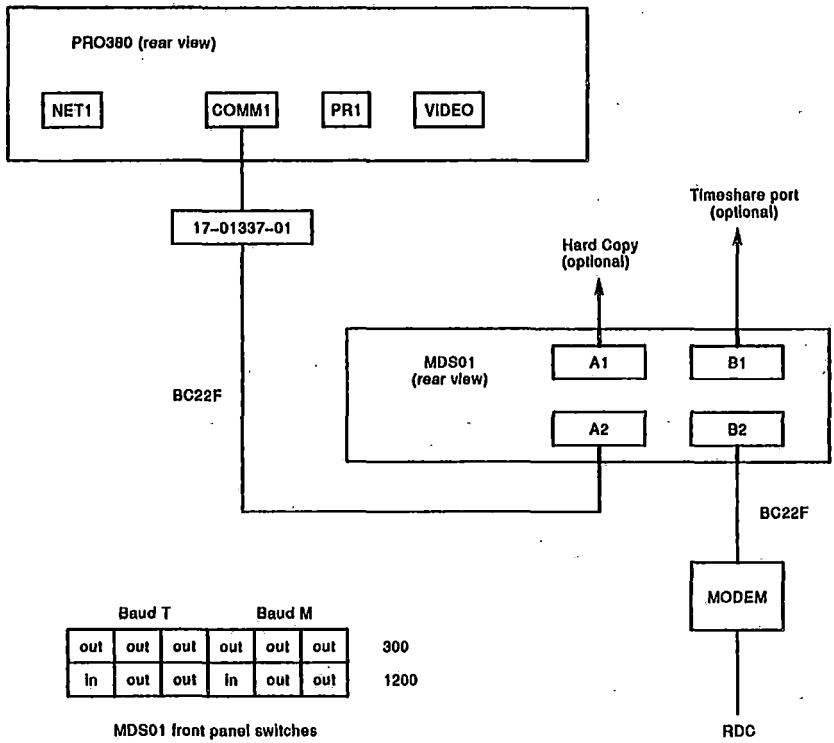
Baud T is used to set the speed of the link between the MDS01 and the PRO380 COMM1 port. This is also the A1 output speed.

Baud M is used to set the speed of the link between the MDS01 and the RDC modem. (See Figure 2–4)

Note

Note: An adapter (17-01337-01) is required between the PRO380 COMM1 port and the BC22F cable from the MDS01.

Figure 2–4: MDS01 Connections



2.7.5.2 RDC - Software Setup

A lot of setting up has to be done for the RDC link to work properly. The software setup divides into three parts: PRO/COMMS, CONSOLE and VMS.

NOTE: the following instructions apply to console versions 8.x and 9.x. If you have to set up a version 10.x console, follow the instructions in the Console Users guide, version 10.0.

2.7.5.2.1 PRO/Communications Setup

1. At >>> EXIT to PRODCL
2. At PRODCL> (or $) EXIT to the P/OS MAIN MENU
3. Select "Pro/Communications V3.x" and press Do
4. You are now in Terminal Emulation Mode, press Set-Up (F4)
5. You now have a window "Terminal Telephone File Setup". Select "Setup", select "Communications line" and press Do
6. You are now in the Communication Line Setup Menu, with "Receive Speed" flashing. Press return.
7. You are now in the Line Speed Options Menu. Select the desired speed and press return. Remember to set the same speed on the MDS01 "Baud T" switches.
8. You are now back at the Communication Line Setup Menu. Set the rest of the parameters as follows:
   - "Transmit Speed" to "Receive"
   - "Character Type" to "8 bits, no parity"
   - "Number of stop bits" to "1"
   - "XOFF Control" to "Enabled"
   - "Autoanswer" to "Disabled"
   - "Remote Access" to "Disabled"
   - "Connection Type" to "Hardwired"
9. Press EXIT (F10) to accept new settings. This takes you to the Setup Menu
10. Press EXIT (F10) again to get back to the P/OS V3.x MAIN MENU. Select CONSOLE/PRODCL and press Do

2.7.5.2.2 CONSOLE setup

To check and/or change the current Remote settings use the following commands:

- To show the current settings:
  >>> SHOW STATUS or SHOW REMOTE (depends on version of CONSOLE)
- To enable connection to RDC:
  >>> ENABLE REMOTE USER (Allows Program Mode access only)
  >>> ENABLE REMOTE CONSOLE (Allows Console and Program Mode access)

MODEM should show as disabled, in the display, as the MDS01 controls the RDC modem and the link to the PRO380 is said to be "hardwired".

BEWARE: These settings can change! Whenever an EXIT is done to PRODCL, the console disables REMOTE USER and REMOTE CONSOLE and shuts down the port. This is a security measure to prevent access to the console whilst the CONSOLE application is not running. However, with some versions, when CONSOLE is run again it *does not* re-enable REMOTE USER and REMOTE CONSOLE. So it is easy to disable remote access by accident. Every time you exit CONSOLE and return you need to check these settings otherwise RDC may not work.

These settings *are* remembered across console power failures.

2.7.5.2.3 VMS Setup

The following SYSGEN commands are required to enable remote access. They must be issued from a privileged account (EG: FIELD). You can do this, but to make them more permanent, they should be added to the SYSTARTUP command file by the System Manager. This way RDC *still* works after VMS is rebooted.

$ MC SYSGEN
SYSGEN> CONNECT CONSOLE/REMOTE (makes OPA5: available)
SYSGEN> CONNECT CONSOLE/USER (makes OPA4: available)

This enables a remote user to start two processes, one on OPA5: and one on OPA4:

2.7.5.2.4 Testing the link

After the long and involved setup above it is important to test that the link works and that RDC can actually log in. Before you call RDC it is worth checking that the 'phone line is ok and the modem answers correctly:

1. Turn the keyswitch on the MDS01 to REMOTE.
2. From any 'phone, dial the RDC modem.
3. Make sure you hear the modem answer.
4. Have someone watch the modem to make sure its the right one!

Now, if all is ok, you can call RDC and have them do a "link test".

2.7.5.3 VCS

A Vax Cluster Console (VCS) can be connected to the PRO380 console in at least two ways. The recommended way is to plug the fibre optic cable (BN25J-xx) from the VCS (or DECSERVER) into the COMM1 port via a special one metre cable (BC14N-04). The PRO380 Comms. line then needs to be set up as follows (see RDC setup for commands):

- "Receive speed" to match the line
- "Transmit Speed" to "Receive"
- "Character Type" to "8 bits, no parity"
- "Number of stop bits" to "1"
- "XOFF Control" to "Enabled"
- "Autoanswer" to "Disabled"
- "Remote Access" to "Disabled"
- "Connection Type" to "Hardwired"

Once back to the >>> prompt, enter the following commands:

>>> DISABLE REMOTE MODEM	Sets port to NO MODEM
>>> ENABLE REMOTE USER	Allows VCS in as USER
>>> ENABLE REMOTE CONSOLE	Allows VCS in as CONSOLE
>>> SET REMOTE TERMINAL OPA0	Makes OPA0 available to VCS
>>> SET TERMINAL OPA5	Makes PRO380 terminal OPA5
>>> SET TERMINAL PROGRAM	Puts you back in Program Mode

Make sure OPA5 is connected under SYSGEN. Note that the RDC link should now be made via the VCS system. See VCS Installation Guide for more details.

Another way is to connect the fibre optic cable via an adapter (BC14R-0F?) to A1 of the MDS01. (The MDS01 is connected normally). If you know how the software should be setup, let me know!

2.7.5.4 Local Terminal

The RDC port can be used to provide the customer with a console terminal in an area away from the Computer room even though the PPI cannot be extended. Here's how you do it:

1. Unplug the RDC cable and adapter from the PRO380 COMM1 port.
2. Plug a BC22F, or equivalent, into COMM1. Connect this to a suitable terminal (a VT100 in this example) in the other area.
3. Set the characteristics for the COMM1 port to the following: (see RDC setup for how to do).
   - "Receive Speed" to match VT100 speed
   - "Transmit Speed" to "Receive"
   - "Character Type" to "8 bits, no parity"
   - "Number of stop bits" to "1"
   - "XOFF Control" to "Enabled"
   - "Autoanswer" to "Disabled"
   - "Remote Access" to "Enabled"
   - "Connection Type" to "Hardwired"
4. At console prompt on PRO380 type:
   >>> ENABLE REMOTE USER
   >>> ENABLE REMOTE CONSOLE

   Remember these settings can be lost if CONSOLE application is exited.
5. Ensure console is connected /REMOTE under SYSGEN (see RDC setup)
6. At console prompt on the VT100 type:
   >>> Set terminal OPA0
7. Now the VT100 should behave as a console.

Note

A power on/off command CANNOT be issued from the VT100. Remember that the line characteristics for the COMM1 port will have to be changed when RDC is reconnected.

2.7.6 TESTING THE RTI

To completely test out the RTI module on the PRO380 console at a diagnostic level, it is useful to run the P/OS maintenance test for the RTI in conjunction with a test connector. You need to bring up the PRO380 with an RX50 in the top drive, containing P/OS. This way you can use the Maintenance Application without affecting the P/OS version on the RD52. DO NOT install the Maintenance Application on the RD52.

The part numbers for the floppies and test connector are:

Floppy-Based P/OS:	BL-V811C-BH
PRO/RTI MAINT V2.0 RX50	BL-X997B-BK. (Use UPDATE MAINT. SERVICES to install)
Services Diskette 2:	BL-P751D-BH
Maintenance Application:	BL-T308D-MH

RTI Test Connector: 12-21246-01

It appears that maintenance floppies for some options are not distributed with the basic diagnostic kit. To get to "service mode" from the maintenance application, press F1, F19, F5, in that order. See PRO380 Pocket Service Guide.

2.8 Memory

Currently there are three types of array used in Nautilus Memory Systems:

MS88-AA	LO116	4 Mbyte array
MS88-CA	LO115	16 Mbyte array
MS88-DA	LO122	64 Mbyte array

They can all be mixed in one backplane with the following restrictions:

- Slot 0 (LHS from front) must *always* contain a module.
- Additional modules should be added from the left. IE: Starting from slot 0 and working towards slot 4 or 7.
- Larger arrays should be installed first. IE: Starting at slot 0, all MS88-DAs, then all MS88-CAs, then any MS88-AAs.
- If the system has an "older" memory backplane, its memory capacity is reduced. See Section 2.8.1.

2.8.1 Memory Backplanes

88/8700s have 8 slot memory backplanes, and 85xxs have 5 slot ones. For both 88/8700s and 85xxs there are two types:

2.8.1.1 Old types

The older memory backplanes had 0.8" module spacing. MS88-CA and MS88-DA arrays both have daughter boards which make them too wide to fit in adjacent slots. They have to be installed in every second slot, with an empty slot between them. This limits 88/8700 systems to 4 x MS88-CA or DA arrays, and 85xx systems to 3 x MS88-CA or DA arrays. MS88-AA arrays do not have daughter boards and are thin enough to fit in every slot, so systems can have a maximum of 5 or 8 respectively.

2.8.1.2 New types

The newer memory backplanes have 1.0" module spacing, so that the larger arrays can fit in every slot. This means 88/8700 systems can have up to 8 of any type of array, and that 85xx systems can have up to 5.

Various upgrades are available to replace the older backplanes with newer ones, to give greater memory capacity. (Up to 512 Mbyte, which used to be the full whack!)

See MS88-xx Maintenance Advisorys for more details.

2.8.2 Memory Configuration

Configuring the various arrays into the best scheme of interleaving etc. is done by the console during @SYSINIT. The actual command is INIT/MEMORY, and this loads the console file MEMCONFIG.DAT into the Decoder RAM, on the MCL, which controls array addressing. If any arrays are added or removed the old MEMCONFIG.DAT file should be deleted. This forces the console to re-size memory and create a new configuration file. During @SYSINIT a table of the arrays is displayed on the console, so the configuration can be checked.

2.8.3 Memory Issues

2.8.3.1 Failing Daughter Board (SMU) Isolation

This is a famous and long running saga for Nauti folk. I will try to explain it briefly.

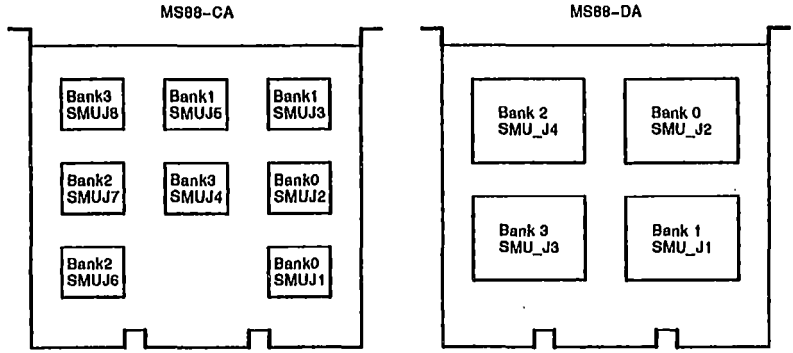
The Problem: VMS errorlogs DO NOT call out the correct SMU for CRD and RDS memory errors. This problem occurs with ALL versions of VMS and MCL.

The Reason: The MCL does not correctly latch the bank select bits if an error occurs during an Octaword transfer. (Most transfers are Octaword, 'cos its most efficient).

The Fix/Workaround: This comes in several parts, as follows:

1. Only MS88-CA and DA arrays are affected. MS88-AA don't have SMUs.
2. If the failure is solid enough for the micros to catch it, all is well. Micros do Longword tranfers and so do call out the correct SMU or motherboard. (But, see Section 2.8.3.2).
3. Some systems benefitted from an FCO which replaced the MCL with a PMCL. This is the Polarstar Memory Controller which does latch the bits correctly. Thus, you can believe what the errorlog tells you. (But see item 6). Unfortunately this FCO caused a world shortage of PMCL modules, so now they can only be obtained for Polarstars.
4. If none of the above can help you, this is the recommended procedure for intermittant single bit (CRD) and double bit (RDS) errors. (See Figure 2–5):
   - For MS88-CA SBE/CRDs, replace the whole MS88-CA option, or the 4 indicated daughter boards. (The SMU called out by the errorlog will be in one of two groups: [2,7,4,5] or [1,3,6,8], replace the whole group).
   - For MS88-CA DBE/RDSs, replace the whole MS88-CA option, or all 8 daughterboards or the motherboard.
   - For MS88-DA SBE/CRDs or DBE/RDSs replace all 4 daughterboards or the motherboard.
5. Bear in mind that this was a temporary procedure for a problem that never got fixed. Logistics did stock whole options for a while but, probably believing that the FCO fixed everything, they don't any longer.
6. If a large number of CRDs occur on systems with PMCLs, some of the errors can still be attributed to the wrong SMU. However the vast majority (~ 90%) will point to the correct one, so replace this. (See item 9).
7. **Note** that this procedure supercedes any in the Maintenance Advisories.
8. **Note** also that the MCL must be Rev D or higher to get the right slot. (See Section 2.13)
9. **Note** also that CRDs can be caused by Alpha particle damage. It is recommended that the system be rebooted as the first fix for these errors. Only if they persist should the array or SMU be replaced.

Figure 2–5: MS88-CA and DA module layout



2.8.3.2 Microdiagnostics

Sometimes VMS indicates hundreds of single bit errors (SBEs) and yet the microdiagnostics run error free. This is because the Nautilus micros use a flag to set a theshold below which SBEs are not reported. The default for this flag can be 512!

To see how its set:
MIC> SHOW MICMON

To set it:
MIC> SET FLAG SBE = 1

Since the micros *do* call out the correct SMU, this could help a lot!

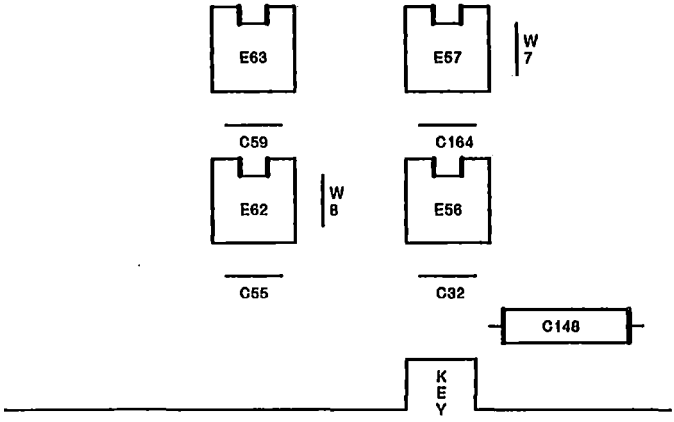
2.8.3.3 PMCL Jumpers

The PMCL (F1021) module is the memory controller for Polarstar systems. It can be used in Nautilus systems and was installed in some with MS88-DA, as an FCO. This was done because it correctly reports the failing SMU for memory errors. (See Section 2.8.3.1). However, there are two jumpers on this module which have to be configured differently for Nautilus and Polarstar systems. If configured incorrectly, damage can occur to the CIM module (F1032) and/or the PCLK module (F1033). (Note, these are Polarstar modules).

When installing this module jumpers W7 and W8 must be configured as follows:

W7	W8	
IN	IN	= VAX 85X0, 8700, 8800, 8810N, 8820N
OUT	OUT	= VAX 8820, 8830, 8840

Figure 2–6: PMCL jumper location



2.9 The BI

The Nautilus BI supports all current BI I/O nodes. Memory and CPU nodes are not supported. The following table lists some typical devices. For a complete list of BI nodes see Chapter 8, table "BI modules and device codes".

Table 2–6: Typical Nautilus BI nodes

Device type	Module No.	Name	Description
0106	T1020	NBIB	BI end of NMI to BI adapter
0108	T1015 & T1025	CIBCA-A	Older BI to CI adapter
0108	T1045 & T1046	CIBCA-B	Newer BI to CI adapter
0109	T1012	DMB32	8 x SLU, 1 x sync. line and parallel printer port
0102	T1010	DWBUA	BI to UNIBUS adapter

2.9.1 BI Register Addressing

Like any BI, to access a register you have to add the register offset to the node base address and add that to the starting address of the BI. EG:

>>> E/P/L 20000000

This would get you the contents of the register at bb + 00 (device type) on node 0 of BI 0. Big Nautilii can have up to 4 BIs, see Section 2.5 for their addressing. Remember that 85xx systems only have NBIA1, so their first BI starts at 24000000.

2.9.2 UNIBUS on the BI

A limited UNIBUS can be connected to Nautilus systems via the DWBUA, BI to UNIBUS adapter. The following options are supported. Of course, other options may work, but we never said they would (did we?).

Option	Supported
DEUNA	Yes
DHU11	Yes
DMF32	(1) 2 max
DMR11	1 max
DMZ32	Yes
DR11-W	1 max
TU80/TU81	Yes

Note

The asychronous lines, synchronous line, and line printer port of the DMF32 are all supported. All line printers which attach to the DMF32 are supported as are all line printers which connect to the asynchronous lines.

DWBUA must be Rev. E2 or higher

2.10 Diagnostics

2.10.1 Microdiagnostics

The following table lists the Nautilus microdiagnostics and approximately what they test. They are designed to be run in order, each one assuming the logic tested by the one before is ok. (Bottom up testing). They are normally run by typing >>> TEST. This calls the Micromonitor (MICMON) and runs the entire suite. However, for specific testing the separate diagnostics can be run individually. On 8800s the Left or Right or both CPUs can be selected for testing.

Table 2–7: microdiagnostics

udiag	Main logic tested
EZKAA	PPI, VBUS and CLK
EZKAB	SEQ, WCS, CCS and DEC
EZKAC	DEC, SLC0, SLC1, SEQ, WCS and SHR
EZKAD	SEQ, DEC, WCS, SLC0 and SLC1
EZKAE	DEC, SEQ, CCS, SLC0 and SLC1
EZKAF	SEQ and DEC
EZKAH	SLC0, SLC1 and SHR
EZKAJ	CCS
EZKAK	CCS
EZKAL	SEQ, CCS, ADP and MCL
EZKAM	SEQ and ADP
EZKAN	ADP
EZKAP	ADP

Table 2–7 (Cont.): microdiagnostics

udiag	Main logic tested
EZKAR	SLC0, SLC1, and CCS
EZKAS	DEC, ADP, CCS, SLC0 and SLC1
EZKAT	DEC
EZKAU	DEC
EZKAV	SEQ, DEC
EZKAW	DEC, SEQ and CCS
EZKAY	SLC0, SLC1 and SHR
EZKAZ	SLC0, SLC1, SHR and CCS
EZKBA	MCL and MARs
EZKBB	MCL and MARs
EZKBC	CLK, SEQ and MCL
EZKBD	MARs
EZKBE	???

It is also possible to "verify" a particular module. EG:

MIC> VER/MOD WCS (Use >>> TEST/C to get MIC> prompt).

This would run all the separate tests which check the WCS module. Because it bypasses "bottom up testing" this should ONLY be used to check a replacement module has fixed a problem. It should not be used for trouble-shooting.

For more details on using the microdiagnostics see Diagnostic section of Maintenance Guide.

2.10.1.1 Bugs and Problems

2.10.1.1.1 Bugs

See Diagnostics Chapter, Section 12.1.15 for up to date details.

2.10.2 Macrodiagnostics

2.10.2.1 EVKAA

This level 4 diagnostic tests the basic VAX instruction set to make sure enough is working for the Diagnostic Supervisor to load and run successfully. To run it on a Nautilus:

+ >>> LOAD/MAINMEM/START = 0 EVKAA.EXE
+ >>> START 200
+ "Hit any key to continue..."

2.10.2.2 Diagnostic Supervisor (EZSAA)

On Nautilus systems the Diagnostic Supervisor is usually loaded from the console RD52/32 as follows:

>>> @DIABOO

If this does not work, (it takes a minute or two) check DIABOO.COM in [CONSOLE] is set up correctly.

Alternatively, if Diagnostics are present on the System Disc, Diagnostic Supervisor can booted from there in the usual way. IE: Same as DEFBOO but R5 = xxxxxx10. The following level 3 diagnostics test a Nautilus CPU:

Table 2–8: Some Macrodiagnostics

Diag.	Description
EVKAB	Basic VAX instruction exerciser
EVKAC	VAX floating point exerciser
EVKAE	VAX priviledged architecture diagnostic
EZKAX	VAX 8800 specific CPU exerciser
EZXCA	NMI to VAXBI adapter diagnostic test
EZCJA	NMI activity diagnostic test

For more details on using the macrodiagnostics see Diagnostic section of Maintenance Guide.

2.10.2.3 Bugs and problems

2.10.2.3.1 Bugs

See Diagnostics Chapter, Section 12.1.16 for up to date details.

2.10.2.3.2 EVGDA and CIBCA-A and CIBCA-B ucode updates

Updating the ucode on these two types of CI adapter requires running EVGDA to replace the part that lives on the modules. There can be a problem with incompatibility between versions of EVGDA, EZSAA and the new ucode files.

If you have a rev. 8.x console you need to copy these from the same VAXPAX tape. Alternatively upgrade to rev. 9.x.

If you have a rev. 9.x console, the diagnostics are OK but you may need new ucode files. At Welwyn/Newmarket, a set of floppies containing the latest files, CIBCA.BIN rev 8.5 and CIBCB.BIN rev 4007.4002, is kept in the Datadoc Media Cabinet.

The spare logistics console RD52 (DI-RD52-01) and the office master RD52 also contain the latest versions of everything.

2.11 VMS Issues

Most of these are historic now, but I've included them just in case.

2.11.1 V4.4 and V4.5 SYSGEN> Connect console causes crash

There was an error in the VMS device driver support for the console block storage devices, CSA1, CSA2, and CSA3 on VAX 8500, 8550, 8700, and 8800. This error could cause a variety of system crashes if the device is used and then left idle for a long enough period (about 18 hours). The simplest work around is to prevent use of these devices from VMS by not issuing the SYSGEN CONNECT CONSOLE command at system startup or any other time.

2.11.2 Console Hangs with V4.5, V4.6 and V4.7

The console hangs after entering Console Mode. This problem was properly fixed by V5.x VMS and CONSOLE revision 8. However, V4.5, V4.6 and V4.7 had to be patched at the same time as the console upgrade. No-one should have this problem now, but your local PFE has the patches if you need them.

2.11.3 V4.5 and V4.6 can crash turning Cache off

VMS should be able to turn cache off if it detects cache parity errors. There is a bug in VMS which jumps to the wrong address causing an *Invalid Exception - Access Violation* bugcheck. It is possible to miss the fact that the real problem was the cache parity error. A patch was available.

2.11.4 Errorlog Problems

2.11.4.1 MS88-CA and DA Failing SMU callout

The Errorlog (all versions) does not callout the correct SMU for memory errors. See Section 2.8.3.1.

2.11.4.2 Machine check incorrectly reported

Some versions of VMS (I can't recall which) do not decode the Machine Check Type Code correctly. This results in the "decode text" reporting a machine check equivalent to the actual type code + 1.

Always decode the registers yourself and check the Errorlog is telling the truth.

Note also that if NMIFSR <27:26> are 00 a timeout *did not* occur, whatever the Errorlog says.

2.11.5 Mounting CSA3: can cause crash

VMS does not support writing to CSA3: (Console RD52/32). If you try to mount CSA3: without the "/NOWRITE" option you can cause the system to crash.

Customers should be informed that they **CAN ONLY READ** CSA3: They should use one of the following VMS commands to mount it:

$ MOUNT/NOWRITE/OVERRIDE=IDENT CSA3:

or

$ MOUNT/NOWRITE CSA3: PROVOLUME

For detailed instructions on how to copy files between VMS and CSA3 see Section 2.7.4.2.

2.11.6 CIBCA-B and V4.7, Bugcheck on Boot

When CIBCA-Bs first appeared on the scene, VMS was not quite ready for them. When attempting to boot with a CIBCA-B, VMS 4.7 would bugcheck after the banner with an Access Violation. VMS V5.x was ok.

The workaround for this problem was to use the 57 block VMB.EXE. Unfortunately this VMB tries to load CIBCA.BIN instead of CIBCB.BIN. So what you had to do was rename CIBCB.BIN to CIBCA.BIN to fool it! This is obviously a recipe for confusion so be **VERY CAREFUL** with CI ucode on VMS V4.7 systems.

This chart should help you work out what you need:

	VMS	VMB	UCODE FILE
CIBCA-AA (T1015/T1025)	4.6 or 4.7	57 Block	CIBCA.BIN
	5.0 or 5.1	72 or 73 block	CIBCA.BIN
CIBCA-BA (T1045/T1046)	4.6 or 4.7	57 block	CIBCB.BIN renamed to CIBCA.BIN
	5.0 or 5.1	72 or 73 block	CIBCB.BIN

All current Nautilus consoles have the 57 block VMB. On more recent ones it is called VMBV47.BIN, otherwise look for VMB.OLD. Remember that CI ucode must be in [USERFILES] directory.

2.11.7 V5.x long boot time

Later versions of VMB (from the 73 block version onwards) test memory more extensively than previous ones did. The tests take about 1 minute per 10 Mbyte. This can add up to a long time if you've got lots of memory. You can disable this test by setting bit 7 in R5 in DEFBOO.

2.12 Parts and FRUs

NOTE: For BI part numbers see Chapter 8 "Parts".

Table 2–9: CPU Modules and Regulators

Part Number	Module	Description
F1001	MCL	Memory Control module (Rev F3/F4)
F1002	SHR	Shifter module
F1003	SLC1	Data Slice 1 module
F1004	SLC0	Data Slice 0 module
F1005	ADP	Address and Data Path module
F1006	CCS	Cache Control Sequencer module
F1007	DEC	Decoder module (8800/8700/8550)
F1015	DEC	Decoder module (8500/8530)
F1008	SEQ	Micro-Sequencer module
F1009	WCS	Writable Control Store module
F1010	CLK	Clock module
F1011	NBIA	NMI-BI adapter module
F1012		Extender Board
F10xx	NMLD	NMI Load module
L0116	MAR4	MS88-AA, 4 Mbyte array
L0115	MAR16	MS88-CA, 16 Mbyte motherboard
54-16500-BA	SMU	MS88-CA, 2 Mbyte Daughterboard
L0122	MAR64	MS88-DA, 64 Mbyte array
54-17052-AA	SMU	MS88-DA, 16 Mbyte Daughterboard
T1020	NBIB	BI-NMI adapter module
H7170-A	MOD J	+300v Phase module (8800/8700)
H7180-A	MOD E	-5.2V 200A regulator
H7186-A	MOD B/C	+5.0V 80A regulator
H7187-A	MOD D	-2.0V 100A regulator
H7188-AB	EMM	Environment monitoring module (Rev. E1)
H7189-A	MOD F/H	BI regulator
H7061-A	ILM	Interface Logic Module
H7060-A	CSP	Control Startup Power Module
H7062-A	NBT	New Box Translator (8800/8700)
H7231-F	BBU	Battery Backup Unit
H7230-D		Battery Charger
H7176-A	MOD J	PCM Bulk DC Power Converter (8500)
876-A		Power Controller(8800/8700)
H405-B		Power controller (8500)

Table 2–10: Useful Parts

Part Number	Description
12-19486-00	Air flow assy
12-22805-02	Air flow sensor
12-22307-03	Blower motor 50 HZ
12-19526-01	Temp. sensor assy
12-23034-01	Air filter CPU Cab.
12-23034-05	Air filter BI Exp. Cab.
12-23034-06	Air filter Mem. Cab.
12-17437-01	Transformer PEEWEE fan
70-19886-00	Transformer fans panel
12-20083-06	Main Circuit Breaker (Front end cab)
54-16157-01	MPS Backplane #1

Table 2–10 (Cont.): Useful Parts

Part Number	Description
54-16159-01	MPS BACKPLANE #2
70-21696-02	CPU Backplane
70-21701-01	Memory Backplane
34-23566-01	ESD Modules Container
70-21693-01	NBI Cable #1 (To 1st BI - all 4 cables)
70-21692-01	NBI Cable #2 (To 2nd BI - ditto)
70-21694-01	NBI Cable #3 (To Exp. cab. - ditto)
70-21695-01	NBI Cable #4 (To Exp. cab. - ditto)
54-17780-01	N.Box Backplane
17-00555-01	Cable Mem->CPU BUS
17-01172-01	Console Cable
H7862	PRO Power Supply
KDJ11-CA	PC380 System Module
17-00280-00	DC Power Cable (system board)
17-00342-01	DC Power Cable, RD Drive (4 in)
17-00342-01	DC Power Cable, RX Drive (6 in)
54-15058-00	RX50 Controller
17-00285-00	RX50 diskette drive signal cable
54-15134-01	RD52 Controller
17-00282-00	RD52 Data Cable
17-00286-00	RD52 Control Cable
54-15539-01	RTI Module > or = Rev C1
12-21246-01	RTI Loopback connector
17-01198-01	PPI/Console Cable
70-21700-01	Console disk assembly
17-00283-01	Video Cable (2.5 ft)
17-00289-01	Modem Cable (25 ft)
17-00300-00	Printer Cable (10 ft)
17-00083-10	AC Power Cable
12-19245-00	Battery Pack
29-24795-00	Comms port test connector
12-13185-00	Fan
29-24794-00	Printer test connector

2.13 FCOs

Table 2–11: FCO summary for 85xx/87xx/88xx (not Polarstar)

FCO	SB#	Description
85XBA-R001 871BA-R001 882BA-R001	485	MCL problem with updating error page address Kit = EQ-01450-01. Quick Check: F1001 at F3/F4
85XBA-R002 — 882BA-R002	483	Console only power fail problems can cause VMS to crash Address bit 23 problem. Kit = EQ-01448-01/02 Quick Check: F1010 at B1, F1005 at B1
85XBA-I003 — —	480	The Fusable resistor used for overload protection of the Transformer T1, blows prematurely on power up. (H7176-A module will not turn on)
85XBA-I004 — —	480	Trip point for AC Low Out, signal set for 226VDC is too high for VAX 8530/8550. Kit = EQ-01461-01. Quick Check: H7061-A at B1.
85XBA-R005 — —	511	Machine shuts down prematurely because of error in Temp Sensor_3 location. Kit = EQ-01470-01 Quick Check: Temp Sensor_3 located behind ground strap
85XBA-R006 871BA-R002 882BA-R003	489	Console update to 22E (Console 5, Maindecs E) This FCO is obsolete, install FCO 85XBA-I007 etc. Was also 8500 to 8530 upgrade
— — 882BA-I004	489	Fixes read timeout problems with VMS V5 and Unibus. Kit = EQ-01502-01 Quick Check: F1011 at B2,3,4 or 5.
85XBA-I007 871BA-I003 882BA-I005	542	Console update to RELEASE V8.x. Use local update plan if replacing RD52/RD32. Quick Check: PRO38N Console will show V8.x
85XBA-I008 871BA-I004 882BA-I006	542	The MCL (F1001) cannot isolate failing SMU Only do FCO if MS88-DA is installed. Kit = EQ-01518-01. Quick Check: F1021 (PMCL) module present
85XBA-I009 — —	565	Overvoltage fault on H7187 after short power interruption. Kit = EQ-01535-01 Quick Check: H7060 = Rev. B6, B7 or higher.
85XBA-F010 871BA-F005 882BA-F007	629	Console update to RELEASE V9.x. Use local update plan if replacing RD52/RD32. Quick Check: PRO38N Console will show V9.x

2.14 Tech Tips

The following tables provide a cross-reference of Tech Tip numbers between the different CPU types. (EG: A "7" in the 8800 column means 8800-TT-07, and this is the same as 8700-TT-01). Look on Speed Bulletins or green fiche for details.

Table 2–12: Nautilus Tech Tips 1

8800	8700	8550	8530	8500	Description
1					Fibre optic cable
2					V7.0 CI ucode
3					CSA3: and VMS connect
4					"System Buffer" Circuit bounce
5					Signal meaning, SHOW POWER
6					Console update, release 29
7	1	1	1		Backplane re-torquing
8	2				H7170 Zener diode problem
9	3		2	1	Sharp edges
10	4				Terminal block, loose connections
11	5			2	Screw damage to PC38N motherboard
12	6				Air filter switch, power problem

Table 2–13: Nautilus Tech Tips 2

882BA	871BA	85XBA	855BA	851BA	Description
			1	1	See 8800-TT-03
			2	2	See 8800-TT-04
	1		3	3	CB1 trips after power off
			4	4	See 8800-TT-05
			5	5	See 8800-TT-06
				6	Don't use unlabeled plug
1	2	1	6	7	Blower plug, FCC problem
2	3		7	8	New backplane
3	4	2	8	9	DEC Power Bus connector

2.15 Other Goodies

2.15.1 85xx Backplane Short

Early Memory backplanes were isolated from the frame with tape. The tape was found to wear and was replaced by nylon washers. This problem should be long gone by now, but just in case, the washers' part number is 90-06713-00.

2.15.2 Overtemperature problem on 85xxs

Some early 85xxs had their airflow and temperature sensors the wrong way round. This made them prone to yellow and red zone exceptions. Fixed by an FCO.

2.15.3 Faulty BI Node Plugs

An "unknown" quantity of bad BI node plugs got into Nautilus systems. Some might still be lurking. These plugs are labelled node 4 but are actually node 1.

2.15.4 Power off problem

In some situations after issuing a >>> POWER OFF command the following console message is seen:

- *WARNING* POWER NOT SET TO DESIRED STATE
- However, >>> SHOW POWER indicates all regulators are off, and issuing another >>> POWER OFF command results in this message:
- POWER NOW SET TO DESIRED STATE
- The system can now be worked on safely.

This problem is thought to be due to regulator bleed times and timing within the console software.

2.15.5 BI Load Resistor problem

Various intermittant power troubles have been attributed to a shorting problem with these resistors. There are 4 resistors mounted on a metal plate behind the RHS (from front) panel. They run quite warm and sometimes melt the insulation on their supply wires. These wires can then short out. The fix is to remove the side panel (*however* hard that is) and re-route the wires so they do not touch the resistors. If you find the wires already damaged they should be replaced.

All systems should have been checked for this 2 years ago, however some may have slipped through the net.

2.15.6 Power Supply trouble-shooting

If Mod E (-5.2v) regulators have a problem they can fire the overvoltage crowbars of the Mod D (-2v) regulators. The red overvoltage LED stays on until logic power is cycled off and on. If Mod E just had a glitch, it may not give any indication. So, if you're having trouble fixing Mod D, remember Mod E may be the culprit.

2.15.7 BA32 expander box trouble-shooting

Some 85xx systems have a BA32 box for BI expansion. This is basically an 8200 CPU box. See Chapter 8 for maintainance details. Make sure you read the "Power Supply Safety" section first.

2.15.8 Bad NBIA and NBIB chips

Bad chips on F1011 and T1020 can cause the following symptoms:

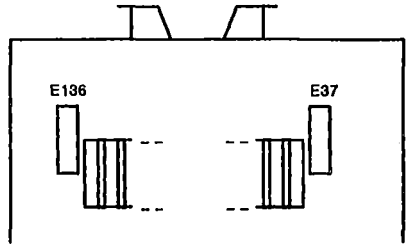
- System crash or hangs and fails reboot with a "%BOOT-F-No such device"
- ">>> SENSE REVISION NBI" error message: "*** ERROR, VAXBI 2 NBIB may not be VAXBI node 2"
- EZKBC, EZKBD callout SEQ module (F1008) but NMI bad ! Disconnecting the NMI cables suppresses failure callout.

Check on the following chips for a manufacturing datecode between 8648 and 8715. See diagram below for locations.

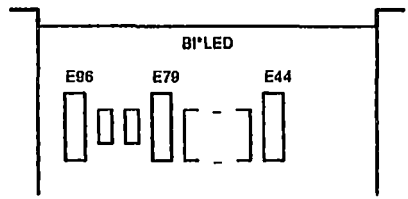
- NBIA (F1011), chips at E37 and E136
- NBIB (T1020), chips at E44, E79 and E96

If any problem chips are found, the module should be replaced.

F1011 :



T1020 :



2.16 POLARSTAR

The Polarstar range was designed to extend the power of the Nautilus. They can have up to four CPUs and up to six BIs.

2.16.1 Logic

(See Figure 2–7)

Due to a restriction of only five nexii per NMI, Polarstar systems have two NMIs with a "window" between them. One NMI lives in the CPU cabinet on two backplanes called POLR and STAR. On this sit the four CPUs, the Console Interface (CIM) and Clock (PCLK) modules, and one NMI Bus Window (NBW) module. This NBW is connected by cables to another one on the second NMI. This NMI lives in the Memory cabinet on a backplane called NEMO. On this sit three Polarstar NMI to BI adapter modules (PBIA) and the Memory Controller (PMCL).

The majority of modules used in Polarstar systems are the same as those in Nautilus systems. Table Table 2–14 lists those which are different.

Table 2–14: Modified and New Modules for Polarstar

Part Number	Module	Description
F1021	PMCL	Polarstar Memory Controller
F1028	PSEQ	Polarstar Micro-Sequencer
F1031	PBIA	Polarstar NMI to BI Adapter
F1032	CIM	Console Interface Module
F1033	PCLK	Polarstar Clock
F1034	NBW	NMI Bus Window
F1036	PCCS	Polarstar Cache Control Sequencer
H7177	SST	300v Bulk Regulator
880		Polarstar Power Controller

2.16.2 Power

As the Polarstar was originally designed for the US market, no 415 VAC versions were made. So every one you see in the UK has its own PDS+ (H7317) Power Distribution System to provide the appropriate supply (208 VAC 3 phase). Since the console uVAX, terminal and printer are usually powered from the CPU cabinet, they are set for *115v* - Be Careful!

Inside the cabinets the power system is similar to that of the Nautilus, there's just more of it! There are two EMMs, one for each cabinet, but only one +300v bulk regulator.

2.16.2.1 The PDS+

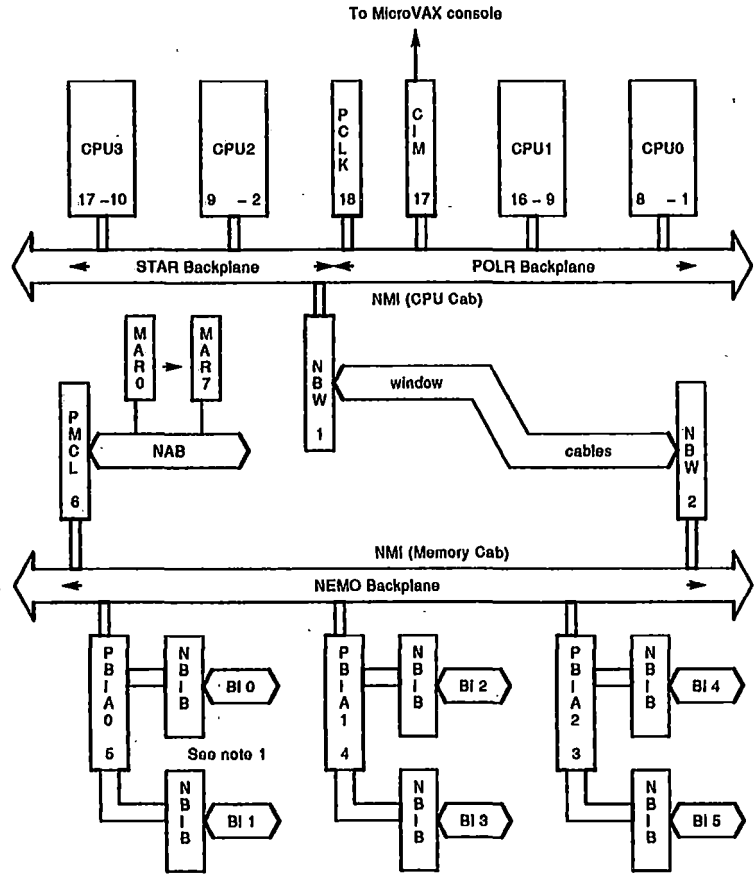
This is basically a big box with a big (50KVA) transformer in it. It is designed to supply power to a whole installation via various outputs. It can also be used to monitor various conditions and raise alarms and/or cut the power if a problem occurs.

Behind the front door is a big (~80A) breaker controlling the power *input* to the PDS+. Under the top cover are a number of breakers controlling the *output* to various circuits. In the door itself is the monitoring logic and display.

PDS+ attached to Polarstar systems usually have only one output and monitor nothing outside the PDS+. However some internal conditions are monitored by default and, depending on the setup of the PDS+, this can lead to annoying whistling and (even more annoying!) the input breaker getting popped. The FCO and correct setup are essential for this box to behave itself. (See Section 2.16.8).

NOTE: Due to the high voltages involved **NO-ONE** is allowed to work on this product unless formally trained. (See Section 2.16.10.4, PDS/PCS SAFETY ALERT (old factflash) for more details).

Figure 2–7: Polarstar Block Diagram



NOTES:

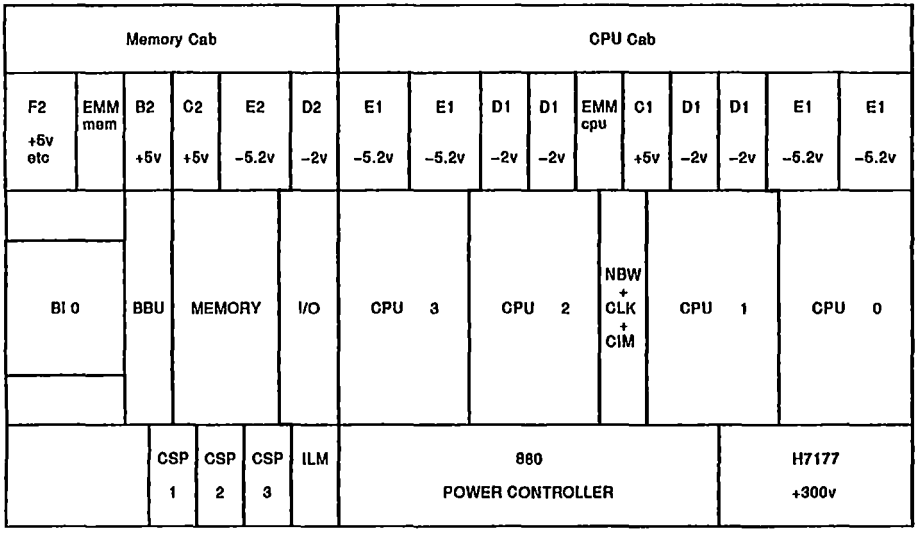
1. This shows full I/O configuration. Minimum is just PBIA0 and BI 0. Slots 3 and 4 then contain NMLD load modules. BI 0 (6 slot) fits in memory cab, others need expansion cab.
2. Slot numbering assumes front view.

2.16.3 Packaging

(See Figure 2–8)

The four CPUs fit in a double width CPU cabinet. The I/O, Memory, BBU and one BI fit in a front end Memory cabinet. If more BIs are required an expansion cabinet is placed next to the Memory cabinet.

Figure 2–8: Polarstar Cabinet Layout



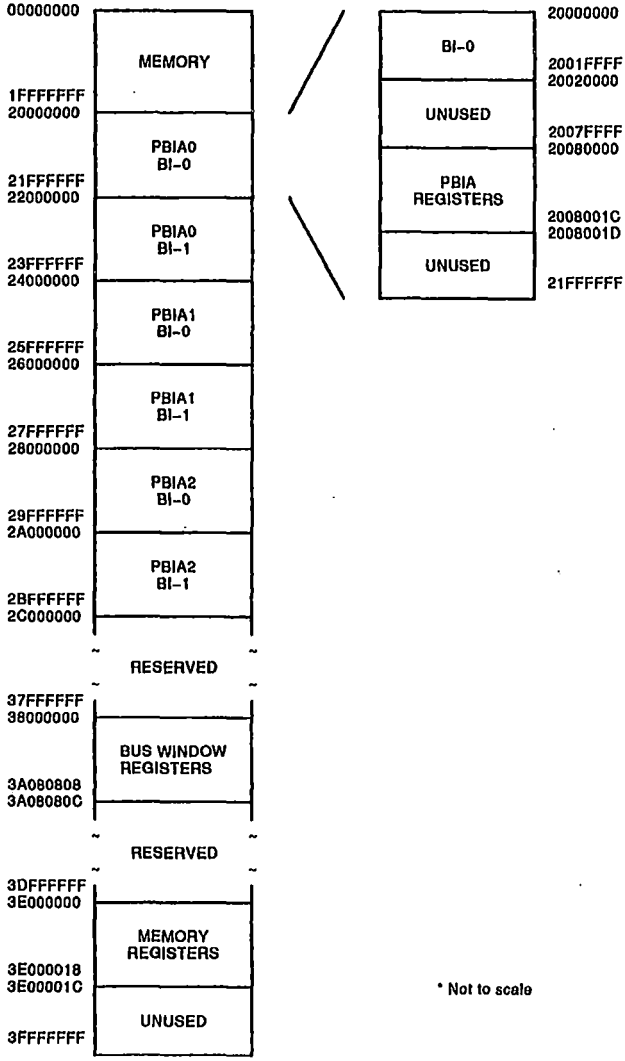
Front view

2.16.4 Physical Addressing

The Polarstar address space contains the same as the Nautilus plus an extra two BIs and some registers for handling the NMI bus window. These registers are in two groups. One group, starting at 38000000, is for the CPU NBW. The other, starting at 3A000000, is for the Memory NBW. A breakdown of these registers can be found in Chapter 25 of the System Maintenance Guide (EK-88XVS-KT-002).

Note that most systems don't actually have all six BIs. See Figure 2–9 for address space layout.

Figure 2–9: Polarstar Address Space



2.16.5 Polarstar Who's Who

8810	One CPU. 5 to 6 VUPs
8820	Two CPUs. 11 VUPs
8830	Three CPUs. 17 VUPs
8840	Four CPUs. 22 VUPs
8842	Two 8820s, plus 1 HSC70 and an SA482 in a CLUSTER

NOTE: *Sometimes* the 8810 and 8820 have a "P" suffix. This is to tell you they are not an 8810N or 8820N. At some point in the Nautilus production the 8700 got called 8810N and the 8800 got called 8820N. This is a bit confusing because the 8810N and 8820N are still Nautilii and thus can only have two CPUs maximum. Whereas the 8810 (or 8810P) and the 8820 (or 8820P) can be upgraded to 8830s or 8840s. The "P"s and "N"s have been known to get lost so the best way to tell the difference is to find out if the console is a uVAX or a PRO!

2.16.6 Console

The console for the Polarstar is a freestanding MicroVAX II. It has the following configuration:

- MicroVAX II CPU
- 5 Mbyte of Memory (1 Mbyte on CPU module)
- DZQ11 - 4 x SLU provides connection for RDC, VCS and LA75
- QC module - provides interface to Polarstar. To EMMs via RS232 line and CIM via CSL bus
- TK50 and RD53

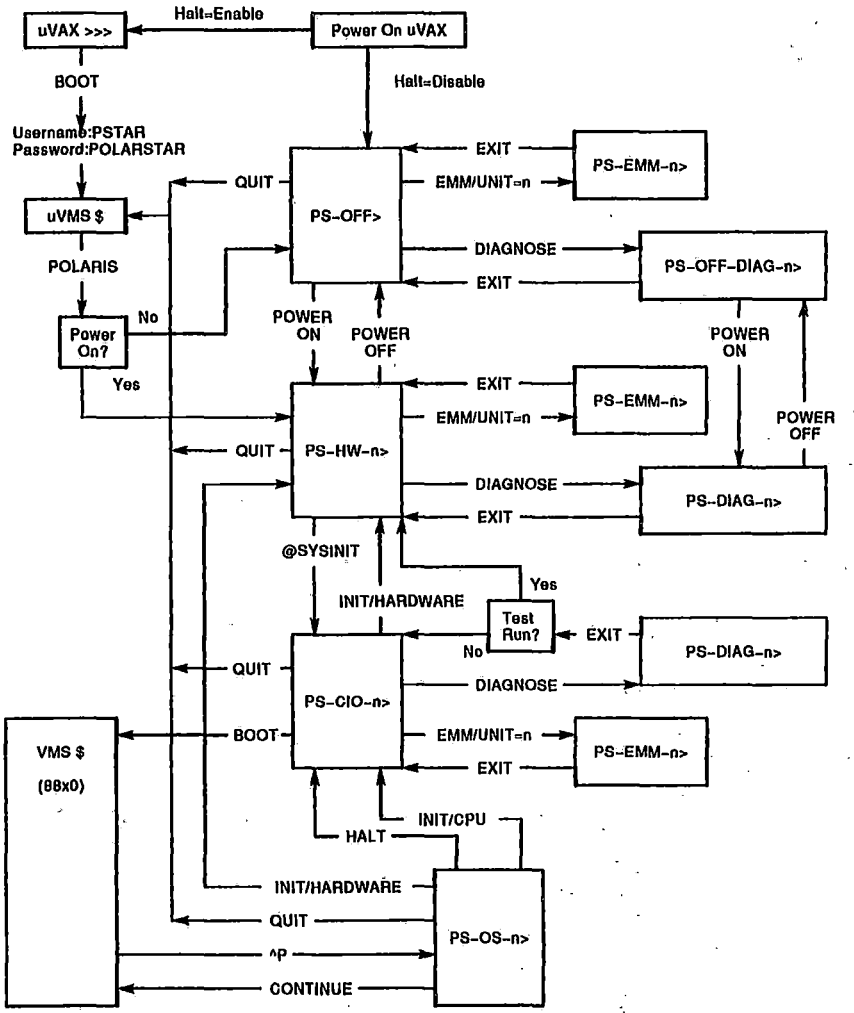
Software resident on RD53 consists of:

- uVMS V4.6
- Console Application
- All Polarstar ucode and Setup files
- SYSINIT and BOOT files
- uDiagnostics
- Macro-Diagnostics and Diagnostic Supervisor
- Two versions of Standalone Backup. 1 for uVAX, 1 for big VAX

The Polarstar console has many different states. To help (?) you know where you are, each state has its own prompt. Figure 2–10 shows a basic layout of these, plus the commands needed to navigate between them. Note the possibility of confusion between the "$" prompt on the uVAX and the "$" prompt on the big VAX. Later versions of the console use "c" (cent) for the uVAX. ($ = big VAX, c = little VAX - get it?). Note also that DCL or SPAWN commands are preferred to QUIT. See version 8.0 release notes.

For more information on commands, directory structure, initialisation and boot sequences etc. see Console User's Guide and Console Release Notes.

Figure 2–10: Polarstar Console Roadmap



2.16.6.1 Standalone Backup

Two different versions of Standalone Backup are needed on the RD53.

One is in SYSE and is used to backup uVMS for the uVAX. This one is created thus:

1. Get to uVMS prompt (you have to use QUIT this time to have enough privileges)
2. @SYS$UPDATE:STABACKIT
3. Target device?: DUA0:

To boot this type B/R5:E0000000 at >>> prompt (hit break with halt enabled). Remember this Backup is for backing up the uVAX.

The other is in SYSD and is used to backup VMS on the Polarstar. This one is created thus:

1. Load TK50 called SABKP.BCK in TK50 drive.
2. Get to PS-HW-n> prompt
3. SPAWN
4. MOUNT/FOR MUA0:
5. BACKUP/VER MUA0:SABKP.BCK/SAVE/REW DUA0:[*...]/NEW

The tape contains a saveset of VMS 5.n S/A Backup and is supposed to come with each VMS upgrade. See your local PFE if you have difficulties locating one. To boot this type BOOT CSA at PS-CIO-n> prompt. (NOTE: CSABOO needs to be set up. B/R5:D0000000 at >>> prompt does not work). Remember this Backup is for backing up the Polarstar. Note that customer should *still* have S/A Backup in SYSE of their *System* disc.

2.16.6.2 Upgrading Console

Upgrading the Polarstar console is fairly easy as nearly everything comes in one saveset on a TK50. (At Welwyn a copy of the latest version is kept in the Datadoc Media Cabinet, otherwise see your local PFE). The upgrade is described in detail in the release notes, but here is a summary based on V8.1:

1. Save anything required from RD53. (EG:POLARIS and Boot files)
2. Shutdown Polarstar
3. Halt uVAX
4. Load TK50
5. >>>B/20000 MUA0:
6. Wait 15 mins.
7. Enter time and date
8. $ BACKUP/INIT/IMAGE/BUFFER=5 MUA0:CONBCK.SAV/SAVE DUA0:
9. Wait 20 mins.
10. Boot uVAX and edit boot files etc. (Edit POLARIS.INI to enable correct number of CPUs)
11. Create 2 x S/A Backup as described above

Now everything you want is on the RD53! It is a good plan to take a backup of the RD53 at this point, and keep it on site. This will be required should the drive ever fail.

2.16.7 Diagnostics

2.16.7.1 Microdiagnostics

These are similar in concept to the Nautilus EZKxx series. "J" is the letter for Polarstar and there are 26 diagnostics, EJKAA thru' EJKBF. Run them from the PS-DIAG-n> prompt. @TEST runs the lot (plenty of time for a cup of coffee). RUN EJKxx just runs one. See System Diagnostic Users Guide for more details.

There is a command file called STRESS.CMD. This runs all the microdiagnostics at various Clock and Power margins and is designed to be used at install time. Be careful with this though as it doesn't always return things to normal.

2.16.7.2 EVKAA

Run this after the Micros, as follows:

+ PS-CIO-n> LOAD EVKAA.EXE
+ PS-CIO-n> START 200
+ CTRL/P when you've had enough

2.16.7.3 MacroDiagnostics

The Diagnostic Supervisor for Polarstars is EJSAA. Boot it from the console by typing: PS-HW-n> @DIABOO. (It takes a minute or two). The following diagnostics test a Polarstar CPU:

Table 2–15: Some Macrodiagnostics

EVKAQ	VAX Architectural Instruction Test
EVKAR	ditto
EVKAS	VAX Floating Point Instruction Test
EVKAT	ditto
EVKAU	VAX Privileged Architectural Instruction Test
EVKAV	ditto
EJKAX	VAX 8820/8830/8840 (Single-CPU) System Kernel Test
EJKBX	VAX 8820/8830/8840 (Multi-CPU) System Kernel Test
EJXCA	NMI Activity Test
EJXCB	NMI Activity Test Multi-processors
EJCJA	NMI-to-NBIB Test

2.16.7.4 Bugs

See Diagnostics Chapter, Section 12.1.16 for up to date details.

2.16.8 FCOs

Table 2–16: FCO summary for 8810/8820/8830/8840/8842

FCO	SB#	Description
885BA-0001	573	Diags/ucode fail to load due to QC module noise Kit = EQ-01481-01. Quick Check: M7553 at C2/C3
885BA-F002	649	Memory box can fail to power up + Console upgrade Kit = EQ-01575-01. Quick check: Cable 17-02438-01 in J29 of Power Controller and Console = Rev 8
H7317-F001	632	PDS+ false alarms etc. Kit = EQ-01572-03. Quick check: Firmware version = 2.4

2.16.9 Tech Tips

The following table provides a cross-reference of Tech Tip numbers between the different CPU types. (EG: A "1" in the 8820 column means 8820-TT-01, and this is the same as 8830-TT-01). Look on Speed Bulletins or green fiche for details.

Table 2–17: Polarstar Tech Tips

8810	8820	8830	8840	885BA	Description
1					Screw damage to PC38N (See 8800-TT-11)
2					Air filter switch, power problem
	1	1	1		Maintenance Guide correction
				1	Don't use unlabeled plug (See 851BA-TT-06)
				2	Console uVAX machine check

2.16.10 Other Goodies

2.16.10.1 Console uVAX machine checks

If you do "SHOW ERROR" or ANAL/ERROR at the uVMS $ prompt you will see machine check and memory errors. These are not normally real hardware errors. They are NXM errors which occur when the console attempts to access registers which "live" in the Polarstar. For various reasons these registers can be unavailable and the access times out. Hence the NXM. Every time "POLARIS" is run 5 machine checks and 5 fatal memory errors are logged. These console errors can also be precipitated by problems in the Polarstar. (If a regulator is faulty, for instance).

So examine any console machine checks you see **very carefully** and make sure they indicate a real hardware error **in the console** before changing anything!

2.16.10.2 Temperature and Airflow sensor mis-labeling

The console software has unique names for each temperature sensor. This is so each can be accessed through a unique console command. These names DO NOT MATCH the silkscreens on the cabinet backplane. See table below for relationship. NOTE: There is NO TS-4 in the CPU cab or AFS-2 in the Memory cab.

Description	Console S/W name	Silkscreen Legend
	CPU Cabinet	
Ambient Temp Sensor	T1	TS-1
Exaust Temp. Sensor	T2, T3	TS-2,TS-3
Air Flow Sensor	AF1, AF2	AFS-1,AFS-2
	Memory Cabinet	
Ambient Temp. Sensor	T5	TS-1
Exaust Temp. Sensor	T6, T7, T8	TS-2,TS-3,TS-4
Air Flow Sensor	AF1	AFS-1

2.16.10.3 Polarstar Table Safety

There is a problem with the table which supports the console terminal on Polarstar systems. It does not meet Digital Stability requirements without the support bracket attached. Equipment damage or even injury could occur if this bracket is missing and someone sits or stands on the table.

The support bracket, which should have shipped with the console table, is an "L" shaped metal bracket. It is designed to be installed to the right outboard side of the table leg, the side where the microvax installs. If you have customers who are using this table without the bracket and the bracket is available to you, install it. If a bracket is not available, order a new table since the bracket is part of the table assembly and does not have a separate part number. The table part number is P/N 34-28924-01.

2.16.10.4 PDS/PCS SAFETY ALERT (old factflash)

This factflash is being re-issued because UNTRAINED engineers are STILL working, or being asked to work, on these products.

This warning covers the following products:

- PDS aka. H7226
- PCS aka. H7228
- PDS+ aka. H7317
- PCS+ aka. H7318

8820/8830/8840/8842 systems have a PDS+, as a standard option. Also some computer rooms (mostly inhouse) have PDS or PDS+ options for power distribution and/or control.

Untrained personnel performing service or maintenance functions on these products has lead to personal injuries and product or property damage.

ENGINEERS MUST NOT WORK ON THESE PRODUCTS UNLESS THEY HAVE RECEIVED FORMAL TRAINING.

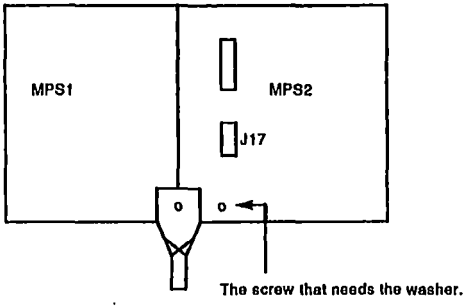
I have reminded Resource Controllers and Unit Managers so you **should not** be asked to work on them if you are not trained. Don't!!

2.16.10.5 MPS2 backplane short

A problem has been discovered with a screw on the MPS2 backplane part number (54-18462-01) for the **Polarstar** systems. The unsheilded screw has the potential to short underlying etches over time, causing CB1 to trip and the EMM to show a code of 10.

The fix for this problem is to install a nylon washer on the screw during the next PM. The part number for the washer is 90-06707-00, and the part can be ordered from stockroom 17. The cost is less then one cent per washer. Please refer to the diagram below for the screw location. I have some washers for those of you at Welwyn.

The screw is below J17, the second one in from the bottom left side of MPS2. If you see any etches running under the head of the screw then you should install a washer.



F A C T F L A S H

Options Affected: VAX 88/87/85xx (not Polarstar)
Submitted By: Dave Bazley
Date: 24-May-1994
Filing Instructions: File at end of Chapter 2, 88x0/8700/85x0 and remove previous version dated 4-Feb-1994

Nautilus Consoles at Welwyn/Newmarket

History

To speed up the replacement of faulty RD52s in NAUTILUS PRO380 consoles there is a spare one kept at Logistics. It is an RD52 containing console software plus diagnostics. The part no. is DI-RD52-01.

When this part is used the **only** way it gets replaced is if someone orders another RD52 from Logistics and copies the software onto it. This can be done using the dual PRO380 copy station in the office which has a "Master" drive for copying only. The Master **must not** leave the office.

So if you use the spare console make sure it gets replaced. If you are unable to do this yourself please ask someone else. (Involve Resource Controller/ Duty Manager if necessary).

Status

The Master and Logistics spare contain rev 9.4A console software. This includes diagnostics from VAXPAX 41/42, plus CIBCA.BIN rev 8.5 and CIBCB.BIN rev 4007.4002, and a local help file, which you should read **before** doing an upgrade.

DI-RD52-01 is kept at Newmarket Logistics. Also at Newmarket Logs. there is a diagnostics kit, part no. DIAG KIT 34. This kit contains a rev 9.4B console RD52, and a rev 10.0 console RD52. The above replacement rules also apply to these disks.

We now have two complete option swap PRO380 console systems at Welwyn. One has a rev 9.4 console and one has a rev 10.0 console. These can be used to quickly resolve those "is it the console or the VAX?" faults.

Rev 10.0 "gotchas"

Don't use PRO/Comms to set speed of remote port. Use >>>SET REMOTE SPEED instead. See release notes for RDC setup.
Don't copy diagnostics to LB0:[*], 'cos they'll end up in [USERFILES]. Copy them to LB0:[CONSOLE].
Console now stops in ODT if it crashes so you can debug it. Alternatively type 'X' to exit to PRO/DCL as before.
Console may hang if PRO 380 has less than 1 Megabyte of memory. "Show memory" gives value as 512 Kilowords.
EZKAL (and other micros?) may cause console bugcheck due to DIAGCSM init problem. Can be patched, see note 1345.
EVKAE V6.9 fails TOD test. Can be patched, see note 1340.