

MARK IV DAS PERFORMANCE CHECK LIST

Dan Smythe
Haystack Observatory
4 January, 1999

This check list can be used to verify proper operation of all of the modules and cables after a Mark IV upgrade. This list can also be used to check the system after a part has been replaced. Before these tests can be performed, the system must be fully configured and calibrated, with the correct *equip.ctl* and *head.ctl* files. This list can be used for a final acceptance test.

POWER SUPPLIES

Measure the DC level and AC ripple in all power supplies. Record the results in the station log book.

BASIC FORMATTER TESTS

1. Enter
`form=a,8`
`form4=/status.`

The response should be

```
.../form4/0x0016 0x0000 0x92XX 38 1 8000 11 0 0 0
```

or

```
.../form4/0x8016 0x1004 0x92XX 38 1 8000 11 0 0 0
```

where **xx** is the correct rack ID for the station. If the Rack ID is wrong, press the **RESET** button on the front panel of the Formatter and try again.

2. Check that the Formatter time agrees with GPS time at the one-second level. If it does not, use *fmset* to adjust the Formatter time.
3. Check that the FS clock is correct to better than 1 second. If it is not, enter the command `sy=run setcl offset &`. This command should also be issued whenever the Formatter time is reset.
4. Using a counter with time interval measurement accuracy better than 1 μ s, measure the time interval between the Formatter **CLOCK 1PPS** BNC and a GPS receiver or the maser.
5. Check that the Formatter/GPS/maser 1pps offsets are consistent with other recent measurements.
6. Move the cable to the to the **HOUSE 1PPS** BNC to verify that this signal is present, then put it back on the one that really counts: **CLOCK 1PPS**.

TAPE RECORDER CHECKS

Perform the recorder tests in the **Recorder Performance Tests** document

(`ftp://dopey.haystack.edu/pub/mark4/DAS/reccheck.ps`).

VIDEO CONVERTER TESTS

Check that the video converter power levels are in the proper range. Adjust the IFD/IF3 attenuation to give USB and LSB power readings of 0.1-2.0 on the front-panel meter of each VC, with the 10-dB attenuators in. If readings of 0.1-2.0 can not be achieved in all VCs, as a temporary measure the lower limit can be relaxed to 0.05, or small (1-3 dB) SMA attenuators can be added to the inputs to the stronger VCs. Do not use large (> 9 dB) attenuators on the VC inputs, as those VCs without attenuators are liable to saturate.

The schedule *4chcklst.snp* is provided to help perform the following tests on the Video Converters. This schedule performs an end-to-end system test and checks for incorrect or defective cable connections.

Before running this schedule, connect the **CH A** and **CH B DECODER DATA** outputs to a dual-trace oscilloscope via two 10-KHz viewing filters. (Or one viewing filter can be moved back and forth between the **CH A** and **CH B** outputs of the Decoder.) Connect the external trigger input of the oscilloscope to the **FRAME SYNC** BNC on the Decoder.

For each VC, this schedule checks that the LO will lock over the full design frequency range (100-500 MHz).

Then it sets the VC frequencies to all common frequency sequences used at the station and enables you to measure the frequency of each VC LO with a frequency counter and compare against the correct value.

Finally, it performs an end-to-end system test. It enables phase cal in only one side band and allows you to look for the presence of the phase cal signal in the bit stream from that channel, and the absence of phase cal in the bit stream from the image channel. This test will verify that all cables are properly connected, except the ones going to the head stacks.

When the schedule halts and instructs you to do so, trigger the oscilloscope with the **FRAME SYNC** signal from the Decoder and examine the base-band phase-cal signals in the **CH A** and **CH B DECODER DATA** outputs. Phase cal should be present with the proper amplitude in the desired channel and down at least a factor of 10 (20 dB) in the image channel.

Phase cal should be stable in phase relative to the **FRAME SYNC** signal.

ZERO-BASELINE TESTS

Mount a blank thin tape, and run the *zbttests* schedule. This schedule runs for about 30 minutes and records several passes to check the over-all performance of the system using all 64 tape heads on the two head stacks and over a wide range of Formatter modes and data rates.

While these passes are being recorded, phase cal should be visible at both Decoder **DATA** outputs, except during the 320 ips scan and the long, slow 15 ips scan. The phase cal signals should be stable in phase relative to the **FRAME SYNC** signal from the Decoder.

The schedule includes two parity checks, both performed at 80 ips, the first one to check a forward pass recorded at 320 ips and the second to check a reverse pass recorded at 160 ips. During each parity check, observe the eye patterns on an oscilloscope and look for unstable or low amplitude, a closed eye, or other anomalies. Phase cal will not be visible with a 10 KHz viewing filter during these checks; but you should be able to see it at 5 KHz with a spectrum analyzer.

Return this zero-baseline fringe test tape to the Haystack correlator via the quickest means for prompt evaluation.

REFERENCES

All related files and documents are available on the internet, in directory

`ftp://dopey.haystack.edu/pub/mark4/DAS/`

form4 command syntax `mk4vocab.text`

Recorder Performance Tests `reccheck.*`

Video Converter Tests `checklst.snp`

Zero-Baseline Tests `zbttests.snp`

Zero-Baseline Procedures `zbttests.prc`


```

"
"checklst.snp - check list for Mark IV Upgrade - dls - 2003 Feb 27
"Start at line 57 to check formatter, sign bits only.
vcall=100
"When all VCs are locked, enter 'cont'.
halt
valarm
vread
vcall=229.99
"When all VCs are locked, enter 'cont'.
halt
valarm
vread
vcall=231
"When all VCs are locked, enter 'cont'.
halt
valarm
vread
vcall=500
"When all VCs are locked, enter 'cont'.
halt
valarm
vread
vcsx2
"Check the LO frequency of each VC with a counter.
"When all VCs are locked at the correct frequency, enter 'cont'.
halt
valarm
vread
vcwb2
"Check the LO frequency of each VC with a counter.
"When all VCs are locked at the correct frequency, enter 'cont'.
halt
valarm
vread
vcnw2
"Check the LO frequency of each VC with a counter.
"When all VCs are locked at the correct frequency, enter 'cont'.
halt
valarm
vread
vcsx8
"Check the LO frequency of each VC with a counter.
"When all VCs are locked at the correct frequency, enter 'cont'.
halt
valarm
vread
vcall=220
vread
vcall=220,2,1
vread
"For each Video Converter,
"Check the gain match between the upper and lower sideband channels.
"The difference between USB and LSB should be less than 1 dB.
"(1 dB is a factor of 0.79 or 1.26 in power.)
halt
form4=/rate 4000
form4=/con 207
enable=s1,s2
st=for,0
vcall=219.5
vc01=219.99
!+5s
vc01=alarm
repro=byp,6,2
decode4=dqa clear
"Trigger scope on Decoder FRAME SYNC.

```

```

"Connect viewing filters to Decoder DATA BNCs.
"Checking USB1 Phase cal in Channel A, image in Channel B.
"Enter 'cont' when OK
halt
vc01=220.01
!+5s
vc01=alarm
"Checking LSB1 image in Channel A, phase cal in Channel B.
"Enter 'cont' when OK
halt
vc01=220.5
vc02=219.99
!+5s
vc01=alarm
vc02=alarm
decode4=dqa
repro=byp,14,10,,*
decode4=dqa clear
"Checking USB2 Phase cal in Channel A, image in Channel B.
"Enter 'cont' when OK
halt
vc02=220.01
!+5s
vc02=alarm
"Checking LSB2 image in Channel A, phase cal in Channel B.
"Enter 'cont' when OK
halt
vc02=220.5
vc03=219.99
!+5s
vc02=alarm
vc03=alarm
decode4=dqa
repro=byp,22,18,,*
decode4=dqa clear
"Checking USB3 Phase cal in Channel A, image in Channel B.
"Enter 'cont' when OK
halt
vc03=220.01
!+5s
vc03=alarm
"Checking LSB3 image in Channel A, phase cal in Channel B.
"Enter 'cont' when OK
halt
vc03=219.5
vc04=219.99
!+5s
vc03=alarm
vc04=alarm
decode4=dqa
repro=byp,30,26,,*
decode4=dqa clear
"Checking USB4 Phase cal in Channel A, image in Channel B.
"Enter 'cont' when OK
halt
vc04=220.01
!+5s
vc04=alarm
"Checking LSB4 image in Channel A, phase cal in Channel B.
"Enter 'cont' when OK
halt
vc04=219.5
vc05=219.99
!+5s
vc04=alarm
vc05=alarm
decode4=dqa

```

```

repro=byp,7,3,,*
decode4=dqa clear
"Checking USB5 Phase cal in Channel A, image in Channel B.
"Enter 'cont' when OK
halt
vc05=220.01
!+5s
vc05=alarm
"Checking LSB5 image in Channel A, phase cal in Channel B.
"Enter 'cont' when OK
halt
vc05=219.5
vc06=219.99
!+5s
vc05=alarm
vc06=alarm
decode4=dqa
repro=byp,15,11,,*
decode4=dqa clear
"Checking USB6 Phase cal in Channel A, image in Channel B.
"Enter 'cont' when OK
halt
vc06=220.01
!+5s
vc06=alarm
"Checking LSB6 image in Channel A, phase cal in Channel B.
"Enter 'cont' when OK
halt
vc06=219.5
vc07=219.99
!+5s
vc06=alarm
vc07=alarm
decode4=dqa
repro=byp,23,19,,*
decode4=dqa clear
"Checking USB7 Phase cal in Channel A, image in Channel B.
"Enter 'cont' when OK
halt
vc07=220.01
!+5s
vc07=alarm
"Checking LSB7 image in Channel A, phase cal in Channel B.
"Enter 'cont' when OK
halt
vc07=229.5
vc08=219.99
!+5s
vc07=alarm
vc08=alarm
decode4=dqa
repro=byp,31,27,,*
decode4=dqa clear
"Checking USB8 Phase cal in Channel A, image in Channel B.
"Enter 'cont' when OK
halt
vc08=220.01
!+5s
vc08=alarm
"Checking LSB8 image in Channel A, phase cal in Channel B.
"Enter 'cont' when OK
halt
vc08=229.5
vc09=219.99
!+5s
vc08=alarm
vc09=alarm

```

```

decode4=dqa
repro=byp,106,102,,*
decode4=dqa clear
"Checking USB9 Phase cal in Channel A, image in Channel B.
"Enter 'cont' when OK
halt
vc09=220.01
!+5s
vc09=alarm
"Checking LSB9 image in Channel A, phase cal in Channel B.
"Enter 'cont' when OK
halt
vc09=219.5
vc10=219.99
!+5s
vc09=alarm
vc10=alarm
decode4=dqa
repro=byp,114,110,,*
decode4=dqa clear
"Checking USB10 Phase cal in Channel A, image in Channel B.
"Enter 'cont' when OK
halt
vc10=220.01
!+5s
vc10=alarm
"Checking LSB10 image in Channel A, phase cal in Channel B.
"Enter 'cont' when OK
halt
vc10=219.5
vc11=219.99
!+5s
vc10=alarm
vc11=alarm
decode4=dqa
repro=byp,122,118,,*
decode4=dqa clear
"Checking USB11 Phase cal in Channel A, image in Channel B.
"Enter 'cont' when OK
halt
vc11=220.01
!+5s
vc11=alarm
"Checking LSB11 image in Channel A, phase cal in Channel B.
"Enter 'cont' when OK
halt
vc11=219.5
vc12=219.99
!+5s
vc11=alarm
vc12=alarm
decode4=dqa
repro=byp,130,126,,*
decode4=dqa clear
"Checking USB12 Phase cal in Channel A, image in Channel B.
"Enter 'cont' when OK
halt
vc12=220.01
!+5s
vc12=alarm
"Checking LSB12 image in Channel A, phase cal in Channel B.
"Enter 'cont' when OK
halt
vc12=219.5
vc13=219.99
!+5s
vc12=alarm

```



```
vc13=alarm
decode4=dqa
repro=byp,107,103,,*
decode4=dqa clear
"Checking USB13 Phase cal in Channel A, image in Channel B.
"Enter 'cont' when OK
halt
vc13=220.01
!+5s
vc13=alarm
"Checking LSB13 image in Channel A, phase cal in Channel B.
"Enter 'cont' when OK
halt
vc13=219.5
vc14=219.99
!+5s
vc13=alarm
vc14=alarm
decode4=dqa
repro=byp,115,111,,*
decode4=dqa clear
"Checking USB14 Phase cal in Channel A, image in Channel B.
"Enter 'cont' when OK
halt
vc14=220.01
!+5s
vc14=alarm
decode4=dqa
"Checking LSB14 image in Channel A, phase cal in Channel B.
```

```

"
"chklst43.snp - check list for checking Mark IV formatter in a
"Mark III VLBI Rack with a Mark III Recorder - dls - 2000 Aug 04
"schedule=chklst43,#48 to check only the Formatter.
"proc=checklst
vcall=100
"Check the LO frequency of each VC with a counter.
"When all VCs are locked at the correct frequency, enter 'cont'.
halt
valarm
vread
vcall=229.99
"Check the LO frequency of each VC with a counter.
"When all VCs are locked at the correct frequency, enter 'cont'.
halt
valarm
vread
vcall=231
"Check the LO frequency of each VC with a counter.
"When all VCs are locked at the correct frequency, enter 'cont'.
halt
valarm
vread
vcall=500
"Check the LO frequency of each VC with a counter.
"When all VCs are locked at the correct frequency, enter 'cont'.
halt
valarm
ifd=max,max
"Switch the IFD to REMOTE.
halt
vcall=220
vread
vcall=220,2,1
vread
"All total power reading should be in the range 100-1000.
"Switch the IFD back to LOCAL when finished.
halt
valarm
vcall=220
vread
vcall=220,2,1
vread
"For each Video Converter,
"Check the gain match between the upper and lower sideband channels.
"The difference between USB and LSB should be less than 1 dB.
"(1 dB is a factor of 0.79 or 1.26 in power.)
halt
form=a,4
vcall=179.5
vc01=219.99
!+1s
vc01=alarm
repro=byp,1,15
pcab=4
"Trigger scope on Decoder FRAME SYNC.
"Connect viewing filters to Decoder DATA BNCs.
"Checking USB1 Phase cal in Channel A, image in Channel B.
"Enter 'cont' when OK
halt
vc01=220.01
!+1s
vc01=alarm
pcab=4
"Checking LSB1 image in Channel A, phase cal in Channel B.
"Enter 'cont' when OK
halt

```

```
vc01=179.5
vc02=219.99
!+1s
vc01=alarm
vc02=alarm
repro=byp,2,16
pcab=4
"Checking USB2 Phase cal in Channel A, image in Channel B.
"Enter 'cont' when OK
halt
vc02=220.01
!+1s
vc02=alarm
pcab=4
"Checking LSB2 image in Channel A, phase cal in Channel B.
"Enter 'cont' when OK
halt
vc02=179.5
vc03=219.99
!+1s
vc02=alarm
vc03=alarm
repro=byp,3,17
pcab=4
"Checking USB3 Phase cal in Channel A, image in Channel B.
"Enter 'cont' when OK
halt
vc03=220.01
!+1s
vc03=alarm
pcab=4
"Checking LSB3 image in Channel A, phase cal in Channel B.
"Enter 'cont' when OK
halt
vc03=179.5
vc04=219.99
!+1s
vc03=alarm
vc04=alarm
repro=byp,4,18
pcab=4
"Checking USB4 Phase cal in Channel A, image in Channel B.
"Enter 'cont' when OK
halt
vc04=220.01
!+1s
vc04=alarm
pcab=4
"Checking LSB4 image in Channel A, phase cal in Channel B.
"Enter 'cont' when OK
halt
vc04=179.5
vc05=219.99
!+1s
vc04=alarm
vc05=alarm
repro=byp,5,19
pcab=4
"Checking USB5 Phase cal in Channel A, image in Channel B.
"Enter 'cont' when OK
halt
vc05=220.01
!+1s
vc05=alarm
pcab=4
"Checking LSB5 image in Channel A, phase cal in Channel B.
"Enter 'cont' when OK
```

```

halt
vc05=179.5
vc06=219.99
!+1s
vc05=alarm
vc06=alarm
repro=byp,6,20
pcab=4
"Checking USB6 Phase cal in Channel A, image in Channel B.
"Enter 'cont' when OK
halt
vc06=220.01
!+1s
vc06=alarm
pcab=4
"Checking LSB6 image in Channel A, phase cal in Channel B.
"Enter 'cont' when OK
halt
vc06=179.5
vc07=219.99
!+1s
vc06=alarm
vc07=alarm
repro=byp,7,21
pcab=4
"Checking USB7 Phase cal in Channel A, image in Channel B.
"Enter 'cont' when OK
halt
vc07=220.01
!+1s
vc07=alarm
pcab=4
"Checking LSB7 image in Channel A, phase cal in Channel B.
"Enter 'cont' when OK
halt
vc07=179.5
vc08=219.99
!+1s
vc07=alarm
vc08=alarm
repro=byp,8,22
pcab=4
"Checking USB8 Phase cal in Channel A, image in Channel B.
"Enter 'cont' when OK
halt
vc08=220.01
!+1s
vc08=alarm
pcab=4
"Checking LSB8 image in Channel A, phase cal in Channel B.
"Enter 'cont' when OK
halt
vc08=179.5
vc09=219.99
!+1s
vc08=alarm
vc09=alarm
repro=byp,9,23
pcab=4
"Checking USB9 Phase cal in Channel A, image in Channel B.
"Enter 'cont' when OK
halt
vc09=220.01
!+1s
vc09=alarm
pcab=4
"Checking LSB9 image in Channel A, phase cal in Channel B.

```

```

"Enter 'cont' when OK
halt
vc09=179.5
vc10=219.99
!+1s
vc09=alarm
vc10=alarm
repro=byp,10,24
pcab=4
"Checking USB10 Phase cal in Channel A, image in Channel B.
"Enter 'cont' when OK
halt
vc10=220.01
!+1s
vc10=alarm
pcab=4
"Checking LSB10 image in Channel A, phase cal in Channel B.
"Enter 'cont' when OK
halt
vc10=179.5
vc11=219.99
!+1s
vc10=alarm
vc11=alarm
repro=byp,11,25
pcab=4
"Checking USB11 Phase cal in Channel A, image in Channel B.
"Enter 'cont' when OK
halt
vc11=220.01
!+1s
vc11=alarm
pcab=4
"Checking LSB11 image in Channel A, phase cal in Channel B.
"Enter 'cont' when OK
halt
vc11=179.5
vc12=219.99
!+1s
vc11=alarm
vc12=alarm
repro=byp,12,26
pcab=4
"Checking USB12 Phase cal in Channel A, image in Channel B.
"Enter 'cont' when OK
halt
vc12=220.01
!+1s
vc12=alarm
pcab=4
"Checking LSB12 image in Channel A, phase cal in Channel B.
"Enter 'cont' when OK
halt
vc12=179.5
vc13=219.99
!+1s
vc12=alarm
vc13=alarm
repro=byp,13,27
pcab=4
"Checking USB13 Phase cal in Channel A, image in Channel B.
"Enter 'cont' when OK
halt
vc13=220.01
!+1s
vc13=alarm
pcab=4

```

```
"Checking LSB13 image in Channel A, phase cal in Channel B.  
"Enter 'cont' when OK  
halt  
vc13=179.5  
vc14=219.99  
!+1s  
vc13=alarm  
vc14=alarm  
repro=byp,14,28  
pcab=4  
"Checking USB14 Phase cal in Channel A, image in Channel B.  
"Enter 'cont' when OK  
halt  
vc14=220.01  
!+1s  
vc14=alarm  
pcab=4  
"Checking LSB14 image in Channel A, phase cal in Channel B.  
"Enter 'cont' when OK  
halt
```

```
"Schedule for testing all usb samplers of a Mark IV Formatter
"in a Mark IV Rack with 15 VCs
"and a Mark III Tape recorder
"chkusb43.snp 8 March 2001 - DLSmythe
"2-bit 1:1 at 4 Mb/s
" Sign bits -> Mark III heads 1-14
"Magnitude bits -> Mark III heads 15-28
setupusb
repro=byp,1,15
"Connect VC15 LO output through 60-dB attenuator to both IF inputs.
"trigger 'scope on decoder frame sync output.
"connect 'scope inputs to decoder data outputs.
"observe sum of data outputs.
"'scope trace should resemble a 3-level sinusoid.
halt
!+1s
vread
decode4=pcal a 10000 4
"usb1
halt
decode4=pcal
repro=byp,2,16
"usb2
halt
decode4=pcal
repro=byp,3,17
"usb3
halt
decode4=pcal
repro=byp,4,18
"usb4
halt
decode4=pcal
repro=byp,5,19
"usb5
halt
decode4=pcal
repro=byp,6,20
"usb6
halt
decode4=pcal
repro=byp,7,21
"usb7
halt
decode4=pcal
repro=byp,8,22
"usb8
halt
decode4=pcal
repro=byp,9,23
"usb9
halt
decode4=pcal
repro=byp,10,24
"usb10
halt
decode4=pcal
repro=byp,11,25
"usb11
halt
decode4=pcal
repro=byp,12,26
"usb12
halt
decode4=pcal
repro=byp,13,27
"usb13
```

```
halt  
decode4=pcal  
repro=byp,14,28  
"usb14  
halt  
decode4=pcal
```



```

"Schedule for testing all lsb samplers of a Mark IV Formatter
"in a Mark IV Rack with 15 VCs
"and a Mark III Tape recorder
"chklsb43.snp   8 March 2001 - DLSmythe
"2-bit 1:1 at 4 Mb/s
"  Sign bits -> Mark III heads 1-14
"Magnitude bits -> Mark III heads 15-28
setuplsb
vc15=220
st=for,0
repro=byp,1,15
"Connect VC15 LO output through 60-dB attenuator to both IF inputs.
"trigger 'scope on decoder frame sync output.
"connect 'scope inputs to decoder data outputs.
"observe sum of data outputs.
"'scope trace should resemble a 3-level sinusoid.
halt
!+1s
vread
decode4=pcal a 10000 4
"lsb1
halt
decode4=pcal
repro=byp,2,16
"lsb2
halt
decode4=pcal
repro=byp,3,17
"lsb3
halt
decode4=pcal
repro=byp,4,18
"lsb4
halt
decode4=pcal
repro=byp,5,19
"lsb5
halt
decode4=pcal
repro=byp,6,20
"lsb6
halt
decode4=pcal
repro=byp,7,21
"lsb7
halt
decode4=pcal
repro=byp,8,22
"lsb8
halt
decode4=pcal
repro=byp,9,23
"lsb9
halt
decode4=pcal
repro=byp,10,24
"lsb10
halt
decode4=pcal
repro=byp,11,25
"lsb11
halt
decode4=pcal
repro=byp,12,26
"lsb12
halt
decode4=pcal

```

```
repro=byp,13,27  
"lsb13  
halt  
decode4=pcal  
repro=byp,14,28  
"lsb14  
halt  
decode4=pcal
```