MARK 5 MEMO #63.4

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To: Mark 5 Development Group

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Subject: Testing the Mark 5B (VSI4) Sampler Module

Test equipment required:

Field System (FS) Computer with fs-9.10.0 or higher
`chkvsi4.prc` file
Mark 3 Rack with 14 Video Converters
Mark 4 Decoder (Optional)
26-way ribbon cable (connects VSI4 Sampler to Mark 4 Decoder)
IF signal source
Mark 5B DIM
VSI cable
Mark5B control program dated 25 July 2007 (2007y206d) or later

The installation instructions for building a new Mark5B/B+ operating system disk can be found on the download page on the Haystack web site:

http://www.haystack.mit.edu/tech/vlbi/mark5/downloads.html

Test setup:

(Some obvious changes to the setup are required if you have a VLBA4 rack.)
Install the Sampler in the rack
Connect a signal source to both IF1 and IF2.
Verify that the Video Converter USBPWR levels are in the normal operating range (greater than 0.1 volt).
Connect one Sampler Module VSI output to the DIM input.
Connect the Sampler to the Decoder with the 26-way cable (if you have a Mark 4 Decoder).
Connect the FS to the front panel connector on the Sampler Module
Switch the Sampler Module front panel switch to `LOCAL`.
Press `Ctrl+Alt+F1` on the Mark 5B DIM computer console.
Login
Edit `/usr2/control/equip.ctl` and `matad.ctl` according to the instructions in `/usr2/fs/misc/mk5_ops.txt`
Enter `dimino` (or `Mark5B`) on the Mark 5B DIM computer console.
Start the FS.

Test Procedure:

1. Enter `log=`<Serial No. of VSI4 board> or `log=chkvsi4.`

2. Enter `vsi4`
   See `/vsi4/geo,m,n,0x10`
   where `m` and `n` can be any numbers less than 17, usually 1,2

3. Move the FS cable to the MAT input on the rack,
   move the switch to `MAT`,
   enter `vsi4`, and
   see the same response as before.

4. Enter `proc=chkvsi4`

5. Enter `chksamp` (If you do not have a Mark 4 Decoder, see Appendix B.)
   See something like
   ```
   /decode4/samples usbx 3236634 4803390 4734541 3225179
   /decode4/samples lsbx 3590547 4424443 4400732 3584022
   /decode4/samples usby 3314399 4694313 4645301 3345731
   /decode4/samples lsby 3415546 4614214 4534756 3435228
   ```
   repeated 7 times

6. Enter `vsi4`
   See `/vsi4/geo,13,14,0x10`

7. Enter `vsi4=tvg`

8. Enter `vsi4`
   See `/vsi4/tvg,13,14,0x10`

9. Enter `tvron`
   See `!tvr? 0 : 0xffffffff : 0 : 1 ;`
   and the TVR LED on the Mark 5B DIM turn green.

10. Move the VSI cable to the other VSI output of the Mark 5B Sampler Module.

11. Enter `tvron`
    See `!tvr? 0 : 0xffffffff : 0 : 1 ;`
    and the TVR LED on the Mark 5B DIM stay green.

12. Enter `mk5=dot?` and wait a few seconds.

13. Enter `mk5=dot?` again, and see that the last number, `<DOT-OS difference>`, changes by no more than a few milliseconds, and is not exactly `0.0`. (`DOT` is Data Observe Time and is the time recorded in the frame headers on the disk module by the Frame Header Generator (`FHG`).) Using the Test Vector Generator on the VSI4 board, the `<DOT-OS difference>` can be as large as 0.999999s, because the 1PPS for the TVG is not synced to the `HOUSE 1PPS`.

14. Enter `vsi4=geo`

15. Enter `mk5=dot_set=:force`

16. Enter `mk5=dot?` yet again.

17. See, among other things, `syncerr_eq_0`
    If not, then check the `HOUSE 1PPS`, and verify that `SAMPLE CLOCK` is locked to the rack 5 MHz.

Appendix A

Contents of the `chkvsi4.prc` file:

```
define  tvron         00000000000x
"tvron
" check vsi cable connections
" using the test vector generator in the sampler module
" and the test vector receiver in the mark 5b dim.
" dan smythe - mit haystack observatory - 2 july 2007
mk5=tvr=0
vsi4=tvg
!+.1s
vsi4
mk5=dot_set=:force
mk5=dot?
mk5=tvr=0xffffffff
!+1s
mk5=tvr?
enddef
```

```
define  chksamp       00000000000
"chksamp - dls - 2 july 2007
"checks sampler statistics - mark 5b sampler
"from raw sampler outputs.
"requires 26-conductor ribbon cable from formatter j13 to decoder j7.
vsi4=,1,2
vsi4
samplesxy
vsi4=,3,4
vsi4
samplesxy
vsi4=,5,6
vsi4
samplesxy
vsi4=,7,8
vsi4
samplesxy
vsi4=,9,10
vsi4
samplesxy
vsi4=,11,12
vsi4
samplesxy
vsi4=,13,14
vsi4
samplesxy
enddef
define  samplesxy     00000000000x
"samplesxy - 2007 june 29 - dls
decode4=samples usbx
!+1.5s
decode4=samples
!+.1s
decode4=samples lsbx
!+1.5s
decode4=samples
!+.1s
decode4=samples usby
!+1.5s
decode4=samples
!+.1s
decode4=samples lsby
!+1.5s
decode4=samples
enddef
```

Appendix B

If you do not have a Mark 4 Decoder, replace Step 5 in the Test Procedure with the following.

5A) At a Linux Command Prompt run the shell script
`checksamp` to check USB 1-14 and LSB 1 & 8.

See something like

ch	--	-	+	++	--	-	+	++	gfact
0	41711	84031	82960	41298	16.7	33.2	33.6	16.5	1.07
1	48485	76818	76640	48057	19.4	30.7	30.7	19.2	0.95
2	50976	74837	72690	51497	20.4	29.1	29.9	20.6	0.91
3	50186	74926	74590	50298	20.1	29.8	30.0	20.1	0.92
4	47720	78170	77152	46958	19.1	30.9	31.3	18.8	0.97
5	48753	77121	76023	48103	19.5	30.4	30.8	19.2	0.95
6	46371	78573	78224	46832	18.5	31.3	31.4	18.7	0.98
7	44481	81065	79702	44752	17.8	31.9	32.4	17.9	1.01
8	48164	77136	76669	48031	19.3	30.7	30.9	19.2	0.95
9	47718	77739	76876	47667	19.1	30.8	31.1	19.1	0.96
10	43296	82539	81352	42813	17.3	32.5	33.0	17.1	1.04
11	46701	79146	78697	45456	18.7	31.5	31.7	18.2	0.99
12	43526	82236	79995	44243	17.4	32.0	32.9	17.7	1.02
13	51520	73822	72917	51741	20.6	29.2	29.5	20.7	0.90
14	45475	80074	79228	45223	18.2	31.7	32.0	18.1	1.00
15	44273	80917	80483	44327	17.7	32.2	32.4	17.7	1.02

Enter `help=vsi4` in the Field System `oprin` window to see the Sampler to Bit Stream (BS) mapping, where `ch` in the above table equals BS divided by 2.
For example, USB 1-8 -> BS 0-15 -> `ch 0-7`.

5B) Enter `vsi4=vlba` in the Field System `oprin` window.

5C) Run `checksamp` again to check LSB 1-7.

Contents of the `checksamp` script:

```
#!/bin/tcsh -f
# checksamp shell script
# Revised: 2010 July 15, DLS
# Record a scan and checks sampler statistics.
echo "record=on:checksamp"| tstdimino
echo "record=off"| tstdimino
echo "scan_check?" | tstdimino
echo "disk2file=/home/oper/checksamp.m5b::+10000000:w"| tstdimino
sleep 1
echo "scan_set=" | tstdimino
bstate /home/oper/checksamp.m5b 100
rm /home/oper/checksamp.m5b
```