HV SPECIAL TEST

This test should be run on the hardware simulator.

Before running this test load good high voltage tables, using
Load “hv1.img”
Load “hv2.img”

Also before running this test, disable ITOS range checking on;
the Current parameter in iBPELED,
the Value parameter in iHVAutoRamp,
the Value parameter in iHVRamp,
and the Value parameter in iHVSet.

Re-enable ITOS range checking after the test.

1. Set LED

Send the command
`/iBPELED Current=300`

An 'Illegal Parameter Values' verification packet should be received and the housekeeping display and hardware simulator current should not alter.

'Illegal Parameter Values' packet seen Y/N ____________
Housekeeping display does not alter Y/N ______________
Hardware simulator current does not alter Y/N __________

Send the commands
1. `/iBPELED Current=7`
2. `/iBPELED Current=15`
3. `/iBPELED Current=0`

After each command check the housekeeping display and hardware simulator.

In each case a 'successful acceptance' verification packet should be received and the housekeeping and hardware should show the flood LED bias current as in the table below.

Command	**Expected flood LED bias value**	**'Successful acceptance' packet received Y/N**	**Hardware simulator shows expected value Y/N**	**Housekeeping display shows expected value Y/N**
1	7			
2	15			
3	0			

Leave the current set to 0 – this is the default.

If the three first responses and all the responses in columns 3, 4 and 5 of the table above are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

2. Autoramp and Enable/Disable HV

Please note that it should not be possible to change the high voltages with HV commanding disabled, which is the default state. It should also not be possible to ramp them up if the filter wheel is not at datum.

Also note that the values displayed on the telescope simulator and housekeeping displays are scaled versions of the value requested in each command. For a high voltage commanded to go to value x, the scaling factors are;
For Vcathode, (x - 0.5) / 0.487525
For Vmcp1, (x – 2.5) / 2.437625
For Vmcp23, (x – 10.0) / 9.7505
These scaling factors may change after calibration.

Finally note that the cathode voltage has a 'twilight zone' roughly between 130V and 270V, and cannot be set to any voltage in that range.

Before enabling HV commanding send the command
`/iHVAutoRamp Vmcp1, Value=900`

A 'successful acceptance' verification packet and an NHK 'HV Ramp Failed' message should be received. Vmcp1 should not alter on either the hardware simulator or the housekeeping display. Task HV_Ramp should stay asleep, and its counter should not increase.

'Successful acceptance' received Y/N ___________
'HV Ramp Failed' received Y/N ____________
Vmcp1 did not alter on houskeeping display Y/N _____________
Vmcp1 did not alter on hardware simulator Y/N______________
Task HV_Ramp asleep Y/N______________
HV_Ramp Counter does not alter Y/N___________

Now enable the HV commanding with
`/iHVEnable On`

A 'successful acceptance' verification packet should be received, high voltage commanding should be enabled on the hardware simulator, and the HV Enabled flag should be set to 1 in the housekeeping.

'Successful acceptance' received Y/N ___________
HV commanding enabled on hardware simulator Y/N ____________
HV Enabled flag set to 1 in housekeeping Y/N _____________

Send the commands

1. `/iHVAutoRamp Vcathode, Value=396`

```
2. /iHVAutoRamp Vcathode, Value=396
3. /iHVAutoRamp Vcathode, Value=100
4. /iHVAutoRamp Vcathode, Value=0
5. /iHVAutoRamp Vmcp1, Value=900
6. /iHVAutoRamp Vmcp1, Value=450
7. /iHVAutoRamp Vmcp1, Value=450
8. /iHVAutoRamp Vmcp1, Value=0
9. /iHVAutoRamp Vmcp23, Value=2005
10.  /iHVAutoRamp Vmcp23, Value=1000
11.  /iHVAutoRamp Vmcp23, Value=0
12.  /iHVAutoRamp Vmcp23, Value=0
```

Watch the hardware simulator until it settles and then check the housekeeping display.

For command 9, during ramp briefly check the housekeeping display for the following;

Task HV_Ramp is alive Y/N______________
Task HV_Ramp counter increases Y/N______

In each case the chosen high voltage should ***ramp*** *to the requested value, a 'successful acceptance' verification packet and an NHK 'HV Ramp Succeeded' message should be received and the hardware simulator and housekeeping displays should show the final value as given in the table below. A variation of up to +/-50V from the expected value is permissible. When the expected value is 'No change' the voltages should not ramp.*

Command	**Expected display value**	**'Successful acceptance' received Y/N**	**'HV Ramp Succeeded' received Y/N**	**Hardware simulator shows ramp to expected value or no change if none expected Y/N**	**Housekeeping shows expected value Y/N**
1	811				
2	No change				
3	204				
4	0				
5	368				
6	184				
7	No change				
8	0				
9	204				
10	102				
11	0				
12	No change				

Send the command

```
/iHVAutoRamp Vmcp23, Value=5
```

A 'successful acceptance' verification packet and an NHK 'HV Ramp Succeeded' message should be received. On the hardware simulator it should be seen that the actual voltage Vmcp23 has ramped to is approximately 10, as this is the minimum step size permissible (which may change with calibration). The scaled value on the housekeeping display should remain as 0.

'Successful acceptance' received Y/N ___________
'HV Ramp Succeeded' received Y/N ___________
Actual voltage approximately 10V Y/N ____________
Housekeeping display shows scaled voltage as 0 Y/N____________

Send the commands

1. `/iHVAutoRamp Vcathode, Value=150`
2. `/iHVAutoRamp Vmcp1, Value=10000`
3. `/iHVAutoRamp Vmcp23, Value=-1000`

In each case an 'Illegal Parameter Values' verification message should be received. The high voltages should not alter on either the hardware simulator or the housekeeping display.

Command	**'Illegal Parameter Values' received Y/N**	**Hardware simulator shows no alteration Y/N**	**Housekeeping shows no alteration Y/N**
1			
2			
3			

Try to ramp two voltages simultaneously by sending the following two commands in quick succession

```
/iHVAutoRamp Vmcp1, Value=900
/iHVAutoRamp Vcathode, Value=396
```

The first command should receive a 'successful acceptance' verification packet, Vmcp1 should ramp up as normal, and should then receive an 'HV Ramp Succeeded' NHK message. The second command should receive a verification error message 'Busy', and Vcathode should not alter on either the hardware simulator or the housekeeping display.

'Successful acceptance' received Y/N ___________
'HV Ramp Succeeded' received Y/N ___________
Vmcp1 ramped as normal Y/N ___________
'Busy' received Y/N ____________
Vcathode did not alter on housekeeping display Y/N____________
Vcathode did not alter on hardware simulator Y/N____________

Reset Vmcp1 to 0 with the command
`/iHVAutoRamp Vmcp1, Value=0`

Now move the filter wheel and then try to change a high voltage with the commands
`/iFWPulse NumPulses=2`
`/iHVAutoRamp Vcathode, Value=396`

A 'successful acceptance' verification packet and an NHK 'FW Not at Blocked' message should be received. Vcathode should not alter on either the hardware simulator or the housekeeping display.

'Successful acceptance' received Y/N ___________
'FW Not at Blocked' received Y/N ____________
Vmcp1 did not alter on housekeeping display Y/N _____________
Vmcp1 did not alter on hardware simulator Y/N _____________

Reset the filter wheel with the command
`/iFWDatum`

Finally, disable the HV commanding with
`/iHVEnable Off`

A 'successful acceptance' verification packet should be received, high voltage commanding should be disabled on the hardware simulator, and the HV Enabled flag should be set to 0 on the housekeeping display.

'Successful acceptance' received Y/N ___________
HV commanding disabled on hardware simulator Y/N ____________
HV Enabled flag set to 0 in housekeeping Y/N _____________

If all responses above, including those in both tables, are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

3. Manual HV Ramp

Please note that all notes from the previous section also apply here.

Before enabling HV commanding send the command
`/iHVAutoRamp Vmcp23, Value=2005`

A 'successful acceptance' verification packet and an NHK 'HV Ramp Failed' message should be received. Vmcp23 should not alter on either the hardware simulator or the housekeeping display.

'Successful acceptance' received Y/N ___________
'HV Ramp Failed' received Y/N ____________
Vmcp23 did not alter on the housekeeping display Y/N _____________
Vmcp23 did not alter on the hardware simulator Y/N _____________

Now enable the HV commanding with
`/iHVEnable On`

Send the commands

```
1.  /iHVRamp Vcathode, Value=396, RampRate=0
2.  /iHVRamp Vcathode, Value=300, RampRate=0
3.  /iHVRamp Vcathode, Value=0, RampRate=0
4.  /iHVRamp Vcathode, Value=396, RampRate=50
5.  /iHVRamp Vcathode, Value=396, RampRate=50
6.  /iHVRamp Vcathode, Value=396, RampRate=0
7.  /iHVRamp Vcathode, Value=396, RampRate=-50
8.  /iHVRamp Vcathode, Value=0, RampRate=-50
9.  /iHVRamp Vcathode, Value=0, RampRate=-50
10. /iHVRamp Vcathode, Value=0, RampRate=0
11. /iHVRamp Vcathode, Value=0, RampRate=50
12. /iHVRamp Vcathode, Value=300, RampRate=100
13. /iHVRamp Vcathode, Value=100, RampRate=-100
14. /iHVRamp Vmcp1, Value=900, RampRate=0
15. /iHVRamp Vmcp1, Value=450, RampRate=0
16. /iHVRamp Vmcp1, Value=0, RampRate=0
17. /iHVRamp Vmcp1, Value=900, RampRate=50
18. /iHVRamp Vmcp1, Value=900, RampRate=50
19. /iHVRamp Vmcp1, Value=900, RampRate=0
20. /iHVRamp Vmcp1, Value=900, RampRate=-50
21. /iHVRamp Vmcp1, Value=0, RampRate=-50
22. /iHVRamp Vmcp1, Value=0, RampRate=-50
23. /iHVRamp Vmcp1, Value=0, RampRate=0
24. /iHVRamp Vmcp1, Value=0, RampRate=50
25. /iHVRamp Vmcp1, Value=600, RampRate=100
26. /iHVRamp Vmcp1, Value=300, RampRate=-100
27. /iHVRamp Vmcp23, Value=2005, RampRate=0
```

```
28. /iHVRamp Vmcp23, Value=1000, RampRate=0
29. /iHVRamp Vmcp23, Value=0, RampRate=0
30. /iHVRamp Vmcp23, Value=2005, RampRate=50
31. /iHVRamp Vmcp23, Value=2005, RampRate=50
32. /iHVRamp Vmcp23, Value=2005, RampRate=0
33. /iHVRamp Vmcp23, Value=2005, RampRate=-50
34. /iHVRamp Vmcp23, Value=0, RampRate=-50
35. /iHVRamp Vmcp23, Value=0, RampRate=-50
36. /iHVRamp Vmcp23, Value=0, RampRate=0
37. /iHVRamp Vmcp23, Value=0, RampRate=50
38. /iHVRamp Vmcp23, Value=1500, RampRate=100
39. /iHVRamp Vmcp23, Value=1000, RampRate=-100
```

Watch the hardware simulator until it settles and then check the housekeeping display.

In each case the chosen high voltage should ***ramp*** *to the requested value, or stay still if it is already there, a 'successful acceptance' verification packet and an NHK 'HV Ramp Succeeded' message should be received and the hardware simulator and the housekeeping display should show the final value as given in the table below. A variation of up to +/-50V from the expected value is permissible. When the expected value is 'No change' the voltages should not ramp.*

Command	**Expected display value**	**'Successful acceptance' received Y/N**	**'HV Ramp Succeeded' received Y/N**	**Hardware simulator shows ramp to expected value or no change if none expected Y/N**	**Housekeeping shows expected value Y/N**
1	811				
2	615				
3	0				
4	811				
5	No change				
6	No change				
7	No change				
8	0				
9	No change				
10	No change				
11	No change				
12	615				
13	204				
14	368				
15	184				
16	0				

17	368				
18	No change				
19	No change				
20	No change				
21	0				
22	No change				
23	No change				
24	No change				
25	245				
26	122				
27	204				
28	102				
29	0				
30	204				
31	No change				
32	No change				
33	No change				
34	0				
35	No change				
36	No change				
37	No change				
38	153				
39	102				

Send the command
`/iHVRamp Vmcp23, Value=2005, RampRate=2000`

On the hardware simulator it should be seen that Vmcp23 jumps straight up to its final value, a 'successful acceptance' verification packet and an NHK 'HV Ramp Succeeded' message should be received and the hardware simulator and housekeeping display should show the final value as 204.

'Successful acceptance' received Y/N ___________
'HV Ramp Succeeded' received Y/N ____________
Vmcp23 jumped to final value on hardware simulator Y/N _____________
Final value on hardware simulator is 204 Y/N___________
Housekeeping display shows value 204 Y/N _____________

Send the command
`/iHVRamp Vmcp23, Value=0, RampRate=-2000`

On the hardware simulator it should be seen that Vmcp23 drops straight to 0, a 'successful acceptance' verification packet and an NHK 'HV Ramp Succeeded' message should be received and the hardware simulator and housekeeping display should show the final value as 0.

‘Successful acceptance’ received Y/N ___________
‘HV Ramp Succeeded’ received Y/N ____________
Vmcp23 dropped straight to 0 on hardware simulator Y/N _____________
Final hardware simulator value is 0 Y/N____________
Houskeeping display shows value 0 Y/N _____________

Send the commands

1. `/iHVRamp Vcathode, Value=396, RampRate=-50`
2. `/iHVRamp Vcathode, Value=0, RampRate=100`
3. `/iHVRamp Vmcp1, Value=900, RampRate=-100`
4. `/iHVRamp Vmcp1, Value=0, RampRate=50`
5. `/iHVRamp Vmcp23, Value=2005, RampRate=-50`
6. `/iHVRamp Vmcp23, Value=0, RampRate=50`

In each case a ‘Successful acceptance’ verification message and an NHK ‘HV Above/Below Requested’ message should be received. The high voltages should not alter on either the hardware simulator or the housekeeping display.

Command	**‘Successful acceptance’ received Y/N**	**‘HV Above/Below Requested’ received Y/N**	**Hardware simulator shows no alteration Y/N**	**Housekeeping shows no alteration Y/N**
1				
2				
3				
4				
5				
6				

Reset all the high voltages to 0 with the commands

```
/iHVRamp Vcathode, Value=0, RampRate=0
/iHVRamp Vmcp1, Value=0, RampRate=0
/iHVRamp Vmcp23, Value=0, RampRate=0
```

Send the commands

1. `/iHVRamp Vcathode, Value=150, RampRate=0`
2. `/iHVRamp Vmcp1, Value=10000, RampRate=0`
3. `/iHVRamp Vmcp23, Value=-1000, RampRate=0`

In each case an ‘Illegal Parameter Values’ verification message should be received. The high voltages should not alter on either the hardware simulator or the housekeeping display.

Command	‘Illegal Parameter Values’ received Y/N	Hardware simulator shows no alteration Y/N	Housekeeping shows no alteration Y/N
1			
2			
3			

Now move the filter wheel and then try to change a high voltage with the commands

```
/iFWPulse NumPulses=2
/iHVRamp Vmcp23, Value=2005, RampRate=50
```

A ‘successful acceptance’ verification packet and an NHK ‘FW Not at Blocked’ message should be received. Vmcp23 should not alter on either the hardware simulator or the housekeeping display.

‘Successful acceptance’ received Y/N ___________
‘FW Not at Blocked’ received Y/N ____________
Vmcp1 did not alter on housekeeping display Y/N _____________
Vmcp1 did not alter on hardware simulator Y/N _____________

Reset the filter wheel with the command

```
/iFWDatum
```

Finally, disable the HV commanding with

```
/iHVEnable Off
```

If all responses above, including those in both tables, are Y’s then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

4. Stop HV ramp

Enable the HV commanding with
`/iHVEnable On`

While the voltages are all stationary and at 0 send the command
`/iHVStopRamp`

A 'successful acceptance' verification packet should be received and the high voltages should not alter on either the hardware simulator or the housekeeping display.

'Successful acceptance' received Y/N ___________
High voltages did not alter on housekeeping display Y/N _____________
High voltages did not alter on hardware simulator Y/N _____________

Reset all the high voltages to their highest values with the commands
```
/iHVAutoRamp Vcathode, Value=396
/iHVAutoRamp Vmcp1, Value=900
/iHVAutoRamp Vmcp23, Value=2005
```

While the voltages are all stationary and high send the command
`/iHVStopRamp`

A 'successful acceptance' verification packet should be received and the high voltages should not alter on either the hardware simulator or the housekeeping display.

'Successful acceptance' received Y/N ___________
High voltages did not alter on housekeeping display Y/N _____________
High voltages did not alter on hardware simulator Y/N _____________

Send the following sets of commands, sending the stop command only after the ramp has been seen to start;

1. `/iHVRamp Vcathode, Value=0, RampRate=0` followed by `/iHVStopRamp`
2. `/iHVRamp Vmcp1, Value=0, RampRate=0` followed by `/iHVStopRamp`
3. `/iHVRamp Vmcp23, Value=0, RampRate=0` followed by `/iHVStopRamp`
4. `/iHVAutoRamp Vcathode, Value=396` followed by `/iHVStopRamp`
5. `/iHVAutoRamp Vmcp1, Value=900` followed by `/iHVStopRamp`
6. `/iHVAutoRamp Vmcp23, Value=2005,` followed by `/iHVStopRamp`

On the hardware simulator the high voltages should start to ramp and then stop. A 'successful acceptance' verification packet and an NHK 'HV ramp aborted' message should also be received.

Command	'Successful acceptance' received Y/N	'HV Ramp Aborted' received Y/N	Ramp stops Y/N
1			
2			
3			
4			
5			
6			

Send the commands
`/iHVAutoRamp Vmcp23, Value=2005,` followed by `/iHVStopRamp`

The value of Vmcp23 should not alter on the hardware simulator or the housekeeping display. A 'successful acceptance' verification packet and an NHK 'HV ramp aborted' message should be received.

'Successful acceptance' received Y/N ___________
'HV Ramp Aborted' message received Y/N ___________
High voltages did not alter on housekeeping display Y/N _____________
High voltages did not alter on hardware simulator Y/N _____________

Reset all the high voltages to 0 with the commands

```
/iHVRamp Vcathode, Value=0, RampRate=0
/iHVRamp Vmcp1, Value=0, RampRate=0
/iHVRamp Vmcp23, Value=0, RampRate=0
```

Finally, disable the HV commanding with
`/iHVEnable Off`

If all responses above, including all those in the table, are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

5. Set HV with no ramping

Before enabling HV commanding send the command

```
/iHVSet Vcathode, Value=300
```

Nothing should be received. Vcathode should not alter on either the hardware simulator or the housekeeping display.

Vcathode did not alter on either display Y/N _____________

Enable the HV commanding with

```
/iHVEnable On
```

Send the commands

```
1.   /iHVSet Vcathode, Value=396
2.   /iHVSet Vcathode, Value=396
3.   /iHVSet Vcathode, Value=300
4.   /iHVSet Vcathode, Value=0
5.   /iHVSet Vmcp1, Value=450
6.   /iHVSet Vmcp1, Value=900
7.   /iHVSet Vmcp1, Value=900
8.   /iHVSet Vmcp1, Value=0
9.   /iHVSet Vmcp23, Value=1000
10.  /iHVSet Vmcp23, Value=2005
11.  /iHVSet Vmcp23, Value=0
12.  /iHVSet Vmcp23, Value=0
```

In each case a 'successful acceptance' verification packet should be received. On the hardware simulator the given voltage should change immediately to the requested value with no ramping, or stay still if it is already there. Check that the change is shown on the housekeeping display within 30s. The expected value is given below. When the expected value is 'No change' the voltages should not alter.

Command	**Expected display value**	**'Successful acceptance' received Y/N**	**Hardware simulator shows ramp to expected value or no change if none expected Y/N**	**Housekeeping shows expected value Y/N**
1	811			
2	No change			
3	615			
4	0			
5	184			
6	368			
7	No change			
8	0			

9	102			
10	204			
11	0			
12	No change			

Send the commands

```
1.   /iHVSet Vcathode, Value=150
2.   /iHVSet Vmcp1, Value=10000
3.   /iHVSet Vmcp23, Value=-1000
```

In each case an 'Illegal Parameter Values' verification message should be received. The high voltages should not alter on either the hardware simulator or the housekeeping display.

Command	**'Illegal Parameter Values' received Y/N**	**Hardware simulator shows no alteration Y/N**	**Housekeeping shows no alteration Y/N**
1			
2			
3			

Now move the filter wheel and then try to change a high voltage with the commands

```
/iFWPulse NumPulses=2
/iHVSet Vmcp1, Value=900
```

An NHK 'FW Not at Blocked' message should be received. Vmcp1 should not alter on either the hardware simulator or the housekeeping display.

'FW Not at Blocked' received Y/N ____________
Vmcp1 did not alter on housekeeping display Y/N _____________
Vmcp1 voltages did not alter on hardware simulator Y/N _____________

Reset the filter wheel with the command

```
/iFWDatum
```

Finally, disable the HV commanding with

```
/iHVEnable Off
```

If all responses above, including all those in both tables, are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

6. Error Conditions

Load invalid parameters into EEPROM using

```
/load "hvcorr1.img"
/load "hvcorr2.img"
```

Reload the flight code icu.hex.

Check on the NHK display that a 'Corrupted EEPROM' message has been received.

'Corrupted EEPROM' received Y/N _____________

Now enable the HV commanding again and try to command a voltage up with

```
/iHVEnable On
/iHVAutoRamp Vcathode, Value=396
```

Check on the NHK display that a 'HV Calibration Data Failure' message has been received.

'HV Calibration Data Failure' received Y/N _____________

Also check on the hardware simulator that the cathode voltage does not ramp up.

Cathode voltage ramps up Y/N________________

Disable HV commanding with

```
/iHVEnable Off
```

If all the responses above are Y, Y and N respectively then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

Don't forget to reload the good HV tables, and to re-enable range checking for the commands in ITOS.