SWIFT-UVOT

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SWIFT-UVOT ICU CODE BUILD 5 TEST PLAN

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1. INTRODUCTION AND TEST ENVIRONMENT

This test is designed to cover Swift-UVOT ICU software function, to flight level.

All sections should be run on the telescope simulator, running configuration file hv0vc0fw0.dat, the software DPU simulator and the Spectrum Astro spacecraft simulator, unless otherwise stated.

Nominal values for UVOT currents are (write in as appropriate for current test set up);
Vcathode
Vmcp1
Vmcp23
Flood LED

Nominal values for the safety circuit are (write in as appropriate for current test set up);

For some of these tests the spacecraft time will be altered to enable a particular planetary/solar/lunar configuration scenario to be used. After these have been done a manual reset of the spacecraft time will be necessary, and this must be calculated at the reset time. As a baseline measurement;
Midnight beginning 1st February 2002 is 1063238404 seconds on the spacecraft clock.

Two other separate tests are provided, the Filter Wheel Special Test and the HV Special Test. These should be performed before this test, with as much of the real hardware as possible.

2. TIME

2.1 1PPS

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Check on the spacecraft display that 1PPS A is being used.

1PPS A used Y/N____________

Turn off 1PPS A and turn on 1PPS B using
`/iTimesync Enable=Off, Channel=0`

Check that UVOT switches to using 1PPS B.

Switches to 1PPS B Y/N____________

Return to 1PPS A using
`/iTimesync Enable=On, Channel=0`

Check on the spacecraft display that 1PPS A is being used.

1PPS A used Y/N____________

Disconnect 1PPS A.

Check on the spacecraft display that after 2s UVOT automatically switches to using 1PPS B, and that an NHK 'Timesync too long since' message is received.

Switches to 1PPS B after 2s Y/N____________
'Timesync too long since' received Y/N_______

Connect up the 1PPS hardware simulator.

Check on the spacecraft display that 1PPS A is being used.

1PPS A used Y/N____________

Configure the 1PPS simulator to interrupt 1PPS A twice in one second.

Check that UVOT automatically switches to using 1PPS B.

Switches to 1PPS B Y/N___________

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

2.2 TIMETONE alterations

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Note the timestamp on the next housekeeping packet that arrives __________________

Change the UTC Delta using
`/SDISCLKMOD seconds=5`

Note the timestamp on the subsequent housekeeping packet __________________

The difference between the two timestamps should be 15 seconds

15s difference Y/N________________

Reset the UTC Delta using
`/SDISCLKMOD seconds=-5`

Note the timestamp on the subsequent housekeeping packet __________________

The difference between the two timestamps should be 5 seconds

5s difference Y/N________________

Try to command the spacecraft time to alter to a too large value using
`Start changetimes`

Check on the NHK display that a 'Timesync Overflow' message has been received.

'Timesync Overflow' received Y/N__________

Reset clock to a sensible value using
`/SDISCLKSET seconds=1146528004`

Command the spacecraft time to jump forwards using
`/SDISCLKMOD seconds=600`

Check on the NHK display that a 'Timesync Jump' message has been received.

'Timesync Jump' received Y/N__________

Edit the code to force out a 'Timesync Too Late' message, and run this test code.

'Timesync Too Late' received Y/N__________

Reload normal flight code.

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

3. FAST TELECOMMANDING

3.1 Tasks

NB: Fast commanding of the filter wheel will take place in the FW Special Test

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

From the housekeeping display write down the number of good and bad telecommands received so far;
TC Good_________
TC Bad__________

Run the ITOS script fastcommands.proc with the command
```
Start fastcommands
```

From the housekeeping display write down the number of good and bad telecommands received now;
TC Good_________
TC Bad__________

Check on the NHK display that no error messages have been received (‘Busy’ is acceptable).

NHK error messages received Y/N__________

Check that the following are all as stated;

Limit checking on Y/N_____________
DPU task on Y/N________________
Watchdog on Y/N_________________
Heater control on Y/N_____________
RTS Trace off Y/N_______________
HK rate 1 per 10s Y/N_____________

If the number of good telecommands has increased by 64, the number of bad telecommands has increased by 2, no unexpected NHK error messages have been received, and the final block of responses are all Y’s then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

4. MEMORY

EEPROM A was thoroughly tested during the PROM test, and so does not need testing here. Only boundary checks need to be performed on EEPROM B.

4.1 EEPROM B boundary checks

NB – This test overwrites some of the star catalogue, which must be reloaded afterwards.

Open packet dump screens for memory dumps and CRCs using

```
Pktdump vc0 0x390
Pktdump vc0 0x391
```

Check RAM briefly (already checked in some detail during the PROM test) by sending the commands

```
/iICUDump Mid=0, Offset=0x2000, Numbytes=5, APID=0x390
/iICUCRC Mid=0, Offset=0x2000, Length=5, APID=0x391
```

Write down the five dumped values here:___________________________________

Check that the five values dumped do give the CRC value given.

CRC is consistent with five dumped values Y/N______________

Run the ITOS script checkeepromb.proc line by line with the command

```
Start checkeepromb halted
```

In the first block of commands, after each dump or CRC command, check the values that are dumped with the list below;

Dump 1 – 0x52, 0x53, 0x54 and any other 7 values – Y/N_______________
CRC 1 – 0x424E – Y/N____
Dump 2 – a value, 0x55, 0x56, 0x57 and any other 6 values – Y/N________
Dump 3 - 0x55, 0x56, 0x57 and any other 7 values – Y/N_______________
Dump 4 - 0x56, 0x57 and any other 8 values – Y/N____________________
Dump 5 - 0x55, 0x58, 0x59, 0x5A and any other 6 values – Y/N__________
Dump 6 - 0x58, 0x59, 0x5A and any other 7 values – Y/N_______________
CRC 2 – 0x04C6 – Y/N____
CRC 3 – 0xB873 – Y/N____
Dump 7 - 0x5B, 0x5C, 0x5D and any other 7 values – Y/N_______________
Dump 8 - 0x5C, 0x5D and any other 8 values – Y/N____________________
Dump 9 - 0x5B, 0x5E, 0x5F, 0x60 and any other 6 values – Y/N__________
Dump 10 - 0x5E, 0x5F, 0x60 and any other 7 values – Y/N_______________
CRC 4 – 0x1908 – Y/N____

CRC 5 – 0x6A15 – Y/N____
Dump 11 - 0x61, 0x62, 0x63 and any other 7 values – Y/N________________
Dump 12 - 0x62, 0x63 and any other 8 values – Y/N_____________________
Dump 13 - 0x61, 0x64, 0x65, 0x66 and any other 6 values – Y/N__________
CRC 6 – 0xC635 – Y/N____
CRC 7 – 0xFF68– Y/N____
Dump 14 - 0x64, 0x65, 0x66 and any other 7 values – Y/N________________
Dump 15 – any 13 values, then 0x67, 0x68 – Y/N______________________
Dump 16 – 0x69 – Y/N____
Dump 17 – 0x6A – Y/N____
Dump 18 – 0x68, 0x6A – Y/N____
CRC 8 – 0xD0E3 – Y/N____

For the second block of commands, check that all five are rejected.

Command 1 rejected Y/N_________________
Command 2 rejected Y/N_________________
Command 3 rejected Y/N_________________
Command 4 rejected Y/N_________________
Command 5 rejected Y/N_________________

For the third block, check that all four commands complete successfully. There is no need to check all the output. These will take some time. Also check before command 1 that in housekeeping task mem dump is asleep and its task counter is not increasing, whilst during the first commanded dump this task comes alive and the counter increases.

Before command 1, mem dump task asleep Y/N____________
And mem dump task counter unchanging Y/N________

During command 1, mem dump task alive Y/N____________
And mem dump task counter increases Y/N__________

Command 1 completed Y/N_________________
Command 2 completed Y/N_________________
Command 3 completed Y/N_________________
Command 4 completed Y/N_________________

For the fourth block, check that both commands receive an 'Unsuccessful Acceptance' verification message, due to 'invalid length'.

Command 1 has invalid length Y/N___________
Command 2 has invalid length Y/N___________

NB It would be possible to run test 17.16 now without editing code, as the star catalogue is currently in a seriously corrupted state.

Reload the star catalogue, addendum and pointer table before running any other tests, using

```
load "cat.img"
load "addendum.img"
load "pointers.img"
```

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

4.2 Dump during load

Start a long memory dump using
`/iICUDump Mid=5, Offset=0, Numbytes=0xFFFF, APID=0x390`

While this is running, command a load using
`Load "pointers.img"`

Check the NHK display for a 'Busy' message.

'Busy' received Y/N_____________

If the response above is Y then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

5. HOUSEKEEPING

5.1 Contents

Note that this is a very awkward test. There are 179 different items in each housekeeping packet. Some of them are tested in other tests in this document, so they do not appear here. Some will always keep the same value and only need to be tested once. Some increment, and only the rate of increment is important, not the absolute value. To cover all possibilities three valid housekeeping configuration files, one with all values as high as possible, one with all values low, one mid-range have been prepared. Each one should be run once and each item given checked against its expected value. The items whose value never changes are only checked in the mid-range test. The DPU temperature and voltage flags can each take one of four values, each of which must be tested. Consequently, once the mid-range test has been run, four subtests, one for each flag setting, must be done with the mid-range configuration files. With the same configuration files, the code must also be edited to change the settings of Version Basic and version Oper, and another subtest run to check that these are picked up correctly. The filter wheel counter is only checked in the high range test, as its lower ranges are tested in the safing tests. The values of iSC1553Ints, iSC1553IHTC and iSC1553TCPckt should be the same, or within 1 of each other, at all times. Finally watchdog tasks 15 to 24 and software tasks 15 to 24 are spares and do not need to be tested.

<u>Test 1, all values low</u>

Run the telescope simulator with valid housekeeping configuration file hk_all_low.dat. Check that the values displayed on the telescope simulator window are the same as those given in the table below – if they are not, check against the configuration file and make any alterations necessary to get agreement before running this test. Enter a low range set of values (A to D channels, parity errors and reserves, mode and submode) into the DPU simulator, as defined in the table below.
Check one housekeeping packet against the configuration file to make sure that they are the same.

Note that in the case of incrementing values, there may be some beating with the housekeeping display, and so the value given should be an average over several packets. It is given in the table below as a decimal value.

All values that are indicated in hex in the housekeeping are given in hex here.

Variable	**Description**	**Value or increase in value seen**	**Value or increase in value expected**	**Are values seen and expected the same Y/N**

iBPETemp	BPE Thermistor Readings		0	
iBPERefBTemp	BPE Thermistor Readings		0	
iBPERefCTemp	BPE Thermistor Readings		0	
iBPEMainTemp	BPE Thermistor Readings		0	
iBPEForward1Temp	BPE Thermistor Readings		0	
iBPEForward2Temp	BPE Thermistor Readings		0	
iBPECCDTemp	BPE Thermistor Readings		0	
iBPERefATemp	BPE Thermistor Readings		0	
iHVmcp1	Vmcp1		0	
iHVmcp23	Vmcp23		0	
iHVCathode	Vcathode		0	
iLVPlus5	Low Voltage +5		0	
iLVPlus15	Low Voltage +15		0	
iLVMinus15	Low Voltage -15		0	
iLVRef	Low Voltage 1.23 V Reference		0	
iFWPickOff	F/W Analogue Pick-Off		0	
iBPEIntegratNbld	BPE Integration Enabled		0	
iBPEAcqMode	BPE Acquisition Mode		0	
iBPEFrameTagNbld	Frame Tag Enabled		1	
iBPECentrdTblOk	Centroid Table Access		0	
iBPECamStarted	Camera Started/No Window Tble Access		0	
iTMPSUPlus28	+28V Rail Current		0	
iTMPSUPlus11	+11V Rail		0	

	Current			
iTMPSUPlus15	+15V Rail Current		0	
iTMPSUMinus15	-15V Rail Current		0	
iTMPSUPlus5B	+5VB Rail Current		0	
iTMPSUPlus5A	+5VA Rail Current		0	
iTMPSUMinus5A	-5VA Rail Current		0	
iTMPSUDisMon	DISMON, Ballast Resistor Temp Comparitor Status		0	
iSC1553Ints	1553 Interrupt Count		Increments by 60 per packet	
iSC1553IHTC	1553 IHTC Count		Increments by 60 per packet	
iSC1553TCPckt	1553 TC Packet Count		Increments by 60 per packet	
iDPUMode	DPU Mode		0	
iDPUSubMode	DPU SubMode		0	
iDPUTempPSUA	DPU Temp PSU A		0	
iDPUTempPSUB	DPU Temp PSU B		0	
iDPUTempICUCPU	DPU Temp ICU CPU Module		0	
iDPUTempICUIF	DPU Temp ICU I/F Module		0	
iDPUTempComm	DPU Temp DPU Comm/Mem Module		0	
iDPUTempRes1	DPU Temp Reserve 1		0	
iDPUTempRes2	DPU Temp Reserve 2		0	
iDPUPlus5VA	DPU Voltage PSU A +5V		0	
iDPUPlus5VB	DPU Voltage PSU B +5V		0	
iDPUPlus12VA	DPU Voltage PSU A +12V		0	
iDPUMinus12VA	DPU Voltage PSU A -12V		0	
iDPUPlus5VRef	DPU Voltage PSU +5V Ref		0	
iDPUMinus5VRef	DPU Voltage PSU -5V Ref		0	
iDPUPowerRes	DPU Power		0	

	Reserve			
iDPUParityErrors	DPU Parity Errors		0	
iDPURes1	DPU Reserve 1		0	
iDPURes2	DPU Reserve 2		0	

If all responses in column 5 of the table above are Y's then the test is successful.

Test Successful _____________

Initials ______________ Date ______________ Time __________________

Test 2, all values mid-range

Run the telescope simulator with valid housekeeping configuration file hk_in_limits.dat. Check that the values displayed on the telescope simulator window are the same as those given in the table below – if they are not, check against the configuration file and make any alterations necessary to get agreement before running this test. Enter a mid range set of values (A to D channels, parity errors and reserves, mode and submode) into the DPU simulator, as defined in the table below.

Check one housekeeping packet against the configuration file to make sure that they are the same.

Note that in the case of incrementing values, there may be some beating with the housekeeping display, and so the value given should be an average over several packets. It is given in the table below as a decimal value.

All values that are indicated in hex in the housekeeping are given in hex here.

Variable	**Description**	**Value or increase in value seen**	**Value or increase in value expected**	**Are values seen and expected the same Y/N**
iDebugIntCntr	Debug Int Counter (HK SID)		Increments by 35 per packet	
iBPETemp	BPE Thermistor Readings		0x1F8	
iBPERefBTemp	BPE Thermistor Readings		0x1F9	

iBPERefCTemp	BPE Thermistor Readings		0x1FA	
iBPEMainTemp	BPE Thermistor Readings		0x1FB	
iBPEForward1Temp	BPE Thermistor Readings		0x1FC	
iBPEForward2Temp	BPE Thermistor Readings		0x1FD	
iBPECCDTemp	BPE Thermistor Readings		0x1FE	
iBPERefATemp	BPE Thermistor Readings		0x1FF	
iHVmcp1	Vmcp1		0x201	
iHVmcp23	Vmcp23		0x202	
iHVCathode	Vcathode		0x200	
iLVPlus5	Low Voltage +5		0x203	
iLVPlus15	Low Voltage +15		0x204	
iLVMinus15	Low Voltage -15		0x205	
iLVRef	Low Voltage 1.23 V Reference		0x206	
iFWPickOff	F/W Analogue Pick-Off		0x207	
iBPEIntegratNbld	BPE Integration Enabled		1	
iBPEAcqMode	BPE Acquisition Mode		3	
iBPEFrameTagNbld	Frame Tag Enabled		0	
iBPECentrdTblOk	Centroid Table Access		1	
iBPECamStarted	Camera Started/No Window Tble Access		1	
iBPEEventThold	Event Detect Threshold		0	
iHtrMetering	Metering Rods Htr		0	
iHtrSecondary	Secondary Mirror Htr		0	
iDMCounter	Dichroic Position Counter		0	

iOnePPSSyncStat	Time Sync Status		0	
iOnePPSSyncChan	Time Sync Channel		0	
iTMPSUPlus28	+28V Rail Current		0x7C	
iTMPSUPlus11	+11V Rail Current		0x7D	
iTMPSUPlus15	+15V Rail Current		0x7E	
iTMPSUMinus15	-15V Rail Current		0x7F	
iTMPSUPlus5B	+5VB Rail Current		0x80	
iTMPSUPlus5A	+5VA Rail Current		0x81	
iTMPSUMinus5A	-5VA Rail Current		0x82	
iTMPSUDisMon	DISMON, Ballast Resistor Temp Comparitor Status		0x83	
iSSISent	SSI Sent Count		0	
iOnePPSInts	1 PPS A Interrupt Count		0	
iOnePPSInts2	1 PPS B Interrupt Count (Redundant)		0	
iSC1553Ints	1553 Interrupt Count		Increments by 60 per packet	
iSC1553IHTC	1553 IHTC Count		Increments by 60 per packet	
iSC1553TCPckt	1553 TC Packet Count		Increments by 60 per packet	
iUVOTState	UVOT State		0	
iActiveDEM	Active DEM		1	
iDPUHeartbeats	DPU Heartbeat Counts		Increments by 1 per packet	
iDPUMode	DPU Mode		0x7F	
iDPUSubMode	DPU SubMode		0x7F	
iDPUTempPSUA	DPU Temp PSU A		0x810	
iDPUTempPSUB	DPU Temp PSU B		0x820	
iDPUTempICUCPU	DPU Temp ICU CPU Module		0x830	
iDPUTempICUIF	DPU Temp ICU		0x840	

	I/F Module			
iDPUTempComm	DPU Temp DPU Comm/Mem Module		0x850	
iDPUTempRes1	DPU Temp Reserve 1		0x860	
iDPUTempRes2	DPU Temp Reserve 2		0x870	
iDPUPlus5VA	DPU Voltage PSU A +5V		0x880	
iDPUPlus5VB	DPU Voltage PSU B +5V		0x890	
iDPUPlus12VA	DPU Voltage PSU A +12V		0x900	
iDPUMinus12VA	DPU Voltage PSU A -12V		0x910	
iDPUPlus5VRef	DPU Voltage PSU +5V Ref		0x920	
iDPUMinus5VRef	DPU Voltage PSU -5V Ref		0x930	
iDPUPowerRes	DPU Power Reserve		0x940	
iDPUParityErrors	DPU Parity Errors		0x7FFF	
iDPURes1	DPU Reserve 1		0x950	
iDPURes2	DPU Reserve 2		0x960	
iSCVoltage	S/C Voltage		0	
iACSCount	ACS Counter		Increments by 50 per packet	
iTimetoneCount	Timetone Counter		Increments by 10 per packet	
iWatchdogTsk01	Task TCQ Monitored by Watchdog		Alive	
iWatchdogTsk02	Task HV_Ramp Monitored by Watchdog		Asleep	
iWatchdogTsk03	Task DPU_Mntr Monitored by Watchdog		Alive	
iWatchdogTsk04	Task Htr_Cntrol Monitored by Watchdog		Alive	
iWatchdogTsk05	Task Limit_Chck Monitored by Watchdog		Alive	
iWatchdogTsk06	Task Mechanism		Asleep	

	Monitored by Watchdog			
iWatchdogTsk07	Task Feed_1553 Monitored by Watchdog		Alive	
iWatchdogTsk08	Task HK Monitored by Watchdog		Alive	
iWatchdogTsk09	Task Mem Dump Monitored by Watchdog		Asleep	
IWatchdogTsk10	Task DCS Monitored by Watchdog		Asleep	
IWatchdogTsk11	Task Load Centroid Monitored by Watchdog		Asleep	
IWatchdogTsk12	Task Load Window Monitored by Watchdog		Asleep	
IWatchdogTsk13	Task Feed SSI Monitored by Watchdog		Asleep	
IWatchdogTsk14	Task Star Cat Monitored by Watchdog		Asleep	
iDebug1stEx	Debug First Exception		0	
iDebug1stProg	Debug First Progress		0	
iSWTaskCntr01	S/w task TCQ counter		Increments by 60 per packet	
iSWTaskCntr02	S/w task HV_Ramp counter		1	
iSWTaskCntr03	S/w task DPU_Mntr counter		Increments by 1 per packet	
iSWTaskCntr04	S/w task Htr_Cntrol counter		Increments by 10 per packet	
iSWTaskCntr05	S/w task Limit_chck counter		Increments by 6 per packet	
iSWTaskCntr06	S/w task Mechanism counter		1	
iSWTaskCntr07	S/w task Feed_1553 counter		Increments by 10 per packet	
iSWTaskCntr08	S/w task HK		Increments	

	counter		by 7 per packet	
iSWTaskCntr09	S/w task Mem Dump counter		No increment	
ISWTaskCntr10	S/w task DCS counter		No increment	
ISWTaskCntr11	S/w task Load Centroid counter		No increment	
ISWTaskCntr12	S/w task Load Window counter		No increment	
ISWTaskCntr13	S/w task Feed SSI counter		No increment	
ISWTaskCntr14	S/w task Star Cat counter		No increment	
iWatchdogTskCntr	Watchdog Task Counter		Increments by 2 per packet	
H0864SEQCNT	Packet Sequence Count		Increments by 1 per packet	

If all responses in column 5 of the table above are Y's then the test is successful.

Test Successful __________

Initials ______________ Date ______________ Time __________________

<u>Subtest 1, both flags 0</u>

Variable	**Description**	**Value seen**	**Value expected**	**Are values seen and expected the same Y/N**
iDPUTempPSUAF	DPU Temp PSU A Status Flags		00	
iDPUTempPSUBF	DPU Temp PSU B Status Flags		00	
iDPUTempICUCPUF	DPU Temp ICU CPU Module Status Flags		00	
iDPUTempICUIFF	DPU Temp ICU I/F Module Status Flags		00	
iDPUTempCommF	DPU Temp		00	

	DPU Comm/Mem Module Status Flags			
iDPUTempRes1F	DPU Temp Reserve 1 Status Flags		00	
iDPUTempRes2F	DPU Temp Reserve 2 Status Flags		00	
iDPUPlus5VAF	DPU Voltage PSU A +5V Status Flags		00	
iDPUPlus5VBF	DPU Voltage PSU B +5V Status Flags		00	
iDPUPlus12VAF	DPU Voltage PSU A +12V Status Flags		00	
iDPUMinus12VAF	DPU Voltage PSU A -12V Status Flags		00	
iDPUPlus5VRefF	DPU Voltage PSU +5V Ref Status Flags		00	
iDPUMinus5VRefF	DPU Voltage PSU -5V Ref Status Flags		00	
iDPUPowerResF	DPU Power Reserve Status Flags		00	

If all responses in column 5 of the table above are Y's then the test is successful.

Test Successful __________

Initials ______________ Date ______________ Time __________________

Subtest 2, first flag 0, second flag 1

Variable	**Description**	**Value seen**	**Value expected**	**Are values seen and expected the same Y/N**
iDPUTempPSUAF	DPU Temp PSU A Status Flags		01	
iDPUTempPSUBF	DPU Temp PSU B Status Flags		01	
iDPUTempICUCPUF	DPU Temp ICU CPU Module		01	

	Status Flags			
iDPUTempICUIFF	DPU Temp ICU I/F Module Status Flags		01	
iDPUTempCommF	DPU Temp DPU Comm/Mem Module Status Flags		01	
iDPUTempRes1F	DPU Temp Reserve 1 Status Flags		01	
iDPUTempRes2F	DPU Temp Reserve 2 Status Flags		01	
iDPUPlus5VAF	DPU Voltage PSU A +5V Status Flags		01	
iDPUPlus5VBF	DPU Voltage PSU B +5V Status Flags		01	
iDPUPlus12VAF	DPU Voltage PSU A +12V Status Flags		01	
iDPUMinus12VAF	DPU Voltage PSU A -12V Status Flags		01	
iDPUPlus5VRefF	DPU Voltage PSU +5V Ref Status Flags		01	
iDPUMinus5VRefF	DPU Voltage PSU -5V Ref Status Flags		01	
iDPUPowerResF	DPU Power Reserve Status Flags		01	

If all responses in column 5 of the table above are Y's then the test is successful.

Test Successful ________

Initials ______________ Date ______________ Time __________________

Subtest 3, first flag 1, second flag 0

Variable	**Description**	**Value seen**	**Value expected**	**Are values seen and expected the same Y/N**
iDPUTempPSUAF	DPU Temp PSU A Status Flags		10	

iDPUTempPSUBF	DPU Temp PSU B Status Flags		10	
iDPUTempICUCPUF	DPU Temp ICU CPU Module Status Flags		10	
iDPUTempICUIFF	DPU Temp ICU I/F Module Status Flags		10	
iDPUTempCommF	DPU Temp DPU Comm/Mem Module Status Flags		10	
iDPUTempRes1F	DPU Temp Reserve 1 Status Flags		10	
iDPUTempRes2F	DPU Temp Reserve 2 Status Flags		10	
iDPUPlus5VAF	DPU Voltage PSU A +5V Status Flags		10	
iDPUPlus5VBF	DPU Voltage PSU B +5V Status Flags		10	
iDPUPlus12VAF	DPU Voltage PSU A +12V Status Flags		10	
iDPUMinus12VAF	DPU Voltage PSU A -12V Status Flags		10	
iDPUPlus5VRefF	DPU Voltage PSU +5V Ref Status Flags		10	
iDPUMinus5VRefF	DPU Voltage PSU -5V Ref Status Flags		10	
iDPUPowerResF	DPU Power Reserve Status Flags		10	

If all responses in column 5 of the table above are Y's then the test is successful.

Test Successful ________

Initials ______________ Date ______________ Time __________________

Subtest 4, both flags 1

Variable	**Description**	**Value seen**	**Value**	**Are values**

			expected	**seen and expected the same Y/N**
iDPUTempPSUAF	DPU Temp PSU A Status Flags		11	
iDPUTempPSUBF	DPU Temp PSU B Status Flags		11	
iDPUTempICUCPUF	DPU Temp ICU CPU Module Status Flags		11	
iDPUTempICUIFF	DPU Temp ICU I/F Module Status Flags		11	
iDPUTempCommF	DPU Temp DPU Comm/Mem Module Status Flags		11	
iDPUTempRes1F	DPU Temp Reserve 1 Status Flags		11	
iDPUTempRes2F	DPU Temp Reserve 2 Status Flags		11	
iDPUPlus5VAF	DPU Voltage PSU A +5V Status Flags		11	
iDPUPlus5VBF	DPU Voltage PSU B +5V Status Flags		11	
iDPUPlus12VAF	DPU Voltage PSU A +12V Status Flags		11	
iDPUMinus12VAF	DPU Voltage PSU A -12V Status Flags		11	
iDPUPlus5VRefF	DPU Voltage PSU +5V Ref Status Flags		11	
iDPUMinus5VRefF	DPU Voltage PSU -5V Ref Status Flags		11	
iDPUPowerResF	DPU Power Reserve Status Flags		11	

If all responses in column 5 of the table above are Y's then the test is successful.

Test Successful ________

Initials ______________ Date ______________ Time __________________

Subtest 5, change basic and oper version numbers

Use all of the configuration files from test 2 above but edit the code to give the basic version number as 126 (decimal) and the oper version as 60 (decimal). Check that these values are now picked up by the housekeeping.

Variable	**Description**	**Value seen**	**Value expected**	**Are values seen and expected the same Y/N**
iVersionBasic	Basic S/W Version		0x7E	
iVersionOper	Oper S/W Version		0x3C	

If all responses in column 5 of the table above are Y's then the test is successful.

Test Successful _______

Initials ______________ Date ______________ Time __________________

Test 3, all values high

Run the telescope simulator with valid housekeeping configuration file hk_all_high.dat. Check that the values displayed on the telescope simulator window are the same as those given in the table below – if they are not, check against the configuration file and make any alterations necessary to get agreement before running this test. Enter a high range set of values (A to D channels, parity errors and reserves, mode and submode) into the DPU simulator, as defined in the table below.

Check one housekeeping packet against the configuration file to make sure that they are the same.

Note that in the case of incrementing values, there may be some beating with the housekeeping display, and so the value given should be an average over several packets. It is given in the table below as a decimal value.

All values that are indicated in hex in the housekeeping are given in hex here.

Variable	**Description**	**Value or increase in value seen**	**Value or increase in value expected**	**Are values seen and expected the same Y/N**
iBPETemp	BPE Thermistor		0x3FF	

	Readings			
iBPERefBTemp	BPE Thermistor Readings		0x3FF	
iBPERefCTemp	BPE Thermistor Readings		0x3FF	
iBPEMainTemp	BPE Thermistor Readings		0x3FF	
iBPEForward1Temp	BPE Thermistor Readings		0x3FF	
iBPEForward2Temp	BPE Thermistor Readings		0x3FF	
iBPECCDTemp	BPE Thermistor Readings		0x3FF	
iBPERefATemp	BPE Thermistor Readings		0x3FF	
iHVmcp1	Vmcp1		0x3FF	
iHVmcp23	Vmcp23		0x3FF	
iHVCathode	Vcathode		0x3FF	
iLVPlus5	Low Voltage +5		0x3FF	
iLVPlus15	Low Voltage +15		0x3FF	
iLVMinus15	Low Voltage -15		0x3FF	
iLVRef	Low Voltage 1.23 V Reference		0x3FF	
iFWPickOff	F/W Analogue Pick-Off		0x3FF	
iBPEIntegratNbld	BPE Integration Enabled		1	
iBPEAcqMode	BPE Acquisition Mode		7	
iBPEFrameTagNbld	Frame Tag Enabled		0	
iBPECentrdTblOk	Centroid Table Access		1	
iBPECamStarted	Camera Started/No Window Tble Access		1	
iFWCounter	F/W Position Counter		Blank	
iTMPSUPlus28	+28V Rail Current		0xFF	
iTMPSUPlus11	+11V Rail		0xFF	

	Current			
iTMPSUPlus15	+15V Rail Current		0xFF	
iTMPSUMinus15	-15V Rail Current		0xFF	
iTMPSUPlus5B	+5VB Rail Current		0xFF	
iTMPSUPlus5A	+5VA Rail Current		0xFF	
iTMPSUMinus5A	-5VA Rail Current		0xFF	
iTMPSUDisMon	DISMON, Ballast Resistor Temp Comparitor Status		0xFF	
iSC1553Ints	1553 Interrupt Count		Increments by 60 per packet	
iSC1553IHTC	1553 IHTC Count		Increments by 60 per packet	
iSC1553TCPckt	1553 TC Packet Count		Increments by 60 per packet	
iDPUMode	DPU Mode		0xFF	
iDPUSubMode	DPU SubMode		0xFF	
iDPUTempPSUA	DPU Temp PSU A		0xFFF	
iDPUTempPSUB	DPU Temp PSU B		0xFFF	
iDPUTempICUCPU	DPU Temp ICU CPU Module		0xFFF	
iDPUTempICUIF	DPU Temp ICU I/F Module		0xFFF	
iDPUTempComm	DPU Temp DPU Comm/Mem Module		0xFFF	
iDPUTempRes1	DPU Temp Reserve 1		0xFFF	
iDPUTempRes2	DPU Temp Reserve 2		0xFFF	
iDPUPlus5VA	DPU Voltage PSU A +5V		0xFFF	
iDPUPlus5VB	DPU Voltage PSU B +5V		0xFFF	
iDPUPlus12VA	DPU Voltage PSU A +12V		0xFFF	
iDPUMinus12VA	DPU Voltage PSU A -12V		0xFFF	
iDPUPlus5VRef	DPU Voltage PSU +5V Ref		0xFFF	
iDPUMinus5VRef	DPU Voltage PSU -5V Ref		0xFFF	
iDPUPowerRes	DPU Power		0xFFF	

	Reserve			
iDPUParityErrors	DPU Parity Errors		0xFFFF	
iDPURes1	DPU Reserve 1		0xFFFF	
iDPURes2	DPU Reserve 2		0xFFFF	

If all responses in column 5 of the table above are Y's then the test is successful.

Test Successful _______

Initials ______________ Date ______________ Time __________________

5.2 Copy to TDRSS

Open two packet dump windows using

```
Pktdump vc0 0x3C1
Pktdump vc0 0x362
```

Make a note of the TDRSS counter value from housekeeping here ____________

Send a copy of the next HK packet to TDRSS using

```
/iHKTDRSS Packets=1
```

Check that the TDRSS counter increases by 1

TDRSS Counter increases by 1 Y/N____________

Check that a packet appears in the 0x3C1 packet dump window, and that, except for the header, this packet is identical to the corresponding packet in the 0x360 window.

TDRSS HK copy packet appears Y/N___________
TDRSS copy identical to standard HK Y/N_______

Send the command

```
/iHKTDRSS Packets=0
```

Check that this is rejected ie no packets appear.

TDRSS HK copy packet appears Y/N________

Send the command

```
/iHKTDRSS Packets=301
```

Check that this is rejected ie no packets appear.

TDRSS HK copy packets appear Y/N________

Send the maximum allowed number of packets to TDRSS using

```
/iHKTDRSS Packets=300
```

Check that packets appear in the packet dump window.

TDRSS HK copy packets appear Y/N________

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

Test Successful Y/N__________

Initials _____________ Date _____________ Time ________________

5.3 Rate changes

First use a sequence print or the packet dump window in ITOS to examine two successive housekeeping packets. Check that the sequence count of the second is one greater than the sequence count of the first, and that the timestamp on the second is 1s greater than that on the first. Also check the packet length on one of them – it should be 223.

Sequence count of second packet 1 greater than that of first Y/N_________
Timestamp of second packet 10s greater than that of first Y/N____________
Packet length is 223 Y/N____

Command housekeeping rate to be 1 per 4, 6, 10, 60 and 100s.
`Eg /iHKRate Rate=4`

Check the housekeeping telemetry at each rate.
Check the rate the housekeeping packets are arriving at, with a stopwatch for a rough guide, or by examining their timestamps. Note that due to timing matters on the display and elsewhere a jitter of +/- 1s on the observed timestamp is acceptable.

Requested housekeeping rate	**Observed housekeeping rate**	**Requested and observed rates are the same Y/N**
1 per 4s		
1 per 6s		
1 per 10s		
1 per 60s		
1 per 100s		

Disable range checking on the iHKRate command in ITOS.
Check that illegal rates are rejected by commanding the rate to be 1 per 0, 3, 101 and 200s.

In each case an 'Illegal Parameter Values' NHK message should be received.

Requested housekeeping rate	**'Illegal Parameter Values' received Y/N**
1 per 0s	
1 per 3s	
1 per 101s	
1 per 200s	

Re-enable range checking on the iHKRate command in ITOS.

If all responses above and in column 3 of the first table and column 2 of the second table above are Y's then the test is successful.

Test Successful Y/N__________

Initials _____________ Date _____________ Time ________________

5.4 Stop and start

Command the housekeeping to stop using.
`/iHKOff`

Check that no housekeeping packets arrive.

HK packets arrive Y/N____________________

Wait 2 minutes, then command housekeeping to start using
`/iHKOn`

Check that housekeeping packets start arriving within 30s.

HK packets start arriving within 20s Y/N_______

Wait 2 minutes, then command housekeeping to start when started using
`/iHK Enable=On`

Check that the housekeeping continues.

HK packets keep arriving Y/N_______________

Wait 2 minutes, then command housekeeping to stop when started using
`/iHK Enable=Off`

Check that the housekeeping stops within 20s.

HK packets stop arriving within 20s Y/N________

Wait 2 minutes, then command housekeeping to stop when stopped using
`/iHKOff`

Check over 1 minute that the housekeeping stays stopped.

HK packets stay stopped Y/N________________

Wait 2 minutes, then command housekeeping to start after stoppage (this is different from starting it after a stop at initial switch on, as the system is in a different state in this case) using
`/iHKOn`

Check that the housekeeping starts within 20s.

HK packets start arriving within 20s Y/N________

If the first response above is a N and all other responses are Y's then the test is successful.

Test Successful Y/N__________

Initials ______________ Date ______________ Time __________________

5.5 Task

Command a long memory dump using
`/iICUDump Mid=0, Offset=0, NumBytes=0xFFFF, APID=0x390`

Check that the housekeeping rate is normal by examining the timestamps in housekeeping under iTIME and iSUBSECS – the packets should arrive one every 10s

HK packets arriving 1 per 10s Y/N__________

If the above response is Y then the test is successful.

Test Successful _______

Initials ______________ Date ______________ Time __________________

6. DPU

Note that the processing of DPU commands is the responsibility of the DPU team. The tests in this section are only concerned with checking that these commands can be passed by the ICU to the DPU correctly.

6.1 DPU Task

Check on the housekeeping display that the DPU task and data manager are enabled, and that the DPU Task counter increases by 10 per hk packet.

DPU task enabled Y/N_________________
DPU Data Manager enabled Y/N______________
DPU Task counter increases by 10 per hk packet Y/N____________

Send the command
```
/iDPUTask Enable=Off
```

Check on the housekeeping display that the DPU task and monitor are disabled, and that the DPU task counter does not increase.

DPU task disabled Y/N_________________
DPU Monitor disabled Y/N______________
DPU task counter unchanging Y/N________

Again send the command
```
/iDPUTask Enable=Off
```

Check on the housekeeping display that the DPU task is still disabled.

DPU task disabled Y/N_________________

Send the command
```
/iDPUTask Enable=On
```

Check on the housekeeping display that the DPU task is enabled again.

DPU task enabled Y/N_________________

Again send the command
```
/iDPUTask Enable=On
```

Check on the housekeeping display that the DPU task is still enabled.

DPU task enabled Y/N_________________

If the responses above are all Y's then the test is successful.

Test Successful Y/N_________

Initials _____________ Date _____________ Time _________________

6.2 DPU Mode

Run the ITOS script testdpumode.proc using
`Start testdpumode`

Check on the housekeeping display that the DPU does not crash. Check on the DPU display that 'DPU Mode Ready' and 'DPU Mode Complete' messages are received.

DPU crashed Y/N___________________
'DPU Mode Ready' received Y/N_______
'DPU Mode Complete' received Y/N_____

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

Test Successful Y/N_________

Initials _____________ Date _____________ Time _________________

6.3 Other commands

Make a note from the housekeeping display of the Feed SSI task counter value ________

Send the command
`/iDPUStop`

Check on the housekeeping display that the Feed SSI task counter has increased by 1.

Feed SSI task counter increased by 1 Y/N____________

Check that a verification 'Successful Acceptance' message and a DPU ACK message are received.

'Successful Acceptance' received Y/N__________
DPU ACK received Y/N_____________________

Send the command
`/iDPUPurgeDCX`

Check that a verification 'Successful Acceptance' message and a DPU ACK message are received.

'Successful Acceptance' received Y/N__________
DPU ACK received Y/N_____________________

Send the command
`/iDPUPurgeSci`

Check that a verification 'Successful Acceptance' message and a DPU ACK message are received.

'Successful Acceptance' received Y/N__________
DPU ACK received Y/N_____________________

Run the ITOS script testdpuxrtpos.proc using
`Start testdpuxrtpos`

Check that a verification 'Successful Acceptance' message and a DPU ACK message are received.

'Successful Acceptance' received Y/N__________
DPU ACK received Y/N_____________________

Send the command
`/iDPUAbort`

Check that a verification 'Successful Acceptance' message and a DPU ACK message are received.

'Successful Acceptance' received Y/N__________
DPU ACK received Y/N_____________________

Send the command
`/iDPUNoop`

Check that a verification 'Successful Acceptance' message and a DPU ACK message are received.

'Successful Acceptance' received Y/N__________
DPU ACK received Y/N_____________________

Send the command
`/iDPUReboot`

Wait 3 minutes, then check on the housekeeping display that the DPU is sending heartbeats, and check on the DPU display that a 'DPU Boot Complete' message is received.

DPU heartbeats restart Y/N__________________
'DPU Boot Complete' received Y/N___________

If all the responses above are Y's then the test is successful.

Test Successful Y/N__________

Initials ______________ Date ______________ Time __________________

6.4 Other messages

Edit the code to force out a 'DPU NAK' NHK message, and run this test code.

'DPU NAK' received Y/N__________

Edit the code to force out a 'DPU Timeout' NHK message, and run this test code.

'DPU Timeout' received Y/N__________

Edit the code to force out a 'DPU Incorrect ACK' NHK message, and run this test code.

'DPU Incorrect ACK' received Y/N__________

Edit the code to force out a 'DPU Unexpected ACK NAK' NHK message, and run this test code.

'DPU Unexpected ACK NAK' received Y/N__________

Edit the code to force out a 'DPU Inconsistent APID ID' NHK message, and run this test code.

'DPU Inconsistent APID ID' received Y/N__________

Edit the code to force out a 'DPU Invalid APID or ID' NHK message, and run this test code.

'DPU Invalid APID or ID' received Y/N__________

Alter the DPU simulator so it always responds to the DPU aliveness test with a NAK.

Send the aliveness test.
`/iDPUNoop`

Check on the NHK display that a NAK is received, and forwarded by the ICU.

NAK received Y/N_____________
NAK forwarded Y/N____________

Check that the ICU retries the aliveness test twice and then gives up.

ICU retries twice Y/N_________
ICU discontinues retrying Y/N_______

If all the responses above are Y's then the test is successful.

Test Successful Y/N__________

Initials ______________ Date ______________ Time __________________

6.5 Heartbeat monitor

Load flight code icu.hex

Command the ICU to the idle state
`/istate state=idle`

Make sure from the NHK display that DPU heartbeats are on and being forwarded.

DPU heartbeats being forwarded Y/N__________

Switch off the DPU heartbeats, and make sure that the ICU safes itself.

ICU goes to safe Y/N_____________

Restart the DPU heartbeats.

Check on the housekeeping display that the heartbeat monitor value is increasing between successive updates.

Heartbeat monitor value increasing Y/N___________

Upload a new table to stop the heartbeat monitor.

Load flight code icu.hex

Check on the housekeeping display that the heartbeat monitor value is static between successive updates.

Heartbeat monitor value static Y/N___________

Reload the standard table, to restart the heartbeat monitor.

If all the responses above are Y's then the test is successful.

Test Successful Y/N__________

Initials ______________ Date ______________ Time __________________

7. EXCEPTIONS

7.1 Main ada program

Force an Ada exception by making a divide by zero error in the main loop of icu.ada. Recompile this test version of the code and run it.
Make sure that the code doesn't crash.
Make sure that an nhk packet arrives detailing a constraint error, with package code 0x10, error 0xEC, Param1 0x1000, Param2 0x1000 and last progress the same as the last progress before where the code causing the exception was inserted. Eg if the divide by zero was inserted at line 50, and the last progress before that was 40, then the nhk packet should give the last progress as 40. Also make sure an hk packet arrives with debug first exception set to the same as nhk Param1 and debug first progress set to the same as nhk Param3 .

	Result	**Expected result**	**Are result and expected result the same Y/N**
Code crashes Y/N		N	
NHK packet arrives Y/N		Y	
NHK pkg value		0x10	
NHK err value		0xEC	
NHK Param1 value		0x1000	
NHK Param2 value		0x1000	
Last progress in code before error inserted		Any value is permitted	
Last progress reached when running (ie NHK Param3 value)		The same value as was written in for 'last progress in code before error inserted'	
HK iDebug1stEx value		0x1000	
HK iDebug1stProg value		The same value as was written in for 'last progress in code before error inserted'	

If all the responses in column 4 of the table above are Y's then the test is successful.

Test Successful Y/N________

Initials ______________ Date ______________ Time __________________

7.2 DPU Data manager

Force an Ada exception by making a divide by zero error in the main loop of DPU_DATA_MANAGER.
Recompile this test version of the code and run it.
Make sure that the code doesn't crash.
Make sure that an NHK packet arrives detailing a constraint error, with package code 0xD0, error 0xEC, Param1 0xD000, Param2 0xD000 and last progress the same as the last progress before where the code causing the exception was inserted. Eg if the divide by zero was inserted at line 50, and the last progress before that was 40, then the NHK packet should give the last progress as 40. Also make sure an hk packet arrives with debug first exception set to the same as nhk Param1 and debug first progress set to the same as nhk Param3 .

	Result	**Expected result**	**Are result and expected result the same Y/N**
Code crashes Y/N		N	
NHK packet arrives Y/N		Y	
NHK pkg value		0xD0	
NHK err value		0xEC	
NHK Param1 value		0xD000	
NHK Param2 value		0xD000	
Last progress in code before error inserted		Any value is permitted	
Last progress reached when running (ie NHK Param3 value)		The same value as was written in for 'last progress in code before error inserted'	
HK iDebug1stEx value		0xD000	
HK iDebug1stProg value		The same value as was written in for 'last progress in code before error inserted'	

If all the responses in column 4 of the table above are Y's then the test is successful.

Test Successful Y/N________

Initials ______________ Date ______________ Time __________________

7.3 Heater Control

Force an Ada exception by making a divide by zero error in the main loop of HEATER_CONTROL.
Recompile this test version of the code and run it.
Make sure that the code doesn't crash.
Make sure that an NHK packet arrives detailing a constraint error, with package code 0x45, error 0xEC, Param1 0x4500, Param2 0x4500 and last progress the same as the last progress before where the code causing the exception was inserted. Eg if the divide by zero was inserted at line 50, and the last progress before that was 40, then the NHK packet should give the last progress as 40. Also make sure an hk packet arrives with debug first exception set to the same as nhk Param1 and debug first progress set to the same as nhk Param3 .

	Result	**Expected result**	**Are result and expected result the same Y/N**
Code crashes Y/N		N	
NHK packet arrives Y/N		Y	
NHK pkg value		0x45	
NHK err value		0xEC	
NHK Param1 value		0x4500	
NHK Param2 value		0x4500	
Last progress in code before error inserted		Any value is permitted	
Last progress reached when running (ie NHK Param3 value)		The same value as was written in for 'last progress in code before error inserted'	
HK iDebug1stEx value		0x4500	
HK iDebug1stProg value		The same value as was written in for 'last progress in code before error inserted'	

If all the responses in column 4 of the table above are Y's then the test is successful.

Test Successful Y/N________

Initials ______________ Date ______________ Time __________________

7.4 Housekeeping type

Force an Ada exception by making a divide by zero error in the main loop of HOUSEKEEPING_TYPE.
Recompile this test version of the code and run it.
Make sure that the code doesn't crash.
Make sure that an NHK packet arrives detailing a constraint error, with package code 0x23, error 0xEC, Param1 0x2300, Param2 0x2300 and last progress the same as the last progress before where the code causing the exception was inserted. Eg if the divide by zero was inserted at line 50, and the last progress before that was 40, then the NHK packet should give the last progress as 40. Also make sure an hk packet arrives with debug first exception set to the same as nhk Param1 and debug first progress set to the same as nhk Param3 .

	Result	**Expected result**	**Are result and expected result the same Y/N**
Code crashes Y/N		N	
NHK packet arrives Y/N		Y	
NHK pkg value		0x23	
NHK err value		0xEC	
NHK Param1 value		0x2300	
NHK Param2 value		0x2300	
Last progress in code before error inserted		Any value is permitted	
Last progress reached when running (ie NHK Param3 value)		The same value as was written in for 'last progress in code before error inserted'	
HK iDebug1stEx value		0x2300	
HK iDebug1stProg value		The same value as was written in for 'last progress in code before error inserted'	

If all the responses in column 4 of the table above are Y's then the test is successful.

Test Successful Y/N________

Initials ______________ Date ______________ Time __________________

7.5 Memory dump type

Force an Ada exception by making a divide by zero error in the main loop of MEMORY_DUMP_TYPE.
Recompile this test version of the code and run it.
Make sure that the code doesn't crash.
Make sure that an NHK packet arrives detailing a constraint error, with package code 0x12, error 0xEC, Param1 0x120A, Param2 0x120A and last progress the same as the last progress before where the code causing the exception was inserted. Eg if the divide by zero was inserted at line 50, and the last progress before that was 40, then the NHK packet should give the last progress as 40. Also make sure an hk packet arrives with debug first exception set to the same as nhk Param1 and debug first progress set to the same as nhk Param3 .

	Result	**Expected result**	**Are result and expected result the same Y/N**
Code crashes Y/N		N	
NHK packet arrives Y/N		Y	
NHK pkg value		0x12	
NHK err value		0xEC	
NHK Param1 value		0x120A	
NHK Param2 value		0x120A	
Last progress in code before error inserted		Any value is permitted	
Last progress reached when running (ie NHK Param3 value)		The same value as was written in for 'last progress in code before error inserted'	
HK iDebug1stEx value		0x120A	
HK iDebug1stProg value		The same value as was written in for 'last progress in code before error inserted'	

If all the responses in column 4 of the table above are Y's then the test is successful.

Test Successful Y/N________

Initials ______________ Date ______________ Time __________________

7.6 Limit Monitoring

Force an Ada exception by making a divide by zero error in the main loop of LIMIT_MONITORING.
Recompile this test version of the code and run it.
Make sure that the code doesn't crash.
Make sure that an NHK packet arrives detailing a constraint error, with package code 0x11, error 0xEC, Param1 0x1100, Param2 0x1100 and last progress the same as the last progress before where the code causing the exception was inserted. Eg if the divide by zero was inserted at line 50, and the last progress before that was 40, then the NHK packet should give the last progress as 40. Also make sure an hk packet arrives with debug first exception set to the same as nhk Param1 and debug first progress set to the same as nhk Param3 .

	Result	**Expected result**	**Are result and expected result the same Y/N**
Code crashes Y/N		N	
NHK packet arrives Y/N		Y	
NHK pkg value		0x11	
NHK err value		0xEC	
NHK Param1 value		0x1100	
NHK Param2 value		0x1100	
Last progress in code before error inserted		Any value is permitted	
Last progress reached when running (ie NHK Param3 value)		The same value as was written in for 'last progress in code before error inserted'	
HK iDebug1stEx value		0x1100	
HK iDebug1stProg value		The same value as was written in for 'last progress in code before error inserted'	

If all the responses in column 4 of the table above are Y's then the test is successful.

Test Successful Y/N________

Initials ______________ Date ______________ Time __________________

7.7 Mech

Force an Ada exception by making a divide by zero error in the main loop of MECH.
Recompile this test version of the code and run it.
Make sure that the code doesn't crash.
Make sure that an NHK packet arrives detailing a constraint error, with package code 0x40, error 0xEC, Param1 0x400A, Param2 0x400A and last progress the same as the last progress before where the code causing the exception was inserted. Eg if the divide by zero was inserted at line 50, and the last progress before that was 40, then the NHK packet should give the last progress as 40. Also make sure an hk packet arrives with debug first exception set to the same as nhk Param1 and debug first progress set to the same as nhk Param3 .

	Result	**Expected result**	**Are result and expected result the same Y/N**
Code crashes Y/N		N	
NHK packet arrives Y/N		Y	
NHK pkg value		0x40	
NHK err value		0xEC	
NHK Param1 value		0x400F	
NHK Param2 value		0x400F	
Last progress in code before error inserted		Any value is permitted	
Last progress reached when running (ie NHK Param3 value)		The same value as was written in for 'last progress in code before error inserted'	
HK iDebug1stEx value		0x400F	
HK iDebug1stProg value		The same value as was written in for 'last progress in code before error inserted'	

If all the responses in column 4 of the table above are Y's then the test is successful.

Test Successful Y/N________

Initials ______________ Date ______________ Time __________________

7.8 TCQ

Force an Ada exception by making a divide by zero error in the main loop of TCQ. Recompile this test version of the code and run it.
Make sure that the code doesn't crash.
Make sure that an NHK packet arrives detailing a constraint error, with package code 0x2C, error 0xEC, Param1 0x2C0F, Param2 0x2C0F and last progress the same as the last progress before where the code causing the exception was inserted. Eg if the divide by zero was inserted at line 50, and the last progress before that was 40, then the NHK packet should give the last progress as 40. Also make sure an hk packet arrives with debug first exception set to the same as nhk Param1 and debug first progress set to the same as nhk Param3 .

	Result	**Expected result**	**Are result and expected result the same Y/N**
Code crashes Y/N		N	
NHK packet arrives Y/N		Y	
NHK pkg value		0x2C	
NHK err value		0xEC	
NHK Param1 value		0x2C0F	
NHK Param2 value		0x2C0F	
Last progress in code before error inserted		Any value is permitted	
Last progress reached when running (ie NHK Param3 value)		The same value as was written in for 'last progress in code before error inserted'	
HK iDebug1stEx value		0x2C0F	
HK iDebug1stProg value		The same value as was written in for 'last progress in code before error inserted'	

If all the responses in column 4 of the table above are Y's then the test is successful.

Test Successful Y/N________

Initials ______________ Date ______________ Time __________________

7.9 Feed 1553 type

Force an Ada exception by making a divide by zero error in the main loop of FEED_1553_TYPE.
Recompile this test version of the code and run it.
Make sure that the code doesn't crash.
Make sure that an NHK packet arrives detailing a constraint error, with package code 0x2F, error 0xEC, Param1 0x2F0A, Param2 0x2F0A and last progress the same as the last progress before where the code causing the exception was inserted. Eg if the divide by zero was inserted at line 50, and the last progress before that was 40, then the NHK packet should give the last progress as 40. Also make sure an hk packet arrives with debug first exception set to the same as nhk Param1 and debug first progress set to the same as nhk Param3 .

	Result	**Expected result**	**Are result and expected result the same Y/N**
Code crashes Y/N		N	
NHK packet arrives Y/N		Y	
NHK pkg value		0x2F	
NHK err value		0xEC	
NHK Param1 value		0x2F0A	
NHK Param2 value		0x2F0A	
Last progress in code before error inserted		Any value is permitted	
Last progress reached when running (ie NHK Param3 value)		The same value as was written in for 'last progress in code before error inserted'	
HK iDebug1stEx value		0x2F0A	
HK iDebug1stProg value		The same value as was written in for 'last progress in code before error inserted'	

If all the responses in column 4 of the table above are Y's then the test is successful.

Test Successful Y/N________

Initials ______________ Date ______________ Time __________________

7.10 Watchdog task

Force an Ada exception by making a divide by zero error in the main loop of WATCHDOG_TASK.
Recompile this test version of the code and run it.
Make sure that the code doesn't crash.
Make sure that an NHK packet arrives detailing a constraint error, with package code 0x16, error 0xEC, Param1 0x1600, Param2 0x1600 and last progress the same as the last progress before where the code causing the exception was inserted. Eg if the divide by zero was inserted at line 50, and the last progress before that was 40, then the NHK packet should give the last progress as 40. Also make sure an hk packet arrives with debug first exception set to the same as nhk Param1 and debug first progress set to the same as nhk Param3 .

	Result	**Expected result**	**Are result and expected result the same Y/N**
Code crashes Y/N		N	
NHK packet arrives Y/N		Y	
NHK pkg value		0x16	
NHK err value		0xEC	
NHK Param1 value		0x1600	
NHK Param2 value		0x1600	
Last progress in code before error inserted		Any value is permitted	
Last progress reached when running (ie NHK Param3 value)		The same value as was written in for 'last progress in code before error inserted'	
HK iDebug1stEx value		0x1600	
HK iDebug1stProg value		The same value as was written in for 'last progress in code before error inserted'	

If all the responses in column 4 of the table above are Y's then the test is successful.

Test Successful Y/N________

Initials ______________ Date ______________ Time __________________

7.11 HK change rate

Force an Ada exception by making a divide by zero error in HK.CHANGE_RATE. Recompile this test version of the code and run it – this may mean that after starting the code a command to change the housekeeping rate must be sent, eg
`/iHKRate Rate=11`

Make sure that the code doesn't crash.
Make sure that an NHK packet arrives detailing a constraint error, with package code 0x23, error 0xEC, Param1 0x2314, Param2 0x2314 and last progress the same as the last progress before where the code causing the exception was inserted. Eg if the divide by zero was inserted at line 50, and the last progress before that was 40, then the NHK packet should give the last progress as 40. Also make sure an hk packet arrives with debug first exception set to the same as nhk Param1 and debug first progress set to the same as nhk Param3 .

	Result	**Expected result**	**Are result and expected result the same Y/N**
Code crashes Y/N		N	
NHK packet arrives Y/N		Y	
NHK pkg value		0x23	
NHK err value		0xEC	
NHK Param1 value		0x2314	
NHK Param2 value		0x2314	
Last progress in code before error inserted		Any value is permitted	
Last progress reached when running (ie NHK Param3 value)		The same value as was written in for 'last progress in code before error inserted'	
HK iDebug1stEx value		0x2314	
HK iDebug1stProg value		The same value as was written in for 'last progress in code before error inserted'	

If all the responses in column 4 of the table above are Y's then the test is successful.

Test Successful Y/N________

Initials ______________ Date ______________ Time __________________

7.12 RTS type

Force an Ada exception by making a divide by zero error in RTS_TYPE
Recompile this test version of the code and run it.
Make sure that the code doesn't crash.
Make sure that an nhk packet arrives detailing a constraint error, with package code 0xDC, error 0xEC, Param1 0xDC14, Param2 0xDC14 and last progress the same as the last progress before where the code causing the exception was inserted. Eg if the divide by zero was inserted at line 50, and the last progress before that was 40, then the nhk packet should give the last progress as 40. Also make sure an hk packet arrives with debug first exception set to the same as nhk Param1 and debug first progress set to the same as nhk Param3 .

	Result	**Expected result**	**Are result and expected result the same Y/N**
Code crashes Y/N		N	
NHK packet arrives Y/N		Y	
NHK pkg value		0xDC	
NHK err value		0xEC	
NHK Param1 value		0xDC14	
NHK Param2 value		0xDC14	
Last progress in code before error inserted		Any value is permitted	
Last progress reached when running (ie NHK Param3 value)		The same value as was written in for 'last progress in code before error inserted'	
HK iDebug1stEx value		0xDC14	
HK iDebug1stProg value		The same value as was written in for 'last progress in code before error inserted'	

If all the responses in column 4 of the table above are Y's then the test is successful.

Test Successful Y/N________

Initials ______________ Date ______________ Time __________________

7.13 Perform ramp type

Force an Ada exception by making a divide by zero error in PERFORM_RAMP_TYPE
Recompile this test version of the code and run it.
Make sure that the code doesn't crash.
Make sure that an nhk packet arrives detailing a constraint error, with package code 0xDA, error 0xEC, Param1 0xDA41, Param2 0xDA41 and last progress the same as the last progress before where the code causing the exception was inserted. Eg if the divide by zero was inserted at line 50, and the last progress before that was 40, then the nhk packet should give the last progress as 40. Also make sure an hk packet arrives with debug first exception set to the same as nhk Param1 and debug first progress set to the same as nhk Param3 .

	Result	**Expected result**	**Are result and expected result the same Y/N**
Code crashes Y/N		N	
NHK packet arrives Y/N		Y	
NHK pkg value		0xDA	
NHK err value		0xEC	
NHK Param1 value		0xDA41	
NHK Param2 value		0xDA41	
Last progress in code before error inserted		Any value is permitted	
Last progress reached when running (ie NHK Param3 value)		The same value as was written in for 'last progress in code before error inserted'	
HK iDebug1stEx value		0xDA41	
HK iDebug1stProg value		The same value as was written in for 'last progress in code before error inserted'	

If all the responses in column 4 of the table above are Y's then the test is successful.

Test Successful Y/N________

Initials ______________ Date ______________ Time __________________

7.14 Load centroid table task

Force an Ada exception by making a divide by zero error in LOAD_CENTROID_TABLE_TASK
Recompile this test version of the code and run it.
Make sure that the code doesn't crash.
Make sure that an nhk packet arrives detailing a constraint error, with package code 0xDD, error 0xEC, Param1 0xDD0A, Param2 0xDD0A and last progress the same as the last progress before where the code causing the exception was inserted. Eg if the divide by zero was inserted at line 50, and the last progress before that was 40, then the nhk packet should give the last progress as 40. Also make sure an hk packet arrives with debug first exception set to the same as nhk Param1 and debug first progress set to the same as nhk Param3 .

	Result	**Expected result**	**Are result and expected result the same Y/N**
Code crashes Y/N		N	
NHK packet arrives Y/N		Y	
NHK pkg value		0xDD	
NHK err value		0xEC	
NHK Param1 value		0xDD1E	
NHK Param2 value		0xDD1E	
Last progress in code before error inserted		Any value is permitted	
Last progress reached when running (ie NHK Param3 value)		The same value as was written in for 'last progress in code before error inserted'	
HK iDebug1stEx value		0xDD1E	
HK iDebug1stProg value		The same value as was written in for 'last progress in code before error inserted'	

If all the responses in column 4 of the table above are Y's then the test is successful.

Test Successful Y/N________

Initials ______________ Date ______________ Time __________________

7.15 Load window table task type

Force an Ada exception by making a divide by zero error in LOAD_WINDOW_TABLE_TASK_TYPE
Recompile this test version of the code and run it.
Make sure that the code doesn't crash.
Make sure that an nhk packet arrives detailing a constraint error, with package code 0xDD, error 0xEC, Param1 0xDD0F, Param2 0xDD0F and last progress the same as the last progress before where the code causing the exception was inserted. Eg if the divide by zero was inserted at line 50, and the last progress before that was 40, then the nhk packet should give the last progress as 40. Also make sure an hk packet arrives with debug first exception set to the same as nhk Param1 and debug first progress set to the same as nhk Param3 .

	Result	**Expected result**	**Are result and expected result the same Y/N**
Code crashes Y/N		N	
NHK packet arrives Y/N		Y	
NHK pkg value		0xDD	
NHK err value		0xEC	
NHK Param1 value		0xDD23	
NHK Param2 value		0xDD23	
Last progress in code before error inserted		Any value is permitted	
Last progress reached when running (ie NHK Param3 value)		The same value as was written in for 'last progress in code before error inserted'	
HK iDebug1stEx value		0xDD23	
HK iDebug1stProg value		The same value as was written in for 'last progress in code before error inserted'	

If all the responses in column 4 of the table above are Y's then the test is successful.

Test Successful Y/N________

Initials ______________ Date ______________ Time __________________

7.16 SSI feed type

Force an Ada exception by making a divide by zero error in SSI_FEED_TYPE
Recompile this test version of the code and run it.
Make sure that the code doesn't crash.
Make sure that an nhk packet arrives detailing a constraint error, with package code 0xD0, error 0xEC, Param1 0xD023, Param2 0xD023 and last progress the same as the last progress before where the code causing the exception was inserted. Eg if the divide by zero was inserted at line 50, and the last progress before that was 40, then the nhk packet should give the last progress as 40. Also make sure an hk packet arrives with debug first exception set to the same as nhk Param1 and debug first progress set to the same as nhk Param3 .

	Result	**Expected result**	**Are result and expected result the same Y/N**
Code crashes Y/N		N	
NHK packet arrives Y/N		Y	
NHK pkg value		0xD0	
NHK err value		0xEC	
NHK Param1 value		0xD028	
NHK Param2 value		0xD028	
Last progress in code before error inserted		Any value is permitted	
Last progress reached when running (ie NHK Param3 value)		The same value as was written in for 'last progress in code before error inserted'	
HK iDebug1stEx value		0xD028	
HK iDebug1stProg value		The same value as was written in for 'last progress in code before error inserted'	

If all the responses in column 4 of the table above are Y's then the test is successful.

Test Successful Y/N________

Initials ______________ Date ______________ Time __________________

7.17 Starcat task

Force an Ada exception by making a divide by zero error in STARCAT_TASK
Recompile this test version of the code and run it.
Make sure that the code doesn't crash.
Make sure that an nhk packet arrives detailing a constraint error, with package code 0xCA, error 0xEC, Param1 0xCA00, Param2 0xCA00 and last progress the same as the last progress before where the code causing the exception was inserted. Eg if the divide by zero was inserted at line 50, and the last progress before that was 40, then the nhk packet should give the last progress as 40. Also make sure an hk packet arrives with debug first exception set to the same as nhk Param1 and debug first progress set to the same as nhk Param3 .

	Result	**Expected result**	**Are result and expected result the same Y/N**
Code crashes Y/N		N	
NHK packet arrives Y/N		Y	
NHK pkg value		0xCA	
NHK err value		0xEC	
NHK Param1 value		0xCA00	
NHK Param2 value		0xCA00	
Last progress in code before error inserted		Any value is permitted	
Last progress reached when running (ie NHK Param3 value)		The same value as was written in for 'last progress in code before error inserted'	
HK iDebug1stEx value		0xCA00	
HK iDebug1stProg value		The same value as was written in for 'last progress in code before error inserted'	

If all the responses in column 4 of the table above are Y's then the test is successful.

Test Successful Y/N________

Initials ______________ Date ______________ Time __________________

7.18 Poll TC type

Force an Ada exception by making a divide by zero error in POLL_TC_TYPE
Recompile this test version of the code and run it.
Make sure that the code doesn't crash.
Make sure that an nhk packet arrives detailing a constraint error, with package code 0x2C, error 0xEC, Param1 0x2C0F, Param2 0x2C0F and last progress the same as the last progress before where the code causing the exception was inserted. Eg if the divide by zero was inserted at line 50, and the last progress before that was 40, then the nhk packet should give the last progress as 40. Also make sure an hk packet arrives with debug first exception set to the same as nhk Param1 and debug first progress set to the same as nhk Param3 .

	Result	**Expected result**	**Are result and expected result the same Y/N**
Code crashes Y/N		N	
NHK packet arrives Y/N		Y	
NHK pkg value		0x2C	
NHK err value		0xEC	
NHK Param1 value		0x2C0F	
NHK Param2 value		0x2C0F	
Last progress in code before error inserted		Any value is permitted	
Last progress reached when running (ie NHK Param3 value)		The same value as was written in for 'last progress in code before error inserted'	
HK iDebug1stEx value		0x2C0F	
HK iDebug1stProg value		The same value as was written in for 'last progress in code before error inserted'	

If all the responses in column 4 of the table above are Y's then the test is successful.

Test Successful Y/N________

Initials ______________ Date ______________ Time __________________

8. PACKETS AND MESSAGES NOT COVERED ELSEWHERE

This section will force examples of all possible packets that have not already been covered in this test.

8.1 Reboot

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Check on the housekeeping display that Boot Status is set to ‘Cmd’

Boot Status Cmd Y/N_____________________

To aid checking that the safety circuit resets correctly after reboot, load unusual values into it now, and write them down here
____

Trip the watchdog.

Check on the NHK display that an ‘ICU Watchdog Trip’ message has been received.

‘ICU Watchdog Trip’ received Y/N___________

Check on the housekeeping display that Boot Status is set to ‘Wdog’

Boot Status Wdog Y/N_____________________

Check on the boot display that the boot report has been received.

‘Boot Report’ received Y/N_________________

Check that the safety circuit values have been reset to nominal

Safety circuit values nominal Y/N_______________

If all the above responses are Y’s then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

8.2 Memory dump

Switch off the housekeeping and open a packet dump window with the commands

```
/iHK Off
Pktdump
```

Send the command below to force a memory dump TDRSS report

```
/iICUDump Mid=5, Offset=0x1412, Numbytes=1, APID=0x3C2
```

Check in the packet dump window that a packet with APID 0x3C2 appears, with value 0x9F15.

Value 0x9F15 appears Y/N____________

Send the command below to force a memory dump ST report

```
/iICUDump Mid=5, Offset=0x1412, Numbytes=1, APID=0x450
```

Check in the packet dump window that a packet with APID 0x450 appears, with value 0x9F15.

Value 0x9F15 appears Y/N____________

Send the command below to force a memory CRC TDRSS report

```
/iICUCRC Mid=5, Offset=0, Numbytes=0x1413, APID=0x3C3
```

Check in the packet dump window that a packet with APID 0x3C3 appears, with value 0.

Value 0 appears Y/N____________

Send the command below to force a memory CRC ST report

```
/iICUCRC Mid=5, Offset=0, Numbytes=0x1413, APID=0x451
```

Check in the packet dump window that a packet with APID 0x451 appears, with value 0.

Value 0 appears Y/N____________

Switch the housekeeping back on with

```
/iHK On
```

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

8.3 Table loads

Make sure that the telescope simulator display is enabled.

Send the commands

```
/iBPEStartCntrdLd Verify=Off, Force=1, x0=-1000, x1=-750,
x2=-500, x3=-250, x4=0, x5=250, x6=500, x7=750, x8=1000,
y0=-1000, y1=-750, y2=-500, y3=-250, y4=0, y5=250, y6=500,
y7=750, y8=1000
/iBPEStopCntrdLd
```

Check on the NHK display that a 'Centroid Table Load Aborted' message has been received.

'Centroid Table Load Aborted' received Y/N _____________

Send the commands

```
/iBPEStartWndwLd Verify=Off, Force=1, NWdw=1, xLow1=0,
yLow1=1, xSize1=255, ySize1=255
/iBPEStopWndwLd
```

Check on the NHK display that a 'Window Table Load Aborted' message has been received.

'Window Table Load Aborted' received Y/N _____________

Send the following command, which is unsupported by the BPE simulator

```
/iBPEStartCntrdLd Verify=On, Force=1, x0=-1000, x1=-750,
x2=-500, x3=-250, x4=0, x5=250, x6=500, x7=750, x8=1000,
y0=-1000, y1=-750, y2=-500, y3=-250, y4=0, y5=250, y6=500,
y7=750, y8=1000
```

Check on the NHK display that a 'Centroid Table Load Failure' message has been received.

'Centroid Table Load Failure' received Y/N _____________

Send the following command, which is unsupported by the BPE simulator

```
/iBPEStartWndwLd Verify=Off, Force=1, NWdw=1, xLow1=0,
yLow1=1, xSize1=255, ySize1=255
```

Check on the NHK display that a 'Window Table Load Failure' message has been received.

‘Window Table Load Failure’ received Y/N ____________

Check on the housekeeping display that the centroid load task is asleep and its counter is not increasing.

Centroid Load task is asleep Y/N_____________
Centroid Load Task counter is unchanging Y/N_________

Send the following commands, which only differ in the force parameter

```
/iBPEStartCntrdLd Verify=Off, Force=1, x0=-1000, x1=-750,
x2=-500, x3=-250, x4=0, x5=250, x6=500, x7=750, x8=1000,
y0=-1000, y1=-750, y2=-500, y3=-250, y4=0, y5=250, y6=500,
y7=750, y8=1000
/iBPEStartCntrdLd Verify=Off, Force=0, x0=-1000, x1=-750,
x2=-500, x3=-250, x4=0, x5=250, x6=500, x7=750, x8=1000,
y0=-1000, y1=-750, y2=-500, y3=-250, y4=0, y5=250, y6=500,
y7=750, y8=1000
```

While the first command is running check on the housekeeping display that the window load task is alive and its counter is increasing, and on the telescope simulator display that the standard fan shaped display is created.

Centroid Load task is alive Y/N_____________
Centroid Load Task counter is increasing Y/N_________
Fan shaped display showing Y/N______________

Check on the NHK display that a ‘Centroid Table Already Loaded’ message has been received.

‘Centroid Table Already Loaded’ received Y/N ____________

Send the following commands, which only differ in the force parameter

```
/iBPEStartWndwLd Verify=Off, Force=1, NWdw=1, xLow1=0,
yLow1=1, xSize1=255, ySize1=255
/iBPEStartWndwLd Verify=Off, Force=0, NWdw=1, xLow1=0,
yLow1=1, xSize1=255, ySize1=255
```

While the first command is running check on the telescope simulator display that the standard square shaped display is created.

Square shaped display showing Y/N______________

Check on the NHK display that a ‘Window Table Already Loaded’ message has been received.

‘Window Table Already Loaded’ received Y/N ____________

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

8.4 Verification errors

Note the value of the TM Bad counter on the housekeeping display here______

Edit the code to force out a packet with incorrect checksum 0xFFFF. Compile this test version of the code and run it.

Check on the verification display that the message 'Incorrect Checksum' is received, and on the housekeeping display that the TM Bad counter increments by 1.

'Incorrect Checksum' received Y/N__________________
TM Bad increments by 1 Y/N____________________

Edit the code to force out a packet with incorrect APID 0x7FF. Compile this test version of the code and run it.

Check on the verification display that the message 'Illegal APID' is received.

'Illegal APID' received Y/N__________________

Note the value of the TC Bad counter on the housekeeping display here______

Send the command below, which has an illegal function code
`/iBad660`

Check on the verification display that the message 'Illegal Function Code' is received, and on the housekeeping display that the TC Bad counter increments by 1.

'Illegal Function Code' received Y/N__________________
TC Bad increments by 1 Y/N____________________

Edit the code to force out a packet with incorrect length 0xFFFF. Compile this test version of the code and run it.

Check on the verification display that the message 'Invalid Length' is received.

'Invalid Length' received Y/N__________________

Disable range checking on the iState command in ITOS.

Send the command below, which has an illegal state number
`/iState State=20`

Check on the verification display that the message 'Illegal State' is received.

'Illegal State' received Y/N_________________

Re-enable range checking on the iState command in ITOS.

Disable range checking on the iICUDump command in ITOS.

Send the command below, which has an illegal Mid

```
/iICUDump Mid=9, Offset=0, Numbytes=1, APID=0x390
```

Check on the verification display that the message 'Illegal Mid' is received.

'Illegal Mid' received Y/N_________________

Send the command below, which has an illegal start address

```
/iICUDump Mid=1, Offset=0xFFFFFFFF, Numbytes=1, APID=0x390
```

Check on the verification display that the message 'Illegal Start Address' is received.

'Illegal Start Address' received Y/N_________________

Send the command below, which has an illegal dump APID

```
/iICUDump Mid=1, Offset=0, Numbytes=1, APID=0x38F
```

Check on the verification display that the message 'Illegal Memory APID' is received.

'Illegal Memory APID' received Y/N_________________

Re-enable range checking on the iICUDump command in ITOS.

Edit the code to force out a packet with illegal APID length 0xFFFF. Compile this test version of the code and run it.

Check on the verification display that the message 'Illegal APID Length' is received.

'Illegal APID Length' received Y/N_________________

Note the value of the RT-RT Bad counter on the housekeeping display here______

Edit the code to force out a FONEXTOBSINFO message with an incorrect checksum. Compile this test version of the code and run it.

Check on the housekeeping display that the TM Bad counter increments by 1.

RT-RT Bad increments by 1 Y/N___________________

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

8.5 TDRSS

First make sure that the debug screen is not active – if it is press key ‘q’ while on the debug screen. Also make sure that the TDRSS display is up – use ‘seqprt TDRSS’ if not.

Force a watchdog reset.using

```
/iWatchdogInt ResetInterval=100, TaskCheckFreq=3,
TaskCheckMask=0xFFFF
```

Check on the TDRSS display that a ‘TDRSS Emergency Report’ message has been received.

‘TDRSS Emergency Report’ received Y/N________________

Load a heater control table with bad data into EEPROM and make sure it is seen using

```
load "heaterb1.img"
load "heaterb2.img"
/iHtr Enable=Off
/iHtr Enable=On
```

Check on the TDRSS display that a ‘Bad EEPROM Data’ message has been received.

‘Bad EEPROM Data’ received Y/N________________

Reset the heater table using

```
load "heater1.img"
load "heater2.img"
/iHtr Enable=Off
/iHtr Enable=On
```

If all the above responses are Y’s then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

8.6 State Changes

Alter the state transition table to allow but have no RTS defined for a given transition and upload this test version, then reload the flight code using

```
load "???.img"
load icu.hex
```

Command the altered state transition using

```
/iState State=???
```

Check on the NHK display that a 'Forbidden State RTS' message has been received.

'Forbidden State RTS' received Y/N ____________

Reload the original state transition table and flight code using

```
load "???.img"
load icu.hex
```

Check that the ICU is in the safe state

ICU safe Y/N________

Command a disallowed state transition using

```
/iState State=AT
```

Check on the NHK display that an 'Impossible State Transition' message has been received.

'Impossible State Transition' received Y/N ____________

Run the ITOS script getnoconfig.proc using

```
Start getnoconfig
```

Check on the NHK display that a 'No Such PT UVOT Mode' message has been received.

'No Such PT UVOT Mode' received Y/N ____________

Run the ITOS script getnouvotmode.proc using

```
Start getnouvotmode
```

Check on the NHK display that a 'No Such AT UVOT Mode' message has been received.

'No Such AT UVOT Mode' received Y/N ____________

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

8.7 SC1553

Edit the code to force out an 'SC1553 Startup Error' NHK message, and run this test code.

'SC1553 Startup Error' received Y/N__________

Edit the code to force out an 'SC1553 Read Error' NHK message, and run this test code.

'SC1553 Read Error' received Y/N__________

Edit the code to force out an 'SC1553 Dump Report SID' NHK message, and run this test code.

'SC1553 Dump Report SID' received Y/N__________

Edit the code to force out an 'SC1553 Error Report' NHK message, and run this test code.

'SC1553 Error Report' received Y/N__________

If all the responses above are Y's then the test is successful.

Test Successful Y/N__________

Initials ______________ Date ______________ Time __________________

8.8 SSI

Edit the code to force out an ‘SSI Error’ NHK message, and run this test code.

‘SSI Error’ received Y/N__________

If all the responses above are Y’s then the test is successful.

Test Successful Y/N__________

Initials ______________ Date ______________ Time __________________

8.9 EEPROM

Edit the code to force out an 'EEPROM Write Error' NHK message, and run this test code.

'EEPROM Write Error' received Y/N__________

Edit the code to force out an 'EEPROM Code Compare Error' NHK message, and run this test code.

'EEPROM Code Compare Error' received Y/N__________

Edit the code to force out an 'EEPROM Star Cat Compare Error' NHK message, and run this test code.

'EEPROM Star Cat Compare Error' received Y/N__________

If all the responses above are Y's then the test is successful.

Test Successful Y/N__________

Initials ______________ Date ______________ Time __________________

9. COMMANDS NOT COVERED ELSEWHERE

9.1 Table loads

Send the commands

1. /iBPEStartCntrdLd Verify=Off, Force=1, x0=-1000, x1=-750, x2=-500, x3=-250, x4=0, x5=500, x6=250, x7=750, x8=1000, y0=-1000, y1=-750, y2=-500, y3=-250, y4=0, y5=250, y6=500, y7=750, y8=1000
2. /iBPEStartCntrdLd Verify=Off, Force=1, x0=-1000, x1=-750, x2=-500, x3=-250, x4=0, x5=250, x6=500, x7=750, x8=1000, y0=-1000, y1=-750, y2=-500, y3=-250, y4=0, y5=250, y6=750, y7=500, y8=1000
3. /iBPEStartCntrdLd Verify=Off, Force=1, x0=-900, x1=-750, x2=-500, x3=-250, x4=0, x5=250, x6=500, x7=750, x8=1000, y0=-1000, y1=-750, y2=-500, y3=-250, y4=0, y5=250, y6=500, y7=750, y8=1000
4. /iBPEStartCntrdLd Verify=Off, Force=1, x0=-1000, x1=-750, x2=-500, x3=-250, x4=0, x5=250, x6=500, x7=750, x8=1000, y0=-900, y1=-750, y2=-500, y3=-250, y4=0, y5=250, y6=500, y7=750, y8=1000
5. /iBPEStartCntrdLd Verify=Off, Force=1, x0=-1000, x1=-750, x2=-500, x3=-250, x4=0, x5=250, x6=500, x7=750, x8=900, y0=-1000, y1=-750, y2=-500, y3=-250, y4=0, y5=250, y6=500, y7=750, y8=1000
6. /iBPEStartCntrdLd Verify=Off, Force=1, x0=-1000, x1=-750, x2=-500, x3=-250, x4=0, x5=250, x6=500, x7=750, x8=1000, y0=-1000, y1=-750, y2=-500, y3=-250, y4=0, y5=250, y6=500, y7=750, y8=900
7. /iBPEStartCntrdLd Verify=Off, Force=1, x0=-1000, x1=-750, x2=-1500, x3=-250, x4=0, x5=250, x6=500, x7=750, x8=1000, y0=-1000, y1=-750, y2=-500, y3=-250, y4=0, y5=250, y6=500, y7=750, y8=1000
8. /iBPEStartCntrdLd Verify=Off, Force=1, x0=-1000, x1=-750, x2=-500, x3=-250, x4=1500, x5=250, x6=500, x7=750, x8=1000, y0=-1000, y1=-750, y2=-500, y3=-250, y4=0, y5=250, y6=500, y7=750, y8=1000
9. /iBPEStartCntrdLd Verify=Off, Force=1, x0=-1000, x1=-750, x2=-500, x3=-250, x4=0, x5=250, x6=500, x7=750, x8=1000, y0=-1000, y1=-1500, y2=-500, y3=-250, y4=0, y5=250, y6=500, y7=750, y8=1000
10. /iBPEStartCntrdLd Verify=Off, Force=1, x0=-1000, x1=-750, x2=-500, x3=-250, x4=0, x5=250, x6=500, x7=750, x8=1000, y0=-1000, y1=-750, y2=-500, y3=-250, y4=0, y5=1500, y6=500, y7=750, y8=1000

Check that in each case an 'Illegal Parameter Values' NHK message is received.

For command 1, 'Illegal Parameter Values' received Y/N______________
For command 2, 'Illegal Parameter Values' received Y/N______________
For command 3, 'Illegal Parameter Values' received Y/N______________
For command 4, 'Illegal Parameter Values' received Y/N______________
For command 5, 'Illegal Parameter Values' received Y/N______________
For command 6, 'Illegal Parameter Values' received Y/N______________
For command 7, 'Illegal Parameter Values' received Y/N______________
For command 8, 'Illegal Parameter Values' received Y/N______________
For command 9, 'Illegal Parameter Values' received Y/N______________
For command 10, 'Illegal Parameter Values' received Y/N_____________

Check on the housekeeping display that the window load task is asleep and its counter is not increasing.

Window Load task is asleep Y/N_____________
Window Load Task counter is unchanging Y/N_________

Send the command

```
/iBPEStartWndwLd Verify=Off, Force=1, NWdw=6, xLow1=10,
yLow1=9, xSize1=20, ySize1=20, xLow2=100, yLow2=9,
xSize2=20, ySize2=20, xLow3=200, yLow3=9, xSize3=20,
ySize3=20, xLow4=10, yLow4=109, xSize4=20, ySize4=20,
xLow5=100, yLow5=109, xSize5=20, ySize5=20, xLow6=200,
yLow6=109, xSize6=20, ySize6=20
```

While the load is running, check on the housekeeping display that the window load task is alive and its counter is increasing.

Window Load task is alive Y/N_____________
Window Load Task counter is increasing Y/N_________

Check that a 'Successful Acceptance' verification message is received.

'Successful Acceptance' received Y/N______________

Send the commands

1. ```
   /iBPEStartWndwLd Verify=Off, Force=1, NWdw=7,
   xLow1=10, yLow1=9, xSize1=20, ySize1=20, xLow2=100,
   yLow2=9, xSize2=20, ySize2=20, xLow3=200, yLow3=9,
   xSize3=20, ySize3=20, xLow4=10, yLow4=109, xSize4=20,
   ySize4=20, xLow5=100, yLow5=109, xSize5=20, ySize5=20,
   xLow6=200, yLow6=109, xSize6=20, ySize6=20
   ```
   ```

2. /iBPEStartWndwLd Verify=Off, Force=1, NWdw=6, xLow1=5, yLow1=9, xSize1=20, ySize1=20, xLow2=100, yLow2=9, xSize2=20, ySize2=20, xLow3=200, yLow3=9, xSize3=20, ySize3=20, xLow4=10, yLow4=109, xSize4=20, ySize4=20, xLow5=100, yLow5=109, xSize5=20, ySize5=20, xLow6=200, yLow6=109, xSize6=20, ySize6=20
3. /iBPEStartWndwLd Verify=Off, Force=1, NWdw=6, xLow1=10, yLow1=8, xSize1=20, ySize1=20, xLow2=100, yLow2=9, xSize2=20, ySize2=20, xLow3=200, yLow3=9, xSize3=20, ySize3=20, xLow4=10, yLow4=109, xSize4=20, ySize4=20, xLow5=100, yLow5=109, xSize5=20, ySize5=20, xLow6=200, yLow6=109, xSize6=20, ySize6=20
4. /iBPEStartWndwLd Verify=Off, Force=1, NWdw=6, xLow1=10, yLow1=9, xSize1=20, ySize1=20, xLow2=100, yLow2=9, xSize2=1, ySize2=20, xLow3=200, yLow3=9, xSize3=20, ySize3=20, xLow4=10, yLow4=109, xSize4=20, ySize4=20, xLow5=100, yLow5=109, xSize5=20, ySize5=20, xLow6=200, yLow6=109, xSize6=20, ySize6=20
5. /iBPEStartWndwLd Verify=Off, Force=1, NWdw=6, xLow1=10, yLow1=9, xSize1=20, ySize1=20, xLow2=100, yLow2=9, xSize2=20, ySize2=20, xLow3=200, yLow3=9, xSize3=20, ySize3=1, xLow4=10, yLow4=109, xSize4=20, ySize4=20, xLow5=100, yLow5=109, xSize5=20, ySize5=20, xLow6=200, yLow6=109, xSize6=20, ySize6=20
6. /iBPEStartWndwLd Verify=Off, Force=1, NWdw=6, xLow1=10, yLow1=9, xSize1=20, ySize1=20, xLow2=100, yLow2=9, xSize2=20, ySize2=20, xLow3=200, yLow3=9, xSize3=20, ySize3=20, xLow4=10, yLow4=109, xSize4=257, ySize4=20, xLow5=100, yLow5=109, xSize5=20, ySize5=20, xLow6=200, yLow6=109, xSize6=20, ySize6=20
7. /iBPEStartWndwLd Verify=Off, Force=1, NWdw=6, xLow1=10, yLow1=9, xSize1=20, ySize1=20, xLow2=100, yLow2=9, xSize2=20, ySize2=20, xLow3=200, yLow3=9, xSize3=20, ySize3=20, xLow4=10, yLow4=109, xSize4=20, ySize4=20, xLow5=100, yLow5=109, xSize5=20, ySize5=257, xLow6=200, yLow6=109, xSize6=20, ySize6=20
8. /iBPEStartWndwLd Verify=Off, Force=1, NWdw=6, xLow1=10, yLow1=9, xSize1=20, ySize1=20, xLow2=100, yLow2=9, xSize2=20, ySize2=20, xLow3=200, yLow3=9, xSize3=20, ySize3=20, xLow4=10, yLow4=109, xSize4=20, ySize4=20, xLow5=100, yLow5=109, xSize5=20, ySize5=20, xLow6=0, yLow6=109, xSize6=1, ySize6=20
9. /iBPEStartWndwLd Verify=Off, Force=1, NWdw=6, xLow1=10, yLow1=9, xSize1=20, ySize1=20, xLow2=100, yLow2=9, xSize2=20, ySize2=20, xLow3=200, yLow3=9, xSize3=20, ySize3=20, xLow4=10, yLow4=109, xSize4=20,

```
   ySize4=20, xLow5=100, yLow5=109, xSize5=20, ySize5=20,
   xLow6=200, yLow6=1, xSize6=20, ySize6=0
10.     /iBPEStartWndwLd Verify=Off, Force=1, NWdw=6,
   xLow1=10, yLow1=9, xSize1=256, ySize1=20, xLow2=100,
   yLow2=9, xSize2=20, ySize2=20, xLow3=200, yLow3=9,
   xSize3=20, ySize3=20, xLow4=10, yLow4=109, xSize4=20,
   ySize4=20, xLow5=100, yLow5=109, xSize5=20, ySize5=20,
   xLow6=200, yLow6=109, xSize6=20, ySize6=20
11.     /iBPEStartWndwLd Verify=Off, Force=1, NWdw=6,
   xLow1=10, yLow1=9, xSize1=20, ySize1=20, xLow2=100,
   yLow2=9, xSize2=20, ySize2=256, xLow3=200, yLow3=9,
   xSize3=20, ySize3=20, xLow4=10, yLow4=109, xSize4=20,
   ySize4=20, xLow5=100, yLow5=109, xSize5=20, ySize5=20,
   xLow6=200, yLow6=109, xSize6=20, ySize6=20
```

Check that in each case an 'Illegal Parameter Values' NHK message is received.

For command 1, 'Illegal Parameter Values' received Y/N______________
For command 2, 'Illegal Parameter Values' received Y/N______________
For command 3, 'Illegal Parameter Values' received Y/N______________
For command 4, 'Illegal Parameter Values' received Y/N______________
For command 5, 'Illegal Parameter Values' received Y/N______________
For command 6, 'Illegal Parameter Values' received Y/N______________
For command 7, 'Illegal Parameter Values' received Y/N______________
For command 8, 'Illegal Parameter Values' received Y/N______________
For command 9, 'Illegal Parameter Values' received Y/N______________
For command 10, 'Illegal Parameter Values' received Y/N_____________
For command 11, 'Illegal Parameter Values' received Y/N_____________

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

9.2 BPE Commands

Send the commands

```
/iBPEAcqMode AcqMode=0
/iBPEAcqMode AcqMode=7
/iBPEAcqMode AcqMode=8
```

In the first two cases check on the housekeeping display that the values are as commanded. In the third case check that an NHK 'Illegal Parameter Values' message is received.

For AcqMode=0, display shows 0 Y/N______________________
For AcqMode=7, display shows 7 Y/N______________________
For AcqMode=8, 'Illegal Parameter Values' received Y/N_______

Send the commands

```
/iBPEThreshold Threshold=0
/iBPEThreshold Threshold=255
/iBPEThreshold Threshold=256
```

In the first two cases check on the housekeeping display that the values are as commanded. In the third case check that an NHK 'Illegal Parameter Values' message is received.

For Threshold=0, display shows 0 Y/N________________________
For Threshold=255, display shows 255 Y/N____________________
For Threshold=256, 'Illegal Parameter Values' received Y/N_______

Send the commands

```
/iBPEInteg Enable=On
/iBPEInteg Enable=Off
```

For each command check on the housekeeping display that the value is as commanded.

BPE integration enabled Y/N____________
BPE integration disabled Y/N____________

Send the commands

```
/iBPEFrameTags Enable=On
/iBPEFrameTags Enable=Off
```

For each command check on the housekeeping display that the value is as commanded.

BPE frame tags enabled Y/N____________

BPE frame tags disabled Y/N___________

Send the commands
```
/iBPECamera Enable=On
/iBPECamera Enable=Off
```

For each command check on the housekeeping display that the value is as commanded.

BPE camera enabled Y/N___________
BPE camera disabled Y/N___________

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

9.3 ICB commands using ICB slave

Attach the ICB slave to the MACSbus before running this test.

Before enabling direct ICB commands send these commands
```
/iICBWrite Address=0x7, SubAddress=0, Datum=0x1234
/iICBRead Address=0x7, SubAddress=0x0
```

Check that an 'unsuccessful acceptance' verification message was received, and also an NHK 'illegal function code' message.

'Successful acceptance' received Y/N_____________
'Illegal function code' received Y/N_______________

Open a packet dump window using
```
Pktdump vc0 0x3B0
```

Enable direct ICB commands using
```
/iICBEnable On
```

Send the commands
1. `/iICBRead Address=0x18, SubAddress=0`
2. `/iICBRead Address=0x7, SubAddress=0x31`
3. `/iICBRead Address=0x18, SubAddress=0x32`
4. `/iICBRead Address=0x11, SubAddress=0`

In the first two cases check that a 'successful acceptance' verification message was received, and that a task management report packet appears in the packet dump window. In the latter two cases check that an 'Illegal Parameter Values' NHK message was received.

For command 1, 'Successful Acceptance' received Y/N____________
And task management report packet received Y/N_________________
For command 2, 'Successful Acceptance' received Y/N____________
And task management report packet received Y/N_________________
For command 3, 'Illegal Parameter Values' received Y/N___________
For command 4, 'Illegal Parameter Values' received Y/N___________

Send the commands
1. `/iICBWrite Address=0x18, SubAddress=0, Datum=0x1234`
2. `/iICBWrite Address=0x7, SubAddress=0x31, Datum=0x1234`
3. `/iICBWrite Address=0x18, SubAddress=0x32, Datum=0x1234`
4. `/iICBWrite Address=0x11, SubAddress=0, Datum=0x1234`

In the first two cases check that a 'successful acceptance' verification message was received. In the latter three cases check that an 'Illegal Parameter Values' NHK message was received.

For command 1, 'Successful Acceptance' received Y/N____________
For command 2, 'Successful Acceptance' received Y/N____________
For command 3, 'Illegal Parameter Values' received Y/N___________
For command 4, 'Illegal Parameter Values' received Y/N___________

Disable direct ICB commands using
```
/iICBEnable Off
```

Check on the housekeeping display that the ICB is alive.

ICB Alive Y/N_____________

From the housekeeping display write down the following;

ICB Errors ____________
ICB Status ____________
ICB Err Datum _________
ICB Err Cmd Wd _______

Disconnect the ICB slave.

Disconnect the ICB itself.

Check on the housekeeping display that the ICB is dead.

ICB Dead Y/N_____________

Enable direct ICB commands and try to write to the ICB using
```
/iICBEnable On
/iICBWrite Address=7, SubAddress=0, Datum=0x1234
```

Check on the housekeeping display that the following have changed;

ICB Errors changed Y/N____________
ICB Status changed Y/N____________
ICB Err Datum changed Y/N_________
ICB Err Cmd Wd changed Y/N_______

Check on the NHK display that an 'ICB Error' message has been received, followed by a 'Heater ICB Shutdown' message.

'ICB Error' received Y/N _____________
'Heater ICB Shutdown' received Y/N________________

Disable direct ICB commands using
`/iICBEnable Off`

Now perform a crash test. Edit the code to simulate ICB values of 0 to 0xFFFF in a loop repeatedly for 2 days. Make sure that no ICB errors or crashes occur.

ICB error/crash occurs Y/N_____________

If all the above responses except the last are Y's and the last is a N then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

9.4 State commands

Load a dummy state transition table in which the action for each commanded state transition is no-op, using
`Load "???.img"`

Send the commands

1. `/iState State=0`
2. `/iState State=1`
3. `/iState State=2`
4. `/iState State=3`
5. `/iState State=4`
6. `/iState State=5`
7. `/iState State=6`
8. `/iState State=7`
9. `/iState State=8`
10. `/iState State=9`
11. `/iState State=10`
12. `/iState State=11`
13. `/iState State=12`

Check that in each case except the last a response is issued – this could be that the state transition is allowed or disallowed, it doesn't matter which. Check that in the last case an 'Illegal Parameter Values' NHK message is received.

For command 1, response made Y/N_________
For command 2, response made Y/N_________
For command 3, response made Y/N_________
For command 4, response made Y/N_________
For command 5, response made Y/N_________
For command 6, response made Y/N_________
For command 7, response made Y/N_________
For command 8, response made Y/N_________
For command 9, response made Y/N_________
For command 10, response made Y/N_________
For command 11, response made Y/N_________
For command 12, response made Y/N_________
For command 13, 'Illegal Parameter Values' received Y/N__________

Reload the good state transition table, using
`Load "???.img"`

Go to the idle state using
`/iState State=Idle`

Send the command
```
/iStateTrans Enable=Off, ATEnable=On, PTEnable=On,
SPEnable=On
```

Command a safepointing by running ITOS script safepoint.proc using
```
Start safepoint
```

Check that nothing happens

Nothing happens Y/N_________

Send the command
```
/iStateTrans Enable=Off, ATEnable=Off, PTEnable=Off,
SPEnable=Off
```

Command a safepointing by running ITOS script safepoint.proc using
```
Start safepoint
```

Check that nothing happens

Nothing happens Y/N_________

Send the command
```
/iStateTrans Enable=On, ATEnable=Off, PTEnable=Off,
SPEnable=On
```

Command a safepointing by running ITOS script safepoint.proc using
```
Start safepoint
```

Check that the UVOT state transitions to safepointing

UVOT safepointing Y/N_________

Send the command
```
/iStateTrans Enable=On, ATEnable=On, PTEnable=Off,
SPEnable=Off
```

Command an AT by running ITOS script firstat.proc using
```
Start firstat
```

Check that the UVOT state transitions to AT

UVOT in AT Y/N_________

Command a PT by running ITOS script pt.proc using

```
Start pt
```

Check that nothing happens

Nothing happens Y/N_________

Send the command
```
/iStateTrans Enable=On, ATEnable=Off, PTEnable=On,
SPEnable=Off
```

Command a PT by running ITOS script pt.proc using
```
Start pt
```

Check that the UVOT state transitions to PT

UVOT in PT Y/N_________

Command an AT by running ITOS script firstat.proc using
```
Start firstat
```

Check that nothing happens

Nothing happens Y/N_________

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

9.5 NHK Echo

Note here the values from the housekeeping display of TM Good__________

Send the commands

1. `/iNHKEcho TMAPID=0x360, PackageNo=256, ErrorCode=0, Param1=0, Param2=0, Param3=0`
2. `/iNHKEcho TMAPID=0x451, PackageNo=65535, ErrorCode=255, Param1=0xFFFF, Param2=0xFFFF, Param3=0xFFFF`
3. `/iNHKEcho TMAPID=0x35F, PackageNo=256, ErrorCode=0, Param1=0, Param2=0, Param3=0`
4. `/iNHKEcho TMAPID=0x452, PackageNo=256, ErrorCode=0, Param1=0, Param2=0, Param3=0`
5. `/iNHKEcho TMAPID=0x360, PackageNo=255, ErrorCode=0, Param1=0, Param2=0, Param3=0`
6. `/iNHKEcho TMAPID=0x360, PackageNo=65536, ErrorCode=0, Param1=0, Param2=0, Param3=0`
7. `/iNHKEcho TMAPID=0x360, PackageNo=256, ErrorCode=256, Param1=0, Param2=0, Param3=0`
8. `/iNHKEcho TMAPID=0x360, PackageNo=256, ErrorCode=0, Param1=0xFFFFF, Param2=0, Param3=0`
9. `/iNHKEcho TMAPID=0x360, PackageNo=256, ErrorCode=0, Param1=0, Param2=0xFFFFF, Param3=0`
10. `/iNHKEcho TMAPID=0x360, PackageNo=256, ErrorCode=0, Param1=0, Param2=0, Param3=0xFFFFF`

For the first two cases, check that the NHK display shows the echoed command. For the rest, check that an 'Illegal Parameter Values' NHK message is received. Also, after the first command check that the TM Good counter has incremented by 1.

For command 1, command correctly echoed Y/N______________
TM Good incremented by 1 Y/N______________
For command 2, command correctly echoed Y/N______________
For command 3, 'Illegal Parameter values' received Y/N________
For command 4, 'Illegal Parameter values' received Y/N________
For command 5, 'Illegal Parameter values' received Y/N________
For command 6, 'Illegal Parameter values' received Y/N________
For command 7, 'Illegal Parameter values' received Y/N________
For command 8, 'Illegal Parameter values' received Y/N________
For command 9, 'Illegal Parameter values' received Y/N________
For command 10, 'Illegal Parameter values' received Y/N________

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

9.6 Watchdog

Send the commands

1. `/iWatchdogInt ResetInterval=1, TaskCheckFreq=1, TaskCheckMask=1`
2. `/iWatchdogInt ResetInterval=65535, TaskCheckFreq=65535, TaskCheckMask=1`
3. `/iWatchdogInt ResetInterval=0, TaskCheckFreq=1, TaskCheckMask=1`
4. `/iWatchdogInt ResetInterval=1, TaskCheckFreq=0, TaskCheckMask=1`

For the first two, check that a 'Successful Acceptance' message is received. For the latter two, check on the verification display that the message 'Unsuccessful Acceptance' is received.

For command 1, 'Successful Acceptance' received Y/N__________________
For command 2, 'Successful Acceptance' received Y/N__________________
For command 3, 'Unsuccessful Acceptance' received Y/N__________________
For command 4, 'Unsuccessful Acceptance' received Y/N__________________

Then command it back to defaults using

```
/iWatchdogInt ResetInterval=1, TaskCheckFreq=0,
TaskCheckMask=1
```

Send the following commands, with a 2 minute wait between each

```
/iWatchdog On
/iWatchdog Off
/iWatchdog Off
/iWatchdog On
/iWatchdog On
```

Check on the housekeeping display that the watchdog task is first enabled, then disabled, then stays disabled, then is re-enabled and finally stays enabled.

Watchdog enabled Y/N_________
Watchdog disabled Y/N_________
Watchdog stays disabled Y/N_____
Watchdog re-enabled Y/N_______
Watchdog stays enabled Y/N_____

Edit the code to change the watchdog kick period to be 20% longer, ie 4.8s.
Run this test code and leave it running overnight.

Check that no watchdog reset occurs.
No bootstrap record should appear.

Bootstrap record appears Y/N_________

If all bar the last of the above responses are Y's and the last is a N then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

9.7 Test

Make a note of TC Good from the housekeeping display ___________

Send the command
`/iTest`

Check on the verification display that a 'Successful Acceptance' message is received.

'Successful Acceptance' received Y/N__________

Check on the housekeeping display that TC Good has increased by 1

TC Good increased by 1 Y/N______________

Make a note of TC Bad from the housekeeping display ___________

Send the command
`/iBad660`

Check on the housekeeping display that TC Bad has increased by 1

TC Bad increased by 1 Y/N______________

If the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

10. HEATERS

10.1 Enable/disable automatic heater control

Load the telescope simulator configuration file heater_test.dat

Load a correct heater control table into EEPROM.
```
load "heater1.img"
load "heater2.img"
```

Reset the ICU.
```
icureset
```

Run a STOL procedure to set the spacecraft voltage to 32V.
```
start scvolts32
```

In housekeeping the spacecraft voltage should now be set to 32.00V

Spacecraft voltage set to 32.00V in housekeeping Y/N __________

Monitor the telescope simulator temperatures IF_A and SEC1 on the telescope simulator display.
IF_A should fall below 567. When it does the first heater should come on within 10s – the first value in the heater array will be a 1. IF_A should now increase in value. Once it exceeds 583 the first heater should go off within 10s, ie the value will be 0 and IF_A should start to decrease again.
SEC1 should fall below 551. When it does the second heater should come on within 10s – the second value in the heater array will be a 1. SEC1 should now increase in value. Once it exceeds 599 the second heater should go off within 10s, ie the value will be 0 and SEC1 should start to decrease again.
The third heater should cycle 5s on and 5s off – the third value in the heater array will switch between a 1 and a 0 every 5s.
The fourth heater should not come on – the fourth value in the heater array should stay at 0.
Also check that heater control is active, ie iHtrCntrlActive in the housekeeping is set to 1.

IF_A falls below 567 Y/N	
Then first heater comes on within 10s Y/N	
Then IF_A rises to above 583 Y/N	
Then first heater goes off within 10s Y/N	
Then IF_A falls again Y/N	
SEC1 falls below 551 Y/N	
Then second heater comes on within 10s Y/N	
Then SEC1 rises to above 599 Y/N	

Then second heater goes off within 10s Y/N	
Then SEC1 falls again Y/N	
Third heater cycles, 5s on, 5s off Y/N	
Fourth heater stays 0 all the time Y/N	
iHtrCntrlActive in housekeeping set to 1 Y/N	

Then load another correct heater control table into EEPROM.

```
load "heater_alt1.img"
load "heater_alt2.img"
```

Make sure the table is seen.

```
/iHtr Off
```

Make sure that the heater control active flag is set to 0 in the housekeeping

```
/iHtr On
```

Monitor the telescope simulator temperatures IF_A and SEC1 on the telescope simulator display.

IF_A should fall below 567. When it does the first heater should come on within 10s – the first value in the heater array will be a 1. IF_A should now increase in value. Once it exceeds 583 the first heater should go off within 10s, ie the value will be 0 and IF_A should start to decrease again.

SEC1 should fall below 551. When it does the second heater should come on within 10s – the second value in the heater array will be a 1. SEC1 should now increase in value. Once it exceeds 599 the second heater should go off within 10s, ie the value will be 0 and SEC1 should start to decrease again.

The third heater should not come on – the third value in the heater array should stay at 0.

The fourth heater should cycle 5s on and 5s off – the fourth value in the heater array will switch between a 1 and a 0 every 5s.

Also check that heater control is active, ie iHtrCntrlActive in the housekeeping is set to 1.

IF_A falls below 567 Y/N	
Then first heater comes on within 10s Y/N	
Then IF_A rises to above 583 Y/N	
Then first heater goes off within 10s Y/N	
Then IF_A falls again Y/N	
SEC1 falls below 551 Y/N	
Then second heater comes on within 10s Y/N	
Then SEC1 rises to above 599 Y/N	
Then second heater goes off within 10s Y/N	
Then SEC1 falls again Y/N	
Third heater stays 0 all the time Y/N	
Fourth heater cycles, 5s on, 5s off Y/N	
iHtrCntrlActive in housekeeping set to 1 Y/N	

Now run a series of stop-start checks.

The heaters are already running. Command them to switch on while they're on and watch for 5 minutes to check that this is handled correctly.

```
/iHtr On
```

On the telescope simulator display, the temperatures should rise and fall as before. Check that when IF_A falls below 567 iHtrMain is set to 1 in the housekeeping within 10s, and when SEC1 falls below 551 iHtrForward is set to 1 in the housekeeping within 10s. Also check that when IF_A rises above 583 iHtrMain is set to 0 in the housekeeping within 10s, and when SEC1 rises above 599 iHtrForward is set to 1 in the housekeeping within 10s. iHtrSecondary should always be set to 0, while on the telescope simulator display the fourth heater should cycle 5s on, 5s off. The heater control active flag should be set to 1.

	Result seen	**Expected result**	**Are seen and expected results the same Y/N**
iHtrMain set to 1 when IF_A falls below 567 Y/N		Y	
iHtrForward set to 1 when SEC1 falls below 551 Y/N		Y	
iHtrMain set to 0 when IF_A rises above 583 Y/N		Y	
iHtrForward set to 0 when SEC1 rises above 599 Y/N		Y	
iHtrSecondary always set to 0 Y/N		Y	
Fourth heater cycles Y/N		Y	
iHtrCntrlActive set to 1		Y	

Switch off the heaters and check that this is handled correctly. Watch for 5 minutes

```
/iHtr Off
```

On the housekeeping display iHtrCntrlActive should be set to 0 and all so should all heaters. The heater control task should be asleep and its task counter not changing.

	Result seen	**Expected result**	**Are seen and expected results the same Y/N**
iHtrCntrlActive value		0	
iHtrMain value		0	
iHtrForward value		0	
iHtrMetering value		0	
iHtrSecondary value		0	
Heater Control Task value		Asleep	
Heater Control Task		No changes	

Counter			

Then test to see whether commanding the heaters to switch off while they are already off is handled correctly.

```
/iHtr Off
```

On the housekeeping display iHtrCntrlActive should stay at 0 and all heaters should stay at 0.

	Result seen	**Expected result**	**Are seen and expected results the same Y/N**
iHtrCntrlActive value		0	
iHtrMain value		0	
iHtrForward value		0	
iHtrMetering value		0	
iHtrSecondary value		0	

Finally return the system to its normal state. Watch for 5 minutes.

```
/iHtr On
```

On the telescope simulator display, the temperatures should rise and fall as before. Check that when IF_A falls below 567 iHtrMain is set to 1 in the housekeeping within 10s, and when SEC1 falls below 551 iHtrForward is set to 1 in the housekeeping within 10s. Also check that when IF_A rises above 583 iHtrMain is set to 0 in the housekeeping within 10s, and when SEC1 rises above 599 iHtrForward is set to 1 in the housekeeping within 10s. iHtrSecondary should always be set to 0, while on the telescope simulator display the fourth heater should cycle 5s on, 5s off. The heater control active flag should be set to 1. The heater control task should be alive and its counter increasing by 20 per hk packet.

	Result seen	**Expected result**	**Are seen and expected results the same Y/N**
iHtrMain set to 1 when IF_A falls below 567 Y/N		Y	
iHtrForward set to 1 when SEC1 falls below 551 Y/N		Y	
iHtrMain set to 0 when IF_A rises above 583 Y/N		Y	
iHtrForward set to 0 when SEC1 rises above 599 Y/N		Y	
iHtrSecondary always set to 0 Y/N		Y	
Fourth heater cycles Y/N		Y	
iHtrCntrlActive set to 1		Y	
Heater Control Task Alive		Y	

Heater Control Task counter increases by 20 per hk packet		Y	

Now make sure that a TDRSS packet (APID 0x3C0) and a realtime copy of it (APID 0x361) are produced when a corrupted heater control table is in EEPROM. First make sure that the TDRSS packets can be seen on ITOS by entering

```
seqprt tdrss
```

Then load the corrupted table

```
load "heaterc1.img"
load "heaterc2.img"
```

Make sure the table is seen.

```
/iHtr Off
```

Make sure that the heater control active flag is set to 0 in the housekeeping

```
/iHtr On
```

A TDRSS packet with error 'Corrupted EEPROM Data' and first parameter set to 3 should be received, plus a realtime copy of this packet in housekeeping. The heaters should never come on, which can be ascertained from the housekeeping display – iHtrCntrlActive should be set to 0.

TDRSS packet received Y/N	
Error message 'Corrupted EEPROM Data' received Y/N	
First parameter set to 3 Y/N	
Realtime copy of packet received Y/N	
Heaters never come on Y/N	

Then, make sure that a TDRSS packet and a realtime copy of it are produced when a heater control table with bad data is in EEPROM.

```
load "heaterb1.img"
load "heaterb2.img"
```

Make sure the table is seen.

```
/iHtr Off
```

Make sure that the heater control active flag is set to 0 in the housekeeping

```
/iHtr On
```

A TDRSS packet with error 'Bad Data in EEPROM' and first parameter set to 3 should be received, plus a realtime copy of this packet in housekeeping. The heaters should never come on, which can be ascertained from the housekeeping display – iHtrCntrlActive should be set to 0.

TDRSS packet received Y/N	
Error message 'Bad Data in EEPROM' received Y/N	
First parameter set to 3 Y/N	
Realtime copy of packet received Y/N	
Heaters never come on Y/N	

Then, make sure that a TDRSS packet and a realtime copy of it are produced when a heater control table with bad thermistor data is in EEPROM.

```
load "heaterbt1.img"
load "heaterbt2.img"
```

Make sure the table is seen.

```
/iHtr Off
```

Make sure that the heater control active flag is set to 0 in the housekeeping

```
/iHtr On
```

A TDRSS packet with error 'Bad Data in EEPROM' and first parameter set to 3 should be received, plus a realtime copy of this packet in housekeeping. The heaters should never come on, which can be ascertained from the housekeeping display – iHtrCntrlActive should be set to 0.

TDRSS packet received Y/N	
Error message 'Bad Data in EEPROM' received Y/N	
First parameter set to 3 Y/N	
Realtime copy of packet received Y/N	
Heaters never come on Y/N	

Then, make sure that a TDRSS packet and a realtime copy of it are produced when a heater control table with bad thermistor number data is in EEPROM.

```
load "heaterbn1.img"
load "heaterbn2.img"
```

Make sure the table is seen.

```
/iHtr Off
```

Make sure that the heater control active flag is set to 0 in the housekeeping

```
/iHtr On
```

A TDRSS packet with error 'Bad Data in EEPROM' and first parameter set to 3 should be received, plus a realtime copy of this packet in housekeeping. The heaters should never come on, which can be ascertained from the housekeeping display – iHtrCntrlActive should be set to 0.

TDRSS packet received Y/N	

Error message 'Bad Data in EEPROM' received Y/N	
First parameter set to 3 Y/N	
Realtime copy of packet received Y/N	
Heaters never come on Y/N	

Finally, reload good heater tables.

```
load "heater1.img"
load "heater2.img"
```

Make sure the table is seen.

```
/iHtr Off
```

Make sure that the heater control active flag is set to 0 in the housekeeping

```
/iHtr On
```

The test is successful if the spacecraft voltage is set correctly and all responses in the last column of each table are Y's.

Test Successful __________

Initials ______________ Date ______________ Time __________________

10.2 Automatic heater setting

This command is still under debate. A partial test is given below. If the command has been further refined by testing time then please construct a relevant test procedure and append it to the end of this document.

Make sure that the heater table loaded is the one contained in heater1.img and heater2.img. Also make sure that the telescope simulator is running with configuration file heater_test.dat.

Note that heater settings can only be changed when the automatic heater control is off.

Set automatic heater control on first of all

```
/iHtr On
```

Send the command

```
/iHtrParams Number=3, OnTime=0, CycleTime=0,
   Tmin_Vnom=3200, Tmax_Vdrop=150
```

A verification packet with the message 'Illegal Function Code' should be received.

Message 'Illegal Function Code' received Y/N ____________

Switch off the automatic heater control

```
/iHtr Off
```

Send the command

```
/iHtrParams Number=3, OnTime=0, CycleTime=0,
   Tmin_Vnom=3200, Tmax_Vdrop=150
```

A 'successful acceptance' verification packet should be received.

'Successful acceptance' received Y/N _______________

Switch the automatic heater control back on

```
/iHtr On
```

Watch the telescope simulator display.

The first two heaters should cycle as described for the first table in the previous section. The third and fourth heaters should be permanently off, ie set to 0.

First and second heaters cycling as before Y/N _________
Third and fourth heaters off Y/N ___________

Switch the heater control off and alter the settings again, then switch it back on
```
/iHtr Off
/iHtrParams Number=2, Tmin_Vnom=540, Tmax_Vdrop=610,
NumThermistors=1, Therm1=4, Therm2=4, Therm3=4
/iHtr On
```

Watch the telescope simulator display.

The main heater should cycle between the values 567 and 583, triggering on the value of main, and the forward heater should cycle between the values 540 and 610, triggering on the value of forward1.

Main cycles between 567 and 583 on main Y/N____________
Forward cycles between 540 and 610 on forward 1 Y/N_________

Switch the heater control off and alter the settings again, then switch it back on
```
/iHtr Off
/iHtrParams Number=1, Tmin_Vnom=570, Tmax_Vdrop=580,
NumThermistors=1, Therm1=3, Therm2=3, Therm3=3
```
/iHtr On

Watch the telescope simulator display.

The main heater should cycle between the values 570 and 580, triggering on the value of main, and the forward heater should cycle between the values 540 and 610, triggering on the value of forward1.

Main cycles between 570 and 580 on main Y/N____________
Forward cycles between 540 and 610 on forward 1 Y/N_________

Switch the heater control off and alter the settings again, then switch it back on
```
/iHtr Off
/iHtrParams Number=1, Tmin_Vnom=570, Tmax_Vdrop=580,
NumThermistors=1, Therm1=1, Therm2=2, Therm3=7
```
/iHtr On

Watch the telescope simulator display.

The main heater should cycle between the values 570 and 580, triggering on the value of ref A, and the forward heater should cycle between the values 540 and 610, triggering on the value of forward1.

Main cycles between 570 and 580 on ref A Y/N____________
Forward cycles between 540 and 610 on forward 1 Y/N_________

Switch the heater control off and alter the settings again, then switch it back on
```
/iHtr Off
/iHtrParams Number=2, Tmin_Vnom=540, Tmax_Vdrop=610,
NumThermistors=1, Therm1=5, Therm2=4, Therm3=4
/iHtr On
```

Watch the telescope simulator display.

The main heater should cycle between the values 567 and 583, triggering on the value of main, and the forward heater should cycle between the values 540 and 610, triggering on the value of forward2.

Main cycles between 567 and 583 on main Y/N____________
Forward cycles between 540 and 610 on forward 2 Y/N_________

Switch the heater control off and alter the settings again, then switch it back on
```
/iHtr Off
/iHtrParams Number=2, Tmin_Vnom=540, Tmax_Vdrop=610,
NumThermistors=2, Therm1=5, Therm2=4, Therm3=4
/iHtr On
```

Watch the telescope simulator display.

The main heater should cycle between the values 567 and 583, triggering on the value of main, and the forward heater should cycle between the values 540 and 610, triggering on the average value of forward1 and forward2.

Main cycles between 567 and 583 on main Y/N____________
Forward cycles between 540 and 610 on ave. of forwards 1 and 2 Y/N_________

Switch the heater control off and alter the settings again, then switch it back on
```
/iHtr Off
/iHtrParams Number=1, Tmin_Vnom=570, Tmax_Vdrop=580,
NumThermistors=3, Therm1=7, Therm2=1, Therm3=2
/iHtr On
```

Watch the telescope simulator display.

The main heater should cycle between the values 570 and 580, triggering on the average value of ref A, refB and ref C, and the forward heater should cycle between the values 540 and 610, triggering on the average value of forward1 and forward2.

Main cycles between 570 and 580 on ave. of refs A, B and C Y/N____________
Forward cycles between 540 and 610 on ave. of forwards 1 and 2 Y/N_________

Now reset to the onboard table values using

```
/iHtr Off
/iHtr On
```

Watch the telescope simulator display.

The main heater should cycle between the values 567 and 583, triggering on the value of main, and the forward heater should cycle between the values 551 and 599, triggering on the value of forward1.

Main cycles between 567 and 583 on main Y/N___________
Forward cycles between 551 and 599 on forward 1 Y/N________

If all the responses above are Y's then the test is successful.

Test Successful _________

Initials _____________ Date _____________ Time ________________

11. DCS

11.1 DCS

Command a low priority RTS to run and then interrupt it with a higher priority RTS using
```
/iRTSRun RTS=0x53
/iRTSRun RTS=0x52
```

Check on the NHK display that a 'DCS Aborting' message and a 'Switching RTS' message have been received.

'DCS Aborting' received Y/N _____________
'Switching RTS' received Y/N ____________

Command an RTS to run and then interrupt it with the same RTS using
```
/iRTSRun RTS=0x52
/iRTSRun RTS=0x52
```

Check on the NHK display that a 'DCS RTS Already Running' message is received.

'DCS RTS Already Running' received Y/N _____________

Call a non-existent RTS using
```
/iRTSRun RTS=0xFFF
```

Check on the NHK display that a 'DCS No Such RTS' message has been received.

'DCS No Such RTS' received Y/N _____________

Call an RTS that calls a dummy telecommand with too many parameters using
```
/iRTSRun RTS=0x50
```

Check on the NHK display that a 'DCS Stack Exceeded' message has been received.

'DCS Stack Exceeded' received Y/N _____________

Load a corrupted rts.img file, then reload the flight code using
```
load "test_rts_bad_code.img"
load icu.hex
```

Call an RTS that will encounter the corruption using
```
/iRTSRun RTS=0x53
```

Check on the NHK display that a 'DCS Invalid Command Token' message has been received.

'DCS Invalid Command Token' received Y/N _____________

Reload the original rts.img
```
load "rts.img"
```

Reload flight code icu.hex.

Check on the housekeeping that the ICU is in the safe state and the RTS Depth is 0.

ICU safe Y/N________
RTS Depth 0 Y/N________

Call an RTS that will call itself
```
/iRTSRun RTS=0x51
```

Check on the NHK display that a 'DCS Call Depth Exceeded' message has been received, and on the housekeeping display that the RTS Depth is 5.

'DCS Call Depth Exceeded' received Y/N _____________
RTS Depth 5 Y/N________________

Order a state transition to idle mode.
```
/iState idle
```

Check on the NHK display that an 'Exit from safe Forbidden' message is received, and from the housekeeping display that the ICU stays in safe mode.

'Exit from safe Forbidden' received Y/N_________
ICU stays in safe mode Y/N____________

Edit the code to force a DCS timeout, compile this test version of the code and run it.

Check on the NHK display that a 'DCS Timeout Aborting RTS' message has been received.

'DCS Timeout Aborting RTS' received Y/N _____________

Command two RTS's to run in quick succession, the second having lower priority than the first using
```
/iRTSRun RTS=0x52
/iRTSRun RTS=0x53
```

Check on the NHK display that a 'DCS Insufficient Priority' message has been received.

'DCS Insufficient Priority' received Y/N _____________

After the RTS finishes check on the housekeeping the following;

Top Level RTS is 0 Y/N_____________
Bottom Level RTS is 0 Y/N__________
Task DCS is asleep Y/N______________
Task DCS counter is unchanging Y/N_________

Enable line tracing using
```
/iRTSTrace Enable=On
```

Call an RTS
```
/iRTSRun RTS=0x52
```

Check on the NHK display that at least one 'DCS Line Trace' message has been received.

'DCS Line Trace' received Y/N _____________

Check on the housekeeping the following;

Top Level RTS is 0x52 Y/N_____________
Bottom Level RTS is 0x52 Y/N__________
RTS Line Number changes Y/N__________
Task DCS is alive Y/N______________
Task DCS counter is increasing Y/N_________

Disable line tracing using
```
/iRTSTrace Enable=Off
```

Check on the NHK display that 'DCS Line Trace' messages cease

Messages cease Y/N________________

Also check that the kill command works by sending
```
/iRTSKill
```

Check on the housekeeping display that the RTS stops, and on the NHK that a 'DCS Exiting RTS' message is received.

RTS stops Y/N___________________
'DCS Exiting RTS'received Y/N__________

Call an RTS with too few arguments
```
/iRTSRun RTS=0x500
```

Check on the NHK display that the messages ‘DCS Starting RTS’, ‘DCS Too Few Arguments’ and ‘DSC Exiting RTS’ are received.

‘DCS Starting RTS’ received Y/N________
‘DCS Too Few Arguments’ received Y/N_________
‘DSC Exiting RTS’ received Y/N_____________

If all the above responses are Y’s then the test is successful.

Test Successful _________

Initials ________ Date __________ Time __________

12. SC1553

Set up the test environment with the debug interface, and run the telescope simulator with the configuration file hk_in_limits.dat, and run the DPU simulator with any one value out of limits, the rest within limits.

Check that as yet no errors are registered by the SC1553 interface.
In housekeeping iSC1553Errors and iSC1553IntReg should be set to 0.

In housekeeping, iSC1553Errors set to 0 Y/N	
In housekeeping, iSC1553IntReg set to 0 Y/N	

Switch off the limit checking
`/iLimitOff`

Make a note of the value of iTMBadPckts in the housekeeping here _________

Remove the spacecraft interface for 60s.

During this time make sure that the interface interrupt, IHTC and TC packet counters stop.

In housekeeping, iSC1553Ints does not increment Y/N	
In housekeeping, iSC1553IHTC does not increment Y/N	
In housekeeping, iSC1553TCPckt does not increment Y/N	

Reconnect the spacecraft interface to A.
Check that the ICU hasn't crashed via the debug interface.
0xEC5E should not appear.
Check telemetry.
Make sure in housekeeping that iTMBadPckts has increased by 6 (ie once per 10s while interface is disconnected, there may be some jitter on this value due to interacting timing cycles), and that iSC1553Channel is set to A. Check that after reconnection iTMGoodPckts increases by 1 per 10s. Also make sure that the interface interrupt, IHTC and TC packet counters start to increment again – generally they should all have the same value, and increment at a rate of 6 per second (ie about 60 per housekeeping packet), although it is possible for the TC packet counter to drop behind the others in value by as much as 10.
Check the debug interface for an appropriate message.
0x1589 should appear.

0xEC5E does NOT appear on debug interface Y/N	
In housekeeping, iTMBadPckts increased by 6 Y/N	
In housekeeping, iSC1553Channel set to A Y/N	

In housekeeping, iTMGoodPckts increments by 1 per 10s Y/N	
In housekeeping, iSC1553Ints increments by 60 per 10s Y/N	
In housekeeping, iSC1553IHTC increments by 60 per 10s Y/N	
In housekeeping, iSC1553TCPckt increments by 60 per 10s Y/N	
0x1589 appears on debug interface Y/N	

Switch the limit checking back on
`/iLimitOn`

Check that RT to RT packets are arriving correctly in telemetry.
iRT2RTGoodPckts should increase at the same rate as TDRSS packets arrive.

In housekeeping, iRT2RTGoodPckts increases at the same rate as TDRSS packets arrive Y/N	

Make a note of the value of iRT2RTGoodPackts here _______

Disconnect the spacecraft interface for 5mins.

Reconnect the spacecraft interface to B.

Check that RT to RT bad packets are seen correctly in telemetry.
iRT2RTBadPckts should have increased at the same rate as iRT2RTGoodPckts did above.

In housekeeping, iRT2RTBadPckts increased at the same rate as iRT2RTGoodPckts did aboveY/N	

Check that the ICU hasn't crashed via the debug interface.
0xEC5E should not appear.
Check that housekeeping continues after the interruption.
In the housekeeping packet iSC1553Channel should be B.

0xEC5E does NOT appear on debug interface Y/N	
In housekeeping, iSC1553Channel set to B Y/N	

Now force errors on the SC1553 interface by disconnecting and reconnecting it – about ten times should be sufficient.
In housekeeping iSC1553Errors should increase and iSC1553IntReg should become non-zero.

In housekeeping, iSC1553Errors increases Y/N	
In housekeeping, iSC1553IntReg non-zero Y/N	

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

Test Successful _________

Initials _________ Date ___________ Time ___________

13. SSI

Switch on the DPU simulator, which will then automatically send heartbeats.

Check the housekeeping packet for the heartbeat counter
In housekeeping iDPUHeartbeats should increment approximately once every 10s. (For information, this value is approximate because the sending and sampling rates beat together, so occasionally a heartbeat may be missed by the sampling.)

	Result seen	**Expected result**	**Are result seen and expected result the same Y/N**
iDPUHeartbeats increment rate		1 per 10s	

Check the housekeeping packet for heartbeat related housekeeping values.
Check that iSSIInterrupts and iSSIGood increment at the same rate as the heartbeats are sent.
Check that iSSIBad and iSSIErrors do not increment.

	Result seen	**Expected result**	**Are result seen and expected result the same Y/N**
iSSIInterrupts increment rate		1 per 10s	
iSSIGood increment rate		1 per 10s	
iSSIBad increment rate		None	
iSSIErrors increment rate		None	

Now stop the DPU task.
`/iDPUTask Off`

Check that no overflows have occurred so far.
The half-full counter iSSIHalfFulls and the overflow counter iSSIOverflows should be set to 0 in housekeeping.

	Result seen	**Expected result**	**Are result seen and expected result the same Y/N**
iSSIHalfFulls value		0	
iSSIOverflows value		0	

Force overflows by increasing the DPU simulator rate to its fastest possible, which is 1 per 4ms, and check the results in housekeeping.
The half-full counter iSSIHalfFulls should increment rapidly and so should iSSIOverflows. They should both reach 0xFFFF and clock over within one minute . For information, the overflow counter iSSIOverflows may briefly register a value and then reset itself to zero - this is expected behaviour.

	Result seen	**Expected result**	**Are result seen and expected result the same Y/N**
iSSIHalfFulls clocks over within 1minute		Y	
iSSIOverflows clocks over within 1minute		Y	

Finally restore the DPU simulator to its normal rate and re-enable the DPU task.
`/iDPUTask On`

If all responses in column 4 of all the tables above are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

14. FUNDAMENTAL STATE CHANGES

14.1 Safe to idle transition

Load flight code icu.hex.

Check that the following parameters on the housekeeping display are as given below.

ICU state safe Y/N ___________
Vcathode off Y/N ___________
Vmcp1 off Y/N_____________
Vmcp23 off Y/N ____________
Filter wheel blocked Y/N______

Send the command
`/istate state=idle`

Check that the following parameters on the housekeeping display are as given below.

ICU state idle Y/N ________________
Vcathode off Y/N _________________
Vmcp1 nominal Y/N_______
Vmcp23 nominal Y/N _____
Filter wheel blocked Y/N____________

Check on the NHK display that a 'Centroid Table Load OK' message and a 'Window Table Load OK' message have been received.

'Centroid Table Load OK' received Y/N___________
'Window Table Load OK' received Y/N___________

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

14.2 AT at a never before observed location

Set up the celestial environment with
```
Start autumnsafe
```

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Note here the RT-RT Good value in the housekeeping________

Enable a full dump of the RTS's run with the command
```
/iDCSTraceEnable On
```

Run the ITOS script firstat.proc with the command
```
Start firstat
```

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below. Also check that the RT-RT Good counter increments by 1.

ICU in slew Y/N ________________
Filter wheel blocked Y/N__________
RT-RT Good increments by 1 Y/N______

Check on the housekeeping display that the ICU goes to the settling state, and that the following parameters are as given below.

ICU in settling Y/N ______________
Vcathode nominal Y/N ___________
Vmcp1 nominal Y/N_____________
Vmcp23 nominal Y/N ____________
Filter wheel on filter 2 Y/N______

Check on the housekeeping display that the ICU goes to the finding state, and that the following parameters are as given below.

ICU in finding Y/N ______________

Vcathode nominal Y/N ___________
Vmcp1 nominal Y/N_____________
Vmcp23 nominal Y/N ____________
Filter wheel on filter 3 Y/N______

Check on the housekeeping display that the ICU goes to the AT state, that the three high voltages are set to nominal and that the filter wheel goes to filter 4, and that this configuration continues for 10s.

ICU in AT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 4 Y/N________
Configuration held for 10s Y/N_____

Check on the housekeeping display that the ICU stays in the AT state, that the three high voltages stay nominal and that the filter wheel goes to filter 6, and that this configuration continues for 20s.

ICU in AT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 6 Y/N________
Configuration held for 20s Y/N_____

Check on the housekeeping display that the ICU stays in the AT state, that the three high voltages stay nominal and that the filter wheel goes to filter 7, and that this configuration continues for 10s.

ICU in AT Y/N _______________
Vcathode nominal Y/N __________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 7 Y/N________
Configuration held for 10s Y/N_____

Check on the housekeeping display that the ICU stays in the AT state, that the three high voltages stay nominal and that the filter wheel goes to filter 9, and that this configuration continues for 10s.

ICU in AT Y/N _______________
Vcathode nominal Y/N __________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________

Filter wheel at filter 9 Y/N________
Configuration held for 10s Y/N_____

Check on the housekeeping display that the ICU stays in the AT state, that the three high voltages stay nominal and that the filter wheel goes to filter 10, and that this configuration continues for 20s.

ICU in AT Y/N _______________
Vcathode nominal Y/N __________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 10 Y/N________
Configuration held for 20s Y/N_____

Check on the housekeeping display that the ICU stays in the AT state, that the three high voltages stay nominal and that the filter wheel goes to filter 1, and that this configuration continues for 20s.

ICU in AT Y/N _______________
Vcathode nominal Y/N __________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 1 Y/N________
Configuration held for 20s Y/N_____

Check on the housekeeping display that the ICU stays in the AT state, that the three high voltages stay nominal and that the filter wheel goes to filter 2, and that this configuration continues for 10s.

ICU in AT Y/N _______________
Vcathode nominal Y/N __________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 2 Y/N________
Configuration held for 10s Y/N_____

Check on the housekeeping display that the ICU stays in the AT state, that the three high voltages stay nominal and that the filter wheel goes to filter 3, and that this configuration continues for 20s.

ICU in AT Y/N _______________
Vcathode nominal Y/N __________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 3 Y/N________
Configuration held for 20s Y/N_____

Check on the housekeeping display that the ICU stays in the AT state, that the three high voltages stay nominal and that the filter wheel goes to filter 4, and that this configuration continues for 10s.

ICU in AT Y/N _______________
Vcathode nominal Y/N __________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 4 Y/N________
Configuration held for 10s Y/N_____

Check on the housekeeping display that the ICU stays in the AT state, that the three high voltages stay nominal and that the filter wheel goes to filter 6, and that this configuration continues for 25s.

ICU in AT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 6 Y/N________
Configuration held for 25s Y/N_____

Check on the housekeeping display that the ICU stays in the AT state, that the three high voltages stay nominal and that the filter wheel goes to filter 7, and that this configuration continues for 15s.

ICU in AT Y/N _______________
Vcathode nominal Y/N __________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 7 Y/N________
Configuration held for 15s Y/N_____

Finally, check from the RTS trace that the star catalogue was accessed and returned its values within 1s, and that the ICU began its response to the spacecraft slew warning within 1s.

Star catalogue returned within 1s Y/N__________
Slew warning response began within 1s Y/N_______

Disable the full dump of the RTS's run with the command
`/iDCSTraceEnable Off`

Also check that the NHK message 'Centroid table load complete' was issued during this run.

Centroid table load complete' issued Y/N____________

If all the above responses are Y's then the test is successful.

Test Successful _________

Initials ________ Date __________ Time __________

14.3 AT with no XRT position given

Set up the celestial environment with
`Start autumnsafe`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Run the ITOS script atnoxrt.proc with the command
`Start atnoxrt`

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ________________
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the settling state, and that the following parameters are as given below.

ICU in settling Y/N ______________
Vcathode nominal Y/N ___________
Vmcp1 nominal Y/N_____________
Vmcp23 nominal Y/N ____________
Filter wheel on filter 2 Y/N______

Check on the housekeeping display that the ICU goes to the finding state, and that the following parameters are as given below.

ICU in finding Y/N ______________
Vcathode nominal Y/N ___________
Vmcp1 nominal Y/N_____________
Vmcp23 nominal Y/N ____________
Filter wheel on filter 3 Y/N______

Check on the housekeeping display that the ICU goes to the AT state, that the three high voltages are set to nominal and that the filter wheel goes to filter 4, and that this configuration continues for 20s.

ICU in AT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 4 Y/N________
Configuration held for 20s Y/N_____

Check on the housekeeping display that the ICU stays in the AT state, that the three high voltages stay nominal and that the filter wheel goes to filter 6, and that this configuration continues for 10s.

ICU in AT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 6 Y/N________
Configuration held for 10s Y/N_____

Check on the housekeeping display that the ICU stays in the AT state, that the three high voltages stay nominal and that the filter wheel goes to filter 7, and that this configuration continues for 20s.

ICU in AT Y/N _______________
Vcathode nominal Y/N __________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 7 Y/N________
Configuration held for 20s Y/N_____

Check on the housekeeping display that the ICU stays in the AT state, that the three high voltages stay nominal and that the filter wheel goes to filter 9, and that this configuration continues for 20s.

ICU in AT Y/N _______________
Vcathode nominal Y/N __________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 9 Y/N________
Configuration held for 20s Y/N_____

Check on the housekeeping display that the ICU stays in the AT state, that the three high voltages stay nominal and that the filter wheel goes to filter 10, and that this configuration continues for 10s.

ICU in AT Y/N _______________

Vcathode nominal Y/N __________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 10 Y/N________
Configuration held for 10s Y/N_____

Check on the housekeeping display that the ICU stays in the AT state, that the three high voltages stay nominal and that the filter wheel goes to filter 1, and that this configuration continues for 10s.

ICU in AT Y/N _______________
Vcathode nominal Y/N __________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 1 Y/N________
Configuration held for 10s Y/N_____

Check on the housekeeping display that the ICU stays in the AT state, that the three high voltages stay nominal and that the filter wheel goes to filter 2, and that this configuration continues for 20s.

ICU in AT Y/N _______________
Vcathode nominal Y/N __________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 2 Y/N________
Configuration held for 20s Y/N_____

Check on the housekeeping display that the ICU stays in the AT state, that the three high voltages stay nominal and that the filter wheel goes to filter 3, and that this configuration continues for 10s.

ICU in AT Y/N _______________
Vcathode nominal Y/N __________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 3 Y/N________
Configuration held for 10s Y/N_____

Check on the housekeeping display that the ICU stays in the AT state, that the three high voltages stay nominal and that the filter wheel goes to filter 4, and that this configuration continues for 20s.

ICU in AT Y/N _______________
Vcathode nominal Y/N __________
Vmcp1 nominal Y/N____________

Vmcp23 nominal Y/N ___________
Filter wheel at filter 4 Y/N________
Configuration held for 20s Y/N_____

Check on the housekeeping display that the ICU stays in the AT state, that the three high voltages stay nominal and that the filter wheel goes to filter 6, and that this configuration continues for 25s.

ICU in AT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 6 Y/N________
Configuration held for 25s Y/N_____

Check on the housekeeping display that the ICU stays in the AT state, that the three high voltages stay nominal and that the filter wheel goes to filter 7, and that this configuration continues for 15s.

ICU in AT Y/N _______________
Vcathode nominal Y/N __________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 7 Y/N________
Configuration held for 15s Y/N_____

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

14.4 PT

Set up the celestial environment with
`Start autumnsafe`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state, and that the star cat task is asleep, and that its counter is not increasing.

ICU safe Y/N _______________
Star cat task asleep Y/N_______
Star cat task counter unchanging Y/N____________

Run the ITOS script pt.proc with the command
`Start pt`

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below, and also that the star cat task comes alive (this may be difficult to see given the housekeeping sampling rate) and its counter increases by 1.

ICU in slew Y/N ________________
Filter wheel blocked Y/N__________

Star cat task counter alive Y/N_________
Star cat task counter has increased by 1 Y/N___________

Check on the housekeeping display that the ICU goes to the PT state, that the three high voltages are set to nominal and that the filter wheel goes to filter 5, and that this configuration continues for 10s.

ICU in PT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 5 Y/N________
Configuration held for 10s Y/N_____

Check on the housekeeping display that the ICU stays in the PT state, that the three high voltages stay nominal and that the filter wheel goes to filter 6, and that this configuration continues for 20s.

ICU in PT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 6 Y/N________
Configuration held for 20s Y/N_____

Check on the housekeeping display that the ICU stays in the PT state, that the three high voltages stay nominal and that the filter wheel goes to filter 7, and that this configuration continues for 30s.

ICU in PT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 7 Y/N________
Configuration held for 30s Y/N_____

Check on the housekeeping display that the ICU goes to the idle state, that the three high voltages stay nominal and that the filter wheel goes to blocked.

ICU in PT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel blocked Y/N_________

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

14.5 Calibration PT – Intensifier Characteristics / Pulse Height

Set up the celestial environment with
`Start autumnsafe`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Run the ITOS script calibintens.proc with the command
`Start calibintens`

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ________________
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the PT state, that the three high voltages are set to nominal and that the filter wheel stays blocked, and that this configuration continues for 20s. Also the Flood LED current should be set to 8 units.

ICU in PT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N___________
Vmcp23 nominal Y/N __________
Filter wheel blocked Y/N_______
Configuration held for 20s Y/N___
Flood LED at 8 units Y/N_______

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

14.6 A PT with a non-full-image detector window

Set up the celestial environment with
`Start autumnsafe`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

Run the ITOS script smallwin.proc with the command
`Start smallwin`

Check on the NHK display that a 'Window Table Load OK' message has been received.

'Window Table Load OK' received Y/N___________

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ________________
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the PT state, that the three high voltages are set to nominal and that the filter wheel goes to filter 5, and that this configuration continues for 10s.

ICU in PT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 5 Y/N________
Configuration held for 10s Y/N_____

Check on the housekeeping display that the ICU stays in the PT state, that the three high voltages stay nominal and that the filter wheel goes to filter 6, and that this configuration continues for 20s.

ICU in PT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N____________

Vmcp23 nominal Y/N ___________
Filter wheel at filter 6 Y/N________
Configuration held for 20s Y/N_____

Check on the housekeeping display that the ICU stays in the PT state, that the three high voltages stay nominal and that the filter wheel goes to filter 7, and that this configuration continues for 30s.

ICU in PT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 7 Y/N________
Configuration held for 30s Y/N_____

Check on the NHK display that another ‘Window Table Load OK’ message has been received.

‘Window Table Load OK’ received Y/N___________

If all the above responses are Y’s then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

14.7 Safepointing

Set up the celestial environment with
`Start autumn`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Run the ITOS script safepoint.proc with the command
`Start safepoint`

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ________________
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the safepoint state, and that the following parameters are as given below. Please note that the filter given below is for purposes of this test only – we have not yet been informed by our PI as to which filters will actually be used during safepointing.

ICU in safepoint Y/N ____________
Vcathode nominal Y/N ___________
Vmcp1 nominal Y/N_____________
Vmcp23 nominal Y/N ____________
Filter wheel at filter1 Y/N_____

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

14.8 Two AT's at the same pointing, with a PT between them

NB: The test script also includes accurate longitude and latitude simulation in the ACS messages. This should not affect the outcome of the test.

Set up the celestial environment with
`Start autumnsafe`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Run the ITOS script atptat.proc with the command
`Start atptat`

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ________________
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the settling state, and that the following parameters are as given below.

ICU in settling Y/N ______________
Vcathode nominal Y/N ___________
Vmcp1 nominal Y/N_____________
Vmcp23 nominal Y/N ____________
Filter wheel on filter 2 Y/N______

Check on the housekeeping display that the ICU goes to the finding state, and that the following parameters are as given below.

ICU in finding Y/N ______________
Vcathode nominal Y/N ___________
Vmcp1 nominal Y/N_____________
Vmcp23 nominal Y/N ____________
Filter wheel on filter 3 Y/N______

Check on the housekeeping display that the ICU goes to the AT state, that the three high voltages are set to nominal and that the filter wheel goes to filter 4, and that this configuration continues for 10s.

ICU in AT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 4 Y/N________
Configuration held for 10s Y/N_____

Check on the housekeeping display that the ICU stays in the AT state, that the three high voltages stay nominal and that the filter wheel goes to filter 6, and that this configuration continues for approximately 15s.

ICU in AT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 6 Y/N________
Configuration held for 15s Y/N_____

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ________________
Filter wheel at filter 5 Y/N_________
Vcathode zero Y/N_______________

Check on the housekeeping display that the ICU goes to the PT state, that the three high voltages are set to nominal and that the filter wheel goes to filter 5, and that this configuration continues for 10s.

ICU in PT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 5 Y/N________
Configuration held for 10s Y/N_____

Check on the housekeeping display that the ICU stays in the PT state, that the three high voltages stay nominal and that the filter wheel goes to filter 6, and that this configuration continues for approximately 15s.

ICU in PT Y/N _______________

Vcathode nominal Y/N _________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 6 Y/N________
Configuration held for 15s Y/N_____

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ________________
Filter wheel at filter 6 Y/N_________

Check on the housekeeping display that the ICU goes to the AT state, that the three high voltages are set to nominal and that the filter wheel goes to filter 7, and that this configuration continues for 10s.

ICU in AT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 7 Y/N________
Configuration held for 10s Y/N_____

Check on the housekeeping display that the ICU stays in the AT state, that the three high voltages stay nominal and that the filter wheel goes to filter 9, and that this configuration continues for 10s.

ICU in AT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 9 Y/N________
Configuration held for 10s Y/N_____

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

14.9 One AT followed by another at almost the same pointing

Set up the celestial environment with
`Start autumnsafe`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Run the ITOS script shortslew.proc with the command
`Start shortslew`

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ________________
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the settling state, and that the following parameters are as given below.

ICU in settling Y/N ______________
Vcathode nominal Y/N ___________
Vmcp1 nominal Y/N_____________
Vmcp23 nominal Y/N ____________
Filter wheel on filter 2 Y/N______

Check on the housekeeping display that the ICU goes to the finding state, and that the following parameters are as given below.

ICU in finding Y/N ______________
Vcathode nominal Y/N ___________
Vmcp1 nominal Y/N_____________
Vmcp23 nominal Y/N ____________
Filter wheel on filter 3 Y/N______

Check on the housekeeping display that the ICU goes to the AT state, that the three high voltages are set to nominal and that the filter wheel goes to filter 4, and that this configuration continues for 10s.

ICU in AT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 4 Y/N________
Configuration held for 10s Y/N_____

Check on the housekeeping display that the ICU stays in the AT state, that the three high voltages stay nominal and that the filter wheel goes to filter 6, and that this configuration continues for approximately 15s.

ICU in AT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 6 Y/N________
Configuration held for 15s Y/N_____

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ________________
Filter wheel at filter 6 Y/N_________

Check on the housekeeping display that the ICU goes to the settling state, and that the following parameters are as given below.

ICU in settling Y/N ______________
Vcathode nominal Y/N ___________
Vmcp1 nominal Y/N_____________
Vmcp23 nominal Y/N ____________
Filter wheel on filter 2 Y/N______

Check on the housekeeping display that the ICU goes to the finding state, and that the following parameters are as given below.

ICU in finding Y/N ______________
Vcathode nominal Y/N ___________
Vmcp1 nominal Y/N_____________
Vmcp23 nominal Y/N ____________
Filter wheel on filter 3 Y/N______

Check on the housekeeping display that the ICU goes to the AT state, that the three high voltages are set to nominal and that the filter wheel goes to filter 4, and that this configuration continues for 10s.

ICU in AT Y/N ______________
Vcathode nominal Y/N ________
Vmcp1 nominal Y/N___________
Vmcp23 nominal Y/N __________
Filter wheel at filter 4 Y/N_______
Configuration held for 10s Y/N_____

Check on the housekeeping display that the ICU stays in the AT state, that the three high voltages stay nominal and that the filter wheel goes to filter 6, and that this configuration continues for approximately 20s.

ICU in AT Y/N ______________
Vcathode nominal Y/N ________
Vmcp1 nominal Y/N___________
Vmcp23 nominal Y/N __________
Filter wheel at filter 6 Y/N_______
Configuration held for 20s Y/N_____

If all the above responses are Y's then the test is successful.

Test Successful _________

Initials ________ Date __________ Time __________

14.10 Interruption in finding state

Set up the celestial environment with
```
Start autumnsafe
```

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Run the ITOS script if1.proc with the command
```
Start if1
```

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ________________
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the settling state, and that the following parameters are as given below.

ICU in settling Y/N ______________
Vcathode nominal Y/N ___________
Vmcp1 nominal Y/N_____________
Vmcp23 nominal Y/N ____________
Filter wheel on filter 2 Y/N______

Check on the housekeeping display that the ICU goes to the finding state, and that the following parameters are as given below.

ICU in finding Y/N ______________
Vcathode nominal Y/N ___________
Vmcp1 nominal Y/N_____________
Vmcp23 nominal Y/N ____________
Filter wheel on filter 3 Y/N______

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ________________
Filter wheel on filter 3 Y/N_______

Check on the housekeeping display that the ICU goes to the PT state, that the three high voltages are set to nominal and that the filter wheel goes to filter 5, and that this configuration continues for 10s.

ICU in PT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 5 Y/N________
Configuration held for 10s Y/N_____

Check on the housekeeping display that the ICU stays in the PT state, that the three high voltages stay nominal and that the filter wheel goes to filter 6, and that this configuration continues for approximately 15s.

ICU in PT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 6 Y/N________
Configuration held for 15s Y/N_____

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ________________
Filter wheel on filter 6 Y/N_______

Check on the housekeeping display that the ICU goes to the finding state for 100s, and that the following parameters are as given below.

ICU in finding Y/N ______________
Vcathode nominal Y/N ___________
Vmcp1 nominal Y/N_____________
Vmcp23 nominal Y/N ____________
Filter wheel on filter 3 Y/N________
In finding state for 100s Y/N_______

Check on the housekeeping display that the ICU goes to the AT state, that the three high voltages are set to nominal and that the filter wheel goes to filter 4, and that this configuration continues for 10s.

ICU in AT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 4 Y/N________
Configuration held for 10s Y/N_____

Check on the housekeeping display that the ICU stays in the AT state, that the three high voltages stay nominal and that the filter wheel goes to filter 6, and that this configuration continues for 20s.

ICU in AT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 6 Y/N________
Configuration held for 20s Y/N_____

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

14.11 Finding state untenable

Set up the celestial environment with
```
Start autumnsafe
```

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Run the ITOS script if2.proc with the command
```
Start if2
```

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ________________
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the settling state, and that the following parameters are as given below.

ICU in settling Y/N ______________
Vcathode nominal Y/N ___________
Vmcp1 nominal Y/N_____________
Vmcp23 nominal Y/N ____________
Filter wheel on filter 2 Y/N______

Check on the housekeeping display that the ICU goes to the finding state, and that the following parameters are as given below.

ICU in finding Y/N ______________
Vcathode nominal Y/N ___________
Vmcp1 nominal Y/N_____________
Vmcp23 nominal Y/N ____________
Filter wheel on filter 3 Y/N______

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ________________
Filter wheel on filter 3 Y/N_______

Check on the housekeeping display that the ICU goes to the PT state, that the three high voltages are set to nominal and that the filter wheel goes to filter 5, and that this configuration continues for 10s.

ICU in PT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 5 Y/N________
Configuration held for 10s Y/N_____

Check on the housekeeping display that the ICU stays in the PT state, that the three high voltages stay nominal and that the filter wheel goes to filter 6, and that this configuration continues for approximately 15s.

ICU in PT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 6 Y/N________
Configuration held for 15s Y/N_____

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ________________
Filter wheel on filter 6 Y/N_______

Check on the housekeeping display that the ICU goes to the finding state, and that the following parameters are as given below.

ICU in finding Y/N ______________
Vcathode nominal Y/N ___________
Vmcp1 nominal Y/N_____________
Vmcp23 nominal Y/N ____________
Filter wheel on filter 3 Y/N______

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ________________
Filter wheel on filter 3 Y/N_______

Check on the housekeeping display that the ICU goes to the PT state, that the three high voltages are set to nominal and that the filter wheel goes to filter 5, and that this configuration continues for 10s.

ICU in PT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 5 Y/N________
Configuration held for 10s Y/N_____

Check on the housekeeping display that the ICU stays in the PT state, that the three high voltages stay nominal and that the filter wheel goes to filter 6, and that this configuration continues for approximately 15s.

ICU in PT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 6 Y/N________
Configuration held for 15s Y/N_____

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ________________
Filter wheel on filter 6 Y/N_______

Check on the housekeeping display that the ICU goes to the AT state, that the three high voltages are set to nominal and that the filter wheel goes to filter 4, and that this configuration continues for 10s.

ICU in AT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 4 Y/N________
Configuration held for 10s Y/N_____

Check on the housekeeping display that the ICU stays in the AT state, that the three high voltages stay nominal and that the filter wheel goes to filter 6, and that this configuration continues for approximately 15s.

ICU in AT Y/N _______________
Vcathode nominal Y/N _________

Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 6 Y/N________
Configuration held for 15s Y/N_____

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ________________
Filter wheel on filter 6 Y/N_______

Check on the housekeeping display that the ICU goes to the PT state, that the three high voltages are set to nominal and that the filter wheel goes to filter 5, and that this configuration continues for 10s.

ICU in PT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 5 Y/N________
Configuration held for 10s Y/N_____

Check on the housekeeping display that the ICU stays in the PT state, that the three high voltages stay nominal and that the filter wheel goes to filter 6, and that this configuration continues for approximately 15s.

ICU in PT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 6 Y/N________
Configuration held for 15s Y/N_____

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ________________
Filter wheel on filter 6 Y/N_______

Check on the housekeeping display that the ICU goes to the AT state, that the three high voltages are set to nominal and that the filter wheel goes to filter 7, and that this configuration continues for 10s.

ICU in AT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N____________

Vmcp23 nominal Y/N ___________
Filter wheel at filter 7 Y/N________
Configuration held for 10s Y/N_____

Check on the housekeeping display that the ICU stays in the AT state, that the three high voltages stay nominal and that the filter wheel goes to filter 9, and that this configuration continues for 10s.

ICU in AT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 9 Y/N________
Configuration held for 10s Y/N_____

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

14.12 A PT interrupted by an AT

Set up the celestial environment with
`Start autumnsafe`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Run the ITOS script ptatpt.proc with the command
`Start ptatpt`

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes through the slew state to the PT state, that the three high voltages are set to nominal and that the filter wheel goes to filter 5.

ICU in PT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 5 Y/N________
Configuration held for 10s Y/N_____

Check on the housekeeping display that the ICU then goes through a slew to the AT state.

ICU in AT Y/N _______________

Check on the housekeeping display that the ICU then goes through a slew back to the PT state, that the three high voltages again become nominal and that the filter wheel goes to filter 6, and that this configuration continues for 20s, i.e the PT restarts at the point of interruption

ICU in PT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 6 Y/N________
Configuration held for 20s Y/N_____

Check on the housekeeping display that the ICU stays in the PT state, that the three high voltages stay nominal and that the filter wheel goes to filter 7, and that this configuration continues for 30s.

ICU in PT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 7 Y/N________
Configuration held for 30s Y/N_____

Check on the housekeeping display that the ICU goes to the idle state, that the three high voltages stay nominal and that the filter wheel goes to blocked.

ICU in PT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel blocked Y/N_________

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

14.13 Safehold

Load flight code icu.hex.

Command the ICU to the idle state
`/istate state=idle`

Alter the spacecraft simulator ACS messages so that the 'safehold' flag is set.

Make sure that the ICU safes itself.

ICU goes to safe state Y/N__________

If the above response is Y then the test is successful.

Test Successful _________

Initials ________ Date __________ Time __________

15. BRIGHT SOURCE AVOIDANCE

15.1 Requested AT with Sun in field of view.

Set up the celestial environment with
`Start springsun`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Run the ITOS script atsun.proc with the command
`Start atsun`

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Also check on the housekeeping display that the sun constraint is OK and the sun angular distance is approximately 60.

Sun constraint OK Y/N__________
Sun angular distance 60 Y/N______

Watching the proc and NHK displays, note the time between the FONEXTOBSINFO command and the 'Bright Star Present' NHK (see below) appearing. This should be 5s or less.

Warning interval less than or equal to 5s Y/N_____________

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ________________
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the idle state, and that the following parameters are as given below.

ICU idle Y/N __________________
Vcathode off Y/N ______________
Vmcp1 at 70% of nominal Y/N_____

Vmcp23 at 70% of nominal Y/N ___
Filter wheel blocked Y/N_________

Also check on the housekeeping display that the sun constraint is CLOSE and the sun angular distance is approximately 40.

Sun constraint CLOSE Y/N_____________
Sun angular distance 40 Y/N______

Check on the NHK display that a 'Bright Planet Present' message has been received, with its second parameter set to 8.

'Bright Planet Present' received Y/N___________
Second parameter set to 8 Y/N________________

Upload a new avoidance angles table, where all avoidance angles are set to zero.
`Load ???.img`

Run the ITOS script atsun.proc with the command
`Start atsun`

Check on the housekeeping display that the ICU goes to the slew state, followed by the settling state.

ICU in slew Y/N_________
ICU in settling Y/N_______

Check on the NHK display that no 'Bright Planet Present' message has been received.

'Bright Planet Present' received Y/N___________

Upload the original avoidance angle table.

If all the above responses except the last are Y's and the last is a N then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

15.2 Requested AT with Earth in field of view

Set up the celestial environment with
```
Start springearth
```

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Also check on the housekeeping display that the earth constraint is OK and the earth angular distance is approximately 100.

Earth constraint OK Y/N_____________
Earth angular distance 100 Y/N______

Run the ITOS script atearth.proc with the command
```
Start atearth
```

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ________________
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the idle state, and that the following parameters are as given below.

ICU idle Y/N __________________
Vcathode off Y/N ______________
Vmcp1 at 70% of nominal Y/N_____
Vmcp23 at 70% of nominal Y/N ___
Filter wheel blocked Y/N_________

Also check on the housekeeping display that the earth constraint is CLOSE and the earth angular distance is approximately 90.

Earth constraint CLOSE Y/N_____________
Earth angular distance 90 Y/N______

Upload a new avoidance angles table, where all avoidance angles are set to zero.
`Load ???.img`

Run the ITOS script atearth.proc with the command
`Start atearth`

Check on the housekeeping display that the ICU goes to the slew state, followed by the settling state, and that the Earth constraint is always OK.

ICU in slew Y/N_________
ICU in settling Y/N_______
Earth constraint OK Y/N_______

Upload the original avoidance angle table.

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

15.3 Requested AT with Moon in field of view

Set up the celestial environment with
`Start autumnmoon`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Also check on the housekeeping display that the moon constraint is OK and the moon angular distance is approximately 62.

Moon constraint OK Y/N_____________
Moon angular distance 62 Y/N______

Run the ITOS script atmoon.proc with the command
`Start atmoon`

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ________________
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the idle state, and that the following parameters are as given below.

ICU idle Y/N __________________
Vcathode off Y/N ______________
Vmcp1 at 70% of nominal Y/N_____________
Vmcp23 at 70% of nominal Y/N ___
Filter wheel blocked Y/N_________

Also check on the housekeeping display that the moon constraint is CLOSE and the moon angular distance is approximately 29.

Moon constraint CLOSE Y/N_____________
Moon angular distance 29 Y/N______

Check on the NHK display that a ‘Bright Planet Present’ message has been received, with its second parameter set to 9.

‘Bright Planet Present’ received Y/N___________
Second parameter set to 9 Y/N________________

Upload a new avoidance angles table, where all avoidance angles are set to zero.
`Load ???.img`

Run the ITOS script atmoon.proc with the command
`Start atmoon`

Check on the housekeeping display that the ICU goes to the slew state, followed by the settling state.

ICU in slew Y/N_________
ICU in settling Y/N_______

Check on the NHK display that no ‘Bright Planet Present’ message has been received.

‘Bright Planet Present’ received Y/N___________

Upload the original avoidance angle table.

If all the above responses except the last are Y’s and the last is N then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

15.4 Requested AT with a planet in the field of view

Set up the celestial environment with
`Start springjupiter`

Load flight code icu.hex.

Enable a full dump of the RTS's run with the command
`/iDCSTraceEnable On`

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N ____________

Run the ITOS script atplanet.proc with the command
`Start atplanet`

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N ______________

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N _______________
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the idle state, and that the following parameters are as given below.

ICU idle Y/N _________________
Vcathode off Y/N _____________
Vmcp1 at 70% of nominal Y/N____________
Vmcp23 at 70% of nominal Y/N ___
Filter wheel blocked Y/N_________

Check on the NHK display that a 'Bright Planet Present' message has been received, with its first parameter set to 3.

'Bright Planet Present' received Y/N___________
First parameter set to 3 Y/N_______________

Check from the RTS trace that the planet locater was accessed and returned its values within 1s.

Planet locater returned within 1s Y/N__________

Disable the full dump of the RTS's run with the command
`/iDCSTraceEnable Off`

Upload a new avoidance angles table, where all avoidance angles are set to zero.
`Load ???.img`

Run the ITOS script atplanet.proc with the command
`Start atplanet`

Check on the housekeeping display that the ICU goes to the slew state, followed by the settling state.

ICU in slew Y/N_________
ICU in settling Y/N_______

Check on the NHK display that no 'Bright Planet Present' message has been received.

'Bright Planet Present' received Y/N___________

Upload the original avoidance angle table.

If all the above responses except the last are Y's, and the last is a N, then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

15.5 Requested AT with a bright star in the field of view

Set up the celestial environment with
`Start springcanopus`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Run the ITOS script atstar.proc with the command
`Start atstar`

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ________________
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the idle state, and that the following parameters are as given below.

ICU idle Y/N __________________
Vcathode off Y/N ______________
Vmcp1 at 70% of nominal Y/N____
Vmcp23 at 70% of nominal Y/N ___
Filter wheel blocked Y/N_________

Check on the NHK display that a ‘Bright Star Present’ message has been received.

‘Bright Star Present’ received Y/N___________

Upload a new avoidance angles table, where all avoidance angles are set to zero.
`Load ???.img`

Run the ITOS script atstar.proc with the command
`Start atstar`

Check on the housekeeping display that the ICU goes to the slew state, followed by the settling state.

ICU in slew Y/N_________
ICU in settling Y/N_______

Check on the NHK display that no 'Bright Star Present' message has been received.

'Bright Star Present' received Y/N___________

Upload the original avoidance angle table.

If all the above responses except the last are Y's and the last is N then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

15.6 AT exposure shortened due to presence of dim stars

Set up the celestial environment with (and this isn't a misprint)
```
Start springcanopus
```

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Run the ITOS script atshort.proc with the command
```
Start atshort
```

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes to the slew, settling and finding states.

ICU in slew Y/N ________________
ICU in settling Y/N______________
ICU in finding Y/N______________

Check on the housekeeping display that the ICU goes to the AT state, that the three high voltages are set to nominal and that the filter wheel goes to filter ???, and that this configuration continues for ???s.

ICU in AT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter ??? Y/N________
Configuration held for ???s Y/N_____

Check on the housekeeping display that the ICU stays in the AT state, that the three high voltages stay nominal and that the filter wheel goes to filter ???, and that this configuration continues for ???s.

ICU in AT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________

Filter wheel at filter ??? Y/N________
Configuration held for ???s Y/N_____

Check on the housekeeping display that the ICU stays in the AT state, that the three high voltages stay nominal and that the filter wheel goes to filter ???, and that this configuration continues for ???s.

ICU in AT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter ??? Y/N________
Configuration held for ???s Y/N_____

Check on the NHK display that the messages 'Too Many Accumulated Counts', 'No Useable Filters in Config', 'Reducing Requested Exp Time' and 'UVOT Mode Exhausted' messages have been received.

'Too Many Accumulated Counts' received Y/N___________
'No Useable Filters in Config' received Y/N___________
'Reducing Requested Exposure' received Y/N____________
'UVOT Mode Exhausted' received Y/N___________

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

15.7 Requested PT with Sun in field of view.

Set up the celestial environment with
`Start springsun`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Also check on the housekeeping display that the sun constraint is OK and the sun angular distance is approximately 60.

Sun constraint OK Y/N___________
Sun angular distance 60 Y/N______

Run the ITOS script ptsun.proc with the command
`Start ptsun`

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ________________
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the idle state, and that the following parameters are as given below.

ICU idle Y/N __________________
Vcathode off Y/N ______________
Vmcp1 at 70% of nominal Y/N_____________
Vmcp23 at 70% of nominal Y/N ___
Filter wheel blocked Y/N_________

Also check on the housekeeping display that the sun constraint is CLOSE and the sun angular distance is approximately 40.

Sun constraint CLOSE Y/N_____________
Sun angular distance 40 Y/N______

Check on the NHK display that a ‘Bright Planet Present’ message has been received, with its second parameter set to 8.

‘Bright Planet Present’ received Y/N___________
Second parameter set to 8 Y/N________________

If all the above responses are Y’s then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

15.8 Requested PT with Earth in field of view

Set up the celestial environment with
```
Start springearth
```

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Also check on the housekeeping display that the earth constraint is OK and the earth angular distance is approximately 100.

Earth constraint OK Y/N_____________
Earth angular distance 100 Y/N______

Run the ITOS script ptearth.proc with the command
```
Start ptearth
```

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ________________
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the idle state, and that the following parameters are as given below.

ICU idle Y/N __________________
Vcathode off Y/N ______________
Vmcp1 at 70% of nominal Y/N_____________
Vmcp23 at 70% of nominal Y/N ___
Filter wheel blocked Y/N_________

Also check on the housekeeping display that the earth constraint is CLOSE and the earth angular distance is approximately 90.

Earth constraint CLOSE Y/N_______
Earth angular distance 90 Y/N______

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

15.9 Requested PT with Moon in field of view

Set up the celestial environment with
`Start autumnmoon`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Also check on the housekeeping display that the moon constraint is OK and the moon angular distance is approximately 62.

Moon constraint OK Y/N____________
Moon angular distance 62 Y/N______

Run the ITOS script ptmoon.proc with the command
`Start ptmoon`

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ________________
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the idle state, and that the following parameters are as given below.

ICU idle Y/N __________________
Vcathode off Y/N ______________
Vmcp1 at 70% of nominal Y/N_____
Vmcp23 at 70% of nominal Y/N ___
Filter wheel blocked Y/N_________

Also check on the housekeeping display that the moon constraint is CLOSE and the moon angular distance is approximately 29.

Moon constraint CLOSE Y/N____________
Moon angular distance 29 Y/N______

Check on the NHK display that a ‘Bright Planet Present’ message has been received, with its second parameter set to 9.

‘Bright Planet Present’ received Y/N___________
Second parameter set to 9 Y/N________________

If all the above responses are Y’s then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

15.10 Requested PT with a planet in the field of view

Set up the celestial environment with
`Start springjupiter`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _____________

Run the ITOS script ptplanet.proc with the command
`Start ptplanet`

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ________________
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the idle state, and that the following parameters are as given below.

ICU idle Y/N __________________
Vcathode off Y/N ______________
Vmcp1 at 70% of nominal Y/N_____________
Vmcp23 at 70% of nominal Y/N ___
Filter wheel blocked Y/N_________

Check on the NHK display that a ‘Bright Planet Present’ message has been received, with its first parameter set to 3.

‘Bright Planet Present’ received Y/N___________
First parameter set to 3 Y/N________________

If all the above responses are Y’s then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

15.11 Requested PT with a bright star in the field of view

Set up the celestial environment with
`Start springcanopus`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Run the ITOS script ptstar.proc with the command
`Start ptstar`

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ________________
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the idle state, and that the following parameters are as given below.

ICU idle Y/N __________________
Vcathode off Y/N ______________
Vmcp1 at 70% of nominal Y/N_____________
Vmcp23 at 70% of nominal Y/N ___
Filter wheel blocked Y/N_________

Check on the NHK display that a 'Bright Star Present' message has been received.

'Bright Star Present' received Y/N___________

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

15.12 PT exposure shortened due to presence of dim stars

Set up the celestial environment with (and this is not a misprint)
`Start springcanopus`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Run the ITOS script ptshort.proc with the command
`Start ptshort`

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ________________
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the PT state, that the three high voltages are set to nominal and that the filter wheel goes to filter 5, and that this configuration continues for ???s.

ICU in PT Y/N ________________
Vcathode nominal Y/N __________
Vmcp1 nominal Y/N_____________
Vmcp23 nominal Y/N ____________
Filter wheel at filter 5 Y/N_________
Configuration held for ???s Y/N_____

Check on the housekeeping display that the ICU stays in the PT state, that the three high voltages stay nominal and that the filter wheel goes to filter 6, and that this configuration continues for ???s.

ICU in PT Y/N _________________
Vcathode nominal Y/N __________
Vmcp1 nominal Y/N_____________
Vmcp23 nominal Y/N ____________
Filter wheel at filter 6 Y/N_________

Configuration held for ???s Y/N_____

Check on the housekeeping display that the ICU stays in the PT state, that the three high voltages stay nominal and that the filter wheel goes to filter 7, and that this configuration continues for ???s.

ICU in PT Y/N ________________
Vcathode nominal Y/N ___________
Vmcp1 nominal Y/N_____________
Vmcp23 nominal Y/N ____________
Filter wheel at filter 7 Y/N_________
Configuration held for ???s Y/N_____

Check on the NHK display that the messages 'Too Many Accumulated Counts', 'No Useable Filters in Config', 'Reducing Requested Exp Time' and 'UVOT Mode Exhausted' messages have been received.

'Too Many Accumulated Counts' received Y/N___________
'No Useable Filters in Config' received Y/N___________
'Reducing Requested Exposure' received Y/N____________
'UVOT Mode Exhausted' received Y/N___________

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

15.13 Several bright stars in the field of view

Set up the celestial environment with
`Start autumnsafe`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N ______________

Run the ITOS script threebright.proc with the command
`Start threebright`

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N ______________

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N _______________
Filter wheel blocked Y/N_________

Check on the housekeeping display that the ICU goes to the idle state, and that the following parameters are as given below.

ICU idle Y/N _________________
Vcathode off Y/N _____________
Vmcp1 at 70% of nominal Y/N____________
Vmcp23 at 70% of nominal Y/N ___
Filter wheel blocked Y/N_________

Check on the ICU Events display that three 'Bright Star Report' messages have been received.

Three 'Bright Star Report' messages received Y/N__________

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

15.14 Drift towards Sun, Moon or Earth

Set up the celestial environment with
```
Start autumnsafe
```

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Command the ICU to the idle state with
```
/iState State=idle
```

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Change the ACS message on whichever simulator is available to move the Sun to just within the Sun avoidance angle.

Check on the housekeeping display that the ICU goes to the safe state.

ICU safe Y/N _______________

Command the ICU to the idle state with
```
/iState State=idle
```

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Change the ACS message on whichever simulator is available to move the Moon to just within the Moon avoidance angle.

Check on the housekeeping display that the ICU goes to the safe state.

ICU safe Y/N _______________

Command the ICU to the idle state with
```
/iState State=idle
```

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Change the ACS message on whichever simulator is available to move the Earth to just within the Earth avoidance angle.

Check on the housekeeping display that the ICU goes to the safe state.

ICU safe Y/N _______________

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

16. STATE CHANGES INVOLVING THE SAA

16.1 Safe to idle transition in the SAA

Load flight code icu.hex.

Check that the following parameters on the housekeeping display are as given below.

ICU state safe Y/N ___________
Vcathode off Y/N ___________
Vmcp1 off Y/N_____________
Vmcp23 off Y/N ____________
Filter wheel blocked Y/N______

Set the SAA flag high using
```
Start saaon
```

Check on the SCACS display that the SAA flag is high

SAA flag set Y/N___________________

Send the command
```
/istate state=idle
```

Check that the following parameters on the housekeeping display are as given below.

ICU state SAA Y/N ________________
Vcathode off Y/N _________________
Vmcp1 at 70% of nominal Y/N_______
Vmcp23 at 70% of nominal Y/N _____
Filter wheel blocked Y/N____________

Check on the NHK display that a 'Centroid Table Load OK' message and a 'Window Table Load OK' message have been received.

'Centroid Table Load OK' received Y/N___________
'Window Table Load OK' received Y/N___________

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

16.2 Entering and exiting SAA during slew

NB: This test also checks on the ability of the code to handle a boundary condition, in that the SAA flag is set for the first time in the same ACS message as the is_settled flag becomes false at the start of the slew.

Set up the celestial environment with
`Start autumnsafe`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Run the ITOS script slewio.proc with the command
`Start slewio`

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ________________
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the slewSAA state, and that the following parameters are as given below.

ICU in slewSAA Y/N ____________
Vcathode stays where it was at point of interruption Y/N _______________
Vmcp1 stays where it was at point of interruption Y/N_____________
Vmcp23 stays where it was at point of interruption Y/N ___
Filter wheel blocked Y/N__________

Check on the NHK display that a ‘State Transition Complete’ message has been received.

‘State Transition Complete’ received Y/N___________

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N _______________
Filter wheel blocked Y/N__________

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

16.3 Starting the slew while in the SAA and exiting it during slew

Set up the celestial environment with
```
Start autumnsafe
```

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Run the ITOS script slewo.proc with the command
```
Start slewo
```

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes to the SAA state, and that the following parameters are as given below.

ICU in SAA Y/N ________________
Vcathode off Y/N _______________
Vmcp1 at 70% of nominal Y/N_____________
Vmcp23 at 70% of nominal Y/N ___
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the slewSAA state, and that the following parameters are as given below.

ICU in slewSAA Y/N ____________
Vcathode off Y/N _______________
Vmcp1 at 70% of nominal Y/N_____________
Vmcp23 at 70% of nominal Y/N ___
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ________________
Filter wheel blocked Y/N__________

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

16.4 Entering the SAA while slewing and exiting it in the settling state

Set up the celestial environment with
`Start autumnsafe`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state,.

ICU safe Y/N _______________

Run the ITOS script setto.proc with the command
`Start setto`

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes to the SAA state, and that the following parameters are as given below.

ICU in SAA Y/N ____________
Vcathode off Y/N _______________
Vmcp1 at 70% of nominal Y/N_____________
Vmcp23 at 70% of nominal Y/N ___
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the slewSAA state, and that the following parameters are as given below.

ICU in slewSAA Y/N ____________
Vcathode off Y/N _______________
Vmcp1 at 70% of nominal Y/N_____________
Vmcp23 at 70% of nominal Y/N ___
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the SAA state, and that the following parameters are as given below.

ICU in SAA Y/N _______________
Vcathode off Y/N _______________
Vmcp1 at 70% of nominal Y/N_____________
Vmcp23 at 70% of nominal Y/N ___
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the settling state, and that the following parameters are as given below.

ICU in settling Y/N ________________
Vcathode nominal Y/N _____________
Vmcp1 nominal Y/N_______________
Vmcp23 nominal Y/N ______________
Filter wheel at filter 2 Y/N_________

If all the above responses are Y's then the test is successful.

Test Successful _________

Initials ________ Date __________ Time __________

16.5 Entering and exiting the SAA in the settling state

Set up the celestial environment with
`Start autumnsafe`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Run the ITOS script settio.proc with the command
`Start settio`

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ____________
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the settling state, and that the following parameters are as given below.

ICU in settling Y/N _________
Vcathode nominal Y/N ______________
Vmcp1 nominal Y/N________________
Vmcp23 nominal Y/N _______________
Filter wheel at filter 2 Y/N__________

Check on the housekeeping display that the ICU goes to the SAA state, and that the following parameters are as given below.

ICU in SAA Y/N _________________
Vcathode off Y/N _______________
Vmcp1 at 70% of nominal Y/N_____________
Vmcp23 at 70% of nominal Y/N ___
Filter wheel at filter 2 Y/N__________

Check on the housekeeping display that the ICU goes to the settling state, and that the following parameters are as given below.

ICU in settling Y/N _________
Vcathode nominal Y/N ______________
Vmcp1 nominal Y/N_______________
Vmcp23 nominal Y/N _______________
Filter wheel at filter 2 Y/N__________

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

16.6 Entering and exiting the SAA in the finding state

Set up the celestial environment with
```
Start autumnsafe
```

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Run the ITOS script findio.proc with the command
```
Start findio
```

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N _______________
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the settling state, and that the following parameters are as given below.

ICU in settling Y/N ________________
Vcathode nominal Y/N ______________
Vmcp1 nominal Y/N________________
Vmcp23 nominal Y/N _______________
Filter wheel at filter 2 Y/N__________

Check on the housekeeping display that the ICU goes to the finding state, and that the following parameters are as given below.

ICU in finding Y/N _________________
Vcathode nominal Y/N ______________
Vmcp1 nominal Y/N________________
Vmcp23 nominal Y/N _______________
Filter wheel at filter 3 Y/N__________

Check on the housekeeping display that the ICU goes to the SAA state, and that the following parameters are as given below.

ICU in SAA Y/N _________________
Vcathode off Y/N _______________
Vmcp1 at 70% of nominal Y/N_____________
Vmcp23 at 70% of nominal Y/N ___
Filter wheel at filter 3 Y/N__________

Check on the housekeeping display that the ICU goes to the finding state, and that the following parameters are as given below.

ICU in finding Y/N _________________
Vcathode nominal Y/N ______________
Vmcp1 nominal Y/N________________
Vmcp23 nominal Y/N _______________
Filter wheel at filter 3 Y/N__________

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

16.7 Staying a long time in the SAA in the finding state

Set up the celestial environment with
`Start autumnsafe`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Run the ITOS script getretry.proc with the command
`Start getretry`

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ________________
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the settling state, and that the following parameters are as given below.

ICU in settling Y/N ________________
Vcathode nominal Y/N ______________
Vmcp1 nominal Y/N________________
Vmcp23 nominal Y/N _______________
Filter wheel at filter 2 Y/N__________

Check on the housekeeping display that the ICU goes to the finding state, and that the following parameters are as given below.

ICU in finding Y/N _________________
Vcathode nominal Y/N ______________
Vmcp1 nominal Y/N________________
Vmcp23 nominal Y/N _______________
Filter wheel at filter 3 Y/N__________

Check on the housekeeping display that the ICU goes to the SAA state, and that the following parameters are as given below.

ICU in SAA Y/N ________________
Vcathode off Y/N _______________
Vmcp1 at 70% of nominal Y/N_____________
Vmcp23 at 70% of nominal Y/N ___
Filter wheel at filter 3 Y/N__________

Check on the housekeeping display that the ICU goes to the finding state, and that the following parameters are as given below.

ICU in finding Y/N _________________
Vcathode nominal Y/N ______________
Vmcp1 nominal Y/N________________
Vmcp23 nominal Y/N _______________
Filter wheel at filter 3 Y/N__________

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

16.8 Entering the SAA during slew and leaving it in the finding state

Set up the celestial environment with
```
Start autumnsafe
```

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Run the ITOS script slewifindo.proc with the command
```
Start slewifindo
```

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ____________
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the slewSAA state, and that the following parameters are as given below.

ICU in slewSAA Y/N ________
Vcathode off Y/N _______________
Vmcp1 at 70% of nominal Y/N_____________
Vmcp23 at 70% of nominal Y/N ___
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the SAA state, and that the following parameters are as given below.

ICU in SAA Y/N _________________
Vcathode off Y/N _______________
Vmcp1 at 70% of nominal Y/N_____________
Vmcp23 at 70% of nominal Y/N ___
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the finding state, and that the following parameters are as given below.

ICU in finding Y/N __________
Vcathode nominal Y/N ______________
Vmcp1 nominal Y/N________________
Vmcp23 nominal Y/N _______________
Filter wheel at filter 3 Y/N__________

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

16.9 Entering the SAA in the settling state and exiting it in the finding state

Set up the celestial environment with
`Start autumnsafe`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Run the ITOS script settifindo.proc with the command
`Start settifindo`

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ____________
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the settling state, and that the following parameters are as given below.

ICU in settling Y/N _________
Vcathode nominal Y/N ______________
Vmcp1 nominal Y/N________________
Vmcp23 nominal Y/N _______________
Filter wheel at filter 2 Y/N__________

Check on the housekeeping display that the ICU goes to the SAA state, and that the following parameters are as given below.

ICU in SAA Y/N _________________
Vcathode off Y/N _______________
Vmcp1 at 70% of nominal Y/N_____________
Vmcp23 at 70% of nominal Y/N ___
Filter wheel at filter 2 Y/N__________

Check on the housekeeping display that the ICU goes to the finding state, and that the following parameters are as given below.

ICU in finding Y/N __________
Vcathode nominal Y/N ______________
Vmcp1 nominal Y/N________________
Vmcp23 nominal Y/N _______________
Filter wheel at filter 3 Y/N__________

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

16.10 Entering and exiting the SAA during an AT exposure

Set up the celestial environment with
`Start autumnsafe`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Run the ITOS script atio.proc with the command
`Start atio`

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ________________
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the settling state, and that the following parameters are as given below.

ICU in settling Y/N ______________
Vcathode nominal Y/N ___________
Vmcp1 nominal Y/N_____________
Vmcp23 nominal Y/N ____________
Filter wheel on filter 2 Y/N______

Check on the housekeeping display that the ICU goes to the finding state, and that the following parameters are as given below.

ICU in finding Y/N ______________
Vcathode nominal Y/N ___________
Vmcp1 nominal Y/N_____________
Vmcp23 nominal Y/N ____________
Filter wheel on filter 3 Y/N______

Check on the housekeeping display that the ICU goes to the AT state, and that the following parameters are as given below.

ICU in AT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N___________
Vmcp23 nominal Y/N __________
Filter wheel at filter 4 Y/N_______
Stays in this configuration for 10s Y/N________

Check on the housekeeping display that the ICU goes to the AT state, and that the following parameters are as given below.

ICU in AT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N___________
Vmcp23 nominal Y/N __________
Filter wheel at filter 6 Y/N_______
Stays in this configuration for 15s Y/N________

Check on the housekeeping display that the ICU goes to the SAA state, and that the following parameters are as given below.

ICU in SAA Y/N ________________
Vcathode off Y/N _______________
Vmcp1 at 70% of nominal Y/N_____
Vmcp23 at 70% of nominal Y/N ___
Filter wheel at filter 6 Y/N__________

Check on the housekeeping display that the ICU goes back to the AT state, and that the following parameters are as given below.

ICU in AT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N___________
Vmcp23 nominal Y/N __________
Filter wheel at filter 7 Y/N_______
Stays in this configuration for 15s Y/N_________

Now load a new table with a different restart action, and note this action here;
____

Rerun the test as above. Make sure that after the SAA interruption the new restart action is seen.

New restart action seen Y/N_____________

Now load a new table with a different exposure completion criterion, and note this criterion here;
____

Rerun the test as above. Make sure that after the SAA interruption the new criterion is applied.

New criterion applied Y/N____________

If all the above responses are Y's then the test is successful.

Test Successful   _________

Initials _________ Date ___________ Time ___________

16.11 Entering the SAA during slew and exiting it during an AT exposure

Note that to force the direct slew to AT transition first an AT with a finding chart for this location must be done. Consequently a number of already checked state transitions are run through before the new ones are checked.

Set up the celestial environment with
`Start autumnsafe`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Run the ITOS script ato.proc with the command
`Start ato`

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes to the slew state.

ICU in slew Y/N _______________

Check on the housekeeping display that the ICU goes to the settling state.

ICU in settling Y/N _______________

Check on the housekeeping display that the ICU goes to the finding state.

ICU in finding Y/N _______________

Check on the housekeeping display that the ICU goes to the AT state.

ICU in AT Y/N _______________

Check on the housekeeping display that the ICU goes to the slew state.

ICU slew Y/N _______________

Check on the housekeeping display that the ICU goes to the PT state.

ICU in PT Y/N _______________

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ____________
Filter wheel at filter 5 Y/N__________

Check on the housekeeping display that the ICU goes to the slewSAA state, and that the following parameters are as given below.

ICU in slewSAA Y/N ________
Vcathode off Y/N _______________
Vmcp1 at 70% of nominal Y/N_____________
Vmcp23 at 70% of nominal Y/N ___
Filter wheel at filter 5 Y/N__________

Check on the housekeeping display that the ICU goes to the SAA state, and that the following parameters are as given below.

ICU in SAA Y/N _________________
Vcathode off Y/N _______________
Vmcp1 at 70% of nominal Y/N_____________
Vmcp23 at 70% of nominal Y/N ___
Filter wheel at filter 5 Y/N__________

Check on the housekeeping display that the ICU goes to the AT state, and that the following parameters are as given below.

ICU in AT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N___________
Vmcp23 nominal Y/N __________
Filter wheel at filter 7 Y/N_____
Stays in this configuration for 10s Y/N__________

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

16.12 Entering and leaving the SAA during a PT exposure

Set up the celestial environment with
`Start autumnsafe`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Run the ITOS script ptio.proc with the command
`Start ptio`

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ____________
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the PT state, and that the following parameters are as given below.

ICU in PT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N___________
Vmcp23 nominal Y/N __________
Filter wheel at filter 5 Y/N_____

Check on the housekeeping display that the ICU goes to the SAA state, and that the following parameters are as given below.

ICU in SAA Y/N _________________
Vcathode off Y/N _______________
Vmcp1 at 70% of nominal Y/N_____________
Vmcp23 at 70% of nominal Y/N ___
Filter wheel at filter 5 Y/N__________

Check on the housekeeping display that the ICU goes back to the PT state, and that the following parameters are as given below.

ICU in PT Y/N ______________
Vcathode nominal Y/N ________
Vmcp1 nominal Y/N__________
Vmcp23 nominal Y/N _________
Filter wheel at filter 6 Y/N_____

Now alter in the script the start of the SAA interruption, so that it starts within the first 10% of the first exposure.

Rerun the test as above, and make sure that after the SAA interruption the ICU goes back to the PT state and restarts the first exposure, ie stays at filter 5.

After SAA interruption ICU in PT Y/N____________
Filter wheel at filter 5 Y/N_____________

If all the above responses are Y's then the test is successful.

Test Successful _________

Initials ________ Date __________ Time __________

16.13 Entering the SAA during slew and exiting it during a PT exposure

Set up the celestial environment with
`Start autumnsafe`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Run the ITOS script pto.proc with the command
`Start pto`

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ________________
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the slewSAA state, and that the following parameters are as given below.

ICU in slewSAA Y/N ____________
Vcathode off Y/N _______________
Vmcp1 at 70% of nominal Y/N_____________
Vmcp23 at 70% of nominal Y/N ___
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the SAA state, and that the following parameters are as given below.

ICU in SAA Y/N ________________
Vcathode off Y/N _______________
Vmcp1 at 70% of nominal Y/N_____________
Vmcp23 at 70% of nominal Y/N ___
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the PT state, and that the following parameters are as given below.

ICU in PT Y/N ______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N___________
Vmcp23 nominal Y/N __________
Filter wheel at filter 5 Y/N_____

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

16.14 Entering and exiting the SAA during a safe pointing

Set up the celestial environment with
`Start autumnsafe`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Run the ITOS script sfptio.proc with the command
`Start sfptio`

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N _______________
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the safepoint state, and that the following parameters are as given below.

ICU in safepoint Y/N __________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N___________
Vmcp23 nominal Y/N __________
Filter wheel at filter 1 Y/N_____

Check on the housekeeping display that the ICU goes to the SAA state, and that the following parameters are as given below.

ICU in SAA Y/N ________________
Vcathode off Y/N _______________
Vmcp1 at 70% of nominal Y/N_____________
Vmcp23 at 70% of nominal Y/N ___
Filter wheel at filter 1 Y/N__________

Check on the housekeeping display that the ICU goes to the safepoint state, and that the following parameters are as given below.

ICU in safepoint Y/N __________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N___________
Vmcp23 nominal Y/N __________
Filter wheel at filter 1 Y/N_____

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

16.15 Entering the SAA during slew and exiting it during a safe pointing

Set up the celestial environment with
`Start autumnsafe`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Run the ITOS script sfpto.proc with the command
`Start sfpto`

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes to the SAA state, and that the following parameters are as given below.

ICU in SAA Y/N ________________
Vcathode off Y/N _______________
Vmcp1 at 70% of nominal Y/N_____________
Vmcp23 at 70% of nominal Y/N ___
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the slewSAA state, and that the following parameters are as given below.

ICU in slewSAA Y/N ____________
Vcathode off Y/N _______________
Vmcp1 at 70% of nominal Y/N_____________
Vmcp23 at 70% of nominal Y/N ___
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the SAA state, and that the following parameters are as given below.

ICU in SAA Y/N ________________
Vcathode off Y/N _______________
Vmcp1 at 70% of nominal Y/N_____________
Vmcp23 at 70% of nominal Y/N ___
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the safepoint state, and that the following parameters are as given below.

ICU in safepoint Y/N __________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N___________
Vmcp23 nominal Y/N __________
Filter wheel at filter 1 Y/N_____

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

16.16 Entering and exiting the SAA while in the idle state

Set up the celestial environment with
`Start autumn`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Run the ITOS script idleio.proc with the command
`Start idleio`

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes to the SAA state, and that the following parameters are as given below.

ICU in SAA Y/N ________________
Vcathode off Y/N _______________
Vmcp1 at 70% of nominal Y/N______
Vmcp23 at 70% of nominal Y/N ___
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes back to the idle state, and that the following parameters are as given below.

ICU idle Y/N __________________
Vcathode off Y/N _______________
Vmcp1 at 70% of nominal Y/N_____________
Vmcp23 at 70% of nominal Y/N ___
Filter wheel blocked Y/N__________

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

16.17 Entering and exiting the SAA in the safe state

Set up the celestial environment with
`Start autumn`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Run the ITOS script safeio.proc with the command
`Start safeio`

Check on the housekeeping display that the ICU stays in the safe state, that the three high voltages are off and that the filter wheel is blocked throughout.

ICU safe Y/N _______________
Vcathode off Y/N ___________
Vmcp1 off Y/N_____________
Vmcp23 off Y/N ____________
Filter wheel blocked Y/N______

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

17. ERROR CONDITIONS

17.1 Loss of spacecraft messaging

Load flight code icu.hex.

Command the ICU to the idle state using
`/iState State=Idle`

Check on the housekeeping display that the ICU has gone to the idle state, and that the following parameters are as given below.

ICU idle Y/N ___________________
Vcathode off Y/N ________________
Vmcp1 at 70% of nominal Y/N______________
Vmcp23 at 70% of nominal Y/N ___
Filter wheel blocked Y/N__________

Unplug the spacecraft simulator network cable from the wall, then reconnect it 1 minute later, or if using the SWRI simulator, then quit stoi and restart it 1 minute later.

After reconnection, check on the housekeeping display that the ICU has gone to the safe state, that the three high voltages are off and that the filter wheel is blocked.

ICU safe Y/N ________________
Vcathode off Y/N ____________
Vmcp1 off Y/N_____________
Vmcp23 off Y/N _____________
Filter wheel blocked Y/N______

Check on the NHK display that an 'ACS Missing' message has been received.

'ACS Missing' received Y/N____________

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

17.2 Loss of spacecraft messaging during exposure

Load flight code icu.hex.

Run the ITOS script firstat.proc with the command
`Start firstat`

Once the AT state has been reached, disconnect the spacecraft simulator for approx 45s. Make sure that the watchdog does not trip.

Watchdog trips Y/N____________

If the above response is N then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

17.3 Out of limits triggering a power off UVOT request

Change the test environment so that it is as standard except for the telescope simulator running with out-of-limits configuration file hk_low_high.dat, and the DPU simulator running with one or two values out of limits.

Load flight code icu.hex.

From the spacecraft display (or the stoi.out log if using the SWRI simulator), make a note here of the number of SACPWROFFUVOT requests issued so far ________________

Load a partially configured limit checking table using the commands

```
load "limpart1.img"
load "limpart2.img"
```

Check on the housekeeping display that limit checking and the limit checking task are enabled and the limit checking task counter is increasing by 10 per hk packet.

Limit checking status 1 Y/N_________
Limit checking task alive Y/N________
Limit checking task counter increasing by 10 per hk packet Y/N________

Make sure that the new table is seen using the commands

```
/ilimitoff
/ilimiton
```

Check on the housekeeping display that limit checking, task and counter are disabled and then re-enabled

Limit checking status 0 Y/N_________
Limit checking task asleep Y/N________
Limit checking task counter unchanging Y/N________

Limit checking re-enabled Y/N_______

Check on the spacecraft display that another SACPWROFFUVOT request is issued.

SACPWROFFUVOT request issued Y/N___________

If the above response is Y then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

17.4 Out of limits triggering a power off UVOT TM request

Change the test environment so that it is as standard except for the telescope simulator running with out-of-limits configuration file hk_low_high.dat, and the DPU simulator running with one or two values out of limits.

Load flight code icu.hex.

From the spacecraft display, make a note here of the number of SACPWROFFUVOTTM requests issued so far ___________________

Load a partially configured limit checking table using the commands

```
load "lim???.img"
load "lim???.img"
```

Make sure that the new table is seen using the commands

```
/ilimitoff
/ilimiton
```

Check on the spacecraft display (or the stoi.out log if using the SWRI simulator) that another SACPWROFFUVOTTM request is issued.

SACPWROFFUVOTTM request issued Y/N____________

If the above response is Y then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

17.5 TMPSU out of limits

Make sure that the test environment is normal, as detailed in the introduction to this document. If necessary reload the standard limit checking table using the commands

```
load "???1.img"
load "???2.img"
```

and make sure that the new table is seen using the slightly different commands (which are themselves being tested here)

```
/ilimit enable=off
/ilimit enable=on
```

Set up the celestial environment with

```
Start autumnsafe
```

Load flight code icu.hex.

Start a PT exposure by running the ITOS script pt.proc with the command

```
Start pt
```

Check on the housekeeping display that the ICU, after slewing, gets to the PT state, that the three high voltages are set to nominal and that the filter wheel goes to filter 5.

ICU in PT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N___________
Vmcp23 nominal Y/N __________
Filter wheel at filter 5 Y/N_____

Now command the TMPSU to an out-of-limits value with the command

```
???
```

Check on the housekeeping display that within 10s the ICU goes to the safe state, that the three high voltages are turned off and that the filter wheel is blocked.

ICU safe within 10sY/N _______________
Vcathode off Y/N ___________
Vmcp1 off Y/N_____________
Vmcp23 off Y/N ____________
Filter wheel blocked Y/N______

Check on the NHK display that a 'Limit Exceeded' message has been received.

'Limit Exceeded' received Y/N___________

Load flight code icu.hex.

Turn limit checking off with
`/ilimitoff`

Start a PT exposure by running the ITOS script pt.proc with the command
`Start pt`

Check on the housekeeping display that the ICU, after slewing, gets to the PT state, that the three high voltages are set to nominal and that the filter wheel goes to filter 5.

ICU in PT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N___________
Vmcp23 nominal Y/N __________
Filter wheel at filter 5 Y/N_____

Check on the housekeeping display that the ICU stays in the PT state, that the three high voltages are set to nominal and that the filter wheel is at filter 5.

ICU in PT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N___________
Vmcp23 nominal Y/N __________
Filter wheel at filter 5 Y/N_____

Load a new limit table where the action on a TMPSU limit being exceeded is to issue a warning message.

Load flight code icu.hex

Now command the TMPSU to an out-of-limits value with the command
`???`

Check that the warning message is issued.

Warning message issued Y/N_____________

Reload the standard limit table.

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

17.6 BPE out of limits

Set up the celestial environment with
`Start autumnsafe`

Load flight code icu.hex.

Start a PT exposure by running the ITOS script pt.proc with the command
`Start pt`

Check on the housekeeping display that the ICU, after slewing, gets to the PT state, that the three high voltages are set to nominal and that the filter wheel goes to filter 5.

ICU in PT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N___________
Vmcp23 nominal Y/N __________
Filter wheel at filter 5Y/N_______

Now command the BPE to an out-of-limits value with the command
`???`

Check on the housekeeping display that within 10s the ICU goes to the safe state, that the three high voltages are turned off and that the filter wheel is blocked.

ICU safe within 10s Y/N _______________
Vcathode off Y/N ___________
Vmcp1 off Y/N_____________
Vmcp23 off Y/N ____________
Filter wheel blocked Y/N______

Load flight code icu.hex.

Turn limit checking off with
`/ilimitoff`

Start a PT exposure by running the ITOS script pt.proc with the command
`Start pt`

Check on the housekeeping display that the ICU, after slewing, gets to the PT state, that the three high voltages are set to nominal and that the filter wheel goes to filter 5.

ICU in PT Y/N _______________
Vcathode nominal Y/N _________

Vmcp1 nominal Y/N__________
Vmcp23 nominal Y/N __________
Filter wheel at filter 5 Y/N_____

Check on the housekeeping display that the ICU stays in the PT state, that the three high voltages are set to nominal and that the filter wheel is at filter 5.

ICU in PT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N__________
Vmcp23 nominal Y/N __________
Filter wheel at filter 5 Y/N_____

Load a new limit table where the action on a BPE limit being exceeded is to issue a warning message.

Load flight code icu.hex

Now command the BPE to an out-of-limits value with the command
???

Check that the warning message is issued.

Warning message issued Y/N_____________

Reload the standard limit table.

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

17.7 DPU out of limits

Set up the celestial environment with
`Start autumnsafe`

Load flight code icu.hex.

Start a PT exposure by running the ITOS script pt.proc with the command
`Start pt`

Check on the housekeeping display that the ICU, after slewing, gets to the PT state, that the three high voltages are set to nominal and that the filter wheel goes to filter 5

ICU in PT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N___________
Vmcp23 nominal Y/N __________
Filter wheel at filter 5Y/N_______

Now command the DPU to an out-of-limits value with the command
`???`

Check on the housekeeping display that within 10s the ICU goes to the safe state, that the three high voltages are turned off and that the filter wheel is blocked.

ICU safe within 10s Y/N _______________
Vcathode off Y/N ___________
Vmcp1 off Y/N_____________
Vmcp23 off Y/N ____________
Filter wheel blocked Y/N______

Load flight code icu.hex.

Turn limit checking off with
`/ilimitoff`

Start a PT exposure by running the ITOS script pt.proc with the command
`Start pt`

Check on the housekeeping display that the ICU, after slewing, gets to the PT state, that the three high voltages are set to nominal and that the filter wheel goes to filter 5.

ICU in PT Y/N _______________
Vcathode nominal Y/N _________

Vmcp1 nominal Y/N___________
Vmcp23 nominal Y/N __________
Filter wheel at filter 5 Y/N_____

Check on the housekeeping display that the ICU stays in the PT state, that the three high voltages are set to nominal and that the filter wheel is at filter 5.

ICU in PT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N___________
Vmcp23 nominal Y/N __________
Filter wheel at filter 5 Y/N_____

Load a new limit table where the action on a DPU limit being exceeded is to issue a warning message.

Load flight code icu.hex

Now command the DPU to an out-of-limits value with the command
???

Check that the warning message is issued.

Warning message issued Y/N_____________

Reload the standard limit table.

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

17.8 DPUHB out of limits

Set up the celestial environment with
`Start autumnsafe`

Load flight code icu.hex.

Start a PT exposure by running the ITOS script pt.proc with the command
`Start pt`

Check on the housekeeping display that the ICU, after slewing, gets to the PT state, that the three high voltages are set to nominal and that the filter wheel goes to filter 5

ICU in PT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N___________
Vmcp23 nominal Y/N __________
Filter wheel at filter 5 YN_______

Now command the DPUHB to an out-of-limits value with the command
`???`

Check on the housekeeping display that within 10s the ICU goes to the safe state, that the three high voltages are turned off and that the filter wheel is blocked.

ICU safe within 10s Y/N _______________
Vcathode off Y/N ___________
Vmcp1 off Y/N_____________
Vmcp23 off Y/N ____________
Filter wheel blocked Y/N______

Load flight code icu.hex.

Turn limit checking off with
`/ilimitoff`

Start a PT exposure by running the ITOS script pt.proc with the command
`Start pt`

Check on the housekeeping display that the ICU, after slewing, gets to the PT state, that the three high voltages are set to nominal and that the filter wheel goes to filter 5.

ICU in PT Y/N _______________
Vcathode nominal Y/N _________

Vmcp1 nominal Y/N___________
Vmcp23 nominal Y/N __________
Filter wheel at filter 5 Y/N_____

Check on the housekeeping display that the ICU stays in the PT state, that the three high voltages are set to nominal and that the filter wheel is at filter 5.

ICU in PT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N___________
Vmcp23 nominal Y/N __________
Filter wheel at filter 5 Y/N_____

Load a new limit table where the action on a DPUHB limit being exceeded is to issue a warning message.

Load flight code icu.hex

Now command the DPUHB to an out-of-limits value with the command
???

Check that the warning message is issued.

Warning message issued Y/N_____________

Reload the standard limit table.

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

17.9 Bad is_settled flag in ACS

Set up the celestial environment with
`Start autumnsafe`

Load flight code icu.hex.

Run the ITOS proc badacs1.proc with the command
`Start badacs1`

Check on the housekeeping display that the ICU, after slewing, gets to the PT state, that the three high voltages are set to nominal and that the filter wheel goes to filter 5

ICU in PT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N___________
Vmcp23 nominal Y/N __________
Filter wheel at filter 5 Y/N_______

Check on the housekeeping display that the ICU goes to the safe state, that the three high voltages go off and that the filter wheel is blocked.

ICU safe Y/N ______________
Vcathode off Y/N __________
Vmcp1 off Y/N_____________
Vmcp23 off Y/N ___________
Filter wheel blocked Y/N______

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

17.10 A glitch in the is_settled flag

Set up the celestial environment with
`Start autumnsafe`

Load flight code icu.hex .

Command the ICU to the idle state using
`/iState State=Idle`

Check on the housekeeping display that the ICU has gone to the idle state.

ICU idle Y/N ______________

Run the ITOS proc badacs2.proc with the command
`Start badacs2`

Check on the housekeeping display that the ICU, after slewing, gets to the PT state, that the three high voltages are set to nominal and that the filter wheel goes to filter 5, and this configuration is held for 10s.

ICU in PT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N___________
Vmcp23 nominal Y/N __________
Filter wheel at filter 5 Y/N_______
Configuration held for 10s Y/N____

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

17.11 Bad pointing values

NB The case of an ACS message with all values set to 0 is automatically tested every time the autumnsafe ITOS procedure is run.

Alter the database so that there are no limits set for possible right ascension, declination, roll and spacecraft voltage values in the SACSIMSETATT command and for possible right ascension, declination and roll values in the FONEXTOBSINFO command.

Load flight code icu.hex.

Command the ICU to the idle state using
```
/iState State=Idle
```

Check on the housekeeping display that the ICU has gone to the idle state.

ICU idle Y/N ______________

Change the RA value in the ACS messages with the commands
```
RA=0xffff
Start changeatt
```

Check on the housekeeping display that the ICU goes to the safe state, that the three high voltages go off and that the filter wheel is blocked.

ICU safe Y/N ______________
Vcathode off Y/N __________
Vmcp1 off Y/N_____________
Vmcp23 off Y/N ___________
Filter wheel blocked Y/N______

Check that an NHK ‘Bad Value’ message is received.

‘Bad Value’ received Y/N_____________

Change the declination value in the ACS messages with the commands
RA=0
```
Dec=0xffff
Start changeatt
```

Check on the housekeeping display that the ICU goes to the safe state, that the three high voltages go off and that the filter wheel is blocked.

ICU safe Y/N ______________

Vcathode off Y/N __________
Vmcp1 off Y/N_____________
Vmcp23 off Y/N ___________
Filter wheel blocked Y/N______

Check that an NHK 'Bad Value' message is received.

'Bad Value' received Y/N_____________

Change the roll value in the ACS messages with the commands

```
Dec=0
Roll=0xffff
Start changeatt
```

Check on the housekeeping display that the ICU goes to the safe state, that the three high voltages go off and that the filter wheel is blocked.

ICU safe Y/N ______________
Vcathode off Y/N __________
Vmcp1 off Y/N_____________
Vmcp23 off Y/N ___________
Filter wheel blocked Y/N______

Check that an NHK 'Bad Value' message is received.

'Bad Value' received Y/N_____________

Change the spacecraft voltage value in the ACS messages with the commands

```
Dec=0
Busvolt=0xffff
Start changeatt
```

Check on the housekeeping display that the ICU goes to the safe state, that the three high voltages go off and that the filter wheel is blocked.

ICU safe Y/N ______________
Vcathode off Y/N __________
Vmcp1 off Y/N_____________
Vmcp23 off Y/N ___________
Filter wheel blocked Y/N______

Check that an NHK 'Bad Value' message is received.

'Bad Value' received Y/N_____________

Change the spacecraft voltage value in the ACS messages with the commands

```
Busvolt=0
Start changeatt
```

Check on the ACS display that the voltage has automatically been assigned 30V.

Spacecraft voltage 30V Y/N_____________

Change to the idle state with
```
/istate state=idle
```

Fool the ICU into thinking a slew has started by sending the command
```
/sislewwarning
```

Change the RA value in the FONEXTOBSINFO messages with the commands
```
fomra=0xffff
Start sendfom
```

Check on the housekeeping display that the ICU goes to the safe state, that the three high voltages go off and that the filter wheel is blocked.

ICU safe Y/N _____________
Vcathode off Y/N __________
Vmcp1 off Y/N_____________
Vmcp23 off Y/N ___________
Filter wheel blocked Y/N______

Check that an NHK ‘Bad Value’ message is received.

‘Bad Value’ received Y/N____________

Change to the idle state with
```
/istate state=idle
```

Fool the ICU into thinking a slew has started by sending the command
```
/sislewwarning
```

Change the declination value in the FONEXTOBSINFO messages with the commands
```
fomra=0
fomdec=0xffff
Start sendfom
```

Check on the housekeeping display that the ICU goes to the safe state, that the three high voltages go off and that the filter wheel is blocked.

ICU safe Y/N _____________
Vcathode off Y/N __________

Vmcp1 off Y/N____________
Vmcp23 off Y/N __________
Filter wheel blocked Y/N_____

Check that an NHK 'Bad Value' message is received.

'Bad Value' received Y/N____________

Change to the idle state with
```
/istate state=idle
```

Fool the ICU into thinking a slew has started by sending the command
```
/sislewwarning
```

Change the roll value in the FONEXTOBSINFO messages with the commands
```
fomdec=0
fomroll=0xffff
Start sendfom
```

Check on the housekeeping display that the ICU goes to the safe state, that the three high voltages go off and that the filter wheel is blocked.

ICU safe Y/N _____________
Vcathode off Y/N _________
Vmcp1 off Y/N____________
Vmcp23 off Y/N __________
Filter wheel blocked Y/N_____

Check that an NHK 'Bad Value' message is received.

'Bad Value' received Y/N____________

Change to the idle state with
```
/istate state=idle
```

Fool the ICU into thinking a slew has started by sending the command
```
/sislewwarning
```

Change the attitude values in the FONEXTOBSINFO messages with the commands
```
fomra=0
fomdec=0
fomroll=0
Start sendfom
```

Check that no error messages are received.

Error messages received Y/N___________

NB: Return the database to normal now.

If all the above responses bar the last are Y's and the last is N then the test is successful.

Test Successful _________

Initials _________ Date ___________ Time ___________

17.12 Slewing towards the Sun

Set up the celestial environment with
```
Start springsun
```

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Check on the housekeeping display that the sun constraint violation flag is set to OK.

Sun constraint violation OK Y/N___________

Run the ITOS script looksun.proc with the command
```
Start looksun
```

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ____________
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the idle state, and that the following parameters are as given below.

ICU idle Y/N _______________
Vcathode off Y/N ___________
Vmcp1 stays where it was at the point of interruption Y/N_____________
Vmcp23 stays where it was at the point of interruption Y/N ____________
Filter wheel blocked Y/N______

Check on the housekeeping display that the sun constraint violation flag is set to CLOSE.

Sun constraint violation CLOSE Y/N___________

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

17.13 Slewing towards the Earth

Set up the celestial environment with
`Start autumnsafe`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Check on the housekeeping display that the earth constraint violation flag is set to OK.

Earth constraint violation OK Y/N___________

Run the ITOS script lookearth.proc with the command
`Start lookearth`

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ____________
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the idle state, and that the following parameters are as given below.

ICU safe Y/N _______________
Vcathode off Y/N ___________
Vmcp1 stays where it was at the point of interruption Y/N_____________
Vmcp23 stays where it was at the point of interruption Y/N ____________
Filter wheel blocked Y/N______

Check on the housekeeping display that the earth constraint violation flag is set to CLOSE.

Earth constraint violation CLOSE Y/N___________

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

17.14 Drift off target once settled

Set up the celestial environment with
`Start autumnsafe`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Run the ITOS script drift.proc with the command
`Start drift`

Check on the housekeeping display that the ICU, after going to idle and then slewing, gets to the PT state, that the three high voltages are set to nominal and that the filter wheel goes to filter 5.

ICU in PT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N___________
Vmcp23 nominal Y/N __________
Filter wheel at filter 5 Y/N_______

Check on the housekeeping display stays in the PT state, that the three high voltages are set to nominal and that the filter wheel goes to filter 6.

ICU in PT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N___________
Vmcp23 nominal Y/N __________
Filter wheel at filter 6 Y/N_______

Then check that 25s after the first exposure started the ICU goes to the safe state, that the three high voltages go off and that the filter wheel is blocked.

ICU safe Y/N _______________
Vcathode off Y/N ___________
Vmcp1 off Y/N_____________
Vmcp23 off Y/N ____________
Filter wheel blocked Y/N______

Check on the NHK display that an ‘Unacceptable Differential Drift’ message has been received.

'Unacceptable Differential Drift' received Y/N______________

Wait one minute and check on the NHK display that another 'Unacceptable Differential Drift' message has been received. Check that this is timestamped one minute after the first.

'Unacceptable Differential Drift' received Y/N______________
Timestamps one minute apart Y/N________________________

Now load a new limit table, where the default action on ACS going out of limits is no-op.

Load flight code icu.hex

Run the ITOS script drift.proc with the command
```
Start drift
```

Check on the housekeeping display that the ICU, after going to idle and then slewing, gets to the PT state, that the three high voltages are set to nominal and that the filter wheel goes to filter 5.

ICU in PT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N___________
Vmcp23 nominal Y/N __________
Filter wheel at filter 5 Y/N_______

Check on the housekeeping display stays in the PT state, that the three high voltages are set to nominal and that the filter wheel goes to filter 6.

ICU in PT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N___________
Vmcp23 nominal Y/N __________
Filter wheel at filter 6 Y/N_______

Check on the housekeeping display stays in the PT state, that the three high voltages are set to nominal and that the filter wheel goes to filter 7 ie the ICU has not safed itself.

ICU in PT Y/N _______________
Vcathode nominal Y/N _________
Vmcp1 nominal Y/N___________
Vmcp23 nominal Y/N __________
Filter wheel at filter 7 Y/N_______

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

17.15 Settled on wrong target

Set up the celestial environment with
`Start autumnsafe`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Run the ITOS script wrongtarget.proc with the command
`Start wrongtarget`

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ____________
Filter wheel blocked Y/N__________

Then check that after 20s the ICU goes to the safe state, that the three high voltages go off and that the filter wheel is blocked.

ICU safe Y/N _______________
Vcathode off Y/N ___________
Vmcp1 off Y/N_____________
Vmcp23 off Y/N ____________
Filter wheel blocked Y/N______

Check on the NHK display that a 'Not at Predicted Position' message has been received.

'Not at Predicted Position' received Y/N___________

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

17.16 Corrupted star catalogue

If this test is being run immediately after test 4.1 then the star catalogue memory will actually be corrupted. If not, then edit the code so that the starcat task always returns a corrupted EEPROM message.

Set up the celestial environment with
```
Start autumnsafe
```

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Run the ITOS script pt.proc with the command
```
Start pt
```

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ________________
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the idle state, and that the following parameters are as given below.

ICU idle Y/N __________________
Vcathode off Y/N ______________
Vmcp1 at 70% of nominal Y/N_____________
Vmcp23 at 70% of nominal Y/N ___
Filter wheel blocked Y/N_________

Check on the NHK display that a 'Corrupted EEPROM Data' message has been received, with first parameter 0004 and second parameter EEEE.

'Corrupted EEPROM Data' received Y/N___________
First parameter 0004 Y/N________________________
Second parameter EEEE Y/N_____________________

NB Now either take the edits out of the code or reload the star catalogue using

```
Load "cat.img"
Load "pointers.img"
Load "addendum.img"
```

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

17.17 Unknown UVOT modes

Set up the celestial environment with
`Start autumnsafe`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Run the ITOS script getnoatmode.proc with the command
`Start getnoatmode`

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ________________
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the idle state, and that the following parameters are as given below.

ICU idle Y/N __________________
Vcathode off Y/N ______________
Vmcp1 at 70% of nominal Y/N_____________
Vmcp23 at 70% of nominal Y/N ___
Filter wheel blocked Y/N_________

Check on the NHK display that a 'No Such UVOT AT Mode' message has been received.

'No Such UVOT AT Mode' received Y/N___________

Run the ITOS script getnoptmode.proc with the command
`Start getnoptmode`

Check on the housekeeping display that the ICU stays in the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ________________
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the idle state, and that the following parameters are as given below.

ICU idle Y/N __________________
Vcathode off Y/N ______________
Vmcp1 at 70% of nominal Y/N_____________
Vmcp23 at 70% of nominal Y/N ___
Filter wheel blocked Y/N_________

Check on the NHK display that a 'No Such UVOT PT Mode' message has been received.

'No Such UVOT PT Mode' received Y/N___________

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

17.18 Bright star store exhausted

Edit the code so that the bright star store will only contain three values.

Set up the celestial environment with
`Start springcanopus`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Run the ITOS script ptstar.proc with the command
`Start ptstar`

Check on the housekeeping display that the ICU goes to the idle state.

ICU idle Y/N _______________

Check on the housekeeping display that the ICU goes to the slew state, and that the following parameters are as given below.

ICU in slew Y/N ________________
Filter wheel blocked Y/N__________

Check on the housekeeping display that the ICU goes to the idle state, and that the following parameters are as given below.

ICU idle Y/N __________________
Vcathode off Y/N ______________
Vmcp1 at 70% ofnominal Y/N_____________
Vmcp23 at 70% of nominal Y/N ___
Filter wheel blocked Y/N_________

Check on the NHK display that a ‘Bright Star Store Exhausted’ message has been received.

‘Bright Star Store Exhausted’ received Y/N___________

If all the above responses are Y’s then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

17.19 Exposures commanded while UVOT is safed

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Run an ITOS script to start an AT without taking the UVOT out of the safe state.

Check on the housekeeping display that the ICU stays in the safe state throughout.

ICU safe Y/N _______________

Run an ITOS script to start a PT without taking the UVOT out of the safe state.

Check on the housekeeping display that the ICU stays in the safe state throughout.

ICU safe Y/N _______________

Run an ITOS script to start a safepointing without taking the UVOT out of the safe state.

Check on the housekeeping display that the ICU stays in the safe state throughout.

ICU safe Y/N _______________

If all the above responses are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

18. MANUAL STATE TRANSITIONS

18.1 Manual state transitions

Load flight code icu.hex.

Load an altered state transition table, which will change state when allowable but otherwise perform no-op, using
`Load "???.img"`

In the table below, for each line, check that UVOT is in the current state, and command it to go to the next state. In some cases a series of state changes is given – this is because to access some states repetition of previously checked transitions is necessary. In each case check that the response is as given. The last transition in the series is the one being checked. A disallowed transition will receive a 'Forbidden State Transition' NHK message. The state change command, eg for slew, is
`/iState State=slew`

Current state	Next state	Response expected	Response as expected Y/N
Safe	Slew	'Forbidden State Transition'	
Safe	SlewSAA	'Forbidden State Transition'	
Safe	AT	'Forbidden State Transition'	
Safe	PT	'Forbidden State Transition'	
Safe	Safepoint	'Forbidden State Transition'	
Safe	Settling	'Forbidden State Transition'	
Safe	Finding	'Forbidden State Transition'	
Safe	SAA	'Forbidden State Transition'	
Safe	Safe	'Forbidden State Transition'	
Safe	Idle	Transition to Idle	
Idle	SlewSAA	'Forbidden State Transition'	
Idle	Settling	'Forbidden State Transition'	
Idle	Finding	'Forbidden State Transition'	
Idle	AT	'Forbidden State Transition'	
Idle	PT	'Forbidden State Transition'	
Idle	Safepoint	'Forbidden State Transition'	
Idle	Idle	'Forbidden State Transition'	
Idle	Slew	Transition to Slew	
Slew	Idle	Transition to Idle	
Idle	SAA	Transition to SAA	
SAA	Idle	Transition to Idle	
Idle	Safe	Transition to Safe	
Safe	to Idle to	'Forbidden State Transition'	

	SAA to Slew		
SAA	SAA	'Forbidden State Transition'	
SAA	SlewSAA	Transition to SlewSAA	
SlewSAA	SAA	Transition to SAA	
SAA	AT	Transition to AT	
AT	SAA	Transition to SAA	
SAA	PT	Transition to PT	
PT	SAA	Transition to SAA	
SAA	Safepoint	Transition to Safepoint	
Safepoint	SAA	Transition to SAA	
SAA	Settling	Transition to Settling	
Settling	SAA	Transition to SAA	
SAA	Finding	Transition to Finding	
Finding	SAA	Transition to SAA	
SAA	Safe	Transition to Safe	
Safe	to Idle to SAA to SlewSAA to AT	'Forbidden State Transition'	
SlewSAA	PT	'Forbidden State Transition'	
SlewSAA	Safepoint	'Forbidden State Transition'	
SlewSAA	Idle	'Forbidden State Transition'	
SlewSAA	Settling	'Forbidden State Transition'	
SlewSAA	Finding	'Forbidden State Transition'	
SlewSAA	SlewSAA	'Forbidden State Transition'	
SlewSAA	Slew	Transition to Slew	
Slew	SlewSAA	Transition to SlewSAA	
SlewSAA	Safe	Transition to Safe	
Safe	to Idle to Slew to Slew	'Forbidden State Transition'	
Slew	SAA	'Forbidden State Transition'	
Slew	AT	Transition to AT	
AT	Slew	Transition to Slew	
Slew	PT	Transition to PT	
PT	Slew	Transition to Slew	
Slew	Safepoint	Transition to Safepoint	
Safepoint	Slew	Transition to Slew	
Slew	Settling	Transition to Settling	
Settling	Slew	Transition to Slew	
Slew	Finding	Transition to Finding	
Finding	Slew	Transition to Slew	
Slew	Safe	Transition to Safe	
Safe	to Idle to Slew to AT to Settling	'Forbidden State Transition'	

AT	Finding	'Forbidden State Transition'	
AT	PT	'Forbidden State Transition'	
AT	Safepoint	'Forbidden State Transition'	
AT	SlewSAA	'Forbidden State Transition'	
AT	AT	Transition to AT	
AT	Idle	Transition to Idle	
Idle	to Slew to AT to Safe	Transition to Safe	
Safe	to Idle to Slew to PT to Settling	'Forbidden State Transition'	
PT	Finding	'Forbidden State Transition'	
PT	AT	'Forbidden State Transition'	
PT	Safepoint	'Forbidden State Transition'	
PT	SlewSAA	'Forbidden State Transition'	
PT	PT	Transition to PT	
PT	Idle	Transition to Idle	
Idle	to Slew to PT to Safe	Transition to Safe	
Safe	to Idle to Slew to Safepoint	Transition to Safepoinnt	
Safepoint	Settling	'Forbidden State Transition'	
Safepoint	Finding	'Forbidden State Transition'	
Safepoint	AT	'Forbidden State Transition'	
Safepoint	PT	'Forbidden State Transition'	
Safepoint	SlewSAA	'Forbidden State Transition'	
Safepoint	Safepoint	Transition to Safepoint	
Safepoint	Idle	Transition to Idle	
Idle	to Slew to Safepoint to Safe	Transition to Safe	
Safe	to Idle to Slew to Settling to SlewSAA	'Forbidden State Transition'	
Settling	AT	'Forbidden State Transition'	
Settling	PT	'Forbidden State Transition'	
Settling	Safepoint	'Forbidden State Transition'	
Settling	Settling	'Forbidden State Transition'	
Settling	Finding	Transition to Finding	
Finding	Idle	Transition to Idle	
Idle	to Slew to Settling to Idle	Transition to Idle	

Idle	to Slew to Settling to Safe	Transition to Safe	
Safe	to Idle to Slew to Settling to Finding to Settling	'Forbidden State Transition'	
Finding	Finding	'Forbidden State Transition'	
Finding	PT	'Forbidden State Transition'	
Finding	Safepoint	'Forbidden State Transition'	
Finding	SlewSAA	'Forbidden State Transition'	
Finding	AT	Transition to AT	
AT	to Slew to Settling to Finding to Safe	Transition to Safe	

If all the responses in column 4 of the table above are Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

19. CORRUPTED TABLES

19.1 Random corruption

Note that the star catalogue tables are not tested here as they have already been tested in section 17.16.

Load two tables that will corrupt all the non-star catalogue tables in EEPROM B using

```
Load "corrtbl1.img"
Load "corrtbl2.img"
```

Load flight code icu.hex.

Check on the NHK display that two 'Corrupted EEPROM Data' messages are received, one with a first parameter of 3 and the other with a first parameter 0x23.

'Corrupted EEPROM Data 0003' received Y/N__________
'Corrupted EEPROM Data 0023' received Y/N__________

Try to ramp up the high voltages, run an RTS, and change state,using

```
/iHVEnable On
/iHVRamp Vmcp23, Value=110, RampRate=0
/iHVEnable Off
/iRTSRun RTS=0x52
/iState Idle
```

None of these should work.

High voltages would not move Y/N_________
RTS would not run Y/N__________________
ICU state stayed safe Y/N_________________

Load the second heater table using

```
Load "heater2.img"
```

Reload flight code icu.hex.

Check on the NHK display that a 'Corrupted EEPROM Data' message is received, with a first parameter of 3.

'Corrupted EEPROM Data 0003' received Y/N__________

Load the first heater table using

```
Load "heater1.img"
```

Reload flight code icu.hex.

Check on the NHK display that two 'Corrupted EEPROM Data' messages are received, one with a first parameter of 2 and the other with a first parameter 0x22.

'Corrupted EEPROM Data 0002' received Y/N__________
'Corrupted EEPROM Data 0022' received Y/N__________

Try to ramp up the high voltages, run an RTS, and change state,using

```
/iHVEnable On
/iHVRamp Vmcp23, Value=110, RampRate=0
/iHVEnable Off
/iRTSRun RTS=0x52
/iState Idle
```

None of these should work.

High voltages would not move Y/N_________
RTS would not run Y/N_________________
ICU state stayed safe Y/N_________________

Load the second limit table using

```
Load "lim2.img"
```

Reload flight code icu.hex.

Check on the NHK display that a 'Corrupted EEPROM Data' message is received, with a first parameter of 2.

'Corrupted EEPROM Data 0002' received Y/N__________

Load the first limit table using

```
Load "lim1.img"
```

Reload flight code icu.hex.

Check on the NHK display that two 'Corrupted EEPROM Data' messages are received, one with a first parameter of 1 and the other with a first parameter 0x21.

'Corrupted EEPROM Data 0001' received Y/N__________
'Corrupted EEPROM Data 0021' received Y/N__________

Try to ramp up the high voltages, run an RTS, and change state,using

```
/iHVEnable On
/iHVRamp Vmcp23, Value=110, RampRate=0
```

```
/iHVEnable Off
/iRTSRun RTS=0x52
/iState Idle
```

None of these should work.

High voltages would not move Y/N________
RTS would not run Y/N________________
ICU state stayed safe Y/N________________

Load the second HV table using
```
Load "hv2.img"
```

Reload flight code icu.hex.

Check on the NHK display that a 'Corrupted EEPROM Data' message is received, with a first parameter of 2.

'Corrupted EEPROM Data 0001' received Y/N_________

Try to ramp up the high voltages, run an RTS, and change state,using
```
/iHVEnable On
/iHVRamp Vmcp23, Value=110, RampRate=0
/iHVEnable Off
/iRTSRun RTS=0x52
/iState Idle
```

None of these should work.

High voltages would not move Y/N________
RTS would not run Y/N________________
ICU state stayed safe Y/N________________

Load the first HV table using
```
Load "hv1.img"
```

Reload flight code icu.hex.

Check on the NHK display that a 'Corrupted EEPROM Data' message is received, with a first parameter of 0xA.

'Corrupted EEPROM Data 000a' received Y/N_________

Try to ramp up the high voltages, run an RTS, and change state,using
```
/iHVEnable On
/iHVRamp Vmcp23, Value=110, RampRate=0
```

```
/iHVEnable Off
/iRTSRun RTS=0x52
/iState Idle
```

None of these should work.

High voltages would not move Y/N_________
RTS would not run Y/N_________________
ICU state stayed safe Y/N________________

Load the state table using
```
Load "state_changes_eeprom_0ff600.img"
```

Reload flight code icu.hex.

Check on the NHK display that a 'Corrupted EEPROM Data' message is received, with a first parameter of 0xE.

'Corrupted EEPROM Data   000e' received Y/N__________

Try to ramp up the high voltages, run an RTS, and change state,using
```
/iHVEnable On
/iHVRamp Vmcp23, Value=110, RampRate=0
/iHVEnable Off
/iRTSRun RTS=0x52
/iState Idle
```

None of these should work.

High voltages would not move Y/N_________
RTS would not run Y/N_________________
ICU state stayed safe Y/N________________

Load the count rate table using
```
Load "count_rate_table_eeprom_0ff380.img"
```

Reload flight code icu.hex.

Check on the NHK display that a 'Corrupted EEPROM Data' message is received, with a first parameter of 0x7.

'Corrupted EEPROM Data   0007' received Y/N__________

Try to ramp up the high voltages, run an RTS, and change state,using
```
/iHVEnable On
/iHVRamp Vmcp23, Value=110, RampRate=0
```

```
/iHVEnable Off
/iRTSRun RTS=0x52
/iState Idle
```

None of these should work.

High voltages would not move Y/N_________
RTS would not run Y/N_________________
ICU state stayed safe Y/N________________

Load the AT configuration tables using

```
Load "at_config_eeprom_0fe380.img"
Load "at_config_eeprom_0f6280.img"
```

Reload flight code icu.hex.

Check on the NHK display that a 'Corrupted EEPROM Data' message is received, with a first parameter of 0xF.

'Corrupted EEPROM Data   000f' received Y/N__________

Try to ramp up the high voltages, run an RTS, and change state,using

```
/iHVEnable On
/iHVRamp Vmcp23, Value=110, RampRate=0
/iHVEnable Off
/iRTSRun RTS=0x52
/iState Idle
```

None of these should work.

High voltages would not move Y/N_________
RTS would not run Y/N_________________
ICU state stayed safe Y/N________________

Load the PT configuration ID tables using

```
Load "pt_config_id_eeprom_0f8480.img"
Load "pt_config_id_eeprom_0f8380.img"
```

Reload flight code icu.hex.

Check on the NHK display that a 'Corrupted EEPROM Data' message is received, with a first parameter of 0x8.

'Corrupted EEPROM Data   0008' received Y/N__________

Try to ramp up the high voltages, run an RTS, and change state,using

```
/iHVEnable On
/iHVRamp Vmcp23, Value=110, RampRate=0
/iHVEnable Off
/iRTSRun RTS=0x52
/iState Idle
```

None of these should work.

High voltages would not move Y/N_________
RTS would not run Y/N_________________
ICU state stayed safe Y/N________________

Load the PT configuration table using
```
Load "pt_config_eeprom_0fa380.img"
```

Reload flight code icu.hex.

Check on the NHK display that a 'Corrupted EEPROM Data' message is received, with a first parameter of 0x9.

'Corrupted EEPROM Data   0009' received Y/N__________

Try to ramp up the high voltages, run an RTS, and change state,using
```
/iHVEnable On
/iHVRamp Vmcp23, Value=110, RampRate=0
/iHVEnable Off
/iRTSRun RTS=0x52
/iState Idle
```

None of these should work.

High voltages would not move Y/N_________
RTS would not run Y/N_________________
ICU state stayed safe Y/N________________

Load the standard table using
```
Load "standard_eeprom_0fff80.img"
```

Reload flight code icu.hex.

Check on the NHK display that a 'Corrupted EEPROM Data' message is received, with a first parameter of 0x5.

'Corrupted EEPROM Data   0005' received Y/N__________

Try to ramp up the high voltages, run an RTS, and change state,using

```
/iHVEnable On
/iHVRamp Vmcp23, Value=110, RampRate=0
/iHVEnable Off
/iRTSRun RTS=0x52
/iState Idle
```

None of these should work.

High voltages would not move Y/N_________
RTS would not run Y/N_________________
ICU state stayed safe Y/N________________

Load the avoidance angles table using
`Load "avoidance_eeprom_0ff500.img"`

Reload flight code icu.hex.

Check on the NHK display that a ‘Corrupted EEPROM Data’ message is received, with a first parameter of 0xD.

‘Corrupted EEPROM Data   000d’ received Y/N__________

Try to ramp up the high voltages, run an RTS, and change state,using

```
/iHVEnable On
/iHVRamp Vmcp23, Value=110, RampRate=0
/iHVEnable Off
/iRTSRun RTS=0x52
/iState Idle
```

None of these should work.

High voltages would not move Y/N_________
RTS would not run Y/N_________________
ICU state stayed safe Y/N________________

Load the error action table using
`Load "errors_table_eeprom_0f8280.img"`

Reload flight code icu.hex.

Run a test RTS, number 0x20, using
`/iRTSRun Number=0x20`

Check on the NHK display that a ‘Corrupted EEPROM Data’ message is received, with a first parameters of 0x10.

'Corrupted EEPROM Data 0010' received Y/N__________

Try to ramp up the high voltages, run an RTS, and change state,using

```
/iHVEnable On
/iHVRamp Vmcp23, Value=110, RampRate=0
/iHVEnable Off
/iRTSRun RTS=0x52
/iState Idle
```

None of these should work.

High voltages would not move Y/N_________
RTS would not run Y/N__________________
ICU state stayed safe Y/N_________________

Load the RTS index table using

```
Load "rts.img"
```

Poke this table so that there is a corruption in the test RTS using
???

Reload flight code icu.hex.

Run a test RTS, number 0x20, using

```
/iRTSRun Number=0x20
```

Check on the NHK display that a 'Corrupted EEPROM Data' message is received, with a first parameter of 0xC.

'Corrupted EEPROM Data 000c' received Y/N__________

Try to ramp up the high voltages, run an RTS, and change state,using

```
/iHVEnable On
/iHVRamp Vmcp23, Value=110, RampRate=0
/iHVEnable Off
/iRTSRun RTS=0x52
/iState Idle
```

None of these should work.

High voltages would not move Y/N_________
RTS would not run Y/N__________________
ICU state stayed safe Y/N_________________

Undo the poke using
???

Reload flight code icu.hex.

Run a test RTS, number 0x20, using
```
/iRTSRun Number=0x20
```

Check on the NHK display that a 'Corrupted EEPROM Data' message is received, with a first parameter of 0xB.

'Corrupted EEPROM Data 000b' received Y/N__________

Try to ramp up the high voltages, run an RTS, and change state,using
```
/iHVEnable On
/iHVRamp Vmcp23, Value=110, RampRate=0
/iHVEnable Off
/iRTSRun RTS=0x52
/iState Idle
```

None of these should work.

High voltages would not move Y/N_________
RTS would not run Y/N__________________
ICU state stayed safe Y/N_________________

Load the command database table using
```
Load "dbase2_eeprom_080300.img"
```

Reload flight code icu.hex.

Try to ramp up the high voltages, run an RTS, and change state,using
```
/iHVEnable On
/iHVRamp Vmcp23, Value=110, RampRate=0
/iHVEnable Off
/iRTSRun RTS=0x52
/iState Idle
```

All of these should now work.

Vmcp23 ramped up Y/N_________
RTS ran Y/N_________________
ICU went to idle Y/N_________________

Run a test RTS, number 0x20, using
```
/iRTSRun Number=0x20
```

Check on the NHK display that no 'Corrupted EEPROM Data' messages are received.

‘Corrupted EEPROM Data’ messages received Y/N__________

If all the responses above bar the last are Y’s and the last is N then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

19.2 Corrupted token in DCS

Note that this is an extremely unlikely fault, which can only be caused by mistakes in the compilation of the RTS tables on the ground.

Poke the RTS table to create a bad token, and poke the CRC value for the table to accept this bad value,using
???

Load flight code icu.hex.

Run a test RTS, number 0x20, using
`/iRTSRun Number=0x20`

Check on the NHK display that a ‘DCS Invalid Command Token’ message is received.

‘DCS Invalid Command Token’ message received Y/N__________

If the response above is Y then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

20. FORCED STATE CHANGES TO SAFE, IDLE OR SLEW

20.1 From slew to safe

Set up the celestial environment with
`Start autumnsafe`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N ______________

Run the ITOS script safefromslew.proc with the command
`Start safefromslew`

Check on the housekeeping display that the ICU follows its usual sequence until it reaches the slew state (this has been tested many times by now and need not be tested in detail here). Then check that it goes to the safe state correctly.

ICU reaches slew state Y/N_____________
ICU then goes to safe state Y/N_________
Vcathode off Y/N __________
Vmcp1 off Y/N____________
Vmcp23 off Y/N ___________
Filter wheel blocked Y/N_____

If the responses above are all Y's then the test is successful.

Test Successful _________

Initials ________ Date __________ Time __________

20.2 From slewSAA to safe

Set up the celestial environment with
`Start autumnsafe`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N ______________

Run the ITOS script safefromslewsaa.proc with the command
`Start safefromslewsaa`

Check on the housekeeping display that the ICU follows its usual sequence until it reaches the slewSAA state (this has been tested many times by now and need not be tested in detail here). Then check that it goes to the safe state correctly.

ICU reaches slewSAA state Y/N_____________
ICU then goes to safe state Y/N_________
Vcathode off Y/N __________
Vmcp1 off Y/N____________
Vmcp23 off Y/N ___________
Filter wheel blocked Y/N______

If the responses above are all Y's then the test is successful.

Test Successful _________

Initials ________ Date __________ Time __________

20.3 From idle to safe

Set up the celestial environment with
`Start autumnsafe`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Run the ITOS script safefromidle.proc with the command
`Start safefromidle`

Check on the housekeeping display that the ICU follows its usual sequence until it reaches the idle state (this has been tested many times by now and need not be tested in detail here). Then check that it goes to the safe state correctly.

ICU reaches idle state Y/N______________
ICU then goes to safe state Y/N__________
Vcathode off Y/N ___________
Vmcp1 off Y/N_____________
Vmcp23 off Y/N ____________
Filter wheel blocked Y/N______

If the responses above are all Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

20.4 From settling to safe

Set up the celestial environment with
`Start autumnsafe`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Run the ITOS script safefromsett.proc with the command
`Start safefromsett`

Check on the housekeeping display that the ICU follows its usual sequence until it reaches the settling state (this has been tested many times by now and need not be tested in detail here). Then check that it goes to the safe state correctly.

ICU reaches settling state Y/N______________
ICU then goes to safe state Y/N__________
Vcathode off Y/N ___________
Vmcp1 off Y/N_____________
Vmcp23 off Y/N ____________
Filter wheel blocked Y/N______

If the responses above are all Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

20.5 From finding to safe

Set up the celestial environment with
`Start autumnsafe`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N ______________

Run the ITOS script safefromfind.proc with the command
`Start safefromfind`

Check on the housekeeping display that the ICU follows its usual sequence until it reaches the finding state (this has been tested many times by now and need not be tested in detail here). Then check that it goes to the safe state correctly.

ICU reaches finding state Y/N_____________
ICU then goes to safe state Y/N_________
Vcathode off Y/N __________
Vmcp1 off Y/N____________
Vmcp23 off Y/N ___________
Filter wheel blocked Y/N_____

If the responses above are all Y's then the test is successful.

Test Successful _________

Initials ________ Date __________ Time __________

20.6 From AT to safe

Set up the celestial environment with
`Start autumnsafe`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N ______________

Run the ITOS script safefromat.proc with the command
`Start safefromat`

Check on the housekeeping display that the ICU follows its usual sequence until it reaches the AT state (this has been tested many times by now and need not be tested in detail here). Then check that it goes to the safe state correctly.

ICU reaches AT state Y/N_____________
ICU then goes to safe state Y/N_________
Vcathode off Y/N __________
Vmcp1 off Y/N____________
Vmcp23 off Y/N ___________
Filter wheel blocked Y/N_____

If the responses above are all Y's then the test is successful.

Test Successful _________

Initials ________ Date __________ Time __________

20.7 From PT to safe

Set up the celestial environment with
`Start autumnsafe`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N ______________

Run the ITOS script safefrompt.proc with the command
`Start safefrompt`

Check on the housekeeping display that the ICU follows its usual sequence until it reaches the PT state (this has been tested many times by now and need not be tested in detail here). Then check that it goes to the safe state correctly.

ICU reaches PT state Y/N_____________
ICU then goes to safe state Y/N__________
Vcathode off Y/N ___________
Vmcp1 off Y/N_____________
Vmcp23 off Y/N ____________
Filter wheel blocked Y/N______

If the responses above are all Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

20.8 From safepointing to safe

Set up the celestial environment with
`Start autumnsafe`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N ______________

Run the ITOS script safefromsafept.proc with the command
`Start safefromsafept`

Check on the housekeeping display that the ICU follows its usual sequence until it reaches the safepointing state (this has been tested many times by now and need not be tested in detail here). Then check that it goes to the safe state correctly.

ICU reaches safepointing state Y/N_____________
ICU then goes to safe state Y/N_________
Vcathode off Y/N __________
Vmcp1 off Y/N____________
Vmcp23 off Y/N ___________
Filter wheel blocked Y/N_____

If the responses above are all Y's then the test is successful.

Test Successful _________

Initials ________ Date __________ Time __________

20.9 From SAA to safe

Set up the celestial environment with
`Start autumnsafe`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N ______________

Run the ITOS script safefromsaa.proc with the command
`Start safefromsaa`

Check on the housekeeping display that the ICU follows its usual sequence until it reaches the SAA state (this has been tested many times by now and need not be tested in detail here). Then check that it goes to the safe state correctly.

ICU reaches SAA state Y/N______________
ICU then goes to safe state Y/N__________
Vcathode off Y/N ___________
Vmcp1 off Y/N_____________
Vmcp23 off Y/N ____________
Filter wheel blocked Y/N______

If the responses above are all Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

20.10 From settling to idle

Set up the celestial environment with
```
Start autumnsafe
```

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N ______________

Run the ITOS script idlefromsett.proc with the command
```
Start idlefromsett
```

Check on the housekeeping display that the ICU follows its usual sequence until it reaches the settling state (this has been tested many times by now and need not be tested in detail here). Then check that it goes to the idle state correctly.

ICU reaches settling state Y/N_____________
ICU then goes to idle state Y/N_________
Vcathode nominal Y/N __________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel blocked Y/N_____

If the responses above are all Y's then the test is successful.

Test Successful _________

Initials ________ Date __________ Time __________

20.11 From finding to idle

Set up the celestial environment with
`Start autumnsafe`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N ______________

Run the ITOS script idlefromfind.proc with the command
`Start idlefromfind`

Check on the housekeeping display that the ICU follows its usual sequence until it reaches the finding state (this has been tested many times by now and need not be tested in detail here). Then check that it goes to the idle state correctly.

ICU reaches finding state Y/N______________
ICU then goes to idle state Y/N__________
Vcathode nominal Y/N ___________
Vmcp1 nominal Y/N_____________
Vmcp23 nominal Y/N ____________
Filter wheel blocked Y/N______

If the responses above are all Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

20.12 From AT to idle

Set up the celestial environment with
`Start autumnsafe`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N ______________

Run the ITOS script idlefromat.proc with the command
`Start idlefromat`

Check on the housekeeping display that the ICU follows its usual sequence until it reaches the AT state (this has been tested many times by now and need not be tested in detail here). Then check that it goes to the idle state correctly.

ICU reaches AT state Y/N_____________
ICU then goes to idle state Y/N_________
Vcathode nominal Y/N __________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel blocked Y/N_____

If the responses above are all Y's then the test is successful.

Test Successful _________

Initials ________ Date __________ Time __________

20.13 From PT to idle

Set up the celestial environment with
`Start autumnsafe`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Run the ITOS script idlefrompt.proc with the command
`Start idlefrompt`

Check on the housekeeping display that the ICU follows its usual sequence until it reaches the PT state (this has been tested many times by now and need not be tested in detail here). Then check that it goes to the idle state correctly.

ICU reaches PT state Y/N______________
ICU then goes to idle state Y/N__________
Vcathode nominal Y/N ___________
Vmcp1 nominal Y/N_____________
Vmcp23 nominal Y/N ____________
Filter wheel blocked Y/N______

If the responses above are all Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

20.14 From safepointing to idle

Set up the celestial environment with
`Start autumnsafe`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N ______________

Run the ITOS script idlefromsafept.proc with the command
`Start idlefromsafept`

Check on the housekeeping display that the ICU follows its usual sequence until it reaches the safepointing state (this has been tested many times by now and need not be tested in detail here). Then check that it goes to the idle state correctly.

ICU reaches safepointing state Y/N_____________
ICU then goes to idle state Y/N_________
Vcathode nominal Y/N __________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel blocked Y/N_____

If the responses above are all Y's then the test is successful.

Test Successful _________

Initials ________ Date __________ Time __________

20.15 From settling and safepointing to slew

Set up the celestial environment with
`Start autumnsafe`

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N ______________

Run the ITOS script manyslew.proc with the command
`Start manyslew`

Check on the housekeeping display that the ICU follows its usual sequence until it reaches the settling state (this has been tested many times by now and need not be tested in detail here). Then check that it goes to the slew state correctly.

ICU reaches settling state Y/N_____________
ICU then goes to slew state Y/N_________
Vcathode nominal Y/N __________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 2 Y/N______

Then check on the housekeeping display that the ICU follows its usual sequence until it reaches the safepointing state (this has been tested many times by now and need not be tested in detail here). Then check that it goes to the slew state correctly.

ICU reaches safepointing state Y/N_____________
ICU then goes to slew state Y/N_________
Vcathode nominal Y/N __________
Vmcp1 nominal Y/N____________
Vmcp23 nominal Y/N ___________
Filter wheel at filter 1 Y/N______

If the responses above are all Y's then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________

21. SOAK TEST

21.1 72hr Soak

Load flight code icu.hex.

Check on the housekeeping display that the ICU is in the safe state.

ICU safe Y/N _______________

Run the ITOS script soaktest.proc with the command
`Start soaktest`

After 72hrs check that the code has not crashed.

Code crashed Y/N_____________

If the above response is N then the test is successful.

Test Successful __________

Initials _________ Date ___________ Time ___________