ACCEPTANCE TESTING

THERMAL VACUUM CONTINGENCY PLAN

QUAL SA, FLIGHT 1 & 2

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1.0 THERMAL VACUUM WATCHKEEPING GUIDELINES

1. The watchkeeping mode of operation is that which occurs after initial ALSEP turn on and between functional tests while achieving thermal soaking or transitions. This specifically excludes RTG start up.

2. The recommended condition of the ALSEP during these periods is:

   Central Station Timer - OFF
   Central Station - ON
   DATA RATE - NORMAL
   TRANSMITTER A
   Data Processor Y
   ADDRESS - A
   CENTRAL STATION BACK UP HEATERS - ON
   PCU #1
   DUMP LOAD #1 - OFF
   DUMP LOAD #2 - OFF
   EXPERIMENT #1 (PSE) - ON
   EXPERIMENT #2 (LSM) - ON
   EXPERIMENT #3 (SWS) - ON*
   EXPERIMENT #4 (SIDE) - ON*
   EXPERIMENT #5 (COMMANDABLE HEATERS) - STANDBY OFF**
   PSE STATUS - PRESET
   LSM STATUS - PRESET
   *SIDE STATUS - PRESET
   SIDE -3.5 Kv - OFF
   SIDE 4.5 Kv - OFF
   SWS - - low voltage range

3. The recommended program loading for these periods is:

   Executive Operating System - 2335245
   CMALT Thermal Vacuum - 2335240
   LSM Temperature MONITOR - 2335233
   SWS Temperature MONITOR - 2335243
   SIDE Temperature MONITOR - 2335205
   A1-A2 Integrated Decommutation - 2335210

*SWS and SIDE will be turned on during lunar morning IST until that time they will be in standby.

**Except for the lunar night calibration; Exp #5 shall be in the Power On Mode.

4. Manual Plotting is required on several parameters in order to maintain a constant and readily accessible record useful in determining trends. Graphical forms are provided for this purpose. The parameters to be plotted are shown in the attached table. This plotting is to be done at intervals indicated in the table. Note that these intervals vary depending on whether active testing or watchkeeping mode is in effect.

5. Emergency guidelines are provided to give "first aid" direction to test personnel whenever OT conditions occur. It is important to keep in mind that on a system as complex as ALSEP, the most obvious emergency procedure (e.g. turn-off) is not always correct or even safe. For this reason the Emergency Guidelines are given to be used whenever an OT condition occurs on the STS printout.

6. Reference should be made to CMALT listing and ATM-704 for the values of normal limits (contained in programs) and danger limits.

2.0 STRUCTURAL/THERMAL TEMPERATURES

The following are actions to be taken if these temperatures exceed their operating limits and are approaching or passed their danger limits.

Corrective Action	Channel Assignment
2.1 Sunshield Temperatures	
1) Contact engineering	
2) Verify temperature OT with DAS to confirm data.	Temp. = HK # #1 = 27 #2 = 42
3) Verify thermal plate temperatures are within limits.	
4) Verify external heat sources are functioning properly.	
5) Continue to monitor thermal plate temperatures to insure they are not approaching limits if 3) and 4) are normal.	

Corrective Action	Channel Assignment
2.2 Thermal Plate Temperature	
1) Contact engineering	
2) Verify temperature OT with DAS for confirmation of data.	#1 = 4 #2 = 28 #3 = 43
3) If 1) verifies and temperature is too low, turn on commandable heater Exp #5 if too high, turn off commandable heater.	#4 = 58 #5 = 71
4) Reduce or increase external heat sources to obtain a within tolerance output.	
5) If unable to control temperature, hold meeting with engineering, NASA prior to turn off of ALSEP.	
2.3 Vertical Structures, Bottom Structure, Outer Multilayer Insulation	
1) Contact engineering.	
2) Verify temperature OT with DAS for confirmation.	Temp. #1 = 59 #2 = 87 #3 = 15 #4 = 88 Outer multilayer = 72
3) Verify thermal plate temperatures are within limits.	
4) Verify external heat sources are functioning properly.	
5) If 3) and 4) are normal, continue to monitor thermal plate temperatures to insure they are not approaching limits.	

Corrective Action	Channel Assignment
2.4 Inner Multilayer Insulation Temperature	
1) Contact engineering.	
2) Verify temperatures are within limits.	Inner Multilayer = 60
3) Verify external heat sources are functioning correctly.	
4) If 2) and 3) are normal, monitor Central Station to insure temperatures are not approaching critical limits.	

3.0 ELECTRONIC TEMPERATURES

Corrective Action	Channel Assignment
3.1 Receiver Local Oscillator	
1) Check Receiver Pre-Limiting level HK-21, Receiver Local Oscillator level HK-36. Determine if a trend in output exists.	Local Osc. A = 16 Local Osc. B = 17
2) Determine if switchover from A to B has occurred i.e. is temperature B OT?	
3) Determine if uplink is functioning correctly by sending the PSE filter in/out command twice, check for proper CV, printout.	
4) If uplink is functioning, continue test. Notify Engineering. If uplink has failed, notify appropriate Test Conductor and Engineering to determine appropriate action.	
3.2 Transmitter, Heat Sink and Crystal Temperature	
1) Contact engineering	
2) Verify thermal plate temperatures are within limits.	A Crystal = 18 B Crystal = 31 A Heat Sink = 19 B Heat Sink = 32

Corrective Action	Channel Assignment
3) Switch transmitters and verify a within tolerance output from the alternate transmitter.	
4) Monitor temperatures of alternate transmitter to determine trend.	

3.3 Analog and Digital Processor Temperatures

1) Verify thermal plate temperatures are within limits.	Analog Base = 33 Analog Internal = 34 Digital Base = 46 Digital Internal = 47
2) Switch data processors and determine temperature trend.	
3) If Step 2 fails to control temperature, verify correct operation of processors from the printout of analog channels (PSE) Status, etc.)	
4) Contact Engineering if temperature cannot be controlled or processor does not operate correctly.	

3.4 Command Decoder Temperatures

1) Verify Thermal Plate temperatures are within limits.	Base = 48 Internal = 49 Mod. VCO = 61
2) Test uplink by sending PSE filters in/out command twice, verify correct CV printout.	

Corrective Action	Channel Assignment
3) If there is no response to commands, switch to appropriate alternate address (1A to 1B etc.), retest uplink and determine temperature trend.	
4) Contact appropriate test conductor and Engineering if temperature cannot be controlled.	

3.5 Power Distribution Temperatures

1) Verify thermal plate temperatures are within limits.	Base = 62 Internal = 63
2) Contact appropriate test conductor and Engineering.	

3.6 PCU, Power Oscillator and Regulator Temperatures

1) Verify thermal plate temperatures are within limits.	Osc. #1 = 64 Osc. #2 = 74 Reg. #1 = 77 Reg. #2 = 78
2) Switch over PCU's monitor temperature to determine trend.	
3) If unable to control temperature, contact appropriate Test conductor and Engineering.	

4.0 CENTRAL STATION ELECTRICAL

4.1 Analog Converter Calibration

1) Contact Engineering.	
2) Verify PCU output voltages are within tolerance.	ADC Cal 0.25 = 2 ADC Cal 4.75 = 3
3) Switch processors.	

Corrective Action	Channel Assignment
4.2 PCU Input - Output Currents and Voltages	
1) Contact engineering	
2) Verify Central Station is operating within regulation via Reserve Power Indication on the analog recorder.	Input Volt = 1 Input Amp = 5 Shunt Reg. #1 amp. =8 Shunt Reg. #2 amp. =13
3) Verify station status has not changed i.e. dump loads on, should be off, etc.	+29V = 20 +15V = 35
4) Verify correct output of RTG via IPU Test Console or RTG Simulator .	+12V = 50 +5V = 65 -12V = 79
5) If Steps 2-4 are normal, switch over PCU's.	- 6V = 80
6) If unable to obtain correct output Test Conductor and Engineering will determine appropriate action.	
4.3 Receiver, Prelimiting and Local Oscillation Level	
1) Contact engineering	
2) Verify STS transmitter output is within limits.	Prelimit = 21 L.O. = 36
3) Determine if uplink is functioning correctly by sending PSE filter in/out twice.	
4) If uplink is operative continue test.	
5) If uplink fails contact appropriate Test Conductor and Engineering.	
4.4 Transmitter AGC Voltage, Power Doubler Current	
1) Switch transmitters.	AGC A = 51 AGC B = 66
2) If unable to obtain correct limits, Verify downlink is functioning via STS printer.	Power Doub. A = 81 Power Doub. B =22

Corrective Action

3) Contact appropriate Test Conductor and Engineering.

4.5 Receiver, 1 KHz Subcarrier — 1 KHz Sub = 9

1) Verify if uplink is functioning by sending PSE filter in/out command twice

2) If uplink has failed, check STS transmitter and cables to chamber.

3) If unable to rectify problem, contact appropriate Test Conductor and Engineering.

4.6 ALSEP Experiment Power Distribution: — Exp. #1 & 2 = 12; Exp. #3, 4, & 5 = 14

1) Verify correct status of experiment via STS Printer or by command switching and PCU shunt regulator current.

2) Contact Engineering for an out-of-tolerance condition.

5.0 RTG TEMPERATURES*

Hot Fr. #1 = 6
Hot Fr. #2 = 37
Hot Fr. #3 = 52
Cold Fr. #1 = 7
Cold Fr. #2 = 67
Cold Fr. #3 = 82

1) Confirm data by comparing with external RTG temperature measurements.

2) If temperatures exceed 1130°F max. for the hot frame and 575°F max. for the cold frame switch the load to the RTG Simulator and begin emergency turn off procedure for the RTG.

* NOTE: Qual ALSEP employs dummy resistors. Use external temperature monitor for correct values of RTG temperatures.

Corrective Action	Channel Assignment
3) Contact the appropriate Test Conductor and PE to determine further action.	

6.0 DUST ACCRETION

1) Contact Engineering.	Cell Temp. #1 = 83 Cell Temp. #2 = 30 Cell Temp. #3 = 56 Cell Volt. #1 = 84 Cell Volt. #2 = 26 Cell Volt. #3 = 41
2) Command Dust Detector off if meaningful data is not being obtained.	

7.0 PASSIVE SEISMIC EXPERIMENT

1) Send commands to obtain correct response.	LP AMP GAIN X, Y = 23 LP AMP GAIN Z = 38 LEV. DIR. & SP. = 53 SP. AMP. GAIN = 68 LEV MOD & COARSE =24 THERMAL CONT. = 39 CAL LP & SP = 54 UNCAGE STATUS = 69
2) Contact Engineering.	
3) If thermal status exceeds critical limit, determine temperature trend of PSE sensor. Advise appropriate Test Conductor and PE if temperature exceeds limit.	
4) If uncage status indicates uncaging, verify by a pressure measurement via PSE exciter. Nofify PSE PE immediately and appropriate Test Conductor.	

8.0 SUPRATHERMAL ION DETECTOR EXPERIMENT

1) Verify a shift in the "normal" output of the science data. SIDE words 4-5 and 9 - 10, has occurred. NOTE: The HK is a logrithmic conversion of the science data rate.	SIDE Analog Channels LEDCR = HK-70 HEDCR = HK-85

Corrective Action	Channel Assignment

2) If the science data appears abnormal switch the experiment to Standby. Contact the appropriate Test Conductor and the PE.

9.0 FAILURE OF DOWNLINK (LOSS OF MF LOCK)

1) Verify or correct if necessary phase locking of STS receiver.

2) Switch transmitters and return.

3) Switch data processors.

4) Reload DPS 2000 programs.

5) Verify proper NRZ and clock from STS demodulator to DPS 2000 with a scope.

6) Load a second STS with identical software and play back a portion of the Ampex magnetic tape just recorded.

7) Contact Systems Engineering before stopping test.

10.0 FAILURE OF UPLINK (TOTAL)

1) Switch Addresses

2) Check STS transmitter power output and cables to chamber (RF attenuation)

3) Check STS modulation (1000 cps attenuation, data attenuation, 1000 cps phase)

4) Contact Engineering.

Corrective Action	Channel Assignment
11.0 FAILURE OF UPLINK (PARTIAL)	
1) Contact Engineering.	
2) Perform steps of 9.0 and test failed commands.	
3) Modify procedures to omit affected commands and continue test.	
12.0 LUNAR SURFACE MAGNETOMETER (LSM)	
12.1 Analog Engineering Data (Word 5) Temperature	
1) Contact Systems Engineering, and PE.	Temp. #1 = 1, 9 #2 = 2, 10 #3 = 3, 11 #4 = 4, 12 #5 = 5, 13
2) Verify temperature OT with DAS to confirm data.	
3) Verify external heat sources are functioning correctly.	
4) Reduce or increase external heat sources to return to within tolerance.	
12.2 Level Sensors	
1) Verify by visual inspection that LSM is still in an upright condition.	L.S. #1 = 6, 14 #2 = 7, 15
2) If tipped, contact System Engineering and PE. Monitor temperatures; if critical limits approached bring the lunar surface under LSM to room temperature as quickly as possible.	
12.3 Supply Voltage	
1) Determine trend to see if danger limits have been reached or are being approached.	SV = 8, 16

Corrective Action	Channel Assignment

2) If at, or approaching danger limit, command LSM to standby and immediately institute action to keep LSM within safe temperatures (as sensed via DAS) by using the chamber environmental controls.

3) Contact Systems Engineering and PE.

12.4 Status Bits (Change Only)

1) Note occurrence, include time, old and new values. — All Frames

2) Restore original status by command(s).

3) Contact Systems Engineering and PE.

13.0 SUPRATHERMAL ION DETECTOR EXPERIMENTS (SIDE)

13.1 Temperatures

1) Verify temperature OT with DAS to confirm data.

2) Verify external heat sources are functioning correctly.

3) Reduce or increase external heat to return within tolerance.

4) Contact Systems Engineering and PE.

SIDE Word	SIDE Frame
#1 = 2	2, 34, 66, 98
#2 = 2	4, 36, 68, 100
#3 = 2	6, 38, 70, 102
#4 = 2	11, 43, 75, 107
#5 = 2	12, 44, 76, 108

13.2 High Voltages (any indication of arcing such as SIDE frame counter skiping in its sequence or noisy science data; (SIDE WORDS 4, 5 and 9, 10)

1) Command off the OT high voltage.

2) Contact Systems Engineering and PE.

14.0 SOLAR WIND SPECTROMETER (SWS)

14.1 Temperatures

Corrective Action	Channel Assignment
1) Verify temperature with environmental DAS to confirm data.	Temp. Mod 100 1
	200 2
	300 3
2) Verify external heat sources are functioning correctly.	Cups 4
3) Reduce or increase external heat sources to return within tolerance.	
4) Contact Systems Engineering and PE.	

14.2 High Voltage Arching On Turn ON

1) Monitor reserve power profile at initial turn on. If any indication of not following regular sequence is seen Turn SWS to standby.

2) Allow SWS to outgas further prior to turn on.

14.3 High Voltage Arcing During Operation (erratic science data)

1) If any indication of arcing during operation is seen immediately turn SWS to standby.

2) Contact Systems Engineering and PE.

14.4 SWS Loss of Lock

1) If SWS fails to regain lock after 75 seconds. Switch Exp. #3 to standby ON. Analyze data to determine if SWE was sequence correctly via the Reserve Power Monitor. Contact PE.