DISR

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EXPERIMENT USER'S MANUAL
CDRL#–OP001 & SW002

FOR

HUYGENS PROBE

DESCENT IMAGER / SPECTRAL RADIOMETER

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1.0 SCOPE

1.1 Identification

This document is the Experiment User's Manual for the Descent Imager / Spectral Radiometer (DISR) system. It also serves as the flight Software User's Manual.

1.2 Purpose

The purpose of this document is to describe the operations of the DISR instrument. It will be used as a reference manual during AIV, launch, and actual operations. Facets of the as–built experiment which are relevant for instrument operations are described. Operation of the experiment with reference to commands and expected telemetry are included. Error conditions are described as well as the diagnostic features built into the software. All formats for Telecommands and Telemetry are covered. The software is described and addressed from a user's view and also from the maintenance view. The use of the GSE to perform specific tests, how to build commands, how to start the system, etc. is described in the GSE Users Manual.

1.3 Introduction

The DISR system is an instrument that is part of the Huygens Probe. The Huygens probe is in turn part of the Cassini Spacecraft. The mission of the Cassini Spacecraft is to study Saturn and its moon system. The specific purpose of the Huygens probe is to study the atmosphere and surface of Titan, one of the moons of Saturn. DISR will make spectral measurements of the moon and the atmosphere as the probe descends into the atmosphere of Titan. In addition, it will take image measurements of the surface and the cloud structures.

The flight software controls the operation of the DISR instrument during the descent, during in flight cruise operations, during calibration operations, and finally for test operations. Specifically, it will schedule measurements to be taken, control the actual collection of data, perform some data reduction, put the data into telemetry packets, and provide telemetry packets to the probe. The probe relays the telemetry packets to the Cassini spacecraft and Cassini relays the packets to Earth.

All numbering of bits in this document use the 1750 standard convention that bit 0 is the most significant bit of a word and bit 15 is the least significant. This is distinctly different from the Huygens convention of bit 15 being the most significant bit and 0 being the least significant bit.

MSB							**1750 Standard**								**LSB**
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

MSB							**Huygens Standard**								**LSB**
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

2.0 APPLICABLE DOCUMENTS

ESA–SP–xxxx	The Descent Imager/Spectral Radiometer (DISR) Instrument Aboard the Huygens Entry Probe of Titan

3.0 SCIENCE OVERVIEW

The information for this section was taken entirely from the document "The Descent Imager/Spectral Radiometer (DISR) Instrument Aboard the Huygens Entry Probe of Titan". The referenced document contains much more information than is presented here.

3.1 Introduction

Sunlight plays a key role in driving many important physical processes in planetary physics. Absorption of ultraviolet light drives photochemical reactions, leading to changes in atmospheric composition and to the production of atmospheric aerosols. The size, shape, composition, and distribution of aerosols and cloud particles determine their optical properties and their ability to absorb sunlight and emit thermal infrared radiation, thus playing a key role in the thermal balance of the atmosphere. The net radiative heating or cooling rate provides the forcing for atmospheric dynamics, which in turn can affect the distribution of aerosol and cloud particles and climate. The composition, thermal balance, dynamics, and meteorology of the atmosphere also affect (and are affected by) the nature of the surface. Images of the surface in reflected sunlight together with near infrared reflection spectra can reveal the nature of the surface and its interactions with atmospheric processes. Thus, optical measurements in the wavelength of solar radiation made inside a planetary atmosphere can reveal a great deal about many important physical processes occurring there.

The Descent Imager/Spectral Radiometer (DISR) is the optical instrument that makes measurements at solar wavelengths aboard the Huygens Probe of the Cassini mission. This instrument is being developed in a collaborative effort by scientists from the US, France, and Germany. DISR measures solar radiation using silicon photodiodes, a two–dimensional silicon Charge Coupled Device (CCD) detector and two InGaAs near–infrared linear array detectors. The light is brought to the detectors using fiber optics from many separate sets of foreoptics that collect light from different directions and in different spectral regions. In this way the instrument can make a suite of measurements which are carefully selected to answer key questions concerning the nature of the surface and the composition, meteorology, thermal balance, and clouds and aerosols in the atmosphere of Titan.

3.2 Scientific Objectives

3.2.1 Thermal Balance and Dynamics

The first objective of DISR is to measure directly the vertical profile of the solar heating rate. This will be done using measurements of the upward and downward solar flux over the spectral interval from 0.35 to 1.7μm from 160 km to the surface at a vertical resolution of approximately 2 km. The downward flux minus the upward flux gives the net flux, and the difference in the net flux at two altitudes gives the amount of solar energy absorbed by the intervening layer of atmosphere. This basic measurement gives an important quantity for understanding the thermal balance of Titan's atmosphere.

From other Huygens measurements of the temperature profile and the gaseous composition, the science team plans to model the radiative cooling rate at wavelengths in the thermal infrared. An important contribution to this calculation will be the measurements of the size, shape, optical properties, and vertical distribution of aerosol and cloud particles determined by other DISR measurements. The combination of the measured solar heating rate with the computed thermal cooling rate will give the net radiative drive for atmospheric dynamics. Model computations can be used to estimate the wind field from the radiative forcing.

Finally, the science team plans to measure the horizontal wind direction and speed as functions of altitude from images of the surface obtained every few kilometers in altitude which will show directly the drift of the probe over the surface of Titan. The measured wind speed and direction determined by DISR can be compared to the wind field computed from the net radiative forcing determined above.

3.2.2 Distribution and Properties of Aerosol and Cloud Particles

Several properties of the cloud and aerosol particles are important for understanding their interaction with solar and thermal radiation field. The size of the particles compared to the wavelength of the radiation is important for understanding their scattering properties. Measurements of both the forward scattering and polarizing nature of the aerosols on Titan have been used to show that spherical particles can not simultaneously explain these two types of observations (see Hunten *et al*., 1984). We are therefore interested in knowing particle shape as well as size. The vertical distribution of the particles is obviously important for knowing their influence on the profiles of solar and thermal radiation. Finally, a suite of optical properties are needed as functions of wavelength to permit accurate computations of the interactions of the particles with radiation. These include the optical depth, single scattering albedo, and the shape of the scattering phase function. These properties together with the determinations of size and shape can yield the imaginary refractive index (and possibly constrain the real refractive index also) and thus constrain the composition of the particles.

We plan to measure as many of these properties as possible by combinations of measurements of small angle scattering in the solar aureole in two colors, by measurements of side and back scattering in two colors and two polarizations, by measurements of the extinction as a function of wavelength from the blue to the near infrared, and by measurements of the diffuse transmission and reflection properties of layers in the atmosphere as described in sections III and IV.

3.2.3 Nature of the Surface

The surface of Titan was hidden from view of the cameras aboard the Pioneer and Voyager spacecraft by the layers of small haze particles suspended in the atmosphere. Nevertheless, intriguing suggestions regarding the nature of the surface have been made (Lunine, 19xx), including the possibility that the surface consists of a global ocean of liquid methane–ethane. Recent radar observations (Muhlman, 19xx) and direct observations at longer wavelengths (Smith et al., 19xx; Lemmon et al., 1993) strongly hint that the surface is not a global ocean. The range of fascinating surfaces observed by the Voyager mission on satellites of the outer solar system showed a surprising range of phenomena including craters, glacial flows, frost and ice coverings, and active geysers and volcanoes. These preliminary explorations of the small bodies of the outer solar system suggest that the surface of Titan also may well contain new surprises.

We plan to measure the state (solid or liquid) of the surface near the probe impact site, and to determine the fraction of the surface that is solid and liquid in this region. We plan to measure the topography of the surface, and explore the range of physical phenomena that have formed the surface. We plan to measure the reflection spectra of surface features from the blue to the near infrared in order to constrain the composition of the different types of terrain observed. In addition, we plan to image the surface at resolution scales from hundreds of meters (similar to those accessible from the orbiter) to tens of centimeters over as large an area as possible to study the physical properties occurring on the surface and to understand the interactions of the surface and the atmosphere.

3.2.4 Composition of the Atmosphere

The Huygens Probe contains a mass spectrometer/gas chromatograph to measure directly the composition of the atmosphere. Nevertheless, direct sampling techniques can have problems with constituents that can condense in the atmosphere should a cloud particle enter and slowly evaporate in the sampling system of such an instrument. The DISR will provide an important complementary capability by being able to record the spectrum of the downward streaming sunlight which shows the absorption bands of methane, the most likely condensable constituent. The observations of the visible and near infrared absorption bands of methane will be used to determine the profile of the mixing ratio of methane gas during the descent of the Huygens Probe.

Methane can exist as a solid, liquid, or gas on Titan, and has been suggested to play a role in the meteorology of Titan similar to the role played by water on the Earth. Our measurements of methane mixing profile will be analogous to a relative humidity profile on the Earth.

Finally, the atmosphere of Titan is believed to consist primarily of nitrogen, methane and argon. Our measurements of the mixing ratio of methane together with the determination of total mean molecular weight of the atmosphere by radio occultation measurements made by the Cassini Orbiter will indirectly yield the argon to nitrogen mixing ratio as an important backup to the mass spectrometer measurements planned for the Huygens Probe.

3.3 Instrument Approach

In order to achieve this broad range of scientific objectives, it is necessary to measure the brightness of the sunlight in Titan's atmosphere with several different spatial fields of view, in several directions, and with various spectral resolutions. For measurements of solar energy deposition, for example, measurements of the downward and upward solar flux is needed with broad and flat spectral sensitivity, and with a cosine zenith angle weighting. For determination of the composition of the surface, spectral resolution is desirable, and spatial information is necessary. For determination of the physical processes occurring on the surface, images with very broad fields of view looking downward toward the surface are needed. To determine the size distribution of aerosol particles above the altitude of the probe, upward–looking measurements of the brightness of the region of the sky near the sun (the solar aureole) are needed in at least two colors with modest angular resolution. Images looking outward toward the horizon are useful for sensing the presence of thin haze layers during the descent.

It is not possible to include in the limited payload of the Huygens Probe separate instruments devoted to each of these scientific objectives. Nevertheless, it has been possible to increase considerably the usefulness of the single Huygens optical instrument by making extensive use of fiber optics to collect the light from different directions and bring the light to a few centrally located detectors after various spectral or spatial analyses. In this way redundant electrical systems have been minimized, and moving mechanical parts have been all but eliminated. A summary of the locations of the fields of view and spectral coverage of the DISR optical measurements is given in Table 1 (upward looking instruments) and Table 2 (downward looking instruments) while the onboard sources are summarized in Table 3.

One of the detectors around which the DISR is build is a 512 x 520 Charge Coupled Device (CCD) silicon detector with a wavelength response from 400 nm to 1000 nm. The surface of the CCD is divided into 9 separate regions, with the light collected by different foreoptics and brought to the detector by fiber optic bundles and ribbons. These include imagers that look in three different directions with different fields of view and angular resolutions, two regions fed by light collected by upward and downward looking grating spectrometers for flux measurements and for making spatially resolved spectra of the surface in the spectral range from 480 nm to 960 nm, and four regions devoted to measurements across the solar aureole in two colors and in two different polarization states.

The second type of DISR detector is a pair of 150 element InGaAs near–infrared linear arrays. The two InGaAs arrays are mounted side–by–side in the focal plane of a second grating spectrometer covering the spectral region from 870 to 1650 nm. This spectrometer is also fed by two sets of optical fibers which collect

1) the downward flux from a horizontal diffusing flux plate which is sensitive to half the upper hemisphere and
2) a slit looking at the ground to permit a measure of the upward flux as well as a measure of the reflectivity of a well defined region on the ground.

The third detector type is single silicon photodiodes with enhanced ultraviolet response to extend the upward and downward flux measurements to 350 nm from the short wavelength limit of the visible spectrometer at 480 nm. This type of detector is also used in a separate optical system to detect the azimuth of the sun for controlling data collection timing.

We begin a more detailed discussion of the instrument by turning first to the detectors around which the DISR is built. Other significant aspects of the instrument such as a lamp for providing spectrally continuous illumination of the surface just before impact, and the ambitious in flight relative calibration system as well as the shadow bars and optical baffles are discussed later when we review each system in turn.

Table 1 – Instrument Summary (Upward Looking Instruments)

Upward–Looking Instrument	Azimuth Range	Zenith Range	Spectral Range (nm)	Spectral Scale (per pixel)	Spatial Scale (per pixel)	Pixel Format
Violet Photometer (ULV)	170°	5°–88°	350–480	–	–	1
Visible Spectrometer (ULVS)	170°	5°–88°	480–960	2.4 nm	–	8 x 200
Infrared Spectrometer (ULIS)	170°	5°–88°	870–1700	6.3 nm	–	132
Solar Aureole (SA 1) Vertical Polarization	6°	25°–75°	500±25	–	1°	6 x 50
Solar Aureole (SA 2) Horizontal Polarization	6°	25°–75°	500±25	–	1°	6 x 50
Solar Aureole (SA 3) Vertical Polarization	6°	25°–75°	935±35	–	1°	6 x 50
Solar Aureole (SA 4) Horizontal Polarization	6°	25°–75°	935±35	–	1°	6 x 50
Sun Sensor (SS) (64° cone FOV)	64° cone	25°–75°	939±6	–	–	1

Table 2 – Instrument Summary (Downward Looking Instruments)

Downward–Looking Instrument	Azimuth Range	Nadir Range	Spectral Range (nm)	Spectral Scale (per pixel)	Spatial Scale (per pixel)	Pixel Format
Violet Photometer (DLV)	170°	5°–88°	350–480	–	–	1
Visible Spectrometer (DLVS)	4°	10°–50°	480–960	2.4 nm	2°	20 x 200
Infrared Spectrometer (DLIS)	3°	15.5°–24.5°	870–1700	6.3 nm	–	132
High–Resolution Imager (HRI)	9.6°	6.4°–21.6°	660–1000	–	0.06°	160 x 254
Medium–Resolution Imager (MRI)	21.1°	15.75°–46.25°	660–1000	–	0.12°	176 x 254
Side–Looking Imager (SLI)	25.6°	45.2°–96°	660–1000	–	0.20°	128 x 254

Table 3 – Summary of Onboard Sources

System	Number of Lamps	Power each	Field	Spectral Range (nm)	Optics
Inflight Calibration	3	1 watt	Fills each instrument FOV	400–2000	f/2 fiber feed
Surface Science Lamp (SSL)	1	20 watts	4°x12° centered on DLIS FOV	400–2000	50mm parabola
Sun Sensor Stimulator	1	xx mwatt diode	Illuminates only sun sensor detector	939 ± 6	feeds fiber

4.0 INSTRUMENT OVERVIEW

4.1 Instrument Configuration

The DISR instrument physically consists of two separate units. A Sensor Head (SH) unit and an Electrical Assembly (EA) unit. The Sensor Head unit includes all of the optical elements, the detectors, and a small number of electrical components, primarily used for preamplification of the signal data. This unit is installed in the probe with part of it extending outside of the aft cone of the probe. The Electrical Assembly unit is located near the SH unit in the probe and is connected to it via three cables for signal and power transmission. Figure 1 shows the DISR instrument configuration in the probe. The EA unit is pictured in Figure 2 and the SH unit in Figure 3.

4.2 Functional Design and Operating Principles

The DISR flight software was developed using an object–oriented design in the ADA language. The software uses a re–entrant event dispatcher to control execution based on the priorities of events occurring in both the hardware and software. Multi–tasking is not used. Hardware interrupts are used to provide services for the probe interface, the sun sensor, a general purpose event timer, the telemetry channels, the direct memory access controllers, the CCD, the IR detector, and the hardware data compressor.

The software controls the calibration and surface science lamps. The calibration lamps are turned on during appropriate parts of calibrations cycles. The surface science lamp is turned on at a preset altitude (currently 400 meters).

All commands to the DISR are processed by the software. Only six commands exist, although some may have a variety of parameters.

1) A receipt–enable telecommand must begin a commanding session. This command is used as an error protection feature against spurious commands.

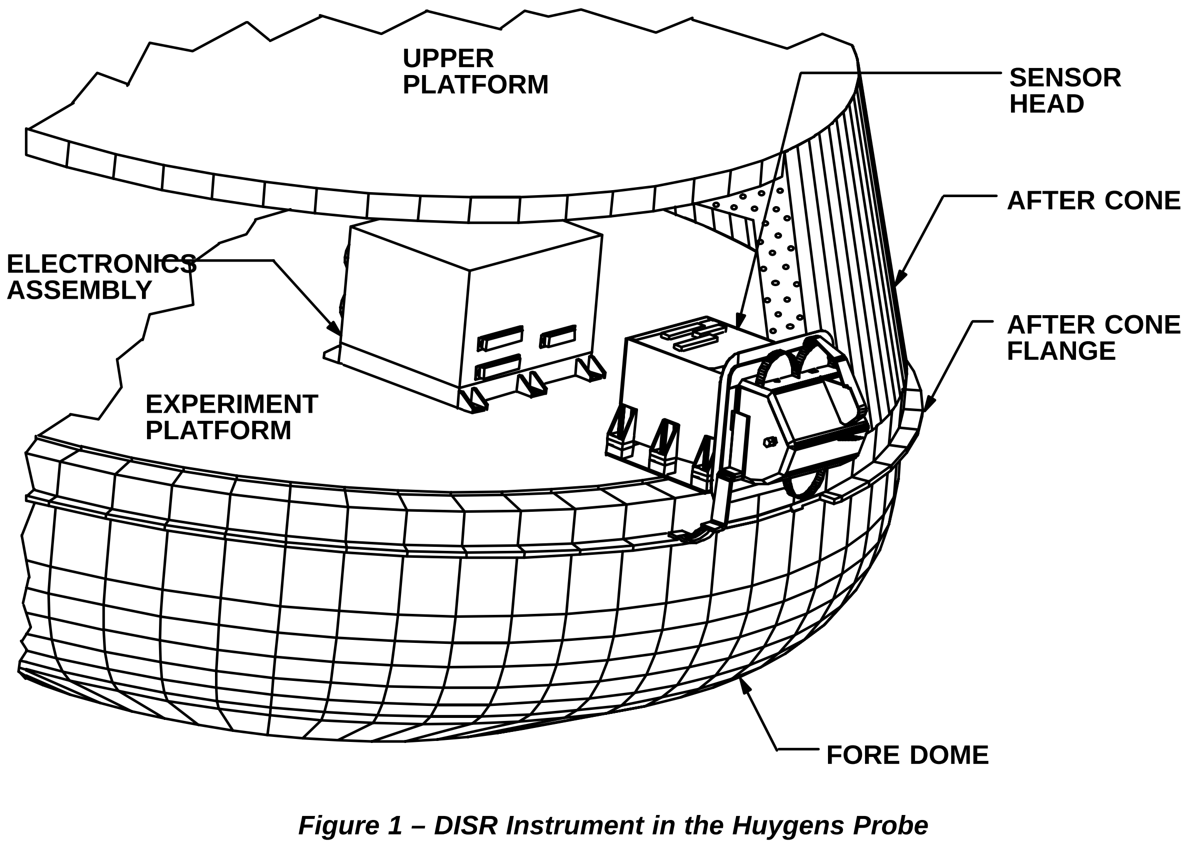

Figure 1 – DISR Instrument in the Huygens Probe

2) A change mode telecommand may be used to change the operating mode of the DISR into descent mode (the default mode), calibration mode, single telecommand mode, and memory access mode. (See Table 4 below for a description of these modes.)

3) Single measurement telecommands direct the instrument to perform one or more iterations of a particular measurement. These commands are useful during instrument calibration and test.

4) Single test telecommands are similar to single measurement telecommands, except they initiate preprogrammed test sequences on the IR shutter, hardware data compressor, heaters, and lamps.

5) Memory upload commands are used in memory access mode to store new tables which are read by the software to control bad pixel maps, square root compression tables, and possibly measurement scheduling and processing parameters .

6) Memory dump telecommands permit dumping of any portion of DISR memory into telemetry for verification.

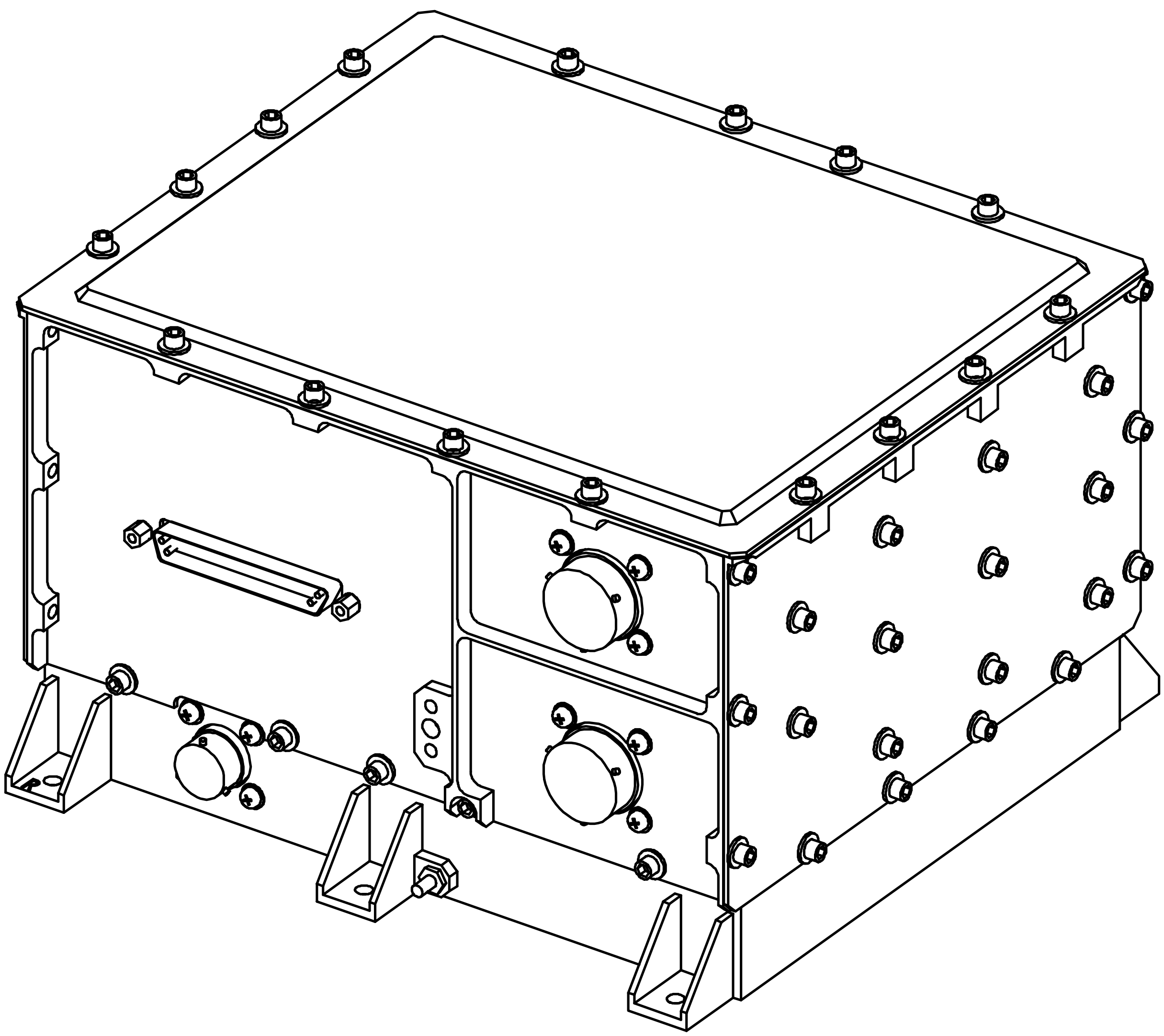

Figure 2 – DISR EA Unit

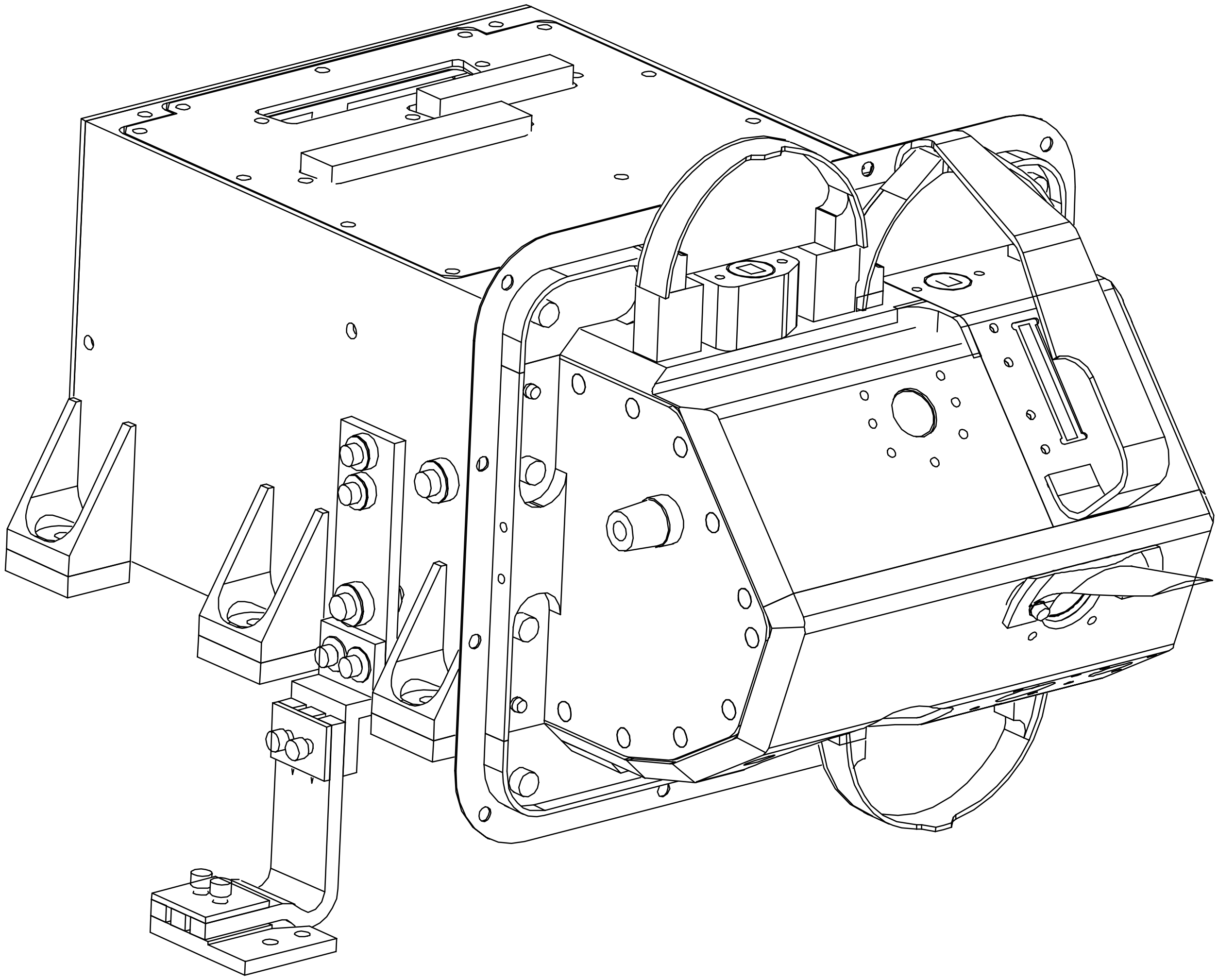

Figure 3 – DISR Sensor Head Unit

Table 4 – DISR Operational Modes

Mode No.	Mode Name	Mode Characteristics
1	Nominal descent mode	Default mode on power up. Operations are defined by ROM–based descent sequence tables as modified by uploaded changes in EEPROM. Sub–modes: imaging 1, imaging 2, non–imaging, spectrophotometric, descent calibration, flat field calibration, near–surface, surface.
2	Single measurement mode	Acquire measurements specifically commanded through subsequent telecommand requests. Each sub–instrument can be activated, and all data gathering and processing options can be specified for that sub–instrument. This is the principal mode for ground calibration.

Mode No.	Mode Name	Mode Characteristics
3	Calibration mode	Includes two sub–modes: Health check sequence and calibration sequence.
4	Memory access mode	Enables access to memory dump of PROM, EEPROM, and RAM. Enables access to load EEPROM.

The software also coordinates and controls all data collection. Optimum exposure times are computed for each subinstrument using the CCD and IR detectors. These times are based on the data number population histograms of the most recent previous exposure of the same type. The exposure time can also be limited by the amount of smear caused by the spin of the probe. For example, the exposure time of the imagers is limited to 1.5 pixels of motion in the center of the High Resolution Imager (HRI).

On–board data processing functions also include several miscellaneous functions. Adjacent columns of pixels within the same instrument field of view may be averaged. This is done, e.g., in the DLVS where the highest spatial resolution is not required and may be traded off in favor of measurement frequency (vertical resolution). Data for the hardware data compressor must be reformatted before it is fed to the compressor. Lossless compression is done entirely in software. Bad pixels are eliminated according to a bad pixel map which is stored in EEPROM.

Data from the imagers are also reduced from 12 bits to 8 bits before being fed to the hardware data compressor. This is done using a table lookup which performs a pseudo–square root transformation of the raw data. The table is based on an algorithm which degrades the signal–to–noise ratio of the data in each pixel, but keeps it above 100 for those pixels where it initially exceeds 100 (based on a noise model of the instrument). The signal–to–noise ratio for pixels with initial signal–to–noise ratios less than 100 is degraded by only 7.6%.

4.3 Performance Characteristics

The DISR Instrument performance conforms to the constraints previously documented in various Interface Data Sheets (IDS). Specifically the IDSs that describe performance characteristics are shown in Table 5.

Table 5 – IDSs Relating to Instrument Performance

IDS Page	IDS Title	Performance Characteristic
1	Mechanical/Thermal Characteristics – EA	Thermal
2	Mechanical/Thermal Characteristics – SH	Thermal
2d–1	Sensor Head Thermal/Interface Drawing	Thermal
2d–2	Electronics Assembly Thermal Interface Drawing	Thermal
3a	Electrical Power Demand: Average – Main	Electrical
3b	Electrical Power Demand: Peak – Main	Electrical
3c	Electrical Power Profile Curve: Average–Main–Descent	Electrical
3d	Electrical Power Profile Table: Average–Main–Descent	Electrical
3e	Electrical Power Profile Curve: Peak–Main–Descent	Electrical
3f	Electrical Power Profile Table: Peak–Main–Descent	Electrical
3g	Electrical Power Profile Curve: Average–Main–Cruise–Health Check	Electrical
3h	Electrical Power Profile Table: Average–Main–Cruise–Health Check	Electrical

IDS Page	IDS Title	Performance Characteristic
3i	Electrical Power Profile Curve: Average–Main–Cruise–Calibration	Electrical
3j	Electrical Power Profile Table: Average–Main–Cruise–Calibration	Electrical
3k	Electrical Power Profile Curve: Average–Main–Cruise–Descent	Electrical
3l	Electrical Power Profile Table: Average–Main–Cruise–Descent	Electrical
3m	Electrical Power Profile Curve: Peak–Main–Cruise	Electrical
3n	Electrical Power Profile Table: Peak–Main–Cruise	Electrical
4	Electrical Power Demand: Average–Lamp	Electrical

4.4 Interfaces

The DISR instrument interfaces to the probe in many forms but has no interfaces to any of the other instruments that are in the probe. All of the key interfaces are documented in the IDSs. Those IDSs are shown in Table 6.

Table 6 – IDSs Relating to the Probe Interface

IDS Page	IDS Title	Interface Type
2b	Sensor Head Interface Drawing – Envelope	Mechanical
2c	Sensor Head Interface Drawing – Seal Flange, Lugs	Mechanical
2e	DISR Probe Interface	Mechanical
2f–2p	xxx FOV (Field of View)	Mechanical
5a–5g	Cable and pin allocations	Mechanical Electrical
6	Telecommand	Software
7	Telemetry	Software
8	Probe Interface (Circuit Diagram)	Electrical
10a	Power Interface – Power Supply	Electrical
10b	Power Interface – Lamp Regulator	Electrical
11	Grounding Scheme	Electrical
14a–g	Thermal	Thermal

4.5 Telemetry and Telecommands

The Telemetry and Telecommand formats are described in Appendix A and Appendix B. The DISR Instrument is designed to adjust to changes in the telemetry rates dynamically. The instrument operational sequences have been optimized for the telemetry rates specified in the EID Part A. The instrument sends most of the telemetry data types on both telemetry channels to ensure good transmission. However, some of the data types, primarily image data, is transmitted on only one of the two channels. Since the image data accounts for a large portion of the overall telemetry data stream this allows DISR to potentially acquire twice as much image data as would otherwise be possible. The risk is the loss of half of that image data, but that corresponds to the situation if all data was sent on both channels.

The instrument is also designed to dynamically switch from the telecommand channel A to B or back depending of the quality of data being received and the state of the processor valid flag provided by the probe CDMU. The design is graphically described in Figure 4 and has the following key properties:

1) The side indicated by processor valid is always tried first.
2) If processor valid changes a switch is always made to the new processor valid channel.
3) If valid data is being received over the channel indicated by processor valid then that data is used.
4) If no ”valid” data is being received over the processor valid channel a switch is made to the other channel.

The simple data check is a check that the first word is a valid DISR command or DDB message command identifier. Whenever a switch is made from one side to the other a message is placed into the telemetry stream

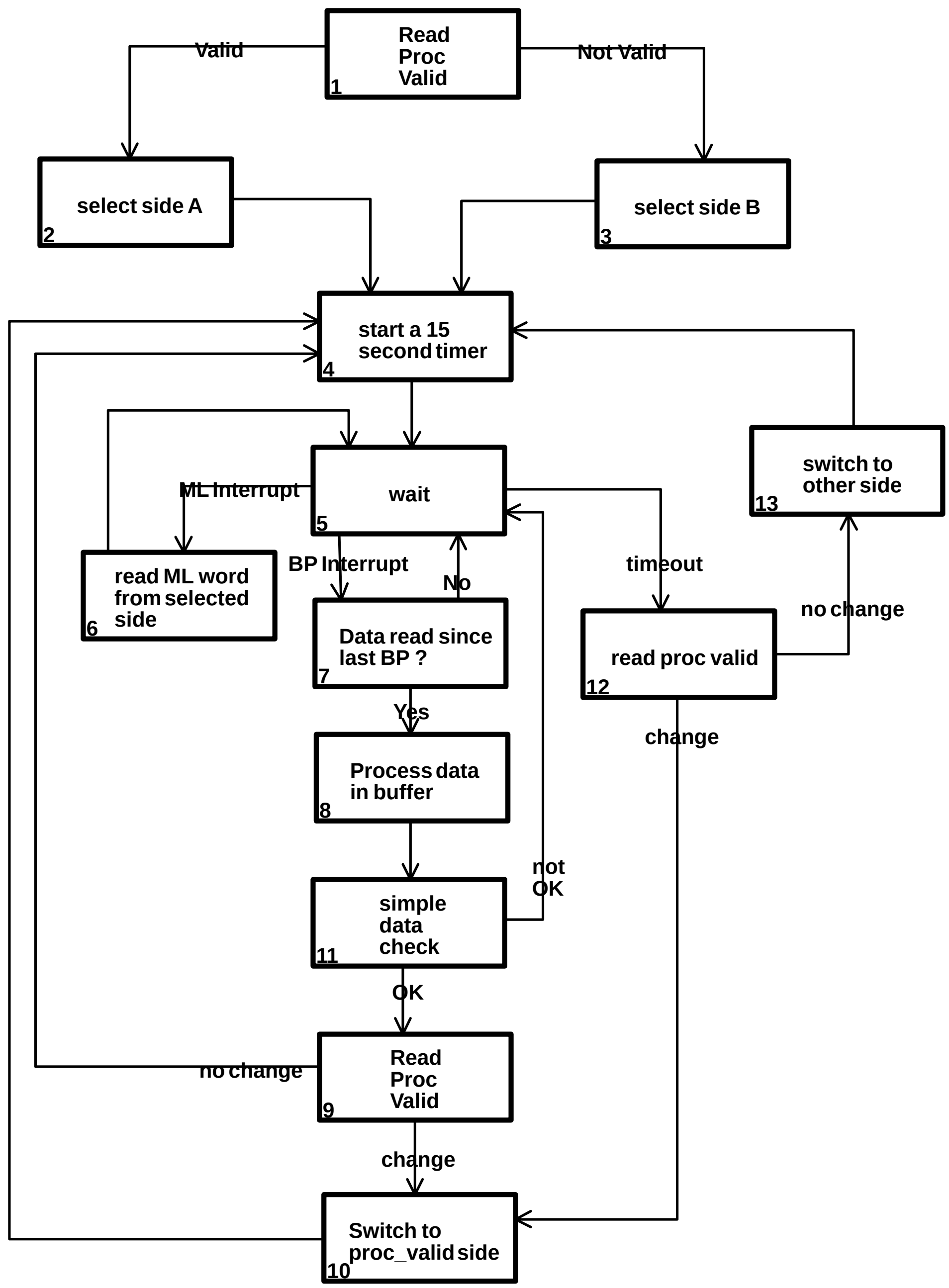

Figure 4 – CDMU Selection Flow

indicating the switch that is being made. This message is also sent out during the initialization process when the initial side selection is made.

There is a potential situation where a channel not indicated by processor valid could be used to receive data even though data is being sent on the processor valid channel. This requires the following sequence of events:

1) DISR selects side A (processor valid is true);
2) no data is received over that channel for over 15 seconds (at least 7 broadcast message periods);
3) the processor valid flag never changes to side B; and
4) valid data then resumes on channel A.

Except for this scenario it is believed that the proposed solution to the problem is better than simply using the processor valid flag as the absolute truth since it can react to channel errors other than those that go into constructing the processor valid signal. Such failures as a DISR channel A failure would be included in those that can be corrected for by the proposed algorithm that could not be accounted for with a reliance on processor valid only.

4.6 Serial Status Word

The format of the DISR serial status word is described in the following paragraphs. The format is provided in both the 1750 standard used internally and the Huygens standard as specified in the EID Part A. The MSB is always transmitted first as required by the interface.

4.6.1 Overall Format

Table 7 – Overall Serial Status Word Format

MSB							**1750 Standard**								**LSB**
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
HW	Mode			Mode specific information											
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
MSB							**Huygens Standard**								**LSB**

Bit 0 (Huygens 15) of the status word is used to indicate the hardware status summary. If no hardware problems are known it is set to a value of 1. If any hardware problems are known it is set to a value of 0.

Bits 1 to 3 (Huygens 12 to 14) of the status word is used to indicate the operating mode of the instrument according to the following list (all values are binary)

1) ”000” Not used
2) ”001” During initialization of the instrument
3) ”010” Descent Mode
4) ”011” Calibration Mode
5) ”100” Single Measurement Mode
6) ”101” Memory Access Mode
7) ”110” Spare
8) ”111” Spare

Bits 4 to 15 (Huygens 0 to 11) of the status word is used to indicate mode specific processing state. Specific mode bit allocations are listed in the following requirements.

4.6.2 Initialization Mode

The format for the serial status word for the initialization mode is shown in Table 8.

Table 8 – Serial Status Word for Initialization Mode

MSB							**1750 Standard**								**LSB**
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
HW	Mode			start	Memory test		EEPROM update		RA M	start Ada	wait BP	BP rec	spare		
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
MSB							**Huygens Standard**								**LSB**

For initialization mode the mode specific bits of the status word is used as follows:

1) Bit 4 (Huygens 11) – Used to indicate if the execution has started in the PROM. A 1 indicates that execution has started and a 0 indicates it has not.
2) Bits 5 and 6 (Huygens 9 and 10) – Used to indicate the memory test status. A ”00” indicates the memory test has not started, a ”01” is not used, a ”10” indicates it completed unsuccessfully, and a ”11” indicates a successful completion.
3) Bits 7 and 8 (Huygens 7 and 8) – Unused
4) Bit 9 (Huygens 6) – Set immediately after transfer from PROM to RAM execution. It is 0 before the transfer and 1 after the transfer.
5) Bit 10 (Huygens 5) – Set after the Ada kernel transfers to the DISR code. It is 0 before the DISR specific code starts and 1 after that.
6) Bit 11 (Huygens 4) – Set after all DISR initialization is complete except the reception of the first broadcast pulse and DDB message. It is 0 before the initialization is complete and 1 after initialization is complete and the instrument is waiting for the first broadcast pulse.
7) Bit 12 (Huygens 3) – Set to 1 after the first broadcast pulse is received.
8) Bits 13 to 15 (Huygens 0 to 2) – Spares – Set to 0

4.6.3 Descent Mode

The format for the serial status word for the descent mode is shown in Table 9.

Table 9 – Serial Status Word for Descent Mode

MSB							**1750 Standard**								**LSB**
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
HW	Mode			Cycle count						Measurement count					
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
MSB							**Huygens Standard**								**LSB**

For descent mode the mode specific bits of the status word is used as follows:

1) Bits 4 to 9 (Huygens 6 to 11) – The cycle number mod 64.
2) Bits 10 to 15 (Huygens 0 to 5) – The number of measurements complete within the cycle mod 64. Set to ”63” when all measurements in a cycle are complete.

4.6.4 Calibration Mode

The format for the serial status word for the calibration mode is shown in Table 10.

Table 10 – Serial Status Word for Calibration Mode

MSB							**1750 Standard**								**LSB**
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

HW	Mode			Cycle count			Measurement count							Spare	
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
MSB							**Huygens Standard**								**LSB**

For Calibration mode the mode specific bits of the status word is used as follows:

1) Bits 4 to 6 (Huygens 9 to 11) – The calibration cycle number.
2) Bits 7 to 13 (Huygens 2 to 8) – The number of measurements complete within the cycle mod 128. Use ”127” when all measurements in the sequence are done.
3) Bits 14 to 15 (Huygens 0 and 1) – Spares – Set to 0

4.6.5 Single Measurement Mode

The format for the serial status word for the single measurement mode is shown in Table 11.

Table 11 – Serial Status Word for Single Measurement Mode

MSB							**1750 Standard**								**LSB**
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
HW	Mode			Measurement count						Last Measurement ID					comp
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
MSB							**Huygens Standard**								**LSB**

For Single Measurement Mode the mode specific bits of the status word is used as follows:

1) Bits 4 to 9 (Huygens 6 to 11) – The number of measurements taken since the mode was entered mod 64
2) Bits 10 to 14 (Huygens 1 to 5) – The last measurement accepted type ID number
3) Bit 15 (Huygens 0) – The last measurement accepted completion flag. Set to 0 when the measurement is accepted and set to 1 when it completes.

4.6.6 Memory Access Mode

The format for the serial status word for the memory access mode is shown in Table 12.

Table 12 – Serial Status Word for Memory Access Mode

MSB							**1750 Standard**								**LSB**
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
HW	Mode			Memory dump count					Memory load count					id	comp
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
MSB							**Huygens Standard**								**LSB**

For memory access mode the mode specific bits of the status word is used as follows:

1) Bits 4 to 8 (Huygens 7 to 11) – The number of memory dump commands executed since the mode was entered mod 32
2) Bits 9 to 13 (Huygens 2 to 6) – The number of memory load commands executed since the mode was entered mod 32
3) Bit 14 (Huygens 1) – The last command type accepted. A 0 is used to memory load command and a 1 for memory dump command.

4) Bit 15 (Huygens 0) – The last command completion flag. Set to 0 when the command is accepted and set to 1 when it completes.

5.0 NOMINAL OPERATIONS

This section describes the planned operations for descent, cruise, and ground testing.

5.1 Descent Operations

5.1.1 Purpose

This section describes the operating sequence for the descent mode of operation. This is the mode that is used during the Titan descent.

5.1.2 Constraints

Care should be taken when performing descents during ground test operations. The surface lamp will be turned on at the appropriate time (altitude) for the descent. Since the surface lamp is a limited life item it is desired that for the majority of the descent runs performed the power controlling the surface lamp be disabled so that even though the software may "turn it on" the lamp will not really be used.

5.1.3 Operational Characteristics

This is a fairly complex mode to describe. Activities are scheduled in cycles with the cycle type being dependent on parameters such as time, altitude, spin rate, and telemetry buffer fullness. The most common cycles are imaging cycles and non–imaging cycles. Other cycle types are calibration cycles (4 sets performed for a full descent), flat field cycles (1), drain cycles (1), spectrophotometric cycles(2), and various near–surface and surface cycles. Within cycles the measurements are scheduled based on resource availability and azimuth. Azimuth is determined based on input received from the sun sensor or extrapolated from the last data based on the spin rate from the DDB messages. Within cycles the IR, CCD, and violet measurements are scheduled independently and in many cases concurrently. This is the only mode where concurrent measurements using the different detectors are performed.

5.1.4 Consumption Characteristics

In this mode the instrument will consume some of all of the consumable items. In particular it will consume calibration lamp time (all lamps), IR shutter cycles, and surface lamp time (only if power is enabled).

5.1.5 Operating Procedures

This is the default operating mode for the DISR instrument. If power is applied to the instrument unless specific command sequences are sent to the instrument it will start executing the descent operating mode within two minutes of power on. As long as DDB messages are being received a nominal type descent will be performed. With no DDBs being received a descent like sequence will be performed but no altitude keyed measurements will be taken. This includes all of the near surface operations, the spectrophotometric cycles, and the surface operations.

5.2 Cruise Operations – Simulated Descent

5.2.1 Purpose

The purpose of a simulated descent during the cruise phase is to operate the instrument in as descent like a condition as possible.

5.2.2 Constraints

Due to power constraints the simulated descent needs to be performed with only a single lamp enabled for the calibration cycles that are performed during the descent. In addition the power for the surface lamp should be disabled for the simulated descent.

5.2.3 Operational Characteristics

The simulated descent has the same operational characteristics as the actual descent with a few differences. As planned only one of the calibration lamps will be used. The calibration lamps are only used for the calibration cycles which occur at four times during the descent. Secondly, since the sun simulator LED is enabled a constant spin rate of 4.578 rpm (13.1072 seconds per rotation) is used throughout the descent.

5.2.4 Consumption Characteristics

In this mode the instrument will consume some of all of the consumable items. In particular it will consume calibration lamp time (a single lamp), IR shutter cycles, and surface lamp time (only if power is enabled).

5.2.5 Operating Procedures

If the simulated descent were identical to the real descent the operating procedures would be the same. However, there are two key differences. First, two of the three calibration lamps must be disabled to limit the peak current. Second, the internal sun simulator LED must be enabled. To do this the following should be done at instrument power on.

1) Start sending these commands 38 $\pm$ 10 seconds after instrument power on
2) Command to enable command receipt
3) Command to memory access mode
4) Wait for 45 seconds – instrument still waits before going to memory access mode
5) Command to modify memory (Change 2 RAM locations to change lamp configuration for the two calibration cycles with lamps on)
6) Command to descent mode with the sun simulator LED on
7) Command to disable command receipt

With this set of commands the instrument will start a descent with the LED on and will only use the calibration lamp specified with the modify memory commands.

5.3 Cruise Operations – Health Check

5.3.1 Purpose

The purpose of the health check sequence is to check out all instrument functions. This is a built in sequence for the instrument that can be initiated by sending a sequence of commands.

5.3.2 Constraints

There are no specific constraints in this mode.

5.3.3 Operational Characteristics

The health check sequence is a built in sequence of measurements that are performed when commanded. This sequence is designed to use all instrument functions to determine if all are operating normally. The health check sequence performs measurements in a known sequence as quickly as possible. If the measurement taking proceeds faster than the telemetry can be sent out of the system and the telemetry buffer fills up the measurement taking process is stopped to allow telemetry buffer space to become available. The IR, CCD and violet measurements are performed sequentially with no overlap. In addition all tests, except the surface science lamp test, are performed as part of this sequence.

5.3.4 Consumption Characteristics

In this mode the instrument will consume some of all of the consumable items. In particular it will consume calibration lamp time (all lamps), and IR shutter cycles.

5.3.5 Operating Procedures

The health check sequence is a built in sequence within the DISR instrument. To initiate that sequence a series of commands should be executed. They are:

1) Start sending these commands 38 $\pm$ 10 seconds after instrument power on
2) Command to enable command receipt
3) Command to go to calibration mode and execute sequence number 1

4) Command to disable command receipt

The sequence will start within 45 seconds of receiving this set of commands. When the sequence is done the instrument will finish transmitting all telemetry for the cycle and then be in a idle state. In this state no measurements will be taken. However, a time data set will be produced once every 40 seconds and a housekeeping data set will be produced once every 2 minutes.

5.4 Cruise Operations – In–Flight Calibration

5.4.1 Purpose

The purpose of the In–Flight calibration sequence is to characterize the DISR instrument and measure any changes in performance since ground calibration.

5.4.2 Constraints

There are no specific constraints in this mode.

5.4.3 Operational Characteristics

The In–Flight calibration sequence is a built in sequence of measurements that are performed when commanded. This sequence is designed to determine if the instrument performance has changed since the ground calibration was performed. The In–Flight calibration sequence performs measurements in a known sequence as quickly as possible. If the measurement taking proceeds faster than the telemetry can be sent out of the system and the telemetry buffer fills up the measurement taking process is stopped to allow telemetry buffer space to become available. The IR, CCD and violet measurements are performed sequentially with no overlap.

5.4.4 Consumption Characteristics

In this mode the instrument will consume some of all of the consumable items. In particular it will consume calibration lamp time (all lamps) and IR shutter cycles.

5.4.5 Operating Procedures

The in–flight calibration sequence is a built in sequence within the DISR instrument. To initiate that sequence a series of commands should be executed. They are:

1) Start sending these commands 38 $\pm$ 10 seconds after instrument power on
2) Command to enable command receipt
3) Command to go to calibration mode and execute sequence number 2
4) Command to disable command receipt

The sequence will start within 45 seconds of receiving this set of commands. When the sequence is done the instrument will finish transmitting all telemetry for the cycle and then be in a idle state. In this state no measurements will be taken. However, a time data set will be produced once every 40 seconds and a housekeeping data set will be produced once every 2 minutes.

5.5 Test Operations – Safe Mode

5.5.1 Purpose

The purpose of this mode of operation is to be in a state where the instrument is on but does as close to nothing as possible. This could be used for a number of purposes as part of the integration type activities.

5.5.2 Constraints

There are no specific constraints in this mode.

5.5.3 Operational Characteristics

As planned this mode is a very do–nothing mode. In this state no measurements will be taken. However, a time data set will be produced once every 40 seconds and a housekeeping data set will be produced once every 2 minutes. Because of this a very low rate of telemetry will be created (an average of two packets per channel per minute).

5.5.4 Consumption Characteristics

If run as planned, this mode will consume no consumable items.

5.5.5 Operating Procedures

The actual mode used is the single measurement mode with no commands to do measurements. To initiate this mode a series of commands should be executed. They are:

1) Start sending these commands 38 $\pm$ 10 seconds after instrument power on
2) Command to enable command receipt
3) Command to go to single measurement mode
4) Command to disable command receipt

5.6 Test Operations – Telemetry Source Mode

5.6.1 Purpose

The purpose of this mode of operation is to be a telemetry source for probe integration checkout. In this mode the DISR instrument creates telemetry as fast as the probe takes it. The instrument can remain in this mode indefinitely and with the sequence planned it can produce over 24 hours of continuous telemetry.

5.6.2 Constraints

There are no specific constraints in this mode.

5.6.3 Operational Characteristics

As planned this mode will keep the telemetry channel busy all the time. It can adjust to wide changes in the telemetry rate from small rates (such as a few packets every 16 seconds) to maximum rates (theoretically up to 128 packets per 16 seconds). CCD measurements will be taken as needed to maintain this rate. Also the time data sets (once per 40 seconds) and housekeeping data sets (once per 2 minutes) will be produced during this mode.

5.6.4 Consumption Characteristics

If run as planned, this mode will consume no consumable items.

5.6.5 Operating Procedures

The actual mode used is the single measurement mode with a single command to do 255 full CCD readouts. To initiate this mode a series of commands should be executed. They are:

1) Start sending these commands 38 $\pm$ 10 seconds after instrument power on
2) Command to enable command receipt
3) Command to go to single measurement mode
4) Wait for an additional 45 seconds
5) Command to do 255 full CCD readouts

The telemetry will start within 45 seconds of receiving this set of commands and will continue for at least 24 hours. The actual time depends on the exact rate at which telemetry is taken from the DISR instrument.

5.7 Test Operations – Modification of Operational Parameters

5.7.1 Purpose

There are occasions when operational parameters need to be modified. These occur during testing, primarily at the factory but potentially at other locations. Some examples of parameters that could change for specific testing purposes are listed here:

1) Modify the temperature set points for controlling the heaters
2) Change the frequency of creation of housekeeping data sets
3) Modification of bad pixel maps

5.7.2 Constraints

There are no particular constraints associated with this type of operation. However, the modification of some parameters can affect the use of some of the limited use items. Care should be taken to insure that this does not occur.

5.7.3 Operational Characteristics

These types of operations should be planned in advance and all commands reviewed thoroughly before being used. The system can be used in other operational modes after the desired operations are completed. Address of memory to be modified should be identified by using the memory map.

5.7.4 Consumption Characteristics

No specific consumables are used by this procedure although this procedure may change the consumptions of resources for other modes.

5.7.5 Operating Procedures

The system must be in memory access mode to perform this procedure since the modification is performed in this manner.

1) Start sending these commands 38 ± 10 seconds after instrument power on
2) Command to enable command receipt
3) Command to go to memory access mode
4) Wait for an additional 45 seconds
5) Send memory modification commands to perform the changes desired.
6) Command to new mode desired

6.0 COMMANDING THE INSTRUMENT

This section is primarily intended to describe the use of the telecommands and not the format. The format is described in complete detail in Appendix A.

6.1 Telecommand Overview

There are two basic types of commands that can be sent over the telecommand channels. The first is the Descent Data Broadcast (DDB) messages. These are produced inside the probe and provide DISR with a time reference, the current altitude, and the current spin rate. These are processed by DISR whenever they are received. That is, enabling and disabling command receipt has no affect on DDB messages. The second type of message are commands intended to change the mode or operations of the DISR instrument. If none of these are received the DISR instrument will execute a standard descent sequence.

The DISR instrument has two interfaces for reception of telecommands. They are referred to as channel A and channel B. Associated with the telecommand channel is a flag, called processor valid, which indicates which channel the probe thinks is the best one to use. If both channels perform properly then channel A will be used for the entire mission. However, if there are problems the system will switch from one to the other. The switching algorithm can be summarized as follows:

1) Start using the channel indicated by the processor valid flag
2) If the processor valid flag changes state, switch to the channel indicated by processor valid
3) If no valid data is being received on the channel being used, switch sides

This algorithm protects against errors occurring both on the probe side of the interface and against errors occurring on the DISR side of the interface.

In addition to the words coming across the memory load interface there is a broadcast pulse interface. The broadcast pulse is used by DISR for two distinct purposes. The first is to distinguish when entire commands have been received and should be processed by the instrument. If any words have been received and are not yet processed when a broadcast pulse is received, the words are processed as a group. The DISR instrument is able to handle a DDB message and a commanding type of command received between two broadcast pulses. These two types can be received in either order and still be processed successfully. The second purpose of the broadcast pulse is to indicate a time reference. When a DDB is received the time in the message is the time at which the next DDB is sent. This is used by the DISR instrument to synchronize its internal clock (resolution 0.1 millisecond) with the time from the probe. When a clock drift of more than 2 milliseconds is detected the clocks are re–synchronized and a message is placed into the telemetry stream indicating the time it occurred.

6.2 Descent Data Broadcast Telecommand

This message is received once every 2 seconds during the mission. The contents of the message include the time (at the next broadcast pulse), the altitude, and the spin rate. There are also some other parameters not used by the DISR instrument, including some mission flags. These DDB messages are used by the flight software to synchronize the internal clock with the probe time, to determine the altitude, and to determine the spin rate. This spin rate is only used if there are no sun pulses being received by the sun sensor which is the preferred source of spin rate and azimuth.

6.3 Enable Command Receipt Telecommand

The purpose of this command to to protect the flight software from executing unexpected commands. The initial state of the software is that any commands received are ignored. This does not apply to the DDB messages which are always allowed and processed. Before sending any command to change the operating state of the DISR instrument the enable command receipt telecommand must be sent. As many commands as desired may then be sent and processed. There is a corresponding command to disable command receipt when all desired commands have been sent.

6.4 Scenario Change Telecommand

This command is used to change the operating mode of the DISR instrument. As previously indicated the initial operating mode is the descent mode of operations. Initially the instrument gets prepared to start operations and then waits for 30 seconds before proceeding to the descent mode. During this time a scenario change mode command would have the effect of having the instrument start in the new mode rather than descent mode. After that time period the instrument can still be commanded to a different mode but the timing will be hard to predict. Once a descent cycle has been started the new mode will not take effect until the current cycle has completed. This is generally true with any mode switch, the current cycle will be completed before the mode switch takes effect. Depending on the current mode this has the following effect:

1) In descent mode the new mode does not start until the end of the current cycle (usually no more than 3 minutes).
2) In calibration mode the new mode does not start until the end of the current cycle (this could be a long time since there are not a lot of cycles for the two calibration sequences).
3) In single measurement mode the new mode starts after the current measurement is complete or immediately if no measurement or test is currently in progress.
4) In memory access mode the new mode starts after the current command has been completed or immediately if no command is in progress.

Note : Do not send a change mode command to enter Memory Access mode if DISR is already running in Memory Access mode. Although the command will execute correctly, the usage block that counts updates to EEPROM will not be updated properly. Updates since the last Change Mode command will not be counted.

There are parameters allowed with mode change telecommands are shown in Table 13.

Table 13 – Mode Change Telecommand Parameters

New Mode	Parameter Description
Descent	Sun simulator flag – indicates if the sun simulator is to be enabled or disabled
Calibration	Scenario to execute 1 – Health Check 2 – In–Flight Calibration 3–8 – User defined sequences
Single Measurement	None
Memory Access	None

Within the descent and calibration modes no additional commands are required to perform the measurements desired. Within the single measurement and memory access modes additional commands are required to actually perform an action. The mode change command simply puts the system into a state where those additional commands are accepted and acted upon. The specific single measurement commands and memory access commands are accepted and acted upon if the previous command has completed.

6.5 Perform One Measurement Telecommand

This command is only valid in the Single Measurement mode of operations. It actually is a series of commands all having the same format to take a science measurement or to perform one of the six built in tests. All of these can be commanded multiple times with a single command (a command repeat capability). There are actually two different command formats one for a single scientific type measurement and another for a single test. Appendix A has a section for each of these commands.

6.5.1 General Command Parameters

Many of the commands to take measurement have parameters which are included in all or many of the individual commands. These include exposure times, repeat counts, and processing flags. These are described in Table 14 and then indicated if they are applicable for a particular type of measurement.

Table 14 – Common Command Parameters

Parameter Name	Parameter Use
Repetitions	Indicates the number of times to repeat the measurement.
Exposure Time	Used for all CCD measurements. Indicates the exposure time for the CCD measurement. Values of from 0.0 milliseconds to 32 seconds are allowed with a 0.5 millisecond resolution.
Collection Time	Used for all IR measurement. Indicates the total collection time for the measurement. See below for a thorough discussion of the relationships between the collection time, the shutter time, and the sample times.
Shutter Time	Used for all IR measurements performing shutter activity. This is not strictly the shutter period although it is related to the period. See below for a thorough discussion of the relationships between the collection time, the shutter time, and the sample times.
Shutter Operating Mode	Used for IR measurements. Indicates what type of shutter operations are to be used. Options are: Closed for the entire collection Open for the entire collection Alternating
Sample Time (ULIS, DLIS)	Used for all IR measurements. This is the time for each individual readout of the IR. See below for a thorough discussion of the relationships between the collection time, the shutter time, and the sample times.
Lamp States	The lamp states to use for the measurement. Each of the three calibration lamps and the surface lamp can be commanded on for this measurement. After a measurement the lamps remain in the state that was commanded to until a subsequent measurement changes the lamp state. This is done to reduce the number of times the lamps are switched on or off. For the single test commands the lamps are always returned to the state they were in before the test was performed.
Use Auto–Exposure	A flag indicating if the auto–exposure tables are to be used instead of the supplied tables.
General Processing Options	These indicate a whole set of processing options available. Note that not all options are allowable for each measurement type. These options are shown in Table 15.
Image Processing Options	These indicate a set of options available only for image measurements. These options are shown in Table 16.

The IR collection time, shutter time, and sample time are related in a fairly complex way.

Table 15 – General Processing Options

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
bad pixel elim	sqrt proc	summ–ing	calc opt ex-pose times	com-press data	in-clude error bits	unused		num fields of view							
0=no 1=yes	0=no 1=yes	0=no 1=yes	0=no 1=yes	0=no 1=yes	0=no 1=yes	00									
0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**

Table 16 – Image Processing Options

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
perf dark meas	single image	half image	comp type	compression ratio							which image only if single image options selected				
0=no 1=yes	0=no 1=yes	0=no 1=yes	0=HW 1=SW	1–16 valid							DLI 2 = 21 = 15_{16} SLI = 22 = 16_{16} DLI1 = 23 = 17_{16}				
0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**

Note that there are two different fields controlling optimum exposure calculations. The ”use auto–exposure” option specifies that the measurement is to use the data already in the table. The ”calc opt expose times” is used to update the value in the table. Any combination of these flags may be used. Thus you may start off an auto exposure sequence specifying not to use the value but to update it and then perform a series to both use it and updated it.

6.5.2 ULVS Measurement

This measurement takes a ULVS measurement using the CCD detector. General command parameters ”repetitions”, ”Exposure Time”, ”Lamp States”, ”Use Auto–Exposure”, and ”General Processing Options” are used with this command. The general processing options which are applicable for a ULVS measurement are ”bad pixel elim”, ”summing”, ”calc opt expose times”, and ”compress data”. If summing is performed it is fixed at two fields of view, each one the sum of 4 columns of data.

6.5.3 DLVS Measurement

This measurement takes a DLVS measurement. General command parameters ”repetitions”, ”Exposure Time”, ”Lamp States”, ”Use Auto–Exposure”, and ”General Processing Options” are used with this command. The general processing options which are applicable for a DLVS measurement are ”bad pixel elim”, ”summing”, ”calc opt expose times”, ”compress data”, and ”num fields of view”. The number of fields of view can be 2, 5, or 10.

6.5.4 Dark Current Measurement

This measurement takes a Dark measurement using the CCD detector. General command parameters ”repetitions”, ”Exposure Time”, ”Lamp States”, and ”General Processing Options” are used with this command. The general processing options which are applicable for a Dark measurement are ”bad pixel elim”, ”summing”, and ”compress data”. If summing is specified the number of fields of view is 2 each on the sum of two columns of data.

6.5.5 Image Set Measurement

This measurement takes an image set measurement. General command parameters ”repetitions”, ”Exposure Time”, ”Lamp States”, ”Use Auto–Exposure”, ”General Processing Options”, and ”Image Processing

Options" are used with this command. The general processing options which are applicable for an image set measurement are "bad pixel elim", "square root", "calc opt expose times", and "compress data". All image processing options are available.

6.5.6 Strip Measurement

This measurement takes a Strip measurement using the CCD detector. General command parameters "repetitions", "Exposure Time", "Lamp States", "Use Auto–Exposure", and "General Processing Options" are used with this command. The general processing options which are applicable for a Strip measurement are "bad pixel elim", "summing", "calc opt expose times", and "compress data". If summing is performed it is fixed at two fields of view each the sum of 13 columns of data. In addition there is an additional parameter which is only applicable for the strip measurement. This parameter is called the "strip column" and specifies the number of the column to use as the "center" column for the measurement.

6.5.7 Solar Aureole Measurement

This measurement takes a Solar Aureole measurement using the CCD detector. General command parameters "repetitions", "Exposure Time", "Lamp States", "Use Auto–Exposure", and "General Processing Options" are used with this command. The general processing options which are applicable for a SA measurement are "bad pixel elim", "summing", "calc opt expose times", and "compress data". If summing is performed it is fixed at 4 fields of view, each one the sum of 6 columns of data.

6.5.8 Full CCD Measurement

This measurement takes a Full CCD readout measurement using the CCD detector. General command parameters "repetitions", "Exposure Time", "Lamp States", and "General Processing Options" are used with this command. The general processing options which are applicable for a Full measurement are "compress data" and "include error bits".

6.5.9 DLIS Measurement

This measurement takes a DLIS measurement using the IR detector. General command parameters "repetitions", "Collection Time", "Shutter Time", "Shutter Operating Mode", "Sample Time" (DLIS only), "Lamp States", and "General Processing Options" are used with this command. The only general processing options which is applicable for a DLIS measurement is "compress data".

6.5.10 ULIS Measurement

This measurement takes a ULIS measurement using the IR detector. General command parameters "repetitions", "Collection Time", "Shutter Time", "Shutter Operating Mode", "Sample Time" (ULIS only), "Lamp States", and "General Processing Options" are used with this command. The only general processing options which is applicable for a ULIS measurement is "compress data".

6.5.11 Combined ULIS/DLIS Measurement

This measurement takes a combined IR measurement using the IR detector. General command parameters "repetitions", "Collection Time", "Shutter Time", "Shutter Operating Mode", "Sample Time" (both ULIS and DLIS), "Lamp States", and "General Processing Options" are used with this command. The only general processing options which is applicable for a combined IR measurement is "compress data".

6.5.12 Long Integration IR Measurement

This measurement takes a long integration IR measurement using the IR detector. General command parameters "repetitions", "Collection Time", "Lamp States", and "General Processing Options" are used with this command. The only general processing options which is applicable for a combined IR measurement is "compress data".

6.5.13 DLV Measurement

This measurement takes a DLV measurement using the downward looking violet detector. General command parameters "repetitions" and "Lamp States" are used with this command.

6.5.14 ULV Measurement

This measurement takes a ULV measurement using the upward looking violet detector. General command parameters "repetitions" and "Lamp States" are used with this command.

6.5.15 Shutter Test

This measurement takes an IR shutter test. General command parameters "repetitions" is used with this command. In addition there is a single word parameter associated with the command. This parameter is used to specify the number of shutter tests to perform. Each single measurement is for one shutter cycle (close and then open).

6.5.16 DCS Test

This measurement performs a DCS test. General command parameters "repetitions" is used with this command. In addition there is a single word parameter associated with the command. This parameter is used to specify the type of software image to generate and the compression ratio. The GSE software compares with a standard image generated but will still display the other types. The standard type is a checkerboard pattern of 15x15 blocks. The second type is a repeated 15x15 pattern with a peak in the center of each 15x15 block and then a gradual decrease towards the outside of the block. The last pattern is a slope in both the x and y direction. A DCS internal test takes 20 seconds to complete so the entire test takes about 25 seconds or less.

Table 17 – DCS Test Parameter Description

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
unused									image type		compression ratio				
0									0 – Checkerboard 1 – Center peaks 2 – Gradual slope		2–16				
0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**

6.5.17 Heater Test

This measurement performs a heater test. General command parameters "repetitions" is used with this command. In addition there is a single word parameter associated with the command. This parameter is used to specify which heaters to test. The least significant bit controls the test for the focal plane heater test and the next to least significant bit controls the aux board heater test. A 0 in the respective location causes no test to be performed while a 1 causes the test to be performed. This is summarized in Table 18. Each heater tested takes 90 seconds to complete the test for that heater.

Table 18 – Heater Test Parameter Description

Parameter Value	Action
0001_{16}	Focal plane heater test only
0002_{16}	SH aux board heater test only
0003_{16}	Test both heaters (This is also the default if any value other than 1 or 2 is selected)

6.5.18 Calibration Lamp Test

This measurement performs a calibration lamp test. General command parameters "repetitions" is used with this command. In addition there is a single word parameter associated with the command. This parameter is used to specify which lamps to turn on during the test. Bit 15 (the least significant bit) is used to control turning on lamp 3, bit 14 is used to control turning on lamp 2, and bit 13 is used to control turning on lamp 1. A 0 in the respective bit location means to leave the lamp off, a 1 means to turn the lamp on. This is summarized in Table 19.

Table 19 – Calibration Lamp Test Parameter Description

Parameter Value	Lamp 1	Lamp 2	Lamp 3
0000_{16}	off	off	off
0001_{16}	off	off	on
0002_{16}	off	on	off
0003_{16}	off	on	on
0004_{16}	on	off	off
0005_{16}	on	off	on
0006_{16}	on	on	off
0007_{16}	on	on	on

6.5.19 Surface Lamp Test

This measurement performs a surface lamp test. General command parameters ”repetitions” is used with this command. In addition there is a single word parameter associated with the command. This parameter is used to specify whether to turn on the surface lamp during the test. A 0 means to leave the lamp off, a 1 means to turn the lamp on. This is summarized in Table 20.

Table 20 – Surface Lamp Test Parameter Description

Parameter Value	Lamp State
0000_{16}	off
0001_{16}	on

6.5.20 Sun Lamp Test

This measurement performs a sun lamp test. General command parameters ”repetitions” is used with this command. In addition there is a single word parameter associated with the command. This parameter is not used by the system.

6.5.21 IR Command Generation

The process of generating commands for the IR subsystem that do what you need them to has been a difficult one to work out. However, it is now well understood and can be used to reliably generate the commands that you need. The following is what to do for standard alternating shutter operations.

1) Decide on the sample time. This parameter understands that 8 is really 8.064 so for the purposes of calculating sample time assume that a frame period is exactly 8 milliseconds long.
2) Determine how many samples you want in a full shutter open (or closed) cycle. For example the famous 6–12–6 has 12 samples in a full shutter open. This number must be even since with the first and last closed cycles being only half as long the number you choose needs to be divisible by 2. Take that number (eg. 12), multiply by the sample time divided by 8, add 2 and then multiply by 8.064. This is the shutter time to enter into the command generation window. The number will have to be ”rounded” up to the next multiple of 1 millisecond. Example: for the 6–12–6, shutter time = (12*1+2)*8.064 = 112.896, rounded up to 113.
3) Determine how many shutter cycles you want to include. This is often 1 cycle but is not limited to 1. For example the 6–12–6 is one cycle. A 6–12–12–12–6 is 2 cycles. Take the shutter time

computed in the previous step, multiply by 2 times the number of cycles desired, and then add 16.128. This is the collection time needed. Again for the 6–12–6 the computation is 112.896 * 2 * 1 + 16.128 = 241.92. Again this number needs to be "rounded" up to the next multiple of 1 millisecond to be entered into the menu.

This should allow the user to create IR commands that do what is desired. Table 21 shows a number of IR commands that may be useful.

Table 21 – Sample IR Commands with Shutter Operations

Measurement description	Sample Time	Shutter Time	Collection Time
6–12–6	8	113	242
1–2–1	8	33	81
2–4–2	8	49	113
3–6–3	8	65	146
16 msec sample – 2 * 16 msec sample – 16 msec sample	16	49	113
6–12–12–12–12–12–12–12–12–12–6	8	113	1146

Commands for the IR not involving the shutter are somewhat easier to generate. The shutter time can be set to 0 since it is never used. Sample times are always entered using a frame as exactly 8 milliseconds. The collection time is the total number of frame times required (sample time divided by 8 times the number of samples desired), plus 2, times 8.064. Table 22 shows a number of useful IR command parameters.

Table 22 – Sample IR Commands without Shutter Operations

Measurement description	Sample Time	Collection Time
Single 8 msec read	8	25
10 x 8 msec read	8	97
1 second read	1000	1025

6.6 Memory Upload Telecommand

Memory uploads can be made to either EEPROM or to RAM. The purpose of EEPROM uploads is to permanently modify the system. On initialization the EEPROM is examined for modifications to the PROM code and/or data and changes are made after the PROM has been copied but before the system really starts to run. Thus, these changes are incorporated to the running system every time it is started. These changes need to include where in the EEPROM the change will reside as well as the locations and data that need to be modified in the RAM area. These changes do not take affect until the next time the system starts from a power up. On the other hand RAM memory loads take immediate effect but do not carry over once the power is turned off. EEPROM changes would be used to make changes to descent or calibration sequences while the RAM changes are used for such things as running a simulated descent since the changes should only be in effect for that run of the system.

6.7 Dump Memory Telecommand

Memory dumps are performed to examine the contents of the various memory locations. All memory can be dumped although some may not be particularly useful to dump. Up to 10 ranges of memory may be dumped at any time. Each range is limited to a 16 bit address range. In addition the ranges must be within allowable ranges with not overlap of different regions. The allowable ranges with their general content is shown in Table 23.

Table 23 – Dump Memory Command Address Ranges

Range (hex)	Type of Memory
0 – F,FFF	RAM
10,000 – 1F,FFF	Instruction RAM
20,000 – 2F,FFF	EEPROM
40,000 – 4F,FFF	PROM
100,000 – 1BF,FFF	Frame Buffer
200,000 – 207,FFF	IR RAM
310,000 –32F,FFF	Flat Field
400,000 – 43F,FFF	DCS RAM

7.0 SOFTWARE ARCHITECTURE

7.1 System Memory Map

Table 24 contains a summary of the data space map for normal operations.

Table 24 – System Memory Map

Start address (hex)	End address (hex)	Size (K Words)	Description
0	7,FFF	32	Data Ram area
8,000	8,FFF	4	Extended memory area 1
9,000	9,FFF	4	Extended memory area 2
A,000	A,FFF	4	Extended memory area 3
B,000	B,FFF	4	Extended memory area 4
C,000	C,FFF	4	Extended memory area 5
D,000	D,FFF	4	Extended memory area 6
E,000	E,FFF	4	Extended memory area 7
F,000	F,FFF	4	Extended memory area 8
10,000	1F,FFF	64	Instruction RAM (not available through extended memory)
20,000	2F,FFF	64	EEPROM – 8 bit data only (not available through extended memory)
30,000	30,02F	<1	CPU I/O (not available through extended memory)
30,030	3F,FFF		Not used
40,000	4F,FFF	64	PROM data (not available through extended memory)
50,000	50,02F	<1	CPU I/O (not available through extended memory)
50,030	FF,FFF		Not used
100,000	1BF,FFF	768	Frame buffer
1C0,000	1C0,05F	<1	TM / DMA / CCD
1C0,060	1FF,FFF		Not used
200,000	203,FFF	16	IR RAM – Commands
204,000	207,FFF	16	IR RAM – Data
208,000	20F,FFF	32	Spare (IR RAM)
210,000	210,001	<1	IRIF I/O
210,002	2FF,FFF		Not used
300,000	300,0FF	<1	Aux Board I/O
300,100	3FF,FFF		Not used
310,000	32F,FFF	128	Flat Field
330,000	3FF,FFF		Not used

Start address (hex)	End address (hex)	Size (K Words)	Description
400,000	41F,FFF	128	DCS Image Buffer – 8 bit data only
420,000	43F,FFF	128	DCS Result Buffer – 8 bit data only
440,000	440,000	<1	DCS command/status
440,001	500,01F		Not used
500,020	500,03F	<1	Interrupt Acknowledge Registers
500,040	FFF,FFF		Not used

7.2 Data Structures Overview

7.2.1 Bad Pixel Map

The bad pixel map contains bad pixels for the CCD. They are arranged into two different areas. One for the bad pixels in the spectral readout areas and the other for bad pixels in the image areas. Both are arranged so that if a column or a part of a column is bad a single entry is made in the bad pixel map. In both cases the entries include the column that is bad, the first bad row and the last bad row. For the image are a substitute row to use in its place is also included. The maximum number of spectral readout bad pixel entries is 10 and the maximum number of image area bad pixel entries is 700. The bad pixel map data structure is shown in Table 25. Entries are shown with both a table offset (the value to add to the beginning of the data area to get the address that contains the particular variable of interest) and the word number (a sequential word count starting at 1). See Table 32 for the location of the bad pixel map in memory.

Table 25 – Bad Pixel Map Data Structure

Table Offset	Word Number	Description
0	1	Number of spectral area bad pixels defined Range: 0..10
1	2	Number of image area bad pixels defined Range: 0..700
2	3	1st Spectral area entry – column number Range: 0..53
3	4	1st Spectral area entry – first (most significant byte) and last (least significant byte) row affected by the bad pixel area Range: 0..255
4 – 5	5 – 6	2nd Spectral area entry – Same format as the 1st entry
6 – 7	7 – 8	3rd Spectral area entry – Same format as the 1st entry
...	...	...
2*n* – 2*n*+1	2*n*+1 – 2*n*+2	*n*th Spectral area entry – Same format as the 1st entry
...	...	...
18 – 19	19 – 20	9th Spectral area entry – Same format as the 1st entry
20 – 21	21 – 22	10th Spectral area entry – Same format as the 1st entry
22	23	1st Image area entry – column number Range: 54..255
23	24	1st Image area entry – substitute column number Range: 54..255

Table Offset	Word Number	Description
24	25	1st Image area entry – first (most significant byte) and last (least significant byte) row affected by the bad pixel area Range: 0..255
25 – 27	26 – 28	2nd Image area entry – Same format as the 1st entry
28 – 30	29 – 31	3rd Image area entry – Same format as the 1st entry
...	...	...
3*n*+19 – 3*n*+21	3*n*+20 – 3*n*+22	*n*th Image area entry – Same format as the 1st entry
...	...	...
2116–2118	2117–2119	699th Image area entry – Same format as the 1st entry
2119–2121	2120–2122	700th Image area entry – Same format as the 1st entry

7.2.2 Instrument Misalignment Table

The instrument misalignment table contains an entry for each different measurement type. In some cases a single measurement uses more than one instrument. In that case the entry in the misalignment table will have to be a compromise for the misalignments of the different instruments. The entries in the table are in units of 0.01 degrees and can be both positive and negative values. Entries are shown with both a table offset (the value to add to the beginning of the data area to get the address that contains the particular variable of interest) and the word number (a sequential word count starting at 1). The instrument misalignment table data structure is shown in Table 26. See Table 32 for the location of the instrument misalignment table in memory.

Table 26 – Instrument Misalignment Table Data Structure

Table Offset	Word Number	Measurement Type
0	1	ULVS/ULV
1	2	ULVS
2	3	DLVS
3	4	Full CCD
4	5	Dark
5	6	Image
6	7	Strip
7	8	SA
8	9	DLIS
9	10	ULIS
10	11	IR Combined
11	12	IR Long
12	13	DLV
13	14	ULV

7.2.3 Frame Buffer Use

The frame buffer is located in the system memory from address $100{,}000_{16}$ through $1BF{,}FFF_{16}$. This area has been partitioned for use in a large number or areas. The bulk of the area is used for a telemetry buffer and CCD readout buffers. The entire use of the area is shown in Table 27.

Table 27 – Frame Buffer Allocations

Use	**Address Range (hex)**	**Description**
Telemetry Buffer	100,000 – 149,FFF	This stores telemetry until it can be sent out the telemetry channels. It is organized in 4KW groups with the last 16 words of each group being unused.
Spare	14A,000 – 14B,FFF	Currently unused. This will be allocated to the frame buffer in the flight unit.
Adjusted Square root table	14C,000 – 14C,FFF	This is the square root table after it has been adjusted to account for the histogram of the actual data for an image set.
Square root table	14D,000 – 14D,FFF	This is the table for square root lookup used in preparation for the hardware compression process.
SW compressor	14E,000 – 14E,FFF	Allocated to the software compressor. Used to store some intermediate versions of a data stream being compressed.
Memory dump	14F,000 – 14F,FFF	Allocated to the memory dump function. Used to temporarly store a 4KW chunck of memory being prepared for telemetry packets.
IR rotation data area	150,000 – 150,FFF	Used to store data associated with IR region and rotations. See object `0414_IR_Raw_Data` for the specific definition of the data format. Note the last 4 words are not used.
IR spectral data area	151,000 – 151,F6F 152,000 – 152,F6F 153,000 – 153,F6F	Used to store IR recorded data that is awaiting science processing. Note the unused space at the end of each 4KW block is to facilitate the use of extended memory to access the data. See object `0414_IR_Raw_Data` for the specific definition of the data format.
Unused	151,F70 – 151,FFF 152,F70 – 152,F7F	144 words 16 words
Telemetry A packet	152,F80 – 152,FBE	Telemetry channel packet buffer for DMA transfer
Telemetry B packet	152,FBF – 152,FFD	Telemetry channel packet buffer for DMA transfer
Unused	152,FFE – 152,FFF 153,F70 – 153,FDF	2 words 112 words
Telemetry work area	153,FE0 – 153,FFF	Allocated to the telemetry processing area.
CCD or IR work area	154,000 – 175,5FF	Used to prepare science data sets for telemetry transmission.
Unused	175,600 – 175,FFF	2560 words
CCD readout buffer – full readout – # 1	176,000 – 196,BFF	Used for full CCD readout storage before science processing of data.
Unused	196,C00 – 196,FFF	1024 words
CCD readout buffer – full readout – # 2	197,000 – 1B7,BFF	Used for full CCD readout storage before science processing of data.
Unused	1B7,C00 – 1B7,FFF	1024 words
CCD readout buffer – spectral readout – # 1	1B8,000 – 1BB,4FF	Used for spectral CCD readout storage before science processing of data.

Use	Address Range (hex)	Description
Unused	1BB,500 – 1BB,FFF	2816 words
CCD readout buffer – spectral readout – # 2	1BC,000 – 1BF,4FF	Used for spectral CCD readout storage before science processing of data.
Unused	1BF,500 – 1BF,7FF	768 words
CCD exposure histogram	1BF,800 – 1BF,FFF	Used to save a histogram of CCD counts for auto–exposure processing.

7.2.4 Extended Memory Register Assignments

An approach to access of the frame buffer without use of a DMA has been defined. Since there are only 32KW of local processor memory and there up to 64KW can be accessed by the 1750 processor we will use the high order 32KW of that area to map to other areas of the memory. The high order 32KW will be broken up into 8 pieces of 4KW each. There will be 8 registers specifying the high order 12 bits of address for each of these pieces. The low order 12 bits will be taken from the processor. The high order 4 bits of the processor address will be used to determine which register to use. This is only done if the processor address indicates an address in the range of the upper 32KW of the local memory area. Note that this is not limited to the frame buffer area only. It could be used for other areas of memory. However it cannot be used to access the instruction RAM as data, the PROM, the CPU I/O registers, or the EEPROM data areas.

The reason for 8 memory areas is that the software needs 7 areas and there is a spare for future expansion if necessary. The software uses the registers is shown in Table 28.

Table 28 – Extended Memory Register Assignments

Register Number	Address Range (hex)	Use
1	8,000 – 8,FFF	Science processing
2	9,000 – 9,FFF	Science processing
3	A,000 – A,FFF	Telemetry manager
4	B,000 – B,FFF	Telemetry manager
5	C,000 – C,FFF	Telemetry buffer refresh
6	D,000 – D,FFF	IR manager / shutter test
7	E,000 – E,FFF	Software compressor
8	F,000 – F,FFF	Spare

7.2.5 Hardware / Software Registers

The interface between hardware and software is primarily through a series of memory mapped registers. There addresses and use is summarized in Table . More complete descriptions can be found in the Electronics Assembly Specification and the Flight Software Specification.

Table 29 – Register Descriptions

Identifier	Address (hex)	Name	Description
HW_ reset_sts	30,000	Hardware reset status	16–bit value bit 0 Type of reset (=0 Power on boot, =1 Watchdog timer reset) bits 1–15 Unused read only H/W initial value = 0
CCD_IF_ sts	30,001	CCD Interface status	16–bit value bit 0 CCDDataReq bit 1 CCDError bit 2 CCDExecutCmpl bit 3 Always 0 bit 4 Always 1 bit 5 Always 1 bit 6 Always 1 bit 7 Always 0 bit 8 Unknown – usually 1 bit 9 Always 0 bits 10–15 Unknown – usually 1 read only
Test_reg	30,002	Test register	16–bit balue Always reads "6EBF"
CFW	30,003	CFW test register	16–bit value Always reads "8EBF"
IRIF_ Cmd	30,004	IRIF command	8–bit value (2 bits used) bit 0 IRIF enable (0=disable, 1=enable) bit 1 IRSE calibration (1=start calibration) bit 2–7 Unused write–only H/W initial value = 0
EDAC_Ct l	30,008	EDAC Control Register	16–bit value bit 0 EDAC up enable (0=enabled) H/W initial value = 0

Identifier	**Address (hex)**	**Name**	**Description**
Reset_ctl	30,00C	Reset control	8–bit value (don't reset = 0, reset = 1) (disable = 0, enable = 1) bit 0 CCD reset bit 1 DCS reset bit 2 IRIF/IRSE reset bit 3 DMA reset bit 4 Digital reset bit 5 Reset type reset bit 6 Clock select (0=4 MHz, 1=12 MHz) bit 7 Watchdog timer enable (=0 enable, =1 disable) See also bit 1 of 30,01C write only H/W initial value = 0
PROM_ pwr	30,010	PROM_ power_control	16–bit value bit 0 Power on (1=off, 0=on) Default = 0
Timer_ WD_ lsb	30,018	Watchdog Timer	16–bit value Clock frequency is 100 Hz bits 0–7 watchdog timer least significant 8 bits bits 8–15 unused write only H/W initial value = 0
Timer_ WD_ msb	30,019	Watchdog Timer	16–bit value Clock frequency is 100 Hz bits 0–7 watchdog timer most significant 8 bits bits 8–15 unused write only H/W initial value = 0
DMA_ctl	30,01C	DMA control	16–bit value bit 0 DMA Enable (=1 enable, =0 disable) bit 1 Watchdog timer enable (=0 enable, =1 disable) See also bit 7 of 30,00C bits 2–15 Unused write only H/W initial value = 0
Ext_ Mem_1	50,020	Extended memory area 1 address	16–bit value Bits 0–11 High order 12 bits of the physical address for local processor addresses with the high order 4 bits of the 16 bit address of 1000 (binary). Note the MSB is always 0 because of the address range supported by the processor. Bits 12–15 Unusd H/W initial value = 0

Identifier	Address (hex)	Name	Description
Ext_ Mem_2	50,021	Extended memory area 2 address	16–bit value Bits 0–11 High order 12 bits of the physical address for local processor addresses with the high order 4 bits of the 16 bit address of 1001 (binary). Note the MSB is always 0 because of the address range supported by the processor. Bits 12–15 Unusd H/W initial value = 0
Ext_ Mem_3	50,022	Extended memory area 3 address	16–bit value Bits 0–11 High order 12 bits of the physical address for local processor addresses with the high order 4 bits of the 16 bit address of 1010 (binary). Note the MSB is always 0 because of the address range supported by the processor. Bits 12–15 Unusd H/W initial value = 0
Ext_ Mem_4	50,023	Extended memory area 4 address	16–bit value Bits 0–11 High order 12 bits of the physical address for local processor addresses with the high order 4 bits of the 16 bit address of 1011 (binary). Note the MSB is always 0 because of the address range supported by the processor. Bits 12–15 Unusd H/W initial value = 0
Ext_ Mem_5	50,024	Extended memory area 5 address	16–bit value Bits 0–11 High order 12 bits of the physical address for local processor addresses with the high order 4 bits of the 16 bit address of 1100 (binary). Note the MSB is always 0 because of the address range supported by the processor. Bits 12–15 Unusd H/W initial value = 0
Ext_ Mem_6	50,025	Extended memory area 6 address	16–bit value Bits 0–11 High order 12 bits of the physical address for local processor addresses with the high order 4 bits of the 16 bit address of 1101 (binary). Note the MSB is always 0 because of the address range supported by the processor. Bits 12–15 Unusd H/W initial value = 0

Identifier	Address (hex)	Name	Description
Ext_ Mem_7	50,026	Extended memory area 7 address	16–bit value Bits 0–11 High order 12 bits of the physical address for local processor addresses with the high order 4 bits of the 16 bit address of 1110 (binary). Note the MSB is always 0 because of the address range supported by the processor. Bits 12–15 Unusd H/W initial value = 0
Ext_ Mem_8	50,027	Extended memory area 8 address	16–bit value Bits 0–11 High order 12 bits of the physical address for local processor addresses with the high order 4 bits of the 16 bit address of 1111 (binary). Note the MSB is always 0 because of the address range supported by the processor. Bits 12–15 Unusd H/W initial value = 0
Probe_ Cmd_A	1C0,000	Command A	16–bit value bit 0 Enable selection (select ML and BCP for this side – Note only side A or B can be enabled) – 1=enable bit 1 Start transfer or TM enable (DMA channel must be enabled before this when using DMA. – 1=start bit 2 CPU TM complete (Used to signal the last word of a packet when the CPU controls loading instead of the DMA) – 1=complete bit 3 CPU direct flag (Set when controlling the TM channel through the CPU not the DMA) – 1=direct bits 4–15 Unused write only
Probe_ Sts_A	1C0,001	Status A	16–bit value bit 0 ML A interrupt active (Reading the MLC data register causes this bit to be cleared) – 1=active bit 1 Select A side active (Readback of bit 0 of the command register) m – 1=side selected bit 2 Processor valid flag (For channel A only) – 1=processor valid bits 3–15 Unused read only
Mem_ Load_A	1C0,002	Memory Load A	16–bit value read only Contains data from ML interface to the probe. Max rate 1 word / 128 μ–sec Reading this word clears the ML interrupt line Signaled by interrupt

Identifier	Address (hex)	Name	Description
Ser_ Status_A	1C0,003	Serial Status A	16–bit value entirely determined by software write only
TM_ Chnl_A	1C0,004	Telemetry channel A	16–bit value data moved here by the TLM A DMA write only
Probe_ IF_A	1C0,005	Probe Interface A	16–bit value bits 0–3 unused bit 4 probe interrrupt level 0 = level 12 1 = level 13 bit 5 CCD I/F enable 0 = disabled 1 = enabled bits 6–15 unused
Probe_ Cmd_B	1C0,010	Command B	Same as A side
Probe_ Sts_B	1C0,011	Status B	Same as A side
Mem_ Load_B	1C0,012	Memory Load B	Same as A side
Ser_ Status_B	1C0,013	Serial Status B	Same as A side
TM_ Chnl_B	1C0,014	Telemetry channel B	Same as A side
Probe_ IF_B	1C0,015	Probe Interface B	Same as A side
DMA_A_ ctl	1C0,020	DMA channel A control TM channel A	16–bit value bit 0 Mode ID – msb bit 1 Mode ID – lsb bit 2 Interrupt enable (1=enabled) (not used) bit 3 DMA channel enable (1=enabled) bit 4 interrupt acknowledge (1=acknowledge) bit 5 DMA channel reset (1=reset) bits 6–15 TBD The Mode ID is a 2 bit field with the following definition: 00 – unused 01 – TM channel A 10 – CCD 11 – TM channel B write only

Identifier	Address (hex)	Name	Description
DMA_A_ sts	1C0,021	DMA channel A status	16–bit value bit 0 DMA in progress (1=in progress) bit 1 DMA complete (1=complete) bit 2 DMA error (CCD channel only) (1=error) bits 3–15 TBD read only
DMA_A_ fix	1C0,022 1C0,023	DMA channel A fixed address	22–bit value 1C0,022 – upper word (6 lsb) 1C0,023 – lower word (16 bits) For the CCD channel this is the source For the TM channels this is the destination write only
DMA_A_ chg	1C0,024 1C0,025	DMA channel A changing address	22–bit value 1C0,024 – upper word (6 lsb) 1C0,025 – lower word (16 bits) For the CCD channel this is the destination For the TM channels this is the source write only
DMA_A_ wc	1C0,026 1C0,027	DMA channel A word count	18–bit value 1C0,026 – upper word (2 lsb) 1C0,027 – lower word (16 bits) write only
DMA_B_ ctl	1C0,030	DMA channel B control TM channel B	Same as channel A
DMA_B_ sts	1C0,031	DMA channel B status	Same as channel A
DMA_B_ fix	1C0,032 1C0,033	DMA channel B fixed address	Same as channel A
DMA_B_ chg	1C0,034 1C0,035	DMA channel B changing address	Same as channel A
DMA_B_ wc	1C0,036 1C0,037	DMA channel B word count	Same as channel A
DMA_C_ ctl	1C0,040	DMA channel C control CCD channel	Same as channel A
DMA_C_ sts	1C0,041	DMA channel C status	Same as channel A
DMA_C_ fix	1C0,042 1C0,043	DMA channel C fixed address	Same as channel A
DMA_C_ chg	1C0,044 1C0,045	DMA channel C DMA changing address	Same as channel A
DMA_C_ wc	1C0,046 1C0,047	DMA channel C word count	Same as channel A

Identifier	Address (hex)	Name	Description
CCD_ Cmd	1C0,050	CCD command	16–bit value bit 15 Not used bit 14 Full CCD readout bit 13 Spectra readout bit 12 Continuous readout bits 11..0 Spares write only
CCD_ Data	1C0,051	CCD data	16–bit word The CCD writes to this register The CCD DMA transfers data from this register to the frame buffer read only
CCD_ Time	1C0,052	CCD Integration time	16–bit value 0.5 millisecond units 0.5 to 32 seconds write only
IRIF_Ctl	210,000	IRIF Control	16–bit value bit 0 Latchup enable (1=enable, 0=disable) bits 1–15 Unused write only
IRIF_Sts	210,001	IRIF Status	16–bit value bit 15 IRIF execution complete (1=complete) bit 14 IR ADC power status (1=power enabled) read only
ADC_ Cmd	300,000	A/D Converter Cmd	Any write causes start convert write only
ADC_ Val	300,001	A/D latch Value	16–bits, 12 for data, others for status bit 0–2 Unused bit 3 Conversion complete bit 4–15 data value read only
ADC_ MUX_Sel	300,002	MUX / DEMUX Select	16–bit word (7 bits needed) – See section 8.0 bits 0–6 MUX channel bits 7–15 unused write only
MISC	300,003	Miscellaneous	16–bit value bit 0–7 Sun pulse threshold bit 8 Sun sim LED (enable = 1) bit 9 Cal lamp 1 (on = 1) bit 10 Cal lamp 2 (on = 1) bit 11 Cal lamp 3 (on = 1) bit 12 Surface lamp (on = 1) bit 13 FP heater (on = 1) bit 14 CPU heater (on = 1) bit 15 Sun Sim LED (on=1) write with readback

Identifier	**Address (hex)**	**Name**	**Description**
SS_cmd	300,004	Sun Sensor command register	16–bit value bit 0 Peak/Hold (1=clear) , must be set for at least 10 *u*–sec write only
Time_ Master	300,006 300,007	Master Timer	27–bit value 300,006 – bits 0–4 unused 300,006 – upper word (11 lsb) 300,007 – lower word (16 bits) read only
Time_BP	300,008 300,009	Broadcast Pulse Time	27–bit value 300,008 – bits 0–4 unused 300,008 – upper word (11 lsb) 300,009 – lower word (16 bits) read only
Time_ Event	300,00A 300,00B	Event Timer Value	27–bit value 300,00A – bits 0–4 unused 300,00A – upper word (11 lsb) 300,00B – lower word (16 bits) write only
Time_ SP_LE	300,00C 300,00D	Sun Pulse Leading Edge Time	27–bit value 300,00C – bits 0–4 unused 300,00C – upper word (11 lsb) 300,00D – lower word (16 bits) read only
Time_ SP_TE	300,00E 300,00F	Sun Pulse Trailing Edge Time	27–bit value 300,00E – bits 0–4 unused 300,00E – upper word (11 lsb) 300,00F – lower word (16 bits) read only

Identifier	Address (hex)	Name	Description
DCS_ Cmd/Sts	440,000	DCS status	16–bit value bits 7–0 Not used bit 8 HiLURAM bit 9 LoLURAM bit 10 CPU crash bit 11 HiLUComp bit 12 LoLUComp bit 13 Not used bit 14 Operation status (0=success) bit 15 DCS ready read only
		DCS command	16–bit value bits 7–0 Not used bit 8 EnHiLURAM bit 9 EnLoLURAM bit 10 EnHiLUComp bit 11 EnLoLUComp bits 12–15 DCS command DCS commands (see 12–15) 0001 Start compression 0011 Start self test 0101 Recover from compressor LU xxx0 Change LU bits only write only
ML Ack	500,025	ML interrupt acknowledge	16–bit value, Any read or write causes the ML interrupt to be acknowledged. This must be done by software because the timing of the hardware pulse is not sufficient to allow the hardware to do it correctly.
BP Ack	500,031	BP interrupt acknowledge	16–bit value, Any read or write causes the BP interrupt to be acknowledged. This must be done by software because the timing of the hardware pulse is not sufficient to allow the hardware to do it correctly.
SS Ack	500,035	SS interrupt acknowledge	16–bit value, Any read or write causes the SS interrupt to be acknowledged. This must be done by software because the timing of the hardware pulse is not sufficient to allow the hardware to do it correctly.
ET Ack	500,037	ET interrupt acknowledge	16–bit value, Any read or write causes the ET interrupt to be acknowledged. This must be done by software because the timing of the hardware pulse is not sufficient to allow the hardware to do it correctly.

Identifier	Address (hex)	Name	Description
TMA Ack	500,039	TM A interrupt acknowledge	16–bit value, Any read or write causes the TM A interrupt to be acknowledged. This must be done by software because the timing of the hardware pulse is not sufficient to allow the hardware to do it correctly.
TMB Ack	500,03B	TM B interrupt acknowledge	16–bit value, Any read or write causes the TM B interrupt to be acknowledged. This must be done by software because the timing of the hardware pulse is not sufficient to allow the hardware to do it correctly.

7.2.6 Interrupt Use

There are a total of 9 interrupt levels that have not been predefined by the 1750 architecture. The current assignment uses 6 of the 9 leaving 3 spare. These are shown in Table 30.

Table 30 – Interrupt Level Usage

Identifier	Interrupt Level	Name	Interrupt Clearing Mechanism	Description
ML	INT02 # 2 LP = 24_{16} SP = 25_{16}	Memory Load	Read the MLC word.	One interrupt per word.
BP	INT08 # 8 LP = 30_{16} SP = 31_{16}	Broadcast Pulse	Auxiliary Digital command register / bit 0	Interrupt when broadcast pulse is received. Needs to be maskable
SS	INT10 # 10 LP = 34_{16} SP = 35_{16}	Sun Sensor	Auxiliary Digital command register / bit 1	Interrupt when a sun pulse has been detected. Both rising edge and trailing edge time registers have good times in them.
ET	INT11 # 11 LP = 36_{16} SP = 37_{16}	Event Timer	Auxiliary Digital command register / bit 2	Interrupt when event timer value is equal to the mission timer.
TLM A	IOI1 # 12 LP = 38_{16} SP = 39_{16}	Telemetry channel A – word	Probe command A / bit 1	This is used for operating the telemetry channel without a DMA. This interrupt indicates an interrupt for one word on the channel A side or completion of the last word when used with the DMA.
TLM B	INT13 # 13 LP = $3A_{16}$ SP = $3B_{16}$	Telemetry channel B – word	Probe command B / bit 1	This is used for operating the telemetry channel without a DMA. This interrupt indicates an interrupt for one word on the channel B side or completion of the last word when used with the DMA.

7.2.7 Flat Field Area

The flat field area is divided into 3 sections, one for each of the imagers. Table 31 defines the address range of each of the imagers. Within each section, the flat field is organized so that the first pixel read from the CCD is the first pixel in the table and it continues for all pixels of the imager.

Table 31 – Flat Field Memory Assignments

Address Range (hex)	Use
310,000–31A,FFF	DLI2
31B,000–322,FFF	SLI
323,000–32C,FFF	DLI1
32E,000–32F,FFF	unused

7.2.8 Memory Map

The linker directives used for linking the software are shown in Figure 5. The memory allocation map for the instruction space is shown in Figure 6 and the memory allocation map for the data space is shown in Figure 7. A set of key memory addresses are provided in Table 32.

Figure 5 – Linker Directives

```
Command Line Switches:
tldlnk –directive=exec.dir –map
--
--      template.dir
--
-- Author: Dave Gingerich
--
-- Released:    March 31, 1994
-- Modified:    April 27, 1994
--              daveg: Brought RAM_Write into Startup so runs from RAM
--              after short initial load while in PROM. Can't read PROM
--              past 41FFFh while in PROM.
--
-- Purpose:     Provides a template directive file for linking DISR flight
--              software. Just need to add the specific user modules. It also
--              provides comments about process.
-------------------------------------------------------------------------------
-- Set max address to 24 bits and set load module type to hp (Hewlett Packard)
maxadr FFFFFF                   --Set maximum address to 24 bits
ldmtype = hp                    --Set load module type to hp (Hewlett Packard)
-------------------------------------------------------------------------------
-- Set aside 1750 user address space not used by DISR
reserve  30020, 3FFFF
reserve  50000, FFFFF
reserve 1D0000,1FFFFF
reserve 210001,2FFFFF
reserve 300100,3FFFFF
reserve 440001,FFFFF0
-------------------------------------------------------------------------------
-- Name the main node
node root
-------------------------------------------------------------------------------
-- Define symbols needed somewhere, maybe only during link/bind, by TLDacs.
let A$PDG       = 0             --Set page descriptor to zero (TLD variable)
let A$STSIZ     = 01000         --Set stack size to 1000h (TLD variable)
let A$HEAP      = 0.6FFFo       --Set start of heap address (TLD variable)
let A$HEAPND    = 0.07FFFo      --Set end of heap address (TLD variable)
let A$UNDEFINED = 0             --Turn this symbol off (TLD variable)
-------------------------------------------------------------------------------
-- Define symbols created by and used by DISR code.
let STACK       = 7FFF          --Set start of stack location. Builds down
```

```
-----------------------------------------------------------------------------
-- Assign logical pages to physical pages.
-- lpage = Logical page number in form {a.}n{i|o} where a is address space
--        (default is 0), n is a hex number from 0 to F giving the page number
--        within the addr space and i or o indicates instruction or operand.
-- ppage = A physical page # in hex from 0 to FF.
assign 0.0o 00 10       --assign lpage, ppage, number-pages (all in hex)
assign 0.0i 10 10       --assign lpage, ppage, number-pages (all in hex)
-----------------------------------------------------------------------------
-- Reserve space set aside by 1750 MIL-SPEC.
reserve 0.0002o,0.001Fo
reserve 0.8000o,0.EFFFo
-----------------------------------------------------------------------------
-- Include DISR flight software.  The includes can be in any order.
include /users/disr/SW/ateam/DISR_Macros/disr_start.obj
include /users/disr/SW/ateam/DISR_Macros/verfy_ram.obj
include /users/disr/SW/ateam/DISR_Macros/common_int.obj
-----------------------------------------------------------------------------
--    These modules are only used to build the flight software.
-- mark.obj places some useful labels. prom_wr copies the code and constant
-- data from the target RAM into some EEPROMs. These EEPROMs are then
-- removed from the target system and copied into flight PROMs with a
-- PROM-programmer.
--    The module prom_wr, is not copied into the EEPROMs so it isn't copied
-- into the flight PROMs. It is only used to program the EEPROMs and isn't
-- needed after that point.
--    cksum calculates checksums for the 16 flight PROMs based upon the
-- code burned into the EEPROMs. It saves the 16 checksums to RAM where
-- the user reads them with the emulator. These checksums are NOT a good
-- way to verify the flight PROMs as each of the 2**16 checksums could be
-- the result of 1 of 32 completely different PROM configurations. So,
-- not counting complimentary bit flips, the checksum catches just 99.9%
-- (999 in 1000) errors.
--    verfy_prom is used to read some real flight PROMs or EEPROMs and
-- verify that they match the code downloaded into RAM. This is the best
-- way to validate the flight PROMs.
include /users/disr/SW/ateam/DISR_Macros/mark.obj
include /users/disr/SW/ateam/DISR_Macros/prom_wr.obj
include /users/disr/SW/ateam/DISR_Macros/verfy_prom.obj
include /users/disr/SW/ateam/DISR_Macros/cksum.obj
-----------------------------------------------------------------------------
-- Rest of DISR flight software is included here.
--<<< Begin user unique includes >>>--
include /disk2/sqa/flight/FSW_EA1_B/source/dispatch.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/dispatch_E1.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/dispatch_E2.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/dispatch_E3.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/dispatch_E4.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/dispatch_M.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/event_priority.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/event_que.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/exec.obj
include /disk2/sqa/flight/FSW_EA1_B/source/exec_e.obj
include /disk2/sqa/flight/FSW_EA1_B/source/mcode.obj
include /disk2/sqa/flight/FSW_EA1_B/source/object_instan.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/proj_lib.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O0011_Alarm_Queue.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O001_Clock.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O002_Loader.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O004_Memory.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O005_Populated_Memory.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O007_RAM_Data_Set.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O008_Dump_Data_Set.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O011_Command_Buffer.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O012_Probe_Cmd.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O013_Broadcast_Cmd.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O021_Enable_Cmd.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O022_Change_Mode_Cmd.s.obj
```

```
include /disk2/sqa/flight/FSW_EA1_B/source/O023_Single_Meas_Cmd.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O024_Single_Test_Cmd.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O026_Dump_Cmd.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O027_Uplink_EEPROM_Cmd.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O028_Uplink_RAM_Cmd.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O030_Attitude.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O031_Altitude.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O040_Descent_Scheduler.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O041_Scenario_Spec.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O042_Cycle_Spec.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O044_Descent_Cycle_Data_Set.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O045_Inst_Misalignment.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O050_CCD_Manager.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O051_CCD_Meas_Set.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O052_CCD_Index_Table.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O053_CCD_Exposure.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O054_CCD_Meas_Spec.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O055_CCD_Exposure_Limits.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O059_CCD_Background.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O060_IR_Manager.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O061_IR_Meas_Spec.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O062_IR_Region_Spec.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O063_IR_Exposure.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O064_IR_Regions.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O069_IR_Background.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O070_Violet_Manager.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O071_Violet_Meas_Set.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O072_Violet_Meas_Spec.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O074_ULV_Collection.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O079_Violet_Background.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O080_SPM_Scheduler.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O081_SPM_CCD_Manager.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O082_SPM_IR_Manager.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O085_Cal_Scheduler.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O086_Cal_Cycle_Spec.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O087_Cal_Spec_Index_Table.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O088_Cal_Cycle_Data_Set.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O089_Cal_Violet_Index_Table.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O090_Cal_CCD_Manager.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O091_Cal_CCD_Exposure.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O092_Cal_CCD_Meas_Spec.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O093_Cal_CCD_Index_Table.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O094_Cal_IR_Spec.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O095_Cal_IR_Manager.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O096_Cal_IR_Exposure.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O097_Cal_Violet_Manager.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O098_Cal_Violet_Spec.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O099_Cal_IR_Index_Table.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O100_Operating_Mode.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O122_EEPROM_Data_Set.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O123_Patch_Data.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O124_EEPROM_Patch.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O125_EEPROM_Usage.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O130_Error_Detect.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O131_Angle_Lib.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O132_Sqrt.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O180_Packet_Manager.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O181_Tlm_Queue_Control.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O182_Data_Set_Header.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O183_Free_Packet_Control.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O184_Partial_Packet.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O185_Tlm_Channel_Manager.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O186_Predicted_Tlm_Rates.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O187_Tlm_Queue.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O188_Pending_Tlm_Requests.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O190_Message.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O191_Message_Data_Set.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O200_CCD.s.obj
```

```
include /disk2/sqa/flight/FSW_EA1_B/source/O201_CCD_Data_Buffer.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O210_Probe_Input_Buffer.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O213_Probe_Cmd_Reg.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O217_TM_Refresher.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O218_TM_DMAs.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O229_DCS_Test_Data_Set.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O230_DCS.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O240_Sun_Sensor.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O241_Sun_Data_Set.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O242_Sun_Sensor_Constants.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O250_Watchdog.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O251_PROM_Power.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O260_Shutter_Tester.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O261_DCS_Tester.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O262_Heater_Tester.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O263_Cal_Lamp_Tester.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O264_Surface_Lamp_Tester.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O265_Sun_Lamp_Tester.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O266_Shutter_Test_Data_Set.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O267_Heater_Test_Data_Set.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O268_Cal_Lamp_Test_Data_Set.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O269_Surface_Lamp_Test_Data_Set.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O270_Broadcast_Pulse.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O271_Sun_Lamp_Test_Data_Set.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O283_Time_Data_Set.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O290_Interrupt_Controller.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O291_Interrupt_IF.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O292_Reset_Control.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O293_DMA_Control.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O294_Ext_Mem_Registers.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O295_Memory_Management.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O298_Ext_Mem.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O301_Radio_Processor.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O302_CCD_Transposed.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O303_CCD_Format.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O304_Bad_Pixel_Map.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O305_CCD_Optimum_Exposure.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O306_IR_Optimum_Sampling.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O308_SW_Compressor.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O309_Bit_Processor.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O313_IR_Set.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O314_Dark_Set.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O315_Image_Set.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O316_Strip_Set.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O317_Solar_Set.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O318_Visible_Set.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O319_CCD_Set.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O320_Violet_Measure.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O330_IR_Spectrum.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O340_Dark_Current.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O350_Image_Pic.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O358_Flat_Field_Lookup.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O359_LookUp_Table.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O360_Image_Strip.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O370_Solar_Aureole.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O380_Visible_Spectrum.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O390_Full_CCD.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O400_Multiplexed_Device.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O404_Housekeeping_Data_Set.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O410_IR_Interface.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O414_IR_Raw_Data.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O442_Sun_Sensor_Lamp.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O450_Heater.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O460_Lamp.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O461_Lamp_Data_Set.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O465_Misc_Dev_Control_Register.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O470_Thermal_Manager.s.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O480_Status_Word.s.obj
```

```
include /disk2/sqa/flight/FSW_EA1_B/source/dispatch.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/event_que.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/proj_lib.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O0011_Alarm_Queue.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O001_Clock.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O002_Loader.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O004_Memory.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O005_Populated_Memory.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O007_RAM_Data_Set.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O008_Dump_Data_Set.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O011_Command_Buffer.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O012_Probe_Cmd.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O013_Broadcast_Cmd.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O021_Enable_Cmd.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O022_Change_Mode_Cmd.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O023_Single_Meas_Cmd.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O024_Single_Test_Cmd.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O026_Dump_Cmd.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O027_Uplink_EEPROM_Cmd.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O028_Uplink_RAM_Cmd.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O030_Attitude.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O031_Altitude.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O040_Descent_Scheduler.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O041_Scenario_Spec.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O042_Cycle_Spec.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O044_Descent_Cycle_Data_Set.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O045_Inst_Misalignment.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O050_CCD_Manager.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O051_CCD_Meas_Set.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O052_CCD_Index_Table.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O053_CCD_Exposure.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O054_CCD_Meas_Spec.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O055_CCD_Exposure_Limits.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O059_CCD_Background.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O060_IR_Manager.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O061_IR_Meas_Spec.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O062_IR_Region_Spec.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O063_IR_Exposure.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O064_IR_Regions.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O069_IR_Background.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O070_Violet_Manager.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O071_Violet_Meas_Set.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O072_Violet_Meas_Spec.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O074_ULV_Collection.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O079_Violet_Background.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O080_SPM_Scheduler.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O081_SPM_CCD_Manager.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O082_SPM_IR_Manager.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O085_Cal_Scheduler.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O086_Cal_Cycle_Spec.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O087_Cal_Spec_Index_Table.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O088_Cal_Cycle_Data_Set.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O089_Cal_Violet_Index_Table.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O090_Cal_CCD_Manager.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O091_Cal_CCD_Exposure.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O092_Cal_CCD_Meas_Spec.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O093_Cal_CCD_Index_Table.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O094_Cal_IR_Spec.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O095_Cal_IR_Manager.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O096_Cal_IR_Exposure.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O097_Cal_Violet_Manager.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O098_Cal_Violet_Spec.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O099_Cal_IR_Index_Table.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O100_Operating_Mode.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O122_EEPROM_Data_Set.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O123_Patch_Data.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O124_EEPROM_Patch.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O125_EEPROM_Usage.b.obj
```

```
include /disk2/sqa/flight/FSW_EA1_B/source/O130_Error_Detect.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O131_Angle_Lib.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O132_Sqrt.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O180_Packet_Manager.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O181_Tlm_Queue_Control.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O182_Data_Set_Header.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O183_Free_Packet_Control.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O184_Partial_Packet.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O185_Tlm_Channel_Manager.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O186_Predicted_Tlm_Rates.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O187_Tlm_Queue.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O188_Pending_Tlm_Requests.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O190_Message.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O191_Message_Data_Set.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O200_CCD.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O201_CCD_Data_Buffer.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O210_Probe_Input_Buffer.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O213_Probe_Cmd_Reg.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O217_TM_Refresher.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O218_TM_DMAs.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O229_DCS_Test_Data_Set.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O230_DCS.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O240_Sun_Sensor.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O241_Sun_Data_Set.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O242_Sun_Sensor_Constants.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O250_Watchdog.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O251_PROM_Power.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O260_Shutter_Tester.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O261_DCS_Tester.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O262_Heater_Tester.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O263_Cal_Lamp_Tester.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O264_Surface_Lamp_Tester.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O265_Sun_Lamp_Tester.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O266_Shutter_Test_Data_Set.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O267_Heater_Test_Data_Set.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O268_Cal_Lamp_Test_Data_Set.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O269_Surface_Lamp_Test_Data_Set.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O270_Broadcast_Pulse.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O271_Sun_Lamp_Test_Data_Set.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O283_Time_Data_Set.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O290_Interrupt_Controller.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O291_Interrupt_IF.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O292_Reset_Control.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O293_DMA_Control.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O294_Ext_Mem_Registers.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O295_Memory_Management.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O298_Ext_Mem.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O301_Radio_Processor.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O302_CCD_Transposed.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O303_CCD_Format.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O304_Bad_Pixel_Map.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O305_CCD_Optimum_Exposure.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O306_IR_Optimum_Sampling.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O308_SW_Compressor.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O309_Bit_Processor.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O313_IR_Set.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O314_Dark_Set.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O315_Image_Set.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O316_Strip_Set.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O317_Solar_Set.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O318_Visible_Set.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O319_CCD_Set.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O320_Violet_Measure.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O330_IR_Spectrum.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O340_Dark_Current.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O350_Image_Pic.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O358_Flat_Field_Lookup.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O359_LookUp_Table.b.obj
```

```
include /disk2/sqa/flight/FSW_EA1_B/source/O360_Image_Strip.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O370_Solar_Aureole.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O380_Visible_Spectrum.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O390_Full_CCD.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O400_Multiplexed_Device.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O404_Housekeeping_Data_Set.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O410_IR_Interface.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O414_IR_Raw_Data.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O442_Sun_Sensor_Lamp.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O450_Heater.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O460_Lamp.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O461_Lamp_Data_Set.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O465_Misc_Dev_Control_Register.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O470_Thermal_Manager.b.obj
include /disk2/sqa/flight/FSW_EA1_B/source/O480_Status_Word.b.obj
--<<< End user unique includes >>>--
------------------------------------------------------------------------------
-- Search for any assembly langauge programs called by above included modules.
-- Only modules explicitly called will be included.
search /users/disr/SW/ateam/DISR_Macros/lo_int.obj
search /users/disr/SW/ateam/DISR_Macros/blk_cp.obj
search /users/disr/SW/ateam/DISR_Macros/w_mlt.obj
search /users/disr/SW/ateam/DISR_Macros/pack.obj
search /users/disr/SW/ateam/DISR_Macros/unpack.obj
search /users/disr/SW/ateam/DISR_Macros/disr_crc.obj
search /users/disr/SW/ateam/DISR_Macros/wait.obj
search /users/disr/SW/ateam/DISR_Macros/bld_hist.obj
search /users/disr/SW/ateam/DISR_Macros/sqrt_proc.obj
search /users/disr/SW/ateam/DISR_Macros/flat_fld.obj
------------------------------------------------------------------------------
-- Search these (modified) TLD libraries for remaining unresolved modules.
-- These have been modified to fit DISR program needs.
-- standard math, standard functions and Ada POS function (one version)
--      DON’T search any other TLD libraries.
search  /users/disr/SW/ateam/DISR_Macros/stnmth.obj
search  /users/disr/SW/ateam/DISR_Macros/stnfnc.obj
search  /users/disr/SW/ateam/DISR_Macros/stnpos.obj
------------------------------------------------------------------------------
-- Group the control section in the desired order into control groups. Then
-- their attributes can be set as a group. Only the new TLDlnk has this option.
group in_order :code_area=  (*:START,*:DISRCODE,                \
                             *:$ISECT$,*:A$KCOD,*:RAM_CODE_END, \
                             *:BURN_PROM, *:CHKSUMCODE)
group in_order :vector_tbl= (*:INT_VECTORS)
group in_order :cons_area=  (*:DISRCONS,*:$CONS$, *:A$KCNS,*:CONS_END)
group in_order :data_area=  (*:DISRDATA,*:$DATA$,*:DATA_END,*:CHKSUMDATA)
------------------------------------------------------------------------------
-- Set writeprotect attribute for some groups and assign a logical address to 2
set   :code_area’   (Writeprotect=False)
set   :vector_tbl’  (Writeprotect=False,Laddr=0020o)
set   :cons_area’   (Writeprotect=False,Laddr=0040o)
------------------------------------------------------------------------------
--   Use the following for simio. Place the IO_BLOCK.
--set simio:IO_BLOCK’ (Writeprotect=False,Laddr=F300o)
--set simio:IO_CONS’ (Writeprotect=False)
--set simio:IO_DATA’ (Writeprotect=False)
--set simio:IO_CODE’ (Writeprotect=False)
end
```

Figure 6 – Instruction RAM Memory Allocation

```
                                        NODE
                                           MODULE
   INST OPND    PHYS                          CONTROL SECTION            ATTRIBUTES
AS ADDR ADDR    ADDR SIZE                         SYMBOL               BP DP RT OI WP
START OF GROUP :CODE_AREA
                                           DISR_START
      0       10000   C0                      START                    F  F  RR I  F
     36       10036                              +SJS_RAM_VERIFY
     41       10041                              +BOOT_COPY
     49       10049                              +END_BOOT_COPY
     60       10060                              +JS_RAM_COPY
     68       10068                              +RAM_COPY
                                           VERIFY_RAM
     C0       100C0   DC                      DISRCODE                 F  F  RR I  F
     C0       100C0                               RAM_VERIFY
                                           COMMON_INT
    19C       1019C   92                      DISRCODE                 F  F  RR I  F
    1CB       101CB                              +COMMON_ISR
    221       10221                              +MACHINE_ERR
    226       10226                              +SPURIOUS_INT
                                           MSET_IMSK
    22E       1022E    9                      DISRCODE                 F  F  RR I  F
    22E       1022E                               SET_IMSK
                                           MUNMSKI
    237       10237    C                      DISRCODE                 F  F  RR I  F
    237       10237                               UNMSKI
                                           MMASK_ALL_USER
    243       10243    B                      DISRCODE                 F  F  RR I  F
    243       10243                               MASK_ALL_USER
                                           MMSKINT
    24E       1024E    C                      DISRCODE                 F  F  RR I  F
    24E       1024E                               MSKINT
                                           MBLK_PP
    25A       1025A   1E                      DISRCODE                 F  F  RR I  F
    25A       1025A                               BLK_PPS
    25F       1025F                              +BLK_PPL
                                           MBLK_MSK_PP
    278       10278   1A                      DISRCODE                 F  F  RR I  F
    278       10278                               BLK_MSK_PPS
                                           MBLK_MP
    292       10292   11                      DISRCODE                 F  F  RR I  F
    292       10292                               BLK_MP
                                           MBLK_PM
    2A3       102A3   11                      DISRCODE                 F  F  RR I  F
    2A3       102A3                               BLK_PM
                                           MBLK_MMQ
    2B4       102B4    5                      DISRCODE                 F  F  RR I  F
    2B4       102B4                               BLK_MMQ
                                           MBLK_MP1W
    2B9       102B9    7                      DISRCODE                 F  F  RR I  F
    2B9       102B9                               BLK_MP1W
                                           MBLK_PM1W
    2C0       102C0    7                      DISRCODE                 F  F  RR I  F
    2C0       102C0                               BLK_PM1W
                                           MBLK_PP1W
    2C7       102C7    7                      DISRCODE                 F  F  RR I  F
    2C7       102C7                               BLK_PP1W
                                           MBLK_MP2W
    2CE       102CE    7                      DISRCODE                 F  F  RR I  F
    2CE       102CE                               BLK_MP2W
                                           MBLK_PM2W
    2D5       102D5    7                      DISRCODE                 F  F  RR I  F
    2D5       102D5                               BLK_PM2W
                                           MW_MLT_P
    2DC       102DC    C                      DISRCODE                 F  F  RR I  F
    2DC       102DC                               W_MLT_P
```

```
                                 MPACK1_MP
2E8        102E8     9             DISRCODE                   F  F  RR I  F
2E8        102E8                       PACK1_MP
                                 MPACK_MP
2F1        102F1    11             DISRCODE                   F  F  RR I  F
2F1        102F1                       PACK_MP
                                 MUNPACK_MM
302        10302     F             DISRCODE                   F  F  RR I  F
302        10302                       UNPACK_MM
                                 MDISR_CRC
311        10311    1E             DISRCODE                   F  F  RR I  F
311        10311                       DISR_CRC
                                 SHORT_WAIT
32F        1032F     B             DISRCODE                   F  F  RR I  F
32F        1032F                       WAIT
                                 MBLD_HISTGRM
33A        1033A    1B             DISRCODE                   F  F  RR I  F
33A        1033A                       BLD_HISTGRM
                                 MSQRT_PROC
355        10355    17             DISRCODE                   F  F  RR I  F
355        10355                       SQRT_PROC
                                 MFF_CORR
36C        1036C    37             DISRCODE                   F  F  RR I  F
36C        1036C                       FF_CORR
                                 EVENT_QUE.INIT_$EVF001
3A3        103A3     5             $ISECT$                    F  F  RR I  F
3A3        103A3                       INIT_$EVF001
                                 EXEC.EXEC_$EXE002
3A8        103A8    55             $ISECT$                    F  F  RR I  F
3A8        103A8                       EXEC_$EXE002
                                 $PROG.$PROG
3FD        103FD   10F             $ISECT$                    F  F  RR I  F
3FD        103FD                       $PROG
                                 PROJ_LIB.MESSAGE_PARAMETERS_I_$PRO02X
50C        1050C    97             $ISECT$                    F  F  RR I  F
50C        1050C                       MESSAGE_PARAMETERS_I_$PRO105
                                 PROJ_LIB.MESSAGE_PARAMETERS_C_$PRO02Y
5A3        105A3   3CD             $ISECT$                    F  F  RR I  F
5A3        105A3                     +MESSAGE_PARAMETERS_C_$PRO106
                                 PROJ_LIB.MESSAGE_PARAMETERS_C_$PRO02Z
970        10970   2BA             $ISECT$                    F  F  RR I  F
970        10970                       MESSAGE_PARAMETERS_C_$PRO107
                                 PROJ_LIB.MESSAGE_PARAMETERS_D_$PRO030
C2A        10C2A   152             $ISECT$                    F  F  RR I  F
C2A        10C2A                     +MESSAGE_PARAMETERS_D_$PRO108
                                 O0011_ALARM_QUEUE.INIT_$O00001
D7C        10D7C     5             $ISECT$                    F  F  RR I  F
D7C        10D7C                       INIT_$O00001
                                 O001_CLOCK.INIT_$O01001
D81        10D81    19             $ISECT$                    F  F  RR I  F
D81        10D81                       INIT_$O01001
                                 O004_MEMORY.INIT_$O03001
D9A        10D9A     D             $ISECT$                    F  F  RR I  F
D9A        10D9A                       INIT_$O03001
                                 O005_POPULATED_MEMORY.INIT_$O04001
DA7        10DA7     E             $ISECT$                    F  F  RR I  F
DA7        10DA7                       INIT_$O04001
                                 O008_DUMP_DATA_SET.INIT_$O06001
DB5        10DB5     A             $ISECT$                    F  F  RR I  F
DB5        10DB5                       INIT_$O06001
                                 O011_COMMAND_BUFFER.INIT_$O07001
DBF        10DBF     3             $ISECT$                    F  F  RR I  F
DBF        10DBF                       INIT_$O07001
                                 O012_PROBE_CMD.INIT_$O08001
DC2        10DC2     7             $ISECT$                    F  F  RR I  F
DC2        10DC2                       INIT_$O08001
                                 O013_BROADCAST_CMD.INIT_$O09001
DC9        10DC9     3             $ISECT$                    F  F  RR I  F
```

```
DC9       10DC9                 INIT_$O09001
                            O021_ENABLE_CMD.INIT_$O1A001
DCC       10DCC    3           $ISECT$                   F  F  RR I  F
DCC       10DCC                 INIT_$O1A001
                            O022_CHANGE_MODE_CMD.INIT_$O1B001
DCF       10DCF    3           $ISECT$                   F  F  RR I  F
DCF       10DCF                 INIT_$O1B001
                            O023_SINGLE_MEAS_CMD.INIT_$O1C001
DD2       10DD2    F           $ISECT$                   F  F  RR I  F
DD2       10DD2                 INIT_$O1C001
                            O024_SINGLE_TEST_CMD.INIT_$O1D001
DE1       10DE1    3           $ISECT$                   F  F  RR I  F
DE1       10DE1                 INIT_$O1D001
                            O026_DUMP_CMD.INIT_$O1E001
DE4       10DE4    5           $ISECT$                   F  F  RR I  F
DE4       10DE4                 INIT_$O1E001
                            O027_UPLINK_EEPROM_CMD.INIT_$O1F001
DE9       10DE9    D           $ISECT$                   F  F  RR I  F
DE9       10DE9                 INIT_$O1F001
                            O028_UPLINK_RAM_CMD.INIT_$O1G001
DF6       10DF6    5           $ISECT$                   F  F  RR I  F
DF6       10DF6                 INIT_$O1G001
                            O030_ATTITUDE.INIT_$O1H001
DFB       10DFB   17           $ISECT$                   F  F  RR I  F
DFB       10DFB                 INIT_$O1H001
                            O031_ALTITUDE.INIT_$O1I001
E12       10E12    F           $ISECT$                   F  F  RR I  F
E12       10E12                 INIT_$O1I001
                            O040_DESCENT_SCHEDULER.INIT_$O1J001
E21       10E21   25           $ISECT$                   F  F  RR I  F
E21       10E21                 INIT_$O1J001
                            O041_SCENARIO_SPEC.INIT_$O1K001
E46       10E46    E           $ISECT$                   F  F  RR I  F
E46       10E46                 INIT_$O1K001
                            O042_CYCLE_SPEC.INIT_$O1L001
E54       10E54    E           $ISECT$                   F  F  RR I  F
E54       10E54                 INIT_$O1L001
                            O044_DESCENT_CYCLE_DATA_SET.INIT_$O1M001
E62       10E62    A           $ISECT$                   F  F  RR I  F
E62       10E62                 INIT_$O1M001
                            O045_INST_MISALIGNMENT.INIT_$O1N001
E6C       10E6C    D           $ISECT$                   F  F  RR I  F
E6C       10E6C                 INIT_$O1N001
                            O050_CCD_MANAGER.INIT_$O1O001
E79       10E79    5           $ISECT$                   F  F  RR I  F
E79       10E79                 INIT_$O1O001
                            O051_CCD_MEAS_SET.INIT_$O1P001
E7E       10E7E    3           $ISECT$                   F  F  RR I  F
E7E       10E7E                 INIT_$O1P001
                            O052_CCD_INDEX_TABLE.INIT_$O1Q001
E81       10E81    E           $ISECT$                   F  F  RR I  F
E81       10E81                 INIT_$O1Q001
                            O053_CCD_EXPOSURE.INIT_$O1R001
E8F       10E8F    E           $ISECT$                   F  F  RR I  F
E8F       10E8F                 INIT_$O1R001
                            O054_CCD_MEAS_SPEC.INIT_$O1S001
E9D       10E9D    E           $ISECT$                   F  F  RR I  F
E9D       10E9D                 INIT_$O1S001
                            O055_CCD_EXPOSURE_LIMITS.INIT_$O1T001
EAB       10EAB    E           $ISECT$                   F  F  RR I  F
EAB       10EAB                 INIT_$O1T001
                            O059_CCD_BACKGROUND.INIT_$O1U001
EB9       10EB9    C           $ISECT$                   F  F  RR I  F
EB9       10EB9                 INIT_$O1U001
                            O060_IR_MANAGER.INIT_$O1V001
EC5       10EC5    5           $ISECT$                   F  F  RR I  F
EC5       10EC5                 INIT_$O1V001
                            O061_IR_MEAS_SPEC.INIT_$O1W001
```

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ECA      10ECA    E       $ISECT$                         F  F  RR I  F
ECA      10ECA                INIT_$O1W001
                      O062_IR_REGION_SPEC.INIT_$O1X001
ED8      10ED8    E       $ISECT$                         F  F  RR I  F
ED8      10ED8                INIT_$O1X001
                      O063_IR_EXPOSURE.INIT_$O1Y001
EE6      10EE6   2F       $ISECT$                         F  F  RR I  F
EE6      10EE6                INIT_$O1Y001
                      O069_IR_BACKGROUND.INIT_$O2A001
F15      10F15    E       $ISECT$                         F  F  RR I  F
F15      10F15                INIT_$O2A001
                      O070_VIOLET_MANAGER.INIT_$O2B001
F23      10F23    3       $ISECT$                         F  F  RR I  F
F23      10F23                INIT_$O2B001
                      O071_VIOLET_MEAS_SET.INIT_$O2C001
F26      10F26    3       $ISECT$                         F  F  RR I  F
F26      10F26                INIT_$O2C001
                      O072_VIOLET_MEAS_SPEC.INIT_$O2D001
F29      10F29    E       $ISECT$                         F  F  RR I  F
F29      10F29                INIT_$O2D001
                      O074_ULV_COLLECTION.INIT_$O2E001
F37      10F37    3       $ISECT$                         F  F  RR I  F
F37      10F37                INIT_$O2E001
                      O079_VIOLET_BACKGROUND.INIT_$O2F001
F3A      10F3A    8       $ISECT$                         F  F  RR I  F
F3A      10F3A                INIT_$O2F001
                      O080_SPM_SCHEDULER.INIT_$O2G001
F42      10F42    3       $ISECT$                         F  F  RR I  F
F42      10F42                INIT_$O2G001
                      O081_SPM_CCD_MANAGER.INIT_$O2H001
F45      10F45    3       $ISECT$                         F  F  RR I  F
F45      10F45                INIT_$O2H001
                      O082_SPM_IR_MANAGER.INIT_$O2I001
F48      10F48    3       $ISECT$                         F  F  RR I  F
F48      10F48                INIT_$O2I001
                      O085_CAL_SCHEDULER.INIT_$O2J001
F4B      10F4B    7       $ISECT$                         F  F  RR I  F
F4B      10F4B                INIT_$O2J001
                      O086_CAL_CYCLE_SPEC.INIT_$O2K001
F52      10F52    E       $ISECT$                         F  F  RR I  F
F52      10F52                INIT_$O2K001
                      O087_CAL_SPEC_INDEX_TABLE.INIT_$O2L001
F60      10F60    D       $ISECT$                         F  F  RR I  F
F60      10F60                INIT_$O2L001
                      O088_CAL_CYCLE_DATA_SET.INIT_$O2M001
F6D      10F6D    A       $ISECT$                         F  F  RR I  F
F6D      10F6D                INIT_$O2M001
                      O089_CAL_VIOLET_INDEX_TABLE.INIT_$O2N001
F77      10F77    D       $ISECT$                         F  F  RR I  F
F77      10F77                INIT_$O2N001
                      O090_CAL_CCD_MANAGER.INIT_$O2O001
F84      10F84    B       $ISECT$                         F  F  RR I  F
F84      10F84                INIT_$O2O001
                      O091_CAL_CCD_EXPOSURE.INIT_$O2P001
F8F      10F8F    E       $ISECT$                         F  F  RR I  F
F8F      10F8F                INIT_$O2P001
                      O092_CAL_CCD_MEAS_SPEC.INIT_$O2Q001
F9D      10F9D    E       $ISECT$                         F  F  RR I  F
F9D      10F9D                INIT_$O2Q001
                      O093_CAL_CCD_INDEX_TABLE.INIT_$O2R001
FAB      10FAB    E       $ISECT$                         F  F  RR I  F
FAB      10FAB                INIT_$O2R001
                      O094_CAL_IR_SPEC.INIT_$O2S001
FB9      10FB9    E       $ISECT$                         F  F  RR I  F
FB9      10FB9                INIT_$O2S001
                      O095_CAL_IR_MANAGER.INIT_$O2T001
FC7      10FC7    B       $ISECT$                         F  F  RR I  F
FC7      10FC7                INIT_$O2T001
```

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                                 O096_CAL_IR_EXPOSURE.INIT_$O2U001
 FD2      10FD2    D               $ISECT$                      F  F  RR I  F
 FD2      10FD2                        INIT_$O2U001
                                 O097_CAL_VIOLET_MANAGER.INIT_$O2V001
 FDF      10FDF    7               $ISECT$                      F  F  RR I  F
 FDF      10FDF                        INIT_$O2V001
                                 O098_CAL_VIOLET_SPEC.INIT_$O2W001
 FE6      10FE6    E               $ISECT$                      F  F  RR I  F
 FE6      10FE6                        INIT_$O2W001
                                 O099_CAL_IR_INDEX_TABLE.INIT_$O2X001
 FF4      10FF4    C               $ISECT$                      F  F  RR I  F
1000      11000    1
 FF4      10FF4                        INIT_$O2X001
                                 O100_OPERATING_MODE.INIT_$O10001
1001      11001   13               $ISECT$                      F  F  RR I  F
1001      11001                        INIT_$O10001
                                 O122_EEPROM_DATA_SET.INIT_$O12001
1014      11014    B               $ISECT$                      F  F  RR I  F
1014      11014                        INIT_$O12001
                                 O123_PATCH_DATA.INIT_$O13001
101F      1101F    3               $ISECT$                      F  F  RR I  F
101F      1101F                        INIT_$O13001
                                 O124_EEPROM_PATCH.INIT_$O14001
1022      11022    9               $ISECT$                      F  F  RR I  F
1022      11022                        INIT_$O14001
                                 O125_EEPROM_USAGE.INIT_$O15001
102B      1102B    3               $ISECT$                      F  F  RR I  F
102B      1102B                        INIT_$O15001
                                 O180_PACKET_MANAGER.INIT_$O19001
102E      1102E    3               $ISECT$                      F  F  RR I  F
102E      1102E                        INIT_$O19001
                                 O181_TLM_QUEUE_CONTROL.INIT_$O2Y001
1031      11031    3               $ISECT$                      F  F  RR I  F
1031      11031                        INIT_$O2Y001
                                 O182_DATA_SET_HEADER.INIT_$O2Z001
1034      11034    3               $ISECT$                      F  F  RR I  F
1034      11034                        INIT_$O2Z001
                                 O184_PARTIAL_PACKET.INIT_$O3B001
1037      11037   17               $ISECT$                      F  F  RR I  F
1037      11037                        INIT_$O3B001
                                 O185_TLM_CHANNEL_MANAGER.INIT_$O3C001
104E      1104E   28               $ISECT$                      F  F  RR I  F
104E      1104E                        INIT_$O3C001
                                 O186_PREDICTED_TLM_RATES.INIT_$O3D001
1076      11076    D               $ISECT$                      F  F  RR I  F
1076      11076                        INIT_$O3D001
                                 O187_TLM_QUEUE.INIT_$O3E001
1083      11083    B               $ISECT$                      F  F  RR I  F
1083      11083                        INIT_$O3E001
                                 O188_PENDING_TLM_REQUESTS.INIT_$O3F001
108E      1108E   24               $ISECT$                      F  F  RR I  F
108E      1108E                        INIT_$O3F001
                                 O190_MESSAGE.INIT_$O3G001
10B2      110B2    B               $ISECT$                      F  F  RR I  F
10B2      110B2                        INIT_$O3G001
                                 O191_MESSAGE_DATA_SET.INIT_$O3H001
10BD      110BD    A               $ISECT$                      F  F  RR I  F
10BD      110BD                        INIT_$O3H001
                                 O200_CCD.INIT_$O20001
10C7      110C7    C               $ISECT$                      F  F  RR I  F
10C7      110C7                        INIT_$O20001
                                 O201_CCD_DATA_BUFFER.INIT_$O21001
10D3      110D3   13               $ISECT$                      F  F  RR I  F
10D3      110D3                        INIT_$O21001
                                 O210_PROBE_INPUT_BUFFER.INIT_$O22001
10E6      110E6   1D               $ISECT$                      F  F  RR I  F
10E6      110E6                        INIT_$O22001
                                 O213_PROBE_CMD_REG.INIT_$O23001
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1103      11103    5       $ISECT$                       F  F  RR I  F
1103      11103                INIT_$O23001
                       O218_TM_DMAS.INIT_$O25001
1108      11108   14       $ISECT$                       F  F  RR I  F
1108      11108                INIT_$O25001
                       O229_DCS_TEST_DATA_SET.INIT_$O26001
111C      1111C    A       $ISECT$                       F  F  RR I  F
111C      1111C                INIT_$O26001
                       O230_DCS.INIT_$O27001
1126      11126   39       $ISECT$                       F  F  RR I  F
1126      11126                INIT_$O27001
                       O240_SUN_SENSOR.INIT_$O28001
115F      1115F    B       $ISECT$                       F  F  RR I  F
115F      1115F                INIT_$O28001
                       O241_SUN_DATA_SET.INIT_$O29001
116A      1116A    D       $ISECT$                       F  F  RR I  F
116A      1116A                INIT_$O29001
                       O242_SUN_SENSOR_CONSTANTS.INIT_$O3I001
1177      11177   27       $ISECT$                       F  F  RR I  F
1177      11177                INIT_$O3I001
                       O250_WATCHDOG.INIT_$O3J001
119E      1119E    9       $ISECT$                       F  F  RR I  F
119E      1119E                INIT_$O3J001
                       O251_PROM_POWER.INIT_$O3K001
11A7      111A7    7       $ISECT$                       F  F  RR I  F
11A7      111A7                INIT_$O3K001
                       O260_SHUTTER_TESTER.INIT_$O3L001
11AE      111AE    7       $ISECT$                       F  F  RR I  F
11AE      111AE                INIT_$O3L001
                       O261_DCS_TESTER.INIT_$O3M001
11B5      111B5    7       $ISECT$                       F  F  RR I  F
11B5      111B5                INIT_$O3M001
                       O262_HEATER_TESTER.INIT_$O3N001
11BC      111BC    C       $ISECT$                       F  F  RR I  F
11BC      111BC                INIT_$O3N001
                       O263_CAL_LAMP_TESTER.INIT_$O3O001
11C8      111C8   10       $ISECT$                       F  F  RR I  F
11C8      111C8                INIT_$O3O001
                       O264_SURFACE_LAMP_TESTER.INIT_$O3P001
11D8      111D8   10       $ISECT$                       F  F  RR I  F
11D8      111D8                INIT_$O3P001
                       O265_SUN_LAMP_TESTER.INIT_$O3Q001
11E8      111E8    B       $ISECT$                       F  F  RR I  F
11E8      111E8                INIT_$O3Q001
                       O266_SHUTTER_TEST_DATA_SET.INIT_$O3R001
11F3      111F3    B       $ISECT$                       F  F  RR I  F
11F3      111F3                INIT_$O3R001
                       O267_HEATER_TEST_DATA_SET.INIT_$O3S001
11FE      111FE    9       $ISECT$                       F  F  RR I  F
11FE      111FE                INIT_$O3S001
                       O268_CAL_LAMP_TEST_DATA_SET.INIT_$O3T001
1207      11207    8       $ISECT$                       F  F  RR I  F
1207      11207                INIT_$O3T001
                       O269_SURFACE_LAMP_TEST_DATA_SET.INIT_$O3U001
120F      1120F    8       $ISECT$                       F  F  RR I  F
120F      1120F                INIT_$O3U001
                       O271_SUN_LAMP_TEST_DATA_SET.INIT_$O3W001
1217      11217    8       $ISECT$                       F  F  RR I  F
1217      11217                INIT_$O3W001
                       O283_TIME_DATA_SET.INIT_$O3X001
121F      1121F   21       $ISECT$                       F  F  RR I  F
121F      1121F                INIT_$O3X001
                       O290_INTERRUPT_CONTROLLER.INIT_$O3Y001
1240      11240   17       $ISECT$                       F  F  RR I  F
1240      11240                INIT_$O3Y001
                       O292_RESET_CONTROL.INIT_$O4A001
1257      11257    7       $ISECT$                       F  F  RR I  F
1257      11257                INIT_$O4A001
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                                 O293_DMA_CONTROL.INIT_$O4B001
125E      1125E    3               $ISECT$                    F  F  RR I  F
125E      1125E                        INIT_$O4B001
                                 O301_RADIO_PROCESSOR.INIT_$O30001
1261      11261   5E               $ISECT$                    F  F  RR I  F
1261      11261                        INIT_$O30001
                                 O302_CCD_TRANSPOSED.INIT_$O31001
12BF      112BF   11               $ISECT$                    F  F  RR I  F
12BF      112BF                        INIT_$O31001
                                 O303_CCD_FORMAT.INIT_$O32001
12D0      112D0   65               $ISECT$                    F  F  RR I  F
12D0      112D0                        INIT_$O32001
                                 O304_BAD_PIXEL_MAP.INIT_$O33001
1335      11335    9               $ISECT$                    F  F  RR I  F
1335      11335                        INIT_$O33001
                                 O305_CCD_OPTIMUM_EXPOSURE.INIT_$O34001
133E      1133E    3               $ISECT$                    F  F  RR I  F
133E      1133E                        INIT_$O34001
                                 O306_IR_OPTIMUM_SAMPLING.INIT_$O35001
1341      11341    9               $ISECT$                    F  F  RR I  F
1341      11341                        INIT_$O35001
                                 O313_IR_SET.INIT_$O38001
134A      1134A    7               $ISECT$                    F  F  RR I  F
134A      1134A                        INIT_$O38001
                                 O314_DARK_SET.INIT_$O39001
1351      11351   11               $ISECT$                    F  F  RR I  F
1351      11351                        INIT_$O39001
                                 O315_IMAGE_SET.INIT_$O4F001
1362      11362   10               $ISECT$                    F  F  RR I  F
1362      11362                        INIT_$O4F001
                                 O316_STRIP_SET.INIT_$O4G001
1372      11372   10               $ISECT$                    F  F  RR I  F
1372      11372                        INIT_$O4G001
                                 O317_SOLAR_SET.INIT_$O4H001
1382      11382   10               $ISECT$                    F  F  RR I  F
1382      11382                        INIT_$O4H001
                                 O318_VISIBLE_SET.INIT_$O4I001
1392      11392   10               $ISECT$                    F  F  RR I  F
1392      11392                        INIT_$O4I001
                                 O319_CCD_SET.INIT_$O4J001
13A2      113A2   13               $ISECT$                    F  F  RR I  F
13A2      113A2                        INIT_$O4J001
                                 O320_VIOLET_MEASURE.INIT_$O4K001
13B5      113B5    B               $ISECT$                    F  F  RR I  F
13B5      113B5                        INIT_$O4K001
                                 O330_IR_SPECTRUM.INIT_$O4L001
13C0      113C0   18               $ISECT$                    F  F  RR I  F
13C0      113C0                        INIT_$O4L001
                                 O340_DARK_CURRENT.INIT_$O4M001
13D8      113D8    3               $ISECT$                    F  F  RR I  F
13D8      113D8                        INIT_$O4M001
                                 O350_IMAGE_PIC.INIT_$O4N001
13DB      113DB    B               $ISECT$                    F  F  RR I  F
13DB      113DB                        INIT_$O4N001
                                 O358_FLAT_FIELD_LOOKUP.INIT_$O4O001
13E6      113E6   16               $ISECT$                    F  F  RR I  F
13E6      113E6                        INIT_$O4O001
                                 O359_LOOKUP_TABLE.INIT_$O4P001
13FC      113FC    5               $ISECT$                    F  F  RR I  F
13FC      113FC                        INIT_$O4P001
                                 O360_IMAGE_STRIP.INIT_$O4Q001
1401      11401    3               $ISECT$                    F  F  RR I  F
1401      11401                        INIT_$O4Q001
                                 O370_SOLAR_AUREOLE.INIT_$O4R001
1404      11404    3               $ISECT$                    F  F  RR I  F
1404      11404                        INIT_$O4R001
                                 O380_VISIBLE_SPECTRUM.INIT_$O4S001
1407      11407   11               $ISECT$                    F  F  RR I  F
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1407      11407                INIT_$O4S001
                         O400_MULTIPLEXED_DEVICE.INIT_$O40001
1418      11418   23       $ISECT$                 F  F  RR I  F
1418      11418                INIT_$O40001
                         O404_HOUSEKEEPING_DATA_SET.INIT_$O41001
143B      1143B   15       $ISECT$                 F  F  RR I  F
143B      1143B                INIT_$O41001
                         O410_IR_INTERFACE.INIT_$O42001
1450      11450   1B       $ISECT$                 F  F  RR I  F
1450      11450                INIT_$O42001
                         O414_IR_RAW_DATA.INIT_$O43001
146B      1146B   2F       $ISECT$                 F  F  RR I  F
146B      1146B                INIT_$O43001
                         O460_LAMP.INIT_$O46001
149A      1149A   1B       $ISECT$                 F  F  RR I  F
149A      1149A                INIT_$O46001
                         O461_LAMP_DATA_SET.INIT_$O47001
14B5      114B5    D       $ISECT$                 F  F  RR I  F
14B5      114B5                INIT_$O47001
                         O465_MISC_DEV_CONTROL_REGISTER.INIT_$O48001
14C2      114C2    7       $ISECT$                 F  F  RR I  F
14C2      114C2                INIT_$O48001
                         O470_THERMAL_MANAGER.INIT_$O49001
14C9      114C9    F       $ISECT$                 F  F  RR I  F
14C9      114C9                INIT_$O49001
                         O480_STATUS_WORD.O480_STATUS_WORD_FOR_$O5A030
14D8      114D8    3       $ISECT$                 F  F  RR I  F
14D8      114D8              +O480_STATUS_WORD_FOR_$O5A108
                         O480_STATUS_WORD.O480_STATUS_WORD_FOR_$O5A031
14DB      114DB   BF       $ISECT$                 F  F  RR I  F
14DB      114DB              +O480_STATUS_WORD_FOR_$O5A109
                         O480_STATUS_WORD.O480_STATUS_WORD_FOR_$O5A032
159A      1159A   92       $ISECT$                 F  F  RR I  F
159A      1159A              +O480_STATUS_WORD_FOR_$O5A110
                         O480_STATUS_WORD.O480_STATUS_WORD_FOR_$O5A033
162C      1162C   26       $ISECT$                 F  F  RR I  F
162C      1162C              +O480_STATUS_WORD_FOR_$O5A111
                         O480_STATUS_WORD.INIT_$O5A001
1652      11652   1F       $ISECT$                 F  F  RR I  F
1652      11652                INIT_$O5A001
                         DISPATCH.SERVICE_EVENT_$DIS02V
1671      11671   85       $ISECT$                 F  F  RR I  F
1671      11671                SERVICE_EVENT_$DIS103
                         DISPATCH.INIT_$DIS002
16F6      116F6    1       $ISECT$                 F  F  RR I  F
16F6      116F6                INIT_$DIS002
                         EVENT_QUE.INIT_EVT_QUE_$EVF02X
16F7      116F7   3E       $ISECT$                 F  F  RR I  F
16F7      116F7                INIT_EVT_QUE_$EVF105
                         EVENT_QUE.SEND_EVENT_$EVF02Y
1735      11735   9C       $ISECT$                 F  F  RR I  F
1735      11735                SEND_EVENT_$EVF106
                         EVENT_QUE.DISPATCH_EVENT_$EVF02Z
17D1      117D1   86       $ISECT$                 F  F  RR I  F
17D1      117D1                DISPATCH_EVENT_$EVF107
                         EVENT_QUE.DELETE_EVENT_$EVF030
1857      11857   8C       $ISECT$                 F  F  RR I  F
1857      11857                DELETE_EVENT_$EVF108
                         EVENT_QUE.MARK_USED_$EVF031
18E3      118E3    6       $ISECT$                 F  F  RR I  F
18E3      118E3                MARK_USED_$EVF109
                         EVENT_QUE.MARK_UNUSED_$EVF032
18E9      118E9    6       $ISECT$                 F  F  RR I  F
18E9      118E9                MARK_UNUSED_$EVF110
                         EVENT_QUE.INIT_$EVF002
18EF      118EF   33       $ISECT$                 F  F  RR I  F
18EF      118EF                INIT_$EVF002
                         PROJ_LIB.SYSTEM_ADDRESS_FOR_$PRO02V
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1922        11922     C          $ISECT$                    F  F  RR I  F
1922        11922                   +SYSTEM_ADDRESS_FOR_$PRO103
                              PROJ_LIB.ADDRESS_VALUE_FOR_$PRO02W
192E        1192E     C          $ISECT$                    F  F  RR I  F
192E        1192E                    ADDRESS_VALUE_FOR_$PRO104
                              PROJ_LIB.INIT_$PRO002
193A        1193A     1          $ISECT$                    F  F  RR I  F
193A        1193A                    INIT_$PRO002
                              O0011_ALARM_QUEUE.ADD_ALARM_$O0002W
193B        1193B    8B          $ISECT$                    F  F  RR I  F
193B        1193B                    ADD_ALARM_$O00104
                              O0011_ALARM_QUEUE.DELETE_ALARM_$O0002X
19C6        119C6    71          $ISECT$                    F  F  RR I  F
19C6        119C6                    DELETE_ALARM_$O00105
                              O0011_ALARM_QUEUE.REMOVE_CURRENT_$O0002Y
1A37        11A37    2D          $ISECT$                    F  F  RR I  F
1A37        11A37                    REMOVE_CURRENT_$O00106
                              O0011_ALARM_QUEUE.GET_NEXT_ALARM_$O0002Z
1A64        11A64    27          $ISECT$                    F  F  RR I  F
1A64        11A64                    GET_NEXT_ALARM_$O00107
                              O001_CLOCK.CURRENT_TIME_$O0102X
1A8B        11A8B    43          $ISECT$                    F  F  RR I  F
1A8B        11A8B                    CURRENT_TIME_$O01105
                              O001_CLOCK.INT32_TO_MTIME_$O01036
1ACE        11ACE    10          $ISECT$                    F  F  RR I  F
1ACE        11ACE                    INT32_TO_MTIME_$O01114
                              O001_CLOCK.CORRELATE_CLOCKS_$O0102Y
1ADE        11ADE   12E          $ISECT$                    F  F  RR I  F
1ADE        11ADE                    CORRELATE_CLOCKS_$O01106
                              O001_CLOCK.MASTER_TIME_$O01035
1C0C        11C0C    3F          $ISECT$                    F  F  RR I  F
1C0C        11C0C                    MASTER_TIME_$O01113
                              O001_CLOCK.ADD_ALARM_TO_QUEUE_$O0102Z
1C4B        11C4B    28          $ISECT$                    F  F  RR I  F
1C4B        11C4B                    ADD_ALARM_TO_QUEUE_$O01107
                              O001_CLOCK.SETUP_NEXT_ALARM_$O01034
1C73        11C73    49          $ISECT$                    F  F  RR I  F
1C73        11C73                    SETUP_NEXT_ALARM_$O01112
                              O001_CLOCK.DELETE_ALARM_FROM_QU_$O01030
1CBC        11CBC    12          $ISECT$                    F  F  RR I  F
1CBC        11CBC                    DELETE_ALARM_FROM_QU_$O01108
                              O001_CLOCK.ALARM_$O01031
1CCE        11CCE    3A          $ISECT$                    F  F  RR I  F
1CCE        11CCE                    ALARM_$O01109
                              O001_CLOCK.CLOCK_ROLL_OVER_$O01033
1D08        11D08    13          $ISECT$                    F  F  RR I  F
1D08        11D08                    CLOCK_ROLL_OVER_$O01111
                              O001_CLOCK.CONVERT_MASTER_TO_MI_$O01032
1D1B        11D1B     C          $ISECT$                    F  F  RR I  F
1D1B        11D1B                    CONVERT_MASTER_TO_MI_$O01110
                              O002_LOADER.RAM_START_UP_$O0202X
1D27        11D27     5          $ISECT$                    F  F  RR I  F
1D27        11D27                   +RAM_START_UP_$O02105
                              O002_LOADER.RAM_START_UP_$O0202W
1D2C        11D2C    32          $ISECT$                    F  F  RR I  F
1D2C        11D2C                    RAM_START_UP_$O02104
                              O002_LOADER.INITIALIZE_HW_AND_SW_$O02030
1D5E        11D5E    74          $ISECT$                    F  F  RR I  F
1D5E        11D5E                    INITIALIZE_HW_AND_SW_$O02108
                              O002_LOADER.NO_BROADCAST_RECEIVE_$O0202Y
1DD2        11DD2    1F          $ISECT$                    F  F  RR I  F
1DD2        11DD2                    NO_BROADCAST_RECEIVE_$O02106
                              O002_LOADER.FINISH_INITIALIZATIO_$O0202Z
1DF1        11DF1    19          $ISECT$                    F  F  RR I  F
1DF1        11DF1                    FINISH_INITIALIZATIO_$O02107
                              O002_LOADER.START_INITIAL_MODE_$O02031
1E0A        11E0A     C          $ISECT$                    F  F  RR I  F
1E0A        11E0A                    START_INITIAL_MODE_$O02109
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                                 0002_LOADER.SET_TIMER_DONE_$O02032
1E16      11E16     9               $ISECT$                    F  F  RR I  F
1E16      11E16                         SET_TIMER_DONE_$O02110
                                 0004_MEMORY.START_MEMORY_DUMP_$O0302W
1E1F      11E1F    22               $ISECT$                    F  F  RR I  F
1E1F      11E1F                         START_MEMORY_DUMP_$O03104
                                 0004_MEMORY.CHECK_DUMP_RANGE_$O0302X
1E41      11E41    8D               $ISECT$                    F  F  RR I  F
1E41      11E41                         CHECK_DUMP_RANGE_$O03105
                                 0004_MEMORY.DUMP_MEMORY_RANGE_$O0302Y
1ECE      11ECE    6B               $ISECT$                    F  F  RR I  F
1ECE      11ECE                         DUMP_MEMORY_RANGE_$O03106
                                 0004_MEMORY.NEXT_DUMP_PAIR_$O0302Z
1F39      11F39    16               $ISECT$                    F  F  RR I  F
1F39      11F39                         NEXT_DUMP_PAIR_$O03107
                                 0004_MEMORY.UPLINK_RAM_$O03030
1F4F      11F4F    A9               $ISECT$                    F  F  RR I  F
1F4F      11F4F                         UPLINK_RAM_$O03108
                                 0004_MEMORY.END_PACKAGING_$O03031
1FF8      11FF8     8               $ISECT$                    F  F  RR I  F
2000      12000    2E
1FF8      11FF8                         END_PACKAGING_$O03109
                                 0007_RAM_DATA_SET.SEND_RAM_DATA_SET_$O0502W
202E      1202E    35               $ISECT$                    F  F  RR I  F
202E      1202E                         SEND_RAM_DATA_SET_$O05104
                                 0011_COMMAND_BUFFER.PROCESS_PROBE_INPUT_$O0702X
2063      12063   10D               $ISECT$                    F  F  RR I  F
2063      12063                         PROCESS_PROBE_INPUT_$O07105
                                 0012_PROBE_CMD.STORE_CHANGE_ENABLE_$O0802X
2170      12170     A               $ISECT$                    F  F  RR I  F
2170      12170                         STORE_CHANGE_ENABLE_$O08105
                                 0012_PROBE_CMD.RECORD_CMD_END_$O0802Y
217A      1217A     5               $ISECT$                    F  F  RR I  F
217A      1217A                         RECORD_CMD_END_$O08106
                                 0012_PROBE_CMD.DECODE_DISR_CMD_$O0802Z
217F      1217F    AB               $ISECT$                    F  F  RR I  F
217F      1217F                         DECODE_DISR_CMD_$O08107
                                 0013_BROADCAST_CMD.DECODE_BROADCAST_CMD_$O0902W
222A      1222A    5B               $ISECT$                    F  F  RR I  F
222A      1222A                         DECODE_BROADCAST_CMD_$O09104
                                 0021_ENABLE_CMD.PROCESS_ENABLE_CMD_$O1A02W
2285      12285    51               $ISECT$                    F  F  RR I  F
2285      12285                         PROCESS_ENABLE_CMD_$O1A104
                                 0022_CHANGE_MODE_CMD.PROCESS_NEW_MODE_CMD_$O1B02W
22D6      122D6    5C               $ISECT$                    F  F  RR I  F
22D6      122D6                         PROCESS_NEW_MODE_CMD_$O1B104
                                 0023_SINGLE_MEAS_CMD.PROCESS_SINGLE_MEAS__$O1C02W
2332      12332    73               $ISECT$                    F  F  RR I  F
2332      12332                         PROCESS_SINGLE_MEAS__$O1C104
                                 0023_SINGLE_MEAS_CMD.START_MEAS_$O1C02X
23A5      123A5    A6               $ISECT$                    F  F  RR I  F
23A5      123A5                         START_MEAS_$O1C105
                                 0023_SINGLE_MEAS_CMD.MEAS_COMPLETE_$O1C02Y
244B      1244B     C               $ISECT$                    F  F  RR I  F
244B      1244B                         MEAS_COMPLETE_$O1C106
                                 0024_SINGLE_TEST_CMD.PROCESS_SINGLE_TEST__$O1D02X
2457      12457    6D               $ISECT$                    F  F  RR I  F
2457      12457                         PROCESS_SINGLE_TEST__$O1D105
                                 0024_SINGLE_TEST_CMD.DO_NEXT_TEST_$O1D02Y
24C4      124C4    92               $ISECT$                    F  F  RR I  F
24C4      124C4                         DO_NEXT_TEST_$O1D106
                                 0026_DUMP_CMD.RECORD_DUMP_END_$O1E02X
2556      12556     C               $ISECT$                    F  F  RR I  F
2556      12556                         RECORD_DUMP_END_$O1E105
                                 0026_DUMP_CMD.PROCESS_DUMP_CMD_$O1E02Y
2562      12562    7E               $ISECT$                    F  F  RR I  F
2562      12562                         PROCESS_DUMP_CMD_$O1E106
                                 0027_UPLINK_EEPROM_CMD.PROCESS_UPLINK_EEPRO_$O1F02X
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25E0       125E0   73         $ISECT$                    F  F  RR I  F
25E0       125E0                  PROCESS_UPLINK_EEPRO_$O1F105
                           O027_UPLINK_EEPROM_CMD.UPLINK_EEPROM_$O1F02Y
2653       12653   3F         $ISECT$                    F  F  RR I  F
2653       12653                  UPLINK_EEPROM_$O1F106
                           O028_UPLINK_RAM_CMD.RECORD_UPLINK_RAM_EN_$O1G02X
2692       12692    C         $ISECT$                    F  F  RR I  F
2692       12692                  RECORD_UPLINK_RAM_EN_$O1G105
                           O028_UPLINK_RAM_CMD.PROCESS_UPLINK_RAM_C_$O1G02Y
269E       1269E   70         $ISECT$                    F  F  RR I  F
269E       1269E                  PROCESS_UPLINK_RAM_C_$O1G106
                           O030_ATTITUDE.UPDATE_SUN_INFO_$O1H02W
270E       1270E   3A         $ISECT$                    F  F  RR I  F
270E       1270E                  UPDATE_SUN_INFO_$O1H104
                           O030_ATTITUDE.UPDATE_PROBE_INFO_$O1H02X
2748       12748   4C         $ISECT$                    F  F  RR I  F
2748       12748                  UPDATE_PROBE_INFO_$O1H105
                           O030_ATTITUDE.CURRENT_AZIM_$O1H02Y
2794       12794   10         $ISECT$                    F  F  RR I  F
2794       12794                  CURRENT_AZIM_$O1H106
                           O030_ATTITUDE.AZIM_AT_TIME_$O1H031
27A4       127A4   83         $ISECT$                    F  F  RR I  F
27A4       127A4                  AZIM_AT_TIME_$O1H109
                           O030_ATTITUDE.CURRENT_SPIN_$O1H02Z
2827       12827   60         $ISECT$                    F  F  RR I  F
2827       12827                  CURRENT_SPIN_$O1H107
                           O030_ATTITUDE.CURRENT_SPIN_$O1H030
2887       12887   69         $ISECT$                    F  F  RR I  F
2887       12887                  CURRENT_SPIN_$O1H108
                           O030_ATTITUDE.TIME_TO_AZIM_RANGE_$O1H032
28F0       128F0   5A         $ISECT$                    F  F  RR I  F
28F0       128F0                  TIME_TO_AZIM_RANGE_$O1H110
                           O030_ATTITUDE.TIME_TO_AZIM_$O1H033
294A       1294A   12         $ISECT$                    F  F  RR I  F
294A       1294A                  TIME_TO_AZIM_$O1H111
                           O030_ATTITUDE.TIME_TO_AZIM_$O1H034
295C       1295C  117         $ISECT$                    F  F  RR I  F
295C       1295C                  TIME_TO_AZIM_$O1H112
                           O030_ATTITUDE.SUN_LOCK_LOST_$O1H035
2A73       12A73    D         $ISECT$                    F  F  RR I  F
2A73       12A73                  SUN_LOCK_LOST_$O1H113
                           O031_ALTITUDE.STORE_ALTITUDE_$O1I02W
2A80       12A80   55         $ISECT$                    F  F  RR I  F
2A80       12A80                  STORE_ALTITUDE_$O1I104
                           O031_ALTITUDE.CURRENT_ALTITUDE_$O1I02X
2AD5       12AD5    3         $ISECT$                    F  F  RR I  F
2AD5       12AD5                  CURRENT_ALTITUDE_$O1I105
                           O031_ALTITUDE.INIT_ALT_FLAGS_$O1I02Y
2AD8       12AD8    9         $ISECT$                    F  F  RR I  F
2AD8       12AD8                  INIT_ALT_FLAGS_$O1I106
                           O031_ALTITUDE.SURFACE_MODE_TIME_$O1I02Z
2AE1       12AE1    E         $ISECT$                    F  F  RR I  F
2AE1       12AE1                  SURFACE_MODE_TIME_$O1I107
                           O040_DESCENT_SCHEDULER.START_DESCENT_SCENAR_$O1J02W
2AEF       12AEF   12         $ISECT$                    F  F  RR I  F
2AEF       12AEF                  START_DESCENT_SCENAR_$O1J104
                           O040_DESCENT_SCHEDULER.START_DESCENT_CYCLE_$O1J02X
2B01       12B01   90         $ISECT$                    F  F  RR I  F
2B01       12B01                  START_DESCENT_CYCLE_$O1J105
                           O040_DESCENT_SCHEDULER.SET_LAMP_STATE_$O1J02Y
2B91       12B91   2A         $ISECT$                    F  F  RR I  F
2B91       12B91                  SET_LAMP_STATE_$O1J106
                           O040_DESCENT_SCHEDULER.START_MEASUREMENTS_$O1J02Z
2BBB       12BBB   8C         $ISECT$                    F  F  RR I  F
2BBB       12BBB                  START_MEASUREMENTS_$O1J107
                           O040_DESCENT_SCHEDULER.CHECK_MEAS_DONE_$O1J030
2C47       12C47   43         $ISECT$                    F  F  RR I  F
2C47       12C47                  CHECK_MEAS_DONE_$O1J108
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                                    O040_DESCENT_SCHEDULER.CHECK_CYCLE_END_$O1J031
2C8A      12C8A   7E                  $ISECT$                  F  F  RR I  F
2C8A      12C8A                          CHECK_CYCLE_END_$O1J109
                                    O040_DESCENT_SCHEDULER.END_CYCLE_$O1J032
2D08      12D08   3D                  $ISECT$                  F  F  RR I  F
2D08      12D08                          END_CYCLE_$O1J110
                                    O041_SCENARIO_SPEC.SEARCH_SCEN_CRITERIA_$O1K02Y
2D45      12D45   EF                  $ISECT$                  F  F  RR I  F
2D45      12D45                          SEARCH_SCEN_CRITERIA_$O1K106
                                    O041_SCENARIO_SPEC.RESET_EXEC_DONE_$O1K02Z
2E34      12E34   1E                  $ISECT$                  F  F  RR I  F
2E34      12E34                          RESET_EXEC_DONE_$O1K107
                                    O042_CYCLE_SPEC.GET_CYCLE_LIMITS_$O1L02Y
2E52      12E52   60                  $ISECT$                  F  F  RR I  F
2E52      12E52                          GET_CYCLE_LIMITS_$O1L106
                                    O042_CYCLE_SPEC.GET_LAMP_DESIRED_$O1L02Z
2EB2      12EB2    8                  $ISECT$                  F  F  RR I  F
2EB2      12EB2                          GET_LAMP_DESIRED_$O1L107
                                    O042_CYCLE_SPEC.GET_CYCLE_MEAS_$O1L030
2EBA      12EBA   3B                  $ISECT$                  F  F  RR I  F
2EBA      12EBA                          GET_CYCLE_MEAS_$O1L108
                                    O042_CYCLE_SPEC.CHECK_CYCLE_ID_$O1L031
2EF5      12EF5   3F                  $ISECT$                  F  F  RR I  F
2EF5      12EF5                          CHECK_CYCLE_ID_$O1L109
                                    O044_DESCENT_CYCLE_DATA_SET.GEN_DESCENT_CYCLE_DA_$O1M02X
2F34      12F34   4F                  $ISECT$                  F  F  RR I  F
2F34      12F34                          GEN_DESCENT_CYCLE_DA_$O1M105
                                    O045_INST_MISALIGNMENT.GET_INST_MISALIGNMEN_$O1N02X
2F83      12F83    C                  $ISECT$                  F  F  RR I  F
2F83      12F83                          GET_INST_MISALIGNMEN_$O1N105
                                    O050_CCD_MANAGER.INIT_CCD_$O1O02W
2F8F      12F8F   30                  $ISECT$                  F  F  RR I  F
2F8F      12F8F                          INIT_CCD_$O1O104
                                    O050_CCD_MANAGER.CHECK_READOUT_SPACE_$O1O02X
2FBF      12FBF   2A                  $ISECT$                  F  F  RR I  F
2FBF      12FBF                          CHECK_READOUT_SPACE_$O1O105
                                    O050_CCD_MANAGER.PICK_NEXT_MEAS_$O1O02Y
2FE9      12FE9   17                  $ISECT$                  F  F  RR I  F
3000      13000   4E
2FE9      12FE9                          PICK_NEXT_MEAS_$O1O106
                                    O050_CCD_MANAGER.START_AZIM_TIMER_$O1O02Z
304E      1304E   1D                  $ISECT$                  F  F  RR I  F
304E      1304E                          START_AZIM_TIMER_$O1O107
                                    O050_CCD_MANAGER.PICK_ALTERNATE_MEAS_$O1O030
306B      1306B   6D                  $ISECT$                  F  F  RR I  F
306B      1306B                          PICK_ALTERNATE_MEAS_$O1O108
                                    O050_CCD_MANAGER.START_INTEGRATION_$O1O031
30D8      130D8   78                  $ISECT$                  F  F  RR I  F
30D8      130D8                          START_INTEGRATION_$O1O109
                                    O050_CCD_MANAGER.START_CCD_PROC_$O1O032
3150      13150   66                  $ISECT$                  F  F  RR I  F
3150      13150                          START_CCD_PROC_$O1O110
                                    O050_CCD_MANAGER.WAIT_AZIM_$O1O033
31B6      131B6    7                  $ISECT$                  F  F  RR I  F
31B6      131B6                          WAIT_AZIM_$O1O111
                                    O050_CCD_MANAGER.CHECK_END_MEAS_$O1O034
31BD      131BD   29                  $ISECT$                  F  F  RR I  F
31BD      131BD                          CHECK_END_MEAS_$O1O112
                                    O050_CCD_MANAGER.START_MAX_TIMER_$O1O035
31E6      131E6   19                  $ISECT$                  F  F  RR I  F
31E6      131E6                          START_MAX_TIMER_$O1O113
                                    O050_CCD_MANAGER.CHECK_READOUTS_$O1O036
31FF      131FF   1E                  $ISECT$                  F  F  RR I  F
31FF      131FF                          CHECK_READOUTS_$O1O114
                                    O050_CCD_MANAGER.REPORT_MAX_EXCEEDED_$O1O037
321D      1321D   23                  $ISECT$                  F  F  RR I  F
321D      1321D                          REPORT_MAX_EXCEEDED_$O1O115
                                    O050_CCD_MANAGER.RECALC_AZIM_TIME_$O1O038
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3240      13240   58      $ISECT$                    F  F  RR I  F
3240      13240               RECALC_AZIM_TIME_$O1O116
                       O051_CCD_MEAS_SET.GEN_CCD_TABLE_$O1P02W
3298      13298   87      $ISECT$                    F  F  RR I  F
3298      13298               GEN_CCD_TABLE_$O1P104
                       O051_CCD_MEAS_SET.CALC_TABLE_TIMES_$O1P034
331F      1331F  204      $ISECT$                    F  F  RR I  F
331F      1331F               CALC_TABLE_TIMES_$O1P112
                       O051_CCD_MEAS_SET.FIND_NEXT_CCD_$O1P02X
3523      13523  109      $ISECT$                    F  F  RR I  F
3523      13523               FIND_NEXT_CCD_$O1P105
                       O051_CCD_MEAS_SET.CHECK_LINKED_$O1P02Y
362C      1362C   61      $ISECT$                    F  F  RR I  F
362C      1362C               CHECK_LINKED_$O1P106
                       O051_CCD_MEAS_SET.CALC_AZIM_TIME_$O1P032
368D      1368D   1D      $ISECT$                    F  F  RR I  F
368D      1368D               CALC_AZIM_TIME_$O1P110
                       O051_CCD_MEAS_SET.SET_LINKED_MEAS_$O1P02Z
36AA      136AA   73      $ISECT$                    F  F  RR I  F
36AA      136AA               SET_LINKED_MEAS_$O1P107
                       O051_CCD_MEAS_SET.STORE_CCD_MEAS_DONE_$O1P030
371D      1371D   30      $ISECT$                    F  F  RR I  F
371D      1371D               STORE_CCD_MEAS_DONE_$O1P108
                       O051_CCD_MEAS_SET.REPORT_CCD_LEFT_$O1P031
374D      1374D   29      $ISECT$                    F  F  RR I  F
374D      1374D               REPORT_CCD_LEFT_$O1P109
                       O051_CCD_MEAS_SET.UPDATE_CCD_TABLE_$O1P033
3776      13776   55      $ISECT$                    F  F  RR I  F
3776      13776               UPDATE_CCD_TABLE_$O1P111
                       O052_CCD_INDEX_TABLE.GET_INDEX_RANGE_$O1Q02X
37CB      137CB   22      $ISECT$                    F  F  RR I  F
37CB      137CB               GET_INDEX_RANGE_$O1Q105
                       O053_CCD_EXPOSURE.STORE_EXPOSE_TIME_$O1R02X
37ED      137ED   2B      $ISECT$                    F  F  RR I  F
37ED      137ED               STORE_EXPOSE_TIME_$O1R105
                       O053_CCD_EXPOSURE.GET_OPT_EXPOSE_TIME_$O1R02Y
3818      13818   87      $ISECT$                    F  F  RR I  F
3818      13818               GET_OPT_EXPOSE_TIME_$O1R106
                       O053_CCD_EXPOSURE.CONSTRAIN_EXPOSURE_$O1R02Z
389F      1389F   C0      $ISECT$                    F  F  RR I  F
389F      1389F               CONSTRAIN_EXPOSURE_$O1R107
                       O054_CCD_MEAS_SPEC.GET_CCD_SPEC_$O1S02Y
395F      1395F   50      $ISECT$                    F  F  RR I  F
395F      1395F               GET_CCD_SPEC_$O1S106
                       O054_CCD_MEAS_SPEC.GET_CCD_PROC_INFO_$O1S02Z
39AF      139AF   1B      $ISECT$                    F  F  RR I  F
39AF      139AF               GET_CCD_PROC_INFO_$O1S107
                       O060_IR_MANAGER.SETUP_IR_$O1V02W
39CA      139CA   79      $ISECT$                    F  F  RR I  F
39CA      139CA               SETUP_IR_$O1V104
                       O060_IR_MANAGER.SETUP_LONG_IR_$O1V02X
3A43      13A43   36      $ISECT$                    F  F  RR I  F
3A43      13A43               SETUP_LONG_IR_$O1V105
                       O060_IR_MANAGER.CHECK_READOUT_SPACE_$O1V02Y
3A79      13A79   1D      $ISECT$                    F  F  RR I  F
3A79      13A79               CHECK_READOUT_SPACE_$O1V106
                       O060_IR_MANAGER.DO_IR_SELF_CAL_$O1V02Z
3A96      13A96   24      $ISECT$                    F  F  RR I  F
3A96      13A96               DO_IR_SELF_CAL_$O1V107
                       O060_IR_MANAGER.START_IR_COLLECTION_$O1V030
3ABA      13ABA   B8      $ISECT$                    F  F  RR I  F
3ABA      13ABA               START_IR_COLLECTION_$O1V108
                       O060_IR_MANAGER.CHECK_COLLECTION_END_$O1V031
3B72      13B72   1D      $ISECT$                    F  F  RR I  F
3B72      13B72               CHECK_COLLECTION_END_$O1V109
                       O060_IR_MANAGER.END_IR_$O1V032
3B8F      13B8F   A1      $ISECT$                    F  F  RR I  F
3B8F      13B8F               END_IR_$O1V110
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                                  O060_IR_MANAGER.RECALC_START_AZIM_$O1V033
3C30       13C30   5D               $ISECT$                    F  F  RR I  F
3C30       13C30                        RECALC_START_AZIM_$O1V111
                                  O060_IR_MANAGER.SEND_IR_TABLE_$O1V034
3C8D       13C8D   41               $ISECT$                    F  F  RR I  F
3C8D       13C8D                        SEND_IR_TABLE_$O1V112
                                  O060_IR_MANAGER.WAIT_FOR_STARTING_AZ_$O1V035
3CCE       13CCE   1B               $ISECT$                    F  F  RR I  F
3CCE       13CCE                        WAIT_FOR_STARTING_AZ_$O1V113
                                  O061_IR_MEAS_SPEC.GET_IR_COLLECT_SPEC_$O1W02Y
3CE9       13CE9   5A               $ISECT$                    F  F  RR I  F
3CE9       13CE9                        GET_IR_COLLECT_SPEC_$O1W106
                                  O061_IR_MEAS_SPEC.GET_IR_PROC_SPEC_$O1W02Z
3D43       13D43   12               $ISECT$                    F  F  RR I  F
3D43       13D43                        GET_IR_PROC_SPEC_$O1W107
                                  O061_IR_MEAS_SPEC.GET_REGION_SET_NUMBE_$O1W030
3D55       13D55    E               $ISECT$                    F  F  RR I  F
3D55       13D55                        GET_REGION_SET_NUMBE_$O1W108
                                  O062_IR_REGION_SPEC.GET_REGION_CNT_$O1X02X
3D63       13D63   21               $ISECT$                    F  F  RR I  F
3D63       13D63                        GET_REGION_CNT_$O1X105
                                  O062_IR_REGION_SPEC.GET_REGION_AZIM_SPEC_$O1X02Y
3D84       13D84   1C               $ISECT$                    F  F  RR I  F
3D84       13D84                        GET_REGION_AZIM_SPEC_$O1X106
                                  O062_IR_REGION_SPEC.GET_BIN_NUMBERS_$O1X02Z
3DA0       13DA0   1E               $ISECT$                    F  F  RR I  F
3DA0       13DA0                        GET_BIN_NUMBERS_$O1X107
                                  O062_IR_REGION_SPEC.FIND_NEXT_REGION_$O1X030
3DBE       13DBE   68               $ISECT$                    F  F  RR I  F
3DBE       13DBE                        FIND_NEXT_REGION_$O1X108
                                  O062_IR_REGION_SPEC.FIND_CURRENT_REGION_$O1X031
3E26       13E26   7E               $ISECT$                    F  F  RR I  F
3E26       13E26                        FIND_CURRENT_REGION_$O1X109
                                  O063_IR_EXPOSURE.STORE_SAMPLE_TIME_$O1Y02Z
3EA4       13EA4   32               $ISECT$                    F  F  RR I  F
3EA4       13EA4                        STORE_SAMPLE_TIME_$O1Y107
                                  O063_IR_EXPOSURE.GET_SAMPLE_TIME_$O1Y030
3ED6       13ED6   3C               $ISECT$                    F  F  RR I  F
3ED6       13ED6                        GET_SAMPLE_TIME_$O1Y108
                                  O063_IR_EXPOSURE.GET_DARK_EXPOSURE_$O1Y031
3F12       13F12   13               $ISECT$                    F  F  RR I  F
3F12       13F12                        GET_DARK_EXPOSURE_$O1Y109
                                  O064_IR_REGIONS.GEN_IR_REGION_TIMES_$O1Z02W
3F25       13F25   DB               $ISECT$                    F  F  RR I  F
4000       14000  141
3F25       13F25                        GEN_IR_REGION_TIMES_$O1Z104
                                  O070_VIOLET_MANAGER.INIT_VIOLET_$O2B02W
4141       14141   2E               $ISECT$                    F  F  RR I  F
4141       14141                        INIT_VIOLET_$O2B104
                                  O070_VIOLET_MANAGER.PICK_NEXT_VIOLET_$O2B02X
416F       1416F   3D               $ISECT$                    F  F  RR I  F
416F       1416F                        PICK_NEXT_VIOLET_$O2B105
                                  O070_VIOLET_MANAGER.START_AZIM_TIMER_$O2B02Y
41AC       141AC   19               $ISECT$                    F  F  RR I  F
41AC       141AC                        START_AZIM_TIMER_$O2B106
                                  O070_VIOLET_MANAGER.START_VIOLET_COLLECT_$O2B02Z
41C5       141C5   40               $ISECT$                    F  F  RR I  F
41C5       141C5                        START_VIOLET_COLLECT_$O2B107
                                  O070_VIOLET_MANAGER.CHECK_VIOLET_END_$O2B030
4205       14205   23               $ISECT$                    F  F  RR I  F
4205       14205                        CHECK_VIOLET_END_$O2B108
                                  O070_VIOLET_MANAGER.REPORT_MAX_EXCEEDED_$O2B031
4228       14228   23               $ISECT$                    F  F  RR I  F
4228       14228                        REPORT_MAX_EXCEEDED_$O2B109
                                  O070_VIOLET_MANAGER.RECALC_AZIM_TIME_$O2B032
424B       1424B   38               $ISECT$                    F  F  RR I  F
424B       1424B                        RECALC_AZIM_TIME_$O2B110
                                  O070_VIOLET_MANAGER.START_MAX_TIMER_$O2B033
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4283      14283   19        $ISECT$                         F  F  RR I  F
4283      14283                 START_MAX_TIMER_$O2B111
                         O071_VIOLET_MEAS_SET.GEN_VIOLET_TABLE_$O2C02W
429C      1429C   BC        $ISECT$                         F  F  RR I  F
429C      1429C                 GEN_VIOLET_TABLE_$O2C104
                         O071_VIOLET_MEAS_SET.FIND_NEXT_VIOLET_$O2C02X
4358      14358   9A        $ISECT$                         F  F  RR I  F
4358      14358                 FIND_NEXT_VIOLET_$O2C105
                         O071_VIOLET_MEAS_SET.STORE_VIOLET_MEAS_DO_$O2C02Y
43F2      143F2    6        $ISECT$                         F  F  RR I  F
43F2      143F2                 STORE_VIOLET_MEAS_DO_$O2C106
                         O071_VIOLET_MEAS_SET.REPORT_VIOLET_LEFT_$O2C02Z
43F8      143F8   29        $ISECT$                         F  F  RR I  F
43F8      143F8                 REPORT_VIOLET_LEFT_$O2C107
                         O072_VIOLET_MEAS_SPEC.GET_VIOLET_SPEC_$O2D02X
4421      14421   2E        $ISECT$                         F  F  RR I  F
4421      14421                 GET_VIOLET_SPEC_$O2D105
                         O072_VIOLET_MEAS_SPEC.GET_NUM_VIOLET_$O2D02Y
444F      1444F   26        $ISECT$                         F  F  RR I  F
444F      1444F                 GET_NUM_VIOLET_$O2D106
                         O074_ULV_COLLECTION.WAIT_ULV_AZIM_$O2E02W
4475      14475   4F        $ISECT$                         F  F  RR I  F
4475      14475                 WAIT_ULV_AZIM_$O2E104
                         O074_ULV_COLLECTION.START_ULV_$O2E02X
44C4      144C4   34        $ISECT$                         F  F  RR I  F
44C4      144C4                 START_ULV_$O2E105
                         O080_SPM_SCHEDULER.START_SPM_MEASUREMEN_$O2G02W
44F8      144F8   35        $ISECT$                         F  F  RR I  F
44F8      144F8                 START_SPM_MEASUREMEN_$O2G104
                         O080_SPM_SCHEDULER.CHECK_SPM_END_$O2G02X
452D      1452D   27        $ISECT$                         F  F  RR I  F
452D      1452D                 CHECK_SPM_END_$O2G105
                         O081_SPM_CCD_MANAGER.SETUP_SPM_CCD_$O2H02Y
4554      14554   28        $ISECT$                         F  F  RR I  F
4554      14554                 SETUP_SPM_CCD_$O2H106
                         O081_SPM_CCD_MANAGER.CHECK_READOUT_SPACE_$O2H02Z
457C      1457C   1A        $ISECT$                         F  F  RR I  F
457C      1457C                 CHECK_READOUT_SPACE_$O2H107
                         O081_SPM_CCD_MANAGER.START_MEASUREMENT_$O2H030
4596      14596   28        $ISECT$                         F  F  RR I  F
4596      14596                 START_MEASUREMENT_$O2H108
                         O081_SPM_CCD_MANAGER.START_CCD_PROC_$O2H031
45BE      145BE   5F        $ISECT$                         F  F  RR I  F
45BE      145BE                 START_CCD_PROC_$O2H109
                         O081_SPM_CCD_MANAGER.END_SPM_CCD_$O2H032
461D      1461D   10        $ISECT$                         F  F  RR I  F
461D      1461D                 END_SPM_CCD_$O2H110
                         O082_SPM_IR_MANAGER.SETUP_SPM_IR_$O2I02X
462D      1462D   28        $ISECT$                         F  F  RR I  F
462D      1462D                 SETUP_SPM_IR_$O2I105
                         O082_SPM_IR_MANAGER.CHECK_READOUT_SPACE_$O2I02Y
4655      14655    B        $ISECT$                         F  F  RR I  F
4655      14655                 CHECK_READOUT_SPACE_$O2I106
                         O082_SPM_IR_MANAGER.DO_IR_SELF_CAL_$O2I02Z
4660      14660    C        $ISECT$                         F  F  RR I  F
4660      14660                 DO_IR_SELF_CAL_$O2I107
                         O082_SPM_IR_MANAGER.START_IR_COLLECTION_$O2I030
466C      1466C   68        $ISECT$                         F  F  RR I  F
466C      1466C                 START_IR_COLLECTION_$O2I108
                         O082_SPM_IR_MANAGER.CHECK_COLLECTION_END_$O2I031
46D4      146D4   6B        $ISECT$                         F  F  RR I  F
46D4      146D4                 CHECK_COLLECTION_END_$O2I109
                         O082_SPM_IR_MANAGER.END_SPM_IR_$O2I032
473F      1473F   10        $ISECT$                         F  F  RR I  F
473F      1473F                 END_SPM_IR_$O2I110
                         O085_CAL_SCHEDULER.START_CAL_SCENARIO_$O2J02W
474F      1474F   38        $ISECT$                         F  F  RR I  F
474F      1474F                 START_CAL_SCENARIO_$O2J104
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                                  O085_CAL_SCHEDULER.START_CAL_CYCLE_$O2J02X
4787       14787   C4               $ISECT$                  F  F  RR I  F
4787       14787                        START_CAL_CYCLE_$O2J105
                                  O085_CAL_SCHEDULER.START_CAL_CCD_$O2J02Y
484B       1484B   2B               $ISECT$                  F  F  RR I  F
484B       1484B                        START_CAL_CCD_$O2J106
                                  O085_CAL_SCHEDULER.START_SHUTTER_TEST_$O2J02Z
4876       14876   32               $ISECT$                  F  F  RR I  F
4876       14876                        START_SHUTTER_TEST_$O2J107
                                  O085_CAL_SCHEDULER.END_CAL_CYCLE_$O2J030
48A8       148A8   2E               $ISECT$                  F  F  RR I  F
48A8       148A8                        END_CAL_CYCLE_$O2J108
                                  O085_CAL_SCHEDULER.END_SCENARIO_$O2J031
48D6       148D6   22               $ISECT$                  F  F  RR I  F
48D6       148D6                        END_SCENARIO_$O2J109
                                  O085_CAL_SCHEDULER.START_CAL_IR_$O2J032
48F8       148F8   2B               $ISECT$                  F  F  RR I  F
48F8       148F8                        START_CAL_IR_$O2J110
                                  O085_CAL_SCHEDULER.START_CAL_VIOLET_$O2J033
4923       14923   2B               $ISECT$                  F  F  RR I  F
4923       14923                        START_CAL_VIOLET_$O2J111
                                  O085_CAL_SCHEDULER.START_DCS_TEST_$O2J034
494E       1494E   32               $ISECT$                  F  F  RR I  F
494E       1494E                        START_DCS_TEST_$O2J112
                                  O085_CAL_SCHEDULER.START_HEATER_TEST_$O2J035
4980       14980   32               $ISECT$                  F  F  RR I  F
4980       14980                        START_HEATER_TEST_$O2J113
                                  O085_CAL_SCHEDULER.START_CAL_LAMP_TEST_$O2J036
49B2       149B2   32               $ISECT$                  F  F  RR I  F
49B2       149B2                        START_CAL_LAMP_TEST_$O2J114
                                  O085_CAL_SCHEDULER.START_SURF_LAMP_TEST_$O2J037
49E4       149E4   32               $ISECT$                  F  F  RR I  F
49E4       149E4                        START_SURF_LAMP_TEST_$O2J115
                                  O085_CAL_SCHEDULER.START_SUN_LAMP_TEST_$O2J038
4A16       14A16   32               $ISECT$                  F  F  RR I  F
4A16       14A16                        START_SUN_LAMP_TEST_$O2J116
                                  O086_CAL_CYCLE_SPEC.GET_CAL_CYCLE_INFO_$O2K02X
4A48       14A48   94               $ISECT$                  F  F  RR I  F
4A48       14A48                        GET_CAL_CYCLE_INFO_$O2K105
                                  O087_CAL_SPEC_INDEX_TABLE.GET_CAL_INDEX_RANGE_$O2L02X
4ADC       14ADC   21               $ISECT$                  F  F  RR I  F
4ADC       14ADC                        GET_CAL_INDEX_RANGE_$O2L105
                                  O088_CAL_CYCLE_DATA_SET.GEN_CAL_CYCLE_DATA_S_$O2M02X
4AFD       14AFD   6E               $ISECT$                  F  F  RR I  F
4AFD       14AFD                        GEN_CAL_CYCLE_DATA_S_$O2M105
                                  O089_CAL_VIOLET_INDEX_TABLE.GET_CAL_VIOLET_INDEX_$O2N02X
4B6B       14B6B   21               $ISECT$                  F  F  RR I  F
4B6B       14B6B                        GET_CAL_VIOLET_INDEX_$O2N105
                                  O090_CAL_CCD_MANAGER.START_CCD_PROC_$O2O002W
4B8C       14B8C   8F               $ISECT$                  F  F  RR I  F
4B8C       14B8C                        START_CCD_PROC_$O2O104
                                  O090_CAL_CCD_MANAGER.END_CAL_CCD_$O2O02X
4C1B       14C1B   15               $ISECT$                  F  F  RR I  F
4C1B       14C1B                        END_CAL_CCD_$O2O105
                                  O090_CAL_CCD_MANAGER.INIT_CAL_CCD_$O2O02Y
4C30       14C30   3C               $ISECT$                  F  F  RR I  F
4C30       14C30                        INIT_CAL_CCD_$O2O106
                                  O090_CAL_CCD_MANAGER.PICK_CAL_CCD_MEAS_$O2O02Z
4C6C       14C6C   5F               $ISECT$                  F  F  RR I  F
4C6C       14C6C                        PICK_CAL_CCD_MEAS_$O2O107
                                  O090_CAL_CCD_MANAGER.START_ONE_CCD_$O2O030
4CCB       14CCB   32               $ISECT$                  F  F  RR I  F
4CCB       14CCB                        START_ONE_CCD_$O2O108
                                  O090_CAL_CCD_MANAGER.SETUP_MEAS_$O2O031
4CFD       14CFD   25               $ISECT$                  F  F  RR I  F
4CFD       14CFD                        SETUP_MEAS_$O2O109
                                  O090_CAL_CCD_MANAGER.CHECK_READOUT_SPACE_$O2O032
4D22       14D22   65               $ISECT$                  F  F  RR I  F
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4D22      14D22            CHECK_READOUT_SPACE_$O2O110
                        O090_CAL_CCD_MANAGER.START_CAL_INTEGRATIO_$O2O033
4D87      14D87   35       $ISECT$                    F  F  RR I  F
4D87      14D87            START_CAL_INTEGRATIO_$O2O111
                        O090_CAL_CCD_MANAGER.SET_LAMP_STATES_$O2O034
4DBC      14DBC   34       $ISECT$                    F  F  RR I  F
4DBC      14DBC            SET_LAMP_STATES_$O2O112
                        O091_CAL_CCD_EXPOSURE.CAL_CONSTRAIN_EXPOSU_$O2P02X
4DF0      14DF0   23       $ISECT$                    F  F  RR I  F
4DF0      14DF0            CAL_CONSTRAIN_EXPOSU_$O2P105
                        O091_CAL_CCD_EXPOSURE.GET_CAL_OPT_EXP_TIME_$O2P02Y
4E13      14E13    D       $ISECT$                    F  F  RR I  F
4E13      14E13            GET_CAL_OPT_EXP_TIME_$O2P106
                        O091_CAL_CCD_EXPOSURE.STORE_CAL_EXPOSE_TIM_$O2P02Z
4E20      14E20    A       $ISECT$                    F  F  RR I  F
4E20      14E20            STORE_CAL_EXPOSE_TIM_$O2P107
                        O092_CAL_CCD_MEAS_SPEC.GET_CAL_CCD_SPEC_$O2Q02Y
4E2A      14E2A   57       $ISECT$                    F  F  RR I  F
4E2A      14E2A            GET_CAL_CCD_SPEC_$O2Q106
                        O093_CAL_CCD_INDEX_TABLE.GET_CAL_CCD_INDEX_$O2R02X
4E81      14E81   22       $ISECT$                    F  F  RR I  F
4E81      14E81            GET_CAL_CCD_INDEX_$O2R105
                        O094_CAL_IR_SPEC.GET_CAL_IR_SPEC_$O2S02Y
4EA3      14EA3   6D       $ISECT$                    F  F  RR I  F
4EA3      14EA3            GET_CAL_IR_SPEC_$O2S106
                        O095_CAL_IR_MANAGER.CAL_IR_INIT_$O2T02W
4F10      14F10   3A       $ISECT$                    F  F  RR I  F
4F10      14F10            CAL_IR_INIT_$O2T104
                        O095_CAL_IR_MANAGER.CHECK_READOUT_SPACE_$O2T02X
4F4A      14F4A   15       $ISECT$                    F  F  RR I  F
4F4A      14F4A            CHECK_READOUT_SPACE_$O2T105
                        O095_CAL_IR_MANAGER.DO_IR_SELF_CAL_$O2T02Y
4F5F      14F5F   28       $ISECT$                    F  F  RR I  F
4F5F      14F5F            DO_IR_SELF_CAL_$O2T106
                        O095_CAL_IR_MANAGER.START_IR_COLLECTION_$O2T02Z
4F87      14F87   3F       $ISECT$                    F  F  RR I  F
4F87      14F87            START_IR_COLLECTION_$O2T107
                        O095_CAL_IR_MANAGER.CHECK_IR_END_$O2T030
4FC6      14FC6   3A       $ISECT$                    F  F  RR I  F
5000      15000   62
4FC6      14FC6            CHECK_IR_END_$O2T108
                        O095_CAL_IR_MANAGER.END_CAL_IR_$O2T031
5062      15062   15       $ISECT$                    F  F  RR I  F
5062      15062            END_CAL_IR_$O2T109
                        O095_CAL_IR_MANAGER.SETUP_IR_$O2T032
5077      15077   57       $ISECT$                    F  F  RR I  F
5077      15077            SETUP_IR_$O2T110
                        O095_CAL_IR_MANAGER.PICK_NEXT_IR_$O2T033
50CE      150CE   69       $ISECT$                    F  F  RR I  F
50CE      150CE            PICK_NEXT_IR_$O2T111
                        O095_CAL_IR_MANAGER.START_ONE_IR_$O2T034
5137      15137   3E       $ISECT$                    F  F  RR I  F
5137      15137            START_ONE_IR_$O2T112
                        O095_CAL_IR_MANAGER.SET_LAMP_STATES_$O2T035
5175      15175   22       $ISECT$                    F  F  RR I  F
5175      15175            SET_LAMP_STATES_$O2T113
                        O096_CAL_IR_EXPOSURE.STORE_CAL_SAMPLE_TIM_$O2U02X
5197      15197    6       $ISECT$                    F  F  RR I  F
5197      15197            STORE_CAL_SAMPLE_TIM_$O2U105
                        O096_CAL_IR_EXPOSURE.GET_CAL_SAMPLE_TIME_$O2U02Y
519D      1519D    D       $ISECT$                    F  F  RR I  F
519D      1519D            GET_CAL_SAMPLE_TIME_$O2U106
                        O097_CAL_VIOLET_MANAGER.INIT_CAL_VIOLET_$O2V02W
51AA      151AA   3C       $ISECT$                    F  F  RR I  F
51AA      151AA            INIT_CAL_VIOLET_$O2V104
                        O097_CAL_VIOLET_MANAGER.START_ONE_VIOLET_$O2V02X
51E6      151E6   31       $ISECT$                    F  F  RR I  F
51E6      151E6            START_ONE_VIOLET_$O2V105
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                                O097_CAL_VIOLET_MANAGER.DO_VIOLET_COLLECTION_$O2V02Y
5217       15217   71             $ISECT$                          F  F  RR I  F
5217       15217                      DO_VIOLET_COLLECTION_$O2V106
                                O097_CAL_VIOLET_MANAGER.CHECK_END_VIOLET_$O2V02Z
5288       15288   3E             $ISECT$                          F  F  RR I  F
5288       15288                      CHECK_END_VIOLET_$O2V107
                                O097_CAL_VIOLET_MANAGER.SET_LAMP_STATES_$O2V030
52C6       152C6   22             $ISECT$                          F  F  RR I  F
52C6       152C6                      SET_LAMP_STATES_$O2V108
                                O097_CAL_VIOLET_MANAGER.PICK_NEXT_VIOLET_$O2V031
52E8       152E8   50             $ISECT$                          F  F  RR I  F
52E8       152E8                      PICK_NEXT_VIOLET_$O2V109
                                O097_CAL_VIOLET_MANAGER.END_CAL_VIOLET_$O2V032
5338       15338   15             $ISECT$                          F  F  RR I  F
5338       15338                      END_CAL_VIOLET_$O2V110
                                O098_CAL_VIOLET_SPEC.GET_CAL_VIOLET_SPEC_$O2W02Y
534D       1534D   31             $ISECT$                          F  F  RR I  F
534D       1534D                      GET_CAL_VIOLET_SPEC_$O2W106
                                O099_CAL_IR_INDEX_TABLE.GET_CAL_IR_INDEX_$O2X02X
537E       1537E   21             $ISECT$                          F  F  RR I  F
537E       1537E                      GET_CAL_IR_INDEX_$O2X105
                                O100_OPERATING_MODE.START_NEW_MODE_$O1002W
539F       1539F   28             $ISECT$                          F  F  RR I  F
539F       1539F                      START_NEW_MODE_$O10104
                                O100_OPERATING_MODE.STORE_NEW_MODE_$O1002X
53C7       153C7   44             $ISECT$                          F  F  RR I  F
53C7       153C7                      STORE_NEW_MODE_$O10105
                                O100_OPERATING_MODE.CURRENT_MODE_$O1002Y
540B       1540B    3             $ISECT$                          F  F  RR I  F
540B       1540B                      CURRENT_MODE_$O10106
                                O100_OPERATING_MODE.REPORT_PENDING_MODE_$O1002Z
540E       1540E   10             $ISECT$                          F  F  RR I  F
540E       1540E                      REPORT_PENDING_MODE_$O10107
                                O100_OPERATING_MODE.RECORD_WAITING_STATE_$O10030
541E       1541E    5             $ISECT$                          F  F  RR I  F
541E       1541E                      RECORD_WAITING_STATE_$O10108
                                O100_OPERATING_MODE.FINISH_MODE_CHANGE_$O10031
5423       15423   56             $ISECT$                          F  F  RR I  F
5423       15423                      FINISH_MODE_CHANGE_$O10109
                                O100_OPERATING_MODE.SET_LAMP_STATE_$O10032
5479       15479   1E             $ISECT$                          F  F  RR I  F
5479       15479                      SET_LAMP_STATE_$O10110
                                O100_OPERATING_MODE.DO_EEPROM_PATCHES_$O10033
5497       15497   16             $ISECT$                          F  F  RR I  F
5497       15497                      DO_EEPROM_PATCHES_$O10111
                                O122_EEPROM_DATA_SET.SEND_EEPROM_DATA_SET_$O1202X
54AD       154AD   3B             $ISECT$                          F  F  RR I  F
54AD       154AD                      SEND_EEPROM_DATA_SET_$O12105
                                O122_EEPROM_DATA_SET.RECORD_BAD_EEPROM_$O1202Y
54E8       154E8   12             $ISECT$                          F  F  RR I  F
54E8       154E8                      RECORD_BAD_EEPROM_$O12106
                                O123_PATCH_DATA.REFORMAT_PATCH_$O1302W
54FA       154FA   BE             $ISECT$                          F  F  RR I  F
54FA       154FA                      REFORMAT_PATCH_$O13104
                                O123_PATCH_DATA.WRITE_BLOCK_$O1302X
55B8       155B8   35             $ISECT$                          F  F  RR I  F
55B8       155B8                      WRITE_BLOCK_$O13105
                                O123_PATCH_DATA.CHECK_BLOCK_$O1302Y
55ED       155ED   8D             $ISECT$                          F  F  RR I  F
55ED       155ED                      CHECK_BLOCK_$O13106
                                O124_EEPROM_PATCH.MAKE_EEPROM_PATCHES_$O1402X
567A       1567A   EF             $ISECT$                          F  F  RR I  F
567A       1567A                      MAKE_EEPROM_PATCHES_$O14105
                                O124_EEPROM_PATCH.CHECK_LINKED_PATCHES_$O1402Y
5769       15769   60             $ISECT$                          F  F  RR I  F
5769       15769                      CHECK_LINKED_PATCHES_$O14106
                                O124_EEPROM_PATCH.CONVERT_BYTES_TO_PAT_$O1402Z
57C9       157C9   10             $ISECT$                          F  F  RR I  F
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57C9        157C9                 CONVERT_BYTES_TO_PAT_$O14107
                           O125_EEPROM_USAGE.GET_USAGE_BLOCK_$O1502W
57D9        157D9     D       $ISECT$                   F  F  RR I  F
57D9        157D9                 GET_USAGE_BLOCK_$O15104
                           O125_EEPROM_USAGE.SAVE_USAGE_BLOCK_$O1502X
57E6        157E6    16       $ISECT$                   F  F  RR I  F
57E6        157E6                 SAVE_USAGE_BLOCK_$O15105
                           O125_EEPROM_USAGE.INCR_USAGE_CNT_$O1502Y
57FC        157FC    16       $ISECT$                   F  F  RR I  F
57FC        157FC                 INCR_USAGE_CNT_$O15106
                           O131_ANGLE_LIB.ADD_ANGLE_$O1702V
5812        15812    1F       $ISECT$                   F  F  RR I  F
5812        15812                 ADD_ANGLE_$O17103
                           O131_ANGLE_LIB.SUBT_ANGLE_$O1702W
5831        15831    1F       $ISECT$                   F  F  RR I  F
5831        15831                 SUBT_ANGLE_$O17104
                           O132_SQRT.SQRT_$O1802V
5850        15850    40       $ISECT$                   F  F  RR I  F
5850        15850                 SQRT_$O18103
                           O180_PACKET_MANAGER.DETERMINE_TLM_SPACE_$O1902W
5890        15890    69       $ISECT$                   F  F  RR I  F
5890        15890                 DETERMINE_TLM_SPACE_$O19104
                           O180_PACKET_MANAGER.WAIT_TLM_SPACE_$O1902X
58F9        158F9    6E       $ISECT$                   F  F  RR I  F
58F9        158F9                 WAIT_TLM_SPACE_$O19105
                           O180_PACKET_MANAGER.DATA_SET_PACKAGED_$O1902Y
5967        15967    76       $ISECT$                   F  F  RR I  F
5967        15967                 DATA_SET_PACKAGED_$O19106
                           O180_PACKET_MANAGER.SETUP_PENDING_TLM_$O1902Z
59DD        159DD    3E       $ISECT$                   F  F  RR I  F
59DD        159DD                 SETUP_PENDING_TLM_$O19107
                           O180_PACKET_MANAGER.PACK_DATA_IN_PACKETS_$O19030
5A1B        15A1B   1B4       $ISECT$                   F  F  RR I  F
5A1B        15A1B                 PACK_DATA_IN_PACKETS_$O19108
                           O181_TLM_QUEUE_CONTROL.ADD_TLM_QUEUE_$O2Y02X
5BCF        15BCF    AD       $ISECT$                   F  F  RR I  F
5BCF        15BCF                 ADD_TLM_QUEUE_$O2Y105
                           O181_TLM_QUEUE_CONTROL.GET_NEXT_PACKET_$O2Y02Y
5C7C        15C7C    D2       $ISECT$                   F  F  RR I  F
5C7C        15C7C                 GET_NEXT_PACKET_$O2Y106
                           O181_TLM_QUEUE_CONTROL.UPDATE_PACKET_SENT_$O2Y02Z
5D4E        15D4E    5C       $ISECT$                   F  F  RR I  F
5D4E        15D4E                 UPDATE_PACKET_SENT_$O2Y107
                           O181_TLM_QUEUE_CONTROL.REBUILD_TLM_LINKS_$O2Y031
5DAA        15DAA    C4       $ISECT$                   F  F  RR I  F
5DAA        15DAA                 REBUILD_TLM_LINKS_$O2Y109
                           O181_TLM_QUEUE_CONTROL.INIT_USED_PKT_LISTS_$O2Y030
5E6E        15E6E    18       $ISECT$                   F  F  RR I  F
5E6E        15E6E                 INIT_USED_PKT_LISTS_$O2Y108
                           O181_TLM_QUEUE_CONTROL.PICK_SMALLER_QUEUE_$O2Y032
5E86        15E86    34       $ISECT$                   F  F  RR I  F
5E86        15E86                 PICK_SMALLER_QUEUE_$O2Y110
                           O181_TLM_QUEUE_CONTROL.REPORT_LESSER_PKT_CN_$O2Y033
5EBA        15EBA    44       $ISECT$                   F  F  RR I  F
5EBA        15EBA                 REPORT_LESSER_PKT_CN_$O2Y111
                           O182_DATA_SET_HEADER.GENERATE_DATA_SET_HE_$O2Z02W
5EFE        15EFE    26       $ISECT$                   F  F  RR I  F
5EFE        15EFE                 GENERATE_DATA_SET_HE_$O2Z104
                           O183_FREE_PACKET_CONTROL.REMOVE_FREE_PACKET_$O3A02W
5F24        15F24    4C       $ISECT$                   F  F  RR I  F
5F24        15F24                 REMOVE_FREE_PACKET_$O3A104
                           O183_FREE_PACKET_CONTROL.ADD_FREE_PACKET_$O3A02X
5F70        15F70    5B       $ISECT$                   F  F  RR I  F
5F70        15F70                 ADD_FREE_PACKET_$O3A105
                           O183_FREE_PACKET_CONTROL.REPORT_FREE_PACKETS_$O3A02Y
5FCB        15FCB     C       $ISECT$                   F  F  RR I  F
5FCB        15FCB                 REPORT_FREE_PACKETS_$O3A106
                           O183_FREE_PACKET_CONTROL.INIT_FREE_PKT_LIST_$O3A02Z
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5FD7       15FD7   29        $ISECT$                  F  F  RR I  F
6000       16000   25
5FD7       15FD7                 INIT_FREE_PKT_LIST_$O3A107
                           O183_FREE_PACKET_CONTROL.STORE_PKTS_NEEDED_$O3A030
6025       16025    5        $ISECT$                  F  F  RR I  F
6025       16025                 STORE_PKTS_NEEDED_$O3A108
                           O184_PARTIAL_PACKET.GET_PARTIAL_PACKET_$O3B02Y
602A       1602A   1C        $ISECT$                  F  F  RR I  F
602A       1602A                 GET_PARTIAL_PACKET_$O3B106
                           O184_PARTIAL_PACKET.STORE_PARTIAL_PACKET_$O3B02Z
6046       16046   12        $ISECT$                  F  F  RR I  F
6046       16046                 STORE_PARTIAL_PACKET_$O3B107
                           O184_PARTIAL_PACKET.FLUSH_PARTIAL_PACKET_$O3B030
6058       16058   4C        $ISECT$                  F  F  RR I  F
6058       16058                 FLUSH_PARTIAL_PACKET_$O3B108
                           O185_TLM_CHANNEL_MANAGER.SETUP_NEXT_TLM_$O3C02Z
60A4       160A4   6B        $ISECT$                  F  F  RR I  F
60A4       160A4                 SETUP_NEXT_TLM_$O3C107
                           O185_TLM_CHANNEL_MANAGER.FINISH_AND_SEND_PKT_$O3C032
610F       1610F   72        $ISECT$                  F  F  RR I  F
610F       1610F                 FINISH_AND_SEND_PKT_$O3C110
                           O185_TLM_CHANNEL_MANAGER.INIT_PROBE_TLM_$O3C030
6181       16181   39        $ISECT$                  F  F  RR I  F
6181       16181                 INIT_PROBE_TLM_$O3C108
                           O185_TLM_CHANNEL_MANAGER.CHECK_CHAN_IN_USE_$O3C031
61BA       161BA   3E        $ISECT$                  F  F  RR I  F
61BA       161BA                 CHECK_CHAN_IN_USE_$O3C109
                           O185_TLM_CHANNEL_MANAGER.SET_CHAN_OP_STATE_$O3C033
61F8       161F8   11        $ISECT$                  F  F  RR I  F
61F8       161F8                 SET_CHAN_OP_STATE_$O3C111
                           O185_TLM_CHANNEL_MANAGER.CURRENT_CHAN_OP_STAT_$O3C034
6209       16209    8        $ISECT$                  F  F  RR I  F
6209       16209                 CURRENT_CHAN_OP_STAT_$O3C112
                           O186_PREDICTED_TLM_RATES.PREDICT_TLM_EMPTY_TI_$O3D02X
6211       16211   34        $ISECT$                  F  F  RR I  F
6211       16211                 PREDICT_TLM_EMPTY_TI_$O3D105
                           O186_PREDICTED_TLM_RATES.GET_PREDICTED_RATE_$O3D02Y
6245       16245   26        $ISECT$                  F  F  RR I  F
6245       16245                 GET_PREDICTED_RATE_$O3D106
                           O187_TLM_QUEUE.INIT_TLM_PTR_$O3E02Y
626B       1626B    7        $ISECT$                  F  F  RR I  F
626B       1626B                 INIT_TLM_PTR_$O3E106
                           O187_TLM_QUEUE.MAP_TLM_NDX_$O3E02Z
6272       16272   35        $ISECT$                  F  F  RR I  F
6272       16272                 MAP_TLM_NDX_$O3E107
                           O188_PENDING_TLM_REQUESTS.ADD_TLM_REQ_$O3F02Y
62A7       162A7   E7        $ISECT$                  F  F  RR I  F
62A7       162A7                 ADD_TLM_REQ_$O3F106
                           O188_PENDING_TLM_REQUESTS.PENDING_TLM_$O3F02Z
638E       1638E    9        $ISECT$                  F  F  RR I  F
638E       1638E                 PENDING_TLM_$O3F107
                           O188_PENDING_TLM_REQUESTS.REMOVE_PENDING_$O3F030
6397       16397   48        $ISECT$                  F  F  RR I  F
6397       16397                 REMOVE_PENDING_$O3F108
                           O190_MESSAGE.MESSAGE_SENT_$O3G02W
63DF       163DF   45        $ISECT$                  F  F  RR I  F
63DF       163DF                 MESSAGE_SENT_$O3G104
                           O190_MESSAGE.SAVE_MESSAGE_$O3G02X
6424       16424   52        $ISECT$                  F  F  RR I  F
6424       16424                 SAVE_MESSAGE_$O3G105
                           O191_MESSAGE_DATA_SET.GENERATE_MESSAGE_DAT_$O3H02W
6476       16476   3C        $ISECT$                  F  F  RR I  F
6476       16476                 GENERATE_MESSAGE_DAT_$O3H104
                           O191_MESSAGE_DATA_SET.MESSAGE_PACKAGED_$O3H02X
64B2       164B2    8        $ISECT$                  F  F  RR I  F
64B2       164B2                 MESSAGE_PACKAGED_$O3H105
                           O200_CCD.START_CCD_INT_$O20037
64BA       164BA   97        $ISECT$                  F  F  RR I  F
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64BA      164BA             START_CCD_INT_$O20115
                         O200_CCD.CCD_TIMEOUT_$O20038
6551      16551   55       $ISECT$                    F  F  RR I  F
6551      16551             CCD_TIMEOUT_$O20116
                         O200_CCD.READOUT_TIME_$O20039
65A6      165A6   12       $ISECT$                    F  F  RR I  F
65A6      165A6             READOUT_TIME_$O20117
                         O201_CCD_DATA_BUFFER.REPORT_FREE_BUFFERS_$O21030
65B8      165B8   25       $ISECT$                    F  F  RR I  F
65B8      165B8             REPORT_FREE_BUFFERS_$O21108
                         O201_CCD_DATA_BUFFER.RELEASE_BUFFER_$O21031
65DD      165DD   35       $ISECT$                    F  F  RR I  F
65DD      165DD             RELEASE_BUFFER_$O21109
                         O201_CCD_DATA_BUFFER.GET_BUFFER_$O21032
6612      16612   43       $ISECT$                    F  F  RR I  F
6612      16612             GET_BUFFER_$O21110
                         O210_PROBE_INPUT_BUFFER.REPORT_BUFFER_$O2202Y
6655      16655   4E       $ISECT$                    F  F  RR I  F
6655      16655             REPORT_BUFFER_$O22106
                         O210_PROBE_INPUT_BUFFER.START_TIMER_$O22031
66A3      166A3    C       $ISECT$                    F  F  RR I  F
66A3      166A3             START_TIMER_$O22109
                         O210_PROBE_INPUT_BUFFER.RELEASE_BUFFER_$O2202Z
66AF      166AF    9       $ISECT$                    F  F  RR I  F
66AF      166AF             RELEASE_BUFFER_$O22107
                         O210_PROBE_INPUT_BUFFER.TIMEOUT_$O22030
66B8      166B8   14       $ISECT$                    F  F  RR I  F
66B8      166B8             TIMEOUT_$O22108
                         O213_PROBE_CMD_REG.DETERMINE_INITIAL_CH_$O2302W
66CC      166CC   12       $ISECT$                    F  F  RR I  F
66CC      166CC             DETERMINE_INITIAL_CH_$O23104
                         O213_PROBE_CMD_REG.CURRENT_PROC_VALID_$O2302Z
66DE      166DE   13       $ISECT$                    F  F  RR I  F
66DE      166DE             CURRENT_PROC_VALID_$O23107
                         O213_PROBE_CMD_REG.SWITCH_SIDES_$O2302X
66F1      166F1   43       $ISECT$                    F  F  RR I  F
66F1      166F1             SWITCH_SIDES_$O23105
                         O213_PROBE_CMD_REG.SET_XFER_STATE_$O2302Y
6734      16734   1A       $ISECT$                    F  F  RR I  F
6734      16734             SET_XFER_STATE_$O23106
                         O217_TM_REFRESHER.REFRESH_BUFFER_$O2402V
674E      1674E   37       $ISECT$                    F  F  RR I  F
674E      1674E             REFRESH_BUFFER_$O24103
                         O218_TM_DMAS.START_TM_DMA_$O25030
6785      16785   B1       $ISECT$                    F  F  RR I  F
6785      16785             START_TM_DMA_$O25108
                         O218_TM_DMAS.TM_TIMEOUT_$O25031
6836      16836   26       $ISECT$                    F  F  RR I  F
6836      16836             TM_TIMEOUT_$O25109
                         O218_TM_DMAS.CHECK_STATUS_$O25032
685C      1685C   6B       $ISECT$                    F  F  RR I  F
685C      1685C             CHECK_STATUS_$O25110
                         O218_TM_DMAS.TRY_AGAIN_$O25033
68C7      168C7   4A       $ISECT$                    F  F  RR I  F
68C7      168C7             TRY_AGAIN_$O25111
                         O218_TM_DMAS.TM_INIT_$O25034
6911      16911   14       $ISECT$                    F  F  RR I  F
6911      16911             TM_INIT_$O25112
                         O230_DCS.INITIALIZE_DCS_$O2703B
6925      16925   10       $ISECT$                    F  F  RR I  F
6925      16925             INITIALIZE_DCS_$O27119
                         O230_DCS.LOAD_IMAGE_DATA_$O2703C
6935      16935   1A       $ISECT$                    F  F  RR I  F
6935      16935             LOAD_IMAGE_DATA_$O27120
                         O230_DCS.START_COMPRESSION_$O2703D
694F      1694F   50       $ISECT$                    F  F  RR I  F
694F      1694F             START_COMPRESSION_$O27121
                         O230_DCS.RETRIEVE_COMP_DATA_$O2703E
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699F        1699F   50         $ISECT$                    F  F  RR I  F
699F        1699F                  RETRIEVE_COMP_DATA_$O27122
                            O230_DCS.RELEASE_BUFFER_$O2703F
69EF        169EF    D         $ISECT$                    F  F  RR I  F
69EF        169EF                  RELEASE_BUFFER_$O27123
                            O230_DCS.WAIT_AGAIN_$O2703G
69FC        169FC   2A         $ISECT$                    F  F  RR I  F
69FC        169FC                  WAIT_AGAIN_$O27124
                            O230_DCS.CHECK_STATUS_$O2703H
6A26        16A26   79         $ISECT$                    F  F  RR I  F
6A26        16A26                  CHECK_STATUS_$O27125
                            O240_SUN_SENSOR.PULSE_WIDTH_IS_VALID_$O2802Y
6A9F        16A9F   18         $ISECT$                    F  F  RR I  F
6A9F        16A9F                  PULSE_WIDTH_IS_VALID_$O28106
                            O240_SUN_SENSOR.PULSE_GAP_IS_VALID_$O2802Z
6AB7        16AB7   18         $ISECT$                    F  F  RR I  F
6AB7        16AB7                  PULSE_GAP_IS_VALID_$O28107
                            O240_SUN_SENSOR.INTERPULSE_RATIO_IS__$O28030
6ACF        16ACF   1C         $ISECT$                    F  F  RR I  F
6ACF        16ACF                  INTERPULSE_RATIO_IS__$O28108
                            O240_SUN_SENSOR.INIT_SUN_PROC_$O28031
6AEB        16AEB   41         $ISECT$                    F  F  RR I  F
6AEB        16AEB                  INIT_SUN_PROC_$O28109
                            O240_SUN_SENSOR.START_SEARCH_$O28032
6B2C        16B2C   50         $ISECT$                    F  F  RR I  F
6B2C        16B2C                  START_SEARCH_$O28110
                            O240_SUN_SENSOR.START_DETECTION_$O28033
6B7C        16B7C   5C         $ISECT$                    F  F  RR I  F
6B7C        16B7C                  START_DETECTION_$O28111
                            O240_SUN_SENSOR.SEARCH_FOR_LOCK_$O28034
6BD8        16BD8   1F         $ISECT$                    F  F  RR I  F
6BD8        16BD8                  SEARCH_FOR_LOCK_$O28112
                            O240_SUN_SENSOR.ACQUIRE_PULSE_DATA_$O28039
6BF7        16BF7   67         $ISECT$                    F  F  RR I  F
6BF7        16BF7                  ACQUIRE_PULSE_DATA_$O28117
                            O240_SUN_SENSOR.TRIPLET_IS_VALID_$O2803A
6C5E        16C5E   6D         $ISECT$                    F  F  RR I  F
6C5E        16C5E                  TRIPLET_IS_VALID_$O28118
                            O240_SUN_SENSOR.STARTING_LOCKED_MODE_$O28035
6CCB        16CCB   2F         $ISECT$                    F  F  RR I  F
6CCB        16CCB                  STARTING_LOCKED_MODE_$O28113
                            O240_SUN_SENSOR.PROCESS_A_TRIPLET_$O2803B
6CFA        16CFA   59         $ISECT$                    F  F  RR I  F
6CFA        16CFA                  PROCESS_A_TRIPLET_$O28119
                            O240_SUN_SENSOR.LOCKED_TO_SIGNAL_$O28036
6D53        16D53   37         $ISECT$                    F  F  RR I  F
6D53        16D53                  LOCKED_TO_SIGNAL_$O28114
                            O240_SUN_SENSOR.CENTER_PULSE_IS_VALI_$O2803D
6D8A        16D8A   4A         $ISECT$                    F  F  RR I  F
6D8A        16D8A                  CENTER_PULSE_IS_VALI_$O28121
                            O240_SUN_SENSOR.SIGNAL_LOST_$O28037
6DD4        16DD4   26         $ISECT$                    F  F  RR I  F
6DD4        16DD4                  SIGNAL_LOST_$O28115
                            O240_SUN_SENSOR.INTRAPULSE_RATIO_IS__$O28038
6DFA        16DFA   17         $ISECT$                    F  F  RR I  F
6DFA        16DFA                  INTRAPULSE_RATIO_IS__$O28116
                            O240_SUN_SENSOR.INTERPULSE_RATIO_IS__$O2803C
6E11        16E11   17         $ISECT$                    F  F  RR I  F
6E11        16E11                  INTERPULSE_RATIO_IS__$O28120
                            O240_SUN_SENSOR.SEARCH_FOR_MAX_$O2803E
6E28        16E28   33         $ISECT$                    F  F  RR I  F
6E28        16E28                  SEARCH_FOR_MAX_$O28122
                            O241_SUN_DATA_SET.ADD_TO_DATA_SET_$O2902W
6E5B        16E5B   2E         $ISECT$                    F  F  RR I  F
6E5B        16E5B                  ADD_TO_DATA_SET_$O29104
                            O241_SUN_DATA_SET.SEND_DATA_SET_$O2902X
6E89        16E89   60         $ISECT$                    F  F  RR I  F
6E89        16E89                  SEND_DATA_SET_$O29105
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                             O250_WATCHDOG.SET_TIMER_$O3J02Y
6EE9      16EE9     9           $ISECT$                   F  F  RR I  F
6EE9      16EE9                     SET_TIMER_$O3J106
                             O250_WATCHDOG.NEW_MODE_$O3J02Z
6EF2      16EF2    2C           $ISECT$                   F  F  RR I  F
6EF2      16EF2                     NEW_MODE_$O3J107
                             O251_PROM_POWER.SET_PROM_POWER_$O3K02X
6F1E      16F1E     E           $ISECT$                   F  F  RR I  F
6F1E      16F1E                     SET_PROM_POWER_$O3K105
                             O260_SHUTTER_TESTER.PERFORMING_IR_SELF_C_$O3L02W
6F2C      16F2C     C           $ISECT$                   F  F  RR I  F
6F2C      16F2C                     PERFORMING_IR_SELF_C_$O3L104
                             O260_SHUTTER_TESTER.COLLECTING_DATA_$O3L02X
6F38      16F38    32           $ISECT$                   F  F  RR I  F
6F38      16F38                     COLLECTING_DATA_$O3L105
                             O260_SHUTTER_TESTER.REDUCING_DATA_$O3L02Y
6F6A      16F6A    96           $ISECT$                   F  F  RR I  F
7000      17000    13
6F6A      16F6A                     REDUCING_DATA_$O3L106
                             O260_SHUTTER_TESTER.FINISHING_TEST_$O3L02Z
7013      17013     C           $ISECT$                   F  F  RR I  F
7013      17013                     FINISHING_TEST_$O3L107
                             O260_SHUTTER_TESTER.START_TEST_$O3L030
701F      1701F    18           $ISECT$                   F  F  RR I  F
701F      1701F                     START_TEST_$O3L108
                             O260_SHUTTER_TESTER.SINGLE_TEST_DONE_$O3L031
7037      17037    17           $ISECT$                   F  F  RR I  F
7037      17037                     SINGLE_TEST_DONE_$O3L109
                             O261_DCS_TESTER.START_DCS_SELF_TEST_$O3M02X
704E      1704E    34           $ISECT$                   F  F  RR I  F
704E      1704E                     START_DCS_SELF_TEST_$O3M105
                             O261_DCS_TESTER.START_DCS_SW_TEST_$O3M02Y
7082      17082    15           $ISECT$                   F  F  RR I  F
7082      17082                     START_DCS_SW_TEST_$O3M106
                             O261_DCS_TESTER.FINISH_DCS_TEST_$O3M02Z
7097      17097    2F           $ISECT$                   F  F  RR I  F
7097      17097                     FINISH_DCS_TEST_$O3M107
                             O261_DCS_TESTER.SEND_TM_$O3M035
70C6      170C6    31           $ISECT$                   F  F  RR I  F
70C6      170C6                     SEND_TM_$O3M113
                             O261_DCS_TESTER.TM_DONE_$O3M030
70F7      170F7    10           $ISECT$                   F  F  RR I  F
70F7      170F7                     TM_DONE_$O3M108
                             O261_DCS_TESTER.SELF_TEST_DCS_ACCESS_$O3M031
7107      17107     C           $ISECT$                   F  F  RR I  F
7107      17107                     SELF_TEST_DCS_ACCESS_$O3M109
                             O261_DCS_TESTER.SW_TEST_DCS_ACCESS_$O3M032
7113      17113    1E           $ISECT$                   F  F  RR I  F
7113      17113                     SW_TEST_DCS_ACCESS_$O3M110
                             O261_DCS_TESTER.LOAD_TEST_IMAGE_$O3M034
7131      17131    AB           $ISECT$                   F  F  RR I  F
7131      17131                     LOAD_TEST_IMAGE_$O3M112
                             O261_DCS_TESTER.NO_DCS_ACCESS_$O3M033
71DC      171DC    17           $ISECT$                   F  F  RR I  F
71DC      171DC                     NO_DCS_ACCESS_$O3M111
                             O262_HEATER_TESTER.START_TESTS_$O3N02W
71F3      171F3    2C           $ISECT$                   F  F  RR I  F
71F3      171F3                     START_TESTS_$O3N104
                             O262_HEATER_TESTER.START_A_TEST_$O3N02X
721F      1721F    39           $ISECT$                   F  F  RR I  F
721F      1721F                     START_A_TEST_$O3N105
                             O262_HEATER_TESTER.RECORD_A_TEMP_$O3N02Y
7258      17258    2D           $ISECT$                   F  F  RR I  F
7258      17258                     RECORD_A_TEMP_$O3N106
                             O262_HEATER_TESTER.COMPLETE_A_TEST_$O3N02Z
7285      17285    1B           $ISECT$                   F  F  RR I  F
7285      17285                     COMPLETE_A_TEST_$O3N107
                             O262_HEATER_TESTER.COMPLETE_ALL_TESTS_$O3N030
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72A0      172A0    C       $ISECT$                     F  F  RR I  F
72A0      172A0                COMPLETE_ALL_TESTS_$O3N108
                          O262_HEATER_TESTER.PACKAGE_DATA_$O3N031
72AC      172AC   3A       $ISECT$                     F  F  RR I  F
72AC      172AC                PACKAGE_DATA_$O3N109
                          O263_CAL_LAMP_TESTER.START_A_TEST_$O3O02W
72E6      172E6   29       $ISECT$                     F  F  RR I  F
72E6      172E6                START_A_TEST_$O3O104
                          O263_CAL_LAMP_TESTER.COLLECTING_DATA_$O3O02X
730F      1730F   50       $ISECT$                     F  F  RR I  F
730F      1730F                COLLECTING_DATA_$O3O105
                          O263_CAL_LAMP_TESTER.DONE_TEST_$O3O02Y
735F      1735F    C       $ISECT$                     F  F  RR I  F
735F      1735F                DONE_TEST_$O3O106
                          O263_CAL_LAMP_TESTER.PACKAGE_DATA_$O3O02Z
736B      1736B   2E       $ISECT$                     F  F  RR I  F
736B      1736B                PACKAGE_DATA_$O3O107
                          O264_SURFACE_LAMP_TESTER.START_A_TEST_$O3P02Z
7399      17399   3E       $ISECT$                     F  F  RR I  F
7399      17399                START_A_TEST_$O3P107
                          O264_SURFACE_LAMP_TESTER.COLLECTING_DATA_$O3P030
73D7      173D7   24       $ISECT$                     F  F  RR I  F
73D7      173D7                COLLECTING_DATA_$O3P108
                          O264_SURFACE_LAMP_TESTER.TEST_DONE_$O3P031
73FB      173FB    C       $ISECT$                     F  F  RR I  F
73FB      173FB                TEST_DONE_$O3P109
                          O264_SURFACE_LAMP_TESTER.PACKAGE_DATA_$O3P032
7407      17407   2E       $ISECT$                     F  F  RR I  F
7407      17407                PACKAGE_DATA_$O3P110
                          O265_SUN_LAMP_TESTER.START_A_TEST_$O3Q02X
7435      17435   4F       $ISECT$                     F  F  RR I  F
7435      17435                START_A_TEST_$O3Q105
                          O265_SUN_LAMP_TESTER.TEST_DONE_$O3Q02Y
7484      17484    C       $ISECT$                     F  F  RR I  F
7484      17484                TEST_DONE_$O3Q106
                          O283_TIME_DATA_SET.ADD_TIME_PAIR_$O3X02Y
7490      17490   5A       $ISECT$                     F  F  RR I  F
7490      17490                ADD_TIME_PAIR_$O3X106
                          O290_INTERRUPT_CONTROLLER.INITIALIZE_INTERRUPT_$O3Y032
74EA      174EA   52       $ISECT$                     F  F  RR I  F
74EA      174EA                INITIALIZE_INTERRUPT_$O3Y110
                          O290_INTERRUPT_CONTROLLER.MASK_INTERRUPT_$O3Y033
753C      1753C    D       $ISECT$                     F  F  RR I  F
753C      1753C                MASK_INTERRUPT_$O3Y111
                          O290_INTERRUPT_CONTROLLER.UNMASK_INTERRUPT_$O3Y034
7549      17549    D       $ISECT$                     F  F  RR I  F
7549      17549                UNMASK_INTERRUPT_$O3Y112
                          O290_INTERRUPT_CONTROLLER.ML_INTERRUPT
7556      17556   43       $ISECT$                     F  F  RR I  F
7556      17556                ML_INTERRUPT
                          O290_INTERRUPT_CONTROLLER.BP_INTERRUPT
7599      17599   87       $ISECT$                     F  F  RR I  F
7599      17599                BP_INTERRUPT
                          O290_INTERRUPT_CONTROLLER.SS_INTERRUPT
7620      17620   34       $ISECT$                     F  F  RR I  F
7620      17620                SS_INTERRUPT
                          O290_INTERRUPT_CONTROLLER.ET_INTERRUPT
7654      17654   29       $ISECT$                     F  F  RR I  F
7654      17654                ET_INTERRUPT
                          O290_INTERRUPT_CONTROLLER.TM_A_INTERRUPT
767D      1767D   29       $ISECT$                     F  F  RR I  F
767D      1767D                TM_A_INTERRUPT
                          O290_INTERRUPT_CONTROLLER.TM_B_INTERRUPT
76A6      176A6   29       $ISECT$                     F  F  RR I  F
76A6      176A6                TM_B_INTERRUPT
                          O290_INTERRUPT_CONTROLLER.BEX0F_INTERRUPT
76CF      176CF   1A       $ISECT$                     F  F  RR I  F
76CF      176CF                BEX0F_INTERRUPT
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                                  O292_RESET_CONTROL.RESET_HARDWARE_$O4A02W
76E9        176E9   27              $ISECT$                   F  F  RR I  F
76E9        176E9                       RESET_HARDWARE_$O4A104
                                  O292_RESET_CONTROL.WATCHDOG_ENABLE_$O4A02X
7710        17710    B              $ISECT$                   F  F  RR I  F
7710        17710                       WATCHDOG_ENABLE_$O4A105
                                  O292_RESET_CONTROL.WATCHDOG_DISABLE_$O4A02Y
771B        1771B    B              $ISECT$                   F  F  RR I  F
771B        1771B                       WATCHDOG_DISABLE_$O4A106
                                  O293_DMA_CONTROL.SET_DMA_STATE_$O4B02W
7726        17726   11              $ISECT$                   F  F  RR I  F
7726        17726                       SET_DMA_STATE_$O4B104
                                  O293_DMA_CONTROL.WATCHDOG_ENABLE_$O4B02X
7737        17737    B              $ISECT$                   F  F  RR I  F
7737        17737                       WATCHDOG_ENABLE_$O4B105
                                  O293_DMA_CONTROL.WATCHDOG_DISABLE_$O4B02Y
7742        17742    B              $ISECT$                   F  F  RR I  F
7742        17742                       WATCHDOG_DISABLE_$O4B106
                                  O294_EXT_MEM_REGISTERS.MAP_EXT_MEM_$O4C02V
774D        1774D   17              $ISECT$                   F  F  RR I  F
774D        1774D                       MAP_EXT_MEM_$O4C103
                                  O301_RADIO_PROCESSOR.PROCESS_NEW_MEASUREM_$O30031
7764        17764   D6              $ISECT$                   F  F  RR I  F
7764        17764                       PROCESS_NEW_MEASUREM_$O30109
                                  O301_RADIO_PROCESSOR.SCIENCE_CONTROLLER_$O30032
783A        1783A   18              $ISECT$                   F  F  RR I  F
783A        1783A                       SCIENCE_CONTROLLER_$O30110
                                  O301_RADIO_PROCESSOR.SCIENCE_PROCESSOR_$O30033
7852        17852   1A              $ISECT$                   F  F  RR I  F
7852        17852                       SCIENCE_PROCESSOR_$O30111
                                  O301_RADIO_PROCESSOR.CCD_PROCESSING_$O30034
786C        1786C  1DD              $ISECT$                   F  F  RR I  F
786C        1786C                       CCD_PROCESSING_$O30112
                                  O301_RADIO_PROCESSOR.SUM_NULL_PIXS_$O30038
7A49        17A49   69              $ISECT$                   F  F  RR I  F
7A49        17A49                       SUM_NULL_PIXS_$O30116
                                  O301_RADIO_PROCESSOR.SET_CCD_FLAGS_$O30037
7AB2        17AB2   68              $ISECT$                   F  F  RR I  F
7AB2        17AB2                       SET_CCD_FLAGS_$O30115
                                  O301_RADIO_PROCESSOR.STRIP_ROWS_COLS_$O30039
7B1A        17B1A  100              $ISECT$                   F  F  RR I  F
7B1A        17B1A                       STRIP_ROWS_COLS_$O30117
                                  O301_RADIO_PROCESSOR.MOVE_TRANSPOSE_$O30036
7C1A        17C1A   57              $ISECT$                   F  F  RR I  F
7C1A        17C1A                       MOVE_TRANSPOSE_$O30114
                                  O301_RADIO_PROCESSOR.TLM_DATA_PACKAGED_$O30035
7C71        17C71   36              $ISECT$                   F  F  RR I  F
7C71        17C71                       TLM_DATA_PACKAGED_$O30113
                                  O305_CCD_OPTIMUM_EXPOSURE.EXCLUDE_PIXELS_$O3402Z
7CA7        17CA7   A9              $ISECT$                   F  F  RR I  F
7CA7        17CA7                       EXCLUDE_PIXELS_$O34107
                                  O305_CCD_OPTIMUM_EXPOSURE.OPT_EXPOSURE_$O34030
7D50        17D50  125              $ISECT$                   F  F  RR I  F
7D50        17D50                       OPT_EXPOSURE_$O34108
                                  O305_CCD_OPTIMUM_EXPOSURE.CLEAR_HISTGRAM_$O34031
7E75        17E75    8              $ISECT$                   F  F  RR I  F
7E75        17E75                       CLEAR_HISTGRAM_$O34109
                                  O306_IR_OPTIMUM_SAMPLING.OPT_SAMPLING_$O3502X
7E7D        17E7D   87              $ISECT$                   F  F  RR I  F
7E7D        17E7D                       OPT_SAMPLING_$O35105
                                  O306_IR_OPTIMUM_SAMPLING.SORT_VALUES_$O3502Y
7F04        17F04   4A              $ISECT$                   F  F  RR I  F
7F04        17F04                       SORT_VALUES_$O35106
                                  O308_SW_COMPRESSOR.COMPRESS_$O3602Z
7F4E        17F4E   B2              $ISECT$                   F  F  RR I  F
8000        18000   35
7F4E        17F4E                       COMPRESS_$O36107
                                  O308_SW_COMPRESSOR.GEN_FUND_SEQ_$O36030
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8035        18035  122        $ISECT$                   F  F  RR I  F
8035        18035                 GEN_FUND_SEQ_$O36108
                             O308_SW_COMPRESSOR.WRITE_ORIGINAL_DATA_$O36035
8157        18157   38        $ISECT$                   F  F  RR I  F
8157        18157                 WRITE_ORIGINAL_DATA_$O36113
                             O308_SW_COMPRESSOR.PSI_0_$O36032
818F        1818F  10F        $ISECT$                   F  F  RR I  F
818F        1818F                 PSI_0_$O36110
                             O308_SW_COMPRESSOR.PSI_1_$O36031
829E        1829E   42        $ISECT$                   F  F  RR I  F
829E        1829E                 PSI_1_$O36109
                             O308_SW_COMPRESSOR.PSI_14_$O36033
82E0        182E0  13D        $ISECT$                   F  F  RR I  F
82E0        182E0                 PSI_14_$O36111
                             O308_SW_COMPRESSOR.PSI_F_$O36034
841D        1841D   BB        $ISECT$                   F  F  RR I  F
841D        1841D                 PSI_F_$O36112
                             O309_BIT_PROCESSOR.WOR_$O3702V
84D8        184D8    B        $ISECT$                   F  F  RR I  F
84D8        184D8                 WOR_$O37103
                             O309_BIT_PROCESSOR.WAND_$O3702W
84E3        184E3    B        $ISECT$                   F  F  RR I  F
84E3        184E3                 WAND_$O37104
                             O313_IR_SET.CREATE_IR_TLM_$O38030
84EE        184EE  160        $ISECT$                   F  F  RR I  F
84EE        184EE                 CREATE_IR_TLM_$O38108
                             O314_DARK_SET.CREATE_DARK_TLM_$O3902Y
864E        1864E  144        $ISECT$                   F  F  RR I  F
864E        1864E                 CREATE_DARK_TLM_$O39106
                             O315_IMAGE_SET.CREATE_IMAGE_TLM_$O4F02Z
8792        18792  100        $ISECT$                   F  F  RR I  F
8792        18792                 CREATE_IMAGE_TLM_$O4F107
                             O315_IMAGE_SET.CREATE_RAW_IMAGE_TLM_$O4F030
8892        18892   C5        $ISECT$                   F  F  RR I  F
8892        18892                 CREATE_RAW_IMAGE_TLM_$O4F108
                             O316_STRIP_SET.CREATE_STRIP_TLM_$O4G02Y
8957        18957  176        $ISECT$                   F  F  RR I  F
8957        18957                 CREATE_STRIP_TLM_$O4G106
                             O317_SOLAR_SET.CREATE_SOLAR_TLM_$O4H02Y
8ACD        18ACD  162        $ISECT$                   F  F  RR I  F
8ACD        18ACD                 CREATE_SOLAR_TLM_$O4H106
                             O318_VISIBLE_SET.CREATE_VISIBLE_TLM_$O4I02Y
8C2F        18C2F  16A        $ISECT$                   F  F  RR I  F
8C2F        18C2F                 CREATE_VISIBLE_TLM_$O4I106
                             O318_VISIBLE_SET.CREATE_VISIBLE_EXT_T_$O4I02Z
8D99        18D99   E8        $ISECT$                   F  F  RR I  F
8D99        18D99                 CREATE_VISIBLE_EXT_T_$O4I107
                             O319_CCD_SET.CREATE_FULLCCD_TLM_$O4J02Y
8E81        18E81   AC        $ISECT$                   F  F  RR I  F
8E81        18E81                 CREATE_FULLCCD_TLM_$O4J106
                             O320_VIOLET_MEASURE.PROCESS_UV_DATA_$O4K02X
8F2D        18F2D   8F        $ISECT$                   F  F  RR I  F
8F2D        18F2D                 PROCESS_UV_DATA_$O4K105
                             O330_IR_SPECTRUM.PROCESS_IR_DATA_$O4L02Y
8FBC        18FBC   44        $ISECT$                   F  F  RR I  F
9000        19000  1C6
8FBC        18FBC                 PROCESS_IR_DATA_$O4L106
                             O340_DARK_CURRENT.PROCESS_DARK_DATA_$O4M02Z
91C6        191C6  14C        $ISECT$                   F  F  RR I  F
91C6        191C6                 PROCESS_DARK_DATA_$O4M107
                             O340_DARK_CURRENT.MARK_BAD_PIX_$O4M030
9312        19312   96        $ISECT$                   F  F  RR I  F
9312        19312                 MARK_BAD_PIX_$O4M108
                             O350_IMAGE_PIC.HW_COMP_IMAGE_$O4N033
93A8        193A8   10        $ISECT$                   F  F  RR I  F
93A8        193A8                 HW_COMP_IMAGE_$O4N111
                             O350_IMAGE_PIC.DCS_ACCESS_NOT_GRANT_$O4N034
93B8        193B8   27        $ISECT$                   F  F  RR I  F
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93B8      193B8              DCS_ACCESS_NOT_GRANT_$O4N112
                       O350_IMAGE_PIC.FILL_WITH_RAW_IMAGE_$O4N03E
93DF      193DF    ED     $ISECT$                   F  F  RR I  F
93DF      193DF              FILL_WITH_RAW_IMAGE_$O4N122
                       O350_IMAGE_PIC.HW_COMP_TLM_SENT_$O4N035
94CC      194CC    1A     $ISECT$                   F  F  RR I  F
94CC      194CC              HW_COMP_TLM_SENT_$O4N113
                       O350_IMAGE_PIC.SW_COMP_TLM_SENT_$O4N036
94E6      194E6     9     $ISECT$                   F  F  RR I  F
94E6      194E6              SW_COMP_TLM_SENT_$O4N114
                       O350_IMAGE_PIC.PREP_FOR_NEXT_IMAGE_$O4N03H
94EF      194EF    5D     $ISECT$                   F  F  RR I  F
94EF      194EF              PREP_FOR_NEXT_IMAGE_$O4N125
                       O350_IMAGE_PIC.UN_COMP_TLM_SENT_$O4N037
954C      1954C     9     $ISECT$                   F  F  RR I  F
954C      1954C              UN_COMP_TLM_SENT_$O4N115
                       O350_IMAGE_PIC.END_IMAGE_PROCESSING_$O4N038
9555      19555    29     $ISECT$                   F  F  RR I  F
9555      19555              END_IMAGE_PROCESSING_$O4N116
                       O350_IMAGE_PIC.SET_UP_DARK_CURRENT_$O4N03D
957E      1957E    6F     $ISECT$                   F  F  RR I  F
957E      1957E              SET_UP_DARK_CURRENT_$O4N121
                       O350_IMAGE_PIC.OPT_TIME_CALC_$O4N039
95ED      195ED    33     $ISECT$                   F  F  RR I  F
95ED      195ED              OPT_TIME_CALC_$O4N117
                       O350_IMAGE_PIC.COLLECT_IMAGE_$O4N03A
9620      19620    69     $ISECT$                   F  F  RR I  F
9620      19620              COLLECT_IMAGE_$O4N118
                       O350_IMAGE_PIC.HW_COMP_PREP_$O4N03B
9689      19689    FA     $ISECT$                   F  F  RR I  F
9689      19689              HW_COMP_PREP_$O4N119
                       O350_IMAGE_PIC.FRAME_RUNOUT_CORRECT_$O4N03O
9783      19783    A4     $ISECT$                   F  F  RR I  F
9783      19783              FRAME_RUNOUT_CORRECT_$O4N132
                       O350_IMAGE_PIC.SETUP_SW_COMP_$O4N03C
9827      19827    7D     $ISECT$                   F  F  RR I  F
9827      19827              SETUP_SW_COMP_$O4N120
                       O350_IMAGE_PIC.PROC_ACCORD_REQS_$O4N03F
98A4      198A4   17C     $ISECT$                   F  F  RR I  F
98A4      198A4              PROC_ACCORD_REQS_$O4N123
                       O350_IMAGE_PIC.ADJUST_SQRT_TABLE_$O4N03S
9A20      19A20   36E     $ISECT$                   F  F  RR I  F
9A20      19A20              ADJUST_SQRT_TABLE_$O4N136
                       O350_IMAGE_PIC.BAD_PIX_DETECT_$O4N03P
9D8E      19D8E     1     $ISECT$                   F  F  RR I  F
9D8E      19D8E              BAD_PIX_DETECT_$O4N133
                       O350_IMAGE_PIC.PROCESS_IMAGE_DATA_$O4N03G
9D8F      19D8F    79     $ISECT$                   F  F  RR I  F
9D8F      19D8F              PROCESS_IMAGE_DATA_$O4N124
                       O350_IMAGE_PIC.DCS_ACCESS_GRANTED_$O4N03I
9E08      19E08    A4     $ISECT$                   F  F  RR I  F
9E08      19E08              DCS_ACCESS_GRANTED_$O4N126
                       O350_IMAGE_PIC.WRITE_IMAGE_TO_DCS_$O4N03J
9EAC      19EAC    90     $ISECT$                   F  F  RR I  F
9EAC      19EAC              WRITE_IMAGE_TO_DCS_$O4N127
                       O350_IMAGE_PIC.SW_COMP_IMAGE_$O4N03K
9F3C      19F3C    79     $ISECT$                   F  F  RR I  F
9F3C      19F3C              SW_COMP_IMAGE_$O4N128
                       O350_IMAGE_PIC.GENERATE_TLM_$O4N03L
9FB5      19FB5    4B     $ISECT$                   F  F  RR I  F
A000      1A000    9B
9FB5      19FB5              GENERATE_TLM_$O4N129
                       O350_IMAGE_PIC.PICK_NEXT_IMAGE_$O4N03Q
A09B      1A09B     9     $ISECT$                   F  F  RR I  F
A09B      1A09B              PICK_NEXT_IMAGE_$O4N134
                       O350_IMAGE_PIC.PICK_NEXT_IMAGE2_$O4N03R
A0A4      1A0A4    3C     $ISECT$                   F  F  RR I  F
A0A4      1A0A4              PICK_NEXT_IMAGE2_$O4N135
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                                O359_LOOKUP_TABLE.GENERATE_TABLE_$O4P02Z
A0E0       1A0E0   46             $ISECT$                     F  F  RR I  F
A0E0       1A0E0                      GENERATE_TABLE_$O4P107
                                O360_IMAGE_STRIP.PROCESS_STRIP_DATA_$O4Q02Z
A126       1A126  1EE             $ISECT$                     F  F  RR I  F
A126       1A126                      PROCESS_STRIP_DATA_$O4Q107
                                O360_IMAGE_STRIP.MARK_BAD_PIX_$O4Q030
A314       1A314   8F             $ISECT$                     F  F  RR I  F
A314       1A314                      MARK_BAD_PIX_$O4Q108
                                O370_SOLAR_AUREOLE.PROCESS_SOLAR_DATA_$O4R02Z
A3A3       1A3A3  1B9             $ISECT$                     F  F  RR I  F
A3A3       1A3A3                      PROCESS_SOLAR_DATA_$O4R107
                                O370_SOLAR_AUREOLE.MARK_BAD_PIX_$O4R030
A55C       1A55C   91             $ISECT$                     F  F  RR I  F
A55C       1A55C                      MARK_BAD_PIX_$O4R108
                                O380_VISIBLE_SPECTRUM.PROCESS_VISIBLE_DATA_$O4S033
A5ED       1A5ED  2C9             $ISECT$                     F  F  RR I  F
A5ED       1A5ED                      PROCESS_VISIBLE_DATA_$O4S111
                                O380_VISIBLE_SPECTRUM.MARK_BAD_PIX_$O4S034
A8B6       1A8B6   87             $ISECT$                     F  F  RR I  F
A8B6       1A8B6                      MARK_BAD_PIX_$O4S112
                                O380_VISIBLE_SPECTRUM.PROCESS_VISIBLE_EXT__$O4S035
A93D       1A93D   F6             $ISECT$                     F  F  RR I  F
A93D       1A93D                      PROCESS_VISIBLE_EXT__$O4S113
                                O390_FULL_CCD.PROCESS_FULLCCD_DATA_$O4T02Z
AA33       1AA33   3A             $ISECT$                     F  F  RR I  F
AA33       1AA33                      PROCESS_FULLCCD_DATA_$O4T107
                                O390_FULL_CCD.COMPRESS_FULLCCD_PIE_$O4T030
AA6D       1AA6D   75             $ISECT$                     F  F  RR I  F
AA6D       1AA6D                      COMPRESS_FULLCCD_PIE_$O4T108
                                O390_FULL_CCD.TELEMETER_FULLCCD_PI_$O4T031
AAE2       1AAE2   9E             $ISECT$                     F  F  RR I  F
AAE2       1AAE2                      TELEMETER_FULLCCD_PI_$O4T109
                                O400_MULTIPLEXED_DEVICE.READ_MUX_$O40031
AB80       1AB80   6F             $ISECT$                     F  F  RR I  F
AB80       1AB80                      READ_MUX_$O40109
                                O404_HOUSEKEEPING_DATA_SET.GENERATE_HK_DATA_SET_$O4102Y
ABEF       1ABEF   BC             $ISECT$                     F  F  RR I  F
ABEF       1ABEF                      GENERATE_HK_DATA_SET_$O41106
                                O404_HOUSEKEEPING_DATA_SET.NEW_MODE_$O4102Z
ACAB       1ACAB   39             $ISECT$                     F  F  RR I  F
ACAB       1ACAB                      NEW_MODE_$O41107
                                O410_IR_INTERFACE.SELF_CALIBRATING_$O42031
ACE4       1ACE4   2F             $ISECT$                     F  F  RR I  F
ACE4       1ACE4                      SELF_CALIBRATING_$O42109
                                O410_IR_INTERFACE.READY_TO_START_$O42032
AD13       1AD13    C             $ISECT$                     F  F  RR I  F
AD13       1AD13                      READY_TO_START_$O42110
                                O410_IR_INTERFACE.GENERATING_SEQUENCE_$O42033
AD1F       1AD1F  18D             $ISECT$                     F  F  RR I  F
AD1F       1AD1F                      GENERATING_SEQUENCE_$O42111
                                O410_IR_INTERFACE.GEN_SHUTTER_TEST_SEQ_$O42037
AEAC       1AEAC   5E             $ISECT$                     F  F  RR I  F
AEAC       1AEAC                      GEN_SHUTTER_TEST_SEQ_$O42115
                                O410_IR_INTERFACE.GEN_CMD_SEQ_$O42036
AF0A       1AF0A   F6             $ISECT$                     F  F  RR I  F
B000       1B000  291
AF0A       1AF0A                      GEN_CMD_SEQ_$O42114
                                O410_IR_INTERFACE.NEXT_CMD_IDX_$O4203A
B291       1B291   42             $ISECT$                     F  F  RR I  F
B291       1B291                      NEXT_CMD_IDX_$O42118
                                O410_IR_INTERFACE.WAITING_FOR_NEXT_SEG_$O42034
B2D3       1B2D3   45             $ISECT$                     F  F  RR I  F
B2D3       1B2D3                      WAITING_FOR_NEXT_SEG_$O42112
                                O410_IR_INTERFACE.IR_OFF_$O42035
B318       1B318   16             $ISECT$                     F  F  RR I  F
B318       1B318                      IR_OFF_$O42113
                                O410_IR_INTERFACE.BUF_ID_FOR_BIN_$O4203C
```

```
B32E      1B32E   49       $ISECT$                    F  F  RR I  F
B32E      1B32E                BUF_ID_FOR_BIN_$O42120
                        O410_IR_INTERFACE.WAIT_FOR_A_WHILE_$O4203D
B377      1B377  108       $ISECT$                    F  F  RR I  F
B377      1B377                WAIT_FOR_A_WHILE_$O42121
                        O410_IR_INTERFACE.CLOSE_THE_SHUTTER_$O42039
B47F      1B47F   13       $ISECT$                    F  F  RR I  F
B47F      1B47F                CLOSE_THE_SHUTTER_$O42117
                        O410_IR_INTERFACE.GEN_SHUTTER_SEQ_$O4203B
B492      1B492  155       $ISECT$                    F  F  RR I  F
B492      1B492                GEN_SHUTTER_SEQ_$O42119
                        O410_IR_INTERFACE.OPEN_THE_SHUTTER_$O42038
B5E7      1B5E7   13       $ISECT$                    F  F  RR I  F
B5E7      1B5E7                OPEN_THE_SHUTTER_$O42116
                        O410_IR_INTERFACE.GEN_SHUTTER_SEQ2_$O4203E
B5FA      1B5FA  1D4       $ISECT$                    F  F  RR I  F
B5FA      1B5FA                GEN_SHUTTER_SEQ2_$O42122
                        O410_IR_INTERFACE.COLLECTING_DATA_$O4203F
B7CE      1B7CE   26       $ISECT$                    F  F  RR I  F
B7CE      1B7CE                COLLECTING_DATA_$O42123
                        O414_IR_RAW_DATA.RELEASE_BUFFER_$O43034
B7F4      1B7F4   5E       $ISECT$                    F  F  RR I  F
B7F4      1B7F4                RELEASE_BUFFER_$O43112
                        O414_IR_RAW_DATA.SAVE_BUFFERS_NOW_$O43036
B852      1B852   80       $ISECT$                    F  F  RR I  F
B852      1B852                SAVE_BUFFERS_NOW_$O43114
                        O414_IR_RAW_DATA.SAVE_BUFFERS_$O43035
B8D2      1B8D2   2F       $ISECT$                    F  F  RR I  F
B8D2      1B8D2                SAVE_BUFFERS_$O43113
                        O414_IR_RAW_DATA.CHECK_BUF_AVAIL_$O43037
B901      1B901   35       $ISECT$                    F  F  RR I  F
B901      1B901                CHECK_BUF_AVAIL_$O43115
                        O442_SUN_SENSOR_LAMP.SET_SUN_LAMP_STATE_$O4402V
B936      1B936    F       $ISECT$                    F  F  RR I  F
B936      1B936                SET_SUN_LAMP_STATE_$O44103
                        O450_HEATER.HEATER_OFF_$O4502W
B945      1B945    6       $ISECT$                    F  F  RR I  F
B945      1B945                HEATER_OFF_$O45104
                        O450_HEATER.HEATER_ON_$O4502X
B94B      1B94B    6       $ISECT$                    F  F  RR I  F
B94B      1B94B                HEATER_ON_$O45105
                        O460_LAMP.SET_LAMPS_$O46031
B951      1B951  117       $ISECT$                    F  F  RR I  F
B951      1B951                SET_LAMPS_$O46109
                        O460_LAMP.CURRENT_LAMP_STATES_$O46032
BA68      1BA68    7       $ISECT$                    F  F  RR I  F
BA68      1BA68                CURRENT_LAMP_STATES_$O46110
                        O460_LAMP.LAMPS_STABLE_$O46033
BA6F      1BA6F   2F       $ISECT$                    F  F  RR I  F
BA6F      1BA6F                LAMPS_STABLE_$O46111
                        O460_LAMP.REPORT_LAMP_DATA_$O46034
BA9E      1BA9E   66       $ISECT$                    F  F  RR I  F
BA9E      1BA9E                REPORT_LAMP_DATA_$O46112
                        O460_LAMP.SURFACE_LAMP_TIMEOUT_$O46035
BB04      1BB04   25       $ISECT$                    F  F  RR I  F
BB04      1BB04                SURFACE_LAMP_TIMEOUT_$O46113
                        O460_LAMP.AT_SURFACE_$O46036
BB29      1BB29   19       $ISECT$                    F  F  RR I  F
BB29      1BB29                AT_SURFACE_$O46114
                        O465_MISC_DEV_CONTROL_REGISTER.INITIALIZE_DEVICES_$O4802W
BB42      1BB42    C       $ISECT$                    F  F  RR I  F
BB42      1BB42                INITIALIZE_DEVICES_$O48104
                        O465_MISC_DEV_CONTROL_REGISTER.TIMED_WRITE_$O4802X
BB4E      1BB4E    E       $ISECT$                    F  F  RR I  F
BB4E      1BB4E                TIMED_WRITE_$O48105
                        O465_MISC_DEV_CONTROL_REGISTER.NEW_VALUE_$O4802Y
BB5C      1BB5C   65       $ISECT$                    F  F  RR I  F
BB5C      1BB5C                NEW_VALUE_$O48106
```

```
                                   O470_THERMAL_MANAGER.DISABLED_$O4902Z
BBC1      1BBC1   12                  $ISECT$                  F  F  RR I  F
BBC1      1BBC1                          DISABLED_$O49107
                                   O470_THERMAL_MANAGER.ENABLED_$O49030
BBD3      1BBD3   48                  $ISECT$                  F  F  RR I  F
BBD3      1BBD3                          ENABLED_$O49108
                                   O480_STATUS_WORD.UPDATE_MODE_$O5A036
BC1B      1BC1B   98                  $ISECT$                  F  F  RR I  F
BC1B      1BC1B                          UPDATE_MODE_$O5A114
                                   O480_STATUS_WORD.WRITE_REGISTERS_$O5A03K
BCB3      1BCB3    F                  $ISECT$                  F  F  RR I  F
BCB3      1BCB3                          WRITE_REGISTERS_$O5A128
                                   O480_STATUS_WORD.UPDATE_DESC_CYCLE_$O5A037
BCC2      1BCC2   27                  $ISECT$                  F  F  RR I  F
BCC2      1BCC2                          UPDATE_DESC_CYCLE_$O5A115
                                   O480_STATUS_WORD.INCR_DESC_MEAS_$O5A038
BCE9      1BCE9   1F                  $ISECT$                  F  F  RR I  F
BCE9      1BCE9                          INCR_DESC_MEAS_$O5A116
                                   O480_STATUS_WORD.DESC_MEAS_COMPLETE_$O5A039
BD08      1BD08   1A                  $ISECT$                  F  F  RR I  F
BD08      1BD08                          DESC_MEAS_COMPLETE_$O5A117
                                   O480_STATUS_WORD.INCR_CAL_MEAS_$O5A03A
BD22      1BD22   20                  $ISECT$                  F  F  RR I  F
BD22      1BD22                          INCR_CAL_MEAS_$O5A118
                                   O480_STATUS_WORD.UPDATE_CAL_CYCLE_NUM_$O5A03B
BD42      1BD42   26                  $ISECT$                  F  F  RR I  F
BD42      1BD42                          UPDATE_CAL_CYCLE_NUM_$O5A119
                                   O480_STATUS_WORD.UPDATE_CAL_MEAS_COMP_$O5A03C
BD68      1BD68   1A                  $ISECT$                  F  F  RR I  F
BD68      1BD68                          UPDATE_CAL_MEAS_COMP_$O5A120
                                   O480_STATUS_WORD.UPDATE_SINGLE_CMD_$O5A03D
BD82      1BD82   31                  $ISECT$                  F  F  RR I  F
BD82      1BD82                          UPDATE_SINGLE_CMD_$O5A121
                                   O480_STATUS_WORD.SINGLE_CMD_COMPLETE_$O5A03E
BDB3      1BDB3   13                  $ISECT$                  F  F  RR I  F
BDB3      1BDB3                          SINGLE_CMD_COMPLETE_$O5A122
                                   O480_STATUS_WORD.UPDATE_MEMORY_ACCESS_$O5A03F
BDC6      1BDC6   3B                  $ISECT$                  F  F  RR I  F
BDC6      1BDC6                          UPDATE_MEMORY_ACCESS_$O5A123
                                   O480_STATUS_WORD.MEMORY_ACCESS_COMPLE_$O5A03G
BE01      1BE01   13                  $ISECT$                  F  F  RR I  F
BE01      1BE01                          MEMORY_ACCESS_COMPLE_$O5A124
                                   O480_STATUS_WORD.NEW_DCS_STATUS_$O5A03H
BE14      1BE14   17                  $ISECT$                  F  F  RR I  F
BE14      1BE14                          NEW_DCS_STATUS_$O5A125
                                   O480_STATUS_WORD.NEW_HW_STATUS_$O5A03L
BE2B      1BE2B   58                  $ISECT$                  F  F  RR I  F
BE2B      1BE2B                          NEW_HW_STATUS_$O5A129
                                   O480_STATUS_WORD.NEW_CCD_STATUS_$O5A03I
BE83      1BE83   17                  $ISECT$                  F  F  RR I  F
BE83      1BE83                          NEW_CCD_STATUS_$O5A126
                                   O480_STATUS_WORD.NEW_TM_STATUS_$O5A03J
BE9A      1BE9A   2F                  $ISECT$                  F  F  RR I  F
BE9A      1BE9A                          NEW_TM_STATUS_$O5A127
                                   O480_STATUS_WORD.LATCH_TIMEOUT_$O5A03M
BEC9      1BEC9   2B                  $ISECT$                  F  F  RR I  F
BEC9      1BEC9                          LATCH_TIMEOUT_$O5A130
                                   O480_STATUS_WORD.UPDATE_INIT_STATE_$O5A03N
BEF4      1BEF4   93                  $ISECT$                  F  F  RR I  F
BEF4      1BEF4                          UPDATE_INIT_STATE_$O5A131
                                   STNNEXT.A_REP_POS
BF87      1BF87   38                  $ISECT$                  F  F  RR I  F
BF87      1BF87                          A_REP_POS
                                   MOD
BFBF      1BFBF    C                  A$KCOD                   F  F  RR I  F
BFBF      1BFBF                          A_MOD
                                   FRND
BFCB      1BFCB   1C                  A$KCOD                   F  F  RR I  F
```

```
   BFCB       1BFCB                   A_FRND
                               LFRND
   BFE7       1BFE7   19          A$KCOD                F  F  RR I  F
   C000       1C000    E
   BFE7       1BFE7                   A_LFRND
                               BLOCKASGN
   C00E       1C00E   1C          A$KCOD                F  F  RR I  F
   C00E       1C00E                   A_BLOCKASMM
   C00E       1C00E                  +A_BLOCKASGN
                               ZERO
   C02A       1C02A    D          A$KCOD                F  F  RR I  F
   C02A       1C02A                   A_ZERO
                               MARKER
   C037       1C037    1          RAM_CODE_END          F  F  RR I  F
   C037       1C037                   END_OF_RAM_CODE
                               PROM_WRITE
   C038       1C038   9A          BURN_PROM             F  F  RR I  F
   C038       1C038                  +PROM_BURN
                               MCHKSUM
   C0D2       1C0D2   22          CHKSUMCODE            F  F  RR I  F
   C0D2       1C0D2                  +CHKSUM
END OF GROUP :CODE_AREA
                               PROM_CHECK
   C0F4       1C0F4   3C          VERIFY_PROM           F  F  RR I  F
   C0F4       1C0F4                  +PROM_VERIFY
```

Figure 7 – Data RAM Memory Allocation

```
                               COMMON_INT
        20     20   20            INT_VECTORS               F  F  RR O  F
        20     20                    +VECTOR_TBL
END OF GROUP :VECTOR_TBL
START OF GROUP :CONS_AREA
        40     40   B7            DISRCONS                  F  F  RR O  F
        40     40                     DEFMSK
        41     41                     DSBLMSK
        42     42                     INTPROC
        43     43                    +USER_ISR_TBL
        53     53                    +SERVICE_TBL
        83     83                    +SERV05
        85     85                    +BEX_TBL
        94     94                    +BEX0F
        95     95                    +STUCK_CNT_TBL
        A5     A5                    +STUCK_LIM_TBL
                               DISPATCH_E1.DISPATCH_E1
        F7     F7  1D0            $CONS$                    F  F  RR O  F
        F7     F7                     E_EVENT_$DIT103
                               DISPATCH_E2.DISPATCH_E2
       2C7    2C7  312            $CONS$                    F  F  RR O  F
       2C7    2C7                     E_OBJECT_$DIU103
                               DISPATCH_E3.DISPATCH_E3
       5D9    5D9  154            $CONS$                    F  F  RR O  F
       5D9    5D9                     E_CUR_STATE_$DIV103
                               DISPATCH_E4.DISPATCH_E4
       72D    72D  154            $CONS$                    F  F  RR O  F
       72D    72D                     E_ROUTINE_ADDR_$DIW103
                               DISPATCH_M.DISPATCH_M
       881    881   A4            $CONS$                    F  F  RR O  F
       881    881                     M_EVENT_$DIX103
       8EB    8EB                     M_STATE_$DIX104
                               EVENT_PRIORITY.EVENT_PRIORITY
       925    925  11E            $CONS$                    F  F  RR O  F
       925    925                     EVT_PRI_$EVE103
                               EXEC.EXEC_$EXE002
       A43    A43    3            $CONS$                    F  F  RR O  F
       A43    A43                    +AGG$_$EXE001
                               PROJ_LIB.MESSAGE_PARAMETERS_C_$PRO02Y
       A46    A46   7E            $CONS$                    F  F  RR O  F
                               PROJ_LIB.MESSAGE_PARAMETERS_C_$PRO02Z
       AC4    AC4   7E            $CONS$                    F  F  RR O  F
                               PROJ_LIB.MESSAGE_PARAMETERS_D_$PRO030
       B42    B42   7E            $CONS$                    F  F  RR O  F
                               O001_CLOCK.INIT_$O01001
       BC0    BC0    4            $CONS$                    F  F  RR O  F
                               O005_POPULATED_MEMORY.O005_POPULATED_MEMORY
       BC4    BC4   28            $CONS$                    F  F  RR O  F
       BC4    BC4                     CONSTAGG_$O04104
                               O030_ATTITUDE.INIT_$O1H001
       BEC    BEC    2            $CONS$                    F  F  RR O  F
                               O031_ALTITUDE.INIT_$O1I001
       BEE    BEE    2            $CONS$                    F  F  RR O  F
                               O041_SCENARIO_SPEC.O041_SCENARIO_SPEC
       BF0    BF0  221            $CONS$                    F  F  RR O  F
       BF0    BF0                     CONSTAGG_$O1K104
                               O042_CYCLE_SPEC.O042_CYCLE_SPEC
       E11    E11   DC            $CONS$                    F  F  RR O  F
       E11    E11                     CONSTAGG_$O1L104
                               O045_INST_MISALIGNMENT.O045_INST_MISALIGNMENT
       EED    EED    E            $CONS$                    F  F  RR O  F
       EED    EED                     CONSTAGG_$O1N104
                               O052_CCD_INDEX_TABLE.O052_CCD_INDEX_TABLE
       EFB    EFB   15            $CONS$                    F  F  RR O  F
       EFB    EFB                     CONSTAGG_$O1Q104
                               O053_CCD_EXPOSURE.O053_CCD_EXPOSURE
```

```
 F10    F10   F0        $CONS$                    F  F  RR O  F
1000   1000   A0
 F10    F10                 CONSTAGG_$O1R104
                     O054_CCD_MEAS_SPEC.O054_CCD_MEAS_SPEC
10A0   10A0  5CD        $CONS$                    F  F  RR O  F
10A0   10A0                 CONSTAGG_$O1S104
                     O055_CCD_EXPOSURE_LIMITS.O055_CCD_EXPOSURE_LIMITS
166D   166D   20        $CONS$                    F  F  RR O  F
166D   166D                 CONSTAGG_$O1T104
                     O061_IR_MEAS_SPEC.O061_IR_MEAS_SPEC
168D   168D   FC        $CONS$                    F  F  RR O  F
168D   168D                 CONSTAGG_$O1W104
                     O062_IR_REGION_SPEC.O062_IR_REGION_SPEC
1789   1789   7C        $CONS$                    F  F  RR O  F
1789   1789                 CONSTAGG_$O1X104
                     O063_IR_EXPOSURE.INIT_$O1Y001
1805   1805    8        $CONS$                    F  F  RR O  F
                     O063_IR_EXPOSURE.O063_IR_EXPOSURE
180D   180D   20        $CONS$                    F  F  RR O  F
180D   180D                 CONSTAGG_$O1Y105
                     O072_VIOLET_MEAS_SPEC.O072_VIOLET_MEAS_SPEC
182D   182D   9C        $CONS$                    F  F  RR O  F
182D   182D                 CONSTAGG_$O2D104
                     O081_SPM_CCD_MANAGER.O081_SPM_CCD_MANAGER
18C9   18C9    2        $CONS$                    F  F  RR O  F
18C9   18C9                 O081_PROC_OPT_$O2H103
18CA   18CA                 O081_IMAGE_OPT_$O2H104
                     O082_SPM_IR_MANAGER.O082_SPM_IR_MANAGER
18CB   18CB    1        $CONS$                    F  F  RR O  F
18CB   18CB                 O082_PROC_OPT_$O2I103
                     O086_CAL_CYCLE_SPEC.O086_CAL_CYCLE_SPEC
18CC   18CC  12C        $CONS$                    F  F  RR O  F
18CC   18CC                 CONSTAGG_$O2K104
                     O087_CAL_SPEC_INDEX_TABLE.O087_CAL_SPEC_INDEX_TABLE
19F8   19F8    8        $CONS$                    F  F  RR O  F
19F8   19F8                 CONSTAGG_$O2L104
                     O089_CAL_VIOLET_INDEX_TABLE.O089_CAL_VIOLET_INDEX_TABLE
1A00   1A00    5        $CONS$                    F  F  RR O  F
1A00   1A00                 CONSTAGG_$O2N104
                     O091_CAL_CCD_EXPOSURE.O091_CAL_CCD_EXPOSURE
1A05   1A05   2A        $CONS$                    F  F  RR O  F
1A05   1A05                 CONSTAGG_$O2P104
                     O092_CAL_CCD_MEAS_SPEC.O092_CAL_CCD_MEAS_SPEC
1A2F   1A2F  258        $CONS$                    F  F  RR O  F
1A2F   1A2F                 CONSTAGG_$O2Q104
                     O093_CAL_CCD_INDEX_TABLE.O093_CAL_CCD_INDEX_TABLE
1C87   1C87   14        $CONS$                    F  F  RR O  F
1C87   1C87                 CONSTAGG_$O2R104
                     O094_CAL_IR_SPEC.O094_CAL_IR_SPEC
1C9B   1C9B   B0        $CONS$                    F  F  RR O  F
1C9B   1C9B                 CONSTAGG_$O2S104
                     O096_CAL_IR_EXPOSURE.O096_CAL_IR_EXPOSURE
1D4B   1D4B    8        $CONS$                    F  F  RR O  F
1D4B   1D4B                 CONSTAGG_$O2U104
                     O098_CAL_VIOLET_SPEC.O098_CAL_VIOLET_SPEC
1D53   1D53   18        $CONS$                    F  F  RR O  F
1D53   1D53                 CONSTAGG_$O2W104
                     O099_CAL_IR_INDEX_TABLE.O099_CAL_IR_INDEX_TABLE
1D6B   1D6B    5        $CONS$                    F  F  RR O  F
1D6B   1D6B                 CONSTAGG_$O2X104
                     O186_PREDICTED_TLM_RATES.O186_PREDICTED_TLM_RATES
1D70   1D70    C        $CONS$                    F  F  RR O  F
1D70   1D70                 CONSTAGG_$O3D104
                     O200_CCD.O200_CCD
1D7C   1D7C   27        $CONS$                    F  F  RR O  F
1D7C   1D7C                 DMA_RESET_$O20103
1D7D   1D7D                 DMA_DISABLE_$O20104
1D7E   1D7E                 DMA_ENABLE_$O20105
```

```
1D7F   1D7F                WORD_COUNT_FOR_BUFFE_$O20106
1D87   1D87                LAST_NEWLINE_ADDR_FO_$O20107
1D8F   1D8F                LAST_PIXEL_ADDR_FOR__$O20108
1D97   1D97                READOUT_TIME_FOR_BUF_$O20112
1D9F   1D9F                START_COMMAND_FOR_BU_$O20113
                    O201_CCD_DATA_BUFFER.O201_CCD_DATA_BUFFER
1DA3   1DA3   10       $CONS$                      F  F  RR O  F
1DA3   1DA3                O201_BUFF_WIDE_$O21104
1DAB   1DAB                O201_BUFF_ADDR_$O21105
                    O218_TM_DMAS.O218_TM_DMAS
1DB3   1DB3    4       $CONS$                      F  F  RR O  F
1DB3   1DB3                CHANNEL_TO_MODE_$O25103
1DB5   1DB5                CONSTAGG_$O25107
                    O230_DCS.INIT_$O27001
1DB7   1DB7    E       $CONS$                      F  F  RR O  F
                    O242_SUN_SENSOR_CONSTANTS.INIT_$O3I001
1DC5   1DC5    4       $CONS$                      F  F  RR O  F
                    O250_WATCHDOG.O250_WATCHDOG
1DC9   1DC9    2       $CONS$                      F  F  RR O  F
1DC9   1DC9                CONSTAGG_$O3J104
                    O251_PROM_POWER.O251_PROM_POWER
1DCB   1DCB    2       $CONS$                      F  F  RR O  F
1DCB   1DCB                CONSTAGG_$O3K104
                    O264_SURFACE_LAMP_TESTER.INIT_$O3P001
1DCD   1DCD    2       $CONS$                      F  F  RR O  F
                    O264_SURFACE_LAMP_TESTER.O264_SURFACE_LAMP_TESTER
1DCF   1DCF    2       $CONS$                      F  F  RR O  F
1DCF   1DCF               +SURF_LAMP_ON_$O3P103
1DD0   1DD0               +SURF_LAMP_OFF_$O3P104
                    O267_HEATER_TEST_DATA_SET.O267_HEATER_TEST_DATA_SET
1DD1   1DD1    4       $CONS$                      F  F  RR O  F
1DD1   1DD1                DS_SIZE_$O3S103
                    O290_INTERRUPT_CONTROLLER.INIT_$O3Y001
1DD5   1DD5    2       $CONS$                      F  F  RR O  F
                    O290_INTERRUPT_CONTROLLER.O290_INTERRUPT_CONTROLLER
1DD7   1DD7    6       $CONS$                      F  F  RR O  F
1DD7   1DD7                CONSTAGG_$O3Y104
                    O295_MEMORY_MANAGEMENT.O295_MEMORY_MANAGEMENT
1DDD   1DDD   18       $CONS$                      F  F  RR O  F
1DDD   1DDD                TM_DATA_REG_ADDR_$O4D103
1DE1   1DE1                TM_DMA_CTL_REG_ADDR_$O4D104
1DE5   1DE5                TM_DMA_STS_REG_ADDR_$O4D105
1DE9   1DE9                TM_DMA_DST_REG_ADDR_$O4D106
1DED   1DED                TM_DMA_SRC_REG_ADDR_$O4D107
1DF1   1DF1                TM_DMA_WC_REG_ADDR_$O4D108
                    O302_CCD_TRANSPOSED.O302_CCD_TRANSPOSED
1DF5   1DF5    4       $CONS$                      F  F  RR O  F
1DF5   1DF5                O302_BUFF_ADDR_$O31104
                    O303_CCD_FORMAT.O303_CCD_FORMAT
1DF9   1DF9   39       $CONS$                      F  F  RR O  F
1DF9   1DF9                O303_CCD_FORMAT_OBJE_$O32103
1E26   1E26                CONSTAGG_$O32110
                    O305_CCD_OPTIMUM_EXPOSURE.O305_CCD_OPTIMUM_EXPOSURE
1E32   1E32   30       $CONS$                      F  F  RR O  F
1E32   1E32                O305_CCD_OPT_EXP_$O34103
                    O306_IR_OPTIMUM_SAMPLING.O306_IR_OPTIMUM_SAMPLING
1E62   1E62   2A       $CONS$                      F  F  RR O  F
1E62   1E62                O306_IR_OPT_SAMPLE_$O35103
                    O308_SW_COMPRESSOR.O308_SW_COMPRESSOR
1E8C   1E8C   4A       $CONS$                      F  F  RR O  F
1E8C   1E8C                SET_BIT_$O36103
1E9C   1E9C                SHIFT_$O36104
1EBE   1EBE                PSI_0_TABLE_$O36105
                    O330_IR_SPECTRUM.O330_IR_SPECTRUM
1ED6   1ED6    4       $CONS$                      F  F  RR O  F
1ED6   1ED6                CONSTAGG_$O4L104
                    O340_DARK_CURRENT.O340_DARK_CURRENT
1EDA   1EDA    4       $CONS$                      F  F  RR O  F
```

```
1EDA   1EDA             SUM_DATA_COL_HEADER_$O4M103
                     O358_FLAT_FIELD_LOOKUP.O358_FLAT_FIELD_LOOKUP
1EDE   1EDE  106        $CONS$                   F  F  RR O  F
1EDE   1EDE                 CONSTAGG_$O4O105
1EE4   1EE4                 CONSTAGG_$O4O107
                     O359_LOOKUP_TABLE.O359_LOOKUP_TABLE
1FE4   1FE4   1C        $CONS$                   F  F  RR O  F
2000   2000   E4
1FE4   1FE4                 O359_COMP_VAL_$O4P103
                     O360_IMAGE_STRIP.O360_IMAGE_STRIP
20E4   20E4    4        $CONS$                   F  F  RR O  F
20E4   20E4                 SUM_DATA_COL_HEADER_$O4Q103
                     O370_SOLAR_AUREOLE.O370_SOLAR_AUREOLE
20E8   20E8    4        $CONS$                   F  F  RR O  F
20E8   20E8                 SUM_DATA_COL_HEADER_$O4R103
                     O380_VISIBLE_SPECTRUM.O380_VISIBLE_SPECTRUM
20EC   20EC    4        $CONS$                   F  F  RR O  F
20EC   20EC                 SUM_DATA_COL_HEADER_$O4S103
                     O400_MULTIPLEXED_DEVICE.O400_MULTIPLEXED_DEVICE
20F0   20F0   1F        $CONS$                   F  F  RR O  F
20F0   20F0                 CONSTAGG_$O40107
                     O404_HOUSEKEEPING_DATA_SET.INIT_$O41001
210F   210F    4        $CONS$                   F  F  RR O  F
                     O414_IR_RAW_DATA.INIT_$O43001
2113   2113    4        $CONS$                   F  F  RR O  F
                     O450_HEATER.O450_HEATER
2117   2117    2        $CONS$                   F  F  RR O  F
2117   2117                 TEMP_SENSOR_ID_FOR_$O45103
                     O460_LAMP.INIT_$O46001
2119   2119    4        $CONS$                   F  F  RR O  F
                     O460_LAMP.O460_LAMP
211D   211D    7        $CONS$                   F  F  RR O  F
211D   211D                 CONSTAGG_$O46104
2121   2121                 DEVICE_FOR_LAMP_$O46107
                     O470_THERMAL_MANAGER.INIT_$O49001
2124   2124    2        $CONS$                   F  F  RR O  F
                     O470_THERMAL_MANAGER.O470_THERMAL_MANAGER
2126   2126    2        $CONS$                   F  F  RR O  F
2126   2126                 CONSTAGG_$O49105
                     O480_STATUS_WORD.O480_STATUS_WORD_FOR_$O5A031
2128   2128    6        $CONS$                   F  F  RR O  F
                     O480_STATUS_WORD.O480_STATUS_WORD_FOR_$O5A032
212E   212E    6        $CONS$                   F  F  RR O  F
                     O480_STATUS_WORD.O480_STATUS_WORD_FOR_$O5A033
2134   2134    6        $CONS$                   F  F  RR O  F
                     O480_STATUS_WORD.INIT_$O5A001
213A   213A    2        $CONS$                   F  F  RR O  F
                     O001_CLOCK.CURRENT_TIME_$O0102X
213C   213C    2        $CONS$                   F  F  RR O  F
                     O001_CLOCK.INT32_TO_MTIME_$O01036
213E   213E    2        $CONS$                   F  F  RR O  F
                     O001_CLOCK.CORRELATE_CLOCKS_$O0102Y
2140   2140    A        $CONS$                   F  F  RR O  F
                     O001_CLOCK.MASTER_TIME_$O01035
214A   214A    2        $CONS$                   F  F  RR O  F
                     O001_CLOCK.SETUP_NEXT_ALARM_$O01034
214C   214C    7        $CONS$                   F  F  RR O  F
214C   214C               +AGG$_$O01001
                     O001_CLOCK.ALARM_$O01031
2153   2153    2        $CONS$                   F  F  RR O  F
                     O001_CLOCK.CLOCK_ROLL_OVER_$O01033
2155   2155    4        $CONS$                   F  F  RR O  F
                     O002_LOADER.RAM_START_UP_$O0202W
2159   2159    7        $CONS$                   F  F  RR O  F
2159   2159               +AGG$_$O02001
215C   215C               +AGG$_$O02002
                     O002_LOADER.INITIALIZE_HW_AND_SW_$O02030
2160   2160    7        $CONS$                   F  F  RR O  F
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2160   2160          +AGG$_$O02007
2164   2164          +AGG$_$O02008
2165   2165          +AGG$_$O02009
2166   2166          +AGG$_$O02010
                  O002_LOADER.NO_BROADCAST_RECEIVE_$O0202Y
2167   2167   1     $CONS$                      F  F  RR O  F
2167   2167          +AGG$_$O02003
                  O002_LOADER.FINISH_INITIALIZATIO_$O0202Z
2168   2168   9     $CONS$                      F  F  RR O  F
2168   2168          +AGG$_$O02004
216A   216A          +AGG$_$O02005
216D   216D          +AGG$_$O02006
                  O002_LOADER.START_INITIAL_MODE_$O02031
2171   2171   1     $CONS$                      F  F  RR O  F
2171   2171          +AGG$_$O02011
                  O004_MEMORY.START_MEMORY_DUMP_$O0302W
2172   2172   3     $CONS$                      F  F  RR O  F
2172   2172          +AGG$_$O03001
                  O004_MEMORY.CHECK_DUMP_RANGE_$O0302X
2175   2175   A     $CONS$                      F  F  RR O  F
2175   2175          +AGG$_$O03002
2176   2176          +AGG$_$O03003
                  O004_MEMORY.DUMP_MEMORY_RANGE_$O0302Y
217F   217F   6     $CONS$                      F  F  RR O  F
                  O004_MEMORY.NEXT_DUMP_PAIR_$O0302Z
2185   2185   1     $CONS$                      F  F  RR O  F
2185   2185          +AGG$_$O03004
                  O004_MEMORY.UPLINK_RAM_$O03030
2186   2186   6     $CONS$                      F  F  RR O  F
                  O004_MEMORY.END_PACKAGING_$O03031
218C   218C   4     $CONS$                      F  F  RR O  F
218C   218C          +AGG$_$O03005
218D   218D          +AGG$_$O03006
                  O007_RAM_DATA_SET.SEND_RAM_DATA_SET_$O0502W
2190   2190   6     $CONS$                      F  F  RR O  F
                  O011_COMMAND_BUFFER.PROCESS_PROBE_INPUT_$O0702X
2196   2196   4     $CONS$                      F  F  RR O  F
                  O012_PROBE_CMD.STORE_CHANGE_ENABLE_$O0802X
219A   219A   1     $CONS$                      F  F  RR O  F
219A   219A          +AGG$_$O08001
                  O013_BROADCAST_CMD.DECODE_BROADCAST_CMD_$O0902W
219B   219B   B     $CONS$                      F  F  RR O  F
219B   219B          +AGG$_$O09001
                  O021_ENABLE_CMD.PROCESS_ENABLE_CMD_$O1A02W
21A6   21A6   3     $CONS$                      F  F  RR O  F
21A6   21A6          +AGG$_$O1A001
                  O022_CHANGE_MODE_CMD.PROCESS_NEW_MODE_CMD_$O1B02W
21A9   21A9   3     $CONS$                      F  F  RR O  F
21A9   21A9          +AGG$_$O1B001
                  O023_SINGLE_MEAS_CMD.PROCESS_SINGLE_MEAS__$O1C02W
21AC   21AC   4     $CONS$                      F  F  RR O  F
21AC   21AC          +AGG$_$O1C001
21AD   21AD          +AGG$_$O1C002
                  O023_SINGLE_MEAS_CMD.START_MEAS_$O1C02X
21B0   21B0   4     $CONS$                      F  F  RR O  F
                  O023_SINGLE_MEAS_CMD.MEAS_COMPLETE_$O1C02Y
21B4   21B4   1     $CONS$                      F  F  RR O  F
21B4   21B4          +AGG$_$O1C003
                  O024_SINGLE_TEST_CMD.PROCESS_SINGLE_TEST__$O1D02X
21B5   21B5   4     $CONS$                      F  F  RR O  F
21B5   21B5          +AGG$_$O1D001
21B6   21B6          +AGG$_$O1D002
                  O024_SINGLE_TEST_CMD.DO_NEXT_TEST_$O1D02Y
21B9   21B9   2     $CONS$                      F  F  RR O  F
21B9   21B9          +AGG$_$O1D003
21BA   21BA          +AGG$_$O1D004
                  O026_DUMP_CMD.RECORD_DUMP_END_$O1E02X
21BB   21BB   2     $CONS$                      F  F  RR O  F
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21BB   21BB               +AGG$_$O1E001
21BC   21BC               +AGG$_$O1E002
                      O026_DUMP_CMD.PROCESS_DUMP_CMD_$O1E02Y
21BD   21BD    5        $CONS$                   F  F  RR O  F
21BD   21BD               +AGG$_$O1E003
21BF   21BF               +AGG$_$O1E004
                      O027_UPLINK_EEPROM_CMD.PROCESS_UPLINK_EEPRO_$O1F02X
21C2   21C2    6        $CONS$                   F  F  RR O  F
21C2   21C2               +AGG$_$O1F001
21C4   21C4               +AGG$_$O1F002
21C5   21C5               +AGG$_$O1F003
                      O027_UPLINK_EEPROM_CMD.UPLINK_EEPROM_$O1F02Y
21C8   21C8    2        $CONS$                   F  F  RR O  F
21C8   21C8               +AGG$_$O1F004
21C9   21C9               +AGG$_$O1F005
                      O028_UPLINK_RAM_CMD.RECORD_UPLINK_RAM_EN_$O1G02X
21CA   21CA    2        $CONS$                   F  F  RR O  F
21CA   21CA               +AGG$_$O1G001
21CB   21CB               +AGG$_$O1G002
                      O028_UPLINK_RAM_CMD.PROCESS_UPLINK_RAM_C_$O1G02Y
21CC   21CC    5        $CONS$                   F  F  RR O  F
21CC   21CC               +AGG$_$O1G003
21CE   21CE               +AGG$_$O1G004
                      O030_ATTITUDE.UPDATE_SUN_INFO_$O1H02W
21D1   21D1    2        $CONS$                   F  F  RR O  F
21D1   21D1               +AGG$_$O1H001
21D2   21D2               +AGG$_$O1H002
                      O030_ATTITUDE.UPDATE_PROBE_INFO_$O1H02X
21D3   21D3   16        $CONS$                   F  F  RR O  F
                      O030_ATTITUDE.AZIM_AT_TIME_$O1H031
21E9   21E9   12        $CONS$                   F  F  RR O  F
                      O030_ATTITUDE.CURRENT_SPIN_$O1H02Z
21FB   21FB    F        $CONS$                   F  F  RR O  F
                      O030_ATTITUDE.CURRENT_SPIN_$O1H030
220A   220A    F        $CONS$                   F  F  RR O  F
                      O030_ATTITUDE.TIME_TO_AZIM_RANGE_$O1H032
2219   2219    2        $CONS$                   F  F  RR O  F
                      O030_ATTITUDE.TIME_TO_AZIM_$O1H034
221B   221B   1E        $CONS$                   F  F  RR O  F
                      O031_ALTITUDE.STORE_ALTITUDE_$O1I02W
2239   2239   10        $CONS$                   F  F  RR O  F
2239   2239               +AGG$_$O1I001
223D   223D               +AGG$_$O1I002
                      O031_ALTITUDE.SURFACE_MODE_TIME_$O1I02Z
2249   2249    3        $CONS$                   F  F  RR O  F
2249   2249               +AGG$_$O1I003
                      O040_DESCENT_SCHEDULER.START_DESCENT_SCENAR_$O1J02W
224C   224C    4        $CONS$                   F  F  RR O  F
224C   224C               +AGG$_$O1J001
                      O040_DESCENT_SCHEDULER.START_DESCENT_CYCLE_$O1J02X
2250   2250    1        $CONS$                   F  F  RR O  F
2250   2250               +AGG$_$O1J002
                      O040_DESCENT_SCHEDULER.START_MEASUREMENTS_$O1J02Z
2251   2251    1        $CONS$                   F  F  RR O  F
2251   2251               +AGG$_$O1J003
                      O040_DESCENT_SCHEDULER.CHECK_MEAS_DONE_$O1J030
2252   2252    2        $CONS$                   F  F  RR O  F
2252   2252               +AGG$_$O1J004
2253   2253               +AGG$_$O1J005
                      O040_DESCENT_SCHEDULER.CHECK_CYCLE_END_$O1J031
2254   2254    5        $CONS$                   F  F  RR O  F
2254   2254               +AGG$_$O1J006
2255   2255               +AGG$_$O1J007
2257   2257               +AGG$_$O1J008
2258   2258               +AGG$_$O1J009
                      O040_DESCENT_SCHEDULER.END_CYCLE_$O1J032
2259   2259    5        $CONS$                   F  F  RR O  F
2259   2259               +AGG$_$O1J010
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225B   225B                +AGG$_$O1J011
225C   225C                +AGG$_$O1J012
225D   225D                +AGG$_$O1J013
                        O041_SCENARIO_SPEC.SEARCH_SCEN_CRITERIA_$O1K02Y
225E   225E    4          $CONS$                     F  F  RR O  F
                        O042_CYCLE_SPEC.GET_CYCLE_LIMITS_$O1L02Y
2262   2262    8          $CONS$                     F  F  RR O  F
                        O044_DESCENT_CYCLE_DATA_SET.GEN_DESCENT_CYCLE_DA_$O1M02X
226A   226A    6          $CONS$                     F  F  RR O  F
                        O050_CCD_MANAGER.INIT_CCD_$O1O02W
2270   2270    2          $CONS$                     F  F  RR O  F
2270   2270                +AGG$_$O1O001
2271   2271                +AGG$_$O1O002
                        O050_CCD_MANAGER.CHECK_READOUT_SPACE_$O1O02X
2272   2272    2          $CONS$                     F  F  RR O  F
2272   2272                +AGG$_$O1O003
2273   2273                +AGG$_$O1O004
                        O050_CCD_MANAGER.PICK_NEXT_MEAS_$O1O02Y
2274   2274    3          $CONS$                     F  F  RR O  F
2274   2274                +AGG$_$O1O005
2275   2275                +AGG$_$O1O006
2276   2276                +AGG$_$O1O007
                        O050_CCD_MANAGER.PICK_ALTERNATE_MEAS_$O1O030
2277   2277    4          $CONS$                     F  F  RR O  F
2277   2277                +AGG$_$O1O008
2279   2279                +AGG$_$O1O009
227A   227A                +AGG$_$O1O010
                        O050_CCD_MANAGER.START_INTEGRATION_$O1O031
227B   227B    3          $CONS$                     F  F  RR O  F
227B   227B                +AGG$_$O1O011
                        O050_CCD_MANAGER.START_CCD_PROC_$O1O032
227E   227E    4          $CONS$                     F  F  RR O  F
227E   227E                +AGG$_$O1O012
227F   227F                +AGG$_$O1O013
                        O050_CCD_MANAGER.CHECK_END_MEAS_$O1O034
2282   2282    4          $CONS$                     F  F  RR O  F
2282   2282                +AGG$_$O1O014
2283   2283                +AGG$_$O1O015
2284   2284                +AGG$_$O1O016
2285   2285                +AGG$_$O1O017
                        O050_CCD_MANAGER.CHECK_READOUTS_$O1O036
2286   2286    3          $CONS$                     F  F  RR O  F
2286   2286                +AGG$_$O1O018
2288   2288                +AGG$_$O1O019
                        O050_CCD_MANAGER.REPORT_MAX_EXCEEDED_$O1O037
2289   2289    1          $CONS$                     F  F  RR O  F
2289   2289                +AGG$_$O1O020
                        O050_CCD_MANAGER.RECALC_AZIM_TIME_$O1O038
228A   228A    5          $CONS$                     F  F  RR O  F
228A   228A                +AGG$_$O1O021
228C   228C                +AGG$_$O1O022
228D   228D                +AGG$_$O1O023
228E   228E                +AGG$_$O1O024
                        O051_CCD_MEAS_SET.CALC_TABLE_TIMES_$O1P034
228F   228F    6          $CONS$                     F  F  RR O  F
                        O051_CCD_MEAS_SET.FIND_NEXT_CCD_$O1P02X
2295   2295    2          $CONS$                     F  F  RR O  F
                        O051_CCD_MEAS_SET.SET_LINKED_MEAS_$O1P02Z
2297   2297    4          $CONS$                     F  F  RR O  F
                        O051_CCD_MEAS_SET.UPDATE_CCD_TABLE_$O1P033
229B   229B    4          $CONS$                     F  F  RR O  F
229B   229B                +AGG$_$O1P001
229D   229D                +AGG$_$O1P002
229E   229E                +AGG$_$O1P003
                        O053_CCD_EXPOSURE.CONSTRAIN_EXPOSURE_$O1R02Z
229F   229F    6          $CONS$                     F  F  RR O  F
                        O060_IR_MANAGER.SETUP_IR_$O1V02W
22A5   22A5    5          $CONS$                     F  F  RR O  F
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22A5   22A5              +AGG$_$O1V001
22A6   22A6              +AGG$_$O1V002
22A7   22A7              +AGG$_$O1V003
                      O060_IR_MANAGER.SETUP_LONG_IR_$O1V02X
22AA   22AA   3         $CONS$                  F  F  RR O  F
22AA   22AA              +AGG$_$O1V004
                      O060_IR_MANAGER.CHECK_READOUT_SPACE_$O1V02Y
22AD   22AD   2         $CONS$                  F  F  RR O  F
22AD   22AD              +AGG$_$O1V005
                      O060_IR_MANAGER.DO_IR_SELF_CAL_$O1V02Z
22AF   22AF   2         $CONS$                  F  F  RR O  F
22AF   22AF              +AGG$_$O1V006
                      O060_IR_MANAGER.START_IR_COLLECTION_$O1V030
22B1   22B1   2         $CONS$                  F  F  RR O  F
22B1   22B1              +AGG$_$O1V007
22B2   22B2              +AGG$_$O1V008
                      O060_IR_MANAGER.CHECK_COLLECTION_END_$O1V031
22B3   22B3   2         $CONS$                  F  F  RR O  F
22B3   22B3              +AGG$_$O1V009
22B4   22B4              +AGG$_$O1V010
                      O060_IR_MANAGER.END_IR_$O1V032
22B5   22B5   9         $CONS$                  F  F  RR O  F
22B5   22B5              +AGG$_$O1V011
22B6   22B6              +AGG$_$O1V012
22B7   22B7              +AGG$_$O1V013
22B8   22B8              +AGG$_$O1V014
22B9   22B9              +AGG$_$O1V015
                      O060_IR_MANAGER.RECALC_START_AZIM_$O1V033
22BE   22BE   5         $CONS$                  F  F  RR O  F
22BE   22BE              +AGG$_$O1V016
22C0   22C0              +AGG$_$O1V017
22C1   22C1              +AGG$_$O1V018
22C2   22C2              +AGG$_$O1V019
                      O060_IR_MANAGER.WAIT_FOR_STARTING_AZ_$O1V035
22C3   22C3   2         $CONS$                  F  F  RR O  F
                      O064_IR_REGIONS.GEN_IR_REGION_TIMES_$O1Z02W
22C5   22C5   8         $CONS$                  F  F  RR O  F
                      O070_VIOLET_MANAGER.INIT_VIOLET_$O2B02W
22CD   22CD   2         $CONS$                  F  F  RR O  F
22CD   22CD              +AGG$_$O2B001
22CE   22CE              +AGG$_$O2B002
                      O070_VIOLET_MANAGER.PICK_NEXT_VIOLET_$O2B02X
22CF   22CF   5         $CONS$                  F  F  RR O  F
22CF   22CF              +AGG$_$O2B003
22D1   22D1              +AGG$_$O2B004
22D2   22D2              +AGG$_$O2B005
22D3   22D3              +AGG$_$O2B006
                      O070_VIOLET_MANAGER.CHECK_VIOLET_END_$O2B030
22D4   22D4   3         $CONS$                  F  F  RR O  F
22D4   22D4              +AGG$_$O2B007
22D5   22D5              +AGG$_$O2B008
22D6   22D6              +AGG$_$O2B009
                      O070_VIOLET_MANAGER.REPORT_MAX_EXCEEDED_$O2B031
22D7   22D7   1         $CONS$                  F  F  RR O  F
22D7   22D7              +AGG$_$O2B010
                      O070_VIOLET_MANAGER.RECALC_AZIM_TIME_$O2B032
22D8   22D8   5         $CONS$                  F  F  RR O  F
22D8   22D8              +AGG$_$O2B011
22DA   22DA              +AGG$_$O2B012
22DB   22DB              +AGG$_$O2B013
22DC   22DC              +AGG$_$O2B014
                      O074_ULV_COLLECTION.WAIT_ULV_AZIM_$O2E02W
22DD   22DD   3         $CONS$                  F  F  RR O  F
22DD   22DD              +AGG$_$O2E001
                      O074_ULV_COLLECTION.START_ULV_$O2E02X
22E0   22E0   1         $CONS$                  F  F  RR O  F
22E0   22E0              +AGG$_$O2E002
                      O080_SPM_SCHEDULER.CHECK_SPM_END_$O2G02X
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22E1   22E1    1          $CONS$                    F  F  RR O  F
22E1   22E1                  +AGG$_$O2G001
                       O081_SPM_CCD_MANAGER.SETUP_SPM_CCD_$O2H02Y
22E2   22E2    1          $CONS$                    F  F  RR O  F
22E2   22E2                  +AGG$_$O2H001
                       O081_SPM_CCD_MANAGER.CHECK_READOUT_SPACE_$O2H02Z
22E3   22E3    1          $CONS$                    F  F  RR O  F
22E3   22E3                  +AGG$_$O2H002
                       O081_SPM_CCD_MANAGER.START_MEASUREMENT_$O2H030
22E4   22E4    2          $CONS$                    F  F  RR O  F
                       O081_SPM_CCD_MANAGER.START_CCD_PROC_$O2H031
22E6   22E6    8          $CONS$                    F  F  RR O  F
22E6   22E6                  +AGG$_$O2H003
22E7   22E7                  +AGG$_$O2H004
22E8   22E8                  +AGG$_$O2H005
22E9   22E9                  +AGG$_$O2H006
                       O081_SPM_CCD_MANAGER.END_SPM_CCD_$O2H032
22EE   22EE    3          $CONS$                    F  F  RR O  F
22EE   22EE                  +AGG$_$O2H007
22F0   22F0                  +AGG$_$O2H008
                       O082_SPM_IR_MANAGER.SETUP_SPM_IR_$O2I02X
22F1   22F1    1          $CONS$                    F  F  RR O  F
22F1   22F1                  +AGG$_$O2I001
                       O082_SPM_IR_MANAGER.CHECK_READOUT_SPACE_$O2I02Y
22F2   22F2    2          $CONS$                    F  F  RR O  F
22F2   22F2                  +AGG$_$O2I002
                       O082_SPM_IR_MANAGER.DO_IR_SELF_CAL_$O2I02Z
22F4   22F4    2          $CONS$                    F  F  RR O  F
22F4   22F4                  +AGG$_$O2I003
                       O082_SPM_IR_MANAGER.START_IR_COLLECTION_$O2I030
22F6   22F6    6          $CONS$                    F  F  RR O  F
                       O082_SPM_IR_MANAGER.CHECK_COLLECTION_END_$O2I031
22FC   22FC   27          $CONS$                    F  F  RR O  F
22FC   22FC                  +AGG$_$O2I004
231A   231A                  +AGG$_$O2I005
231B   231B                  +AGG$_$O2I006
231C   231C                  +AGG$_$O2I007
231D   231D                  +AGG$_$O2I008
231E   231E                  +AGG$_$O2I009
                       O082_SPM_IR_MANAGER.END_SPM_IR_$O2I032
2323   2323    3          $CONS$                    F  F  RR O  F
2323   2323                  +AGG$_$O2I010
2325   2325                  +AGG$_$O2I011
                       O085_CAL_SCHEDULER.START_CAL_SCENARIO_$O2J02W
2326   2326    2          $CONS$                    F  F  RR O  F
2326   2326                  +AGG$_$O2J001
2327   2327                  +AGG$_$O2J002
                       O085_CAL_SCHEDULER.START_CAL_CYCLE_$O2J02X
2328   2328    1          $CONS$                    F  F  RR O  F
2328   2328                  +AGG$_$O2J003
                       O085_CAL_SCHEDULER.START_CAL_CCD_$O2J02Y
2329   2329    1          $CONS$                    F  F  RR O  F
2329   2329                  +AGG$_$O2J004
                       O085_CAL_SCHEDULER.START_SHUTTER_TEST_$O2J02Z
232A   232A    2          $CONS$                    F  F  RR O  F
232A   232A                  +AGG$_$O2J005
232B   232B                  +AGG$_$O2J006
                       O085_CAL_SCHEDULER.END_CAL_CYCLE_$O2J030
232C   232C    4          $CONS$                    F  F  RR O  F
232C   232C                  +AGG$_$O2J007
232D   232D                  +AGG$_$O2J008
232E   232E                  +AGG$_$O2J009
232F   232F                  +AGG$_$O2J010
                       O085_CAL_SCHEDULER.END_SCENARIO_$O2J031
2330   2330    1          $CONS$                    F  F  RR O  F
2330   2330                  +AGG$_$O2J011
                       O085_CAL_SCHEDULER.START_CAL_IR_$O2J032
2331   2331    1          $CONS$                    F  F  RR O  F
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2331   2331              +AGG$_$O2J012
                      O085_CAL_SCHEDULER.START_CAL_VIOLET_$O2J033
2332   2332    1         $CONS$                    F  F  RR O  F
2332   2332              +AGG$_$O2J013
                      O085_CAL_SCHEDULER.START_DCS_TEST_$O2J034
2333   2333    2         $CONS$                    F  F  RR O  F
2333   2333              +AGG$_$O2J014
2334   2334              +AGG$_$O2J015
                      O085_CAL_SCHEDULER.START_HEATER_TEST_$O2J035
2335   2335    2         $CONS$                    F  F  RR O  F
2335   2335              +AGG$_$O2J016
2336   2336              +AGG$_$O2J017
                      O085_CAL_SCHEDULER.START_CAL_LAMP_TEST_$O2J036
2337   2337    2         $CONS$                    F  F  RR O  F
2337   2337              +AGG$_$O2J018
2338   2338              +AGG$_$O2J019
                      O085_CAL_SCHEDULER.START_SURF_LAMP_TEST_$O2J037
2339   2339    2         $CONS$                    F  F  RR O  F
2339   2339              +AGG$_$O2J020
233A   233A              +AGG$_$O2J021
                      O085_CAL_SCHEDULER.START_SUN_LAMP_TEST_$O2J038
233B   233B    2         $CONS$                    F  F  RR O  F
233B   233B              +AGG$_$O2J022
233C   233C              +AGG$_$O2J023
                      O088_CAL_CYCLE_DATA_SET.GEN_CAL_CYCLE_DATA_S_$O2M02X
233D   233D    4         $CONS$                    F  F  RR O  F
                      O090_CAL_CCD_MANAGER.START_CCD_PROC_$O2O02W
2341   2341    8         $CONS$                    F  F  RR O  F
2341   2341              +AGG$_$O2O001
2342   2342              +AGG$_$O2O002
2343   2343              +AGG$_$O2O003
2344   2344              +AGG$_$O2O004
2345   2345              +AGG$_$O2O005
2346   2346              +AGG$_$O2O006
                      O090_CAL_CCD_MANAGER.END_CAL_CCD_$O2O02X
2349   2349    2         $CONS$                    F  F  RR O  F
2349   2349              +AGG$_$O2O007
234A   234A              +AGG$_$O2O008
                      O090_CAL_CCD_MANAGER.INIT_CAL_CCD_$O2O02Y
234B   234B    2         $CONS$                    F  F  RR O  F
234B   234B              +AGG$_$O2O009
234C   234C              +AGG$_$O2O010
                      O090_CAL_CCD_MANAGER.PICK_CAL_CCD_MEAS_$O2O02Z
234D   234D    2         $CONS$                    F  F  RR O  F
234D   234D              +AGG$_$O2O011
234E   234E              +AGG$_$O2O012
                      O090_CAL_CCD_MANAGER.START_ONE_CCD_$O2O030
234F   234F    1         $CONS$                    F  F  RR O  F
234F   234F              +AGG$_$O2O013
                      O090_CAL_CCD_MANAGER.SETUP_MEAS_$O2O031
2350   2350    3         $CONS$                    F  F  RR O  F
2350   2350              +AGG$_$O2O014
                      O090_CAL_CCD_MANAGER.CHECK_READOUT_SPACE_$O2O032
2353   2353    1         $CONS$                    F  F  RR O  F
2353   2353              +AGG$_$O2O015
                      O091_CAL_CCD_EXPOSURE.CAL_CONSTRAIN_EXPOSU_$O2P02X
2354   2354    4         $CONS$                    F  F  RR O  F
                      O095_CAL_IR_MANAGER.CAL_IR_INIT_$O2T02W
2358   2358    2         $CONS$                    F  F  RR O  F
2358   2358              +AGG$_$O2T001
2359   2359              +AGG$_$O2T002
                      O095_CAL_IR_MANAGER.CHECK_READOUT_SPACE_$O2T02X
235A   235A    4         $CONS$                    F  F  RR O  F
235A   235A              +AGG$_$O2T003
235C   235C              +AGG$_$O2T004
                      O095_CAL_IR_MANAGER.CHECK_IR_END_$O2T030
235E   235E    9         $CONS$                    F  F  RR O  F
235E   235E              +AGG$_$O2T005
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235F   235F              +AGG$_$O2T006
2360   2360              +AGG$_$O2T007
2361   2361              +AGG$_$O2T008
2362   2362              +AGG$_$O2T009
2363   2363              +AGG$_$O2T010
2364   2364              +AGG$_$O2T011
                    O095_CAL_IR_MANAGER.END_CAL_IR_$O2T031
2367   2367   2        $CONS$                    F  F  RR O  F
2367   2367              +AGG$_$O2T012
2368   2368              +AGG$_$O2T013
                    O095_CAL_IR_MANAGER.SETUP_IR_$O2T032
2369   2369   3        $CONS$                    F  F  RR O  F
2369   2369              +AGG$_$O2T014
                    O095_CAL_IR_MANAGER.PICK_NEXT_IR_$O2T033
236C   236C   2        $CONS$                    F  F  RR O  F
236C   236C              +AGG$_$O2T015
236D   236D              +AGG$_$O2T016
                    O095_CAL_IR_MANAGER.START_ONE_IR_$O2T034
236E   236E   1        $CONS$                    F  F  RR O  F
236E   236E              +AGG$_$O2T017
                    O097_CAL_VIOLET_MANAGER.INIT_CAL_VIOLET_$O2V02W
236F   236F   2        $CONS$                    F  F  RR O  F
236F   236F              +AGG$_$O2V001
2370   2370              +AGG$_$O2V002
                    O097_CAL_VIOLET_MANAGER.START_ONE_VIOLET_$O2V02X
2371   2371   1        $CONS$                    F  F  RR O  F
2371   2371              +AGG$_$O2V003
                    O097_CAL_VIOLET_MANAGER.DO_VIOLET_COLLECTION_$O2V02Y
2372   2372   2        $CONS$                    F  F  RR O  F
2372   2372              +AGG$_$O2V004
2373   2373              +AGG$_$O2V005
                    O097_CAL_VIOLET_MANAGER.CHECK_END_VIOLET_$O2V02Z
2374   2374   3        $CONS$                    F  F  RR O  F
2374   2374              +AGG$_$O2V006
2375   2375              +AGG$_$O2V007
2376   2376              +AGG$_$O2V008
                    O097_CAL_VIOLET_MANAGER.PICK_NEXT_VIOLET_$O2V031
2377   2377   2        $CONS$                    F  F  RR O  F
2377   2377              +AGG$_$O2V009
2378   2378              +AGG$_$O2V010
                    O097_CAL_VIOLET_MANAGER.END_CAL_VIOLET_$O2V032
2379   2379   2        $CONS$                    F  F  RR O  F
2379   2379              +AGG$_$O2V011
237A   237A              +AGG$_$O2V012
                    O100_OPERATING_MODE.START_NEW_MODE_$O1002W
237B   237B   2        $CONS$                    F  F  RR O  F
237B   237B              +AGG$_$O10001
237C   237C              +AGG$_$O10002
                    O100_OPERATING_MODE.STORE_NEW_MODE_$O1002X
237D   237D   2        $CONS$                    F  F  RR O  F
237D   237D              +AGG$_$O10003
237E   237E              +AGG$_$O10004
                    O100_OPERATING_MODE.FINISH_MODE_CHANGE_$O10031
237F   237F   1        $CONS$                    F  F  RR O  F
237F   237F              +AGG$_$O10005
                    O100_OPERATING_MODE.DO_EEPROM_PATCHES_$O10033
2380   2380   4        $CONS$                    F  F  RR O  F
2380   2380              +AGG$_$O10006
                    O122_EEPROM_DATA_SET.SEND_EEPROM_DATA_SET_$O1202X
2384   2384   6        $CONS$                    F  F  RR O  F
                    O123_PATCH_DATA.REFORMAT_PATCH_$O1302W
238A   238A   C        $CONS$                    F  F  RR O  F
238A   238A              +AGG$_$O13001
238B   238B              +AGG$_$O13002
                    O123_PATCH_DATA.WRITE_BLOCK_$O1302X
2396   2396   4        $CONS$                    F  F  RR O  F
2396   2396              +AGG$_$O13003
                    O123_PATCH_DATA.CHECK_BLOCK_$O1302Y
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239A   239A    8        $CONS$                      F  F  RR O  F
239A   239A                +AGG$_$O13004
239B   239B                +AGG$_$O13005
                     O124_EEPROM_PATCH.MAKE_EEPROM_PATCHES_$O1402X
23A2   23A2    2        $CONS$                      F  F  RR O  F
                     O124_EEPROM_PATCH.CONVERT_BYTES_TO_PAT_$O1402Z
23A4   23A4    4        $CONS$                      F  F  RR O  F
                     O125_EEPROM_USAGE.GET_USAGE_BLOCK_$O1502W
23A8   23A8    2        $CONS$                      F  F  RR O  F
                     O125_EEPROM_USAGE.SAVE_USAGE_BLOCK_$O1502X
23AA   23AA    6        $CONS$                      F  F  RR O  F
23AA   23AA                +AGG$_$O15001
                     O125_EEPROM_USAGE.INCR_USAGE_CNT_$O1502Y
23B0   23B0    2        $CONS$                      F  F  RR O  F
                     O131_ANGLE_LIB.ADD_ANGLE_$O1702V
23B2   23B2    2        $CONS$                      F  F  RR O  F
                     O131_ANGLE_LIB.SUBT_ANGLE_$O1702W
23B4   23B4    2        $CONS$                      F  F  RR O  F
                     O132_SQRT.SQRT_$O1802V
23B6   23B6    3        $CONS$                      F  F  RR O  F
                     O180_PACKET_MANAGER.DETERMINE_TLM_SPACE_$O1902W
23B9   23B9    7        $CONS$                      F  F  RR O  F
23B9   23B9                +AGG$_$O19001
23BA   23BA                +AGG$_$O19002
23BB   23BB                +AGG$_$O19003
                     O180_PACKET_MANAGER.WAIT_TLM_SPACE_$O1902X
23C0   23C0    3        $CONS$                      F  F  RR O  F
23C0   23C0                +AGG$_$O19004
                     O180_PACKET_MANAGER.DATA_SET_PACKAGED_$O1902Y
23C3   23C3   2B        $CONS$                      F  F  RR O  F
23C3   23C3                +AGG$_$O19005
23C4   23C4                +AGG$_$O19006
23C5   23C5                +AGG$_$O19007
23C6   23C6                +AGG$_$O19008
23C7   23C7                +AGG$_$O19009
23C8   23C8                +AGG$_$O19010
23C9   23C9                +AGG$_$O19011
23CA   23CA                +AGG$_$O19012
23CB   23CB                +AGG$_$O19013
23CC   23CC                +AGG$_$O19014
23CD   23CD                +AGG$_$O19015
23CE   23CE                +AGG$_$O19016
23CF   23CF                +AGG$_$O19017
23D0   23D0                +AGG$_$O19018
23D1   23D1                +AGG$_$O19019
                     O180_PACKET_MANAGER.SETUP_PENDING_TLM_$O1902Z
23EE   23EE    1        $CONS$                      F  F  RR O  F
23EE   23EE                +AGG$_$O19020
                     O180_PACKET_MANAGER.PACK_DATA_IN_PACKETS_$O19030
23EF   23EF    9        $CONS$                      F  F  RR O  F
23EF   23EF                +AGG$_$O19021
                     O181_TLM_QUEUE_CONTROL.ADD_TLM_QUEUE_$O2Y02X
23F8   23F8    4        $CONS$                      F  F  RR O  F
                     O181_TLM_QUEUE_CONTROL.GET_NEXT_PACKET_$O2Y02Y
23FC   23FC    2        $CONS$                      F  F  RR O  F
                     O181_TLM_QUEUE_CONTROL.UPDATE_PACKET_SENT_$O2Y02Z
23FE   23FE    2        $CONS$                      F  F  RR O  F
                     O181_TLM_QUEUE_CONTROL.REBUILD_TLM_LINKS_$O2Y031
2400   2400    2        $CONS$                      F  F  RR O  F
                     O183_FREE_PACKET_CONTROL.REMOVE_FREE_PACKET_$O3A02W
2402   2402    2        $CONS$                      F  F  RR O  F
                     O183_FREE_PACKET_CONTROL.ADD_FREE_PACKET_$O3A02X
2404   2404    3        $CONS$                      F  F  RR O  F
2404   2404                +AGG$_$O3A001
                     O184_PARTIAL_PACKET.GET_PARTIAL_PACKET_$O3B02Y
2407   2407    2        $CONS$                      F  F  RR O  F
                     O184_PARTIAL_PACKET.STORE_PARTIAL_PACKET_$O3B02Z
2409   2409    2        $CONS$                      F  F  RR O  F
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                      O185_TLM_CHANNEL_MANAGER.SETUP_NEXT_TLM_$O3C02Z
240B  240B   8           $CONS$                  F  F  RR O  F
240B  240B                  +AGG$_$O3C001
240C  240C                  +AGG$_$O3C002
                      O185_TLM_CHANNEL_MANAGER.FINISH_AND_SEND_PKT_$O3C032
2413  2413   6           $CONS$                  F  F  RR O  F
                      O186_PREDICTED_TLM_RATES.PREDICT_TLM_EMPTY_TI_$O3D02X
2419  2419   4           $CONS$                  F  F  RR O  F
                      O187_TLM_QUEUE.MAP_TLM_NDX_$O3E02Z
241D  241D   6           $CONS$                  F  F  RR O  F
                      O188_PENDING_TLM_REQUESTS.ADD_TLM_REQ_$O3F02Y
2423  2423   2           $CONS$                  F  F  RR O  F
                      O191_MESSAGE_DATA_SET.GENERATE_MESSAGE_DAT_$O3H02W
2425  2425   4           $CONS$                  F  F  RR O  F
                      O191_MESSAGE_DATA_SET.MESSAGE_PACKAGED_$O3H02X
2429  2429   1           $CONS$                  F  F  RR O  F
2429  2429                  +AGG$_$O3H001
                      O200_CCD.START_CCD_INT_$O20037
242A  242A  12           $CONS$                  F  F  RR O  F
                      O200_CCD.CCD_TIMEOUT_$O20038
243C  243C   6           $CONS$                  F  F  RR O  F
                      O210_PROBE_INPUT_BUFFER.START_TIMER_$O22031
2442  2442   6           $CONS$                  F  F  RR O  F
2442  2442                  +AGG$_$O22001
2444  2444                  +AGG$_$O22002
                      O213_PROBE_CMD_REG.CURRENT_PROC_VALID_$O2302Z
2448  2448   2           $CONS$                  F  F  RR O  F
                      O213_PROBE_CMD_REG.SWITCH_SIDES_$O2302X
244A  244A   4           $CONS$                  F  F  RR O  F
                      O213_PROBE_CMD_REG.SET_XFER_STATE_$O2302Y
244E  244E   4           $CONS$                  F  F  RR O  F
                      O217_TM_REFRESHER.REFRESH_BUFFER_$O2402V
2452  2452   A           $CONS$                  F  F  RR O  F
2452  2452                  +AGG$_$O24001
                      O218_TM_DMAS.START_TM_DMA_$O25030
245C  245C   C           $CONS$                  F  F  RR O  F
245C  245C                  +AGG$_$O25001
2460  2460                  +AGG$_$O25002
                      O218_TM_DMAS.CHECK_STATUS_$O25032
2468  2468   4           $CONS$                  F  F  RR O  F
2468  2468                  +AGG$_$O25003
246A  246A                  +AGG$_$O25004
                      O218_TM_DMAS.TM_INIT_$O25034
246C  246C   5           $CONS$                  F  F  RR O  F
246C  246C                  +AGG$_$O25005
                      O230_DCS.INITIALIZE_DCS_$O2703B
2471  2471   2           $CONS$                  F  F  RR O  F
                      O230_DCS.LOAD_IMAGE_DATA_$O2703C
2473  2473   3           $CONS$                  F  F  RR O  F
2473  2473                  +AGG$_$O27001
                      O230_DCS.START_COMPRESSION_$O2703D
2476  2476   2           $CONS$                  F  F  RR O  F
                      O230_DCS.RETRIEVE_COMP_DATA_$O2703E
2478  2478   3           $CONS$                  F  F  RR O  F
2478  2478                  +AGG$_$O27002
                      O230_DCS.RELEASE_BUFFER_$O2703F
247B  247B   2           $CONS$                  F  F  RR O  F
                      O230_DCS.WAIT_AGAIN_$O2703G
247D  247D   3           $CONS$                  F  F  RR O  F
247D  247D                  +AGG$_$O27003
                      O230_DCS.CHECK_STATUS_$O2703H
2480  2480   5           $CONS$                  F  F  RR O  F
2480  2480                  +AGG$_$O27004
2481  2481                  +AGG$_$O27005
2482  2482                  +AGG$_$O27006
                      O240_SUN_SENSOR.PULSE_WIDTH_IS_VALID_$O2802Y
2485  2485   2           $CONS$                  F  F  RR O  F
                      O240_SUN_SENSOR.PULSE_GAP_IS_VALID_$O2802Z
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2487   2487    2       $CONS$                     F  F  RR O  F
                     O240_SUN_SENSOR.INTERPULSE_RATIO_IS__$O28030
2489   2489    2       $CONS$                     F  F  RR O  F
                     O240_SUN_SENSOR.INIT_SUN_PROC_$O28031
248B   248B    3       $CONS$                     F  F  RR O  F
248B   248B               +AGG$_$O28001
                     O240_SUN_SENSOR.START_SEARCH_$O28032
248E   248E    C       $CONS$                     F  F  RR O  F
                     O240_SUN_SENSOR.START_DETECTION_$O28033
249A   249A    B       $CONS$                     F  F  RR O  F
249A   249A               +AGG$_$O28002
                     O240_SUN_SENSOR.SEARCH_FOR_LOCK_$O28034
24A5   24A5    3       $CONS$                     F  F  RR O  F
24A5   24A5               +AGG$_$O28003
24A7   24A7               +AGG$_$O28004
                     O240_SUN_SENSOR.ACQUIRE_PULSE_DATA_$O28039
24A8   24A8    A       $CONS$                     F  F  RR O  F
                     O240_SUN_SENSOR.PROCESS_A_TRIPLET_$O2803B
24B2   24B2    6       $CONS$                     F  F  RR O  F
24B2   24B2               +AGG$_$O28009
                     O240_SUN_SENSOR.LOCKED_TO_SIGNAL_$O28036
24B8   24B8    1       $CONS$                     F  F  RR O  F
24B8   24B8               +AGG$_$O28005
                     O240_SUN_SENSOR.SIGNAL_LOST_$O28037
24B9   24B9    4       $CONS$                     F  F  RR O  F
24B9   24B9               +AGG$_$O28006
24BB   24BB               +AGG$_$O28007
24BC   24BC               +AGG$_$O28008
                     O240_SUN_SENSOR.INTRAPULSE_RATIO_IS__$O28038
24BD   24BD    2       $CONS$                     F  F  RR O  F
                     O240_SUN_SENSOR.INTERPULSE_RATIO_IS__$O2803C
24BF   24BF    2       $CONS$                     F  F  RR O  F
                     O240_SUN_SENSOR.SEARCH_FOR_MAX_$O2803E
24C1   24C1    1       $CONS$                     F  F  RR O  F
24C1   24C1               +AGG$_$O28010
                     O241_SUN_DATA_SET.ADD_TO_DATA_SET_$O2902W
24C2   24C2    2       $CONS$                     F  F  RR O  F
                     O241_SUN_DATA_SET.SEND_DATA_SET_$O2902X
24C4   24C4    8       $CONS$                     F  F  RR O  F
                     O250_WATCHDOG.SET_TIMER_$O3J02Y
24CC   24CC    2       $CONS$                     F  F  RR O  F
                     O250_WATCHDOG.NEW_MODE_$O3J02Z
24CE   24CE    4       $CONS$                     F  F  RR O  F
24CE   24CE               +AGG$_$O3J001
24CF   24CF               +AGG$_$O3J002
                     O251_PROM_POWER.SET_PROM_POWER_$O3K02X
24D2   24D2    2       $CONS$                     F  F  RR O  F
                     O260_SHUTTER_TESTER.PERFORMING_IR_SELF_C_$O3L02W
24D4   24D4    2       $CONS$                     F  F  RR O  F
24D4   24D4               +AGG$_$O3L001
                     O260_SHUTTER_TESTER.COLLECTING_DATA_$O3L02X
24D6   24D6    2       $CONS$                     F  F  RR O  F
                     O260_SHUTTER_TESTER.REDUCING_DATA_$O3L02Y
24D8   24D8   16       $CONS$                     F  F  RR O  F
                     O260_SHUTTER_TESTER.FINISHING_TEST_$O3L02Z
24EE   24EE    1       $CONS$                     F  F  RR O  F
24EE   24EE               +AGG$_$O3L002
                     O260_SHUTTER_TESTER.START_TEST_$O3L030
24EF   24EF    2       $CONS$                     F  F  RR O  F
24EF   24EF               +AGG$_$O3L003
                     O260_SHUTTER_TESTER.SINGLE_TEST_DONE_$O3L031
24F1   24F1    2       $CONS$                     F  F  RR O  F
24F1   24F1               +AGG$_$O3L004
24F2   24F2               +AGG$_$O3L005
                     O261_DCS_TESTER.START_DCS_SELF_TEST_$O3M02X
24F3   24F3    3       $CONS$                     F  F  RR O  F
24F3   24F3               +AGG$_$O3M001
                     O261_DCS_TESTER.START_DCS_SW_TEST_$O3M02Y
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24F6    24F6    2       $CONS$                      F  F  RR O  F
24F6    24F6               +AGG$_$O3M002
24F7    24F7               +AGG$_$O3M003
                        O261_DCS_TESTER.SEND_TM_$O3M035
24F8    24F8    6       $CONS$                      F  F  RR O  F
                        O261_DCS_TESTER.TM_DONE_$O3M030
24FE    24FE    2       $CONS$                      F  F  RR O  F
24FE    24FE               +AGG$_$O3M004
24FF    24FF               +AGG$_$O3M005
                        O261_DCS_TESTER.SELF_TEST_DCS_ACCESS_$O3M031
2500    2500    4       $CONS$                      F  F  RR O  F
2500    2500               +AGG$_$O3M006
                        O261_DCS_TESTER.LOAD_TEST_IMAGE_$O3M034
2504    2504    4       $CONS$                      F  F  RR O  F
                        O262_HEATER_TESTER.START_TESTS_$O3N02W
2508    2508    2       $CONS$                      F  F  RR O  F
2508    2508               +AGG$_$O3N001
2509    2509               +AGG$_$O3N002
                        O262_HEATER_TESTER.START_A_TEST_$O3N02X
250A    250A    4       $CONS$                      F  F  RR O  F
250A    250A               +AGG$_$O3N003
                        O262_HEATER_TESTER.RECORD_A_TEMP_$O3N02Y
250E    250E    5       $CONS$                      F  F  RR O  F
250E    250E               +AGG$_$O3N004
2512    2512               +AGG$_$O3N005
                        O262_HEATER_TESTER.COMPLETE_A_TEST_$O3N02Z
2513    2513    2       $CONS$                      F  F  RR O  F
2513    2513               +AGG$_$O3N006
2514    2514               +AGG$_$O3N007
                        O262_HEATER_TESTER.COMPLETE_ALL_TESTS_$O3N030
2515    2515    1       $CONS$                      F  F  RR O  F
2515    2515               +AGG$_$O3N008
                        O262_HEATER_TESTER.PACKAGE_DATA_$O3N031
2516    2516    3       $CONS$                      F  F  RR O  F
2516    2516               +AGG$_$O3N009
                        O263_CAL_LAMP_TESTER.DONE_TEST_$O3O02Y
2519    2519    1       $CONS$                      F  F  RR O  F
2519    2519               +AGG$_$O3O001
                        O263_CAL_LAMP_TESTER.PACKAGE_DATA_$O3O02Z
251A    251A    4       $CONS$                      F  F  RR O  F
                        O264_SURFACE_LAMP_TESTER.TEST_DONE_$O3P031
251E    251E    1       $CONS$                      F  F  RR O  F
251E    251E               +AGG$_$O3P001
                        O264_SURFACE_LAMP_TESTER.PACKAGE_DATA_$O3P032
251F    251F    4       $CONS$                      F  F  RR O  F
                        O265_SUN_LAMP_TESTER.START_A_TEST_$O3Q02X
2523    2523    4       $CONS$                      F  F  RR O  F
                        O265_SUN_LAMP_TESTER.TEST_DONE_$O3Q02Y
2527    2527    1       $CONS$                      F  F  RR O  F
2527    2527               +AGG$_$O3Q001
                        O283_TIME_DATA_SET.ADD_TIME_PAIR_$O3X02Y
2528    2528    4       $CONS$                      F  F  RR O  F
                        O290_INTERRUPT_CONTROLLER.INITIALIZE_INTERRUPT_$O3Y032
252C    252C    C       $CONS$                      F  F  RR O  F
                        O290_INTERRUPT_CONTROLLER.ML_INTERRUPT
2538    2538    4       $CONS$                      F  F  RR O  F
                        O290_INTERRUPT_CONTROLLER.BP_INTERRUPT
253C    253C    7       $CONS$                      F  F  RR O  F
253C    253C               +AGG$_$O3Y001
                        O290_INTERRUPT_CONTROLLER.SS_INTERRUPT
2543    2543    3       $CONS$                      F  F  RR O  F
2543    2543               +AGG$_$O3Y002
                        O290_INTERRUPT_CONTROLLER.ET_INTERRUPT
2546    2546    1       $CONS$                      F  F  RR O  F
2546    2546               +AGG$_$O3Y003
                        O290_INTERRUPT_CONTROLLER.TM_A_INTERRUPT
2547    2547    2       $CONS$                      F  F  RR O  F
2547    2547               +AGG$_$O3Y004
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                       O290_INTERRUPT_CONTROLLER.TM_B_INTERRUPT
2549   2549    2          $CONS$                      F  F  RR O  F
2549   2549                  +AGG$_$O3Y005
                       O292_RESET_CONTROL.RESET_HARDWARE_$O4A02W
254B   254B    8          $CONS$                      F  F  RR O  F
                       O292_RESET_CONTROL.WATCHDOG_ENABLE_$O4A02X
2553   2553    2          $CONS$                      F  F  RR O  F
                       O292_RESET_CONTROL.WATCHDOG_DISABLE_$O4A02Y
2555   2555    2          $CONS$                      F  F  RR O  F
                       O293_DMA_CONTROL.SET_DMA_STATE_$O4B02W
2557   2557    2          $CONS$                      F  F  RR O  F
                       O293_DMA_CONTROL.WATCHDOG_ENABLE_$O4B02X
2559   2559    2          $CONS$                      F  F  RR O  F
                       O293_DMA_CONTROL.WATCHDOG_DISABLE_$O4B02Y
255B   255B    2          $CONS$                      F  F  RR O  F
                       O294_EXT_MEM_REGISTERS.MAP_EXT_MEM_$O4C02V
255D   255D    4          $CONS$                      F  F  RR O  F
                       O301_RADIO_PROCESSOR.PROCESS_NEW_MEASUREM_$O30031
2561   2561   1F          $CONS$                      F  F  RR O  F
2561   2561                  +NEW_MEASURE_$O30118
256E   256E                  +AGG$_$O30001
257D   257D                  +AGG$_$O30002
                       O301_RADIO_PROCESSOR.SCIENCE_CONTROLLER_$O30032
2580   2580    1          $CONS$                      F  F  RR O  F
2580   2580                  +AGG$_$O30003
                       O301_RADIO_PROCESSOR.CCD_PROCESSING_$O30034
2581   2581   1B          $CONS$                      F  F  RR O  F
2581   2581                  +COL_IMAGE_$O30119
2584   2584                  +COL_SOLAR_$O30120
                       O301_RADIO_PROCESSOR.SUM_NULL_PIXS_$O30038
259C   259C    6          $CONS$                      F  F  RR O  F
                       O301_RADIO_PROCESSOR.STRIP_ROWS_COLS_$O30039
25A2   25A2    8          $CONS$                      F  F  RR O  F
                       O301_RADIO_PROCESSOR.TLM_DATA_PACKAGED_$O30035
25AA   25AA   15          $CONS$                      F  F  RR O  F
25AA   25AA                  +AGG$_$O30004
                       O305_CCD_OPTIMUM_EXPOSURE.EXCLUDE_PIXELS_$O3402Z
25BF   25BF    2          $CONS$                      F  F  RR O  F
                       O305_CCD_OPTIMUM_EXPOSURE.OPT_EXPOSURE_$O34030
25C1   25C1   13          $CONS$                      F  F  RR O  F
25C1   25C1                  +AGG$_$O34001
                       O305_CCD_OPTIMUM_EXPOSURE.CLEAR_HISTGRAM_$O34031
25D4   25D4    2          $CONS$                      F  F  RR O  F
                       O306_IR_OPTIMUM_SAMPLING.OPT_SAMPLING_$O3502X
25D6   25D6    6          $CONS$                      F  F  RR O  F
                       O308_SW_COMPRESSOR.COMPRESS_$O3602Z
25DC   25DC   12          $CONS$                      F  F  RR O  F
                       O308_SW_COMPRESSOR.GEN_FUND_SEQ_$O36030
25EE   25EE   10          $CONS$                      F  F  RR O  F
                       O308_SW_COMPRESSOR.WRITE_ORIGINAL_DATA_$O36035
25FE   25FE    2          $CONS$                      F  F  RR O  F
                       O308_SW_COMPRESSOR.PSI_0_$O36032
2600   2600    C          $CONS$                      F  F  RR O  F
                       O308_SW_COMPRESSOR.PSI_1_$O36031
260C   260C    6          $CONS$                      F  F  RR O  F
                       O308_SW_COMPRESSOR.PSI_14_$O36033
2612   2612    4          $CONS$                      F  F  RR O  F
                       O308_SW_COMPRESSOR.PSI_F_$O36034
2616   2616    4          $CONS$                      F  F  RR O  F
                       O313_IR_SET.CREATE_IR_TLM_$O38030
261A   261A    C          $CONS$                      F  F  RR O  F
                       O314_DARK_SET.CREATE_DARK_TLM_$O3902Y
2626   2626    C          $CONS$                      F  F  RR O  F
                       O315_IMAGE_SET.CREATE_IMAGE_TLM_$O4F02Z
2632   2632   15          $CONS$                      F  F  RR O  F
2632   2632                  +MEAS_TYPE_$O4F109
                       O315_IMAGE_SET.CREATE_RAW_IMAGE_TLM_$O4F030
2647   2647   11          $CONS$                      F  F  RR O  F
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2647   2647           +MEAS_TYPE_$O4F110
                   O316_STRIP_SET.CREATE_STRIP_TLM_$O4G02Y
2658   2658   10      $CONS$                    F  F  RR O  F
                   O317_SOLAR_SET.CREATE_SOLAR_TLM_$O4H02Y
2668   2668    C      $CONS$                    F  F  RR O  F
                   O318_VISIBLE_SET.CREATE_VISIBLE_TLM_$O4I02Y
2674   2674    C      $CONS$                    F  F  RR O  F
                   O318_VISIBLE_SET.CREATE_VISIBLE_EXT_T_$O4I02Z
2680   2680    6      $CONS$                    F  F  RR O  F
                   O319_CCD_SET.CREATE_FULLCCD_TLM_$O4J02Y
2686   2686    8      $CONS$                    F  F  RR O  F
                   O320_VIOLET_MEASURE.PROCESS_UV_DATA_$O4K02X
268E   268E    4      $CONS$                    F  F  RR O  F
                   O330_IR_SPECTRUM.PROCESS_IR_DATA_$O4L02Y
2692   2692   16      $CONS$                    F  F  RR O  F
                   O340_DARK_CURRENT.PROCESS_DARK_DATA_$O4M02Z
26A8   26A8    8      $CONS$                    F  F  RR O  F
                   O350_IMAGE_PIC.HW_COMP_IMAGE_$O4N033
26B0   26B0    3      $CONS$                    F  F  RR O  F
26B0   26B0           +AGG$_$O4N001
                   O350_IMAGE_PIC.DCS_ACCESS_NOT_GRANT_$O4N034
26B3   26B3    3      $CONS$                    F  F  RR O  F
26B3   26B3           +AGG$_$O4N002
                   O350_IMAGE_PIC.FILL_WITH_RAW_IMAGE_$O4N03E
26B6   26B6   29      $CONS$                    F  F  RR O  F
26B6   26B6            AGG$_$O4N007
                   O350_IMAGE_PIC.HW_COMP_TLM_SENT_$O4N035
26DF   26DF    2      $CONS$                    F  F  RR O  F
26DF   26DF           +AGG$_$O4N003
26E0   26E0           +AGG$_$O4N004
                   O350_IMAGE_PIC.PREP_FOR_NEXT_IMAGE_$O4N03H
26E1   26E1    3      $CONS$                    F  F  RR O  F
26E1   26E1           +AGG$_$O4N011
26E2   26E2           +AGG$_$O4N012
26E3   26E3           +AGG$_$O4N013
                   O350_IMAGE_PIC.END_IMAGE_PROCESSING_$O4N038
26E4   26E4    1      $CONS$                    F  F  RR O  F
26E4   26E4           +AGG$_$O4N005
                   O350_IMAGE_PIC.SET_UP_DARK_CURRENT_$O4N03D
26E5   26E5    2      $CONS$                    F  F  RR O  F
                   O350_IMAGE_PIC.COLLECT_IMAGE_$O4N03A
26E7   26E7    7      $CONS$                    F  F  RR O  F
26E7   26E7           +AGG$_$O4N006
                   O350_IMAGE_PIC.HW_COMP_PREP_$O4N03B
26EE   26EE   12      $CONS$                    F  F  RR O  F
                   O350_IMAGE_PIC.FRAME_RUNOUT_CORRECT_$O4N03O
2700   2700    4      $CONS$                    F  F  RR O  F
                   O350_IMAGE_PIC.SETUP_SW_COMP_$O4N03C
2704   2704    4      $CONS$                    F  F  RR O  F
                   O350_IMAGE_PIC.PROC_ACCORD_REQS_$O4N03F
2708   2708    8      $CONS$                    F  F  RR O  F
                   O350_IMAGE_PIC.ADJUST_SQRT_TABLE_$O4N03S
2710   2710   19      $CONS$                    F  F  RR O  F
                   O350_IMAGE_PIC.PROCESS_IMAGE_DATA_$O4N03G
2729   2729    3      $CONS$                    F  F  RR O  F
2729   2729           +AGG$_$O4N008
272A   272A           +AGG$_$O4N009
272B   272B           +AGG$_$O4N010
                   O350_IMAGE_PIC.DCS_ACCESS_GRANTED_$O4N03I
272C   272C    4      $CONS$                    F  F  RR O  F
                   O350_IMAGE_PIC.WRITE_IMAGE_TO_DCS_$O4N03J
2730   2730    E      $CONS$                    F  F  RR O  F
                   O350_IMAGE_PIC.SW_COMP_IMAGE_$O4N03K
273E   273E    4      $CONS$                    F  F  RR O  F
                   O350_IMAGE_PIC.GENERATE_TLM_$O4N03L
2742   2742    8      $CONS$                    F  F  RR O  F
                   O350_IMAGE_PIC.PICK_NEXT_IMAGE2_$O4N03R
274A   274A    2      $CONS$                    F  F  RR O  F
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274A   274A               +AGG$_$O4N014
274B   274B               +AGG$_$O4N015
                        O359_LOOKUP_TABLE.GENERATE_TABLE_$O4P02Z
274C   274C     2         $CONS$                      F  F  RR O  F
                        O360_IMAGE_STRIP.PROCESS_STRIP_DATA_$O4Q02Z
274E   274E     C         $CONS$                      F  F  RR O  F
                        O370_SOLAR_AUREOLE.PROCESS_SOLAR_DATA_$O4R02Z
275A   275A     E         $CONS$                      F  F  RR O  F
                        O380_VISIBLE_SPECTRUM.PROCESS_VISIBLE_DATA_$O4S033
2768   2768     C         $CONS$                      F  F  RR O  F
                        O380_VISIBLE_SPECTRUM.PROCESS_VISIBLE_EXT__$O4S035
2774   2774     6         $CONS$                      F  F  RR O  F
                        O390_FULL_CCD.PROCESS_FULLCCD_DATA_$O4T02Z
277A   277A     6         $CONS$                      F  F  RR O  F
                        O390_FULL_CCD.COMPRESS_FULLCCD_PIE_$O4T030
2780   2780     4         $CONS$                      F  F  RR O  F
                        O390_FULL_CCD.TELEMETER_FULLCCD_PI_$O4T031
2784   2784     8         $CONS$                      F  F  RR O  F
                        O400_MULTIPLEXED_DEVICE.READ_MUX_$O40031
278C   278C     6         $CONS$                      F  F  RR O  F
                        O404_HOUSEKEEPING_DATA_SET.GENERATE_HK_DATA_SET_$O4102Y
2792   2792     4         $CONS$                      F  F  RR O  F
                        O404_HOUSEKEEPING_DATA_SET.NEW_MODE_$O4102Z
2796   2796     2         $CONS$                      F  F  RR O  F
2796   2796               +AGG$_$O41001
                        O410_IR_INTERFACE.SELF_CALIBRATING_$O42031
2798   2798     B         $CONS$                      F  F  RR O  F
2798   2798               +AGG$_$O42001
2799   2799               +AGG$_$O42002
                        O410_IR_INTERFACE.READY_TO_START_$O42032
27A3   27A3     1         $CONS$                      F  F  RR O  F
27A3   27A3               +AGG$_$O42003
                        O410_IR_INTERFACE.GENERATING_SEQUENCE_$O42033
27A4   27A4    15         $CONS$                      F  F  RR O  F
27A4   27A4               +AGG$_$O42004
27A6   27A6               +AGG$_$O42005
                        O410_IR_INTERFACE.GEN_SHUTTER_TEST_SEQ_$O42037
27B9   27B9    2A         $CONS$                      F  F  RR O  F
27B9   27B9               +AGG$_$O42008
27BB   27BB               +AGG$_$O42009
27BD   27BD               +AGG$_$O42010
27BF   27BF               +AGG$_$O42011
27C1   27C1               +AGG$_$O42012
27C3   27C3               +AGG$_$O42013
27C5   27C5               +AGG$_$O42014
27C7   27C7               +AGG$_$O42015
27C9   27C9               +AGG$_$O42016
27CB   27CB               +AGG$_$O42017
27CD   27CD               +AGG$_$O42018
27CF   27CF               +AGG$_$O42019
27D1   27D1               +AGG$_$O42020
27D3   27D3               +AGG$_$O42021
27D5   27D5               +AGG$_$O42022
27D7   27D7               +AGG$_$O42023
27D9   27D9               +AGG$_$O42024
27DB   27DB               +AGG$_$O42025
27DD   27DD               +AGG$_$O42026
27DF   27DF               +AGG$_$O42027
                        O410_IR_INTERFACE.GEN_CMD_SEQ_$O42036
27E3   27E3    1B         $CONS$                      F  F  RR O  F
27E3   27E3               +LOG2_TABLE_$O42128
                        O410_IR_INTERFACE.NEXT_CMD_IDX_$O4203A
27FE   27FE     A         $CONS$                      F  F  RR O  F
                        O410_IR_INTERFACE.WAITING_FOR_NEXT_SEG_$O42034
2808   2808     7         $CONS$                      F  F  RR O  F
2808   2808               +AGG$_$O42006
280A   280A               +AGG$_$O42007
                        O410_IR_INTERFACE.IR_OFF_$O42035
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280F   280F   2       $CONS$                      F  F  RR O  F
                   O410_IR_INTERFACE.WAIT_FOR_A_WHILE_$O4203D
2811   2811   2       $CONS$                      F  F  RR O  F
2811   2811              +AGG$_$O42030
                   O410_IR_INTERFACE.CLOSE_THE_SHUTTER_$O42039
2813   2813   2       $CONS$                      F  F  RR O  F
2813   2813              +AGG$_$O42029
                   O410_IR_INTERFACE.OPEN_THE_SHUTTER_$O42038
2815   2815   2       $CONS$                      F  F  RR O  F
2815   2815              +AGG$_$O42028
                   O410_IR_INTERFACE.COLLECTING_DATA_$O4203F
2817   2817   8       $CONS$                      F  F  RR O  F
                   O414_IR_RAW_DATA.SAVE_BUFFERS_NOW_$O43036
281F   281F   8       $CONS$                      F  F  RR O  F
                   O460_LAMP.SET_LAMPS_$O46031
2827   2827   6       $CONS$                      F  F  RR O  F
2827   2827              +AGG$_$O46001
2828   2828              +AGG$_$O46002
282A   282A              +AGG$_$O46003
                   O460_LAMP.LAMPS_STABLE_$O46033
282D   282D   2       $CONS$                      F  F  RR O  F
282D   282D              +AGG$_$O46004
282E   282E              +AGG$_$O46005
                   O460_LAMP.REPORT_LAMP_DATA_$O46034
282F   282F   4       $CONS$                      F  F  RR O  F
                   O460_LAMP.AT_SURFACE_$O46036
2833   2833   2       $CONS$                      F  F  RR O  F
2833   2833              +AGG$_$O46006
                   O465_MISC_DEV_CONTROL_REGISTER.INITIALIZE_DEVICES_$O4802W
2835   2835   2       $CONS$                      F  F  RR O  F
2835   2835              +AGG$_$O48001
2836   2836              +AGG$_$O48002
                   O465_MISC_DEV_CONTROL_REGISTER.TIMED_WRITE_$O4802X
2837   2837   6       $CONS$                      F  F  RR O  F
2837   2837              +AGG$_$O48003
                   O465_MISC_DEV_CONTROL_REGISTER.NEW_VALUE_$O4802Y
283D   283D   C       $CONS$                      F  F  RR O  F
                   O470_THERMAL_MANAGER.DISABLED_$O4902Z
2849   2849   2       $CONS$                      F  F  RR O  F
2849   2849              +AGG$_$O49001
                   O480_STATUS_WORD.UPDATE_MODE_$O5A036
284B   284B   5       $CONS$                      F  F  RR O  F
                   O480_STATUS_WORD.WRITE_REGISTERS_$O5A03K
2850   2850   4       $CONS$                      F  F  RR O  F
                   O480_STATUS_WORD.UPDATE_DESC_CYCLE_$O5A037
2854   2854   4       $CONS$                      F  F  RR O  F
2854   2854              +AGG$_$O5A001
                   O480_STATUS_WORD.INCR_DESC_MEAS_$O5A038
2858   2858   4       $CONS$                      F  F  RR O  F
2858   2858              +AGG$_$O5A002
                   O480_STATUS_WORD.DESC_MEAS_COMPLETE_$O5A039
285C   285C   2       $CONS$                      F  F  RR O  F
285C   285C              +AGG$_$O5A003
                   O480_STATUS_WORD.INCR_CAL_MEAS_$O5A03A
285E   285E   4       $CONS$                      F  F  RR O  F
285E   285E              +AGG$_$O5A004
                   O480_STATUS_WORD.UPDATE_CAL_CYCLE_NUM_$O5A03B
2862   2862   4       $CONS$                      F  F  RR O  F
2862   2862              +AGG$_$O5A005
                   O480_STATUS_WORD.UPDATE_CAL_MEAS_COMP_$O5A03C
2866   2866   2       $CONS$                      F  F  RR O  F
2866   2866              +AGG$_$O5A006
                   O480_STATUS_WORD.UPDATE_SINGLE_CMD_$O5A03D
2868   2868   6       $CONS$                      F  F  RR O  F
2868   2868              +AGG$_$O5A007
                   O480_STATUS_WORD.SINGLE_CMD_COMPLETE_$O5A03E
286E   286E   2       $CONS$                      F  F  RR O  F
286E   286E              +AGG$_$O5A008
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                                   O480_STATUS_WORD.UPDATE_MEMORY_ACCESS_$O5A03F
        2870   2870    4             $CONS$                    F  F  RR O  F
        2870   2870                     +AGG$_$O5A009
                                   O480_STATUS_WORD.MEMORY_ACCESS_COMPLE_$O5A03G
        2874   2874    2             $CONS$                    F  F  RR O  F
        2874   2874                     +AGG$_$O5A010
                                   O480_STATUS_WORD.NEW_CCD_STATUS_$O5A03I
        2876   2876    1             $CONS$                    F  F  RR O  F
        2876   2876                     +AGG$_$O5A011
                                   O480_STATUS_WORD.UPDATE_INIT_STATE_$O5A03N
        2877   2877    B             $CONS$                    F  F  RR O  F
                                   FRND
        2882   2882    6             A$KCNS                    F  F  RR O  F
                                   LFRND
        2888   2888    9             A$KCNS                    F  F  RR O  F
                                   MARKER
        2891   2891    1             CONS_END                  F  F  RR O  F
        2891   2891                      END_OF_CONS
   END OF GROUP :CONS_AREA
   START OF GROUP :DATA_AREA
                                   COMMON_INT
        2892   2892   34             DISRDATA                  F  F  RA O  F
        2892   2892                     +DHLINK
        2895   2895                     +INTLEVEL
        2896   2896                     +LINK_TBL
                                   EVENT_QUE.EVENT_QUE
        28C6   28C6    2             $DATA$                    F  F  RA O  F
        28C6   28C6                      MAX_EVENT_QUE_$EVF103
        28C7   28C7                      NUM_EVENT_QUE_$EVF104
                                   O0011_ALARM_QUEUE.O0011_ALARM_QUEUE
        28C8   28C8   6B             $DATA$                    F  F  RA O  F
        28C8   28C8                      O0011_ALARM_QUEUE_DA_$O00103
                                   O001_CLOCK.O001_CLOCK
        2933   2933   17             $DATA$                    F  F  RA O  F
        2933   2933                      ROLLOVER_TIME_$O01103
        2935   2935                      O001_CLOCK_DATA_$O01104
                                   O002_LOADER.O002_LOADER
        294A   294A    4             $DATA$                    F  F  RA O  F
        294A   294A                      O002_LOADER_DATA
                                   O004_MEMORY.O004_MEMORY
        294E   294E   31             $DATA$                    F  F  RA O  F
        294E   294E                      O004_MEMORY_DATA_$O03103
                                   O005_POPULATED_MEMORY.O005_POPULATED_MEMORY
        297F   297F   28             $DATA$                    F  F  RA O  F
        297F   297F                      O005_POPULATED_MEMOR_$O04103
                                   O007_RAM_DATA_SET.O007_RAM_DATA_SET
        29A7   29A7   C9             $DATA$                    F  F  RA O  F
        29A7   29A7                      O007_RAM_DATA_SET
                                   O008_DUMP_DATA_SET.O008_DUMP_DATA_SET
        2A70   2A70    4             $DATA$                    F  F  RA O  F
        2A70   2A70                      O008_DUMP_DATA_SET_D_$O06103
        2A73   2A73                      O008_DUMP_DATA_SET_I_$O06104
                                   O011_COMMAND_BUFFER.O011_COMMAND_BUFFER
        2A74   2A74   81             $DATA$                    F  F  RA O  F
        2A74   2A74                      CMD_HEADER_$O07103
        2A75   2A75                      O011_COMMAND_BUFFER__$O07104
                                   O012_PROBE_CMD.O012_PROBE_CMD
        2AF5   2AF5    3             $DATA$                    F  F  RA O  F
        2AF5   2AF5                      DISR_HEADER_$O08103
        2AF6   2AF6                      O012_PROBE_CMD_DATA_$O08104
                                   O013_BROADCAST_CMD.O013_BROADCAST_CMD
        2AF8   2AF8    1             $DATA$                    F  F  RA O  F
        2AF8   2AF8                      O013_BROADCAST_CMD_D_$O09103
                                   O021_ENABLE_CMD.O021_ENABLE_CMD
        2AF9   2AF9    1             $DATA$                    F  F  RA O  F
        2AF9   2AF9                      O021_ENABLE_CMD_DATA_$O1A103
                                   O022_CHANGE_MODE_CMD.O022_CHANGE_MODE_CMD
        2AFA   2AFA    1             $DATA$                    F  F  RA O  F
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2AFA   2AFA              O022_CHANGE_MODE_CMD_$O1B103
                  O023_SINGLE_MEAS_CMD.O023_SINGLE_MEAS_CMD
2AFB   2AFB   12       $DATA$                    F  F  RA O  F
2AFB   2AFB              O023_SINGLE_MEAS_CMD_$O1C103
                  O024_SINGLE_TEST_CMD.O024_SINGLE_TEST_CMD
2B0D   2B0D    9       $DATA$                    F  F  RA O  F
2B0D   2B0D              TEST_CMD_$O1D103
2B14   2B14              O024_SINGLE_TEST_CMD_$O1D104
                  O026_DUMP_CMD.O026_DUMP_CMD
2B16   2B16    2       $DATA$                    F  F  RA O  F
2B16   2B16              O026_DUMP_CMD_DATA_$O1E103
2B17   2B17              DUMP_HEADER_SIZE_$O1E104
                  O027_UPLINK_EEPROM_CMD.O027_UPLINK_EEPROM_CMD
2B18   2B18   6F       $DATA$                    F  F  RA O  F
2B18   2B18              O027_UPLINK_EEPROM_C_$O1F103
2B86   2B86              EE_HEADER_SIZE_$O1F104
                  O028_UPLINK_RAM_CMD.O028_UPLINK_RAM_CMD
2B87   2B87    2       $DATA$                    F  F  RA O  F
2B87   2B87              O028_UPLINK_RAM_CMD__$O1G103
2B88   2B88              RAM_HEADER_SIZE_$O1G104
                  O030_ATTITUDE.O030_ATTITUDE
2B89   2B89    C       $DATA$                    F  F  RA O  F
2B89   2B89              O030_ATTITUDE_DATA_$O1H103
                  O031_ALTITUDE.O031_ALTITUDE
2B95   2B95    6       $DATA$                    F  F  RA O  F
2B95   2B95              O031_ALTITUDE_DATA_$O1I103
                  O040_DESCENT_SCHEDULER.O040_DESCENT_SCHEDULER
2B9B   2B9B   14       $DATA$                    F  F  RA O  F
2B9B   2B9B              O040_DESCENT_SCHEDUL_$O1J103
                  O041_SCENARIO_SPEC.O041_SCENARIO_SPEC
2BAF   2BAF  222       $DATA$                    F  F  RA O  F
2BAF   2BAF             +TEMP__$O1K105
2BB0   2BB0              O041_SCENARIO_SPEC_D_$O1K103
                  O042_CYCLE_SPEC.O042_CYCLE_SPEC
2DD1   2DD1   DD       $DATA$                    F  F  RA O  F
2DD1   2DD1             +TEMP__$O1L105
2DD2   2DD2              O042_CYCLE_SPEC_DATA_$O1L103
                  O044_DESCENT_CYCLE_DATA_SET.O044_DESCENT_CYCLE_DATA_SET
2EAE   2EAE    A       $DATA$                    F  F  RA O  F
2EAE   2EAE              O044_DESCENT_CYCLE_D_$O1M103
2EB7   2EB7              O044_CYCLE_DATA_SET__$O1M104
                  O045_INST_MISALIGNMENT.O045_INST_MISALIGNMENT
2EB8   2EB8    E       $DATA$                    F  F  RA O  F
2EB8   2EB8              O045_INST_MISALIGNME_$O1N103
                  O050_CCD_MANAGER.O050_CCD_MANAGER
2EC6   2EC6    C       $DATA$                    F  F  RA O  F
2EC6   2EC6              O050_CCD_MANAGER_DAT_$O1O103
                  O051_CCD_MEAS_SET.O051_CCD_MEAS_SET
2ED2   2ED2  12E       $DATA$                    F  F  RA O  F
3000   3000   3B
2ED2   2ED2              O051_CCD_MEAS_SET_DA_$O1P103
                  O052_CCD_INDEX_TABLE.O052_CCD_INDEX_TABLE
303B   303B   15       $DATA$                    F  F  RA O  F
303B   303B              O052_CCD_INDEX_TABLE_$O1Q103
                  O053_CCD_EXPOSURE.O053_CCD_EXPOSURE
3050   3050  190       $DATA$                    F  F  RA O  F
3050   3050              O053_CCD_EXPOSURE_DA_$O1R103
                  O054_CCD_MEAS_SPEC.O054_CCD_MEAS_SPEC
31E0   31E0  5CE       $DATA$                    F  F  RA O  F
31E0   31E0             +TEMP__$O1S105
31E1   31E1              O054_CCD_MEAS_SPEC_D_$O1S103
                  O055_CCD_EXPOSURE_LIMITS.O055_CCD_EXPOSURE_LIMITS
37AE   37AE   20       $DATA$                    F  F  RA O  F
37AE   37AE              O055_CCD_EXPOSURE_LI_$O1T103
                  O059_CCD_BACKGROUND.O059_CCD_BACKGROUND
37CE   37CE    D       $DATA$                    F  F  RA O  F
37CE   37CE              O059_CCD_BACKGROUND__$O1U103
                  O060_IR_MANAGER.O060_IR_MANAGER
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37DB   37DB   16        $DATA$                      F  F  RA O  F
37DB   37DB                     O060_IR_MANAGER_DATA_$O1V103
                     O061_IR_MEAS_SPEC.O061_IR_MEAS_SPEC
37F1   37F1   FD        $DATA$                      F  F  RA O  F
37F1   37F1                    +TEMP__$O1W105
37F2   37F2                     O061_IR_MEAS_SPEC_DA_$O1W103
                     O062_IR_REGION_SPEC.O062_IR_REGION_SPEC
38EE   38EE   7C        $DATA$                      F  F  RA O  F
38EE   38EE                     O062_IR_REGION_SPEC__$O1X103
                     O063_IR_EXPOSURE.O063_IR_EXPOSURE
396A   396A   8A        $DATA$                      F  F  RA O  F
396A   396A                    +TEMP__$O1Y104
396B   396B                    +TEMP__$O1Y106
396C   396C                     O063_IR_EXPOSURE_DAT_$O1Y103
                     O064_IR_REGIONS.O064_IR_REGIONS
39F4   39F4   72        $DATA$                      F  F  RA O  F
39F4   39F4                     O064_IR_REGIONS_DATA_$O1Z103
                     O069_IR_BACKGROUND.O069_IR_BACKGROUND
3A66   3A66    D        $DATA$                      F  F  RA O  F
3A66   3A66                     O069_IR_BACKGROUND_D_$O2A103
                     O070_VIOLET_MANAGER.O070_VIOLET_MANAGER
3A73   3A73    7        $DATA$                      F  F  RA O  F
3A73   3A73                     O070_VIOLET_MANAGER__$O2B103
                     O071_VIOLET_MEAS_SET.O071_VIOLET_MEAS_SET
3A7A   3A7A   51        $DATA$                      F  F  RA O  F
3A7A   3A7A                     O071_VIOLET_MEAS_SET_$O2C103
                     O072_VIOLET_MEAS_SPEC.O072_VIOLET_MEAS_SPEC
3ACB   3ACB   9C        $DATA$                      F  F  RA O  F
3ACB   3ACB                     O072_VIOLET_MEAS_SPE_$O2D103
                     O074_ULV_COLLECTION.O074_ULV_COLLECTION
3B67   3B67    3        $DATA$                      F  F  RA O  F
3B67   3B67                     O074_ULV_COLLECTION__$O2E103
                     O079_VIOLET_BACKGROUND.O079_VIOLET_BACKGROUND
3B6A   3B6A    A        $DATA$                      F  F  RA O  F
3B6A   3B6A                     O079_VIOLET_BACKGROU_$O2F103
                     O080_SPM_SCHEDULER.O080_SPM_SCHEDULER
3B74   3B74    3        $DATA$                      F  F  RA O  F
3B74   3B74                     O080_SPM_SCHEDULER_D_$O2G103
                     O081_SPM_CCD_MANAGER.O081_SPM_CCD_MANAGER
3B77   3B77    3        $DATA$                      F  F  RA O  F
3B77   3B77                     O081_SPM_CCD_MANAGER_$O2H105
                     O082_SPM_IR_MANAGER.O082_SPM_IR_MANAGER
3B7A   3B7A    4        $DATA$                      F  F  RA O  F
3B7A   3B7A                     O082_SPM_IR_MANAGER__$O2I104
                     O085_CAL_SCHEDULER.O085_CAL_SCHEDULER
3B7E   3B7E   18        $DATA$                      F  F  RA O  F
3B7E   3B7E                     O085_CAL_SCHEDULER_D_$O2J103
                     O086_CAL_CYCLE_SPEC.O086_CAL_CYCLE_SPEC
3B96   3B96  12C        $DATA$                      F  F  RA O  F
3B96   3B96                     O086_CAL_CYCLE_SPEC__$O2K103
                     O087_CAL_SPEC_INDEX_TABLE.O087_CAL_SPEC_INDEX_TABLE
3CC2   3CC2    8        $DATA$                      F  F  RA O  F
3CC2   3CC2                     O087_CAL_SPEC_INDEX__$O2L103
                     O088_CAL_CYCLE_DATA_SET.O088_CAL_CYCLE_DATA_SET
3CCA   3CCA    D        $DATA$                      F  F  RA O  F
3CCA   3CCA                     O088_CAL_CYCLE_DATA__$O2M103
3CD6   3CD6                     O088_CAL_CYCLE_DATA__$O2M104
                     O089_CAL_VIOLET_INDEX_TABLE.O089_CAL_VIOLET_INDEX_TABLE
3CD7   3CD7    5        $DATA$                      F  F  RA O  F
3CD7   3CD7                     O089_CAL_VIOLET_INDE_$O2N103
                     O090_CAL_CCD_MANAGER.O090_CAL_CCD_MANAGER
3CDC   3CDC    B        $DATA$                      F  F  RA O  F
3CDC   3CDC                     O090_CAL_CCD_MANAGER_$O2O103
                     O091_CAL_CCD_EXPOSURE.O091_CAL_CCD_EXPOSURE
3CE7   3CE7   2A        $DATA$                      F  F  RA O  F
3CE7   3CE7                     O091_CAL_CCD_EXPOSUR_$O2P103
                     O092_CAL_CCD_MEAS_SPEC.O092_CAL_CCD_MEAS_SPEC
3D11   3D11  259        $DATA$                      F  F  RA O  F
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3D11   3D11              +TEMP__$O2Q105
3D12   3D12               O092_CAL_CCD_MEAS_SP_$O2Q103
                   O093_CAL_CCD_INDEX_TABLE.O093_CAL_CCD_INDEX_TABLE
3F6A   3F6A   14      $DATA$                    F  F  RA O  F
3F6A   3F6A               O093_CAL_CCD_INDEX_T_$O2R103
                   O094_CAL_IR_SPEC.O094_CAL_IR_SPEC
3F7E   3F7E   82      $DATA$                    F  F  RA O  F
4000   4000   2F
3F7E   3F7E              +TEMP__$O2S105
3F7F   3F7F               O094_CAL_IR_SPEC_DAT_$O2S103
                   O095_CAL_IR_MANAGER.O095_CAL_IR_MANAGER
402F   402F   14      $DATA$                    F  F  RA O  F
402F   402F               O095_CAL_IR_MANAGER__$O2T103
                   O096_CAL_IR_EXPOSURE.O096_CAL_IR_EXPOSURE
4043   4043    8      $DATA$                    F  F  RA O  F
4043   4043               O096_CAL_IR_EXPOSURE_$O2U103
                   O097_CAL_VIOLET_MANAGER.O097_CAL_VIOLET_MANAGER
404B   404B    6      $DATA$                    F  F  RA O  F
404B   404B               O097_CAL_VIOLET_MANA_$O2V103
                   O098_CAL_VIOLET_SPEC.O098_CAL_VIOLET_SPEC
4051   4051   19      $DATA$                    F  F  RA O  F
4051   4051              +TEMP__$O2W105
4052   4052               O098_CAL_VIOLET_SPEC_$O2W103
                   O099_CAL_IR_INDEX_TABLE.O099_CAL_IR_INDEX_TABLE
406A   406A    5      $DATA$                    F  F  RA O  F
406A   406A               O099_CAL_IR_INDEX_TA_$O2X103
                   O100_OPERATING_MODE.O100_OPERATING_MODE
406F   406F    7      $DATA$                    F  F  RA O  F
406F   406F               O100_OPERATING_MODE__$O10103
                   O122_EEPROM_DATA_SET.O122_EEPROM_DATA_SET
4076   4076   34      $DATA$                    F  F  RA O  F
4076   4076               O122_EEPROM_DATA_SET_$O12103
40A9   40A9               O122_EEPROM_DATA_SET_$O12104
                   O123_PATCH_DATA.O123_PATCH_DATA
40AA   40AA   49      $DATA$                    F  F  RA O  F
40AA   40AA               O123_PATCH_DATA_DATA_$O13103
                   O124_EEPROM_PATCH.O124_EEPROM_PATCH
40F3   40F3  41F      $DATA$                    F  F  RA O  F
40F3   40F3               O124_EEPROM_PATCH_DA_$O14103
                   O125_EEPROM_USAGE.O125_EEPROM_USAGE
4512   4512   21      $DATA$                    F  F  RA O  F
4512   4512               O125_EEPROM_USAGE_DA_$O15103
                   O180_PACKET_MANAGER.O180_PACKET_MANAGER
4533   4533   48      $DATA$                    F  F  RA O  F
4533   4533               O180_PACKET_MANAGER__$O19103
                   O181_TLM_QUEUE_CONTROL.O181_TLM_QUEUE_CONTROL
457B   457B   10      $DATA$                    F  F  RA O  F
457B   457B               O181_TLM_QUEUE_CONTR_$O2Y103
458A   458A               O181_REBUILD_IN_PROG_$O2Y104
                   O182_DATA_SET_HEADER.O182_DATA_SET_HEADER
458B   458B    1      $DATA$                    F  F  RA O  F
458B   458B               O182_DATA_SET_HEADER_$O2Z103
                   O183_FREE_PACKET_CONTROL.O183_FREE_PACKET_CONTROL
458C   458C    4      $DATA$                    F  F  RA O  F
458C   458C               O183_FREE_PACKET_CON_$O3A103
                   O184_PARTIAL_PACKET.O184_PARTIAL_PACKET
4590   4590   B3      $DATA$                    F  F  RA O  F
4590   4590              +TEMP__$O3B104
4591   4591              +TEMP__$O3B105
4592   4592               O184_PARTIAL_PACKET__$O3B103
                   O185_TLM_CHANNEL_MANAGER.O185_TLM_CHANNEL_MANAGER
4643   4643   87      $DATA$                    F  F  RA O  F
4643   4643              +TEMP__$O3C104
4644   4644              +TEMP__$O3C105
4645   4645               O185_TLM_CHANNEL_MAN_$O3C103
46C9   46C9               O185_SEND_PKTS_$O3C106
                   O186_PREDICTED_TLM_RATES.O186_PREDICTED_TLM_RATES
46CA   46CA    C      $DATA$                    F  F  RA O  F
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46CA   46CA                 O186_PREDICTED_TLM_R_$O3D103
                     O187_TLM_QUEUE.O187_TLM_QUEUE
46D6   46D6    3        $DATA$                     F  F  RA O  F
46D6   46D6                 O187_TLM_REG_PTR_$O3E103
46D7   46D7                 O187_CURR_REG_$O3E104
46D8   46D8                 O187_WROTE_TO_SEND_A_$O3E105
                     O188_PENDING_TLM_REQUESTS.O188_PENDING_TLM_REQUESTS
46D9   46D9  14B        $DATA$                     F  F  RA O  F
46D9   46D9               +TEMP__$O3F104
46DA   46DA               +TEMP__$O3F105
46DB   46DB                 O188_PENDING_TLM_REQ_$O3F103
                     O190_MESSAGE.O190_MESSAGE
4824   4824   7F        $DATA$                     F  F  RA O  F
4824   4824                 O190_MESSAGE_DATA_$O3G103
                     O191_MESSAGE_DATA_SET.O191_MESSAGE_DATA_SET
48A3   48A3    5        $DATA$                     F  F  RA O  F
48A3   48A3                 O191_MESSAGE_DATA_SE_$O3H103
                     O200_CCD.O200_CCD
48A8   48A8    7        $DATA$                     F  F  RA O  F
48A8   48A8                 LAST_NEWLINE_VAL_$O20109
48A9   48A9                 LAST_PIXEL_VAL_$O20110
48AA   48AA                 NEW_FRAME_VAL_$O20111
48AB   48AB                 O200_CCD_DATA_$O20114
                     O201_CCD_DATA_BUFFER.O201_CCD_DATA_BUFFER
48AF   48AF    7        $DATA$                     F  F  RA O  F
48AF   48AF                 O201_PNTR_$O21103
48B0   48B0                 O201_CCD_DATA_BUFFER_$O21107
                     O210_PROBE_INPUT_BUFFER.O210_PROBE_INPUT_BUFFER
48B6   48B6  108        $DATA$                     F  F  RA O  F
48B6   48B6               +TEMP__$O22104
48B7   48B7               +TEMP__$O22105
48B8   48B8                 O210_PROBE_INPUT_BUF_$O22103
                     O213_PROBE_CMD_REG.O213_PROBE_CMD_REG
49BE   49BE    4        $DATA$                     F  F  RA O  F
49BE   49BE                 O213_PROBE_CMD_REG_D_$O23103
                     O218_TM_DMAS.O218_TM_DMAS
49C2   49C2    C        $DATA$                     F  F  RA O  F
49C2   49C2                 PROBE_IF_A_$O25104
49C3   49C3                 PROBE_IF_B_$O25105
49C4   49C4                 O218_TM_DMAS_DATA_$O25106
                     O229_DCS_TEST_DATA_SET.O229_DCS_TEST_DATA_SET
49CE   49CE    6        $DATA$                     F  F  RA O  F
49CE   49CE                 O229_DCS_TEST_DATA_S_$O26103
                     O230_DCS.O230_DCS
49D4   49D4   18        $DATA$                     F  F  RA O  F
49D4   49D4                 LATCHUP_ON_$O27103
49D5   49D5                 LATCHUP_OFF_$O27104
49D6   49D6                 START_DCS_$O27105
49D7   49D7                 START_SELF_TEST_$O27106
49D8   49D8                 DCS_OK_$O27107
49D9   49D9                 O235_ADDR_$O27108
49DB   49DB                 O235_PARM_$O27109
49DD   49DD                 O231_ADDR_$O27110
49DF   49DF                 O231_PARM_$O27111
49E1   49E1                 SELF_CAL_TIMEOUT_$O27112
49E3   49E3                 STD_COMP_TIMEOUT_$O27113
49E5   49E5                 READY_TIMEOUT_$O27114
49E7   49E7                 MAX_READY_COUNT_$O27115
49E8   49E8                 O230_DO_DCS_BAD_PIX_$O27116
49E9   49E9                 O230_DCS_DATA_$O27117
                     O240_SUN_SENSOR.O240_SUN_SENSOR
49EC   49EC   41        $DATA$                     F  F  RA O  F
49EC   49EC                 PEAK_HOLD_CLEAR_$O28103
49ED   49ED                 PEAK_HOLD_ENABLE_$O28104
49EE   49EE                 O240_SUN_SENSOR_DATA_$O28105
                     O241_SUN_DATA_SET.O241_SUN_DATA_SET
4A2D   4A2D  162        $DATA$                     F  F  RA O  F
4A2D   4A2D                 O241_SUN_DATA_SET_DA_$O29103
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                               O242_SUN_SENSOR_CONSTANTS.O242_SUN_SENSOR_CONSTANTS
4B8F    4B8F    D                 $DATA$                    F  F  RA O  F
4B8F    4B8F                          THRESH_FACT_$O3I103
4B90    4B90                          MISSION_TIMEOUT_$O3I104
4B92    4B92                          MASTER_TIMEOUT_$O3I105
4B94    4B94                          MAX_SEARCH_TIME_$O3I106
4B96    4B96                          MIN_VALID_PEAK_$O3I107
4B97    4B97                          PULSE_WIDTH_FACT_$O3I108
4B98    4B98                          PULSE_GAP_FACT_$O3I109
4B99    4B99                          INTERPULSE_FACT_$O3I110
4B9A    4B9A                          INTRAPULSE_FACT_$O3I111
4B9B    4B9B                          ADC_TO_DAC_CONVERSIO_$O3I112
                               O250_WATCHDOG.O250_WATCHDOG
4B9C    4B9C    3                 $DATA$                    F  F  RA O  F
4B9C    4B9C                          WATCHDOG_VALUE_$O3J103
4B9E    4B9E                          O250_WATCHDOG_DATA_$O3J105
                               O251_PROM_POWER.O251_PROM_POWER
4B9F    4B9F    2                 $DATA$                    F  F  RA O  F
4B9F    4B9F                          O251_PROM_POWER_DATA_$O3K103
                               O260_SHUTTER_TESTER.O260_SHUTTER_TESTER
4BA1    4BA1    3                 $DATA$                    F  F  RA O  F
4BA1    4BA1                          O260_SHUTTER_TESTER__$O3L103
                               O261_DCS_TESTER.O261_DCS_TESTER
4BA4    4BA4    3                 $DATA$                    F  F  RA O  F
4BA4    4BA4                          O261_DCS_TESTER_DATA_$O3M103
                               O262_HEATER_TESTER.O262_HEATER_TESTER
4BA7    4BA7    7                 $DATA$                    F  F  RA O  F
4BA7    4BA7                          O262_HEATER_TESTER_D_$O3N103
                               O263_CAL_LAMP_TESTER.O263_CAL_LAMP_TESTER
4BAE    4BAE    3                 $DATA$                    F  F  RA O  F
4BAE    4BAE                          O263_CAL_LAMP_TESTER_$O3O103
                               O264_SURFACE_LAMP_TESTER.O264_SURFACE_LAMP_TESTER
4BB1    4BB1    4                 $DATA$                    F  F  RA O  F
4BB1    4BB1                          LAMP_READY_DELAY_$O3P105
4BB3    4BB3                          O264_SURFACE_LAMP_TE_$O3P106
                               O265_SUN_LAMP_TESTER.O265_SUN_LAMP_TESTER
4BB5    4BB5    2                 $DATA$                    F  F  RA O  F
4BB5    4BB5                          SUN_TEST_DELAY_$O3Q103
4BB6    4BB6                          O265_SUN_LAMP_TESTER_$O3Q104
                               O266_SHUTTER_TEST_DATA_SET.O266_SHUTTER_TEST_DATA_SET
4BB7    4BB7   63                 $DATA$                    F  F  RA O  F
4BB7    4BB7                          O266_SHUTTER_TEST_DA_$O3R103
                               O267_HEATER_TEST_DATA_SET.O267_HEATER_TEST_DATA_SET
4C1A    4C1A   18                 $DATA$                    F  F  RA O  F
4C1A    4C1A                          O267_HEATER_TEST_DAT_$O3S104
                               O268_CAL_LAMP_TEST_DATA_SET.O268_CAL_LAMP_TEST_DATA_SET
4C32    4C32    C                 $DATA$                    F  F  RA O  F
4C32    4C32                          O268_CAL_LAMP_TEST_D_$O3T103
                               O269_SURFACE_LAMP_TEST_DATA_SET.O269_SURFACE_LAMP_TEST_DATA_SET
4C3E    4C3E    6                 $DATA$                    F  F  RA O  F
4C3E    4C3E                          O269_SURFACE_LAMP_TE_$O3U103
                               O270_BROADCAST_PULSE.O270_BROADCAST_PULSE
4C44    4C44    2                 $DATA$                    F  F  RA O  F
4C44    4C44                          O270_BROADCAST_PULSE_$O3V103
                               O271_SUN_LAMP_TEST_DATA_SET.O271_SUN_LAMP_TEST_DATA_SET
4C46    4C46    6                 $DATA$                    F  F  RA O  F
4C46    4C46                          O271_SUN_LAMP_TEST_D_$O3W103
                               O283_TIME_DATA_SET.O283_TIME_DATA_SET
4C4C    4C4C   A6                 $DATA$                    F  F  RA O  F
4C4C    4C4C                         +TEMP__$O3X104
4C4D    4C4D                         +TEMP__$O3X105
4C4E    4C4E                          O283_TIME_DATA_SET_D_$O3X103
                               O290_INTERRUPT_CONTROLLER.O290_INTERRUPT_CONTROLLER
4CF2    4CF2    E                 $DATA$                    F  F  RA O  F
4CF2    4CF2                          O290_INTERRUPT_CONTR_$O3Y103
4CF8    4CF8                          MAX_STACK_$O3Y105
4CF9    4CF9                          LAST_BP_TIME_$O3Y106
4CFB    4CFB                          THIS_BP_TIME_$O3Y107
```

```
4CFD   4CFD                   NUM_BP_ERRORS_$O3Y108
4CFE   4CFE                   LAST_SUN_TIME_$O3Y109
                       O292_RESET_CONTROL.O292_RESET_CONTROL
4D00   4D00     1         $DATA$                    F  F  RA O  F
4D00   4D00                   O292_RESET_CONTROL_D_$O4A103
                       O293_DMA_CONTROL.O293_DMA_CONTROL
4D01   4D01     1         $DATA$                    F  F  RA O  F
4D01   4D01                   O293_DMA_CONTROL_DAT_$O4B103
                       O301_RADIO_PROCESSOR.O301_RADIO_PROCESSOR
4D02   4D02   2CD         $DATA$                    F  F  RA O  F
4D02   4D02                   SYNC_WORD_$O30103
4D03   4D03                  +TEMP__$O30105
4D04   4D04                  +TEMP__$O30106
4D05   4D05                   O301_RADIO_PROCESSOR_$O30104
4FC2   4FC2                   O301_SAVE_$O30107
                       O302_CCD_TRANSPOSED.O302_CCD_TRANSPOSED
4FCF   4FCF     8         $DATA$                    F  F  RA O  F
4FCF   4FCF                   O302_PNTR_$O31103
4FD0   4FD0                   O302_STRIP_$O31106
4FD1   4FD1                   O302_DARK_$O31108
4FD2   4FD2                   O302_SA_$O31110
4FD3   4FD3                   O302_ULVS_$O31112
4FD4   4FD4                   O302_DLVS_$O31114
4FD5   4FD5                   O302_NLVS_$O31116
4FD6   4FD6                   O302_ELVS_$O31118
                       O303_CCD_FORMAT.O303_CCD_FORMAT
4FD7   4FD7    14         $DATA$                    F  F  RA O  F
4FD7   4FD7                   TEMP__$O32104
4FD8   4FD8                   TEMP__$O32105
4FD9   4FD9                   TEMP__$O32106
4FDB   4FDB                   TEMP__$O32107
4FDD   4FDD                   TEMP__$O32108
4FDF   4FDF                   O303_RUNOUT_ROWS_$O32109
                       O304_BAD_PIXEL_MAP.O304_BAD_PIXEL_MAP
4FEB   4FEB    15         $DATA$                    F  F  RA O  F
5000   5000   835
4FEB   4FEB                   O304_BAD_PIXEL_MAP_D_$O33103
                       O305_CCD_OPTIMUM_EXPOSURE.O305_CCD_OPTIMUM_EXPOSURE
5835   5835     1         $DATA$                    F  F  RA O  F
5835   5835                   O305_HIST_TAB
                       O306_IR_OPTIMUM_SAMPLING.O306_IR_OPTIMUM_SAMPLING
5836   5836    28         $DATA$                    F  F  RA O  F
5836   5836                   O306_IR_OPT_SAMPLE_H_$O35104
                       O313_IR_SET.O313_IR_SET
585E   585E     7         $DATA$                    F  F  RA O  F
585E   585E                   O313_IR_SET_DATA_$O38103
5863   5863                   O313_INFO_$O38104
5864   5864                   O313_DATA_$O38105
                       O314_DARK_SET.O314_DARK_SET
5865   5865    11         $DATA$                    F  F  RA O  F
5865   5865                   O314_DARK_SET_DATA_$O39103
5875   5875                   O314_PNTR_$O39104
                       O315_IMAGE_SET.O315_IMAGE_SET
5876   5876    23         $DATA$                    F  F  RA O  F
5876   5876                   O315_IMAGE_SET_DATA_$O4F103
5898   5898                   O315_PNTR_$O4F104
                       O316_STRIP_SET.O316_STRIP_SET
5899   5899    14         $DATA$                    F  F  RA O  F
5899   5899                   O316_STRIP_SET_DATA_$O4G103
58AC   58AC                   O316_PNTR_$O4G104
                       O317_SOLAR_SET.O317_SOLAR_SET
58AD   58AD    14         $DATA$                    F  F  RA O  F
58AD   58AD                   O317_SOLAR_SET_DATA_$O4H103
58C0   58C0                   O317_PNTR_$O4H104
                       O318_VISIBLE_SET.O318_VISIBLE_SET
58C1   58C1    12         $DATA$                    F  F  RA O  F
58C1   58C1                   O318_VISIBLE_SET_DAT_$O4I103
58D2   58D2                   O318_PNTR_$O4I104
```

```
                           O319_CCD_SET.O319_CCD_SET
58D3   58D3   11              $DATA$                    F  F  RA O  F
58D3   58D3                       O319_CCD_SET_DATA_$O4J103
58E3   58E3                       O319_PTR_$O4J104
                           O320_VIOLET_MEASURE.O320_VIOLET_MEASURE
58E4   58E4   11              $DATA$                    F  F  RA O  F
58E4   58E4                       O320_VIOLET_MEASURE__$O4K103
                           O330_IR_SPECTRUM.O330_IR_SPECTRUM
58F5   58F5   AE              $DATA$                    F  F  RA O  F
58F5   58F5                       IR_COL_HEADER_$O4L103
58F9   58F9                       O330_IR_SPECTRUM_DAT_$O4L105
                           O340_DARK_CURRENT.O340_DARK_CURRENT
59A3   59A3    3              $DATA$                    F  F  RA O  F
59A3   59A3                       O340_PNTR_$O4M104
59A4   59A4                       O340_DARK_CURRENT_DA_$O4M106
                           O350_IMAGE_PIC.O350_IMAGE_PIC
59A6   59A6   23              $DATA$                    F  F  RA O  F
59A6   59A6                       ROW_INFO_$O4N103
59A8   59A8                       ROW_HEAD_$O4N104
59AC   59AC                       O350_EXP_COMP_DATA_$O4N105
59B2   59B2                       O350_IMAGE_PIC_DATA_$O4N106
59C7   59C7                       O350_DOING_FLAT_FIEL_$O4N107
59C8   59C8                       O350_DOING_BAD_PIX_D_$O4N108
                           O358_FLAT_FIELD_LOOKUP.O358_FLAT_FIELD_LOOKUP
59C9   59C9  107              $DATA$                    F  F  RA O  F
59C9   59C9                       O358_FLAT_FIELD_OFFSET
59CA   59CA                       O358_FF_START_ADDR_$O4O104
59D0   59D0                       O358_FLAT_FIELD_LOOKUP_DATA
                           O359_LOOKUP_TABLE.O359_LOOKUP_TABLE
5AD0   5AD0    2              $DATA$                    F  F  RA O  F
5AD0   5AD0                       O359_SQRT_VAL
5AD1   5AD1                       O359_ADJ_SQRT_TAB_$O4P105
                           O360_IMAGE_STRIP.O360_IMAGE_STRIP
5AD2   5AD2    3              $DATA$                    F  F  RA O  F
5AD2   5AD2                       O360_PNTR_$O4Q104
5AD3   5AD3                       O360_IMAGE_STRIP_DAT_$O4Q106
                           O370_SOLAR_AUREOLE.O370_SOLAR_AUREOLE
5AD5   5AD5    3              $DATA$                    F  F  RA O  F
5AD5   5AD5                       O370_PNTR_$O4R104
5AD6   5AD6                       O370_SOLAR_AUREOLE_D_$O4R106
                           O380_VISIBLE_SPECTRUM.O380_VISIBLE_SPECTRUM
5AD8   5AD8    7              $DATA$                    F  F  RA O  F
5AD8   5AD8                       O380_PNTR_$O4S104
5AD9   5AD9                       O380_VISIBLE_SPECTRU_$O4S106
5ADB   5ADB                       O380_DLVS_EXT_COL1_$O4S107
5ADC   5ADC                       O380_DLVS_EXT_COL2_$O4S108
5ADD   5ADD                       O380_ULVS_EXT_COL1_$O4S109
5ADE   5ADE                       O380_ULVS_EXT_COL2_$O4S110
                           O390_FULL_CCD.O390_FULL_CCD
5ADF   5ADF   12              $DATA$                    F  F  RA O  F
5ADF   5ADF                       ROW_INFO_$O4T103
5AE1   5AE1                       ROW_HEAD_$O4T104
5AE5   5AE5                       O390_FULL_CCD_DATA_$O4T105
                           O400_MULTIPLEXED_DEVICE.O400_MULTIPLEXED_DEVICE
5AF1   5AF1   41              $DATA$                    F  F  RA O  F
5AF1   5AF1                       CHANNEL_SELECT_DELAY_$O40103
5AF2   5AF2                       CONVERT_COMPLETE_DEL_$O40104
5AF3   5AF3                       CHANNEL_CONVERSION_F_$O40105
5AF4   5AF4                       CHANNEL_NUM_$O40106
5B13   5B13                       O400_MULTIPLEXED_DEV_$O40108
                           O404_HOUSEKEEPING_DATA_SET.O404_HOUSEKEEPING_DATA_SET
5B32   5B32   1C              $DATA$                    F  F  RA O  F
5B32   5B32                       TIMEOUT_PERIOD_$O41103
5B34   5B34                       MIN_TIME_BETWEEN_SET_$O41104
5B36   5B36                       O404_HOUSEKEEPING_DA_$O41105
                           O410_IR_INTERFACE.O410_IR_INTERFACE
5B4E   5B4E   A9              $DATA$                    F  F  RA O  F
5B4E   5B4E                       IRIF_CMD_ENABLE_$O42103
```

```
5B4F   5B4F                 IRIF_CMD_DISABLE_$O42104
5B50   5B50                 IRIF_CTL_ENABLE_$O42105
5B51   5B51                 IRIF_CTL_DISABLE_$O42106
5B52   5B52                 IR_CMD_$O42107
5B53   5B53                 O410_IR_INTERFACE_DA_$O42108
                     O414_IR_RAW_DATA.O414_IR_RAW_DATA
5BF7   5BF7   D9        $DATA$                     F  F  RA O  F
5BF7   5BF7                 IR_REG_REV_ADDR_$O43103
5BF9   5BF9                 O414_REV_PNTR_$O43105
5BFA   5BFA                 IR_RAW_DATA_ADDR_$O43106
5BFC   5BFC                 O414_RAW_PNTR_$O43108
5BFD   5BFD                +TEMP__$O43110
5BFE   5BFE                +TEMP__$O43111
5BFF   5BFF                 O414_IR_RAW_DATA_DAT_$O43109
                     O460_LAMP.O460_LAMP
5CD0   5CD0    C        $DATA$                     F  F  RA O  F
5CD0   5CD0                 CAL_LAMP_DELAY_$O46103
5CD4   5CD4                 REPORTING_PERIOD_$O46105
5CD6   5CD6                 SURFACE_LAMP_ALTERNA_$O46106
5CD8   5CD8                 O460_LAMP_DATA_$O46108
                     O461_LAMP_DATA_SET.O461_LAMP_DATA_SET
5CDC   5CDC    C        $DATA$                     F  F  RA O  F
5CDC   5CDC                 O461_LAMP_DATA_SET_D_$O47103
                     O465_MISC_DEV_CONTROL_REGISTER.O465_MISC_DEV_CONTROL_REGISTER
5CE8   5CE8    1        $DATA$                     F  F  RA O  F
5CE8   5CE8                 O465_MISC_DEV_CONTRO_$O48103
                     O470_THERMAL_MANAGER.O470_THERMAL_MANAGER
5CE9   5CE9    5        $DATA$                     F  F  RA O  F
5CE9   5CE9                 MONITOR_PERIOD_$O49103
5CEB   5CEB                 TEMP_LIMIT_$O49104
5CED   5CED                 O470_THERMAL_MANAGER_$O49106
                     O480_STATUS_WORD.O480_STATUS_WORD
5CEE   5CEE    F        $DATA$                     F  F  RA O  F
5CEE   5CEE                 LATCH_PERIOD_$O5A103
5CF0   5CF0                 O480_STATUS_WORD_DAT_$O5A112
5CFC   5CFC                 O480_STATUS_WORD_COPY
                     EVENT_QUE.EVENT_QUE
5CFD   5CFD  303        $DATA$                     F  F  RA O  F
6000   6000  39D
5CFD   5CFD                +TEMP__$EVF112
5CFE   5CFE                +TEMP__$EVF113
5CFF   5CFF                 EVT_QUE_$EVF111
633F   633F                +TEMP__$EVF115
6340   6340                +TEMP__$EVF116
6341   6341                 EVT_CNTL_$EVF114
                     O301_RADIO_PROCESSOR.CCD_PROCESSING_$O30034
639D   639D   2D        $DATA$                     F  F  RA O  F
                     O301_RADIO_PROCESSOR.STRIP_ROWS_COLS_$O30039
63CA   63CA   2E        $DATA$                     F  F  RA O  F
                     O305_CCD_OPTIMUM_EXPOSURE.OPT_EXPOSURE_$O34030
63F8   63F8   31        $DATA$                     F  F  RA O  F
                     O306_IR_OPTIMUM_SAMPLING.OPT_SAMPLING_$O3502X
6429   6429    1        $DATA$                     F  F  RA O  F
                     O306_IR_OPTIMUM_SAMPLING.SORT_VALUES_$O3502Y
642A   642A    1        $DATA$                     F  F  RA O  F
                     O313_IR_SET.CREATE_IR_TLM_$O38030
642B   642B   2A        $DATA$                     F  F  RA O  F
                     O315_IMAGE_SET.CREATE_IMAGE_TLM_$O4F02Z
6455   6455   30        $DATA$                     F  F  RA O  F
                     O315_IMAGE_SET.CREATE_RAW_IMAGE_TLM_$O4F030
6485   6485   30        $DATA$                     F  F  RA O  F
                     O316_STRIP_SET.CREATE_STRIP_TLM_$O4G02Y
64B5   64B5   30        $DATA$                     F  F  RA O  F
                     O317_SOLAR_SET.CREATE_SOLAR_TLM_$O4H02Y
64E5   64E5   30        $DATA$                     F  F  RA O  F
                     O318_VISIBLE_SET.CREATE_VISIBLE_TLM_$O4I02Y
6515   6515   30        $DATA$                     F  F  RA O  F
                     O318_VISIBLE_SET.CREATE_VISIBLE_EXT_T_$O4I02Z
```

```
       6545   6545   30         $DATA$                   F  F  RA O  F
                             O350_IMAGE_PIC.SET_UP_DARK_CURRENT_$O4N03D
       6575   6575   2D         $DATA$                   F  F  RA O  F
                             MARKER
       65A2   65A2    1         DATA_END                 F  F  RA O  F
       65A2   65A2                 +END_OF_DATA
                             MCHKSUM
       65A3   65A3   20         CHKSUMDATA               F  F  RA O  F
       65A3   65A3                 +CHKSUM_TBL
END OF GROUP :DATA_AREA
                             A$LNKMOD
       6FFF   6FFF    1         $HEAP                          RA O  F
       7000   7000 1000
```

Table 32 – Addresses for Key Memory Locations

Address (hex)	Description
4FEB–5834	Bad pixel map – See section 7.2.1 for a description of the format of the bad pixel table
5B34 – 5B35	Housekeeping data set time period. Not used during descent mode of operation. Units are 0.0001 seconds.
5CE9 – 5CEA	Thermal control monitor period. Units are 0.0001 seconds.
5CEB	Set point for the focal plane heater. The built in value for this is 1492 = $5D4_{16}$.
5CEC	Set point for the SH aux board heater. The built in value for this is 2285 = $8ED_{16}$.
2EB8 – 2EC5	Instrument misalignment table.
4B8F – 4B9B	Sun sensor constants.
5CD0 – 5CD1	Calibration lamp turn off delay. Units are 0.0001 seconds. The built in value is 100 m–sec = 1,000 = $3E8_{16}$.
5CD2 – 5CD3	Calibration lamp turn on delay. Units are 0.0001 seconds. The built in value is 500 m–sec = 5,000 = $1,388_{16}$.
5CD4 – 5CD5	Lamp data set reporting period. Units are 0.0001 seconds. The built in value is 5 seconds = 50,000 = $C,350_{16}$.

8.0 NOTES

8.1 Acronyms

CCD . . . . Charge Coupled Device
CRC . . . . Cyclic Redundancy Check
CSCI . . . . Computer Software Configuration Item
DISR . . . . Descent Imager / Spectral Radiometer
DLI . . . . Downward Looking Imager
DLIS . . . . Downward Looking Infrared Spectrum
DLV . . . . Downwrad Looking Violet
DLVS . . . . Downwark Looking Visible Spectrum
EEPROM . . . . Electrically Erasable Programmable Read–Only Memory
PROM . . . . Programmable Read–Only Memory
RAM . . . . Random Access Memory
SA . . . . Solar Aureole
SLI . . . . Side Looking Imager
SUM . . . . Software User's Manual
ULIS . . . . Upward Looking Infrared Spectrum
ULV . . . . Upward Looking Violet
ULVS . . . . Upward Looking Visible Spectrum

8.2 Bit Numbering

All numbering of bits in this document use the 1750 standard convention that bit 0 is the most significant bit of a word and bit 15 is the least significant. This is distinctly different from the Huygens convention of bit 15 being the most significant bit and 0 being the least significant bit.

Appendix A – TELECOMMAND FORMATS

This section specifies the format of the commands the DISR flight software processes. Commands may either be directly specifically to the DISR instrument or to all of the instruments. Commands directed to all instruments are referred to as broadcast commands. Information that distinguishes which type of command is being sent will be included in the header information.

All numbering of bits in this document (including the telecommand definitions) use the 1750 standard convention that bit 0 is the most significant bit of a word and bit 15 is the least significant. This is distinctly different from the Huygens convention of bit 15 being the most significant bit and 0 being the least significant bit.

MSB							**1750 Standard**								**LSB**
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

MSB							**Huygens Standard**								**LSB**
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

A.1 General Telecommand Format

All telecommands sent by the probe to the DISR instrument will contain three header words, the specific command words and a checksum word. The total number of command words can vary per specific command. Commands have the following format:

0   15
Header word 1
Header word 2
Header word 3
data word 1
data word 2
•
•
•
data word n–1
CRC

A.1.1 Header Word Formats

The header words are specified by JPL and ESA and they will contain a 16-bit Packet ID, a 16-bit Sequence Control and a 16-bit Packet Length for a total of 48 bits.

0   15
Packet ID

Sequence Control
Command Length

The Packet ID header word is comprised of the following bit fields:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
VER			D	H	ID										

where :

Name	Description	Comments
VER	Version Number	3 bits – set to 000_2
D	Direction	1 bit – set to 1_2. (A "1" indicates a packet being sent from the probe)
H	Header Flag	1 bit – set to 1_2
ID	Application ID	11 bits – This field is uniquely identifies the commands as being for a particular instrument.

For the broadcast commands the application id field will equal 78Fh if the command is sent on side A and 7AFh for side B. For DISR specific commands it is set to 792h for side A and 7B2h for side B. Therefore the first header word will always equal 1F8Fh or 1FAFh for broadcast commands and 1F92h or 1FB2h for DISR specific commands.
The Sequence Control header word contains the following bit fields:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
SEG		Seq_count													

where

Name	Description	Comments
SEG	Segmentation Flag	2 bits – set to "11_2". (Segmentation is not performed.)
Seq_ count	Source Sequence Count	14 bits containing "00000000000000_2". (Incoming commands will not contain sequence numbers.)

Therefore the second header word will always equal C000h.

The Command Length header word will contain the number of 8–bit bytes in the command after three header words – 1.

A.2 Broadcast Command Formats

Like all commands the broadcast command will contain the three header words, followed by the data values being broadcast, and a CRC. The application ID field will be set to 78Fh for commands sent on side A and 7AFh for commands send on side B,

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Header word 1															
Header word 2															
Header word 3															
TT		time													
A	altitude														
spin								flags							
CRC															

where:

Name	Comments
time	Mission time at which other values are valid (LSB = 2 seconds)
TT	Flag indicating if time is before or after t0 (not used)
altitude	Probe altitude at time (LSB = 10 meters)
A	Flag indicating if the altitude is read from the probe altimeter or generated from a lookup table (not used)
spin	Probe spin rate at time (LSB = 0.1 rpm)
flags	Mission control flags (not used)

A.3 DISR Command Format

The following diagram shows the format of commands sent only to the DISR instrument. It is composed of the three header words, an opcode word, up to 121 data words, and a checksum word.

0 7	8 15
Header word 1	
Header word 2	
Header word 3	
Command ID	
Opcode word	
data word 1	
data word 2	
•	
•	
•	
data word n–1	
CRC	

A.3.1 Command ID Field

0 15
Command ID

The command ID word will be sent back with any ACK or NAK message generated by this command. It is intended that this field be unique, although no checking is preformed to verify that it is, for each command sent so that the ACK/NAK messages can be correlated to the commands sent. The command ID could be generated as a counter for each command or simply as a unique number for each different command being sent.

A.3.2 Opcode Word Format

0 15
Opcode word

The opcode word will uniquely identify the type of command being send. The possible opcodes are included in the following table and the specific command formats for each opcode will be included in Section A.3.3.

Opcode	Command
1	Enable Command Receipt
2	Change Mode
3	Single Measurement
4	Single Test
5	Uplink EEPROM
6	Uplink RAM
7	Dump Memory

A.3.3 Specific DISR Software Commands

A.3.3.1 Enable Command Receipt Command

This command is included in order to protect against inadvertent commands effecting operations. This command must be received with the value set to enable before the software will accept any other command. This command with the value set to disable will halt the acceptance of other commands until another of these commands is received with the value set to enable.

The opcode for this command equals 1. Its format is as follows:

0	15
Header word 1	
Header word 2	
Header word 3	
Command ID	
Opcode word = 1	
receipt enable	
CRC	

where:

Name	Comments
Receipt Enable	0 for disable receipt of commands 1 for enable receipt of commands

A.3.3.2 Change Mode Command

This command causes the fight software to change to the new operating mode. If the mode to change to is the descent mode, the sun simulator may commanded on or off. If the sun simulator is commanded on it will remain on until a change mode command to descent mode is received with the flag set to OFF or a change mode command to a mode other than descent is received. If the mode to change to is calibration mode, the command must also specify the number of the calibration sequence to run.

The change to the new mode will occur immediately if the currently running mode is Single Measurement or Memory Access. For descent or calibration mode, the currently running cycle will be completed before the new mode is entered.

Note : Do not send a change mode command to enter Memory Access mode if DISR is already running in Memory Access mode. Although the command will execute correctly, the usage block that counts updates to EEPROM will not be updated properly. Updates since the last Change Mode command will not be counted.

The opcode for this command equals 2. Its format is as follows:

0 7	8 15
Header word 1	
Header word 2	
Header word 3	
Command ID	
Opcode word = 2	
mode	scenario #
sun simulator flag	
CRC	

where:

Name	Comments
mode	What mode to go to. 1 = Descent 2 = Calibration 3 = Single measurement 4 = Memory access
scenario #	The new calibration scenario to run. Valid scenario numbers are 1..8. Note: This field is used only if the mode is calibration Health check sequence is scenario 1. In–flight calibration sequence is scenario 2.
sun simulator flag	Flag indicating if the sun simulator is to be turned ON or OFF. Note: This field is used only if the mode is descent. 0 to turn the sun simulator OFF 1 to turn the sun simulator ON

A.3.3.3 Single Measurement Command

This command allows measurements to be collected, processed and telemetered upon request. The flight software must already be executing in Single Measurement mode before this command will be accepted.

Many of the parameters are only used if another parameter is set to a particular state. The measurement type, repetition and lamp state parameters are used for all commands. For violet measurements, none of the other parameters are used. For the CCD commands, the auto exposure flag, the exposure time, both processing option words and the strip column are used. For IR commands, the auto exposure flag, collection time, shutter time, sample times, shutter operating mode, and the general processing option word are used. The image option word is used only if the measurement type equals image set. The strip column word is used only if the measurement type equals SLI strip.

The opcode for this command equals 3. Its format is as follows:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Header word 1															
Header word 2															
Header word 3															
Command_ID															
Opcode Word = 3															
measurement type															

repetitions	unused	c1	c2	c3	sl	A
exposure time						
collection time (MSW)						
collection time (LSW)						
shutter period						
shutter operating mode						
ULIS sample time						
DLIS sample time						
general processing options						
image set processing option						
strip column						
CRC						

where:

Name	Comments
type	Measurement to take. A list of measurement types and their corresponding values are included in a table below.
repetitions	Number of times the measurement is to be performed, 1..255.
c1	State the calibration lamp #1 is to be set to (0 = off, 1 = on)
c2	State the calibration lamp #2 is to be set to (0 = off, 1 = on)
c3	State the calibration lamp #3 is to be set to (0 = off, 1 = on)
sl	State the surface lamp is to be set to (0 = off, 1 = on)
A	Flag indicating if the exposure time from the optimum exposure time table or from the command is to be used 0 = use command time value 1 = use optimum exposure time table value
exposure time	Exposure time to take CCD measurements for (unused if A = 0) – in 0.5 millisecond units
collection time	Collection time to take IR measurements for – in milliseconds
shutter period	Interval between times the shutter state is changed for IR measurements– in milllliseconds
shutter operating mode	How the shutter is to be operated during the collection. (closed for the whole collection = 0, open for the whole collection = 1, alternating = 2)
ULIS sample time	Sample time to take ULIS measurements for (unused if A = 0) – in milllliseconds
DLIS sample time	Sample time to take DLIS measurements for (unused if A = 0) – in milllliseconds
general processing options	Options used to determine what types of processing should be done on the measurement data
image processing option	Option used to determine what types of additional processing should be done on image set data
strip column	The number of the column to be used as the center column for SLI strip measurements.

The following table corelates measurement types to specific values.

Measurement Name	Value
ULVS	2
DLVS	3
Full CCD	4
Dark Current	5
Image Set	6
SLI Strip	7
Solar Aureole	8
DLIS	9
ULIS	10
Combined ULIS/DLIS	11
Long Integration IR	12
DLV	13
ULV	14

The general processing option word is further broken down into individual fields as follows:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
B	Q	S	E	C	I	unused		field of view							

B	Flag indicating if bad pixel elimination is to be done (0 = false, 1 = true)
Q	Flag indicating if square root processing is to be done (0 = false, 1 = true)
S	Flag indicating if summing is to be done (0 = false, 1 = true)
E	Flag indicating if the optimum exposure time table is to be updated with the measurement data (0 = false, 1 = true)
C	Flag indicating if compression is to be done (0 = false, 1 = true)
I	Flag indicating if all 16 bits of CCD data is to be included in telemetry (0 = false, 1 = true)
field of view	Number of fields of view the data is to be summed into (used only if measurement type = DLVS and S = 1)

Many of the processing options are only available for some measurement types. The following table defines which options are available for each measurement type.

measurement type	B	Q	S	E	C	I	FOV
DLVS	X		X	X	X		X
ULVS	X		X	X	X		
Dark Current	X		X		X		
Solar Aureole	X		X	X	X		
SLI Strip	X		X	X	X		
Image Set	X	X		X	X		

Full_CCD					X	X	
IR (all)					X		

The image processing option word is further broken down into individual fields as follows:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
D	O	H	T	compression ratio							which image				

D	Flag indicating if a dark current measurement is to be done from the same input as the image data (0 = false, 1 = true).
O	Flag indicating if a single section of the image area is to be processed or if all three image set sections are to be processed (0 = all section, 1 = single piece)
H	Flag indicating if each image is to be telemetered as two halves or as a single data set. (0 = single, 1 = halves)
T	Flag indicating which type of compression is to be used (0 = HW, 1 = SW) Used only if flag C =1.
compression ratio	The compression ratio to send the hardware compressor. Used only if T = 0. Valid ratio = 1..64.
which image	Flag indicating which section will be done if only a single image is done. (0x15 = DLI–2, 0x16 = SLI,0x17 = DLI–1) Used only if O = 1.

A.3.3.4 Single Test Command

This command allows hardware tests to be performed upon request. The hardware tests that can be performed include shutter test, DCS test, heater test, calibration lamp test, surface lamp test, and sun lamp test. The flight software must already be executing in Single Measurement mode before this command will be accepted.

Each type of hardware test can be sent a parameter and the meaning of the parameter is different for each test type. For the shutter test, the parameter is the number of times the basic shutter sequence shall be repeated for the test. For the DCS test, the parameter is the compression ratio; legal values include 1 .. 64. For the heater test the parameter represents which heaters are to be tested; 1 = heater A, 2 = heater B, 3 = both heaters. For the calibration lamp test, the parameter represents which calibration lamps will be powered on for the test; bit 13 for cal lamp #1, bit 14 for cal lamp #2, and bit 15 for cal lamp #3. The lamps states are 0=off and 1 = on. For the surface lamp test, the parameter represents the state the surface lamp will be in for the test, 0=off and 1 = on. For the sun lamp test, the parameter is not used.

The opcode for this command equals 4. It format is as follows:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Header word 1															
Header word 2															
Header word 3															
Command_ID															
Opcode Word = 4															
test type								test parameter							
repetitions															
CRC															

where:

test type	HW test to perform to take. A list of measurement types and their corresponding values are included in a table below.
test parameter	parameter specific to type of test
repetitions	Number of times the measurement is to be performed, 1..512.

The following table correlates test types to specific values.

Measurement Name	Value	Parameter Use
Shutter test	32	Number of individual shutter tests to perform for this test.
DCS test	33	Compression factor (range is 2 to 16) You can also select a different compression type than the normal by setting some of the high order bits. Add the following number to the compression factor for these types of tests 0 – Normal (Checkerboard pattern – 15x15 squares) 64 – 1/(distance from center) type – 15x15 squares 128 – Gradual change across and down area.
Heater test	34	What heater to test 1 – Focal plane only 2 – SH Aux only 3 – Both
Calibration Lamp test	35	Which lamps to have on for the test 0 – None 1 – Lamp 1 only 2 – Lamp 2 only 3 – Lamp 1 and 2 4 – Lamp 3 only 5 – Lamp 1 and 3 6 – Lamp 2 and 3 7 – All lamps
Surface Lamp test	36	Test with lamp on or off 0 – Lamp off 1 – Lamp on
Sun Lamp test	37	Unused

A.3.3.5 EEPROM Uplink Command

A EEPROM Uplink command replaces slots in the EEPROM memory area specified in the command with the data words, patches, in the command. The flight software must already be executing in Memory Access mode before this command will be accepted.

Each patch can be stored into 2 different slots in EEPROM. To get redundant copies in different EEPROM chips, one should be stored in slots 1..512 and the other in slots 513..1023.

The opcode for this command equals 5. Its format is as follows:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Header word 1															
Header word 2															
Header word 3															
Command_ID															

Opcode Word = 5	
patch type	number patches
Patch 1	
Patch 2	
Patch 3	
CRC	

where:

Name	Comments
patch type	= 0 ; patch is to EEPROM area at 20,000 = 1 ; patch is to flat field area
number patches	number of patches send in this command (=1..3)

If a patch is for the EEPROM at address 20,000h thru 2F,FFFh (patch type = 0), it is formatted as follows:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
EEPROM slot 1															
EEPROM slot 2															
Patch CRC															
length					C	next link									
RAM address															
word 1															
...															
word 29															

where:

EEPROM slot number 1	The first slot in EEPROm to store the patch. (0 = no first slot, slots = 1..1023)
EEPROM slot number 2	The second slot in EEPROM to store the patch. (0 = no second slot, slots = 1..1023)
Patch CRC	The CRC of the next 31 words of the patch
length	The number of words actually used in the patch (1..29)
C	Flag indicating if the patch is to be made to instruction or data RAM. (0 = data, 1 = instruction)
next link	The slot number of the next patch in a group
RAM address	The address in RAM the patch is eventually destined for (16 LSBs)
words	see next paragraph

The words 1 thru 29 must start with the words that are to be uplinked to the RAM address specified. If there is enough space left over, other small patches may be packed into the unused space. Each small patch must include the length, C, next link, RAM address, and words to uplink. Any unused space must be set to zero.

If the patch is for the flat field area (patch type = 1), it is formatted as follows :

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Flat Field Address (MSB)															
Flat_Field Address (LSB)															
word 1															
...															
word 32															

where:

Flat Field Address	The address in the flat field area were this block of 32 words is to start. (address should be on 32 word boundary.)
words	Words to upload to memory

A.3.3.6 RAM Uplink Command

A RAM uplink command replaces a RAM area specified in the command with the data words in the command. Any number of consecutive words from 1 to 120 may be replaced at one time. Either data tables or code areas may be overwritten. The flight software must already be executing in Memory Access mode before this command will be accepted.

The opcode for this command equals 6. Its format is as follows:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Header word 1															
Header word 2															
Header word 3															
Command ID															
Opcode Word = 6															
length								code_fl							
address															
data word 1															
.															
.															
.															
data word n															
CRC															

where:

Name	Comments
code_fl	Flag indicating if the destination of the upload is in the instruction or data RAM area
address	Starting RAM address to replace (16 LSBs)
length	Number of 16–bit words to replace (= 1..120)
data words	New words to load in RAM

A.3.3.7 Dump Memory Command

This command will cause the specified range of memory locations to be placed in telemetry packets for relaying to the ground. The flight software must already be executing in Memory Access mode before this command will be accepted. Up to 10 distinct ranges of memory can be dumped by one command. All of the following areas can dumped : instruction RAM, data RAM, PROM, EEPROM, Frame Buffer, IR Buffer, DCS Buffer, Flat Field. Note that the ranges must not overlap between different types of memory. For example a range can't start in the instruction RAM area and end in the data RAM area.

The opcode for this command equals 7. Its format is as follows:

15 8	7 0
Header word 1	
Header word 2	
Header word 3	
Command ID	
Opcode word = 7	
number ranges	
range 1 : start address (high 16 bits)	
range 1 : start address (low 16 bits)	
range 1 : length (high 16 bits)	
range 1 : length (low 16 bits)	
...	
range n : start address (high 16 bits)	
range n : start address (low 16 bits)	
range n : length (high 16 bits)	
range n : length (low 16 bits)	
CRC	

where:

Name	Comments
number ranges	number of different memory dump ranges specified in this command (= 1..10)
start address	Memory address of where to start dumping memory at
length	Number of 16–bit words to dump

Appendix B – TELEMETRY FORMATS

All numbering of bits in this document (including the telemetry definitions) use the 1750 standard convention that bit 0 is the most significant bit of a word and bit 15 is the least significant. This is distinctly different from the Huygens convention of bit 15 being the most significant bit and 0 being the least significant bit.

MSB								**1750 Standard**							**LSB**
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

MSB								**Huygens Standard**							**LSB**
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

B.1 General Packet Format

The telemetry output by the DISR instrument is in the form of packets. Each packet will contain header information followed by DISR specific data and a CRC. Each packet will be 126 bytes long. (This equals 63 16–bit words or 1008 bits.) The general packet format is

PROBE HEADER
DISR HEADER
SOURCE DATA
CRC

B.2 Probe Header Field Format

The probe header information field contains the same fields as for the incoming commands but some fields have different values. The fields are a 16-bit Packet ID, a 16-bit Sequence Control, and a 16-bit Packet Length for a total of 48 bits.

	0															15
1	Packet ID															
2	Sequence Control															
3	Packet Length															

The Packet ID header word is comprised of the following bit fields:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
VER			D	H	ID										

where :

Name	Description	Comments
VER	Version Number	3 bits – set to 000_2

D	Direction	1 bit – set to 0_2. (indicates a packet being sent to the probe)
H	Header Flag	1 bit – set to 1_2. (indicates a data field header exists)
ID	Application ID	11 bits – set to "11110010010_2" or 792_{16} for channel A and "11110110010_2" or $7B2_{16}$ for channel B. (uniquely identifies the packet as being from DISR)

Therefore the first header word will always equal 0F92h or 0FB2h.
The Sequence Control word in the probe header contains the following:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
SEG		Seq Count													

where

Name	Description	Comments
SEG	Segmentation Flag	2 bits – set to "11_2". (Segmentation is not performed.)
Seq count	Source Sequence Count	14 bits containing a straight sequential count (modulo 16384) of the number of DISR telemetry packets down-linked since the last DISR reset.

The 16-bit Packet Length field in the probe header contains the number of bytes, minus 1, in the packet, not including the probe header bytes. Since the whole packet is always 126 bytes long, this value will always be 119.

B.3 DISR Header

The DISR header contains information that identifies which telemetry channel the packet was received over, and which priority level the data is associated with. Data generated by DISR is considered to be at one of two priority levels. High priority data is always sent over both channels and low priority data is sent over one channel or the other.

The format of the DISR header is :

0						6	7	8					13	14	15
unused							P	unused							C

where

Name	Description	Comments
C	Telemetry Channel	1 bit, = 0 for telemetry channel A = 1 for telemetry channel B
P	Priority Level	1 bit, = 0 for high priority = 1 for low priority

B.4 Source Data Field Format

The source data field is 58 words long and contains all the science and engineering data produced by DISR. The data will be logically grouped into data sets. More than one data set can be contained in one packet, or one data set may be packaged across several telemetry packets. None of the data sets appear in fixed locations within the field and not all the data set types will be represented in every telemetry packet. Each data set occupies an integral number of words, i.e., an even number of bytes.

Since a data set may be broken up across many packets, each piece will be called a data set segment. Each segment will have a data set header attached to the front of it. The header will containing the data set name, a data set id, a segment number, and the number of data words in the segment. The format of the source data field is shown in the following figure.

<table>
<tr><td></td><td>0</td><td></td><td></td><td></td><td></td><td></td><td></td><td>7</td><td>8</td><td></td><td></td><td></td><td></td><td></td><td></td><td>15</td></tr>
<tr><td>1</td><td colspan="5">data set name</td><td colspan="10">segment number</td><td>L</td></tr>
<tr><td>2</td><td colspan="10">data set id</td><td colspan="6">segment length</td></tr>
<tr><td>3</td><td colspan="16">data word 1</td></tr>
<tr><td>4</td><td colspan="16">data word 2</td></tr>
<tr><td></td><td colspan="16">...</td></tr>
<tr><td></td><td colspan="16">data word n</td></tr>
</table>

where:

Name	Comments
data set name	A unique identifier for each type of data set that can be telemetered. Table 33 lists the names of the data sets.
data set id	A sequential number associated with the particular type of data. For example, all message data sets will be numbered sequentially.
L	0 for not last data set segment for this data set 1 for last data set segment for this data set
segment number	data set segment number
segment length	the number of data words in the segment, not including the data set header

Table 33 – DISR Source Field Data Sets Names

Data Set Name	**Number**
Message	1
Time	2
Sun Sensor	3
Attitude (Deleted)	4
Housekeeping	6
Lamp	7
Descent Cycle	8
Calibration Cycle	9
Visible	10
Image	11
Strip	12
Solar Aureole	13
Dark Current	14
Full CCD	15
IR	16

Violet	17
Shutter Test	20
DCS Test	21
Heater Test	22
Calibration Lamp Test	23
Surface Lamp Test	24
Sun Lamp Test	25
Bad RAM	26
Bad EEPROM	27
Memory Dump	28
Empty	0

B.5 CRC Field

A CRC will be calculated for all telemetry packet words including the header words. It will be added to the packet as the last word.

B.6 Data Set Definitions

B.6.1 Message Data Set

A message is an indication of a change in the condition of the DISR instrument or a detection of an error that needs to be reported to the ground. Each time a new message is identified for transmission, a message data set is produced. The data set will include a code indicating the type of message, an identification field that is specific to the type of message, and the mission time that the message was generated. Appendix C lists all the message codes, gives a description of each, and defines the identification field.

Messages, and therefore message data sets, may be generated in any operating mode of the flight software. Since most of the messages are error conditions, they are never expected to occur unless there are hardware failures or conditions at Titan are not as expected. There are a very few messages that will be generated during nominal conditions.

The message data set format is as follows:

	0							7	8							15
1	unused								message code							
2	message id															
3	message time, MSH															
4	message time, LSH															

where:

Name	Comments
message code	a unique value for the type of message generated.
message id	additional information specific to the type of message
message time	mission time when message was detected; specified in 0.1 millisecond units

The size of the message data set is always 4 words.

B.6.2 Time Data Set

The time data set is used to record the correlation between the mission time as kept by the probe and sent to DISR in the probe broadcast messages and the master time which is kept by a hardware clock. The data set is produced as soon as enough data is collected to fill up the data set. The definition of the data set includes 20 pairs of time. With a pair being generated each 2 seconds this causes a data set to be produced every 40 seconds.

The time data set consists of the following data:

	0			3	4			7	8			11	12			15
1	number of pairs of data															
▶ 1	Broadcast Time – MSH															
▶ 2	Broadcast Time – LSH															
▶ 3	Master Time – MSH															
▶ 4	Master Time – LSH															

where:

Name	Comments
number of pairs of data	The number of pairs of data included in the data set. Fixed at 20.
Broadcast Time	The mission time from the descent data broadcast message. This number is in 0.0001 second increments from the beginning of the mission.
Master Time	The master timer value corresponding to the mission time. This is the value latched by the hardware when the broadcast pulse is detected. This number is also in 0.0001 second increments.

The size of the time data set is [4*(number of pairs of data) + 1] words. For the nominal data set consisting of 20 pairs this is 81 words and it is sent once every 40 seconds.

B.6.3 Sun Sensor Data Set

The sun sensor data set is used to record the sun pulse data. This data is collected for each sun pulse received by the system. It is used dynamically in the instrument to determine the azimuth and rotation rate of the probe and sent to the ground for further analysis for those purposes and in addition to determine the zenith angle of the sun.

The sun sensor data set is generated once per data cycle or when it is full which ever is first. The actual rate will depend on the spin rate of the probe. At a 25 rpm spin rate the data set would be generated once every minute at a minimum.

The sun sensor data set consists of the following data:

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	number of triplets in the data set															
▶ 1	1st pulse center time – MSP															
▶ 2	1st pulse center time – LSP															
▶ 3	2nd pulse center time – MSP															
▶ 4	2nd pulse center time – LSP															
▶ 5	3rd pulse center time – MSP															
▶ 6	3rd pulse center time – LSP															
▶ 7	2nd pulse amplitude															

where:

Name	Comments
number of triplets in the data set	Sun sensor data is provided for validated triplets only. Each pulse in a triplet is represented by the average time of the leading and trailing edge times for the actual pulses (the "center" time). In addition the amplitude of the center of the three pulses is included for each triplet. Maximum value is 25.
"center" time	The 27–bit time associated with the average of the leading and trailing edge times. It is split into the least significant part (16 bits) and the most significant part (11 bits). Each time value is in 0.0001 second units.
pulse amplitude	A 12 bit value associated with the pulse amplitude for the center pulse of the triplet. This is a raw A/D value.

The size of the data set is [7*(number of triplets) + 1] words. For a full data set of 25 pulses this is 176 words.

B.6.4 Attitude Data Set (Deleted)

The attitude data set has been deleted.

B.6.5 Housekeeping Data Set

The housekeeping data set is used to record some overall housekeeping data. It is generated once per cycle during descent mode and once every two minutes for other modes of operation. The data set includes a number of temperature measurements and some standard voltage point measurements.
The housekeeping data set consists of the following data:

	0			3	4			7	8			11	12			15
1	Time – MSH															
2	Time – LSH															
3	EA box (motherboard) temperature															
4	Thermal strap temperature															
5	CCD tab temperature															
6	Sensor head board temperature															
7	Sensor head box temperature															
8	Violet temperature															
9	Optics temperature															
10	CCD chip temperature															
11	Aux board voltage															
12	CPU board voltage															
13	Calibrated source voltage															
14	ADC offset voltage															
15	ADC gain voltage															
16	Dispatcher queue maximum size															
17	Alarm queue maximum size															
18	Telemetry queue maximum size															
19	Science processing queue maximum size															
20	Stack maximum size															

where:

Name	Comments
Time	Start time of the data set collection – Mission time in 0.1 millisecond units.
”X” temperature	The raw reading from the ADC for the specified temperature measurement point.
”X” voltage	The raw reading from the ADC for the specified voltage measurement point.
”X” maximum size	Each of the queues in the system has a maximum used size maintained and reported in this data set. Whenever the data is collected it is also zeroed so that the maximum is actually the maximum size since the last data set.

The size of the data set is 20 words.

B.6.6 Lamp Data Set

The lamp data set is used to record the lamp performance data whenever any of the lamps are on. The data set is generated once just after one or more lamps are turned on and then every 30 seconds until all lamps are turned off. During the descent this would be for the calibration cycles and near the surface. The lamp data set consists of the following data:

	0			3	4			7	8			11	12			15
1	Time – MSH															
2	Time – LSH															
3	unused												C1	C2	C3	S
4	Cal lamp 1, Voltage 1															
5	Cal lamp 1, Voltage 2															
6	Cal lamp 2, Voltage 1															
7	Cal lamp 2, Voltage 2															
8	Cal lamp 3, Voltage 1															
9	Cal lamp 3, Voltage 2															
10	Surface Lamp Voltage															
11	Surface Lamp Current															

where:

Name	Comments
Time	Start time of the data set collection – Mission time in 0.1 millisecond units
Cn	The state of calibration lamp n (off=0, on=1)
S	The state of the surface lamp (off=0, on=1)
Cal lamp n, voltage m	The raw reading from the ADC for the specified calibration lamp voltage measurement point.
Surface lamp voltage	The raw reading from the ADC for the surface lamp voltage measurement point.
Surface lamp current	The raw reading from the ADC for the surface lamp current measurement point.

The size of the data set is 11 words.

B.6.7 Descent Cycle Data Set

A descent cycle data set is generated for each cycle during the descent mode. It describes the state of some of the selection criteria parameters at the start of the cycle . It also includes information on what cycle type and measurements were specified to be done during the cycle.

The descent cycle data set contains the following fields:

	0							7	8							15
1	unused								cycle number							
2	start time, MSB															
3	start time, LSH															
4	start azimuth															
5	start altitude															
6	start spin															
7	scenario step								cycle type							
8	SPM flag								IR meas set							
9	CCD meas set								violet meas set							

where:

Name	Comments
cycle number	the number of the current cycle
start time	mission time for the start of the cycle; specified in 0.1 millisecond units
start azimuth	the azimuth at the start of the cycle; specified as 0.1 deg units
start altitude	the altitude at the start of the cycle; specified as 10 meter units
start spin	the probe spin rate at the start of the cycle; specified as 0.1 deg units
scenario step	the entry number in the cycle criteria table for which the criteria was met
cycle type	the entry number in the cycle specification table which was performed during the cycle
SPM flag	flag indicating whether a spectrophotometric cycle was performed
CCD meas set	the number of the CCD measurement set performed during the cycle
IR meas set	the number of the IR measurement set performed during the cycle
violet meas set	the number of the violet measurement set performed during the cycle

The size of the descent cycle data set is always 9 words.

B.6.8 Calibration Cycle Data Set

A calibration cycle data set is generated for each cycle during the calibration mode. It includes information on what measurements and hardware tests were specified to be done during the cycle.

A calibration cycle data set is formatted as follows:

	0							7	8							15
1	cycle number								scenario number							
2	start time, MSB															
3	start time, LSH															
4	IR meas set								IR repetitions							
5	CCD meas set								CCD repetitions							
6	violet meas set								violet repetitions							
7	shutter test reps								shutter test params							
8	DCS test reps								DCS test params							
9	heater test reps								heater params							
10	cal lamp test reps								cal lamp params							
11	surf lamp test reps								surf lamp params							
12	sun lamp test reps								sun lamp params							

where:

Name	Comments
scenario number	the number of the calibration sequence being run
cycle number	the number of the current cycle
start time	mission time for the start of the cycle; specified in 0.1 millisecond units.
CCD meas set	the number of the CCD calibration measurement set performed during the cycle
CCD repetitions	the number of times the CCD measurement set is to be repeated
IR meas set	the number of the IR calibration measurement set performed during the cycle
IR repetitions	the number of times the IR measurement set is to be repeated
violet meas set	the number of the violet measurement set performed during the cycle
violet repetitions	the number of times the violet measurement set is to be repeated
shutter test reps	the number of times the IR shutter test is to be repeated
shutter test params	number of shutter cycles per shutter test
DCS test reps	the number of times the DCS test is to be repeated
DCS test params	compression ratio to use during DCS test
heater test reps	the number of times the heater test is to be repeated
heater test params	flags indicating which heaters were tested
cal lamp test reps	the number of times the calibration lamp test is to be repeated

cal lamp test params	flags indicating the state of the calibration lamps during the test
surf lamp test reps	the number of times the surface lamp test is to be repeated
surf lamp test params	flag indicating if the surface lamp is to be on or off for the surface lamp test
sun lamp test reps	the number of times the sun lamp test is to be repeated
sun lamp test params	parameter used for the sun lamp test; currently undefined

The size of the calibration cycle data set is always 12 words.

B.6.9 Violet Data Set

This data set provides to the user the violet photometer measurement data and information associated with the measurement.

	0			3	4			7	8			11	12			15
1	measure type					NOT USED							L1	L2	L3	SL
2	cycle number															
3	mission time (MSW)															
4	mission time (LSW)															
5	target azimuth															
6	actual azimuth															
7	violet sensor temp															
8	measurement data															

where:

Name	Comments
measure type	6 = DLV 7 = ULV
L1	calibration lamp 1 state: 0 = OFF; 1 = ON
L2	calibration lamp 2 state: 0 = OFF; 1 = ON
L3	calibration lamp 3 state: 0 = OFF; 1 = ON
SL	surface science lamp state: 0 = OFF; 1 = ON
cycle number	number of cycle in which measurement was taken
mission time	time at which measurement was begun MSW = upper 16 bits of mission time LSW = lower 16 bits of mission time Time is in 0.1 millisecond units.
target azimuth	azimuth at which measurement should have been taken. Azimuth is in 0.01 degree units.
actual azimuth	azimuth at which measurement was actually taken. Azimuth is in 0.01 degree units.
violet sensor temp	temperature of the violet sensor. Raw A/D converter units.
measurement data	measurement value from the instrument. Raw A/D converter units.

There is only one word of measurement data for the ULV photometer and one word of measurement data for the DLV photometer.

TOTAL LENGTH for the data set is 8 words.

B.6.10 IR Data Set

This data set provides to the user the IR measurement data and information associated with the measurement. The IR data is read from the IR collection buffer as 32–bit data values. This data is averaged to reduce the data to 14–bits. The data may or may not be compressed.

<table>
<tr><td colspan="3"></td><td>0</td><td></td><td></td><td>3</td><td>4</td><td></td><td></td><td>7</td><td>8</td><td></td><td></td><td>11</td><td>12</td><td></td><td></td><td>15</td></tr>
<tr><td>1</td><td></td><td></td><td colspan="5">measure type</td><td colspan="5">NOT USED</td><td>B</td><td>C</td><td>L1</td><td>L2</td><td>L3</td><td>SL</td></tr>
<tr><td>2</td><td></td><td></td><td colspan="16">cycle number</td></tr>
<tr><td>3</td><td></td><td></td><td colspan="16">mission time (MSW)</td></tr>
<tr><td>4</td><td></td><td></td><td colspan="16">mission time (LSW)</td></tr>
<tr><td>5</td><td></td><td></td><td colspan="16">IR status word</td></tr>
<tr><td>6</td><td></td><td></td><td colspan="16">begin focal temp</td></tr>
<tr><td>7</td><td></td><td></td><td colspan="16">end focal temp</td></tr>
<tr><td>8</td><td></td><td></td><td colspan="16">IRPA temp</td></tr>
<tr><td>9</td><td></td><td></td><td colspan="16">actual azimuth</td></tr>
<tr><td>10</td><td></td><td></td><td colspan="16">precharge val up</td></tr>
<tr><td>11</td><td></td><td></td><td colspan="16">precharge val down</td></tr>
<tr><td>12</td><td></td><td></td><td colspan="16">collection time (MSW)</td></tr>
<tr><td>13</td><td></td><td></td><td colspan="16">collection time (LSW)</td></tr>
<tr><td>14</td><td></td><td></td><td colspan="8">up looking target percent</td><td colspan="8">up looking specific no</td></tr>
<tr><td>15</td><td></td><td></td><td colspan="8">down looking target percent</td><td colspan="8">down looking specific no</td></tr>
<tr><td>16</td><td></td><td></td><td colspan="8">number of rotations</td><td colspan="8">number of bins</td></tr>
<tr><td>17</td><td></td><td></td><td colspan="16">no of regions</td></tr>
<tr><td>▶</td><td>1</td><td></td><td colspan="16">region number</td></tr>
<tr><td>▶</td><td>2</td><td></td><td colspan="16">region start azimuth</td></tr>
<tr><td>▶</td><td>3</td><td></td><td colspan="16">region angular width</td></tr>
<tr><td>▶</td><td>4</td><td></td><td colspan="8">up bin number</td><td colspan="8">down bin number</td></tr>
<tr><td></td><td>▶</td><td>1</td><td colspan="8">rotation number</td><td colspan="8">region number</td></tr>
<tr><td></td><td>▶</td><td>2</td><td colspan="16">collection start time (MSW)</td></tr>
<tr><td></td><td>▶</td><td>3</td><td colspan="16">collection start time (LSW)</td></tr>
<tr><td></td><td>▶</td><td>4</td><td colspan="16">collection duration</td></tr>
<tr><td></td><td>▶</td><td>5</td><td colspan="16">shutter period</td></tr>
<tr><td></td><td>▶</td><td>6</td><td colspan="16">sample time</td></tr>
<tr><td>▶</td><td>1</td><td></td><td colspan="8">bin number</td><td colspan="6">NOT USED</td><td>L</td><td>S</td></tr>
<tr><td>▶</td><td>2</td><td></td><td colspan="16">total sample time (MSW)</td></tr>
<tr><td>▶</td><td>3</td><td></td><td colspan="16">total sample time (LSW)</td></tr>
<tr><td>▶</td><td>4</td><td></td><td colspan="16">number of reads</td></tr>
<tr><td>▶</td><td>5</td><td></td><td>N</td><td colspan="9">no pixels per spec</td><td>N</td><td colspan="5">no bits sample</td></tr>
<tr><td>▶</td><td>6</td><td></td><td colspan="4">NOT USED</td><td colspan="4">comp scheme</td><td colspan="4">NOT USED</td><td colspan="4">no bits split</td></tr>
<tr><td>▶</td><td>7</td><td></td><td colspan="16">reference predictor</td></tr>
</table>

▶ 8	length of data
▶ 1	measurement data

where:

Name	Comments
measure type	8 = DLIS 9 = ULIS 10 = IR_Comb 11 = IR_Long
B	optimum sampling calculation flag for bright (open shutter) data 0 = no calculation; 1 = calculate optimum times
C	compression flag 0 = no compression; 1 = data is compressed
L1	calibration lamp 1 state: 0 = OFF; 1 = ON
L2	calibration lamp 2 state: 0 = OFF; 1 = ON
L3	calibration lamp 3 state: 0 = OFF; 1 = ON
SL	surface science lamp state: 0 = OFF; 1 = ON
cycle number	number of cycle in which measurement was taken
mission time	time at which measurement was begun MSW = upper 16 bits of mission time LSW = lower 16 bits of mission time Time is in 0.1 millisecond units.
IR status word	IR hardware status word
begin focal temp	optics focal plane temperature at start of measurement collection. Raw A/D converter units.
end focal temp	optics focal plane temperature at start of measurement collection. Raw A/D converter units.
FPA temp	FPA temperature. Raw A/D converter units.
IRPA temp	IRPA temperature. Raw A/D converter units.
actual azimuth	actual starting azimuth of the IR in spectrophotometric mode. Azimuth is in 0.01 degree units.
precharge val up	precharge vaule for upward looking instrument. Raw A/D converter units.
precharge val down	precharge vaule for downward looking instrument. Raw A/D converter units.
collection time	IR collection time used for this measurement MSW = upper 16 bits of mission time LSW = lower 16 bits of mission time Time is in 0.1 millisecond units.
up looking target percent	targeted percentage pixel value used in optimum sampling time calculations for upward looking data collections. 1 percent units.
up looking specific number	which of the sorted pixel values used in optimum sampling time calculations for upward looking data collections
down looking target percent	targeted percentage pixel value used in optimum sampling time calculations for downward looking data collections. 1 percent units.

down looking specific number	which of the sorted pixel values used in optimum sampling time calculations for downward looking data collections
number of rotations	number of rotations for which data was collected
no of regions	number of regions included in telemetry
number of bins	number of collection bins included in telemetry
region number	region number of the specific rotation data
region start azimuth	defined region starting azimuth
region angular width	defined region angular width
bin number	bin number of this data for optimum sampling time calculations
up bin number	defined region bin number for upward looking data collection
down bin number	defined region bin number for downward looking data collection
region number	region number of the specific region data for this rotation
rotation number	rotation number of the specific rotation data
collection start time	start time of the data collection for this region MSW = upper 16 bits of mission time LSW = lower 16 bits of mission time Time is in 0.1 millisecond units.
collection duration	duration of the collection for this region in IR frame periods
shutter period	shutter period used for this region in IR frame periods
sample time	sample time used to collect data for region in IR frame periods
bin number	bin number of this spectrum
L	channel look direction: 0 = down looking; 1 = up looking
S	shutter status: 0 = open; 1 = closed
total sample time	total sample time for the data collected for this spectrum MSW = upper 16 bits of mission time LSW = lower 16 bits of mission time Time is in 0.1 millisecond units.
number of reads	number of sample reads collected and summed for this spectrum
N	NOT USED
no pixels per spec	number of pixels per spectrum transmitted = 150
no bits sample	number of bits per sample; used in de–compression
comp scheme	compression scheme used for this spectrum (bit pattern): 1111 = no compression 0000 = psi–0 compression 0001 = psi–1 compression 0010 = NOT USED 0011 = psi–F compression 0100 = psi–14 compression
no bits split	number of low order bits split from the data in the spectrum
reference predictor	reference predictor used in data compression
length of data	number of bits transmitted for the data in this spectrum
measurement data	measurement value from the instrument. (Measurement data is the total data collected for a bin divided by the number of samples for the bin and the result multiplied by 4)

If data compression was not selected, each spectrum of transmitted data will have a length of 2400 bits. The number of words of measurement data will be 150 16–bit words. If data compression was selected, each spectrum of transmitted data will have a different length depending on the amount of compression. The number of words of measurement data for a spectrum will be a whole number of 16–bit words.

The total number of words for the data set is the sum of the different groups of data that are repeated for each region and each rotation and each spectrum (or bin) for processing purposes and general information associated with the measurement and the measurement data itself. There is a maximum of 4 upward looking collections and 8 downward looking collections. Each collection may have an open shutter spectrum and a closed shutter spectrum. There is, therefore, a maximum of 24 spectra (or bins).

number of words for measurement information = 17

number of words for region definition = 4 * (number of regions) = 32
there are 8 regions defined for descent data collection

number of words for spectrum information = 8 * (number of bins)
there is one bin for each spectrum; there is a maximum of 24 spectra (or bins)

number of words for the spectra = (number of bins) * (number of words for a spectrum)
there is a maximum 150 words for each spectrum

number of words for rotation information = 6 * (number of regions) * (number of rotations)
there is a maximum capability of 34 rpm; space is allocated for 35 rotations for data collection

TOTAL WORDS =		number of words for measurement information	17
	+	number of words for region definition	
	+	number of words for bin identification	
	+	number of words for spectra	
	+	number of words for rotation information	

B.6.10.1 Examples

1. **1 spectrum for calibration**

a) assumptions

2:1 SW compression:	number of words for a spectrum = 75	
	number of words for bin identification = 8	
	number of words for the bin(s) = 83	
1 RPM rotation rate:	TOTAL WORDS = 17 + 4 + 83 + 6 =	110
5 RPM rotation rate:	TOTAL WORDS = 17 + 4 + 83 + 30 =	134
25 RPM rotation rate:	TOTAL WORDS = 17 + 4 + 83 + 150 =	254

b) assumptions

NO compression:	number of words for a spectrum = 150	
	number of words for bin identification = 8	
	number of words for the bin(s) = 158	
1 RPM rotation rate:	TOTAL WORDS = 17 + 4 + 158 + 6 =	185
5 RPM rotation rate:	TOTAL WORDS = 17 + 4 + 158 + 30 =	209
25 RPM rotation rate:	TOTAL WORDS = 17 + 4 + 158 + 150 =	329

2. **2 spectra for long integration IR:** one each for upward looking and downward looking

a) assumptions

2:1 SW compression:	number of words for a spectrum = 75	
	number of words for bin identification = 8	
	number of words for the bin(s) = 166	
1 RPM rotation rate:	TOTAL WORDS = 17 + 4 + 166 + 6 =	193
5 RPM rotation rate:	TOTAL WORDS = 17 + 4 + 166 + 30 =	217
25 RPM rotation rate:	TOTAL WORDS = 17 + 4 + 166 + 150 =	337

3. **24 spectra for upward and downward looking bright and dark IR**

a) assumptions

2:1 SW compression: number of words for a spectrum = 75

number of words for bin identification = 8
number of words for the bin(s) = 1992

1 RPM rotation rate:	TOTAL WORDS = 17 + 32 + 1992 + 48 =	2089
5 RPM rotation rate:	TOTAL WORDS = 17 + 32 + 1992 + 240 =	2281
25 RPM rotation rate:	TOTAL WORDS = 17 + 32 + 1992 + 1200 =	3241

B.6.11 Dark Current Data Set

This data set provides to the user the dark current measurement data and information associated with the measurement. The dark current measurement data includes all rows of the CCD. It s split in two sections with two columns on the edge of the CCD and two columns in the area between the spectral and image parts of the CCD. The data may or may not have bad pixels eliminated. The data may or may not be summed. The data may or may not be compressed. The data will be processed regardless of the condition of the CCD status flags.

	0			3	4			7	8			11	12			15
1	measure type					N	B	S	C	F	L	P	L1	L2	L3	SL
2	cycle number															
3	mission time (MSW)															
4	mission time (LSW)															
5	target azimuth															
6	actual azimuth															
7	CCD status word															
8	focal plane temp															
9	chip temp															
10	exposure time															
11	null pixel 2															
12	null pixel 3															
13	number of columns															
▶ 1	N	no pixels per col									N	no bits sample				
▶ 2	NOT USED				comp scheme				NOT USED				no bits split			
▶ 3	reference predictor															
▶ 4	length of data															
▶ 1	measurement data															

where:

Name	Comments
measure type	18 = CCD dark current data
N	NOT USED
B	bad pixel elimination flag 0 = no elimination;1 = eliminated bad pixels
S	summing flag 0 = no summing; 1 = summing performed
C	noiseless compression flag 0 = no compression; 1 = data is compressed
F	new frame CCD status flag 0 = new frame bit not set; 1 = new frame bit set
L	new line CCD status flag 0 = new line bit not set; 1 = new line bit set
P	no pixel error CCD status flag 0 = pixel error bit set; 1 = no pixel error bit set

L1	calibration lamp 1 state: 0 = OFF; 1 = ON
L2	calibration lamp 2 state: 0 = OFF; 1 = ON
L3	calibration lamp 3 state: 0 = OFF; 1 = ON
SL	surface science lamp state: 0 = OFF; 1 = ON
cycle number	number of cycle in which measurement was taken
mission time	time at which measurement was begun MSW = upper 16 bits of mission time LSW = lower 16 bits of mission time Time is in 0.1 millisecond units.
target azimuth	azimuth at which measurement should have been taken. Azimuth is in 0.01 degree units.
actual azimuth	azimuth at which measurement was actually taken. Azimuth is in 0.01 degree units.
CCD status word	CCD hardware status word
focal plane temp	optics focal plane temperature. This is a raw A/D measurement value.
chip temp	temperature of the CCD chip. This is a raw A/D measurement value.
exposure time	CCD exposure time used for this measurement. Exposure time is in 0.5 millisecond units.
null pixel 2	sum of null pixel 2 value on each CCD row
null pixel 3	sum of null pixel 3 value on each CCD row
number of columns	number of columns of data transmitted
no pixels per col	number of pixels per column of data transmitted = 256
N	NOT USED
no bits sample	number of bits per sample; used in de–compression
comp scheme	compression scheme used for this spectrum (bit pattern): 1111 = no compression 0000 = psi–0 compression 0001 = psi–1 compression 0010 = NOT USED 0011 = psi–F compression 0100 = psi–14 compression
no bits split	number of low order bits split from the data in this column
reference predictor	reference predictor used in data compression
length of data	number of bits transmitted for the data in this column
measurement data	measurement value from the instrument

If data summing was selected, the transmitted data will consist of 2 columns. Summed data requires 13 bits for each sample. Otherwise, there will be 4 columns of data where 12 bits is required for each sample.

If data compression was not selected, each column of transmitted data will have a length of 4096 bits. The number of words of measurement data will be 256 16–bit words. If data compression was selected, each column of transmitted data will have a different length depending on the amount of compression. The number of words of measurement data for a column will be a whole number of 16–bit words.

TOTAL WORDS = 12 + (number of columns) * (4 + (number of words for each column))

B.6.11.1 Examples

1. **descent mode dark current measurement**
   a) assumptions

summing:	number of columns = 2
2:1 SW compression:	number of words for a column = ((256 * 13) / 2) / 16 = 104
	TOTAL WORDS = 224

2. **calibration mode dark current measurement**
   a) assumptions

NO summing:	number of columns = 4
2:1 SW compression:	number of words for a column = ((256 * 12) / 2) / 16 = 96
	TOTAL WORDS = 412

   b) assumptions

NO summing:	number of columns = 4
NO compression:	number of words for a column = 256
	TOTAL WORDS = 1052

B.6.12 Image and Raw Image Data Set

These data set provides to the user the image measurement data and information associated with the measurement. Image data sets are generated every time a image measurement is taken during any mode. Raw image data sets are generated only if DCS compression was requested for an image measurement, but either no or not enough output data was generated by the DCS compressor. Not enough data is defined as less than 80% of the data that was expected given the input compression ratio. The amount of data sent in the raw image data set is the closest number of whole rows of data that bring the total data generated up to the expected amount. Image and raw image data sets have the same format except for in the Raw Image data sets some of the flags are always set to one state and the amount of data will not be the entire image area.

All image measurements read all rows of the CCD except the first and last rows. The DLI_1 image measurement data includes 160 columns, the DLI_2 image includes 176 columns, and the SLI image includes 128 columns. The data may or may not have bad pixels replaced. The data may or may not have square root data reduction performed. The data may or may not be compressed. If the data is DCS compressed, then the top and bottom rows (rows 0 and 255) will be replaced with the values of the adjacent rows.

The image data can be DCS compressed or noiselessly compressed or uncompressed. DCS compressed images have a data set structure that differs from the data set structure for uncompressed or noiselessly compressed images. The information below is the beginning of the image data set for both structures. The next two subparagraphs describe the format of the remaining data set structure depending on the type of data compression completed for the data. Raw Image data sets contain only uncompressed data.

	0			3	4			7	8			11	12			15
1	measure type					NOT USED				F	L	P	L1	L2	L3	SL
2	NOT USED											B	Q	C	D	E
3	cycle number															
4	mission time (MSW)															
5	mission time (LSW)															
6	target azimuth															
7	actual azimuth															
8	DCS status word															
9	CCD status word															
10	focal plane temp															
11	chip temp															
12	exposure time															
13	target percent								histogram percent							
14	null pixel 2															
15	null pixel 3															
16	image minimum															
17	image maximum															
18	amount of data															

where:

Name	Comments
measure type	0 = U_DLI_1 upper half DLI–1 image 1 = U_DLI_2 upper half DLI–2 image 2 = U_SLI upper half SLI image 3 = L_DLI_1 lower half DLI–1 image 4 = L_DLI_2 lower half DLI–2 image 5 = L_SLI lower half SLI image 21 = DLI_2 whole DLI–2 image 22 = SLI whole SLI image 23 = DLI_1 whole DLI–1 image
F	new frame flag 0 = new frame bit not set; 1 = new frame bit set
L	new line flag 0 = new line bit not set; 1 = new line bit set
P	no pixel error flag 0 = pixel error bit set; 1 = no pixel error bit set
L1	calibration lamp 1 state: 0 = OFF; 1 = ON
L2	calibration lamp 2 state: 0 = OFF; 1 = ON
L3	calibration lamp 3 state: 0 = OFF; 1 = ON
SL	surface science lamp state: 0 = OFF; 1 = ON
B	bad pixel replacement flag 0 = no replacement;1 = replaced bad pixels Flag set to 0 for Raw Image data sets
Q	square root flag 0 = no square root; 1 = square root data reduction performed Flag set to 0 for Raw Image data sets
C	compression flag 0 = no compression; 1 = data is compressed Flag set to 0 for Raw Image data sets
D	type of data compression 0 = DCS compression; 1 = noiseless compression
E	optimum exposure time calculation flag 0 = no calculations; 1 = calculate optimum exposure time
cycle number	number of cycle in which measurement was taken
mission time	time at which measurement was begun MSW = upper 16 bits of mission time LSW = lower 16 bits of mission time Time is in 0.1 millisecond units.
target azimuth	azimuth at which measurement should have been taken. Azimuth is in 0.01 degree units.
actual azimuth	azimuth at which measurement was actually taken. Azimuth is in 0.01 degree units.
DCS status word	DCS hardware status word
CCD status word	CCD hardware status word
focal plane temp	optics focal plane temperature. This is a raw A/D measurement value.
chip temp	temperature of the CCD chip. This is a raw A/D measurement value.

exposure time	CCD exposure time used for this measurement. Exposure time is in 0.5 millisecond units.
target percent	CCD targeted full well percentage
histogram percent	CCD histogram percentile pixel value used in calculations
null pixel 2	sum of null pixel 2 value on each CCD row
null pixel 3	sum of null pixel 3 value on each CCD row
image minimum	minimum value used by the adjustable square root processor
image maximum	maximum value used by the adjustable square root processor
amount of data	for SW compressed or UN–compressed data number of rows of data transmitted = 254 for whole rows =127 for half rows for DCS compressed data number of bytes of compressed data for the image for Raw Image data sets number of rows of data transmitted

B.6.12.1 Data Set for DCS Compressed Images

Each DCS compressed image will be compressed as a whole giving a stream of byte values. These values are packed 2 byte values per word in the telemetry stream.

▶ 1	measurement data	measurement data

where:

Name	Comments
measurement data	compressed measurement data from the instrument

For DCS compressed data, each image will have a different length depending on the amount of compression. The number of words of measurement data for the image will be a whole number of 16–bit words.

TOTAL WORDS = 16 + (number of words for the image)

B.6.12.1.1 Examples

1. **DLI–1 image:** 160 columns and 256 rows = 40960 pixels of 8 bits each
   a) assumptions
   8:1 HW compression: number of words = ((40960 * 8) / 8) / 16 = 2560
   TOTAL WORDS = 2576
2. **DLI_1 half image:** 160 columns and 128 rows = 20480 pixels of 8 bits each
   a) assumptions
   8:1 HW compression: number of words = ((20480 * 8) / 8) / 16 = 1280
   TOTAL WORDS = 1296
3. **DLI_2 image:** 176 columns and 256 rows = 45056 pixels of 8 bits each
   a) assumptions
   8:1 HW compression: number of words = ((45056 * 8) / 8) / 16 = 2816
   TOTAL WORDS = 2832
4. **DLI_2 half image:** 176 columns and 128 rows = 22528 pixels of 8 bits each
   a) assumptions
   8:1 HW compression: number of words = ((22528 * 8) / 8) / 16 = 1408

TOTAL WORDS = 1424

5. **SLI image:** 128 columns and 256 rows = 32768 pixels of 8 bits each
   a) assumptions
      8:1 HW compression: number of words = ((32768 * 8) / 8) / 16 = 2048
      TOTAL WORDS = 2064

6. **SLI half image:** 128 columns and 128 rows = 16284 pixels of 8 bits each
   a) assumptions
      8:1 HW compression: number of words = ((16284 * 8) / 8) / 16 = 1024
      TOTAL WORDS = 1040

B.6.12.2 Data Set for Uncompressed or Noiselessly Compressed Images

Each noiselessly compressed image will be compressed by row. These compressed rows and the un–compressed image rows will be transmitted in telemetry by row (not by column as with other measurements).

▶ 1	sync word			
▶ 2	row number			
▶ 3	N	no pixels per row	N	no bits sample
▶ 4	NOT USED	comp scheme	NOT USED	no bits split
▶ 5	reference predictor			
▶ 6	length of data			
▶ 1	measurement data			

where:

Name	Comments
sync word	sync word to indicate the start of a new row = 6969 (hex)
row number	row number of data transmitted
no pixels per row	number of pixels per row of data transmitted: for DLI–1 = 160 for DLI–2 = 176 for SLI = 128
N	NOT USED
no bits sample	number of bits per sample; used in de–compression
comp scheme	compression scheme used for this spectrum (bit pattern): 1111 = no compression 0000 = psi–0 compression 0001 = psi–1 compression 0010 = NOT USED 0011 = psi–F compression 0100 = psi–14 compression
no bits split	number of low order bits split from the data in this column
reference predictor	reference predictor used in data compression
length of data	number of bits transmitted for the data in this column
measurement data	measurement data from the instrument

If data compression was not selected, each row of transmitted data will have a length dependent upon the image type. The number of words of measurement data in each row will be a whole number of 16–bit words:

1. DLI_1 image data has a length of 2,560 bits = 160 words.
2. DLI_2 image data has a length of 2,816 bits = 176 words.
3. SLI image data has a length of 2,048 bits = 128 words.

If data compression was selected, each row of transmitted data will have a different length depending on the amount of compression. The number of words of measurement data will be a whole number of 16–bit words.

TOTAL WORDS = 16 + (number of rows) * (6 + number of words for each row)

B.6.12.2.1 Examples

1. **DLI_1 image:** 160 columns and 254 rows
   a) assumptions
   2:1 SW compression: number of words = ((160 * 12) / 2) / 16 = 60
   TOTAL WORDS = 16,778
   no compression: number of words = 160
   TOTAL WORDS = 42,180
2. **DLI_1 half image:** 160 columns and 127 rows
   a) assumptions
   2:1 SW compression: number of words = ((160 * 12) / 2) / 16 = 60
   TOTAL WORDS = 8,398
3. **DLI_2 image:** 176 columns and 254 rows
   a) assumptions
   2:1 SW compression: number of words = ((176 * 12) / 2) / 16 = 66
   TOTAL WORDS = 18,304
   no compression: number of words = 176
   TOTAL WORDS = 46,244
4. **DLI_2 half image:** 176 columns and 127 rows
   a) assumptions
   2:1 SW compression: number of words = ((176 * 12) / 2) / 16 = 66
   TOTAL WORDS = 9,160
5. **SLI image:** 128 columns and 254 rows
   a) assumptions
   2:1 SW compression: number of words = ((128 * 12) / 2) / 16 = 48
   TOTAL WORDS = 13,732
   no compression: number of words = 128
   TOTAL WORDS = 34,052
6. **SLI half image:** 128 columns and 127 rows
   a) assumptions
   2:1 SW compression: number of words = ((128 * 12) / 2) / 16 = 48
   TOTAL WORDS = 6,874

B.6.13 Strip Data Set

This data set provides to the user the measurement data and information associated with the measurement. The image strip measurement data contains all rows of the CCD except the top and bottom rows and it it 26 columns wide. The specific set of 26 columns is based on the target and actual azimuth in descent mode, on table values in calibration mode, and on an input value in single measurement mode. The data may or may not have bad pixels eliminated. The data may or may not be summed. The data may or may not be compressed. The data will be processed regardless of the condition of the CCD status flags.

	0			3	4			7	8			11	12			15
1	measure type					E	B	S	C	F	L	P	L1	L2	L3	SL
2	cycle number															
3	mission time (MSW)															
4	mission time (LSW)															
5	target azimuth															
6	actual azimuth															
7	CCD status word															
8	focal plane temp															
9	chip temp															
10	exposure time															
11	target percent								histogram percent							
12	null pixel 2															
13	null pixel 3															
14	strip center column															
15	first column															
16	number of columns															
▶ 1	N	no pixels per col									N	no bits sample				
▶ 2	NOT USED				comp scheme				NOT USED				no bits split			
▶ 3	reference predictor															
▶ 4	length of data															
▶ 1	measurement data															

where:

Name	Comments
measure type	12 = CCD SLI strip measurement data
E	optimum exposure time calculation flag 0 = no calculations; 1 = calculate optimum exposure time
B	bad pixel elimination flag 0 = no elimination;1 = eliminated bad pixels
S	summing flag 0 = no summing; 1 = summing performed
C	noiseless compression flag 0 = no compression; 1 = data is compressed
F	new frame flag 0 = new frame bit not set; 1 = new frame bit set

L	new line flag 0 = new line bit not set; 1 = new line bit set
P	no pixel error flag 0 = pixel error bit set; 1 = no pixel error bit set
L1	calibration lamp 1 state: 0 = OFF; 1 = ON
L2	calibration lamp 2 state: 0 = OFF; 1 = ON
L3	calibration lamp 3 state: 0 = OFF; 1 = ON
SL	surface science lamp state: 0 = OFF; 1 = ON
cycle number	number of cycle in which measurement was taken
mission time	time at which measurement was begun MSW = upper 16 bits of mission time LSW = lower 16 bits of mission time Time is in 0.1 millisecond units.
target azimuth	azimuth at which measurement should have been taken. Azimuth is in 0.01 degree units.
actual azimuth	azimuth at which measurement was actually taken. Azimuth is in 0.01 degree units.
CCD status word	CCD hardware status word
focal plane temp	optics focal plane temperature. This is a raw A/D measurement value.
chip temp	temperature of CCD chip. This is a raw A/D measurement value.
exposure time	CCD exposure time used for this measurement. Exposure time is in 0.5 millisecond units.
target percent	CCD targeted full well percentage
histogram percent	CCD histogram percentile pixel value used in calculations
null pixel 2	sum of null pixel 2 value on each CCD row
null pixel 3	sum of null pixel 3 value on each CCD row
strip center column	center column of SLI imaging area to used as center of strip in calibration or single measurement mode
first column	first column of the strip from the right edge of the CCD
number of columns	number of columns of data transmitted
no pixels per col	number of pixels per column of data transmitted = 254
N	NOT USED
no bits sample	number of bits per sample; used in de–compression
comp scheme	compression scheme used for this spectrum (bit pattern): 1111 = no compression 0000 = psi–0 compression 0001 = psi–1 compression 0010 = NOT USED 0011 = psi–F compression 0100 = psi–14 compression
no bits split	number of low order bits split from the data in this column
reference predictor	reference predictor used in data compression
length of data	number of bits transmitted for the data in this column
measurement data	measurement value from the instrument

If data summing was selected, the transmitted data will consist of 2 columns. Summed data requires 16 bits for each sample. Otherwise, there will be 26 columns of data where 12 bits is required for each sample.

If data compression was not selected, each column of transmitted data will have a length of 4064 bits. The number of words of measurement data will be 254 16–bit words. If data compression was selected, each column of transmitted data will have a different length depending on the amount of compression. The number of words of measurement data for a column will be a whole number of 16–bit words.

TOTAL WORDS = 16 + (number of columns) * (4 + (number of words for each column))

B.6.13.1 Examples

1. **nominal strip measurement**
   a) assumptions

summing:	number of columns = 2
2:1 SW compression:	number of words for a column = ((254 * 16) / 2) / 16 = 127
	TOTAL WORDS = 278

B.6.14 Solar Aureole Data Set

This data set provides to the user the measurement data and information associated with the measurement. The solar aureole instrument consists of 4 channels with 4 separate measurement areas on the CCD. Each solar aureole measurement represents an area 6 columns by 50 rows. The data may or may not have bad pixels eliminated. The data may or may not be summed. The data may or may not be compressed. The data will be processed regardless of the condition of the CCD status flags.

	0			3	4			7	8			11	12			15
1	measure type					E	B	S	C	F	L	P	L1	L2	L3	SL
2	cycle number															
3	mission time (MSW)															
4	mission time (LSW)															
5	target azimuth															
6	actual azimuth															
7	CCD status word															
8	focal plane temp															
9	chip temp															
10	exposure time															
11	target percent								histogram percent							
12	null pixel 2															
13	null pixel 3															
14	number of columns															
▶ 1	N	no pixels per col									N	no bits sample				
▶ 2	NOT USED				comp scheme				N		SA		no bits split			
▶ 3	reference predictor															
▶ 4	length of data															
▶ 1	measurement data															

where:

Name	Comments
measure type	14 = CCD solar aureole measurement data
E	optimum exposure time calculation flag 0 = no calculations; 1 = calculate optimum exposure time
B	bad pixel elimination flag 0 = no elimination;1 = eliminated bad pixels
S	summing flag 0 = no summing; 1 = summing performed
C	noiseless compression flag 0 = no compression; 1 = data is compressed
F	new frame flag 0 = new frame bit not set; 1 = new frame bit set
L	new line flag 0 = new line bit not set; 1 = new line bit set

P	no pixel error flag 0 = pixel error bit set; 1 = no pixel error bit set
L1	calibration lamp 1 state: 0 = OFF; 1 = ON
L2	calibration lamp 2 state: 0 = OFF; 1 = ON
L3	calibration lamp 3 state: 0 = OFF; 1 = ON
SL	surface science lamp state: 0 = OFF; 1 = ON
cycle number	number of cycle in which measurement was taken
mission time	time at which measurement was begun MSW = upper 16 bits of mission time LSW = lower 16 bits of mission time Time is in 0.1 millisecond units.
target azimuth	azimuth at which measurement should have been taken. Azimuth is in 0.01 degree units.
actual azimuth	azimuth at which measurement was actually taken. Azimuth is in 0.01 degree units.
CCD status word	CCD hardware status word
focal plane temp	optics focal plane temperature. This is a raw A/D measurement value.
chip temp	temperature of CCD chip. This is a raw A/D measurement value.
exposure time	CCD exposure time used for this measurement. Exposure time is in 0.5 millisecond units.
target percent	CCD targeted full well percentage
histogram percent	CCD histogram percentile pixel value used in calculations
null pixel 2	sum of null pixel 2 value on each CCD row
null pixel 3	sum of null pixel 3 value on each CCD row
number of columns	number of columns of data transmitted for each channel
no pixels per col	number of pixels per column of data transmitted = 50
N	NOT USED
SA	solar aureole channel: 0=SA_1; 1=SA_2; 2=SA_3; 3=SA_4*
no bits sample	number of bits per sample; used in de–compression
comp scheme	compression scheme used for this spectrum (bit pattern): 1111 = no compression 0000 = psi–0 compression 0001 = psi–1 compression 0010 = NOT USED 0011 = psi–F compression 0100 = psi–14 compression
no bits split	number of low order bits split from the data in this column
reference predictor	reference predictor used in data compression
length of data	number of bits transmitted for the data in this column
measurement data	measurement value from the instrument

* SA_1 refers to the solar aureole block closest to the imagers on the CCD. SA_2 is beside SA–1 and SA_3 is beside SA_2. SA_4 is the solar aureole block farthest from the imagers on the CCD.

If data summing was selected, the transmitted data will consist of 4 columns, one for each solar aureole channel. Summed data requires 15 bits for each sample. Otherwise, there will be 24 columns of data, six for each solar aureole channel, where 12 bits is required for each sample.

If data compression was not selected, each column of transmitted data will have a length of 300 bits. The number of words of measurement data will be 50 16–bit words. If data compression was selected, each column of transmitted data will have a different length depending on the amount of compression. The number of words of measurement data for a column will be a whole number of 16–bit words.

TOTAL WORDS = 14 + (number of columns) * (4 + (number of words for each column))

B.6.14.1 Examples

1. **nominal solar aureole measurement**

a) assumptions

summing:	number of columns = 6
2:1 SW compression:	number of words for a column = ((50 * 15) / 2) / 16 = 24
	TOTAL WORDS = 182

b) assumptions

NO summing:	number of columns = 24
2:1 SW compression:	number of words for a column = ((50 * 12) / 2) / 16 = 19
	TOTAL WORDS = 566

c) assumptions

NO summing:	number of columns = 24
NO compression:	number of words for a column = 50
	TOTAL WORDS = 1310

B.6.15 Visible and Visible Ext Data Set

The visible data set provides to the user the measurement data and information associated with DLVS and ULVS measurements. The ULVS measurement data is 8 columns wide and the DLVS measurement data is 20 columns wide. The data may or may not have bad pixels eliminated. The data may or may not be summed. The data may or may not be compressed. The data will be processed regardless of the condition of the CCD status flags.

The visible ext data set contains two vectors taken at the same time as a DLVS or ULVS measurement. These vectors contain data from the same rows but from two columns on either side of the cooresponding DLVS or ULVS. This data is compressed the same way as the cooresponding DLVS or ULVS.

	0			3	4			7	8			11	12			15
1	measure type					E	B	S	C	F	L	P	L1	L2	L3	SL
2	cycle number															
3	mission time (MSW)															
4	mission time (LSW)															
5	target azimuth															
6	actual azimuth															
7	CCD status word															
8	focal plane temp															
9	chip temp															
10	exposure time															
11	target percent								histogram percent							
12	null pixel 2															
13	null pixel 3															
14	no fields of view															
▶ 1	N	no pixels per col									N	no bits sample				
▶ 2	NOT USED				comp scheme				NOT USED				no bits split			
▶ 3	reference predictor															
▶ 4	length of data															
▶ 1	measurement data															

where:

Name	Comments
measure type	15 = near surface DLVS 16 = DLVS 17 = ULVS 30 = DLVS_Ext 31 = ULVS_Ext
E	optimum exposure time calculation flag 0 = no calculations; 1 = calculate optimum exposure time Flag set to 0 for Visible_Ext data sets
B	bad pixel elimination flag 0 = no elimination;1 = eliminated bad pixels Flag set to 0 for Visible_Ext data sets

S	summing flag 0 = no summing; 1 = summing performed Flag set to 0 for Visible_Ext data sets
C	noiseless compression flag 0 = no compression; 1 = data is compressed
F	new frame flag 0 = new frame bit not set; 1 = new frame bit set
L	new line flag 0 = new line bit not set; 1 = new line bit set
P	no pixel error flag 0 = pixel error bit set; 1 = no pixel error bit set
L1	calibration lamp 1 state: 0 = OFF; 1 = ON
L2	calibration lamp 2 state: 0 = OFF; 1 = ON
L3	calibration lamp 3 state: 0 = OFF; 1 = ON
SL	surface science lamp state: 0 = OFF; 1 = ON
cycle number	number of cycle in which measurement was taken
mission time	time at which measurement was begun MSW = upper 16 bits of mission time LSW = lower 16 bits of mission time Time is in 0.1 millisecond units.
target azimuth	azimuth at which measurement should have been taken. Azimuth is in 0.01 degree units.
actual azimuth	azimuth at which measurement was actually taken. Azimuth is in 0.01 degree units.
CCD status word	CCD hardware status word
focal plane temp	optics focal plane temperature. This is a raw A/D measurement value.
chip temp	temperature of CCD chip. This is a raw A/D measurement value.
exposure time	CCD exposure time used for this measurement. Exposure time is in 0.5 millisecond units.
target percent	CCD targeted full well percentage Value set to 0 for Visible_Ext data sets
histogram percent	CCD histogram percentile pixel value used in calculations Value set to 0 for Visible_Ext data sets
null pixel 2	sum of null pixel 2 value on each CCD row
null pixel 3	sum of null pixel 3 value on each CCD row
no fields of view	number of fields of view of data transmitted
no pixels per col	number of pixels per column of data transmitted = 200
N	NOT USED
no bits sample	number of bits per sample; used in de–compression

comp scheme	compression scheme used for this spectrum (bit pattern): 1111 = no compression 0000 = psi–0 compression 0001 = psi–1 compression 0010 = NOT USED 0011 = psi–F compression 0100 = psi–14 compression
no bits split	number of low order bits split from the data in this column view
reference predictor	reference predictor used in data compression
length of data	number of bits transmitted for the data in this column view
measurement data	measurement value from the instrument

If data summing was selected for ULVS, the transmitted data will consist of 2 columns. Summed data requires 14 bits for each sample. Otherwise, there will be 8 columns of data, where 12 bits is required for each sample.

If data summing was selected for DLVS, the number of fields of view (FOV) must be specified. The transmitted data will consist of a number of columns equal to the number of FOV; otherwise, there will be 20 columns of data, where 12 bits is required for each sample. If 2 FOV is specified, the 4 pixels in each row centered in the light of the surface science lamp will be summed together in groups of 2 to form 2 columns of data, where 13 bits is required for each sample. If 5 FOV is specified, the 20 pixels in each row will be summed together in groups of 4 to form 5 columns of data, where 15 bits is required for each sample. If 10 FOV is specified, the 20 pixels in each row will be summed together in groups of 2 to form 10 columns of data, where 13 bits is required for each sample.

If data compression was not selected, each column of transmitted data will have a length of 3200 bits. The number of words of measurement data will be 200 16–bit words. If data compression was selected, each column of transmitted data will have a different length depending on the amount of compression. The number of words of measurement data for a column will be a whole number of 16–bit words.

TOTAL WORDS = 14 + (number of columns) * (4 + (number of words for each column))

B.6.15.1 Examples

1. **nominal visible measurement**

a) assumptions
ULVS summing: number of columns = 2
2:1 SW compression: number of words for a column = ((200 * 14) / 2) / 16 = 88
TOTAL WORDS = 198

b) assumptions
ULVS NO summing: number of columns = 8
2:1 SW compression: number of words for a column = ((200 * 12) / 2) / 16 = 75
TOTAL WORDS = 646

c) assumptions
ULVS NO summing: number of columns = 8
NO compression: number of words for a column = 200
TOTAL WORDS = 1646

d) assumptions
DLVS 2 FOV summing: number of columns = 2
2:1 SW compression: number of words for a column = ((200 * 13) / 2) / 16 = 82
TOTAL WORDS = 186

e) assumptions
DLVS 5 FOV summing: number of columns = 5
2:1 SW compression: number of words for a column = ((200 * 14) / 2) / 16 = 88
TOTAL WORDS = 474

f) assumptions
DLVS 10 FOV summing: number of columns = 10
2:1 SW compression: number of words for a column = ((200 * 13) / 2) / 16 = 82
TOTAL WORDS = 874

g) assumptions
DLVS NO summing: number of columns = 20
2:1 SW compression: number of words for a column = ((200 * 12) / 2) / 16 = 75
TOTAL WORDS = 1674

h) assumptions
DLVS NO summing: number of columns = 20
NO compression: number of words for a column = 200
TOTAL WORDS = 4094

1. **visible ext measurement**

a) assumptions
Ext, No compression number of words for a column = 204
TOTAL WORDS = 422

b) assumptions
EXT, compression: number of words for a column = 200 / 2 +4 =104
TOTAL WORDS = 222

B.6.16 Full CCD Data Set

This data set provides to the user the measurement data and information associated with the measurement. The full CCD measurement data is read from the CCD in columns 0 through 523 (524 columns) and rows 0 through 255 (256 rows). The full CCD measurement data is transmitted in half rows of 262 values. The data may or may not be compressed. The data will be processed regardless of the condition of the CCD status flags.

	0			3	4			7	8			11	12			15
1	measure type					NOT USED			C	F	L	P	L1	L2	L3	SL
2	cycle number															
3	mission time (MSW)															
4	mission time (LSW)															
5	target azimuth															
6	actual azimuth															
7	CCD status word															
8	focal plane temp															
9	chip temp															
10	exposure time															
11	null pixel 2															
12	null pixel 3															
13	number of rows															
▶ 1	sync word															
▶ 2	row number															
▶ 3	N	no pixels per row									N	no bits sample				
▶ 4	NOT USED				comp scheme				NOT USED				no bits split			
▶ 5	reference predictor															
▶ 6	length of data															
▶ 1	measurement data															

where:

Name	Comments
measure type	19 = full CCD
C	compression flag 0 = no compression; 1 = data is compressed
F	new frame flag 0 = new frame bit not set; 1 = new frame bit set
L	new line flag 0 = new line bit not set; 1 = new line bit set
P	no pixel error flag 0 = pixel error bit set; 1 = no pixel error bit set
L1	calibration lamp 1 state: 0 = OFF; 1 = ON
L2	calibration lamp 2 state: 0 = OFF; 1 = ON
L3	calibration lamp 3 state: 0 = OFF; 1 = ON

SL	surface science lamp state: 0 = OFF; 1 = ON
cycle number	number of cycle in which measurement was taken
mission time	time at which measurement was begun upper half = MSH (upper 16 bits) of mission time lower half = LSH (lower 16 bits) of mission time Time is in 0.1 millisecond units.
target azimuth	azimuth at which measurement should have been taken. Azimuth is in 0.01 degree units.
actual azimuth	azimuth at which measurement was actually taken. Azimuth is in 0.01 degree units.
CCD status word	CCD hardware status word
focal plane temp	optics focal plane temperature. This is a raw A/D measurement value.
chip temp	temperature of the CCD chip. This is a raw A/D measurement value.
exposure time	CCD exposure time used for this measurement. Exposure time is in 0.5 millisecond units.
null pixel 2	sum of null pixel 2 value on each CCD row
null pixel 3	sum of null pixel 3 value on each CCD row
number of rows	number of half rows of data transmitted: 512
sync word	sync word to indicate the start of a new row = 6969 (hex)
row number	half row number of data transmitted: odd number is the first half of the actual row: actual row = (half row number + 1) / 2 even number is the second half of the actual row: actual row = half row number / 2
no pixels per row	number of pixels per row of data transmitted = 262
N	NOT USED
no bits sample	number of bits per sample; used in de–compression
comp scheme	compression scheme used for this spectrum (bit pattern): 1111 = no compression 0000 = psi–0 compression 0001 = psi–1 compression 0010 = NOT USED 0011 = psi–F compression 0100 = psi–14 compression
no bits split	number of low order bits split from the data in this column
reference predictor	reference predictor used in data compression
length of data	number of bits transmitted for the data in this column
measurement data	measurement data from the instrument

If data compression was not selected, each half row of transmitted data will have a length of 4192 bits. The number of words of measurement data will be 262 16–bit words. If data compression was selected, each half row of transmitted data will have a different length depending on the amount of compression. The number of words of measurement data for a column will be a whole number of 16–bit words.

TOTAL WORDS = 14 + (512) * (6 + (number of words for each each half row))

B.6.16.1 Examples

1. **nominal full CCD measurement**

   a) assumptions

   2:1 SW compression: number of words for a row = ((262 * 12) / 2) / 16 = 99
   TOTAL WORDS = 53774

B.6.17 DCS Test Data Set

The DCS Test Data Set contains data associated with a DCS test. There are two components to the DCS test. The first performs the self–test function of the DCS. This is entirely internal to the DCS unit. The only indication of success or failure is the byte of data returned from the DCS in the DCS status area. This byte includes indicators of latchup condition detected (4), of CPU crash condition, of operations status, and of DCS ready. The second component of the test is to load a fixed sequence into the DCS image buffer area and compress it. The results are put into the telemetry stream. The data may be compressed with different compression ratios. The data loaded into the memory area is the size of the largest image or 176 by 256.

This data set is used whenever a DCS test is performed. This may be done either by a single test command or as part of a calibration sequence. A test of the DCS is planned as part of the health check sequence but not as part of the in–flight calibration sequence.

The data set format is as follows:

	0			3	4			7	8			11	12			15
1	Time – MSH															
2	Time – LSH															
3	overall test status								target compression ratio							
4	self test status								SW test status							
5	number bytes of compressed data															
6	compressed data word 2n–1								compressed data word 2n–1							

where;

Name	Comments
Time	Start time of the test – Mission time in 0.1 milliseconds
overall test status	This is an indicator of the success or failure of the overall test. It indicates if the DCS could not be accessed to perform one or more of the tests.
target compression ratio	The target compression ratio for the test. This is the value used for the software test.
self test status	The byte of DCS status information returned after the completion of the self test function.
SW test status	The byte of DCS status information returned after the completion of the software test function.
number of bytes of compressed data	The number of bytes of compressed data for the software test.
compressed data	An individual byte of compressed data.

The size of the data set depends on the compression ratio chosen. Actual sizes are not known at this time but an estimate of the actual size can be made assuming that the data is compressed exactly as specified. The size of the data set as a function of the compression ratio is shown in the following table.

Compression Ratio	Data Set Size (words)
1	22,533
2	11,269
3	7,515
4	5,637
5	4,511

6	3,760
7	3,224
8	2,821
9	2,509
10	2,258
11	2,053
12	1,883
13	1,738
14	1,615
15	1,507
16	1,413

The nominal compression ratio is 8 which gives a data set size of 2,821 words.

B.6.18 IR Shutter Test Data Set

The IR shutter Test Data Set contains data for a single shutter test. The shutter test command sequence is as follows:

1. Open the shutter and reset up and down channels – repeated 10 times to make sure the shutter has had plenty of time to be open.
2. Open shutter and read both the up and down looking channels (measurement number 1). This measurement provides a baseline for the nominal shutter open values.
3. Close shutter and read both the up and down looking channels (measurements 2 through 7). This measurement is repeated six times. This provides up to 6 measurements for when the shutter is in the process of closing. Since the shutter close operation should take less than 2 of the 6 this should catch the shutter in the process of closing and should show three measurements where the shutter is fully closed.
4. Close the shutter and reset both up and down looking channels for 10 IR commands. This will allow the shutter to close even if it takes longer than expected.
5. Close shutter and read both the up and down looking channels (measurement number 8 and 9). These two measurements provide a baseline long after the shutter has completely closed.
6. Open shutter and read both the up and down looking channels (measurements 10 through 15). This measurement is repeated six times. This provides up to 6 measurements for when the shutter is in the process of opening. Since the shutter open operation should take less than 2 of the 6 this should catch the shutter in the process of opening and should show three measurements where the shutter is fully opened.
7. Open the shutter and reset up and down channels – repeated 10 times to make sure the shutter has had plenty of time to be open.
8. Open shutter and read both the up and down looking channels (measurement number 16).

This data set is used whenever an IR shutter test measurement is performed. This may be commanded from the single measurement mode of operation or may be commanded as part of a calibration sequence. It is included as a measurement in the health check calibration sequence but not the in–flight calibration sequence.

For each read of the IR data, 6 data set values are returned; 3 data set items for the ULIS and 3 for the DLIS. The three data set set items include a precharge value, a dark value, and a signal value. The precahrge value is the average of IR pixels 148 and 149. The dark current value is the average of pixels 2 thru 5 and 144 thru 147. The signal value is the average of pixels 9 thru 140.

Calibration lamps are not explicitly commanded on for this test.

The data set format is as follows:

	0			3	4			7	8			11	12			15
1	Time – MSH															
2	Time – LSH															
3	meas 1 – up, open, precharge															
4	meas 1 – up, open, dark															
5	meas 1 – up, open signal															
6	meas 2 – up, close, precharge															
7	meas 2 – up, close, dark															
8	meas 2 – up, close, signal															
9	meas 3 – up, close, precharge															
10	meas 3 – up, close, dark															
11	meas 3 – up, close, signal															

12	meas 4 – up, close, precharge
13	meas 4 – up, close, dark
14	meas 4 – up, close, signal
15	meas 5 – up, close, precharge
16	meas 5 – up, close, dark
17	meas 5 – up, close, signal
18	meas 6 – up, close, precharge
19	meas 6 – up, close, dark
20	meas 6 – up, close, signal
21	meas 7 – up, close, precharge
22	meas 7 – up, close, dark
23	meas 7 – up, close, signal
24	meas 8 – up, close, precharge
25	meas 8 – up, close, dark
26	meas 8 – up, close, signal
27	meas 9 – up, close, precharge
28	meas 9 – up, close, dark
29	meas 9 – up, close signal
30	meas 10 – up, open, precharge
31	meas 10 – up, open, dark
32	meas 10 – up, open signal
33	meas 11 – up, open, precharge
34	meas 11 – up, open, dark
35	meas 11 – up, open signal
36	meas 12 – up, open, precharge
37	meas 12 – up, open, dark
38	meas 12 – up, open signal
39	meas 13 – up, open, precharge
40	meas 13 – up, open, dark
41	meas 13 – up, open signal
42	meas 14 – up, open, precharge
43	meas 14 – up, open, dark
44	meas 14 – up, open signal
45	meas 15 – up, open, precharge
46	meas 15 – up, open, dark
47	meas 15 – up, open signal
48	meas 16 – up, open, precharge
49	meas 16 – up, open, dark
50	meas 16 – up, open signal

51	meas 1 – down, open, precharge
52	meas 1 – down, open, dark
53	meas 1 – down, open signal
54	meas 2 – down, close, precharge
55	meas 2 – down, close, dark
56	meas 2 – down, close, signal
57	meas 3 – down, close, precharge
58	meas 3 – down, close, dark
59	meas 3 – down, close, signal
60	meas 4 – down, close, precharge
61	meas 4 – down, close, dark
62	meas 4 – down, close, signal
63	meas 5 – down, close, precharge
64	meas 5 – down, close, dark
65	meas 5 – down, close, signal
66	meas 6 – down, close, precharge
67	meas 6 – down, close, dark
68	meas 6 – down, close, signal
69	meas 7 – down, close, precharge
70	meas 7 – down, close, dark
71	meas 7 – down, close, signal
72	meas 8 – down, close, precharge
73	meas 8 – down, close, dark
74	meas 8 – down, close, signal
75	meas 9 – down, close, precharge
76	meas 9 – down, close, dark
77	meas 9 – down, close signal
78	meas 10 – down, open, precharge
79	meas 10 – down, open, dark
80	meas 10 – down, open signal
81	meas 11 – down, open, precharge
82	meas 11 – down, open, dark
83	meas 11 – down, open signal
84	meas 12 – down, open, precharge
85	meas 12 – down, open, dark
86	meas 12 – down, open signal
87	meas 13 – down, open, precharge
88	meas 13 – down, open, dark
89	meas 13 – down, open signal

90	meas 14 – down, open, precharge
91	meas 14 – down, open, dark
92	meas 14 – down, open signal
93	meas 15 – down, open, precharge
94	meas 15 – down, open, dark
95	meas 15 – down, open signal
96	meas 16 – down, open, precharge
97	meas 16 – down, open, dark
98	meas 16 – down, open signal

where:

Name	Comments
Time	Start time of the test – Mission time in 0.1 milliseconds
meas m, open/closed, up/down, precharge	This is the precharge value for a particular test, a particular shutter test, the upward or downward looking channel and measurement m in the sequence. The 4 precharge pixels of data are averaged to produce the value placed into the telemetry data set.
meas m, open/closed, up/down, dark	This is the dark value for a particular test, a particular shutter test, the upward or downward looking channel and measurement m in the sequence. The 8 dark pixels of data are averaged to produce the value placed into the telemetry data set.
meas m, open/closed, up/down, signal	This is the signal value for a particular test, a particular shutter test, the upward or downward looking channel and measurement m in the sequence. The 132 active pixels of data are averaged to produce the value placed into the telemetry data set.

The size of the data set is 98 words.

B.6.19 Heater Test Data Set

The heater test may be performed on either or both heaters at any one time. The test of an individual heater consists of reading an associated temperature, turning on the heater, and then measuring the temperature every 15 seconds for a total of 2 minutes. If both heaters are tested the tests are performed sequentially.

This data set is used whenever a heater test is performed. This may be done either by a single test command or as part of a calibration sequence. A test of both heaters is planned as part of the health check sequence but not as part of the in–flight calibration sequence.
The heater test data set consists of the following data:

	0			3	4			7	8			11	12			15
1	Time – MSH															
2	Time – LSH															
3	number of heaters tested															
▶ 1	heater id															
▶ 2	measurement at time 0:00															
▶ 3	measurement at time 0:15															
▶ 4	measurement at time 0:30															
▶ 5	measurement at time 0:45															
▶ 6	measurement at time 1:00															
▶ 7	measurement at time 1:15															
▶ 8	measurement at time 1:30															
▶ 9	measurement at time 1:45															
▶ 10	measurement at time 2:00															

where:

Name	Comments
Time	Start time of the test – Mission time in 0.1 milliseconds
number of heaters tested	The number of heaters that were tested. May be either 1 or 2.
heater id	The id of the heater test data included The id for the focal plane heater is 1 and the id for the SH aux heater is 2.
measurement at time x:xx	The value returned from the A/D converter for the thermistor associated the the heater being tested. The time is shown in seconds relative to the start of the individual test.

The size of the data set is either 13 words for a single heater or 23 words for both heaters.

B.6.20 Cal Lamp Test Data Set

The cal lamp test may be performed on any combination of the three calibration lamps at any one time. The test of the lamps is to put them in the desired state (on or off), wait until they have had time to settle, and measure the two voltage points for each lamp.

This data set is used whenever a calibration lamp test is performed. This may be done either by a single test command or as part of a calibration sequence. A test of the calibration lamps is planned as part of the health check sequence but not as part of the in–flight calibration sequence.
The calibration lamp test data set consists of the following data:

	0			3	4			7	8			11	12			15
1	Time – MSH															
2	Time – LSH															
3	Lamp 1 state															
4	Lamp 1, Voltage 1															
5	Lamp 1, Voltage 2															
6	Lamp 2 state															
7	Lamp 2, Voltage 1															
8	Lamp 2, Voltage 2															
9	Lamp 3 state															
10	Lamp 3, Voltage 1															
11	Lamp 3, Voltage 2															

where:

Name	Comments
Time	Start time of the test – Mission time in 0.1 milliseconds
Lamp n state	The state of the nth lamp (On=1, Off=0)
Lamp n, Voltage m	The raw reading from the ADC for the specified lamp and voltage measurement point.

The size of the data set is 11 words.

B.6.21 Surface Lamp Test Data Set

The test of the surface lamp is to put it in the desired state (on or off), wait until the lamp has had time to settle, and measure the current and voltage for the lamp.

This data set is used whenever a surface lamp test is performed. This may be done either by a single test command or as part of a calibration sequence. A test of the surface lamp is planned as part of the health check sequence but not as part of the in–flight calibration sequence.
The surface lamp test data set consists of the following data:

	0			3	4			7	8			11	12			15
1	Time – MSH															
2	Time – LSH															
3	Lamp state															
4	Voltage															
5	Current															

where:

Name	Comments
Time	Start time of the test – Mission time in 0.1 milliseconds
Lamp state	The state of the lamp (On=1, Off=0)
Voltage	The raw reading from the ADC for the specified lamp voltage measurement point.
Current	The raw reading from the ADC for the specified lamp current measurement point.

The size of the data set is 5 words.

B.6.22 Sun Lamp Test Data Set

The test of the sun lamp is to cause the lamp to go on and measure the two voltage points and the response for the lamp.

This data set is used whenever a sun lamp test is performed. This may be done either by a single test command or as part of a calibration sequence. A test of the sun lamp is planned as part of the health check sequence but not as part of the in–flight calibration sequence.
The sun lamp test data set consists of the following data:

	0			3	4			7	8			11	12			15
1	Time – MSH															
2	Time – LSH															
3	Voltage 1															
4	Voltage 2															
5	Sun Sensor Response															

where:

Name	Comments
Time	Start time of the test – Mission time in 0.1 milliseconds
Voltage n	The raw reading from the ADC for the specified lamp voltage measurement point.
Sun Sensor Response	The raw reading from the ADC for the sun sensor response measurement point.

The size of the data set is 5 words.

B.6.23 Bad RAM Data Set

The Bad RAM Data Set will be generated once after a power up or restart occurs. It defines the ranges of memory addresses that failed the memory verification check. If no addresses fails the check, the data set will not be produced. If more than 50 ranges fail the check, the overflow flag will be set and the additional ranges will not be recorded.

A bad RAM data set contains the following fields:

	0							7	8							15
1	number ranges								unused							O
▶ 1	start address, MSH															
▶ 2	start address, LSH															
▶ 3	end address, MSH															
▶ 4	end address, LSH															

where:

Name	Comments
number ranges	the number of ranges in the data set
O	flag indicating if there were more entries than would fit in the data set
start address	the starting address of a bad address range
end address	the ending address of a bad address range

The size of the bad RAM data set is 1 + (number ranges * 4) words. Since there is a maximum of 50 entries possible for this data set, the data set can contain a maximum of 201 words.

B.6.24 Bad EEPROM Data Set

The Bad EEPROM Data Set will be generated once after a power up or restart occurs. It identifies which EEPROM patches failed the CRC check. If no EEPROM patches fails the check, the data set will not be produced. If more than 50 patches fail the check, the overflow flag will be set and the indexes will not be recorded.

The contents of the bad EEPROM data set are:

	0							7	8							15
1	number indexes								unused							O
▶ 1	patch index															

where:

Name	Comments
number indexes	the number of patch indexes in the data set
O	flag indicating if there were more entries than would fit in the data set
patch index	the patch index that failed the CRC check

The size of the bad EEPROM data set is 1 + (number indexes * 1) words. Since there is a maximum of 50 entries possible for this data set, the data set can contain a maximum of 51 words.

B.6.25 Memory Dump Data Set

Memory Dump Data Sets will be generated upon receipt of a valid memory dump command in the memory access mode. Each range of addresses in the command will generate at least one data set. For each range which is greater than 2**12 words, it will be divided into sections of not more than 2**12 words each and several memory dump data sets will be produced.

The format of the memory dump data set is as follows:

	0							7	8							15
1	dump start address, MSH															
2	dump start address, LSH															
3	B	dump length														
▶ 1	data word															

where:

Name	Comments
dump start address	the address of the first data word in the data set
dump length	the number of data words in the data set
B	flag indicating if addresses containing only byte information were packed together
data word	the contents of the address

The size of the memory dump data set is 3 + (dump length * 1) words. Since there is a maximum of 2**12 words possible for a memory dump section, the data set can contain a maximum 2**12 + 3 words.

B.6.26 Empty Data Set

At least 3 words are required to identify a data set and have a data value. If any words remain at the end of a packet, they will be filled with zeros. This is also used to fill partial packets if there is nothing else to send.

Appendix C – MESSAGES

A message is an indication of a change in condition of the DISR instrument or a detection of an error that needs to be reported to the ground. Each message will include a code indicating the type of message and an identification field that is specific to the type of message. Table 34 defines the message codes and the identification field that is associated with them.

Table 34 – Flight Error and Informational Messages

Code	Name	Description
0	ACK_cmd	This message is generated for every command that is determined to be valid. The parameter is the command id field from the command.
1	NAK_bad_cmd_dest	This messsage is produced if the destination field in the command does not match one of the two expected destination fields. The parameter is the command id field from the command.
2	NAK_bad_cmd_crc	This message is generated if the CRC calculated for a command doesn't match the one received with the command. The parameter is the command id field from the command.
3	NAK_bad_brdcast_crc	This message is generated if the CRC calculated for a DDB command doesn't match the one received with the command. The parameter is the command id field from the command.
4	NAK_illegal_opcode	This message is generated if the opcode field in a command does not match one of the expected opcode values. The parameter is the command id field from the command.
5	NAK_cmd_recpt_dsable	This message indicates that an Enable Command was not received before this new command was received. The parameter is the command id field from the command.
6	NAK_bad_cmd_length	This message indicates that the proper number of words were not received with a command for the type of command indicated. The parameter is the command id field from the command.
7	NAK_bad_bc_length	This message indicates that the proper number of words were not received for a DDB command. There is no parameter wiht this message.
8	NAK_bad_new_mode	This message indicates that the new mode field of a Change Mode command was not an expected value. The parameter is the command id field from the command.
9	NAK_bad_sngl_mes_typ	This message indicates that the measurement type field of a Single Measurement command was not an expected value. The parameter is the command id field from the command.
10	NAK_bad_op_mode	This message indicates that the flight software was not running in the proper mode to execute this command. The parameter is the command id field from the command.
11	NAK_bad_sngl_tst_typ	This message indicates that the test type field of a Single Measurement command was not an expected value. The parameter is the command id field from the command.

Code	Name	Description
12	NAK_prv_cmd_not_comp	This message is generated if a command was still being processed when this command was received. The parameter is the command id field from the command.
13	NAK_bad_dump_cmd	This message indicates that a Dump command was received with too many pairs of addresses requested. The parameter is the command id field from the command.
14	NAK_bad_EEPROM_cmd	This message indicates that the number of patches field of an Uplink EEPROM command does not match the number of words received for patches. The parameter is the command id field from the command.
15	bad_dump_range	Memory dump range is bad.
16	bad_EEPROM_index	This message indicates that both EEPROM indexes specified with an Uplink EEPROM command indicate that a patch is to be stored to illegal locations. The index value must be a number between 1 and 1023. The parameter is the index number that was illegal.
17	bad_EEPROM_load	This message indicates that both attempts to store a patch into EEPROM failed. All of the patch words were stored but a problem was detected reading back at least one of the words. There is no parameter with this message.
18	bad_uplink_RAM_addr	This message indicates that the address specified to store the command words is an illegal address. Addresses that are illegal to uplink to include those used by the extended memory, 8000h thru FFFFh. The parameter is the 16 least significant bits of the address.
19	tlm_space_full	This message is generated in descent mode if there is not enough space left in the telemetry queue to store the data set currently requesting to be packaged. In this case the data set is discarded without being saved in telemetry and the associated data is lost. The parameter indicates the type of data set the was discarded.
20	rebuilding_tlm_links	This message indicates that the telemetry queue links are being rewritten. This happens if a problem in the link information was found when a new telemtry packet was being stored or when an old packet was released The link field must be greater than zero or less than TBD and the field indicating which subqueue, high, low channel A or low channel B, must be as expected. This error should only happen if an SEU alters a buffer location including the link information. Note that after the queue has been rebuilt, the telemetry packets may not be received in the order they are expected so reassembling the data sets will be difficult. There is no parameter with this message.
21	data_set_dropped	This message indicates that a data set was discarded in calibration or do single mode. The data set will be discarded if the telemetry queue was full and the queue of pending telemetry requests was full. The parameter indicates the type of data set that was discarded.
22	old_pkts_deleted	TBD

Code	Name	Description
23	data_set_too_big	TBD
24	no_free_pkt_avail	This message is generated if a request to store a data set into the telemetry buffer is made but when packets were being requested to put the data into, no packet was available. The only reason for this error to occur is that an SEU has altered linkage information for the packets in the telemetry queue. If the telemetry buffer was too full to store the data set, the tlm_buffer_full message would be generated instead. If this message does occur, the next message received should be a rebuilding_tlm_queue message. Part of the current data set may be stored in the telemetry queue before the error condition is detected and the remaining data is discarded. There is no parameter with this message.
25	release_pkts_err	TBD
26	message_overflow	This message is generated if more requests to store messages are received than can be stored in an internal message queue. Messages are only stored in this queue until internal operating priorities are correct for the messages to be stored in the telemetry buffer. The message won't be generated until the other messages have been put in telemety and the internal queue is empty. There is no parameter with this message.
27	mode_change_ignored	This message is generated if a Change mode command is received before the last change mode command has been processed. In this case the old unexecuted command is ignore and the new Change Mode command is executed as expected. The parameter is an indication of the mode for the discarded command.
28	sun_pulse_too_close	TBD
29	using_sun_pulses	This message is generated when the flight software changes from using probe information to using sun sensor information for predicting azimuth.
30	sun_pulse_lost	TBD
31	third_sun_pulse_lost	TBD
32	bad_cycle_id_found	This message is generated if during descent mode, a cycle number is identified for use that is not defined in the internal scheduling tables. This error should not happen unless EEPROM uploads overwrite the orginal table values and the new values are in error. The parameter is the number of the cycle that was bad.
33	bad_cal_scen_spec	This message is generated if the Change Mode command to calibration mode contains a scenario number that does not have a sequence defined for it. Legal scenario number are 1 thru 8 but only scenarios 1 and 2 are defined by flight software. The parameter is the number of the scenario requested.

Code	Name	Description
34	bad_cal_scen_entry	This message is generated during calibraion mode if there is a problem in the cycle definition for a cycle. This error should not happen unless EEPROM uploads overwrite the orginal table values and the new values are in error. The parameter is the number of the cycle that was bad.
35	bad_CCD_set_num	This message is generated in descent mode if the CCD measurement set number for a cycle indicates a set that is not defined. This error should not happen unless EEPROM uploads overwrite the orginal table values and the new values are in error. The parameter is the number of the measuarment set that was bad.
36	bad_cal_CCD_entry	This message is generated during descent mode if there is a problem in the CCD measurment set definition for a cycle. This error should not happen unless EEPROM uploads overwrite the orginal table values and the new values are in error. The parameter is the number of the measurement set that was bad.
37	bad_IR_set_num	This message is generated in descent mode if the IR measurement set number for a cycle indicates a set that is not defined. This error should not happen unless EEPROM uploads overwrite the orginal table values and the new values are in error. The parameter is the number of the measuarment set that was bad.
38	bad_cal_IR_entry	This message is generated during descent mode if there is a problem in the IR measurment set definition for a cycle. This error should not happen unless EEPROM uploads overwrite the orginal table values and the new values are in error. The parameter is the number of the measurement set that was bad.
39	bad_violet_set_num	This message is generated in descent mode if the violet measurement set number for a cycle indicates a set that is not defined. This error should not happen unless EEPROM uploads overwrite the orginal table values and the new values are in error. The parameter is the number of the measuarment set that was bad.
40	bad_cal_violet_entry	This message is generated during descent mode if there is a problem in the violet measurment set definition for a cycle. This error should not happen unless EEPROM uploads overwrite the orginal table values and the new values are in error. The parameter is the number of the measurement set that was bad.
41	CCD_meas_not_done	This message is generated if the maximum cycle time is reached but not all CCD measurements were performed during the cycle. The parameter indicates how many CCD measurements were left to be performed.
42	violet_meas_not_done	This message is generated if the maximum cycle time is reached but not all violet measurements were performed during the cycle. The parameter indicates how many violet measurements were left to be performed.
43	measurement_dropped	TBD

Code	Name	Description
44	IR_coll_ID_not_found	TBD
45	new_time_correction	This message indicates that the clock has determined that the master timer and the mission timer have drifted and that a new time correction is needed. The parameter is used to indicate the reason for the correction. A 1 indicates that the mission time (from DDB) looked OK but that the master timer did not. A 2 indicates that the master timer appeared correct but that the mission time did not. A 3 indicates that both appeared incorrect. This usually happens for the first DDB received. Finally a 0 indicates that both appear correct but that cumulative drift has caused a new correction to be needed.
46	swtch_probe_cmd_side	This message indicates that the software is switching sides in using the telecommand channels. The switch occurs for two possible reasons. First, a switch will be made if the current channels appears to be sending incorrect data (bad first word of the messages for at least 15 seconds). The second reason for a switch is that the processor valid flag has changed state. In this case the software will always switch to the side indicated by the new processor valid flag. In this case the message is sent even if the side is the same as the current side. So if processor valid indicates the use of side A, but the software has not gotten data for side A and switched to side B, and then the processor valid switched to side B, a message will still indicate switching to side B even though it was already using side B. The parameter indicates the new channel in use (1 for side A, 2 for side B).
47	input_buf_not_rel	This message means that one of the command buffers has not been released when it is needed again. The software maintains two input command buffers that it useses in an alternating manner. This message is an indication that the software is not processing the data quickly enough and that it is possible for a command to be lost.
48	TM_channel_down	This message indicates that three successive tries to send a telemetry packet all resulted in failures. The software continues to attempt to send the packet and if it succeeds a TM_channel_up message will be sent. The parameter indicates which telemetry channel (0 for channel A, 1 for channel B).
49	TM_channel_up	This message indicates that a previously down telemetry channel is now believed to be working. The parameter indicates which telemetry channel (0 for channel A, 1 for channel B).
50	Mux_Channel_Failure	This is an informational message that a read from the Mux returned a bad stats. The channel number in question is placed into the ID field. Continued failures will not produce any more error messages but a good read will be indicated by the Mux_Channel_OK message.
51	Mux_Channel_OK	This is an informational message that a previously bad Mux channel now appears to be working. The parameter is the channel ID.

Code	Name	Description
52	DCS_not_ready	This message indicates that the DCS never returned a ready status. The software tries to wait for a ready status for up to 5 seconds when DCS access is needed. If does not get a ready in this time it produces this message and resets the DCS hardware.
53	DCS_failure	This message is indicates that the DCS compression failed. The software tries to wait for twice the standard delay before indicating a failure of this type. A reset of the DCS is attemped after this condition is detected.
54	SunSensor_locked	This message is placed into telemetry whenever the software determines that the sun sensor has locked onto sun pulses.
55	SunSensor_sig_lost	This message indicates that the sun sensor had previously obtained a lock on the sun pulses but has lost it. The parameter indicates the reason that the pulse was rejected. This is summarized as follows: 21 – 2nd pulse of triplet – width of 1st and 2nd pulses were too different 22 – 2nd pulse of triplet – ratio of gap time to pulse widths was too small 23 – 2nd pulse of triplet – ratio of rotation period to gap time too small 24 – 2nd pulse of triplet – pulse amplitude is too small 31 – 3rd pulse of triplet – width of 2nd and 3rd pulses were too different. 32 – 3rd pulse of triplet – width of 1st and 2nd pulses were too different. 33 – 3rd pulse of triplet – gap between 1–2 and gap between 2–3 were too different. 34 – 3rd pulse of triplet – ratio of gap time to pulse widths is too small 35 – 3rd pulse of triplet – ratio of rotation period to gap time is too small 36 – 3rd pulse of triplet – pulse amplitude is too small 99 – No valid triplet received within time limit
56	bad_RAM_copy	If this message is output it means that the copy from PROM to RAM detected errors. Each word is copied, verified, and recopied if found to be in error. However, if there is still an error this message is produced.
57	no_bc_mess_recd	This message appears near the beginning of DISR operations if no broadcast message is received for the standard timeout period (30 seconds).
58	timer_test_result	This message signifies the results of the timer test that is performed as part of the initialization of the instrument. The expected range is between TBD and TBD.

Code	Name	Description
59	unexpected_BP	This occurs if the broadcast pulses are not received with the expected frequency. They should be received once each 125 milliseconds. If they are not received at this frequence (+/– 0.1 millisecond) the error message is generated. The parameter is the actual difference in times between the last broadcast pulse and this broadcast pulse (in 0.1 millisecond units). Only the first 100 such errors are reported.
60	ML_int_stuck_on	This occurs when the software detects that the ML interrupt is stuck on. The software then disables that interrupt level so it will never occur again. This is a very serious error in that no commands or DDB messages can be received after this occurs.
61	BP_int_stuck_on	This occurs when the software detects that the BP interrupt is stuck on. The software then disables that interrupt level so it will never occur again. This is a very serious error in that no commands or DDB messages can be received after this occurs.
62	SS_int_stuck_on	This occurs when the software detects that the SS interrupt is stuck on. The software then disables that interrupt level so it will never occur again. This is a fairly serious error in that no subsequent sun sensor data will be received.
63	ET_int_stuck_on	This occurs when the software detects that the ET interrupt is stuck on. The software then disables that interrupt level so it will never occur again. This is a fatal error in that the system will not function without this interrupt.
64	TMA_int_stuck_on	This occurs when the software detects that the TMA interrupt is stuck on. The software then disables that interrupt level so it will never occur again. This is a fairly serious error in that it effectively disables that telemetry channel.
65	TMB_int_stuck_on	This occurs when the software detects that the TMB interrupt is stuck on. The software then disables that interrupt level so it will never occur again. This is a fairly serious error in that it effectively disables that telemetry channel.
66	ET_int_missed	This error occurs if the event timer misses an interrupt. The flight code has background loop checking for this condition. When it occurs it causes the same processing that would normally occur when the timer interrupt occurs. However, this may not occur until well after the interrupt should have occurred.
67	IR_Cmd_Buf_Overflow	The requested IR command required more than the allowable total commands to generate. The command sequence will definitely be in error.
68	DMA_controller_reset	Both DMA controlled TM devices are reporting error conditions. It is likely that the DMA controller has hung up. A reset of the controller is being tried to get them working again.
69	Bad_flat_field_addr	For an Upload EEPROM commands with the patch type = 1, the address sent was not within the flat field area.