PACE OCI Level-1A Data Product User's Guide

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I. Overview

This document describes the structure and contents of the PACE Ocean Color Instrument (OCI) Level-1A (L1A) data products generated by the Science Data Segment. All products generated by the SDS use the Network Common Data Format 4 (NetCDF4), which is self-describing and machine-independent. This includes a description of how the data structures (e.g., dimensions) are derived, the source of each data object in the product, and explanations of the data where needed. References to other documentation are included where relevant.

II. Organization

The document organization follows that of the L1A data product. Specifically, it contains the following sections:

- Dimensions
- Global attributes
- Scan line attributes
- Spatial/spectral modes
- Engineering data
- Navigation data
- Onboard calibration data
- Science data

III. Product Description

a. Dimensions

The NetCDF format includes named dimensions for all dimensioned data objects. The data object dimensions for the L1A products include values derived from the granule period or OCI configuration, fixed values based on data characteristics, and fixed values based on standard conventions. More details of how these are determined are provided in the descriptions of the data objects that use the dimensions.

The following dimensions depend on the granule period.

number_of_scans: number of OCI science data scans, i.e., spins of the rotating telescope assembly, in the product at the scan rate of ~5.7 Hz.

number_of_mce_scans: number of mechanism control electronics (MCE) telemetry packets at the 5.7 Hz spin rate

number_of_sca_scans: number of solar calibrator assembly (SCA) telemetry packets at a 5 Hz sample rate.

tlm_packets: number of OCI housekeeping telemetry samples at 1 Hz.

att_records: number of spacecraft attitude samples at 10 Hz, including 10 seconds of padding at each end for interpolation.

orb_records: number of spacecraft orbit samples at 1 Hz, including 10 seconds of padding at each end for interpolation.

tilt_samples: number of tilt subsystem samples at 1 Hz.

The following dimensions are calculated for each granule based on the OCI configuration.

ccd_pixels: determined by the number of active data collection zones, the number of lines and spatial aggregation for each zone.

SWIR_pixels: determined by the number of active data collection zones and the number of lines for each zone; the effective aggregation for the SWIR bands is always 8.

DC_pixels: determined by the number of dark collect zones, the number of lines and spatial aggregation for each zone.

blue_bands: determined by the enable flag and spectral aggregation for each blue CCD tap.

red_bands: determined by the enable flag and spectral aggregation for each blue CCD tap.

The following dimensions are fixed by the OCI design.

SWIR_bands: 9; number of short-wave infrared (SWIR) channels.

number_of_taps: 16; number of readout taps per CCD array.

spatial_zones: 10; number of spatial zone rows in mode table.

encoder_samples: 200; maximum number of RTA and half-angle mirror (HAM) encoder samples per scan in the mechanism control electronics (MCE) stripchart packet (APID 712).

encoder_channels: 4; number of channels of encoder data.

The following dimensions are based on the characteristics of the OCI housekeeping telemetry (HKT) packets.

MCE_block: 480; size of MCE raw telemetry (APID 711) in bytes.

sidecar_tlm: 76; size of the System for Image Digitization, Enhancement Control and Retrieval (SIDECAR) raw telemetry (APID 721) in bytes.

DAU_tlm: 620; size of the data acquisition unit (DAU) raw telemetry (APID 723) in bytes.

DDC_tlm: 524; size of the DAU digital controller (DDC) raw telemetry (APID 701) in bytes.

TC_tlm: 1216; size of the temperature controller (TC) raw telemetry (APID 656) in bytes.

ICDU_MCE_temp_tlm: 76; size of the ICDU/MCE temperature (TC) raw telemetry (APID 745) in bytes.

ancil_tlm: 6; size of the ancillary telemetry and error status field in the ancillary packet (APID 636) in bytes.

ADC_lat: 4; dimension of the ADC latency field in the DDC telemetry.

ICDU_therm: 74; number of converted thermistor readings in the TC telemetry.

DAUC_temps: 69; number of temperature fields in the FSW DAUC telemetry.

ICDU_MCE_temps: 16; number of temperature fields in the FSW ICDU/MCE telemetry.

lin_skips: 33; number of line skip values used for the OCI linearity mode, from the DDC table (APID 703) packet.

The following dimensions are defined by standard conventions.

quaternion_elements: 4

vector_elements: 3

b. Global attributes

Each L1A data product contains global metadata fields stored as NetCDF attributes. The specific metadata fields and attribute names follow conventions that are common to all data products generated by the SDS and its parent organization, the Ocean Biology Processing Group (OBPG). Most of the attributes have static values for all L1A products; only those with dynamically set values are listed here. All of these attributes are stored as character strings.

product_name: name of the product file, following the convention PACE_OCI[_fffffffff][_mmmm].yyyymmddThhmmss.L1A.nc, where fffffffff is the concatenated year, day and sequence number from the input FEDS file during prelaunch testing, mmmm is the instrument mode (other than Earth collect) and yyyymmddThhmmss is a date/time string representing the file UTC start time.

history: string containing all of the processing information used to generate the product, including the names of input and parameter files and command line parameters.

time_coverage_start: UTC date/time of the **scan_start_time** from the first scan in the form yyyy-mm-ddThh:mm:ss.sssZ.

time_coverage_end: UTC date/time of the **scan_start_time** from the last scan.

date_created: file creation date/time.

startDirection: orbit direction (Ascending or Descending) at the start of the file.

endDirection: orbit direction at the end of the file.

data_collect_mode: OCI data collection mode; valid values are “Earth Collect”, “Dark Collect”, “Solar Cal Daily”, “Solar Cal Monthly”, “Response Curve”, “Lunar Cal”, “Diagnostic”, “Snapshot (trigger)”, “Snapshot (duration)”, “Static”, and “Earth Spectrum”; see description of data types in Section d.

SWIR_data_mode: SWIR band data collection mode; valid values are “Science”, “Diagnostic”, “Single-image raw”, and “Test pattern”.

CDS_mode: correlated double-sampling mode; valid values are "CDS", “Reset” and “Video.

c. Scan line attributes

All of the data objects in the L1A product are organized by groups, to provide a logical separation of data types and sources. The **scan_line_attributes** group contains fields that are common for all of the data from a scan, i.e., a single spin of the RTA.

scan_start_time(number_of_scans): the time (in seconds of the UTC day) of the pulse-per-revolution (PPR) for a scan. The PPR is a signal issued by the OCI electronics that represents the start of each scan, and also corresponds to a fixed scan angle. It is determined using the **scan_start_CCSDS_sec** and **scan_start_CCSDS_usec** fields extracted from the ancillary packet.

scan_start_CCSDS_sec(number_of_scans): raw CCSDS time field from the ancillary packet, in integer seconds since the CCSDS epoch of 00:00 UTC on January 1, 1958. This field includes leapseconds accumulated since the epoch.

scan_start_CCSDS_usec(number_of_scans): raw CCSDS time field from the ancillary packet, representing the fractional-second part of the time in microseconds.

spin_ID(number_of_scans): scan counter since the last OCI power-on cycle. The spin_ID is used to relate OCI data from various sources to a single scan period. This field is read from the ancillary and science data packets and used within the software to identify all of the science packets for a scan.

HAM_side(number_of_scans): HAM side from the MCE telemetry packet; alternates 0 and 1 on successive scans.

pseq_flag(number_of_scans): Flag indicating science packets out of order for a scan; determined by the software.

line_flag(number_of_scans): Flag indicating CCD line number errors in the science data; determined by the software.

d. Spatial/spectral modes

The spatial_spectral_modes group contains the parameters that define the spatial and spectral configuration of the instrument. Various instrument configurations are stored as predefined mode tables that are loaded by command. Except where noted, all of these fields are read from the ancillary packet. Each L1A product contains data for a single instrument configuration, so only one set of values is stored representing all of the scans in a product. The instrument mode table is described in reference 1 section 8.5, and the ancillary packet in reference 3.

spatial_zone_data_type(spatial_zones): Data collection type for each data zone. The range of values is 0 to 12. A value of 0 represents a no-data zone, representing a part of the scan where no data are collected; there are normally no-data zones at the start of the scan and between data collection zones within a scan. The remaining types (1 – 12) are: earth, dark_cal, solar_daily, solar_monthly, response_curve, lunar, diagnostic, static, earth_spectrum, no_processing, external_snapshop_trigger, and internal_snapshop_trigger.

spatial_aggregation(spatial_zones): Spatial aggregation used for each data zone, representing the number of CCD spatial samples (also called lines) aggregated into each science pixel. Valid values are 0 (no data), 1, 2, 4 and 8. The native spatial resolution is ~125m at nadir; a value of 8 results in a pixel size of ~1 km at nadir.

spatial_zone_lines(spatial_zones): number of CCD spatial samples (lines) in each data zone. The actual number of values generated for the zone is that value divided by the associated spatial aggregation. There are ~32400 lines total per scan.

blue_spectral_mode(number_of_taps): spectral aggregation for each data readout tap on the blue (UVVis) focal plane. There are 16 taps, and each tap can be set independently. Valid values are 0 (tap disabled), 1, 2, 4 and 8. The native spectral resolution of the CCDs is 0.625nm; the spectral resolution output for each tap is the product of that value and the aggregation factor.

red_spectral_mode(number_of_taps): spectral aggregation for each data readout tap on the red (VisNIR) focal plane; same description as above.

aux_param_table(lin_skips): Auxiliary parameter table containing linearity mode line skip values from the DDC table packet (APID 703). These values indicate the number of successive pixels that are integrated in the instrument linearity mode. The use of the auxiliary parameter table in the linearity mode is described in reference 1, section 8.10.

e. Engineering data

The engineering_data group contains data from selected OCI and spacecraft HKT packets that are used for downstream processing (e.g., geolocation and calibration). All of the HKT packets listed are sampled at 1 Hz except for the MCE packets that are sampled at the instrument scan rate (~5.73 Hz). The data objects include both raw and extracted/converted data, as well as time stamps and spin IDs where available; all time stamps are in seconds of the UTC day. This group is expected to grow as additional data needs are identified. The table of all temperature fields is in Appendix A. The spacecraft HKT data objects are currently TBA.

DAU_telemetry(tlm_packets, DAU_tlm): raw telemetry from the DAU HKT packets (APID 723); see reference 2 for details.

DAU_tlm_time(tlm_packets): time stamps from the DAU HKT packets.

DAU_spin_ID(tlm_packets): spin ID from the DAU HKT packets.

DDC_telemetry(tlm_packets, DDC_tlm): raw telemetry from the DDC HKT packets (APID 701); see reference 1 for details.

DDC_tlm_time(tlm_packets): time stamps from the DDC HKT packets.

TC_telemetry(tlm_packets, TC_tlm): raw telemetry from the TC packets (APID 656); see reference 5 for details.

TC_tlm_time(tlm_packets): time stamps from the TC packets.

DAUC_temp_time(tlm_packets): time stamps from the DAUC temperature HKT packets (APID 744).

ICDU_MCE_temp tlm(tlm_packets, ICDU_MCE_temp_tlm): raw telemetry from the ICDU/MCE temperature HKT packets (APID 745).

ICDU_MCE_temp_time(tlm_packets): time stamps from the ICDU/MCE temperature HKT packets.

MCE_telemetry(number_of_scans, MCE_block): raw telemetry from the MCE HKT packets (APID 711); see reference 4 for details.

MCE_spin_ID(number_of_scans): spin ID from the MCE HKT packets. Note that the MCE packets are generated one spin behind the science and ancillary packets, so the first MCE spin ID will normally be one less than the first value in the **scan_line_attributes** group.

MCE_encoder_data(number_of_scans, encoder_samples, encoder_channels): RTA and HAM encoder (stripchart) data from the MCE encoder packets (APID 712). In the **encoder_channel** dimension, index 0 is the HAM error and 1 is the RTA error.

encoder_spin_ID(number_of_scans): spin ID from the MCE encoder packets.

ancillary_tlm(number_of_scans, ancil_tlm): aw status flag and error count telemetry from the ancillary packets (APID 636); see reference 3 for details.

agg_control(number_of_scans): aggregation control fields from the ancillary packets; see reference 3 for details.

blue_agg_error(number_of_scans): blue band aggregation error flags from the ancillary packets; see reference 3 for details.

red_agg_error(number_of_scans): red band aggregation error flags from the ancillary packets; see reference 3 for details.

dig_card_error(number_of_scans): digital card error status flags from the ancillary packets; see reference 3 for details.

CDS_disable(tlm_packets): correlated double-sampling (CDS) enable/disable flag from the DDC HKT packets; 0 = CDS enabled.

ADC_latency(tlm_packets, ADC_lat): ADC latency from the DDC HKT packets (used in conjunction with **CDS_disable**).

DAUC_temperatures(tlm_packets, DAUC_temps): Converted temperature data extracted from the FSW DAUC temperature packets; see Appendix A for details; the time stamp field is **DAUC_temp_time.**

ICDU_MCE_temperatures(tlm_packets, ICDU_MCE_temps): Converted temperature data extracted from the FSW ICDU MCE temperature packets; see Appendix A for details; the time stamp field is **ICDU_MCE_temp_time.**

ICDU_thermisters(tlm_packets, ICDU_therm): Converted ICDU thermistor data from the FSW TC packets; see Appendix A for details; the time stamp field is **TC_tlm_time.**

blue_channel_mask(number_of_taps): bit-mapped field indicating any blue CCD columns that have been excluded from the spectral aggregation; see reference 1 for details.

red_channel_mask(number_of_taps): bit-mapped field indicating any red CCD columns that have been excluded from the spectral aggregation; see reference 1 for details.

f. Navigation data

The **navigation_data** group contains spacecraft attitude, orbit and tilt data from the spacecraft HKT packets. These are required for the geolocation processing performed as part of the Level-1B product generation. The orbit and attitude data are extracted from the guidance and control (GNC) telemetry and the tilt data from the spacecraft MCE telemetry.

att_time(att_records): time stamps for the spacecraft attitude data (**att_quat** and **att_rate**).

att_quat(att_records, quaternion_elements): spacecraft attitude quaternions representing the J2000-to-spacecraft coordinate transformation, at the GNC packet rate of 1 Hz.

att_rate(att_records, vector_elements): spacecraft attitude rates in the spacecraft reference frame, at the GNC packet rate of 1 Hz.

orb_time(orb_records): time stamps for the spacecraft orbit data (**orb_pos** and **orb_vel**).

orb_pos(orb_records, vector_elements): orbit position vectors in the Earth-centered rotating (ECR) reference frame, at the GNC packet rate of 0.25 Hz.

orb_vel(orb_records, vector_elements): orbit velocity vectors in the Earth-centered rotating (ECR) reference frame, at the GNC packet rate of 0.25 Hz.

tilt_time(tilt_samples): time stamps for the spacecraft MCE telemetry including the tilt angles.

tilt(tilt_samples): OCI tilt angles computed from the spacecraft MCE telemetry, at the packet rate of 1 Hz.

g. Onboard calibration data

The **onboard_calibration_data** group contains the dark collect (DC) data from the blue, red and SWIR bands. Note that the current version of the OCI L1A software also includes these data in the science data fields. The packet format for the blue and red bands (APID 700) is described in reference 1, section 5.2, and that for the SWIR bands (APID 720) in reference 2, Appendix B. The blue and red bands are stored in the packets in descending wavelength order; the L1A processing reverses this order to ascending.

DC_blue(number_of_scans, blue_bands, DC_pixels): DC data for blue bands.

DC_red(number_of_scans, red_bands, DC_pixels): DC data for red bands.

DC_SWIR(number_of_scans, SWIR_bands, DC_pixels): DC data for SWIR bands.

DC_blue_qual(number_of_scans, DC_pixels): not currently implemented.

DC_red_qual(number_of_scans, DC_pixels): not currently implemented.

DC_SWIR_qual(number_of_scans, DC_pixels): not currently implemented.

frm_type_DC_SWIR(number_of_scans, DC_pixels): SWIR band DC frame type for non-science modes; extracted from SWIR science packets; the SWIR band data mode is stored as a global attribute. The non-science modes and frame types are described in reference 6, section 3.2.3.

h. Science data

The **science_data** group contains the science data from the blue, red and SWIR bands. The current version of the L1A software stores the data from all collects in these fields, including the dark collect. The packet format for the blue and red bands (APID 700) is described in reference 1, section 5.2, and that for the SWIR bands (APID 720) in reference 2, Appendix B. The blue and red bands are stored in the packets in descending wavelength order; the L1A processing reverses this order to ascending.

The SWIR data are also re-ordered in ascending wavelength order; the order of the dual gain bands is Standard Gain / High Gain as shown in Table 1. The band order in the packets is shown in reference 8. In addition, the SWIR bands are pixel-shifted to co-register them with the blue and red band data. This is needed because the SWIR band detectors are distributed along-scan as shown in reference 8. The required shift for each band is shown in Table 1; because of this, that number of data object locations for each band contain fill values in the L1A products, with positive values indicating the start of the scan and negative values the end.

sci_blue(number_of_scans, blue_bands, ccd_pixels): science data for blue bands.

sci_red(number_of_scans, red_bands, ccd_pixels): science data for red bands.

sci_SWIR(number_of_scans, SWIR_bands, SWIR_pixels): science data for SWIR bands.

frm_type_SWIR(number_of_scans, SWIR_pixels): SWIR band frame type for non-science modes; extracted from SWIR science packets; the SWIR band data mode is stored as a global attribute. The non-science modes and frame types are described in reference 6, section 3.2.3.

Table 1. SWIR band pixel shifts

Band	Shift
940 nm	-1
1038 nm	11
1250 nm SG	9
1250 nm HG	1
1378 nm	-1
1615 nm SG	9
1615 nm HG	1
2130 nm	11
2260 nm	13

REFERENCES

1. DAU DDC FPGA Specification, OCI-ELEC-SPEC-0009
2. OCI Digital Acquisition Unit Controller (DAUC) FPGA Specification, OCI-ELEC-SPEC-0028
3. OCI Ancillary Packet Definition, OCI-INST-DESC-0063
4. OCI MCE FPGA Specification, OCI-MECH-SPEC-0050
5. OCI Thermal Hardware Specification, OCI-THRM-SPEC-0108
6. OCI SWIR SIDECAR Module (SSM) Hardware-Software ICD, OCI-ELEC-ICD-0023
7. OCI Flight Temperature Sensor Summary, OCI-SYS-DESC-0195
8. SDA Channel to CCD Position Mapping, OCI-SYS-DESC-0205

APPENDIX A – OCI Temperature Fields

The table below lists all of the temperature fields stored in the L1A files. The element and thermal mnemonic fields are from Reference 7.

L1A field name	Index	Element	Thermal mnemonic
DAUC_temperatures	0	VISNIR FEE Temp Sensor at Clock Driver, Bottom Side of PWA	oci.ptlm.Therm.Temp.VisnirClockDriver
DAUC_temperatures	1	VISNIR FEE Temp Sensor at ADC (Channel 9-16) Bottom Side of PWA	oci.ptlm.Therm.Temp.VisnirAdcHighChannels
DAUC_temperatures	2	VISNIR FEE Temp Sensor at ADC (Channel 1-8), Bottom Side of PWA	oci.ptlm.Therm.Temp.VisnirAdcLowChannels
DAUC_temperatures	3	VISNIR FEE Temp Sensor at PreAmp Right and Bottom Side of PWA	oci.ptlm.Therm.Temp.VisnirPreampRightBottom
DAUC_temperatures	4	VISNIR FEE Temp Sensor at PreAmp Top and Left Side of PWA	oci.ptlm.Therm.Temp.VisnirPreampLeftTop
DAUC_temperatures	5	VISNIR FEE Temp Sensor at CCD Right Side	oci.ptlm.Therm.Temp.VisnirCcdRight
DAUC_temperatures	6	VISNIR FEE Temp Sensor at CCD Left Side	oci.ptlm.Therm.Temp.VisnirCcdLeft
DAUC_temperatures	7	UVVIS FEE Temp Sensor at Clock Driver, Bottom Side of PWA	oci.ptlm.Therm.Temp.UvvisClockDriver
DAUC_temperatures	8	UVVIS FEE Temp Sensor at ADC (Channel 9-16) Bottom Side of PWA	oci.ptlm.Therm.Temp.UvvisAdcHighChannels
DAUC_temperatures	9	UVVIS FEE Temp Sensor at ADC (Channel 1-8), Bottom Side of PWA	oci.ptlm.Therm.Temp.UvvisAdcLowChannels
DAUC_temperatures	10	UVVIS FEE Temp Sensor at PreAmp Right and Bottom Side of PWA	oci.ptlm.Therm.Temp.UvvisPreampRightBottom
DAUC_temperatures	11	UVVIS FEE Temp Sensor at PreAmp Top and Left Side of PWA	oci.ptlm.Therm.Temp.UvvisPreampLeftTop
DAUC_temperatures	12	UVVIS FEE Temp Sensor at CCD Right Side	oci.ptlm.Therm.Temp.UvvisCcdRight
DAUC_temperatures	13	UVVIS FEE Temp Sensor at CCD Left Side	oci.ptlm.Therm.Temp.UvvisCcdLeft

DAUC_temperatures	14	SDS_DET_TEMP1 (SdsDetectorTemp1)	oci.ptlm.Therm.Temp.SdsAssembly1
DAUC_temperatures	15	SDS_DET_TEMP2 (SdsDetectorTemp2)	oci.ptlm.Therm.Temp.SdsAssembly2
DAUC_temperatures	16	SDS_DET_TEMP3 (SdsDetectorTemp3)	oci.ptlm.Therm.Temp.SdsAssembly3
DAUC_temperatures	17	SDS_DET_TEMP4 (SdsDetectorTemp4)	oci.ptlm.Therm.Temp.SdsAssembly4
DAUC_temperatures	18	SDS_DET_TEMP5 (SdsDetectorTemp5)	oci.ptlm.Therm.Temp.SdsAssembly5
DAUC_temperatures	19	SDS_DET_TEMP6 (SdsDetectorTemp6)	oci.ptlm.Therm.Temp.SdsAssembly6
DAUC_temperatures	20	SDS_DET_TEMP7 (SdsDetectorTemp7)	oci.ptlm.Therm.Temp.SdsAssembly7
DAUC_temperatures	21	SDS_DET_TEMP8 (SdsDetectorTemp8)	oci.ptlm.Therm.Temp.SdsAssembly8
DAUC_temperatures	22	SDS_DET_TEMP9 (SdsDetectorTemp9)	oci.ptlm.Therm.Temp.SdsAssembly9
DAUC_temperatures	23	SDS_DET_TEMP10 (SdsDetectorTemp10)	oci.ptlm.Therm.Temp.SdsAssembly10
DAUC_temperatures	24	SDS_DET_TEMP11 (SdsDetectorTemp11)	oci.ptlm.Therm.Temp.SdsAssembly11
DAUC_temperatures	25	SDS_DET_TEMP12 (SdsDetectorTemp12)	oci.ptlm.Therm.Temp.SdsAssembly12
DAUC_temperatures	26	SDS_DET_TEMP13 (SdsDetectorTemp13)	oci.ptlm.Therm.Temp.SdsAssembly13
DAUC_temperatures	27	SDS_DET_TEMP14 (SdsDetectorTemp14)	oci.ptlm.Therm.Temp.SdsAssembly14
DAUC_temperatures	28	SDS_DET_TEMP15 (SdsDetectorTemp15)	oci.ptlm.Therm.Temp.SdsAssembly15
DAUC_temperatures	29	SDS_DET_TEMP16 (SdsDetectorTemp16)	oci.ptlm.Therm.Temp.SdsAssembly16
DAUC_temperatures	30	AOB_TEMP1_S (AobTemp1)	oci.ptlm.Therm.Temp.AobNearSds1
DAUC_temperatures	31	AOB_TEMP2_S (AobTemp2)	oci.ptlm.Therm.Temp.AobNearSds4
DAUC_temperatures	32	AOB_TEMP3_S (AobTemp3)	oci.ptlm.Therm.Temp.AobNearSds6and7
DAUC_temperatures	33	AOB_TEMP4_S (AobTemp4)	oci.ptlm.Therm.Temp.AobNearSds6and10
DAUC_temperatures	34	AOB_TEMP5_S (AobTemp5)	oci.ptlm.Therm.Temp.AobSds10QMeterHot
DAUC_temperatures	35	AOB_TEMP6_S (AobTemp6)	oci.ptlm.Therm.Temp.AobSds10QMeterCold
DAUC_temperatures	36	AOB_TEMP7_S (AobTemp7)	oci.ptlm.Therm.Temp.AobNearSds9
DAUC_temperatures	37	AOB_TEMP8_S (AobTemp8)	oci.ptlm.Therm.Temp.AobNearSds12
DAUC_temperatures	38	AOB_TEMP9_S (AobTemp9)	oci.ptlm.Therm.Temp.AobBottom

DAUC_temperatures	39	SSM_TEMP_CAL_LOW (TempCalLow)	oci.ptlm.Therm.Temp.SdaCal1350Ohm
DAUC_temperatures	40	SSM_TEMP_CAL_MID (TempCalMid)	oci.ptlm.Therm.Temp.SdaCal1470Ohm
DAUC_temperatures	41	SSM_TEMP_CAL_HIGH (TempCalHigh)	oci.ptlm.Therm.Temp.SdaCal1682Ohm
DAUC_temperatures	42	SSM_TEMP_CAL_0C (TempCal0C)	oci.ptlm.Therm.Temp.SdaCal2kOhm
DAUC_temperatures	43	SSM_THRM1_MUX (SsmThrm1Mux)	oci.ptlm.Therm.Temp.SsmMux1
DAUC_temperatures	44	SSM_THRM2_MUX (SsmThrm2Mux)	oci.ptlm.Therm.Temp.SsmMux2
DAUC_temperatures	45	DDC Temp 1 (DdcTemp1_Temp)	oci.ptlm.Therm.Temp.Ddc136MhzOscillator
DAUC_temperatures	46	DDC Temp 2 (DdcTemp2_Temp)	oci.ptlm.Therm.Temp.DdcBoardCenter
DAUC_temperatures	47	DDC FPGA (DdcFpga_Temp)	oci.ptlm.Therm.Temp.DdcFpga
DAUC_temperatures	48	DAUC Board Temperature (DauccBoardTemp)	oci.ptlm.Therm.Temp.DaucBoardCenter
DAUC_temperatures	49	RED CBGM Card Board Temperature 1 (Red_BdTemp1)	oci.ptlm.Therm.Temp.VisnirCbgmTopMid
DAUC_temperatures	50	RED CBGM Card Board Temperature 2 (Red_BdTemp2)	oci.ptlm.Therm.Temp.VisnirCbgmCenter
DAUC_temperatures	51	RED CBGM Card Board Temperature 3 (Red_BdTemp3)	oci.ptlm.Therm.Temp.VisnirCbgmBottomMid
DAUC_temperatures	52	RED CBGM Card Board Temperature 4 (Red_BdTemp4)	oci.ptlm.Therm.Temp.VisnirCbgmBottomOutput
DAUC_temperatures	53	BLUE CBGM Card Board Temperature 1 (Blue_BdTemp1)	oci.ptlm.Therm.Temp.UvvisCbgmTopMid
DAUC_temperatures	54	BLUE CBGM Card Board Temperature 2 (Blue_BdTemp2)	oci.ptlm.Therm.Temp.UvvisCbgmCenter
DAUC_temperatures	55	BLUE CBGM Card Board Temperature 3 (Blue_BdTemp3)	oci.ptlm.Therm.Temp.UvvisCbgmBottomMid
DAUC_temperatures	56	BLUE CBGM Card Board Temperature 4 (Blue_BdTemp4)	oci.ptlm.Therm.Temp.UvvisCbgmBottomOutput
DAUC_temperatures	57	DAUC DDSA P3P3_Temp (DsaAnalogChannel_9)	oci.ptlm.Therm.Temp.DdsaRegulationMosfet
DAUC_temperatures	58	DAUC DDSA Ddsa_FW_Temp (DsaAnalogChannel_10)	oci.ptlm.Therm.Temp.DdsaFreeWheelingMosfet
DAUC_temperatures	59	DAUC DDSA Ddsa_PN12P0_Temp (DsaAnalogChannel_11)	oci.ptlm.Therm.Temp.DdsaPri12VMosfet
DAUC_temperatures	60	RED BDSA RedBdsa_P3P3_Temp (RedDsa_Analog_Channel_9)	oci.ptlm.Therm.Temp.VisnirBdsaRegulationMosfet
DAUC_temperatures	62	RED BDSA RedBdsa_FW_Temp (RedDsa_Analog_Channel_10)	oci.ptlm.Therm.Temp.VisnirBdsaFreeWheelingMosfet
DAUC_temperatures	62	RED BDSA RedBdsa_PN12P0_Temp (RedDsa_Analog_Channel_11)	oci.ptlm.Therm.Temp.VisnirBdsaPri12VMosfet

DAUC_temperatures	63	BLUE BDSA BlueBdsa_P3P3_Temp (BlueDsa_Analog_Channel_9)	oci.ptlm.Therm.Temp.UvvisBdsaRegulationMosfet
DAUC_temperatures	64	BLUE BDSA BlueBdsa_FW_Temp (BlueDsa_Analog_Channel_10)	oci.ptlm.Therm.Temp.UvvisBdsaFreeWheelingMosfet
DAUC_temperatures	65	BLUE BDSA BlueBdsa_PN12P0_Temp (BlueDsa_Analog_Channel_11)	oci.ptlm.Therm.Temp.UvvisBdsaPri12VMosfet
DAUC_temperatures	66	DAUC FpgaTemp (FpgaTemp)	oci.ptlm.Therm.Temp.DaucFpga
DAUC_temperatures	67	DAUC 5V Reg in FLT (PolTemp)	oci.ptlm.Therm.Temp.DaucP5VRegulator
DAUC_temperatures	68	DAUC N5V_RegTemp (RegTemp)	oci.ptlm.Therm.Temp.DaucN5VRegulator
ICDU_MCE_temperatures	0	ICDU Housekeeping Card	oci.ptlm.Therm.Temp.IcduHkCard
ICDU_MCE_temperatures	1	ICDU Processor Temp 1	oci.ptlm.Therm.Temp.IcduProcFpga
ICDU_MCE_temperatures	2	ICDU Processor Temp 2	oci.ptlm.Therm.Temp.IcduProcCard
ICDU_MCE_temperatures	3	ICDU LVPC Converter Card Temp	oci.ptlm.Therm.Temp.IcduLvpcConvCard
ICDU_MCE_temperatures	4	ICDU LVPC Switch Card Temp	oci.ptlm.Therm.Temp.IcduLvpcSwitchCard
ICDU_MCE_temperatures	5	ICDU Output Module Temp 1	oci.ptlm.Therm.Temp.IcduOmCenter
ICDU_MCE_temperatures	6	ICDU Output Module Temp 2	oci.ptlm.Therm.Temp.IcduOmBottomRight
ICDU_MCE_temperatures	7	ICDU Heater Module #1 Temp 1	oci.ptlm.Therm.Temp.IcduHm1Top
ICDU_MCE_temperatures	8	ICDU Heater Module #1 Temp 2	oci.ptlm.Therm.Temp.IcduHm1Bottom
ICDU_MCE_temperatures	9	ICDU Heater Module #2 Temp 1	oci.ptlm.Therm.Temp.IcduHm2Top
ICDU_MCE_temperatures	10	ICDU Heater Module #2 Temp 2	oci.ptlm.Therm.Temp.IcduHm2Bottom
ICDU_MCE_temperatures	11	ICDU Thermal Control Card Temp	oci.ptlm.Therm.Temp.IcduTccVConv
ICDU_MCE_temperatures	12	RTHAM Controller FPGA (Pri or Red) (Converted: 41264 oci_mce_rtaham_TlmGtAdc0Chan5SampDat)	oci.ptlm.Therm.Temp.RtHamCardFpga
ICDU_MCE_temperatures	13	RTA Encoder Electronics (Pri or Red) (Converted: 41232 oci_mce_rtaham_TlmGtAdc2Chan2SampDat)	oci.ptlm.Therm.Temp.RtReb
ICDU_MCE_temperatures	14	HAM Encoder Electronics (Pri or Red) (Converted: 41224 oci_mce_rtaham_TlmGtAdc2Chan5SampDat)	oci.ptlm.Therm.Temp.HamReb

ICDU_MCE_temperatures	15	SCA Controller FPGA (Converted: 60101 oci_mce_solcal_TlmGtAdc0Chan5SampDat)	oci.ptlm.Therm.Temp.SoCalCardFpga
ICDU_thermisters	0	SCA Diffuser Housing +Z	oci.ptlm.Therm.Temp.ScaDiffuserHousingPZ
ICDU_thermisters	1	Earth Shield mX Wing center	oci.ptlm.Therm.Temp.EarthShadeNXWing
ICDU_thermisters	2	SCA Baffle	oci.ptlm.Therm.Temp.ScaBaffle
ICDU_thermisters	3	SCA Motor Housing	oci.ptlm.Therm.Temp.ScaMotorHousing
ICDU_thermisters	4	IDS near MOB pY IF	oci.ptlm.Therm.Temp.IdsNearMobPYFlexures
ICDU_thermisters	5	VISNIR LHP Vapor Line near Evaporator	oci.ptlm.Therm.Temp.VisnirLhpVaporLineEvap
ICDU_thermisters	6	MOB near RT and -Z	oci.ptlm.Therm.Temp.MobNearRtAndNZ
ICDU_thermisters	7	MOB near HAM and -Z	oci.ptlm.Therm.Temp.MobNearHamAndNZ
ICDU_thermisters	8	MOB near RT and +Z	oci.ptlm.Therm.Temp.MobNearRTandPZ
ICDU_thermisters	9	MOB near HAM and +Z	oci.ptlm.Therm.Temp.MobNearHamAndPZ
ICDU_thermisters	10	DAU Chassis	oci.ptlm.Therm.Temp.DauChassis
ICDU_thermisters	11	MOSB near MLA	oci.ptlm.Therm.Temp.MosbNearMla
ICDU_thermisters	12	MOSB center -X	oci.ptlm.Therm.Temp.MosbCenterNX
ICDU_thermisters	13	RT Actuator -X	oci.ptlm.Therm.Temp.RtActuatorNX
ICDU_thermisters	14	HAM Actuator -X	oci.ptlm.Therm.Temp.HamActuatorNX
ICDU_thermisters	15	DAU Radiator	oci.ptlm.Therm.Temp.DauRadiator
ICDU_thermisters	16	ICDU Chassis Rad IF	oci.ptlm.Therm.Temp.IcduRadInterface
ICDU_thermisters	17	MCE Chassis Rad IF	oci.ptlm.Therm.Temp.MceRadInterface
ICDU_thermisters	18	UVVIS LHP Evaporator	oci.ptlm.Therm.Temp.UvvisLhpEvaporator
ICDU_thermisters	19	UVVIS LHP Liq Line nr CC	oci.ptlm.Therm.Temp.UvvisLhpLiquidLineCc
ICDU_thermisters	20	Fiber Assembly (MLA Mount) #1	oci.ptlm.Therm.Temp.FiberAssyMLAMount
ICDU_thermisters	21	UVVIS LHP Radiator	oci.ptlm.Therm.Temp.UvvisLhpRadCenter
ICDU_thermisters	22	UVVIS LHP Rad Subcooler	oci.ptlm.Therm.Temp.UvvisLhpRadSubcooler
ICDU_thermisters	23	UVVIS Lens Housing (CCD side)	oci.ptlm.Therm.Temp.UvvisLensHousingCcd

ICDU_thermisters	24	UVVIS Lens Housing (grating side)	oci.ptlm.Therm.Temp.UvvisLensHousingGrating
ICDU_thermisters	25	VISNIR Lens Housing (CCD side)	oci.ptlm.Therm.Temp.VisnirLensHousingCcd
ICDU_thermisters	26	VISNIR Lens Housing (grating side)	oci.ptlm.Therm.Temp.VisnirLensHousingGrating
ICDU_thermisters	27	FPA UVVIS Housing	oci.ptlm.Therm.Temp.UvvisHousing
ICDU_thermisters	28	FPA VISNIR Housing	oci.ptlm.Therm.Temp.VisnirHousing
ICDU_thermisters	29	Fiber Assembly #2 on Blankets	oci.ptlm.Therm.Temp.FiberAssyBlankets
ICDU_thermisters	30	RT Actuator +X	oci.ptlm.Therm.Temp.RtActuatorPX
ICDU_thermisters	31	HAM Actuator +X	oci.ptlm.Therm.Temp.HamActuatorPX
ICDU_thermisters	32	Fiber Assembly (AOB Interface) #3 on FOSS	oci.ptlm.Therm.Temp.FiberAssyAOBSide
ICDU_thermisters	33	UVVIS LHP CC nr Evap	oci.ptlm.Therm.Temp.UvvisLhpCcNearEvap
ICDU_thermisters	34	UVVIS LHP Vap Line nr Evap	oci.ptlm.Therm.Temp.UvvisLhpVaporLineEvap
ICDU_thermisters	35	VISNIR LHP CC nr Evap	oci.ptlm.Therm.Temp.VisnirLhpCcNearEvap
ICDU_thermisters	36	Launch Lock	oci.ptlm.Therm.Temp.LaunchLockMount
ICDU_thermisters	37	UVVIS LHP Liq Line nr Rad	oci.ptlm.Therm.Temp.UvvisLhpLiquidLineRad
ICDU_thermisters	38	UVVIS LHP Rad nr VL	oci.ptlm.Therm.Temp.UvvisLhpRadInlet
ICDU_thermisters	39	SPARE (MOB)	oci.ptlm.Therm.Temp.MobSpare
ICDU_thermisters	40	IDS near MOB I/F	oci.ptlm.Therm.Temp.IdsNearMobNYFlexure
ICDU_thermisters	41	RSS center +X	oci.ptlm.Therm.Temp.RssCenterPX
ICDU_thermisters	42	Grating (Blue)	oci.ptlm.Therm.Temp.UvvisGrating
ICDU_thermisters	43	Grating (Red)	oci.ptlm.Therm.Temp.VisnirGrating
ICDU_thermisters	44	MOB and HAM I/F	oci.ptlm.Therm.Temp.MobHamInterface
ICDU_thermisters	45	IDS near Tilt I/F	oci.ptlm.Therm.Temp.IdsNearTilt
ICDU_thermisters	46	IDS near RSS bipods	oci.ptlm.Therm.Temp.IdsNearRssBipods
ICDU_thermisters	47	IDS near SDA	oci.ptlm.Therm.Temp.IdsNearSdaMount
ICDU_thermisters	48	VISNIR LHP Liq Line nr CC	oci.ptlm.Therm.Temp.VisnirLhpLiquidLineCc

ICDU_thermisters	49	VISNIR LHP Evaporator	oci.ptlm.Therm.Temp.VisnirLhpEvaporator
ICDU_thermisters	50	IDS between ICDU_MCE	oci.ptlm.Therm.Temp.IdsBetweenIcduAndMce
ICDU_thermisters	51	IDS near DAU +x	oci.ptlm.Therm.Temp.IdsNearDauPX
ICDU_thermisters	52	IDS near ST	oci.ptlm.Therm.Temp.IdsNearStarTrackerMount
ICDU_thermisters	53	VISNIR LHP Rad nr VL	oci.ptlm.Therm.Temp.VisnirLhpRadInlet
ICDU_thermisters	54	VISNIR LHP Liq Line nr Rad	oci.ptlm.Therm.Temp.VisnirLhpLiquidLineRad
ICDU_thermisters	55	SDA CSA Radiator Top	oci.ptlm.Therm.Temp.SdaTopDetRad
ICDU_thermisters	56	SDA CSA Radiator Bot	oci.ptlm.Therm.Temp.SdaBottomDetRad
ICDU_thermisters	57	VISNIR LHP Radiator	oci.ptlm.Therm.Temp.VisnirLhpRadCenter
ICDU_thermisters	58	VISNIR LHP Rad Subcooler	oci.ptlm.Therm.Temp.VisnirLhpRadSubcooler
ICDU_thermisters	59	SDA AOB Radiator Coase	oci.ptlm.Therm.Temp.SdaBoxRadiator
ICDU_thermisters	60	UVVIS LHP Compensation Chamber Primary Control	oci.ptlm.Therm.Temp.UvvisLhpCcControlPri
ICDU_thermisters	61	VISNIR LHP Compensation Chamber Primary Control	oci.ptlm.Therm.Temp.VisnirLhpCcControlPri
ICDU_thermisters	62	UVVIS LHP Compensation Chamber Redundant Control	oci.ptlm.Therm.Temp.UvvisLhpCcControlRed
ICDU_thermisters	63	VISNIR LHP Compensation Chamber Redundant Control	oci.ptlm.Therm.Temp.VisnirLhpCcControlRed
ICDU_thermisters	64	SDA CSA Top Fine pri	oci.ptlm.Therm.Temp.SdaTopDetRadControlPri
ICDU_thermisters	65	SDA CSA Bottom Fine pri	oci.ptlm.Therm.Temp.SdaBottomDetRadControlPri
ICDU_thermisters	66	SDA CSA Top Fine red	oci.ptlm.Therm.Temp.SdaBottomDetRadControlRed
ICDU_thermisters	67	SDA CSA Bottom Fine red	oci.ptlm.Therm.Temp.SdaTopDetRadControlRed
ICDU_thermisters	68	AOB Radiator Fine pri	oci.ptlm.Therm.Temp.SdaBoxRadControlPri
ICDU_thermisters	69	AOB Radiator Fine red	oci.ptlm.Therm.Temp.SdaBoxRadControlRed
ICDU_thermisters	70	Collimator Housing	oci.ptlm.Therm.Temp.CollimatorHousing
ICDU_thermisters	71	MOB plusY Dark Target	oci.ptlm.Therm.Temp.SpcaMount
ICDU_thermisters	72	RIO on center back	oci.ptlm.Therm.Temp.RioCloseout
ICDU_thermisters	73	VISNIR Red Grating mZ	oci.ptlm.Therm.Temp.VisnirGratingNZ