LICOS Processing of LAT-Related SC Housekeeping
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The LAT test conductor's LICOS workstation on the I&T LAN executes a LICOS-AstroRT proxy which establishes TCP/IP client connection to the SCIT rack for receipt of real time telemetry packets (VC0, VC1, VC11). Processing within the proxy unpacks the housekeeping and diagnostic CCSDC packets from the transmitted VCDU format. LAT-generated housekeeping packets (ApID range 0x200 – 0x25F) are passed on to the LICOS housekeeping processing. LAT-generated diagnostic packets (ApID range 0x260 – 0x33F) are passed on to the LICOS diagnostic processing. Spacecraft housekeeping packets containing LAT-related information (currently ApIDs 0x000 – 0x009, 0x00B – 0x01A, 0x124, 0x126, 0x139, 0x13A) are subjected to an extraction process described below before it is passed on to LICOS handling routines. All other ApIDs are ignored and in no way processed or archived. The processing of an archived VC3 file is identical.

All of these filtered and extracted ApIDs are processed by the LICOS Current Value Table decom process in support of script execution and real time data displays. These data are also archived in binary files of the CCSDS packets. Housekeeping and diagnostics are archived in separate files. An automatic archiving process opens and closes the files at 5 minute intervals. File names represent the time of creation of the file and its contents, eg. GLAST_yyyyddd_hhmmss_HSK.PKT for housekeeping and GLAST_yyyyddd_hhmmss_DIA.PKT for diagnostic data, where yyyy is the year, ddd is julian day of year, hhmmss is the time.

These files are transferred thru the firewalls to the MCR and subsequently on to SLAC computer center for offline processing and archiving. Part of the ingestion of these files in the offline processing at SLAC is a decommutation of the housekeeping data to a trending database which tracks all LAT-related housekeeping as a function of time. A web access to this database permits LAT scientists and engineers to track performance and configuration of the LAT instrument throughout its integration and test program. This website is not protected and is generally available to the scientific community.

The flow of housekeeping and diagnostic data is summarized in Figure 1.

LAT-related SC housekeeping processing.

SC ApIDs which contain LAT-related, ITAR-free, telemetry parameters are processed by a redaction process which zero's all fields in the packets not identified in the approved list as identified in Appendix A. The process preserves the original packet header and approved LAT-related telemetry fields. All other fields in the packet are zeroed. Consequently, the output of the process is a packet of identical length as the original but with only LAT-related data preserved. The process is defined by a redacted version of the SC telemetry database (sc-hwtlm-itos.dbx, itos-dbx-tlm.dbx) which only defines the LAT-related fields in the packets. Appendix B shows a piece of the LICOS Python script that defines the redacted packets. Note that both the data and the mnemonics for the fields not related to LAT are removed – the data are zeroed and the mnemonics are changed to a generic "zeroed_sc_pad" field identifier.
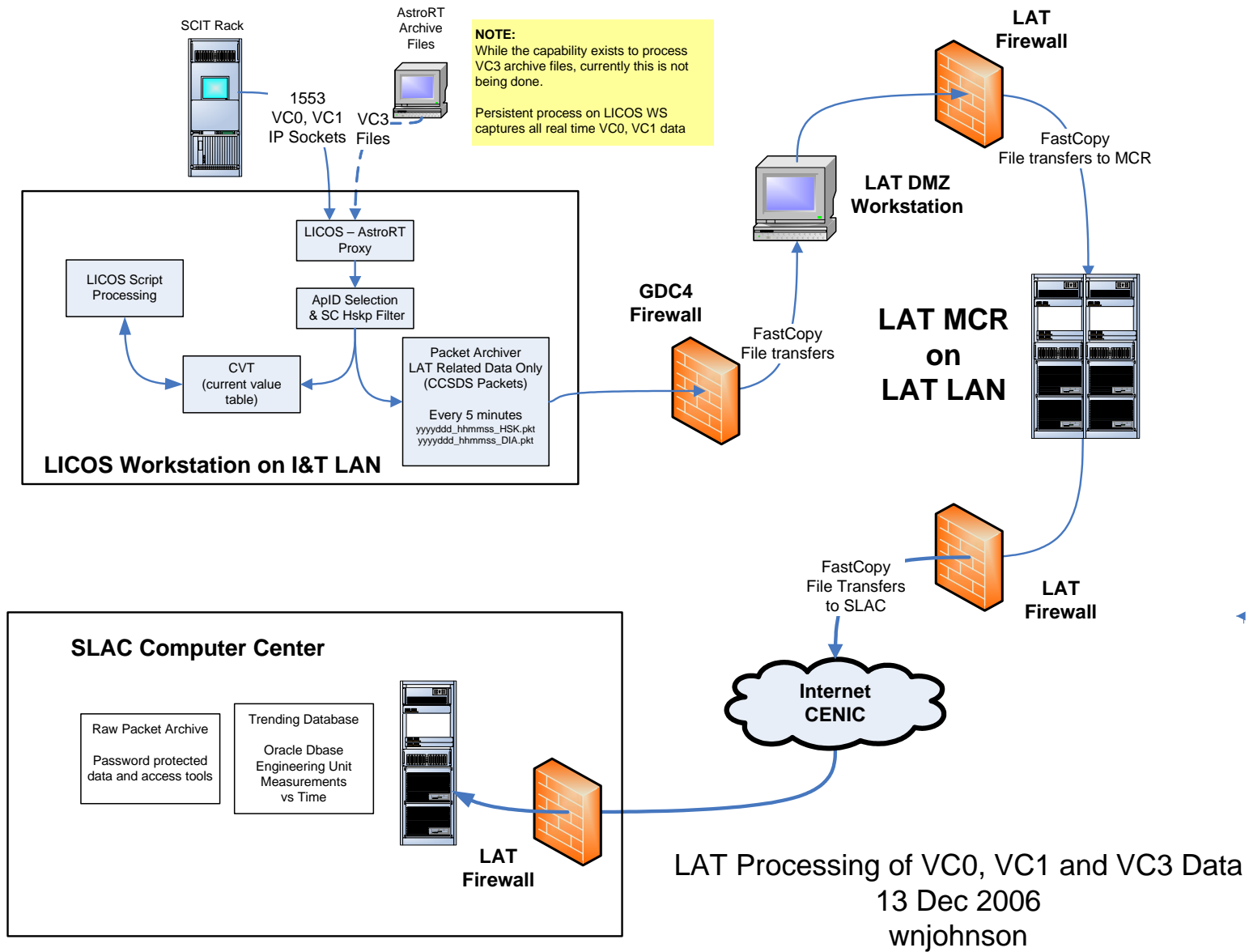
Figure 1. LAT Processing of Housekeeping and Diagnostic Telemetry

Appendix A. LAT-Related Housekeeping from SC Housekeeping Packets

Mnemonic	Source	1st APID	Description
L_ACD_NX_ICS_T	sc_hwtlm_itos	3	-X ACD Inside Composite Shell Temperature
L_ACD_NX_PRR_T	sc_hwtlm_itos	3	-X PMT Rail Right Temperature
L_ACD_NX_TILE_T	sc_hwtlm_itos	8	-X tile temp Temperature
L_ACD_NY_ICS_T	sc_hwtlm_itos	3	-Y ACD Inside Composite Shell Temperature
L_ACD_NY_PRR_T	sc_hwtlm_itos	3	-Y PMT Rail Right
L_ACD_NY_TILE_T	sc_hwtlm_itos	8	-Y tile temp Temperature
L_ACD_PX_ICS_T	sc_hwtlm_itos	3	+X ACD Inside Composite Shell
L_ACD_PX_PRR_T	sc_hwtlm_itos	3	+X PMT Rail Right Temperature
L_ACD_PX_TILE_T	sc_hwtlm_itos	8	+X tile Temperature
L_ACD_PY_ICS_T	sc_hwtlm_itos	3	+Y ACD Inside Composite Shell Temperature
L_ACD_PY_PRR_T	sc_hwtlm_itos	3	+Y PMT Rail Right Temperature
L_ACD_PY_TILE_T	sc_hwtlm_itos	8	+Y tile temp Temperature
L_ACD_PZ_ICS_T	sc_hwtlm_itos	3	+Z ACD Inside Composite Shell Temperature
L_ACD_PZ_TILE_T	sc_hwtlm_itos	8	+Z tile Temperature
L_DAQ_P_EBM25_V	sc_hwtlm_itos	0	GASU AEM EBM 0 2.5 V
L_DAQ_P_EBM33_V	sc_hwtlm_itos	0	GASU AEM EBM 0 3.3 V
L_DAQ_P_GASU_T	sc_hwtlm_itos	3	LAT Primary GASU Temperature
L_DAQ_P_GEM25_V	sc_hwtlm_itos	0	GASU CRU GEM 0 2.5 V
L_DAQ_P_GEM33_V	sc_hwtlm_itos	0	GASU CRU GEM 0 3.3 V
L_DAQ_P_PDU_T	sc_hwtlm_itos	9	LAT PDU Primary Constant Current Thermister (44909)
L_DAQ_P_PDU_V	sc_hwtlm_itos	0	LAT Primary PDU Voltage
L_DAQ_P_RSF_V	sc_hwtlm_itos	0	LAT Primary Regulated SIU Feeder Voltage
L_DAQ_P_RVF_V	sc_hwtlm_itos	0	LAT Primary Regulated VCHP Feeder Voltage
L_DAQ_P_SIU_T	sc_hwtlm_itos	9	LAT SIU Primary Constant Current Thermister (44909)
L_DAQ_P_SIU_V	sc_hwtlm_itos	0	LAT Primary SIU Voltage
L_DAQ_R_EBM25_V	sc_hwtlm_itos	0	GASU AEM EBM 1 2.5 V
L_DAQ_R_EBM33_V	sc_hwtlm_itos	0	GASU AEM EBM 1 3.3 V
L_DAQ_R_GASU_T	sc_hwtlm_itos	3	LAT Redundant GASU Temperature
L_DAQ_R_GEM25_V	sc_hwtlm_itos	0	GASU CRU GEM 1 2.5 V
L_DAQ_R_GEM33_V	sc_hwtlm_itos	0	GASU CRU GEM 1 3.3 V
L_DAQ_R_PDU_T	sc_hwtlm_itos	3	LAT Redundant PDU Temperature
L_DAQ_R_PDU_V	sc_hwtlm_itos	0	LAT Redundant PDU Voltage
L_DAQ_R_RSF_V	sc_hwtlm_itos	0	LAT Redundant Regulated SIU Feeder Voltage
L_DAQ_R_RVF_V	sc_hwtlm_itos	0	LAT Redundant Regulated VCHP Feeder Voltage
L_DAQ_R_SIU_T	sc_hwtlm_itos	3	LAT Redundant SIU Temperature
L_DAQ_R_SIU_V	sc_hwtlm_itos	0	LAT Redundant SIU Voltage
L_MCH_NY_P_HTRV	sc_hwtlm_itos	0	LAT -Y VCHP Reservoir Primary Heater Voltage
L_MCH_NY_R_HTRV	sc_hwtlm_itos	0	LAT -Y VCHP Reservoir Redundant Heater Voltage
L_MCH_NY_VHP0_T	sc_hwtlm_itos	8	-Y VCHP Reservoir Htr Mon 0 Temperature (HP 0)
L_MCH_NY_VHP1_T	sc_hwtlm_itos	8	-Y VCHP Reservoir Htr Mon 1 Temperature (HP 1)
L_MCH_NY_VHP2_T	sc_hwtlm_itos	8	-Y VCHP Reservoir Htr Mon 2 Temperature (HP 2)
L_MCH_NY_VHP3_T	sc_hwtlm_itos	8	-Y VCHP Reservoir Htr Mon 3 Temperature (HP 3)
L_MCH_NY_VHP4_T	sc_hwtlm_itos	8	-Y VCHP Reservoir Htr Mon 4 Temperature (HP 4)
L_MCH_NY_VHP5_T	sc_hwtlm_itos	8	-Y VCHP Reservoir Htr Mon 5 Temperature (HP 5)
L_MCH_NY_XHP0_T	sc_hwtlm_itos	3	-Y VCHP-XLHP Interface -X Side Temperature
L_MCH_NY_XHP3_T	sc_hwtlm_itos	3	-Y VCHP-XLHP Interface +X Side Temperature
L_MCH_NYNX_GMHT	sc_hwtlm_itos	3	-Y Grid Make-up Heaters -X Side Temperature
L_MCH_NYNX_GRIT	sc_hwtlm_itos	3	-Y Grid-Radiator Interface -X Side Temperature
L_MCH_NYPX_GMHT	sc_hwtlm_itos	3	-Y Grid Make-up Heaters +X Side Temperature
L_MCH_NYPX_GRIT	sc_hwtlm_itos	3	-Y Grid-Radiator Interface +X Side Temperature
L_MCH_PY_P_HTRV	sc_hwtlm_itos	0	LAT +Y VCHP Reservoir Primary Heater Voltage

L_MCH_PY_R_HTRV	sc_hwtlm_itos	0	LAT +Y VCHP Reservoir Redundant Heater Voltage
L_MCH_PY_VHP0_T	sc_hwtlm_itos	8	+Y VCHP Reservoir Heater Mon 0 Temperature (HP 6)
L_MCH_PY_VHP1_T	sc_hwtlm_itos	8	+Y VCHP Reservoir Heater Mon 1 Temperature (HP 7)
L_MCH_PY_VHP2_T	sc_hwtlm_itos	8	+Y VCHP Reservoir Heater Mon 2 Temperature (HP 8)
L_MCH_PY_VHP3_T	sc_hwtlm_itos	8	+Y VCHP Reservoir Heater Mon 3 Temperature (HP 9)
L_MCH_PY_VHP4_T	sc_hwtlm_itos	8	+Y VCHP Reservoir Heater Mon 4 Temperature (HP 10)
L_MCH_PY_VHP5_T	sc_hwtlm_itos	8	+Y VCHP Reservoir Heater Mon 5 Temperature (HP 11)
L_MCH_PY_XHP1_T	sc_hwtlm_itos	3	+Y VCHP-XLHP Interface -X Side Temperature
L_MCH_PY_XHP5_T	sc_hwtlm_itos	3	+Y VCHP-XLHP Interface +X Side Temperature
L_MCH_PYNX_GMHT	sc_hwtlm_itos	3	+Y Grid Make-up Heaters -X Side Temperature
L_MCH_PYNX_GRIT	sc_hwtlm_itos	3	+Y Grid-Radiator Interface -X Side Temperature
L_MCH_PYPX_GMHT	sc_hwtlm_itos	3	+Y Grid Make-up Heaters +X Side Temperature
L_MCH_PYPX_GRIT	sc_hwtlm_itos	3	+Y Grid-Radiator Interface +X Side Temperature
L_MCH_XLPLT_1T	sc_hwtlm_itos	3	X-LAT Plate Heat Pipe 1 Temperature
L_MCH_XLPLT_2T	sc_hwtlm_itos	3	X-LAT Plate Heat Pipe 2 Temperature
L_MCH_XLPLT_3T	sc_hwtlm_itos	3	X-LAT Plate Heat Pipe 3 Temperature
L_MCH_XLPLT_5T	sc_hwtlm_itos	3	X-LAT Plate Heat Pipe 5 Temperature
L_RAD_NYNX_L_T	sc_hwtlm_itos	8	-Y Radiator Panel Lower Left Survival Temperature
L_RAD_NYNX_U_T	sc_hwtlm_itos	8	-Y Radiator Panel Upper Left Survival Temperature
L_RAD_NYPX_L_T	sc_hwtlm_itos	8	-Y Radiator Panel Lower Right Survival Temperature
L_RAD_NYPX_U_T	sc_hwtlm_itos	8	-Y Radiator Panel Upper Right Survival Temperature
L_RAD_PYNX_L_T	sc_hwtlm_itos	8	+Y Radiator Panel Lower Left Survival Temperature
L_RAD_PYNX_U_T	sc_hwtlm_itos	8	+Y Radiator Panel Upper Left Survival Temperature
L_RAD_PYPX_L_T	sc_hwtlm_itos	8	+Y Radiator Panel Lower Right Survival Temperature
L_RAD_PYPX_U_T	sc_hwtlm_itos	8	+Y Radiator Panel Upper Right Survival Temperature
L_SPARE_10V	sc_hwtlm_itos	0	LAT Spare 10 Voltage
L_SPARE_13V	sc_hwtlm_itos	0	LAT Spare 13 Voltage
L_SPARE_14V	sc_hwtlm_itos	0	LAT Spare 14 Voltage
L_SPARE_15V	sc_hwtlm_itos	0	LAT Spare 15 Voltage
L_SPARE_16V	sc_hwtlm_itos	0	LAT Spare 16 Voltage
L_SPARE_19V	sc_hwtlm_itos	0	LAT Spare 19 Voltage
L_SPARE_1T	sc_hwtlm_itos	3	LAT Spare 1 Temperature
L_SPARE_20V	sc_hwtlm_itos	0	LAT Spare 20 Voltage
L_SPARE_23V	sc_hwtlm_itos	0	LAT Spare 23 Voltage
L_SPARE_24V	sc_hwtlm_itos	0	LAT Spare 24 Voltage
L_SPARE_2T	sc_hwtlm_itos	3	LAT Spare 2 Temperature
L_SPARE_3T	sc_hwtlm_itos	3	LAT Spare 3 Temperature
L_SPARE_4T	sc_hwtlm_itos	3	LAT Spare 4 Temperature
L_SPARE_5T	sc_hwtlm_itos	3	LAT Spare 5 Temperature
L_SPARE_6T	sc_hwtlm_itos	3	LAT Spare 6 Temperature
L_SPARE_7T	sc_hwtlm_itos	3	LAT Spare 7 Temperature
L_SPARE_8T	sc_hwtlm_itos	3	LAT Spare 8 Temperature
L_SPARE_9V	sc_hwtlm_itos	0	LAT Spare 9 Voltage
SAC_MODE	itos_dbx_tlm	13	GNC_TLM_MODE Telemetry (SIANCILLARY GNC_MODE)
SACFLAGARRENABL	itos_dbx_tlm	13	SIANCILLARY - ARR_ENABLE - Equals 1 when ENABLED; Equal 0 when DISABLED.
SACFLAGGBMINSAA	itos_dbx_tlm	13	SIANCILLARY - Indicates whether spacecraft, referencing the GBM, is located within the 12 point polygon defined for the South Atlantic Anomaly
SACFLAGGPSOUTAG	itos_dbx_tlm	13	SIANCILLARY - GPS_OUTAGE - Equals one (1) during a GPS outage; otherwise zero (0).
SACFLAGISINSUN	itos_dbx_tlm	13	SIANCILLARY - IS_IN_SUN - Equals one (1) when S/C is in the sun; otherwise zero (0).
SACFLAGKUBANDON	itos_dbx_tlm	13	SIANCILLARY - KUBAND_ON - Equals one (1) when the KUBAND transmitter is on; otherwise zero (0).

SACFLAGLATINSAA	itos_dbx_tlm	13	SIANCILLARY - Indicates whether spacecraft, referencing the LAT, is located within the 12 point polygon defined for the South Atlantic Anomaly
SACFLAGSBANDON	itos_dbx_tlm	13	SIANCILLARY - SBAND_ON - Equals one (1) when the SBAND transmitter is on; otherwise zero (0).
SACSCLKSECS	itos_dbx_tlm	13	SIATTITUDE - The seconds field of the S/C Clock time associated with the S/C attitude.
SACSCLKSUBSECS	itos_dbx_tlm	13	SIATTITUDE - The subseconds field of the S/C Clock time associated with the S/C attitude.
SACTCFLAGS	itos_dbx_tlm	13	SIANCILLARY FLAGS field.
SACSSRUSAGE	itos_dbx_tlm	15	SIANCILLARY - SSR usage indicator.
SBCHEARTBEATLAT	itos_dbx_tlm	13	Indicates whether S/C is receiving LAT telemetry heartbeat. 1 = Heart is beating. 0 = Heart beat has stopped. S/C 1553 Bus Simulator is hardcoded to expect telemetry at least once every 10 seconds. For S/C FSW, the timeout will be a flight parameter.
SBCLERRCWLAT	itos_dbx_tlm	14	Last LAT transaction error 1553 Command Word. Because errors are not queued, this only indicates the last error that occured.
SBCLERRTYPELAT	itos_dbx_tlm	14	Last LAT transaction error type.
SBCPRMBUSLAT	itos_dbx_tlm	13	LAT 1553 prime bus (0 = A; 1 =B)
SBCRCVTC_LAT	itos_dbx_tlm	15	Received telecommand to route from LAT
SBCRCVTLMALAT	itos_dbx_tlm	14	Received TDRSS telemetry count from LAT
SBCRCVTLMBYTLAT	itos_dbx_tlm	13	Increments for each telemetry byte received from LAT. Counter will increment whether or not telemetry packet validation is successful.
SBCRCVTLMDLAT	itos_dbx_tlm	14	Received science telemetry count from LAT
SBCRCVTLMRLAT	itos_dbx_tlm	14	Received real-time telemetry count from LAT
SBCREJECTTLMLAT	itos_dbx_tlm	15	Rejected telemetry count from LAT. S/C FSW validates format of each received telemetry packet. This indicator is incremented when a packet is discarded.
SBCRJCTTC_LAT	itos_dbx_tlm	15	Rejected telecommand count from LAT. S/C FSW validates format of each received telecommand packet. This indicator is incremented when a packet is discarded.
SBCRJCTTLMRLAT	itos_dbx_tlm	15	Nnumber of rejected LAT housekeeping packets.
SBCRTENBLLAT	itos_dbx_tlm	14	One if LAT is enabled for 1553 communications
SBCTXERRCNTLAT	itos_dbx_tlm	14	Increments for each LAT transaction error.
SD_AA_CPUA	sc_hwtlm_itos	0	CPU A ON
SD_AA_CPUB	sc_hwtlm_itos	0	CPU B ON
SD_AB_CPUA	sc_hwtlm_itos	0	CPU A ON
SD_AB_CPUB	sc_hwtlm_itos	0	CPU B ON
SD_RTD_CAL_1T	sc_hwtlm_itos	8	CAL Resistor 1 Temperature
SD_RTD_CAL_2T	sc_hwtlm_itos	8	CAL Resistor 2 Temperature
SD_YSI_CAL_1T	sc_hwtlm_itos	9	Calibration Resistor 1 Temperature
SD_YSI_CAL_2T	sc_hwtlm_itos	9	Calibration Resistor 2 Temperature
SD_YSI_CAL_3T	sc_hwtlm_itos	9	Calibration Resistor 3 Temperature
SD_YSI_CAL_4T	sc_hwtlm_itos	9	Calibration Resistor 4 Temperature
SE_PAL2_CB1_CMD	sc_hwtlm_itos	1	PDU A LCB2 CB1 Command
SE_PAL2_CB1_PWR	sc_hwtlm_itos	1	PDU A LCB2 CB1 Power Status
SE_PAL2_CB1_S	sc_hwtlm_itos	1	PDU A LCB2 CB1 Status
SE_PAL2_CB1_S_1	sc_hwtlm_itos	1	PDU A LCB2 CB1 Status 1
SE_PAL2_CB1_S_2	sc_hwtlm_itos	1	PDU A LCB2 CB1 Status 2
SE_PAL2_CB2_CMD	sc_hwtlm_itos	1	PDU A LCB2 CB2 Command
SE_PAL2_CB2_PWR	sc_hwtlm_itos	1	PDU A LCB2 CB2 Power Status
SE_PAL2_CB2_S	sc_hwtlm_itos	1	PDU A LCB2 CB2 Status
SE_PAL2_CB2_S_1	sc_hwtlm_itos	1	PDU A LCB2 CB2 Status 1
SE_PAL2_CB2_S_2	sc_hwtlm_itos	1	PDU A LCB2 CB2 Status 2
SE_PAL2_CB7_CMD	sc_hwtlm_itos	1	PDU A LCB2 CB7 Command
SE_PAL2_CB7_PWR	sc_hwtlm_itos	1	PDU A LCB2 CB7 Power Status
SE_PAL2_CB7_S	sc_hwtlm_itos	1	PDU A LCB2 CB7 Status

SE_PAL2_CB7_S_1	sc_hwtlm_itos	1	PDU A LCB2 CB7 Status 1
SE_PAL2_CB7_S_2	sc_hwtlm_itos	1	PDU A LCB2 CB7 Status 2
SE_PAL2_CB8_CMD	sc_hwtlm_itos	1	PDU A LCB2 CB8 Command
SE_PAL2_CB8_PWR	sc_hwtlm_itos	1	PDU A LCB2 CB8 Power Status
SE_PAL2_CB8_S	sc_hwtlm_itos	1	PDU A LCB2 CB8 Status
SE_PAL2_CB8_S_1	sc_hwtlm_itos	1	PDU A LCB2 CB8 Status 1
SE_PAL2_CB8_S_2	sc_hwtlm_itos	1	PDU A LCB2 CB8 Status 2
SE_PAL3_SIU_SW	sc_hwtlm_itos	2	PDU A LCB3 SIU SW
SE_PAL3_VCHP_SW	sc_hwtlm_itos	2	PDU A LCB3 VHCP SW
SE_PAL4_DAQ_INH	sc_hwtlm_itos	2	PDU A DAQ Inhibit Status
SE_PAL4_SIU_INH	sc_hwtlm_itos	2	PDU A SIU Inhibit Status
SE_PBL2_CB1_CMD	sc_hwtlm_itos	2	PDU-B LCB2 CB1 Command
SE_PBL2_CB1_PWR	sc_hwtlm_itos	2	PDU-B LCB2 CB1 Power Status
SE_PBL2_CB1_S_1	sc_hwtlm_itos	2	PDU-B LCB2 CB1 Status 1
SE_PBL2_CB1_S_2	sc_hwtlm_itos	2	PDU-B LCB2 CB1 Status 2
SE_PBL2_CB1_ST	sc_hwtlm_itos	2	PDU B LCB2 CB1 Status - IPCU CPU A
SE_PBL2_CB2_CMD	sc_hwtlm_itos	2	PDU-B LCB2 CB2 Command
SE_PBL2_CB2_PWR	sc_hwtlm_itos	2	PDU-B LCB2 CB2 Power Status
SE_PBL2_CB2_S	sc_hwtlm_itos	2	PDU B LCB2 CB2 Status - IPCU CPU B
SE_PBL2_CB2_S_1	sc_hwtlm_itos	2	PDU-B LCB2 CB2 Status 1
SE_PBL2_CB2_S_2	sc_hwtlm_itos	2	PDU-B LCB2 CB2 Status 2
SE_PBL2_CB7_CMD	sc_hwtlm_itos	2	PDU-B LCB2 CB7 Command
SE_PBL2_CB7_PWR	sc_hwtlm_itos	2	PDU-B LCB2 CB7 Power Status
SE_PBL2_CB7_S	sc_hwtlm_itos	2	PDU B LCB2 CB7 Status
SE_PBL2_CB7_S_1	sc_hwtlm_itos	2	PDU-B LCB2 CB7 Status 1
SE_PBL2_CB7_S_2	sc_hwtlm_itos	2	PDU-B LCB2 CB7 Status 2
SE_PBL2_CB8_CMD	sc_hwtlm_itos	2	PDU-B LCB2 CB8 Command
SE_PBL2_CB8_PWR	sc_hwtlm_itos	2	PDU-B LCB2 CB8 Power Status
SE_PBL2_CB8_S	sc_hwtlm_itos	2	PDU B LCB2 CB8 Status
SE_PBL2_CB8_S_1	sc_hwtlm_itos	2	PDU-B LCB2 CB8 Status 1
SE_PBL2_CB8_S_2	sc_hwtlm_itos	2	PDU-B LCB2 CB8 Status 2
SE_PBL3_SIU_SW	sc_hwtlm_itos	3	PDU B LCB3 SIU SW
SE_PBL3_VCHP_SW	sc_hwtlm_itos	3	PDU B LCB3 VHCP SW
SE_PBL4_DAQ_INH	sc_hwtlm_itos	3	PDU B DAQ Inhibit Status
SE_PBL4_SIU_INH	sc_hwtlm_itos	3	PDU B SIU Inhibit Status
SE_PDUA_ESB_V	sc_hwtlm_itos	0	PDU A, Bus Voltage
SE_PDUA_NB2	sc_hwtlm_itos	2	PDU A NEB2 State
SE_PDUA_NB4	sc_hwtlm_itos	2	PDU A NEB4 State
SE_PDUA_SW_L2_I	sc_hwtlm_itos	0	PDU A, Switched LCB Bus Current 2(7:0)
SE_PDUA_SW_L4_I	sc_hwtlm_itos	0	PDU A, Switched LCB Bus Current 4(7:0)
SE_PDUB_ESB_V	sc_hwtlm_itos	0	PDU B, Bus Voltage(7:0)
SE_PDUB_NB2	sc_hwtlm_itos	3	PDU B NEB2 State
SE_PDUB_NB4	sc_hwtlm_itos	3	PDU B NEB4 State
SE_PDUB_SW_L2_I	sc_hwtlm_itos	0	PDU B, Switched LCB Bus Current 2(7:0)
SE_PDUB_SW_L4_I	sc_hwtlm_itos	0	PDU B, Switched LCB Bus Current 4(7:0)
SE_PRU_P_DAQ_V	sc_hwtlm_itos	0	EPS Primary DAQ Feeder Voltage
SE_PRU_P_SIU_V	sc_hwtlm_itos	0	EPS Primary PRU SIU/VCHP Bus Voltage
SE_PRU_R_DAQ_V	sc_hwtlm_itos	0	EPS Redundant DAQ Feeder Voltage
SE_PRU_R_SIU_V	sc_hwtlm_itos	0	EPS Redundant PRU SIU/VCHP Bus Voltage
SG_INSAALAT	itos_dbx_tlm	15	GNC_TLM_IN_SAA_LAT - SAA indicator
SG_NAVPOSJ2000_1	itos_dbx_tlm	13	GNC_TLM_NAV_POS_J2000(1) (m) Spacecraft position
SG_NAVPOSJ2000_2	itos_dbx_tlm	13	GNC_TLM_NAV_POS_J2000(2) (m) Spacecraft position
SG_NAVPOSJ2000_3	itos_dbx_tlm	13	GNC_TLM_NAV_POS_J2000(3) (m) Spacecraft position
SG_NAVVELJ2000_1	itos_dbx_tlm	13	GNC_TLM_NAV_VEL_J2000(1) (m/sec) Spacecraft velocity
SG_NAVVELJ2000_2	itos_dbx_tlm	13	GNC_TLM_NAV_VEL_J2000(2) (m/sec) Spacecraft velocity
SG_NAVVELJ2000_3	itos_dbx_tlm	13	GNC_TLM_NAV_VEL_J2000(3) (m/sec) Spacecraft velocity

SG_OMEGA1	itos_dbx_tlm	13	GNC_TLM_OMEGA(1) (deg/sec) Spacecraft rate
SG_OMEGA2	itos_dbx_tlm	13	GNC_TLM_OMEGA(2) (deg/sec) Spacecraft rate
SG_OMEGA3	itos_dbx_tlm	13	GNC_TLM_OMEGA(3) (deg/sec) Spacecraft rate
SG_QBI1	itos_dbx_tlm	13	GNC_TLM_QBI(1) - Spacecraft Attitude
SG_QBI2	itos_dbx_tlm	13	GNC_TLM_QBI(2) - Spacecraft Attitude
SG_QBI3	itos_dbx_tlm	13	GNC_TLM_QBI(3) - Spacecraft Attitude
SG_QBI4	itos_dbx_tlm	13	GNC_TLM_QBI(4) - Spacecraft Attitude
SLGIOLATBYTECNT	itos_dbx_tlm	26	LGIO LAT Byte Count
SLGIOLATCTRLB00	itos_dbx_tlm	26	LAT_PRI_CNTRL_0
SLGIOLATCTRLB01	itos_dbx_tlm	26	LAT_PRI_CNTRL_1
SLGIOLATCTRLB02	itos_dbx_tlm	26	LAT_PRI_CNTRL_2
SLGIOLATCTRLB03	itos_dbx_tlm	26	LAT_RED_CNTRL0
SLGIOLATCTRLB04	itos_dbx_tlm	26	LAT_RED_CNTRL1
SLGIOLATCTRLB05	itos_dbx_tlm	26	LAT_RED_CNTRL2
SLGIOLATCTRLB06	itos_dbx_tlm	26	LAT_PRI_MNTR0 (PRIM_SIU_MEM_ERROR)
SLGIOLATCTRLB07	itos_dbx_tlm	26	LAT_PRI_MNTR1 (PRIM_SIU_COMM_ERROR)
SLGIOLATCTRLB08	itos_dbx_tlm	26	LAT_RED_MNTR0 (RDNT_SIU_MEM_ERROR)
SLGIOLATCTRLB09	itos_dbx_tlm	26	LAT_RED_MNTR1 (RDNT_SIU_COMM_ERROR)
SLGIOLATCTRLB11	itos_dbx_tlm	26	SPARE_LDVS_O_UT0
SLGIOLATCTRLB12	itos_dbx_tlm	26	SPACE_LVDS_O_UT1
SLGIOLATCTRLB13	itos_dbx_tlm	26	SPARE_LVDS_O_UT2
SLGIOLATCTRLREG	itos_dbx_tlm	26	LGIO LAT Control Register
SLGIOLATGBMDATA	itos_dbx_tlm	26	LGIO Status Register's LAT/GBM Data.
SLGIOLATINMUX	itos_dbx_tlm	26	LGIO Control Register's LAT Input Mux Select
SLGIOLATINSTOP	itos_dbx_tlm	26	LGIO Status Register's LAT Input Stop
SLGIOLATPKTCNT	itos_dbx_tlm	26	LGIO LAT Packet Counter
SLGIOLATPRIMCNT	itos_dbx_tlm	26	Number of LGIO LAT Primary interface reset attempts. (Count of PRIM_SIU_RST Pulses)
SLGIOLATPRIVALID	itos_dbx_tlm	26	LGIO Status Register's LAT Primary Valid*
SLGIOLATPTRCTRL	itos_dbx_tlm	26	Number of LGIO Zero LAT Memory Pointer attempts.
SLGIOLATREDCNT	itos_dbx_tlm	26	Number of LGIO LAT Redundant interface reset attempts. (Count of RDNT_SIU_RST Pulses)
SLGIOLATREDVALID	itos_dbx_tlm	26	LGIO Status Register's LAT Redundant Valid*
SLGIOSCREADY	itos_dbx_tlm	26	LGIO Status Register's SC Ready*
SPLLAT1TCRECVD	itos_dbx_tlm	15	LAT normal TC received
SPLLAT1TCREJCT	itos_dbx_tlm	15	LAT normal TC rejected (queue was full)
SPLLAT2TCRECVD	itos_dbx_tlm	15	LAT RT-to-RT TC received
SPLLAT2TCREJCT	itos_dbx_tlm	15	LAT RT-to-RT TC rejected (queue was full)cted (queue was full)
STWRENBL_SSRSCI	itos_dbx_tlm	15	Indicates whether writes to Instrument SSR Science Data partition are enabled.
STWRENBL_SSRTLM	itos_dbx_tlm	15	Indicates whether writes to SSR Housekeeping partition are enabled.
VSACTMGT_ARR_ENA	itos_dbx_tlm	292	Indicates whether Autonomous Repoint Requests (ARR) will be accepted (1 = yes, 0 = no)
VSBCPBUSLAT	itos_dbx_tlm	294	1553 prime bus for LAT (0=Bus A, 1=Bus B)
VSGSAA2PLAT01	itos_dbx_tlm	313	GNC_PARM_SAA2POLY_LAT_01 (deg) SAA Polygon Definition
VSGSAA2PLAT02	itos_dbx_tlm	313	GNC_PARM_SAA2POLY_LAT_02 (deg) SAA Polygon Definition
VSGSAA2PLAT03	itos_dbx_tlm	314	GNC_PARM_SAA2POLY_LAT_03 (deg) SAA Polygon Definition
VSGSAA2PLAT04	itos_dbx_tlm	314	GNC_PARM_SAA2POLY_LAT_04 (deg) SAA Polygon Definition
VSGSAA2PLAT05	itos_dbx_tlm	314	GNC_PARM_SAA2POLY_LAT_05 (deg) SAA Polygon Definition
VSGSAA2PLAT06	itos_dbx_tlm	314	GNC_PARM_SAA2POLY_LAT_06 (deg) SAA Polygon Definition
VSGSAA2PLAT07	itos_dbx_tlm	314	GNC_PARM_SAA2POLY_LAT_07 (deg) SAA Polygon Definition
VSGSAA2PLAT08	itos_dbx_tlm	314	GNC_PARM_SAA2POLY_LAT_08 (deg) SAA Polygon Definition
VSGSAA2PLAT09	itos_dbx_tlm	314	GNC_PARM_SAA2POLY_LAT_09 (deg) SAA Polygon Definition
VSGSAA2PLAT10	itos_dbx_tlm	314	GNC_PARM_SAA2POLY_LAT_10 (deg) SAA Polygon Definition
VSGSAA2PLAT11	itos_dbx_tlm	314	GNC_PARM_SAA2POLY_LAT_11 (deg) SAA Polygon Definition
VSGSAA2PLAT12	itos_dbx_tlm	314	GNC_PARM_SAA2POLY_LAT_12 (deg) SAA Polygon Definition

VSGSAA2PLONG01	itos_dbx_tlm	314	GNC_PARM_SAA2POLY_LONG_01 (deg) SAA Polygon Definition
VSGSAA2PLONG02	itos_dbx_tlm	314	GNC_PARM_SAA2POLY_LONG_02 (deg) SAA Polygon Definition
VSGSAA2PLONG03	itos_dbx_tlm	314	GNC_PARM_SAA2POLY_LONG_03 (deg) SAA Polygon Definition
VSGSAA2PLONG04	itos_dbx_tlm	314	GNC_PARM_SAA2POLY_LONG_04 (deg) SAA Polygon Definition
VSGSAA2PLONG05	itos_dbx_tlm	314	GNC_PARM_SAA2POLY_LONG_05 (deg) SAA Polygon Definition
VSGSAA2PLONG06	itos_dbx_tlm	314	GNC_PARM_SAA2POLY_LONG_06 (deg) SAA Polygon Definition
VSGSAA2PLONG07	itos_dbx_tlm	314	GNC_PARM_SAA2POLY_LONG_07 (deg) SAA Polygon Definition
VSGSAA2PLONG08	itos_dbx_tlm	314	GNC_PARM_SAA2POLY_LONG_08 (deg) SAA Polygon Definition
VSGSAA2PLONG09	itos_dbx_tlm	314	GNC_PARM_SAA2POLY_LONG_09 (deg) SAA Polygon Definition
VSGSAA2PLONG10	itos_dbx_tlm	314	GNC_PARM_SAA2POLY_LONG_10 (deg) SAA Polygon Definition
VSGSAA2PLONG11	itos_dbx_tlm	314	GNC_PARM_SAA2POLY_LONG_11 (deg) SAA Polygon Definition
VSGSAA2PLONG12	itos_dbx_tlm	0	GNC_PARM_SAA2POLY_LONG_12 (deg) SAA Polygon Definition

Appendix B. LICOS SC Housekeeping Packet Definition

Below is a piece of the LICOS Python script that defines the class representation of the extracted
LAT-related housekeeping telemetry from the original SC packets. The piece shows the class
definition for ApIDs 0,1, and 2. Note that most of the packet is defined as
"ZEROED_SC_PADxx_nnn" which creates placeholders in the definition where original SC
telemetry items were zeroed out. Note that in this representation both the data and the mnemonics
of SC housekeeping not related to LAT are deleted from the LICOS process.

```python
class LCAT_TlmPacket000(LCAT_TlmPacket):
  def __init__(self,ui):
    self.hdrList = [
    ('H000APID', 'APID 0x000 Application ID'),
    ('H000SHDR', 'APID 0x000 Secondary Header Flag'),
    ('H000PTYP', 'APID 0x000 CCSDS Packet Type'),
    ('H000PVER', 'APID 0x000 Packet Version'),
    ('H000SCNT', 'APID 0x000 Sequence Count'),
    ('H000SEQF', 'APID 0x000 Sequence Flag'),
    ('H000PLEN', 'APID 0x000 Packet Length'),
    ('H000SECONDS', 'APID 0x000 Timestamp Seconds'),
    ('H000SUBSECS', 'APID 0x000 Timestamp Subseconds'),
    ]
    self.mnemList = [
    ('ZEROED_SC_PAD32_000', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_001', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_002', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_003', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_004', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_005', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_006', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_007', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_008', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_009', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_010', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_011', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_012', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('SE_PDUA_SW_L2_I', 'VSC_ADC_U21', 'PDU A, Switched LCB Bus Current 2(7:0)', '', 'short', ''),
    ('SE_PDUA_ESB_V', 'VSC_ADC_U21', 'PDU A, Bus Voltage', '', 'short', ''),
    ('ZEROED_SC_PAD16_013', 'ZEROED_SC_PAD16', '', '', 'unsigned short', ''),
    ('SE_PDUA_SW_L4_I', 'VSC_ADC_U21', 'PDU A, Switched LCB Bus Current 4(7:0)', '', 'short', ''),
    ('ZEROED_SC_PAD32_014', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_015', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_016', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_017', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_018', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_019', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_020', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_021', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('SE_PDUB_SW_L2_I', 'VSC_ADC_U21', 'PDU B, Switched LCB Bus Current 2(7:0)', '', 'short', ''),
    ('SE_PDUB_ESB_V', 'VSC_ADC_U21', 'PDU B, Bus Voltage', '', 'short', ''),
    ('ZEROED_SC_PAD16_022', 'ZEROED_SC_PAD16', '', '', 'unsigned short', ''),
    ('SE_PDUB_SW_L4_I', 'VSC_ADC_U21', 'PDU B, Switched LCB Bus Current 4(7:0)', '', 'short', ''),
    ('ZEROED_SC_PAD32_023', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_024', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_025', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_026', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_027', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_028', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD8_029', 'ZEROED_SC_PAD8', '', '', 'unsigned char', ''),
    ('ZEROED_SC_PAD3_030', 'ZEROED_SC_PAD3', '', '1', 'unsigned char', ''),
    ('SD_AA_CPUB', 'VSC_BIT1', 'CPU B ON', '1', 'unsigned char', ''),
    ('ZEROED_SC_PAD3_031', 'ZEROED_SC_PAD3', '', '1', 'unsigned char', ''),
    ('SD_AA_CPUA', 'VSC_BIT1', 'CPU A ON', '1', 'unsigned char', ''),
```

```
    ('ZEROED_SC_PAD16_032', 'ZEROED_SC_PAD16', '', '', 'unsigned short', ''),
    ('ZEROED_SC_PAD32_033', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_034', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD8_035', 'ZEROED_SC_PAD8', '', '', 'unsigned char', ''),
    ('ZEROED_SC_PAD3_036', 'ZEROED_SC_PAD3', '', '1', 'unsigned char', ''),
    ('SD_AB_CPUB', 'VSC_BIT1', 'CPU B ON', '1', 'unsigned char', ''),
    ('ZEROED_SC_PAD3_037', 'ZEROED_SC_PAD3', '', '1', 'unsigned char', ''),
    ('SD_AB_CPUA', 'VSC_BIT1', 'CPU A ON', '1', 'unsigned char', ''),
    ('ZEROED_SC_PAD16_038', 'ZEROED_SC_PAD16', '', '', 'unsigned short', ''),
    ('SE_PRU_P_DAQ_V', 'VSC_ADC_U21', 'EPS Primary DAQ Feeder Voltage', '', 'short', ''),
    ('SE_PRU_R_DAQ_V', 'VSC_ADC_U21', 'EPS Redundant DAQ Feeder Voltage', '', 'short', ''),
    ('SE_PRU_P_SIU_V', 'VSC_ADC_U21', 'EPS Primary PRU SIU/VCHP Bus Voltage', '', 'short', ''),
    ('SE_PRU_R_SIU_V', 'VSC_ADC_U21', 'EPS Redundant PRU SIU/VCHP Bus Voltage', '', 'short', ''),
    ('ZEROED_SC_PAD32_039', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_040', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('L_DAQ_P_SIU_V', 'VSC_ADC_U21', 'LAT Primary SIU Voltage', '', 'short', ''),
    ('L_DAQ_R_SIU_V', 'VSC_ADC_U21', 'LAT Redundant SIU Voltage', '', 'short', ''),
    ('L_DAQ_P_PDU_V', 'VSC_ADC_U21', 'LAT Primary PDU Voltage', '', 'short', ''),
    ('L_DAQ_R_PDU_V', 'VSC_ADC_U21', 'LAT Redundant PDU Voltage', '', 'short', ''),
    ('L_DAQ_P_GEM33_V', 'VSC_ADC_U21', 'GASU CRU GEM 0    3.3 V', '', 'short', ''),
    ('L_DAQ_R_GEM33_V', 'VSC_ADC_U21', 'GASU CRU GEM 1    3.3 V', '', 'short', ''),
    ('L_MCH_PY_P_HTRV', 'VSC_ADC_U21', 'LAT +Y VCHP Reservoir Primary Heater Voltage', '', 'short',
''),
    ('L_MCH_NY_P_HTRV', 'VSC_ADC_U21', 'LAT -Y VCHP Reservoir Primary Heater Voltage', '', 'short',
''),
    ('L_MCH_PY_R_HTRV', 'VSC_ADC_U21', 'LAT +Y VCHP Reservoir Redundant Heater Voltage', '',
'short', ''),
    ('L_MCH_NY_R_HTRV', 'VSC_ADC_U21', 'LAT -Y VCHP Reservoir Redundant Heater Voltage', '',
'short', ''),
    ('L_DAQ_P_RSF_V', 'VSC_ADC_U21', 'LAT Primary Regulated SIU Feeder Voltage', '', 'short', ''),
    ('L_DAQ_R_RSF_V', 'VSC_ADC_U21', 'LAT Redundant Regulated SIU Feeder Voltage', '', 'short',
''),
    ('L_DAQ_P_RVF_V', 'VSC_ADC_U21', 'LAT Primary Regulated VCHP Feeder Voltage', '', 'short', ''),
    ('L_DAQ_R_RVF_V', 'VSC_ADC_U21', 'LAT Redundant Regulated VCHP Feeder Voltage', '', 'short',
''),
    ('L_SPARE_9V', 'VSC_ADC_U21', 'LAT Spare 9 Voltage', '', 'short', ''),
    ('L_SPARE_10V', 'VSC_ADC_U21', 'LAT Spare 10 Voltage', '', 'short', ''),
    ('L_DAQ_P_GEM25_V', 'VSC_ADC_U21', 'GASU CRU GEM 0    2.5 V', '', 'short', ''),
    ('L_DAQ_R_GEM25_V', 'VSC_ADC_U21', 'GASU CRU GEM 1    2.5 V', '', 'short', ''),
    ('L_SPARE_13V', 'VSC_ADC_U21', 'LAT Spare 13 Voltage', '', 'short', ''),
    ('L_SPARE_14V', 'VSC_ADC_U21', 'LAT Spare 14 Voltage', '', 'short', ''),
    ('L_SPARE_15V', 'VSC_ADC_U21', 'LAT Spare 15 Voltage', '', 'short', ''),
    ('L_SPARE_16V', 'VSC_ADC_U21', 'LAT Spare 16 Voltage', '', 'short', ''),
    ('L_DAQ_P_EBM33_V', 'VSC_ADC_U21', 'GASU AEM EBM 0    3.3 V', '', 'short', ''),
    ('L_DAQ_P_EBM25_V', 'VSC_ADC_U21', 'GASU AEM EBM 0    2.5 V', '', 'short', ''),
    ('L_SPARE_19V', 'VSC_ADC_U21', 'LAT Spare 19 Voltage', '', 'short', ''),
    ('L_SPARE_20V', 'VSC_ADC_U21', 'LAT Spare 20 Voltage', '', 'short', ''),
    ('L_DAQ_R_EBM33_V', 'VSC_ADC_U21', 'GASU AEM EBM 1    3.3 V', '', 'short', ''),
    ('L_DAQ_R_EBM25_V', 'VSC_ADC_U21', 'GASU AEM EBM 1    2.5 V', '', 'short', ''),
    ('L_SPARE_23V', 'VSC_ADC_U21', 'LAT Spare 23 Voltage', '', 'short', ''),
    ('L_SPARE_24V', 'VSC_ADC_U21', 'LAT Spare 24 Voltage', '', 'short', ''),
    ('ZEROED_SC_PAD32_041', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_042', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_043', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_044', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_045', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_046', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_047', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_048', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_049', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_050', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_051', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_052', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_053', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_054', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_055', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_056', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ]
    LCAT_TlmPacket.__init__(self,ui)
    self.apid  = 0
    self.length = 294
```

```python
    self.name  = "SC000"
    self.brief = ""
    self.descr = ""

class LCAT_TlmPacket001(LCAT_TlmPacket):
  def __init__(self,ui):
    self.hdrList = [
    ('H001APID', 'APID 0x001 Application ID'),
    ('H001SHDR', 'APID 0x001 Secondary Header Flag'),
    ('H001PTYP', 'APID 0x001 CCSDS Packet Type'),
    ('H001PVER', 'APID 0x001 Packet Version'),
    ('H001SCNT', 'APID 0x001 Sequence Count'),
    ('H001SEQF', 'APID 0x001 Sequence Flag'),
    ('H001PLEN', 'APID 0x001 Packet Length'),
    ('H001SECONDS', 'APID 0x001 Timestamp Seconds'),
    ('H001SUBSECS', 'APID 0x001 Timestamp Subseconds'),
    ]
    self.mnemList = [
    ('ZEROED_SC_PAD32_000', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_001', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_002', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_003', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_004', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_005', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_006', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_007', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_008', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_009', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_010', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_011', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_012', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_013', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_014', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_015', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_016', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('SE_PDUA_SW_L2_I', 'VSC_ADC_U21', 'PDU A, Switched LCB Bus Current 2(7:0)', '', 'short', ''),
    ('SE_PDUA_ESB_V', 'VSC_ADC_U21', 'PDU A, Bus Voltage', '', 'short', ''),
    ('ZEROED_SC_PAD16_017', 'ZEROED_SC_PAD16', '', '', 'unsigned short', ''),
    ('SE_PDUA_SW_L4_I', 'VSC_ADC_U21', 'PDU A, Switched LCB Bus Current 4(7:0)', '', 'short', ''),
    ('ZEROED_SC_PAD32_018', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_019', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_020', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_021', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_022', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_023', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_024', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_025', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('SE_PDUB_SW_L2_I', 'VSC_ADC_U21', 'PDU B, Switched LCB Bus Current 2(7:0)', '', 'short', ''),
    ('SE_PDUB_ESB_V', 'VSC_ADC_U21', 'PDU B, Bus Voltage', '', 'short', ''),
    ('ZEROED_SC_PAD16_026', 'ZEROED_SC_PAD16', '', '', 'unsigned short', ''),
    ('SE_PDUB_SW_L4_I', 'VSC_ADC_U21', 'PDU B, Switched LCB Bus Current 4(7:0)', '', 'short', ''),
    ('ZEROED_SC_PAD32_027', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_028', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_029', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_030', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_031', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_032', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_033', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_034', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_035', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_036', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('SE_PRU_P_DAQ_V', 'VSC_ADC_U21', 'EPS Primary DAQ Feeder Voltage', '', 'short', ''),
    ('SE_PRU_R_DAQ_V', 'VSC_ADC_U21', 'EPS Redundant DAQ Feeder Voltage', '', 'short', ''),
    ('SE_PRU_P_SIU_V', 'VSC_ADC_U21', 'EPS Primary PRU SIU/VCHP Bus Voltage', '', 'short', ''),
    ('SE_PRU_R_SIU_V', 'VSC_ADC_U21', 'EPS Redundant PRU SIU/VCHP Bus Voltage', '', 'short', ''),
    ('ZEROED_SC_PAD32_037', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_038', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_039', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_040', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_041', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_042', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
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      ('ZEROED_SC_PAD32_045', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
      ('ZEROED_SC_PAD32_046', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
      ('ZEROED_SC_PAD32_047', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
      ('ZEROED_SC_PAD32_048', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
      ('ZEROED_SC_PAD32_049', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
      ('ZEROED_SC_PAD32_050', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
      ('ZEROED_SC_PAD32_051', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
      ('ZEROED_SC_PAD32_052', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
      ('ZEROED_SC_PAD32_053', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
      ('ZEROED_SC_PAD32_054', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
      ('ZEROED_SC_PAD32_055', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
      ('ZEROED_SC_PAD32_056', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
      ('ZEROED_SC_PAD32_057', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
      ('ZEROED_SC_PAD32_058', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
      ('ZEROED_SC_PAD32_059', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
      ('ZEROED_SC_PAD32_060', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
      ('ZEROED_SC_PAD16_061', 'ZEROED_SC_PAD16', '', '', 'unsigned short', ''),
      ('SE_PAL2_CB1_S_2', 'VSC_BIT1', 'PDU A LCB2 CB1 Status 2', '1', 'unsigned char', ''),
      ('SE_PAL2_CB1_S_1', 'VSC_BIT1', 'PDU A LCB2 CB1 Status 1', '1', 'unsigned char', ''),
      ('SE_PAL2_CB1_CMD', 'VSC_BIT1', 'PDU A LCB2 CB1 Command', '1', 'unsigned char', ''),
      ('SE_PAL2_CB1_PWR', 'VSC_BIT1', 'PDU A LCB2 CB1 Power Status', '1', 'unsigned char', ''),
      ('SE_PAL2_CB2_S_2', 'VSC_BIT1', 'PDU A LCB2 CB2 Status 2', '1', 'unsigned char', ''),
      ('SE_PAL2_CB2_S_1', 'VSC_BIT1', 'PDU A LCB2 CB2 Status 1', '1', 'unsigned char', ''),
      ('SE_PAL2_CB2_CMD', 'VSC_BIT1', 'PDU A LCB2 CB2 Command', '1', 'unsigned char', ''),
      ('SE_PAL2_CB2_PWR', 'VSC_BIT1', 'PDU A LCB2 CB2 Power Status', '1', 'unsigned char', ''),
      ('ZEROED_SC_PAD16_062', 'ZEROED_SC_PAD16', '', '', 'unsigned short', ''),
      ('SE_PAL2_CB7_S_2', 'VSC_BIT1', 'PDU A LCB2 CB7 Status 2', '1', 'unsigned char', ''),
      ('SE_PAL2_CB7_S_1', 'VSC_BIT1', 'PDU A LCB2 CB7 Status 1', '1', 'unsigned char', ''),
      ('SE_PAL2_CB7_CMD', 'VSC_BIT1', 'PDU A LCB2 CB7 Command', '1', 'unsigned char', ''),
      ('SE_PAL2_CB7_PWR', 'VSC_BIT1', 'PDU A LCB2 CB7 Power Status', '1', 'unsigned char', ''),
      ('SE_PAL2_CB8_S_2', 'VSC_BIT1', 'PDU A LCB2 CB8 Status 2', '1', 'unsigned char', ''),
      ('SE_PAL2_CB8_S_1', 'VSC_BIT1', 'PDU A LCB2 CB8 Status 1', '1', 'unsigned char', ''),
      ('SE_PAL2_CB8_CMD', 'VSC_BIT1', 'PDU A LCB2 CB8 Command', '1', 'unsigned char', ''),
      ('SE_PAL2_CB8_PWR', 'VSC_BIT1', 'PDU A LCB2 CB8 Power Status', '1', 'unsigned char', ''),
      ('ZEROED_SC_PAD32_063', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
      ('ZEROED_SC_PAD32_064', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
      ('ZEROED_SC_PAD32_065', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
      ('ZEROED_SC_PAD16_066', 'ZEROED_SC_PAD16', '', '', 'unsigned short', ''),
      ]
      LCAT_TlmPacket.__init__(self,ui)
      self.apid  = 1
      self.length = 294
      self.name  = "SC001"
      self.brief = ""
      self.descr = ""

class LCAT_TlmPacket002(LCAT_TlmPacket):
  def __init__(self,ui):
    self.hdrList = [
    ('H002APID', 'APID 0x002 Application ID'),
    ('H002SHDR', 'APID 0x002 Secondary Header Flag'),
    ('H002PTYP', 'APID 0x002 CCSDS Packet Type'),
    ('H002PVER', 'APID 0x002 Packet Version'),
    ('H002SCNT', 'APID 0x002 Sequence Count'),
    ('H002SEQF', 'APID 0x002 Sequence Flag'),
    ('H002PLEN', 'APID 0x002 Packet Length'),
    ('H002SECONDS', 'APID 0x002 Timestamp Seconds'),
    ('H002SUBSECS', 'APID 0x002 Timestamp Subseconds'),
    ]
    self.mnemList = [
    ('ZEROED_SC_PAD8_000', 'ZEROED_SC_PAD8', '', '', 'unsigned char', ''),
    ('SE_PAL3_SIU_S', 'VSC_BIT1', 'PDU A LCB3 SIU SW', '1', 'unsigned char', ''),
    ('SE_PAL3_VCHP_S', 'VSC_BIT1', 'PDU A LCB3 VCHP SW', '1', 'unsigned char', ''),
    ('ZEROED_SC_PAD6_001', 'ZEROED_SC_PAD6', '', '1', 'unsigned char', ''),
    ('ZEROED_SC_PAD32_002', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD32_003', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
    ('ZEROED_SC_PAD8_004', 'ZEROED_SC_PAD8', '', '', 'unsigned char', ''),
    ('SE_PAL4_SIU_INH', 'VSC_BIT1', 'PDU A SIU Inhibit Status', '1', 'unsigned char', ''),
    ('SE_PAL4_DAQ_INH', 'VSC_BIT1', 'PDU A DAQ Inhibit Status', '1', 'unsigned char', ''),
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('ZEROED_SC_PAD6_005', 'ZEROED_SC_PAD6', '', '1', 'unsigned char', ''),
('ZEROED_SC_PAD16_006', 'ZEROED_SC_PAD16', '', '', 'unsigned short', ''),
('ZEROED_SC_PAD3_007', 'ZEROED_SC_PAD3', '', '1', 'unsigned char', ''),
('SE_PDUA_NEB2', 'VSC_BIT1', 'PDU A NEB2 State', '1', 'unsigned char', ''),
('ZEROED_SC_PAD1_008', 'ZEROED_SC_PAD1', '', '1', 'unsigned char', ''),
('SE_PDUA_NEB4', 'VSC_BIT1', 'PDU A NEB4 State', '1', 'unsigned char', ''),
('ZEROED_SC_PAD2_009', 'ZEROED_SC_PAD2', '', '1', 'unsigned char', ''),
('ZEROED_SC_PAD8_010', 'ZEROED_SC_PAD8', '', '', 'unsigned char', ''),
('ZEROED_SC_PAD32_011', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
('ZEROED_SC_PAD32_012', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
('ZEROED_SC_PAD32_013', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
('ZEROED_SC_PAD32_014', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
('ZEROED_SC_PAD32_015', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
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('ZEROED_SC_PAD32_017', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
('ZEROED_SC_PAD32_018', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
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('ZEROED_SC_PAD32_021', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
('ZEROED_SC_PAD32_022', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
('ZEROED_SC_PAD32_023', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
('ZEROED_SC_PAD32_024', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
('ZEROED_SC_PAD32_025', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
('SE_PDUA_SW_L2_I', 'VSC_ADC_U21', 'PDU A, Switched LCB Bus Current 2(7:0)', '', 'short', ''),
('SE_PDUA_ESB_V', 'VSC_ADC_U21', 'PDU A, Bus Voltage', '', 'short', ''),
('ZEROED_SC_PAD16_026', 'ZEROED_SC_PAD16', '', '', 'unsigned short', ''),
('SE_PDUA_SW_L4_I', 'VSC_ADC_U21', 'PDU A, Switched LCB Bus Current 4(7:0)', '', 'short', ''),
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('ZEROED_SC_PAD32_028', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
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('ZEROED_SC_PAD32_030', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
('ZEROED_SC_PAD32_031', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
('ZEROED_SC_PAD32_032', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
('ZEROED_SC_PAD32_033', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
('ZEROED_SC_PAD32_034', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
('SE_PDUB_SW_L2_I', 'VSC_ADC_U21', 'PDU B, Switched LCB Bus Current 2(7:0)', '', 'short', ''),
('SE_PDUB_ESB_V', 'VSC_ADC_U21', 'PDU B, Bus Voltage', '', 'short', ''),
('ZEROED_SC_PAD16_035', 'ZEROED_SC_PAD16', '', '', 'unsigned short', ''),
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('ZEROED_SC_PAD32_044', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
('ZEROED_SC_PAD32_045', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
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('SE_PRU_R_DAQ_V', 'VSC_ADC_U21', 'EPS Redundant DAQ Feeder Voltage', '', 'short', ''),
('SE_PRU_P_SIU_V', 'VSC_ADC_U21', 'EPS Primary PRU SIU/VCHP Bus Voltage', '', 'short', ''),
('SE_PRU_R_SIU_V', 'VSC_ADC_U21', 'EPS Redundant PRU SIU/VCHP Bus Voltage', '', 'short', ''),
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('ZEROED_SC_PAD32_063', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
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('ZEROED_SC_PAD32_066', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
('ZEROED_SC_PAD32_067', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
('ZEROED_SC_PAD32_068', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
('ZEROED_SC_PAD16_069', 'ZEROED_SC_PAD16', '', '', 'unsigned short', ''),
('SE_PBL2_CB1_S_2', 'VSC_BIT1', 'PDU-B LCB2 CB1 Status 2', '1', 'unsigned char', ''),
('SE_PBL2_CB1_S_1', 'VSC_BIT1', 'PDU-B LCB2 CB1 Status 1', '1', 'unsigned char', ''),
('SE_PBL2_CB1_CMD', 'VSC_BIT1', 'PDU-B LCB2 CB1 Command', '1', 'unsigned char', ''),
('SE_PBL2_CB1_PWR', 'VSC_BIT1', 'PDU-B LCB2 CB1 Power Status', '1', 'unsigned char', ''),
('SE_PBL2_CB2_S_2', 'VSC_BIT1', 'PDU-B LCB2 CB2 Status 2', '1', 'unsigned char', ''),
('SE_PBL2_CB2_S_1', 'VSC_BIT1', 'PDU-B LCB2 CB2 Status 1', '1', 'unsigned char', ''),
('SE_PBL2_CB2_CMD', 'VSC_BIT1', 'PDU-B LCB2 CB2 Command', '1', 'unsigned char', ''),
('SE_PBL2_CB2_PWR', 'VSC_BIT1', 'PDU-B LCB2 CB2 Power Status', '1', 'unsigned char', ''),
('ZEROED_SC_PAD16_070', 'ZEROED_SC_PAD16', '', '', 'unsigned short', ''),
('SE_PBL2_CB7_S_2', 'VSC_BIT1', 'PDU-B LCB2 CB7 Status 2', '1', 'unsigned char', ''),
('SE_PBL2_CB7_S_1', 'VSC_BIT1', 'PDU-B LCB2 CB7 Status 1', '1', 'unsigned char', ''),
('SE_PBL2_CB7_CMD', 'VSC_BIT1', 'PDU-B LCB2 CB7 Command', '1', 'unsigned char', ''),
('SE_PBL2_CB7_PWR', 'VSC_BIT1', 'PDU-B LCB2 CB7 Power Status', '1', 'unsigned char', ''),
('SE_PBL2_CB8_S_2', 'VSC_BIT1', 'PDU-B LCB2 CB8 Status 2', '1', 'unsigned char', ''),
('SE_PBL2_CB8_S_1', 'VSC_BIT1', 'PDU-B LCB2 CB8 Status 1', '1', 'unsigned char', ''),
('SE_PBL2_CB8_CMD', 'VSC_BIT1', 'PDU-B LCB2 CB8 Command', '1', 'unsigned char', ''),
('SE_PBL2_CB8_PWR', 'VSC_BIT1', 'PDU-B LCB2 CB8 Power Status', '1', 'unsigned char', ''),
('ZEROED_SC_PAD32_071', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
('ZEROED_SC_PAD32_072', 'ZEROED_SC_PAD32', '', '', 'unsigned int', ''),
('ZEROED_SC_PAD16_073', 'ZEROED_SC_PAD16', '', '', 'unsigned short', ''),
]
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