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Telemetry Handbook

For the COSMOS Demo Project



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Telemetry Packets

COSMOS LIMITS_CHANGE

COSMOS limits change

Item Name	Description	Bit Offset	Bit Size	Data Type	Units Format
RECEIVED_TIMESECONDS	COSMOS Received Time (UTC, Floating point, Unix epoch) Read Conversion: ReceivedTimeSecondsConversion	0	0	DERIVED	%0.6f
RECEIVED_TIMEFORMATTED	COSMOS Received Time (Local time zone, Formatted string) Read Conversion: ReceivedTimeFormattedConversion	0	0	DERIVED	
RECEIVED_COUNT	COSMOS packet received count Read Conversion: ReceivedCountConversion	0	0	DERIVED	
PKT_ID	Packet ID Id Value: 2	0	8	UINT	
TARGET	Target name	8	240	STRING	
PACKET	Packet name	248	240	STRING	
ITEM	Item that changed limits state	488	240	STRING	
OLD_STATE	The old limit state	728	240	STRING	
NEW_STATE	The new limit state	968	240	STRING	

COSMOS VERSION

COSMOS version information

Item Name	Description	Bit Offset	Bit Size	Data Type	Units Format
RECEIVED_TIMESECONDS	COSMOS Received Time (UTC, Floating point, Unix epoch) Read Conversion: ReceivedTimeSecondsConversion	0	0	DERIVED	%0.6f
RECEIVED_TIMEFORMATTED	COSMOS Received Time (Local time zone, Formatted string) Read Conversion: ReceivedTimeFormattedConversion	0	0	DERIVED	
RECEIVED_COUNT	COSMOS packet received count Read Conversion: ReceivedCountConversion	0	0	DERIVED	
PKT_ID	Packet ID Id Value: 1	0	8	UINT	
COSMOS	COSMOS version	8	240	STRING	
RUBY	Ruby version	248	240	STRING	
CTDB	Command Telemetry Database Version	488	240	STRING	
USER	User Version	728	240	STRING	

PI HOUSEKEEPING

housekeeping telemetry

Bit Bit Data



Item Name	Description	Bit Offset	Bit Size	Data Type	Units Format
RECEIVED_TIMESECONDS	COSMOS Received Time (UTC, Floating point, Unix epoch) Read Conversion: ReceivedTimeSecondsConversion	0	0	DERIVED	%0.6f
RECEIVED_TIMEFORMATTED	COSMOS Received Time (Local time zone, Formatted string) Read Conversion: ReceivedTimeFormattedConversion	0	0	DERIVED	
RECEIVED_COUNT	COSMOS packet received count Read Conversion: ReceivedCountConversion	0	0	DERIVED	
LENGTH	length of packet in bytes	0	32	UINT	
PKT_ID	packet id which must be 0xFF Id Value: 255	32	8	UINT	
TIMESTAMP	system time in seconds since epoch Read Conversion: Timestamp	40	64	UINT	%0.6f
QUEUE_SIZE	size of telemetry queue	104	16	UINT	
CPU_TEMP	temperature of CPU (degrees C)	120	32	FLOAT	
CPU_LOAD	one minute cpu load average	152	32	FLOAT	
MEM_USAGE	bytes of memory in use	184	32	UINT	

PI LEVEL

Level sensor packet

Item Name	Description	Bit Offset	Bit Size	Data Type	Units Format
RECEIVED_TIMESECONDS	COSMOS Received Time (UTC, Floating point, Unix epoch) Read Conversion: ReceivedTimeSecondsConversion	0	0	DERIVED	%0.6f
RECEIVED_TIMEFORMATTED	COSMOS Received Time (Local time zone, Formatted string) Read Conversion: ReceivedTimeFormattedConversion	0	0	DERIVED	
RECEIVED_COUNT	COSMOS packet received count Read Conversion: ReceivedCountConversion	0	0	DERIVED	
LEVEL_VOLTS	ADC voltage measurement of level sensor Read ProcessorConversion L_CONVERSIONS Conversion: LEVEL_VOLTS	0	0	DERIVED V	
LEVEL_INCHES	level of liquid level sensor in inches Read ProcessorConversion L_CONVERSIONS Conversion: LEVEL_INCHES	0	0	DERIVED in	
LENGTH	length of packet in bytes	0	32	UINT	
PKT_ID	packet id which must be 0x40 Id Value: 64	32	8	UINT	
TIMESTAMP	system time in seconds since epoch Read Conversion: Timestamp	40	64	UINT	%0.6f
LEVEL_RAW	raw liquid level sensor value	104	32	UINT	

PI POWER

Pump power packet

Bit Bit Data



Item Name	Description	Bit Offset	Bit Size	Data Type	Units	Format
RECEIVED_TIMESECONDS	COSMOS Received Time (UTC, Floating point, Unix epoch) Read Conversion: ReceivedTimeSecondsConversion	0	0	DERIVED		%0.6f
RECEIVED_TIMEFORMATTED	COSMOS Received Time (Local time zone, Formatted string) Read Conversion: ReceivedTimeFormattedConversion	0	0	DERIVED		
RECEIVED_COUNT	COSMOS packet received count Read Conversion: ReceivedCountConversion	0	0	DERIVED		
VOLTAGE	measurement of voltage used to drive pump Read ProcessorConversion Conversion: POWER_CONVERSIONS VOLTAGE	0	0	DERIVED	V	
AMPERAGE	measurement of amperage pulled by pump Read ProcessorConversion Conversion: POWER_CONVERSIONS AMPERAGE	0	0	DERIVED	A	
WATTS	measurement of power consumed by pump Read ProcessorConversion Conversion: POWER_CONVERSIONS POWER	0	0	DERIVED	W	
LENGTH	length of packet in bytes	0	32	UINT		
PKT_ID	packet id which must be 0x50 Id Value: 80	32	8	UINT		
VOLTAGE_TIMESTAMP	voltage - system timestamp in seconds since epoch Read Conversion: Timestamp	40	64	UINT		%0.6f
VOLTAGE_RAW	raw measurement of voltage used to drive pump	104	32	UINT		
AMPERAGE_TIMESTAMP	amperage - system timestamp in seconds since epoch Read Conversion: Timestamp	136	64	UINT		%0.6f
AMPERAGE_RAW	raw measurement of amperage pulled by pump	200	32	UINT		

PI PRESSURE

pressure sensor readings

Item Name	Description	Bit Offset	Bit Size	Data Type	Units	Format
RECEIVED_TIMESECONDS	COSMOS Received Time (UTC, Floating point, Unix epoch) Read Conversion: ReceivedTimeSecondsConversion	0	0	DERIVED		%0.6f
RECEIVED_TIMEFORMATTED	COSMOS Received Time (Local time zone, Formatted string) Read Conversion: ReceivedTimeFormattedConversion	0	0	DERIVED		
RECEIVED_COUNT	COSMOS packet received count Read Conversion: ReceivedCountConversion	0	0	DERIVED		
VENTURI_VOLTS	voltage measurement of venturi ADC Read ProcessorConversion P_CONVERSIONS Conversion: VENTURI_VOLTS	0	0	DERIVED	V	
VENTURI_CURRENT	current measurement of venturi ADC Read ProcessorConversion P_CONVERSIONS Conversion: VENTURI_CURRENT	0	0	DERIVED	mA	
VENTURI_PRESSURE	differential pressure measurement of venturi Read ProcessorConversion P_CONVERSIONS	0	0	DERIVED	psid	



Conversion: VENTURI_PRESSURE					
flow rate measurement of venturi					
VENTURI_FLOW	Read ProcessorConversion P_CONVERSIONS Conversion: VENTURI_FLOW	0	0	DERIVED mL/min	
voltage measurement of ADC from differential pressure across pump					
PUMP_VOLTS	Read ProcessorConversion P_CONVERSIONS Conversion: PUMP_VOLTS	0	0	DERIVED V	
current measurement of ADC from differential pressure across pump					
PUMP_CURRENT	Read ProcessorConversion P_CONVERSIONS Conversion: PUMP_CURRENT	0	0	DERIVED mA	
pressure differential across pump					
PUMP_PRESSURE	Read ProcessorConversion P_CONVERSIONS Conversion: PUMP_PRESSURE	0	0	DERIVED psid	
voltage measurement of static pressure ADC					
STATIC_VOLTS	Read ProcessorConversion P_CONVERSIONS Conversion: STATIC_VOLTS	0	0	DERIVED V	
current measurement of static pressure ADC					
STATIC_CURRENT	Read ProcessorConversion P_CONVERSIONS Conversion: STATIC_CURRENT	0	0	DERIVED mA	
pressure measurement of static pressure					
STATIC_PRESSURE	Read ProcessorConversion P_CONVERSIONS Conversion: STATIC_PRESSURE	0	0	DERIVED psig	
LENGTH	length of packet in bytes	0	32	UINT	
PKT_ID	packet id which must be 0x00 Id Value: 0	32	8	UINT	
VENTURI_TIME	venturi pressure timestamp in seconds since epoch Read Conversion: Timestamp	40	64	UINT	%.6f
VENTURI_RAW	venturi meter ADC code	104	32	UINT	
VENTURI_ZERO	zero value for venturi pressure	136	32	FLOAT	
PUMP_TIME	pump pressure timestamp in seconds since epoch Read Conversion: Timestamp	168	64	UINT	%.6f
PUMP_RAW	measured ADC code from pump pressure sensor	232	32	UINT	
PUMP_ZERO	zero value for pump pressure	264	32	FLOAT	
STATIC_TIME	static pressure timestamp in seconds since epoch Read Conversion: Timestamp	296	64	UINT	%.6f
STATIC_RAW	measured ADC code from static pressure sensor	360	32	UINT	
STATIC_ZERO	zero value for static pressure	392	32	FLOAT	

PI RPM

RPM of the pump

Item Name	Description	Bit Offset	Bit Size	Data Type	Units Format
RECEIVED_TIMESECONDS	COSMOS Received Time (UTC, Floating point, Unix epoch) Read Conversion: ReceivedTimeSecondsConversion	0	0	DERIVED	%.06f



RECEIVED_TIMEFORMATTED	COSMOS Received Time (Local time zone, Formatted string)	0	0	DERIVED	
	Read Conversion: ReceivedTimeFormattedConversion				
RECEIVED_COUNT	COSMOS packet received count	0	0	DERIVED	
	Read Conversion: ReceivedCountConversion				
LENGTH	length of packet in bytes	0	32	UINT	
PKT_ID	packet id which must be 0x20 Id Value: 32	32	8	UINT	
TIMESTAMP	system time in seconds since epoch	40	64	UINT	%.6f
	Read Conversion: Timestamp				
VALUE	measured RPM of the pump	104	16	UINT	

PI TEMPERATURE

temperature sensor reading

Item Name	Description	Bit Offset	Bit Size	Data Type	Units Format
RECEIVED_TIMESECONDS	COSMOS Received Time (UTC, Floating point, Unix epoch)	0	0	DERIVED	%.6f
	Read Conversion: ReceivedTimeSecondsConversion				
RECEIVED_TIMEFORMATTED	COSMOS Received Time (Local time zone, Formatted string)	0	0	DERIVED	
	Read Conversion: ReceivedTimeFormattedConversion				
RECEIVED_COUNT	COSMOS packet received count	0	0	DERIVED	
	Read Conversion: ReceivedCountConversion				
TEMP1_OHMS	calculated ohmage of temperature sensor #1				
	Read ProcessorConversion TEMP_CONVERSIONS	0	0	DERIVED	ohms
	Conversion: TEMP1_OHMS				
TEMP1	calculated temperature of temperature sensor #1				
	Read ProcessorConversion	0	0	DERIVED	C
	Conversion: TEMP_CONVERSIONS TEMP1				
TEMP2_OHMS	calculated ohmage of temperature sensor #2				
	Read ProcessorConversion TEMP_CONVERSIONS	0	0	DERIVED	ohms
	Conversion: TEMP2_OHMS				
TEMP2	calculated temperature of temperature sensor #1				
	Read ProcessorConversion	0	0	DERIVED	C
	Conversion: TEMP_CONVERSIONS TEMP2				
TEMP3_OHMS	calculated ohmage of temperature sensor #3				
	Read ProcessorConversion TEMP_CONVERSIONS	0	0	DERIVED	ohms
	Conversion: TEMP3_OHMS				
TEMP3	calculated temperature of temperature sensor #1				
	Read ProcessorConversion	0	0	DERIVED	C
	Conversion: TEMP_CONVERSIONS TEMP3				
TEMP4_OHMS	calculated ohmage of temperature sensor #4				
	Read ProcessorConversion TEMP_CONVERSIONS	0	0	DERIVED	ohms
	Conversion: TEMP4_OHMS				
TEMP4	calculated temperature of temperature sensor #1				
	Read ProcessorConversion	0	0	DERIVED	C



	Conversion: TEMP_CONVERSIONS TEMP4				
LENGTH	length of packet in bytes	0	32	UINT	
PKT_ID	packet id which must be 0x10 Id Value: 16	32	8	UINT	
TIME1	temp1 timestamp in seconds since epoch Read Conversion: Timestamp	40	64	UINT	%.6f
TEMP1_RAW	measured value from temperature sensor #1	104	16	UINT	
TIME2	temp2 timestamp in seconds since epoch Read Conversion: Timestamp	120	64	UINT	%.6f
TEMP2_RAW	measured value from temperature sensor #2	184	16	UINT	
TIME3	temp3 timestamp in seconds since epoch Read Conversion: Timestamp	200	64	UINT	%.6f
TEMP3_RAW	measured value from temperature sensor #3	264	16	UINT	
TIME4	temp4 timestamp in seconds since epoch Read Conversion: Timestamp	280	64	UINT	%.6f
TEMP4_RAW	measured value from temperature sensor #4	344	16	UINT	
