A Summary of Spacecraft Engineering Sensors

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The attached table is a summary of the different types of engineering sensors that are used onboard a typical spacecraft. These sensors would be used to send telemetry on the health and operation of a spacecraft and its subsystems back to the ground operations centers. This telemetry would also be available to the onboard crew for onboard systems monitoring, if this happened to be an inhabited (manned) spacecraft. This sensor data would also be available to any fault protection or health management system flying on the spacecraft.

As such, data from these sensors would be the only data available for any the purposes described above.

The author created the first draft of this information, by creating sensor tables for each spacecraft subsystem. The author then asked the subsystems specialists in the JPL Team-X to review the resulting tables. The results of this review were used to update the initial result tables. The results of this update were then used to create the single table that is in this document.

Spacecraft Engineering Sensor Types

Sensor	CDS	Tcomm	GN&C AACS	Main Prop	OMS RCS	EPS	PTCS	ATCS	Mech	Stru
Current Sensor	X	X	X	X	X	X	X	X		
Voltage Sensor	X	X	X	X	X	X	X	X		
Temperature Sensor	X	X	X	X	X	X	X	X	X	X
Data Bus Monitor	X									
Processor Idle Time Monitor	X	X(1)	X(1)	X(1)	X(1)	X(1)	X(1)	X(1)	X(1)	
Task Completion Monitor	X	X(1)	X(1)	X(1)	X(1)	X(1)	X(1)	X(1)	X(1)	
Buffer Capacity Monitor	X	X(1)	X(1)	X(1)	X(1)	X(1)	X(1)	X(1)	X(1)	
Other Flight Software	X	X(1)	X(1)	X(1)	X(1)	X(1)	X(1)	X(1)	X(1)	
Digital H/W Built in Test Equipment	X	X(2)	X(2)	X(2)	X(2)	X(2)	X(2)	X(2)	X(2)	
RF Power Detector		X								
RF Carrier Detector		X								
Position Sensor		X		X	X	X			X	
Angle Encoder			X						X	
Sun Sensor			X							
Derived Measurements for Specific Devices (3)			X							
Vibration Sensor (Accelerometer)			X	X						
Pressure Transducers				X	X	X		X	X	X
Acoustic (noise) Sensor				X						
Exhaust Plume Sensor (4)				X	X					
Strain Gauge				X	X					X
Flow Meter					X	X		X		
Optical Pyrometer (5)				X	X					
Tachometer						X			X	
Fluid Level						X				
Calorimeter							X			

NOTES:

1)   Health of digital avionics processes that may be used to support this subsystem could be monitored by this flight software sensor which is part of the operating system or flight software for another subsystem, such as the C&DH.

2)   Health of digital avionics hardware that may be used to support this subsystem could be monitored by this digital hardware build in test equipment (DBITE) which is part of another subsystem, such as the C&DH.

3)   This will be a derived measurement for a specific device, which is usually relatively complex. The specific measurement may require processing or computation on the output of the device, or of another device in order to monitor the device's health.

4)   This sensor could be an IR video sensor, a trace materials sensor (with or without laser induced fluorescence), or another type of sensor

5)   Can be used to monitor temperature of exterior wall of the combustion chamber

6)   Measurement of the Switch, Valve, Fuse, or Circuit Breaker state