

2.0 TELEMETRY DATABASE TABLES

The Telemetry Database (TDB) is a relational database that consists of the following tables:

- Telemetry System
- Owner
- Block
- Block Format
- Packet
- Packet Format
- Subset
- Subset Format
- TDM
- TDM Format
- Stream ID
- Measurement
- MSID Sampling
- MSID Location
- Counter
- Polynomial Calibration
- Point Pair
- State Code
- Calibration Switch
- Limit
- Limit Switch
- Expected State
- Expected State Switch
- Control Group
- Group Content
- GSE MSID
- GSE Packet

The following sections describe the columns of each TDB table. Column type definitions are defined in Appendix B. Appendix C contains legal characters and special characters.

The following summary of the tables is provided to give the reader an overview before proceeding into the details of the content of each table.

The Telemetry System table is used to differentiate one project TDB from another. It contains data relevant to the project and mission, the particular revision of the database, and historical dates for the revision. This table is stored with the TDB so that it can be retrieved from backups and restored in case of system faults.

The Owner table is used to cross-reference an owner identifier (ID) to a text description of the owner. Owners are a means by which telemetry measurements and streams are grouped so that privileges associated with the telemetry definition can be established. The authorized owner of the telemetry data can be several users who have the ability to view proprietary data or to

update the definition of the telemetry data. A user may be a spacecraft subsystem or payload, a HOSC console position, or anything else that the project wishes to use.

Several tables describe different types of telemetry streams. Telemetry standards for time division multiplexed (TDM) streams are defined in the MSFC-STD-1274A, Volume 1. Telemetry standards for packetized streams are defined in the MSFC-STD-1274B, Volume 2. Some types of streams can be encapsulated into other stream structures. The Block and Block Format tables are used to describe 4800-bit data blocks. The Packet and Packet Format tables describe Consultative Committee for Space Data System (CCSDS) packets. The Subset and Subset Format tables describe subsets that are embedded in packets or other subsets. The TDM and TDM Format tables describe streams that have a major frame/minor frame structure. Project streams will not normally require using all of these tables to define the telemetry streams. For example, a NASA Communication (NASCOM) block would be described using the Block, Block Format, Packet and Packet Format tables. Depending on the type of stream being processed, it is mandatory that appropriate tables be supplied. The Block Format, Packet Format, Subset Format and TDM Format tables contain the data that can change from format to format in a description of the Block, Packet, Subset, or TDM tables, respectively. The Stream ID table is used to define a Huntsville Operations Support Center (HOSC)-unique stream number for each format and stream.

The Measurement table is used to describe general information about each measurement. Each measurement in the database is accessed by using a measurement/stimulus identifier (MSID) name. The general information for a measurement includes a technical name, a descriptor, and an owner ID. General calibration or conversion information consists of a data type, calibration type, engineering units, low and high raw counts, and total data length. Low and high counts are not used by the real-time system, and are provided for information only. Other attributes of a measurement can be dependent on the real-time value of other measurements. For example, a measurement can be activated or deactivated, based on a counter or a range measurement. Also, other measurements can determine which calibration set, limit set, or expected state set is to be used.

The MSID Sampling table is used to define the parameter composition and the sampling composition of a measurement for each format of the data stream. The parameter composition defines the information required to define a single sample of data for a measurement. For example, a sample may be a number of contiguous bits, or a sample may require several non-contiguous syllables. Each of the syllables will consist of contiguous bits. The sampling composition defines the information required to define all the samples, such as sample rate and the offset to the next sample. This table also contains the information for a counter dependent or range dependent measurement for each format of the data stream.

The MSID Location table is used to define the location of the first sample for each format of the data stream. If a measurement is bit contiguous, only one syllable is required; otherwise, multi-syllables are required. This table contains the start word/octet, start bit, and data length of each syllable.

The Counter table is used to define the characteristics of a counter measurement. Within the different types of telemetry streams, various counters may be described that are used in the construction of the data stream. For example, a TDM data stream requires a minor frame

counter for checking data quality, and a major frame counter for counter dependent sampled data. A packet may require a counter for determining the sequence of data reception.

The Polynomial Calibration table is used to define the polynomial coefficients that are used to calibrate the measurement. The Point Pair table is used to define point pairs for line segments that are used to calibrate the measurement. The State Code table is used to convert a discrete measurement to a state code text. A measurement may have an entry in only one of these tables. The calibration type in the Measurement table defines which of these tables to use.

The Calibration Switch, Limit Switch, and Expected State Switch tables are used for switching between different sets of calibration, limit, or expected state data. Switching is based on the real-time value of the switch measurement. The switch measurement for each of these tables is found in the Measurement table.

The Limit table is used to describe caution and warning limits for a non-discrete measurement. The Expected State table is used to describe an expected state for a measurement that has state codes defined in the State Code table. Both of these tables are used to notify an application process of an unexpected or out-of-limit condition.

The Control Group and Group Content tables are used to describe a list of measurements whose set of expected states or limits should be activated based on a predefined time, or on a control measurement. The Control Group table defines the activation conditions for each group, and the Group Content table defines the measurements in each group.

The GSE MSID table contains the list of measurements, along with the location and the number of samples for each measurement, for each unique Ground Support Equipment (GSE) packet.

The GSE Packet table contains the definitions of each of the GSE packets.

Other constraints that apply to these tables are described in more detail in the sections devoted to each table. Column values that are required from the user must be provided by the user, and no system defaults are provided. Column values that are required by the system must be provided through one of the following means: the user provides that value, the system provides a default value, or the system derives a default value from other data that has been provided.

Table 2.0-1 is a summary of the columns contained in the TDB tables.

Table 2.0-1. Telemetry Database Tables Summary

TABLE NAME	COLUMN NAME
Telemetry	PROJECT, MISSION, REVISION, DELIVERED_DATE, PRE_RELEASE_DATE, BASELINE_DATE
Owner	OWNER_ID, DESCRIPTION
Block	BLOCK_ID, BLOCK_ID_MSID, FORMAT_ID_MSID
Block Format	BLOCK_ID, BLOCK_FORMAT_ID, FORMAT, ENCAP_STREAM_NUMBER
Packet	PACKET_ID, PROTOCOL, PACKET_ID_MSID, FORMAT_ID_MSID, TIME_MSID, SEC_HEADER, SEC_HEADER_LENGTH, CONTEXT_LVT_SIZE
Packet Format	PACKET_ID, PROTOCOL, PACKET_FORMAT_ID, FORMAT, LENGTH, UPDATE_CYCLE, DATA_CYCLE, SUBSET_FLAG

Table 2.0-1. Telemetry Database Tables Summary (Continued)

TABLE NAME	COLUMN NAME
Subset	SUBSET_ID, ENCAP_STREAM_NUMBER, SUBSET_ID_MSID, FORMAT_ID_MSID, TIME_MSID, SAMPLE_COMP, SAMPLE_RATE, DATA_CYCLE, START_OCTET, OFFSET, COUNTER_MSID, START_COUNTER_VALUE, COUNTER_OFFSET, RANGE_MSID, LOW_RANGE, HIGH_RANGE, STATE_CODE
Subset Format	SUBSET_ID, SUBSET_FORMAT_ID, FORMAT, LENGTH, SUBSET_FLAG
TDM	TDM_ID, FORMAT_ID_MSID, TIME_MSID, SYNC_PATTERN, SYNC_PATTERN_MSID, SYNC_LENGTH
TDM Format	TDM_ID, TDM_FORMAT_ID, FORMAT, BITS_PER_WORD, WORDS_PER_MINOR_FRAME, MINOR_FRAMES_PER_MAJOR_FRAME, DATA_CYCLE, MAJOR_FRAME_PERIOD, ENCAP_STREAM_NUMBER, ENCAP_BOUNDARY, ENCAP_FRAME_PER_PACKET
Stream ID	STREAM_NUMBER, STREAM_TYPE, STREAM_ID, STREAM_FORMAT_ID, PROTOCOL, STREAM_PRIORITY, STREAM_PROP, STREAM_OWNER_ID, STREAM_DESCRIPTION

Table 2.0-1. Telemetry Database Tables Summary (Continued)

TABLE NAME	COLUMN NAME
Measurement	MSID, TECHNICAL_NAME, DATA_TYPE, CALIBRATION_TYPE, ENG_UNIT, LOW_RAW_COUNT, HIGH_RAW_COUNT, TOTAL_LENGTH, PROP, COUNTER_MSID, RANGE_MSID, CALIBRATION_SWITCH_MSID, CALIBRATION_DEFAULT_SET_NUM, LIMIT_SWITCH_MSID, LIMIT_DEFAULT_SET_NUM, ES_SWITCH_MSID, ES_DEFAULT_SET_NUM, OWNER_ID, DESCRIPTION, EHS_HEADER_FLAG, LIMIT_LRVT_LOCATION EM_ERROR_DESCRIPTION
MSID Sampling	MSID, STREAM_NUMBER, PAR_COMP, SAMPLE_PER_GROUP, GROUP_SAMPLE_OFFSET, SAMPLE_COMP, SAMPLE_RATE, OFFSET, START_COUNTER_VALUE, COUNTER_OFFSET, LOW_RANGE, HIGH_RANGE, STATE_CODE, CONTEXT_PACKET_ID, CONTEXT_LVT_LOCATION, CONTEXT_PROTOCOL
MSID Location	MSID, STREAM_NUMBER, SYLLABLE_NUMBER, START_MINOR_FRAME, START_WORD, START_BIT, LENGTH

Table 2.0-1. Telemetry Database Tables Summary (Continued)

TABLE NAME	COLUMN NAME
Counter	MSID, STREAM_NUMBER, INIT_VALUE, END_VALUE, WRAP_AROUND_FLAG, DIR, DELTA, COUNTER_TYPE
Polynomial Calibration	MSID, CALIBRATION_SET_NUM, ENG_UNIT_LOW, ENG_UNIT_HIGH, DEG, COEF0, COEF1, COEF2, COEF3, COEF4, COEF5, COEF6, COEF7, COEF8, COEF9
Point Pair	MSID, CALIBRATION_SET_NUM, SEQUENCE_NUM, RAW_COUNT, ENG_UNIT_VALUE
State Code	MSID, CALIBRATION_SET_NUM, SEQUENCE_NUM, LOW_RAW_COUNT, HIGH_RAW_COUNT, STATE_CODE
Calibration Switch	MSID, CALIBRATION_SET_NUM, LOW_RANGE, HIGH_RANGE, STATE_CODE
Limit	MSID, LIMIT_SET_NUM, CAUTION_LOW, CAUTION_HIGH, WARNING_LOW, WARNING_HIGH, DELTA, TOLER, EM_ALL_SAMP_FLAG

Table 2.0-1. Telemetry Database Tables Summary (Continued)

TABLE NAME	COLUMN NAME
Limit Switch	MSID, LIMIT_SET_NUM, LOW_RANGE, HIGH_RANGE, STATE_CODE
Expected State	MSID, ES_SET_NUM, EXPECTED_STATE, TOLER, EM_ALL_SAMP_FLAG
Expected State Switch	MSID, ES_SET_NUM, LOW_RANGE, HIGH_RANGE, STATE_CODE
Control Group	GROUP_ID, PROJECT_EM, TIME_TYPE, START_TIME, STOP_TIME, CONTROL_MSID, CONTROL_LOW, CONTROL_HIGH, CONTROL_CODE, DELAY_TIME, OWNER_ID
Group Content	GROUP_ID, MSID, MSID_SET_NUM, DELAY_TIME
GSE MSID	GSE_PACKET_ID, MSID, START_OCTET, SAMPLE_RATE
GSE Packet	GSE_PACKET_ID, PARITY, BAUD_RATE, BYTE_SWAP, PROJECT_USER, LENGTH