

DS Requirements to Design Traceability

DS Version 2.6.0

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| **Requirement Number** | **Requirement Text** | **Software Design Element** | **Applicable Software Functions** |
| DS1000 | Upon receipt of a No-Op command, DS shall increment the DS Valid Command Counter and generate an event message. | Operation | DS\_CmdNoop |
| DS1001 | Upon receipt of a Reset Counters command, DS shall reset the following housekeeping variables to a value of zero:   a) Valid Command Counter   b) Command Rejected Counter   c) Packets discarded (DS was disabled) Counter   d) Packets discarded (pkt has no filter) Counter   e) Packets discarded (failed filter test) Counter   f) Packets that passed filter test Counter   g) Good destination file I/O Counter   h) Bad destination file I/O Counter   i) Good updates to secondary header Counter   j) Bad updates to secondary header Counter   k) Destination file table loads Counter   l) Failed attempts to get table data pointer Counter   m) Packet filter table loads Counter   n) Failed attempts to get table data pointer Counter | Operation | DS\_CmdReset |
| DS1002 | For all DS commands, if the length contained in the message header is not equal to the expected length, DS shall reject the command and issue an event message. | Operation | DS\_CmdNoop  DS\_CmdReset  DS\_CmdSetAppState  DS\_CmdSetFilterFile  DS\_CmdSetFilterType  DS\_CmdSetFilterParms  DS\_CmdSetDestType  DS\_CmdSetDestState  DS\_CmdSetDestPath  DS\_CmdSetDestBase  DS\_CmdSetDestExt  DS\_CmdSetDestSize  DS\_CmdSetDestAge  DS\_CmdSetDestCount  DS\_CmdCloseFile  DS\_CmdCloseAll  DS\_CmdGetFileInfo  DS\_CmdAddMID |
| DS1004 | If DS accepts any command as valid, DS shall execute the command, increment the DS Valid Command Counter and issue an event message. | Operation | DS\_CmdNoop  DS\_CmdReset  DS\_CmdSetAppState  DS\_CmdSetFilterFile  DS\_CmdSetFilterType  DS\_CmdSetFilterParms  DS\_CmdSetDestType  DS\_CmdSetDestState  DS\_CmdSetDestPath  DS\_CmdSetDestBase  DS\_CmdSetDestExt  DS\_CmdSetDestSize  DS\_CmdSetDestAge  DS\_CmdSetDestCount  DS\_CmdCloseFile  DS\_CmdCloseAll  DS\_CmdGetFileInfo  DS\_CmdAddMID |
| DS1005 | If DS rejects any command, DS shall abort the command execution, increment the DS Command Rejected Counter and issue an error event message. | Operation | DS\_CmdNoop  DS\_CmdReset  DS\_CmdSetAppState  DS\_CmdSetFilterFile  DS\_CmdSetFilterType  DS\_CmdSetFilterParms  DS\_CmdSetDestType  DS\_CmdSetDestState  DS\_CmdSetDestPath  DS\_CmdSetDestBase  DS\_CmdSetDestExt  DS\_CmdSetDestSize  DS\_CmdSetDestAge  DS\_CmdSetDestCount  DS\_CmdCloseFile  DS\_CmdCloseAll  DS\_CmdGetFileInfo  DS\_CmdAddMID |
| DS2000 | Upon receipt of a message, if the Packet Processing State is ENABLED, DS shall determine if the message shall be stored based on the contents of the Packet Filter Table and the Destination File Table. | Operation | DS\_AppProcessMsg  DS\_AppStorePacket  DS\_FileStorePacket |
| DS2000.1 | The Packet Filter Table contents shall include:   a) Message ID   b) Destination file table index   c) Filter type (time/sequence count)   d) Algorithm N value   e) Algorithm X value   f) Algorithm O value | Operation | DS\_FilterParms\_t  DS\_PacketEntry\_t  DS\_FilterTable\_t |
| DS2000.2 | The Destination File Table contents shall include:   a) Pathname   b) Basename   c) Extension   d) Filename type (time/sequence)   e) Default Destination enable state   f) Max file size (in bytes)   g) Max file age (in seconds)   h) Initial Sequence Count: | Operation | DS\_DestFileEntry\_t  DS\_DestFileTable\_t |
| DS2001 | DS shall store "N of X" messages starting at offset O. | Operation | DS\_FileStorePacket  CFS\_IsPacketFiltered |
| DS2001.1 | If either the X value or the N value is zero, then the message shall not be stored. | Operation | DS\_FileStorePacket  CFS\_IsPacketFiltered |
| DS2002 | DS shall store each message in up to <PLATFORM\_DEFINED> different destination files. | Operation | DS\_FileStorePacket  DS\_FileSetupWrite |
| DS2002.1 | Destination files shall be created when the first message is received that is passed by the filter algorithm for that particular message and selects that particular destination file. | Operation | DS\_FileSetupWrite  DS\_FileCreateDest |
| DS2003 | The input argument to the filter algorithm shall be determined by the Filter Type indicator. | Operation | DS\_FileStorePacket  CFS\_IsPacketFiltered |
| DS2003.1 | If Filter Type indicates Sequence based filtering then the algorithm input argument is a value equal to the packet sequence count. | Operation | DS\_FileStorePacket  CFS\_IsPacketFiltered |
| DS2003.2 | If Filter Type indicates Time based filtering then the algorithm input argument is a value created from the lower 11 bits of packet timestamp seconds plus the high 4 bits of timestamp subseconds. | Operation | DS\_FileStorePacket  CFS\_IsPacketFiltered |
| DS3000 | DS shall construct filenames based on the following definitions provided in the Destination File Table: | Operation | DS\_FileCreateDest  DS\_FileCreateName |
| DS3000.1 | If Filename Type indicates naming based on Sequence the constructed filename will include a character representation of the Sequence Count value from the Destination File Table. | Operation | DS\_FileCreateDest  DS\_FileCreateName  DS\_FileCreateSequence |
| DS3000.1.1 | If Filename Type indicates naming based on Sequence the value of Sequence Count shall be incremented each time a file is created. | Operation | DS\_FileCreateSequence |
| DS3000.2 | If Filename Type indicates naming based on Time the constructed filename will include a character representation of the packet timestamp. | Operation | DS\_FileCreateSequence |
| DS3000.2.1 | If Filename Type indicates naming based on Time the file date and time shall be represented in the following format: "YYYYDDDHHMMSS". | Operation | DS\_FileCreateSequence |
| DS3001 | Prior to writing a packet to an existing destination file, DS shall verify that the resulting file size (after the write) shall not exceed the file size limit as defined in the Destination File Table. | Operation | DS\_FileSetupWrite |
| DS3001.1 | If the resulting file size would exceed the file size limit then DS shall close the existing file and open another file. | Operation | DS\_FileSetupWrite  DS\_FileUpdateHeader  DS\_FileCloseDest  DS\_FileCreateDest |
| DS3001.2 | A minimum of one packet shall be written to a file | Operation | DS\_FileSetupWrite |
| DS3002 | Periodically, DS shall test the age of all open destination files. If any file age exceeds the maximum age defined for that file in the Destination File Table, then DS shall close the file. | Operation | DS\_AppMain  DS\_FileTestAge |
| DS3002.1 | DS shall update file age and test age limits every time DS processes its housekeeping telemetry request command. | Operation | DS\_FileTestAge  DS\_AppProcessHK |
| DS3003 | Each DS destination file shall contain a primary cFE file header with the following information:   a) Content Type   b) SubType   c) Primary header length   d) Spacecraft ID   e) Processor ID   f) Application ID   g) File creation time (seconds)   h) File creation time (sub-seconds) | Operation | DS\_FileWriteHeader  CFE\_FS\_WriteHeader |
| DS3004 | Each DS destination file shall contain a secondary file header with the following information:  a) File close time (seconds)  b) File close time (sub-seconds)  c) File table index  d) Qualified Filename | Operation | DS\_FileWriteHeader |
| DS3005 | For every file write error, DS shall:   a) Send an event message   b) Increment total number of file write errors   c) Close the destination file   d) Disable the destination | Operation | DS\_FileWriteError |
| DS5000 | Upon receipt of a Disable command, DS shall stop filtering and storing messages.  Note: This command will set the Packet Processing State to DISABLED. | Operation | DS\_CmdSetAppState |
| DS5001 | Upon receipt of an Enable command, DS shall begin filtering and storing messages.  Note: This command will set the Packet Processing State to ENABLED. | Operation | DS\_CmdSetAppState |
| DS5002 | Upon receipt of a Close File Command, DS shall close the command-specified files. | Operation | DS\_CmdCloseFile |
| DS5003 | Upon receipt of a Set File Basename command, DS shall set the file basename for the command-specified destination file. | Operation | DS\_CmdSetDestBase |
| DS5004 | Upon receipt of a Set Next File Sequence Counter command, DS shall set the command-specified file counter for the command-specified Destination File. | Operation | DS\_CmdSetDestCount |
| DS5005 | Upon receipt of an Enable Destination File command, DS shall enable file collection for the command-specified Destination File. | Operation | DS\_CmdSetDestState |
| DS5006 | Upon receipt of a Disable Destination File command, DS disable file collection for the command-specified Destination File. | Operation | DS\_CmdSetDestState |
| DS5008 | Upon receipt of a Set File Index for a Packet Filter Table entry command, DS shall update the destination file index. | Operation | DS\_CmdSetFilterFile |
| DS5009 | Upon receipt of a Set Filter Type for a Packet Filter Table entry command, DS shall update the filter type to the command-specified filter type. | Operation | DS\_CmdSetFilterType |
| DS5010 | Upon receipt of a Set Filter Parameter for a Packet Filter Table entry command, DS shall update the N, X, O Parameters to the command-specified values | Operation | DS\_CmdSetFilterParms |
| DS5011 | Upon receipt of a Set Destination Type for a destination file type command, DS shall update the Destination type to the command-specified destination type. | Operation | DS\_CmdSetDestType |
| DS5012 | Upon receipt of a Set Path for a destination filename command, DS shall update the path to the command-specified path. | Operation | DS\_CmdSetDestPath |
| DS5013 | Upon receipt of a Set Extension for destination filename command, DS shall update the file extension to the command-specified extension. | Operation | DS\_CmdSetDestExt |
| DS5014 | Upon receipt of a Set Maximum Size for a destination file command, DS shall update the maximum file size to the command-specified maximum | Operation | DS\_CmdSetDestSize |
| DS5015 | Upon receipt of a Set Maximum Age for a destination file command, DS shall update the maximum destination file age to the command-specified maximum age. | Operation | DS\_CmdSetDestAge |
| DS5016 | Upon receipt of an Add Message ID to Packet Filter Table command, DS shall add the command-specified Message ID to the next unused entry in the Packet Filter Table. | Operation | DS\_CmdAddMID |
| DS5016.1 | If the command-specified Message ID is invalid DS will reject the command and send an event message. | Operation | DS\_CmdAddMID |
| DS5016.2 | If the Packet Filter table is not loaded DS will reject the command and send an event message. | Operation | DS\_CmdAddMID |
| DS5016.3 | If the command-specified Message ID is already specified in the Packet Filter Table DS will reject the command and send an event message | Operation | DS\_CmdAddMID |
| DS5016.4 | If there are no unused entries in the Packet Filter Table DS will reject the command and send an event message | Operation | DS\_CmdAddMID |
| DS5017 | Upon Receipt of a Get File Info command, DS shall generate a telemetry packet containing the following information for each destination file:  1) File age  2) File size  3) File rate  4) Sequence count  5) Enable state  6) Open state  7) Filename | Operation | DS\_CmdGetFileInfo |
| DS8000 | DS shall generate a housekeeping message containing the following:   a) Valid Command Counter   b) Command Rejected Counter   c) Packets discarded (DS was disabled) Counter   d) Packets discarded (pkt has no filter) Counter   e) Packets discarded (failed filter test) Counter   f) Packets that passed filter test Counter   g) Good destination file I/O Counter   h) Bad destination file I/O Counter   i) Good updates to secondary header Counter   j) Bad updates to secondary header Counter   k) Destination file table loads Counter   l) Failed attempts to get table data pointer Counter   m) Packet filter table loads Counter   n) Failed attempts to get table data pointer Counter   o) Application State   p) Filename of last loaded Filter Table | Operation | DS\_AppProcessHK |
| DS9000 | Upon cFE Power-On DS shall initialize the following Housekeeping data to Zero (or value specified):  a) Valid Command Counter  b) Command Rejected Counter  c) Packets discarded (DS was disabled) Counter  d) Packets discarded (pkt has no filter) Counter  e) Packets discarded (failed filter test) Counter  f) Packets that passed filter test Counter  g) Good destination file I/O Counter h) Bad destination file I/O Counter  i) Good updates to secondary header Counter  j) Bad updates to secondary header Counter  k) Destination file table loads Counter  l) Failed attempts to get table data pointer Counter  m)Packet filter table loads Counter  n) Failed attempts to get table data pointer Counter | Initialization | DS\_AppInitialize |
| DS9001 | Upon cFE Power-On DS shall initialize the DS tables from the default files. | Initialization | DS\_AppInitialize  DS\_TableInit |
| DS9002 | Upon a cFE Processor Reset or DS Application Reset, DS shall close all files. | Initialization | DS\_AppInitialize |
| DS9003 | Upon a cFE Processor Reset or DS Application Reset , DS shall restore the following if the associated <PLATFORM\_DEFINED> Preserve Flag is set to TRUE:   a) Packet Filter Table   b) Destination File Table   c) File Sequence number for all Destination File Sets   d) Packet Processing State (ENABLED or DISABLED) | Initialization | DS\_AppInitialize  DS\_TableCreateCDS |
| DS9004 | Upon a cFE Processor Reset or DS Application Reset , DS shall restore the following if the associated <PLATFORM\_DEFINED> Preserve Flag is set to FALSE:   a) File Sequence Counters   b) <PLATFORM\_DEFINED> Packet Processing State | Initialization | DS\_AppInitialize  DS\_TableCreateCDS |
| DS9005 | Upon any initialization and/or Packet Filter Table Update, DS shall validate the Packet Filter Table:  a) table descriptor text for each packet entry:  b) message ID (0 = unused, else ok)  c) destination file table index  d) filter type (time/sequence)  e) filter parms (N,X,O) | Initialization | DS\_AppInitialize  DS\_TableInit DS\_TableManageFilter  DS\_TableVerifyFilter  DS\_TableVerifyFilterEntry |
| DS9006 | Upon any initialization and/or Packet Filter Table Update, DS shall subscribe to the messages defined in the Data Storage Packet Filter Table. | Initialization | DS\_AppInitialize  DS\_TableManageFilter  DS\_TableSubscribe |
| DS9007 | Upon any initialization and/or Destination File Table Update, DS will validate the Destination File Table:  a) table descriptor text for each destination file entry  b) pathname  c) basename  d) extension  e) filename type  f) file enable/disable state  g) max file size   h) max file age   i) sequence count | Initialization | DS\_AppInitialize  DS\_TableInit  DS\_TableManageDestFile  DS\_TableVerifyDestFile  DS\_TableVerifyDestFileEntry |
| DS9008 | Upon cFE Power-On DS shall set the Packet Processing State to the <PLATFORM\_DEFINED> state (ENABLED or DISABLED). | Initialization | DS\_AppInitialize |