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ACRONYMS AND ABBREVIATIONS

| | |
|---------|---|
| APID | Application Programming Interface Definition |
| CCSDS | Consultative Committee for Space Data Systems |
| CRC | Cyclic Redundancy Checksum |
| CSCI | Computer Software Configuration Item |
| CSW | Common Software |
| DLL | Dynamic Link Library |
| EMU | EXPRESS Memory Unit |
| EXPRESS | EXpedite the PROcessing of Experiments to the Space Station |
| FM | File Manager |
| GUI | Graphical User Interface |
| HRF | Human Research Facility |
| I/O | Input/Output |
| ICD | Interface Control Document |
| ID | Identification |
| LSDS | Life Science Data Systems |
| LSB | Least Significant Byte |
| MDM | Multiplexer Demultiplexer |
| MSB | Most Significant Byte |
| N/A | Not Applicable |
| PC | Portable Computer |
| PEP | Payload Executive Processor |
| PLD | Payload |
| RI | Rack Interface |
| RIC | Rack Interface Controller |
| SDD | Software Design Document |
| SRS | Software Requirement Specifications |
| UI | User Interface |
| UIL | User Interface Language |
| UTC | Universal Time Code |
| VDD | Version Description Document |

1.0 INTRODUCTION

This document describes the interfaces of the Human Research Facility (HRF) Common Software (CSW) required for payload client software connectivity. The CSW provides user and client software access to launching payload software and controlling telemetry of payload data to the ground by passing the corresponding data to the Rack Interface Controller (RIC). This document provides all information needed to generate an interface to the CSW.

1.1 COMMON SOFTWARE OVERVIEW

The CSW consists of three Computer Software Configuration Items (CSCIs): the Server or Rack Interface (RI), the File Manager (FM), and the User Interface (UI). These CSCIs communicate through named pipes. The UI and RI communicate through a single synchronized named pipe. Commands, requests, and status messages flow between the UI and RI. The FM communicates with the Server through two named pipe instances. The FM writer pipe is used for writing downlink packets and messages to the Server, and the FM reader pipe is used for reading uplink messages and commands from the Server. (Ref. Figure 1-1)

The UI and FM communicate indirectly by sending messages and commands to each other through the Server. The UI and FM also share access to the downlink list file. This file contains the list of all files, experiment and data files, to be sent to the ground by batch downlink telemetry. The downlink list file is created by the FM and can be changed by either the FM or the UI. Additionally, the UI and FM share access to the downlink file ID file which holds the next file identifier to be assigned to a file added to the downlink list file.

Client software may also communicate with the server using a named pipe. Two named pipe connections are required for communication. One pipe is solely used for writing to the Server and the other for reading from the Server. Once a connection has been established, client software may transmit real time telemetry data to the server as well as receive periodic health and status or ancillary data.

The FM primarily handles batch downlink of files found in the downlink list. The FM takes each file on the downlink list, breaks it up into packets, and sends each packet to the Server.

The UI provides a Graphical User Interface (GUI) for the crewmember to launch HRF payload software, view CSW log files, and control batch downlink telemetry. In the UI, HRF payload software is listed under an experiments listing and a payload or instruments listing. Additionally, the UI displays the downlink list that the FM uses. From this display, the crewmember can impede files from being sent, add files to the downlink list, and start or stop the batch downlink telemetry process.

Example scenario: The server, FM, and UI are all running on the HRF PC connected to the RIC by Ethernet. The UI and FM have connected to the Server. Batch file downlink is initiated from a command sent from the ground through the RIC. The “start telemetry” command is received by the Server which sends it to the FM.

Upon receiving the command, the FM goes through the downlink list. The FM takes each enabled file on the downlink list, breaks it up into packets, and sends each packet to the Server. The Server accepts the packets, puts on the appropriate Expedite

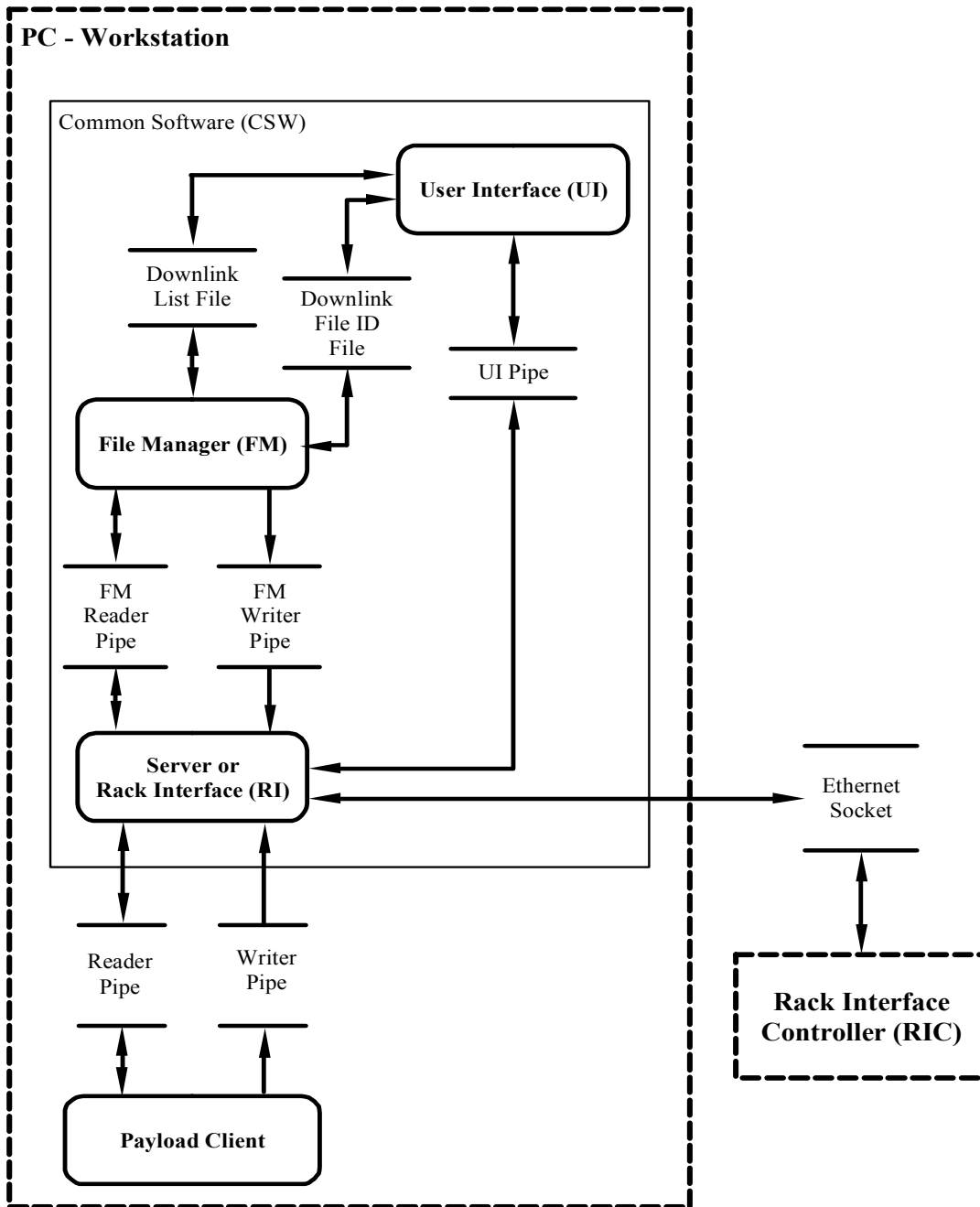


Figure 1-1. CSW Interface Diagram

the Processing of Experiments to the Space Station (EXPRESS) header and sends it to the RIC, which sends the data packets to the ground.

1.2 COMMON SOFTWARE DEVELOPER ENVIRONMENTS

All CSW CSCIs were developed for MS Windows NT 4.0 and Windows 2000.

Developer Environments

- Server - MS Visual C++ 6.0
- FM - MS Visual C++ 6.0
- UI - MS Visual BASIC 6.0
- UI help file - MS Help Workshop 6.0

NOTE: The MS Help Workshop is an application bundled with the MS Visual C++ developer.

1.3 COMMON SOFTWARE NAMED PIPE INTERFACE

The named pipes used by the CSW team in the RI software are overlapped pipes which allow for asynchronous I/O. An overlapped structure must be associated with each read and write operation. These structures are used to signal that a read or write action has occurred on the named pipe. The CreateFile function is used in Visual C++ and BASIC to connect to the server. The ReadFile and WriteFile functions are used in Visual C++ and BASIC to communicate with the Server.

Reference Section 3.5 for specific functions to communicate with the server.

1.4 COMMON SOFTWARE FILE INTERFACE

Each payload client should create a file location file that defines the location of their data files. The file location files are used by the CSW FM, to add data files to the downlink list. This downlink list can be updated by a user through the UI, by payload client software through a command to the CSW Server, or by a ground issued command.

The user can inhibit files on the downlink list from being sent. Additionally, the user can add files to the downlink list individually or can add files by using the 'Add Data' button on the Experiment window.

The Add Data button sends a command to the FM that includes a path to a file location file. The FM then reads the file location file and updates the downlink list accordingly by adding files that meet the file parameters contained in the file location file.

Each line in the file location file must specify a descriptive experiment name, an experiment identifier, a priority level from 1 to 3, most important to least important, a value of 0 or 1 for the recursion flag, and a file prototype. The priority level determines which files get sent first when telemetry is active. See Section 3.7 for information on file naming convention and file location file format.

NOTE: The location of the data files and their priority levels will be determined on a case by case basis.

2.0 REFERENCED DOCUMENTS

| <u>Document Number</u> | <u>Rev.</u> | <u>Document Title</u> |
|------------------------|--------------------|---|
| LS-71083-A | Basic | Software Design Document for the Human Research Facility |
| LS-71062-9-2 | | Common Software Version Description Document (VDD) for the Human Research Facility |
| LS-71062 | C | Software Requirements Specification (SRS) for the Human Research Facility (HRF) Common Software |
| Boeing D683-43525-1 | Issue A Draft 8 | EXPRESS Software Interface Control Document - HRF |
| MIL-STD-1553 | B | Digital Time Division Command/Response Multiplex Data Bus |

3.0 INTERFACE DESIGN

The interface between the CSW RI and payload client software must handle the following actions:

- Sending Messages and Data Packets to the RI
- Receiving Messages from the RI
- Accessing the CSW Dynamic Link Library (DLL)

3.1 FUNCTION CALLS FOR COMMUNICATING WITH THE COMMON SOFTWARE RACK INTERFACE

The following function calls are examples that may be used in payload software to connect to the CSW as well as read and write to the CSW. Use of the CSW DLL is recommended. (Ref. Section 3.5)

```
HANDLE m_write_handle = CreateFile("\\\\.\\PIPE\\CSW\\",GENERIC_WRITE || GENERIC_READ,
FILE_SHARE_WRITE || FILE_SHARE_READ,NULL,OPEN_EXISTING,FILE_ATTRIBUTE_NORMAL
& FILE_FLAG_OVERLAPPED,NULL);
```

```
int STDCALL Read_CSW (void* data_buffer, int data_size)
{
DWORD bytes_read = 0;
OVERLAPPED olread;
olread.hEvent = CreateEvent (NULL,TRUE, FLASE, NULL);
read_ret = ReadFile(m_read_handle,data_buffer,data_size,&abytes_read,&olread);
}
```

```
int STDCALL Write_CSW (HANDLE send_handle,void* data)string,int send_size)
{
int send_ret = 0;
DWORD bytes_written = 0;
OVERLAPPED olsend;
olsend.hEvent = CreateEvent(NULL,TRUE,FALSE,NULL);
send_ret = WriteFile(send_handle,data_string,send_size,&bytes_written,&olsend);
}
```

3.2 CLIENT COMMANDS ISSUED TO COMMON SOFTWARE RACK INTERFACE

3.2.1 Connect Message

The connect message is used to tell the server the name of the client connecting. This message must be sent to the server immediately after connection. Use the “Client Type” to inform the server whether reading or writing will occur over this pipe connection. If reading from the server with this connection, set the “Client Type” to 0x13. If writing to the server with this connection, set the “Client Type” to 0x14.

TABLE 3.2.1-1. CONNECT MESSAGE STRUCTURE

| Client Message Field | Description | Size |
|----------------------|--------------------------------|------|
| Client ID High Byte | ID Assigned to Client | byte |
| Client ID Low Byte | ID Assigned to Client | byte |
| Client Type | Reader - 0x13 Writer - 0x14 | byte |

3.2.2 Update File Location Message

The update file location file message is used to tell the server that new data files have been recorded and should be added to the downlink list. Give a file path to the location of the file location file in the “Additional Data” field. The Size Byte fields should be set to the size of the entire message from the Sync High field to the end of the message.

TABLE 3.2.2-1. UPDATE FILE LOCATION FILE MESSAGE STRUCTURE

| Client Message Field | Description | Size |
|----------------------|---|-----------------|
| Sync High Byte | 0x55 | byte |
| Sync Low Byte | 0xAA | byte |
| Destination | File Manager (FM) - 0x03 | byte |
| Client ID High Byte | ID Assigned to Client | byte |
| Client ID Low Byte | ID Assigned to Client | byte |
| Size High Byte | Message Packet Size in Bytes (High) | byte |
| Size Low Byte | Message Packet Size in Bytes (Low) | byte |
| Message High Byte | Update File Location File - 0x00 | byte |
| Message Low Byte | Update File Location File - 0x81 | byte |
| Additional Data | File Path of the File Location File - Null Terminated (Supports all Win32 file names) | up to 128 bytes |

3.2.3 Batch Downlink On Message

The batch downlink on message is used to enable the batch downlink capabilities of the server after time critical downlink has finished. It is important that this message be sent immediately after completing the real time work.

TABLE 3.2.3-1. BATCH DOWNLINK ON MESSAGE STRUCTURE

| Client Message Field | Description | Size |
|----------------------|--|------|
| Sync High Byte | 0x55 | byte |
| Sync Low Byte | 0xAA | byte |
| Destination | Server - 0x01 | byte |
| Client ID High Byte | ID Assigned to Client | byte |
| Client ID Low Byte | ID Assigned to Client | byte |
| Size High Byte | Message Packet Size in Bytes (High) - 0x00 | byte |
| Size Low Byte | Message Packet Size in Bytes (Low) - 0x09 | byte |
| Message High Byte | Batch Downlink On - 0x00 | byte |
| Message Low Byte | Batch Downlink On - 0x18 | byte |

3.2.4 Batch Downlink Off Message

The batch downlink off message is used to stop the server from beginning batch downlink during time critical real time data downlink.

TABLE 3.2.4-1. BATCH DOWNLINK OFF MESSAGE STRUCTURE

| Client Message Field | Description | Size |
|----------------------|--|------|
| Sync High Byte | 0x55 | byte |
| Sync Low Byte | 0xAA | byte |
| Destination | Server - 0x01 | byte |
| Client ID High Byte | ID Assigned to Client | byte |
| Client ID Low Byte | ID Assigned to Client | byte |
| Size High Byte | Message Packet Size in Bytes (High) - 0x00 | byte |
| Size Low Byte | Message Packet Size in Bytes (Low) - 0x09 | byte |
| Message High Byte | Batch Downlink Off - 0x00 | byte |
| Message Low Byte | Batch Downlink Off - 0x19 | byte |

3.2.5 Ancillary Data Control Message

The ancillary data control message is used to request ancillary data sets.

TABLE 3.2.5-1. ANCILLARY DATA CONTROL MESSAGE STRUCTURE

| Client Message Field | Description | Size |
|----------------------|---|------|
| Sync High Byte | 0x55 | byte |
| Sync Low Byte | 0xAA | byte |
| Destination | Server - 0x01 | byte |
| Client ID High Byte | ID Assigned to Client | byte |
| Client ID Low Byte | ID Assigned to Client | byte |
| Size High Byte | Message Packet Size in Bytes (High) - 0x00 | byte |
| Size Low Byte | Message Packet Size in Bytes (Low) - 0x0B | byte |
| Message High Byte | Ancillary Data Control - 0x00 | byte |
| Message Low Byte | Ancillary Data Control - 0x20 | byte |
| Request ID | One Time Data Request - 0x00 Add Entry - 0x01 Delete Entry - 0x03 | byte |
| Data Set ID | Data Sets - 0x01 to 0x64 All Broadcast Ancillary Data - 0xE4 Request Broadcast - 0x80 to 0xE3 | byte |

3.2.6 Rack Time Request Message

The rack time request message is used to request rack time from the server. One shot of time will be sent to the client per request.

TABLE 3.2.6-1. RACK TIME REQUEST MESSAGE STRUCTURE

| Client Message Field | Description | Size |
|----------------------|--|------|
| Sync High Byte | 0x55 | byte |
| Sync Low Byte | 0xAA | byte |
| Destination | Server - 0x01 | byte |
| Client ID High Byte | ID Assigned to Client | byte |
| Client ID Low Byte | ID Assigned to Client | byte |
| Size High Byte | Message Packet Size in Bytes (High) - 0x00 | byte |
| Size Low Byte | Message Packet Size in Bytes (Low) - 0x09 | byte |
| Message High Byte | Rack Time Request - 0x00 | byte |
| Message Low Byte | Rack Time Request - 0x4D | byte |

3.2.7 Health and Status Message

The health and status message is used by clients sending health and status data to the ground in order to update their data being sent. The Size Byte fields should be set to the size of the entire message from the Sync High field to the end of the message. The cyclic counter should begin with zero and increment by one for consecutive packets. The size of the health and status data is assigned to the client. The size assigned is based on both need and availability.

TABLE 3.2.7-1. HEALTH AND STATUS MESSAGE STRUCTURE

| Client Message Field | Description | Size |
|--------------------------|--|-------|
| Sync High Byte | 0x55 | byte |
| Sync Low Byte | 0xAA | byte |
| Destination | Server - 0x01 | byte |
| Client ID High Byte | ID Assigned to Client | byte |
| Client ID Low Byte | ID Assigned to Client | byte |
| Size High Byte | Message Packet Size in Bytes (High) | byte |
| Size Low Byte | Message Packet Size in Bytes (Low) | byte |
| Message High Byte | Health and Status - 0x00 | byte |
| Message Low Byte | Health and Status - 0x9B | byte |
| Cyclic Counter High Byte | Starts at 0 and increment by one for every packet. | byte |
| Cyclic Counter Low Byte | Starts at 0 and increment by one for every packet. | byte |
| Health and Status Data | Assigned to Client and Configurable | bytes |

3.2.8 Payload Executive Processor (PEP) Bundle Request Message

The PEP bundle request message is used to send a series of commands to the RIC. This message must be sent before the PEP execution request message.

TABLE 3.2.8-1. PEP BUNDLE REQUEST MESSAGE STRUCTURE

| Client Message Field | Description | Size |
|----------------------|---|------|
| Sync High Byte | 0x55 | byte |
| Sync Low Byte | 0xAA | byte |
| Destination | Server - 0x01 | byte |
| Client ID High Byte | ID Assigned to Client | byte |
| Client ID Low Byte | ID Assigned to Client | byte |
| Size High Byte | Message Packet Size in Bytes (High) - 0x00 | byte |
| Size Low Byte | Message Packet Size in Bytes (Low) - 0x0D | byte |
| Message High Byte | PEP Bundle Request - 0x00 | byte |
| Message Low Byte | PEP Bundle Request - 0x49 | byte |
| Request ID High Byte | Any request message - 0x00 | byte |
| Request ID Low Byte | Install - 0x15 Halt - 0x16 Remove - 0x17 | byte |
| Bundle ID High Byte | Unique Value Relating to the UIL Bundle Assigned by the PEP | byte |
| Bundle ID Low Byte | Unique Value Relating to the UIL Bundle Assigned by the PEP | byte |

3.2.9 PEP Execution Request Message

The PEP execution request message is used to tell the RIC to perform the PEP bundle request previously sent.

TABLE 3.2.9-1. PEP EXECUTION REQUEST MESSAGE STRUCTURE

| Client Message Field | Description | Size |
|-------------------------------|---|------|
| Sync High Byte | 0x55 | byte |
| Sync Low Byte | 0xAA | byte |
| Destination | Server - 0x01 | byte |
| Client ID High Byte | ID Assigned to Client | byte |
| Client ID Low Byte | ID Assigned to Client | byte |
| Size High Byte | Message Packet Size in Bytes (High) - 0x00 | byte |
| Size Low Byte | Message Packet Size in Bytes (Low) - 0x0D | byte |
| Message High Byte | PEP Execution Request - 0x00 | byte |
| Message Low Byte | PEP Execution Request - 0x4C | byte |
| Request ID High Byte | Any request message - 0x00 | byte |
| Request ID Low Byte | Start - 0x12 Stop - 0x13 Resume - 0x14 | byte |
| Payload Sequence ID High Byte | Unique Value Relating to the Sequence Assigned by the PEP | byte |
| Payload Sequence ID Low Byte | Unique Value Relating to the Sequence Assigned by the PEP | byte |

3.2.10 Local Client Message

The local client message is defined by the client receiving the message. The local client message is from a client to another client running on the same system. The Size Byte fields should be set to the size of the entire message from the Sync High field to the end of the message.

TABLE 3.2.10-1. LOCAL CLIENT MESSAGE STRUCTURE

| Client Message Field | Description | Size |
|----------------------|---|------------------|
| Sync High Byte | 0x55 | byte |
| Sync Low Byte | 0xAA | byte |
| Destination | Local Client ID to Send to | byte |
| Client ID High Byte | ID Assigned to Client | byte |
| Client ID Low Byte | ID Assigned to Client | byte |
| Size High Byte | Message packet size in bytes (High) | byte |
| Size Low Byte | Message packet size in bytes (Low) | byte |
| Message High Byte | Local Client Message - 0x00 | byte |
| Message Low Byte | Local Client Message - 0x03 | byte |
| Message Word | Message Data | 2 bytes |
| Message Size High | Size of following message in bytes (High) | byte |
| Message Size Low | Size of following message in bytes (Low) | byte |
| Message | | up to 1248 bytes |

3.2.11 Remote Client Message

The remote client message is understood by the RIC. The remote client message is sent from a client to another client on a remote system. The Size Byte fields should be set to the size of the entire message from the Sync High field to the end of the message.

TABLE 3.2.11-1. REMOTE CLIENT MESSAGE STRUCTURE

| Client Message Field | Description | Size |
|----------------------|-------------------------------------|------------------|
| Sync High Byte | 0x55 | byte |
| Sync Low Byte | 0xAA | byte |
| Destination | RIC 0x01 | byte |
| Client ID High Byte | ID Assigned to Client | byte |
| Client ID Low Byte | ID Assigned to Client | byte |
| Size High Byte | Message Packet Size in Bytes (High) | byte |
| Size Low Byte | Message Packet Size in Bytes (Low) | byte |
| Message High Byte | Local Client Message - 0x00 | byte |
| Message Low Byte | Local Client Message - 0x03 | byte |
| Function Code | 0x0040 to 0xFFFE | 2 bytes |
| Message Word | Message Word in EXPRESS Header | 2 bytes |
| Message | | Up to 1248 bytes |

3.2.12 Sending Data Packets to the Common Software Rack Interface Server

The data packets are used for the payload clients to send data to the server. The Size Byte fields should be set to the size of the entire message from the Sync High field to the end of the message.

TABLE 3.2.12-1. DATA PACKET STRUCTURE

| Client Message Field | Description | Size |
|--|---|-------------------------------------|
| Sync High Byte | 0x55 | byte |
| Sync Low Byte | 0xAA | byte |
| Destination | Server - 0x01 | byte |
| Client ID High Byte | ID Assigned to Client | byte |
| Client ID Low Byte | ID Assigned to Client | byte |
| Size High Byte | Message Packet Size in Bytes (High) | byte |
| Size Low Byte | Message Packet Size in Bytes (Low) | byte |
| Message High Byte | Data Packet - 0xDD | byte |
| Message Low Byte | Data Packet - 0xDD | byte |
| Life Science Data Systems (LSDS) Client ID Byte High | Highest bit is set to 1 when data is in LSDS format | byte |
| LSDS Client ID Byte Low | Rest of the two bytes is the Client ID | byte |
| Client Data | | Up to 316200 bytes (255*1240 bytes) |

3.3 MESSAGES AND RESPONSES ISSUED TO CLIENT BY COMMON SOFTWARE RACK INTERFACE

For messages received by payload software from the CSW RI Server, the first two bytes are read to determine the message.

3.3.1 Ancillary Data Response

Ancillary data is sent to the client after it has been requested.

TABLE 3.3.1-1. ANCILLARY DATA RESPONSE STRUCTURE

| Client Message Field | Description | Size |
|----------------------|--------------------------------|----------|
| Message High Byte | Ancillary Data Response - 0x00 | byte |
| Message Low Byte | Ancillary Data Response - 0x98 | byte |
| Data Set High Byte | Data Set ID (High) | byte |
| Data Set Low Byte | Data Set ID (Low) | byte |
| Ancillary Data | Data | 46 bytes |

3.3.2 Broadcast Ancillary Data Response

Broadcast ancillary data is received at a 10 Hz rate from the RIC and sent to the payload clients that have requested broadcast ancillary data.

TABLE 3.3.2-1. BROADCAST ANCILLARY DATA RESPONSE STRUCTURE

| Client Message Field | Description | Size |
|--|--|-----------|
| Message High Byte | Broadcast Ancillary Data Response - 0x00 | byte |
| Message Low Byte | Broadcast Ancillary Data Response - 0x99 | byte |
| Consultative Committee for Space Data Systems (CCSDS) Primary Header | Reference Boeing Document D683-43525-1 | 6 bytes |
| CCSDS Secondary Header | Reference Boeing Document D683-43525-1 | 10 bytes |
| Broadcast Ancillary Data | Data | 112 bytes |

The CCSDS primary and secondary headers are used in commands sent from the PEP to the RIC across the PLD MDM Local MIL-STD-1553B bus interface. The headers consist of the following parameters: description, type transmit/receive, sub-address, bit assignment, and parameter name. The secondary header contains command-specific data used to identify the type of command packet being sent and when it was issued.

TABLE 3.3.2-2. CCSDS PRIMARY HEADER STRUCTURE

| Field | Description | Size |
|--|--|---------|
| Version Number | | 3 bits |
| Application Programming Interface Definition (APID) Type | System - 0 Payload - 1 | 1 bit |
| Secondary Header Flag | 0 - No Secondary Header 1 - Secondary Header | 1 bit |
| APID | Variable | 11 bits |
| Sequence Flag | | 2 bits |
| Package Sequence Count | Increments by one with each transmission. Auto roll over at maximum. | 14 bits |
| Package Length | Number of octets. | 2 bytes |

NOTE: Verify this structure with Boeing Document Number D683-4352501.

TABLE 3.3.2-3. CCSDS SECONDARY HEADER STRUCTURE

| Field | Description | Size |
|--|-----------------------------------|---------|
| Time - Most Significant Bytes (MSBs) of Course Time | | 2 bytes |
| Time - Least Significant Bytes (LSBs) of Course Time | LSB - 1 second | 2 bytes |
| Fine Time | | byte |
| Time ID | | 2 bits |
| Checkword Indicator | | 1 bit |
| Spare - Empty | 0 | 1 bit |
| Packet Type | Variable | 4 bits |
| Packet ID Word 1 | Variable | 2 bytes |
| Packet ID Word 2 | Broadcast Ancillary frame number. | 2 bytes |

NOTE: Verify this structure with Boeing Document Number D683-4352501.

3.3.3 Rack Time Response

The rack time response is the message high and low bytes followed by the rack time described in the EXPRESS Software Interface Control Document - HRF Issue A, Draft 8.

TABLE 3.3.3-1. RACK TIME RESPONSE STRUCTURE

| Client Message Field | Description | Size |
|---------------------------------------|---|------|
| Message High Byte | Rack Time Response - 0x00 | byte |
| Message Low Byte | Rack Time Response - 0x80 | byte |
| CCSDS Preamble | 01010000 (binary) | byte |
| MSB of Year | 19-20 | byte |
| LSB of Year | 0-99 | byte |
| Month | 1-12 | byte |
| Day | 1-31 | byte |
| Hour | 0-23 | byte |
| Minutes | 0-59 | byte |
| Seconds | 0-59 | byte |
| Spare Sub Seconds High - High Byte | Spare sub seconds high and low bytes together range 0-15. | byte |
| Spare Sub Seconds High - Low Byte | Spare sub seconds high and low bytes together range 0-15. | byte |
| Binary Sub Seconds Low - High Byte* | Binary sub seconds high and low bytes together range 0-65525. | byte |
| Binary Sub Seconds Low - Low Byte* | Binary sub seconds high and low bytes together range 0-65525. | byte |
| Universal Time Code (UTC) - High Byte | 0 | byte |
| UTC - Low Byte | 0 | byte |
| Non-CCSDS Seconds - High Byte** | Non-CCSDS seconds high and low bytes together range 0-65535. | byte |
| Non-CCSDS Seconds - Low Byte** | Non-CCSDS seconds high and low bytes together range 0-65535. | byte |

* **NOTE:** Combining binary sub seconds high and low, the total range is 0-1048575 at one microsecond (1 μ sec) per count.

** **NOTE:** Non-CCSDS seconds high and low bytes represent the one's portion of the seconds plus the sub seconds information of the CCSDS time converted to a straight binary count rounded to the nearest 256 microseconds (256 μ sec).

3.3.4 Generic Client Message

The generic client message is defined by the client receiving the message. The Size Byte fields will be set to the entire message size from the Message High Byte to the end of the message.

TABLE 3.3.4-1. GENERIC CLIENT MESSAGE STRUCTURE

| Client Message Field | Description | Size |
|----------------------|-------------------------------------|----------------|
| Message High Byte | Defined by Client | byte |
| Message Low Byte | Defined by Client | byte |
| Size High Byte | Message Packet Size in Bytes (High) | byte |
| Size Low Byte | Message Packet Size in Bytes (Low) | byte |
| Message | Defined by Client | Up to 90 bytes |

3.4 COMMON SOFTWARE GROUND COMMANDS

The following tables show the formats for ground issued Common Software commands. Each command begins with the EXPRESS header and does not show the CCSDS and other required headers.

Generic Ground Command Format

The table below shows the generic format for a CSW command issued from the ground.

| | | | | | | | | | | | | | | | | | | | | |
|---|--|--|--|--------------|--|--|--|--|--|-------------------------------|--|--|--|--|--|--|--|--|--|-----|
| MSB | | | | | | | | | | | | | | | | | | | | LSB |
| EXPRESS Version (0000) | | | | EXPRESS Size | | | | | | | | | | | | | | | | |
| EXPRESS Message Type (0xFFFF) | | | | | | | | | | | | | | | | | | | | |
| Function Code Source (0x000F) | | | | | | | | | | | | | | | | | | | | |
| Function Code Destination High | | | | | | | | | | Function Code Destination Low | | | | | | | | | | |
| CSW Destination High | | | | | | | | | | CSW Destination Low | | | | | | | | | | |
| CSW Message Size High | | | | | | | | | | CSW Message Size Low | | | | | | | | | | |
| CSW Message Type High | | | | | | | | | | CSW Message Type Low | | | | | | | | | | |
| Message Data Word 1 | | | | | | | | | | | | | | | | | | | | |
| ... | | | | | | | | | | | | | | | | | | | | |
| Message Data Word N | | | | | | | | | | | | | | | | | | | | |
| The size of the message data may be anything from 0 to 45 words long. The CSW Message size includes the CSW Message Type bytes and the Message Data. EXPRESS Size = CSW Message Size + 10 | | | | | | | | | | | | | | | | | | | | |

3.4.1 CONTROL COMMANDS

3.4.1.1 Batch Mode On

This command places the CSW in batch downlink mode. Batch downlink of data files may only be initiated if the CSW is in batch downlink mode.

| | | | | | | | | | | | | | | | | | | | |
|--------------------------------------|--|--|--|--------------|--|--|--|--|-------------------------------|--|--|--|--|--|--|--|--|--|-----|
| MSB | | | | | | | | | | | | | | | | | | | LSB |
| EXPRESS Version (0000) | | | | EXPRESS Size | | | | | | | | | | | | | | | |
| EXPRESS Message Type (0xFFFF) | | | | | | | | | | | | | | | | | | | |
| Function Code Source (0x000F) | | | | | | | | | | | | | | | | | | | |
| Function Code Destination High | | | | | | | | | Function Code Destination Low | | | | | | | | | | |
| CSW Destination High (0x00) | | | | | | | | | CSW Destination Low (0x01) | | | | | | | | | | |
| CSW Message Size High (0x00) | | | | | | | | | CSW Message Size Low (0x02) | | | | | | | | | | |
| CSW Message Type High (0x00) | | | | | | | | | CSW Message Type Low (0x18) | | | | | | | | | | |
| EXPRESS Size = CSW Message Size + 10 | | | | | | | | | | | | | | | | | | | |

3.4.1.2 Batch Mode Off

This command takes the CSW out of batch downlink mode. The CSW must be commanded back into batch downlink mode in order to downlink data files.

| | | | | | | | | | | | | | | | | | | | |
|--------------------------------------|--|--|--|--------------|--|--|--|--|-------------------------------|--|--|--|--|--|--|--|--|--|-----|
| MSB | | | | | | | | | | | | | | | | | | | LSB |
| EXPRESS Version (0000) | | | | EXPRESS Size | | | | | | | | | | | | | | | |
| EXPRESS Message Type (0xFFFF) | | | | | | | | | | | | | | | | | | | |
| Function Code Source (0x000F) | | | | | | | | | | | | | | | | | | | |
| Function Code Destination High | | | | | | | | | Function Code Destination Low | | | | | | | | | | |
| CSW Destination High (0x00) | | | | | | | | | CSW Destination Low (0x01) | | | | | | | | | | |
| CSW Message Size High (0x00) | | | | | | | | | CSW Message Size Low (0x02) | | | | | | | | | | |
| CSW Message Type High (0x00) | | | | | | | | | CSW Message Type Low (0x19) | | | | | | | | | | |
| EXPRESS Size = CSW Message Size + 10 | | | | | | | | | | | | | | | | | | | |

3.4.1.3 Debug Mode On

This command places the CSW in debug mode. The CSW server logs the contents of all output and input when in this mode. This extra data logged will increase the size of log files dramatically and should only be used if absolutely necessary.

| | | | | | | | | | | | | | | | | | | | |
|--------------------------------------|--|--|--|--------------|--|--|--|--|-------------------------------|--|--|--|--|--|--|--|--|--|-----|
| MSB | | | | | | | | | | | | | | | | | | | LSB |
| EXPRESS Version (0000) | | | | EXPRESS Size | | | | | | | | | | | | | | | |
| EXPRESS Message Type (0xFFFF) | | | | | | | | | | | | | | | | | | | |
| Function Code Source (0x000F) | | | | | | | | | | | | | | | | | | | |
| Function Code Destination High | | | | | | | | | Function Code Destination Low | | | | | | | | | | |
| CSW Destination High (0x00) | | | | | | | | | CSW Destination Low (0x01) | | | | | | | | | | |
| CSW Message Size High (0x00) | | | | | | | | | CSW Message Size Low (0x02) | | | | | | | | | | |
| CSW Message Type High (0x00) | | | | | | | | | CSW Message Type Low (0x36) | | | | | | | | | | |
| EXPRESS Size = CSW Message Size + 10 | | | | | | | | | | | | | | | | | | | |

3.4.1.4 Debug Mode Off

This command takes the CSW out of debug mode.

| MSB | | | | | | | | | | | | | | | | | | LSB |
|--------------------------------------|--|--|--|--------------|--|--|--|--|-------------------------------|--|--|--|--|--|--|--|--|-----|
| EXPRESS Version (0000) | | | | EXPRESS Size | | | | | | | | | | | | | | |
| EXPRESS Message Type (0xFFFF) | | | | | | | | | | | | | | | | | | |
| Function Code Source (0x000F) | | | | | | | | | | | | | | | | | | |
| Function Code Destination High | | | | | | | | | Function Code Destination Low | | | | | | | | | |
| CSW Destination High (0x00) | | | | | | | | | CSW Destination Low (0x01) | | | | | | | | | |
| CSW Message Size High (0x00) | | | | | | | | | CSW Message Size Low (0x02) | | | | | | | | | |
| CSW Message Type High (0x00) | | | | | | | | | CSW Message Type Low (0x37) | | | | | | | | | |
| EXPRESS Size = CSW Message Size + 10 | | | | | | | | | | | | | | | | | | |

3.4.1.5 Health and Status Configuration Change

This command updates the CSW Health and Status configuration on the fly. If the Permanent Change Flag value is set (0x01) then the contents of HSConfig.txt will be rewritten with this commands configuration information. If the value is set to zero, the configuration change is temporary and will revert back to the old configuration when the CSW Server restarts.

| MSB | | | | | | | | | | | | | | | | | | | LSB |
|--|--|--|--|--------------|--|--|--|--|--------------------------------------|--|--|--|--|--|--|--|--|--|-----|
| EXPRESS Version (0000) | | | | EXPRESS Size | | | | | | | | | | | | | | | |
| EXPRESS Message Type (0xFFFF) | | | | | | | | | | | | | | | | | | | |
| Function Code Source (0x000F) | | | | | | | | | | | | | | | | | | | |
| Function Code Destination High | | | | | | | | | Function Code Destination Low | | | | | | | | | | |
| CSW Destination High (0x00) | | | | | | | | | CSW Destination Low (0x03) | | | | | | | | | | |
| CSW Message Size High (0x00) | | | | | | | | | CSW Message Size Low | | | | | | | | | | |
| CSW Message Type High (0x00) | | | | | | | | | CSW Message Type Low (0x39) | | | | | | | | | | |
| Num Clients | | | | | | | | | Permanent Change Flag (0x00 or 0x01) | | | | | | | | | | |
| Total Data Words High | | | | | | | | | Total Data Words Low | | | | | | | | | | |
| Client 1 ID High | | | | | | | | | Client 1 ID Low | | | | | | | | | | |
| Client 1 Subset ID High | | | | | | | | | Client 1 Subset ID 1 Low | | | | | | | | | | |
| Client 1 Data Words High | | | | | | | | | Client 1 Data Words Low | | | | | | | | | | |
| ... | | | | | | | | | | | | | | | | | | | |
| Client N ID High | | | | | | | | | Client N ID Low | | | | | | | | | | |
| Client N Subset ID High | | | | | | | | | Client N Subset ID 1 Low | | | | | | | | | | |
| Client N Data Words High | | | | | | | | | Client N Data Words Low | | | | | | | | | | |
| Maximum file path size is 90 bytes. CSW Message Size is $6*(N + 1)$ where N is the number of clients in the Health and Status configuration. EXPRESS Size = CSW Message Size + 10 | | | | | | | | | | | | | | | | | | | |

3.4.1.6 Request File CRC-32

This command requests that the CSW File Manager calculate the CRC-32 for a file. The File Manager will immediately send down a telemetry response that contains the CRC-32. The format of that telemetry packet can be found in Appendix A.

| MSB | | | | | | | | | | | | | | | | LSB |
|--|--|--|--|--------------|--|--|--|-------------------------------|--|--|--|--|--|--|--|-----|
| EXPRESS Version (0000) | | | | EXPRESS Size | | | | | | | | | | | | |
| EXPRESS Message Type (0xFFFF) | | | | | | | | | | | | | | | | |
| Function Code Source (0x000F) | | | | | | | | | | | | | | | | |
| Function Code Destination High | | | | | | | | Function Code Destination Low | | | | | | | | |
| CSW Destination High (0x00) | | | | | | | | CSW Destination Low (0x03) | | | | | | | | |
| CSW Message Size High (0x00) | | | | | | | | CSW Message Size Low | | | | | | | | |
| CSW Message Type High (0x00) | | | | | | | | CSW Message Type Low (0x3F) | | | | | | | | |
| File Path Byte 1 | | | | | | | | File Path Byte 2 | | | | | | | | |
| File Path Byte 3 | | | | | | | | File Path Byte 4 | | | | | | | | |
| | | | | | | | | ... | | | | | | | | |
| File Path Byte N - 1 | | | | | | | | File Path Byte N | | | | | | | | |
| Maximum file path size is 90 bytes. CSW Message Size is N + 2. EXPRESS Size = CSW Message Size + 10 | | | | | | | | | | | | | | | | |

3.4.1.7 Shutdown Windows

This command will shut down the Windows operating system and place the system in a state where the power may be switched off. If the CSW File Manager and/or User Interface are running, they will be terminated cleanly before the system goes down.

| MSB | | | | | | | | | | | | | | | | LSB |
|--------------------------------------|--|--|--|--------------|--|--|--|-------------------------------|--|--|--|--|--|--|--|-----|
| EXPRESS Version (0000) | | | | EXPRESS Size | | | | | | | | | | | | |
| EXPRESS Message Type (0xFFFF) | | | | | | | | | | | | | | | | |
| Function Code Source (0x000F) | | | | | | | | | | | | | | | | |
| Function Code Destination High | | | | | | | | Function Code Destination Low | | | | | | | | |
| CSW Destination High (0x00) | | | | | | | | CSW Destination Low (0x03) | | | | | | | | |
| CSW Message Size High (0x00) | | | | | | | | CSW Message Size Low (0x02) | | | | | | | | |
| CSW Message Type High (0x00) | | | | | | | | CSW Message Type Low (0x95) | | | | | | | | |
| EXPRESS Size = CSW Message Size + 10 | | | | | | | | | | | | | | | | |

3.4.1.8 Start Batch Telemetry

This command begins telemetry of batch downlink files.

| | | | | | | | | | | | | | | | | | | | | |
|--------------------------------------|--|--------------|--|--|--|--|--|--|--|-------------------------------|--|--|--|--|--|--|--|--|--|-----|
| MSB | | | | | | | | | | | | | | | | | | | | LSB |
| EXPRESS Version (0000) | | EXPRESS Size | | | | | | | | | | | | | | | | | | |
| EXPRESS Message Type (0xFFFF) | | | | | | | | | | | | | | | | | | | | |
| Function Code Source (0x000F) | | | | | | | | | | | | | | | | | | | | |
| Function Code Destination High | | | | | | | | | | Function Code Destination Low | | | | | | | | | | |
| CSW Destination High (0x00) | | | | | | | | | | CSW Destination Low (0x03) | | | | | | | | | | |
| CSW Message Size High (0x00) | | | | | | | | | | CSW Message Size Low (0x02) | | | | | | | | | | |
| CSW Message Type High (0x00) | | | | | | | | | | CSW Message Type Low (0x35) | | | | | | | | | | |
| EXPRESS Size = CSW Message Size + 10 | | | | | | | | | | | | | | | | | | | | |

3.4.1.9 Stop Batch Telemetry

This command stops telemetry of batch downlink files.

| | | | | | | | | | | | | | | | | | | | | |
|--------------------------------------|--|--------------|--|--|--|--|--|--|--|-------------------------------|--|--|--|--|--|--|--|--|--|-----|
| MSB | | | | | | | | | | | | | | | | | | | | LSB |
| EXPRESS Version (0000) | | EXPRESS Size | | | | | | | | | | | | | | | | | | |
| EXPRESS Message Type (0xFFFF) | | | | | | | | | | | | | | | | | | | | |
| Function Code Source (0x000F) | | | | | | | | | | | | | | | | | | | | |
| Function Code Destination High | | | | | | | | | | Function Code Destination Low | | | | | | | | | | |
| CSW Destination High (0x00) | | | | | | | | | | CSW Destination Low (0x03) | | | | | | | | | | |
| CSW Message Size High (0x00) | | | | | | | | | | CSW Message Size Low (0x02) | | | | | | | | | | |
| CSW Message Type High (0x00) | | | | | | | | | | CSW Message Type Low (0x25) | | | | | | | | | | |
| EXPRESS Size = CSW Message Size + 10 | | | | | | | | | | | | | | | | | | | | |

3.4.1.10 Start Downlink List Telemetry

This command starts telemetry of the CSW batch downlink list file.

| | | | | | | | | | | | | | | | | | | | | |
|--------------------------------------|--|--------------|--|--|--|--|--|--|--|-------------------------------|--|--|--|--|--|--|--|--|--|-----|
| MSB | | | | | | | | | | | | | | | | | | | | LSB |
| EXPRESS Version (0000) | | EXPRESS Size | | | | | | | | | | | | | | | | | | |
| EXPRESS Message Type (0xFFFF) | | | | | | | | | | | | | | | | | | | | |
| Function Code Source (0x000F) | | | | | | | | | | | | | | | | | | | | |
| Function Code Destination High | | | | | | | | | | Function Code Destination Low | | | | | | | | | | |
| CSW Destination High (0x00) | | | | | | | | | | CSW Destination Low (0x03) | | | | | | | | | | |
| CSW Message Size High (0x00) | | | | | | | | | | CSW Message Size Low (0x02) | | | | | | | | | | |
| CSW Message Type High (0x00) | | | | | | | | | | CSW Message Type Low (0x32) | | | | | | | | | | |
| EXPRESS Size = CSW Message Size + 10 | | | | | | | | | | | | | | | | | | | | |

3.4.1.11 Start Current Logs Telemetry

This command starts telemetry of all current CSW log files.

| | | | | | | | | | | | | | | | | | | |
|--------------------------------------|--|--|--|--------------|--|--|--|--|-------------------------------|--|--|--|--|--|--|--|--|-----|
| MSB | | | | | | | | | | | | | | | | | | LSB |
| EXPRESS Version (0000) | | | | EXPRESS Size | | | | | | | | | | | | | | |
| EXPRESS Message Type (0xFFFF) | | | | | | | | | | | | | | | | | | |
| Function Code Source (0x000F) | | | | | | | | | | | | | | | | | | |
| Function Code Destination High | | | | | | | | | Function Code Destination Low | | | | | | | | | |
| CSW Destination High (0x00) | | | | | | | | | CSW Destination Low (0x03) | | | | | | | | | |
| CSW Message Size High (0x00) | | | | | | | | | CSW Message Size Low (0x02) | | | | | | | | | |
| CSW Message Type High (0x00) | | | | | | | | | CSW Message Type Low (0x33) | | | | | | | | | |
| EXPRESS Size = CSW Message Size + 10 | | | | | | | | | | | | | | | | | | |

3.4.1.12 Terminate File Manager

This command terminates execution of the CSW File Manager.

| | | | | | | | | | | | | | | | | | | |
|--------------------------------------|--|--|--|--------------|--|--|--|--|-------------------------------|--|--|--|--|--|--|--|--|-----|
| MSB | | | | | | | | | | | | | | | | | | LSB |
| EXPRESS Version (0000) | | | | EXPRESS Size | | | | | | | | | | | | | | |
| EXPRESS Message Type (0xFFFF) | | | | | | | | | | | | | | | | | | |
| Function Code Source (0x000F) | | | | | | | | | | | | | | | | | | |
| Function Code Destination High | | | | | | | | | Function Code Destination Low | | | | | | | | | |
| CSW Destination High (0x00) | | | | | | | | | CSW Destination Low (0x03) | | | | | | | | | |
| CSW Message Size High (0x00) | | | | | | | | | CSW Message Size Low (0x02) | | | | | | | | | |
| CSW Message Type High (0x00) | | | | | | | | | CSW Message Type Low (0x98) | | | | | | | | | |
| EXPRESS Size = CSW Message Size + 10 | | | | | | | | | | | | | | | | | | |

3.4.1.13 Terminate Rack Interface

This command terminates execution of the CSW Server. The Server will ignore this command if in the middle of batch downlink. If the CSW File Manager is running, the Server will command the File Manager to terminate before halting its own execution.

| | | | | | | | | | | | | | | | | | | |
|--------------------------------------|--|--|--|--------------|--|--|--|--|-------------------------------|--|--|--|--|--|--|--|--|-----|
| MSB | | | | | | | | | | | | | | | | | | LSB |
| EXPRESS Version (0000) | | | | EXPRESS Size | | | | | | | | | | | | | | |
| EXPRESS Message Type (0xFFFF) | | | | | | | | | | | | | | | | | | |
| Function Code Source (0x000F) | | | | | | | | | | | | | | | | | | |
| Function Code Destination High | | | | | | | | | Function Code Destination Low | | | | | | | | | |
| CSW Destination High (0x00) | | | | | | | | | CSW Destination Low (0x01) | | | | | | | | | |
| CSW Message Size High (0x00) | | | | | | | | | CSW Message Size Low (0x02) | | | | | | | | | |
| CSW Message Type High (0x00) | | | | | | | | | CSW Message Type Low (0x99) | | | | | | | | | |
| EXPRESS Size = CSW Message Size + 10 | | | | | | | | | | | | | | | | | | |

3.4.1.14 Terminate User Interface

This command terminates execution of the CSW User Interface.

| MSB | | | | | | | | | | | | | | | | LSB |
|--------------------------------------|--|--|--|--------------|--|--|--|-------------------------------|--|--|--|--|--|--|--|-----|
| EXPRESS Version (0000) | | | | EXPRESS Size | | | | | | | | | | | | |
| EXPRESS Message Type (0xFFFF) | | | | | | | | | | | | | | | | |
| Function Code Source (0x000F) | | | | | | | | | | | | | | | | |
| Function Code Destination High | | | | | | | | Function Code Destination Low | | | | | | | | |
| CSW Destination High (0x00) | | | | | | | | CSW Destination Low (0x01) | | | | | | | | |
| CSW Message Size High (0x00) | | | | | | | | CSW Message Size Low (0x02) | | | | | | | | |
| CSW Message Type High (0x00) | | | | | | | | CSW Message Type Low (0x97) | | | | | | | | |
| EXPRESS Size = CSW Message Size + 10 | | | | | | | | | | | | | | | | |

3.4.2 FILE COMMANDS

A wildcard may be used to force some file commands to act on multiple files. The wildcard can appear in the following ways in a file path:

```
C:\hrf_data\*.txt
C:\hrf_data\!*.txt
C:\hrf_data\!*
```

Commands that accept wildcards have “**wildcard ready**” next to their names.

3.4.2.1 Add Files with File Location File

This command adds files to the batch downlink list that are successfully compared with the paths with wildcards contained in a file location file. The file path in the command is the path to the file location file.

| MSB | | | | | | | | | | | | | | | | LSB |
|--|--|--|--|--------------|--|--|--|-------------------------------|--|--|--|--|--|--|--|-----|
| EXPRESS Version (0000) | | | | EXPRESS Size | | | | | | | | | | | | |
| EXPRESS Message Type (0xFFFF) | | | | | | | | | | | | | | | | |
| Function Code Source (0x000F) | | | | | | | | | | | | | | | | |
| Function Code Destination High | | | | | | | | Function Code Destination Low | | | | | | | | |
| CSW Destination High (0x00) | | | | | | | | CSW Destination Low (0x03) | | | | | | | | |
| CSW Message Size High (0x00) | | | | | | | | CSW Message Size Low | | | | | | | | |
| CSW Message Type High (0x00) | | | | | | | | CSW Message Type Low (0x81) | | | | | | | | |
| File Path Byte 1 | | | | | | | | File Path Byte 2 | | | | | | | | |
| File Path Byte 3 | | | | | | | | File Path Byte 4 | | | | | | | | |
| ... | | | | | | | | | | | | | | | | |
| File Path Byte N – 1 | | | | | | | | File Path Byte N | | | | | | | | |
| Maximum file path size is 90 bytes. CSW Message Size is N + 2. EXPRESS Size = CSW Message Size + 10 | | | | | | | | | | | | | | | | |

3.4.2.2 Add File (**wildcard ready**)

This command will add a file or files (using a wildcard) to the downlink list.

| MSB | | | | | | | | | | | | | | | | | LSB |
|--|--|--|--|--------------|--|--|--|--|-------------------------------|--|--|--|--|--|--|--|-----|
| EXPRESS Version (0000) | | | | EXPRESS Size | | | | | | | | | | | | | |
| EXPRESS Message Type (0xFFFF) | | | | | | | | | | | | | | | | | |
| Function Code Source (0x000F) | | | | | | | | | | | | | | | | | |
| Function Code Destination High | | | | | | | | | Function Code Destination Low | | | | | | | | |
| CSW Destination High (0x00) | | | | | | | | | CSW Destination Low (0x03) | | | | | | | | |
| CSW Message Size High (0x00) | | | | | | | | | CSW Message Size Low | | | | | | | | |
| CSW Message Type High (0x00) | | | | | | | | | CSW Message Type Low (0x2B) | | | | | | | | |
| File Path Byte 1 | | | | | | | | | File Path Byte 2 | | | | | | | | |
| File Path Byte 3 | | | | | | | | | File Path Byte 4 | | | | | | | | |
| ... | | | | | | | | | | | | | | | | | |
| File Path Byte N - 1 | | | | | | | | | File Path Byte N | | | | | | | | |
| Maximum file path size is 90 bytes. CSW Message Size is N + 2. EXPRESS Size = CSW Message Size + 10 | | | | | | | | | | | | | | | | | |

3.4.2.3 Add File List

This command adds files to the downlink list that are listed on individual lines in a text file. The file path in the command is the path to this text file.

| MSB | | | | | | | | | | | | | | | | | LSB |
|--|--|--|--|--------------|--|--|--|--|-------------------------------|--|--|--|--|--|--|--|-----|
| EXPRESS Version (0000) | | | | EXPRESS Size | | | | | | | | | | | | | |
| EXPRESS Message Type (0xFFFF) | | | | | | | | | | | | | | | | | |
| Function Code Source (0x000F) | | | | | | | | | | | | | | | | | |
| Function Code Destination High | | | | | | | | | Function Code Destination Low | | | | | | | | |
| CSW Destination High (0x00) | | | | | | | | | CSW Destination Low (0x03) | | | | | | | | |
| CSW Message Size High (0x00) | | | | | | | | | CSW Message Size Low | | | | | | | | |
| CSW Message Type High (0x00) | | | | | | | | | CSW Message Type Low (0x6B) | | | | | | | | |
| File Path Byte 1 | | | | | | | | | File Path Byte 2 | | | | | | | | |
| File Path Byte 3 | | | | | | | | | File Path Byte 4 | | | | | | | | |
| ... | | | | | | | | | | | | | | | | | |
| File Path Byte N - 1 | | | | | | | | | File Path Byte N | | | | | | | | |
| Maximum file path size is 90 bytes. CSW Message Size is N + 2. EXPRESS Size = CSW Message Size + 10 | | | | | | | | | | | | | | | | | |

3.4.2.4 Confirm File (**wildcard ready**)

This command removes a file or files (using a wildcard) with “sent” status from the downlink list. The file is then logged as confirmed in the downlink log file.

| MSB | | | | | | | | | | | | | | | | LSB |
|--|--|--|--|--------------|--|--|--|-------------------------------|--|--|--|--|--|--|--|-----|
| EXPRESS Version (0000) | | | | EXPRESS Size | | | | | | | | | | | | |
| EXPRESS Message Type (0xFFFF) | | | | | | | | | | | | | | | | |
| Function Code Source (0x000F) | | | | | | | | | | | | | | | | |
| Function Code Destination High | | | | | | | | Function Code Destination Low | | | | | | | | |
| CSW Destination High (0x00) | | | | | | | | CSW Destination Low (0x03) | | | | | | | | |
| CSW Message Size High (0x00) | | | | | | | | CSW Message Size Low | | | | | | | | |
| CSW Message Type High (0x00) | | | | | | | | CSW Message Type Low (0x31) | | | | | | | | |
| File Path Byte 1 | | | | | | | | File Path Byte 2 | | | | | | | | |
| File Path Byte 3 | | | | | | | | File Path Byte 4 | | | | | | | | |
| ... | | | | | | | | | | | | | | | | |
| File Path Byte N – 1 | | | | | | | | File Path Byte N | | | | | | | | |
| Maximum file path size is 90 bytes. CSW Message Size is N + 2. EXPRESS Size = CSW Message Size + 10 | | | | | | | | | | | | | | | | |

3.4.2.5 Confirm File List

This command removes files from the downlink list with “sent” status that are listed on individual lines in a text file. The file path in the command is the path to this text file.

| MSB | | | | | | | | | | | | | | | | LSB |
|--|--|--|--|--------------|--|--|--|-------------------------------|--|--|--|--|--|--|--|-----|
| EXPRESS Version (0000) | | | | EXPRESS Size | | | | | | | | | | | | |
| EXPRESS Message Type (0xFFFF) | | | | | | | | | | | | | | | | |
| Function Code Source (0x000F) | | | | | | | | | | | | | | | | |
| Function Code Destination High | | | | | | | | Function Code Destination Low | | | | | | | | |
| CSW Destination High (0x00) | | | | | | | | CSW Destination Low (0x03) | | | | | | | | |
| CSW Message Size High (0x00) | | | | | | | | CSW Message Size Low | | | | | | | | |
| CSW Message Type High (0x00) | | | | | | | | CSW Message Type Low (0x71) | | | | | | | | |
| File Path Byte 1 | | | | | | | | File Path Byte 2 | | | | | | | | |
| File Path Byte 3 | | | | | | | | File Path Byte 4 | | | | | | | | |
| ... | | | | | | | | | | | | | | | | |
| File Path Byte N – 1 | | | | | | | | File Path Byte N | | | | | | | | |
| Maximum file path size is 90 bytes. CSW Message Size is N + 2. EXPRESS Size = CSW Message Size + 10 | | | | | | | | | | | | | | | | |

3.4.2.6 Delete File (**wildcard ready**)

This command deletes a file or files (using a wildcard) from the hard drive of the destination computer. This command does not apply to the batch downlink file list.

| MSB | | | | | | | | | | | | | | | | LSB |
|--|--|--|--|--------------|--|--|--|-------------------------------|--|--|--|--|--|--|--|-----|
| EXPRESS Version (0000) | | | | EXPRESS Size | | | | | | | | | | | | |
| EXPRESS Message Type (0xFFFF) | | | | | | | | | | | | | | | | |
| Function Code Source (0x000F) | | | | | | | | | | | | | | | | |
| Function Code Destination High | | | | | | | | Function Code Destination Low | | | | | | | | |
| CSW Destination High (0x00) | | | | | | | | CSW Destination Low (0x03) | | | | | | | | |
| CSW Message Size High (0x00) | | | | | | | | CSW Message Size Low | | | | | | | | |
| CSW Message Type High (0x00) | | | | | | | | CSW Message Type Low (0x11) | | | | | | | | |
| File Path Byte 1 | | | | | | | | File Path Byte 2 | | | | | | | | |
| File Path Byte 3 | | | | | | | | File Path Byte 4 | | | | | | | | |
| ... | | | | | | | | | | | | | | | | |
| File Path Byte N - 1 | | | | | | | | File Path Byte N | | | | | | | | |
| Maximum file path size is 90 bytes. CSW Message Size is N + 2. EXPRESS Size = CSW Message Size + 10 | | | | | | | | | | | | | | | | |

3.4.2.7 Delete File List

This command deletes files that are listed on individual lines in a text file. The file path in the command is the path to this text file.

| MSB | | | | | | | | | | | | | | | | LSB |
|--|--|--|--|--------------|--|--|--|-------------------------------|--|--|--|--|--|--|--|-----|
| EXPRESS Version (0000) | | | | EXPRESS Size | | | | | | | | | | | | |
| EXPRESS Message Type (0xFFFF) | | | | | | | | | | | | | | | | |
| Function Code Source (0x000F) | | | | | | | | | | | | | | | | |
| Function Code Destination High | | | | | | | | Function Code Destination Low | | | | | | | | |
| CSW Destination High (0x00) | | | | | | | | CSW Destination Low (0x03) | | | | | | | | |
| CSW Message Size High (0x00) | | | | | | | | CSW Message Size Low | | | | | | | | |
| CSW Message Type High (0x00) | | | | | | | | CSW Message Type Low (0x51) | | | | | | | | |
| File Path Byte 1 | | | | | | | | File Path Byte 2 | | | | | | | | |
| File Path Byte 3 | | | | | | | | File Path Byte 4 | | | | | | | | |
| ... | | | | | | | | | | | | | | | | |
| File Path Byte N - 1 | | | | | | | | File Path Byte N | | | | | | | | |
| Maximum file path size is 90 bytes. CSW Message Size is N + 2. EXPRESS Size = CSW Message Size + 10 | | | | | | | | | | | | | | | | |

3.4.2.8 Enable File (**wildcard ready**)

This command will enable a file or files (using a wildcard) that have “inhibited” status on the downlink list.

| MSB | | | | | | | | | | | | | | | | LSB |
|--|--|--|--|--------------|--|--|--|-------------------------------|--|--|--|--|--|--|--|-----|
| EXPRESS Version (0000) | | | | EXPRESS Size | | | | | | | | | | | | |
| EXPRESS Message Type (0xFFFF) | | | | | | | | | | | | | | | | |
| Function Code Source (0x000F) | | | | | | | | | | | | | | | | |
| Function Code Destination High | | | | | | | | Function Code Destination Low | | | | | | | | |
| CSW Destination High (0x00) | | | | | | | | CSW Destination Low (0x03) | | | | | | | | |
| CSW Message Size High (0x00) | | | | | | | | CSW Message Size Low | | | | | | | | |
| CSW Message Type High (0x00) | | | | | | | | CSW Message Type Low (0x23) | | | | | | | | |
| File Path Byte 1 | | | | | | | | File Path Byte 2 | | | | | | | | |
| File Path Byte 3 | | | | | | | | File Path Byte 4 | | | | | | | | |
| ... | | | | | | | | | | | | | | | | |
| File Path Byte N – 1 | | | | | | | | File Path Byte N | | | | | | | | |
| Maximum file path size is 90 bytes. CSW Message Size is N + 2. EXPRESS Size = CSW Message Size + 10 | | | | | | | | | | | | | | | | |

3.4.2.9 Enable File List

This command enables files on the downlink list with “inhibited” status that are listed on individual lines in a text file. The file path in the command is the path to this text file.

| MSB | | | | | | | | | | | | | | | | LSB |
|--|--|--|--|--------------|--|--|--|-------------------------------|--|--|--|--|--|--|--|-----|
| EXPRESS Version (0000) | | | | EXPRESS Size | | | | | | | | | | | | |
| EXPRESS Message Type (0xFFFF) | | | | | | | | | | | | | | | | |
| Function Code Source (0x000F) | | | | | | | | | | | | | | | | |
| Function Code Destination High | | | | | | | | Function Code Destination Low | | | | | | | | |
| CSW Destination High (0x00) | | | | | | | | CSW Destination Low (0x03) | | | | | | | | |
| CSW Message Size High (0x00) | | | | | | | | CSW Message Size Low | | | | | | | | |
| CSW Message Type High (0x00) | | | | | | | | CSW Message Type Low (0x63) | | | | | | | | |
| File Path Byte 1 | | | | | | | | File Path Byte 2 | | | | | | | | |
| File Path Byte 3 | | | | | | | | File Path Byte 4 | | | | | | | | |
| ... | | | | | | | | | | | | | | | | |
| File Path Byte N – 1 | | | | | | | | File Path Byte N | | | | | | | | |
| Maximum file path size is 90 bytes. CSW Message Size is N + 2. EXPRESS Size = CSW Message Size + 10 | | | | | | | | | | | | | | | | |

3.4.2.10 Inhibit File (**wildcard ready**)

This command will inhibit a file or files (using a wildcard) that have “enabled” status on the downlink list.

| MSB | | | | | | | | | | | | | | | | | LSB |
|--|--|--|--|--------------|--|--|--|--|-------------------------------|--|--|--|--|--|--|--|-----|
| EXPRESS Version (0000) | | | | EXPRESS Size | | | | | | | | | | | | | |
| EXPRESS Message Type (0xFFFF) | | | | | | | | | | | | | | | | | |
| Function Code Source (0x000F) | | | | | | | | | | | | | | | | | |
| Function Code Destination High | | | | | | | | | Function Code Destination Low | | | | | | | | |
| CSW Destination High (0x00) | | | | | | | | | CSW Destination Low (0x03) | | | | | | | | |
| CSW Message Size High (0x00) | | | | | | | | | CSW Message Size Low | | | | | | | | |
| CSW Message Type High (0x00) | | | | | | | | | CSW Message Type Low (0x29) | | | | | | | | |
| File Path Byte 1 | | | | | | | | | File Path Byte 2 | | | | | | | | |
| File Path Byte 3 | | | | | | | | | File Path Byte 4 | | | | | | | | |
| ... | | | | | | | | | | | | | | | | | |
| File Path Byte N – 1 | | | | | | | | | File Path Byte N | | | | | | | | |
| Maximum file path size is 90 bytes. CSW Message Size is N + 2. EXPRESS Size = CSW Message Size + 10 | | | | | | | | | | | | | | | | | |

3.4.2.11 Inhibit File List

This command inhibits files on the downlink list with “enabled” status that are listed on individual lines in a text file. The file path in the command is the path to this text file.

| MSB | | | | | | | | | | | | | | | | | LSB |
|--|--|--|--|--------------|--|--|--|--|-------------------------------|--|--|--|--|--|--|--|-----|
| EXPRESS Version (0000) | | | | EXPRESS Size | | | | | | | | | | | | | |
| EXPRESS Message Type (0xFFFF) | | | | | | | | | | | | | | | | | |
| Function Code Source (0x000F) | | | | | | | | | | | | | | | | | |
| Function Code Destination High | | | | | | | | | Function Code Destination Low | | | | | | | | |
| CSW Destination High (0x00) | | | | | | | | | CSW Destination Low (0x03) | | | | | | | | |
| CSW Message Size High (0x00) | | | | | | | | | CSW Message Size Low | | | | | | | | |
| CSW Message Type High (0x00) | | | | | | | | | CSW Message Type Low (0x69) | | | | | | | | |
| File Path Byte 1 | | | | | | | | | File Path Byte 2 | | | | | | | | |
| File Path Byte 3 | | | | | | | | | File Path Byte 4 | | | | | | | | |
| ... | | | | | | | | | | | | | | | | | |
| File Path Byte N – 1 | | | | | | | | | File Path Byte N | | | | | | | | |
| Maximum file path size is 90 bytes. CSW Message Size is N + 2. EXPRESS Size = CSW Message Size + 10 | | | | | | | | | | | | | | | | | |

3.4.2.12 Remove File (**wildcard ready**)

This command will remove a file or files (using a wildcard) from the downlink list regardless of the file status.

| MSB | | | | | | | | | | | | | | | | | LSB |
|--|--|--|--|--------------|--|--|--|--|-------------------------------|--|--|--|--|--|--|--|-----|
| EXPRESS Version (0000) | | | | EXPRESS Size | | | | | | | | | | | | | |
| EXPRESS Message Type (0xFFFF) | | | | | | | | | | | | | | | | | |
| Function Code Source (0x000F) | | | | | | | | | | | | | | | | | |
| Function Code Destination High | | | | | | | | | Function Code Destination Low | | | | | | | | |
| CSW Destination High (0x00) | | | | | | | | | CSW Destination Low (0x03) | | | | | | | | |
| CSW Message Size High (0x00) | | | | | | | | | CSW Message Size Low | | | | | | | | |
| CSW Message Type High (0x00) | | | | | | | | | CSW Message Type Low (0x2F) | | | | | | | | |
| File Path Byte 1 | | | | | | | | | File Path Byte 2 | | | | | | | | |
| File Path Byte 3 | | | | | | | | | File Path Byte 4 | | | | | | | | |
| ... | | | | | | | | | | | | | | | | | |
| File Path Byte N - 1 | | | | | | | | | File Path Byte N | | | | | | | | |
| Maximum file path size is 90 bytes. CSW Message Size is N + 2. EXPRESS Size = CSW Message Size + 10 | | | | | | | | | | | | | | | | | |

3.4.2.13 Remove File List

This command deletes files from the downlink list regardless of status that are listed on individual lines in a text file. The file path in the command is the path to this text file.

| MSB | | | | | | | | | | | | | | | | | LSB |
|--|--|--|--|--------------|--|--|--|--|-------------------------------|--|--|--|--|--|--|--|-----|
| EXPRESS Version (0000) | | | | EXPRESS Size | | | | | | | | | | | | | |
| EXPRESS Message Type (0xFFFF) | | | | | | | | | | | | | | | | | |
| Function Code Source (0x000F) | | | | | | | | | | | | | | | | | |
| Function Code Destination High | | | | | | | | | Function Code Destination Low | | | | | | | | |
| CSW Destination High (0x00) | | | | | | | | | CSW Destination Low (0x03) | | | | | | | | |
| CSW Message Size High (0x00) | | | | | | | | | CSW Message Size Low | | | | | | | | |
| CSW Message Type High (0x00) | | | | | | | | | CSW Message Type Low (0x6F) | | | | | | | | |
| File Path Byte 1 | | | | | | | | | File Path Byte 2 | | | | | | | | |
| File Path Byte 3 | | | | | | | | | File Path Byte 4 | | | | | | | | |
| ... | | | | | | | | | | | | | | | | | |
| File Path Byte N - 1 | | | | | | | | | File Path Byte N | | | | | | | | |
| Maximum file path size is 90 bytes. CSW Message Size is N + 2. EXPRESS Size = CSW Message Size + 10 | | | | | | | | | | | | | | | | | |

3.4.2.14 Resend File/Resend File Block (**wildcard ready**)

This command enables a file or files (using a wildcard) with “sent” status on the batch downlink list. For resending an individual file segment, append the segment number followed by a dash at the beginning of the file path. For resending a contiguous set of file segments, append the start segment followed by ‘>’, the last segment desired, and finally a dash. Below are examples of resending file segments:

```
2-c:\hrf_data\file.dat    (resends segment 2 of file1.dat)
2>5-c:\hrf_data\file.dat (resends segments 2 to 5 of file1.dat)
```

Also, file segment commands can be queued up. For instance, use the following paths in resend commands prior to starting batch downlink of files:

```
1-c:\hrf_data\file.dat
3-c:\hrf_data\file.dat
7-c:\hrf_data\file.dat
```

After these three resend commands are received, the next telemetry session will transmit segments 1, 3, and 7 to the ground.

NOTE: Wildcards cannot be used for resending file segments.

| | | | | | | | | | | | | | | | | | | | | |
|--|--|--------------|--|--|--|--|--|--|--|-------------------------------|--|--|--|--|--|--|--|--|--|-----|
| MSB | | | | | | | | | | | | | | | | | | | | LSB |
| EXPRESS Version (0000) | | EXPRESS Size | | | | | | | | | | | | | | | | | | |
| EXPRESS Message Type (0xFFFF) | | | | | | | | | | | | | | | | | | | | |
| Function Code Source (0x000F) | | | | | | | | | | | | | | | | | | | | |
| Function Code Destination High | | | | | | | | | | Function Code Destination Low | | | | | | | | | | |
| CSW Destination High (0x00) | | | | | | | | | | CSW Destination Low (0x03) | | | | | | | | | | |
| CSW Message Size High (0x00) | | | | | | | | | | CSW Message Size Low | | | | | | | | | | |
| CSW Message Type High (0x00) | | | | | | | | | | CSW Message Type Low (0x21) | | | | | | | | | | |
| File Path Byte 1 | | | | | | | | | | File Path Byte 2 | | | | | | | | | | |
| File Path Byte 3 | | | | | | | | | | File Path Byte 4 | | | | | | | | | | |
| ... | | | | | | | | | | | | | | | | | | | | |
| File Path Byte N – 1 | | | | | | | | | | File Path Byte N | | | | | | | | | | |
| Maximum file path size is 90 bytes. CSW Message Size is N + 2. EXPRESS Size = CSW Message Size + 10 | | | | | | | | | | | | | | | | | | | | |

3.4.2.15 Resend File List

This command enables files on the downlink list with “sent” status that are listed on individual lines in a text file. The file path in the command is the path to this text file.

| MSB | | | | | | | | | | | | | | | | LSB |
|--|--|--|--|--------------|--|--|--|-------------------------------|--|--|--|--|--|--|--|-----|
| EXPRESS Version (0000) | | | | EXPRESS Size | | | | | | | | | | | | |
| EXPRESS Message Type (0xFFFF) | | | | | | | | | | | | | | | | |
| Function Code Source (0x000F) | | | | | | | | | | | | | | | | |
| Function Code Destination High | | | | | | | | Function Code Destination Low | | | | | | | | |
| CSW Destination High (0x00) | | | | | | | | CSW Destination Low (0x03) | | | | | | | | |
| CSW Message Size High (0x00) | | | | | | | | CSW Message Size Low | | | | | | | | |
| CSW Message Type High (0x00) | | | | | | | | CSW Message Type Low (0x61) | | | | | | | | |
| File Path Byte 1 | | | | | | | | File Path Byte 2 | | | | | | | | |
| File Path Byte 3 | | | | | | | | File Path Byte 4 | | | | | | | | |
| ... | | | | | | | | | | | | | | | | |
| File Path Byte N – 1 | | | | | | | | File Path Byte N | | | | | | | | |
| Maximum file path size is 90 bytes. CSW Message Size is N + 2. EXPRESS Size = CSW Message Size + 10 | | | | | | | | | | | | | | | | |

3.4.2.16 Common Software File Transfer Command

This command tells the CSW file manager to initiate a file transfer. The local file path must be 60 characters. Any unused characters should be set to null.

| MSB | | | | | | | | | | | | | | | | LSB |
|--------------------------------|--|--|--|--------------|--|--|--|--|--|--|--|--|--|--|--|-----|
| EXPRESS Version (0000) | | | | EXPRESS Size | | | | | | | | | | | | |
| EXPRESS Message Type (0xFFFF) | | | | | | | | | | | | | | | | |
| Function Code Source (0x000F) | | | | | | | | | | | | | | | | |
| Function Code Destination High | | | | | | | | Function Code Destination Low | | | | | | | | |
| CSW Destination High (0x00) | | | | | | | | CSW Destination Low (0x03) | | | | | | | | |
| CSW Message Size High (0x00) | | | | | | | | CSW Message Size Low (0x54) | | | | | | | | |
| CSW Message Type High (0x00) | | | | | | | | CSW Message Type Low (0xF1) | | | | | | | | |
| EMU Filename Character 1 | | | | | | | | EMU Filename Character 2 | | | | | | | | |
| EMU Filename Character 3 | | | | | | | | EMU Filename Character 4 | | | | | | | | |
| EMU Filename Character 5 | | | | | | | | EMU Filename Character 6 | | | | | | | | |
| EMU Filename Character 7 | | | | | | | | EMU Filename Character 8 | | | | | | | | |
| EMU Filename Character 9 | | | | | | | | EMU Filename Character 10 | | | | | | | | |
| EMU Filename Character 11 | | | | | | | | EMU Filename Character 12 | | | | | | | | |
| Request Type Transfer ID | | | | | | | | Block Restart High | | | | | | | | |
| Block Restart Low | | | | | | | | Transfer Type (41h – PLD EMU, 42h PEP EMU) | | | | | | | | |
| PEP File ID High | | | | | | | | PEP File ID Low | | | | | | | | |
| Local Filename Character 1 | | | | | | | | Local Filename Character 2 | | | | | | | | |
| Local Filename Character 3 | | | | | | | | Local Filename Character 4 | | | | | | | | |
| ... | | | | | | | | | | | | | | | | |
| Local Filename Character 59 | | | | | | | | Local Filename Character 60 | | | | | | | | |
| EMU Directory Character 1 | | | | | | | | EMU Directory Character 2 | | | | | | | | |
| EMU Directory Character 3 | | | | | | | | EMU Directory Character 4 | | | | | | | | |

3.4.2.17 Request Type Transfer IDs

| Description | Value |
|--------------------------------|-------|
| Start PEP to EMU Transfer | 00h |
| Stop PEP to EMU Transfer | 40h |
| Restart PEP to EMU Transfer | 80h |
| Start EMU to PEP Transfer | 10h |
| Stop EMU to PEP Transfer | 50h |
| Restart EMU to PEP Transfer | 90h |
| Start EMU to Ground Transfer | 20h |
| Stop EMU to Ground Transfer | 60h |
| Restart EMU to Ground Transfer | A0h |
| Start PLD to EMU Transfer | 00h |
| Stop PLD to EMU Transfer | 40h |
| Restart PLD to EMU Transfer | 80h |
| Start EMU to PLD Transfer | 10h |
| Stop EMU to PLD Transfer | 50h |
| Restart EMU to PLD Transfer | 90h |

3.5 ACCESSING THE COMMON SOFTWARE DYNAMIC LINK LIBRARY

The CSW DLL has been designed for client software to use for communicating with the CSW. The following section describes each function of the DLL, including parameters used in function calls and function return values.

3.5.1 Common Software Dynamic Link Library Function Prototypes and Descriptions

Files Needed: csw_dll.dll
csw_dll.lib
csw_dll.h

3.5.1.1 Connect Command

Call one of the following functions to connect to the CSW RI Server:

```
int STDCALL Connect_To_Server(BYTE client_id);
int STDCALL Connect_To_Server_2(WORD client_id);
```

NOTE: The function “Connect_To_Server_2” must be used. “Connect_To_Server” exists for legacy software applications only.

Each of these function calls will connect a client to the CSW RI Server. Two named pipe connections are established. One connection is for reading data and the other is for writing data. The client_id parameter tells the CSW RI Server which client is connecting. The client_id will be assigned by the HRF Software Integration Team. Only one connect call may be made by a single process.

A return value of 1 means that a connection was successfully established, and a value of 0 means connection was unsuccessful.

3.5.1.2 Request/Send Commands

Call the following functions to write to the CSW RI Server:

int STDCALL Request_Rack_Time();

This function requests rack time from the CSW RI Server. The RIC will return the rack time to the CSW RI Server, and the time will be passed on to the client. The client will continue to receive time every time a request goes out to the RIC. The function returns 0 if successful otherwise a negative number. Rack time will be returned in the form found in Section 3.3.3.

int STDCALL Request_Ancillary_Data(BYTE data_set_id, BYTE request_id);

This function requests configuration of an ancillary data set. The first parameter is the data set id and the second argument is the request id. The value for the data_set_id may be 0x01 to 0x64 for ancillary, 0x80 to 0xE3 for broadcast frames, and 0xE4 for all broadcast frames. The request id may be as follows:

| | |
|--------------------------|------------------------------|
| 0x00, One shot request | ONE_SHOT to return once |
| 0x01, Continuous request | ADD_ENTRY to start sending |
| 0x03, Delete request | DELETE_ENTRY to stop sending |

The function returns 2 if successful or 0 if the function was unsuccessful. Ancillary data packet format is in Sections 3.3.1 and 3.3.2.

int STDCALL Send_File_Location_File(char file_path);*

This function sends a data file location message. This should be called when new data has been recorded and needs to be added to the batch downlink list. Sending this message will put the new data on the batch downlink list. The parameter is the path to a file location file which lists all the paths where data may be found.

The function returns the path length including null characters if successful or 0 if the function was unsuccessful.

int STDCALL Batch_Downlink_Control(int Control_id);

This function turns on and off the batch downlink capability of the HRF CSW. The parameter value must either be 101 for enabling batch downlink or 102 for disabling batch downlink. Disabling batch downlink will allow a client to send real time telemetry data to the RIC without interference from batch downlink. The function returns 0 if successful otherwise a negative number.

int STDCALL Update_Health_and_Status(BYTE health_buffer, int buffer_size);*

This function sends health and status data to the CSW RI Server. The first parameter is a pointer to the health and status data, and the second parameter is the data size in bytes. Health and status data must be configured for a client. If a client is not configured for health and status, the CSW RI Server will discard Health and Status

data packets. The function returns the health buffer size if successful or 0 if the function was unsuccessful. The buffer size must match the health and status size assigned to the client. Excess buffer data will be discarded. The first WORD (2 bytes) of health buffer must be a data cycle counter. The initial value of this counter must be zero. The counter must increment by one for every new call to this function. The counter should return to zero after reaching 65,535.

int STDCALL Send_PEP_Bundle_Request(int request_type ,int bundle parameter);

This function sends a Payload Executive Processor (PEP) Bundle Request to the CSW RI Server which is passed on to the PEP through the RIC. The first parameter is the request type, and the second parameter is the bundle parameter. The value for the bundle parameter will vary depending on the request. The request_type can be INSTALL_BUNDLE_REQ (21 decimal), HALT_BUNDLE_REQ (22 decimal), or REMOVE_BUNDLE_REQ (23 decimal). The function returns 4 if successful or 0 if the function was unsuccessful.

int STDCALL Send_PEP_Execution_Request(int request_type,int payload_seq_id);

This function sends a PEP Execution Request to the CSW RI Server which is passed on to the PEP through the RIC. The first parameter is the request type, and the second parameter is the payload sequence id.

The payload sequence id will vary for different requests. The request_type can be START_EXEC (18 decimal), STOP_EXEC (19 decimal), or RESUME_EXEC (20 decimal). The function returns 4 if successful or 0 if the function was unsuccessful.

int STDCALL Send_Data(void data_buffer,int data_size);*

This function writes data packets to the CSW RI Server and returns the number of bytes written to the server. The first parameter is a pointer to the data buffer, and the second parameter is the size of the data buffer. The size may be no greater than 4090 bytes. The function returns immediately. The client software is responsible for making sure that all data is written. The first word in the data buffer must be the two LSDS bytes described in Section 3.2.12. Set the highest bit of the first LSDS byte when the data is in LSDS format. The remaining 15 bits are used for the client ID. This is the same ID passed in the Connect_To_Server function call.

int STDCALL Read_Server(void data_buffer, int data_size);*

int STDCALL Read_Server_Wait(void data_buffer, int data_size);*

These functions will return the number of bytes read from the server and data from the named pipe buffer. The following items may be read from the CSW RI Server:

- Rack Time
- Ancillary Data Sets
- Broadcast Ancillary Data
- Generic Client Messages

The Read_Server_Wait function will wait for data on the pipe, but the Read_Server function will return immediately.

Void Disconnect_Server();

This function disconnects the client software from the CSW RI Server. The function should be called by the client software before program termination.

int STDCALL Send_Client_Message(void message, int message_size, BYTE destination)*

This function sends a client specific message to the server for transfer to another client. The destination should be the client id of the client receiving the message. The return value is the message size.

3.6 COMMON SOFTWARE HEALTH AND STATUS FORMAT

| | |
|------|--|
| 55AA | Sync Word |
| XXXX | Byte Count |
| XXXX | Message Type |
| 0100 | Source Function Code |
| 0001 | Destination Function Code |
| 0000 | Caution and Warning Data Word |
| 0000 | Cycle Counter (increases with each packet and cycles back to zero after FFFF) |
| 0100 | Common Software Source Word (tells whether the data is from Laptop or Workstation) |
| 000X | Common Software Health Word - 0009 Server Running (batch mode on) |
| | 000B Server/User Interface Running (batch mode on) |
| | 000F Server/User Interface/File Manager Running (batch mode on) |
| | 000D Server/File Manager Running (batch mode on) |
| 0000 | CSW Commands Received Word |
| 0000 | # Enabled Downlink Files Word (will be FFFF if the File Manager is not connected to the Server) |
| 0046 | 10 Words that show which experiment software clients are connected to the CSW Server |
| 0000 | Each word is 0000 if a client is not connected. In this case only client id 0046 is connected |
| 0000 | The number of words used for connected clients may be changed in the Rack Interface (Server) |
| 0000 | configuration file, "CFRIconfig.txt". Ten words were used in this case as an example. |
| 0000 | |
| 0000 | |
| 0000 | |
| 0000 | |
| 0000 | |
| 0000 | |
| XXXX | Client 1 subset id |
| XXXX | Client caution and warning word |
| 0000 | Client cycle counter (increases with each packet received from the client and cycles back to zero) |
| XXXX | Client Health Data |
| XXXX | |
| XXXX | |
| XXXX | |
| XXXX | Client 2 subset id |
| XXXX | Client caution and warning word |
| 0000 | Client cycle counter (increases with each packet received from the client and cycles back to zero) |
| XXXX | Client Health Data |
| XXXX | |
| XXXX | |
| XXXX | |

3.7 BATCH DOWNLINK

3.7.1 File Naming Convention Restrictions - Using Unique File Names

One of two naming conventions must be used for files created for batch downlink. One convention involves using a unique file name for each file created. The other convention involves using the same file name every time information such as experiment data is written to file. Use of this secondary convention is described in the next section. The remainder of this section discusses using unique file names.

There are two basic ways to create a unique file name. The preferred method is to include a date and time stamp in the file name. The other method is to include a sequence number in the file name. If the latter approach is used, the sequence number shall not be dependent on the existence of any previously created file. A separate file located outside of the downlink directory should be used to maintain the sequence count.

The file names below are examples of both these methods.

Exp_data10142003065830.dat (with date and time stamp)

Exp_data0001.dat (with sequence number)

The following tables show the format and example contents of the file location text file for this naming convention.

| Line | Section (separated by tabs) | Represents | Description |
|------|-----------------------------|---------------------------|--|
| 1 | N/A | File Location File Method | The type of file location file. For example, "SAME FILE OFF." |
| 2+ | 1 | Data Type Name | The name of the type of data files. For example, "HRFdata". |
| 2+ | 2 | Experiment ID | Identification for the data. |
| 2+ | 3 | Priority Level | The priority of the data files: "1", "2", or "3". |
| 2+ | 4 | Recursion Flag | Set the recursion flag to "0" to gather the files from the folder specified only. Set the recursion flag to "1" to gather files from the folder and all of its subfolders. |
| 2+ | 5 | Data Path | The complete path of the data files, including wildcards. For example, "d:\HRF_data*.dat" |

FileLocation.txt Example with "SAME FILE OFF"

| | | | | |
|----------------|----|---|---|---------------------------|
| SAME FILE OFF | | | | |
| hrfdata | 45 | 2 | 1 | d:\hrfdata*.dat |
| ws diagnostics | 55 | 1 | 0 | c:\workstation\test*.log |

3.7.2 Using Same File Name

In some cases, an experiment or instrument may save their data to one file and each data session just appends to that data file. In this event, the file location file should use the “SAME FILE ON” method.

When using the “SAME FILE ON” method, a number file is used to track how many data sessions has occurred with the experiment/instrument. This setup is needed so the File Manager can rename and move the data session file to appear as a nominal, separate data file. Then the file can be added to the downlink list and telemetry can occur as normal.

Also note then when using the “SAME FILE ON” method, the recursion flag must be set to “0”, the data folder path must have a subfolder called “same_file_name_data”. In the example below, “d:\hrf_data\evarm\” is the data folder path and so, the path “d:\hrf_data\evarm\same_file_name_data\” must exist.

The following tables show the format and example contents of the file location text file for the naming convention.

| Line | Section (separated by tabs) | Represents | Description |
|------|-----------------------------|---------------------------|---|
| 1 | N/A | File Location File Method | The type of file location file. For example, “SAME FILE ON” |
| 2 | N/A | Number File | Path of file designated to track the number of data sessions. |
| 3+ | 1 | Data Type Name | The name of the type of data files. For example, “HRFdata”. |
| 3+ | 2 | Experiment ID | Identification for the data. |
| 3+ | 3 | Priority Level | The priority of the data files: “1”, “2”, or “3”. |
| 3+ | 4 | Recursion Flag | The recursion flag must be set to “0”. |
| 3+ | 5 | Data Path | The complete path of the data files, including wildcards. For example, “d:\HRF_data*.dat”. |

FileLocation.txt Example with “SAME FILE ON”

| | | | |
|------------------------------------|----|---|-------------------------|
| SAME FILE ON | | | |
| d:\hrf_prog\evarm\evarm_number.txt | | | |
| evarm files | 33 | 1 | 0 |
| | | | d:\hrf_data\evarm*.log |

NOTE: In this example, the “d:\hrf_prog\evarm\evarm_number.txt” file must exist and be set to a starting number, e.g., “1”.

3.7.3 Downlink File ID File

The downlink file ID file (downlink_file_id.txt) is monitored by the CSW FM and UI only. No payload client software should modify this file.

The file contains the next unique file ID number for the FM or UI to use when adding a file to the downlink list.

3.7.4 Downlink List

The downlink list files (downlinklist.txt, csw_archive_list.txt, csw_largefilesegment_list.txt) are monitored by the CSW FM and UI only. No payload client software should modify this file.

The format of a line in a downlink list file is as follows with the fields separated by tabs.

| File ID | Experiment ID | Folder | File | Size | Priority | Status | Modified Time | Sent/Inhibited Time |
|---------|---------------|--------|------|------|----------|--------|---------------|---------------------|
|---------|---------------|--------|------|------|----------|--------|---------------|---------------------|

*Note: Priority - 1, 2, or 3; highest to lowest priority of files

*Note: Status - sent, inhibited, or enabled

*Note: Modified Time - time stamp when the file was last modified, ddMmmyy hh:mm:ss

*Note: Sent/Inhibited Time - time stamp when the file is sent or inhibited, in format ddMmmyy hh:mm:ss

The following is an example of a downlink list file.

| | | | | | | | | |
|---|----|-------------------|------------|-------|---|---------|------------------|----------------------|
| 1 | 8 | c:\data\e308data\ | re2379.dat | 79085 | 2 | enabled | 02Apr99 12:39:03 | xxxxxxxxxxxxxxxxxxxx |
| 2 | 10 | c:\exper\yphb\ | o0752.sw1 | 5241 | 1 | sent | 01Apr99 03:59:24 | 03Apr99 11:34:28 |

APPENDIX A
COMMON SOFTWARE TELEMETRY HEADER DEFINITIONS

EXPRESS packet format (header 1)

Version is the high 3 bits of the Version-Byte count word

Byte count is the size of the entire message not counting the version-byte count word.

| MSB | LSB |
|---------------------------|---------------------------|
| Version – Byte Count | Version Byte Count |
| Message Type | Message Type |
| Function Code Source | Function Code Source |
| Function Code Destination | Function Code Destination |

EXPRESS packet format (header 2)

Telemetry Data Type

0x100 Batch Telemetry

0x101 Real Time Telemetry

0x102 CRC packet

| MSB | LSB |
|-------------------------|---------------------|
| Telemetry Data Type | Telemetry Data Type |
| Sequence Count | Sequence Count |
| Coarse Time (High Word) | Coarse Time |
| Coarse Time (Low Word) | Coarse Time |

Real Time Packet Format (TSC header)

The highest bit in the Format-Experiment ID word is set if the data is in LSDS format.

The other 15 bits represent the experiment ID.

| MSB | LSB |
|---------------------------|---------------------------|
| Current Packet | Total Packets |
| Current Packet Byte Count | Current Packet Byte Count |
| Total Byte Count | Total Byte Count |
| Format-Experiment ID | Format-Experiment ID |

Batch Downlink Header 1

Current segment and total segment words are zero if the file is not segmented.

| MSB | LSB |
|----------------------------|----------------------------|
| Block ID | Header Version |
| Experiment-Instrument ID | Experiment-Instrument ID |
| Downlink File ID | Downlink File ID |
| Packet Data Size | Packet Data Size |
| Current Packet Number | Current Packet Number |
| Total File Packets | Total File Packets |
| Current Segment Number | Current Segment Number |
| Total File Segments | Total File Segments |
| Cyclic Redundancy Checksum | Cyclic Redundancy Checksum |
| Cyclic Redundancy Checksum | Cyclic Redundancy Checksum |
| Filename Byte 1 | Filename Byte 2 |
| Filename Byte 3 | Filename Byte 4 |
| | |
| Filename Byte 127 | Filename Byte 128 |

Batch Downlink Header 2

| MSB | LSB |
|--------------------------|--------------------------|
| Block ID | Header Version |
| Experiment-Instrument ID | Experiment-Instrument ID |
| Downlink File ID | Downlink File ID |
| Packet Data Size | Packet Data Size |
| Current Packet Number | Current Packet Number |
| Total File Packets | Total File Packets |
| Current Segment Number | Current Segment Number |
| Total File Segments | Total File Segments |

Cyclic Redundancy Checksum (CRC) packet

This packet is sent to the ground after a ground command is sent to the CSW requesting a calculation of a CRC for a file.

| MSB | LSB |
|----------------------------|----------------------------|
| Cyclic Redundancy Checksum | Cyclic Redundancy Checksum |
| Cyclic Redundancy Checksum | Cyclic Redundancy Checksum |
| Filename Byte 1 | Filename Byte 2 |
| Filename Byte 3 | Filename Byte 4 |
| | |
| Filename Byte 93 | Filename Byte 94 |

APPENDIX B

CSW SPECIFIC FILE IDS USED IN TELEMETRY HEADERS

| File Type | File ID |
|----------------------------|---------|
| Archived Logs | 65000 |
| Current Logs | 65000 |
| Archive Downlink List | 65533 |
| File Segment Downlink List | 65534 |
| Downlink List | 65535 |

Max File ID for user data files is 64,999.

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