

Command and Control ToolkitTM
Synchronous Serial Interface – IRIG 161
Reference Manual

Command and Control ToolkitTM

Synchronous Serial Interface - IRIG 161

Reference Manual

February 2006

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Sync Serial I/F – IRIG 161

MNL-CCTK-SyncSer161

February 27, 2006

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1 INTRODUCTION

The Command and Control Toolkit™ product is a data acquisition and commanding software package that can be tailored to a wide range of command and control applications. The product, also known as CCTK, provides a customizable client/server environment designed to meet the performance requirements of mission critical command and control operations. The CCTK client/server environment can be easily expanded from a single display console to any number of networked display consoles.

The CCTK documentation set provides a comprehensive description of how to install, configure, and use the CCTK software. This documentation, together with the reference documents listed in each manual, contains the information you will need to apply CCTK and any optional modules you have purchased to your command and control operation.

1.1 Manual Organization

This document describes the general user operation of the CCTK Synchronous Serial Interface. It is intended to be a guide for new users of the software. This document is organized such that information needed from installation to operation is presented in the order that you will need it.

Section 2 provides installation instructions for the Synchronous Serial Interface software.

Section 3 provides an overview of the Synchronous Serial capability.

Section 4 discusses the database configuration necessary to operate the Synchronous Interface.

Section 5 discusses the process of integrating the Synchronous Interface configuration into the CCTK Project configuration.

Section 6 discusses the initiation and execution of the Synchronous Serial Interface operations

Appendix A includes a full listing of the metadata specification for the IRIG 161 formats

A glossary of commonly used terms, phrases, and acronyms is included at the end of the manual.

1.2 CCTK Documentation Guide

This manual is one of a set of five manuals included in the CCTK product suite, illustrated in Figure 1-1 below. The manuals are designed to address the needs of particular classes of CCTK users such as installers, administrators, and operators.

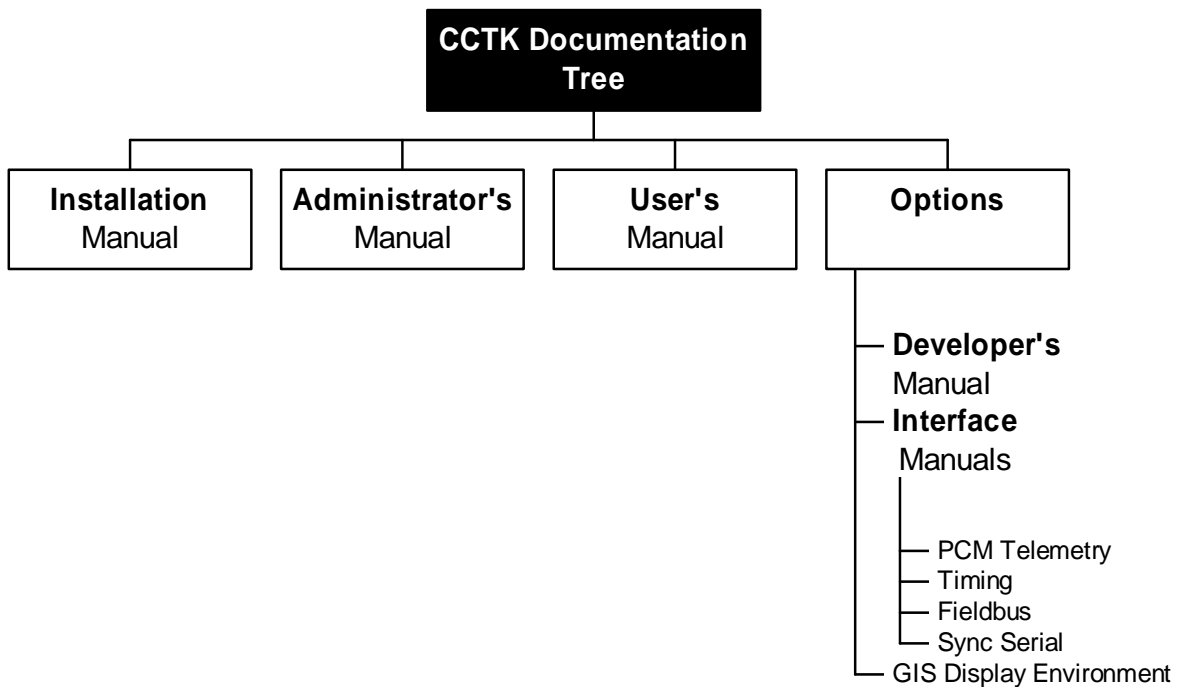


Figure 1-1. CCTK Documentation Tree.

Release notes provide supplemental information to this manual. Please refer to the RELEASE_NOTES installed with the latest version of the software.

- ***CCTK Installation Manual*** – Describes the steps needed to install CCTK client and CCTK server software from the CCTK CD. Installation on Microsoft Windows® and UNIX® systems is described.
- ***CCTK Administrator's Manual*** – Describes setup, configuration, and administration of CCTK. The material addresses software setup, user administration, project configuration, hardware configuration, and other topics related to administration of a CCTK-based system.
- ***CCTK User's Manual*** – Includes an overview of the CCTK architecture and a complete description of how to use CCTK for operations.
- ***CCTK GIS Display Environment User's Manual*** – Describes setup and operation of GIS Display Environment option.
- ***CCTK PCM Telemetry Interface Reference Manual*** – Describes setup, configuration, and use of the optional PCM Telemetry Interface software module.
- ***CCTK Timing Interface Reference Manual*** – Describes setup, configuration, and use of the optional Timing Interface software module.
- ***CCTK Fieldbus Interface Reference Manual*** – Describes setup, configuration, and use of the optional Fieldbus Interface software module.
- ***CCTK Sync Serial Interface Reference Manual*** – Describes the setup, configuration, and use of the optional Synchronous Serial Interface software module.

- ***CCTK Developer's Manual*** – Describes the optional CCTK application development environment and how to use the CCTK Developer's kit to extend and customize CCTK to a particular application or operation with your own software.
-

1.3 Reference Documentation

The following documents complement the material presented in this manual:

- Hardware Information FarSync_WAN_PCI-X_X.21_V.35_RS-530_windows_datasheet.pdf at <http://www.farsite.com>.
- IRIG Standard 161-00, IRIG Data Formats for Inter-range Transmission of Tracking Data From Computer to Computer (EFG, RAE, AND XYZ FORMATS), Range Commanders Council, March 2000
- AGSP Metadata for IRIG-161 Formats: 0, 0A, 0B, 0C, 1, 1A, 1B, 1C, 2, 2A, 2B, 2C, & 3, 3A – Included in Appendix A

2 OVERVIEW

This section provides a basic overview of the Synchronous Serial IRIG-161 interface.

2.1 Introduction

In order for the TelSim system to acquire or transmit synchronous serial tracking data, a CCTK Interface process is required. The synchronous serial interface supports data acquisition, playback, transmission (from a UNIX pipe, or CCTK Channel), and data simulation of IRIG 161 synchronous serial streams.

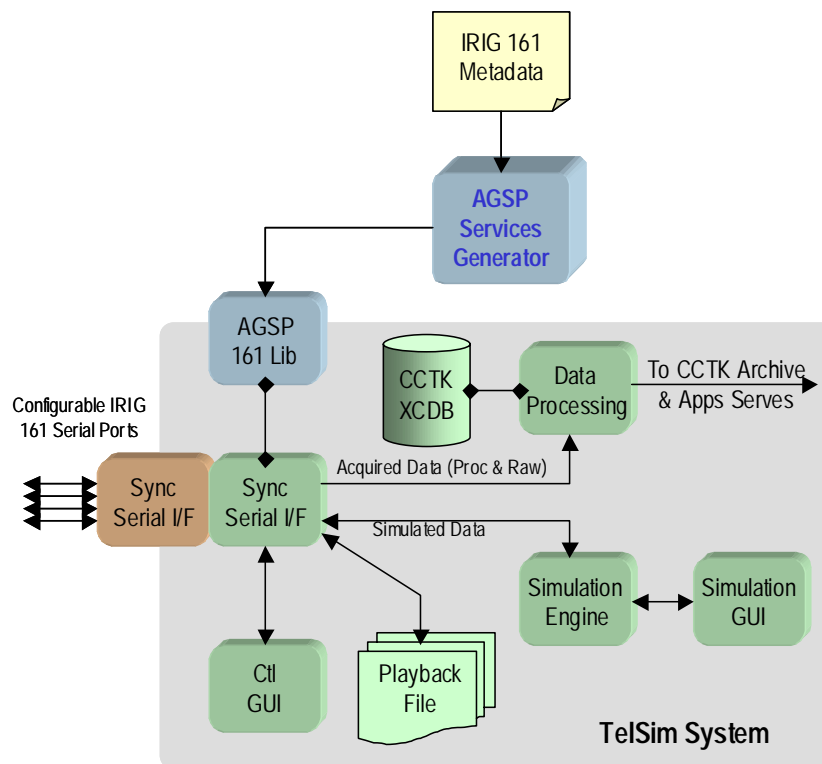


Figure 2-1 Sync Serial Interface Overview

The Synchronous Serial Interface is composed of a number of components:

- Configuration Database: Modeled after the CCTK configuration database, XML files are used to configure the Synchronous Serial interface. The configuration database is detailed in Section 3.
- AGSP Library: Auto-generated semantic processing services (AGSP) provide the entire stream, protocol, and data processing required to support the IRIG-161 formats.
- SyncSerialIf: The SyncSerial Interface (*SyncSerialIf*) process performs the processing of serial data during project execution. One *SyncSerialIf* process is needed per input or output stream. The *SyncSerialIf* process is detailed in Section 4.3.1.
- User Interface: The tracking interface is controlled via a Graphical User Interface (GUI) used to send commands to the *SyncSerialIf* process. The *SyncSerialIf* control GUIs are detailed in Section 5.
- CCTK Simulation Engine: The CCTK Simulation Engine is a standard CCTK component and serves as the modeling environment for the TelSim. The Simulation user interface is described in the CCTK Users Manual. Simulation details for creating simulation scripts and/or software is discussed in the CCTK Administrators Manual.
- CCTK Data Processing: Data Processing is a standard CCTK service to processes data and distributes it for archive, application processing, and display. Sometimes referred to as “DataProc”, its capabilities are described in detail in the CCTK Administrators manual.
- Synchronous Serial Device: This serial communications card is available from Farsite Communications (<http://www.farsite.co.uk/>) in a PCI form factor. It fully supports the synchronous serial communications required by the IRIG-161 specification.

3 SYNC SERIAL INTERFACE CONFIGURATION

This section contains an explanation of how to configure the Configuration Database (CDB). Configuring the CDB for a Synchronous Serial stream consists of the following steps:

- Assign a unique, identifying name to the interface.
- Set the processing options for the interface
- Set the card-specific configuration.

3.1 Configuration Overview

There are two primary XML files used to configure TelSim and the Sync Serial Interface. They are:

- Sync Serial Configuration Database file (typically *sync_serial.xml*) – defines the run-time configuration of the SyncSerialIf, mapping formats to physical ports for transmission or receipt.
- Project Configuration file (typically *project_config.pcmf*) – Describes the composition of any single instance of a configuration. It points to configuration database files, defines communications resources within CCTK, Defines the processes and applications that are automatically started when a project is activated (including the SyncSerialIf process), and defines the applications and displays that can be initiated at runtime by the systems operator from the CCTK Client.
- IRIG-161 Protocol Definition - See IRIG-161 protocol definition in AGSP IRIG-161 Metadata (see the XTCE IRIG-161 metadata definition in Appendix A). This metadata defines the logical tags, or Function Designators, used to reference data for simulation or acquisition. It also defines the structural and data processing necessary to commute and decommute IRIG-161 data streams as defined by the Range Commanders Council document *IRIG Data Formats for Inter-range Transmission of Tracking Data From Computer to Computer (EFG, RAE, AND XYZ FORMATS)*, March 2000.

Note: The TelSim Sync Serial Interface utilizes auto-generated software libraries to process the IRIG-161 protocol. Modification of the IRIG-161 specification, or the CCT provided IRIG-161 Metadata will require the AGSP library to be regenerated. Please contact CCT technical support if a revised AGSP library is required.

3.2 Sync Serial Interface Definition

The following is an example of entries in the Sync Serial Configuration Database xml file for the interface. Transmit (TX) and receive (RX) channels have separate definition structures.

```
<SyncSerialRxInterface name="RX_0A" interfaceType="IRIG-161 Rx">
  <Description>IRIG161_0A SerialIf Interface, PCI Device</Description>
  <SyncSerialRxSerialPort>
    <FarsyncDevice filename="/dev/sync3" />
  </SyncSerialRxSerialPort>
  <SerialFrameParameters type="Format161_0A"
AGSPLibrary="libSyncSerialIRIG161_0A.so" AGSPContext="IRIG161"/>
  <SyncSerialRawDataArchive active="false" filename="raw_filename"/>
</SyncSerialRxInterface>

<SyncSerialTxInterface name="TX_0A" interfaceType="IRIG-161 Tx" >
  <Description>IRIG161_0A SerialIf Interface</Description>
  <SyncSerialTxSerialPort>
    <FarsyncDevice filename="/dev/sync0"lineInterface="x21" />
  </SyncSerialTxSerialPort>
  <SerialFrameParameters type="Format161_0A"
AGSPLibrary="libSyncSerialIRIG161_0A.so" AGSPContext="IRIG161"
reverseBuffer="false" />
  <SyncSerialRawDataPlayback active="false" rewindOnEof="true"
filename="raw_filename" />
</SyncSerialTxInterface>
```

Note: This xml file is included in the IRIG-161 projects folder at ../projects/IRIG161/..

3.2.1 SyncSerial Interface Entry

For each communications channel (port) an entry set needs to be specified in XML format, these entries will contain the parameters needed to configure the interface. For Transmit <SyncSerialTxInterface > is used and for receive <SyncSerialRxInterface> is used.

3.2.1.1 Receive Interface Definition

```
<SyncSerialRxInterface>
```

Contains specifications for Description, Serial Port, Frame Parameters, AGSP Library, and Playback configuration. Fields on this line are:

name: the logical name of the interface and can be specified by the user. This name will appear on the display for the port.

interfaceType: Should be set to "IRIG-161 Rx".

```
<Description>
```

This is a user-defined entry and can be any text field.

```
<SyncSerialRxSerialPort>
```

Contains the specification of the device/port to be used. The only valid entry at this time is “FarsyncDevice”.

Note: The SyncSerial interface was designed in anticipation of supporting other serial devices in the future.

<FarsyncDevice>

Within the FarsyncDevice there are two fields. The first is *filename*. This field must be included. The filename is the linux device filename in the /dev directory for a port on the card. The Farsite T4U card provides four ports *sync0*, *sync1*, *sync2*, *sync3*. If additional cards are configured the ports for the device will start at *sync4* and increment sequentially. Currently full duplex is not supported so a specified filename (port) can be defined as transmit or receive but not both. In the example above, the Farsync device is configured to transmit on the first port , *or sync0*. The second field is *lineInterface*. This field is optional. The values are x21 or v24. The x21 specifies a RS422 interface, and v24 specifies a RS232 interface. If no line interface is specified the default will be x21.

<SyncSerialFrameParameters>

Contains the specification for the format. This contains three required fields: *type*, *AGSPLibrary*, and *AGSPContext*.

The *type* and *AGSPLibrary* fields specify the format for the port. The library must match the format type.

For IRIG-161 the following are allowed:

Table 3-2, AGSP Receive (Rx) Configuration Information

Type	AGSPLibrary
Format161_0	libSyncSerialIRIG161_0.so
Format161_0A	libSyncSerialIRIG161_0A.so
Format161_0B	libSyncSerialIRIG161_0B.so
Format161_0C	libSyncSerialIRIG161_0C.so
Format161_1	libSyncSerialIRIG161_1.so
Format161_1A	libSyncSerialIRIG161_1A.so
Format161_1B	libSyncSerialIRIG161_1B.so
Format161_1C	libSyncSerialIRIG161_1C.so
Format161_2	libSyncSerialIRIG161_2.so
Format161_2A	libSyncSerialIRIG161_2A.so
Format161_2B	libSyncSerialIRIG161_2B.so
Format161_2C	libSyncSerialIRIG161_2C.so

Type	AGSPLibrary
Format161_3	libSyncSerialIRIG161_3.so
Format161_3A	libSyncSerialIRIG161_3A.so
LTAS	libSyncSerialIRIG161_LTAS.so
MDDF	libSyncSerialIRIG161_MDDF.so

The **AGSPContext** field provides a text string that allows the interface process to access the AGSP functions. For IRIG-161 this should be set to "IRIG161".

<SyncSerialRawDataArchive>

Contains the parameters needed to configure the port for raw archiving. There are two fields used for parameters.

active: This enables and disables this port as raw archive.

filename: specifies a file to be used as a raw . This field is optional. If a file is not specified a default filename will be used. The default filename will be the name assigned to the port with .raw appended. See <SyncSerialRxInterface> name field for this default name.

3.2.1.2 Transmit Interface Definition

<SyncSerialTxInterface>

Contains specifications for Description, Serial Port, Frame Parameters, AGSP Library, and Playback configuration. Fields on this line are:

name: The logical name of the interface and can be specified by the user. This name will appear on the display for the port.

interface type: Should be set to "IRIG-161 Tx".

<Description>

This is a user defined entry, can be any text field.

<SyncSerialTxSerialPort>

Contains the specification of the device/port to be used. The only valid entry at this time is "FarsyncDevice". The SyncSerial interface was designed in anticipation of supporting other serial devices in the future.

<FarsyncDevice>

Within the **FarsyncDevice** there is a single field called filename. This field must be included. The filename is the linux device filename in the /dev directory for a port on the card. The Farsite T4u card provides four ports **sync0**, **sync1**, **sync2**, **sync3**. If additional cards are configured the ports for the device will start at **sync4** and increment sequentially. Currently full duplex is not supported so a specified filename (port) can be specified transmit or receive

but not both. In the example above, the Farsync device is configured to transmit on the last port, *sync3*.

<SyncSerialFrameParameters>

Contains the specification for the format. This contains three required fields: *type*, *AGSPLibrary*, and *AGSPContext*.

The *type* and *AGSPLibrary* fields specify the format for the port. The library must match the format type.

For IRIG-161 the following are allowed:

Table 3-1, AGSP Transmit Configuration Information

Type	AGSPLibrary
Format161_0	libSyncSerialIRIG161_0.so
Format161_0A	libSyncSerialIRIG161_0A.so
Format161_0B	libSyncSerialIRIG161_0B.so
Format161_0C	libSyncSerialIRIG161_0C.so
Format161_1	libSyncSerialIRIG161_1.so
Format161_1A	libSyncSerialIRIG161_1A.so
Format161_1B	libSyncSerialIRIG161_1B.so
Format161_1C	libSyncSerialIRIG161_1C.so
Format161_2	libSyncSerialIRIG161_2.so
Format161_2A	libSyncSerialIRIG161_2A.so
Format161_2B	libSyncSerialIRIG161_2B.so
Format161_2C	libSyncSerialIRIG161_2C.so
Format161_3	libSyncSerialIRIG161_3.so
Format161_3A	libSyncSerialIRIG161_3A.so
LTAS	libSyncSerialIRIG161_LTAS.so
MDDF	libSyncSerialIRIG161_MDDF.so

The *AGSPContext* field provides a text string that allows the interface process to access the AGSP functions. For IRIG-161 this should be set to "IRIG161".

The *reverse_buffer* field should be set to "false" for the Sync Serial Interface.

<SyncSerialRawDataPlayback>

Contains the parameters needed to configure the port for playback. There are three fields used for parameters.

active: This enables and disables this port as playback.

rewindOnEof: Configures playback to rewind when the end of file is reached. This allows continuous replay of a playback file. Allowable values are true or false.

filename: specifies a file to be used as playback. This field is optional. If a file is not specified a default filename will be used. The default filename will be the name assigned to the port with .raw appended. See <SyncSerialTxInterface> name field for this default name.

3.2.1.3 Sync Serial Interface Status

<i>Measurement</i>	<i>Description</i>
Bit Errors	Set when data is not received at the expected rate
Bit Sync Status	Set when data is seen at the interface
DA Status	Data Acquisition Command Status
DP Status	Data Processing Command Status
Device Error	Set if a the socket call to the device returns an error
Frame Errors	Future implementation
Frame Sync Status	Set if frame sync is acquired
Frames Received	Number of frames processed
Packets Sent	Counter indicating the number of measurements sent from the interface to data processing.
Raw Arch Status	Raw Archive Command Status
Raw Dump Status	Raw Dump Command Status

3.3 Project Configuration File Entry

This sub-section assumes you have a detailed understanding of the CCTK configuration database. If you are not familiar with the CCTK configuration database, please see the *CCTK Administrator's Manual* for more information.

The default Project Configuration File is called `project_config.pcm1` and normally resides in the KPATH (`../projects/project_name`) directory.

The Project Configuration File entry for a the Sync Serial Interface consists of two entries:

- Specification of the CDB – the location of the CDB file defaults to the same location as the Project Configuration File. The Sync Serial CDB file (created in the previous sub-section) is normally placed in the KPATH directory although it can be placed anywhere.

```
<ConfigDb file="sync_serial.xml" />
```

- The SyncSerialIf Application call.

```
<Execute waitFor="running" critical="YES">SyncSerialIf -P "RX_0A - Serial Port" -o  
AGSP_out -D 5</Execute>
```

3.3.1 The SyncSerialIf Application call

See section 3.4 Project Configuration File Entry Examples for examples of how to configure the SyncSerialIf application in the Project Configuration File.

3.3.1.1 Options

- `-p Port_FD_Name` - The `Port_FD_Name` is a required text string command line argument. The Port FD is used to identify the port descriptor the SyncSerialIf process will use to set its distribution vector.
- `-o Output_Chan_Name` - The `Output_Chan_Name` is a required text string command line argument. The Output Channel is the channel where the raw Synchronous Serial data packets (Minor Frames) are distributed.
- `-s Status_Chan_Name` - The `Status_Chan_Name` is an optional text string command line argument. The Status Channel is the output channel where Health and Status measurement packets are distributed. The `STDSTATUS` Channel will be used as a default if one is not specified on the command line.
- `-i Input_Chan_Name` - The `Input_Chan_Name` is an optional text string command line argument. The Input Channel is the channel where SyncSerialIf receives system commands. The next available Input Channel will be used as a default if one is not specified on the command line.
- `-k KPATH_Name` - The `KPATH_Name` is an optional text string command line argument. The KPATH Name specifies the value to be used to set the KPATH environment variable. The KPATH environment variable is a required environment variable. The existing KPATH environment variable will be used as a default if one is not specified on the command line.
- `-D Dbg_Level` - The `-D` option will enable debug mode. Debug mode causes verbose messages to be printed to a debug file in the log directory. The `Dbg_Level` is an optional

integer between 0 and 5 that determines how verbose the messages will be. Level 5 is most verbose.

- -h - The -h option will print a help message to the screen. The help message indicates the current default values of the optional command line arguments.

3.3.1.1.1 Return Values

The SyncSerialIf process returns SUCCESS_EXIT to the invocation environment if process initialization and termination was successful. One of the following values is returned to indicate the reason for failure if an initialization or termination error occurs:

Table 3-1, AGSP Return Values

Description	Error
Error processing command line arguments.	OPT_ARG_INIT_EXIT_ERR
Error establishing CCTK Kernel resources.	CCTK_INIT_EXIT_ERR
Error accessing configuration data.	CONFIG_INIT_EXIT_ERR
Error updating Health and Status.	STATUS_INIT_EXIT_ERR
Error occurred after initialization.	PROC_STATE_EXIT_ERR
Error terminating CCTK Kernel resources.	CCTK_TERM_EXIT_ERR

3.4 Project Configuration File Entry Examples

3.4.1 Basic Synchronous Serial

The following project configuration file shows an example configuration for TelSim with one simulation channel for IRIG-161 format 0A “TX_0A – Serial Port”, and one acquisition channel for IRIG-161 format 0A “RX_0A – Serial Port”.

```
<Mode name="IRIG_161" inherits="base">
  <Description>Farsync Sync Serial If</Description>

  <ConfigDb file="sync_serial.xml" />

  <Channel name="Channell" size="40000" />
  <Channel name="AGSP_out" size="40000" />

  <Execute waitFor="running" critical="YES">DataProc -i Channell -t mdt</Execute>
  <Execute waitFor="running" critical="YES">CDTimeControl -p CDTime_port -o Channell -u
    1000</Execute>

  <Execute waitFor="running" critical="YES">DataProc -i STDSTATUS -t mdt</Execute>
  <Execute waitFor="running" critical="YES">DataProc -i AGSP_out -t mdt</Execute>
  <Execute waitFor="running" critical="YES">SyncSerialIf -P "RX_0A - Serial Port" -o
    AGSP_out -D 5</Execute>
  <Execute waitFor="running" critical="YES">SyncSerialIf -P "TX_0A - Serial Port" -D
    5</Execute>
</Mode>
```

4 OPERATIONS

This section describes the operation of the Synchronous Serial interface and the Graphical User Interface (GUI) displays.

4.1 Getting Started

From the TelSim desktop start the CCTK client by selecting the CCTK icon from the Start Menu.

Open the desired project database to configure the TelSim for a specific operation. TelSim includes a basic IRIG-161 database called "IRIG161_0A. You can open this project by navigating to the project folder and selecting the project_config.pcml file.

You can create your own customized projects for IRIG-161 by copying this folder and uniquely renaming it.

Note: There are a number of example project folders installed by default on your system.

Select the up-arrow on the client toolbar or select start from the File pull-down menu. Refer to the CCTK User's Manual for details as necessary.

The project will activate the necessary resources required to run the specified project. A green healthy indicator will be visible in the bottom right-hand corner of the client when activation is complete.

At this point you are ready to acquire or simulate IRIG-161 data. Select the interface menu option from menu tree on the left side of the CCTK client.

4.2 Data Acquisition

The Data Acquisition (Rx) user interface provides access to high-level commands to control the Data Acquisition interface and monitor its health and status. The Interface Control display is shown in Figure 4-1.

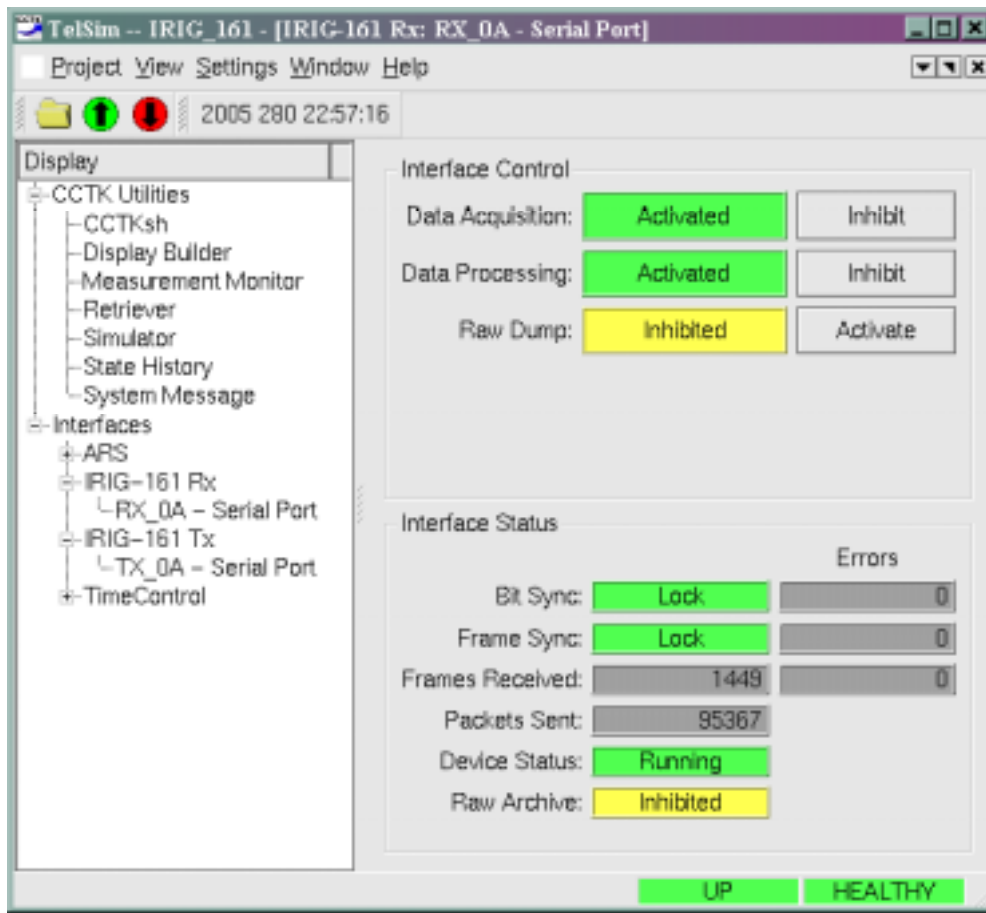


Figure 4-1, IRIG-161 Data Acquisition Control & Monitor GUI

The available controls and their descriptions are as follows:

- Data Acquisition – Controls the capability of the SyncSerialIf process to acquire IRIG-161 data from the hardware interface. When inhibited, no data will be acquired. The status of the command button shows the current state (Active or Inhibited) of data acquisition.
- Data Processing – Controls the capability of the SyncSerialIf to process the IRIG-161 data being acquired from the hardware interface. When inhibited, no TSPI data will be processed and or sent to the CCTK/TelSim system for further processing. The Data Processing capability is independent of the Raw Dump capability. The status of the command button shows the current state (Active or Inhibited) of IRIG-161 data processing.
- Raw Dump – Graphical control not implemented. Raw Dump is activated by default. Note: Activation of Raw Dump causes raw IRIG-161 frames to be sent to the CCTK/TelSim archive and retrieval subsystem for later retrieval and analysis.

4.2.1 Interface Status

The Interface Status panel displays current status information pertaining to the acquisition of the IRIG-161 data being acquired by the SyncSerialIf process. The display panel for Interface

Status is shown in Figure 4-1. The available status and error counts, and their descriptions, are described below

- **Bit Sync:** Indicates if SyncSerialIf has acquired bit sync. Bit sync is acquired anytime valid data is read from the device.
- **Bit Sync Errors:** Counter indicating the number of times SyncSerialIf has lost bit sync. Bit sync is considered lost when SyncSerialIf fails to read valid data from the device at the expected rate.
- **Frame Sync:** Indicates if SyncSerialIf has acquired frame sync. Frame sync is acquired when two valid frame sync characters (as defined in the database) appear the proper number of characters apart in the stream. Once frame sync is acquired data processing will start.
- **Frame Sync Errors:** Future implementation.
- **Frames Received:** Counter indicating the total number of frames received. This will only increment if data acquisition is active and both frame and bit sync has been acquired.
- **Packets Sent:** Counter indicating the number decommutated measurements forwarded to the CCTK TelSim system. This will increment for each measurement sample.
- **Device Status:** Indicates the status of the device. Valid states are “green” running, “gray” stopped, or “red” error. If an error is detected, see the system message log for detailed information on the error.

4.3 Data Transmission

The Data Transmission (Tx) user interface provides access to high-level commands to control the Data Simulation interface and monitor its health and status. The Interface Control display is shown in Figure 4-2.

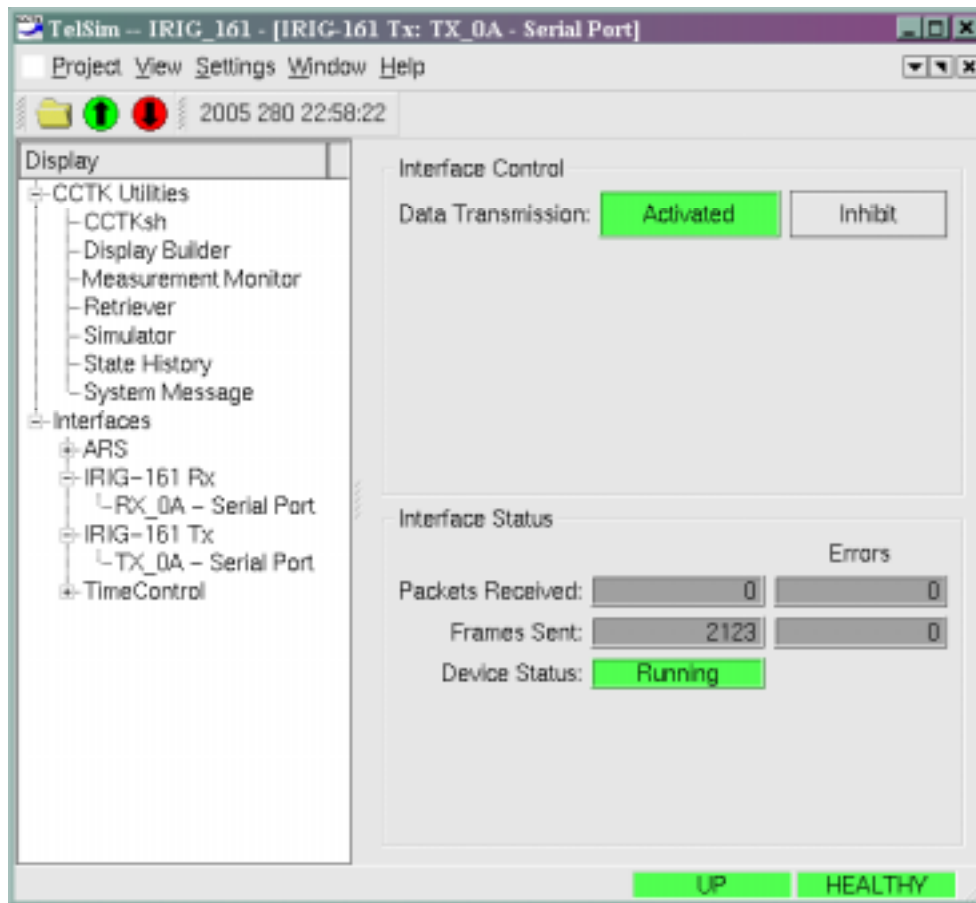


Figure 4-2, IRIG-161 Data Simulation Control & Monitor GUI

4.3.1 Interface Control

The command buttons allow the user to inhibit/activate data transmission. The current state of data transmission is indicated and updated shortly after a command is sent.

The “Interface Control” group box provides control of the following:

- Data Transmission: When activated, SyncSerialIf will attempt to write information to the configured output device (serial device, file, or pipe) whenever the byte array measurement source changes.
 - If Data Transmission is configured for playback, the default or designated playback file will be transmitted.
 - If Data Transmission is not configured for playback, the interface will automatically commutate data generated from the simulation engine into the transmitted frames.

4.3.2 Interface Status

The “Interface Status” group box provides the following status on the synchronous serial interface:

- **Packets Received:** Counter indicating the total number of measurement update packets received by SyncSerialIf from the CCTK system or simulation engine.
- **Packets Received Errors:** Counter indicating the number of packets received by SyncSerialIf from the CCTK system that contained errors.
- **Frames Sent:** Counter indicating the total number of raw frames forwarded to the configured output device. This counter will only increment if packets received are incrementing and data transmission is enabled.

4.3.3 File Playback Control

File playback control from the GUI will be available in a future release. File playback is currently controlled only from the configuration database. See section 4.2.1.2 for information on how to set up the configuration database.

5 OPERATIONAL EXAMPLES

5.1 Using Farsite utility

The hardware interface card vendor provides a utility to view the status and configuration of a synchronous serial port. As the utility can also be used to configure the card it must be invoked at the root permission level. Changing configuration when the syncserialif process is running is not recommended. The utility is invoked from the /etc/farsite directory. Parameter information can be obtained by entering ./farutil at a shell command prompt.

The following is an example output of the command.

```
[root@ws13 SyncSerialIf]# farutil sync0 info
card:          T4U FarSync T-Series
ports:         4
state:         Running normally

firmware id:   4
firmware vers: 1.00.00

Configuration for port 0
physical:      X.21 (RS422/V.11)
  cable status: Cable presence detected
  active inputs: None
  active outputs: None
  clock:       Internal but not detected ?
  speed:       2400
protocol:     Raw packet interface
```

5.2 Integrity testing

The hardware interface card vendor provides a utility to perform a wrap test to verify the hardware and associated driver is installed correctly and functioning properly. This should not be running when the ctk syncserialif process is running. To perform this test two ports must be connected to each other. This can be accomplished by using a loopback cable or inserting a loopback plug on the back of the farsync interface card. The utility is invoked from the /etc/farsite directory. As the utility will configure the card it must be invoked at the root permission level. Parameter information can be obtained by entering ./farperf at a shell command prompt. The following is an example wrap test:

```
[root@ws13 farsync]# ./farperf sync0 sync1 10 1000 128000 x21
Two Port Test
...
sync0: Duration complete tx = 186 rx = 158 lost = 0
sync0: Rx: 155000 bytes - 0 errs. in 10 s pps = 15 bps = 124000
sync0: Tx: 186000 bytes - 0 errs & 0 pauses. in 10 s pps = 18 bps = 148800
sync0: Rx Line errors: errs = 0 drop = 0 fifo = 0 frame = 0
sync0: Tx Line errors: errs = 0 drop = 0 fifo = 0 carrier = 0

sync1: Duration complete tx = 185 rx = 158 lost = 0
sync1: Rx: 156000 bytes - 0 errs. in 10 s pps = 15 bps = 124800
sync1: Tx: 185000 bytes - 0 errs & 0 pauses. in 10 s pps = 18 bps = 148000
sync1: Rx Line errors: errs = 0 drop = 0 fifo = 0 frame = 0
sync1: Tx Line errors: errs = 0 drop = 0 fifo = 0 carrier = 0
```

6 INSTALLATION PROCEDURE

6.1 Software Installation

6.1.1 Software Requirements

The CCTK distribution media should contain p/n SW-SSCI-SL-P (or SSCI) for the syncserial software.

6.1.2 Installation Steps

- 1 The driver for the farsync is automatically installed with the cctk kernel (C2OS).
- 2 See CCTK Installation Manual for steps to install the distribution.
- 3 Reboot the system "kudzu" should find the device and install the driver.
- 4 Starting farsync: “[OK]” should be displayed on console boot messages
- 5 Perform integrity checks described in section 6.2.

6.2 Hardware installation

6.2.1 Hardware Requirements

This describes the installation of the Farsync T4U card in a TelSim Linux PCI bus. The box must have an open PCI slot. Also the Farsync firmware must be configured to support low data rates (2400 baud). As there is no way to verify this by any physical indications, you must contact the vendor and have them check their database using the serial number to verify the modification. If you received your IRIG 161 system preconfigured by CCT, this step has already been performed.

6.2.2 Installation Steps

1. Remove power, open the case and install the Farsync T4U card in an open PCI slot.

2. Connect the wrap plug or interface cable to the back of the card.
3. Replace cover and close the case.
4. See section 6 for steps to perform an integrity test.

APPENDIX A

XTCE XML metadata specifications for IRIG-161 Formats

IRIG161_0 format definition:

```
<?xml version="1.0" encoding="UTF-8"?>
<SpaceSystem name="Format161_0" shortDescription="IRIG 161_0, 240-Bit Format (EFG)"
  xmlns="http://www.omg.org/space/xtce" xmlns:xsi="http://www.w3.org/2001/XMLSchema-
  instance"
  xsi:schemaLocation="http://www.omg.org/space/xtce SpaceSystemV1.0.xsd">
  <LongDescription>This format is used for transmitting and receiving tracking data
  between PMRF
  and KMR and internally within KMR </LongDescription>
  <Header date="May 2005" validationStatus="Unknown" version="161-00">
  <AuthorSet>
    <Author>Data Reduction and Computer Group</Author>
    <Author>Range Commanders Council</Author>
    <Author>Translated to XTCE by Command and Control Technologies, Inc.</Author>
  </AuthorSet>
  <NoteSet>
    <Note>SignalToNoiseFlag is created to distinguish whether Spare bits are used
  as spare
    or for SignalToNoise.</Note>
  </NoteSet>
  <HistorySet>
    <History>Initial implementation</History>
  </HistorySet>
  </Header>
  <TelemetryMetaData>
  <ParameterTypeSet>
    <IntegerParameterType name="TestNum" signed="false" sizeInBits="16"
    validRangeAppliesToCalibrated="true"
    shortDescription="Test Number: holds number up to 65535">
    <UnitSet/>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
  encoding="unsigned"
    sizeInBits="16">
    <ByteOrderList>
      <Byte byteSignificance="2"/>
      <Byte byteSignificance="1"/>
    </ByteOrderList>
    </IntegerDataEncoding>
  </ParameterTypeSet>
  </TelemetryMetaData>
</SpaceSystem>
```

```

        <ValidRange maxInclusive="65535"/>
    </IntegerParameterType>
    <IntegerParameterType name="DayOfYr" signed="false" sizeInBits="9"
        shortDescription="Day of Year">
        <UnitSet>
            <Unit>day</Unit>
        </UnitSet>
        <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
            sizeInBits="9">
            <ByteOrderList>
                <Byte byteSignificance="2"/>
                <Byte byteSignificance="1"/>
            </ByteOrderList>
        </IntegerDataEncoding>
    </IntegerParameterType>
    <EnumeratedParameterType name="Format" shortDescription="Format Type: 0000">
        <UnitSet/>
        <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
            sizeInBits="5"/>
        <EnumerationList>
            <Enumeration label="KMR" value="0"/>
        </EnumerationList>
    </EnumeratedParameterType>
    <FloatParameterType name="TenthOfSec" sizeInBits="64"
        shortDescription="Tenth of Second: MSB=800 milli seconds">
        <UnitSet>
            <Unit description="milli seconds">ms</Unit>
        </UnitSet>
        <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
            sizeInBits="4">
            <DefaultCalibrator>
                <PolynomialCalibrator>
                    <Term coefficient="0.1" exponent="1"/>
                </PolynomialCalibrator>
            </DefaultCalibrator>
        </IntegerDataEncoding>
        <ValidRange maxInclusive="0.9" minInclusive="0.0"/>
    </FloatParameterType>
    <IntegerParameterType name="Time" signed="false" sizeInBits="17"
        shortDescription="Time of Day or Plus Time: depending upon bit 150;
LSB=1 sec">
        <UnitSet>
            <Unit description="seconds">s</Unit>
        </UnitSet>
        <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
            sizeInBits="17">
            <ByteOrderList>
                <Byte byteSignificance="3"/>
                <Byte byteSignificance="2"/>
                <Byte byteSignificance="1"/>
            </ByteOrderList>
        </IntegerDataEncoding>

```

```

</IntegerParameterType>
<IntegerParameterType name="SiteID" signed="false" sizeInBits="9">
  <UnitSet/>
  <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
  sizeInBits="9">
    <ByteOrderList>
      <Byte byteSignificance="2"/>
      <Byte byteSignificance="1"/>
    </ByteOrderList>
  </IntegerDataEncoding>
</IntegerParameterType>
<FloatParameterType name="Position" sizeInBits="64"
validRangeAppliesToCalibrated="true"
shortDescription="MSB indicates sign">
  <UnitSet>
    <Unit description="meters">m</Unit>
  </UnitSet>
  <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="twosCompliment"
  sizeInBits="28">
    <ByteOrderList>
      <Byte byteSignificance="4"/>
      <Byte byteSignificance="3"/>
      <Byte byteSignificance="2"/>
      <Byte byteSignificance="1"/>
    </ByteOrderList>
    <ContextCalibratorList>
      <ContextCalibrator>
        <UseWhenCondition>
          <Condition>
            <ParameterInstanceRef
parameterRef="PosScale"
              useCalibratedValue="true"/>
          </Condition>
        </UseWhenCondition>
        <Calibrator>
          <PolynomialCalibrator>
            <Term coefficient="1.0"
exponent="1"/>
          </PolynomialCalibrator>
        </Calibrator>
      </ContextCalibrator>
      <ContextCalibrator>
        <UseWhenCondition>
          <Condition>
            <ParameterInstanceRef
parameterRef="PosScale"
              useCalibratedValue="true"/>
          </Condition>
        </UseWhenCondition>
        <Calibrator>
          <PolynomialCalibrator>
            <Term coefficient="1.0"
exponent="1"/>
          </PolynomialCalibrator>
        </Calibrator>
      </ContextCalibrator>
    </ContextCalibratorList>
  </IntegerDataEncoding>
</FloatParameterType>

```

```

        </UseWhenCondition>
        <Calibrator>
            <PolynomialCalibrator>
                <Term coefficient="10.0"
exponent="1" />
            </PolynomialCalibrator>
        </Calibrator>
    </ContextCalibrator>
    <ContextCalibrator>
        <UseWhenCondition>
            <Condition>
                <ParameterInstanceRef
parameterRef="PosScale"
                useCalibratedValue="true" />
            </Condition>
        </UseWhenCondition>
        <ComparisonOperator>==</ComparisonOperator>
            <Value>2</Value>
        </Condition>
    </UseWhenCondition>
    <Calibrator>
        <PolynomialCalibrator>
            <Term coefficient="1E3"
exponent="1" />
        </PolynomialCalibrator>
    </Calibrator>
    </ContextCalibrator>
    <ContextCalibrator>
        <UseWhenCondition>
            <Condition>
                <ParameterInstanceRef
parameterRef="PosScale"
                useCalibratedValue="true" />
            </Condition>
        </UseWhenCondition>
        <ComparisonOperator>==</ComparisonOperator>
            <Value>3</Value>
        </Condition>
    </UseWhenCondition>
    <Calibrator>
        <PolynomialCalibrator>
            <Term coefficient="1E10"
exponent="1" />
        </PolynomialCalibrator>
    </Calibrator>
    </ContextCalibrator>
</ContextCalibratorList>
</IntegerDataEncoding>
<ValidRange maxInclusive="134217727" />
</FloatParameterType>
<FloatParameterType name="PosScale" sizeInBits="64"
shortDescription="Position Scale Factor: KMR always sends 00">
    <UnitSet/>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
        sizeInBits="2">
        <ContextCalibratorList>
            <ContextCalibrator>

```



```

        </ContextCalibrator>
    </ContextCalibratorList>
    </IntegerDataEncoding>
    </FloatParameterType>
    <BooleanParameterType name="OptTrack" oneStringValue="on-track"
zeroStringValue=""
        shortDescription="Optical Track: KMR always sends 0">
        <UnitSet/>
        <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
    </BooleanParameterType>
    <BooleanParameterType name="PlusTimeFlag" oneStringValue="Plus-Time"
zeroStringValue="Zulu-Time"
        shortDescription="KMR always sends 0; 1=if plus time rather than Zulu
time">
        <UnitSet/>
        <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
    </BooleanParameterType>
    <FloatParameterType name="Velocity" sizeInBits="64"
        shortDescription="MSB indicates sign">
        <UnitSet>
            <Unit description="meters per second">m/s</Unit>
        </UnitSet>
        <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="twosCompliment"
            sizeInBits="15">
            <ByteOrderList>
                <Byte byteSignificance="2"/>
                <Byte byteSignificance="1"/>
            </ByteOrderList>
            <ContextCalibratorList>
                <ContextCalibrator>
                    <UseWhenCondition>
                        <Condition>
                            <ParameterInstanceRef
parameterRef="VelScale"
                                useCalibratedValue="true"/>
                        </Condition>
                    </UseWhenCondition>
                    <ComparisonOperator>==</ComparisonOperator>
                        <Value>0</Value>
                    </Condition>
                </ContextCalibrator>
                <ContextCalibrator>
                    <PolynomialCalibrator>
                        <Term coefficient="1.0"
exponent="1"/>
                    </PolynomialCalibrator>
                </ContextCalibrator>
            </ContextCalibratorList>
            <ContextCalibrator>
                <UseWhenCondition>
                    <Condition>
                        <ParameterInstanceRef
parameterRef="VelScale"
                            useCalibratedValue="true"/>
                    </Condition>
                </UseWhenCondition>
                <ComparisonOperator>==</ComparisonOperator>

```

```

                                <Value>1</Value>
                                </Condition>
                                </UseWhenCondition>
                                <Calibrator>
                                    <PolynomialCalibrator>
                                        <Term coefficient="10.0"
exponent="1" />
                                </PolynomialCalibrator>
                                </Calibrator>
                                </ContextCalibrator>
                                </ContextCalibratorList>
                                </IntegerDataEncoding>
                                </FloatParameterType>
                                <BooleanParameterType name="LiftOff" oneStringValue="liftoff has occurred"
                                    zeroStringValue="" shortDescription="KMR always sends 1">
                                    <UnitSet/>
                                    <IntegerDataEncoding encoding="unsigned" sizeInBits="1" />
                                </BooleanParameterType>
                                <BooleanParameterType name="Plunge" oneStringValue="Plunge"
zeroStringValue=""
                                    shortDescription="Plunge Mode: KMR always sends 0">
                                    <UnitSet/>
                                    <IntegerDataEncoding encoding="unsigned" sizeInBits="1" />
                                </BooleanParameterType>
                                <FloatParameterType name="Pulse" sizeInBits="64"
                                    shortDescription="Pulse Width: KMR always sends 0">
                                    <UnitSet/>
                                    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
                                        sizeInBits="2">
                                        <ContextCalibratorList>
                                            <ContextCalibrator>
                                                <UseWhenCondition>
                                                    <Condition>
                                                        <ParameterInstanceRef
parameterRef="Pulse"
                                                            useCalibratedValue="false" />
                                                    </Condition>
                                                </UseWhenCondition>
                                                <ComparisonOperator>=</ComparisonOperator>
                                                    <Value>0</Value>
                                                    </Condition>
                                                    </UseWhenCondition>
                                                    <Calibrator>
                                                        <PolynomialCalibrator>
                                                            <Term coefficient="1.0"
exponent="0" />
                                                    </PolynomialCalibrator>
                                                    </Calibrator>
                                                </ContextCalibrator>
                                                </ContextCalibrator>
                                                <UseWhenCondition>
                                                    <Condition>
                                                        <ParameterInstanceRef
parameterRef="Pulse"
                                                            useCalibratedValue="false" />
                                                    </Condition>
                                                </UseWhenCondition>
                                            </ContextCalibrator>
                                        </ContextCalibratorList>
                                    </IntegerDataEncoding>
                                </FloatParameterType>

```

```

<ComparisonOperator>==</ComparisonOperator>
    <Value>1</Value>
    </Condition>
</UseWhenCondition>
<Calibrator>
    <PolynomialCalibrator>
        <Term coefficient="2.4"
exponent="0" />
    </PolynomialCalibrator>
</Calibrator>
</ContextCalibrator>
<ContextCalibrator>
    <UseWhenCondition>
        <Condition>
            <ParameterInstanceRef
parameterRef="Pulse"
                useCalibratedValue="false" />
    </UseWhenCondition>
</ContextCalibrator>
<ComparisonOperator>==</ComparisonOperator>
    <Value>2</Value>
    </Condition>
</UseWhenCondition>
<Calibrator>
    <PolynomialCalibrator>
        <Term coefficient="5.0"
exponent="0" />
    </PolynomialCalibrator>
</Calibrator>
</ContextCalibrator>
<ContextCalibrator>
    <UseWhenCondition>
        <Condition>
            <ParameterInstanceRef
parameterRef="Pulse"
                useCalibratedValue="false" />
    </UseWhenCondition>
</ContextCalibrator>
<ComparisonOperator>==</ComparisonOperator>
    <Value>3</Value>
    </Condition>
</UseWhenCondition>
<Calibrator>
    <PolynomialCalibrator>
        <Term coefficient="10.0"
exponent="0" />
    </PolynomialCalibrator>
</Calibrator>
</ContextCalibrator>
</ContextCalibratorList>
</IntegerDataEncoding>
</FloatParameterType>
<BooleanParameterType name="InOut" oneStringValue="in" zeroStringValue="out">
    <UnitSet />
    <IntegerDataEncoding encoding="unsigned" sizeInBits="1" />
</BooleanParameterType>
<BooleanParameterType name="OnOff" oneStringValue="on" zeroStringValue="off">

```

```

        <UnitSet/>
        <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
    </BooleanParameterType>
    <BooleanParameterType name="Single" oneStringValue="dual lo"
zeroStringValue="single lo"
        shortDescription="KMR always sends 0">
        <UnitSet/>
        <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
    </BooleanParameterType>
    <BooleanParameterType name="SkinBeacon" oneStringValue="beacon"
zeroStringValue="skin"
        shortDescription="Skin/Beacon Mode">
        <UnitSet/>
        <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
    </BooleanParameterType>
    <BooleanParameterType name="Quality" oneStringValue="good"
zeroStringValue="bad">
        <UnitSet/>
        <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
    </BooleanParameterType>
    <EnumeratedParameterType name="Mode"
        shortDescription="KMR always sends 7=active track and 1 = all
others">
        <UnitSet/>
        <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
            sizeInBits="3"/>
        <EnumerationList>
            <Enumeration label="manual" value="0"/>
            <Enumeration label="auto track" value="1"/>
            <Enumeration label="computer drive" value="2"/>
            <Enumeration label="on-axis orbital" value="3"/>
            <Enumeration label="on-axis powered flight" value="4"/>
            <Enumeration label="on-axis coast" value="5"/>
            <Enumeration label="auto track coast" value="6"/>
            <Enumeration label="active track" value="7"/>
        </EnumerationList>
    </EnumeratedParameterType>
    <IntegerParameterType name="Checksum" signed="false" sizeInBits="8">
        <UnitSet/>
        <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
            sizeInBits="8">
            <ByteOrderList>
                <Byte byteSignificance="1"/>
            </ByteOrderList>
        </IntegerDataEncoding>
    </IntegerParameterType>
    <!-- SignalToNoiseFlag is created to distinguish whether these bits are used
as Spare or for SignalToNoise -->
    <BooleanParameterType name="SignalToNoiseFlag" oneStringValue="true"
zeroStringValue="false"
        shortDescription="If spares are being used for target signal-to-noise
level">
        <UnitSet/>
        <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>

```

```

</BooleanParameterType>
<BinaryParameterType name="Spares">
  <UnitSet/>
  <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
    <SizeInBits>
      <FixedValue>6</FixedValue>
    </SizeInBits>
  </BinaryDataEncoding>
</BinaryParameterType>
<IntegerParameterType name="SignalToNoise" signed="false" sizeInBits="6"
  validRangeAppliesToCalibrated="true"
  shortDescription="Spares can be used for the target signal-to-noise
level, 0 to 63">
  <UnitSet/>
  <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
  sizeInBits="6">
    <ByteOrderList>
      <Byte byteSignificance="1"/>
    </ByteOrderList>
  </IntegerDataEncoding>
  <ValidRange maxInclusive="63"/>
</IntegerParameterType>
<IntegerParameterType name="SyncPattern" signed="false" sizeInBits="16">
  <UnitSet/>
  <IntegerDataEncoding bitOrder="mostSignificantBitFirst"
encoding="unsigned"
  sizeInBits="16"/>
</IntegerParameterType>
</ParameterTypeSet>
<ParameterSet>
  <Parameter name="TestNum" parameterTypeRef="TestNum"/>
  <Parameter name="DayOfYr" parameterTypeRef="DayOfYr"/>
  <Parameter name="Format" parameterTypeRef="Format"/>
  <Parameter name="TenthOfSec" parameterTypeRef="TenthOfSec"/>
  <Parameter name="TimeOfDay" parameterTypeRef="Time"
  shortDescription="TimeOfDay if PlusTimeFlag (Bit 150) is set to 0">
    <ParameterProperties>
      <ValidityCondition>
        <Comparison parameterRef="PlusTimeFlag" value="0"
useCalibratedValue="false"
        />
      </ValidityCondition>
    </ParameterProperties>
  </Parameter>
  <Parameter name="PlusTime" parameterTypeRef="Time"
  shortDescription="PlusTime if PlusTimeFlag (Bit 150) is set to 1">
    <ParameterProperties>
      <ValidityCondition>
        <Comparison parameterRef="PlusTimeFlag" value="1"
useCalibratedValue="false"
        />
      </ValidityCondition>
    </ParameterProperties>
  </Parameter>
  <Parameter name="SiteID" parameterTypeRef="SiteID"/>

```

```

<Parameter name="EPos" parameterTypeRef="Position"/>
<Parameter name="PosScale" parameterTypeRef="PosScale"/>
<Parameter name="FPos" parameterTypeRef="Position"/>
<Parameter name="VelScale" parameterTypeRef="VelScale"/>
<Parameter name="GPos" parameterTypeRef="Position"/>
<Parameter name="OptTrack" parameterTypeRef="OptTrack"/>
<Parameter name="PlusTimeFlag" parameterTypeRef="PlusTimeFlag"/>
<Parameter name="FVel" parameterTypeRef="Velocity"/>
<Parameter name="EVel" parameterTypeRef="Velocity"/>
<Parameter name="LiftOff" parameterTypeRef="LiftOff"/>
<Parameter name="Plunge" parameterTypeRef="Plunge"/>
<Parameter name="Pulse" parameterTypeRef="Pulse"/>
<Parameter name="Refraction" parameterTypeRef="InOut"/>
<Parameter name="RFLimit" parameterTypeRef="InOut"/>
<Parameter name="Paramp" parameterTypeRef="OnOff"/>
<Parameter name="Radiation" parameterTypeRef="OnOff"/>
<Parameter name="Single" parameterTypeRef="Single"/>
<Parameter name="SkinBeacon" parameterTypeRef="SkinBeacon"/>
<Parameter name="Track" parameterTypeRef="OnOff"/>
<Parameter name="Quality" parameterTypeRef="Quality"/>
<Parameter name="Mode" parameterTypeRef="Mode"/>
<Parameter name="GVel" parameterTypeRef="Velocity"/>
<Parameter name="Checksum" parameterTypeRef="Checksum"/>
<Parameter name="SignalToNoiseFlag" parameterTypeRef="SignalToNoiseFlag"/>
<Parameter name="Spares" parameterTypeRef="Spares"
    shortDescription="Spares are not being used for target signal-to-noise
level">
    <ParameterProperties>
        <ValidityCondition>
            <Comparison parameterRef="SignalToNoiseFlag" value="0"
                useCalibratedValue="false"/>
        </ValidityCondition>
    </ParameterProperties>
</Parameter>
<Parameter name="SignalToNoise" parameterTypeRef="SignalToNoise"
    shortDescription="Spares are being used for target signal-to-noise
level">
    <ParameterProperties>
        <ValidityCondition>
            <Comparison parameterRef="SignalToNoiseFlag" value="1"
                useCalibratedValue="false"/>
        </ValidityCondition>
    </ParameterProperties>
</Parameter>
<Parameter parameterTypeRef="SyncPattern" name="SyncPattern"/>
</ParameterSet>
<ContainerSet>
    <SequenceContainer name="Frame">
        <BinaryEncoding bitOrder="leastSignificantBitFirst">
            <ErrorDetectCorrect>
                <Checksum parameterTypeRef="Checksum"
                    bitLocationFromStartOfContainer="210"
                    name="IRIG161_0_8bit_Checksum"/>
            </ErrorDetectCorrect>
            <SizeInBits>
                <FixedValue>240</FixedValue>
            </SizeInBits>
        </BinaryEncoding>
    </SequenceContainer>
</ContainerSet>

```

```

        </SizeInBits>
    </BinaryEncoding>
    <EntryList>
        <ParameterRefEntry parameterRef="TestNum" />
        <ParameterRefEntry parameterRef="DayOfYr" />
        <ParameterRefEntry parameterRef="Format" />
        <ParameterRefEntry parameterRef="TenthOfSec" />
        <ParameterRefEntry parameterRef="TimeOfDay">
            <LocationInContainerInBits
referenceLocation="containerStart">
                <FixedValue>34</FixedValue>
            </LocationInContainerInBits>
            <IncludeCondition>
                <Comparison parameterRef="PlusTimeFlag" value="0"
                    useCalibratedValue="false" />
            </IncludeCondition>
        </ParameterRefEntry>
        <ParameterRefEntry parameterRef="PlusTime">
            <LocationInContainerInBits
referenceLocation="containerStart">
                <FixedValue>34</FixedValue>
            </LocationInContainerInBits>
            <IncludeCondition>
                <Comparison parameterRef="PlusTimeFlag" value="1"
                    useCalibratedValue="false" />
            </IncludeCondition>
        </ParameterRefEntry>
        <ParameterRefEntry parameterRef="SiteID">
            <LocationInContainerInBits
referenceLocation="containerStart">
                <FixedValue>51</FixedValue>
            </LocationInContainerInBits>
        </ParameterRefEntry>
        <ParameterRefEntry parameterRef="EPos" />
        <ParameterRefEntry parameterRef="PosScale" />
        <ParameterRefEntry parameterRef="FPos" />
        <ParameterRefEntry parameterRef="VelScale" />
        <ParameterRefEntry parameterRef="GPos" />
        <ParameterRefEntry parameterRef="OptTrack" />
        <ParameterRefEntry parameterRef="PlusTimeFlag" />
        <ParameterRefEntry parameterRef="FVel" />
        <ParameterRefEntry parameterRef="EVel" />
        <ParameterRefEntry parameterRef="LiftOff" />
        <ParameterRefEntry parameterRef="Plunge" />
        <ParameterRefEntry parameterRef="Pulse" />
        <ParameterRefEntry parameterRef="Refraction" />
        <ParameterRefEntry parameterRef="RFLimit" />
        <ParameterRefEntry parameterRef="Paramp" />
        <ParameterRefEntry parameterRef="Radiation" />
        <ParameterRefEntry parameterRef="Single" />
        <ParameterRefEntry parameterRef="SkinBeacon" />
        <ParameterRefEntry parameterRef="Track" />
        <ParameterRefEntry parameterRef="Quality" />
        <ParameterRefEntry parameterRef="Mode" />
        <ParameterRefEntry parameterRef="GVel" />
        <ParameterRefEntry parameterRef="CheckSum" />
    </EntryList>

```

```

        <ParameterRefEntry parameterRef="Spares">
            <LocationInContainerInBits
referenceLocation="containerStart">
                <FixedValue>218</FixedValue>
            </LocationInContainerInBits>
            <IncludeCondition>
                <Comparison parameterRef="SignalToNoiseFlag"
value="0"
                    useCalibratedValue="false"/>
            </IncludeCondition>
        </ParameterRefEntry>
        <ParameterRefEntry parameterRef="SignalToNoise">
            <LocationInContainerInBits
referenceLocation="containerStart">
                <FixedValue>218</FixedValue>
            </LocationInContainerInBits>
            <IncludeCondition>
                <Comparison parameterRef="SignalToNoiseFlag"
value="1"
                    useCalibratedValue="false"/>
            </IncludeCondition>
        </ParameterRefEntry>
        <ParameterRefEntry parameterRef="SyncPattern"/>
    </EntryList>
</SequenceContainer>
<!--
    <SequenceContainer name="SubFrameA">
        <EntryList/>
        <BaseContainer containerRef="Frame">
            <RestrictionCriteria>
                <ComparisonList>
                    <Comparison value="0" comparisonOperator="=="
parameterRef="PosScale"/>
                    <Comparison value="0" comparisonOperator="=="
parameterRef="OptTrack"/>
                    <Comparison value="0" comparisonOperator="=="
parameterRef="LiftOff"/>
                    <Comparison value="0" comparisonOperator="=="
parameterRef="Plunge"/>
                    <Comparison value="0" comparisonOperator="=="
parameterRef="Pulse"/>
                    <Comparison value="1" comparisonOperator="=="
parameterRef="Refraction"/>
                    <Comparison value="0" comparisonOperator="=="
parameterRef="Paramp"/>
                    <Comparison value="1" comparisonOperator="=="
parameterRef="Radiation"/>
                    <Comparison value="0" comparisonOperator="=="
parameterRef="Single"/>
                    <Comparison value="7" comparisonOperator="=="
parameterRef="Mode"/>
                </ComparisonList>
            </RestrictionCriteria>
        </BaseContainer>
    </SequenceContainer>

```

```

    <SequenceContainer name="SubFrameB">
      <EntryList/>
      <BaseContainer containerRef="Frame">
        <RestrictionCriteria>
          <ComparisonList>
            <Comparison value="0" comparisonOperator="!="
parameterRef="PosScale"/>
            <Comparison value="1" comparisonOperator="=="
parameterRef="OptTrack"/>
            <Comparison value="1" comparisonOperator="=="
              parameterRef="PlusTimeFlag"/>
            <Comparison value="0" comparisonOperator="=="
parameterRef="LiftOff"/>
            <Comparison value="1" comparisonOperator="=="
parameterRef="Plunge"/>
            <Comparison value="1" comparisonOperator="=="
parameterRef="Pulse"/>
            <Comparison value="0" comparisonOperator="=="
parameterRef="Refraction"/>
            <Comparison value="1" comparisonOperator="=="
parameterRef="Paramp"/>
            <Comparison value="0" comparisonOperator="=="
parameterRef="Radiation"/>
            <Comparison value="1" comparisonOperator="=="
parameterRef="Single"/>
            <Comparison value="7" comparisonOperator="!="
parameterRef="Mode"/>
          </ComparisonList>
        </RestrictionCriteria>
      </BaseContainer>
    </SequenceContainer>-->
  </ContainerSet>
  <StreamSet>
    <FixedFrameStream name="Serial" frameLengthInBits="240">
      <ContainerRef containerRef="Frame"/>
      <SyncStrategy>
        <SyncPatternList bitLocationFromStartOfContainer="224"
patternLengthInBits="16">
          <SyncPattern pattern="1a1a"/>
          <!-- pattern "1a1a" occurs on one and pattern "1a05"
occurs on next -->
          <SyncPattern pattern="1a05"/>
        </SyncPatternList>
      </SyncStrategy>
    </FixedFrameStream>
  </StreamSet>
</TelemetryMetaData>
</SpaceSystem>

```

IRIG161_0A format definition:

```
<?xml version="1.0" encoding="UTF-8"?>
<SpaceSystem xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://www.omg.org/space/xtce SpaceSystemV1.0A.xsd"
  xmlns="http://www.omg.org/space/xtce" name="Format161_0A"
  shortDescription="IRIG 16_0A 240-Bit Format (EFG)">
  <LongDescription>This format is used for transmitting from 45 SW to WSMR, EPG (Ft.
  Hauchuca),
  Bermuda, Wallops Island, and Korou. </LongDescription>
  <Header date="May 2005" validationStatus="Unknown" version="161-00">
  <AuthorSet>
    <Author>Data Reduction and Computer Group</Author>
    <Author>Range Commanders Council</Author>
    <Author>Translated to XTCE by Command and Control Technologies, Inc.</Author>
  </AuthorSet>
  <NoteSet>
    <Note>SignalToNoiseFlag is created to distinguish whether Spare bits are used
  as spare
    or for SignalToNoise.</Note>
  </NoteSet>
  <HistorySet>
    <History>Initial implementation</History>
  </HistorySet>
  </Header>
  <TelemetryMetaData>
  <ParameterTypeSet>
    <IntegerParameterType name="TestNum" signed="false" sizeInBits="17"
      shortDescription="Test Number: LSB=Bit 1">
      <UnitSet/>
      <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
  encoding="unsigned"
      sizeInBits="17">
      <ByteOrderList>
        <Byte byteSignificance="3"/>
        <Byte byteSignificance="2"/>
        <Byte byteSignificance="1"/>
      </ByteOrderList>
      </IntegerDataEncoding>
    </IntegerParameterType>
    <IntegerParameterType name="DayOfYr" signed="false" sizeInBits="9"
      shortDescription="Day of Year">
      <UnitSet>
        <Unit>day</Unit>
      </UnitSet>
      <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
  encoding="unsigned"
      sizeInBits="9">
      <ByteOrderList>
        <Byte byteSignificance="2"/>
        <Byte byteSignificance="1"/>
      </ByteOrderList>
      </IntegerDataEncoding>
    </IntegerParameterType>
    <EnumeratedParameterType name="Format" shortDescription="Format Type:0000">
```

```

        <UnitSet/>
        <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
        sizeInBits="4"/>
        <EnumerationList>
            <Enumeration label="45SWToWSMR" value="0"/>
        </EnumerationList>
    </EnumeratedParameterType>
    <FloatParameterType name="TenthOfSec" sizeInBits="64"
shortDescription="Tenth of Second: MSB=800 milli seconds">
    <UnitSet>
        <Unit description="milli seconds">ms</Unit>
    </UnitSet>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
        sizeInBits="4">
        <DefaultCalibrator>
            <PolynomialCalibrator>
                <Term coefficient="0.1" exponent="1"/>
            </PolynomialCalibrator>
        </DefaultCalibrator>
    </IntegerDataEncoding>
    <ValidRange maxInclusive="0.9" minInclusive="0.0"/>
</FloatParameterType>
    <IntegerParameterType name="Time" signed="false" sizeInBits="17"
shortDescription="Time of Day or Plus Time: depending upon bit 150;
LSB=1 sec">
    <UnitSet>
        <Unit description="seconds">s</Unit>
    </UnitSet>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
        sizeInBits="17">
        <ByteOrderList>
            <Byte byteSignificance="3"/>
            <Byte byteSignificance="2"/>
            <Byte byteSignificance="1"/>
        </ByteOrderList>
    </IntegerDataEncoding>
</IntegerParameterType>
    <IntegerParameterType name="SiteID" signed="false" sizeInBits="9">
    <UnitSet/>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
        sizeInBits="9">
        <ByteOrderList>
            <Byte byteSignificance="2"/>
            <Byte byteSignificance="1"/>
        </ByteOrderList>
    </IntegerDataEncoding>
</IntegerParameterType>
    <FloatParameterType name="Position" sizeInBits="64"
validRangeAppliesToCalibrated="true"
shortDescription=" MSB indicates sign">
    <UnitSet>
        <Unit description="meters">m</Unit>

```

```

        </UnitSet>
        <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="twosCompliment"
        sizeInBits="28">
        <ByteOrderList>
            <Byte byteSignificance="4" />
            <Byte byteSignificance="3" />
            <Byte byteSignificance="2" />
            <Byte byteSignificance="1" />
        </ByteOrderList>
        <ContextCalibratorList>
            <ContextCalibrator>
                <UseWhenCondition>
                    <Condition>
                        <ParameterInstanceRef
parameterRef="PosScale"
                                useCalibratedValue="false" />
                    </Condition>
                </UseWhenCondition>
                <ComparisonOperator>==</ComparisonOperator>
                <Value>0</Value>
            </Condition>
            </UseWhenCondition>
            <Calibrator>
                <PolynomialCalibrator>
                    <Term coefficient="1.0"
exponent="1" />
                </PolynomialCalibrator>
            </Calibrator>
        </ContextCalibrator>
        <ContextCalibrator>
            <UseWhenCondition>
                <Condition>
                    <ParameterInstanceRef
parameterRef="PosScale"
                                useCalibratedValue="false" />
                </Condition>
            </UseWhenCondition>
            <ComparisonOperator>==</ComparisonOperator>
            <Value>1</Value>
        </Condition>
        </UseWhenCondition>
        <Calibrator>
            <PolynomialCalibrator>
                <Term coefficient="10.0"
exponent="1" />
            </PolynomialCalibrator>
        </Calibrator>
        </ContextCalibrator>
        <ContextCalibrator>
            <UseWhenCondition>
                <Condition>
                    <ParameterInstanceRef
parameterRef="PosScale"
                                useCalibratedValue="false" />
                </Condition>
            </UseWhenCondition>
            <ComparisonOperator>==</ComparisonOperator>
            <Value>2</Value>
        </Condition>
    </ContextCalibrator>
    </ContextCalibratorList>
    </IntegerDataEncoding>
    </UnitSet>

```

```

        </Condition>
    </UseWhenCondition>
    <Calibrator>
        <PolynomialCalibrator>
            <Term coefficient="1E3"
exponent="1"/>
        </PolynomialCalibrator>
    </Calibrator>
</ContextCalibrator>
<ContextCalibrator>
    <UseWhenCondition>
        <Condition>
            <ParameterInstanceRef
parameterRef="PosScale"
                                useCalibratedValue="false"/>
        </Condition>
    </UseWhenCondition>
</ContextCalibrator>
<ComparisonOperator>==</ComparisonOperator>
    <Value>3</Value>
    </Condition>
</UseWhenCondition>
<Calibrator>
    <PolynomialCalibrator>
        <Term coefficient="1E10"
exponent="1"/>
    </PolynomialCalibrator>
</Calibrator>
</ContextCalibrator>
</ContextCalibratorList>
</IntegerDataEncoding>
<ValidRange maxInclusive="134217727"/>
</FloatParameterType>
<FloatParameterType name="PosScale" sizeInBits="64"
shortDescription="Position Scale Factor: KMR always sends 00">
    <UnitSet/>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
                                sizeInBits="2">
        <ContextCalibratorList>
            <ContextCalibrator>
                <UseWhenCondition>
                    <Condition>
                        <ParameterInstanceRef
parameterRef="PosScale"
                                useCalibratedValue="false"/>
                    </Condition>
                </UseWhenCondition>
            </ContextCalibrator>
        </ContextCalibratorList>
    </IntegerDataEncoding>
</FloatParameterType>
<ComparisonOperator>==</ComparisonOperator>
    <Value>0</Value>
    </Condition>
</UseWhenCondition>
<Calibrator>
    <PolynomialCalibrator>
        <Term coefficient="1" exponent="0"/>
    </PolynomialCalibrator>
</Calibrator>
</ContextCalibrator>
</ContextCalibrator>

```

```

        <UseWhenCondition>
            <Condition>
                <ParameterInstanceRef
parameterRef="PosScale"
                    useCalibratedValue="false" />
            </Condition>
            <Value>1</Value>
        </UseWhenCondition>
    </ContextCalibrator>
    <ContextCalibrator>
        <UseWhenCondition>
            <Condition>
                <ParameterInstanceRef
parameterRef="PosScale"
                    useCalibratedValue="false" />
            </Condition>
            <Value>2</Value>
        </UseWhenCondition>
    </ContextCalibrator>
    <ContextCalibrator>
        <UseWhenCondition>
            <Condition>
                <ParameterInstanceRef
parameterRef="PosScale"
                    useCalibratedValue="false" />
            </Condition>
            <Value>3</Value>
        </UseWhenCondition>
    </ContextCalibrator>
</ContextCalibratorList>
</IntegerDataEncoding>
</FloatParameterType>
<FloatParameterType name="VelScale" sizeInBits="64"

```

```

        shortDescription="Velocity Scale Factor">
        <UnitSet/>
        <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
        sizeInBits="2">
        <ContextCalibratorList>
            <ContextCalibrator>
                <UseWhenCondition>
                    <Condition>
                        <ParameterInstanceRef
parameterRef="VelScale"
                                useCalibratedValue="false"/>
                    </Condition>
                </UseWhenCondition>
                <ComparisonOperator>==</ComparisonOperator>
                    <Value>0</Value>
                </Condition>
            </ContextCalibrator>
            <ContextCalibrator>
                <UseWhenCondition>
                    <Condition>
                        <ParameterInstanceRef
parameterRef="VelScale"
                                useCalibratedValue="false"/>
                    </Condition>
                </UseWhenCondition>
                <ComparisonOperator>==</ComparisonOperator>
                    <Value>1</Value>
                </Condition>
            </ContextCalibrator>
        </ContextCalibratorList>
        </IntegerDataEncoding>
    </FloatParameterType>
    <BooleanParameterType name="OptTrack" oneStringValue="on-track"
zeroStringValue=""
        shortDescription="Optical Track: KMR always sends 0">
        <UnitSet/>
        <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
    </BooleanParameterType>
    <BooleanParameterType name="PlusTimeFlag" oneStringValue="Plus-Time"
zeroStringValue="Zulu-Time"
        shortDescription="KMR always sends 0; 1=if plus time rather than Zulu
time">
        <UnitSet/>
        <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
    </BooleanParameterType>

```

```

    <FloatParameterType name="Velocity" sizeInBits="64"
      shortDescription="MSB indicates sign">
      <UnitSet>
        <Unit description="meters per second">m/s</Unit>
      </UnitSet>
      <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="twosCompliment"
        sizeInBits="15">
        <ByteOrderList>
          <Byte byteSignificance="2"/>
          <Byte byteSignificance="1"/>
        </ByteOrderList>
        <ContextCalibratorList>
          <ContextCalibrator>
            <UseWhenCondition>
              <Condition>
                <ParameterInstanceRef
parameterRef="VelScale"
                  useCalibratedValue="false"/>
              </Condition>
            </UseWhenCondition>
            <ComparisonOperator>==</ComparisonOperator>
              <Value>0</Value>
            </Condition>
          </ContextCalibrator>
          <ContextCalibrator>
            <UseWhenCondition>
              <Condition>
                <ParameterInstanceRef
parameterRef="VelScale"
                  useCalibratedValue="false"/>
              </Condition>
            </UseWhenCondition>
            <ComparisonOperator>==</ComparisonOperator>
              <Value>1</Value>
            </Condition>
          </ContextCalibrator>
        </ContextCalibratorList>
      </IntegerDataEncoding>
    </FloatParameterType>
    <BooleanParameterType name="LiftOff" oneStringValue="liftoff has occurred"
      zeroStringValue="" shortDescription="KMR always sends 1">
    <UnitSet/>
    <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>

```



```

<ComparisonOperator>==</ComparisonOperator>
    <Value>2</Value>
    </Condition>
</UseWhenCondition>
<Calibrator>
    <PolynomialCalibrator>
        <Term coefficient="5.0"
exponent="0" />
    </PolynomialCalibrator>
</Calibrator>
</ContextCalibrator>
<ContextCalibrator>
    <UseWhenCondition>
        <Condition>
            <ParameterInstanceRef
parameterRef="Pulse"
            useCalibratedValue="false" />
        </Condition>
    </UseWhenCondition>
</ContextCalibrator>
</ContextCalibratorList>
</IntegerDataEncoding>
</FloatParameterType>
<BooleanParameterType name="InOut" oneStringValue="in" zeroStringValue="out">
    <UnitSet/>
    <IntegerDataEncoding encoding="unsigned" sizeInBits="1" />
</BooleanParameterType>
<BooleanParameterType name="OnOff" oneStringValue="on" zeroStringValue="off">
    <UnitSet/>
    <IntegerDataEncoding encoding="unsigned" sizeInBits="1" />
</BooleanParameterType>
<BooleanParameterType name="Single" oneStringValue="dual lo"
zeroStringValue="single lo"
    shortDescription="KMR always sends 0">
    <UnitSet/>
    <IntegerDataEncoding encoding="unsigned" sizeInBits="1" />
</BooleanParameterType>
<BooleanParameterType name="SkinBeacon" oneStringValue="beacon"
zeroStringValue="skin"
    shortDescription="Skin/Beacon Mode">
    <UnitSet/>
    <IntegerDataEncoding encoding="unsigned" sizeInBits="1" />
</BooleanParameterType>
<BooleanParameterType name="Quality" oneStringValue="good"
zeroStringValue="bad">
    <UnitSet/>

```

```

        <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
    </BooleanParameterType>
    <EnumeratedParameterType name="Mode"
        shortDescription="KMR always sends 7= active track and 1 = all
others">
        <UnitSet/>
        <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
            sizeInBits="3"/>
        <EnumerationList>
            <Enumeration label="manual" value="0"/>
            <Enumeration label="auto track" value="1"/>
            <Enumeration label="computer drive" value="2"/>
            <Enumeration label="on-axis orbital" value="3"/>
            <Enumeration label="on-axis powered flight" value="4"/>
            <Enumeration label="on-axis coast" value="5"/>
            <Enumeration label="auto track coast" value="6"/>
            <Enumeration label="active track" value="7"/>
        </EnumerationList>
    </EnumeratedParameterType>
    <IntegerParameterType name="Checksum" signed="false" sizeInBits="7">
        <UnitSet/>
        <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
            sizeInBits="7">
        </IntegerDataEncoding>
    </IntegerParameterType>
    <!-- SignalToNoiseFlag is created to distinguish whether these bits are used
as Spare or for SignalToNoise -->
    <BooleanParameterType name="SignalToNoiseFlag" oneStringValue="true"
        zeroStringValue="false"
        shortDescription="If spares are being used for target signal-to-noise
level">
        <UnitSet/>
        <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
    </BooleanParameterType>
    <BinaryParameterType name="Spares">
        <UnitSet/>
        <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
            <SizeInBits>
                <FixedValue>7</FixedValue>
            </SizeInBits>
        </BinaryDataEncoding>
    </BinaryParameterType>
    <IntegerParameterType name="SignalToNoise" signed="false" sizeInBits="7"
        validRangeAppliesToCalibrated="true"
        shortDescription="Spares can be used for the target signal-to-noise
level, 0 to 63">
        <UnitSet/>
        <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
            sizeInBits="7">
        </IntegerDataEncoding>
        <ValidRange maxInclusive="63"/>
    </IntegerParameterType>

```

```

        <IntegerParameterType name="SyncPattern" signed="false" sizeInBits="16">
            <UnitSet/>
            <IntegerDataEncoding bitOrder="mostSignificantBitFirst"
encoding="unsigned"
                sizeInBits="16"/>
        </IntegerParameterType>
</ParameterTypeSet>
<ParameterSet>
    <Parameter name="TestNum" parameterTypeRef="TestNum"/>
    <Parameter name="DayOfYr" parameterTypeRef="DayOfYr"/>
    <Parameter name="Format" parameterTypeRef="Format"/>
    <Parameter name="TenthOfSec" parameterTypeRef="TenthOfSec"/>
    <Parameter name="TimeOfDay" parameterTypeRef="Time"
        shortDescription="TimeOfDay if PlusTimeFlag (Bit 150) is set to 0">
        <ParameterProperties>
            <ValidityCondition>
                <Comparison parameterRef="PlusTimeFlag" value="0"
useCalibratedValue="false"
                    />
            </ValidityCondition>
        </ParameterProperties>
    </Parameter>
    <Parameter name="PlusTime" parameterTypeRef="Time"
        shortDescription="PlusTime if PlusTimeFlag (Bit 150) is set to 1">
        <ParameterProperties>
            <ValidityCondition>
                <Comparison parameterRef="PlusTimeFlag" value="1"
useCalibratedValue="false"
                    />
            </ValidityCondition>
        </ParameterProperties>
    </Parameter>
    <Parameter name="SiteID" parameterTypeRef="SiteID"/>
    <Parameter name="EPos" parameterTypeRef="Position"/>
    <Parameter name="PosScale" parameterTypeRef="PosScale"/>
    <Parameter name="FPos" parameterTypeRef="Position"/>
    <Parameter name="VelScale" parameterTypeRef="VelScale"/>
    <Parameter name="GPos" parameterTypeRef="Position"/>
    <Parameter name="OptTrack" parameterTypeRef="OptTrack"/>
    <Parameter name="PlusTimeFlag" parameterTypeRef="PlusTimeFlag"/>
    <Parameter name="FVel" parameterTypeRef="Velocity"/>
    <Parameter name="EVel" parameterTypeRef="Velocity"/>
    <Parameter name="LiftOff" parameterTypeRef="LiftOff"/>
    <Parameter name="Plunge" parameterTypeRef="Plunge"/>
    <Parameter name="Pulse" parameterTypeRef="Pulse"/>
    <Parameter name="Refraction" parameterTypeRef="InOut"/>
    <Parameter name="RFLimit" parameterTypeRef="InOut"/>
    <Parameter name="Paramp" parameterTypeRef="OnOff"/>
    <Parameter name="Radiation" parameterTypeRef="OnOff"/>
    <Parameter name="Single" parameterTypeRef="Single"/>
    <Parameter name="SkinBeacon" parameterTypeRef="SkinBeacon"/>
    <Parameter name="Track" parameterTypeRef="OnOff"/>
    <Parameter name="Quality" parameterTypeRef="Quality"/>
    <Parameter name="Mode" parameterTypeRef="Mode"/>
    <Parameter name="GVel" parameterTypeRef="Velocity"/>
    <Parameter name="Checksum" parameterTypeRef="Checksum"/>

```

```

<Parameter name="SignalToNoiseFlag" parameterTypeRef="SignalToNoiseFlag" />
<Parameter name="Spares" parameterTypeRef="Spares"
  shortDescription="Spares are not being used for target signal-to-noise
level">
  <ParameterProperties>
    <ValidityCondition>
      <Comparison parameterRef="SignalToNoiseFlag" value="0"
        useCalibratedValue="false" />
    </ValidityCondition>
  </ParameterProperties>
</Parameter>
<Parameter name="SignalToNoise" parameterTypeRef="SignalToNoise"
  shortDescription="Spares are being used for target signal-to-noise
level">
  <ParameterProperties>
    <ValidityCondition>
      <Comparison parameterRef="SignalToNoiseFlag" value="1"
        useCalibratedValue="false" />
    </ValidityCondition>
  </ParameterProperties>
</Parameter>
<Parameter parameterTypeRef="SyncPattern" name="SyncPattern" />
</ParameterSet>
<ContainerSet>
  <SequenceContainer name="Frame">
    <BinaryEncoding bitOrder="leastSignificantBitFirst">
      <ErrorDetectCorrect>
        <Checksum parameterTypeRef="Checksum"
          bitLocationFromStartOfContainer="210"
          name="IRIG161_0_7bit_Checksum" />
      </ErrorDetectCorrect>
      <SizeInBits>
        <FixedValue>240</FixedValue>
      </SizeInBits>
    </BinaryEncoding>
    <EntryList>
      <ParameterRefEntry parameterRef="TestNum">
        <LocationInContainerInBits
          referenceLocation="containerStart">
          <FixedValue>0</FixedValue>
        </LocationInContainerInBits>
      </ParameterRefEntry>
      <ParameterRefEntry parameterRef="DayOfYr" />
      <ParameterRefEntry parameterRef="Format" />
      <ParameterRefEntry parameterRef="TenthOfSec" />
      <ParameterRefEntry parameterRef="TimeOfDay">
        <LocationInContainerInBits
          referenceLocation="containerStart">
          <FixedValue>34</FixedValue>
        </LocationInContainerInBits>
        <IncludeCondition>
          <Comparison parameterRef="PlusTimeFlag" value="0"
            useCalibratedValue="false" />
        </IncludeCondition>
      </ParameterRefEntry>
      <ParameterRefEntry parameterRef="PlusTime">

```

```

        <LocationInContainerInBits
referenceLocation="containerStart">
        <FixedValue>34</FixedValue>
    </LocationInContainerInBits>
    <IncludeCondition>
        <Comparison parameterRef="PlusTimeFlag" value="1"
            useCalibratedValue="false"/>
    </IncludeCondition>
</ParameterRefEntry>
<ParameterRefEntry parameterRef="SiteID">
    <LocationInContainerInBits
referenceLocation="containerStart">
        <FixedValue>51</FixedValue>
    </LocationInContainerInBits>
</ParameterRefEntry>
<ParameterRefEntry parameterRef="EPos"/>
<ParameterRefEntry parameterRef="PosScale"/>
<ParameterRefEntry parameterRef="FPos"/>
<ParameterRefEntry parameterRef="VelScale"/>
<ParameterRefEntry parameterRef="GPos"/>
<ParameterRefEntry parameterRef="OptTrack"/>
<ParameterRefEntry parameterRef="PlusTimeFlag"/>
<ParameterRefEntry parameterRef="FVel"/>
<ParameterRefEntry parameterRef="EVel"/>
<ParameterRefEntry parameterRef="LiftOff"/>
<ParameterRefEntry parameterRef="Plunge"/>
<ParameterRefEntry parameterRef="Pulse"/>
<ParameterRefEntry parameterRef="Refraction"/>
<ParameterRefEntry parameterRef="RFLimit"/>
<ParameterRefEntry parameterRef="Paramp"/>
<ParameterRefEntry parameterRef="Radiation"/>
<ParameterRefEntry parameterRef="Single"/>
<ParameterRefEntry parameterRef="SkinBeacon"/>
<ParameterRefEntry parameterRef="Track"/>
<ParameterRefEntry parameterRef="Quality"/>
<ParameterRefEntry parameterRef="Mode"/>
<ParameterRefEntry parameterRef="GVel"/>
<ParameterRefEntry parameterRef="CheckSum"/>
<ParameterRefEntry parameterRef="Spares">
    <LocationInContainerInBits
referenceLocation="containerStart">
        <FixedValue>217</FixedValue>
    </LocationInContainerInBits>
    <IncludeCondition>
        <Comparison parameterRef="SignalToNoiseFlag"
value="0"
            useCalibratedValue="false"/>
    </IncludeCondition>
</ParameterRefEntry>
<ParameterRefEntry parameterRef="SignalToNoise">
    <LocationInContainerInBits
referenceLocation="containerStart">
        <FixedValue>217</FixedValue>
    </LocationInContainerInBits>
    <IncludeCondition>

```

```

value="1"
                                <Comparison parameterRef="SignalToNoiseFlag"
                                useCalibratedValue="false"/>
                                </IncludeCondition>
                                </ParameterRefEntry>
                                <ParameterRefEntry parameterRef="SyncPattern"/>
                                </EntryList>
                                </SequenceContainer>
                                <SequenceContainer name="SubFrameA">
                                <EntryList/>
                                <BaseContainer containerRef="Frame">
                                <RestrictionCriteria>
                                <ComparisonList>
                                <Comparison value="0" comparisonOperator="=="
parameterRef="PosScale"/>
                                <Comparison value="0" comparisonOperator="=="
parameterRef="OptTrack"/>
                                <Comparison value="0" comparisonOperator="=="
                                parameterRef="PlusTimeFlag"/>
                                <Comparison value="1" comparisonOperator="=="
parameterRef="LiftOff"/>
                                <Comparison value="0" comparisonOperator="=="
parameterRef="Plunge"/>
                                <Comparison value="0" comparisonOperator="=="
parameterRef="Pulse"/>
                                <Comparison value="1" comparisonOperator="=="
parameterRef="Refraction"/>
                                <Comparison value="0" comparisonOperator="=="
parameterRef="Paramp"/>
                                <Comparison value="1" comparisonOperator="=="
parameterRef="Radiation"/>
                                <Comparison value="0" comparisonOperator="=="
parameterRef="Single"/>
                                <Comparison value="7" comparisonOperator="=="
parameterRef="Mode"/>
                                </ComparisonList>
                                </RestrictionCriteria>
                                </BaseContainer>
                                </SequenceContainer>
                                <SequenceContainer name="SubFrameB">
                                <EntryList/>
                                <BaseContainer containerRef="Frame">
                                <RestrictionCriteria>
                                <ComparisonList>
                                <Comparison value="0" comparisonOperator="!="
parameterRef="PosScale"/>
                                <Comparison value="1" comparisonOperator="=="
parameterRef="OptTrack"/>
                                <Comparison value="1" comparisonOperator="=="
                                parameterRef="PlusTimeFlag"/>
                                <Comparison value="0" comparisonOperator="=="
parameterRef="LiftOff"/>
                                <Comparison value="1" comparisonOperator="=="
parameterRef="Plunge"/>
                                <Comparison value="1" comparisonOperator="=="
parameterRef="Pulse"/>

```

```

parameterRef="Refraction"/>
parameterRef="Paramp"/>
parameterRef="Radiation"/>
parameterRef="Single"/>
parameterRef="Mode"/>
    <Comparison value="0" comparisonOperator="=="
    <Comparison value="1" comparisonOperator="=="
    <Comparison value="0" comparisonOperator="=="
    <Comparison value="1" comparisonOperator="=="
    <Comparison value="7" comparisonOperator="!="
    </ComparisonList>
  </RestrictionCriteria>
</BaseContainer>
</SequenceContainer>
</ContainerSet>
<StreamSet>
  <FixedFrameStream name="Serial" frameLengthInBits="240">
    <ContainerRef containerRef="Frame"/>
    <SyncStrategy>
      <SyncPatternList bitLocationFromStartOfContainer="224"
patternLengthInBits="16">
        <SyncPattern pattern="1a1a"/>
        <!-- pattern "1a1a" occurs on one and pattern "1a05"
occurs on next -->
        <SyncPattern pattern="1a05"/>
      </SyncPatternList>
    </SyncStrategy>
  </FixedFrameStream>
</StreamSet>
</TelemetryMetaData>
</SpaceSystem>

```

IRIG161_OB format definition:

```

<?xml version="1.0" encoding="UTF-8"?>
<SpaceSystem name="Format161_OB" shortDescription="IRIG 161_OB, 240-Bit Format (EFG)"
  xmlns="http://www.omg.org/space/xtce" xmlns:xsi="http://www.w3.org/2001/XMLSchema-
  instance"
  xsi:schemaLocation="http://www.omg.org/space/xtce SpaceSystemV1.0.xsd">
  <LongDescription>This format is used for transmission only of tracking data from KMR
  to NASA,
  PMRF, and Kaena Point. It is also used to transmit internally within KMR.
  </LongDescription>
  <Header date="May 2005" validationStatus="Unknown" version="161-00">
  <AuthorSet>
    <Author>Data Reduction and Computer Group</Author>
    <Author>Range Commanders Council</Author>
    <Author>Translated to XTCE by Command and Control Technologies, Inc.</Author>
  </AuthorSet>
  <NoteSet>
    <Note>SignalToNoiseFlag is created to distinguish whether Spare bits are used
  as spare
    or for SignalToNoise.</Note>
  </NoteSet>
  <HistorySet>
    <History>Initial implementation</History>
  </HistorySet>
  </Header>
  <TelemetryMetaData>
  <ParameterTypeSet>
    <IntegerParameterType name="ObjCode" signed="false" sizeInBits="3"
    shortDescription="Objective Code">
    <UnitSet/>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
  encoding="unsigned"
    sizeInBits="3">
    <ByteOrderList>
      <Byte byteSignificance="1"/>
    </ByteOrderList>
    </IntegerDataEncoding>
  </IntegerParameterType>
  <BinaryParameterType name="Spare">
    <UnitSet/>
    <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
    <SizeInBits>
      <FixedValue>13</FixedValue>
    </SizeInBits>
    </BinaryDataEncoding>
  </BinaryParameterType>
  <IntegerParameterType name="DayOfYr" signed="false" sizeInBits="9"
  shortDescription="Day of Year">
    <UnitSet>
      <Unit>day</Unit>
    </UnitSet>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
  encoding="unsigned"
    sizeInBits="9">

```

```

        <ByteOrderList>
            <Byte byteSignificance="2"/>
            <Byte byteSignificance="1"/>
        </ByteOrderList>
    </IntegerDataEncoding>
</IntegerParameterType>
<EnumeratedParameterType name="Format" shortDescription="Format Type: 0000">
    <UnitSet/>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
        sizeInBits="5"/>
    <EnumerationList>
        <Enumeration label="KMR" value="0"/>
    </EnumerationList>
</EnumeratedParameterType>
<BinaryParameterType name="NotUsed" shortDescription="Not Used">
    <UnitSet/>
    <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
        <SizeInBits>
            <FixedValue>4</FixedValue>
        </SizeInBits>
    </BinaryDataEncoding>
</BinaryParameterType>
<IntegerParameterType name="Time" signed="false" sizeInBits="17"
shortDescription="Time of Day or Plus Time: depending upon bit 150;
LSB=1 sec">
    <UnitSet>
        <Unit description="seconds">s</Unit>
    </UnitSet>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
        sizeInBits="17">
        <ByteOrderList>
            <Byte byteSignificance="3"/>
            <Byte byteSignificance="2"/>
            <Byte byteSignificance="1"/>
        </ByteOrderList>
    </IntegerDataEncoding>
</IntegerParameterType>
<IntegerParameterType name="SiteID" signed="false" sizeInBits="9">
    <UnitSet/>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
        sizeInBits="9">
        <ByteOrderList>
            <Byte byteSignificance="2"/>
            <Byte byteSignificance="1"/>
        </ByteOrderList>
    </IntegerDataEncoding>
</IntegerParameterType>
<FloatParameterType name="Position" sizeInBits="64"
validRangeAppliesToCalibrated="true"
shortDescription="MSB indicates sign">
    <UnitSet>
        <Unit description="meters">m</Unit>
    </UnitSet>

```

```

        <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="twosCompliment"
    sizeInBits="28">
        <ByteOrderList>
            <Byte byteSignificance="4"/>
            <Byte byteSignificance="3"/>
            <Byte byteSignificance="2"/>
            <Byte byteSignificance="1"/>
        </ByteOrderList>
        <ContextCalibratorList>
            <ContextCalibrator>
                <UseWhenCondition>
                    <Condition>
                        <ParameterInstanceRef
parameterRef="PosScale"
                                useCalibratedValue="true"/>
                    </Condition>
                </UseWhenCondition>
                <Calibrator>
                    <PolynomialCalibrator>
                        <Term coefficient="1.0"
exponent="1"/>
                    </PolynomialCalibrator>
                </Calibrator>
            </ContextCalibrator>
            <ContextCalibrator>
                <UseWhenCondition>
                    <Condition>
                        <ParameterInstanceRef
parameterRef="PosScale"
                                useCalibratedValue="true"/>
                    </Condition>
                </UseWhenCondition>
                <Calibrator>
                    <PolynomialCalibrator>
                        <Term coefficient="10.0"
exponent="1"/>
                    </PolynomialCalibrator>
                </Calibrator>
            </ContextCalibrator>
            <ContextCalibrator>
                <UseWhenCondition>
                    <Condition>
                        <ParameterInstanceRef
parameterRef="PosScale"
                                useCalibratedValue="true"/>
                    </Condition>
                </UseWhenCondition>
                <Calibrator>
                    <PolynomialCalibrator>
                        <Term coefficient="2"
exponent="1"/>
                    </PolynomialCalibrator>
                </Calibrator>
            </ContextCalibrator>
        </ContextCalibratorList>
    </IntegerDataEncoding>

```

```

        </UseWhenCondition>
        <Calibrator>
            <PolynomialCalibrator>
                <Term coefficient="1E3"
exponent="1" />
            </PolynomialCalibrator>
        </Calibrator>
    </ContextCalibrator>
<ContextCalibrator>
    <UseWhenCondition>
        <Condition>
            <ParameterInstanceRef
parameterRef="PosScale"
                                useCalibratedValue="true" />
        </Condition>
    </UseWhenCondition>
<ComparisonOperator>==</ComparisonOperator>
                                <Value>3</Value>
        </Condition>
    </UseWhenCondition>
<Calibrator>
    <PolynomialCalibrator>
        <Term coefficient="1E10"
exponent="1" />
    </PolynomialCalibrator>
</Calibrator>
</ContextCalibrator>
</ContextCalibratorList>
</IntegerDataEncoding>
<ValidRange maxInclusive="134217727" />
</FloatParameterType>
<FloatParameterType name="PosScale" sizeInBits="64"
shortDescription="Position Scale Factor: KMR always sends 00">
    <UnitSet />
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
                                sizeInBits="2">
        <ContextCalibratorList>
            <ContextCalibrator>
                <UseWhenCondition>
                    <Condition>
                        <ParameterInstanceRef
parameterRef="PosScale"
                                useCalibratedValue="false" />
                    </Condition>
                </UseWhenCondition>
            </ContextCalibrator>
        </ContextCalibratorList>
    </IntegerDataEncoding>
</FloatParameterType>
<ComparisonOperator>==</ComparisonOperator>
                                <Value>0</Value>
        </Condition>
    </UseWhenCondition>
<Calibrator>
    <PolynomialCalibrator>
        <Term coefficient="1" exponent="0" />
    </PolynomialCalibrator>
</Calibrator>
</ContextCalibrator>
<ContextCalibrator>
    <UseWhenCondition>

```

```

                <Condition>
                    <ParameterInstanceRef
parameterRef="PosScale"
                                useCalibratedValue="false"/>
                <Value>1</Value>
            </Condition>
        </UseWhenCondition>
    </ContextCalibrator>
    <Calibrator>
        <PolynomialCalibrator>
            <Term coefficient="10" exponent="0"/>
        </PolynomialCalibrator>
    </Calibrator>
</ContextCalibrator>
<ContextCalibrator>
    <UseWhenCondition>
        <Condition>
            <ParameterInstanceRef
parameterRef="PosScale"
                                useCalibratedValue="false"/>
        </Condition>
    </UseWhenCondition>
    <Value>2</Value>
</Condition>
</UseWhenCondition>
</ContextCalibrator>
<Calibrator>
    <PolynomialCalibrator>
        <Term coefficient="1E3"
exponent="0"/>
    </PolynomialCalibrator>
</Calibrator>
</ContextCalibrator>
<ContextCalibrator>
    <UseWhenCondition>
        <Condition>
            <ParameterInstanceRef
parameterRef="PosScale"
                                useCalibratedValue="false"/>
        </Condition>
    </UseWhenCondition>
    <Value>3</Value>
</Condition>
</UseWhenCondition>
</ContextCalibrator>
<Calibrator>
    <PolynomialCalibrator>
        <Term coefficient="1E10"
exponent="0"/>
    </PolynomialCalibrator>
</Calibrator>
</ContextCalibrator>
</ContextCalibratorList>
</IntegerDataEncoding>
</FloatParameterType>
<FloatParameterType name="VelScale" sizeInBits="64"
shortDescription="Velocity Scale Factor">

```

```

        <UnitSet/>
        <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
        sizeInBits="2">
        <ContextCalibratorList>
            <ContextCalibrator>
                <UseWhenCondition>
                    <Condition>
                        <ParameterInstanceRef
parameterRef="VelScale"
                                useCalibratedValue="false"/>
                    </Condition>
                </UseWhenCondition>
                <ComparisonOperator>==</ComparisonOperator>
                    <Value>0</Value>
                </Condition>
            </UseWhenCondition>
            <Calibrator>
                <PolynomialCalibrator>
                    <Term coefficient="1" exponent="0"/>
                </PolynomialCalibrator>
            </Calibrator>
        </ContextCalibrator>
        <ContextCalibrator>
            <UseWhenCondition>
                <Condition>
                    <ParameterInstanceRef
parameterRef="VelScale"
                                useCalibratedValue="false"/>
                </Condition>
            </UseWhenCondition>
            <ComparisonOperator>==</ComparisonOperator>
                <Value>1</Value>
            </Condition>
        </UseWhenCondition>
        <Calibrator>
            <PolynomialCalibrator>
                <Term coefficient="10" exponent="0"/>
            </PolynomialCalibrator>
        </Calibrator>
    </ContextCalibratorList>
</IntegerDataEncoding>
</FloatParameterType>
<BooleanParameterType name="OptTrack" oneStringValue="on-track"
zeroStringValue=""
    shortDescription="Optical Track: KMR always sends 0">
    <UnitSet/>
    <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
</BooleanParameterType>
<BooleanParameterType name="PlusTimeFlag" oneStringValue="Plus-Time"
zeroStringValue="Zulu-Time"
    shortDescription="KMR always sends 0; 1=if plus time rather than Zulu
time">
    <UnitSet/>
    <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
</BooleanParameterType>
<FloatParameterType name="Velocity" sizeInBits="64"

```

```

shortDescription="MSB indicates sign">
  <UnitSet>
    <Unit description="meters per second">m/s</Unit>
  </UnitSet>
  <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="twosCompliment"
  sizeInBits="15">
    <ByteOrderList>
      <Byte byteSignificance="2"/>
      <Byte byteSignificance="1"/>
    </ByteOrderList>
    <ContextCalibratorList>
      <ContextCalibrator>
        <UseWhenCondition>
          <Condition>
            <ParameterInstanceRef
parameterRef="VelScale"
              useCalibratedValue="true"/>
          </Condition>
        </UseWhenCondition>
        <Calibrator>
          <PolynomialCalibrator>
            <Term coefficient="1.0"
exponent="1"/>
          </PolynomialCalibrator>
        </Calibrator>
      </ContextCalibrator>
      <ContextCalibrator>
        <UseWhenCondition>
          <Condition>
            <ParameterInstanceRef
parameterRef="VelScale"
              useCalibratedValue="true"/>
          </Condition>
        </UseWhenCondition>
        <Calibrator>
          <PolynomialCalibrator>
            <Term coefficient="10.0"
exponent="1"/>
          </PolynomialCalibrator>
        </Calibrator>
      </ContextCalibrator>
    </ContextCalibratorList>
  </IntegerDataEncoding>
</FloatParameterType>
<BooleanParameterType name="LiftOff" oneStringValue="liftoff has occurred"
  zeroStringValue="" shortDescription="KMR always sends 1">
  <UnitSet/>
  <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
</BooleanParameterType>

```



```

<ComparisonOperator>==</ComparisonOperator>
    <Value>2</Value>
    </Condition>
</UseWhenCondition>
<Calibrator>
    <PolynomialCalibrator>
        <Term coefficient="5.0"
exponent="0"/>
    </PolynomialCalibrator>
</Calibrator>
</ContextCalibrator>
<ContextCalibrator>
    <UseWhenCondition>
        <Condition>
            <ParameterInstanceRef
parameterRef="Pulse"
            useCalibratedValue="false"/>
        </Condition>
    </UseWhenCondition>
</ContextCalibrator>
</ContextCalibratorList>
</IntegerDataEncoding>
</FloatParameterType>
<BooleanParameterType name="InOut" oneStringValue="in" zeroStringValue="out">
    <UnitSet/>
    <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
</BooleanParameterType>
<BooleanParameterType name="OnOff" oneStringValue="on" zeroStringValue="off">
    <UnitSet/>
    <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
</BooleanParameterType>
<BooleanParameterType name="Single" oneStringValue="dual lo"
zeroStringValue="single lo"
    shortDescription="KMR always sends 0">
    <UnitSet/>
    <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
</BooleanParameterType>
<BooleanParameterType name="SkinBeacon" oneStringValue="beacon"
zeroStringValue="skin"
    shortDescription="Skin/Beacon Mode">
    <UnitSet/>
    <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
</BooleanParameterType>
<BooleanParameterType name="Quality" oneStringValue="good"
zeroStringValue="bad">
    <UnitSet/>

```

```

        <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
    </BooleanParameterType>
    <EnumeratedParameterType name="Mode"
        shortDescription="KMR always sends 7= active track and 1 = all
others">
        <UnitSet/>
        <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
            sizeInBits="3"/>
        <EnumerationList>
            <Enumeration label="manual" value="0"/>
            <Enumeration label="auto track" value="1"/>
            <Enumeration label="computer drive" value="2"/>
            <Enumeration label="on-axis orbital" value="3"/>
            <Enumeration label="on-axis powered flight" value="4"/>
            <Enumeration label="on-axis coast" value="5"/>
            <Enumeration label="auto track coast" value="6"/>
            <Enumeration label="active track" value="7"/>
        </EnumerationList>
    </EnumeratedParameterType>
    <IntegerParameterType name="CheckSum" signed="false" sizeInBits="8">
        <UnitSet/>
        <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
            sizeInBits="8">
            <ByteOrderList>
                <Byte byteSignificance="1"/>
            </ByteOrderList>
        </IntegerDataEncoding>
    </IntegerParameterType>
    <!-- SignalToNoiseFlag is created to distinguish whether these bits are used
as Spare or for SignalToNoise -->
    <BooleanParameterType name="SignalToNoiseFlag" oneStringValue="true"
        zeroStringValue="false"
        shortDescription="If spares are being used for target signal-to-noise
level">
        <UnitSet/>
        <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
    </BooleanParameterType>
    <BinaryParameterType name="Spares">
        <UnitSet/>
        <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
            <SizeInBits>
                <FixedValue>6</FixedValue>
            </SizeInBits>
        </BinaryDataEncoding>
    </BinaryParameterType>
    <IntegerParameterType name="SignalToNoise" signed="false" sizeInBits="6"
        validRangeAppliesToCalibrated="true"
        shortDescription="Spares can be used for the target signal-to-noise
level, 0 to 63">
        <UnitSet/>
        <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
            sizeInBits="6">
            <ByteOrderList>

```

```

        <Byte byteSignificance="1"/>
    </ByteOrderList>
</IntegerDataEncoding>
    <ValidRange maxInclusive="63"/>
</IntegerParameterType>
    <IntegerParameterType name="SyncPattern" signed="false" sizeInBits="16">
        <UnitSet/>
        <IntegerDataEncoding bitOrder="mostSignificantBitFirst"
encoding="unsigned"
        sizeInBits="16"/>
    </IntegerParameterType>
</ParameterTypeSet>
<ParameterSet>
    <Parameter name="ObjCode" parameterTypeRef="ObjCode"/>
    <Parameter name="Spare" parameterTypeRef="Spare"/>
    <Parameter name="DayOfYr" parameterTypeRef="DayOfYr"/>
    <Parameter name="Format" parameterTypeRef="Format"/>
    <Parameter name="NotUsed" parameterTypeRef="NotUsed"/>
    <Parameter name="TimeOfDay" parameterTypeRef="Time"
        shortDescription="TimeOfDay if PlusTimeFlag (Bit 150) is set to 0">
        <ParameterProperties>
            <ValidityCondition>
                <Comparison parameterRef="PlusTimeFlag" value="0"
useCalibratedValue="false"
                />
            </ValidityCondition>
        </ParameterProperties>
    </Parameter>
    <Parameter name="PlusTime" parameterTypeRef="Time"
        shortDescription="PlusTime if PlusTimeFlag (Bit 150) is set to 1">
        <ParameterProperties>
            <ValidityCondition>
                <Comparison parameterRef="PlusTimeFlag" value="1"
useCalibratedValue="false"
                />
            </ValidityCondition>
        </ParameterProperties>
    </Parameter>
    <Parameter name="SiteID" parameterTypeRef="SiteID"/>
    <Parameter name="EPos" parameterTypeRef="Position"/>
    <Parameter name="PosScale" parameterTypeRef="PosScale"/>
    <Parameter name="FPos" parameterTypeRef="Position"/>
    <Parameter name="VelScale" parameterTypeRef="VelScale"/>
    <Parameter name="GPos" parameterTypeRef="Position"/>
    <Parameter name="OptTrack" parameterTypeRef="OptTrack"/>
    <Parameter name="PlusTimeFlag" parameterTypeRef="PlusTimeFlag"/>
    <Parameter name="FVel" parameterTypeRef="Velocity"/>
    <Parameter name="EVel" parameterTypeRef="Velocity"/>
    <Parameter name="LiftOff" parameterTypeRef="LiftOff"/>
    <Parameter name="Plunge" parameterTypeRef="Plunge"/>
    <Parameter name="Pulse" parameterTypeRef="Pulse"/>
    <Parameter name="Refraction" parameterTypeRef="InOut"/>
    <Parameter name="RFLimit" parameterTypeRef="InOut"/>
    <Parameter name="Paramp" parameterTypeRef="OnOff"/>
    <Parameter name="Radiation" parameterTypeRef="OnOff"/>
    <Parameter name="Single" parameterTypeRef="Single"/>

```

```

<Parameter name="SkinBeacon" parameterTypeRef="SkinBeacon"/>
<Parameter name="Track" parameterTypeRef="OnOff"/>
<Parameter name="Quality" parameterTypeRef="Quality"/>
<Parameter name="Mode" parameterTypeRef="Mode"/>
<Parameter name="GVel" parameterTypeRef="Velocity"/>
<Parameter name="Checksum" parameterTypeRef="Checksum"/>
<Parameter name="SignalToNoiseFlag" parameterTypeRef="SignalToNoiseFlag"/>
<Parameter name="Spares" parameterTypeRef="Spares"
    shortDescription="Spares are not being used for target signal-to-noise
level">
    <ParameterProperties>
        <ValidityCondition>
            <Comparison parameterRef="SignalToNoiseFlag" value="0"
                useCalibratedValue="false"/>
        </ValidityCondition>
    </ParameterProperties>
</Parameter>
<Parameter name="SignalToNoise" parameterTypeRef="SignalToNoise"
    shortDescription="Spares are being used for target signal-to-noise
level">
    <ParameterProperties>
        <ValidityCondition>
            <Comparison parameterRef="SignalToNoiseFlag" value="1"
                useCalibratedValue="false"/>
        </ValidityCondition>
    </ParameterProperties>
</Parameter>
<Parameter parameterTypeRef="SyncPattern" name="SyncPattern"/>
</ParameterSet>
<ContainerSet>
    <SequenceContainer name="Frame">
        <BinaryEncoding bitOrder="leastSignificantBitFirst">
            <ErrorDetectCorrect>
                <Checksum parameterTypeRef="Checksum"
bitLocationFromStartOfContainer="210"
                    name="IRIG161_0_8bit_Checksum"/>
            </ErrorDetectCorrect>
            <SizeInBits>
                <FixedValue>240</FixedValue>
            </SizeInBits>
        </BinaryEncoding>
        <EntryList>
            <ParameterRefEntry parameterRef="ObjCode"/>
            <ParameterRefEntry parameterRef="Spare"/>
            <ParameterRefEntry parameterRef="DayOfYr"/>
            <ParameterRefEntry parameterRef="Format"/>
            <ParameterRefEntry parameterRef="NotUsed"/>
            <ParameterRefEntry parameterRef="TimeOfDay">
                <LocationInContainerInBits
referenceLocation="containerStart">
                    <FixedValue>34</FixedValue>
                </LocationInContainerInBits>
            </ParameterRefEntry>
            <IncludeCondition>
                <Comparison parameterRef="PlusTimeFlag" value="0"
                    useCalibratedValue="false"/>
            </IncludeCondition>
        </EntryList>
    </SequenceContainer>
</ContainerSet>

```

```

        </ParameterRefEntry>
        <ParameterRefEntry parameterRef="PlusTime">
            <LocationInContainerInBits
referenceLocation="containerStart">
                <FixedValue>34</FixedValue>
            </LocationInContainerInBits>
            <IncludeCondition>
                <Comparison parameterRef="PlusTimeFlag" value="1"
                    useCalibratedValue="false"/>
            </IncludeCondition>
        </ParameterRefEntry>
        <ParameterRefEntry parameterRef="SiteID">
            <LocationInContainerInBits
referenceLocation="containerStart">
                <FixedValue>51</FixedValue>
            </LocationInContainerInBits>
        </ParameterRefEntry>
        <ParameterRefEntry parameterRef="EPos"/>
        <ParameterRefEntry parameterRef="PosScale"/>
        <ParameterRefEntry parameterRef="FPos"/>
        <ParameterRefEntry parameterRef="VelScale"/>
        <ParameterRefEntry parameterRef="GPos"/>
        <ParameterRefEntry parameterRef="OptTrack"/>
        <ParameterRefEntry parameterRef="PlusTimeFlag"/>
        <ParameterRefEntry parameterRef="FVel"/>
        <ParameterRefEntry parameterRef="EVel"/>
        <ParameterRefEntry parameterRef="LiftOff"/>
        <ParameterRefEntry parameterRef="Plunge"/>
        <ParameterRefEntry parameterRef="Pulse"/>
        <ParameterRefEntry parameterRef="Refraction"/>
        <ParameterRefEntry parameterRef="RFLimit"/>
        <ParameterRefEntry parameterRef="Paramp"/>
        <ParameterRefEntry parameterRef="Radiation"/>
        <ParameterRefEntry parameterRef="Single"/>
        <ParameterRefEntry parameterRef="SkinBeacon"/>
        <ParameterRefEntry parameterRef="Track"/>
        <ParameterRefEntry parameterRef="Quality"/>
        <ParameterRefEntry parameterRef="Mode"/>
        <ParameterRefEntry parameterRef="GVel"/>
        <ParameterRefEntry parameterRef="Checksum"/>
        <ParameterRefEntry parameterRef="Spares">
            <LocationInContainerInBits
referenceLocation="containerStart">
                <FixedValue>218</FixedValue>
            </LocationInContainerInBits>
            <IncludeCondition>
                <Comparison parameterRef="SignalToNoiseFlag"
value="0"
                    useCalibratedValue="false"/>
            </IncludeCondition>
        </ParameterRefEntry>
        <ParameterRefEntry parameterRef="SignalToNoise">
            <LocationInContainerInBits
referenceLocation="containerStart">
                <FixedValue>218</FixedValue>
            </LocationInContainerInBits>

```

```

                                <IncludeCondition>
                                    <Comparison parameterRef="SignalToNoiseFlag"
value="1"
                                                useCalibratedValue="false"/>
                                </IncludeCondition>
                            </ParameterRefEntry>
                            <ParameterRefEntry parameterRef="SyncPattern"/>
                        </EntryList>
                    </SequenceContainer>
                    <!--<SequenceContainer name="SubFrameA">
                        <EntryList/>
                        <BaseContainer containerRef="Frame">
                            <RestrictionCriteria>
                                <ComparisonList>
                                    <Comparison value="0" comparisonOperator="=="
parameterRef="PosScale"/>
                                    <Comparison value="0" comparisonOperator="=="
parameterRef="OptTrack"/>
                                    <Comparison value="0" comparisonOperator="=="
parameterRef="PlusTimeFlag"/>
                                    <Comparison value="1" comparisonOperator="=="
parameterRef="LiftOff"/>
                                    <Comparison value="0" comparisonOperator="=="
parameterRef="Plunge"/>
                                    <Comparison value="0" comparisonOperator="=="
parameterRef="Pulse"/>
                                    <Comparison value="1" comparisonOperator="=="
parameterRef="Refraction"/>
                                    <Comparison value="0" comparisonOperator="=="
parameterRef="Paramp"/>
                                    <Comparison value="1" comparisonOperator="=="
parameterRef="Radiation"/>
                                    <Comparison value="0" comparisonOperator="=="
parameterRef="Single"/>
                                    <Comparison value="7" comparisonOperator="=="
parameterRef="Mode"/>
                                </ComparisonList>
                            </RestrictionCriteria>
                        </BaseContainer>
                    </SequenceContainer>

                    <SequenceContainer name="SubFrameB">
                        <EntryList/>
                        <BaseContainer containerRef="Frame">
                            <RestrictionCriteria>
                                <ComparisonList>
                                    <Comparison value="0" comparisonOperator="!="
parameterRef="PosScale"/>
                                    <Comparison value="1" comparisonOperator="=="
parameterRef="OptTrack"/>
                                    <Comparison value="1" comparisonOperator="=="
parameterRef="PlusTimeFlag"/>
                                    <Comparison value="0" comparisonOperator="=="
parameterRef="LiftOff"/>
                                    <Comparison value="1" comparisonOperator="=="
parameterRef="Plunge"/>
                                </ComparisonList>
                            </RestrictionCriteria>
                        </BaseContainer>
                    </SequenceContainer>
                </EntryList>
            </BaseContainer>
        </RestrictionCriteria>
    </SequenceContainer>

```

```

parameterRef="Pulse" />          <Comparison value="1" comparisonOperator="=="
parameterRef="Refraction" />    <Comparison value="0" comparisonOperator="=="
parameterRef="Paramp" />       <Comparison value="1" comparisonOperator="=="
parameterRef="Radiation" />    <Comparison value="0" comparisonOperator="=="
parameterRef="Single" />      <Comparison value="1" comparisonOperator="=="
parameterRef="Mode" />        <Comparison value="7" comparisonOperator="!="
                                </ComparisonList>
                                </RestrictionCriteria>
                                </BaseContainer>
                                </SequenceContainer>    -->
</ContainerSet>
<StreamSet>
  <FixedFrameStream name="Serial" frameLengthInBits="240">
    <ContainerRef containerRef="Frame" />
    <SyncStrategy>
      <SyncPatternList bitLocationFromStartOfContainer="224"
patternLengthInBits="16">
        <SyncPattern pattern="1a1a" />
        <!-- pattern "1a1a" occurs on one and pattern "1a05"
occurs on next -->
        <SyncPattern pattern="1a05" />
      </SyncPatternList>
    </SyncStrategy>
  </FixedFrameStream>
</StreamSet>
</TelemetryMetaData>
</SpaceSystem>

```

IRIG161_OC format definition:

```
<?xml version="1.0" encoding="UTF-8"?>
<SpaceSystem name="Format161_OC" shortDescription="IRIG 161_OC, 240-Bit Format (EFG)"
  xmlns="http://www.omg.org/space/xtce" xmlns:xsi="http://www.w3.org/2001/XMLSchema-
  instance"
  xsi:schemaLocation="http://www.omg.org/space/xtce SpaceSystemV1.0.xsd">
  <LongDescription>This format is used for transmitting and receiving data between
  PMRF and NASA,
  and between 30 SW and NASA Goddard. </LongDescription>
  <Header date="May 2005" validationStatus="Unknown" version="161-00">
  <AuthorSet>
    <Author>Data Reduction and Computer Group</Author>
    <Author>Range Commanders Council</Author>
    <Author>Translated to XTCE by Command and Control Technologies, Inc.</Author>
  </AuthorSet>
  <NoteSet>
    <Note>SignalToNoiseFlag is created to distinguish whether Spare bits are used
  as spare
    or for SignalToNoise.</Note>
  </NoteSet>
  <HistorySet>
    <History>Initial implementation</History>
  </HistorySet>
  </Header>
  <TelemetryMetaData>
  <ParameterTypeSet>
    <IntegerParameterType name="SatCode" signed="false" sizeInBits="13"
    shortDescription="Satellite Code">
    <UnitSet/>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
  encoding="unsigned"
    sizeInBits="13">
    <ByteOrderList>
      <Byte byteSignificance="2"/>
      <Byte byteSignificance="1"/>
    </ByteOrderList>
    </IntegerDataEncoding>
  </IntegerParameterType>
  <IntegerParameterType name="VehID" signed="false" sizeInBits="4"
  shortDescription="Vehicle ID">
  <UnitSet/>
  <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
  encoding="unsigned"
    sizeInBits="4">
    <ByteOrderList>
      <Byte byteSignificance="1"/>
    </ByteOrderList>
    </IntegerDataEncoding>
  </IntegerParameterType>
  <IntegerParameterType name="DayOfYr" signed="false" sizeInBits="8"
  shortDescription="Day of Year">
  <UnitSet>
    <Unit>day</Unit>
  </UnitSet>
```

```

        <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
        sizeInBits="8">
        <ByteOrderList>
            <Byte byteSignificance="1"/>
        </ByteOrderList>
    </IntegerDataEncoding>
</IntegerParameterType>
<EnumeratedParameterType name="Format" shortDescription="Format Type: 00000">
    <UnitSet/>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
        sizeInBits="5"/>
    <EnumerationList>
        <Enumeration label="KMR" value="0"/>
    </EnumerationList>
</EnumeratedParameterType>
<BinaryParameterType name="NotUsed" shortDescription="Not Used">
    <UnitSet/>
    <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
        <SizeInBits>
            <FixedValue>4</FixedValue>
        </SizeInBits>
    </BinaryDataEncoding>
</BinaryParameterType>
<IntegerParameterType name="Time" signed="false" sizeInBits="17"
shortDescription="Time of Day or Plus Time: depending upon bit 150;
LSB=1 sec">
    <UnitSet>
        <Unit description="seconds">s</Unit>
    </UnitSet>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
        sizeInBits="17">
        <ByteOrderList>
            <Byte byteSignificance="3"/>
            <Byte byteSignificance="2"/>
            <Byte byteSignificance="1"/>
        </ByteOrderList>
    </IntegerDataEncoding>
</IntegerParameterType>
<IntegerParameterType name="SiteID" signed="false" sizeInBits="9">
    <UnitSet/>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
        sizeInBits="9">
        <ByteOrderList>
            <Byte byteSignificance="2"/>
            <Byte byteSignificance="1"/>
        </ByteOrderList>
    </IntegerDataEncoding>
</IntegerParameterType>
<FloatParameterType name="Position" sizeInBits="64"
validRangeAppliesToCalibrated="true"
shortDescription="MSB indicates sign">
    <UnitSet>

```



```

                <Value>2</Value>
            </Condition>
        </UseWhenCondition>
    </Calibrator>
        <PolynomialCalibrator>
            <Term coefficient="1E3"
exponent="1"/>
        </PolynomialCalibrator>
    </Calibrator>
</ContextCalibrator>
<ContextCalibrator>
    <UseWhenCondition>
        <Condition>
            <ParameterInstanceRef
parameterRef="PosScale"
                useCalibratedValue="true"/>
        </Condition>
    </UseWhenCondition>
</ContextCalibrator>
<ComparisonOperator>==</ComparisonOperator>
                <Value>3</Value>
            </Condition>
        </UseWhenCondition>
    </Calibrator>
        <PolynomialCalibrator>
            <Term coefficient="1E10"
exponent="1"/>
        </PolynomialCalibrator>
    </Calibrator>
</ContextCalibrator>
</ContextCalibratorList>
</IntegerDataEncoding>
<ValidRange maxInclusive="134217727"/>
</FloatParameterType>
<FloatParameterType name="PosScale" sizeInBits="64"
    shortDescription="Position Scale Factor: KMR always sends 00">
    <UnitSet/>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
        sizeInBits="2">
        <ContextCalibratorList>
            <ContextCalibrator>
                <UseWhenCondition>
                    <Condition>
                        <ParameterInstanceRef
parameterRef="PosScale"
                            useCalibratedValue="false"/>
                    </Condition>
                </UseWhenCondition>
            </ContextCalibrator>
        </ContextCalibratorList>
    </IntegerDataEncoding>
</FloatParameterType>
<ComparisonOperator>==</ComparisonOperator>
                <Value>0</Value>
            </Condition>
        </UseWhenCondition>
    </Calibrator>
        <PolynomialCalibrator>
            <Term coefficient="1" exponent="0"/>
        </PolynomialCalibrator>
    </Calibrator>
</ContextCalibrator>

```

```

        <ContextCalibrator>
            <UseWhenCondition>
                <Condition>
                    <ParameterInstanceRef
parameterRef="PosScale"
                                useCalibratedValue="false"/>
                </Condition>
            </UseWhenCondition>
            <Value>1</Value>
        </Condition>
    </UseWhenCondition>
    <Calibrator>
        <PolynomialCalibrator>
            <Term coefficient="10" exponent="0"/>
        </PolynomialCalibrator>
    </Calibrator>
</ContextCalibrator>
<ContextCalibrator>
    <UseWhenCondition>
        <Condition>
            <ParameterInstanceRef
parameterRef="PosScale"
                                useCalibratedValue="false"/>
        </Condition>
    </UseWhenCondition>
    <Value>2</Value>
</Condition>
</UseWhenCondition>
<Calibrator>
    <PolynomialCalibrator>
        <Term coefficient="1E3"
exponent="0"/>
    </PolynomialCalibrator>
</Calibrator>
</ContextCalibrator>
<ContextCalibrator>
    <UseWhenCondition>
        <Condition>
            <ParameterInstanceRef
parameterRef="PosScale"
                                useCalibratedValue="false"/>
        </Condition>
    </UseWhenCondition>
    <Value>3</Value>
</Condition>
</UseWhenCondition>
<Calibrator>
    <PolynomialCalibrator>
        <Term coefficient="1E10"
exponent="0"/>
    </PolynomialCalibrator>
</Calibrator>
</ContextCalibrator>
</ContextCalibratorList>
</IntegerDataEncoding>
</FloatParameterType>

```

```

        <FloatParameterType name="VelScale" sizeInBits="64"
            shortDescription="Velocity Scale Factor">
            <UnitSet/>
            <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
                sizeInBits="2">
                <ContextCalibratorList>
                    <ContextCalibrator>
                        <UseWhenCondition>
                            <Condition>
                                <ParameterInstanceRef
parameterRef="VelScale"
                                    useCalibratedValue="false"/>
                                <Value>0</Value>
                            </Condition>
                        </UseWhenCondition>
                    </ContextCalibrator>
                    <ContextCalibrator>
                        <UseWhenCondition>
                            <Condition>
                                <ParameterInstanceRef
parameterRef="VelScale"
                                    useCalibratedValue="false"/>
                                <Value>1</Value>
                            </Condition>
                        </UseWhenCondition>
                    </ContextCalibrator>
                </ContextCalibratorList>
            </IntegerDataEncoding>
        </FloatParameterType>
        <BooleanParameterType name="OptTrack" oneStringValue="on-track"
zeroStringValue=""
            shortDescription="Optical Track: KMR always sends 0">
            <UnitSet/>
            <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
        </BooleanParameterType>
        <BooleanParameterType name="PlusTimeFlag" oneStringValue="Plus-Time"
zeroStringValue="Zulu-Time"
            shortDescription="KMR always sends 0; 1=if plus time rather than Zulu
time">
            <UnitSet/>
            <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>

```

```

</BooleanParameterType>
<FloatParameterType name="Velocity" sizeInBits="64"
  shortDescription="MSB indicates sign">
  <UnitSet>
    <Unit description="meters per second">m/s</Unit>
  </UnitSet>
  <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="twosCompliment"
  sizeInBits="15">
  <ByteOrderList>
    <Byte byteSignificance="2"/>
    <Byte byteSignificance="1"/>
  </ByteOrderList>
  <ContextCalibratorList>
    <ContextCalibrator>
      <UseWhenCondition>
        <Condition>
          <ParameterInstanceRef
parameterRef="VelScale"
          useCalibratedValue="true"/>
        </Condition>
      </UseWhenCondition>
      <Calibrator>
        <PolynomialCalibrator>
          <Term coefficient="1.0"
exponent="1"/>
        </PolynomialCalibrator>
      </Calibrator>
    </ContextCalibrator>
    <ContextCalibrator>
      <UseWhenCondition>
        <Condition>
          <ParameterInstanceRef
parameterRef="VelScale"
          useCalibratedValue="true"/>
        </Condition>
      </UseWhenCondition>
      <Calibrator>
        <PolynomialCalibrator>
          <Term coefficient="10.0"
exponent="1"/>
        </PolynomialCalibrator>
      </Calibrator>
    </ContextCalibrator>
  </ContextCalibratorList>
</IntegerDataEncoding>
</FloatParameterType>
<BooleanParameterType name="LiftOff" oneStringValue="liftoff has occurred"
  zeroStringValue="" shortDescription="KMR always sends 1">
  <UnitSet/>

```



```

useCalibratedValue="false"/>

<ComparisonOperator>==</ComparisonOperator>
    <Value>2</Value>
    </Condition>
</UseWhenCondition>
<Calibrator>
    <PolynomialCalibrator>
        <Term coefficient="5.0"
exponent="0"/>
    </PolynomialCalibrator>
</Calibrator>
</ContextCalibrator>
<ContextCalibrator>
    <UseWhenCondition>
        <Condition>
            <ParameterInstanceRef
parameterRef="Pulse"
useCalibratedValue="false"/>

<ComparisonOperator>==</ComparisonOperator>
    <Value>3</Value>
    </Condition>
</UseWhenCondition>
<Calibrator>
    <PolynomialCalibrator>
        <Term coefficient="10.0"
exponent="0"/>
    </PolynomialCalibrator>
</Calibrator>
</ContextCalibrator>
</ContextCalibratorList>
</IntegerDataEncoding>
</FloatParameterType>
<BooleanParameterType name="InOut" oneStringValue="in" zeroStringValue="out">
    <UnitSet/>
    <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
</BooleanParameterType>
<BooleanParameterType name="OnOff" oneStringValue="on" zeroStringValue="off">
    <UnitSet/>
    <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
</BooleanParameterType>
<BooleanParameterType name="Single" oneStringValue="dual lo"
zeroStringValue="single lo"
shortDescription="KMR always sends 0">
    <UnitSet/>
    <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
</BooleanParameterType>
<BooleanParameterType name="SkinBeacon" oneStringValue="beacon"
zeroStringValue="skin"
shortDescription="Skin/Beacon Mode">
    <UnitSet/>
    <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
</BooleanParameterType>
<BooleanParameterType name="Quality" oneStringValue="good"
zeroStringValue="bad">

```

```

        <UnitSet/>
        <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
    </BooleanParameterType>
    <EnumeratedParameterType name="Mode"
        shortDescription="KMR always sends 7= active track and 1 = all
others">
        <UnitSet/>
        <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
            sizeInBits="3"/>
        <EnumerationList>
            <Enumeration label="manual" value="0"/>
            <Enumeration label="auto track" value="1"/>
            <Enumeration label="computer drive" value="2"/>
            <Enumeration label="on-axis orbital" value="3"/>
            <Enumeration label="on-axis powered flight" value="4"/>
            <Enumeration label="on-axis coast" value="5"/>
            <Enumeration label="auto track coast" value="6"/>
            <Enumeration label="active track" value="7"/>
        </EnumerationList>
    </EnumeratedParameterType>
    <IntegerParameterType name="Checksum" signed="false" sizeInBits="8">
        <UnitSet/>
        <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
            sizeInBits="8">
            <ByteOrderList>
                <Byte byteSignificance="1"/>
            </ByteOrderList>
        </IntegerDataEncoding>
    </IntegerParameterType>
    <!-- SignalToNoiseFlag is created to distinguish whether these bits are used
as Spare or for SignalToNoise -->
    <BooleanParameterType name="SignalToNoiseFlag" oneStringValue="true"
        zeroStringValue="false"
        shortDescription="If spares are being used for target signal-to-noise
level">
        <UnitSet/>
        <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
    </BooleanParameterType>
    <BinaryParameterType name="Spares">
        <UnitSet/>
        <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
            <SizeInBits>
                <FixedValue>6</FixedValue>
            </SizeInBits>
        </BinaryDataEncoding>
    </BinaryParameterType>
    <IntegerParameterType name="SignalToNoise" signed="false" sizeInBits="6"
        validRangeAppliesToCalibrated="true"
        shortDescription="Spares can be used for the target signal-to-noise
level, 0 to 63">
        <UnitSet/>
        <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
            sizeInBits="6">

```

```

        <ByteOrderList>
            <Byte byteSignificance="1"/>
        </ByteOrderList>
    </IntegerDataEncoding>
    <ValidRange maxInclusive="63"/>
</IntegerParameterType>
<IntegerParameterType name="SyncPattern" signed="false" sizeInBits="16">
    <UnitSet/>
    <IntegerDataEncoding bitOrder="mostSignificantBitFirst"
encoding="unsigned"
        sizeInBits="16"/>
</IntegerParameterType>
</ParameterTypeSet>
<ParameterSet>
    <Parameter name="SatCode" parameterTypeRef="SatCode"/>
    <Parameter name="VehID" parameterTypeRef="VehID"/>
    <Parameter name="DayOfYr" parameterTypeRef="DayOfYr"/>
    <Parameter name="Format" parameterTypeRef="Format"/>
    <Parameter name="NotUsed" parameterTypeRef="NotUsed"/>
    <Parameter name="TimeOfDay" parameterTypeRef="Time"
        shortDescription="TimeOfDay if PlusTimeFlag (Bit 150) is set to 0">
        <ParameterProperties>
            <ValidityCondition>
                <Comparison parameterRef="PlusTimeFlag" value="0"
useCalibratedValue="false"
            />
            </ValidityCondition>
        </ParameterProperties>
    </Parameter>
    <Parameter name="PlusTime" parameterTypeRef="Time"
        shortDescription="PlusTime if PlusTimeFlag (Bit 150) is set to 1">
        <ParameterProperties>
            <ValidityCondition>
                <Comparison parameterRef="PlusTimeFlag" value="1"
useCalibratedValue="false"
            />
            </ValidityCondition>
        </ParameterProperties>
    </Parameter>
    <Parameter name="SiteID" parameterTypeRef="SiteID"/>
    <Parameter name="EPos" parameterTypeRef="Position"/>
    <Parameter name="PosScale" parameterTypeRef="PosScale"/>
    <Parameter name="FPos" parameterTypeRef="Position"/>
    <Parameter name="VelScale" parameterTypeRef="VelScale"/>
    <Parameter name="GPos" parameterTypeRef="Position"/>
    <Parameter name="OptTrack" parameterTypeRef="OptTrack"/>
    <Parameter name="PlusTimeFlag" parameterTypeRef="PlusTimeFlag"/>
    <Parameter name="FVel" parameterTypeRef="Velocity"/>
    <Parameter name="EVel" parameterTypeRef="Velocity"/>
    <Parameter name="LiftOff" parameterTypeRef="LiftOff"/>
    <Parameter name="Plunge" parameterTypeRef="Plunge"/>
    <Parameter name="Pulse" parameterTypeRef="Pulse"/>
    <Parameter name="Refraction" parameterTypeRef="InOut"/>
    <Parameter name="RFLimit" parameterTypeRef="InOut"/>
    <Parameter name="Paramp" parameterTypeRef="OnOff"/>
    <Parameter name="Radiation" parameterTypeRef="OnOff"/>

```

```

<Parameter name="Single" parameterTypeRef="Single"/>
<Parameter name="SkinBeacon" parameterTypeRef="SkinBeacon"/>
<Parameter name="Track" parameterTypeRef="OnOff"/>
<Parameter name="Quality" parameterTypeRef="Quality"/>
<Parameter name="Mode" parameterTypeRef="Mode"/>
<Parameter name="GVel" parameterTypeRef="Velocity"/>
<Parameter name="Checksum" parameterTypeRef="Checksum"/>
<Parameter name="SignalToNoiseFlag" parameterTypeRef="SignalToNoiseFlag"/>
<Parameter name="Spares" parameterTypeRef="Spares"
    shortDescription="Spares are not being used for target signal-to-noise
level">
    <ParameterProperties>
        <ValidityCondition>
            <Comparison parameterRef="SignalToNoiseFlag" value="0"
                useCalibratedValue="false"/>
        </ValidityCondition>
    </ParameterProperties>
</Parameter>
<Parameter name="SignalToNoise" parameterTypeRef="SignalToNoise"
    shortDescription="Spares are being used for target signal-to-noise
level">
    <ParameterProperties>
        <ValidityCondition>
            <Comparison parameterRef="SignalToNoiseFlag" value="1"
                useCalibratedValue="false"/>
        </ValidityCondition>
    </ParameterProperties>
</Parameter>
<Parameter parameterTypeRef="SyncPattern" name="SyncPattern"/>
</ParameterSet>
<ContainerSet>
    <SequenceContainer name="Frame">
        <BinaryEncoding bitOrder="leastSignificantBitFirst">
            <ErrorDetectCorrect>
                <Checksum parameterTypeRef="Checksum"
                    bitLocationFromStartOfContainer="210"
                    name="IRIG161_0_8bit_Checksum"/>
            </ErrorDetectCorrect>
            <SizeInBits>
                <FixedValue>240</FixedValue>
            </SizeInBits>
        </BinaryEncoding>
        <EntryList>
            <ParameterRefEntry parameterRef="SatCode"/>
            <ParameterRefEntry parameterRef="VehID"/>
            <ParameterRefEntry parameterRef="DayOfYr"/>
            <ParameterRefEntry parameterRef="Format"/>
            <ParameterRefEntry parameterRef="NotUsed"/>
            <ParameterRefEntry parameterRef="TimeOfDay">
                <LocationInContainerInBits
                    referenceLocation="containerStart">
                        <FixedValue>34</FixedValue>
                    </LocationInContainerInBits>
                <IncludeCondition>
                    <Comparison parameterRef="PlusTimeFlag" value="0"
                        useCalibratedValue="false"/>
                </IncludeCondition>
            </ParameterRefEntry>
        </EntryList>
    </SequenceContainer>
</ContainerSet>

```

```

        </IncludeCondition>
    </ParameterRefEntry>
    <ParameterRefEntry parameterRef="PlusTime">
        <LocationInContainerInBits
referenceLocation="containerStart">
            <FixedValue>34</FixedValue>
        </LocationInContainerInBits>
        <IncludeCondition>
            <Comparison parameterRef="PlusTimeFlag" value="1"
                useCalibratedValue="false"/>
        </IncludeCondition>
    </ParameterRefEntry>
    <ParameterRefEntry parameterRef="SiteID">
        <LocationInContainerInBits
referenceLocation="containerStart">
            <FixedValue>51</FixedValue>
        </LocationInContainerInBits>
    </ParameterRefEntry>
    <ParameterRefEntry parameterRef="EPos" />
    <ParameterRefEntry parameterRef="PosScale" />
    <ParameterRefEntry parameterRef="FPos" />
    <ParameterRefEntry parameterRef="VelScale" />
    <ParameterRefEntry parameterRef="GPos" />
    <ParameterRefEntry parameterRef="OptTrack" />
    <ParameterRefEntry parameterRef="PlusTimeFlag" />
    <ParameterRefEntry parameterRef="FVel" />
    <ParameterRefEntry parameterRef="EVel" />
    <ParameterRefEntry parameterRef="LiftOff" />
    <ParameterRefEntry parameterRef="Plunge" />
    <ParameterRefEntry parameterRef="Pulse" />
    <ParameterRefEntry parameterRef="Refraction" />
    <ParameterRefEntry parameterRef="RFLimit" />
    <ParameterRefEntry parameterRef="Paramp" />
    <ParameterRefEntry parameterRef="Radiation" />
    <ParameterRefEntry parameterRef="Single" />
    <ParameterRefEntry parameterRef="SkinBeacon" />
    <ParameterRefEntry parameterRef="Track" />
    <ParameterRefEntry parameterRef="Quality" />
    <ParameterRefEntry parameterRef="Mode" />
    <ParameterRefEntry parameterRef="GVel" />
    <ParameterRefEntry parameterRef="CheckSum" />
    <ParameterRefEntry parameterRef="Spares">
        <LocationInContainerInBits
referenceLocation="containerStart">
            <FixedValue>218</FixedValue>
        </LocationInContainerInBits>
        <IncludeCondition>
            <Comparison parameterRef="SignalToNoiseFlag"
value="0"
                useCalibratedValue="false"/>
        </IncludeCondition>
    </ParameterRefEntry>
    <ParameterRefEntry parameterRef="SignalToNoise">
        <LocationInContainerInBits
referenceLocation="containerStart">
            <FixedValue>218</FixedValue>

```

```

        </LocationInContainerInBits>
        <IncludeCondition>
            <Comparison parameterRef="SignalToNoiseFlag"
value="1"
                                useCalibratedValue="false"/>
        </IncludeCondition>
    </ParameterRefEntry>
    <ParameterRefEntry parameterRef="SyncPattern"/>
</EntryList>
</SequenceContainer>
<!--<SequenceContainer name="SubFrameA">
    <EntryList/>
    <BaseContainer containerRef="Frame">
        <RestrictionCriteria>
            <ComparisonList>
                <Comparison value="0" comparisonOperator="=="
parameterRef="PosScale"/>
                <Comparison value="0" comparisonOperator="=="
parameterRef="OptTrack"/>
                <Comparison value="0" comparisonOperator="=="
                    parameterRef="PlusTimeFlag"/>
                <Comparison value="1" comparisonOperator="=="
parameterRef="LiftOff"/>
                <Comparison value="0" comparisonOperator="=="
parameterRef="Plunge"/>
                <Comparison value="0" comparisonOperator="=="
parameterRef="Pulse"/>
                <Comparison value="1" comparisonOperator="=="
parameterRef="Refraction"/>
                <Comparison value="0" comparisonOperator="=="
parameterRef="Paramp"/>
                <Comparison value="1" comparisonOperator="=="
parameterRef="Radiation"/>
                <Comparison value="0" comparisonOperator="=="
parameterRef="Single"/>
                <Comparison value="7" comparisonOperator="=="
parameterRef="Mode"/>
            </ComparisonList>
        </RestrictionCriteria>
    </BaseContainer>
</SequenceContainer>
<SequenceContainer name="SubFrameB">
    <EntryList/>
    <BaseContainer containerRef="Frame">
        <RestrictionCriteria>
            <ComparisonList>
                <Comparison value="0" comparisonOperator="!="
parameterRef="PosScale"/>
                <Comparison value="1" comparisonOperator="=="
parameterRef="OptTrack"/>
                <Comparison value="1" comparisonOperator="=="
                    parameterRef="PlusTimeFlag"/>
                <Comparison value="0" comparisonOperator="=="
parameterRef="LiftOff"/>
                <Comparison value="1" comparisonOperator="=="
parameterRef="Plunge"/>
            </ComparisonList>
        </RestrictionCriteria>
    </BaseContainer>
</SequenceContainer>

```

```

parameterRef="Pulse"/>          <Comparison value="1" comparisonOperator==="
parameterRef="Refraction"/>    <Comparison value="0" comparisonOperator==="
parameterRef="Paramp"/>       <Comparison value="1" comparisonOperator==="
parameterRef="Radiation"/>    <Comparison value="0" comparisonOperator==="
parameterRef="Single"/>       <Comparison value="1" comparisonOperator==="
parameterRef="Mode"/>         <Comparison value="7" comparisonOperator!="
                                </ComparisonList>
                                </RestrictionCriteria>
                                </BaseContainer>
                                </SequenceContainer>-->
</ContainerSet>
<StreamSet>
  <FixedFrameStream name="Serial" frameLengthInBits="240">
    <ContainerRef containerRef="Frame"/>
    <SyncStrategy>
      <SyncPatternList bitLocationFromStartOfContainer="224"
patternLengthInBits="16">
        <SyncPattern pattern="1a1a"/>
        <!-- pattern "1a1a" occurs on one and pattern "1a05"
occurs on next -->
        <SyncPattern pattern="1a05"/>
      </SyncPatternList>
    </SyncStrategy>
  </FixedFrameStream>
</StreamSet>
</TelemetryMetaData>
</SpaceSystem>

```

IRIG161_1 format definition:

```
<?xml version="1.0" encoding="UTF-8"?>
<SpaceSystem name="Format161_1" shortDescription="IRIG 161_1, 240-Bit Format (RAE)"
  xmlns="http://www.omg.org/space/xtce" xmlns:xsi="http://www.w3.org/2001/XMLSchema-
  instance"
  xsi:schemaLocation="http://www.omg.org/space/xtce SpaceSystemV1.0.xsd">
  <LongDescription>This format is used for the transmission of time space position
    information (TSPI) and acquisition data from NAWCWD (Point Mugu) to 30 SW, and
    AFFTC.
  </LongDescription>

  <Header date="May 2005" validationStatus="Unknown" version="161-00">
    <AuthorSet>
      <Author>Data Reduction and Computer Group</Author>
      <Author>Range Commanders Council</Author>
      <Author>Translated to XTCE by Command and Control Technologies, Inc.</Author>
    </AuthorSet>
    <NoteSet>
      <Note>ClassificationFlag is created to distinguish whether spare bits are being
        used for Classification or as Spares.</Note>
    </NoteSet>
    <HistorySet>
      <History>Initial implementation</History>
    </HistorySet>
  </Header>

  <TelemetryMetaData>

  <ParameterTypeSet>
    <BinaryParameterType name="CRC" shortDescription="CRC Error check: used for
      error detection for the previous frame" >
      <UnitSet/>
      <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
        <SizeInBits>
          <FixedValue>9</FixedValue>
        </SizeInBits>
      </BinaryDataEncoding>
    </BinaryParameterType>

    <BinaryParameterType name="FrameSync" shortDescription="Sync code: pattern
      1110010; complemented every other frame; maintained at 1 pps" >
      <UnitSet/>
      <BinaryDataEncoding bitOrder="mostSignificantBitFirst">
        <SizeInBits>
          <FixedValue>7</FixedValue>
        </SizeInBits>
      </BinaryDataEncoding>
    </BinaryParameterType>

    <IntegerParameterType name="SiteID" signed="false" sizeInBits="7">
      <UnitSet/>
      <IntegerDataEncoding bitOrder="leastSignificantBitFirst" encoding=
        "unsigned"
        sizeInBits="7">
```

```

        <ByteOrderList>
            <Byte byteSignificance="1"/>
        </ByteOrderList>
    </IntegerDataEncoding>
</IntegerParameterType>

    <BooleanParameterType name="OnTrack" oneStringValue="on-track"
zeroStringValue="off-track">
        <UnitSet/>
        <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
    </BooleanParameterType>

    <IntegerParameterType name="ZeroValue" signed="false" sizeInBits="1">
        <UnitSet/>
        <IntegerDataEncoding bitOrder="leastSignificantBitFirst" encoding=
"unsigned"
            sizeInBits="1">
            <ByteOrderList>
                <Byte byteSignificance="1"/>
            </ByteOrderList>
        </IntegerDataEncoding>
        <ValidRange minExclusive="0"/>
    </IntegerParameterType>

    <BooleanParameterType name="SkinBeacon" oneStringValue="skin-track"
zeroStringValue="beacon-track">
        <UnitSet/>
        <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
    </BooleanParameterType>

    <!-- ClassificationFlag is created to distinguish whether these bits are
being used as Classification or as Spares -->
    <BooleanParameterType name="ClassificationFlag" oneStringValue="true"
zeroStringValue="false" shortDescription="If spares are being used for
classification">
        <UnitSet/>
        <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
    </BooleanParameterType>

    <BinaryParameterType name="Spare" shortDescription="Spare" >
        <UnitSet/>
        <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
            <SizeInBits>
                <FixedValue>2</FixedValue>
            </SizeInBits>
        </BinaryDataEncoding>
    </BinaryParameterType>

    <EnumeratedParameterType name="Classification">
        <UnitSet/>
        <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
            sizeInBits="2"/>
        <EnumerationList>
            <Enumeration label="Confidential" value="1"/>
            <Enumeration label="Secret" value="2"/>
        </EnumerationList>
    </EnumeratedParameterType>

```

```

    </EnumerationList>
  </EnumeratedParameterType>

  <FloatParameterType name="Range" sizeInBits="64">
    <UnitSet>
      <Unit description="yards">yd</Unit>
    </UnitSet>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
      sizeInBits="25">
      <ByteOrderList>
        <Byte byteSignificance="4" />
        <Byte byteSignificance="3" />
        <Byte byteSignificance="2" />
        <Byte byteSignificance="1" />
      </ByteOrderList>
    </IntegerDataEncoding>
  </FloatParameterType>

  <FloatParameterType name="Azimuth" sizeInBits="64">
    <UnitSet>
      <Unit description="degrees">deg</Unit>
    </UnitSet>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
      sizeInBits="19">
      <ByteOrderList>
        <Byte byteSignificance="3" />
        <Byte byteSignificance="2" />
        <Byte byteSignificance="1" />
      </ByteOrderList>
      <DefaultCalibrator>
        <PolynomialCalibrator>
          <Term coefficient="0.0006866455" exponent="1" />
        </PolynomialCalibrator>
      </DefaultCalibrator>
    </IntegerDataEncoding>
  </FloatParameterType>

  <FloatParameterType name="ElevationType" sizeInBits="64">
    <UnitSet>
      <Unit description="degrees">deg</Unit>
    </UnitSet>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
      sizeInBits="19">
      <ByteOrderList>
        <Byte byteSignificance="3" />
        <Byte byteSignificance="2" />
        <Byte byteSignificance="1" />
      </ByteOrderList>
      <DefaultCalibrator>
        <PolynomialCalibrator>
          <Term coefficient="0.0006866455" exponent="1" />
          <Term coefficient="-360" exponent="0" />
        </PolynomialCalibrator>
      </DefaultCalibrator>
    </IntegerDataEncoding>
  </FloatParameterType>

```

```

        </DefaultCalibrator>
        <ContextCalibratorList>
            <ContextCalibrator>
                <UseWhenCondition>
                    <Condition>
                        <ParameterInstanceRef
parameterRef="Elevation"
                                useCalibratedValue="false" />
                    </Condition>
                </UseWhenCondition>
            </ContextCalibrator>
            <ContextCalibrator>
                <UseWhenCondition>
                    <Condition>
                        <Value>262144</Value>
                    </Condition>
                </UseWhenCondition>
            </ContextCalibrator>
            <ContextCalibrator>
                <PolynomialCalibrator>
                    <Term coefficient="0.0006866455"
exponent="1" />
                </PolynomialCalibrator>
            </ContextCalibrator>
        </ContextCalibratorList>
    </IntegerDataEncoding>
</FloatParameterType>

<FloatParameterType name="RangeRate" sizeInBits="64">
    <UnitSet>
        <Unit description="yards per second">yd/s</Unit>
    </UnitSet>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
        sizeInBits="21">
        <ByteOrderList>
            <Byte byteSignificance="4" />
            <Byte byteSignificance="3" />
            <Byte byteSignificance="2" />
            <Byte byteSignificance="1" />
        </ByteOrderList>
    </IntegerDataEncoding>
</FloatParameterType>

<BinaryParameterType name="ExpOpts" shortDescription="Expansion Options" >
    <UnitSet />
    <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
        <SizeInBits>
            <FixedValue>6</FixedValue>
        </SizeInBits>
    </BinaryDataEncoding>
</BinaryParameterType>

<BinaryParameterType name="Events">
    <UnitSet />
    <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
        <SizeInBits>
            <FixedValue>3</FixedValue>
        </SizeInBits>
    </BinaryDataEncoding>

```

```

    </BinaryParameterType>

    <FloatParameterType name="TimeVernier" sizeInBits="64"
shortDescription="MSB=800 msec">
      <UnitSet>
        <Unit description="milli seconds">ms</Unit>
      </UnitSet>
      <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
      sizeInBits="6">
        <ByteOrderList>
          <Byte byteSignificance="1"/>
        </ByteOrderList>
        <DefaultCalibrator>
          <PolynomialCalibrator>
            <Term coefficient="25.0" exponent="1"/>
          </PolynomialCalibrator>
        </DefaultCalibrator>
      </IntegerDataEncoding>
    </FloatParameterType>

    <BinaryParameterType name="AuxData" shortDescription="Auxiliary Data" >
      <UnitSet/>
      <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
        <SizeInBits>
          <FixedValue>4</FixedValue>
        </SizeInBits>
      </BinaryDataEncoding>
    </BinaryParameterType>

    <IntegerParameterType name="TimeOfDay" signed="false" sizeInBits="17"
shortDescription="Time of Day:LSB=1 sec">
      <UnitSet>
        <Unit description="seconds">s</Unit>
      </UnitSet>
      <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
      sizeInBits="17">
        <ByteOrderList>
          <Byte byteSignificance="3"/>
          <Byte byteSignificance="2"/>
          <Byte byteSignificance="1"/>
        </ByteOrderList>
      </IntegerDataEncoding>
    </IntegerParameterType>
  </ParameterTypeSet>

  <ParameterSet>
    <Parameter name="FrameSync" parameterTypeRef="FrameSync"/>
    <Parameter name="SiteID" parameterTypeRef="SiteID"/>
    <Parameter name="OnTrack" parameterTypeRef="OnTrack"/>
    <Parameter name="BitValueA" parameterTypeRef="ZeroValue"/>
    <Parameter name="SkinBeacon" parameterTypeRef="SkinBeacon"/>
    <Parameter name="BitValueB" parameterTypeRef="ZeroValue"/>
    <Parameter name="ClassificationFlag" parameterTypeRef="ClassificationFlag"/>
  </ParameterSet>

```

```

    <Parameter name="Spare" parameterTypeRef="Spare" shortDescription="Spares are
not being used for Classification">
      <ParameterProperties>
        <ValidityCondition>
          <Comparison parameterRef="ClassificationFlag" value="0"
useCalibratedValue="false"></Comparison>
        </ValidityCondition>
      </ParameterProperties>
    </Parameter>
    <Parameter name="Classification" parameterTypeRef="Classification"
shortDescription="Spares are being used forClassification">
      <ParameterProperties>
        <ValidityCondition>
          <Comparison parameterRef="ClassificationFlag" value="1"
useCalibratedValue="false"></Comparison>
        </ValidityCondition>
      </ParameterProperties>
    </Parameter>
    <Parameter name="BitValueC" parameterTypeRef="ZeroValue"/>
    <Parameter name="Range" parameterTypeRef="Range"/>
    <Parameter name="Azimuth" parameterTypeRef="Azimuth"/>
    <Parameter name="Elevation" parameterTypeRef="ElevationType"/>
    <Parameter name="RangeRate" parameterTypeRef="RangeRate"/>
    <Parameter name="ExpOpts" parameterTypeRef="ExpOpts"/>
    <Parameter name="Events" parameterTypeRef="Events"/>
    <Parameter name="TimeVernier" parameterTypeRef="TimeVernier"/>
    <Parameter name="AuxData" parameterTypeRef="AuxData"/>
    <Parameter name="TimeOfDay" parameterTypeRef="TimeOfDay"/>
    <Parameter name="RangeA" parameterTypeRef="Range"/>
    <Parameter name="AzimuthA" parameterTypeRef="Azimuth"/>
    <Parameter name="ElevationA" parameterTypeRef="ElevationType"/>
    <Parameter name="RangeRateA" parameterTypeRef="RangeRate"/>
    <Parameter name="ExpOptsA" parameterTypeRef="ExpOpts"/>
    <Parameter name="CRC" parameterTypeRef="CRC"/>
  </ParameterSet>

  <ContainerSet>
    <SequenceContainer name="Frame">
      <BinaryEncoding bitOrder="leastSignificantBitFirst">
        <SizeInBits><FixedValue>240</FixedValue></SizeInBits>
      </BinaryEncoding>
      <EntryList>
        <ParameterRefEntry parameterRef="FrameSync"/>
        <ParameterRefEntry parameterRef="SiteID"/>
        <ParameterRefEntry parameterRef="OnTrack"/>
        <ParameterRefEntry parameterRef="BitValueA"/>

        <ParameterRefEntry parameterRef="SkinBeacon"/>
        <ParameterRefEntry parameterRef="BitValueB"/>
        <ParameterRefEntry parameterRef="Spare">

          <IncludeCondition>
            <Comparison parameterRef="ClassificationFlag"
value="0" useCalibratedValue="false"></Comparison>
          </IncludeCondition>
        </ParameterRefEntry>
      </EntryList>
    </SequenceContainer>
  </ContainerSet>

```

```

        <ParameterRefEntry parameterRef="Classification">
            <IncludeCondition>
                <Comparison parameterRef="ClassificationFlag"
value="1" useCalibratedValue="false"></Comparison>
            </IncludeCondition>
        </ParameterRefEntry>
        <ParameterRefEntry parameterRef="BitValueC" />
        <ParameterRefEntry parameterRef="Range" />
        <ParameterRefEntry parameterRef="Azimuth" />
        <ParameterRefEntry parameterRef="Elevation" />
        <ParameterRefEntry parameterRef="RangeRate" />
        <ParameterRefEntry parameterRef="ExpOpts" />
        <ParameterRefEntry parameterRef="Events" />
        <ParameterRefEntry parameterRef="TimeVernier" />
        <ParameterRefEntry parameterRef="AuxData" />
        <ParameterRefEntry parameterRef="TimeOfDay" />
        <ParameterRefEntry parameterRef="RangeA" />
        <ParameterRefEntry parameterRef="AzimuthA" />
        <ParameterRefEntry parameterRef="ElevationA" />
        <ParameterRefEntry parameterRef="RangeRateA" />
        <ParameterRefEntry parameterRef="ExpOptsA" />
        <ParameterRefEntry parameterRef="CRC" />
    </EntryList>
</SequenceContainer>
</ContainerSet>

<StreamSet>
    <FixedFrameStream name="Serial" frameLengthInBits="240">
        <ContainerRef containerRef="Frame" />
        <SyncStrategy>
            <!-- Sync code is complemented every other frame. master sync
has the pattern '1110010' -->
            <SyncPatternList bitLocationFromStartOfContainer="0"
patternLengthInBits="7">
                <SyncPattern pattern="72" />
                <SyncPattern pattern="0d" />
            </SyncPatternList>
        </SyncStrategy>
    </FixedFrameStream>
</StreamSet>

<AlgorithmSet>
    <MathAlgorithm name="RangeFeet">
        <MathOperation>
            <ParameterInstanceRef parameterRef="RangeYards" />
            <Operator>mult</Operator>
            <Value>3</Value>
        </MathOperation>
    </MathAlgorithm>
</AlgorithmSet>

</TelemetryMetaData>
</SpaceSystem>

```

IRIG161_1A format definition:

```
<?xml version="1.0" encoding="UTF-8"?>
<SpaceSystem name="Format161_1A" shortDescription="IRIG 161_1A, 240-Bit Format (RAE)"
  xmlns="http://www.omg.org/space/xtce" xmlns:xsi="http://www.w3.org/2001/XMLSchema-
  instance"
  xsi:schemaLocation="http://www.omg.org/space/xtce SpaceSystemV1.0.xsd">
  <LongDescription>This format is used for the transmission of data from 30 SW to AFFTC,
    and for transmitting and receiving data between NAWCWD (Point Mugu) and 30 SW,
    between 30 SW and 45 SW, and between 30 SW and Kaena Point. It is also used to
    transmit internally within 30 SW .
  </LongDescription>

  <Header date="May 2005" validationStatus="Unknown" version="161-00">
    <AuthorSet>
      <Author>Data Reduction and Computer Group</Author>
      <Author>Range Commanders Council</Author>
      <Author>Translated to XTCE by Command and Control Technologies, Inc.</Author>
    </AuthorSet>
    <NoteSet>
      <Note>The values for the bit weights are nominal for the 30 SW radar. Some
        radars from NAWCWD (Point Mugu) have different nominal values. Radars operating and
        transmitting 10-pps data shall have the respective data the same for 30 SW line Bits
        31-114 and Bits 151-234. Radars operating and transmitting 20-pps data shall have
        Bits 31-114 associated with the Time Vernier, and data contained in 30 SW line Bits
        151-234 shall be 50 milliseconds later.</Note>
    </NoteSet>
    <HistorySet>
      <History>Initial implementation</History>
    </HistorySet>
  </Header>

  <TelemetryMetaData>

  <ParameterTypeSet>
    <BinaryParameterType name="CRC" shortDescription="CRC Error check: used for
    error detection for the previous frame" >
      <UnitSet/>
      <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
        <SizeInBits>
          <FixedValue>9</FixedValue>
        </SizeInBits>
      </BinaryDataEncoding>
    </BinaryParameterType>

    <BinaryParameterType name="FrameSync" shortDescription="Sync code: pattern
    1110010; complemented every other frame; maintained at 1 pps" >
      <UnitSet/>
      <BinaryDataEncoding bitOrder="mostSignificantBitFirst">
        <SizeInBits>
          <FixedValue>7</FixedValue>
        </SizeInBits>
      </BinaryDataEncoding>
    </BinaryParameterType>
  </ParameterTypeSet>
</SpaceSystem>
```

```

    <IntegerParameterType name="SiteID" signed="false" sizeInBits="7">
      <UnitSet/>
      <IntegerDataEncoding bitOrder="leastSignificantBitFirst" encoding=
"unsigned"
        sizeInBits="7">
          <ByteOrderList>
            <Byte byteSignificance="1"/>
          </ByteOrderList>
        </IntegerDataEncoding>
      </IntegerParameterType>

    <BooleanParameterType name="OnTarget" oneStringValue="sensor-on-target"
zeroStringValue="sensor-not-on-target">
      <UnitSet/>
      <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
    </BooleanParameterType>

    <BooleanParameterType name="CohTrack" oneStringValue="coherent-track"
zeroStringValue="not-coherent-track">
      <UnitSet/>
      <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
    </BooleanParameterType>

    <BooleanParameterType name="SkinBeacon" oneStringValue="skin-track"
zeroStringValue="beacon-track">
      <UnitSet/>
      <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
    </BooleanParameterType>

    <BooleanParameterType name="MIPIR" oneStringValue="good-data-quality"
zeroStringValue="no-good-quality">
      <UnitSet/>
      <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
    </BooleanParameterType>

    <BooleanParameterType name="RefraInd" oneStringValue="on"
zeroStringValue="off" shortDescription="Refraction Correction Indicator">
      <UnitSet/>
      <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
    </BooleanParameterType>

    <BooleanParameterType name="TranCorrect" oneStringValue="transit-correct"
zeroStringValue="">
      <UnitSet/>
      <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
    </BooleanParameterType>

    <BinaryParameterType name="UnUsed1" shortDescription="Unused: size=1 bit" >
      <UnitSet/>
      <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
        <SizeInBits>
          <FixedValue>1</FixedValue>
        </SizeInBits>
      </BinaryDataEncoding>
    </BinaryParameterType>

```

```

<!-- Please see NOTE at the top in reagrd to Range and RangeRate etc weighing --
>
<FloatParameterType name="Range" sizeInBits="64">
  <UnitSet>
    <Unit description="yards">yd</Unit>
  </UnitSet>
  <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
  sizeInBits="28">
    <ByteOrderList>
      <Byte byteSignificance="4"/>
      <Byte byteSignificance="3"/>
      <Byte byteSignificance="2"/>
      <Byte byteSignificance="1"/>
    </ByteOrderList>
    <DefaultCalibrator>
      <PolynomialCalibrator>
        <Term coefficient="1.953125" exponent="1"/>
      </PolynomialCalibrator>
    </DefaultCalibrator>
  </IntegerDataEncoding>
</FloatParameterType>

<FloatParameterType name="Azimuth" sizeInBits="64">
  <UnitSet>
    <Unit description="degrees">deg</Unit>
  </UnitSet>
  <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
  sizeInBits="19">
    <ByteOrderList>
      <Byte byteSignificance="3"/>
      <Byte byteSignificance="2"/>
      <Byte byteSignificance="1"/>
    </ByteOrderList>
    <DefaultCalibrator>
      <PolynomialCalibrator>
        <Term coefficient="0.0006866455" exponent="1"/>
      </PolynomialCalibrator>
    </DefaultCalibrator>
  </IntegerDataEncoding>
</FloatParameterType>

<FloatParameterType name="ElevationType" sizeInBits="64">
  <UnitSet>
    <Unit description="degrees">deg</Unit>
  </UnitSet>
  <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
  sizeInBits="19">
    <ByteOrderList>
      <Byte byteSignificance="3"/>
      <Byte byteSignificance="2"/>
      <Byte byteSignificance="1"/>
    </ByteOrderList>
    <DefaultCalibrator>

```

```

        <PolynomialCalibrator>
            <Term coefficient="0.0006866455" exponent="1"/>
            <Term coefficient="-360" exponent="0"/>
        </PolynomialCalibrator>
    </DefaultCalibrator>
    <ContextCalibratorList>
        <ContextCalibrator>
            <UseWhenCondition>
                <Condition>
                    <ParameterInstanceRef
parameterRef="Elevation"
                                useCalibratedValue="false"/>
                </Condition>
            </UseWhenCondition>
            <Calibrator>
                <PolynomialCalibrator>
                    <Term coefficient="0.0006866455"
exponent="1"/>
                </PolynomialCalibrator>
            </Calibrator>
        </ContextCalibrator>
    </ContextCalibratorList>
</IntegerDataEncoding>
</FloatParameterType>

    <!-- Please see NOTE at the top in reagrd to Range and RangeRate etc weighing --
    >
    <FloatParameterType name="RangeRate" sizeInBits="64"
shortDescription="LSB=0.03125 yrd/sec MSB=sign bit, 1=decreasing range 0=increasing
range">
        <UnitSet>
            <Unit description="yards per second">yd/s</Unit>
        </UnitSet>
        <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="signMagnitude"
sizeInBits="24">
            <ByteOrderList>
                <Byte byteSignificance="3"/>
                <Byte byteSignificance="2"/>
                <Byte byteSignificance="1"/>
            </ByteOrderList>
            <DefaultCalibrator>
                <PolynomialCalibrator>
                    <Term coefficient="0.03125" exponent="1"/>
                </PolynomialCalibrator>
            </DefaultCalibrator>
        </IntegerDataEncoding>
    </FloatParameterType>

    <!-- Events -->
        <BooleanParameterType name="LiftOff" oneStringValue="liftoff"
zeroStringValue="stand-by">
            <UnitSet/>

```

```

    <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
  </BooleanParameterType>

  <BooleanParameterType name="SensorSwitch" oneStringValue="sensor-switch"
zeroStringValue="off">
    <UnitSet/>
    <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
  </BooleanParameterType>

  <FloatParameterType name="TimeVernier" sizeInBits="64" shortDescription="Time
Vernier: MSB=800 msec">
    <UnitSet>
      <Unit description="milli seconds">ms</Unit>
    </UnitSet>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
      sizeInBits="7">
      <ByteOrderList>
        <Byte byteSignificance="1"/>
      </ByteOrderList>
      <DefaultCalibrator>
        <PolynomialCalibrator>
          <Term coefficient="12.5" exponent="1"/>
        </PolynomialCalibrator>
      </DefaultCalibrator>
    </IntegerDataEncoding>
  </FloatParameterType>

  <BinaryParameterType name="AuxBits" shortDescription="Auxiliary Bits: unused
but reserved" >
    <UnitSet/>
    <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
      <SizeInBits>
        <FixedValue>4</FixedValue>
      </SizeInBits>
    </BinaryDataEncoding>
  </BinaryParameterType>

  <IntegerParameterType name="SampleTime" signed="false" sizeInBits="17"
shortDescription="Sample Time: LSB=1 sec, binary count of secs Univ Time
Coordinated (UTC)">
    <UnitSet>
      <Unit description="seconds">s</Unit>
    </UnitSet>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
      sizeInBits="17">
      <ByteOrderList>
        <Byte byteSignificance="3"/>
        <Byte byteSignificance="2"/>
        <Byte byteSignificance="1"/>
      </ByteOrderList>
    </IntegerDataEncoding>
  </IntegerParameterType>
</ParameterTypeSet>

```

```

<ParameterSet>
  <Parameter name="FrameSync" parameterTypeRef="FrameSync" />
  <Parameter name="SiteID" parameterTypeRef="SiteID" />
  <Parameter name="OnTarget" parameterTypeRef="OnTarget" />
  <Parameter name="CohTrack" parameterTypeRef="CohTrack" />
  <Parameter name="SkinBeacon" parameterTypeRef="SkinBeacon" />
  <Parameter name="MIPIR" parameterTypeRef="MIPIR" />
  <Parameter name="RefraInd" parameterTypeRef="RefraInd" />
  <Parameter name="TranCorrect" parameterTypeRef="TranCorrect" />
  <Parameter name="UnUsedA" parameterTypeRef="UnUsed1" />
  <Parameter name="Range" parameterTypeRef="Range" />
  <Parameter name="Azimuth" parameterTypeRef="Azimuth" />
  <Parameter name="Elevation" parameterTypeRef="ElevationType" />
  <Parameter name="RangeRate" parameterTypeRef="RangeRate" />
  <Parameter name="LiftOff" parameterTypeRef="LiftOff" />
  <Parameter name="SensorSwitch" parameterTypeRef="SensorSwitch" />
  <Parameter name="TimeVernier" parameterTypeRef="TimeVernier" />
  <Parameter name="AuxBits" parameterTypeRef="AuxBits" />
  <Parameter name="SampleTime" parameterTypeRef="SampleTime" />
  <Parameter name="RangeA" parameterTypeRef="Range" />
  <Parameter name="AzimuthA" parameterTypeRef="Azimuth" />
  <Parameter name="ElevationA" parameterTypeRef="ElevationType" />
  <Parameter name="RangeRateA" parameterTypeRef="RangeRate" />
  <Parameter name="CRC" parameterTypeRef="CRC" />
</ParameterSet>

<ContainerSet>
  <SequenceContainer name="Frame">
    <BinaryEncoding bitOrder="leastSignificantBitFirst">
      <SizeInBits><FixedValue>240</FixedValue></SizeInBits>
    </BinaryEncoding>
    <EntryList>
      <ParameterRefEntry parameterRef="FrameSync" />
      <ParameterRefEntry parameterRef="SiteID" />
      <ParameterRefEntry parameterRef="OnTarget" />
      <ParameterRefEntry parameterRef="CohTrack" />

      <ParameterRefEntry parameterRef="SkinBeacon" />
      <ParameterRefEntry parameterRef="MIPIR" />
      <ParameterRefEntry parameterRef="RefraInd" />
      <ParameterRefEntry parameterRef="TranCorrect" />
      <ParameterRefEntry parameterRef="UnUsedA" />
      <ParameterSegmentRefEntry parameterRef="Range" sizeInBits="25"
order="2">
        <LocationInContainerInBits
referenceLocation="containerStart">
          <FixedValue>30</FixedValue>
        </LocationInContainerInBits>
      </ParameterSegmentRefEntry>
      <ParameterRefEntry parameterRef="Azimuth" />
      <ParameterRefEntry parameterRef="Elevation" />
      <ParameterSegmentRefEntry parameterRef="RangeRate"
sizeInBits="21" order="2">
        <LocationInContainerInBits
referenceLocation="containerStart">
          <FixedValue>93</FixedValue>

```

```

        </LocationInContainerInBits>
    </ParameterSegmentRefEntry>
    <ParameterSegmentRefEntry parameterRef="Range" sizeInBits="3"
order="1">
        <LocationInContainerInBits
referenceLocation="containerStart">
            <FixedValue>114</FixedValue>
        </LocationInContainerInBits>
    </ParameterSegmentRefEntry>
    <ParameterSegmentRefEntry parameterRef="RangeRate"
sizeInBits="3" order="1">
        <LocationInContainerInBits
referenceLocation="containerStart">
            <FixedValue>117</FixedValue>
        </LocationInContainerInBits>
    </ParameterSegmentRefEntry>
    <ParameterRefEntry parameterRef="LiftOff"/>
    <ParameterRefEntry parameterRef="SensorSwitch"/>
    <ParameterRefEntry parameterRef="TimeVernier"/>
    <ParameterRefEntry parameterRef="AuxBits"/>
    <ParameterRefEntry parameterRef="SampleTime"/>
    <ParameterSegmentRefEntry parameterRef="RangeA" sizeInBits="25"
order="2">
        <LocationInContainerInBits
referenceLocation="containerStart">
            <FixedValue>150</FixedValue>
        </LocationInContainerInBits>
    </ParameterSegmentRefEntry>
    <ParameterRefEntry parameterRef="AzimuthA"/>
    <ParameterRefEntry parameterRef="ElevationA"/>
    <ParameterSegmentRefEntry parameterRef="RangeRateA"
sizeInBits="21" order="2">
        <LocationInContainerInBits
referenceLocation="containerStart">
            <FixedValue>213</FixedValue>
        </LocationInContainerInBits>
    </ParameterSegmentRefEntry>
    <ParameterSegmentRefEntry parameterRef="RangeA" sizeInBits="3"
order="1">
        <LocationInContainerInBits
referenceLocation="containerStart">
            <FixedValue>234</FixedValue>
        </LocationInContainerInBits>
    </ParameterSegmentRefEntry>
    <ParameterSegmentRefEntry parameterRef="RangeRateA"
sizeInBits="3" order="1">
        <LocationInContainerInBits
referenceLocation="containerStart">
            <FixedValue>237</FixedValue>
        </LocationInContainerInBits>
    </ParameterSegmentRefEntry>
    <ParameterRefEntry parameterRef="CRC"/>
</EntryList>
</SequenceContainer>
</ContainerSet>

```

```

<StreamSet>
  <FixedFrameStream name="Serial" frameLengthInBits="240">
    <ContainerRef containerRef="Frame"/>
    <SyncStrategy>
      <!-- Sync code is complemented every other frame. master sync
has the pattern '1110010' -->
      <SyncPatternList bitLocationFromStartOfContainer="0"
patternLengthInBits="7">
        <SyncPattern pattern="72"/>
        <SyncPattern pattern="0d"/>
      </SyncPatternList>
    </SyncStrategy>
  </FixedFrameStream>
</StreamSet>

<AlgorithmSet>
  <MathAlgorithm name="RangeFeet">
    <MathOperation>
      <ParameterInstanceRef parameterRef="RangeYards"/>
      <Operator>mult</Operator>
      <Value>3</Value>
    </MathOperation>
  </MathAlgorithm>
</AlgorithmSet>

</TelemetryMetaData>
</SpaceSystem>

```

IRIG161_1B format definition:

```
<?xml version="1.0" encoding="UTF-8"?>
<SpaceSystem name="Format161_1B" shortDescription="IRIG 161_1B, 240-Bit Format (RAE)"
  xmlns="http://www.omg.org/space/xtce" xmlns:xsi="http://www.w3.org/2001/XMLSchema-
  instance"
  xsi:schemaLocation="http://www.omg.org/space/xtce SpaceSystemV1.0.xsd">
  <LongDescription>This format is used for the transmission of data from AFFTC to NAWCWD
    (Point Mugu), 30 SW, and 45 SW.</LongDescription>

  <Header date="May 2005" validationStatus="Unknown" version="161-00">
    <AuthorSet>
      <Author>Data Reduction and Computer Group</Author>
      <Author>Range Commanders Council</Author>
      <Author>Translated to XTCE by Command and Control Technologies, Inc.</Author>
    </AuthorSet>
    <HistorySet>
      <History>Initial implementation</History>
    </HistorySet>
  </Header>

  <TelemetryMetaData>

  <ParameterTypeSet>
    <BinaryParameterType name="CRC" shortDescription="CRC Error check: used for
error detection for the previous frame" >
      <UnitSet/>
      <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
        <SizeInBits>
          <FixedValue>9</FixedValue>
        </SizeInBits>
      </BinaryDataEncoding>
    </BinaryParameterType>

    <BinaryParameterType name="FrameSync" shortDescription="Sync code: pattern
1110010; complemented every other frame; maintained at 1 pps" >
      <UnitSet/>
      <BinaryDataEncoding bitOrder="mostSignificantBitFirst">
        <SizeInBits>
          <FixedValue>7</FixedValue>
        </SizeInBits>
      </BinaryDataEncoding>
    </BinaryParameterType>

    <IntegerParameterType name="SiteID" signed="false" sizeInBits="7">
      <UnitSet/>
      <IntegerDataEncoding bitOrder="leastSignificantBitFirst" encoding=
"unsigned"
        sizeInBits="7">
        <ByteOrderList>
          <Byte byteSignificance="1"/>
        </ByteOrderList>
      </IntegerDataEncoding>
    </IntegerParameterType>
```

```

<BooleanParameterType name="OnTrack" oneStringValue="on-track">
  <UnitSet/>
  <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
</BooleanParameterType>

<BooleanParameterType name="CohTrack" oneStringValue="coherent-track"
zeroStringValue="not-coherent-track">
  <UnitSet/>
  <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
</BooleanParameterType>

<BooleanParameterType name="SkinBeacon" oneStringValue="skin-track"
zeroStringValue="beacon-track">
  <UnitSet/>
  <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
</BooleanParameterType>

<BinaryParameterType name="UnUsed1" shortDescription="UnUsed: size=1 bit" >
  <UnitSet/>
  <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
    <SizeInBits>
      <FixedValue>1</FixedValue>
    </SizeInBits>
  </BinaryDataEncoding>
</BinaryParameterType>

<BooleanParameterType name="OptTrack" oneStringValue="Optical-track"
zeroStringValue="not-optical-track">
  <UnitSet/>
  <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
</BooleanParameterType>

<BooleanParameterType name="AzOverride" oneStringValue="azimuth-override"
zeroStringValue="off">
  <UnitSet/>
  <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
</BooleanParameterType>

<BooleanParameterType name="ElevOverride" oneStringValue="elevation-override"
zeroStringValue="off">
  <UnitSet/>
  <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
</BooleanParameterType>

<FloatParameterType name="Range" sizeInBits="64">
  <UnitSet>
    <Unit description="yards">yd</Unit>
  </UnitSet>
  <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
sizeInBits="25">
    <ByteOrderList>
      <Byte byteSignificance="4" />
      <Byte byteSignificance="3" />
      <Byte byteSignificance="2" />
      <Byte byteSignificance="1" />
    </ByteOrderList>
  </IntegerDataEncoding>
</FloatParameterType>

```

```

        </ByteOrderList>
    </IntegerDataEncoding>
</FloatParameterType>

    <BinaryParameterType name="Unused2" shortDescription="Unused: size=2 bits" >
        <UnitSet/>
        <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
            <SizeInBits>
                <FixedValue>2</FixedValue>
            </SizeInBits>
        </BinaryDataEncoding>
    </BinaryParameterType>

<FloatParameterType name="Azimuth" sizeInBits="64">
    <UnitSet>
        <Unit description="degrees">deg</Unit>
    </UnitSet>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
    sizeInBits="17">
        <ByteOrderList>
            <Byte byteSignificance="3"/>
            <Byte byteSignificance="2"/>
            <Byte byteSignificance="1"/>
        </ByteOrderList>
        <DefaultCalibrator>
            <PolynomialCalibrator>
                <Term coefficient="0.0006866455" exponent="1"/>
            </PolynomialCalibrator>
        </DefaultCalibrator>
    </IntegerDataEncoding>
</FloatParameterType>

<FloatParameterType name="ElevationType" sizeInBits="64">
    <UnitSet>
        <Unit description="degrees">deg</Unit>
    </UnitSet>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
    sizeInBits="17">
        <ByteOrderList>
            <Byte byteSignificance="3"/>
            <Byte byteSignificance="2"/>
            <Byte byteSignificance="1"/>
        </ByteOrderList>
        <DefaultCalibrator>
            <PolynomialCalibrator>
                <Term coefficient="0.0006866455" exponent="1"/>
                <Term coefficient="-360" exponent="0"/>
            </PolynomialCalibrator>
        </DefaultCalibrator>
        <ContextCalibratorList>
            <ContextCalibrator>
                <UseWhenCondition>
                    <Condition>

```

```

parameterRef="Elevation"
                                <ParameterInstanceRef
                                useCalibratedValue="false"/>

<ComparisonOperator>&lt;</ComparisonOperator>
                                <Value>262144</Value>
                                </Condition>
                                </UseWhenCondition>
                                <Calibrator>
                                    <PolynomialCalibrator>
                                        <Term coefficient="0.0006866455"
exponent="1"/>
                                    </PolynomialCalibrator>
                                </Calibrator>
                                </ContextCalibrator>
                                </ContextCalibratorList>
                                </IntegerDataEncoding>
</FloatParameterType>

<FloatParameterType name="RangeRate" sizeInBits="64">
    <UnitSet>
        <Unit description="yards per second">yd/s</Unit>
    </UnitSet>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
    sizeInBits="21">
        <ByteOrderList>
            <Byte byteSignificance="4"/>
            <Byte byteSignificance="3"/>
            <Byte byteSignificance="2"/>
            <Byte byteSignificance="1"/>
        </ByteOrderList>
    </IntegerDataEncoding>
</FloatParameterType>

<FloatParameterType name="RangeA" sizeInBits="32">
    <UnitSet>
        <Unit description="yards">yd</Unit>
    </UnitSet>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
    sizeInBits="3">
        <ByteOrderList>
            <Byte byteSignificance="2"/>
            <Byte byteSignificance="1"/>
        </ByteOrderList>
    </IntegerDataEncoding>
</FloatParameterType>

<FloatParameterType name="RangeARate" sizeInBits="32">
    <UnitSet>
        <Unit description="yards per second">yd/s</Unit>
    </UnitSet>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
    sizeInBits="3">

```

```

        <ByteOrderList>
            <Byte byteSignificance="2"/>
            <Byte byteSignificance="1"/>
        </ByteOrderList>
    </IntegerDataEncoding>
</FloatParameterType>

<BinaryParameterType name="ExpOpts" shortDescription="Expansion Options" >
    <UnitSet/>
    <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
        <SizeInBits>
            <FixedValue>6</FixedValue>
        </SizeInBits>
    </BinaryDataEncoding>
</BinaryParameterType>

<!-- Events -->
    <BooleanParameterType name="LiftOff" oneStringValue="liftoff"
zeroStringValue="stand-by">
        <UnitSet/>
        <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
    </BooleanParameterType>

    <BooleanParameterType name="SensorSwitch" oneStringValue="sensor-switch"
zeroStringValue="off">
        <UnitSet/>
        <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
    </BooleanParameterType>

    <FloatParameterType name="TimeVernier" sizeInBits="64" shortDescription="Time
Vernier: MSB=800 msec">
        <UnitSet>
            <Unit description="milli seconds">ms</Unit>
        </UnitSet>
        <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
            sizeInBits="6">
            <ByteOrderList>
                <Byte byteSignificance="1"/>
            </ByteOrderList>
            <DefaultCalibrator>
                <PolynomialCalibrator>
                    <Term coefficient="25.0" exponent="1"/>
                </PolynomialCalibrator>
            </DefaultCalibrator>
        </IntegerDataEncoding>
    </FloatParameterType>

    <BinaryParameterType name="AuxData" shortDescription="Auxiliary Data" >
        <UnitSet/>
        <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
            <SizeInBits>
                <FixedValue>4</FixedValue>
            </SizeInBits>
        </BinaryDataEncoding>
    </BinaryParameterType>

```

```

    <IntegerParameterType name="TimeOfDay" signed="false" sizeInBits="17"
shortDescription="Time of Day: LSB=1 sec">
    <UnitSet>
        <Unit description="seconds">s</Unit>
    </UnitSet>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
        sizeInBits="17">
        <ByteOrderList>
            <Byte byteSignificance="3" />
            <Byte byteSignificance="2" />
            <Byte byteSignificance="1" />
        </ByteOrderList>
    </IntegerDataEncoding>
    </IntegerParameterType>
</ParameterTypeSet>

<ParameterSet>
    <Parameter name="FrameSync" parameterTypeRef="FrameSync" />
    <Parameter name="SiteID" parameterTypeRef="SiteID" />
    <Parameter name="OnTrack" parameterTypeRef="OnTrack" />
    <Parameter name="CohTrack" parameterTypeRef="CohTrack" />
    <Parameter name="SkinBeacon" parameterTypeRef="SkinBeacon" />
    <Parameter name="UnUsedA" parameterTypeRef="UnUsed1" />
    <Parameter name="OptTrack" parameterTypeRef="OptTrack" />
    <Parameter name="AzOverride" parameterTypeRef="AzOverride" />
    <Parameter name="ElevOverride" parameterTypeRef="ElevOverride" />
    <Parameter name="Range" parameterTypeRef="Range" />
    <Parameter name="UnUsedB" parameterTypeRef="UnUsed2" />
    <Parameter name="Azimuth" parameterTypeRef="Azimuth" />
    <Parameter name="UnUsedC" parameterTypeRef="UnUsed2" />
    <Parameter name="Elevation" parameterTypeRef="ElevationType" />
    <Parameter name="RangeRate" parameterTypeRef="RangeRate" />
    <Parameter name="RangeA" parameterTypeRef="RangeA" />
    <Parameter name="RangeRateA" parameterTypeRef="RangeARate" />
    <Parameter name="LiftOff" parameterTypeRef="LiftOff" />
    <Parameter name="SensorSwitch" parameterTypeRef="SensorSwitch" />
    <Parameter name="UnUsedD" parameterTypeRef="UnUsed1" />
    <Parameter name="TimeVernier" parameterTypeRef="TimeVernier" />
    <Parameter name="AuxData" parameterTypeRef="AuxData" />
    <Parameter name="TimeOfDay" parameterTypeRef="TimeOfDay" />
    <Parameter name="RangeB" parameterTypeRef="Range" />
    <Parameter name="UnUsedE" parameterTypeRef="UnUsed2" />
    <Parameter name="AzimuthB" parameterTypeRef="Azimuth" />
    <Parameter name="UnUsedF" parameterTypeRef="UnUsed2" />
    <Parameter name="ElevationB" parameterTypeRef="ElevationType" />
    <Parameter name="RangeRateB" parameterTypeRef="RangeRate" />
    <Parameter name="ExpOpts" parameterTypeRef="ExpOpts" />
    <Parameter name="CRC" parameterTypeRef="CRC" />
</ParameterSet>

<ContainerSet>
    <SequenceContainer name="Frame">
        <EntryList>
            <ParameterRefEntry parameterRef="FrameSync" />

```

```

<ParameterRefEntry parameterRef="SiteID" />
<ParameterRefEntry parameterRef="OnTrack" />
<ParameterRefEntry parameterRef="CohTrack" />

<ParameterRefEntry parameterRef="SkinBeacon" />
<ParameterRefEntry parameterRef="UnUsedA" />
<ParameterRefEntry parameterRef="OptTrack" />
<ParameterRefEntry parameterRef="AzOverride" />
<ParameterRefEntry parameterRef="ElevOverride" />
<ParameterRefEntry parameterRef="Range" />
<ParameterRefEntry parameterRef="UnUsedB" />
<ParameterRefEntry parameterRef="Azimuth" />
<ParameterRefEntry parameterRef="UnUsedC" />
<ParameterRefEntry parameterRef="Elevation" />
<ParameterRefEntry parameterRef="RangeRate" />
<ParameterRefEntry parameterRef="RangeA" />
<ParameterRefEntry parameterRef="RangeRateA" />
<ParameterRefEntry parameterRef="LiftOff" />
<ParameterRefEntry parameterRef="SensorSwitch" />
<ParameterRefEntry parameterRef="UnUsedD" />
<ParameterRefEntry parameterRef="TimeVernier" />
<ParameterRefEntry parameterRef="AuxData" />
<ParameterRefEntry parameterRef="TimeOfDay" />
<ParameterRefEntry parameterRef="RangeB" />
<ParameterRefEntry parameterRef="UnUsedE" />
<ParameterRefEntry parameterRef="AzimuthB" />
<ParameterRefEntry parameterRef="UnUsedF" />
<ParameterRefEntry parameterRef="ElevationB" />
<ParameterRefEntry parameterRef="RangeRateB" />
<ParameterRefEntry parameterRef="ExpOpts" />
<ParameterRefEntry parameterRef="CRC" />
    </EntryList>
  </SequenceContainer>
</ContainerSet>

<StreamSet>
  <FixedFrameStream name="Serial" frameLengthInBits="240">
    <ContainerRef containerRef="Frame" />
    <SyncStrategy>
      <!-- Sync code is complemented every other frame. master sync
has the pattern '1110010' -->
      <SyncPatternList bitLocationFromStartOfContainer="0"
patternLengthInBits="7">
        <SyncPattern pattern="72" />
        <SyncPattern pattern="0d" />
      </SyncPatternList>
    </SyncStrategy>
  </FixedFrameStream>
</StreamSet>

<AlgorithmSet>
  <MathAlgorithm name="RangeFeet">
    <MathOperation>
      <ParameterInstanceRef parameterRef="RangeYards" />
      <Operator>mult</Operator>
      <Value>3</Value>
    </MathOperation>
  </MathAlgorithm>
</AlgorithmSet>

```

```
        </MathOperation>
      </MathAlgorithm>
    </AlgorithmSet>

  </TelemetryMetaData>
</SpaceSystem>
```

IRIG161_1C format definition:

```
<?xml version="1.0" encoding="UTF-8"?>
<SpaceSystem name="Format161_1C" shortDescription="IRIG 161_1C, 240-Bit Format (RAE)"
  xmlns="http://www.omg.org/space/xtce" xmlns:xsi="http://www.w3.org/2001/XMLSchema-
  instance"
  xsi:schemaLocation="http://www.omg.org/space/xtce SpaceSystemV1.0.xsd">
  <LongDescription>This format is used for transmitting and receiving shuttle landing
    data at 45 SW.</LongDescription>

  <Header date="May 2005" validationStatus="Unknown" version="161-00">
    <AuthorSet>
      <Author>Data Reduction and Computer Group</Author>
      <Author>Range Commanders Council</Author>
      <Author>Translated to XTCE by Command and Control Technologies, Inc.</Author>
    </AuthorSet>
    <HistorySet>
      <History>Initial implementation</History>
    </HistorySet>
  </Header>

  <TelemetryMetaData>

  <ParameterTypeSet>
    <BinaryParameterType name="CRC" shortDescription="CRC Error check: used for
    error detection for the previous frame" >
      <UnitSet/>
      <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
        <SizeInBits>
          <FixedValue>9</FixedValue>
        </SizeInBits>
      </BinaryDataEncoding>
    </BinaryParameterType>

    <BinaryParameterType name="FrameSync" shortDescription="Sync code: pattern
    1110010; complemented every other frame; maintained at 1 pps" >
      <UnitSet/>
      <BinaryDataEncoding bitOrder="mostSignificantBitFirst">
        <SizeInBits>
          <FixedValue>7</FixedValue>
        </SizeInBits>
      </BinaryDataEncoding>
    </BinaryParameterType>

    <IntegerParameterType name="SiteID" signed="false" sizeInBits="7">
      <UnitSet/>
      <IntegerDataEncoding bitOrder="leastSignificantBitFirst" encoding=
      "unsigned"
        sizeInBits="7">
        <ByteOrderList>
          <Byte byteSignificance="1"/>
        </ByteOrderList>
      </IntegerDataEncoding>
    </IntegerParameterType>
```

```

    <BooleanParameterType name="OnTrack" oneStringValue="on-track"
zeroStringValue="off-track">
    <UnitSet/>
    <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
</BooleanParameterType>

    <BooleanParameterType name="CohTrack" oneStringValue="coherent-track"
zeroStringValue="not-coherent-track">
    <UnitSet/>
    <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
</BooleanParameterType>

    <BooleanParameterType name="SkinBeacon" oneStringValue="skin-track"
zeroStringValue="beacon-track">
    <UnitSet/>
    <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
</BooleanParameterType>

    <BinaryParameterType name="Spare" shortDescription="Spare" >
    <UnitSet/>
    <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
        <SizeInBits>
            <FixedValue>4</FixedValue>
        </SizeInBits>
    </BinaryDataEncoding>
</BinaryParameterType>

<FloatParameterType name="Range" sizeInBits="64">
    <UnitSet>
        <Unit description="yards">yd</Unit>
    </UnitSet>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
    sizeInBits="25">
        <ByteOrderList>
            <Byte byteSignificance="4" />
            <Byte byteSignificance="3" />
            <Byte byteSignificance="2" />
            <Byte byteSignificance="1" />
        </ByteOrderList>
    </IntegerDataEncoding>
</FloatParameterType>

<FloatParameterType name="Azimuth" sizeInBits="64">
    <UnitSet>
        <Unit description="degrees">deg</Unit>
    </UnitSet>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
    sizeInBits="19">
        <ByteOrderList>
            <Byte byteSignificance="3" />
            <Byte byteSignificance="2" />
            <Byte byteSignificance="1" />
        </ByteOrderList>
        <DefaultCalibrator>

```

```

        <PolynomialCalibrator>
            <Term coefficient="0.0006866455" exponent="1"/>
        </PolynomialCalibrator>
    </DefaultCalibrator>
</IntegerDataEncoding>
</FloatParameterType>

<FloatParameterType name="ElevationType" sizeInBits="64">
    <UnitSet>
        <Unit description="degrees">deg</Unit>
    </UnitSet>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
    sizeInBits="19">
        <ByteOrderList>
            <Byte byteSignificance="3"/>
            <Byte byteSignificance="2"/>
            <Byte byteSignificance="1"/>
        </ByteOrderList>
        <DefaultCalibrator>
            <PolynomialCalibrator>
                <Term coefficient="0.0006866455" exponent="1"/>
                <Term coefficient="-360" exponent="0"/>
            </PolynomialCalibrator>
        </DefaultCalibrator>
        <ContextCalibratorList>
            <ContextCalibrator>
                <UseWhenCondition>
                    <Condition>
                        <ParameterInstanceRef
parameterRef="Elevation"
                                useCalibratedValue="false"/>
                    </Condition>
                </UseWhenCondition>
                <Value>262144</Value>
            </ContextCalibrator>
        </ContextCalibratorList>
    </IntegerDataEncoding>
</FloatParameterType>

<FloatParameterType name="RangeRate" sizeInBits="64">
    <UnitSet>
        <Unit description="yards per second">yd/s</Unit>
    </UnitSet>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
    sizeInBits="21">
        <ByteOrderList>

```

```

        <Byte byteSignificance="4" />
        <Byte byteSignificance="3" />
        <Byte byteSignificance="2" />
        <Byte byteSignificance="1" />
    </ByteOrderList>
</IntegerDataEncoding>
</FloatParameterType>

<BinaryParameterType name="ExpOpts" shortDescription="Expansion Options" >
    <UnitSet/>
    <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
        <SizeInBits>
            <FixedValue>6</FixedValue>
        </SizeInBits>
    </BinaryDataEncoding>
</BinaryParameterType>

<BinaryParameterType name="Events" shortDescription="Events" >
    <UnitSet/>
    <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
        <SizeInBits>
            <FixedValue>3</FixedValue>
        </SizeInBits>
    </BinaryDataEncoding>
</BinaryParameterType>

<FloatParameterType name="TimeVernier" sizeInBits="64" shortDescription="Time
Vernier: MSB=800 msec">
    <UnitSet>
        <Unit description="milli seconds">ms</Unit>
    </UnitSet>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
    sizeInBits="6">
        <ByteOrderList>
            <Byte byteSignificance="1" />
        </ByteOrderList>
        <DefaultCalibrator>
            <PolynomialCalibrator>
                <Term coefficient="25.0" exponent="1" />
            </PolynomialCalibrator>
        </DefaultCalibrator>
    </IntegerDataEncoding>
</FloatParameterType>

<BinaryParameterType name="ObjNum" shortDescription="Object Number" >
    <UnitSet/>
    <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
        <SizeInBits>
            <FixedValue>3</FixedValue>
        </SizeInBits>
    </BinaryDataEncoding>
</BinaryParameterType>

<BinaryParameterType name="UnUsed1" shortDescription="UnUsed: size=1 bit" >
    <UnitSet/>

```

```

        <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
            <SizeInBits>
                <FixedValue>1</FixedValue>
            </SizeInBits>
        </BinaryDataEncoding>
    </BinaryParameterType>

    <IntegerParameterType name="TimeOfDay" signed="false" sizeInBits="17"
shortDescription="Time of Day: LSB=1 sec">
        <UnitSet>
            <Unit description="seconds">s</Unit>
        </UnitSet>
        <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
sizeInBits="17">
            <ByteOrderList>
                <Byte byteSignificance="3"/>
                <Byte byteSignificance="2"/>
                <Byte byteSignificance="1"/>
            </ByteOrderList>
        </IntegerDataEncoding>
    </IntegerParameterType>
</ParameterTypeSet>

<ParameterSet>
    <Parameter name="FrameSync" parameterTypeRef="FrameSync" />
    <Parameter name="SiteID" parameterTypeRef="SiteID" />
    <Parameter name="OnTrack" parameterTypeRef="OnTrack" />
    <Parameter name="CohTrack" parameterTypeRef="CohTrack" />
    <Parameter name="SkinBeacon" parameterTypeRef="SkinBeacon" />
    <Parameter name="Spare" parameterTypeRef="Spare" />
    <Parameter name="Range" parameterTypeRef="Range" />
    <Parameter name="Azimuth" parameterTypeRef="Azimuth" />
    <Parameter name="Elevation" parameterTypeRef="ElevationType" />
    <Parameter name="RangeRate" parameterTypeRef="RangeRate" />
    <Parameter name="ExpOpts" parameterTypeRef="ExpOpts" />
    <Parameter name="Events" parameterTypeRef="Events" />
    <Parameter name="TimeVernier" parameterTypeRef="TimeVernier" />
    <Parameter name="ObjNum" parameterTypeRef="ObjNum" />
    <Parameter name="UnUsedA" parameterTypeRef="UnUsed1" />
    <Parameter name="TimeOfDay" parameterTypeRef="TimeOfDay" />
    <Parameter name="RangeA" parameterTypeRef="Range" />
    <Parameter name="AzimuthA" parameterTypeRef="Azimuth" />
    <Parameter name="ElevationA" parameterTypeRef="ElevationType" />
    <Parameter name="RangeRateA" parameterTypeRef="RangeRate" />
    <Parameter name="ExpOptsA" parameterTypeRef="ExpOpts" />
    <Parameter name="CRC" parameterTypeRef="CRC" />
</ParameterSet>

<ContainerSet>
    <SequenceContainer name="Frame">
        <EntryList>
            <ParameterRefEntry parameterRef="FrameSync" />
            <ParameterRefEntry parameterRef="SiteID" />
            <ParameterRefEntry parameterRef="OnTrack" />

```

```

        <ParameterRefEntry parameterRef="CohTrack" />

        <ParameterRefEntry parameterRef="SkinBeacon" />
        <ParameterRefEntry parameterRef="Spare" />

        <ParameterRefEntry parameterRef="Range" />
        <ParameterRefEntry parameterRef="Azimuth" />
        <ParameterRefEntry parameterRef="Elevation" />
        <ParameterRefEntry parameterRef="RangeRate" />
        <ParameterRefEntry parameterRef="ExpOpts" />
        <ParameterRefEntry parameterRef="Events" />
        <ParameterRefEntry parameterRef="TimeVernier" />
        <ParameterRefEntry parameterRef="ObjNum" />
        <ParameterRefEntry parameterRef="UnUsedA" />
        <ParameterRefEntry parameterRef="TimeOfDay" />
        <ParameterRefEntry parameterRef="RangeA" />
        <ParameterRefEntry parameterRef="AzimuthA" />
        <ParameterRefEntry parameterRef="ElevationA" />
        <ParameterRefEntry parameterRef="RangeRateA" />
        <ParameterRefEntry parameterRef="ExpOptsA" />
        <ParameterRefEntry parameterRef="CRC" />
    </EntryList>
</SequenceContainer>
</ContainerSet>

<StreamSet>
    <FixedFrameStream name="Serial" frameLengthInBits="240">
        <ContainerRef containerRef="Frame" />
        <SyncStrategy>
            <!-- Sync code is complemented every other frame. master sync
has the pattern '1110010' -->
            <SyncPatternList bitLocationFromStartOfContainer="0"
patternLengthInBits="7">
                <SyncPattern pattern="72" />
                <SyncPattern pattern="0d" />
            </SyncPatternList>
        </SyncStrategy>
    </FixedFrameStream>
</StreamSet>

<AlgorithmSet>
    <MathAlgorithm name="RangeFeet">
        <MathOperation>
            <ParameterInstanceRef parameterRef="RangeYards" />
            <Operator>mult</Operator>
            <Value>3</Value>
        </MathOperation>
    </MathAlgorithm>
</AlgorithmSet>

</TelemetryMetaData>
</SpaceSystem>

```

IRIG161_2 format definition:

```
<?xml version="1.0" encoding="UTF-8"?>
<SpaceSystem name="Format161_2" shortDescription="Format161_2, 240-Bit Format (EFG)"
  xmlns="http://www.omg.org/space/xtce" xmlns:xsi="http://www.w3.org/2001/XMLSchema-
  instance"
  xsi:schemaLocation="http://www.omg.org/space/xtce SpaceSystemV1.0.xsd">
  <LongDescription>This format is used for the transmission of radar and acquisition data
    from PMRF to 45 SW .</LongDescription>

  <Header date="Jun 2005" validationStatus="Unknown" version="161-00">
    <AuthorSet>
      <Author>Data Reduction and Computer Group</Author>
      <Author>Range Commanders Council</Author>
      <Author>Translated to XTCE by Command and Control Technologies, Inc.</Author>
    </AuthorSet>
    <HistorySet>
      <History>Initial implementation</History>
    </HistorySet>
  </Header>

  <TelemetryMetaData>

  <ParameterTypeSet>
    <BinaryParameterType name="CRC" shortDescription="Cyclic redundancy check for
    error detection" >
      <UnitSet/>
      <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
        <SizeInBits>
          <FixedValue>9</FixedValue>
        </SizeInBits>
      </BinaryDataEncoding>
    </BinaryParameterType>

    <BinaryParameterType name="FrameSync" shortDescription="Pattern 1110010;
    complemented every other frame" >
      <UnitSet/>
      <BinaryDataEncoding bitOrder="mostSignificantBitFirst">
        <SizeInBits>
          <FixedValue>7</FixedValue>
        </SizeInBits>
      </BinaryDataEncoding>
    </BinaryParameterType>

    <BooleanParameterType name="ActivePassive" oneStringValue="active"
    zeroStringValue="passive">
      <UnitSet/>
      <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
    </BooleanParameterType>

    <BinaryParameterType name="UnUsed1" shortDescription="Unused: size=1 bit" >
      <UnitSet/>
      <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
        <SizeInBits>
          <FixedValue>1</FixedValue>
        </SizeInBits>
      </BinaryDataEncoding>
    </BinaryParameterType>
  </ParameterTypeSet>
</SpaceSystem>
```

```

        </SizeInBits>
    </BinaryDataEncoding>
</BinaryParameterType>

    <BooleanParameterType name="TrueFalse" oneStringValue="true"
zeroStringValue="false">
    <UnitSet/>
    <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
</BooleanParameterType>

    <BooleanParameterType name="StarData" oneStringValue="star-data"
zeroStringValue="normal-data">
    <UnitSet/>
    <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
</BooleanParameterType>

    <BinaryParameterType name="VehicleNum" shortDescription="Vehicle Number: V0,
V1, V2" >
    <UnitSet/>
    <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
    <SizeInBits>
    <FixedValue>3</FixedValue>
    </SizeInBits>
    </BinaryDataEncoding>
</BinaryParameterType>

    <BinaryParameterType name="SubSync" shortDescription="Sub Sync: pattern
11010, complemented every other frame">
    <UnitSet/>
    <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
    <SizeInBits>
    <FixedValue>5</FixedValue>
    </SizeInBits>
    </BinaryDataEncoding>
</BinaryParameterType>

    <FloatParameterType name="Axis" sizeInBits="64">
    <UnitSet>
    <Unit description="feet">ft</Unit>
    </UnitSet>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
sizeInBits="30">
    <ByteOrderList>
    <Byte byteSignificance="4"/>
    <Byte byteSignificance="3"/>
    <Byte byteSignificance="2"/>
    <Byte byteSignificance="1"/>
    </ByteOrderList>
    <ContextCalibratorList>
    <ContextCalibrator>
    <UseWhenCondition>
    <Condition>
    <ParameterInstanceRef
parameterRef="PosScale" useCalibratedValue="true"></ParameterInstanceRef>

```

```

<ComparisonOperator>==</ComparisonOperator>
    <Value>0</Value>
    </Condition>
</UseWhenCondition>
</ContextCalibrator>
<ContextCalibrator>
    <UseWhenCondition>
    <Condition>
        <ParameterInstanceRef
parameterRef="PosScale" useCalibratedValue="true"></ParameterInstanceRef>
    </Condition>
    </UseWhenCondition>
    </ContextCalibrator>
</ContextCalibrator>
</ContextCalibrator>
<ComparisonOperator>==</ComparisonOperator>
    <Value>1</Value>
    </Condition>
</UseWhenCondition>
</ContextCalibrator>
<ContextCalibrator>
    <UseWhenCondition>
    <Condition>
        <ParameterInstanceRef
parameterRef="PosScale" useCalibratedValue="true"></ParameterInstanceRef>
    </Condition>
    </UseWhenCondition>
    </ContextCalibrator>
</ContextCalibrator>
<ComparisonOperator>==</ComparisonOperator>
    <Value>2</Value>
    </Condition>
</UseWhenCondition>
</ContextCalibrator>
<ContextCalibrator>
    <UseWhenCondition>
    <Condition>
        <ParameterInstanceRef
parameterRef="PosScale" useCalibratedValue="true"></ParameterInstanceRef>
    </Condition>
    </UseWhenCondition>
    </ContextCalibrator>
</ContextCalibrator>
<ComparisonOperator>==</ComparisonOperator>
    <Value>3</Value>
    </Condition>
</UseWhenCondition>
</ContextCalibrator>
<ContextCalibrator>
    <UseWhenCondition>
    <Condition>
        <ParameterInstanceRef
parameterRef="PosScale" useCalibratedValue="true"></ParameterInstanceRef>
    </Condition>
    </UseWhenCondition>
    </ContextCalibrator>
</ContextCalibrator>

```

```

        <PolynomialCalibrator>
            <Term coefficient="1E20" exponent="1"/>
        </PolynomialCalibrator>
    </Calibrator>
</ContextCalibrator>

</ContextCalibratorList>
</IntegerDataEncoding>
</FloatParameterType>

<FloatParameterType name="TimeVernier" sizeInBits="64" shortDescription="LSB=1
milli seconds">
    <UnitSet>
        <Unit description="milli seconds">ms</Unit>
    </UnitSet>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
    sizeInBits="10">
        <ByteOrderList>
            <Byte byteSignificance="2"/>
            <Byte byteSignificance="1"/>
        </ByteOrderList>
        <DefaultCalibrator>
            <PolynomialCalibrator>
                <Term coefficient="1.0" exponent="1"/>
            </PolynomialCalibrator>
        </DefaultCalibrator>
    </IntegerDataEncoding>
</FloatParameterType>

<IntegerParameterType name="Time" signed="false" sizeInBits="17"
shortDescription="Time: GMT time, LSB=1 sec">
    <UnitSet>
        <Unit description="seconds">s</Unit>
    </UnitSet>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
    sizeInBits="17">
        <ByteOrderList>
            <Byte byteSignificance="3"/>
            <Byte byteSignificance="2"/>
            <Byte byteSignificance="1"/>
        </ByteOrderList>
        <DefaultCalibrator>
            <PolynomialCalibrator>
                <Term coefficient="1.0" exponent="1"/>
            </PolynomialCalibrator>
        </DefaultCalibrator>
    </IntegerDataEncoding>
</IntegerParameterType>

<BooleanParameterType name="SkinBeacon" oneStringValue="beacon"
zeroStringValue="skin">
    <UnitSet/>
    <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
</BooleanParameterType>

```

```

    <BooleanParameterType name="ValidData" oneStringValue="valid-data"
zeroStringValue="not-valid">
    <UnitSet/>
    <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
</BooleanParameterType>

    <FloatParameterType name="Velocity" sizeInBits="64" shortDescription="feet/
sec, two's complement negative number, LSB weighing depends upon SCV">
    <UnitSet>
        <Unit description="feet per second">ft/s</Unit>
    </UnitSet>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="twosCompliment"
        sizeInBits="16">
        <ByteOrderList>
            <Byte byteSignificance="2"/>
            <Byte byteSignificance="1"/>
        </ByteOrderList>
        <ContextCalibratorList>
            <ContextCalibrator>
                <UseWhenCondition>
                    <Condition>
                        <ParameterInstanceRef
parameterRef="VelScale" useCalibratedValue="true"></ParameterInstanceRef>
                    </Condition>
                </UseWhenCondition>
                <ComparisonOperator>==</ComparisonOperator>
                    <Value>0</Value>
                </Condition>
            </UseWhenCondition>
            <Calibrator>
                <PolynomialCalibrator>
                    <Term coefficient="1.0" exponent="1"/>
                </PolynomialCalibrator>
            </Calibrator>
        </ContextCalibrator>
        <ContextCalibrator>
            <UseWhenCondition>
                <Condition>
                    <ParameterInstanceRef
parameterRef="VelScale" useCalibratedValue="true"></ParameterInstanceRef>
                </Condition>
            </UseWhenCondition>
            <ComparisonOperator>==</ComparisonOperator>
                <Value>1</Value>
            </Condition>
        </UseWhenCondition>
        <Calibrator>
            <PolynomialCalibrator>
                <Term coefficient="10.0" exponent="1"/>
            </PolynomialCalibrator>
        </Calibrator>
    </ContextCalibrator>
    </ContextCalibratorList>
</IntegerDataEncoding>
</FloatParameterType>

```

```

        <FloatParameterType name="SCV" sizeInBits="64" shortDescription="Velocity
Data Scale">
            <UnitSet/>
            <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned" sizeInBits="2">
                <ContextCalibratorList>
                    <ContextCalibrator>
                        <UseWhenCondition>
                            <Condition>
                                <ParameterInstanceRef
parameterRef="VelScale" useCalibratedValue="false"></ParameterInstanceRef>
                            </Condition>
                        </UseWhenCondition>
                        <ComparisonOperator>==</ComparisonOperator>
                        <Value>0</Value>
                    </Condition>
                </UseWhenCondition>
                <Calibrator>
                    <PolynomialCalibrator>
                        <Term coefficient="1" exponent="0"/>
                    </PolynomialCalibrator>
                </Calibrator>
            </ContextCalibrator>
            <ContextCalibrator>
                <UseWhenCondition>
                    <Condition>
                        <ParameterInstanceRef
parameterRef="VelScale" useCalibratedValue="false"></ParameterInstanceRef>
                    </Condition>
                </UseWhenCondition>
                <ComparisonOperator>==</ComparisonOperator>
                <Value>1</Value>
            </Condition>
        </UseWhenCondition>
        <Calibrator>
            <PolynomialCalibrator>
                <Term coefficient="10" exponent="0"/>
            </PolynomialCalibrator>
        </Calibrator>
    </ContextCalibrator>
</ContextCalibratorList>
</IntegerDataEncoding>
</FloatParameterType>

<!-- Debug mode
    <FloatParameterType name="SCP" sizeInBits="64" shortDescription="Position
Data Scale Factor">
        <UnitSet>
            <Unit description="feet per second">ft/s</Unit>
        </UnitSet>
        <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
            sizeInBits="2">
            <DefaultCalibrator>
                <SplineCalibrator order="1">
                    <SplinePoint calibrated="1" raw="0"/>
                </SplineCalibrator>
            </DefaultCalibrator>
        </IntegerDataEncoding>
    </FloatParameterType>

```

```

        <SplinePoint calibrated="10" raw="1"/>
        <SplinePoint calibrated="1000" raw="2"/>
        <SplinePoint calibrated="1E20" raw="3"/>
    </SplineCalibrator>
</DefaultCalibrator>
</IntegerDataEncoding>
</FloatParameterType>
-->

    <FloatParameterType name="SCP" sizeInBits="64" shortDescription="Position
Data Scale Factor">
    <UnitSet/>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned" sizeInBits="2">
    <ContextCalibratorList>
    <ContextCalibrator>
    <UseWhenCondition>
    <Condition>
    <ParameterInstanceRef
parameterRef="PosScale" useCalibratedValue="false"></ParameterInstanceRef>

<ComparisonOperator>==</ComparisonOperator>
    <Value>0</Value>
    </Condition>
    </UseWhenCondition>
    <Calibrator>
    <PolynomialCalibrator>
    <Term coefficient="1" exponent="0"/>
    </PolynomialCalibrator>
    </Calibrator>
    </ContextCalibrator>
    <ContextCalibrator>
    <UseWhenCondition>
    <Condition>
    <ParameterInstanceRef
parameterRef="PosScale" useCalibratedValue="false"></ParameterInstanceRef>

<ComparisonOperator>==</ComparisonOperator>
    <Value>1</Value>
    </Condition>
    </UseWhenCondition>
    <Calibrator>
    <PolynomialCalibrator>
    <Term coefficient="10" exponent="0"/>
    </PolynomialCalibrator>
    </Calibrator>
    </ContextCalibrator>
    <ContextCalibrator>
    <UseWhenCondition>
    <Condition>
    <ParameterInstanceRef
parameterRef="PosScale" useCalibratedValue="false"></ParameterInstanceRef>

<ComparisonOperator>==</ComparisonOperator>
    <Value>2</Value>
    </Condition>

```

```

        </UseWhenCondition>
        <Calibrator>
            <PolynomialCalibrator>
                <Term coefficient="1000"
exponent="0" />
            </PolynomialCalibrator>
        </Calibrator>
    </ContextCalibrator>
    <ContextCalibrator>
        <UseWhenCondition>
            <Condition>
                <ParameterInstanceRef
parameterRef="PosScale" useCalibratedValue="false"></ParameterInstanceRef>
            </Condition>
            <ComparisonOperator>==</ComparisonOperator>
                <Value>3</Value>
            </Condition>
        </UseWhenCondition>
        <Calibrator>
            <PolynomialCalibrator>
                <Term coefficient="1E20"
exponent="0" />
            </PolynomialCalibrator>
        </Calibrator>
    </ContextCalibrator>
</ContextCalibratorList>
</IntegerDataEncoding>
</FloatParameterType>

    <IntegerParameterType name="DayOfYr" signed="false" sizeInBits="10"
shortDescription="Day of Year">
        <UnitSet>
            <Unit>day</Unit>
        </UnitSet>
        <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
            sizeInBits="10">
            <ByteOrderList>
                <Byte byteSignificance="2" />
                <Byte byteSignificance="1" />
            </ByteOrderList>
        </IntegerDataEncoding>
    </IntegerParameterType>

    <IntegerParameterType name="SiteID" signed="false" sizeInBits="8"
shortDescription="Site ID">
        <UnitSet />
        <IntegerDataEncoding bitOrder="leastSignificantBitFirst" encoding=
"unsigned"
            sizeInBits="8">
            <ByteOrderList>
                <Byte byteSignificance="1" />
            </ByteOrderList>
        </IntegerDataEncoding>
    </IntegerParameterType>

```

```

    <BinaryParameterType name="Unused2" shortDescription="Unused: size=2 bits" >
      <UnitSet/>
      <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
        <SizeInBits>
          <FixedValue>2</FixedValue>
        </SizeInBits>
      </BinaryDataEncoding>
    </BinaryParameterType>

    <FloatParameterType name="FracVel" sizeInBits="64"
shortDescription="Fractional Velocity, LSB weighing depends upon SCV, appended to
Velocity ">
      <UnitSet>
        <Unit description="feet per second">ft/s</Unit>
      </UnitSet>
      <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
sizeInBits="4">
        <ByteOrderList>
          <Byte byteSignificance="1"/>
        </ByteOrderList>
        <ContextCalibratorList>
          <ContextCalibrator>
            <UseWhenCondition>
              <Condition>
                <ParameterInstanceRef
parameterRef="VelScale" useCalibratedValue="true"></ParameterInstanceRef>
              </Condition>
            </UseWhenCondition>
            <ComparisonOperator>==</ComparisonOperator>
              <Value>0</Value>
            </Condition>
          </UseWhenCondition>
          <Calibrator>
            <PolynomialCalibrator>
              <Term coefficient="1.0" exponent="1"/>
            </PolynomialCalibrator>
          </Calibrator>
        </ContextCalibrator>
        <ContextCalibrator>
          <UseWhenCondition>
            <Condition>
              <ParameterInstanceRef
parameterRef="VelScale" useCalibratedValue="true"></ParameterInstanceRef>
            </Condition>
          </UseWhenCondition>
          <ComparisonOperator>==</ComparisonOperator>
            <Value>1</Value>
          </Condition>
        </UseWhenCondition>
        <Calibrator>
          <PolynomialCalibrator>
            <Term coefficient="10.0" exponent="1"/>
          </PolynomialCalibrator>
        </Calibrator>
      </ContextCalibrator>
    </ContextCalibratorList>
  </IntegerDataEncoding>

```

```

        </FloatParameterType>

        <BinaryParameterType name="FilterCoef" shortDescription="1000 (1-B) FPQ-14
Filter Coefficient, 000000=perfect data" >
            <UnitSet/>
            <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
                <SizeInBits>
                    <FixedValue>6</FixedValue>
                </SizeInBits>
            </BinaryDataEncoding>
        </BinaryParameterType>
    </ParameterTypeSet>

    <ParameterSet>
        <Parameter name="CRC" parameterTypeRef="CRC" />
        <Parameter name="FrameSync" parameterTypeRef="FrameSync" />
        <Parameter name="ActivePassive" parameterTypeRef="ActivePassive" />
        <Parameter name="UnUsedA" parameterTypeRef="UnUsed1" />
        <Parameter name="OnAxisMode" parameterTypeRef="TrueFalse" />
        <Parameter name="OnTrackMode" parameterTypeRef="TrueFalse" />
        <Parameter name="CompDriveMode" parameterTypeRef="TrueFalse" />
        <Parameter name="StarData" parameterTypeRef="StarData" />
        <Parameter name="V0" parameterTypeRef="TrueFalse" shortDescription="Vehicle
Number V0" />
        <Parameter name="V1" parameterTypeRef="TrueFalse" shortDescription="Vehicle
Number V1" />
        <Parameter name="V2" parameterTypeRef="TrueFalse" shortDescription="Vehicle
Number V2" />
        <Parameter name="SubSync" parameterTypeRef="SubSync" />
        <Parameter name="EAxis" parameterTypeRef="Axis" />
        <Parameter name="FAxis" parameterTypeRef="Axis" />
        <Parameter name="GAxis" parameterTypeRef="Axis" />
        <Parameter name="TimeVernier" parameterTypeRef="TimeVernier" />
        <Parameter name="Time" parameterTypeRef="Time" />
        <Parameter name="UnUsedB" parameterTypeRef="UnUsed1" />
        <Parameter name="SkinBeacon" parameterTypeRef="SkinBeacon" />
        <Parameter name="ValidData" parameterTypeRef="ValidData" />
        <Parameter name="EVelocity" parameterTypeRef="Velocity" />
        <Parameter name="VelScale" parameterTypeRef="SCV" />
        <Parameter name="PosScale" parameterTypeRef="SCP" />
        <Parameter name="DayOfYr" parameterTypeRef="DayOfYr" />
        <Parameter name="FVelocity" parameterTypeRef="Velocity" />
        <Parameter name="SiteID" parameterTypeRef="SiteID" />
        <Parameter name="UnUsedC" parameterTypeRef="UnUsed2" />
        <Parameter name="FracEVel" parameterTypeRef="FracVel" />
        <Parameter name="GVelocity" parameterTypeRef="Velocity" />
        <Parameter name="FilterCoef" parameterTypeRef="FilterCoef" />
        <Parameter name="FracGVel" parameterTypeRef="FracVel" />
        <Parameter name="FracFVel" parameterTypeRef="FracVel" />
    </ParameterSet>

    <ContainerSet>
        <SequenceContainer name="Frame">
            <EntryList>
                <ParameterRefEntry parameterRef="CRC" />
                <ParameterRefEntry parameterRef="FrameSync" />
            </EntryList>
        </SequenceContainer>
    </ContainerSet>

```

```

<ParameterRefEntry parameterRef="ActivePassive" />
<ParameterRefEntry parameterRef="UnUsedA" />
<ParameterRefEntry parameterRef="OnAxisMode" />

<ParameterRefEntry parameterRef="OnTrackMode" />
<ParameterRefEntry parameterRef="CompDriveMode" />
<ParameterRefEntry parameterRef="StarData" />
<ParameterRefEntry parameterRef="V0" />
<ParameterRefEntry parameterRef="V1" />
<ParameterRefEntry parameterRef="V2" />
<ParameterRefEntry parameterRef="SubSync" />
<ParameterRefEntry parameterRef="EAxis" />
<ParameterRefEntry parameterRef="FAxis" />
<ParameterRefEntry parameterRef="GAxis" />
<ParameterRefEntry parameterRef="TimeVernier" />
<ParameterRefEntry parameterRef="Time" />
<ParameterRefEntry parameterRef="UnUsedB" />
<ParameterRefEntry parameterRef="SkinBeacon" />
<ParameterRefEntry parameterRef="ValidData" />
<ParameterRefEntry parameterRef="EVelocity" />
<ParameterRefEntry parameterRef="VelScale" />
<ParameterRefEntry parameterRef="PosScale" />
<ParameterRefEntry parameterRef="DayOfYr" />
<ParameterRefEntry parameterRef="FVelocity" />
<ParameterRefEntry parameterRef="SiteID" />
<ParameterRefEntry parameterRef="UnUsedC" />
<ParameterRefEntry parameterRef="FracEVel" />
<ParameterRefEntry parameterRef="GVelocity" />
<ParameterRefEntry parameterRef="FilterCoef" />
<ParameterRefEntry parameterRef="FracGVel" />
<ParameterRefEntry parameterRef="FracFVel" />
    </EntryList>
  </SequenceContainer>
</ContainerSet>

<StreamSet>
  <FixedFrameStream name="Serial" frameLengthInBits="240">
    <ContainerRef containerRef="Frame" />
    <SyncStrategy>
      <SyncPattern bitLocationFromStartOfContainer="9" pattern="E2"
patternLengthInBits="7" />
    </SyncStrategy>
  </FixedFrameStream>
</StreamSet>

</TelemetryMetaData>
</SpaceSystem>

```

IRIG161_2A format definition:

```

<?xml version="1.0" encoding="UTF-8"?>
<SpaceSystem name="Format161_2A" shortDescription="Format161_2A, 240-Bit Format (EFG)"
  xmlns="http://www.omg.org/space/xtce" xmlns:xsi="http://www.w3.org/2001/XMLSchema-
  instance"
  xsi:schemaLocation="http://www.omg.org/space/xtce SpaceSystemV1.0.xsd">
  <LongDescription>This format is used for the transmission of shuttle and special space
    test data from 45 SW to PMRF (Kauai).</LongDescription>

  <Header date="Jun 2005" validationStatus="Unknown" version="161-00">
    <AuthorSet>
      <Author>Data Reduction and Computer Group</Author>
      <Author>Range Commanders Council</Author>
      <Author>Translated to XTCE by Command and Control Technologies, Inc.</Author>
    </AuthorSet>
    <HistorySet>
      <History>Initial implementation</History>
    </HistorySet>
  </Header>

  <TelemetryMetaData>

  <ParameterTypeSet>
    <BinaryParameterType name="CRC" shortDescription="Cyclic redundancy check for
  error detection" >
      <UnitSet/>
      <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
        <SizeInBits>
          <FixedValue>9</FixedValue>
        </SizeInBits>
      </BinaryDataEncoding>
    </BinaryParameterType>

    <BinaryParameterType name="FrameSync" shortDescription="Pattern 1110010;
  complemented every other frame" >
      <UnitSet/>
      <BinaryDataEncoding bitOrder="mostSignificantBitFirst">
        <SizeInBits>
          <FixedValue>7</FixedValue>
        </SizeInBits>
      </BinaryDataEncoding>
    </BinaryParameterType>

    <BooleanParameterType name="ActivePassive" oneStringValue="active"
  zeroStringValue="passive">
      <UnitSet/>
      <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
    </BooleanParameterType>

    <BinaryParameterType name="UnUsed1" shortDescription="Unused: size=1 bit" >
      <UnitSet/>
      <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
        <SizeInBits>
          <FixedValue>1</FixedValue>
        </SizeInBits>
      </BinaryDataEncoding>
    </BinaryParameterType>
  </ParameterTypeSet>
</SpaceSystem>

```

```

        </SizeInBits>
    </BinaryDataEncoding>
</BinaryParameterType>

    <BooleanParameterType name="TrueFalse" oneStringValue="true"
zeroStringValue="false">
    <UnitSet/>
    <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
</BooleanParameterType>

    <BooleanParameterType name="StarData" oneStringValue="star-data"
zeroStringValue="normal-data">
    <UnitSet/>
    <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
</BooleanParameterType>

    <BinaryParameterType name="VehicleNum" shortDescription="Vehicle Number: V0,
V1, V2" >
    <UnitSet/>
    <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
        <SizeInBits>
            <FixedValue>3</FixedValue>
        </SizeInBits>
    </BinaryDataEncoding>
</BinaryParameterType>

    <BinaryParameterType name="Spares">
    <UnitSet/>
    <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
        <SizeInBits>
            <FixedValue>5</FixedValue>
        </SizeInBits>
    </BinaryDataEncoding>
</BinaryParameterType>

    <FloatParameterType name="Axis" sizeInBits="64">
    <UnitSet>
        <Unit description="feet">ft</Unit>
    </UnitSet>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
sizeInBits="30">
    <ByteOrderList>
        <Byte byteSignificance="4"/>
        <Byte byteSignificance="3"/>
        <Byte byteSignificance="2"/>
        <Byte byteSignificance="1"/>
    </ByteOrderList>
    <ContextCalibratorList>
        <ContextCalibrator>
            <UseWhenCondition>
                <Condition>
                    <ParameterInstanceRef
parameterRef="PosScale" useCalibratedValue="true"></ParameterInstanceRef>

    <ComparisonOperator>==</ComparisonOperator>

```

```

                <Value>0</Value>
            </Condition>
        </UseWhenCondition>
    </ContextCalibrator>
    <Calibrator>
        <PolynomialCalibrator>
            <Term coefficient="1.0" exponent="1"/>
        </PolynomialCalibrator>
    </Calibrator>
</ContextCalibrator>
<ContextCalibrator>
    <UseWhenCondition>
        <Condition>
            <ParameterInstanceRef
parameterRef="PosScale" useCalibratedValue="true"></ParameterInstanceRef>

<ComparisonOperator>==</ComparisonOperator>
                <Value>1</Value>
            </Condition>
        </UseWhenCondition>
    </ContextCalibrator>
    <Calibrator>
        <PolynomialCalibrator>
            <Term coefficient="10.0" exponent="1"/>
        </PolynomialCalibrator>
    </Calibrator>
</ContextCalibrator>

    <ContextCalibrator>
        <UseWhenCondition>
            <Condition>
                <ParameterInstanceRef
parameterRef="PosScale" useCalibratedValue="true"></ParameterInstanceRef>

<ComparisonOperator>==</ComparisonOperator>
                <Value>2</Value>
            </Condition>
        </UseWhenCondition>
    </ContextCalibrator>
    <Calibrator>
        <PolynomialCalibrator>
            <Term coefficient="1000.0"
exponent="1"/>
        </PolynomialCalibrator>
    </Calibrator>
</ContextCalibrator>
    <ContextCalibrator>
        <UseWhenCondition>
            <Condition>
                <ParameterInstanceRef
parameterRef="PosScale" useCalibratedValue="true"></ParameterInstanceRef>

<ComparisonOperator>==</ComparisonOperator>
                <Value>3</Value>
            </Condition>
        </UseWhenCondition>
    </ContextCalibrator>
    <Calibrator>
        <PolynomialCalibrator>
            <Term coefficient="1E20" exponent="1"/>

```

```

        </PolynomialCalibrator>
    </Calibrator>
</ContextCalibrator>

    </ContextCalibratorList>
</IntegerDataEncoding>
</FloatParameterType>

<FloatParameterType name="TimeVernier" sizeInBits="64" shortDescription="LSB=1
milli seconds">
    <UnitSet>
        <Unit description="milli seconds">ms</Unit>
    </UnitSet>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
sizeInBits="10">
        <ByteOrderList>
            <Byte byteSignificance="2"/>
            <Byte byteSignificance="1"/>
        </ByteOrderList>
        <DefaultCalibrator>
            <PolynomialCalibrator>
                <Term coefficient="1.0" exponent="1"/>
            </PolynomialCalibrator>
        </DefaultCalibrator>
    </IntegerDataEncoding>
</FloatParameterType>

<IntegerParameterType name="Time" signed="false" sizeInBits="17"
shortDescription="Time: GMT time, LSB=1 sec">
    <UnitSet>
        <Unit description="seconds">s</Unit>
    </UnitSet>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
sizeInBits="17">
        <ByteOrderList>
            <Byte byteSignificance="3"/>
            <Byte byteSignificance="2"/>
            <Byte byteSignificance="1"/>
        </ByteOrderList>
        <DefaultCalibrator>
            <PolynomialCalibrator>
                <Term coefficient="1.0" exponent="1"/>
            </PolynomialCalibrator>
        </DefaultCalibrator>
    </IntegerDataEncoding>
</IntegerParameterType>

<BooleanParameterType name="SkinBeacon" oneStringValue="beacon"
zeroStringValue="skin">
    <UnitSet/>
    <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
</BooleanParameterType>

```

```

    <BooleanParameterType name="ValidData" oneStringValue="valid-data"
zeroStringValue="not-valid">
    <UnitSet/>
    <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
</BooleanParameterType>

    <FloatParameterType name="Velocity" sizeInBits="64" shortDescription="feet/
sec, two's complement negative number, LSB weighing depends upon SCV">
    <UnitSet>
        <Unit description="feet per second">ft/s</Unit>
    </UnitSet>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="twosCompliment"
        sizeInBits="16">
    <ByteOrderList>
        <Byte byteSignificance="2"/>
        <Byte byteSignificance="1"/>
    </ByteOrderList>
    <ContextCalibratorList>
        <ContextCalibrator>
            <UseWhenCondition>
                <Condition>
                    <ParameterInstanceRef
parameterRef="VelScale" useCalibratedValue="true"></ParameterInstanceRef>
                </Condition>
            </UseWhenCondition>
            <Calibrator>
                <PolynomialCalibrator>
                    <Term coefficient="1.0" exponent="1"/>
                </PolynomialCalibrator>
            </Calibrator>
        </ContextCalibrator>
        <ContextCalibrator>
            <UseWhenCondition>
                <Condition>
                    <ParameterInstanceRef
parameterRef="VelScale" useCalibratedValue="true"></ParameterInstanceRef>
                </Condition>
            </UseWhenCondition>
            <Calibrator>
                <PolynomialCalibrator>
                    <Term coefficient="10.0" exponent="1"/>
                </PolynomialCalibrator>
            </Calibrator>
        </ContextCalibrator>
    </ContextCalibratorList>
    </IntegerDataEncoding>
</FloatParameterType>

```

```

        <FloatParameterType name="SCV" sizeInBits="64" shortDescription="Velocity
Data Scale">
            <UnitSet/>
            <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned" sizeInBits="2">
                <ContextCalibratorList>
                    <ContextCalibrator>
                        <UseWhenCondition>
                            <Condition>
                                <ParameterInstanceRef
parameterRef="VelScale" useCalibratedValue="false"></ParameterInstanceRef>
                            </Condition>
                        </UseWhenCondition>
                        <ComparisonOperator>==</ComparisonOperator>
                            <Value>0</Value>
                        </Condition>
                    </UseWhenCondition>
                    <Calibrator>
                        <PolynomialCalibrator>
                            <Term coefficient="1" exponent="0"/>
                        </PolynomialCalibrator>
                    </Calibrator>
                </ContextCalibrator>
                <ContextCalibrator>
                    <UseWhenCondition>
                        <Condition>
                            <ParameterInstanceRef
parameterRef="VelScale" useCalibratedValue="false"></ParameterInstanceRef>
                        </Condition>
                    </UseWhenCondition>
                    <ComparisonOperator>==</ComparisonOperator>
                        <Value>1</Value>
                    </Condition>
                </UseWhenCondition>
                <Calibrator>
                    <PolynomialCalibrator>
                        <Term coefficient="10" exponent="0"/>
                    </PolynomialCalibrator>
                </Calibrator>
            </ContextCalibratorList>
        </IntegerDataEncoding>
    </FloatParameterType>

<!-- Debug mode
    <FloatParameterType name="SCP" sizeInBits="64" shortDescription="Position
Data Scale Factor">
        <UnitSet>
            <Unit description="feet per second">ft/s</Unit>
        </UnitSet>
        <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
            sizeInBits="2">
            <DefaultCalibrator>
                <SplineCalibrator order="1">
                    <SplinePoint calibrated="1" raw="0"/>
                    <SplinePoint calibrated="10" raw="1"/>
                </SplineCalibrator>
            </DefaultCalibrator>
        </IntegerDataEncoding>
    </FloatParameterType>

```

```

        <SplinePoint calibrated="1000" raw="2"/>
        <SplinePoint calibrated="1E20" raw="3"/>
    </SplineCalibrator>
</DefaultCalibrator>
</IntegerDataEncoding>
</FloatParameterType>
-->

    <FloatParameterType name="SCP" sizeInBits="64" shortDescription="Position
Data Scale Factor">
        <UnitSet/>
        <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned" sizeInBits="2">
            <ContextCalibratorList>
                <ContextCalibrator>
                    <UseWhenCondition>
                        <Condition>
                            <ParameterInstanceRef
parameterRef="PosScale" useCalibratedValue="false"></ParameterInstanceRef>
                        </Condition>
                    </UseWhenCondition>
                    <Value>0</Value>
                </ContextCalibrator>
                <ContextCalibrator>
                    <UseWhenCondition>
                        <Condition>
                            <ParameterInstanceRef
parameterRef="PosScale" useCalibratedValue="false"></ParameterInstanceRef>
                        </Condition>
                    </UseWhenCondition>
                    <Value>1</Value>
                </ContextCalibrator>
                <ContextCalibrator>
                    <UseWhenCondition>
                        <Condition>
                            <ParameterInstanceRef
parameterRef="PosScale" useCalibratedValue="false"></ParameterInstanceRef>
                        </Condition>
                    </UseWhenCondition>
                    <Value>2</Value>
                </ContextCalibrator>
            </ContextCalibratorList>
        </IntegerDataEncoding>
    </FloatParameterType>

```

```

        <Calibrator>
            <PolynomialCalibrator>
                <Term coefficient="1000"
exponent="0" />
            </PolynomialCalibrator>
        </Calibrator>
    </ContextCalibrator>
</ContextCalibrator>
    <UseWhenCondition>
        <Condition>
            <ParameterInstanceRef
parameterRef="PosScale" useCalibratedValue="false"></ParameterInstanceRef>
        </Condition>
    </UseWhenCondition>
    <ComparisonOperator>==</ComparisonOperator>
        <Value>3</Value>
    </Condition>
</UseWhenCondition>
    <Calibrator>
        <PolynomialCalibrator>
            <Term coefficient="1E20"
exponent="0" />
        </PolynomialCalibrator>
    </Calibrator>
</ContextCalibrator>
</ContextCalibratorList>
</IntegerDataEncoding>
</FloatParameterType>

    <IntegerParameterType name="DayOfYr" signed="false" sizeInBits="10"
shortDescription="Day of Year">
    <UnitSet>
        <Unit>day</Unit>
    </UnitSet>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
        sizeInBits="10">
        <ByteOrderList>
            <Byte byteSignificance="2" />
            <Byte byteSignificance="1" />
        </ByteOrderList>
    </IntegerDataEncoding>
</IntegerParameterType>

    <IntegerParameterType name="SiteID" signed="false" sizeInBits="8"
shortDescription="Site ID">
    <UnitSet />
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst" encoding=
"unsigned"
        sizeInBits="8">
        <ByteOrderList>
            <Byte byteSignificance="1" />
        </ByteOrderList>
    </IntegerDataEncoding>
</IntegerParameterType>

    <BinaryParameterType name="UnUsed2" shortDescription="Unused: size=2 bits" >

```

```

<UnitSet/>
<BinaryDataEncoding bitOrder="leastSignificantBitFirst">
  <SizeInBits>
    <FixedValue>2</FixedValue>
  </SizeInBits>
</BinaryDataEncoding>
</BinaryParameterType>

<FloatParameterType name="FracVel" sizeInBits="64"
shortDescription="Fractional Velocity, LSB weighing depends upon SCV, appended to
Velocity ">
  <UnitSet>
    <Unit description="feet per second">ft/s</Unit>
  </UnitSet>
  <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
sizeInBits="4">
    <ByteOrderList>
      <Byte byteSignificance="1"/>
    </ByteOrderList>
    <ContextCalibratorList>
      <ContextCalibrator>
        <UseWhenCondition>
          <Condition>
            <ParameterInstanceRef
parameterRef="VelScale" useCalibratedValue="true"></ParameterInstanceRef>
          </Condition>
        </UseWhenCondition>
        <Calibrator>
          <PolynomialCalibrator>
            <Term coefficient="1.0" exponent="1"/>
          </PolynomialCalibrator>
        </Calibrator>
      </ContextCalibrator>
      <ContextCalibrator>
        <UseWhenCondition>
          <Condition>
            <ParameterInstanceRef
parameterRef="VelScale" useCalibratedValue="true"></ParameterInstanceRef>
          </Condition>
        </UseWhenCondition>
        <Calibrator>
          <PolynomialCalibrator>
            <Term coefficient="10.0" exponent="1"/>
          </PolynomialCalibrator>
        </Calibrator>
      </ContextCalibrator>
    </ContextCalibratorList>
  </IntegerDataEncoding>
</FloatParameterType>

```

```

    <BinaryParameterType name="FilterCoef" shortDescription="1000 (1-B) FPQ-14
Filter Coefficient, 000000=perfect data" >
      <UnitSet/>
      <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
        <SizeInBits>
          <FixedValue>6</FixedValue>
        </SizeInBits>
      </BinaryDataEncoding>
    </BinaryParameterType>
  </ParameterTypeSet>

<ParameterSet>
  <Parameter name="CRC" parameterTypeRef="CRC" />
  <Parameter name="FrameSync" parameterTypeRef="FrameSync" />
  <Parameter name="ActivePassive" parameterTypeRef="ActivePassive" />
  <Parameter name="UnUsedA" parameterTypeRef="UnUsed1" />
  <Parameter name="OnAxisMode" parameterTypeRef="TrueFalse" />
  <Parameter name="AutoTrack" parameterTypeRef="TrueFalse" />
  <Parameter name="CompDriveMode" parameterTypeRef="TrueFalse" />
  <Parameter name="StarData" parameterTypeRef="StarData" />
  <Parameter name="V0" parameterTypeRef="TrueFalse" shortDescription="Vehicle
Number V0" />
  <Parameter name="V1" parameterTypeRef="TrueFalse" shortDescription="Vehicle
Number V1" />
  <Parameter name="V2" parameterTypeRef="TrueFalse" shortDescription="Vehicle
Number V2" />
  <Parameter name="Spares" parameterTypeRef="Spares" />
  <Parameter name="EAxis" parameterTypeRef="Axis" />
  <Parameter name="FAxis" parameterTypeRef="Axis" />
  <Parameter name="GAxis" parameterTypeRef="Axis" />
  <Parameter name="TimeVernier" parameterTypeRef="TimeVernier" />
  <Parameter name="Time" parameterTypeRef="Time" />
  <Parameter name="UnUsedB" parameterTypeRef="UnUsed1" />
  <Parameter name="SkinBeacon" parameterTypeRef="SkinBeacon" />
  <Parameter name="ValidData" parameterTypeRef="ValidData" />
  <Parameter name="EVelocity" parameterTypeRef="Velocity" />
  <Parameter name="VelScale" parameterTypeRef="SCV" />
  <Parameter name="PosScale" parameterTypeRef="SCP" />
  <Parameter name="DayOfYr" parameterTypeRef="DayOfYr" />
  <Parameter name="FVelocity" parameterTypeRef="Velocity" />
  <Parameter name="SiteID" parameterTypeRef="SiteID" />
  <Parameter name="UnUsedC" parameterTypeRef="UnUsed2" />
  <Parameter name="FracEVel" parameterTypeRef="FracVel" />
  <Parameter name="GVelocity" parameterTypeRef="Velocity" />
  <Parameter name="FilterCoef" parameterTypeRef="FilterCoef" />
  <Parameter name="FracGVel" parameterTypeRef="FracVel" />
  <Parameter name="FracFVel" parameterTypeRef="FracVel" />
</ParameterSet>

<ContainerSet>
  <SequenceContainer name="Frame">
    <EntryList>
      <ParameterRefEntry parameterRef="CRC" />
      <ParameterRefEntry parameterRef="FrameSync" />
      <ParameterRefEntry parameterRef="ActivePassive" />

```

```

<ParameterRefEntry parameterRef="UnusedA" />
<ParameterRefEntry parameterRef="OnAxisMode" />

<ParameterRefEntry parameterRef="AutoTrack" />
<ParameterRefEntry parameterRef="CompDriveMode" />
<ParameterRefEntry parameterRef="StarData" />
<ParameterRefEntry parameterRef="V0" />
<ParameterRefEntry parameterRef="V1" />
<ParameterRefEntry parameterRef="V2" />
<ParameterRefEntry parameterRef="Spares" />
<ParameterRefEntry parameterRef="EAxis" />
<ParameterRefEntry parameterRef="FAxis" />
<ParameterRefEntry parameterRef="GAxis" />
<ParameterRefEntry parameterRef="TimeVernier" />
<ParameterRefEntry parameterRef="Time" />
<ParameterRefEntry parameterRef="UnusedB" />
<ParameterRefEntry parameterRef="SkinBeacon" />
<ParameterRefEntry parameterRef="ValidData" />
<ParameterRefEntry parameterRef="EVelocity" />
<ParameterRefEntry parameterRef="VelScale" />
<ParameterRefEntry parameterRef="PosScale" />
<ParameterRefEntry parameterRef="DayOfYr" />
<ParameterRefEntry parameterRef="FVelocity" />
<ParameterRefEntry parameterRef="SiteID" />
<ParameterRefEntry parameterRef="UnusedC" />
<ParameterRefEntry parameterRef="FracVel" />
<ParameterRefEntry parameterRef="GVelocity" />
<ParameterRefEntry parameterRef="FilterCoef" />
<ParameterRefEntry parameterRef="FracGVel" />
<ParameterRefEntry parameterRef="FracFVel" />
</EntryList>
</SequenceContainer>
</ContainerSet>

<StreamSet>
  <FixedFrameStream name="Serial" frameLengthInBits="240">
    <ContainerRef containerRef="Frame" />
    <SyncStrategy>
      <SyncPattern bitLocationFromStartOfContainer="9" pattern="E2"
patternLengthInBits="7" />
    </SyncStrategy>
  </FixedFrameStream>
</StreamSet>

</TelemetryMetaData>
</SpaceSystem>

```

IRIG161_2B format definition:

```
<?xml version="1.0" encoding="UTF-8"?>
<SpaceSystem name="Format161_2B" shortDescription="Format161_2B, 240-Bit Format (EFG)"
  xmlns="http://www.omg.org/space/xtce" xmlns:xsi="http://www.w3.org/2001/XMLSchema-
  instance"
  xsi:schemaLocation="http://www.omg.org/space/xtce SpaceSystemV1.0.xsd">
  <LongDescription>Format 2B is used for transmitting and receiving radar and acquisition
    data between KMR and Kaena Point. It is also used for transmission from KMR to
    PMRF, and for post transmission and receipt of data between 30 SW and Kaena Point,
    and between 45 SW and 30 SW .</LongDescription>

  <Header date="Jun 2005" validationStatus="Unknown" version="161-00">
    <AuthorSet>
      <Author>Data Reduction and Computer Group</Author>
      <Author>Range Commanders Council</Author>
      <Author>Translated to XTCE by Command and Control Technologies, Inc.</Author>
    </AuthorSet>
    <HistorySet>
      <History>Initial implementation</History>
    </HistorySet>
  </Header>

  <TelemetryMetaData>

  <ParameterTypeSet>
    <BinaryParameterType name="CRC" shortDescription="Cyclic redundancy check for
    error detection" >
      <UnitSet/>
      <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
        <SizeInBits>
          <FixedValue>9</FixedValue>
        </SizeInBits>
      </BinaryDataEncoding>
    </BinaryParameterType>

    <BinaryParameterType name="FrameSync" shortDescription="Pattern 1110010;
    complemented every other frame" >
      <UnitSet/>
      <BinaryDataEncoding bitOrder="mostSignificantBitFirst">
        <SizeInBits>
          <FixedValue>7</FixedValue>
        </SizeInBits>
      </BinaryDataEncoding>
    </BinaryParameterType>

    <BooleanParameterType name="ActivePassive" oneStringValue="active"
    zeroStringValue="passive">
      <UnitSet/>
      <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
    </BooleanParameterType>

    <BinaryParameterType name="UnUsed1" shortDescription="Unused: size=1 bit" >
      <UnitSet/>
      <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
```

```

        <SizeInBits>
            <FixedValue>1</FixedValue>
        </SizeInBits>
    </BinaryDataEncoding>
</BinaryParameterType>

    <BooleanParameterType name="TrueFalse" oneStringValue="true"
zeroStringValue="false">
    <UnitSet/>
    <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
</BooleanParameterType>

    <BooleanParameterType name="StarData" oneStringValue="star-data"
zeroStringValue="normal-data">
    <UnitSet/>
    <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
</BooleanParameterType>

    <BinaryParameterType name="VehicleNum" shortDescription="Vehicle Number: V0,
V1, V2" >
    <UnitSet/>
    <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
        <SizeInBits>
            <FixedValue>3</FixedValue>
        </SizeInBits>
    </BinaryDataEncoding>
</BinaryParameterType>

    <BinaryParameterType name="SubSync" shortDescription="Sub Sync: pattern
11010, complemented every other frame">
    <UnitSet/>
    <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
        <SizeInBits>
            <FixedValue>5</FixedValue>
        </SizeInBits>
    </BinaryDataEncoding>
</BinaryParameterType>

<FloatParameterType name="Axis" sizeInBits="64">
    <UnitSet>
        <Unit description="feet">ft</Unit>
    </UnitSet>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
    sizeInBits="30">
        <ByteOrderList>
            <Byte byteSignificance="4" />
            <Byte byteSignificance="3" />
            <Byte byteSignificance="2" />
            <Byte byteSignificance="1" />
        </ByteOrderList>
        <ContextCalibratorList>
            <ContextCalibrator>
                <UseWhenCondition>
                    <Condition>

```

```

        <ParameterInstanceRef
parameterRef="PosScale" useCalibratedValue="true"></ParameterInstanceRef>

<ComparisonOperator>==</ComparisonOperator>
        <Value>0</Value>
        </Condition>
    </UseWhenCondition>
</Calibrator>
    <PolynomialCalibrator>
        <Term coefficient="1.0" exponent="1"/>
    </PolynomialCalibrator>
</Calibrator>
</ContextCalibrator>
<ContextCalibrator>
    <UseWhenCondition>
        <Condition>
            <ParameterInstanceRef
parameterRef="PosScale" useCalibratedValue="true"></ParameterInstanceRef>

<ComparisonOperator>==</ComparisonOperator>
        <Value>1</Value>
        </Condition>
    </UseWhenCondition>
</Calibrator>
    <PolynomialCalibrator>
        <Term coefficient="10.0" exponent="1"/>
    </PolynomialCalibrator>
</Calibrator>
</ContextCalibrator>

<ContextCalibrator>
    <UseWhenCondition>
        <Condition>
            <ParameterInstanceRef
parameterRef="PosScale" useCalibratedValue="true"></ParameterInstanceRef>

<ComparisonOperator>==</ComparisonOperator>
        <Value>2</Value>
        </Condition>
    </UseWhenCondition>
</Calibrator>
    <PolynomialCalibrator>
        <Term coefficient="1000.0"
exponent="1"/>
    </PolynomialCalibrator>
</Calibrator>
</ContextCalibrator>
<ContextCalibrator>
    <UseWhenCondition>
        <Condition>
            <ParameterInstanceRef
parameterRef="PosScale" useCalibratedValue="true"></ParameterInstanceRef>

<ComparisonOperator>==</ComparisonOperator>
        <Value>3</Value>
        </Condition>

```

```

        </UseWhenCondition>
        <Calibrator>
            <PolynomialCalibrator>
                <Term coefficient="1E20" exponent="1"/>
            </PolynomialCalibrator>
        </Calibrator>
    </ContextCalibrator>

    </ContextCalibratorList>
</IntegerDataEncoding>
</FloatParameterType>

<FloatParameterType name="TimeVernier" sizeInBits="64" shortDescription="LSB=1
milli seconds">
    <UnitSet>
        <Unit description="milli seconds">ms</Unit>
    </UnitSet>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
sizeInBits="10">
        <ByteOrderList>
            <Byte byteSignificance="2"/>
            <Byte byteSignificance="1"/>
        </ByteOrderList>
        <DefaultCalibrator>
            <PolynomialCalibrator>
                <Term coefficient="1.0" exponent="1"/>
            </PolynomialCalibrator>
        </DefaultCalibrator>
    </IntegerDataEncoding>
</FloatParameterType>

<IntegerParameterType name="Time" signed="false" sizeInBits="17"
shortDescription="Time: GMT time, LSB=1 sec">
    <UnitSet>
        <Unit description="seconds">s</Unit>
    </UnitSet>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
sizeInBits="17">
        <ByteOrderList>
            <Byte byteSignificance="3"/>
            <Byte byteSignificance="2"/>
            <Byte byteSignificance="1"/>
        </ByteOrderList>
        <DefaultCalibrator>
            <PolynomialCalibrator>
                <Term coefficient="1.0" exponent="1"/>
            </PolynomialCalibrator>
        </DefaultCalibrator>
    </IntegerDataEncoding>
</IntegerParameterType>

<BooleanParameterType name="SkinBeacon" oneStringValue="beacon"
zeroStringValue="skin">
    <UnitSet/>

```

```

        <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
    </BooleanParameterType>

    <BooleanParameterType name="ValidData" oneStringValue="valid-data"
zeroStringValue="not-valid">
        <UnitSet/>
        <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
    </BooleanParameterType>

    <FloatParameterType name="Velocity" sizeInBits="64" shortDescription="feet/
sec, two's complement negative number, LSB weighing depends upon SCV">
        <UnitSet>
            <Unit description="feetper second">ft/s</Unit>
        </UnitSet>
        <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="twosCompliment"
            sizeInBits="16">
            <ByteOrderList>
                <Byte byteSignificance="2"/>
                <Byte byteSignificance="1"/>
            </ByteOrderList>
            <ContextCalibratorList>
                <ContextCalibrator>
                    <UseWhenCondition>
                        <Condition>
                            <ParameterInstanceRef
parameterRef="VelScale" useCalibratedValue="true"></ParameterInstanceRef>
                        </Condition>
                    </UseWhenCondition>
                    <ComparisonOperator>==</ComparisonOperator>
                        <Value>0</Value>
                    </Condition>
                </UseWhenCondition>
                <Calibrator>
                    <PolynomialCalibrator>
                        <Term coefficient="1.0" exponent="1"/>
                    </PolynomialCalibrator>
                </Calibrator>
            </ContextCalibrator>
            <ContextCalibrator>
                <UseWhenCondition>
                    <Condition>
                        <ParameterInstanceRef
parameterRef="VelScale" useCalibratedValue="true"></ParameterInstanceRef>
                    </Condition>
                </UseWhenCondition>
                <ComparisonOperator>==</ComparisonOperator>
                    <Value>1</Value>
                </Condition>
            </UseWhenCondition>
            <Calibrator>
                <PolynomialCalibrator>
                    <Term coefficient="10.0" exponent="1"/>
                </PolynomialCalibrator>
            </Calibrator>
        </ContextCalibrator>
    </ContextCalibratorList>

```

```

        </IntegerDataEncoding>
    </FloatParameterType>

    <FloatParameterType name="SCV" sizeInBits="64" shortDescription="Velocity
Data Scale">
        <UnitSet/>
        <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned" sizeInBits="2">
            <ContextCalibratorList>
                <ContextCalibrator>
                    <UseWhenCondition>
                        <Condition>
                            <ParameterInstanceRef
parameterRef="VelScale" useCalibratedValue="false"></ParameterInstanceRef>
                        </Condition>
                    </UseWhenCondition>
                    <Value>0</Value>
                </ContextCalibrator>
            </ContextCalibratorList>
            <ContextCalibrator>
                <UseWhenCondition>
                    <Condition>
                        <ParameterInstanceRef
parameterRef="VelScale" useCalibratedValue="false"></ParameterInstanceRef>
                    </Condition>
                </UseWhenCondition>
                <Value>1</Value>
            </ContextCalibrator>
        </ContextCalibratorList>
    </IntegerDataEncoding>
</FloatParameterType>

<!-- Debug mode
    <FloatParameterType name="SCP" sizeInBits="64" shortDescription="Position
Data Scale Factor">
        <UnitSet>
            <Unit description="feet per second">ft/s</Unit>
        </UnitSet>
        <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
            sizeInBits="2">
            <DefaultCalibrator>

```

```

        <SplineCalibrator order="1">
            <SplinePoint calibrated="1" raw="0"/>
            <SplinePoint calibrated="10" raw="1"/>
            <SplinePoint calibrated="1000" raw="2"/>
            <SplinePoint calibrated="1E20" raw="3"/>
        </SplineCalibrator>
    </DefaultCalibrator>
</IntegerDataEncoding>
</FloatParameterType>
-->

    <FloatParameterType name="SCP" sizeInBits="64" shortDescription="Position
Data Scale Factor">
        <UnitSet/>
        <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned" sizeInBits="2">
            <ContextCalibratorList>
                <ContextCalibrator>
                    <UseWhenCondition>
                        <Condition>
                            <ParameterInstanceRef
parameterRef="PosScale" useCalibratedValue="false"></ParameterInstanceRef>
                        </Condition>
                    </UseWhenCondition>
                    <ComparisonOperator>==</ComparisonOperator>
                        <Value>0</Value>
                    </Condition>
                </ContextCalibrator>
                <ContextCalibrator>
                    <UseWhenCondition>
                        <Condition>
                            <ParameterInstanceRef
parameterRef="PosScale" useCalibratedValue="false"></ParameterInstanceRef>
                        </Condition>
                    </UseWhenCondition>
                    <ComparisonOperator>==</ComparisonOperator>
                        <Value>1</Value>
                    </Condition>
                </ContextCalibrator>
                <ContextCalibrator>
                    <UseWhenCondition>
                        <Condition>
                            <ParameterInstanceRef
parameterRef="PosScale" useCalibratedValue="false"></ParameterInstanceRef>
                        </Condition>
                    </UseWhenCondition>
                    <ComparisonOperator>==</ComparisonOperator>
                        <Value>10</Value>
                    </Condition>
                </ContextCalibrator>
            </ContextCalibratorList>
        </IntegerDataEncoding>
    </FloatParameterType>

```

```

                <Value>2</Value>
            </Condition>
        </UseWhenCondition>
    </Calibrator>
    <PolynomialCalibrator>
        <Term coefficient="1000"
exponent="0"/>
    </PolynomialCalibrator>
</Calibrator>
</ContextCalibrator>
<ContextCalibrator>
    <UseWhenCondition>
        <Condition>
            <ParameterInstanceRef
parameterRef="PosScale" useCalibratedValue="false"></ParameterInstanceRef>
        </Condition>
    </UseWhenCondition>
</ContextCalibrator>
<ComparisonOperator>==</ComparisonOperator>
    <Value>3</Value>
    </Condition>
</UseWhenCondition>
<Calibrator>
    <PolynomialCalibrator>
        <Term coefficient="1E20"
exponent="0"/>
    </PolynomialCalibrator>
</Calibrator>
</ContextCalibrator>
</ContextCalibratorList>
</IntegerDataEncoding>
</FloatParameterType>

    <IntegerParameterType name="DayOfYr" signed="false" sizeInBits="10"
shortDescription="Day of Year">
    <UnitSet>
        <Unit>day</Unit>
    </UnitSet>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
        sizeInBits="10">
        <ByteOrderList>
            <Byte byteSignificance="2"/>
            <Byte byteSignificance="1"/>
        </ByteOrderList>
    </IntegerDataEncoding>
</IntegerParameterType>

    <IntegerParameterType name="SiteID" signed="false" sizeInBits="8"
shortDescription="Site ID">
    <UnitSet/>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst" encoding=
"unsigned"
        sizeInBits="8">
        <ByteOrderList>
            <Byte byteSignificance="1"/>
        </ByteOrderList>
    </IntegerDataEncoding>

```

```

</IntegerParameterType>

<BinaryParameterType name="Unused2" shortDescription="Unused: size=2 bits" >
  <UnitSet/>
  <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
    <SizeInBits>
      <FixedValue>2</FixedValue>
    </SizeInBits>
  </BinaryDataEncoding>
</BinaryParameterType>

<FloatParameterType name="FracVel" sizeInBits="64"
shortDescription="Fractional Velocity, LSB weighing depends upon SCV, appended to
Velocity ">
  <UnitSet>
    <Unit description="feet per second">ft/s</Unit>
  </UnitSet>
  <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
sizeInBits="4">
    <ByteOrderList>
      <Byte byteSignificance="1"/>
    </ByteOrderList>
  <ContextCalibratorList>
    <ContextCalibrator>
      <UseWhenCondition>
        <Condition>
          <ParameterInstanceRef
parameterRef="VelScale" useCalibratedValue="true"></ParameterInstanceRef>
        </Condition>
      </UseWhenCondition>
      <Calibrator>
        <PolynomialCalibrator>
          <Term coefficient="1.0" exponent="1"/>
        </PolynomialCalibrator>
      </Calibrator>
    </ContextCalibrator>
    <ContextCalibrator>
      <UseWhenCondition>
        <Condition>
          <ParameterInstanceRef
parameterRef="VelScale" useCalibratedValue="true"></ParameterInstanceRef>
        </Condition>
      </UseWhenCondition>
      <Calibrator>
        <PolynomialCalibrator>
          <Term coefficient="10.0" exponent="1"/>
        </PolynomialCalibrator>
      </Calibrator>
    </ContextCalibrator>
  </ContextCalibratorList>
</IntegerDataEncoding>
</FloatParameterType>

```

```

        </ContextCalibratorList>
        </IntegerDataEncoding>
    </FloatParameterType>

    <BinaryParameterType name="Spares">
        <UnitSet/>
        <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
            <SizeInBits>
                <FixedValue>6</FixedValue>
            </SizeInBits>
        </BinaryDataEncoding>
    </BinaryParameterType>
</ParameterTypeSet>

<ParameterSet>
    <Parameter name="CRC" parameterTypeRef="CRC" />
    <Parameter name="FrameSync" parameterTypeRef="FrameSync" />
    <Parameter name="ActivePassive" parameterTypeRef="ActivePassive" />
    <Parameter name="GoodData" parameterTypeRef="TrueFalse" />
    <Parameter name="OnAxisMode" parameterTypeRef="TrueFalse" />
    <Parameter name="AutoTrack" parameterTypeRef="TrueFalse" />
    <Parameter name="CompDriveMode" parameterTypeRef="TrueFalse" />
    <Parameter name="StarData" parameterTypeRef="StarData" />
    <Parameter name="V0" parameterTypeRef="TrueFalse" shortDescription="Vehicle
Number V0" />
    <Parameter name="V1" parameterTypeRef="TrueFalse" shortDescription="Vehicle
Number V1" />
    <Parameter name="V2" parameterTypeRef="TrueFalse" shortDescription="Vehicle
Number V2" />
    <Parameter name="SubSync" parameterTypeRef="SubSync" />
    <Parameter name="EAxis" parameterTypeRef="Axis" />
    <Parameter name="FAxis" parameterTypeRef="Axis" />
    <Parameter name="GAxis" parameterTypeRef="Axis" />
    <Parameter name="TimeVernier" parameterTypeRef="TimeVernier" />
    <Parameter name="Time" parameterTypeRef="Time" />
    <Parameter name="UnUsedB" parameterTypeRef="UnUsed1" />
    <Parameter name="SkinBeacon" parameterTypeRef="SkinBeacon" />
    <Parameter name="ValidData" parameterTypeRef="ValidData" />
    <Parameter name="EVelocity" parameterTypeRef="Velocity" />
    <Parameter name="VelScale" parameterTypeRef="SCV" />
    <Parameter name="PosScale" parameterTypeRef="SCP" />
    <Parameter name="DayOfYr" parameterTypeRef="DayOfYr" />
    <Parameter name="FVelocity" parameterTypeRef="Velocity" />
    <Parameter name="SiteID" parameterTypeRef="SiteID" />
    <Parameter name="UnUsedC" parameterTypeRef="UnUsed2" />
    <Parameter name="FracEVel" parameterTypeRef="FracVel" />
    <Parameter name="GVelocity" parameterTypeRef="Velocity" />
    <Parameter name="Spares" parameterTypeRef="Spares" />
    <Parameter name="FracGVel" parameterTypeRef="FracVel" />
    <Parameter name="FracFVel" parameterTypeRef="FracVel" />
</ParameterSet>

<ContainerSet>
    <SequenceContainer name="Frame">
        <EntryList>
            <ParameterRefEntry parameterRef="CRC" />

```

```

<ParameterRefEntry parameterRef="FrameSync" />
<ParameterRefEntry parameterRef="ActivePassive" />
<ParameterRefEntry parameterRef="GoodData" />
<ParameterRefEntry parameterRef="OnAxisMode" />

<ParameterRefEntry parameterRef="AutoTrack" />
<ParameterRefEntry parameterRef="CompDriveMode" />
<ParameterRefEntry parameterRef="StarData" />
<ParameterRefEntry parameterRef="V0" />
<ParameterRefEntry parameterRef="V1" />
<ParameterRefEntry parameterRef="V2" />
<ParameterRefEntry parameterRef="SubSync" />
<ParameterRefEntry parameterRef="EAxis" />
<ParameterRefEntry parameterRef="FAxis" />
<ParameterRefEntry parameterRef="GAxis" />
<ParameterRefEntry parameterRef="TimeVernier" />
<ParameterRefEntry parameterRef="Time" />
<ParameterRefEntry parameterRef="UnUsedB" />
<ParameterRefEntry parameterRef="SkinBeacon" />
<ParameterRefEntry parameterRef="ValidData" />
<ParameterRefEntry parameterRef="EVelocity" />
<ParameterRefEntry parameterRef="VelScale" />
<ParameterRefEntry parameterRef="PosScale" />
<ParameterRefEntry parameterRef="DayOfYr" />
<ParameterRefEntry parameterRef="FVelocity" />
<ParameterRefEntry parameterRef="SiteID" />
<ParameterRefEntry parameterRef="UnUsedC" />
<ParameterRefEntry parameterRef="FracEVel" />
<ParameterRefEntry parameterRef="GVelocity" />
<ParameterRefEntry parameterRef="Spares" />
<ParameterRefEntry parameterRef="FracGVel" />
<ParameterRefEntry parameterRef="FracFVel" />
    </EntryList>
  </SequenceContainer>
</ContainerSet>

<StreamSet>
  <FixedFrameStream name="Serial" frameLengthInBits="240">
    <ContainerRef containerRef="Frame" />
    <SyncStrategy>
      <SyncPattern bitLocationFromStartOfContainer="9" pattern="E2"
patternLengthInBits="7" />
    </SyncStrategy>
  </FixedFrameStream>
</StreamSet>

</TelemetryMetaData>
</SpaceSystem>

```

IRIG161_2C format definition:

```
<?xml version="1.0" encoding="UTF-8"?>
<SpaceSystem name="Format161_2C" shortDescription="Format161_2C, 240-Bit Format (EFG)"
  xmlns="http://www.omg.org/space/xtce" xmlns:xsi="http://www.w3.org/2001/XMLSchema-
  instance"
  xsi:schemaLocation="http://www.omg.org/space/xtce SpaceSystemV1.0.xsd">
  <LongDescription>This format is used by PMRF to transmit acquisition and metric
    tracking data to the Kaena Point FPQ-14 radar, the Air Force Kaena Point Satellite
    Tracking Facility, the Sandia Kauai Test Facility of PMRF, KMR, and 30 SW.
  </LongDescription>

  <Header date="Jun 2005" validationStatus="Unknown" version="161-00">
    <AuthorSet>
      <Author>Data Reduction and Computer Group</Author>
      <Author>Range Commanders Council</Author>
      <Author>Translated to XTCE by Command and Control Technologies, Inc.</Author>
    </AuthorSet>
    <NoteSet>
      <Note>KMRFlag is created to identify if it is a KMR message.</Note>
    </NoteSet>
    <HistorySet>
      <History>Initial implementation</History>
    </HistorySet>
  </Header>

  <TelemetryMetaData>

  <ParameterTypeSet>
    <BinaryParameterType name="FrameSync" shortDescription="Pattern 1110010;
    complemented every other frame" >
      <UnitSet/>
      <BinaryDataEncoding bitOrder="mostSignificantBitFirst">
        <SizeInBits>
          <FixedValue>7</FixedValue>
        </SizeInBits>
      </BinaryDataEncoding>
    </BinaryParameterType>

    <!-- KMRFlag is created to identify if it is a KMR message.-->
    <BooleanParameterType name="KMRFlag" oneStringValue="true"
    zeroStringValue="false" shortDescription="If this is a KMR message">
      <UnitSet/>
      <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
    </BooleanParameterType>

    <EnumeratedParameterType name="ZeroVal" shortDescription="Zero Value: Bit set
    to 0">
      <UnitSet/>
      <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
    encoding="unsigned"
      sizeInBits="1"/>
      <EnumerationList>
        <Enumeration label="ZeroValue" value="0"/>
      </EnumerationList>
    </EnumeratedParameterType>
  </ParameterTypeSet>
</SpaceSystem>
```

```

    </EnumerationList>
  </EnumeratedParameterType>

  <EnumeratedParameterType name="OneVal" shortDescription="One Value: Bit set
to 1">
    <UnitSet/>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
      sizeInBits="1"/>
    <EnumerationList>
      <Enumeration label="ZeroValue" value="1"/>
    </EnumerationList>
  </EnumeratedParameterType>

  <BinaryParameterType name="UnUsed1" shortDescription="Unused: size=1 bit" >
    <UnitSet/>
    <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
      <SizeInBits>
        <FixedValue>1</FixedValue>
      </SizeInBits>
    </BinaryDataEncoding>
  </BinaryParameterType>

  <BooleanParameterType name="TrueFalse" oneStringValue="true"
zeroStringValue="false">
    <UnitSet/>
    <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
  </BooleanParameterType>

  <BooleanParameterType name="StarData" oneStringValue="star-data"
zeroStringValue="normal-data">
    <UnitSet/>
    <IntegerDataEncoding encoding="unsigned" sizeInBits="1"/>
  </BooleanParameterType>

  <BinaryParameterType name="VehicleNum" shortDescription="Vehicle Number: V0,
V1, V2">
    <UnitSet/>
    <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
      <SizeInBits>
        <FixedValue>3</FixedValue>
      </SizeInBits>
    </BinaryDataEncoding>
  </BinaryParameterType>

  <BinaryParameterType name="SubSync" shortDescription="Sub Sync: pattern
11010, complemented every other frame">
    <UnitSet/>
    <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
      <SizeInBits>
        <FixedValue>5</FixedValue>
      </SizeInBits>
    </BinaryDataEncoding>
  </BinaryParameterType>

```

```

<FloatParameterType name="Axis" sizeInBits="64">
  <UnitSet>
    <Unit description="feet">ft</Unit>
  </UnitSet>
  <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
  sizeInBits="30">
    <ByteOrderList>
      <Byte byteSignificance="4" />
      <Byte byteSignificance="3" />
      <Byte byteSignificance="2" />
      <Byte byteSignificance="1" />
    </ByteOrderList>
    <ContextCalibratorList>
      <ContextCalibrator>
        <UseWhenCondition>
          <Condition>
            <ParameterInstanceRef
parameterRef="PosScale" useCalibratedValue="true"></ParameterInstanceRef>
          </Condition>
          <ComparisonOperator>==</ComparisonOperator>
            <Value>0</Value>
          </Condition>
        </UseWhenCondition>
        <Calibrator>
          <PolynomialCalibrator>
            <Term coefficient="1.0" exponent="1" />
          </PolynomialCalibrator>
        </Calibrator>
      </ContextCalibrator>
      <ContextCalibrator>
        <UseWhenCondition>
          <Condition>
            <ParameterInstanceRef
parameterRef="PosScale" useCalibratedValue="true"></ParameterInstanceRef>
          </Condition>
          <ComparisonOperator>==</ComparisonOperator>
            <Value>1</Value>
          </Condition>
        </UseWhenCondition>
        <Calibrator>
          <PolynomialCalibrator>
            <Term coefficient="10.0" exponent="1" />
          </PolynomialCalibrator>
        </Calibrator>
      </ContextCalibrator>
      <ContextCalibrator>
        <UseWhenCondition>
          <Condition>
            <ParameterInstanceRef
parameterRef="PosScale" useCalibratedValue="true"></ParameterInstanceRef>
          </Condition>
          <ComparisonOperator>==</ComparisonOperator>
            <Value>2</Value>
          </Condition>
        </UseWhenCondition>
      </ContextCalibrator>
    </ContextCalibratorList>
  </IntegerDataEncoding>
</FloatParameterType>

```

```

        </UseWhenCondition>
        <Calibrator>
            <PolynomialCalibrator>
                <Term coefficient="1000.0"
exponent="1"/>
            </PolynomialCalibrator>
        </Calibrator>
    </ContextCalibrator>
    <ContextCalibrator>
        <UseWhenCondition>
            <Condition>
                <ParameterInstanceRef
parameterRef="PosScale" useCalibratedValue="true"></ParameterInstanceRef>
            </Condition>
        </UseWhenCondition>
        <ComparisonOperator>==</ComparisonOperator>
            <Value>3</Value>
        </Condition>
    </UseWhenCondition>
    <Calibrator>
        <PolynomialCalibrator>
            <Term coefficient="1E20" exponent="1"/>
        </PolynomialCalibrator>
    </Calibrator>
</ContextCalibrator>

    </ContextCalibratorList>
</IntegerDataEncoding>
</FloatParameterType>

    <FloatParameterType name="TimeVernier" sizeInBits="64" shortDescription="LSB=1
milli seconds">
        <UnitSet>
            <Unit description="milli seconds">ms</Unit>
        </UnitSet>
        <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
        sizeInBits="10">
            <ByteOrderList>
                <Byte byteSignificance="2"/>
                <Byte byteSignificance="1"/>
            </ByteOrderList>
            <DefaultCalibrator>
                <PolynomialCalibrator>
                    <Term coefficient="1.0" exponent="1"/>
                </PolynomialCalibrator>
            </DefaultCalibrator>
        </IntegerDataEncoding>
    </FloatParameterType>

    <IntegerParameterType name="Time" signed="false" sizeInBits="17"
shortDescription="Time: GMT time, LSB=1 sec">
        <UnitSet>
            <Unit description="seconds">s</Unit>
        </UnitSet>
        <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"

```

```

        sizeInBits="17">
        <ByteOrderList>
            <Byte byteSignificance="3" />
            <Byte byteSignificance="2" />
            <Byte byteSignificance="1" />
        </ByteOrderList>
        <DefaultCalibrator>
            <PolynomialCalibrator>
                <Term coefficient="1.0" exponent="1" />
            </PolynomialCalibrator>
        </DefaultCalibrator>
    </IntegerDataEncoding>
</IntegerParameterType>

    <BooleanParameterType name="SkinBeacon" oneStringValue="beacon"
zeroStringValue="skin">
        <UnitSet />
        <IntegerDataEncoding encoding="unsigned" sizeInBits="1" />
    </BooleanParameterType>

    <BooleanParameterType name="ValidData" oneStringValue="valid-data"
zeroStringValue="not-valid">
        <UnitSet />
        <IntegerDataEncoding encoding="unsigned" sizeInBits="1" />
    </BooleanParameterType>

    <FloatParameterType name="Velocity" sizeInBits="64" shortDescription="feet/
sec, two's complement negative number, LSB weighing depends upon SCV">
        <UnitSet>
            <Unit description="feetper second">ft/s</Unit>
        </UnitSet>
        <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="twosCompliment"
        sizeInBits="16">
            <ByteOrderList>
                <Byte byteSignificance="2" />
                <Byte byteSignificance="1" />
            </ByteOrderList>
            <ContextCalibratorList>
                <ContextCalibrator>
                    <UseWhenCondition>
                        <Condition>
                            <ParameterInstanceRef
parameterRef="VelScale" useCalibratedValue="true"></ParameterInstanceRef>
                        </Condition>
                    </UseWhenCondition>
                    <Value>0</Value>
                </ContextCalibrator>
            </ContextCalibratorList>
            <Calibrator>
                <PolynomialCalibrator>
                    <Term coefficient="1.0" exponent="1" />
                </PolynomialCalibrator>
            </Calibrator>
        </ContextCalibrator>
    </ContextCalibrator>

```

```

        <UseWhenCondition>
            <Condition>
                <ParameterInstanceRef
parameterRef="VelScale" useCalibratedValue="true"></ParameterInstanceRef>

<ComparisonOperator>==</ComparisonOperator>

                <Value>1</Value>
            </Condition>
        </UseWhenCondition>
        <Calibrator>
            <PolynomialCalibrator>
                <Term coefficient="10.0" exponent="1"/>
            </PolynomialCalibrator>
        </Calibrator>
    </ContextCalibrator>

    </ContextCalibratorList>
</IntegerDataEncoding>
</FloatParameterType>

    <FloatParameterType name="SCV" sizeInBits="64" shortDescription="Velocity
Data Scale">
        <UnitSet/>
        <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned" sizeInBits="2">
            <ContextCalibratorList>
                <ContextCalibrator>
                    <UseWhenCondition>
                        <Condition>
                            <ParameterInstanceRef
parameterRef="VelScale" useCalibratedValue="false"></ParameterInstanceRef>

<ComparisonOperator>==</ComparisonOperator>

                            <Value>0</Value>
                        </Condition>
                    </UseWhenCondition>
                    <Calibrator>
                        <PolynomialCalibrator>
                            <Term coefficient="1" exponent="0"/>
                        </PolynomialCalibrator>
                    </Calibrator>
                </ContextCalibrator>
                <ContextCalibrator>
                    <UseWhenCondition>
                        <Condition>
                            <ParameterInstanceRef
parameterRef="VelScale" useCalibratedValue="false"></ParameterInstanceRef>

<ComparisonOperator>==</ComparisonOperator>

                            <Value>1</Value>
                        </Condition>
                    </UseWhenCondition>
                    <Calibrator>
                        <PolynomialCalibrator>
                            <Term coefficient="10" exponent="0"/>

```

```

        </PolynomialCalibrator>
    </Calibrator>
</ContextCalibrator>
</ContextCalibratorList>
</IntegerDataEncoding>
</FloatParameterType>

    <FloatParameterType name="SCP" sizeInBits="64" shortDescription="Position
Data Scale Factor">
    <UnitSet/>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned" sizeInBits="2">
    <ContextCalibratorList>
    <ContextCalibrator>
    <UseWhenCondition>
    <Condition>
    <ParameterInstanceRef
parameterRef="PosScale" useCalibratedValue="false"></ParameterInstanceRef>

    <ComparisonOperator>==</ComparisonOperator>
    <Value>0</Value>
    </Condition>
    </UseWhenCondition>
    <Calibrator>
    <PolynomialCalibrator>
    <Term coefficient="1" exponent="0"/>
    </PolynomialCalibrator>
    </Calibrator>
    </ContextCalibrator>
    <ContextCalibrator>
    <UseWhenCondition>
    <Condition>
    <ParameterInstanceRef
parameterRef="PosScale" useCalibratedValue="false"></ParameterInstanceRef>

    <ComparisonOperator>==</ComparisonOperator>
    <Value>1</Value>
    </Condition>
    </UseWhenCondition>
    <Calibrator>
    <PolynomialCalibrator>
    <Term coefficient="10" exponent="0"/>
    </PolynomialCalibrator>
    </Calibrator>
    </ContextCalibrator>
    <ContextCalibrator>
    <UseWhenCondition>
    <Condition>
    <ParameterInstanceRef
parameterRef="PosScale" useCalibratedValue="false"></ParameterInstanceRef>

    <ComparisonOperator>==</ComparisonOperator>
    <Value>2</Value>
    </Condition>
    </UseWhenCondition>

```

```

        <Calibrator>
            <PolynomialCalibrator>
                <Term coefficient="1000"
exponent="0" />
            </PolynomialCalibrator>
        </Calibrator>
    </ContextCalibrator>
</ContextCalibrator>
    <UseWhenCondition>
        <Condition>
            <ParameterInstanceRef
parameterRef="PosScale" useCalibratedValue="false"></ParameterInstanceRef>
        </Condition>
    </UseWhenCondition>
    <Calibrator>
        <PolynomialCalibrator>
            <Term coefficient="1E20"
exponent="0" />
        </PolynomialCalibrator>
    </Calibrator>
</ContextCalibratorList>
</IntegerDataEncoding>
</FloatParameterType>

    <IntegerParameterType name="DayOfYr" signed="false" sizeInBits="10"
shortDescription="Day of Year">
    <UnitSet>
        <Unit>day</Unit>
    </UnitSet>
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
encoding="unsigned"
        sizeInBits="10">
        <ByteOrderList>
            <Byte byteSignificance="2" />
            <Byte byteSignificance="1" />
        </ByteOrderList>
    </IntegerDataEncoding>
</IntegerParameterType>

    <IntegerParameterType name="SiteID" signed="false" sizeInBits="8"
shortDescription="Site ID">
    <UnitSet />
    <IntegerDataEncoding bitOrder="leastSignificantBitFirst" encoding=
"unsigned"
        sizeInBits="8">
        <ByteOrderList>
            <Byte byteSignificance="1" />
        </ByteOrderList>
    </IntegerDataEncoding>
</IntegerParameterType>

    <BinaryParameterType name="UnUsed2" shortDescription="Unused: size=2 bits" >

```

```

<UnitSet/>
<BinaryDataEncoding bitOrder="leastSignificantBitFirst">
  <SizeInBits>
    <FixedValue>2</FixedValue>
  </SizeInBits>
</BinaryDataEncoding>
</BinaryParameterType>

<FloatParameterType name="FracVel" sizeInBits="64"
shortDescription="Fractional Velocity, LSB weighing depends upon SCV, appended to
Velocity ">
  <UnitSet>
    <Unit description="feet per second">ft/s</Unit>
  </UnitSet>
  <IntegerDataEncoding bitOrder="leastSignificantBitFirst"
sizeInBits="4">
    <ByteOrderList>
      <Byte byteSignificance="1"/>
    </ByteOrderList>
    <ContextCalibratorList>
      <ContextCalibrator>
        <UseWhenCondition>
          <Condition>
            <ParameterInstanceRef
parameterRef="VelScale" useCalibratedValue="true"></ParameterInstanceRef>
          </Condition>
        </UseWhenCondition>
        <Value>0</Value>
      </ContextCalibrator>
      <ContextCalibrator>
        <UseWhenCondition>
          <Condition>
            <ParameterInstanceRef
parameterRef="VelScale" useCalibratedValue="true"></ParameterInstanceRef>
          </Condition>
        </UseWhenCondition>
        <Calibrator>
          <PolynomialCalibrator>
            <Term coefficient="1.0" exponent="1"/>
          </PolynomialCalibrator>
        </Calibrator>
      </ContextCalibrator>
      <ContextCalibrator>
        <UseWhenCondition>
          <Condition>
            <ParameterInstanceRef
parameterRef="VelScale" useCalibratedValue="true"></ParameterInstanceRef>
          </Condition>
        </UseWhenCondition>
        <Value>1</Value>
      </ContextCalibrator>
      <ContextCalibrator>
        <UseWhenCondition>
          <Condition>
            <ParameterInstanceRef
parameterRef="VelScale" useCalibratedValue="true"></ParameterInstanceRef>
          </Condition>
        </UseWhenCondition>
        <Calibrator>
          <PolynomialCalibrator>
            <Term coefficient="10.0" exponent="1"/>
          </PolynomialCalibrator>
        </Calibrator>
      </ContextCalibrator>
    </ContextCalibratorList>
  </IntegerDataEncoding>
</FloatParameterType>

```

```

    <BinaryParameterType name="FilterCoef" shortDescription="1000 (1-B) FPQ-14
Filter Coefficient, 000000=perfect data" >
    <UnitSet/>
    <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
        <SizeInBits>
            <FixedValue>6</FixedValue>
        </SizeInBits>
    </BinaryDataEncoding>
</BinaryParameterType>

    <BinaryParameterType name="CRC" shortDescription="Cyclic redundancy check for
error detection" >
    <UnitSet/>
    <BinaryDataEncoding bitOrder="leastSignificantBitFirst">
        <SizeInBits>
            <FixedValue>9</FixedValue>
        </SizeInBits>
    </BinaryDataEncoding>
</BinaryParameterType>
</ParameterTypeSet>

<ParameterSet>
    <Parameter name="FrameSync" parameterTypeRef="FrameSync"/>
    <Parameter name="ZeroValA" parameterTypeRef="ZeroVal"/>
    <Parameter name="KMRFlag" parameterTypeRef="KMRFlag"/>

    <Parameter name="ST" parameterTypeRef="OneVal" shortDescription="ST: set bit
to 1 if KMR message">
        <ParameterProperties>
            <ValidityCondition>
                <Comparison parameterRef="KMRFlag" value="1"
useCalibratedValue="false"></Comparison>
            </ValidityCondition>
        </ParameterProperties>
    </Parameter>

    <Parameter name="ZeroValB" parameterTypeRef="ZeroVal" shortDescription="Set
bit to 0 for any other type of message">
        <ParameterProperties>
            <ValidityCondition>
                <Comparison parameterRef="KMRFlag" value="0"
useCalibratedValue="false"></Comparison>
            </ValidityCondition>
        </ParameterProperties>
    </Parameter>

    <Parameter name="ZeroValC" parameterTypeRef="ZeroVal"/>

    <Parameter name="OnTrackMode" parameterTypeRef="OneVal"
shortDescription="OnTrackMode: set bit to 1 if KMR message">
        <ParameterProperties>
            <ValidityCondition>
                <Comparison parameterRef="KMRFlag" value="1"
useCalibratedValue="false"></Comparison>
            </ValidityCondition>
        </ParameterProperties>

```

```

    </Parameter>
    <Parameter name="ZeroValD" parameterTypeRef="ZeroVal" shortDescription="Set
bit to 0 for any other type of message">
      <ParameterProperties>
        <ValidityCondition>
          <Comparison parameterRef="KMRFlag" value="0"
useCalibratedValue="false"></Comparison>
        </ValidityCondition>
      </ParameterProperties>
    </Parameter>
    <Parameter name="ZeroValE" parameterTypeRef="ZeroVal" />
    <Parameter name="ZeroValF" parameterTypeRef="ZeroVal" />
    <Parameter name="V0" parameterTypeRef="TrueFalse" shortDescription="Vehicle
Number V0" />
    <Parameter name="V1" parameterTypeRef="TrueFalse" shortDescription="Vehicle
Number V1" />
    <Parameter name="V2" parameterTypeRef="TrueFalse" shortDescription="Vehicle
Number V2" />
    <Parameter name="SubSync" parameterTypeRef="SubSync" />
    <Parameter name="EAxis" parameterTypeRef="Axis" />
    <Parameter name="FAxis" parameterTypeRef="Axis" />
    <Parameter name="GAxis" parameterTypeRef="Axis" />
    <Parameter name="TimeVernier" parameterTypeRef="TimeVernier" />
    <Parameter name="Time" parameterTypeRef="Time" />
    <Parameter name="UnUsedB" parameterTypeRef="UnUsed1" />
    <Parameter name="SkinBeacon" parameterTypeRef="SkinBeacon" />
    <Parameter name="ValidData" parameterTypeRef="ValidData" />
    <Parameter name="EVelocity" parameterTypeRef="Velocity" />
    <Parameter name="VelScale" parameterTypeRef="SCV" />
    <Parameter name="PosScale" parameterTypeRef="SCP" />
    <Parameter name="DayOfYr" parameterTypeRef="DayOfYr" />
    <Parameter name="FVelocity" parameterTypeRef="Velocity" />
    <Parameter name="SiteID" parameterTypeRef="SiteID" />
    <Parameter name="UnUsedC" parameterTypeRef="UnUsed2" />
    <Parameter name="FracEVel" parameterTypeRef="FracVel" />
    <Parameter name="GVelocity" parameterTypeRef="Velocity" />
    <Parameter name="FilterCoef" parameterTypeRef="FilterCoef" />
    <Parameter name="FracGVel" parameterTypeRef="FracVel" />
    <Parameter name="FracFVel" parameterTypeRef="FracVel" />
    <Parameter name="CRC" parameterTypeRef="CRC" />
  </ParameterSet>

  <ContainerSet>
    <SequenceContainer name="Frame">
      <EntryList>
        <ParameterRefEntry parameterRef="FrameSync" />
        <ParameterRefEntry parameterRef="ZeroValA" />
        <ParameterRefEntry parameterRef="ST">
          <IncludeCondition>
            <Comparison parameterRef="KMRFlag" value="1"
useCalibratedValue="false"></Comparison>
          </IncludeCondition>
        </ParameterRefEntry>
        <ParameterRefEntry parameterRef="ZeroValB">
          <IncludeCondition>

```

```

        <Comparison parameterRef="KMRFlag" value="0"
useCalibratedValue="false"></Comparison>
        </IncludeCondition>
    </ParameterRefEntry>

    <ParameterRefEntry parameterRef="ZeroValC" />

    <ParameterRefEntry parameterRef="OnTrackMode">

        <IncludeCondition>
            <Comparison parameterRef="KMRFlag" value="1"
useCalibratedValue="false"></Comparison>
            </IncludeCondition>
        </ParameterRefEntry>
        <ParameterRefEntry parameterRef="ZeroValD">

            <IncludeCondition>
                <Comparison parameterRef="KMRFlag" value="0"
useCalibratedValue="false"></Comparison>
                </IncludeCondition>
            </ParameterRefEntry>
            <ParameterRefEntry parameterRef="ZeroValE" />
            <ParameterRefEntry parameterRef="ZeroValF" />
            <ParameterRefEntry parameterRef="V0" />
            <ParameterRefEntry parameterRef="V1" />
            <ParameterRefEntry parameterRef="V2" />
            <ParameterRefEntry parameterRef="SubSync" />
            <ParameterRefEntry parameterRef="EAxis" />
            <ParameterRefEntry parameterRef="FAxis" />
            <ParameterRefEntry parameterRef="GAxis" />
            <ParameterRefEntry parameterRef="TimeVernier" />
            <ParameterRefEntry parameterRef="Time" />
            <ParameterRefEntry parameterRef="UnUsedB" />
            <ParameterRefEntry parameterRef="SkinBeacon" />
            <ParameterRefEntry parameterRef="ValidData" />
            <ParameterRefEntry parameterRef="EVelocity" />
            <ParameterRefEntry parameterRef="VelScale" />
            <ParameterRefEntry parameterRef="PosScale" />
            <ParameterRefEntry parameterRef="DayOfYr" />
            <ParameterRefEntry parameterRef="FVelocity" />
            <ParameterRefEntry parameterRef="SiteID" />
            <ParameterRefEntry parameterRef="UnUsedC" />
            <ParameterRefEntry parameterRef="FracEVel" />
            <ParameterRefEntry parameterRef="GVelocity" />
            <ParameterRefEntry parameterRef="FilterCoef" />
            <ParameterRefEntry parameterRef="FracGVel" />
            <ParameterRefEntry parameterRef="FracFVel" />
            <ParameterRefEntry parameterRef="CRC" />
        </EntryList>
    </SequenceContainer>
</ContainerSet>

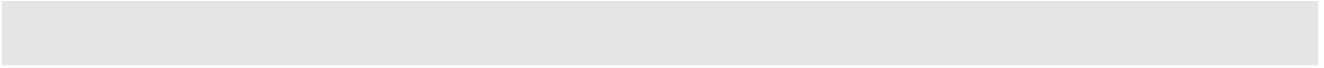
<StreamSet>
    <FixedFrameStream name="Serial" frameLengthInBits="240">
        <ContainerRef containerRef="Frame" />
        <SyncStrategy>

```

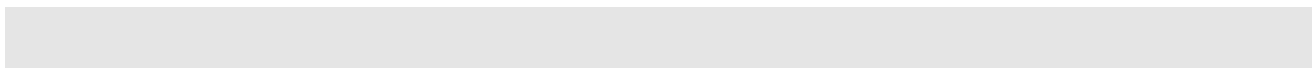
```
        <SyncPattern bitLocationFromStartOfContainer="9" pattern="E2"
patternLengthInBits="7" />
        </SyncStrategy>
    </FixedFrameStream>
</StreamSet>

</TelemetryMetaData>
</SpaceSystem>
```

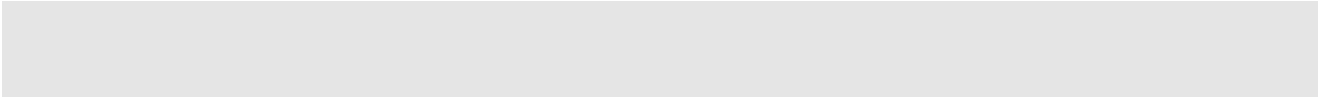
IRIG161_3 format definition:



IRIG161_3A format definition:



IRIG161_8 format definition:



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