

451-ICD-NCCDS/MOC  
(formerly 530-ICD-NCCDS/MOC)

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**NETWORKS AND MISSION SERVICES PROJECT**

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**Interface Control Document  
Between the  
Network Control Center Data  
System  
and the  
Mission Operations Centers**

Revision 1  
June 1999



National Aeronautics and  
Space Administration

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Goddard Space Flight Center  
Greenbelt, Maryland

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# Interface Control Document Between the Network Control Center Data System and the Mission Operations Centers

June 1999

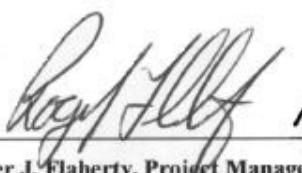
Prepared Under Contract NAS-9-98100

Prepared By:



Kant R. Patel 6/4/99  
Computer Sciences Corporation  
NCC Project

Approved By:

11/16/00  
Roger N. Clason, Project Manager  
NCC Project, Code 451.5  
Goddard Space Flight Center11/29/00  
Roger J. Flaherty, Project Manager  
Space Network Project, Code 451  
Goddard Space Flight Center11/1/2000  
David J. Littmann, Chairman  
Configuration Control Board  
Space Network Project, Code 451  
Goddard Space Flight Center

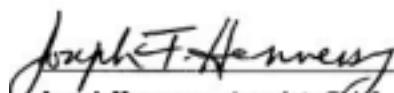
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Revision 1

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Approved By:

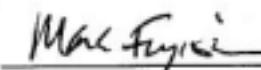
  
Joseph F. Hennessey, Associate Chief  
Information Systems Center, Code 580  
Goddard Space Flight Center  
10/30/00  
Date

  
Axel Roth, Director  
Flight Projects Directorate, FD01  
Marshall Space Flight Center  
10 Feb 00  
Date

  
Dr. R. S. Wallace, Project Manager  
Consolidated Space Operations Contract, Code 450.C  
Goddard Space Flight Center  
11/5/00  
Date

  
Dorothy C. Perkins, Deputy Asso. Dir.  
Flight Projects for EOS Operations, Code 423.  
Goddard Space Flight Center  
6/25/00  
Date

  
Thomas J. Kalaskey, Project Manager  
STARLink Project Office  
Ames Research Center  
01/31/00  
Date

  
Mark D. Fujishin, Manager  
Earth Science Mission Operations  
Jet Propulsion Laboratory  
3/27/00  
Date

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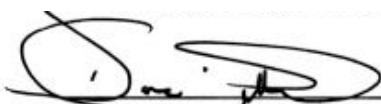
Approved By:

Arnold L. Torres 11/14/00

Arnold L. Torres, Director Date  
Suborbital and Special Orbital Projects, Code 800  
Wallops Flight Facility

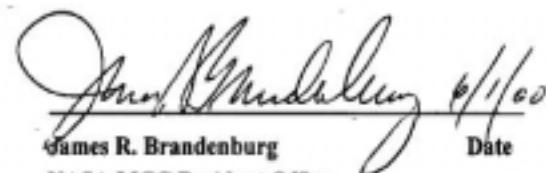
Roger J. Flaherty 11/29/00

Roger J. Flaherty, Project Manager Date  
Special Projects and Missions  
Goddard Space Flight Center



11/01/2000

William J. Guit, Mission Director Date  
LANDSAT-7 Project, Code 428  
Goddard Space Flight Center

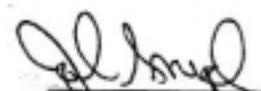


James R. Brandenburg Date  
NASA MCC Resident Office  
Johnson Space Flight Center

Rex Geveden

09/25/00

Rex Geveden, Program Manager Date  
Gravity Probe-B Project  
Marshall Space Flight Center



09/25/00

John Snyder Date  
CSOC JSC Site Manager  
Consolidated Space Operations Contract

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## Preface

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The information contained in this document applies to the interface between the Goddard Space Flight Center (GSFC) Network Control Center (NCC) Data System (NCCDS) and the National Aeronautics and Space Administration (NASA) Mission Operations Centers (MOCs). This document presents a detailed definition of the electronic high-speed message communications interface between the NCCDS and the MOCs. This includes Nascom 4800-bit block protocol communication information, Transmission Control Protocol/Internet Protocol (TCP/IP), File Transfer Protocol (FTP), and Hypertext Transfer Protocol (HTTP).

This Interface Control Document (ICD) pertains to systems and capabilities of the NCCDS 98 and the operation of the White Sands Complex (WSC).

Direct all comments, questions, or suggestions regarding this document draft to:

Network Control Center Project  
Code 451.5  
Goddard Space Flight Center  
Greenbelt, MD 20771

OR

NCC Sustaining Engineering Support  
Goddard Corporate Park  
7515 Mission Drive  
Lanham-Seabrook MD 20706

## Abstract

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This document defines and controls the communications protocols and message format characteristics of the interface between the NCCDS and the MOC. Specifically treated are messages exchanged for planning and scheduling of the Space Network communications resources and for their real-time control. Keywords: Mission Operations Center, SN customer, communication protocol, TCP/IP, client, server, firewall, FTP, HTTP, message exchange, message format, interface control.

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<b>List of Effective Pages</b>			
<b>Page Number</b>	<b>Issue</b>	<b>Page Number</b>	<b>Issue</b>
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iii through ix/x	Revision 1	A-20	DCN 01
xi through xiii/xiv	DCN 01	A-21	Revision 1
xv through xxv/xxvi	Revision 1	A-22 through A-23	DCN 01
1-1 through 1-4	Revision 1	A-24	Revision 1
2- 1 through 2-3/2-4	Revision 1	A-25	DCN 01
3-1 through 3-7/3-8	Revision 1	A-26 through A-32	Revision 1
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5-1 through 5-5/5-6	Revision 1	C-1 through C-2	Revision 1
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7-54 through 7-55	DCN 01	GL-1 through GL-5/GL-6	Revision 1
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7-59	DCN 01	Annex 2, AN2-1 thru AN2-3/AN2-4	Revision 1
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8-1 through 8-24	Revision 1	Annex 4, AN4-1 thru AN4-7/AN4-8	Revision 1
8-25 through 8-26	DCN 01	Annex 5, AN5-1 thru AN5-3/AN5-4	Revision 1
8-27 through 8-29	Revision 1	Annex 6, AN6-1 thru AN6-3/AN6-4	Revision 1
8-30	DCN 01	Annex 7, AN7-1 thru AN7-4	Revision 1
8-31 through 8-81	Revision 1	Annex 8, AN8-1/AN8-2	Revision 1
8-82	DCN 01	Annex 9, AN9-1 thru AN9-5/AN9-6	Revision 1
8-83 through 8-86	Revision 1	Annex 10, AN10-1 thru AN10-8	Revision 1
8-87	DCN 01	Annex 11, AN11-1 thru AN11-3/AN11-4	Revision 1
8-88 through 8-91	Revision 1	Annex 12, AN12-1 thru AN12-4	Revision 1
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## DCN Control Sheet

DCN Number	Date/Time Group (AMS Only)	Month/Year	Section(s) Affected	Initials
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## **Appendix B. Schedule Request Validation**

## **Appendix C. Engineering Interface Test Descriptions**

## **Appendix D. Guidelines for Use of Service-Level Flexibility Parameters**

## **Abbreviations and Acronyms**

## **Glossary**

## **Annex 1. GSFC MOCs**

## **Annex 2. MSFC HOSC**

**Annex 3. BRTS MOC**

**Annex 4. EOS EOC**

**Annex 5. STARLink MOC**

**Annex 6. TOPEX MOC**

**Annex 7. LDPB MOC**

**Annex 8. Special Projects and Missions**

**Annex 9. LS-7 MOC**

**Annex 10. JSC MCC**

**Annex 11. FDF Acquisition Data**

**Annex 12. GPB MOC**

# Section 1. Introduction

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## 1.1 Purpose

The purpose of this document is to provide a detailed definition of the electronic high-speed message communications interface between the Goddard Space Flight Center (GSFC) Network Control Center (NCC) Data System (NCCDS) and the National Aeronautics and Space Administration (NASA) Mission Operations Centers (MOC).

In addition to updating the original version of this document, revision 1 supersedes:

- *External Interface Control Document JSC/GSFC NCC Operational Communications ICD for Mission Control Center Systems, JSC-11534, Vol. V.*
- *Interface Control Document Between the Network Control Center Data System and the Flight Dynamics Facility, 530-ICD-NCCDS/FDF, Revision 2, December 1995.*

## 1.2 Scope

This document defines and controls the communications protocols and message format characteristics of the interface between the NCCDS and MOC. This includes Nascom 4800-bit block protocol communication information, Transmission Control Protocol/Internet Protocol (TCP/IP), File Transfer Protocol (FTP), and Hypertext Transfer Protocol (HTTP) which are treated in several sections of the document.

## 1.3 Time Frame

This Interface Control Document (ICD) shall be in effect from the date of approval by Networks and Mission Services Project (N&MS) Configuration Control Board (CCB), and when all applicable signatures, including JSC, MSFC, EOS, and others, are obtained. This ICD applies to the interface between NCCDS and its customers (i.e., MOCs), and includes modifications for flexible scheduling and TDRS H, I, J support.

## 1.4 Coordinating Elements

The following customers have been identified as subscribers, in part or whole, of this ICD. This ICD provides each of these customers with an annex containing information applicable only to that customer. A customer's approval signature on that customer's annex confirms acceptance of the customer-specific information specified in that annex. A customer's approval signature at the front of this ICD confirms acceptance of those communication message formats and interface requirements contained in the main body of this ICD that are indicated as being applicable to that customer by the customer's annex. Changes in the main body of this ICD must be coordinated with all of these customers; however, changes in a customer's annex need only be coordinated with that customer.

1. Goddard Space Flight Center Mission Operations Centers (GSFC MOC).
  - GSFC Multisatellite Operations Control Center (MSOCC).
  - GSFC Hubble Space Telescope (HST) Project.
2. Marshall Space Flight Center Huntsville Operations Support Center (MSFC HOSC).
3. Bilateral Ranging Transponder System Mission Operations Center (BRTS MOC).
4. Earth Observing System Operations Center (EOS EOC).
5. STARLink Program Mission Operations Center (STARLink MOC).
6. Ocean TOPOgraphy EXperiment/POSEIDON Project Mission Operations Center (TOPEX MOC).
7. Long Duration Balloon Program Mission Operations Center (LDBP MOC).
8. Special Projects and Missions
9. Landsat-7 Mission Operations Center (LS-7 MOC)
10. Johnson Space Center Mission Control Center (JSC/MCC)
11. Flight Dynamics Facility
12. Gravity Probe-B (GPB) Mission Operations Center (GPB/MOC)

## 1.5 Organization

This document organizes its interface descriptions from the general to the specific, as follows:

- a. General interface information is given in three sections. Section 1 is an introduction, Section 2 discusses applicable documents, and Section 3 provides system descriptions.
- b. Communications and message descriptions are provided in six sections. Sections 4 and 5 provide descriptions of the communications format and the data field protocol, respectively; Section 6 discusses the NCCDS message organization and content; and Sections 7 and 8 provide formats for planning and scheduling messages and for real-time messages, respectively. Section 9 provides message structure and formats for State Vectors.
- c. Appendix A describes the Service Specification Codes.
- d. Appendix B provides Schedule Request Validation for Space Network Customers.
- e. Appendix C provides Engineering Interface Test Descriptions.
- f. Appendix D provides Guidelines for Use of Service-Level Flexibility Parameters.
- g. A separate annex for each individual MOC provides communication parameters, messages supported and mission-unique identifiers.

## 1.6 Classes of Customers

The NCCDS supports two classes of customers. They are referred to as "baseline customers" with zero (0) or 1 priority, and "full support customers" with 1 to 9 priorities. Zero (0) indicates the highest priority whereas 9 indicate the lowest priority.

The baseline customers are those customers who still requires support using the baseline, pre-NCC98 message, formats. The full support customers are those customers who are capable of using the full set of NCCDS 1998 message formats and any or all-new scheduling features such as service duration flexibility. They must adopt new features of the following four modified messages:

1. Schedule Add Request Message.
2. Schedule Result Message.
3. Schedule Delete Request Message.
4. User Schedule Message.

In addition, full support customers may use the following new messages:

1. Replace Request Message.
2. Alternate Schedule Add Request Message.
3. Wait List Request Message.
4. TDRS Scheduling Window Message.

There is no modification to the format of the Schedule Deletion Notification Message; however, it is only used to notify baseline customers of event deletions. The Schedule Result Message is used to notify full support customers of event deletions.

The baseline customers are those who are unable to adopt new message formats. The new schedule message formats presented herein are based on the baseline schedule message formats and provide all of the flexibility and other features needed for full support. All new features are included in these messages in a way that is completely transparent to baseline customers.

The NCCDS database identifies each customer as either a baseline customer or as a full support customer. This information is used to interpret incoming schedule messages and in the generation of outgoing messages.

## 1.7 Primary References

This document is premised upon the assumption that its readers will have at least a basic knowledge of NASA's Space Network (SN) and of the NCC's role in the SN. All readers should be familiar with the following three documents

- a. NCCDS Operations Concepts, 1998, 451-OCD-NCCDS/1998.
- b. Space Network (SN) Users' Guide, 530-SNUG.

c. NCCDS System Requirements, 1998, 451-SRD-NCCDS/1998.

This document specifies the requirements for the NCCDS, including the high-level requirements for its interface with the MOCs. These interface requirements are the basis for this ICD. Several areas of 451-SRD-NCCDS/1998 may be of particular interest to MOC personnel. These include:

- Paragraph 5.2.3 which specifies the requirements for the customer data area of the NCCDS database.
- Paragraph 5.3 which specifies the requirements for the scheduling messages.
- Paragraph 5.4 which specifies the requirements for the scheduling rules.

## Section 2. Applicable Documents

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### 2.1 General

Section 2 lists the specifications, standards, and other documents that serve as references for supplemental system descriptive information. It also lists documents that are directly applicable to the ICD and that, by specific reference, constitute a part of this ICD.

### 2.2 Specifications

- a. *NCCDS System Requirements, 1998*, 451-SRD- NCCDS/1998.
- b. *NCCDS System Design Specification, 1998*, 451-SDS-NCCDS/1998.
- c. *Interface Control Document (ICD) Between the Network Control Center (NCC)/Flight Dynamics Facility (FDF) and the White Sands Complex (WSC)*, 530-ICD-NCC-FDF/WS, 6/97.
- d. *Requirements Specification for the White Sands Complex (WSC)*, 530-RSD-WSC, 6/97.
- e. RFC 791, Internet Protocol: DARPA Internet Program Protocol Specification, September 1981.
- f. RFC 792, Internet Control Message Protocol, September 1981.
- g. RFC 793, Transmission Control Protocol, September 1981.
- h. RFC 822, Standard for the Format of ARPA Internet Text Messages, August 1982.
- i. RFC 826, An Ethernet Address Resolution Protocol or Converting Network Protocol Addresses to 38-bit Ethernet Addresses for Transmission on Ethernet Hardware, November 1982.
- j. RFC 959, File Transfer Protocol, October 1985.
- k. RFC 1009, Requirements for Internet Gateways, June 1987.
- l. RFC 1122, Requirements for Internet Hosts -- Communications Layers, October 1989.
- m. RFC 1123, Requirements for Internet Hosts -- Application and Support, October 1989.
- n. RFC 1155, Structure and identification of management information for TCP/IP-based Internets, May 1990.
- o. RFC 1157, Simple Network Management Protocol (SNMP), May 1990.
- p. RFC 1212, Concise MIB definitions, March 1991.
- q. RFC 1213, Management Information Base for network management of TCP/IP-based Internets: MIB-II, March 1991.

- r. RFC 1256, ICMP Router Discovery Messages, September 1991.
- s. RFC 1508, Generic Security Service Application Program Interface, September 1993.
- t. Deleted
- u. RFC 1832, XDR: External Data Representation Standard, August 1995.
- v. Deleted
- w. RFC 2068, Hypertext Transfer Protocol, January 1997.

## 2.3 Standards

- a. *Nascom Interface Standard for Digital Data Transmission (NISDDT)*, 542-003, Rev. 2, 11/89.
- b. *IRIG Standard Parallel Binary Time Code Format*, X-814-77-64, 5/77.
- c. *Electrical Characteristics of Balanced Voltage Digital Interface Circuits*, EIA RS-422A (Federal Standard 1020A), Electronic Industries Association, Washington, D.C.
- d. *General Purpose 37-position and 9-position Interface for Data Terminal Equipment and Data Circuit-terminating Equipment Employing Serial Binary Data Interchange*, EIA RS-449 (Federal Standard 1031), Electronic Industries Association, Washington, D.C.
- e. Federal Information Processing Standard Publication 46-2: DATA ENCRYPTION STANDARD (DES), 30 December 1993.

## 2.4 Other Documents

- a. *NASA Communications Operating Procedures (NASCOP)*, 542-006, Volumes I, Rev. 2, 1/92, and II, Rev. 1, **9/95**.
- b. Space Network (SN) Users' Guide, 530-SNUG.
- c. *Abbreviations and Acronyms*, 532-Abbreviations/Acronyms, 8/96.
- d. *Space Network Interoperable PN Code Libraries*, 451-PN Code-SNIP, Revision 1, November 1998.
- e. *Support Identification Code Dictionary*, 532-808, 5/97.
- f. *Digital Data Source/Destination and Format Codes Handbook for the NISN/Nascom Ground Network*, GSFC-NISN-COM-99-0001, February 1999.
- g. *Operations and Maintenance Manual for a Data Block Emulator*, ME-7712.
- h. *NASA Communications (Nascom) Space Network Ground Segment Support Data Book*, 542-016, Revision 2, 10/97.

- i. *Information Processing Systems—Open Systems Interconnection—Basic Reference Model*, ISO 7498-1984(E).
- j. *Space Network Users' Guide for Real-Time Operations*, 534-UGD-SN-RTOPS, 3/93.
- k. Deleted.
- l. Deleted.
- m. *NCCDS Operations Concepts*, 1998, 451-OCD-NCCDS/1998.
- n. *Security Plan for the Network Control Center*, NCC 98, 451-SP-NCC/1998
- o. *NASA Automated Information Security Handbook*, NHB 2410.9A, June 1993.
- p. *NASA Procedures and Guidelines for Security of Information Technology*, NPG 2810.1, August 1999

#### NOTE

NPG 2810.1 supersedes NHB 2410.9A. However, NHB 2410.9A continues to be included as a reference because NCCDS 1998 was developed based on NHB 2410.9A. Unless otherwise indicated, security terminology in this ICD is consistent with NHB 2410.9A.

- q. *Space Network (SN) Security Classification Guide (SCG)*
- r. Deleted.
- s. *Goddard Space Flight Center Security Manual*, GHP-1600.1A, November 1990.
- t. Deleted.

## 2.5 Document Precedence

In case of conflicts between this document and any other with respect to the requirements of the interface between the NCCDS and MOC, this document takes precedence.

## Section 3. System Descriptions

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### 3.1 General

Section 3 provides background information regarding the basic functions of (and the interactions between) the NCCDS and a generic MOC. Section 3 does not give binding requirements or require configuration control. The actual interface requirements are provided in Sections 4 through 9.

### 3.2 NCC Data System Description

#### 3.2.1 General

##### 3.2.1.1

The Spaceflight Tracking and Data Network (STDN) consists of the Ground Network (GN) and the Space Network (SN). The NCC is the focal point for management of the SN. In this capacity, the NCC schedules, controls, and ensures the reliability of the SN. The NCC and the MOC communicate using the NASA Integrated Services Network (NISN).

##### 3.2.1.2

The NCCDS is designed to provide Tracking and Data Relay Satellite System TDRSS services to the Space Network (SN) customers. It is operated by the Networks and Mission Services Project. The NCCDS is located at GSFC.

##### 3.2.1.3

Under certain predefined conditions as directed by NASA management, GSFC, through the NCC facility, takes the lead role in scheduling all applicable worldwide U.S. Government communications networks as necessary per mission objectives. These networks may consist of the GSFC-managed GN; the Jet Propulsion Laboratory (JPL)-managed Deep Space Network (DSN); other NASA-managed resources, such as the Wallops Flight Facility (WFF); and the Air Force-managed Remote Tracking Stations (RTS). NCC operational interface procedures for the operational management of SN and non-SN resources are documented in the STDN series of documentation. These documents include the definition of non-computer to computer systems communications.

#### 3.2.2 NCC Data System Configuration

The current high-level NCCDS hardware architecture and software configuration environment can be found on the NCC 98 homepage; the URL is “<http://ncc98.gsfc.nasa.gov/>”.

### **3.2.3 NCC Data System Functional Capabilities**

#### **3.2.3.1 General**

The NCCDS schedules and controls customer services, monitors performance data from the SN, and provides an interface between the SN and customer facilities. To carry out its responsibilities, the NCCDS performs the following functions:

- a. Service planning.
- b. Service control.
- c. Service assurance.
- d. Service accounting.
- e. System operations.
- f. Security.

#### **3.2.3.2 Service Planning**

- a. Service planning is the NCCDS function that schedules the use of services of the SN, in response to SN customer requests. This function generates a conflict-free schedule for use of SN resources based on requested support and resource availability. The process also provides for adjusting the schedule based on customer requests.
- b. The services scheduled for customers are real-time data transport (digital and analog/video), tracking, and simulations.
- c. The SN resources scheduled by the NCCDS include the following:
  - 1. TDRSS services.
  - 2. Space to ground link terminal (SGLT) antennas.
  - 3. Interface channels.
  - 4. Simulators.
  - 5. Transport services (NISN) - The NCCDS schedules NISN transport services for all SN TDRS customers.

#### **3.2.3.3 Service Control**

Service control is the NCCDS function that establishes and modifies the services of the SN upon request, as scheduled by the service planning function. This function includes the following:

- a. Dissemination of the service schedule and updates to affected elements and customer facilities.
- b. Dissemination of data used to determine Tracking and Data Relay Satellite (TDRS) antenna pointing angles and link Doppler shifts.

- c. Provision of the means for customers to change some characteristics of the service in progress for their spacecraft.
- d. Dissemination of SN performance data to customers.

#### **3.2.3.4 Service Assurance**

Service assurance is the NCCDS function that provides the means to monitor ongoing SN services as scheduled by the service planning function. The NCCDS provides tools that allow NCC operations personnel to:

- a. Monitor (manually) performance data received from the WSC in the form of Operations Data Messages (ODMs).
- b. Receive (via voice) and process (manually) status reports from the various elements when service outages occur (NCC attempts to minimize the impact of these outages on the customer).
- c. Serve as the focal point for SN fault isolation (manually).
- d. Receive (via voice) and process (manually) summary data at the end of each event.

#### **3.2.3.5 Service Accounting**

Service accounting is the NCCDS function that collects, stores, and reports usage data on SN services. The SAS data base maintains a log of all network services provided and uses these data to produce reports that are made available to management for assessment of network performance. The NCCDS provides service accounting data (via the SAS) to operators for analyzing, problem reporting, and identifying trends that may affect network elements.

#### **3.2.3.6 System Operations**

This NCCDS function controls the day-to-day operation of the NCCDS, which supports the other functional areas, either directly or indirectly, and manages the interaction of personnel, hardware, and software. System operations also addresses the operator/system interface and external communications.

#### **3.2.3.7 Security**

The NCCDS handles unclassified sensitive data. The functions described in Section 3.2.3.2 through Section 3.2.3.6 must be performed in a secure environment. The NCCDS meets AIS Sensitivity Criticality Level 3 requirements.

### **3.3 Mission Operations Centers System Description**

#### **3.3.1 Introduction**

The Mission Operations Centers are responsible for the design, development, maintenance, and operation of their own payload operations Control Center (CC). The MOC may be a dedicated or

multimission center. The Hubble Space Telescope (HST) Operations Control Center (HSTOCC) is a primary example of a dedicated facility. It is responsible for a single spacecraft, the HST. The GSFC Multisatellite Operations Control Center (MSOCC) is a multimission facility. It has resources to support up to six spacecraft simultaneously and approximately fifteen spacecraft on a time-shared basis. Functionally, all MOCs are similar as described in the functional descriptions in this ICD. Generic MOC components and functions are described here. A MOC may be any of the facilities identified in the annexes to this document, or may be any other control center that complies with the interface requirements specified herein. Each SN customer's MOC-specific parameters are provided in the appropriate annex to this document. Some MOCs transmit state vectors to the NCCDS. These state vectors are transmitted as Improved Interrange Vectors (IIRV), see Section 9.

### **3.3.2 MOC Functions**

#### **3.3.2.1 General**

The primary functions performed routinely by the MOC include spacecraft and experiment mission planning and scheduling, commands management, and mission monitoring.

#### **3.3.2.2 Mission Planning/Scheduling**

- a. The MOCs are responsible for operations planning and coordination in support of their missions. Operations planning is carried out in several phases: pre-flight planning, pre-event planning, and online near-real-time planning. The MOCs interface with experimenters and payload customers for operational requirements, plan payload and experiment operations, develop requirements for payload data acquisition and command operations, negotiate for the support of multiuser facilities, and coordinate the use of Shuttle Orbiter support of their payload, as required.
- b. The MOCs have access to scheduling systems which make SN system-related information available and provide tools for weekly and day-to-day planning and scheduling. MOC scheduling systems interface with the NCCDS scheduling system via NISN for the exchange of individual MOC SN schedules, planning, and status information for use in planning or modifying payload activities or for requesting additional support requirements when necessary. Each MOC independently prepares and inputs its requests for SN support to the NCC. These requests depend on mission operational needs and constraints, ground system and supporting computing resources, and some internal constraints, as well as network station coverage.

#### **3.3.2.3 Command Management**

Each MOC has the prime responsibility to prepare, build, check, send, and verify commands to its spacecraft. The MOC has a capability to specify network parameters to be changed in conjunction with spacecraft parameters (e.g., the network bit synchronizers must be changed when the data rate is changed onboard the spacecraft) and the ability to request network

reconfigurations in order to ensure proper handling of its data. The NCCDS protects this process from unauthorized access by other customers.

### **3.3.2.4 Mission Monitoring**

**Internal Monitoring and Problem Correction.** The MOC is responsible for monitoring and controlling its own equipment, configuration, and status.

**External Monitoring and Problem Identification.** Each MOC is cognizant of the configuration and status of all NCC, NISN, and TDRSS elements that directly affect the MOC's data. The MOC has the responsibility to recognize problems in the data stream and request that the NCC perform fault isolation and attempt to correct the problem. The MOC is responsible for correcting spacecraft problems if possible. As needed, the MOC shall assist the NCC in performing fault isolation.

## **3.4 MOC-NCCDS Functional Interactions**

### **3.4.1 General**

Each of the six functional capabilities of the NCCDS (refer to paragraph 3.2.3) is compared with each of the three functional capabilities of the MOCs (refer to paragraph 3.3.2), which are shown in the Functional Interactions Matrix (Table 3-1). The matrix forms a functional interaction table identifying five functional interactions between the MOCs and the NCCDS. These interactions are described in paragraphs 3.4.2 through 3.4.6.

### **3.4.2 Real-Time Network Status Analysis**

Both the NCC and the MOCs possess varying degrees of network status analysis capability during real-time operations. Sufficient interactions exist in the NCC-MOC interface to allow these capabilities to be complementary and provide for the exchange of pertinent information between the two organizations. Real-time network status analysis consists of User Performance Data, Return Channel Time Delay Measurements, Acquisition Failure Notification (AFN), Time Transfer and communications circuit tests. The real-time network status analysis aspect of the NCC-MOC interface consists of automated and semiautomated functions to accomplish the exchange of necessary data. Automated functions include provision for User Performance Data, Return Channel Time Delay Measurements, and AFN's.

### **3.4.3 Manual Operations and Voice Coordination**

Manual operations and voice coordination between NCC and MOC personnel support the other functional areas, either directly or indirectly. This covers the interaction of personnel, hardware, and software. The operation of the NCCDS and the MOC are essentially automatic, although the console operators can assume a partial or complete control of their respective systems, as required. The NCCDS and the MOC console operators can query for displays which contain schedule, status, and performance information provided by their respective software. Voice communications are used between the NCC and the MOC operations personnel to coordinate operations, fault isolation, testing, and other necessary activities as required.

**Table 3-1. Functional Interactions Matrix for MOC and the NCC Data System**

NCCDS MOC	Service Planning (3.2.3.2)	Service Control (3.2.3.3)	Service Assurance (3.2.3.4)	Service Accounting (3.2.3.5)	System Operations (3.2.3.6)	Security (3.2.3.7)
<b>Mission Monitoring (3.3.2.4)</b>			Real-time Network Status Analysis (3.4.2)	Performance Monitoring & Trend Analysis (3.4.7)	Manual Operations and Voice Coordination (3.4.3)	Secure Environment (3.4.6)
<b>Command Management (3.3.2.3)</b>		Forward and Return Service Control (3.4.4)				Secure Environment (3.4.6)
<b>Mission Planning/ Scheduling (3.3.2.2)</b>	System Scheduling (3.4.5)					Secure Environment (3.4.6)

#### **3.4.4 Forward and Return Service Control**

Forward and return service control is performed through Ground Control Message Requests (GCMR) from the MOC which are converted to Ground Control Messages (GCM) by the NCC to communicate information, instructions, and requests to the SN. Functions accomplished through GCM (refer to paragraph 6.3.1) include customer service support reconfigurations, forward link sweep requests, forward link Effective Isotropic Radiated Power (EIRP) reconfigurations, expanded customer frequency uncertainty requests, Doppler compensation inhibit requests, reacquisition requests, and changes in data rate and data stream ID.

#### **3.4.5 System Scheduling**

The NCCDS scheduling activities are in direct response to MOC scheduling requests, cancellations, and updates. NCCDS scheduling action consists of scanning an inventory of available resources (network and customer channel interfaces, communications channels, bandwidth, which are necessary to create an end-to-end path for requested service); allocating or reserving resources; and storing the schedules for execution at prescribed times. Interaction between the NCCDS and the MOC is in the form of scheduling requests and responses.

#### **3.4.6 Secure Environment**

The NCCDS must be capable of processing and handling sensitive unclassified information. All functions of the NCCDS must be performed in a secure environment. The need for protection of information contained in the NCCDS applies to all levels of the functional requirements. The NCC facility provides the appropriate level of security. NCCDS functionality allows necessary human interaction with the MOC to perform operational activities within the scope of appropriate procedural guidelines.

#### **3.4.7 Performance Monitoring and Trend Analysis**

Reporting information is available to customers describing the support schedule and the support provided. This information can be used to determine reimbursable customer support levels as well as identify trends in system performance.

## Section 4. Communications Format Description

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### 4.1 General

This section describes the communication protocols to be used to exchange electronic messages between the NCCDS and the MOC. The NCCDS offers the MOC the choice of two types of communication layer protocols, the baseline Nascom 4800-bit block (4800BB) protocol, and the Transmission Control Protocol/Internet Protocol (TCP/IP). In addition, MOCs have the option to use File Transfer Protocol (FTP) to transfer IIRV messages to the NCCDS. Authorized MOCs may also use Hypertext Transfer Protocol (HTTP) to obtain the TDRSS Unscheduled Time (TUT) files from the NCCDS server. Paragraph 4.2, Figure 4-1, Table 4-1, paragraph 5.6, Table 5-3, paragraph 8.4.1.1, Figures 8-1 and 8-2, paragraphs 9.1.1 through 9.3.1, Figure 9-1, and Table 9-1 apply only to MOCs using the Nascom 4800-bit block protocol. Paragraph 4.3, Tables 4-2 and 4-3, paragraph 6.2.1.5, paragraph 7.2.5, Table 7-10, paragraph 8.4.1.2, paragraph 9.3.2, and Appendix C apply only to MOCs using the TCP/IP protocol. Paragraph 4.4 applies to MOCs using FTP for IIRV message transfer. Paragraphs 4.5, 6.2.3, and 7.4, and Tables 7-23 and 7-24 apply to MOCs using HTTP to obtain TUT. Unless otherwise specified, all other areas of this document apply to all MOCs. Actual electronic messages to be exchanged and their formats are specified in Sections 6 through 9. NCCDS will not offer User Datagram Protocol (UDP) services to MOCs. The UDP protocol is supported by NCCDS only as a means of transporting Nascom 4800 bit blocks as defined by the Nascom IP transition. Use of UDP is internal to Nascom (supported by Small Conversion Device (SCD) or other conversion devices).

There are 2 significant differences between the new TCP services and the current 4800BB capability. First, TCP is used as the transport level protocol rather than the 4800BBs. Second, MOCs using the TCP services are responsible for ensuring that connections are established when needed. In the 4800BB world, both the MOC and the NCCDS verify that communications take place as needed.

The NCCDS meets Reliability/Maintainability/Availability (RMA) and Automated Information System (AIS) Security Criticality Level (S/CL) 3 requirements, (see reference 2.2a). The mechanisms employed to implement these requirements are covered in NCC design documentation. The operational procedures, including WAN trouble shooting techniques, are documented in the appropriate Interface Operating Procedures documents.

#### 4.1.1 Definition of Message

As used within this document, a message is a complete and coherent collection of applications-level data (i.e., the message content) and all lower-level data packaged together with the message content for the purpose of transmitting the message content in a specific protocol. In general, messages have these characteristics:

- a. Each message is identified by a seven digit Message ID.

- b. The format of the applications-level content of a message is specified by its Message Type and Message Class.
- c. The format of the applications-level content of a message is independent of the lower-level protocol.
- d. Every message can be transmitted using either TCP/IP or Nascom 4800-bit block protocol.

#### **4.1.1.1 Exceptions**

The following exceptions apply:

- a. The Nascom 4800 bb acknowledgment (see Table 5-3) has no Message ID, Message Type, or Message Class; and applies only to Nascom 4800-bit block protocol.
- b. The type 03 class 14 message (see Table 9-1) applies only to Nascom 4800-bit block protocol.
- c. Message ID is a general term. For a few messages, more specific alternative terms are used for convenience. For example, the term “Request ID” is used rather than “message ID of a request.” Refer to 7.1.1.2 and see Tables 7-1, 7-9, 7-10, and 7-12.
- d. On external interfaces, the Schedule Results Request message (see Table 7-8) applies only to TCP/IP. However, the NCCDS generates it internally for MOCs using Nascom 4800-bit block protocol.
- e. The IIRV message (see Table 9-2) can be transmitted using FTP as well as TCP/IP or Nascom 4800-bit block protocol. Although the format of the applications-level content of the IIRV message is essentially the same regardless of the lower-level protocol, longer messages are possible when FTP is used.
- f. The format of the applications-level content of the User Performance Data message (refer to 8.4.1) varies slightly depending on the lower-level protocol. When Nascom 4800-bit block protocol is used, each message block within a multiple-block message includes either 52 or 74 spare bytes at the end of the block. These spare bytes are not included when TCP/IP is used.
- g. TDRSS Unscheduled Time (TUT) information (refer to 7.4) is provided in a file format, and is not regarded as a message per se.

## **4.2 Nascom 4800-bit Block Protocol**

This section describes the Nascom 4800-bit Block protocol used to exchange electronic messages between the NCCDS and the MOC. Messages are composed of one or more Nascom 4800-bit blocks. The lower-level communications protocol requirements are defined in *NISDDT* (Reference 2.3a). Figure 4-1 shows the 4800-bit block format. The Nascom block format used for the messages detailed in Sections 5 through 8 is described in this section. A different block format is used for the messages in Section 9, and is described in Section 9. This section contains

general rules that apply to all block fields. Specific points that apply only to the data portion of the message are described in Sections 5 through 9.

#### **4.2.1 Messaging Protocol**

Message integrity is assured by using the protocol presented in paragraphs 4.2.1.1 through 4.2.1.5 to handle acknowledgments, deal with transmission errors, provide data accountability, and control the end-to-end communications exchange.

##### **4.2.1.1 Acknowledgment Protocol**

- a. On receipt of a complete message requiring an acknowledgment (i.e., Acknowledgment Request Flag, bit 172, in the first block of the message is set to 1), the receiver will transmit an acknowledgment to the originator at the next block transmission opportunity.
- b. If a message is received with the Acknowledgment Request Flag (bit 172) in the first block of the message set to 1 and the Retransmitted Block Flag (bit 173) in each block of the message set to 1, the receiver will acknowledge receipt of this messages as stated above. The receiver is responsible for determining whether this message has already been processed (i.e., same Message Block ID and Source Code). If so, the second copy of the message should not be processed.

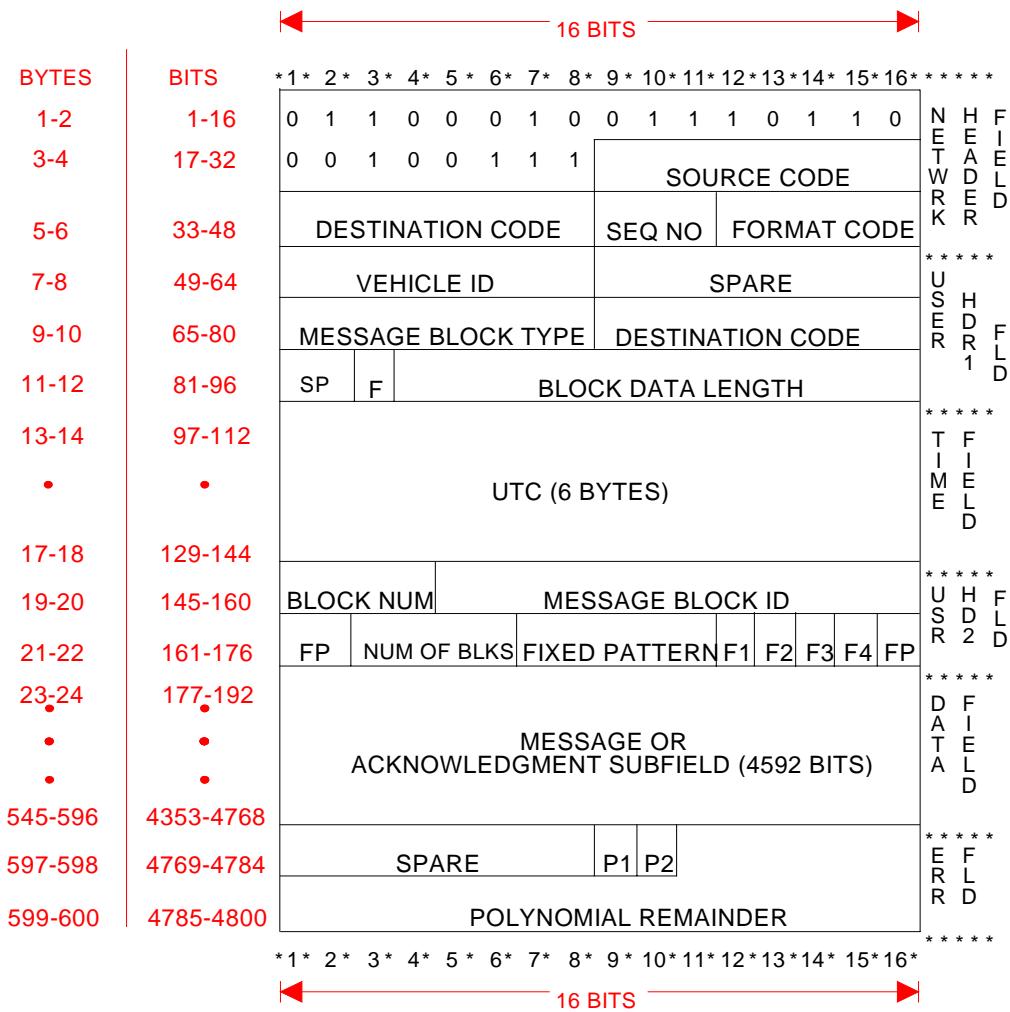
##### **4.2.1.2 Retransmission Protocol**

On failure to receive an acknowledgment within 5 seconds of transmission of the last block of the message, the originator will set the Retransmitted Block Flag (bit 173) to 1 in each block of the message and retransmit the entire message. Retransmitted blocks will have the original Block Number, Message Block ID, and Message Block Type. Failure to receive acknowledgment for the first Retransmission within 5 seconds will result in a second retransmission. Failure to receive acknowledgment for the second retransmission within 5 seconds will result in an error indication being sent to the appropriate operator, and may result in corrective actions being taken in order to restore communications with the destination.

##### **4.2.1.3 Error Handling**

Error handling procedures will apply as follows:

- a. Messages received in error will not be acknowledged. A message will be considered in error for any of these reasons:
  1. Failure to pass the polynomial error checks for any block.
  2. Blocks received out of sequence in a multiblock message.
  3. Any detected syntax error in either the network or user header fields of any block.
- b. On failure to receive an acknowledgment within 5 seconds of transmission, the originator will follow the retransmission protocol as described in paragraph 4.2.1.2.



F = FLAG  
 FP = FIXED  
 SP = SPARE  
 NAS BLK1.WMF

**Figure 4-1. Nascom 4800-bit Block Format (MOC)**

#### **4.2.1.4 Transmission Priority**

Messages will be transmitted on a priority basis. At each block transmission opportunity for a given destination, the originator will:

- a. Transmit an acknowledgment message block if one is pending for transmission.
- b. If no acknowledgments are pending, transmit the next message block for a multiblock message in progress. The originator will transmit all blocks of a message before initiating the transmission of another message to the same destination except for acknowledgment messages which will be transmitted, as required, at the first block transmission opportunity.
- c. If no multiblock message transmission is in progress, transmit the first block of the next message pending retransmission. Retransmitted messages shall be sent with at least equal priority to the original message transmissions.
- d. If no messages are pending retransmission, transmit the first block of the next message pending transmission.

#### **4.2.1.5 Message Reception**

The receiver will be capable of receiving, from the same source, acknowledgments interleaved with a multiblock message transmission or retransmission.

### **4.2.2 Block Protocol**

#### **4.2.2.1 Block Metering**

The NCCDS and the MOC will each regulate the rate of flow of 4800-bit blocks at the interface to minimize contiguous block transmission. Acknowledgment blocks are not subject to block metering restrictions.

##### **4.2.2.1.1 Block Metering from the NCCDS to the MOC**

The NCCDS will meter blocks transmitted to the MOC at the specified rate of five blocks per second per line. However, the metering rate is under NCC operational control and can be modified as necessary.

##### **4.2.2.1.2 Block Metering from the MOC to the NCCDS**

The MOC will meter blocks transmitted to the NCCDS to not exceed a specified rate of two blocks per second per line. However, the metering rate is under MOC operational control and can be modified as necessary.

#### **4.2.2.2 Block Format Standard**

The 4800-bit block format standard conforms to conventions specified in the NISDDT (Reference 2.3a) for Nascom message switching and polynomial error detection. The block

format is shown in Figure 4-1. The 4800-bit block is segmented into six distinct parts: Network Header Field, User Header 1 Field, Time Field, User Header 2 Field, Data Field, and Error Control Field. The individual fields are described as follows:

#### 4.2.2.2.1 Network Header Field

- a. Nascom Synchronization Subfield. This 24-bit binary subfield, bits 1 through 24, has the following structure:
 

first bit transmitted→011000100111011000100111←last bit transmitted
- b. Source Code Subfield. This 8-bit binary field, bits 25 through 32, describes the data source. Nascom assigns these codes, which are detailed in the *Digital Data Source/Destination and Format Codes Handbook for the NISN/Nascom Ground Network* (Reference 2.4f).
- c. Destination Code Subfield. This 8-bit binary field, bits 33 through 40, describes the data destination. Nascom assigns these codes, which are detailed in the *Digital Data Source/Destination and Format Codes Handbook for the NISN/Nascom Ground Network* (Reference 2.4f).
- d. Sequence Number Subfield. This 3-bit binary field, bits 41 through 43, is used to identify the sequence in which blocks were transmitted from a source. The range of this cyclic counter is 0 through 7. For those MOCs that implemented 9-bit source/destination expansion codes this three bit binary field may contain zeros. The NCCDS ignores the sequence number within incoming messages.
- e. Format Code Subfield. This 5-bit binary subfield, bits 44 through 48, is used to identify the type of data block being used. Nascom assigns these codes. All message blocks covered by this document will use a binary 01011 code in this subfield.

#### 4.1.1.1.2 User Header 1 Field

- a. VID Subfield. This 8-bit binary subfield, bits 49 through 56, contains a code identifying the spacecraft being supported. The Vehicle Identification (VID) indicates the spacecraft or test with which the message block is associated. The VID should not be confused with the Vehicle Identification Code (VIC), which is used in acquisition and tracking data to identify payloads and launch vehicles and generally takes a value of 1 to 5 for any mission supported. GSFC N&MS assigns the VID codes, which are listed in the Support Identification Code Dictionary (Reference 2.4e).
- b. Spare Subfield. This 8-bit binary subfield, bits 57 through 64, is spare.
- c. Message Block Type Subfield. This 8-bit binary subfield, bits 65 through 72, contains a code that defines the specific type of data contained in the block. Table 4-1 specifies Message Block Type codes for each message type and class. The listed Message Block Type codes are in octal notation, with the MSB (bit 65) given first.

- d. Destination Code Subfield. This 8-bit binary subfield, bits 73 through 80, is reserved for a destination code, which identifies the recipient of the data block and contains the same value as bits 33 through 40.
- e. Spare Subfield. This 2-bit subfield, bit 81 and 82, is a spare.
- f. Full Block Flag Subfield. This 1-bit binary subfield, bit 83, is set to a binary one to indicate that the Data Field is completely used, or is set to a binary zero to indicate that the Data Field is less than full.
- g. Block Data Length Subfield. This 13-bit binary subfield, bits 84 through 96, contains in binary, the length, in bits, of the User Header 2 Field, plus the portion of the Data Field used within that block. If the block is full, this field will contain the binary equivalent of 4624 bits (578 bytes).

#### **4.1.1.3 Time Field**

This 48-bit binary field, bits 97 through 144, is optional. When used, it contains the NASA Parallel Grouped Binary Millisecond/Microsecond Time Code (PB4) time, as defined in the IRIG Standard Parallel Binary Time Code Format (Reference 2.3b). NCCDS-generated blocks will always contain a time code in this field. The time will reflect the coordinated universal time (UTC) of generation of the associated block. When the time field does not contain a PB4 time code, all bits will be set to a binary one.

#### **4.1.1.4 User Header 2 Field**

- a. Block Number Subfield. This 4-bit binary subfield, bits 145 through 148, is an incrementing binary counter associated with a unique Message Block ID and is used to keep blocks in a multiblock message in their proper sequence. The Block Number always starts at one and increments by one for each subsequent block within a multiblock message. A Block Number of one indicates that the block is the only block of a single block message or the first block of a multiblock message. The maximum allowable value in this subfield is 15.
- b. Message Block ID Subfield. This 12-bit binary subfield, bits 149 through 160, is used to define a unique message. The Message Block ID starts with an initial value of one and increments by one for successive messages. Message Block ID assignment is controlled by the message originator. Sequential messages received at a destination are not required to have sequential Message Block IDs.
- c. Fixed Pattern Subfield. This 2-bit binary subfield, bits 161 and 162, is a fixed pattern of binary zeros.
- d. Number of Blocks Subfield. This 4-bit binary subfield, bits 163 through 166, contains, in binary, the number of blocks constituting the message. The maximum number of blocks per message is 15. The number in this field will be the same for all blocks in a multiblock message.

**Table 4-1. Message Block Type Codes**

Message Block Type Code (Octal)	Message Type/Message Class	Message Name
116	91/01	User Performance Data Message
050	91/03	Communications Test Message
112	92/04	User Performance Data Request
116	92/62	Return Channel Time Delay Measurement
116	92/63	Acquisition Failure Notification
116	92/66	Time Transfer
120	94/01	User Fixed Schedule — Normal Support
120	94/02	User Fixed Schedule — Premium Support
120	94/03	User Fixed Schedule — Simulation Support
120	94/04	User Flexible Schedule — Normal Support
120	94/05	User Flexible Schedule — Simulation Support
115	98/01	GCM Status
114	98/02	GCM Disposition
112	98/03	User Reacquisition Request
112	98/04	User Reconfiguration Request
112	98/05	Forward Link Sweep Request
112	98/06	Forward Link EIRP Reconfiguration Request
112	98/07	Expanded User Frequency Uncertainty Request
112	98/08	Doppler Compensation Inhibit Request
120	99/01	Schedule Deletion Notification Message
120	99/02	Schedule Result Message
112	99/10	Schedule Add Request
112	99/11	Schedule Delete Request Message
112	99/12	Schedule Replace Request
112	99/21	Alternate Schedule Add Request
112	99/24	Schedule Wait List Request
112	99/25	TDRS Scheduling Windows
113	N/A	Acknowledgment
360	03/10	State Vector (IIRV) - Uses different block format (see Section 9)
360	03/14	Acknowledgment (see Section 9)
360	03/15	State Vector (IIRV) - (see Section 9)
360	03/60	Acknowledgment (see Section 9)

- e. Fixed Pattern Subfield. This 5-bit binary subfield, bits 167 through 171, is a fixed pattern of binary zeros.
- f. Message Block Flag Subfields. Five 1-bit flags, bits 172 through 176, are used to signify an Acknowledgment Request, a Retransmitted Block, an Acknowledgment Enclosed, a Last Block Indicator, and one fixed pattern bit. Any of the five flags designated as “set” means the bit equals a binary one.
  - 1. The Acknowledgment Request Flag (F1-bit 172) is set in the first block of any message that requires an acknowledgment. An acknowledgment will be sent to the originator upon receipt of a complete message having the Acknowledgment Request Flag set. The originator need not wait for the acknowledgment for one message before transmitting another message.
  - 2. The Retransmitted Block Flag (F2-bit 173) is set in all blocks of a retransmitted message. The original Block Number and Message Block ID are not altered during retransmission.
  - 3. The Acknowledgment Enclosed Flag (F3-bit 174) is set when bits 177 through 320 contain an acknowledgment.
  - 4. The Last Block Indicator Flag (F4-bit 175) must be set in the last block of a message and must be a binary zero in all preceding blocks.
  - 5. The remaining bit (FP-bit 176) is a fixed pattern of a binary zero.

#### **4.1.1.5 Data Field**

This field is 4592 bits (574 bytes) long, bits 177 through 4768, and consists of either the Acknowledgment Subfield of 144 bits, or of the Message Subfield of 4592 bits.

- a. Acknowledgment Subfield. The Acknowledgment Subfield, bits 177 through 320 (bytes 23 through 40), is a duplication of bits 145 through 176 (bytes 19 through 22) of the last block of the message being acknowledged, and 14 additional bytes as discussed in paragraph 5.2.
- b. Message Subfield. The Message Subfield, bits 177 through 4768 (bytes 23 through 596), consists of 574 eight-bit bytes (4592 bits). The data field protocol, message definitions, and message formats are described in Sections 5 through 8.

#### **4.1.1.6 Error Control Field**

This 32-bit binary field, bits 4769 through 4800, contains 8 spare bits, 2 flag bits, and a 22-bit polynomial remainder, and is defined as follows:

- a. Bits 4769 through 4776 are spares.
- b. Bits 4777 and 4778 are used to indicate the detection of errors in a decoded block. Bit 4777 is used to indicate the detection of errors that occurred during transmission between block error detection (BED) devices. A binary zero indicates that no error

occurred. A binary one indicates that an error occurred. Bit 4778 is used to indicate the detection of an error during transmission over the MDM system. It is not utilized in the interface between the NCCDS and the MOC.

- c. Bit 4779 through 4800 contain a 22-bit polynomial remainder (see reference 2.3a).

## 4.3 TCP/IP Protocol Suite

This section describes TCP/IP and associated protocols to be used to exchange electronic messages between the NCCDS and the MOC. The basic function of the TCP/IP protocol is to provide a reliable, full duplex connection between a process in the NCCDS and another process in the MOC. Table 4-2 lists the NCCDS/MOC protocol suite. Except for the TDRSS acknowledgment message (Table 9-1), all messages detailed in Sections 6 through 9 can be exchanged using these protocols.

### 4.3.1 TCP Connection Establishment

In establishing a TCP connection, the MOC performs the client role, and the NCCDS performs the server role. To provide a TCP-based service, an NCCDS server calls on its Commercial Off-The-Shelf (COTS) TCP module to perform a PASSIVE OPEN with unspecified remote transport address, thereby "listening" for an incoming connection request from any client.

In order to establish a TCP connection to an NCCDS service, a MOC application process calls on its COTS TCP module to perform an ACTIVE OPEN, specifying the destination transport address as that of the desired NCCDS service. A transport address consists of Internet Protocol address and port number.

The IP port numbers for NCCDS TCP services are static and are listed in Table 4-3. NCCDS service IP addresses are obtained by resolving server aliases to IP addresses. Nascom operates a Domain Name System (DNS) server supporting NCCDS server aliases to permit a client's DNS Name Resolvers to perform this resolution. The Engineering Interface (EIF) testing process using TCP/IP protocol should use the TCP/IP service names specified in Appendix C. Table C-1 is similar to Table 4-3 except for the service names. This will provide MOC testing of TCP/IP interfaces without interfering with the NCCDS operational system. The baseline EIF process using the Nascom 4800-bit block (4800BB) protocol remains the same as in past.

NCCDS host aliases are constructed by appending an "h" (for host) and a numeric digit to the NCCDS service name (e.g., schReqh1). The server aliases are then obtained by concatenating this host alias with the domain in which the NCCDS resides. The NCCDS domain name for MOCs is "ncc.ops.nascom.nasa.gov". Thus the server aliases for the schedule request service will be "schReqh1.ncc.ops.nascom.nasa.gov". The client should use the digit 1 in this construction when it first attempts to establish a connection to an NCCDS service, even if establishing a connection to replace one that was abnormally terminated. The client should continue this process until a connection is established, the DNS Name Resolver has no entry for the constructed alias, or the digit 9 is attempted and does not work. When the client next attempts to establish a connection to the service, it should begin with the digit 1 again.

A Schedule Result Request (SRR) message must be sent from the client to the server immediately following the establishment of a connection to the Schedule Status service. A User Performance Data Request (UPDR) message must be sent from the client to the server following the establishment of a connection to the User Performance Data service in order to receive the User Performance Data.

At the TCP level, the NCCDS makes no distinction between a "new" service request connection and "replacement" service request connection. The time required to (re)establish a connection and a new security context will be minimal. The time required to (re)establish a connection will be minimal.

**Table 4-2. NCCDS/MOC Protocol Suite**

Protocols	Internet Standard Reference
TCP/IP Suite	<p>RFC 1122 Requirements for Internet Hosts -- Communication Layers.</p> <p style="text-align: center;"><b>NOTE</b></p> <p>RFC 1122 amends, corrects, supplements, and incorporates by reference the primary protocol standards documents relating to implementation and integration of the communication layers of the TCP/IP suite in an Internet host, including IP (RFC 791), ICMP (RFC 792), TCP (RFC 793), UDP (RFC 768), and various supporting link layer protocols.</p>
DNS, Name Resolver	<p>Chapter 6, RFC 1123 Requirements for Internet Hosts -- Applications and Support.</p> <p style="text-align: center;"><b>NOTE</b></p> <p>RFC 1123 is a companion to RFC 1122. Chapter 6 amends, corrects, supplements, and incorporates by reference the primary protocol standards documents relating to the DNS Name Resolver function that must be implemented by an Internet host to obtain name-address translation services from DNS servers. The primary DNS protocol specifications, including RFC 1034 and RFC 1035, are included by reference.</p>
XDR	RFC 1832 XDR: eXternal Data Representation Standard.
FTP	RFC 959, File Transfer Protocol, October 1985.
HTTP	RFC 2068, Hypertext Transfer Protocol, January 1997.

**Table 4-3. NCCDS Services**

Service Name	Service Type	Open Service Port Numbers	Message Type	Message Class	Nominal Duration <sup>1</sup>
schReq	Schedule Request	55101	99 12, 21,24	10, 11 12, 21,24	Duration of message(s) transmission
schStatus	Schedule Status	55102	99 94	01, 02, 28 01 - 05	Indefinite
pmData	User Performance Data	55103	91 92	01 04, 62, 63, 66	<sup>2</sup> Duration of message transmissions associated with scheduled event
reconfig	Reconfiguration	55104	98	01 - 08	Duration of message transmissions associated with a service reconfiguration
acqStore	Acquisition Data Storage	55105	03	10, 15	Duration of message(s) transmission
tswStore	TSW Storage	55106	99	25	Duration of message(s) transmission

**NOTES**

<sup>1</sup>Refer to paragraph 4.3.3.

<sup>2</sup>For any event, User Performance Data messages (91/01) will normally be transmitted from scheduled event start time until a few seconds after scheduled event stop time. An Acquisition Failure Notification message (92/63) could be sent at any time during an event, but would normally be sent shortly following detection of the TDRS's failure to acquire the customer spacecraft signal at scheduled service start time. The other messages (92/62 and 92/66) can be sent up to two minutes after the last UPD message for the event.

### 4.3.2 Data Flow Over TCP Connections

Communication between MOC and NCCDS processes over TCP connections is via formatted messages. The formats of these messages are detailed in Sections 6 through 9. Table 4-3 documents the set of messages supported by each of the TCP services.

#### 4.3.2.1 Message Delineation

Transmission of all messages is accomplished using the eXternal Data Representation format (XDR). The XDR format allows multiple record fragments. Each record fragment contains a four byte record length followed by a data length parameter and an opaque data type that contains the modified message. The first record fragment in a record is indicated by setting the most significant bit of the four byte record length to a logic 1. In all cases covered by this ICD, there is one fragment per record. The most significant bit of every XDR record is thus a logical 1. The next 31 bits are the record length in bytes.

A data length field (byte 4 through byte 7)—comprising an XDR integer indicating the number of bytes in the data—precedes the data. The first byte of the message starts at byte 8 and has a data length that depends upon the message type and class. A pad of variable length of up to 3 bytes of value 0 is appended so that the whole XDR record is a multiple of 4 bytes.

Each message exchanged between the NCCDS and the MOC is contained in a single XDR record. The message may be of variable length. Sections 7 through 9 provide specific ground rules and data formats (to the bit and byte level) for each message exchanged between the NCCDS and the MOC. To ensure prompt delivery of a complete XDR record, the TCP SEND containing a complete XDR record (or the last part of a record if it is sent in multiple SENDs) should be made with the PUSH flag set.

#### 4.3.2.2 Communication Test Messages (CTM)

CTMs (see Table 8-38) may be used by MOCs to confirm the existence of their operational TCP/IP communication links with the NCCDS. The NCCDS echoes CTMs it receives on any service. Successful transmission of a CTM and receipt of an echo indicates that an NCC process is capable of receiving a message and transmitting a response.

The NCCDS does not require clients to provide a CTM echo capability over TCP connections (i.e., the NCCDS will not originate CTMs). Although CTMs are not required, they may be used by the MOC for network troubleshooting.

### 4.3.3 TCP Connection Termination

MOC client processes establish and maintain connections to NCC TCP services on an as needed basis. Table 4-3 indicates nominal duration for the connections on each service. The strategies implied by these nominal durations will assure that all messages will be received without maintaining unnecessary connections, but these nominal durations are only suggestions. MOC processes may terminate services at any time and the NCC will not interpret these terminations as errors.

The NCC will only terminate connections in anomalous situations including:

- Failover from a primary to a backup server due to an error (unplanned).
- Failover from a primary to a backup server for maintenance purposes (planned).
- Authorization failure, e. g., invalid password.
- Incorrect SRR or other message that doesn't have an application level response.

Because all of these terminations are due to anomalous conditions, NCC operators will be alerted when they occur.

MOC client processes are responsible for re-establishing connections to NCCDS services that terminate abnormally. (See Section 4.3.1) These processes will become aware of a connection termination the next time they attempt to send a message over the terminated connection. MOC processes may send CTMs periodically on any NCC service to ensure that terminations are detected in a timely manner.

#### **4.3.4 Message Queuing**

The NCCDS sends data to MOCs on three service types. Data on the Schedule Status service retains operational value for an extended period of time. Hence, the NCCDS queues this outgoing data. In normal circumstances, MOCs may retrieve previously untransmitted Schedule Status service data by simply establishing a valid connection. Verbal coordination is required to retrieve previously transmitted data or in cases of system or database failure.

Data on the User Performance Data and Reconfiguration services is of a real-time nature and very quickly loses its operational value. Hence, the NCCDS does not queue any of this data. There is no way for the MOC to retrieve any such data that is created while a connection is closed or that was created as a connection was closing.

### **4.4 File Transfer Protocol**

#### **4.4.1 Introduction**

FTP is an application layer protocol that uses TCP as the transport layer. It is the Internet standard high-level protocol for transferring files from client to server or vice versa. The server side requires a client to supply a login identifier and password before it will honor file transfer requests. The server must be notified of any changes to the client's network address, user account name, user password or the designated directory to which the files are copied.

#### **NOTE**

In contrast with TCP/IP used for other message transmissions, FTP does not use the eXternal Data Representation Format to transfer IIRV files.

FTP is used by the MOC for transferring improved interrange vector (IIRV) files to the NCCDS. For those external interfaces using FTP, the NCCDS uses standard FTP features to assure reliable receipt of files.

#### **4.4.2 FTP IIRV Data Description**

##### **4.4.2.1 MOC to NCCDS FTP IIRV File Transfers**

The MOC uses FTP to transfer state vector data in IIRV format files to the NCCDS. The MOC employs FTP and issues the FTP “put” command to place the files in a MOC-specific target directory of one of the following three NCCDS hosts:

1. “ftph1.ncc.ops.nascom.nasa.gov” for server 1.
2. “ftph2.ncc.ops.nascom.nasa.gov” for server 2.
3. “ftph3.ncc.ops.nascom.nasa.gov” for server 3.

The MOC will start with the server 1, use server 2 if server 1 is not available, and use server 3 only as directed by the NCC. The target directory name for each MOC using this service is exchanged as described in the applicable MOC-specific Annex of this ICD.

##### **4.4.2.2 NCCDS Detection of FTP IIRV Files**

The NCCDS will have a process for checking the applicable directory to detect the receipt of IIRV files in a timely manner, and to assure that files are processed in the correct order. The NCCDS will validate the content of each file. Any file containing anything other than valid IIRVs will be discarded, and the NCC operator will be alerted.

##### **4.4.2.3 File Naming Convention**

The FTP file name is given in Section II.C.2 of the annex for each MOC that uses FTP. The FTP file name is arranged in the following sequence:

XX = two characters used to uniquely identify the MOC transferring the  
FTP file (e.g., Landsat-7 = L7).

YYYY = four characters used to show the year of file creation (i.e., 1997).

DDD = three characters used to show day of file creation (i.e., 078).

XXX = three characters used to identify the destination station ID, (i.e.,  
NCC).

XXX = three characters used to identify data type (i.e., IRV).

. = a period “.”, used to separate the file name from the  
following file sequence number extension.

SNN = an S (that stands for sequence number), followed by a two digit  
sequence number starting at 00 for the first file. This number is then

incremented by one for each additional file transferred on a given day.

The file number should be reset to 00 for the first file each day.

This file naming convention allows each file to be unambiguously identified. The NCCDS validates file name syntax, and uses information within the file name to assure that files are processed in the correct order.

#### **4.4.2.4 FTP IIRV File Format**

Each FTP file contains a single IIRV message as described in Section 9.5

### **4.5 HTTP Protocol Suite**

The Hypertext Transfer Protocol (HTTP) is an application-level protocol used between World-Wide Web servers (NCCDS) and clients (MOCs) as well as for other tasks such as file transfer. This protocol is used in the NCCDS to provide TDRSS Unscheduled Time (TUT) to the MOC through the use of a web server in the NCCDS and a web browser in the MOC. An authorized MOC may also read the entire TUT file through HTTP for further internal processing. HTTP uses the TCP/IP protocols, with a default port of 80. The protocol HTTP/1.1 is described in reference 2.3.w.

Connections to the NCCDS TUT server should be made to the Universal Resource Locator (URL)

“<http://tuth1.ncc.ops.nascom.nasa.gov/>”

If this connection fails, the client should attempt to connect with a URL with the digit 2 (i.e., tuth2), and so on until the digit 9 is attempted. The client should continue this process until a connection is established, or the DNS Name Resolver has no entry for the constructed alias. When the client next attempts to establish a connection to the service, it should begin with the digit 1 again.

## Section 5. Message Content Data Rules

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### 5.1 General

For the messages whose formats are specified in Sections 7 and 8, this section contains general rules applicable to the entire applications-level message content rather than specific rules applicable to individual data items (see Sections 6, 7, 8 and 9). Each byte of the message content may contain an ASCII character or binary data. Binary data are situated so that the most significant bit occurs first in a serial transmission. Two or more contiguous bytes may be combined to form binary fields in multiples of eight-bit bytes. All data items described in the remainder of this document are in ASCII code unless otherwise noted in their descriptions. Table 5-1 contains a list of applicable ASCII characters.

### 5.2 Character Format

As indicated in Figure 5-1, ASCII characters will have the parity bit (bit  $2^7$ ) set to zero for transmission. The parity bit will occur first in a serial transmission. For example, a value of 94 decimal as ASCII appears as shown in Figure 5-1. After the parity bit transmission, the most significant bit (bit 178) of the ASCII character (9) occurs in the serial transmission.

First bit in serial transmission

Bit 177	Bit 192
0 0 1 1 1 0 0 1 0 0 1 1 0 1 0 0	
Parity	Parity

**Figure 5-1. Example of ASCII Character Format (Message Type 94)**

**Table 5-1. Applicable ASCII Characters**

Octal	Character	Binary	Octal	Character	Binary
012	(line feed)	00 001 010	111	I	01 001 001
015	(carriage return)	00 001 101	112	J	01 001 010
040	(space)	00 100 000	113	K	01 001 011
041	!	00 100 001	114	L	01 001 100
042	"	00 100 010	115	M	01 001 101
043	#	00 100 011	116	N	01 001 110
044	\$	00 100 100	120	P	01 010 000
045	%	00 100 101	121	Q	01 010 001
046	&	00 100 110	122	R	01 010 010
047	'	00 100 111	123	S	01 010 011
050	(	00 101 000	124	T	01 010 100
051	)	00 101 001	125	U	01 010 101
052	*	00 101 010	126	V	01 010 110
053	+	00 101 011	127	W	01 010 111
054	,	00 101 100	130	X	01 011 000
055	-	00 101 101	131	Y	01 011 001
056	.	00 101 110	132	Z	01 011 010
057	/	00 101 111	141	a	01 100 001
060	0	00 110 000	142	b	01 100 010
061	1	00 110 001	143	c	01 100 011
062	2	00 110 010	144	d	01 100 100
063	3	00 110 011	145	e	01 100 101
064	4	00 110 100	146	f	01 100 110
065	5	00 110 101	147	g	01 100 111
066	6	00 110 110	150	h	01 101 000
067	7	00 110 111	151	i	01 101 001
070	8	00 111 000	152	j	01 101 010
071	9	00 111 001	153	k	01 101 011
072	:	00 111 010	154	l	01 101 100
073	;	00 111 011	155	m	01 101 101
074	<	00 111 100	156	n	01 101 110
075	=	00 111 101	157	o	01 101 111
076	>	00 111 110	160	p	01 110 000
077	?	00 111 111	161	q	01 110 001
100	@	01 000 000	162	r	01 110 010
101	A	01 000 001	163	s	01 110 011
102	B	01 000 010	164	t	01 110 100
103	C	01 000 011	165	u	01 110 101
104	D	01 000 100	166	v	01 110 110
105	E	01 000 101	167	w	01 110 111
106	F	01 000 110	170	x	01 111 000
107	G	01 000 111	171	y	01 111 001
110	H	01 001 000	172	z	01 111 010

## 5.3 Time Format

A number of the message formats in this document contain a time field. This time reflects UTC and may contain up to 11 ASCII characters. This format is defined in Table 5-2.

**Table 5-2. Time Format**

Format Descriptor	Definition	Range of Values
YY	Calendar Year	00-99
DDD	Day of Year	001-366
HH	Hour of Day	00-23
MM	Minute of Hour	00-59
SS	Second of Minute	00-59

### NOTE

The interface specified by this document will be in operation through the transition from 1999 to 2000. It will be necessary for all systems to recognize that YY=00 is greater than YY=99. For example, it can be expected that some events will begin on December 31, 1999 and end on January 1, 2000.

## 5.4 Data Item Ground Rules

Data Items (identified as Item Number 1 through N of each message format) may be one or more bytes in length.

- a. If the values are fewer characters than the Number of Bytes indicated, the following rules will apply:
  - 1. All Data Item values will be right justified.
  - 2. The remainder of the Data Item will be filled with ASCII spaces. Numeric Data Items will be filled with leading zeros.

### NOTE

There is an apparent exception to rule a.1. "User ID," a data item consisting of four ASCII characters will usually appear to be left justified rather than right justified because it generally includes an ASCII space as its fourth character.

- b. If in any particular instance an entire data item is not used, the following rules will apply:
  1. The data item is not required to contain any specific values.
  2. Data items defined as alpha or alphanumeric will usually be filled with ASCII spaces.
  3. Data items defined as numeric will usually be filled with ASCII zeroes.
  4. Exceptions may be specified elsewhere in the document. These exceptions may apply to individual data items, individual messages, or to groups of messages.

## **5.5 Undefined and Spare Areas**

The areas of the Message Subfield that are not specifically defined are not required to contain any specific values. However, undefined and spare areas will usually be filled with ASCII spaces.

## **5.6 Nascom 4800 bit blocks**

### **5.6.1 Acknowledgment Subfield Format**

The Acknowledgment Subfield begins at byte 23 (bit 177). The acknowledgment is sent as a separate standalone message. The format of the acknowledgment message is defined in Table 5-3. The acknowledgment contains a copy of bytes 19 through 22 of the last block of the message being acknowledged. The acknowledgment block has a Message Block Type of 113 (octal) in bits 65 through 72.

### **5.6.2 Message Subfield Format**

The Message Subfield comprises bytes 23 through 596 (bits 177 through 4768) of each block of the message. Sections 7 and 8 provide specific ground rules and data formats (to the bit and byte level) for each message exchanged between the NCCDS and the MOC.

#### **5.6.2.1 Messages Requiring Multiple Blocks**

The data items specified in Sections 7, 8 and 9 constitute the message text. Whenever a message requires more than one 4800-bit block for transmission (e.g., the message text exceeds 574 bytes in length), the communication block overhead is used to determine sequence and continuity of the related message data. Except for the User Performance Data Messages, data is continuously packed from byte 596 of one block to byte 23 of the next block even if this splits a single field across two blocks. Information included in the Message Subfield to identify the type of data contained in the message (e.g., Message Type, Message ID, and Message Class) is not repeated in successive blocks. The message text must be fully packed in multiblock messages unless otherwise specified.

**Table 5-3. Acknowledgment Message Format**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	4	1	Acknowledgment Subfield	Duplicate of bytes 19 through 22 from acknowledged message
2	7	5	Spare	ASCII spaces
3	7	12	SUPIDEN	Refer to 532-808 or enter "Z9999ZZ"

# Section 6. Message Organization and Content

---

## 6.1 General

This section describes the organization and content of the messages exchanged between the NCCDS and the MOC. These messages occur in three high-level groupings and support six functional interactions, as described in Sections 6.2, 6.3 and 6.4. Figure 6-1 shows the organization of these messages down to the level of individual message type and class identifiers. The presentation of these messages in the following sections is in the order of their use in operations relative to any particular time period. Thus for a particular time period, the planning and scheduling messages precede real-time messages; within the planning and scheduling category, Schedule Coordination Messages precede User Schedule Messages. This organization permits the customer to associate MOC activities with both the NCCDS functions that support them and with the messages that implement them.

### 6.1.1 Message Requests and Responses

The messages described in this section provide the MOC with a means of requesting the allocation of SN resources to meet mission requirements and the management of these resources while in use. The NCCDS acts on these requests, in turn, by scheduling SN resources and by controlling and monitoring the SN during real-time support. The NCCDS responds with messages to inform the MOC of the support to be received at appointed times (i.e., the schedule). The schedule includes data rates, data types, sources, destinations and customer-oriented system setup options and parameters, as required for end-to-end customer data flows related to customer events and services. (Individual communications service elements of these requests are referred to as data streams.) The NCCDS can unilaterally cancel all pending schedule requests if a national emergency or spacecraft emergency situation exists. During real-time support of the event, the MOC may also request reconfiguration of SN services and receive periodic SN performance data updates.

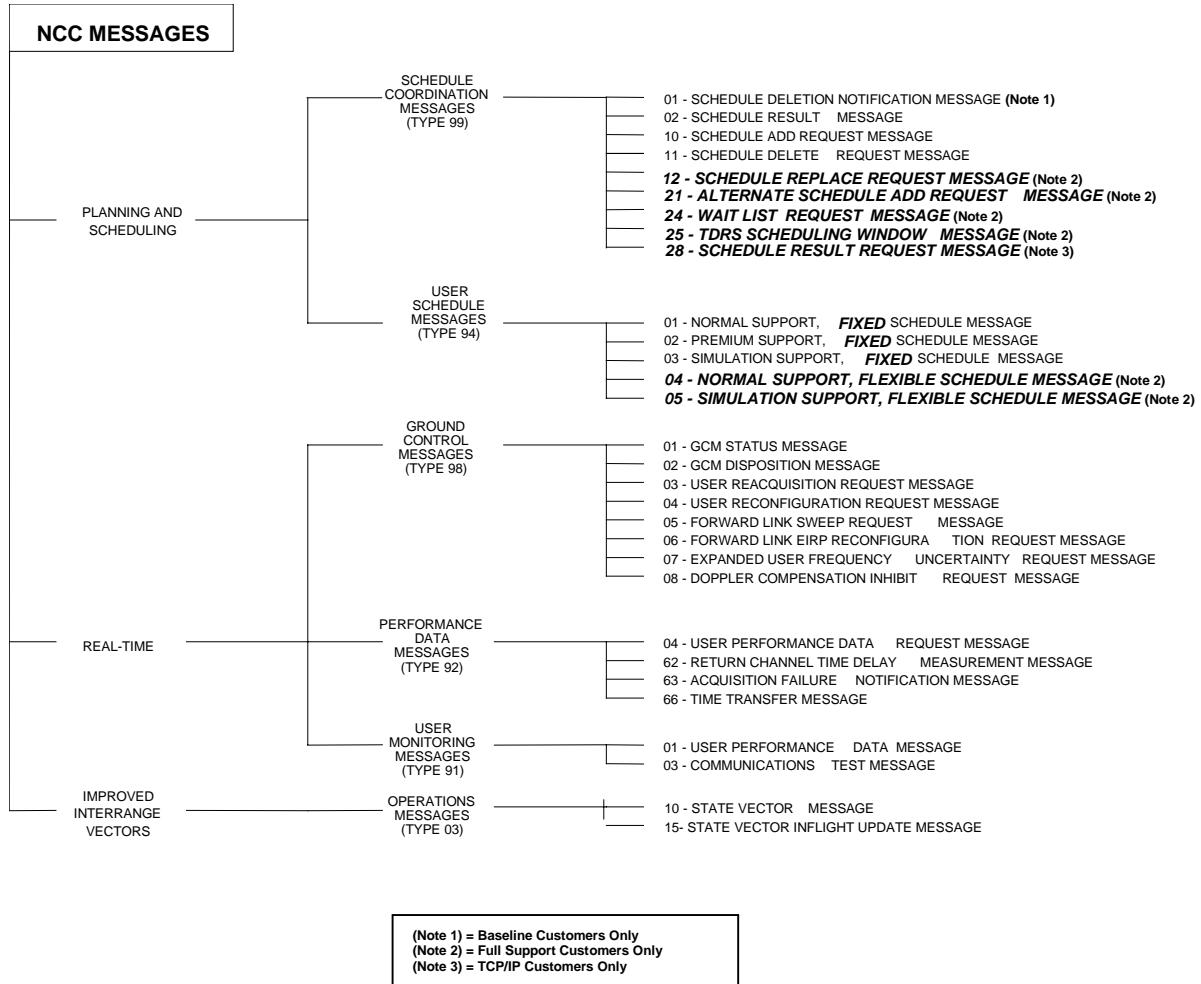
## 6.2 Planning and Scheduling Messages

Planning and scheduling messages permit the MOC to request SN resources and the NCCDS to schedule them. During the forecast period (two to three weeks prior to SN support), the MOC submits its requests. Based on all requests received during the forecast period, the NCCDS generates the schedule and transmits User Schedule Messages to the MOC. During the active period (the next two weeks), the MOC may submit additional requests. The active period is further subdivided into the batch and automatic scheduling update subphases. During the batch scheduling subphase, schedule updates are generally controlled manually by the NCC operator through the batch scheduling process. During the automatic scheduling update subphase, schedule updates are performed automatically on a first-in-first-out basis. Except for the Alternate SAR, all messages are valid in both active period subphases. The NCCDS-MOC interface supports the following two types of planning and scheduling messages:

- a. Schedule Coordination Messages, message type 99.
- b. User Schedule Messages, message type 94.

### **6.2.1 Schedule Coordination Messages, Message Type 99**

- a. A scheduled event consists of all related services (forward link, return link, tracking and simulation service) for a single TDRS and a single SUPIDEN for one continuous SN support period. Events are scheduled by the NCCDS for the MOC in response to Schedule Add Requests (SARs) (message type 99, class 10). Each SAR, using either service specification codes or a prototype event, designates a combination of support configurations in a particular time sequence for specific duration. Service specification codes, prototype events, and spacecraft characteristics are defined in the mission planning phase through coordination between the NCC and the MOC.
- b. The MOC is informed of each scheduled event by a separate User Schedule Message as described in Section 6.2.2. Schedule Coordination Messages comprise nine messages, as follows:
  1. Schedule Add Request Message, message class 10.
  2. Schedule Result Message, message class 02.
  3. Schedule Delete Request Message, message class 11.
  4. Schedule Deletion Notification Message, message class 01.
  5. Replace Request Message, message class 12.
  6. Alternate Schedule Add Request Message, message class 21.
  7. Wait List Request Message, message class 24.
  8. TDRS Scheduling Window Message, message class 25.
  9. Schedule Result Request Message, message class 28.



*Figure 6-1. NCC Message Structure*

### **6.2.1.1 Schedule Add Request Message, Message Type 99, Class 10**

- a. The MOC uses the SAR Message to request the NCCDS to schedule an event for a spacecraft over which the MOC has scheduling authority. The MOC can modify a previously scheduled event by sending a Replace Request.
- b. Respecifiable parameters are used in the SAR Message to change the initial values of certain data items in one or more SN services (e.g., for S-band Single Access (SSA) forward service, “Doppler compensation required”). For the requested event, the values for such data items as defined in the service specification code may be replaced by values specified in the SAR.
- c. If a SAR, received at the NCC less than 45 minutes before the requested start time, is successfully scheduled, a User Schedule - Premium Support, Fixed Schedule Message (message type 94, class 02) is sent to the MOC, as described in paragraph 6.2.2.2.

#### **NOTE**

A premium support message does not change the support provided a customer, but may change the rate a reimbursable customer is charged.

- d. The SAR's requested event start time and flexibility parameters must allow an event to be added to the schedule with an event start time between approximately 7 minutes and 28 days in the future. The exact times will be set by the NCC operator.

### **6.2.1.2 Schedule Result Message, Message Type 99, Class 02**

The Schedule Result Message (SRM) is sent by the NCCDS to the MOC in response to each request submitted by the MOC (i.e., Section 7.2, items a, c, e, f, and g). The SRM describes the results of NCCDS processing for each submitted request. In many cases, a single request will result in the transmission of multiple SRMs each one of which describes a distinct step in the total processing of the request. The SRM allows for unambiguous reference to any customer schedule request, or actions taken by an NCC operator.

### **6.2.1.3 Schedule Delete Request Message, Message Type 99, Class 11**

The Schedule Delete Request Message allows the MOC to request the NCCDS to delete a previously scheduled event by Event ID for a spacecraft under its control, or to delete a queued Schedule Add Request (message class 10), Schedule Replace Request (message class 12), or Alternate Schedule Add Request (message class 21) by Request ID for a spacecraft under its control.

### **6.2.1.4 Schedule Deletion Notification Message, Message Type 99, Class 01**

The Schedule Deletion Notification Message applies only to baseline customers. It is used to notify the MOC of deletion of a previously scheduled event. During emergencies related to customer's spacecraft, the NCC operator may delete a customer's event without that customer's concurrence. Circumstances permitting, an NCC operator contacts the MOC and verbally

propose a substitute event for the support that is being deleted. In all other cases, events are deleted only in response to the customer's request or with the customer's concurrence. The Schedule Deletion Notification Message is sent only in the following cases:

- a. Deletion requested by the MOC operator.
- b. NCC scheduler-assisted deletion to resolve emergency conflicts.

#### **6.2.1.5 Schedule Result Request Message, Message Type 99, Class 28**

The Schedule Result Request (SRR) Message is sent to the NCCDS by all MOCs that communicate via TCP/IP protocol, and is internally generated by NCCDS for MOCs that use Nascom 4800-bit block protocol. The MOC sends the SRR Message initially when it establishes a connection to the Schedule Status service. The SRR identifies the SUPIDEN(s) and the logical destination to be supported by that connection. The NCCDS server sends schedule results as Schedule Result Messages (see paragraph 6.2.1.2) and User Schedule Messages (see paragraph 6.2.2) to the logical destination identified and only for the indicated MOC SUPIDEN(s).

#### **6.2.1.6 Replace Request Message, Message Type 99, Class 12**

The MOC uses the Replace Request Message to request replacement of a scheduled event by another event or for replacement of a queued SAR, Alternate SAR, or Replace Request.

#### **6.2.1.7 Alternate Schedule Add Request Message, Message Type 99, Class 21**

During the forecast period and during the batch scheduling update subphase of the active period, the MOC uses the Alternate SAR to form a chain of queued schedule requests with the Alternate SAR being added to the chain following the request referenced by the Alternate SAR. In general, the NCCDS will use all specified options for scheduling the first member of the chain and if these are unsuccessful will then attempt to schedule the second member of the chain, etc. The Alternate SAR may reference any previously submitted SAR, Alternate SAR, or Replace Request that has been queued for batch processing. If a new Alternate SAR references anything other than the last member of a chain, the chain is broken and the segment below the referenced member is discarded.

#### **6.2.1.8 Wait List Request Message, Message Type 99, Class 24**

The MOC uses the Wait List Request Message to request that a previously declined request be placed on the NCCDS Wait List. Since no requests are reported to the MOC as having been declined until after initial schedule generation, the Wait List Request is applicable only in the active period. If the referenced request is a member of a chain of requests, all members of the chain from the referenced request to the end of the chain are placed on the Wait List. The Wait List Request also includes an expiration time. If this time is reached without successful scheduling of the request on the Wait List, the request is removed from the Wait List and a Schedule Result Message (SRM) is sent to the customer to indicate that the wait listing process did not result in an event being added to the schedule.

### **6.2.1.9 TDRS Scheduling Window Message, Message Type 99, Class 25**

A TDRS Scheduling Window (TSW) is an interval of time specified by a MOC during which the customer spacecraft can be scheduled to communicate with a TDRS. A TSW set is a collection of TSWs used for a specific purpose by the MOC. For example, a MOC may define multiple TSW sets to distinguish between TSWs applicable to different frequency bands or antenna types. The TSW Message provides the MOC with the capability to send its TSWs to the NCCDS. Each TSW message specifies a timespan in terms of a start time and an end time. All TSWs within a single TSW message apply to a single TDRS and to a single TSW set, and must lie within the message's specified timespan.

### **6.2.2 User Schedule Messages, Message Type 94**

Schedules for use of SN resources will be transmitted to the MOC via a User Schedule Message. A single User Schedule Message will include all related services (forward link, return link, tracking and simulation service) for a single TDRS and a single SUPIDEN for one continuous SN support period. A User Schedule Message will consist of one or more service Descriptions. Each service description will include the values of the fixed parameters and the initial values of the reconfigurable parameters required for that service. The MOC receives only the schedules relevant to its activities, based on the SUPIDEN.

#### **6.2.2.1 User Schedule - Normal Support, Fixed Schedule, Message Type 94, Class 01**

The User Schedule - Normal Support, Fixed Schedule Message is a schedule message sent to the MOC that defines the scheduled services and parameter values for one SN event. This specifies exact resource and time allocations.

#### **6.2.2.2 User Schedule - Premium Support, Fixed Schedule, Message Type 94, Class 02**

The User Schedule - Premium Support, Fixed Schedule Message is a schedule message sent to the MOC that defines the scheduled services and parameter values for one SN event that is in response to a SAR received less than 45 minutes prior to the requested start time. This specifies exact resource and time allocations.

#### **6.2.2.3 User Schedule - Simulation Support, Fixed Schedule, Message Type 94, Class 03**

The User Schedule - Simulation Support, Fixed Schedule Message is a schedule message sent to the MOC that defines the scheduled services and parameter values for one SN simulation event. This specifies exact resource and time allocations.

#### **6.2.2.4 Schedule - Normal Support, Flexible Schedule, Message Type 94, Class 04**

The User Schedule - Normal Support, Flexible Schedule Message is a schedule message sent to the MOC that defines the scheduled services and flexible (“best estimate”) parameter values for one SN event. Depending on the flexibility specified in the original request, this may specify estimated event and service start and stop times and preliminary resource allocation. Refer to paragraph 7.3.1.

#### **6.2.2.5 Schedule - Simulation Support, Flexible Schedule, Message Type 94, Class 05**

The User Schedule - Simulation Support, Flexible Schedule Message is a schedule message sent to the MOC that defines the scheduled services and flexible parameter values for one SN simulation event. Depending on the flexibility specified in the original request, this may specify estimated event and service start and stop times and preliminary resource allocation. Refer to paragraph 7.3.1.

### **6.2.3 TDRSS Unscheduled Time (TUT) Service**

The MOC may, with a World-Wide Web browser, access information describing the unscheduled TDRS time. There are two types of information available, as described below. Each may be presented in either tabular or graphical form. For the graphical form, the user may position the cursor on one of the elements in the graph, press either mouse button, and see the exact numerical values for the element.

The information is generated periodically by the NCCDS and is correct at the time of generation. Subsequent scheduling activities may result in the information becoming stale, and the available times as shown may no longer be available.

#### **6.2.3.1 Fixed Schedule**

This selection presents the unscheduled blocks of time as if all flexible events had been frozen.

#### **6.2.3.2 Flexible Schedule**

This selection presents the fraction of the selected resource that is available in each hour interval. A “confidence level” is also presented. In the current implementation, all events are treated as fixed events and the confidence level is always 100.

### **6.3 Real-Time Messages**

Real-time messages permit the MOC to modify scheduled events and network resources during the time scheduled for those events and to request and receive performance data relative to an ongoing event. The NCCDS-MOC interface supports three types of these messages:

- a. Ground Control Messages, message type 98.
- b. Performance Data Messages, message type 92.

- c. User Monitoring Messages, message type 91.

### **6.3.1 Ground Control Messages, Message Type 98**

- a. GCMs are used to communicate real-time modification requests from the MOC to the NCCDS and to provide status information regarding these requests back to the MOC. When the need to modify an active (ongoing) service exists, the MOC will send a Ground Control Message Request (GCMR) to the NCCDS. The NCCDS transmits the appropriate message to the SN. A GCM is one of the following classes of messages (items 1 through 6 are GCMRs):
  1. User Reacquisition Request Message, message class 03.
  2. Forward Link Sweep Request Message, message class 05.
  3. Forward Link EIRP Reconfiguration Request Message, message class 06.
  4. Expanded User Frequency Uncertainty Request Message, message class 07.
  5. User Reconfiguration Request Message, message class 04.
  6. Doppler Compensation Inhibit Request Message, message class 08.
  7. GCM Disposition Message, message class 02.
  8. GCM Status Message, message class 01.
- b. On receipt of a GCMR from the MOC, the NCCDS will verify that the MOC is eligible to submit such a request and that the referenced service is available. If the request passes these validation checks, an operations message (OPM) containing the GCM information is transmitted to the applicable SN ground terminal. Data rate changes are also sent to Nascom and other SN elements, as necessary. If the request fails these validation checks, a GCM status message is sent to the MOC, and the reason for failure is cited.
- c. When the SN ground terminal receives an OPM, it will send an acknowledgment to the NCCDS. A GCM Disposition Message will be sent by the NCCDS to the MOC advising the MOC whether or not the acknowledgment was received. Each SN element will also perform validity checks and then transmit a status message to the NCCDS, indicating that either an error was detected and the GCM is being rejected or that no errors were detected and the GCM is being executed. When the status message is received from the SN ground terminal, the NCCDS will send a GCM Status Message to the MOC. Status messages from other SN elements are provided as information to NCC operators, but do not result in any automatic messages being sent to the MOC.
- d. The NCCDS allows up to 12 valid User IDs to be assigned to a given SUPIDEN. The User ID within the GCMR is used by the NCCDS to determine the routing for any response messages relating to that GCMR.

### **6.3.1.1 User Reacquisition Request Message, Message Type 98, Class 03**

The User Reacquisition Request Message provides the MOC with the capability of requesting a service compatible link reacquisition procedure.

### **6.3.1.2 Forward Link Sweep Request Message, Message Type 98, Class 05**

The Forward Link Sweep Request Message provides the MOC with the capability of requesting a forward link sweep on the designated forward service.

### **6.3.1.3 Forward Link EIRP Reconfiguration Message, Message Type 98, Class 06**

The Forward Link EIRP Reconfiguration Message provides the MOC with the capability of requesting the SN ground terminal to reconfigure the SSA, KSA, or KaSA forward link EIRP between normal and high power modes.

### **6.3.1.4 Expanded User Frequency Uncertainty Request Message, Message Type 98, Class 07**

The Expanded User Frequency Uncertainty Request Message provides the MOC with the capability of expanding the frequency uncertainty of a scheduled return service.

### **6.3.1.5 User Reconfiguration Request Message, Message Type 98, Class 04**

The MOC may request reconfiguration for ten types of customer support links: forward and return links on MA, SMA, SSA, KSA, and KaSA services. For a support service reconfiguration, the MOC sends a User Reconfiguration Request Message to the NCCDS, with a legal value or ASCII spaces in the message fields for each reconfigurable parameter. For GCMs sent as OPMs to the SN ground terminal by the NCCDS, any ASCII spaces are transmitted exactly as received from the MOC. Such ASCII spaces indicate that no change is to be made to the current SN ground terminal configuration. For other SN elements, the NCCDS replaces any ASCII spaces received from the MOC with the current value from the NCCDS data base prior to construction and transmission of the GCM.

### **6.3.1.6 Doppler Compensation Inhibit Request Message, Message Type 98, Class 08**

The Doppler Compensation Inhibit Request Message provides the MOC with the capability of requesting that forward link Doppler compensation be inhibited on the specified link.

### **6.3.1.7 GCM Disposition Message, Message Type 98, Class 02**

The GCM Disposition Message is transmitted by the NCCDS to the MOC to indicate whether an acknowledgment was received from the SN ground terminal for the service reconfiguration OPM.

### **6.3.1.8 GCM Status Message, Message Type 98, Class 01**

The GCM Status Message is transmitted by the NCCDS to the MOC either on receipt of an invalid GCMR from the MOC, on receipt of an OPM status message from the SN ground terminal, or upon failure to receive an OPM status message within a specified time (nominally 20 seconds) after receipt of the SN ground terminal's acknowledgment of the service reconfiguration OPM. The NCCDS's detailed validation of GCMRs depends upon the type of GCMR. In general, the NCCDS will reject GCMRs for the following reasons:

- a. The MOC is not a valid requester for the specified spacecraft.
- b. The service referenced by the GCMR is not currently active.
- c. The previous GCMR for the same service is still active. The NCCDS regards a GCMR as active until one of the following occurs:
  1. The NCCDS rejects the GCMR.
  2. The SN ground terminal transmits an OPM Status message in response to a reconfiguration message transmitted to the ground terminal.
  3. The SN ground terminal fails to acknowledge the reconfiguration message within a specified time.
  4. The SN ground terminal fails to transmits an OPM Status message within a specified time after its acknowledgment of the reconfiguration message.
- d. The type of service referenced by the GCMR is invalid for that type of GCMR (e.g., a forward Link Sweep Request applies only to forward services).
- e. The link referenced by the GCMR is invalid for that type of GCMR or for the type of service referenced by the GCMR.
- f. Various parameter-specific conditions dependent upon the type of GCMR and the type of service referenced by the GCMR.

### **6.3.2 Performance Data Messages, Message Type 92**

Performance Data Messages are exchanged between the NCCDS and the MOC. Once performance data has been requested, it will continue to be forwarded to the MOC during each event for that SIC until disabled by another User Performance Data Request Message. Performance Data Messages include the following:

- a. User Performance Data Request Message, message class 04.
- b. Return Channel Time Delay Measurement Message, message class 62.
- c. Acquisition Failure Notification Message, message class 63.
- d. Time Transfer Message, message class 66.

### **6.3.2.1 User Performance Data Request Message, Message Type 92, Class 04**

The User Performance Data Request message is used by the MOCs to enable or disable the transmission of User Performance Data messages (message type 91, class 01).

For MOCs using Nascom 4800- bit block protocol, the User Performance Data messages will remain enabled or disabled until another User Performance Data Request message is sent to the NCCDS.

A MOC that uses TCP/IP protocol must send a User Performance Data Request Message to the NCCDS when it establishes a connection to the User Performance Data service. The NCCDS can send no data ( i.e., User Performance Data Messages, Return Channel Time Delay Measurement Message, Acquisition Failure Notification Message, and Time Transfer Message) on this service until an initial User Performance Data Request message is received. However, this initial User Performance Data Request message may either enable or disable User Performance Data Messages. The User Performance Data messages will remain enabled or disabled until another User Performance Data Request message is sent to the NCCDS, or until the connection is broken.

### **6.3.2.2 Return Channel Time Delay Measurement Message, Message Type 92, Class 62**

Return Channel Time Delay Measurement Messages are used to transmit return channel time delay measurements. The NCCDS transmits these messages for the return services for which the MOC in its SAR had requested return channel time delay measurement and ranging services. Return channel time delay measurements are performed by the SN ground terminal at the start and stop of the return service, after changes in equipment configuration, and at certain service reconfigurations. The Return Channel Time Delay Message will be transmitted to the MOC after the termination of the return services.

#### **NOTE**

Return Channel Time Delay Measurement can always be requested in the SAR without causing errors or rejections. However, if support is scheduled via the Guam Remote Ground Terminal (GRGT), there will be no Return Channel Time Delay Measurement message.

### **6.3.2.3 Acquisition Failure Notification Message, Message Type 92, Class 63**

An Acquisition Failure Notification Message is relayed by the NCCDS from the SN ground terminal to the MOC when an attempt to provide a scheduled return service does not occur due to the inability of the SN to acquire the MOC spacecraft.

### **6.3.2.4 Time Transfer Message, Message Type 92, Class 66**

Time Transfer Messages are used to provide the MOC with time transfer data measurements taken by the SN ground terminal. The Time Transfer Message will be transmitted to the MOC upon termination of a tracking service for which time transfer data were requested (in the SAR).

### **6.3.3 User Monitoring Messages, Message Type 91**

The two User Monitoring Messages are the User Performance Data Message, which consists of user performance data, and the Communications Test Message (CTM), which provides an NCCDS-MOC link check capability.

#### **6.3.3.1 User Performance Data Message, Message Type 91, Class 01**

The User Performance Data Message is organized in a standard format. The flow of User Performance Data Messages is controlled by the User Performance Request Message in exactly the same way as is the flow of Performance Data Messages (see paragraph 6.3.2). User Performance Data Messages for a spacecraft are sent only after activation by a User Performance Request Message (message type 92, class 04) or by NCC operator action. The current User Performance Data for one combination of SUPIDEN/TDRS is contained in one User Performance Data Message. The data is organized by service type (SA, MA, and simulation). The User Performance Data Message is transmitted every 5 seconds when support is ongoing. Acknowledgments are not solicited for User Performance Data Messages.

#### **NOTE**

Each User Performance Data message can contain data for only one TDRS. If services are active on more than one TDRS for the same SUPIDEN, there will be multiple User Performance data messages.

#### **6.3.3.2 Communications Test Message, Message Type 91, Class 03**

CTMs (see Table 8-38) are used by the originator to ascertain the existence of an operational communications link between the NCCDS and the MOC. The NCCDS sends CTMs to MOCs that use Nascom 4800-bit block protocol to communicate with the NCCDS, but will never send a CTM to a MOC that uses TCP/IP. Regardless of protocol, any MOC may send a CTM to the NCCDS at any time on any connection.

The CTM is a single block message for the Nascom 4800-bit block protocol. The originator always requests an acknowledgment for this message. Aside from an acknowledgment, no other response by the recipient is required. CTMs may be used by MOCs to confirm the existence of their operational TCP/IP communication links with the NCCDS. The NCCDS echoes CTMs it receives on any service. Successful transmission of a CTM and receipt of an echo indicates that an NCC process is capable of receiving a message and transmitting a response.

The NCCDS does not require clients to provide a CTM capability over TCP connections (i.e., the NCCDS will not originate CTMs).

## **6.4 Improved Interrange Vector Message, Message Type 3, Class 10 or Class 15**

The IIRV messages are used by the MOC and NCCDS to exchange information on user orbits. The message structure and format are provided in Section 9.

# Section 7. Planning and Scheduling Message Formats

---

## 7.1 Overview

The following Planning and Scheduling Messages are described in this section:

- a. Schedule Coordination Messages, Message Type 99
- b. User Schedule Messages, Message Type 94

### 7.1.1 Identification of Events

#### 7.1.1.1 Baseline Customers

For baseline customers, the NCCDS identifies events by:

TDRS-Name + SUPIDEN + Event-Start-Time.

When necessary, the NCCDS will add one second to an event's start time in order to ensure that each event is uniquely identified.

#### 7.1.1.2 Full Support Customers

For full support customers, events are uniquely identified by:

SIC + Event ID.

The Event ID is a seven-digit number and is used as the Message ID of the corresponding User Schedule Message (USM). For events scheduled in response to requests submitted by customers, the Event ID is equal to the Request ID of the request that resulted in the event being scheduled. For events scheduled in response to requests initiated by the NCC operator, the Event ID is internally generated by the NCCDS and is in the range 9,000,000 to 9,999,999. Therefore, in order to preclude conflict, all Request IDs for requests submitted by MOCs must be in the range 0,000,001 to 8,999,999.

#### NOTE

The terms "Request ID" and "Message ID of a request" are equivalent. The terms "Event ID" and "Message ID of a USM" are equivalent.

### 7.1.2 Distinction Between Shuttle and Normal User Parameters

The SN has two types of users, Shuttle and Normal (i.e., all non-Shuttle users). Correspondingly, there are three types of parameters: Shuttle-unique parameters, Normal-unique parameters, and common parameters applicable to both Shuttle and Normal users. In order to clearly show this distinction, this document uses the following formatting:

- a. Tables applicable only to Normal users include "Normal User" in their titles. The titles are also boxed. No special formatting is applied to the remainder of the table.
- b. Tables applicable only to Shuttle include "Shuttle" in their titles. The titles are also shaded. No special formatting is applied to the remainder of the table.
- c. Within tables applicable to both Shuttle and Normal users, individual areas of the tables are formatted as follows:
  - 1. Items applicable only to Normal users are boxed. In nearly all cases, "Normal User" is also included in the name of the item.
  - 2. Items applicable only to Shuttle are shaded. In nearly all cases, "Shuttle" is also included in the name of the item.
  - 3. No special formatting is applied to common items.

## 7.2 Schedule Coordination Messages, Message Type 99

The following Schedule Coordination Messages formats are described in this section:

- a. Schedule Add Request Message, message class 10.
- b. Schedule Result Message, message class 02.
- c. Schedule Delete Request Message, message class 11.
- d. Schedule Deletion Notification Message, message class 01.
- e. Replace Request Message, message class 12
- f. Alternate Schedule Add Request Message, message class 21
- g. Wait List Request Message, message class 24
- h. TDRS Scheduling Window Message, message class 25
- i. Schedule Result Request Message, message class 28

### 7.2.1 Schedule Add Request Message, Message Class 10

The SAR Message allows the MOC to request the NCCDS to add a schedule event for a spacecraft for which the MOC has scheduling authority. The format for the SAR message is shown in Table 7-1.

#### NOTE

For convenience all tables referenced in Sections 7.2 and 7.3 begin on Page 7-14 following the text.

Table 7-2 gives the name of respecifiable parameters as they are used in the SAR along with their relationship to the fields of the MOC-provided schedule. Except for I/Q power ratio, the range of values for each respecifiable parameter is as shown in Appendix A.

Formats of the parameter values are the same as those specified in the reconfigurable parameter areas of the service formats for the User Schedule Message (Section 7.3) except for the tracking respecifiable parameters which are not reconfigurable and the I/Q power ratio which has a different format. The I/Q Channel power ratio should be entered as three ASCII characters N:M, with N and M representing the integers that yield the desired ratio of I to Q channel power. The NCCDS then computes the I/Q power ratio as  $10 \log (N/M)$ , and uses the result in the form shown in the USM formats. N and M are each valid in the range 1 to 9.

### 7.2.1.1 Service Flexibility

In the baseline SAR format, a nominal Event Start Time is specified along with plus and minus tolerances. Each service is specified in terms of its duration and in terms of its start time relative to the Event Start Time. The full support SAR extends these concepts to allow for plus and minus tolerances on the relative service start times and for minimum service durations. In order to maintain necessary inter-service relationships, the full support SAR format provides the capability to specify the start of a service relative to the start of another service rather than relative to the Event Start Time. The service-level flexibility parameters are defined in Table 7-3. General guidelines for use of these parameters are presented in Appendix D. In addition, the following specific rules apply to the use of these service-level flexibility parameters:

- a. Based on TDRSS ground rules, the nominal values in a SAR must define a valid event.
- b. The flexibility parameters may create the possibility of inter-service relationships that would violate TDRSS ground rules. It is the responsibility of the NCCDS to use the flexibility parameters so as to not violate TDRSS ground rules.
- c. The event must start at its Event Start Time. To ensure this, the following constraints are specified on the use of event start time and service start time flexibility:
  - 1. If a SAR specifies non-zero event start time plus tolerance or non-zero event start time minus tolerance, at least one of the services in the SAR must have its start time specified relative to the Event Start Time and must have its relative start time, start time minus tolerance, and start time plus tolerance all equal to zero.
  - 2. If a SAR specifies zero event start time plus tolerance and zero event start time minus tolerance, at least one of the services in the SAR must have its start time specified relative to the Event Start Time. However, service start time flexibility may be specified for any of the services in the SAR. When no event start time flexibility is specified, the NCCDS will apply the specified service-level flexibilities as needed and the earliest scheduled service start time will be used as the scheduled event start time.
  - d. The SAR parameters allow for explicit specification of the relationship of one service's start relative to the start time of another service. If the customer intends a particular relationship of the stop time of one service relative to the stop time of another service, the customer must indirectly control this relationship via use of the start time and duration parameters.

- e. When two or more services in a request have their start times defined relative to the start times of other services, the relationships cannot be circular (i.e., every service must have its start time either directly or indirectly defined relative to Event Start Time.)

**NOTE**

The customer may have “minimum gap” parameters specified in the NCCDS database. Use of these parameters will allow the customer to make full use of scheduling flexibility while assuring that the customer's own events will maintain a specified minimum gap between each other. The minimum gap parameters allow the customer to specify gaps between pairs of SA events, between pairs of MA/SMA events, between SA and MA/SMA events, and between MA/SMA and SA events.

- f. To ensure compliance with SN ground rules, the NCCDS will schedule each simulation service with the scheduled start and stop times of its associated normal forward or return service. The NCCDS disregards the nominal service start time, nominal service duration, and any service-level flexibility keyword parameters specified for simulation services. Any service-level flexibility specified for the normal forward or return service is therefore automatically applied to the associated simulation service.

### 7.2.1.2 TDRS

The TDRS parameter is interpreted in a way that allows for flexible specification of TDRS. TDRS operational names are assigned by NCC operational personnel and all MOCs are notified. Example: there are four TDRSs stationed at 41°, 46°, 171°, and 174°. If the customer wishes to request support on one of these TDRSs, the schedule request identifies the requested TDRS as either "041", "046", "171", or "174. "In addition, NCC operations personnel may define three-character TDRS set names. Such a TDRS set may contain all TDRSs, a subset of TDRSs, a single TDRS, or other TDRS sets. For example, the names 'ALL', 'TDW', 'TDE', 'TE1', 'TE2', 'TE3', 'TE4', and 'TEE' could be defined such that:

1. 'ALL' means 041 or 046 or 171 or 174.
2. 'TDW' means 171 or 174.
3. 'TDE' means 041 or 046.
4. 'TE1' means 041.
5. 'TE2' means 041.
6. 'TE3' means 046.
7. 'TE4' means 046.
8. 'TEE' means TE1, TE2, TE3, or TE4.

Note that when a TDRS set contains a single TDRS operational name, the set name serves as an alias for the TDRS operational name. In this example, TDE and TEE are nearly equivalent.

However, TEE refers to 041 and 046 via their aliases. For some customers, this will allow greater flexibility in their use of TSWs. Refer to Table 7-12.

TDRS sets are not customer-specific. Unless precluded by operational agreements or by other parameters in the NCCDS database, all TDRS sets are available to all customers."

### **7.2.1.3 Customer Priorities**

For full support customers, "1" indicates the highest customer priority level and the values "2" and above indicate successively lower priority levels. The NCCDS interprets all values entered by baseline customers as indicating normal support. When baseline customers require support at higher than the normal level, the NCC operator edits this parameter.

### **7.2.1.4 Ground Rules**

The following ground rules apply for the SAR Message format:

- a. All unused fields must be ASCII spaces, unless otherwise indicated to be zero filled.
- b. All related services (forward, return, tracking, etc.) for one SUPIDEN for one TDRS for one contiguous time interval are contained in the same SAR. However, if needed to obtain the necessary support the customer may submit two (or more) SARs applicable to the same TDRS at the same time.
- c. For the baseline customers, changes to configurations (prior to event start) require the entire scheduled event to be deleted, via a Schedule Delete Request Message (Section 7.2.3), and requires that an SAR be submitted to add the schedule event as changed. Full support customers may use a Replace Request Message (Section 7.2.6) instead.
- d. The configuration of services for a requested event is specified either by a set of service specification codes (items 17 through 22 of Table 7-1) or by a Prototype Event ID (item 15 of Table 7-1) that designates a predefined set of service specification codes in the NCCDS database. Refer to Appendix A for the service specification codes and prototype event formats used in the NCCDS database.
- e. Each service specification code represents a single service over one continuous interval of time and designates a predefined set of initial service parameter values with which the SN resources are scheduled and a set of maximum service parameter values that the SN resources are allocated for the service.
- f. Certain initial parameter values may be replaced by values specified in the request for some items in service specification codes (items 20 and 21 of Table 7-1). Parameters having initial values that may be changed in this manner in the request are referred to as "respecifiable parameters." Parameters may not be respecified when scheduling by a prototype event. A complete description and list of respecifiable parameters are provided in Table 7-2.

## NOTE

Values specified for respecifiable parameters in item 21 of Table 7-1 indicate initial values only and do not refer to reconfigurations that might occur while the service is in progress.

### 7.2.1.5 Service Specification Codes Sequence

In the SAR the MOC is required to arrange the service specification codes in the order as described below. The service specification codes for the normal and simulation events are listed as follows:

- a. Normal Event:
  1. Forward service no. 1 service specification code.
  2. Forward service no. 2 service specification code.
  3. Forward service no. n service specification code.
  4. Return service no. 1 service specification code.
  5. Return service no. 2 service specification code.
  6. Return service no. n service specification code.
  7. Tracking service no. 1 service specification code.
  8. Tracking service no. 2 service specification code.
  9. Tracking service no. n service specification code.
- b. Simulation Event:
  1. Forward service no. 1 service specification code.
  2. Simulation service specification code for forward service no. 1.
  3. Forward service no. 2 service specification code .
  4. Simulation service specification code for forward service no. 2.
  5. Forward service no. n service specification code.
  6. Simulation service specification code for forward service no. n.
  7. Return service no. 1 service specification code.
  8. Simulation service specification code for return service no. 1.
  9. Return service no. 2 service specification code.
  10. Simulation service specification code for return service no. 2.
  11. Return service no. n service specification code.
  12. Simulation service specification code for return service no. n.

13. Tracking service no. 1 service specification code.
14. Tracking service no. 2 service specification code.
15. Tracking service no. n service specification code.

#### **7.2.1.6 Use of Schedule Add Request By Baseline Customers**

For baseline customers, the NCCDS database indicates that the SAR is to be interpreted such that baseline customers can continue to use this format with no changes or constraints.

#### **7.2.2 Schedule Result Message Format, Message Class 02**

The NCCDS sends a Schedule Result Message (SRM) to announce any action taken in response to any schedule request submitted by the MOC (i.e., Section 7.2, items a, c, e, f, and g) and to announce when an event is added or deleted. SRMs announcing that an event has been deleted are sent to each destination that received a User Schedule Message for the event. For each customer SIC, all other SRMs are sent to a single fixed logical destination specified in the NCCDS database as the “primary logical destination” for that customer SIC. For full support customers, the SRM format allows for unambiguous reference to any customer schedule request, or to actions taken by an NCC operator. For full support customers, the modified SRM also replaces the Schedule Deletion Notification message. For items 7, 8, and 9, the SRM will contain exact copies of data provided by the customer in the schedule request. If the values for any of this data were outside of the specified range of values in the request, they will also be outside of the specified range of values in the SRM. The format for the Schedule Result Message is shown in Table 7-4.

##### **7.2.2.1 Use of Schedule Result Message By Baseline Customers**

An additional parameter is added to the end of the SRM format, but this may be ignored by baseline customers. The set of Result Codes and Explanation Codes used for baseline customers are a subset of those currently used. In addition, the NCCDS continues to provide the Schedule Deletion Notification message for baseline customers.

##### **7.2.2.2 Valid SRM Result and Explanation Code Combinations**

Table 7-5 lists the Valid Combinations of all SRM Result Codes (item 10 of Table 7-4) and Explanation Codes (item 11 of Table 7-4).

#### **7.2.3 Schedule Delete Request Message, Message Class 11**

The Schedule Delete Request Message allows the MOC to request the NCCDS to delete a scheduled event for a spacecraft for which the MOC has scheduling authority, or to remove a queued schedule request. The format for the Schedule Delete Request Message is shown in Table 7-6.

## NOTE

If there is a chain of schedule requests queued for batch processing (see section 7.2.7) and a Delete Request is used to delete any request other than the last request in the chain, the chain is broken. In effect, such a Delete Request deletes the referenced request and all requests below the referenced request. Requests above the referenced request are not affected. This applies to both the Real-Time and the Forecast periods.

The following ground rules apply for the Schedule Delete Request Message format:

- a. All unused fields must be ASCII spaces or zero filled.
- b. Changes to configurations require the entire scheduled event to be deleted, via a Schedule Delete Request, followed by a SAR (Section 7.2.1) submitted to schedule an event or through the use of a Replace Request (Section 7.2.6).
- c. Deletions of a scheduled event may be accomplished only by the MOC or NCC scheduling operator.

### **7.2.3.1 Use of Schedule Delete Request Message By Baseline Customers**

Baseline customers use the SUPIDEN, TDRS, and old event start time parameters within the Schedule Delete Request to identify an event to be deleted. However if these parameters do not identify an event but do identify a queued request, the NCCDS will delete the queued request.

### **7.2.4 Schedule Deletion Notification Message Format, Message Class 01**

When the NCCDS deletes a baseline customer's scheduled event, it sends a Schedule Deletion Notification Message to the MOC. The format for the Schedule Deletion Notification Message is shown in Table 7-7. The NCCDS uses the Schedule Deletion Notification message only for baseline customers.

## NOTE

In response to a delete request, the NCCDS may also send an SRM to a baseline customer to announce the deletion of an event. The SRM's Message ID will be the Message ID of the customer's delete request, the result code will be "01" and the explanation code will be blank.

### **7.2.5 Schedule Result Request Message Format, Message Class 28**

The client (MOC) sends one Schedule Result Request (SRR) Message (type 99, class 28) when it establishes any connection to the Schedule Status service including those for multiple missions. The SRR identifies the SUPIDEN(s) and logical destination to be supported by that connection. The format for the SRR message is shown in Table 7-8. This Schedule Result Request message is used by all MOCs using TCP/IP interfaces, and it is never used for the baseline Nascom 4800-bit block protocol interface.

The NCCDS database allows for multiple User IDs and passwords for a single customer spacecraft (i.e., SICs). There is nothing to prevent the same User ID and password from being entered for multiple customer spacecraft.

If a single client process wants USMs for multiple customer spacecraft, the same User ID and password must be valid for all of these customer spacecraft.

#### **7.2.6 Replace Request Message, Message Type 99, Class 12**

The Replace Request format is nearly the same as the SAR format, but allows for replacement of a scheduled event by another event or for replacement of an SAR, Alternate SAR, or Replace Request. See Table 7-9. There is no customer priority parameter within the Replace Request. In all cases, Replace Requests inherit their priority from the referenced request. This message is not available to baseline customers.

#### **7.2.7 Alternate Schedule Add Request Message, Message Type 99, Class 21**

The Alternate SAR is applicable only during the forecast period and during the batch scheduling update subphase of the active period. The Alternate SAR format is nearly the same as the SAR format, but allows for reference to a SAR, a Replace Request, or another Alternate SAR queued for batch processing. See Table 7-10. There is no customer priority parameter within the Alternate SAR. In all cases, Alternate SARs inherit their priority from the referenced request. Since an Alternate SAR can point to another Alternate SAR, it is possible to form a chain of Alternate SARs. This is identified as a chain of schedule requests. This message is not available to baseline customers.

##### **NOTE**

If there is a chain of schedule requests and a new Alternate SAR references any request other than the last request in the chain, the new request creates a branch in the chain. NCCDS processing follows the new branch. All requests in the old branch are deleted.

#### **7.2.8 Wait List Request Message, Message Type 99, Class 24**

The Wait List Request refers to a declined request, and requests that it be placed on the NCCDS Wait List. The Wait List Request may refer only to requests that are not members of a chain of requests, or to the first member of a chain of requests. If the referenced request is the first member of a chain of requests, all members of the chain must have been declined and all members of the chain are placed on the Wait List. The Wait List Request also includes an expiration time. If this time is reached without successful scheduling of the request on the Wait List, the request is removed from the Wait List and a Schedule Result Message (SRM) is sent to the customer to indicate that the wait listing process did not result in an event being added to the schedule. See Table 7-11. This message is not available to baseline customers.

### 7.2.9 TDRS Scheduling Window Message, Message Type 99, Class 25

The TDRS Scheduling Window (TSW) message provides full support customers with the capability to specify their TSWs for use in scheduling by the NCCDS. See Table 7-12. Each TSW message specifies a timespan in terms of a start time and an end time. All TSWs within the message are to have opening and closing times lying within the specified timespan. The timespan controls how the NCCDS uses the contents of the TSW message to update its database. Each TSW message may contain up to 388 TSWs. Each TSW specifies a TSW opening time and a TSW closing time. All of the TSWs within the same message must be for the same TDRS and TSW set. All of the TSWs within the same message must be for the same TSW set and for the same TDRS or TDRS set. However, the NCCDS accepts the TSW message regardless of the order of the TSWs within it. This message is not available to baseline customers.

#### NOTE

388 is the number of TSWs that can be transmitted in a 15 block Nascom 4800-bit block message. For consistency, this same limit also applies to TCP/IP messages. The customer may choose to use shorter TSW messages.

#### NOTE

A TSW message containing zero TSWs is valid. Such a message directs the NCCDS to delete all TSWs for the specified TDRS and TSW set within the specified time range.

#### NOTE

There must be a gap between the closing time of one TSW and the opening time of the next TSW. If there is any overlap of TSWs in a message, the NCCDS rejects the entire message as invalid.

## 7.3 User Schedule Messages, Message Type 94

The following User Schedule Message formats are described in this section:

- a. User Schedule Message - Normal Support, Fixed Schedule, message class 01.
- b. User Schedule Message - Premium Support, Fixed Schedule, message class 02.
- c. User Schedule Message - Simulation Support, Fixed Schedule, message class 03
- d. User Schedule Message - Normal Support, Flexible Schedule, message class 04
- e. User Schedule Message - Simulation Support, Flexible Schedule, message class 05

### 7.3.1 General

The User Schedule Messages, which consist of customer schedule information, are organized in a standard format for the MOC. The User Schedule Message consists of two types of formats:

- a. Schedule Data Message Header format

b. Service formats

Within a fixed USM, the final settings of all parameter values are specified. No change to a fixed USM can occur in the absence of explicit action on the part of either the MOC or the NCC operator. Except in extreme operational contingencies, the concurrence of the customer is required before the NCC operator can make any change to an event after a fixed USM has been transmitted.

When the customer specifies a minimum service duration parameter by use of the MIND keyword and it is not possible to schedule the service with its full nominal duration, the NCCDS will transmit a flexible USM rather than a fixed USM. Within the flexible USM, flexibility will be retained for certain resource and time-related parameters. At the freeze time specified by the customer, the NCCDS will use event flexibility to attempt to recapture the service duration that had been reduced by use of MIND and then will transmit a fixed USM.

#### **7.3.1.1 Flexible Resources Parameters**

The customer may specify resource flexibility for TDRS, SA antenna and for user interface channels. Flexibility is always assumed for MAR/SMART link.

- a. TDRS. If the request specified TDRS flexibility, the TDRS parameter will contain the name of a specific TDRS. However, this should not be interpreted as precluding the selection of a different TDRS when the event is frozen and a fixed USM is transmitted.
- b. SA Antenna. If the request specified SA antenna flexibility, a specific SA antenna will be indicated in the service support subtype parameter. However, this indication should not be interpreted as precluding the selection of another SA antenna when the event is frozen and a fixed USM is transmitted.
- c. User Interface Channel ID. If the request specified User Interface Channel flexibility (i.e., the referenced SSC provided a list of User Interface Channel IDs rather than an individual User Interface Channel ID), a specific User Interface Channel ID will be indicated in the flexible USM. However, this indication should not be interpreted as precluding the selection of a different User Interface Channel ID when the event is frozen and a fixed USM is transmitted.
- d. MAR and SMART Link ID. Flexibility is always assumed for MAR/SMART link, and the MAR/SMART link ID parameters always contain ASCII spaces in flexible USMs.

#### **7.3.1.2 Time-Related Flexible Schedule Parameters**

The meaning of the time-related parameters in the USM Header and in the remainder of the message is different in fixed USMs and flexible USMs. These parameters are: Event Start Time, Service Start Time, and Service Stop Time. In the fixed USM, these parameters are the actual times at which the event is supported. Except in extreme operational contingencies, the concurrence of the customer is required before the NCC can make any change to an event after a fixed USM has been transmitted. In the flexible USM, these parameters represent the NCC's best knowledge as of the time that the USM was transmitted. The NCC can modify these parameters

within the flexibility ranges specified in the original flexible request without the customer's concurrence and without notifying the customer. However except in extreme operational contingencies, the concurrence of the customer is required before the NCC can reduce a service duration (i.e., the difference between service stop time and service start time).

### **7.3.2 Service Descriptions**

Each service description will include the values of the fixed parameters and the initial values of the reconfigurable parameters required for that service format. Reconfigurations are accomplished through GCMRs (refer to Section 6.3.1).

### **7.3.3 User Schedule Message Formats**

A single User Schedule Message will include all related services (forward link, return link, tracking, and simulation service) for a single TDRS and a single SUPIDEN for one continuous SN support period. The User Schedule Message ordering of services is as described in section 7.2.1.5. All defined fields not containing a MOC selection will contain ASCII spaces unless specified to be zero filled. A User Schedule Message will consist of a Schedule Data Message Header, followed by one or more service descriptions. If simulation services are included in the User Schedule Message, the service description for the simulation will follow immediately after the service description defining the related forward or return service.

#### **NOTE**

In the following tables all shaded areas contain information which is associated with the Shuttle only. Non-shaded areas contain information which is associated with non-Shuttle customers (normal users) and may also contain information associated with Shuttle.

#### **7.3.3.1 User Schedule Message Header Format**

The format for the User Schedule Message Header is shown in Table 7-13.

#### **7.3.3.2 MA/SMA Forward Service Format**

The format for the fixed and reconfigurable parameters for MA/SMA Forward Service is shown in Table 7-14.

#### **7.3.3.3 SSA Forward Service Format**

The format for the fixed and reconfigurable parameters for SSA Forward Service is shown in Table 7-15.

#### **7.3.3.4 KSA/KaSA Forward Service Format**

The format for the fixed and reconfigurable parameters for KSA/KaSA Forward Service is shown in Table 7-16.

### **7.3.3.5 MA Return Service Format**

The format for the fixed and reconfigurable parameters for MA Return Service is shown in Table 7-17.

### **7.3.3.6 SSA/SMA Return Service Format**

The format for the fixed and reconfigurable parameters for SSA/SMA Return Service is shown in Table 7-18.

### **7.3.3.7 KSA/KaSA Return Service Format**

The format for the fixed and reconfigurable parameters for KSA/KaSA Return Service is shown in Table 7-19.

### **7.3.3.8 Normal Tracking Service Format**

The format for the parameters for the Normal Tracking Service is shown in Table 7-20.

### **7.3.3.9 Cross-Support Tracking Service Format**

The format for the parameters for the Cross-Support Tracking Service is shown in Table 7-21.

### **7.3.3.10 Simulation Service Format**

The format for the Simulation Service is shown in Table 7-22.

**Table 7-1. Schedule Add Request Message Format  
 (From MOC To NCCDS)(1 of 4)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	2	1	Message Type	99 = Schedule Coordination Message
2	7	3	Request ID	A unique 7-character number used to reference this message
3	2	10	Message Class	10 = SAR Message
4	7	12	SUPIDEN	Refer to 532-808.
5	4	19	User ID	Requester ID (four ASCII characters)
6	4	23	Password	Alphanumeric code
7	1	27	Customer Priority	<p>Full Support Customers:            1 to 9; with 1 indicating the highest priority for the individual customer, 2 indicating the next highest, 9 indicating the lowest.</p> <p>Baseline Customers:            0 or 1</p> <p>(Note: for baseline customers, the NCCDS translates “0” and “1” to a value that indicates normal support.)</p>
8	3	28	TDRS	AAA; three alphanumeric characters used to specify a TDRS or a predefined set of TDRSs
*9A	7	31	Spare	
*9B	1	38	TSWs  or  Spare	<p>Full Support Customers:            0 = Do not use TSWs to constrain scheduling of this event            1 = Use TSWs</p> <p>Baseline Customers:            Not Applicable</p>

\* Items 9A, 9B, 9C and 9D total to the same number of bytes as Item 9 in the baseline format.

**Table 7-1. Schedule Add Request Message Format  
 (From MOC To NCCDS)(2 of 4)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
*9C	1	39	Wait List  or  Spare	Full Support Customers: 0 = Do not place on Wait List 1 = Place on Wait List if initial scheduling is unsuccessful  (Note: Wait List flag is applicable only during active period. If set prior to active period, it is ignored, but SAR is not rejected)  Baseline Customers: Not applicable
*9D	2	40	Spare	
* Items 9A, 9B, 9C and 9D total to the same number of bytes as Item 9 in the baseline format.				
10	11	42	Nominal Event Start Time	YYDDDHMMSS
11	6	53	Event Start Time Plus Tolerance	HHMMSS
12	6	59	Event Start Time Minus Tolerance	HHMMSS
13	6	65	Freeze Interval  or  Event Duration	Full Support Customers  DDHHMM DD=00 to 99 HH=00 to 23 MM=00 to 59  If all ASCII spaces, the customer's default freeze interval is used.  Baseline Customers  HHMMSS  (Note: the NCCDS ignores Event Duration, however, baseline customers can continue to provide this parameter.)
14	1	71	Fixed Pattern	0 (zero)

**Table 7-1. Schedule Add Request Message Format  
 (From MOC To NCCDS)(3 of 4)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
15	3	72	Prototype Event ID	AAA; three alphanumeric characters. If specified, all following fields are spare. (Note: ASCII spaces if not specified).
16	2	75	Number of Service Specification Codes	01 through 16 (total number of service specification codes for this request)
17	3	77	Service Specification Code ID	AAA; three alphanumeric characters  (Note: For baseline customers, the NCCDS database includes service specification codes equivalent to their original configuration codes. These service specification codes are specified by the same IDs as the original configuration codes.)
18	6	80	Nominal Service Start Time	HHMMSS (relative to event start or to start time of another service -- see item 21)
19	6	86	Nominal Service Duration	HHMMSS
20	2	92	Number of Keyword Parameters	Number of keyword parameters for this service (00 if no keyword parameters are used)

**Table 7-1. Schedule Add Request Message Format  
 (From MOC To NCCDS)(4 of 4)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
21	Variable	94	Keyword names, delimiters, and values	<p>Keyword parameters include both service-level flexibility parameters, and respecifiable parameters. The parameters may be entered in any order. The set of respecifiable parameters is listed in Table 7-2. The set of service-level flexibility parameters is listed in Table 7-3.</p> <p>This field has the following internal format:</p> <p>NAME1=VALUE1,NAME2=VALUE2</p> <p>Each keyword parameter is delimited by a comma, and the list is terminated by a semicolon. The semicolon is always present even if no keyword parameters are used for that service specification code.</p>
22	Variable		Additional Service Specification Codes	Repeat items 17 through 21 for each additional service specification code.

**Table 7-2. Respecifiable Parameters (1 of 3)**

Service	Item of Service	Name	Bytes
MAF/SMAF <sup>1</sup>	TSW Set ID User Despun Antenna, Normal User Data Rate, Normal User Receive Frequency, Normal User Doppler Compensation Required, Normal User	TSWS UDAN DTR1 FRQ1 DOPC	10 1 9 10 1
SSAF	TSW Set ID User Despun Antenna	TSWS UDAN	10 1
	Data Rate, Normal User Receive Frequency, Normal User	DTR1 FRQ1	9 10
	Receive Frequency, Shuttle	FRQ2	10
	Polarization, Normal User	POLN	1
	Polarization, Shuttle	POLS	1
	Command Channel PN Modulation, Normal user Doppler Compensation Required, Normal User	CCPN DOPC	1 1
	Shuttle Carrier Doppler Compensation Shuttle PN Rate Doppler Compensation Shuttle PN Modulation Shuttle Data Configuration Mode	SCDC SPDC SHPN SCON	1 1 1 1
KSAF/ KaSAF <sup>1</sup>	TSW Set ID	TSWS	10
	Data Rate, Normal User	DTR1	9
	Data Rate, Shuttle	DTR3	9
	Receive Frequency, Normal User	FRQ1	10
	Receive Frequency, Shuttle	FRQ2	10
	Polarization, Normal User	POLN	1
	Polarization, Shuttle	POLS	1
	Command Channel PN Modulation	CCPN	1
	Doppler Compensation Required, Normal User	DOPC	1
	Doppler Compensation Required, Shuttle	SCDC	1
MAR <sup>1</sup>	TSW Set ID User Despun Antenna, Normal User Date Rate, I Channel, Normal User Date Rate, Q Channel, Normal User Transmit Frequency, Normal User Maximum EIRP, Normal User Minimum EIRP, Normal User I/Q Channel Power Ratio (N:N) , Normal User Data Format, I Channel, Normal User Data Format, Q Channel, Normal User Data Bit Jitter, I Channel, Normal User Data Bit Jitter, Q Channel, Normal User	TSWS UDAN DTR1 DTR2 FRQ1 ERP1 ERP2 CPR DTF1 DTF2 JTR1 JTR2	10 1 9 9 10 4 4 3 1 1 1 1

**Table 7-2 Respecifiable Parameters (2 of 3)**

Service	Item of Service	Name	Bytes
MAR <sup>1</sup> (cont.)	G2 Inversion, I Channel, Normal User G2 Inversion, Q Channel, Normal User Mode, Normal User Data Stream ID, I Channel, Normal User Data Stream ID, Q Channel, Normal User	G2II G2IQ MODE DSD1 DSD2	1 1 1 3 3
SSAR/SMART <sup>1</sup>	TSW Set ID User Despun Antenna	TSWS UDAN	10 1
	Date Rate (DG1/DG2), I Channel, Normal User Date Rate (DG1/DG2), Q Channel, Normal User Transmit Frequency, Normal User Polarization, Normal User (N/A for SMART )	DTR1 DTR2 FRQ1 POLN	9 9 10 1
	Polarization, Shuttle	POLS	1
	Maximum EIRP, Normal User Minimum EIRP, Normal User	ERP1 ERP2	4 4
	Maximum EIRP, Shuttle Minimum EIRP, Shuttle	ERP3 ERP4	4 4
	I/Q Channel Power Ratio (DG1/DG2) (N:M), Normal User Data Format, I Channel (DG1/DG2), Normal User Data Format, Q Channel (DG1/DG2), Normal User Data Bit Jitter, I Channel (DG1/DG2), Normal User Data Bit Jitter, Q Channel (DG1/DG2), Normal User	CPR DTF1 DTF2 JTR1 JTR2	3 1 1 1 1
	Data Bit Jitter, Shuttle Shuttle Transmit Frequency	JTR4 FRQ2	1 10
	Data Group, Normal User DG1 Mode, Normal User DG2 Type, Normal User	DG DG1M DG2T	1 1 1
	Shuttle Data Configuration Mode	SCON	1
	G2 Inversion, I Channel, Normal User G2 Inversion, Q Channel, Normal User Data Stream ID, I Channel (DG1/DG2), Normal User Data Stream ID, Q Channel (DG1/DG2), Normal User	G2II G2IQ DSD1 DSD2	1 1 3 3
	Data Stream ID, Shuttle	DSD4	3
KSAR/KaSAR <sup>1,2</sup>	TSW Set ID	TSWS	10
	Data Rate, I Channel (DG1/DG2), Normal User Data Rate, Q Channel (DG1/DG2), Normal User Transmit Frequency, Normal User Polarization, Normal User	DTR1 DTR2 FRQ1 POLN	9 9 10 1
	Polarization, Shuttle	POLS	1
	Maximum EIRP, Normal User Minimum EIRP, Normal User	ERP1 ERP2	4 4
	Maximum EIRP, Shuttle Minimum EIRP, Shuttle	ERP3 ERP4	4 4

**Table 7-2 Respecifiable Parameters (3 of 3)**

Service	Item of Service	Name	Bytes
KSAR/KaSAR <sup>1,2</sup> (cont.)	Autotrack Enable/Disable	ATBW	8
	I/Q Channel Power Ratio (N:M), Normal User	CPR	3
	Data Format, I Channel (DG1/DG2), Normal User	DTF1	1
	Data Format, Q Channel (DG1/DG2), Normal User	DTF2	1
	Data Bit Jitter, I Channel (DG1/DG2), Normal User	JTR1	1
	Data Bit Jitter, Q Channel (DG1/DG2), Normal User	JTR2	1
	Shuttle Transmit Frequency	FRQ2	10
	Data Group (N/A for KaSAR), Normal User	DG	1
	DG1 Mode (N/A for KaSAR), Normal User	DG1M	1
	DG2 Type (N/A for KaSAR), Normal User	DG2T	1
	Shuttle Mode	SHMO	1
	Data Bit Jitter, Channel 1, Mode 1 or 2	JTR3	1
	Data Format, Channel 2, Mode 1 or 2	DTF4	1
	Data Bit Jitter, Channel 2, Mode 1 or 2	JTR4	1
	Data Rate, Channel 2, Mode 1 or 2	DTR3	9
	Data Format, Channel 3, Mode 1 or 2	DTF5	1
	Data Bit Jitter, Channel 3, Mode 1 or 2	JTR5	1
	Data rate, Channel 3, Mode 1 or 2	DTR4	9
	G2 Inversion, I Channel, Normal User	G2II	1
	G2 Inversion, Q Channel, Normal User	G2IQ	1
TRK	Data Stream ID, I Channel (DG1/DG2), Normal User	DSD1	3
	Data Stream ID, Q Channel (DG1/DG2), Normal User	DSD2	3
	Data Stream ID Mode 1 or 2, Channel 1	DSD3	3
	Data Stream ID Mode 1 or 2, Channel 2	DSD4	3
	Data Stream ID Mode 1 or 2, Channel 3	DSD5	3
	Shuttle 1.024-MHz Subcarrier	SHPI	1
	Sample Rate	SRRQ	1
	Forward Link Reference Service specification code	FLCC	3
	Return Link Reference Service specification code	RLCC	3
	Time Transfer Tracking Required	TTTR	1
	Time Transfer Number of Samples	TTNR	1

<sup>1</sup>MAF, SMAF, KaSAF, MAR,SMAR, and KaSAR parameters are not applicable for Shuttle.

<sup>2</sup>KaSAR includes both normal bandwidth (i.e., KaSA1 and KaSA2) and wideband (i.e., KaSA1WB) forms of the Ka-band return service. All parameters listed above for KaSAR will be accepted for all KaSAR services. However the only parameters applicable to KaSA1WB operations are TSWS, FRQ1, and POLN. ATBW may be applicable in the future.

**Table 7-3. Service-Level Flexibility Keyword Parameters (From MOC To NCCDS)**

Keyword	Number of Bytes	Data Item	Range of Values
CSN*	2	Coupled Service Number	01 - 16 = Nominal Service Start Time for this service is relative to service start time of the referenced service. (Services are numbered according to their order of appearance in the SAR.)  If neither CSN nor SBSN is included, the service start time is relative to Event Start Time.
SBSN*	2	Service Bounded By Service Number	01 - 16 = Nominal Service Start Time for this service is ignored. Actual service start time for this service will be no earlier than service start time of the referenced service. Actual service stop time for this service will be no later than service stop time of the referenced service. Services are numbered according to their order of appearance in the SAR.  If neither CSN nor SBSN is included, the service start time is relative to Event Start Time. Use of SBSN implies that the duration of the referenced service equals or exceeds that of the referencing service.
STPT*	6	Service Start Time Plus Tolerance	HHMMSS  If not included, the service start time plus tolerance defaults to zero.
STMT*	6	Service Start Time Minus Tolerance	HHMMSS  If not included, the service start time minus tolerance defaults to zero.
MIND	6	Minimum Service Duration	HHMMSS  If not included, the minimum service duration defaults to the nominal service duration (item 19 of Table 7-1).
* If SBSN is used, use of CSN, STPT, or STMT is invalid and will result in rejection of request.			

**Table 7-4. Schedule Result Message Format  
 (From NCCDS To MOC)(1 of 3)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	2	1	Message Type	99 = Schedule Coordination Message
2	7	3	Message ID	<p>A unique 7-character number used to reference this message.</p> <p>(Note: For baseline customers, the message ID of an SRM is a copy of the message ID of the Schedule Add Request or Schedule Delete Request that caused the SRM to be generated.)</p>
3	2	10	Message Class	02 = Schedule Result Message
4	7	12	SUPIDEN	Refer to 532-808
5	4	19	User ID	<p>Requester ID; four ASCII characters</p> <p>(Note: When the SRM reports an action initiated by a NCC operator, the UserID will be “NCC.”)</p>
6	2	23	Referenced Request Class	<p>10 = Add          11 = Customer Requested Delete          12 = Replace          21 = Alternate Add          24 = Wait List</p> <p>(Note: In the above item, the values 12, 21, and 24 are new for full support customers and do not apply to baseline customers.)</p> <p>Note: When an SRM is used to announce that an event has been deleted (i.e., the result code is 01 or 15), this item will always have the value 10.)</p>

**Table 7-4. Schedule Result Message Format  
 (From NCCDS To MOC)(2 of 3)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
7	3	25	Spare or TDRS	Full Support Customers Not Applicable Baseline Customers AAA; three alphanumeric characters used to specify a TDRS
8	11	28	Spare or New Event Start Time	Full Support Customers Not Applicable Baseline Customers  YYDDDHMMSS for SRMs in response to SARs, ASCII spaces for SRMs in response to Schedule Delete Requests
9	11	39	Spare or Old Event Start Time	Full Support Customers Not Applicable Baseline Customers  YYDDDHMMSS for SRMs in response to Schedule Delete Requests, ASCII spaces for SRMs in response to SARs.  (Note: The NCCDS may include TDRS, New Event Start Time, and Old Event Start Time in SRMs sent to full support customers. Full support customers should ignore these parameters and use item 12 to determine what is being referenced by the SRM.)  (Note: New Event Start Time applies to SRMs in response to SARs. Old Event Start Time applies to SRMs in response to Schedule Delete Requests.)

**Table 7-4. Schedule Result Message Format**  
**(From NCCDS To MOC)(3 of 3)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
10	2	50	Result Code	Refer to Table 7-5
11	2	52	Explanation Code	Refer to Table 7-5
12	7	54	Referenced Request ID or Event ID  or  Spare	<p>Full Support Customers If the SRM announces the deletion of a request or event (i.e. Result Code = 15), this is the ID of the deleted request or event.</p> <p>For all other Result Codes, this is the Request ID of the schedule request that initiated the action announced by the SRM.</p> <p>Baseline Customers Not Applicable</p> <p>(Note: The SRM always includes the Referenced Request ID or Event ID. Baseline customers can ignore this.)</p>

**Table 7-5. Valid SRM Result and Explanation Code Combinations (1 of 4)**

<b>Result Code</b>	<b>Expl. Code</b>	<b>Result and Explanation</b>	<b>Restrictions</b>
00	09	Request granted	Baseline customers only.
00	62	Request granted and, if applicable, event fits in newest available TSWs. Based on request from customer	Full Support customers only.
00	63	Request granted and, if applicable, event fits in newest available TSWs. Based on request from customer, but with editing by NCC operator	Full Support customers only.
01	blank	Request cancelled by operator, or request or event deleted by customer delete request.	Baseline customers only.
02	20	Request declined due to conflict: MA or SMA resource.	
02	21	Request declined due to conflict: SA resource.	
02	23	Request declined due to conflict: MDM data rate duty factor.	
02	25	Request declined due to conflict: End-to-end test resource.	
02	26	Request declined due to conflict: HDRM data rate duty factor.	
02	45	Request declined due to conflict: User interface channel.	
02	64	Request declined due to conflict: WSC SGLT return service composite bandwidth duty factor.	New; but applies to all customers.
02	65	Request declined due to conflict: WSC SGLT forward service composite bandwidth duty factor.	New; but applies to all customers.
06	04	Request rejected: Requested event start too far into future.	
06	05	Request rejected: Requested event start too close to current time.	
07	01	Request rejected due to invalid parameter: Old Start Time.	Baseline customers only. Sent in response to Delete Request.
07	02	Request rejected due to invalid parameter: Invalid Service Duration.	
07	03	Request rejected due to invalid parameter: New Start Time.	
07	10	Request rejected due to invalid parameter: Illegal SUPIDEN.	
07	18	Request rejected due to invalid parameter.	
08	blank	Rejected due to NCC system error.	
08	15	Rejected due to NCC system error: Database error.	
10	blank	Request rejected: Event or request identified by a Schedule Delete Request could not be found.	Baseline customers only.

**Table 7-5. Valid SRM Result and Explanation Code Combinations(2 of 4)**

<b>Result Code</b>	<b>Expl. Code</b>	<b>Result and Explanation</b>	<b>Restrictions</b>
10	02	Request rejected: Invalid Event or Service Duration period.	
10	06	Request rejected: Incorrect service order.	
10	07	Request Rejected: Requested capability not provided by specified TDRS and/or Ground Terminal	
10	12	Request rejected: TDRS not allowed for this SUPIDEN.	
10	18	Request rejected: Invalid request.	
10	19	Request rejected: Invalid or non-existent TDRS.	
10	22	Request rejected: Value of 40 octal is not allowed for Data Stream ID.	
10	27	Request rejected: More than one SA antenna is requested.	
10	31	Request rejected: Gap between same services is less than setup time.	
10	32	Request rejected: Invalid or missing forward link for tracking service.	
10	35	Request rejected: Invalid or missing return link for tracking service.	
10	39	Request rejected: A user interface channel is specified to support more than one data channel at the same time.	
10	41	Request rejected: Initial data rate exceeds maximum data rate.	
10	43	Request rejected: Nonrecoverable syntax error; request has not been saved for editing.	
10	47	Request rejected: Gaps in coverage of event by its services.	
10	48	Request rejected: Earliest service start not same as event start.	
10	49	Request rejected: Service specification code not found.	
10	50	Request rejected: Prototype Event ID not found.	
10	51	Request rejected: More than one tracking service for same return or forward service at same time.	
10	52	Request rejected: MA or SMA resource limitation.	
10	53	Request rejected: SA resource limitation.	
10	54	Request rejected: HDRM cannot support initial data rate.	
10	56	Request rejected: A high rate LI port is required to support initial data rate; only a low rate LI port is included	
10	57	Request rejected: A low rate LI port is required to support initial data rate; only a high rate LI port is included.	
10	59	Request rejected: Circular service start time specification.	Full Support customers only.

**Table 7-5. Valid SRM Result and Explanation Code Combinations (3 of 4)**

<b>Result Code</b>	<b>Expl. Code</b>	<b>Result and Explanation</b>	<b>Restrictions</b>
10	74	Request rejected: Referenced event or request exists; but it cannot be acted upon as requested.	Full Support customers only.
10	75	Request rejected: Referenced request is a member of a chain of requests that has already yielded an active event.	Full Support customers only.
11	blank	Referenced event or request cannot be found.	
12	blank	Request placed on wait list.	Full Support customers only.
13	blank	Request removed from wait list, but event has not been scheduled.	Full Support customers only.
14	62	Request granted, but event does not fit in newest available TSWs. Based on request from customer.	Full Support customers only.
14	63	Request granted, but event does not fit in newest available TSWs. Based on request from customer, but with editing by NCC operator.	Full Support customers only.
15	71	Event or request deleted by NCC operator.	Full Support customers only. [Schedule Deletion Notification is used for baseline customers.]
15	72	Event or request deleted by customer request.	Full Support customers only. [Schedule Deletion Notification is used for baseline customers.]
26	blank	Request placed in valid request queue.	Baseline customers only.
26	66	Request placed in valid request queue. Use of TSWs not requested, or not applicable.	Full Support customers only.
26	67	Request placed in valid request queue. Use of TSWs requested, applicable TSWs not available.	Full Support customers only.
26	68	Request placed in valid request queue. Use of TSWs requested, but request cannot be scheduled within available TSWs.	Full Support customers only.
26	69	Request placed in valid request queue. Use of TSWs requested, and either all services with specified TSW set IDs can be scheduled within available TSWs or no services have specified TSW set IDs.	Full Support customers only.
03	----	Not used	
04	----	Not used	
05	----	Not used	
09	----	Not used	
16	----	Not used	
17	----	Not used	

**Table 7-5. Valid SRM Result and Explanation Code Combinations(4 of 4)**

<b>Result Code</b>	<b>Expl. Code</b>	<b>Result and Explanation</b>	<b>Restrictions</b>
18	----	Not used	
19	----	Not used	
20	----	Not used	
21	----	Not used	
22	----	Not used	
23	----	Not used	
24	----	Not used	
25	----	Not used	
----	08	Not used	
----	11	Not used	
----	13	Not used	
----	14	Not used	
----	16	Not used	
----	17	Not used	
----	24	Not used	
----	28	Not used	
----	29	Not used	
----	30	Not used	
----	33	Not used	
----	34	Not used	
----	36	Not used	
----	37	Not used	
----	38	Not used	
----	40	Not used	
----	42	Not used	
----	44	Not used	
----	46	Not used	
----	55	Not used	
----	58	Not used	
----	60	Not used	
----	70	Not used	
----	73	Not used	
----	76	Not used	

**Table 7-6. Schedule Delete Request Message Format  
 (From MOC To NCCDS)(1 of 2)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	2	1	Message Type	99 = Schedule Coordination Message
2	7	3	Message ID	A unique 7-character number used to reference this message
3	2	10	Message Class	11 = Schedule Delete Request Message
4	7	12	SUPIDEN	Refer to 532-808
5	4	19	User ID	Requester ID (four ASCII characters)
6	4	23	Password	Alphanumeric code
7	1	27	Spare or Normal/Pre- mium Support Flag	Full Support Customers  Not Applicable  Baseline Customers  0 = Normal Support  1 = Premium Support   (Note: The NCCDS ignores Normal/Premium Support Flag, however, baseline customers can continue to provide this parameter.)

**Table 7-6. Schedule Delete Request Message Format  
 (From MOC To NCCDS)(2 of 2)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
8	3	28	Spare or TDRS	Full Support Customers Not Applicable Baseline Customers AAA (three alphanumeric characters)
9	11	31	Spare or Event Start Time of event to be deleted	Full Support Customers Not Applicable Baseline Customers YYDDDHMMSS
*10A	7	42	Referenced Request ID or Event ID or Spare	Full Support Customers ID of the Schedule Add Request (99/10), Schedule Replace Request (99/12), Alternate Schedule Add Request (99/21), or Event which is to be deleted. Baseline Customers Not Applicable
*10B	4	49	Spare	

\* Items 10A and 10B total the same number of bytes as Item bytes as Item 10 in the baseline format.

**Table 7-7. Schedule Deletion Notification Message Format  
 (From NCCDS To MOC)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	2	1	Message Type	99 = Schedule Coordination Message
2	7	3	Message ID	A unique 7-character number used to reference this message
3	2	10	Message Class	01 = Schedule Deletion Notification Message
4	7	12	SUPIDEN	Refer to 532-808
5	4	19	User ID	Requester ID; four ASCII characters
6	3	23	TDRS	AAA; three alphanumeric characters
7	11	26	Event Start Time	YYDDDHMMSS
8	1	37	Deletion Status	1 = Complete
9	74	38	Delete Explanation	Fixed to "SCHEUDLE DELETED" followed by 58 ASCII spaces

**NOTE**

Baseline message used only for baseline customers.

**Table 7-8. Schedule Result Request Message Format  
 (From: MOC; To: NCCDS)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	2	1	Message Type	99 = Schedule Coordination Message
2	7	3	Message ID	A unique 7-character number used to reference this message
3	2	10	Message Class	28 = Schedule Result Request Message
4	7	12	Spare	ASCII Spaces
5	4	19	User ID	Requester ID (four ASCII characters)
6	4	23	Password	Alphanumeric code
7	16	27	Destination Name	Logical destination name to be associated with the current IP connection
8	3	43	Number of SUPIDENs to Follow (nnn)	001 through 999  (Note: The specified maximum value (i.e., "999") exceeds the actual NCCDS capacity. The NCCDS has been verified with values up to "099".)
9	7	46	SUPIDEN	Refer to 532-808.  For each specified SUPIDEN, the NCCDS will transmit schedule results (i.e., User Schedule Message (USM), Schedule Delete Notification Message (SDN), and Schedule Result Message (SRM) to the specified logical destination via the current IP connection.

**Table 7-9. Replace Request Message Format  
 (From MOC To NCCDS) (1 of 2)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	2	1	Message Type	99 = Schedule Coordination Message
2	7	3	Request ID	A unique 7-character number used to reference this message
3	2	10	Message Class	12= Replace Request Message
4	7	12	SUPIDEN	Refer to 532-808
5	4	19	User ID	Requester ID; four ASCII characters
6	4	23	Password	Alphanumeric code
7	1	27	Spare	
8	3	28	TDRS	AAA; three alphanumeric characters used to specify a TDRS or a predefined set of TDRSs.
*9A	7	31	Referenced Request ID	ID of the Schedule Add Request (99/10), Schedule Replace Request (99/12), Alternate Schedule Add Request (99/21), or Event which is to be replaced.
*9B	1	38	TSWs  or  Spare	Full Support Customers: 0 = Do not use TSWs to constrain scheduling of this event 1 = Use TSWs  Baseline Customers: Not Applicable
* Items 9A, 9B, 9C, and 9D total the same number of bytes as Item bytes as Item 9 in the baseline format.				

**Table 7-9. Replace Request Message Format  
 (From MOC To NCCDS) (2 of 2)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
*9C	1	39	Wait List  or  Spare	<p>Full Support Customers:          0 = Do not place on Wait List          1 = Place on Wait List if initial scheduling is unsuccessful</p> <p>(Applicable only when Replace Request references an active event or a SAR stored for batch scheduling.)</p> <p>(Note: Wait List flag is applicable only during active period. If set prior to active period, it is ignored.)</p> <p>Baseline Customers:          Not applicable</p>
*9D to 22	Same as SAR, see Table 7-1.			

\* Items 9A, 9B, 9C and 9D total the same number of bytes as Item bytes as Item 10 in the baseline format.

**Table 7-10. Alternate Schedule Add Request Message Format  
 (From MOC To NCCDS)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	2	1	Message Type	99 = Schedule Coordination Message
2	7	3	Request ID	A unique 7-character number used to reference this message
3	2	10	Message Class	21= Alternate SAR Message
4	7	12	SUPIDEN	Refer to 532-808
5	4	19	User ID	Requester ID; four ASCII characters
6	4	23	Password	Alphanumeric code
7	1	27	Spare	
8	3	28	TDRS	AAA; three alphanumeric characters used to specify a TDRS or a predefined set of TDRSs.
9A	7	31	Referenced Request ID	ID of the Schedule Add Request (99/10), Schedule Replace Request (99/12), or Alternate Schedule Add Request (99/21) for which this request is the alternate.
9B	1	38	TSWs or Spare	Full Support Customers: 0 = Do not use TSWs to constrain scheduling of this event 1 = Use TSWs  Baseline Customers: Not Applicable
9C	1	39	Spare	
9D to 22	Same as SAR, see Table 7-1.			

**Table 7-11. Wait List Request Message Format  
 (From MOC To NCCDS)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	2	1	Message Type	99 = Schedule Coordination Message
2	7	3	Message ID	A unique 7-character number used to reference this message
3	2	10	Message Class	24 = Wait List Request Message
4	7	12	SUPIDEN	Refer to 532-808
5	4	19	User ID	Requester ID (four ASCII characters)
6	4	23	Password	Alphanumeric code
*7	1	27	Spare	
*8	3	28	Spare	
9	11	31	Expiration Time	YYDDDHMMSS
10A	7	42	Referenced Request ID	ID of the Schedule Add Request (99/10) or Schedule Replace Request (99/12) which is to be placed on the Wait List.
*10B	4	49	Spare	

\* Items 7, 8, and 10B are included as spare in order to allow the Wait List Request to have the same structure as the Delete Request.

**Table 7-12. TDRS Scheduling Window Message  
 (From MOC To NCCDS)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	2	1	Message Type	99 = Schedule Coordination Message
2	7	3	Message ID	A unique 7-character number used to reference this message
3	2	10	Message Class	25 = TDRS Scheduling Window Message
4	7	12	SUPIDEN	Refer to 532-808. (Note: SUPIDEN is used for consistency with other formats, however the NCCDS stores TSWs by SIC (i.e., the 2nd through 5th characters of SUPIDEN.)
5	4	19	User ID	Requester ID (four ASCII characters)
6	4	23	Password	Alphanumeric code
7	3	27	TDRS	AAA; three alphanumeric characters used to specify a TDRS or a predefined TDRS set  (Note: Use of TDRS set names within TSW messages should be limited to TDRS sets that include a single TDRS operational name, i.e., the TDRS set name is used an alias for the TDRS operational name. When used in this way, the customer can use TDRS aliases to maintain multiple TSW subsets for the same TDRS in the same TSW set.)
8	10	30	TSW Set ID	Alphanumerics and underscore (i.e., "_").
9	11	40	Timespan Start	YYDDDHMMSS
10	11	51	Timespan End	YYDDDHMMSS
11*	3	62	Number of TSWs	Number of occurrences of items 12 - 13. Valid range is 000 - 388.
12	11	65	TSW Opening Time	YYDDDHMMSS
13	11	76	TSW Closing Time	YYDDDHMMSS
*Item 11 indicates the number of times Items 12 and 13, repeated in that order, without separation.				

**Table 7-13. User Schedule Message Header Format  
 (From NCCDS To MOC)(1 of 2)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	2	1	Message Type	94 = User Schedule Message
2	7	3	Event ID	A unique 7-character number used to reference this message and the event defined by it
3	2	10	Message Class	01 = Normal support -- Fixed USMs 02 = Premium support -- Fixed USMs 03 = Simulation support -- Fixed USMs 04 = Normal Support -- Flexible USMs 05 = Simulation Support -- Flexible USMs  (Note: In the above item, the values 04 and 05 are new for full support customers and do not apply to baseline customers.)
4	7	12	SUPIDEN	Refer to 532-808
5	2	19	VIC	NN (two numeric character)
*6	2	21	S-band User Code	PN code assignment. These codes are defined in 451-PN Code-SNIP
*7	2	23	K/Ka-band User Code	PN code assignment for K/Ka-band user. These codes are defined in 451-PN Code-SNIP.
*8	1	25	Least significant byte of S-band User Code	PN code assignment. These codes are defined in 451-PN Code-SNIP
* Item 6 and Item 7 are equal, except for Shuttle and “dual support” customers. * Item 8 is the least significant byte of item 6. This facilitates backwards compatibility for Shuttle. For Shuttle the most significant byte of item 6 is always 0.				

**Table 7-13. User Schedule Message Header Format  
 (From NCCDS To MOC)(2 of 2)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
9	1	26	Fixed value	0 (zero)
10	2	27	Number of Services in Schedule Event	A count of the number of services included in this message (01-16)
11	3	29	TDRS	Fixed USMs (message class = 01,02,03) AAA; three alphanumeric characters used to specify a TDRS  Flexible USMs (message class = 04,05) AAA; three alphanumeric characters used to specify a TDRS or predefined set of TDRSs
12	11	32	Event Start Time	YYDDDHHMMSS
13	3	43	Prototype Event ID	AAA; three alphanumeric characters (Note: ASCII spaces when not applicable.)

**Table 7-14. MA/SMA Forward Service Format, Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
<b>Fixed Parameters</b>				
1	1	1	Service Support Type	0 = Forward
2	1	2	Service Support Subtype	0 = MA 5 = SMA
3	3	3	TDRS	AAA (three alphanumeric characters)
4	11	6	Service Start Time	YYDDDDHHMMSS (refer to Table 5-3)
5	11	17	Service Stop Time	YYDDDDHHMMSS (refer to Table 5-3)
6	3	28	Service Specification Code ID	AAA (three alphanumeric characters)
7	3	31	User Interface Channel ID for MDM port or LI port	AAA (three alphanumeric characters)
8	3	34	Spare	ASCII spaces
<b>Reconfigurable Parameters</b>				
9	1	37	User Despun Antenna	0 = No type 1 = Type 1 2 = Type 2
10	9	38	Data Rate	(LSD = 1 bps)
11	10	47	Receive Frequency	(LSD = 10 Hz)
12	1	57	Doppler Compensation Required	0 = No 1 = Yes

**Table 7-15. SSA Forward Service Format (1 of 2)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
<b>Fixed Parameters</b>				
1	1	1	Service Support Type	0 = Forward
2	1	2	Service Support Subtype	1 = SSA1 (Antenna 1) 2 = SSA2 (Antenna 2)
3	3	3	TDRS	AAA (three alphanumeric characters)
4	11	6	Service Start Time	YYDDDHHMMSS (refer to Table 5-3)
5	11	17	Service Stop Time	YYDDDHHMMSS (refer to Table 5-3)
6	3	28	Service Specification Code ID	AAA (three alphanumeric characters)
7	1	31	Service Configuration	1 = Normal User (Shuttle unique parameters set to ASCII spaces)  2 = Shuttle (Normal User unique parameters set to ASCII spaces)
8	1	32	Power Mode, Normal User	0 = Normal 1 = High
9	1	33	Power Mode, Shuttle	0 = Normal 1 = High
10	8	34	Shuttle PN rate	(LSD = 1 chip/second)
11	1	42	Spare	ASCII space
12	3	43	User Interface Channel ID for MDM port or LI port, Normal User	AAA (three alphanumeric characters)
13	3	46	User Interface Channel ID, Shuttle	AAA (three alphanumeric characters)
14	3	49	Spare	ASCII spaces
15	3	52	Spare	ASCII spaces
<b>Reconfigurable Parameters</b>				
16	1	55	User despun antenna	0 = No type 1 = Type 1 2 = Type 2

**Table 7-15. SSA Forward Service Format (2 of 2)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
<b>Reconfigurable Parameters (continued)</b>				
17	9	56	Data rate, Normal User	(LSD = 1 bps)
18	10	65	Receive frequency, Normal User	(LSD = 10 Hz)
19	10	75	Receive frequency, Shuttle	(LSD = 10 Hz)
20	1	85	Polarization, Normal User	0 = LCP 1 = RCP
21	1	86	Polarization, Shuttle	0 = LCP 1 = RCP
22	1	87	Command channel PN modulation, Normal User	0 = No 1 = Yes
23	1	88	Doppler compensation required, Normal User	0 = No 1 = Yes
24	1	89	Shuttle carrier Doppler compensation	0 = No 1 = Yes
25	1	90	Shuttle PN rate Doppler compensation	0 = No 1 = Yes
26	1	91	Shuttle PN modulation	0 = No 1 = Yes
27	1	92	Shuttle Data Configuration Mode	1 = Mode 1 (32 kbps) 2 = Mode 2 (72 kbps)

**Table 7-16. KSA/KaSA Forward Service Format (1 of 2)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
<b>Fixed Parameters</b>				
1	1	1	Service Support Type	0 = Forward
2	1	2	Service Support Subtype	3 = KSA1 (Antenna 1) 4 = KSA2 (Antenna 2) 6 = KaSA1 (Antenna 1) 7 = KaSA2 (Antenna 2)
3	3	3	TDRS	AAA (three alphanumeric characters)
4	11	6	Service Start Time	YYDDDHHMMSS (refer to Table 5-3)
5	11	17	Service Stop Time	YYDDDHHMMSS (refer to Table 5-3)
6	3	28	Service Specification Code ID	AAA (three alphanumeric characters)
7	1	31	Service Configuration	1 = Normal User  2 = Shuttle (KaSAF not applicable) (Normal User unique parameters set to ASCII spaces)
8	1	32	Power Mode, Normal User	0 = Normal 1 = High
9	1	33	Power Mode, Shuttle	0 = Normal 1 = High
10	1	34	Spare	ASCII space
11	3	35	User Interface Channel ID for MDM port or LI port, Normal User	AAA (three alphanumeric characters)
12	3	38	Shuttle Interface Channel ID	AAA (three alphanumeric characters)
13	3	41	Spare	ASCII spaces
14	3	44	Spare	ASCII spaces

**Table 7-16. KSA/KaSA Forward Service Format (2 of 2)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
<b>Reconfigurable Parameters</b>				
15	9	47	Data Rate, Normal User	(LSD = 1 bps)
16	9	56	Data Rate, Shuttle	(LSD = 1 bps)
17	10	65	Receive Frequency Normal User	(LSD = 10 Hz)
18	10	75	Receive Frequency, Shuttle	(LSD = 10 Hz)
19	1	85	Polarization, Normal User	0 = LCP 1 = RCP
20	1	86	Polarization, Shuttle	0 = LCP 1 = RCP
21	1	87	Command Channel PN Modulation	0 = No 1 = Yes (Note: Not applicable for data rates above 300 kbps.)
22	1	88	Doppler Compensation Required, Normal User	0 = No 1 = Yes
23	1	89	Doppler Compensation Required, Shuttle	0 = No 1 = Yes

**Table 7-17. MA Return Service Format (1 of 3), Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
<b>Fixed Parameters</b>				
1	1	1	Service Support Type	1 = Return
2	1	2	Service Support Subtype	0 = MA
3	3	3	TDRS	AAA (three alphanumeric characters)
4	11	6	Service Start Time	YYDDDHHMMSS (refer to Table 5-3)
5	11	17	Service Stop Time	YYDDDHHMMSS (refer to Table 5-3)
6	3	28	Service Specification Code ID	AAA (three alphanumeric characters)
7	1	31	Receiver Configuration	0 = Normal 1 = Cross-support
8	1	32	Symbol Format Conversion to Bi $\phi$ -L, I Channel	0 = No 1 = Yes
9	1	33	Symbol Format Conversion to Bi $\phi$ -L, Q Channel	0 = No 1 = Yes
10	3	34	Spare	ASCII spaces
11	3	37	Spare	ASCII spaces
12	2	40	MA Return Link ID	01 thru 05
13	3	42	Spare	ASCII spaces
14	1	45	Cross-Support Forward Link	1 = SSA1 2 = SSA2
15	1	46	Configuration	0 = I Channel only (BPSK) 1 = Q Channel only (BPSK) 2 = I and Q Channel (QPSK)
16	1	47	Data Channel Configuration	0 = Single data source 1 = Dual data source
17	1	48	Return Channel Time Delay Data Required	0 = No 1 = Yes
18	3	49	User Interface Channel ID for MDM port or low rate LI port, I Channel	AAA (three alphanumeric characters)
19	3	52	User Interface Channel ID for MDM port or low rate LI port, Q Channel	AAA (three alphanumeric characters)

**Table 7-17. MA Return Service Format (2 of 3), Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
<b>Reconfigurable Parameters</b>				
20	1	55	User Despun Antenna	0 = No type 1 = Type 1 2 = Type 2
21	9	56	Initial Data Rate, I Channel	(LSD = 1 bps; all zeros indicates no data on channel)
22	9	65	Initial Data Rate, Q Channel	(LSD = 1 bps; all zeros indicates no data on channel)
23	10	74	Transmit Frequency	(LSD = 10 Hz)
24	4	84	Maximum EIRP	Sign, 3 digits (LSD = 0.1 dBW)
25	4	88	Minimum EIRP	Sign, 3 digits (LSD = 0.1 dBW)
26	3	92	I/Q Channel Power Ratio	Sign, 2 digits (LSD = 0.1 dB)
27	1	95	Data Format, I Channel	0 = NRZ-L 1 = NRZ-M 2 = NRZ-S
28	1	96	Data Format, Q Channel	0 = NRZ-L 1 = NRZ-M 2 = NRZ-S
29	1	97	Data Bit Jitter, I Channel	0 = None 1 = 0.01% 2 = 0.1% 3 = Reserved (WSC will currently treat as 0.1%) 4 = Reserved (WSC will currently treat as 0.1%) 5 = Reserved (WSC will currently treat as 0.1%)
30	1	98	Data Bit Jitter, Q Channel	0 = None 1 = 0.01% 2 = 0.1% 3 = Reserved (WSC will currently treat as 0.1%) 4 = Reserved (WSC will currently treat as 0.1%) 5 = Reserved (WSC will currently treat as 0.1%)
31	1	99	G2 Inversion, I Channel	0 = Do not invert 1 = Invert

**Table 7-17. MA Return Service Format (3 of 3), Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
<b>Reconfigurable Parameters (continued)</b>				
32	1	100	G2 Inversion, Q Channel	0 = Do not invert 1 = Invert
33	1	101	Mode	1 = Mode 1; Coherent 2 = Mode 2; Non-coherent
34	1	102	Spare	
35	3	103	Data Stream ID, I Channel	001 through 037, 041 through 377 (octal)
36	3	106	Data Stream ID, Q Channel	001 through 037, 041 through 377 (octal)

**Table 7-18. SSA/SMA Return Service Format (1 of 6)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
<b>Fixed Parameters</b>				
1	1	1	Service Support Type	1 = Return
2	1	2	Service Support Subtype	1 = SSA1 (Antenna 1) 2 = SSA2 (Antenna 2) <b>5 = SMA, Normal User</b>
3	3	3	TDRS	AAA (three alphanumeric characters)
4	11	6	Service Start Time	YYDDDHHMMSS (refer to Table 5-3)
5	11	17	Service Stop Time	YYDDDHHMMSS (refer to Table 5-3)
6	3	28	Service Specification Code ID	AAA (three alphanumeric characters)
7	1	31	Service Configuration	1 = Normal User (Shuttle unique parameters set to ASCII spaces)  2 = Shuttle (SMAR not applicable) (Normal User unique parameters set to ASCII spaces)
8	1	32	DG1 Configuration, Normal User	0 = I Channel only (BPSK) 1 = Q Channel only (BPSK) 2 = I and Q Channel (QPSK)
9	1	33	Data Channel Configuration, Normal User	0 = Single data source; Identical coded data on I and Q channels, (DG1) G1 on I Channel and G2 on Q Channel (DG2) 1 = Dual data source 2 = Single data source; G1 G2 (G3) of alternate data bits on I Channel, G1 G2 (G3) of alternate data bits on Q Channel
10	1	34	Data Coding, I Channel, Normal User	0 = Uncoded 1 = Code 1 (rate 1/2) 2 = Code 2 (rate 1/2, G1 inverted) 3 = Code 3 (rate 1/3)
11	1	35	Data Coding, Q Channel, Normal User	0 = Uncoded 1 = Code 1 (rate 1/2) 2 = Code 2 (rate 1/2, G1 inverted) 3 = Code 3 (rate 1/3)
12	1	36	DG2 Modulation, Normal User	0 = QPSK 1 = BPSK

**Table 7-18. SSA/SMA Return Service Format (2 of 6)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
<b>Fixed Parameters (continued)</b>				
13	3	37	Spare	ASCII spaces
14	3	40	Spare	ASCII spaces
15	3	43	Spare	ASCII spaces
16	3	46	Spare	ASCII spaces
17	1	49	Receiver Configuration, Normal User	0 = Normal 1 = Cross-support
18	1	50	Symbol Format Conversion to Bi $\phi$ -L, for DG1/DG2 I Channel, Normal User	0 = No 1 = Yes
19	1	51	Symbol Format Conversion to Bi $\phi$ -L, for DG1/DG2 Q Channel, Normal User	0 = No 1 = Yes
20	1	52	SSA Combining	0 = No 1 = Yes ASCII space for SMAR
21A	1	53	Spare	ASCII space
21B	2	54	SMAR Link ID, Normal User	01 - 05 (ASCII spaces for SSAR)
22	1	56	Cross-Support Configuration Forward Link, Normal User	0 = MA 1 = SSA1 2 = SSA2 3 = SMA
23	1	57	Return Channel Time Delay	0 = No
24	1	58	Data Required	1 = Yes
			Spare	ASCII space
25	3	59	User Interface Channel ID, DG1/DG2, for MDM port or low rate LI port, I Channel, Normal User	AAA (three alphanumeric characters)
26	3	62	User Interface Channel ID, DG1/DG2, for MDM port or low rate LI port, Q Channel, Normal User	AAA (three alphanumeric characters)
27	3	65	User Interface Channel ID, Shuttle	AAA (three alphanumeric characters)
28	3	68	High Data Rate Multiplexer Port, I Channel, Normal User	Z51 through Z54, or ASCII spaces
29	3	71	High Data Rate Multiplexer Port, Q Channel, Normal User	Z51 through Z54, or ASCII spaces

**Table 7-18. SSA/SMA Return Service Format (3 of 6)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
<b>Fixed Parameters (continued)</b>				
30	3	74	High Data Rate Multiplexer Port, Shuttle	Z51 through Z54, or ASCII spaces. (Note: This service is not supported by the NCCDS. Because of its fixed, low rates, the NCCDS supports SSAR Shuttle services in MDM mode only).
<b>Reconfigurable Parameters</b>				
31	1	77	User Despun Antenna	0 = No type 1 = Type 1 2 = Type 2
32	9	78	Data Rate, DG1/DG2, I Channel, Normal User	(LSD = 1 bps; all zeros indicates no data on channel)
33	9	87	Data Rate, DG1/DG2, Q Channel, Normal User	(LSD = 1 bps; all zeros indicates no data on channel)
34	10	96	Transmit Frequency, Normal User	(LSD = 10 Hz)
35	1	106	Polarization, Normal User	0 = LCP 1 = RCP (Not valid for SMAR)
36	1	107	Polarization, Shuttle	0 = LCP 1 = RCP
37	4	108	Maximum EIRP, Normal User	Sign, 3 digits (LSD = 0.1 dBW)
38	4	112	Minimum EIRP, Normal User	Sign, 3 digits (LSD = 0.1 dBW)
39	4	116	Maximum EIRP, Shuttle	Sign, 3 digits (LSD = 0.1 dBW)
40	4	120	Minimum EIRP, Shuttle	Sign, 3 digits (LSD = 0.1 dBW)
41	3	124	I/Q Channel Power Ratio, (DG1/DG2), Normal User	Sign, 2 digits (LSD = 0.1 dB)
42	1	127	Data Format, I Channel, (DG1/DG2), Normal User	0 = NRZ-L 1 = NRZ-M 2 = NRZ-S 3 = BIΦ-L 4 = BIΦ-M 5 = BIΦ-S

**Table 7-18. SSA/SMA Return Service Format (4 of 6)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
<b>Reconfigurable Parameters (continued)</b>				
43	1	128	Data Format, Q Channel, (DG1/DG2) , Normal User	0 = NRZ-L 1 = NRZ-M 2 = NRZ-S 3 = BIΦ-L 4 = BIΦ-M 5 = BIΦ-S
44	1	129	Data Bit Jitter , I Channel, ( DG1/DG2), Normal User	0 = None 1 = 0.01% 2 = 0.1% 3 = Reserved (WSC will currently treat as 0.1%) 4 = Reserved (WSC will currently treat as 0.1%) 5 = Reserved (WSC will currently treat as 0.1%)
45	1	130	Data Bit Jitter , Q Channel, (DG1/DG2), Normal User	0 = None 1 = 0.01% 2 = 0.1% 3 = Reserved (WSC will currently treat as 0.1%) 4 = Reserved (WSC will currently treat as 0.1%) 5 = Reserved (WSC will currently treat as 0.1%)
46	1	131	Data Bit Jitter, Shuttle	0 = None 1 = 0.01% 2 = 0.1% 3 = Reserved (WSC will currently treat as 0.1%) 4 = Reserved (WSC will currently treat as 0.1%) 5 = Reserved (WSC will currently treat as 0.1%)
47	10	132	Shuttle Transmit Frequency if Noncoherent	(LSD = 10 Hz) (Note: Must have all zeros if transmit is coherent.)
48	1	142	Data Group, Normal User	1 = Data group 1 2 = Data group 2

**Table 7-18. SSA/SMA Return Service Format (5 of 6)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
<b>Reconfigurable Parameters (continued)</b>				
49	1	143	DG1 Mode, Normal User	1 = Mode 1; Coherent (PN on I and Q) 2 = Mode 2; Noncoherent (PN on I and Q) 3 = Mode 3; Coherent with no Q Channel deinterleaving (PN on I only) 4 = Mode 3; Coherent with Q channel deinterleaving (PN on I only)
50	1	144	DG2 Type, Normal User	0 = Noncoherent, I and Q Channel deinterleaving 1 = Noncoherent, no deinterleaving 2 = Coherent, no deinterleaving 3 = Coherent, I and Q Channel deinterleaving 4 = Noncoherent, I Channel deinterleaving 5 = Noncoherent, Q Channel deinterleaving 6 = Coherent, Q Channel deinterleaving 7 = Coherent, I Channel deinterleaving
51	1	145	Shuttle Data Configuration Mode	1 = Mode 1 (96 kbps) 2 = Mode 2 (192 kbps) 3 = Mode 3 (a coherent carrier only)
52	1	146	G2 Inversion, I Channel, Normal User	0 = G2 polynomial normal, - I leads Q, or G2 polynomial inverted and I lags Q 1 = G2 polynomial inverted - I leads Q, or G2 polynomial normal and I lags Q [Note: ASCII space if Data Coding (Item No. #10) not equal to "1"]
53	1	147	G2 Inversion, Q Channel, Normal User	0 = G2 polynomial normal 1 = G2 polynomial inverted [Note: ASCII space if Data Coding (item No. # 11) not equal to "1".]
54	3	148	Data Stream ID, (DG1/DG2), I Channel, Normal User	001 through 037, 041 through 377 (octal)

**Table 7-18. SSA/SMA Return Service Format (6 of 6)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
<b>Reconfigurable Parameters (continued)</b>				
55	3	151	Data Stream ID, (DG1/DG2), Q Channel, Normal User	001 through 037, 041 through 377 (octal)
56	3	154	Data Stream ID, Shuttle	001 through 037, 041 through 377 (octal)

**Table 7-19. KSA/KaSA Return Service Format (1 of 6)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
<b>Fixed Parameters</b>				
1	1	1	Service Support Type	1 = Return
2*	1	2	Service Support Subtype	3 = KSA1 (Antenna 1) 4 = KSA2 (Antenna 2)
				6 = KaSA1 (Antenna 1), Normal User 7 = KaSA2 (Antenna 2), Normal User <b>8 = KaSA1WB (Antenna 1), Normal User</b>
3	3	3	TDRS	AAA (three alphanumeric characters)
4	11	6	Service Start Time	YYDDDHHMMSS (refer to Table 5-3)
5	11	17	Service Stop Time	YYDDDHHMMSS (refer to Table 5-3)
6	3	28	Service Specification Code ID	AAA (three alphanumeric characters)
7**	1	31	Service Configuration	1 = Normal User (Shuttle unique parameters set to ASCII spaces)
				2 = Shuttle (Normal User unique parameters set to ASCII spaces)
				<b>4 = IF (Normal User)</b> (Shuttle unique parameters set to ASCII spaces)
8	1	32	DG1 Configuration, Normal User	0 = I Channel only (BPSK) 1 = Q Channel only (BPSK) 2 = I and Q Channel (QPSK)
9	1	33	Data Channel Configuration, Normal User	0 = Single data source 1 = Dual data source
10	1	34	Data Coding, I Channel, Normal User	0 = Uncoded 1 = Code 1 (rate 1/2)
11	1	35	Data Coding, Q Channel, Normal User	0 = Uncoded 1 = Code 1 (rate 1/2)
12	1	36	DG2 Modulation, Normal User	0 = QPSK 1 = BPSK
13	3	37	Spare	ASCII spaces
14	1	40	Symbol Format Conversion to Bi $\phi$ -L for (DG1/DG2), I Channel, Normal User	0 = No 1 = Yes
15	1	41	Symbol Format Conversion to Bi $\phi$ -L for (DG1/DG2),	0 = No 1 = Yes

**Table 7-19. KSA/KaSA Return Service Format (2 of 6)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
<b>Fixed Parameters (continued)</b>				
16	1	42	Return Channel Time Delay	0 = No
17	1	43	Data Required	1 = Yes
			Spare	ASCII space
18**	3	44	User Interface Channel ID (DG1/DG2) for MDM port, low rate LI port, <b>or IF port</b> , I Channel, Normal User	AAA (three alphanumeric characters)
19	3	47	User Interface Channel ID (DG1/DG2) for MDM port or low rate LI port, Q Channel, Normal User	AAA (three alphanumeric characters)
20	3	50	User Interface Channel ID, Shuttle Mode 1 or 2, Channel 1	AAA (three alphanumeric characters)
21	3	53	User Interface Channel ID, Shuttle Mode 1 or 2, Channel 2	AAA (three alphanumeric characters)
22	3	56	User Interface Channel ID, Shuttle Mode 1 or 2, Channel 3	AAA (three alphanumeric characters)
23	3	59	User Interface Channel ID for HDRM port or high rate LI port, I Channel, Normal User	AAA (three alphanumeric characters)
24	3	62	User Interface Channel ID for HDRM port or high rate LI port, Q Channel, Normal User	AAA (three alphanumeric characters)
25	3	65	Spare	ASCII spaces
26	3	68	Spare	ASCII spaces
27	3	71	High Data Rate Multiplexer, Shuttle Mode 1 or 2, Channel 3	Z51 through Z54, or ASCII spaces
28	9	74	Spare	ASCII spaces
29	6	83	Spare	ASCII spaces
30	3	89	Spare	ASCII spaces
31	3	92	Spare	ASCII spaces
32	9	95	Spare	ASCII spaces

**Table 7-19. KSA/KaSA Return Service Format (3 of 6)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
<b>Reconfigurable Parameters</b>				
33	9	104	Data Rate, (DG1/DG2), I Channel, Normal User	(LSD = 1 bps)
34	9	113	Data Rate, (DG1/DG2), Q Channel, Normal User	(LSD = 1 bps)
35	10	122	Transmit Frequency, Normal User	(LSD = 10 Hz)
36	1	132	Polarization, Normal User	0 = LCP 1 = RCP
37	1	133	Polarization, Shuttle	0 = LCP 1 = RCP
38	4	134	Maximum EIRP, Normal User	Sign, 3 digits (LSD = 0.1dBW)
39	4	138	Minimum EIRP, Normal User	Sign, 3 digits (LSD = 0.1dBW)
40	4	142	Maximum EIRP, Shuttle	Sign, 3 digits (LSD = 0.1dBW)
41	4	146	Minimum EIRP, Shuttle	Sign, 3 digits (LSD = 0.1dBW)
42	8	150	Autotrack Enable/Disable	00000000 = Enable 00000001 = Disable
43	3	158	I/Q Channel Power Ratio, Normal User	Sign, 2 digits (LSD = 0.1 dB)
44	1	161	Data Format, (DG1/DG2), I Channel, Normal User	0 = NRZ-L 1 = NRZ-M 2 = NRZ-S 3 = Bi $\phi$ -L 4 = Bi $\phi$ -M 5 = Bi $\phi$ -S
45	1	162	Data Format, (DG1/DG2), Q Channel, Normal User	0 = NRZ-L 1 = NRZ-M 2 = NRZ-S 3 = Bi $\phi$ -L 4 = Bi $\phi$ -M 5 = Bi $\phi$ -S
46	1	163	Data Bit Jitter, (DG1/DG2), I Channel, Normal User	0 = None 1 = 0.01% 2 = 0.1% 3 = Reserved (WSC will currently treat as 0.1%) 4 = Reserved (WSC will currently treat as 0.1%) 5 = Reserved (WSC will currently treat as 0.1%)

**Table 7-19. KSA/KaSA Return Service Format (4 of 6)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
<b>Reconfigurable Parameters (continued)</b>				
47	1	164	Data Bit Jitter, (DG1/DG2), Q Channel, Normal User	0 = None 1 = 0.01% 2 = 0.1% 3 = Reserved (WSC will currently treat as 0.1%) 4 = Reserved (WSC will currently treat as 0.1%) 5 = Reserved (WSC will currently treat as 0.1%)
48	10	165	Shuttle Transmit Frequency	(LSD = 10 Hz)
49	1	175	Data Group, Normal User	1 = Data Group 1( not valid for KaSAR)
50	1	176	DG1 Mode, Normal User	2 = Data Group 2 1 = Mode 1; Coherent (PN on I and Q) 2 = Mode 2; Noncoherent (PN on I and Q) 3 = Mode 3; Coherent (PN on I only)
51	1	177	DG2 Type, Normal User	1 = Noncoherent 2 = Coherent (not valid for KaSAR)
52	1	178	Shuttle Mode	1 = Mode 1 (PM) 2 = Mode 2 (FM, Chan. 3-digital) 3 = Mode 2 (FM, Chan. 3-analog) 4 = Mode 2 (FM, Chan. 3-video)
53	1	179	Data Format, Channel 1, Shuttle Mode 1 or 2	3 = Bi $\phi$ -L
54	1	180	Data Bit Jitter, Channel 1 Shuttle Mode 1 or 2	0 = None 1 = 0.01% 2 = 0.1% 3 = Reserved (WSC will currently treat as 0.1%) 4 = Reserved (WSC will currently treat as 0.1%) 5 = Reserved (WSC will currently treat as 0.1%)
55	1	181	Data Format, Channel 2, Shuttle Mode 1 or 2	0 = NRZ-L 1 = NRZ-M 2 = NRZ-S 3 = Bi $\phi$ -L 4 = Bi $\phi$ -M 5 = Bi $\phi$ -S

**Table 7-19. KSA/KaSA Return Service Format (5 of 6)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
<b>Reconfigurable Parameters (continued)</b>				
56	1	182	Data Bit Jitter, Channel 2, Shuttle Mode 1 or 2	0 = None 1 = 0.01% 2 = 0.1% 3 = 0.5% (Bi $\phi$ -L only; WSC will currently treat as 0.1% if received for any other data format.) 4 = 1.0% (Bi $\phi$ -L only; WSC will currently treat as 0.1% if received for any other data format.) 5 = 2.0% (Bi $\phi$ -L only; WSC will currently treat as 0.1% if received for any other data format.)
57	9	183	Data Rate, Channel 2, Shuttle Mode 1 or 2	(LSD = 1 bps)
58	1	192	Data Format, Channel 3, Shuttle Mode 1 or 2	0 = NRZ-L 1 = NRZ-M 2 = NRZ-S 3 = Bi $\phi$ -L 4 = Bi $\phi$ -M 5 = Bi $\phi$ -S
59	1	193	Data Bit Jitter, Channel 3, Shuttle Mode 1 or 2	0 = None 1 = 0.01% 2 = 0.1% 3 = Reserved (WSC will currently treat as 0.1%) 4 = Reserved (WSC will currently treat as 0.1%) 5 = Reserved (WSC will currently treat as 0.1%)
60	9	194	Data Rate, Channel 3, Shuttle Mode 1 or 2	(LSD = 1 bps)

**Table 7-19. KSA/KaSA Return Service Format (6 of 6)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
<b>Reconfigurable Parameters (continued)</b>				
61	1	203	G2 Inversion, I Channel, Normal User	0 = G2 polynomial normal, - I leads Q, or G2 polynomial inverted and I lags Q 1 = G2 polynomial inverted - I leads Q, or G2 polynomial normal and I lags Q
62	1	204	G2 Inversion, Q Channel, Normal User	0 = G2 polynomial normal 1 = G2 polynomial inverted
63	3	205	Data Stream ID, I Channel, Normal User	001 through 037, 041 through 377 (octal)
64	3	208	Data Stream ID, Q Channel, Normal User	001 through 037, 041 through 377 (octal)
65	3	211	Data Stream ID, Shuttle Mode 1 or 2, Channel 1	001 through 037, 041 through 377 (octal)
66	3	214	Data Stream ID, Shuttle Mode 1 or 2, Channel 2	001 through 037, 041 through 377 (octal)
67	3	217	Data Stream ID, Shuttle Mode 1 or 2, Channel 3	001 through 037, 041 through 377 (octal)
68	1	220	Shuttle 1.024 MHz Subcarrier	1 = Not Used 2 = Channel 2 (Shuttle Mode must be 1,3 or 4) 3 = Channel 3 (Shuttle Mode must be 2)
<p>* The Service Support Subtypes KaSA1 and KaSA2 apply to normal bandwidth Ka-band return services. The Service Support Subtype KaSA1WB applies to wideband Ka-band return services. The only parameters applicable to KaSA1WB operations are: Service Support Type, Service Support Subtype, TDRS, Service Start Time, Service Stop Time, Service Specification Code ID, Service Configuration, Normal User I Channel User Interface Channel ID for IF port, Normal User Transmit Frequency, and Normal User Polarization. Autotrack Enable/Disable is not currently applicable, but may be applicable in the future. Valid KaSAR parameter values may be included in other parameters; however this will have no effect on the operational configuration of the KaSA1WB service.</p> <p>** The IF service configuration and User Interface Channel IDs for IF ports are applicable only to KaSA1WB.</p>				

**Table 7-20. Normal Tracking Service Format (1 of 2)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	1	1	Service Support Type	2 = Tracking
2	1	2	Service Support Subtype	0 = MA, Normal User 1 = SSA1 (Antenna 1) 2 = SSA2 (Antenna 2) 3 = KSA1 (Antenna 1) 4 = KSA2 (Antenna 2)
				5 = SMA, Normal User
3	3	3	TDRS	AAA (three alphanumeric characters)
4	11	6	Service Start Time	YYDDDHMMSS (refer to Table 5-3)
5	11	17	Service Stop Time	YYDDDHMMSS (refer to Table 5-3)
6	3	28	Service Specification Code ID	AAA (three alphanumeric characters)
7	1	31	Tracking Configuration	0 = Normal
8	1	32	Normal Tracking	0 = MA, Normal User 1 = SSA, Normal User 2 = KSA, Normal User 3 = Shuttle S-Band 4 = Shuttle Ku-Band
				5 = SMA, Normal User
9	1	33	Time Transfer Tracking Required	0 = No 1 = Yes
10	1	34	Time Transfer Number of Samples	0, 20 through 255 (expressed in binary form)
11	1	35	Spare	ASCII space
12	1	36	Sample Rate	0 = 1/1 (sample/second) 1 = 1/5 (sample/seconds) 2 = 1/10 (sample/seconds) 3 = 1/60 (sample/seconds) 4 = 1/300 (sample/seconds)
13	1	37	Range Tracking Required	0 = No 1 = Yes
14	1	38	Doppler Tracking Required	0 = Not required 1 = One-way 2 = Two-way
15	10	39	Spare	ASCII spaces

**Table 7-20. Normal Tracking Service Format (2 of 2)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
16	2	49	MA/SMA Return Link ID, Normal User	01 thru 05
17	3	51	Spare	ASCII spaces
18	3	54	Forward Reference Service Specification Code	AAA (three alphanumeric characters) (Note: ASCII spaces for one-way tracking)
19	3	57	Return Reference Service Specification Code	AAA (three alphanumeric characters)

**Table 7-21. Cross-Support Tracking Service Format (1 of 2), Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	1	1	Service Support Type	2 = Tracking
2	1	2	Service Support Subtype	0 = MA 1 = SSA1 (Antenna 1) 2 = SSA2 (Antenna 2) 5 = SMA
3	3	3	TDRS	AAA (three alphanumeric characters)
4	11	6	Service Start Time	YYDDDHMMSS (refer to Table 5-3)
5	11	17	Service Stop Time	YYDDDHMMSS (refer to Table 5-3)
6	3	28	Service Specification Code ID	AAA (three alphanumeric characters)
7	1	31	Tracking Configuration	1 = Cross-support
8	1	32	Cross-Support Tracking	0 = Range 1 = Two-way Doppler 2 = Both
9	1	33	Time Transfer Tracking Required	0 = No 1 = Yes
10	1	34	Time Transfer Number of Samples	0, 20 through 255 (expressed in binary form)
11	1	35	Spare	ASCII space
12	1	36	Sample Rate	0 = 1/1 (sample/second) 1 = 1/5 (sample/seconds) 2 = 1/10 (sample/seconds) 3 = 1/60 (sample/seconds) 4 = 1/300 (sample/seconds)
13	1	37	Forward Link	0 = MA 1 = SSA1 2 = SSA2 3 = SMA
14	1	38	Return Link	0 = MA 1 = SSA1 2 = SSA2 3 = SMA

**Table 7-21. Cross-Support Tracking Service Format (2 of 2), Normal user**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
15	2	39	MA/SMA Return Link ID	01 thru 05 (Note: ASCII spaces for non-MA support)
16	3	41	Spare	ASCII spaces
17	3	44	Forward Reference Service Specification Code	AAA (three alphanumeric characters)
18	3	47	Return Reference Service Specification Code	AAA (three alphanumeric characters)

**Table 7-22. Simulation Service Format**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	1	1	Service Support Type	3 = Forward simulation 4 = Return simulation
2	1	2	Service Support Subtype	0 = MA, Normal User 1 = SSA1 (Antenna 1) 2 = SSA2 (Antenna 2) 3 = KSA1 (Antenna 1) 4 = KSA2 (Antenna 2) 5 = SMA, Normal User
3	3	3	TDRS	AAA (three alphanumeric characters)
4	11	6	Service Start Time	YYDDDHMMSS (refer to Table 5-3)
5	11	17	Service Stop Time	YYDDDHMMSS (refer to Table 5-3)
6	3	28	Service Specification Code ID	AAA (three alphanumeric characters)
7	4	31	Simulation EIRP (Applicable to return simulations only)	(LSD = 0.1 dBW) (Note: +000 for a forward simulation.)
8	4	35	Simulation Gain/Temperature (Applicable to forward simulations only)	(LSD = 0.1 dB/°K) (Note: +000 for a return simulation.)
9	1	39	Local or MOC Data	0 = Local Signal Source 1 = MOC Signal Source
10	1	40	Spare	ASCII spaces

## 7.4 TDRSS Unscheduled Time File Format

MOCs that wish to import the entire TUT file information for processing in their own system may access it at the URL

<http://tuth1.nascom.nasa.gov/data/newtut.dat>

where the digit may be incremented to find the active TUT server as described in Section 4.5. The TUT file may be accessed with a World-Wide Web browser and saved as text form, or it can be read by a program using the HTTP GET request. The file is ASCII text, with the format shown in Table 7-23. TDRS Unscheduled Time Entry Format is shown in Table 7-24.

**Table 7-23. TDRSS Unscheduled Time File Format**

Line Number	Item Number	Number of Bytes	Data Item	Description and/or Range of Values
1	1	Variable	File Title	Up to eighty alphanumeric characters. e.g., TDRSS Unscheduled Time Report
2	1	Variable	TUT Generation Time Information	Information that contains the time at which the TUT was generated. YYYY is the year, DDD is the day of year, HH (00-23), is the hour of the day, MM (00-23) is the minutes of the hour, and SS (00-59) is the seconds of the minute. e.g., As of YYYY/DDD/HH:MM:SS
3	1	Variable	TUT Stop Time Information	The time of the end of the active schedule when the TUT was generated. e.g., TUT Stop Time YYYY/DDD/HH:MM:SS
4 to N	This entry repeats up to the number (N) of entries in the TUT report. The entries are sorted in ascending order on the key TDRS + Antenna/Link Type + Antenna Link Identification + StartTime.			

**Table 7-24. TDRS Unscheduled Time Entry Format**

Line Number	Item Number *	Number of Bytes	Data Item	Description and/or Range of Values
4	1	1	TUT Block Type	1 for Fixed TUT block, 2 for Flexible (resource usage) block
4	2	3	TDRS	AAA, TDRS Operational Name (three alphanumeric characters)
4	3 **	Variable (2, 3, or 4)	Antenna/Link Type	SA, ((MAF, MAR, SMAF, or SMAR)(Normal User))
4	4 ***	2	Antenna/Link Identification	Two digit number with a leading zero that represents the specific antenna/link. For MAF or SMAF, use 01
4	5	17	Start Time	YYYY/DDD/HH:MM:SS Start Time is the start of the Unscheduled Time.
4	6	17	Stop Time	YYYY/DDD/HH:MM:SS Stop Time is the end of the Unscheduled Time.
4	7	3	Confidence Level	100 In the current implementation, all events are treated as fixed events. The confidence level is always 100 for both fixed and flexible TUT blocks.
4	8	3	Percentage Used	0 to 100; The value indicates the percentage of the time in the block that the resources are used. For the Fixed TUT blocks, this value is always 0 (Zero).
<b>NOTES</b>				
* Each item is separated by one or more ASCII spaces.				
** MAF and MAR apply to TDRS A-G; SMAF and SMAR apply to TDRS H,I,J; SA applies to all TDRS A-J				
*** The link identification is provided to identify separate blocks of unscheduled time on resources of the same type and TDRS. The customer cannot specify the MAR/SMAR link ID, and should use flexibility on Schedule Add Requests by not specifying the SA antenna.				

## Section 8. Real-Time Message Formats

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### 8.1 Overview

The following Real-Time Messages are described in this section:

- a. Message Type 98 Ground Control Messages
- b. Message Type 92 Performance Data Messages
- c. Message Type 91 User Monitoring Messages

#### NOTE

In the following tables all shaded areas contain information which applies only to Shuttle. When an item has separate values for Normal User and Shuttle, only the "Range of Values" column area is shaded. Areas of the tables for Normal User and those shared by both Normal User and Shuttle are not shaded.

#### NOTE

For convenience all tables referenced in this section follow the text.

#### 8.1.1 Distinction Between Shuttle and Normal User Parameters

The SN has two types of users, Shuttle and Normal (i.e., all non-Shuttle users). Correspondingly, there are three types of parameters: Shuttle-unique parameters, Normal-unique parameters, and common parameters applicable to both Shuttle and Normal users. In order to clearly show this distinction, this document uses the following formatting:

- a. Tables applicable only to Normal users include "Normal User" in their titles. The titles are also boxed. No special formatting is applied to the remainder of the table.
- b. Tables applicable only to Shuttle include "Shuttle" in their titles. The titles are also shaded. No special formatting is applied to the remainder of the table.
- c. Within tables applicable to both Shuttle and Normal users, individual areas of the tables are formatted as follows:
  1. Items applicable only to Normal users are boxed. In nearly all cases, "Normal User" is also included in the name of the item.
  2. Items applicable only to Shuttle are shaded. In nearly all cases, "Shuttle" is also included in the name of the item.
- d. No special formatting is applied to common items.

## 8.2 Control Messages, Message Type 98

### 8.2.1 General

The following GCM formats are described in this section:

- a. User Reacquisition Request Message, message class 03 (see Table 8-1).
- b. Forward Link Sweep Request Message, message class 05 (see Table 8-2).
- c. Forward Link EIRP Reconfiguration Request Message, message class 06 (see Table 8-3).
- d. Expanded User Frequency Uncertainty Request Message, message class 07 (see Table 8-4).
- e. User Reconfiguration Request Message, message class 04 (see Tables 8-5 through 8-10).
- f. Doppler Compensation Inhibit Request Message, message class 08 (see Table 8-11).
- g. GCM Disposition Message, message class 02 (see Table 8-12).
- h. GCM Status Message, message class 01 (see Table 8-13).

### 8.2.2 Reconfiguration Messages

The NCCDS allocates six messages for a MOC to use for requesting a reconfiguration of the specified services. The Link and Service Support Type (Items 8 and 9 of Tables 8-5 through 8-10) define the type of link reconfiguration for a User Reconfiguration Request Message, commonly referred to as a GCMR, or Ground Control Message Request. The customer provides a valid value or ASCII spaces for each reconfigurable parameter. Parameter fields containing ASCII spaces in the GCMR will not be set to their respective last values (i.e., from the MOC schedule or previous GCMR) when the corresponding message to the Ground Terminal element is constructed by the NCCDS. The ASCII spaces indicate to the SN that the parameter has not changed. The User ID Field in the GCMR will be used by the NCCDS to determine the Nascom routing for GCM Status and GCM Disposition Messages transmitted in response to the processing of that GCMR.

## 8.3 Performance Data Messages, Message Type 92

The following Performance Data Message formats are described in this section:

- a. User Performance Data Request Message, message class 04 (see Table 8-15).
- b. Return Channel Time Delay Measurement Message, message class 62 (see Table 8-16).
- c. Acquisition Failure Notification Message, message class 63 (see Table 8-17).
- d. Time Transfer Message, message class 66 (see Table 8-18).

## 8.4 User Monitoring Messages, Message Type 91

The user monitoring messages, User Performance Data (UPD) message, message (class 01), and the Communications Test Message (CTM) (class 03) formats are described in this section.

### 8.4.1 User Performance Data Message Format, Message Class 01

#### 8.4.1.1 UPD Format for Nascom 4800-bit Block Protocol

- a. The User Performance Data Message is organized in a standard format, and consists of the following four types of packets:
  1. User Performance Data Header Packet.
  2. Service Type Header Data Packets.
  3. Service Data Packets.
  4. Data Quality Monitoring Data Packets.
- b. The first 22 bytes of the Message Subfield in the first Nascom block for the message contain the User Performance Data Header Packet. The User Performance Data Header Packet is always the first packet preceding any data packets. The User Performance Data message is organized according to service type (SA/SMART, MA/SMAF, and simulation). Each service type group begins with a Service Type Header Data Packet, which identifies the number of Service Data Packets of that type to follow. Each Service Type Header Data Packet, Service Data Packet, and Data Quality Monitoring Data Packet is a standard 100-byte length. A maximum of five data packets can be fit into a Nascom block. The data packets start in byte 45 of the first Nascom block and byte 23 of succeeding Nascom blocks.
- c. Byte 100 of each data packet contains a flag indicating whether this Data Packet has been previously transmitted to the user. This flag is set to zero if it is the first transmission of the data, and is set to a one if the data is a repeat of the data transmitted to the MOC in the previous message. A maximum of three Nascom blocks are required for User Performance Data Messages. Only the minimum number of Nascom blocks required are transmitted to support the amount of data applicable to the number of services supported.
- d. Return Service Data Quality Monitoring (DQM) Packets are included in the User Performance Data (UPD) message at the option of the MOC. Implemented as part of pre-mission support activities, the NCCDS database parameter which controls DQM transmission is enabled or disabled. If DQM transmission is enabled, UPD messages contain DQM packets for any active SSA, KSA, KaSA, MA, and/or SMA Return services. If DQM transmission is disabled, no DQM packets are contained in UPD messages. Subject to rare modifications at explicit MOC request, all UPD messages transmitted to the MOC throughout the full period of SN support of the mission reflect this initial choice.

- e. When multiple services are active, the Service Type Header Data Packets, Service Data Packets, and DQM Packets are transmitted in the order listed below. When a service listed below does not apply or becomes inactive, it drops from the listed sequence. The data packets following in order move up within the Nascom block, maintaining the relative order described below. Also, when a service becomes active its associated packets appear in the sequence of packets described below.
  - 1. SA/SMART Service Type Header Data Packet (SA/SMART Header).
  - 2. SSA Forward Service Data Packet (SSA Forward).
  - 3. KSA/KaSA Forward Service Data Packet (KSA/KaSA Forward).
  - 4. SSA/SMA Return Service Data Packet (SSA/SMA Return).
  - 5. SSA/SMA Return DQM Data Packet (SSA/SMA Return DQM).
  - 6. KSA/KaSA Return Service Data Packet (KSA/KaSA Return).
  - 7. KSA/KaSA Return DQM Data Packet (KSA/KaSA Return DQM).
  - 8. MA/SMAF Service Type Header Data Packet (MA/SMAF Header).
  - 9. MA/SMA Forward Service Data Packet (MA/SMA Forward).
  - 10. MA Return Service Data Packet (MA Return).
  - 11. MA Return DQM Data Packet (MA Return DQM).
  - 12. Simulation Service Type Header Data Packet (SIM Header).
  - 13. Simulation Forward Service Data Packet (SIM Forward).
  - 14. Simulation Return Service Data Packet (SIM Return).
- f. An example of message packing for SSA, KSA, MA and End-to-End test (simulation) with DQM is shown in Figure 8-1. An example of message packing for Normal/Shuttle SSA, KSA, SSA End-to-End test and KSA End-to-End test with DQM is shown in Figure 8-2.

#### **8.4.1.2 UPD Format for TCP/IP Protocol**

- a. The UPD message is organized in a standard format, and consists of the following four types of packets:
  - 1. User Performance Data Header Packet.
  - 2. Service Type Header Data Packets.
  - 3. Service Data Packets.
  - 4. Data Quality Monitoring Data Packets.
- b. The User Performance Data Header Packet is always the first packet preceding any data packets. The UPD message is organized according to service type (SA/SMART,

MA/SMAF, and simulation). Each service type group begins with a Service Type Header Data Packet, which identifies the number of Service Data Packets of that type to follow. Each Service Type Header Data Packet, Service Data Packet, and Data Quality Monitoring Data Packet is a standard 100-byte length.

- c. Byte 100 of each data packet contains a flag indicating whether this Data Packet has been previously transmitted to the user. This flag is set to zero if it is the first transmission of the data, and is set to a one if the data is a repeat of the data transmitted to the MOC in the previous message.
- d. Return Service Data Quality Monitoring (DQM) Packets will be included in the User Performance Data (UPD) message at the option of the MOC. Implemented as part of pre-mission support activities, the NCCDS data base parameter which controls DQM transmission will be enabled or disabled. If DQM transmission is enabled, UPD messages will contain DQM packets for any active SSA, KSA, KaSA, MA, and/or SMA Return services. If DQM transmission is disabled, no DQM packets will be contained in UPD messages. Subject to rare modifications at explicit MOC request, all UPD messages transmitted to the MOC throughout the full period of SN support of the mission will reflect this initial choice.
- e. When multiple services are active, the Service Type Header Data Packets, Service Data Packets, and DQM Packets are transmitted in the order listed below. When a service listed below does not apply or becomes inactive, it drops from the listed sequence. The data packets following in order move up within the message, maintaining the relative order described below. Also, when a service becomes active its associated packets appear in the sequence of packets described below.
  1. SA/SMART Service Type Header Data Packet (SA/SMART Header).
  2. SSA Forward Service Data Packet (SSA Forward).
  3. KSA/KaSA Forward Service Data Packet (KSA/KaSA Forward).
  4. SSA/SMA Return Service Data Packet (SSA/SMA Return).
  5. SSA/SMA Return DQM Data Packet (SSA/SMA Return DQM).
  6. KSA/KaSA Return Service Data Packet (KSA/KaSA Return).
  7. KSA/KaSA Return DQM Data Packet (KSA/KaSA Return DQM).
  8. MA/SMAF Service Type Header Data Packet (MA/SMAF Header).
  9. MA/SMA Forward Service Data Packet (MA/SMA Forward).
  10. MA Return Service Data Packet (MA Return).
  11. MA Return DQM Data Packet (MA Return DQM).
  12. Simulation Service Type Header Data Packet (SIM Header).

13. Simulation Forward Service Data Packet (SIM Forward).
14. Simulation Return Service Data Packet (SIM Return).

#### **8.4.2 Performance Data Message Packet Formats**

##### **8.4.2.1 Performance Data Header Packet Format**

The format for the User Performance Data Header Packet is shown in Table 8-19.

##### **8.4.2.2 SA/SMART Service Type Header Data Packet Format**

If the MOC has one or more SA or SMART service(s) active, the group of SA Forward and/or SA Return and/or SMA Return Service Data Packet(s) is preceded by the SA/SMART Service Type Header Data Packet. The format for the SA/SMART Service Type Header Data Packet is shown in Table 8-20.

##### **8.4.2.3 Data Packet Format**

The format for the SSA Forward Service Data Packet is shown in Table 8-21.

##### **8.4.2.4 KSA/KaSA Forward Service Data Packet Format**

The format for the KSA/KaSA Forward Service Data Packet is shown in Table 8-22.

##### **8.4.2.5 SSA/SMA DG1 Return Service Data Packet Format**

The format for the SSA/SMA DG1 Return Service Data Packet is shown in Table 8-23. Items 14 through 21, 51 and 52 apply for only SSA1, SMART and SSA combining services. Items 22 through 29, 53 and 54 apply for only SSA2 and SSA combining services.

##### **8.4.2.6 SSA/SMA DG2 Return Service Data Packet Format**

The format for the SSA/SMA DG2 Return Service Data Packet is shown in Table 8-24. Items 14 through 21, 49 and 50 apply for only SSA1, SMART and SSA combining services. Items 22 through 29, 51 and 52 apply for only SSA2 and SSA combining services.

##### **8.4.2.7 SSA Shuttle Return Service Data Packet Format**

The format for the SSA Shuttle Return Service Data Packet is shown in Table 8-25. Items 18 through 21 and 26 apply for only SSA1 and SSA combining services. Items 22 through 25 and 27 apply for only SSA2 and SSA combining services.

##### **8.4.2.8 SSA/SMA Return Service Data Quality Monitoring Packet Format**

The format for the SSA/SMA Return Service DQM Packet is shown in Table 8-26.

#### **8.4.2.9 KSA DG1 Return Service Data Packet Format**

The format for the KSA DG1 Return Service Data Packet is shown in Table 8-27.

#### **8.4.2.10 KSA/KaSA DG2 Return Service Data Packet Format**

The format for the KSA/KaSA DG2 Return Service Data Packet is shown in Table 8-28.

#### **8.4.2.11 KSA Shuttle Return Service Data Packet Format**

The format for the KSA Shuttle Return Service Data Packet is shown in Table 8-29.

#### **8.4.2.12 KSA/KaSA Return Service Data Quality Monitoring Packet Format**

The format for the KSA/KaSA Return Service DQM Packet is shown in Table 8-30.

#### **8.4.2.13 MA/SMAF Service Type Header Data Packet Format**

If the MOC has one or more MA or SMAF Services active, the group of MA Forward and/or Return or SMA Forward Services Data Packet(s) is preceded by the MA/SMAF Service Type Header Data Packet. The format for the MA/SMAF Service Type Header Data Packet is shown in Table 8-31.

#### **8.4.2.14 MA/SMA Forward Service Data Packet Format**

The format for the MA/SMA Forward Service Data Packet is shown in Table 8-32.

#### **8.4.2.15 MA Return Service Data Packet Format**

The format for the MA Return Service Data Packet is shown in Table 8-33.

#### **8.4.2.16 MA Return Service Data Quality Monitoring Data Packet Format**

The format for the MA Return Service Data Quality Monitoring Data Packet is shown in Table 8-34.

#### **8.4.2.17 Simulation Service Type Header Data Packet Format**

If the MOC has one or more Simulation Services active, the group of Simulation Forward and/or Return Service Data Packet(s) is preceded by the Simulation Service Type Header Data Packet. The format for the Simulation Service Type Header Data Packet is shown in Table 8-35.

#### **8.4.2.18 Simulation Forward Service Data Packet Format**

The format for the Simulation Forward Service Data Packet is shown in Table 8-36.

#### **8.4.2.19 Simulation Return Service Data Packet Format**

The format for the Simulation Return Service Data Packet is shown in Table 8-37.

### **8.4.3 Communication Test Message Format, Message Class 03**

The operator-initiated Communications Test Message contains a valid VID (bits 49 through 56 in the User Header 1). Refer to the *Support Identification Code Dictionary* (Reference 2.4e) for the list of valid VID codes. The format for the Communications Test Message is shown in Table 8-38.

**Table 8-1. User Reacquisition Request Message Format  
 (FROM MOC TO NCCDS)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	2	1	Message Type	98 = GCM
2	7	3	Message ID	A unique 7-character number used to reference this message
3	2	10	Message Class	03 = User Reacquisition Request Message
4	7	12	SUPIDEN	Refer to 532-808
5	4	19	User ID	Requester ID (four ASCII characters)
6	4	23	Password	Alphanumeric code
7	3	27	TDRS	AAA (three alphanumeric characters)
8	2	30	Link	00 = MA forward 01 = SSA1 02 = SSA2 03 = KSA1 04 = KSA2  05 = SMA Forward 06 = KaSA1 07 = KaSA2 21 through 25 = MAR 01 through 05 31 through 35 = SMAR 01 through 05
9	1	32	Service Support Type	0 = Forward 1 = Return

**Table 8-2. Forward Link Sweep Request Message Format  
 (FROM MOC TO NCCDS)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	2	1	Message Type	98 = GCM
2	7	3	Message ID	A unique 7-character number used to reference this message
3	2	10	Message Class	05 = Forward Link Sweep Request Message
4	7	12	SUPIDEN	Refer to 532-808
5	4	19	User ID	Requester ID (four ASCII characters)
6	4	23	Password	Alphanumeric code
7	3	27	TDRS	AAA (three alphanumeric characters)
8	2	30	Link	<div style="background-color: black; color: white; padding: 2px;">00 = MA 01 = SSA1 02 = SSA2</div> <div style="background-color: #cccccc; color: black; padding: 2px;">03 = KSA1 04 = KSA2</div> <div style="background-color: black; color: white; padding: 2px;">05 = SMA 06 = KaSA1 07 = KaSA2</div>

**Table 8-3. Forward Link EIRP Reconfiguration Request Message Format  
 (FROM MOC TO NCCDS)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	2	1	Message Type	98 = GCM
2	7	3	Message ID	A unique 7-character number used to reference this message
3	2	10	Message Class	06 = Forward Link EIRP Reconfiguration Request Message
4	7	12	SUPIDEN	Refer to 532-808
5	4	19	User ID	Requester ID (four ASCII characters)
6	4	23	Password	Alphanumeric code
7	3	27	TDRS	AAA (three alphanumeric characters)
8	2	30	Link	01 = SSA1 02 = SSA2 03 = KSA1 04 = KSA2
9	1	32	Power Mode	06 = KaSA1 07 = KaSA2
				0 = Normal 1 = High

**Table 8-4. Expanded User Frequency Uncertainty Request Message Format  
 (FROM MOC TO NCCDS)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	2	1	Message Type	98 = GCM
2	7	3	Message ID	A unique 7-character number used to reference this message
3	2	10	Message Class	07 = Expanded User Frequency Uncertainty Request Message (Note: For noncoherent services only)
4	7	12	SUPIDEN	Refer to 532-808
5	4	19	User ID	Requester ID (four ASCII characters)
6	4	23	Password	Alphanumeric code
7	3	27	TDRS	AAA (three alphanumeric characters)
8	2	30	Link	01 = SSA1 02 = SSA2 03 = KSA1 04 = KSA2 06 = KaSA1 07 = KaSA2 21 through 25 = MAR 01 through 05 31 through 35 = SMAR 01 through 05

**Table 8-5. MA/SMA Forward Link Reconfiguration Request Message Format  
 (FROM MOC TO NCCDS), Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	2	1	Message Type	98 = GCM
2	7	3	Message ID	A unique 7-character number used to reference this message
3	2	10	Message Class	04 = User Reconfiguration Request Message
4	7	12	SUPIDEN	Refer to 532-808
5	4	19	User ID	Requester ID (four ASCII characters)
6	4	23	Password	Alphanumeric code
7	3	27	TDRS	AAA (three alphanumeric characters)
8	2	30	Link	00 = MA 05 = SMA
9	1	32	Service Support Type	0 = Forward
10	1	33	User Despun Antenna	0 = No type 1 = Type 1 2 = Type 2
11	9	34	Date Rate	(LSD = 1 bps)
12	10	43	Receive Frequency	(LSD = 10 Hz)
13	1	53	Doppler Compensation Required	0 = No 1 = Yes

**Table 8-6. SSA Forward Link Reconfiguration Request Message Format  
 (FROM MOC TO NCCDS) (1 of 2)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	2	1	Message Type	98 = GCM
2	7	3	Message ID	A unique 7-character number used to reference this message
3	2	10	Message Class	04 = User Reconfiguration Request Message
4	7	12	SUPIDEN	Refer to 532-808
5	4	19	User ID	Requester ID (four ASCII characters)
6	4	23	Password	Alphanumeric code
7	3	27	TDRS	AAA (three alphanumeric characters)
8	2	30	Link	01 = SSA1 02 = SSA2
9	1	32	Service Support Type	0 = Forward
10	1	33	Despun Antenna	0 = No type 1 = Type 1 2 = Type 2
11	9	34	Date Rate, Normal User	(LSD = 1 bps)
12	10	43	Receive Frequency, Normal User	(LSD = 10 Hz)
13	10	53	Receive Frequency, Shuttle	(LSD = 10 Hz)
14	1	63	Polarization, Normal User	0 = LCP 1 = RCP
15	1	64	Polarization Shuttle	0 = LCP 1 = RCP
16	1	65	Command Channel PN Modulation, Normal User	0 = No 1 = Yes

**Table 8-6. SSA Forward Link Reconfiguration Request Message Format  
 (FROM MOC TO NCCDS) (2 of 2)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
17	1	66	Doppler Compensation Required, Normal User	0 = No 1 = Yes
18	1	67	Shuttle Carrier Doppler Compensation	0 = No 1 = Yes
19*	1	68	Shuttle PN Rate Doppler Compensation	0 = No 1 = Yes
20	1	69	Shuttle PN Modulation	0 = No 1 = Yes
21	1	70	Shuttle Data Configuration Mode	1 = Mode 1 (32 kbps) 2 = Mode 2 (72 kbps)

\* Item 19, JSC will not inhibit the Shuttle PN rate Doppler compensation with this message.  
 Message Type 98, Class 08, Doppler Compensation Inhibit Request, shown in Table 8-11 will be used.

**Table 8-7. KSA/KaSA Forward Link Reconfiguration Request Message Format  
 (FROM MOC TO NCCDS)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	2	1	Message Type	98 = GCM
2	7	3	Message ID	A unique 7-character number used to reference this message
3	2	10	Message Class	04 = User Reconfiguration Request Message
4	7	12	SUPIDEN	Refer to 532-808
5	4	19	User ID	Requester ID (four ASCII characters)
6	4	23	Password	Alphanumeric code
7	3	27	TDRS	AAA (three alphanumeric characters)
8	2	30	Link	03 = KSA1 04 = KSA2 06 = KaSA1 07 = KaSA2
9	1	32	Service Support Type	0 = Forward
10	9	33	Data Rate, Normal User	(LSD = 1 bps)
11	9	42	Data Rate, Shuttle	(LSD = 1 bps)
12	10	51	Receive Frequency, Normal User	(LSD = 10 Hz)
13	10	61	Receive Frequency, Shuttle	(LSD = 10 Hz)
14	1	71	Polarization, Normal User	0 = LCP 1 = RCP
15	1	72	Polarization, Shuttle	0 = LCP 1 = RCP
16	1	73	Command Channel PN Modulation	0 = No 1 = Yes (Note: ASCII spaces for data rates above 300 kbps.)
17	1	74	Doppler Compensation Required, Normal User	0 = No 1 = Yes
18	1	75	Doppler Compensation Required, Shuttle	0 = No 1 = Yes

**Table 8-8. MA Return Link Reconfiguration Request Message Format  
 (FROM MOC TO NCCDS) (1 of 3), Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	2	1	Message Type	98 = GCM
2	7	3	Message ID	A unique 7-character number used to reference this message
3	2	10	Message Class	04 = User Reconfiguration Request Message
4	7	12	SUPIDEN	Refer to 532-808
5	4	19	User ID	Requester ID (four ASCII characters)
6	4	23	Password	Alphanumeric code
7	3	27	TDRS	AAA (three alphanumeric characters)
8	2	30	Link	21 through 25 = MAR 01 through 05
9	1	32	Service Support Type	1 = Return
10	1	33	User Despun Antenna	0 = No type 1 = Type 1 2 = Type 2
11	9	34	Date Rate, I Channel	(LSD = 1 bps) (Note: Zero value indicates no data on channel.)
12	9	43	Data Rate, Q Channel	(LSD = 1 bps) (Note: Zero value indicates no data on channel.)
13	10	52	Transmit Frequency	(LSD = 10 Hz)
14	4	62	Maximum EIRP	Sign, 3 digits (LSD = 0.1 dBW)
15	4	66	Minimum EIRP	Sign, 3 digits (LSD = 0.1 dBW)
16	3	70	I/Q Channel Power Ratio	Sign, 2 digits (LSD = 0.1 dB)

**Table 8-8. MA Return Link Reconfiguration Request Message Format  
 (FROM MOC TO NCCDS) (2 of 3), Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
17	1	73	Data Format, I Channel	0 = NRZ-L 1 = NRZ-M 2 = NRZ-S
18	1	74	Data Format, Q Channel	0 = NRZ-L 1 = NRZ-M 2 = NRZ-S
19	1	75	Data Bit Jitter, I Channel	0 = None 1 = 0.01% 2 = 0.1% 3 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.) 4 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.) 5 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.)
20	1	76	Data Bit Jitter, Q Channel	0 = None 1 = 0.01% 2 = 0.1% 3 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.) 4 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.) 5 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.)
21	1	77	G2 Inversion, I Channel	0 = Do not invert 1 = Invert
22	1	78	G2 Inversion, Q Channel	0 = Do not invert 1 = Invert

**Table 8-8. MA Return Link Reconfiguration Request Message Format  
 (FROM MOC TO NCCDS) (3 of 3), Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
23	1	79	Mode	1 = Mode 1; Coherent 2 = Mode 2; Non-coherent
24	1	80	Spare	ASCII space
25	3	81	Data Stream ID, I Channel	001 through 037, 041 through 377 (octal)
26	3	84	Data Stream ID, Q Channel	001 through 037, 041 through 377 (octal)

**Table 8-9. SSA/SMA Return Link Reconfiguration Request Message Format  
 (FROM MOC TO NCCDS) (1 of 5)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	2	1	Message Type	98 = GCM
2	7	3	Message ID	A unique 7-character number used to reference this message
3	2	10	Message Class	04 = User Reconfiguration Request Message
4	7	12	SUPIDEN	Refer to 532-808
5	4	19	User ID	Requester ID (four ASCII characters)
6	4	23	Password	Alphanumeric code
7	3	27	TDRS	AAA (three alphanumeric characters)
8	2	30	Link	01 = SSA1 02 = SSA2 31 through 35 = SMAR 01 through 05
9	1	32	Service Support Type	1 = Return
10	1	33	User Despun Antenna, Normal User	0 = No type 1 = Type 1 2 = Type 2
11	9	34	Date Rate, I Channel, Normal User	(LSD = 1 bps) (Note: Zero value indicates no data on channel.)
12	9	43	Data Rate, Q Channel, Normal User	(LSD = 1 bps) (Note: Zero value indicates no data on channel.)
13	10	52	Transmit Frequency, Normal User	(LSD = 10 Hz)
14	1	62	Polarization, Normal User	0 = LCP 1 = RCP (not valid for SMAR)
15	1	63	Polarization, Shuttle	0 = LCP 1 = RCP
16	4	64	Maximum EIRP, Normal User	Sign, 3 digits (LSD = 0.1 dBW)

**Table 8-9. SSA/SMA Return Link Reconfiguration Request Message Format  
 (FROM MOC TO NCCDS) (2 of 5)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
17	4	68	Minimum EIRP, Normal User	Sign, 3 digits (LSD = 0.1 dBW)
18*	4	72	Maximum EIRP, Shuttle	Sign, 3 digits (LSD = 0.1 dBW)
19*	4	76	Minimum EIRP, Shuttle	Sign, 3 digits (LSD = 0.1 dBW)
20	3	80	I/Q Channel Power Ratio, Normal User	Sign, 2 digits (LSD = 0.1 dB)
21	1	83	Data Format, I Channel, Normal User	0 = NRZ-L 1 = NRZ-M 2 = NRZ-S 3 = BiΦ-L 4 = BiΦ-M 5 = BiΦ-S
22	1	84	Data Format, Q Channel, Normal User	0 = NRZ-L 1 = NRZ-M 2 = NRZ-S 3 = BiΦ-L 4 = BiΦ-M 5 = BiΦ-S
23	1	85	Data Bit Jitter, I Channel, Normal User	0 = None 1 = 0.01% 2 = 0.1% 3 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.) 4 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.) 5 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.)

**Table 8-9. SSA/SMA Return Link Reconfiguration Request Message Format  
 (FROM MOC TO NCCDS) (3 of 5)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
24	1	86	Data Bit Jitter, Q Channel, Normal User	<p>0 = None          1 = 0.01%          2 = 0.1%</p> <p>3 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.)</p> <p>4 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.)</p> <p>5 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.)</p>
25	1	87	Data Bit Jitter, Shuttle	<p>0 = None          1 = 0.01%          2 = 0.1%</p> <p>3 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.)</p> <p>4 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.)</p> <p>5 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.)</p>
26	10	88	Shuttle Transmit Frequency if Noncoherent	<p>(LSD = 10 Hz)          (Note: must have zero value if transmit frequency is coherent)</p>
27	1	98	Data Group, Normal User	<p>1 = Data group 1 (DG1)          2 = Data group 2 (DG2)</p>

**Table 8-9. SSA/SMA Return Link Reconfiguration Request Message Format  
 (FROM MOC TO NCCDS) (4 of 5)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
28	1	99	DG1 Mode, Normal User	1 = Mode 1; Coherent (PN on I and Q) 2 = Mode 2; Noncoherent (PN on I and Q) 3 = Mode 3; Coherent with no Q Channel deinterleaving (PN on I only) 4 = Mode 3; Coherent with Q Channel deinterleaving (PN on I only)
29	1	100	DG2 Type, Normal User	0 = Noncoherent, I and Q Channel deinterleaving 1 = Noncoherent, no deinterleaving 2 = Coherent, no deinterleaving 3 = Coherent, I and Q Channel deinterleaving 4 = Noncoherent, I Channel deinterleaving 5 = Noncoherent, Q Channel deinterleaving 6 = Coherent, Q Channel deinterleaving 7 = Coherent, I Channel deinterleaving
30	1	101	Shuttle Data, Configuration Mode	1 = Mode 1 (96 kbps) 2 = Mode 2 (192 kbps) 3 = Mode 3 (a coherent carrier only)
31	1	102	G2 Inversion, I Channel, Normal User	0 = Do not invert 1 = Invert (Note: ASCII space when Data Coding, I Channel = 1 is not scheduled)
32	1	103	G2 Inversion, Q Channel, Normal User	0 = Do not invert 1 = Invert (Note: ASCII space when Data Coding, Q Channel = 1 is not scheduled)

**Table 8-9. SSA/SMA Return Link Reconfiguration Request Message Format  
 (FROM MOC TO NCCDS) (5 of 5)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
33	3	104	Data Stream ID, I Channel, Normal User	001 through 037, 041 through 377 (octal)
34	3	107	Data Stream ID, Q Channel, Normal User	001 through 037, 041 through 377 (octal)
35	3	110	Data Stream ID, Shuttle	001 through 037, 041 through 377 (octal)
* Items 18 and 19 cannot be changed via GCMR; require manual configuration.				

**Table 8-10. KSA/KaSA Return Link Reconfiguration Request Message Format  
 (FROM MOC TO NCCDS) (1 of 6)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	2	1	Message Type	98 = GCM
2	7	3	Message ID	A unique 7-character number used to reference this message
3	2	10	Message Class	04 = User Reconfiguration Request Message
4	7	12	SUPIDEN	Refer to 532-808
5	4	19	User ID	Requester ID (four ASCII characters)
6	4	23	Password	Alphanumeric code
7	3	27	TDRS	AAA (three alphanumeric characters)
8*	2	30	Link	03 = KSA1 04 = KSA2  06 = KaSA1 07 = KaSA2 08 = KaSA1WB
9	1	32	Service Support Type	1 = Return
10	9	33	Data Rate, I Channel, Normal User	(LSD = 1 bps) (Note: Zero value indicates no data on channel.)
11	9	42	Date Rate, Q Channel, Normal User	(LSD = 1 bps) (Note: Zero value indicates no data on channel.)
12	10	51	Transmit Frequency, Normal User	(LSD = 10 Hz)
13	1	61	Polarization, Normal User	0 = LCP 1 = RCP
14	1	62	Polarization, Shuttle	0 = LCP 1 = RCP
15	4	63	Maximum EIRP, Normal User	Sign, 3 digits (LSD = 0.1 dBW)
16	4	67	Minimum EIRP, Normal User	Sign, 3 digits (LSD = 0.1 dBW)
17	4	71	Maximum EIRP, Shuttle	Sign, 3 digits (LSD = 0.1 dBW)
18	4	75	Minimum EIRP, Shuttle	Sign, 3 digits (LSD = 0.1 dBW)

**Table 8-10. KSA/KaSA Return Link Reconfiguration Request Message Format  
 (FROM MOC TO NCCDS) (2 of 6)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
19**	8	79	Autotrack Enable/Disable	00000000 = Enable 00000001 = Disable
20	3	87	I/Q Channel Power Ratio, Normal User	Sign, 2 digits (LSD = 0.1 dB)
21	1	90	Data Format, I Channel, Normal User	0 = NRZ-L 1 = NRZ-M 2 = NRZ-S 3 = Bi $\phi$ -L 4 = Bi $\phi$ -M 5 = Bi $\phi$ -S
22	1	91	Data Format, Q Channel, Normal User	0 = NRZ-L 1 = NRZ-M 2 = NRZ-S 3 = Bi $\phi$ -L 4 = Bi $\phi$ -M 5 = Bi $\phi$ -S
23	1	92	Data Bit Jitter, I Channel, Normal User	0 = None 1 = 0.01% 2 = 0.1% 3 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.) 4 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.) 5 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.)

**Table 8-10. KSA/KaSA Return Link Reconfiguration Request Message Format  
 (FROM MOC TO NCCDS) (3 of 6)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
24	1	93	Data Bit Jitter, Q Channel, Normal User	0 = None 1 = 0.01% 2 = 0.1% 3 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.) 4 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.) 5 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.)
25	10	94	Shuttle Transmit Frequency if Noncoherent	(LSD = 10 Hz) (Note: ASCII spaces if coherent.)
26	1	104	Data Group, Normal User	1 = Data group 1 (DG1) ( not valid for KaSAR) 2 = Data group 2 (DG2)
27	1	105	DG1 Mode, Normal User	1 = Mode 1; Coherent (PN on I and Q) 2 = Mode 2; Noncoherent (PN on I and Q) 3 = Mode 3; Coherent (PN on I only)
28	1	106	DG2 Type, Normal User	1 = Noncoherent 2 = Coherent ( not valid for KaSAR)
29	1	107	Shuttle Mode	1 = Mode 1 (PM) 2 = Mode 2 (FM, Chan. 3 digital) 3 = Mode 2 (FM, Chan. 3 analog) 4 = Mode 2 (FM, Chan. 3 video)

**Table 8-10. KSA/KaSA Return Link Reconfiguration Request Message Format  
 (FROM MOC TO NCCDS) (4 of 6)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
30	1	108	Data Format, Channel 1, Shuttle Mode 1 or 2	3 = Bi $\phi$ -L
31	1	109	Data Bit Jitter, Channel 1 Shuttle Mode 1 or 2	0 = None 1 = 0.01% 2 = 0.1% 3 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.) 4 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.) 5 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.)
32	1	110	Data Format, Channel 2, Shuttle Mode 1 or 2	0 = NRZ-L 1 = NRZ-M 2 = NRZ-S 3 = Bi $\phi$ -L 4 = Bi $\phi$ -M 5 = Bi $\phi$ -S
33	1	111	Data Bit Jitter, Channel 2, Shuttle Mode 1 or 2	0 = None 1 = 0.01% 2 = 0.1% 3 = 0.5% (Bi $\phi$ -L only; WSC will currently treat as 0.1% if received for any other data format.) 4 = 1.0% (Bi $\phi$ -L only; WSC will currently treat as 0.1% if received for any other data format.) 5 = 2.0% (Bi $\phi$ -L only; WSC will currently treat as 0.1% if received for any other data format.)
34	9	112	Data Rate, Channel 2, Shuttle Mode 1 or 2	(LSD = 1 bps)

**Table 8-10. KSA/KaSA Return Link Reconfiguration Request Message Format  
 (FROM MOC TO NCCDS) (5 of 6)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
35	1	121	Data Format, Channel 3, Shuttle Mode 1 or 2	<p>0 = NRZ-L          1 = NRZ-M          2 = NRZ-S          3 = Bi<math>\phi</math>-L          4 = Bi<math>\phi</math>-M          5 = Bi<math>\phi</math>-S</p> <p>(Note: Values 3, 4, and 5 are only applicable for channel 3, mode 2)</p>
36	1	122	Data Bit Jitter, Channel 3, Shuttle Mode 1 or 2	<p>0 = None          1 = 0.01%          2 = 0.1%          3 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.)          4 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.)          5 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.)</p>
37	9	123	Data Rate, Channel 3, Shuttle Mode 1 or 2	(LSD = 1 bps)
38	1	132	G2 Inversion, I Channel, Normal User	<p>0 = G2 polynomial normal,          - I leads Q, or          G2 polynomial inverted and I lags Q          1 = G2 polynomial inverted          - I leads Q, or          G2 polynomial normal and I lags Q</p> <p>(Note: ASCII space when no data coding, "0" is selected)</p>

**Table 8-10. KSA/KaSA Return Link Reconfiguration Request Message Format  
 (FROM MOC TO NCCDS) (6 of 6)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
39	1	133	G2 Inversion, Q Channel, Normal User	0 = G2 polynomial normal 1 = G2 polynomial inverted (Note: ASCII space when no data coding, "0" is selected)
40	3	134	Data Stream ID, I Channel, Normal User	001 through 037, 041 through 377 (octal)
41	3	137	Data Stream ID, Q Channel, Normal User	001 through 037, 041 through 377 (octal)
42	3	140	Data Stream ID, Channel 1, Shuttle Mode 1 or 2	001 through 037, 041 through 377 (octal)
43	3	143	Data Stream ID, Channel 2, Shuttle Mode 1 or 2	001 through 037, 041 through 377 (octal)
44	3	146	Data Stream ID, Channel 3, Shuttle Mode 1 or 2	001 through 037, 041 through 377 (octal)
45***	1	149	Shuttle 1.024 MHz Subcarrier	1 = Not Used 2 = Channel 2 (Shuttle Mode must be 1,3 or 4) 3 = Channel 3 (Shuttle Mode must be 2)  (Note: GCMR conflicts between Shuttle mode and Shuttle 1.024-Mhz subcarrier are reported with accept/reject status code of 21 (reference Table 8-14 item 8) with Shuttle 1.024-Mhz subcarrier indicated as the parameter in error)

\* The KaSA1 and KaSA2 links apply to normal bandwidth Ka-band return services. The KaSA1WB link applies to wideband Ka-band return services. The only reconfigurable parameters applicable to KaSA1WB operations are: Normal User Transmit Frequency and Normal User Polarization. No other parameters should be reconfigured for KaSA1WB. The NCCDS will accept reconfigurations of other parameters provided that the new values are valid for KaSAR; however, such reconfigurations will have no effect on the operational configuration of the KaSA1WB link. Autotrack Enable/Disable is not currently applicable to KaSA1WB, but may be applicable in the future.

\*\* Item 19, Autotrack Enable/Disable, reconfiguration is performed by the Ground Terminal operator and should be carried out only with pre-coordination.

\*\*\* Item 45, User must specify data rate, data stream ID, data format, and data bit jitter for shuttle 1024-Mhz subcarrier channel 3, mode 2.

**Table 8-11. Doppler Compensation Inhibit Request Message Format  
 (FROM MOC TO NCCDS)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	2	1	Message Type	98 = GCM
2	7	3	Message ID	A unique 7-character number used to reference this message
3	2	10	Message Class	08 = Doppler Compensation Inhibit Request Message
4	7	12	SUPIDEN	Refer to 532-808
5	4	19	User ID	Requester ID (four ASCII characters)
6	4	23	Password	Alphanumeric code
7	3	27	TDRS	AAA (three alphanumeric characters)
8	2	30	Link	<div style="border: 2px solid black; padding: 2px;">00 = MA</div> <div style="border: 2px solid black; padding: 2px;">01 = SSA1 02 = SSA2 03 = KSA1 04 = KSA2</div> <div style="border: 2px solid black; padding: 2px;">05 = SMA 06 = KaSA1 07 = KaSA2</div>
9	1	32	Compensation Inhibit Code	<div style="background-color: #cccccc; padding: 2px;">0 = Other than SSA shuttle 1 = SSA Shuttle, carrier only 2 = SSA Shuttle, PN rate only 3 = SSA Shuttle, both carrier and PN rate</div>

**Table 8-12. GCM Disposition Message Format (FROM NCCDS TO MOC)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	2	1	Message Type	98 = GCM
2	7	3	Message ID	A unique 7-character number used to reference this message
3	2	10	Message Class	02 = GCM Disposition Message
4	7	12	SUPIDEN	Refer to 532-808
5	7	19	Reference Message ID	Message ID of the GCMR being reported
6	2	26	Reference Message Class	Message class of the GCMR being reported
7	2	28	Fixed Pattern	00 (zeros)
8	1	30	Message Status	1 = Acknowledgment received from WSC 2 = No acknowledgment received from WSC
9	11	31	Time	YYDDDHMMSS (Refer to Table 5-2)

**Table 8-13. GCM Status Message Format (FROM NCCDS TO MOC)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	2	1	Message Type	98 = GCM
2	7	3	Message ID	A unique 7-character number used to reference this message
3	2	10	Message Class	01 = GCM Status Message
4	7	12	SUPIDEN	Refer to 532-808
5	7	19	Reference Message ID	Message ID of the GCMR that is accepted/rejected
6	2	26	Reference Message Class	Message class of the GCMR that is accepted/rejected
7	2	28	Real or Simulated Indicator	00 = Fixed pattern of normal message from NCC 99 = JSC locally simulated message (not transmitted from NCC)
8	2	30	Accept/Reject Status Code	Refer to Table 8-14
9	3	32	Parameter in Error	Address of the first byte of a parameter causing an accept/reject status code of 21. The address is relative to the beginning of the Message Subfield.

**Table 8-14. Accept/Reject Status Codes**

Code	Accept/Reject Status Explanations
00	MOC request accepted (WSC)
01	Syntax error (WSC)
02	SHO ID not found (WSC)
03	Specified service not found (WSC)
04	Specified service is not active or is undergoing change because of a previous MOC request (98/03 or 98/04); an equipment outage or a loss of lock (WSC)
05	Parameter out of range (WSC)
06	Incoming queues full (WSC)
07	User spacecraft not recognized (WSC)
08	MOC request not applicable for service designated (WSC)
09	Incomplete or ambiguous parameter designation (WSC)
10	Spare (WSC)
11	Equipment conflict (WSC)
12	Required corresponding forward service is not in operation (WSC) (applicable for class 04 only)
13	Connectivity table error (no TDRS/ground antenna match) (WSC)
14	No response received from WSC (NCCDS)
15-20	Not used
21	Invalid parameter in MOC request (NCCDS)
22	SUPIDEN conflicts with scheduled SUPIDEN (NCCDS)
23	Service is not scheduled (NCCDS)
24	Data rate exceeds allowable rate for this service (NCCDS) (applicable for class 04 only)
25	MOC not authorized for this spacecraft (NCCDS)
26	Interface channel not available (NCCDS) (applicable for class 04 only)
27	Not used
28	GCM class inappropriate to service type or configuration (NCCDS)
29	Doppler compensation inhibit code inappropriate for configuration (NCCDS) (applicable for class 04 and class 08 only)
30	WSC is down (NCCDS)
31	Pending request for same service (NCCDS); the NCCDS will not accept further MOC requests for the same service until all processing for previous request for same service is complete.
	<p>Note: The location identified in the parentheses in the "Accept/Reject Status Explanations" column, e.g., (WSC), indicates the source of the status code.</p>

**Table 8-15. User Performance Data Request Message Format  
 (FROM MOC TO NCCDS)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	2	1	Message Type	92 = Performance Data Message
2	7	3	Message ID	A unique 7-character number used to reference this message
3	2	10	Message Class	04 = User Performance Data Request Message
4	7	12	SUPIDEN	Refer to 532-808
5	4	19	User ID	Requester ID (four ASCII characters)
6	4	23	Password	Alphanumeric code
7	1	27	Function	0 = Enable transmission of User Performance Data Messages 1 = Disable transmission of User Performance Data Messages

**Table 8-16. Return Channel Time Delay Measurement Message Format  
 (FROM NCCDS TO MOC) (1 of 2)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	2	1	Message Type	92 = Performance Data Message
2	7	3	Message ID	A unique 7-character number used to reference this message
3	2	10	Message Class	62 = Return Channel Time Delay Measurement Message
4	7	12	SUPIDEN	Refer to 532-808
5	3	19	TDRS	AAA (three alphanumeric characters)
6	1	22	Service Support Subtype	<div style="border: 1px solid black; padding: 2px;">0 = MA</div> <div style="border: 1px solid black; padding: 2px; margin-top: 2px;">1 = SSA1 2 = SSA2 3 = KSA1 4 = KSA2</div> <div style="border: 1px solid black; padding: 2px; margin-top: 2px;">5 = SMA 6 = KaSA1 7 = KaSA2</div>
7	2	23	MA/SMA Return Link ID	00 = Not MA/SMA return 01 through 05 = MA/SMA return link ID
8	7	25	Time Delay at Service Start, I Channel	(LSD = 1 $\mu$ sec)
9	7	32	Time Delay at Service Start, Q Channel	(LSD = 1 $\mu$ sec)
10	7	39	Spare	ASCII spaces
11	7	46	Time Delay at Service Stop, I Channel	(LSD = 1 $\mu$ sec)
12	7	53	Time Delay at Service Stop, Q Channel	(LSD = 1 $\mu$ sec)

**Table 8-16. Return Channel Time Delay Measurement Message Format  
 (FROM NCCDS TO MOC) (2 of 2)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
13	7	60	Spare	ASCII spaces
14	28	67	Fixed Pattern	28 ASCII zeros
15	2	95	Number of Interim Time Delays to Follow (n)	00 through 99
16*	9	97	Delay Time (n = 1)	DDDHHMMSS (refer to Table 5-2)
17*	7	106	Interim Time Delay, I Channel (n = 1)	(LSD = 1 $\mu$ sec)
18*	7	113	Interim Time Delay, Q Channel (n = 1)	(LSD = 1 $\mu$ sec)
19*	7	120	Spare (n = 1)	ASCII spaces
20*	30	127	Return Channel Time Delay Data (n = 2)	Repeat items 16 through 19, n-1 times as indicated by the value in Item 15, (n).
	30	157	(n = 3)	RCTD data start byte computation = 97 + 30(n-1).
	30	187	(n = 4)	
.	.	.	.	(Note: This message may require multiple Nascom blocks. When value in Item 15 is 00 or 01 these data items do not apply. The remainder of the message subfield of the last Nascom block required shall be ASCII spaces.)
.	.	.	.	
.	.	.	.	
30	2977		(n = 97)	
30	3007		(n = 98)	
30	3037		(n = 99)	

\* Items 16 through 20 ASCII spaces if Item is not applicable.

**Table 8-17. Acquisition Failure Notification Message Format  
 (FROM NCCDS TO MOC)**

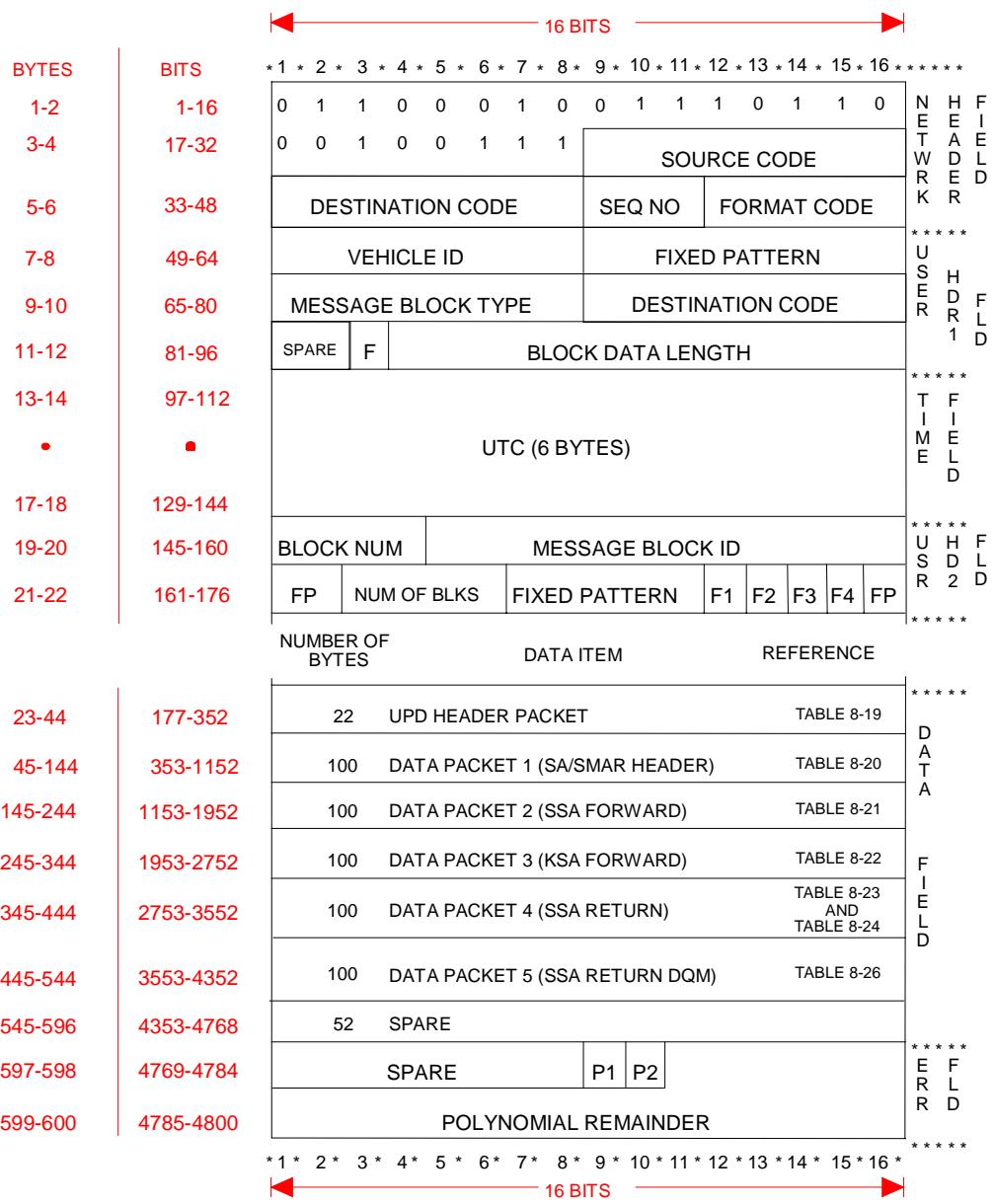
Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	2	1	Message Type	92 = Performance Data Message
2	7	3	Message ID	A unique 7-character number used to reference this message
3	2	10	Message Class	63 = Acquisition Failure Notification Message
4	7	12	SUPIDEN	Refer to 532-808
5	3	19	TDRS	AAA (three alphanumeric characters)
6	1	22	Service Support Subtype	<div style="border: 1px solid black; padding: 2px;">0 = MA</div> <div style="border: 1px solid black; padding: 2px;">1 = SSA1</div> <div style="border: 1px solid black; padding: 2px;">2 = SSA2</div> <div style="border: 1px solid black; padding: 2px;">3 = KSA1</div> <div style="border: 1px solid black; padding: 2px;">4 = KSA2</div> <div style="border: 1px solid black; padding: 2px;">5 = SMA</div> <div style="border: 1px solid black; padding: 2px;">6 = KaSA1</div> <div style="border: 1px solid black; padding: 2px;">7 = KaSA2</div>
7	2	23	MA/SMA Return Link ID	00 = Not MA/ SMA return 01 through 05 = MA/SMA return link ID

**Table 8-18. Time Transfer Message Format  
 (FROM NCCDS TO MOC) (1 of 2)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	2	1	Message Type	92 = Performance Data Message
2	7	3	Message ID	A unique 7-character number used to reference this message
3	2	10	Message Class	66 = Time Transfer Message
4	7	12	SUPIDEN	Refer to 532-808
5	3	19	TDRS	AAA (three alphanumeric characters)
6	1	22	Service Support Subtype	0 = MA 1 = SSA1 2 = SSA2 3 = KSA1 4 = KSA2 5 = SMA
7	2	23	MA/SMA Return Link ID	00 = Not MA/SMA Return 01 through 05 = MA/SMA return link ID
8	4	25	Forward PN Time Delay	LSB = 10 nsec (expressed in binary format)
9	4	29	Return PN Time Delay	LSB = 10 nsec (expressed in binary format)
10	1	33	Number of Occurrences (n)	20 through 255 (expressed in binary format)
11	5	34	NASA PB-1 Time Sample (n = 1)	Expressed in binary format
12	1	39	Receive PN Lock (n = 1)	0 = No lock 1 = Lock
13	3	40	Forward Delta Time (n = 1)	LSB = 200 nsec (expressed in binary format)

**Table 8-18. Time Transfer Message Format  
 (FROM NCCDS TO MOC) (2 of 2)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
14	3	43	Return Delta Time (n = 1)	LSB = 200 nsec (expressed in binary format)
15	12	46	Time Transfer Data (n = 2)	Repeat items 11 through 14, n-1 times as indicated by the value in item 10, (n).
	12	58	(n = 3)	TT data start byte computation = $34 + 12(n-1)$ .
	12	70	(n = 4)	
.	.	.	.	(Note: This message may require more than one Nascom block. Value in Item 10 will be a minimum value of 20. The remainder of the message subfield of the last Nascom block required shall be ASCII spaces.)
.	12	262	(n = 20)	
.	.	.	.	
.	12	3058	(n = 253)	
.	12	3070	(n = 254)	
.	12	3082	(n = 255)	



Note: Consists of up to three 4800-bit blocks, (block one).

F = FLAG

FP = FIXED PATTERN

A0950006.WMF

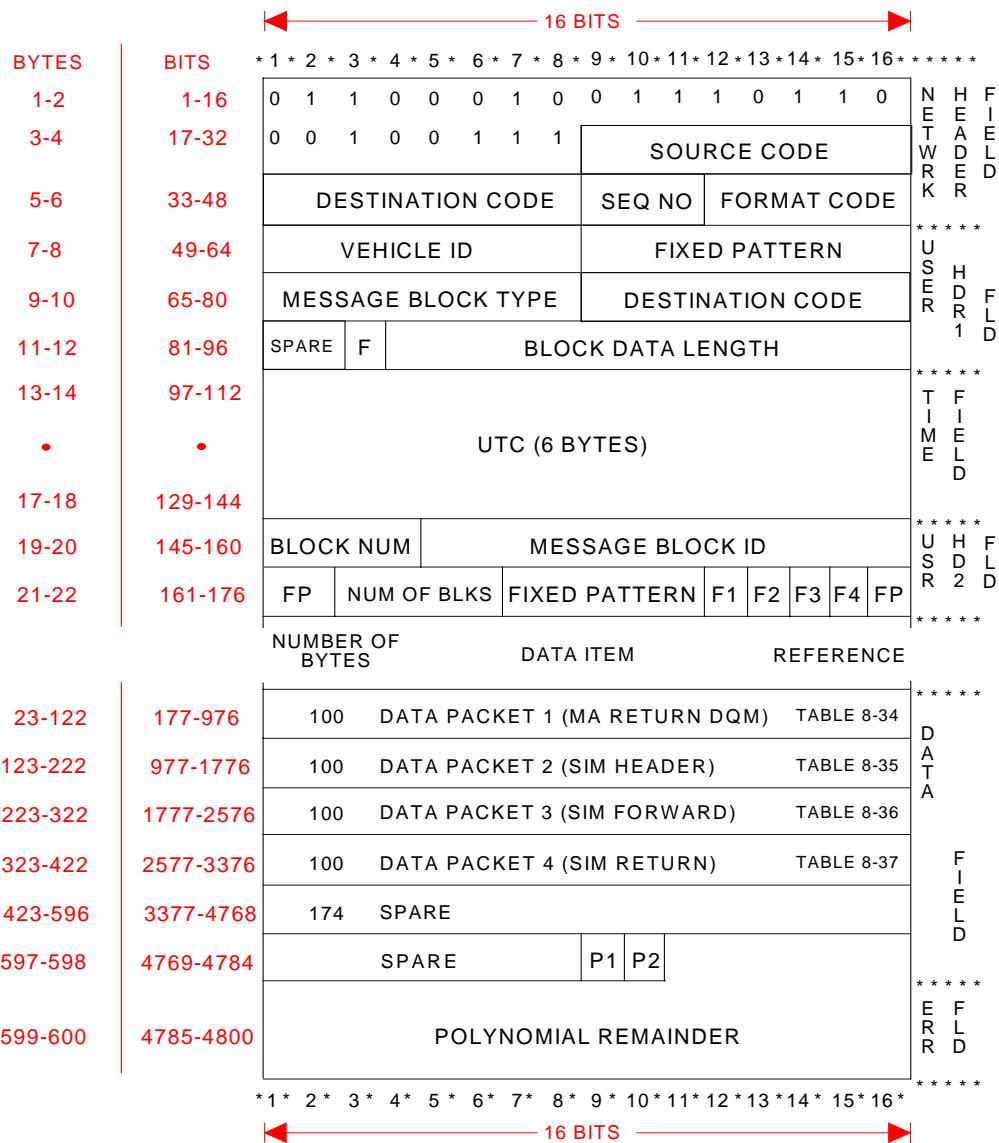
**Figure 8-1. Example of Message Packing for SSA/KSA/MA (Forward/Return) and Simulation UPD - Nascom 4800-bit block protocol (1 of 3)**

Note: Consists of up to three 4800-bit blocks, (block two).

**F = FLAG**  
**FP = FIXED PATTERN**

A0950007.WMF

**Figure 8-1. Example of Message Packing for SSA/KSA/MA (Forward/Return) and Simulation UDP - Nascom 4800-bit block protocol (2 of 3)**

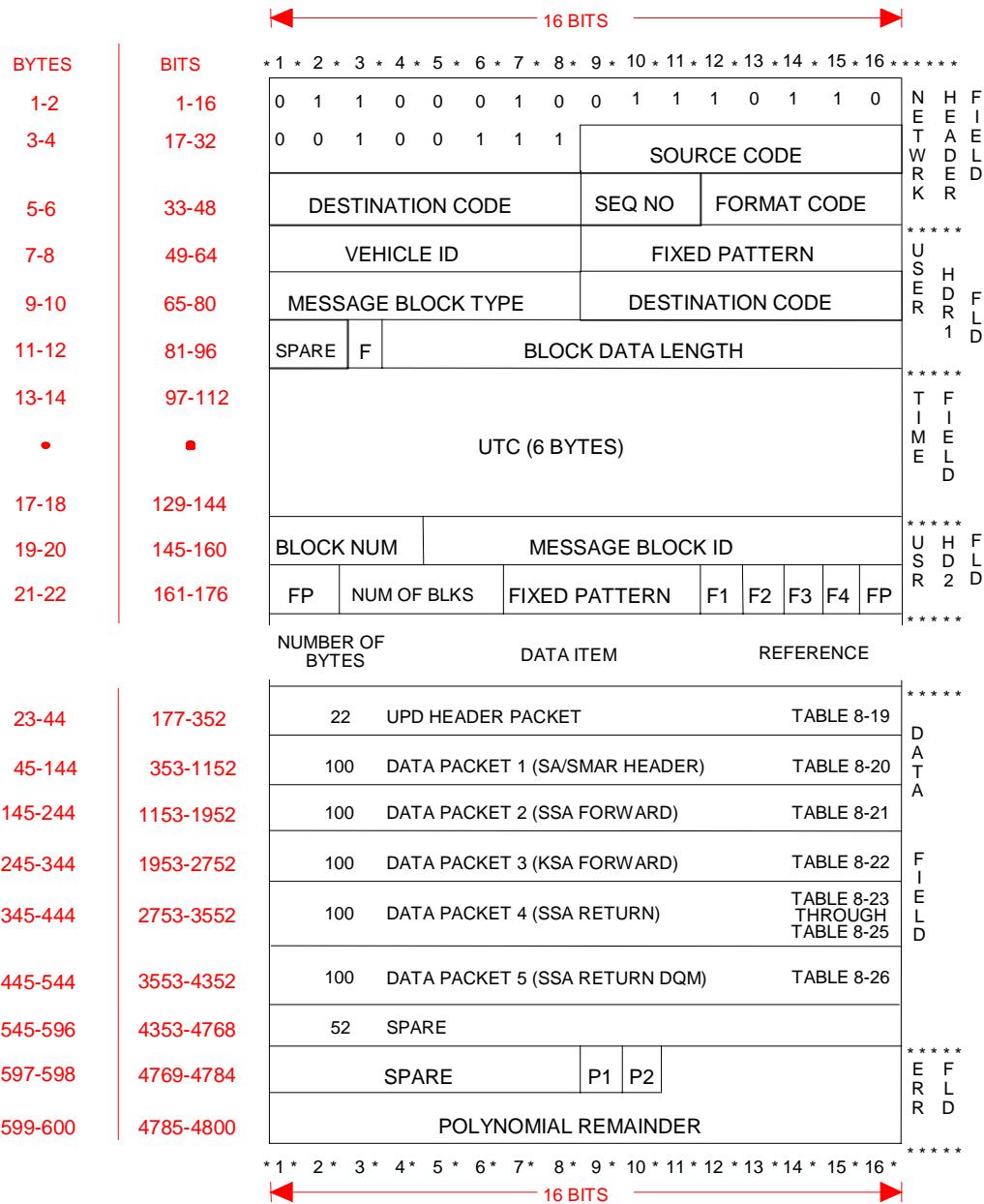


Note: Consists of up to three 4800-bit blocks, (block three).

F = FLAG  
 FP = FIXED PATTERN

A0950008.WMF

**Figure 8-1. Example of Message Packing for SSA/KSA/MA (Forward/Return) and Simulation UPD - Nascom 4800-bit block protocol (3 of 3)**



Note: Consists of up to three 4800-bit blocks, (block one).

F = FLAG  
 FP = FIXED PATTERN  
 A095009.WMF

**Figure 8-2. Example of Message Packing for Normal/Shuttle SSA/KSA (Forward/Return) and Simulation UPD - Nascom 4800-bit block protocol (1 of 3)**

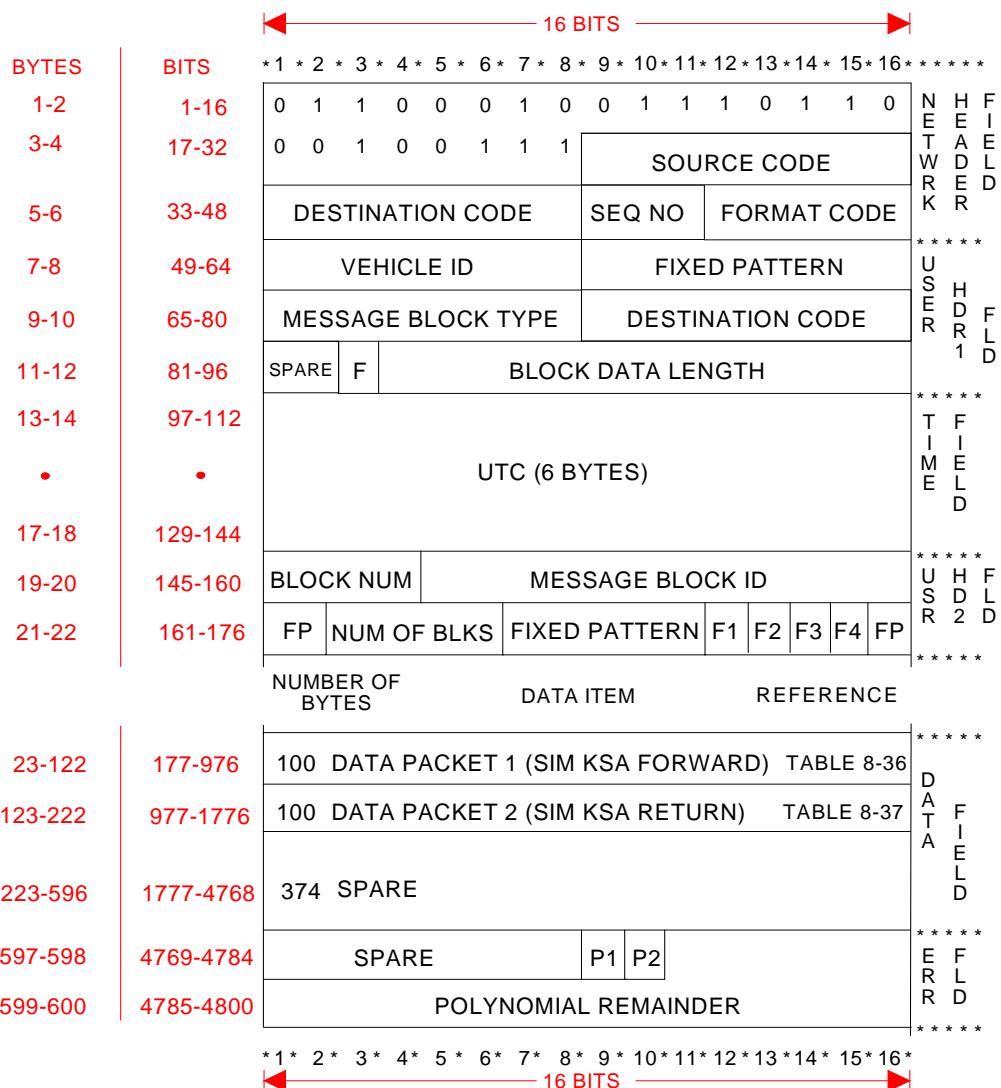
BYTES	BITS	* 1 * 2 * 3 * 4 * 5 * 6 * 7 * 8 * 9 * 10 * 11 * 12 * 13 * 14 * 15 * 16 * *****																																	
1-2	1-16	0 1 1 0 0 0 1 0 0 1 1 1 0 1 1 0	N	H	F																														
3-4	17-32	0 0 1 0 0 1 1 1	SOURCE CODE								T	A	E																						
5-6	33-48	DESTINATION CODE				SEQ NO	FORMAT CODE		N	E																									
7-8	49-64	VEHICLE ID				FIXED PATTERN				U	S	H																							
9-10	65-80	MESSAGE BLOCK TYPE				DESTINATION CODE				S	D	F																							
11-12	81-96	SPARE	F	BLOCK DATA LENGTH												1	D																		
13-14	97-112	UTC (6 BYTES)																																	
•	•																																		
17-18	129-144																																		
19-20	145-160	BLOCK NUM		MESSAGE BLOCK ID																															
21-22	161-176	FP	NUM OF BLKS	FIXED PATTERN		F1	F2	F3	F4	FP	U	S	D	L																					
		NUMBER OF BYTES				DATA ITEM				REFERENCE				*****																					
23-122	177-976	100	DATA PACKET 1 (KSA RETURN)														*****																		
123-222	977-1776	100	DATA PACKET 2 (KSA RETURN DQM)														D																		
223-322	1777-2576	100	DATA PACKET 3 (SIM HEADER)														A																		
323-422	2577-3376	100	DATA PACKET 4 (SIM SSA FORWARD)														F																		
423-522	3377-4176	100	DATA PACKET 5 (SIM SSA RETURN)														E																		
523-596	4177-4768	74	SPARE														I																		
597-598	4769-4784	SPARE		P1	P2												L																		
599-600	4785-4800	POLYNOMIAL REMAINDER																																	

Note: Consists of up to three 4800-bit blocks, (block two).

F = FLAG  
 FP = FIXED PATTERN

A0950010.WMF

**Figure 8-2. Example of Message Packing for Normal/Shuttle SSA/KSA (Forward/Return) and Simulation UDP - Nascom 4800-bit block protocol (2 of 3)**



Note: Consists of up to three 4800-bit blocks, (block three).

F = FLAG  
 FP = FIXED PATTERN  
 A0950011.WMF

**Figure 8-2. Example of Message Packing for Normal/Shuttle SSA/KSA (Forward/Return) and Simulation UPD - Nascom 4800-bit block protocol (3 of 3)**

**Table 8-19. User Performance Data Header Packet Format (FROM NCCDS TO MOC)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	2	1	Message Type	91 = UPD
2	7	3	Message ID	A unique 7-character number used to reference this message
3	2	10	Message Class	01 = User Performance Data Message
4	7	12	SUPIDEN	Refer to 532-808
5	2	19	VIC	NN (two numeric characters)
6	2	21	Real or Simulated Indicator	00 = Fixed pattern of normal message from NCC 99 = JSC simulated message (not transmitted from NCC)

**Table 8-20. SA/SMART Service Type Header Data Packet Format  
 (FROM NCCDS TO MOC)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	2	1	Service Type	05 = SA/SMART user performance data
2	7	3	User Performance Data Message ID	A unique 7-character identifier used to reference this message
3	1	10	Spare	ASCII space
4	3	11	TDRS	AAA (three alphanumeric characters)
5	12	14	TDRS Orientation	Angle 1 = Yaw; 0 to 360 deg, to accuracy of 0.25 deg (LSD = 0.1 deg, 4 bytes) Angle 2 = Roll; 0 to 360 deg, to accuracy of 0.1 deg (LSD = 0.1 deg, 4 bytes) Angle 3 = Pitch; 0 to 360 deg, to accuracy of 0.1 deg (LSD = 0.1 deg, 4 bytes)
6	11	26	Time Tag	YYDDDDHHMMSS (refer to Table 5-2)
7	2	37	Number SA and/or SMART Services	Number of SA and/or SMART services reported in this message
8	61	39	Spare	ASCII spaces
9	1	100	Refresh Word	0 = New transmission of this packet 1 = Transmitted in last message

**Table 8-21. SSA Forward Service Data Packet Format  
 (FROM NCCDS TO MOC) (1 of 4)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	1	1	Service Support Type	0 = Forward
2	7	2	SUPIDEN	Refer to 532-808
3	2	9	VIC	NN (two numeric characters)
4	1	11	Service Support Subtype	1 = SSA1 2 = SSA2
5	1	12	Support Function Subgroup	0 = Not applicable, Normal User 3 = Shuttle
6	3	13	Spare	ASCII spaces
7	8	16	RF Beam Pointing	Azimuth (0 to $\pm 90$ deg); sign, 3 digits (LSD = 0.1 deg, 4 bytes) Elevation (0 to $\pm 90$ deg); sign, 3 digits (LSD = 0.1 deg, 4 bytes)
8	1	24	Service Configuration	1 = SSA, Normal User 3 = Shuttle
9	1	25	Polarization	0 = LCP 1 = RCP

**Table 8-21. SSA Forward Service Data Packet Format  
 (FROM NCCDS TO MOC) (2 of 4)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
10	1	26	Link Status	<p>0 = Active          Status will be active during the following conditions:</p> <ul style="list-style-type: none"> <li>a. Forward service is set-up and running</li> <li>b. Return service has achieved link lock</li> </ul> <p>1 = Pending (equipment is unavailable for service). Status will be pending during the following conditions:</p> <ul style="list-style-type: none"> <li>a. Both prime and redundant equipment required for this support are FAILED</li> <li>b. No TT&amp;C look angles available for antenna service</li> <li>c. No USS doppler correction</li> <li>d. Equipment not configured/reconfigured (event processing error)</li> </ul> <p>2 = Acquisition/reacquisition (service is being initiated/reinitiated/reconfigured)          Status will be acquisition/reacquisition during the following conditions:</p> <ul style="list-style-type: none"> <li>a. Link lock has not been achieved for initiation of a return service</li> <li>b. Link lock is not achieved for a return service recovering from a PENDING state</li> <li>c. Link lock is not achieved for a return service undergoing reconfiguration/reacquisition</li> </ul>

**Table 8-21. SSA Forward Service Data Packet Format  
 (FROM NCCDS TO MOC) (3 of 4)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
11	2	27	Spare	ASCII spaces
12	1	29	Command Channel PN Modulation, Normal User	0 = No 1 = Yes
13	1	30	Doppler Compensation, Normal User	0 = Off 1 = On
14	4	31	Signal EIRP	Sign, 3 digits (LSD = 0.1 dBW)
15	10	35	Radiated Carrier Frequency	(LSD = 10 Hz)
16	1	45	Power Mode	0 = Normal 1 = High
17**	1	46	Clock Presence (for all 5 sec of the Measurement Interval)	0 = No 1 = Yes
18**	2	47	Data Transition Density Percent Transitions (Average of Five 1-sec Readings)	00 through 99
19	1	49	Shuttle carrier Doppler compensation	0 = Off 1 = On
20	1	50	Shuttle PN modulation	0 = Off 1 = On
21	1	51	Shuttle PN rate, Doppler compensation	0 = Off 1 = On
22	1	52	Shuttle data configuration mode	1 = Mode 1 (32 kbps) 2 = Mode 2 (72 kbps)
23***	1	53	Frame sync mode at end of reporting period, Shuttle	0 = Search 1 = Check 2 = Lock 3 = Flywheel
24***	1	54	Shuttle-unique equipment clock presence for all 5 seconds of the reporting period	0 = No 1 = Yes

**Table 8-21. SSA Forward Service Data Packet Format  
 (FROM NCCDS TO MOC) (4 of 4)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
25***	2	55	Shuttle-unique equipment data transition density percent transitions (average of five 1-second readings)	00 through 99
26***	3	57	Percent frames in lock for all 5 seconds of the reporting period, Shuttle	000 through 100
27***	8	60	Sync lock dropout count for all 5 seconds of the reporting period, Shuttle	00000000 through 99999999
28***	4	68	Frame sync word BER at ODM time tag, Shuttle	XEYY (X = 0-9; E = ASCII E; YY = 00-99, exponent assumed negative)
29	28	72	Spare	ASCII spaces
30	1	100	Refresh Word	0 = New transmission of this packet 1 = Transmitted in last message

\*\* Items 17 and 18 are based on measurements made as forward service data are received at the ground terminal front end.

\*\*\* Items 23 through 28 are based on measurements made at the ground terminal Shuttle-unique equipment.

**Table 8-22. KSA/KaSA Forward Service Data Packet Format  
 (FROM NCCDS TO MOC) (1 of 4)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	1	1	Service Support Type	0 = Forward
2	7	2	SUPIDEN	Refer to 532-808
3	2	9	VIC	NN (two numeric characters)
4	1	11	Service Support Subtype	3 = KSA1 4 = KSA2 6 = KaSA1 7 = KaSA2
5	1	12	Support Function Subgroup	0 = Not applicable (Normal User) 3 = Shuttle
6	3	13	Spare	ASCII spaces
7	8	16	RF Beam Pointing	Azimuth (0 to $\pm 90$ deg); sign, 3 digits (LSD = 0.1 deg, 4 bytes) Elevation (0 to $\pm 90$ deg); sign, 3 digits (LSD = 0.1 deg, 4 bytes)
8	1	24	Service Configuration	2 = KSA (Normal User) 3 = Shuttle 5 = KaSA
9	1	25	Polarization	0 = LCP 1 = RCP

**Table 8-22. KSA/KaSA Forward Service Data Packet Format  
 (FROM NCCDS TO MOC) (2 of 4)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
10	1	26	Link Status	<p>0 = Active          Status will be active during the following conditions:</p> <ul style="list-style-type: none"> <li>a. Forward service is set-up and running</li> <li>b. Return service has achieved link lock</li> </ul> <p>1 = Pending (equipment is unavailable for service).          Status will be pending during the following conditions:</p> <ul style="list-style-type: none"> <li>a. Both prime and redundant equipment required for this support are FAILED</li> <li>b. No TT&amp;C look angles available for antenna service</li> <li>c. No USS doppler correction</li> <li>d. Equipment not configured/reconfigured (event processing error)</li> </ul> <p>2 = Acquisition/reacquisition (service is being initiated/reinitiated/reconfigured)          Status will be Acquisition/reacquisition during the following conditions:</p> <ul style="list-style-type: none"> <li>a. Link lock has not been achieved for initiation of a return service</li> <li>b. Link lock is not achieved for a return service recovering from a PENDING state</li> <li>c. Link lock is not achieved for a return service undergoing reconfiguration/reacquisition</li> </ul>

**Table 8-22. KSA/KaSA Forward Service Data Packet Format  
 (FROM NCCDS TO MOC) (3 of 4)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
11	2	27	Spare	ASCII spaces
12	1	29	Command Channel PN Modulation, Normal User	0 = No 1 = Yes
13	1	30	Doppler Compensation, Normal User	0 = Off 1 = On
14	4	31	Signal EIRP	Sign, 3 digits (LSD = 0.1 dBW)
15	10	35	Radiated Carrier Frequency	(LSD = 10 Hz)
16	1	45	Power Mode	0 = Normal 1 = High
17**	1	46	Clock Presence (for all 5 sec of the Measurement Interval)	0 = No 1 = Yes
18**	2	47	Data Transition Density Percent Transitions (Average of Five 1-sec Readings)	00 through 99
19***	1	49	Frame sync mode at end of reporting period, Shuttle	0 = Search 1 = Check 2 = Lock 3 = Flywheel
20***	1	50	Shuttle unique equipment clock presence for all 5 seconds of the reporting period	0 = No 1 = Yes
21***	2	51	Shuttle unique equipment data transition density percent transactions (Average of Five 1-sec Readings)	00 through 99

**Table 8-22. KSA/KaSA Forward Service Data Packet Format  
 (FROM NCCDS TO MOC) (4 of 4)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
22***	3	53	Percent frames in lock for all 5 seconds of the reporting period, (average of five 1-second readings), Shuttle	000 through 100
23***	8	56	Sync lock dropout count for all 5 seconds of the reporting period, Shuttle	00000000 through 99999999
24***	4	64	Frame sync word BER at ODM time tag, Shuttle	XEYY (X = 0-9; E = ASCII E; YY = 00-99, exponent assumed negative)
25	32	68	Spare	ASCII spaces
26	1	100	Refresh Word	0 = New transmission of this packet 1 = Transmitted in last message
<p>** Items 17 and 18 are based on measurements made as forward service data are received at the ground terminal front end.</p> <p>*** Items 19 through 24 are based on measurements made at the ground terminal Shuttle-unique equipment.</p>				

**Table 8-23. SSA/SMA DG1 Return Service Data Packet Format  
 (FROM NCCDS TO MOC) (1 of 7), Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	1	1	Service Support Type	1 = Return
2	7	2	SUPIDEN	Refer to 532-808
3	2	9	VIC	NN (two numeric characters)
4	1	11	Service Support Subtype	1 = SSA1 2 = SSA2 5 = SMA
5	1	12	Support Function Subgroup	1 = DG1
6	3	13	Spare	ASCII spaces
7	8	16	RF Beam Pointing	Azimuth (0 to $\pm 90$ deg); sign, 3 digits (LSD = 0.1 deg, 4 bytes) Elevation (0 to $\pm 90$ deg); sign, 3 digits (LSD = 0.1 deg, 4 bytes)
8	1	24	Service Configuration	1 = SSA 4 = SMA
9	1	25	Polarization	0 = LCP 1 = RP

**Table 8-23. SSA/SMA DG1 Return Service Data Packet Format  
 (FROM NCCDS TO MOC) (2 of 7), Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
10	1	26	Link Status	<p>0 = Active          Status will be active during the following conditions:</p> <ul style="list-style-type: none"> <li>a. Forward service is set-up and running</li> <li>b. Return service has achieved link lock</li> </ul> <p>1 = Pending (equipment is unavailable for service).          Status will be pending during the following conditions:</p> <ul style="list-style-type: none"> <li>a. Both prime and redundant equipment required for this support are FAILED</li> <li>b. No TT&amp;C look angles available for antenna service</li> <li>c. No USS doppler correction</li> <li>d. Equipment not configured/reconfigured (event processing error)</li> </ul> <p>2 = Acquisition/reacquisition (service is being initiated/reinitiated/reconfigured)          Status will be          Acquisition/reacquisition during the following conditions:</p> <ul style="list-style-type: none"> <li>a. Link lock has not been achieved for initiation of a return service</li> <li>b. Link lock is not achieved for a return service recovering from a PENDING state</li> <li>c. Link lock is not achieved for a return service undergoing reconfiguration/reacquisition</li> </ul>

**Table 8-23. SSA/SMA DG1 Return Service Data Packet Format  
 (FROM NCCDS TO MOC) (3 of 7), Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
11	2	27	Spare	ASCII spaces
12	1	29	Receiver Configuration	0 = Normal 1 = Cross Support
13	1	30	Doppler Tracking Status	0 = Inactive 1 = One-way 2 = Two-way 3 = Cross-support
<b>SSA1/SMAR Data</b>				
14	1	31	Integrated Receiver Lock Indicator	0 = No lock 1 = Lock
15	5	32	Integrated Receiver Signal Strength; C/N <sub>0</sub>	Five numeric characters (LSD = 0.1 dB-Hz)
16	1	37	SMAR Link ID (from Schedule)	1 thru 5
17A	1	38	SMAR Link ID (SMAR Equipment String ID)	1 thru 6
17B	4	39	Spare	ASCII spaces
18	1	43	Symbol Synchronizer Lock Indicator, I Channel	0 = No lock 1 = Lock
19	1	44	Symbol Synchronizer Lock Indicator, Q Channel	0 = No lock 1 = Lock
20**	1	45	BER Status, I Channel	0 = Status not valid 1 = BER ≤ 10 <sup>-5</sup> 2 = BER > 10 <sup>-5</sup>
21**	1	46	BER Status, Q Channel	0 = Status not valid 1 = BER ≤ 10 <sup>-5</sup> 2 = BER > 10 <sup>-5</sup>
<b>SSA2 Data</b>				
22	1	47	Integrated Receiver Lock Indicator	0 = No lock 1 = Lock
23	5	48	Integrated Receiver Signal Strength; C/N <sub>0</sub>	Five numeric characters (LSD = 0.1 dB-Hz)
24	1	53	Spare	ASCII space

**Table 8-23. SSA/SMA DG1 Return Service Data Packet Format  
 (FROM NCCDS TO MOC) (4 of 7), Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
<b>SSA2 Data (continued)</b>				
25	5	54	Spare	ASCII spaces
26	1	59	Symbol Synchronizer Lock Indicator, I Channel	0 = No Lock 1 = Lock
27	1	60	Symbol Synchronizer Lock Indicator, Q Channel	0 = No lock 1 = Lock
28**	1	61	BER Status, I Channel	0 = Status not valid 1 = $BER \leq 10^{-5}$ 2 = $BER > 10^{-5}$
29**	1	62	BER Status, Q Channel	0 = Status not valid 1 = $BER \leq 10^{-5}$ 2 = $BER > 10^{-5}$
<b>End of SSA2 Data</b>				
30	1	63	Deinterleaving Selection	0 = No deinterleaving 1 = Deinterleaving I only 2 = Deinterleaving Q only 3 = Deinterleaving I & Q (Note: If a channel is not used or if uncoded, this byte will be ASCII space).
31	1	64	Spare	ASCII space
32	1	65	Data Format Conversion Configuration, I Channel	0 = No 1 = Yes
33	1	66	Data Format Conversion Configuration, Q Channel	0 = No 1 = Yes
34	3	67	I/Q Channel Power Ratio	Sign, 2 digits (LSD = 0.1 dB)
35	1	70	Symbol Format Conversion; Bi $\phi$ to NRZ, I Channel	0 = No 1 = Yes
36	1	71	Symbol Format Conversion; Bi $\phi$ to NRZ, Q Channel	0 = No 1 = Yes
37	1	72	Data Channel Configuration	0 = Single data source; Identical coded data on I and Q Channel 1 = Dual data source 2 = Single data source; G1G2(G3) of alternate data bits on I Channel, Q Channel

**Table 8-23. SSA/SMA DG1 Return Service Data Packet Format  
 (FROM NCCDS TO MOC) (5 of 7), Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
38	1	73	Data Coding, I Channel	0 = Uncoded 1 = Code 1 (rate 1/2) 2 = Code 2 (rate 1/2, G1 inverted) 3 = Code 3 (rate 1/3)
39	1	74	Data Coding, Q Channel	0 = Uncoded 1 = Code 1 (rate 1/2) 2 = Code 2 (rate 1/2, G1 inverted) 3 = Code 3 (rate 1/3)
40	1	75	G2 Inversion, I Channel	0 = Not inverted 1 = Inverted (Note: ASCII space when data coding 2 or 3 is selected)
41	1	76	G2 Inversion, Q Channel	0 = Not inverted 1 = Inverted (Note: ASCII space when data coding 2 or 3 is selected)
42	1	77	DG1 Configuration	0 = I Channel only (BPSK) 1 = Q Channel only (BPSK) 2 = I and Q Channel (QPSK)
43	1	78	Range Tracking Status	0 = Inactive 1 = Normal 2 = Cross Support
44	1	79	DG1 Mode	1 = Mode 1; Coherent (PN on I and Q) 2 = Mode 2; Noncoherent (PN on I and Q) 3 = Mode 3 ; Coherent (PN on I only)
45	1	80	Receiver Coherency Indicator	0 = Noncoherent 1 = Coherent
46	3	81	Spare	ASCII spaces
47	1	84	Spare	ASCII space
48	3	85	Spare	ASCII spaces
49	3	88	Spare	ASCII spaces
50	1	91	SSA Combining	0 = No 1 = Yes

**Table 8-23. SSA/SMA DG1 Return Service Data Packet Format  
 (FROM NCCDS TO MOC) (6 of 7), Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
51**	1	92	SSA1/SMART Data, BER Status, I Channel	0 = Status not valid 1 = $BER \geq 10^{-3}$ 2 = $10^{-3} > BER \geq 10^{-4}$ 3 = $10^{-4} > BER \geq 10^{-5}$ 4 = $10^{-5} > BER \geq 10^{-6}$ 5 = $10^{-6} > BER \geq 10^{-7}$ 6 = $10^{-7} > BER \geq 10^{-8}$ 7 = $10^{-8} > BER \geq 10^{-9}$ 8 = $BER < 10^{-9}$
52**	1	93	SSA1/SMART Data, BER Status, Q Channel	0 = Status not valid 1 = $BER \geq 10^{-3}$ 2 = $10^{-3} > BER \geq 10^{-4}$ 3 = $10^{-4} > BER \geq 10^{-5}$ 4 = $10^{-5} > BER \geq 10^{-6}$ 5 = $10^{-6} > BER \geq 10^{-7}$ 6 = $10^{-7} > BER \geq 10^{-8}$ 7 = $10^{-8} > BER \geq 10^{-9}$ 8 = $BER < 10^{-9}$
53**	1	94	SSA2 Data, BER Status, I Channel	0 = Status not valid 1 = $BER \geq 10^{-3}$ 2 = $10^{-3} > BER \geq 10^{-4}$ 3 = $10^{-4} > BER \geq 10^{-5}$ 4 = $10^{-5} > BER \geq 10^{-6}$ 5 = $10^{-6} > BER \geq 10^{-7}$ 6 = $10^{-7} > BER \geq 10^{-8}$ 7 = $10^{-8} > BER \geq 10^{-9}$ 8 = $BER < 10^{-9}$
54**	1	95	SSA2 Data, BER Status, Q Channel	0 = Status not valid 1 = $BER \geq 10^{-3}$ 2 = $10^{-3} > BER \geq 10^{-4}$ 3 = $10^{-4} > BER \geq 10^{-5}$ 4 = $10^{-5} > BER \geq 10^{-6}$ 5 = $10^{-6} > BER \geq 10^{-7}$ 6 = $10^{-7} > BER \geq 10^{-8}$ 7 = $10^{-8} > BER \geq 10^{-9}$ 8 = $BER < 10^{-9}$

**Table 8-23. SSA/SMA DG1 Return Service Data Packet Format  
 (FROM NCCDS TO MOC) (7 of 7), Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
55	4	96	Spare	ASCII spaces
56	1	100	Refresh Word	0 = New transmission of this packet 1 = Transmitted in last message
** Items 20, 21, 28 and 29 are computed from data for items 51, 52, 53, and 54 respectively and stated in reference to a BER of $10^{-5}$ . BER Status not valid indicates no decoder lock.				

**Table 8-24. SSA/SMA DG2 Return Service Data Packet Format  
 (FROM NCCDS TO MOC) (1 of 6), Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	1	1	Service Support Type	1 = Return
2	7	2	SUPIDEN	Refer to 532-808
3	2	9	VIC	NN (two numeric characters)
4	1	11	Service Support Subtype	1 = SSA1 2 = SSA2 5 = SMA
5	1	12	Support Function Subgroup	2 = DG2
6	3	13	Spare	ASCII spaces
7	8	16	RF Beam Pointing	Azimuth (0 to $\pm 90$ deg); sign, 3 digits (LSD = 0.1 deg, 4 bytes) Elevation (0 to $\pm 90$ deg); sign, 3 digits (LSD = 0.1 deg, 4 bytes)
8	1	24	Service Configuration	1 = SSA 4 = SMA
9	1	25	Polarization	0 = LCP 1 = RCP

**Table 8-24. SSA/SMA DG2 Return Service Data Packet Format  
 (FROM NCCDS TO MOC) (2 of 6) , Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
10	1	26	Link Status	<p>0 = Active          Status will be active during the following conditions:</p> <ul style="list-style-type: none"> <li>a. Forward service is set-up and running</li> <li>b. Return service has achieved link lock</li> </ul> <p>1 = Pending (equipment is unavailable for service).          Status will be pending during the following conditions:</p> <ul style="list-style-type: none"> <li>a. Both prime and redundant equipment required for this support are FAILED</li> <li>b. No TT&amp;C look angles available for antenna service</li> <li>c. No USS doppler correction</li> <li>d. Equipment not configured/reconfigured (event processing error)</li> </ul> <p>2 = Acquisition/reacquisition (service is being initiated/reinitiated/reconfigured)          Status will be Acquisition/reacquisition during the following conditions:</p> <ul style="list-style-type: none"> <li>a. Link lock has not been achieved for initiation of a return service</li> <li>b. Link lock is not achieved for a return service recovering from a PENDING state</li> <li>c. Link lock is not achieved for a return service undergoing reconfiguration/reacquisition</li> </ul>

**Table 8-24. SSA/SMA DG2 Return Service Data Packet Format  
 (FROM NCCDS TO MOC) (3 of 6) , Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
11	2	27	Spare	ASCII spaces
12	1	29	Receiver Configuration	0 = Normal 1 = Cross Support
13	1	30	Doppler Tracking Status	0 = Inactive 1 = One-way 2 = Two-way 3 = Cross-support
<b>SSA1/SMAR Data</b>				
14	1	31	Integrated Receiver Lock Indicator	0 = No lock 1 = Lock
15	5	32	Integrated Receiver Signal Strength; C/N <sub>0</sub>	Five numeric characters (LSD = 0.1 dB-Hz)
16	1	37	SMAR Link ID (from Schedule)	1 thru 5
17A	1	38	SMAR Link ID (SMAR Equipment String ID)	1 thru 6
17B	4	39	Spare	ASCII spaces
18	1	43	Symbol Synchronizer Lock Indicator, I Channel	0 = No lock 1 = Lock
19	1	44	Symbol Synchronizer Lock Indicator, Q Channel	0 = No lock 1 = Lock
20**	1	45	BER Status, I Channel	0 = Status not valid 1 = BER $\leq 10^{-5}$ 2 = BER $> 10^{-5}$
21**	1	46	BER Status, Q Channel	0 = Status not valid 1 = BER $\leq 10^{-5}$ 2 = BER $> 10^{-5}$
<b>SSA2 Data</b>				
22	1	47	Integrated Receiver Lock Indicator	0 = No lock 1 = Lock
23	5	48	Integrated Receiver Signal Strength; C/N <sub>0</sub>	Five numeric characters (LSD = 0.1 dB-Hz)
24	1	53	Spare	ASCII space
25	5	54	Spare	ASCII spaces
26	1	59	Symbol Synchronizer Lock Indicator, I Channel	0 = No Lock 1 = Lock

**Table 8-24. SSA/SMA DG2 Return Service Data Packet Format  
 (FROM NCCDS TO MOC) (4 of 6), Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
<b>SSA2 Data (continued)</b>				
27	1	60	Symbol Synchronizer Lock Indicator, Q Channel	0 = No lock 1 = Lock
28**	1	61	BER Status, I Channel	0 = Status not valid 1 = $\text{BER} \leq 10^{-5}$ 2 = $\text{BER} > 10^{-5}$
29**	1	62	BER Status, Q Channel	0 = Status not valid 1 = $\text{BER} \leq 10^{-5}$ 2 = $\text{BER} > 10^{-5}$
<b>End of SSA2 Data</b>				
30	1	63	Deinterleaving Selection	0 = No deinterleaving 1 = Deinterleaving I only 2 = Deinterleaving Q only 3 = Deinterleaving I & Q (Note: ASCII space when not applicable)
31	1	64	Spare	ASCII space
32	1	65	Data Format Conversion Configuration, I Channel	0 = No 1 = Yes
33	1	66	Data Format Conversion Configuration, Q Channel	0 = No 1 = Yes
34	3	67	I/Q Channel Power Ratio	Sign, 2 digits (LSD = 0.1 dB)
35	1	70	Symbol Format Conversion; Bi $\phi$ to NRZ, I Channel	0 = No 1 = Yes
36	1	71	Symbol Format Conversion; Bi $\phi$ to NRZ, Q Channel	0 = No 1 = Yes
37	1	72	Data Channel Configuration	0 = Single data source; G1 on I Channel, G2 on Q Channel 1 = Dual data source 2 = Single data source; G1 G2 (G3) of alternate data bits on I Channel, Q Channel

**Table 8-24. SSA/SMA DG2 Return Service Data Packet Format  
 (FROM NCCDS TO MOC) (5 of 6) , Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
38	1	73	Data Coding, I Channel	0 = Uncoded 1 = Code 1 (rate 1/2) 2 = Code 2 (rate 1/2, G1 inverted) 3 = Code 3 (rate 1/3)
39	1	74	Data Coding, Q Channel	0 = Uncoded 1 = Code 1 (rate 1/2) 2 = Code 2 (rate 1/2, G1 inverted) 3 = Code 3 (rate 1/3)
40	1	75	G2 Inversion, I Channel	0 = Not inverted 1 = Inverted (Note: ASCII space specifies Data Coding , I channel (item 38) is not equal to 1.)
41	1	76	G2 Inversion, Q Channel	0 = Not inverted 1 = Inverted (Note: ASCII space specifies Data Coding , Q channel (item 39) is not equal to 1.)
42	3	77	Spare	ASCII spaces
43	1	80	Spare	ASCII space
44	3	81	Spare	ASCII spaces
45	3	84	Spare	ASCII spaces
46	1	87	SSA Combining	0 = No 1 = Yes
47	1	88	DG2 Modulation	0 = QPSK 1 = BPSK
48	1	89	Receiver Coherency Indicator	0 = Noncoherent 1 = Coherent
49**	1	90	SSA1/SMART Data, BER Status, I Channel	0 = Status not valid 1 = $BER \geq 10^{-3}$ 2 = $10^{-3} > BER \geq 10^{-4}$ 3 = $10^{-4} > BER \geq 10^{-5}$ 4 = $10^{-5} > BER \geq 10^{-6}$ 5 = $10^{-6} > BER \geq 10^{-7}$ 6 = $10^{-7} > BER \geq 10^{-8}$ 7 = $10^{-8} > BER \geq 10^{-9}$ 8 = $BER < 10^{-9}$

**Table 8-24. SSA/SMA DG2 Return Service Data Packet Format  
 (FROM NCCDS TO MOC) (6 of 6), Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
50**	1	91	SSA1/SMART Data, BER Status, Q Channel	0 = Status not valid 1 = $\text{BER} \geq 10^{-3}$ 2 = $10^{-3} > \text{BER} \geq 10^{-4}$ 3 = $10^{-4} > \text{BER} \geq 10^{-5}$ 4 = $10^{-5} > \text{BER} \geq 10^{-6}$ 5 = $10^{-6} > \text{BER} \geq 10^{-7}$ 6 = $10^{-7} > \text{BER} \geq 10^{-8}$ 7 = $10^{-8} > \text{BER} \geq 10^{-9}$ 8 = $\text{BER} < 10^{-9}$
51**	1	92	SSA2 Data, BER Status, I Channel	0 = Status not valid 1 = $\text{BER} \geq 10^{-3}$ 2 = $10^{-3} > \text{BER} \geq 10^{-4}$ 3 = $10^{-4} > \text{BER} \geq 10^{-5}$ 4 = $10^{-5} > \text{BER} \geq 10^{-6}$ 5 = $10^{-6} > \text{BER} \geq 10^{-7}$ 6 = $10^{-7} > \text{BER} \geq 10^{-8}$ 7 = $10^{-8} > \text{BER} \geq 10^{-9}$ 8 = $\text{BER} < 10^{-9}$
52**	1	93	SSA2 Data, BER Status, Q Channel	0 = Status not valid 1 = $\text{BER} \geq 10^{-3}$ 2 = $10^{-3} > \text{BER} \geq 10^{-4}$ 3 = $10^{-4} > \text{BER} \geq 10^{-5}$ 4 = $10^{-5} > \text{BER} \geq 10^{-6}$ 5 = $10^{-6} > \text{BER} \geq 10^{-7}$ 6 = $10^{-7} > \text{BER} \geq 10^{-8}$ 7 = $10^{-8} > \text{BER} \geq 10^{-9}$ 8 = $\text{BER} < 10^{-9}$
53	6	94	Spare	ASCII spaces
54	1	100	Refresh Word	0 = New transmission of this packet 1 = Transmitted in last message

\*\* Items 20, 21, 28 and 29 are computed from data for items 49, 50, 51, and 52 respectively and stated in reference to a BER of  $10^{-5}$ . BER status not valid indicates no decoder lock.

**Table 8-25. SSA Shuttle Return Service Data Packet Format  
 (FROM NCCDS TO MOC) (1 of 4)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	1	1	Service Support Type	1 = Return
2	7	2	SUPIDEN	Refer to 532-808
3	2	9	VIC	NN (two numeric characters)
4	1	11	Service Support Subtype	1 = SSA1 2 = SSA2
5	1	12	Support Function Subgroup	3 = Shuttle
6	3	13	Spare	ASCII spaces
7	8	16	RF Beam Pointing	Azimuth (0 to $\pm 90$ deg); sign, 3 digits (LSD = 0.1 deg, 4 bytes) Elevation (0 to $\pm 90$ deg); sign, 3 digits (LSD = 0.1 deg, 4 bytes)
8	1	24	Service Configuration	3 = Shuttle
9	1	25	Polarization	0 = LCP 1 = RCP

**Table 8-25. SSA Shuttle Return Service Data Packet Format  
 (FROM NCCDS TO MOC) (2 of 4)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
10	1	26	Link Status	<p>0 = Active          Status will be active during the following conditions:</p> <ul style="list-style-type: none"> <li>a. Forward service is set-up and running</li> <li>b. Return service has achieved link lock</li> </ul> <p>1 = Pending (equipment is unavailable for service).          Status will be pending during the following conditions:</p> <ul style="list-style-type: none"> <li>a. Both prime and redundant equipment required for this support are FAILED</li> <li>b. No TT&amp;C look angles available for antenna service</li> <li>c. No USS doppler correction</li> <li>d. Equipment not configured/reconfigured (event processing error)</li> </ul> <p>2 = Acquisition/reacquisition (service is being initiated/reinitiated/reconfigured)          Status will be Acquisition/reacquisition during the following conditions:</p> <ul style="list-style-type: none"> <li>a. Link lock has not been achieved for initiation of a return service</li> <li>b. Link lock is not achieved for a return service recovering from a PENDING state</li> <li>c. Link lock is not achieved for a return service undergoing reconfiguration/reacquisition</li> </ul>

**Table 8-25. SSA Shuttle Return Service Data Packet Format  
 (FROM NCCDS TO MOC) (3 of 4)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
11	2	27	Spare	ASCII spaces
12	1	29	Receiver Configuration	0 = Normal
13	1	30	Receiver Coherency Indicator	0 = Noncoherent 1 = Coherent
14	1	31	Doppler Tracking Status	0 = Inactive 1 = One-way 2 = Two-way
15	1	32	SSA Combining	0 = No 1 = Yes
16	1	33	Mode	1 = Mode 1 (96 kbps) 2 = Mode 2 (192 kbps) 3 = Mode 3 (a coherent carrier only)
17	3	34	Spare	ASCII spaces
<b>SSA1 Data</b>				
18	1	37	Integrated Receiver Lock Indicator	0 = No lock 1 = Lock
19	5	38	Integrated Receiver Signal Strength-carrier power to power spectral density ratio (C/N <sub>0</sub> )	Five numeric characters (LSB = 0.1 dB-Hz)
20**	1	43	BER Status	0 = Status not valid 1 = BER $\leq 10^{-4}$ 2 = BER $> 10^{-4}$
21	1	44	Symbol Synchronizer Lock Indicator	0 = No lock 1 = Lock
<b>SSA2 Data</b>				
22	1	45	Integrated Receiver Lock Indicator	0 = No lock 1 = Lock
23	5	46	Integrated Receiver Signal Strength-carrier power to power spectral density ratio (C/N <sub>0</sub> )	Five numeric characters (LSB = 0.1 dB-Hz)
24**	1	51	BER Status	0 = Status not valid 1 = BER $\leq 10^{-4}$ 2 = BER $> 10^{-4}$

**Table 8-25. SSA Shuttle Return Service Data Packet Format  
 (FROM NCCDS TO MOC) (4 of 4)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
25	1	52	Symbol Synchronizer Lock Indicator	0 = No lock 1 = Lock
<b>End of SSA2 Data</b>				
26**	1	53	SSA1 Data, BER Status	0 = Status not valid 1 = $\text{BER} \geq 10^{-3}$ 2 = $10^{-3} > \text{BER} \geq 10^{-4}$ 3 = $10^{-4} > \text{BER} \geq 10^{-5}$ 4 = $10^{-5} > \text{BER} \geq 10^{-6}$ 5 = $10^{-6} > \text{BER} \geq 10^{-7}$ 6 = $10^{-7} > \text{BER} \geq 10^{-8}$ 7 = $10^{-8} > \text{BER} \geq 10^{-9}$ 8 = $\text{BER} < 10^{-9}$
27**	1	54	SSA2 Data, BER Status	0 = Status not valid 1 = $\text{BER} \geq 10^{-3}$ 2 = $10^{-3} > \text{BER} \geq 10^{-4}$ 3 = $10^{-4} > \text{BER} \geq 10^{-5}$ 4 = $10^{-5} > \text{BER} \geq 10^{-6}$ 5 = $10^{-6} > \text{BER} \geq 10^{-7}$ 6 = $10^{-7} > \text{BER} \geq 10^{-8}$ 7 = $10^{-8} > \text{BER} \geq 10^{-9}$ 8 = $\text{BER} < 10^{-9}$
28	45	55	Spare	ASCII Spaces
29	1	100	Refresh Word	0 = New transmission of this packet 1 = Transmitted in last message
** Items 20 and 24 are computed from data for items 26 and 27 respectively and stated in reference to a BER of $10^{-4}$ . BER status not valid indicates no decoder lock.				

**Table 8-26. SSA/SMA Return Service Data Quality Monitoring Packet Format  
 (FROM NCCDS TO MOC) (1 of 2)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	1	1	Service Support Type	2 = DQM
2	7	2	SUPIDEN	Refer to 532-808
3	2	9	VIC	NN (two numeric characters)
4	1	11	Service Support Subtype	1=SSA1 2=SSA2
				5=SMAR, Normal User
5	1	12	Support Function Subgroup	1 = DG1, Normal User 2 = DG2, Normal User
				3 = Shuttle
<b>Data for I Channel or Shuttle</b>				
6	1	13	Frame Sync Mode (at end of measurement interval)	0 = Search 1 = Check 2 = Lock 3 = Flywheel
7	1	14	Clock Presence (for all 5 sec of the measurement period)	0 = No 1 = Yes
8	2	15	Data Transition Density Percent Transitions (average of five 1-sec readings)	00 through 99
9	3	17	Percent Frames in Lock (frame lock count per frame count for 5-sec measurement interval)	000 through 100
10	8	20	Sync Lock Dropout Count (for 5-sec measurement interval)	00000000 through 99999999
11	4	28	Frame Sync Word BER (at ODM time tag)	XEYY (X = 0-9; E = ASCII E; YY = 00-99, exponent assumed negative)
<b>Data for Q Channel</b>				
12*	1	32	Frame Sync Mode (at end of measurement interval)	0 = Search 1 = Check 2 = Lock 3 = Flywheel
13*	1	33	Clock Presence (for all 5 sec of the measurement period)	0 = No 1 = Yes

**Table 8-26. SSA/SMA Return Service Data Quality Monitoring Packet Format  
 (FROM NCCDS TO MOC) (2 of 2)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
<b>Data for Q Channel (continued)</b>				
14*	2	34	Data Transition Density Percent Transitions (average of five 1-sec readings)	00 through 99
15*	3	36	Percent Frames in Lock (frame lock count per frame count for 5-sec measurement interval)	000 through 100
16*	8	39	Sync Lock Dropout Count (for 5-sec measurement interval)	00000000 through 99999999
17*	4	47	Frame Sync Word BER (at ODM time tag)	XEYY (X = 0-9; E = ASCII E; YY = 00-99, exponent assumed negative)
<b>End of Data for Q Channel</b>				
18	49	51	Spare	ASCII spaces
19	1	100	Refresh Word	0 = New transmission of this packet 1 = Transmitted in last message
* Items 12 through 17 do not apply to Shuttle, where bytes 32 through 50 are ASCII spaces.				

**Table 8-27. KSA DG1 Return Service Data Packet Format  
 (FROM NCCDS TO MOC) (1 of 6), Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	1	1	Service Support Type	1 = Return
2	7	2	SUPIDEN	Refer to 532-808
3	2	9	VIC	NN (two numeric characters)
4	1	11	Service Support Subtype	3 = KSA1 4 = KSA2
5	1	12	Support Function Subgroup	1 = DG1
6	3	13	Spare	ASCII spaces
7	8	16	RF Beam Pointing	Azimuth (0 to $\pm 90$ deg); sign, 3 digits (LSD = 0.1 deg, 4 bytes) Elevation (0 to $\pm 90$ deg); sign, 3 digits (LSD = 0.1 deg, 4 bytes)
8	1	24	Service Configuration	2 = KSA
9	1	25	Polarization	0 = LCP 1 = RCP

**Table 8-27. KSA DG1 Return Service Data Packet Format  
 (FROM NCCDS TO MOC) (2 of 6) , Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
10	1	26	Link Status	<p>0 = Active          Status will be active during the following conditions:</p> <ul style="list-style-type: none"> <li>a. Forward service is set-up and running</li> <li>b. Return service has achieved link lock</li> </ul> <p>1 = Pending (equipment is unavailable for service).          Status will be pending during the following conditions:</p> <ul style="list-style-type: none"> <li>a. Both prime and redundant equipment required for this support are FAILED</li> <li>b. No TT&amp;C look angles available for antenna service</li> <li>c. No USS doppler correction</li> <li>d. Equipment not configured/reconfigured (event processing error)</li> </ul> <p>2 = Acquisition/reacquisition (service is being initiated/reinitiated/reconfigured)          Status will be Acquisition/reacquisition during the following conditions:</p> <ul style="list-style-type: none"> <li>a. Link lock has not been achieved for initiation of a return service</li> <li>b. Link lock is not achieved for a return service recovering from a PENDING state</li> <li>c. Link lock is not achieved for a return service undergoing reconfiguration/reacquisition</li> </ul>

**Table 8-27. KSA DG1 Return Service Data Packet Format  
 (FROM NCCDS TO MOC) (3 of 6), Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
11	2	27	Spare	ASCII spaces
12	1	29	Receiver Configuration	0 = Normal
13	1	30	Doppler Tracking Status	0 = Inactive 1 = One-way 2 = Two-way
14	1	31	First Demodulator Type Indicator, I Channel	1 = Integrated Receiver 2 = High Data Rate Receiver
15	1	32	First Demodulator Lock Indicator, I Channel	0 = No lock 1 = Lock
16	5	33	First Demodulator Signal Strength; C/N <sub>0</sub> , I Channel	Five numeric characters (LSB = 0.1 dB-Hz)
17	1	38	Second Demodulator Type Indicator, Q Channel	1 = Integrated Receiver 2 = High Data Rate Receiver
18	1	39	Second Demodulator Lock Indicator, Q Channel	0 = No lock 1 = Lock
19	5	40	Second Demodulator Signal Strength; C/N <sub>0</sub> , Q Channel	Five numeric characters (LSB = 0.1 dB-Hz)
20	1	45	Symbol Synchronizer, Lock Indicator, I Channel	0 = No lock 1 = Lock
21	1	46	Symbol Synchronizer Lock Indicator, Q Channel	0 = No lock 1 = Lock
22**	1	47	BER Status, I Channel	0 = Status not valid 1 = BER $\leq 10^{-5}$ 2 = BER $> 10^{-5}$

**Table 8-27. KSA DG1 Return Service Data Packet Format  
 (FROM NCCDS TO MOC) (4 of 6), Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
23**	1	48	BER Status, Q Channel	0 = Status not valid 1 = $\text{BER} \leq 10^{-5}$ 2 = $\text{BER} > 10^{-5}$
24	1	49	Data Format Conversion Configuration, I Channel	0 = No 1 = Yes
25	1	50	Data Format Conversion Configuration, Q Channel	0 = No 1 = Yes
26	3	51	I/Q Channel Power Ratio	Sign, 2 digits (LSD = 0.1 dB)
27	1	54	Symbol Format Conversion; Bi $\phi$ to NRZ, I Channel	0 = No 1 = Yes
28	1	55	Symbol Format Conversion; Bi $\phi$ to NRZ, Q Channel	0 = No 1 = Yes
29	1	56	Data Channel Configuration	0 = Single data source 1 = Dual data source
30	1	57	Data Coding, I Channel	0 = Uncoded 1 = Code 1 (rate 1/2)
31	1	58	Data Coding, Q Channel	0 = Uncoded 1 = Code 1 (rate 1/2)
32	1	59	G2 Inversion, I Channel	0 = Not inverted 1 = Inverted (Note: ASCII space when a data coding of 0 is selected)
33	1	60	G2 Inversion, Q Channel	0 = Not inverted 1 = Inverted (Note: ASCII space when a data coding of 0 is selected)
34	1	61	DG1 Configuration	0 = I Channel only (BPSK) 1 = Q Channel only (BPSK) 2 = I and Q Channels (QPSK)
35	1	62	Range Tracking Status	0 = Inactive 1 = Normal

**Table 8-27. KSA DG1 Return Service Data Packet Format  
 (FROM NCCDS TO MOC) (5 of 6), Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
36	1	63	Mode	1 = Mode 1; Coherent (PN on I and Q) 2 = Mode 2; Noncoherent (PN on I and Q) 3 = Mode 3; Coherent (PN on I only)
37	1	64	Receiver Coherency Indicator	0 = Noncoherent 1 = Coherent
38	1	65	Autotrack Status	TDRS A-G 0 = Disabled 1 = No signal presence indication 2 = Signal presence; no zero crossing 3 = Zero crossing; both axes 4 = Autotrack; fine pointing mode  TDRS H-J 0 = Disabled 1 = No signal presence 2 = Signal presence 3 = Not Applicable 4 = Autotrack; zero crossing both axes
39	3	66	Spare	ASCII spaces
40	3	69	Spare	ASCII spaces
41**	1	72	BER Status, I Channel	0 = Status not valid 1 = $\text{BER} \geq 10^{-3}$ 2 = $10^{-3} > \text{BER} \geq 10^{-4}$ 3 = $10^{-4} > \text{BER} \geq 10^{-5}$ 4 = $10^{-5} > \text{BER} \geq 10^{-6}$ 5 = $10^{-6} > \text{BER} \geq 10^{-7}$ 6 = $10^{-7} > \text{BER} \geq 10^{-8}$ 7 = $10^{-8} > \text{BER} \geq 10^{-9}$ 8 = $\text{BER} < 10^{-9}$
42**	1	73	BER Status, Q Channel	0 = Status not valid 1 = $\text{BER} \geq 10^{-3}$ 2 = $10^{-3} > \text{BER} \geq 10^{-4}$ 3 = $10^{-4} > \text{BER} \geq 10^{-5}$ 4 = $10^{-5} > \text{BER} \geq 10^{-6}$ 5 = $10^{-6} > \text{BER} \geq 10^{-7}$ 6 = $10^{-7} > \text{BER} \geq 10^{-8}$ 7 = $10^{-8} > \text{BER} \geq 10^{-9}$ 8 = $\text{BER} < 10^{-9}$

**Table 8-27. KSA DG1 Return Service Data Packet Format  
 (FROM NCCDS TO MOC) (6 of 6) , Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
43	26	74	Spare	ASCII spaces
44	1	100	Refresh Word	0 = New transmission of this packet 1 = Transmitted in last message
** Items 22 and 23 are computed from data for items 41 and 42 respectively and stated in reference to a BER of $10^{-5}$ . BER Status not valid indicates no BITSYNC lock for uncoded service and no decoder lock for coded service.				

**Table 8-28. KSA/KaSA DG2 Return Service Data Packet Format  
 (FROM NCCDS TO MOC) (1 of 6), Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	1	1	Service Support Type	1 = Return
2	7	2	SUPIDEN	Refer to 532-808
3	2	9	VIC	NN (two numeric characters)
4*	1	11	Service Support Subtype	3 = KSA1 4 = KSA2 6 = KaSA1 7 = KaSA2 8 = <b>KaSA1WB</b>
5	1	12	Support Function Subgroup	2 = DG2
6	3	13	Spare	ASCII spaces
7	8	16	RF Beam Pointing	Azimuth (0 to ±90 deg); sign, 3 digits (LSD = 0.1 deg, 4 bytes) Elevation (0 to ±90 deg); sign, 3 digits (LSD = 0.1 deg, 4 bytes)
8	1	24	Service Configuration	2 = KSA (applicable for Service Support Subtype = 3, 4) 5 = KaSA (applicable for Service Support Subtype = 6, 7) 6 = IF Service (applicable for Service Support Subtype = 8)
9	1	25	Polarization	0 = LCP 1 = RCP

**Table 8-28. KSA/KaSA DG2 Return Service Data Packet Format  
 (FROM NCCDS TO MOC) (2 of 6) , Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
10	1	26	Link Status	<p>0 = Active          Status will be active during the following conditions:</p> <ul style="list-style-type: none"> <li>a. Forward service is set-up and running</li> <li>b. Return service has achieved link lock</li> </ul> <p>1 = Pending (equipment is unavailable for service). Status will be pending during the following conditions:</p> <ul style="list-style-type: none"> <li>a. Both prime and redundant equipment required for this support are FAILED</li> <li>b. No TT&amp;C look angles available for antenna service</li> <li>c. No USS doppler correction</li> <li>d. Equipment not configured/reconfigured (event processing error)</li> </ul> <p>2 = Acquisition/reacquisition (service is being initiated/reinitiated/reconfigured)          Status will be Acquisition/reacquisition during the following conditions:</p> <ul style="list-style-type: none"> <li>a. Link lock has not been achieved for initiation of a return service</li> <li>b. Link lock is not achieved for a return service recovering from a PENDING state</li> <li>c. Link look is not achieved for a return service undergoing reconfiguration/reacquisition</li> </ul>

**Table 8-28. KSA/KaSA DG2 Return Service Data Packet Format  
 (FROM NCCDS TO MOC) (3 of 6) , Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
11	2	27	Spare	ASCII spaces
12	1	29	Receiver Configuration	0 = Normal
13	1	30	Doppler Tracking Status	0 = Inactive 1 = One-way 2 = Two-way
14	1	31	First Demodulator Type Indicator, I Channel	1 = Integrated Receiver 2 = High Data Rate Receiver
15	1	32	First Demodulator Lock Indicator, I Channel	0 = No lock 1 = Lock
16	5	33	First Demodulator Signal Strength; C/N <sub>0</sub> , I Channel	Five numeric characters (LSB = 0.1 dB-Hz)
17	1	38	Second Demodulator Type Indicator, Q Channel	1 = Integrated Receiver 2 = High Data Rate Receiver
18	1	39	Second Demodulator Lock Indicator, Q Channel	0 = No lock 1 = Lock
19	5	40	Second Demodulator Signal Strength; C/N <sub>0</sub> , Q Channel	Five numeric characters (LSB = 0.1 dB-Hz)
20	1	45	Symbol Synchronizer Lock Indicator, I Channel	0 = No lock 1 = Lock
21	1	46	Symbol Synchronizer Lock Indicator, Q Channel	0 = No lock 1 = Lock
22**	1	47	BER Status, I Channel	0 = Status not valid 1 = BER $\leq 10^{-5}$ 2 = BER $> 10^{-5}$

**Table 8-28. KSA/KaSA DG2 Return Service Data Packet Format  
 (FROM NCCDS TO MOC) (4 of 6) , Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
23**	1	48	BER Status, Q Channel	0 = Status not valid 1 = $\text{BER} \leq 10^{-5}$ 2 = $\text{BER} > 10^{-5}$
24	1	49	Data Format Conversion Configuration, I Channel	0 = No 1 = Yes
25	1	50	Data Format Conversion Configuration, Q Channel	0 = No 1 = Yes
26	3	51	I/Q Channel Power Ratio	Sign, 2 digits (LSD = 0.1 dB)
27	1	54	Symbol Format Conversion Bi $\phi$ to NRZ, I Channel	0 = No 1 = Yes
28	1	55	Symbol Format Conversion Bi $\phi$ to NRZ, Q Channel	0 = No 1 = Yes
29	1	56	Data Channel Configuration	0 = Single data source 1 = Dual data source
30	1	57	Data Coding, I Channel	0 = Uncoded 1 = Code 1 (rate 1/2)
31	1	58	Data Coding, Q Channel	0 = Uncoded 1 = Code 1 (rate 1/2)
32	1	59	G2 Inversion, I Channel	0 = Not inverted 1 = Inverted (Note: ASCII space when a data coding of 0 is selected)
33	1	60	G2 Inversion, Q Channel	0 = Not inverted 1 = Inverted (Note: ASCII space when a data coding of 0 is selected)

**Table 8-28. KSA/KaSA DG2 Return Service Data Packet Format  
 (FROM NCCDS TO MOC) (5 of 6) , Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
34	1	61	Autotrack Status	<p>TDRS A-G</p> <p>0 = Disabled</p> <p>1 = No signal presence indication</p> <p>2 = Signal presence; no zero crossing</p> <p>3 = Zero crossing; both axes</p> <p>4 = Autotrack; fine pointing mode</p> <p>TDRS H-J</p> <p>0 = Disabled</p> <p>1 = No signal presence</p> <p>2 = Signal presence</p> <p>3 = Not Applicable</p> <p>4 = Autotrack; zero crossing both axes</p>
35	3	62	Spare	ASCII spaces
36	3	65	Spare	ASCII spaces
37	1	68	DG2 Modulation	<p>0 = QPSK</p> <p>1 = BPSK</p>
38	1	69	Receiver Coherency Indicator	<p>0 = Noncoherent</p> <p>1 = Coherent</p>
39**	1	70	BER Status, I Channel	<p>0 = Status not valid</p> <p>1 = <math>BER \geq 10^{-3}</math></p> <p>2 = <math>10^{-3} &gt; BER \geq 10^{-4}</math></p> <p>3 = <math>10^{-4} &gt; BER \geq 10^{-5}</math></p> <p>4 = <math>10^{-5} &gt; BER \geq 10^{-6}</math></p> <p>5 = <math>10^{-6} &gt; BER \geq 10^{-7}</math></p> <p>6 = <math>10^{-7} &gt; BER \geq 10^{-8}</math></p> <p>7 = <math>10^{-8} &gt; BER \geq 10^{-9}</math></p> <p>8 = <math>BER &lt; 10^{-9}</math></p>

**Table 8-28. KSA/KaSA DG2 Return Service Data Packet Format  
 (FROM NCCDS TO MOC) (6 of 6) , Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
40**	1	71	BER Status, Q Channel	0 = Status not valid 1 = $BER \geq 10^{-3}$ 2 = $10^{-3} > BER \geq 10^{-4}$ 3 = $10^{-4} > BER \geq 10^{-5}$ 4 = $10^{-5} > BER \geq 10^{-6}$ 5 = $10^{-6} > BER \geq 10^{-7}$ 6 = $10^{-7} > BER \geq 10^{-8}$ 7 = $10^{-8} > BER \geq 10^{-9}$ 8 = $BER < 10^{-9}$
41	28	72	Spare	ASCII spaces
42	1	100	Refresh Word	0 = New transmission of this packet 1 = Transmitted in last message
<p>* When the Service Support Subtype parameter indicates KaSA1WB, the only parameters applicable to KaSA1WB operations are Service Support Type, SUPIDEN, VIC, Service Support Subtype, RF Beam Pointing, Service Configuration, and Polarization. Autotrack Status is not currently applicable, but may be applicable in the future.</p> <p>** Items 22 and 23 are computed from data for items 39 and 40 respectively and stated in reference to a BER of 10-5. BER status not valid indicates no BITSYNC lock for uncoded service and no decoder lock for coded service.</p>				

**Table 8-29. KSA Shuttle Return Service Data Packet Format  
 (FROM NCCDS TO MOC) (1 of 4)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	1	1	Service Support Type	1 = Return
2	7	2	SUPIDEN	Refer to 532-808
3	2	9	VIC	NN (two numeric characters)
4	1	11	Service Support Subtype	3 = KSA1 4 = KSA2
5	1	12	Support Function Subgroup	3 = Shuttle
6	3	13	Spare	ASCII spaces
7	8	16	RF Beam Pointing	Azimuth (0 to $\pm 90$ deg); sign, 3 digits (LSD = 0.1 deg, 4 bytes) Elevation (0 to $\pm 90$ deg); sign, 3 digits (LSD = 0.1 deg, 4 bytes)
8	1	24	Service Configuration	3 = Shuttle
9	1	25	Polarization	0 = LCP 1 = RCP

**Table 8-29. KSA Shuttle Return Service Data Packet Format  
 (FROM NCCDS TO MOC) (2 of 4)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
10	1	26	Link Status	<p>0 = Active          Status will be active during the following conditions:</p> <ul style="list-style-type: none"> <li>a. Forward service is set-up and running</li> <li>b. Return service has achieved link lock</li> </ul> <p>1 = Pending (equipment is unavailable for service).          Status will be pending during the following conditions:</p> <ul style="list-style-type: none"> <li>a. Both prime and redundant equipment required for this support are FAILED</li> <li>b. No TT&amp;C look angles available for antenna service</li> <li>c. No USS doppler correction</li> <li>d. Equipment not configured/reconfigured (event processing error)</li> </ul> <p>2 = Acquisition/reacquisition (service is being initiated/reinitiated/reconfigured)          Status will be Acquisition/reacquisition during the following conditions:</p> <ul style="list-style-type: none"> <li>a. Link lock has not been achieved for initiation of a return service</li> <li>b. Link lock is not achieved for a return service recovering from a PENDING state</li> <li>c. Link lock is not achieved for a return service undergoing reconfiguration/reacquisition</li> </ul>

**Table 8-29. KSA Shuttle Return Service Data Packet Format  
 (FROM NCCDS TO MOC) (3 of 4)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
11	2	27	Spare	ASCII spaces
12	1	29	Autotrack Status	TDRS A-G 0 = Disabled 1 = No signal presence indication 2 = Signal presence, no zero crossing 3 = Zero crossing, both axes 4 = Autotrack, fine pointing mode  TDRS H-J 0 = Disabled 1 = No signal presence 2 = Signal presence 3 = Not Applicable 4 = Autotrack; zero crossing both axes
13	1	30	Receiver Coherency Indicator	0 = Noncoherent 1 = Coherent
14	1	31	Doppler Tracking Status	0 = Inactive 1 = One-way 2 = Two-way
15	1	32	HDRR Lock Indicator, Mode 1	0 = No lock 1 = Lock (ASCII space when in Mode 2)
16	5	33	Spare	ASCII Spares
17	1	38	Integrated Receiver Lock Indicator, Mode 1 or 2,	0 = No lock 1 = Lock
18	5	39	Integrated Receiver Signal Strength, mode 1 or 2- carrier power to noise power spectral density ratio ( $C/N_0$ )	Five numeric characters (LSB = 0.1 dB-Hz)
19	1	44	Symbol Synchronizer, Lock Indicator, Mode 1 or 2, Channel 1	0 = No lock 1 = Lock
20**	1	45	Symbol Synchronizer Lock Indicator, Mode 1 or 2, Channel 2	0 = No lock 1 = Lock
21	1	46	Symbol Synchronizer Lock Indicator, Mode 1, Channel 3	0 = No lock 1 = Lock (ASCII space when in Mode 2)

**Table 8-29. KSA Shuttle Return Service Data Packet Format  
 (FROM NCCDS TO MOC) (4 of 4)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
22***	1	47	BER Status, Mode 1, Channel 3	0 = Status not valid 1 = $\text{BER} \leq 10^{-5}$ 2 = $\text{BER} > 10^{-5}$
23	1	48	Data Format Conversion Configuration, Mode 1 or 2, Channel 1	0 = No 1 = Yes
24	1	49	Data Format Conversion Configuration, Mode 1 or 2, Channel 2	0 = No 1 = Yes
25	1	50	Data Format Conversion Configuration, Mode 1, Channel 3	0 = No 1 = Yes (ASCII space when in Mode 2)
26	1	51	Shuttle Mode	1 = Mode 1 (PM) 2 = Mode 2 (FM, Chan. 3 digital) 3 = Mode 2 (FM, Chan. 3 analog) 4 = Mode 2 (FM, Chan. 3 video)
27	3	52	Spare	ASCII spaces
28	3	55	Spare	ASCII spaces
29	3	58	Spare	ASCII spaces
30***	1	61	BER Status, Mode 1, Channel 3	0 = Status not valid 1 = $\text{BER} \geq 10^{-3}$ 2 = $10^{-3} > \text{BER} \geq 10^{-4}$ 3 = $10^{-4} > \text{BER} \geq 10^{-5}$ 4 = $10^{-5} > \text{BER} \geq 10^{-6}$ 5 = $10^{-6} > \text{BER} \geq 10^{-7}$ 6 = $10^{-7} > \text{BER} \geq 10^{-8}$ 7 = $10^{-8} > \text{BER} \geq 10^{-9}$ 8 = $\text{BER} < 10^{-9}$
31	38	62	Spare	ASCII spaces
32	1	100	Refresh Word	0 = New transmission of this packet 1 = Transmitted in last message

\*\* Item 20. For 1.024 Mhz Subcarrier, the IR Lock Indication is for the 1.024 Mhz Subcarrier, not the data.

\*\*\* Item 22 is computed from data for item 30 and stated in reference to a BER of  $10^{-5}$ . BER status not valid indicates no decoder lock for coded service.

**Table 8-30. KSA/KaSA Return Service Data Quality Monitoring Packet Format  
 (FROM NCCDS TO MOC) (1 of 3)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	1	1	Service Support Type	2 = DQM
2	7	2	SUPIDEN	Refer to 532-808
3	2	9	VIC	NN (two numeric characters)
4*	1	11	Service Support Subtype	3 = KSA1 4 = KSA2
				6 = KaSA1 7 = KaSA2 <b>8 = KaSA1WB</b>
5	1	12	Support Function Subgroup	1 = DG1 2 = DG2
				3 = Shuttle
<b>Data for I Channel or Shuttle Channel 1</b>				
6	1	13	Frame Sync Mode (at end of measurement period)	0 = Search 1 = Check 2 = Lock 3 = Flywheel
7	1	14	Clock Presence (for all 5 sec of measurement interval)	0 = No 1 = Yes
8	2	15	Data Transition Density Percent Transitions (average of five 1-sec readings)	00 through 99
9	3	17	Percent Frames in Lock (frame lock count per frame count for 5-sec measurement interval)	000 through 100
10	8	20	Sync Lock Dropout Count (for 5-sec measurement interval)	00000000 through 99999999
11	4	28	Frame Sync Word BER (at ODM time tag)	XEYY (X = 0-9; E = ASCII E; YY = 00-99, exponent assumed negative)

**Table 8-30. KSA/KaSA Return Service Data Quality Monitoring Packet Format  
 (FROM NCCDS TO MOC) (2 of 3)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
<b>Data for Q Channel or Shuttle Channel 2</b>				
12	1	32	Frame Sync Mode (at end of measurement period)	0 = Search 1 = Check 2 = Lock 3 = Flywheel
13	1	33	Clock Presence (for all 5 sec of the measurement interval)	0 = No 1 = Yes
14	2	34	Data Transition Density Percent Transitions (average of five 1-sec readings)	00 through 99
15	3	36	Percent Frames in Lock (frame lock count per frame count for 5-sec measurement interval)	000 through 100
16	8	39	Sync Lock Dropout Count (for 5-sec measurement interval)	00000000 through 99999999
17	4	47	Frame Sync Word BER (at ODM time tag)	XEYY (X = 0-9; E = ASCII E; YY = 00-99, exponent assumed negative)

**Table 8-30. KSA/KaSA Return Service Data Quality Monitoring Packet Format  
 (FROM NCCDS TO MOC) (3 of 3)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
<b>Data for Shuttle Channel 3</b>				
18**	1	51	Frame Sync Mode (at end of measurement interval)	0 = Search 1 = Check 2 = Lock 3 = Flywheel
19**	1	52	Clock Presence (for all 5 sec of the measurement interval)	0 = No 1 = Yes
20**	2	53	Data Transition Density Percent Transitions (average of five 1-sec readings)	00 through 99
21**	3	55	Percent Frames in Lock (frame lock count per frame count for 5-sec measurement interval)	000 through 100
22**	8	58	Sync Lock Dropout Count (for 5-sec measurement interval)	00000000 through 99999999
23**	4	66	Frame Sync Word BER (at ODM time tag)	XEYY (X = 0-9; E = ASCII E; YY = 00-99, exponent assumed negative)
<b>End of Data for Shuttle Channel 3</b>				
24	30	70	Spare	ASCII spaces
25	1	100	Refresh Word	0 = New transmission of this packet 1 = Transmitted in last message
<p>* Data Quality Monitoring (DQM) data is not applicable for KaSA1WB services; however, DQM packets for KaSA1WB services will be included in UPD messages for users who receive DQM packets for other service subtypes.</p> <p>** Items 18 through 23 do not apply to the Normal User and Shuttle Mode 2, Channel 3. For normal user and Shuttle Mode 2, Channel 3, bytes 51 through 69 are ASCII spaces.</p>				

**Table 8-31. MA/SMAF Service Type Header Data Packet Format  
 (FROM NCCDS TO MOC), Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	2	1	Service Type	06 = MA/SMAF user performance data
2	7	3	User Performance Data Message ID	A unique 7-character identifier used to reference this message
3	1	10	Spare	ASCII space
4	3	11	TDRS	AAA (three alphanumeric characters)
5	12	14	TDRS Orientation	Angle 1 = Yaw; 0 to 360 deg, to accuracy of 0.25 deg (LSD = 0.1 deg, 4 bytes) Angle 2 = Roll; 0 to 360 deg, to accuracy of 0.1 deg (LSD = 0.1 deg, 4 bytes) Angle 3 = Pitch; 0 to 360 deg, to accuracy of 0.1 deg (LSD = 0.1 deg, 4 bytes)
6	11	26	Time Tag	YYDDDDHHMMSS (refer to Table 5-2)
7	2	37	Number MA/SMAF Services	Number of MA /SMAF services reported in this message
8	1	39	Spare	ASCII space
9	4	40	Spare	ASCII spaces
10	2	44	Spare	ASCII spaces
11	54	46	Spare	ASCII spaces
12	1	100	Refresh Word	0 = New transmission of this packet 1 = Transmitted in last message

**Table 8-32. MA/SMA Forward Service Data Packet Format  
 (FROM NCCDS TO MOC) (1 of 2), Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	1	1	Service Support Type	0 = Forward
2	7	2	SUPIDEN	Refer to 532-808
3	2	9	VIC	NN (two numeric characters)
4	3	11	Spare	ASCII spaces
5	8	14	RF Beam Pointing	Azimuth (0 to $\pm 90$ deg); sign, 3 digits (LSD = 0.1 deg, 4 bytes) Elevation (0 to $\pm 90$ deg); sign, 3 digits (LSD = 0.1 deg, 4 bytes)
6	4	22	Signal EIRP	Sign, 3 digits (LSD = 0.1 dBW)
7	10	26	Radiated Carrier Frequency	(LSD = 10 Hz)
8	1	36	Link Status	0 = Active Status will be active during the following conditions: a. Forward service is set-up b. Return service has achieved link lock  1 = Pending (equipment is unavailable for service). Status will be pending during the following conditions: a. Both prime and redundant b. No TT&C look angles available for antenna service c. No USS doppler correction d. Equipment not configured/reconfigured  2 = Acquisition/reacquisition (service is being initiated/reinitiated/reconfigured) Status will be Acquisition/reacquisition during the following conditions: a. Link lock has not been achieved for initiation of a b. Link lock is not achieved c. Link lock is not achieved

**Table 8-32 MA/SMA Forward Service Data Packet Format  
 (FROM NCCDS TO MOC) (2 of 2), Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
9	1	37	Clock Presence (for all 5 sec of the measurement interval)	0 = No 1 = Yes
10	2	38	Data Transition Density Percent Transactions (average of five 1-sec readings)	00 through 99
11	60	40	Spare	ASCII spaces
12	1	100	Refresh Word	0 = New transmission of this packet 1 = Transmitted in last message

**Table 8-33. MA Return Service Data Packet Format  
 (FROM NCCDS TO MOC) (1 of 4), Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	1	1	Service Support Type	1 = Return
2	7	2	SUPIDEN	Refer to 532-808
3	2	9	VIC	NN (two numeric characters)
4	2	11	Scheduled MA Return Link ID	Obtained from SHO (01-05)
5	3	13	Spare	ASCII spaces
6	3	16	Spare	ASCII spaces
7	8	19	RF Beam Pointing	Azimuth (0 to ±90 deg); sign, 3 digits (LSD = 0.1 deg, 4 bytes) Elevation (0 to ±90 deg); sign, 3 digits (LSD = 0.1 deg, 4 bytes)
8	2	27	MA Return Link ID	RF Beam forming equipment ID (01-06)
9	1	29	Doppler Tracking Status	0 = Inactive 1 = One-way 2 = Two-way 3 = Cross-Support
10	1	30	Range Tracking Status	0 = Inactive 1 = Active 2 = Cross-Support
11	1	31	Receiver Coherency Indicator	0 = Non-coherent 1 = Coherent
12	1	32	Data Format Conversion Configuration, I Channel	0 = No 1 = Yes
13	1	33	Data Format Conversion Configuration, Q Channel	0 = No 1 = Yes
14	3	34	I/Q Channel Power Ratio	Sign, 2 digits (LSD = 0.1 dB)
15	1	37	Symbol Format Conversion Bi $\phi$ to NRZ, I Channel	0 = No 1 = Yes
16	1	38	Symbol Format Conversion Bi $\phi$ to NRZ, Q Channel	0 = No 1 = Yes

**Table 8-33. MA Return Service Data Packet Format  
 (FROM NCCDS TO MOC) (2 of 4), Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
17	1	39	Configuration	0 = I Channel only (BPSK) 1 = Q Channel only (BPSK) 2 = I and Q Channel (QPSK)
18	1	40	Integrated Receiver Lock Indicator	0 = No lock 1 = Lock
19	5	41	Integrated Receiver Signal Strength; C/N <sub>0</sub>	Five numeric characters (LSB = 0.1 dB-Hz)
20	1	46	Symbol Synchronizer Lock Indicator, I Channel	0 = No lock 1 = Lock
21	1	47	Symbol Synchronizer Lock Indicator, Q Channel	0 = No lock 1 = Lock
22**	1	48	BER Status, I Channel	0 = Status not valid 1 = BER $\leq 10^{-5}$ 2 = BER $> 10^{-5}$
23**	1	49	BER Status, Q Channel	0 = Status not valid 1 = BER $\leq 10^{-5}$ 2 = BER $> 10^{-5}$
24	1	50	Data Channel Configuration	0 = Single data source 1 = Dual data source

**Table 8-33. MA Return Service Data Packet Format  
 (FROM NCCDS TO MOC) (3 of 4) , Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
25	1	51	Link Status	<p>0 = Active          Status will be active during the following conditions:</p> <ul style="list-style-type: none"> <li>a. Forward service is set-up and running</li> <li>b. Return service has achieved link lock</li> </ul> <p>1 = Pending (equipment is unavailable for service).          Status will be pending during the following conditions:</p> <ul style="list-style-type: none"> <li>a. Both prime and redundant equipment required for this support are FAILED</li> <li>b. No TT&amp;C look angles available for antenna service</li> <li>c. No USS doppler correction</li> <li>d. Equipment not configured/reconfigured (event processing error)</li> </ul> <p>2 = Acquisition/reacquisition (service is being initiated/reinitiated/reconfigured)          Status will be Acquisition/reacquisition during the following conditions:</p> <ul style="list-style-type: none"> <li>a. Link lock has not been achieved for initiation of a return service</li> <li>b. Link lock is not achieved for a return service recovering from a PENDING state</li> <li>c. Link lock is not achieved for a return service undergoing reconfiguration/reacquisition</li> </ul>

**Table 8-33. MA Return Service Data Packet Format  
 (FROM NCCDS TO MOC) (4 of 4), Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
26	1	52	Spare	ASCII space
27	1	53	Mode	1 = Mode 1; Coherent 2 = Mode 2; Non-coherent
28	1	54	G2 Inversion, I Channel	0 = Not inverted 1 = Inverted
29	1	55	G2 Inversion, Q Channel	0 = Not inverted 1 = Inverted
30**	1	56	BER Status, I Channel	0 = Status not valid 1 = $\text{BER} \geq 10^{-3}$ 2 = $10^{-3} > \text{BER} \geq 10^{-4}$ 3 = $10^{-4} > \text{BER} \geq 10^{-5}$ 4 = $10^{-5} > \text{BER} \geq 10^{-6}$ 5 = $10^{-6} > \text{BER} \geq 10^{-7}$ 6 = $10^{-7} > \text{BER} \geq 10^{-8}$ 7 = $10^{-8} > \text{BER} \geq 10^{-9}$ 8 = $\text{BER} < 10^{-9}$
31**	1	57	BER Status, Q Channel	0 = Status not valid 1 = $\text{BER} \geq 10^{-3}$ 2 = $10^{-3} > \text{BER} \geq 10^{-4}$ 3 = $10^{-4} > \text{BER} \geq 10^{-5}$ 4 = $10^{-5} > \text{BER} \geq 10^{-6}$ 5 = $10^{-6} > \text{BER} \geq 10^{-7}$ 6 = $10^{-7} > \text{BER} \geq 10^{-8}$ 7 = $10^{-8} > \text{BER} \geq 10^{-9}$ 8 = $\text{BER} < 10^{-9}$
32	42	58	Spare	ASCII spaces
33	1	100	Refresh Word	0 = New transmission of this packet 1 = Transmitted in last message

\*\* Items 22 and 23 are computed from data for items 30 and 31 respectively and stated in reference to a BER of  $10^{-5}$ . BER status not valid indicates no decoder lock for coded service.

**Table 8-34. MA Return Service Data Quality Monitoring Packet Format  
 (FROM NCCDS TO MOC) (1 of 2), Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	1	1	Service Support Type	2 = DQM
2	7	2	SUPIDEN	Refer to 532-808
3	2	9	VIC	NN (two numeric characters)
4	2	11	Scheduled MA Return Link ID	Obtained from SHO (01-05)
<b>Data for I Channel</b>				
5	1	13	Frame Sync Mode (at end of measurement interval)	0 = Search 1 = Check 2 = Lock 3 = Flywheel
6	1	14	Clock Presence (for all 5 sec of the measurement period)	0 = No 1 = Yes
7	2	15	Data Transition Density Percent Transitions (average of five 1-sec readings)	00 through 99
8	3	17	Percent Frames in Lock (frame lock count per frame count for 5-sec measurement interval)	000 through 100
9	8	20	Sync Lock Dropout Count (for 5-sec measurement interval)	00000000 through 99999999
10	4	28	Frame Sync Word BER (at ODM time tag)	XEYY (X = 0-9; E = ASCII E; YY = 00-99, exponent assumed negative)
<b>Data for Q Channel</b>				
11	1	32	Frame Sync Mode (at end of measurement interval)	0 = Search 1 = Check 2 = Lock 3 = Flywheel
12	1	33	Clock Presence (for all 5 sec of the measurement period)	0 = No 1 = Yes
13	2	34	Data Transition Density Percent Transitions (average of five 1-sec readings)	00 through 99

**Table 8-34. MA Return Service Data Quality Monitoring Packet Format  
 (FROM NCCDS TO MOC) (2 of 2) , Normal User**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
<b>Data for Q Channel (continued)</b>				
14	3	36	Percent Frames in Lock (frame lock count per frame count for 5-sec measurement interval)	000 through 100
15	8	39	Sync Lock Dropout Count (for 5-sec measurement interval)	00000000 through 99999999
16	4	47	Frame Sync Word BER (at ODM time tag)	XEYY (X = 0-9; E = ASCII E; YY = 00-99, exponent assumed negative)
<b>End of Data for Q Channel</b>				
17	49	51	Spare	ASCII spaces
18	1	100	Refresh Word	0 = New transmission of this packet 1 = Transmitted in last message

**Table 8-35. Simulation Service Type Header Data Packet Format  
 (FROM NCCDS TO MOC)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	2	1	Service Type	07 = Simulation User Performance Data
2	7	3	User Performance Data Message ID	A unique 7-character identifier used to reference this message
3	1	10	Spare	ASCII space
4	3	11	TDRS	AAA (three alphanumeric characters)
5	12	14	TDRS Orientation	Angle 1 = Yaw; 0 to 360 deg, to accuracy of 0.25 deg (LSD = 0.1 deg, 4 bytes) Angle 2 = Roll; 0 to 360 deg, to accuracy of 0.1 deg (LSD = 0.1 deg, 4 bytes) Angle 3 = Pitch; 0 to 360 deg, to accuracy of 0.1 deg (LSD = 0.1 deg, 4 bytes)
6	11	26	Time Tag	YYDDDDHHMMSS (refer to Table 5-2)
7	2	37	Number of Simulated Services	Number of simulated services reported in this message
8	61	39	Spare	ASCII spaces
9	1	100	Refresh Word	0 = New transmission of this packet 1 = Transmitted in last message

**Table 8-36. Simulation Forward Service Data Packet Format  
 (FROM NCCDS TO MOC) (1 of 2)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	1	1	Service Support Type	0 = Forward
2	7	2	SUPIDEN	Refer to 532-808
3	2	9	VIC	NN (two numeric characters)
4	1	11	Service Support Subtype Configuration	0 = MA 1 = SSA 2 = KSA  3 = S-Band Shuttle 4 = K-Band Shuttle  5 = SMA
5	1	12	Antenna Polarization	0 = LCP 1 = RCP
6	1	13	Spare	ASCII space
7	3	14	Spare	ASCII spaces
8	4	17	Simulation Gain/Temperature	(LSD = 0.1 dB/°K)
9	10	21	Forward Link Frequency	(LSD = 10 Hz)
10	1	31	Simulation Command Channel Lock	0 = No lock 1 = Lock
11	1	32	Simulation Carrier Lock (PTE Demodulator)	0 = No lock 1 = Lock
12	1	33	Simulation Bit Sync Lock	0 = No lock 1 = Lock
13	1	34	Spare	ASCII space
14*	1	35	BER Status (Valid for Only Locally Generated Simulation Test Data)	0 = Status not valid 1 = $BER \geq 10^{-3}$ 2 = $10^{-3} > BER \geq 10^{-4}$ 3 = $10^{-4} > BER \geq 10^{-5}$ 4 = $10^{-5} > BER \geq 10^{-6}$ 5 = $10^{-6} > BER \geq 10^{-7}$ 6 = $10^{-7} > BER \geq 10^{-8}$ 7 = $10^{-8} > BER \geq 10^{-9}$ 8 = $BER < 10^{-9}$

**Table 8-36. Simulation Forward Service Data Packet Format  
 (FROM NCCDS TO MOC) (2 of 2)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
15	64	36	Spare	ASCII spaces
16	1	100	Refresh Word	0 = New transmission of this packet 1 = Transmitted in last message
* Item 14, BER Status not valid indicates no BITSYNC lock for uncoded service and no decoder lock for coded service.				

**Table 8-37. Simulation Return Service Data Packet Format  
 (FROM NCCDS TO MOC)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	1	1	Service Support Type	1 = Return
2	7	2	SUPIDEN	Refer to 532-808
3	2	9	VIC	NN (two numeric characters)
4	1	11	Service Support Subtype/ Configuration	0 = MA 1 = SSA 2 = KSA  3 = S-Band Shuttle 4 = K-Band Shuttle  5 = SMA
5	1	12	Antenna Polarization	0 = LCP 1 = RCP
6	1	13	Spare	ASCII space
7	3	14	Spare	ASCII spaces
8	4	17	Simulation EIRP	Sign, 3 digits (LSD = 0.1 dBW)
9	10	21	Return Link Frequency	(LSD = 10 Hz) (Note: For noncoherent services this is the return frequency transmitted from the simulation antenna; ASCII spaces for coherent services.)
10	69	31	Spare	ASCII spaces
11	1	100	Refresh Word	0 = New transmission of this packet 1 = Transmitted in last message

**Table 8-38. Communications Test Message Format  
 (FROM NCCDS/MOC TO MOC/NCCDS)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	2	1	Message Type	91 = ODM
2	7	3	Message ID	A unique 7-character number used to reference this message
3	2	10	Message Class	03 = CTM
4	7	12	SUPIDEN	Refer to 532-808 or enter "Z9999ZZ"

# Section 9. State Vectors Interface Requirements

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## 9.1 Message Structure and Protocol

This section describes the message structure and communication protocols used to transfer state vector data from the MOC to the NCCDS. There are three alternative methods for transferring state vector data:

- The Nascom 4800-bit block protocol which can be used to transfer messages comprising one or more Nascom 4800-bit blocks. However, all messages specified in this section comprise only one block each. The lower-level communications protocol requirements are defined in NISDDT (Reference 2.3.a). Figure 9-1 shows the Nascom 4800-bit block protocol TDRSS block format.
- TCP/IP protocol, that uses the eXternal Data Representation (XDR) language on TCP/IP. (See paragraph 4.3).
- FTP protocol, for which the MOC employs FTP and issues the FTP “put” command to place the IIRV files in a designated directory in the NCCDS (see paragraph 4.4).

The NCCDS is capable of receiving IIRVs through use of the three different protocols. For some customers, it may be operationally desirable to provide some IIRVs from one source (e.g., a MOC) and to provide other IIRVs from another source (e.g., FDF). This may involve use of more than one protocol. The NCCDS does not preclude this, and will apply all applicable identification, authentication, and authorization mechanisms to each individual IIRV transmission. In such cases, it is the customer's responsibility to provide sufficient time delay between transmissions to assure that the NCCDS processes IIRVs in the intended order.

### 9.1.1 Nascom 4800-Bit TDRSS Block Format

The 4800-bit TDRSS block format standard will conform to conventions specified in NISDDT (reference paragraph 2.3a), for Nascom message switching and polynomial error detection. The 4800-bit TDRSS block format is defined in Figure 9-1. The 4800-bit TDRSS block is segmented into five distinct parts: Network Header Field, User Header Field, Time Field, Data Field, and Error Control Field. The individual fields are described in paragraphs 9.1.2 through 9.1.6.

### 9.1.2 Network Header Field

- a. Nascom Synchronization Subfield. This 24-bit binary field, bits 1 through 24, has the following structure:  
first bit transmitted→011000100111011000100111←last bit transmitted
- b. Source Code Subfield. This 8-bit binary field, bits 25 through 32, describes the data source. Nascom assigns these codes which are detailed in the *Digital Data*

*Source/Destination and Format Codes Handbook for the NISN/Nascom Ground Network* (Reference 2.4f).

- c. Destination Code Subfield. This 8-bit binary field, bits 33 through 40, describes the data destination. Nascom assigns these codes which are detailed in the *Digital Data Source/Destination and Format Codes Handbook for the NISN/Nascom Ground Network* (Reference 2.4f).
- d. Sequence Number Subfield. This 3-bit binary field, bits 41 through 43, is used to identify the sequence in which blocks were transmitted from a source. The range of this cyclic counter is 0 through 7. For those MOCs that implemented 9-bit source/destination expansion codes this three bit binary field may contain zeros. The NCCDS ignores the sequence number within incoming messages.
- e. Format Code Subfield. This 5-bit binary field, bits 44 through 48, is used to identify the type of data block being used. Nascom assigns these codes. All message blocks covered by this document will use a binary 01011 code in this field.

### **9.1.3 User Header Field**

- a. Block Number Subfield. This 4-bit field, bits 49 through 52, is a 4-bit incrementing binary counter associated with a unique block ID. It is used to place blocks in their proper sequence in a multiblock message. The block count always starts at 1 and increments by 1 for each subsequent block within a multiblock message. A block count of 1 indicates that this block is the only block of a single block message or the first block of a multiblock message. The maximum allowable value in this field is 15.
- b. Message Block ID Subfield. This 12-bit field, bits 53 through 64 is used to define a unique message. The Message Block ID starts with an initial value of 1 and increments by 1 for successive messages. Message Block ID assignment is controlled by the message originator. It should not be expected that sequential messages received at a destination will have sequential block ID's.
- c. Message Block Type Subfield. This 8-bit field, bits 65 through 72, is used to define the Message Block Type (or structure) of the block being used. All blocks covered by Section 9 will use the code for NCC communications blocks which is as follows: first bit transmitted→11110000←last bit transmitted.:
- d. Fixed Pattern Subfield. This 3-bit field, bits 73 through 75, is a fixed pattern of binary 011.
- e. Message Block Flag Subfields
  1. Five 1-bit flags, bits 76 through 80, are included in the User Header. These flags will be used to signify Acknowledgment Request, Retransmitted Block, Acknowledgment Enclosed, Last Block Indicator Flags, and one bit with a fixed pattern. A flag designated as "SET" means the bit equals a binary 1.

2. The Acknowledgment Request Flag (F1, bit 76) is set in any message which requires an acknowledgment. An acknowledgment will be sent to the originator upon a receipt of a complete message having the Acknowledgment Request Flag set. The originator need not wait for the acknowledgment for one message before transmitting the next message. The Acknowledgment Request Flag is only required in the first block of a multiblock group.
3. The Retransmitted Block Flag (F2, bit 77) is set in any retransmitted blocks. The original block number and ID are not altered by retransmission.
4. The Acknowledgment Enclosed Flag (F3, bit 78) is set when bits 145 through 176 contain an acknowledgment.
5. The Last Block Indicator Flag (F4, bit 79) must be set in the last block of a message and must be a binary zero in all preceding blocks.
6. The remaining bit (FP, bit 80) is a fixed pattern of a binary zero.
- f. Fixed Pattern Subfield. This 2-bit field, bits 81 and 82, is a fixed pattern of binary zeros.
- g. Number of Blocks Subfield. This 4-bit field, bits 83 through 86, contains, in binary, the number of blocks constituting the message. The maximum number of blocks per message is 15. The number in this field will be the same in all blocks of a multiblock message.
- h. Block Data Length Subfield. This 10-bit field, bits 87 through 96, contains in binary the length, in bytes, of the acknowledgment and data portions of the block used within that block. If the block is full this field will contain the binary equivalent of 4624 bits (578 bytes).

#### **9.1.4 Time Field**

This 48-bit field, bits 97 through 144, is optional. When used, it contains NASA Parallel Grouped Binary Millisecond/Microsecond Time Code (PB4) time, as defined in the *IRIG Standard Parallel Binary Time Code Format* document (reference 2.3b). NCC-generated blocks will always contain a time code in this field. The time will reflect the Universal Time Coordinated (UTC) of the generation of the associated block. When the Time Field does not contain a PB4 time code, it will be set to all binary ones.

#### **9.1.5 Data Field**

This field is 4624 bits (578 bytes) long, bits 145 through 4768, and consists of the acknowledgment subfield, of 32 bits (bits 145 through 176), and the data or message subfield, of 4592 bits (bits 177 through 4768).

- a. Acknowledgment Subfield. The Acknowledgment Subfield, bits 145 through 176 (bytes 19 through 22), is a duplication of bits 49 through 80 (bytes 7 through 10) of the last block of the message being acknowledged. If no acknowledgment is contained in a

message block, this field will contain all 1's. The acknowledgment subfield encompasses the following data fields previously described:

1. Block Number.
2. Message Block ID.
3. Message Block Type.
4. Fixed Pattern.
5. Message Block Flags.

b. Data or Message Subfield. This subfield, bits 177 through 4768 (bytes 23 through 596), consists of 574 eight-bit bytes (4592 bits). Format ground rules are described in paragraph 9.4 and Message Formats in paragraph 9.5.

### **9.1.6 Error Control Field**

This field of 32 bits, bits 4769 through 4800, contains 8 spare bits, 2 flag bits, and a 22-bit polynomial remainder and are defined as follows:

- a. Bits 4769 through 4776 are spares.
- b. Bits 4777 and 4778 are used to indicate the detection of errors in a decoded block.
- c. Bits 4779 through 4800 contain a 22-bit polynomial remainder.

## **9.2 Nascom Bit Block Acknowledgment Protocol**

### **9.2.1 General**

On receipt of a complete message requiring an acknowledgment, either an acknowledgment will be inserted into the next block to be transmitted back to the originator or a separate acknowledgment operations message will be transmitted as the next block transmission opportunity occurs. In either case, the acknowledgment will repeat bytes 7 through 10, of the last block of the message being acknowledged, in the acknowledgment subfield, bytes 19 through 22. The acknowledgment only block will be a type 3 class 14 message for acknowledgments generated by the NCC. If a message is received with flag bit 2 set to a 1 (retransmitted message) and an acknowledgment is required (flag bit 1 set to a 1), the receiver will acknowledge receipt of this message in the manner just described. It is the receiver's responsibility to determine if this message has already been processed; i.e., same message block ID and source code. If so, the second copy of the message should not be processed.

### **9.2.2 TDRSS Acknowledgment-only Message**

The format shown in Table 9-1 will be used for the transmission of a message acknowledgment when no other message is pending transmission.

## 9.3 Metering

### 9.3.1 Nascom 4800-Bit Block Metering

The NCC and the MOC each regulates the rate of flow of 4800-bit message blocks at the interface to minimize contiguous block transmission at the metering rates defined in paragraph 4.2.2.1. The acknowledgment-only block is not subject to the block metering restrictions.

### 9.3.2 TCP/IP Message Metering

The flow of messages using the TCP/IP protocol is controlled by the TCP/IP protocol.

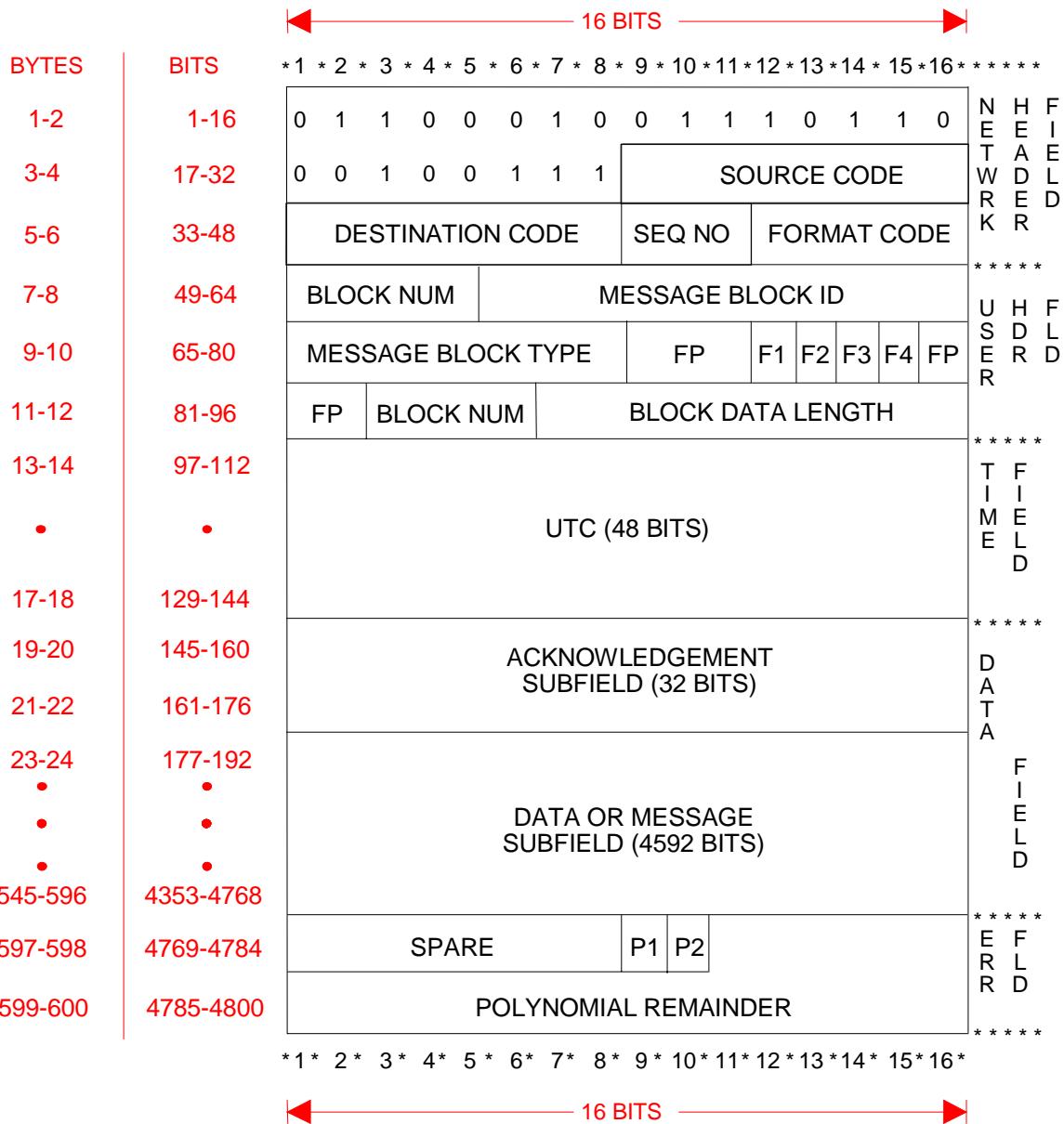
## 9.4 General Message Guidelines

The ground rules that apply to all messages in this section are fully described in paragraphs 5.1 through 5.5. All data items in the formats described in this section must be in ASCII unless otherwise noted in the description of such items. The list of applicable ASCII characters is provided in Table 5-1 of this document.

## 9.5 Improved Interrange Vector Message Formats

State vectors are used to transmit site prediction and satellite acquisition data. These messages use the improved interrange vector (IIRV) format, as follows:

- a. An IIRV contains the spacecraft position and velocity vectors for the given epoch time; the IIRV also contains information indicating whether it is a nominal or real-time message, and the type of vector contained (free flight, powered flight, reentry, etc.). The IIRV format is also used for intercenter exchange of acquisition data. Refer to Table 9-2 for the format used to pack up to three IIRVs into the data field of a one block 4800-bit block message. For consistency, TCP/IP messages are also limited to 3 IIRVs per message. But for FTP messages, the IIRV format can be used to pack up to 100 IIRVs into the data field of a single FTP IIRV message. Items 1 through 4 are defined for message identification. The first IIRV begins with item 5 and extends through item 64. See Table 9-2 for information pertaining to the packing of multiple vectors within an IIRV message.
- b. All data fields are right justified, with leading zeros added as needed. A positive sign (+) is indicated by an ASCII space, and a negative sign is indicated by a minus (-).
- c. Generally the Message ID, Item Number 2 of Table 9-2, is expected to be incremented by 1 for each new IIRV message. But for FTP IIRV messages, each external source is required to increment the Message ID by at least 100 for each FTP message transferred to the NCCDS.



F = FLAG  
 FP = FIXED PATTERN

POC\_BLK1.WMF

**Figure 9-1. Nascom 4800-Bit Block Format (TDRSS)**

**Table 9-1. TDRSS Acknowledgment-only Message (FROM NCCDS TO MOC)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	2	1	Message type	03 = Operations Message
2	7	3	Message ID	A unique 7-character number used to reference this message
3	1	10	Message Source	ASCII zero
4	2	11	Message class	14 = Acknowledgment from NCCDS
5	7	13	SUPIDEN	Z9999ZZ

**Table 9-2. Improved Interrange Vector Message Format  
 (FROM MOC TO NCCDS) (1 of 5)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
1	2	1	Message type	03 = Operations Data Message
2	7	3	Message ID	A unique 7-character number (0000001 to 9999999) used to reference this message
3	1	10	Message Source	0 = (fixed)
4	2	11	Message Class	10 = IIRV (nominal) 15 = IIRV (inflight update)
5	5	13	Message Start	GIIRV (fixed)
6	1	18	Originator ID	Alphabetic character that identifies the originator of message: ASCII Space = GSFC
7	4	19	Routing Indicator	Four Alphanumeric characters or ASCII Spaces
8-9	2	23	Carriage Returns	Two carriage returns, refer to Table 5-1 for the ASCII character set
10-11	2	25	Line Feeds	Two Line feeds; refer to Table 5-1 for the ASCII character set
12	1	27	Vector Type	1 = Routine on-orbit (free flight) 2 = Forced (special orbit update) 3 = Spare 4 = Maneuver ignition 5 = Maneuver cutoff 6 = Reentry 7 = Powered flight 8 = Stationary
13	1	28	Data Source	1 = Nominal/planning 2 = Real-time 3 = Off-line
14	1	29	Transfer Type	1 = Interrange
15	1	30	Coordinate System	1 = Geocentric true-of-date rotating

**Table 9-2. Improved Interrange Vector Message Format  
 (FROM MOC TO NCCDS) (2 of 5)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
16	4	31	Support Identification Code	NNNN; four numeric characters Refer to 532-808
17	2	35	Vehicle Identification Code	NN; two numeric characters Defines the specific element of the SIC to be referenced
18	3	37	Sequence Number	Counter incremented for each vector in a set of vector data
19	3	40	Day of Year	Day of year (001 = January 1)
20	9	43	Vector Epoch	HHMMSSSS in UTC with resolution to nearest millisecond (the implied decimal point is three places from the right).
21	3	52	Check Sum	Sum of the decimal equivalent of the preceding characters for items 12-20 (right- justified), where: 0-9 = face value Minus = 1 ASCII Space = 0
22-23	2	55	Carriage Returns	Same as items 8-9
24-25	2	57	Line Feeds	Same as items 10-11
26	1	59	Sign Character	ASCII space = Positive Minus sign = Negative
27	12	60	X Position	X component of position*
28	1	72	Sign Character	Same as Item 26
29	12	73	Y Position	Y component of position*
30	1	85	Sign Character	Same as item 26
31	12	86	Z Position	Z component of position*

\* All position components are in meters with a resolution to the nearest meter.

**Table 9-2. Improved Interrange Vector Message Format  
 (FROM MOC TO NCCDS) (3 of 5)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
32	3	98	Check Sum	Sum of the decimal equivalent of the preceding characters for items 26-31 (right-justified), where: 0-9 = face value Minus = 1 ASCII Space = 0
33-34	2	101	Carriage Returns	Same as items 8-9
35-36	2	103	Line Feeds	Same as items 10-11
37	1	105	Sign Character	Same as item 26
38	12	106	X Velocity	X component of velocity**
39	1	118	Sign Character	Same as item 26
40	12	119	Y Velocity	Y component of velocity**
41	1	131	Sign Character	Same as item 26
42	12	132	Z Velocity	Z component of velocity**
43	3	144	Check Sum	Sum of the decimal equivalent of the preceding characters for items 37-42 (right-justified) where: 0-9 = face value Minus = 1 ASCII Space = 0
44-45	2	147	Carriage Returns	Same as items 8-9
46-47	2	149	Line Feeds	Same as items 10-11
48	8	151	Mass	Mass of spacecraft in kilograms with a resolution to the nearest tenth of a kilogram. The implied decimal point is one place from the right. Contains all zeros when not used.

\*\* All velocity components are in meters per second with a resolution to the nearest millimeter per second. The implied decimal point is three places from the right.

**Table 9-2. Improved Interrange Vector Message Format  
 (FROM MOC TO NCCDS) (4 of 5)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
49	5	159	Cross-sectional Area	Average spacecraft cross-sectional area in square meters with a resolution to the nearest hundredth of a square meter. The implied decimal point is two places from the right. Contains all zeros when not used.
50	4	164	Drag	Dimensionless Drag coefficient. The implied decimal point is two places from the right. Contains all zeros when not used.
51	1	168	Sign Character	Same as item 26
52	7	169	Coefficient of Solar Reflectivity	Dimensionless Solar Reflectivity coefficient. The implied decimal point is six places from the right. Contains all zeros when not used.
53	3	176	Check Sum	Sum of the decimal equivalent of the preceding characters for items 48-52 (right-justified), where: 0-9 = face value Minus = 1 ASCII Space = 0
54-55	2	179	Carriage Returns	Same as items 8-9
56-57	2	181	Line Feeds	Same as items 10-11
58	5	183	End of Message	Set to ITERM
59	1	188	Spare	ASCII space

**Table 9-2. Improved Interrange Vector Message Format  
 (FROM MOC TO NCCDS) (5 of 5)**

Item Number	Number of Bytes	Start Byte	Data Item	Range of Values
60	1	189	Originator Routing Indicator	Set to GCQU or GAQD
61-62	2	193	Carriage Returns	Same as items 8-9
63-64	2	195	Line feeds	Same as items 10-11
65-124	184	197	Second IIRV if provided	Same as items 5-64 when the message contains a second vector.
125-184	184	381	Third IIRV if provided	Same as items 5-64 when the message contains a third vector.
The following information applies to the packing of FTP IIRV messages that contain more than three vectors.				
185-244	184	565	Fourth IIRV	Same as items 5-64 when the message contains a fourth vector.
• • •	• • •	• • •	• • •	Same as items 5-64 when the message contains additional vectors.
5945-6004	184	18229	100th IIRV	Same as items 5-64 when the message contains a 100th vector.

# Appendix A. Service Specification Code Data

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## A.1 Overview

Service Specification Code (SSC) data is not electronically exchanged between the NCCDS and the MOC. However SSCs are referenced, either directly or indirectly, by all Schedule Add Requests, Alternate Schedule Add Requests, and Replace Requests. When an SSC is referenced by a request, the information content of the SSC becomes a logical part of the request. For this reason, it is critical that the NCCDS and the MOC have a common understanding of the information content of the SSCs for the various service types.

Tables A-1 through A-14 specify the information content of the SSCs for each service type. For consistency with other material within this document, the data format of each SSC parameter is generally the same as in the USM formats (Tables 7-16 through 7-24) and the SSC parameters are presented in the same relative order as in the USM formats. However, this particular presentation of the SSC information content does not preclude different methods of organizing SSC information within the NCCDS and MOC databases.

Within the tables in this appendix, 'Data Element Name' corresponds to 'Item of Service' in Table 7-2 and 'Data Item' in Tables 7-16 through 7-24. For respecifiable parameters, an additional name is placed in parenthesis following the Data Element Name. This corresponds to "Name" in Table 7-2. In a few cases, there may be minor variations in the form of the name. Also note that the 'Item Number' used in these tables is provided only for convenience in referring to these tables. This item number is not related to the item numbers within the USM tables or any other tables.

## A.2 Use of Service Specification Code Parameters

When an SSC is referenced by a schedule request, the NCCDS scheduling software retrieves that SSC's parameters from the NCCDS database and uses them in the scheduling of the requested service. If the event requested by the schedule request is successfully scheduled, the majority of the parameters within the SSC for the requested service are directly copied into the USM transmitted to the MOC. However, there are exceptions. These include:

- SIC. The NCCDS extracts this parameter from the SUPIDEN parameter in the schedule request, and uses it to access the SSC in the NCCDS database. However, the SUPIDEN from the schedule request is used in the USM.
- Service Type. This parameter is not directly used in the USM. Rather it is used in the process of forming two other parameters: "Service Support Type" and "Service Support Subtype". For services using TDRS Single Access (SA) antennas, the "SA Antenna" parameter is also used in the process of forming the "Service Support Subtype" parameter.
- SA Antenna. This parameter may either specify a specific SA antenna or be left blank to specify that the NCCDS is to select the SA antenna. If the NCCDS selects the antenna and a

flexible USM is transmitted, the "Service Support Subtype" parameter will indicate a specific SA antenna. However, this is subject to change. A different SA antenna may be selected when the event is frozen and a fixed USM is transmitted. If a specific SA antenna is specified in the SSC, the USM's "Service Support Subtype" parameter will indicate this antenna.

- TSW Set ID. This parameter is not used in the USM. Rather this parameter is used by the MOC to specify what TSW information (if any) is to be used by the NCCDS in the scheduling of the service.
- User Interface Channel ID. The SSCs allow for the specification of multiple User Interface Channel IDs. In particular, this applies to customers whose User Interface Channels are not valid for both WSC ground terminals. The SSCs for these customers will generally contain pairs of User Interface Channels with each member of the pair being valid for only one ground terminal. When multiple User Interface Channel IDs have been specified and a flexible USM is transmitted, the "User Interface Channel ID" parameter will indicate a specific User Interface Channel ID. However, this is subject to change. A different User Interface Channel ID may be selected when the event is frozen and a fixed USM is transmitted.
- Respecifiable Parameters. If the schedule request specifies that a respecifiable parameter is to be used, the parameter value from the request is used rather than the parameter value from the SSC. With one exception, respecifiable parameter values in schedule requests are formatted as shown in Tables A-1 through A-14. The "I/Q Channel Power Ratio" parameter uses a different format. Refer to paragraph 7.2.1.

### **A.2.1 Range of Values**

The majority of SSC parameters appear in the USM transmitted to the MOC and also appear in the SHO transmitted to WSC. For each parameter that appears in the SHO, the range of values specified herein is based on the range of values specified for that parameter in 530-ICD-NCC-FDF/WSC (reference 2.2c.). These values correspond to required capabilities of the TDRSS as specified in 530-ICD-NCC-FDF/WSC, or implied by 530-RSD-WSC (reference 2.2d.). Such increases to the range of values for a parameter will usually be documented by a Network Advisory Message (NAM).

The actual range of values for each parameter for each user is specified in the NCCDS database. In all cases, the range of values specified herein is used as the default range of values in the NCCDS database. However, modifications can be entered to meet specific customer needs. Normally, this capability is used to block out parameter values that are not applicable for a specific user. In a few cases, this capability can also be used to expand the range of values beyond the nominal set of values specified in 530-ICD-NCC-FDF/WSC. This can be done only when the additional parameter values have been demonstrated to yield consistent operational results.

Such increases to the range of values for a parameter will usually be documented by a Network Advisory Message (NAM).

## NOTE

In a few instances, the range of values specified herein reflects information extracted from current NAMs rather than from 530-ICD-NCC-FDF/WSC or 530-RSD-WSC. The current NAMs can be accessed from <http://ncc.gsfc.nasa.gov/>.

## A.3 Service Specification Code Tables

**Table A-1. MA Forward Service Specification Code Data, Normal User**

Item	Data Element Name	Data Format	Range of Values
1	SIC	NNNN	NNNN = 4 Numeric Characters
2	Service Specification Code ID	AAA	AAA = 3 Alphanumeric Characters
3	Service Type		MAF (Service Support Type = 0; Service Support Subtype = 0)
<b>Electronically Fixed Data Elements</b>			
4	Maximum Data Rate	NNNNNNNNNN	000000000; 000000100 ↔ 000300000 (LSD = 1 bps)
5	User Interface Channel ID*	AAA	AAA = 3 Alphanumeric Characters
<b>Electronically Respecifiable Data Elements</b>			
6	TSW Set ID (TSWS)	AAAAAAAAAA	All Zeroes = None AAAAAAAAAA = 10 Alphanumerics or underscore
7	User Despun Antenna (UDAN)	N	0 = No type 1 = Type 1 2 = Type 2
8	Initial Data Rate (DTR1)	NNNNNNNNNN	000000000; 000000100 ↔ 000300000 (LSD = 1 bps; all zeros indicates that initially there will be no data)
9	Receiver Frequency (FRQ1)	NNNNNNNNNN	0210630000 ↔ 0210650000 (LSD = 10 Hz)
10	Doppler Compensation Required (DOPC)	N	0 = No 1 = Yes

\*There can be multiple entries for this data element.

**Table A-2. SMA Forward Service Specification Code Data, Normal User**

Item	Data Element Name	Data Format	Range of Values
1	SIC	NNNN	NNNN = 4 Numeric Characters
2	Service Specification Code ID	AAA	AAA = 3 Alphanumeric Characters
3	Service Type		SMAF (Service Support Type = 0; Service Support Subtype = 5)
<b>Electronically Fixed Data Elements</b>			
4	Maximum Data Rate	NNNNNNNNNN	000000000; 000001000 ↔ 000300000 (LSD = 1 bps)
5	User Interface Channel ID*	AAA	AAA = 3 Alphanumeric Characters
<b>Electronically Respecifiable Data Elements</b>			
6	TSW Set ID (TSWS)	AAAAAAAAAA	All Zeroes = None AAAAAAAAAA = 10 Alphanumerics or underscore
7	User Despun Antenna (UDAN)	N	0 = No type 1 = Type 1 2 = Type 2
8	Initial Data Rate (DTR1)	NNNNNNNNNN	000000000; 000000100 ↔ 000300000 (LSD = 1 bps; all zeros indicates that initially there will be no data)
9	Receiver Frequency (FRQ1)	NNNNNNNNNN	0210617625 ↔ 0210663625 (LSD = 10 Hz)
10	Doppler Compensation Required (DOPC)	N	0 = No 1 = Yes

\* There can be multiple entries for this data element.

**Table A-3. MA Return Service Specification Code Data (1 of 2), Normal User**

Item	Data Element Name	Data Format	Range of Values
1	SIC	NNNN	NNNN = 4 Numeric Characters
2	Service Specification Code ID	AAA	AAA = 3 Alphanumeric Characters
3	Service Type		MAR (Service Support Type = 1; Service Support Subtype = 0)
<b>Electronically Fixed Data Elements</b>			
4	Receiver Configuration	N	0 = Normal 1 = Cross Support
5	Symbol Format Conversion to Bi $\phi$ -L, I Channel	N	0 = No 1 = Yes
6	Symbol Format Conversion to Bi $\phi$ -L, Q Channel	N	0 = No 1 = Yes
7	Maximum Data Rate, I Channel	NNNNNNNN	00000000; 00001000 $\leftrightarrow$ 000150000 (LSD = 1 bps)
8	Maximum Data Rate, Q Channel	NNNNNNNN	00000000; 00001000 $\leftrightarrow$ 000150000 (LSD = 1 bps)
9	Configuration	N	0 = I Channel only 1 = Q Channel only 2 = Both I and Q Channels
10	Data Channel Configuration	N	0 = Single data source 1 = Dual Data Source
11	Return Channel Time Delay Data Required	N	0 = No 1 = Yes
12	User Interface Channel ID*, I Channel	AAA	AAA = 3 Alphanumeric Characters
13	User Interface Channel ID*, Q Channel	AAA	AAA = 3 Alphanumeric Characters
<b>Electronically Respecifiable Data Elements</b>			
14	TSW Set ID (TSWS)	AAAAAAAAAA	All Zeroes = None AAAAAAAAAA = 10 Alphanumeric or underscore
15	User Despun Antenna (UDAN)	N	0 = No type 1 = Type 1 2 = Type 2
16	Data Rate (Initial), I Channel (DTR1)	NNNNNNNN	00000000; 000000100 $\leftrightarrow$ 000150000 (LSD = 1 bps; all zeros indicates that initially no data will be on I channel)
17	Data Rate (Initial), Q Channel (DTR2)	NNNNNNNN	00000000; 000000100 $\leftrightarrow$ 000150000 (LSD = 1 bps; all zeros indicates that initially no data will be on Q channel)

**Table A-3. MA Return Service Specification Code Data (2 of 2), Normal User**

Item	Data Element Name	Data Format	Range of Values
18	Transmit Frequency (FRQ1)	NNNNNNNNNN	0228740000 ↔ 0228760000 (LSD = 10 Hz; all zeros for a coherent service)
19	Maximum EIRP (ERP1)	SNNN	S = Sign (+/-); NNN = 000 ↔ 999 (LSD = 0.1 dBw)
20	Minimum EIRP (ERP2)	SNNN	S = Sign (+/-); NNN = 000 ↔ 999 (LSD = 0.1 dBw)
21	I/Q Channel Power Ratio (CPR)	SNN	S = Sign (+/-); NN = 00 ↔ 99 (LSD = 0.1 dB)
22	Data Format, I Channel (DTF1)	N	0 = NRZ-L 1 = NRZ-M 2 = NRZ-S
23	Data Format, Q Channel (DTF2)	N	0 = NRZ-L 1 = NRZ-M 2 = NRZ-S
24	Data Bit Jitter, I Channel (JTR1)	N	0 = None 1 = 0.01% 2 = 0.1% 3 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.) 4 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.) 5 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.)
25	Data Bit Jitter, Q Channel (JTR2)	N	0 = None 1 = 0.01% 2 = 0.1% 3 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.) 4 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.) 5 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.)
26	G2 Inversion, I Channel (G2II)	N	0 = Do not invert 1 = Invert
27	G2 Inversion, Q Channel (G2IQ)	N	0 = Do not invert 1 = Invert
28	Mode (MODE)	N	1 = Mode 1 (Coherent) 2 = Mode 2 (Noncoherent)
29	Data Stream ID I Channel (DSD1)	NNN or Blank	001 ↔ 037, 041 ↔ 377 (octal) (See MO&DSD 532-808)
30	Data Stream ID Q Channel (DSD2)	NNN or Blank	001 ↔ 037, 041 ↔ 377 (octal) (See MO&DSD 532-808)

\* There can be multiple entries for this data element

**Table A-4. Normal SSA Forward Service Specification Code Data, Normal User**

Item	Data Element Name	Data Format	Range of Values
1	SIC	NNNN	NNNN = 4 Numeric Characters
2	Service Specification Code ID	AAA	AAA = 3 Alphanumeric Characters
3	Service Type		Normal SSAF (Service Support Type = 0)
<b>Electronically Fixed Data Elements</b>			
4	SA Antenna	N or Blank	1 = SA1 (Service Support Subtype = 1 = SSA1) 2 = SA2 (Service Support Subtype = 2 = SSA2) Blank = NCCDS will Select the Antenna
5	Service Configuration	N	1 = Normal User
6	Power Mode,	N	0 = Normal
7	User Interface Channel ID*	AAA	1 = High AAA = 3 Alphanumeric Characters
8	Maximum Data Rate	NNNNNNNN	00000000; 00000100 ↔ 00700000 (LSD = 1 bps)
<b>Electronically Respecifiable Data Elements</b>			
9	TSW Set ID (TSWS)	AAAAAAAAAA	All Zeroes = None AAAAAAAAAA = 10 Alphanumerics or underscore
10	User Despun Antenna (UDAN)	N	0 = No type 1 = Type 1 2 = Type 2
11	Initial Data Rate (DTR1)	NNNNNNNN	00000000; 00000100 ↔ 00700000 (LSD = 1 bps; all zeros indicates that initially there will be no data)
12	Receiver Frequency, (FRQ1)	NNNNNNNNNN	0202500000 ↔ 0212000000 (LSD = 10 Hz)
13	Polarization, (POLN)	N	0 = LCP 1 = RCP
14	Command Channel PN Modulation, (CCPN)	N	0 = No 1 = Yes
15	Doppler Compensation Required, (DOPC)	N	0 = No 1 = Yes

\* There can be multiple entries for this data element

**Table A-5. Shuttle SSA Forward Service Specification Code Data**

Item	Data Element Name	Data Format	Range of Values
1	SIC	NNNN	NNNN = 4 Numeric Characters
2	Service Specification Code ID	AAA	AAA = 3 Alphanumeric Characters
3	Service Type		Shuttle SSAF (Service Support Type = 0)
<b>Electronically Fixed Data Elements</b>			
4	SA Antenna	N or Blank	1 = SA1 (Service Support Subtype = 1 = SSA1) 2 = SA2 (Service Support Subtype = 2 = SSA2) Blank = NCCDS will Select the Antenna
5	Service Configuration	N	2 = Shuttle
6	Power Mode,	N	0 = Normal 1 = High
7	PN Rate	NNNNNNNN	NNNNNNNN (LSD = 1 chip/second)
8	User Interface Channel ID*	AAA	AAA = 3 Alphanumeric Characters
<b>Electronically Respecifiable Data Elements</b>			
9	TSW Set ID (TSWS)	AAAAAAAAAA	All Zeroes = None AAAAAAAAAA = 10 Alphanumerics or underscore
10	User Despun Antenna (UDAN)	N	0 = No type 1 = Type 1 2 = Type 2
11	Receiver Frequency, (FRQ2)	NNNNNNNNNN	0202500000 ↔ 0212000000 (LSD = 10 Hz)
12	Polarization, (POLS)	N	0 = LCP 1 = RCP
13	Doppler Compensation Required, (SCDC)	N	0 = No 1 = Yes
14	PN Rate Doppler Compensation (SPDC)	N	0 = No 1 = Yes
15	PN Modulation (SHPN)	N	0 = No 1 = Yes
16	Data Configuration Mode (SCON)	N	1 = Mode 1 (32 kbps) 2 = Mode 2 (72 kbps)

\* There can be multiple entries for this data element

**Table A-6. Normal SSA Return Service Specification Code Data (1 of 4), Normal User**

Item	Data Element Name	Data Format	Range of Values
1	SIC	NNNN	NNNN = 4 Numeric Characters
2	Service Specification Code ID	AAA	AAA = 3 Alphanumeric Characters
3	Service Type		Normal SSAR (Service Support Type = 1)
<b>Electronically Fixed Data Elements</b>			
4	SA Antenna	N or Blank	1 = SA1 (Service Support Subtype = 1 = SSA1) 2 = SA2 (Service Support Subtype = 2 = SSA2) Blank = NCCDS will Select the Antenna
5	Service Configuration	N	1 = Normal User
6	DG1 Configuration	N	0 = I Channel only 1 = Q Channel only 2 = I and Q Channels
7	Data Channel Configuration	N	0 = Single data source; DG1: identical coded data G1 G2 on I Channel and Q Channel, DG2: G1 on I Channel and G2 on Q Channel 1 = Dual Data Source 2 = Single data source; data bits alternating between I and Q channels - G1 G2 (G3) on each channel (DG1 or DG2)
8	Data Coding, I Channel	N	0 = Uncoded 1 = Code 1 (rate 1/2) 2 = Code 2 (rate 1/2; G1 inverted) 3 = Code 3 (rate 1/3)
9	Data Coding, Q Channel	N	0 = Uncoded 1 = Code 1 (rate 1/2) 2 = Code 2 (rate 1/2; G1 inverted) 3 = Code 3 (rate 1/3)
10	DG2 Modulation	N	0 = QPSK 1 = BPSK
11	Maximum MDM Data Rate, I Channel	NNNNNNNN	0000000000 ↔ 0020000000 (LSD = 1 bps)
12	Maximum MDM Data Rate, Q Channel	NNNNNNNN	0000000000 ↔ 0020000000 (LSD = 1 bps)
13	Maximum HDRM Data Rate, I Channel	NNNNNNNN	0000000000; 0001250000 ↔ 0030000000 (LSD = 1 bps)
14	Maximum HDRM Data Rate, Q Channel	NNNNNNNN	0000000000; 0001250000 ↔ 0030000000 (LSD = 1 bps)
15	Maximum Data Rate, I Channel	NNNNNNNN	0000000000; 0000010000 ↔ 0030000000 (LSD = 1 bps)
16	Maximum Data Rate, Q Channel	NNNNNNNN	0000000000; 0000010000 ↔ 0030000000 (LSD = 1 bps)

**Table A-6. Normal SSA Return Service Specification Code Data (2 of 4), Normal User**

Item	Data Element Name	Data Format	Range of Values
17	Receiver Configuration	N	0 = Normal 1 = Cross Support
18	Symbol Format Conversion to Bi $\phi$ -L, I Channel	N	0 = No 1 = Yes
19	Symbol Format Conversion to Bi $\phi$ -L, Q Channel	N	0 = No 1 = Yes
20	SSA Combining	N	0 = No 1 = Yes
21	Return Channel Time Delay Data Required	N	0 = No 1 = Yes
22	User Interface Channel ID*, I Channel	AAA	AAA = 3 Alphanumeric Characters
23	User Interface Channel ID*, Q Channel	AAA	AAA = 3 Alphanumeric Characters
<b>Electronically Respecifiable Data Elements</b>			
24	TSW Set ID (TSWS)	AAAAAAAAAA	All Zeroes = None AAAAAAAAAA = 10 Alphanumerics or underscore
25	User Despun Antenna (UDAN)	N	0 = No type 1 = Type 1 2 = Type 2
26	Initial Data Rate I Channel (DTR1)	NNNNNNNN	00000000; 00000100 $\leftrightarrow$ 003000000 (LSD = 1 bps; all zeros indicates that initially no data will be on I channel)
27	Initial Data Rate Q Channel (DTR2)	NNNNNNNN	00000000; 00000100 $\leftrightarrow$ 003000000 (LSD = 1 bps; all zeros indicates that initially no data will be on Q channel)
28	Transmit Frequency, (FRQ1)	NNNNNNNNNN	0220000000 $\leftrightarrow$ 0230000000 (LSD = 10 Hz; all zeros for a coherent service)
29	Polarization (POLN)	N	0 = LCP 1 = RCP
30	Maximum EIRP, (ERP1)	SNNN	S = Sign (+/-); NNN = 000 $\leftrightarrow$ 999 (LSD = 0.1 dBw)
31	Minimum EIRP, (ERP2)	SNNN	S = Sign (+/-); NNN = 000 $\leftrightarrow$ 999 (LSD = 0.1 dBw)
32	I/Q Channel Power Ratio (CPR)	SNN	S = Sign (+/-); NN = 00 $\leftrightarrow$ 99 (LSD = 0.1 dB)

**Table A-6. Normal SSA Return Service Specification Code Data (3 of 4) , Normal User**

Item	Data Element Name	Data Format	Range of Values
33	Data Format, I Channel (DTF1)	N	0 = NRZ-L 1 = NRZ-M 2 = NRZ-S 3 = BIΦ-L 4 = BIΦ-M 5 = BIΦ-S
34	Data Format, Q Channel (DTF2)	N	0 = NRZ-L 1 = NRZ-M 2 = NRZ-S 3 = BIΦ-L 4 = BIΦ-M 5 = BIΦ-S
35	Data Bit Jitter, I Channel (JTR1)	N	0 = None 1 = 0.01% 2 = 0.1% 3 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.) 4 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.) 5 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.)
36	Data Bit Jitter, Q Channel (JTR2)	N	0 = None 1 = 0.01% 2 = 0.1% 3 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.) 4 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.) 5 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.)
37	Data Group (DG)	N	1 = DG1 2 = DG2
38	DG1 Mode (DG1M)	N	1 = Mode 1; Coherent (PN on I and Q) 2 = Mode 2; Noncoherent (PN on I and Q) 3 = Mode 3; Coherent with no Q Channel deinterleaving (PN on I only) 4 = Mode 3; Coherent with Q Channel deinterleaving (PN on I only)

**Table A-6. Normal SSA Return Service Specification Code Data (4 of 4), Normal User**

Item	Data Element Name	Data Format	Range of Values
39	DG2 Type (DG2T)	N	0 = Noncoherent, I and Q Channel deinterleaving 1 = Noncoherent no deinterleaving 2 = Coherent no deinterleaving 3 = Coherent I and Q Channel deinterleaving 4 = Noncoherent, I Channel deinterleaving 5 = Noncoherent Q Channel deinterleaving 6 = Coherent Q Channel deinterleaving 7 = Coherent I Channel deinterleaving
40	G2 Inversion, I Channel (G2II)	N	0 = G2 polynomial normal, - I leads Q, or G2 polynomial inverted and I lags Q 1 = G2 polynomial inverted - I leads Q, or G2 polynomial normal and I lags Q (Note: ASCII space if Data Coding, I Channel is not equal to 1)
41	G2 Inversion, Q Channel (G2IQ)	N	0 = G2 polynomial normal 1 = G2 polynomial inverted (Note: ASCII space if Data Coding, Q Channel is not equal to 1)
42.	Data Stream ID I Channel (DSD1)	NNN or Blank	001 ↔ 037, 041 ↔ 377 (octal) (See 532-808)
43.	Data Stream ID, Q Channel (DSD2)	NNN or Blank	001 ↔ 037, 041 ↔ 377 (octal) (See 532-808)

\* There can be multiple entries for this data element

**Table A-7. SMA Return Service Specification Code Data (1 of 4) , Normal User**

Item	Data Element Name	Data Format	Range of Values
1	SIC	NNNN	NNNN = 4 Numeric Characters
2	Service Specification Code ID	AAA	AAA = 3 Alphanumeric Characters
3	Service Type		SMAR (Service Support Type = 1; Service Support Subtype = 5)
<b>Electronically Fixed Data Elements</b>			
4	Service Configuration	N	1 = Normal User
5	DG1 Configuration	N	0 = I Channel only 1 = Q Channel only 2 = I and Q Channels
6	Data Channel Configuration	N	0 = Single data source; DG1: identical coded data G1 G2 on I Channel and Q Channel, DG2: G1 on I Channel and G2 on Q Channel 1 = Dual Data Source 2 = Single data source; data bits alternating between I and Q channels - G1 G2 (G3) on each channel (DG1 or DG2)
7	Data Coding, I Channel	N	0 = Uncoded 1 = Code 1 (rate 1/2) 2 = Code 2 (rate 1/2; G1 inverted) 3 = Code 3 (rate 1/3)
8	Data Coding, Q Channel	N	0 = Uncoded 1 = Code 1 (rate 1/2) 2 = Code 2 (rate 1/2; G1 inverted) 3 = Code 3 (rate 1/3)
9	DG2 Modulation	N	0 = QPSK 1 = BPSK
10	Maximum MDM Data Rate, I Channel	NNNNNNNN	000000000 ↔ 001500000 (LSD = 1 bps)
11	Maximum MDM Data Rate, Q Channel	NNNNNNNN	000000000 ↔ 001500000 (LSD = 1 bps)
12	Maximum HDRM Data Rate, I Channel	NNNNNNNN	000000000; 000125000 ↔ 001500000 (LSD = 1 bps)
13	Maximum HDRM Data Rate, Q Channel	NNNNNNNN	000000000; 000125000 ↔ 001500000 (LSD = 1 bps)
14	Maximum Data Rate, I Channel	NNNNNNNN	000000000; 000001000 ↔ 001500000 (LSD = 1 bps)
15	Maximum Data Rate, Q Channel	NNNNNNNN	000000000; 000001000 ↔ 001500000 (LSD = 1 bps)
16	Receiver Configuration	N	0 = Normal 1 = Cross Support

**Table A-7. SMA Return Service Specification Code Data (2 of 4) , Normal User**

Item	Data Element Name	Data Format	Range of Values
17	Symbol Format Conversion to Bi $\phi$ -L, I Channel	N	0 = No 1 = Yes
18	Symbol Format Conversion to Bi $\phi$ -L, Q Channel	N	0 = No 1 = Yes
19	SSA Combining	A	ASCII space (Note: Not Applicable for SMAR services)
20	Return Channel Time Delay Data Required	N	0 = No 1 = Yes
21	User Interface Channel ID*, I Channel	AAA	AAA = 3 Alphanumeric Characters
22	User Interface Channel ID*, Q Channel	AAA	AAA = 3 Alphanumeric Characters
<b>Electronically Respecifiable Data Elements</b>			
23	TSW Set ID (TSWS)	AAAAAAAAAA	All Zeroes = None AAAAAAAAAA = 10 Alphanumerics or underscore
24	User Despun Antenna (UDAN)	N	0 = No type 1 = Type 1 2 = Type 2
25	Initial Data Rate I Channel (DTR1)	NNNNNNNN	00000000; 000000100 $\leftrightarrow$ 001500000 (LSD = 1 bps; all zeros indicates that initially no data will be on I channel)
26	Initial Data Rate Q Channel (DTR2)	NNNNNNNN	00000000; 000000100 $\leftrightarrow$ 001500000 (LSD = 1 bps; all zeros indicates that initially no data will be on Q channel)
27	Transmit Frequency, (FRQ1)	NNNNNNNNNN	0228727000 $\leftrightarrow$ 0228773000 (LSD = 10 Hz; all zeros for a coherent service)
28	Polarization (POLN)	N	0 = LCP
29	Maximum EIRP, (ERP1)	SNNN	S = Sign (+/-); NNN = 000 $\leftrightarrow$ 999 (LSD = 0.1 dBw)
30	Minimum EIRP, (ERP2)	SNNN	S = Sign (+/-); NNN = 000 $\leftrightarrow$ 999 (LSD = 0.1 dBw)
31	I/Q Channel Power Ratio (CPR)	SNN	S = Sign (+/-); NN = 00 $\leftrightarrow$ 99 (LSD = 0.1 dB)
32	Data Format, I Channel (DTF1)	N	0 = NRZ-L 1 = NRZ-M 2 = NRZ-S 3 = BI $\phi$ -L 4 = BI $\phi$ -M 5 = BI $\phi$ -S

**Table A-7. SMA Return Service Specification Code Data (3 of 4) , Normal User**

Item	Data Element Name	Data Format	Range of Values
33	Data Format, Q Channel (DTF2)	N	0 = NRZ-L 1 = NRZ-M 2 = NRZ-S 3 = BIΦ-L 4 = BIΦ-M 5 = BIΦ-S
34	Data Bit Jitter, I Channel (JTR1)	N	0 = None 1 = 0.01% 2 = 0.1%
35	Data Bit Jitter, Q Channel (JTR2)	N	0 = None 1 = 0.01% 2 = 0.1%
36	Data Group (DG)	N	1 = DG1 2 = DG2
37	DG1 Mode (DG1M)	N	1 = Mode 1; Coherent (PN on I and Q) 2 = Mode 2; Noncoherent (PN on I and Q) 3 = Mode 3; Coherent with no Q Channel deinterleaving (PN on I only) 4 = Mode 3; Coherent with Q Channel deinterleaving (PN on I only)
38	DG2 Type (DG2T)	N	0 = Noncoherent, I and Q Channel deinterleaving 1 = Noncoherent no deinterleaving 2 = Coherent no deinterleaving 3 = Coherent I and Q Channel deinterleaving 4 = Noncoherent, I Channel deinterleaving 5 = Noncoherent Q Channel deinterleaving 6 = Coherent Q Channel deinterleaving 7 = Coherent I Channel deinterleaving
39	G2 Inversion, I Channel (G2II)	N	0 = G2 polynomial normal, - I leads Q, or G2 polynomial inverted and I lags Q 1 = G2 polynomial inverted - I leads Q, or G2 polynomial normal and I lags Q (Note: ASCII space if Data Coding I Channel is not equal to 1)

**Table A-7. SMA Return Service Specification Code Data (4 of 4) , Normal User**

Item	Data Element Name	Data Format	Range of Values
40	G2 Inversion, Q Channel (G2IQ)	N	0 = G2 polynomial normal 1 = G2 polynomial inverted (Note: ASCII space if Data Coding Q Channel is not equal to 1)
41	Data Stream ID I Channel (DSD1)	NNN or Blank	001 ↔ 037, 041 ↔ 377 (octal) (See 532-808)
42	Data Stream ID, Q Channel (DSD2)	NNN or Blank	001 ↔ 037, 041 ↔ 377 (octal) (See 532-808)

\* There can be multiple entries for this data element

**Table A-8. Shuttle SSA Return Service Specification Code Data (1 of 2)**

Item	Data Element Name	Data Format	Range of Values
1	SIC	NNNN	NNNN = 4 Numeric Characters
2	Service Specification Code ID	AAA	AAA = 3 Alphanumeric Characters
3	Service Type		Shuttle SSAR (Service Support Type = 1)
<b>Electronically Fixed Data Elements</b>			
4	SA Antenna	N or Blank	1 = SA1 (Service Support Subtype = 1 = SSA1) 2 = SA2 (Service Support Subtype = 2 = SSA2) Blank = NCCDS will Select the Antenna
5	Service Configuration	N	2 = Shuttle
6	SSA Combining	N	0 = No 1 = Yes
7	Return Channel Time Delay Data Required	N	0 = No 1 = Yes
8	Shuttle User Interface Channel ID *	AAA	AAA = 3 Alphanumeric Characters
<b>Electronically Respecifiable Data Elements</b>			
9	TSW Set ID (TSWS)	AAAAAAAAAA	All Zeroes = None AAAAAAAAAA = 10 Alphanumerics or underscore
10	User Despun Antenna (UDAN)	N	0 = No type 1 = Type 1 2 = Type 2
11	Shuttle Polarization (POLS)	N	0 = LCP 1 = RCP
12	Shuttle Maximum EIRP, (ERP3)	SNNN	S = Sign (+/-); NNN = 000 ↔ 999 (LSD = 0.1 dBw)
13	Shuttle Minimum EIRP, (ERP4)	SNNN	S = Sign (+/-); NNN = 000 ↔ 999 (LSD = 0.1 dBw)
14	Shuttle Data Bit Jitter (JTR4)	N	0 = None 1 = 0.01% 2 = 0.1%  3 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.) 4 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.) 5 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.)
15	Shuttle Transmit Frequency (FRQ2)	NNNNNNNNNN	0220000000 ↔ 0230000000 (LSD = 10 Hz; all zeros for a coherent service)

**Table A-8. Shuttle SSA Return Service Specification Code Data (2 of 2)**

Item	Data Element Name	Data Format	Range of Values
16	Shuttle Data Configuration Mode (SCON)	N	1 = Mode 1 (96 kbps; coherent if Transmit Frequency = 0000000000) 2 = Mode 2 (192 kbps; coherent if Transmit Frequency = 0000000000) 3 = Mode 3 (coherent carrier only)
17	Shuttle Data Stream ID Shuttle (DSD4)	NNN or Blank	001 ↔ 037, 041 ↔ 377 (octal) (See 532-808)

\* There can be multiple entries for this data element

**Table A-9. Normal KSA/KaSA Forward Service Specification Code Data,**

**Normal User**

Item	Data Element Name	Data Format	Range of Values
1	SIC	NNNN	NNNN = 4 Numeric Characters
2	Service Specification Code ID	AAA	AAA = 3 Alphanumeric Characters
3	Service Type		Normal KSAF or Normal KaSAF (Service Support Type = 0)
<b>Electronically Fixed Data Elements</b>			
4	SA Antenna	N or Blank	For KSAF: 1 = SA1 (Service Support Subtype = 3 = KSA1) 2 = SA2 (Service Support Subtype = 4 = KSA2) Blank = NCCDS will select the antenna  For KaSAF: 1 = SA1 (Service Support Subtype = 6 = KaSA1) 2 = SA2 (Service Support Subtype = 7 = KaSA2) Blank = NCCDS will select the antenna
5	Service Configuration	N	1 = Normal User
6	Power Mode	N	0 = Normal 1 = High
7	Maximum Data Rate	NNNNNNNN	00000000; 000001000 ↔ 025000000 (LSD = 1 bps)
8	User Interface Channel ID*	AAA	AAA = 3 Alphanumeric Characters
<b>Electronically Respecifiable Data Elements</b>			
9	TSW Set ID (TSWS)	AAAAAAAAAA	All Zeroes = None AAAAAAAAAA = 10 Alphanumerics or underscore
10	Initial Data Rate (DTR1)	NNNNNNNN	000000000; 000001000 ↔ 025000000 (LSD = 1 bps; all zeros indicates that initially there will be no data)
11	Receiver Frequency, (FRQ1)	NNNNNNNNNN	1375000000 ↔ 1380000000 (TDRS A - G) 1377430000 ↔ 1377570000 (TDRS H - J) 2255372000 ↔ 2354628000 (KaSAF) (LSD = 10 Hz)
12	Polarization, (POLN)	N	0 = LCP 1 = RCP
13	Command Channel PN Modulation (CCPN)	N	0 = No 1 = Yes (Note: ASCII space for data rates above 300 kbps)
14	Doppler Compensation Required (DOPC)	N	0 = No 1 = Yes

\* There can be multiple entries for this data element

**Table A-10. Shuttle KSA Forward Service Specification Code Data**

Item	Data Element Name	Data Format	Range of Values
1	SIC	NNNN	NNNN = 4 Numeric Characters
2	Service Specification Code ID	AAA	AAA = 3 Alphanumeric Characters
3	Service Type		Shuttle KSAF (Service Support Type = 0)
<b>Electronically Fixed Data Elements</b>			
4	SA Antenna	N or Blank	1 = SA1 (Service Support Subtype = 3 = KSA1) 2 = SA2 (Service Support Subtype = 4 = KSA2) Blank = NCCDS will Select the Antenna
5	Service Configuration	N	2 = Shuttle
6	Shuttle Power Mode	N	0 = Normal 1 = High
7	Shuttle Maximum Data Rate	NNNNNNNN	000216000 (LSD = 1 bps)
8	Shuttle User Interface Channel ID*	AAA	AAA = 3 Alphanumeric Characters
<b>Electronically Respecifiable Data Elements</b>			
9	TSW Set ID (TSWS)	AAAAAAAAAA	All Zeroes = None AAAAAAAAAA = 10 Alphanumerics or underscore
10	Shuttle Initial Data Rate (DTR3)	NNNNNNNN	00000000, 000072000, 000216000 (LSD = 1 bps; all zeros indicates that initially there will be no data)
11	Shuttle Receive Frequency, (FRQ2)	NNNNNNNNNN	1375000000 ↔ 1380000000 (TDRS A - G) 1377430000 ↔ 1377570000 (TDRS H - J) (LSD = 10 Hz)
12	Shuttle Polarization (POLS)	N	0 = LCP 1 = RCP
13	Command Channel PN Modulation (CCPN)	N	0 = No 1 = Yes
14	Shuttle Doppler Compensation (SCDC)	N	0 = No 1 = Yes

\* There can be multiple entries for this data element

**Table A-11. Normal KSA/KaSA Return Service Specification Code Data (1 of 4),**

**Normal User**

Item	Data Element Name	Data Format	Range of Values
1	SIC	NNNN	NNNN = 4 Numeric Characters
2	Service Specification Code ID	AAA	AAA = 3 Alphanumeric Characters
3 *	Service Type		Normal KSAR, Normal KaSAR, or Normal KaSA1WB (Service Support Type = 1)
<b>Electronically Fixed Data Elements</b>			
4 *	SA Antenna	N or Blank	For KSAR: 1 = SA1 (Service Support Subtype = 3 = KSA1) 2 = SA2 (Service Support Subtype = 4 = KSA2) Blank = NCCDS will select the antenna  For KaSAR: 1 = SA1 (Service Support Subtype = 6 = KaSA1) 2 = SA2 (Service Support Subtype = 7 = KaSA2) Blank = NCCDS will select the antenna  For KaSA1WB: 1 = SA1 (Service Support Subtype = 8 = KaSA1WB) 1 = Normal User (not applicable for KaSA1WB) 4 = IF Service (applicable only for KaSA1WB)
5	Service Configuration	N	
6	DG1 Configuration	N	0 = I Channel only (BPSK) 1 = Q Channel only (BPSK) 2 = I and Q Channels (QPSK)
7	Data Channel Configuration	N	0 = Single data source 1 = Dual data source
8	Data Coding, I Channel	N	0 = Uncoded 1 = Code 1 (rate 1/2)
9	Data Coding, Q Channel	N	0 = Uncoded 1 = Code 1 (rate 1/2)
10	DG2 Modulation	N	0 = QPSK 1 = BPSK
11	Maximum MDM Data Rate, I Channel	NNNNNNNN	000000000 ↔ 002000000 (LSD = 1 bps)
12	Maximum MDM Data Rate, Q Channel	NNNNNNNN	000000000 ↔ 002000000 (LSD = 1 bps)
13	Maximum HDRM Data Rate, I Channel	NNNNNNNN	000000000; 000125000 ↔ 048000000 (LSD = 1 bps)
14	Maximum HDRM Data Rate, Q Channel	NNNNNNNN	000000000; 000125000 ↔ 048000000 (LSD = 1 bps)
15	Maximum Data Rate, I Channel	NNNNNNNN	000000000; 000001000 ↔ 150000000 (LSD = 1 bps)

**Table A-11. Normal KSA/KaSA Return Service Specification Code Data (2 of 4),**

**Normal User**

<b>Item</b>	<b>Data Element Name</b>	<b>Data Format</b>	<b>Range of Values</b>
16	Maximum Data Rate, Q Channel	NNNNNNNNNN	000000000; 000001000 ↔ 150000000 (LSD = 1 bps)
17	Symbol Format Conversion to Biφ-L, I Channel	N	0 = No 1 = Yes
18	Symbol Format Conversion to Biφ-L, Q Channel	N	0 = No 1 = Yes
19	Return Channel Time Delay Data Required	N	0 = No 1 = Yes
20 **	User Interface Channel ID**, I Channel	AAA	AAA = 3 Alphanumeric Characters
21 **	User Interface Channel ID**, Q Channel	AAA	AAA = 3 Alphanumeric Characters
<b>Electronically Respecifiable Data Elements</b>			
22	TSW Set ID (TSWS)	AAAAAAAAAA	All Zeroes = None AAAAAAAAAA = 10 Alphanumerics or underscore
23	Data Rate (Initial), I Channel (DTR1)	NNNNNNNNNN	000000000; 000001000 ↔ 150000000 (LSD = 1 bps; all zeros indicates that initially no data will be on I channel)
24	Data Rate (Initial), Q Channel (DTR2)	NNNNNNNNNN	000000000; 000001000 ↔ 150000000 (LSD = 1 bps; all zeros indicates that initially no data will be on Q channel)
25	Transmit Frequency, Normal User (FRQ1)	NNNNNNNNNN	1500040000 ↔ 1500640000 (KSA) (LSD = 10 Hz; all zeros for a coherent service) <b>2525212000 ↔ 2747968000</b> (KaSA) (LSD = 10 Hz)
26	Polarization, Normal User (POLN)	N	0 = LCP 1 = RCP
27	Maximum EIRP, (ERP1)	SNNN	S = Sign (+/-); NNN = 000 ↔ 999 (LSD = 0.1 dBw)
28	Minimum EIRP, (ERP2)	SNNN	S = Sign (+/-); NNN = 000 ↔ 999 (LSD = 0.1 dBw)
29	Autotrack Enable/Disable (ATBW)	NNNNNNNN	00000000 = Enable 00000001 = Disable
30	I/Q Channel Power Ratio (CPR)	SNN	S = Sign (+/-); NN = 00 ↔ 99 (LSD = 0.1 dB)

**Table A-11. Normal KSA/KaSA Return Service Specification Code Data (3 of 4),**

**Normal User**

Item	Data Element Name	Data Format	Range of Values
31	Data Format, I Channel (DTF1)	N	0 = NRZ-L 1 = NRZ-M 2 = NRZ-S 3 = Bi $\phi$ -L 4 = Bi $\phi$ -M 5 = Bi $\phi$ -S
32	Data Format, Q Channel (DTF2)	N	0 = NRZ-L 1 = NRZ-M 2 = NRZ-S 3 = Bi $\phi$ -L 4 = Bi $\phi$ -M 5 = Bi $\phi$ -S
33	Data Bit Jitter, I Channel (JTR1)	N	0 = None 1 = 0.01% 2 = 0.1% 3 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.) 4 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.) 5 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.)
34	Data Bit Jitter, Q Channel (JTR2)	N	0 = None 1 = 0.01% 2 = 0.1% 3 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.) 4 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.) 5 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.)
35	Data Group (DG)	N	1 = DG1 (not valid for KaSAR) 2 = DG2
36	DG1 Mode (DG1M)	N	1 = Mode 1; Coherent (PN on I and Q) 2 = Mode 2; Noncoherent (PN on I and Q) 3 = Mode 3; Coherent with no Q Channel deinterleaving (PN on I only)
37	DG2 Type (DG2T)	N	1 = Noncoherent 2 = Coherent(not valid for KaSAR)

**Table A-11. Normal KSA/KaSA Return Service Specification Code Data (4 of 4),**

**Normal User**

Item	Data Element Name	Data Format	Range of Values
38	G2 Inversion, I Channel (G2II)	N	0 = G2 polynomial normal, - I leads Q, or G2 polynomial inverted and I lags Q 1 = G2 polynomial inverted, - I leads Q, or G2 polynomial normal and I lags Q
39	G2 Inversion, Q Channel (G2IQ)	N	0 = G2 polynomial normal 1 = G2 polynomial inverted
40	Data Stream ID, I Channel (DSD1)	NNN or Blank	001 ↔ 037, 041 ↔ 377 (octal) (See 532-808)
41	Data Stream ID, Q Channel (DSD2)	NNN or Blank	001 ↔ 037, 041 ↔ 377 (octal) (See 532-808)

\* The Normal KaSAR service type applies to normal user normal bandwidth Ka-band return services. The Normal KaSA1WB service type applies to normal user wideband Ka-band return services. The following applies to the entry of parameter values for KaSA1WB SSCs in the NCCDS database:

- The only fixed data elements applicable to KaSA1WB operations are: SA Antenna, Service Configuration, and User Interface Channel ID -- I Channel. Operationally valid values must be entered for these parameters.
- The only respecifiable data elements applicable to KaSA1WB operations are: Transmit Frequency and Polarization. Operationally valid values must be entered for these parameters. Autotrack Enable/Disable is not currently applicable, but may be applicable in the future.
- In addition, the NCCDS requires entry of valid non-zero values for Maximum Data Rate -- I Channel and Data Rate (Initial) – I Channel. Entry of the minimum value (i.e., 1000 bps) is recommended.
- For any other parameter shown in this table, the NCCDS may require entry of a value indicated as valid for KaSAR.
- In all cases, entry of TSW Set ID is optional.

\*\* For KaSA1WB, the I Channel User Interface Channel must be for an IF port and there should be no Q Channel User Interface Channel.

\*\*\* There can be multiple entries for this data element.

**Table A-12. Shuttle KSA Return Service Specification Code Data (1 of 3)**

Item	Data Element Name	Data Format	Range of Values
1	SIC	NNNN	NNNN = 4 Numeric Characters
2	Service Specification Code ID	AAA	AAA = 3 Alphanumeric Characters
3	Service Type		Shuttle KSAR (Service Support Type = 1)
<b>Electronically Fixed Data Elements</b>			
4	SA Antenna	N or Blank	1 = SA1 (Service Support Subtype = 3 = KSA1) 2 = SA2 (Service Support Subtype = 4 = KSA2) Blank = NCCDS will select the antenna 2 = Shuttle
5	Service Configuration	N	
6	Maximum MDM Data Rate, Channel 2	NNNNNNNN	00000000 ↔ 00200000 (LSD = 1 bps)
7	Maximum MDM Data Rate, Channel 3	NNNNNNNN	00000000 ↔ 00200000 (LSD = 1 bps)
8	Maximum HDRM Data Rate, Channel 3	NNNNNNNN	00000000; 000125000 ↔ 048000000 (LSD = 1 bps)
9	Maximum Data Rate, Channel 2	NNNNNNNN	00000000; 000001000 ↔ 002000000 (LSD = 1 bps)
10	Maximum Data Rate, Channel 3	NNNNNNNN	00000000; 000001000 ↔ 050000000 (LSD = 1 bps)
11	Return Channel Time Delay Data Required	N	0 = No 1 = Yes
12	User Interface Channel ID*, Channel 1	AAA	AAA = 3 Alphanumeric Characters
13	User Interface Channel ID*, Channel 2	AAA	AAA = 3 Alphanumeric Characters
14	User Interface Channel ID*, Channel 3	AAA	AAA = 3 Alphanumeric Characters
<b>Electronically Respecifiable Data Elements</b>			
15	TSW Set ID (TSWS)	AAAAAAAAAA	All Zeroes = None AAAAAAAAAA = 10 Alphanumeric or underscore
16	Shuttle Polarization (POLS)	N	0 = LCP 1 = RCP
17	Shuttle Maximum EIRP (ERP3)	SNNN	S = Sign (+/-); NNN = 000 ↔ 999 (LSD = 0.1 dBw)

**Table A-12. Shuttle KSA Return Service Specification Code Data (2 of 3)**

Item	Data Element Name	Data Format	Range of Values
18	Shuttle Minimum EIRP (ERP4)	SNNN	S = Sign (+/-); NNN = 000 ↔ 999 (LSD = 0.1 dBw)
19	Autotrack Enable/Disable (ATBW)	NNNNNNNN	00000000 = Enable 00000001 = Disable
20	Shuttle Transmit Frequency (FRQ2)	NNNNNNNNNN	1500040000 ↔ 1500640000 (LSD = 10 Hz)
21	Shuttle Mode (SHMO)	N	1 = Mode 1 (PM) 2 = Mode 2 (FM, Chan. 3-digital) 3 = Mode 2 (FM, Chan. 3-analog) 4 = Mode 2 (FM, Chan. 3-video)
22	Shuttle Data Format, Mode 1 or 2, Channel 1, (DTF3)	N	3 = Bi $\phi$ -L
23	Shuttle Data Bit Jitter, Mode 1 or 2, Channel 1, (JTR3)	N	0 = None 1 = 0.01% 2 = 0.1%  3 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.) 4 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.) 5 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.)
24	Data Format, Shuttle Mode 1 or 2, Channel 2 (DTF4)	N	0 = NRZ-L 1 = NRZ-M 2 = NRZ-S 3 = Bi $\phi$ -L 4 = Bi $\phi$ -M 5 = Bi $\phi$ -S
25	Shuttle Data Bit Jitter, Mode 1 or 2, Channel 2 (JTR4)	N	0 = None 1 = 0.01% 2 = 0.1%  3 = 0.5% (Bi $\phi$ -L only; WSC will currently treat as 0.1% if received for any other data format.) 4 = 1.0% (Bi $\phi$ -L only; WSC will currently treat as 0.1% if received for any other data format.) 5 = 2.0% (Bi $\phi$ -L only; WSC will currently treat as 0.1% if received for any other data format.)

**Table A-12. Shuttle KSA Return Service Specification Code Data (3 of 3)**

Item	Data Element Name	Data Format	Range of Values
26	Shuttle Data Rate (Initial), Mode 1 or 2, Channel 2, (DTR3)	NNNNNNNNNN	000000000; 000001000; 000002000; 000004000; 000008000; 000016000 ↔ 002000000 (LSD = 1 bps; all zeros indicates that initially no data will be on channel 2)
27	Shuttle Data Format, Mode 1 or 2, Channel 3 (DTF5)	N	0 = NRZ-L 1 = NRZ-M 2 = NRZ-S 3 = Bi $\phi$ -L 4 = Bi $\phi$ -M 5 = Bi $\phi$ -S (3, 4, 5 applicable to mode 1 only)
28	Shuttle Data Bit Jitter, Mode 1 or 2, Channel 3 (JTR5)	N	0 = None 1 = 0.01% 2 = 0.1% 3 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.) 4 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.) 5 = Reserved (WSC will currently treat as 0.1%; however, users should use "2" whenever possible.)
29	Shuttle Data Rate (Initial), Mode 1 or 2, Channel 3, (DTR4)	NNNNNNNNNN	000000000; 000001000; 000002000; 000004000; 000008000; 000016000 ↔ 050000000 (LSD = 1 bps; all zeros indicates that initially no digital data will be on channel 3)
30	Shuttle Data Stream ID, Mode 1 or 2, Channel 1 (DSD3)	NNN or Blank	001 ↔ 037, 041 ↔ 377 (octal) (See 532-808)
31	Shuttle Data Stream ID, Mode 1 or 2, Channel 2 (DSD4)	NNN or Blank	001 ↔ 037, 041 ↔ 377 (octal) (See 532-808)
32	Shuttle Data Stream ID, Mode 1 or 2, Channel 3 (DSD5)	NNN or Blank	001 ↔ 037, 041 ↔ 377 (octal) (See 532-808)
33	Shuttle 1.024 MHz Subcarrier (SHPI)	N	1 = Not Used 2 = Channel 2 3 = Channel 3

\* There can be multiple entries for this data element

**Table A-13. End-to-End Test Service Specification Code Data**

Item	Data Element Name	Data Format	Range of Values
1	SIC	NNNN	NNNN = 4 Numeric Characters
2	Service Specification Code ID	AAA	AAA = 3 Alphanumeric Characters
3	Service Type		Forward End-to-End Test (Service Support Type = 3) Return End-to-End Test (Service Support Type = 4)
<b>Electronically Fixed Data Elements</b>			
4	Simulation EIRP (Return)	SNNN	S = Sign (+/-); NNN = 000 ↔ 999 (LSD = 0.1 dBw; +000 for a forward simulation)
5	Simulation Gain/Temperature (Forward)	SNNN	S = Sign (+/-); NNN = 000 ↔ 999 (LSD = 0.1 dB/degree K; +000 for a return simulation)
6	Local or MOC	N	0 = Local 1 = MOC
7	User Interface Channel ID*	AAA	AAA = 3 Alphanumeric Characters
8	User Interface Channel ID*	AAA	AAA = 3 Alphanumeric Characters
9	Data Stream ID (DSID), (Forward)	NNN	001 ↔ 037, 041 ↔ 377 (octal) (See 532-808)
<p>* There can be multiple entries for this data element.          Item 7 and/or 8 may be used for return end-to-end test; only item 7 is used for forward end-to-end test.          For forward end-to-end test, the User Interface Channel ID is optional. If used, it specifies the destination for the return flow of the forward end-to-end test data.          For return end-to-end test, the User Interface Channel IDs do not apply if the data source (item 6) is local.          When the MOC is specified as the data source, the User Interface Channel IDs specify the source of the forward flow of the return end-to-end test data. For test data actually provided by the MOC, one or both channels may apply. For tape playback of test data at WSC, the User Interface Channel IDs do not apply but the MOC is specified as the data source.</p>			

**Table A-14. Tracking Service Specification Code Data**

Item	Data Element Name	Data Format	Range of Values
1	SIC	NNNN	NNNN = 4 Numeric Characters
2	Service Specification Code ID	AAA	AAA = 3 Alphanumeric Characters
3	Service Type		Tracking (Service Support Type = 2)
<b>Electronically Fixed Data Elements</b>			
4	Tracking Configuration	N	0 = Normal Tracking Service 1 = Cross-Support Tracking Service
5	Return Service Type for Normal Tracking Service	N	0 = MA, Normal User 1 = SSA, Normal User 2 = KSA, Normal User 3 = Shuttle S-Band 4 = Shuttle Ku-Band 5 = SMA, Normal User
6	Range/Doppler for Cross-Support Tracking Service	N	0 = Range 1 = Two-way Doppler 2 = Both
7	Range Tracking Required for Normal Tracking Service	N	0 = No 1 = Yes
8	Doppler Tracking Required for Normal Tracking Service	N	0 = Not required 1 = One-way 2 = Two-way
<b>Electronically Respecifiable Data Elements</b>			
9	Time Transfer Required (TTTR)	N	0 = No 1 = Yes
10	Time Transfer Number of Samples (TTNR)	N	000, 020 ↔ 255 (expressed in binary form)
11	Sample Rate (SRRQ)	N	0 = 1/1 (sample/second) 1 = 1/5 (sample/seconds) 2 = 1/10 (sample/seconds) 3 = 1/60 (sample/seconds) 4 = 1/300 (sample/seconds)
12	Reference Forward Link Service Specification Code (FLCC)	AAA	AAA = 3 Alphanumeric Characters or Blank
13	Reference Return Link Service Specification Code (RLCC)	AAA	AAA = 3 Alphanumeric Characters

## A.4 Baseline Configuration Code ID Convention

For baseline customers, the NCCDS database will contain SSCs based on their original configuration codes. In all cases, the SSC ID of the new SSC will be the same as the configuration code ID of the original configuration code. However, unlike SSCs which contain an explicit Service Type parameter, the service type of a configuration code was implied by its ID. Table A-15 specifies this service type to configuration code ID relationship. This relationship will be strictly observed for all baseline customers. In many cases, it may also continue to apply for customers who had been baseline customers and who have become full support customers .

**Table A-15. Service Type to Configuration Code ID Relationships for Baseline Customers**

Service Type	Configuration Code ID Range
Multiple Access Forward	A01—A99
Multiple Access Return	B01—B99
	C01—C99
	D01—D99
	E01—E99
	F01—F99
S-Band Single Access Forward	H01—H99
S-Band Single Access Return	I01—I99
	J01—J99
	K01—K99
	L01—L99
K-Band Single Access Forward	N01—N99
S-Band Single Access Return	O01—O99
	P01—P99
	Q01—Q99
	R01—R99
Multiple Access EET	G01—G99
S-Band Single Access EET	M01—M99
K-Band Single Access EET	S01—S99
Tracking	T01—T99

## A.5 Prototype Event Format

The format for a prototype event is shown in Table A-16.

**Table A-16. Prototype Event Format**

Item	Data Element Name	Data Format	Range of Values
1	Prototype Event ID	AAA	AAA = 3 Alphanumeric Characters
2	Number of Service Specification Codes in Prototype Event	NN	01-16
3*	Service Specification Code ID	AAA	AAA = 3 Alphanumeric Characters
4	Relative Start Time	NNNNNN	HHMMSS
5	Nominal Duration	NNNNNN	HHMMSS
6**	Number of Keyword Parameters	N	0-9. Number of keyword parameters for this service (0 if no keyword parameters are used)
7**	Keyword names, delimiters, and values	Variable	Keyword service-level flexibility parameters. The parameters may be entered in any order. The set of service-level flexibility parameters is listed in Table 7-3. This field has the following internal format: NAME1=VALUE1,NAME2=VALUE2; Each keyword parameter is delimited by a comma, and the list is terminated by a semicolon. The semicolon is always present even if no keyword parameters are used for that service specification code
8	Additional Service Specification Codes	Variable	Repeat items 3 through 7 for each additional service specification code

\*See paragraph 7.2.1.5. Just as in the SAR format, the SSCs in a prototype event must be in a specified order.

\*\*Prototype events specified for baseline customers may use keyword service-flexibility parameters.

# Appendix B. Schedule Request Validation

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## B.1 General

### B.1.1 Purpose

NCC 98 provides SN customers with three types of requests that can be used to add events to the schedule: the Schedule Add Request (SAR), the Alternate SAR, and the Replace Request. The purpose of this appendix is to describe what a Space Network (SN) customer must do to ensure that a request to add an event to the schedule will be accepted when submitted to the NCC. This appendix does not:

- a. Address the SN rules that apply when several customers contend for the same resources or when a resource has failed.
- b. Address certain Tracking and Data Relay Satellite System (TDRSS) ground rules that if violated may result in unsatisfactory service performance, but will not result in the scheduled event being rejected.
- c. Address TDRSS ground rules that are unique to Shuttle. Shuttle-unique TDRSS ground rules are included in paragraph 5.4 of 530-SRD-NCCDS/1998.
- d. Address any difference between schedule request validation for full support customers and for baseline customers. Baseline customers may simply ignore discussion of features that they do not use.
- e. Specify any requirements for the NCC Data System (NCCDS), the User Planning System (UPS), or for any other system.

### B.1.2 Overview

This appendix describes the process for ensuring the validity of a schedule request in terms of the following considerations:

- a. NCCDS database.
- b. NCCDS SAR validation.
- c. NCCDS Alternate SAR validation.
- d. NCCDS Replace Request validation.
- e. Operational constraints.

## B.2 NCCDS Database

Before a new customer submits any schedule request to the NCC, certain information for that customer must be established within the NCCDS database. However, not all of this information

is directly used in the validation of schedule requests. For each customer, the formal process of specifying this information involves creation of a document such as a System Operations Requirements Document (SORD). Customer-specific information in the NCCDS database includes:

- a. Spacecraft Parameters
- b. Service Types
- c. Service Parameter Records
- d. Nascom Parameters
- e. Schedule Distribution List
- f. Support Identification (SUPIDEN) and TDRS
- g. User Authorization
- h. Data Quality Monitoring (DQM) Setup Parameters
- i. Service Specification Codes
- j. Prototype Events

#### NOTE

This discussion provides a high-level description of customer-specific information included in the NCCDS database. The actual NCCDS database includes all of this information, but organizes it in a significantly different manner.

### **B.2.1 Spacecraft Parameters**

For each customer, the spacecraft parameters must be specified before any other data can be specified. The spacecraft parameters include the customer's Support Identification Code (SIC), Vehicle Identification Code (VIC), Vehicle Identification (VID), and Pseudo-Noise (PN) codes. Note that within the remainder of this appendix, there is a one-to-one relationship between the terms "customer" and "SIC".

### **B.2.2 Service Types**

For each customer, the Service Types list the types of services that can be scheduled for that customer. The service types must be specified before the Service Parameter Records can be specified.

### **B.2.3 Service Parameter Records**

For each service type for each customer, the Service Parameter Records, define how each schedulable parameter is to be validated as the Service Specification Codes (SSCs) for that service type and customer are entered into the NCCDS database. The Service Parameter Records comprise very nearly the same parameters as the SSC definitions given in Appendix A. For each

parameter, Appendix A shows the range, or set, of values that is generally valid in terms of the NCC/WSC interface. In contrast, the Service Parameter Records can be customized to specify ranges, or sets, of values unique to each customer.

#### **B.2.4 Nascom Parameters**

For each customer, the Nascom Parameters specify the settings of certain parameters used in the schedules transmitted to the White Sands Ground Terminal (WSGT) and to the Second TDRSS Ground Terminal (STGT). These parameters are used for purposes such as configuring the Multiplexer/Demultiplexer (MDM) system and do not appear in User Schedule Messages (USMs).

#### **B.2.5 Schedule Distribution List**

For each customer, the Schedule Distribution List specifies the destinations to which the NCCDS will transmit fixed USMs. One of these destinations will also be specified as the customer's "primary logical destination" and will receive Schedule Result Messages (SRMs) transmitted in response to schedule requests. Any or all of these destinations may also be specified to receive flexible USMs.

#### **B.2.6 SUPIDEN and TDRS**

For each customer, the NCCDS database contains a list of valid SUPIDENs. For each valid SUPIDEN, the NCCDS database contains a list of valid TDRSs.

#### **B.2.7 User Authorization**

For each customer, the NCCDS database contains a list of valid user IDs and associated passwords.

#### **B.2.8 DQM Setup Parameters**

For each combination of SIC, return service Data Stream ID and data rate, the NCCDS database may contain a set of DQM setup parameters. The NCCDS uses the DQM Setup Parameters in the construction of Scheduled Service Orders (SHOs) transmitted to STGT and WSGT. They do not appear in USMs.

#### **B.2.9 Service Specification Codes**

The SSC formats are shown in Appendix A. For each service type to be scheduled, each customer must have at least one SSC specified in the NCCDS database. For each customer, each SSC specifies a set of initial parameter values for the applicable service type. When SSCs are entered into the database, they are validated according to the Service Parameter Records.

#### **B.2.10 Prototype Events**

After the SSCs have been established for a customer, it is then possible to define prototype events for that customer. Each prototype event specifies a set of SSCs with associated service

durations, service start time offsets, and service-level flexibility parameters. Prototype events are optional. It is possible to schedule SN events without the use of prototype events. However, prototype events can simplify scheduling for customers that repeatedly schedule events with the same structure (i.e., the same set of services with the same durations, relative start times, and flexibility options).

## **B.3 NCCDS SAR Validation**

The NCCDS performs four general types of validation on each SAR:

- a. NCCDS database references.
- b. Event structure and time.
- c. TDRS Scheduling Windows.
- d. TDRSS rules.

### **B.3.1 NCCDS Database References**

The validation of a SAR is partially based on information in the NCCDS database.

- a. The SAR's SIC (i.e., the four numeric characters of the seven character SUPIDEN) must exist in the NCCDS database's Spacecraft Parameters.
- b. The alpha characters of the SAR's SUPIDEN (i.e., the first, sixth, and seventh characters) must be valid for the SIC.
- c. The SAR's User ID and password must be valid for the SAR's SIC.
- d. The SAR must either directly specify a TDRS allowed for the specified SUPIDEN, or must specify a TDRS set that contains at least one TDRS allowed for the specified SUPIDEN.
- e. The SAR must reference either a valid prototype event or one or more valid SSCs.
- f. If the SAR directly references SSCs, it may also reference valid combinations of respecifiable parameter names and values. Table 7-2 lists the valid respecifiable parameter names. The Spacecraft Parameters Records in the NCCDS database specify the valid range (or set of values) for each such parameter for each customer.

### **B.3.2 Event Structure and Time**

#### **B.3.2.1 General**

The validation of a SAR is partially based on the structure of the event requested by the SAR and on certain time relationships.

### **B.3.2.2 Service Specification Code References**

- a. The SAR must specify at least 1 and at most 16 services; however, any SSAR combining service is to be counted as two services. In an end-to-end test (EET) event, the EET data sets and the normal forward and return traffic services are each counted as a separate service.
- b. If the SAR references SSCs, they must be in a valid order. For normal events, this is: forward service SSCs, return service SSCs, and tracking service SSCs. For EET events, the order is the same except that each forward service SSC and each return service SSC is immediately followed by a corresponding EET SSC.
- c. If the SAR references a prototype event, the prototype event must reference SSCs in a valid order.

### **B.3.2.3 External Timing Relationships**

- a. The SAR's specification of event start time must allow the event to start less than twenty-eight days in the future.
- b. The SAR's specification of event start time must allow the event to start more than an NCC operator-specified time interval into the future. This interval will usually be five to ten minutes.
- c. The SAR's specification of service durations, service start time offsets, and service-level flexibilities must allow the event to be scheduled with a total duration of less than twenty-four hours.
- d. Each service duration requested by the SAR must be at least one minute.
- e. Values in time fields must fall within the customary ranges for such fields. Minutes and seconds must be in the range 00 to 59. Hours, when used in a time of day field, must be in the range 00 to 23 (see also note in paragraph 5.3.3).

### **B.3.2.4 Internal Timing Relationships**

- a. The SAR's event start time plus tolerance must be less than 24 hours.
- b. The SAR's event start time minus tolerance must be less than 24 hours.
- c. At least one of the services in the SAR must have its start time specified relative to the Event Start Time. Additional constraints apply to the use of event start time and service start time flexibility. Refer to paragraph 7.2.1.1
- d. The nominal structure of the event requested by the SAR must have at least one service active at all times during the event.
- e. As indicated in Table 7-3, several constraints apply to the use of the service-level flexibility keyword parameters.

1. If the Service Bounded By Service Number (SBSN) parameter is used, the duration of the referenced service must equal or exceed that of the referencing service.
2. The Coupled Service Number (CSN), Service Start Time Plus Tolerance (STPT), and Service Start Time Minus Tolerance (STMT) parameters may be used together in any combination. However if SBSN is used, it must not be in used in combination with CSN, STPT, or STMT.
3. CSN and SBSN may be used to create chains of references. Example: Service A (via use of CSN) starts 10 minutes after service B, and service B (via use of SBSN) is bounded by service C. However, such a chain cannot close to create a circular reference.

### **B.3.3 TDRS Scheduling Windows**

Each SAR specifies whether TSWs are to be used to constrain the scheduling of the requested event. If TSWs are to be used for an event, the NCCDS will use the TSWs from the TSW set specified by each SSC to schedule the service specified by that SSC. When a SAR is received, the NCCDS will attempt to locate the applicable TSWs. If they are not available, the NCCDS will report this to the customer by sending an SRM. However, this does not cause the SAR to be immediately rejected. Rejection does not occur until the NCCDS attempts to schedule an event in response to the SAR and then finds that applicable TSWs are not available. For SARs applicable to forecast scheduling, the customer may send the applicable TSWs to the NCCDS after the SAR is received and prior to schedule generation. For a SAR applicable to the active period, applicable TSWs should generally be sent to the NCCDS before the SAR is sent.

### **B.3.4 TDRSS Rules**

#### **B.3.4.1 General**

The validation of a SAR is partially based on TDRSS service scheduling rules. TDRSS service scheduling rules are presented in five categories:

- Single Access
- Multiple Access and S-Band Multiple Access
- Tracking
- End-to-End Test
- Coherent Pairs and Cross Support

#### **B.3.4.2 Single Access Service Ground Rules**

- a. For SA services, the customer may specify a specific SA antenna (i.e., either SA1 or SA2) or allow the NCCDS to select the SA antenna. If the customer specifies a specific SA antenna, the same SA antenna must be specified for all SA services requested by the SAR.

- b. If an SSAR combining service is requested and the customer specifies a specific SA antenna, the specified antenna must be SA1.
- c. Ku-band and Ka-band services cannot be active at the same time within an event.

**NOTE**

If an event contains both Ku-band and Ka-band services, the user must ensure at least a 20 second gap between them. However, the NCCDS does not check for this.

- d. Any SAR that requests discontinuous use of an SA antenna must allow for a minimum 30-second gap between each use of the SA antenna.
- e. All Ka-band return services must be specified as data group 2 services and only as noncoherent services.

**B.3.4.3 Multiple Access and S-Band Multiple Access Service Ground Rules**

- a. Any SAR that requests discontinuous MAR services must allow for a minimum 15-second gap between services.
- b. Any SAR that requests discontinuous MAF services must allow for a minimum 15-second gap between services.
- c. Any SAR that requests discontinuous SMAR services must allow for a minimum 15-second gap between services.
- d. Any SAR that requests discontinuous SMAF services must allow for a minimum 15-second gap between services.
- e. Although there may be multiple MAR links per TDRS, a SAR must not request concurrent MAR services.
- f. Although there may be multiple SMAR links per TDRS, a SAR must not request concurrent SMAR services.
- g. A SAR cannot request both MA and SMA services.
- h. A SAR cannot request both MA and Ka-band services.
- i. SMAR services must be requested in left circular polarization (LCP) only.

**B.3.4.4 Tracking Service Ground Rules**

- a. If the SAR requests a one-way tracking service, it must also request a corresponding return service. The tracking service must start no earlier than the return service and end no later than the return service.
- b. If the SAR requests a two-way tracking service, it must also request a corresponding return service and a corresponding forward service. The return service must be coherent with the forward service. The tracking service must start no earlier than the return

service and end no later than the return service. The tracking service must start no earlier than the forward service and end no later than the forward service.

- c. At any time, each return service is to be associated with at most one tracking service.
- d. At any time, each forward service is to be associated with at most one tracking service.
- e. There is no Ka-band tracking.

#### **B.3.4.5 End-to-End Test Service Ground Rules**

- a. If the SAR requests end-to-end test (EET) services, it must also request a normal forward traffic service or a normal return traffic service for each EET service. The start and end times of each EET service must be the same as those of the associated forward or return service.
- b. The number of concurrent EET services in an event is limited as follows:
  1. No more than one forward S-band EET service. This may be either SSAF, MAF, or SMAF.
  2. No more than one return S-band EET service. This may be either SSAR, MAR, or SMAR.
  3. No more than one forward Ku-band EET service.
  4. No more than one return Ku-band EET service.
- c. The first occurrence of each service type included in an EET event should begin at event start time.
- d. The normal forward traffic service associated with an EET service must have Doppler compensation enabled.
- e. There is no Ka-band EET.

#### **B.3.4.6 Coherent Pairs and Cross Support Ground Rules**

- a. A coherent pair of services may be either a KuSAR and a KuSAF, an SSAR and an SSAF, an SSAR and a MAF, an SSAR and an SMAF, an MAR and an MAF, an SMAR and an SMAF, an MAR and an SSAF, or an SMAR and an SSAF. If a SAR specifies that a return service is to be coherent with a forward service, the related forward service must start no later than the start time of the return service.
- b. If the SAR requests a cross support return service, the SAR must also request a forward service bearing a valid relationship to the return service. If a related tracking service is requested, it also must bear a valid relationship to the return service.
  1. The forward and return services must be on different TDRS antennas -- one SA and the other MA or SMA.

2. In order for the cross support relationship between the return and forward services to be meaningful, the return service must also be coherent with the forward. If the return service begins earlier than the forward service, the return service must be initially specified as non-coherent and then reconfigured to be coherent at the forward service start time. Otherwise, the return service should be initially specified as coherent.

**NOTE**

When a cross support return service begins earlier than the forward service, the WSC will automatically reconfigure the return service to coherent support at the forward service start time. This requires no direct action on the part of either the NCC or the MOC, and is beyond the scope of this document.

3. The return service must start no earlier than the forward and end no later than the forward.
4. The associated tracking service (if any) must be specified as cross support.
5. The SSC for the tracking service (if any) must reference the SSCs for the forward and return services.
6. The tracking service (if any) must be a valid two-way tracking service as indicated in paragraph B.3.4.4.

## **B.4 NCCDS Alternate SAR Validation**

All of the above considerations applicable to SAR validation also apply to Alternate SAR validation. In addition, each Alternate SAR must refer to a previously received request. There are five possibilities:

- a. The Alternate SAR refers to a request queued for processing, and the referenced request is either the last member of a chain of requests or is a SAR that does not have an Alternate SAR linked to it. The Alternate SAR is linked to the referenced request and becomes the last member of the chain of requests.
- b. The Alternate SAR refers to a request queued for processing, but the referenced request is not the last member of a chain of requests. The Alternate SAR is linked to the referenced request and becomes the last member of the chain of requests, but the chain is broken at that point with the requests that had previously been linked below that point being discarded.
- c. The Alternate SAR refers to a declined request and that declined request was not a member of a chain that resulted in an event on the active schedule. The Alternate SAR is processed as if it were a SAR.
- d. The Alternate SAR refers to a request that has resulted in an event on the active schedule or to a declined request that was a member of a chain that resulted in an event on the active schedule. The Alternate SAR is rejected.

- e. The NCCDS cannot locate a previously received request referenced by the Alternate SAR. The Alternate SAR is rejected.

## **B.5 NCCDS Replace Request Validation**

All of the above considerations applicable to SAR validation also apply to Replace Request validation. In addition, each Replace Request must refer to an event on the active schedule or to a previously received request. There are five possibilities:

- a. The Replace Request refers to an event on the active schedule. The NCCDS attempts to add an event to the active schedule as specified by the Replace Request. In attempting to add the new event, the NCCDS may use resources currently allocated to the referenced event. If successful, the referenced event is then deleted from the schedule. If unsuccessful, there is no change to the referenced event.
- b. The Replace Request refers to a request queued for processing. The referenced request is replaced by the Replace Request. If the referenced request were a member of a chain of requests, the Replace Request is linked into the chain exactly as was the referenced request.
- c. The Replace Request refers to a declined request and that declined request was not a member of a chain that resulted in an event on the active schedule. The Replace Request is processed as if it were a SAR.
- d. The Replace Request refers to a declined request that was a member of a chain that resulted in an event on the active schedule. The Replace Request is rejected.
- e. The NCCDS cannot locate an event or a previously received request referenced by the Replace Request. The Replace Request is rejected.

## **B.6 Operational Constraints**

From time to time, SN operations finds it necessary to define and enforce constraints above and beyond the scheduling rules embodied in the various SN systems. When such constraints are in force, SN operations requests that customers avoid submitting schedule requests that would violate these constraints. In addition, the NCC scheduling operators will attempt to verify that schedule requests and scheduled events do not violate the constraints.

When such constraints are defined, SN operations publishes Network Advisory Messages (NAMs). Any customer can obtain a current list of NAMs by contacting Goddard Space Flight Center (GSFC) Code 450. In addition, customers can use the on-line Space Network Advisory System (SNAS) to obtain current information.

# Appendix C. Engineering Interface Test Descriptions

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## C.1 General

This section describes the communication protocols to be used to exchange electronic messages during the Engineering Interface (EIF) testing Phase. The baseline EIF process using the Nascom 4800-bit block (4800BB) protocol remains the same as in past. However the EIF process using TCP/IP protocol should use the TCP/IP service names specified in this appendix. This will provide MOC testing of TCP/IP interfaces without interfering with the NCCDS operational system. Table C-1 is similar to Table 4-3 except for the service names. Use of the TCP/IP protocol is described in its entirety in Section 4.

**Table C-1. NCCDS EIF Services <sup>1</sup>**

<b>EIF Service Name</b>	<b>Service Type</b>	<b>Open Service Port Numbers</b>	<b>Message Type</b>	<b>Message Class</b>	<b>Nominal Duration</b>
ESchReq	Schedule Request	55101	99 12, 21, 24	10, 11 12, 21, 24	Duration of message(s) transmission
ESchStatus	Schedule Status	55102	99 94	01, 02, 28 01 - 05	Indefinite
EPmData	User Performance Data	55103	91 92	01 04, 62, 63, 66	<sup>2</sup> Duration of message transmissions associated with scheduled event
EReconfig	Reconfiguration	55104	98	01 - 08	Duration of message transmissions associated with a service reconfiguration
EAcqStore	Acquisition Data Storage	55105	03	10,15	Duration of message(s) transmission
ETswStore	TSW Storage	55106	99	25	Duration of message(s) transmission

**NOTES**

<sup>1</sup> The Communications Test Message (CTM) (91/03) is a Nascom application level message. It can be sent on any valid port number with NCCDS EIF services and it will be echoed.

<sup>2</sup> For any event, User Performance Data messages (91/01) will normally be transmitted from scheduled event start time until a few seconds after scheduled event stop time. An Acquisition Failure Notification message (92/63) could be sent at any time during an event, but would normally be sent shortly following detection of the TDRS's failure to acquire the customer spacecraft signal at scheduled service start time. The other messages (92/62 and 92/66) can be sent up to two minutes after the last UPD message for the event.

## Appendix D. Guidelines for Use of Service-Level Flexibility Parameters

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### D.1 Background and Purpose

Experience with the baseline NCCDS indicated that Space Network (SN) customers should be provided with a service-level flexibility capability. This capability can greatly reduce the need for customer interaction with the NCC scheduling operator when minor modifications are needed to allow schedule requests to be successfully scheduled.

The NCCDS 1998 service-level flexibility capability is based on the five parameters specified in Table 7-3 of this document. Each of these parameters was created in response to specific known customer needs. However, the specification of these parameters places very little restriction on the use of combinations of these parameters and allows for extremely complex service-level interrelationships that do not correspond to known customer needs.

The purpose of this appendix is to provide guidelines for the customer's use of the service-level flexibility parameters, and to clarify how the NCCDS will apply these parameters. In many cases, the customer can achieve equivalent results through use of two or more different combinations of these parameters. In all cases, the customer may use the most convenient effective combination.

### D.2 Overview of The Service-Level Flexibility Parameters

#### D.2.1 Service-Level Flexibility Parameters

Table 7-3 of this document specifies five parameters:

- CSN
- SBSN
- STPT
- STMT
- MIND

#### D.2.2 CSN

In many cases, two (or more) of a customer's services will have a time-based relationship that must be preserved when service-level flexibility is used. CSN (Coupled Service Number) allows the customer to specify that the nominal start time of a service is relative to the start time of a referenced service rather than relative to the event start time. If the NCCDS slides the referenced service in an attempt to find a time when it can be scheduled, use of CSN will automatically drag the coupled service along with the referenced service and preserve the time-based relationship.

For CSN to provide significant benefit, two conditions should ordinarily exist:

- The customer should specify some form of service-level flexibility for the referenced service.
- The two services should either require the same primary TDRS resource or have a tightly coupled operational relationship (e.g., a return service coherent with a forward service, or a tracking service coupled to a return service).

**NOTE**

CSN cannot be specified when SBSN is specified.

**NOTE**

When neither CSN nor SBSN (Service Bounded by Service Number) is used, a service's nominal start time is relative to event start time.

### **D.2.3 SBSN**

In some cases, a customer may want to allow one service to slide anywhere within the start and stop times of another service. The customer could specify this by use of CSN, nominal service start time, and STPT and/or STMT. However, this would require careful determination of the values to be specified for nominal start time, STPT, and STMT. The SBSN parameter allows the customer to directly and simply specify that the start and stop times of one service are to be bounded by the start and stop times of another service. When the customer specifies SBSN, the NCCDS may slide the bounded service anywhere within the bounding service in an attempt to find a time when it can be scheduled.

For SBSN to provide significant benefit that couldn't easily be obtained by use of CSN, two conditions should ordinarily exist:

- The two services should require different primary TDRS resources (e.g., an SA antenna and an MA antenna).
- When SBSN is specified, the nominal service start time parameter is not applicable. Therefore the customer should be willing to accept placement of the bounded service anywhere within the bounding service.

**NOTE**

SBSN cannot be specified when CSN, STPT, or STMT are specified.

**NOTE**

The algorithm used by the NCCDS tends to place the bounded service as early as possible within the bounding service.

## NOTE

In many cases, use of SBSN and CSN will tend to achieve equivalent results. For example, using SBSN for two services that have the same primary TDRS resource would generally achieve the same result as using CSN with a relative start time of zero. However if an exact placement is required, the customer should use CSN rather than SBSN.

### D.2.4 STPT

In many cases, a customer will have a preferred nominal start time for a service but can also accept later start times. STPT (Service Start Time Plus Tolerance) allows the customer to specify that a service's actual start time may be later than its nominal start time. When the customer specifies STPT, the NCCDS may slide the service in an attempt to find a time when it can be scheduled. STPT may be specified either with or without CSN also being specified. For STPT to provide significant benefit, two conditions should ordinarily exist:

- If CSN is specified, the service should require a different primary TDRS resource than the service to which it is coupled.
- The customer should be willing to accept any service start time from the nominal time to the nominal time plus the full value of STPT. However, the NCCDS is required to place the service as close as possible to the nominal start time.

## NOTE

STPT cannot be specified when SBSN is specified.

### D.2.5 STMT

In many cases, a customer will have a preferred nominal start time for a service but can also accept earlier start times. STMT (Service Start Time Minus Tolerance) allows the customer to specify that a service's actual start time may be earlier than its nominal start time. When the customer specifies STMT, the NCCDS may slide the service in an attempt to find a time when it can be scheduled. STMT may be specified either with or without CSN also being specified. For STMT to provide significant benefit, two conditions should ordinarily exist:

- If CSN is specified, the service should require a different primary TDRS resource than the service to which it is coupled.
- The customer should be willing to accept any service start time from the nominal time to the nominal time minus the full value of STMT. However, the NCCDS is required to place the service as close as possible to the nominal start time.

## NOTE

STMT cannot be specified when SBSN is specified.

## D.2.6 MIND

In many cases, a customer will have a preferred duration for a service within a request but can accept a shorter duration when necessary to avoid having the NCCDS decline the request due to resource conflicts. MIND (Minimum Service Duration) allows the customer to specify that a service may be scheduled with a duration less than its specified nominal duration. When the customer specifies MIND, the NCCDS may reduce the duration to fit the service within the available resources. For this to be useful, the customer's operations must be adaptable to a range of service durations. However, the NCCDS is required to schedule the service with a duration as close as possible to the nominal duration.

If MIND is specified without also specifying SBSN or STPT, MIND can only help to avoid resource conflicts occurring at the end of a service. If MIND is specified together with SBSN or is specified together with STPT and a constraint exists that keeps the end of the service from moving to a later time, MIND can also help to avoid resource conflicts occurring at the beginning of a service.

## D.3 General Rules and Limitations

### D.3.1 Nominal Values

In all cases, the event specified by the customer's schedule request must be in compliance with the SN scheduling ground rules when the nominal service start time and service duration values are used. The service-level flexibility parameters are intended to be used to resolve resource allocation conflicts. The NCCDS is not required to use these parameters to rearrange services in an attempt to achieve compliance with the SN scheduling ground rules.

#### NOTE

When SBSN is specified for a service, the nominal service start time parameter is not applicable for that service and the NCCDS must always determine service start time.

### D.3.2 Specified Values for Service-Level Flexibility Parameters

#### D.3.2.1 Invalid Values

The NCCDS may reject a schedule request if independent use of the full specified value of a service-level flexibility parameter would create an invalid event. Examples include:

- MIND specified with a value less than one minute.
- STPT specified with a value that would cause the total duration of an event to exceed 24 hours.

### **D.3.2.2 Flexibility Combinations**

The customer is not required to ensure that all possible combinations of all possible values of all flexibility parameters will yield a valid event. The NCCDS must limit its application of the flexibility parameters such that an event that is initially valid remains valid.

### **D.3.3 Event Structure**

#### **D.3.3.1 Service Start Times**

The customer may specify a service's start time to be relative to the event start time, to be relative to the start time of another service though use of CSN, or to be implicitly bounded by another service though use of SBSN. Service start time flexibility may be specified by use of STPT, STMT, or SBSN.

- a. In all cases, use of service start time flexibility is optional.
- b. In all cases, a schedule request must include at least one service whose start time is specified relative to event start time, i.e., neither CSN or SBSN is specified for that service.
- c. If a schedule request does not specify event start time flexibility, service start time flexibility may be specified for any of the services in the schedule request.
- d. If a schedule request specifies event start time flexibility, it must also specify that at least one service is anchored to the event start time. However, service start time flexibility may be specified for any of the other services in the schedule request. For a service to have its service start time anchored to the event start time, the following conditions must be true:
  - CSN is not specified.
  - SBSN is not specified.
  - STPT is not specified.
  - STMT is not specified.
  - Nominal service start time is specified as 00 hours 00 minutes 00 seconds.

#### **D.3.3.2 Event Start Time**

In a scheduled event, no service can begin earlier than event start time and at least one service must begin at event start time. The NCCDS will ensure this as follows:

- a. If a schedule request does not specify event start time flexibility, the NCCDS will apply specified service-level flexibility as needed. The NCCDS will then use the earliest actual scheduled service start time as the actual scheduled event start time.

- b. If a schedule request specifies event start time flexibility, the NCCDS will limit use of service-level flexibility parameters so that no service's start time becomes earlier than the event start time.

#### **D.3.3.3 Event Start Time Flexibility**

The customer may specify event start time flexibility to allow the NCCDS to resolve resource conflicts for services with no specified service start time flexibility. When the NCCDS applies event start time flexibility, the internal event structure is not changed. There is no change to the relative service start times, and the actual service start times of all services are initially incremented or decremented by the amount of event start time plus or minus tolerance that was applied. Subsequently, the NCCDS may apply specified service start time flexibility as needed.

##### **NOTE**

Although event start time flexibility and service start time flexibility can both be specified within a request, many customers will find it simpler to use only one or the other. Event start time flexibility may be preferred when all services within a request use the same primary TDRS resource (e.g., SA antenna).

#### **D.3.3.4 Event Duration**

No event's duration can exceed 24 hours. The event specified by the customer's schedule request must not have a duration in excess of 24 hours when the nominal service start time and service duration values are used. When a combination of service-level flexibility parameters is specified, the NCCDS must limit their use so that event duration does not exceed 24 hours.

#### **D.3.3.5 Circular Relationships**

No service within a customer's schedule request can have its start time specified, either directly or indirectly, relative to itself. Prohibited circular relationships include, but are not limited to:

- Using CSN to couple a service to itself.
- Using SBSN to bound a service by itself.
- Using CSN to couple a service to a second service that is coupled to the first service.

#### **D.3.4 Precedence**

When use of flexibility is necessary to resolve resource allocation conflicts, the NCCDS is required to apply flexibility parameters in the following precedence order:

- a. Select alternate TDRSS resources (e.g., SA antenna).
- b. Apply event start time flexibility and/or apply service start time flexibility.

When event start time flexibility is specified, the NCCDS must place the event start time as close as possible to the nominal event start time. When service start time

flexibility is specified through use of STPT or STMT, the NCCDS must place the service start time as close as possible to the nominal service start time. When service start time flexibility is specified through use of SBSN, the NCCDS may select any valid service start time that will allow the service to remain bounded by the referenced service.

**NOTE**

The SBSN algorithm used by the NCCDS tends to place the bounded service as early as possible within the bounding service.

- c. Apply MIND.

The NCCDS must schedule services with durations as close as possible to the nominal durations.

**NOTE**

When SBSN is specified for a service, the NCCDS must always determine service start time. A preliminary determination of a valid service start time may be needed before TDRSS resources can be selected. However, the start time flexibility options must be exhausted before MIND can be applied to any service.

## **D.4 Interrelationships Required by Space Network Scheduling Ground Rules**

### **D.4.1 Introduction**

The SN scheduling ground rules imply specific limitations on service-level flexibility when particular interrelationships exist among two or more services. There are four such interrelationships. These fall into two groups:

- a. Interrelationships based on primary and secondary services.
  - 1. One-way tracking.
  - 2. Coherent pairs.
  - 3. Two-way tracking.
- b. Interrelationships between normal and end-to-end test services.

### **D.4.2 Interrelationships Based on Primary and Secondary Services**

#### **D.4.2.1 General**

The following guidelines serve as a model for how the customer should use the service-level flexibility parameters for one-way tracking, coherent pairs, and two-way tracking. As implied by the SN scheduling ground rules, these guidelines treat one of the interrelated services as the primary service and the other one(s) as secondary. The customer is not specifically required to

adhere to these guidelines; however, adherence to these guidelines will help to ensure that use of the flexibility parameters will result in a scheduled event whose service structure is consistent with the customer's intent and that complies with SN scheduling ground rules.

#### **D.4.2.1.1 Recommended Relationships**

It is strongly recommended that the customer apply the service-level flexibility parameters to the primary and secondary services as follows:

- a. If the primary service has no flexibility (i.e., SBSN, CSN, STPT, STMT, and MIND are not used), the secondary service may or may not be linked to the primary with SBSN or CSN.
- b. If the primary service has flexibility (i.e., at least one of SBSN, CSN, STPT, STMT, or MIND is used), the secondary service should be linked to the primary service with either SBSN or CSN. This linkage will automatically preserve the required relationships between the services if the primary service is shifted.

#### **NOTE**

The NCCDS will not reject requests that fail to specify this linkage and will always attempt to schedule a valid event. However, failure to specify this linkage significantly complicates the task and may preclude full use of the specified flexibility and/or result in inability to schedule a valid event.

#### **D.4.2.2 One-Way Tracking**

##### **D.4.2.2.1 General Requirements**

- a. A tracking service's service specification code (SSC) indicates one-way tracking when all of the following are true:
  1. Tracking configuration is normal.
  2. One-way Doppler tracking is required.
  3. Range tracking is not required.
  4. Time transfer is not required.
- b. A one-way tracking service must be associated with a return service. The tracking service's SSC indicates both the return service type and the return service's SSC.

#### **NOTE**

The SN does not provide a Ka-band tracking capability. Consequently, the return service cannot be a KaSAR service.

- c. The start time of the tracking service can be no earlier than the start time of the return service.

- d. The stop time of the tracking service can be no later than the stop time of the return service.
- e. A return service can have only one tracking service associated with it at any one time.
- f. The nominal schedule request must specify a valid event.

#### **D.4.2.2.2 Primary and Secondary Service Relationships**

The return service is the primary service. The one-way tracking service is the secondary service. If the customer's request specifies any service-level flexibility for the return service, it is strongly recommended that the request also explicitly link the tracking service to the return service. The following discussion of NCCDS limitations assumes that this linkage is specified if service-level flexibility is specified for the return service.

#### **D.4.2.2.3 NCCDS Limitations**

The NCCDS must limit its use of the specified service-level flexibility parameters to ensure that the general requirements are satisfied. The primary requirement relevant to use of the service-level flexibility parameters is that the tracking service be bounded by the return service. The following specific limitations apply to one-way tracking. Additional limitations would apply if multiple one-way tracking services were to be specified for a single return service.

- a. Return service specifies MIND.

The NCCDS may use MIND to shorten the return service. This would be done to resolve return service resource conflicts. The NCCDS must limit its use of the return service MIND to ensure that the return service does not end before the stop time of the tracking service.

- b. Tracking service specifies STPT.

The NCCDS will not normally use STPT if it is specified on a one-way tracking service, i.e., sliding the tracking service to a later time will not normally help to avoid conflicts.

- c. Tracking service specifies STMT.

The NCCDS may use STMT to slide the tracking service to an earlier time. This would be done to offset use of return service MIND that could otherwise bring the return service stop time earlier than the tracking service stop time. The NCCDS must limit its use of tracking service STMT to ensure that the tracking service does not start before the return service.

- d. Tracking service specifies MIND.

The NCCDS may use MIND to shorten the tracking service. This would be done to offset use of return service MIND that could otherwise bring the return service stop time earlier than the tracking service stop time. There are no specific limitations on the extent of this use of MIND.

- e. Tracking service specifies SBSN.

The NCCDS will normally start the tracking service at the start time of the return service, i.e., sliding the tracking service to a later time will not normally help to avoid conflicts.

#### **D.4.2.3 Coherent Pairs**

##### **D.4.2.3.1 General Requirements**

- a. As specified by parameters in its SSC, a return service may be either coherent or non-coherent. These parameters are also respecifiable.
  1. MAR. Coherency is indicated by the Mode parameter.
  2. SMAR, Normal SSAR, and Normal KuSAR. Coherency is indicated by combination of the Data Group, DG1 Mode, and DG2 Type parameters.
  3. KaSAR. Always DG2 non-coherent. This must be indicated by combination of the Data Group and DG2 Type parameters.
  4. Shuttle SSAR. Coherency is indicated by Shuttle Transmit Frequency (FRQ2) = 0000000000.
  5. Shuttle KuSAR. Always non-coherent.
- b. When a return service is specified as coherent, it must be paired with a forward service. The possible pairings depend on whether the return service's receiver configuration parameter is specified as Normal or Cross.
  1. Normal support coherent pairs:
    - KuSAR and KuSAF.
    - SSAR and SSAF.
    - MAR and MAF.
    - SMAR and SMAF.
  2. Cross support coherent pairs:
    - SSAR and MAF.
    - SSAR and SMAF.
    - MAR and SSAF.
    - SMAR and SSAF.
- c. The return service must start no earlier than the start time of the forward service, and no later than the stop time of the forward service.
- d. The nominal schedule request must specify a valid event.

- e. When the NCCDS applies flexibility, it will ensure a minimum of one minute of forward and return overlap.

**NOTE**

This is an arbitrary rule not directly based on any SN scheduling ground rule. It is intended to preclude the scheduling of a coherent return service beginning very shortly before the stop time of the associated forward service.

#### **D.4.2.3.2 Primary and Secondary Service Relationships**

The forward service is the primary service. The return service is the secondary service. If the customer's request specifies any service-level flexibility for the forward service, it is strongly recommended that request also explicitly link the return service to the forward service. The following discussion of NCCDS limitations assumes that this linkage is specified if service-level flexibility is specified for the forward service.

#### **D.4.2.3.3 NCCDS Limitations**

The NCCDS must limit its use of the specified service-level flexibility parameters to ensure that the general requirements are satisfied. The primary requirements relevant to use of the service-level flexibility parameters are that the start time of the return service be bounded by the forward service, and that there be a minimum of one minute of forward and return overlap. The following specific limitations apply to coherent pairs:

- a. Forward service specifies MIND.

The NCCDS may use MIND to shorten the forward service. This would be done to resolve forward service resource conflicts. The NCCDS must limit its use of forward service MIND to ensure a minimum of one minute of overlap between the forward and the return service. If the return service specifies SBSN, the NCCDS must limit its use of forward service MIND to ensure that the forward service does not end before the stop time of the return service.

- b. Return service specifies STPT.

The NCCDS may use STPT to slide the return service to a later time. This would be done to resolve return service resource conflicts. The NCCDS must limit its use of return service STPT to ensure a minimum of one minute of overlap between the forward and the return service.

- c. Return service specifies STMT.

The NCCDS may use STMT to slide the return service to an earlier time. This would be done to resolve return service resource conflicts, or to offset use of forward service MIND that could otherwise place the stop time of the forward service less than one minute after the return service start time. The NCCDS must limit its use of return service STMT to ensure that the return service does not start before the forward service.

- d. Return service specifies SBSN.

The NCCDS may use SBSN to slide the return service within the forward service. Unless a later start time is needed to resolve return service resource conflicts, the NCCDS will start the return service at the start time of the forward service.

- e. Return service specifies MIND.

The NCCDS may use MIND to shorten the return service. This would normally be done to resolve return service resource conflicts. However if MIND is specified for the forward service and SBSN is specified for the return service, MIND may be applied to the return service to offset use of forward service MIND that could otherwise place the stop time of the forward service earlier than the stop time of return service. There are no specific limitations on the extent of this use of MIND.

#### **D.4.2.4 Two-Way Tracking**

##### **D.4.2.4.1 General Requirements**

- a. A tracking service's SSC indicates two-way tracking when any of the following is true:
  1. Range tracking is required.
  2. Two-way Doppler tracking is required.
  3. Time transfer is required.
- b. A two-way tracking service must be associated with both a return service and with a forward service. The tracking service's SSC indicates the return service type, the return service's SSC, and the forward service's SSC.

##### **NOTE**

The valid pairs of forward and return services for two-way tracking are the same as the valid pairs for coherent support.

- c. The tracking service must lie within the intersection of the forward and return services.
- d. A return service can have only one tracking service associated with it at any one time.
- e. A forward service can have only one tracking service associated with it at any one time.
- f. For valid two-way tracking to be performed, the return service must be coherent with the forward. If the return service is initially specified as coherent, all of the above rules applicable to coherent pairs apply in addition to the two-way tracking rules. However, the return service may be initially specified as non-coherent and then reconfigured to be coherent. In such cases, the coherent pairs scheduling rules do not apply.
- g. When two-way tracking is scheduled, the NCCDS uses the value from the "Tracking Configuration" parameter in the tracking service's SSC in the return service in place of the value from the "Receiver Configuration" parameter from the return service's SSC.

This ensures that these two parameters will be consistent in the SHO, and may reduce the number of return service SSCs that must be maintained.

- h. The nominal schedule request must specify a valid event.

#### **D.4.2.4.2 Primary and Secondary Service Relationships**

Either the forward or the return service may be the primary service. Either the return or the forward service may be the secondary service. In terms of the general guidelines described in E.4.2.1, the tracking service relates to the secondary service as if the secondary service is a primary service and the tracking service is a secondary service. If the customer's request specifies any service-level flexibility for the primary service, it is strongly recommended that the request also explicitly link the secondary service to the primary service and explicitly link the tracking service to the secondary service. If the customer's request specifies any service-level flexibility for the secondary service, it is strongly recommended that the request also explicitly link the tracking service to the secondary service. The following discussion of NCCDS limitations assumes that this linkage is specified if service-level flexibility is specified for the primary or secondary service.

#### **NOTE**

If the return service is initially specified as coherent, the forward service must be the primary service and the return service must be the secondary service.

#### **D.4.2.4.3 NCCDS Limitations**

The NCCDS must limit its use of the specified service-level flexibility parameters to ensure that the general requirements are satisfied. The primary requirement relevant to use of the service-level flexibility parameters is that the tracking service be bounded by the intersection of the forward and return services. The following specific limitations apply to two-way tracking. Additional limitations would apply if multiple two-way tracking services were to be specified for a single pair of forward and return services.

- a. Primary service specifies MIND.

The NCCDS may use MIND to shorten the primary service. This would be done to resolve primary service resource conflicts. This could shrink the intersection of the forward and return services. The NCCDS must limit its use of the primary service MIND to ensure that the tracking service lies within the intersection of the forward and return services. If the secondary service specifies SBSN, the NCCDS must limit its use of primary service MIND to ensure that the primary service does not end before the stop time of the secondary service.

- b. Secondary service specifies STPT.

The NCCDS may use STPT to slide the secondary service to a later time relative to the primary service. This would be done to resolve secondary service resource conflicts. This could shrink the intersection of the forward and return services. The NCCDS must

limit its use of secondary service STPT to ensure that the tracking service lies within the intersection of the forward and return services.

c. Secondary service specifies STMT.

The NCCDS may use STMT to slide the secondary service to an earlier time relative to the primary service. This would be done to resolve secondary service resource conflicts, or to drag the tracking service to an earlier time thereby offsetting use of forward service MIND that could otherwise bring the stop time of the primary service earlier than the stop time of the tracking service. Use of STMT on the secondary service could shrink the intersection of the forward and return services. The NCCDS must limit its use of secondary service STMT to ensure that the tracking service lies within the intersection of the forward and return services.

d. Secondary service specifies SBSN.

The NCCDS may use SBSN to slide the secondary service within the primary service. Unless a later start time is needed to resolve secondary service resource conflicts, the NCCDS will start the secondary service at the start time of the primary service.

e. Secondary service specifies MIND.

The NCCDS may use MIND to shorten the secondary service. This would normally be done to resolve secondary service resource conflicts. However if MIND is specified for the primary service and SBSN is specified for the secondary service, MIND may be applied to the secondary service to offset use of primary service MIND that could otherwise place the stop time of the primary service earlier than the stop time of secondary service. Use of secondary service MIND could shrink the intersection of the forward and return services. The NCCDS must limit its use of secondary service MIND to ensure that the tracking service lies within the intersection of the forward and return services.

f. Tracking service specifies STPT.

The NCCDS may use STPT to slide the tracking service to a later time relative to the secondary service. This would be done to offset use of STMT on the secondary service which could otherwise drag the start of the tracking service to be earlier than the start of the primary service. The NCCDS must limit its use of tracking service STPT to ensure that the tracking service ends no later than the stop time of the return service and no later than the stop time of the forward service.

g. Tracking service specifies STMT.

The NCCDS may use STMT to slide the tracking service to an earlier time relative to the secondary service. This would be done to offset the use of MIND on either the primary or secondary service which might otherwise bring the primary or the secondary service stop times earlier than the tracking service stop time. The NCCDS must limit its use of tracking service STMT to ensure that the tracking service begins no earlier than the start of the return service and no earlier than the start of the forward service.

- h. Tracking service specifies SBSN.

The NCCDS will normally start the tracking service at the later of:

- Primary service start time.
- Secondary service start time.

Sliding the tracking service to a later time will not normally help to avoid conflicts.

- i. Tracking service specifies MIND.

The NCCDS may use MIND to shorten the tracking service. This would be done to offset the use of MIND on either the primary or secondary service which might otherwise bring the primary or the secondary service stop times earlier than the tracking service stop time. There are no specific limitations on the extent of this use of MIND.

### **D.4.3 End-to-End Test**

#### **D.4.3.1 General Requirements**

- a. Within the schedule request, each forward end-to-end test service must immediately follow an associated normal forward service.
- b. Each forward end-to-end test service must be scheduled with the same start and stop times as the associated normal forward service.
- c. Within the schedule request, each return end-to-end test service must immediately follow an associated normal return service.
- d. Each return end-to-end test service must be scheduled with the same start and stop times as the associated normal return service.

#### **D.4.3.2 Service-Level Parameter Guidelines**

- a. The schedule request message formats require that the nominal service start time and nominal service duration parameters be specified for all services. However, the NCCDS will disregard these parameters for end-to-end test services.
- b. The customer should not specify any of the five service-level flexibility parameters for end-to-end test services. However, the NCCDS will disregard these parameters if they are specified for an end-to-end test service.
- c. It is strongly recommend that the customer's request not link any other service to an end-to-end test service by use of CSN or SBSN. Any such linkage should be applied to the associated normal forward or normal return service.

#### **D.4.3.3 NCCDS Scheduling**

The NCCDS will schedule each end-to-end test service with the scheduled start and stop times of its associated normal forward or return service. Any service-level flexibility specified for the

normal forward or return service is therefore automatically applied to the associated end-to-end test service.

## **D.5 Characteristics of The NCCDS 1998 Scheduler**

### **D.5.1 General**

The NCCDS 1998 scheduler incorporates many flexibility features previously unavailable for SN scheduling. The following paragraphs describe how these features interact when a schedule request specifies more than one type of flexibility for a single service or when a schedule request specifies flexibility for more than one service.

### **D.5.2 Service Sequencing**

The original order of services within a schedule request must be consistent with the order specified in paragraph 7.2.1.5. When a request includes more than one service, the scheduler determines the sequence in which the services will be scheduled and then schedules the services one at a time with the scheduling of each service dependent upon how each of the previous services was scheduled. This sequence is determined as follows:

- a. If any service uses CSN or SBSN to reference a service lower in the list, the referenced service is brought up to just above the service using CSN or SBSN.
- b. If event start time flexibility is specified, at least one of the services must be anchored to the event start time as described in paragraph 7.2.1.1 c. 1. If it is not already at the top of the list, the highest anchored service is brought to the top of the list.
- c. If neither of the preceding conditions apply, there is no change to the original order of services.

### **D.5.3 Use of Flexibility in The Scheduling of Services**

Beginning from the top of the list of services, the scheduler will attempt to schedule each service as follows:

- a. If any combination of available resources is found that allows the service to be scheduled at its nominal start time and with its nominal duration, that combination is used and the scheduler proceeds to the next service. If not, the scheduler proceeds to the next step.
- b. If any combination of available resources and service start times is found that allows the service to be scheduled with its nominal duration, that combination is used and the scheduler proceeds to the next service. If not, the scheduler proceeds to the next step.
- c. If any combination of available resources, service start times and service duration is found that allows the service to be scheduled, that combination is used and the scheduler proceeds to the next service. If such a combination cannot be found, the scheduler proceeds as follows:

1. If this is the first service in the sequence, the request is declined.
2. If none of the previously scheduled services retain resource flexibility, the request is declined.
3. If the previously scheduled services retain resource flexibility, the scheduler will attempt to reschedule the previous services using different resources in an attempt to allow subsequent services to schedule.

#### **D.5.4 Limitations**

Because of the need to achieve a satisfactory balance of scheduling performance and scheduling effectiveness, the scheduler cannot always make optimal use of all customer-specified scheduling flexibility. The following limitations apply:

- a. Refer to D.5.3 b. At this step, the scheduler accepts the first combination of available resources and service start times that allows the service to be scheduled with its nominal duration. It does not attempt to minimize the amount of time shifting.
- b. Refer to D.5.3 c. At this step, the scheduler accepts the first combination of available resources and service start time and service duration that allows the service to be scheduled. It does not attempt to minimize the amount of service reduction.
- c. Refer to D.5.3 c.2. The scheduler does not attempt to reschedule previously scheduled services if they only retain start time or duration flexibility.

#### **D.5.5 Customer Control of Service Sequencing**

The order of the services within a schedule request must be consistent with the order specified in paragraph 7.2.1.5. In addition, the customer should comply with the guidelines presented earlier in this Appendix. These constraints limit the customer's ability to control the order in which the scheduler will attempt to schedule the services within a schedule request. Nonetheless, it may be possible for some customers to improve their scheduling results by restructuring their schedule requests. Whenever possible, schedule requests should be structured such that services with relatively little flexibility will be scheduled before services with greater flexibility. This will tend to maximize the likelihood that the scheduler will effectively use the specified service flexibility.

Resource flexibility is of particular concern. Whenever possible, schedule requests should be structured such that services requiring relatively scarce resources will be scheduled before services requiring relatively abundant resources. The resources of greatest concern are the SA antennas, the MAF and SMAF antennas, and the MAR and SMAR links. Relative to these resources, it is suggested that:

- a. Assuming that services would not be reordered, if a request includes both SA forward and MA (or SMA) forward services, the SA forward services should precede the MA (or SMA) forward services.

- b. Assuming that services would not be reordered, if a request includes both SA return and MA (or SMA) return services, the SA return services should precede the MA (or SMA) return services.
- c. If a forward service is coupled to an MA (or SMA) return service, it may be possible to use the parameters in a different manner that will couple the return service to the forward service but retain essentially the same relationship.

Some schedule requests will use combinations of resource and start time flexibility in ways in which analysis cannot easily be used to determine a preferred service order. In such cases, experimentation with different service orders is recommended if satisfactory results are not obtained with the original service order.

## Abbreviations and Acronyms

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AFN	Acquisition Failure Notification
AIS	Automated Information System
AMS	Automated Message System
API	Application Program Interface
ASCII	American Standard Code for Information Interchange
AXAF	Advanced X-Ray Astrophysics Facility
BED	block error detection
BER	bit error rate
BI	bi phase
BRTS	Bilateration Ranging Transponder System
C/N0	carrier power to noise power spectral density ratio
CCB	Configuration Control Board
CCF	Consolidated Communications Facility
CCR	configuration change request
CCS	Communications and Control Segment, NCCDS
CDDS	Communications and Data Distribution System
COTS	commercial off the shelf
CTM	Communications Test Message
DBE	Data Block Emulator
DBM	Data Base Manager
DCN	Documentation Change Notice
DES	Data Encryption Standard
DG1	Data Group 1
DG2	Data Group 2
DIS	Data Information System
DNS	Domain Name System
DPI	Data Processing Installation

DQM	Data Quality Monitoring
DSN	Deep Space Network
DSRS	Data Storage and Retrieval System
ECS	External Communications Subsystem
EIRP	effective isotropic radiated power
EIF	Engineering Interface Testing
EOS	Earth Observing System
ERBS	Earth Radiation Budget Satellite
EUVE	Extreme Ultraviolet Explorer
FDS	Flight Dynamics System
FP	fixed pattern
FSS	Flight Support System
FTP	File Transfer Protocol
GCM	Ground Control Message
GCMR	Ground Control Message Request
GN	Ground Network
GRGT	Guam Remote Ground Terminal
GRO	Gamma Ray Observatory (now Compton GRO)
GSDE	Ground System Development Environment
GSFC	Goddard Space Flight Center
GSS	Generic Security Service or Ground Support System
GSTDN	Goddard Space Flight Tracking and Data Network
HOSC	Huntsville Operations Support Center
HRDM	high-rate demultiplexer
HDRR	high data rate recorder
HST	Hubble Space Telescope
HSTOCC	Hubble Space Telescope Operations Control Center
HTTP	Hypertext Transfer Protocol
ICA	Interface Control Agreement
ICD	Interface Control Document

ICMP	Internet Control Message Protocol
ID	identification
IF	intermediate frequency
IIRV	Improved Interrange Vector
IP	Internet Protocol
IRIG	inter-range instrumentation group
ISI	Interim Support Instruction
JPL	Jet Propulsion Laboratory
JSC	Johnson Space Center
KaSA	Ka-band single access
<b>KaSA1WB</b>	<b>Ka-band single access antenna 1 wideband (service)</b>
KaSAF	Ka-band single access forward (service)
KaSAR	Ka-band single access return (service)
KuSA	Ku-band single access
KuSAF	Ku-band single access forward (service)
KuSAR	Ku-band single access return (service)
LAN	local area network
LCP	left circular polarization
LDBP	Long Duration Balloon Program
LI	local interface
LSD	least significant digit
MA	multiple access
MAF	multiple access forward
MAR	multiple access return
MDM	multiplexer/demultiplexer
MOC	Mission Operations Center
MOD	Mission Operations Directorate, JSC
MOM	Mission Operations Manager
MO&DSD	Mission Operations and Data Systems Directorate

MSB	most significant bit
MSFC	Marshall Space Flight Center
MSM	Mission Support Manager
MSOCC	Multisatellite Operations Control Center
MSB	most significant bit
NASA	National Aeronautics and Space Administration
Nascom	NASA Communications
NASCOP	NASA Communications Operating Procedures
NCC	Network Control Center
NCCDS	Network Control Center Data System
NFE	NCC front end
NISDDT	Nascom Interface Standard for Digital Data Transmission
NISN	Nascom Integrated Services Network
NOAA	National Oceanic and Atmospheric Administration
NRZ	nonreturn to zero
NSBF	National Scientific Balloon Facility
OCC/MPS	Operations Control Center/Mission Planning System
ODM	Operations Data Message
OPM	operations message
OST	Operations Support Team
PB4	Parallel Grouped Binary Millisecond/Microsecond Time Code
PN	pseudorandom noise
POIC	Payload Operations Integration Center
QOP	quality of protection
RCP	right circular polarization
RF	radio frequency
RFC	Request for Comments
RMA	Reliability/Maintainability/Availability
RTS	Remote Tracking Station

SA	single access
SAR	Schedule Add Request
SAS	Service Accounting Segment, NCCDS
SCD	Small Conversion Device
SEAS	Systems, Engineering, and Analysis Support
S/CL	Security/Criticality Level
SGLT	Space-Ground Link Terminal
SHO	Scheduling Order Data Message
SIC	support identification code
SL3	Sensitivity Level Three
SMA	S-band multiple access
SMAF	S-band multiple access forward
SMAR	S-band multiple access return
SN	Space Network
SNMP	Simple Network Management Protocol
SPSR	Service Planning Segment Replacement
SRM	Schedule Result Message
SRR	Schedule Result Request
SSA	S-band single access
SSAF	S-band single access forward
SSAR	S-band single access return
SSC	service specification code
STDN	Spaceflight Tracking and Data Network
STGT	Second TDRSS Ground Terminal
SUPIDEN	support identifier
TBR	to be reviewed
TBS	to be specified; or, to be supplied
TCP	Transmission Control Protocol
TDRS	Tracking and Data Relay Satellite
TDRSS	Tracking and Data Relay Satellite System

TOPEX	Topography Experiment
TRK	tracking
TRMM	Tropical Rainfall Measuring Mission
TSW	TDRS Scheduling Window
TT&C	Tracking, Telemetry and Command
TUT	TDRSS Unscheduled Time
UARS	Upper Atmosphere Research Satellite
UCB	University California Berkley
UDP	User Datagram Protocol
UPD	User Performance Data
UPS	User Planning System
USM	User Schedule Message
USS	User Services Subsystem
UTC	universal time coordinated
VIC	vehicle identification code
VID	vehicle identification
WFF	Wallops Flight Facility
WSC	White Sands Complex
WSGT	White Sands Ground Terminal
XDR	eXternal Data Representation
XTE	X-Ray Timing Explorer (now Rossi XTE)

## Glossary

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acknowledgment	The confirmation of receipt of a message, according to communications protocol.
active period	The period of time covered by published schedules.
active schedule	The schedule that includes all events for which customer schedules have been disseminated.
Alternate SAR	A request to add a single event to the schedule if a referenced request fails to add an event to the schedule.
authentication	The process of determining the identity of a user that is attempting to access a system.
client/server computing	A model for how computers can share resources in a network. In client/server computing, one component of an application called the “client”, runs on one computer, while another component runs on a remote computer called a “server”, with files, databases, and programs. Special software needs to be installed on both the client and the server. The client makes requests for services such as printing, database processing, and file sharing from the server.
conflict	A situation that occurs when a request for network resources cannot be granted.
current schedule	See active schedule.
customer	Any entity which makes use of the STDN for operations, simulation, or testing.
data stream	An independent data signal contained within a service. I and Q channels are separate data streams within a service.
Data Stream ID	An identifier for each data stream.
declined request	A schedule request that has been processed without placing an event on the schedule.
end-to-end test	A WSC service used to simulate customer satellite K- and S-band communications.
event	All related services (forward link, return link, tracking and simulation service) for a single TDRS, and a single SUPIDEN, for one continuous SN support period.

event start tolerances	These are the plus and minus values specifying the time that an event can be shifted forward or backward to resolve a conflict.
event termination	The end of an event, either at its normally scheduled termination time, or when requested by the customer or a NCC console operator.
field	Defined areas of the standard Nascom 4800-bit block, consisting of the network control header, user headers, time, data, and error control fields.
firewall	A system or group of systems that enforces an access control policy between two networks. The firewall can be thought of as a pair of mechanisms: one which exists to block traffic, and the other which exists to permit traffic.
formatted message	A high-speed message whose text is fully specified in advance by a known set of values to express the contents of any field in the message.
Ground Control Message	A message used to make changes to the service support equipment configuration and to implement specific WSC functions (i.e., reacquisition, forward link sweep, Doppler compensation inhibit) that may be necessary to meet the individual customer's requirements.
Ground Network	A NASA institutional resource consisting of the ground stations at Merritt Island/Ponce de Leon, Bermuda, and Dakar that provide tracking and data acquisition services to approved spacecraft missions.
high-speed message	A message passed from computer to computer over high-capacity data lines.
interface channel	A NISN communication data channel connecting SN elements and control centers.
interference	A degradation in communication due to noise.
multiple access	The S-band communications capability in TDRSS which provides one forward and five simultaneous return links per TDRS using phased array techniques.
parameter fields	Fields defined within the data message subfield of the data field of the standard Nascom 4800-bit block.
Premium Support Request	A specific request to add an event for a spacecraft that affirms the customer's willingness to accept billing at a premium rate for support scheduled in response to requests received less than 45 minutes prior to the requested event start time.

prototype event	A predefined combination of service configurations, as defined by service specification codes, for service durations, and relative start times defined for a specific customer spacecraft to be used in the scheduling process. Each prototype event is identified by a three character alphanumeric code and can contain up to 16 services.
reconfiguration	A near-real-time change in one or more parameters of a service.
Replace Request	A customer request to delete a scheduled event and replace it with another. If the NCCDS is unable to effect the replacement, the original event remains on the schedule.
request ID	An identification number assigned by the requester to a specific request.
S-band multiple access	A more advanced form of multiple access available on TDRS H, I, and J, but not available on earlier TDRSs. Note that although all TDRS multiple access services operate within the S-band frequencies only the multiple access services on TDRS H, I, and J are termed S-band multiple access. Refer to multiple access.
Schedule Add Request (SAR)	A specific schedule request to add a single event to the schedule.
schedule delete request	A request to delete a customer scheduled event.
schedule dissemination	The process by which the NCC transmits schedules to customers and SN elements, including Payload Operations Control Centers, WSC ground stations, Nascom, Flight Dynamics Facility, and Sensor Data Processing Facility.
Schedule generation period	The period of time in advance of publication (transmission) of the weekly schedule, during which the schedule is developed.
Schedule generation process	This process produces events through the use of prototype events, service specification codes, and specific requests for customers.
Scheduling Order	A message sent to the WSC that defines the scheduled services and parameter values for a particular event. Each SHO has a unique identifier called the SHO ID.
Second TDRSS Ground Terminal	One of two ground facilities for support and control of TDRS and communications services.
service	A service describes a functional type of support for a customer for a continuous period of time (e.g., forward links, return links, tracking, and end-to-end test).

service specification code	A set of data that specifies the initial configuration of a service for a given customer.
setup time	The time required to properly configure equipment while preparing to support each service.
simulation	See “end-to-end test”.
single access (SA)	Refers to one of the steerable antennas on a TDRS, which is able to support only one customer at a time; also refers to a service supported by such an antenna.
space network functional elements	TDRS, White Sands Ground Terminal, GN, NCC, Second TDRSS Ground Terminal, functional Vandenberg Air Force Base Relay, functional elements DSN, Bilateral Ranging Transponder System, Compatibility Test Van, SOC, Flight Dynamics Facility, NISN, Merritt Island Tracking Station.
Spaceflight Tracking and Data Network	A combination of the GN and SN.
start time tolerances	See event start tolerances.
subfield	Fields within the network control header, user header, time, data, and error control fields of the standard Nascom 4800-bit block.
support identification code	The unique four-character numeric indicator for a mission. Refer also to support identifier.
support identifier	A seven-character code used to identify the satellite or task being supported. It is broken into three parts: class, SIC, and function. Class identifies the major entity for which the support is being provided (e.g., Houston, network, and GSFC). The SIC identifies the mission being requested. The function is an identification of the type of support being provided (e.g., launch simulator). SUPIDEN codes and their meanings are explained in the Support Identification Code Dictionary (Reference 2.4e).
TDRS Scheduling Window	A period of time during which the SN can provide support to a customer on a specific TDRS.
tracking and data relay satellite	A communications relay satellite used as the link between a WSC relay ground station and the customer satellites.
transport address	For each process communicating over a TCP connection, the transport address consists of the Internet Protocol (IP) address and port number.

TDRSS Unscheduled Time (TUT)	Time within SN active schedule that has not been allocated for customer support. Lists of TUT are distributed to customers to assist them in performing schedule updates.
wait list	A list of declined requests that are reprocessed when resources are relinquished by events being deleted from the active schedule.
Wait List Request	A request to place a declined request on the wait list.
White Sands Complex	The entire ground segment of the TDRSS located at White Sands, New Mexico.
White Sands Ground Terminal	The White Sands Ground Terminal that is functionally identical to the Second TDRSS Ground Terminal.

**Annex 1**  
**To**  
**Interface Control Document**  
**Between the**  
**Network Control Center Data System**  
**and the**  
**Mission Operations Centers**  
**GSFC MOCs**

June 1999

Prepared Under Contract NAS-9-98100

Prepared By:

 6/4/99

Kant R. Patel  
Computer Sciences Corporation  
NCC Project

Date

Approved By:

 11/16/00

Roger N. Clason, Project Manager  
NCC Project, Code 451.5  
Goddard Space Flight Center

Date

 11/25/00

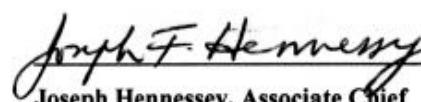
Roger J. Flaherty, Project Manager  
Space Network Project, Code 451.  
Goddard Space Flight Center

Date

 11/01/2000

David J. Littmann, Chairman  
Configuration Control Board  
Space Network Project, Code 451.  
Goddard Space Flight Center

Date

 10/30/00

Joseph Hennessey, Associate Chief  
Information Systems Center, Code 580  
Goddard Space Flight Center

Date

This Revision 1 issue of 451-ICD-NCCDS/MOC supersedes the Interface Control Document Between the Network Control Center Data System and the Mission Operations Centers 530-ICD-NCCDS/MOC and all of its DCNs.

**Goddard Space Flight Center**  
**Greenbelt, Maryland**

# Annex 1

## GSFC MOCs

---

### I. Introduction

The purpose of this annex is to provide information, unique to the Goddard Space Flight Center (GSFC) Mission Operations Centers (MOCs), that supplements general MOC information in the main body of this document. It includes communication format parameters, messages supported and mission-unique identifiers for some of the missions supported by the Multisatellite Operations Control Center (MSOCC), or stand alone Mission Operations Centers (MOC ) or the Operation Control Centers (OCC).

### II. Communication Format Parameters

#### A. Nascom 4800bit Block Protocol Parameters

##### A.1 Hubble Space Telescope Operation Control Center (HSTOCC) at GSFC:

Parameter	Value	MOC ICD Reference
Source Code	113 (octal) Operations 373 (octal) Scheduling	4.2.2.2.1 b
Destination Code	same as source code	4.2.2.2.1 c, 4.2.2.2.2 d
VID	001 (octal)	4.2.2.2.2 a

##### A.2 Gamma Ray Observatory (GRO) MOC, (Also known as Compton GRO) at GSFC:

Parameter	Value	MOC ICD Reference
Source Code	240(octal) Operations 353 (octal) Scheduling	4.2.2.2.1 b
Destination Code	same as source code	4.2.2.2.1 c, 4.2.2.2.2 d
VID	005 (octal)	4.2.2.2.2 a

**A.3 Earth Radiation Budget Satellite (ERBS) at MSOCC:**

Parameter	Value	MOC ICD Reference
Source Code	336 (octal) Operations 353(octal) Scheduling	4.2.2.2.1 b
Destination Code	same as source code	4.2.2.2.1 c, 4.2.2.2.2 d
VID	004 (octal)	4.2.2.2.2 a

**A.4 Upper Atmosphere Research Satellite (UARS) at MSOCC:**

Parameter	Value	MOC ICD Reference
Source Code	076 (octal) Operations 353 (octal) Scheduling	4.2.2.2.1 b
Destination Code	same as source code	4.2.2.2.1 c, 4.2.2.2.2 d
VID	007 (octal)	4.2.2.2.2 a

**A.5 X-Ray Timing Explorer (XTE) MOC, (Also known now as Rossi XTE) at GSFC:**

Parameter	Value	MOC ICD Reference
Source Code	315(octal) Operations 353(octal) Scheduling	4.2.2.2.1 b
Destination Code	same as source code	4.2.2.2.1 c, 4.2.2.2.2 d
VID	015 (octal)	4.2.2.2.2 a

**A.6 Extreme Ultraviolet Explorer (EUVE) MOC at University California Berkley (UCB):**

Parameter	Value	MOC ICD Reference
Source Code	054 (octal) Operations 353 (octal) Scheduling	4.2.2.2.1 b
Destination Code	same as source code	4.2.2.2.1 c, 4.2.2.2.2 d
VID	010(octal)	4.2.2.2.2 a

**A.7 Tropical Rainfall Measuring Mission (TRMM) at GSFC:**

Parameter	Value	MOC ICD Reference
Source Code	151 (octal) Operations 353 (octal) Scheduling	4.2.2.2.1 b
Destination Code	same as source code	4.2.2.2.1 c, 4.2.2.2.2 d
VID	016(octal)	4.2.2.2.2 a

**B. TCP/IP Protocol Parameters**

The GSFC MOCs do not use TCP/IP Parameters for their communications with the NCCDS.

**C. FTP Protocol Parameters**

The GSFC MOCs do not use FTP Parameters for their communications with the NCCDS.

### III. Messages Supported

Message Type/Class	Name	In use by GSFC MOC	MOC ICD Reference
99/10	Schedule Add Request Message	Yes	6.2.1.1, 7.2.1
99/02	Schedule Result Message	Yes	6.2.1.2, 7.2.2
99/11	Schedule Delete Request Message	Yes	6.2.1.3, 7.2.3
99/12	Schedule Replace Request Message	No	6.2.1.6, 7.2.6
99/21	Alternate Schedule Add Request Message	No	6.2.1.7, 7.2.7
99/24	Wait List Request Message	No	6.2.1.8, 7.2.8
99/25	TDRS Scheduling Window Message	No	6.2.1.9, 7.2.9
99/28	Schedule Result Request Message	No	6.2.1.5, 7.2.5
99/01	Schedule Delete Notification Message	Yes	6.2.1.4, 7.2.4
94/01	User Schedule Message—Fixed Normal Support	Yes	6.2.2.1, 7.3
94/02	User Schedule Message—Fixed Premium Support	Yes	6.2.2.2, 7.3
94/03	User Schedule Message—Fixed Simulation Support	Yes	6.2.2.3, 7.3
94/04	User Schedule Message—Flexible Normal Support	No	6.2.2.4, 7.3
94/05	User Schedule Message—Flexible Simulation Support	No	6.2.2.5, 7.3
98/03	User Reacquisition Request Message	Yes	6.3.1.1, 8.2.1a
98/05	Forward Link Sweep Request Message	Yes	6.3.1.2, 8.2.1b
98/06	Forward Link EIRP Reconfiguration Message	Yes	6.3.1.3, 8.2.1c
98/07	Expanded User Freq. Uncertainty Request Message	Yes	6.3.1.4, 8.2.1d
98/04	User Reconfiguration Request Message	Yes	6.3.1.5, 8.2.1e
98/08	Doppler Compensation Inhibit Request Message	Yes	6.3.1.6, 8.2.1f
98/02	GCM Disposition Message	Yes	6.3.1.7, 8.2.1g
98/01	GCM Status Message	Yes	6.3.1.8, 8.2.1h
92/04	User Performance Data Request Message	Yes	6.3.2.1, 8.3a
92/62	Return Channel Time Delay Measurement Message	Yes	6.3.2.2, 8.3b
92/63	Acquisition Failure Notification Message	Yes	6.3.2.3, 8.3c
92/66	Time Transfer Message	Yes	6.3.2.4, 8.3d
91/01	User Performance Data Message	Yes	6.3.3.1, 8.4.1
91/03	Communications Test Message	Yes	6.3.3.2, 8.4.3
N/A	Acknowledgment	Yes	5.6.1
03/10	State Vector Message	No	9.1, 9.5
03/14	State Vector Acknowledgment from NCCDS	No	9.2
03/15	State Vector Inflight Update Message	No	9.1, 9.5
03/60	State Vector Acknowledgment from MOC	No	9.2

## IV. Mission-Unique Identifiers

### A. HSTOCC at GSFC:

Parameter	Value	MOC ICD Reference
SUPIDEN	A1446MS	The SUPIDEN is used in all message types defined in Sections 5 through 8.
VIC	01	Item 5 of Table 7-13, Item 5 of Table 8-19, Item 3 of Tables 8-21 - 8-30, Item 3 of Tables 8-32 - 8-34 Item 3 of Tables 8-36 - 8-37

### B. GRO MOC at GSFC:

Parameter	Value	MOC ICD Reference
SUPIDEN	A4625MS	The SUPIDEN is used in all message types defined in Sections 5 through 8.
VIC	01	Item 5 of Table 7-13, Item 5 of Table 8-19, Item 3 of Tables 8-21 - 8-30, Item 3 of Tables 8-32 - 8-34 Item 3 of Tables 8-36 - 8-37

### C. ERBS at MSOCC:

Parameter	Value	MOC ICD Reference
SUPIDEN	A1398MS	The SUPIDEN is used in all message types defined in Sections 5 through 8.
VIC	01	Item 5 of Table 7-13, Item 5 of Table 8-19, Item 3 of Tables 8-21 - 8-30, Item 3 of Tables 8-32 - 8-34 Item 3 of Tables 8-36 - 8-37

**D. UARS at MSOCC:**

Parameter	Value	MOC ICD Reference
SUPIDEN	A3782MS	The SUPIDEN is used in all message types defined in Sections 5 through 8.
VIC	01	Item 5 of Table 7-13, Item 5 of Table 8-19, Item 3 of Tables 8-21 - 8-30, Item 3 of Tables 8-32 - 8-34 Item 3 of Tables 8-36 - 8-37

**E. XTE MOC at GSFC:**

Parameter	Value	MOC ICD Reference
SUPIDEN	A6581MS	The SUPIDEN is used in all message types defined in Sections 5 through 8.
VIC	01	Item 5 of Table 7-13, Item 5 of Table 8-19, Item 3 of Tables 8-21 - 8-30, Item 3 of Tables 8-32 - 8-34 Item 3 of Tables 8-36 - 8-37

**F. EUVE MOC at UCB:**

Parameter	Value	MOC ICD Reference
SUPIDEN	A6951MS	The SUPIDEN is used in all message types defined in Sections 5 through 8.
VIC	01	Item 5 of Table 7-13, Item 5 of Table 8-19, Item 3 of Tables 8-21 - 8-30, Item 3 of Tables 8-32 - 8-34 Item 3 of Tables 8-36 - 8-37

## G. TRMM MOC at GSFC:

Parameter	Value	MOC ICD Reference
SUPIDEN	A0338MS	The SUPIDEN is used in all message types defined in Sections 5 through 8.
VIC	01	Item 5 of Table 7-13, Item 5 of Table 8-19, Item 3 of Tables 8-21 - 8-30, Item 3 of Tables 8-32 - 8-34 Item 3 of Tables 8-36 - 8-37

## V. Mission-Unique Agreement

This Mission-Unique Agreement specifies the roles, responsibilities, and agreements between the Network Control Center Data System (NCCDS) Data Processing Installation (DPI) and the GSFC MOC DPI with respect to the security of the information exchanged between them.

NCCDS shall be designed and operated to protect all information stored and processed by it as S/CL 3 information. The GSFC MOC DPI shall be designed and operated to protect all information stored and processed by it as Security Criticality Level (S/CL) **TBS** information.

The NCCDS is governed by the Security Plan for the Network Control Center, NCC 98, April 1998 and the GSFC MOC will be governed by **TBS** Security Policy.

## VI. Message Interchange Security Arrangements

The following are the current message interchange security arrangements:

**TBS**

## VII. Approvals

The management of NCCDS and the GSFC MOC DPIs are each responsible for securing certification and authorization to operate their respective DPI. Automated exchange of information between the NCCDS and the GSFC MOC is permitted only under both approvals, including joint approval of this interface arrangement.

**Annex 2**  
**To**  
**Interface Control Document**  
**Between the**  
**Network Control Center Data System**  
**and the**  
**Mission Operations Centers**  
**MSFC HOSC**

June 1999

Prepared Under Contract NAS-9-98100

Prepared By:



6/4/99

Kant R. Patel  
Computer Sciences Corporation  
NCC Project

Date

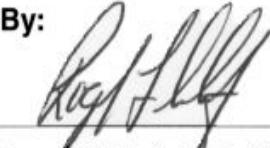
Approved By:



11/16/00

Roger N. Clason, Project Manager  
NCC Project, Code 451.5  
Goddard Space Flight Center

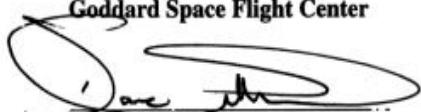
Date



11/29/00

Roger J. Flaherty, Project Manager  
Space Network Project, Code 451.  
Goddard Space Flight Center

Date



11/01/2000

David J. Littmann, Chairman  
Configuration Control Board  
Space Network Project, Code 451.  
Goddard Space Flight Center

Date



11/01/2000

Axel Roth, Director  
Flight Projects Directorate, FD01  
Marshall Space Flight Center

Date

This Revision 1 issue of 451-ICD-NCCDS/MOC supersedes the Interface Control Document Between the Network Control Center Data System and the Mission Operations Centers 530-ICD-NCCDS/MOC and all of its DCNs.

**Goddard Space Flight Center**  
**Greenbelt, Maryland**

## Annex 2 MSFC HOSC

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### I. Introduction

The purpose of this annex is to provide information, unique to the Marshall Space Flight Center (MSFC) Huntsville Operations Support Center (HOSC) that supplements MOC information in the main body of this document. It includes communication format parameters, supported messages, and mission-unique identifiers for the MSFC facility.

### II. Communication Format Parameters

#### A. Nascom 4800bit Block Parameters

Parameter	Value	MOC ICD Reference
Source Code	242 (octal) Operations	4.2.2.2.1 b
Destination Code	same as source code	4.2.2.2.1 c, 4.2.2.2.2 d
VID	NNN	4.2.2.2.2 a

#### B. TCP/IP Protocol Parameters

The MSFC HOSC does not use TCP/IP Parameters for its communications with the NCCDS.

#### C. FTP Protocol Parameters

The MSFC HOSC does not use FTP Protocol Parameters for its communications with the NCCDS.

### III. Messages Supported

Message Type/Class	Name	In use by MSFC HOSC	MOC ICD Reference
99/10	Schedule Add Request Message	No	6.2.1.1, 7.2.1
99/02	Schedule Result Message	No	6.2.1.2, 7.2.2
99/11	Schedule Delete Request Message	No	6.2.1.3, 7.2.3
99/12	Schedule Replace Request Message	No	6.2.1.6, 7.2.6
99/21	Alternate Schedule Add Request Message	No	6.2.1.7, 7.2.7
99/24	Wait List Request Message	No	6.2.1.8, 7.2.8
99/25	TDRS Scheduling Window Message	No	6.2.1.9, 7.2.9
99/28	Schedule Result Request Message	No	6.2.1.5, 7.2.5
99/01	Schedule Delete Notification Message	No	6.2.1.4, 7.2.4
94/01	User Schedule Message—Fixed Normal Support	No	6.2.2.1, 7.3
94/02	User Schedule Message—Fixed Premium Support	No	6.2.2.2, 7.3
94/03	User Schedule Message—Fixed Simulation Support	No	6.2.2.3, 7.3
94/04	User Schedule Message—Flexible Normal Support	No	6.2.2.4, 7.3
94/05	User Schedule Message—Flexible Simulation Support	No	6.2.2.5, 7.3
98/03	User Reacquisition Request Message	No	6.3.1.1, 8.2.1a
98/05	Forward Link Sweep Request Message	No	6.3.1.2, 8.2.1b
98/06	Forward Link EIRP Reconfiguration Message	No	6.3.1.3, 8.2.1c
98/07	Expanded User Frequency Uncertainty Request Message	No	6.3.1.4, 8.2.1d
98/04	User Reconfiguration Request Message	No	6.3.1.5, 8.2.1e
98/08	Doppler Compensation Inhibit Request Message	No	6.3.1.6, 8.2.1f
98/02	GCM Disposition Message	No	6.3.1.7, 8.2.1g
98/01	GCM Status Message	No	6.3.1.8, 8.2.1h
92/04	User Performance Data Request Message	No	6.3.2.1, 8.3a
92/62	Return Channel Time Delay Measurement Message	No	6.3.2.2, 8.3b
92/63	Acquisition Failure Notification Message	No	6.3.2.3, 8.3c
92/66	Time Transfer Message	No	6.3.2.4, 8.3d
91/01	User Performance Data Message	Yes	6.3.3.1, 8.4.1
91/03	Communications Test Message	No	6.3.3.2, 8.4.3
N/A	Acknowledgment	No	5.6.1
03/10	State Vector Message	No	9.1, 9.5
03/14	State Vector Acknowledgment from NCCDS	No	9.2
03/15	State Vector Inflight Update Message	No	9.1, 9.5
03/60	State Vector Acknowledgment from MOC	No	9.2

## IV. Mission-Unique Identifiers

Parameter	Value	MOC ICD Reference
SUPIDEN	ANNNNAA	The SUPIDEN is used in all message types defined in Sections 5 through 8.
VIC	NN	Item 5 of Table 7-13, Item 5 of Table 8-19, Item 3 of Tables 8-21 - 8-30, Item 3 of Tables 8-32 - 8-34 Item 3 of Tables 8-36 - 8-37

## V. Mission-Unique Agreement

This Mission-Unique Agreement specifies the roles, responsibilities, and agreements between the Network Control Center Data System (NCCDS) Data Processing Installation (DPI) and the MSFC HOSC DPI with respect to the security of the information exchanged between them.

NCCDS shall be designed and operated to protect all information stored and processed by it as S/CL 3 information. The MSFC HOSC DPI shall be designed and operated to protect all information stored and processed by it as Security Criticality Level (S/CL) **TBS** information.

The NCCDS is governed by the Security Plan for the Network Control Center, NCC 98, April 1998 and the MSFC HOSC will be governed by **TBS** Security Policy.

## VI. Message Interchange Security Arrangements

The following are the current message interchange security arrangements:

### **TBS**

## VII. Approvals

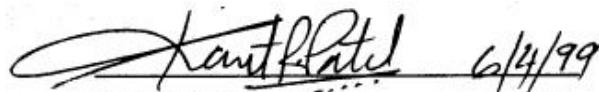
The management of NCCDS and the MSFC HOSC DPIs are each responsible for securing certification and authorization to operate their respective DPI. Automated exchange of information between the NCCDS and the MSFC HOSC is permitted only under both approvals, including joint approval of this interface arrangement.

**Annex 3**  
**To**  
**Interface Control Document**  
**Between the**  
**Network Control Center Data System**  
**and the**  
**Mission Operations Centers**  
**BRTS MOC**

June 1999

Prepared Under Contract NAS-9-98100

Prepared By:

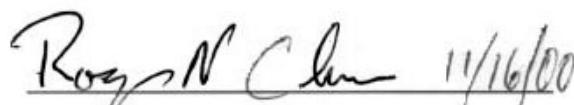


Kant R. Patel 6/4/99

Kant R. Patel  
Computer Sciences Corporation  
NCC Project

Date

Approved By:



Roger N. Clason 11/16/00

Roger N. Clason, Project Manager  
NCC Project, Code 451.5  
Goddard Space Flight Center

Date



Roger J. Flaherty 11/25/00

Roger J. Flaherty, Project Manager  
Space Network Project, Code 451.  
Goddard Space Flight Center

Date



David J. Littmann 11/01/2000

David J. Littmann, Chairman  
Configuration Control Board  
Space Network Project, Code 451.  
Goddard Space Flight Center

Date



Dr. R. S. Wallace 11/8/00

Dr. R. S. Wallace, Project Manager  
Consolidated Space Operations Contract, Code 450.C  
Goddard Space Flight Center

Date

This Revision 1 issue of 451-ICD-NCCDS/MOC supersedes the Interface Control Document Between the Network Control Center Data System and the Mission Operations Centers 530-ICD-NCCDS/MOC and all of its DCNs.

**Goddard Space Flight Center**  
**Greenbelt, Maryland**

## Annex 3 BRTS MOC

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### I. Introduction

The purpose of this annex is to provide information, unique to the Bilateral Ranging Transponder System (BRTS) Mission Operations Center (MOC), that supplements general MOC information in the main body of this document. It includes communication format parameters, messages supported and mission-unique identifiers for the Flight Dynamics Facility (FDF) BRTS MOC.

### II. Communication Format Parameters

#### A. Nascom 4800bit Block Protocol Parameters

Parameter	Value	MOC ICD Reference
Source Code	020 (octal) Operations 020 (octal) Scheduling	4.2.2.2.1 b
Destination Code	same as source code	4.2.2.2.1 c, 4.2.2.2.2 d
VID	003 (octal)	4.2.2.2.2 a

#### B. TCP/IP Protocol Parameters

The BRTS MOC does not use TCP/IP Parameters for its communications with the NCCDS.

#### C. FTP Protocol Parameters

The BRTS MOC does not use FTP Protocol Parameters for its communication with the NCCDS.

### III. Messages Supported

Message Type/Class	Name	In use by BRTS MOC	MOC ICD Reference
99/10	Schedule Add Request Message	Yes	6.2.1.1, 7.2.1
99/02	Schedule Result Message	Yes	6.2.1.2, 7.2.2
99/11	Schedule Delete Request Message	Yes	6.2.1.3, 7.2.3
99/12	Schedule Replace Request Message	No	6.2.1.6, 7.2.6
99/21	Alternate Schedule Add Request Message	No	6.2.1.7, 7.2.7
99/24	Wait List Request Message	No	6.2.1.8, 7.2.8
99/25	TDRS Scheduling Window Message	No	6.2.1.9, 7.2.9
99/28	Schedule Result Request Message	No	6.2.1.5, 7.2.5
99/01	Schedule Delete Notification Message	Yes	6.2.1.4, 7.2.4
94/01	User Schedule Message—Fixed Normal Support	Yes	6.2.2.1, 7.3
94/02	User Schedule Message—Fixed Premium Support	Yes	6.2.2.2, 7.3
94/03	User Schedule Message—Fixed Simulation Support	Yes	6.2.2.3, 7.3
94/04	User Schedule Message—Flexible Normal Support	No	6.2.2.4, 7.3
94/05	User Schedule Message—Flexible Simulation Support	No	6.2.2.5, 7.3
98/03	User Reacquisition Request Message	No	6.3.1.1, 8.2.1a
98/05	Forward Link Sweep Request Message	No	6.3.1.2, 8.2.1b
98/06	Forward Link EIRP Reconfiguration Message	No	6.3.1.3, 8.2.1c
98/07	Expanded User Freq. Uncertainty Request Message	No	6.3.1.4, 8.2.1d
98/04	User Reconfiguration Request Message	No	6.3.1.5, 8.2.1e
98/08	Doppler Compensation Inhibit Request Message	No	6.3.1.6, 8.2.1f
98/02	GCM Disposition Message	No	6.3.1.7, 8.2.1g
98/01	GCM Status Message	No	6.3.1.8, 8.2.1h
92/04	User Performance Data Request Message	No	6.3.2.1, 8.3a
92/62	Return Channel Time Delay Measurement Message	No	6.3.2.2, 8.3b
92/63	Acquisition Failure Notification Message	No	6.3.2.3, 8.3c
92/66	Time Transfer Message	No	6.3.2.4, 8.3d
91/01	User Performance Data Message	No	6.3.3.1, 8.4.1
91/03	Communications Test Message	Yes	6.3.3.2, 8.4.3
N/A	Acknowledgment	Yes	5.6.1
03/10	State Vector Message	No	9.1, 9.5
03/14	State Vector Acknowledgment from NCCDS	No	9.2
03/15	State Vector Inflight Update Message	No	9.1, 9.5
03/60	State Vector Acknowledgment from MOC	No	9.2

## IV. Mission-Unique Identifiers

Parameter	Value	MOC ICD Reference
SUPIDEN	C131?MS (note 1)	The SUPIDEN is used in all message types defined in Sections 5 through 8.
VIC	01	Item 5 of Table 7-13, Item 5 of Table 8-19, Item 3 of Tables 8-21 - 8-30, Item 3 of Tables 8-32 - 8-34 Item 3 of Tables 8-36 - 8-37

note 1 : ? = 0 through 9, for ten different transponders

## V. Mission-Unique Agreement

This Mission-Unique Agreement specifies the roles, responsibilities, and agreements between the Network Control Center Data System (NCCDS) Data Processing Installation (DPI) and the BRTS MOC DPI with respect to the security of the information exchanged between them.

NCCDS shall be designed and operated to protect all information stored and processed by it as S/CL 3 information. The BRTS MOC DPI shall be designed and operated to protect all information stored and processed by it as Security Criticality Level (S/CL) TBS information.

The NCCDS is governed by the *Security Plan for the Network Control Center, NCC 98*, April 1998 and the BRTS MOC will be governed by the *Flight Dynamics Division (FDD) Security Plan*.

## VI. Message Interchange Security Arrangements

The following are the current message interchange security arrangements:

### TBS

## VII. Approvals

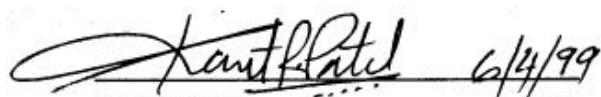
The management of NCCDS and the BRTS MOC DPIs are each responsible for securing certification and authorization to operate their respective DPI. Automated exchange of information between the NCCDS and the BRTS MOC is permitted only under both approvals, including joint approval of this interface arrangement.

**Annex 4**  
**To**  
**Interface Control Document**  
**Between the**  
**Network Control Center Data System**  
**and the**  
**Mission Operations Centers**  
**EOS EOC**

June 1999

Prepared Under Contract NAS-9-98100

Prepared By:



Kant R. Patel 6/4/99  
Date

Computer Sciences Corporation  
NCC Project

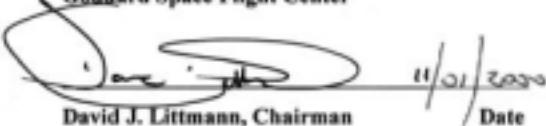
Approved By:



Roger N. Clason, Project Manager Date

NCC Project, Code 451.5

Goddard Space Flight Center



David J. Littmann, Chairman

Configuration Control Board

Space Network Project, Code 451.

Goddard Space Flight Center



Roger J. Flaherty, Project Manager Date

Space Network Project, Code 451.

Goddard Space Flight Center



Dorothy C. Perkins, Deputy Ass't. Dir. Date

Flight Projects for EOS Operations, Code 423.

Goddard Space Flight Center

This Revision 1 issue of 451-ICD-NCCDS/MOC supersedes the Interface Control Document Between the Network Control Center Data System and the Mission Operations Centers 530-ICD-NCCDS/MOC and all of its DCNs.

**Goddard Space Flight Center**  
**Greenbelt, Maryland**

## Annex 4 EOS EOC

---

### I. Introduction

The purpose of this annex is to provide information, unique to the EOS AM/Terra and EOS PM/Aqua missions supported by the Earth Observing System (EOS) Operations Center (EOC), that supplements general MOC information in the main body of this document. It includes communication format parameters, messages supported, mission-unique identifiers, and a mission-unique agreement for the EOS.

### II. Communication Format Parameters

#### A. Nascom 4800bit Block Protocol Parameters

The EOS EOC does not use Nascom 4800bit block Protocol Parameters for its communication with the NCCDS.

#### B. TCP/IP Protocol Parameters

Except for the transfer of IIRVs, the EOS EOC uses TCP/IP Parameters for all of its communications with the NCCDS.

##### B.1 Client TCP/IP Protocol for EOS AM/Terra

Service Type	Client SUPIDEN	Source Port Numbers	MOC ICD Reference
Schedule Request	A1873MS	60013	6.2.1, 7.2.1, 7.2.3
Schedule Status	A1873MS	60012	6.2.1, 6.2.2, 7.2.2, 7.2.4, 7.2.5, 7.3
User Performance Data	A1873MS	60011	6.3.2, 6.3.3, 8.3, 8.4.1
Reconfiguration	A1873MS	60010	6.3.1, 8.2

## B.2 Client TCP/IP Protocol for EOS PM/Aqua

Service Type	Client SUPIDEN	Source Port Numbers	MOC ICD Reference
Schedule Request	A1874MS	60013	6.2.1, 7.2.1, 7.2.3
Schedule Status	A1874MS	60012	6.2.1, 6.2.2, 7.2.2, 7.2.4, 7.2.5, 7.3
User Performance Data	A1874MS	60011	6.3.2, 6.3.3, 8.3, 8.4.1
Reconfiguration	A1874MS	60010	6.3.1, 8.2

## B.3 Server TCP/IP Protocol

Logical Destination Name	MOC ICD Reference
EOS-AM1	Table 7-8 (item 7), 7.2.5
EOS-PM	Table 7-8 (item 7), 7.2.5

## C. FTP Protocol Parameters

The EOC's Flight Dynamics System (FDS) uses FTP Protocol Parameters to transfer IIRVs of satellites AM/Terra and PM/Aqua to the NCCDS.

### C.1 FTP Communication Parameters

FDS FTP Command	NCCDS Directory	MOC ICD Reference
FTP put	TBS*	4.4

\* To be determined and assigned by interfacing entities' administrative personnel

### C.2 FTP File Information

Item Description	FDS Specific Data	MOC ICD Reference
FTP File Name	XXYYYYDDDNCIRV.SNN	4.4.2.3

Note: The format of the FTP file name is specified in 4.4.2.3. This states that "XX" will be used to uniquely identify the MOC transferring the FTP file. However for EOS, "XX" will be used to uniquely identify the specific EOS satellite whose IIRVs have been transferred by the EOS EOC. XX = A1 will be used for AM/Terra, and XX = PM will be used for PM/Aqua. Others will be specified as needed.

### III. Messages Supported

Message Type/Class	Name	In use by EOS	MOC ICD Reference
99/01	Schedule Delete Notification Message	Yes	6.2.1.4, 7.2.4
99/02	Schedule Result Message	Yes	6.2.1.2, 7.2.2
99/10	Schedule Add Request Message	Yes	6.2.1.1, 7.2.1
99/11	Schedule Delete Request Message	Yes	6.2.1.3, 7.2.3
99/12	Schedule Replace Request Message	No	6.2.1.6, 7.2.6
99/21	Alternate Schedule Add Request Message	No	6.2.1.7, 7.2.7
99/24	Wait List Request Message	No	6.2.1.8, 7.2.8
99/25	TDRS Scheduling Window Message	No	6.2.1.9, 7.2.9
99/28	Schedule Result Request Message	Yes	6.2.1.5, 7.2.5
98/01	GCM Status Message	Yes	6.3.1.8, 8.2.1h
98/02	GCM Disposition Message	Yes	6.3.1.7, 8.2.1g
98/03	User Reacquisition Request Message	Yes	6.3.1.1, 8.2.1a
98/04	User Reconfiguration Request Message	Yes	6.3.1.5, 8.2.1e
98/05	Forward Link Sweep Request Message	Yes	6.3.1.2, 8.2.1b
98/06	Forward Link EIRP Reconfiguration Message	Yes	6.3.1.3, 8.2.1c
98/07	Expanded User Freq. Uncertainty Request Message	Yes	6.3.1.4, 8.2.1d
98/08	Doppler Compensation Inhibit Request Message	Yes	6.3.1.6, 8.2.1f
94/01	User Schedule Message—Fixed Normal Support	Yes	6.2.2.1, 7.3
94/02	User Schedule Message—Fixed Premium Support	Yes	6.2.2.2, 7.3
94/03	User Schedule Message—Fixed Simulation Support	Yes	6.2.2.3, 7.3
94/04	User Schedule Message—Flexible Normal Support	No	6.2.2.4, 7.3
94/05	User Schedule Message—Flexible Simulation Support	No	6.2.2.5, 7.3
92/04	User Performance Data Request Message	Yes	6.3.2.1, 8.3a
92/62	Return Channel Time Delay Measurement Message	Yes	6.3.2.2, 8.3b
92/63	Acquisition Failure Notification Message	Yes	6.3.2.3, 8.3c
92/66	Time Transfer Message	Yes	6.3.2.4, 8.3d
91/01	User Performance Data Message	Yes	6.3.3.1, 8.4.1
91/03	Communications Test Message	Yes	6.3.3.2, 8.4.3
03/10*	State Vector Message	Yes	9.1, 9.5
03/14	State Vector Acknowledgment from NCCDS	No	9.2
03/15	State Vector Inflight Update Message	No	9.1, 9.5
N/A	MOC Acknowledgment	No	5.6.1

\* 03/10 State Vector Messages are used by the FDS.

## IV. Services Supported

TDRSS Scheduling Capabilities (Type 94 Messages)			
Link	Capability	AM/Terra	PM/Aqua
“Service Support Type”	“Service Support Subtype”	Class 01 (Normal), Class 02 (Premium), & Class 03 (Simulation)	Class 01 (Normal), Class 02 (Premium), & Class 03 (Simulation)
Forward	MA	YES	YES
Return	MA	YES	YES
Forward	KSA (KSA1, KSA2)	NO	NO
Return	KSA (KSA1, KSA2)	YES	NO
Forward	SSA (SSA1, SSA2)	YES	YES
Return	SSA (SSA1, SSA2)	YES	YES
Forward	SMA	NO	YES
Return	SMA	NO	YES
Forward	KaSA (KaSA1, KaSA2)	NO	NO
Return	KaSA (KaSA1, KaSA2)	NO	NO
Normal Tracking	MA SSA1 SSA2 KSA1 KSA2 SMA	YES YES YES YES YES NO	YES YES YES NO NO YES
Cross-Support Tracking	MA SSA1 SSA2 SMA	YES YES YES NO	YES YES YES YES
Forward Simulation	MA SSA1 SSA2 KSA1 KSA2 SMA	YES YES YES NO NO NO	YES YES YES NO NO YES
Return Simulation	MA SSA1 SSA2 KSA1 KSA2 SMA	YES YES YES YES YES NO	YES YES YES NO NO YES

## V. Mission-Unique Identifiers

### A. EOS AM/Terra:

Parameter	Value	MOC ICD Reference
SUPIDEN	A1873MS	The SUPIDEN is used in all message types defined in Sections 5 through 8.
SIC	1873	The SIC is used in the IIRV message defined in Section 9.
VIC	01	Item 5 of Table 7-13, Item 5 of Table 8-19, Item 3 of Tables 8-21 - 8-30, Item 3 of Tables 8-32 - 8-34 Item 3 of Tables 8-36 - 8-37 Item 17 of Table 9-2

### B. EOS PM/Aqua

Parameter	Value	MOC ICD Reference
SUPIDEN	A1874MS	The SUPIDEN is used in all message types defined in Sections 5 through 8.
SIC	1874	The SIC is used in the IIRV message defined in Section 9.
VIC	01	Item 5 of Table 7-13, Item 5 of Table 8-19, Item 3 of Tables 8-21 - 8-30, Item 3 of Tables 8-32 - 8-34 Item 3 of Tables 8-36 - 8-37 Item 17 of Table 9-2

Note: The last two characters of the SUPIDEN are the SUPIDEN function. Throughout their lifetimes, most of the SN support provided to EOS AM/Terra and to EOS PM/Aqua will be orbital mission support (MS). However, other types of support are possible. As needed, other SUPIDENs with appropriate functions will be entered into the database. Refer to the *Support Identification Code Dictionary*, 532-808 for a complete list of SUPIDEN functions.

## VI. Mission-Unique Agreement

This Mission-Unique Agreement specifies the roles, responsibilities, and agreements between the Network Control Center Data System (NCCDS) Data Processing Installation (DPI) and the EOS EOC DPI with respect to the security of the information exchanged between them.

NCCDS shall be designed and operated to protect all information stored and processed by it as S/CL 3 information. The EOS EOC DPI shall be designed and operated to protect all information stored and processed by it as Security Criticality Level (S/CL) 2 information.

The NCCDS is governed by the Security Plan for the Network Control Center, NCC 98, April 1998 and the EOS EOC will be governed by EOSDIS Security Policy.

## **VII. Message Interchange Security Arrangements**

The following are the current message interchange security arrangements:

- a. The NCCDS and the EOC will communicate by exchange of messages over TCP connections via the Open IONET as specified in this ICD.
- b. Each transport address in EOS EOC that communicates with NCCDS will be provided by the EOS EOC Security Officer to the NCCDS Security Officer.
- c. The EOS Security Officer will register, with the NCC Security Officer, what IP addresses are to be used by the EOS EOC clients.

### **NOTE**

Any communication attempt from an unregistered address will be blocked by the NCCDS Firewall.

## **VIII. Approvals**

The management of NCCDS and the EOS EOC DPIs are each responsible for securing certification and authorization to operate their respective DPI. Automated exchange of information between the NCCDS and the EOS EOC is permitted only under both approvals, including joint approval of this interface arrangement.

**Annex 5**  
**To**  
**Interface Control Document**  
**Between the**  
**Network Control Center Data System**  
**and the**  
**Mission Operations Centers**  
**STARLink MOC**

June 1999

Prepared Under Contract NAS-9-98100

Prepared By:

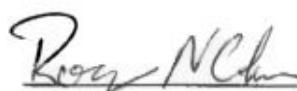


*Kant R. Patel* 6/4/99

Kant R. Patel  
Computer Sciences Corporation  
NCC Project

Date

Approved By:



*Roger N. Clason* 11/16/00

Roger N. Clason, Project Manager  
NCC Project, Code 451.5  
Goddard Space Flight Center

11/16/00



*Roger J. Flaherty*

Roger J. Flaherty, Project Manager  
Space Network Project, Code 451.  
Goddard Space Flight Center

11/16/00



*David J. Littmann* 11/01/00

David J. Littmann, Chairman  
Configuration Control Board  
Space Network Project, Code 451.  
Goddard Space Flight Center

Thomas J. Kalaskey, Project Manager  
STARLink Project Office  
Ames Research Center

11/01/00

Thomas J. Kalaskey, Project Manager

Date

This Revision 1 issue of 451-ICD-NCCDS/MOC supersedes the Interface Control Document Between the Network Control Center Data System and the Mission Operations Centers 530-ICD-NCCDS/MOC and all of its DCNs.

**Goddard Space Flight Center**  
**Greenbelt, Maryland**

## Annex 5

# STARLink MOC

---

### I. Introduction

The purpose of this annex is to provide information, unique to the STARLink Control Center, that supplements general MOC information in the main body of this document. It includes communication format parameters, messages supported and mission-unique identifiers for STARLINK.

### II. Communication Format Parameters

#### A. Nascom 4800bit block Protocol Parameters

Parameter	Value	MOC ICD Reference
Source Code	163 (octal) Operations 016 (octal) Scheduling	4.2.2.2.1 b
Destination Code	same as source code	4.2.2.2.1 c, 4.2.2.2.2 d
VID	017 (octal)	4.2.2.2.2 a

#### B. TCP/IP Protocol Parameters

The STARlink MOC does not use TCP/IP Parameters for its communications with the NCCDS.

#### C. FTP Protocol Parameters

The STARlink MOC does not use FTP Protocol Parameters for its communication with the NCCDS.

### III. Messages Supported

Message Type/Class	Name	In use by STARLink MOC	MOC ICD Reference
99/10	Schedule Add Request Message	Yes	6.2.1.1, 7.2.1
99/02	Schedule Result Message	Yes	6.2.1.2, 7.2.2
99/11	Schedule Delete Request Message	Yes	6.2.1.3, 7.2.3
99/12	Schedule Replace Request Message	No	6.2.1.6, 7.2.6
99/21	Alternate Schedule Add Request Message	No	6.2.1.7, 7.2.7
99/24	Wait List Request Message	No	6.2.1.8, 7.2.8
99/25	TDRS Scheduling Window Message	No	6.2.1.9, 7.2.9
99/28	Schedule Result Request Message	No	6.2.1.5, 7.2.5
99/01	Schedule Delete Notification Message	Yes	6.2.1.4, 7.2.4
94/01	User Schedule Message—Fixed Normal Support	Yes	6.2.2.1, 7.3
94/02	User Schedule Message—Fixed Premium Support	Yes	6.2.2.2, 7.3
94/03	User Schedule Message—Fixed Simulation Support	Yes	6.2.2.3, 7.3
94/04	User Schedule Message—Flexible Normal Support	No	6.2.2.4, 7.3
94/05	User Schedule Message—Flexible Simulation Support	No	6.2.2.5, 7.3
98/03	User Reacquisition Request Message	Yes	6.3.1.1, 8.2.1a
98/05	Forward Link Sweep Request Message	Yes	6.3.1.2, 8.2.1b
98/06	Forward Link EIRP Reconfiguration Message	Yes	6.3.1.3, 8.2.1c
98/07	Expanded User Freq. Uncertainty Request Message	Yes	6.3.1.4, 8.2.1d
98/04	User Reconfiguration Request Message	Yes	6.3.1.5, 8.2.1e
98/08	Doppler Compensation Inhibit Request Message	Yes	6.3.1.6, 8.2.1f
98/02	GCM Disposition Message	Yes	6.3.1.7, 8.2.1g
98/01	GCM Status Message	Yes	6.3.1.8, 8.2.1h
92/04	User Performance Data Request Message	Yes	6.3.2.1, 8.3a
92/62	Return Channel Time Delay Measurement Message	Yes	6.3.2.2, 8.3b
92/63	Acquisition Failure Notification Message	Yes	6.3.2.3, 8.3c
92/66	Time Transfer Message	Yes	6.3.2.4, 8.3d
91/01	User Performance Data Message	Yes	6.3.3.1, 8.4.1
91/03	Communications Test Message	Yes	6.3.3.2, 8.4.3
N/A	Acknowledgment	Yes	5.6.1
03/10	State Vector Message	Yes	9.1, 9.5
03/14	State Vector Acknowledgment from NCCDS	Yes	9.2
03/15	State Vector Inflight Update Message	Yes	9.1, 9.5
03/60	State Vector Acknowledgment from MOC	Yes	9.2

## IV. Mission-Unique Identifiers

Parameter	Value	MOC ICD Reference
SUPIDEN	Q3363MS	The SUPIDEN is used in all message types defined in Sections 5 through 8.
SIC	3363	The SIC is used in the IIRV message defined in Section 9.
VIC	01	Item 5 of Table 7-13, Item 5 of Table 8-19, Item 3 of Tables 8-21 - 8-30, Item 3 of Tables 8-32 - 8-34 Item 3 of Tables 8-36 - 8-37 Item 17 of Table 9-2

## V. Mission-Unique Agreement

This Mission-Unique Agreement specifies the roles, responsibilities, and agreements between the Network Control Center Data System (NCCDS) Data Processing Installation (DPI) and the STARLink MOC DPI with respect to the security of the information exchanged between them.

NCCDS shall be designed and operated to protect all information stored and processed by it as S/CL 3 information. The STARLink MOC DPI shall be designed and operated to protect all information stored and processed by it as Security Criticality Level (S/CL) **TBS** information.

The NCCDS is governed by the Security Plan for the Network Control Center, NCC 98, April 1998 and the STARLink MOC will be governed by **TBS** Security Policy.

## VI. Message Interchange Security Arrangements

The following are the current message interchange security arrangements:

**TBS**

## VII. Approvals

The management of NCCDS and the STARLink MOC DPIs are each responsible for securing certification and authorization to operate their respective DPI. Automated exchange of information between the NCCDS and the STARLink MOC is permitted only under both approvals, including joint approval of this interface arrangement.

**Annex 6**  
**To**  
**Interface Control Document**  
**Between the**  
**Network Control Center Data System**  
**and the**  
**Mission Operations Centers**  
**TOPEX MOC**

June 1999

Prepared Under Contract NAS-9-98100

Prepared By:



*Kant R. Patel* 6/4/99

Kant R. Patel  
Computer Sciences Corporation  
NCC Project

Date

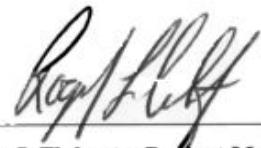
Approved By:



*Roger N. Clason* 11/16/00

Roger N. Clason, Project Manager  
NCC Project, Code 451.5  
Goddard Space Flight Center

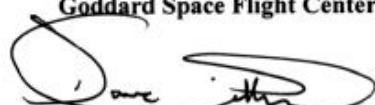
Date



*Roger J. Flaherty* 11/28/00

Roger J. Flaherty, Project Manager  
Space Network Project, Code 451.  
Goddard Space Flight Center

Date



*David J. Littmann* 11/01/2000

David J. Littmann, Chairman  
Configuration Control Board  
Space Network Project, Code 451.  
Goddard Space Flight Center

Date



*Mark D. Fujishin* 3/27/00

Mark D. Fujishin, Manager  
Earth Science Mission Operations  
Jet Propulsion Laboratory

Date

This Revision 1 issue of 451-ICD-NCCDS/MOC supersedes the Interface Control Document Between the Network Control Center Data System and the Mission Operations Centers 530-ICD-NCCDS/MOC and all of its DCNs.

**Goddard Space Flight Center**  
**Greenbelt, Maryland**

## Annex 6

# TOPEX MOC

---

### I. Introduction

The purpose of this annex is to provide information, unique to the TOPEX Ground System (TGS) located at the JPL, that supplements general MOC information in the main body of this document. It includes communication format parameters, messages supported and mission-unique identifiers for the TOPEX/POSEIDON project.

### II. Communication Format Parameters

#### A. Nascom 4800bit Block Protocol Parameters

Parameter	Value	MOC ICD Reference
Source Code	376 (octal) Operations	4.2.2.2.1 b
Destination Code	same as source code	4.2.2.2.1 c, 4.2.2.2.2 d
VID	013 (octal)	4.2.2.2.2 a

#### B. TCP/IP Protocol Parameters

The TOPEX MOC does not use TCP/IP Parameters for its communications with the NCCDS.

#### C. FTP Protocol Parameters

The TOPEX MOC does not use FTP Protocol Parameters for its communication with the NCCDS.

### III. Messages Supported

Message Type/Class	Name	In use by TOPEX MOC	MOC ICD Reference
99/10	Schedule Add Request Message	Yes	6.2.1.1, 7.2.1
99/02	Schedule Result Message	Yes	6.2.1.2, 7.2.2
99/11	Schedule Delete Request Message	Yes	6.2.1.3, 7.2.3
99/12	Schedule Replace Request Message	No	6.2.1.6, 7.2.6
99/21	Alternate Schedule Add Request Message	No	6.2.1.7, 7.2.7
99/24	Wait List Request Message	No	6.2.1.8, 7.2.8
99/25	TDRS Scheduling Window Message	No	6.2.1.9, 7.2.9
99/28	Schedule Result Request Message	No	6.2.1.5, 7.2.5
99/01	Schedule Delete Notification Message	Yes	6.2.1.4, 7.2.4
94/01	User Schedule Message—Fixed Normal Support	Yes	6.2.2.1, 7.3
94/02	User Schedule Message—Fixed Premium Support	Yes	6.2.2.2, 7.3
94/03	User Schedule Message—Fixed Simulation Support	Yes	6.2.2.3, 7.3
94/04	User Schedule Message—Fixed Normal Support	No	6.2.2.4, 7.3
94/05	User Schedule Message—Fixed Simulation Support	No	6.2.2.5, 7.3
98/03	User Reacquisition Request Message	Yes	6.3.1.1, 8.2.1a
98/05	Forward Link Sweep Request Message	Yes	6.3.1.2, 8.2.1b
98/06	Forward Link EIRP Reconfiguration Message	Yes	6.3.1.3, 8.2.1c
98/07	Expanded User Freq. Uncertainty Request Message	Yes	6.3.1.4, 8.2.1d
98/04	User Reconfiguration Request Message	Yes	6.3.1.5, 8.2.1e
98/08	Doppler Compensation Inhibit Request Message	Yes	6.3.1.6, 8.2.1f
98/02	GCM Disposition Message	Yes	6.3.1.7, 8.2.1g
98/01	GCM Status Message	Yes	6.3.1.8, 8.2.1h
92/04	User Performance Data Request Message	Yes	6.3.2.1, 8.3a
92/62	Return Channel Time Delay Measurement Message	Yes	6.3.2.2, 8.3b
92/63	Acquisition Failure Notification Message	Yes	6.3.2.3, 8.3c
92/66	Time Transfer Message	Yes	6.3.2.4, 8.3d
91/01	User Performance Data Message	Yes	6.3.3.1, 8.4.1
91/03	Communications Test Message	Yes	6.3.3.2, 8.4.3
N/A	Acknowledgment	Yes	5.6.1
03/10	State Vector Message	No	9.1, 9.5
03/14	State Vector Acknowledgment from NCCDS	No	9.2
03/15	State Vector Inflight Update Message	No	9.1, 9.5
03/60	State Vector Acknowledgment from MOC	No	9.2

## IV. Mission-Unique Identifiers

Parameter	Value	MOC ICD Reference
SUPIDEN	J4377MS	The SUPIDEN is used in all message types defined in Sections 5 through 8.
VIC	01	Item 5 of Table 7-13, Item 5 of Table 8-19, Item 3 of Tables 8-21 - 8-30, Item 3 of Tables 8-32 - 8-34 Item 3 of Tables 8-36 - 8-37

## V. Mission-Unique Agreement

This Mission-Unique Agreement specifies the roles, responsibilities, and agreements between the Network Control Center Data System (NCCDS) Data Processing Installation (DPI) and the TOPEX MOC DPI with respect to the security of the information exchanged between them.

NCCDS shall be designed and operated to protect all information stored and processed by it as S/CL 3 information. The TOPEX MOC DPI shall be designed and operated to protect all information stored and processed by it as Security Criticality Level (S/CL) **TBS** information.

The NCCDS is governed by the Security Plan for the Network Control Center, NCC 98, April 1998 and the TOPEX MOC will be governed by **TBS** Security Policy.

## VI. Message Interchange Security Arrangements

The following are the current message interchange security arrangements:

**TBS**

## VII. Approvals

The management of NCCDS and the TOPEX MOC DPIs are each responsible for securing certification and authorization to operate their respective DPI. Automated exchange of information between the NCCDS and the TOPEX MOC is permitted only under both approvals, including joint approval of this interface arrangement.

**Annex 7**  
**To**  
**Interface Control Document**  
**Between the**  
**Network Control Center Data System**  
**and the**  
**Mission Operations Centers**  
**LDBP MOC**

June 1999

Prepared Under Contract NAS-9-98100

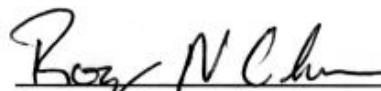
Prepared By:



6/4/99

Kant R. Patel  
Computer Sciences Corporation  
NCC Project

Date



11/16/00

Roger N. Clason, Project Manager  
NCC Project, Code 451.5  
Goddard Space Flight Center

Date

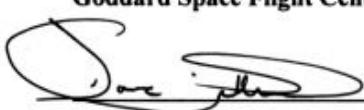
Approved By:



1/25/00

Roger J. Flaherty, Project Manager  
Space Network Project, Code 451.  
Goddard Space Flight Center

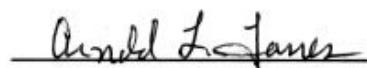
Date



6/21/2000

David J. Littmann, Chairman  
Configuration Control Board  
Space Network Project, Code 451.  
Goddard Space Flight Center

Date



4-14-00

Arnold L. Torres, Director  
Suborbital and Special Orbital Projects, Code 800  
Wallops Flight Facility

Date

This Revision 1 issue of 451-ICD-NCCDS/MOC supersedes the Interface Control Document Between the Network Control Center Data System and the Mission Operations Centers 530-ICD-NCCDS/MOC and all of its DCNs.

**Goddard Space Flight Center**  
**Greenbelt, Maryland**

# Annex 7

## LDBP MOC

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### I. Introduction

The purpose of this annex is to provide information, unique to the Goddard Space Flight Center (GSFC) Long Duration Balloon Program (LDBP) Mission Operations Center (MOC), that supplements general MOC information in the main body of this document. It includes communication format parameters, messages supported and mission-unique identifiers for the LDBP.

### II. Communication Format Parameters

#### A. Nascom 4800bit Block Protocol Parameters

Parameter	Value	MOC ICD Reference
Source Code	165 (octal) Operations 165 (octal) Scheduling	4.2.2.2.1 b
Destination Code	same as source code	4.2.2.2.1 c, 4.2.2.2.2 d
VID	011 (octal)	4.2.2.2.2 a

#### B. TCP/IP Protocol Parameters

The LDBP MOC does not use TCP/IP Parameters for its communications with the NCCDS.

#### C. FTP Protocol Parameters

The LDBP MOC does not use FTP Protocol Parameters for its communication with the NCCDS.

### III. Messages Supported

Message Type/Class	Name	In use by LDBP MOC	MOC ICD Reference
99/10	Schedule Add Request Message	Yes	6.2.1.1, 7.2.1
99/02	Schedule Result Message	Yes	6.2.1.2, 7.2.2
99/11	Schedule Delete Request Message	Yes	6.2.1.3, 7.2.3
99/12	Schedule Replace Request Message	No	6.2.1.6, 7.2.6
99/21	Alternate Schedule Add Request Message	No	6.2.1.7, 7.2.7
99/24	Wait List Request Message	No	6.2.1.8, 7.2.8
99/25	TDRS Scheduling Window Message	No	6.2.1.9, 7.2.9
99/28	Schedule Result Request Message	No	6.2.1.5, 7.2.5
99/01	Schedule Delete Notification Message	Yes	6.2.1.4, 7.2.4
94/01	User Schedule Message—Fixed Normal Support	Yes	6.2.2.1, 7.3
94/02	User Schedule Message—Fixed Premium Support	Yes	6.2.2.2, 7.3
94/03	User Schedule Message—Fixed Simulation Support	Yes	6.2.2.3, 7.3
94/04	User Schedule Message—Fixed Normal Support	No	6.2.2.4, 7.3
94/05	User Schedule Message—Fixed Simulation Support	No	6.2.2.5, 7.3
98/03	User Reacquisition Request Message	Yes	6.3.1.1, 8.2.1a
98/05	Forward Link Sweep Request Message	Yes	6.3.1.2, 8.2.1b
98/06	Forward Link EIRP Reconfiguration Message	Yes	6.3.1.3, 8.2.1c
98/07	Expanded User Freq. Uncertainty Request Message	Yes	6.3.1.4, 8.2.1d
98/04	User Reconfiguration Request Message	Yes	6.3.1.5, 8.2.1e
98/08	Doppler Compensation Inhibit Request Message	Yes	6.3.1.6, 8.2.1f
98/02	GCM Disposition Message	Yes	6.3.1.7, 8.2.1g
98/01	GCM Status Message	Yes	6.3.1.8, 8.2.1h
92/04	User Performance Data Request Message	Yes	6.3.2.1, 8.3a
92/62	Return Channel Time Delay Measurement Message	Yes	6.3.2.2, 8.3b
92/63	Acquisition Failure Notification Message	Yes	6.3.2.3, 8.3c
92/66	Time Transfer Message	Yes	6.3.2.4, 8.3d
91/01	User Performance Data Message	Yes	6.3.3.1, 8.4.1
91/03	Communications Test Message	Yes	6.3.3.2, 8.4.3
N/A	Acknowledgment	Yes	5.6.1
03/10	State Vector Message	Yes	9.1, 9.5
03/14	State Vector Acknowledgment from NCCDS	Yes	9.2
03/15	State Vector Inflight Update Message	Yes	9.1, 9.5
03/60	State Vector Acknowledgment from MOC	Yes	9.2

## IV. Mission-Unique Identifiers

Parameter	Value	MOC ICD Reference
SUPIDEN	W1501MS, W1502MS	The SUPIDEN is used in all message types defined in Sections 5 through 8.
SIC	1501, 1502	The SIC is used in the IIRV message defined in Section 9.
VIC	01	Item 5 of Table 7-13, Item 5 of Table 8-19, Item 3 of Tables 8-21 - 8-30, Item 3 of Tables 8-32 - 8-34 Item 3 of Tables 8-36 - 8-37 Item 17 of Table 9-2

## V. Mission-Unique Agreement

This Mission-Unique Agreement specifies the roles, responsibilities, and agreements between the Network Control Center Data System (NCCDS) Data Processing Installation (DPI) and the LDBP MOC DPI with respect to the security of the information exchanged between them.

NCCDS shall be designed and operated to protect all information stored and processed by it as S/CL 3 information. The LDBP MOC DPI shall be designed and operated to protect all information stored and processed by it as Scientific, Engineering, and Research (SER) information.

### NOTE

In Section 2, refer to the Note following 2.4 p. “S/CL 3 information” is defined by NHB 2410.9A. “SER information” is defined by NPG 2810.1.

The NCCDS is governed by the Security Plan for the Network Control Center, NCC 98, April 1998 and the LDBP MOC is governed by the National Scientific Balloon Facility Computer and Network Security and Administration Policy, November 1999.

## VI. Message Interchange Security Arrangements

The following are the current message interchange security arrangements:

- The NCCDS and the LDBP MOC will communicate by exchange of messages over circuits and networks provided by NISN.

- b. All messages exchanged between the NCCDS and the LDBP MOC will be in 4800-bit block format. However in order to allow their transmission over IP networks, these 4800-bit blocks will be encapsulated into User Datagram Protocol (UDP)/IP datagrams.
- c. The LDBP MOC will be connected to a NISN-provided conversion device located at GSFC. All 4800-bit blocks transmitted from the LDBP MOC to the NCCDS will be encapsulated into UDP/IP datagrams by this conversion device, and then forwarded to the NCCDS. All encapsulated 4800-bit blocks transmitted from the NCCDS to the LDBP MOC will be decapsulated by this conversion device, and then forwarded to the LDBP MOC.
- d. As needed, authorized NISN personnel will provide IP addressing information related to any conversion device used by the LDBP MOC to the NCC Security Officer.

**NOTE**

Any communications attempt from an unregistered address will be blocked by the NCCDS Firewall.

## **VII. Approvals**

The management of NCCDS and the LDBP MOC DPIs are each responsible for securing certification and authorization to operate their respective DPI. Automated exchange of information between the NCCDS and the LDBP MOC is permitted only under both approvals, including joint approval of this interface arrangement.

**Annex 8**  
**To**  
**Interface Control Document**  
**Between the**  
**Network Control Center Data System**  
**and the**  
**Mission Operations Centers**

*Special Projects and Missions*

June 1999

Prepared Under Contract NAS-9-98100

Prepared By:



6/4/99

Kant R. Patel  
Computer Sciences Corporation  
NCC Project

Date

Approved By:



11/16/00

Roger N. Clason, Project Manager Date

NCC Project, Code 451.5

Goddard Space Flight Center



1/25/01

Roger J. Flaherty, Project Manager Date  
Special Projects and Missions  
Goddard Space Flight Center



11/01/2000

David J. Littmann, Chairman Date

Configuration Control Board

Space Network Project, Code 451.

Goddard Space Flight Center

This Revision 1 issue of 451-ICD-NCCDS/MOC supersedes the Interface Control Document Between the Network Control Center Data System and the Mission Operations Centers 530-ICD-NCCDS/MOC and all of its DCNs.

**Goddard Space Flight Center**  
**Greenbelt, Maryland**

## **ANNEX 8**

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***RESERVED***

**for**

**Special Projects and Missions**

**Annex 9**  
**To**  
**Interface Control Document**  
**Between the**  
**Network Control Center Data System**  
**and the**  
**Mission Operations Centers**  
**LS-7 MOC**

June 1999

Prepared Under Contract NAS-9-98100

Prepared By:



6/4/99

Kant R. Patel  
Computer Sciences Corporation  
NCC Project

Date



11/16/00

Roger N. Clason, Project Manager  
NCC Project, Code 451.5  
Goddard Space Flight Center

Date

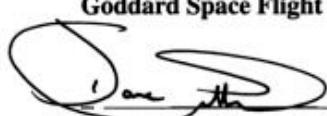
Approved By:



11/25/00

Roger J. Flaherty, Project Manager  
Space Network Project, Code 451.  
Goddard Space Flight Center

Date



11/01/2000

David J. Littmann, Chairman  
Configuration Control Board  
Space Network Project, Code 451.  
Goddard Space Flight Center

Date



11/01/2000

For William J. Guit, Mission Director  
LANDSAT-7 Project, Code 428  
Goddard Space Flight Center

Date

This Revision 1 issue of 451-ICD-NCCDS/MOC supersedes the Interface Control Document Between the Network Control Center Data System and the Mission Operations Centers 530-ICD-NCCDS/MOC and all of its DCNs.

**Goddard Space Flight Center**  
**Greenbelt, Maryland**

# Annex 9

## LS-7 MOC

---

### I. Introduction

The purpose of this annex is to provide information, unique to the Landsat-7 Mission Operations Center (LS-7 MOC), that supplements general MOC information in the main body of this document. It includes communication format parameters, messages supported, mission-unique identifiers, and mission-unique agreement for the Landsat-7.

### II. Communication Format Parameters

#### A. Nascom 4800bit Block Protocol Parameters

Landsat-7 does not use Nascom 4800bit Block Protocol Parameters for its communication with the NCCDS.

#### B. TCP/IP Protocol Parameters

Landsat-7 uses TCP/IP Protocol Parameters for its communication with the NCCDS for all messages other than IIRVs.

#### B.1 Client TCP/IP Protocol

Service Type	Client SUPIDEN	Source Port Numbers *	MOC ICD Reference
Schedule Request	B7368MS**	TBD	6.2.1, 7.2.1, 7.2.3
Schedule Status	B7368MS**	TBD	6.2.1, 6.2.2, 7.2.2, 7.2.4, 7.2.5, 7.3
User Performance Data	B7368MS**	TBD	6.3.2, 6.3.3, 8.3, 8.4.1
Reconfiguration	B7368MS**	TBD	6.3.1, 8.2

\* To be determined and assigned by interfacing entities' administrative personnel

\*\* This SUPIDEN (B7368MS) will be in effect until NOAA assumes responsibility of the Landsat-7 spacecraft. Then the SUPIDEN will be changed to Y7368MS.

#### B.2 Server TCP/IP Protocol

Logical Destination Name *	MOC ICD Reference
TBD	Table 7-8 (item 7), 7.2.5

\* To be determined and assigned by interfacing entities' administrative personnel

## C. FTP Protocol Parameters

Landsat-7 uses FTP to transfer IIRVs to the NCCDS.

### C.1 FTP Communication Parameters

<b>MOC FTP Command</b>	<b>NCCDS Directory *</b>	<b>MOC ICD Reference</b>
FTP put	TBS	4.4

\* To be determined and assigned by interfacing entities' administrative personnel

### C.2 FTP File Information

<b>Item Description</b>	<b>MOC Specific Data</b>	<b>MOC ICD Reference</b>
FTP File Name	L7YYYYDDDNCIRV.SNN	4.4.2.3

### III. Messages Supported

Message Type/Class	Name	In use by LS-7	MOC ICD Reference
99/01	Schedule Delete Notification Message	Yes	6.2.1.4, 7.2.4
99/02	Schedule Result Message	Yes	6.2.1.2, 7.2.2
99/10	Schedule Add Request Message	Yes	6.2.1.1, 7.2.1
99/11	Schedule Delete Request Message	Yes	6.2.1.3, 7.2.3
99/12	Schedule Replace Request Message	No	6.2.1.6, 7.2.6
99/21	Alternate Schedule Add Request Message	No	6.2.1.7, 7.2.7
99/24	Wait List Request Message	No	6.2.1.8, 7.2.8
99/25	TD RS Scheduling Window Message	No	6.2.1.9, 7.2.9
99/28	Schedule Result Request Message	Yes	6.2.1.5, 7.2.5
98/01	GCM Status Message	Yes	6.3.1.8, 8.2.1h
98/02	GCM Disposition Message	Yes	6.3.1.7, 8.2.1g
98/03	User Reacquisition Request Message	Yes	6.3.1.1, 8.2.1a
98/04	User Reconfiguration Request Message	Yes	6.3.1.5, 8.2.1e
98/05	Forward Link Sweep Request Message	Yes	6.3.1.2, 8.2.1b
98/06	Forward Link EIRP Reconfiguration Message	Yes	6.3.1.3, 8.2.1c
98/07	Expanded User Freq. Uncertainty Request Message	Yes	6.3.1.4, 8.2.1d
98/08	Doppler Compensation Inhibit Request Message	Yes	6.3.1.6, 8.2.1f
94/01	User Schedule Message—Fixed Normal Support	Yes	6.2.2.1, 7.3
94/02	User Schedule Message—Fixed Premium Support	Yes	6.2.2.2, 7.3
94/03	User Schedule Message—Fixed Simulation Support	Yes	6.2.2.3, 7.3
94/04	User Schedule Message—Flexible Normal Support	No	6.2.2.4, 7.3
94/05	User Schedule Message—Flexible Simulation Support	No	6.2.2.5, 7.3
92/04	User Performance Data Request Message	Yes	6.3.2.1, 8.3a
92/62	Return Channel Time Delay Measurement Message	Yes	6.3.2.2, 8.3b
92/63	Acquisition Failure Notification Message	Yes	6.3.2.3, 8.3c
92/66	Time Transfer Message	Yes	6.3.2.4, 8.3d
91/01	User Performance Data Message	Yes	6.3.3.1, 8.4.1
91/03	Communications Test Message	Yes	6.3.3.2, 8.4.3
03/10	State Vector Message	Yes	9.1, 9.5
03/14	State Vector Acknowledgment from NCCDS	No	9.2
03/15	State Vector Inflight Update Message	No	9.1, 9.5
N/A	MOC Acknowledgment	No	5.6.1

## IV. Mission-Unique Identifiers

Parameter	Value	MOC ICD Reference
SUPIDEN	B7368MS**	The SUPIDEN is used in all message types defined in sections 5 through 8.
SIC	7368	The SIC is used in the IIRV message defined in Section 9.
VIC	01	Item 5 of Table 7-13, Item 5 of Table 8-19, Item 3 of Tables 8-21 - 8-30, Item 3 of Tables 8-32 - 8-34 Item 3 of Tables 8-36 - 8-37 Item 17 of Table 9-2

\*\* This SUPIDEN (B7368MS) will be in effect until NOAA assumes responsibility of the Landsat-7 spacecraft. Then the SUPIDEN will be changed to Y7368MS.

## V. Mission-Unique Agreement

This Mission-Unique Agreement specifies the roles, responsibilities, and agreements between the Network Control Center Data System (NCCDS) Data Processing Installation (DPI) and the Landsat-7 (LS-7) DPI with respect to the security of the information exchanged between them.

The NCCDS is governed by the Security Plan for the Network Control Center, NCC 98, April 1998 and the LS-7 will be governed by LS-7 Security Policy.

## VI. Mission Interchange Security Arrangements

The following are the current message interchange security arrangements:

- a) The NCCDS and the LS-7 will communicate by exchange of all messages except state vectors over TCP connections as specified in this ICD.
- b) The LS-7 will pass state vector files to the NCCDS using FTP "put" commands as specified in this ICD.
- c) The NCCDS and the LS-7 will secure all message exchange connections (except state vector file transfers) by use of the Open Service as specified in this ICD.
- d) The LS-7 will secure state vector file transfers by authenticating to the NCCDS with a name and password.
- e) The NCC and LS-7 Security Officers will arrange to pass the password needed to authenticate LS-7 Open Service.
- f) The NCC and LS-7 Security Officers will arrange to pass the name, password, and target directory for state vector file transfer service.
- g) The LS-7 Security Officer will register with the NCC Security Officer what IP addresses are to be used by the LS-7 clients for each NCCDS service to be used.

## **VII. Approvals**

The management of NCCDS and the LS-7 DPIs are each responsible for securing certification and authorization to operate their respective DPI. Automated exchange of information between the NCCDS and the LS-7 is permitted only under both approvals, including joint approval of this interface arrangement.

**Annex 10**  
**To**  
**Interface Control Document**  
**Between the**  
**Network Control Center Data System**  
**and the**  
**Mission Operations Centers**  
**JSC MCC**  
**January 2000**  
**Prepared Under Contract NAS-9-98100**

**Prepared By:**

 6/4/99

**Kant R. Patel** **Date**  
Computer Sciences Corporation  
NCC Project

**Approved By:**

 11/16/00

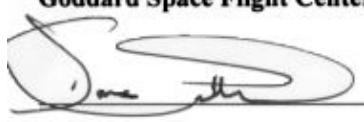
**Roger J. Clason, Project Manager**  
NCC Project, Code 451.5  
Goddard Space Flight Center

**Date**

 11/25/00

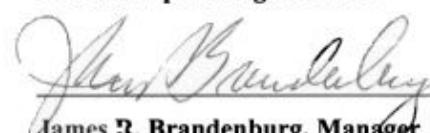
**Roger J. Flaherty, Project Manager**  
Space Network Project, Code 451  
Goddard Space Flight Center

**Date**

 11/01/2000

**David J. Littmann, Chairman**  
Configuration Control Board  
Space Network Project, Code 451  
Goddard Space Flight Center

**Date**

 11/1/00

**James R. Brandenburg, Manager**  
NASA MCC Resident Office  
Johnson Space Center

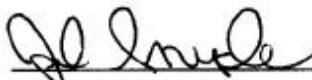
**Date**

This Revision 1 issue of 451-ICD-NCCDS/MOC supersedes the Interface Control Document Between the Network Control Center Data System and the Mission Operations Centers 530-ICD-NCCDS/MOC and all of its DCNs. Also it retires the External Interface Control Document JSC/GSFC NCC Operational Communications ICD for Mission Control Center Systems, JSC-11534, Vol. V.

**Goddard Space Flight Center**  
**Greenbelt, Maryland**

**Annex 10**  
**To**  
**Interface Control Document**  
**Between the**  
**Network Control Center Data System**  
**and the**  
**Mission Operations Centers**  
**JSC MCC**  
**January 2000**  
**Prepared Under Contract NAS-9-98100**

**Approved By:**

5/21/00  
John Snyder  
CSOC JSC Site Manager  
Consolidated Space Operations Contract

4/1/00  
for Roy Harris, Director  
Human Spaceflight  
Consolidated Space Operations Contract

This Revision 1 issue of 451-ICD-NCCDS/MOC supersedes the Interface Control Document Between the Network Control Center Data System and the Mission Operations Centers 530-ICD-NCCDS/MOC and all of its DCNs. Also it retires the External Interface Control Document JSC/GSFC NCC Operational Communications ICD for Mission Control Center Systems, JSC-11534, Vol. V.

**Goddard Space Flight Center**  
**Greenbelt, Maryland**

451-ICD-NCCDS/MOC  
Revision 1

# ANNEX 10

## JSC MCC

---

### I. Introduction

The purpose of this annex is to provide information, unique to the Johnson Space Center (JSC) Mission Control Center (MCC), that supplements general MOC information in the main body of this document. The MCC supports both the Shuttle and Space Station missions. This annex includes the JSC Spaceflight Missions MCC-unique communication format parameters, messages supported, mission-unique identifiers, mission-unique security agreement, message interchange security arrangements, and security approvals.

### II. Communication Format Parameters

#### A. Nascom 4800bit Block Protocol Parameters

Except for scheduling, the JSC MCC uses Nascom 4800-bit block Protocol Parameters for its communication with the NCCDS.

**Table AN10-1. Shuttle Parameters**

Parameter	Value	MOC ICD Reference
Source Code	160 Operations 130 Simulations	4.2.2.2.1b
Destination Code	160 Operations 130 Simulations	4.2.2.2.1c, 4.2.2.2.2d
VID	377(octal)	4.2.2.2.2a

**Table AN10-2. Space Station Parameters**

Parameter	Value	MOC ICD Reference
Source Code	160 Operations 130 Simulations	4.2.2.2.1b
Destination Code	160 Operations 130 Simulations	4.2.2.2.1c, 4.2.2.2.2d

**B. TCP/IP Protocol Parameters**

For scheduling, the JSC MCC uses TCP/IP Parameters for its communications with the NCCDS. This involves use of the Schedule Request and Schedule Status services (see Table 4-3) to exchange all applicable planning and scheduling messages (refer to Section 7) between the JSC MCC and the NCCDS.

**NOTE**

Use of TCP/IP on this interface was established in January 2000.

**C. FTP Protocol Parameters**

The JSC MCC does not use FTP Protocol Parameters for its communication with the NCCDS.

### III. Messages Supported

#### A. Table AN10-3. Shuttle Messages

Message Type/Class	Name	In use by JSC Shuttle MCC	MOC ICD Reference
99/01	Schedule Delete Notification Message	Yes	6.2.1.4, 7.2.4
99/02	Schedule Result Message	Yes	6.2.1.2, 7.2.2
99/10	Schedule Add Request Message	Yes	6.2.1.1, 7.2.1
99/11	Schedule Delete Request Message	Yes	6.2.1.3, 7.2.3
99/12	Schedule Replace Request Message	No	6.2.1.6, 7.2.6
99/21	Alternate Schedule Add Request Message	No	6.2.1.7, 7.2.7
99/24	Wait List Request Message	No	6.2.1.8, 7.2.8
99/25	TDRS Scheduling Window Message	No	6.2.1.9, 7.2.9
99/28	Schedule Result Request Message	Yes	6.2.1.5, 7.2.5
98/01	GCM Status Message	Yes	6.3.1.8, 8.2.1h
98/02	GCM Disposition Message	Yes	6.3.1.7, 8.2.1g
98/03	User Reacquisition Request Message	Yes	6.3.1.1, 8.2.1a
98/04	User Reconfiguration Request Message	Yes	6.3.1.5, 8.2.1e
98/05	Forward Link Sweep Request Message	Yes	6.3.1.2, 8.2.1b
98/06	Forward Link EIRP Reconfiguration Message	Yes	6.3.1.3, 8.2.1c
98/07	Expanded User Freq. Uncertainty Request Message	Yes	6.3.1.4, 8.2.1d
98/08	Doppler Compensation Inhibit Request Message	Yes	6.3.1.6, 8.2.1f
94/01	User Schedule Message—Fixed Normal Support	Yes	6.2.2.1, 7.3
94/02	User Schedule Message—Fixed Premium Support	Yes	6.2.2.2, 7.3
94/03	User Schedule Message—Fixed Simulation Support	Yes	6.2.2.3, 7.3
94/04	User Schedule Message—Flexible Normal Support	No	6.2.2.4, 7.3
94/05	User Schedule Message—Flexible Simulation Support	No	6.2.2.5, 7.3
92/04	User Performance Data Request Message	No	6.3.2.1, 8.3a
92/62	Return Channel Time Delay Measurement Message	No	6.3.2.2, 8.3b
92/63	Acquisition Failure Notification Message	Yes	6.3.2.3, 8.3c
92/66	Time Transfer Message	No	6.3.2.4, 8.3d
91/01	User Performance Data Message	Yes	6.3.3.1, 8.4.1
91/03	Communications Test Message	Yes	6.3.3.2, 8.4.3
03/10	State Vector Message	No	9.1, 9.5
03/14	State Vector Acknowledgment from NCCDS	No	9.2
03/15	State Vector Inflight Update Message	No	9.1, 9.5
N/A	MOC Acknowledgment	Yes	5.6.1

**B. Table AN10-4. Space Station Messages**

Message Type/Class	Name	In use by JSC ISS MCC	MOC ICD Reference
99/01	Schedule Delete Notification Message	Yes	6.2.1.4, 7.2.4
99/02	Schedule Result Message	Yes	6.2.1.2, 7.2.2
99/10	Schedule Add Request Message	Yes	6.2.1.1, 7.2.1
99/11	Schedule Delete Request Message	Yes	6.2.1.3, 7.2.3
99/12	Schedule Replace Request Message	No	6.2.1.6, 7.2.6
99/21	Alternate Schedule Add Request Message	No	6.2.1.7, 7.2.7
99/24	Wait List Request Message	No	6.2.1.8, 7.2.8
99/25	TDRS Scheduling Window Message	No	6.2.1.9, 7.2.9
99/28	Schedule Result Request Message	Yes	6.2.1.5, 7.2.5
98/01	GCM Status Message	Yes	6.3.1.8, 8.2.1h
98/02	GCM Disposition Message	Yes	6.3.1.7, 8.2.1g
98/03	User Reacquisition Request Message	Yes	6.3.1.1, 8.2.1a
98/04	User Reconfiguration Request Message	Yes	6.3.1.5, 8.2.1e
98/05	Forward Link Sweep Request Message	Yes	6.3.1.2, 8.2.1b
98/06	Forward Link EIRP Reconfiguration Message	Yes	6.3.1.3, 8.2.1c
98/07	Expanded User Freq. Uncertainty Request Message	Yes	6.3.1.4, 8.2.1d
98/08	Doppler Compensation Inhibit Request Message	Yes	6.3.1.6, 8.2.1f
94/01	User Schedule Message—Fixed Normal Support	Yes	6.2.2.1, 7.3
94/02	User Schedule Message—Fixed Premium Support	Yes	6.2.2.2, 7.3
94/03	User Schedule Message—Fixed Simulation Support	Yes	6.2.2.3, 7.3
94/04	User Schedule Message—Flexible Normal Support	No	6.2.2.4, 7.3
94/05	User Schedule Message—Flexible Simulation Support	No	6.2.2.5, 7.3
92/04	User Performance Data Request Message	No	6.3.2.1, 8.3a
92/62	Return Channel Time Delay Measurement Message	No	6.3.2.2, 8.3b
92/63	Acquisition Failure Notification Message	Yes	6.3.2.3, 8.3c
92/66	Time Transfer Message	Yes	6.3.2.4, 8.3d
91/01	User Performance Data Message	Yes	6.3.3.1, 8.4.1
91/03	Communications Test Message	Yes	6.3.3.2, 8.4.3
03/10	State Vector Message	No	9.1, 9.5
03/14	State Vector Acknowledgment from NCCDS	No	9.2
03/15	State Vector Inflight Update Message	No	9.1, 9.5
N/A	MOC Acknowledgment	Yes	5.6.1

## IV. Mission-Unique Identifiers

**Table AN10-5. Shuttle Mission-Unique Identifiers**

Parameter	Value	MOC ICD Reference
SUPIDEN	M2XXXMS	The SUPIDEN is used in all message types defined in sections 5 through 8.
VIC	05	Item 5 of Table 7-13, Item 5 of Table 8-19, Item 3 of Tables 8-21 - 8-22, Item 3 of Tables 8-25 - 8-26, Item 3 of Tables 8-29 - 8-30, Item 3 of Tables 8-36 - 8-37
SIC	2XXX Testing=2008	Ref. 2.4e
Destination Name	JXXX	Table 7-8 (item 7), 7.2.5
PN Code	S-band =1 Ku-band =65	Item 8 of Table 7-13 Item 7 of Table 7-13

**Table AN10-6. Space Station ECOMM Mission-Unique Identifiers**

Parameter	Value	MOC ICD Reference
SUPIDEN	M8001MS	The SUPIDEN is used in all message types defined in sections 5 through 8.
VIC	01	Item 5 of Table 7-13, Item 5 of Table 8-19, Item 3 of Tables 8-21 - 8-24, Item 3 of Tables 8-26 - 8-28, Item 3 of Tables 8-30, Item 3 of Tables 8-32 – 8-34, Item 3 of Tables 8-36 - 8-37
SIC	ECOMM = 8001	Ref. 2.4e
Destination Name	J801	Table 7-8 (item 7), 7.2.5
PN Code	ISS ECOMM = 61	Item 6 of Table 7-13
VID	ECOMM=24(octal)	4.2.2.2.2a

**Table AN10-7. Space Station S-Band & Ku-Band Mission-Unique Identifiers**

Parameter	Value	MOC ICD Reference
SUPIDEN	M8000MS	The SUPIDEN is used in all message types defined in sections 5 through 8.
VIC	01	Item 5 of Table 7-13, Item 5 of Table 8-19, Item 3 of Tables 8-21 - 8-30, Item 3 of Tables 8-32 - 8-34, Item 3 of Tables 8-36 - 8-37
SIC	ACS=8000	Ref. 2.4e
Destination Name	J800	Table 7-8 (item 7), 7.2.5
PN Code	S-band=49 Ku-band=49	Item 6 of Table 7-13 Item 7 of Table 7-13
VID	ISS=24(octal)	4.2.2.2.2a

**Table AN10-8. Space Station ICM Mission-Unique Identifiers**

Parameter	Value	MOC ICD Reference
SUPIDEN	M8002MS	The SUPIDEN is used in all message types defined in sections 5 through 8.
VIC	01	Item 5 of Table 7-13, Item 5 of Table 8-19, Item 3 of Tables 8-21 - 8-30, Item 3 of Tables 8-32 - 8-34, Item 3 of Tables 8-36 - 8-37
SIC	ICM = 8002	Ref. 2.4e
Destination Name	J802	Table 7-8 (item 7), 7.2.5
PN Code	S-band=72*	Item 6 of Table 7-13
VID	ICM=25(octal)	4.2.2.2.2a

\* Applicable for both MA and SSA.

**Table AN10-9. Automated Transfer Vehicle (ATV) Mission-Unique Identifiers**

Parameter	Value	MOC ICD Reference
SUPIDEN	M8003MS	The SUPIDEN is used in all message types defined in sections 5 through 8.
VIC	01	Item 5 of Table 7-13, Item 5 of Table 8-19, Item 3 of Tables 8-21 - 8-30, Item 3 of Tables 8-32 - 8-34, Item 3 of Tables 8-36 - 8-37
SIC	ATV = 8003	Ref. 2.4e
Destination Name	J803	Table 7-8 (item 7), 7.2.5
PN Code	TBS	Item 6 of Table 7-13
VID	ATV=TBS	4.2.2.2.2a

**Table AN10-10. H-II Transfer Vehicle Mission-Unique Identifiers**

Parameter	Value	MOC ICD Reference
SUPIDEN	M8004MS	The SUPIDEN is used in all message types defined in sections 5 through 8.
VIC	01	Item 5 of Table 7-13, Item 5 of Table 8-19, Item 3 of Tables 8-21 - 8-30, Item 3 of Tables 8-32 - 8-34, Item 3 of Tables 8-36 - 8-37
SIC	HTV = 8004	Ref. 2.4e
Destination Name	J804	Table 7-8 (item 7), 7.2.5
PN Code	TBS	Item 6 of Table 7-13
VID	HTV=TBS	4.2.2.2.2a

## **V. Mission-Unique Agreement**

This Mission-Unique Agreement specifies the roles, responsibilities, and agreements between the Network Control Center Data System (NCCDS) Data Processing Installation (DPI) and the JSC MCC DPI with respect to the security of the information exchanged between them.

NCCDS shall be designed and operated to protect all information associated with Shuttle and Space Station that is stored and processed by it as Security Criticality Level (S/CL 3). The connection service to the JSC MCC shall be designed and operated to protect all information stored and processed by it as S/CL 3 information.

The NCCDS is governed by the Security Plan for the Network Control Center, NCC 98, April 1998 and the JSC MCC will be governed by the Johnson Space Center Information Technology Security Handbook, JPG 2810.1.

## **VI. Message Interchange Security Arrangements**

The following are the current message interchange security arrangements:

- a. The NCCDS and the JSC MCC will communicate by exchange of messages over NISN connections as specified in this ICD.

## **VII. Approvals**

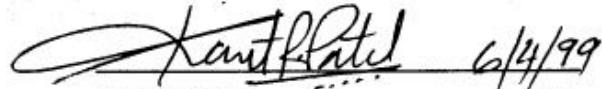
The management of NCCDS and the JSC MCC DPIs are each responsible for securing certification and authorization to operate their respective DPI. Automated exchange of information between the NCCDS and the JSC MCC is permitted only under both approvals, including joint approval of this interface arrangement.

**Annex 11**  
**To**  
**Interface Control Document**  
**Between the**  
**Network Control Center Data System**  
**and the**  
**Mission Operations Centers**  
**FDF -- Acquisition Data**

June 1999

**Prepared Under Contract NAS-9-98100**

**Prepared By:**

  
Kant R. Patel 6/4/99  
Date  
Computer Sciences Corporation  
NCC Project

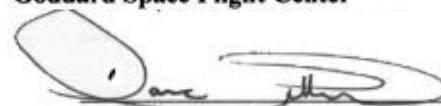
  
Roger N. Clason, Project Manager  
NCC Project, Code 451.5  
Goddard Space Flight Center

11/16/00  
Date

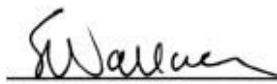
**Approved By:**

  
Roger J. Flaherty, Project Manager  
Space Network Project, Code 451.  
Goddard Space Flight Center

Date

  
David J. Littmann, Chairman  
Configuration Control Board  
Space Network Project, Code 451.  
Goddard Space Flight Center

11/01/2000  
Date

  
Dr. R. S. Wallace, Project Manager  
Consolidated Space Operations Contract, Code 450.C  
Goddard Space Flight Center

Date

This Revision 1 issue of 451-ICD-NCCDS/MOC supersedes the Interface Control Document Between the Network Control Center Data System and the Mission Operations Centers 530-ICD-NCCDS/MOC and all of its DCNs. Also it retires the Interface Control Document Between the Network Control Center Data System and the Flight Dynamics Facility, 530-ICD-NCCDS/FDF.

**Goddard Space Flight Center**  
**Greenbelt, Maryland**

## Annex 11

# FDF Acquisition Data

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### I. Introduction

The purpose of this annex is to provide information, unique to the acquisition data messages provided by the Flight Dynamics Facility (FDF), that supplements general MOC information provided in the main body of this document. It includes communications format parameters, messages supported, and mission-unique identifiers for the FDF. The applicable information is primarily included in Section 9. The inclusion of this annex allows this document to supersede the Interface Control Document Between the Network Control Center Data System and the Flight Dynamics Facility, 530-ICD-NCCDS/FDF.

### II. Communication Format Parameters

#### A. Nascom 4800bit Block Protocol Parameters

Parameter	MOC ICD Reference	Value
Source Code	4.2.2.2.1 b	020 (octal) Operations 020 (octal) Scheduling
Destination Code	4.2.2.2.1 c, 4.2.2.2.2 d	same as source code
VID	4.2.2.2.2 a	003 (octal)

#### B. TCP/IP Protocol Parameters

The FDF does not use TCP/IP for its communications with the NCCDS.

#### C. FTP Protocol Parameters

The FDF does not use FTP Protocol Parameters for its communication with the NCCDS.

### III. Messages Supported

Message Type/Class	Name	In use by FDF	MOC ICD Reference
99/10	Schedule Add Request Message	No	6.2.1.1, 7.2.1
99/02	Schedule Result Message	No	6.2.1.2, 7.2.2
99/11	Schedule Delete Request Message	No	6.2.1.3, 7.2.3
99/12	Schedule Replace Request Message	No	6.2.1.6, 7.2.6
99/21	Alternate Schedule Add Request Message	No	6.2.1.7, 7.2.7
99/24	Wait List Request Message	No	6.2.1.8, 7.2.8
99/25	TDRS Scheduling Window Message	No	6.2.1.9, 7.2.9
99/28	Schedule Result Request Message	No	6.2.1.5, 7.2.5
99/01	Schedule Delete Notification Message	No	6.2.1.4, 7.2.4
94/01	User Schedule Message—Fixed Normal Support	No	6.2.2.1, 7.3
94/02	User Schedule Message—Fixed Premium Support	No	6.2.2.2, 7.3
94/03	User Schedule Message—Fixed Simulation Support	No	6.2.2.3, 7.3
94/04	User Schedule Message—Flexible Normal Support	No	6.2.2.4, 7.3
94/05	User Schedule Message—Flexible Simulation Support	No	6.2.2.5, 7.3
98/03	User Reacquisition Request Message	No	6.3.1.1, 8.2.1a
98/05	Forward Link Sweep Request Message	No	6.3.1.2, 8.2.1b
98/06	Forward Link EIRP Reconfiguration Message	No	6.3.1.3, 8.2.1c
98/07	Expanded User Freq. Uncertainty Request Message	No	6.3.1.4, 8.2.1d
98/04	User Reconfiguration Request Message	No	6.3.1.5, 8.2.1e
98/08	Doppler Compensation Inhibit Request Message	No	6.3.1.6, 8.2.1f
98/02	GCM Disposition Message	No	6.3.1.7, 8.2.1g
98/01	GCM Status Message	No	6.3.1.8, 8.2.1h
92/04	User Performance Data Request Message	No	6.3.2.1, 8.3a
92/62	Return Channel Time Delay Measurement Message	No	6.3.2.2, 8.3b
92/63	Acquisition Failure Notification Message	No	6.3.2.3, 8.3c
92/66	Time Transfer Message	No	6.3.2.4, 8.3d
91/01	User Performance Data Message	No	6.3.3.1, 8.4.1
91/03	Communications Test Message	Yes	6.3.3.2, 8.4.3
N/A	Acknowledgment	No	5.6.1
03/10	State Vector Message	Yes	9.1, 9.5
03/14	State Vector Acknowledgment from NCCDS	Yes	9.2
03/15	State Vector Inflight Update Message	Yes	9.1, 9.5
03/60	State Vector Acknowledgment from MOC	Yes	9.2

## **IV. Mission-Unique Identifiers**

There are no mission-unique identifiers applicable to the FDF. For acquisition data provided by the FDF, items 16 and 17 of Table 9-2 contain information applicable to specific TDRSs, customer spacecraft, or permanent Earth stations supported by the FDF, rather than to the FDF, itself.

## **V. Mission-Unique Agreement**

This Mission-Unique Agreement specifies the roles, responsibilities, and agreements between the Network Control Center Data System (NCCDS) Data Processing Installation (DPI) and the FDF DPI with respect to the security of the information exchanged between them.

NCCDS shall be designed and operated to protect all information stored and processed by it as S/CL 3 information. The FDF DPI shall be designed and operated to protect all information stored and processed by it as Security Criticality Level (S/CL) TBS information.

The NCCDS is governed by the *Security Plan for the Network Control Center, NCC 98*, April 1998 and the FDF will be governed by the *Flight Dynamics Division (FDD) Security Plan*.

## **VI. Message Interchange Security Arrangements**

The following are the current message interchange security arrangements:

**TBS**

## **VII. Approvals**

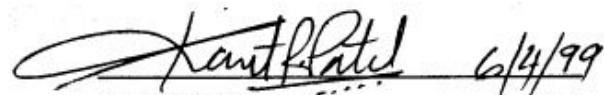
The management of NCCDS and the FDF DPIS are each responsible for securing certification and authorization to operate their respective DPI. Automated exchange of information between the NCCDS and the FDF is permitted only under both approvals, including joint approval of this interface arrangement.

**Annex 12**  
**To**  
**Interface Control Document**  
**Between the**  
**Network Control Center Data System**  
**and the**  
**Mission Operations Centers**  
**GPB MOC**

June 1999

Prepared Under Contract NAS-9-98100

Prepared By:



6/4/99

Kant R. Patel Date

Computer Sciences Corporation  
NCC Project

Approved By:

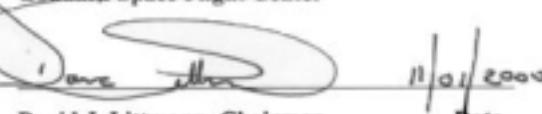


11/16/00

Roger N. Clason, Project Manager Date

NCC Project, Code 451.5

Goddard Space Flight Center



11/01/2000

David J. Littmann, Chairman Date

Configuration Control Board

Space Network Project, Code 451

Goddard Space Flight Center

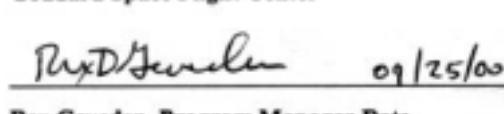


4/29/00

Roger J. Flaherty, Project Manager Date

Space Network Project, Code 451

Goddard Space Flight Center



09/25/00

Rex Geveden, Program Manager Date

Gravity Probe-B Program

Marshall Space Flight Center

This Revision 1 issue of 451-ICD-NCCDS/MOC supersedes the Interface Control Document Between the Network Control Center Data System and the Mission Operations Centers 530-ICD-NCCDS/MOC and all of its DCNs.

**Goddard Space Flight Center**  
**Greenbelt, Maryland**

## Annex 12

### GPB MOC

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#### **I. Introduction**

The purpose of this annex is to provide information, unique to the Gravity Probe-B (GPB) Mission Operations Center (MOC), that supplements general MOC information in the main body of this document. It includes communication format parameters, messages supported, mission-unique identifiers, and a mission-unique agreement for the GPB. The GPB MOC communicates with the NCCDS via the SN Web Services Interface (SWSI), hence some of the material in this Annex applies to the interface between the NCCDS and the SWSI rather than being directly applicable to the GPB MOC interface with the NCCDS.

#### **II. Communication Format Parameters**

##### **A. Nascom 4800bit Block Protocol Parameters**

The GPB MOC does not use Nascom 4800bit block Protocol for its communication with the NCCDS.

##### **B. TCP/IP Protocol Parameters**

The SWSI uses TCP/IP Protocol Parameters for all of its communications with the NCCDS on behalf of the GPB MOC. As needed, the system administrators responsible for the NCCDS and the SWSI will exchange information necessary for the establishment of the communications connections related to GPB's use of the service types shown in Table B.1. The logical destination name shown in Table B.2 will be used in GPB's Schedule Result Request messages.

##### **B.1 Client TCP/IP Protocol**

Service Type	Client SUPIDEN	MOC ICD Reference
Schedule Request	T8603MS	6.2.1, 7.2.1, 7.2.3
Schedule Status	T8603MS	6.2.1, 6.2.2, 7.2.2, 7.2.4, 7.2.5, 7.3
User Performance Data	T8603MS	6.3.2, 6.3.3, 8.3, 8.4.1
Reconfiguration	T8603MS	6.3.1, 8.2
Acquisition Data Storage	8603*	6.4, 9.5
TSW Storage	T8603MS	6.2.1.9, 7.2.9

\* Only the SIC portion of the SUPIDEN is applicable to messages exchanged on the Acquisition Data Storage service.

## B.2 Server TCP/IP Protocol

Logical Destination Name	MOC ICD Reference
GPB-Scheduler	Table 7-8 (item 7), 7.2.5

## C. FTP Protocol Parameters

The GPB MOC does not use FTP Protocol Parameters for its communication with the NCCDS.

### III. Messages Supported

Message Type/Class	Name	In use by GPB	MOC ICD Reference
99/01	Schedule Delete Notification Message	No	6.2.1.4, 7.2.4
99/02	Schedule Result Message	Yes	6.2.1.2, 7.2.2
99/10	Schedule Add Request Message	Yes	6.2.1.1, 7.2.1
99/11	Schedule Delete Request Message	Yes	6.2.1.3, 7.2.3
99/12	Schedule Replace Request Message	Yes	6.2.1.6, 7.2.6
99/21	Alternate Schedule Add Request Message	Yes	6.2.1.7, 7.2.7
99/24	Wait List Request Message	Yes	6.2.1.8, 7.2.8
99/25	TDRS Scheduling Window Message	Yes	6.2.1.9, 7.2.9
99/28	Schedule Result Request Message	Yes	6.2.1.5, 7.2.5
98/01	GCM Status Message	Yes	6.3.1.8, 8.2.1h
98/02	GCM Disposition Message	Yes	6.3.1.7, 8.2.1g
98/03	User Reacquisition Request Message	Yes	6.3.1.1, 8.2.1a
98/04	User Reconfiguration Request Message	Yes	6.3.1.5, 8.2.1e
98/05	Forward Link Sweep Request Message	Yes	6.3.1.2, 8.2.1b
98/06	Forward Link EIRP Reconfiguration Message	Yes	6.3.1.3, 8.2.1c
98/07	Expanded User Freq. Uncertainty Request Message	Yes	6.3.1.4, 8.2.1d
98/08	Doppler Compensation Inhibit Request Message	Yes	6.3.1.6, 8.2.1f
94/01	User Schedule Message—Fixed Normal Support	Yes	6.2.2.1, 7.3
94/02	User Schedule Message—Fixed Premium Support	Yes	6.2.2.2, 7.3
94/03	User Schedule Message—Fixed Simulation Support	Yes	6.2.2.3, 7.3
94/04	User Schedule Message—Flexible Normal Support	Yes	6.2.2.4, 7.3
94/05	User Schedule Message—Flexible Simulation Support	Yes	6.2.2.5, 7.3
92/04	User Performance Data Request Message	Yes	6.3.2.1, 8.3a
92/62	Return Channel Time Delay Measurement Message	Yes	6.3.2.2, 8.3b
92/63	Acquisition Failure Notification Message	Yes	6.3.2.3, 8.3c
92/66	Time Transfer Message	Yes	6.3.2.4, 8.3d
91/01	User Performance Data Message	Yes	6.3.3.1, 8.4.1
91/03	Communications Test Message	No	6.3.3.2, 8.4.3
03/10	State Vector Message	Yes	9.1, 9.5
03/14	State Vector Acknowledgment from NCCDS	No	9.2
03/15	State Vector Inflight Update Message	No	9.1, 9.5
N/A	MOC Acknowledgment	No	5.6.1

## IV. Mission-Unique Identifiers

Parameter	Value	MOC ICD Reference
SUPIDEN	T8603MS	The SUPIDEN is used in all message types defined in Sections 5 through 8.
SIC	8603	The SIC is used in the IIRV message defined in Section 9.
VIC	01	Item 5 of Table 7-13, Item 5 of Table 8-19, Item 3 of Tables 8-21 - 8-30, Item 3 of Tables 8-32 - 8-34 Item 3 of Tables 8-36 - 8-37 Item 17 of Table 9-2

## V. Mission-Unique Agreement

This Mission-Unique Agreement specifies the roles, responsibilities, and agreements between the Network Control Center Data System (NCCDS) Data Processing Installation (DPI) and the GPB MOC DPI with respect to the security of the information exchanged between them.

NCCDS shall be designed and operated to protect all information stored and processed by it as S/CL 3 information. The GPB MOC DPI shall be designed and operated to protect all information stored and processed by it as Security Criticality Level (S/CL) 2 information.

The NCCDS is governed by the Security Plan for the Network Control Center, NCC 98, April 1998 and the GPB MOC will be governed by GPBDIS Security Policy.

## VI. Message Interchange Security Arrangement

The following are the current message interchange security arrangements:

- The GPB MOC will communicate with the NCCDS via the SWSI.
- The SWSI and workstations in the GPB MOC will communicate via the Open IONET.
- The SWSI will be located in the NCC, and the NCCDS and the SWSI will communicate by exchange of messages over TCP connections as specified in this ICD.
- The security arrangements applicable to message interchange between the NCCDS and the SWSI are beyond the scope of this Annex.

## VII. Approvals

The management of NCCDS and the GPB MOC DPIs are each responsible for securing certification and authorization to operate their respective DPI. Automated exchange of information between the NCCDS and the GPB MOC is permitted only under both approvals, including joint approval of this interface arrangement.