

IDC DOCUMENTATION

Formats and Protocols for Messages

IMS1.0



Notice

Every effort was made to ensure that the information in this document was accurate at the time of printing. However, the information is subject to change.

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Formats and Protocols for Messages-IMS1.0

CONTENTS

About this Document

■ PURPOSE	i
■ SCOPE	ii
■ AUDIENCE	iv
■ RELATED INFORMATION	iv
■ USING THIS DOCUMENT	v
Conventions	vi

Message Protocol

■ INTRODUCTION	1
■ PROTOCOLS	2
■ MESSAGE CONVENTIONS	3
Message Size	3
Line Length	4
Free Format Lines	4
Fixed Format Lines	5
Blank Lines	5
Missing Data	6
Comments	6
Date and Time Formats	6
Radionuclide Site Codes	7
Radionuclide Detector Codes	8
S/H/I Network Codes	16
S/H/I Station Codes	17
S/H/I Channel Codes	17
S/H/I Auxiliary Codes	18
Latitude/Longitude Conventions	19
	20

Energy Units	20
Distance Units	20
■ MESSAGE STRUCTURE	20
Begin	21
Msg_type	22
Msg_id	22
Ref_id	23
Prod_id	27
Stop	27
■ MESSAGE AUTHENTICATION	27
Request Messages	29
■ INTRODUCTION	30
■ HELP LINE	30
■ REQUEST FORMAT	31
■ REQUEST CONTROL LINES	31
E-mail	32
FTP	32
■ REQUEST ENVIRONMENT LINES	33
Arrival_list	35
Aux_list	35
Bull_type	36
Chan_list	37
Comm_list	37
Depth	38
Depth_conf	38
Depth_minus_error	39
Depth_thresh	40
Event_list	40
Event_sta_dist	41
Group_bull_list	43
Lat	44
Loc_conf	45

Lon	45
Mag	46
Mag_type	47
Mb_minus_ms	48
Mbms_conf	48
Mbms_slope	49
Mbms_thresh	49
Min_nsta_ms	50
Origin_list	51
Relative_to	52
Sta_list	53
Time	54
Time_stamp	55
■ REQUEST LINES	56
ARMR	60
ARR	61
Arrival/SLSD	62
Blankphd	64
Bulletin	64
Calibphd	68
Channel	69
Chan_status	70
Comment	70
Comm_status	71
Detbkphd	72
Event	73
FPEB	74
Origin	75
Outage	77
Qcphd	77
Response	78
SLSD	79
Sphdf/p	79

<u>Station</u>	80
<u>Sta_status</u>	81
<u>Waveform</u>	82
<u>Subscription Messages</u>	85
■ <u>INTRODUCTION</u>	86
■ <u>SUBSCRIPTION PROCEDURES</u>	87
■ <u>SUBSCRIPTION FORMAT</u>	88
■ <u>SUBSCRIPTION CONTROL LINES</u>	89
<u>Send_empty</u>	90
<u>Time</u>	90
■ <u>SUBSCRIPTION ENVIRONMENT LINES</u>	91
<u>Freq</u>	91
<u>Prodid_list</u>	92
<u>Subscr_list</u>	93
<u>Subscr_name</u>	94
<u>Delivid_list</u>	94
■ <u>SUBSCRIPTION REQUEST LINES</u>	96
<u>ARMR</u>	98
<u>ARR</u>	99
<u>Arrival</u>	99
<u>Bulletin</u>	100
<u>Calibphd</u>	102
<u>Change</u>	103
<u>Chan_status</u>	104
<u>Comm_status</u>	104
<u>Detbkphd</u>	105
<u>Event</u>	106
<u>FPEB</u>	106
<u>Origin</u>	107
<u>Qcphd</u>	108
<u>Sphdf/p</u>	109
<u>Sta_status</u>	110

Subscribe	111
Subscr_log	111
Subscr_prod	113
Subscr_resend	114
Unsubscribe	115
Waveform	116
S/H/I Data Messages	119
■ INTRODUCTION	120
Data_type	120
■ STATION INFORMATION	121
Channel	121
Network	123
Station	123
■ WAVEFORM DATA	125
Response	125
Waveform	131
■ PROCESSING PRODUCTS	146
Arrival	146
Bulletin	154
Comment	165
Event	165
Origin	166
■ STATUS INFORMATION	166
Auth_status	166
Chan_status	168
Comm_status	171
Outage	173
Sta_status	175
■ LOGS	180
Error_log	180
FTP_log	180
Log	181

<u>Radionuclide Data Messages</u>	183
■ <u>INTRODUCTION</u>	184
<u>Data_type</u>	184
■ <u>PULSE HEIGHT DATA</u>	186
<u>Background Measurement Identification</u>	193
<u>Certificate</u>	194
<u>Energy Span</u>	194
<u>Energy/Resolution/Efficiency/Totaleff</u>	194
<u>Identification Number of First Split</u>	194
<u>Identification Number of Second Split</u>	195
<u>Measurement Identification</u>	196
<u>Sample Geometry</u>	197
<u>Sample Reference Identification</u>	198
<u>Spectral Qualifier</u>	199
<u>Total Efficiency</u>	199
■ <u>FLOW RATE DATA</u>	200
<u>Actual Sampling Duration</u>	201
<u>Expected Sampling Duration</u>	201
<u>Expected Sampling Interval</u>	201
■ <u>METEOROLOGICAL DATA</u>	201
■ <u>ALERTS</u>	202
■ <u>REPORTS</u>	203
<u>ARR</u>	204
<u>ARMR</u>	213
<u>RMS Summary Report</u>	213
■ <u>LABORATORY ANALYSIS RESULTS</u>	214
■ <u>FISSION PRODUCT EVENT BULLETIN</u>	214
<u>Station AutoDRM Basics</u>	217
■ <u>INTRODUCTION</u>	218
■ <u>BASIC MESSAGE SUPPORT</u>	218
<u>BEGIN Line</u>	218

MSG_TYPE	218
MSG_ID	219
REF_ID	219
E-MAIL Line	219
■ ENVIRONMENT LINES	219
■ REQUEST LINES	219
■ DATA TYPES	220
■ AUTODRM IMPLEMENTATION SAFEGUARDS	220
Message Size	220
Request Echo	220
Repeat Requests	220
Returned Messages	221
Syntax Errors	221
AutoDRM Internal Problem Logging	221
AutoDRM Operation Logs	221
■ HELP RECOMMENDATIONS	222
References	225
Appendix A: Data Message Examples	A1
■ ALERT_FLOW	A2
■ ALERT_SYSTEM	A2
■ ALERT_TEMP	A2
■ ALERT_UPS	A2
■ ARMR	A3
■ ARR	A8
■ ARRIVAL:ASSOCIATED	A13
■ ARRIVAL:AUTOMATIC	A13
■ ARRIVAL:GROUPED	A14
■ ARRIVAL:REVIEWED	A14
■ ARRIVAL:UNASSOCIATED	A14
■ AUTH_STATUS	A14

■ BLANKPHD	A15
■ BULLETIN (IMS1.0:SHORT FORMAT)	A16
■ BULLETIN (IMS1.0:LONG FORMAT)	A16
■ CALIBPHD	A18
■ CHANNEL	A19
■ CHAN_STATUS	A19
■ COMMENT	A20
■ COMM_STATUS	A20
■ DETBKPHD	A21
■ ERROR_LOG	A21
■ EVENT	A22
■ FLOW	A22
■ FPEB	A23
■ FTP_LOG	A24
■ HELP	A24
■ LOG	A24
■ MET	A25
■ NETWORK	A25
■ ORIGIN	A26
■ OUTAGE	A26
■ QCPHD	A27
■ RESPONSE	A28
■ RSR	A28
■ SAMPLEPHD	A30
■ STATION	A31
■ STA_STATUS	A32
■ WAVEFORM (IMS1.0:CM6 FORMAT)	A32
■ WAVEFORM (IMS1.0:INT FORMAT)	A33

Appendix B: Authentication Example

B1

■ AUTHENTICATED REQUEST MESSAGE

B2

■ DECODED SIGNATURE BLOCK

B4

Glossary

G1

Index

I1

Formats and Protocols for Messages-IMS1.0

FIGURES

<u>FIGURE 1.</u>	<u>FORTRAN SUBROUTINE FOR COMPUTING CHK2 CHECKSUM</u>	137
<u>FIGURE 2.</u>	<u>C FUNCTION FOR COMPUTING CHK2 CHECKSUM</u>	138

Formats and Protocols for Messages-IMS1.0

TABLES

<u>TABLE I:</u>	<u>TYPOGRAPHICAL CONVENTIONS</u>	vi
<u>TABLE II:</u>	<u>TERMINOLOGY</u>	vii
<u>TABLE 1:</u>	<u>COUNTRY CODES</u>	8
<u>TABLE 2:</u>	<u>S/H/I CHANNEL BAND CODES</u>	18
<u>TABLE 3:</u>	<u>S/H/I CHANNEL INSTRUMENT CODES</u>	19
<u>TABLE 4:</u>	<u>S/H/I CHANNEL ORIENTATION CODES</u>	19
<u>TABLE 5:</u>	<u>S/H/I DATA REQUEST ENVIRONMENT VARIABLES</u>	58
<u>TABLE 6:</u>	<u>RADIONUCLIDE DATA REQUEST ENVIRONMENT VARIABLES</u>	59
<u>TABLE 7:</u>	<u>S/H/I SUBSCRIPTION REQUEST ENVIRONMENTS</u>	96
<u>TABLE 8:</u>	<u>RMS SUBSCRIPTION REQUEST ENVIRONMENTS</u>	97
<u>TABLE 9:</u>	<u>CHANNEL FORMAT</u>	122
<u>TABLE 10:</u>	<u>NETWORK FORMAT</u>	123
<u>TABLE 11:</u>	<u>STATION FORMAT</u>	124
<u>TABLE 12:</u>	<u>CALIBRATION IDENTIFICATION BLOCK FORMAT</u>	126
<u>TABLE 13:</u>	<u>POLES AND ZEROS BLOCK FORMAT</u>	127
<u>TABLE 14:</u>	<u>FREQUENCY, AMPLITUDE, AND PHASE BLOCK FORMAT</u>	128
<u>TABLE 15:</u>	<u>GENERIC RESPONSE BLOCK FORMAT</u>	129
<u>TABLE 16:</u>	<u>DIGITIZER RESPONSE BLOCK FORMAT</u>	129
<u>TABLE 17:</u>	<u>FINITE IMPULSE RESPONSE BLOCK FORMAT</u>	130
<u>TABLE 18:</u>	<u>RESPONSE COMMENT BLOCK FORMAT</u>	130
<u>TABLE 19:</u>	<u>WAVEFORM IDENTIFICATION BLOCK FORMAT</u>	131
<u>TABLE 20:</u>	<u>STATION BLOCK FORMAT</u>	132
<u>TABLE 21:</u>	<u>WAVEFORM DATA BLOCK FORMAT</u>	133
<u>TABLE 22:</u>	<u>CHECKSUM BLOCK FORMAT</u>	133
<u>TABLE 23:</u>	<u>IMS S/H/I INSTRUMENT TYPES</u>	134
<u>TABLE 24:</u>	<u>APPLICABLE BLOCKS FOR WAVEFORM MESSAGES</u>	139

<u>TABLE 25:</u>	<u>OUT2 BLOCK FORMAT</u>	139
<u>TABLE 26:</u>	<u>DLY2 BLOCK FORMAT</u>	139
<u>TABLE 27:</u>	<u>EID2 BLOCK FORMAT</u>	140
<u>TABLE 28:</u>	<u>BEA2 BLOCK FORMAT</u>	140
<u>TABLE 29:</u>	<u>BIT POSITIONS FOR CM6</u>	142
<u>TABLE 30:</u>	<u>ASCII REPRESENTATION OF BIT PATTERNS FOR CM6</u>	143
<u>TABLE 31:</u>	<u>BIT POSITIONS FOR CM8</u>	144
<u>TABLE 32:</u>	<u>AUTHENTICATION DATA FORMAT</u>	144
<u>TABLE 33:</u>	<u>AUTOMATIC ARRIVAL FORMAT</u>	146
<u>TABLE 34:</u>	<u>REVIEWED ARRIVAL FORMAT</u>	148
<u>TABLE 35:</u>	<u>DETECTION CHARACTER FROM UNCERTAINTY</u>	149
<u>TABLE 36:</u>	<u>GROUPED ARRIVAL FORMAT</u>	150
<u>TABLE 37:</u>	<u>ASSOCIATED ARRIVAL FORMAT</u>	152
<u>TABLE 38:</u>	<u>BLOCKS USED IN BULLETIN FORMATS</u>	155
<u>TABLE 39:</u>	<u>BULLETIN TITLE BLOCK FORMAT</u>	155
<u>TABLE 40:</u>	<u>EVENT TITLE BLOCK FORMAT</u>	155
<u>TABLE 41:</u>	<u>ORIGIN BLOCK FORMAT</u>	156
<u>TABLE 42:</u>	<u>PHASE BLOCK FORMAT</u>	159
<u>TABLE 43:</u>	<u>EVENT SCREENING BLOCK FORMAT</u>	161
<u>TABLE 44:</u>	<u>EVENT CHARACTERIZATION ARRIVAL BLOCK FORMAT</u>	162
<u>TABLE 45:</u>	<u>COMMENT FORMAT</u>	165
<u>TABLE 46:</u>	<u>REPORT PERIOD BLOCK FORMAT</u>	166
<u>TABLE 47:</u>	<u>AUTHENTICATION LIST BLOCK FORMAT</u>	167
<u>TABLE 48:</u>	<u>CHANNEL STATISTICS BLOCK FORMAT</u>	169
<u>TABLE 49:</u>	<u>DATA TIMELINESS BLOCK FORMAT</u>	170
<u>TABLE 50:</u>	<u>COMMUNICATIONS STATISTICS BLOCK FORMAT</u>	172
<u>TABLE 51:</u>	<u>COMMUNICATIONS OUTAGE BLOCK FORMAT</u>	173
<u>TABLE 52:</u>	<u>OUTAGE FORMAT</u>	173
<u>TABLE 53:</u>	<u>STATION CAPABILITY CRITERIA</u>	176
<u>TABLE 54:</u>	<u>STA STATUS FORMAT</u>	178
<u>TABLE 55:</u>	<u>DATA BLOCKS FOR PULSE HEIGHT DATA</u>	187

<u>TABLE 56:</u>	<u>#HEADER BLOCK FORMAT</u>	188
<u>TABLE 57:</u>	<u>#COMMENT BLOCK FORMAT</u>	189
<u>TABLE 58:</u>	<u>#COLLECTION BLOCK FORMAT</u>	189
<u>TABLE 59:</u>	<u>#SAMPLE BLOCK FORMAT</u>	189
<u>TABLE 60:</u>	<u>#PROFILE BLOCK FORMAT</u>	190
<u>TABLE 61:</u>	<u>#ACQUISITION BLOCK FORMAT</u>	190
<u>TABLE 62:</u>	<u>#CALIBRATION BLOCK FORMAT</u>	190
<u>TABLE 63:</u>	<u>#ENERGY BLOCK FORMAT</u>	191
<u>TABLE 64:</u>	<u>#RESOLUTION BLOCK FORMAT</u>	191
<u>TABLE 65:</u>	<u>#EFFICIENCY BLOCK FORMAT</u>	191
<u>TABLE 66:</u>	<u>#TOTALEFF BLOCK FORMAT</u>	192
<u>TABLE 67:</u>	<u>#SPECTRUM BLOCK FORMAT</u>	192
<u>TABLE 68:</u>	<u>#CERTIFICATE BLOCK FORMAT</u>	193
<u>TABLE 69:</u>	<u>FLOW DATA FORMAT</u>	200
<u>TABLE 70:</u>	<u>MET DATA FORMAT</u>	201
<u>TABLE 71:</u>	<u>GENERAL ALERT DATA FORMAT</u>	203
<u>TABLE 72:</u>	<u>ENERGIES OF UNKNAT LINES</u>	212

About this Document

This chapter describes the organization and content of the document and includes the following topics:

- [Purpose](#)
- [Scope](#)
- [Audience](#)
- [Related Information](#)
- [Using this Document](#)

About this Document

PURPOSE

This document describes the International Monitoring System 1.0 (IMS1.0) version of the formats and protocols used for discrete message exchange, including requests for subscriptions and data messages.

This document is Revision 1 of *Formats and Protocols for Messages*, published May 1998 [\[IDC3.4.1\]](#). The following changes have been made for this publication:

- **General**
The document title has been changed to *Formats and Protocols for Messages-IMS1.0*. The term “S/H/I” is used to refer to the Seismic, Hydroacoustic, and Infrasonic technologies.
- [About this Document](#)
This chapter provides a more detailed description of the document's organization and an expanded terminology table (see [Table II](#)). The paragraphs describing ASCII formats also have been revised.
- [Message Protocol](#)
This chapter now emphasizes the differences between S/H/I message formats and protocols and those of radionuclide messages. Additional examples and cross-references have been included. Also, a section describing the protocol for authenticating messages has been added (see [“Message Authentication” on page 27](#)).
- [Request Messages](#)
This chapter now includes a description of how radionuclide data may be requested using the *AutoDRM* system. Environments for specifying event characterization thresholds also have been added. These environments are available only for request messages and therefore do not

appear in the Subscription Messages chapter. A synonym for the Arrival data request, SLSD (Standard List of Event Detections), has been included in the Arrival data request type (page 62).

- [Subscription Messages](#)

This chapter now includes a description of subscriptions to radionuclide data and products using the *AutoDRM* system. Capabilities (including the environments AUX_LIST, COMM_LIST, GROUP_BULL_LIST, TIME_STAMP, and NET_LIST) that are not currently supported by the *Subscription Subsystem* have been removed.

- [S/H/I Data Messages](#)

This chapter has been re-organized to reflect the different categories of data messages, including “Station Information” on page 121), “Waveform Data” on page 125, “Processing Products” on page 146, “Status Information” on page 166, and “Logs” on page 180. The Bulletin format in this chapter has been changed; the Bulletin Title Block now accommodates 136 characters (page 155), and the Event Screening Block replaces the old Event Characterization Block (page 161).

- [Radionuclide Data Messages](#)

The wording of this chapter has been changed to include noble gas sampling as an equal to particulate sampling. ALERT messages (page 202) are now a type of data message, and the new data types ARR (Automated Radionuclide Report, page 204) and LAR (Laboratory Analysis Results, page 214) have also been included. Formats for the ARMR (Atmospheric Radionuclide Measurement Report, page 213) and FPEB (Fission Product Event Bulletin, page 214) have been updated, and the section on Pulse Height Data (PHD, page 186) includes additional footnotes, descriptions, and examples.

- [Station AutoDRM Basics](#)

Minor changes have been made to this chapter.

- The Problem Message chapter was omitted from this publication.

**About this ▼
Document**■ [Appendix A: Data Message Examples](#)

This appendix replaces the original "Appendix." Examples of the new radionuclide data types have been added, and formats for the other examples have been updated as needed. The examples are shown in a smaller font to accommodate most wide data messages, however, a few examples still wrap to the next line.

- ["Appendix B: Authentication Example"](#) has been added.
- The [Glossary](#) includes additional terms.
- The document now includes an [Index](#).

SCOPE

This document describes the formats and protocols to use for all messages that are not part of the *Continuous Data Subsystem* [\[IDC3.4.2Rev1\]](#). It does not describe software for receiving or generating messages or the formats and protocols for continuous data exchange. These topics are described in sources cited in ["Related Information" on page iv](#).

AUDIENCE

This document is intended for users, software developers, and engineers of the *Message* and *Subscription Subsystems*.

RELATED INFORMATION

The following documents complement this document:

- *Formats and Protocols for Continuous Data* [\[IDC3.4.2Rev1\]](#)
- *Message Subsystem Software* [\[IDC7.4.2\]](#)
- *Subscription Subsystem Software* [\[IDC7.4.4\]](#)

See ["References" on page 225](#) for a listing of all the sources of information consulted in preparing this document.

USING THIS DOCUMENT

This document is part of the overall documentation architecture for the International Data Centre (IDC) as charted on the Roadmap located on the pages preceding the Table of Contents. As part of the Products and Services document category, this document provides descriptions of IDC products and their formats. The highlighted box on the Roadmap represents this document.

This document is organized as follows:

- [Message Protocol](#)
This chapter provides a high-level description of the protocol used to exchange messages.
- [Request Messages](#)
This chapter describes the formats for messages that are used to make requests for data and data products.
- [Subscription Messages](#)
This chapter describes the formats for messages that are used to establish and manipulate subscriptions.
- [S/H/I Data Messages](#)
This chapter describes the formats for messages that contain seismic, hydroacoustic, and infrasonic (S/H/I) data and data products.
- [Radionuclide Data Messages](#)
This chapter describes the formats for messages that contain radionuclide data and data products, including messages used for reporting problems encountered within the Radionuclide Monitoring System (RMS).
- [Station AutoDRM Basics](#)
This chapter describes the formats that must be supported by auxiliary seismic stations of the International Monitoring System (IMS).
- [References](#)
This section lists the sources cited in this document.

About this Document ▼

- [Appendix A: Data Message Examples](#)

This appendix contains examples of formatted data messages.

- [Appendix B: Authentication Example](#)

This appendix contains an example of an authenticated request message.

- [Glossary](#)

This section defines the terms, abbreviations, and acronyms used in this document.

- [Index](#)

This section lists topics and features provided in the document along with page numbers for reference.

Conventions

This document uses a variety of conventions, which are described in the following tables. Table I shows the typographical conventions.

TABLE I: TYPOGRAPHICAL CONVENTIONS

Element	Font	Example
required environments	bold	time
attributes of database tables when written separately	<i>italics</i>	<i>status</i>
processes and software units		<i>ParseSubs</i>
user-defined arguments		<i>delete-remarks object</i>
computer code and output filenames, directories, and websites text that should be typed in exactly as shown	courier	<code>>(list 'a 'b 'c) ars.scm edit-filter-dialog</code>
key words of control lines, environ- ment lines, request lines, data lines, and specific data message types when used in text.	CAPITALS	E-MAIL, TIME, ARR, BULLETIN, LOG

Table II explains certain technical terms that are not part of the standard Glossary, which is located at the end of this document.

TABLE II: TERMINOLOGY

Term	Description
*	(asterisks) symbol indicating that any ASCII character(s) may be substituted
[]	(square brackets) symbols delineating optional parameters in a syntax description
...	(ellipsis) symbol indicating that lines of an example have been intentionally omitted
	(vertical bar) symbol indicating “or” in a syntax or environment description
block	group of lines in a data message that constitutes a cohesive unit of information
compressed data	data that have been reduced significantly in size to make transmission more efficient
control lines	request or subscription message lines that specify how and/or when the response to the request or subscription will be sent
data message	<i>AutoDRM</i> message that contains data; usually sent in response to a request message or a subscription
data products	reports, bulletins, and other products that contain the results of processing
environment lines	request or subscription message lines that establish an environment within which requests or subscriptions are made
identification lines	<i>AutoDRM</i> message lines that identify the <i>AutoDRM</i> version, message type, and reference numbers

TABLE II: TERMINOLOGY (CONTINUED)

Term	Description
logical line	<i>AutoDRM</i> instruction or data line that is a complete unit as defined in this document. A logical line may consist of one or more physical lines.
physical line	line terminated by a Line Feed, or by a Line Feed followed by a Carriage Return
request lines	request or subscription message lines that specify the data or data product being requested
request message	<i>AutoDRM</i> message that requests data or data products
subscription message	<i>AutoDRM</i> message that establishes or alters regular delivery of data or data products

Formats in this document represent either American Standard Code for Information Interchange (ASCII) characters or binary fields, depending on the type of data being described. The conventions for ASCII formats include the following format types:

- "a" alphanumeric character strings
- "i" integers
- "f" floating point numbers
- "e" exponential numbers

Depending on the format type indicator (a, i, f, e), each is followed by either an integer or a decimal number. For alphanumeric character strings and integer numbers, the number following the format type is an integer that describes the maximum number of characters or digits allowed in a field. For example, the format "a5" indicates that the field is represented by five alphanumeric characters (for example, SE001); and the format "i4" indicates an integer number with four positions (for example, 4321). For floating point and exponential numbers, the type

indicator is followed by two numbers separated by a period as in “n.m”. In both formats, “n” describes the maximum number of characters that may be used to represent the number, including decimal points, exponential indicators, plus or minus signs, and so on. For floating point numbers, “m” is the recommended number of digits that follow the decimal point. The number of digits after the decimal point is allowed to “float” to accommodate anomalous data. For example, “f5.2” accommodates numbers from .0001 to 9999., but the preferred representation is two digits after the decimal point. For exponential number formats, “m” is the exact number of digits to the right of the decimal. For example, “e11.4” accommodates numbers like $-1.2345+E03$.

Some fixed formats allow combinations of the format types. Time and date formats combine the a, f, and i format types. A typical format for a date (such as 1998/04/15) is i4,a1,i2,a1,i2.

Where binary data are part of a format description, the numbers and characters are expressed as the number of bytes that are used to store them along with the convention that is used for ordering the bytes. The Institute for Electrical and Electronic Engineers (IEEE) byte order convention is used throughout this document.

Message Protocol

This chapter describes the message protocol and includes the following topics:

- [Introduction](#)
- [Protocols](#)
- [Message Conventions](#)
- [Message Structure](#)
- [Message Authentication](#)

Message Protocol

INTRODUCTION

The protocol for exchanging noncontinuous IMS data, IDC products, and other messages is based upon *AutoDRM*, an automatic data request management system used for obtaining data automatically through a system of email messages [\[Kra93\]](#). When request messages are sent via electronic mail (email) to the *AutoDRM*, the system responds with a return email message containing the requested data.

The basic *AutoDRM* formats and protocols established by [\[Kra93\]](#) were extended for the Group of Scientific Experts Third Technical Test (GSETT-3) [\[GSE95b\]](#). The GSETT-3 formats were adopted for use at the IDC and were expanded from the original seismic application to include hydroacoustic, infrasonic, and radionuclide messages. This version of the formats has been designated IMS1.0.

The three types of messages are described as follows:

- Request
This message type contains a request for IMS/IDC data or data products.
- Subscription
This message type establishes (or alters) standing requests for IMS/IDC data and/or data products.
- Data
This message type contains IMS/IDC data or data products as well as RMS Alert data messages.

These message types are described in subsequent chapters.

PROTOCOLS

Two standard low-level protocols are used for the exchange of messages: electronic mail (email) and file transfer protocol (FTP). Differences exist, however, in the circumstances under which these protocols are used for transmitting radionuclide and S/H/I data messages.

For S/H/I-related messages, the use of the available message protocols depends on the message length and content. For example, email is used for exchanging shorter S/H/I-related messages containing alphanumeric data. FTP is used for exchanging longer S/H/I-related messages as well as those containing binary data.

In contrast, all radionuclide-related messages are exchanged via email. FTP is used only in extremely limited cases where large radionuclide data files are sent from the IMS/IDC to a National Data Center (NDC).

At the application level, the message protocol requires that request and subscription messages be answered with data messages. Information controlling the format, low-level protocol, and destination for the data message are included in request and subscription messages.

MESSAGE CONVENTIONS

Basic message conventions are used for both radionuclide- and S/H/I-related messages. However, some differences in conventions exist between the radionuclide- and S/H/I-related messages, including:

- fixed format field justification,
- case sensitivity,
- blank lines,
- missing data,
- station naming, and
- comment conventions.

Message Size

The size of a message is unlimited. The maximum message size depends on the bandwidth of the connection between the message source and recipient, as well as the space available on computers for storing messages.

Although certain sites may be constrained by system limitations to sending email messages smaller than 400 kilobytes, Transmission Control Protocol/Internet Protocol-based (TCP/IP) email systems are generally reliable up to at least 1 megabyte. To accommodate data messages larger than these limits, a mechanism is provided for a single data message to be split into several parts that can be reconstructed by the recipient (see [“Ref id” on page 23](#)).

Radionuclide-related messages larger than 1 megabyte should be broken into several smaller emails using the methods described in [“Ref id” on page 23](#). For S/H/I-related messages, the message size determines the protocol that is most appropriate for message transmission. Messages larger than 1 megabyte should be transferred via FTP or should be broken into several smaller emails using the methods described in [“Ref id” on page 23](#).

Line Length

Line length conventions apply only to ASCII message lines (as opposed to binary message lines that may be used in some waveform data messages). A line may be up to 1,024 characters long, excluding the special characters Line Feed (LF) and Carriage Return (CR). An ASCII message line may be terminated by a LF or by a LF followed by a CR.

The format for a message line determines its logical line length. A logical line may be broken into several physical lines. To break a logical line into several physical lines, a backslash (\) is inserted at the desired break point. The logical line is then continued on the next physical line. The backslash may occur in any character position of the line and is counted as one of the physical line characters. The backslash does not hold the place of a blank or any other character. The character preceding the backslash is concatenated with the character in position one of the

next physical line. If the logical line length for an ASCII line is longer than 1,024 (such as with ASCII waveform data), then the line break character (\) is not used. Data are simply continued on the next line.

Free Format Lines

Message lines that are not in fixed format are known as free format lines. A free format line may consist of a keyword followed by an argument list or it may contain unformatted free text. Free format lines are left justified and case insensitive. Free format lines must have one or more blank spaces between fields. All lines in request and subscription messages are free format lines.

Fixed Format Lines

Fixed format lines differ from free format lines in that they have explicitly defined character fields. Most data message lines are in fixed format (header and data lines are examples).

Although many fixed format lines are case insensitive, some are not. Fixed format lines that are case sensitive include message lines in waveform data messages after compression by the CM6 compression scheme (see [“Subformat CM6” on page 141](#)). No fixed format lines in radionuclide data messages are case sensitive.

Field contents in radionuclide data messages that must be parsed into the IMS/IDC database are left justified regardless of field or line formatting. Otherwise, field contents are right or left justified according to the field and line formatting. Alphanumeric character fields in fixed format lines (such as a field with format a12) must be left justified. Numeric fields and numeric/alphanumeric character combination fields (such as f10.4; or i4,a1,i2) must be right justified.

Blank Lines

Blank lines are not permitted in radionuclide data messages that must be parsed into the IMS/IDC database. The exception to this rule occurs within free format line text. Blank lines are allowed in free text fields such as those found in a `#Comment` block and an ALERT data message (see [Table 57 on page 189](#) and [“Alerts” on page 202](#)).

In all other message types, blank lines may be added to improve legibility where they do not cause ambiguity.

Missing Data

Some fields in a message are required, while others are not. Blank characters can be used for missing data in S/H/I data message but not in Radionuclide data messages. For proper data parsing during automatic input processing, Radionuclide fields that are not required and are missing data must be filled. Missing Radionuclide numerical data (that is, floating point, integer, and exponential numbers) are indicated by a negative sign followed by as many “9s” as the field formatting will allow. For example, if the quantity for a field with format `f5.2` is unknown, then the field should contain the number `-999`. Missing Radionuclide character data with formats such as `a50` are designated with a single zero (0).

Comments

Comments for S/H/I-related messages are used primarily in LOG, ERROR_LOG, and FTP_LOG data messages. In these messages the comments are free-format lines in which the first character is blank.

Comments in radionuclide-related messages use a free format line structure that begins with a `#Comment` line. The lines following the `#Comment` line contain the comment text. The end of the comment is designated by a `STOP` line or another line beginning with a `#`. Comments may appear in all radionuclide data messages, however only one `#Comment` block is allowed per message. `#Comment` blocks cannot occur within other data blocks, but instead must precede or follow a data block.

Date and Time Formats

The standard format for specifying the date and time contains two fields: one for the date and one for the time, with a blank separating the two fields. The date must always be present, but the time field may be omitted. When no time is specified, the field defaults to 00:00:00.000.

The time field may have varying degrees of precision (that is, decimal places in the *seconds* attribute). The time format with the highest precision is shown below.

Syntax

yyyy/mm/dd hh:mm:ss.sss

<i>yyyy</i>	year
<i>mm</i>	month number
<i>dd</i>	day of the month
<i>hh</i>	hour in universal time coordinates (UTC)
<i>mm</i>	minute
<i>ss.sss</i>	seconds

The range of time over a day is from 00:00:00.000 to 23:59:59.999 (24:00:00.000 is not a valid time). Leading zeros in any of the number fields may be dropped in free format lines, but they must be present in fixed format lines. In addition, some of the values may be dropped from the time field in free format lines. If the seconds, or the minutes and seconds are dropped, then they are assumed to be "0" (for example, 21:03 is interpreted as 21:03:00.000 and 9 is interpreted as 09:00:00.000).

The following date-time formats are acceptable for free format lines:

```
1994/01/01 13:04:12.003
1994/12/23
1995/07/14 01:05
1995/09/10 2:15:3
```

Radionuclide Site Codes

RMS site codes must contain five characters. The first two characters are the two-letter country code for the country in which the site resides (see [Table 1](#)). The next character identifies the site type. Site types include R for Regional Lab, C for Certified Lab, N for NDC, X for Experimental, and 0 (zero) for Sampling Station. The last two characters are numbers representing the sequence of that site within the country (01, 02, 03).

The following examples show possible site codes:

```
ARR01
FIC07
CNX09
RU001
```

TABLE 1: COUNTRY CODES¹

Country	Three-letter Country Code	Two-letter Country Code
Afghanistan	AFG	AF
Albania	ALB	AL
Algeria	DZA	DZ
Andorra	AND	AD
Angola	AGO	AO
Antigua and Baruda	ATG	AG
Argentina	ARG	AR
Armenia	ARM	AM
Australia	AUS	AU
Austria	AUT	AT
Azerbaijan	AZE	AZ
Bahamas	BHS	BS
Bahrain	BHR	BH

TABLE 1: COUNTRY CODES¹ (CONTINUED)

Country	Three-letter Country Code	Two-letter Country Code
Bangladesh	BGD	BD
Barbados	BRB	BB
Belarus	BLR	BY
Belgium	BEL	BE
Belize	BLZ	BZ
Benin	BEN	BJ
Bhutan	BTN	BT
Bolivia	BOL	BO
Bosnia and Herzegovina	BIH	BA
Botswana	BWA	BW
Brazil	BRA	BR
Brunei Darussalam	BRN	BN
Bulgaria	BGR	BG
Burkina Faso	BFA	BF
Burundi	BDI	BI
Cambodia	KHM	KH
Cameroon	CMR	CM
Canada	CAN	CA
Cape Verde	CPV	CV
Central African Republic	CAF	CF
Chad	TCD	TD
Chile	CHL	CL
China	CHN	CN
Columbia	COL	CO
Comoros	COM	KM

TABLE 1: COUNTRY CODES¹ (CONTINUED)

Country	Three-letter Country Code	Two-letter Country Code
Congo	COG	CG
Congo, The Democratic Republic of the	COD	CD
Cook Islands	COK	CK
Costa Rica	CRI	CR
Cote d'Ivoire	CIV	CI
Croatia	HRV	HR
Cuba	CUB	CU
Cyprus	CYP	CY
Czech Republic	CZE	CZ
Denmark	DNK	DK
Djibouti	DJI	DJ
Dominica	DMA	DM
Dominican Republic	DOM	DO
Ecuador	ECU	EC
Egypt	EGY	EG
El Salvador	SLV	SV
Equatorial Guinea	GNQ	GQ
Eritrea	ERI	ER
Estonia	EST	EE
Ethiopia	ETH	ET
Fiji	FJI	FJ
Finland	FIN	FI
France	FRA	FR
Gabon	GAB	GA
Gambia	GMB	GM

TABLE 1: COUNTRY CODES¹ (CONTINUED)

Country	Three-letter Country Code	Two-letter Country Code
Georgia	GEO	GE
Germany	DEU	DE
Ghana	GHA	GH
Greece	GRC	GR
Grenada	GRD	GD
Guatemala	GTM	GT
Guinea	GIN	GN
Guinea-Bissau	GNB	GW
Guyana	GUY	GY
Haiti	HTI	HT
Holy See	VAT	VA
Honduras	HND	HN
Hungary	HUN	HU
Iceland	ISL	IS
India	IND	IN
Indonesia	IDN	ID
Iran, Islamic Republic of	IRN	IR
Iraq	IRQ	IQ
Ireland	IRL	IE
Israel	ISR	IL
Italy	ITA	IT
Jamaica	JAM	JM
Japan	JPN	JP
Jordan	JOR	JO
Kazakhstan	KAZ	KZ

TABLE 1: COUNTRY CODES¹ (CONTINUED)

Country	Three-letter Country Code	Two-letter Country Code
Kenya	KEN	KE
Kiribati	KIR	KI
Korea, Democratic People's Republic of	PRK	KP
Korea, Republic of	KOR	KR
Kuwait	KWT	KW
Kyrgyzstan	KGZ	KG
Lao People's Democratic Republic	LAQ	LA
Latvia	LVA	LV
Lebanon	LBN	LB
Lesotho	LSO	LS
Liberia	LBR	LR
Libyan Arab Jamahiriya	LBY	LY
Liechtenstein	LIE	LI
Lithuania	LTU	LT
Luxembourg	LUX	LU
Macedonia, The Former Yugoslav Republic of	MKD	MK
Madagascar	MDG	MG
Malawi	MWI	MW
Malaysia	MYS	MY
Maldives	MDV	MV
Mali	MLI	ML
Malta	MLT	MT
Marshall Islands	MHL	MH
Mauritania	MRT	MR
Mauritius	MUS	MU

TABLE 1: COUNTRY CODES¹ (CONTINUED)

Country	Three-letter Country Code	Two-letter Country Code
Mexico	MEX	MX
Micronesia, Federated States of	FSM	FM
Moldova	MDA	MD
Monaco	MCO	MC
Mongolia	MNG	MN
Morocco	MAR	MA
Mozambique	MOZ	MZ
Myanmar	MMR	MM
Namibia	NAM	NA
Nauru	NRU	NR
Nepal	NPL	NP
Netherlands	NLD	NL
New Zealand	NZL	NZ
Nicaragua	NIC	NI
Niger	NER	NE
Nigeria	NGA	NG
Niue	NIU	NU
Norway	NOR	NO
Oman	OMN	OM
Pakistan	PAK	PK
Palau	PLW	PW
Panama	PAN	PA
Papua New Guinea	PNG	PG
Paraguay	PRY	PY
Peru	PER	PE

TABLE 1: COUNTRY CODES¹ (CONTINUED)

Country	Three-letter Country Code	Two-letter Country Code
Philippines	PHL	PH
Poland	POL	PL
Portugal	PRT	PT
Qatar	QAT	QA
Romania	ROM	RO
Russian Federation	RUS	RU
Rwanda	RWA	RW
Saint Kitts and Nevis	KNA	KN
Saint Lucia	LCA	LC
Saint Vincent and the Grenadines	VCT	VC
Samoa	WSM	WS
San Marino	SMR	SM
Sao Tome & Principe	STP	ST
Saudi Arabia	SAU	SA
Senegal	SEN	SN
Seychelles	SYC	SC
Sierra Leone	SLE	SL
Singapore	SGP	SG
Slovakia	SVK	SK
Slovenia	SVN	SI
Solomon Islands	SLB	SB
Somalia	SOM	SO
South Africa	ZAF	ZA
Spain	ESP	ES
Sri Lanka	LKA	LK

TABLE 1: COUNTRY CODES¹ (CONTINUED)

Country	Three-letter Country Code	Two-letter Country Code
Sudan	SDN	SD
Suriname	SUR	SR
Swaziland	SWZ	SZ
Sweden	SWE	SE
Switzerland	CHE	CH
Syrian Arab Republic	SYR	SY
Tajikistan	TWN	TJ
Tanzania, United Republic of	TZA	TZ
Thailand	THA	TH
Togo	TGO	TG
Tonga	TON	TO
Trinidad and Tobago	TTO	TT
Tunisia	TUN	TN
Turkey	TUR	TR
Turkmenistan	TKM	TM
Tuvalu	TUV	TV
Uganda	UGA	UG
Ukraine	UKR	UA
United Arab Emirates	ARE	AE
United Kingdom of Great Britain and Northern Ireland	GBR	GB
United States of America	USA	US
Uruguay	URY	UY
Uzbekistan	UZB	UZ

TABLE 1: COUNTRY CODES¹ (CONTINUED)

Country	Three-letter Country Code	Two-letter Country Code
Vanuatu	VUT	VU
Venezuela	VEN	VE
Viet Nam	VNM	VN
Yemen	YEM	YE
Yugoslavia	YUG	YU
Zambia	ZMB	ZM
Zimbabwe	ZWE	ZW

1. [ISO 3166]

Radionuclide Detector Codes

The detector code enables easy identification of a unique detector and its location. RMS detector codes contain nine characters. The first five characters are the site code (see [“Radionuclide Site Codes” on page 8](#)). This code is followed by a unique four-character alphanumeric identifier assigned to the detector by its owner(s) or operating staff. Blank spaces and backslash (\) characters are not allowed in the four-character identifier.

The following example shows a possible detector code for an HPGe detector located at station DE002:

DE002HPGE

The following example shows a possible detector code for an HPGe detector at Health Canada in Ottawa used regularly for counting particulate samples from a remote, manual station:

CAR01-0G2

The following example shows a possible detector code for a LEGe detector located at station SE001:

SE001-XE1

The following example shows a possible detector code for an experimental gas monitoring unit in the U.S.:

USX03ARSA

S/H/I Network Codes

With the large number of S/H/I stations distributed globally, unique station names cannot be guaranteed. The seismic, hydroacoustic, and infrasonic network naming format supports the concept of duplicate station names and thus requires that stations be affiliated with a network.

The network identifier can be up to nine characters in length and consists of two parts separated by an underscore. The first part is three or four characters in length and is the “domain” of the network. This code is either an internationally recognized affiliation (such as IDC) or a three-letter ISO standard country code, as shown in [Table 1](#). The second part of the network identifier is the network code (1–4 characters) within that domain. An NDC sending data to the IDC may use the network code NDC. For example, the three-letter ISO code for the Czech Republic is CZE, so the default network code for the NDC of the Czech Republic is CZE_NDC.

S/H/I Station Codes

To guarantee that station names are unique and follow international naming conventions, seismic, hydroacoustic, and infrasonic station codes should be registered with the International Seismic Centre (ISC) in the United Kingdom and/or the National Earthquake Information Center (NEIC) in the United States.

All station codes must be five or fewer characters. Array stations have unique station codes for each element of the array as well as a unique array code that refers to the entire array. The code referencing the array should not be the same as the station code of any of the array elements.

S/H/I Channel Codes

The format for channel designators of S/H/I stations expands upon the format used by the Federation of Digital Seismic Networks (FDSN). Three characters are used to designate a channel. The first specifies the general sampling rate and the response band of the instrument, as shown in Table 2. The second character specifies the instrument code, as shown in Table 3. The third character specifies the physical configuration of the members of a multiple axis instrument package or other parameters as specified for each instrument, as shown in Table 4.

TABLE 2: S/H/I CHANNEL BAND CODES

Band Code	Band Type	Sample rate (Hz)	Corner period (seconds)
E	extremely short period	≥ 80	< 10
S	short period	≥ 10 to < 80	< 10
H	high broadband	≥ 80	≥ 10
B	broadband	≥ 10 to < 80	≥ 10
M	mid period	> 1 to < 10	
L	long period	$= 1$	
V	very long period	$= 0.1$	
U	ultra long period	$= 0.01$	
R	extremely long period	$= 0.001$	
W	weather/environmental		
X	experimental		

TABLE 3: S/H/I CHANNEL INSTRUMENT CODES

Instrument Code	Description
H	high-gain seismometer
L	low-gain seismometer
G	gravimeter/accelerometer seismometer
M	mass position seismometer
D	pressure sensor
C	composite trace

TABLE 4: S/H/I CHANNEL ORIENTATION CODES

Orientation Code	Description
Z, N, or E	traditional (vertical, north-south, east-west)
A, B, or C	tri-axial (along the edges of a cube turned up on a corner)
T or R	for transverse and radial rotations
1, 2, or 3	orthogonal components but nontraditional orientations
U, V, or W	optional components
H	hydrophone
F	infrasonic pressure
C	coherent beam
I	incoherent beam
O	origin beam

S/H/I Auxiliary Codes

The auxiliary designator is used to distinguish between different instruments or data streams that have the same station and channel codes. This four-letter designator is used only when a conflict exists. When not needed, this field is left blank.

Latitude/Longitude Conventions

All latitudes and longitudes are written as floating point numbers. Latitudes in the Southern Hemisphere have negative values. Longitudes in the Western Hemisphere have negative values.

Energy Units

All energy units are reported in kiloelectron volts (keV).

Distance Units

Distance units used for S/H/I-related messages are nanometers for ground displacement, degrees for source-receiver distances, and kilometers for all other distance measures (this includes, for example, event depth, emplacement depth, and station elevation). Distance units in radionuclide-related messages are specific to each field as described in [“Radionuclide Data Messages” on page 183](#).

MESSAGE STRUCTURE

The first three lines of a message are the BEGIN, MSG_TYPE, and MSG_ID lines. These provide information on

- the message format version number,
- the message type, and
- the message identification code.

If the message refers to a previous message (for example, a data message in response to a request message), then the fourth line is the REF_ID line. This line contains the message identification code of the referenced message.

If the message is a data message for a subscription, then the fourth line is a PROD_ID line. This line contains the product identification number and the sequence number for that product.

The BEGIN, MSG_TYPE, MSG_ID, and REF_ID/PROD_ID lines are followed by data specific to the message type. The final line of the message is the STOP line. The basic structure of a message is as follows:

Syntax

```
begin ims1.0
msg_type data | request | subscription
msg_id id_string [source]
[ref_id ref_str [ref_src] [part seq_num [of tot_num]]] |
[prod_id product_id delivery_id]
...
stop
```

Begin

Except in the case of a HELP message, the BEGIN line is the first line of an *AutoDRM* message. The BEGIN line contains the version identifier of the *AutoDRM* command syntax.

Syntax

```
begin [ims1.0]
```

The argument in the BEGIN line of a data message indicates the format of the data to follow. In some cases, earlier format versions will be accepted by the IDC.

The argument in the BEGIN line of a request message is the default format of the data that are requested. If a specific format string is given on a request line, that format specification will override the default.

**Message ▼
Protocol****Msg_type**

The MSG_TYPE line is the second line of a message. A message type is required for *AutoDRM* to distinguish between the different types of messages. Only one MSG_TYPE is allowed per message. Combining different message types in the same *AutoDRM* message is prohibited.

Syntax

```
msg_type request | data | subscription
```

Msg_id

The MSG_ID line is the third line of a message. A message identification code is required for tracking and identifying messages. The MSG_ID line is comprised of the MSG_ID keyword followed by an *id_string* code and a *source* code, separated by a blank.

The sender is responsible for providing a unique *id_string*, as well as a descriptive *source* code. The *id_string* may contain up to 20 alphanumeric characters. The *source* code is optional and may contain up to 16 alphanumeric characters. Blanks or backslash (\) characters are not allowed in either the *id_string* or the *source* codes.

Syntax

```
msg_id id_string [source]
```

id_string unique identification code (up to 20 characters)

source message source code (up to 16 characters)

The *source* of a message can be a station, a laboratory, an NDC, or the IDC. For radionuclide facilities, the radionuclide site code is used as the *source* (see [“Radio-nuclide Site Codes” on page 8](#)). For S/H/I stations and data centers (NDCs and the IDC) the source is the network code (see [“S/H/I Network Codes” on page 17](#)).

Ref_id

The REF_ID line is included in a message in two cases:

- when a message is generated and transmitted to a party in response to a message received from (sent by) the same party, and/or
- when a very large message is split into several separate, smaller messages.

Like the MSG_ID, the REF_ID also serves to track and identify messages. If the REF_ID line function is not required in a message, it is omitted. Otherwise, it occurs as the fourth message line.

The REF_ID line is comprised of the REF_ID command followed by a *ref_str* code and a *ref_src* code, separated by a blank. The *ref_str* and *ref_src* are, respectively, the *id_string* and *source* in the MSG_ID line of the original message received. Like the *source*, the *ref_src* is not a required field.

For multiple messages that must be recombined to form a complete message, the REF_ID line contains additional commands and attributes. Following the *ref_src*, the commands *part* and *of* are added with their respective attributes *seq_num* and *tot_num*. The *tot_num* is the total number of separate messages that comprise the complete message unit. The order in which the messages should be recombined is indicated in the *seq_num*.

Syntax

```
ref_id ref_str [ref_src] [part seq_num [of tot_num]]
```

<i>ref_str</i>	the <i>id_string</i> from the MSG_ID line of the request message
<i>ref_src</i>	the message source code from the MSG_ID line of the request message
<i>seq_num</i>	sequence number beginning with 1
<i>tot_num</i>	total number of parts for this response

**Message ▼
Protocol**

If a message must be split into smaller messages, the split(s) must occur only at DATA_TYPE boundaries. This method has the following advantages:

- data sections are never broken in the middle; and
- each message split is headed by BEGIN, MSG_TYPE, MSG_ID, and REF_ID lines, and terminated by a STOP line.

Each *id_string* in the MSG_ID lines of the individual split messages must be unique. The REF_ID lines, however, will have identical *ref_str* and *ref_src* codes. The *part seq_num* command is needed only when a message is split into parts. The *of tot_num* coding is optional for all but the last section of the split message.

Examples

To illustrate the use of REF_ID, suppose the following request for waveform data is sent from the NDC in country ABC to the IDC:

```
begin ims1.0
msg_type request
msg_id 1999/05/21_0001 ABC_NDC
...
stop
```

The IDC's response to the request will have a REF_ID from the IDC and will use the request message MSG_ID string in the REF_ID line:

```
begin ims1.0
msg_type data
msg_id 00000023 IMS_IDC
ref_id 1999/05/21_0001 ABC_NDC
...
stop
```

The following example shows a data message with four distinct DATA_TYPES:

```
begin ims1.0
msg_type data
msg_id 54965 IMS_IDC
ref_id 0002324 ANY_NDC
data_type type1 ims1.0
...
data_type type2 ims1.0
...
data_type type3 ims1.0
...
data_type type4 ims1.0
...
stop
```

**Message ▼
Protocol**

The following example shows how a message can be split. The single message in the previous example is split into two distinct messages using the *part seq_num* [of *tot_num*] referencing mechanism.

```
begin ims1.0
msg_type data
msg_id 54965 IMS_IDC
ref_id 0002324 ANY_NDC part 1 of 2
data_type type1 ims1.0
...
data_type type2 ims1.0
...
stop

begin ims1.0
msg_type data
msg_id 54966 IMS_IDC
ref_id 0002324 ANY_NDC part 2 of 2
data_type type3 ims1.0
...
data_type type4 ims1.0
...
stop
```

Prod_id

The PROD_ID line is the fourth line of a data message that is generated for a subscription. The PROD_ID line is comprised of the PROD_ID keyword followed by a *product_id* code and a *delivery_id* code, separated by a blank. These numbers help users receiving the subscription know if a delivery has been omitted.

Syntax

```
prod_id product_id delivery_id
      product_id      product identification code
      delivery_id     delivery identification
```

Stop

Except in the case of a HELP message, the STOP line is the last line of an *Auto-DRM* message. In the case where two or more messages with different MSG_ID *id_strings* are included in one email or file, all lines between the STOP and BEGIN lines are ignored. A message without a STOP line is considered incomplete and is ignored.

MESSAGE AUTHENTICATION

IMS1.0 messages are sent via email using Multi-purpose Internet Mail Extension (MIME) (see Request for Comments [\[Fre96a\]](#), [\[Fre96b\]](#), [\[Moo96\]](#), [\[Fre96c\]](#), and [\[Fre96d\]](#)). Data and request messages in IMS1.0 format may be authenticated using MIME email signed message formats without altering the IMS1.0 formats. The authentication mechanism encapsulates the message within MIME boundaries consisting of the message body and the signature.

The MIME format is defined in [\[Gal95\]](#) and [\[Cro95\]](#). Further drafts for these formats have standardized more aspects of the encapsulating procedures. The current industry practices, based on the standard described in [\[PKCS-7\]](#), provide the basis for the internet drafts. Messages delivered using a retrieval mechanism based on FTP would also use the MIME format for authentication.

**Message ▼
Protocol**

Email signatures for messages would usually carry the entire senders X.509 signed certificate in the signature block [\[ITU95\]](#). [“Appendix B: Authentication Example” on page B1](#) provides an example of a signed email request and a breakdown of the signature block.

Standard email readers and senders have the capability to interpret and create these authentication signatures. With an appropriate certificate installed in a mail application, a user could manually create a valid request message. The particular message format does not have to be changed to be authenticated; it will just be encapsulated in a MIME standard signed format.

The originating parties signature may be retained when data or products are forwarded from one site to another. In this case, any subsequent signatures would encapsulate the entire previously signed message into a message body with an additional signature.

Request Messages

This chapter describes the request message formats and includes the following topics:

- [Introduction](#)
- [Help Line](#)
- [Request Format](#)
- [Request Control Lines](#)
- [Request Environment Lines](#)
- [Request Lines](#)

Request Messages

INTRODUCTION

The request message format provides a framework in which almost all data or data products can be requested from the IMS/IDC. The data and data products available include radionuclide pulse-height data and analysis reports, S/H/I waveforms and bulletin products, and more.

Within a single request message, several types of data may be requested. For example, requests may be made for a bulletin and associated waveforms or for specific event information from several different regions. The order of the requests in the request message is preserved in the response (data) message.

Implementation of the *AutoDRM* formats will vary from site to site and will depend on the type of data and information that is available from the site. The minimum required configuration for a station or NDC *AutoDRM* is outlined in [“Station AutoDRM Basics” on page 217](#).

HELP LINE

The HELP line is considered a request message because it is used to request an *AutoDRM* Users Guide by email. Only the *AutoDRM* email address is required for this protocol to work properly. No other message lines are required in a HELP line message. The same result may be achieved by sending the *AutoDRM* an empty message with the word “help” as the email subject (see [“HELP” on page A24](#)).

REQUEST FORMAT

With the exception of the HELP request, all request messages require the basic message structure described in [“Message Structure” on page 20](#). To inform the *AutoDRM* that the message is a request message, the MSG_TYPE is set to request.

The body of a request message contains a series of free-format command lines that provide information about the return message (request control lines), sets the environment for subsequent request lines (request environment lines), and specifies the type of data that are to be returned within the limits of the environment (request lines). Some request lines must be preceded by environment lines that, by constraining the request, limit the size of the response.

The response to a request is contained in a data message. In the response data message, the identification (ID) fields from the MSG_ID line of the request message are placed in the REF_ID line.

REQUEST CONTROL LINES

Request control lines are commands that specify the protocol of the response data message. The existing options for the response message protocol are email and FTP. These options should be used in accordance with the guidelines described in [“Protocols” on page 3](#) and [“Message Size” on page 4](#).

Only one response message protocol can be specified in each request message. If different protocols are desired for the response data, separate request messages must be submitted to the *AutoDRM*. A request message that does not specify a response message protocol will be answered by email using the return address of the sender.

The syntax for the E-MAIL and FTP request control lines are described in the following sections.

E-mail

The E-MAIL line indicates to the *AutoDRM* that the response message protocol is email. The argument for the E-MAIL command is the email address to which the response message should be sent.

Syntax

`e-mail address`

`address` email address to send reply

If no E-MAIL line is included in the request message, the reply is sent to the address obtained from the mail header. Because the return address from an email header may not be reliable, it is highly recommended to specify the return email address using an E-MAIL line.

FTP

The FTP line specifies that the message should be put in a file for transmission using FTP. The argument for the FTP line is the email address to which notification should be sent, indicating that the FTP file is ready for transfer.

Syntax

`ftp address`

`address` email address to send notification

The notification message (an FTP_LOG data message) sent to the requestor contains the name and location of the FTP file(s) with the requested data or data product. (See [“FTP log” on page 180](#) for more about this data type and [“Ftp_log” on page A24](#) for an example of an FTP_LOG data message.)

REQUEST ENVIRONMENT LINES

Environment lines identify the variables to which the response to the request line is constrained (for example, TIME or STATION). An environment variable is set by arguments that follow a predetermined keyword and is reset with another environment line including the same keyword. An environment keyword with no arguments resets the constraint on that environmental parameter to the default value.

Environment variables may be specified using either ranges or lists. An environment range constrains the variable within the inclusive limits between two values. Ranges are specified using the word “to” surrounded by blank spaces.

Syntax

environment_keyword [[*low_limit*] to [*high_limit*]]

Open-ended ranges are specified by omitting the *low_limit* or the *high_limit*. A blank may also be used in the *low_limit* or the *high_limit* when a TIME environment is being specified.

Examples

All times between February 23, 1999 at 00:00:00 and March 10, 1999 at 14:37:02 are specified with the following environment line:

```
time 1999/02/23 to 1999/03/10 14:37:02
```

The following example specifies all magnitudes of 5.0 and above:

```
mag 5.0 to
```

List environment lines contain lists of comma-delimited parameters that specify discrete constraints, such as station names and channels. Some list environments are allowed only one parameter (for example, BULL_TYPE); others may have an unlimited number. Spaces after the commas are optional. The general syntax for a list environment is as follows:

Syntax

environment_keyword [*arg1*[, *arg2*[, *arg3*[, ...]]]]]

Lists can be long, so a wild card character (*) may be used as a substitute for any string of characters in some list environments.

Examples

The following environment line specifies all IMS stations, including seismic, hydroacoustic, and infrasonic stations:

```
sta_list *
```

The following environment line specifies all IMS stations beginning with "A":

```
sta_list a*
```

The following environment line specifies all radionuclide stations operated by the U.S.:

```
sta_list us*
```

The following environment line specifies all IMS channels ending with "Z":

```
chan_list *Z
```

The following sections describe specific environment variables. Default settings and examples are given for each variable. Although many environment variables are listed, only certain ones may be applicable to a particular *AutoDRM* installation. Those variables that have been implemented should be described in the *AutoDRM Users Guide* available through the HELP request line (see ["Help Line" on page 30](#)).

The STA_LIST, TIME, and TIME_STAMP environments can be used in requesting either radionuclide or S/H/I data. All other environment variables are used exclusively for requesting S/H/I data.

Arrival_list

A unique arrival identification code is assigned to each waveform arrival. This arrival identification number appears in the data types for arrivals and bulletins and may be used to obtain arrival information.

Syntax

```
arrival_list [ arid [ , arid [ , ... ] ] ]  
             arid          arrival identification code
```

Default

```
arrival_list *
```

Example

The following environment line limits the arrivals to those with arids 8971234 or 90814:

```
arrival_list 8971234,90814
```

Aux_list

Station and channel are not always adequate to completely describe a specific data stream for some seismic stations. An auxiliary identification is supplied for completeness in handling these special cases. The instances in which the auxiliary identifications are necessary should be rare. The wildcard character (*) is allowed in specifying auxiliary codes.

Syntax

```
aux_list [ aux [ , aux [ , ... ] ] ]  
          aux          auxiliary code
```

Default

```
aux_list *
```

Example

The following environment line limits the auxiliary code to `chi` and `med`:

```
aux_list chi,med
```

Bull_type

The BULL_TYPE environment provides a means to specify which type of S/H/I bulletin to retrieve. Only one bulletin type may be specified in any BULL_TYPE line. The bulletin types include SEL1 (Standard Event List 1), SEL2 (Standard Event List 2), SEL3 (Standard Event List 3), REB (Reviewed Event Bulletin), SEB (Standard Event Bulletin), SSEB (Standard Screened Event Bulletin), NEB (National Event Bulletin), and NSEB (National Screened Event Bulletin).

Syntax

```
bull_type [ bulletin ]
```

<i>bulletin</i>	bulletin code (sel1, sel2, sel3, reb, seb, sseb, neb, nseb)
-----------------	---

Default

```
none
```

Example

The following environment line limits the bulletin type to `sel1`:

```
bull_type sel1
```


Chan_list

The S/H/I channel search list is given in the CHAN_LIST environment. The wild-card character (*) is allowed for specifying channel codes.

Syntax

```
chan_list [ chan [ , chan [ , ... ] ] ]  
           chan           channel code
```

Default

```
chan_list *z
```

Example

The following environment line limits the channels to three short-period channels:

```
chan_list shz, shn, she
```

The following environment line limits the channels to all short-period channels:

```
chan_list s*
```

Comm_list

The communications list is a list of communication links to include in S/H/I status reports. Links are defined by the end of the link furthest from the IDC. Thus, for the link between the USA_NDC and the IDC, the communications link would be designated as USA_NDC. Station codes are used for links from the station to the NDC or from the station to the IDC, and so on.

Syntax

```
comm_list [ comm [ , comm [ , ... ] ] ]  
           comm           communications link code
```

Default

```
comm_list *
```

Example

The following environment line limits the communications links to the ones between the French and Russian NDCs and the IDC:

```
comm_list FRA_NDC,RUS_NDC
```

Depth

S/H/I events may be constrained by their depth using the DEPTH environment. Depth is given in kilometers from the surface.

Syntax

```
depth [[ shallow ] to [ deep ]]  
shallow      low depth range  
deep         high depth range
```

Default

no constraint

Example

The following environment line limits depths to a range from 0 to 10 km:

```
depth 0.0 to 10.0
```

Depth_conf

The DEPTH_CONF environment defines the confidence level for the S/H/I depth screening criterion and is given as a number between 0.0 and 1.0.

Syntax

```
depth_conf [ conf ]
```

conf confidence level of depth screening criterion

Default

```
depth_conf 0.975
```

Example

The following environment line sets the confidence level for the depth screening criterion at 99 percent:

```
depth_conf 0.990
```

Depth_minus_error

The DEPTH_MINUS_ERROR environment is used to obtain all S/H/I events that have a 90 percent probability of being within a certain depth range. The ranges must be given in kilometers of depth from the surface.

Syntax

```
depth_minus_error [[ shallow ] to [ deep ]]
```

shallow low depth range

deep high depth range

Default

no constraint

Example

The following environment line limits the depth of events to a 90 percent probability of being within 10 km of the surface:

```
depth_minus_error 0.0 to 10.0
```

Depth_thresh

The depth screening threshold is given in kilometers of depth from the surface. The value of DEPTH_THRESH must be non-negative. S/H/I events with depth confidence intervals deeper than this threshold are screened out.

Syntax

```
depth_thresh [ threshold ]  
threshold      depth threshold
```

Default

```
depth_thresh 10.0
```

Example

The following environment line sets the depth screening threshold at 20.0 km:

```
depth_thresh 20.0
```

Event_list

A unique event identification code is assigned to each S/H/I event. This number appears in S/H/I bulletins and may be used subsequently to request waveforms or comments associated with a specific event.

Syntax

```
event_list [ evid [ , evid [ , ... ] ] ]  
evid           event identification code
```

Default

```
event_list *
```

Example

The following environment line limits the event number to 87623495 and 87:

```
event_list 87623495, 87
```

Event_sta_dist

The EVENT_STA_DIST environment is the distance in degrees between the S/H/I event and the S/H/I station. The environment is applied in context to the request. When requesting waveform data associated with specific S/H/I events, EVENT_STA_DIST helps determine the stations from which the data will be retrieved. When requesting bulletin-type information (bulletins, events, origins, or arrivals), EVENT_STA_DIST helps determine the S/H/I events for which the data will be retrieved.

Syntax

```
event_sta_dist [ [ low_dist ] to [ high_dist ] ]  
low_dist       low-distance range  
high_dist      high-distance range
```

Default

no constraint

Examples

The following EVENT_STA_DIST environment line limits the request for S/H/I bulletin information to events within 20 degrees of stations ABC or DEF:

```
sta_list ABC, DEF
event_sta_dist 0 to 20
bull_type REB
bulletin ims1.0
```

The following EVENT_STA_DIST environment line limits the request for waveform data to stations within 20 degrees of an event:

```
event_sta_dist 0 to 20
bull_type REB
relative_to bulletin
waveform ims1.0
```

Group_bull_list

S/H/I events are often common between bulletins. Sometimes it is desirable to list the various solutions (origins) together. GROUP_BULL_LIST is a list of the bulletins that should be combined with the S/H/I bulletin specified in the BULL_TYPE environment. Origin information from these other bulletins will be included in the combined bulletin that is returned. The arrival information will be for the BULL_TYPE bulletin.

Events in the GROUP_BULL_LIST will be grouped with at most one S/H/I event in the BULL_TYPE bulletin. To be grouped, events must have locations within three degrees and origin times within 60 seconds. If the initial criteria are met for more than one S/H/I event, all events within the range are reported.

Syntax

```
group_bull_list [ bulletin [ , bulletin [ , ... ] ] ]
               bulletin      bulletin code
```

Default

none (no grouping)

Example

The following environment lines group SEL3 origins with the SEL1:

```
bull_type SEL1
group_bull_list SEL3
```

Lat

The LAT environment specifies the range of latitude in degrees. Southern latitudes are negative. The low-range value must be smaller than the high-range value.

In cases where LAT can apply to origins or stations (for example, when requesting a S/H/I bulletin), the constraint will be applied to origins.

Syntax

```
lat [[ low_lat ] to [ high_lat ]]
```

<i>low_lat</i>	low-range latitude
<i>high_lat</i>	high-range latitude

Default

no constraint

Example

The following environment line limits latitudes to a range from 12 south to 17 north:

```
lat -12 to 17
```


Loc_conf

The LOC_CONF environment is used to specify the confidence level for location error ellipses as a number between 0.0 and 1.0. This environment is used to assess whether or not the error ellipse for an S/H/I event was onshore, offshore, or mixed (in other words, partially onshore and offshore).

Syntax

```
loc_conf [ conf ]  
      conf      confidence level for location error ellipses
```

Default

```
loc_conf 0.90
```

Example

The following environment line sets the confidence level for location error ellipses at 99 percent:

```
loc_conf 0.99
```

Lon

The LON environment specifies the range of longitude in degrees. Western longitudes are negative, and the range is interpreted from west to east. Either both or neither (to return to the default values) of the longitudes must be provided in the LON environment.

In cases where LON can apply to S/H/I origins or stations (for example, when requesting a S/H/I bulletin), the constraint will be applied to origins.

Syntax

```
lon [ west_lon to east_lon ]
```

west_lon western longitude

east_lon eastern longitude

Default

no constraint

Examples

The following environment line limits the longitude range to 350 degrees:

```
lon -175 to 175
```

The following environment line limits the longitude range to a 10-degree range spanning the international date line:

```
lon 175 to -175
```

Mag

The MAG environment specifies the range of magnitudes to include in the search for seismic events. The type of magnitude (m_b , M_s , and so on) is specified in the MAG_TYPE environment.

Syntax

```
mag [ [ low_mag ] to [ high_mag ] ]
```

low_mag low-magnitude range

high_mag high-magnitude range

Default

no constraint

Example

The following environment line limits magnitudes to those with magnitudes above 4.5:

```
mag 4.5 to
```

Mag_type

The MAG_TYPE list environment specifies the type of magnitude to search when the MAG environment is provided. Standard accepted magnitude codes are mb (body wave magnitude), Ms (surface wave magnitude), mbmle (maximum likelihood body wave magnitude), msmle (maximum likelihood surface wave magnitude), and ML (local magnitude). Data centers may report other types of magnitudes, provided an explanation is given in the HELP message.

Syntax

```
mag_type [ mag_type [ , mag_type [ , ... ] ] ]  
mag_type      mb | mbmle | Ms | msmle | ML
```

Default

no constraint

Example

The following environment line limits the magnitude types to m_b and M_s :

```
mag_type mb, Ms
```

Mb_minus_ms

This difference between m_b and M_s magnitude values specifies the range of magnitude differences to include in the search.

Syntax

```
mb_minus_ms [[ low_mag_diff ] to [ high_mag_diff ] ]  
    low_mag_diff    low-magnitude difference  
    high_mag_diff   high-magnitude difference
```

Default

no constraint

Example

The following environment line limits the difference of magnitudes to the range from 1 to 2:

```
mb_minus_ms 1.0 to 2.0
```

Mbms_conf

The MBMS_CONF environment defines the confidence level for the Am_b-M_s screening criterion, given as a number between 0.0 and 1.0, where A is the slope.

Syntax

```
mbms_conf [ conf ]  
    conf           confidence level of the  $Am_b-M_s$  screening criterion
```

Default

```
mbms_conf 0.975
```

Example

The following environment line sets the confidence level of the $A_{m_b}-M_s$ screening criterion at 99 percent:

```
mbms_conf 0.99
```

Mbms_slope

The MBMS_SLOPE environment defines the slope (A) of the m_b-M_s relation. The value should be a positive number (typically between 1.0 and 1.5).

Syntax

```
mbms_slope [ slope ]  
slope      the slope (A) of the  $m_b-M_s$  relation
```

Default

```
mbms_slope 1.25
```

Example

The following environment line sets the slope of the m_b-M_s relation at 1.50:

```
mbms_slope 1.50
```

Mbms_thresh

The $A_{m_b}-M_s$ screening threshold is given in magnitude units. S/H/I events with confidence intervals for $A_{m_b}-M_s$ less than this threshold are screened out. The value of MBMS_THRESH is not restricted.

**Request ▼
Messages****Syntax**

```
mbms_thresh [ threshold ]
```

threshold threshold of the A_{m_b} - M_s screening criterion

Default

```
mbms_thresh 2.20
```

Example

The following environment line sets the A_{m_b} - M_s screening threshold at 3.5:

```
mbms_thresh 3.50
```

Min_nsta_ms

MIN_NSTA_MS is the minimum number of S/H/I stations required with M_s measurements for the A_{m_b} - M_s screening criterion to be applied. The value of MIN_NSTA_MS must be a positive integer.

Syntax

```
min_nsta_ms [ integer ]
```

integer minimum number of S/H/I stations required with M_s measurements

Default

```
min_nsta_ms 1
```

Example

The following environment line sets the minimum number of S/H/I stations required with M_s measurements at 2:

```
min_nsta_ms 2
```

Origin_list

A unique origin identification code is assigned to each origin. This origin identification code appears in S/H/I bulletins and may be used subsequently to request waveforms or comments associated with a specific origin.

Syntax

```
origin_list [orid[ , orid[ , ...]]]  
orid          origin identification code
```

Default

```
origin_list *
```

Example

The following environment line limits the origins to those with orids 132456 or 190672:

```
origin_list 132456,190672
```

Relative_to

The concept of association provides the ability to tie or associate one S/H/I data type with another. The most common association is between waveforms and events and allows a user to request waveforms associated with a particular set of origins.

RELATIVE_TO has all of the characteristics of a list environment, except that it is active only for the subsequent request line, and the arguments are request keywords.

Syntax

```
relative_to origin | event | bulletin
```

The data type given in the RELATIVE_TO environment line is not returned in the response. That data type must be explicitly requested on another line, which typically precedes the RELATIVE_TO environment line.

Example

The following message requests the associated waveforms in CM6 subformat for events found in the bulletin between 1:00 and 1:15 on January 9, 1999:

```
begin ims1.0
msg_type request
msg_id ex001 ANY_NDC
e-mail name@my.computer
time 1999/1/9 1:00 to 1999/1/9 1:15
bull_type reb
relative_to bulletin
waveform ims1.0:cm6
stop
```


To also request the REB bulletin for the time period in the example given above, the line `bulletin ims1.0` must be added:

```
begin ims1.0
msg_type request
msg_id ex002 ANY_NDC
e-mail name@my.computer
time 1999/1/9 1:00 to 1999/1/9 1:15
bull_type reb
bulletin ims1.0
relative_to bulletin
waveform ims1.0:cm6
stop
```

Sta_list

The STA_LIST environment provides the station search list. This variable may be used for specifying radionuclide and/or S/H/I stations. Radionuclide stations are identified by site codes (see [“Radionuclide Site Codes” on page 8](#)). If a S/H/I array station is specified, then all elements of the array are implied. Specific array elements may be referenced individually. The wildcard character (*) is allowed in specifying station codes.

When S/H/I bulletins are requested, STA_LIST can be used to specify the events to be included. If an event in the S/H/I bulletin contains at least one of the stations in the STA_LIST, that event, and all arrivals available for that event, will be included in the bulletin.

Syntax

```
sta_list [sta [, sta [, ...]]]
          sta          station or array code
```

Default

```
sta_list *
```

Example

The following environment line limits the station list to four specific S/H/I stations:

```
sta_list WHY,WOOL,STKA,FCC
```

The following environment line limits the returned data to that from radionuclide station CA004:

```
sta_list CA004
```

The following environment line limits the stations to those beginning with the character "A":

```
sta_list A*
```

Time

The TIME environment is expressed as a range with date and decimal time entries. The time entries are optional. Unlike most range environments, a space is allowed between the date and time entries of the limits. In addition, this environment variable is translated according to the context of the requested data product. For example, TIME applies to the collection date and time for Fission Product Event Bulletins (FPEBs) and Sample Pulse Height Data (SAMPLEPHD), but applies to acquisition date and time for Blank Pulse Height Data (BLANKPHD), Calibration Pulse Height Data (CALIBPHD), Detector Background Pulse Height Data (DETBKPHD), and Quality Control Pulse Height Data (QCPHD). This convention is used only for request messages.

In requests for S/H/I data, only the date and time fields that are necessary to obtain the resolution must be specified; all other fields are assumed to be 0 or 1 as appropriate (1 for month and day, 0 for hour, minute, and second).

Syntax

```
time [[date1 [time1]] to [date2 [time2]]]
```

date1 time1 low-range date and time

date2 time2 high-range date and time

Default

```
time (current date and time) to (current date and time)
```

Examples

The following environment line limits the time to a range from 1999/02/01 00:00:00.0 to 1999/03/01 00:00:00.0:

```
time 1999/02/01 to 1999/03/01
```

Either of the following environment lines limits the time to a range from 1999/02/01 23:14:19.7 to 1999/03/01 12:00:00.0:

```
time 1999/02/01 23:14:19.7 to 1999/03/01 12
```

```
time 1999/2/1 23:14:19.7 to 1999/3/1 12
```

Time_stamp

The TIME_STAMP environment is used to request that data messages be time stamped. If requested, time stamps will appear at the beginning and end of each data type. Time stamps record the start time and end time that the message entered and exited the processing system.

Syntax

```
time_stamp
```

Default

```
none (do not time stamp the returned message)
```

Example

The following environment line turns on the time stamp utility:

```
time_stamp
```

REQUEST LINES

Request lines specify the type of information to be retrieved from the *AutoDRM* installation. All arguments in a request line are optional and include the format for the return message. The format is specified as a generic term, such as *ims1.0*. The arguments *subtype* and *sub_format* are used only in requests for S/H/I data. Radionuclide data are returned in the format specified on the BEGIN line.

Syntax

```
request_keyword [ :subtype ] [ format [ :sub_format ] ]
```

request_keyword

The *request_keyword* specifies the requested data type.

subtype

The S/H/I *subtype* specifies which subtype to use with this data type. The *subtype* allows a more precise data selection. The *subtype* is used primarily for arrival requests.

format

The *format* specifies the data format to use in the return message (for example, *ims1.0*).

sub_format

The S/H/I *sub_format* further specifies the precise format to use with this data type.

If the format of the S/H/I return data is not specified, the default format in the BEGIN line will be used.

The *subtype* argument is concatenated to the *request_keyword* with a colon (:) (for example, *arrival:automatic*). In addition, *sub_format* is concatenated to the *format* with a colon (for example, *ims1.0:cm6*).

For each request, a subset of the environments described in “Request Environment Lines” on page 33 must be specified (see Table 5 and Table 6). All required environments are enforced for each request. If an environment is not specified explicitly, then the default is used. Because the default values for some environments specify a zero length range (for example, *time*), a request made without explicitly defining these environments will result in no data being returned. Descriptions of the request lines include the applicable environment variables.

The order of the request lines is significant because the environment established prior to the request line is used to constrain the request. The environment can be changed between request lines to allow multiple requests for the same type of information within the same request message.

Example

The following message requests S/H/I bulletin information for all events in January 1999 within the areas defined by 10 to 20 degrees north and 120 to 160 degrees east and 55 to 45 degrees south and 25 to 15 degrees west:

```
begin ims1.0
msg_type request
msg_id ex003 any_ndc
e-mail name@my.computer
time 1999/01/01 to 1999/02/01
lat 10.0 to 20.0
lon 120.0 to 160.0
bull_type reb
bulletin ims1.0
lat -55.0 to -45.0
lon -25.0 to -15.0
bulletin ims1.0
stop
```

TABLE 5: S/H/I DATA REQUEST ENVIRONMENT VARIABLES

Environments ¹	Request Lines													
	arrival or SLSD	bulletin	channel	chan_status	comment	comm_status	event	network	origin	outage	response	station	sta_status	waveform
arrival_list	o	o			o									
aux_list			o	o						o	o		o	o
bull_type	r	r					r		r					
chan_list	o		o	o						o	o			o
comm_list						o								
depth		o					o		o					
depth_conf		o ²												
depth_minus_error		o					o		o					
depth_thresh		o ¹												
event_list		o			o		o							
event_sta_dist		o					o		o					
group_bull_list		o					o							
lat		o	o				o		o			o		
loc_conf		o ¹												
lon		o	o				o		o			o		
mag		o					o		o					
mag_type		o					o		o					
mb_minus_ms		o					o		o					
mbms_conf		o ¹												
mbms_slope		o ¹												

TABLE 5: S/H/I DATA REQUEST ENVIRONMENT VARIABLES (CONTINUED)

Environments ¹	Request Lines													
	arrival or SLSD	bulletin	channel	chan_status	comment	comm_status	event	network	origin	outage	response	station	sta_status	waveform
mbms_thresh		o ¹												
min_nsta_ms		o ¹												
origin_list		o			o				o					
relative_to														o
sta_list	o	o	o	o	o		o	o	o	o	o	o	o	o
time	r	r		r	o	r	r		r	r	o		r	r
time_stamp	o	o	o	o	o	o	o	o	o	o	o	o	o	o

1. r = required, o = optional

2. may be applied only to NEB and NSEB

TABLE 6: RADIONUCLIDE DATA REQUEST ENVIRONMENT VARIABLES

Environments ¹	Request Lines								
	armr	arr	blankphd	calibphd	detbkphd	fpeb	qcphd	sphdf	sphdp
sta_list	o	o	o	o	o	o	o	o	o
time	r	r	r	r	r	r	r	r	r
time_stamp	o	o	o	o	o	o	o	o	o

1. r = required, o = optional

**Request ▼
Messages**

Descriptions of the possible request lines are given below, and include the applicable environment variables. The variables that must be explicitly specified to obtain a result are in **bold** type.

ARMR

This data type is one of several radionuclide data products available from the IDC. The ARMR, or Atmospheric Radionuclide Measurement Report, is a revised version of the ARR, or Automated Radionuclide Report, and is generated after manual review of a radionuclide sample is complete. See ["ARMR" on page 213](#) for a complete description and ["ARMR" on page A3](#) for an example.

Environment

time,
sta_list, time_stamp

Example

The following message requests time-stamped ARMRs from all U.S. radionuclide stations for the month of June 1998:

```
begin ims1.0
msg_type request
msg_id ex004
e-mail name@my.computer
time_stamp
time 1998/06/01 to 1998/07/01
sta_list US*
armr
stop
```


ARR

This data type is one of several radionuclide data products available from the IDC. The ARR includes results from the automated analysis of a radionuclide sample. See [“ARR” on page 204](#) for a complete description and [“ARR” on page A8](#) for an example.

Environment

```
time,  
sta_list, time_stamp
```

Example

The following message requests time-stamped ARR from radionuclide stations FI001 and RU001 for the month of March 1999:

```
begin ims1.0  
msg_type request  
msg_id ex005  
e-mail name@my.computer  
time_stamp  
time 1999/03/01 to 1999/04/01  
sta_list FI001,RU001  
arr  
stop
```

Arrival/SLSD

The ARRIVAL and SLSD (Standard List of Signal Detections) requests are synonymous. An arrival is defined by excess energy that is identified in S/H/I waveform data. The amount of information about an arrival depends on the amount of processing that has been applied to the data. The different stages of processing are expressed using subtypes to the ARRIVAL or SLSD request lines as follows:

- `arrival:automatic | slsd:automatic`
The AUTOMATIC subtype provides the result of the automatic detection process run on waveforms.
- `arrival:reviewed | slsd:reviewed`
The REVIEWED subtype provides the arrivals that have been automatically or manually reviewed to the extent that phase names have been assigned.
- `arrival:grouped | slsd:grouped`
The GROUPED subtype provides the arrivals that have been assigned phase names and that have also been grouped together with the assumption that they belong to the same event.
- `arrival:associated | slsd:associated`
The ASSOCIATED subtype provides the arrivals that have been run through a location program and are associated to an event. ASSOCIATED is the default subtype for ARRIVAL/SLSD.
- `arrival:unassociated | slsd:unassociated`
The UNASSOCIATED subtype provides the arrivals that have been detected but not associated with any event.

A specific bulletin type must be specified through the BULL_TYPE environment for associated and unassociated arrivals.

Environment

bull_type, time,
arrival_list, beam_list, chan_list, sta_list,
time_stamp

Example

The following message requests automatically determined arrivals from stations ABC and DEF for the month of March 1999:

```
begin ims1.0
msg_type request
msg_id ex006 any_ndc
e-mail name@my.computer
time 1999/03/01 to 1999/04/01
sta_list ABC,DEF
bull_type SEL1
arrival:automatic ims1.0
stop
```

The following message requests associated arrivals from the REB from stations ABC and DEF for the month of March 1999:

```
begin ims1.0
msg_type request
msg_id ex007 any_ndc
e-mail name@my.computer
time 1999/03/01 to 1999/04/01
sta_list ABC, DEF
bull_type reb
arrival:associated ims1.0
stop
```

Blankphd

BLANKPHD is one of several pulse height data (PHD) types available for particulate radionuclide samples. It contains the PHD of an unexposed air filter as well as other important information. See [“Pulse Height Data” on page 186](#) for a description of the various PHD types and [“Blankphd” on page A15](#) for an example.

Environment

```
time,  
sta_list, time_stamp
```

Example

The following message requests time-stamped BLANKPHDs from all radionuclide stations acquired during the year 1998. Note that the STA_LIST environment is not explicitly specified and therefore defaults to all stations.

```
begin ims1.0  
msg_type request  
msg_id ex008  
e-mail name@my.computer  
time_stamp  
time 1998/01/01 to 1999/01/01  
blankphd  
stop
```

Bulletin

Bulletins are composed of S/H/I origin, event, and associated arrival information. The FPEB cannot be obtained using BULLETIN; it is requested using a FPEB request line.

The IMS1.0 format bulletins, as implemented by the IDC, have two subformats: `ims1.0:short` and `ims1.0:long`. If the subformat is not specified, the `short` subformat is used.

The DEPTH_CONF, DEPTH_THRESH, LOC_CONF, MBMS_CONF, MBMS_SLOPE, MBMS_THRESH, and MIN_NSTA_MS environments are applied only to the NEB and NSEB bulletins specified in the BULL_TYPE environment.

The environment for BULLETIN is also used to constrain waveforms when the RELATIVE_TO environment is used.

Environment

bull_type, time,
arrival_list, depth, depth_conf, depth_minus_error,
depth_thresh, event_list, event_sta_dist, group_bull_list,
lat, loc_conf, lon, mag, mag_type, mb_minus_ms, mbms_conf,
mbms_slope, mbms_thresh, min_nsta_ms, relative_to, sta_list,
time_stamp

Example

The following message requests the REB for December 25, 1998:

```
begin ims1.0
msg_type request
msg_id ex009 any_ndc
e-mail name@my.computer
time 1998/12/25 to 1998/12/26
bull_type reb
bulletin ims1.0
stop
```

**Request ▼
Messages**

The following message requests the REB and associated SEL2 origins for December 25, 1998:

```
begin ims1.0
msg_type request
msg_id ex009a any_ndc
e-mail name@my.computer
time 1998/12/25 to 1998/12/26
bull_type reb
group_bull_list sel2
bulletin ims1.0
stop
```

The following message requests the REB and associated SEL2 origins whose DEPTH_MINUS_ERROR is less than 10 km in the long subformat for December 25, 1998:

```
begin ims1.0
msg_type request
msg_id ex009b any_ndc
e-mail name@my.computer
time 1998/12/25 to 1998/12/26
depth_minus_error to 10
bull_type reb
group_bull_list sel2
bulletin ims1.0:long
stop
```

The following message requests the REB and associated SEL2 origins for December 25, 1998 with DEPTH_MINUS_ERROR less than 10 km and MB_MINUS_MS greater than 0.5:

```
begin ims1.0
msg_type request
msg_id ex009c any_ndc
e-mail name@my.computer
time 1998/12/25 to 1998/12/26
depth_minus_error to 10
mb_minus_ms 0.5 to
bull_type reb
group_bull_list sel2
bulletin ims1.0
stop
```

The following message requests a NSEB for events on June 10, 1998, between magnitudes 4.0 and 6.0, within an area defined by latitude and longitude ranges, and using custom depth and m_b minus M_s screening criteria:

```
begin ims1.0
msg_type request
msg_id ex009d any_ndc
e-mail name@my.computer
time 1998/06/10 to 1998/06/10
bull_type nseb
mag 4.0 to 6.0
lat 60 to 90
lon 45 to 75
depth_thresh 20.0
depth_conf 0.99
mbms_slope 1.5
mbms_thresh 3.5
mbms_conf 0.99
min_nsta_ms 2
bulletin ims1.0
stop
```

Calibphd

This data type is one of several PHD types available for radionuclide samples. It contains the PHD of a standard calibration source, as well as other important information. See [“Pulse Height Data” on page 186](#) for a description of the various PHD types and [“Calibphd” on page A18](#) for an example.

Environment

```
time,  
sta_list, time_stamp
```

Example

The following message requests time-stamped CALIBPHDs from all radionuclide stations acquired during the year 1998. Because the STA_LIST environment is not specified the default (all stations) is used.

```
begin ims1.0  
msg_type request  
msg_id ex013  
e-mail name@my.computer  
time_stamp  
time 1998/01/01 to 1999/01/01  
calibphd  
stop
```


Channel

Channel is a complete set of information about the location, emplacement, and type of seismometers at a station.

Environment

`aux_list, chan_list, lat, lon, sta_list, time_stamp`

Example

The following message requests the short-period channel information for stations in South America using the appropriate LAT and LON environment range. Note that the STA_LIST environment is not explicitly specified; the default for this variable is all stations.

```
begin ims1.0
msg_type request
msg_id ex014 any_ndc
e-mail name@my.computer
lat -60 to 10.0
lon -81 to -34
chan_list s*
channel ims1.0
stop
```

Chan_status

Channel status is given for the channels in the CHAN_LIST and AUX_LIST environments for the stations in the STA_LIST environment. The TIME environment defines the report period. The minimum report period is one day.

Environment

time,
aux_list, chan_list, sta_list, time_stamp

Example

The following message requests the channel status reports for the short-period channels over a four-day period for station ARA0:

```
begin ims1.0
msg_type request
msg_id ex015 any_ndc
e-mail name@my.computer
time 1998/11/14 to 1998/11/18
sta_list ara0
chan_list s*
chan_status ims1.0
stop
```

Comment

Comments may be associated with a S/H/I station, a S/H/I event, an origin, or an arrival. To retrieve comments, the station code or the identifications (IDs) of the arrival, origin, or event can be used. These codes or IDs are listed in the bulletins and are obtained with a request (or subscription to) a bulletin or event list.

Environment

arrival_list | event_list | origin_list | sta_list,
time, time_stamp

Example

The following message requests the comments for events 510 and 512:

```
begin ims1.0
msg_type request
msg_id ex016 any_ndc
e-mail name@my.computer
event_list 510, 512
comment ims1.0
stop
```

Comm_status

Communications status is given for the communications links listed in the COMM_LIST environment. The TIME environment defines the report period. The minimum report period is one day. The *sub_format* field is used to indicate a verbose communications status report.

Syntax

```
comm_status [ ims1.0 [ :verbose ] ]
```

Environment

time,
comm_list, time_stamp

Example

The following message requests the verbose communications status reports for the link from any_ndc over a one-week period:

```
begin ims1.0
msg_type request
msg_id ex017 any_ndc
e-mail name@my.computer
time 1998/11/14 to 1998/11/21
comm_list any_ndc
comm_status ims1.0:verbose
stop
```

Detbkphd

This data type is one of several PHD types available for radionuclide samples. It contains the PHD of an empty detector chamber, as well as other important information. See ["Pulse Height Data" on page 186](#) for a description of the various PHD types and ["Detbkphd" on page A21](#) for an example.

Environment

```
time,
sta_list, time_stamp
```

Example

The following message requests time-stamped DETBKPHDs acquired during the year 1998 from all operating European radionuclide stations:

```
begin ims1.0
msg_type request
msg_id ex018
e-mail name@my.computer
time_stamp
time 1998/01/01 to 1999/01/01
sta_list DE002,FI001,SE001,UK001
detbkphd
stop
```

Event

An S/H/I event is the physical occurrence that was detected through the network of S/H/I sensors. S/H/I events can have many estimates of their time and location; and these estimates are known as origins. Only those estimates given in the BULL_TYPE and GROUP_BULL_LIST environments are provided. The origin estimates in BULL_TYPE provide the basis for associating the origins in the GROUP_BULL_LIST.

Environment

```
bull_type, time,
depth, depth_minus_error, event_list, event_sta_dist,
group_bull_list, lat, lon, mag, mag_type, mb_minus_ms,
relative_to, sta_list, time_stamp
```

**Request ▼
Messages****Example**

The following message requests all of the March 1998 REB events within regional distance (20 degrees) of stations ABC and/or DEF. The list is also requested to include the SEL2 events that can be grouped with the REB events.

```
begin ims1.0
msg_type request
msg_id ex019 any_ndc
e-mail name@my.computer
time 1998/03/01 to 1998/04/01
bull_type reb
group_bull_list sel2
sta_list abc,def
event_sta_dist 0.0 to 20.0
event ims1.0
stop
```

FPEB

This data type is one of several radionuclide data products available from the IDC. The FPEB, or Fission Product Event Bulletin, is generated by the IDC when fission or activation products are detected at a radionuclide station above normal limits. An FPEB contains ARMRs from the stations that detect the fission product(s), information identifying the fission product(s), an estimate of the source location and time, as well as any sample analysis results from Certified Laboratories. See [“Fission Product Event Bulletin” on page 214](#) for a description of the FPEB and [“FPEB” on page A23](#) for an example.

Environment

```
time,
sta_list, time_stamp
```

Example

The following message requests all FPEBs generated by the IDC during the first quarter of 1998:

```
begin ims1.0
msg_type request
msg_id ex020
e-mail name@my.computer
time 1998/01/01 to 1998/04/01
fpeb
stop
```

Origin

Origins are solutions to the location and time of a S/H/I event. Several origins may be determined for any one S/H/I event.

Environment

```
bull_type, time,
depth, depth_minus_error, event_sta_dist, lat, lon, mag,
mag_type, mb_minus_ms, origin_list, relative_to, sta_list,
time_stamp
```

Example

The following message requests origin information for the REB origins for August 8, 1998:

```
begin ims1.0
msg_type request
msg_id ex021 any_ndc
e-mail name@my.computer
time 1998/08/08 to 1998/08/09
bull_type reb
origin ims1.0
stop
```

The following message limits the previous request to a specific magnitude and depth range by including more environment lines:

```
begin ims1.0
msg_type request
msg_id ex022 any_ndc
e-mail name@my.computer
time 1998/08/08 to 1998/08/09
mag 4.5 to 5.5
depth 0 to 10
bull_type reb
origin ims1.0
stop
```


Outage

OUTAGE requests reports on S/H/I data that are not available for the specified time range.

Environment

time,
aux_list, chan_list, sta_list, time_stamp

Example

The following message requests the outage reports for all S/H/I stations and channels for the month of March 1998. If the station and channels of interest are not explicitly specified, then the default station list (*) and channel list (*z) are used.

```
begin ims1.0
msg_type request
msg_id ex023 any_ndc
e-mail name@my.computer
time 1998/03/01 to 1998/04/01
outage ims1.0
stop
```

Qcphd

This data type is one of several PHD types available for radionuclide samples. It contains the PHD of a 15 minute sample acquisition as well as other important information. See ["Pulse Height Data" on page 186](#) for a description of the various PHD types and ["Qcphd" on page A27](#) for an example.

**Request ▼
Messages****Environment**

time,
sta_list, time_stamp

Example

The following message requests QCPHDs from KW001 acquired on December 14, 1997:

```
begin ims1.0
msg_type request
msg_id ex024
e-mail name@my.computer
time 1997/12/14 to 1997/12/15
sta_list KW001
qcphd
stop
```

Response

The response is the instrument response of the specified S/H/I network/station/channel/auxiliary identification code. Responses are valid at any given time and may change through time.

Environment

aux_list, chan_list, sta_list, time, time_stamp

Example

The following message requests all the instrument responses for the broadband vertical channel of station ABC used in January 1999:

```
begin ims1.0
msg_type request
msg_id ex025 any_ndc
e-mail name@my.computer
time 1999/01/01 to 1999/02/01
sta_list abc
chan_list bhz
response ims1.0
stop
```

SLSD

SLSD is a synonym for arrival. See [“Arrival/SLSD” on page 62](#).

Sphdf/p

The Sample Pulse Height Data– Full (SPHDF) and Sample Pulse Height Data–Preliminary (SPHDP) data types are two of several PHD types available for radionuclide samples. The SPHDP contains PHD from a sample acquired for a time shorter than that of the full acquisition time. The SPHDF contains PHD from a sample acquired for the IDC-defined full acquisition time. Like the other PHD types, the SPHDF and SPHDP also include other important information. See [“Pulse Height Data” on page 186](#) for a description of the various PHD types and [“Samplephd” on page A30](#) for an example.

Environment

```
time,
sta_list, time_stamp
```

**Request ▼
Messages****Example**

The following message requests SPHDPs and SPHDFs from all Australian radionuclide stations for June 22, 1998:

```
begin ims1.0
msg_type request
msg_id ex026
e-mail name@my.computer
time 1998/06/22 to 1998/06/23
sta_list AU*
sphdp
sphdf
stop
```

Station

S/H/I station information includes station codes, locations, elevations, station type (array, 3-C), and dates for which waveform or arrival data are available from an *AutoDRM*. Additional station codes may be reported for which neither waveform nor arrival data are available, but this can present problems for users of the *AutoDRM*.

Environment

```
lat, lon, sta_list, time_stamp
```

Example

The following message requests station information for all S/H/I stations serviced by this *AutoDRM*:

```
begin ims1.0
msg_type request
msg_id ex027 any_ndc
e-mail name@my.computer
station ims1.0
stop
```

The following message requests station information for S/H/I stations in the southern hemisphere:

```
begin ims1.0
msg_type request
msg_id ex028 any_ndc
e-mail name@my.computer
lat -90 to 0.0
station ims1.0
stop
```

Sta_status

Station status is given for the S/H/I stations in the STA_LIST environment. The TIME environment defines the report period. The minimum report period is one day.

Environment

```
time,
aux_list, sta_list, time_stamp
```

**Request ▼
Messages****Example**

The following message requests the S/H/I station status reports for all stations over a one-week period:

```
begin ims1.0
msg_type request
msg_id ex029 any_ndc
e-mail name@my.computer
time 1998/11/14 to 1998/11/21
sta_status ims1.0
stop
```

Waveform

Waveforms are digital timeseries data (S/H/I). The WAVEFORM request format will typically accept subformats that specify how the digital data are formatted within the general format of the waveform data type. The subformats include int, cm6, cm8, aut, au6, and au8 for IMS1.0 data.

Environment

```
time,
aux_list, beam_list, chan_list, sta_list, time_stamp
```

Example

The following message requests data in six-bit compressed subformat from all channels of station ABC from 03:25 to 03:40 on March 1, 1998:

```
begin ims1.0
msg_type request
msg_id ex030 ANY_NDC
e-mail name@my.computer
time 1998/03/01 03:25 to 1998/03/01 03:40
sta_list abc
chan_list *
waveform ims1.0:CM6
stop
```


Subscription Messages

This chapter describes the formats for subscription messages and includes the following topics:

- [Introduction](#)
- [Subscription Procedures](#)
- [Subscription Format](#)
- [Subscription Control Lines](#)
- [Subscription Environment Lines](#)
- [Subscription Request Lines](#)

Subscription Messages

INTRODUCTION

Subscription messages can be used as follows:

- to initiate a subscription,
- to change a subscription,
- to request an inventory of personal subscriptions,
- to request that issue(s) of a subscription be resent, or
- to terminate a subscription.

The messages containing the subscription data are sent as data messages.

Subscriptions allow authorized users to have IDC data and data products automatically forwarded to them on a regular basis. The S/H/I products available through subscriptions include the continuous data from primary S/H/I stations in near-real time, bulletins, waveform segments, and arrival information. The radionuclide products available through subscriptions include all those available by request: ARR, ARMR, BLANKPHD, CALIBPHD, DETBKPHD, FPEB, QCPhD, SPHDF, and SPHDP.

Subscriptions may be set up for continuous delivery (in the case of continuous data), immediately upon receipt or generation at the IDC (for example, discrete waveform or radionuclide data and data products), on a daily basis (for example, daily S/H/I bulletins and status reports or radionuclide data and data products), or at a user-specified frequency/time.

SUBSCRIPTION PROCEDURES

A subscription is made by sending a subscription message to the IDC *AutoDRM*. Upon receipt, the source of a subscription message is first validated for its authenticity. Next the volume of data that will be generated by the request is checked. Subscription messages that are not sent by an authorized user are rejected. After validation, the new subscription is added to the existing subscriptions for that user, and notification of the new subscription is sent to the subscriber in the form of a LOG data message. (See [“Log” on page 181](#) for a description of the LOG message and [“Log” on page A24](#) for an example.) Each subscription is assigned a unique identification number at the IDC.

Examples

A subscription message is sent to the IDC requesting the daily REB:

```
begin ims1.0
msg_type subscription
msg_id ex031 any_ndc
e-mail name@my.computer
freq daily
bull_type reb
bulletin ims1.0
stop
```

**Subscription ▼
Messages**

The subscriber receives the following LOG data message as confirmation of the subscription. The subscription ID and product ID numbers are included in the message.

```
begin ims1.0
msg_type data
msg_id ex032 ctbo_idc
ref_id 0088 any_ndc
data_type log ims1.0
subscription id: 52
product id: 74
  added at 1997/01/12 19:36:00
  freq daily
  bull_type reb
  bulletin ims1.0:short
  e-mail name@my.computer
stop
```

After the subscription begins, data messages sent to the subscriber include the PROD_ID line that includes the product identification (ID) and a delivery ID number along with the subscription data.

SUBSCRIPTION FORMAT

A subscription message is formatted much the same way as a request message, but because subscription messages provide data on a scheduled basis rather than as a response to an individual request, they are given a separate message type and have additional capabilities that are not found in request messages.

Like most messages, a subscription request must contain the basic message lines: BEGIN, MSG_TYPE, MSG_ID, and STOP.

Example

The following example shows the general format of a subscription message:

```
begin ims1.0
msg_type subscription
msg_id ex033 any_ndc
...
stop
```

A subscription message contains information about where to send the subscribed data, how often the subscribed data should be sent, and what data (or data products) to send. Like request messages, subscriptions are defined through environment variables that constrain the data to be sent and request lines that specify which data to send. Separate subscriptions are delimited by separate subscription request lines. In other words, each time a subscription request line is encountered, a corresponding subscription will be initiated for the user.

SUBSCRIPTION CONTROL LINES

Subscription control lines specify:

- the protocol of the response data message,
- the time duration and frequency of the subscription, and
- whether or not a message should be sent if there are no data to send.

Like request messages, the existing options for the response message protocol are email and FTP. These options should be used in accordance with the guidelines described in ["Protocols" on page 3](#) and ["Message Size" on page 4](#). The formats for E-MAIL and FTP control lines are identical to that in Request messages and can be found in ["Request Control Lines" on page 31](#).

**Subscription ▼
Messages**

As in request messages, only one response message protocol can be specified in a subscription message. If different protocols are desired for the response data, separate subscription messages must be submitted to the *AutoDRM*. A subscription message that does not specify a response message protocol will be answered by email using the return address of the sender.

Control lines that are unique to subscription messages are described below.

Send_empty

The SEND_EMPTY control line is a switch that controls whether or not a message is sent if no data match the subscription. This option allows a user to be notified of the absence of data or products.

To prevent the sending of numerous empty messages, this control line is not allowed when the FREQ environment is set to *immediate* (see [“Freq” on page 91](#)).

Syntax

```
send_empty
```

Default

none (empty messages are not sent)

Time

In a subscription message, the TIME control line refers to the active time of a subscription. The active time is given as a range. The format of TIME is similar to that in the request environment line (see [“Time” on page 54](#)). In a subscription control line, however, the start time may have the value *now* (the current date and time), and the end time may have the value *forever* (the subscription will run indefinitely). These time limits are not valid for use in request messages.

Default

`time now to forever`

In the event that a subscription includes a start time before `now`, *AutoDRM* will generate a request message for the data from `time start time` to `now`, and the actual subscription will run from `now` to the specified end date.

SUBSCRIPTION ENVIRONMENT LINES

Subscription environment lines are used to define and limit the response to subscription request lines (see [“Subscription Request Lines” on page 96](#)). Many of the request environment variables in [“Request Environment Lines” on page 33](#) are also used as subscription environment variables. These request lines include `BULL_TYPE`, `CHAN_LIST`, `DEPTH`, `DEPTH_MINUS_ERROR`, `EVENT_STA_DIST`, `LAT`, `LON`, `MAG`, `MAG_TYPE`, `MB_MINUS_MS`, `RELATIVE_TO`, and `STA_LIST`.

Some request environment variables are not used in subscription messages. These include the following: `ARRIVAL_LIST`, `BEAM_LIST`, `EVENT_LIST`, `ORIGIN_LIST`, and `TIME`. Formats for the environment variables unique to subscriptions are provided in the following sections. These environment variables include `FREQ`, `SUBSCR_LIST`, `SUBSCR_NAME`, `PRODID_LIST`, and `DELIVID_LIST`. The environment variables described previously in the chapter on [Request Messages](#) are not repeated here. Formats for these environment variables may be found in [“Request Environment Lines” on page 33](#).

Freq

The `FREQ` environment specifies how often the data or products should be sent to the subscriber. The `FREQ` line may appear only once in a subscription message.

Four frequencies are allowed: `continuous`, `immediate`, `daily`, or `custom`. When requesting continuous waveform data, `FREQ` is set to `continuous`. If it is desired for data or products to be delivered as soon as they become available, `FREQ` is set to `immediate`. When `FREQ` is set to `daily`, data and products are

**Subscription ▼
Messages**

delivered once every day. If none of the previous **FREQ** options satisfies a user's needs, a **FREQ** of **custom** may be used. This allows a subscriber to specify the frequency/time at which a subscription is to be delivered.

Syntax

```
freq [ continuous | immediate | daily | custom per/dow:dom:hr ]
```

per number of hours between messages

dow day of the week (Sunday is 0)

dom day of the month

hr hour of the day

(-1 in any field indicates that the field should be ignored)

Default

```
freq daily
```

Example

The following environment line limits the delivery of data messages to the third day of every month at 00:00:00.000 UTC (*per* and *dow* have no meaning and are set to -1):

```
freq custom -1/-1:3:0
```

Prodid_list

The **PRODID_LIST** environment is a list of product ID numbers. A product ID number is a unique identifier for a certain IDC product and may be shared by multiple subscribers. All of the products identified in the **PRODID_LIST** will be processed for a subscription when the subscription request line is reached.

Syntax

```
prodid_list [prod_id[ , prod_id[ , ...]]]
```

prod_id identification number of the product

Default

The default values for this subscription environment variable depends on the subscription request line. The subscription request lines are as follows:

- none for unsubscribe (see ["Unsubscribe" on page 115](#))
- all for subscr_prod (see ["Subscr_prod" on page 113](#))
- all for subscr_log (see ["Subscr_log" on page 111](#))

Subscr_list

The SUBSCR_LIST environment lists subscription ID numbers. A subscription ID is a unique identifier for a particular subscription. All of the subscriptions specified in the SUBSCR_LIST will be processed for a subscription when the subscription request line is reached.

Syntax

```
subscr_list [subscr_id[ , subscr_id[ , ...]]]
```

subscr_id identification number of the subscription

Default

The default values for this subscription environment variable depends on the subscription request line. The subscription request lines are as follows:

- none for unsubscribe (see ["Unsubscribe" on page 115](#))
- all for subscr_prod (see ["Subscr_prod" on page 113](#))
- all for subscr_log (see ["Subscr_log" on page 111](#))

**Subscription ▼
Messages****Subscr_name**

The SUBSCR_NAME environment lists the names of certain IDC data products. All IDC data products specified in the SUBSCR_NAME line will be processed for a subscription when the subscription request line is reached. These names may be used instead of subscription identifiers or product identifiers.

Syntax

```
subscr_name [ name [ , name [ , ... ] ] ]  
            name          name of the subscription
```

Default

none

Delivid_list

The DELIVID_LIST environment is a list of delivery identifiers. The delivery identifier is a number that appears as the third argument in the PROD_ID line for each message sent to a user for a given subscription. The second argument in the PROD_ID line is the product identifier, which denotes a specific product. These numbers are consecutive. This feature allows a user to identify a missing issue to a subscription. This environment is used only with the command SUBSCR_RESEND.

Syntax

```
delivid_list [ deliv_id [ , deliv_id [ , ... ] ] ]  
            deliv_id      delivery identification number
```

Default

none

Example

The following subscription example demonstrates how delivery identification numbers are provided through the PROD_ID line.

Three consecutive messages received by a subscriber over three days contain sequential delivery identification numbers: 30, 31, and 32.

```
begin ims1.0
msg_type data
msg_id ex034 ctbo_idc
prod_id 74 30
data_type bulletin ims1.0:short
...
(bulletin information)
...
stop

begin ims1.0
msg_type data
msg_id ex035 ctbo_idc
prod_id 74 31
data_type bulletin ims1.0:short
...
(bulletin information)
...
stop

begin ims1.0
msg_type data
msg_id ex036 ctbo_idc
prod_id 74 32
data_type bulletin ims1.0:short
...
(bulletin information)
...
stop
```

SUBSCRIPTION REQUEST LINES

Subscription message request lines specify the information to send in the return data message. The general formats used for request lines are described in [“Request Lines” on page 56](#).

Some subscription request lines are the same as those used in request messages. Others (NETWORK, STATION, CHANNEL, BEAM, RESPONSE, OUTAGE, and COMMENT) are not used at all in subscriptions. The following request lines are unique to subscriptions: SUBSCRIBE, UNSUBSCRIBE, SUBSCR_PROD, CHANGE, SUBSCR_RESEND, and SUBSCR_LOG. Tables 7 and 8 give the applicable environments for the subscription request lines.

TABLE 7: S/H/I SUBSCRIPTION REQUEST ENVIRONMENTS

Environments ¹	Request Lines												
	arrival	bulletin	change	chan_status	comm_status	event	origin	sta_status	subscribe	subscr_log	subscr_prod	subscr_resend	unsubscribe
chan_list				o									o
delivid_list												r	
depth		o				o	o						
bull_type	r	r				r	r						
depth_minus_error		o				o	o						
event_sta_dist		o				o	o						
freq	o	o		o	o	o	o	o					o
lat		o				o	o						
lon		o				o	o						
mag		o				o	o						
mag_type		o				o	o						
mb_minus_ms		o				o	o						

TABLE 7: S/H/I SUBSCRIPTION REQUEST ENVIRONMENTS (CONTINUED)

Environments ¹	Request Lines													
	arrival	bulletin	change	chan_status	comm_status	event	origin	sta_status	subscribe	subscr_log	subscr_prod	subscr_resend	unsubscribe	waveform
prodid_list			*							o	o	*	*	
relative_to														o
sta_list	r	o		o	o	o	o	o						o
subscr_list			*							o	o	*	*	
subscr_name			*						r	o	o	*	*	

1. r = required, * = one required, o = optional

TABLE 8: RMS SUBSCRIPTION REQUEST ENVIRONMENTS

Environments ¹	Request Lines														
	armr	arr	blankphd	calibphd	change	detbkphd	fpeb	qcphd	sphdf	sphdp	subscribe	subscr_log	subscr_prod	subscr_resend	unsubscribe
delivid_list														r	
freq	o	o	o	o		o	o	o	o	o					
prodid_list					*							o	o	*	*
sta_list	o	o	o	o		o	o	o	o	o					
subscr_list					*							o	o	*	*
subscr_name					*						r	o	o	*	*

1. r = required, * = one required, o = optional

**Subscription ▼
Messages**

The following sections describe the possible request lines and the applicable environment variables. The environment variables that must be explicitly specified to obtain a result are in **bold type**.

ARMR

This data type is one of several radionuclide data products available from the IDC. The ARMR, or Atmospheric Radionuclide Measurement Report, is a revised version of the ARR, or Automated Radionuclide Report, and is generated after manual review of a radionuclide sample is complete. See [“ARMR” on page 213](#) for a complete description and [“ARMR” on page A3](#) for an example.

Environment

freq, sta_list

Example

The following subscription message requests daily ARMRs from stations in New Zealand. The frequency is not specifically identified because the default transmittal rate is daily.

```
begin ims1.0
msg_type subscription
msg_id ex037
e-mail name@my.computer
sta_list NZ*
ARMR
stop
```

ARR

This data type is one of several radionuclide data products available from the IDC. The ARR, or Automated Radionuclide Report, includes results from the automated analysis of a radionuclide sample. See [“ARR” on page 204](#) for a complete description and [“ARR” on page A8](#) for an example.

Environment

freq, sta_list

Example

The following message requests ARRs with no restraints:

```
begin ims1.0
msg_type subscription
msg_id ex038
e-mail name@my.computer
freq immediate
ARR
stop
```

Arrival

An ARRIVAL line requests arrival information from specific S/H/I stations relative to events in a S/H/I bulletin. The amount of information that is returned depends on the amount of processing that has been applied to the data. The different stages of processing are expressed using subtypes to the arrival request lines as follows: `arrival:automatic`, `arrival:reviewed`, `arrival:associated`, `arrival:grouped`, and `arrival:unassociated` (see [“Arrival/SLSD” on page 62](#) for definitions).

**Subscription ▼
Messages****Environment**

bull_type, sta_list
freq

Example

The following subscription message requests automatic arrivals from S/H/I stations ABC and DEF from the SEL1 bulletin each day:

```
begin ims1.0
msg_type subscription
msg_id ex039 any_ndc
e-mail name@my.computer
freq daily
sta_list ABC,DEF
bull_type sell
arrival:automatic ims1.0
stop
```

Bulletin

S/H/I bulletins are composed of arrival, origin, and event lines. All arrival information associated with the S/H/I event is given in the bulletin. A BULLETIN request line indicates a request for bulletin information for S/H/I events satisfying the environmental conditions.

Environment

bull_type,
depth, depth_minus_error, event_sta_dist, freq, lat, lon, mag,
mag_type, mb_minus_ms, sta_list

Example

The following subscription message requests the daily REB with no constraints:

```
begin ims1.0
msg_type subscription
msg_id ex040 any_ndc
e-mail name@my.computer
freq daily
bull_type reb
bulletin ims1.0
stop
```

The following subscription message requests the immediate SEL1 and SEL2. Soon after an event has been located (about two hours after real time for the SEL1 and about six hours after real time for the SEL2), the subscription software forwards the results to the user. In the example, messages would be sent to the user as often as once every 20 minutes, because the request has no constraints. This arrangement would be appropriate for an NDC system that processes the data automatically.

```
begin ims1.0
msg_type subscription
msg_id ex041 any_ndc
e-mail name@my.computer
freq immediate
bull_type sel1
bulletin ims1.0
bull_type sel2
bulletin ims1.0
stop
```

**Subscription ▼
Messages**

The following subscription message requests the daily REB for events with depths less than 30 km, between magnitudes 3.5 and 4.5, and within the two areas defined by the latitude and longitude ranges:

```
begin ims1.0
msg_type subscription
msg_id ex042 any_ndc
e-mail name@my.computer
freq daily
bull_type reb
mag 3.5 to 4.5
depth to 30
lat -30 to -20
lon -180 to -140
bulletin ims1.0
lat 75 to 79
lon 110 to 140
bulletin ims1.0
stop
```

Calibphd

This data type is one of several PHD types available for radionuclide samples. It contains the PHD of a standard calibration source as well as other information. See [“Pulse Height Data” on page 186](#) for a description of the PHD types and [“Calibphd” on page A18](#) for an example.

Environment

```
freq, sta_list
```

Example

The following message requests CALIBPHDs from all RMS stations to be sent monthly:

```
begin ims1.0
msg_type subscription
msg_id ex043
e-mail name@my.computer
freq monthly
calibphd
stop
```

Change

After a subscription is established, it can be modified through the CHANGE request line. The subscription being changed is specified in the SUBSCR_LIST, PRODID_LIST, or SUBSCR_NAME environment. This line is followed by the CHANGE request line, then a listing of the changed environments and new values, and finally the applicable product. After the change, the subscription identifier will remain the same, but the product identifier and the delivery identifier will change.

Environment

prodid_list | subscr_list | subscr_name

Example

The following subscription message requests a change to the LAT and LON environments for the BULLETIN subscription number 52:

```
begin ims1.0
msg_type subscription
msg_id ex044 any_ndc
e-mail name@my.computer
subscr_list 52
change
lat 12 to 22
lon 18 to 28
```

**Subscription ▼
Messages**

```
bulletin ims1.0  
stop
```

Chan_status

CHAN_STATUS requests channel status information for the channels in the CHAN_LIST environment for the S/H/I stations in the STA_LIST environment.

Environment

```
chan_list, freq, sta_list
```

Example

The following subscription message requests the daily channel status reports for the short-period channels at station ARA0:

```
begin ims1.0  
msg_type subscription  
msg_id ex045 any_ndc  
e-mail name@my.computer  
freq daily  
sta_list ARA0  
chan_list s*  
chan_status ims1.0  
stop
```

Comm_status

COMM_STATUS requests communications status information for the S/H/I communications links. A verbose communications status report listing individual circuit dropouts is obtained by using the verbose subformat.

Environment

```
freq, sta_list
```

Example

The following subscription message requests the verbose communications status reports for all links:

```
begin ims1.0
msg_type subscription
msg_id ex046 any_ndc
e-mail name@my.computer
freq daily
comm_status ims1.0:verbose
stop
```

Detbkphd

This data type is one of several PHD types available for radionuclide samples. It contains the PHD of an empty detector chamber as well as other important information. See [“Pulse Height Data” on page 186](#) for a description of the various PHD types and [“Detbkphd” on page A21](#) for an example.

Environment

```
freq, sta_list
```

Example

The following message requests DETBKPHDs from all Russian stations to be sent on a monthly basis:

```
begin ims1.0
msg_type subscription
msg_id ex047
e-mail name@my.computer
freq monthly
sta_list RU*
detbkphd
stop
```

**Subscription ▼
Messages****Event**

EVENT requests S/H/I event information for preferred origins satisfying the environmental constraints.

Environment

bull_type,
depth, depth_minus_error, event_sta_dist, freq, lat, lon, mag,
mag_type, mb_minus_ms, sta_list

Example

The following subscription message requests all of the REB events within regional distance (20 degrees) of stations ABC and DEF:

```
begin ims1.0
msg_type subscription
msg_id ex048 any_ndc
e-mail name@my.computer
freq daily
bull_type reb
sta_list ABC,DEF
event_sta_dist 0.0 to 20.0
event ims1.0
stop
```

FPEB

This data type is one of several radionuclide data products available from the IDC. The FPEB, or Fission Product Event Bulletin, is generated by the IDC when fission or activation products are detected at a radionuclide station above normal limits. An FPEB contains ARMRS from the stations that detect the fission product(s), information identifying the fission product(s), an estimate of the source location

and time, as well as any sample analysis results from certified laboratories. See [“Fission Product Event Bulletin” on page 214](#) for a description of the FPEB and [“FPEB” on page A23](#) for an example.

Environment

freq, sta_list

Example

The following message requests all FPEBs to be sent immediately:

```
begin ims1.0
msg_type subscription
msg_id ex049
e-mail name@my.computer
freq immediate
fpeb
stop
```

Origin

Origins are solutions to the location and time of a S/H/I source. Several origins may be determined for any one source. The ORIGIN line requests information for those origins that satisfy the environment constraints.

Environment

bull_type,
depth, depth_minus_error, event_sta_dist, freq, lat, lon, mag,
mag_type, mb_minus_ms, sta_list

**Subscription ▼
Messages****Example**

The following subscription message requests origin information for the daily REB delivered when the REB is ready for distribution:

```
begin ims1.0
msg_type subscription
msg_id ex049 any_ndc
e-mail name@my.computer
freq daily
bull_type reb
origin ims1.0
stop
```

The following subscription message requests origin information for events in the daily REB limited to a specific geographic region:

```
begin ims1.0
msg_type subscription
msg_id ex050 any_ndc
e-mail name@my.computer
freq daily
lat -60 to 10.0
lon -81 to -34
bull_type reb
origin ims1.0
stop
```

Qcphd

This data type is one of several PHD types available for radionuclide samples. It contains the PHD of a 15 minute sample acquisition as well as other important information. See [“Pulse Height Data” on page 186](#) for a description of the PHD types and [“Qcphd” on page A27](#) for an example.

Environment

freq, sta_list

Example

The following message requests QCPHDs from TZP64 to be sent monthly:

```
begin ims1.0
msg_type subscription
msg_id ex051
e-mail name@my.computer
freq monthly
sta_list TZP64
qcphd
stop
```

Sphdf/p

The Sample Pulse Height Data–Full (SPHDF) and Sample Pulse Height Data–Preliminary (SPHDP) data types are two of several PHD types available for radionuclide samples. The SPHDP contains PHD from a sample acquired for a time shorter than that of the full acquisition time. The SPHDF contains PHD from a sample acquired for the IDC-defined full acquisition time. Like the other PHD types, the SPHDF and SPHDP also include other important information. See [“Pulse Height Data” on page 186](#) for a description of the PHD types and [“Samplephd” on page A30](#) for an example.

Environment

freq, sta_list

**Subscription ▼
Messages****Example**

The following message requests weekly SPHDFs from radionuclide stations located in New Zealand:

```
begin ims1.0
msg_type subscription
msg_id ex052
e-mail name@my.computer
freq weekly
sta_list NZ*
sphdf
stop
```

Sta_status

STA_STATUS requests the station status for the S/H/I stations in the STA_LIST environment.

Environment

```
freq, sta_list
```

Example

The following subscription message requests the daily station status reports for all S/H/I stations:

```
begin ims1.0
msg_type subscription
msg_id ex053 any_ndc
e-mail name@my.computer
freq daily
sta_list *
sta_status ims1.0
stop
```

Subscribe

SUBSCRIBE is a request to initiate a new subscription for each standard product given by the SUBSCR_NAME environment.

Environment

subscr_name

Example

The following subscription message requests a subscription to the standard product FPEB:

```
begin ims1.0
msg_type subscription
msg_id ex054 any_ndc
e-mail name@my.computer
subscr_name fpeb
subscribe
stop
```

Subscr_log

SUBSCR_LOG requests a log of all of the user's changes to the subscriptions. The subscriber's email address determines the subscriptions to which a user is subscribed. Based on the email address, a log of all changes is sent out. The SUBSCR_LOG can be further constrained by use of the environments SUBSCR_LIST, PRODID_LIST, or SUBSCR_NAME.

Environment

subscr_list | prodid_list | subscr_name

**Subscription ▼
Messages****Example**

The following subscription message requests a log of subscription 74:

```
begin ims1.0
msg_type subscription
msg_id ex055 any_ndc
subscr_list 74
e-mail name@my.computer
subscr_log
stop
```

The response to the preceding message is as follows:

```
begin ims1.0
msg_type data
msg_id 132430 ctbo_idc
ref_id ex056 any_ndc
data_type log ims1.0
  subscription id: 74
  product id: 52
    was added at 1997/01/09 19:36:00
    freq immediate
    bull_type reb
    bulletin ims1.0
  subscription id: 74
  product id: 94
    was changed at 1997/01/21 15:24:13
    the new product constraints are:
    freq immediate
    lat 12.00 to 22.00
    lon 18.00 to 28.00
    bull_type reb
    bulletin ims1.0
stop
```

Subscr_prod

SUBSCR_PROD requests a list of the products currently subscribed to by the user. The response to this request includes the subscription identifier, product identifier, subscription name (where applicable), and a listing of the environment and request lines that define the specific product. The response is sent as a LOG data message. If SUBSCR_LIST, PRODID_LIST, or SUBSCR_NAME environments are not specified, then all products currently subscribed to by the user are provided.

Environment

subscr_list | prodid_list | subscr_name

Example

The following subscription message requests the current list of subscriptions that are in effect for the user:

```
begin ims1.0
msg_type subscription
msg_id ex057 any_ndc
e-mail name@my.computer
subscr_prod
stop
```

**Subscription ▼
Messages**

The response to this message is a LOG data message from the IDC:

```
begin ims1.0
msg_type data
msg_id 937418 ctbo_idc
ref_id ex058 any_ndc
data_type log ims1.0
  the following data products are subscribed
  to by name@my.computer:
  subscription id: 52
  product id: 74
    freq daily
    bull_type reb
    bulletin ims1.0
  subscription id: 57
  product id: 78
    freq immediate
    lat 0.0 to 10.0
    lon 120.0 to 140.0
    bull_type sel2
    bulletin ims1.0
stop
```

Subscr_resend

The SUBSCR_RESEND request causes a subscribed product to be re-delivered. This command gives the subscriber the ability to re-request delivery of a product.

Environment

delivid_list, prodid_list | subscr_list | subscr_name

Example

The following subscription message requests that delivery 32 of subscription 52 be resent to the user:

```
begin ims1.0
msg_type subscription
msg_id ex059 any_ndc
e-mail name@my.computer
subscr_list 52
delivid_list 32
subscr_resend
stop
```

Unsubscribe

The UNSUBSCRIBE request informs the IDC that the user wishes to remove the subscriptions referenced by the SUBSCR_LIST, PRODID_LIST, or SUBSCR_NAME environments. A LOG data message is sent confirming that the subscription has been cancelled.

Environment

subscr_list | prodid_list | subscr_name

Example

The following subscription message requests that subscriptions 52 and 57 be discontinued:

```
begin ims1.0
msg_type subscription
msg_id ex060 any_ndc
e-mail name@my.computer
subscr_list 52, 57
```

**Subscription ▼
Messages**

```
unsubscribe  
stop
```

A confirming LOG data message from the IDC to the subscription user will be sent verifying that the subscription has been terminated:

```
begin ims1.0  
msg_type data  
msg_id 784321 ctbo_idc  
ref_id ex061 any_ndc  
data_type log ims1.0  
the following data products have been removed  
by name@my.computer:  
subscription id: 52  
product id: 94  
    freq daily  
    bull_type reb  
    bulletin ims1.0  
subscription id: 57  
product id: 101  
    freq immediate  
    bull_type sel2  
    bulletin ims1.0  
stop
```

Waveform

Waveforms are the digital timeseries data. WAVEFORM requests will typically accept subformats that specify the format of digital data within the general format of the waveform data type. The available formats for waveform data from the IDC subscription service are continuous data format for continuous data and IMS1.0 format for all other waveform data. The available subformats are int, cm6, cm8, aut, au6, and au8.

Environment

chan_list, freq, sta_list, relative_to

Examples

The following subscription message requests continuous data from the short-period, high-gain, vertical channels of the ABAR array and from the central site (CDA0) of the CDAR array:

```
begin ims1.0
msg_type subscription
msg_id ex062 any_ndc
e-mail name@my.computer
freq continuous
sta_list ABAR,CDA0
chan_list shz
waveform ims1.0
stop
```

The following subscription message requests any waveform segments from auxiliary station ABC as soon as they are received by the IDC:

```
begin ims1.0
msg_type subscription
msg_id ex063 any_ndc
e-mail name@my.computer
freq immediate
sta_list ABC
waveform ims1.0
stop
```


S/H/I Data Messages

This chapter describes the request message formats and includes the following topics:

- [Introduction](#)
- [Station Information](#)
- [Waveform Data](#)
- [Processing Products](#)
- [Status Information](#)
- [Logs](#)

S/H/I Data Messages

INTRODUCTION

AutoDRM data formats provide a common format for data and data product exchange. The data formats all contain ASCII options that allow the exchange of information via email (even for waveforms). Waveforms in binary format may also be sent using the *AutoDRM* message format, but the transmission of data messages with binary information must be via FTP.

Each data message contains the required information for all *AutoDRM* messages. All data messages must contain the BEGIN line and be followed by a MSG_TYPE line and a MSG_ID line using the proper formats for the arguments. The MSG_TYPE for data messages is data. Because a data message may be a response to a request, a REF_ID line may also appear. If the data message is a response to a subscription, then a PROD_ID line will be included. Sections of data-specific information follow the identification line(s).

Many types of data can be exchanged by using the message formats described in this chapter. These types of data include timeseries, bulletins, station information, and others. The main data format supported by the IDC *AutoDRM* is IMS1.0. Sub-formats may also be available within a specific data type. The type of data that is included in a data section and the format of the data are designated with a DATA_TYPE line.

Data_type

Data sections must begin with a DATA_TYPE line. The arguments to DATA_TYPE are the type of data that follows (for example, WAVEFORM or BULLETIN) and the format (IMS1.0). The *subtype* and *sub_format* allow more precise selection of the data type and format, respectively.

Syntax

`data_type data_type[:subtype] format[:sub_format]`

<i>data_type</i>	type of data that follows; typical examples are WAVEFORM, BULLETIN, and RESPONSE
<i>subtype</i>	subtype to use with this data type. <i>subtype</i> is used primarily for ARRIVAL data types.
<i>format</i>	general format of the data (IMS1.0)
<i>sub_format</i>	internal format to use with this data type. <i>sub_format</i> is used primarily for BULLETIN and WAVEFORM data types.

Example

`data_type waveform IMS1.0:cm6`

The end of a data section is implied by another DATA_TYPE line, or a STOP line.

The following sections give the formats for data messages. Examples of these data formats are provided in ["Appendix A: Data Message Examples" on page A1](#).

STATION INFORMATION

Data types for S/H/I stations describe the stations through their locations, instrumentation, channels, and so on.

Channel

The CHANNEL data type contains information describing the sensors and their emplacement. Table 9 gives the format for the CHANNEL data message and an example is provided in ["Channel" on page A19](#).

S/H/I Data ▼
Messages

TABLE 9: CHANNEL FORMAT

Record	Position	Format	Description
1 (header)	1-3	a3	Net
	11-13	a3	Sta
	16-19	a4	Chan
	21-23	a3	Aux
	27-34	a8	Latitude
	36-45	a9	Longitude
	47-55	a9	Coord Sys
	63-66	a4	Elev
	70-74	a5	Depth
	78-81	a4	Hang
	84-87	a4	Vang
	89-99	a11	Sample Rate
	101-104	a4	Inst
	111-117	a7	On Date
	122-128	a7	Off Date
2- <i>n</i> (data)	1-9	a9	network code
	11-15	a5	station code
	17-19	a3	FDSN channel code
	21-24	a4	auxiliary code
	26-34	f9.5	latitude (degrees, South is negative)
	36-45	f10.5	longitude (degrees, West is negative)
	47-58	a12	coordinate system (for example, WGS-84)
	60-64	f5.3	elevation (km)
	66-70	f5.3	emplacement depth (km)

TABLE 9: CHANNEL FORMAT (CONTINUED)

Record	Position	Format	Description
2- <i>n</i>	72-77	f6.1	horizontal angle of emplacement (positive degrees clockwise from North, -1.0 if vertical)
	79-83	f5.1	vertical angle of emplacement (degrees from vertical, 90.0 if horizontal)
	85-95	f11.6	sample rate (samples/sec)
	97-103	a6	instrument type
	105-114	i4,a1,i2,a1,i2	start date of channel operation (yyyy/mm/dd)
	116-125	i4,a1,i2,a1,i2	end date of channel operation (yyyy/mm/dd)

Network

The NETWORK data type provides a descriptive name for each network code. Table 10 shows the format for the NETWORK data message. An example is provided in [“Network” on page A25](#).

TABLE 10: NETWORK FORMAT

Record	Position	Format	Description
1 (header)	1-3	a3	Net
	11-21	a11	Description
2- <i>n</i> (data)	1-9	a9	network code
	11-74	a64	descriptive network name

Station

The STATION data type describes the site, location, and dates of operation. For arrays, the unique array code that defines a reference point (used for beam) is given along with the information from each element. Table 11 shows the format for the STATION data message. An example is provided in [“Station” on page A31](#).

S/H/I Data ▼
Messages

TABLE 11: STATION FORMAT

Record	Position	Format	Description
1 (header)	1-3	a3	Net
	11-13	a3	Sta
	17-20	a4	Type
	23-30	a8	Latitude
	33-41	a9	Longitude
	43-51	a9	Coord Sys
	57-60	a4	Elev
	64-70	a7	On Date
	74-81	a8	Off Date
2- <i>n</i> (data)	1-9	a9	network code
	11-15	a5	station code
	17-20	a4	1C = single component 3C = three component hfa = high-frequency array lpa = long-period array
	22-30	f9.5	latitude (degrees, South is negative)
	32-41	f10.5	longitude (degrees, West is negative)
	43-54	a12	coordinate system (for example, WGS-84)
	56-60	f5.3	elevation (km)
	62-71	i4,a1,i2,a1,i2	start of station operation (yyyy/mm/dd)
	73-82	i4,a1,i2,a1,i2	end of station operation (yyyy/mm/dd)

WAVEFORM DATA

Data types for waveforms include the response of the instrumentation and the waveform data formats.

Response

The RESPONSE data type allows the complete response to be given as a series of response groups that can be cascaded. Modern instruments are composed of several different components, each with its own response. This format mimics the actual configuration of the instrumentation.

A complete response description is made up of the CAL2 block (Table 12) plus one or more of the PAZ2, FAP2, GEN2, DIG2, and FIR2 response blocks in any order (Tables 13–17). The response blocks should be given sequential stage numbers (beginning with 1) in the order that they occur in the system response.

Each response block is comprised of a header line and sufficient occurrences of the values lines to provide all required coefficients. The DIG2 block may occur only once per response. Comments may be inserted after the CAL2 block and after any response section as desired, provided that they are enclosed with parenthesis beginning in column 2. Successive channel responses should also be separated by blank lines for readability.

The input of the earth to seismic stations is in nanometers of displacement (all of the responses are displacement responses). For hydroacoustic and infrasonic, the input is units=pressure=(micro-Pascal). Velocity or acceleration responses can be obtained by multiplying the response curve by $i\omega$ or $-\omega^2$, respectively. An example of the RESPONSE data message is provided in ["Response" on page A28](#).

The CAL2 block gives general information about the response information that follows (see Table 12).

TABLE 12: CALIBRATION IDENTIFICATION BLOCK FORMAT

Record	Position	Format	Description
1	1-4	a4	CAL2
	6-10	a5	station code
	12-14	a3	FDSN channel code
	16-19	a4	auxiliary identification code
	21-26	a6	instrument type
	28-42	e15.8	system sensitivity (nm/count) at calibration reference period ¹
	44-50	f7.3	calibration reference period (seconds)
	52-62	f11.5	system output sample rate (Hz)
	64-73	i4,a1,i2,a1,i2	effective start date (yyyy/mm/dd)
	75-79	i2,a1,i2	effective start time (hh:mm)
	81-90	i4,a1,i2,a1,i2	effective end date (yyyy/mm/dd) ²
	92-96	i2,a1,i2	effective end time (hh:mm)

1. System sensitivity, calibration reference period, and sample rate should be the same as in the wid2 block.
2. The start/end date/times specify the time period for which the response is valid. If the response is still valid, the end date/time should be left blank.

A poles and zeros block (PAZ2) can be used for either an analog filter or an infinite impulse response (IIR) filter. In the data section, poles are always given first followed by zeros (see Table 13).

TABLE 13: POLES AND ZEROS BLOCK FORMAT

Record	Position	Format	Description
1	1-4	a4	PAZ2
	6-7	i2	stage sequence number
	9	a1	output units code (V = volts, A = amps, C = counts)
	11-25	e15.8	scale factor
	27-30	i4	decimation (blank if analog)
	32-39	f8.3	group correction applied (seconds)
	41-43	i3	number of poles
	45-47	i3	number of zeros
	49-73	a25	description
2-n	2-16	e15.8	real part of pole or zero
	18-32	e15.8	imaginary part of pole or zero

Like PAZ2, the frequency, amplitude, phase (FAP2) block can be used to specify the response of analog or digital filters, or some combination of them including a complete system response (see Table 14).

TABLE 14: FREQUENCY, AMPLITUDE, AND PHASE BLOCK FORMAT

Record	Position	Format	Description
1	1-4	a4	FAP2
	6-7	i2	stage sequence number
	9	a1	output units code (V = volts, A = amps, C = counts)
	11-14	i4	decimation (blank if analog)
	16-23	f8.3	group correction applied (seconds)
	25-27	i3	number of frequency, amplitude, phase triplets
	29-53	a25	description
2- <i>n</i> (data)	2-11	f10.5	frequency (Hz)
	13-27	e15.8	amplitude (input units/output units)
	29-32	i4	phase delay (degrees)

The generic response block (GEN2) can specify the response of analog or digital filters, or some combination of them, including a complete system response (see Table 15).

TABLE 15: GENERIC RESPONSE BLOCK FORMAT

Record	Position	Format	Description
1	1-4	a4	GEN2
	6-7	i2	stage sequence number
	9	a1	output units code (V = volts, A = amps, C = counts)
	11-25	e15.8	section sensitivity (input units/output units)
	27-32	f7.3	calibration reference period (seconds)
	35-38	i4	decimation (blank if analog)
	40-47	f8.3	group correction applied (seconds)
	49-51	i3	number of corners
	53-77	a25	description
2- <i>n</i> (data)	2-12	f11.5	corner frequency (Hz)
	14-19	f6.2	slope above corner (dB/decade)

The digitizer block (DIG2) specifies the digitizer sample rate and sensitivity. It also provides a description field to identify the model of digitizer being used (Table 16).

TABLE 16: DIGITIZER RESPONSE BLOCK FORMAT

Record	Position	Format	Description
1	1-4	a4	DIG2
	6-7	i2	stage sequence number
	9-23	e15.8	sensitivity (counts/input unit)
	25-35	f11.5	digitizer sample rate (Hz)
	37-61	a25	description

The finite impulse response block (FIR2) is used to describe the response of FIR digital filters (see Table 17).

TABLE 17: FINITE IMPULSE RESPONSE BLOCK FORMAT

Record	Position	Format	Description
1	1-4	a4	FIR2
	6-7	i2	stage sequence number
	9-18	e10.2	filter gain (relative factor, <i>not</i> in dB)
	20-23	i4	decimation (blank if analog)
	25-32	f8.3	group correction applied (seconds)
	34	a1	symmetry flag (A = asymmetric, B = symmetric [odd], C = symmetric [even])
	36-39	i4	number of factors
	41-65	a25	description
	2-16	e15.8	factor(i)
	18-32	e15.8	factor(i+1)
2-n (data)	34-48	e15.8	factor(i+2)
	50-64	e15.8	factor(i+3)
	66-80	e15.8	factor(i+4)

Comments on the response of an instrument are enclosed in parentheses (Table 18).

TABLE 18: RESPONSE COMMENT BLOCK FORMAT

Record	Position	Format	Description
1	2	a1	(
	3-n	a<n-1>	Comment
	n+1	a1)

Waveform

The format for WAVEFORM data messages consists of a waveform identification (WID2) block (Table 19), followed by the station (STA2) block (Table 20), the waveform data (DAT2) block (Table 21), and a checksum (CHK2) block (Table 22). Each DAT2 block should be followed by a CHK2 block so that the validity (or otherwise) of the data can be verified.

TABLE 19: WAVEFORM IDENTIFICATION BLOCK FORMAT

Record	Position	Format	Description
1	1-4	a4	WID2
	6-15	i4,a1,i2,a1,i2	date of the first sample (yyyy/mm/dd)
	17-28	i2,a1,i2,a1,f6.3	time of the first sample (hh:mm:ss.sss)
	30-34	a5	station code
	36-38	a3	FDSN channel code
	40-43	a4	auxiliary identification code
	45-47	a3	INT, CM n , or AU x INT is free-format integers as ASCII characters. CM denotes compressed data, and n is either 6 (6-bit compression), or 8 (8-bit binary compression) AU signifies authentication, and x is T (uncompressed binary integers), 6 (6-bit compression), or 8 (8-bit binary compression)
	49-56	i8	number of samples
	58-68	f11.6	data sampling rate (Hz)
	70-79	e10.2	system sensitivity (nm/count) at the calibration reference period, the ground motion in nanometers per digital count at calibration period (calper)

TABLE 19: WAVEFORM IDENTIFICATION BLOCK FORMAT (CONTINUED)

Record	Position	Format	Description
1	81-87	f7.3	calibration reference period; the period in seconds at which the system sensitivity is valid; calper should be near the flat part of the response curve (in most cases, 1 second)
	89-94	a6	instrument type (from Table 23)
	96-100	f5.1	horizontal orientation of sensor, measured in positive degrees clockwise from North (–1.0 if vertical)
	102-105	f4.1	vertical orientation of sensor, measured in degrees from vertical (90.0 if horizontal)

TABLE 20: STATION BLOCK FORMAT

Record	Position	Format	Description
1	1-4	a4	STA2
	6-14	a9	network identifier
	16-24	f9.5	latitude (degrees, South is negative)
	26-35	f10.5	longitude (degrees, West is negative)
	37-48	a12	reference coordinate system (for example, WGS-84)
	50-54	f5.3	elevation (km)
	56-60	f5.3	emplacement depth (km)

TABLE 21: WAVEFORM DATA BLOCK FORMAT

Record	Position	Format	Description
1	1-4	a4	DAT2
2- <i>n</i>	1-1024 <i>variable</i>	i, a, or f	data values

TABLE 22: CHECKSUM BLOCK FORMAT

Record	Position	Format	Description
1	1-4	a4	CHK2
	6-13	i8	checksum

The WID2 block gives the following information:

- date and time of the first data sample
- station, channel, and auxiliary codes
- subformat of the data;
- number of samples and sample rate
- calibration of the instrument represented as the number of nanometers per digital count at the calibration period
- type of instrument (shown in Table 23)
- horizontal and vertical orientation of the instrument.

The auxiliary code will be blank in most cases; the code is only used when two data streams with the same station and channel codes conflict. Instrument response information must be obtained separately using a RESPONSE request.

TABLE 23: IMS S/H/I INSTRUMENT TYPES

Instrument Type	Description
Akashi	Akashi
20171A	Geotech 20171A
23900	Geotech 23900
7505A	Geotech 7505A
8700C	Geotech 8700C
BB-13V	Geotech BB-13V
CMG-3	Guralp CMG-3
CMG-3N	Guralp CMG-3NSN
CMG-3T	Guralp CMG-3T
CMG-3E	Guralp CMG3-ESP
FBA-23	Kinematics FBA-23
GS-13	Geotech GS-13
GS-21	Geotech GS-21
HM-500	HM-500
KS3600	Geotech KS-36000
KS360i	Geotech KS-36000-I
KS5400	Geotech KS-54000
LE-3D	LE-3D
Mk II	Willmore Mk II
MP-L4C	Mark Products L4C
Oki	Oki
Parus2	Parus-2
Podrst	Podrost
S-13	Geotech S-13
S-500	Geotech S-500

TABLE 23: IMS S/H/I INSTRUMENT TYPES (CONTINUED)

Instrument Type	Description
S-750	Geotech S-750
STS-1	Streckeisen STS-1
STS-2	Streckeisen STS-2
SDSE-1	SDSE-1
SOSUS	SOSUS
TSJ-1e	TSJ-1e

Data following the DAT2 block may be in any of six different subformats recognized in the IMS1.0 waveform format: `int`, `cm6`, `cm8`, `aut`, `au6`, and `au8`. `int` is in a simple ASCII subformat; the `cm`- subformats are for compressed data, and the `au`- subformats are for authenticated data. All of the *AutoDRM* formats represent the numbers as integers.

A checksum must be computed for the waveform data in the IMS1.0 waveform format. The checksum is computed from integer data values prior to converting them to any of the subformats. [Figure 1](#) shows the FORTRAN subroutine for computing `CHK2` checksum, and [Figure 2](#) shows the C function for computing the `CHK2` checksum. To prevent overflow, the checksum is computed modulo 100,000,000 and stored as an eight-digit integer without a sign.

The line length limits for *AutoDRM* messages are enforced for the IMS1.0 data formats; no line may be longer than 1,024 bytes. The line continuation character (`\`) is not used in waveform data lines.

Examples of the `cm6` and `int` subformats of the WAVEFORM data message are provided in ["Waveform \(IMS1.0:cm6 format\)" on page A32](#) and ["Waveform \(IMS1.0:int format\)" on page A33](#).

**S/H/I Data ▼
Messages**

Using the `OUT2` and `DLY2` blocks, the `WAVEFORM` data type can also be used to respond that no data are available for a request or that the response to the request will be delayed. Table 24 shows how the blocks are used (see also Table 25 and Table 26). In addition, the `STA2` block contains station information. This block is mandatory and must immediately follow the `WID2`, `OUT2`, and `DLY2` blocks.

```

      subroutine compute_checksum(signal_int,number_of_samples,checksum)
c*****
c This subroutine computes ims1.0 checksum used in the CHK2 line
c*****
c declarations
c
c      implicit none
c
c      integer*4 signal_int(*)      ! (input)  seismic signal
c                                   !          (counts, integer values)
c      integer*4 number_of_samples ! (input)  number of used samples
c      integer*4 checksum          ! (output) computed checksum
c      integer*4 i_sample          ! index
c      integer*4 sample_value      ! value of one sample after
c                                   ! sample overflow check
c      integer*4 modulo            ! overflow protection value
c      integer*4 MODULO_VALUE      ! overflow protection value
c      parameter (MODULO_VALUE = 100 000 000)
c
c initialize the checksum
c      checksum = 0
c
c use modulo variable besides MODULO_VALUE parameter to suppress
c optimizing compilers to bypass local modulo division computation
c      modulo = MODULO_VALUE
c
c loop over all samples (counts, integer values)
c
c      do i_sample = 1, number_of_samples
c
c check on sample value overflow
c
c          sample_value = signal_int(i_sample)
c          if(abs(sample_value) .ge. modulo)then
c              sample_value = sample_value-
c              * (sample_value/modulo)*modulo
c          endif
c
c add the sample value to the checksum
c
c          checksum = checksum+sample_value
c
c apply modulo division to the checksum
c
c          if(abs(checksum) .ge. modulo)then
c              checksum = checksum-
c              * (checksum/modulo)*modulo
c          endif
c
c end of loop over samples
c      enddo
c
c compute absolute value of the checksum
c
c      checksum = abs(checksum)
c
c      return
c      end

```

FIGURE 1. FORTRAN SUBROUTINE FOR COMPUTING CHK2 CHECKSUM

S/H/I Data ▼
Messages

```

#include <stdlib.h>
#include <math.h>

/*
   This function computes the ims1.0 checksum used in the CHK2 line
*/
void
compute_checksum(signal_int, number_of_samples, _checksum)
    int      *signal_int;
    int      number_of_samples;
    int      *_checksum;
{
    int      i_sample;
    int      sample_value;
    int      modulo;
    int      checksum;

    int      MODULO_VALUE = 100000000;

    checksum = 0;
    modulo = MODULO_VALUE;

    for (i_sample=0; i_sample < number_of_samples; i_sample++)
    {
        /* check on sample value overflow */

        sample_value = signal_int[i_sample];

        if (abs(sample_value) >= modulo)
        {
            sample_value = sample_value -
                (sample_value/modulo)*modulo;
        }

        /* add the sample value to the checksum */

        checksum += sample_value;

        /* apply modulo division to the checksum */

        if (abs(checksum) >= modulo)
        {
            checksum = checksum -
                (checksum/modulo)*modulo;
        }
    }

    /* compute absolute value of the checksum */

    *_checksum = abs(checksum);
}

```

FIGURE 2. C FUNCTION FOR COMPUTING CHK2 CHECKSUM

TABLE 24: APPLICABLE BLOCKS FOR WAVEFORM MESSAGES

Waveform Message	Block ¹							
	WID2	OUT2	DLY2	STA2	EID2	BEA2	DAT2	CHK2
waveform data message	r			r	o	o	r	r
no data message		r		r				
data delayed message			r	r				

1. r = required, o = optional

TABLE 25: OUT2 BLOCK FORMAT

Record	Position	Format	Description
1	1-4	a4	OUT2
	6-15	i4,a1,i2,a1,i2	date of the first missing sample (yyyy/mm/dd)
	17-28	i2,a1,i2,a1,f6.3	time of the first missing sample (hh:mm:ss.sss)
	30-34	a5	station code
	36-38	a3	FDSN channel code
	40-43	a4	auxiliary identification code
	45-55	f11.3	duration that data are unavailable (seconds)

TABLE 26: DLY2 BLOCK FORMAT

Record	Position	Format	Description
1	1-4	a4	DLY2
	6-15	i4,a1,i2,a1,i2	date of the first delayed sample (yyyy/mm/dd)
	17-28	i2,a1,i2,a1,f6.3	time of the first delayed sample (hh:mm:ss.sss)
	30-34	a5	station code

TABLE 26: DLY2 BLOCK FORMAT (CONTINUED)

Record	Position	Format	Description
1	36-38	a3	FDSN channel code
	40-43	a4	auxiliary identification code
	45-55	f11.3	estimated duration of queue (seconds)

The optional EID2 block specifies to which event(s) a waveform is associated (see Table 27). This block is used when waveforms are requested from a bulletin with the RELATIVE_TO environment. The EID2 block may be repeated for each event to which a waveform is associated.

TABLE 27: EID2 BLOCK FORMAT

Record	Position	Format	Description
1	1-4	a4	EID2
	6-13	a8	event identification of associated event
	15-23	a9	bulletin type

The optional BEA2 block specifies how a beamed waveform was formed (see Table 28). This block is only used when the waveform is the result of beaming.

TABLE 28: BEA2 BLOCK FORMAT

Record	Position	Format	Description
1	1-4	a4	BEA2
	6-17	a12	beam identification for the waveform
	19-23	f5.1	azimuth used to steer the beam (measured in positive degrees clockwise from North)
	25-29	f5.1	slowness used to steer the beam (s/degree, -999.0 if vertical beam)

Subformat INT

The INT waveform subformat represents integer data as blank or newline delimited ASCII characters. The number of blank spaces between samples is unspecified, and an individual sample value may not be continued on the next line.

Waveform Compression Schemes

Two different compression schemes are recognized in the IMS1.0 waveform format: CM6 and CM8.

For waveform data, the difference between data samples is usually much smaller than the instantaneous magnitudes. The difference of the differences (the second difference) is even smaller. Transmitting the second difference requires fewer significant bits. Reductions in the message length can be achieved if the number of bits to convey the information is reduced when the signal level is small and expanded when the signal level rises. Because samples will take a variable number of bits, an index is required to specify the number of bits in each sample.

Both compression schemes use second differences as a first step in reducing the number of significant bits required to convey the information in the timeseries. A first difference is computed as the difference between successive samples. A second difference is the difference between the differences. The first value in both steps keeps its absolute value (see the following sections).

The following paragraphs describe the compression schemes to reduce the number of bits and/or to make transmission easy.

Subformat CM6

The CM6 compression scheme is a six-bit compression of second differences. The advantage of this method is in its conversion of binary integer data to ASCII characters that can be successfully transmitted using email. The compression algorithm converts waveforms into a set of printable ASCII characters carefully avoiding

those that have been found to cause problems to either communications circuits or the computers connected to them. The algorithm uses only the 64 characters +, -, 0 - 9, A - Z and a - z.

Initially, all data samples in the packet are represented as 32-bit, 2's complement integers, with a range of $-(2^{31})$ to $+(2^{31}-1)$. Second difference samples are encoded as the difference between the first differences and can be computed for the j th sample using the following formula:

$$D_2(j) = S(j) - 2S(j-1) + S(j-2)$$

where zero and negative indices are ignored. Thus, the second difference data for N samples are as follows:

$$S(1), S(2) - 2S(1), S(3) - 2S(2) + S(1), \dots, S(N) - 2S(N-1) + S(N-2)$$

To compress the numbers, the second differences are converted from 2's complement to sign and magnitude. These numbers are then fit into a variable number of bytes in which only the six most significant bits (MSB) are used. The most significant usable bit of each byte is used as a flag or control bit, which, if set, signifies that the following byte also contains information relating to the same sample. The second most significant bit is used as a sign bit in the first byte pertaining to a sample and as a data bit in all following bytes of the sample. All other bits are used to represent the value of the second difference of the sample. These numbers are then fit into a variable number of bytes in which only the six most significant bits are used (see Table 29).

TABLE 29: BIT POSITIONS FOR CM6

Most Significant Bit						Least Significant Bit	
control	sign/data	data	data	data	data	unused	unused

These six-bit bytes are then used to refer to a lookup table (see Table 30) from which one of 64 different ASCII characters (+, -, 0-9, A-Z, a-z) is extracted.

TABLE 30: ASCII REPRESENTATION OF BIT PATTERNS FOR CM6

Bit Pattern	Char ¹	Bit Pattern	Char	Bit Pattern	Char	Bit Pattern	Char
000000	+	010000	E	100000	U	110000	k
000001	–	010001	F	100001	V	110001	l
000010	0	010010	G	100010	W	110010	m
000011	1	010011	H	100011	X	110011	n
000100	2	010100	I	100100	Y	110100	o
000101	3	010101	J	100101	Z	110101	p
000110	4	010110	K	100110	a	110110	q
000111	5	010111	L	100111	b	110111	r
001000	6	011000	M	101000	c	111000	s
001001	7	011001	N	101001	d	111001	t
001010	8	011010	O	101010	e	111010	u
001011	9	011011	P	101011	f	111011	v
001100	A	011100	Q	101100	g	111100	w
001101	B	011101	R	101101	h	111101	x
001110	C	011110	S	101110	i	111110	y
001111	D	011111	T	101111	j	111111	z

1. char = character

Subformat CM8

The CM8 subformat is similar to the CM6 subformat. The same algorithm is used, but the compression is more efficient than the 6-bit subformat because all bits are used. The 8-bit scheme is a binary format that cannot be transmitted using email; FTP must be used.

The second-difference integers are first converted from 2's complement to sign and magnitude. These numbers are then fit into a variable number of bytes in which all eight significant bits are used. The most significant usable bit of each byte is used as a flag or control bit, which, if set, is used to signify that the following byte also contains information relating to the same sample. The second most significant bit is used as a sign bit in the first byte pertaining to a sample and as data in all following bytes. All other bits are used to represent the value of the second difference (Table 31).

TABLE 31: BIT POSITIONS FOR CM8

Most Significant Bit					Least Significant Bit		
control	sign/data	data	data	data	data	data	data

Subformat AUT

Waveform data that have been signed for authentication must contain more than just waveform samples; they must also contain time and status information. The IMS1.0 authentication subformat includes this information in packets that are individually signed for authentication. The signed data in this subformat include the time-stamp, the number of samples, the status word, and the data. Waveform segments consist of several of these packets concatenated, as shown in Table 32. The data are binary integers.

TABLE 32: AUTHENTICATION DATA FORMAT

Name	Format	Description
length of packet	4-byte IEEE integer	length of packet in bytes, not counting this word, for channel data that follows (divisible by 4)
authentication	40-byte string	authentication signature
timestamp	8-byte IEEE float	seconds since 1 January 1970 00:00 for first sample. Must be within one sample of nominal time.

TABLE 32: AUTHENTICATION DATA FORMAT (CONTINUED)

Name	Format	Description
samples	4-byte IEEE integer	number of samples in channel packet
status word	4-byte string	Data status byte (most significant byte): bit 31 1 = dead channel bit 30 1 = zeroed data bit 29 1 = clipped bit 28 1 = calibration signal bits 24-27 undefined Station status byte: bit 23 1 = vault door open bit 22 1 = authentication box opened bit 21 1 = equipment moved bit 20 1 = clock differential too large bits 16-19 undefined Station specific bits: bits 0-15 user defined (for example, station status counter)
data	(length of packet minus 56 bytes - based on original 4-byte IEEE integers)	raw four-byte integers or compressed data

Subformats AU6 and AU8

Data that have an authentication signature may be compressed for ease in transmission. The same authentication subformat described above is used for compressed authenticated data, with the difference that the data are compressed. The AU6 and AU8 authentication formats are compressed using the 6-bit and 8-bit compression schemes described above. The compression algorithm is applied only to the data, not to the 60 bytes of header information given in Table 32. Before verifying the authenticity of the data, the data must be uncompressed using the appropriate decompression scheme.

PROCESSING PRODUCTS

Data types for processing products include the results of the various stages of S/H/I processing from arrivals through events.

Arrival

The ARRIVAL data type is divided into five subtypes (automatic, reviewed, grouped, associated, and unassociated) to reflect the different processing stages.

Automatic Arrivals

The automatic subtype provides the result of a detection process run on waveforms. The format for the automatic data subtype is given in Table 33, and an example is provided in [“Arrival:automatic” on page A13](#).

TABLE 33: AUTOMATIC ARRIVAL FORMAT

Record	Position	Format	Description
1 (header)	1-3	a3	Net
	11-13	a3	Sta
	17-22	a6	BeamID
	33-36	a4	Date
	44-47	a4	Time
	54-58	a5	Phase
	64-67	a4	Azim
	70-73	a4	Slow
	77-79	a3	SNR
	87-89	a3	Amp
	93-95	a3	Per
	99-101	a3	STA

TABLE 33: AUTOMATIC ARRIVAL FORMAT (CONTINUED)

Record	Position	Format	Description
1 (header)	105-107	a3	Dur
	109-114	a6	Author
	122-126	a5	DetID
2- <i>n</i> (data)	1-9	a9	network code
	11-15	a5	station code
	17-28	a12	beam identifier
	30-39	i4,a1,i2,a1,i2	detection date (yyyy/mm/dd)
	41-52	i2,a1,i2,a1,f6.3	detection time (hh:mm:ss.sss)
	54-61	a8	preliminary phase code
	63-67	f5.1	observed azimuth (degrees)
	69-73	f5.1	observed slowness (seconds/degree)
	75-79	f5.1	signal-to-noise ratio
	81-89	f9.1	amplitude (nanometers)
	91-95	f5.2	period (seconds)
	97-101	f5.1	short-term average
	103-107	f5.1	detection duration (seconds)
	109-117	a9	author of the detection
	119-126	a8	detection identifier

Reviewed Arrivals

The reviewed subtype is used for arrivals that have been reviewed and assigned phase names. Phase names are not expected to have been verified by location. Table 34 gives the format for the reviewed data subtype, and an example is provided in ["Arrival:reviewed" on page A14](#).

TABLE 34: REVIEWED ARRIVAL FORMAT

Record	Position	Format	Description
1 (header)	1-3	a3	Net
	11-13	a3	Sta
	16-19	a4	Chan
	22-24	a3	Aux
	30-33	a4	Date
	40-43	a4	Time
	50-54	a5	Phase
	60-63	a4	Azim
	66-69	a4	Slow
	73-75	a3	SNR
	83-85	a3	Amp
	89-91	a3	Per
	93-96	a4	Qual
	98-103	a6	Author
	110-114	a5	ArrID
2- <i>n</i> (data)	1-9	a9	network code
	11-15	a5	station code
	17-19	a3	FDSN channel code
	21-24	a4	auxiliary identification code
	26-35	i4,a1,i2,a1,i2	arrival date (yyyy/mm/dd)
	37-48	i2,a1,i2,a1,f6.3	arrival time (hh:mm:ss.sss)
	50-57	a8	phase code
	59-63	f5.1	observed azimuth (degrees)
	65-69	f5.1	observed slowness (seconds/degree)

TABLE 34: REVIEWED ARRIVAL FORMAT (CONTINUED)

Record	Position	Format	Description
2- <i>n</i> (data)	71-75	f5.1	signal-to-noise ratio
	77-85	f9.1	amplitude (nanometers)
	87-91	f5.2	period (seconds)
	93	a1	type of pick (a = automatic, m = manual)
	94	a1	direction of short period motion (c = compression, d = dilatation, _ = null)
	95	a1	detection character (i = impulsive, e = emergent, q = questionable, _ = null [see Table 9])
	97-105	a9	author of the arrival
	107-114	a8	arrival identification

TABLE 35: DETECTION CHARACTER FROM UNCERTAINTY

Detection Character	Uncertainty for Local Phases	Uncertainty for Regional/Teleseismic Phases
i	< 0.05 sec	< 0.2 sec
e	< 0.25 sec	< 1.0 sec
q	> 0.25 sec	> 1.0 sec

Grouped Arrivals

The grouped subtype is used for arrivals that have phase names and have been grouped together, with the implication that they were generated by the same seismic event. Table 36 gives the format for the grouped data subtype, and an example is provided in [“Arrival:grouped” on page A14](#).

TABLE 36: GROUPED ARRIVAL FORMAT

Record	Position	Format	Description
1 (header)	1-3	a3	Net
	11-13	a3	Sta
	16-19	a4	Chan
	21-23	a3	Aux
	29-32	a4	Date
	39-42	a4	Time
	50-54	a5	Phase
	60-63	a4	Azim
	66-69	a4	Slow
	73-75	a3	SNR
	83-85	a3	Amp
	89-91	a3	Per
	93-96	a4	Qual
	100-104	a5	Group
	106	a1	C
	108-113	a6	Author
	121-125	a5	ArrID
2- <i>n</i> (data)	1-9	a9	network code
	11-15	a5	station code
	17-19	a3	FDSN channel code
	21-24	a4	auxiliary identification code
	26-35	i4,a1,i2,a1,i2	arrival date (yyyy/mm/dd)
	37-48	i2,a1,i2,a1,f6.3	arrival time (hh:mm:ss.sss)
	50-57	a8	phase code

TABLE 36: GROUPED ARRIVAL FORMAT (CONTINUED)

Record	Position	Format	Description
2- <i>n</i> (data)	59-63	f5.1	observed azimuth (degrees)
	65-69	f5.1	observed slowness (seconds/degree)
	71-75	f5.1	signal-to-noise ratio
	77-85	f9.1	amplitude (nanometers)
	87-91	f5.2	period (seconds)
	93	a1	type of pick (a = automatic, m = manual)
	94	a1	direction of short period motion (c = compression, d = dilatation, _ = null)
	95	a1	detection quality (i = impulsive, e = emergent, q = questionable, _ = null)
	97-104	a8	group identification
	106	i1	conflict flag (number of times an arrival belongs to more than one group; leave blank if arrival only belongs to one group)
	108-116	a9	author of the arrival
	118-125	a8	arrival identification

Associated Arrivals

The associated subtype is used for arrivals that have been run through a location program and have formed a seismic event. If multiple magnitude measurements have been made on an arrival, the subsequent magnitudes will appear on lines immediately after the arrival. Table 37 gives the format for the associated data subtype, and an example is provided in ["Arrival:associated" on page A13](#).

S/H/I Data ▼
Messages

TABLE 37: ASSOCIATED ARRIVAL FORMAT

Record	Position	Format	Description
1 (header)	1-3	a3	Net
	11-13	a3	Sta
	19-22	a4	Dist
	25-28	a4	EvAz
	30-34	a5	Phase
	41-44	a4	Date
	53-56	a4	Time
	64-67	a4	TRes
	70-73	a4	Azim
	75-79	a5	AzRes
	82-85	a4	Slow
	88-91	a4	SRes
	93-95	a3	Def
	99-101	a3	SNR
	109-111	a3	Amp
	115-117	a3	Per
	119-122	a4	Qual
	124-132	a9	Magnitude
	136-141	a6	OrigID
	143-148	a6	Author
	156-160	a5	ArrID
2- <i>n</i> (data)	1-9	a9	network code
	11-15	a5	station code
	17-22	f6.2	station to event distance (degrees)

TABLE 37: ASSOCIATED ARRIVAL FORMAT (CONTINUED)

Record	Position	Format	Description
2- <i>n</i> (data)	24-28	f5.1	event to station azimuth (degrees)
	30-37	a8	phase code
	39-48	i4,a1,i2,a1,i2	arrival date (yyyy/mm/dd)
	50-61	i2,a1,i2,a1,f6.3	arrival time (hh:mm:ss.sss)
	63-67	f5.1	time residual (seconds)
	69-73	f5.1	observed backazimuth (degrees)
	75-79	f5.1	azimuth residual (degrees)
	81-85	f5.1	observed slowness (seconds/degree)
	87-91	f5.1	slowness residual (seconds/degree)
	93	a1	time defining flag (T or _)
	94	a1	azimuth defining flag (A or _)
	95	a1	slowness defining flag (S or _)
	97-101	f5.1	signal-to-noise ratio
	103-111	f9.1	amplitude (nanometers)
	113-117	f5.2	period (seconds)
	119	a1	type of pick (a = automatic, m = manual)
	120	a1	direction of short period motion (c = compression, d = dilatation, _ = null)
	121	a1	onset quality (i = impulsive, e = emergent, q = questionable, _ = null)
	123-127	a5	magnitude type (mb, Ms, ML, mbmle, msmle)
	128	a1	min max indicator (<, >, or blank)
	129-132	f4.1	magnitude value

TABLE 37: ASSOCIATED ARRIVAL FORMAT (CONTINUED)

Record	Position	Format	Description
2- <i>n</i> (data)	134-141	a8	origin identification
	143-151	a9	author of the arrival
	153-160	a8	arrival identification

Unassociated Arrivals

The unassociated subtype is used for arrivals that have been detected and reviewed, but have not been not associated with a seismic origin. Table 33 gives the format of the unassociated subtype line is the same as the format for the automatic subtype. An example is provided in [“Arrival:unassociated” on page A14](#).

Bulletin

Bulletins are composed of origin and arrival information. The information is provided in a series of data blocks as shown in Table 38: bulletin title block (Table 39), event title block (Table 40), origin block (Table 41), phase block (Table 42), phase correction block (under development), event screening block (Table 43), and event characterization arrival block (Table 44). The verbosity of a bulletin can be controlled by specifying the subformat, which can be `short` or `long`. The default is `short`.

The BULL_TYPE environment and the subformat control the blocks of information that appear in a bulletin. Table 38 lists the blocks that are included for each BULL_TYPE and subformat.

A BULLETIN data message contains one bulletin title block and one set of the other block types for each event. The blocks in a BULLETIN data message appear in the order given in Table 38. Examples of the `short` and `long` subformats for bulletins are provided in [“Bulletin \(IMS1.0:short Format\)” on page A16](#) and [“Bulletin \(IMS1.0:long Format\)” on page A16](#).

TABLE 38: BLOCKS USED IN BULLETIN FORMATS

Block Name	SEL1, SEL2, SEL3, REB subformats		SEB, SSEB, NEB, NSEB subformats	
	short	long	short	long
bulletin title block	r	r	r	r
event title block	r	r	r	r
origin block	r	r	r	r
phase block	r	r	r	r
phase correction block		r		r
event screening block			r	r
event characterization arrival block				r

TABLE 39: BULLETIN TITLE BLOCK FORMAT

Record	Position	Format	Description
1	1-136	a136	bulletin title

TABLE 40: EVENT TITLE BLOCK FORMAT

Record	Position	Format	Description
1	1-5	a5	Event
	7-14	a8	event identification number
	16-80	a65	geographic region

TABLE 41: ORIGIN BLOCK FORMAT

Record	Position	Format	Description
Origin Sub-block			
1 (header)	4-7	a4	Date
	15-18	a4	Time
	27-29	a3	Err
	33-35	a3	RMS
	37-44	a8	Latitude
	46-54	a9	Longitude
	57-60	a4	Smaj
	63-66	a4	Smin
	69-70	a2	Az
	72-76	a5	Depth
	80-82	a3	Err
	84-87	a4	Ndef
	89-92	a4	Nst
	94-96	a3	Gap
	99-103	a5	mdist
	106-110	a5	Mdist
	112-115	a4	Qual
	119-124	a6	Author
	131-136	a6	OrigID
2- <i>n</i> (data)	1-10	i4,a1,i2,a1,i2	epicenter date (yyyy/mm/dd)
	12-22	i2,a1,i2,a1,f5.2	epicenter time (hh:mm:ss.ss)
	23	a1	fixed flag (f = fixed origin time solution, blank if not a fixed origin time)

TABLE 41: ORIGIN BLOCK FORMAT (CONTINUED)

Record	Position	Format	Description
2-n (data)	25-29	f5.2	origin time error (seconds; blank if fixed origin time)
	31-35	f5.2	root mean square of time residuals (seconds)
	37-44	f8.4	latitude (negative for South)
	46-54	f9.4	longitude (negative for West)
	55	a1	fixed flag (f = fixed epicenter solution, blank if not a fixed epicenter solution)
	57-60	f4.1	semi-major axis of 90% ellipse or its estimate (km, blank if fixed epicenter)
	62-66	f5.1	semi-minor axis of 90% ellipse or its estimate (km, blank if fixed epicenter)
	68-70	i3	strike ($0 \leq x \leq 360$) of error ellipse clock- wise from North (degrees)
	72-76	f5.1	depth (km)
	77	a1	fixed flag (f = fixed depth station, d = depth phases, blank if not a fixed depth)
	79-82	f4.1	depth error 90% (km; blank if fixed depth)
	84-87	i4	number of defining phases
	89-92	i4	number of defining stations
	94-96	i3	gap in azimuth coverage (degrees)
	98-103	f6.2	distance to closest station (degrees)
	105-110	f6.2	distance to furthest station (degrees)
	112	a1	analysis type: (a = automatic, m = manual, g = guess)
	114	a1	location method: (i = inversion, p = pattern recognition, g = ground truth, o = other)

TABLE 41: ORIGIN BLOCK FORMAT (CONTINUED)

Record	Position	Format	Description
2- <i>n</i> (data)	116-117	a2	event type: uk = unknown ke = known earthquake se = suspected earthquake kr = known rockburst sr = suspected rockburst ki = known induced event si = suspected induced event km = known mine expl. sm = suspected mine expl. kx = known experimental expl. sx = suspected experimental expl. kn = known nuclear expl. sn = suspected nuclear explosion ls = landslide
	119-127	a9	author of the origin
	129-136	a8	origin identification
Magnitude Sub-block			
1 (header)	1-9	a9	Magnitude
	12-14	a3	Err
	16-19	a4	Nsta
	21-26	a6	Author
	33-38	a6	OrigID
2- <i>n</i> (data)	1-5	a5	magnitude type (mb, Ms, ML, mbmle, msmle)
	6	a1	<i>min max</i> indicator (<, >, or blank)
	7-10	f4.1	magnitude value
	12-14	f3.1	standard magnitude error
	16-19	i4	number of stations used to calculate magnitude

TABLE 41: ORIGIN BLOCK FORMAT (CONTINUED)

Record	Position	Format	Description
2- <i>n</i> (data)	21-29	a9	author of the origin
	31-38	a8	origin identification
Comment Sub-block			
1	2	a1	(
	3-M	a(M-2)	comment
	M+1	a1)

TABLE 42: PHASE BLOCK FORMAT

Record	Position	Format	Description
1 (header)	1-3	a3	Sta
	9-12	a4	Dist
	15-18	a4	EvAz
	20-24	a5	Phase
	33-36	a4	Time
	43-46	a4	TRes
	49-52	a4	Azim
	54-58	a5	AzRes
	62-65	a4	Slow
	69-72	a4	SRes
	74-76	a3	Def
	80-82	a3	SNR
	90-92	a3	Amp
	96-98	a3	Per
	100-103	a4	Qual

TABLE 42: PHASE BLOCK FORMAT (CONTINUED)

Record	Position	Format	Description
1 (header)	105-113	a9	Magnitude
	118-122	a5	ArrID
2- <i>n</i> (data)	1-5	a5	station code
	7-12	f6.2	station-to-event distance (degrees)
	14-18	f5.1	event-to-station azimuth (degrees)
	20-27	a8	phase code
	29-40	i2,a1,i2,a1,f6.3	arrival time (<i>hh:mm:ss.sss</i>)
	42-46	f5.1	time residual (seconds)
	48-52	f5.1	observed azimuth (degrees)
	54-58	f5.1	azimuth residual (degrees)
	60-65	f5.1	observed slowness (seconds/degree)
	67-72	f5.1	slowness residual (seconds/degree)
	74	a1	time defining flag (T or _)
	75	a1	azimuth defining flag (A or _)
	76	a1	slowness defining flag (S or _)
	78-82	f5.1	signal-to-noise ratio
	84-92	f9.1	amplitude (nanometers)
	94-98	f5.2	period (seconds)
	100	a1	type of pick (a = automatic, m = manual)
	101	a1	direction of short period motion (c = compression, d = dilatation, _ = null)
	102	a1	onset quality (i = impulsive, e = emergent, q = questionable, _ = null)
	104-108	a5	magnitude type (mb, Ms, ML, mbmle, msmle)

TABLE 42: PHASE BLOCK FORMAT (CONTINUED)

Record	Position	Format	Description
2- <i>n</i> (data)	109	a1	min max indicator (<, >, or blank)
	110-113	f4.1	magnitude value
	115-122	a8	arrival identification

TABLE 43: EVENT SCREENING BLOCK FORMAT

Record	Position	Format	Description
1 (title)	1-15	a15	EVENT SCREENING
2 (header)	2-9	a8	OriginID
	11-17	a7	Smaj_sc
	19-25	a7	Smin_sc
	28-32	a5	Depth
	35-38	a4	Sdep
	41-44	a4	mbms
	47-51	a5	Smbms
	53-61	a6	Foffshore
	63-68	a6	Dscore
	70-75	a6	Mscore
	78-82	a5	Score
	84-91	a8	Category
3 (data)	1-9	i9	Origin Identifier
	11-17	f7.1	semi-major axis of location confidence ellipse
	19-25	f7.1	semi-minor axis of location confidence ellipse
	28-32	f5.1	depth estimate (km)

S/H/I Data ▼
Messages

TABLE 43: EVENT SCREENING BLOCK FORMAT (CONTINUED)

Record	Position	Format	Description
3 (data)	34-38	f5.1	depth confidence interval (km)
	40-44	f5.2	$m_b - M_s$
	47-51	f5.2	$m_b - M_s$ confidence interval
	58-61	f4.2	fraction of location ellipse offshore
	63-68	f6.2	depth score
	70-75	f6.2	$m_b \cdot M_s$ score
	77-82	f6.2	total combined screening score
	84-103	a11,a1,a8	Category: NotConsider InsufftData NotScreened ScreenedOut / Offshore Onshore Mixed

TABLE 44: EVENT CHARACTERIZATION ARRIVAL
BLOCK FORMAT

Record	Position	Format	Description
Cepstral Peak Analysis Sub-block			
1 (title)	1-22	a22	cepstral peak analysis
2 (header)	1-3	a3	Sta
	8-14	a7	PeakAmp
	16-23	a8	PeakQuef
3- <i>n</i> (data)	1-5	a5	station code
	8-14	f7.5	peak amplitude
	16-23	f8.4	peak quefreny

**TABLE 44: EVENT CHARACTERIZATION ARRIVAL
BLOCK FORMAT (CONTINUED)**

Record	Position	Format	Description
Energy Ratio Sub-block			
1 (title)	1-37	a37	short-period/long-period energy ratio
2 (header)	1-3	a3	Sta
	13-17	a5	Ratio
3- <i>n</i> (data)	1-5	a5	station code
	8-17	f10.8	short-period/long-period energy ratio
Frequency Dependent Phase Amplitude Sub-block			
1 (title)	1-47	a47	origin-based frequency-dependent phase amplitude
2 (header)	1-3	a3	Sta
	7-11	a5	Phase
	19-24	a6	Amp2-4
	27-32	a6	SNR2-4
	37-42	a6	Amp4-6
	45-50	a6	SNR4-6
	55-60	a6	Amp6-8
	63-68	a6	SNR6-8
	72-78	a7	Amp8-10
3- <i>n</i> (data)	1-5	a5	station code
	7-14	a8	associated phase
	16-24	f9.1	amplitude in 2-4 Hz band
	28-32	f5.1	snr in 2-4 Hz band
	34-42	f9.1	amplitude in 4-6 Hz band
	46-50	f5.1	snr in 4-6 Hz band
	52-60	f9.1	amplitude in 6-8 Hz band

**TABLE 44: EVENT CHARACTERIZATION ARRIVAL
BLOCK FORMAT (CONTINUED)**

Record	Position	Format	Description
3- <i>n</i> (data)	64-68	f5.1	snr in 6-8 Hz band
	70-78	f9.1	amplitude in 8-10 Hz band
	82-86	f5.1	snr in 8-10 Hz band
Spectral Variance Sub-block			
1 (title)	1-47	a47	spectral variance of the detrended log spectrum
2 (header)	1-3	a3	Sta
	7-11	a5	Phase
	13-19	a7	MinFreq
	21-27	a7	MaxFreq
	35-41	a7	SpecVar
3- <i>n</i> (data)	1-5	a5	station code
	7-14	a8	associated phase
	16-22	f7.2	minimum frequency
	24-30	f7.2	maximum frequency
	32-43	f12.6	spectral variance of detrended log spectrum
Complexity Sub-block			
1 (title)	1-10	a10	Complexity
2 (header)	1-3	a3	Sta
	7-11	a5	Phase
	17-26	a10	Complexity
	30-32	a3	SNR

**TABLE 44: EVENT CHARACTERIZATION ARRIVAL
BLOCK FORMAT (CONTINUED)**

Record	Position	Format	Description
3- <i>n</i> (data)	1-5	a5	station code
	7-14	a8	associated phase
	16-26	f11.4	complexity
	28-32	f5.1	snr of complexity

Comment

The first line of the COMMENT data type provides a mechanism for associating the comment to a station, arrival, origin, event, and so on. If no association is needed, then this line may be left blank. The comment is written in free format and can be up to 1,024 characters. Table 45 gives the format for the COMMENT data message, and an example is provided in ["Comment" on page A20](#).

TABLE 45: COMMENT FORMAT

Record	Position	Format	Description
1	1-10	a10	identification type (Station, Arrival, Origin, Event)
	12-19	a8	identification string of the identification type
2	1-1024	a1024	free-format comment

Event

Any S/H/I event can have several estimates of the location, origin time, and size (origins). The format for events places these different origins into separate origin blocks. The bulletin title block at the beginning of the data section must include the name of the bulletin used as the basis for associating the separate origin estimates. The events data messages include:

- one bulletin title block (see Table 39)
- n origin blocks (see Table 41)

An example of the EVENT data message is provided in ["Event" on page A22](#).

Origin

The ORIGIN data type consists of a number of origin blocks (Table 41). Multiple magnitudes may be given for the same origin. An example of the ORIGIN data message is provided in ["Origin" on page A26](#).

STATUS INFORMATION

Several data types provide status information. Status information is available for authentication, stations, channels, communications, and data availability.

Auth_status

Some data channels contain authentication signatures that are verified at the IDC. The AUTH_STATUS data type provides statistics on the authentication process over the time of the report. The first block (Table 46) of the report gives the number of packets tested (Table 47), the number that passed, and the number that failed by station. The second block contains a list of the failures grouped as intervals for each data channel that failed to verify the authentication signature. An example of the AUTH_STATUS data message is provided in ["Auth_status" on page A14](#).

TABLE 46: REPORT PERIOD BLOCK FORMAT

Record	Position	Format	Description
1	1-18	a18	Report period
	20-29	i4,a1,i2,a1,i2	date (yyyy/mm/dd)
	31-40	i2,a1,i2,a1,f4.1	time (hh:mm:ss.s)
	42-43	a2	to

TABLE 46: REPORT PERIOD BLOCK FORMAT (CONTINUED)

Record	Position	Format	Description
1	45-54	i4,a1,i2,a1,i2	date (yyyy/mm/dd)
	56-65	i2,a1,i2,a1,f4.1	time (hh:mm:ss.s)
2 (header)	1-3	a3	Net
	11-13	a3	Sta
	16-19	a4	Chan
	21-23	a3	Aux
	27-40	a14	Packets_Test
	43-56	a14	Packets_Failed
3- <i>n</i> (data)	1-9	a9	network code
	11-15	a5	station code
	17-19	a3	FSDN channel code
	21-24	a4	auxiliary identification code
	22-40	i8	number of packets tested
	49-56	i8	number of packets failing verification

TABLE 47: AUTHENTICATION LIST BLOCK FORMAT

Record	Position	Format	Description
1 (title)	1-23	a23	Failed Packet Intervals
2 (header)	1-3	a3	Net
	11-13	a3	Sta
	16-19	a4	Chan
	21-23	a3	Aux
	31-40	a10	Start_Time

TABLE 47: AUTHENTICATION LIST BLOCK FORMAT (CONTINUED)

Record	Position	Format	Description
2 (header)	55-61	a8	End_Time
	71-77	a7	Comment
3- <i>n</i> (data)	1-9	a9	network code
	11-15	a5	station code
	17-19	a3	channel code
	21-24	a4	auxiliary identification code
	26-35	i4,a1,i2,a1,i2	start date of failure interval (yyyy/mm/dd)
	37-46	i2,a1,i2,a1,f4.1	start time of failure interval (hh:mm:ss.s)
	49-58	i4,a1,i2,a1,i2	end date of failure interval (yyyy/mm/dd)
	60-69	i2,a1,i2,a1,f4.1	end time of failure interval (hh:mm:ss.s)
	71-132	a62	comment

Chan_status

The CHAN_STATUS data type gives specific information on the data that have been received at the IDC by station and channel. Detailed statistics on data gaps and timeliness are included. The first block of the report provides the following information (see Table 48):

- reporting period over which the statistics are calculated;
- data availability statistics with the station, channel, and auxiliary codes that identify the reporting data stream;
- amount of data expected for the data stream;
- availability of the data at the IDC as a percentage of the data that were expected over the report period; and
- total number of gaps followed by the median, mean, standard deviation, and minimum and maximum gap size.

The second block of the report provides the following information (see Table 49):

- data timeliness statistics with the station, channel, and auxiliary codes that identify the reporting data stream;
- amount of data expected for the data stream; and
- median, mean, standard deviation, and minimum and maximum delay times for data arriving at the IDC.

For readability, the information is grouped by station with a blank line between stations in each of the sections. An example of the CHAN_STATUS data message is provided in ["Chan_status" on page A19](#).

TABLE 48: CHANNEL STATISTICS BLOCK FORMAT

Record	Position	Format	Description
1	1-18	a18	Report period from
	20-29	i4,a1,i2,a1,i2	date (yyyy/mm/dd)
	31-40	i2,a1,i2,a1,f4.1	time (hh:mm:ss.s)
	42-43	a2	to
	45-54	i4,a1,i2,a1,i2	date (yyyy/mm/dd)
	56-65	i2,a1,i2,a1,f4.1	time (hh:mm:ss.s)
2 (title)	1-28	a28	Data Availability Statistics
3 (header)	1-3	a3	Net
	11-13	a3	Sta
	17-20	a4	Chan
	22-24	a3	Aux
	29-40	a12	Max_Exp_Time
	46-52	a6	%_Avail
	55-58	a4	Gaps
	63-68	a6	Median

TABLE 48: CHANNEL STATISTICS BLOCK FORMAT (CONTINUED)

Record	Position	Format	Description
3 (header)	75-77	a3	Min
	86-88	a3	Max
4- <i>n</i> (data)	1-9	a9	network code
	11-15	a5	station code
	18-20	a3	FDSN channel code
	22-25	a4	auxiliary identification code
	29-40	i3,a1,i2,a1,i2, a1,f4.1	maximum data time possible (<i>ddd hh:mm:ss.s</i>)
	46-52	f7.3	percent of data available at the IDC
	54-58	i5	number of data gaps
	61-69	13,a1,i2,a1,i2	median length of data gaps (<i>hhh:mm:ss</i>)
	72-80	13,a1,i2,a1,i2	minimum length of data gaps (<i>hhh:mm:ss</i>)
	83-91	13,a1,i2,a1,i2	maximum length of data gaps (<i>hhh:mm:ss</i>)

TABLE 49: DATA TIMELINESS BLOCK FORMAT

Record	Position	Format	Description
1 (title)	1-26	a26	Data Timeliness Statistics
2 (header)	1-3	a3	Net
	11-13	a3	Sta
	17-20	a4	Chan
	22-24	a3	Aux
	28-39	a12	Max_Exp_Time
	42-50	a9	Delay_Med
	56-59	a4	Mean

TABLE 49: DATA TIMELINESS BLOCK FORMAT (CONTINUED)

Record	Position	Format	Description
2 (header)	65-71	a7	Std_Dev
	78-80	a3	Min
	89-91	a3	Max
3- <i>n</i> (data)	1-9	a9	network code
	11-15	a5	station code
	18-20	a3	channel code
	22-25	a4	auxiliary code
	28-39	i3,a1,i2,a1,i2, a1,f4.1	maximum data time possible (<i>ddd hh:mm:ss.s</i>)
	42-50	i3,a1,i2,a1,i2	median delay time (<i>hhh:mm:ss</i>)
	53-61	i3,a1,i2,a1,i2	mean delay time (<i>hhh:mm:ss</i>)
	64-72	i3,a1,i2,a1,i2	standard deviation of delay time (<i>hhh:mm:ss</i>)
	75-83	i3,a1,i2,a1,i2	minimum delay time (<i>hhh:mm:ss</i>)
	86-94	i3,a1,i2,a1,i2	maximum delay time (<i>hhh:mm:ss</i>)

Comm_status

Communications status is given over the time interval specified in the TIME or FREQ environments for *AutoDRM* or subscription requests, respectively. The report is comprised of a communications statistics block giving the report period and a summary section in which each link is described with statistics of link performance for the reporting period (see Table 50). The next block is a list of the link outages for each link (see Table 51). The link outages block is included only in the long subformat. An example of the COMM_STATUS data message is provided in ["Comm_status" on page A20](#).

S/H/I Data ▼
Messages

TABLE 50: COMMUNICATIONS STATISTICS BLOCK FORMAT

Record	Position	Format	Description
1	1-18	a18	Report period from
	20-29	i4,a1,i2,a1,i2	start date (yyyy/mm/dd)
	31-40	i2,a1,i2,a1,f4.1	start time (hh:mm:ss.s)
	42-43	a2	to
	45-54	i4,a1,i2,a1,i2	end date (yyyy/mm/dd)
	56-65	i2,a1,i2,a1,f4.1	end time (hh:mm:ss.s)
2 (header)	1-4	a4	Link
	22-29	a8	Nom_kbps
	32-35	a4	Mode
	38-41	a4	%_up
	44-47	a4	From
	54-57	a4	Util
	60-63	a4	From
	70-73	a4	Util
3-n (data)	1-9	a9	link code (farthest from IDC)
	11	a1	–
	13-21	a9	link code (closest to IDC)
	24-29	f6.1	nominal speed of link in kbps
	32-35	a4	full for full-duplex or half for half-duplex
	37-41	f5.1	percent uptime
	44-52	a9	link code (farthest from IDC)
	54-57	f4.2	use of link (dat_rate/speed)
	60-68	a9	link code (closest to IDC)
	70-73	f4.2	use of link (dat_rate/speed)

TABLE 51: COMMUNICATIONS OUTAGE BLOCK FORMAT

Record	Position	Format	Description
1 (title)	1-9	a8	link code (farthest from IDC)
	11	a1	–
	13-21	a9	link code (closest to IDC)
	23-34	a12	link outages
2 (header)	10-13	a4	From
	30-36	a7	Through
	50-57	a8	Duration
3- <i>n</i> (data)	1-10	i4,a1,i2,a1,i2	date of beginning of outage (yyyy/mm/dd)
	12-21	i2,a1,i2,a1,f4.1	time of beginning of outage (hh:mm:ss.s)
	24-33	i4,a1,i2,a1,i2	date of end of outage (yyyy/mm/dd)
	35-44	i2,a1,i2,a1,f4.1	time of end of outage (hh:mm:ss.s)
	47-60	i3,a1,i2,a1,i2, a1,f4.1	duration of outage (ddd hh:mm:ss.s)

Outage

The OUTAGE data type provides information on the dates and times of data gaps. Table 52 gives the format for the OUTAGE data message, and an example is provided in [“Outage” on page A26](#).

TABLE 52: OUTAGE FORMAT

Record	Position	Format	Description
1	1-18	a18	Report period from
	20-29	i4,a1,i2,a1,i2	date (yyyy/mm/dd)
	31-42	i2,a1,i2,a1,f6.3	time (hh:mm:ss.sss)
	44-45	a2	to

TABLE 52: OUTAGE FORMAT (CONTINUED)

Record	Position	Format	Description
1	47-56	i4,a1,i2,a1,i2	date (yyyy/mm/dd)
	58-67	i2,a1,i2,a1,f6.3	time (hh:mm:ss.sss)
2 (header)	1-3	a3	Net
	11-13	a3	Sta
	16-19	a4	Chan
	21-23	a3	Aux
	30-44	a15	Start Date Time
	55-67	a13	End Date Time
	76-83	a8	Duration
	85-91	a7	Comment
3- <i>n</i> (data)	1-9	a9	network code
	11-15	a5	station code
	17-19	a3	FDSN channel code
	21-24	a4	auxiliary identification code
	26-35	i4,a1,i2,a1,i2	date of last sample before outage interval or start date of report period ¹
	37-48	i2,a1,i2,a1,f6.3	time of last sample before outage interval
	50-59	i4,a1,i2,a1,i2	date of first sample after outage interval ²
	61-72	i2,a1,i2,a1,f6.3	time of first sample after outage interval or end time of the report period
	74-83	f10.3	duration of interval (seconds)
	85-132	a48	comment

1. Time of last available sample preceding the outage or the start time of the report period.

2. Time of first available sample after the outage or the end time of the report period.

Sta_status

Station status is given over the time interval specified in the TIME or FREQ environments for *AutoDRM* or subscription requests, respectively. The report is comprised of statistics that can be used to evaluate the overall performance of one or more stations. The first record of the report gives the report period. The status records give the station code and the nominal number of channels for the station. This record is followed by the station capability entries in which station problems are grouped into four categories depending on the impact each failure has on the capability of that station. Station capability is assessed relative to the maximum performance of that particular station based on instrument configuration and site characteristics.

In the context of assessing station status, the station consists of the sensors, digitizers, communications within the site, and data loggers. Station status is assessed at the IDC based on data that are available there, and may therefore include the effects of problems with communications, problems at a NDC, or Data Relay Center. Moreover, because data may arrive late at the IDC, the station status assessment is a snapshot of station capability at a single time.

Station capability is categorized as follows:

- Fully capable
The system is operating and contributing data to the mission at the level for which it was designed.
- Partially capable
The system is impaired and contributing significant data to the mission but of degraded quality, reduced quantity, or reduced operational capability.
- Low capability
The system is severely impaired and is contributing data that do not meet minimum requirements for the designed mission but are still useful for the global monitoring network.

S/H/I Data ▼
Messages

■ Not capable

The system is completely inoperative, or the data being contributed are not useful for the global monitoring network in any way.

For arrays, capability is estimated based on the theoretical array gain for the available channels relative to maximum array gain with all channels operational. The array gain is estimated from the square root of the number of channels; the geometry of the active channels and the relative values of individual array elements are neglected.

Station mission capability may be estimated based on data available at the IDC. Problems not affiliated with stations, such as outages of long-haul or tail communication circuits and problems with forwarding the data from NDCs will be folded into the capability estimates. Problems affecting the quality or timing of seismic waveforms will not be included in the automated station capability estimate, at least in the first instance, and thus capability may be overestimated (see Table 53).

TABLE 53: STATION CAPABILITY CRITERIA

Station Type	Fully Capable	Partial Capability	Low Capability	Non-Capable
SP or HF array	array gain \geq 90% max	70% \leq array gain < 90% max	array gain < 70% max, at least one channel operational	no channels operational
3-C BB station	all channels operational	one vertical and one horizontal operational	one channel operational	no channel operational

TABLE 53: STATION CAPABILITY CRITERIA (CONTINUED)

Station Type	Fully Capable	Partial Capability	Low Capability	Non-Capable
Examples:	(operational channels)			
25-element array	21-25	13-20	1-12	0
19-element array	16-19	10-15	1-9	0
16-element array	13-16	8-12	1-7	0
9-element array	8-9	5-7	1-4	0
7-element array	6-7	4-5	1-3	0

The maximum data time, which is the cumulative amount of time for which data are expected for this station, follows the station capability entries. For primary stations, this time will be the entire report period; for auxiliary stations, this time will be the sum of the requested data segment time intervals. Availability indicates the percent of data that are available at the IDC relative to that expected. If an array with 10 channels sends 9 channels of data to the IDC for the entire period, then the data availability would be 90.0 percent (even though the data capability may be fully capable 100 percent of the time). The median delay measures the time delay between ground motion and receipt of data at the IDC for primary stations and the delay between request and receipt for auxiliary stations. Finally, the number of successful retrievals of data from the auxiliary stations and the number of retrieval attempts are given. Table 54 gives the station status format and an example is provided in ["Sta status" on page A32](#).

S/H/I Data ▼
Messages

TABLE 54: STA_STATUS FORMAT

Record	Position	Format	Description
1	1-18	a18	Report period from
	20-29	i4,a1,i2,a1,i2	start date (yyyy/mm/dd)
	31-40	i2,a1,i2,a1,f4.1	start time (hh:mm:ss.s)
	42-43	a2	to
	45-54	i4,a1,i2,a1,i2	end date (yyyy/mm/dd)
	56-65	i2,a1,i2,a1,f4.1	end time (hh:mm:ss.s)
2 (title)	28-45	a18	Station Capability
3 (header)	1-3	a3	Net
	11-13	a3	Sta
	17-18	a2	Ch
	21-24	a4	Full
	31-34	a4	Part
	40-42	a3	Low
	48-50	a3	Non
	52-63	a12	Max_Exp_Time
	67-71	a5	Avail
	75-83	a9	Med_Delay
	87-89	a3	Att
	93-95	a3	Suc
	99-101	a3	Pnd
4- <i>n</i> (data)	1-9	a9	network code
	11-15	a5	station code
	17-18	i2	nominal number of channels
	20-26	f7.3	full station capability (% of report period)

TABLE 54: STA_STATUS FORMAT (CONTINUED)

Record	Position	Format	Description
4-n (data)	28-34	f7.3	partial station capability (% of report period)
	36-42	f7.3	low station capability (% of report period)
	44-50	f7.3	noncapable station (% of report period)
	52-63	i3,a1,i2,a1,i2, a1,i2	maximum data time possible (<i>ddd hh:mm:ss</i>)
	65-71	f7.3	percent of data available at the IDC
	73-83	i3,a1,i2,a1,f4.1	median delay of data from station to IDC (<i>ddd hh:mm:ss.s</i>)
	85-87	i3	number of IDC attempts to retrieve data
	89-91	i3	number of successful attempts to retrieve data from auxiliary station
	93-95	i3	number of IDC pending data retrievals

LOGS

LOG data types are used primarily as administrative messages.

Error_log

The ERROR_LOG data type is reserved for responses to request messages that contain errors. Specific formats have not been defined at this time, although the request message can be given with the line or lines causing the error identified. The information is provided in free-format comment lines in which the first character is blank. An example of an ERROR_LOG is provided in [“Error_log” on page A21](#).

FTP_log

In response to a large data request, data are provided via FTP, and the user receives an email message containing information about the location of the file to be retrieved by the requestor using FTP. The FTP_LOG data type is used to convey this information in a consistent manner so that automated data retrieval programs can easily obtain the data.

Common conventions (for example, .Z and .gz) exist for expressing that a file is compressed. All files should be compressed.

The FTP_LOG data type consists of a free-format FTP_FILE line followed by comment lines, which have a blank as the first character. This data type must contain the information necessary for retrieving the message file.

Syntax

ftp_file net_address login_mode directory file

net_address address of machine where data reside (although names are preferred, the IP number may be used)

login_mode user | guest; if user, then the requestor should log in as a user to FTP the data (an account is required); if guest, the requestor should log in as anonymous to FTP the data (an account is not required)

directory directory in which the message file will reside (case sensitive)

file name of the file that contains the message (case sensitive)

An example of the FTP_LOG data message is provided in ["Ftp_log" on page A24](#).

Log

The LOG data type includes free-format comment lines in which the first character of the line is blank. The exact content of the logs is unspecified. An example of the LOG data message is provided in ["Log" on page A24](#).

Radionuclide Data Messages

This chapter describes the radionuclide data message formats and includes the following topics:

- [Introduction](#)
- [Pulse Height Data](#)
- [Flow Rate Data](#)
- [Meteorological Data](#)
- [Alerts](#)
- [Reports](#)
- [Laboratory Analysis Results](#)
- [Fission Product Event Bulletin](#)

Radionuclide Data Messages

INTRODUCTION

Data messages provide a common format for data and data product exchange. Many different types of RMS data may be exchanged using the message formats described herein.

A data message consists of the basic message structure:

- BEGIN line
- MSG_TYPE line
- MSG_ID line
- message body
- STOP line

Within the message body, several data types may be present. The type of data included in a data section are designated with a DATA_TYPE line. Each data section is comprised of distinct data blocks that contain required and supplemental data.

The data types described in this chapter enable the transmittal and processing of data from High-Purity Germanium (HPGe) and Low-Energy Germanium (LEGe) detectors only. Additional data types will be added soon to enable the transmittal of data from counting systems employing electron-photon coincidence techniques.

Data_type

Data sections must begin with a DATA_TYPE line. The argument of the DATA_TYPE command designates the type of data that is included in the message section. The RMS data format version (RMS2.0 or RMS1.0) need not be specified

in the DATA_TYPE line. The processing code determines the data format based upon certain characteristics found within the data message. No designated line type is used to end a data section. The end of the section is implied by another DATA_TYPE line or a STOP line.

Syntax

`data_type data_type`
`data_type` the type of RMS data that follows

Possible data types for radionuclide data messages are as follows:

- ALERT_FLOW
- ALERT_SYS
- ALERT_TEMP
- ALERT_UPS
- ARMR
- ARR
- BLANKPHD
- CALIBPHD
- DETBKPHD
- FLOW
- FPEB
- MET
- QCPHD
- RSR
- SAMPLEPHD

Data types generated by the IDC include the Automatic Radionuclide Report (ARR), Atmospheric Radionuclide Measurement Report (ARMR), Radionuclide Summary Report (RSR), and Fission Product Event Bulletin (FPEB). All others are currently

sent to the IDC by RMS stations and regional laboratories. Descriptions and formats for each data type are included in this chapter. Examples of each are located in [“Appendix A: Data Message Examples” on page A1](#).

PULSE HEIGHT DATA

The following five photon pulse height data (PHD) types contain the results of counts performed on either an HPGe detector or a LEGe detector. PHD types for electron-photon coincidence systems will be added at a later date.

- SAMPLEPHD

This data message type contains PHD acquired by counting a gas or particulate sample with a detector system. See [“Samplephd” on page A30](#) for an example.

- BLANKPHD

This data message type contains PHD acquired by counting an unexposed filter paper on an HPGe detector. See [“Blankphd” on page A15](#) for an example. Count times for blanks are long (two to three days or more).

- DETBKPHD

This data message type contains PHD acquired by performing a background count with a detector system. See [“Detbkphd” on page A21](#) for an example. Background counts are performed with empty detector chambers, closed shields, and long count times (two to three days or more).

- CALIBPHD

This data message type contains PHD acquired by counting a known standard source with a detector system. See [“Calibphd” on page A18](#) for an example. Calibration sources are counted until at least 10,000 counts have been acquired under each photopeak used for the detector calibration.

■ QCPHD

This data message type contains PHD acquired from a brief count of a known standard source with a detector system. See [“Qcphd” on page A27](#) for an example.

Each PHD type is composed of a number of data blocks. The start of a data block is designated by a line containing the block name. All data block names begin with a pound (#) sign.

Depending on the PHD type, some data blocks are required, and some are optional. Table 55 lists the required and optional data blocks for each photon PHD type. Data sections that do not contain the required data blocks are considered incomplete.

TABLE 55: DATA BLOCKS FOR PULSE HEIGHT DATA

Data Block ¹	SAMPLEPHD	BLANKPHD	DETBKPHD	CALIBPHD	QCPHD
#Header	r	r	r	r	r
#Comment	o	o	o	o	o
#Collection	r				
#Sample	o	o	o	o	o
#Profile	o	o	o	o	o
#Acquisition	r	r	r	r	r
#Calibration	o	o	o	r	r
#Energy	r	r	r	r	r
#Resolution	r	r	r	r	r
#Efficiency	r	r	r	r	r
#Totaleff	o	o	o	o	o
#Spectrum	r	r	r	r	r
#Certificate				r	r

1. r = required, o = optional

**Radionuclide ▼
Data
Messages**

PHD blocks contain fixed format lines that comprise separate data block records (see [“Fixed Format Lines” on page 5](#)). Data blocks may require several records for completion. For example, at least three records must be present in an #Energy block to be valid. The data blocks in a data section are not required to be in order.

The formats of the data blocks listed in Table 55 are described in Tables 56–68. If a required data block is shown as having an undetermined number of possible records (denoted by, for example, 2-*n*), the minimum number of records is one unless specified otherwise.

In the future, the IDC will provide code for converting Canberra Nuclear Format (CNF) files into IMS/IDC-acceptable PHD messages. The converter program will use the latest acceptable message formats when creating PHD messages to be transmitted to the IDC/IMS.

TABLE 56: #HEADER BLOCK FORMAT

Record	Position	Format	Description
1	1-7	a7	#Header
2	1-5	a5	site code
	7-15	a9	detector code
	17	a1	system type: p for particulate, g for gas
	19-35	a17	sample geometry
	37-40	a4	spectrum qualifier: preliminary (PREL) or full (FULL)
	42-70	a29	sample reference identification
	72-103	a32	identification number of the first split
3	105-139	a35	identification number of the second split
	1-31	a31	measurement identification
4	33-63	a31	background measurement identification
	1-10	i4,a1,i2,a1,i2	transmit date (yyyy/mm/dd)
	12-21	i2,a1,i2,a1,f4.1	transmit time (hh:mm:ss.s)

TABLE 57: #COMMENT BLOCK FORMAT

Record	Position	Format	Description
1	1-8	a8	#Comment
2- <i>n</i>	1-80	a80	free text

TABLE 58: #COLLECTION BLOCK FORMAT

Record	Position	Format	Description
1	1-11	a11	#Collection
2	1-10	i4,a1,i2,a1,i2	collection start date (yyyy/mm/dd)
	12-21	i2,a1,i2,a1,f4.1	collection start time (hh:mm:ss.s)
	23-32	i4,a1,i2,a1,i2	collection stop date (yyyy/mm/dd)
	34-43	i2,a1,i2,a1,f4.1	collection stop time (hh:mm:ss.s)
	45-54	f10	total air volume sampled (scm)

TABLE 59: #SAMPLE BLOCK FORMAT

Record	Position	Format	Description
1	1-7	a7	#Sample
2	1-5	f5.2	sample mass (g)
	7-11	f5.2	sample density (g/cm ³)
	13-17	f5.2	sample height (mm)

**Radionuclide ▼
Data
Messages**
TABLE 60: #PROFILE BLOCK FORMAT

Record	Position	Format	Description
1	1-8	a8	#Profile
2- <i>n</i>	1-7	f7.2	average flow rate (scm per hour (scm/h))
	9-15	f7.2	average barometric pressure (hectopascal [hPa])
	17-23	f7.2	average outside temperature (°C)
	25-34	i4,a1,i2,a1,i2	data sampling end date (yyyy/mm/dd)
	36-45	i2,a1,i2,a1,f4.1	data sampling end time (hh:mm:ss.s)

TABLE 61: #ACQUISITION BLOCK FORMAT

Record	Position	Format	Description
1	1-12	a12	#Acquisition
2	1-10	i4,a1,i2,a1,i2	acquisition start date (yyyy/mm/dd)
	12-21	i2,a1,i2,a1,f4.1	acquisition start time (hh:mm:ss.s)
	23-36	f14	acquisition real time (seconds (s))
	38-51	f14	acquisition live time (s)

TABLE 62: #CALIBRATION BLOCK FORMAT

Record	Position	Format	Description
1	1-12	a12	#Calibration
2	1-10	i4,a1,i2,a1,i2	date of last detector calibration (yyyy/mm/dd)
	12-21	i2,a1,i2,a1,f4.1	time of last detector calibration (hh:mm:ss.s)

TABLE 63: #ENERGY BLOCK FORMAT¹

Record	Position	Format	Description
1	1-7	a7	#Energy
2- <i>n</i>	1-16	f16	photon energy (keV)
	18-33	f16	photopeak centroid channel
	35-50	f16	photopeak centroid uncertainty (channels)

1. An #Energy block must contain at least three records.

TABLE 64: #RESOLUTION BLOCK FORMAT¹

Record	Position	Format	Description
1	1-11	a11	#Resolution
2- <i>n</i>	1-16	f16	photon energy (keV)
	18-33	f16	photopeak FWHM (keV)
	35-50	f16	photopeak uncertainty (keV)

1. A #Resolution block must contain at least three records.

TABLE 65: #EFFICIENCY BLOCK FORMAT¹

Record	Position	Format	Description
1	1-11	a11	#Efficiency
2- <i>n</i>	1-16	f16	photon energy (keV)
	18-33	f16	photopeak efficiency (counts/photon)
	35-50	f16	photopeak efficiency uncertainty (counts/photon)

1. An #Efficiency block must contain at least three records.

TABLE 66: #TOTALEFF BLOCK FORMAT¹

Record	Position	Format	Description
1	1-9	a9	#Totaleff
2- <i>n</i>	1-16	f16	photon energy (keV)
	18-33	f16	total efficiency (counts/photon)
	35-50	f16	total efficiency uncertainty (counts/photon)

1. A #Totaleff block must contain at least three records.

TABLE 67: #SPECTRUM BLOCK FORMAT¹

Record	Position	Format	Description
1	1-9	a9	#Spectrum
2	1-5	i5	total number of channels
	7-10	i4	energy span (keV)
3- <i>n</i>	1-5	i5	channel
	7-16	i10	counts at channel + 0
	18-27	i10	counts at channel + 1
	29-38	i10	counts at channel + 2
	40-49	i10	counts at channel + 3
	51-60	i10	counts at channel + 4

1. Counts must be reported for at least 4096 channels in a #Spectrum block.

TABLE 68: #CERTIFICATE BLOCK FORMAT¹

Record	Position	Format	Description
1	1-12	a12	#Certificate
2	1-10	i10	quantity (grams)
	12-21	i4,a1,i2,a1,i2	assay date (yyyy/mm/dd)
	23-32	i2,a1,i2,a1,f4.1	assay time (hh:mm:ss.s)
3- <i>n</i>	1-8	a8	radionuclide name
	10-32	a23	half-life (hours [H], days [D], years [Y])
	34-41	f8.3	photon energy (keV)
	43-50	f8.3	of radionuclide activity at time of assay (Becquerel [Bq])
	52-58	f7.3	radionuclide activity uncertainty at time of assay (%)
	60-66	f7.3	photon intensity (%)

1. A #Certificate block must contain at least two records.

Some of the data fields in Tables 56–68 are described in in the following paragraphs.

Background Measurement Identification

The background measurement identification (BMID) specifies the measurement identification (MID) of the PHD message containing the results of the relevant background count. The background count is subtracted from the acquisition results reported in the PHD message.

Certificate

“Certificate” refers to the assay report associated with the standard source of known activity used in the acquisition of calibration, energy, resolution, efficiency, and total efficiency data. The #Certificate data block is required only in QCPHD or CALIBPHD data messages.

Energy Span

The spectrum energy range is rounded to the nearest hundred keV. For particulate samples, the energy span will usually be 2000, 3000, or 4000 keV. For noble gas samples, the energy range will generally be 1000 keV or less.

Energy/Resolution/Efficiency/ Totaleff

Calibration data transmitted in pulse height data messages should be acquired directly from a calibration-source spectrum, not derived with an interpolating function from a calibration-source spectrum. The calibration equations used in the IDC processing are reported in the ARR and ARMR.

Identification Number of First Split

A sample might be split for archival purposes or, if it is found to contain multiple relevant fission products, several independent analyses are required for confirmation of the sample contents. As a result, each sample part must be uniquely named. The identification number of the first split and second split facilitates this ability (see [“Identification Number of Second Split” on page 195](#)). This field is zero-filled for undivided samples.

The first 29 characters of the field are the SRID. The last three characters are a dash, followed by a unique two-digit identifier (from 01 up to the total number of sample splits).

Syntax

code-d-date-time-id1

<i>code</i>	radionuclide site code
<i>d</i>	data type (s for SAMPLEPHD, b for BLANKPHD, c for CALIBPHD, and q for QCPHD)
<i>date</i>	date of collection or acquisition start (yyyy/mm/dd)
<i>time</i>	time of collection or acquisition start (hh:mm:ss.s)
<i>id1</i>	unique two-digit identifier (i2)

Examples

Analysis of a particulate sample from station NZ003 has shown the presence of several fission products. The Technical Secretariat has asked the sample to be split into four equal parts with each part being sent to one of four certified laboratories for analysis. The following ID numbers are possible for the first split:

NZ003-S-1999/08/15-00:32:55.7-01
NZ003-S-1999/08/15-00:32:55.7-02
NZ003-S-1999/08/15-00:32:55.7-03
NZ003-S-1999/08/15-00:32:55.7-04

Identification Number of Second Split

A sample split might be further partitioned, for example, to quantify the reproducibility of the analysis of a sample split. The format for this field is similar to that of the ID number of the first split, however it includes an additional unique two-digit integer (from 1 up to the total number of secondary sample splits) at the end. This field is zero-filled for undivided samples and splits.

The first 32 characters of the field are the ID number of the first split. The last three characters are a dash, followed by a unique two-digit identifier (from 01 up to the total number of split parts).

Syntax*code-d-date-time-id1-id2*

<i>code</i>	radionuclide site code
<i>d</i>	data type (s for SAMPLEPHD, B for BLANKPHD, c for CALIBPHD, and Q for QCPHD)
<i>date</i>	date of collection or acquisition start (yyyy/mm/dd)
<i>time</i>	time of collection or acquisition start (hh:mm:ss.s)
<i>id1</i>	unique two-digit identifier assigned to the first split
<i>id2</i>	unique two-digit identifier assigned to the second split

Examples

Upon receipt of the third sample split from the previous example on page 195, a certified laboratory divides the sample split in two. This split quantifies the reproducibility of the analysis results. ID numbers of the second split for these parts are as follows:

NZ003-S-1999/08/15-00:32:55.7-03-01

NZ003-S-1999/08/15-00:32:55.7-03-02

Measurement Identification

The measurement identification (MID) uniquely identifies the results of each detector acquisition. The first nine characters are the detector code (see ["Radionuclide Detector Codes" on page 16](#)), the tenth character is a dash, and the remaining characters are the date and time of the acquisition start. This MID enables identification of each PHD set acquired with a detector system throughout the RMS.

Examples

The following example is a possible MID for a particulate sample acquisition performed using a detector located at station KW001. The sample acquisition start is February 6, 1999 at 8:00 p.m.

```
KW001KWA1-1999/02/06-20:00.0
```

The following example is a possible MID for a calibration count performed on a detector at the National Radiation Laboratory in New Zealand. The acquisition start is November 2, 1999 at 9:37:30.5 a.m.

```
NZC14-1999/11/02-09:37:30.5
```

The following example is a possible detector code for a quality control count performed on a detector at station SE001. The sample collection start is May 23, 1999 at 12:00 p.m.

```
SE001-PGD-1999/05/23-12:00:00.0
```

Sample Geometry

This field describes the sample geometry used during data acquisition and should not be confused with detector geometry. At present, no choices are preset for this field. Consequently, discretion is given to the data sender in adequately describing the sample geometry in 17 characters or less. No blank spaces or backslashes are allowed.

Examples

```
bigcoil  
1/4-filter  
5_mL_petri_dish  
compressed_filter  
detector_top  
filter_pellet  
In_holder
```

**Radionuclide ▼
Data
Messages**

normal/face-up
S7_rack-E

Sample Reference Identification¹

The Sample Reference Identification (SRID) is a unique alphanumeric string that identifies a unique physical entity for which pulse height information was collected. This unique identifier allows a physical entity to be matched with data that describes it. For detector background counts, this field is zero-filled.

The SRID is comprised of the radionuclide site code (see [“Radionuclide Site Codes” on page 8](#)) followed by the data type, a date, and time. For collected particulate and gas samples, the site code is that of the RMS station where the sample was collected, while the date and time are those of the sample collection start. For blank filters and calibration sources, the site code is that of the station or laboratory where the entity was counted, and the date and time are those of the detector acquisition start.

Syntax

code-d-date-time

<i>code</i>	radionuclide site code
<i>d</i>	data type (s for SAMPLEPHD, B for BLANKPHD, c for CALIBPHD, and q for QCPHD)
<i>date</i>	date of collection or acquisition start (yyyy/mm/dd)
<i>time</i>	time of collection or acquisition start (hh:mm:ss.s)

-
1. Currently, this field syntax is not enforced. If data are not entered into this field using the specified syntax, a zero must be entered as a place holder. Whether this field is zero-filled or not, the data are still parsed and stored in the RMS database.

Example

The following example is an SRID for a sample from station FI001. The collection start date and time is 6:50 a.m. 1 April, 1996.

FI001-S-1996/04/01-06:50:00.0

The following example is an SRID for a blank filter counted at station CA002. The acquisition start date and time is 6:50:30.4 p.m. 23 November, 1998.

CA002-B-1998/11/23-18:50:30.4

The following example is the SRID for a calibration source counted at the National Radiation Laboratory, in Christchurch, New Zealand. This SRID has an acquisition start date and time of exactly midnight on 7 January, 2000.

NZC14-C-2000/01/07-00:00:00.0

Spectral Qualifier

Valid values for the spectral qualifier field are preliminary (PREL) and full (FULL). The FULL count represents the daily spectrum of record. Preliminary counts are sent to the IDC at specified time intervals during the acquisition of the FULL count, and represent the acquisition results accumulated since the start time of the FULL count.

Total Efficiency

The “total efficiency” of a monoenergetic photon source is the ratio of the total counts detected to the number of photons emitted. This parameter can be useful for correcting peak areas from losses due to cascade summing.

FLOW RATE DATA

Data messages of DATA_TYPE FLOW contain data from the blower flow rate meter at an RMS station. The format for the FLOW section is given in Table 69 and an example is provided in [“Flow” on page A22](#). The minimum number of records required for this type of data message is one.

In the future, data from this section will be combined with the #Profile PHD block, as well as a record from DATA_TYPE MET (see [“Meteorological Data” on page 201](#)), to create a new DATA_TYPE (RMSSOH) for state of health data.

TABLE 69: FLOW DATA FORMAT

Record	Position	Format	Description
1	1-5	a5	station code
	7-12	i6	expected sampling interval (s)
	14-19	i6	expected sampling duration (s)
2- <i>n</i>	21-30	i4,a1,i2,a1.i2	date of sampling interval commencement (yyyy/mm/dd)
	31-40	i2,a1,i2,a1,f4.1	time of sampling interval commencement (hh:mm:ss.s)
	42-47	i6	actual sampling duration(s)
	49-58	f10.4	average flow rate (m ³ /h)
	60-69	f10.6	flow rate uncertainty (m ³ /h)

Some data fields from Table 69 are described in the following sections.

Actual Sampling Duration

This field describes the actual total time during which data was sampled and averaged and may be different than that of the expected sampling duration.

Expected Sampling Duration

This field describes the expected total time during which data was sampled and averaged. Data from several sampling durations may be included in a FLOW data message.

Expected Sampling Interval

This field describes the expected discrete time interval during which flow data are to be sampled. Data from several sampling intervals are averaged to give the average flow rate for a total time duration.

METEOROLOGICAL DATA

Data messages of DATA_TYPE MET contain meteorological data recorded at an RMS station. The format for the MET data type is given in Table 70, and an example is provided in ["Met" on page A25](#). The minimum number of records required for this type of data message is one.

TABLE 70: MET DATA FORMAT

Record	Position	Format	Description
1	1-5	a5	station code
2- <i>n</i>	1-10	i4,a1,i2,a1,i2	met start date (yyyy/mm/dd)
	12-21	i2,a1,i2,a1,f4.1	met start time (hh:mm:ss.s)
	23-32	i4,a1,i2,a1,i2	met end date (yyyy/mm/dd)
	34-43	i2,a1,i2,a1,f4.1	met end time (hh:mm:ss.s)
	45-47	i3	average inside temperature (°C)

TABLE 70: MET DATA FORMAT (CONTINUED)

Record	Position	Format	Description
2- <i>n</i>	49-51	i3	average outside temperature (°C)
	53-55	i3	average wind-direction (degrees from North)
	57-59	i3	average wind-speed (km/h)
	61-67	f7.2	average barometric pressure (hPa)
	69-71	i3	average relative humidity (% relative humidity)
	73-74	i2	rainfall (mm)

ALERTS

Once their own message type, ALERTS are now a type of data message. The possible alert data types are as follows:

- **ALERT_FLOW**
This type of data message indicates that the sampler flow rate is above or below the maximum or minimum IMS required flow rate.
- **ALERT_SYSTEM**
This type of data message indicates that the computer controlling the sampler/acquisition system is being rebooted or that the system is shutting down.
- **ALERT_TEMP**
This type of data message indicates that a system temperature is outside the IMS required temperature range for that parameter.
- **ALERT_UPS**
This type of data message indicates a problem with the Uninterruptable Power Supply (UPS).

More alert data types and formats will be added in the future.

The general format for the ALERT data types is given in Table 71, and an example of each type of ALERT message is provided in ["ALERT_FLOW" on page A2](#).

TABLE 71: GENERAL ALERT DATA FORMAT

Record	Position	Format	Description
1	1-5	a5	station code
2- <i>n</i>	1-80	a512	free text describing alert
<i>n</i> +1 ¹	29-38	i4,a1,i2,a1,i2	date (yyyy/mm/dd)
	40-49	i2,a1,i2,a1,f4.1	time (hh:mm:ss.s)

1. *n*+1 should be 3 or greater.

REPORTS

The following types of radionuclide reports are generated by the IDC and are made available to subscribers as data products:

- **ARR (Automated Radionuclide Report)**
The ARR reports results from the automated analysis of a particulate or gas sample.
- **ARMR (Atmospheric Radionuclide Measurement Report)**
The ARMR is a revised version of the ARR and is generated after the manual analysis of a particulate or gas sample is complete.
- **RSR (RMS Summary Report)**
The RSR gives a summary of all released samples within a designated collect-stop window.

The DATA_TYPES of these messages are specified as ARR, ARMR, and RSR.

ARR

The ARR is comprised of the following sections:

- Sample Information
This section includes information on the sample collection and data acquisition.
- Measurement Categorization
This section includes the overall category for a sample. If the category level is greater than one, an explanation of the category assignment is also included.
- Activity Summary
This section includes the concentrations and relative uncertainties of the radionuclides detected in the sample.
- Minimum Detectable Concentration (MDC) for Key Nuclides
This section lists the half-lives and MDCs of the radionuclides specified in [\[WGI95\]](#).
- Peak Search Results
This section includes information on the peaks identified during automated spectrum analysis.
- Peak Search Notes
This section includes notes written during the automated analysis process.
- Processing Parameters
This section includes the settings used by the *rms_analyze* software unit to identify peaks and quantify peak characteristics. (See [\[IDC7.1.7\]](#) for a description of the *rms_analyze* software unit.)
- Update Parameters
This section lists the settings used by the *rms_analyze* software unit to update the energy and resolution calibration curves.

- Data Quality Flags

This section lists values for state of health and data quality parameters, acceptable values for these parameters, and test results (PASS/FAIL).

- Event Screening Flags

This section lists the anthropogenic radionuclides detected, as well as the station-dependent frequency of detection for each nuclide.

- Calibration Equations

This section includes the energy, resolution, and efficiency calibration equations generated during automated analysis.

- Field of Regard

This section includes a hypertext link that can be accessed to display atmospheric modeling results for the surrounding region.

An example of an Automated Radionuclide Report is provided in [“ARR” on page A8](#). Some of the data fields are described below. More information on processing parameters, update parameters, data quality flags, event screening flags, and calibration equations can be found in [\[IDC5.2.2\]](#).

%Eff

This parameter is the detector efficiency relative to a standard 3X3-inch cylindrical NaI(Tl) crystal with a source-to-detector distance of 25 cm. The %Eff is given in percent.

%Uncer

This parameter is the 1σ uncertainty of the net area, reported in percentage of net area.

Allow Multiplets

This parameter can have one of two values: Off or On. When Allow Multiplets is On, the *rms_analyze* software unit allows multiplets to be used in update matching. When Allow Multiplets is Off, multiplets are not allowed.

Avg Flow Rate

This field contains the average blower flow rate in scm/h and is equivalent to the Sample Quantity divided by the Sampling Time.

Baseline Channels

This parameter gives the number of channels to the left and right of a Region-of-Interest (ROI) that are used in estimating the background contribution under a peak.

Baseline Type

This parameter describes the type of equation used for estimating the shape of the background under a peak. The Baseline Type can be either STEP, indicating a step-function, or LINEAR.

Centroid

Photopeak and ROI centroids are reported in units of channels.

Collection Station Comments

This field contains any comments made by station personnel.

Confidence Threshold

This parameter is a confidence factor used in the nuclide identification process. The lower the Confidence Threshold, the more likely a possible peak will be accepted.

Critical-level Test

This parameter can also have one of two values: off or on. When Critical Level Test is On, the *rms_analyze* software unit tests whether the gross peak area exceeds 1.64 times the background standard deviation. Peaks that exceed this limit have less than a 10% probability of originating from a fluctuation in background radiation.

Detector Type

This field describes the kind of detector used in the acquisition process. Possible detector types include:

- HPGe n
This detector type describes an n-type HPGe detector, that is, one with a germanium crystal doped with donor atoms at impurity concentration levels.
- HPGe p
This detector type describes a p-type HPGe detector, that is, one with a germanium crystal doped with acceptor atoms at impurity concentration levels.
- inHPGe
This detector type describes an intrinsic HPGe detector, that is, one with a germanium crystal of extremely high purity.
- HPGe
This detector type describes an HPGe detector of unknown carrier type.
- LGe
This detector type describes a low-energy germanium detector. This is an acceptable detector type for noble gas monitoring.

Detector types to describe those employing electron-photon coincidence techniques will be added soon.

Energy Tolerance

The *rms_analyze* software unit will associate a photopeak with a certain nuclide when the peak centroid falls within the Energy Tolerance of the photon energy listed in the nuclide library.

Estimate Peak Widths

This parameter can have one of two values: `Off` or `On`. When `Estimate Peak Widths` is `Off`, the *rms_analyze* software unit calculates peak widths with a peak fitting equation. Otherwise, the *rms_analyze* software unit uses resolution calibration data to determine peak widths.

Fit Singles

This parameter can have one of two values: `Off` or `On`. When `Fit Singles` is `On`, the *rms_analyze* software unit determines ROI areas using a Gaussian fitting function. When `Fit Singles` is `Off`, the *rms_analyze* software unit determines ROI areas using a simple summation. ROI areas for multiplets are always determined using a Gaussian fit.

Force Linear

This parameter can have one of two values: `Off` or `On`. When `Force Linear` is `On`, the *rms_analyze* software unit uses a linear fit for the energy vs. channel regression (ECR). When `Force Linear` is `Off`, the *rms_analyze* software unit uses the type of polynomial that best fits the data for the ECR. The maximum polynomial order is three, that is, a cubic polynomial.

FWHM

This parameter gives the full width at half-max (FWHM) of a photopeak or ROI, that is, the peak width at half the maximum peak height. The FWHM is reported in keV.

FWHM Limits

The Left FWHM limit, the Right FWHM limit, and the Multiplet FWHM limit confine the width of a ROI. These parameters are given in units of FWHMs.

Gain Shift

This parameter is the shift in gain used by *rms_analyze* in the iterative process of locating reference (ref) lines during update processing. The Gain Shift is given in percent and is used with the zero Shift below in determining the energy step interval used in finding the ref lines from an original estimated energy value.

K40_LocationDifference

This parameter is the distance between a sample's K-40 photopeak centroid and that of the MRP, which is reported in units of channels. If Use MRP is OFF, then this data quality test is not performed.

Lookup Tol Floor

This parameter is the minimum energy tolerance for matching peaks with nuclides during the update processing.

Minimum Area

Ref lines with net peak areas less than the Minimum Area are not used in the update process.

Most Recent Prior Sample

This parameter is the sample ID (SID) of the most recent prior (MRP).

Net Area

The `Net Area` is the total number of counts in a ROI that is not associated with background radiation levels.

NormalizedGainDifference

The gain is determined by dividing the difference in peak energies for the highest and lowest ref lines by the difference in centroid channels for the highest and lowest ref lines. The normalized gain is determined by dividing the gain by the total spectrum gain, that is, the result from dividing the difference in the highest and lowest spectrum energies by the total spectrum channels. The `NormalizedGainDifference` is then the difference between a sample's normalized gain and the normalized gain of the MRP. A small value for the `NormalizedGainDifference` is indicative of a very stable detector system – especially stable electronics.

Nts

This parameter is a number assigned to an explanatory footnote that is located at the end of the Peak Search Results section.

Perform Subtraction

This parameter can have one of two values: `Off` or `On`. When `Perform Subtraction` is `On`, the `rms_analyze` software unit performs a ROI-by-ROI blank subtraction.

Sample ID

This is a unique number assigned to a PHD message by the IDC. This number is referenced in all data products resulting from the PHD set with that SID.

Sample Quantity

This field describes the total atmospheric air volume sampled (in scm).

Sampling Time

This field is the sample collection duration and is equal to the difference in the Collection Stop and Collection Start times.

Station Type

This field contains a descriptor of the monitoring station. Some possible station types include:

- ISAR
International Surveillance of Atmospheric Radionuclides station developed and produced by Pacific-Sierra Research Corp., Arlington, VA, U.S.A. in conjunction with the Defense Research Establishment (FOA), Stockholm, Sweden.
- RASA
Radionuclide Aerosol Sampler/Analyzer unit developed by Pacific Northwest National Laboratory, Richland, WA, U.S.A. and produced by DME Corp., Orlando, FL, U.S.A.
- XPU
Xenon Processing Unit developed and produced by FOA, Stockholm, Sweden
- ARSA
Automated Radioxenon Sampler/Analyzer unit developed by Pacific Northwest National Laboratory, Richland, WA, U.S.A. and produced by DME Corp., Orlando, FL, U.S.A..

More station types will be added in the future.

Threshold

When the width of a possible photopeak is greater than the `Threshold` multiplied by the peak centroid's standard deviation, the possible peak is accepted and analyzed as a true spectrum line. The `Threshold` can have any value between zero and three, including three.

UNKNAT

Certain photopeaks are frequently observed in spectra, but the radionuclides or processes responsible for these peaks have yet to be explicitly defined. Such peaks are denoted by the series, UNKNAT01, UNKNAT02, UNKNAT03. The energies of these lines are listed in Table 72.

TABLE 72: ENERGIES OF UNKNAT LINES

Name	Energy (keV)
UNKNAT01	803.1
UNKNAT02	558.5
UNKNAT03	962.1

Use MRP

This parameter can have one of two values: `Yes` or `No`. When `Use MRP` is `Yes`, the *rms_analyze* software unit uses the energy and resolution data from the MRP sample in the update process. The MRP is the sample counted most recently on the detector, originating from the same station as the sample of interest. When `Use MRP` is `No`, the *rms_analyze* software unit uses the energy and resolution pair data of the present sample.

Use Weights

This parameter can have one of two values: Off or On. When Use Weights is On, the *rms_analyze* software unit determines calibration regression lines by weighting peaks according to their size and area uncertainty. When Use Weights is Off, all peaks are weighted equally.

Width

This field contains the total number of channels in which the photopeak or ROI of interest is observed.

Zero Shift

This parameter is the channel shift in the zero energy point used by *rms_analyze* in the iterative process of locating ref lines during update processing. The Zero Shift is given in channels and is used with the Gain Shift above in determining the energy step interval used in finding the ref lines from an original estimated energy value.

ARMR

All sections in the ARR are also found in the ARMR, including one additional section: Spectral-Region-of-Interest Editing. The ARMR is a product of the manual review of the automated results by an IDC analyst. The Spectral-Region-of-Interest Editing section summarizes the number of peaks added, deleted, and modified by the analyst.

An example of an ARMR is provided in ["ARMR" on page A3](#).

RMS Summary Report

The RMS Summary Report is comprised of the following sections:

**Radionuclide ▼
Data
Messages**

- Measurement Categorization Summary

This section lists samples with category 2, 3, 4, and 5 for the summary period. See [\[IDC7.1.7\]](#) for more details on categorization and category numbering.

- Man-made Radionuclide Summary

This section lists the collection times and locations of all man-made radionuclides detected during the summary period.

- Data Receipt Summary

This section lists the PHD messages received at the IDC during the summary period.

- Minimum Detectable Concentration (MDC) Summary

This section lists the ratios of median station MDCs (calculated for the time period desired) to maximum station MDCs for the station/nuclide combinations given in CD-WP224.

An example of an RSR is provided in ["RSR" on page A28](#).

LABORATORY ANALYSIS RESULTS

(To be added at a later date)

FISSION PRODUCT EVENT BULLETIN

The Fission Product Event Bulletin (FPEB) is designated as DATA_TYPE FPEB. The FPEB is comprised of the following sections:

- Event Window

This section summarizes information about the event.

- Regional Source Location

This section includes a description and map of the event location.

- Event Detection Summary

This section summarizes the sample characteristics that resulted in the creation of the FPEB.

- Isotopic Ratios

This section includes any isotopic ratios (for example, $^{134}\text{Cs}/^{137}\text{Cs}$) resulting from sample analysis.

- Certified Laboratory Results

This section includes any sample analysis results performed at a certified radionuclide laboratory.

An example of an FPEB is provided in ["FPEB" on page A23](#).

Station AutoDRM Basics

This chapter describes the basic *AutoDRM* capabilities that are needed for auxiliary seismic stations and includes the following topics:

- [Introduction](#)
- [Basic Message Support](#)
- [Environment Lines](#)
- [Request Lines](#)
- [Data Types](#)
- [AutoDRM Implementation Safeguards](#)
- [Help Recommendations](#)

Station AutoDRM Basics

INTRODUCTION

Stations and NDCs providing station data must have a minimum capability to provide data to the IDC through the message system. Clearly, all of the functionality of the request and data messages cannot be supported by these stations to the full extent, and a minimal *AutoDRM* capability is all that is necessary. This chapter describes the minimal *AutoDRM* configuration necessary to fulfill the duties of an auxiliary station supplying data in IMS1.0 format.

BASIC MESSAGE SUPPORT

A station/NDC providing segmented data must adhere to all of the basic message conventions on size, line length, date-time formats, station and channel naming, and use of units. The following sections describe the basic message formats that must be supported.

Begin Line

All messages must contain the BEGIN line and must support IMS1.0 format.

Msg_type

The request message type must be supported for receiving requests; the data message type must be supported for sending data messages.

Msg_id

The message identification string and optional source in the MSG_ID line must be recognized in request messages, and a unique message identification string must be generated for data messages.

Ref_id

The message identification of the request message must be used as the reference identifier of the returned data message.

E-mail Line

Email must be supported as a data return mechanism. FTP is not required.

ENVIRONMENT LINES

Many of the environment lines described in the chapter on Request Messages are not applicable to a limited station capability for *AutoDRMs*. The only variable that must be explicitly specified is TIME. If STA_LIST and CHAN_LIST are not explicitly specified, the default values of all stations and all channels are assumed. The AUX_LIST environment is required only if necessary to distinguish between two different data streams. Using these environments, simple requests can be made that obtain data from a particular station and channel within a specified time interval.

REQUEST LINES

The request lines specify the data that can be obtained from the *AutoDRM*. A simple station *AutoDRM* should be able to provide WAVEFORM, STATION, CHANNEL, RESPONSE, and OUTAGE data.

Request lines may have one or more arguments that specify subtype, formats, and subformats. A simple *AutoDRM* must support the IMS1.0 format as the main format for all requests, as well as one of the ASCII subformats (INT, CM6, or AU6) for waveforms.

DATA TYPES

Data messages are sent in response to requests sent to the *AutoDRM*. Thus, WAVEFORM, STATION, CHANNEL, RESPONSE, and radionuclide data types must be supported by a simple *AutoDRM* in the IMS1.0 format.

AUTODRM IMPLEMENTATION SAFEGUARDS

Responding to requests in an automatic system requires safeguards against repeated requests, excessive numbers of requests, excessively large requests, and failures of the email system (for example, returned mail). Although each installation of the *AutoDRM* will be different, some general guidelines are suggested to avoid major problems.

Message Size

Messages returned by email will have a maximum size of 1 megabyte. Each *AutoDRM* site may set their own limit for the maximum size of an FTP message, and may give priority to trusted users as they see fit.

Request Echo

The original request message should be echoed in the returned data message as a LOG data type.

Repeat Requests

Repeated requests for the same data by the same requestor within 10 minutes of the original request may be ignored by an *AutoDRM*.

Returned Messages

An error in the address for a data message sent out by an *AutoDRM* will result in an email returned to the *AutoDRM* by the email system. The sender's name (before the @ character in the mail address) for such an email will be either mailer-daemon or postmaster (with any combination of upper- and lowercase letters). The *AutoDRM* will forward these messages to the local *AutoDRM*-operator; no other action is taken and no response is sent. The *AutoDRM* may also recognize returned messages by the MSG_TYPE, which will be data, or by the presence of a REF_ID line, which is not used in request messages.

Syntax Errors

In case any syntax error is detected while processing a request message, a ERROR_LOG data message is returned. Also, if a request is made with a keyword that has not been implemented, a ERROR_LOG data message is sent.

A serious syntax error anywhere in a message should abort the entire message, but local policy can override this suggestion.

AutoDRM Internal Problem Logging

Any problem other than a syntax error revealed during processing of a request message should be reported to the *AutoDRM* operator who should take appropriate action. All request messages must be answered; ERROR_LOG data message is sent as response for these types of errors.

AutoDRM Operation Logs

All local *AutoDRM* installations should keep logs of incoming and outgoing messages, parameters of MSG_ID lines, volume of data transferred, and Universal Coordinated Times (UTC) of message receipt and dispatch.

HELP RECOMMENDATIONS

The HELP mechanism can be used to convey a wide variety of information. The following topics can be included in an *AutoDRM* HELP message. At a minimum, every HELP message contains the items shown in **bold**.

Introduction

- information about the local data center
- **email address of local contact** (in case of problems)
- recently added features
- date that the HELP message was last updated

Description of message formats and protocols

- basic message format
- sending and receiving email through *AutoDRM*

Description of commands understood by this *AutoDRM*

- **supported environments**
- **supported data types**
 - **supported subtypes, default subtype**
 - **supported subformats, default subformats**
- local extensions

Local limits

- maximum size of email message
- maximum size of FTP message
- types of requests that will be rejected (for example, sent by root or mailer-daemon)
- repeated identical requests from the same user over a short interval

Local data

- description of what data types are available from what stations/channels

- description of local data archives
 - segmented versus continuous
 - delay in data collection (how soon after real time is data available)
 - time period during which data are available

References

The following sources are referenced in or supplement this document:

- [Cro95] Crocker, S., Freed, N., Galvin, J., and Murphy, S., *Request for Comment 1848: MIME Object Security Services*, October 1995.
(online) <http://www.cis.ohio-state.edu/htbin/rfc/rfc1848.html>
- [Fre96a] Freed, N., and Borenstein, N., *Request for Comment 2045: Multipurpose Internet Mail Extensions (MIME) Part One: Format of Internet Message Bodies*, November 1996.
(online) <http://www.cis.ohio-state.edu/htbin/rfc/rfc2045.html>
- [Fre96b] Freed, N., and Borenstein, N., *Request for Comment 2046: Multipurpose Internet Mail Extensions (MIME) Part Two: Media Types*, November 1996.
(online) <http://www.cis.ohio-state.edu/htbin/rfc/rfc2046.html>
- [Fre96c] Freed, N., Klensin, J., and Postel, J., *Request for Comment 2048: Multipurpose Internet Mail Extensions (MIME) Part Four: Registration Procedures*, November 1996.
(online) <http://www.cis.ohio-state.edu/htbin/rfc/rfc2048.html>
- [Fre96d] Freed, N., and Borenstein, N., *Request for Comment 2049: Multipurpose Internet Mail Extensions (MIME) Part Five: Conformance Criteria and Examples*, November 1996.
(online) <http://www.cis.ohio-state.edu/htbin/rfc/rfc2049.html>

References ▼

- [Gal95] Galvin, J., Murphy, S., Crocker, S., and Freed, N., *Request for Comment 1847: Security Multiparts for MIME: Multipart/Signed and Multipart/Encrypted*, October 1995.
(online) <http://www.cis.ohio-state.edu/htbin/rfc/rfc1847.html>
- [GSE95b] Group of Scientific Experts, *GSETT 3 Documentation, Volume Two: Operations*, CRP/243, 1995.
- [IDC3.4.1] Science Applications International Corporation, Pacific-Sierra Research Corporation, *Formats and Protocols for Messages*, SAIC-98/3004, PSR-98/TN1129, 1998.
- [IDC3.4.2Rev1] Science Applications International Corporation, *Formats and Protocols for Continuous Data, CD-2, Revision 1*, SAIC-99/3005, 1999.
- [IDC5.2.2] Pacific-Sierra Research Corporation, *IDC Processing of Radionuclide Data*, PSR-99/1139, 1999.
- [IDC6.5.2] Science Applications International Corporation, *Distributed Application Control System Software User Manual*, SAIC-99/3036, 1999.
- [IDC7.1.7] Pacific-Sierra Research Corporation, *Radionuclide Detection Processing*, PSR-98/TN1123, 1998.
- [IDC7.4.2] Science Applications International Corporation, Pacific-Sierra Research Corporation, *Message Subsystem*, SAIC-98/3003, 1998.
- [IDC7.4.4] Science Applications International Corporation, *Subscription Subsystem*, SAIC-98/3001, 1998.
- [ISO 3166] International Organization for Standardization, *ISO Country Codes*, ISO 3166 Maintenance Agency, latest change August, 1997. (online) <ftp://ftp.fu-berlin.de/pub/doc/iso/>
- [ITU95] ITU-T Recommendation X.509v3 Information Technology - Open Systems Interconnection - The Directory: Authentication Framework ISO/IEC 9594-8, 1995.

▼ References

- [Kra93] Kradolfer, U., "Automating the Exchange of Earthquake Information," *Eos Transactions, American Geophysical Society*, 74, 442, 1993.
- [Moo96] Moore, K., *Request for Comment 2047: MIME (Multipurpose Internet Mail Extensions) Part Three: Message Header Extensions for Non-ASCII Text*, November 1996.
(online) <http://www.cis.ohio-state.edu/htbin/rfc/rfc2047.html>
- [PKCS-7] PKCS #7: Cryptographic Message Syntax, Internet Draft draft-hoffman-pkcs-crypt-msg.
- [WG195] Working Group 1, *Radionuclide Monitoring*, Ad Hoc Committee on a Nuclear Test Ban, WG1/NTB/224, 1995.

Appendix A: Data Message Examples

This appendix contains examples of formatted data messages. Some of the examples wrap onto the next line and appear as they would on a computer screen.

**Appendix A: ▼
Data Message
Examples**

Appendix A: Data Message Examples

ALERT_FLOW

```
DATA_TYPE ALERT_FLOW
RU001
DEBRIS IS STUCK IN THE INTAKE PIPE! Stopping blower for cleanup!
1999-09-29 14:51:19.1
```

ALERT_SYSTEM

```
DATA_TYPE ALERT_SYSTEM
AU003
THE SYSTEM IS BEING SHUTDOWN!
1999-04-09 08:23:55.4
```

ALERT_TEMP

```
DATA_TYPE ALERT_SYSTEM
CA004
Detector crystal temp. is too high! Shutting system down!
1999-10-13 22:30:04.9
```

ALERT_UPS

```
DATA_TYPE ALERT_UPS
US001
UPS AC line power failure time exceeded! System stopping!
1999-02-22 10:45:55.5
```

ARMR

DATA_TYPE ARMR

PIDC GENERATED REPORT
ATMOSPHERIC RADIONUCLIDE MEASUREMENT REPORT
Particulate Version

SAMPLE INFORMATION =====

Station ID:	CA002	Detector ID:	CA002CAA2
Station Type:	ISAR2	Detector Type:	HPGe p

Station Location: Vancouver, Canada
Detector Description: Detector A in Vancouver, Canada

Sample ID:	0023593	Sample Geometry:	DISK
Sample Quantity:	22710.00 m3	Sample Type:	Particulate

Collection Start:	1998/10/27 01:31	Sampling Time:	23.65 hours
Collection Stop:	1998/10/28 01:10	Decay Time:	24.79 hours
Acquisition Start:	1998/10/29 01:58	Acquisition Time:	23.31 hours
Acquisition Stop:	1998/10/30 01:16	Avg Flow Rate:	960.25 m3/hr

Collection Station Comments:
ermias - ubc928 Detector 1 Ranger (29-OCT-1998)

IDC Analysis General Comments:
Analysis 1998/10/29 20:19:15

MEASUREMENT CATEGORIZATION =====

Categorization Legend

Level 1 = Typical Background Rad. Meas.
Level 2 = Anomalous Background Rad. Meas.
Level 3 = Typical Anthropogenic Rad. Meas.
Level 4 = Anomalous Anthropogenic Rad. Meas.
Level 5 = Mult. Abnormal Anthropogenic Rad. Meas.

Spectrum Category (4) -- Anomalous Anthropogenic Rad. Meas.

Categorization Summary:

Name	Category	Categorization Comment
----	-----	-----
TE-123M	2	Not Regularly Measured
EU-155	4	Not Regularly Measured

ACTIVITY SUMMARY =====

Appendix A: ▼ Data Message Examples

NATURAL RADIOACTIVITY:

Nuclides Identified and not Quantified:

AC-228, BI-212, BI-214, K-40, PB-214, TL-208, UNKNAT01, UNKNAT03

Nuclides Quantified:

Nuclide	Half-Life	Conc (uBq/m3)	%RelErr	Notes
BE-7	53.3 D	1.9E+03	3.20	
PB-212	10.64 H	8.1E+03	8.10	

ACTIVATION-PRODUCT RADIOACTIVITY:

I-123	13.13 H	7.7E+02	3.61
TE-123M	119.7 D	68	3.61

FISSION-PRODUCT RADIOACTIVITY:

EU-155	4.76 Y	2	122.87
--------	--------	---	--------

MINIMUM DETECTABLE CONCENTRATION FOR KEY NUCLIDES =====

Nuclide	Half-Life	MDC (uBq/m3)
BA-140	12.75 D	8.64
CE-143	1.4 D	12.61
CS-134	2.06135 Y	2.74
CS-136	13.16 D	2.61
CS-137	30.0197 Y	2.61
I-131	8.04 D	2.82
I-133	20.8 H	10.74
MO-99	65.94 H	30.58
NB-95	35.15 D	2.57
RU-103	39.26 D	2.21
TE-132	78.2 H	3.15
ZR-95	64.02 D	4.49
ZR-97	17 H	16.06

PEAK SEARCH RESULTS =====

33 peaks found in spectrum by automated peak search.
 33 peaks associated with nuclides by automated processing.
 0 peaks not associated with nuclides by automated processing.
 100 percent of peaks were associated with nuclides.

Note: "*" indicates that a peak was a component of a multiplet.

▼ Appendix A:
Data Message
Examples

Energy	Centroid	Width	FWHM	%Eff	Net Area	%RelErr	Nuclide	Nts
44.83	92.24	8	1.55	5.76	668.08	18.73	EU-155	
53.60	110.17	10	1.44	7.71	266.89	32.49	PB-214	
74.80	153.51 *	15	1.32	10.59	7836.51	1.65	PB-212	
74.80	153.51 *	15	1.32	10.59	7836.51	1.65	PB-214	
74.80	153.51 *	15	1.32	10.59	7836.51	1.65	TL-208	
77.08	158.17 *	15	1.32	10.76	12106.68	1.40	BI-214	
77.08	158.17 *	15	1.32	10.76	12106.68	1.40	PB-212	
77.08	158.17 *	15	1.32	10.76	12106.68	1.40	PB-214	
87.15	178.76 *	16	1.40	11.31	4565.86	2.78	EU-155	
87.15	178.76 *	16	1.40	11.31	4565.86	2.78	PB-212	
87.15	178.76 *	16	1.40	11.31	4565.86	2.78	PB-214	
89.88	184.34 *	16	1.40	11.40	1316.21	4.88	AC-228	
89.88	184.34 *	16	1.40	11.40	1316.21	4.88	BI-214	
89.88	184.34 *	16	1.40	11.40	1316.21	4.88	PB-212	
115.16	236.05	10	1.03	11.55	373.32	19.30	PB-212	
158.98	325.66	11	1.31	10.49	11332.32	1.59	I-123	
158.98	325.66	11	1.31	10.49	11332.32	1.59	TE-123M	
238.63	488.59	12	1.36	8.23	28748.37	0.91	PB-212	
277.36	567.84	12	1.44	7.34	1086.72	7.19	TL-208	
295.23	604.40 *	23	1.50	6.99	294.65	12.38	PB-214	
300.11	614.40 *	23	1.51	6.89	1697.73	5.08	PB-212	
338.52	693.00	12	0.91	6.23	132.89	30.78	AC-228	
351.97	720.52	10	1.14	6.03	337.60	15.15	PB-214	
477.60	977.73	14	1.54	4.59	16395.45	1.18	AC-228	
477.60	977.73	14	1.54	4.59	16395.45	1.18	BE-7	
510.81	1045.72	14	1.93	4.31	3685.18	2.85	TL-208	
583.21	1194.00	14	1.63	3.81	8711.32	1.66	AC-228	
583.21	1194.00	14	1.63	3.81	8711.32	1.66	TL-208	
609.38	1247.61	15	1.62	3.65	340.86	13.18	BI-214	
727.32	1489.22	15	1.79	3.09	1850.16	3.93	AC-228	
727.32	1489.22	15	1.79	3.09	1850.16	3.93	BI-212	
763.26	1562.85	13	1.66	2.95	159.71	20.07	TL-208	
785.49	1608.41	15	1.90	2.87	252.13	14.68	BI-212	
785.49	1608.41	15	1.90	2.87	252.13	14.68	BI-214	
785.49	1608.41	15	1.90	2.87	252.13	14.68	PB-214	
802.84	1643.97	11	0.89	2.82	48.40	39.86	UNKNAT01	
860.54	1762.20	16	1.86	2.64	1103.41	5.37	TL-208	
893.02	1828.76	10	1.49	2.55	55.02	45.91	BI-212	
911.21	1866.05	16	2.12	2.50	184.92	18.00	AC-228	
962.26	1970.67 *	24	1.74	2.38	106.39	22.26	UNKNAT03	
968.89	1984.25 *	24	1.75	2.37	73.68	26.35	AC-228	
1078.76	2209.46	13	1.66	2.15	119.44	22.62	BI-212	
1093.84	2240.36	17	1.42	2.12	90.49	28.29	TL-208	
1460.81	2992.53	19	2.23	1.65	3117.45	2.77	K-40	
1512.22	3097.90	16	2.69	1.61	87.10	27.20	BI-212	
1592.28	3261.96	16	2.29	1.55	225.23	13.55	TL-208	
1620.66	3320.10	15	1.97	1.52	211.80	14.25	BI-212	

SPECTRAL-REGION-OF-INTEREST (SROI) EDITING =====

PEAKS ADDED: none

PEAKS DELETED: none

SROIs MODIFIED: none

Nuclide ID Changes:

Appendix A: ▼ Data Message Examples

Average Concentration Differences: none
Nuclides Entering: none
Nuclides Leaving: none

PROCESSING PARAMETERS =====

Threshold: 3
Peak Start (keV): 42
Peak End (keV): 1990
Left FWHM limit: 2
Right FWHM limit: 2
Multiplet FWHM limit: 4
Fit Singlets: On
Critical-level Test: On
Estimate Peak Widths: On
Baseline Type: STEP
Baseline Channels: 3
Perform Subtraction: Off
Energy Tolerance 0.75
Confidence Threshold 0.25

UPDATE PARAMETERS =====

Use MRP: Yes
Most Recent Prior sample: Used
Gain Shift (%): 0.1
Zero Shift (Channels): 0.5
Minumum Area: 100
Use Weights: On
Allow Multiplets: On
Force Linear: Off
Lookup Tol Floor (keV): 0.2
Default RER Intercept: 0.8
Default RER Slope: 0.03
Default ECR Slope: 0.488281

DATA QUALITY FLAGS =====

Name	Pass/Fail	Value	Test
FlowRate	PASS	960.242	>500
Ba140_MDC	PASS	8.63981	<30
Be7_FWHM	PASS	1.54202	<1.7
K40_LocationDifference	PASS	0.0625	<3*std deviation
NormalizedGainDifference	FAIL	0.000155754	<0.0001

EVENT SCREENING FLAGS =====

Activation Products present in this spectrum	Yes
Number of days since last activation product	59.8716
One fission product in spectrum	Yes
Number of days since last fission product	0.0120602
2 or more fission products in spectrum	No
Number of days since 2 or more fission products	Never Seen

Cs-137 present in spectrum	No
Number of times seen in last 30 days	Never Seen

CALIBRATION EQUATIONS =====

Energy vs. Channel

$$E(c) = -0.2963 + 0.4893*c - 5.808E-07*c^2 + 7.949E-11*c^3$$

E = energy (keV)
c = channel number

Resolution vs. Energy

$$FWHM(E) = 0.79 + 0.03582*SQRT(E)$$

FWHM = Full Width Half Max (keV)
E = energy (keV)

Efficiency vs. Energy

$$L(E) = \ln(962.1/E)$$

$$e(E) = \exp \{ -3.738 + 0.9178*L + 0.07541*L^2 - 0.07795*L^3 + 0.01588*L^4 - 0.006628*L^5 \}$$

e = efficiency (counts/gamma)
E = energy (keV)

FIELD OF REGARD =====

<http://www.pidc.org//for/US001/1998/300>

Appendix A: ▼ Data Message Examples

ARR

DATA_TYPE ARR

PIDC GENERATED REPORT AUTOMATED RADIONUCLIDE REPORT Particulate Version

SAMPLE INFORMATION =====

Station ID:	CA002	Detector ID:	CA002CAA2
Station Type:	ISAR2	Detector Type:	HPGe p

Station Location: Vancouver, Canada
Detector Description: Detector A in Vancouver, Canada

Sample ID:	0023593	Sample Geometry:	DISK
Sample Quantity:	22710.00 m3	Sample Type:	Particulate

Collection Start:	1998/10/27 01:31	Sampling Time:	23.65 hours
Collection Stop:	1998/10/28 01:10	Decay Time:	24.79 hours
Acquisition Start:	1998/10/29 01:58	Acquisition Time:	23.31 hours
Acquisition Stop:	1998/10/30 01:16	Avg Flow Rate:	960.25 m3/hr

Collection Station Comments:
ermias - ubc928 Detector 1 Ranger (29-OCT-1998)

IDC Analysis General Comments:
Analysis 1998/10/29 20:19:15

MEASUREMENT CATEGORIZATION =====

Categorization Legend

Level 1 = Typical Background Rad. Meas.
Level 2 = Anomalous Background Rad. Meas.
Level 3 = Typical Anthropogenic Rad. Meas.
Level 4 = Anomalous Anthropogenic Rad. Meas.
Level 5 = Mult. Abnormal Anthropogenic Rad. Meas.

Spectrum Category (4) -- Anomalous Anthropogenic Rad. Meas.

Categorization Summary:

Name	Category	Categorization Comment
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Nuclides Identified and not Quantified:

AC-228, BI-212, BI-214, K-40, PB-214, TL-208, UNKNAT01, UNKNAT03

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Nuclide	Half-Life	Conc(uBq/m3)	%RelErr	Notes
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EU-155	4.76 Y	2	122.87
--------	--------	---	--------

MINIMUM DETECTABLE CONCENTRATION FOR KEY NUCLIDES =====

Nuclide	Half-Life	MDC(uBq/m3)
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CS-134	2.06135 Y	2.74
CS-136	13.16 D	2.61
CS-137	30.0197 Y	2.61
I-131	8.04 D	2.82
I-133	20.8 H	10.74
MO-99	65.94 H	30.58
NB-95	35.15 D	2.57
RU-103	39.26 D	2.21
TE-132	78.2 H	3.15
ZR-95	64.02 D	4.49
ZR-97	17 H	16.06

PEAK SEARCH RESULTS =====

33 peaks found in spectrum by automated peak search.
 33 peaks associated with nuclides by automated processing.
 0 peaks not associated with nuclides by automated processing.
 100 percent of peaks were associated with nuclides.

Note: "*" indicates that a peak was a component of a multiplet.

Energy	Centroid	Width	FWHM	%Eff	Net Area	%RelErr	Nuclide	Nts
44.83	92.24	8	1.55	5.76	668.08	18.73	EU-155	

Appendix A: ▼ Data Message Examples

53.60	110.17	10	1.44	7.71	266.89	32.49	PB-214
74.80	153.51 *	15	1.32	10.59	7836.51	1.65	PB-212
74.80	153.51 *	15	1.32	10.59	7836.51	1.65	PB-214
74.80	153.51 *	15	1.32	10.59	7836.51	1.65	TL-208
77.08	158.17 *	15	1.32	10.76	12106.68	1.40	BI-214
77.08	158.17 *	15	1.32	10.76	12106.68	1.40	PB-212
77.08	158.17 *	15	1.32	10.76	12106.68	1.40	PB-214
87.15	178.76 *	16	1.40	11.31	4565.86	2.78	EU-155
87.15	178.76 *	16	1.40	11.31	4565.86	2.78	PB-212
87.15	178.76 *	16	1.40	11.31	4565.86	2.78	PB-214
89.88	184.34 *	16	1.40	11.40	1316.21	4.88	AC-228
89.88	184.34 *	16	1.40	11.40	1316.21	4.88	BI-214
89.88	184.34 *	16	1.40	11.40	1316.21	4.88	PB-212
115.16	236.05	10	1.03	11.55	373.32	19.30	PB-212
158.98	325.66	11	1.31	10.49	11332.32	1.59	I-123
158.98	325.66	11	1.31	10.49	11332.32	1.59	TE-123M
238.63	488.59	12	1.36	8.23	28748.37	0.91	PB-212
277.36	567.84	12	1.44	7.34	1086.72	7.19	TL-208
295.23	604.40 *	23	1.50	6.99	294.65	12.38	PB-214
300.11	614.40 *	23	1.51	6.89	1697.73	5.08	PB-212
338.52	693.00	12	0.91	6.23	132.89	30.78	AC-228
351.97	720.52	10	1.14	6.03	337.60	15.15	PB-214
477.60	977.73	14	1.54	4.59	16395.45	1.18	AC-228
477.60	977.73	14	1.54	4.59	16395.45	1.18	BE-7
510.81	1045.72	14	1.93	4.31	3685.18	2.85	TL-208
583.21	1194.00	14	1.63	3.81	8711.32	1.66	AC-228
583.21	1194.00	14	1.63	3.81	8711.32	1.66	TL-208
609.38	1247.61	15	1.62	3.65	340.86	13.18	BI-214
727.32	1489.22	15	1.79	3.09	1850.16	3.93	AC-228
727.32	1489.22	15	1.79	3.09	1850.16	3.93	BI-212
763.26	1562.85	13	1.66	2.95	159.71	20.07	TL-208
785.49	1608.41	15	1.90	2.87	252.13	14.68	BI-212
785.49	1608.41	15	1.90	2.87	252.13	14.68	BI-214
785.49	1608.41	15	1.90	2.87	252.13	14.68	PB-214
802.84	1643.97	11	0.89	2.82	48.40	39.86	UNKNAT01
860.54	1762.20	16	1.86	2.64	1103.41	5.37	TL-208
893.02	1828.76	10	1.49	2.55	55.02	45.91	BI-212
911.21	1866.05	16	2.12	2.50	184.92	18.00	AC-228
962.26	1970.67 *	24	1.74	2.38	106.39	22.26	UNKNAT03
968.89	1984.25 *	24	1.75	2.37	73.68	26.35	AC-228
1078.76	2209.46	13	1.66	2.15	119.44	22.62	BI-212
1093.84	2240.36	17	1.42	2.12	90.49	28.29	TL-208
1460.81	2992.53	19	2.23	1.65	3117.45	2.77	K-40
1512.22	3097.90	16	2.69	1.61	87.10	27.20	BI-212
1592.28	3261.96	16	2.29	1.55	225.23	13.55	TL-208
1620.66	3320.10	15	1.97	1.52	211.80	14.25	BI-212

PROCESSING PARAMETERS =====

Threshold:	3
Peak Start (keV):	42
Peak End (keV):	1990
Left FWHM limit:	2
Right FWHM limit:	2
Multiplet FWHM limit:	4
Fit Singlets:	On
Critical-level Test:	On
Estimate Peak Widths:	On
Baseline Type:	STEP
Baseline Channels:	3
Perform Subtraction:	Off
Energy Tolerance	0.75
Confidence Threshold	0.25

UPDATE PARAMETERS =====

```

Use MRP:                Yes
Most Recent Prior sample: Used
Gain Shift (%):         0.1
Zero Shift (Channels):   0.5
Minumum Area:           100
Use Weights:            On
Allow Multiplets:        On
Force Linear:           Off
Lookup Tol Floor (keV):  0.2
Default RER Intercept:   0.8
Default RER Slope:       0.03
Default ECR Slope:       0.488281

```

DATA QUALITY FLAGS =====

Name	Pass/Fail	Value	Test
FlowRate	PASS	960.242	>500
Ba140_MDC	PASS	8.63981	<30
Be7_FWHM	PASS	1.54202	<1.7
K40_LocationDifference	PASS	0.0625	<3*std deviation
NormalizedGainDifference	FAIL	0.000155754	<0.0001

EVENT SCREENING FLAGS =====

```

Activation Products present in this spectrum      Yes
  Number of days since last activation product    59.8716

One fission product in spectrum                  Yes
  Number of days since last fission product       0.0120602

2 or more fission products in spectrum           No
  Number of days since 2 or more fission products Never Seen

Cs-137 present in spectrum                       No
  Number of times seen in last 30 days            Never Seen

```

CALIBRATION EQUATIONS =====

Energy vs. Channel

$$E(c) = -0.2963 + 0.4893*c - 5.808E-07*c^2 + 7.949E-11*c^3$$

E = energy (keV)
c = channel number

Resolution vs. Energy

$$FWHM(E) = 0.79 + 0.03582*SQRT(E)$$

FWHM = Full Width Half Max (keV)

**Appendix A: ▼
Data Message
Examples**

E = energy (keV)

Efficiency vs. Energy

$L(E) = \ln(962.1/E)$

$e(E) = \exp \{ -3.738 + 0.9178*L + 0.07541*L^2$
 $- 0.07795*L^3 + 0.01588*L^4 - 0.006628*L^5 \}$

e = efficiency (counts/gamma)
E = energy (keV)

FIELD OF REGARD =====

<http://www.pidc.org/web-gards/for/CA002/1998/300>

ARRIVAL:ASSOCIATED

DATA_TYPE ARRIVAL:ASSOCIATED IMS1.0																					
Net	Sta	Dist	EvAz	Phase	Date	Time	TRes	Azim	AzRes	Slow	SRes	Def	SNR	Amp	Per	Qual	Magn				
			tude	OrigID	Author	ArrID															
IDC_SEIS	BBB	1.61	57.1	Pg	1996/08/16	03:41:40.523	-1.1	256.3	17.5	16.2	-2.4	T__	13.4	228.6	0.33	a__	ML				
4.1	769476	IDC_REB	11618399																		
IDC_SEIS	BBB	1.61	57.1	Lg	1996/08/16	03:42:04.531	1.1	334.7	95.9	18.6	-12.5	T__	8.2	338.6	0.33	a__					
			769476	IDC_REB	11618393																
IDC_SEIS	DLBC	7.12	1.2	Pn	1996/08/16	03:42:58.584	0.5	166.7	-14.8	16.5	2.8	T__	16.5	1.5	0.33	a__	ML				
4.2	769476	IDC_REB	11618396																		
IDC_SEIS	DLBC	7.12	1.2	Lg	1996/08/16	03:44:59.808	1.1											T__			
			769476	IDC_REB	11621022																
IDC_SEIS	NEW	9.07	104.6	Pn	1996/08/16	03:43:23.394	-1.3	308.2	13.5	6.6	-7.2	T__	4.2	0.3	0.33	a__	ML				
3.5	769476	IDC_REB	11614783																		
IDC_SEIS	NEW	9.07	104.6	Lg	1996/08/16	03:46:03.321	2.8	337.6	42.9	12.2	-19.6	__	4.1	0.2	0.33	a__					
			769476	IDC_REB	11614787																
IDC_SEIS	YKA	14.05	31.2	Pn	1996/08/16	03:44:30.887	-1.7	222.6	-1.8	12.4	-1.2	T__	11.9	0.5	0.33	a__	ML				
4.5	769476	IDC_REB	11614280																		
IDC_SEIS	WAKE	58.41	261.4	T	1996/08/16	04:52:31.503	-94.3											3.1			
			769476	IDC_REB	11614764																
IDC_SEIS	HFS	65.16	18.9	P	1996/08/16	03:51:55.581	0.9	343.9	7.9	3.5	-3.0	T__	5.0	1.2	0.55	a__	mb				
4.1	769476	IDC_REB	11614380																		
4.4	769476	IDC_REB	11614380																		

ARRIVAL:AUTOMATIC

DATA TYPE ARRIVAL:AUTOMATIC IMS1.0														
Net	Sta	BeamID	Date	Time	Phase	Azim	Slow	SNR	Amp	Per	STA	Dur	Author	DetID
IDC_SEIS	BBB	BP0.5_4.0	1996/08/16	03:41:40.523	P	256.3	16.2	13.4	228.6	0.33	4.5	0.2	IDC_REB	11618391
IDC_SEIS	BBB	BP0.2_1.0	1996/08/16	03:42:04.531	S	334.7	18.6	8.2	338.6	0.33	9.1	1.2	IDC_REB	11618393
IDC_SEIS	DLBC	BP0.2_2.0	1996/08/16	03:42:58.584	P	166.7	16.5	16.5	1.5	0.33	2.0	0.4	IDC_REB	11618396
IDC_SEIS	DLBC	BP0.4_6.0	1996/08/16	03:44:59.808									IDC_REB	11621022

Appendix A: ▼ Data Message Examples

ARRIVAL:GROUPED

DATA_TYPE ARRIVAL:GROUPED IMS1.0																
Net	Sta	Chan	Aux	Date	Time	Phase	Azim	Slow	SNR	Amp	Per	Qual	Group	C	Author	ArrID
IDC_SEIS	BBB	bhz		1996/08/16	03:41:40.523	P	256.3	16.2	13.4	228.6	0.33	a	5636	IDC_REB		11618395
IDC_SEIS	BBB	bhz		1996/08/16	03:42:04.531	S	334.7	18.6	8.2	338.6	0.33	a	5636	IDC_REB		11618393
IDC_SEIS	DLBC	bhz		1996/08/16	03:42:58.584	P	166.7	16.5	16.5	1.5	0.33	a	5636	IDC_REB		11618396
IDC_SEIS	DLBC	bhz		1996/08/16	03:44:59.808	S					m		5636	IDC_REB		11621022
IDC_SEIS	NEW	bhz		1996/08/16	03:43:23.394	P	308.2	6.6	4.2	0.3	0.33	a	5636	IDC_REB		11614783
IDC_SEIS	NEW	bhz		1996/08/16	03:46:03.321	S	337.6	12.2	4.1	0.2	0.33	a	5636	IDC_REB		11614787

ARRIVAL:REVIEWED

DATA_TYPE ARRIVAL:REVIEWED IMS1.0														
Net	Sta	Chan	Aux	Date	Time	Phase	Azim	Slow	SNR	Amp	Per	Qual	Author	ArrID
IDC_SEIS	BBB	bhz		1996/08/16	03:41:40.523	P	256.3	16.2	13.4	228.6	0.33	a	IDC_REB	11618391
IDC_SEIS	BBB	bhz		1996/08/16	03:42:04.531	S	334.7	18.6	8.2	338.6	0.33	a	IDC_REB	11618393
IDC_SEIS	DLBC	bhz		1996/08/16	03:42:58.584	P	166.7	16.5	16.5	1.5	0.33	a	IDC_REB	11618396
IDC_SEIS	DLBC	bhz		1996/08/16	03:44:59.808	S					m		IDC_REB	11621022
IDC_SEIS	NEW	bhz		1996/08/16	03:43:23.394	P	308.2	6.6	4.2	0.3	0.33	a	IDC_REB	11614783
IDC_SEIS	NEW	bhz		1996/08/16	03:46:03.321	S	337.6	12.2	4.1	0.2	0.33	a	IDC_REB	11614787

ARRIVAL:UNASSOCIATED

DATA_TYPE ARRIVAL:UNASSOCIATED IMS1.0														
Net	Sta	BeamID	Date	Time	Phase	Azim	Slow	SNR	Amp	Per	STA	Dur	Author	DetID
IDC_SEIS	BBB	BP0.5_4.0	1996/08/16	03:41:40.523	P	256.3	16.2	13.4	228.6	0.33	4.5	0.2	IDC_REB	11618391
IDC_SEIS	BBB	BP0.2_1.0	1996/08/16	03:42:04.531	S	334.7	18.6	8.2	338.6	0.33	9.1	1.2	IDC_REB	11618393
IDC_SEIS	DLBC	BP0.2_2.0	1996/08/16	03:42:58.584	P	166.7	16.5	16.5	1.5	0.33	2.0	0.4	IDC_REB	11618396
IDC_SEIS	DLBC	BP0.4_6.0	1996/08/16	03:44:59.808									IDC_REB	11621022

AUTH_STATUS

DATA_TYPE AUTH_STATUS IMS1.0									
Report period from 1994/12/03 00:00:00.0 to 1994/12/04 00:00:00.0									
Net	Sta	Chan	Aux	Packets_Tested	Packets_Failed	Failed Packet Intervals	Start_time	End_time	Comment
IDC_SEIS	ABC	shz		8640	3		1994/12/03 14:28:40	1994/12/03 14:29:10	Unknown cause
IDC_SEIS	DEF	bhz		8640	0				
Net	Sta	Chan	Aux						
IDC_SEIS	ABC	shz							

BLANKPHD

```

DATA_TYPE BLANKPHD
#Header
US001 US001USA1 P DISK FULL 0 0 0
0 0
1997/09/28 19:17:59.0
#Comment
3 day, for subtraction - Blank FOA Filter
Detector 1 Test Filter (25-SEP-1997)
#Acquisition
1997/09/25 19:15:38.0 259223.6 259200.0
#Energy
88.000000 179.626129 0.000000
...
1836.099976 3764.159180 0.000000
#Resolution
88.000000 1.368276 0.000000
...
1836.099976 2.340262 0.000000
#Efficiency
88.000000 0.068337 0.002864
...
1836.099976 0.010264 0.000262
#Spectrum
4096 0
0 0 0 0 0
...

```

Appendix A: ▼ Data Message Examples

BULLETIN (IMS1.0:SHORT FORMAT)

DATA_TYPE BULLETIN IMS1.0:short
Reviewed Event Bulletin (REB) of the CTBO IDC for August 16, 1996
EVENT 768958 QUEEN CHARLOTTE ISLANDS REGION

Date	Time	Err	RMS	Latitude	Longitude	Smaj	Smin	Az	Depth	Err	Ndef	Nsta	Gap	mdist	Mdist	Qual	Author
OrigID																	
1996/08/16	03:41:12.45	0.88	0.92	51.3300	-130.3100	16.6	7.7	63	0.0f	23	18	192	1.61	77.98	m	i	uk IDC_REB

769476

Magnitude	Err	Nsta	Author	OrigID
ML	3.8	0.5	7	IDC_REB
mb	4.0	0.2	6	IDC_REB

769476

Sta	Dist	EvAz	Phase	Time	TRes	Azim	AzRes	Slow	SRes	Def	SNR	Amp	Per	Qual	Magnitude	ArrID
BBB	1.61	57.1	Pg	03:41:40.523	-1.1	256.3	17.5	16.2	-2.4	T	13.4	228.6	0.33	a	ML	4.1 11618391
NEW	9.07	104.6	Pn	03:43:23.394	-1.3	308.2	13.5	6.6	-7.2	T	4.2	0.3	0.33	a	ML	3.5 11614783
YKA	14.05	31.2	Pn	03:44:30.887	-1.7	222.6	-1.8	12.4	-1.2	T	11.9	0.5	0.33	a	ML	4.5 11614280
WAKE	58.41	261.4	T	04:52:31.503	-94.3						3.1			m		11614764
HFS	65.16	18.9	P	03:51:55.581	0.9	343.9	7.9	3.5	-3.0	T	5.0	1.2	0.55	a	mb	4.1 11614380
															mbmle	4.4 11614380

BULLETIN (IMS1.0:LONG FORMAT)

DATA_TYPE BULLETIN IMS1.0:LONG
Standard Event Bulletin of the PIDC from 1999/01/01 00:00:00 to 1999/01/02 00:00:00, generated 1999/01/21 18:02:23
EVENT 20276917 VANCOUVER ISLAND REGION

Date	Time	Err	RMS	Latitude	Longitude	Smaj	Smin	Az	Depth	Err	Ndef	Nsta	Gap	mdist	Mdist	Qual	Author
OrigID																	
1999/01/01	11:01:05.04	2.57	0.74	48.8408	-128.7391	54.3	21.6	58	0.0f	10	9	196	3.37	68.22	m	i	uk IDC_SEB

20282397

Magnitude	Err	Nsta	Author	OrigID
mbmle	3.6	0.0	2	IDC_SEB
mb	3.6	0.0	2	IDC_SEB
Ms	3.4	0.2	4	IDC_SEB
ML	2.9	0.2	5	IDC_SEB
msmle	3.1	0.1	15	IDC_SEB

Sta	Dist	EvAz	Phase	Time	TRes	Azim	AzRes	Slow	SRes	Def	SNR	Amp	Per	Qual	Magnitude	ArrID
BBB	3.37	6.6	Pn	11:02:00.100	1.2	194.6	7.5	11.4	-2.3	T	139.5	20.4	0.33	a		23580875
BBB	3.37	6.6	Sn	11:02:41.057	0.4	87.7	-99.3	22.0	-2.7	T	2.9	3.6	0.33	m		23625256
ELK	12.53	125.2	Pn	11:04:06.274	1.5	322.1	7.4	9.2	-4.5	T	4.0	0.2	0.33	m	ML	3.5 23625254
MNV	12.91	139.8	Pn	11:04:10.326	0.5	326.3	-0.8	7.2	-6.5	T	9.8	0.06	0.33	a	ML	3.1 23579738
MNV	12.91	139.8	LR	11:09:09.898	25.7	234.0	-93.1	37.6	2.0	T		59.6	21.31	a	Ms	2.9 23625273
PDAR	14.68	107.3	Pn	11:04:34.116	0.1	356.7	47.1	13.9	2.0	T	5.5			m		23608178
PDAR	14.68	107.3	LR	11:10:26.438	34.6	345.6	44.6	38.3	2.4	T		202.9	20.69	a	Ms	3.5 23625274

YKA	15.78	24.6	Pn	11:04:48.562	0.2	212.6	-3.8	12.4	-0.5	T	7.7	0.03	0.33	a	ML	3.2	23579691
YKA	15.78	24.6	LR	11:11:30.039	45.0	85.0	-131.1	39.6	2.9	—	—	97.5	20.18	a	MS	3.2	23625275
ILAR	18.68	335.4	P	11:05:24.993	0.6	120.9	-19.1	2.1	-9.3	T	3.8	0.004	0.33	m	ML	2.1	23608180
INK	19.67	354.7	P	11:05:35.424	0.2	326.5	155.9	11.7	0.8	T	2.0	0.009	0.33	m	ML	2.6	23625253
ULM	21.28	73.7	P	11:05:52.200	-0.6	10.7	91.8	9.0	-1.8	T	3.7	1.7	0.55	a	mb	3.6	23579678
WK31	59.49	262.4	T	12:15:34.290	-1.3	—	—	—	—	—	10.0	—	—	a	—	23580272	
WK30	59.50	264.9	T	12:15:36.263	-0.2	—	—	—	—	—	8.0	—	—	a	—	23580277	
PDY	60.91	329.3	LR	11:39:48.313	27.7	299.4	-102.1	38.1	0.5	—	—	66.0	18.50	a	MS	3.8	23625272
FINES	68.22	12.7	P	11:12:06.123	-0.7	1.7	21.8	7.7	0.8	T	2.5	0.5	0.72	m	mb	3.6	23608179
ESDC	79.25	40.2	P	11:13:07.949	-4.2	6.4	40.0	28.6	23.1	—	2.7	0.6	0.90	m	—	23625255	
ESDC	79.25	40.2	PcP	11:13:19.399	-0.7	315.7	-0.1	4.8	0.4	—	6.3	0.7	0.67	a	—	23579788	

EVENT SCREENING

OriginID	SmaJ_sc	Smin_sc	Depth	Sdep	mbms	Smbms	Foffshore	Dscore	Mscore	Score	Category
20282397	54.3	21.6	0.0	0.0	0.64	0.60	1.00	1.62	1.62	ScreenedOut/Offshore	

CEPSTRAL PEAK ANALYSIS

Sta	PeakAmp	PeakQuef
BBB	0.06527	0.2000
MNV	0.09767	0.0750
MNV	0.09767	0.0750

SHORT-PERIOD/LONG-PERIOD ENERGY RATIO

Sta	Ratio
MNV	0.00009819
MNV	0.00009819

ORIGIN-BASED FREQUENCY-DEPENDENT PHASE AMPLITUDE

Sta	Phase	Amp2-4	SNR2-4	Amp4-6	SNR4-6	Amp6-8	SNR6-8	Amp8-10	SNR8-10
BBB	Pn	40.6	89.0	6.6	80.9	4.6	163.4	2.3	121.8
BBB	Sn	13.5	0.8	6.1	1.7	1.8	1.7	0.6	1.0
ELK	Pn	0.5	1.0	0.3	1.0	0.2	1.0	0.1	1.1
MNV	Pn	0.3	1.4	0.1	1.7	0.1	1.3	0.0	0.9
MNV	LR	2.0	0.6	0.4	0.7	0.2	1.1	0.1	1.3
PDAR	Pn	0.5	0.9	0.5	0.7	0.7	0.7	—	—
PDAR	LR	0.1	1.1	0.1	1.2	0.1	0.9	—	—
YKA	Pn	0.1	1.5	0.0	1.2	0.0	1.3	—	—
YKA	LR	0.0	1.0	0.0	1.0	0.0	1.3	—	—
ILAR	P	0.1	1.2	0.0	1.6	0.0	1.0	—	—
INK	P	0.1	1.2	0.0	0.9	0.0	1.0	0.0	1.1

Appendix A: ▼ Data Message Examples

CALIBPHD

```

DATA_TYPE CALIBPHD
#Header
CA002 CA002CAA2 P DISK FULL 0 0 0
0 0
1997/08/05 01:44:15.0
#Comment
- Standard
ISAR2 CALIBRATION SOURCE IPL 560-73
#Acquisition
1997/08/05 01:26:09.6 906.7          900.0
#Energy
88.099998      180.260513      0.000000
...
1836.099976    3759.928711      0.000000
#Resolution
88.099998      1.161428        0.000000
...
1836.099976    2.283365        0.000000
#Efficiency
88.099998      0.106188        0.004743
...
1836.099976    0.012928        0.000351
#Certificate
1.000000 1997/08/01 19:00:00
Cd-109  1.27083 Y      88.100  80.000  4.000  3.600
Co-57   271.79 D      122.100  74.000  3.000  85.600
Te-123m 119.7 D      159.000  93.000  2.400  84.000
Cr-51   27.71 D      320.100  232.000  2.400  9.900
Sn-113  115.09 D     391.700  254.000  2.600  64.900
Sr-85   64.84 D      514.000  541.000  2.500  98.400
Cs-137  30.1198 Y     661.600  318.000  3.400  85.100
Y-88    106.63 D     898.000  784.000  2.500  94.000
Co-60   5.27347 Y     1173.200  452.000  3.400  99.900
Co-60   5.27347 Y     1332.500  452.000  3.400  100.000
Y-88    106.63 D     1836.100  829.000  2.500  99.400
#Spectrum
4096 0
0 0      0      0      0      0
...

```

CHANNEL

DATA_TYPE CHANNEL IMS1.0														
Net	Sta	Chan	Aux	Latitude	Longitude	Coord Sys	Elev	Depth	Hang	Vang	Sample Rate	Inst	On Date	Off Date
IDC_SEIS	ARA0	she		69.53490	25.50580	WGS-84	0.403	0.010	90.0	90.0	40.000000	GS-13	1987/09/30	
IDC_SEIS	ARA0	shn		69.53490	25.50580	WGS-84	0.403	0.011	0.0	90.0	40.000000	GS-13	1987/09/30	
IDC_SEIS	ARA0	shz		69.53490	25.50580	WGS-84	0.403	0.010	-1.0	0.0	40.000000	GS-13	1987/09/30	
IDC_SEIS	ARA1	shz		69.53630	25.50710	WGS-84	0.411	0.010	-1.0	0.0	40.000000	GS-13	1987/09/30	
IDC_SEIS	ARA2	shz		69.53380	25.50780	WGS-84	0.392	0.010	-1.0	0.0	40.000000	GS-13	1987/09/30	
IDC_SEIS	ARA3	shz		69.53460	25.50190	WGS-84	0.402	0.010	-1.0	0.0	40.000000	GS-13	1987/09/30	
IDC_SEIS	ARB1	shz		69.53790	25.50790	WGS-84	0.414	0.010	-1.0	0.0	40.000000	GS-13	1987/09/30	
IDC_SEIS	ARB2	shz		69.53570	25.51340	WGS-84	0.397	0.010	-1.0	0.0	40.000000	GS-13	1987/09/30	
IDC_SEIS	ARB3	shz		69.53240	25.51060	WGS-84	0.376	0.010	-1.0	0.0	40.000000	GS-13	1987/09/30	
IDC_SEIS	ARB4	shz		69.53280	25.49980	WGS-84	0.378	0.010	-1.0	0.0	40.000000	GS-13	1987/09/30	
IDC_SEIS	ARB5	shz		69.53630	25.49850	WGS-84	0.405	0.010	-1.0	0.0	40.000000	GS-13	1987/09/30	

CHAN_STATUS

DATA_TYPE CHAN_STATUS IMS1.0
Report period from 1994/12/03 00:00:00.0 to 1994/12/04 00:00:00.0

Data Availability Statistics

Net	Sta	Chan	Aux	Max_Exp_Time	% Avail	Gaps	Median	Min	Max
IDC_SEIS	OBN	bhz		000 00:05:00	100.000	0	000:00:00	000:00:00	000:00:00
IDC_SEIS	OBN	bhn		000 00:05:00	99.034	6	000:00:10	000:00:00	000:00:24
IDC_SEIS	OBN	bhe		000 00:05:00	100.000	0	000:00:00	000:00:00	000:00:00
IDC_SEIS	ARU	bhz		000 01:23:14	99.843	8	000:00:07	000:00:00	000:00:12
IDC_SEIS	ARU	bhn		000 01:23:14	99.843	12	000:00:10	000:00:00	000:00:12
IDC_SEIS	ARU	bhe		000 01:23:14	99.843	12	000:00:10	000:00:00	000:00:12

Data Timeliness Statistics

Net	Sta	Chan	Aux	Max_Exp_time	Delay_Med	Mean	Std_Dev	Min	Max
IDC_SEIS	OBN	bhz		000 00:05:00	000:00:00	000:00:00	000:00:00	000:00:00	000:00:00
IDC_SEIS	OBN	bhn		000 00:05:00	000:00:00	000:00:00	000:00:00	000:00:00	000:00:00
IDC_SEIS	OBN	bhe		000 00:05:00	000:00:00	000:00:00	000:00:00	000:00:00	000:00:00
IDC_SEIS	ARU	bhz		000 01:23:14	000:46:22	000:50:17	000:25:50	000:44:14	000:58:01
IDC_SEIS	ARU	bhn		000 01:23:14	000:46:27	000:50:21	000:25:55	000:44:16	000:58:05
IDC_SEIS	ARU	bhe		000 01:23:14	000:45:53	000:49:39	000:26:28	000:43:45	000:57:39

Appendix A: ▼ Data Message Examples

COMMENT

DATA_TYPE COMMENT IMS1.0

Almost anything may be typed into the space between the DATA_TYPE line and the STOP line. No association was desired for this comment, so the association line was left blank. Note that this comment is indented so that the DATA_TYPE in the second line of this paragraph is not interpreted as a command line.

DATA_TYPE COMMENT IMS1.0

Event 7687234

The referenced event was felt over a wide area (300 square kilometers) near the epicenter.

COMM_STATUS

DATA_TYPE COMM_STATUS IMS1.0

Report period from 1994/12/03 00:00:00.0 to 1994/12/04 00:00:00.0

Link		Nom_kbps	Mode	%_Up	From	Util	From	Util
AUS_NDC	- CTBO_IDC	56.0	full	88.4	AUS_NDC	0.50	CTBO_IDC	0.08
NOR_NDC	- CTBO_IDC	128.0	full	99.2	NOR_NDC	0.77	CTBO_IDC	0.10
USA_NDC	- CTBO_IDC	1000.0	full	100.0	USA_NDC	0.25	CTBO_IDC	0.25

AUS_NDC - CTBO_IDC link outages

From	Through	Duration
1994/12/02 20:23:14.0	1994/12/03 00:48:28.0	000 00:25:14.0
1994/12/03 02:34:31.0	1994/12/03 02:49:39.0	000 00:15:08.0
1994/12/03 19:02:27.0	1994/12/03 19:12:29.0	000 00:10:02.0

NOR_NDC - CTBO_IDC link outages

From	Through	Duration
1994/12/03 04:34:31.0	1994/12/03 06:35:39.0	000 00:45:13.0

DETBKPHD

```

DATA_TYPE DETBKPHD
#Header
US001 US001USA1 P DISK FULL 0 0 0
0 0
1997/06/25 21:07:39.0
#Comment
M. Cook - Background
Detector 1 Background (25-JUN-1997)
#Acquisition
1997/06/25 16:42:36.5 15720.8 15719.6
#Energy
88.000000 119.365860 0.000000
...
1836.099976 2507.416504 0.000000
#Resolution
88.000000 1.550320 0.000000
...
1836.099976 2.757118 0.000000
#Efficiency
88.000000 0.089655 0.001912
...
1836.099976 0.012618 0.000324
#Spectrum
4096 0
0 0 0 0 0
...

```

ERROR_LOG

The following example shows how the error_log section is used to identify that the request message line in a request failed.

```

data_type error_log IMS1.0
An error was detected in the
following request message:
begin IMS1.0
msg_type request
msg_id 1040 any_ndc
time 94/03/01 to 94/03/02
*** unrecognized time format ***
sta_list ARA0
waveform
stop

```

**Appendix A: ▼
Data Message
Examples****EVENT**

DATA_TYPE EVENT IMS1.0:short
Reviewed Event Bulletin (REB) of the CTBO_IDC for August 16, 1996
Event 768958 QUEEN CHARLOTTE ISLANDS REGION

Date	Time	Err	RMS	Latitude	Longitude	Smaj	Smin	Az	Depth	Err	Ndef	Nsta	Gap	mdist	Mdist	Qual	Author
1996/08/16	03:41:12.45	0.88	0.92	51.3310	-130.3125	16.6	7.7	63	0.0f	23	18	192	1.61	77.98	m	i	uk IDC_REB
769476																	
1996/08/16	03:41:17.63	1.20	4.26	51.4100	-129.7300	18.9	12.4	70	0.0f	18	17	160	1.27	77.69	m	i	uk IDC_SEL1
768958																	

Magnitude Err Nsta Author OrigID

ML	3.8	0.5	7	IDC_REB	769476
mb	4.0	0.2	6	IDC_REB	769476
ML	3.9	0.2	6	IDC_SEL1	768958
mb	4.1	0.4	10	IDC_SEL1	768958

FLOW

DATA_TYPE FLOW
KW001 30 900

1997/11/13	20:17:00	900	0.17	0.01
1997/11/13	20:32:00	900	0.17	0.01
1997/11/13	20:47:00	900	0.17	0.01
1997/11/13	21:02:00	900	0.17	0.01
1997/11/13	21:17:00	900	0.17	0.01
1997/11/13	21:32:00	900	0.17	0.01
1997/11/13	21:47:00	900	0.17	0.01
1997/11/13	22:02:00	900	0.17	0.01
1997/11/13	22:17:00	900	0.17	0.01
1997/11/13	22:32:00	900	0.16	0.01
1997/11/13	22:47:00	900	0.17	0.01
1997/11/13	23:02:00	900	0.17	0.01
1997/11/13	23:17:00	900	0.16	0.01
1997/11/13	23:32:00	900	0.16	0.01
1997/11/13	23:47:00	900	0.16	0.01

FPEB

DATA_TYPE FPEB

PIDC GENERATED REPORT
FISSION PRODUCT EVENT BULLETIN

Fission Product ID: 59 Revision Number: 1

EVENT WINDOW =====

This section is currently under development.

REGIONAL SOURCE LOCATION =====

This section is currently under development.

EVENT DETECTION SUMMARY =====

Station	Collect Stop	Sample ID	Name	Categorization	Comment
NZ004	1998/08/29 21:15:00	22583	I-123	Not Regularly Measured	
NZ004	1998/08/29 21:15:00	22583	RU-106	Not Regularly Measured	
NZ004	1998/08/29 21:15:00	22583	TE-123M	Not Regularly Measured	

Activation Products present in this spectrum	Yes
Number of days since last activation product	78.4354
One fission product in spectrum	Yes
Number of days since last fission product	7.0104282
2 or more fission products in spectrum	Yes
Number of days since 2 or more fission products	10.0768056
Cs-137 present in spectrum	Yes
Number of times seen in last 30 days	Never Seen

ISOTOPIC RATIOS =====

This section is currently under development.

CERTIFIED LABORATORY RESULTS =====

This section is currently under development.

**Appendix A: ▼
Data Message
Examples****FTP_LOG**

The following example is a data message sent to a requestor of data. It indicates that the data are on machine `pidc.org` in directory `/pub/data` in file `1994001.gz`. The requestor must log into `pidc.org` as a user to obtain the data.

```
data_type ftp_log IMS1.0
ftp_file pidc.org user /pub/data any_ndc 1994001.gz
The original request could not be satisfied using
email due to the size of the requested
information; ftp was used instead. Please
log into your user account to retrieve the
data. Data will be removed by 1996/10/23.
```

HELP

The following examples use the correct protocols for requesting an *AutoDRM User's Guide* from the message subsystem.

```
to: [AutoDRM email address]
from: [your email address]
subject: [any subject]
cc:
bcc:
Attached:
[Text as follows: help]
```

```
to: [AutoDRM email address]
from: [your email address]
subject: help
cc:
bcc:
Attached:
```

LOG

The following example is a section of a message that is sent to a data requestor or subscriber after *AutoDRM* processes a subscription or request message. The log section precedes the message data section and is used to state that the request command was processed.

```
data_type log IMS1.0
command waveform processed.
data_type waveform IMS1.0:cm6
...
```


MET

DATA_TYPE MET

KW001

1997/11/09	09:46:00	1997/11/09	10:01:00	21	28	330	0	1021.87	3	0
1997/11/09	10:01:00	1997/11/09	10:16:00	21	28	330	0	1022.80	3	0
1997/11/09	10:16:00	1997/11/09	10:31:00	21	28	330	0	1023.27	3	0
1997/11/09	10:31:00	1997/11/09	10:46:00	21	27	330	0	1023.97	3	0
1997/11/09	10:46:00	1997/11/09	11:01:00	21	27	315	0	1025.37	3	0
1997/11/09	11:01:00	1997/11/09	11:16:00	20	27	310	0	1025.43	3	0
1997/11/09	11:16:00	1997/11/09	11:31:00	20	27	310	0	1024.37	3	0
1997/11/09	11:31:00	1997/11/09	11:46:00	20	26	310	0	1024.27	3	0
1997/11/09	11:46:00	1997/11/09	12:01:00	20	26	310	0	1024.07	3	0

NETWORK

data_type network IMS1.0

Net Description

IDC_SEIS International Data Center Seismic Network

IDC_HYDR International Data Center Hydroacoustic Network

ORIGIN

```
DATA_TYPE ORIGIN IMS1.0
Date      Time      Err      RMS Latitude Longitude  Smaj  Smin  Az  Depth  Err Ndef Nsta Gap  mdist  Mdist Qual  Author
OrigID
1996/08/16 03:41:12.45  0.88  0.92  51.3300 -130.3100  16.6  7.7  63  0.0f  23  18 192  1.61  77.98 m i uk IDC_REB
769476

Magnitude Err Nsta Author  OrigID
ML  3.8 0.5 7 IDC_REB 769476
mb  4.0 0.2 6 IDC_REB 769476

Date      Time      Err      RMS Latitude Longitude  Smaj  Smin  Az  Depth  Err Ndef Nsta Gap  mdist  Mdist Qual  Author
OrigID
1996/08/16 04:35:17.66  2.72  0.29  2.1300 127.8800  55.1  44.2  71  0.0f  9  9 150  22.84  92.33 m i uk IDC_REB
769435

Magnitude Err Nsta Author  OrigID
mb  4.1 0.4 7 IDC_REB 769435
```

OUTAGE

```
DATA_TYPE OUTAGE IMS1.0
Report period from 1994/12/24 00:00:00.000 to 1994/12/25 12:00:00.000
NET Sta Chan Aux Start Date Time End Date Time Duration Comment
IDC_SEIS APL shz 1994/12/24 08:13:05.000 1994/12/24 08:14:10.000 65.000
IDC_SEIS APL shn 1994/12/25 10:00:00.000 1994/12/25 10:00:00.030 0.030
```

QCPHD

```

DATA_TYPE QCPHD
#Header
CA002 CA002CAA2 P DISK FULL 0 0 0
0 0
1997/10/06 05:02:08.0
#Comment
goshka - Standard
ISAR2 CALIBRATION SOURCE IPL 560-73
#Acquisition
1997/10/06 04:43:52.8 904.8          900.0
#Energy
88.099998      180.234055      0.000000
...
1836.099976    3759.182129      0.000000
#Resolution
88.099998      1.188847        0.000000
...
1836.099976    2.365590         0.000000
#Efficiency
88.099998      0.103601        0.004296
...
1836.099976    0.012451         0.000325
#Certificate
1.000000 1997/08/01 19:00:00
Cd-109  1.27083 Y      88.100  80.000  4.000  3.600
Co-57   271.79 D      122.100  74.000  3.000  85.600
Te-123m 119.7 D      159.000  93.000  2.400  84.000
Cr-51   27.71 D      320.100  232.000  2.400  9.900
Sn-113  115.09 D      391.700  254.000  2.600  64.900
Sr-85   64.84 D      514.000  541.000  2.500  98.400
Cs-137  30.1198 Y     661.600  318.000  3.400  85.100
Y-88    106.63 D     898.000  784.000  2.500  94.000
Co-60   5.27347 Y     1173.200  452.000  3.400  99.900
Co-60   5.27347 Y     1332.500  452.000  3.400  100.000
Y-88    106.63 D     1836.100  829.000  2.500  99.400
#Spectrum
4096 0
0 0      0      0      0      0
...

```

Appendix A: ▼ Data Message Examples

RESPONSE

```

DATA_TYPE RESPONSE
CAL2 MIAR BHZ      CMG-3N 4.11000000E+00 16.000 40.00000 1992/09/23 20:00
(USNSN station at Mount Ida, Arkansas, USA)
PAZ2 1 V 7.29000000E+04 1.000 4 2 CMG-3 (NSN) Acc-Vel (Std)
-3.14000000E-02 3.14000000E-04
-1.97000000E-01 1.97000000E-03
-2.01000000E+02 2.01000000E+00
-6.97000000E+02 6.97000000E+00
0.00000000E+00 0.00000000E+00
0.00000000E+00 0.00000000E+00
(Theoretical response provided by Guralp Systems, Ltd.)
DIG2 2 4.18000000E+05 5120.00000 Quanterra QX80
FIR2 3 1.00E+00 16 0.006 C 30 QDP380/900616 stage 1
-1.11328112e-03 -1.00800209e-03 -1.35286082e-03 -1.73045369e-03 -2.08418001e-03
-2.38537718e-03 -2.60955630e-03 -2.73352256e-03 -2.73316190e-03 -2.58472445e-03
-2.26411712e-03 -1.74846814e-03 -1.01403310e-03 -3.51681737e-05 1.23782025e-03
3.15983174e-03 6.99944980e-03 9.09959897e-03 1.25423642e-02 1.63123012e-02
2.02632397e-02 2.43172608e-02 2.84051094e-02 3.24604138e-02 3.64142842e-02
4.01987396e-02 4.37450483e-02 4.69873249e-02 4.98572923e-02 5.22795729e-02
FIR2 4 1.00E+00 2 0.379 C 22 QDP380/900616 stage 2,3,4
2.88049545e-04 1.55313976e-03 2.98230513e-03 2.51714466e-03 -5.02926821e-04
-2.81205843e-03 -8.08708369e-04 3.21542984e-03 2.71266000e-03 -2.91550322e-03
-5.09429071e-03 1.33933034e-03 7.40034366e-03 1.82796526e-03 -8.81958286e-03
-6.56719319e-03 8.38608573e-03 1.24268681e-02 -5.12978853e-03 -1.84868593e-02
-1.79236766e-03 2.33604181e-02
(Theoretical response provided by Quanterra, Inc.)

```

RSR

```

DATA_TYPE RSR
Radionuclide Summary Report
RSR Collect-Stop Window: 1997/10/12 00:00:00 - 1997/10/19 23:59:59

```

MEASUREMENT CATEGORIZATION SUMMARY:

Categorization Legend

```

Level 1 = Normal Natural Rad. Meas.
Level 2 = Abnormal Natural Rad. Meas.
Level 3 = Normal Anthropogenic Rad. Meas.
Level 4 = Abnormal Anthropogenic Rad. Meas.
Level 5 = Mult. Abnormal Anthropogenic Rad. Meas.

```

Categories Itemized: 2 4

Collect Stop Station	SID	Name	Level	Statistical Range Status
1997/10/15 AR001	29467	BE-7	2	Below Statistical Range
1997/10/16 SE001	29522	BE-7	2	Below Statistical Range

Level Distribution Over All Categorized & Reviewed Spectra

Total Categorized & Reviewed Spectra: 28

Level 1	Level 2	Level 3	Level 4
21 (75.00%)	2 (7.14%)	5 (17.86%)	0 (0.00%)

MAN-MADE RADIONUCLIDE SUMMARY:

▼ Appendix A:
Data Message
Examples

Legend:

 Conc -> Concentration of Nuclide measured in uBq/m3
 CP -> Collection Period measured in days

Col Stop	Station	Station Location	Nuclide	Conc	Error	CP
-----	-----	-----	-----	----	-----	--
1997/10/13	FI001	Helsinki, Finland	CS-137	1.42	5.78	7.0
1997/10/13	SE001	Stockholm, Sweden	CS-137	3.02	16.81	3.0
1997/10/13	SE001	Stockholm, Sweden	XE-133	5681.95	10.06	3.0
1997/10/14	SE001	Stockholm, Sweden	CS-137	1.72	50.36	1.0
1997/10/15	SE001	Stockholm, Sweden	XE-133	1617.03	27.02	2.0
1997/10/16	SE001	Stockholm, Sweden	CS-137	0.98	45.12	1.0

DATA RECEIPT SUMMARY:

Station	Station Location	Full Spectra	Other Spectra
-----	-----	-----	-----
AR001	Argentina	3	0
AU001	Melbourne, Australia	10	10
CA002	Vancouver, Canada	14	16
FI001	Helsinki, Finland	1	1
KW001	Kuwait City, Kuwait	10	10
SE001	Stockholm, Sweden	6	0
US001	Charlottesville, VA, USA	6	6

MINIMUM DETECTABLE CONCENTRATION SUMMARY:

 Each cell in this table expresses the ratio of the actual MDC of the station/nuclide combination (calculated by taking the median of the MDCs over the time period desired) to the maximum MDC for that station/nuclide combination as expressed in CD-WP224.

	BA-140	CE-143	CS-134	CS-136	CS-137	I-131	I-133
AR001	0.71	0.56	0.48	0.50	0.55	1.36	0.83
AU001	1.92	0.91	1.27	1.25	1.56	3.43	1.18
AU002	1.60	17.10	0.90	1.55	0.91	3.24	135.78
AU003	1.58	19.61	0.79	1.50	0.83	3.09	188.91
AU004	0.87	12.47	0.55	0.88	0.60	2.41	57.92
CA002	0.28	0.26	0.26	0.25	0.26	0.53	0.29
DE002	0.04	0.73	0.02	0.03	0.01	0.11	1.54
FI001	0.04	0.66	0.02	0.03	0.02	0.11	2.90
KW001	0.98	1.21	0.69	0.70	0.77	2.08	1.37
NZ001	0.19	0.24	0.10	0.02	0.11	0.11	22.90
NZ002	0.36	2.20	0.17	0.05	0.19	0.34	305.41
NZ003	0.21	0.08	0.14	0.02	0.15	0.13	2.62
SE001	0.42	0.41	0.34	0.41	0.26	0.74	0.72
US001	1.06	0.80	0.68	0.75	0.80	2.01	1.26
	MO-99	NB-95	RU-103	TE-132	ZR-95	ZR-97	XE-131M
AR001	1.06	0.38	0.48	0.50	0.89	0.55	0.00
AU001	2.08	1.02	1.44	1.22	2.27	0.57	0.00
AU002	10.55	0.81	0.85	2.50	1.79	286.44	0.00
AU003	10.03	0.67	0.82	2.52	1.81	379.18	0.00
AU004	5.69	0.41	0.55	1.97	1.02	112.10	0.00
CA002	0.47	0.16	0.19	0.19	0.40	0.24	0.00
DE002	0.22	0.02	0.02	0.13	0.04	2.25	0.00
FI001	0.23	0.02	0.02	0.10	0.04	4.33	0.00
KW001	1.47	0.50	0.72	0.87	1.32	0.79	0.00
NZ001	1.46	0.09	0.10	0.10	0.20	46.07	0.00
NZ002	4.52	0.15	0.18	0.44	0.35	1073.10	0.00

Appendix A: ▼ Data Message Examples

NZ003	0.86	0.11	0.13	0.08	0.26	3.18	0.00
SE001	0.98	0.25	0.28	0.31	0.63	0.51	4.91
US001	1.47	0.56	0.78	0.84	1.27	0.76	0.00

	XE-133	XE-133M	XE-135
AR001	0.00	0.00	****
AU001	0.00	0.00	****
AU002	0.00	0.00	****
AU003	0.00	0.00	****
AU004	0.00	0.00	****
CA002	0.00	0.00	****
DE002	0.00	0.00	****
FI001	0.00	0.00	****
KW001	0.00	0.00	****
NZ001	0.00	0.00	****
NZ002	0.00	0.00	****
NZ003	0.00	0.00	****
SE001	2.15	17.75	****
US001	0.00	0.00	****

SAMPLEPHD

```
DATA_TYPE SAMPLEPHD
#Header
FI001 FI001-F09 P W FULL FI001-S-1997/09/15-06:46:00.0 0 0
FI001-F09-1997/09/26-13:37:00.0 FI001-F09-1996/11/05-12:59:00.0
1997/09/29 09:25:41.0
#Collection
1997/09/15 06:46:00.0 1997/09/22 06:43:00.0 99043
#Sample
15.60 1.02 11.00
#Acquisition
1997/09/26 13:37:00.0 229200 229200
#Energy
2.449E+00 3.000E+00 3.000E-01
...
2.706E+03 8.129E+03 3.000E-01
#Resolution
2.449E+00 7.695E-01 5.000E-02
...
2.706E+03 2.465E+00 5.000E-02
#Efficiency
3.000E+01 2.160E-03 1.000E-01
...
3.600E+03 2.108E-02 6.312E-04
#Totaleff
3.000E+01 7.202E-03 1.000E-01
...
3.600E+03 1.109E-01 3.323E-03
#Spectrum
8192 2700
0 7 10 11 8 9
....
```

STATION

DATA_TYPE	STATION	IMS1.0							
Net	Sta	Type	Latitude	Longitude	Coord Sys	Elev	On Date	Off Date	
IDC_SEIS	ARCES	hfa	69.53490	25.50580	WGS-84	0.403	1987/09/30		
IDC_SEIS	ARA0	3C	69.53490	25.50580	WGS-84	0.403	1987/09/30		
IDC_SEIS	ARA1	1C	69.53630	25.50710	WGS-84	0.411	1987/09/30		
IDC_SEIS	ARA2	1C	69.53380	25.50780	WGS-84	0.392	1987/09/30		
IDC_SEIS	ARA3	1C	69.53460	25.50190	WGS-84	0.402	1987/09/30		
IDC_SEIS	ARB1	1C	69.53790	25.50790	WGS-84	0.414	1987/09/30		
IDC_SEIS	ARB2	1C	69.53570	25.51340	WGS-84	0.397	1987/09/30		
IDC_SEIS	ARB3	1C	69.53240	25.51060	WGS-84	0.376	1987/09/30		
IDC_SEIS	ARB4	1C	69.53280	25.49980	WGS-84	0.378	1987/09/30		
IDC_SEIS	ARB5	1C	69.53630	25.49850	WGS-84	0.400	1987/09/30		
IDC_SEIS	ARC1	1C	69.54110	25.50790	WGS-84	0.381	1987/09/30		
IDC_SEIS	ARC2	3C	69.53830	25.52290	WGS-84	0.395	1987/09/30		
IDC_SEIS	ARC3	1C	69.53290	25.52310	WGS-84	0.376	1987/09/30		
IDC_SEIS	ARC4	3C	69.52930	25.51170	WGS-84	0.377	1987/09/30		
IDC_SEIS	ARC5	1C	69.53000	25.49820	WGS-84	0.374	1987/09/30		
IDC_SEIS	ARC6	1C	69.53410	25.48820	WGS-84	0.395	1987/09/30		
IDC_SEIS	ARC7	3C	69.53960	25.49360	WGS-84	0.362	1987/09/30		
IDC_SEIS	ARD1	1C	69.54830	25.50930	WGS-84	0.395	1987/09/30		
IDC_SEIS	ARD2	1C	69.54520	25.53080	WGS-84	0.366	1987/09/30		

STA_STATUS

DATA_TYPE STA_STATUS IMS1.0
Report period from 1994/12/03 00:00:00.0 to 1994/12/04 00:00:00.0

Station Capability												
Net	Sta	Ch	Full	Part	Low	Non	Max_Exp_Time	Avail	Med_Delay	Att	Suc	Pnd
IDC_SEIS	ARCES	33	100.000	0.000	0.000	0.000	000 24:00:00	98.587	000 00:42.9			
IDC_SEIS	ABC	3	90.056	5.944	0.000	4.000	000 00:23:35	90.089	000 00:55.7	3	3	0
IDC_SEIS	DEF	3	80.154	19.846	0.000	0.000	000 24:00:00	83.080	000 05:23.6			

WAVEFORM (IMS1.0:CM6 FORMAT)

The following waveform has the channel code scc, which indicates that it is a short-period coherent beam. The eid2 line shows that this waveform is associated with the IDC_REB event 54903285. The bea2 line reveals that the beam was formed with an azimuth of 127.6 degrees and slowness of 0.125 degrees/second. The Beam/D FICB.Pa may be used to get more detailed beam information from the beam data type.

DATA_TYPE WAVEFORM IMS1.0:CM6
WID2 1996/10/15 09:54:00.000 ARCES scc CM6 1200 20.000000 2.70e-01 1.0000 S-13 -1.0 0.0
STA2 IDC_SEIS 69.53489 25.50580 WGS-84 0.402 0.009
EID2 54903285 IDC_REB
BEA2 FICB.Pa 127.6 0.125
DAT2
AFKFCUHTKHHCKRMUK-F4N+2-M1UHKGT6UHKGRUG6KQDDKEPUI7KO0UKLMUFLP6-F2R+AKKFC3OGA+KG65KEABQR
8DQIAFS+BR5UFTKFUG5SFCNH7OLF7HP5BK6-AMKG6U
...
CHK2 8439546

The following message would be sent if data were not available from station KAF, channel shz from 1996 October 15 9:56:00.000 through 1996 October 15 9:57:00.000.

```
DATA TYPE WAVEFORM IMS1.0:CM6
WID2 1996/10/15 09:54:00.000 KAF shz CM6 2400 20.000000 2.70e-01 1.0000 S-13 -1.0 0.0
STA2 IDC_SEIS 62.11270 26.30621 WGS-84 0.195 0.014
DAT2
APKFCUHTK-HUHCKRMUK-F4N+2-M1UHKGT6UHKGRUG6KQDDKEPUI7KO0UKLMUFLP6-F2R+AKKFC3OGA+kG65KEABQR
8DQIAFS+BR5UFTKRFUG5SFCNH70LF7HP5BK-G-AMKG6U
...
CHK2 1439544
OUT2 1996/10/15 09:56:00.000 KAF shz 60.000
STA2 IDC_SEIS 62.11270 26.30621 WGS-84 0.195 0.014
WID2 1996/10/15 09:57:00.000 KAF shz CM6 1200 20.000000 2.70e-01 1.0000 S-13 -1.0 0.0
STA2 IDC_SEIS 62.11270 26.30621 WGS-84 0.195 0.014
DAT2
APKFCUHTK-HUHCKRMUK-F4N+2-M1UHKGT6UHKGRUG6KQDDKEPUI7KO0UKLMUFLP6-FH62R+AKKFC3OGA+kG65KEABQR
8DQIAFS+BR5UFTKRFUG5SFCNH70LF7HP5BK-G-AMKG6U
...
CHK2 8648264
STOP
```

WAVEFORM (IMS1.0:INT FORMAT)

```
WID2 1994/03/10 12:13:14.800 BLA shz INT 32490 40.000000 1.30e-02 2.000 GS-13 -1.0 0.0
STA2 IDC_SEIS 37.21130 -80.42050 WGS-84 0.491 0.009
DAT2
1873 1734 1690 1200 873 340 -290 -478 -1300 -209 -1972 -24 13 25 64 81 102 76 53 23 -10 -80 -132
...
12 15 36 75 53 80 27 6 -17 -32 -95 -73 -43 -4 3 29 46 59 100 125 103 76 52 10 -30
CHK2 4968214
```


Appendix B: Authentication Example

This appendix contains an example of an authenticated request message.

**Appendix B: ▼
Authentication
Example**

Appendix B: Authentication Example

AUTHENTICATED REQUEST MESSAGE

The following example shows a message requesting data from the Standard Event List 1 (SEL1). The message would be authenticated between the 'BEGIN' and 'STOP' lines. The digital signature is in the section labeled 'Cryptographic Signature'.

```
Received: from oedipus.CSS.GOV (oedipus.CSS.GOV [140.162.3.93])
    by zydeco.CSS.GOV (8.8.8/8.8.8) with ESMTTP id KAA10451;
    Fri, 2 Oct 1998 10:37:32 -0400 (EDT)
Received: from cmr.gov (localhost [127.0.0.1])
    by oedipus.CSS.GOV (8.8.8/8.8.8) with ESMTTP id KAA20612;
    Fri, 2 Oct 1998 10:37:30 -0400 (EDT)
Sender: pmoore@cmr.gov
Message-ID: <3614E521.707893E2@cmr.gov>
Date: Fri, 02 Oct 1998 10:37:21 -0400
From: "Patrick G. Moore" <pmoore@cmr.gov>
Organization: Center for Monitoring Research
X-Mailer: Mozilla 4.05 [en] (X11; I; SunOS 5.6 sun4m)
MIME-Version: 1.0
To: salzberg@css.gov
Subject: signed request message
Content-Type: multipart/signed; protocol="application/x-pkcs7-signature";
    micalg=sha1; boundary="-----msDC7ECA315AB748BC62A6C224"
Content-Length: 3772
X-Mozilla-Status: 8001
```

This is a cryptographically signed message in MIME format.

```
-----msDC7ECA315AB748BC62A6C224
Content-Type: text/plain; charset=us-ascii
```

Content-Transfer-Encoding: 7bit

```
BEGIN IMS1.0
MSG_TYPE REQUEST
MSG_ID Auth_ex GSI_IDC
TIME 1998/01/01 to 1998/01/02
BULL_TYPE SEL1
BULLETIN IMS1.0
STOP
-----msDC7ECA315AB748BC62A6C224
Content-Type: application/x-pkcs7-signature; name="smime.p7s"
Content-Transfer-Encoding: base64
Content-Disposition: attachment; filename="smime.p7s"
Content-Description: S/MIME Cryptographic Signature
```

MI1JMAJJKoZIhvcNAQcCoIIJITCCCR0CAQEXcZAJBgUrDgMCGGUAMASGCSqGS1b3DQEHAaC
B6wwggQ3MIIDoKADAgECAgQ0Y1loEMA0GCSqGS1b3DQEBBAUAMGAXcZAJBgNVBAYTAkNBMR4w
HAYDVQQKEExVobyBMAWFiawXpdHkgQWNjZXB0ZWQxMTAvBgNVBAsTKEVudHJ1c3QgRGVtbyBX
ZWIGQ2VydG1maWNhdGlvb1BbdXR0b3JpdHkwHhcNOTgxMDAxMTgyMzA2WhcNOTkwNDAMTgy
MzA2WjCBiJELMAkGA1UEBhMCMVVMxJzAlBgNVBAoThkNlbnRlciBmb3IgtW9uaXRvcmluZyBS
ZXNlYXJjaDEdMBsGA1UECXMUUD9mdHdhcmUgRGV2ZWxvcG11bnQxMzAUBgNVBAMTDVBhdHJp
Y2sgTW9vcmlUwGwYJKoZIhvcNAQkBFg5wbW9vcmlVAY21yLmdvdjBcMA0GCSqGS1b3DQEBQUA
A0sAMEGCGQODTgV4+uPoreqmgelL2T0VubbsKqU6X7sJx2IRm68GI35c1+97f68DgWss+T61Lz
K4e1Ut70QJ9JedzbqhmpQq3NAGMBAAGjggIVMICETA9Bg1ghkgBhvCAQMEMBYuY2dpLWNs
aS93ZWJjbGkuZXB3R5cGU9cmV2Y2h1Y2s/Q1JMPTY/c2VyaWFsPTARBglghkgBhvCAQEE
BAMCBSAwJQYJYIZIAyb4QgECBBGWFmh0dHA6Ly8yMDQuMTAxLjEyOC41MCM8wIAYJYIZIAyb4
QgEHBMMWEWRvY2Nsas9pbmRlc5odG1sMCEGCWCWSAGG+EIBCAQUFhJkb2NjbGkvcG9saWN5
Lmh0bWwwNwYJYIZIAyb4QgENBCoWKFROaXMGaXMGYSBTL01JTUUtT25seSBjbG11bnQgY2Vy
dG1maWNhdGUwHwYDVR0jBBgwFoAukXyPpqwKH9VS8o3Yym0f1fhL9EcwHQYDVR0OBBYEFPyj
DVfe+80lpNxytK9daBITznPTMASGA1UdDwQEAWiFoDAAaBgNVHRAEEZARgQ8xOtK5MDIwNjAz
MjMwNlowCQYDVR0TBAlwADCBggYDVR0fBHsweTB3oHWgc6RxMG8xCZAJBgNVBAYTAkNBMR4w
HAYDVQQKEExVobyBMAWFiawXpdHkgQWNjZXB0ZWQxMTAvBgNVBAsTKEVudHJ1c3QgRGVtbyBX
ZWIGQ2VydG1maWNhdGlvb1BbdXR0b3JpdHkwHhcNOTcxMTA2MjEzNDU0WhcNMdIXMTA2
MjEzNDU0WjBGMQswCQYDVQQGEWJQTEeMBWGA1UEChMVTm8tGtG1hYmlsaXR5IEFyY2VwdGVk

Appendix B: ▼ Authentication Example

```
MTEwLwYDVQQLYmFbnRydXN0IERlbW8gV2ViIENlcnpZmljYXRpb24gQXV0aG9yaXR5MIGd
MA0GCSqGSIb3DQEBAQUAA4GLADCBhwKBgQCt0ateoxBrX9dRs59Layn0VVN/qDtqYOADZexB
qm514GkOV1wyj6chu74AjvNMMcikhR3cOLBw6edRlzo0FZOIGFtABXPfqcBwjLeMCx6VeI
TMTrVhUvh04M+P/Rfkd6eR+T3aKffH0pNemlaVd1zoywHQ7R0JA5rihShB/u9QIBA6OCATQw
ggEwMB8GA1UdIwQYMBaAFJMWKb6sCh/VUvKN2MptH5X4S/RHMB0GA1UdDgQWBBSTFim+rAof
1VLyjdjKbr+V+Ev0RzALBgNVHQ8EBAMCAQYwGgYDVR0QBBMwEYEPmjAwMjExMDYyMTM0NTRa
MAwGA1UdEwQFMAMBAf8wgYIGA1UdHwR7MHkwd6Bl0HOkcTBvMQswCQYDVQQGEwJDQTEeMBwG
A1UEChMVTm8gTGhlhYmlsaXR5IEFjY2VwdGVkMTEwLwYDVQQLYmFbnRydXN0IERlbW8gV2Vi
IENlcnpZmljYXRpb24gQXV0aG9yaXR5MQ0wCwYDVQQDEwRDUkwMB8GCSqGSIb2fQdBAAQS
MBAbCldFQknBIDEuMDEDAgbAMBEGCWCsAGG+EIBAQQEAWIABzANBgkqhkiG9w0BAQQFAAOB
gQAJHffNpg4CAhG/61jQBkzGoxJRMpYj6jhknclZt1/EcU96YtZ38FP/SO4V0jtYK21PRI1
LKw/MfOVH+IiehXg58NMkpqXHK00YY1j4Jy4TTLncFaRh101tPXtegaykQp+FLxkDc9638d+
aG4fm0V3BRe8G1+pLx4mN9eobeexzjGCAUwwgGFIAGEBMGgwYDELMakGA1UEBhMCQ0ExHjAc
BgNVBAoTFU5vIEExpYWJpbG10eSBBY2NlcHRlZDExMC8GA1UECXMORW50cnVzdCBEZW1vIFdl
YiBDZXJ0aWZpY2F0aW9uIEF1dGhvcml0eQIENGJaBDAJBGUrdGMCgUAOh0wGAYJKoZIhvcN
AQkDMQsGCSqGSIb3DQEHAQACBgkqhkiG9w0BCQUxDxcNOtgxMDAyMTQzNzIxWjAeBgkqhkiG
9w0BCQ8xETAPMA0GCCqGSIb3DQMAAgEoMCMGCSqGSIb3DQEJBDEWBBT+v88ZXyzZ6HBAABDd
0z7ITN3LkjANBgkqhkiG9w0BAQEFAARAJWfm571r5R24d9jWsmZ8e/qB4yVC39zPHLvhkwoV
Nju0AxQw6eNt8Mp7GpO22vI7Vz/sIA1ptsE2unNH1T5wwA==
-----msDC7ECA315AB748BC62A6C224--
```

DECODED SIGNATURE BLOCK

This section shows the decoded contents of the signature block for the previous example. The signature block was first converted from its base 64 encoding to the ASN.1 binary representation. Next, the binary representation was parsed with a custom program to identify each ASN.1 field that is contained in the signature block. The X.509 specification determines the ASN.1 fields and their ordering within the certificates and signatures [\[ITU95\]](#).

This signature block in the example contains the signature of the body of the message using one PIDC staff member's secret RSA key, along with a public key in a certificate, which has been signed by the Entrust demo Certificate Authority. To verify this signature, the application must have the PIDC staff member's or the Certificate Authority's certificate in its list of trusted certificates. This block would be almost identical had DSA been used rather than RSA signatures.

▼ **Appendix B:
Authentication
Example**

```

0 30 2352: SEQUENCE {
  4 06    9:  OBJECT IDENTIFIER signedData (1 2 840 113549 1 7 2)
15 A0 2337:  [0] {
19 30 2333:    SEQUENCE {
23 02    1:      INTEGER 1
26 31   11:      SET {
28 30    9:        SEQUENCE {
30 06    5:          OBJECT IDENTIFIER sha1 (1 3 14 3 2 26)
37 05    0:          NULL
      :          }
      :          }
39 30   11:    SEQUENCE {
41 06    9:      OBJECT IDENTIFIER data (1 2 840 113549 1 7 1)
      :      }
52 A0 1964:    [0] {
56 30 1079:      SEQUENCE {
60 30  928:        SEQUENCE {
64 A0    3:          [0] {
66 02    1:            INTEGER 2
      :            }
69 02    4:            INTEGER 878860804
75 30   13:          SEQUENCE {
77 06    9:            OBJECT IDENTIFIER
      :            md5withRSAEncryption (1 2 840 113549 1 1 4)
88 05    0:            NULL
      :            }
90 30   96:          SEQUENCE {
92 31   11:            SET {
94 30    9:              SEQUENCE {
96 06    3:                OBJECT IDENTIFIER countryName (2 5 4 6)
101 13   2:                PrintableString 'CA'
      :                }
      :                }
105 31   30:          SET {
107 30   28:            SEQUENCE {
109 06    3:              OBJECT IDENTIFIER organizationName (2 5 4 10)
114 13   21:              PrintableString 'No Liability Accepted'
      :              }
      :          }
      :      }

```

Appendix B: ▼ Authentication Example

```

137 31 49:      SET {
139 30 47:      SEQUENCE {
141 06 3:        OBJECT IDENTIFIER
                  organizationalUnitName (2 5 4 11)
146 13 40:      PrintableString 'Entrust Demo Web Certification
Authority'
                  :
                  :
                  :
188 30 30:      SEQUENCE {
190 17 13:      UTCTime '981001182306Z'
205 17 13:      UTCTime '990401182306Z'
                  :
                  :
220 30 138:     SEQUENCE {
223 31 11:      SET {
225 30 9:        SEQUENCE {
227 06 3:        OBJECT IDENTIFIER countryName (2 5 4 6)
232 13 2:        PrintableString 'US'
                  :
                  :
                  :
236 31 39:      SET {
238 30 37:      SEQUENCE {
240 06 3:        OBJECT IDENTIFIER organizationName (2 5 4 10)
245 13 30:      PrintableString 'Center for Monitoring Research'
                  :
                  :
                  :
277 31 29:      SET {
279 30 27:      SEQUENCE {
281 06 3:        OBJECT IDENTIFIER
                  organizationalUnitName (2 5 4 11)
286 13 20:      PrintableString 'Software Development'
                  :
                  :
                  :
308 31 51:      SET {
310 30 20:      SEQUENCE {
312 06 3:        OBJECT IDENTIFIER commonName (2 5 4 3)
317 13 13:      PrintableString 'Patrick Moore'
                  :
                  :
332 30 27:      SEQUENCE {
334 06 9:        OBJECT IDENTIFIER

```


▼ **Appendix B:
Authentication
Example**

```

:                               emailAddress (1 2 840 113549 1 9 1)
345 16 14:                     IA5String 'pmoore@cmr.gov'
:                               }
:                               }
:                               }
361 30 92: SEQUENCE {
363 30 13: SEQUENCE {
365 06 9:   OBJECT IDENTIFIER
:         rsaEncryption (1 2 840 113549 1 1 1)
376 05 0:   NULL
:         }
378 03 75: BIT STRING 0 unused bits
:         30 48 02 41 00 D3 82 FE 3E B8 F3 AB 7A A9 A0 78
:         BD 93 D1 55 1B 6E C2 AA 53 A5 FB B0 9C 76 21 19
:         BA F0 62 37 E5 CD 7E F7 B7 FA F0 38 16 B1 2F 93
:         E8 89 59 2B 87 B5 52 DE CE 40 9F 49 78 3C DB AA
:         19 A9 42 AD CD 02 03 01 00 01
:         }
455 A3 533: [3] {
459 30 529: SEQUENCE {
463 30 61: SEQUENCE {
465 06 9:   OBJECT IDENTIFIER
:         revocation-url (2 16 840 1 113730 1 3)
476 04 48:   OCTET STRING
:         16 2E 63 67 69 2D 63 6C 69 2F 77 65 62 63 6C 69
:         2E 65 78 65 3F 74 79 70 65 3D 72 65 76 63 68 65
:         63 6B 3F 43 52 4C 3D 36 3F 73 65 72 69 61 6C 3D
:         }
526 30 17: SEQUENCE {
528 06 9:   OBJECT IDENTIFIER
:         cert-type (2 16 840 1 113730 1 1)
539 04 4:   OCTET STRING
:         03 02 05 20
:         }
545 30 37: SEQUENCE {
547 06 9:   OBJECT IDENTIFIER
:         base-url (2 16 840 1 113730 1 2)
558 04 24:   OCTET STRING
:         16 16 68 74 74 70 3A 2F 2F 32 30 34 2E 31 30 31
:         2E 31 32 38 2E 35 30 2F

```

Appendix B: ▼ Authentication Example

```

:
584 30 32: SEQUENCE {
586 06 9:   OBJECT IDENTIFIER
:         renewal-url (2 16 840 1 113730 1 7)
597 04 19:   OCTET STRING
:         16 11 64 6F 63 63 6C 69 2F 69 6E 64 65 78 2E 68
:         74 6D 6C
:       }
618 30 33: SEQUENCE {
620 06 9:   OBJECT IDENTIFIER
:         ca-policy-url (2 16 840 1 113730 1 8)
631 04 20:   OCTET STRING
:         16 12 64 6F 63 63 6C 69 2F 70 6F 6C 69 63 79 2E
:         68 74 6D 6C
:       }
653 30 55: SEQUENCE {
655 06 9:   OBJECT IDENTIFIER
:         comment (2 16 840 1 113730 1 13)
666 04 42:   OCTET STRING
:         16 28 54 68 69 73 20 69 73 20 61 20 53 2F 4D 49
:         4D 45 2D 4F 6E 6C 79 20 63 6C 69 65 6E 74 20 63
:         65 72 74 69 66 69 63 61 74 65
:       }
710 30 31: SEQUENCE {
712 06 3:   OBJECT IDENTIFIER
:         authorityKeyIdentifier (2 5 29 35)
717 04 24:   OCTET STRING
:         30 16 80 14 93 16 29 BE AC 0A 1F D5 52 F2 8D D8
:         CA 6D 1F 95 F8 4B F4 47
:       }
743 30 29: SEQUENCE {
745 06 3:   OBJECT IDENTIFIER
:         subjectKeyIdentifier (2 5 29 14)
750 04 22:   OCTET STRING
:         04 14 F6 23 0D 57 DE FB C3 A5 A4 DC 58 B4 AF 5D
:         68 12 13 CE 73 D3
:       }
774 30 11: SEQUENCE {
776 06 3:   OBJECT IDENTIFIER keyUsage (2 5 29 15)
781 04 4:   OCTET STRING

```

▼ **Appendix B:
Authentication
Example**

```

      :      03 02 05 A0
      :
      :      }
787 30 26:      SEQUENCE {
789 06 3:      OBJECT IDENTIFIER
      :      privateKeyUsagePeriod (2 5 29 16)
794 04 19:      OCTET STRING
      :      30 11 81 0F 31 39 39 39 30 32 30 36 30 33 32 33
      :      30 36 5A
      :      }
815 30 9:      SEQUENCE {
817 06 3:      OBJECT IDENTIFIER basicConstraints (2 5 29 19)
822 04 2:      OCTET STRING
      :      30 00
      :      }
826 30 130:      SEQUENCE {
829 06 3:      OBJECT IDENTIFIER cRLDistPoints (2 5 29 31)
834 04 123:      OCTET STRING
      :      30 79 30 77 A0 75 A0 73 A4 71 30 6F 31 0B 30 09
      :      06 03 55 04 06 13 02 43 41 31 1E 30 1C 06 03 55
      :      04 0A 13 15 4E 6F 20 4C 69 61 62 69 6C 69 74 79
      :      20 41 63 63 65 70 74 65 64 31 31 30 2F 06 03 55
      :      04 0B 13 28 45 6E 74 72 75 73 74 20 44 65 6D 6F
      :      20 57 65 62 20 43 65 72 74 69 66 69 63 61 74 69
      :      6F 6E 20 41 75 74 68 6F 72 69 74 79 31 0D 30 0B
      :      06 03 55 04 03 13 04 43 52 4C 36
      :      }
959 30 31:      SEQUENCE {
961 06 9:      OBJECT IDENTIFIER nsn-ce (1 2 840 113533 7 65)
972 04 18:      OCTET STRING
      :      30 10 1B 0A 57 45 42 43 41 20 31 2E 30 31 03 02
      :      06 C0
      :      }
      :      }
      :      }
      :      }
992 30 13:      SEQUENCE {
994 06 9:      OBJECT IDENTIFIER
      :      md5withRSAEncryption (1 2 840 113549 1 1 4)
1005 05 0:      NULL
      :      }

```

Appendix B: ▼ Authentication Example

```

1007 03 129:      BIT STRING 0 unused bits
                  :      4A 03 BA 9F C0 2C D2 A9 69 E2 FE EE F7 D8 9A 03
                  :      C2 54 36 6F 64 D8 5C 69 FE 69 9C 55 A2 BD D4 6D
                  :      AA 34 F1 64 3F 57 57 AA 3D 23 27 50 64 2D 05 B6
                  :      79 61 1C A2 0C E0 17 CD 28 75 B9 55 2E AC 68 0D
                  :      47 8E AF 87 A4 42 78 18 C0 2D 8B 3E D1 A8 A5 C0
                  :      35 73 5F 85 6A AB 71 DF D4 63 59 DD AB 01 93 69
                  :      2F 8A 5D 29 E4 D0 F8 CA C7 63 55 81 00 0B 53 F0
                  :      BE 89 26 F1 64 0E 68 97 F2 3E 79 2E ED 43 96 46
                  :
                  :      }
1139 30 877:      SEQUENCE {
1143 30 726:      SEQUENCE {
1147 A0 3:        [0] {
1149 02 1:        INTEGER 2
                  :
                  :      }
1152 02 4:        INTEGER 878852095
1158 30 13:       SEQUENCE {
1160 06 9:        OBJECT IDENTIFIER
                  :      md5withRSAEncryption (1 2 840 113549 1 1 4)
1171 05 0:        NULL
                  :
                  :      }
1173 30 96:      SEQUENCE {
1175 31 11:       SET {
1177 30 9:        SEQUENCE {
1179 06 3:        OBJECT IDENTIFIER countryName (2 5 4 6)
1184 13 2:        PrintableString 'CA'
                  :
                  :      }
                  :
                  :      }
1188 31 30:      SET {
1190 30 28:      SEQUENCE {
1192 06 3:        OBJECT IDENTIFIER organizationName (2 5 4 10)
1197 13 21:      PrintableString 'No Liability Accepted'
                  :
                  :      }
                  :
                  :      }
1220 31 49:      SET {
1222 30 47:      SEQUENCE {
1224 06 3:        OBJECT IDENTIFIER
                  :      organizationalUnitName (2 5 4 11)
1229 13 40:      PrintableString 'Entrust Demo Web Certification
Authority'

```

▼ **Appendix B:
Authentication
Example**

```

:      }
:      }
:      }
1271 30 30: SEQUENCE {
1273 17 13:     UTCTime '971106213454Z'
1288 17 13:     UTCTime '021106213454Z'
:      }
1303 30 96: SEQUENCE {
1305 31 11:     SET {
1307 30 9:       SEQUENCE {
1309 06 3:         OBJECT IDENTIFIER countryName (2 5 4 6)
1314 13 2:         PrintableString 'CA'
:       }
:     }
1318 31 30: SET {
1320 30 28:     SEQUENCE {
1322 06 3:       OBJECT IDENTIFIER organizationName (2 5 4 10)
1327 13 21:       PrintableString 'No Liability Accepted'
:     }
:   }
1350 31 49: SET {
1352 30 47:     SEQUENCE {
1354 06 3:       OBJECT IDENTIFIER
:         organizationalUnitName (2 5 4 11)
1359 13 40:       PrintableString 'Entrust Demo Web Certification
Authority'
:     }
:   }
: }
1401 30 157: SEQUENCE {
1404 30 13:     SEQUENCE {
1406 06 9:       OBJECT IDENTIFIER
:         rsaEncryption (1 2 840 113549 1 1 1)
1417 05 0:       NULL
:     }
1419 03 139: BIT STRING 0 unused bits
:       30 81 87 02 81 81 00 AD D1 AB 5E A3 10 6B 5F D7
:       51 B3 9F 4B 6B 29 F4 55 53 7F A8 3B 6A 60 E0 03
:       65 EC 41 AA 6E 75 E0 69 0E 57 5C 18 8F A7 21 BB
:       BE 00 8E 3B CD 1C C3 1C 8A 48 51 DD C3 8B 07 0E

```

Appendix B: ▼ Authentication Example

```

:          9E 75 19 73 A3 41 59 38 81 85 B4 00 57 3D FA 9C
:          07 08 CB 78 C0 B1 E9 57 88 4C C4 EB 56 15 2F 87
:          4E 0C F8 FF D1 16 40 FA 79 1F 93 DD A2 9F 14 7D
:          29 35 E9 B5 69 57 75 CE 8C B0 1D 0E D1 D0 90 39
:          [ Another 10 bytes skipped ]
:
:      }
1561 A3 308: [3] {
1565 30 304:     SEQUENCE {
1569 30 31:         SEQUENCE {
1571 06 3:             OBJECT IDENTIFIER
:                 authorityKeyIdentifier (2 5 29 35)
1576 04 24:             OCTET STRING
:                 30 16 80 14 93 16 29 BE AC 0A 1F D5 52 F2 8D D8
:                 CA 6D 1F 95 F8 4B F4 47
:             }
1602 30 29:         SEQUENCE {
1604 06 3:             OBJECT IDENTIFIER
:                 subjectKeyIdentifier (2 5 29 14)
1609 04 22:             OCTET STRING
:                 04 14 93 16 29 BE AC 0A 1F D5 52 F2 8D D8 CA 6D
:                 1F 95 F8 4B F4 47
:             }
1633 30 11:         SEQUENCE {
1635 06 3:             OBJECT IDENTIFIER keyUsage (2 5 29 15)
1640 04 4:             OCTET STRING
:                 03 02 01 06
:             }
1646 30 26:         SEQUENCE {
1648 06 3:             OBJECT IDENTIFIER
:                 privateKeyUsagePeriod (2 5 29 16)
1653 04 19:             OCTET STRING
:                 30 11 81 0F 32 30 30 32 31 31 30 36 32 31 33 34
:                 35 34 5A
:             }
1674 30 12:         SEQUENCE {
1676 06 3:             OBJECT IDENTIFIER basicConstraints (2 5 29 19)
1681 04 5:             OCTET STRING
:                 30 03 01 01 FF
:             }
1688 30 130:        SEQUENCE {

```

▼ **Appendix B:
Authentication
Example**

```

1691 06    3:      OBJECT IDENTIFIER cRLDistPoints (2 5 29 31)
1696 04   123:      OCTET STRING
      :           30 79 30 77 A0 75 A0 73 A4 71 30 6F 31 0B 30 09
      :           06 03 55 04 06 13 02 43 41 31 1E 30 1C 06 03 55
      :           04 0A 13 15 4E 6F 20 4C 69 61 62 69 6C 69 74 79
      :           20 41 63 63 65 70 74 65 64 31 31 30 2F 06 03 55
      :           04 0B 13 28 45 6E 74 72 75 73 74 20 44 65 6D 6F
      :           20 57 65 62 20 43 65 72 74 69 66 69 63 61 74 69
      :           6F 6E 20 41 75 74 68 6F 72 69 74 79 31 0D 30 0B
      :           06 03 55 04 03 13 04 43 52 4C 31
      :           }
1821 30    31:      SEQUENCE {
1823 06     9:      OBJECT IDENTIFIER nsn-ce (1 2 840 113533 7 65)
1834 04    18:      OCTET STRING
      :           30 10 1B 0A 57 45 42 43 41 20 31 2E 30 31 03 02
      :           06 C0
      :           }
1854 30    17:      SEQUENCE {
1856 06     9:      OBJECT IDENTIFIER
      :           cert-type (2 16 840 1 113730 1 1)
1867 04     4:      OCTET STRING
      :           03 02 00 07
      :           }
      :           }
      :           }
      :           }
1873 30    13:      SEQUENCE {
1875 06     9:      OBJECT IDENTIFIER
      :           md5withRSAEncryption (1 2 840 113549 1 1 4)
1886 05     0:      NULL
      :           }
1888 03   129:      BIT STRING 0 unused bits
      :           09 1D F7 CD A6 0E 02 02 11 BF EB 58 D0 06 46 46
      :           A3 12 51 30 F6 23 EA 38 64 9D C6 CB CE D9 7F 11
      :           C5 3D E9 8B 59 DF C1 4F FD 23 B8 57 48 ED 60 AD
      :           B5 3D 18 B5 2C AC 3F 31 F3 95 1F E2 22 7A 15 E0
      :           E7 C3 4C 28 FA 97 1C A3 B4 61 8D 63 E0 9C B8 4D
      :           32 E7 70 56 91 87 5D 35 B4 F5 ED 7A 06 B2 91 0A
      :           7E 14 BC 64 0D CF 7A DF C7 7E 68 6E 1F 9B 45 77
      :           05 17 BC 1B 5F A9 2F 1E 26 37 D7 A8 6D E7 B1 CE

```

Appendix B: ▼ Authentication Example

```

:      }
:      }
2020 31 332: SET {
2024 30 328: SEQUENCE {
2028 02 1: INTEGER 1
2031 30 104: SEQUENCE {
2033 30 96: SEQUENCE {
2035 31 11: SET {
2037 30 9: SEQUENCE {
2039 06 3: OBJECT IDENTIFIER countryName (2 5 4 6)
2044 13 2: PrintableString 'CA'
:      }
:      }
2048 31 30: SET {
2050 30 28: SEQUENCE {
2052 06 3: OBJECT IDENTIFIER organizationName (2 5 4 10)
2057 13 21: PrintableString 'No Liability Accepted'
:      }
:      }
2080 31 49: SET {
2082 30 47: SEQUENCE {
2084 06 3: OBJECT IDENTIFIER
:      organizationalUnitName (2 5 4 11)
2089 13 40: PrintableString 'Entrust Demo Web Certification
Authority'
:      }
:      }
:      }
2131 02 4: INTEGER 878860804
:      }
2137 30 9: SEQUENCE {
2139 06 5: OBJECT IDENTIFIER sha1 (1 3 14 3 2 26)
2146 05 0: NULL
:      }
2148 A0 125: [0] {
2150 30 24: SEQUENCE {
2152 06 9: OBJECT IDENTIFIER
:      contentType (1 2 840 113549 1 9 3)
2163 31 11: SET {
2165 06 9: OBJECT IDENTIFIER data (1 2 840 113549 1 7 1)

```


▼ **Appendix B:
Authentication
Example**

```

      :      }
      :      }
2176 30 28: SEQUENCE {
2178 06 9:   OBJECT IDENTIFIER
      :      signingTime (1 2 840 113549 1 9 5)
2189 31 15: SET {
2191 17 13:   UTCTime '981002143721Z'
      :      }
      :      }
2206 30 30: SEQUENCE {
2208 06 9:   OBJECT IDENTIFIER
      :      sMIMECapabilities (1 2 840 113549 1 9 15)
2219 31 17: SET {
2221 30 15:   SEQUENCE {
2223 30 13:     SEQUENCE {
2225 06 8:       OBJECT IDENTIFIER rc2CBC (1 2 840 113549 3 2)
2235 02 1:       INTEGER 40
      :       }
      :     }
      :   }
      :   }
2238 30 35: SEQUENCE {
2240 06 9:   OBJECT IDENTIFIER
      :      messageDigest (1 2 840 113549 1 9 4)
2251 31 22: SET {
2253 04 20:   OCTET STRING
      :      FE BF CF 19 5F 2C D9 E8 70 40 00 10 DD D3 3E C8
      :      4C DD CB 92
      :   }
      :   }
      :   }
2275 30 13: SEQUENCE {
2277 06 9:   OBJECT IDENTIFIER
      :      rsaEncryption (1 2 840 113549 1 1 1)
2288 05 0:   NULL
      :   }
2290 04 64: OCTET STRING
      :      25 67 E6 E7 BD 6B E5 1D B8 77 D8 D6 B2 66 7C 7B
      :      FA 81 E3 25 42 DF DC CF 1C BB E1 93 0A 15 36 3B
      :      B4 03 14 30 E9 E3 6D F0 CA 7B 1A 93 B6 DA F2 3B

```

**Appendix B: ▼
Authentication
Example**

```
:          57 3F EC 20 09 69 B6 C1 36 BA 73 47 D5 3E 70 C0
:          }
:        }
:      }
:    }
:  }
```

0 warnings, 0 errors.

Glossary

Symbols

μBq

MicroBecquerels.

A

acquisition live time

Time multichannel analyzer (MCA) electronics is available for processing pulse amplitude signals; equivalent to acquisition real-time less detector dead-time, reported in seconds.

acquisition real time

Total elapsed clock time a sample is counted, reported in seconds.

acquisition start date

Date of spectrum acquisition commencement, format is *yyyy/mm/dd*.

acquisition start time

Time of spectrum acquisition commencement, format is *hh:mm:ss.s*.

acquisition time interval

Equivalent to live time, reported in seconds.

activation products

Nuclides produced from the absorption of a neutron by a nucleus.

activity

Decay rate of a radionuclide; this quantity is usually expressed in Becquerels (disintegrations per second), Bq.

ARMR

Atmospheric Radionuclide Measurement Report; electronic file containing a spectrum summary, collection statistics, comments, nuclide results, MDC's peak search results, and calibration equations.

ARR

Automatic Radionuclide Report; product of automatic data processing that includes sections describing the sample information, categorization results, sample activity, MDCs for key nuclides, peak search results and notes, processing parameters, update parameters, data quality flags, event screening flags, calibration equations, and field of regard.

array

Collection of sensors distributed over a finite area (usually in a cross or concentric pattern) and referred to as a single station.

ARSA

Automated Radioxenon Sampler/Analyzer.

Glossary ▼

ASCII

American Standard Code for Information Interchange. Standard, unformatted 256-character set of letters and numbers.

assay date

Date of certificate source assay, format is *yyyy/mm/dd*.

assay time

Time of certificate source assay, format is *hh:mm:ss.s*.

AutoDRM

Automatic Data Request Manager.

AUX

(1) R: Auxiliary Power Supply. (2) S/H/I: Abbreviation for an auxiliary station code.

avg

Average.

B**background**

Contribution to a spectrum from naturally occurring radionuclides as well as interactions between radiation and materials in the vicinity of the detector.

background measurement ID

Unique alphanumeric string identifying the relevant background measurement for a specific sample; includes the detector code and the background acquisition initiation date and time.

barometric pressure

Outside air pressure, expressed in hPa.

baseline

Contribution to a spectrum from the partial energy deposition of a photon in a detector.

beam

Waveform created from array station elements that are sequentially summed in the direction of a specified azimuth and slowness.

Becquerel

Unit of activity equal to one disintegration per second; denoted by Bq.

BLANKPHD

Blank Pulse Height Data; ASCII data message containing the pulse height data of an unexposed air filter, as well as other information, in an IDC-approved format.

BMID

Background Measurement ID.

Bq

Becquerel.

C**°C**

Degrees Celsius.

CALIBPHD

Calibration Pulse Height Data; ASCII data message containing the pulse height data of a certified standard

source, as well as other information, in an IDC-approved format. The data in a CALIBPHD is used to perform the ECR, EER, and RER.

category

R: Number from 1 to 5 assigned to a radionuclide sample indicating the presence of certain types of nuclides. Category 1 indicates a spectrum with normal natural nuclides while 5 indicates spectra with multiple man made nuclides.

centroid

Energy (in keV) or channel number at the center of a fitted peak.

centroid channel

Spectrum channel at the center of a photopeak.

certificate

Certified standard source of known activity used in the acquisition of radionuclide energy, resolution, and efficiency calibration data.

certified laboratory

Radionuclide laboratories listed in Annex 1 of the CTBT and including any laboratories that are certified by the IMS/IDC in the future.

channel

(1) R: Energy window (in keV) representing a differential increment of pulse height. Many spectra are divided into 4,096 channels. (2) S/H/I: Component of motion or distinct stream of data.

cm

Centimeter.

CNF

Canberra Nuclear Format.

collection start date

Date of air sample collection commencement, format is *yyyy/mm/dd*.

collection start time

Time of air sample collection commencement, format is *hh:mm:ss.s*.

collection stop date

Date of air sample collection termination, format is *yyyy/mm/dd*.

collection stop time

Time of air sample collection termination, format is *hh:mm:ss.s*.

comments

Free text field containing comments made by a station operator or IDC analyst.

count(s)

(1) R: Number of pulses observed within a spectrum channel. (2) S/H/I: Units of digital waveform data.

CTBT

Comprehensive Nuclear Test-Ban Treaty (the Treaty).

CTBTO

Comprehensive Nuclear Test-Ban Treaty Organization.

Glossary ▼

D**data block**

Units of information that, when combined with other data blocks, comprise a data message.

data type

Kind of data in a data message.

date of last calibration

Date of previous detector calibration, format is *yyyy/mm/dd*.

dB

Decibel.

decade

Factor of ten in frequency (Hz).

decay time

Duration of time an exposed filter is allowed to decay before data acquisition begins.

deg.

Degrees (as a distance).

DETBKPHD

Detector Background Pulse Height Data; ASCII data message containing the pulse height data from a background count, as well as other information, in an IDC-approved format.

detector code (or ID)

Includes the radionuclide site code plus four unique characters identifying a specific detector unit.

detector type

Data field describing the type of radiation detector used in the data acquisition process.

E**E.**

East.

ECR

Energy versus Channel Regression; an equation providing the detector-specific relationship between channel number and energy. The equation contains calibration coefficients and is interpolated from a transmitted calibration spectrum and compared to the ECRU for quality control.

ECRU

Energy versus Channel Regression Update; an equation providing the detector-specific relationship between channel number and energy. The equation contains calibration coefficients, is interpolated using photopeak identification data from the transmitted spectrum and is compared with the ECR for quality control.

efficiency

Ratio of counts detected under a photopeak to the amount of radiation quanta emitted by a sample; depends on detector configuration and geometry.

email

Electronic mail.

energy

(1) R: Kinetic energy of a photon or particle emitted from a nuclide (in keV). (2) S/H/I: Occurrence that displays characteristics indicative of a possible nuclear weapons test.

event

(1) S/H/I: Unique source of seismic, hydroacoustic, or infrasonic wave energy that is limited in both time and space. (2) R: occurrence that displays characteristics indicative of a possible nuclear weapons test.

Executive Council

Executive body of the CTBTO responsible for supervising the activities of the Technical Secretariat.

F**FDSN**

Federation of Digital Seismic Networks.

FIR

Finite Impulse Response.

fission products

Radionuclides produced from fission.

flow rate

Air volume passing through an air filter per unit time; reported in scm (m³)/hr.

FPEB

Fission Product Event Bulletin; bulletin generated by the IDC when fission or activation products are detected at a radionuclide station above normal limits.

An FPEB contains information on the possible event, source location, fission products, activation products detected, any isotopic ratios calculated, and any certified laboratory results.

FTP

File Transfer Protocol; protocol for transferring files between computers.

FULL SPHD

Full Sample Pulse Height Data; ASCII data message containing the pulse height data of a sample acquired for approximately 24 hours, as well as other information, in an IDC-approved format.

full width at half-maximum

Metric of detector resolution and equivalent to the width of a photopeak (in keV) taken at the peak height equal to half the maximum peak counts.

FWHM

Full Width at Half-Maximum.

G**g**

Gram.

gain

(1) R: Amplification of a photon's energy deposition signal in a detector crystal. This is achieved through the use of electronic amplifiers. (2) S/H/I: Amplification of waveform energy.

GSE

Group of Scientific Experts.

Glossary ▼

GSETT-3

Group of Scientific Experts Third Technical Test.

H**h**

Hour.

HPGe

High-Purity Germanium Detector.

Hz

Hertz.

I**IDC**

International Data Centre.

IEEE

Institute for Electrical and Electronic Engineers.

IIR

Infinite Impulse Response.

IMS

International Monitoring System.

inHPGE

Intrinsic HPGE detector.

ISAR

International Surveillance of Atmospheric Radionuclides.

ISAR station

Radionuclide monitoring station set up by the PIDC and that meets CTBT requirements.

ISC

International Seismic Centre.

K**keV**

Kiloelectron Volts; a metric of energy.

km

Kilometer.

L**LAR**

Laboratory Analysis Results.

LEGe

Low-Energy Germanium; a type of germanium detector that is used for low-energy gamma spectroscopy.

LSB

Least significant bit.

M**m**

1) Meter. 2) Megabyte. 1,024 kilobytes.

m_b

Magnitude of a seismic body wave.

mbmle

Magnitude of an event based on maximum likelihood estimation using seismic body waves.

MDC

Minimum Detectable Concentration. See minimum detectable concentration.

measurement ID

Unique alphanumeric string identifying a specific data acquisition; includes the detector code and the acquisition commencement date and time.

message type

Kind of message; possible message types include DATA, REQUEST, and SUBSCRIPTION.

message ID

Unique 20-character alphanumeric identification given to a message by the sender that facilitates message tracking for the sender.

met end date

Date of meteorological data collection termination, format is *yyyy/mm/dd*.

met end time

Time of meteorological data collection termination, format is *hh:mm:ss.s*.

met start date

Date of meteorological data collection commencement, format is *yyyy/mm/dd*.

met start time

Time of meteorological data collection commencement, format is *hh:mm:ss.s*.

MID

Measurement ID.

minimum detectable concentration

Activity concentration of a given radionuclide that is indistinguishable from zero or the measurement process noise level.

ML

Magnitude based on waves measured near the source.

mm

Millimeter.

MRP

Most Recent Prior; the sample counted most recently on the same detector and originating from the same station as the sample presently being analyzed.

M_s

Magnitude of seismic surface waves.

MSB

Most significant bit.

msmle

Magnitude of an event based on maximum likelihood estimation using surface waves.

multiplet

Spectral region of interest comprised of more than one photopeak.

Glossary ▼

Mw

Magnitude of an event based on measurements of the moment tensor.

N**N.**

North.

natural radioactivity

Radioactivity from cosmogenic and primordial nuclides that is always present on earth.

NDC

National Data Center.

NEB

National Event Bulletin. Bulletin of events that is a national product.

NEIC

National Earthquake Information Center.

net area

Equal to the integrated photopeak counts minus the baseline and background counts.

nm

Nanometer.

NSEB

National Screened Event Bulletin. Bulletin of events that is produced using a national event screen.

nuclide

One of many combinations of nucleons that may comprise an atomic nucleus. Because all nuclides of interest with respect to CTBT compliance verification are radioactive, this term is often used to refer specifically to radionuclides.

P**peak**

R: Statistically significant increase in counts above a spectrum baseline at an energy associated with a gamma line of a particular radionuclide or other phenomenon.

PHD

Pulse Height Data; a format for spectral data messages. Possible PHD data message types include SAMPLEPHD, BLANKPHD, DETBKPHD, CALIBPHD, and QCPHD.

photon energy

Component of the data pairs comprising a radionuclide detector's energy, resolution, and efficiency calibration data (in KeV).

PIDC

Prototype International Data Centre.

PREL SPHD

Preliminary Sample Pulse Height Data; ASCII data message containing the pulse height data of a sample acquired for less than the nominal 24 hours, as well as other information.

Provisional Technical Secretariat

(PTS) body of the CTBTO that includes the IMS and the IDC; the PTS will assist the Executive Council and the States Parties to implement the Treaty. After entry into force of the Treaty, the PTS will be referred to as the Technical Secretariat.

Q**QCPHD**

Quality Control Pulse Height Data; ASCII data message containing the spectrum of a certificate source as well as other information. Information in the QCPHD, along with other data, is used to check a detector's state of health.

quantity

Collected air volume in scm; same as sampled air volume.

R**radioactivity**

See activity.

radionuclide

Nuclide that has an unstable nucleus, that is, a radioactive nuclide.

RASA

Radionuclide Aerosol Sampler/Analyzer.

REB

Reviewed Event Bulletin; the bulletin formed of all S/H/I events that have passed analyst inspection and quality assurance review.

reference ID

See sample reference ID.

RER

Resolution (versus) Energy Regression; an equation providing the detector-specific relationship between resolution and energy. This equation contains calibration coefficients and is interpolated from a transmitted calibration spectrum.

resolution

R: Metric of a detector's ability to detect photons at discrete energies and is equivalent to the FWHM.

RMS

Radionuclide Monitoring System; the part of the IMS that monitors the atmosphere for radionuclides.

ROI

Region of Interest; group of radionuclide spectrum channels that include either one or multiple peaks.

RSR

Radionuclide Summary Report; report containing lists of category measurements, collection times, and locations of anthropo-genic radionuclides, MDC's, and spectra received by the IDC within a time period.

Glossary ▼

S

S.

South.

s

Second (time).

sample

(1) Any physical entity counted on a detector. (2) Solid or gaseous entity collected by a blower at an RMS station that is analyzed for its radioactive contents.

sample geometry

Sample configuration, shape, and physical state in a detector chamber.

sample ID

Unique identification number assigned to a given spectrum or record by the PIDC operations system.

sample reference ID

Unique alphanumeric string identifying a sample; includes station code, data type, and sample collection commencement date and time.

SAMPLEPHD

Sample Pulse Height Data; ASCII data message containing pulse height data acquired by counting a gas or particulate sample with a detector system.

scm

Standard Cubic Meter.

SEB

Standard Event Bulletin; a list of analyst reviewed S/H/I events and event parameters (origin and associated arrival information). The SEB is similar to the REB, but also includes event characterization parameters and event screening results for each event.

second split

Fractionation of the first split.

SEL1

Standard Event List 1; S/H/I bulletin created by total automatic analysis of continuous timeseries data. Typically, the list runs one hour behind real time.

SEL2

Standard Event List 2; S/H/I bulletin created by totally automatic analysis of both continuous data and segments of data specifically down-loaded from stations of the auxiliary seismic network. Typically, the list runs five hours behind real time.

SEL3

Standard Event List 3; S/H/I bulletin created by totally automatic analysis of both continuous data and segments of data specifically down-loaded from stations of the auxiliary seismic network. Typically, the list runs 12 hours behind real time.

S/H/I

Seismic, hydroacoustic, and infrasonic.

SID

R: Sample ID; unique alphanumeric string assigned to a sample during the automated processing for identification and accounting purposes.

singlet

Spectrum photopeak consisting of counts from one mono-energetic photon; photopeak containing counts from multiple photons, but fit as if it is comprised of counts from only one because contributions from the individual radiations have yet to be separated.

site code

Five character alphanumeric field identifying a particular RMS site: the first two characters are the county code, the third identifies the site type (R for Regional Lab, C for Certified Lab, N for National Data Center, X for Experimental, and 0 for Sampling Station), and the last two characters are the country code.

SLSD

Standard List of Signal Detections.

snr

Signal-to-noise ratio.

spectral qualifier

Code in a SAMPLEPHD that indicates whether the spectrum acquisition time is truncated or full; spectral qualifier "FULL" indicates a spectrum was acquired for a full acquisition time interval while "PREL" indicates a spectrum was acquired for an acquisition time LESS than a full acquisition time interval.

spectrum

(1) R: a plot of the differential number of pulses (in counts) per differential pulse height (in channels or keV). (2) S/H/I: a plot of the energy contained in waveforms as a function of frequency.

SPHD

Sample Pulse Height Data; ASCII data message type containing the pulse height data of a sample, as well as other information. There are two types of SPHDs: full and preliminary. See FULL SPHD and PREL SPHD.

SPHDF

Full SPHD.

SPHDP

Preliminary SPHD.

SRID

Sample reference ID.

SSEB

Standard Screened Event Bulletin; similar in content and format to the Standard Event Bulletin (SEB), but does not include events that were screened out by a standard set of event screening criteria.

standard cubic meter

Volume occupied by 1 m³ of gas at 0°C and 1013 hpa.

station code (or ID)

(1) Code used to identify distinct stations. (2) Site code.

Glossary ▼

system type

Phase of the RMS sample being collected; "P" indicates particulate and "G" gaseous.

T**TCP/IP**

Transmission Control Protocol/Internet Protocol.

Technical Secretariat

Referred to as the Provisional Technical Secretariat prior to the Treaty's entry-into-force; body of the CTBTO that includes the IMS and the IDC.

3-C

Three component.

time of last calibration

Time of previous detector calibration, format is *hh:mm:ss.s*.

total efficiency

Ratio of gamma-rays interacting with the detector crystal to the total number emitted by a sample.

transmit date

Date a message was sent from a transmitter, format is *yyyy/mm/dd*.

transmit time

Time a message is sent from a transmitter, format is *hh:mm:ss.s*.

Treaty

Comprehensive Nuclear Test-Ban Treaty (CTBT).

U**UPS**

Uninterruptable Power Supply.

UTC

Universal Coordinated Time.

V**V**

Volts; a unit of electrical potential or electromotive force.

W**W.**

West.

X**XPU**

Xenon Processing Unit.

Index

Symbols

#Acquisition block [190](#)
 #Calibration block [190](#)
 #Certificate block [193](#)
 #Collection block [189](#)
 #Comment block [189](#)
 #Efficiency block [191](#)
 #Energy block [191](#)
 #Header Block [188](#)
 #Header block [188](#)
 #Profile block [190](#)
 #Resolution block [191](#)
 #Sample block [189](#)
 #Spectrum block [192](#)
 #Totaleff block [192](#)
 %Eff [205](#)
 %Uner [205](#)

A

actual sampling duration [201](#)
 alert messages [202](#)
 ALERT_FLOW example [A2](#)
 ALERT_SYSTEM example [A2](#)
 ALERT_TEMP example [A2](#)
 ALERT_UPS example [A2](#)
 allow multiplets [206](#)
 ARMR [60](#), [98](#), [213](#)
 example [A3](#)

ARR [61](#), [99](#), [204](#)
 example [A8](#)
 ARRIVAL [99](#)
 associated example [A13](#)
 automatic example [A13](#)
 grouped example [A14](#)
 reviewed example [A14](#)
 unassociated example [A14](#)
 ARRIVAL_LIST [35](#)
 ARSA [211](#)
 AU6 [145](#)
 AU8 [145](#)
 AUT [144](#)
 AUTH_STATUS [166](#)
 authentication list block [167](#)
 example [A14](#)
 report period block [166](#)
 authentication [27](#)
 data format [144](#)
 AutoDRM basics [218](#)
 AUX_LIST [35](#)
 average flow rate [206](#)

B

background measurement ID [193](#)
 baseline channels [206](#)
 baseline type [206](#)
 BEGIN [21](#)
 blank lines [6](#)
 BLANKPHD [64](#)
 example [A15](#)
 BULL_TYPE [36](#)
 BULLETIN [64](#), [100](#)
 event title block [155](#)
 long format example [A16](#)
 origin block [156](#)

Index ▼

short format example [A16](#)
 title block [155](#)
 bulletin title block format [155](#)

C

CAL2 [125](#)
 CALIBPHD [68](#), [102](#)
 example [A18](#)
 calibration
 data [208](#)
 equations [205](#)
 S/H/I identification block [126](#)
 centroid [206](#)
 certificate [194](#)
 certified laboratory results [215](#)
 CHAN_LIST [37](#)
 CHAN_STATUS [70](#), [104](#), [168](#)
 channel statistics block [169](#)
 data timeliness block [170](#)
 example [A19](#)
 CHANNEL [69](#), [121](#)
 example [A19](#)
 channel
 S/H/I band codes [18](#)
 S/H/I instrument codes [19](#)
 S/H/I orientation codes [19](#)
 CHK2 [133](#)
 C checksum subroutine [138](#)
 fortran subroutine [137](#)
 CM6 [141](#), [143](#)
 CM8 [143](#)
 COMM_LIST [37](#)
 COMM_STATUS [71](#), [104](#), [171](#)
 communications outage block [173](#)
 communications statistics block [172](#)
 example [A20](#)
 COMMENT [70](#)
 data format [165](#)
 example [A20](#)
 comments [6](#)
 compression schemes [141](#)

confidence threshold [206](#)
 country codes [8](#)
 critical-level test [207](#)

D

DAT2 [131](#), [133](#)
 data message [2](#)
 data quality flags [205](#)
 DATA_TYPE [120](#)
 date and time formats [7](#)
 DEPTH [38](#)
 DEPTH_CONF [38](#)
 DEPTH_MINUS_ERROR [39](#)
 DETBKPHD [72](#), [105](#)
 example [A21](#)
 detector type [207](#)
 digitizer response block format [129](#)
 distance units [20](#)

E

E-MAIL [32](#), [219](#)
 email protocol [3](#)
 energy
 span [194](#)
 tolerance [208](#)
 units [20](#)
 environment
 ARRIVAL_LIST [35](#)
 AUX_LIST [35](#)
 BULL_TYPE [36](#)
 CHAN_LIST [37](#)
 COMM_LIST [37](#)
 DEPTH [38](#)
 DEPTH_CONF [38](#)
 DEPTH_MINUS_ERROR [39](#)
 EVENT_LIST [40](#)
 EVENT_STA_DIST [41](#)
 FREQ [91](#)
 GROUP_BULL_LIST [43](#)

- LAT [44](#)
 - LOC_CONF [45](#)
 - LON [45](#)
 - MAG [46](#)
 - MAG_TYPE [47](#)
 - MB_MINUS_MS [48](#)
 - MBMS_CONF [48](#)
 - MBMS_SLOPE [49](#)
 - MBMS_THRESH [49](#)
 - MIN_NSTA_MS [50](#)
 - ORIGIN_LIST [51](#)
 - PRODID_LIST [92](#)
 - RELATIVE_TO [52](#)
 - STA_LIST [53](#)
 - SUBSCR_LIST [93](#)
 - TIME [54](#)
 - TIME_STAMP [55](#)
 - environment lines [33](#), [219](#)
 - ERROR_LOG example [A21](#)
 - estimate peak widths [208](#)
 - EVENT [73](#), [106](#)
 - data format [165](#)
 - example [A22](#)
 - event
 - detection summary (radionuclide) [215](#)
 - screening flags (radionuclide) [205](#)
 - title block format (S/H/I) [155](#)
 - EVENT_LIST [40](#)
 - EVENT_STA_DIST [41](#)
 - expected sampling durations [201](#)
 - expected sampling interval [201](#)
- F**
- FAP2 [127](#)
 - field of regard [205](#)
 - finite impulse response
 - block format [130](#)
 - fit singles [208](#)
 - fixed format lines [5](#)
 - FLOW example [A22](#)
 - flow rate data [200](#)
 - force linear [208](#)
 - FPEB [74](#), [106](#)
 - example [A23](#)
 - free format lines [5](#)
 - FREQ [91](#)
 - frequency, amplitude, and phase block
 - format [128](#)
 - FTP [32](#)
 - protocol [3](#)
 - FTP_LOG [180](#)
 - example [A24](#)
 - FWHM [208](#)
 - limits [209](#)
- G**
- gain shift [209](#)
 - generic response block format [129](#)
 - GROUP_BULL_LIST [43](#)
- H**
- HELP [30](#)
 - example [A24](#)
- I**
- ID number
 - of the first split [194](#)
 - of the second split [195](#)
 - instrument types [134](#)
 - INT [141](#)
 - isotopic ratios [215](#)
- K**
- K40_locationdifference [209](#)

Index ▼

L

laboratory analysis results [214](#)
 LAT [44](#)
 latitude/longitude conventions [20](#)
 line length [4](#)
 LOC_CONF [45](#)
 LOG [181](#)
 example [A24](#)
 LON [45](#)
 lookup tol floor [209](#)

M

MAG [46](#)
 MAG_TYPE [47](#)
 man-made radionuclide summary [214](#)
 MB_MINUS_MS [48](#)
 MBMS_CONF [48](#)
 MBMS_SLOPE [49](#)
 MBMS_THRESH [49](#)
 measurement categorization [204](#)
 summary [214](#)
 measurement ID [196](#)
 message
 blank lines [6](#)
 comments [6](#)
 date and time formats [7](#)
 distance units [20](#)
 energy units [20](#)
 fixed format lines [5](#)
 free format lines [5](#)
 latitude/longitude conventions [20](#)
 missing data [6](#)
 size [4](#)
 structure [20](#)
 MET example [A25](#)
 meteorological data [201](#)
 MIME [27](#)
 MIN_NSTA_MS [50](#)
 minimum area [209](#)
 minimum detectable concentration

for key nuclides [204](#)

summary [214](#)

missing data [6](#)

most recent prior sample [209](#)

MRP [212](#)

MSG_ID [22](#), [219](#)

MSG_TYPE [22](#), [218](#)

Multi-purpose Internet Mail Extension [27](#)

N

net area [210](#)

network codes [17](#)

NETWORK example [A25](#)

normalized gain difference [210](#)

O

ORIGIN [75](#), [107](#)

example [A26](#)

origin block format [156](#)

ORIGIN_LIST [51](#)

OUTAGE [77](#), [173](#)

example [A26](#)

P

PAZ2 [126](#)

peak search

notes [204](#)

results [204](#)

perform subtraction [210](#)

poles and zeros block format [127](#)

processing parameters [204](#)

PROD_ID [27](#)

PRODID_LIST [92](#)

pulse height data [186](#)

Q

QCPHD [77](#), [108](#)
 example [A27](#)

R

radionuclide detector codes [16](#)
 radionuclide site codes [8](#)
 RASA [211](#)
 REF_ID [23](#), [219](#)
 RELATIVE_TO [52](#)
 request
 ARMR [60](#), [98](#)
 ARR [61](#), [99](#)
 ARRIVAL [99](#)
 BLANKPHD [64](#)
 BULLETIN [64](#), [100](#)
 CALIBPHD [68](#), [102](#)
 CHAN_STATUS [70](#), [104](#)
 CHANNEL [69](#)
 COMM_STATUS [71](#), [104](#)
 COMMENT [70](#)
 DETBKPHD [72](#), [105](#)
 E-MAIL [32](#)
 environments [33](#)
 EVENT [73](#), [106](#)
 FPEB [74](#), [106](#)
 FTP [32](#)
 lines [56](#)
 lines for basic station AutoDRM [219](#)
 message [2](#)
 messages [31](#)
 ORIGIN [75](#), [107](#)
 OUTAGE [77](#)
 QCPHD [77](#), [108](#)
 RESPONSE [78](#)
 SPHDF [79](#), [109](#)
 SPHDP [79](#), [109](#)
 STA_STATUS [81](#), [110](#)
 STATION [80](#)
 SUBSCR_PROD [113](#)

UNSUBSCRIBE [115](#)
 WAVEFORM [82](#), [116](#)
 RESPONSE [78](#), [125](#)
 calibration identification block [126](#)
 comment block [130](#)
 digitizer block [129](#)
 finite impulse response block [130](#)
 frequency, amplitude, and phase
 block [128](#)
 generic block [129](#)
 poles and zeros block [127](#)
 response comment block format [130](#)
 RESPONSE example [A28](#)
 RMS summary report [213](#)
 rms_analyze software unit [208](#)
 RSR example [A28](#)

S

sample geometry [197](#)
 sample ID [210](#)
 sample quantity [210](#)
 sample reference ID [198](#)
 SAMPLEPHD example [A30](#)
 sampling time [211](#)
 spectral qualifier [199](#)
 SPHDF [79](#), [109](#)
 SPHDP [79](#), [109](#)
 STA_LIST [53](#)
 STA_STATUS [81](#), [110](#), [175](#)
 capability assessment [175](#)
 capability criteria [176](#)
 example [A32](#)
 station status format [178](#)
 STATION [80](#), [123](#)
 example [A31](#)
 station capability criteria [176](#)
 station comments [206](#)
 station type [211](#)
 STOP [27](#)
 SUBSCR_LIST [93](#)
 SUBSCR_PROD [113](#)

Index ▼

subscription
environments [91](#)
format description [88](#)
message [2](#)
procedures [87](#)
request lines [96](#)

T

threshold [212](#)
TIME [54](#)
time format [7](#)
TIME_STAMP [55](#)
total efficiency [194](#)

U

UNKNAT [212](#)
UNSUBSCRIBE [115](#)
update parameters [204](#)
use MRP [212](#)
use weights [213](#)

W

WAVEFORM [82](#), [116](#)
AU6 sub format [145](#)
AU8 sub format [145](#)
AUT sub format [144](#)
C checksum subroutine [138](#)
CHK2 block [133](#)
CHK2 fortran subroutine [137](#)
cm6 format example [A32](#)
CM6 sub format [141](#)
CM8 sub format [143](#)
compression [141](#)
dat2 block [133](#)
instrument types [134](#)
int format example [A33](#)
INT sub format [141](#)

WID2 block [131](#)
waveform identification
block format [131](#)
WID2 [131](#), [132](#), [133](#)
width [213](#)

X

XPU [211](#)

Z

zero shift [213](#)