



TELEMETRY GROUP

DOCUMENT 106-07

**TELEMETRY STANDARDS
(PART 1)**

**WHITE SANDS MISSILE RANGE
REAGAN TEST SITE
YUMA PROVING GROUND
DUGWAY PROVING GROUND
ABERDEEN TEST CENTER
NATIONAL TRAINING CENTER
ELECTRONIC PROVING GROUND
HIGH ENERGY LASER SYSTEMS TEST FACILITY**

**NAVAL AIR WARFARE CENTER WEAPONS DIVISION, PT. MUGU
NAVAL AIR WARFARE CENTER WEAPONS DIVISION, CHINA LAKE
NAVAL AIR WARFARE CENTER AIRCRAFT DIVISION, PATUXENT RIVER
NAVAL UNDERSEA WARFARE CENTER DIVISION, NEWPORT
PACIFIC MISSILE RANGE FACILITY
NAVAL UNDERSEA WARFARE CENTER DIVISION, KEYPORT**

**30TH SPACE WING
45TH SPACE WING
AIR FORCE FLIGHT TEST CENTER
AIR ARMAMENT CENTER
ARNOLD ENGINEERING DEVELOPMENT CENTER
BARRY M. GOLDWATER RANGE**

NATIONAL NUCLEAR SECURITY ADMINISTRATION (NEVADA)

**DISTRIBUTION A: APPROVED FOR PUBLIC RELEASE
DISTRIBUTION IS UNLIMITED**

This page intentionally left blank.

DOCUMENT 106-07

**TELEMETRY STANDARDS
(PART 1)**

SEPTEMBER 2007

Prepared by

TELEMETRY GROUP

Published by

**Secretariat
Range Commanders Council
U.S. Army White Sands Missile Range,
New Mexico 88002-5110**

This page intentionally left blank.

TELEMETRY STANDARDS (PART 1)

TABLE OF CONTENTS

[CHANGES IN THIS EDITION \(SUMMARY\)](#)

v

[PREFACE](#)

vii

CHAPTERS

[CHAPTER 1:](#) [Introduction, Part I](#)

[CHAPTER 2:](#) * [Transmitter and Receiver Systems](#)

[CHAPTER 3:](#) [Frequency Division Multiplexing Telemetry Standards](#)

[CHAPTER 4:](#) [Pulse Code Modulation Standards](#)

[CHAPTER 5:](#) [Digitized Audio Telemetry Standard](#)

[CHAPTER 6:](#) * [Digital Cassette Helical Scan Recorder/Reproducer, Multiplexer/Demultiplexer, Tape Cassette, and Recorder Control and Command Mnemonics Standards](#)

[CHAPTER 7:](#) [Reserved for New Topic: "Ground Based Digital Recording Standard \(Solid State and Disk Systems\)"](#)

[CHAPTER 8:](#) [Digital Data Bus Acquisition Formatting Standard](#)

[CHAPTER 9:](#) * [Telemetry Attributes Transfer Standard](#)

[CHAPTER 10:](#) * [Digital On-board Recorder Standard](#)

APPENDIXES

[APPENDIX A:](#) * [Frequency Considerations for Telemetry](#)

[APPENDIX B:](#) [Use Criteria for Frequency Division Multiplexing](#)

[APPENDIX C:](#) [PCM Standards \(Additional Information and Recommendations\)](#)

[APPENDIX D:](#) [Magnetic Tape Recorder and Reproducer Information and Use Criteria](#)

[APPENDIX E:](#) [Deleted \(Available Transducer Documentation\)](#)

[APPENDIX F:](#) [Continuously Variable Slope Delta Modulation](#)

[APPENDIX G:](#) [ADARIO Data Block Field Definitions](#)

[APPENDIX H:](#) [Application of the Telemetry Attributes Transfer Standard](#)

[APPENDIX I:](#) [Telemetry Attributes Transfer Standard Cover Sheet](#)

[APPENDIX J:](#) [Telemetry Attributes Transfer Standard Format Example](#)

[APPENDIX K:](#) [Pulse Amplitude Modulation Standards](#)

[APPENDIX L:](#) [Asynchronous Recorder Multiplexer Output Re-constructor \(ARMOR\)](#)

[APPENDIX M:](#) [Properties of the Differential Encoder Specified in IRIG Standard 106 for OQPSK Modulations](#)

[APPENDIX N:](#) ** [Telemetry Transmitter Command and Control Protocol](#)

[APPENDIX O:](#) ** [Floating Point Formats](#)

[Top](#)

* Changed ** New

This page intentionally left blank.

CHANGES IN THIS EDITION

This document is an updated version of and replaces Range Commanders Council (RCC) Document 106-05 (Part 1: Telemetry Standards (July 2005)). The RCC Telemetry Group (TG) made an extensive effort to produce a well-coordinated and useful document. The following is a summary of these efforts.

a. Task TG-76: Incorporate New Technology into TMATS.

Task Objective/Product. Develop and eXtensible Markup Language (XML)-based version of the Telemetry Attributes Transfer Standard (TMATS) to augment the existing American Standard Code for Information Interchange (ASCII) text version of TMATS. The new product is a tool to facilitate the use of XML files and associated software to process telemetry attributes.

Comment. The TMATS XML schema is now available on the RCC web site. Note: a new appendix (Appendix O, Floating Point Formats) was also developed and referenced in Chapter 9.

b. Task TG-82: Update Chapter 10, IRIG 106.

Task Objective/Product. Update Chapter 10 to include 16PP, Ethernet type one day to and 1394 type one data and command/control said using Ethernet and new network interfaces. The product is an updated chapter 10.

Comment. Work for this task also included updates to Chapter 6, Digital Cassette Helical Scan Recorder/Reproducer, Multiplexer/Demultiplexer, Tape Cassette, and Recorder Control and Command Mnemonics Standards.

c. Task TG-84: Standard for Data Display Definitions.

Task Objective/Product. To establish a standard for describing commonly used types of data displays. The product is a standard for data display information that will allow data to be readily exchanged between ranges and other test organizations.

Comment. Chapter 9 was changed in many sections addressing media and data structure as well as telemetry attributes. The new standard format for describing commonly used data displays, DDML, is presented in paragraph 9.6.

d. Task TG-86: Transmitter Frequency Assignment Guidelines.

Task Objective/Product. To provide telemetry transmitter frequency assignment guidance and relevant sections of IRIG 106. This product will be useful to instrumentation engineers, mission planners, frequency managers, and other range personnel.

Comment. Chapter 2 and Appendix A were updated to address the topic “Valid Center Frequencies near Telemetry Band Edges.” The updates include a new paragraph in Chapter 2 (paragraph 2.4.7) and a new paragraph in Appendix A (paragraph 12.0). An interactive spreadsheet tool for calculating and presenting bit-rate versus band edge back-off is presented in paragraph 12 of Appendix A. The spreadsheet, in Microsoft Excel, can be downloaded from the RCC web site.

e. Task TG-88: Telemetry Transmitter Control Standards.

Task Objective/Product. To provide telemetry transmitter control standards in relevant sections of IRIG 106. This task standardizes the message commands and formats used to control the operating parameters of transmitters equipped with serial control interfaces.

Comment. This task resulted in development of a new appendix, Appendix N, Telemetry Transmitter Command and Control Protocol. Appendix N divides commands into two categories of “command sets.” The basic command set contains the minimum (required) commands for transmitter control, query, and status. The extended command set contains optional commands that may (or may not) be implemented and may be shown as references.

PREFACE

The Telemetry Group (TG) of the Range Commanders Council (RCC) has prepared this document to foster the compatibility of telemetry transmitting, receiving, and signal processing equipment at the member ranges under the cognizance of the RCC. The Range Commanders highly recommend that telemetry equipment operated by the ranges and telemetry equipment used in programs that require range support conform to these standards.

These standards do not necessarily define the existing capability of any test range, but constitute a guide for the orderly implementation of telemetry systems for both ranges and range users. The scope of capabilities attainable with the utilization of these standards requires the careful consideration of tradeoffs. Guidance concerning these tradeoffs is provided in the text. The standards provide the necessary criteria on which to base equipment design and modification. The ultimate purpose is to ensure efficient spectrum utilization, interference-free operation, interoperability between ranges, and compatibility of range user equipment with the ranges.

This standard, published in two parts, is complemented by a companion series, RCC Document 118, Test Methods for Telemetry Systems and Subsystems, and RCC document 119, Telemetry Applications Handbook.

The policy of the Telemetry Group is to update the telemetry standards and test methods documents as required to be consistent with advances in technology.

Please direct any questions to:

Secretariat, Range Commanders Council
ATTN: CSTE-DTC-WS-RCC
100 Headquarters Avenue
White Sands Missile Range, New Mexico 88002-5110
Telephone: (505) 678-1107, DSN 258-1107
E-mail: <mailto:wsmrrcc@conus.army.mil>

***** NOTHING FOLLOWS *****