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# Joint Polar Satellite System (JPSS) Algorithm Specification Volume I: Software Requirement Specification (SRS) for the Clouds and Earth Radiant Energy System (CERES) RDR

**Goddard Space Flight
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NOAA / NASA

# Joint Polar Satellite System (JPSS) Algorithm Specification Volume I: Software Requirement Specification (SRS) for the Clouds and Earth Radiant Energy System (CERES) RDR

## Review/Signature/Approval Page

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# Preface

This document is under JPSS Ground Segment (GS) configuration control. Once this document is approved, JPSS approved changes are handled in accordance with Class I and Class II change control requirements as described in the JPSS Configuration Management Procedures, and changes to this document shall be made by complete revision.

Any questions should be addressed to:

JPSS Configuration Management Office
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# NOTE

NOAA's Office of Low Earth Orbit (LEO) Observations encompasses the Joint Polar Satellite System (JPSS) and Near Earth Orbit Network (NEON) Programs.  The JPSS Ground Segment Project has evolved to the LEO Ground Services Project and its ground system serves the needs of both JPSS and NEON missions.  For efficiency, documents created prior to the formulation of LEO Ground Services will retain legacy terminology (e.g., JPSS Ground Project, JPSS Ground System).

# Change History Log

| Revision | Effective Date | Description of Changes (Reference the CCR & CCB/ERB Approve Date) |
|---|---|---|
| Rev- | Aug 22, 2013 | This version incorporates **474-CCR-13-1172** which was approved by JPSS Ground ERB on the effective date shown. |
| A | Jan 30, 2014 | This version incorporates **474-CCR-13-1442** which was approved by JPSS Ground ERB on the effective date shown. |
| A1 | Oct 23, 2014 | This version incorporates **474-CCR-14-2091** which was approved by the JPSS Ground ERB for CO10 on the effective date shown. |
| B | Oct 07, 2014 | This version incorporates **474-CCR-14-1721, 474-CCR-14-1741, 474-CCR-14-1781, 474-CCR-14-1793** and **474-CCR-14-2011** which was approved by JPSS Ground ERB on the effective date shown. |
| C | Jun 23, 2016 | This version incorporates **474-CCR-14-2110, 474-CCR-15-2452**, **474-CCR-15-2480, 474-CCR-15-2657** and **474-CCR-16-2939** which was approved by JPSS Ground ERB on the effective date shown. |
| 0200D | Sep 22, 2016 | This version incorporates **474-CCR-16-3049** which was approved by JPSS Ground ERB on the effective date shown. |
| 0200E | Feb 09, 2018 | This version incorporates **474-CCR-18-3822** which was approved by JPSS Ground ERB on the effective date shown. |
| F | Dec 14, 2018 | This version incorporates **474-CCR-18-4203.**  This version incorporates 0220A of 474-00448-01-09-B0220, dated 11/29/2016 to create this baseline. This was approved by the JPSS Ground ERB on the effective date shown. |
| G | Jul 30, 2020 | This version incorporates 474-CCR-19-4697 which was approved by the JPSS Ground ERB on Nov 26, 2019 and by the JPSS Ground Segment CCB on Dec 5, 2019; 474-CCR-19-4719 which was approved by the JPSS Ground ERB on Mar 11, 2020 and by the JPSS Ground Segment CCB on Mar 26, 2020; 474-CCR-20-5127 which was approved by the JPSS Ground ERB on Jul 24, 2020 and by the JPSS Ground Segment CCB on the effective date shown. |
| H | Aug 26, 2021 | This version incorporates **474-CCR-21-5445** which was approved by the JPSS Ground ERB on May 07, 2021 and by the JPSS Ground Segment CCB on the effective date shown. |
| I | Aug 25, 2023 | This version incorporates 474-CCR-23-6749 which was approved by the JPSS Ground ERB on Aug 18, 2023 and by the JPSS Ground Segment CCB on the effective date shown. This version was baselined for the LGSS contract. |

# Table of Contents

# 1 INTRODUCTION

The Joint Polar Satellite System (JPSS) is the National Oceanic and Atmospheric Administration's (NOAA) next-generation operational Earth observation program that acquires and distributes global environmental data primarily from multiple polar-orbiting satellites. The program plays a critical role in NOAA's mission to understand and predict changes in weather, climate, oceans and coasts, and the space environment, which support the Nation's economy and protect lives and property. For information regarding the JPSS Program, missions, instruments, and partners, see the JPSS website at https://www.jpss.noaa.gov/.

## 1.1 Identification

This volume documents the software used in the generation of Raw Data Record (RDR) algorithms for the Clouds and the Earth's Radiant Energy System (CERES). It documents the CERES RDRs.

## 1.2 Algorithm Overview

The CERES is a three-channel radiometer instrument that measures both solar-reflected and Earth-emitted radiation from the top of the atmosphere to the Earth's surface. The measurements from CERES are used to observe and understand the role of clouds and the energy cycle in global climate monitoring and prediction. It also determines cloud properties, including the amount, height, thickness, particle size, and phase of clouds using simultaneous measurements by other instruments. The JPSS ground processing software produces RDRs for CERES instrument from the application packets received. The Radiation Budget Instrument (RBI) will be the NASA follow-on to CERES.

## 1.3 Document Overview

| Section | Description |
|---|---|
| Section 1 | Introduction - Provides a brief overview of the JPSS Ground System and the relevant algorithm, as reference material only. |
| Section 2 | Related Documentation - Lists related documents and identifies them as Parent, Applicable, or Information Documents such as, MOAs, MOUs, technical implementation agreements, as well as Data Format specifications. This section also establishes an order of precedence in the event of conflict between two or more documents. |
| Section 3 | Algorithm Requirements - Provides a summary of the science requirements for the products covered by this volume. |
| Appendix A | Requirements Attributes - Provides the mapping of requirements to verification methodology and attributes. |

# 2    RELATED DOCUMENTATION

The latest JPSS documents can be obtained from URL:
https://jpssmis.gsfc.nasa.gov/frontmenu_dsp.cfm.  JPSS Project documents have a document
number starting with 470, 472 or 474 indicating the governing Configuration Control Board
(CCB) (Program, Flight, or Ground) that has the control authority of the document.

## 2.1    Parent Documents

The following reference documents are the Parent Document from which this document has been
derived.  Any modification to a Parent Document will be reviewed to identify the impact upon
this document.  In the event of a conflict between a Parent Document and the content of this
document, the JPSS Program Configuration Change Board has the final authority for conflict
resolution.

| Doc. No. | Document Title |
|---|---|
| 474-01541 | Joint Polar Satellite System (JPSS) Ground System Requirements Document (GSRD) |
| 474-01543 | Joint Polar Satellite System (JPSS) Ground Segment Data Product Specification |
| 474-00448-01-01 | Joint Polar Satellite System (JPSS) Algorithm Specification Volume I: Software Requirements Specification (SRS) for the Common Algorithms |

## 2.2    Applicable Documents

The following documents are the Applicable Documents from which this document has been
derived.  Any modification to an Applicable Document will be reviewed to identify the impact
upon this document.  In the event of conflict between an Applicable Document and the content
of this document, the JPSS Program Configuration Change Board has the final authority for
conflict resolution.

| Doc. No. | Document Title |
|---|---|
| 474-00448-04-09 | Joint Polar Satellite System (JPSS) Algorithm Specification Volume IV: Software Requirements Specification Parameter File (SRSPF) for the CERES RDR |
| 474-00448-04-08 | JPSS Algorithm Specification Volume IV: Software Requirements Specification Parameter File (SRSPF) for the Geolocation and Spacecraft Orientation |

# 3   ALGORITHM REQUIREMENTS

## 3.1   States and Modes

### 3.1.1   Normal Mode Performance

Not applicable

### 3.1.2   Graceful Degradation Mode Performance

Not applicable

## 3.2   Algorithm Functional Requirements

### 3.2.1   Product Production Requirements

Not applicable

### 3.2.2   Algorithm Science Requirements

Not applicable

### 3.2.3   Algorithm Exception Handling

Not applicable

## 3.3   External Interfaces

### 3.3.1   Inputs

Not applicable

### 3.3.2   Outputs

SRS.01.09_143  The CERES RDR software shall generate the CERES Science RDR from
mission data packet APIDs specified in the JPSS Algorithm Specification Vol
IV: SRSPF for CERES RDR (474-00448-04-09)<RDR><Science>.

*Rationale:*  The Science RDR is one of CERES RDR products and is generated from the
specified mission data packet APIDs.  APIDs associated with the Spacecraft Diary, as defined in
the JPSS Algorithm Specification Vol IV: SRS Parameter File for Geolocation and Spacecraft
Orientation (474-00448-04-08), are included in the deliverable RDR.

*Block Start:*  2.0.0      *Block End:*  3.0.0

SRS.01.09_144  The CERES RDR software shall generate the CERES Diagnostic RDR from
mission data packet APIDs specified in the JPSS Algorithm Specification Vol
IV: SRSPF for CERES RDR (474-00448-04-09)<RDR><Diagnostic>.

*Rationale:*  The Diagnostic RDR is one of CERES RDR products and is generated from the
specified mission data packet APIDs.  APIDs associated with the Spacecraft Diary, as defined in

the JPSS Algorithm Specification Vol IV: SRS Parameter File for Geolocation and Spacecraft Orientation (474-00448-04-08), are included in the deliverable RDR.

*Block Start:*  2.0.0      *Block End:*  3.0.0

SRS.01.09_145 The CERES RDR software shall generate the CERES Telemetry RDR from mission data packet APIDs specified in the JPSS Algorithm Specification Vol IV: SRSPF for CERES RDR (474-00448-04-09)<RDR><Telemetry>.

*Rationale:*  The Telemetry RDR is one of CERES RDR products and is generated from the specified mission data packet APIDs.  APIDs associated with the Spacecraft Diary, as defined in the JPSS Algorithm Specification Vol IV: SRS Parameter File for Geolocation and Spacecraft Orientation (474-00448-04-08), are included in the deliverable RDR.

*Block Start:*  2.0.0      *Block End:*  3.0.0

## 3.4   Science Standards

Not applicable

## 3.5   Metadata Output

Not applicable

## 3.6   Quality Flag Content Requirements

Not applicable

## 3.7   Data Quality Notification Requirements

Not applicable

## 3.8   Adaptation

Not applicable

## 3.9   Provenance Requirements

Not applicable

## 3.10  Computer Software Requirements

Not applicable

## 3.11  Software Quality Characteristics

Not applicable

## 3.12  Design and Implementation Constraints

Not applicable

## 3.13  Personnel Related Requirements

Not applicable

## 3.14  Training Requirements

Not applicable

## 3.15  Logistics Related Requirements

Not applicable

## 3.16  Other Requirements

Not applicable

## 3.17  Packaging Requirements

Not applicable

## 3.18  Precedence and Criticality

Not applicable

# Appendix A.   Requirements Attributes

The Requirements Attributes can be found in the VCRMs at Ground > Mission System Engineering > Ground SEIT Unrestricted > VCRM

https://jpss.gsfc.nasa.gov/sites/ground/MSE/9/Forms/AllItems.aspx?RootFolder=%2Fsites%2Fground%2FMSE%2F9%2FVCRM&FolderCTID=0x012000D0555EA1A211E64A9A7DE7CBCE72DE8B&View=%7B4267AEFE%2D7E8B%2D402D%2D919D%2D41BED55BA4E7%7D