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Joint Polar Satellite System (JPSS) Algorithm Specification Volume I: Software Requirement Specification (SRS) for the CrIS RDR/SDR

NOAA / NASA

Goddard Space Flight Center Greenbelt, Maryland

Joint Polar Satellite System (JPSS) Algorithm Specification Volume I: Software Requirement Specification (SRS) for the CrIS RDR/SDR

Review/Signature/Approval Page

Prepared By:

JPSS Ground Segment Systems Engineering

Approved By:

Kellyann F. Jeletic
Ground Segment Project SEIT Lead

Heather Kilcoyne
JPSS Ground Segment Project Manager

Electronic Approval available on-line at: https://jpssmis.gsfc.nasa.gov/frontmenu_dsp.cfm

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
NASA/GSFC
Code 474
Greenbelt, MD 20771

Change History Log

Revision	Effective Date	Description of Changes (Reference the CCR & CCB/ERB Approve Date)
Rev -	August 8, 2013	This version incorporates 474-CCR-13-1110 which was approved by the JPSS Ground ERB on the effective day shown.
A	Jan 23, 2014	This version incorporates 474-CCR-13-1337 which was approved by the 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	Nov 20, 2014	This version incorporates 474-CCR-14-1721, 474-CCR-14-1741, 474-CCR-14-1781, 474-CCR-14-1793, 474-CCR-14-2110 and 474-CCR-14-2118 which was approved by the JPSS Ground ERB on the effective day shown.
C	Jun 19, 2015	This version incorporates 474-CCR-15-2452 and 474-CCR-15-2446, which was approved by JPSS Ground ERB on the effective date shown.
D	Mar 31, 2016	This version incorporates 474-CCR-15-2480 474-CCR-15-2657, and 474-CCR-16-2814, which was approved by JPSS Ground ERB on the effective date shown.
E	Aug 23, 2016	This version incorporates 474-CCR-16-2939 and 474-CCR-16-2985 which was approved by JPSS Ground ERB on the effective date shown.
0200F	Sep 22, 2016	This version incorporates 474-CCR-16-3049 which was approved by JPSS Ground ERB on the effective date shown.
0200G	Feb 09, 2018	This version incorporates 474-CCR-18-3822 which was approved by JPSS Ground ERB on the effective date shown.
H	Dec 14, 2018	This version incorporates 474-CCR-18-4203. This version incorporates 0220A of 474-00448-01-03-B0220, dated 11/29/2016 to create this baseline. This was approved by the JPSS Ground ERB on the effective date shown.
I	Oct 24, 2019	This version incorporates 474-CCR-19-4584 which was approved by the JPSS Ground ERB on Oct 17, 2019 and by the JPSS Ground Segment CCB on the effective date shown.
J	Sep 14, 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-20-5117 which was approved by the JPSS Ground ERB on Aug 12, 2020 and by the JPSS Ground Segment CCB on Aug 27, 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 Jul 30, 2020; 474-CCR-20-4960 which was approved

		by the JPSS Ground ERB on Apr 22, 2020 and by the JPSS Ground Segment CCB on the effective date shown.
K	Mar 09, 2021	This version incorporates 474-CCR-21-5418 which was approved by the JPSS Ground ERB on Mar 09, 2021 and by the JPSS Ground Segment CCB on the effective date shown.
L	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.

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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 SRS provides requirements for the CrIS (Cross-Track Infrared Sounder) Raw Data Records (RDRs) and Sensor Data Records (SDRs). CrIS is a spaceborne Fourier transform spectrometer used for atmospheric sounding at infrared wavelengths, from approximately 3.9 to 15.4 microns, in 2211 spectral channels (1305 spectral channels for S-NPP). The channels are grouped into 3 bands: short, medium, and long wavelength labeled as SWIR, MWIR, and LWIR respectively. Data are taken over a 2200 km wide swath, taken approximately 50 degrees either side of nadir, measuring top-of-atmosphere radiances. A scan is taken every 8 seconds, including an internal warm calibration measurement and a deep-space cold calibration measurement. The CrIS SDR algorithms transform the scene interferograms into fully calibrated, unapodized, spectral information. The spectra have real and imaginary parts. The CrIS field of regard (FOR) consists of a detector with an array of 3x3=9 fields of view (FOV). Each FOV subtends slightly less than 1 degree with a 1.1 degree separation between adjacent FOVs. There are 30 FORs in a single scan.

1.2 Algorithm Overview

The SDR Algorithm system has to mathematically retransform the scene interferograms from the CrIS instrument into spectral information useful to scientists, considering all relevant data from characterization and calibration measurements in order to yield fully calibrated spectra. All this information will enable atmospheric key parameter retrieval.

The main objectives of the SDR Algorithms are:

- Pre-process incoming data packets
  - Load and sort data
  - Convert interferograms to spectra
- Convert scene measurements into calibrated spectra
  - Compute spectral calibration, using metrology wavelength measurements
    - Characterize metrology using neon lamp reference measurements
    - Monitor metrology drift using laser diode parameters measurements
    - Perform alias unfolding and spectral labeling
    - Map spectral channels to a fixed wavenumber grid

Compute radiometric calibration, using reference calibration measurements

Average warm calibration target data, average cold calibration target data

Subtract sensor background radiance

Remove sensor induced phase dispersion

Correct for fringe count errors

Perform non-linearity correction

Correct for off-axis self-apodization on each FOV

Correct for polarization errors

Compute geometric calibration, using LOS direction and ephemeris data

Evaluate the associated error

Check for data quality and maintain quality controls

Compute Noise Equivalent difference Radiance (NEdN) estimates

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 Documents 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
474-00448-02-03	Joint Polar Satellite System (JPSS) Algorithm Specification Volume II: Data Dictionary for CrIS RDR/SDR
474-00448-04-03	Joint Polar Satellite System (JPSS) Algorithm Specification Volume IV: Software Requirements Specification Parameter File (SRSPF) for CrIS RDR/SDR
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

SRS.01.03_49 The CrIS SDR complex spectra algorithm shall calculate the long-wave complex spectra with an accuracy at 287 K of 0.45%.

Rationale: The accuracy values of the long-wave spectral radiance were flowed down from the Level 1 and Level 2 documents.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

Block Start: 2.0.0 *Block End:* 2.0.0

SRS.01.03_50 The CrIS SDR complex spectra algorithm shall calculate the complex spectra with spectral uncertainty of 10 ppm at all bands.

Rationale: The spectral uncertainty values were flowed down from the Level 1 and Level 2 documents.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

Block Start: 2.0.0 *Block End:* 2.0.0

SRS.01.03_51 The CrIS SDR complex spectra algorithm shall calculate the short-wave complex spectra with spectral resolution of at least 2.5 cm^-1 for truncated spectral resolution, or with spectral resolution of at least 0.625 cm^-1 for full spectral resolution.

Rationale: The spectral resolution limit for the short-wave band (wavenumber range in 2155-2550 cm-1) was flowed down from the Level 1 and Level 2 documents. The Truncated Spectral (TS) resolution has mission effectivity of S-NPP and JPSS-1. The Full Spectral (FS) resolution has mission effectivity of S-NPP, JPSS-1 and JPSS-2.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

Block Start: 2.0.0 *Block End:* 2.0.0

SRS.01.03_182 The CrIS SDR complex spectra algorithm shall calculate the mid-wave complex spectra with a spectral resolution of at least 1.25 cm^-1 for truncated resolution, or with spectral resolution of at least 0.625 cm^-1 for full spectral resolution.

Rationale: The spectral resolution limit for the mid-wave band (wavenumber range in 1210-1750 cm-1) was flowed down from the Level 1 and Level 2 documents. The TS resolution has mission effectivity of S-NPP and JPSS-1. The FS resolution has mission effectivity of S-NPP, JPSS-1 and JPSS-2.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

Block Start: 2.0.0 *Block End:* 2.0.0

SRS.01.03_183 The CrIS SDR complex spectra algorithm shall calculate the long-wave complex spectra with a spectral resolution of at least 0.625 cm^-1.

Rationale: The spectral resolution limit for the long-wave band (wavenumber range in 650-1095 cm-1) was flowed down from the Level 1 and Level 2 documents.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

Block Start: 2.0.0 *Block End:* 2.0.0

SRS.01.03_54 The CrIS SDR complex spectra algorithm shall calculate the short-wave complex spectra with a maximum Noise Equivalent difference Radiance (NEdN) specified in nedn_sw_specification.txt for the truncated spectral resolution of 2.5 cm^-1.

Rationale: The maximum NEdN values for the short-wave band were flowed down from the Level 1 and Level 2 documents.

Mission Effectivity: S-NPP, JPSS-1

Block Start: 2.0.0 *Block End:* 2.0.0

SRS.01.03_472 The CrIS SDR complex spectra algorithm shall calculate the short-wave complex spectra with a maximum NEdN specified in nedn_sw_fs_specification.txt for the full spectral resolution of 0.625 cm^-1.

Rationale: The maximum NEdN values for the short-wave band were flowed down from the Level 2 document. The CrIS Full Spectral Resolution SDR NEdN requirements allocated to the Ground Segment will be verified prior to self-apodization correction and spectral calibration.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

Block Start: 2.0.0 *Block End:* 2.0.0

SRS.01.03_347 The CrIS SDR complex spectra algorithm shall calculate the mid-wave complex spectra with a maximum NEdN specified in nedn_mw_specification.txt for the truncated spectral resolution of 1.25 cm^-1.

Rationale: The maximum NEdN values for the mid-wave band were flowed down from the Level 1 and Level 2 documents

Mission Effectivity: S-NPP, JPSS-1

Block Start: 2.0.0 *Block End:* 2.0.0

SRS.01.03_473 The CrIS SDR complex spectra algorithm shall calculate the mid-wave complex spectra with a maximum NEdN specified in nedn_mw_fs_specification.txt for the full spectral resolution of 0.625 cm^-1.

Rationale: The maximum NEdN values for the mid-wave band were flowed down from the Level 2 document. The CrIS Full Spectral Resolution SDR NEdN requirements allocated to the Ground Segment will be verified prior to self-apodization correction and spectral calibration.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

Block Start: 2.0.0 *Block End:* 2.0.0

SRS.01.03_348 The CrIS SDR complex spectra algorithm shall calculate the long-wave complex spectra with a maximum NEdN specified in nedn_lw_specification.txt excluding the effect of the CMO matrix where the truncated resolution is the same as the full spectral resolution of 0.625 cm^-1.

Rationale: The maximum NEdN values for the long-wave band were flowed down from the Level 1 and Level 2 documents.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

Block Start: 2.0.0 *Block End:* 2.0.0

SRS.01.03_345 The CrIS SDR complex spectra algorithm shall calculate the mid-wave complex spectra with an accuracy at 287 K of 0.58%.

Rationale: The accuracy values of the mid-wave band spectral radiance were flowed down from the Level 1 and Level 2 documents.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

Block Start: 2.0.0 *Block End:* 2.0.0

SRS.01.03_346 The CrIS SDR complex spectra algorithm shall calculate the short-wave complex spectra with an accuracy at 287 K of 0.77%.

Rationale: The accuracy values of the short-wave band spectral radiance were flowed down from the Level 1 and Level 2 documents.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

Block Start: 2.0.0 *Block End:* 2.0.0

SRS.01.03_427 The CrIS SDR Geolocation algorithm computation shall have a 3 sigma mapping uncertainty of 5 km.

Rationale: This requirement is derived from L1RD requirements for Atmospheric Vertical Moisture Profile and Atmospheric Vertical Temperature Profile products.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

Block Start: 2.0.0 *Block End:* 2.0.0

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

SRS.01.03_47 The CrIS SDR software shall incorporate a computing algorithm provided for the radiometrically- and spectrally-calibrated earth scene complex spectra for truncated resolution spectral bins.

Rationale: The earth scene complex spectra is one of the CrIS SDR products. The SDR software through its computing algorithm must produce radiometrically and spectrally calibrated earth scene CrIS SDR products in accordance with the JPSS CrIS SDR ATBD (D0001-M01-S01-002). Simultaneous production and delivery of both the truncated and full spectral resolution SDRs is required in order to provide for validation of the full resolution product while avoiding impacts to existing user enterprise systems designed for the truncated product. The envisioned full transition to the full spectral resolution SDR will be dictated by OSPO based on end user readiness for accommodating that transition. The TS resolution has mission effectivity of S-NPP and JPSS-1. The FS resolution has mission effectivity of S-NPP, JPSS-1 and JPSS-2.

Mission Effectivity: S-NPP, JPSS-1

Block Start: 2.0.0 *Block End:* 2.0.0

SRS.01.03_474 The CrIS SDR software shall incorporate a computing algorithm provided for the radiometrically- and spectrally-calibrated earth scene complex spectra for full resolution spectral bins.

Rationale: In accordance with the JPSS CrIS SDR ATBD (D0001-M01-S01-002). Simultaneous production and delivery of both the truncated and full spectral resolution SDRs is required in order to provide for validation of the full resolution product while avoiding impacts to existing user enterprise systems designed for the truncated product. The envisioned full transition to the full spectral resolution SDR will be dictated by OSPO based on end user readiness for accommodating that transition. The TS resolution has mission effectivity of S-NPP and JPSS-1. The FS resolution has mission effectivity of S-NPP, JPSS-1 and JPSS-2.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

Block Start: 2.0.0 *Block End:* 2.0.0

SRS.01.03_52 The CrIS SDR software shall incorporate a computing algorithm provided for the noise equivalent difference radiance (NEdN) for all spectral bins.

Rationale: The NEDN is one CrIS SDR products. The SDR software through its computing algorithm must produce NEDN for all spectral bins in accordance with the JPSS CrIS SDR ATBD (D0001-M01-S01-002).

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

Block Start: 2.0.0 *Block End:* 2.0.0

SRS.01.03_56 The CrIS SDR software shall incorporate a computing algorithm provided for zero path difference amplitude and fringe count.

Rationale: The SDR software through its computing algorithm must compute zero path difference amplitude and fringe count for the CrIS spectro-radiometric calibration process in

accordance with the JPSS CrIS SDR ATBD (D0001-M01-S01-002). The activation of fringe count error processing will be deferred until the optimization of the algorithm meets latency. The fringe count error algorithm will not be activated.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

Block Start: 2.0.0 *Block End:* 2.0.0

SRS.01.03_63 The CrIS SDR software shall incorporate a computing algorithm provided for the deep space spectra symmetry, deep space spectra stability, and ICT spectra stability.

Rationale: The SDR software through its computing algorithm must compute deep space spectra symmetry, deep space spectra stability, and ICT (internal calibration target) spectra stability for the CrIS spectro-radiometric calibration process in accordance with the JPSS CrIS SDR ATBD (D0001-M01-S01-002).

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

Block Start: 2.0.0 *Block End:* 2.0.0

SRS.01.03_86 The CrIS SDR software shall incorporate a computing algorithm provided for the fringe count delay.

Rationale: The SDR software through its computing algorithm must compute the fringe count delay for the CrIS spectro-radiometric calibration process in accordance with the JPSS CrIS SDR ATBD (D0001-M01-S01-002). The activation of fringe count error processing will be deferred until the optimization of the algorithm meets latency. The fringe count error algorithm will not be activated.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

Block Start: 2.0.0 *Block End:* 2.0.0

SRS.01.03_424 The CrIS SDR software shall incorporate a computing algorithm provided for laser wavelengths.

Rationale: The SDR software through its computing algorithm must compute the laser wavelengths for the CrIS spectro-radiometric calibration process in accordance with the JPSS CrIS SDR ATBD (D0001-M01-S01-002).

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

Block Start: 2.0.0 *Block End:* 2.0.0

3.2.3 Algorithm Exception Handling

SRS.01.03_88 The CrIS SDR software shall set the <FillField> to <FillValue> for <FillCondition> specified in the JPSS Algorithm Specification Vol IV: SRSPF for CrIS RDR/SDR (474-00448-04-03) <SDR><fill>.

Rationale: The SDR software through its computing algorithm must fill the CrIS SDR and CrIS FS SDR values based on the established fill conditions to satisfy exclusion and fill conditions.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

Block Start: 2.0.0 *Block End:* 3.0.0

SRS.01.03_98 The CrIS Geolocation SDR software shall set the <FillField> to <FillValue> for <FillCondition> specified in the JPSS Algorithm Specification Vol IV: SRSPF for CrIS RDR/SDR (474-00448-04-03) <SDR_GEO><fill>.

Rationale: The SDR software through its computing algorithm must fill the CrIS SDR Geolocation values based on the established fill conditions to satisfy exclusion and fill conditions.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

Block Start: 2.0.0 *Block End:* 3.0.0

3.3 External Interfaces

3.3.1 Inputs

SRS.01.03_87 The CrIS SDR software shall incorporate inputs specified in Table 3-1.

Rationale: The SDR generation software must be able to receive and process the resource interaction items shown in Table 3-1 in order to produce the intended CrIS SDR products.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

Block Start: 2.0.0 *Block End:* 3.0.0

SRS.01.03_428 The CrIS SDR software shall ingest tables and coefficients formatted in accordance with Section 7 of the JPSS Algorithm Specification Vol II: Data Dictionary for CrIS RDR/SDR (474-00448-02-03).

Rationale: This defines the formats for Lookup Tables, and Processing Coefficients for input into the algorithm module.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

Block Start: 2.0.0 *Block End:* 3.0.0

Table 3-1 and Figure 3-1 are best viewed together since they describe the processes governed by this SRS in different ways. The figure diagrams the data flowing into, out of, and within the code governed by this SRS. The table lists these same data interactions as well as all downstream dependencies for outputs from this SRS.

Each row in the table describes a single software interaction - data flowing from one software item to another. The data is listed in the first column. The second and third columns include the collection short name and mnemonic for the data. Blanks indicate there is no mnemonic. The fourth and fifth columns contain the SRS that generates the data product(s) in the first column, and the SRS that receives those products. The final two columns contain the actual function name in Algorithm Development Library (ADL) that produces those products, and the function that inputs those products. The SRS's titled "Ingest MSD" and "Store/Retrieve" are non-existent

SRS's functioning as data handling for the IDPS. The software functions "Store Products" and "Retrieve Products" are similar non-existent functions that operate as IDPS data handling.

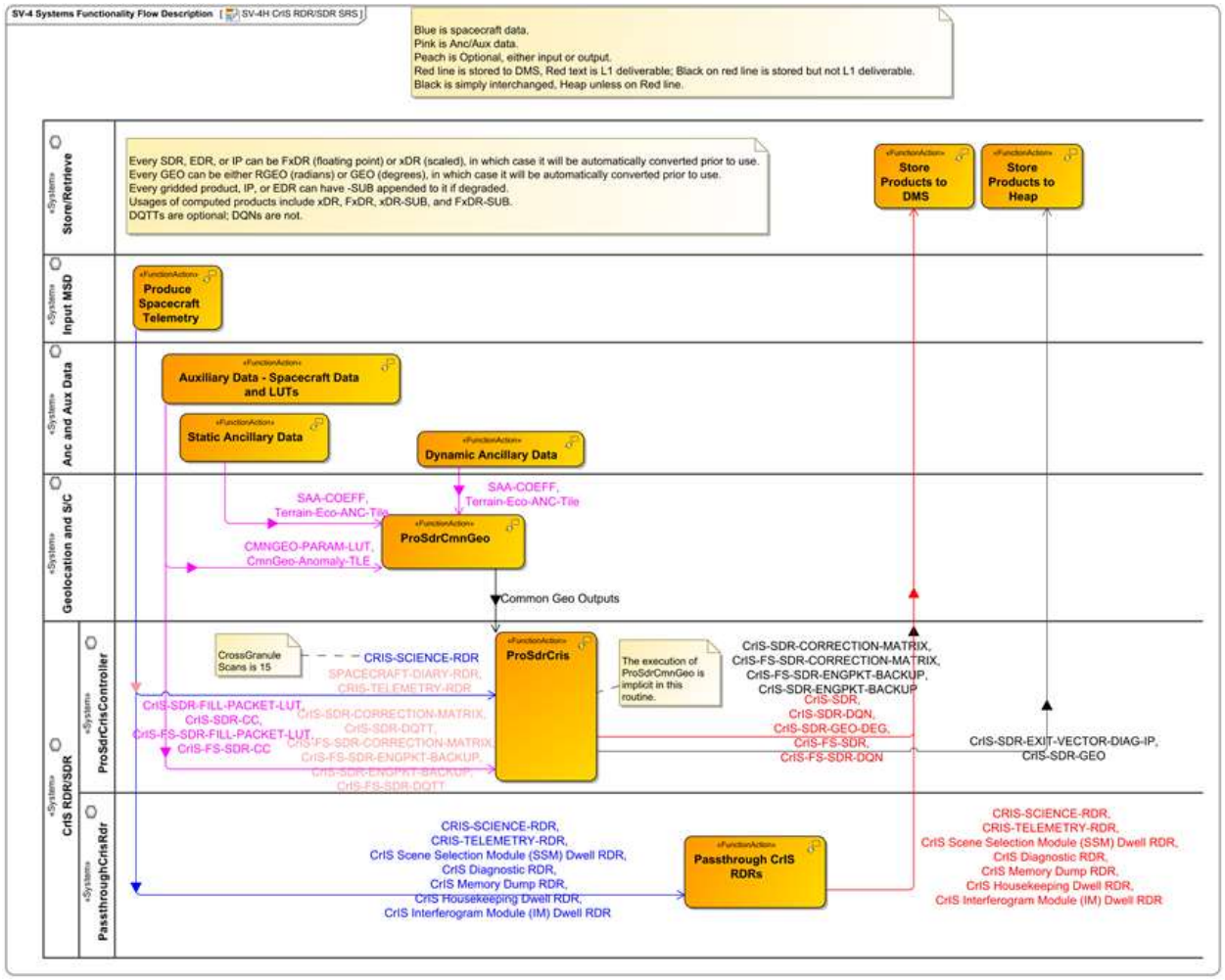

Figure: 3-1 CrIS RDR/SDR Data Flows

Table: 3-1 SV-6 Systems Resource Flow Matrix: CrIS SDR

	Data Product Name	Collection Short Name	Mnemonic	Sending SRS	Receiving SRS	Sending Function	Receiving Function
1	•SPACECRAFT-DIARY-RDR •CRIS-TELEMETRY-RDR	•SPACECRAFT-DIARY-RDR •CRIS-TELEMETRY-RDR	•RDRE-SCAE-C0030 •RDRE-CRIS-C0031	Input MSD	CrIS RDR/SDR	Produce Spacecraft Telemetry	ProSdrCris
2	•CRIS-SCIENCE-RDR •CRIS-TELEMETRY-RDR •CrIS Scene Selection Module (SSM) Dwell RDR •CrIS Diagnostic RDR •CrIS Memory Dump RDR •CrIS Housekeeping Dwell RDR •CrIS Interferogram Module (IM) Dwell RDR	•CRIS-SCIENCE-RDR •CRIS-TELEMETRY-RDR •CRIS-SSMDWELL-RDR •CRIS-DIAGNOSTIC-RDR •CRIS-DUMP-RDR •CRIS-HSKDWELL-RDR •CRIS-IMDWELL-RDR	•RDRE-CRIS-C0030 •RDRE-CRIS-C0031 •RDRE-CRIS-C0046 •RDRE-CRIS-C0032 •RDRE-CRIS-C0035 •RDRE-CRIS-C0036 •RDRE-CRIS-C0056	Input MSD	CrIS RDR/SDR	Produce Spacecraft Telemetry	Passthrough CrIS RDRs
3	•CRIS-SCIENCE-RDR	•CRIS-SCIENCE-RDR	•RDRE-CRIS-C0030	Input MSD	CrIS RDR/SDR	Produce Spacecraft Telemetry	ProSdrCris
4	•CrIS-SDR-FILL-PACKET-LUT •CrIS-SDR-CC •CrIS-FS-SDR-FILL-PACKET-LUT •CrIS-FS-SDR-CC	•CrIS-SDR-FILL-PACKET-LUT •CRIS-SDR-CC •CrIS-FS-SDR-FILL-PACKET-LUT •CrIS-FS-SDR-CC	•NP_NU-LM0230-016 •DP_NU-LM2020-001 •NP_NU-LM0230-017 •DP_NU-LM2020-006	Anc and Aux Data	CrIS RDR/SDR	Auxiliary Data - Spacecraft Data and LUTs	ProSdrCris

	Data Product Name	Collection Short Name	Mnemonic	Sending SRS	Receiving SRS	Sending Function	Receiving Function
5	•CrIS-SDR-CORRECTION-MATRIX •CrIS-SDR-DQTT •CrIS-FS-SDR-CORRECTION-MATRIX •CrIS-FS-SDR-ENGPKT-BACKUP •CrIS-SDR-ENGPKT-BACKUP •CrIS-FS-SDR-DQTT	•CrIS-Correct-Matrix-AUX •CrIS-SDR-DQTT •CrIS-FS-Correct-Matrix-AUX •CrIS-FS-SDR-ENGPKT-BACKUP-AUX •CrIS-SDR-ENGPKT-BACKUP-AUX •CrIS-FS-SDR-DQTT	•NP_NU-LM0130-000 •DP_NU-LM2030-000 •NP_NU-LM0130-002 •NP_NU-LM0130-003 •NP_NU-LM0130-001 •DP_NU-LN2030-000	Anc and Aux Data	CrIS RDR/SDR	Auxiliary Data - Spacecraft Data and LUTs	ProSdrCris
6	•Common Geo Outputs	•None	•None	Geolocation and S/C	CrIS RDR/SDR	ProSdrCmnGeo	ProSdrCris
7	•CRIS-SCIENCE-RDR •CRIS-TELEMETRY-RDR •CrIS Scene Selection Module (SSM) Dwell RDR •CrIS Diagnostic RDR •CrIS Memory Dump RDR •CrIS Housekeeping Dwell RDR •CrIS Interferogram Module (IM) Dwell RDR	•CRIS-SCIENCE-RDR •CRIS-TELEMETRY-RDR •CRIS-SSMDWELL-RDR •CRIS-DIAGNOSTIC-RDR •CRIS-DUMP-RDR •CRIS-HSKDWELL-RDR •CRIS-IMDWELL-RDR	•RDRE-CRIS-C0030 •RDRE-CRIS-C0031 •RDRE-CRIS-C0046 •RDRE-CRIS-C0032 •RDRE-CRIS-C0035 •RDRE-CRIS-C0036 •RDRE-CRIS-C0056	CrIS RDR/SDR	Store/Retrieve	Passthrough CrIS RDRs	Store Products to DMS

	Data Product Name	Collection Short Name	Mnemonic	Sending SRS	Receiving SRS	Sending Function	Receiving Function
8	•CrIS-SDR •CrIS-SDR-DQN •CrIS-SDR-GEO-DEG •CrIS-FS-SDR •CrIS-FS-SDR-DQN	•CrIS-SDR •CrIS-SDR-DQN •CRIS-SDR-GEO •CrIS-FS-SDR •CrIS-FS-SDR-DQN	•SDRE-CRIS-C0030 •DP_NU-L00510-000 •None •SDRE-CRIS-C0031 •DP_NU-L00510-000	CrIS RDR/SDR	Store/Retrieve	ProSdrCris	Store Products to DMS
9	•CrIS-SDR-EXIT-VECTOR-DIAG-IP •CrIS-SDR-GEO	•CrIS-SDR-EXIT-VECTOR-DIAG-IP •CRIS-SDR-RGEO	•None •None	CrIS RDR/SDR	Store/Retrieve	ProSdrCris	Store Products to Heap
10	•CrIS-SDR-CORRECTION-MATRIX •CrIS-FS-SDR-CORRECTION-MATRIX •CrIS-FS-SDR-ENGPKT-BACKUP •CrIS-SDR-ENGPKT-BACKUP	•CrIS-Correct-Matrix-AUX •CrIS-FS-Correct-Matrix-AUX •CrIS-FS-SDR-ENGPKT-BACKUP-AUX •CrIS-SDR-ENGPKT-BACKUP-AUX	•NP_NU-LM0130-000 •NP_NU-LM0130-002 •NP_NU-LM0130-003 •NP_NU-LM0130-001	CrIS RDR/SDR	Store/Retrieve	ProSdrCris	Store Products to DMS

3.3.2 Outputs

SRS.01.03_40 The CrIS RDR software shall generate the CrIS Science RDR from mission data packet APIDs specified in the JPSS Algorithm Specification Vol IV: SRSPF for CrIS RDR/SDR (474-00448-04-03) <RDR><Science>.

Rationale: The Science RDR is one of CrIS 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.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

Block Start: 2.0.0 *Block End:* 3.0.0

SRS.01.03_41 The CrIS RDR software shall generate the CrIS Diagnostic RDR from mission data packet APIDs specified in the JPSS Algorithm Specification Vol IV: SRSPF for CrIS RDR/SDR (474-00448-04-03) <RDR><Diagnostic>.

Rationale: The Diagnostic RDR is one of CrIS 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.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

Block Start: 2.0.0 *Block End:* 3.0.0

SRS.01.03_42 The CrIS RDR software shall generate the CrIS Housekeeping Dwell RDR from mission data packet APIDs specified in the JPSS Algorithm Specification Vol IV: SRSPF for CrIS RDR/SDR (474-00448-04-03) <RDR><HKDwell>.

Rationale: The Housekeeping Dwell RDR is one of CrIS 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.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

Block Start: 2.0.0 *Block End:* 3.0.0

SRS.01.03_43 The CrIS RDR software shall generate the CrIS Interferogram Module (IM) Dwell RDR , from mission data packet APIDs specified in the JPSS Algorithm Specification Vol IV: SRSPF for CrIS RDR/SDR (474-00448-04-03) <RDR><InterfMod>.

Rationale: The Interferogram Module (IM) Dwell RDR is one of CrIS 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.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

Block Start: 2.0.0 *Block End:* 3.0.0

SRS.01.03_44 The CrIS RDR software shall generate the CrIS Scene Selection Module (SSM) Dwell RDR from mission data packet APIDs specified in the JPSS Algorithm Specification Vol IV: SRSPF for CrIS RDR/SDR (474-00448-04-03) <RDR><SSMDwell>.

Rationale: The Interferogram Scene Selection Module (SSM) Dwell RDR is one of CrIS 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.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

Block Start: 2.0.0 *Block End:* 3.0.0

SRS.01.03_45 The CrIS RDR software shall generate the CrIS Memory Dump RDR from mission data packet APIDs specified in the JPSS Algorithm Specification Vol IV: SRSPF for CrIS RDR/SDR (474-00448-04-03) <RDR><MemoryDump>.

Rationale: The Memory Dump RDR is one of CrIS 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.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

Block Start: 2.0.0 *Block End:* 3.0.0

SRS.01.03_46 The CrIS RDR software shall generate the CrIS Telemetry RDR from mission data packet APIDs specified in the JPSS Algorithm Specification Vol IV: SRSPF for CrIS RDR/SDR (474-00448-04-03) <RDR><Telemetry>.

Rationale: The Telemetry RDR is one of CrIS 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.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

Block Start: 2.0.0 *Block End:* 3.0.0

SRS.01.03_57 The CrIS SDR software shall generate the CrIS Truncated Spectral SDR product in conformance with the XML format file in Attachment A.1 of the JPSS Algorithm Specification Vol II: Data Dictionary for CrIS RDR/SDR (474-00448-02-03).

Rationale: The product profile must conform to the XML format file. Simultaneous production and delivery of both the truncated and full spectral resolution SDRs is required in order to provide for validation of the full resolution product while avoiding impacts to existing user enterprise systems designed for the truncated product. The envisioned full transition to the

full spectral resolution SDR will be determined based on end user readiness for accommodating that transition.

Mission Effectivity: S-NPP, JPSS-1

Block Start: 2.0.0 *Block End:* 2.0.0

SRS.01.03_491 The CrIS SDR software shall generate the CrIS Full Spectral SDR product in conformance with the XML format file in Attachment A.3 of the JPSS Algorithm Specification Vol II: Data Dictionary for CrIS RDR/SDR (474-00448-02-03).

Rationale: The product profile must conform to the XML format file. Simultaneous production and delivery of both the truncated and full spectral resolution SDRs is required in order to provide for validation of the full resolution product while avoiding impacts to existing user enterprise systems designed for the truncated product. The envisioned full transition to the full spectral resolution SDR will be determined based on end user readiness for accommodating that transition.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

Block Start: 2.0.0 *Block End:* 3.0.0

SRS.01.03_95 The CrIS SDR software shall generate the SDR geolocation product in conformance with the XML format file in Attachment A.2 of the JPSS Algorithm Specification Vol II: Data Dictionary for CrIS RDR/SDR (474-00448-02-03).

Rationale: The product profile must conform to the XML format file.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

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

SRS.01.03_94 The CrIS SDR software shall report for each <FlagScope> quality flags using <FlagLogic> as specified in the JPSS Algorithm Specification Vol IV: SRSPF for CrIS RDR/SDR (474-00448-04-03) <SDR><QF>.

Rationale: Quality Flags for both the CrIS SDR and CrIS FS SDR must be generated based on the established flag conditions, logic, and format.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

Block Start: 2.0.0 *Block End:* 3.0.0

SRS.01.03_423 The CrIS SDR geolocation software shall report for each <FlagScope> quality flags using <FlagLogic> as specified in the JPSS Algorithm Specification Vol IV: SRSPF for CrIS RDR/SDR (474-00448-04-03) <SDR_GEO><QF>.

Rationale: Quality Flags must be generated based on the established flag conditions, logic, and format.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

Block Start: 2.0.0 *Block End:* 3.0.0

3.7 Data Quality Notification Requirements

SRS.01.03_62 The CrIS SDR software shall send data quality notifications to the operator according to logic specified in the JPSS Algorithm Specification Vol IV: SRSPF for CrIS RDR/SDR (474-00448-04-03) <SDR><Notification>.

Rationale: Notifications for both the CrIS SDR and CrIS FS SDR must be generated and sent based on the established logic and conditions.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

Block Start: 2.0.0 *Block End:* 3.0.0

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

SRS.01.03_343 The JPSS Common Ground System shall execute the CrIS SDR algorithm.

Rationale: The CGS must incorporate algorithm changes that are supplied by the algorithm vendor. Simultaneous production and delivery of both the truncated and full spectral resolution SDRs is required in order to provide for validation of the full resolution product while avoiding impacts to existing user enterprise systems designed for the truncated product. The envisioned full transition to the full spectral resolution SDR will be determined based on end user readiness for accommodating that transition.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

Block Start: 2.0.0 *Block End:* 3.0.0

SRS.01.03_344 The JPSS Common Ground System shall execute the CrIS SDR geolocation algorithm.

Rationale: The CGS must incorporate algorithm changes that are supplied by the algorithm vendor.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

Block Start: 2.0.0 *Block End:* 3.0.0

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