CloudSat Project

A NASA Earth System Science Pathfinder Mission

1B-CPR Interface Control Document

Algorithm Version: 5.3 (18 July 2007)
1B-CPR Product Version: 008 (18 July 2007)

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1. I/O Lists

1.1 Algorithm Inputs

	Source	Field
(1)	0A-CPR 007	
(2)	0A-CPR 007	
(3)	0A-CPR 007	
(4)	0A-CPR 007	
(5)	0A-CPR 007	
(6)	0A-CPR 007	
(7)	0A-CPR 007	
(8)	0A-CPR 007	
(9)	0A-CPR 007	
(10)	0A-CPR 007	
(11)	0A-CPR 007	
(12)	0A-CPR 007	
(13)	0A-CPR 007	
(14)	0A-CPR 007	
(15)	0A-CPR 007	
(16)	0A-CPR 007	
(17)	0A-CPR 007	
(18)	0A-CPR 007	
(19)	0A-CPR 007	
(20)	1A-AUX 007	
(21)	1A-AUX 007	
(22)	1A-AUX 007	
(23)	1A-AUX 007	
(24)	1A-AUX 007	
(25)	1A-AUX 007	
(26)	1A-AUX 007	
(27)	1A-AUX 007	
(28)	1A-AUX 007	
(29)	1A-AUX 007	
(30)	1A-AUX 007	
(31)	1A-AUX 007	

1.2 Products

1.2.1 1B-CPR 008 Fields

	Source	Field
(1)	1B-CPR 008	Seconds since the start of the granule.
(2)	1B-CPR 008	UTC seconds since 00:00 Z of the first profile
(3)	1B-CPR 008	TAI time for the first profile.
(4)	1B-CPR 008	Spacecraft Latitude
(5)	1B-CPR 008	Spacecraft Longitude
(6)	1B-CPR 008	Range to the CPR boresight intercept with the geoid
(7)	1B-CPR 008	Digital Elevation Map
(8)	1B-CPR 008	Range to First Bin
(9)	1B-CPR 008	Ray status range bin size
(10)	1B-CPR 008	Nominal satellite pitch angle offset from nadir
(11)	1B-CPR 008	Nominal satellite roll angle offset from nadir
(12)	1B-CPR 008	Data Quality
(13)	1B-CPR 008	Data status flags
(14)	1B-CPR 008	CPR bus orientation (target ID)
(15)	1B-CPR 008	Land Sea Flag
(16)	1B-CPR 008	Ray (frame) header Metadata wavelength
(17)	1B-CPR 008	Ray Header spatial averaging
(18)	1B-CPR 008	Ray Header Calibration Parameter Version
(19)	1B-CPR 008	Ray Status Validity
(20)	1B-CPR 008	Pulse Repetition Interval
(21)	1B-CPR 008	Pulse Width
(22)	1B-CPR 008	Number of Transmitted Pulses
(23)	1B-CPR 008	Antenna Noise Power
(24)	1B-CPR 008	Transmit Powers
(25)	1B-CPR 008	Average transmit power
(26)	1B-CPR 008	CPR Calibration coefficients
(27)	1B-CPR 008	Noise Floor Power (mean and standard deviation)
(28)	1B-CPR 008	Received Echo Powers
(29)	1B-CPR 008	Sigma-Zero
(30)	1B-CPR 008	Surface Bin Number
(31)	1B-CPR 008	
(32)	1B-CPR 008	
(33)	1B-CPR 008	

2. Input Field Specifications

(1)

Name in file: Block_start_ID
Source: 0A-CPR 007
Field type (in file): UINT(4)
Field type (in algorithm): UINT(4)
Range: 5.98586e+007 to 5.98586e+007
Missing value:
Missing value operator:
Factor: 1

Dimensions: nray
Units:
Offset: 0
MB: 0.139

(2)

Name in file: Seconds
Source: 0A-CPR 007
Field type (in file): UINT(2)
Field type (in algorithm): UINT(2)
Dimensions: nray
Units: seconds
Range: 0 to 65535
Missing value:
Missing value operator:
Factor: 1
Offset: 0
MB: 0.069

(3)

Name in file: VTCW
Source: 0A-CPR 007
Field type (in file): UINT(5)
Field type (in algorithm): UINT(5)
Dimensions: nray
Units: microseconds
Range: 0 to 1.09951e+012
Missing value:
Missing value operator:
Factor: 1
Offset: 0
MB: 0.173

(4)

Name in file: Milliseconds
Source: 0A-CPR 007
Field type (in file): UINT(2)
Field type (in algorithm): UINT(2)
Dimensions: nray
Units: milliseconds
Range: 0 to 1024
Missing value:
Missing value operator:
Factor: 1
Offset: 0
MB: 0.069

(5)

Name in file: RayStatus_PRI
Source: 0A-CPR 007
Field type (in file): UINT(1)
Field type (in algorithm): UINT(1)
Dimensions: nray
Units: 1.6 microsec
Range: 140 to 208
Missing value:
Missing value operator:
Factor: 1
Offset: 0
MB: 0.035

(6)

Name in file: RayStatus_calibration_source
Source: 0A-CPR 007
Field type (in file): UINT(1)
Field type (in algorithm): UINT(1)
Dimensions: nray
Units:
Range: to
Missing value:
Missing value operator:
Factor: 1
Offset: 0
MB: 0.035

(7)

Name in file: RayStatus_data_window_delay
Source: 0A-CPR 007
Field type (in file): UINT(1)
Field type (in algorithm): UINT(1)
Dimensions: nray
Units:
Range: to
Missing value:
Missing value operator:
Factor: 1
Offset: 0
MB: 0.035

(8)

Name in file: RayStatus_echoes_in_flight
Source: 0A-CPR 007
Field type (in file): UINT(1)
Field type (in algorithm): UINT(1)
Dimensions: nray
Units:
Range: to
Missing value:
Missing value operator:
Factor: 1
Offset: 0
MB: 0.035

(9)

Name in file: RayStatus_pulsesTx
Source: 0A-CPR 007
Field type (in file): INT(2)
Field type (in algorithm): INT(2)
Dimensions: nray
Units:
Range: to
Missing value:
Missing value operator:
Factor: 1
Offset: 0
MB: 0.069

(10)

Name in file: RayStatus_mode
Source: 0A-CPR 007
Field type (in file): UINT(1)
Field type (in algorithm): UINT(1)
Dimensions: nray
Units:
Range: to
Missing value:
Missing value operator:
Factor: 1
Offset: 0
MB: 0.035

(11)

Name in file: RayStatus_pulseWidth
Source: 0A-CPR 007
Field type (in file): UINT(1)
Field type (in algorithm): UINT(1)
Dimensions: nray
Units: microsec
Range: 3.1 to 3.8
Missing value:
Missing value operator:
Factor: 1
Offset: 0
MB: 0.035

(12)

Name in file: RayStatus_grid_en_setup
Source: 0A-CPR 007
Field type (in file): UINT(1)
Field type (in algorithm): UINT(1)
Dimensions: nray
Units:
Range: to
Missing value:
Missing value operator:
Factor: 1
Offset: 0
MB: 0.035

(13)

Name in file: RayStatus_RFES_PLL_lock_status
Source: 0A-CPR 007
Field type (in file): UINT(1)
Field type (in algorithm): UINT(1)
Dimensions: nray
Units:
Range: to
Missing value:
Missing value operator:
Factor: 1
Offset: 0
MB: 0.035

(14)

Name in file: Telemetry
Source: 0A-CPR 007
Field type (in file): UINT(1)
Range: to
Missing value:
Missing value operator:

Field type (in algorithm): UINT(1) **Factor:** 1
Dimensions: cpr_telemetry_40,nray **Offset:** 0
Units: **MB:** 1.388

(15)

Name in file: Envelope **Range:** to
Source: 0A-CPR 007 **Missing value:**
Field type (in file): UINT(1) **Missing value operator:**
Field type (in algorithm): UINT(1) **Factor:** 1
Dimensions: cpr_envelope_16,nray **Offset:** 0
Units: **MB:** 0.555

(16)

Name in file: Motor **Range:** to
Source: 0A-CPR 007 **Missing value:**
Field type (in file): UINT(1) **Missing value operator:**
Field type (in algorithm): UINT(1) **Factor:** 1
Dimensions: cpr_motor_4,nray **Offset:** 0
Units: **MB:** 0.139

(17)

Name in file: Science_echo **Range:** to
Source: 0A-CPR 007 **Missing value:**
Field type (in file): REAL(2.5) **Missing value operator:**
Field type (in algorithm): REAL(2.5) **Factor:** 1
Dimensions: cpr_science_echo_126,nray **Offset:** 0
Units: **MB:** 10.93

(18)

Name in file: Frame_counter **Range:** 0 to 65535
Source: 0A-CPR 007 **Missing value:**
Field type (in file): UINT(2) **Missing value operator:**
Field type (in algorithm): UINT(2) **Factor:** 1
Dimensions: nray **Offset:** 0
Units: **MB:** 0.069

(19)

Name in file: CRC
Source: 0A-CPR 007
Field type (in file): UINT(2)
Field type (in algorithm): UINT(2)
Dimensions: nray
Units:
Range: to
Missing value:
Missing value operator:
Factor: 1
Offset: 0
MB: 0.069

(20)

Name in file: Data_status_bit_fields
Source: 1A-AUX 007
Field type (in file): UINT(1)
Field type (in algorithm): UINT(2)
Dimensions: nray
Units:
Range: to
Missing value:
Missing value operator:
Factor: 1
Offset: 0
MB: 0.035

This is a bit field that contains data status flags:

Bit 0: missing frame (0=false, 1=true)
Bit 1: VTCW error (0=false, 1=true)
Bit 2: GPS data valid (0=false, 1=true)
Bit 3: 1 PPS lost (0=false, 1=true)
Bit 4: Star tracker 1 (0=off, 1=on)
Bit 5: Star tracker 2 (0=off, 1=on)
Bit 6: Coast (0=false, 1=true)
Bit 7: NISC (0=false, 1=true)

(21)

Name in file: Data_status_fixed_frame_table_target_ID
Source: 1A-AUX 007
Field type (in file): UINT(1)
Field type (in algorithm): UINT(1)
Dimensions: nray
Units:
Range: 0 to 255
Missing value:
Missing value operator:
Factor: 1
Offset: 0
MB: 0.035

0: CPR to point in 300 seconds - Nominal science mode
1 - 15: Target ID for testing - not planned for operational use
16: CPR to point in 160 seconds
17: CPR 15º to the right
18: CPR 15º to the left

19: CPR 10º to the right -- default rotation
20: CPR 10º to the left -- default rotation
21: CPR 5º to the right
22: CPR 5º to the left
23 - 29: Target ID for testing - not planned for operational use
30 - 36: CPR rotation - not planned for operational use
37 - 39: Not planned for operational use
40: Rotation into the OR orientation
41: Rotation into the x-track along the anti-ang momentum
42: Rotation into the x-track along ang momentum
43: Rotation into the orbit lower orientation
44: Rotation into alt. OR w/ CPR away from Sun
45 - 49: Not planned for operational use
50: Rotation into the OR orientation
51: Rotation into the x-track along the anti-ang momentum
52: Rotation into the x-track along ang momentum
53: Rotation into the orbit lower orientation
54: Rotation into alt. OR w/ CPR away from Sun
55 - 59: Not planned for operational use
60: Rotation into the OR orientation
61: Rotation into the x-track along the anti-ang momentum
62: Rotation into the x-track along ang momentum
63: Rotation into the orbit lower orientation
64: Rotation into alt. OR w/ CPR away from Sun
65 - 69: Not planned for operational use
70: Rotation into the OR orientation
71: Rotation into the x-track along the anti-ang momentum
72: Rotation into the x-track along ang momentum
73: Rotation into the orbit lower orientation
74: Rotation into alt. OR w/ CPR away from Sun
75 - 80: Not planned for operational use
81: Body into the x-track along the anti-ang momentum
82 - 255: Not planned for operational use

ID 0 is control frame 0.
IDs 16-22 are control frame 0, CPR calibration.
IDs 40-44 are control frame 1, 4 thruster closed loop.
IDs 50-54 are control frame 2, 1 thruster open-loop.
IDs 60-64 are control frame 3, 2 thruster open-loop.
IDs 70-74 are control frame 4, 4 thruster open-loop.
ID 81 is control frame 5.

(22)

Name in file: UTC_time_year
Source: 1A-AUX 007
Field type (in file): UINT(2)
Field type (in algorithm): UINT(2)
Dimensions: nray
Range: 0 to 9999
Missing value:
Missing value operator:
Factor: 1
Offset: 0

Units: **MB:** 0.069

(23)

Name in file: UTC_time_julian_day **Range:** 1 to 366
Source: 1A-AUX 007 **Missing value:**
Field type (in file): UINT(2) **Missing value operator:**
Field type (in algorithm): UINT(2) **Factor:** 1
Dimensions: nray **Offset:** 0
Units: **MB:** 0.069

(24)

Name in file: UTC_time_hour **Range:** 0 to 23
Source: 1A-AUX 007 **Missing value:**
Field type (in file): UINT(1) **Missing value operator:**
Field type (in algorithm): UINT(1) **Factor:** 1
Dimensions: nray **Offset:** 0
Units: **MB:** 0.035

(25)

Name in file: UTC_time_minute **Range:** 0 to 59
Source: 1A-AUX 007 **Missing value:**
Field type (in file): UINT(1) **Missing value operator:**
Field type (in algorithm): UINT(1) **Factor:** 1
Dimensions: nray **Offset:** 0
Units: **MB:** 0.035

(26)

Name in file: UTC_time_second **Range:** 0 to 59
Source: 1A-AUX 007 **Missing value:**
Field type (in file): UINT(1) **Missing value operator:**
Field type (in algorithm): UINT(1) **Factor:** 1
Dimensions: nray **Offset:** 0
Units: **MB:** 0.035

(27)

Name in file: UTC_time_millisecond
Source: 1A-AUX 007
Field type (in file): UINT(2)
Field type (in algorithm): UINT(2)
Dimensions: nray
Units:
Range: 0 to 999
Missing value:
Missing value operator:
Factor: 1
Offset: 0
MB: 0.069

(28)

Name in file: Latitude
Source: 1A-AUX 007
Field type (in file): REAL(4)
Field type (in algorithm): REAL(4)
Dimensions: nray
Units: degrees
Range: -90 to 90
Missing value:
Missing value operator:
Factor: 1
Offset: 0
MB: 0.139

(29)

Name in file: Longitude
Source: 1A-AUX 007
Field type (in file): REAL(4)
Field type (in algorithm): REAL(4)
Dimensions: nray
Units: degrees
Range: -180 to 180
Missing value:
Missing value operator:
Factor: 1
Offset: 0
MB: 0.139

(30)

Name in file: Spacecraft_altitude
Source: 1A-AUX 007
Field type (in file): REAL(4)
Field type (in algorithm): REAL(4)
Dimensions: nray
Units: km
Range: 600 to 800
Missing value:
Missing value operator:
Factor: 1
Offset: 0
MB: 0.139

(31)

Name in file: DEM_elevation
Range: -9999 to 8850

Source: 1A-AUX 007
Field type (in file): INT(2)
Field type (in algorithm): INT(2)
Dimensions: nray
Units: meters
Missing value: 9999
Missing value operator: ==
Factor: 1
Offset: 0
MB: 0.069

3. Product Field Specifications

3.1 1B-CPR 008 Fields

(1) Seconds since the start of the granule.

Name in file: Profile_time
Source: 1B-CPR 008
Field type (in file): REAL(4)
Field type (in algorithm): REAL(4)
Dimensions: nray
Units: seconds
Range: 0 to 6000
Missing value:
Missing value operator:
Factor: 1
Offset: 0
MB: 0.139

Seconds since the start of the granule for each profile. The first profile is 0.

(2) UTC seconds since 00:00 Z of the first profile

Name in file: UTC_start
Source: 1B-CPR 008
Field type (in file): REAL(4)
Field type (in algorithm): REAL(4)
Dimensions: <scalar>
Units: seconds
Range: 0 to 86400
Missing value:
Missing value operator:
Factor: 1
Offset: 0
MB: 0

The UTC seconds since 00:00 Z of the first profile in the data file.

(3) TAI time for the first profile.

Name in file: TAI_start
Source: 1B-CPR 008
Field type (in file): REAL(8)
Field type (in algorithm): REAL(8)
Dimensions: <scalar>
Units: seconds
Range: 0 to 6e+008
Missing value:
Missing value operator:
Factor: 1
Offset: 0
MB: 0

The TAI timestamp for the first profile in the data file. TAI is International Atomic Time: seconds since

00:00:00 Jan 1 1993.

(4) Spacecraft Latitude

Name in file: Latitude
Source: 1B-CPR 008
Field type (in file): REAL(4)
Field type (in algorithm): REAL(4)
Dimensions: nray
Units: degrees
Range: -90 to 90
Missing value:
Missing value operator:
Factor: 1
Offset: 0
MB: 0.139

Spacecraft Geodetic Latitude.

(5) Spacecraft Longitude

Name in file: Longitude
Source: 1B-CPR 008
Field type (in file): REAL(4)
Field type (in algorithm): REAL(4)
Dimensions: nray
Units: degrees
Range: -180 to 180
Missing value:
Missing value operator:
Factor: 1
Offset: 0
MB: 0.139

Spacecraft geodetic longitude

(6) Range to the CPR boresight intercept with the geoid

Name in file: Range_to_intercept
Source: 1B-CPR 008
Field type (in file): REAL(4)
Field type (in algorithm): REAL(4)
Dimensions: nray
Units: km
Range: 600 to 800
Missing value:
Missing value operator:
Factor: 1
Offset: 0
MB: 0.139

Range from the spacecraft to the CPR boresight intercept with the geoid.

(7) Digital Elevation Map

Name in file: DEM_elevation
Source: 1B-CPR 008
Field type (in file): INT(2)
Field type (in algorithm): INT(2)
Dimensions: nray
Units: meters
Range: -9999 to 8850
Missing value: 9999
Missing value operator: ==
Factor: 1
Offset: 0
MB: 0.069

Elevation in meters above Mean Sea Level. A value of -9999 indicates ocean. A value of 9999 indicates an error in calculation of the elevation.

(8) Range to First Bin

Name in file: Range_to_first_bin
Source: 1B-CPR 008
Field type (in file): REAL(4)
Field type (in algorithm): REAL(4)
Dimensions: nray
Units: meters
Range: 650000 to 740000
Missing value: -9999
Missing value operator: ==
Factor: 1
Offset: 0
MB: 0.139

Range to first bin is the distance between the satellite and the starting bin number of the ray in meters.

(9) Ray status range bin size

Name in file: RayHeader_RangeBinSize
Source: 1B-CPR 008
Field type (in file): REAL(4)
Field type (in algorithm): REAL(4)
Dimensions: <scalar>
Units: meters
Range: 239.8 to 239.8
Missing value: -9999
Missing value operator: ==
Factor: 1
Offset: 0
MB: 0

spacing between samples in range in meters

(10) Nominal satellite pitch angle offset from nadir

Name in file: Pitch_offset
Source: 1B-CPR 008
Field type (in file): REAL(4)
Field type (in algorithm): REAL(4)
Dimensions: <scalar>
Units: degrees
Range: -90 to 90
Missing value:
Missing value operator:
Factor: 1
Offset: 0
MB: 0

The pitch angle offset from nadir during normal operations. Pitch up is positive (radar points along the flight track in the direction of motion), down is negative (radar points along the flight track opposite the direction of motion).

(11) Nominal satellite roll angle offset from nadir

Name in file: Roll_offset
Source: 1B-CPR 008
Field type (in file): REAL(4)
Field type (in algorithm): REAL(4)
Dimensions: <scalar>
Units: degrees
Range: -90 to 90
Missing value:
Missing value operator:
Factor: 1
Offset: 0
MB: 0

The roll angle offset from nadir during normal operations. Positive roll results in the radar pointing to the right of the flight track. Negative roll to the left.

(12) Data Quality

Name in file: Data_quality	**Range:** 0 to 127
Source: 1B-CPR 008	**Missing value:**
Field type (in file): UINT(1)	**Missing value operator:**
Field type (in algorithm): INT(2)	**Factor:** 1
Dimensions: nray	**Offset:** 0
Units: --	**MB:** 0.035

Flags indicating data quality. If 0, then data is of good quality. Otherwise, treat as a bit field with 8 flags:

0: RayStatus_validity not normal.
1: GPS data not valid.
2: Temperatures not valid.
3: Radar telemetry data quality is not normal.
4: Peak power is not normal.
5: CPR calibration maneuver.
6: Missing frame.
7: Not used.

(13) Data status flags

Name in file: Data_status	**Range:** 0 to 127
Source: 1B-CPR 008	**Missing value:**
Field type (in file): UINT(1)	**Missing value operator:**
Field type (in algorithm): UINT(1)	**Factor:** 1
Dimensions: nray	**Offset:** 0
Units: --	**MB:** 0.035

This is a bit field that contains data status flags:

Bit 0: missing frame (0=false, 1=true)
Bit 1: SOH missing (0=false, 1=true)
Bit 2: GPS data valid (0=false, 1=true)
Bit 3: 1 PPS lost (0=false, 1=true)
Bit 4: Star tracker 1 (0=off, 1=on)
Bit 5: Star tracker 2 (0=off, 1=on)
Bit 6: Coast (0=false, 1=true)
Bit 7: NISC (0=false, 1=true)

(14) CPR bus orientation (target ID)

Name in file: Data_targetID	**Range:** 0 to 81
Source: 1B-CPR 008	**Missing value:**
Field type (in file): UINT(1)	**Missing value operator:**
Field type (in algorithm): INT(1)	**Factor:** 1
Dimensions: nray	**Offset:** 0
Units: --	**MB:** 0.035

The target id indicates the orientation of the spacecraft bus. For normal operations the target ID is 0. The

complete ID table is listed below:

Control Frame 0
0: CPR to point in 300 seconds - Nominal science mode
1 - 15: Target ID for testing - not planned for operational use

Control Frame 0, CPR Calibration
16: CPR to point in 160 seconds
17: CPR 15º to the right
18: CPR 15º to the left
19: CPR 10º to the right -- default rotation
20: CPR 10º to the left -- default rotation
21: CPR 5º to the right
22: CPR 5º to the left
23 - 29: Target ID for testing - not planned for operational use
30 - 36: CPR rotation - not planned for operational use
37 - 39: Not planned for operational use

Control Frame 1, Four thruster closed-loop
40: Rotation into the OR orientation
41: Rotation into the x-track along the anti-ang momentum
42: Rotation into the x-track along ang momentum
43: Rotation into the orbit lower orientation
44: Rotation into alt. OR w/ CPR away from Sun
45 - 49: Not planned for operational use

Control Frame 2, One thruster open-loop
50: Rotation into the OR orientation
51: Rotation into the x-track along the anti-ang momentum
52: Rotation into the x-track along ang momentum
53: Rotation into the orbit lower orientation
54: Rotation into alt. OR w/ CPR away from Sun
55 - 59: Not planned for operational use

Control Frame 3, Two thruster open-loop
60: Rotation into the OR orientation
61: Rotation into the x-track along the anti-ang momentum
62: Rotation into the x-track along ang momentum
63: Rotation into the orbit lower orientation
64: Rotation into alt. OR w/ CPR away from Sun
65 - 69: Not planned for operational use

Control Frame 4, Four thruster open-loop
70: Rotation into the OR orientation
71: Rotation into the x-track along the anti-ang momentum
72: Rotation into the x-track along ang momentum
73: Rotation into the orbit lower orientation
74: Rotation into alt. OR w/ CPR away from Sun
75 - 80: Not planned for operational use

Control Frame 5

81: Body into the x-track along the anti-ang momentum
82 - 1023: Not planned for operational use

(15) Land Sea Flag

Name in file: Navigation_land_sea_flag
Source: 1B-CPR 008
Field type (in file): UINT(1)
Field type (in algorithm): INT(1)
Dimensions: nray
Units: --
Range: 1 to 3
Missing value:
Missing value operator:
Factor: 1
Offset: 0
MB: 0.035

Flag indicating whether spacecraft is over land or sea:

1 = land
2 = ocean
3 = coast

(16) Ray (frame) header Metadata wavelength

Name in file: RayHeader_lambda
Source: 1B-CPR 008
Field type (in file): REAL(4)
Field type (in algorithm): REAL(4)
Dimensions: <scalar>
Units: meters
Range: 0.0031879 to 0.0031879
Missing value:
Missing value operator:
Factor: 1
Offset: 0
MB: 0

Ray (frame) header Metadata Header information about each ray, its contents are defined in Table 1. Wavelength.

(17) Ray Header spatial averaging

Name in file: RayHeader_SpatAvg
Source: 1B-CPR 008
Field type (in file): REAL(4)
Field type (in algorithm): REAL(4)
Dimensions: <scalar>
Units: seconds
Range: 0.16 to 0.48
Missing value: -9999
Missing value operator: ==
Factor: 1
Offset: 0
MB: 0

time interval over which CPR data is averaged on-board

(18) Ray Header Calibration Parameter Version

Name in file: RayHeader_CalVers
Source: 1B-CPR 008
Field type (in file): REAL(4)
Field type (in algorithm): REAL(4)
Range: 0 to 5
Missing value:
Missing value operator:
Factor: 1

Dimensions: <scalar> **Offset:** 0
Units: -- **MB:** 0

Version number for the file contining the parameters used for radar calibration

(19) Ray Status Validity

Name in file: RayStatus_validity **Range:** 0 to 3
Source: 1B-CPR 008 **Missing value:**
Field type (in file): UINT(1) **Missing value operator:**
Field type (in algorithm): INT(2) **Factor:** 1
Dimensions: nray **Offset:** 0
Units: -- **MB:** 0.035

Validity is a bit field that acts as a summary of some of the information from the Data_status field. Each bit = 0 for routine status, 1 for non-routine status. The non-routine situations follow:

0: Non-routine spacecraft orientation
1: Non-routine CPR mode
2: Receive only mode or transmit power is 0, bad calibration
3-7: Not used

(20) Pulse Repetition Interval

Name in file: RayStatus_PRI **Range:** 140 to 208
Source: 1B-CPR 008 **Missing value:** 0
Field type (in file): UINT(1) **Missing value operator:** ==
Field type (in algorithm): CHAR(1) **Factor:** 1
Dimensions: nray **Offset:** 0
Units: 1.6 microsec **MB:** 0.035

Pulse Repetition Interval in units of 1.6 microseconds

(21) Pulse Width

Name in file: RayStatus_pulseWidth **Range:** 3.1 to 3.8
Source: 1B-CPR 008 **Missing value:** 0
Field type (in file): UINT(1) **Missing value operator:** ==
Field type (in algorithm): CHAR(1) **Factor:** 1
Dimensions: nray **Offset:** 0
Units: microsec **MB:** 0.035

Width of the pulse transmitted by CPR. 0-7 is 3.1-3.8 microseconds.

(22) Number of Transmitted Pulses

Name in file: RayStatus_pulsesTx **Range:** 580 to 678
Source: 1B-CPR 008 **Missing value:** 0

Field type (in file): INT(2) **Missing value operator:** ==
Field type (in algorithm): INT(2) **Factor:** 1
Dimensions: nray **Offset:** 0
Units: -- **MB:** 0.069

Number of pulses transmitted in one block of data.

(23) Antenna Noise Power

Name in file: RayStatus_antennaNoise **Range:** to
Source: 1B-CPR 008 **Missing value:**
Field type (in file): REAL(4) **Missing value operator:**
Field type (in algorithm): REAL(4) **Factor:** 1
Dimensions: nray **Offset:** 0
Units: mW **MB:** 0.139

Noise floor when looking through antenna.

(24) Transmit Powers

Name in file: TransmitPower **Range:** 1500 to 2000
Source: 1B-CPR 008 **Missing value:** -9999
Field type (in file): REAL(4) **Missing value operator:** ==
Field type (in algorithm): REAL(4) **Factor:** 1
Dimensions: nray **Offset:** 0
Units: W **MB:** 0.139

The radar transmission power, 4-byte float, determined from calibration peak detector.

(25) Average transmit power

Name in file: TransmitPower_Avg **Range:** 1500 to 2000
Source: 1B-CPR 008 **Missing value:** -9999
Field type (in file): REAL(4) **Missing value operator:** ==
Field type (in algorithm): REAL(4) **Factor:** 1
Dimensions: <scalar> **Offset:** 0
Units: W **MB:** 0

The granule-average transmit power.

(26) CPR Calibration coefficients

Name in file: RadarCoefficient **Range:** 0.01 to 0.1
Source: 1B-CPR 008 **Missing value:** -9999
Field type (in file): REAL(4) **Missing value operator:** ==
Field type (in algorithm): REAL(4) **Factor:** 1

Dimensions: nray **Offset:** 0
Units: m^(-3) **MB:** 0.139

The Radar calibration constant

(27) Noise Floor Power (mean and standard deviation)

Name in file: NoiseFloorPowers **Range:** 1e-015 to 2e-014
Source: 1B-CPR 008 **Missing value:** -9999
Field type (in file): REAL(4) **Missing value operator:** ==
Field type (in algorithm): REAL(4) **Factor:** 1
Dimensions: npowers,nray **Offset:** 0
Units: W **MB:** 0.278

The noise floor is estimated from the first 6-10 range bins. This estimate and its standard deviation will be provided in the Level 1B CPR data but will not be subtracted. The user will need to subtract the value provided or a new noise estimate from the received echo power in all range bins. The noise floor power is found in the first element of the first dimension. The standard deviation is found in the second element of the first dimension.

(28) Received Echo Powers

Name in file: ReceivedEchoPowers **Range:** 1e-015 to 1e-006
Source: 1B-CPR 008 **Missing value:** -9999
Field type (in file): REAL(4) **Missing value operator:** ==
Field type (in algorithm): REAL(4) **Factor:** 1
Dimensions: nbin,nray **Offset:** 0
Units: W **MB:** 17.349

Echo Power is the calibrated range gate power in watts, made in-flight and averaged.

(29) Sigma-Zero

Name in file: Sigma-Zero **Range:** -1000 to 4000
Source: 1B-CPR 008 **Missing value:** -9999
Field type (in file): INT(2) **Missing value operator:** ==
Field type (in algorithm): INT(2) **Factor:** 1
Dimensions: nray **Offset:** 0
Units: dB*100 **MB:** 0.069

The Sigma-Zero is the normalized surface cross section (not corrected for attenuation). It’s multiplied by 100 and stored as 2-byte integers

(30) Surface Bin Number

Name in file: SurfaceBinNumber **Range:** 90 to 125
Source: 1B-CPR 008 **Missing value:** 255
Field type (in file): UINT(1) **Missing value operator:** ==
Field type (in algorithm): INT(2) **Factor:** 1
Dimensions: nray **Offset:** 0
Units: -- **MB:** 0.035

The range bin number of the peak surface echo. Surface bin number is –99 when surface return is missing.

(31)

Name in file: FlatSurfaceClutter **Range:** to
Source: 1B-CPR 008 **Missing value:** 1e-030
Field type (in file): REAL(4) **Missing value operator:** ==
Field type (in algorithm): REAL(4) **Factor:** 1
Dimensions: nscbin,nray **Offset:** 0
Units: W **MB:** 1.943

Estimated profile of surface clutter.

(32)

Name in file: SurfaceClutter_Index **Range:** to
Source: 1B-CPR 008 **Missing value:** 99
Field type (in file): REAL(4) **Missing value operator:** ==
Field type (in algorithm): REAL(4) **Factor:** 1
Dimensions: nray **Offset:** 0
Units: **MB:** 0.139

An mse over the used bins, if positive ==> 5 bins were used for good match, if negative ==> 3 bins were used (and the sign of the MSE was changed). Anything less than 0.1 in modulus is good.

(33)

Name in file: SurfaceBinNumber_Fraction **Range:** to
Source: 1B-CPR 008 **Missing value:** -99
Field type (in file): REAL(4) **Missing value operator:** ==
Field type (in algorithm): REAL(4) **Factor:** 1
Dimensions: nray **Offset:** 0
Units: **MB:** 0.139

The fraction of bin # that the surface is off w/r to the corrected isurf. The preliminary assessment is that this is good to better than 1/100th of range bin (over good matches).

4. Changes Since the Last Product Version

4.1 1B-CPR 008

General product changes
None.

Field changes
Profile_time:
None.
UTC_start:
None.
TAI_start:
None.
Latitude:
None.
Longitude:
None.
Range_to_intercept:
None.
DEM_elevation:
None.
Range_to_first_bin:
None.
RayHeader_RangeBinSize:
None.
Pitch_offset:
None.
Roll_offset:
None.
Data_quality:
None.
Data_status:
None.
Data_targetID:
None.
Navigation_land_sea_flag:
05/18/2007 13:46:33 - Added flag values to the field description. (Phil Partain)
RayHeader_lambda:
None.
RayHeader_SpatAvg:
None.
RayHeader_CalVers:
None.
RayStatus_validity:
None.
RayStatus_PRI:
None.
RayStatus_pulseWidth:
None.
RayStatus_pulsesTx:
None.

RayStatus_antennaNoise:
None.
TransmitPower:
None.
TransmitPower_Avg:
None.
RadarCoefficient:
None.
NoiseFloorPowers:
None.
ReceivedEchoPowers:
None.
Sigma-Zero:
None.
SurfaceBinNumber:
05/25/2007 12:48:02 - Lowered the range min from 105 to 90. (Phil Partain)
FlatSurfaceClutter:
04/11/2007 11:09:38 - Added field (Phil Partain)
05/18/2007 13:41:36 - Added missing value of 1.E-30. (Phil Partain)
SurfaceClutter_Index:
04/11/2007 11:11:21 - Added field (Phil Partain)
05/18/2007 13:40:09 - Added missing value of 99. (Phil Partain)
SurfaceBinNumber_Fraction:
04/11/2007 11:12:22 - Added field (Phil Partain)
05/18/2007 13:38:43 - Added missing value of -99. (Phil Partain)