Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Ops Keyword ACTIVE_FLIGHT_STRING_ID **Archive Attribute** TBD **Definition** Indicates which flight computer "string" (separate sets of electronics) was active when this product was acquired. For M2020 there are two redundant flight computers (called "strings"), also known as Rover Compute Elements (RCE's). Either string (A or B) may be active at any given time.	**Valid Values** • All Cameras "A", "B" **Type** string **Units** n/a **Location** IDENTIFICATION (Class) **X-path** TBD **Reference** TBD	**Mode** EMD in XML format **Field as "<xml name>:[<element>]:[<element>]:<field>"** "MslEarthProductMetadata:MslProductMetadata:CreationStringId" **Type** U16
Ops Keyword ACTIVITY_ID **Archive Attribute** TBD **Definition** Specifies the ground-assigned Activity-ID associated with the data product. The general operational usage of ACTIVITY_ID is to group related datasets together by science or engineering application or theme, such as frames in a mosaic.	**Valid Values** • Eng. Cameras (S) 0 – 4,294,967,295 **Type** string **Units** n/a **Location** IDENTIFICATION (Class) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras (S) "<IDPH DPO>:idph:activity_id" • All other cameras (S) "MslEarthProductMetadata:MslProductMetadata:ActivityId" **Type** • Eng. Cameras (S) U32 • All other cameras U16
Ops Keyword APPLICATION_PROCESS_ID **Archive Attribute** TBD **Definition** Specifies the name associated with the source or process which created the data. For M2020, the Application Process Identifier (APID) identifies the data type encapsulated in the packet, including whether the packet is a data product packet or a non-data product packet. M2020 shall implement the following APID assignments (all numbers below are in decimal, all ranges are inclusive): a) APID 2047 is used for Idle Packets.	**Valid Values** "0" to "2039" (B) **Type** integer **Units** n/a **Location** TELEMETRY (Class) **X-path** TBD **Reference** TBD	**Mode** EMD in XML format **Field as "<xml name>:[<element>]:[<element>]:<field>"** "MslEarthProductMetadata:MslProductMetadata:Apid" **Type** U16

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
b) APID 2040-2046 will not be produced by M2020 as these APIDs are reserved by the CCSDS standard. c) APID 0 will not be produced by M2020 . d) APID 1 is reserved for X-band time correlation packets. e) APIDs 2-99 are assigned to non-data product packets. Individual values will be assigned to particular packet types as they are identified. Definitions of these packet formats are defined in this document. Definition of APID assignments is included in the Rover Flight Software APID XML. f) APIDs 100-2039 are assigned to RCE Flight Software data product packets. Definition of APID assignments is included in the Rover Flight Software APID XML. g) APIDs 1500-2039 are reserved for SSE (Simulation and Support Equipment) product types. (Above text from M2020 FGICD Volume 1, Rev A) For M2020, only APID Names uniquely identify Data Product types across all FSW versions. For this reason, the integer APIDs are not documented here. See also APPLICATION_PROCESS_NAME and Appendix A.		
Ops Keyword APPLICATION_PROCESS_NAME **Archive Attribute** TBD **Definition** Specifies the name associated with the source or process which created the data. For M2020, only APID Names uniquely identify Data Product types across all FSW versions. See also APPLICATION_PROCESS_ID and Appendix A.	**Valid Values** **Surface** See Appendix A. **Cruise** See Appendix A. **Type** String (256) **Units** n/a **Location** TELEMETRY (Class) **X-path** TBD **Reference** TBD	**Mode** EMD in XML format **Field as "<xml name>:[<element>]:[<element>]:<field>"** "MslEarthProductMetadata:MslProductMetadata:ProductName" **Type** n/a
Ops Keyword ARTICULATION_DEVICE_ANGLE **Archive Attribute** TBD **Definition**	**Valid Value** **Surface** • Eng. Cameras (S) • SCAM RMI (S) • MCZ (S) • SHERLOC (S)	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** **Surface**

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Specifies the value of an angle between two parts or segments of an articulated device. NOTE: M2020 uses radians. The PDS default unit for this keyword is degrees, so the <rad> tag is required. For the RSM, the "RESOLVER" values (see ARTICULATION_DEVICE_ANGLE_NAME) represent the value of the resolver (attached to the output side of the joint), while the "ENCODER" values represent the encoder (attached to the motor). The resolver should be preferentially used if available, as it measures the angle after joint backlash. A value of 1e+30 indicates the angle is not available, in which case the encoder should be used instead. Note that the "INITIAL" and "REQUESTED" values are also encoder measurements, and could be used to determine the joint's direction of motion for backlash determination.	• PIXL (S) • MEDA Skycam (S) 1) CHASSIS n/a 2) HGA n/a 3) RSM n/a 4) ARM n/a 5) SHA n/a 6) SCS n/a 7) DRILL n/a **Cruise** • Eng. Cameras (C) 1) CHASSIS n/a 2) HGA n/a 3) RSM n/a 4) ARM n/a • MCZ (C) 1) CHASSIS n/a 2) HGA n/a 3) RSM n/a **Type** **Surface** • Eng. Cameras (S) • SCAM RMI (S) • MCZ (S) • SHERLOC (S) • PIXL (S) • MEDA Skycam (S) 1) float array[14] 2) float array[2] 3) float array[8] 4) float array[11] 5) float array[6] 6) float array[2] 7) float array[4] **Cruise** • Eng. Cameras (C)	• Eng. Cameras (S) 1) "<IDPH DPO>:idph:steer_fl", "<IDPH DPO>:idph:steer_fr", "<IDPH DPO>:idph:steer_rl", "<IDPH DPO>:idph:steer_rr", "<IDPH DPO>:idph:resolver[0]", "<IDPH DPO>:idph:resolver[1]", "<IDPH DPO>:idph:resolver[2]", "<IDPH DPO>:idph:resolver[3]" "<IDPH DPO>:idph:drive_fl", "<IDPH DPO>:idph:drive_fr", "<IDPH DPO>:idph:drive_ml", "<IPDH DPO>:idph:drive_mr", "<IDPH DPO>:idph:drive_rl", "<IDPH DPO>:idph:drive_rr" 2) "<IDPH DPO>:idph:hga_azimuth", "<IDPH DPO>:idph:hga_elevation" 3) "<IDPH DPO>:idph:rsm_final_azimuth_r", "<IDPH DPO>:idph:rsm_final_elevation_r", "<IDPH DPO>:idph:rsm_initial_azimuth_r", "<IDPH DPO>:idph:rsm_initial_elevation_r", "<IDPH DPO>:idph:rsm_target_azimuth", "<IDPH DPO>:idph:rsm_target_elevation", "<IDPH DPO>:idph:rsm_final_azimuth", "<IDPH DPO>:idph:rsm_final_elevation" "<IDPH DPO>:idph:rsm_initial_azimuth", "<IDPH DPO>:idph:rsm_initial_elevation" 4) "<IDPH DPO>:idph:arm:q_hall[0]", "<IDPH DPO>:idph:arm:q_hall[1]", "<IDPH DPO>:idph:arm:q_hall[2]", "<IDPH DPO>:idph:arm:q_hall[3]", "<IDPH DPO>:idph:arm:q_hall[4]", "<IDPH DPO>:idph:arm:q_res[0]", "<IDPH DPO>:idph:arm:q_res[1]", "<IDPH DPO>:idph:arm:q_res[2]", "<IDPH DPO>:idph:arm:q_res[3]", "<IDPH DPO>:idph:arm:q_res[4]", "<IDPH DPO>:idph:arm:docking_clock_angle" 5) "<IDPH DPO>: idph:aca:scs_sha_joint_angles_hall[0]", "<IDPH DPO>: idph:aca:scs_sha_joint_angles_hall[1]", "<IDPH DPO>: idph:aca:scs_sha_joint_angles_hall[2]", "<IDPH DPO>: idph:aca:scs_sha_joint_angles_res[0]", "<IDPH DPO>: idph:aca:scs_sha_joint_angles_res[1]", "<IDPH DPO>: idph:aca:scs_sha_joint_angles_res[2]" 6) "<IDPH DPO>: idph:aca:scs_bit_carousel_angle_hall", "<IDPH DPO>: idph:aca:scs_bit_carousel_angle_res"

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	1) float array[8] 2) float array[2] 3) float array[8] 4) float array[10] • MCZ (C) 1) float array[8] 2) float array[2] 3) float array[8] **Units** radians (<rad> unit tag required) **Location** 1) CHASSIS_ARTICULATION_STATE (Group) 2) HGA_ARTICULATION_STATE (Group) 3) RSM_ARTICULATION_STATE (Group) 4) ARM_ARTICULATION_STATE (Group) 5) SHA_ARTICULATION_STATE (Group) 6) SCS_ARTICULATION_STATE (Group) 7) DRILL_ARTICULATION_STATE (Group) **X-path** TBD **Reference** TBD	7) "<IDPH DPO>:idph:drill:scs_spindle", "<IDPH DPO>:idph:drill:scs_chuck_mech", "<IDPH DPO>:idph:drill:scs_percuss_mech" • SuperCam RMI (S5.2, S6) • MCZ Cameras (S6) • SHERLOC (S6) • PIXL (S6) • MEDA SkyCam (S6) 1) "<IDPH DPO>:idph:mob:steer_lf", "<IDPH DPO>:idph:mob:steer_rf", "<IDPH DPO>:idph:mob:steer_lr", "<IDPH DPO>:idph:mob:steer_rr", "<IDPH DPO>:idph:mob:left_bogie", "<IDPH DPO>:idph:mob:right_bogie", "<IDPH DPO>:idph:mob:left_differential", "<IDPH DPO>:idph:mob:right_differential", "<IDPH DPO>:idph:rvr:drive_fl", "<IDPH DPO>:idph:rvr:drive_fr", "<IDPH DPO>:idph:rvr:drive_lm", "<IPDH DPO>:idph:rvr:drive_rm", "<IDPH DPO>:idph:rvr:drive_rl", "<IDPH DPO>:idph:rvr:drive_rr" 2) "<IDPH DPO>:idph:rvr:hga_azimuth", "<IDPH DPO>:idph:rvr:hga_elevation" 3) "<IDPH DPO>:idph:rsm:resolver_azimuth", "<IDPH DPO>:idph:rsm:resolver_elevation", "<IDPH DPO>:idph:rsm:initial_resolver_azimuth", "<IDPH DPO>:idph:rsm:initial_resolver_elevation", "<IDPH DPO>:idph:rsm:target_azimuth", "<IDPH DPO>:idph:rsm:target_elevation", "<IDPH DPO>:idph:rsm:encoder_azimuth", "<IDPH DPO>:idph:rsm:encoder_elevation", "<IDPH DPO>:idph:rsm:initial_encoder_azimuth", "<IDPH DPO>:idph:rsm:initial_encoder_elevation" 4) "<IDPH DPO>:idph:arm:q_hall[0]", "<IDPH DPO>:idph:arm:q_hall[1]", "<IDPH DPO>:idph:arm:q_hall[2]", "<IDPH DPO>:idph:arm:q_hall[3]", "<IDPH DPO>:idph:arm:q_hall[4]", "<IDPH DPO>:idph:arm:q_res[0]", "<IDPH DPO>:idph:arm:q_res[1]", "<IDPH DPO>:idph:arm:q_res[2]", "<IDPH DPO>:idph:arm:q_res[3]", "<IDPH DPO>:idph:arm:q_res[4]", "<IDPH DPO>:idph:arm:docking_clock_angle" 5) "<IDPH DPO>:idph:scs:sha_joint_angles_hall[0]", "<IDPH DPO>:idph:scs:sha_joint_angles_hall[1]", "<IDPH DPO>:idph:scs:sha_joint_angles_hall[2]", "<IDPH DPO>:idph:scs:sha_joint_angles_res[0]", "<IDPH DPO>:idph:scs:sha_joint_angles_res[1]", "<IDPH DPO>:idph:scs:sha_joint_angles_res[2]"

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
		6) "<IDPH DPO>:idph:scs:bit_carousel_angle_hall", "<IDPH DPO>:idph:scs:bit_carousel_angle_res" 7) "<IDPH DPO>:idph:scs:spindle", "<IDPH DPO>:idph:scs:chuck_mech", "<IDPH DPO>:idph:scs:percuss_mech", **Cruise and S5.2** • Eng. Cameras (C) 1) – 4) Same as MSL Surface 5) – 7) Not in Cruise FSW • MCZ Cameras (C, S5.2) 1) "<IDPH DPO>:cidph:steering:front_left", "<IDPH DPO>:cidph:steering:front_right", "<IDPH DPO>:cidph:steering:rear_left", "<IDPH DPO>:cidph:steering:rear_right", "<IDPH DPO>:cidph:resolvers:bogie_left", "<IDPH DPO>:cidph:resolvers:bogie_right", "<IDPH DPO>:cidph:resolvers:differential_left", "<IDPH DPO>:cidph:resolvers:differential_right" 2) "<IDPH DPO>:cidph:hga:azimuth", "<IDPH DPO>:cidph:hga:elevation" 3) "<IDPH DPO>:cidph:rsm_state:res:azimuth", "<IDPH DPO>:cidph:rsm_state:res:elevation", "<IDPH DPO>:cidph:rsm_state:target:azimuth", "<IDPH DPO>:cidph:rsm_state:target:elevation", "<IDPH DPO>:cidph:rsm_state:initial:azimuth", "<IDPH DPO>:cidph:rsm_state:initial:elevation", "<IDPH DPO>:cidph:rsm_state:final:azimuth", "<IDPH DPO>:cidph:rsm_state:final:elevation" 4) – 7) Not in Cruise FSW **Type** • Eng. Cameras 1) – 6) F32 7) F64 • SCAM RMI, MCZ, SHERLOC, PIXL MCC, MEDA SkyCam 1) – 7) F32
Ops Keyword ARTICULATION_DEVICE_ANGLE_NAME **Archive Attribute** TBD **Definition** Specifies the formal name which identifies each of the values used in ARTICULATION_DEVICE_ANGLE.	**Valid Values** **Surface** • Eng. Cameras (S) • SCAM RMI (S) • MCZ (S) • SHERLOC (S) • PIXL (S) • MEDA Skycam (S) 1) CHASSIS ("LEFT FRONT WHEEL STEER MOTOR", "RIGHT FRONT WHEEL STEER MOTOR", "LEFT REAR WHEEL STEER MOTOR",	**Mode** Static values **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	"RIGHT REAR WHEEL STEER MOTOR", "LEFT BOGIE", "RIGHT BOGIE", "LEFT DIFFERENTIAL", "RIGHT DIFFERENTIAL", "LEFT FRONT WHEEL DRIVE MOTOR", "RIGHT FRONT WHEEL DRIVE MOTOR", "LEFT MIDDLE WHEEL DRIVE MOTOR", "RIGHT MIDDLE WHEEL DRIVE MOTOR", "LEFT REAR WHEEL DRIVE MOTOR", "RIGHT REAR WHEEL DRIVE MOTOR") 2) HGA ("AZIMUTH", "ELEVATION") 3) RSM ("AZIMUTH FINAL-RESOLVER", "ELEVATION FINAL-RESOLVER", "AZIMUTH INITIAL-RESOLVER", "ELEVATION INITIAL-RESOLVER", "AZIMUTH REQUESTED", "ELEVATION REQUESTED", "AZIMUTH FINAL-ENCODER", "ELEVATION FINAL-ENCODER", "AZIMUTH INITIAL-ENCODER", "ELEVATION INITIAL-ENCODER" 4) ARM ("JOINT 1 AZIMUTH-HALL SENSOR", "JOINT 2 ELEVATION-HALL SENSOR", "JOINT 3 ELBOW-HALL SENSOR", "JOINT 4 WRIST-HALL SENSOR", "JOINT 5 TURRET-HALL SENSOR", "JOINT 1 AZIMUTH-RESOLVER", "JOINT 2 ELEVATION-RESOLVER", "JOINT 3 ELBOW-RESOLVER", "JOINT 4 WRIST-RESOLVER", "JOINT 5 TURRET-RESOLVER", "SCS DOCKING CLOCK ANGLE") 5) SHA ("SHA JOINT 1 Z- HALL SENSOR", "SHA JOINT 2 SHOULDER-HALL SENSOR", "SHA JOINT 3 ELBOW-HALL SENOSR", "SHA JOINT 1 Z-RESOLVER", "SHA JOINT 2 SHOUDER-RESOLVER", "SHA JOINT 3 ELBOW-RESOLVER") 6) SCS ("SCS BIT CAROUSEL-HALL SENSOR", "SCS BIT CAROUSEL-RESOLVER") 7) DRILL ("SPINDLE_OUTPUT POSITION-RESOLVER",	

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	"CHUCK POSITION-RESOLVER", "PERCUSS POSITION-RESOLVER") **Cruise** • Eng. Cameras (C) 1) CHASSIS ("LEFT FRONT WHEEL STEER MOTOR", "RIGHT FRONT WHEEL STEER MOTOR", "LEFT REAR WHEEL STEER MOTOR", "RIGHT REAR WHEEL STEER MOTOR", "LEFT BOGIE", "RIGHT BOGIE", "LEFT DIFFERENTIAL", "RIGHT DIFFERENTIAL") 2) HGA ("AZIMUTH", "ELEVATION") 3) RSM ("AZIMUTH FINAL-RESOLVER", "ELEVATION FINAL-RESOLVER", "AZIMUTH REQUESTED", "ELEVATION REQUESTED", "AZIMUTH INITIAL-ENCODER", "ELEVATION INITIAL-ENCODER", "AZIMUTH FINAL-ENCODER", "ELEVATION FINAL-ENCODER") 4) ARM ("JOINT 1 AZIMUTH-HALL SENSOR", "JOINT 2 ELEVATION-HALL SENSOR", "JOINT 3 ELBOW-HALL SENSOR", "JOINT 4 WRIST-HALL SENSOR", "JOINT 5 TURRET-HALL SENSOR", "JOINT 1 AZIMUTH-RESOLVER", "JOINT 2 ELEVATION-RESOLVER ", "JOINT 3 ELBOW-RESOLVER ", "JOINT 4 WRIST-RESOLVER ", "JOINT 5 TURRET-RESOLVER ") • MCZ (C) 1) CHASSIS ("LEFT FRONT WHEEL STEER MOTOR", "RIGHT FRONT WHEEL STEER MOTOR", "LEFT REAR WHEEL STEER MOTOR", "RIGHT REAR WHEEL STEER MOTOR", "LEFT BOGIE", "RIGHT BOGIE", "LEFT DIFFERENTIAL", "RIGHT DIFFERENTIAL") 2) HGA ("AZIMUTH", "ELEVATION") 3) RSM	

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	("AZIMUTH FINAL-RESOLVER", "ELEVATION FINAL-RESOLVER", "AZIMUTH REQUESTED", "ELEVATION REQUESTED", "AZIMUTH INITIAL-ENCODER", "ELEVATION INITIAL-ENCODER", "AZIMUTH FINAL-ENCODER", "ELEVATION FINAL-ENCODER") **Type** **Cruise** 1) string array[8] 2) string array[2] 3) string array[8] 4) string array[10] **Surface** 1) string array[14] 2) string array[2] 3) string array[8] 4) string array[10] 5) string array[6] 6) string array[2] 7) string array[4] **Units** n/a **Location** 1) CHASSIS_ARTICULATION_STATE (Group) 2) HGA_ARTICULATION_STATE (Group) 3) RSM_ARTICULATION_STATE (Group) 4) ARM_ARTICULATION_STATE (Group) 5) SHA_ARTICULATION_STATE (Group) 6) SCS_ARTICULATION_STATE (Group) 7) DRILL_ARTICULATION_STATE (Group) **X-path** TBD **Reference** TBD	
Ops Keyword ART_DEV_COMPONENT_STATE **Archive Attribute** TBD **Definition**	**Valid Values** **Surface** • Eng. Cameras • SuperCam • MCZ • SHERLOC Preload Value[0]: n/a Preload Tool[1]: 0 = "TURRET" 1 = "DRILL"	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** **Surface** • Eng. Cameras (S5.2,S6) • SuperCam RMI (S5.2,S6) • MCZ (S6) • SHERLOC (S6) • PIXL MCC (S6) • MEDA SkyCam (S6)

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	2 = “DOCKING POST” 3 = “PIXL” 4 = “GDRT” 5 = “FCS” 6 = “WATSON” 7 = “SHERLOC” 8 = “CUSTOM TCP” **Type** string[2] **Units** Newtons **Location** ARM_ARTICULATION_STATE **X-path** TBD **Reference** TBD	“<IDPH DPO>:idph:arm:preload”, “<IDPH DPO>:idph:arm:preload_tool” • MCZ (S5.2) N/A • SHERLOC (S5.2) N/A **Type** n/a
Ops Keyword ART_DEV_COMPONENT_STATE_NAME **Archive Attribute** TBD **Definition**	**Valid Values** **Surface** • All Cameras (S) (“PRELOAD_VALUE”,”PRELOAD_TOOL”) **Type** string **Units** n/a **Location** ARM_ARTICULATION_STATE **X-path** TBD **Reference** TBD	**Mode** Static values **Field as “<xml name>:[<element>]:[<element>]:<field>”** n/a **Type** n/a
Ops Keyword ARTICULATION_DEVICE_ID **Archive Attribute** TBD **Definition** Specifies the unique abbreviated identification of an articulation device. An articulation device is anything that can move independently of the spacecraft to which it is attached, (e.g., mast heads, wheel bogies, arms, etc.). NOTE: The ARTICULATION_DEVICE_ID is not a unique identifier for a given articulated device. Note also that the associated ARTICULATION_DEVICE_NAME element provides the full name of the articulated device.	**Valid Values** **Surface** • Eng. Cameras (B) • SCAM RMI (S) • MCZ (B) • SHERLOC (S) • PIXL (S) • MEDA Skycam (S) 1) “CHASSIS” 2) “HGA” 3) “RSM” 4) “ARM” 5) “SHA” 6) “SCS” 7) “DRILL”	**Mode** Static values **Field as “<xml name>:[<element>]:[<element>]:<field>”** n/a **Type** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	Cruise • Eng. Cameras (C) 1) "CHASSIS" 2) "HGA" 3) "RSM" 4) "ARM" • MCZ (C) 1) "CHASSIS" 2) "HGA" 3) "RSM" **Type** string **Units** n/a **Location** 1) CHASSIS_ARTICULATION_STATE (Group) 2) HGA_ARTICULATION_STATE (Group) 3) RSM_ARTICULATION_STATE (Group) 4) ARM_ARTICULATION_STATE (Group) 5) SHA_ARTICULATION_STATE (Group) 6) SCS_ARTICULATION_STATE (Group) 7) DRILL_ARTICULATION_STATE (Group) **X-path** TBD **Reference** TBD	
Ops Keyword ARTICULATION_DEVICE_MODE **Archive Attribute** TBD **Definition** Specifies the deployment state (i.e., physical configuration) of an articulation device at the time of data acquisition. The SCS tube states are defined as followed: a) "EMPTY" – tube has not been used to collect a sample. b) "FILLED" – tube has been used to collect a sample (regardless of volume). c) "SEAL DISPENSED" – seal has been inserted into the tube, but not sealed. d) "SEAL ACTIVATED" – tube is sealed. The drill core break lockout rod (CBLO) states are defined as follows: a) "INVALID POSE" – CBLO is outside valid range of motion.	**Valid Values** **Surface** • Eng. Cameras (S) • SCAM RMI (S) • MCZ (S) • SHERLOC (S) • PIXL (S) • MEDA Skycam (S) 1) CHASSIS "DEPLOYED" 2) HGA "DEPLOYED" 3) RSM 0 = "STOWED" 1 = "DEPLOYED" 4) SCS 0 = "EMPTY" 1 = "FILLED" 2 = "SEAL DISPENSED" 3 = "SEAL ACTIVATED"	**Mode** • Static value: 1) for Chassis 2) for HGA • DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** **Surface** • Eng. Cameras (S5.2, S6) 3) "<IDPH DPO>:idph:rsm_deployed" 4) "<IDPH DPO>:idph:aca:sca_active_tube_state" 5) "<IDPH DPO>:idph:drill:scs_core_break_lock" • SCAM RMI (S5.2, S6) • MCZ Cameras (S6) • SHERLOC (S6) • PIXL (S5.2, S6) • MEDA SkyCam (S6) 3) "<IDPH DPO>:idph:rsm:deployed" 4) "<IDPH DPO>:idph:scs:active_tube_state" 5) "<IDPH DPO>:idph:scs:core_break_lock" **Cruise & S5.2**

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
b) "INDETERMINANT" – CBLO is not near one of the predefined positions, but is within valid range of motion. c) "RETRACTED" – CBLO is at the retracted (spindle homing) hardstop. d) "DRILL" – CBLO is at the drilling position. e) "STUCK RECOVERY" – CBLO is at the stuck recovery position. f) "EXTENDED" – CBLO is at the exentended (core break) hardstop.	5) DRILL 0 = "INVALID POSE" 1 = "INDETERMENT" 2 = "RETRACTED" 3 = "DRILL" 4 = "STUCK RECOVERY" 5 = "EXTENDED" **Cruise** • Eng. Cameras (C) • MCZ (C) 1) CHASSIS "DEPLOYED" 2) HGA "DEPLOYED" 3) RSM 0 = "STOWED" 1 = "DEPLOYED" **Type** string **Units** n/a **Location** 1) CHASSIS_ARTICULATION_STATE (Group) 2) HGA_ARTICULATION_STATE (Group) 3) RSM_ARTICULATION_STATE (Group) 4) SCS_ARTICULATION_STATE (Group) 5) DRILL_ARTICULATION_STATE (Group) **X-path** TBD **Reference** TBD	• Eng. Cameras (C) 3) "<IDPH DPO>:idph:rsm_deployed" • MCZ Cameras (C, S5.2) 3) "<IDPH DPO>:cidph:rsm_state:deployed" **Type** 1) n/a 2) n/a 3) Eng. Bool All other instruments U8 4) U8 5) U8
Ops Keyword ARTICULATION_DEVICE_NAME **Archive Attribute** TBD **Definition** Specifies the common name of an articulation device. An articulation device is anything that can move independently of the spacecraft to which it is attached, (e.g. mast heads, wheel bogies, arms, etc.) NOTE: The associated ARTICULATION_DEVICE_ID element provides an abbreviated name or acronym for the articulated device.	**Valid Values** **Surface** • Eng. Cameras (S) • SCAM RMI (S) • MCZ (S) • SHERLOC (S) • PIXL (S) • MEDA Skycam (S) 1) "MOBILITY CHASSIS" 2) "HIGH GAIN ANTENNA" 3) "REMOTE SENSING MAST" 4) "SAMPLE ARM" 5) "SAMPLE HANDLING ARM" 6) "SAMPLE CACHE SYSTEM" 7) "DRILL"	**Mode** Static values **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	Cruise • Eng. Cameras (C) 1) "MOBILITY CHASSIS" 2) "HIGH GAIN ANTENNA" 3) "REMOTE SENSING MAST" 4) "SAMPLE ARM" • MCZ (C) 1) "MOBILITY CHASSIS" 2) "HIGH GAIN ANTENNA" 3) "REMOTE SENSING MAST" **Type** string **Units** n/a **Location** 1) CHASSIS_ARTICULATION_STATE (Group) 2) HGA_ARTICULATION_STATE (Group) 3) RSM_ARTICULATION_STATE (Group) 4) ARM_ARTICULATION_STATE (Group) 5) SHA_ARTICULATION_STATE (Group) 6) SCS_ARTICULATION_STATE (Group) 7) DRILL_ARTICULATION_STATE (Group) **X-path** TBD **Reference** TBD	
Ops Keyword ARTICULATION_DEVICE_TEMP **Archive Attribute** TBD **Definition** Specifies the temperature, in degrees Celsius, of an articulated device or some part of an articulated device.	**Valid Values** • All Cameras (S) "-3.4e38" to "3.4e38" **Type** **Surface** a. float array[7] b. float array[2] **Cruise** a. float array[5] b. float array[2] **Units** deg C (<degC> unit tag required) **Location** a. ARM_ARTICULATION_STATE (Group) b. RSM_ARTICULATION_STATE (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** **Surface** • Eng. Cameras (S5.2, S6) a. "<IDPH DPO>:idph:arm:temp_actuator[0]" "<IDPH DPO>:idph:arm:temp_actuator[1]" "<IDPH DPO>:idph:arm:temp_actuator[2]" "<IDPH DPO>:idph:arm:temp_actuator[3]" "<IDPH DPO>:idph:arm:temp_actuator[4]" "<IDPH DPO>:idph:arm:temp_deflection[0]" "<IDPH DPO>:idph:arm:temp_deflection[1]" b. "<IDPH DPO>:idph:temp[20]", "<IDPH DPO>:idph:temp[21] • SuperCam (S5.2, S6) • MCZ (S6) • SHERLOC (S6) • PIXL MCC (S6) • MEDA SkyCam(S6) a. "<IDPH DPO>:idph:arm:temp_actuator[0]" "<IDPH DPO>:idph:arm:temp_actuator[1]"

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
		"<IDPH DPO>:idph:arm:temp_actuator[2]" "<IDPH DPO>:idph:arm:temp_actuator[3]" "<IDPH DPO>:idph:arm:temp_actuator[4]" "<IDPH DPO>:idph:arm:temp_deflection[0]" "<IDPH DPO>:idph:arm:temp_deflection[1]" b. "<IDPH DPO>:idph:rsm:camera_plate_temp2", "<IDPH DPO>:idph:rsm:camera_plate_temp1" **Cruise and S5.2** • Eng. Cameras (C) a. "<IDPH DPO>:idph:arm:temp_actuator[0]" "<IDPH DPO>:idph:arm:temp_actuator[1]" "<IDPH DPO>:idph:arm:temp_actuator[2]" "<IDPH DPO>:idph:arm:temp_actuator[3]" "<IDPH DPO>:idph:arm:temp_actuator[4]" b. "<IDPH DPO>:idph:temp[20]", "<IDPH DPO>:idph:temp[21] • MCZ (C, S5.2) a. "<IDPH DPO>:cidph:arm_state:temp[0] "<IDPH DPO>:cidph:arm_state:temp[1] "<IDPH DPO>:cidph:arm_state:temp[2] "<IDPH DPO>:cidph:arm_state:temp[3] "<IDPH DPO>:cidph:arm_state:temp[4] **Type** **Surface** F32[7] **Cruise** F32[5]
Ops Keyword ARTICULATION_DEVICE_TEMP_NAME **Archive Attribute** TBD **Definition** Specifies the array of formal names identifying each of the values used in ARTICULATION_DEVICE_TEMP.	**Valid Values** **Surface** a. ("AZIMUTH JOINT", "ELEVATION JOINT", "ELBOW JOINT", "WRIST JOINT", "TURRET JOINT", "DEFLECTION BODY DELTA TEMPERATURE", "DEFLECTION ARM DELTA TEMPERATURE") b. ("NAVCAM LEFT CAMERA PLATE", "NAVCAM RIGHT CAMERA PLATE") **Cruise** a. ("AZIMUTH JOINT", "ELEVATION JOINT", "ELBOW JOINT", "WRIST JOINT", "TURRET JOINT") b. ("NAVCAM LEFT CAMERA PLATE", "NAVCAM RIGHT CAMERA PLATE") **Type** **Surface** a. string array[7] b. string array[2] **Cruise** a. string array[5] b. string array[2]	**Mode** Static value **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	Units n/a **Location** a. ARM_ARTICULATION_STATE (Group) b. RSM_ARTICULATION_STATE (Group) **X-path** TBD **Reference** TBD	
Ops Keyword ARTICULATION_DEV_INSTRUMENT_ID **Archive Attribute** TBD **Definition** Specifies an abbreviated name or acronym which identifies the instrument mounted on the articulation device.	**Valid Values** **Surface** 0 = "TURRET" 1 = "DRILL" 2 = "DOCKING POST" 3 = "PIXL" 4 = "GDRT" 5 = "FCS" 6 = "WATSON" 7 = "SHERLOC" 8 = "CUSTOM TCP" **Cruise** 0 = "TURRET" 1 = "DRILL" 2 = "DOCKING POST" 3 = "PIXL" 4 = "GDRT" 5 = "FCS" 6 = "WATSON" 7 = "SHERLOC" 8 = "CUSTOM TCP" **Type** string **Units** n/a **Location** ARM_ARTICULATION_STATE (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** **Surface** • Eng. Cameras (S5.2, S6) • SuperCam (S5.2, S6) • MCZ (S6) • SHERLOC (S6) • PIXL MCC (S5.2, S6) • MEDA SkyCam (S6) "<IDPH DPO>:idph:arm:tool" **Cruise and S5.2** • Eng. Cameras (C) "<IDPH DPO>:idph:arm_instrument" • MCZ (C, S5.2) "<IDPH DPO>:cidph:arm_state:instrument" **Type** U8
Ops Keyword ARTICULATION_DEV_POSITION **Archive Attribute** TBD **Definition**	**Valid Values** n/a **Type** int array[3] **Units** n/a	**Mode** DPO in XML format (referenced to APID Name in Appendix A) Calculation: Filter = filter index * 294 **Field as "<xml name>:[<element>]:[<element>]:<field>"**

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Specifies the set of indices for articulation devices that contain moving parts with discrete positions. The associated ARTICULATION_DEV_POSITION_NAME names each moving device. In order to get the actual filter used for this specific image, the FILTER_NAME/FILTER_NUMBER keywords in the INSTRUMENT_DATA group should be used.	**Location** MINI_HEADER (Group)	• MCZ • SHERLOC MMM_Image_Mini_Header:mech[0] MMM_Image_Mini_Header:mech[1] MMM_Image_Mini_Header:mech[2] **Type** Integer Note: For MCZ and SHERLOC products, mech values “focus”, “zoom”, and “filter” are comprised of 8 bytes starting at byte offset 44 (words 11 and 12): Focus = byte offset [44] – [47] Zoom = byte offset [48] – [49] Filter = byte offset [50] – [51]
Ops Keyword ARTICULATION_DEV_POSITION_NAME **Archive Attribute** TBD **Definition** Specifies an array of values that provides the formal names for each entry in ARTICULATION_DEV_POSITION. This element names the actual device doing the moving, (e.g., a filter wheel), not the name of a position (e.g., the filter itself).	**Valid Values** (“FOCUS”,”FILTER”,ZOOM”) **Type** string array[3] **Units** n/a **Location** MINI_HEADER (Group)	**Mode** Static value **Field as “<xml name>:[<element>]:[<element>]:<field>”** • MCZ • SHERLOC **Type** TBD
Ops Keyword ARTICULATION_DEV_VECTOR **Archive Attribute** TBD **Definition** Specifies the direction and magnitude of an external force acting on the articulation device, in the rover's coordinate system, at the time the pose was computed. Note: For M2020 the raw gravity value comes from getting RimuEngIntegratedData (which has a measured delta velocity vector in m/s) from rimu_get_eng_data(), scaling by the rti rate to get m/s/s, scaling by -1 to get the gravity vector, rotating from the RIMU frame to the RNAV frame, and including a parameterized correction bias. See sapp_actions.c:sapp_rimu_get_gravity(). In earth testbed the values recorded were an accurate reading of Earth gravity: 9.8m/s/s. On the surface of Mars the expected values are 3.71m/s/s	**Valid Values** “-1.0” to “1.0” **Type** float array[3] **Units** n/a **Location** 1) ARM_ARTICULATION_STATE (Group) 2) CHASSIS_ARTICULATION_STATE (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as “<xml name>:[<element>]:[<element>]:<field>”** **Surface** • Eng. Cameras (S5.2, S6) 1) “<IDPH DPO>:idph:arm.att_ref[0] “<IDPH DPO>:idph:arm.att_ref[1] “<IDPH DPO>:idph:arm.att_ref[2] “<IDPH DPO>:idph:arm.att_ref[3] Converted to gravity vector by rotating nadir vector by the quaternion specified above 2) ”<IDPH DPO>:idph:raw_gravity[0] ”<IDPH DPO>:idph:raw_gravity[1] ”<IDPH DPO>:idph:raw_gravity[2] • SuperCam RMI (S5.2, S6) • MCZ (S6) • SHERLOC (S6) • PIXL MCC (S6) • MEDA SkyCam (S6) 1) “<IDPH DPO>:idph:arm.att_ref[0] “<IDPH DPO>:idph:arm.att_ref[1] “<IDPH DPO>:idph:arm.att_ref[2]

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
		"<IDPH DPO>:idph:arm.att_ref[3] Converted to gravity vector by rotating nadir vector by the quaternion specified above 2) "<IDPH DPO>:idph:rvr:sapp_raw_gravity[0] "<IDPH DPO>:idph:rvr:sapp_raw_gravity[1] "<IDPH DPO>:idph:rvr:sapp_raw_gravity[2] **Type** 1) F32[3] 2) F32[3]
Ops Keyword ARTICULATION_DEV_VECTOR_NAME **Archive Attribute** TBD **Definition** Specifies the formal name of the vector type acting on the articulation device.	**Valid Values** "GRAVITY" **Type** string **Units** n/a **Location** ARM_ARTICULATION_STATE (Group) CHASSIS_ARTICULATION_STATE (Group) **X-path** TBD **Reference** TBD	**Mode** Static value **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword ATTITUDE_PROPAGATION_COUNTER **Archive Attribute** TBD **Definition** Specifies the total number of RTIs spent propagating since the last gyroscopic propagation counter reset.	**Valid Values** "N/A" **Type** float **Units** n/a **Location** ROVER_COORDINATE_SYSTEM **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras (S) "<IDPH DPO>idph:sapp_counter" **Type** F64
Ops Keyword ATTITUDE_PROPAGATION_DURATION **Archive Attribute** TBD **Definition** Specifies the total time spent propagating on the gyrosince the last gyroscopic propagation counter reset.	**Valid Values** "N/A" **Type** float **Units** Seconds **Location** ROVER_COORDINATE_SYSTEM **X-path**	**Mode** DPO in XML format (referenced to APID Name in Appendix A) Calculation: 1) ECAM = sapp_counter / 8 **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras (S) "<IDPH DPO>idph:sapp_counter" **Type** F64

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	TBD **Reference** TBD	
Ops Keyword AUTO_DELETE_FLAG **Archive Attribute** TBD **Definition** Indicates if the product will be automatically deleted onboard after it is transmitted.	**Valid Values** 0 = "FALSE" 1 = "TRUE" **Type** string **Units** n/a **Location** TELEMETRY (Class) **X-path** TBD **Reference** TBD	**Mode** EMD in XML format **Field as "<xml name>:[<element>]:[<element>]:<field>"** "MslEarthProductMetadata:MslProductMetadata:DeleteOnSend" **Type** n/a
Ops Keyword AUTO_EXPOSURE_DATA_CUT **Archive Attribute** TBD **Definition** Specifies the DN value which a specified fraction of pixels is permitted to exceed. The fraction is specified using the keyword AUTO_EXPOSURE_DATA_FRACTION.	**Valid Values** • Eng. Cameras • MCZ "0" to n **Type** integer **Units** n/a **Location** • Eng. Cameras OBSERVATION_REQUEST_PARMS (Group) • MCZ a. OBSERVATION_REQUEST_PARMS (Group) b. MINI_HEADER (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras "<IDPH DPO>:idph:params:exp_auto_dn" • MCZ • SHERLOC a. "<Ancillary DPO>: cmd_arguments_image:exp_target_DN" b. "MMM_Image_Mini_Header[28]" **Type** • Eng. Cameras U16 • MCZ • SHERLOC U8 Note: For MCZ and SHERLOC products, "auto exposure data cut" is comprised of one byte coming from the MMM mini-header at offset 28.
Ops Keyword AUTO_EXPOSURE_PERCENT **Archive Attribute** TBD **Definition** Specifies the auto-exposure early-termination percent. If the calculated exposure time has written this value, then terminate auto exposure early.	**Valid Values** • Eng. Cameras (B) • MCZ (B) "0.0" to "100.0" **Type** float **Units** n/a	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras "<IDPH DPO>:idph:params:exp_auto_percent" • MCZ Cameras • SHERLOC Cameras

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	Location • Eng. Cameras OBSERVATION_REQUEST_PARMS (Group) • MCZ a. OBSERVATION_REQUEST_PARMS (Group) b. MINI_HEADER (Group) **X-path** TBD **Reference** TBD	a. "<Ancillary DPO>:cmd_arguments_image: exp_early_termination" b. "MMM_Image_Mini_Header: [30]" **Type** U8 Note: For MCZ and SHERLOC non-zstack/range map imaging products, "auto exposure percent" is found in the ancillary per case "a" For MCZ and SHERLOC non-zstack/range map imaging products, "auto exposure percent" is comprised of two bytes coming from the MMM mini-header at offset 30 per case "b".
Ops Keyword AUTO_EXPOSURE_PIXEL_FRACTION **Archive Attribute** TBD **Definition** Specifies the percentage of pixels whose targeted value is higher than the AUTO_EXPOSURE_DATA_CUT keyword.	**Valid Values** • Eng. Cameras (B) • MCZ (B) "0.0" to "100.0" **Type** • Eng. Cameras float • MCZ unsigned int **Units** n/a **Location** 1) OBSERVATION_REQUEST_PARMS (Group) 2) a. OBSERVATION_REQUEST_PARMS (Group) b. MINI_HEADER (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras "<IDPH DPO>:idph:params:exp_auto_frac" • MCZ Cameras • SHERLOC Cameras a. "<Ancillary DPO>:cmd_arguments_image: exp_pixel_fraction" b. "MMM_Image_Mini_Header:Image[29]" **Type** • Eng. Cameras F32 • MCZ U8 NOTES: For MCZ and SHERLOC non-zstack/rangemap imaging products, "auto pixel fraction" is found in the ancillary dpo per case "a". For MCZ and SHERLOC non-zstack/rangemap imaging products, "auto pixel fraction" is comprised of two bytes coming from the MMM mini-header at offset 29 per case "b".
Ops Keyword AUTO_EXPOSURE_ROI_FIRST_LINE **Archive Attribute** TBD **Definition** Specifies the starting line of the autoexposure region of interest. For M2020 SuperCam, only red pixels are used.	**Valid Values** "2" to "1024" (B) **Type** integer **Units** n/a **Location** OBSERVATION_REQUEST_PARMS (Group) SCAM_MINI_HEADER (Group) **X-path** TBD	**Mode** SCAM Image DPO mini-header **Field as "<xml name>:[<element>]:[<element>]:<field>"** "SCAM_Image_Mini_Header:autoexp_roi_y_size" **Type** U16 Notes: For SCAM RMI products, "autoexposure roi y position" is comprised of two bytes coming from the Image DPO mini-header at offset 25. This is 0-based coordinate, so add 1.

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	Reference TBD	
Ops Keyword AUTO_EXPOSURE_ROI_FIRST_SAMPLE **Archive Attribute** TBD **Definition** Specifies the starting sample of the autoexposure region of interest.	**Valid Values** "2" to "1024" (B) **Type** integer **Units** n/a **Location** OBSERVATION_REQUEST_PARMS (Group) SCAM_MINI_HEADER (Group) **X-path** TBD **Reference** TBD	Note: For M2020 SuperCam, it is defined as (2048-size)/2 + 1 where size is always equal to the number of lines as defined in AUTO_EXPOSURE_ROI_LINES
Ops Keyword AUTO_EXPOSURE_ROI_LINES **Archive Attribute** TBD **Definition** Specifies the number of lines in the autoexposure region of interest. For M2020 SuperCam, the value must be even. For M2020 SuperCam, only red pixels are used.	**Valid Values** "2" to "2048" (B) **Type** integer **Units** n/a **Location** OBSERVATION_REQUEST_PARMS (Group) SCAM_MINI_HEADER (Group) **X-path** TBD **Reference** TBD	**Mode** SCAM Image DPO mini-header **Field as "<xml name>:[<element>]:[<element>]:<field>"** "SCAM_Image_Mini_Header:autoexp_roi_y_size" **Type** U16 Notes: For SCAM RMI products, "autoexposure roi y position" is comprised of two bytes coming from the Image DPO mini-header at offset 25.
Ops Keyword AUTO_EXPOSURE_LOWER_LIMIT **Archive Attribute** TBD **Definition** Specifies the maximum number of pixels allowed that are below the lower threshold DN value, as defined by the AUTO_EXPOSURE_LOWER_THRESHOLD keyword.	**Valid Values** "0" to "1048575" (B) **Type** integer **Units** n/a **Location** OBSERVATION_REQUEST_PARMS (Group) SCAM_MINI_HEADER (Group) **X-path** TBD **Reference**	**Mode** SCAM Image DPO mini-header **Field as "<xml name>:[<element>]:[<element>]:<field>"** • SuperCam RMI (S5.2, S6) "SCAM_Image_Mini_Header: autoexp_num_pixels_under_lower_threshold" **Type** U8[] Notes: For SCAM RMI products, "auto exposure lower limit" is comprised of three bytes coming from the Image DPO mini-header at offset 17.

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	TBD	
Ops Keyword AUTO_EXPOSURE_LOWER_THRESHOLD **Archive Attribute** TBD **Definition** Specifies the lower threshold DN value in which a specified number of pixels is permitted to exceed. AUTO_EXPOSURE_LOWER_LIMIT keyword defines the number of pixels allowed to exceed the upper threshold.	**Valid Values** "0" to "1024" (B) **Type** integer **Units** n/a **Location** 1) a. OBSERVATION_REQUEST_PARMS (Group) b. SCAM_MINI_HEADER (Group) **X-path** TBD **Reference** TBD	**Mode** SCAM Image DPO mini-header **Field as "<xml name>:[<element>]:[<element>]:<field>"** "SCAM_Image_Mini_Header:autoexp_lower_threshold" **Type** U16 Notes: For SCAM RMI products, "autoexposure lower threshold" is comprised of two bytes coming from the Image DPO mini-header at offset 13.
Ops Keyword AUTO_EXPOSURE_ROI_SAMPLES **Archive Attribute** TBD **Definition** Specifies the number of samples in the autoexposure region of interest. For M2020 SuperCam, the value must be even and is the same as AUTO_EXP_ROI_LINES. For M2020 SuperCam, only red pixels are used.	**Valid Values** "2" to "2048" (B) **Type** integer **Units** n/a **Location** OBSERVATION_REQUEST_PARMS (Group) SCAM_MINI_HEADER (Group) **X-path** TBD **Reference** TBD	**Mode** Notes: For SCAM RMI products, number of samples has to be equal number of lines, thus SCAM miniheader only stores number of lines.
Ops Keyword AUTO_EXPOSURE_UPPER_LIMIT **Archive Attribute** TBD **Definition** Specifies the lower threshold DN value in which a specified number of pixels is permitted to exceed. AUTO_EXPOSURE_LOWER_LIMIT keyword defines the number of pixels allowed to exceed the upper threshold.	**Valid Values** "0" to "1048576" (B) **Type** integer **Units** n/a **Location** OBSERVATION_REQUEST_PARMS (Group) SCAM_MINI_HEADER (Group) **X-path** TBD **Reference** TBD	**Mode** SCAM Image DPO mini-header **Field as "<xml name>:[<element>]:[<element>]:<field>"** "SCAM_Image_Mini_Header:autoexp_max_num_pixels_above_upper_threshold" **Type** U8[] Notes: For SCAM RMI products, "auto exposure upper limit" is comprised of three bytes coming from the Image DPO mini-header at offset 20.

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Ops Keyword AUTO_EXPOSURE_UPPER_THRESHOLD **Archive Attribute** TBD **Definition** Specifies the upper threshold DN value in which a specified number of pixels is permitted to exceed. AUTO_EXPOSURE_UPPER_LIMIT keyword defines the number of pixels allowed to exceed the upper threshold.	**Valid Values** "0" to "1023" **Type** integer **Units** n/a **Location** 1) a. OBSERVATION_REQUEST_PARMS (Group) b. SCAM_MINI_HEADER (Group) **X-path** TBD **Reference** TBD	**Mode** SCAM Image DPO mini-header **Field as "<xml name>:|<element>|:|<element>|:<field>"** "SCAM_Image_Mini_Header:autoexp_upper_threshold" **Type** U8[] Notes: For SCAM RMI products, "autoexposure upper threshold" is comprised of two bytes coming from the Image DPO mini-header at offset 15.
Ops Keyword AUTO_FOCUS_ZSTACK_FLAG **Archive Attribute** TBD **Definition** Specifies if to acquire a Z-stack.	**Valid Values** • MCZ Cameras (B) • SHERLOC Cameras (B) "TRUE", "FALSE" **Type** String **Units** n/a **Location** IMAGE_REQUEST_PARMS (Group) MINI_HEADER **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:|<element>|:|<element>|:<field>"** • MCZ Cameras • SHERLOC Cameras "MMM_Image_Mini_Header:[27]" **Type** NOTES: For MCZ and SHERLOC non-zstack/rangemap imaging products, "auto focus zstack flag" is found in the MMM mini-header in byte 27, bit 7 (last bit).
Ops Keyword AZIMUTH_FOV **Archive Attribute** TBD **Definition** Specifies the angular measure of the horizontal field of view of an imaged scene. For M2020, it is computed by projecting rays from the left and right edges of the image at the center through the camera model, and computing the angle subtended by those rays.	**Valid Values** "0.0" to "360.0" **Type** float **Units** deg (<deg> unit tag required) **Location** INSTRUMENT_STATE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** • 1) DPO in XML format (referenced to APID Name in Appendix A) 2) DPO in XML format (referenced to APID Name in Appendix A) or Image DPO mini-header • Calculation: - Line/sample is translated into an origin and "look direction" vectors (left and right). The vectors are then used to calculate Azimuth field of view. **Field as "<xml name>:|<element>|:|<element>|:<field>"** 1) Eng. Cameras a. "<IDPH DPO>:idph:cols" b. "<IDPH DPO>:idph:rows" c. "<IDPH DPO>:idph:res_cols" d. "<IDPH DPO>:idph:res_rows"

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
		2) MCZ Cameras SHERLOC Cameras a. "<Ancillary DPO>:cmd_arguments_image: window_width" b. "<Ancillary DPO>: cmd_arguments_image:window_height" c. "MMM_Image_Mini_Header[23]" d. "MMM_Image_Mini_Header[24]" 3) SuperCam "<Ancillary DPO>:cmd_arguments_image: rce_subfrm_start_c_pixel" "<Ancillary DPO>:cmd_arguments_image: rce_subfrm_start_r_pixel" "<Ancillary DPO>:cmd_arguments_image: rce_subfrm_c_height" "<Ancillary DPO>:cmd_arguments_image: rce_subfrm_r_height" **Type** 1) U16 2) U8 3) U16 NOTES: • For MCZ non-recovered data products (cases "a" and "b"), integer values come from the Ancillary DPO. • For MCZ recovered data products (cases "c" and "d"), values analogous to cases "a" (window_width) and "b" (window_height) are each comprised of one byte coming from Image DPO mini-header at byte offsets 22 and 23, respectively. • For MCZ and SHERLOC, parm "window_width" is number of image samples. • For MCZ and SHERLOC, parm "window_height" is number of image lines. • For MCZ and SHERLOC non-Thumbnail data products, multiply by factor of 8 to convert to correct line/sample value. • For SuperCam rce_subfrm_start_c_pixel: Starting column for subframing on RCE. rce_subfrm_start_r_pixel: Starting row for subframing on RCE. rce_subfrm_c_height: Number of columns for subframing on RCE. rce_subfrm_r_height: Number of rows for subframing on RCE.
Ops Keyword BAD_PIXEL_REPLACEMENT_FLAG **Archive Attribute** TBD	**Valid Values** • Eng. Cameras 0 = "FALSE" 1 = "TRUE"	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Definition Specifies whether or not bad pixel replacement processing was requested or completed. If set to TRUE, certain pixels in the image were replaced based on a bad pixel table. See BAD_PIXEL_REPLACEMENT_ID.	**Type** string(5) **Units** n/a **Location** OBSERVATION_REQUEST_PARMS (Group) **X-path** TBD **Reference** TBD	"<IDPH DPO>:idph:params:bad" **Type** boolean
Ops Keyword BAD_PIXEL_REPLACEMENT_ID **Archive Attribute** TBD **Definition** Specifies the ID of the bad pixel table used in the bad pixel replacement process. The bad pixel table ID is incremented every time an update to the bad pixel table is made. See BAD_PIXEL_REPLACEMENT_FLAG.	**Valid Values** • Eng. Cameras 0 = "N/A" "1" to "65535" **Type** string **Units** n/a **Location** INSTRUMENT_STATE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras "<IDPH DPO>:idph:bad" **Type** U16
Ops Keyword BANDS **Archive Attribute** TBD **Definition** Specifies the number of spectral bands in image or other object.	**Valid Values** "1" to "16" **Type** integer **Units** n/a **Location** IMAGE (Object) **X-path** TBD **Reference** TBD	**Mode** Static Value **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword BAND_STORAGE_TYPE **Archive Attribute** TBD	**Valid Values** "BAND_SEQUENTIAL", "SAMPLE_INTERLEAVED", "LINE_INTERLEAVED" **Type**	**Mode** VICAR label **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Definition Specifies the number of spectral bands in image or other object.	string(20) **Units** n/a **Location** IMAGE (Object) **X-path** TBD **Reference** TBD	**Type** n/a
Ops Keyword BAYER_METHOD **Archive Attribute** TBD **Definition** Specifies whether or not the data are encoded in a Bayer pattern, and if not, how the pattern was removed. Valid value definitions; other teams may add their own algorithm names as needed: a) "NONE" – Imager is not a Bayer-pattern imager. Default if keyword is missing. b) "RAW_BAYER" – Image has the raw Bayer pattern; no de-Bayering has been done. c) "MALVAR" – Image has been converted to RGB using the Malvar algorithm. d) "ZHANG_WU – Image has been converted to RGB using the Zhang-Wu algorithm. e) "RED_AVERAGED" – Pixels are created by averaging 1 (or more) pixels from the red band exclusively. f) "GREEN_AVERAGED" – Pixels are created by averaging 1 (or more) pixels from the green band exclusively. g) "BLUE_AVERAGED" – Pixels are created by averaging 1 (or more) pixels from the blue band exclusively. h) "RED_BILINEAR" – Pixels are created by bilinear interpolation of surrounding pixels taken exclusively from the red band. i) "GREEN_BILINEAR" – Pixels are created by bilinear interpolation of surrounding pixels taken exlusively from the green band. j) "BLUE_BILINEAR" – Pixels are created by bilinear interpolation of surrounding pixels taken exclusively from the blue band. k) "AVERAGED" – RGB image created by averaging	**Valid Values** **Surface EDRs** • Eng. Cameras For EDR: 0 = "RAW_BAYER" 1 = "PANCHROMATIC" 2 = "RED_AVERAGED" 3 = "GREEN_AVERAGED" 4 = "BLUE_AVERAGED" • SuperCam (S) • MCZ (S) • SHERLOC-WATSON (S) **Surface RDRs:** "NONE", "RAW_BAYER", "MALVAR", "ZHANG_WU", "RED_AVERAGED", "GREEN_AVERAGED", "BLUE_AVERAGED", "RED_BILINEAR", "GREEN_BILINEAR","BLUE_BILINEAR", "AVERAGED","BILINEAR", "PANCHROMATIC", "IDENTITY" **Cruise** • Eng. Cameras (C) 0 - 15 = "RAW_BAYER" 16 - 19 = "RED_AVERAGED" 20 - 23 = "GREEN_AVERAGED" 24 - 27 = "BLUE_AVERAGED" 28 – 31 = "PANCHROMATIC" 32 = "RED_AVERAGED" 33 = "GREEN_AVERAGED" 34 = "BLUE_AVERAGED" 35 = "PANCHROMATIC" • SuperCam (C) "RAW_BAYER" **Type** string **Units**	**Field as "<xml name>:[<element>]:[<element>]:<field>"** **Surface** • Eng. Cameras a. "<IDPH DPO:idph:color>" b. "<IDPH DPO:idph:params:color" **Cruise** • Eng. Cameras a. "<IDPH DPO>:idph:voff" **Type** **Surface** • Eng. Cameras I32 **Cruise** • Eng. Cameras (C) U16

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
individual cells. Generally a simple composite of RED|GREEN|BLUE_AVERAGED elements. l) "BILINEAR" – Bilinear interpolation of each color treated independently. m) "PANCHROMATIC" – Pixels are created by averaging one or more complete Bayer cells, creating a panchromatic image. n) "IDENTITY" – Sensor has a Bayer pattern but the image can be used as-is due to the presence of other filters.	n/a **Location** a. INSTRUMENT_STATE_PARMS (Group) b. OBSERVATION_REQUEST_PARMS (Group) **X-path** TBD **Reference** TBD	
Ops Keyword BIAS_COEFFS_FILE_DESC **Archive Attribute** TBD **Definition** Specifies a description of bias coefficients file named in BIAS_COEFFS_FILE_NAME.	**Valid Values** n/a **Type** string **Units** n/a **Location** DERIVED_IMAGE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword BIAS_COEFFS_FILE_NAME **Archive Attribute** TBD **Definition** Specifies the name of bias coefficients file used in generating the RDR.	**Valid Values** n/a **Type** string **Units** n/a **Location** DERIVED_IMAGE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword BOOT_COUNT **Archive Attribute** TBD **Definition** Unsigned integer count incremented each time the RCE boots.	**Valid Values** n/a **Type** string **Units** n/a **Location** TELEMETRY (Class)	**Mode** EMD in XML format **Field as "<xml name>:[<element>]:[<element>]:<field>"** "MslEarthProductMetadata:MslProductMetadata:BootCounter" **Type** Unsigned integer

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	X-path TBD **Reference** TBD	
Ops Keyword BRIGHTNESS_CORRECTION_FILE **Archive Attribute** TBD **Definition** Specifies the name of the file containing brightness correction parameters for each input file of a mosaic. The file is in XML format.	**Valid Values** n/a **Type** string **Units** n/a **Location** DERIVED_IMAGE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword BRIGHTNESS_CORRECTION_TYPE **Archive Attribute** TBD **Definition** Identifies the type of brightness correction that was applied to a mosaic. Brightness correction is defined as a mosaic radiometric seam matching process that is done on top of ordinary radiometric correction. Its intent is to reduce visual seams at the expense of radiometric accuracy. Applies to RDRs only, not EDRs. Types may be added over time but currently they consist of: a) "NONE" - No correction made. b) "LINEAR" - Each input image gets a single additive and a single multiplicative factor, which are applied to every pixel in the image as follows: (new_image = image * mult + add). These factors are defined via the IMAGE_RADIANCE_FACTOR and IMAGE_RADIANCE_OFFSET keywords. c) "MIXED" - Multiple types of correction were applied to different input images. This should be avoided but is included as a placeholder.	**Valid Values** "NONE", "LINEAR", "MIXED" **Type** string **Units** n/a **Location** DERIVED_IMAGE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword BYTES **Archive Attribute** TBD **Definition**	**Valid Values** "0" to n **Type** integer **Units**	**Mode** Calculation based on size of VICAR label **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type**

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Specifies the number of bytes allocated for a particular data representation.	n/a **Location** IMAGE_HEADER (Object) **X-path** TBD **Reference** TBD	n/a
Ops Keyword CALIBRATION_SOURCE_ID **Archive Attribute** TBD **Definition** Specifies a unique identifier (within a data set) indicating the source of the calibration data used in generating the entity described by the enclosing group (often, a camera model). The construction of this identifier is mission-specific, but should indicate which specific calibration data set was used (via date or other means) and may also indicate the calibration method.	**Valid Values** n/a **Type** string(47) **Units** n/a **Location** GEOMETRIC_CAMERA_MODEL (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:|<element>|:|<element>|:<field>"** • Eng. Cameras "<IDPH DPO>:idph:cmod_model_id" • MCZ Cameras "<IDPH DPO>:cidph:camera_model:mid" **Type** U16
Ops Keyword CAMERA_ROTATION_AXIS_VECTOR **Archive Attribute** TBD **Definition** Specifies the axis around which the camera rotates. For the Cylindrical-Perspective projection, this is the axis around which one rotates the camera model in azimuth, before (optionally) correcting for rover tilt using PROJECTION_Z_AXIS_VECTOR. It corresponds to the physical azimuth rotation axis for mast-mounted cameras.	**Valid Values** n/a **Type** float array[3] **Units** n/a **Location** SURFACE_PROJECTION_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:|<element>|:|<element>|:<field>"** n/a **Type** n/a
Ops Keyword CAMERA_SERIAL_NUMBER **Archive Attribute** TBD **Definition** Specifies the manufacturer's serial number for the camera for which the camera model was derived. This should match instrument_serial_number in most cases; generally speaking a mismatch should only occur during testing/development.	**Valid Values** • Eng. Cameras EM Strings (RCE) / FM Strings (F Instrument: A / B / A Fhaz Left: TBD / TBD / TBD Fhaz Right: TBD / TBD / TBD Rhaz Left: TBD / TBD Rhaz Right: TBD / TBD Navcam Left: TBD / TBD Navcam Right: TBD / TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:|<element>|:|<element>|:<field>"** "<IDPH DPO>:idph:cmod_serial_no" **Type** U8

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
For M2020, the value might not be identical to that of INSTRUMENT_SERIAL_NUMBER.	Cache TBD TBD • SuperCam Instrument EM FM RMI TBD TBD • Mastcam-Z Instrument EM FM Mastcam-Z Left TBD TBD Mastcam-Z Right TBD TBD • SHERLOC Instrument EM FM WATSON TBD TBD ACI TBD TBD • PIXL Instrument EM FM MCC TBD TBD • MEDA Instrument EM FM SkyCam TBD TBD • EDL Instrument EM FM LVS TBD TBD PUC A TBD TBD PUC B TBD TBD PUC C TBD TBD DDC TBD TBD RDC TBD TBD RUC TBD TBD **Type** string **Units** n/a **Location** GEOMETRIC_CAMERA_MODEL (Group) **X-path** TBD **Reference** TBD	
Ops Keyword CFA_TYPE **Definition** Defines the type of Color Filter Array (CFA) used to encode multiple colors in a single exposure. It is optional if there is no CFA.	**Valid Values** • MEDA SkyCam, SHERLOC-ACI, PIXL MCC: "NONE" • Eng. Cameras, SuperCam RMI, MCZ, SHERLOC Imaging, EDL cameras: "BAYER_RGGB"	**Mode** Static value **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Valid value definitions: a) "NONE" – no CFA b) "BAYER_RGGB" – repated 2x2 square of pixels.	**Type** string **Units** n/a **Location** INSTRUMENT_STATE_PARMS (Group) **X-path** TBD **Reference** TBD	
Ops Keyword CFA_VENUE **Definition** For instruments using a Color Filter Array (CFA), this keyword defines where the CFA pattern was removed from the data. It is optional if there no CFA.	**Valid Values** "NONE", "ONBOARD", "GROUND" SuperCam RMI Cruise: "NONE" **Type** string **Units** n/a **Location** INSTRUMENT_STATE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword COMMAND_DISPATCH_SCLK **Archive Attribute** TBD **Definition** SCLK value corresponding to the time the DP generation command was sent by the RCE. 16 bits for seconds, 8 bits sub- seconds.	**Valid Values** "n/a **Type** string **Units** n/a **Location** TELEMETRY (Class) **X-path** TBD **Reference** TBD	**Mode** EMD in XML format **Field as "<xml name>:[<element>]:[<element>]:<field>"** "MslEarthProductMetadata:MslProductMetadata:Command DispatchTime" **Type** Unsigned integer
Ops Keyword COMMAND_INSTRUMENT_ID	**Valid Values** • Eng. Cameras 0 = "NONE"	**Mode** DPO in XML format (referenced to APID Name in Appendix A)

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Archive Attribute TBD **Definition** Specifies an abbreviated name or acronym which identifies the instrument that was commanded. NOTE: INSTRUMENT_ID is not a unique identifier for a given instrument. Note also that the associated INSTRUMENT_NAME element provides the full name of the instrument. Example values: IRTM (for Viking Infrared Thermal Mapper), PWS (for plasma wave spectrometer).	1 = "FRONT_HAZCAM_LEFT" 2 = "FRONT_HAZCAM_RIGHT" 3 = "REAR_HAZCAM_LEFT" 4 = "REAR_HAZCAM_RIGHT" 5 = "NAVCAM_LEFT" 6 = "NAVCAM_RIGHT" 7 = "CACHECAM" • SuperCam RMI "SCAM_RMI" • MCZ 0x4 = "MCAMZ_LEFT" 0x8 = "MCAMZ_RIGHT" 0xC = "MCAMZ_BOTH" • SHERLOC 0x1 = "SRLC_WATSON" 0x2 = "SRLC_ACI" **Type** string(20) **Units** n/a **Location** OBSERVATION_REQUEST_PARMS (Group) **X-path** TBD **Reference** TBD	**Field as "<xml name>:[<element>]:[<element>]:<field>"** **Surface** • Eng. Cameras "<IDPH DPO>:idph:params:camera" • MCZ Cameras • SHERLOC Cameras "<Ancillary DPO>:cmd_arguments_image:camera" **Cruise** • Eng. Cameras "<IDPH DPO>:idph:params:camera" • MCZ Cameras "<Ancillary DPO>:cmd_arguments_image:camera" **Type** enum
Ops Keyword COMMAND_SEQUENCE_NUMBER **Archive Attribute** TBD **Definition** Specifies a numeric identifier for a sequence of commands sent to a spacecraft or instrument. NOTE: For M2020, this is the command number which identifies the specific generating command within the specified sequence.	**Valid Values** n/a **Type** integer **Units** n/a **Location** IDENTIFICATION (Class) **X-path** TBD **Reference** TBD	**Mode** EMD in XML format **Field as "<xml name>:[<element>]:[<element>]:<field>"** "MslEarthProductMetadata:MslProductMetadata: CommandNumber" **Type** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Ops Keyword COMMUNICATION_SESSION_ID **Archive Attribute** TBD **Definition** Active Communication Session ID at time of MPDU (Metadata Protocol Data Unit) creation. For context, the MPDU is the first PDU (Protocol Data Unit) produced for a data product, and contains general and M2020 specific "metadata". It is wholly contained in a single packet. See also EXPECTED_TRANSMISSION_PATH.	**Valid Values** n/a **Type** string **Units** n/a **Location** TELEMETRY (Class) **X-path** TBD **Reference** TBD	**Mode** EMD in XML format **Field as "<xml name>:[<element>]:[<element>]:<field>"** "MslEarthProductMetadata:MslProductMetadata:CommSessionId" **Type** n/a
Ops Keyword CONFIGURATION_BIT_ID **Archive Attribute** TBD **Definition** Specifies an array of strings identifying the configuration of the arm represented by the bits in the reachability product. Each configuration requires 2 bits to describe. The first entry in the array contains the configuration for the 2 most significant bits, while the last entry contains the configuration for the 2 least significant bits. For M2020, the instrument/tools that are useful in a reachability map are DRILL, BITCAR, SHERLOC-WATSON, APXS and SCOOP_TIP. For M2020, the 8 configuration values are interpreted as follows: a) "ARM_SO_EU_WU" - Shoulder out, Elbow up, Wrist up. b) "ARM_SO_EU_WD" - Shoulder out, Elbow up, Wrist down. c) "ARM_SO_ED_WU" - Shoulder out, Elbow down, Wrist up. d) "ARM_SO_ED_WD" - Shoulder out, Elbow down, Wrist down. e) "ARM_SI_EU_WU" - Shoulder in, Elbow up, Wrist up. f) "ARM_SI_EU_WD" - Shoulder in, Elbow up, Wrist down. g) "ARM_SI_ED_WU" - Shoulder in, Elbow down, Wrist up.	**Valid Values** "ARM_SO_EU_WU", "ARM_SO_EU_WD", "ARM_SO_ED_WU", "ARM_SO_ED_WD", "ARM_SI_EU_WU", "ARM_SI_EU_WD", "ARM_SI_ED_WU", "ARM_SI_ED_WD" **Type** string array[8] **Units** n/a **Location** DERIVED_IMAGE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software, Static value **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
h) "ARM_SI_ED_WD" - Shoulder in, Elbow down, Wrist down. See also INSTRUMENT_BAND_ID.		
Ops Keyword CONTACT_SENSOR_STATE **Archive Attribute** TBD **Definition** Specifies an array of identifiers for the state of an instrument or an instrument host's contact sensors at a specified time.	**Valid Values** **Surface** • Bit 0: FCS A csw triggered 0 = "NO CONTACT" 1 = "CONTACT" • Bit 1: FCS B csw triggered 0 = "NO CONTACT" 1 = "CONTACT" • Bit 2: DRILL STABILIZER 1 csw triggered 0 = "NO CONTACT" 1 = "CONTACT" • Bit 3: DRILL STABILIZER 2 csw triggered 0 = "NO CONTACT" 1 = "CONTACT" • Bit 4: DOCK 1 csw triggered 0 = "NO CONTACT" 1 = "CONTACT" • Bit 5: DOCK 2 csw triggered 0 = "NO CONTACT" 1 = "CONTACT" • Bit 6: DOCK 3 csw triggered 0 = "NO CONTACT" 1 = "CONTACT" • Bit 7: DOCK 4 csw triggered 0 = "NO CONTACT" 1 = "CONTACT" **Type** string array[8] **Units** n/a **Location** ARM_ARTICULATION_STATE (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** **Surface** • All Cameras "<IDPH DPO>:idph:arm:contact" **Type** U8
Ops Keyword CONTACT_SENSOR_STATE_NAME **Archive Attribute** TBD **Definition** Specifies the possible value that can be contained in the CONTACT_SENSOR_STATE array.	**Valid Values** TBD ("FACILITY CONTACT SENSOR A", "FACILITY CONTACT SENSOR B", "DRILL STABILIZER 1", "DRILL STABILIZER 2", "DOCK 1", "DOCK 2", "DOCK 3", "DOCK 4") **Type** string array[8]	**Mode** Static value: - Single value representing array of Bits 0 thru 7 from CONTACT_SENSOR_STATE. **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type**

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
FCS – FACILITY CONTACT SENSOR	**Units** n/a **Location** ARM_ARTICULATION_STATE (Group) **X-path** TBD **Reference** TBD	n/a
Ops Keyword COORDINATE_SYSTEM_INDEX **Archive Attribute** TBD **Definition** Specifies an integer array used to record and track the movement of a rover or lander during surface operations. When in a COORDINATE_SYSTEM_STATE group, this keyword identifies which instance of the coordinate frame, named by COORDINATE_SYSTEM_NAME, is being defined by the group. For M2020, these indices are based on the ROVER_MOTION_COUNTER and are in the same order as specified by ROVER_MOTION_COUNTER_NAME. • EDRs will always contain all 12 elements for this keyword. • For RDRs, the number of indices can be anything from 1 (used for SITE_FRAME) up to 10; however only 1, 2, 3, and 12 indices are common in RDRs. Example: COORDINATE_SYSTEM_INDEX=(1,12)	**Valid Values** n/a **Type** integer array[12] **Units** n/a **Location** • For EDRs … 1) ROVER_COORDINATE_SYSTEM (Group) 2) RSM_COORDINATE_SYSTEM (Group) 3) ARM_COORDINATE_SYSTEM (Group) 4) TURRET_COORDINATE_SYSTEM (Group) 5) TOOL_COORDINATE_SYSTEM (Group) 6) SITE_COORDINATE_SYSTEM (Group) 7) PIXL_SENSOR_COORDINATE_SYSTEM(Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A), Calculation **Field as "<xml name>:[<element>]:[<element>]:<field>"** **Surface** • Eng. Cameras (B) 1) "<IDPH DPO>:idph:rmc_site", "<IDPH DPO>:idph:rmc_drive", "<IDPH DPO>:idph:rmc_pose", "<IDPH DPO>:idph:rmc_arm", "<IDPH DPO>:idph:rmc_sha", "<IDPH DPO>:idph:rmc_drill", "<IDPH DPO>:idph:rmc_rsm", "<IDPH DPO>:idph:rmc_hga", "<IDPH DPO>:idph:rmc_bitcar", "<IDPH DPO>:idph:rmc_seal" 2) same as #1 above 3) same as #1 above 4) same as #1 above 5) same as #1 above 6) "<IDPH DPO>:idph:rmc_site" • SuperCam (S) • MCZ (S) • SHERLOC (S) • MEDA SkyCam (S) • PIXL MCC (S) 1) "<IDPH DPO>:idph:system:rmc:site", "<IDPH DPO>:idph:system:rmc:drive", "<IDPH DPO>:idph:system:rmc:pose", "<IDPH DPO>:idph:system:rmc:arm", "<IDPH DPO>:idph:system:rmc:sha", "<IDPH DPO>:idph:system:rmc:drill", "<IDPH DPO>:idph:system:rmc:rsm", "<IDPH DPO>:idph:system:rmc:hga", "<IDPH DPO>:idph:system:rmc:bitcar", "<IDPH DPO>:idph:system:rmc:seal" "<IDPH DPO>:idph:system:rmc:rtt" "<IDPH DPO>:idph:system:rmc:pmc" 2) same as #1 above 3) same as #1 above 4) same as #1 above 5) same as #1 above

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
		Cruise • MCZ (C) 1) "<IDPH DPO>:cidph:rmc:site", "<IDPH DPO>:cidph:rmc:drive", "<IDPH DPO>:cidph:rmc:pose", "<IDPH DPO>:cidph:rmc:arm", "<IDPH DPO>:cidph:rmc:sha", "<IDPH DPO>:cidph:rmc:drill", "<IDPH DPO>:cidph:rmc:rsm", "<IDPH DPO>:cidph:rmc:hga", "<IDPH DPO>:cidph:rmc:bitcar", "<IDPH DPO>:cidph:rmc:seal" 2) same as #1 above 3) same as #1 above 4) same as #1 above 5) same as #1 above **Type** U16 Note: Elements 11 and 12 are only used by PIXL MCC
Ops Keyword COORDINATE_SYSTEM_INDEX_NAME **Archive Attribute** TBD **Definition** Specifies an array of the formal names identifying each integer specified in COORDINATE_SYSTEM_INDEX. NOTE: Should match the number of values in COORDINATE_SYSTEM_INDEX.	**Valid Values** All Rover Cameras 1) "SITE" 2) "DRIVE" 3) "POSE" 4) "ARM" 5) "SHA" 6) "DRILL" 7) "RSM" 8) "HGA" 9) "BITCAR" 10) "SEAL" 11) "RTT" 12) "PMC" Helicopter Cameras 11) "FLIGHT" 12) "POS" **Type** string array[12] **Units** n/a **Location** • For EDRs … 1) ROVER_COORDINATE_SYSTEM (Group) 2) RSM_COORDINATE_SYSTEM (Group) 3) ARM_COORDINATE_SYSTEM (Group) 4) TURRET_COORDINATE_SYSTEM (Group) 5) TOOL_COORDINATE_SYSTEM (Group) 6) SITE_COORDINATE_SYSTEM (Group) 7) PIXL_SENSOR_COORDINATE_SYSTEM(Group)	**Mode** Static values: 1) for RMC element Site 2) for RMC element Drive 3) for RMC element Pose 4) for RMC element Arm 5) for RMC element SHA 6) for RMC element Drill 7) for RMC element RSM 8) for RMC element HGA 9) for RMC element BITCAR 10) for RMC element SEAL 11) for RMC element RTT 12) for RMC element PMC **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a Note: Elements 11 and 12 are only used by PIXL MCC

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	X-path TBD **Reference** TBD	
Ops Keyword COORDINATE_SYSTEM_NAME **Archive Attribute** TBD **Definition** Specifies the full name of the coordinate system to which the state vectors are referenced. When in a COORDINATE_SYSTEM group, this keyword provides the full name of the coordinate system being defined by the group. The rest of the keywords in the group describe how this coordinate system is related to some other (the "reference"). Non-unique coordinate systems (such as "SITE" for rover or lander missions), which have multiple instances using the same name, also require COORDINATE_SYSTEM_INDEX to completely identify the coordinate system. NOTE: A CS is named by three things: 1) the CS name (e.g. site, rover), 2) the set of indices, and 3) the solution ID (see SOLUTION_ID). A set of index-names is sometimes included for documentation purposes only. The solution ID is often omitted to indicate the default, but is logically part of the name. Any time there's a location (XYZ) or an orientation (in quaternion or angle form), the label group containing that location/orientation should contain the name of the CS in which it is expressed. This means it should contain the three "REFERENCE_*" keywords (or two if the solution ID is omitted). This includes CS definition groups, which have to define in what frame the origin/rotation numbers are expressed (i.e. what is the reference frame).	**Valid Values** • For EDRs and RDRs 1) "SITE_FRAME" 2) "ROVER_NAV_FRAME" 3) "ROVER_MECH_FRAME" 4) "LOCAL_LEVEL_FRAME" 5) "RSM_FRAME" 6) 0 = "ARM_TURRET_FRAME" 1 = "ARM_DRILL_FRAME" 2 = "ARM_DOCKING_POST_FRAME" 3 = "ARM_PIXL_FRAME" 4 = "ARM_GDRT_FRAME" 5 = "ARM_FCS_FRAME" 6 = "ARM_WATSON_FRAME" 7 = "ARM_SHERLOC_FRAME" 8 = "ARM_CUSTOM_TCP_FRAME" 7) "PIXL_BASE_FRAME" 8) "PIXL_SENSOR_FRAME" 9) "HELI_G_FRAME" 10) "HELI_M_FRAME" 11) "HELI_S1_FRAME" 12) "HELI_S2_FRAME" **Type** string **Units** n/a **Location** • For EDRs … 1) ROVER_COORDINATE_SYSTEM (Group) 2) RSM_COORDINATE_SYSTEM (Group) 3) ARM_COORDINATE_SYSTEM (Group) 4) TURRET_COORDINATE_SYSTEM (Group) 5) TOOL_COORDINATE_SYSTEM (Group) 6) PIXL_SENSOR_COORDINATE_SYSTEM(Group) **X-path** TBD **Reference** TBD	**Mode** • Static value: 1) for Rover Navigation Frame 2) for RSM Head Frame 4) for Turret Frame • DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** 3) "<IDPH DPO>:idph:arm:tool" 5) same as #3 above **Type** n/a
Ops Keyword CORRELATION_AVERAGE_SCALE	**Valid Values** n/a	**Mode** RDR-generating software

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Archive Attribute TBD **Definition** Indicates the average scale factor between the left and right image.	**Type** float **Units** n/a **Location** DERIVED_IMAGE_PARMS (Group) **X-path** TBD **Reference** TBD	 **Type** n/a
Ops Keyword CORRELATION_PIXEL_COUNT **Archive Attribute** TBD **Definition** Contains the number of pixels that successfully correlated.	**Valid Values** n/a **Type** integer **Units** n/a **Location** DERIVED_IMAGE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Type** n/a
Ops Keyword DARK_CURRENT_FILE_NAME **Archive Attribute** TBD **Definition** Specifies the name, or array of names, of the dark current image file(s) (image taken without opening the camera shutter) which should be used to perform radiometric calibration of the image. The dark current image provides a reference label of the build-up of any charges on the sensor that need to be subtracted from a shuttered image during calibration. Selection of the appropriate dark current image may be based on time, camera, temperature, readout conditions, light flood, gain and offset.	**Valid Values** n/a **Type** string array **Units** n/a **Location** DERIVED_IMAGE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword DARK_CURRENT_FILE_DESC **Archive Attribute** TBD **Definition**	**Valid Values** n/a **Type** string **Units**	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type**

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Specifies a description of the corresponding dark current files listed in DARK_CURRENT_FILE_NAME.	n/a **Location** DERIVED_IMAGE_PARMS (Group) **X-path** TBD **Reference** TBD	n/a
Ops Keyword DATA_LENGTH **Archive Attribute** TBD **Definition** Size of image in bytes.	**Valid Values** "0" to "8388608" (B) **Type** integer **Units** bytes **Location** SCAM_MINI_HEADER (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:|<element>|:|<element>|:<field>"** "SCAM_Image_Mini_Header:data_length" **Type** U32 Notes: For SCAM RMI products, "rmi_header_size" is comprised of four bytes coming from the Image DPO mini-header at offset 197.
Ops Keyword DC_OFFSET **Archive Attribute** TBD **Definition** Specifies the analog value that is subtracted from the video signal prior to the analog/digital converters. For M2020, the value is a digital number (DN) which represents the offset used in a camera-specific manner. For M2020 MCZ cameras, it is the DC Offset as reported in the MCZ mini-header. For M2020 engineering cameras, this value corresponds to a lookup table that defines a specific readout mode and portion on the detector. The table has a range of 0-35 as defined below. Each tile is 960 lines by 1280 samples. Refer to Table 4-2 in this document.	**Valid Values** • Eng. Cameras (C) "0" to "35" • MCZ Cameras (B) a. "UNK" b. "0" to "4095" **Type** string **Units** n/a **Location** • Eng. Cameras INSTRUMENT_STATE_PARMS (Group) • MCZ a. INSTRUMENT_STATE_PARMS (Group) b. MINI_HEADER (Group) • Skycam INSTRUMENT_STATE_PARMS (Group) **X-path** TBD **Reference**	**Mode** 1) DPO in XML format (referenced to APID Name in Appendix A) 2) DPO in XML format (referenced to APID Name in Appendix A) 3) Image DPO mini-header **Field as "<xml name>:|<element>|:|<element>|:<field>"** • Eng. Cameras "<IDPH DPO>:idph:voff" • MCZ Cameras "MCZ_Image_Mini_Header[52]", "MCZ_Image_Mini_Header[53]", "MCZ_Image_Mini_Header[54]", "MCZ_Image_Mini_Header[55]" • Skycam "<MEDA Image Header>:skycam_vid_offset_lowbyte_data" + "<MEDA Image Header>:skycam_vid_offset_highbyte_data" NOTES: • For MCZ Cameras, value analogous to "DC_offset" is comprised of four bytes coming from Image DPO mini-header at byte offsets 52, 53, 54 and 55.

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	TBD	• For EECAM Cruise, voff values map to a predefined tiling and readout mode. **Type** • Eng. Cameras U16 • SuperCam • MCZ • Skycam U8
Ops Keyword DATA_PRODUCT_COMPRESSION_TYPE **Archive Attribute** TBD **Definition** Indicates if the data product is compressed and the type of compression.	**Valid Values** **Surface only** 0 = “Uncompressed” 1 = “LZO compressed” 2 = “GZIP compressed” **Type** string **Units** n/a **Location** TELEMETRY (Class) **X-path** TBD **Reference** TBD	**Mode** EMD in XML format **Field as “<xml name>:|<element>|:|<element>|:<field>”** “MslEarthProductMetadata:MslProductMetadata:CompressionIndicator” **Type** Unsigned integer
Ops Keyword DERIVED_IMAGE_TYPE **Archive Attribute** TBD **Definition** Specifies how to interpret the pixel values in a derived image RDR (or colloquially, the type of the derived image itself). Values are defined as: • “IMAGE” - Standard image, where pixels represent intensity. Note that this implies nothing about radiometric, geometric, or other corrections that may have been applied. • “DISPARITY_MAP” - Pixels represent line and sample disparity coordinates with respect to another image (2 bands). • “DISPARITY_LINE_MAP” - Pixels represent line disparity only. • “DISPARITY_SAMPLE_MAP” - Pixels represent sample disparity only.	**Valid Values** "IMAGE", "DISPARITY_MAP", "DISPARITY_LINE_MAP", "DISPARITY_SAMPLE_MAP", “DISPARITY_ERROR_MAP”, “DELTA_DISPARITY_MAP”, “DELTA_DISPARITY_LINE_MAP”, “DELTA_DISPARITY_SAMPLE_MAP”, “MASK”, "XYZ_MAP", “XYZ_ERROR_MAP”, "X_MAP", "Y_MAP", "Z_MAP", “ANGLE_MAP”, "RANGE_MAP", “RANGE_ERROR_MAP”, "UVW_MAP", "U_MAP", "V_MAP", "W_MAP", “ROUGHNESS_MAP”, “REACHABILITY_MAP”, “PRELOAD_MAP”, “SLOPE_MAP”, “RADIAL_SLOPE_MAP”, “SLOPE_HEADING_MAP”, “SLOPE_MAGNITUDE”, “NORTHERLY_TILT_MAP”, “SOLAR_ENERGY_MAP”, “IEP_MAP” **Type** string	**Mode** RDR-generating software **Field as “<xml name>:|<element>|:|<element>|:<field>”** n/a **Type** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
• "DISPARITY_ERROR_MAP" - Pixels represent a disparity error metric. • "DELTA_DISPARITY_MAP" - Pixels represent line and sample as an offset with respect to another image (2 bands). • "DELTA_DISPARITY_LINE_MAP" - Pixels represent the line delta disparity only. • "DELTA_DISPARITY_SAMPLE_MAP" - Pixels represent the sample delta disparity only. • "MASK" - Pixels represent a mask to apply to another image. • "XYZ_MAP" - Pixels represent XYZ values (3 bands). • "XYZ_ERROR_MAP" - Pixels represent an XYZ error metric. • "X_MAP" - Pixels represent the X component of an XYZ image. • "Y_MAP" - Pixels represent the Y component of an XYZ image. • "Z_MAP" - Pixels represent the Z component of an XYZ image. • "ANGLE_MAP" - Pixels represent an angle between 2 vectors. • "RANGE_MAP" - Pixels represent a distance from the camera center. • "RANGE_ERROR_MAP" - Pixels represent a range error metric. • "UVW_MAP" - Pixels represent Surface Normal values (3 bands associating to X,Y,Z). • "U_MAP" - Pixels represent the U (X) component of a Surface Normal image. • "V_MAP" - Pixels represent the V (Y) component of a Surface Normal image. • "W_MAP" - Pixels represent the W (Z) component of a Surface Normal image. • "ROUGHNESS_MAP" - Pixels represent a measure of surface roughness. • "REACHABILITY_MAP" - Pixels flag what is reachable on the target feature by the respective IDD instrument. • "PRELOAD_MAP" - Pixels represent an arm preload value. • "SLOPE_MAP" - Pixels represent a slope angle. • "RADIAL_SLOPE_MAP" - Pixels represent the component of slope radial to the rover. • "SLOPE_HEADING_MAP" - Pixels represent a slope heading. • "SLOPE_MAGNITUDE" - Pixels represent a slope magnitude. • "NORTHERLY_TILT_MAP" - Pixels represent the north-facing component of slope. • "SOLAR_ENERGY_MAP" - Pixels represent the available fraction of maximum solar energy. • "IEP_MAP" - Pixels represent Incidence, Emission andPhase angles.	**Units** n/a **Location** DERIVED_IMAGE_PARMS (Group) **X-path** TBD **Reference** TBD	
Ops Keyword ^DESCRIPTION	**Valid Values** "VICAR2.TXT"	**Mode** Static Value

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Archive Attribute TBD **Definition** Specifies a pointer that provides a free-form, unlimited-length character string that represents or gives an account of something.	**Type** string **Units** n/a **Location** IMAGE_HEADER (Object) **X-path** TBD **Reference** TBD	**Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword DETECTOR_ERASE_COUNT **Archive Attribute** TBD **Definition** Specifies the number of times a detector has been flushed of data in raw counts. For MCZ and SHERLOC cameras on M2020, this reports the value of the camera head vertical register (vflush) parameter.	**Valid Values** "0" to "15" **Type** integer **Units** n/a **Location** • Eng. Cameras • SuperCam • Skycam OBSERVATION_REQUEST_PARMS (Group) • MCZ Cameras OBSERVATION_REQUEST_PARMS (Group) MINI_HEADER (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras "<IDPH DPO>:idph:params:flush" • MCZ Cameras • SHERLOC Cameras "MMM_Image_Mini_Header[12]", "MMM_Image_Mini_Header[13]" • SkyCam "MEDA Image Header:skycam_fast_flush_cntr_data" **Type** U8 Note: For MCZ products, "detector erase count" is comprised of two bytes coming from the MMM mini-header starting at offset 12.
Ops Keyword DETECTOR_FIRST_LINE **Archive Attribute** TBD **Definition** Specifies the starting row from the hardware, such as a charge-coupled device (CCD), that contains data.	**Valid Values** • Eng. Cameras "1" to "960" • SuperCam RMI "1" to "2048" • MCZ Cameras • SHERLOC "1" to "1648" • PIXL TBD • Skycam TBD **Type** integer **Units**	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras "<IDPH DPO>:idph:hw_row0" • SuperCam RMI "<SCAM Ancillary DPO>:roi_y_position" Note: 0-based, add +1 to the value • MCZ Cameras • SHERLOC "MMM_Image_Mini_Header[21] • PIXL TBD

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	n/a **Location** 1) INSTRUMENT_STATE_PARMS (Group) **X-path** TBD **Reference** TBD	• Skycam TBD **Type** U16
Ops Keyword DETECTOR_FIRST_LINE_SAMPLE **Archive Attribute** TBD **Definition** Specifies the starting column from the hardware, such as a charge-coupled device (CCD), that contains data.	**Valid Values** • Eng. Cameras "1" to "1280" • SuperCam RMI "1" to "2048" • MCZ Cameras • SHERLOC TBD • PIXL TBD • Skycam TBD **Type** integer **Units** n/a **Location** INSTRUMENT_STATE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras "<IDPH DPO>:idph:hw_col0" • SuperCam RMI "<SCAM Ancillary DPO>:roi_y_position" Note: 0-based, add +1 to the value • MCZ Cameras • SHERLOC "MMM_Image_Mini_Header[20] • PIXL TBD • Skycam TBD **Type** U16
Ops Keyword DETECTOR_LINES **Archive Attribute** TBD **Definition** Specifies the number of rows extracted from the hardware, such as a charge-coupled device (CCD), that contain data.	**Valid Values** • Eng. Cameras "1" to "960" • SuperCam RMI "1" to 2048" • MCZ Cameras • SHERLOC "0" to "1648" • PIXL TBD • Skycam TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras "<IDPH DPO>:idph:hw_rows" • SuperCam RMI "<SCAM Ancillary DPO>:roi_size" • MCZ Cameras • SHERLOC "MMM_Image_Mini_Header[23]" • PIXL TBD

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	Type integer **Units** n/a **Location** INSTRUMENT_STATE_PARMS (Group) **X-path** TBD **Reference** TBD	• Skycam TBD **Type** U16
Ops Keyword DETECTOR_LINE_SAMPLES **Archive Attribute** TBD **Definition** Specifies the number of samples extracted from the hardware, such as a charge-coupled device (CCD), that contain data.	**Valid Values** • Eng. Cameras "0" to "" • SuperCam RMI "1" to 2048" • MCZ Cameras • SHERLOC "0" to "" • PIXL TBD • Skycam TBD **Type** integer **Units** n/a **Location** INSTRUMENT_STATE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras "<IDPH DPO>:idph:hw_cols" • SuperCam RMI • SuperCam RMI "<SCAM Ancillary DPO>:roi_size" • MCZ Cameras • SHERLOC "MMM_Image_Mini_Header[22]" • PIXL TBD • Skycam TBD **Type** U16
Ops Keyword DETECTOR_TO_IMAGE_FLIP **Archive Attribute** TBD **Definition** This attribute indicates whether and how the image was flipped (mirror image) along its optical path through an instrument, from detector to final image orientation. "Horizontal" means a left-to-right flip, while "Vertical means a top-to-bottom-flip. Note that if both this attribute and	**Valid Values** **CacheCam** • "Vertical" **Type** String **Units** N/A	**Mode** N/A

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
DETECTOR_TO_IMAGE_ROTATION exist, the flip is assumed to have happened before the rotation. Note: All M2020 CacheCam images are flipped vertically.	**Location** INSTRUMENT_STATE_PARMS (Group) **X-path** TBD **Reference** TBD	
Ops Keyword DETECTOR_TO_IMAGE_ROTATION **Archive Attribute** TBD **Definition** Specifies the clockwise rotation, in degrees, that was applied to an image along its optical path through an instrument, from detector to final image orientation.	**Valid Values** • Eng. Cameras 0 = IMG_ROT_0 = “0.0” 1 = IMG_ROT_90 = “90.0” 2 = IMG_ROT_180 = “180.0” 3 = IMG_ROT_270 = “270.0” **Type** float **Units** Deg **Location** INSTRUMENT_STATE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A), Table Lookup **Field as “<xml name>:[<element>]:[<element>]:<field>”** Eng. Cameras “<IDPH DPO>:idph:rotation” **Type** enum
Ops Keyword DEVICE_COMPONENT_STATE **Archive Attribute** TBD **Definition**	**Valid Values** • MCZ Cameras • SHERLOC Cameras 0 = “OFF” 1 = “ON” **Type** float **Units** Deg **Location** INSTRUMENT_STATE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A), Table Lookup **Field as “<xml name>:[<element>]:[<element>]:<field>”** • MCZ Cameras • SHERLOC Cameras “<Ancillary DPO>:default_ancillary_data:dea_power”, “<Ancillary DPO>:default_ancillary_data:htr_power” **Type** enum
Ops Keyword DEVICE_COMPONENT_STATE_NAME **Archive Attribute** TBD	**Valid Values** • MCZ Cameras (“DEA POWER”, “HEATER POWER”)	**Mode** Static **Field as “<xml name>:[<element>]:[<element>]:<field>”**

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Definition	**Type** float **Units** Deg **Location** INSTRUMENT_STATE_PARMS (Group) **X-path** TBD **Reference** TBD	**Type** enum
Ops Keyword DOWNLOAD_PRIORITY **Archive Attribute** TBD **Definition** Specifies which data to downlink/transmit, based on order of importance. The lower numerical priority (higher-ranked number) data products are transmitted before higher numerical priority (lower-ranked number) data products. For example, an image with a downlink priority of 25 will be transmitted from the rover before an image with a downlink priority of 50. Value of "0" specifies use of on-board default.	**Valid Values** "0" to "101" **Type** integer **Units** n/a **Location** • Eng. Cameras a. TELEMETRY (Class) b. IMAGE_REQUEST_PARMS (Group) c. THUMBNAIL_REQUEST_PARMS (Group) d. COLUMN_SUM_REQUEST_PARMS (Group) e. ROW_SUM_REQUEST_PARMS (Group) f. HISTOGRAM_REQUEST_PARMS (Group) • SuperCam a. TELEMETRY(Group) b. THUMBNAIL_REQUEST_PARMS (Group) • MCZ • SHERLOC a. TELEMETRY (Class) b. IMAGE_REQUEST_PARMS (Group) c. THUMBNAIL_REQUEST_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras a. "MslEarthProductMetadata:MslProductMetadata: ProductPriority" b. "<IDPH DPO>:idph:params:img_prio" c. "<IDPH DPO>:idph:params:thumb_prio" d. "<IDPH DPO>:idph:params:col_prio" e. "<IDPH DPO>:idph:params:row_prio" f. "<IDPH DPO>:idph:params:hist_prio" • SuperCam a. "MslEarthProductMetadata:MslProductMetadata: ProductPriority" • MCZ • SHERLOC a. "MslEarthProductMetadata:MslProductMetadata: ProductPriority" b. "<Ancillary DPO>:cmd_arguments_image: image_data_priority" c. "<Ancillary DPO>:cmd_arguments_image: thumbnail_data_priority" **Type** U8
Ops Keyword DOWNSAMPLE_METHOD **Archive Attribute** TBD **Definition**	**Valid Values** • Eng. Cameras "HARDWARE", "SOFTWARE", "BOTH", "NONE" • MCZ Cameras "HARDWARE", "NONE" **Type** string	**Mode** 1) DPO in XML format (referenced to APID Name in Appendix A), Calculation 2) EMD in XML format **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Specifies whether or not hardware downsampling was applied to an image.	**Units** n/a **Location** INSTRUMENT_STATE_PARMS (Group) **X-path** TBD **Reference** TBD	a. "<IDPH DPO>:idph:hw_res" b. "<IDPH DPO>:idph:res_rows" c. "<IDPH DPO>:idph:res_cols" • MCZ Cameras "MslEarthProductMetadata:MslProductMetadata:DataFileName" NOTES: • For Eng. Cameras, if res_rows=1 and res_cols=1, then "NONE". • For Eng. Cameras, if hw_res is 2, 4, or 8 and res_rows = res_cols = hw_res, then "HARDWARE" • For Eng. Cameras, if hw_res is 1 and res_rows or res_cols > 1, then "SOFTWARE". • For Eng. Cameras, if hw_res is 2, 4, or 8 and res_rows and res_cols != hw_res , then "BOTH". • For MCZ Cameras, if product filename is Thumbnail, then "HARDWARE". • For MCZ Cameras, if product filename is not Thumbnail, then "NONE". **Type** 1) a. boolean b. enum c. U16 d U16 2) n/a
Ops Keyword EARLY_IMAGE_RETURN_FLAG **Archive Attribute** TBD **Definition** Specifies the deferral of on-board post processing of the image and the returns the image early to an onboard client.	**Valid Values** • Eng. Cameras 0 = "FALSE" 1 = "TRUE" **Type** string **Units** n/a **Location** OBSERVATION_REQUEST_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format, Table Lookup **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras "<IDPH DPO>:idph:params:img_early" **Type** boolean
Ops Keyword EARLY_PIXEL_SCALE_FLAG **Archive Attribute** TBD	**Valid Values** • Eng. Cameras (B) 0 = "FALSE" 1 = "TRUE"	**Mode** DPO in XML format, Table Lookup **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Definition Specifies the scaling of pixels. If TRUE, pixels are scaled early (from 12 to 8 bits).	**Type** string **Units** n/a **Location** OBSERVATION_REQUEST_PARMS (Group) **X-path** TBD **Reference** TBD	"<IDPH DPO>:idph:params:scale_early" **Type** boolean
Ops Keyword EARTH_RECEIVED_START_TIME **Archive Attribute** TBD **Definition** Specifies the beginning time at which telemetry was received during a time period of interest. This should be represented in UTC system format.	**Valid Values** <YYYY>-<MM>-<DD>T<hh>:<mm>:<ss>[.<fff>] **Type** time **Units** n/a **Location** TELEMETRY (Class) **X-path** TBD **Reference** TBD	**Mode** EMD in XML format, Calculation **Field as "<xml name>:[<element>]:[<element>]:<field>"** "MslEarthProductMetadata:MslProductMetadata:PartList:Part:Ert" NOTES: • Value from field "Ert" is extracted for all Parts in PartList. The resulting list is sorted. The lowest value is used as Start time. **Type** n/a
Ops Keyword EARTH_RECEIVED_STOP_TIME **Archive Attribute** TBD **Definition** Specifies the ending time for receiving telemetry during a time period of interest. This should be represented in UTC system format.	**Valid Values** <YYYY>-<MM>-<DD>T<hh>:<mm>:<ss>[.<fff>] **Type** time **Units** n/a **Location** TELEMETRY (Class) **X-path** TBD **Reference** TBD	**Mode** EMD in XML format, Calculation **Field as "<xml name>:[<element>]:[<element>]:<field>"** "MslEarthProductMetadata:MslProductMetadata:PartList:Part:Ert" NOTES: • Value from field "Ert" is extracted for all Parts in PartList. The resulting list is sorted. The highest value is used as Stop time. **Type** n/a
Ops Keyword ELEVATION_FOV **Archive Attribute** TBD **Definition** Specifies the angular measure of the vertical field of view of	**Valid Values** n/a **Type** float **Units** deg	**Mode** • 1) DPO in XML format (referenced to APID Name in Appendix A) 2) DPO in XML format (referenced to APID Name in Appendix A) or Image DPO mini-header • Calculation:

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
an imaged scene. For M2020, it is computed by projecting rays from the top and bottom edges of the image at the center through the camera model, and computing the angle subtended by those rays.	**Location** INSTRUMENT_STATE_PARMS (Group) **X-path** TBD **Reference** TBD	- Line/sample is translated into an origin and "look direction" vectors (left and right). The vectors are then used to calculate Elevation field of view. **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras 1) a. "<IDPH DPO>:idph:cols" b. "<IDPH DPO>:idph:rows" c. "<IDPH DPO>:idph:res_cols" d. "<IDPH DPO>:idph:res_rows" • MCZ Cameras • SHERLOC 2) a. "<Ancillary DPO>:cmd_arguments_image: window_width" b. "<Ancillary DPO>:cmd_arguments_image: window_height" c. "MMM_Image_Mini_Header[22]" d. "MMM_Image_Mini_Header[23]" NOTES: • For MCZ and SHERLOC non-recovered data products (cases "a" and "b"), float values come from the Ancillary DPO. • For MCZ and SHERLOC recovered data products (cases "c" and "d"), values analogous to cases "a" (window_width) and "b" (window_height) are each comprised of one byte coming from Image DPO mini-header at byte offsets 22 and 23, respectively. • For MCZ and SHERLOC, parm "window_width" is number of image samples. • For MCZ and SHERLOC, parm "window_height" is number of image lines. • For MCZ and SHERLOC non-Thumbnail data products, multiply by factor of 8 to convert to correct line/sample value. **Type** 1) U16 2) U8
Ops Keyword ERROR_PIXELS **Archive Attribute** TBD **Definition** Specifies the number of pixels that are outside a valid DN range, after all decompression and post decompression processing has been completed.	**Valid Values** n/a **Type** integer **Units** n/a **Location** COMPRESSION_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** Calculation based on telemetry **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Ops Keyword EXPECTED_PACKETS **Archive Attribute** TBD **Definition** Specifies the total number of telemetry packets which constitute a complete data product, i.e., a data product without missing data. NOTE: For M2020, telemetry data processing does not track "packets", but instead data product "parts".	**Valid Values** n/a **Type** integer **Units** n/a **Location** TELEMETRY (Class) **X-path** TBD **Reference** TBD	**Mode** EMD in XML format **Field as "<xml name>:|<element>|:|<element>|:<field>"** "MslEarthProductMetadata:MslProductMetadata:PartList:TotalExpected" **Type** n/a
Ops Keyword EXPECTED_TRANSMISSION_PATH **Archive Attribute** TBD **Definition** Specifies the planned transmission paths (routes) for the Data Product. Routing control at time of MPDU (Metadata PDU) generation. See also COMMUNICATION_SESSION_ID.	**Valid Values** n/a **Type** string **Units** n/a **Location** TELEMETRY (Class) **X-path** TBD **Reference** TBD	**Mode** EMD in XML format **Field as "<xml name>:|<element>|:|<element>|:<field>"** "MslEarthProductMetadata:MslProductMetadata:TransmissionControlCriterion" **Type** n/a
Ops Keyword EXPOSURE_COADD **Archive Attribute** TBD **Definition** Specifies the total number of images summed (co-added) together to obtain the final image. Co-adding increases the signal-to-noise ratio.	**Valid Values** • Eng. Cameras (S) "0","2","4","8","16" **Type** integer **Units** n/a **Location** • Eng. Cameras a. OBSERVATION_REQUEST_PARMS (Group) b. INSTRUMENT_STATE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:|<element>|:|<element>|:<field>"** • Eng. Cameras a. "<IDPH DPO>:idph:params:exp_coadd" b. "<IDPH DPO>:idph:exp_coadd" **Type** U8

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Ops Keyword EXPOSURE_COUNT **Archive Attribute** TBD **Definition** Specifies the maximum number of exposures taken during a specified interval. The value is dependent on exposure type.	**Valid Values** "0" to "255" **Type** integer **Units** n/a **Location** INSTRUMENT_STATE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** "<IDPH DPO>:idph:exp_count" **Type** U16
Ops Keyword EXPOSURE_DURATION **Archive Attribute** TBD **Definition** Specifies the value of the time between the opening and closing of an instrument aperture (such as a camera shutter). For M2020, there are no mechanical shutters. Instead, an "electronic shutter" concept was adopted whereby the detectors accumulate charge for EXPOSURE_DURATION amount of time and then that charge is flushed to a masked frame transfer area for readout and digitization.	**Valid Values** 1) Eng. Cameras "0.41096" to "3277.16096" 2) SuperCam RMI "0" to "65535" 3) MCZ Cameras SHERLOC Cameras "0" to 838800" 4) SuperCam RMI "0" to "65535" 5) PIXL MCC a. 0 = "125" 1 = "250" 2 = "500" 3 = "1000" 4 = "2000" 5 = "4000" 6 = "8000" 7 = "16000" b. "0" to "n" **Type** float **Units** ms (<ms> unit tag required) **Location** 1) Eng. Cameras INSTRUMENT_STATE_PARMS (Group) 2) SuperCam RMI INSTRUMENT_STATE_PARMS (Group) SCAM_MINI_HEADER (Group) 3) MCZ INSTRUMENT_STATE_PARMS (Group) 4) PIXL INSTRUMENT_STATE_PARMS (Group) 5) Skycam INSTRUMENT_STATE_PARMS (Group)	**Mode** • 1) DPO in XML format (referenced to APID Name in Appendix A) 2) MCZ Image DPO mini-header 3) SCAM Image DPO mini-header 5) Skycam DPO Image Header • Calculation: 1) ECAM = (exp_time * 50 us) + 360.96 us 2) MCZ and SHERLOC = exp_time * 0.1 ms 3) SCAM = exp_time 4) PIXL a. table look up (values in ms) b. exp_time / 1000 5) Skycam = exp_time * 5.333333 ms **Field as "<xml name>:[<element>]:[<element>]:<field>"** • 1) Eng. Cameras "<IDPH DPO>:idph:exp_time" • 2) SCAM Cameras "SCAM_Image_Mini_Header:exposure_time" • 3) MCZ Cameras a. "MMM_Image_Mini_Header[17]", "MMM_Image_Mini_Header[18]", "MMM_Image_Mini_Header[19]" b. "MMM_Image_Mini_Header[28]" • 4) PIXL a. "MCC_Image_Mini_Header[integration_time]" b. "MCC_Image_Meta_Data:Image_Meta_Data_Parameters[shuttime]" • 5) Skycam "MEDA Image Header:exp_time_lowbyte_data" + "MEDA Image Header:exp_time_highbyte_data"

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	X-path TBD **Reference** TBD	NOTES: • ECAM, MCZ, SHERLOC values of "exp_time" are in raw counts. • SCAM value of "exp_time" is in milliseconds. • PIXL values of "exp_time": a. milliseconds b. microseconds. • For MCZ and SHERLOC non-Z-stack data products (case "a"), a value analogous to "exp_time" is comprised of three bytes coming from Image DPO mini-header at offsets 17, 18 and 19. • For MCZ and SHERLOC Z-stack data products (case "b"), a value analogous to "stack depth count" is comprised of one byte coming from Image DPO mini-header at offset 28. • For SCAM RMI products, "exp_time" is comprised of two bytes coming from Image DPO mini-header at offset 5. • For Eng. Cameras, each raw count translates to 50 us. So, calculation is: value = exp_time * 50 us • For MCZ and SHERLOC Cameras, each raw count translates to 0.1 ms. So, calculation is: value = exp_time * 0.1 • For PIXL, there are two cases (a and b). If the "image meta data available" flag in the MCC image mini-header (byte 9, bit 7) is false (0) then use case a, which is comprised of one byte at offset 5 in the "mini-header". If the flag is true (1) then use case b, which is comprised of four bytes starting at offset X in the "Image Meta Data Parameter Struct". • For Skycam units are in raw tick counts. 1 tick = 5.333333 ms. **Type** • Eng. Cameras • SCAM • MCZ • SHERLOC • PIXL U16 • Skycam U8
Ops Keyword EXPOSURE_DURATION_COUNT	**Valid Values** "0" to "65535" (B)	**Mode** DPO in XML format (referenced to APID Name in Appendix A)

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Archive Attribute TBD **Definition** Specifies the value, in raw counts, of the time interval between the opening and closing of an instrument aperture (such as a camera shutter). This is a raw value taken directly from telemetry, as opposed to EXPOSURE_DURATION, which has been converted to engineering units.	**Type** integer **Units** ms (<ms> unit tag required) **Location** • Eng. Cameras a. OBSERVATION_REQUEST_PARMS (Group) b. INSTRUMENT_STATE_PARMS (Group) • SCAM a. OBSERVATION_REQUEST_PARMS (Group) • MCZ • SHERLOC a. OBSERVATION_REQUEST_PARMS (Group) b. MINI_HEADER (Group) **X-path** TBD **Reference** TBD	**Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras a. <IDPH DPO>:idph:params:exp_time b. <IDPH DPO>:idph:exp_time • SuperCam RMI a. <Ancillary DPO>:cmd_arguments: exposure_time_seed • MCZ • SHERLOC a. "<Ancillary DPO>: cmd_arguments_image:exp_time" b. "MMM_Image_Mini_Header[17]", "MMM_Image_Mini_Header[18]", "MMM_Image_Mini_Header[19]" **Type** U16
Ops Keyword EXPOSURE_READOUT_COUNT **Archive Attribute** TBD **Definition** Specifies the number of times an exposure, or part of an exposure (tile), have been read from the camera."	**Valid Values** • Eng. Cameras (S) "0" to "65535" **Type** integer **Units** n/a **Location** • Eng. Cameras INSTRUMENT_STATE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras "<IDPH DPO>:idph:itrans **Type** U16
Ops Keyword EXPOSURE_SCALE_FACTOR **Archive Attribute** TBD **Definition** Specifies a multiplier to the base exposure time. The base exposure time is either user-commanded or is read from the onboard exposure time table. The resulting number is used by the cameras as the actual commanded exposure time. This	**Valid Values** • Eng. Cameras (B) n/a **Type** float **Units** n/a **Location**	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** Eng. Cameras "<IDPH DPO>:idph:params:exp_time_scale" **Type** F32

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
scale factor is commonly used during multi-spectral imaging, when the base exposure time is known for one filter and EXPOSURE_SCALE_FACTOR is used to scale the exposure time to levels appropriate for the other filters.	OBSERVATION_REQUEST_PARMS (Group) **X-path** TBD **Reference** TBD	
Ops Keyword EXPOSURE_TABLE_ID **Archive Attribute** TBD **Definition** Specifies a description for the exposure count value.	**Valid Values** • Eng. Cameras (B) 0 = “NONE” 1 = “FHAZCAM_L” 2 = “FHAZCAM_R” 3 = “RHAZCAM_L” 4 = “RHAZCAM_R” 5 = “NAVCAM_L” 6 = “NAVCAM_R” 7 = “CACHECAM” 8 = “CAMCONFIG_IDS” **Type** string **Units** n/a **Location** OBSERVATION_REQUEST_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A), Table Lookup **Field as “<xml name>:[<element>]:[<element>]:<field>”** • Eng. Cameras “<IDPH DPO>:idph:params:exp_table” **Type** enum
Ops Keyword EXPOSURE_TBL_UPDATE_FLAG **Archive Attribute** TBD **Definition** Specifies whether or not an exposure table entry was updated.	**Valid Values** • Eng. Cameras (B) 0 = “FALSE” 1 = “TRUE” **Type** string **Units** n/a **Location** OBSERVATION_REQUEST_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as “<xml name>:[<element>]:[<element>]:<field>”** • Eng. Cameras “<IDPH DPO>:idph:params:exp_update” **Type** boolean
Ops Keyword EXPOSURE_TYPE	**Valid Values** • Eng. Cameras (B) 0 = “NONE”	**Mode** 1) DPO in XML format (referenced to APID Name in Appendix A),

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Archive Attribute TBD **Definition** Specifies the exposure mode used for image acquisition. For MCZ and Sherlock Cameras the exposure types are: MANUAL: "manual exposure:usese exposure time argument" MANUAL_LAST: "manual exposure: uses last exposure time" AUTO: "auto exposure: uses all exposure arguments" AUTO_LAST: "autoexposure: uses last exposure time as a seed" TEST: "generate a test pattern with the argument exposure time"	1 = "MANUAL" 2 = "AUTO" 3 = "TEST" • SuperCam (S) 0 = "MANUAL" 1 = "AUTO" • MCZ Cameras (B) • SHERLOC Cameras (S) 0 = "MANUAL" 1 = "MANUAL_LAST" 2 = "AUTO" 3 = "AUTO LAST" 4 = "TEST" **Type** string(15) **Units** n/a **Location** • Eng. Cameras • SuperCam OBSERVATION_REQUEST_PARMS (Group) • MCZ Cameras • SHERLOC Cameras a. OBSERVATION_REQUEST_PARMS (Group) b. MINI_HEADER (Group) **X-path** TBD **Reference** TBD	Table Lookup 2) DPO in XML format (referenced to APID Name in Appendix A), Table Lookup 3) Image DPO mini-header **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras (B) "<IDPH DPO>:idph:params:exposure" • SuperCam (S) "<Ancillary Args DPO>:autoexposure" • MCZ Cameras (B) • SHERLOC Cameras (S) a. "<Ancillary DPO>:cmd_arguments_image: exp_type" b. "MMM_Image_Mini_Header[28]", "MMM_Image_Mini_Header[29]", "MMM_Image_Mini_Header[30]", "MMM_Image_Mini_Header[31]" NOTES: • For MCZ and SHERLOC Cameras, a value analogous to "exposure_type" is comprised of four bytes coming from Image DPO mini-header at offsets 28, 29, 30 and 31 for type b above. **Type** Enum SCAM U8
Ops Keyword FILE_RECORDS **Archive Attribute** TBD **Definition** Specifies the number of physical file records, including both label records and data records. NOTE: In the PDS the use of FILE_RECORDS along with other file-related data elements is fully described in the Standards Reference.	**Valid Values** "0" to n **Type** integer **Units** n/a **Location** FILE_DATA_ELEMENT (Class) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A), Calculation: - Value = <DPO value> + size of PDS and VICAR labels **Field as "<xml name>:[<element>]:[<element>]:<field>"** "<IDPH DPO>:idph:rows" **Type** U16
Ops Keyword FILTER_NAME **Archive Attribute** TBD	**Valid Values** • MCZ Cameras … Header — Keyword Value (Left Eye) 0 — "MASTCAM-Z_L0_BROADBAND" 1 — "MASTCAM-Z_L1_801NM"	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"**

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Definition Specifies the commonly-used name of the instrument filter through which an image or measurement was acquired or which is associated with a given instrument mode. See also FILTER_NUMBER. NOTE: FILTER_NAME is unique, while the FILTER_NUMBER is not.	2 "MASTCAM-Z_L2_754NM" 3 "MASTCAM-Z_L3_677NM" 4 "MASTCAM-Z_L4_605NM" 5 "MASTCAM-Z_L5_528NM" 6 "MASTCAM-Z_L6_442NM" 7 "MASTCAM-Z_L7_880NM_ND5" 8 "NO_POS_CHANGE" Header Keyword Value (Right Eye) 0 "MASTCAM-Z_R0_BROADBAND" 1 "MASTCAM-Z_R1_800NM" 2 "MASTCAM-Z_R2_866NM" 3 "MASTCAM-Z_R3_910NM" 4 "MASTCAM-Z_R4_939NM" 5 "MASTCAM-Z_R5_978NM" 6 "MASTCAM-Z_R6_1017NM" 7 "MASTCAM-Z_R7_440NM_ND5" 8 "NO_POS_CHANGE" **Type** string array **Units** n/a **Location** • GEOMETRIC_CAMERA_MODEL (Group) • OBSERVATION_REQUEST_PARMS (Group) • INSTRUMENT_STATE_PARMS (Group) **X-path** TBD **Reference** TBD	• MCZ Cameras "<Ancillary DPO>:cmd_arguments_image:filter **Type** I8
Ops Keyword FILTER_NUMBER **Archive Attribute** TBD **Definition** Specifies the number of an instrument filter through which an image or measurement was acquired or which is associated with a given instrument mode. See also FILTER_NAME. Note: FILTER_NAME is unique, while the FILTER_NUMBER is not.	**Valid Values** • MCZ Cameras • SHERLOC Cameras Header Keyword Value 0 "0" 1 "1" 2 "2" 3 "3" 4 "4" 5 "5" 6 "6" 7 "7" 8 "8" **Type** integer **Units** n/a **Location** a. GEOMETRIC_CAMERA_MODEL (Group)	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** • MCZ Cameras • SHERLOC Cameras a. "<Ancillary DPO>:filter", b. "MCZ_Image_Mini_Header[48]", "MCZ_Image_Mini_Header[49]" **Type** I8

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	OBSERVATION_REQUEST_PARMS (Group) INSTRUMENT_STATE_PARMS (Group) b. MINI_HEADER (Group) **X-path** TBD **Reference** TBD	
Ops Keyword FIRST_LINE **Archive Attribute** TBD **Definition** Specifies the line within a source image that corresponds to the first line in a sub-image.	**Valid Values** **Surface** • Eng. Cameras (S) "1" to "3840" • SuperCam RMI "1" to "2048" • MCZ • SHERLOC • PIXL • SKYCAM **Cruise** • Eng. Cameras (C) "1" to "3840" **Type** integer **Units** n/a **Location** • Eng. Cameras a. IMAGE (Object) b. SUBFRAME_REQUEST_PARMS (Group) • SuperCam SUBFRAME_REQUEST_PARMS (Group) • MCZ • SHERLOC a. SUBFRAME_REQUEST_PARMS (Group) b. MINI_HEADER (Group) • Skycam SUBFRAME_REQUEST_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** 1) DPO in XML format (referenced to APID Name in Appendix A) 2) DPO in XML format (referenced to APID Name in Appendix A) 3) DPO in XML format (referenced to APID Name in Appendix A) or Image DPO mini-header **Field as "<xml name>:[<element>]:[<element>]:<field>"** **Surface** • Eng. Cameras (S) a. "<IDPH DPO>:idph:row0" b. "<IDPH DPO>:idph:params:sub_row0" • SuperCam (S) "<Ancillary DPO>:roi_y_position" "<Ancillary DPO>:rce_subfrm_start_r_pixel" Note: 0-based, add +1 to the value • MCZ (S) • SHERLOC (S) a. <Ancillary DPO>:cmd_arguments_image: window_x" b. "MCZ_Image_Mini_Header[21]" • Skycam (B) "MEDA Image Header:skycam_start_row_lowbyte_data" + "<MEDA Image Header>:skycam_start_row_highbyte_data" **Cruise** • Eng. Cameras (C) a. "<IDPH DPO>:idph:voff" + "<IDPH DPO>:idph:row0" b. "<IDPH DPO>:idph:voff" + "<IDPH DPO>:idph:params:sub_row0" • MCZ Cameras (C) a. <Ancillary DPO>:cmd_arguments_image: window_x" b. "MCZ_Image_Mini_Header[21]" • SHERLOC Cameras (C) b. "MCZ_Image_Mini_Header[21]" NOTES:

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
		• Add "1" to the source value so that image lines begin at Line 1 (see Valid Value range). • For EECAM Cruise, FSW uses a fixed grid (tile) readout defined by a lookup table, commanded from the video offset parameter. See DC_OFFSET table for predefined values. • For MCZ and SHERLOC non-recovered non-Z-stack data products value comes from the Ancillary DPO (case a). • For MCZ and SHEROLOC image and recovered data products, "window_x" is comprised of one byte coming from the Image DPO mini-header at byte offset 21. • For MCZ and SHERLOC Z-stack data products, the value is unknown. • For MCZ and SHERLOC, "window_x" is the starting line of the window. **Type** U16
Ops Keyword FIRST_LINE_SAMPLE **Archive Attribute** TBD **Definition** Specifies the sample within a source image that corresponds to the first sample in a sub-image.	**Valid Values** **Surface** • Eng. Cameras (S) "1" to "5120" **Cruise** • Eng. Cameras (C) "1" to "5120" **Type** integer **Units** n/a **Location** • Eng. Cameras a. IMAGE (Object) b. SUBFRAME_REQUEST_PARMS (Group) • SuperCam RMI SUBFRAME_REQUEST_PARMS (Group) • MCZ Cameras • SHERLOC Cameras a. SUBFRAME_REQUEST_PARMS (Group) b. MINI_HEADER (Group) **X-path** TBD **Reference** TBD	**Mode** 1) DPO in XML format (referenced to APID Name in Appendix A) 2) DPO in XML format (referenced to APID Name in Appendix A) 3) DPO in XML format (referenced to APID Name in Appendix A) or Image DPO mini-header **Field as "<xml name>:[<element>]:[<element>]:<field>"** **Surface** • Eng. Cameras (S) a. "<IDPH DPO>:idph:col0" b. "<IDPH DPO>:idph:params:sub_col0" • SuperCam RMI (S) "<Ancillary DPO>:roi_y_position" "<Ancillary DPO>:rce_subfrm_start_c_pixel" • MCZ Cameras (S) • SHERLOC Cameras (S) a. "<Ancillary DPO>:cmd_arguments_image: window_y" b. "MMM_Image_Mini_Header[20]" **Cruise** • Eng. Cameras (C) a. "<IDPH DPO>:idph:voff" + <IDPH DPO>:idph:col0" b. "<IDPH DPO>:idph:voff" + <IDPH DPO>: idph:params:sub_col0"" NOTES: • Add "1" to the source value so that image lines begin at Line 1 (see Valid Value range). • For EECAM Cruise, FSW uses a fixed grid (tile) readout defined by a lookup table, commanded from the video offset parameter. See DC_OFFSET table for predefined values.

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
		• For MCZ and SHEROLOC image and recovered data products, "window_y" is comprised of one byte coming from the Image DPO mini-header at byte offset 20. • For MCZ and SHERLOC Z-stack data products, the value is unknown. • For MCZ and SHERLOC, "window_y" is the starting line of the window. **Type** U16
Ops Keyword FLAT_FIELD_CORRECTION_FLAG **Archive Attribute** TBD **Definition** Specifies whether or not a flat field correction was applied to an image.	**Valid Values** • Eng. Cameras (B) a. 0 = "FALSE" 1 = "TRUE" b. 0 = "FALSE" non-0 = "TRUE" **Type** string(13) **Units** n/a **Location** • Eng. Cameras a. OBSERVATION_REQUEST_PARMS (Group) b. INSTRUMENT_STATE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras a. "<IDPH DPO>:idph:params:flat" b. "<IDPH DPO>:idph:flat_params[5]" **Type** • Eng. Cameras a. boolean b. F32[5]
Ops Keyword FLAT_FIELD_CORRECTION_PARM **Archive Attribute** TBD **Definition** Specifies the onboard flat-field coefficients/parameters used in the algorithm to remove the flat field signature. The FLAT_FIELD_CORRECTION_FLAG will indicate if the signature was removed. NOTE: The algorithm used by M2020 follows: $new(x,y) = orig(x,y) * ff(x,y)$ where, $r = (x-a)^2 + (y-b)^2$ $ff(x,y) = 1 + c*r + d*r^2 + e*r^3$ and, a = array element 1 b = array element 2 c = array element 3 d = array element 4	**Valid Values** • Eng. Cameras n/a • MCZ Cameras "UNK" **Type** float array[5] **Units** n/a **Location** INSTRUMENT_STATE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** Eng. Cameras "<IDPH DPO>:idph:flat_params[5]" **Type** F32[5]

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
e = array element 5		
Ops Keyword FLAT_FIELD_FILE_NAME **Archive Attribute** TBD **Definition** Specifies the name, or array of names, of the flat field image(s) file (an image taken in an optical laboratory of a white background or an image taken in the dawn with the intention to have an equally illuminated background for the whole image) which should be used to perform radiometric calibration of the image. The flat field image provides a reference label of the sensitivity of the used optics across the field of view. The shuttered image needs to be divided by the flat field image during calibration. Selection of the appropriate flat field image may be based on time, camera, temperature, readout conditions, light flood, gain and offset.	**Valid Values** n/a **Type** string array **Units** n/a **Location** DERIVED_IMAGE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:|<element>|:|<element>|:<field>"** n/a **Type** n/a
Ops Keyword FLAT_FIELD_FILE_DESC **Archive Attribute** TBD **Definition** Specifies a description of the corresponding flat field files listed in FLAT_FIELD_FILE_NAME.	**Valid Values** "Flat field image.", "Flat field standard deviation image." **Type** string array **Units** n/a **Location** DERIVED_IMAGE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:|<element>|:|<element>|:<field>"** n/a **Type** n/a
Ops Keyword FLIGHT_SOFTWARE_MODE **Archive Attribute** TBD **Definition** Active Flight Software mode at Data Product creation.	**Valid Values** Keyword Value / FSW Field Value "0" UNKNOWN "1" TEST "2" PRELAUNCH "3" LAUNCH "4" ECLIPSE "5" CRUISE "6" EDL_APPROAH "7" EDL_MAIN "8" SURFACE_NOMINAL "9" SURFACE_STANDBY "10" NONPRIME_TEST "11" NONPRIME_PRELAUNCH "12" NONPRIME_LAUNCH "13" NONPRIME_ECLIPSE "14" NONPRIME_CRUISE "15" NONPRIME_EDL_APPROACH "16" NONPRIME_EDL_MAIN	**Mode** EMD in XML format **Field as "<xml name>:|<element>|:|<element>|:<field>"** "MslEarthProductMetadata:M202ProductMetadata:FswMode" **Type** unsigned integer

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	"17" NONPRIME_SURFACE_NOMINAL "18" NONPRIME_SURFACE_STANDBY **Type** string **Units** n/a **Location** TELEMETRY (Class) **X-path** TBD **Reference** TBD	
Ops Keyword FLIGHT_SOFTWARE_VERSION_ID **Archive Attribute** TBD **Definition** Active Flight Software version at Data Product creation. The Flight Software version is an opaque token – there is no arithmetic value associated with the token. The version is defined as the time of the FSW build, in seconds since 12:00:00, Jan. 1, 2000.	**Valid Values** n/a **Type** string **Units** n/a **Location** TELEMETRY (Class) **X-path** TBD **Reference** TBD	**Mode** EMD in XML format **Field as "<xml name>:[<element>]:[<element>]:<field>"** "MslEarthProductMetadata:MslProductMetadata:FswVersion" **Type** unsigned integer
Ops Keyword FILTER_POSITION_COUNT **Archive Attribute** TBD **Definition** TBD	**Valid Values** • Mastcam-Z • SHERLOC TBD **Type** integer **Units** n/a **Location** INSTRUMENT_STATE_PARMS **X-path** TBD **Reference** TBD	**Mode** • EMD in XML format **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Mastcam-Z • SHERLOC "MMM_Image_Mini_Header[50]", "MMM_Image_Mini_Header[51]" NOTES: **Type** U16

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Ops Keyword FOCAL_LENGTH **Archive Attribute** TBD **Definition** Focal length of optics.	**Valid Values** • Eng. Cameras • Mastcam-Z • SHERLOC • PIXL • Skycam **Type** float **Units** mm **Location** INSTRUMENT_STATE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** • EMD in XML format **Field as "<xml name>:|<element>|:|<element>|:<field>"** • Eng. Cameras • Mastcam-Z • SHERLOC • PIXL • Skycam **Type** U16
Ops Keyword FOCUS_POSITION_COUNT **Archive Attribute** TBD **Definition** TBD	**Valid Values** • SuperCam RMI • Mastcam-Z • SHERLOC TBD **Type** integer **Units** n/a **Location** INSTRUMENT_STATE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** • EMD in XML format **Field as "<xml name>:|<element>|:|<element>|:<field>"** • Mastcam-Z "MMM_Image_Mini_Header[44]", "MMM_Image_Mini_Header[45]", "MMM_Image_Mini_Header[46]", "MMM_Image_Mini_Header[47]" NOTES: **Type** U16
Ops Keyword FRAME_ID **Archive Attribute** TBD **Definition** Specifies an identification for a particular instrument measurement frame. A frame consists of a sequence of	**Valid Values** • Eng. Cameras ("LEFT", "RIGHT", "MONO", "N/A") • SuperCam RMI "MONO" • Mastcam-Z ("LEFT", "RIGHT", "MONO", "N/A")	**Mode** • Static value: 1) for SuperCam RMI, specify "MONO" 2) for SHERLOC, specify "MONO" 3) for MEDA Skycam, specify "MONO" 4) for PIXL MCC, specify "MONO" • EMD in XML format **Field as "<xml name>:|<element>|:|<element>|:<field>"**

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
measurements made over a specified time interval, and may include measurements from different instrument modes. These sequences repeat from cycle to cycle and sometimes within a cycle. Note that mosaics may contain more than one value in an array.	• SHERLOC "MONO" • MEDA "MONO" • PIXL "MONO" **Type** string array **Units** n/a **Location** IDENTIFICATION (Class) **X-path** TBD **Reference** TBD	Eng. Cameras & Mastcam-Z "MslEarthProductMetadata:MslProductMetadata:ProductName" NOTES: • If ending character in field "ProductName" is "l", valid value is "LEFT". If ending character is "r", valid value is "RIGHT". **Type** n/a
Ops Keyword FRAME_TYPE **Archive Attribute** TBD **Definition** Specifies whether the image was commanded as part of a stereo pair or as a single left or right monoscopic image. If FRAME_TYPE=STEREO, a left and a right image should be present for the same IMAGE_ID	**Valid Values** • SuperCam RMI 1) "MONO" • MARDI & SHERLOC-WATSON 2) "MONO" • Mastcam-Z 3) "MONO" "STEREO" • Eng. Cameras 4) 0 = "MONO" 1 = "STEREO" **Type** string(10) **Units** n/a **Location** IDENTIFICATION (Class) **X-path** TBD **Reference** TBD	**Mode** • Static value: 1) for SuperCam RMI, specify "MONO" 2) for MARDI & SHERLOC-WATSON, specify "MONO" 3) for Mastcam-Z, specify 'MONO" or "STEREO" • DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** Eng. Cameras 1) "IDPH DPO>:idph:stereo" MCZ Cameras a. "<Ancillary DPO>:cmd_arguments_image:camera" **Type** 1) boolean
Ops Keyword GEOMETRY_PROJECTION_TYPE **Archive Attribute** TBD	**Valid Values** "RAW", "LINEARIZED" **Type** string	**Mode** Dependent on EDR/RDR state: - For EDRs, static (default = "RAW") - For RDRs, RDR-generating software

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Definition Specifies the state of the pixels in an image before a re-projection has been applied. Describes if or how the pixels have been reprojected. RAW indicates reprojection has not been done; the pixels are as they came from the camera. For M2020, this means the image uses a CAHVOR or one of the CAHVORE camera models. LINEARIZED means that reprojection has been performed to linearize the camera model (thus removing things like lens distortion). This means the image uses a CAHV camera model.	**Units** n/a **Location** IDENTIFICATION (Class) **X-path** TBD **Reference** TBD	**Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword GROUP_APPLICABILITY_FLAG **Archive Attribute** TBD **Definition** Specifies whether a group of keywords are valid values. It is present in a Group only when information is received from telemetry. For M2020, when in a REQUEST_PARMS group, it specifies whether or not the activity represented by the group was commanded. If TRUE, the rest of the contents of the group specify the commanded arguments or parameters for that activity. For example, a value of TRUE in a HISTOGRAM_REQUEST_GROUP means a histogram was requested.	**Valid Values** • Eng. Cameras (B) • SuperCam (B) 0 = "FALSE" non-0 = "TRUE" **Type** string **Units** n/a **Location** • Eng. Cameras • Eng. Cameras a. IMAGE_REQUEST_PARMS (Group) b. THUMBNAIL_REQUEST_PARMS (Group) c. COLUMN_SUM_REQUEST_PARMS (Group) d. ROW_SUM_REQUEST_PARMS (Group) e. HISTOGRAM_REQUEST_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras a. "<IDPH DPO>:idph:params:image" b. "<IDPH DPO>:idph:params:thumbnail" c. "<IDPH DPO>:idph:params:colsums" d. "<IDPH DPO>:idph:params:rowsums" e. "<IDPH DPO>:idph:params:histogram" **Type** • Eng. Cameras **Type** • Eng. Cameras a. boolean b. boolean c. boolean d. boolean e. boolean f. Boolean
Ops Keyword HDR_ACQUISITION_MODE **Archive Attribute** TBD **Definition** Specifies the type of high dynamic range image acquired by the instrument. For M2020 SuperCam RMI there are three possible types: NONE – no HDR requested (hdr_mode = 0) and a 10-bit image is acquired.	**Valid Values** • SuperCam RMI "NONE", "MULTIFRAME","PIECEWISE" **Type** string **Units** n/a **Location** 1) OBSERVATION_REQUEST_PARMS(Group) 2) SCAM_MINI_HEADER (Group) 3) INSTRUMENT_STATE_PARMS(Group)	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as <xml name>:[<element>]:[<element>]:<field>** • SuperCam RMI 1) <Ancillary DPO>:cmd_arguments:hdr 2) <SCAM Image DPO Mini Header>:hdr_mode 2-3) <SCAM Image DPO Mini Header>:hdr_mode RMI Table field 41

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
MULTIFRAME – HDR is requested (hdr_mode = 1) and HDR_FRAME_COUNT is set to the value between 3 and 7. HDR is performed by acquiring 3 to 7 RMI images, specified in the HDR_FRAME_COUNT keyword. If 3-4 images are requested the resulting HDR frame is 12-bit. If 5-7 images are requested, the resulting HDR frame is 13-bits. PIECEWISE – The Piecewise HDR function divides the sensor response into two or three linear slopes, such that the brightest pixels are less likely to saturate. This is achieved by clipping the pixels that reach a programmable voltage. It is performed on the CMOS. Details TBD. Currently NOT implemented	**X-path** TBD **Reference** TBD	Need clarification from SuperCam team on "piecewise" HDR that is specified in an RMI table. Currently "piecewise" is NOT implemented **Type** U8 Notes: For SCAM RMI products, "hdr mode" is comprised of one byte coming from the Image DPO mini-header at offset 7. Also in Ancillary DPO and RMI TABLE (for piecewise mode which is not implemented)
Ops Keyword HDR_CLIP_THRESHOLD **Archive Attribute** TBD **Definition** The threshold for pixel clipping.	**Valid Values** • SuperCam RMI "0" to "1023" **Type** integer **Units** n/a **Location** 1) OBSERVATION_REQUEST_PARMS (Group) 2) SCAM_MINI_HEADER (Group) 3) INSTRUMENT_STATE_PARMS(Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as <xml name>:|<element>|:|<element>|:<field>** • SuperCam RMI 1) <Ancillary DPO>:cmd_parameters: hdr_clipping_threshold 2-3) <SCAM Image DPO Mini Header>: hdr_clipping_threshold **Type** U16 Notes: For SCAM RMI products, "hdr clipping threshold" is comprised of two bytes coming from the Image DPO mini-header at offset 27.
Ops Keyword HDR_EXPOSURE_TIME_DELTA **Archive Attribute** TBD **Definition** The exposure time step in milliseconds between raw images. Each element provides a delta for that exposure from the previous, so the first element will always be 0. For M2020 SuperCam RMI: 1. 0 always, because it is the delta for the first step. 2 The number of millseconds between raw images 0 and 1. (step 0) 3. The number of millseconds between raw images 1 and 2. (step 1) 4. The number of millseconds between raw images 2 and 3. (step 2) The number of millseconds between raw images 3 and 4. (step 3)	**Valid Values** • SuperCam RMI (0, step0, step1, step2, step3, step4, step5) where step<n> is "0" to "1023" **Type** integer array[7] **Units** ms **Location** 1) OBSERVATION_REQUEST_PARMS (Group) 2) SCAM_MINI_HEADER (Group) 3) INSTRUMENT_STATE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as <xml name>:|<element>|:|<element>|:<field>** • SuperCam RMI 1) <Ancillary DPO>:cmd_parameters: hdr_exposureStep0, hdr_exposureStep1, hdr_exposureStep2, hdr_exposureStep3, hdr_exposureStep4, hdr_exposureStep5 2-3) <SCAM_Image_Mini_Header>: hdr_exposureStep0, hdr_exposureStep1, hdr_exposureStep2, hdr_exposureStep3, hdr_exposureStep4, hdr_exposureStep5

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
The number of millseconds between raw images 4 and 5. (step 4) The number of millseconds between raw images 5 and 6. (step 5)		**Type** U16 Notes: For SCAM RMI products, "hdr exposure steps" 1 - 6 are comprised of 12 bytes coming from the Image DPO mini-header at offset 30.
Ops Keyword HDR_FRAME_COUNT **Archive Attribute** TBD **Definition** The number of raw images combined to get the HDR image.	**Valid Values** • SuperCam RMI "3" to "7" **Type** integer **Units** n/a **Location** 1) OBSERVATION_REQUEST_PARMS (Group) 2) SCAM_MINI_HEADER (Group) 3) INSTRUMENT_STATE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as <xml name>:[<element>]:[<element>]:<field>** • SuperCam RMI 1) <Ancillary DPO>:cmd_parameters: hdr_frame_number 2-3) <SCAM Image DPO Mini Header>: hdr_frame_number **Type** U8 Notes: For SCAM RMI products, "hdr frame number" is comprised of one byte coming from the Image DPO mini-header at offset 29.
Ops Keyword HEADER_TYPE **Archive Attribute** TBD **Definition** Specifies a specific type of header data structure. For example: FITS, VICAR. NOTE: In the PDS, HEADER_TYPE is used to indicate non-PDS headers.	**Valid Values** "VICAR2", "ODL" **Type** string(12) **Units** n/a **Location** IMAGE_HEADER (Object) **X-path** TBD **Reference** TBD	**Mode** Static Value **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword HORIZON_MASK_ELEVATION **Archive Attribute** TBD **Definition** Specifies the elevation (in degrees) used as the horizontal cutoff in a mask file that, when applied to another image file,	**Valid Values** n/a **Type** float **Units** n/a **Location**	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
prevents the horizon and sky features in the image from being processed. If this keyword is not present in the product label, no horizon mask was used. For M2020, this is in degrees as measured in the Local Level (or, equivalently, Site) frame. See also MASK_DESC_FILE_NAME.	DERIVED_IMAGE_PARMS (Group) **X-path** TBD **Reference** TBD	
Ops Keyword ILLUMINATION_DEVICE_NAME **Archive Attribute** TBD **Definition** TBD	**Valid Values** • PIXL "Flood Light" "Structured Light" **Type** • PIXL MCC String **Units** N/A **Location** LED_ILLUMINATION_PARMS (Group) SLI_ILLUMINATION_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** **Surface** • PIXL MCC "PIXL_Image_Mini_Header:Info" "PIXL_Image_Meta_Data:Parameter_Id:SLIFLICL_A" "PIXL_Image_Meta_Data:Parameter_Id:SLIFLICL_B" "PIXL_Image_Meta_Data:Parameter_Id:SLICFG_A" "PIXL_Image_Meta_Data:Parameter_Id:SLICFG_B" **Cruise** **Type** Notes: For PIXL MCC, the values are on only valid if the "Image Meta Data available" flag is True and the parameter values are provided. If the flage is False or the parameters 'FLICFG_A|B are not provided, the values will be "n/a".
Ops Keyword ILLUMINATION_LED_NAME **Archive Attribute** TBD **Definition** TBD	**Valid Values** • PIXL a. "R1R3R5", "R2R4R6" "G1","G2","G3","G4","G5","G6" "B1B4", "B2B5","B3B6", "UV1UV4", "UV2UV5","UV3UV6" b. SLI-A, SLI-B **Type** • PIXL MCC String **Units** N/A **Location** a. LED_ILLUMINATION_PARMS (Group) b. SLI_ILLUMINATION_PARMS (Group)	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** **Surface** • PIXL MCC "PIXL_Image_Mini_Header:Info" "PIXL_Image_Meta_Data:Parameter_Id:FLICFG_A" "PIXL_Image_Meta_Data:Parameter_Id:FLICFG_B" "PIXL_Image_Meta_Data:Parameter_Id:SLICFG_A" "PIXL_Image_Meta_Data:Parameter_Id:SLICFG_B" **Cruise** **Type** Notes:

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	X-path TBD **Reference** TBD	For PIXL MCC, the values are on only valid if the "Image Meta Data available" flag is True and the parameter values are provided. If the flage is False or the parameters 'FLICFG_A|B are not provided, the values will be "n/a".
Ops Keyword ILLUMINATION_LED_STATE **Archive Attribute** TBD **Definition** TBD	**Valid Values** • PIXL "ON" "OFF" **Type** • PIXL MCC String **Units** N/A **Location** LED_ILLUMINATION_PARMS (Group) SLI_ILLUMINATION_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** **Surface** • PIXL MCC "PIXL_Image_Mini_Header:Info" "PIXL_Image_Meta_Data:Parameter_Id:SLIFLICL_A" "PIXL_Image_Meta_Data:Parameter_Id:SLIFLICL_B" "PIXL_Image_Meta_Data:Parameter_Id:SLICFG_A" "PIXL_Image_Meta_Data:Parameter_Id:SLICFG_B" **Cruise** **Type** Notes: For PIXL MCC, the values are on only valid if the "Image Meta Data available" flag is True and the parameter values are provided. If the flage is False or the parameters 'FLICFG_A|B are not provided, the values will be "n/a".
Ops Keyword ILLUMINATION_LED_WAVELENGTH **Archive Attribute** TBD **Definition** TBD	**Valid Values** • PIXL 735, 530,450,385 **Type** • PIXL MCC float **Units** nm **Location** LED_ILLUMINATION_PARMS (Group) SLI_ILLUMINATION_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** **Surface** • PIXL MCC Reference Manual **Cruise** **Type** Notes: For PIXL MCC, the values are on only valid if the "Image Meta Data available" flag is True and the parameter values are provided. If the flage is False or the parameters 'FLICFG_A|B are not provided, the values will be "n/a".

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Ops Keyword ^IMAGE **Archive Attribute** TBD **Definition** Specifies a pointer to the IMAGE object. See chapter 14 of the PDS Standards Reference for more information on pointer usage.	**Valid Values** n/a **Type** NULL **Units** n/a **Location** POINTERS **X-path** TBD **Reference** TBD	**Mode** Calculation **Field as "<xml name>:|<element>|:|<element>|:<field>"** n/a **Type** n/a
Ops Keyword IMAGE_ACQUIRE_MODE **Archive Attribute** TBD **Definition** This keyword describes the mode of image acquisition. Valid values are defined as: a) "NONE" - No image acquired b) "SERNO" - No image acquired, camera serial number returned only c) "IMAGE" - The image was acquired For M2020 Eng. Cameras, there are two acquisition modes pertaining to camera data: "IMAGE" and "SERNO". The normal mode ("IMAGE") acquires and transmits the image according to all the command parameter settings. The "SERNO" case is a mode of acquisition that does just enough to get the camera's hardware serial number. Normally, such a mode should result in a data product with a header only and no image. However, the IMG onboard software supercedes during acquisition and acquires data in hardware windowed mode, resulting in a single row of an image. So, ground processing of the data product will yield a value of 1 for "hw_numrows", but the actual image is still set as 0 rows and 0 columns.	**Valid Values** • Eng. Cameras (B) 0 = "NONE" 1 = "SERNO" 2 = "IMAGE" • MCZ Cameras "IMAGE" • Skycam 0 = "RESET" 1 = "FULL_FRAME" 2 = "WINDOWED" 3 = "ROW_SUMMED" 4 = "FIXED_PATTERN" 5 = "SERNO" **Type** string **Units** n/a **Location** IDENTIFICATION (Class) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:|<element>|:|<element>|:<field>"** • Eng. Cameras "<IDPH DPO>:idph:params:acquire" • MCZ TBD • Skycam "<MEDA Image Header>:skycam_acq_mode" **Type** enum
Ops Keyword IMAGE_DATA_SIZE	**Valid Values** n/a	**Mode**

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Archive Attribute TBD **Definition** Specifies the size of the image data product on the MCZ camera DEA.	**Type** integer **Units** n/a **Location** TELEMETRY (Class) **X-path** TBD **Reference** TBD	DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** • MCZ "<Ancillary DPO>:image_id_data:image_size" • Skycam "<MEDA Image Header>:image_size" **Type** U32
Ops Keyword ^IMAGE_HEADER **Archive Attribute** TBD **Definition** Specifies a pointer to the IMAGE_HEADER object. See chapter 14 of the PDS Standards Reference for more information on pointer usage.	**Valid Values** n/a **Type** NULL **Units** n/a **Location** POINTERS **X-path** TBD **Reference** TBD	**Mode** Calculation **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword IMAGE_ID **Archive Attribute** TBD **Definition** The image_id is an arbitrary string identifier that is associated with this image. The specific interpretation of it is mission-dependent, and it need not be unique to this image. For example, missions may use it as an image counter, a round-trip token indicating how to process the image, or a FSW-assigned value identifying the image. NOTE: See the Imaging FDD for more detailed definition. Examples: Mariner 9 - LevanthalIdentifier - (orbit, camera, pic #, total # of pics in orbit) Viking Orbiter - (orbit #, sc, pic # (FSC/16)) Viking Lander - (sc, camera, mars doy, diode (filter), pic # for that day) Voyager - (pic # for encounter, FDS for cruise)	**Valid Values** n/a **Type** string(30) **Units** n/a **Location** • Eng. Cameras IDENTIFICATION (Class) IMAGE_REQUEST_PARMS(Class) • MCZ a. IDENTIFICATION (Class) b. IMAGE_REQUEST_PARMS(Class) c. MINI_HEADER (Group) • Skycam IDENTIFICATION • Sherloc IMAGE_REQUEST_PARMS(Class)	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** **Surface** • Eng. Cameras "<IDPH DPO>:idph:params:imgid1" • MCZ Cameras a. "<Ancillary DPO>:cmd_arguments_image:image_ID" b. "<Ancillary DPO>:cmd_arguments_zstack:starting_ID" c. "MCZ_Image_Mini_Header[**product_id**]" • Skycam "<Meda Img Header Segment_Id 0>:image_id" **Cruise** • Eng. Cameras "<IDPH DPO>:idph:params:imgid" NOTES: • For MCZ non-Z-stack data products, case "a".

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	X-path TBD **Reference** TBD	• For MCZ Z-stack data products, case "b". **Type** U32
Ops Keyword IMAGE_ID_2 **Archive Attribute** TBD **Definition** Specifies an image and typically consists of a sequence of characters representing 1) a routinely occurring measure, such as revolution number, 2) a letter identifying the spacecraft, target, or camera, and 3) a representation of a count within the measure, such as picture number within a given revolution. NOTE: See the Imaging FDD for more detailed definition. Examples: Mariner 9 - LevanthalIdentifier - (orbit, camera, pic #, total # of pics in orbit) Viking Orbiter - (orbit #, sc, pic # (FSC/16)) Viking Lander - (sc, camera, mars doy, diode (filter), pic # for that day) Voyager - (pic # for encounter, FDS for cruise)	**Valid Values** n/a **Type** string(30) **Units** n/a **Location** 1) IDENTIFICATION (Class) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** **Surface** • Eng. Cameras "<IDPH DPO>:idph:params:imgid2" **Type** U32
Ops Keyword IMAGE_RADIANCE_FACTOR **Archive Attribute** TBD **Definition** For a multi-input image (such as a mosaic), specifies the overall multiplicative factor that was applied to each image as the mosaic was being assembled. Together with IMAGE_RADIANCE_OFFSET, this specifies a simple linear adjustment of the form "dn * factor + offset", that can be used for (limited) radiometric seam correction. Each pixel within a given input image receives the same correction. The order of images is as defined in the input list file (generally delivered along with the mosaic) or INPUT_PRODUCT_ID. Applies to RDRs only, not EDRs. NOTE: This correction is applied after radiometric correction, if any, performed on the inputs.	**Valid Values** n/a **Type** float array **Units** n/a **Location** DERIVED_IMAGE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword IMAGE_RADIANCE_OFFSET **Archive Attribute** TBD	**Valid Values** n/a **Type** float array	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Definition For a multi-input image (such as a mosaic), specifies the overall additive offset that was applied to each image as the mosaic was being assembled. Together with IMAGE_RADIANCE_FACTOR, this specifies a simple linear adjustment of the form "dn * factor + offset", that can be used for (limited) radiometric seam correction. Each pixel within a given input image receives the same correction. Input values of 0 are not adjusted. The order of images is as defined in the input list file (generally delivered along with the mosaic) or INPUT_PRODUCT_ID. Applies to RDRs only, not EDRs. NOTE: This correction is applied after radiometric correction, if any, performed on the inputs.	**Units** n/a **Location** DERIVED_IMAGE_PARMS (Group) **X-path** TBD **Reference** TBD	**Type** n/a
Ops Keyword IMAGE_TYPE **Archive Attribute** TBD **Definition** Specifies the type of image acquired. This may be used to describe characteristics that differentiate one group of images from another such as the nature of the data in the image file, the purpose for which the image was acquired, or the way in which it was acquired. This element is very similar to the older image_observation_type element, but is designed to resolve ambiguities in cases where missions utilize a naming convention for both specific images and more general observations, which consist of multiple images. In those cases, the latter may be described by the observation_type element.	**Valid Values** • Eng. Cameras … Keyword Value APID Names "REGULAR" Any string value starting with "ImgImage" "THUMBNAIL" Any string value starting with "ImgThumb" "HISTOGRAM" Any string value starting with "ImgHistogram" "ROW_SUM" Any string value starting with "ImgRow" "COL_SUM" Any string value starting with "ImgCol" • SuperCam … Keyword Value APID Names "REGULAR" Any string value starting with "ScamRmiImage" "THUMBNAIL" Any string value starting with "ScamRmiThumb" • MCZ Cameras … Keyword Value APID Names "REGULAR" Any string value that contains "Image" "THUMBNAIL" Any string value that contains "Thumbnail" • PIXL MCC 0 = "REGULAR" 1 = "CENTROID" 2 = "REGULAR" 3 = "REGULAR" 4 = "NON-STELLAR OBJECT" 32 = "CIRCLE CENTROID" 33 = "OPTICAL LATERAL-TRACKING" 34 = "STRUCTURED LIGHT ILLUMINATOR"	**Mode** EMD in XML format • PIXL MCC DPO in XML format. **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras • SCAM • MCZ "MslEarthProductMetadata:MslProductMetadata:ProductName" • PIXL MCC ""PIXL MCC Image Mini-Header[mcc_img_format_code] • Skycam a. "<MEDA Image Header>:image_type" b. "<MEDA Image Header>:skycam_acq_mode" **Type** n/a NOTE: For PIXL MCC, image type is comprised of one byte coming from the Image DPO mini-header at offset 5.

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	• Skycam Keyword Value TBD 0 = Dark 1 = BRIGHT 2 = STANDALONE "REGULAR" image_type = bright or standalone "THUMBNAIL" Any string value starting with "MEDAThumbnailImage" "ROW_SUM" image_acq = row_sum **Type** string(15) **Units** n/a **Location** IDENTIFICATION (Class) **X-path** TBD **Reference** TBD	
Ops Keyword INPUT_PRODUCT_ID **Archive Attribute** TBD **Definition** Specifies the product(s) directly used as input to create this product. It may contain either the PRODUCT_ID or the filename of the input products. For M2020, this RDR-only keyword specifies the PRODUCT_IDs of the inputs most directly used to create this product, which may themselves be RDRs. For example, a linearized XYZ image would list the left and right linearized input images as well as the disparity file. Contrast this with SOURCE_PRODUCT_ID, which lists only the root EDR source; INPUT_PRODUCT_ID lists the proximate inputs (EDR or RDR) for the process used to create this product.	**Valid Values** n/a **Type** string array **Units** n/a **Location** DERIVED_IMAGE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword INSTRUMENT_AZIMUTH **Archive Attribute** TBD **Definition** Specifies the value for an instrument's rotation in the	**Valid Values** n/a **Type** float **Units** deg (<deg> unit tag required)	**Mode** Calculation: - The image center is translated into an origin and and "look direction" vectors (left and right). The vectors are then used to calculate instrument azimuth.

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
horizontal direction. It is usually measured from some kind of low hard stop. Although it may be used for any instrument where it makes sense, it is primarily intended for use in surface-based instruments that measure pointing in terms of azimuth and elevation. When in a DERIVED_GEOMETRY group, defines the azimuth (horizontal rotation) at which the instrument is pointed. This value is expressed using the cooridinate system referred to by REFERENCE_COORD_SYSTEM_NAME and REFERENCE_COORD_SYSTEM_INDEX contained within the same group. The interpretation of exactly what part of the instrument is being pointed is mission-specific. It could be the boresight, the camera head direction, the CAHV camera model A vector direction, or any of a number of other things. As such, for multimission use this value should be used mostly as an approximation, e.g. identifying scenes which might contain a given object. For M2020, the interpretation is the boresight of the camera, defined as projecting the center of the nominal image (before downsampling or subframing) through the camera model.	**Location** • ROVER_DERIVED_GEOMETRY_PARMS (Group) • SITE_DERIVED_GEOMETRY_PARMS (Group) **X-path** TBD **Reference** TBD	**Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword INSTRUMENT_BAND_ID **Archive Attribute** TBD **Definition** Specifies an array of strings identifying the instrument represented by the corresponding band in the image. The first entry in the array identifies the instrument for the first band, the second entry for the second band, etc. For M2020 Preload products, the string also indicates whether the value is a minimum or maximum preload. See also CONFIGURATION_BIT_ID.	**Valid Values** • Reachability RDRs ("DRILL", "BITCAR", "SHERLOC-WATSON", "APXS", "SCOOP_TIP") • Preload RDRs ("DRILL_MINIMUM", "DRILL_MAXIMUM") **Type** string array[5] **Units** n/a **Location** DERIVED_IMAGE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** Static Value **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword INSTRUMENT_COORD_FRAME_ID **Archive Attribute** TBD **Definition** Along with INSTRUMENT_COORD_FRAME_INDEX, specifies the name of the coordinate frame in which the pointing for this instrument is expressed. The values of	**Valid Values** • Eng. Cameras (B) 0 = "SITE" 1 = "RNAV_SAVED" 2 = "LL_SAVED" 3 = "SITE_SAVED" 4 = "NAV_GOAL" 5 = "NAV_VTT" 6 = "NAV_MAP" 7 = "AEGIS_1"	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** **Surface** • Eng. Cameras "<IDPH DPO>:idph:params:rsm_frame" • SuperCam

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
INSTRUMENT_COORDINATE should be interpreted using this coordinate frame.	8 = “AEGIS_2” 9 = “AEGIS_3” 10 = “AEGIS_4” 11 = “AEGIS_5” 12 = “LL” 13 = “RNAV” 14 = “SUN” 15 = “EARTH” 16 = “PHOBOS” 17 = “DEIMOS” 18 = “RMECH” 19 = “RA_BASE” 20 = “TURRET” 21 = “DRILL” 22 = “DRILL_BIT_TIP” 23 = “FCS” 24 = “GDRT” 25 = “TOOL” 26 = “ARM_TGT” 27 = “ARM_EVAL_TOOL” 28 = “WATSON” 29 = “SHERLOC” 30 = “PIXL_BASE” 31 = “PIXL_TOOL” 32 = “DOCKING_POST” 33 = “CUSTOM_TCP” 34 = “CAL_PIXL” 35 = “ACA_ORIGIN” 36 = “BC_DOCK_FF” 37 = “BC_TX_EF” 38 = “VIS_FOCAL” 39 = “SHA_BASE” 40 = “SHA_EE_TIP” 41 = “SHA_EE_AXIS” 42 = “ROCKER_L” 43 = “ROCKER_R” 44 = “BOGIE_L” 45 = “BOGIE_R” 46 = “WHEEL_LF” 47 = “WHEEL_RF” 48 = “WHEEL_LM” 49 = “WHEEL_RM” 50 = “WHEEL_LR” 51 = “WHEEL_RR” 52 = “RSM_BASE” 53 = “RSM_GIMBAL” 54 = “RSM_HEAD” 55 = “NCAML_MOUNT” 56 = “NCAML” 57 = “NCAML_SUNID” 58 = “NCAMR_MOUNT” 59 = “NCAMR” 60 = “NCAMR_SUNID” 61 = “SCAM_MOUNT” 62 = “RMI” 63 = “LIBS” 64 = “VISIR” 65 = “MCZL_MOUNT” 66 = “MCZL”	“<Ancillary DPO>:cmd_arguments:frame_id” TBD “<IDPH DPO>:idph:rsm:frame” • MCZ Cameras • SHERLOC Cameras “<Ancillary DPO>:cmd_arguments_image:frame_id” “<IDPH DPO>:idph:rsm:frame” • MEDA • PIXL “<IDPH DPO>:idph:rsm:frame” **Cruise** • Eng. Cameras “<IDPH DPO>:idph:params:rsm_frame” **Type** Enum

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	67 = “MCZR_MOUNT” 68 = “MCZR” 69 = “HGA_BASE” 70 = “HGA_HEAD” 71 = “HGA_BORESIGHT” 72 = “FID_MOBILITY_LDIFF” 73 = “FID_MOBILITY_LF” 74 = “FID_MOBILITY_LR” 75 = “FID_MOBILITY_RDIFF” 76 = “FID_MOBILITY_RF” 77 = “FID_MOBILITY_RR” 78 = “FHCAML” 79 = “FHCAMR” 80 = “RHCAML” 81 = “RHCAMR” 82 = “LCAM_CMECH” 83 = “MEDA_ATS1” 84 = “MEDA_ATS2” 85 = “MEDA_ATS3” 86 = “MEDA_ATS4” 87 = “MEDA_ATS5” 88 = “MEDA_HS” 89 = “MEDA_PS” 90 = “MEDA_RDS” 91 = “MEDA_TIRS” 92 = “MEDA_WS1” 93 = “MEDA_WS2” 94 = “RFAX_ANT” 95 = “MOXIE_FILTER” 96 = “SCAM_CAL” 97 = “MCZ_CAL_PRIMARY” 98 = “MCZ_CAL_SECONDARY” 99 = “CAL_SHERLOC” 100 = “FID_AFT1” 101 = “FID_AFT2” 102 = “FID_RPFA1” 103 = “FID_RPFA2” 104 = “FID_TDF1” 105 = “FID_TDF2” 106 = “FID_TDF3” 107 = “FID_TDF4” 108 = “FID_TUR_WS_A” 109 = “FID_TUR_WS_B” 110 = “FID_TUR_WS_C” 111 = “FID_TUR_WS_D” 112 = “FID_TUR_WS_E” 113 = “FID_TUR_WS_F” 114 = “FID_TUR_DOCK_G” 115 = “FID_TUR_DOCK_H” 116 = “FID_TUR_DOCK_I” 117 = “FID_TUR_DOCK_J” 118 = “FID_TUR_DOCK_K” 119 = “FID_TUR_DOCK_L” 120 = “FID_TUR_DOCK_M” 121 = “FID_TUR_DOCK_N” 122 = “FID_BIT_CAROUSEL_1” 123 = “FID_BIT_CAROUSEL_2” 124 = “FID_BIT_CAROUSEL_3” 125 = “NONE”	

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	Type string **Units** n/a **Location** OBSERVATION_REQUEST_PARMS (Group) **X-path** TBD **Reference** TBD	
Ops Keyword INSTRUMENT_COORD_FRAME_INDEX **Archive Attribute** TBD **Definition** Along with INSTRUMENT_COORD_FRAME_ID, specifies the index of the coordinate frame in which the pointing for this instrument is expressed. Only the SITE, LL, RSM_JOINTS and FIDUCIAL frames are indexed. A positive value means to use specifically that index; a negative value means an index relative to the current.	**Valid Values** "N/A" **Type** integer **Units** n/a **Location** a. OBSERVATION_REQUEST_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** **Surface** • Eng. Cameras a. "<IDPH DPO>:idph:params:rsm_findex" • SuperCam "<IDPH DPO>:idph:rsm:findex" "<Ancillary DPO>:cmd_arguments:frame_index" TBD • MCZ Cameras • SHERLOC Cameras "<IDPH DPO>:idph:rsm:findex" "<Ancillary DPO>:cmd_arguments_image: frame_index" • PIXL "<IDPH DPO>:idph:rsm:findex" **Cruise** • Eng. Cameras "<IDPH DPO>:idph:params:rsm_findex" • MCZ Cameras "<IDPH DPO>:idph:rsm_state:findex" **Type** I32
Ops Keyword INSTRUMENT_COORDINATE **Archive Attribute** TBD **Definition**	**Valid Values** "N/A" **Type** double array[3] **Units**	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** **Surface** • Eng. Cameras

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Specifies an array of coordinate parameters. These values, typically either XYZ or azimuth/elevation values (see INSTRUMENT_COORDINATE_NAME), specify where the instrument is actually pointed in the frame defined by INSTRUMENT_COORD_FRAME_ID/INDEX.	• radians for following Frames (<rad> unit tag required): "AZIMUTH", "ELEVATION", "AZIMUTH_RELATIVE", "ELEVATION_RELATIVE", "RSM_AZIMUTH", "RSM_ELEVATION", "RSM_AZIMUTH_RELATIVE", "RSM_ELEVATION_RELATIVE" • meters for following Frames (<m> unit tag required): "X", "Y", "Z" **Location** OBSERVATION_REQUEST_PARMS (Group) **X-path** TBD **Reference** TBD	"<IDPH DPO>:idph:params:rsm_coord[3]" • SuperCam RMI "<IDPH DPO>:idph:rsm:coord[3]" "<Ancillary DPO>:cmd_arguments:coord1", TBD "<Ancillary DPO>:cmd_arguments:coord2", "<Ancillary DPO>:cmd_arguments:coord3" • MCZ Cameras • SHERLOC Cameras "<IDPH DPO>:idph:rsm:coord[3]" "<Ancillary DPO>:cmd_arguments_image:coord1", "<Ancillary DPO>:cmd_arguments_image:coord2", "<Ancillary DPO>:cmd_arguments_image:coord3" • MEDA Skycam • PIXL MCC "<IDPH DPO>:idph:rsm:coord[3]" **Cruise** • Eng. Cameras "<IDPH DPO>:idph:params:rsm_coord[3]" • MCZ Cameras "<Ancillary DPO>: **Type** • Eng. Cameras F64[3] • SuperCam RMI • MCZ Cameras • SHERLOC Cameras • MEDA Skycam • PIXL F32
Ops Keyword INSTRUMENT_COORDINATE_NAME **Archive Attribute** TBD **Definition** Specifies the name of each element in INSTRUMENT_COORDINATE, indicating how to interpret the value. The "X","Y","Z" values are in meters; all others are in radians. The values should appear in sets as specified in Valid Values.	**Valid Values** • Eng. Cameras (B) • SuperCam RMI (S) • MCZ Cameras(B) • SHERLOC Cameras (S) • MEDA Skycam (S) • PIXL MCC (S) 0 = ("X","Y,"Z") 1 = ("AZIMUTH", "ELEVATION") 2 = ("AZIMUTH_RELATIVE", "ELEVATION_RELATIVE") 3 = ("AZIMUTH") 4 = ("ELEVATION") 5 = ("RSM_AZIMUTH", "RSM_ELEVATION") 6 = ("RSM_AZIMUTH_RELATIVE", "RSM_ELEVATION_RELATIVE") 7 = ("RSM_AZIMUTH") 8 = ("RSM_ELEVATION") 9 = ("RSM_NO_MOTION") 10 = ("RSM_NO_MOTION_NO_ARBITRATION")	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** **Surface** • Eng. Cameras "<IDPH DPO>:idph:params:rsm_ctype" • SuperCam RMI "<IDPH DPO>:idph:rsm:ctype" "<Ancillary DPO>:cmd_arguments:coord_type" TBD • MCZ Cameras • SHERLOC Cameras "<IDPH DPO>:idph:rsm:ctype" "<Ancillary DPO:cmd_arguments_image:coord_type" • MEDA Skycam • PIXL MCC "<IDPH DPO>:idph:rsm:ctype"

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	Cruise **Type** string **Units** n/a **Location** OBSERVATION_REQUEST_PARMS (Group) **X-path** TBD **Reference** TBD	**Cruise** • Eng. Cameras "<IDPH DPO>:idph:params:rsm_ctype" • MCZ Cameras "<IDPH DPO>:cidph:rsm:coord_type" **Type** enum
Ops Keyword INSTRUMENT_COORDINATE_TYPE **Archive Attribute** TBD **Definition** Specifies what kind of coordinates are in the associated INSTRUMENT_COORDINATE keyword. These could be XYZ coordinates, azimuth/elevation values, etc.	**Valid Values** • Eng. Cameras (B) • SuperCam RMI (S) • MCZ Cameras(B) • SHERLOC Cameras (S) • MEDA Skycam (S) • PIXL MCC (S) 0 = ("XYZ") 1 = ("AZEL_ABS) 2 = ("AZEL_REL") 3 = ("AZ_ABS") 4 = ("EL_ABS") 5 = ("JOINTS_AZEL_ABS") 6 = ("JOINTS_AZEL_REL") 7 = ("JOINTS_AZ_ABS") 8 = ("JOINTS_EL_ABS") 9 = ("NO_MOTION") 10 = ("NO_MOTION_NO_ARB") **Type** string **Units** n/a **Location** OBSERVATION_REQUEST_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras "<IDPH DPO>:idph:params:rsm_ctype" • SuperCam RMI "<IDPH DPO>:idph:rsm:ctype" "<Ancillary DPO>:cmd_arguments:coord_type" TBD • MCZ Cameras • SHERLOC Cameras "<IDPH DPO>:idph:rsm:ctype" "<Ancillary DPO:cmd_arguments_image:coord_type" • MEDA Skycam • PIXL MCC "<IDPH DPO>:idph:rsm:ctype" **Cruise** • Eng. Cameras "<IDPH DPO>:idph:params:rsm_ctype" • MCZ Cameras "<IDPH DPO>:cidph:rsm:coord_type" **Type** enum
Ops Keyword INSTRUMENT_ELEVATION **Archive Attribute** TBD	**Valid Values** "-91.0" to "91.0" **Type** float	**Mode** Calculation: - The image center is translated into an origin and and "look

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Definition Specifies a value for an instrument's rotation in the vertical direction. It is usually measured from some kind of low hard stop. Although it may be used for any instrument where it makes sense, it is primarily intended for use in surface-based instruments that measure pointing in terms of azimuth and elevation. When in a DERIVED_GEOMETRY group, defines the elevation (vertical rotation) at which the instrument is pointed. This value is expressed using the cooridinate system referred to by REFERENCE_COORD_SYSTEM_NAME and REFERENCE_COORD_SYSTEM_INDEX contained within the same group. The interpretation of exactly what part of the instrument is being pointed is mission-specific. It could be the boresight, the camera head direction, the CAHV camera model A vector direction, or any of a number of other things. As such, for multimission use this value should be used mostly as an approximation, e.g. identifying scenes which might contain a given object. For M2020, the interpretation is the boresight of the camera, defined as projecting the center of the nominal image (before downsampling or subframing) through the camera model.	**Units** deg (<deg> unit tag required) **Location** • ROVER_DERIVED_GEOMETRY_PARMS (Group) • SITE_DERIVED_GEOMETRY_PARMS (Group) **X-path** TBD **Reference** TBD	direction" vectors (left and right). The vectors are then used to calculate instrument elevation. **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword INSTRUMENT_FOCUS_DISTANCE **Archive Attribute** TBD **Definition** Specifies the distance to the target to use for focusing the instrument.	**Valid Values** • Supercam RMI • MCZ • SHERLOC "0" to "65535" **Type** integer **Units** millimeters (<mm> unit tag required) **Location** OBSERVATION_REQUEST_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** **Surface** • SuperCam RMI <ScamFocalDistance DPO>:focus_distance • MCZ Cameras "<Ancillary DPO>:cmd_arguments_image: focus_initial_position" **Cruise** "supplementary_cmd_arguments: left_focus_initial_position" "supplementary_cmd_arguments: right_focus_initial_position" **Type** I16
Ops Keyword INSTRUMENT_FOCUS_INIT_FLAG **Archive Attribute** TBD	**Valid Values** 0 = "FALSE" 1 = "TRUE" **Type**	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"**

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Definition Specifies whether the instrument focus mechanism should be (or was) initialized before use. For M2020 SuperCam, this pertains to RMI observations only (not LIBS). Value "TRUE" brings the focus stage to the limit switch to initialize its position.	string **Units** n/a **Location** OBSERVATION_REQUEST_PARMS (Group) **X-path** TBD **Reference** TBD	"<Ancillary DPO>:cmd_parameters:fromLimitSwitch" **Type** U8
Ops Keyword INSTRUMENT_FOCUS_MODE **Archive Attribute** TBD **Definition** Specifies how an instrument was focused. The values and their interpretation are mission-specific. For M2020 it is the commanded mode of focus during RMI observations. Valid values for SuperCam are defined as: a) "NO_FOCUS" - Doesn't move focus (others mark SCAM unsafe). b) "AF_OFFSET" - Applies RMI offset from last autofocus solution. For MCZ and SHERLOC imagers, it is the commanded mode of focus during image acquisition. Valid values for MCZ are defined as: a) "AUTOFOCUS" – autofocus mode. b) "EARLY TERMINATION" – if set, stops the autofocus swqqp before the full number of steps has been reached if a peak is detected. c) "THRESHOLD" – If set cause the focus to not be changed if a test image is within 5% of the last image taken with autofocus. d) "EARLY TERMINATION AND THRESHOLD" – early termination and threshold mode (see b and c above).	**Valid Values** • SuperCam RMI "NO_FOCUS" "AF_OFFSET" • MCZ Cameras • SHERLOC Cameras 0 = "AUTOFOCUS" 1 = "EARLY TERMINATION" 2 = "THRESHOLD" 3 = "EARLY TERMINATION AND THRESHOLD" **Type** string **Units** n/a **Location** OBSERVATION_REQUEST_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as <xml name>:|<element>|:|<element>|:<field>** **Surface** • SuperCam RMI <Ancillary DPO>:cmd_arguments:focus_offset • MCZ Cameras • SHERLOC Cameras "<Ancillary DPO>:cmd_arguments_image: focus_mode" **Type** U8 SCAM ENUM
Ops Keyword INSTRUMENT_FOCUS_POSITION **Archive Attribute** TBD **Definition** Specifies the position in motor counts of the focus motor on a camera. For M2020 MCZ, it specifies the initial focus position that was used by the image.	**Valid Values** • MCZ Cameras … Mode: Z-stack — Value: n/a Non-Z-stack — Comprised of the bits 0-14 of four bytes coming from Image DPO mini-header at offsets [24]-[27] **Type**	**Mode** Image DPO mini-header **Field as "<xml name>:|<element>|:|<element>|:<field>"** • MCZ Cameras • SHERLOC Cameras "MMM_Image_Mini_Header[24|", "MMM_Image_Mini_Header[25|", "MMM_Image_Mini_Header[26|", "MMM_Image_Mini_Header[27|" **Type**

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	integer **Units** n/a **Location** MINI_HEADER (Group) **X-path** TBD **Reference** TBD	U32
Ops Keyword INSTRUMENT_FOCUS_POSITION_CNT **Archive Attribute** TBD **Definition** Specifies the commanded position in motor counts of the focus motor on a camera. For MCZ, it specifies the commanded initial focus position.	**Valid Values** • SuperCam RMI • MCZ Cameras • SHERLOC Cameras TBD **Type** integer **Units** n/a **Location** IMAGE_REQUEST_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** Image DPO mini-header **Field as "<xml name>:[<element>]:[<element>]:<field>"** • MCZ Cameras • SHERLOC Cameras "<Ancillary DPO>:cmd_arguments_image: focus_initial_position" **Type** U32
Ops Keyword INSTRUMENT_FOCUS_STEP_SIZE **Archive Attribute** TBD **Definition** For MCZ cameras on M2020, specifies the size in motor counts of each (or the initial) step taken by the focus adjustment mechanism in an autofocus algorithm.	**Valid Values** n/a **Type** integer **Units** n/a **Location** a. IMAGE_REQUEST_PARMS b. MINI_HEADER (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** MCZ Cameras SHERLOC Cameras a. "<Ancillary DPO>:cmd_arguments_image: focus_step_size" b. "MMM_Image_Mini_Header[25]", "MMM_Image_Mini_Header[26]", "MMM_Image_Mini_Header[27]" **Type** U16 NOTE:

<table>
<tr><th colspan="2">Output Metadata (Product Label)</th><th>Input Metadata (Source)</th></tr>
<tr><td>• Ops Keyword
• Archive Label Attribute
• Definition</td><td>• Mission Phase C=Cruise, S=Surface, B=Both
• Valid Values (quoted)
• Type
• Units
• Keyword Location in Ops Label
• Attribute X-path in Archive label
• Attribute Reference in Archive Label (bracketed)</td><td>• Mission Phase C=Cruise, S=Surface, B=Both
• Mode
• Metadata Field
• Type</td></tr>
<tr><td></td><td></td><td>Focus step size value is comprised of 10 bits in bytes 25, 26, and 27 in the mini-header starting with the last bit in byte 25 and ending at the first bit in byte 27 for case b above.</td></tr>
<tr><td>Ops Keyword
INSTRUMENT_FOCUS_STEPS

Archive Attribute
TBD

Definition
For MCZ cameras on M2020, specifies the number of steps (images) to be taken by an autofocus algorithm.</td><td>Valid Values
n/a

Type
integer

Units
n/a

Location
a. IMAGE_REQUEST_PARMS
b. MINI_HEADER (Group)

X-path
TBD

Reference
TBD</td><td>Mode
DPO in XML format (referenced to APID Name in Appendix A)

Field as “<xml name>:[<element>]:[<element>]:<field>”
MCZ Cameras
SHERLOC Cameras
a. “<Ancillary DPO>:cmd_arguments_image: focus_n_steps”
b. “MMM_Image_Mini_Header[27]”

Type
U8

NOTE:
Focus step value is comprised of 6 bits in byte 27 in the mini-header starting with the second bit and ending with the seventh bit, per case b above.</td></tr>
<tr><td>Ops Keyword
INSTRUMENT_HOST_ID

Archive Attribute
TBD

Definition
Specifies a unique identifier for the host where an instrument is located. This host can be either a spacecraft or an earth base (e.g., and observatory or laboratory on the earth). Thus, INSTRUMENT_HOST_ID can contain values which are either SPACECRAFT_ID values or EARTH_BASE_ID values.</td><td>Valid Values
• All Cameras

<table><tr><th>VenueType</th><th>Testbed Name</th><th>Value</th></tr><tr><td>CRUISE</td><td>n/a</td><td>M20</td></tr><tr><td>SURFACE</td><td>n/a</td><td>M20</td></tr><tr><td>ATLO</td><td>n/a</td><td>M20</td></tr><tr><td>TESTBED</td><td>AVSTB</td><td>M20AVSTB</td></tr><tr><td>TESTBED</td><td>FSWTB</td><td>M20FSWTB</td></tr><tr><td>TESTBED</td><td>MSTB</td><td>M20MSTB</td></tr><tr><td>TESTBED</td><td>VSTB</td><td>M20VSTB</td></tr><tr><td>TESTSET</td><td>n/a</td><td>M20WSTS</td></tr><tr><td>TBD</td><td>TBD</td><td>M20SCARECROW</td></tr><tr><td>TBD</td><td>TBD</td><td>M20ROASTT</td></tr></table>
Type
string

Units
n/a

Location
IDENTIFICATION (Class)

X-path
TBD

Reference
TBD</td><td>Mode
Set by IDS pipeline

Field as “<xml name>:[<element>]:[<element>]:<field>”
n/a

Type
n/a</td></tr>
<tr><td>Ops Keyword
INSTRUMENT_HOST_NAME</td><td>Valid Values
• All Cameras</td><td>Mode
Set by IDS pipeline</td></tr>
</table>

<table>
<tr><th colspan="2">Output Metadata (Product Label)</th><th>Input Metadata (Source)</th></tr>
<tr><td>• Ops Keyword
• Archive Label Attribute
• Definition</td><td>• Mission Phase C=Cruise, S=Surface, B=Both
• Valid Values (quoted)
• Type
• Units
• Keyword Location in Ops Label
• Attribute X-path in Archive label
• Attribute Reference in Archive Label (bracketed)</td><td>• Mission Phase C=Cruise, S=Surface, B=Both
• Mode
• Metadata Field
• Type</td></tr>
<tr><td>Archive Attribute
TBD

Definition
Specifies the full name of the host on which an instrument is based. This host can be either a spacecraft or an earth base. Thus, the INSTRUMENT_HOST_NAME element can contain values which are either SPACECRAFT_NAME values or EARTH_BASE_NAME values.

Note that mosaics may contain more than one value in an array.</td><td><table><tr><th>VenueType</th><th>Testbed Name</th><th>Value</th></tr><tr><td>CRUISE</td><td>n/a</td><td>Mars 2020</td></tr><tr><td>SURFACE</td><td>n/a</td><td>Mars 2020</td></tr><tr><td>ATLO</td><td>STC1A
STC1B</td><td>Mars 2020</td></tr><tr><td>TESTBED</td><td>AVSTB</td><td>M20AVSTB</td></tr><tr><td>TESTBED</td><td>FSWTB</td><td>M20FSWTB</td></tr><tr><td>TESTBED</td><td>MSTB</td><td>M20MSTB</td></tr><tr><td>TESTBED</td><td>VSTB</td><td>M20VSTB</td></tr><tr><td>TESTSET</td><td>n/a</td><td>M20WSTS</td></tr><tr><td>TBD</td><td>TBD</td><td>M20SCARECROW</td></tr><tr><td>TBD</td><td>TBD</td><td>M20ROASTT</td></tr></table>Type
string

Units
n/a

Location
IDENTIFICATION (Class)

X-path
TBD

Reference
TBD</td><td>Field as “<xml name>:[<element>]:[<element>]:<field>”
n/a

Type
n/a</td></tr>
<tr><td>Ops Keyword
INSTRUMENT_ID

Archive Attribute
TBD

Definition
Specifies an abbreviated name or acronym which identifies an instrument.

NOTE: INSTRUMENT_ID is not a unique identifier for a given instrument. Note also that the associated INSTRUMENT_NAME element provides the full name of the instrument.

Example values: IRTM (for Viking Infrared Thermal Mapper), PWS (for plasma wave spectrometer).</td><td>Valid Values
Surface
<table><tr><th>Value</th><th>APID Names</th></tr><tr><td>“FRONT_HAZCAM_LEFT_<A|B>”</td><td>Any string value starting with “Img” and ending with “Fhl”</td></tr><tr><td>“FRONT_HAZCAM_RIGHT_<A|B>”</td><td>Any string value starting with “Img” and ending with “Fhr”</td></tr><tr><td>“REAR_HAZCAM_LEFT”</td><td>Any string value starting with “Img” and ending with “Rhl”</td></tr><tr><td>“REAR_HAZCAM_RIGHT”</td><td>Any string value starting with “Img” and ending with “Rhr”</td></tr><tr><td>“NAVCAM_LEFT”</td><td>Any string value starting with “Img” and ending with “Nl”</td></tr></table></td><td>Mode
EMD in XML format

Field as “<xml name>:[<element>]:[<element>]:<field>
• Front Hazcam
“MslEarthProductMetadata:MslProductMetadata:ProductName”,
“MslEarthProductMetadata:MslProductMetadata:CreationStringId”

• All other Eng. Cameras
• Scam

“MslEarthProductMetadata:MslProductMetadata:ProductName”

SHERLOC
“SHERLOC_Image_Mini_Header[50 – 52]”

Type
n/a</td></tr>
</table>

Output Metadata (Product Label)			Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)		• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	"NAVCAM_RIGHT"	Any string value starting with "Img" and ending with "Nr"	
	"CACHECAM"	Any string value starting with "Img" and ending with "Cc"	
	"SUPERCAM_RMI"	Any string value starting with "ScamRmi"	
	"MCZ_LEFT"	Any string value starting with "MczL".	
	"MCZ_RIGHT"	Any string value starting with "MczR".	
	"SHERLOC_WATSON"	Any string value starting with "SrlcImg" and MSB of system serial number = 0	
	"SHERLOC_ACI"	Any string value starting with "SrlcImg" and MSB of system serial number = 1	
	"PIXL_MCC"	Any string value starting with "Pixl" and PDP Category NN	
	"SKYCAM"	Any string starting with "Meda" and ending with "Image"	
	"LVSCAM"	Any string starting with "Vce" and TBD	
	"EDL_PUCAM1" "EDL_PUCAM2" "EDL_PUCAM3" "EDL_DDCAM" "EDL_RDCAM" "EDL_RUCAM" "HELI_NAV" "HELI_RTE"		
	Cruise		

Output Metadata (Product Label)			Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)		• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	Value	**APID Names**	
	"FRONT_HAZCAM_LEFT_<A|B>"	Any string value starting with "Img" and ending with "Fhl"	
	"FRONT_HAZCAM_RIGHT_<A|B>"	Any string value starting with "Img" and ending with "Fhr"	
	"REAR_HAZCAM_LEFT"	Any string value starting with "Img" and ending with "Rhl"	
	"REAR_HAZCAM_RIGHT"	Any string value starting with "Img" and ending with "Rhr"	
	"NAVCAM_LEFT"	Any string value starting with "Img" and ending with "Nl"	
	"NAVCAM_RIGHT"	Any string value starting with "Img" and ending with "Nr"	
	"CACHECAM"	Any string value starting with "Img" and ending with "Cc"	
	"SUPERCAM_RMI"	Any string value starting with "ScamRmi"	
	"MCZ_LEFT"	Any string value starting with "MczL".	
	"MCZ_RIGHT"	Any string value starting with "MczR".	
	"SHERLOC_WATSON"	Any string value starting with "SrlcImg" and MSB of system serial number = 0	
	"SHERLOC_ACI"	Any string value starting with "SrlcImg" and MSB of	

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	system serial number = 1 "PIXL_MCC" Any string value starting with "Pixl" and PDP Category NN "SKYCAM" Any string starting with "Meda" and ending with "Image" "LVSCAM" Any string starting with "Vce" and TBD "EDL_PUCAM1" "EDL_PUCAM2" "EDL_PUCAM3" "EDL_DDCAM" "EDL_RDCAM" "EDL_RUCAM" "HELI_NAV" "HELI_RTE" **Type** string **Units** n/a **Location** IDENTIFICATION (Class) **X-path** TBD **Reference** TBD	
Ops Keyword INSTRUMENT_IDLE_TIMEOUT **Archive Attribute** TBD **Definition** Specifies the amount of time in seconds the instrument may be idle before powering off the instrument.	**Valid Values** • Eng. Cameras "0" to "4294967295" **Type** integer **Units** seconds (<s> unit tag required) **Location** OBSERVATION_REQUEST_PARMS (Group) **X-path** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** "<IDPH DPO>:idph:params:power_timeout" **Type** U32

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	Reference TBD	
Ops Keyword INSTRUMENT_MODE_ID **Archive Attribute** TBD **Definition** Specifies an instrument-dependent designation of operating mode. This may be simply a number, letter or code, or a word such as 'normal', 'full resolution', 'near encounter', or 'fixed grating'. For EECAM on M2020 there is difference between cruise and surface readourt modes. Due to hardware heritage from MSL, FSW will have to read out ECAM images in parts (tiles) before saving the full image to NVM. Cruise FSW will request EECAM tiles from a fixed grid that covers the entire focal plane as defined from a lookup table. Surface FSW will allow a "floating-tile" concept. Mode, tile resolution, color, and size are listed below. Surface (readout modes 0 - 9): 0 = full resolution, bayer, 960 lines x 1280 samples 1 = 2x2 binned, green pixels, 960 lines x 1280 samples 2 = 2x2 binned, red pixels, 960 lines x 1280 samples 3 = 2x2 binned, blue pixels, 960 lines x 1280 samples 4 = 2x2 binned, all pixels, 960 lines x 1280 samples 5 = 4x4 binned, green pixels, 960 lines x 1280 samples 6 = 4x4 binned, red pixels, 960 lines x 1280 samples 7 = 4x4 binned, blue pixels, 960 lines x 1280 samples 8 = 4x4 binned, all pixels, 960 lines x 1280 samples 9 = 8x8 binned, all pixles, 480 lines x 640 samples Cruise (readout modes 0 - 35) 0 - 15 = full resolution, bayer, 960 lines x 1280 samples 16 - 19 = 2x2 binned, green pixels, 960 lines x 1280 samples 20 - 23 = 2x2 binned, red pixels, 960 lines x 1280 samples 24 - 27 = 2x2 binned, blue pixels, 960 lines x 1280 samples 28 - 31 = 2x2 binned, all pixels, 960 lines x 1280 samples 32 = 4x4 binned, green pixels, 960 lines x 1280 samples 33 = 4x4 binned, red pixels, 960 lines x 1280 samples 34 = 4x4 binned, blue pixels, 960 lines x 1280 samples 35 = 4x4 binned, all pixels, 960 lines x 1280 samples For SuperCam on M2020 … a) for RMI instrument, specifies the link between the SuperCam Mast Unit (MU) and SuperCam Body Unit (BU) to use during RMI image commanding. Value of "1" denotes async (currently unavailable).	**Valid Values** **Surface** • Eng. Cameras (S) "0" – "9" • MCZ (S) TBD **Cruise** • Eng. Cameras (C) "0" – "35" • SuperCam (C) 0 = "UNK" 1 = "ASYNC" • MCZ (C) TBD **Type** string(20) **Units** n/a **Location** • Eng. Cameras INSTRUMENT_STATE_PARMS (Group) • SuperCam OBSERVATION_REQUEST_PARMS (Group) • MCZ OBSERVATION_REQUEST_PARMS (Group) MINI_HEADER (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** **Surface** • Eng. Cameras (S) "<IDPH DPO>:idph:hw_mode" • MCZ (S) "MMM_Image_Mini_Header[14]", "MMM_Image_Mini_Header[15]" **Cruise** • Eng. Cameras (C) "<IDPH DPO>:idph:params:voff" **Type** **Surface** • Eng. Cameras • SuperCam U8 • MCZ I32 **Cruise** • Eng. Cameras U16 • SuperCam U8 • MCZ I32

<table>
<tr><th colspan="3">Output Metadata (Product Label)</th><th>Input Metadata (Source)</th></tr>
<tr><td>• Ops Keyword
• Archive Label Attribute
• Definition</td><td colspan="2">• Mission Phase C=Cruise, S=Surface, B=Both
• Valid Values (quoted)
• Type
• Units
• Keyword Location in Ops Label
• Attribute X-path in Archive label
• Attribute Reference in Archive Label (bracketed)</td><td>• Mission Phase C=Cruise, S=Surface, B=Both
• Mode
• Metadata Field
• Type</td></tr>
<tr><td>For MCZ cameras on M2020, this specifies the image or video readout mode, which determines the rate the image is read out.</td><td colspan="2"></td><td></td></tr>
<tr><td><u>Ops Keyword</u>
INSTRUMENT_NAME

<u>Archive Attribute</u>
TBD

<u>Definition</u>
Specifies the full name of an instrument.

Note that the associated INSTRUMENT_ID element provides an abbreviated name or acronym for the instrument.

Example values: FLUXGATE MAGNETOMETER, NEAR_INFRARED MAPPING SPECTROMETER.</td><td colspan="2"><u>Valid Values</u>

<u>Value</u> — <u>APID Names</u>
“FRONT HAZARD AVOIDANCE CAMERA LEFT STRING <A|B>” — Any string value starting with “Img” and ending with “Fhl”
“FRONT HAZARD AVOIDANCE CAMERA RIGHT STRING <A|B>” — Any string value starting with “Img” and ending with “Fhr”
“REAR HAZARD AVOIDANCE CAMERA LEFT” — Any string value starting with “Img” and ending with “Rhl”
“REAR HAZARD AVOIDANCE CAMERA RIGHT” — Any string vaue startring with “Img” and ending with “Rhr”
“NAVIGATION CAMERA LEFT” — Any string value starting with “Img” and ending with “Nl”
“NAVIGATION CAMERA RIGHT” — Any string value starting with “Img” and ending with “Nr”
“SUPER CAMERA REMOTE MICRO IMAGER” — Any string value starting with “ScamRmi”
“MAST CAMERA ZOOM LEFT” — Any string value starting with “MczL”
“MAST CAMERA ZOOM RIGHT” — Any string value starting with “MczR”
“SHERLOC-WATSON IMAGER” — Any string value starting with “SrlcImg”
“SHERLOC AUTOFOCUS AND CONTEXT IMAGER” — Any string value starting with “SrlcImg”
“PIXL MICRO-CONTEXT CAMERA” — Any string value starting with PixlSci</td><td><u>Mode</u>
EMD in XML format

<u>Field as “<xml name>:|<element>|:|<element>|:<field>”</u>
“MslEarthProductMetadata:MslProductMetadata:ProductName”,
“MslEarthProductMetadata:MslProductMetadata:CreationStringId”

<u>Type</u>
n/a</td></tr>
</table>

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	and PDP Category XX "MEDA SKY CAMERA" Any string value starting with "Meda" and ending with "Image" "LANDING VISUAL SYSTEM" Any string value starting with "TBD" and ending with "TBD" "PARACHUTE UPLOOK CAMERA <A|B|C>" "DESCENT STAGE DOWNLOOK CAMERA" "ROVER DOWNLOOK CAMERA" "ROVER UPLOOK CAMERA" Any string value starting with "ImgEdl" and ending with "data" **Type** string array **Units** n/a **Location** IDENTIFICATION (Class) **X-path** TBD **Reference** TBD	
Ops Keyword INSTRUMENT_SERIAL_NUMBER **Archive Attribute** TBD **Definition** Specifies the manufacturer's serial number assigned to an instrument. This number may be used to uniquely identify a particular instrument for tracing its components or determining its calibration history, for example.	**Valid Values** **Instrument** / **ECAM**: FM A / FM B / EM A / EM B Fhaz Left: 105 / 113 / TBD / TBD Fhaz Right: 110 / 112 / TBD / TBD Rhaz Left: 111 / TBD Rhaz Right: 108 / TBD Navcam Left: 103 / TBD	**Mode** 1) DPO in XML format (referenced to APID Name in Appendix A) 2) DPO in XML format (referenced to APID Name in Appendix A) or Image DPO mini-header **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras 1) "<IDPH DPO>:idph:serial_no" • SuperCam RMI

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	<table><tr><td>Navcam Right</td><td>102</td><td>TBD</td></tr><tr><td>CacheCam</td><td>109</td><td>TBD</td></tr><tr><td>SuperCam</td><td>FM</td><td>EM</td></tr><tr><td>RMI</td><td>TBD</td><td>TBD</td></tr><tr><td>Mastcam-Z</td><td>FM</td><td>EM</td></tr><tr><td>MCZ-Left MCZ-Right</td><td>4007 102801</td><td>170203 170205</td></tr><tr><td>SHERLOC</td><td>FM</td><td>EM</td></tr><tr><td>WATSON ACI</td><td>174905 8563513</td><td>TBD TBD</td></tr><tr><td>MEDA</td><td>FM</td><td>EM</td></tr><tr><td>Skycam</td><td>214</td><td>21</td></tr><tr><td>PIXL</td><td>FM</td><td>EM</td></tr><tr><td>MCC</td><td>TBD</td><td>TBD</td></tr><tr><td>EDL</td><td>FM</td><td>EM</td></tr><tr><td>LVS PUC-A PUC-B PUC-C DDC RDC RUC</td><td>TBD TBD TBD TBD TBD TBD TBD</td><td>TBD TBD TBD TBD TBD TBD TBD</td></tr><tr><td>Helicopter</td><td>FM</td><td>EM</td></tr><tr><td>Nav Scout</td><td>TBD TBD</td><td>TBD TBD</td></tr></table> **Type** string **Units** n/a **Location** IDENTIFICATION (Class) MINI_HEADER (Group) **X-path** TBD **Reference** TBD	TBD • MCZ Cameras 2) “MCZ_Image_Mini_Header[41]”, “MCZ_Image_Mini_Header[42]”, “MCZ_Image_Mini_Header[43]” NOTES: • For MCZ Cameras, value analogous to “serial_no” is comprised of three bytes coming from Image DPO mini-header at byte offsets 41, 42 and 43. **Type** U8
Ops Keyword INSTRUMENT_STATE **Archive Attribute** TBD **Definition** Specifies an array of identifiers for the state of an instrument at a specified time.	**Valid Values** • Bit 0: 0 = “FALSE” 1 = “TRUE” • Bit 1: 0 = “FALSE” 1 = “TRUE” • Bit 2: 0 = “FALSE”	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as “<xml name>:|<element>|:|<element>|:<field>”** MCZ Cameras SHERLOC Cameras “MMM_Image_Mini_Header[40]”

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	1 = "TRUE" • Bit 3: 0 = "FALSE" 1 = "TRUE" • Bit 4: 0 = "FALSE" 1 = "TRUE" • Bit 5: 0 = "FALSE" 1 = "TRUE" • Bit 6: 0 = "FALSE" 1 = "TRUE" • Bit 7: 0 = "FALSE" 1 = "TRUE" **Type** string array[8] **Units** n/a **Location** MINI_HEADER (Group) **X-path** TBD **Reference** TBD	**Type** U8
Ops Keyword INSTRUMENT_STATE_NAME **Archive Attribute** TBD **Definition** Specifies the possible value that can be contained in the INSTRUMENT_STATE array.	**Valid Values** ("**SPARE**", "**UV_LED**", "**VIS1_LED**", "**VIS2_LED**", "**SPARE**", "**FILTER_HALL_STATE**", "**COVER_HALL_STATE**", "**FOCUS_HALL_STATE**") **Type** string array[8] **Units** n/a **Location** MINI_HEADER (Group) **X-path** TBD **Reference** TBD	**Mode** Static value: - Single value representing array of Bits 0 thru 7 from INSTRUMENT_STATE. **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword INSTRUMENT_TEMPERATURE **Archive Attribute** TBD	**Valid Values** n/a **Type** float array	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as <xml name>:[<element>]:[<element>]:<field>**

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Definition Specifies the temperature, in degrees Celsius, of an instrument or some part of an instrument. Note that this may be an array of multiple values for temperatures on different parts of the instrument. (Example: CCD array and sensor head)	**Units** deg C (<degC> unit tag required) **Location** INSTRUMENT_STATE_PARMS (Group) **X-path** TBD **Reference** TBD	**Surface** • Eng. Cameras (S) <IDPH DPO>:idph: temp[0] - [22] • SuperCam (S) <Ancillary DPO>:instrument_temperatures: mu_obox_temp, mu_laser_if_temp, mu_ebox_temp, mu_sec_mirror_temp, ramp_temp TBD RMI CMOS sensor temp in register dump (MH) • MCZ Cameras (S) • SHERLOC Cameras (S) <Ancillary DPO>:default_ancillary_data: dea_temp, head_fpa_temp, head_htr_temp_1, head_htr_temp_2 • MEDA Skycam (S) <MEDA Image Header>: cam_pcb_prt, cam_ccd_prt **Cruise** • Eng. Cameras (C) <IDPH DPO>:idph: temp[0] - [22] • MCZ Cameras (C) <Ancillary DPO>:default_ancillary_data: dea_temp, head_fpa_temp, head_htr_temp_1, head_htr_temp_2 **Type** • Eng. Cameras F32 • SuperCam • MCZ F64 • Skycam U16 NOTES: • Skycam value need to be converted?
Ops Keyword INSTRUMENT_TEMPERATURE_NAME **Archive Attribute** TBD	**Valid Values** • Eng. Cameras ("A_FRONT_LEFT_HAZ_1", " "A_FRONT_LEFT_HAZ_2", "A_FRONT_RIGHT_HAZ_1",	**Mode** Static values **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Definition Specifies an array of the formal names identifying each of the values used in INSTRUMENT_TEMPERATURE.	"A_FRONT_RIGHT_HAZ_2", "B_FRONT_LEFT_HAZ_1", "B_FRONT_LEFT_HAZ_2", "B_FRONT_RIGHT_HAZ_1", "B_FRONT_RIGHT_HAZ_2", "REAR_LEFT_HAZ_1", "REAR_LEFT_HAZ_2", "REAR_RIGHT_HAZ_1", "REAR_RIGHT_HAZ_2", "NAVCAM_LEFT_1", "NAVCAM_LEFT_2", "NAVCAM_RIGHT_1", "NAVCAM_RIGHT_2", "CACHE_1", "CACHE_2", "FRONT_HAZ_LEFT_CAL", "FRONT_HAZ_RIGHT_CAL", "NAVCAM_LEFT_CAL", "NAVCAM_RIGHT_CAL") • SuperCam ("MU_OBOX_TEMP","MU_LASER_IF_TEMP", "MU_EBOX_TEMP","MU_SEC_MIRROR_TEMP", "RAMP_TEMP") • MCZ Cameras ("DEA", "HEAD_FPA","HEAD_HTR_1", "HEAD_HTR_2") **Type** string array **Units** n/a **Location** INSTRUMENT_STATE_PARMS (Group) **X-path** TBD **Reference** TBD	**Type** n/a
Ops Keyword INSTRUMENT_TEMPERATURE_STATUS **Archive Attribute** TBD **Definition** Specifies the status of temperature read from Thermal module. Note that INSTRUMENT_TEMPERATURE_NAME specifies the name associated with each value for this keyword.	**Valid Values** n/a **Type** • SuperCam RMI (S) integer array[5] • MCZ Cameras (B) • SHERLOC Cameras (S) Integer array[4] **Units** n/a **Location** INSTRUMENT_STATE_PARMS (Group)	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** **Surface** • SuperCam RMI (S) <Ancillary DPO>:instrument_temperature: mu_obox_temp_status, mu_laser_if_status, mu_ebox_temp_status, mu_sec_mirror_temp_status, mu_ramp_temp_status • MCZ Cameras (S)

<table>
<tr><th colspan="2">Output Metadata (Product Label)</th><th>Input Metadata (Source)</th></tr>
<tr><td>• Ops Keyword
• Archive Label Attribute
• Definition</td><td>• Mission Phase C=Cruise, S=Surface, B=Both
• Valid Values (quoted)
• Type
• Units
• Keyword Location in Ops Label
• Attribute X-path in Archive label
• Attribute Reference in Archive Label (bracketed)</td><td>• Mission Phase C=Cruise, S=Surface, B=Both
• Mode
• Metadata Field
• Type</td></tr>
<tr><td></td><td><u>X-path</u>
TBD

<u>Reference</u>
TBD</td><td>• SHERLOC Cameras (S)
<Ancillary DPO>:default_ancillary_data:
dea_status,
fpa_status,
htr_status_1,
htr_status_2

<u>Cruise</u>
• MCZ Cameras (C)
<Ancillary DPO>:instrument_temperatures:
dea_status,
fpa_status,
htr_status_1,
htr_status_2

<u>Type</u>
• SuperCam
I32
• MCZ Cameras
I32</td></tr>
<tr><td><u>Ops Keyword</u>
INSTRUMENT_TYPE

<u>Archive Attribute</u>
TBD

<u>Definition</u>
Specifies the type of an instrument.

Example values: POLARIMETER, RADIOMETER, REFLECTANCE SPECTROMETER, VIDICON CAMERA.

Note that mosaics may contain more than one value in an array.</td><td><u>Valid Values</u>
• Eng. Cameras …
<u>Value</u> <u>APID Names</u>
“IMAGING CAMERA” • For Eng Cameras, any string value starting with “Img”.
• For SuperCam, any string value starting with “ScamRmi”.
• For MCZ, any string value starting with “Mcz”.
• For PIXL, any string value starting with “PixlSci” and PDP category XX.

<u>Type</u>
string(15)

<u>Units</u>
n/a

<u>Location</u>
IDENTIFICATION (Class)

<u>X-path</u>
TBD

<u>Reference</u>
TBD</td><td><u>Mode</u>
EMD in XML format

<u>Field as “<xml name>:|<element>|:|<element>|:<field>”</u>
“MslEarthProductMetadata:MslProductMetadata:ProductName”

<u>Type</u>
n/a</td></tr>
<tr><td><u>Ops Keyword</u>
INSTRUMENT_VERSION_ID

<u>Archive Attribute</u>
TBD</td><td><u>Valid Values</u>
• Eng. Cameras
<u>Serial Number Range</u> <u>Value</u>
000 – 099 “BB”
100 – 199 “FM”</td><td><u>Mode</u>
1) DPO in XML format (referenced to APID Name in Appendix A)
2) DPO in XML format (referenced to APID Name in Appendix A)
or Image DPO mini-header</td></tr>
</table>

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Definition Specifies the model of an instrument used to obtain data. For example, this keyword could be used to distinguish between an engineering model of a camera used to acquire test data, and a flight model of a camera used to acquire science data during a mission. Identifiers for use in M2020 are: a) "BB" - Breadboard b) "EM" - Engineering Model c) "FM" - Flight Model	200 – 299 "EM" • MCZ Cameras … Serial Number Range Value TBD **Type** string(8) **Units** n/a **Location** IDENTIFICATION (Class) **X-path** TBD **Reference** TBD	**Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras & SuperCam 1) "<IDPH DPO>:idph:serial_no" • MCZ Cameras 2) "MCZ_Image_Mini_Header[41]", "MCZ_Image_Mini_Header[42]", "MCZ_Image_Mini_Header[43]" NOTES: • For MCZ and SHERLOC Cameras, value analogous to "serial_no" is comprised of three bytes coming from Image DPO mini-header at byte offsets 41, 42 and 43. **Type** U8
Ops Keyword INSTRUMENT_ZOOM_POSITION_CNT **Archive Attribute** TBD **Definition** Specifies the position in motor counts of the zoom motor on a camera. For M2020 MCZ, it specifies the requested zoom position that was used by the image.	**Valid Values** • MCZ Cameras TBD **Type** integer **Units** n/a **Location** IMAGE_REQUEST_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** Image DPO mini-header **Field as "<xml name>:[<element>]:[<element>]:<field>"** MCZ Cameras "<Ancillary DPO>: cmd_arguments_image: zoom_position **Type** I32
Ops Keyword INST_CMPRS_COLOR_MODE **Archive Attribute** none **Definition** Specifies the color mode used during compression. For M2020, this is the JPEG color subsampling mode. COLOR_MODE_GRAY indicates a grayscale image, COLOR_MODE_422 indicates 4:2:2 chroma subsampling (the typical case), and COLOR_MODE_444 indicates 4:4:4 chroma sampling (no subsampling). The keyword is not applicable if the INST_CMPRS_NAME is not JPEG and may be omitted.	**Valid Values** 0 or 1 = "N/A" 2 = "COLOR_MODE_GRAY" 3 = "COLOR_MODE_422" 4 = "COLOR_MODE_444" **Type** String **Units** n/a **Location** COMPRESSION_PARMS (Group) **X-path** TBD	**Mode** Image DPO mini-header, Table Lookup **Field as "<xml name>:[<element>]:[<element>]:<field>"** MCZ Cameras SHERLOC Cameras "MMM_Image_Mini_Header[34]", "<Ancillary DPO>:image_id_data: comp_color_mode" "<Ancillary DPO>:cmd_arguments_image: comp_color_mode" SuperCam RMI NOTES:

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	Reference TBD	• For MCZ Cameras and SHERLOC Cameras, value is comprised of one bytes coming from Image DPO mini-header at byte offsets 34. • For SuperCam RMI the color subsampling modes are known from JPEG decompressor. **Type** enum
Ops Keyword INST_CMPRS_DEFERRED_FLAG **Archive Attribute** none **Definition** Specifies a flag to indicate whether compression was done at the time of image acquisition, or was deferred until later (typically at downlink time). For M2020, deferred compression is commonly used with MCZ to downlink differently-compressed versions of the same image; the image is stored onboard in raw form. Deferred compression is specified but not currently implemented for the engineering cameras.	**Valid Values** 0 = "FALSE" non-0 = "TRUE" **Type** string **Units** n/a **Location** 1) COMPRESSION_PARMS (Group) 2) a. IMAGE_REQUEST_PARMS (Group) b. REFERENCE_PIXEL_REQUEST_PARMS (Group) c. THUMBNAIL_REQUEST_PARMS (Group) 3) a. IMAGE_REQUEST_PARMS (Group) b. THUMBNAIL_REQUEST_PARMS (Group) 4) COMPRESSION_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** 1) EMD in XML format, calculation 2) DPO in XML format (referenced to APID Name in Appendix A), Table Lookup 3) DPO in XML format (referenced to APID Name in Appendix A), Table Lookup 4) DPO in XML format (referenced to APID Name in Appendix A) or Image DPO mini-header, Table Lookup **Field as "<xml name>:[<element>]:[<element>]:<field>"** • All Cameras 1) "MslEarthProductMetadata:MslProductMetadata:ProductName" • Eng. Cameras TBD 2) a. "<IDPH DPO>:idph:params:comp:compress" b. "<IDPH DPO>:idph:params:ref_comp:compress" c. "<IDPH DPO>:idph:params:thumb_comp:compress" • SuperCam RMI TBD 3) a. "<Ancillary DPO>:cmd_arguments:compression" b. "<Ancillary DPO>:cmd_arguments:THUMBNAIL_COMPRESSION" • MCZ Cameras 4) "MCZ_Image_Mini_Header[32]", "MCZ_Image_Mini_Header[33]", "MCZ_Image_Mini_Header[34]", "MCZ_Image_Mini_Header[35]", "MCZ_Image_Mini_Header[36]", "MCZ_Image_Mini_Header[37]", "MCZ_Image_Mini_Header[38]", "MCZ_Image_Mini_Header[39]" NOTES: • For MCZ Cameras, value analogous to "compress" is comprised of eight bytes coming from Image DPO mini-header at byte offsets 32, 33, 34, 35, 36, 37, 38 and 39. **Type** enum
Ops Keyword INST_CMPRS_FILTER	**Valid Values** **Surface** • Eng. Cameras & SuperCam	**Mode** 1) Compression algorithm, calculation a. Value returned by compression as variable

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Archive Attribute TBD **Definition** Specifies the wavelet filter used in the ICER compression and decompression algorithm.	ICER (S) "A" = 0 = WAVELET_A "B" = 1 = WAVELET_B "C" = 2 = WAVELET_C "D" = 3 = WAVELET_D "E" = 4 = WAVELET_E "F" = 5 = WAVELET_F "Q" = 6 = WAVELET_Q LOCO (S) "N/A" JPEG (S) "N/A" • MCZ Cameras lossless = "N/A" not lossless = "UNK" **Cruise** **Type** string **Units** n/a **Location** a. COMPRESSION_PARMS (Group) b. IMAGE_REQUEST_PARMS (Group) c. THUMBNAIL_REQUEST_PARMS (Group) **X-path** TBD **Reference** TBD	2) DPO in XML format (referenced to APID Name in Appendix A), Table Lookup **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras b. "<IDPH DPO>:idph:params:comp:wfilter" c. "<IDPH DPO>:idph:params:thumb_comp:wfilter" • SuperCam b. "<Ancillary DPO>:icer_filter" **Type** a. n/a b. enum c. enum
Ops Keyword INST_CMPRS_MODE **Archive Attribute** TBD **Definition** Specifies the method used for on-board compression of data. For the M2020 mission, a value of 0 indicates some form of lossless (or no) compression, while non-0 values indicate modes the lossy compressors may use. See INST_CMPRS_NAME for the actual compression type used. See also INST_CMPRS_COLOR_MODE for JPEG.	**Valid Values** 1) b. "0" = None or Lossless "1" = Lossy 2) "0" = None "0" = 3 = Lossless (LOCO) "0" = 4 = Lossless (LOCO_DEFERRED) "1" = 1 = Lossy (ICER) "1" = 2 = Lossy (ICER_DEFERRED) "2" = 5 = Lossy (JPEG) "2" = 6 = Loss (JPEG_DEFERRED) 3) "0" = None "0" = 1 = Lossless (LOCO) "1" = 2 = Lossy (ICER_1BPP) "2" = 3 = Lossy (ICER_2BPP) "3" = 4 = Lossy (ICER_3BPP) "4" = 5 = Lossy (ICER_4BPP) "5" = 6 = Lossy (ICER_5BPP) "6" = 7 = Lossy (ICER_6BPP) 4) "0" = None "0" = 1 = MSSS Lossless	**Mode** 1) a. Compression algorithm (where value returned by compression as variable), calculation b. EMD in XML format, calculation 2) DPO in XML format (referenced to APID Name in Appendix A), Table Lookup 3) DPO in XML format (referenced to APID Name in Appendix A), Table Lookup 4) DPO in XML format (referenced to APID Name in Appendix A) or Image DPO mini-header, Table Lookup **Field as "<xml name>:[<element>]:[<element>]:<field>"** • All Cameras 1) b. "MslEarthProductMetadata:MslProductMetadata: ProductName" • Eng. Cameras 2) a. "<IDPH DPO>:idph:params:comp:compress"

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	"1" = 2 = JPEG color mode GRAY "2" = 3 = JPEG color mode 422 "3" = 4 = JPEG color mode 444 **Type** integer **Units** n/a **Location** 1) COMPRESSION_PARMS (Group) 2) a. IMAGE_REQUEST_PARMS (Group) b. REFERENCE_PIXEL_REQUEST_PARMS (Group) c. THUMBNAIL_REQUEST_PARMS (Group) 3) a. IMAGE_REQUEST_PARMS (Group) 4) - IMAGE_REQUEST_PARMS (Group) - THUMBNAIL_REQUEST_PARMS (Group) - COMPRESSION_PARMS (Group) **X-path** TBD **Reference** TBD	b. "<IDPH DPO>:idph:params:ref_comp:compress" c. "<IDPH DPO>:idph:params:thumb_comp:compress" • SuperCam RMI 3) a. "<Ancillary DPO>:cmd_arguments: compression" • MCZ Cameras • SHERLOC Cameras 4) a. "<Ancillary DPO>:cmd_arguments_image: comp_quality" b. "<Ancillary DPO>: cmd_arguments_zstack:comp_quality" c. "MMM_Image_Mini_Header[32]", "MMM_Image_Mini_Header[33]", "MMM_Image_Mini_Header[34]", "MMM_Image_Mini_Header[35]", "MMM_Image_Mini_Header[36]", "MMM_Image_Mini_Header[37]", "MMM_Image_Mini_Header[38]", "MMM_Image_Mini_Header[39]" NOTES: • For MCZ and SHERLOC non-recovered (rangemap or zstack) data products, value comes from Ancillary DPO per case "4a". • For MCZ and SHERLOC recovered (rangemap or zstack) data products, value comes from Ancillary DPO per case "4b". • For MCZ and SHERLOC, value analogous to "compress" is comprised of eight bytes coming from Image DPO mini-header at byte offsets 32, 33, 34, 35, 36, 37, 38 and 39 per case "4c". **Type** 1) a. n/a b. enum 2) enum 3) enum 4) enum
Ops Keyword INST_CMPRS_NAME **Archive Attribute** TBD **Definition** Specifies the type of on-board compression used for data storage and transmission. Valid values for compression types supported in M2020 are: a) "NONE" - No compression. b) "ICER" - Adaptive Variable-Length Coding, a lossy or lossless compression algorithm developed at JPL. c) "LOCO" - Low-Complexity Lossless Compression, a lossless compression algorithm developed at JPL. d) "JPEG" - Joint Photographic Experts Group, an industry standard lossy compression algrorithm. e) "MSSS_LOSSLESS" - Lossless compression	**Valid Values** 1) 0 = "None or Lossless" 1 = "Lossy" 2) 0 = "None" 1 = "ICER" 2 = "ICER" 3 = "LOCO" 4 = "LOCO" 5 = "JPEG" 6 = "JPEG" 3) 0 = "None" 1 = "LOCO" 2 = "ICER" 3 = "ICER" 4 = "ICER" 5 = "ICER" 6 = "ICER" 7 = "ICER" 4) 0 = "None"	**Mode** 1) a. Compression algorithm (where value returned by compression as variable), calculation b. EMD in XML format, calculation 2) DPO in XML format (referenced to APID Name in Appendix A), Table Lookup 3) DPO in XML format (referenced to APID Name in Appendix A), Table Lookup 4) Image DPO mini-header, Table Lookup 5) DPO in XML format (referenced to APID Name in Appendix A), Table Lookup **Field as "<xml name>:|<element>|:|<element>|:<field>"** • All Cameras 1) "MslEarthProductMetadata:MslProductMetadata:

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
algorithm developed by Malin Space Science Systems. NOTE: For the M2020 mission, LOCO is lossless, JPEG is lossy, and ICER can be either (generally lossy). See INST_CMPRS_MODE for lossless/lossy status.	1 = "MSSS_LOSSLESS" 2 = "JPEG" 3 = "JPEG" 4 = "JPEG" 5) 0 = "None" 1 = "ICER" 2 = "JPEG" 6) 0 = "Lossless" 1 = "JPEG" **Type** integer **Units** n/a **Location** 1) COMPRESSION_PARMS (Group) 2) a. IMAGE_REQUEST_PARMS (Group) b. REFERENCE_PIXEL_REQUEST_PARMS (Group) c. THUMBNAIL_REQUEST_PARMS (Group) 3) a. IMAGE_REQUEST_PARMS (Group) 4) - IMAGE_REQUEST_PARMS (Group) - THUMBNAIL_REQUEST_PARMS (Group) - COMPRESSION_PARMS (Group) **X-path** TBD **Reference** TBD	ProductName" • Eng. Cameras 2) a. "<IDPH DPO>:idph:params:comp:compress" b. "<IDPH DPO>:idph:params:ref_comp:compress" c. "<IDPH DPO>:idph:params:thumb_comp:compress" • SuperCam RMI 5) a. "<Ancillary DPO>:cmd_arguments: compression" • MCZ Cameras 4) a. "<Ancillary DPO>:cmd_arguments_image: comp_quality" b. "<Ancillary DPO>:cmd_arguments_zstack: comp_quality" c. "MCZ_Image_Mini_Header[32]", "MCZ_Image_Mini_Header[33]", "MCZ_Image_Mini_Header[34]", "MCZ_Image_Mini_Header[35]", "MCZ_Image_Mini_Header[36]", "MCZ_Image_Mini_Header[37]", "MCZ_Image_Mini_Header[38]", "MCZ_Image_Mini_Header[39]" • Helicopter Cameras 6) NOTES: • For MCZ non-recovered (rangemap or zstack) data products, value comes from Ancillary DPO per case "4a". • For MCZ recovered (rangemap or zstack) data products, value comes from Ancillary DPO per case "4b". • For MCZ Cameras, value analogous to "compress" is comprised of eight bytes coming from Image DPO mini-header at byte offsets 32, 33, 34, 35, 36, 37, 38 and 39 per case "4c". **Type** 1) a. n/a b. enum 2) enum 3) enum 4) enum
Ops Keyword INST_CMPRS_QUALITY **Archive Attribute** TBD **Definition** Specifies a JPEG- or ICER-specific variable which identifies the resultant or targeted image quality index for on-board data compression.	**Valid Values** • Eng. Cameras ICER (B) "0" to "18" JPEG (S) "0" to "100" • MCZ Cameras (B) "0" to "100" **Type**	**Mode** 1) DPO in XML format (referenced to APID Name in Appendix A) 2) DPO in XML format (referenced to APID Name in Appendix A) or Image DPO mini-header **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras 1) ICER a. "<IDPH DPO>:idph:params:comp:min_loss" b. "<IDPH DPO>:idph:params:thumb_comp:min_loss"

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
For ECAM and MCZ, a value of 0 indicates lossless or no compression; For JPEG the quality levels are in the range from "0" to "100". The higher the number the better the quality of the image. Specifies companding, spatial sampling, colorspace processing and compression algorithms (meaning described below and related to compression quality factor and/or output bit rate and algorithms used). For ICER, the quality is the "minloss" parameter, which specifies the minimum number of bit planes that will not be encoded in each subband. Note that ICER may stop due to a byte quota before mimloss is achieved, so the actual quality may be less than specified. Unlike JPEG, a lower number means higher quality. If a filter for a given image is not set to clear (filter 0), then compression is performed in "narrowband science" mode; otherwise it is performed in "RGB" mode. If multiple images are acquired by this command, they increment in the order i, i+1, i+2, … i+(n_images-1). NOTE: Viewing the compression parameters as 8 bytes ABCDEFGH from MSB to LSB, the bytes mean the following: • A, B, and EFG are unused and should be commanded as zero. • C is the color mode used for compression, where 0 is gray scale, 1 is 422 color subsampling mode, and 2 is 444 color mode (no subsampling). Most broadband color images should use C=1. • For D, if zero and C is 0xff, then lossless compression is used. If D is non-zero, then the image is JPEG-compressed by the quality factor D which ranges from 1 (lowest quality) to 100 (highest quality). Quality 75 is "usually nearly indistinguishable from the source image" in the ITU T.81 JPEG specification. • H specifies the 12-to-8 bit companding table to use. 0 is the default, nominally lossless square-root table. 1-16 encode the pixles linearly by dividing by N with saturation at 255; 17-32 encode the pixels linearly without saturation (the low-order 8 bits are simply transmitted). 0xff selects 16-bit calibration mode, which has restrictions on image dimension, may not be compressed, and is not intended to be used in flight. Other values are not yet defined.	integer **Units** n/a **Location** 1) a. IMAGE_REQUEST_PARMS (Group) b. THUMBNAIL_REQUEST_PARMS (Group) 2) COMPRESSION _PARMS (Group) **X-path** TBD **Reference** TBD	JPEG a. "<IDPH DPO>:idph:params:comp:quality" b. "<IDPH DPO>:idph:params:thumb_comp:quality" • MCZ Cameras • SHERLOC 2) a. "<Ancillary DPO>: image_id_data:comp_quality" b. "MCZ_Image_Mini_Header[32]", "MCZ_Image_Mini_Header[33]", "MCZ_Image_Mini_Header[34]", "MCZ_Image_Mini_Header[35]", "MCZ_Image_Mini_Header[36]", "MCZ_Image_Mini_Header[37]", "MCZ_Image_Mini_Header[38]", "MCZ_Image_Mini_Header[39]" • SuperCam 3) ICER a. "<Ancillary DPO>: icer_min_loss" JPEG b. "<AncillaryDPO>:jpeg_comp_qual" NOTES: • For MCZ Cameras, if user-specified processing is not configured to use Mini-header compression bytes, then value comes from the Ancillary DPO (case "2a"). • For MCZ Cameras, if user-specified processing is configured to use Mini-header compression bytes, then value is comprised of eight bytes coming from Image DPO mini-header at byte offsets 32, 33, 34, 35, 36, 37, 38 and 39 (case "2b"). • For SCAM, if icer compression is commanded, the value comes from icer_min_loss per case a. • For SCAM, if jpeg is specified the value comes from jpeg_comp_qual per case b. **Type** U8 SuperCam ICER U16 JPEG U8
Ops Keyword INST_CMPRS_RATE **Archive Attribute** TBD	**Valid Values** • Eng. Cameras 1) n/a 2) a. ICER and LOCO "1.0" to "12.0"	**Mode** 1) Calculation: - Value = bits_in/pixels_out 2) DPO in XML format (referenced to APID Name in Appendix A), Table Lookup

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Definition Specifies the average number of bits needed to represent a pixel for an on-board compressed image.	b. JPEG "n/a" • SuperCam 3) "1.0" = 2 = SCAM_ICER_1BPP "2.0" = 3 = SCAM_ICER_2BPP "3.0" = 4 = SCAM_ICER_3BPP "4.0" = 5 = SCAM_ICER_4BPP "5.0" = 6 = SCAM_ICER_5BPP "6.0" = 7 = SCAM_ICER_6BPP • MCZ Cameras 4) n/a • Additional value for Location "1" "N/A" = 0 **Type** float **Units** n/a **Location** 1) COMPRESSION_PARMS (Group) 2) a. IMAGE_REQUEST_PARMS (Group) b. THUMBNAIL_REQUEST_PARMS (Group) 3) a. IMAGE_REQUEST_PARMS (Group) b. THUMBNAIL_REQUEST_PARMS (Group) 4) - IMAGE_REQUEST_PARMS (Group) - THUMBNAIL_REQUEST_PARMS (Group) - COMPRESSION_PARMS (Group) **X-path** TBD **Reference** TBD	3) DPO in XML format (referenced to APID Name in Appendix A), Table Lookup 4) Calculation: - Value = bytes_in * 8/pixels **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras 2) a. "<IDPH DPO>:idph:params:comp:bpp" b. "<IDPH DPO>:idph:params:thumb_comp:bpp" • SuperCam 3) a. "<Ancillary DPO>:icer_bpp" b. "<Ancillary DPO>:cmd_parameters: THUMBNAIL_COMPRESSION" **Type** 1) n/a 2) F32 3) U16 4) n/a
Ops Keyword INST_CMPRS_RATIO **Archive Attribute** TBD **Definition** Specifies the ratio of the size, in bytes, of the original uncompressed data file to its compressed form.	**Valid Values** Uncompressed = "N/A" **Type** float **Units** n/a **Location** COMPRESSION_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** 1) For Eng. Cameras, Calculation: - Sum of the size of ICER uncompressed image over the compressed segments area (bits_out/bits_in) 2) For MCZ Cameras, Calculation: - Value = pixels/bits_in **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword INST_CMPRS_SEGMENTS	**Valid Values** • Eng. Cameras 1) ICER and LOCO (B)	**Mode** • ICER|LOCO segment 1) a. Extracted from ICER|LOCO segment

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Archive Attribute TBD **Definition** Specifies the number of segments into which the image was partitioned for the error containment purposes. For ICER compression, the data within each segment is compressed independently, so that data loss across segments is compartmentalized or contained across segments.	"1" to "32" JPEG (S) "N/A" **Type** integer **Units** n/a **Location** 1) a. COMPRESSION_PARMS (Group) b. IMAGE_REQUEST_PARMS (Group) c. THUMBNAIL_REQUEST_PARMS (Group) **X-path** TBD **Reference** TBD	• DPO in XML format (referenced to APID Name in Appendix A), Table Lookup **Field as "<xml name>:[<element>]:[<element>]:<field>"** 1) b. "<IDPH DPO>:idph:params:comp:n_segs" c. "<IDPH DPO>:idph:params:thumb_comp:n_segs" • SuperCam 1) "<Ancillary DPO>:icer_segments" **Type** • SuperCam U16 1) a. n/a b. U8 c. U8
Ops Keyword INST_CMPRS_SEGMENT_QUALITY **Archive Attribute** TBD **Definition** Specifies the quality level for each ICER segment. For M2020, upon return by the ICER decompress function "deicer_decompress" [Ref 31] for data segment "seg", the output quantity "data_seg_status[seg]" contains a number indicating the decode status. The decode status may have one or more of the following flags set: • SHORTDATASEG FLAG (bit 0): If this flag is set, then the segment contained so little data that nothing could be reconstructed in the segment. • INCONSISTENTDATA FLAG (bit 1): If this flag is set, then one or more pieces of information in the segment header (specifically, image width, image height, n segs, wavelet filter, n decomps) are inconsistent with the value(s) in the first (valid) segment. ICER will ignore the data in this segment. • DUPLICATESEG FLAG (bit 2): If this flag is set, then the segment index given in the header equals that given by a previous segment. The decompressor will ignore the data in this segment. • BADBITPLANENUMBER FLAG (bit 3): If this flag is set, then an ICER internal parameter in the header for this segment has probably been corrupted. The decompressor will ignore the data in this segment. • BADBITPLANECOUNT FLAG (bit 4): If this flag is	**Valid Values** • Eng. Cameras Uncompressed or LOCO = "N/A" • MCZ Cameras "N/A" **Type** float array **Units** n/a **Location** COMPRESSION_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** Extracted from ICER segment **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
set, then an ICER internal parameter in the header for this segment has probably been corrupted. The decompressor will ignore the data in this segment. • BADDATA FLAG (bit 5): If this flag is set, then either the parameter combination given in the header for this segment are not allowed by ICER, or the segment number is bad. This probably indicates corrupted data. The decompressor will ignore the data in this segment.		
Ops Keyword INST_CMPRS_SEGMENT_STATUS **Archive Attribute** TBD **Definition** Specifies a bit mask which provides the status of decoding the nth segment. For M2020, upon return by the ICER decompress function "deicer_decompress" [Ref 31] for data segment "seg", the output quantity "seg_quality[seg]" provides an indication of the quality of the reconstructed segment. Specifically, the value returned is a double for which the integer values correspond to attained min loss values, but in general is an interpolation between these values. Thus lower values of seg_quality[seg] correspond to higher reconstructed qualities, and a value of indicates lossless compression. Note that the compressed stream does not directly contain the value of min loss that was given to the compressor, but the decompressor does know how far alongin the decompression process it got before it ran out of bits; this information is used to determine seg quality[seg]. In rare circumstances the decompressor may not be able to determine seg quality[seg] for a segment that it decompresses. In this case it sets seg quality[seg] to −1.0. The reconstructed segment might be either lossy or lossless when this occurs. The technical condition under which a quality value is not determined is that the decompressor runs out of the data for the segment before decoding any bit plane information. (The only way such a reconstructed segment could be lossless is if every bit plane of this segment contains all zeros, so there is no bit plane information to decode. This could only happen if every pixel of the segment and all pixels sufficiently close to the segment have exactly the same value.) Note that if segment seg cannot be reconstructed, then nothing is written to real seg num[seg], int seg bound first line[seg], int seg bound first sample[seg], int seg bound n lines[seg], int seg bound n samples[seg], and seg quality[seg]. The decompressor also returns a status word which may have one of the following flags set:	**Valid Values** • Eng. Cameras Uncompressed or LOCO = "N/A" • MCZ Cameras "N/A" **Type** integer array **Units** n/a **Location** COMPRESSION_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** Returned from ICER decompression routine **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
• BADNUMDATASEG FLAG (bit 0): If this flag is set, then n data seg, the number of data segments, is outside the allowed range [1, ICER MAX N SEGS]. Decompression could not be performed. • NOGOODSEGMENTS FLAG (bit 1): If this flag is set, then decompression could not be performed because none of the segments contained usable data.		
Ops Keyword INST_CMPRS_SEG_FIRST_LINE **Archive Attribute** TBD **Definition** Specifies an array of values in which each nth element identifies the line within a source image that corresponds to the first line where the nth compression segment applies. Value of "-1" denotes the indeterminate case when the decompressor cannot process the segment, or cannot determine seq_quality for a segment that it could decompress.	**Valid Values** • Eng. Cameras a. "-1" to "1024" b. Uncompressed or LOCO = "N/A" • MCZ Cameras "N/A" **Type** integer array **Units** n/a **Location** COMPRESSION_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** Extracted from ICER segment **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword INST_CMPRS_SEG_FIRST_LINE_SAMP **Archive Attribute** TBD **Definition** Specifies an array of values in which each nth element identifies the line sample within a source image that corresponds to the first line sample where the nth compression segment applies. Value of "-1" denotes the indeterminate case when the decompressor cannot process the segment, or cannot determine seq_quality for a segment that it could decompress.	**Valid Values** • Eng. Cameras a. "-1" to "1024" b. Uncompressed or LOCO = "N/A" • MCZ Cameras "N/A" **Type** integer array **Units** n/a **Location** COMPRESSION_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** Extracted from ICER segment **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword INST_CMPRS_SEG_LINES **Archive Attribute**	**Valid Values** • Eng. Cameras a. "-1" to "1024" b. Uncompressed or LOCO = "N/A"	**Mode** Extracted from ICER segment **Field as "<xml name>:[<element>]:[<element>]:<field>"**

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
TBD **Definition** Specifies an array of elements in which the nth element identifies the total number of data instances along the vertical axis that the nth compression segment defines. Value of "-1" denotes the indeterminate case when the decompressor cannot process the segment, or cannot determine seq_quality for a segment that it could decompress.	• MCZ Cameras "N/A" **Type** integer array **Units** n/a **Location** COMPRESSION_PARMS (Group) **X-path** TBD **Reference** TBD	n/a **Type** n/a
Ops Keyword INST_CMPRS_SEG_MISSING_PIXELS **Archive Attribute** TBD **Definition** Specifies an array of elements in which the nth element identifies the total number of missing pixels that the nth compression segment defines.	**Valid Values** • Eng. Cameras Uncompressed or ICER = "N/A" • MCZ Cameras "N/A" **Type** integer array **Units** n/a **Location** COMPRESSION_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** Extracted from LOCO segment **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword INST_CMPRS_SEG_SAMPLES **Archive Attribute** TBD **Definition** Specifies an array of elements in which the nth element identifies the total number of data instances along the horizontal axis that the nth compression segment defines. Value of "-1" denotes the indeterminate case when the decompressor cannot process the segment, or cannot determine seq_quality for a segment that it could decompress.	**Valid Values** • Eng. Cameras a. "-1" to "1024" b. Uncompressed or LOCO = "N/A" • MCZ Cameras "N/A" **Type** integer array **Units** n/a **Location** COMPRESSION_PARMS (Group) **X-path** TBD	**Mode** Extracted from ICER segment **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	Reference TBD	
Ops Keyword INST_CMPRS_VENUE **Archive Attribute** TBD **Definition** Specifies where the onboard compression was performed.	**Valid Values** • Helicopter Cameras "Hardware" "Software" **Type** String **Units** n/a **Location** COMPRESSION_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword INST_DECOMP_STAGES **Archive Attribute** TBD **Definition** Specifies the number of stages of wavelet decompositions.	**Valid Values** • Eng. Cameras ICER (B) "1" to "6" JPEG (S) "N/A" • MCZ Cameras "N/A" • Additional value for Location "1" Uncompressed or LOCO = "N/A" **Type** integer **Units** n/a **Location** 1) COMPRESSION_PARMS (Group) 2) IMAGE_REQUEST_PARMS (Group) 3) THUMBNAIL_REQUEST_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** • ICER segment 1) Extracted from ICER segment • DPO in XML format (referenced to APID Name in Appendix A), Table Lookup **Field as "<xml name>:[<element>]:[<element>]:<field>"** 2) "<IDPH DPO>:idph:params:comp:n_decomps" 3) "<IDPH DPO>:idph:params:thumb_comp:n_decomps" SCAM: "<Ancillary DPO>:icer_decomps" **Type** 1) n/a 2) U8 3) U8 4) U8 SCAM U16
Ops Keyword INTERCHANGE_FORMAT **Archive Attribute**	**Valid Values** "ASCII", "BINARY" **Type**	**Mode** Static Value **Field as "<xml name>:[<element>]:[<element>]:<field>"**

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
TBD **Definition** Specifies the manner in which data items are stored.	string(6) **Units** n/a **Location** • IMAGE_HEADER (Object) • IMAGE (Object) **X-path** TBD **Reference** TBD	n/a **Type** n/a
Ops Keyword INTERPOLATION_METHOD **Archive Attribute** TBD **Definition** Some cameras exhibit continuous changes in geometric behavior along a dimension, such as temperature, focus, or zoom. In order to model this continuous variation, camera models may be interpolated, which creates camera models "in between" a set of rigorously calibrated models using piecewise linear interpolation. INTERPOLATION_METHOD specifies the dimension(s) along which interpolation has been performed. Note that interpolation can happen either onboard or on the ground. For M20, onboard interpolation may occur based on temperature for the engineering cameras, or zoom for Mastcam-Z. Ground processing can also do focus and zoom interpolation of the Mastcam-Z, and possibly also temperature.	**Valid Values** "NONE" "TEMPERATURE" "FOCUS" "ZOOM" "OTHER" **Type** string **Units** n/a **Location** GEOMETRIC_CAMERA_MODEL_PARMS (Group)	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword INTERPOLATION_VALUE **Archive Attribute** TBD **Definition** Specifies the value to which the camera models were interpolated (usually, the specific focus or temperature value used). See INTERPOLATION_METHOD. Multiple dimensions of interpolation would lead to multiple values in this label.	**Valid Values** n/a **Type** float **Units** n/a **Location** GEOMETRIC_CAMERA_MODEL_PARMS (Group)	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword INVALID_CONSTANT **Archive Attribute** TBD	**Valid Values** Product ..... Value most IDS-gen'd products ..... "0.0" XYZ & Surface Normal ..... "(0.0,0.0,0.0)" Surface Roughness ..... param value (default is "0.1")	**Mode** Static Value **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Definition Specifies the value used when the received data are out of the legitimate range of values. For M2020, the value should be 0.0 for most IDS-generated products, with the exception of Surface Roughness RDRs. For SOAS-generated products, the value may be different.	**Type** float or float array **Units** n/a **Location** IMAGE (Object) **X-path** TBD **Reference** TBD	**Type** n/a
Ops Keyword INVERSE_LUT_FILE_NAME **Archive Attribute** M2020:INVERSE_LUT_FILE_NAME **Definition** Specifies the name of the inverse-lookup-table file used in generating the RDR. NOTE: This keyword only applies if SAMPLE_BIT_MODE_ID in Group INSTRUMENT_STATE_PARMS starts with "LUT", i.e. if an inverse lookup table file was used.	**Valid Values** "N/A" **Type** string **Units** n/a **Location** DERIVED_IMAGE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword LABEL_RECORDS **Archive Attribute** TBD **Definition** Specifies the number of physical file records that contain only (ODL or PDS) label information. The number of data records in a file is determined by subtracting the value of label_records from the value of file_records. NOTE: In the PDS, the use of label_records along with other file-related data elements is fully described in the Standards Reference.	**Valid Values** "0" to n **Type** string array **Units** n/a **Location** FILE (Class) **X-path** TBD **Reference** TBD	**Mode** Calculation: - Based on size of PDS label **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword LINEARIZATION_MODE **Archive Attribute** TBD **Definition**	**Valid Values** • 1st Element in Array "NOMINAL", "ACTUAL", "NONE" • 2nd Element in Array "MIN", "MAX", "LINEAR", "NONE"	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Specifies the way in which an image has been linearized (see GEOMETRY_PROJECTION_TYPE). It can contain one or two values. The first value specifies what kind of stereo partner was used to linearize the image (the process requires two camera models). A value of "NOMINAL" means that it was linearized using the nominal stereo partner at the same pointing (whether or not the partner image was actually acquired). "ACTUAL" means it was linearized using an actual stereo partner image, which may be at a different pointing or rover location (e.g. long-baseline or re-pointed stereo). The product ID of the actual partner used will be in STEREO_PRODUCT_ID. A value of NONE, means that linearization has not been performed. If the value is not present and linearization is on, "NOMINAL" should be assumed. The second value specifies how the linearized camera model's field of view (FOV) was constructed (corresponding to the "cahv_fov" parameter in MIPL software; see [Ref 27]). "MIN" indicates the FOV is the intersection of the two cameras, which means some data are cut off and typically stretched horizontally, but there are no black areas. "MAX" indicates the FOV is the union of the two cameras, which preserves the edges of the images but typically compresses the image horizontally, and creates black areas. "LINEAR" uses only the CAHV vectors, which tends to preserve the aspect ratio and scale of the original but both cuts off data and has black areas. "NONE" means no linearization. If the value is not present and linearization is on, "MIN" should be assumed.	**Type** string array(2) **Units** n/a **Location** DERIVED_IMAGE_PARMS (Group) **X-path** TBD **Reference** TBD	**Type** n/a
Ops Keyword LINEARIZATION_PRODUCT_ID **Archive Attribute** TBD **Definition** Specifies the PRODUCT_ID for the stereo partner used to linearize the image when LINEARIZATION_MODE is "ACTUAL". This keyword may be absent if the mode is not "ACTUAL".	**Valid Values** n/a **Type** string **Units** n/a **Location** DERIVED_IMAGE_PARMS (Group)	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword LINES **Archive Attribute** TBD **Definition** Specifies the total number of data instances along the vertical axis of an image. NOTE: In PDS label convention, the number of lines is stored in a 32-bit integer field. The minimum value of 0 indicates no data received.	**Valid Values** n/a **Type** integer **Units** n/a **Location** • Eng. Cameras a. IMAGE (Object)	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** **Surface** • Eng. Cameras a. "<IDPH DPO>:idph:rows" b. "<IDPH DPO>:idph:params:sub_rows" c. "<IDPH DPO>:idph:params:thumb_rows" • SuperCam

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	b. SUBFRAME_REQUEST_PARMS (Group) c. THUMBNAIL_REQUEST_PARMS (Group) • SuperCam a. MINI_HEADER (Group) b. SUBFRAME_REQUEST_PARMS (Group) • MCZ a. SUBFRAME_REQUEST_PARMS (Group) b. MINI-HEADER (Group) • Skycam SUBFRAME_REQUEST_PARMS **X-path** TBD **Reference** TBD	a. "SCAM_Image_DPO_Mini_Header[7]", "SCAM_Image_DPO_Mini_Header[8]" b. "<Ancillary DPO>:cmd_arguments:c_height" • MCZ Cameras • SHERLOC Cameras a. "<Ancillary DPO>:cmd_arguments_image: window_height" b. "MMM_Image_Mini_Header[23]" • Skycam "<MEDA Image Header>:num_rows_lowbyte_data" + "<MEDA Image Header>:num_rows_highbyte_data" **Cruise** • Eng. Cameras (C) a. 960+("<IDPH DPO>:idph:rows"- 960) b. 960+("<IDPH DPO>:idph:params:sub_rows"-960) c. 960+("<IDPH DPO>:idph:params:thumb_rows"-960) **Type** • Eng. Cameras • SuperCam • MCZ U16 • Skycam U8
Ops Keyword LINE_CAMERA_MODEL_OFFSET **Archive Attribute** TBD **Definition** Specifies the location of the image origin with respect to the camera model's origin. For CAHV/CAHVOR models, this origin is not the center of the camera, but is the upper-left corner of the "standard"-size image, which is encoded in the CAHV vectors. (MIPL Projection - Perspective)	**Valid Values** n/a **Type** float **Units** pixel (<pixel> unit tag required) **Location** SURFACE_PROJECTION_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword LINE_PROJECTION_OFFSET **Archive Attribute** TBD **Definition**	**Valid Values** n/a **Type** float **Units**	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type**

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Specifies the line coordinate of the location in the image of the "special" point of the mosaic. For Polar projections, this is the nadir of the polar projection. For Vertical, Orthographic and Orthorectified projections, this is the origin of the projected coordinate system (corresponding to PROJECTION_ORIGIN_VECTOR), and may be off the image.	pixel (<pixel> unit tag required) **Location** SURFACE_PROJECTION_PARMS (Group) **X-path** TBD **Reference** TBD	n/a
Ops Keyword LINE_SAMPLES **Archive Attribute** TBD **Definition** Specifies the total number of data instances along the horizontal axis of an image.	**Valid Values** "1" to "5120" **Type** integer **Units** n/a **Location** • Eng. Cameras 1) a. IMAGE (Object) b. SUBFRAME_REQUEST_PARMS (Group) c. THUMBNAIL_REQUEST_PARMS (Group) • SuperCam SUBFRAME_REQUEST_PARMS (Group) THUMBNAIL_REQUEST_PARMS (Group) • MCZ a. SUBFRAME_REQUEST_PARMS (Group) b. MINI-HEADER (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:|<element>|:|<element>|:<field>"** **Surface** • Eng. Cameras a. "<IDPH DPO>:idph:cols" b. "<IDPH DPO>:idph:params:sub_cols" c. "<IDPH DPO>:idph:params:thumb_cols" • SuperCam "<Ancillary DPO>:cmd_arguments:r_height" • MCZ Cameras • SHERLOC Cameras a. "<Ancillary DPO>:cmd_arguments_image: window_width" b. "MMM_Image_Mini_Header[22]" • Skycam Static 1024 **Cruise** • Eng. Cameras a. 1280 + ("<IDPH DPO>:idph:cols" - 1280) b. 1280 + ("<IDPH DPO>:idph:params:sub_cols" - 1280) c. 1280 + ("<IDPH DPO>:idph:params:thumb_cols" - 1280) **Type** U16
Ops Keyword LOCAL_MEAN_SOLAR_TIME **Archive Attribute** TBD **Definition** Specifies the Local Mean Solar Time, or LMST. It is one of two types of solar time used to express the time of day at a point on the surface of a planetary body. The desire to work with solar days, hours, minutes, and seconds of uniform length led to the concept of the fictitious mean Sun or FMS. The FMS is defined as a point that moves	**Valid Values** Sol-<nnnnn>M<hh>:<mm>:<ss>[.<fff>] NOTE: Value will be uncalibrated if SPICE kernels are unavailable. **Type** string(30) **Units** n/a **Location** IDENTIFICATION (Class)	**Mode** 1) a. Calculation: - SCLK Kernel - Landing Site Kernel - P Kernel b. DPO in XML format (referenced to APID Name in Appendix A) 2) a. Image DPO mini-header, Calculation: - SCLK Kernel - Landing Site Kernel - P Kernel b. DPO in XML format (referenced to APID Name in Appendix A)

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
on the celestial equator of a planetary body at a constant rate that represents the average mean motion of the Sun over a planetary year. Local mean solar time is defined, by analogy with Local True Solar Time (LTST), as the difference between the areocentric right ascensions of a point on the surface and of the FMS. The difference between LTST and LMST varies over time. The length of a mean solar day is constant and can be computed from the mean motion of the FMS and the rotation rate of a planet. The mean solar day is also called a 'Sol'. Mean solar hours, minutes, and seconds are defined in the same way as the true solar units. For M2020, the valid value is embedded with a Sol value that can be different than the Sol (see PLANET_DAY_NUMBER) associated with LTST (see LOCAL_TRUE_SOLAR_TIME). The time portion of the valid value is expressed in terms of a 24-hour clock. So, in an example using Sol 27, the valid value range for the 24-hour clock would be represented as "Sol-00027M00:00:00.000" to "Sol-00027M23:59:59.999".	**X-path** TBD **Reference** TBD	**Field as "<xml name>:[<element>]:[<element>]:<field>"** Eng. Cameras b. "<IDPH DPO>:idph:sclk_seconds", "<IDPH DPO>:idph:sclk_subseconds" MCZ Cameras (S6) SHERLOC Cameras (S6) a. "MMM_Image_Mini_Header[8]", "MMM_Image_Mini_Header[9]", "MMM_Image_Mini_Header[10]", "MMM_Image_Mini_Header[11]", "MMM_Image_Mini_Header[52] b. "<IDPH DPO>:idph:system:sclk_sec" "<IDPH DPO>:idph:system:sclk_subsec c. "<Ancillary DPO>:sclk:seconds" "<Ancillary DPO>:sclk:subseconds" Skycam "<MEDA Image Header>:time_tag" MCZ Cameras (C4, S5.2) SHERLOC Cameras (C4, S5.2) a. "MMM_Image_Mini_Header[8]", "MMM_Image_Mini_Header[9]", "MMM_Image_Mini_Header[10]", "MMM_Image_Mini_Header[11]" b. "<IDPH DPO>:cidph:sclk:seconds" c. "<Ancillary DPO>:sclk:seconds" NOTES: • For MCZ recovered data products, value is comprised of 5 bytes bytes coming from Image DPO mini-header at byte offsets 8, 9, 10, 11 (seconds) and 52 (subseconds) per case "2a". • For MCZ non-recovered data products, if IDPH is present, value comes from IDPH DPO per case "2b". • For MCZ non-recovered data products, if IDPH is not present, value comes from Ancillary DPO per case "2c". **Type** U32
Ops Keyword LOCAL_TRUE_SOLAR_TIME **Archive Attribute** TBD **Definition** Specifies the local true solar time, or LTST. It is one of two types of solar time used to express the time of day at a point on the surface of a planetary body. LTST is measured relative to the true position of the Sun as seen from a point on the planet's surface. The coordinate system used to define LTST has its origin at the center of the planet. Its Z-axis is the north pole vector (or spin axis) of the planet. The X-axis is chosen to point in the direction of the vernal equinox of the planet's orbit. (The	**Valid Values** <hh>:<mm>:<ss>[.<fff>] NOTE: Value will be uncalibrated if SPICE kernels unavailable. **Type** string(12) **Units** n/a **Location** IDENTIFICATION (Class) **X-path** TBD	**Mode** 1) a. Calculation: - SCLK Kernel - Landing Site Kernel - P Kernel b. DPO in XML format (referenced to APID Name in Appendix A) 2) a. Image DPO mini-header, Calculation: - SCLK Kernel - Landing Site Kernel - P Kernel b. DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** Eng. Cameras b. "<IDPH DPO>:idph:sclk_seconds",

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
vernal or autumnal equinox vectors are found by searching the planetary ephemeris for those times when the vector from the planet's center to the Sun is perpendicular to the planet's north pole vector. The vernal equinox is the time when the Sun appears to rise above the planet's equator.) Positions of points in this frame can be expressed as a radius and areocentric 'right ascension' and 'declination' angles. The areocentric right ascension angle, or ARA, is measured positive eastward in the equatorial plane from the vernal equinox vector to the intersection of the meridian containing the point with the equator. Similarly, the areocentric declination is the angle between the equatorial plane and the vector to the point. LTST is a function of the difference between the ARAs of the vectors to the Sun and to the point on the planet's surface. Specifically, LTST = (a(P) - a(TS)) * (24 / 360) + 12 where, LTST = the local true solar time in true solar hours a(P) = ARA of the point on the planet's surface in deg a(TS) = ARA of the true sun in deg The conversion factor of 24/360 is applied to transform the angular measure in decimal degrees into hours-minutes-seconds of arc. This standard representation divides 360 degrees into 24 hours, each hour into 60 minutes, and each minute into 60 seconds of arc. The hours, minutes, and seconds of arc are called 'true solar' hours, minutes, and seconds when used to measure LTST. The constant offset of 12 hours is added to the difference in ARAs to place local noon (12:00:00 in hours, minutes, seconds) at the point where the Sun is directly overhead; at this time, the ARA of the true sun is the same as that of the surface point so that a(P) - a(TS) = 0. The use of 'true solar' time units can be extended to define a true solar day as 24 true solar hours. Due to the eccentricity of planetary orbits and the inclination of orbital planes to equatorial planes (obliquity), the Sun does not move at a uniform rate over the course of a planetary year. Consequently, the number of SI seconds in a true solar day, hour, minute or second is not constant. For M2020, the valid value is expressed in terms of a 24-hour clock, so the acceptable range is “00:00:00.000” to “23:59:59.999”. See also LOCAL_MEAN_SOLAR_TIME and PLANET_DAY_NUMBER.	**Reference** TBD	“<IDPH DPO>:idph:sclk_subseconds” MCZ Cameras (S6) SHERLOC Cameras (S6) a. “MMM_Image_Mini_Header[8]”, “MMM_Image_Mini_Header[9]”, “MMM_Image_Mini_Header[10]”, “MMM_Image_Mini_Header[11]”, “MMM_Image_Mini_Header[52] b. “<IDPH DPO>:idph:system:sclk_sec”, “<IDPH DPO>:idph:system:sclk_subsec” c. “<Ancillary DPO>:sclk:seconds”, “<Ancillary DPO>:sclk:subseconds Skycam “<MEDA Image Header>:time_tag” MCZ Cameras (C4, S5.2) SHERLOC Cameras (C4, S5.2) a. “MMM_Image_Mini_Header[8]”, “MMM_Image_Mini_Header[9]”, “MMM_Image_Mini_Header[10]”, “MMM_Image_Mini_Header[11]” b. “<IDPH DPO>:cidph:sclk:seconds” c. “<Ancillary DPO>:sclk:seconds” NOTES: • For MCZ or SHERLOC recovered or Z-stack data products, value is comprised of five bytes coming from Image DPO mini-header at byte offsets 8, 9, 10, 11 (seconds), and 52 (subseconds) per case “2a”. • For MMM non-recovered and non-Z-stack data products, if IDPH is present, value comes from IDPH DPO per case “2b”. • For MMM non-recovered and non-Z-stack data products, if IDPH is not present, value comes from Ancillary DPO per case “2c”. **Type** U32
Ops Keyword LOCAL_TRUE_SOLAR_TIME_SOL **Archive Attribute** TBD	**Valid Values** Mission Phase: Cruise — Values: less than or equal to 0 Mission Phase: Surface — Values: “0” to n	**Mode** • Calculation: - SCLK Kernel - Landing Site Kernel - P Kernel

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Definition Specifies the number of solar days elapsed since a reference day (e.g., the day on which a landing vehicle set down) for local true solar time (LTST). Days are measured in rotations of the planet in question from midnight to midnight. For M2020, the reference day is "0", as Landing day is Sol 0. If before Landing day, then value will be less than or equal to "0" and can be negetive. NOTE: Value will be uncalibrated if SPICE kernels are unavailable. See also LOCAL_TRUE_SOLAR_TIME and PLANET_DAY_NUMBER.	**Type** integer **Units** n/a **Location** IDENTIFICATION (Class) **X-path** TBD **Reference** TBD	• DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** 1) Eng. Cameras "<IDPH DPO>:idph:sclk_seconds", "<IDPH DPO>:idph:sclk_subseconds" 2) MCZ Cameras SHERLOC Cameras a. "MMM_Image_Mini_Header[8]", "MMM_Image_Mini_Header[9]", "MMM_Image_Mini_Header[10]", "MMM_Image_Mini_Header[11]", "MMM_Image_Mini_Header[52] b. "<IDPH DPO>:system:sclk_sec", "<IDPH DPO>:system:sclk_subsec" c. "<Ancillary DPO>:sclk:seconds", "<Ancillary DPO>:sclk:subseconds" 3) Skycam "<MEDA Image Header>:time_tag" **Type** U32 NOTES: • For MMM recovered or Z-stack data products, value is comprised of five bytes coming from Image DPO mini-header at byte offsets 8, 9, 10, 11 (seconds), and 52 (subseconds) per case "2a". • For MMM non-recovered and non-Z-stack data products, if IDPH is present, value comes from IDPH DPO per case "2b". • For MMM non-recovered and non-Z-stack data products, if IDPH is not present, value comes from Ancillary DPO per case "2c".
Ops Keyword MAGIC_NUMBERS **Archive Attribute** none **Definition** Specifies constant numbers that should be in a data product to confirm the product is being decoded properly. For MCZ and SHERLOC, this is the "magic0" and "magic1" fields of the Mini-header, in Hex format.	**Valid Values** n/a **Type** string **Units** n/a **Location** MINI_HEADER (Group) **X-path** TBD **Reference** TBD	**Mode** Image DPO mini-header **Field as "<xml name>:[<element>]:[<element>]:<field>"** MCZ Cameras SHERLOC Cameras "MMM_Image_Mini_Header[**4**]" "MMM_Image_Mini_Header[**5**]", "MMM_Image_Mini_Header[**6**]", "MMM_Image_Mini_Header[**7**]" "MMM_Image_Mini_Header[**60**]" "MMM_Image_Mini_Header[**61**]" "MMM_Image_Mini_Header[**62**]" "MMM_Image_Mini_Header[**63**]" **Type** n/a NOTES:

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
		Magic0 is comprised of four bytes coming from the Image DPO mini-header at byte offsets 4, 5, 6, and 7. Magic1 is comprised of four bytes coming from the Image DPO mini-header at byte offsets 60, 61, 62, and 63.
Ops Keyword MAP_PROJECTION_TYPE **Archive Attribute** TBD **Definition** Specifies the type of projection characteristic of a given map. When in a SURFACE_PROJECTION group, defines the surface-based map projection used in the image.	**Valid Values** "CYLINDRICAL", "VERTICAL", "PERSPECTIVE", "POLAR", "ORTHOGRAPHIC", "ORTHORECTIFIED", "CYLINDRICAL-PERSPECTIVE" **Type** string **Units** n/a **Location** SURFACE_PROJECTION_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword MAP_RESOLUTION **Archive Attribute** TBD **Definition** Specifies the scale of a given map. Please refer to the definition for MAP_SCALE for a more complete definition. When in a SURFACE_PROJECTION group, defines the resolution of the map in pixels/degree. For Cylindrical projections, this is constant throughout. For Polar, this is for the Elevation (radial) direction only. For Perspective and Cylindrical-Perspective, this is at the center of the output camera model. Not applicable to Orthographic, Orthorectified and Vertical projections. NOTE: MAP_RESOLUTION and MAP_SCALE both define The scale of a map except that they are expressed in different units: MAP_RESOLUTION is in pixels/deg and MAP_SCALE is in meters/pixel. If two values are present, the first measures in the line direction while the second measures in the sample direction.	**Valid Values** n/a **Type** float array[2] **Units** pixels/deg (<pix/deg> unit tag required) **Location** SURFACE_PROJECTION_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword MAP_SCALE **Archive Attribute** TBD	**Valid Values** n/a **Type** float array[2]	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Definition Specifies the scale of a given map. The scale is defined as the ratio of the actual distance between two points on the surface of the target body to the distance between the corresponding points on the map. MAP_SCALE references the scale of a map at a certain reference point or line. Certain map projections vary in scale throughout the map. When in a SURFACE_PROJECTION group, defines the scale of the map in meters/pixel. Applicable to Vertical, Orthographic and Orthorectified projections only. NOTE: MAP_RESOLUTION and MAP_SCALE both define the scale of a map except that they are expressed in different units: MAP_RESOLUTION is in pixels/deg and MAP_SCALE is in meters/pixel. If two values are present, the first measures in the line direction while the second measures in the sample direction.	**Units** m/pixel (<m/pixel> unit tag required) **Location** SURFACE_PROJECTION_PARMS (Group) **X-path** TBD **Reference** TBD	**Type** n/a
Ops Keyword MARKER_PAD **Archive Attribute** TBD **Definition** Static value used by the Body Unit (BU).	**Valid Values** "0xFDD2" **Type** string **Units** n/a **Location** SCAM_MINI_HEADER (GROUP) **X-path** TBD **Reference** TBD	SCAM Image DPO mini-header **Field as "<xml name>:[<element>]:[<element>]:<field>"** "SCAM_Image_Mini_Header:marker_pad" **Type** U16 Notes: For SCAM RMI products, "marker pad" is comprised of two bytes coming from the Image DPO mini-header at offset 178.
Ops Keyword MARS_YEAR **Archive Attribute** TBD **Definition** The Mars Year is defined using the solar longitude range 0°-360° and April 11, 1955 (Ls=0°) as the beginning of year 1. This is an arbitrary convention to correspond with the year of a global dust storm widely observed in 1956.	**Valid Values** 35+ **Type** integer **Units** n/a **Location** IDENTIFICATION (Group)	Note: Currently defined only for SCAM

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	X-path TBD **Reference** TBD	
Ops Keyword MARS_HELIOCENTRIC_DISTANCE **Archive Attribute** TBD **Definition** Distance to the Sun. Note: uses SPICE routine SPKPOS to gen position of Mars as seen from Sun in the J2000 frame without aberration corrections. The magnitude of the output vector is the value reported.	**Valid Values** 35+ **Type** float **Units** km **Location** IDENTIFICATION (Group) **X-path** TBD **Reference** TBD	Note: Currently defined only for SCAM
Ops Keyword MASK_DESC_FILE_NAME **Archive Attribute** TBD **Definition** Specifies the name of a file or files containing the parameters used to create a binary mask file that, when applied to another image file, prevents specific areas in the image from being processed. For products generated by MIPL, these files are XML formatted and describe each of the mask components. They are serviceable to program "marsfilter". For products generated by other teams, different formats and methods may apply. See also HORIZON_MASK_ELEVATION.	**Valid Values** n/a **Type** string **Units** n/a **Location** DERIVED_IMAGE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword MAXIMUM **Archive Attribute** TBD **Definition** Specifies the largest value occurring in a given instance of the data object. Note that for PDS applications -- because of the unconventional data type of this data element, the element should appear in labels only within an explicit	**Valid Values** n/a **Type** float **Units** n/a **Location** IMAGE (Object)	**Mode** Calculation **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
object, i.e., anywhere between an 'OBJECT =' and an 'END_OBJECT'.	**X-path** TBD **Reference** TBD	
Ops Keyword MAXIMUM_ELEVATION **Archive Attribute** TBD **Definition** Specifies the elevation (as defined by the coordinate system) of the first line of the image. For the Polar projection, specifies the highest elevation used, i.e. the elevation of the outermost circle of pixels. Applies to MIPL projections Cylindrical, Polar, Sinusoidal, Perspective and Cylindrical-Perspective.	**Valid Values** n/a **Type** float **Units** deg (<deg> unit tag required) **Location** SURFACE_PROJECTION_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword MAX_AUTO_EXPOS_ITERATION_COUNT **Archive Attribute** TBD **Definition** Specifies the maximum number of exposure iterations the instrument will perform in order to obtain the requested exposure when operating in an autonomous mode.	**Valid Values** • Eng. Cameras (B) • MCZ (B) "0" to "10" **Type** unsigned integer **Units** n/a **Location** • Eng. Cameras OBSERVATION_REQUEST_PARMS (Group) • MCZ • SHERLOC a. OBSERVATION_REQUEST_PARMS (Group) b. MINI-HEADER (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** 1) Eng. Cameras "<IDPH DPO>:idph:params:exp_auto_iter" 2) MCZ Cameras SHERLOC Cameras a. "<Ancillary DPO>:cmd_arguments_image: exp_n_iterations" b. "MMM_Image_Mini_Header[31]" **Type** U8
Ops Keyword MEAN **Archive Attribute** TBD **Definition** Specifies the average of the DN values in the image array.	**Valid Values** n/a **Type** float **Units** n/a	**Mode** Calculation **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	Location IMAGE (Object) **X-path** TBD **Reference** TBD	
Ops Keyword MEDIAN **Archive Attribute** TBD **Definition** Specifies the median value (middle value) occurring in a given instance of the data object. Because of the unconventional data type of this data element, the element should appear in labels only within an explicit object, i.e., anywhere between an 'OBJECT =' and an 'END OBJECT'.	**Valid Values** n/a **Type** float **Units** n/a **Location** IMAGE (Object) **X-path** TBD **Reference** TBD	**Mode** Calculation **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword MEMORY_BANK **Archive Attribute** TBD **Definition** For SuperCam RMI this specifies the Mast Unit (MU) memory bank used to hold image before transfer to RCE. There are 64 memory banks in the MU.	**Valid Values** "0" to "63" **Type** integer **Units** n/a **Location** SCAM_MINI_HEADER (Group) **X-path** TBD **Reference** TBD	SCAM Image DPO mini-header **Field as "<xml name>:[<element>]:[<element>]:<field>"** "SCAM_Image_Mini_Header:memory_bank" **Type** U8 Notes: For SCAM RMI products, "memory bank" is comprised of one byte coming from the Image DPO mini-header at offset 12.
Ops Keyword MILLISECOND_COUNT **Archive Attribute** TBD **Definition** Millisecond count from RCE time sync when image received from mast unit.	**Valid Values** **Type** integer **Units** seconds **Location** SCAM_MINI_HEADER (Group)	SCAM Image DPO mini-header **Field as "<xml name>:[<element>]:[<element>]:<field>"** "SCAM_Image_Mini_Header[millisec_count]" **Type** U32 Notes: For SCAM RMI products, "millisecond count" is comprised of 4 bytes

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	X-path TBD **Reference** TBD	coming from the Image DPO mini-header at offset 184.
Ops Keyword MINIMUM **Archive Attribute** TBD **Definition** Specifies the smallest value occurring in a given instance of the data object. Note that for PDS applications -- because of the unconventional data type of this data element, the element should appear in labels only within an explicit object, i.e., anywhere between an 'OBJECT =' and an 'END_OBJECT'.	**Valid Values** n/a **Type** float **Units** n/a **Location** IMAGE (Object) **X-path** TBD **Reference** TBD	**Mode** Calculation **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword MINIMUM_ELEVATION **Archive Attribute** TBD **Definition** Specifies the elevation (as defined by the coordinate system) of the last line of the image for Cylindrical map projections. Applies to Cylindrical, Perspective and Cylindrical-Perspective projections.	**Valid Values** n/a **Type** float **Units** deg (<deg> unit tag required) **Location** SURFACE_PROJECTION_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** Calculation **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword MISSING_CONSTANT **Archive Attribute** TBD **Definition** Specifies the flag value used in the image to indicate that no science data are available for any given pixel. See the specific product definitions for standard values used for each product.	**Valid Values** • Nominal "0.0" • XYZ "(0.0, 0.0, 0.0)" • Surface Normal (UVW) "(0.0, 0.0, 0.0)" **Type** float or float array **Units** n/a	**Mode** Static Value **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a

Output Metadata (Product Label)		Input Metadata (Source)
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	Location IMAGE (Object) **X-path** TBD **Reference** TBD	
Ops Keyword MISSION_NAME **Archive Attribute** TBD **Definition** Specifies a major planetary mission or project. A given planetary mission may be associated with one or more spacecraft. Note that mosaics may contain more than one value in an array.	**Valid Values** "MARS 2020" **Type** string array **Units** n/a **Location** IDENTIFICATION (Class) **X-path** TBD **Reference** TBD	**Mode** Static Value **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword MISSION_PHASE_NAME **Archive Attribute** TBD **Definition** Specifies the commonly-used identifier of a mission phase.	**Valid Values** "DEVELOPMENT", "LAUNCH", "CRUISE AND APPROACH", "ENTRY DESCENT AND LANDING", "PRIMARY SURFACE MISSION", "EXTENDED SURFACE MISSION", "TEST" **Type** string(30) **Units** n/a **Location** IDENTIFICATION (Class) **X-path** TBD **Reference** TBD	**Mode** User specified parameter value **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword MODEL_COMPONENT_1 **Archive Attribute** TBD **Definition** Specifies a set of values representing the first component of a model. The significance (or meaning) of this array of values is indicated by the first value of the MODEL_COMPONENT_ID and/or	**Valid Values** n/a **Type** float array **Units** n/a **Location** GEOMETRIC_CAMERA_MODEL (Group)	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras (B) "<IDPH DPO>:idph:cmod_c[0]" "<IDPH DPO>:idph:cmod_c[1]" "<IDPH DPO>:idph:cmod_c[2]"

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
MODEL_COMPONENT_NAME elements. The interpretation of the values themselves depends on the model but they commonly represent a vector, a set of polynomial coefficients, or a simple numeric parameter. For example, for a geometric camera model with a value of "CAHV" for MODEL_TYPE, the first value of the MODEL_COMPONENT_NAME data element is CENTER, meaning that the MODEL_COMPONENT_1 is a focal center vector. The three items in this vector provide X, Y, and Z coordinates of the focal point of the camera. The exact details about each model component vector are provided in MODEL_DESC.	**X-path** TBD **Reference** TBD	• SuperCam RMI (S5.2, S6) • MCZ (S6) • SHERLOC (S6) • MEDA SkyCam (S6) "<IDPH DPO>:idph:image:cmod:c[0]" "<IDPH DPO>:idph:image:cmod:c[1]" "<IDPH DPO>:idph:image:cmod:c[2]" • MCZ Cameras (C4, S5.2) "<IDPH DPO>:cidph:camera_model:c[0]", "<IDPH DPO>:cidph:camera_model:c[1]", "<IDPH DPO>:cidph:camera_model:c[2]" **Type** F64[3]
Ops Keyword MODEL_COMPONENT_2 **Archive Attribute** TBD **Definition** Specifies the value of the component of the MODEL_COMPONENT_ID for the second element.	**Valid Values** n/a **Type** float array **Units** n/a **Location** GEOMETRIC_CAMERA_MODEL (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras (B) "<IDPH DPO>:idph:cmod_a[0]" "<IDPH DPO>:idph:cmod_a[1]" "<IDPH DPO>:idph:cmod_a[2]" • SuperCam RMI (S5.2, S6) • MCZ (S6) • SHERLOC (S6) • MEDA SkyCam (S6) "<IDPH DPO>:idph:image:cmod:a[0]" "<IDPH DPO>:idph:image:cmod:a[1]" "<IDPH DPO>:idph:image:cmod:a[2]" • MCZ Cameras (C4, S5.2) "<IDPH DPO>:cidph:camera_model:a[0]", "<IDPH DPO>:cidph:camera_model:a[1]", "<IDPH DPO>:cidph:camera_model:a[2]" **Type** F64[3]
Ops Keyword MODEL_COMPONENT_3 **Archive Attribute** TBD **Definition** Specifies the value of the component of the MODEL_COMPONENT_ID for the third element.	**Valid Values** n/a **Type** float array **Units** n/a **Location** GEOMETRIC_CAMERA_MODEL (Group) **X-path** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras "<IDPH DPO>:idph:cmod_h[0]" "<IDPH DPO>:idph:cmod_h[1]" "<IDPH DPO>:idph:cmod_h[2]" • SuperCam RMI (S5.2, S6) • MCZ (S6) • SHERLOC (S6)

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	Reference TBD	• MEDA SkyCam (S6) "<IDPH DPO>:idph:image:cmod:h[0]" "<IDPH DPO>:idph:image:cmod:h[1]" "<IDPH DPO>:idph:image:cmod:h[2]" • MCZ Cameras (C4, S5.2) "<IDPH DPO>:cidph:camera_model:h[0]", "<IDPH DPO>:cidph:camera_model:h[1]", "<IDPH DPO>:cidph:camera_model:h[2]" **Type** F64[3]
Ops Keyword MODEL_COMPONENT_4 **Archive Attribute** TBD **Definition** Specifies the value of the component of the MODEL_COMPONENT_ID for the fourth element.	**Valid Values** n/a **Type** float array **Units** n/a **Location** GEOMETRIC_CAMERA_MODEL (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras (B) "<IDPH DPO>:idph:cmod_v[0]" "<IDPH DPO>:idph:cmod_v[1]" "<IDPH DPO>:idph:cmod_v[2]" • SuperCam RMI (S5.2, S6) • MCZ (S6) • SHERLOC (S6) • MEDA SkyCam (S6) "<IDPH DPO>:idph:image:cmod:v[0]" "<IDPH DPO>:idph:image:cmod:v[1]" "<IDPH DPO>:idph:image:cmod:v[2]" • MCZ Cameras (C4, S5.2) "<IDPH DPO>:cidph:camera_model:v[0]", "<IDPH DPO>:cidph:camera_model:v[1]", "<IDPH DPO>:cidph:camera_model:v[2]" **Type** F64[3]
Ops Keyword MODEL_COMPONENT_5 **Archive Attribute** TBD **Definition** Specifies the value of the component of the MODEL_COMPONENT_ID for the fifth element.	**Valid Values** n/a **Type** float array **Units** n/a **Location** GEOMETRIC_CAMERA_MODEL (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras "<IDPH DPO>:idph:cmod_o[0]" "<IDPH DPO>:idph:cmod_o[1]". "<IDPH DPO>:idph:cmod_o[2]" • SuperCam RMI (S5.2, S6) • MCZ (S6) • SHERLOC (S6) • MEDA SkyCam (S6) "<IDPH DPO>:idph:image:cmod:o[0]" "<IDPH DPO>:idph:image:cmod:o[1]"

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
		"<IDPH DPO>:idph:image:cmod:o[2]" • MCZ Cameras "<IDPH DPO>:cidph:camera_model:o[0]", "<IDPH DPO>:cidph:camera_model:o[1]", "<IDPH DPO>:cidph:camera_model:o[2]" **Type** F64[3]
Ops Keyword MODEL_COMPONENT_6 **Archive Attribute** TBD **Definition** Specifies the value of the component of the MODEL_COMPONENT_ID for the sixth element.	**Valid Values** n/a **Type** float array **Units** n/a **Location** GEOMETRIC_CAMERA_MODEL (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras (B) "<IDPH DPO>:idph:cmod_r[0]" "<IDPH DPO>:idph:cmod_r[1]" "<IDPH DPO>:idph:cmod_r[2]" • SuperCam RMI (S5.2, S6) • MCZ (S6) • SHERLOC (S6) • MEDA SkyCam (S6) "<IDPH DPO>:idph:image:cmod:r[0]" "<IDPH DPO>:idph:image:cmod:r[1]" "<IDPH DPO>:idph:image:cmod:r[2]" • MCZ Cameras (C4, S5.2) "<IDPH DPO>:cidph:camera_model:r[0]", "<IDPH DPO>:cidph:camera_model:r[1]", "<IDPH DPO>:cidph:camera_model:r[2]" **Type** F64[3]
Ops Keyword MODEL_COMPONENT_7 **Archive Attribute** TBD **Definition** Specifies the value of the component of the MODEL_COMPONENT_ID for the seventh element.	**Valid Values** n/a **Type** float array **Units** n/a **Location** GEOMETRIC_CAMERA_MODEL (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras "<IDPH DPO>:idph:cmod_e[0]" "<IDPH DPO>:idph:cmod_e[1]" "<IDPH DPO>:idph:cmod_e[2]" • SuperCam RMI (S5.2, S6) • MCZ (S6) • SHERLOC (S6) • MEDA SkyCam (S6) "<IDPH DPO>:idph:image:cmod:e[0]" "<IDPH DPO>:idph:image:cmod:e[1]" "<IDPH DPO>:idph:image:cmod:e[2]"

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
		• MCZ Cameras (C4, S5.2) "<IDPH DPO>:cidph:camera_model:e[0]", "<IDPH DPO>:cidph:camera_model:e[1]", "<IDPH DPO>:cidph:camera_model:e[2]" **Type** F64[3]
Ops Keyword MODEL_COMPONENT_8 **Archive Attribute** TBD **Definition** Specifies the value of the component of the MODEL_COMPONENT_ID for the eighth element.	**Valid Values** n/a **Type** float array **Units** n/a **Location** GEOMETRIC_CAMERA_MODEL (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras (B) "<IDPH DPO>:idph:cmod_mtype" • SuperCam RMI (S5.2, S6) • MCZ (S6) • SHERLOC (S6) • MEDA SkyCam (S6) "<IDPH DPO>:idph:image:cmod:mtype" • MCZ Cameras (C4, S5.2) "<IDPH DPO>:cidph:camera_model:mtype" **Type** U8
Ops Keyword MODEL_COMPONENT_9 **Archive Attribute** TBD **Definition** Specifies the value of the component of the MODEL_COMPONENT_ID for the ninth element.	**Valid Values** n/a **Type** float array **Units** n/a **Location** GEOMETRIC_CAMERA_MODEL (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras "<IDPH DPO>:idph:cmod_mparm" • SuperCam RMI (S5.2, S6) • MCZ (S6) • SHERLOC (S6) • MEDA SkyCam (S6) "<IDPH DPO>:idph:image:cmod:mparm" • MCZ Cameras (C4, S5.2) "<IDPH DPO>:cidph:camera_model:mparm" **Type** F64
Ops Keyword MODEL_COMPONENT_ID **Archive Attribute** TBD	**Valid Values** 0 = "NONE" 1 = "(C,A,H,V)" 2 = "(C,A,H,V,O,R)" 3 = "(C,A,H,V,O,R,E,T,P)"	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"**

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Definition Specifies a sequence of identifiers (usually 1 character), where each identifier corresponds to a model component vector. It is used in conjunction with the MODEL_COMPONENT_n elements, where "n" is a number. The first id in the sequence corresponds to MODEL_COMPONENT_1, the second corresponds to MODEL_COMPONENT_2, etc. For example, for a geometric camera model with a value of "CAHV" for MODEL_TYPE, the MODEL_COMPONENT_ID would be (C, A, H, V). Please see the MODEL_COMPONENT_NAME data element for more details.	**Type** string array **Units** n/a **Location** GEOMETRIC_CAMERA_MODEL (Group) **X-path** TBD **Reference** TBD	• Eng. Cameras (B) "<IDPH DPO>:idph:cmod_mclass" • SuperCam RMI (S5.2, S6) • MCZ (S6) • SHERLOC (S6) • MEDA SkyCam (S6) "<IDPH DPO>:idph:image:cmod:mcalss" • MCZ Cameras (C4, S5.2) "<IDPH DPO>:cidph:camera_model:mclass" **Type** Enum
Ops Keyword MODEL_COMPONENT_NAME **Archive Attribute** TBD **Definition** Specifies a sequence of names, where each name identifies its corresponding model component vector. It is used in conjunction with the MODEL_COMPONENT_n elements, where "n" is a number. The first name in the sequence identifies MODEL_COMPONENT_1, the second identifies the MODEL_COMPONENT_2, etc. For example, for a geometric camera model with "CAHV" for MODEL_TYPE, the value for MODEL_COMPONENT_NAME would be (CENTER, AXIS, HORIZONTAL, VERTICAL). The three values of MODEL_COMPONENT_1 would describe the focal center vector; the three values of MODEL_COMPONENT_2 would describe the pointing direction (axis) vector; the three values of MODEL_COMPONENT_3 would describe the horizontal image plane vector, and the three values of the MODEL_COMPONENT_4 would describe the vertical image plane vector.	**Valid Values** 0 = "NONE" 1 = ("CENTER", "AXIS", "HORIZONTAL", "VERTICAL") 2 = ("CENTER", "AXIS", "HORIZONTAL", "VERTICAL", "OPTICAL", "RADIAL") 3 = ("CENTER", "AXIS", "HORIZONTAL", "VERTICAL", "OPTICAL", "RADIAL", "ENTRANCE", "MTYPE", "MPARM") **Type** string array **Units** n/a **Location** GEOMETRIC_CAMERA_MODEL (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras (B) "<IDPH DPO>:idph:cmod_mclass" • SuperCam RMI (S5.2, S6) • MCZ (S6) • SHERLOC (S6) • MEDA SkyCam (S6) "<IDPH DPO>:idph:image:cmod:mcalss" • MCZ Cameras (C4, S5.2) "<IDPH DPO>:cidph:camera_model:mclass" **Type** enum
Ops Keyword ^MODEL_DESC **Archive Attribute** TBD **Definition** Specifies a textual description of a model (or a pointer to a file containing the description). This is not intended to be a brief summary, but rather a detailed description of the model; at minimum, it should include a reference to a detailed description of the model in published literature. While other data elements such as CALIBRATION_SOURCE_ID, SOLUTION_ID, REFERENCE_COORD_SYSTEM_NAME, and	**Valid Values** "GEOMETRIC_CM.TXT" **Type** string **Units** n/a **Location** GEOMETRIC_CAMERA_MODEL (Group) **X-path** TBD **Reference**	**Mode** Static Value **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
MODEL_COMPONENT_NAME provide quick identifiers that distinguish how this model was generated, the details and data behind each of these identifiers should be explicitly included in the model description.	TBD	
Ops Keyword MODEL_TRANSFORM_QUATERNION **Archive Attribute** TBD **Definition** Specifies, along with MODEL_TRANSFORM_VECTOR, the transform used for the camera model in this image. Camera models created by the calibration process have associated with them a pose, comprised of the position (offset) and orientation (quaternion) of the camera at the time it was calibrated. The model is transformed ("pointed") for a specific image by computing, generally using articulation device kinematics, a final pose for the image. The camera model is then translated and rotated from the calibration to final pose. This keyword specifies the quaternion portion of the final pose. See keyword POINTING_MODEL_NAME.	**Valid Values** n/a **Type** float array **Units** n/a **Location** GEOMETRIC_CAMERA_MODEL (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras (B) "<IDPH DPO>:idph:cmod_trans:quaternion[3]", "<IDPH DPO>:idph:cmod_trans:quaternion[0]", "<IDPH DPO>:idph:cmod_trans:quaternion[1]", "<IDPH DPO>:idph:cmod_trans:quaternion[2]" • SuperCam RMI (S5.2, S6) • MCZ Cameras (S6) • SHERLOC (S6) • MEDA SkyCam (S6) "<IDPH DPO>:idph:image:cmod_quat[3]", "<IDPH DPO>:idph:image:cmod_quat[0]", "<IDPH DPO>:idph:image:cmod_quat[1]", "<IDPH DPO>:idph:image:cmod_quat[2]" • MCZ Cameras (C4, S5.2) "<IDPH DPO>:cidph:transform:quaternion[3]", "<IDPH DPO>:cidph:transform:quaternion[0]", "<IDPH DPO>:cidph:transform:quaternion[1]", "<IDPH DPO>:cidph:transform:quaternion[2]" **Type** • Eng. Cameras (B) F64[4] • SuperCam RMI (S5.2, S6) • MCZ Cameras (S6) • SHERLOC (S6) • MEDA SkyCam (S6) F32[4]
Ops Keyword MODEL_TRANSFORM_VECTOR **Archive Attribute** none **Definition** Specifies, along with MODEL_TRANSFORM_QUATERNION, the transform used for the camera model in this image. Camera models created by the calibration process have associated with them a pose, comprised of the position (offset) and orientation (quaternion) of the camera at the time it was calibrated. The model is	**Valid Values** n/a **Type** float array **Units** n/a **Location** GEOMETRIC_CAMERA_MODEL (Group) **X-path** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras (B) "<IDPH DPO>:idph:cmod_trans:position[0]", "<IDPH DPO>:idph:cmod_trans:position[1]", "<IDPH DPO>:idph:cmod_trans:position[2]" • Supercam RMI (S5.2, S6) • MCZ (S6) • SHERLOC (S6) • MEDA SkyCam (S6)

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
transformed ("pointed") for a specific image by computing, generally using articulation device kinematics, a final pose for the image. The camera model is then translated and rotated from the calibration to final pose. This keyword specifies the offset portion of the final pose.	**Reference** TBD	"<IDPH DPO>:idph:image:cmod_pos[0]", "<IDPH DPO>:idph:image:cmod_pos[1]", "<IDPH DPO>:idph:image:cmod_pos[2]" • MCZ Cameras (C4, S5.2) "<IDPH DPO>:cidph:transform:position[0]", "<IDPH DPO>:cidph:transform:position[1]", "<IDPH DPO>:cidph:transform:position[2]" **Type** • Eng. Cameras (B) F64[3] • Supercam RMI (S5.2, S6) • MCZ (S6) • SHERLOC (S6) • MEDA SkyCam (S6) F32[3]
Ops Keyword MODEL_TYPE **Archive Attribute** TBD **Definition** Specifies an identifier for the type or kind of model. The value should be one of a well defined set, providing an application program with sufficient information to know how to handle the rest of the parameters within the model. (CAHVORE is the only one that uses model component vectors 1-9.) For details on the definitions of the valid camera model types, see [Ref 21] through [Ref 27].	**Valid Values** 0 = "NONE" 1 = "CAHV" 2 = "CAHVOR" 3 = "CAHVORE" 4 = "PSPH" **Type** string(63) **Units** n/a **Location** GEOMETRIC_CAMERA_MODEL (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras "<IDPH DPO>:idph:cmod_mclass" • All Other cameras "<IDPH DPO>:cidph:camera_model:mclass" **Type** enum
Ops Keyword ^MOSAIC_DESC **Archive Attribute** TBD **Definition** Specifies a brief textual description of a mosaic.	**Valid Values** n/a **Type** string **Units** n/a **Location** DERIVED_IMAGE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** Static Value **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Ops Keyword NUM_SOFTWARE_KEYWORDS **Archive Attribute** TBD **Definition** Specifies the number of keywords that were supplied to the primary generating software named in SOFTWARE_MODULE_NAME. The Archive Attributes that contain the software keyword names, values and types (if any) will be provided in SOFTWARE_KEYWORD_NAME, SOFTWARE_KEYWORD_TYPE, and SOFTWARE_KEYWORD_VALUE and are required for each software keyword supplied. For M2020, this keyword may be placed in a xxx_HISTORY_PARMS group, where "xxx" is the task name. There may be multiple groups to accommodate multiple software tasks.	**Valid Values** n/a **Type** integer **Units** n/a **Location** <xxx>_HISTORY_PARMS (Group) where, xxx = RDR software name **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:|<element>|:|<element>|:<field>"** n/a **Type** n/a
Ops Keyword NUM_SOFTWARE_PARAMETERS **Archive Attribute** TBD **Definition** Specifies the number of parameters that were supplied to the primary generating software named in SOFTWARE_MODULE_NAME. The Archive Attributes that contain the software parameter names, values and types (if any) will be provided in SOFTWARE_PARAMETER_NAME, SOFTWARE_PARAMETER_TYPE, and SOFTWARE_PARAMETER_VALUE and are required for each software keyword supplied. For M2020, this keyword may be placed in a xxx_HISTORY_PARMS group, where "xxx" is the task name. There may be multiple groups to accommodate multiple software tasks.	**Valid Values** n/a **Type** integer **Units** n/a **Location** <xxx>_HISTORY_PARMS (Group) where, xxx = RDR software name **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:|<element>|:|<element>|:<field>"** n/a **Type** n/a
Ops Keyword NUM_IMAGES_TRANSMITTED **Archive Attribute** TBD **Definition** For M2020 SuperCam RMI it is the number of images transmitted to the RCE.	**Valid Values** n/a **Type** integer **Units** n/a **Location** MINI_HEADER_GROUP **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:|<element>|:|<element>|:<field>"** <SCAM Image DPO Mini Header>:nv_image_counter **Type** U32 Notes: For SCAM RMI products, "num images transmitted" is comprised of 4 bytes coming from the Image DPO mini-header at byte offset 188 - 191.

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Ops Keyword OBSERVATION_ID **Archive Attribute** TBD **Definition** Specifies a unique identifier for a scientific observation within a data set. It is set via the data product context ID - which doesn't necessarily map to a specific object - it's just used to group various instrument data sets together via a common keyword.	**Valid Values** "UNK" **Type** string **Units** n/a **Location** IDENTIFICATION (Class) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword OBSERVATION_NUMBER **Archive Attribute** TBD **Definition** Identifies which observation of many this data product pertains to. For Supercam on 2020, refers to the number of the point in a raster activity.	**Valid Values** "0 to " 99" **Type** integer **Units** n/a **Location** OBSERVATION_REQUEST_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** • SuperCam (S) <Ancillary DPO>:cmd_arguments:point_number **Type** U8 Notes:
Ops Keyword ODL_VERSION_ID **Archive Attribute** TBD **Definition** Specifies the version number of the PDS standards document used for an ODL format file. ODL3 files conform to the PDS3 standards document structurally and syntactically, the only difference being that keywords do not necessarily need to be defined in a PDS Data Dictionary Examples: ODL3	**Valid Values** "ODL<*version*>" **Type** string[6] **Units** n/a **Location** IDENTIFICATION (Class) **X-path** TBD **Reference** TBD	**Mode** PDS **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword ORIGIN_OFFSET_VECTOR	**Valid Values** n/a	**Mode**

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Archive Attribute TBD **Definition** Specifies the offset from the reference coordinate system's origin to the origin of the coordinate system being defined by the enclosing COORDINATE_SYSTEM group. In other words, it is the location of the current system's origin as measured in the reference system. For M2020, here is an example: In the case of the RSM_COORDINATE_SYSTEM group, ORIGIN_OFFSET_VECTOR describes the rotation of the RSM (camera head) boresight (about the ORIGIN_OFFSET_VECTOR) relative to the Rover frame.	**Type** float array[3] **Units** meters **Location** • For EDRs … 1) SITE_COORDINATE_SYSTEM (Group) 2) ROVER_COORDINATE_SYSTEM (Group) 3) RSM_COORDINATE_SYSTEM (Group) 4) ARM_COORDINATE_SYSTEM (Group) 5) TURRET_COORDINATE_SYSTEM (Group) 6) INITIAL_STATE_PARMS (Group) 7) TOOL_COORDINATE_SYSTEM (Group) 8) PIXL_SENSOR_COORDINATE_SYSTEM(Group) **X-path** TBD **Reference** TBD	• DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:|<element>|:|<element>|:<field>"** **Surface** • Eng. Cameras (S) 1) "<IDPH DPO:idph:site_p[0]" "<IDPH DPO:idph:site_p[1]" "<IDPH DPO:idph:site_p[2]" 2) "<IDPH DPO>:idph:rvr_p[0]" "<IDPH DPO>:idph:rvr_p[1]" "<IDPH DPO>:idph:rvr_p[2]" 3) "<IDPH DPO>:idph:rsm_p[0]" "<IDPH DPO>:idph:rsm_p[1]" "<IDPH DPO>:idph:rsm_p[2]" 4) "<IDPH DPO>:idph:arm:tool_pos[0]" "<IDPH DPO>:idph:arm:tool_pos[1]" "<IDPH DPO>:idph:arm:tool_pos[2]" 5) "<IDPH DPO>:idph:arm:turret_pos[0]" "<IDPH DPO>:idph:arm:turret_pos[1]" "<IDPH DPO>:idph:arm:turret_pos[2]" 6) "<IDPH DPO>:idph:rvr_p0[0]" "<IDPH DPO>:idph:rvr_p0[1]" "<IDPH DPO>:idph:rvr_p0[2]" 7) "<IDPH DPO>:idph:arm:tool_pos[0]" "<IDPH DPO>:idph:arm:tool_pos[1]" "<IDPH DPO>:idph:arm:tool_pos[2]" • SuperCam (S) • MCZ (S) • SHERLOC (S) • MEDA SkyCam (S) • PIXL (S) 2) "<IDPH DPO>:idph:system:sapp_p[0]" "<IDPH DPO>:idph:system:sapp_p[1]" "<IDPH DPO>:idph:system:sapp_p[2]" 3) "<IDPH DPO>:idph:rsm:p[0]" "<IDPH DPO>:idph:rsm:p[1]" "<IDPH DPO>:idph:rsm:p[2]" 4) "<IDPH DPO>:idph:arm:tool_pos[0]" "<IDPH DPO>:idph:arm:tool_pos[1]" "<IDPH DPO>:idph:arm:tool_pos[2]" 5) "<IDPH DPO>:idph:arm:turret_pos[0]" "<IDPH DPO>:idph:arm:turret_pos[1]" "<IDPH DPO>:idph:arm:turret_pos[2]" 7) "<IDPH DPO>:idph:arm:tool_pos[0]" "<IDPH DPO>:idph:arm:tool_pos[1]" "<IDPH DPO>:idph:arm:tool_pos[2]" **Cruise** • MCZ (C) 2) "<IDPH DPO>:cidph:rvr:position[3]", 3) "<IDPH DPO>:cidph:rsm_state:position[3]", **Type**

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
		F32[3]
Ops Keyword ORIGIN_ROTATION_QUATERNION **Archive Attribute** TBD **Definition** Specifies an array of four values that specifies the rotation of the coordinate system being defined by the enclosing COORDINATE_SYSTEM group, relative to the reference system. Mathematically this can be expressed as follows: Given a vector expressed in the current frame, multiplication by this quaternion will give the same vector as expressed in the reference frame. Quaternions are expressed as a set of four numbers in the order: (s, v1, v2, v3) where, s = cos(theta/2) v(n) = sin(theta/2)*a(n). theta = the angle of rotation a = (x,y,z) vector around which rotation occurs Note that quaternions have different component order conventions between flight and ground software. They are received in the order "(v1, v2, v3, s)". However, the ground order convention is "(s, v1, v2, v3)", and all values are converted to the ground order before being stored in the label. For M2020, the value for ORIGIN_ROTATION_QUATERNION that defines a coordinate frame like Rover frame is computed with respect to only the orientations of the frame's axes… regardless of whether POSITIVE_ELEVATION_DIRECTION is declared to be "UP" or "DOWN". For M2020, here is an example: In the case of the RSM_COORDINATE_SYSTEM group, ORIGIN_ROTATION_QUATERNION describes the rotation of the RSM (camera head on Mast) boresight (about the ORIGIN_OFFSET_VECTOR) relative to the Rover frame.	**Valid Values** n/a **Type** float array[4] **Units** meters **Location** • EDRs a. SITE_COORDINATE_SYSTEM (Group) b. ROVER_COORDINATE_SYSTEM (Group) c. RSM_COORDINATE_SYSTEM (Group) d. ARM_COORDINATE_SYSTEM (Group) e. INITIAL_STATE_PARMS (Group) f. TURRET_COORDINATE_SYSTEM (Group) g. TOOL_COORDINATE_SYSTSEM (Group) h. PIXL_SENSOR_COORDINATE_SYSTEM(Group) **X-path** TBD **Reference** TBD	**Mode** • DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** **Surface** • Eng. Cameras (S) a. "<IDPH DPO>:idph:site_q[3]" "<IDPH DPO>:idph:site_q[0]" "<IDPH DPO>:idph:site_q[1]" "<IDPH DPO>:idph:site_q[2]" b. "<IDPH DPO>:idph:rvr_q[3]" "<IDPH DPO>:idph:rvr_q[0]" "<IDPH DPO>:idph:rvr_q[1]" "<IDPH DPO>:idph:rvr_q[2]" c. "<IDPH DPO>:idph:rsm_q[3]" "<IDPH DPO>:idph:rsm_q[0]" "<IDPH DPO>:idph:rsm_q[1]" "<IDPH DPO>:idph:rsm_q[2]" d. "<IDPH DPO>:idph:arm:tool_quat[3]" "<IDPH DPO>:idph:arm:tool_quat[0]" "<IDPH DPO>:idph:arm:tool_quat[1]" "<IDPH DPO>:idph:arm:tool_quat[2]" e. "<IDPH DPO>:idph:rvr_q0[3]" "<IDPH DPO>:idph:rvr_q0[0]" "<IDPH DPO>:idph:rvr_q0[1]" "<IDPH DPO>:idph:rvr_q0[2]" f. "<IDPH DPO>:idph:arm:turret_quat[3]" "<IDPH DPO>:idph:arm:turret_quat[0]" "<IDPH DPO>:idph:arm:turret_quat[1]" "<IDPH DPO>:idph:arm:turret_quat[2]" g. "<IDPH DPO>:idph:arm:tool_quat[3]" "<IDPH DPO>:idph:arm:tool_quat[0]" "<IDPH DPO>:idph:arm:tool_quat[1]" "<IDPH DPO>:idph:arm:tool_quat[2]" • Supercam (S) • MCZ (S) • SHERLOC (S) • MEDA_SkyCam (S) • PIXL_MCC (S) b. "<IDPH DPO>:idph:sapp_q[3]" "<IDPH DPO>:idph:sapp_q[0]" "<IDPH DPO>:idph:sapp_q[1]" "<IDPH DPO>:idph:sapp_q[2]" c. "<IDPH DPO>:idph:rsm_q[3]" "<IDPH DPO>:idph:rsm_q[0]" "<IDPH DPO>:idph:rsm_q[1]" "<IDPH DPO>:idph:rsm_q[2]" d. "<IDPH DPO>:idph:arm:tool_quat[3]" "<IDPH DPO>:idph:arm:tool_quat[0]" "<IDPH DPO>:idph:arm:tool_quat[1]" "<IDPH DPO>:idph:arm:tool_quat[2]" e. "<IDPH DPO>:idph:rvr_q0[3]"

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
		"<IDPH DPO>:idph:rvr_q0[0]" "<IDPH DPO>:idph:rvr_q0[1]" "<IDPH DPO>:idph:rvr_q0[2]" f. "<IDPH DPO>:idph:arm:turret_quat[3]" "<IDPH DPO>:idph:arm:turret_quat[0]" "<IDPH DPO>:idph:arm:turret_quat[1]" "<IDPH DPO>:idph:arm:turret_quat[2]" g. "<IDPH DPO>:idph:arm:tool_quat[3]" "<IDPH DPO>:idph:arm:tool_quat[0]" "<IDPH DPO>:idph:arm:tool_quat[1]" "<IDPH DPO>:idph:arm:tool_quat[2]" **Cruise** • MCZ Cameras b. "<IDPH DPO>:cidph:rvr:quaternion[3]", "<IDPH DPO>:cidph:rvr:quaternion[0]", "<IDPH DPO>:cidph:rvr:quaternion[1]", "<IDPH DPO>:cidph:rvr:quaternion[2]" c. "<IDPH DPO>:cidph:rsm_state:quaternion[3]", "<IDPH DPO>:cidph:rsm_state:quaternion[0]", "<IDPH DPO>:cidph:rsm_state:quaternion[1]", "<IDPH DPO>:cidph:rsm_state:quaternion[2]" **Type** 1) F32[4] 2) F32[4] 3) F32[4]
Ops Keyword PARAMETER_TABLE_NUMBER **Archive Attribute** TBD **Definition** Specifies which table of parameters to use. Tables are defined in a mission- and instrument-specific manner. For M2020 SuperCam RMI, tables hold values of parameters such as gains, internal CMS HDR settings, internal CMOS parameters.	**Valid Values** "0 to " 7" **Type** integer **Units** n/a **Location** OBSERVATION_REQUEST_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** • SuperCam (S) <Ancillary DPO>:cmd_arguments:rmi_table_number **Type** U8 Notes:
Ops Keyword PDS_VERSION_ID **Archive Attribute** TBD **Definition** Specifies the version number of the PDS standards document that is valid when a data product label is created. Values for the PDS_version_id are formed by appending the integer for the latest version number to the letters 'PDS'. Examples: PDS3	**Valid Values** "PDS<*version*>" **Type** string[6] **Units** n/a **Location** IDENTIFICATION (Class) **X-path**	**Mode** PDS **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	TBD **Reference** TBD	
Ops Keyword PHASE_ANGLE **Archive Attribute** TBD **Definition** Sun-target-observer phase angle	**Valid Values** "PDS<*version*>" **Type** float **Units** deg **Location** SITE_DERIVED_GEOMETRY (Class) **X-path** TBD **Reference** TBD	**Mode** PDS **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword PIXEL_AVERAGING_HEIGHT **Archive Attribute** TBD **Definition** Specifies the vertical dimension, in pixels, of the area over which pixels were averaged prior to image compression. For M2020 EECAM, the value is determined by the hardware mode and the reported downsampling in the idph. See INSTRUMENT_MODE_ID (Surface) and OFFSET_MODE_ID (Cruise) for the full description of hardware readout modes. For M2020 reconstructed images (FDR), the value is determined by the "best" resolution.	**Valid Values** • Eng. Cameras (B) a. "1" to "64" b. "1" to "64" • MCZ Cameras (B) • SHERLOC cameras(B) a. "1" b. non-Thumbnail = "1" Thumbnail = "8" • SuperCam RMI (B) • MEDA SkyCam (B) • PIXL MCC (B) a. "1" b. "1" • EDL Cams b. "1" **Type** integer **Units** pixel **Location** a. IMAGE_REQUEST_PARMS (Group) b. INSTRUMENT_STATE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** 1) DPO in XML format (referenced to APID Name in Appendix A) 2) EMD in XML format, calculation 3) Static value **Field as "<xml name>:[<element>]:[<element>]:<field>"** **Surface** • Eng. Cameras 1) a. "<IDPH DPO>:idph:params:res_rows" b. "<IDPH DPO>:idph:res_rows" • MCZ Cameras • SHERLOC cameras 2) "MslEarthProductMetadata:MslProductMetadata:ProductName" • SuperCam RMI • SHERLOC cameras • MEDA SkyCam • PIXL MCC (3) static value **Cruise** • Eng. Cameras 1) a. "<IDPH DPO>:idph:params:res_rows" b. "<IDPH DPO>:idph:res_rows" * "<IDPH DPO>:idph:voff (binning vaulue)" NOTES: • For MCZ cameras and SHERLOC cameras, if product type is Thumbnail, set value to "8". Otherwise, set value to "1". **Type**

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
		U16
Ops Keyword PIXEL_AVERAGING_WIDTH **Archive Attribute** TBD **Definition** Specifies the horizontal dimension, in pixels, of the area over which pixels were averaged prior to image compression. For M2020 EECAM, the value is determined by the hardware mode and the reported downsampling in the idph. See INSTRUMENT_MODE_ID (Surface) and DC_OFFSET for the full description of hardware readout modes. For M2020 reconstructed images (FDR), the value is determined by the "best" resolution.	**Valid Values** • Eng. Cameras 1) "1" to "64" • MCZ Cameras 2) a. "NONE" b. non-Thumbnail = "1" Thumbnail = "8" • EDL Cams 3) "1" **Type** integer **Units** pixel **Location** 1) a. IMAGE_REQUEST_PARMS (Group) b. INSTRUMENT_STATE_PARMS (Group) 2) a. IMAGE_REQUEST_PARMS (Group) b. INSTRUMENT_STATE_PARMS (Group) 3) INSTRUMENT_STATE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** 1) DPO in XML format (referenced to APID Name in Appendix A) 2) EMD in XML format, calculation **Field as "<xml name>:|<element>|:|<element>|:<field>"** **Surface** • Eng. Cameras 1) a. "<IDPH DPO>:idph:params:res_cols" * b. "<IDPH DPO>:idph:res_cols" * • MCZ Cameras 2) "MslEarthProductMetadata:MslProductMetadata:ProductName" **Cruise** • Eng. Cameras 1) a. "<IDPH DPO>:idph:params:res_cols" b. "<IDPH DPO>:idph:res_cols" * "<IDPH DPO>:idph:voff (binning value)" NOTES: • For MCZ Cameras, if product type is Thumbnail, set value to "8". Otherwise, set value to "1". **Type** U16
Ops Keyword PIXEL_DOWNSAMPLE_OPTION **Archive Attribute** TBD **Definition** Specifies whether to downsample the image(s), and if so, which pixel resolution downsample method to use. Note that for M2020, the camera hardware could downsample entire rows 4-to-1, but software had to be used to do additional row-wise downsampling and any column downsampling. For M2020, the meaning of the valid values follows: a) "SW_MN" - Downsampling done in software by calculation of the mean.	**Valid Values** • Eng. Cameras (B) 0 = "NONE" 1 = "SW_MEAN" 2 = "HW_COND" 3 = "HW_SW" 4 = "SW_OUTREJ" 5 = "SW_MEDIAN" • SuperCam RMI • MCZ Cameras • MCZ Cameras "NONE" **Type** string **Units** n/a	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:|<element>|:|<element>|:<field>"** Eng. Cameras "<IDPH DPO>:idph:params:resolution" **Type** enum

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
b) "HW_COND" - Use hardware binning if downsampling (by mean calculation) and subframe arguments are consistent. c) "HW_SW" - Use hardware binning by changing the commanded downsampling and subframe arguments to be consistent with hardware binning. Any subsequent downsampling is done in software by calculation of the mean. d) "SW_OUTREJ" -Software pixel averaging with outlier rejection. The pixel whose value lies farthest away from the mean of the sample is rejected. e) "SW_MEDIAN" - Software downsampling done by calculation of the median rather than the mean.	**Location** IMAGE_REQUEST_PARMS (Group) **X-path** TBD **Reference** TBD	
Ops Keyword PIXL_ILLUM_ADC_OFFSET **Archive Attribute** TBD **Definition** Specifies the current, in milliamps, of an instrument or some part of an instrument. Note that this may be an array of multiple values for current on different parts of the instrument. (Example: CCD array and sensor head)	**Valid Values** • PIXL 0b00 = 0 0b01 = 140 0b10 = 280 0b11 = 500 **Type** • PIXL MCC float array[16] **Units** mA (unit tag required) **Location** INSTRUMENT_STATE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** **Surface** • PIXL MCC "PIXL_Image_Mini_Header:Info" "PIXL_Image_Meta_Data:Parameter_Id:FLICFG_A" "PIXL_Image_Meta_Data:Parameter_Id:FLICFG_B" **Cruise** **Type** Notes: For PIXL MCC, the values are on only valid if the "Image Meta Data available" flag is True and the parameter values are provided. If the flage is False or the parameters 'FLICFG_A|B are not provided, the values will be "n/a".
Ops Keyword PIXL_ILLUM_ADC_OFFSET_NAME **Archive Attribute** TBD **Definition** Specifies the current, in milliamps, of an instrument or some part of an instrument. Note that this may be an array of multiple values for current on different parts of the instrument. (Example: CCD array and sensor head)	**Valid Values** • PIXL 0b00 = 0 0b01 = 140 0b10 = 280 0b11 = 500 **Type** • PIXL MCC float array[16] **Units** mA (unit tag required) **Location**	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** **Surface** • PIXL MCC "PIXL_Image_Mini_Header:Info" "PIXL_Image_Meta_Data:Parameter_Id:FLICFG_A" "PIXL_Image_Meta_Data:Parameter_Id:FLICFG_B" **Cruise** **Type**

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	INSTRUMENT_STATE_PARMS (Group) **X-path** TBD **Reference** TBD	Notes: For PIXL MCC, the values are on only valid if the "Image Meta Data available" flag is True and the parameter values are provided. If the flage is False or the parameters 'FLICFG_A|B are not provided, the values will be "n/a".
Ops Keyword PIXL_ILLUM_CURRENT **Archive Attribute** TBD **Definition** Specifies the current, in milliamps, of an instrument or some part of an instrument. Note that this may be an array of multiple values for current on different parts of the instrument. (Example: CCD array and sensor head) Note: For M20 PIXL the values refer to LED strings	**Valid Values** • PIXL 0b00 = 0 0b01 = 140 0b10 = 280 0b11 = 500 **Type** • PIXL MCC float array[17] **Units** mA (unit tag required) **Location** INSTRUMENT_STATE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:|<element>|:|<element>|:<field>"** **Surface** • PIXL MCC "PIXL_Image_Mini_Header:Info" "PIXL_Image_Meta_Data:Parameter_Id:FLICFG_A" "PIXL_Image_Meta_Data:Parameter_Id:FLICFG_B" **Cruise** **Type** Notes: For PIXL MCC, the values are on only valid if the "Image Meta Data available" flag is True and the parameter values are provided. If the flage is False or the parameters 'FLICFG_A|B are not provided, the values will be "n/a".
Ops Keyword PIXL_ILLUM_CURRENT_NAME **Archive Attribute** TBD **Definition** Specifies the current, in milliamps, of an instrument or some part of an instrument. Note that this may be an array of multiple values for current on different parts of the instrument. (Example: CCD array and sensor head) Note: For M20 PIXL the values refer to LED strings	**Valid Values** • PIXL MCC ("FLICFG_A1","FLICFG_A2","FLICFG_A3", "FLICFG_A4","FLICFG_A5","FLICFG_A6", "FLICFG_A7","FLICFG_A8", "FLICFG_B1","FLICFG_B2","FLICFG_B3", "FLICFG_B4","FLICFG_B5","FLICFG_B6", "FLICFG_B7","FLICFG_B8","Current Drawn During Flash") **Type** string array[16] **Units** deg C (<degC> unit tag required) **Location** LED_ILLUMINATION_PARMS (Group)	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:|<element>|:|<element>|:<field>"** **Surface** • PIXL MCC "PIXL_Image_Mini_Header:Info" "PIXL_Image_Meta_Data:Parameter_Id:FLICFG_A" "PIXL_Image_Meta_Data:Parameter_Id:FLICFG_B" **Cruise** **Type** Notes:

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	X-path TBD **Reference** TBD	For PIXL MCC, the values are on only valid if the "Image Meta Data available" flag is True and the parameter values are provided. If the flage is False or the parameters 'FLICFG_A|B are not provided, the values will be "n/a".
Ops Keyword PIXL_ILLUM_FLASH_DUR **Archive Attribute** TBD **Definition** Provides the values of time flash was active if flash duration controls were enabled. Note: Programmed flash duration is computed as T[s] = dn/(2*4.608MHz)	**Valid Values** • PIXL MCC **Type** float **Units** seconds (<s> unit tag required) **Location** LED_ILLUMINATION_PARMS (Group) SLI_ILLUMINATION_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** **Surface** • PIXL MCC "PIXL_Image_Mini_Header:Info" "PIXL_Image_Meta_Data:Parameter_Id:SLICFG_A" "PIXL_Image_Meta_Data:Parameter_Id:SLICFG_B" "PIXL_Image_Meta_Data:Parameter_Id:FLI_D1D2" "PIXL_Image_Meta_Data:Parameter_Id:FLI_D3D4" "PIXL_Image_Meta_Data:Parameter_Id:FLI_D5D6" "PIXL_Image_Meta_Data:Parameter_Id:FLI_D7D8" **Cruise** **Type** Notes: For PIXL MCC, the values are on only valid if the "Image Meta Data available" flag is True and the parameter values are provided. If the flage is False or the parameters 'FLICFG_A|B are not provided, the values will be "n/a".
Ops Keyword PIXL_ILLUM_FLASH_DUR_NAME **Archive Attribute** TBD **Definition** Provides the values of time flash was active if flash duration controls were enabled. Note: Programmed flash duration is computed as T[s] = dn/(2*4.608MHz)	**Valid Values** • PIXL MCC ('Programmed flash D1D2 for output x', 'Programmed flash D1D2 for output y', 'Programmed flash D3D4 for output x', 'Programmed flash D3D4 for output y', 'Programmed flash D5D6 for output x','Programmed flash D5D6 for output y', 'Programmed flash D7D8 for output x','Programmed flash D7D8 for output y', 'Longest flash duration') **Type** string array[9] **Units** N/A **Location** LED_ILLUMINATION_PARMS (Group) SLI_ILLUMINATION_PARMS (Group)	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** **Surface** • PIXL MCC "PIXL_Image_Mini_Header:Info" "PIXL_Image_Meta_Data:Parameter_Id:SLICFG_A" "PIXL_Image_Meta_Data:Parameter_Id:SLICFG_B" "PIXL_Image_Meta_Data:Parameter_Id:FLI_D1D2" "PIXL_Image_Meta_Data:Parameter_Id:FLI_D3D4" "PIXL_Image_Meta_Data:Parameter_Id:FLI_D5D6" "PIXL_Image_Meta_Data:Parameter_Id:FLI_D7D8"

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	X-path TBD **Reference** TBD	**Cruise** **Type** Notes: For PIXL MCC, the values are on only valid if the "Image Meta Data available" flag is True and the parameter values are provided. If the flage is False or the parameters 'FLICFG_A|B are not provided, the values will be "n/a".
Ops Keyword PIXL_ILLUM_TEMPERATURE **Archive Attribute** TBD **Definition** Provides the values of pre and post flash temperature values	**Valid Values** • PIXL MCC **Type** float **Units** degC **Location** LED_ILLUMINATION_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** **Surface** • PIXL MCC "PIXL_Image_Mini_Header:Info" "PIXL_Image_Meta_Data:Parameter_Id:FLIHK2_A" "PIXL_Image_Meta_Data:Parameter_Id:FLIHK2_B" **Cruise** **Type** Notes: For PIXL MCC, the values are on only valid if the "Image Meta Data available" flag is True and the parameter values are provided. If the flage is False or the parameters 'FLICFG_A|B are not provided, the values will be "n/a".
Ops Keyword PIXL_ILLUM_TEMPERATURE_NAME **Archive Attribute** TBD **Definition** Provides the values of pre an dpost flash temperature values.	**Valid Values** • PIXL MCC **Type** String **Units** degC **Location** LED_ILLUMINATION_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** **Surface** • PIXL MCC "PIXL_Image_Mini_Header:Info" "PIXL_Image_Meta_Data:Parameter_Id:FLIHK2_A" "PIXL_Image_Meta_Data:Parameter_Id:FLIHK2_B" **Cruise** **Type** Notes: For PIXL MCC, the values are on only valid if the "Image Meta Data available" flag is True and the parameter values are provided. If the flage is False or the parameters 'FLICFG_A|B are not provided, the values will be "n/a".
Ops Keyword PIXL_ILLUM_VOLTAGE	**Valid Values** • PIXL MCC	**Mode**

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Archive Attribute TBD **Definition** Values for Capacitor Banks pre and post flash.	**Type** float **Units** Volts (V) **Location** LED_ILLUMINATION_PARMS (Group) **X-path** TBD **Reference** TBD	DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** **Surface** • PIXL MCC "PIXL_Image_Mini_Header:Info" "PIXL_Image_Meta_Data:Parameter_Id:FLIHK3_A" "PIXL_Image_Meta_Data:Parameter_Id:FLIHK3_B" "PIXL_Image_Meta_Data:Parameter_Id:FLIHK4_A" "PIXL_Image_Meta_Data:Parameter_Id:FLIHK4_B" **Cruise** **Type** Notes: For PIXL MCC, the values are on only valid if the "Image Meta Data available" flag is True and the parameter values are provided. If the flage is False or the parameters 'FLICFG_A|B are not provided, the values will be "n/a".
Ops Keyword PIXL_ILLUM_VOLTAGE_NAME **Archive Attribute** TBD **Definition** Values for Capacitor Banks pre and post flash.	**Valid Values** • PIXL MCC **Type** String **Units** N/A **Location** LED_ILLUMINATION_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** **Surface** • PIXL MCC "PIXL_Image_Mini_Header:Info" "PIXL_Image_Meta_Data:Parameter_Id:FLIHK3_A" "PIXL_Image_Meta_Data:Parameter_Id:FLIHK3_B" "PIXL_Image_Meta_Data:Parameter_Id:FLIHK4_A" "PIXL_Image_Meta_Data:Parameter_Id:FLIHK4_B" **Cruise** **Type** Notes: For PIXL MCC, the values are on only valid if the "Image Meta Data available" flag is True and the parameter values are provided. If the flage is False or the parameters 'FLICFG_A|B are not provided, the values will be "n/a".
Ops Keyword PLANET_DAY_NUMBER **Archive Attribute** TBD **Definition**	**Valid Values** Mission Phase — Values Cruise — less than or equal to 0 Surface — "0" to n NOTE: Value will be uncalibrated if SPICE kernels are unavailable.	**Mode** 1) a. Calculation: - SCLK Kernel b. DPO in XML format (referenced to APID Name in Appendix A) 2) a. Image DPO mini-header, Calculation: - SCLK Kernel

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Specifies the number of solar days elapsed since a reference day (e.g., the day on which a landing vehicle set down) for local mean solar time (LMST). Days are measured in rotations of the planet in question from midnight to midnight. For M2020, the reference day is "0", as Landing day is Sol 0. If before Landing day, value will be less than or equal to "0". See also LOCAL_MEAN_SOLAR_TIME and LOCAL_TRUE_SOLAR_TIME_SOL.	**Type** integer **Units** n/a **Location** IDENTIFICATION (Class) **X-path** TBD **Reference** TBD	b. DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras 1) b. "<IDPH DPO>:idph:sclk_seconds", "<IDPH DPO>:idph:sclk_subseconds" • MCZ Cameras 2) a. "MCZ_Image_Mini_Header[8]", "MCZ_Image_Mini_Header[9]", "MCZ_Image_Mini_Header[10]", "MCZ_Image_Mini_Header[11]" b. "<IDPH DPO>:cidph:sclk:seconds" c. "<Ancillary DPO>:sclk:seconds" NOTES: • For MCZ recovered or Z-stack data products, value is comprised of four bytes coming from Image DPO mini-header at byte offsets 8, 9, 10 and 11 per case "2a". • For MCZ non-recovered and non-Z-stack data products, if IDPH is present, value comes from IDPH DPO per case "2b". • For MCZ non-recovered and non-Z-stack data products, if IDPH is not present, value comes from Ancillary DPO per case "2c". **Type** U32
Ops Keyword POINTING_CORRECTION_FILE_NAME **Archive Attribute** TBD **Definition** Specifies the name of the file containing pointing correction parameters for each input file of a mosaic. The file is in XML format, and is often called a "nav" file in operations. See also SOLUTION_ID.	**Valid Values** n/a **Type** string **Units** n/a **Location** DERIVED_IMAGE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword POINTING_MODEL_NAME **Archive Attribute** TBD **Definition** Specifies which of several "pointing models" were used to transform the camera model based on updated pointing information. These updates are typically derived from	**Valid Values** TBD **Type** string **Units** n/a **Location**	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
mosaic seam corrections. This keyword and the associated POINTING_MODEL_PARAMS keyword define what the updated pointing information is, providing enough information to re-create the camera model from calibration data. If present, this keyword overrides the default pointing based on telemetry. The special value "NONE" shall be interpreted the same as if the keyword is absent (i.e. the default pointing model should be used). New model names can be created at any time; the models themselves should be described in the camera model ancillary file "M2020_pointing_models.txt" included in the Archive Volume. See also SOLUTION_ID.	DERIVED_IMAGE_PARMS (Group) **X-path** TBD **Reference** TBD	
Ops Keyword POINTING_MODEL_PARAMS **Archive Attribute** TBD **Definition** Specifies the numeric parameters needed by the pointing model identified in POINTING_MODEL_NAME. The meaning of any given parameter is defined by the pointing model.	**Valid Values** n/a **Type** float **Units** n/a **Location** DERIVED_IMAGE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword POINTING_MODEL_PARAMS_NAME **Archive Attribute** TBD **Definition** This keyword specifies the name assigned by the pointing model for each parameter specified in POINTING_MODEL_PARAMS.	**Valid Values** Pointing Model Parameter Name Values (in order) TBD **Type** string array **Units** n/a **Location** DERIVED_IMAGE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword POSITIVE_AZIMUTH_DIRECTION	**Valid Values** "CLOCKWISE"	**Mode** Static Value: - Determined by Coordinate Frame definitions

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Archive Attribute TBD **Definition** Specifies the direction in which azimuth is measured in positive degrees for an observer on the surface of a body. The azimuth is measured with respect to the elevational reference plane. A value of CW indicates that azimuth is measured positively Clockwise, and CCW indicates that azimuth increases positively Counter-clockwise. For the M2020 operational coordinate frames, which follow the Mars Pathfinder convention, increasing azimuth moves in a clockwise ("CLOCKWISE") direction as viewed from above.	**Type** string **Units** n/a **Location** • For EDRs … - ROVER_COORDINATE_SYSTEM (Group) - RSM_COORDINATE_SYSTEM (Group) - ARM_COORDINATE_SYSTEM (Group) - PIXL_SENSOR_COORDINATE_SYSTEM(Group) • For RDRs … - ROVER_COORDINATE_SYSTEM (Group) - RSM_COORDINATE_SYSTEM (Group) - ARM_COORDINATE_SYSTEM (Group) - SITE_COORDINATE_SYSTEM (Group) - LOCAL_LEVEL_COORDINATE_SYSTEM (Group) **X-path** TBD **Reference** TBD	**Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword POSITIVE_ELEVATION_DIRECTION **Archive Attribute** TBD **Definition** Specifies the direction in which elevation is measured in positive degrees for an observer on the surface of a body. The elevation is measured with respect to the azimuthal reference plane. A value of "UP" indicates that elevation is measured positively upwards, i.e., the zenith point would be at +90 degrees and the nadir point at -90 degrees. "DOWN" indicates that the elevation is measured positively downwards; the zenith point would be at -90 degrees and the nadir point at +90 degrees. For the M2020 operational coordinate frames, which follow the Mars Pathfinder convention, increasing elevation ("UP") moves towards the negative Z axis.	**Valid Values** "UP" **Type** string **Units** n/a **Location** • For EDRs … - ROVER_COORDINATE_SYSTEM (Group) - RSM_COORDINATE_SYSTEM (Group) - ARM_COORDINATE_SYSTEM (Group) - PIXL_SENSOR_COORDINATE_SYSTEM(Group) • For RDRs … - ROVER_COORDINATE_SYSTEM (Group) - RSM_COORDINATE_SYSTEM (Group) - ARM_COORDINATE_SYSTEM (Group) - SITE_COORDINATE_SYSTEM (Group) - LOCAL_LEVEL_COORDINATE_SYSTEM (Group) **X-path** TBD **Reference** TBD	**Mode** Static Value: - Determined by Coordinate Frame definitions **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword PROCESSING_HISTORY_TEXT **Archive Attribute**	**Valid Values** "CODMAC LEVEL 1 TO LEVEL 2 CONVERSION VIA JPL/MIPL M2020EDRGEN"	**Mode** Dependent on EDR/RDR state: - For EDRs, static - For RDRs, RDR-generating software

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
TBD **Definition** Specifies an entry for each processing step and program used in generating a particular data file.	**Type** string **Units** n/a **Location** • For EDRs … - M2020EDRGEN_HISTORY_PARMS (Group) • For RDRs … - <xxx>_HISTORY_PARMS (Group) where, xxx = RDR software name **X-path** TBD **Reference** TBD	**Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword PROCESSING_INFO **Archive Attribute** TBD **Definition** Specifies information about the processing used to generate the RDR that is not covered by other PDS label keywords.	**Valid Values** n/a **Type** string array **Units** n/a **Location** DERIVED_IMAGE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword PRODUCER_INSTITUTION_NAME **Archive Attribute** TBD **Definition** Specifies the identity of a university, research center, NASA center or other institution associated with the production of a data set. This would generally be an institution associated with the element PRODUCER_FULL_NAME.	**Valid Values** "MULTIMISSION INSTRUMENT PROCESSING LAB, JET PROPULSION LAB" **Type** string(60) **Units** n/a **Location** IDENTIFICATION (Class) **X-path** TBD **Reference** TBD	**Mode** Static Value **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword PRODUCT_COMPLETION_STATUS	**Valid Values**	**Mode** EMD in XML format

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Archive Attribute TBD **Definition** Specifies the completion status of a product, specifying for example, if all portions have been downlinked and received correctly, if it is a partial product, or if it contains transmission errors. The specific valid values may be mission-dependent. For M2020, the valid values indicate whether it was a complete or partial product as it came out of MPCS, and whether the checksum passed, failed, or was missing.	"PARTIAL", "PARTIAL_CHECKSUM_FAIL", "COMPLETE_CHECKSUM_PASS", "COMPLETE_NO_CHECKSUM", "COMPLETE_CHECKSUM_FAIL" **Type** string **Units** n/a **Location** TELEMETRY (Class) **X-path** TBD **Reference** TBD	**Field as "<xml name>:[<element>]:[<element>]:<field>"** "MslEarthProductMetadata:MslProductMetadata:GroundStatus" **Type** n/a
Ops Keyword PRODUCT_CREATION_TIME **Archive Attribute** TBD **Definition** Specifies the UTC system format for the time when a product was created.	**Valid Values** <YYYY>-<MM>-<DD>T<hh>:<mm>:<ss>[.<fff>] **Type** time **Units** n/a **Location** IDENTIFICATION (Class) **X-path** TBD **Reference** TBD	**Mode** Calculation **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword PRODUCT_ID **Archive Attribute** TBD **Definition** Specifies a permanent, unique identifier assigned to a data product by its producer. For M2020, it is the filename minus the extension. NOTES: In the PDS, the value assigned to product_id must be unique within its data set. The PRODUCT_ID can describe the lowest-level Data object that has a PDS label.	**Valid Values** n/a **Type** string(40) **Units** n/a **Location** IDENTIFICATION (Class) **X-path** TBD **Reference** TBD	**Mode** • EDR-generating software: - Filename of output EDR product, minus extension • RDR-generating software: - Filename of output RDR product, minus extension **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Ops Keyword PRODUCT_TAG **Archive Attribute** TBD **Definition** Data Product Tag. NOTE: This keyword, while set, is not used on M2020, and does not appear in the PDS4 label"	**Valid Values** n/a **Type** string **Units** n/a **Location** TELEMETRY (Class) **X-path** TBD **Reference** TBD	**Mode** EMD in XML format **Field as "<xml name>:[<element>]:[<element>]:<field>"** "MslEarthProductMetadata:MslProductMetadata:ProductTag " **Type** n/a
Ops Keyword PRODUCT_VERSION_ID **Archive Attribute** TBD **Definition** Specifies the version of an individual product within a data set. PRODUCT_VERSION_ID is intended for use within AMMOS to identify separate iterations of a given product, which will also have a unique FILE_NAME. For M2020, this is a Version field that begins with "V" followed by a decimal number denoting the product's iteration (i.e., version). Example: "V2.0" When appearing in the attached ODL (operations) label, keyword value represents the version incorporated in the Version field of the product's filename. This does not correspond to the keyword value appearing in the detached PDS (archive) label.	**Valid Values** "V<*vernum*>" **Type** string(12) **Units** n/a **Location** IDENTIFICATION (Class) **X-path** TBD **Reference** TBD	**Mode** User specified parameter value **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword PROJECTION_AXIS_OFFSET **Archive Attribute** TBD **Definition** Specifies an offset from a projection axis in a map projection. For the Cylindrical-Perspective projection, this is the radius of a circle which represents the rotation around the projection origin of the synthetic camera used to calculate each column.	**Valid Values** n/a **Type** float **Units** meters (<m> unit tag required) **Location** SURFACE_PROJECTION_PARMS (Group) **X-path**	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	TBD **Reference** TBD	
Ops Keyword PROJECTION_AZIMUTH **Archive Attribute** TBD **Definition** Specifies the azimuth, in degrees, of the horizontal center of projection for the PERSPECTIVE projection (loosely, where the camera model is pointing).	**Valid Values** n/a **Type** float **Units** deg (<deg> unit tag required) **Location** SURFACE_PROJECTION_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword PROJECTION_ELEVATION **Archive Attribute** TBD **Definition** Specifies the elevation, in degrees, of the vertical center of projection (loosely, where the camera is pointing). For Perspective projections, this applies to the single output camera model; for Cylindrical-Perspective it applies to each column's output camera model, before the rotation specified by PROJECTION_AXIS_Z_VECTOR.	**Valid Values** n/a **Type** float **Units** deg (<deg> unit tag required) **Location** SURFACE_PROJECTION_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword PROJECTION_ELEVATION_LINE **Archive Attribute** TBD **Definition** Specifies the image line which corresponds to PROJECTION_ELEVATION for each column of the Cylindrical-Perspective projection, before the rotation specified by PROJECTION_AXIS_Z_VECTOR.	**Valid Values** n/a **Type** float **Units** pixel (<pixel> unit tag required) **Location** SURFACE_PROJECTION_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Ops Keyword PROJECTION_ORIGIN_VECTOR **Archive Attribute** TBD **Definition** Specifies the location of the origin of the projection. For Polar and Cylindrical projections, this is the XYZ point from which all the azimuth/elevation rays emanate. For the Cylindrical-Perspective projection, this defines the center of the circle around which the synthetic camera orbits. For Orthographic, Orthorectified, and Vertical projections, this optional keyword specifies the point on the projection plane that serves as the origin of the projection (i.e. all points on a line through this point in the direction of PROJECTION_Z_AXIS_VECTOR will be located at X=Y=0 in the projection). If not present, (0,0,0) should be assumed. This translation is generally not necessary and not often used; the (X|Y)_AXIS_MINIMUM and (X|Y)_AXIS_MAXIMUM fields allow the mosaic to be located arbitrarily in the projection plane.	**Valid Values** n/a **Type** float array[3] **Units** meters (<m> unit tag required) **Location** SURFACE_PROJECTION_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword PROJECTION_X_AXIS_VECTOR **Archive Attribute** TBD **Definition** Specifies a unit vector defining the X-axis for a given projection. For Orthographic, Orthorectified, and Vertical projections, this vector defines how the * axis in the mosaic is oriented in space. The X and Y axis vectors together define the rotation of the projection plane around the projection axis.	**Valid Values** n/a **Type** float array[3] **Units** n/a **Location** SURFACE_PROJECTION_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword PROJECTION_Y_AXIS_VECTOR **Archive Attribute** TBD **Definition** Specifies a unit vector defining the Y-axis for a given projection. For Orthographic, Orthorectified, and Vertical projections, this vector defines how the * axis in the mosaic is oriented in space. The X and Y axis vectors together define the rotation of the projection plane around the projection axis.	**Valid Values** n/a **Type** float array[3] **Units** n/a **Location** SURFACE_PROJECTION_PARMS (Group) **X-path** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	Reference TBD	
Ops Keyword PROJECTION_Z_AXIS_VECTOR **Archive Attribute** TBD **Definition** Specifies a unit vector defining the Z axis for a given projection. For Orthographic, Orthorectified, and Vertical projections, this vector defines the projection axis for the mosaic. All points along a line parallel to this axis are projected to the same spot in the projection plane. For the Cylindrical-Perspective projections, this defines the new axis of the circle around which the synthetic camera orbits (i.e. the normal to the circle), after the cameras have been rotated to correct for rover tilt. CAMERA_ROTATION_AXIS_VECTOR contains the axis before rotation; the difference in these two indicate the rotation amount.	**Valid Values** n/a **Type** float array[3] **Units** n/a **Location** SURFACE_PROJECTION_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword QUATERNION_MEASUREMENT_METHOD **Archive Attribute** TBD **Definition** Specifies the quality of the rover orientation estimate. Valid values are: a) "UNKNOWN" - The attitude should simply not be trusted. This is the initial grade given on Landing, for example. b) "TILT_ONLY" - The attitude estimate is only good for tilt determination (2-axis knowledge). Activities which require azimuth knowledge should be careful. c) "FINE" - Sun identification or other attitude determination has completed successfully, and the attitude estimate is sufficient for pointing HGA (or "ThreeAxisFine").	**Valid Values** • ALL Cameras 0 = "UNKNOWN" 1 = "TILT_ONLY" 2 = "FINE" • All Cameras no IDPH = "UNK" **Type** string **Units** n/a **Location** a. ROVER_COORDINATE_SYSTEM (Group) b. INITIAL_STATE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A), Table Lookup **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras (B) a. "<IDPH DPO>:idph:rvr_quality" b. "<IDPH DPO>:idph:rvr_quality0" • SuperCam • MCZ • SHERLOC • MEDA SkyCam • PIXL MCC a. "<IDPH DPO>:idph:system:sapp_quality" **Cruise** • MCZ (C) a. "<IDPH DPO>:cidph:rvr:quality" **Type** I32
Ops Keyword RADIANCE_OFFSET **Archive Attribute** TBD **Definition** Specifies the constant value by which a stored radiance is added.	**Valid Values** n/a **Type** float **Units** • RAD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Expressed as an equation as follows: true_radiance_value = radiance_offset + radiance_scaling_factor * stored_radiance value There are 3 types of radiometric corrections: Radiance-calibrated RDRs These "RAD" (and "RADL") RDRs have been scaled to absolute radiance units using either pre-flight radiometric calibration coefficients or calibration coefficients derived from in-flight observations of the calibration target. The units on these files are (W/m^2/sr/nm). Radiance factor-calibrated RDRs These "IOF" (and "IOL") RDRs are unitless but have values in the range of 0.0 to 1.0 (for example, average bright Mars soils exhibit I/F ~ 0.35 at 750 nm and I/F ~ 0.05 at 410 nm). Instrumentally-calibrated RDRs These "CCD" (and "CCL") RDRs have had no radiance scaling applied, so the units on these files are "corrected" DN.	WATT* M**-2* SR**-1* NM**-1 • IOF Unitless I/F • CCD DN **Location** DERIVED_IMAGE_PARMS (Group) **X-path** TBD **Reference** TBD	
Ops Keyword RADIANCE_TYPE **Archive Attribute** TBD **Definition** Specifies the type of radiance product: RADIANCE Need description SPECTRAL RADIANCE Need description This radiance is normalized for the filter bandwidth used to acquire the image. SCALED SPECTRAL RADIANCE Need description Scaling factor applied to the image that is a combination of solar elevation and tau.	**Valid Values** "RADIANCE", "SPECTRAL RADIANCE", "SCALED SPECTRAL RADIANCE" **Type** string **Units** n/a **Location** • DERIVED_IMAGE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword RADIANCE_ZENITH_SCALING_FACTOR **Archive Attribute** TBD **Definition** Specifies the factor used to convert radiance to scaled radiance.	**Valid Values** n/a **Type** float **Units** n/a **Location** • DERIVED_IMAGE_PARMS (Group)	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	X-path TBD **Reference** TBD	
Ops Keyword RADIANCE_SCALING_FACTOR **Archive Attribute** TBD **Definition** Specifies the constant value by which a stored radiance is multiplied. NOTE: Expressed as an equation: true_radiance_value = radiance_offset + radiance_scaling_factor * stored_radiance value There are 3 types of radiometric corrections: Radiance-calibrated RDRs These "RAD" (and "RAL") RDRs have been scaled to absolute radiance units using either pre-flight radiometric calibration coefficients or calibration coefficients derived from in-flight observations of the calibration target. The units on these files are (W/m^2/sr/nm). Radiance factor-calibrated RDRs These "IOF" (and "IOL") RDRs are unitless but have values in the range of 0.0 to 1.0 (for example, average bright Mars soils exhibit I/F ~ 0.35 at 750 nm and I/F ~ 0.05 at 410 nm). Instrumentally-calibrated RDRs These "CCD" (and "CCL") RDRs have had no radiance scaling applied, so the units on these files are "corrected" DN.	**Valid Values** n/a **Type** float **Units** n/a **Location** • DERIVED_IMAGE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:|<element>|:|<element>|:<field>"** n/a **Type** n/a
Ops Keyword RADIOMETRIC_CORRECTION_TYPE **Archive Attribute** TBD **Definition** Identifies the method used for radiometric correction. Values include ""CHEMRAD" for the correction done by the SuperCam team and "MIPLRAD" for the MIPL correction (flat-field, exposure and temperature only), or "NONE" for the case when no radiometric correction has been performed.	**Valid Values** "CHEMRAD", "MIPLRAD", "NONE" **Type** string **Units** n/a **Location** DERIVED_IMAGE_PARMS (Group) **X-path** TBD **Reference**	**Mode** RDR-generating software **Field as "<xml name>:|<element>|:|<element>|:<field>"** n/a **Type** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	TBD	
Ops Keyword RANGE_ORIGIN_VECTOR **Archive Attribute** TBD **Definition** Specifies the 3-D space from which the Range values are measured in a Range RDR. This will normally be the same as the C point of the camera. It is expressed in the coordinate system specified by the REFERENCE_COORD_SYSTEM_* keywords in the enclosing DERIVED_IMAGE_PARMS group.	**Valid Values** n/a **Type** float array[3] **Units** meters (<m> unit tag required) **Location** DERIVED_IMAGE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** "<IDPH DPO>:idph:cmod_c[3]" **Type** F64[3]
Ops Keyword RCE_TIME_SYNC **Archive Attribute** TBD **Definition** Last time sync value received from RCE	**Valid Values** n/a **Type** integer **Units** seconds **Location** SCAM_MINI_HEADER **X-path** TBD **Reference** TBD	SCAM Image DPO mini-header **Field as "<xml name>:[<element>]:[<element>]:<field>"** "SCAM_Image_Mini_Header[180]" **Type** U32 Notes: For SCAM RMI products, "rce_time_sync" is comprised of 4 bytes coming from the Image DPO mini-header at offset 180.
Ops Keyword RECEIVED_PACKETS **Archive Attribute** TBD **Definition** Specifies the total number of telemetry packets which constitute a reconstructed data product. NOTE: For M2020, telemetry data processing does not track "packets", but instead data product "parts".	**Valid Values** n/a **Type** integer **Units** n/a **Location** TELEMETRY (Class) **X-path** TBD **Reference** TBD	**Mode** EMD in XML format **Field as "<xml name>:[<element>]:[<element>]:<field>"** "MslEarthProductMetadata:MslProductMetadata:PartList:TotalReceived" **Type** n/a
Ops Keyword RECORD_BYTES	**Valid Values** "0" to n	**Mode** Calculation

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Archive Attribute TBD **Definition** Specifies the number of bytes in a physical file record, including record terminators and separators. NOTE: In the PDS, the use of record_bytes, along with other file-related data elements is fully described in the Standards Reference.	**Type** integer **Units** n/a **Location** FILE (Class) **X-path** TBD **Reference** TBD	**Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword RECORD_TYPE **Archive Attribute** TBD **Definition** Specifies the record format of a file. NOTE: In the PDS, when record_type is used in a detached label file it always describes its corresponding detached data file, not the label file itself. The use of record_type along with other file-related data elements is fully described in the PDS Standards Reference.	**Valid Values** "FIXED_LENGTH" **Type** string(20) **Units** n/a **Location** FILE (Class) **X-path** TBD **Reference** TBD	**Mode** Calculation **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword REFERENCE_AZIMUTH **Archive Attribute** TBD **Definition** Specifies the azimuth of the line extending from the center of the image to the top center of the image with respect to a polar projection.	**Valid Values** n/a **Type** float **Units** deg (<deg> unit tag required) **Location** SURFACE_PROJECTION_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword REFERENCE_COORD_SYSTEM_INDEX **Archive Attribute** TBD	**Valid Values** n/a **Type** integer array[10]	**Mode** DPO in XML format (referenced to APID Name in Appendix A), Calculation 1) If rmc_site > 1 then: reference_coord_system_index = rmc_site - 1

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Definition Specifies which instance of the coordinate system named by REFERENCE_COORD_SYSTEM_NAME is the reference coordinate system for the group in which the keyword occurs. This index is a set of integers which serve to identify coordinate system instances in a mission-specific manner. For M2020, these indices are based on the ROVER_MOTION_COUNTER and are in the same order as specified by ROVER_MOTION_COUNTER_NAME. • EDRs will contain 1 or 10, depending on the group in which the keyword occurs. • For RDRs, the number of indices can be anything from 1 (used for SITE_FRAME) up to 10; however only 1, 2, 3, and 10 indices are common in RDRs. See also REFERENCE_COORD_SYSTEM_NAME and COORDINATE_SYSTEM_INDEX. The distinction is that COORDINATE_SYSTEM_INDEX is used when defining a coordinate system group to indicate what is being defined, while REFERENCE_COORD_SYSTEM_INDEX is used when referring to one.	**Units** n/a **Location** • For EDRs … 1) SITE_COORDINATE_SYSTEM (Group) 2) ROVER_COORDINATE_SYSTEM (Group) 3) RSM_COORDINATE_SYSTEM (Group) 4) ARM_COORDINATE_SYSTEM (Group) 5) GEOMETRIC_CAMERA_MODEL (Group) 6) ROVER_DERIVED_GEOMETRY_PARMS (Group) 7) SITE_DERIVED_GEOMETRY_PARMS (Group) 8) TURRET_COORDINATE_SYSTEM (Group) 9) TOOL_COORDINATE_SYSTEM (Group) 10) PIXL_SENSOR_COORDINATE_SYSTEM(Group) Note: The SITE_COORDINATE_SYSTEM group is only set if the SITE Index is greater than 1 and the Site Quaternion is not 0,0,0,0 (unknown). **X-path** TBD **Reference** TBD	**Field as "<xml name>:[<element>]:[<element>]:<field>"** **Surface** • Eng. Cameras (B) 1) "<IDPH DPO>:idph:rmc_site" 2) "<IDPH DPO>:idph:rmc_site" 3) "<IDPH DPO>:idph:rmc_site", "<IDPH DPO>:idph:rmc_drive", "<IDPH DPO>:idph:rmc_pose", "<IDPH DPO>:idph:rmc_arm", "<IDPH DPO>:idph:rmc_sha", "<IDPH DPO>:idph:rmc_drill", "<IDPH DPO>:idph:rmc_rsm", "<IDPH DPO>:idph:rmc_hga", "<IDPH DPO>:idph:rmc_bitcar", "<IDPH DPO>:idph:rmc_seal" 4) same as #3 above 5) same as #3 above 6) same as #3 above 7) same as #1 above 8) same as #3 above 9) same as #3 above • SuperCam (S) • MCZ (S) • SHERLOC (S) • PIXL MCC (S) 2) "<IDPH DPO>:idph:system:rmc:site" 3) "<IDPH DPO>:idph:system:rmc:site", "<IDPH DPO>:idph:system:rmc:drive", "<IDPH DPO>:idph:system:rmc:pose", "<IDPH DPO>:idph:system:rmc:arm", "<IDPH DPO>:idph:system:rmc:sha", "<IDPH DPO>:idph:system:rmc:drill", "<IDPH DPO>:idph:system:rmc:rsm", "<IDPH DPO>:idph:system:rmc:hga", "<IDPH DPO>:idph:system:rmc:bitcar", "<IDPH DPO>:idph:system:rmc:seal" 4) same as #3 above 5) same as #3 above 6) same as #3 above 7) same as #1 above 8) same as #3 above 9) same as #3 above **Cruise** • MCZ Cameras 1) "<IDPH DPO>:cidph:rmc:site" 2) "<IDPH DPO>:cidph:rmc:site", "<IDPH DPO>:cidph:rmc:drive", "<IDPH DPO>:cidph:rmc:pose", "<IDPH DPO>:cidph:rmc:arm", "<IDPH DPO>:cidph:rmc:sha", "<IDPH DPO>:cidph:rmc:drill", "<IDPH DPO>:cidph:rmc:rsm", "<IDPH DPO>:cidph:rmc:hga",

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
		"<IDPH DPO>:cidph:rmc:bitcar", "<IDPH DPO>:cidph:rmc:seal" 3) same as #2 above 4) same as #2 above 5) same as #2 above 6) same as #2 above 7) same as #1 above **Type** U16
Ops Keyword REFERENCE_COORD_SYSTEM_NAME **Archive Attribute** TBD **Definition** Specifies the full name of the reference coordinate system (CS) for the group in which the keyword occurs. All vectors and positions relating to 3-D space within the enclosing group are expressed using this reference coordinate system. For rover or lander missions with non-unique coordinate systems (such as "SITE"), the CS name and index (see (REFERENCE_COORD_SYSTEM_INDEX) together, along with the solution id (see REFERENCE_COORD_SYSTEM_SOLN_ID), completely specify the reference CS. The values appearing in a reference index depend on what the reference name is. The valid coordinate frame names vary by project, but are generally the same as for COORDINATE_SYSTEM_FRAME. For M2020, EDRs use a standard, predefined frame name for each occurrence. However, RDRs can use any value available in COORDINATE_SYSTEM_NAME. Despite that, only a few frame names are commonly used. "SITE_FRAME" is used for most SITE, ROVER, and LOCAL_LEVEL CS definitions, as well as for XYZ data and many mosaics. "ROVER_NAV_FRAME" is used for most other CS definitions, surface normals, camera models, and some mosaics. "LOCAL_LEVEL_FRAME" is used for some mosaics. See also COORDINATE_SYSTEM_NAME. The distinction is that COORDINATE_SYSTEM_NAME is used when defining a coordinate system group to indicate what is being defined, while REFERENCE_COORD_SYSTEM_NAME is used when referring to one.	**Valid Values** • For EDRs … 1) "SITE_FRAME" 2) "SITE_FRAME" 3) "ROVER_NAV_FRAME" 4) "ROVER_NAV_FRAME" 5) "ROVER_NAV_FRAME" 6) "ROVER_NAV_FRAME" 7) "SITE_FRAME" 8) "ROVER_NAV_FRAME" 9) "ROVER_NAV_FRAME" 10) "PIXL_BASE_FRAME" 11) "ARM_PIXEL_FRAME" • For RDRs … Any value from COORDINATE_SYSTEM_NAME is valid. **Type** string(20) **Units** n/a **Location** • For EDRs … 1) SITE_COORDINATE_SYSTEM (Group 2) ROVER_COORDINATE_SYSTEM (Group) 3) RSM_COORDINATE_SYSTEM (Group) 4) ARM_COORDINATE_SYSTEM (Group) 5) GEOMETRIC_CAMERA_MODEL (Group) 6) ROVER_DERIVED_GEOMETRY_PARMS (Group) 7) SITE_DERIVED_GEOMETRY_PARMS (Group) 8) TURRET_COORDINATE_SYSTEM (Group) 9) TOOL_COORDINATE_SYSTEM (Group) **X-path** TBD **Reference** TBD	**Mode** Static values: 1) for 1 RMC element defining Site Frame 2) for 1 RMC elements defining Rover Navigation Frame 3) for 10 RMC elements defining Rover Navigatin Frame 4) for 10 RMC elements defining Rover Navigation Frame 5) for 10 RMC elements defining Rover Navigation Frame 6) for 10 RMC elements defining Rover Navigation Frame 7) for 1 RMC element defining Site Frame 8) for 10 RMC elements defining Rover Navigation Frame 9) for 10 RMC elements defining Rover Navigation Frame **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword REFERENCE_COORD_SYSTEM_SOLN_ID	**Valid Values** n/a	**Mode** Software dependent

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Archive Attribute TBD **Definition** See SOLUTION_ID. SOLUTION_ID is used when defining a coordinate system group to indicate what is being defined, while REFERENCE_COORD_SYSTEM_SOLN_ID is used when referring to one. Appears in labels of RDRs only, not EDR products.	**Type** string **Units** n/a **Location** For RDRs only … - ROVER_COORDINATE_SYSTEM (Group) - RSM_COORDINATE_SYSTEM (Group) - ARM_COORDINATE_SYSTEM (Group) - TURRET_COORDINATE_SYSTEM (Group) - TOOL_COORDINATE_SYSTEM (Group) - GEOMETRIC_CAMERA_MODEL (Group) - ROVER_DERIVED_GEOMETRY_PARMS (Group) - SITE_DERIVED_GEOMETRY_PARMS (Group) - SITE_COORDINATE_SYSTEM (Group) - LOCAL_LEVEL_COORDINATE_SYSTEM (Group) - DERIVED_IMAGE_PARMS (Group) - SURFACE_PROJECTION_PARMS (Group) - SURFACE_MODEL_PARMS (Group) **X-path** TBD **Reference** TBD	**Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword REFERENCE_PIXEL_IMAGE_ID **Archive Attribute** TBD **Definition** Specifies the value of IMAGE_ID or PRODUCT_ID for the reference pixel EDR that was used to remove bias in generating the RDR. NOTE: If the model rather than a reference pixel EDR was used to remove the bias then this keyword is not included in the PDS label.	**Valid Values** n/a **Type** string **Units** n/a **Location** DERIVED_IMAGE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword RELEASE_ID **Archive Attribute** TBD **Definition** Specifies the unique identifier associated with the release to the public of all or part of a data set. The release number is associated with the data set, not the mission. When a data set is released incrementally, such as every	**Valid Values** n/a **Type** string **Units** n/a **Location** IDENTIFICATION (Class) **X-path**	**Mode** User parameter input **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
three months during a mission, the RELEASE_ID is updated each time part of the data set is released. The first release of a data set in the mission should have a value of "0001". For example, on M2020 the first release of the EDR data set will have RELEASE_ID = "0001". The next EDR release will have RELEASE_ID = "0002".	TBD **Reference** TBD	
Ops Keyword REQUEST_ID **Archive Attribute** TBD **Definition** Specifies the ground-assigned Request-ID associated with the data product. The general operational usage of Request_ID is to group related datasets together by science or engineering application or theme, such as frames in a mosaic.	**Valid Values** • Eng. Cameras (S) 0 – 4,294,967,295 **Type** string **Units** n/a **Location** IDENTIFICATION (Class) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** • All Cameras (S) "MslEarthProductMetadata:MslProductMetadata:ActivityId" **Type** • Eng. Cameras (S) U32 • All other cameras U16
Ops Keyword RESERVED_1 **Archive Attribute** TBD **Definition** Reserved for future use.	**Valid Values** n/a (B) **Type** integer **Units** n/a **Location** SCAM_MINI_HEADER (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** "SCAM_Image_Mini_Header[189]" **Type** U8 Notes: For SCAM RMI products, "rmi_header_size" is comprised of one byte coming from the Image DPO mini-header at offset 189.
Ops Keyword RESERVED_2 **Archive Attribute** TBD **Definition** Reserved for future use.	**Valid Values** n/a (B) **Type** integer **Units** n/a **Location** SCAM_MINI_HEADER (Group) **X-path** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** "SCAM_Image_Mini_Header[193]" **Type** U32 Notes:

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	Reference TBD	For SCAM RMI products, "rmi_header_size" is comprised of one byte coming from the Image DPO mini-header at offset 193.
Ops Keyword RESPONSIVITY_CONSTANTS **Archive Attribute** TBD **Definition** Specifies the array of responsivity constants used in generating the RDR.	**Valid Values** n/a **Type** float array **Units** n/a **Location** DERIVED_IMAGE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword RESPONSIVITY_CONSTANTS_FILE **Archive Attribute** TBD **Definition** Specifies the name of the responsivity constants file used in generating the RDR.	**Valid Values** n/a **Type** string **Units** n/a **Location** DERIVED_IMAGE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword RMI_CMOS_REGISTERS **Archive Attribute** TBD **Definition** Dump of all RMI hardware registers.	**Valid Values** n/a (B) **Type** String **Units** n/a **Location** SCAM_MINI_HEADER (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** "SCAM_Image_Mini_Header[42]" **Type** U8[] Notes: For SCAM RMI products, "rmi_header_size" is comprised of 128 bytes coming from the Image DPO mini-header at offset 42.

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Ops Keyword RMI_FPGA_REGISTERS **Archive Attribute** TBD **Definition** Dump of all RMI FPGA registers.	**Valid Values** n/a (B) **Type** String **Units** n/a **Location** SCAM_MINI_HEADER (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** "SCAM_Image_Mini_Header[170]" **Type** U8[] Notes: For SCAM RMI products, "rmi_header_size" is comprised of 8 bytes coming from the Image DPO mini-header at offset 170.
Ops Keyword RMI_HEADER_SIZE **Archive Attribute** TBD **Definition** Total number of bytes in MU and BU headers	**Valid Values** "0 to " 200" (B) **Type** integer **Units** bytes **Location** SCAM_MINI_HEADER (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** "SCAM_Image_Mini_Header[0]" **Type** U32 Notes: For SCAM RMI products, "rmi_header_size" is comprised of 4 bytes coming from the Image DPO mini-header at offset 0.
Ops Keyword ROI_SIZE **Archive Attribute** TBD **Definition** For SuperCam RMI this specifies the number of pixels on an edge of an image.	**Valid Values** "6" to "2048" **Type** integer **Units** n/a **Location** MINI_HEADER_GROUP **X-path** TBD **Reference** TBD	SCAM Image DPO mini-header **Field as "<xml name>:[<element>]:[<element>]:<field>"** <SCAM Image DPO Mini Header>:roi_size **Type** U16 Notes: For SCAM RMI products, "roi_size" is comprised of two bytes coming from the Image DPO mini-header at byte offset 8 and 9.
Ops Keyword ROI_Y_POSITION	**Valid Values** "0" to "2042"	SCAM Image DPO mini-header

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Archive Attribute TBD **Definition** For SuperCam RMI this specifies the pixel location for the region of interest upper left corner.	**Type** integer **Units** n/a **Location** MINI_HEADER_GROUP **X-path** TBD **Reference** TBD	**Field as <xml name>:[<element>]:[<element>]:<field>** <SCAM Image DPO Mini Header>:roi_y_position **Type** U16 Notes: For SCAM RMI products, "roi_y_position" is comprised of two bytes coming from the Image DPO mini-header at byte offset 10 and 11.
Ops Keyword ROVER_MOTION_COUNTER **Archive Attribute** TBD **Definition** Specifies a set of integers which describe a (potentially) unique location (position/orientation) for a rover. Each time something happens that moves, or could potentially move, the rover, a new motion counter value is created. This includes intentional motion due to drive commands, as well as potential motion due to other articulating devices, such as arms or antennae. This motion counter (or part of it) is used as a reference to define instances of coordinate systems which can move such as SITE or ROVER frames. The motion counter is defined in a mission-specific manner. Although the original intent was to have incrementing indices (e.g. MER), the motion counter could also contain any integer values which conform to the above definition, such as time or spacecraft clock values. For M2020, the motion counter consists of ten values. In order, they are "Site", "Drive", "Pose", "Arm", "Sha", "Drill", "RSM", "HGA", "Bitcar", and "Seal". The Site value increments whenever a new major Site frame is declared. The Drive value increments any time intentional driving is done. Each of those, along with Pose, resets all later indices to 0 when they increment. The Arm, SHA, DRILL, RSM, HGA, BITCAR, and SEAL increment whenever the corresponding articulation device moves. These all increment independently of each other; they are reset to zero only when the SITE or DRIVE or POSE changes.	**Valid Values** n/a **Type** integer array[10] **Units** n/a **Location** 1) IDENTIFICATION (Class) 2) INITIAL_STATE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** **Surface** • Eng. Cameras (B) 1) "<IDPH DPO>:idph:rmc_site", "<IDPH DPO>:idph:rmc_drive", "<IDPH DPO>:idph:rmc_pose", "<IDPH DPO>:idph:rmc_arm", "<IDPH DPO>:idph:rmc_sha", "<IDPH DPO>:idph:rmc_drill", "<IDPH DPO>:idph:rmc_rsm", "<IDPH DPO>:idph:rmc_hga", "<IDPH DPO>:idph:rmc_bitcar", "<IDPH DPO>:idph:rmc_seal" 2) "<IDPH DPO>:idph:rmc_site0", "<IDPH DPO>:idph:rmc_drive0", "<IDPH DPO>:idph:rmc_pose0", "<IDPH DPO>:idph:rmc_arm0", "<IDPH DPO>:idph:rmc_sha0", "<IDPH DPO>:idph:rmc_drill0", "<IDPH DPO>:idph:rmc_rsm0", "<IDPH DPO>:idph:rmc_hga0", "<IDPH DPO>:idph:rmc_bitcar0", "<IDPH DPO>:idph:rmc_seal0" • SuperCam (S) • MCZ (S) • SHERLOC (S) 1) "<IDPH DPO>:idph:system:rmc:site", "<IDPH DPO>:idph:system:rmc:drive", "<IDPH DPO>:idph:system:rmc:pose", "<IDPH DPO>:idph:system:rmc:arm", "<IDPH DPO>:idph:system:rmc:sha", "<IDPH DPO>:idph:system:rmc:drill", "<IDPH DPO>:idph:system:rmc:rsm", "<IDPH DPO>:idph:system:rmc:hga",

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
		"<IDPH DPO>:idph:system:rmc:bitcar", "<IDPH DPO>:idph:system:rmc:seal" **Cruise** • MCZ Cameras (C) 1) "<IDPH DPO>:cidph:rmc:site", "<IDPH DPO>:cidph:rmc:drive", "<IDPH DPO>:cidph:rmc:pose", "<IDPH DPO>:cidph:rmc:arm", "<IDPH DPO>:cidph:rmc:sha", "<IDPH DPO>:cidph:rmc:drill", "<IDPH DPO>:cidph:rmc:rsm", "<IDPH DPO>:cidph:rmc:hga", "<IDPH DPO>:cidph:rmc:bitcar", "<IDPH DPO>:cidph:rmc:seal" **Type** U16
Ops Keyword ROVER_MOTION_COUNTER_NAME **Archive Attribute** TBD **Definition** Specifies an array that provides the formal names identifying each integer in ROVER_MOTION_COUNTER.	**Valid Values** All Rover Cameras ("SITE", "DRIVE", "POSE", "ARM", "SHA", "DRILL", "RSM", "HGA", "BITCAR", "SEAL") Helicopter Cameras ("FLIGHT", "POS") **Type** string array[10] **Units** n/a **Location** • IDENTIFICATION (Class) • INITIAL_STATE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** Static value: - Single value representing array of 10 RMC elements from ROVER_MOTION_COUNTER. **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword SAMPLE_BITS **Archive Attribute** TBD **Definition** Specifies the stored total number of bits, or units of binary information, contained in a LINE_SAMPLE value. As an example, a SAMPLE_BIT_MASK value of "2#0000111111111111", expressing 12-bit data in the case of	**Valid Values** "1", "2", "4", "8", "16", "32", "64" **Type** integer **Units** n/a **Location** IMAGE (Object)	**Mode** DPO in XML format (referenced to APID Name in Appendix A), Calculation **Field as "<xml name>:[<element>]:[<element>]:<field>"** "<IDPH DPO>:idph:scale" **Type** enum

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
an unscaled EDR or ILUT RDR (see SAMPLE_BIT_METHOD), has a SAMPLE_BITS value of "16".	**X-path** TBD **Reference** TBD	
Ops Keyword SAMPLE_BIT_MASK **Archive Attribute** TBD **Definition** Specifies the active bits in a sample. Any bit mask is valid in an RDR. However, only a few are generated for products described in this SIS. Any 8-bit product, whether a scaled EDR or an RDR, will have the value "2#11111111" and be stored in one byte. Any 12-bit product, whether an unscaled EDR, or an ILUT RDR (see SAMPLE_BIT_METHOD), will have the value "2#0000111111111111" and be stored in two bytes. A 15-bit product (e.g. Radiometrically-corrected RDR product type) will have the value "2#0111111111111111" and be stored in two bytes. Any 32-bit integer product (e.g. Histogram EDR) will have the value "2#11111111111111111111111111111111" and be stored in four bytes. For floating-point data, SAMPLE_BIT_MASK is not valid and may be absent. If present, it should be ignored. NOTE: In the PDS, the domain of SAMPLE_BIT_MASK is dependent upon the currently-described value in the SAMPLE_BITS element and only applies to integer values.	**Valid Values** • For EDRs … - Eng. Cameras "2#11111111#", "2#0000111111111111#", "2#11111111111111111111111111111111#" - MCZ Cameras "2#11111111#" • For RDRs … - Value Any combination of 0's and 1's is valid **Type** non-decimal **Units** n/a **Location** IMAGE (Object) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A), Calculation **Field as "<xml name>:[<element>]:[<element>]:<field>"** Eng. Cameras "<IDPH DPO>:idph:scale" NOTES: • For EDRs … - Eng. Cameras: a. If data type is BYTE … scale = 1 thru 5, 7-11 or 127 and valid value is "2#11111111#" b. If data type is HALF … scale = 0 and valid value is "2#0000111111111111#" c. If data type is FULL … valid value is "2#11111111111111111111111111111111#" **Type** enum
Ops Keyword SAMPLE_BIT_METHOD **Archive Attribute** TBD **Definition** Specifies the method in which bit scaling is performed. For M2020, the bit scaling is a 12-bit to 8-bit scaling and can be performed onboard via hardware and/or software , or on the ground in an inverse operation. As valid values, "SOFTWARE_INVERTED" and "HARDWARE_INVERTED" indicate that an Inverse Lookup Table (ILUT) was applied during ground processing to 8-bit data, scaling the 8 bits in the EDR to the lowest 12	**Valid Values** • For EDRs … - Eng. Cameras & RMI "NONE", "HARDWARE", "SOFTWARE" - MCZ Cameras "NONE", "HARDWARE" • For RDRs … - Eng. Cameras & RMI "NONE", "HARDWARE", "SOFTWARE", "SOFTWARE_INVERTED", "HARDWARE_INVERTED" - MCZ Cameras "NONE", "HARDWARE", "HARDWARE_INVERTED"	**Mode** DPO in XML format (referenced to APID Name in Appendix A), Calculation **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras & RMI "<IDPH DPO>:TBD", "<IDPH DPO>:idph:hw_scale" • SuperCam RMI TBD S6.? • MCZ Cameras "<Ancillary DPO>: image_id_data:comp_companding_mode" NOTES: • For EDRs …. - Eng. Cameras:

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
bits in the signed 16-bit integer RDR. This characterizes the Inverse LUT RDR (IDS), which is the inverse of the "12 to 8-bit" scaled version of onboard 12-bit data (via LUT).	**Type** string **Units** n/a **Location** INSTRUMENT_STATE_PARMS (Group) **X-path** TBD **Reference** TBD	a. If scale = 0, value is "NONE" b. If scale > 0 and hw_scale=0 (false), value is "SOFTWARE" c. If scale > 0 and hw_scale=1 (true), value is "HARDWARE" d. If APID is JPEG and scale = 0, value is "SOFTWARE" - MCZ Cameras: a. If comp_companding_mode <= 32, value is "HARDWARE" b. If comp_companding_mode = 255, value is "NONE" c. If comp_companding_mode not "a" or "b", value is "UNK" • For RDRs …. - Any of the EDR values are valid. - If ILUT (inverse LUT) operation, then append "_INVERTED" to the EDR value, resulting in "SOFTWARE_INVERTED" or "HARDWARE_INVERTED" as the case may be. **Type** enum
Ops Keyword SAMPLE_BIT_MODE_ID **Archive Attribute** TBD **Definition** Specifies the type of pixel scaling performed. For M2020, pixel scaling is accomplished by using onboard lookup tables or by shifting a specified bit into the most significant bit. Descriptions of the valid values for Eng. Cameras and RMI follow: a) "NONE" - No scaling; keep as 12-bit (if available) b) "LUT1" - Use lookup table 1 c) "LUT2" - Use lookup table 2 d) "LUT3" - Use lookup table 3 e) "LUT4" - Use lookup table 4 f) "LUT5" - Use lookup table 5 g) "MSB_BIT7" - No scaling; make bit 7 most significant bit (MSB) h) "MSB_BIT8" - Shift to make bit 8 MSB i) "MSB_BIT9" - Shift to make bit 9 MSB j) "MSB_BIT10" - Shift to make bit 10 MSB k) "MSB_BIT11" - Shift to make bit 11 MSB l) "AUTOSHIFT" - Auto-shift to keep highest value Descriptions of the valid values for MCZ and SHERLOC Cameras follow: a) "NONE" - no scaling b) "MCZ_LUT_<n>" - valid LUT, with n = 0 to 32	**Valid Values** • Eng. Cameras (B) 0 = "NONE" 1 = "LUT1" 2 = "LUT2" 3 = "LUT3" 4 = "LUT4" 5 = "LUT5" 7 = "MSB_BIT7" 8 = "MSB_BIT8" 9 = "MSB_BIT9" 10 = "MSB_BIT10" 11 = "MSB_BIT11" • SuperCam RMI (S) "COMP_LUT<n>", "NONE", "UNK" where, n = 1 to 10 • MCZ Cameras (B) "MCZ_LUT<n>", "NONE", "UNK" where, n = 0 to 32 • SHERLOC-WATSON (S) "SI_LUT<n>", "NONE", "UNK" where, n = 0 to 32 • SHERLOC-ACI (S) "SC_LUT<n>", "NONE", "UNK" where, n = 0 to 32 **Type** string **Units**	**Mode** DPO in XML format (referenced to APID Name in Appendix A), Calculation **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras a. "<IDPH DPO>:idph:scale" b. "<IDPH DPO>:idph:params:scale" c. "<IDPH DPO>:idph:params:thumb_scale" • SuperCam RMI <ScamAncillaryParams DPO>:cmd_parameters:jpeg_bitscaling_13bit <ScamAncillaryParams DPO>:cmd_parameters:jpeg_bitscaling_12bit <ScamAncillaryParams DPO>:cmd_parameters:jpeg_bitscaling_10bit • MCZ • SHERLOC a. "<Ancillary DPO>: image_id_data:comp_companding_mode" NOTES: • For Eng. Cameras, if APID is Jpeg and "idph:scale" is 0, then a simple bit shift is applied by comp module: "MSB_BIT11". • For MCZ and SHERLOC Cameras … a. If comp_companding_mode <= 32, value is "MCZ_LUT_<n>" b. If comp_companding_mode = 255, value is

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
NOTE: For M2020, the instance of SAMPLE_BIT_MODE_ID in the PDS label Group INSTRUMENT_STATE_PARMS will never have the value "AUTOSHIFT".	n/a **Location** • Eng. Cameras a. INSTRUMENT_STATE_PARMS (Group) b. IMAGE_REQUEST_PARMS (Group) c. THUMBNAIL_REQUEST_PARMS (Group) • SuperCam RMI • MCZ • SHERLOC a. INSTRUMENT_STATE_PARMS (Group) **X-path** TBD **Reference** TBD	"NONE" c. If comp_companding_mode not "a" or "b", value is "UNK" • For SuperCam RMI For images that are JPEG compressed, the ID of the LUT is returned as a parameter listed above. **Type** enum
Ops Keyword SAMPLE_CAMERA_MODEL_OFFSET **Archive Attribute** TBD **Definition** Specifies the location of the image origin with respect to the camera model's origin. For CAHV/CAHVOR models, this origin is not the center of the camera, but is the upper-left corner of the "standard"-size image, which is encoded in the CAHV vectors. (MIPL Projections - Perspective)	**Valid Values** n/a **Type** float **Units** pixel (<pixel> unit tag required) **Location** SURFACE_PROJECTION_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword SAMPLE_PROJECTION_OFFSET **Archive Attribute** TBD **Definition** Specifies the sample coordinate of the location in the image of the "special" point of the mosaic. For Polar projections, this is the nadir of the polar projection. For Vertical, Orthographic and Orthorectified projections, this is the origin of the projected coordinate system (corresponding to PROJECTION_ORIGIN_VECTOR), and may be off the image. Not applicable to other projections.	**Valid Values** n/a **Type** float **Units** pixel (<pixel> unit tag required) **Location** SURFACE_PROJECTION_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword SAMPLE_TYPE	**Valid Values** "IEEE_REAL", "MSB_INTEGER", "MSB_UNSIGNED_INTEGER", "PC_REAL",	**Mode** DPO in XML format (referenced to APID Name in Appendix A), depends on host platform type

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Archive Attribute TBD **Definition** Specifies the data storage representation of sample value. The valid values are platform dependent. JAVA, Suns and PPC-based Macs or Intel-based Macs are MSB and IEEE_REAL. Intel-based machines usually running Windows or Linux are LSB integers and PC_REAL.	"LSB_INTEGER", "LSB_UNSIGNED_INTEGER" **Type** string **Units** n/a **Location** IMAGE (Object) **X-path** TBD **Reference** TBD	**Field as "<xml name>:[<element>]:[<element>]:<field>"** 1) "<IDPH DPO>:idph:scale" 2) "<IDPH DPO>:idph:hw_scale" **Type** 1) enum 2) boolean
Ops Keyword SEQUENCE_EXECUTION_COUNT **Archive Attribute** TBD **Definition** Specifies how many times this sequence has executed since the last reset of the flight computer. For M2020, this means RCE (Rover Compute Element) start-up.	**Valid Values** n/a **Type** integer **Units** n/a **Location** TELEMETRY (Class) **X-path** TBD **Reference** TBD	**Mode** EMD in XML format **Field as "<xml name>:[<element>]:[<element>]:<field>"** "MslEarthProductMetadata:MslProductMetadata: SequenceExecutionCounter" **Type** n/a
Ops Keyword SEQUENCE_ID **Archive Attribute** TBD **Definition** Specifies the spacecraft sequence associated with the given product.	**Valid Values** n/a **Type** string(30) **Units** n/a **Location** IDENTIFICATION (Class) **X-path** TBD **Reference** TBD	**Mode** EMD in XML format **Field as "<xml name>:[<element>]:[<element>]:<field>"** "MslEarthProductMetadata:MslProductMetadata:SequenceId " **Type** n/a
Ops Keyword SEQUENCE_VERSION_ID **Archive Attribute** TBD	**Valid Values** n/a **Type** string(30)	**Mode** EMD in XML format **Field as "<xml name>:[<element>]:[<element>]:<field>"** "MslEarthProductMetadata:MslProductMetadata:SequenceV ersion"

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Definition Specifies the version identifier for a particular observation sequence used during planning or data processing.	**Units** n/a **Location** IDENTIFICATION (Class) **X-path** TBD **Reference** TBD	**Type** n/a
Ops Keyword SHUTTER_CORRECTION_MODE_ID **Archive Attribute** TBD **Definition** Specifies whether shutter subtraction will be performed.	**Valid Values** • Eng. Cameras (B) 0 = “NONE” 1 = “CONDITIONAL” 2 = “ALWAYS” **Type** string **Units** n/a **Location** OBSERVATION_REQUEST_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as “<xml name>:[<element>]:[<element>]:<field>”** “<IDPH DPO>:idph:params:shutter” **Type** enum
Ops Keyword SHUTTER_CORRECT_THRESH_COUNT **Archive Attribute** TBD **Definition** Specifies the exposure time threshold for conditional shutter subtraction. For M2020, the count was in increments of 50 µs.	**Valid Values** • Eng. Cameras (B) “0” to “65535” **Type** unsigned integer **Units** n/a **Location** OBSERVATION_REQUEST_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as “<xml name>:[<element>]:[<element>]:<field>”** “<IDPH DPO>:idph:params:shutter_thresh” **Type** U16
Ops Keyword SHUTTER_EFFECT_CORRECTION_FLAG **Archive Attribute** TBD	**Valid Values** • Eng. Cameras (B) 0 = “FALSE” 1 = “TRUE”	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as “<xml name>:[<element>]:[<element>]:<field>”** “<IDPH DPO>:idph:shutter”

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Definition Specifies whether or not a shutter effect correction was applied to the image. The shutter effect correction involves the removal from the image of the shutter, or fixed-pattern.	**Type** string(5) **Units** n/a **Location** INSTRUMENT_STATE_PARMS (Group) **X-path** TBD **Reference** TBD	**Type** boolean
Ops Keyword SOFTWARE_KEYWORD_NAME **Archive Attribute** TBD **Definition** Specifies the value of all keyword names used as input to the primary generating software named in SOFTWARE_MODULE_NAME. For M2020, this keyword may be placed in a xxx_HISTORY_PARMS group, where "xxx" is the task name. There may be multiple groups to accommodate multiple software tasks.	**Valid Values** n/a **Type** string array **Units** n/a **Location** <xxx>_HISTORY_PARMS (Group) where, xxx = RDR software name **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword SOFTWARE_KEYWORD_TYPE **Archive Attribute** TBD **Definition** Specifies the value of a keyword type used as input to the primary generating software named in SOFTWARE_MODULE_NAME. For M2020, this keyword may be placed in a xxx_HISTORY_PARMS group, where "xxx" is the task name. There may be multiple groups to accommodate multiple software tasks. Use of this keyword is optional. NOTE: The value of this keyword will be relevant to SOFTWARE_LANGUAGE.	**Valid Values** n/a **Type** string array **Units** n/a **Location** <xxx>_HISTORY_PARMS (Group) where, xxx = RDR software name **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword SOFTWARE_KEYWORD_VALUE **Archive Attribute** TBD	**Valid Values** n/a **Type** string array	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Definition Specifies the value of a keyword value used as input to the primary generating software named in SOFTWARE_MODULE_NAME. Array values can be nested. Example: "SOFTWARE_KEYWORD_VALUE = (value 1, (value2A, value2b), value3)." For M2020, this keyword may be placed in a xxx_HISTORY_PARMS group, where "xxx" is the task name. There may be multiple groups to accommodate multiple software tasks.	**Units** n/a **Location** <xxx>_HISTORY_PARMS (Group) where, xxx = RDR software name **X-path** TBD **Reference** TBD	**Type** n/a
Ops Keyword SOFTWARE_LANGUAGE **Archive Attribute** TBD **Definition** Specifies the programming language that the primary RDR generating software is written in (eg: IDL)	**Valid Values** n/a **Type** string **Units** n/a **Location** <xxx>_HISTORY_PARMS (Group) where, xxx = RDR software name **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword SOFTWARE_MODULE_NAME **Archive Attribute** TBD **Definition** Specifies the name of the primary software module used to generate this product. This is the module to which the PDS label entries SOFTWARE_PARAMETER_* and SOFTWARE_KEYWORD_* apply. For M2020, this keyword may be placed in a xxx_HISTORY_PARMS group, where "xxx" is the task name. There may be multiple groups to accommodate multiple software tasks.	**Valid Values** n/a **Type** string **Units** n/a **Location** <xxx>_HISTORY_PARMS (Group) where, xxx = RDR software name **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword SOFTWARE_MODULE_TYPE **Archive Attribute** TBD **Definition**	**Valid Values** "PROCEDURE", "FUNCTION", "SCRIPT" **Type** string **Units** n/a	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Specifies the type of the primary software module named in SOFTWARE_MODULE_NAME.	**Location** <xxx>_HISTORY_PARMS (Group) where, xxx = RDR software name **X-path** TBD **Reference** TBD	
Ops Keyword SOFTWARE_NAME **Archive Attribute** TBD **Definition** Specifies the name of data processing software such as a program or a program library.	**Valid Values** "M2020EDRGEN", other **Type** string(60) **Units** n/a **Location** • For EDRs … - M2020EDRGEN_HISTORY_PARMS (Group) • For RDRs … - <xxx>_HISTORY_PARMS (Group) where, xxx = RDR software name **X-path** TBD **Reference** TBD	**Mode** Dependent on EDR/RDR state: - For EDRs, static - For RDRs, RDR-generating software **Field as "<xml name>:|<element>|:|<element>|:<field>"** n/a **Type** n/a
Ops Keyword SOFTWARE_PARAMETER_NAME **Archive Attribute** TBD **Definition** Specifies the value of a parameter name used as input to the primary generating software named in SOFTWARE_MODULE_NAME. For M2020, this keyword may be placed in a xxx_HISTORY_PARMS group, where "xxx" is the task name. There may be multiple groups to accommodate multiple software tasks.	**Valid Values** n/a **Type** string array **Units** n/a **Location** <xxx>_HISTORY_PARMS (Group) where, xxx = RDR software name **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:|<element>|:|<element>|:<field>"** n/a **Type** n/a
Ops Keyword SOFTWARE_PARAMETER_TYPE **Archive Attribute** TBD	**Valid Values** n/a **Type** string array	**Mode** RDR-generating software **Field as "<xml name>:|<element>|:|<element>|:<field>"** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Definition Specifies the value of a parameter type used as input to the primary generating software named in SOFTWARE_MODULE_NAME. For M2020, this keyword may be placed in a xxx_HISTORY_PARMS group, where "xxx" is the task name. There may be multiple groups to accommodate multiple software tasks. Use of this keyword is optional. NOTE: The value of this keyword will be relevant to SOFTWARE_LANGUAGE.	**Units** n/a **Location** <xxx>_HISTORY_PARMS (Group) where, xxx = RDR software name **X-path** TBD **Reference** TBD	**Type** n/a
Ops Keyword SOFTWARE_PARAMETER_VALUE **Archive Attribute** SOFTWARE_PARAMETER_VALUE **Definition** Specifies the value of a parameter value used as input to the primary generating software named in SOFTWARE_MODULE_NAME. Array values can be nested. Example: "SOFTWARE_PARAMETER_VALUE = (value 1, (value2A, value2b),value3)." For M2020, this keyword may be placed in a xxx_HISTORY_PARMS group, where "xxx" is the task name. There may be multiple groups to accommodate multiple software tasks.	**Valid Values** n/a **Type** array **Units** n/a **Location** <xxx>_HISTORY_PARMS (Group) where, xxx = RDR software name **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword SOFTWARE_VERSION_ID **Archive Attribute** TBD **Definition** Specifies the version (development level) of a program or a program library.	**Valid Values** n/a **Type** string(20) **Units** n/a **Location** • For EDRs … - M2020EDRGEN_HISTORY_PARMS (Group) • For RDRs … - <xxx>_HISTORY_PARMS (Group) where, xxx = RDR software name **X-path** TBD **Reference** TBD	**Mode** Dependent on EDR/RDR state: - For EDRs, static - For RDRs, RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword SOLAR_AZIMUTH **Archive Attribute**	**Valid Values** "0.0" to "359.99" "N/A" if any SPICE kernel is unavailable.	**Mode** 1) a. Calculation using SPICE: - EK Kernel - SCLK Kernel

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
TBD **Definition** Specifies one of two angular measurements indicating the direction to the Sun as measured from a specific point on the surface of a planet (ex., from a lander or rover). The positive direction of the elevation is set by the POSITIVE_AZIMUTH_DIRECTION data element. The azimuth is measured positively in the clockwise direction (as viewed from above) with the meridian passing through the positive spin axis of the planet (i.e., the north pole) defining the zero reference. 0 <= SOLAR_AZIMUTH <= 360. Units are degrees. For M2020, the value in the SITE_DERIVED_GEOMETRY group is calculated using SPICE based on the time of the observation. The value in the ROVER_DERIVED_GEOMETRY group reflects what was sent in telemetry (as az/el, converted from the telemetered unit vector). Thus, even after they are converted to a common frame, the values will likely differ by a small amount, representing the difference between the rover's knowledge and the (more accurate) SPICE computation.	**Type** float **Units** deg (<deg> unit tag required) **Location** 1) SITE_DERIVED_GEOMETRY_PARMS (Group) 2) ROVER_DERIVED_GEOMETRY_PARMS (Group) **X-path** TBD **Reference** TBD	- Leapsecond Kernel - SPK Kernel - PCK Kernel - Surface Kernel b. DPO in XML format (referenced to APID Name in Appendix D), Calculation 2) DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:|<element>|:|<element>|:<field>"** 1) b. "<IDPH DPO>:idph:sclk_seconds", "<IDPH DPO>:idph:sclk_subseconds" 2) "<IDPH DPO>:idph:sun_dir" **Type** U32
Ops Keyword SOLAR_ELEVATION **Archive Attribute** TBD **Definition** Specifies one of two angular measurements indicating the direction to the Sun as measured from a specific point on the surface of a planet (ex., from a lander or rover). The positive direction of the elevation is set by the POSITIVE_ELEVATION_DIRECTION data element. The elevation is measured from the plane which is normal to the line passing between the surface point and the planet's center of mass, and which intersects the surface point. -90 <= SOLAR_ELEVATION <= 90. Units are degrees. For M2020, the value in the SITE_DERIVED_GEOMETRY group is calculated using SPICE based on the time of the observation. The value in the ROVER_DERIVED_GEOMETRY group reflects what was sent in telemetry (as az/el, converted from the telemetered unit vector). Thus, even after they are converted to a common frame, the values will likely differ by a small amount, representing the difference between the rover's knowledge and the (more accurate) SPICE computation.	**Valid Values** "-90.0" to "90.0" "N/A" if any SPICE kernel is unavailable. **Type** float **Units** deg (<deg> unit tag required) **Location** 1) SITE_DERIVED_GEOMETRY_PARMS (Group) 2) ROVER_DERIVED_GEOMETRY_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** 1) a. Calculation using SPICE: - EK Kernel - SCLK Kernel - Leapsecond Kernel - SPK Kernel - PCK Kernel - Surface Kernel b. DPO in XML format (referenced to APID Name in Appendix D), Calculation 2) DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:|<element>|:|<element>|:<field>"** 1) b. "<IDPH DPO>:idph:sclk_seconds", "<IDPH DPO>:idph:sclk_subseconds" 2) "<IDPH DPO>:idph:sun_dir" **Type** U32
Ops Keyword SOLAR_LONGITUDE **Archive Attribute** TBD	**Valid Values** "0.0" to "359.99" "N/A" if any SPICE kernel is unavailable. **Type**	**Mode** • Calculation: - SCLK Kernel - Landing Site Kernel - P Kernel

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Definition Specifies the value of the angle between the body_Sun line at the time of interest and the body_Sun line at the vernal equinox. This provides a measure of season on a target body, with values of 0 to 90 degrees representing northern spring, 90 to 180 degrees representing northern summer, 180 to 270 degrees representing northern autumn and 270 to 360 degrees representing northern winter. Example: For IRAS, the geocentric ecliptic longitude (B1950) of the Sun at the start of a scan.	float **Units** deg (<deg> unit tag required) **Location** IDENTIFICATION (Class) **X-path** TBD **Reference** TBD	• DPO in XML format (referenced to APID Name in Appendix A), Calculation **Field as "<xml name>:[<element>]:[<element>]:<field>"** "<IDPH DPO>:idph:sclk_seconds", "<IDPH DPO>:idph:sclk_subseconds" **Type** U32
Ops Keyword SOLUTION_ID **Archive Attribute** TBD **Definition** Specifies the unique identifier for the solution set to which the values in the group belong. For certain kinds of information, such as pointing correction (pointing models) and rover localization (coordinate system definitions), the "true" value is unknown and only estimates of the true value exist. Thus, more than one set of estimates may exist simultaneously, each valid for its intended purpose. Each of these sets is called a "solution" to the unknown true value. SOLUTION_ID is used to identify which solution is being expressed by the containing group. No specific naming convention is defined here, however it is recommended that projects adopt one. The intent is to be able to identify who created the solution, and why. Possible components of the naming convention include user, institution, purpose, request ID, version, program, date/time. The value is not case-sensitive. For M2020, when in a COORDINATE_SYSTEM group, the SOLUTION_ID specifies the ID of the coordinate system being defined in that group. It must be globally unique across all coordinate system instances, i.e. it cannot be reused to define the same coordinate system instance differently. Different coordinate system instances (for example, different values of the RMC index) may share the same SOLUTION_ID. See also REFERENCE_COORD_SYSTEM_NAME and REFERENCE_COORD_SYSTEM_SOLN_ID. The SOLUTION_ID should be the same identifier used in the PLACES rover localization database. The special name "telemetry" is used for values telemetered from the rover. If SOLUTION_ID is absent, "telemetry" should be assumed. For M2020, when in the DERIVED_GEOMETRY_PARMS	**Valid Values** • EDR-generating software "TELEMETRY" • RDR-generating software any string value **Type** string **Units** n/a **Location** • For EDRs … - ROVER_COORDINATE_SYSTEM (Group) - RSM_COORDINATE_SYSTEM (Group) - ARM_COORDINATE_SYSTEM (Group) - PIXL_SENSOR_COORDINATE_SYSTEM(Group) • For RDRs … - ROVER_COORDINATE_SYSTEM (Group) - RSM_COORDINATE_SYSTEM (Group) - ARM_COORDINATE_SYSTEM (Group) - SITE_COORDINATE_SYSTEM (Group) - LOCAL_LEVEL_COORDINATE_SYSTEM (Group) - DERIVED_IMAGE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** • EDR-generating software: - Static Value • RDR-generating software: - Determined **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a

<table>
<tr><th colspan="2">Output Metadata (Product Label)</th><th>Input Metadata (Source)</th></tr>
<tr><td>• Ops Keyword
• Archive Label Attribute
• Definition</td><td>• Mission Phase C=Cruise, S=Surface, B=Both
• Valid Values (quoted)
• Type
• Units
• Keyword Location in Ops Label
• Attribute X-path in Archive label
• Attribute Reference in Archive Label (bracketed)</td><td>• Mission Phase C=Cruise, S=Surface, B=Both
• Mode
• Metadata Field
• Type</td></tr>
<tr><td>group, SOLUTION_ID specifies the identifier of the pointing correction solution used to derive the model specified via POINTING_MODEL_PARAMS et al. This identifier should also appear in the pointing correction file referenced by POINTING_CORRECTION_FILE_NAME. If there is only one identifier in the correction file, then SOLUTION_ID may be omitted. SOLUTION_ID may be reused in the context of pointing corrections, although uniqueness is recommended. The pointing correction solution ID namespace is separate
from the coordinate system namespace.</td><td></td><td></td></tr>
<tr><td><u>Ops Keyword</u>
SOURCE_ID

<u>Archive Attribute</u>
TBD

<u>Definition</u>
Specifies an identifier for the source.

For M2020, it identifies the FSW element that requested the image, i.e. what was the source of the command. The field is based on the value for IMAGE_ID and the mappings are per convention; there is no guarantee that the mappings are used in this way during operations.</td><td><u>Valid Values</u>

• Eng. Cameras
<table><tr><th>Value</th><th>Range</th><th>Source</th></tr><tr><td>“GND”</td><td>0 - 99999999</td><td>Ground</td></tr><tr><td>“NAVF”</td><td>100000000 - 199999999</td><td>Navigation, Front (left/right)</td></tr><tr><td>“NAVR”</td><td>200000000 - 299999999</td><td>Navigation, Rear (left/right)</td></tr><tr><td>“NAVS”</td><td>300000000 - 399999999</td><td>Navigation, Steerable (left/right)</td></tr><tr><td>“HAFIQ”</td><td>40000000 - 49999999</td><td>Hazard Avoidance, Fault Image Queue</td></tr><tr><td>“SUN”</td><td>500000000 - 599999999</td><td>Sun-Finding</td></tr><tr><td>“FAULT”</td><td>600000000 - 699999999</td><td>Fault Protection/ Response</td></tr><tr><td>“VTT”</td><td>700000000 - 799999999</td><td>Target Tracking (left/right)</td></tr><tr><td>“ARMC”</td><td>800000000 - 899999999</td><td>Touch and Go, coarse res (Penultimate left/right)</td></tr><tr><td>“ARMF”</td><td>900000000 - 999999999</td><td>Touch and Go, fine res (Final left/right)</td></tr><tr><td>“WATCH”</td><td>1000000000 - 1099999999</td><td>Dust-Devil detection</td></tr><tr><td>“VISODOM”</td><td>1100000000 - 1199999999</td><td>Visual Odometry (left/right)</td></tr><tr><td>“SPARE1”</td><td>1200000000 - 1299999999</td><td>Spare group 1</td></tr><tr><td>“SPARE2”</td><td>1300000000 - 1399999999</td><td>Spare group 2</td></tr><tr><td>“SPARE3”</td><td>1400000000 - 1499999999</td><td>Spare group 3</td></tr><tr><td>“SPARE4”</td><td>1500000000 - 1599999999</td><td>Spare group 4</td></tr></table>
<u>Type</u></td><td><u>Mode</u>
DPO in XML format (referenced to APID Name in Appendix A)

<u>Field as “<xml name>:|<element>|:|<element>|:<field>”</u>
“<IDPH DPO>:idph:params:imgid1” TBD

<u>Type</u>
U32f</td></tr>
</table>

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	string **Units** n/a **Location** • OBSERVATION_REQUEST_PARMS (Group) **X-path** TBD **Reference** TBD	
Ops Keyword SOURCE_PRODUCT_ID **Archive Attribute** TBD **Definition** Identifies a product used as input to create a new product. The source_product_id may be based on a file name. See also: PRODUCT_ID. For M2020, this keyword indicates the PRODUCT_ID (filename minus extension) of the EDRs (not RDRs) that were used to create this product. In an EDR, this keyword exists and refers to itself; i.e. it is equivalent to PRODUCT_ID. See also INPUT_PRODUCT_ID.	**Valid Values** n/a **Type** string array **Units** n/a **Location** IDENTIFICATION (Class) **X-path** TBD **Reference** TBD	**Mode** • EDR-generating software: - Filename of output EDR product, minus extension • RDR-generating software: - Filename of root input EDR product, minus extension **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword SOURCE_PRODUCT_WAVELENGTH **Archive Attribute** TBD **Definition** Specifies the effective wavelength of the corresponding images listed in SOURCE_PRODUCT_ID.	**Valid Values** n/a **Type** integer array **Units** n/a **Location** DERIVED_IMAGE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword SPACECRAFT_CLOCK_CNT_PARTITION **Archive Attribute** TBD **Definition**	**Valid Values** "1" **Type** integer **Units** n/a	**Mode** Static Value **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Specifies the clock partition active for the SPACECRAFT_CLOCK_START_COUNT and SPACECRAFT_CLOCK_STOP_COUNT elements.	**Location** IDENTIFICATION (Class) **X-path** TBD **Reference** TBD	
Ops Keyword SPACECRAFT_CLOCK_START_COUNT **Archive Attribute** TBD **Definition** Specifies the value of the spacecraft clock at the beginning of a time period of interest. Format is "sssssssss.mmm,", stored as a floating point number where,"sssssssss" = seconds converted from clock's coarse counter "mmm" = milliseconds converted from clock's fine counter. For M2020, the time period of interest is the beginning of data acquisition. The fractional component "mmm" is computed as follows: [(shift right 12 bits) / 2**20] * 1000	**Valid Values** sssssssss.MCZ **Type** string(30) **Units** n/a **Location** 1) IDENTIFICATION (Class) 2) IDENTIFICATION (Class) 3) a. IDENTIFICATION (Class) b. IDENTIFICATION (Class) c. MINI_HEADER (Group) 4) IDENTIFICATION **X-path** TBD **Reference** TBD	**Mode** 1) DPO in XML format (referenced to APID Name in Appendix A) 2) DPO in XML format (referenced to APID Name in Appendix A) 3) DPO in XML format (referenced to APID Name in Appendix A) or Image DPO mini-header **Field as "<xml name>:[<element>]:[<element>]:<field>"** **Surface** 1) Eng. Cameras "<IDPH DPO>:idph:sclk_seconds", "<IDPH DPO>:idph:sclk_subseconds" 2) SuperCam "<IDPH DPO>:system:sclk_sec", "<IDPH DPO>:system:sclk_subsec" 3) MCZ Cameras SHERLOC Cameras a. "<IDPH DPO>:system:sclk_sec", "<IDPH DPO>:system:sclk_subsec b. "<Ancillary DPO>:sclk:seconds", "<Ancillary DPO>:sclk:subseconds" c. "MMM Image Mini Header:[8]-[11]" "MMM Image Mini Header:[52] 4) PIXL MCC MEDA Skycam "<IDPH DPO>:system:sclk_sec", "<IDPH DPO>:system:sclk_subsec "<MEDA Image Header>:time_tag" **Cruise** 1) Eng. Cameras "<IDPH DPO>:idph:sclk_seconds", "<IDPH DPO>:idph:sclk_subseconds" 2) SuperCam TBD 3) MCZ Cameras a. "<IDPH DPO>:cidph:sclk:seconds" b. "<Ancillary DPO>:sclk:seconds" c. "MMM_Image_Mini_Header:[8]-[11]", "MMM_Image_Mini_Header:[52] NOTES:

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
		• For MCZ recovered or Z-stack data products, value is comprised of four bytes coming from Image DPO mini-header at byte offsets 8, 9, 10 and 11 per case "3a". • For MCZ non-recovered and non-Z-stack data products, if IDPH is present, value comes from IDPH DPO per case "3a". • For MCZ non-recovered and non-Z-stack data products, if IDPH is not present, value comes from Ancillary DPO per case "3b". **Type** U32
Ops Keyword SPACECRAFT_CLOCK_STOP_COUNT **Archive Attribute** TBD **Definition** Specifies the value of the spacecraft clock at the end of a time period of interest. Format is "sssssssss.MCZ", stored as a floating point number where, "sssssssss" = seconds converted from clock's coarse counter "MCZ" = milliseconds converted from clock's fine counter. For M2020, the time period of interest is the end of data acquisition. The fractional component "MCZ" is computed as follows: [(shift right 12 bits) / 2**20] * 1000	**Valid Values** sssssssss.mmm **Type** string(30) **Units** n/a **Location** IDENTIFICATION (Class) **X-path** TBD **Reference** TBD	**Mode** 1) DPO in XML format (referenced to APID Name in Appendix A), Calculation: - Stop SCLK Count = Start SCLK Count + (exp_time * 5.12) 2) DPO in XML format (referenced to APID Name in Appendix A) or Image DPO mini-header, Calculation: - Stop SCLK Count = Start SCLK Count + (exp_time / 1000) 3) DPO in XML format (referenced to APID Name in Appendix A), Calculation: - Stop SCLK Count = Start SCLK Count + (exp_time * 5.333333) **Field as "<xml name>:[<element>]:[<element>]:<field>"** 1) Eng. Cameras & SuperCam "<IDPH DPO>:idph:sclk_seconds", "<IDPH DPO>:idph:sclk_subseconds", "<IDPH DPO>:idph:exp_time" 2) MCZ Cameras SHERLOC Cameras a. "<IDPH DPO>:system:sclk_sec", "<IDPH DPO>:system:sclk_subsec b. "<Ancillary DPO>:sclk:seconds", "<Ancillary DPO>:sclk:subseconds" 3) MEDA Skycam "<MEDA Image Header>:time_tag" "<MEDA Image Header>: skycam_exp_time_lowbyte_data" skycam_exp_time_highbyte_data" NOTES: • For Eng. Cameras "exp_time" is in raw counts, with each count translating to 0.000050 µs. • For MCZ non-recovered and non-Z-stack data products, if IDPH is present, value comes from IDPH DPO per case "2b". • For MCZ non-recovered and non-Z-stack data products, if IDPH is not present, value comes from Ancillary DPO per case "2c".

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
		• For Skycam, "exp_time" is in raw counts, with each count translating to 5.333333 ms. **Type** U32
Ops Keyword SPECIAL_LINE **Archive Attribute** none **Definition** For SuperCam on M2020, specifies the line number in a particular RMI image that has a special meaning. The context of the meaning is defined by SPECIAL_NAME.	**Valid Values** "497" **Type** integer **Units** n/a **Location** INSTRUMENT_STATE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** Static value **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** U8
Ops Keyword SPECIAL_NAME **Archive Attribute** none **Definition** Specifies how the coordinate defined as "(SPECIAL_LINE, SPECIAL_SAMPLE)" is to be interpreted; i.e. why that coordinate is special. For SuperCam on M2020, identifies the LIBS laser "hot spot" in a particular RMI image. The text string used is "Location of the LIBS laser spot in the RMI image described by the camera model".	**Valid Values** "Location of the LIBS laser spot in the RMI image" **Type** string **Units** n/a **Location** INSTRUMENT_STATE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** Static value **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** U8
Ops Keyword SPECIAL_SAMPLE **Archive Attribute** none **Definition** For SuperCam on M2020, specifies the sample number in a particular RMI image that has a special meaning. The context of the meaning is defined by SPECIAL_NAME.	**Valid Values** "532" **Type** integer **Units** n/a **Location** INSTRUMENT_STATE_PARMS (Group) **X-path** TBD	**Mode** Static value **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** U8

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	Reference TBD	
Ops Keyword SPICE_FILE_ID **Archive Attribute** TBD **Definition** Specifies an abbreviated name or acronym which identifies a particular SPICE file.	**Valid Values** n/a **Type** string **Units** n/a **Location** TELEMETRY (Class) **X-path** TBD **Reference** TBD	**Mode** User parameter input **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword SPICE_FILE_NAME **Archive Attribute** TBD **Definition** Specifies the names of the SPICE files used in processing the data.	**Valid Values** n/a **Type** string(180) **Units** n/a **Location** TELEMETRY (Class) **X-path** TBD **Reference** TBD	**Mode** User parameter input **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword STANDARD_DEVIATION **Archive Attribute** TBD **Definition** Specifies the standard deviation of the DN values in the image array.	**Valid Values** n/a **Type** float **Units** n/a **Location** IMAGE (Object) **X-path** TBD **Reference** TBD	**Mode** Calculation **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword	**Valid Values**	**Mode**

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
START_AZIMUTH **Archive Attribute** TBD **Definition** Specifies the angular distance from a fixed reference position at which an image or observation starts. Azimuth is measured in a spherical coordinate system, in a plane normal to the principal axis. Azimuth values increase according to the right hand rule relative to the positive direction of the principal axis of the spherical coordinate system. When in a SURFACE_PROJECTION or SITE_DERIVED_GEOMETRY group, specifies the azimuth of the left edge of the output map. Applies to Cylindrical and Cylindrical-Perspective projections only.	"0" to "360" **Type** float **Units** deg (<deg> unit tag required) **Location** • SURFACE_PROJECTION_PARMS (Group) • SITE_DERIVED_GEOMETRY_PARMS (Group) **X-path** TBD **Reference** TBD	RDR-generating software **Field as "<xml name>:|<element>|:|<element>|:<field>"** n/a **Type** n/a
Ops Keyword START_IMAGE_ID **Archive Attribute** TBD **Definition** For SuperCam on M2020, specifies the commanded image start in case the SRAM on the SuperCam Mast Unit (SCMU) goes bad.	**Valid Values** n/a **Type** integer **Units** n/a **Location** OBSERVATION_REQUEST_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:|<element>|:|<element>|:<field>"** "<IDPH DPO>:cmd_parameters:startImageID" TBD **Type** U8
Ops Keyword START_TIME **Archive Attribute** TBD **Definition** Specifies the date and time of the beginning of an event or observation (whether it be a spacecraft, ground-based, or system event) in UTC system format. For M2020, the time period of interest is returned from SPICE suburoutines and based on the beginning of data acquisition.	**Valid Values** <YYYY>-<MM>-<DD>T<hh>:<mm>:<ss>[.<fff>] NOTE: Value will be uncalibrated if SPICE kernels unavailable. **Type** time **Units** n/a **Location** IDENTIFICATION (Class) **X-path** TBD **Reference** TBD	**Mode** 1) a. DPO in XML format (referenced to APID Name in Appendix E), Calculation using SPICE Kernels: - SCLK b. EMD in XML format, Calculation using SPICE Kernels: - SCLK 2) DPO in XML format (referenced to APID Name in Appendix A), Calculation using SPICE Kernels: - SCLK 3) DPO in XML format (referenced to APID Name in Appendix A) or Image DPO mini-header, Calculation using SPICE Kernels: - SCLK 4) DPO in XML format (referenced to APID Name in Appendix A), Calculation using SPICE Kernels: - SCLK **Field as "<xml name>:|<element>|:|<element>|:<field>"**

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
		• Eng. Cameras 1) a. "<IDPH DPO>:idph:sclk_seconds", "<IDPH DPO>:idph:sclk_subseconds" b. "MslEarthProductMetadata:MslProductMetadata: OnboardCreationTime" • SuperCam 2) "<Ancillary DPO>:image_sclk", "<Ancillary DPO>:soh_sclk" • MCZ Cameras 3) a. "MCZ_Image_Mini_Header[8]", "MCZ_Image_Mini_Header[9]", "MCZ_Image_Mini_Header[10]", "MCZ_Image_Mini_Header[11]" b. "<IDPH DPO>:cidph:sclk:seconds" c. "<Ancillary DPO>:sclk:seconds" • Skycam 4) "<MEDA Image Header>:time_tag" NOTES: • For SuperCam, if APID Name contains string "Soh" in it, use field "soh_sclk". Otherwise, use field "image_sclk". • For MCZ recovered or Z-stack data products, value is comprised of four bytes coming from Image DPO mini-header at byte offsets 8, 9, 10 and 11 per case "3a". • For MCZ non-recovered and non-Z-stack data products, if IDPH is present, value comes from IDPH DPO per case "3b". • For MCZ non-recovered and non-Z-stack data products, if IDPH is not present, value comes from Ancillary DPO per case "3c". **Type** 1) a. U32 b. n/a 2) U32 3) U32
Ops Keyword STEREO_BASELINE **Archive Attribute** TBD **Definition** Specifies the separation, in meters, between the two cameras used for processing of the stereo image.	**Valid Values** n/a **Type** float **Units** n/a **Location** DERIVED_IMAGE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:|<element>|:|<element>|:<field>"** n/a **Type** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Ops Keyword STEREO_PRODUCT_ID **Archive Attribute** TBD **Definition** Specifies the PRODUCT_ID for the stereo partner used to linearize the image when LINEARIZATION_MODE is "ACTUAL". This keyword may be absent if the mode is not "ACTUAL".	**Valid Values** n/a **Type** string **Units** n/a **Location** DERIVED_IMAGE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword STOP_AZIMUTH **Archive Attribute** TBD **Definition** Specifies the angular distance from a fixed reference position at which an image or observation stops. Azimuth is measured in a spherical coordinate system, in a plane normal to the principal axis. Azimuth values increase according to the right hand rule relative to the positive direction of the principal axis of the spherical coordinate system. When in a SURFACE_PROJECTION or SITE_DERIVED_GEOMETRY group, specifies the azimuth of the right edge of the output map. Applies to Cylindrical and Cylindrical-Perspective projections only.	**Valid Values** "0" to "360" **Type** float **Units** deg (<deg> unit tag required) **Location** • SURFACE_PROJECTION_PARMS (Group) • SITE_DERIVED_GEOMETRY_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword STOP_TIME **Archive Attribute** TBD **Definition** Specifies the date and time of the end of an event or observation (whether it be a spacecraft, ground-based, or system event) in UTC system format.	**Valid Values** <YYYY>-<MM>-<DD>T<hh>:<mm>:<ss>[.<fff>] NOTE: Value will be uncalibrated if SPICE kernels unavailable. **Type** time **Units** n/a **Location** IDENTIFICATION (Class) **X-path** TBD **Reference** TBD	**Mode** 1) DPO in XML format (referenced to APID Name in Appendix A), Calculation using SPICE Kernels: - SCLK 2) DPO in XML format (referenced to APID Name in Appendix A) or Image DPO mini-header, Calculation using SPICE Kernels: - SCLK **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras & SuperCam 1) a. "<IDPH DPO>:idph:sclk_seconds" b. "<IDPH DPO>:idph:sclk_subseconds" c. "<IDPH DPO>:idph:exp_time" • MCZ Cameras 2) a. "MCZ_Image_Mini_Header[8]", "MCZ_Image_Mini_Header[9]",

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
		"MCZ_Image_Mini_Header[10]", "MCZ_Image_Mini_Header[11]" b. "<IDPH DPO>:cidph:sclk:seconds" c. "<Ancillary DPO>:sclk:seconds" NOTES: • For Eng. Cameras and SuperCam, "exp_time" is in raw counts, with each count translating to 5.12 ms. • For MCZ recovered or Z-stack data products, value is comprised of four bytes coming from Image DPO mini-header at byte offsets 8, 9, 10 and 11 per case "2a". • For MCZ non-recovered and non-Z-stack data products, if IDPH is present, value comes from IDPH DPO per case "2b". • For MCZ non-recovered and non-Z-stack data products, if IDPH is not present, value comes from Ancillary DPO per case "2c". **Type** 1) a. U32 b. U32 c. U16 2) U32
Ops Keyword STRIPING_COUNT **Archive Attribute** TBD **Definition** Specifies the number of stripes (N) used during dark current mitigation within image acquisition. Image "striping" is comprised of reading out the image in N different parts ("stripes") using hardware windowing mode, (where N is a commanded number from 0 to 1024), using N separate exposures (with identical exposure times). These successive stripes correspond to physically different locations on the detector. As part of the striping exposure technique, also include a commandable overlap (M rows) to allow each successive row to "cover" the image pixels towards the readout region.	**Valid Values** • Eng. Cameras (C) "0" **Type** integer **Units** n/a **Location** TELEMETRY (Class) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras "<IDPH DPO>:idph:stripes" **Type** U16
Ops Keyword STRIPING_OVERLAP_ROWS **Archive Attribute** TBD **Definition** Specifies the number of rows (M) of striping overlap used during dark current mitigation within image acquisition. Image "striping" is comprised of reading out the image in N different parts ("stripes") using hardware windowing mode,	**Valid Values** • Eng. Cameras (C) "0" **Type** integer **Units** n/a **Location** TELEMETRY (Class)	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Eng. Cameras "<IDPH DPO>:idph:overlap" **Type** U16

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
(where N is a commanded number from 0 to 1024), using N separate exposures (with identical exposure times). These successive stripes correspond to physically different locations on the detector. As part of the striping exposure technique, also include a commandable overlap (M rows) to allow each successive row to "cover" the image pixels towards the readout region.	**X-path** TBD **Reference** TBD	
Ops Keyword SUBFRAME_TYPE **Archive Attribute** TBD **Definition** Specifies the method of subframing performed on the image. Descriptions of the valid values follow: a) "NONE" - No subframing requested. b) "SW_ONLY" - Software processsing only. c) "HW_COND" - Use hardware only if compatible. d) "HW_SW" - Use hardware then software. e) "SUN_NO_IMG" - If the sun is found, send a subframed image of the sun. If sun is not found, send back no image. f) "SUN_FULL" - If the sun is found, send a subframed image of the sun. If the sun is not found, send back the entire image.	**Valid Values** • Eng. Cameras (B) 0 = "NONE" 1 = "SW_ONLY" 2 = "HW_COND" 3 = "HW_SW" 4 = "SUN_NO_IMG" 5 = "SUN_FULL" • MCZ Cameras (B) - If width is 1648 and height is 1200, then "NONE" - Otherwise, "HW_ONLY" • SCAM 0 = "NONE" 1 = "SW_ONLY" 2 = "HW_ONLY" Hardware and software modes are mutually exclusive **Type** string **Units** n/a **Location** SUBFRAME_REQUEST_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** 1) DPO in XML format (referenced to APID Name in Appendix A) 2) DPO in XML format (referenced to APID Name in Appendix A) or Image DPO mini-header **Field as "<xml name>:|<element>|:|<element>|:<field>"** • Eng. Cameras 1) "<IDPH DPO>:idph:params:subframe" • MCZ Cameras 2) a. "<Ancillary DPO>:cmd_arguments_image:window_width" b. "<Ancillary DPO>:cmd_arguments_image:window_height" c. "MCZ_Image_Mini_Header[22]" d. "MCZ_Image_Mini_Header[23]" • SuperCam RMI "<Ancillary DPO>:rce_subfrm_start_r_pixel" "<Ancillary DPO>:rce_subfrm_start_c_pixel" "<Ancillary DPO>:rce_subfrm_start_r_height" "<Ancillary DPO>:rce_subfrm_start_c_height" NOTES: • For MCZ non-recovered data products (cases "a" and "b"), float values come from the Ancillary DPO. • For MCZ recovered data products (cases "c" and "d"), values analogous to cases "a" (window_width) and "b" (window_height) are each comprised of one byte coming from Image DPO mini-header at byte offsets 22 and 23, respectively. • For MCZ, parm "window_width" is number of image samples. • For MCZ, parm "window_height" is number of image lines. • For MCZ non-Thumbnail data products, multiply by factor of 8 to convert to correct line/sample value. **Type** 1) enum 2) U8
Ops Keyword SUN_VIEW_DIRECTION **Archive Attribute** TBD	**Valid Values** n/a **Type** float array[3]	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as "<xml name>:|<element>|:|<element>|:<field>"**

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Definition Specifies a unit vector identifying the sun viewing direction.	**Units** n/a **Location** ROVER_DERIVED_GEOMETRY_PARMS (Group) **X-path** TBD **Reference** TBD	• Eng. Cameras & SuperCam "<IDPH DPO>:idph:sun_dir[3]" **Type** F32[3]
Ops Keyword SURFACE_GROUND_LOCATION **Archive Attribute** TBD **Definition** Specifies any point on the surface (for SURFACE_MODEL_TYPE of "PLANE"), or the center of the sphere (for the three "SPHERE" types). This point is measured in the coordinates specified by the REFERENCE_COORD_SYSTEM_* keywords in the same group.	**Valid Values** n/a **Type** float array[3] **Units** meters **Location** SURFACE_MODEL_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword SURFACE_MODEL_FILE_NAME **Archive Attribute** TBD **Definition** Specifies the name of an XYZ, Z-component or other RDR used as a digital elevation model onto which the data were projected.	**Valid Values** n/a **Type** string **Units** n/a **Location** SURFACE_MODEL_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword SURFACE_MODEL_TYPE **Archive Attribute** TBD **Definition** Specifies the type of surface used for the reprojection performed during the mosaicking process.	**Valid Values** "INFINITY", "PLANE", "SPHERE", "SPHERE1", "SPHERE2" **Type** string **Units** n/a	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
The valid values are defined as: a) "INFINITY" - refers to an infinitely distant "surface" in all directions and has no parameters. b) "PLANE" - refers to a flat plane and require the SURFACE_NORMAL_VECTOR and SURFACE_GROUND_LOCATION keywords as parameters. c) "SPHERE" – refers to a spherical model where the camera is at the center of the sphere. The origin is specified by SURFACE_GROUND_LOCATION, and the radius by the first element of SURFACE_NORMAL_VECTOR. d) "SPHERE1" – refers to a general sphere model, whose center is defined by SURFACE_GROUND_LOCATION, and radius by the first element of SURFACE_NORMAL_VECTOR. If the camera is outside the sphere, the first intersection with the sphere is used; this makes it useful for modeling hills or rocks. e) "SPHERE2" – just like SPHERE1, except the second intersection with the sphere is used; this makes it useful for modeling craters.	**Location** SURFACE_MODEL_PARMS (Group) **X-path** TBD **Reference** TBD	
Ops Keyword SURFACE_NORMAL_VECTOR **Archive Attribute** TBD **Definition** Specifies a vector normal to the surface (for SURFACE_MODEL_TYPE of "PLANE"). This vector is measured in the coordinates specified by the REFERENCE_COORD_SYSTEM_* keywords in the same group. For the "SPHERE" surface model types, the first element is used to specify the radius; the other two elements are unused. This is a misuse of this keyword's definition, which is retained for historical reasons.	**Valid Values** n/a **Type** float array[3] **Units** n/a **Location** SURFACE_MODEL_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword TARGET_NAME **Archive Attribute** TBD **Definition** Specifies a target. The target may be a planet, satellite, ring, region, feature, asteroid or comet. See TARGET_TYPE.	**Valid Values** For EDRs … Value "MARS", "CALIBRATION" For RDRs … Value any **Type** string(30) **Units** n/a	**Mode** Calculation: - By algorithm to determine if looking at calibration target … if not, then value is "MARS" **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	Location IDENTIFICATION (Class) **X-path** TBD **Reference** TBD	
Ops Keyword TARGET_TYPE **Archive Attribute** TBD **Definition** Specifies the type of a named target.	**Valid Values** "CALIBRATION", "DUST", "SUN", "PLANET", "SATELLITE", "N/A" **Type** string **Units** n/a **Location** IDENTIFICATION (Class) **X-path** TBD **Reference** TBD	**Mode** Static Value **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword TELEMETRY_PROVIDER_ID **Archive Attribute** TBD **Definition** Specifies the provider and version of the telemetry data used in the generation of this data.	**Valid Values** "MPCS_M2020_DP" **Type** string **Units** n/a **Location** TELEMETRY (Class) **X-path** TBD **Reference** TBD	**Mode** User parameter input **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword TELEMETRY_SOURCE_CHECKSUM **Archive Attribute** TBD **Definition** Checksum for the source product from which this product was derived. For M2020, it is the sum of each (unsigned) byte in the data areas of all DPOs. It does not include the DPO headers.	**Valid Values** n/a **Type** integer **Units** n/a **Location** TELEMETRY (Class)	**Mode** EMD in XML format **Field as "<xml name>:[<element>]:[<element>]:<field>"** "MslEarthProductMetadata:MslProductMetadata:ProductChecksum" **Type** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	X-path TBD **Reference** TBD	
Ops Keyword TELEMETRY_SOURCE_HOST_NAME **Archive Attribute** TBD **Definition** Specifies the name of the host venue that provides the telemetry source used in creation of this data set. For M2020, example is "M2020mstbgds1". See also TELEMETRY_SOURCE_NAME.	**Valid Values** n/a **Type** string **Units** n/a **Location** TELEMETRY (Class) **X-path** TBD **Reference** TBD	**Mode** EMD in XML format **Field as "<xml name>:[<element>]:[<element>]:<field>"** "MslEarthProductMetadata:SessionInformation:Venue:Host" **Type** n/a
Ops Keyword TELEMETRY_SOURCE_NAME **Archive Attribute** TBD **Definition** Specifies the name of the telemetry source used in creation of this data set. For M2020, example is "MczRScidata_0123456789-00000-1.dat".	**Valid Values** n/a **Type** string **Units** n/a **Location** TELEMETRY (Class) **X-path** TBD **Reference** TBD	**Mode** EMD in XML format **Field as "<xml name>:[<element>]:[<element>]:<field>"** "MslEarthProductMetadata:MslProductMetadata:DataFileName" **Type** n/a
Ops Keyword TELEMETRY_SOURCE_SCLK_START **Archive Attribute** TBD **Definition** Specifies the value of the spacecraft clock (in seconds) at the creation time of the source product from which this product was derived. This differs from SPACECRAFT_CLOCK_START_COUNT, which is the time the instrument acquired the data. For M2020, it refers to the creation time (DVT) of the onboard DPO and comes from the secondary packet header. Note that this is the SCLK used by Data Management	**Valid Values** sssssssss.MCZ **Type** string(30) **Units** n/a **Location** TELEMETRY (Class) **X-path** TBD **Reference**	**Mode** EMD in XML format **Field as "<xml name>:[<element>]:[<element>]:<field>"** "MslEarthProductMetadata:MslProductMetadata:DvtCoarse" , "MslEarthProductMetadata:MslProductMetadata:DvtFine" **Type** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
operationally to identify data products.	TBD	
Ops Keyword TELEMETRY_SOURCE_SIZE **Archive Attribute** TBD **Definition** Specifies the length in bytes of the source product from which this product was derived. For M2020, it is the length of the user portion of the Data Product Object (DPO).	**Valid Values** n/a **Type** integer **Units** n/a **Location** TELEMETRY (Class) **X-path** TBD **Reference** TBD	**Mode** EMD in XML format **Field as "<xml name>:[<element>]:[<element>]:<field>"** "MslEarthProductMetadata:MslProductMetadata:ProductFileSize" **Type** n/a
Ops Keyword TELEMETRY_SOURCE_START_TIME **Archive Attribute** TBD **Definition** Specifies the creation time of the source product from which this product was derived. It is the same as TELEMETRY_SOURCE_SCLK_START converted to Spacecraft Event Time (SCET).	**Valid Values** <YYYY>-<DDD>T<hh>:<mm>:<ss>[.<fff>] **Type** time **Units** n/a **Location** IDENTIFICATION (Class) **X-path** TBD **Reference** TBD	**Mode** EMD in XML format **Field as "<xml name>:[<element>]:[<element>]:<field>"** "MslEarthProductMetadata:MslProductMetadata:Partlist:Part:Scet" **Type** n/a
Ops Keyword TELEMETRY_SOURCE_TYPE **Archive Attribute** TBD **Definition** Specifies the classification of the source of the telemetry used in creating this data set.	**Valid Values** "DATA PRODUCT" **Type** string(12) **Units** n/a **Location** TELEMETRY (Class) **X-path** TBD **Reference** TBD	**Mode** User parameter input **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword TILE_UPSAMPLE_METHOD	**Valid Values** "NONE", "BILINEAR", "BICUBIC", "REPLICATION"	**Mode** RDR-generating software

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Archive Attribute TBD **Definition** Specifies the upsampling method used for a specific tile in a reconstructed image.	**Type** String array[] **Units** n/a **Location** INSTRUMENT_STATE_PARMS **X-path** TBD **Reference** TBD	**Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword TILE_DOWNSAMPLE_X **Archive Attribute** TBD **Definition** Specifies the downsampling resolution in the X-direction for a specific tile in a reconstructed image.	**Valid Values** **Type** **Units** n/a **Location** INSTRUMENT_STATE_PARMS **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword TILE_DOWNSAMPLE_Y **Archive Attribute** TBD **Definition** Specifies the downsampling resolution in the Y-direction for a specific tile in a reconstructed image.	**Valid Values** **Type** **Units** n/a **Location** INSTRUMENT_STATE_PARMS **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword TILE_FIRST_LINE **Archive Attribute** TBD **Definition** Specifies the starting line for a specific tile in a reconstructed image.	**Valid Values** **Type** **Units** n/a **Location** INSTRUMENT_STATE_PARMS **X-path**	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	TBD **Reference** TBD	
Ops Keyword TILE_FIRST_LINE_SAMPLE **Archive Attribute** TBD **Definition** Specifies the starting sample for a specific tile in a reconstructed image.	**Valid Values** **Type** **Units** n/a **Location** INSTRUMENT_STATE_PARMS **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword TILE_NUM_BANDS **Archive Attribute** TBD **Definition** Specifies the number of bands for a specific tile in a reconstructed image.	**Valid Values** **Type** **Units** n/a **Location** INSTRUMENT_STATE_PARMS **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword TILE_NUM_LINES **Archive Attribute** TBD **Definition** Specifies the total number of lines for a specific tile in a reconstructed image.	**Valid Values** **Type** **Units** n/a **Location** INSTRUMENT_STATE_PARMS **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword TILE_NUM_LINE_SAMPLES **Archive Attribute** TBD	**Valid Values** **Type** **Units**	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Definition Specifies the total number of samples for a specific tile in a reconstructed image.	n/a **Location** INSTRUMENT_STATE_PARMS **X-path** TBD **Reference** TBD	**Type** n/a
Ops Keyword TILE_PRODUCT_ID **Archive Attribute** TBD **Definition** Specifies the filename for a specific input tile in a reconstructed image.	**Valid Values** **Type** **Units** n/a **Location** INSTRUMENT_STATE_PARMS **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword TRANSMISSION_PATH **Archive Attribute** TBD **Definition** Routing status at time of MPDU (Metadata PDU) generation. Indicates the actual transmission paths (routes) of the Data Product.	**Valid Values** n/a **Type** string **Units** n/a **Location** TELEMETRY (Class) **X-path** TBD **Reference** TBD	**Mode** EMD in XML format **Field as "<xml name>:[<element>]:[<element>]:<field>"** "MslEarthProductMetadata:MslProductMetadata: TransmissionStatus" **Type** n/a
Ops Keyword VALID_MAXIMUM_PIXEL **Archive Attribute** TBD **Definition** Specifies the maximum pixel DN value that is considered valid for some use. For M2020 SuperCam, specifies the threshold for pixels used by the autoexposure algorithm.	**Valid Values** "0" to "1023" **Type** integer **Units** n/a **Location** OBSERVATION_REQUEST_PARMS (Group) **X-path** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as <xml name>:[<element>]:[<element>]:<field>** • SuperCam RMI <Ancillary DPO>:cmd_parameters: autoexp_upper_threshold **Type** U16

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
	Reference TBD	
Ops Keyword VALID_MINIMUM_PIXEL **Archive Attribute** TBD **Definition** Specifies the minimum pixel DN value that is considered valid for some use. For M2020 SuperCam, specifies the threshold for pixels used by the autoexposure algorithm.	**Valid Values** "0" to "1023" **Type** integer **Units** n/a **Location** OBSERVATION_REQUEST_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as <xml name>:[<element>]:[<element>]:<field>** • SuperCam RMI <Ancillary DPO>:cmd_parameters: autoexp_lower_threshold **Type** U16
Ops Keyword VIRTUAL_CHANNEL_ID **Archive Attribute** TBD **Definition** The Virtual Channel Identifier is used by M2020 to identify the RCE string generating the Transfer Frame, and to indicate the type of data flowing in the telemetry virtual channel. RCE String A is indicated by all Virtual Channel Identifier values having a '0' as the high bit (e.g., virtual channels 0 to 31); RCE String B is indicated by all Virtual Channel Identifier values having a '1' for the high bit (e.g., virtual channels 32 to 63).	**Valid Values** "0" to "63" **Type** string **Units** n/a **Location** TELEMETRY (Class) **X-path** TBD **Reference** TBD	**Mode** EMD in XML format **Field as "<xml name>:[<element>]:[<element>]:<field>"** "MslEarthProductMetadata:MslProductMetadata:Vcid" **Type** n/a
Ops Keyword X_AXIS_MAXIMUM **Archive Attribute** TBD **Definition** Specifies the value of the X coordinate (measured in the projection frame) of a Vertical, Orthographic or Orthorectified projection at the top of the image. Note that +X is at the top of the image and +Y is at the right, so +X corresponds to North in the Vertical projection.	**Valid Values** n/a **Type** float **Units** meters (<m> unit tag required) **Location** SURFACE_PROJECTION_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Ops Keyword X_AXIS_MINIMUM **Archive Attribute** TBD **Definition** Specifies the value of the X coordinate (measured in the projection frame) of a Vertical, Orthographic or Orthorectified projection at the bottom of the image.	**Valid Values** n/a **Type** float **Units** meters (<m> unit tag required) **Location** SURFACE_PROJECTION_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword Y_AXIS_MAXIMUM **Archive Attribute** TBD **Definition** Specifies the value of the Y coordinate (measured in the projection frame) of a Vertical, Orthographic or Orthorectified projection at the right edge of the image.	**Valid Values** n/a **Type** float **Units** meters (<m> unit tag required) **Location** SURFACE_PROJECTION_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword Y_AXIS_MINIMUM **Archive Attribute** TBD **Definition** Specifies the value of the Y coordinate (measured in the projection frame) of a Vertical, Orthographic or Orthorectified projection at the left edge of the image.	**Valid Values** n/a **Type** float **Units** meters (<m> unit tag required) **Location** SURFACE_PROJECTION_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword ZERO_ELEVATION_LINE **Archive Attribute** TBD	**Valid Values** n/a **Type** float	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Definition Specifies the image line representing 0.0 degree elevation. Applies to Cylindrical projections.	**Units** pixel (<pixel> unit tag required) **Location** SURFACE_PROJECTION_PARMS (Group) **X-path** TBD **Reference** TBD	**Type** n/a
Ops Keyword ZERO_EXPOSURE_IMAGE_ID **Archive Attribute** TBD **Definition** Specifies the value of PRODUCT_ID for the zero-exposure EDR that is subtracted during RDR generation to account for shutter smear and masked-region dark current. NOTE: This keyword is only placed in the PDS label if a zero-exposure image EDR product was used during on-ground calibration. It is not set when on-board shutter-subtraction is done.	**Valid Values** n/a **Type** string **Units** n/a **Location** DERIVED_IMAGE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** RDR-generating software **Field as "<xml name>:[<element>]:[<element>]:<field>"** n/a **Type** n/a
Ops Keyword ZSTACK_DELTA_FOCUS_COUNT **Archive Attribute** TBD **Definition** Amount of change in distance of focusing for each image in z-stack	**Valid Values** • SuperCam RMI 1) 1 to 255 (in motor step nb) **Type** integer **Units** n/a **Location** • SuperCam RMI a. ZSTACK_REQUEST_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as <xml name>:[<element>]:[<element>]:<field>** • SuperCam RMI 1) <Ancillary DPO>:cmd_parameters: step_size **Type** U8
Ops Keyword ZSTACK_IMAGE_DEPTH **Archive Attribute** TBD **Definition**	**Valid Values** • SuperCam RMI 1) 3 to 9 (must be odd number) **Type** integer	**Mode** DPO in XML format (referenced to APID Name in Appendix A) **Field as <xml name>:[<element>]:[<element>]:<field>** • SuperCam RMI

Output Metadata (Product Label)		Input Metadata (Source)
• Ops Keyword • Archive Label Attribute • Definition	• Mission Phase C=Cruise, S=Surface, B=Both • Valid Values (quoted) • Type • Units • Keyword Location in Ops Label • Attribute X-path in Archive label • Attribute Reference in Archive Label (bracketed)	• Mission Phase C=Cruise, S=Surface, B=Both • Mode • Metadata Field • Type
Number of images to combine with the z-stack process.	**Units** n/a **Location** • SuperCam RMI a. ZSTACK_REQUEST_PARMS (Group) **X-path** TBD **Reference** TBD	1) <Ancillary DPO>:cmd_parameters: num_images **Type** U8
Ops Keyword ZOOM_POSITION_COUNT **Archive Attribute** TBD **Definition** TBD	**Valid Values** • Mastcam-Z TBD **Type** integer **Units** n/a **Location** INSTRUMENT_STATE_PARMS (Group) **X-path** TBD **Reference** TBD	**Mode** EMD in XML format **Field as "<xml name>:[<element>]:[<element>]:<field>"** • Mastcam-Z "MMM_Image_Mini_Header[48]", "MMM_Image_Mini_Header[49]" **Type** U32 NOTES: • For MCZ Cameras, zoom position is comprised of two bytes coming from Image DPO mini-header at byte offsets 48 and 49.