

Title: **Equipment User Manual Definition Document**

CI - No: 0000

DRL Refs : TBD


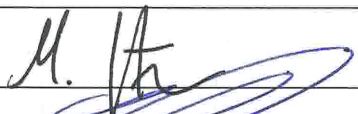


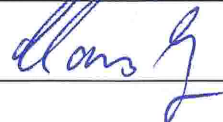
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1. INTRODUCTION

1.1 Scope of the Document

The scope of this document is to provide the requirements for the generation of the equipment user manual of the EarthCARE Space Segment. The equipment user manual will serve AIT as well as Flight Operation purposes.

1.2 References

1.2.1 Applicable Documents

[AD-3]	SRDB Population Requirements	EC.IRD.ASD.SY.00003
[AD-5]	Equipment Property Workbook Population Requirements	EC.IRD.ASD.SY.00020
[AD-110]	EarthCARE Packet Utilization Standard	EC.STD.ASD.SY.00001

1.2.2 Normative Documents

1.2.3 Reference Documents

1.3 Requirements Definitions

Requirements in this specification are identified as follows:

EUM-*nnn* /<source>/ V : <Summary>

where

- "EUM" is the prefix for requirements,
- "*nnn*" is a running number, assigned by the DOORS tool, not editable.
- <source> reads either "created" when the requirement is generated by the prime, or it gives the reference requirement number from an upper level applicable document
- "V" is the proposed verification method, which is either

- "R" for Review of Design: in this document "R" means that the requirements is already covered by the proposed SIS Astrobus tool and the according documentation. In the next phase a compliance matrix will be provided which requirement is covered where in which document
 - "T" for Test
 - "I" for Inspection
 - "A" for Analysis
- <Summary> is a short heading for the requirement text

The character style of the requirements text is in *italic*.

2. EARTHCARE USER MANUAL VOLUME CONTENT DEFINITION

EUM-001 /<CREATED>/ V : <Equipment User Manual Contnt>

The equipment user manual shall provide all technical information necessary to permit the customer to:

- Prepare and validate the EarthCARE space segment segment, including the satellite software simulator;
- Establish the operational databases (including TM/TC and Flight Dynamics)
- Operate and control the EarthCARE spacecraft in nominal and contingency cases for all phases of the mission."

EUM-002 /<CREATED>/ V : <Equipment User Manual Consistency>

The contents of the equipment user manual shall be internally consistent and consistent with the

- the equipment ICD and the related electronically readable equipment physical property work book acc. [AD-05]
- the equipment TM/TC ICD and the related electronically readable equipment TMTC database acc. [AD-03]

EUM-003 /<CREATED>/ V : <ICD & TMTC DB version>

The content of the equipment user manual shall uniquely indicate to which version of the equipment ICD and the TMTC data base it relates.

EUM-004 /<CREATED>/ V : <Equipment User Manual Content >

The content of the ESUM shall be consistent with the latest release of the on-board software and indicate to which versions (for equipment with software) it relates.

EUM-005 /<CREATED>/ V : <Equipment Procedures>

The equipment user manual shall contain all nominal and contingency operations procedures necessary for space segment operations, this also includes an initial version of any necessary Operations Timelines. The list of procedures and timelines to be generated shall be agreed between the Contractor and the customer and recorded in the User Manual.

EUM-006 /<CREATED>/ V : <Procedure Validation>

The procedures presented in the equipment user manual shall be validated at equipment level testing during AIV to the maximum extent. Another system, for example the SVF or EFM, can be used for specific procedures, after agreement with customer.

EUM-007 /<CREATED>/ V : <Equipment User Manual Content>

The equipment user manual shall be used by the contractor as a reference document during the

AIV programme.

EUM-008 /<CREATED>/ V : <Operation Characteristics and Algorithms>

The equipment user manual shall provide the definition of all operational characteristics associated with the control of the equipment in flight and on-ground, including any constraints or special operations. It shall also contain any algorithms or ground processing required to support operations during all phases of the mission.

EUM-009 /<CREATED>/ V : <Equipment User Manual Detailed Content Definition >

The equipment user manual shall be provided as defined by the content definition for the User Manuals for EarthCARE equipments.

1. INTRODUCTION

1.1 SCOPE

Include the following text.

“This User Manual contains all information necessary for proper operation of the integrated <EARTHCARE equipment>, to be flown on EARTHCARE. In particular, this manual describes in detail any procedure to follow and any constraint or limitation to be considered.

This manual covers not only all relevant mission phases but also the on-ground operation.

The current issue of this document deals with the <EARTHCARE equipment> <EM/FM>”

1.2 DOCUMENTS

1.2.1 Applicable Documents

List all applicable documents for this USER MANUAL.

[AD 1]

[AD 2]

1.3.2 Reference Documents

List all the source documents and the used issue for the information contained in this USER MANUAL.

“The operational information in this document is derived from the following reference documents :

[RD 1]

[RD 2]

“

1.3 TERMS AND DEFINITIONS

Any terms and conditions should be included here. Definition of reference frames and reference models should be included here.

2. <EARTHCARE EQUIPMENT> FUNCTIONAL CHARACTERISTICS

2.1 FUNCTIONAL OBJECTIVES

Give a brief overview of the purpose of the equipment.

2.2 PRINCIPLE OF OPERATION

Describe how the functionality described in the previous section is achieved and give a summary of the expected equipment performance (including relevant spec values).

3. <EARTHCARE EQUIPMENT> CONFIGURATION

The objective of this chapter is to give a complete and accurate design description of the physical and functional implementation of the equipment. This should consist of 3 sections as follows

- Physical configuration.
- Functional configuration
- Redundancy

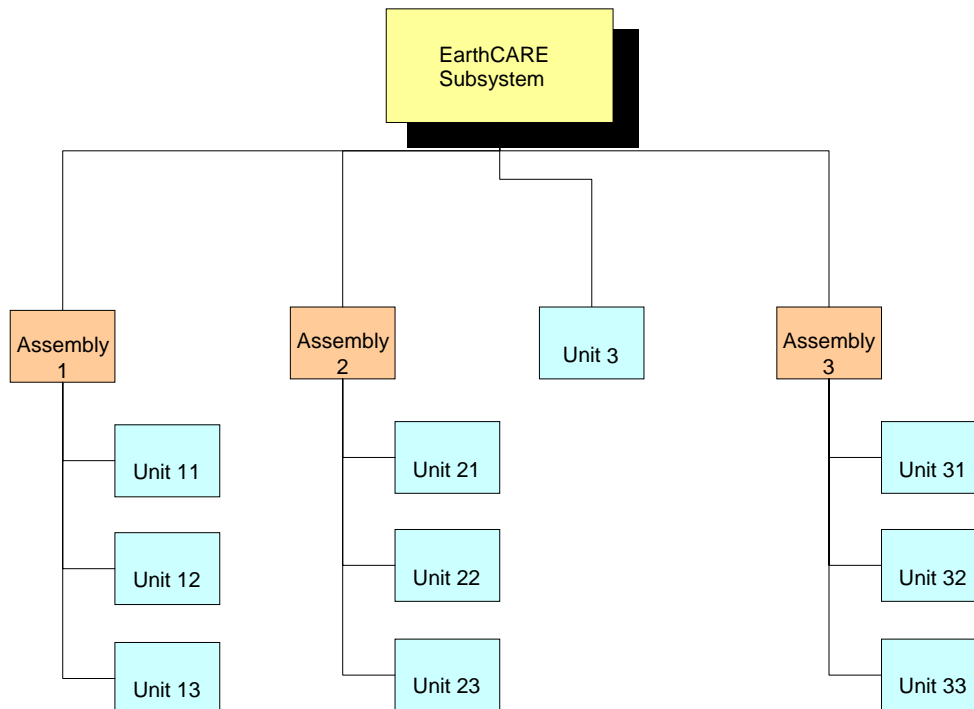
These sections are expanded below.

3.1 PHYSICAL CONFIGURATION

This section should identify all physical assemblies and units in the subsystem and their physical location on the spacecraft.

3.1.1 Units and Assemblies

A configuration block diagram of the equipment showing all its assemblies and units should be given in the format of .



A table listing the Configuration Item Number of each assembly / unit and whether it is the prime or redundant assembly / unit should be provided. This table should be in the following format.

Name	CI	Description	Reference	R
CI = Configuration Item Number R = Redundant assembly/unit <EARTHCARE Equipment> Hardware List				

Table 3-2-1-1: <EARTHCARE Equipment> Hardware List

3.2.2 <EARTHCARE Equipment> Assemblies & Units and their Accommodation on EARTHCARE

This section should provide a physical description of the equipment assemblies and units and the accommodation of them on the EARTHCARE spacecraft. In particular the following should be covered;

- description of structure and physical layout
- description of thermal control hardware and its locations
- description of fields of view and zones of impingement
- description of mechanisms including those for deployments and releases.

This description should be supported by detailed drawings contained in Annex 1 of the USER MANUAL.

3.3 FUNCTIONAL CONFIGURATION

3.3.1 Functional Block Diagram

Provide a functional block diagram identifying all assemblies and units, all internal interfaces and all external interfaces.

Provide supporting descriptive text describing how the assemblies and units function together at equipment level and how they are interfaced to other external equipments.

3.3.2 Functional Description of <EARTHCARE Equipment> Units, Assemblies and Functions

Provide a detailed functional description of each <EarthCARE Equipment> assembly, unit and functions.

3.4 REDUNDANCY

Provide a detailed description of the equipment redundancy and cross-strapping.

4. <EARTHCARE EQUIPMENT> MODES

4.1 MODE DESCRIPTIONS

List all the <EARTHCARE Equipment> modes.

Provide a table mapping each assembly / unit status to each equipment mode using the format of Table 4.1-1 below.

Provide a table summarising the mode characteristics using a format similar to Table 4.1-2 below.

Provide a table summarising which equipment functions are active in each mode using a format similar to Table 4.1-3 below (note that HW functions description is given in section 3.3 whereas SW functions description is given in section 9.3).

Modes Equipment Status	Off	XXX	YYY	ZZZ	...
Assembly 1					
Unit 11					
Unit 12					
...					
Unit 1n					
Assembly 2					
Unit 21					
...					
Assembly m					
Unit m1					
...					
Unit mn					

Table 4.1-1: < EARTHCARE Equipment> equipment status versus <EARTHCARE Equipment> modes

Modes Functions	Off	XXX	YYY	ZZZ	...
e.g. 1553B protocol	NO	YES			
...	NO				
...	NO				

Table 4.1-2: Active Functions versus < EARTHCARE Equipment> Modes

4.1.x Detailed Mode Descriptions

Provide a detailed description of each mode to a more detailed level of information than that contained in the tables in the previous section. If the equipment has different statuses or sub-modes within a mode then these should be described here. The circumstances that lead to these different sub-modes or statuses should also be documented here.

A description of the purpose of each mode or sub-mode, why to enter and exit it and the duration spent in it should be given.

4.2 <EARTHCARE EQUIPMENT> MODE TRANSITIONS

Provide a mode transition diagram showing all the equipment modes and allowed transitions between them. The trigger for each transition path should be identified (e.g. ground command, automatic nominal, internal corrective action, external corrective action, etc).

Provide a table identifying the mode transition times using the format of Table 4 below. A mode transition is defined to start when the equipment leaves a defined mode and is terminated when the equipment has reached a new defined mode. In particular, for a mode transition triggered by a command, the mode transition starts when the command execution is started.

4.2.x Transition to mode x

Provide a detailed description of the mode transition including the sequence of events executed (as a timeline if relevant). Where the sequence of events in the transition is dependent on the initiating trigger this should be clearly described. Likewise the effect of any other means to control the transition (such as control parameters in an initiating telecommand) should be described.

Transition from Transition to	Off	XXX	YYY	ZZZ	...
Off					
XXX		x sec	y sec	z sec	
YYY					
ZZZ					
...					
...					
...					

Table 4.2-1: Mode Transition Times

 Transition not possible

5. OPERATIONAL INTERFACES

5.1 CONTROL SIGNALS

List all the control signal lines used by the EARTHCARE Equipment. Describe all actions and timings, both hardware and software, that take place after the activation of a control signal. Where appropriate, give references to nominal and / or contingency recovery procedures.

Describe <EARTHCARE Equipment> on board time synchronisation. Describe how the <EARTHCARE Equipment> will be synchronised (e.g. describe the procedure), the resolution for maintaining the <EARTHCARE Equipment> on board time, when it shall take place (e.g. after <EARTHCARE Equipment> initialisation), the synchronisation accuracy, the recovery actions in the case of time discrepancies, setting and phase adjustments of counters / clocks, etc.

State if specific synchronisation lines between the <EARTHCARE Equipment> and other EARTHCARE equipments are used. If such lines are used then describe their logical and physical characteristics.

Describe how any <EARTHCARE Equipment> appendages, covers, locks, etc – if any - are commanded, i.e. the used signal lines, schedule, by which unit the process is initiated and controlled, etc. If deployment of appendages can be reversed, both processes together with their circumstances should be described.

5.2 COMMAND MECHANISMS

Describe the used Command and Control interfaces logically (e.g. number of signal lines, signal characteristics (e.g. analog, digital), used protocol, interdiction times, etc) and physically (e.g. 1553B bus, discrete signal lines) in the subchapters of this chapter. Each C&C interface shall be described together with its function.

5.3 TELEMETRY MECHANISM

Describe the used telemetry interfaces logically (e.g. number of signal lines, signal characteristics (e.g. analog, digital), used protocol, interdiction times, etc) and physically (e.g. 1553B bus, discrete signal lines) in the subchapters of this chapter. Note that detailed information about the down-linked packets formats should be contained in Chapter 8.

6. OPERATIONS AND CONSTRAINTS

This chapter should describe the nominal <EARTHCARE Equipment> operation and list all operational constraints or limitations which apply, separated in the following sections. Any mode dependencies should be indicated unambiguously in each of the following sections. In each case the reason for the constraint or limitation and the consequence of violation should be described.

Within the context of this chapter a constraint is anything which, if violated, can risk a permanent degradation of the <EARTHCARE Equipment> performance, function or reliability whereas a limitation is anything which, if violated, only risks a temporary loss or degradation of the planned operations or measurement data quality or availability.

6.1 ROUTINE OPERATIONS

Describe the nominal operation of the <EARTHCARE Equipment> (routine commanding, routine maintenance, routine calibration). Give the operational timeline for the <EARTHCARE Subsystem> – if relevant.

Describe the in-flight calibration process, e.g. how often, when, how and where it shall take place, the command and control procedure, the data flow, etc.

If the <EARTHCARE Equipment> needs to change its modes and/or states during nominal operations then describe the foreseen activities (e.g. when and why to initiate the mode changes).

If the <EARTHCARE Equipment> within one mode changes automatically between submodes then describe these processes. Provide timelines for all such automatic submode changes in the form of horizontal bar charts.

6.2 LAUNCH, INITIAL SWITCH-ON AND IN-ORBIT CHECK OUT

List all operational constraints and limitations regarding the <EARTHCARE Equipment> launch, initial switch-on and in-orbit check out (e.g. deployments, releases, switch-on, in-orbit calibration & verification, etc). In case deployments are foreseen, describe the deployment sequence here.

6.3 OPERATIONS AND CONSTRAINTS FOR GROUND INITIATED RECONFIGURATIONS

Describe all operations and related operational constraints and limitations for ground initiated reconfigurations (i.e. main to redundant, redundant to main, use of cross strapping).

6.4 GENERAL CONSTRAINTS AND LIMITATIONS

Identify and quantify all operational constraints and limitations regarding the <EARTHCARE Equipment> operation. For example, if a specific operation or mode depends on the deployment of an appendage, this should be stated here. Another aspect may be that specific operations are only allowed in specific modes. The constraints and limitations should be given for the following aspects. If no constraint or limitation exists for a particular aspect then this should be explicitly stated. Any other aspects that are not covered in section 6.3 should be included here.

6.4.1 Satellite attitude and altitude

List all EARTHCARE Equipment operational constraints and limitations regarding the spacecraft attitude and altitude, e.g. equipment atomic oxygen exposure (if relevant). Additionally, if the EARTHCARE Equipment performance is a function of spacecraft attitude or altitude, the impact should be described here.

6.4.2 Shocks

Using the following table list all the operational constraints and limitations regarding the <EARTHCARE Equipment> unit shock limits (g load and duration). All units, as identified in section 3.1 should be listed. If no limit applies then this should be stated.

Unit	Constraint
Unit x	x g/t ms
Unit y	
Unit z	

Table 6.4.2-1: Shock limits

6.4.3 In Orbit Acceleration

List all <EARTHCARE Equipment> operational constraints and limitations regarding the spacecraft accelerations and vibrations using the following table.

Frequency range	Nominal Operational Modes	Non-Nominal Operational Modes

Table 6.4.3-1: In-Orbit acceleration constraints

6.4.4 Thermal

In tabular form, for each unit, provide the thermal limits which apply for an operational constraint or limitation. As a minimum this should include definition of the operational temperature range, the non-operational temperature range and the switch-on temperature range.

6.4.5 Sun Illumination

List all operational constraints and limitations regarding sun illumination. For example if a unit shall not be illuminated by direct sunlight (quantify the extent and geometry) the impact should be described here.

6.4.6 Outgassing

List all operational constraints and limitations regarding the <EARTHCARE Equipment> out-gassing. For example, if a unit shall not be operated until its out-gassing is completed to a certain extent, because this could cause performance losses or is harmful in some way then this should be stated here. The out-gassing times shall be given.

6.4.7 Contamination

List all operational constraints and limitations regarding the <EARTHCARE Equipment> contamination. If performance losses are expected under specific circumstances, this should be stated here.

6.4.8 Life Limited Items

Using the following table list all the operational constraints and limitations regarding life limited items. All life limited items associated with their limits should be given. For each listed item a short and precise description of the limitations including the relevant unit (e.g. no. of cycles) and the mode(s), when the item will be used, shall be given.

Unit	Life Limit	Qual Limit	TM parameter (detail) to be monitored
Unit x Switching relays	36540 cycles	1000 cycles	TMxx for main TMyy for redundant
Unit y chain selection relays			
...			

Table 6.4.8-1: Life-Limited Items of <EarthCARE Equipment>

6.4.x Other <EARTHCARE Equipment> Specific Constraints

Any other constraints and limitations not already covered in section 6.3 or in this section should be detailed in additional subsections to section 6.4.

7. COMMAND AND CONTROL

This chapter describes the means of controlling the EARTHCARE Equipment. Operational interfaces can be found in Chapter 5, Operations and Constraints in Chapter 6 and procedures are described in Chapters 12 and 13.

A table listing all <EARTHCARE Equipment> commands available to the ground should be provided. For each command this table should include the command name, the command ID, a brief description of the command function, any mode dependency for the command, how to verify execution of the command and, if relevant, the execution time of the command.

In addition to this table a description should be defined for each command giving:

- a pictorial representation of the command layout and structure showing each parameter as a separate field
- a detailed description for each parameter giving its meaning, its format and a definition of how to compute it
- a detailed description of the command function (including the sequence of actions performed on the subsystem)
- any constraints associated with the command.

8. OBSERVABILITY

This chapter should give a comprehensive description of all the HK data, TM or TM packets produced by the EARTHCARE Equipment. This should include

- the layout of each HK data, TM packet and identification of the parameters contained within each TM packet.
- the generation rate and trigger (cyclic or on specified event) for each packet
- datation information, e.g. the relative age of the data contained within the packet with respect to the time in the TM packet header.

For each parameter a detailed description of its meaning and its behaviour should be given.

Note : Science data produced by the equipment may be subject to the dedicated Annex 7.

9. SOFTWARE

This section shall describe SW functions specific to the <EARTHCARE Equipment>. This should consist of sections as follows

- Software Functional Breakdown.
- Implementation of the Packet Utilisation Standard.

These sections are expanded below.

9.1 SOFTWARE FUNCTIONAL BREAKDOWN

This section shall give a high level overview of the <EARTHCARE Equipment> software and shall also provide a functional breakdown of the <EARTHCARE Equipment> software into its individual elements including interfaces to hardware. In particular, the following information shall be provided:

- A task description giving a mapping of SW tasks onto software modules and giving an overview of the SW implementation and scheduling, including the use of interrupts.
- In the case that any patches are identified to be up-linked from ground for either nominal or contingency operations, these shall be fully described including provision of the SW labels, offsets and associated word values.

9.2 IMPLEMENTATION OF THE PACKET UTILISATION STANDARD (EC-PUS)

This section shall describe the application and implementation of the EC-PUS into the <EARTHCARE Equipment> software including specific services, tables and other data structures as needed. Reference to SW User Manual may be provided.

10 MICROPROCESSORS AND MEMORIES

This section shall describe all microprocessors, their hardware/software interfaces and memories contained in <EARTHCARE Equipment>. The following information should be provided:

- An overview of the processor memory map
- The method and constraints for dumping the memory to the ground (this should include allowed SW modes, limitations due to page boundaries, etc)
- The method and constraints for obtaining the checksum of specified areas of memory.
- The method and constraints for patching the memory (this should include allowed SW modes, limitations due to page boundaries, etc)
- Information about memory protection mechanisms (e.g. scrubbing routines, EDAC etc.)

11. FAILURE DETECTION, ISOLATION AND RECOVERY (FDIR)

This chapter shall allow the ground to isolate the cause of onboard anomalies to the extent that recovery can be made using available onboard resources as e.g. redundancy.

11.1. FAILURE DETECTION AND MONITORING

This section shall describe the failure detection and monitoring mechanisms applied for the <EARTHCARE Equipment> covering use of internal monitoring, external onboard monitoring and ground based monitoring.

11.2.1 Internal Monitoring

List and describe the monitoring functions active within the equipment itself. Mode dependencies, monitoring frequencies, trigger thresholds and filtering values should be included. The identifier of the internal corrective action applied in the event of triggering should be identified (the detailed description of the corrective actions will be in the next section). In addition the justification for the monitoring should be given.

11.2.2 External Monitoring

List and describe the monitoring functions to be performed external to the equipment (e.g. by the onboard software or Ground) . Mode dependencies, monitoring frequencies, trigger thresholds and filtering values should be included. The identifier of the external corrective action applied in the event of triggering should be identified (the detailed description of the corrective actions will be in the next section). In addition the justification for the monitoring should be given.

11.2 FAILURE ISOLATION AND RECOVERY

The objective of this section is to define a logical flow of activities to allow the onboard failure to be isolated and corrected down to the level of available redundancy or equipment / unit re-boot. The activities shall be described for onboard as well for on-ground FDIR needs.

The start point for this must always be the anomaly message contained in the TM (e.g. event message). The logic should be presented in the form of a flow diagram or a table with references to procedures in chapters 12 and 13 as appropriate.

These failure localisations must be based on the FMECA and must either replicate information contained in the FMECA or make reference to the FMECA which must then be included as an Annex to the User Manual.

12. NOMINAL PROCEDURES

All <EARTHCARE Equipment> nominal procedures shall be detailed in this chapter.
 Each procedure shall include a text header and a tabular body.

The text header shall consist of the following:

- *Procedure Name* consisting of a short meaningful description of the procedure and a unique identifier. The unique identifier shall be of the form FCP-xx-nnn, where
 - FCP denotes that the name is a nominal flight control procedure
 - xx is the equipment code
 - nnn is a counter to distinguish between different nominal flight control procedures in the equipment.
- *Procedure Objective* consisting of a description of the principal aims of the procedure;
- *User Manual Reference* referring to the relevant part of Chapter 6;
- *Initial Conditions* specifying the context in which the procedure can be used, in particular the initial configuration of the equipment;
- *Final Configuration* specifying the configuration of the equipment after the procedure has been run;
- *Constraints* referring to any relevant constraints in chapter 6 and any constraints concerning the need for other procedures to be run either before or after this procedure.

Example:

Procedure Name	FCP-xx-nnn: Switch GPS to Operational Mode
Procedure Objective	This procedure switches the GPS into Operational Mode
User Manual Reference	User Manual Volume 9, section x.x
Other Reference	
Initial Configuration	GPS in Standby
Final Configuration	GOS in Operational Mode
Constraints	This procedure requires nominal platform operation

The tabular body shall include

- An incrementing step number
- A description of the action to be performed
- Identification of the TC to be sent and definition of the parameter values to be sent
- Identification of the TM verification to be performed

START OF PROCEDURE			
Step	Activities	TC	TM
1			
2			
END OF PROCEDURE			

13. CONTINGENCY RECOVERY PROCEDURES

All <EARTHCARE Equipment> contingency recovery procedures (CRPs) shall be detailed in this chapter.

Each procedure should use the same layout as used in Chapter 12. The contingency recovery procedure unique identifier shall be of the form CRP-xx-*nnn* where

- CRP denotes that the name is a contingency recovery procedure;
- *xx* is the equipment code;
- *nnn* is a counter to distinguish between different contingency recovery procedures in the equipment.

The structure of the procedures shall be identical to those in section 12.

14. <EARTHCARE EQUIPMENT> ON-GROUND OPERATION

This chapter should describe all aspects of the subsystem operation specific to on ground operations. The following items shall be included at minimum:

- Reference to Installation procedures
- Specific preparations for any operation of the equipment in specific test environment
- GSE to be used to operate the equipment
- Operations of the GSE
- On ground operations constraints (thermal ...)
- On-ground handling constraints
- Special protections/provisions required for on-ground operation including all safety/hazardous aspects
- Life limitation for on-ground operations

Specifics for individual models shall be considered, i.e. if an EM provides other characteristics or specific constraints as an FM.

15. BUDGETS

This chapter should contain all operationally meaningful budgets that are relevant at equipment level. Budgets to be considered are

- Mass
- Moment of inertia
- Mechanical Disturbance
- Telecommand
- Telemetry
- Measurement data rate
- Power
- Thermal dissipation
- Microprocessor Loads
- Microprocessor Memory
- Data Bus load.

16. LIST OF ABBREVIATIONS

This chapter should contain all abbreviations as used in the main body of the User Manual.

ANNEXES:

ANNEX 1 Detailed Configuration Drawings.

All drawings as required by section 3.2.2.

ANNEX 2 Internal Event Tables.

This Annex should contain the internal command event tables, if relevant. These should detail all actions as a result of commands or autonomous actions on an event by event basis, even if they are not directly visible in the telemetry data. Relevant timing information should be included.

ANNEX 3 Command and Control Diagrams.

Command and control diagrams provide a diagrammatic representation of the relationship between bus level commands, acquisitions, control signals and controllable entities such as relays. They should contain representation of all controllable and observable switchable elements and give visibility of command and acquisition data interfaces. The diagrams shall include telemetry points (e.g. relay statuses) and SRDB/IRDB TM and TC names.

ANNEX 4 Logic Diagrams and Truth Tables.

All logic blocks involved in the command and control of equipments, if any, shall be represented in this annex as functional logic diagrams and supporting truth tables. This should include functions implemented in ASICs/FPGA's.

ANNEX 5 Source Code.

This annex should include the source code for equipment processors that is delivered with Software.

ANNEX 6 TM/TC ICD.

This annex shall include the complete TM/TC ICD for the equipment. This shall include

- A list of all unit HK telemetry parameters. For each parameter it shall include a function description with validity conditions, telecommand relationship and all technical information necessary for using it
- A list of all unit commands. For each command it shall include a functional description with utilization conditions and execution verification in telemetry. For each command the execution run-time shall be outlined
- This data may be included in the electronic TM/TC delivery towards the satellite reference data base

ANNEX 7 Equipment Science Data Format and Processing Description

This annex shall include the complete description of the science data stream of the equipment if provided. This shall include

- Definition of the unit science output data, circumstance of generation, format, content and data rate, for each operational mode of the unit
- Definition of the processing performed on the sensor data, the algorithms used, selection or rejection criteria (if under the responsibility of the contractor)
- Definition of the required ground/SW processing of the science data

ANNEX x Other Information

Additional annexes should be provided for any other information that needs to be in the User Manual but whose bulk is such that it is not appropriate to include it within the main body of the User Manual.

In some cases it may also be appropriate to include a complete document within the User Manual. In this case the whole document can be attached as an annex to the User Manual..

3. USER MANUAL DELIVERY SCHEDULE

For the User Manual, the following delivery schedule is proposed (TBC).

UM Issue	Required Content	Due Date
1	Initial Information / Functional description including TM/TC definition	PDR
2	Complete document including all nominal and contingency procedures.	CDR
3	Complete document, reflecting the latest state of knowledge of the Equipment. (Note 1)	DRB (Note 1)

Note 1: Dedicated User manuals required for each delivered model (e.g. EM, FM ..)

