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document title/ *titre du document*

HERSCHEL GROUND SEGMENT

LIST OF ICDS

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C H A N G E L O G

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1 INTRODUCTION

1.1 *Purpose and scope*

This document lists the ICDs between the various systems of the HERSCHEL GS or HGS centers that will be controlled through ICDs. The list of ICDs covers all HERSCHEL mission phases from ILT to post-mission.

The interfaces internal to a given system and centre are not addressed in this document.

In line with the HGS Design Description (see [AD-1]) and HGS IRD (see [AD-2]), the following HGS centers and systems considered are:

(centers)

- the HSC
- the ICCs
- the ICC@MOC
- the MOC

(systems)

- the HERSCHEL Common Science System (HCSS)
- the EGSE-ILT
- the CCS
- the MOC (system)
- the RTA
- the OBSM
- the MIB editor

For each such I/F, the section 2 of this document indicates:

- the definition of the information flow
- the reference to the ICD (document) defining the interface (when available)
- the mission phases for which the I/F is valid
- the HGS team who is the ICD custodian/ mission phase
- the systems (or centers) producing or consuming the information / mission phase

The section 3 of this document traces the interface requirements of the HGS IRD, see[AD-2], to the different ICDs.

1.2 *Reference documents*

1.2.1 APPLICABLE DOCUMENTS

- [AD-1] HGS Design Description Document, FIRST/FSC/DOC/0146, issue 1.1
- [AD-2] HGS Interface Requirement Document, FIRST/FSC/DOC/0117, issue 2.0

1.2.2 REFERENCE DOCUMENTS

- [RD-1] HCSSHCSS Software Project Management, FIRST/FSC/DOC/0016
- [RD-2] Glossary document, FIRST/FSC/DOC/0120

1.3 *Acronyms and Definition*

1.3.1.1 *Acronyms and abbreviations*

The list of acronyms for the Herschel GS can be found in [RD-2] and accessed at <http://astro.estec.esa.nl/Herschel/hscdt/acronyms.html>.

1.3.1.2 *Definitions*

The definition of terms for the Herschel GS can be found in [RD-2] and accessed at <http://astro.estec.esa.nl/Herschel/hscdt/acronyms.html>.

2 LIST OF ICDS

The following table lists all the HGS interfaces and associated information.

For readability purpose, the interfaces have been grouped as follows:

Procedural interfaces: these are the information flow between the HGS operational centers that are subject to manual procedures.

Satellite TC & TM data: this section of the table groups all the ICDs that are related to the definition of the satellite TC and TM data format

MOC data: this section of the table groups all the ICDs that are related to the definition of the format and/or exchange protocol for data generated by MOC in the in-orbit phase. Some of these ICDs may be applicable for ILT, IST as the EGSE-ILT or the CCS may mimic the MOC for these data both wrt the format and/or wrt the exchange protocol.

HSC data: this section of the table groups all the ICDs that are related to the definition of format and/or exchange protocol for data generated by the HSC in the in-orbit or post mission phase.

ICC data: this section of the table groups all the ICDs that are related to the definition of format and/or exchange protocol for data generated by the ICC in the in-orbit or post mission phase. Some of these ICDs may be applicable for ILT or IST as the ICCs may already generate these data for testing their instruments.

Test specific data: this section of the table groups all the ICDs that are related to the definition of format and/or exchange protocol for the data specific to ILT or IST.

SW: this section of the table groups all the ICDs that are related to SW interfaces

The column headings are overall self-explanatory. The "**Systems (centres) involved/ Mission phase**" column lists for each interface the system (or center) which are generating or consuming the information related to the interface. The system (center) generating the information is underlined (when relevant).

The ICDs that are already applicable in the ILT phase are marked in **blue**.

ICD name	ICD No	ICD name and ref. (TBD)	Mission phases	Custodian/ Mission phase	Systems (centres) involved/ Mission phase	ICD brief description <i>and other additional comments</i>
MOC-HSC operational interactions			In-orbit	MOC or HSC?	(MOC-HSC)	MOC-HSC interface procedures
MOC-ICC operational interactions			In-orbit	MOC	(MOC-ICC)	MOC-ICC and ICC@MOC interface procedures
HSC-ICC operational interactions			In-orbit Post mission	ICC or HSC?	(HSC-ICC)	HSC-ICC interface procedures
MIB format	1	SCOS-2000 Database Import ICD Ref. S2K-MCS-ICD-0001- TOS-GCI (all phases)	ILT IST In-orbit Post-mission	HIFI EGSE (LD ¹) Project/Prime MOC TBD	<u>MIB editor</u> – EGSE-ILT – HCSS – RTA <u>MIB editor</u> – CCS – HCSS – RTA <u>(MIB editor)</u> – MOC – HCSS – RTA <u>MIB editor</u> – HCSS - RTA	<p>Formats to support the definition of</p> <ul style="list-style-type: none"> - TC mnemonic - TC packets formats. - HK TM packet (header + data field) - Instrument science TM packet header (not science TM data field). - OOL values - Parameter calibration curves <p>In ILT, the MIB format will also support the definition of the TEI TC and TM and in IST, the definition of SCOE TC and TM.</p> <p><i>The MIB, it self, which will contain the definition of the TC and TM is not part of this list as this is a database not a document.</i></p>

¹ LD: Luc Dubbeldam

ICD name	ICD No	ICD name and ref. (TBD)	Mission phases	Custodian/ Mission phase	Systems (centres) involved/ Mission phase	ICD brief description <i>and other additional comments</i>
Science TM data field	2	HIFI: HIFI TM PACKET ICD Ref. SRON-U/HIFI/SP/2001-2 (all phases) SPIRE: TBD PACS: TBD (*) (*) SPU to DPU ICD ref. PACS-TN-ID-001 is temporarily used for this purpose	ILT IST In-orbit Post-mission	PACS, SPIRE, HIFI (all phases)	<u>Instr.</u> - HCSS (all phases)	Definition of the instruments science packets data field format
<i>MOC data</i>						
Time Correlation			IST (TBC) In-orbit	Project/Prime MOC	<u>CCS</u> – HCSS – RTA <u>MOC</u> – HCSS – RTA	Definition of TiC information format <i>TiC TM in ILT is not used at all: In ILT instrument and TE clocks will be kept synchronized with test contol clock.</i>
Derived parameter			IST(TBC) In-orbit	Project/Prime MOC	<u>CCS</u> – HCSS – RTA <u>MOC</u> – HCSS – RTA	Definition of derived parameter data format <i>Derived parameters TM are created by CCS (IST) (TBC) and MCS (in-orbit operation). Derived parameter TM in ILT will not be used.</i>
OOL data	3	OOL data ICD Ref. SPIRE-ICS-DOC-000974	ILT IST	SPIRE ICC	<u>RTA</u> -HCSS <u>RTA</u> -HCSS	Definition of OOL data format <i>OOL data are created by RTA (ILT &IST), and MCS (in-orbit</i>

ICD name	ICD No	ICD name and ref. (TBD)	Mission phases	Custodian/ Mission phase	Systems (centres) involved/ Mission phase	ICD brief description <i>and other additional comments</i>
			In-Orbit	MOC	MOC-HCSS	<i>operation).</i>
NRT TM I/F	4	Herschel EGSE Packet Router ICD Ref. SRON-G/HIFI/ICD/2001-001	ILT	HIFI EGSE(AdJ ²)	<u>EGSE-ILT</u> – HCSS – RTA	Definition of the protocol for the stream of the NRT TM I/F from EGSE-ILT(router) in ILT, CCS in IST and MOC in operation and for establishing the stream. Although it is expected that the TM stream protocol be similar in all phases (e.g. TCP-IP), the way establishing the stream will differ along the different phases, leading to separate section in the document.
			IST	Project/Prime	<u>CCS</u> – HCSS	
			In-orbit	MOC	<u>MOC</u> – HCSS (ICC@MOC)	
TC history	5	TC history ICD Ref. SPIRE-ICS-DOC-000900	ILT	SPIRE ICC	<u>RTA</u> – HCSS	Definition of the TC history format. <i>The TC history format is expected to be largely the same across mission phases. It is however possible that some fields will be mission phase specific.</i>
			IST(TBC)	Project/Prime	<u>CCS</u> – HCSS	
			In-orbit	MOC	<u>MOC</u> – HCSS	
Planning Skeleton			In-orbit	MOC	<u>MOC</u> – HCSS	
Schedule status information			In-orbit	MOC	<u>MOC</u> – HCSS	
Commanding timeline summary			In-orbit	MOC	<u>MOC</u> – HCSS	
S/C orbit data reconstituted			In-orbit	MOC	<u>MOC</u> – HCSS	
S/C attitude history			In-orbit	MOC	<u>MOC</u> – HCSS	
SSO database			in-orbit	MOC	<u>MOC</u> – HCSS	

² AdJ: Albrecht de Jong

ICD name	ICD No	ICD name and ref. (TBD)	Mission phases	Custodian/ Mission phase	Systems (centres) involved/ Mission phase	ICD brief description <i>and other additional comments</i>
DDS I/F			In-orbit	MOC	<u>MOC</u> - HCSS(HSC)	Definition of DDS services and protocol to retrieve MOC data files and consolidated TM and export HSC/ICC data files to MOC.
Schedule			In-orbit	HSC	<u>HCSS(HSC)</u> – MOC	Definition of the format and contents of schedule. Includes S/C commanding request definition
HSC data to ICC			In-orbit Post-mission	HSC	HCSS (<u>HSC</u> – ICC)	Definition of all the data (and their relationships) shared by HSC and ICC as well as the transfer mechanism from HSC to ICCs <i>Captured by the HCSS design class model and ODBMS replication/remote aCCSs policy</i>
Instrument Command Sequences			In-orbit	MOC	<u>HCSS(ICC)</u> – MOC	Definition of instrument command sequences used for manual commanding by MOC
Instrument OBS interchange format	6	SCOS-2000 OBSM External Interfaces ICD Ref. S2K-MCS-ICD-0014-TOS-GCI (ILT&Ops)	ILT IST (TBC) In-orbit	IFSI Project/Prime MOC	<u>OBSMaint</u> – HCSS – EGSE-ILT <u>OBSMaint</u> – HCSS – CCS <u>OBSMaint</u> – HCSS – MOC	Definition of the exchange format for instrument memory image <i>The instrument memory as returned by MOC and the instrument memory update from ICC to MOC will be exchanged in the same format.</i>
Instrument apertures and pointing misalignment			In-orbit	MOC	MOC – HCSS	

ICD name	ICD No	ICD name and ref. (TBD)	Mission phases	Custodian/ Mission phase	Systems (centres) involved/ Mission phase	ICD brief description <i>and other additional comments</i>
ICC data to HSC			In-orbit Post-mission	HSC	HCSS (<u>ICC</u> - HSC)	Definition of all the data (and their relationships) shared between ICC and HSC as well as the transfer mechanism from ICCs to HSC <i>Captured by the HCSS design class model and ODBMS replication/remote aCCSss policy</i>
HCSS - RTA TM I/F	7	Same as ICD#4	ILT IST In-orbit post-mission	see ICD#4	<u>HCSS</u> – RTA(all phases)	Definition of the TM data flow protocol between HCSS and RTA. The TM data flow is established through the router hence the ICD#4 applicability. The way to trigger the TM flow from the HCSS to the router is defined in the Telemetry and Data Frame ICD Ref. SPIRE-ICS-DOC-000900. This ICD is not an HCSS internal ICD and is therefore not relevant to this list.
RTA – HCSS data I/F	8	RTA-HCSS Data ICD SPIRE-ICS-DOC-000975	ILT IST	SPIRE ICC (all phases)	<u>RTA</u> – HCSS	Definition of the protocol between RTA and the HCSS for <ul style="list-style-type: none"> - transferring TC history data (ILT only) - transferring OOL data (ILT & IST)

ICD name	ICD No	ICD name and ref. (TBD)	Mission phases	Custodian/ Mission phase	Systems (centres) involved/ Mission phase	ICD brief description <i>and other additional comments</i>
HCSS OBS I/F	9	Storage and Retrieval of Raw Datasets Ref. HSCDT/TN/022 section 4 (all phases)	ILT IST In-orbit	HSCDT (all phases)	OBSMaint – HCSS – EGSE-ILT OBSMaint – HCSS – CCS OBSMaint – HCSS	Definition of the protocol to store/retrieve the instrument memory image to/from the HCSS as well as associated files. <i>The transfer of the instrument memory image between the HCSS and MOC in in-orbit phase is covered by the DDS I/F</i>
HCSS MIB I/F	10	Same as ICD#9	ILTIST In-orbit	see ICD#9	MIB editor – HCSS – EGSE-ILT - RTA MIB editor – HCSS – CCS MIB editor – HCSS	Definition of the protocol to store/retrieve the MIB files to/from the HCSS <i>The transfer of the MIB files between the HCSS and MOC in in-orbit phase is covered by the DDS I/F</i>
EGSE-ILT - HCSS Test control I/F	11	HCSS-Test Control ICD Ref. PICC-ME-ID-001	ILT	PACS ICC	<u>EGSE-ILT</u> – HCSS	Definition of the protocol and data format between EGSE-ILT(Test Control) and HCSS to exchange <ul style="list-style-type: none"> - observing modes, - command mnemonic sequences, - test procedures definition, - autonomy procedures definition - test procedure log
CCS - HCSS data I/F			IST(TBC)	Project/Prime	<u>CCS</u> – HCSS	Definition of interface protocol and exchange format between the CCS and the HCSS for test execution data (e.g. test definition, test log execution)

ICD name	ICD No	ICD name and ref. (TBD)	Mission phases	Custodian/ Mission phase	Systems (centres) involved/ Mission phase	ICD brief description <i>and other additional comments</i>
RTA events and TM parameters	12	EGSE BASED ON BASED ON SCOS 2000 THE EGSE & MISSION CONTROL SYSTEM SOFTWARE USER MANUAL Ref. TOS-EMG/01-1029/bm/sv	ILT	PACS ICC	<u>RTA</u> – EGSE-ILT	Definition of RTA events format and TM parameters and transfer protocol to implement autonomy function of the EGSE-ILT. <i>RTA generates events (e.g. OOL) to the EGSE-ILT test controller to drive test procedures execution</i>
S/C orbit predictor algorithm and data			In-orbit	MOC	<u>MOC</u> – HCSS	<i>MOC will deliver deliver algorithm specification for SW (TBC)</i>
S/C attitude constraints algorithm and data			In-orbit	MOC	<u>MOC</u> – HCSS	<i>MOC will deliver deliver algorithm specification for SW (TBC)</i>
S/C slew time and path predictor algorithm and data			In-orbit	MOC	<u>MOC</u> – HCSS	<i>MOC will deliver deliver algorithm specification for SW (TBC)</i>
Instrument simulator SW API			In-orbit	PI	Instrument simulator – S/C simulator	
Instrument time estimator, instrument commanding and instrument data processing API			ILT IST In-orbit Post mission	ICC (all phases)	HCSS	<i>Internal to HCSS, captured by HCSS class model</i>

APPENDIX A : IRD-ICDS TRACEABILITY MATRIX

IRD requirements From the FGS IRD see [AD-2]	I/F name (see section 2)
FGS-IR-3.1-10 FGS-IR-3.1-20 FGS-IR-3.1-30	DDS I/F
FGS-IR-3.1-75 FGS-IR-3.1-80 FGS-IR-3.1-90 FGS-IR-3.1-100 FGS-IR-3.1-110	DDS I/F
FGS-IR-3.1-120 FGS-IR-3.1-130 FGS-IR-3.1-140 FGS-IR-3.1-145	S/C orbit predictor SW and MOC-HSC operational interactions and DDS I/F
FGS-IR-3.1-150 FGS-IR-3.1-160 FGS-IR-3.1-170	S/C attitude constraints SW and MOC-HSC operational interactions and DDS I/F
FGS-IR-3.1-180 FGS-IR-3.1-190 FGS-IR-3.1-200	S/C slew time and path predictor SW and MOC-HSC operational interactions and DDS I/F
FGS-IR-3.1-210 FGS-IR-3.1-220 FGS-IR-3.1-230	Planning Skeleton and MOC-HSC operational interactions and DDS I/F
FGS-IR-3.1-260 FGS-IR-3.1-265	Schedule status information MOC-HSC operational interactions and DDS I/F
FGS-IR-3.1-270 FGS-IR-3.1-280 FGS-IR-3.1-290 FGS-IR-3.1-295	Commanding timeline summary and MOC-HSC operational interactions and DDS I/F
FGS-IR-3.1-300 FGS-IR-3.1-310 FGS-IR-3.1-320 FGS-IR-3.1-330 FGS-IR-3.1-340	TC history and MOC-HSC operational interactions and DDS I/F

FGS-IR-3.1-350 FGS-IR-3.1-360 FGS-IR-3.1-370	S/C orbit data reconstituted and MOC-HSC operational interactions and DDS I/F
FGS-IR-3.1-380 FGS-IR-3.1-390 FGS-IR-3.1-400 FGS-IR-3.1-410	S/C attitude history and MOC-HSC operational interactions and DDS I/F
FGS-IR-3.1-420 FGS-IR-3.1-430 FGS-IR-3.1-435 FGS-IR-3.1-436 FGS-IR-3.1-440	Time Correlation TM and MOC-HSC operational interactions and DDS I/F
FGS-IR-3.1-450 FGS-IR-3.1-455 FGS-IR-3.1-460	Derived parameter TM and MOC-HSC operational interactions and DDS I/F
FGS-IR-3.1-470 FGS-IR-3.1-475 FGS-IR-3.1-480	OOL data. and MOC-HSC operational interactions and DDS I/F
FGS-IR-3.1-490 FGS-IR-3.1-495 FGS-IR-3.1-496 FGS-IR-3.1-498	Instrument OBS Interchange format and MOC-HSC operational interactions and DDS I/F
FGS-IR-3.1-500 FGS-IR-3.1-505 FGS-IR-3.1-506	MIB format and MOC-HSC operational interactions and DDS I/F
FGS-IR-3.1-510 FGS-IR-3.1-515 FGS-IR-3.1-516	Instrument apertures and pointing misalignment and MOC-HSC operational interactions and DDS I/F
FGS-IR-3.1-520 FGS-IR-3.1-525 FGS-IR-3.1-526	SSO database MOC-HSC operational interactions and DDS I/F
FGS-IR-3.1-530 FGS-IR-3.1-535 FGS-IR-3.1-536 FGS-IR-3.1-540 FGS-IR-3.1-545 FGS-IR-3.1-548	MOC-HSC operational interactions
FGS-IR-3.2-10 FGS-IR-3.2-15 FGS-IR-3.2-18	MOC-ICC operational interactions

FGS-IR-3.3-10 FGS-IR-3.3-20 FGS-IR-3.3-30 FGS-IR-3.3-35 FGS-IR-3.3-40 FGS-IR-3.3-50	NRT TM I/F
FGS-IR-3.4-10 FGS-IR-3.4-30 FGS-IR-3.4-50	Schedule and MOC-HSC operational interactions and DDS I/F
FGS-IR-3.4-80 FGS-IR-3.4-100	Instrument OBS interchange format and MOC-HSC operational interactions and DDS I/F
FGS-IR-3.4-110 FGS-IR-3.4-115	SSO database and MOC-HSC operational interactions and DDS I/F
FGS-IR-3.4-120 FGS-IR-3.4-125	MIB format and MOC-HSC operational interactions and DDS I/F
FGS-IR-3.4-130 FGS-IR-3.4-135	MOC-HSC operational interactions
FGS-IR-3.4-140 FGS-IR-3.4-145	Instrument apertures and pointing misalignment and MOC-HSC operational interactions and DDS I/F

FGS-IR-3.5-10 FGS-IR-3.5-15 FGS-IR-3.5-20 FGS-IR-3.5-30 FGS-IR-3.5-40 FGS-IR-3.5-50 FGS-IR-3.5-60 FGS-IR-3.5-70 FGS-IR-3.5-80 FGS-IR-3.5-90 FGS-IR-3.5-100 FGS-IR-3.5-110 FGS-IR-3.5-120 FGS-IR-3.5-130 FGS-IR-3.5-135 FGS-IR-3.5-140 FGS-IR-3.5-150 FGS-IR-3.5-160 FGS-IR-3.5-165 FGS-IT-3.5-170	HSC data to ICC and HSC-ICC operational interactions
FGS-IR-3.7-10 FGS-IR-3.7-20	ICC data to HSC and HSC-ICC operational interactions and Instrument OBS interchange format
FGS-IR-3.7-40 FGS-IR-3.7-45 FGS-IR-3.7-47 FGS-IR-3.7-48 FGS-IR-3.7-50 FGS-IR-3.7-60 FGS-IR-3.7-65 FGS-IR-3.7-70 FGS-IR-3.7-75 FGS-IR-3.7-80 FGS-IR-3.7-85	ICC data to HSC and HSC-ICC operational interactions
FGS-IR-3.7-90 FGS-IR-3.7-127	Instrument simulator SW API and HSC-ICC operational interactions
FGS-IR-3.7-100 FGS-IR-3.7-127	Instrument time estimator SW API and HSC-ICC operational interactions
FGS-IR-3.7-110 FGS-IR-3.7-127	Instrument commanding SW API and HSC-ICC operational interactions
FGS-IR-3.7-120 FGS-IR-3.7-125 FGS-IR-3.7-127	Instrument data processing SW API and HSC-ICC operational interactions

FGS-IR-3.7-130 FGS-IR-3.7-140 FGS-IR-3.7-150 FGS-IR-3.7-155	HSC-ICC operational interactions and/or ICC data to HSC
FGS-IR-3.7-160 FGS-IR-3.7-165	MIB format and HSC-ICC operational interactions and ICC data to HSC and HCSS MIB I/F
FGS-IR-3.7-170 FGS-IR-3.7-175	HSC-ICC operational interactions and
FGS-IR-3.7-180 FGS-IR-3.7-185	Instrument apertures and pointing misalignment and HSC-ICC operational interactions and/or ICC data to HSC
FGS-IR-3.7-200	HSC-ICC operational interactions
FGS-IR-3.8-10 FGS-IR-3.8-20	HCSS – RTA TM I/F
FGS-IR-3.8-25 FGS-IR-3.8-26	HCSS internal ICD: Telemetry and Data Frame ICD Ref. SPIRE-ICS-DOC-000900.
FGS-IR-3.8-30	HCSS – RTA TM I/F
FGS-IR-3.9-10 FGS-IR-3.9-20	RTA - HCSS data I/F
FGS-IR-3.10-10 FGS-IR-3.10-20	HCSS OBS I/F
FGS-IR-3.11-10 FGS-IR-3.11-20	HCSS OBS I/F
FGS-IR-4.1-05 FGS-IR-4.1-10 FGS-IR-4.1-20 FGS-IR-4.1-25 FGS-IR-4.1-30 FGS-IR-4.1-40	EGSE-ILT – HCSS Test Control I/F
FGS-IR-4.1-60 FGS-IR-4.1-70 FGS-IR-4.1-80	MIB format & HCSS MIB I/F
FGS-IR-4.1-90 FGS-IR-4.1-100 FGS-IR-4.1-110	Instrument OBS Interchange Format & HCSS OBS I/F
FGS-IR-4.2-10 FGS-IR-4.2-20	NRT TM I/F
FGS-IR-4.2-21	MIB: these are requirements on the content of the TM packet

FGS-IR-4.2-25 FGS-IR-4.2-30 FGS-IR-4.2-40 FGS-IR-4.2-50	NRT TM I/F
FGS-IR-4.2-60 FGS-IR-4.2-70 FGS-IR-4.2-80 FGS-IR-4.2-90	EGSE-ILT – HCSS Test Control I/F
FGS-IR-4.3-10 FGS-IR-4.3-20	HCSS-RTA TM I/F
FGS-IR-4.3-25 FGS-IR-4.3-26	HCSS internal ICD: Telemetry and Data Frame ICD Ref. SPIRE-ICS-DOC-000900.
FGS-IR-4.3-35	HCSS-RTA TM I/F
FGS-IR-4.3-40 FGS-IR-4.3-50 FGS-IR-4.3-60	MIB format & HCSS MIB I/F
FGS-IR-4.4-10 FGS-IR-4.4-20 FGS-IR-4.4-30	RTA – HCSS data I/F & TC History
FGS-IR-4.4-40 FGS-IR-4.4-50	RTA – HCSS data I/F & OOL data I/F
FGS-IR-4.5-10 FGS-IR-4.5-20	HCSS OBS I/F
FGS-IR-4.7-10 FGS-IR-4.7-20 FGS-IR-4.7-40	RTA events and TM parameters I/F
FGS-IR-4.10-10 FGS-IR-4.10-15 FGS-IR-4.10-20	MIB format & HCSS MIB I/F

APPENDIX B : ILT ICDS AND SET-UP

The following diagram from the HGSDD, see [AD-1] , describes the ILT set-up in terms of systems and components. It shows the data interfaces between the components. The ICDs relevant to these interfaces are indicated in the diagram. The ICD numbers correspond to the number in 2.

