Imperial College

Cluster2 FGM

User's Manual
Appendix C

Instrument Boot Sequences

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Revisions

Issue	Rev.	Date	Sec.	Page	Changes
Draft	0	15 March 95			Document initialisation. This document replaces 'Default Instrument Boot Sequence' ref IC\CLUSTER\COM_PRO1.DOC
Draft	0.1	11 April 95			Corrected range change patch for Y vectors and increased dummy length to 6. Sumchecks updated accordingly.
Draft	0.2	24 July 95	2	3	Sumcheck at T0 + 57 and T0 + 69 corrected
			2	5	Sumcheck at T0 + 57, T0 + 69 and T0 + 81 corrected
Issue 1	0	7 Nov '95		Ap. A	Editorial change to Appendix A title.
2	0	30th April '99	All	-	All sections revised for Cluster2 Document reference changed to: 'Users Manual \ Appndx C Boot Seq'
2	1	23rd March 00	2	-	Instrument patch sequences included in Boot Type 2
2	2	19th May 00	all		Complete revision to reflect revised power-on with strict delta-uplinked commands, as agreed at ESOC, 18th May 00
2	3	23rd May 00	2	5	Changed FGMOPM1 to DPU1 operational. Updated Defualt Boot Sequence notes (p 9) also.
3	0	29th June 00	All		Boot type 2 sequence and notes rewritten to incorporate instrument patches
3	1	5th July 00			Supplementary power on procedures incorporated into document. FGMOPM1 is redefined as 'with patches uplinked'. Introduction updated.

Contents

1. Introduction

There are a number of possible ways to boot the FGM electronics, which relate to the fault tolerant nature of its architecture. Four boot sequences are tested during the commisioning phase and they are defined as follows:

Type 1	Manual boot of DPU1 from either interface
Type 2	Automatic boot of DPU1 from interface 1
Type 3	Manual boot of DPU2 from either interface
Type 4	Automatic boot of DPU2 from interface 2

The Type 2 boot sequence is used as the default for routine operationsandincludes the instrument patchesExecution of this sequence produces the instrument configuration assumed by the 'Parameterised Command Sequences' document, Ref Users Manual \ Appndx I PCS. The other boot sequences will be used for diagnostics purposes and do not include the instrument patches.

The boot sequences include the FGM LCL power-on. The timing of commands is linked relative to the LCL power-on. This is important since once the LCL is on, the processor should be booted as soon as possible. The commands should be loaded in advance as a time tag sequence, to avoid the possibility that any interruption can occur during the execution of these commands. A type 2 boot sequence consists of two distinct command lists. The first (Auto Boot)) is a time tagged sequence of commands that power on the instrument. The second (Instrument patches) is a delta uplink sequence of commands that loads the instrument patches. The instrument patches are in IPCH format.

2. Boot Sequences

Attached

Boot Type 1

This is the manual boot for DPU1 from either interface .

Preconditions for use of interface 1

FGM primary power 1	= OFF
FGM primary power 2	= OFF
FGM converter sync. 1	= Don't care
FGM converter sync. 2	= Don't care
Sun pulse source MN	= Don't care
Reset pulse source MN	= Don't care
HF clock source MN	= Don't care
SC data MN	= ON
HK data MN	= ON
ML1 CMD MN	= ON
ML2 CMD MN	= ON
ML DATA MN	= ON
ST CLOCK MN	= ON

Preconditions for use of interface 2

FGM primary power 1	= OFF
FGM primary power 2	= OFF
FGM converter sync. 1	= Don't care
FGM converter sync. 2	= Don't care
Sun pulse source RD	= Don't care
Reset pulse source RD	= Don't care
HF clock source RD	= Don't care
SC data RD	= ON
HK data RD	= ON
ML1 CMD RD	= ON
ML2 CMD RD	= ON
ML DATA RD	= ON
ST CLOCK RD	= ON

Command List

Time (Base + Offset in seconds)	Commands	Comments
t_0	Switch on FGM LCL 'A' **or** 'B' (NB **not** both)	The FGM DC/DC Converters are running, however the processor is not powered or booted.
$t_0 + 5$	ZEF2MNTS ZEF2MNCS ZEF2MNTS ZEF2MNCS ZEF1DP1N	The FGM is booted into Engineering Mode, with DPU1 operating.

State on Exit

The state of the instrument on completion of this sequence is not defined in the Instrument User's Manual. This sequence is used for engineering purposes, not fight operations. Further commands are required before the instrument will produce valid science data.

Boot Type 2

This is the automatic boot of DPU1 from Interface 1. It is the default FGM boot type.

Preconditions

FGM primary power 1	= OFF
FGM primary power 2	= OFF
FGM converter sync. 1	= Don't care
FGM converter sync. 2	= Don't care
Sun pulse source MN	= ON
Reset pulse source MN	= ON
HF clock source MN	= ON
SC data MN	= ON
HK data MN	= ON
ML1 CMD MN	= ON
ML2 CMD MN	= ON
ML DATA MN	= ON
ST CLOCK MN	= ON

Command List (Auto Boot)

Time (Base + Offset in seconds)	Commands	Comments
t_0	Switch on FGM LCL 'A'	The FGM DC/DC Converters are running, however the processor is not powered or booted.
$t_0 + 5$	ZEF1DR0S ZEF1RESE ZEF1DR0S ZEF2ATTS ZEF2ATCS ZEF2ATTS ZEF2ATCS ZEF1DP1N	The FGM is booted into DPU1 operational

Command List (Instrument Patches)
Preconditions: The FGM has been powered on using the Auto Boot command list and left for 25 seconds.

Delta Uplink Time (s)	Action	Commands	Comments
	Send ML2	ZEF2PATS,0	Open code patch window. Ignore sumcheck warning.
0	Send IPCH	LFGMEX14	Extended mode pre-configuration patch
15	Send ML2	ZEF2PATS,0	Open code patch window. Ignore sumcheck warning.
0	Send IPCH	LFGMEX15	Patch to disable call to extended mode from main
15	Send ML2	ZEF2PATS,0	Open code patch window. Ignore sumcheck warning.
0	Send IPCH	LFGMEX16	Patch to disable call to sumcheck from main
15	Send ML2	ZEF2PATS,0	Open code patch window. Ignore sumcheck warning.
0	Send IPCH	LFGMEX17	Patch that rewrites a section of extended mode
15	Send ML2	ZEF2PATS,0	Open code patch window. Ignore sumcheck warning.
0	Send IPCH	LFGMEX18	Patch that rewrites a section of extended mode
15	Send ML2	ZEF2PATS,0	Open code patch window. Ignore sumcheck warning.
0	Send IPCH	LFGMEX19	Patch that rewrites a section of extended mode
15	Send ML2	ZEF2PATS,0	Open code patch window. Ignore sumcheck warning.

0	Send IPCH	LFGMEX20	Patch that rewrites a section of extended mode
15	Send ML2	ZEF2PATS,0	Open code patch window. Ignore sumcheck warning.
0	Send IPCH	LFGMEX21	Patch that rewrites a section of extended mode
15	Send ML2	ZEF2PATS,0	Open code patch window. Ignore sumcheck warning.
0	Send IPCH	LFGMEX22	Patch that rewrites a section of extended mode
15	Send ML2	ZEF2PATS,0	Open code patch window. Ignore sumcheck warning.
0	Send IPCH	LFGMEX23	Patch that rewrites a section of extended mode
15	Send ML2	ZEF2PATS,0	Open code patch window. Ignore sumcheck warning.
0	Send IPCH	LFGMEX24	Patch that rewrites a section of extended mode
15	Send ML2	ZEF2PATS,0	Open code patch window. Ignore sumcheck warning.
0	Send IPCH	LFGMEX25	Patch that rewrites a section of extended mode
15	Send ML2	ZEF2PATS,0	Open code patch window. Ignore sumcheck warning.
0	Send IPCH	LFGMEX26	Patch that modifies the sumcheck pointer
15	Send ML2	ZEF2PATS,0	Open code patch window. Ignore sumcheck warning.
0	Send IPCH	LFGMEX27	Patch that re-enables call to sumcheck from main
15	Send ML2	ZEF2PATS,0	Open code patch window. Ignore sumcheck warning.
0	Send IPCH	LFGMEX28	Patch that re-enables call to extended from main
15	Send ML2	ZEF2PATS,0	Open code patch window. Ignore sumcheck warning.
0	Send IPCH	LFGMML21	Patch that modifies provides a red int read in reset
15	Send ML2	ZEF2PATS,0	Open code patch window. Ignore sumcheck warning.
0	Send IPCH	LFGMML22	Patch that modifies a jump command in reset
90			Check for no sumcheck error. Sequence ends. The FGM is booted into FGMOPM1

State on Exit

On exit from this boot procedure the instrument will be in FGMOPM1 as defined in the instrument User's Manual.

Boot Type 3

This is the manual boot for DPU2 from either interface.

Preconditions for use of interface 1

FGM primary power 1	= OFF
FGM primary power 2	= OFF
FGM converter sync. 1	= Don't care
FGM converter sync. 2	= Don't care
Sun pulse source MN	= Don't care
Reset pulse source MN	= Don't care
HF clock source MN	= Don't care
SC data MN	= ON
HK data MN	= ON
ML1 CMD MN	= ON
ML2 CMD MN	= ON
ML DATA MN	= ON
ST CLOCK MN	= ON

Preconditions for use of interface 2

FGM primary power 1	= OFF
FGM primary power 2	= OFF
FGM converter sync. 1	= Don't care
FGM converter sync. 2	= Don't care
Sun pulse source RD	= Don't care
Reset pulse source RD	= Don't care
HF clock source RD	= Don't care
SC data RD	= ON
HK data RD	= ON
ML1 CMD RD	= ON
ML2 CMD RD	= ON
ML DATA RD	= ON
ST CLOCK RD	= ON

Command List

Time (Base + Offset in seconds)	Commands	Comments
t_0	Switch on FGM LCL 'A' **or** 'B' (NB **not** both)	The FGM DC/DC Converters are running, however the processor is not powered or booted.
$t_0 + 5$	ZEF2MNTS ZEF2MNCS ZEF2MNTS ZEF2MNCS ZEF1DP2N	The FGM is booted into Engineering Mode, with DPU2 operating.

State on Exit

The state of the instrument on completion of this sequence is not defined in the Instrument User's Manual. This sequence is used for engineering purposes, not fight operations. Further commands are required before the instrument will produce valid science data.

Boot Type 4

This is the automatic boot of DPU2 from interface 2.

Preconditions

FGM primary power 1	= OFF
FGM primary power 2	= OFF
FGM converter sync. 1	= Don't care
FGM converter sync. 2	= Don't care
Sun pulse source RD	= ON
Reset pulse source RD	= ON
HF clock source RD	= ON
SC data RD	= ON
HK data RD	= ON
ML1 CMD RD	= ON
ML2 CMD RD	= ON
ML DATA RD	= ON
ST CLOCK RD	= ON

Command List

Time (Base + Offset in seconds)	Commands	Comments
t_0	Switch on FGM LCL 'A' **or** 'B' (NB **not** both)	The FGM DC/DC Converters are running, however the processor is not powered or booted.
$t_0 + 5$	ZEF1DR0S ZEF1RESE ZEF1DR0S ZEF2ATTS ZEF2ATCS ZEF2ATTS ZEF2ATCS ZEF1DP2N	The FGM is booted into Engineering Mode, with DPU2 operating.

State on Exit

On completion of a type 4 boot the instrument will produce valid science data and will correctly execute all Class 1 commands as defined in 'Cluster FGM, Parameterised Command Sequences' ref. IC\CLUSTER\A95-0002.DOC. However, due to the fact that redundant hardware has been deliberately selected, the instrument is not in one of the operational modes defined by the Instrument User's Maunual.

3. Boot sequence notes

Each boot sequence starts with a command to the spacecraft to switch on one of the two possible primary power supplies for the instrument. Two supplies are available for reduncancy purposes and only one should be used at a time. After power-on the instrument should be left for 5 seconds before the commands are sent. The commands executed after power-on trigger the booting of a processor within the instrument. A pause of 5 reset periods is needed after the sending of this sequence, before further commands can be accepted.

Default boot sequence

The default boot procedure is that described as Boot Type 2 and consists of two command lists which set the FGM to automatically select its internal hardware configuration.The first of these command lists (Auto Boot) is defined as placing the FGM instrument in state DPU1 Operational. This may be regarded as a safe operating configuration. However transitions between FGM operating modes can not be executed in the normal way because the starting point is not FGMOPM1. The FGM instrument is said to be in FGMOPM1 (as described in the Instrument Users Manual) once it is booted **and** patched (via the second command list, Instrument Patches).