SMEI Instrument Software Patch 34 Application

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1. Introduction

The SMEI instrument has the capability to use new flight software while on-orbit. This procedure lays out the steps required to apply the software release 34 patch via the RSC facility.

The procedure is based on 'SMEI/BU/PRO/009 : SMEI Instrument Software Patch Validation Procedure' and 'SMEI/BU/PRO/010 : SMEI Flight Model On-Orbit Procedures – Patching Supplement, Issue 2' document.

2. Software Upload Procedure

The procedure for this is a six step process. First, any existing software image should be disabled. Then a software image must be uploaded into the appropriate non-volatile storage page in the DHU. A patch activate command is then issued. Finally, the DHU is rebooted and the software revision number in telemetry checked to ensure that the DHU is running the newly uploaded software image.

The steps referred to in the following procedure are from Appendix B.

1. Switch on SMEI if necessary, and enter configuration mode by issuing the SM_DHU_COLD or SM_GOTO_CONF command. Ensure everything is operating correctly. [Steps 1-4]

2. Enter patch mode by issuing SM_ENBL_PTCH and then SM_GOTO_PTCH, and issue the SM_PATCH_DEA command. This disables the current software patch. [Steps 5-6]

3. Upload the patch34_v3-<n>.rsc patch files to SMEI. These will upload the new software image into data page 0x42. Repeat steps as indicated in the event of rejected commands due to upload errors. [Steps 7-14]

4. Issue the SM_PATCH_ACT command, with the correct checksum for the newly uploaded software image. This checksum is in the comment fields at the start of the patch34_v3-1.rsc file. [Steps 15]

5. Reset SMEI and return to configuration mode. [Step 16-17]

6. Verify the software revision number in the housekeeping shows 34. This is the SW_REL telemetry point.

3. New Command Enable Procedure

The procedure for this is a four step process. First, SMEI is switched on, and configured into patch mode. Then the command enable bytes are uploaded into the appropriate non-volatile storage page in the DHU. Finally, the DHU is returned to configuration mode.

The steps referred to in the following procedure are from Appendix C.

1. Switch on SMEI if necessary, and enter configuration mode by issuing the SM_DHU_COLD or SM_GOTO_CONF command. Ensure everything is operating correctly. [Steps 1-4]

2. Enter patch mode by issuing SM_ENBL_PTCH and then SM_GOTO_PTCH. [Steps 5]

3. Upload the cmd_update-<n>.rsc patch files to SMEI. These will upload the command enable bytes into data page 0x40. Repeat steps as indicated in the event of rejected commands due to upload errors. [Steps 6-22]

4. Return to configuration mode. [Step 23-25]

A. SMEI Patch File Format And Handling

The patch files for this update are in a simple ASCII format as specified in the draft RSC Tasking Parser User's Manual. It should be noted that these files must be real-time and as such cannot contain any delay commands or timestamps. This limitation is avoided using multiple files, and noting the required delays at appropriate points in the overall procedure.

Shown below is an extract of a previous patch file. Note that the command lines have wrapped in this document, but do not in the original patch file. I have used three dots to indicate a skipped section of the file.

patch-1.rsc:

```
# Automatically converted from coriolis format bulk upload files
# File chunk: 1
#
# Patch upload created for loader.i0
#
# On (Y-M-D) 2002-03-26 at 11:03:03 UCT
#
# CRC to enable the code update is: 0x95E0 (38368)
#
# Enable patch mode
SM_ENBL_PTCH("SM_CMD_SEQ#"="255")
# Goto patch mode
SM_GOTO_PTCH("SM_CMD_SEQ#"="255")
# Upload 0x0040 words to patch buffer offset 0000
SM_PATCH_UPL
("SM_CMD_SEQ#"="255",SM_CMD_CRC="0x4C33",PATCH_BUFFER_OFFSET="0x0000",PATCH_DATA_00="0x00FF",PATCH_DATA_01="0xFF00",PATCH_DATA_02="0x0
000",PATCH_DATA_03="0x0000",PATCH_DATA_04="0x0000",PATCH_DATA_05="0x0000",PATCH_DATA_06="0x0000",PATCH_DATA_07="0x0000",PATCH_DATA_0
8="0x0000",PATCH_DATA_09="0x0000",PATCH_DATA_10="0x0000",PATCH_DATA_11="0x0000",PATCH_DATA_12="0x0000",PATCH_DATA_13="0x0000",PATCH_D
ATA_14="0x0000",PATCH_DATA_15="0x0000",PATCH_DATA_16="0x0000",PATCH_DATA_17="0x0000",PATCH_DATA_18="0x0000",PATCH_DATA_19="0x0000",PA
TCH_DATA_20="0x0000",PATCH_DATA_21="0x0000",PATCH_DATA_22="0x0000",PATCH_DATA_23="0x0000",PATCH_DATA_24="0x0000",PATCH_DATA_25="0x000
0",PATCH_DATA_26="0x0000",PATCH_DATA_27="0x0000",PATCH_DATA_28="0x0000")
SM_PATCH_UPL
("SM_CMD_SEQ#"="0",SM_CMD_CRC="0x0620",PATCH_BUFFER_OFFSET="0x001D",PATCH_DATA_00="0x0000",PATCH_DATA_01="0x0000",PATCH_DATA_02="0x00
00",PATCH_DATA_03="0x0000",PATCH_DATA_04="0x0000",PATCH_DATA_05="0x0000",PATCH_DATA_06="0x0000",PATCH_DATA_07="0x0000",PATCH_DATA_08=
"0x0000",PATCH_DATA_09="0x0000",PATCH_DATA_10="0x0000",PATCH_DATA_11="0x0000",PATCH_DATA_12="0x0000",PATCH_DATA_13="0x0000",PATCH_DAT
A_14="0x0000",PATCH_DATA_15="0x0000",PATCH_DATA_16="0x0000",PATCH_DATA_17="0x0000",PATCH_DATA_18="0x0000",PATCH_DATA_19="0x0000",PATC
H_DATA_20="0x0000",PATCH_DATA_21="0x0000",PATCH_DATA_22="0x0000",PATCH_DATA_23="0x0000",PATCH_DATA_24="0x0000",PATCH_DATA_25="0x0000"
,PATCH_DATA_26="0x0000",PATCH_DATA_27="0x0000",PATCH_DATA_28="0x0000")
SM_PATCH_UPL
("SM_CMD_SEQ#"="1",SM_CMD_CRC="0xB56E",PATCH_BUFFER_OFFSET="0x003A",PATCH_DATA_00="0x0000",PATCH_DATA_01="0x0000",PATCH_DATA_02="0x00
00",PATCH_DATA_03="0x0000",PATCH_DATA_04="0x0000",PATCH_DATA_05="0x0000",PATCH_DATA_06="0x0000",PATCH_DATA_07="0x0000",PATCH_DATA_08=
"0x0000",PATCH_DATA_09="0x0000",PATCH_DATA_10="0x0000",PATCH_DATA_11="0x0000",PATCH_DATA_12="0x0000",PATCH_DATA_13="0x0000",PATCH_DAT
A_14="0x0000",PATCH_DATA_15="0x0000",PATCH_DATA_16="0x0000",PATCH_DATA_17="0x0000",PATCH_DATA_18="0x0000",PATCH_DATA_19="0x0000",PATC
H_DATA_20="0x0000",PATCH_DATA_21="0x0000",PATCH_DATA_22="0x0000",PATCH_DATA_23="0x0000",PATCH_DATA_24="0x0000",PATCH_DATA_25="0x0000"
,PATCH_DATA_26="0x0000",PATCH_DATA_27="0x0000",PATCH_DATA_28="0x0000")
.
.
.
# Commit 0x1000 words to bank:offset 42:0000
SM_PATCH_CMT
("SM_CMD_SEQ#"="255",SM_CMD_CRC="0xE79D",PATCH_BUFFER_OFFSET="0x0000",PATCH_DATA_WORDS="0x1000",PATCH_DESTIN_PAGE="0x0042",PATCH_DEST
IN_OFFSET="0x0000")
#
# INSERT A 5 SECOND DELAY BEFORE RUNNING THE NEXT CHUNK OF THE PATCH
#
```

patch-2.rsc:

```
# Automatically converted from coriolis format bulk upload files
# File chunk: 2
#
#
# INSERT A 5 SECOND DELAY BEFORE RUNNING THIS CHUNK OF THE PATCH
#
# Commit 0x1000 words to bank:offset 42:2000
SM_PATCH_CMT
("SM_CMD_SEQ#"="255",SM_CMD_CRC="0x9C17",PATCH_BUFFER_OFFSET="0x0000",PATCH_DATA_WORDS="0x1000",PATCH_DESTIN_PAGE="0x0042",PATCH_DEST
IN_OFFSET="0x2000")
#
# INSERT A 5 SECOND DELAY BEFORE RUNNING THE NEXT CHUNK OF THE PATCH
#
```

B. SMEI Software Version 34 Commanding

The table below shows the detailed command flow required to apply software patch 34 to the SMEI processor board.

Step	Action	Command(s)	Telemetry Verification
1.	Verify Status		IBCSMEIFGED = ENABLE IBCSMFGBUS = BUS A SMEI_A_S = ON SMEI_B_S = OFF AB_IDENT = A (or B if using SMEI PROC-B) -20°C < SM_DHU_TMP < +50°C
2.	Verify SMEI is in Configuration Mode If YES, proceed to Step 5		SMEI_MODE = CONFIG

3.	Command SMEI into Configuration Mode	SM_GOTO_CONF
		    A/B = BOTH
		    RT_ST = RT
		EXINQ
		    A/B = BOTH
		    RT_ST = RT
			SMCMD_ACP increments by 1
			SMCMD_REJ unchanged
			SMEI_MODE = CONFIG

4.	Wait 96 seconds for Camera Shutter motion		

5.	Enter Patch Mode	SM_ENBL_PTCH
		    A/B = BOTH
		    RT_ST = RT
		SM_GOTO_PTCH
		    A/B = BOTH
		    RT_ST = RT
		EXINQ
		    A/B = BOTH
		    RT_ST = RT
			SMCMD_ACP increments by 2
			SMCMD_REJ unchanged
			SMEI_MODE = PATCH

6.	Disable existing software patch	SM_PTCH_DEA
		    A/B = BOTH
		    RT_ST = RT
		EXINQ
		    A/B = BOTH
		    RT_ST = RT
			SMCMD_ACP increments by 1
			SMCMD_REJ unchanged

7.	Issue patch34_v3-1.rsc bulk command file to upload the first slice of data. If any commands are rejected, repeat this step.		SMCMD_ACP incrementing SMCMD_REJ unchanged SMEI_MODE = PATCH
8.	Wait 5 seconds for patch to be committed to non-volatile storage		
9.	Issue patch34_v3-2.rsc bulk command file to upload the next slice of data. If any commands are rejected, repeat this step.		SMCMD_ACP incrementing SMCMD_REJ unchanged
10.	Wait 5 seconds for patch to be committed to non-volatile storage		
11.	Issue patch34_v3-3.rsc bulk command file to upload the next slice of data. If any commands are rejected, repeat this step.		SMCMD_ACP incrementing SMCMD_REJ unchanged
12.	Wait 5 seconds for patch to be committed to non-volatile storage		
13.	Issue patch34_v3-4.rsc bulk command file to upload the next slice of data. If any commands are rejected, repeat this step.		SMCMD_ACP incrementing SMCMD_REJ unchanged
14.	Wait 5 seconds for patch to be committed to non-volatile storage		

Step	Action	Command(s)	Telemetry Verification

15.	Enable the new patch	SM_PTCH_ACT
		    Software_Image_CRC = 0x8312
		    A/B = BOTH
		    RT_ST = RT
		EXINQ
		    A/B = BOTH
		    RT_ST = RT
			SMCMD_ACP increments by 1
			SMCMD_REJ unchanged

16.	Reset SMEI
	(SMEIDHUBPWRON is required if using the SMEI PROC-B)
		SMEIDHUAPWRON
		    A/B = BOTH
		    RT_ST = RT	

17.	Verify SMEI is in Configuration Mode If YES, proceed to Step 19. Note that SMEI is expected to be in BOOT mode at this point, and that step 18 will need to be performed.		SMEI_MODE = CONFIG

18.	Command SMEI into Configuration Mode	SM_DHU_COLD
		    A/B = BOTH
		    RT_ST = RT
		EXINQ
		    A/B = BOTH
		    RT_ST = RT
			SMCMD_ACP increments by 1
			SMCMD_REJ unchanged
			SMEI_MODE = CONFIG

19.	Verify SMEI is running the new patch.		SW_REL = 34
20.	Procedure Complete.		

C. SMEI New Command Enable Commanding

The table below shows the detailed command flow required to enable the new command in patch 34.

Step	Action	Command(s)	Telemetry Verification
1.	Verify Status		IBCSMEIFGED = ENABLE IBCSMFGBUS = BUS A SMEI_A_S = ON SMEI_B_S = OFF AB_IDENT = A (or B if using SMEI PROC-B) -20℃ < SM_DHU_TMP < +50℃
2.	Verify SMEI is in Configuration Mode If YES, proceed to Step 5		SMEI_MODE = CONFIG

3.	Command SMEI into Configuration Mode	SM_GOTO_CONF
		        A/B = BOTH
		        RT_ST = RT
		EXINQ
		        A/B = BOTH
		        RT_ST = RT
			SMCMD_ACP increments by 1
			SMCMD_REJ unchanged
			SMEI_MODE = CONFIG

4.	Wait 96 seconds for Camera Shutter motion		

5.	Enter Patch Mode	SM_ENBL_PTCH
		        A/B = BOTH
		        RT_ST = RT
		SM_GOTO_PTCH
		        A/B = BOTH
		        RT_ST = RT
		EXINQ
		        A/B = BOTH
		        RT_ST = RT
			SMCMD_ACP increments by 2
			SMCMD_REJ unchanged
			SMEI_MODE = PATCH

7.	Issue cmd_update-1.rsc bulk command file to upload the first slice of data. If any commands are rejected, repeat this step.		SMCMD_ACP incrementing SMCMD_REJ unchanged SMEI_MODE = PATCH
8.	Wait 5 seconds for patch to be committed to non-volatile storage		
9.	Issue cmd_update-2.rsc bulk command file to upload the first slice of data. If any commands are rejected, repeat this step.		SMCMD_ACP incrementing SMCMD_REJ unchanged SMEI_MODE = PATCH
10.	Wait 5 seconds for patch to be committed to non-volatile storage		
11.	Issue cmd_update-3.rsc bulk command file to upload the first slice of data. If any commands are rejected, repeat this step.		SMCMD_ACP incrementing SMCMD_REJ unchanged SMEI_MODE = PATCH
12.	Wait 5 seconds for patch to be committed to non-volatile storage		
13.	Issue cmd_update-4.rsc bulk command file to upload the first slice of data. If any commands are rejected, repeat this step.		SMCMD_ACP incrementing SMCMD_REJ unchanged SMEI_MODE = PATCH
14.	Wait 5 seconds for patch to be committed to non-volatile storage		
15.	Issue cmd_update-5.rsc bulk command file to upload the first slice of data. If any commands are rejected, repeat this step.		SMCMD_ACP incrementing SMCMD_REJ unchanged SMEI_MODE = PATCH
16.	Wait 5 seconds for patch to be committed to non-volatile storage		

Step	Action	Command(s)	Telemetry Verification
17.	Issue cmd_update-6.rsc bulk command file to upload the first slice of data. If any commands are rejected, repeat this step.		SMCMD_ACP incrementing SMCMD_REJ unchanged SMEI_MODE = PATCH
18.	Wait 5 seconds for patch to be committed to non-volatile storage		
19.	Issue cmd_update-7.rsc bulk command file to upload the first slice of data. If any commands are rejected, repeat this step.		SMCMD_ACP incrementing SMCMD_REJ unchanged SMEI_MODE = PATCH
20.	Wait 5 seconds for patch to be committed to non-volatile storage		
21.	Issue cmd_update-8.rsc bulk command file to upload the first slice of data. If any commands are rejected, repeat this step.		SMCMD_ACP incrementing SMCMD_REJ unchanged SMEI_MODE = PATCH
22.	Wait 5 seconds for patch to be committed to non-volatile storage		
23.	Command SMEI into Configuration Mode	SM_GOTO_CONF A/B = BOTH RT_ST = RT EXINQ A/B = BOTH RT_ST = RT	SMCMD_ACP increments by 1 SMCMD_REJ unchanged SMEI_MODE = CONFIG
24.	Wait 96 seconds for Camera Shutter motion		
25.	Procedure Complete.		