Configure 1553 bus FDIR for a remote terminal
File: H_FCP_DHS_3055.xls
Author: S. Manganelli

Procedure Summary

Objectives

This procedure describes the steps needed to manage the three sets of flags controlling the activity on the 1553 S/C bus, that is:

- RTA configuration matrix: settings specific for each terminal (nominal and redundant separately);

- RT configuration matrix: settings specific for each logical unit (nominal and redundant together);

- Bus configuration matrix: settings for the entire bus protocol handling.

Summary of Constraints

RTA configuration matrix:
- ON/OFF status and Valid/Invalid status: these flags are used by some nominal procedure (e.g. PCDU TMTC switch-over).
- Valid/Invalid status, Well/Sick TC status and Well/Sick TM status: these flags are used by the on-board SW in order to implement the bus FDIR (DLL+TFL).
- Dead/Alive status: this is the only flag managed by Ground in a contingency case when it is not possible, for whatever reason, to put OFF a RT. This flag will disable the communication towards the specified RT.

Spacecraft Configuration

Start of Procedure

CDMU in default configuration, that is:
- PM A or B ON (nominally A)
- TM Encoder/OBT A or B active (nominally A)
- RM A and B enabled
- MM A and B ON

End of Procedure

CDMU in default configuration, that is:
- PM A or B ON (nominally A)
- TM Encoder/OBT A or B active (nominally A)
- RM A and B enabled
- MM A and B ON

Reference File(s)

Input Command Sequences

Output Command Sequences

HFD3055B
HFD3055A

Referenced Displays

ANDs **GRDs** **SLDs**

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Configuration Control Information

DATE	FOP ISSUE	VERSION	MODIFICATION DESCRIPTION	AUTHOR	SPR REF
06/11/07		1	Created	cmevi-hp	
10/06/08	1	2	TC Flag and Seq Properly changed	S. Manganelli	
28/11/08	2	3	Following Industry Inputs 15 oct 08, plus added info and FP display	S. Manganelli	
19/04/09	2.3	4	Default RT at step 7 modified to "ACC B" since "Broadcast" is not a valid option here (RT related parameters are anyway ignored in this sample TC)	S. Manganelli	

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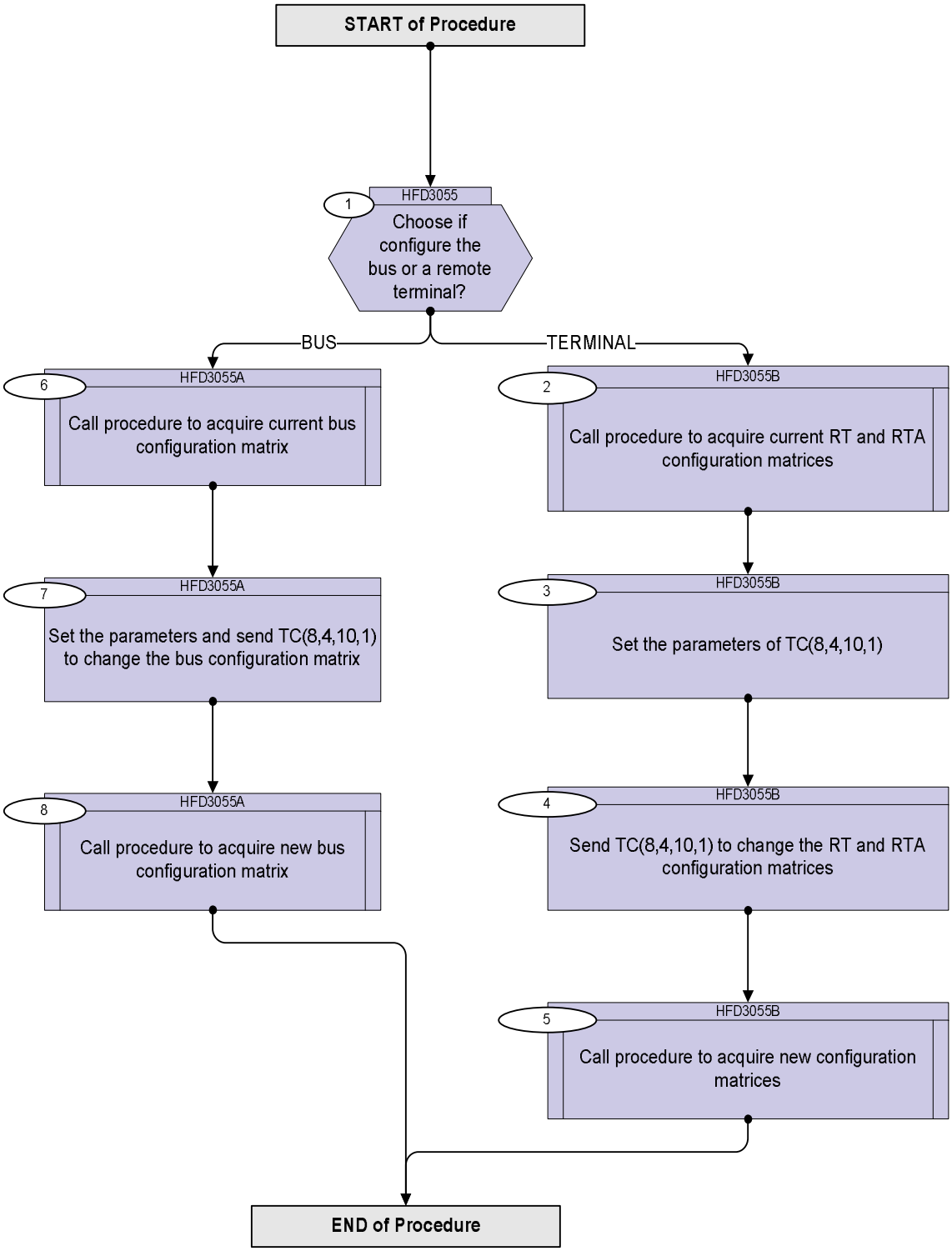
Procedure Flowchart Overview



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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		Beginning of Procedure		
		TC Seq. Name :HFD3055 (Dummy sequence) *TimeTag Type:* *Sub Schedule ID:*		
1		*Choose if configure the bus or a remote terminal?*		Next Step: TERMINAL 2 BUS 6
		TC Seq. Name :HFD3055B (Change RTerm Config) *TimeTag Type: N* *Sub Schedule ID:* *Formal Parameter List :*		
		RTA RT_ID=13	13 <dec>	
		M7 UPTMRETR=1	1 <dec>	
		F0 RTON_OFF=1	1 <dec>	
		F1 RT_AL_DE=1	1 <dec>	
		F2 TC_WE_SI=1	1 <dec>	
		F3 TM_WE_SI=1	1 <dec>	
		F4 RT_VA_IN=1	1 <dec>	
		F5 RT_VT_NV=1	1 <dec>	
		F6 RT_NO_RE=0	0 <dec>	
		F7 TM_RETRY=1	1 <dec>	
		M_C RT_UPCNT=1	1 <dec>	
		F12 RT_FDIR=1	1 <dec>	
		CNT RT_VT_LO=1	1 <dec>	
2		*Call procedure to acquire current RT and RTA configuration matrices*		Next Step: 3
		In the called procedure, choose the same remote terminal.		
		Execute procedure H_FCP_DHS_3060.		
3		*Set the parameters of TC(8,4,10,1)*		Next Step: 4

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		In the TC(8,4,10,1), to configure a remote terminal, it is necessary to set the following parameters: **- Remote Terminal Address** **- RTA TFL-TM FDIR** **- RTA On/Off Status** **- RTA Dead/Alive** **- RTA Well_TC/ Sick_TC** **- RTA Well_TM/Sick_TM** **- RTA Valid/Invalid** **- RT Vital/Non-vital** **- RT Nominal/Redundant** **- Vital RT Loop, only relevant if a Vital RT** **- RT TM Retry ON/OFF, only for the intelligent units.** **The remaining parameters of the TC (bus configuration matrix) are set but the values will be ignored as they have been masked**		
		The <u>Remote Terminal Address</u> uniquely identifies a RT for which all the 'RTA_...' flags are applied to. It also identifies the logical unit to which all the 'RT...' flags are applied.		
3.1		*Settings for a specific RT, ie uniquely identified by its RT @*		
		The <u>RTA TFL-TM FDIR flag</u> allows to disable for a specific RT the TFL-TM FDIR. **Note : the DLL FDIR (see below) will NOT be disabled.** **Note : this flag is not linked to the SDB FDIR flag, i.e. it will not be modified when the global flag is set or reset. Therefore in case for a RT the TFL-TM FDIR was disabled, then the SDB global FDIR was disabled and subsequently enabled, the particular RT will still have its related TFL-TM FDIR disabled.**		
		The <u>RTA On/Off status</u> reflects the power status of the specified RT. Thus in case an RT is definitely failed, but cannot be turned OFF (eg. because a standard LCL has failed, or because the unit is powered via FCL) the status will still be ON. **In that case the <u>RTA Dead/Alive status</u> allows to flag it as 'Dead' thus taking precedence over the erroneous On/Off status. This status can only be set by Ground.**		
		The <u>RTA Valid/Invalid status</u> describes the RT availability. A RT will typically be labelled invalid when it is recognised to be reconfiguring. **The RT *Invalid* to RT *Valid* transition is only performed upon dedicated TC.** **The only exception is : a Vital Active RT is declared temporarily *Invalid* during Vital RT FDIR sequence.**		

Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		The RTA On/Off, Dead/Alive and Valid/Invalid statuses are used by the TFL FDIR. Only the RTs which are On, Alive and Valid will be submitted to the TFL TC FDIR. For the TFL TM FDIR in addition the RTA_Well_TM/Sick_TM needs to be set at 'Well TM' for the FDIR to take place, provided the RTA TFL-TM FDIR flag is not set to 'Disabled'.		
		The RTA_Well_TC/Sick_TC reflects if the last TC packet transfer was successful or not. It is set the first time an error is detected. The same TC is then re-sent. If after the 2nd attempt the transfer has again failed and the RT is non Vital, the relevant RT FDIR will be triggered. In case of a Vital RT or if several non Vital RTs are set to 'Sick TC' a CDMU level 3 error is raised. Resetting the status to 'Well TC' can only be achieved by TC.		
		The RTA_Well_TM/Sick_TM reflects if more than the expected minimum number of TM packets for that RT have been received over a certain period of time specific to that RT. Both the minimum number and the period are part of the on board DB. It is set the first time an error is detected, to reset the status to 'Well TM' can only be achieved by TC. Unlike the TC retry, which is always performed, the TM retry attempt can be enabled or disabled by the Ground.		
3.2		*Settings applicable to the logical unit (corresponding to the supplied RTA), ie for both nominal and redundant RT*		
		The RT_Nominal/Redundant flag sets which RT is active. It can be set both by TC and FDIR.		
		To declare a logical unit (thus both nominal and redundant RTA) as Vital results in specific recovery actions. Currently, only the ACC is identified as a Vital RT ; confirmed communication failure with a Vital RT (on both A & B 1553 Buses) leads to a CDMU level 3 reconfiguration. Vital/Non Vital status is maintained by the Ground.		
		A part of the DLL FDIR, in case the failed RT is a Vital one, the first time round the RT is declared 'Invalid' for N seconds and the Vital Loop counter is incremented by one, ie set to 2. If after these N seconds the Bus anomaly is still present the vital RT is declared Invalid, the Redundant vital RT is now to be used and the Vital Loop counter is incremented by one, ie set to 3. If the Bus anomaly is still present with the redundant vital RT, the DLL FDIR will raise a CDMU level 3 error.		
3.3		*The chosen remote terminal is not intelligent?*		

Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		PCDU, XPNDs are non intelligent RTs For non intelligent RTs the TM retry settings must be ignored.		
3.4		*The chosen terminal is not Vital*		
		The ACC is the only not Vital RT. For non Vital RTs the Vital Loop settings must be ignored.		
4		*Send TC(8,4,10,1) to change the RT and RTA configuration matrices*		Next Step: 5
		Execute Telecommand **ConfigureSDBFDIR** *Command Parameter(s) :* **RTA DH011161** **M0 DH030161** **M1 DH031161** **M2 DH032161** **M3 DH033161** **M4 DH034161** **M5 DH035161** **M6 DH036161** **M7 DH037161** **F0 DH018161** **F1 DH019161** **F2 DH020161** **F3 DH021161** **F4 DH022161** **F5 DH023161** **F6 DH024161** **F7 DH025161** **M12 DH051161** **M_C DH043161** **M8 DH038161** **M9 DH039161** **M10 DH040161** **M11 DH041161** **F12 DH050161** **CNT DH042161** **F8 DH026161** **F9 DH027161** **F10 DH028161** **F11 DH029161** *TC Control Flags :* **GBM IL DSE** **--Y -- ---** *Subsch. ID : 10* Det. descr. : Configure SDB FDIR	**DC005161** **RT_ID** **Update status** **Update status** **Update status** **Update status** **Update status** **Update status** **Update status** **UPTMRETR** **RTON_OFF** **RT_AL_DE** **TC_WE_SI** **TM_WE_SI** **RT_VA_IN** **RT_VT_NV** **RT_NO_RE** **TM_RETRY** **Update status** **RT_UPCNT** **Ignore Flag** **Ignore Flag** **Ignore Flag** **Ignore Flag** **RT_FDIR** **RT_VT_LO** **Bus A** **Healthy** **Healthy** **ENABLED**	

Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
5		*Call procedure to acquire new configuration matrices*		Next Step: END
		In the called procedure, choose the same remote terminal.		
		Execute procedure H_FCP_DHS_3060.		
		TC Seq. Name :HFD3055A (Change BUS config) *TimeTag Type: N* *Sub Schedule ID:* *Formal Parameter List :* F8 ACT_BUS=0 F9 HLT_BUSA=1 F10 HLT_BUSB=1 F11 SDB_FDIR=1	 0 <dec> 1 <dec> 1 <dec> 1 <dec>	
6		*Call procedure to acquire current bus configuration matrix*		Next Step: 7
		In the called procedure, choose BUS.		
		Execute procedure H_FCP_DHS_3060.		
7		*Set the parameters and send TC(8,4,10,1) to change the bus configuration matrix*		Next Step: 8
		In the TC(8,4,10,1), to configure the bus, it is necessary to set the following parameters: **- Active Bus A/B** **- Bus A Healthy/Unhealthy** **- Bus B Healthy/Unhealthy** **- SDB FDIR Enable/Disable** **The remote terminal address for which the FDIR flags shall be updated has been set to 31 (broadcast).** **The remaining parameters of the TC (RT and RTA configuration matrices) have been set but they are not important because are masked.**		
		The DLL FDIR can change the Active Bus flag in case of reconfiguration to the other Bus, provided the other Bus is flagged as Healthy.		

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		Setting the Health flag of Bus A or B does not trigger any reconfiguration. **Though its setting is taken into account after an on onboard detection of an error during communication with an RT. The BSW sets the flag of the Active Bus to 'Unhealthy' and the DLL FDIR sequence is triggered:** **- In case the other Bus is also flagged as 'Unhealthy' a CDMU level 3 error is raised.** **- In case the other Bus is flagged as 'Healthy'** **provided the Data Wrap Around Tests for all** **RTs on both Bus returned no errors the Active Bus Health flag is reset to 'Healthy'. If the results of the Data Wrap Around Tests for all** **RTs on both Bus differ, other Bus is selected as Active.**		
		Setting the SDB FDIR flag enables/disables both the DLL and TFL FDIR. It is strongly recommended never to disable it, as no more onboard SDB error detection would occur.		
		Execute Telecommand **ConfigureSDBFDIR**	**DC005161**	
		Command Parameter(s) : **RTA DH011161** **M0 DH030161** **M1 DH031161** **M2 DH032161** **M3 DH033161** **M4 DH034161** **M5 DH035161** **M6 DH036161** **M7 DH037161** **F0 DH018161** **F1 DH019161**	**ACC B** **Ignore Flag** **Ignore Flag** **Ignore Flag** **Ignore Flag** **Ignore Flag** **Ignore Flag** **Ignore Flag** **Ignore Flag** **ON** **Alive**	
		F2 DH020161 **F3 DH021161** **F4 DH022161** **F5 DH023161** **F6 DH024161** **F7 DH025161** **M12 DH051161** **M_C DH043161** **M8 DH038161** **M9 DH039161** **M10 DH040161** **M11 DH041161** **F12 DH050161** **CNT DH042161** **F8 DH026161**	**Well TC** **Well TM** **Valid** **Non-vital** **NOMINAL** **ON** **Ignore Flag** **Ignore CNT** **Update status** **Update status** **Update status** **Update status** **DISABLED** **LoopCnt1** **ACT_BUS**	
		F9 DH027161 **F10 DH028161** **F11 DH029161** *TC Control Flags :* **GBM IL DSE** **--Y -- ---** *Subsch. ID : 10* Det. descr. : Configure SDB FDIR	**HLT_BUSA** **HLT_BUSB** **SDB_FDIR**	

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
8		*Call procedure to acquire new bus configuration matrix*		Next Step: END
		In the called procedure, choose BUS.		
		Execute procedure H_FCP_DHS_3060.		
End of Procedure				

Info

RTA	Remote Term Addr	See below	The remote terminal address for which the FDIR flags shall be updated.
M0	Mask for F0	0..1	0 = Ignore Flag 1 = Update the status
M1	Mask for F1	0..1	0 = Ignore Flag 1 = Update the status
M2	Mask for F2	0..1	0 = Ignore Flag 1 = Update the status
M3	Mask for F3	0..1	0 = Ignore Flag 1 = Update the status
M4	Mask for F4	0..1	0 = Ignore Flag 1 = Update the status
M5	Mask for F5	0..1	0 = Ignore Flag 1 = Update the status
M6	Mask for F6	0..1	0 = Ignore Flag 1 = Update the status
M7	Mask for F7	0..1	0 = Ignore Flag 1 = Update the status
F0	RTA On/Off Status	0..1	Set the on/off status of the supplied RTA 0 = Off 1 = On
F1	RTA Dead/Alive	0..1	Set the status of the supplied RTA to Dead or Alive. 0 = Dead 1 = Alive
F2	RTA Well_TC/ Sick_TC	0..1	Set the status of the supplied RTA to Well_TC or Sick_TC. 0 = Sick_TC 1 = Well_TC
F3	RTA Well_TM/Sick_TM	0..1	Set the status of the supplied RTA to Well_TM or Sick_TM. 0 = Sick_TM 1 = Well_TM
F4	RTA Valid/Invalid	0..1	Set the status of the supplied RTA to Valid/Invalid. 0 = Invalid 1 = Valid
F5	RT Vital/Non-vital	0..1	Set the status of the logical RT (corresponding to supplied RTA) to Vital/Non-vital. 0 = Non-vital 1 = Vital
F6	RT Nominal/Redundant	0..1	Set the logical RT (corresponding to supplied RTA) to use nom or redund unit as active. 0 = Nom 1 = Redund
F7	RT TM Retry On/Off	0..1	Enables or disables the TM Retry for the logical RT (corresponding to supplied RTA). 0 = Off 1 = On
M12	Mask for F12	0..1	0 = Ignore Flag 1 = Update the status
M_C	Mask for Vital RT Loop	0..1	0 = Ignore CNT field 1 = Update Vital RT Loop counter
M8	Mask for F8	0..1	0 = Ignore Flag 1 = Update the status
M9	Mask for F9	0..1	0 = Ignore Flag 1 = Update the status
M10	Mask for F10	0..1	0 = Ignore Flag 1 = Update the status
M11	Mask for F11	0..1	0 = Ignore Flag 1 = Update the status
F12	TFL-TM FDIR Enable/Disable	0..1	Enables or disables the TFL-TM FDIR for the supplied RTA. 0 = Disable 1 = Enable
CNT	Vital RT Loop	1..3	Loop counter for vital RT DLL FDIR Retry for the logical RT (corresponding to supplied RTA)
F8	Active Bus A/B	0..1	Selects bus A or B for SDB 0 = Bus A 1 = Bus B
F9	Bus A Healthy/Unhealthy	0..1	Sets Bus A status flag to Healthy/Unhealthy 0 = Unhealthy 1 = Healthy
F10	Bus B Healthy/Unhealthy	0..1	Sets Bus B status flag to Healthy/Unhealthy 0 = Unhealthy 1 = Healthy
F11	SDB FDIR Enable/disable	0..1	Enables or disables the FDIR for the SDB. 0 = Disable 1 = Enable

Color code for the different parameters

in blue	RTA Configuration Matrix
in brown	RT Configuration Matrix
in red	Bus Configuration Matrix
	can be updated by FDIR

Remote Term Addr	
RTA	Herschel Unit
13	ACC A
14	ACC B
5	PCDU A
6	PCDU B
7	CCU A
8	CCU B
9	XPND 1
10	XPND 2
16	HIFI A
19	HIFI B
21	SPIRE A
22	SPIRE B
25	PACS A
26	PACS B
31	Broadcast

Exe order if more than one flag is updated by same TC

1. Disable FDIR
2. Update RTA On/Off Status
3. Update RTA Dead/Alive
4. Update RTA Well_TC/Sick_TC
5. Update RTA Well_TM/Sick_TM
6. Update RTA Valid/Invalid
7. Update RTA TFL-TM FDIR Enabled/Disabled
8. Update RT Vital/Non-Vital
9. Update RT Nominal/Redundant
10. Update RT TM Retry On/Off
11. Update Active Bus A/B
12. Update Bus A Healthy/Unhealthy
13. Update Bus B Healthy/Unhealthy
14. Update Vital RT Loop
15. Flush TC and Message queues
16. Enable FDIR