Trigger TTC FDIR Level 1 Recovery
File: H_CRP_TTC_FDIR.xls
Author: E. Picallo

# Procedure Summary

## Objectives

This procedure describes the steps needed to Trigger TTC FDIR Level 1 Recovery.

The two main scenarios for this procedure to be executed are:
1. In the frame of NO TM failure where D/L is not active
2. To speed up the TTC s/o process due to an anomaly detected on Ground and not handled on board e.g. when in AFS. In this case D/L is still available.

## Summary of Constraints

TC (8,4,116,39) and TC(8,4,116,22) are accepted only if the FDIR Management function is active.

In order to ensure a swich-over from TTC chain 1 to TTC chain 2 in the no TM case, the TTC chain 1 is marked OK in the UIU table before sending the TC(8,4,116,39) to trigger TTC chain Failure FDIR Recovery

In order to ensure a swich-over from TTC chain 2 to TTC chain 1 in the no TM case, the TTC chain 2 is marked OK in the UIU table before sending the TC(8,4,116,39) to trigger TTC chain Failure FDIR Recovery

TX and TWTA in use are switched ON a through ASW TCs(8,4,115,1), thus the status of the ASW function "TTC Management" has to be "running".

Note that:
TM mod. index is always 1.2
Coherent mode and Ranging modulator are set OFF
Output power level is always - 4dBm
External ref. & Int. bit pattern gen. are always OFF

The XPND needs a maximum warm-up of 20 min

The FDIR sequence includes RFDN SW change. TC may loss lock. In this case re-sweep carrier taking into account Rx1-Rx2 delta rest freq is 65Khz

## Spacecraft Configuration

**Start of Procedure**

Downlink not active (NO TM scenario) or
Downlink active (TTC anomaly detected on ground and not recovered autonomously)

**End of Procedure**

If switch-over from TTC chain in use to not in use: Downlink active via previously not in use chain and Chain previously in use marked as "failed" in UIU table.

If switch-over from TTC chain 1 to 2: Downlink active via TX2 and TWTA2 and Chain 1 marked as "failed" in UIU table.

If switch-over from TTC chain 2 to 1: Downlink active via TX1 and TWTA1 and Chain 2 marked as "failed" in UIU table.

All EAT entries related to TTC disabled.

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## Reference File(s)

**Input Command Sequences**

**Output Command Sequences**

HRRFDIR1
HRRFDIR2
HRRFDIR3

## Referenced Displays

**ANDs** **GRDs** **SLDs**

## Configuration Control Information

| DATE | FOP ISSUE | VERSION | MODIFICATION DESCRIPTION | AUTHOR | SPR REF |
|---|---|---|---|---|---|
| 17/02/09 | 2.1 | 1 | Created | E. Picallo | |
| 22/03/09 | 2.2 | 2 | Configuration check after injected TTC failure added | E. Picallo | |
| 17/04/09 | | 3 | Procedure Objectives and Start condition updated | E. Picallo | |
| 20/04/09 | 2.3 | 4 | TTC swtichover chain 2 to 1 case added □<br>TTC switchover chain in use to not in use case added | E. Picallo | |
| 05/05/09 | 2.4 | 5 | Perform re-sweep uplink signal (due to RFDN SW position udpate ) added | E. Picallo | |
| 25/09/09 | 2.5 | 6 | FDIR sequence comment update: Disable communication with failed XPND 1553 RT though leave its LCL closed | E. Picallo | |

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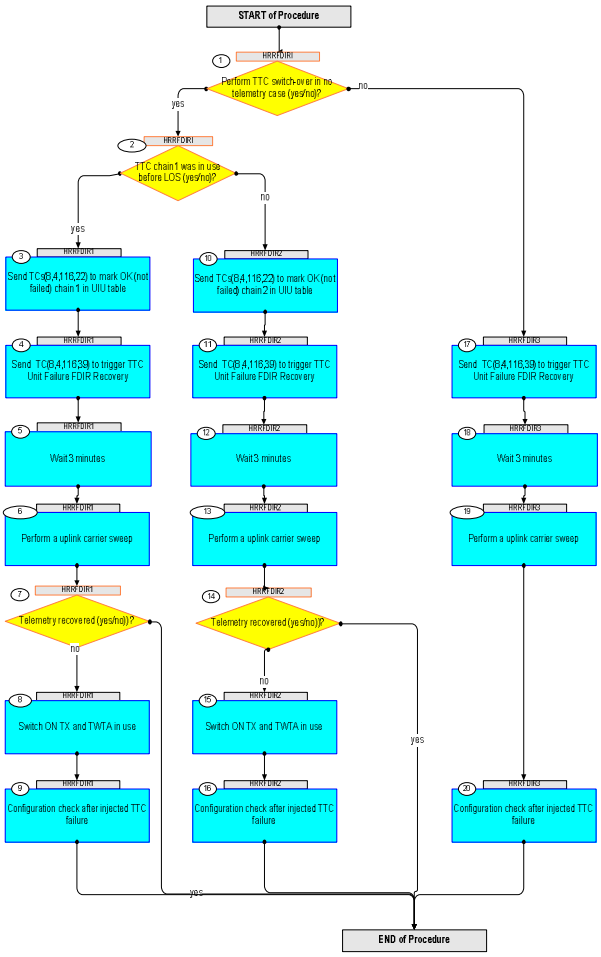
# Procedure Flowchart Overview



| Step No. | Time | Activity/Remarks | TC/TLM | Display/ Branch |
|---|---|---|---|---|
| | | **Beginning of Procedure** | | |
| | | *TC Seq. Name :HRRFDIRI* (Trigger TTC FDIRInit)<br>Trigger TTC FDIR Level 1 Recovery Initial<br><br>*TimeTag Type: N*<br>*Sub Schedule ID:* | | |
| 1 | | *Perform TTC switch-over in no telemetry case (yes/no)?* | | Next Step:<br>yes 2<br>no 17 |
| | | | | |
| 1.1 | | *TTC chain in use to not in use (Telemetry available)* | | |
| | | **To speed up the TTC s/o process due to an anomaly detected on Ground and not handled on board e.g. when in AFS. In this case D/L is still available.** | | |
| | | | | |
| 2 | | *TTC chain 1 was in use before LOS (yes/no)?* | | Next Step:<br>yes 3<br>no 10 |
| | | | | |
| 2.1 | | *If TTC chain 1 was in use before LOS then perform TTC chain 1 to 2 switch-over in (NO telemetry case)* | | |
| | | **In order to ensure a swich-over from TTC chain 1 to TTC chain 2 in the no telemetry case, the TTC chain 1 is marked OK in the UIU table before sending the TC(8,4,116,39) to trigger TTC chain Failure FDIR Recovery** | | |
| | | | | |
| 2.2 | | *If TTC chain 2 was in use before LOS then perform TTC chain 2 to 1 switch-over in (NO telemetry case)* | | |
| | | **In order to ensure a swich-over from TTC chain 2 to TTC chain 1 in the no telemetry case, the TTC chain 2 is marked OK in the UIU table before sending the TC(8,4,116,39) to trigger TTC chain Failure FDIR Recovery** | | |
| | | | | |
| | | | | |
| | | *TC Seq. Name :HRRFDIR1* (Trigger TTCFDIR 1to2)<br>Trigger TTC FDIR Level 1 Recovery from TTC chain 1 to chain 2<br><br>*TimeTag Type: N*<br>*Sub Schedule ID:* | | |
| 3 | | *Send TCs(8,4,116,22) to mark OK (not failed) chain 1 in UIU table* | | Next Step:<br>4 |

| Step No. | Time | Activity/Remarks | TC/TLM | Display/ Branch |
|---|---|---|---|---|
| | | **Mark Unit OK telecommand is used to modify the health status of a unit as OK.**<br>**Note that for XPND TX, XPND RX, TWT assembly, TWT amplifier, and EPC the Failed / Not Failed configuration status is common.** | | |
| | | **Marking the TTC chain 1 OK in the UIU table will ensure that next TC(8,4,116,39) triggers TTC chain 1 Failure FDIR Recovery i.e.TTC chain 1 to TTC chain 2 swich-over** | | |
| | | Execute Telecommand<br>**MarkOKUnitA_XpndRx**<br>*TC Control Flags :*<br>**GBM IL DSE**<br>**-SY -- ---**<br>*Subsch. ID : 10*<br>Det. descr. : Fdir Mark OK Unit A XPND RX, TC(8,4,116,22) | **DCB0H170** | |
| | | | | |
| 4 | | *Send TC(8,4,116,39) to trigger TTC Unit Failure FDIR Recovery* | | Next Step: 5 |
| | | Execute Telecommand<br>**FdirTtcUnitFail**<br>*TC Control Flags :*<br>**GBM IL DSE**<br>**-E- -- ---**<br>*Subsch. ID : 10*<br>Det. descr. : FDIR Recovery: TTC Unit Failure TC(8,4,116,39) | **DCN33170** | |
| | | **The major actions taken by the recovery procedure are:**<br>**- Disable MOT and EAT entries relevant to the Helix Current and RX Supply Power failures regardless of the TTC chain currently in use;**<br>**- Disable EAT entries relevant to BSW SDB 1553 FDIR failures;**<br>**- Save ON/OFF status of currently in use TWT;**<br>**- Switch OFF the TTCs equipments currently in use (TX_RF and TWTA), and update the UIU table by marking them OFF and Failed;**<br>**- Disable communication with failed XPND 1553 RT though leave LCL of TX belonging to failed TTC chain closed;**<br>**- Change currently in use RX unit FDIR status to Failed in UIU table for RX belonging to the failed TTC chain;**<br>**- Close LCL of currently in use XPND TX and enable communication with currently in use XPND 1553 RT;**<br>**- Restore the TTC (RX/TX and antennas) configuration as it was before the failure occurrence and update RFDN switch position accordingly;**<br>**- Restore the TC bit rate as it was before the failure occurrence;**<br>**- Restore ON/OFF status of currently in use TX and TWTA and update the UIU table accordingly;**<br>**- Re-enable MOT entries relevant to Helix Current and RX Supp** | | |
| | | | | |

| Step No. | Time | Activity/Remarks | TC/TLM | Display/ Branch |
|---|---|---|---|---|
| 5 | | *Wait 3 minutes* | | Next Step: 6 |
| | | | | |
| 6 | | *Perform a uplink carrier sweep* | | Next Step: 7 |
| | | **The FDIR sequence updates the RFDN SWs position. After a RFDN switch has been moved could be necessary to re-sweep the uplink signal to re-acquire the lock.** | | |
| | | | | |
| 7 | | *Telemetry recovered (yes/no))?* | | Next Step: no 8 yes END |
| | | | | |
| 8 | | *Switch ON TX and TWTA in use* | | Next Step: 9 |
| | | | | |
| 8.1 | | *Switch ON TX RF output in use* | | □ |
| | | Execute Telecommand **TtcCommandTxInUseOn**<br>*TC Control Flags :* **GBM IL DSE -SY -- ---**<br>*Subsch. ID : 10*<br>Det. descr. : Ttc Command Tx InUse On TC(8,4,115,2) | **DC15E170** | |
| | | | | |
| 8.2 | | *Switch ON TWTA in use (OPLCL+EPC+TWT)* | | □ |
| | | Execute Telecommand **TtcCommandTwtaInUseOn**<br>*TC Control Flags :* **GBM IL DSE -E- -- ---**<br>*Subsch. ID : 10*<br>Det. descr. : Ttc Command Twta In Use On TC(8,4,115,2) | **DC18E170** | |
| | | | | |
| 9 | | *Configuration check after injected TTC failure* | | Next Step: END |
| | | **Call procedure H_CRP_TTC_TTCR Configuration check after XPNDs or TWTAs failure (Do not perform TTC chain roll-back)** | | |
| | | Execute Procedure: **H_CRP_TTC_TTCR Configuration check after XPNDs or TWTAs failure** | | |
| | | | | |

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|---|---|---|---|---|
| | | | | |
| | | *TC Seq. Name :HRRFDIR2* (Trigger TTCFDIR 2to1)<br>Trigger TTC FDIR Level 1 Recovery from TTC chain 2 to chain 1<br><br>*TimeTag Type: N*<br>*Sub Schedule ID:* | | |
| 10 | | *Send TCs(8,4,116,22) to mark OK (not failed) chain 2 in UIU table* | | Next Step: 11 |
| | | **Mark Unit OK telecommand is used to modify the health status of a unit as OK.**<br>**Note that for XPND TX, XPND RX, TWT assembly, TWT amplifier, and EPC the Failed / Not Failed configuration status is common.** | | |
| | | **Marking the TTC chain 2 OK in the UIU table will ensure that next TC(8,4,116,39) triggers TTC chain 2 Failure FDIR Recovery i.e.TTC chain 2 to TTC chain 1 swich-over** | | |
| | | Execute Telecommand<br>**MarkOKUnitB_XpndRx**<br><br>*TC Control Flags :*<br>**GBM IL DSE**<br>**-SY -- ---**<br>*Subsch. ID : 10*<br>Det. descr. : Fdir Mark OK Unit B XPND RX, TC(8,4,116,22) | **DCB8H170** | |
| | | | | |
| 11 | | *Send TC(8,4,116,39) to trigger TTC Unit Failure FDIR Recovery* | | Next Step: 12 |
| | | Execute Telecommand<br>**FdirTtcUnitFail**<br><br>*TC Control Flags :*<br>**GBM IL DSE**<br>**-E- -- ---**<br>*Subsch. ID : 10*<br>Det. descr. : FDIR Recovery: TTC Unit Failure TC(8,4,116,39) | **DCN33170** | |

| Step No. | Time | Activity/Remarks | TC/TLM | Display/ Branch |
|---|---|---|---|---|
| | | **The major actions taken by the recovery procedure are:**<br>**- Disable MOT and EAT entries relevant to the Helix Current and RX Supply Power failures regardless of the TTC chain currently in use;**<br>**- Disable EAT entries relevant to BSW SDB 1553 FDIR failures;**<br>**- Save ON/OFF status of currently in use TWT;**<br>**- Switch OFF the TTCs equipments currently in use (TX and TWTA), and update the UIU table by marking them OFF and Failed;**<br>**- Disable communication with failed XPND 1553 RT though leave LCL of TX belonging to failed TTC chain closed;**<br>**- Change currently in use RX unit FDIR status to Failed in UIU table for RX belonging to the failed TTC chain;**<br>**- Close LCL of currently in use XPND TX and enable communication with currently in use XPND 1553 RT;**<br>**- Restore the TTC (RX/TX and antennas) configuration as it was before the failure occurrence and update RFDN switch position accordingly;**<br>**- Restore the TC bit rate as it was before the failure occurrence;**<br>**- Restore ON/OFF status of currently in use TX and TWTA and update the UIU table accordingly;**<br>**- Re-enable MOT entries relevant to Helix Current and RX Supp** | | |
| | | | | |
| 12 | | *Wait 3 minutes* | | Next Step:<br>13 |
| | | | | |
| 13 | | *Perform a uplink carrier sweep* | | Next Step:<br>14 |
| | | **The FDIR sequence updates the RFDN SWs position. After a RFDN switch has been moved could be necessary to re-sweep the uplink signal to re-acquire the lock.** | | |
| | | | | |
| 14 | | *Telemetry recovered (yes/no))?* | | Next Step:<br>yes END<br>no 15 |
| | | | | |
| 15 | | *Switch ON TX and TWTA in use* | | Next Step:<br>16 |
| | | | | |
| 15.1 | | *Switch ON TX RF output in use* | | |
| | | Execute Telecommand<br>**TtcCommandTxInUseOn**<br>*TC Control Flags :*<br>**GBM IL DSE**<br>**-SY -- ---**<br>*Subsch. ID : 10*<br>Det. descr. : Ttc Command Tx InUse On TC(8,4,115,2) | **DC15E170** | |
| | | | | |

| Step No. | Time | Activity/Remarks | TC/TLM | Display/ Branch |
|---|---|---|---|---|
| 15.2 | | *Switch ON TWTA in use (OPLCL+EPC+TWT)* | | |
| | | Execute Telecommand<br>**TtcCommandTwtaInUseOn**<br><br>*TC Control Flags :*<br>**GBM IL DSE**<br>**-E- -- ---**<br>*Subsch. ID : 10*<br>Det. descr. : Ttc Command Twta In Use On TC(8,4,115,2) | **DC18E170** | |
| | | | | |
| 16 | | *Configuration check after injected TTC failure* | | Next Step:<br>END |
| | | **Call procedure H_CRP_TTC_TTCR Configuration check after XPNDs or TWTAs failure**<br>**(Do not perform TTC chain roll-back)** | | |
| | | Execute Procedure:<br>**H_CRP_TTC_TTCR**<br>**Configuration check after XPNDs or TWTAs failure** | | |
| | | | | |
| | | | | |
| | | *TC Seq. Name :HRRFDIR3* (TriggerTTCFDIRTTCuse)<br>Trigger TTC FDIR Level 1 Recovery from chain inuse to not in use<br><br>*TimeTag Type: N*<br>*Sub Schedule ID:* | |
| 17 | | *Send TC(8,4,116,39) to trigger TTC Unit Failure FDIR Recovery* | | Next Step:<br>18 |
| | | Execute Telecommand<br>**FdirTtcUnitFail**<br><br>*TC Control Flags :*<br>**GBM IL DSE**<br>**--Y -- ---**<br>*Subsch. ID : 10*<br>Det. descr. : FDIR Recovery: TTC Unit Failure TC(8,4,116,39) | **DCN33170** | |

| Step No. | Time | Activity/Remarks | TC/TLM | Display/ Branch |
|---|---|---|---|---|
| | | **The major actions taken by the recovery procedure are:**<br>**- Disable MOT and EAT entries relevant to the Helix Current and RX Supply Power failures regardless of the TTC chain currently in use;**<br>**- Disable EAT entries relevant to BSW SDB 1553 FDIR failures;**<br>**- Save ON/OFF status of currently in use TWT;**<br>**- Switch OFF the TTCs equipments currently in use (TX and TWTA), and update the UIU table by marking them OFF and Failed;**<br>**- Disable communication with failed XPND 1553 RT though leave LCL of TX belonging to failed TTC chain closed;**<br>**- Change currently in use RX unit FDIR status to Failed in UIU table for RX belonging to the failed TTC chain;**<br>**- Close LCL of currently in use XPND TX and enable communication with currently in use XPND 1553 RT;**<br>**- Restore the TTC (RX/TX and antennas) configuration as it was before the failure occurrence and update RFDN switch position accordingly;**<br>**- Restore the TC bit rate as it was before the failure occurrence;**<br>**- Restore ON/OFF status of currently in use TX and TWTA and update the UIU table accordingly;**<br>**- Re-enable MOT entries relevant to Helix Current and RX Supp** | | |
| | | | | |
| 18 | | *Wait 3 minutes* | | Next Step:<br>19 |
| | | | | |
| 19 | | *Perform a uplink carrier sweep* | | Next Step:<br>20 |
| | | **The FDIR sequence updates the RFDN SWs position. After a RFDN switch has been moved could be necessary to re-sweep the uplink signal to re-acquire the lock.** | | |
| | | | | |
| 20 | | *Configuration check after injected TTC failure* | | Next Step:<br>END |
| | | **Call procedure H_CRP_TTC_TTCR Configuration check after XPNDs or TWTAs failure**<br>**(Do not perform TTC chain roll-back)** | | |
| | | Execute Procedure:<br>**H_CRP_TTC_TTCR**<br>**Configuration check after XPNDs or TWTAs failure** | | |
| | | | | |
| | | | | |
| **End of Procedure** | | | | |