

LO functional test  
 File: H\_COP\_HIF\_NFL9.xls  
 Author: R. Biggins



## Procedure Summary

### Objectives

The objective of this procedure is to execute the standard functional test of the Local Oscillator Unit. It consists of a switch of each of the LO-band at the default frequencies and safe voltages, as well as an IV Curve characterization of the multipliers.

Based on procedure:  
 HIFI-COP-1.2-LO\_FT (v1)

### Summary of Constraints

Note that this procedure is made up of 2 sequences.  
 The second sequence is executed via the following TPF file:  
 HCHNFL9Y\_LO\_FT\_5A\_vvvv.IPF

### Spacecraft Configuration

**Start of Procedure**  
 n/a

**End of Procedure**  
 n/a

### Reference File(s)

**Input Command Sequences**

**Output Command Sequences**  
 HCHNFL9X

### Referenced Displays

**ANDs**      **GRDs**      **SLDs**  
 ZAZ9C999

### Configuration Control Information

DATE	FOP ISSUE	VERSION	MODIFICATION DESCRIPTION	AUTHOR	SPR REF
31/10/08		1	Created	R. Biggins	
20/11/08		2	Updates due to updates from D. Teyssier - Step 3 and 4 moved to the second sequence - Last 2 parameters of TC HIFI_P_Configure_FCU (step 5) changed to FP	R. Biggins	
12/12/08		3	Changes due to IPF testing - ALL time tags updated (ET removed) - no change bars	R. Biggins	
13/12/08	2	4	Updates due to errors in the formal parameters	R. Biggins	
08/04/09	2.3	5	Changes due to updates from D. Teyssier - Step 3 removed - HIFL_non_periodic_hk_FCU TC removed from step 5 - TC flags updated	R. Biggins	

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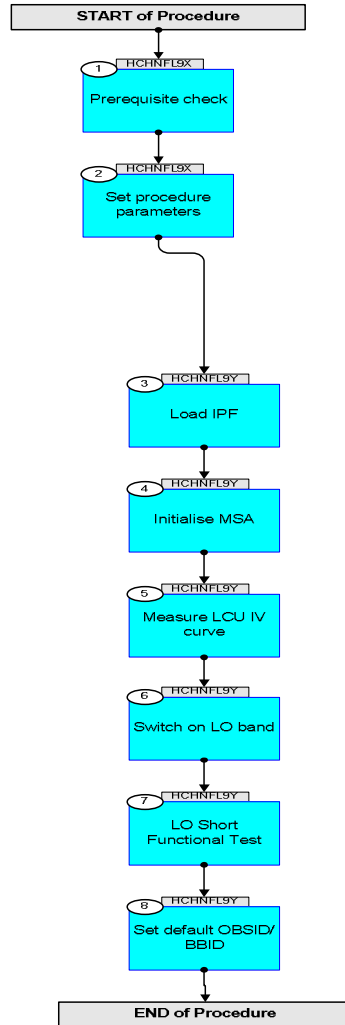


23/05/09	2.5	6	Update due to database changes	R. Biggins	
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## Procedure Flowchart Overview







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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
	ET=+ UT=+00.00.01	HIFI_Configure_FCU_Power  HIFI_Configure_FCU_Power  Command Parameter(s) : HIFI_BB_ID                  HP001197 HF_CPR_Mixer_H_S          HP203191 HF_CPR_Mixer_V_S          HP204191 HF_CPR_Chopper_S          HP205191 HF_CPR_UCH_S              HP206191 HF_CPR_UCV_S              HP207191  TC Control Flags : GBM IL DSE --Y -- ---  Subsch. ID : 70  Det. descr. : Switch ON or OFF the five FCU-boards (mixer H/V, chopper, IF HV)	HC027289   C800001 <hex> ON (Def) ON (Def) ON (Def) ON (Def) ON (Def) ON (Def)	
	ET=+ UT=+00.00.00	HIFI_P_Configure_FCU  HIFI_P_Configure_FCU  Command Parameter(s) : HIFI_BB_ID                  HP001197 HF_CPR_MX BAND              HP202191 HF_CH1_DPFPF1              HP176191 HF_CH2_FIF1_Drain_V         HP177191 HF_CH2_FIF1_Drain_C         HP178191 HF_CH2_FIF2_Drain_V         HP179191 HF_CH2_FIF2_Drain_C         HP180191 HF_CH2_SIF1_Drain_V         HP181191 HF_CH2_SIF1_Drain_C         HP182191 HF_CH2_SIF2_Drain_V         HP183191 HF_CH2_SIF2_Drain_C         HP184191  HF_CH2_SIF3_Drain_V         HP185191 HF_CH2_SIF3_Drain_C         HP186191 HF_CV1_DPFPF1              HP191191 HF_CV2_FIF1_Drain_V         HP192191 HF_CV2_FIF1_Drain_C         HP193191 HF_CV2_FIF2_Drain_V         HP194191 HF_CV2_FIF2_Drain_C         HP195191 HF_CV2_SIF1_Drain_V         HP196191 HF_CV2_SIF1_Drain_C         HP197191 HF_CV2_SIF2_Drain_V         HP198191 HF_CV2_SIF2_Drain_C         HP199191 HF_CV2_SIF3_Drain_V         HP200191 HF_CV2_SIF3_Drain_C         HP201191 HF_CPR_CH_SINE_S            HP211191 HF_CPR_CH_LOOP_S            HP210191	HC182289   C800001 <hex> 5 <dec> 0 <dec> 0.75 V 4.0 mA 0.65 V 3.0 mA 0.8 V 2.5 mA 0.8 V 2.5 mA  0.7 V 2.8 mA 0 <dec> 0.75 V 4.0 mA 0.65 V 3.0 mA 0.8 V 2.5 mA 0.8 V 2.5 mA 0.8 V 2.5 mA 0.8 V ON (Def) CLOSE (Def)	

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		HF_CPR_CHFPG1 HP212191 HF_CPR_CHFPG2 HP213191 HF_CPR_CHFPZ1 HP214191 HF_CPR_CHFPZ2 HP215191 HF_CPR_CHFPP2 HP216191 HF_CPR_Cal_Heater_C HP217191 HF_CH1_MXBIAS_V HP172191 HF_CH1_MX_MG_C HP173191 HF_CV1_MXBIAS_V HP187191 HF_CV1_MX_MG_C HP188191 HF_P_Chopper_Rot HP454191 HF_CH1_DPACT_C HP174191 HF_CV1_DPACT_C HP189191  Subsch. ID : 70  Det. descr. : Configure the FCU-subsystem (prime)	17 <dec> 201 <dec> 1010 <dec> 885 <dec> 149 <dec> 1.1 mA 2.015 mV 15.0 mA 2.015 mV 15.0 mA -1.07 V A B	
	ET=+ UT=+00.00.03	HIFI_CH1_MX_MG_C  Command Parameter(s) : HIFI_BB_ID HP001197 HF_CH1_MX_MG_C HP173191  Subsch. ID : 70 Det. descr. : Send single command to set H mixer magnet current	HIFI_CH1_MX_MG_C  HC096289  C800001 <hex> 5.5 mA	
	ET=+ UT=+00.00.00	HIFI_CV1_MX_MG_C  Command Parameter(s) : HIFI_BB_ID HP001197 HF_CV1_MX_MG_C HP188191  Subsch. ID : 70 Det. descr. : Send single command to set V mixer magnet current	HIFI_CV1_MX_MG_C  HC099289  C800001 <hex> 10.8 mA	
	ET=+ UT=+00.00.01	HIFI_HL_Normal  Command Parameter(s) : HIFI_BB_ID HP001197  Subsch. ID : 70 Det. descr. : Send single command to switch LCU to normal mode	HIFI_HL_Normal  HC082289  E2F0001 <hex>	
	ET=+ UT=+00.00.00	HIFI_Conf_nom_LCU_ch0  Command Parameter(s) : HIFI_BB_ID HP001197  Subsch. ID : 70 Det. descr. : Create macro-command to switch off the bands	HIFI_Conf_nom_LCU_ch0  HC049289  E2F0001 <hex>	

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
	ET=+ UT=+00.00.10	HIFI_HL_heater  HIFI_HL_heater  Command Parameter(s) : HIFI_BB_ID                  HP001197 HL_heater                  HP397194  Subsch. ID : 70 Det. descr. : Send single command to control the LCU heater	HC086289  E2F0001 <hex> 6.0 V	
		Verify Telemetry  HL_Channel_S                  HM003194	= OFF	AND=ZAZ9C999
		Verify Telemetry  HL_MODE_S                  HM258194	= normal	AND=ZAZ9C999
5		Measure LCU IV curve		Next Step: 6
	ET=+ UT=+00.00.00	HIFI_measure_LCU_IV  HIFI_measure_LCU_IV  Command Parameter(s) : HIFI_BB_ID                  HP001197 HIF_LCU_diode                  HP072197 HIF_LCU_IV_delay                  HP073197  TC Control Flags :  GBM IL DSE --Y -- ---  Subsch. ID : 70 Det. descr. : Perform IV-measurement on an LOU-diode	HC108289  E4F0001 <hex> M1_5a 90 <dec>	
	ET=+ UT=+00.01.32	HIFI_measure_LCU_IV  HIFI_measure_LCU_IV  Command Parameter(s) : HIFI_BB_ID                  HP001197 HIF_LCU_diode                  HP072197 HIF_LCU_IV_delay                  HP073197  Subsch. ID : 70 Det. descr. : Perform IV-measurement on an LOU-diode	HC108289  E4F0002 <hex> M2_5a 90 <dec>	
6		Switch on LO band		Next Step: 7
	ET=+ UT=+00.01.32	HIFI_HL_Normal  HIFI_HL_Normal  Command Parameter(s) : HIFI_BB_ID                  HP001197  Subsch. ID : 70 Det. descr. : Send single command to switch LCU to normal mode	HC082289  E2A0001 <hex>	



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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
	ET=+ UT=+00.00.01	HIFI_Conf_nom_LCU_ch5a  <b>HIFI_Conf_nom_LCU_ch5a</b>  <i>Command Parameter(s) :</i> HIFI_BB_ID                  HP001197          1 HL_freq_nx                  HP436194          2 HL_LSU_main                  HP438194          3 HL_LSU_offset                HP439194          4 HL_D2_step                  HP437194          5 HL_PL_5A_C                  HP353194          6 HL_M1_5A_V                  HP354194          7 HL_M2_5A_V                  HP355194          8 HL_Gate1_5A_V                HP356194          9 HL_Gate2_5A_V                HP357194         10 HL_Drain1_5A_V              HP358194         11  HL_Curlim1                  HP290194         12 HL_Drain2_5A_V              HP359194         13 HL_Curlim2                  HP291194         14 HL_macro_checksum            HP440194         15  <i>Subsch. ID : 70</i> Det. descr. : Create macro-command to configure LCU band 5a	HC043289	
	ET=+ UT=+00.00.20	HIFI_LCU_macro_tuning_hk  <b>HIFI_LCU_macro_tuning_hk</b>  <i>Command Parameter(s) :</i> HIF_LCU_memmacro            HP068197          HSK_TM1 (Def)	HC019289	
	ET=+ UT=+00.00.02	HIFI_LCU_macro_tuning_hk  <b>HIFI_LCU_macro_tuning_hk</b>  <i>Command Parameter(s) :</i> HIF_LCU_memmacro            HP068197          HSK_TM2	HC019289	
	ET=+ UT=+00.00.02	HIFI_LCU_macro_tuning_hk  <b>HIFI_LCU_macro_tuning_hk</b>  <i>Command Parameter(s) :</i> HIF_LCU_memmacro            HP068197          HSK_TM3	HC019289	

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
	ET=+ UT=+00.00.02	HIFI_LCU_macro_tuning_hk <b>HIFI_LCU_macro_tuning_hk</b> Command Parameter(s) : <b>HIF_LCU_memmacro HP068197</b> Subsch. ID : 70 Det. descr. : Requests one of the eight LCU intermediate housekeeping-sets	HC019289  HSK_TM	
	ET=+ UT=+00.00.02	HIFI_LCU_macro_tuning_hk <b>HIFI_LCU_macro_tuning_hk</b> Command Parameter(s) : <b>HIF_LCU_memmacro HP068197</b> Subsch. ID : 70 Det. descr. : Requests one of the eight LCU intermediate housekeeping-sets	HC019289  HSK_G	
	ET=+ UT=+00.00.02	HIFI_LCU_Single <b>HIFI_LCU_Single</b> Command Parameter(s) : <b>HIFI_BB_ID HP001197</b> <b>LCU_cmd HP234194</b> Subsch. ID : 70 Det. descr. : Send a single command to LCU	HC101289  E210001 <hex> HL_CLR_ERR	
	ET=+ UT=+00.00.01	HIFI_HL_heater <b>HIFI_HL_heater</b> Command Parameter(s) : <b>HIFI_BB_ID HP001197</b> <b>HL_heater HP397194</b> Subsch. ID : 70 Det. descr. : Send single command to control the LCU heater	HC086289  16 17	
		Verify Telemetry <b>HL_Channel_S HM003194</b>	= 5a	AND=ZAZ9C999
		Verify Telemetry <b>HL_MODE_S HM258194</b>	= normal	AND=ZAZ9C999
7		LO Short Functional Test		Next Step: 8
		The following TCs should be sent automatically with the defined time separation.		
		Verify: Monitor the following parameter and ensure that any occurrences of a 'FAULT' condition are communicated immediately to the HIFI representative (use AND HA004289).  <b>HM259194 HL_error_word_S</b>		

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	ET=+ UT=+00.00.00	HIFI_HL_Normal  HIFI_HL_Normal  Command Parameter(s) : HIFI_BB_ID                  HP001197  TC Control Flags :  GBM IL DSE --Y -- ---  Subsch. ID : 70 Det. descr. : Send single command to switch LCU to normal mode	HC082289  E2A0002 <hex>	
	ET=+ UT=+00.00.01	HIFI_Conf_nom_LCU_ch5a  HIFI_Conf_nom_LCU_ch5a  Command Parameter(s) : HIFI_BB_ID                  HP001197                  18 HL_freq_nx                  HP436194                  19 HL_LSU_main                  HP438194                  20 HL_LSU_offset                  HP439194                  21 HL_D2_step                  HP437194                  22 HL_PL_5A_C                  HP353194                  23 HL_M1_5A_V                  HP354194                  24 HL_M2_5A_V                  HP355194                  25 HL_Gate1_5A_V                  HP356194                  26 HL_Gate2_5A_V                  HP357194                  27 HL_Drain1_5A_V                  HP358194                  28  HL_Curlim1                  HP290194                  29 HL_Drain2_5A_V                  HP359194                  30 HL_Curlim2                  HP291194                  31 HL_macro_checksum                  HP440194                  32  Subsch. ID : 70 Det. descr. : Create macro-command to configure LCU band 5a	HC043289	
	ET=+ UT=+00.00.20	HIFI_LCU_macro_tuning_hk  HIFI_LCU_macro_tuning_hk  Command Parameter(s) : HIF_LCU_memmacro                  HP068197  Subsch. ID : 70 Det. descr. : Requests one of the eight LCU intermediate housekeeping-sets	HC019289  HSK_TM1 (Def)	
	ET=+ UT=+00.00.02	HIFI_LCU_macro_tuning_hk  HIFI_LCU_macro_tuning_hk  Command Parameter(s) : HIF_LCU_memmacro                  HP068197  Subsch. ID : 70 Det. descr. : Requests one of the eight LCU intermediate housekeeping-sets	HC019289  HSK_TM2	

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
	ET=+ UT=+00.00.02	HIFI_LCU_macro_tuning_hk HIFI_LCU_macro_tuning_hk Command Parameter(s) : HIF_LCU_memmacro                  HP068197 Subsch. ID : 70 Det. descr. : Requests one of the eight LCU intermediate housekeeping-sets	HC019289  HSK_TM3	
	ET=+ UT=+00.00.02	HIFI_LCU_macro_tuning_hk HIFI_LCU_macro_tuning_hk Command Parameter(s) : HIF_LCU_memmacro                  HP068197 Subsch. ID : 70 Det. descr. : Requests one of the eight LCU intermediate housekeeping-sets	HC019289  HSK_TM	
	ET=+ UT=+00.00.02	HIFI_LCU_macro_tuning_hk HIFI_LCU_macro_tuning_hk Command Parameter(s) : HIF_LCU_memmacro                  HP068197 Subsch. ID : 70 Det. descr. : Requests one of the eight LCU intermediate housekeeping-sets	HC019289  HSK_G	
	ET=+ UT=+00.00.02	HIFI_LCU_Single HIFI_LCU_Single Command Parameter(s) : HIFI_BB_ID                  HP001197 LCU_cmd                  HP234194 Subsch. ID : 70 Det. descr. : Send a single command to LCU	HC101289  E210002 <hex> HL_CLR_ERR	
	ET=+ UT=+00.00.01	HIFI_HL_heater HIFI_HL_heater Command Parameter(s) : HIFI_BB_ID                  HP001197 HL_heater                  HP397194 Subsch. ID : 70 Det. descr. : Send single command to control the LCU heater	HC086289  33 34	
	ET=+ UT=+00.00.20	HIFI_HL_Normal HIFI_HL_Normal Command Parameter(s) : HIFI_BB_ID                  HP001197 Subsch. ID : 70 Det. descr. : Send single command to switch LCU to normal mode	HC082289  E2A0003 <hex>	



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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
	ET=+ UT=+00.00.02	HIFI_LCU_macro_tuning_hk <b>HIFI_LCU_macro_tuning_hk</b> Command Parameter(s) : HIF_LCU_memmacro                  HP068197 Subsch. ID : 70 Det. descr. : Requests one of the eight LCU intermediate housekeeping-sets	HC019289  HSK_TM	
	ET=+ UT=+00.00.02	HIFI_LCU_macro_tuning_hk <b>HIFI_LCU_macro_tuning_hk</b> Command Parameter(s) : HIF_LCU_memmacro                  HP068197 Subsch. ID : 70 Det. descr. : Requests one of the eight LCU intermediate housekeeping-sets	HC019289  HSK_G	
	ET=+ UT=+00.00.02	HIFI_LCU_Single <b>HIFI_LCU_Single</b> Command Parameter(s) : HIFI_BB_ID                  HP001197 LCU_cmd                  HP234194 Subsch. ID : 70 Det. descr. : Send a single command to LCU	HC101289  E210003 <hex> HL_CLR_ERR	
		Verify: Verify the content of the following ANDs with the HIFI representative:  <b>HA004289 LCU_status2</b> <b>HA015289 LCU_5a</b>		
	ET=+ UT=+00.00.01	HIFI_Housekeeping_on <b>HIFI_Housekeeping_on</b> Command Parameter(s) : HIF_HK_rate                  HP012197 HIF_FCU_S                  HP006197 HIF_LCU_S                  HP007197 HIF_WBSV_S                  HP009197 HIF_WBSH_S                  HP008197 HIF_HRSV_S                  HP011197 HIF_HRSH_S                  HP010197 TC Control Flags : GBM IL DSE --Y -- --- Subsch. ID : 70 Det. descr. : Sets periodic housekeeping packet generation period	HC016289  1_pkt_per_4_s ON (Def) ON (Def) ON (Def) ON (Def) ON (Def) ON (Def) ON (Def)	
		Verify: The following <b>TM(3,25)</b> packets should be produced once every 4 seconds:  <b>HIFI_essential_HK</b> (APID 1024) <b>HIFI_HK_rev_7</b> (APID 1026)		

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8		Set default OBSID/BBID		Next Step: END
	ET=+ UT=+00.00.01	HIFI_Set_OBS_ID <p style="text-align: center;">HIFI_Set_OBS_ID</p> Command Parameter(s) : HIFI_BB_ID           HP001197 HIFI_OBS_ID         HP000197  TC Control Flags : GBM IL DSE --Y -- ---  Subsch. ID : 70 Det. descr. : Set Observation-ID and Building-Block-ID	HC014289  0 <hex> (Def) 0 <hex> (Def)	
		Verify Telemetry BB_ID_per_hk           HM004190	= 0 <hex>	AND=ZAZ9C999
		Verify Telemetry OBS_ID_per_hk         HM003190	= 0 <hex>	AND=ZAZ9C999
<b>End of Procedure</b>				