

FCMP_SRS_Mahindra_HPCC_ICC_Manufacturing_Diagnostics



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1 Scope

Purpose of this document is to describe functional and nonfunctional requirements for Man Diag Component and capabilities that its needs to provide. It also define constraints and assumptions. An overview how the SW Function is interacting with other Functions are also described.

Example: This document contains requirements for the [TBD] function of the Product.

2 Definitions and Acronyms

Term	Definition
ASIL	Automotive Safety Integrity Level
CAN	Controller Area Network
UID	Unique identifier
DID	Data Identifier
VIP	Vehicle interface Processor
SOC	System on Chip
CID	center information display
PID	passenger information display
DTC	Diagnostic trouble code
USB	Universal serial bus
RSSI	Received Signal Strength Indicator

3 References

3.1 References - Customer Documents

S.NO	Title	Version	Hyper link
1.	PDT_PRS_Mahindra_HPCC_ICC_Manufacturing_Diagnostics	1.0	PDT_PRS_Mahindra_HPCC_ICC_Manufacturing_Diagnostics

3.2 References - Aptiv internal documents

S.NO	Title	Version	Hyper link
1.	PDT_PRS_Mahindra_HPCC_ICC_Manufacturing_Diagnostics	1.0	PDT_PRS_Mahindra_HPCC_ICC_Manufacturing_Diagnostics

3.3 References - Industry Documents

NA (Not following any industry standard for this module)

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4 Overview and context

Diagnostics modules is responsible for implementing/testing SW features using UART Protocol. It majorly consists of functionalities related to hardware diagnostics and some software functionality features.

4.1 Assumptions

1. Send valid Man Diag command through UART with valid baud rate 115200.
2. Ensure the voltage is set to 12V & Flash Latest Software Application TK Loggers has been assigned with respective COM port of VIP and AP.
3. Command responses are expected to be complete within 3 sec ,based on the SW design. Consecutive requests without the response of previous request is not a valid use case.

4.2 Dependencies to other Software functions

- AUTOSAR Runnable
- CAN
- HISIP

4.3 Dependencies to other elements

The Manufacturing Diagnostics component is dependent on Vehicle vendor Extension component containing the file types.h for interacting with Android layer. The internal key mapping enum values with feature are as given below :

```

ETHERNET_IP = 1,
MFG_PLANT_PRIVATE_KEY = 2,
IHPSECCOM_PRIVATE_KEY = 3,
KMS_KEY_PAIR_GENERATION_04 = 4,
KMS_PUBLIC_CERT_AND_KEYS_INSTALLATION_05 = 5,
KMS_PRIVATE_KEYS_INSTALLATION_06 = 6,
BLUETOOTH_ON_OFF = 7,
BLUETOOTH_MAC_ADDRESS = 8,
BLUETOOTH_CLEAR_PAIRING_INFORMATION = 9,
BLUETOOTH_INCOMING_PHONE_CALL = 10,
BLUETOOTH_MAKE_PHONE_CALL = 11,
BLUETOOTH_ENABLE_PHONE_PAIRING = 12,
BLUETOOTH_PHONE_STATE = 13,
BLUETOOTH_LOOPBACK_MODE = 14,
WLAN_RUNSTATE = 15,
WLAN_MAC_ADDRESS = 16,
WLAN_DEVICE_MODE = 17,
WLAN_ANTENNA_SELECTION = 18,
WLAN_IP_ADDRESS = 19,
WLAN_ACCESS_POINT_MODE = 20,
USB_READ_WRITE = 21,
USB_PRESENCE_DETECTION = 22,
USB_TRACK_SELECT = 23,
USB_HOST_MODE_STATUS = 24,
USB_READ_WRITE_TEST = 25,
RTN_0500_MAP_REPARTITIONING = 26,
RTN_0600_FIELD_STRENGTH = 27,
BLUETOOTH_ANTENNA_CONNECTION = 28,
AUDIO_PRIMARY_SOURCE = 29,
WLAN_PING = 30,
BLUETOOTH_SINE_TONE = 31,
BLUETOOTH_CLEAR_PAIRING_INFO = 32,
BLUETOOTH_LOOP_BACK = 33,
WLAN_PERF209 = 34,
APPLE_AUTH = 35,
BLUETOOTH_SW_ID = 36,
ADB_SW_ID = 37,
BLUETOOTH_RSSI = 38,
WLAN_DEFAULT = 39,
USB_MODE_SETTING = 40,
CERT_PROVID = 41,
BLUETOOTH_HW_ID = 42,
WIDEVINE_DRM_ENABLE = 43,
WIDEVINE_PROVID_STATUS = 44,
```

5 Interfaces

The interaction of following modules/components with Manufacturing Diagnostics is shown below.

Module	Interface
VIP components	HISIP
AP components	HISIP
Tester	UART

5.1 Interfaces - Inputs

- 1.HISIP (UART) - To receive the vehicle information (eg: MESN, VIN).
2. Ethernet
3. XSAL interface

5.2 Interfaces - Outputs

1. HISIP
2. HMI
3. XSAL interface

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6 Functionality

6.1 <Software subfunction 1>

6.1.1 States

<OPERATION MODES

Identify the OPERATION MODES affecting the function behavior (ex. – start-up, shut-down, calibration etc.). Leave blank if none>

6.1.1.1 Functionality - Behavior in SW State = Initialization

PMH-44437 - <describe what the software shall do with respect to the functionality when in the Software State from the heading

Example: see 1CMP_SRS_ProductName_SuperviseStateMachine >

Normal]

6.1.1.2 Functionality - Behavior in SW State = Run

PMH-44439 - <describe what the software shall do with respect to the functionality when in the Software State from the heading>

Normal]

6.1.1.3 Functionality - Behavior in SW State = Powerdown

PMH-44441 - <describe what the software shall do with respect to the functionality when in the Software State from the heading>

Normal]

6.1.2 General

Status Byte description:

This byte indicates the command processing status as mentioned below,

- 01 if the command was executed with success
- 00 if the diagnostic command failed or was not executed for some reason
- AA if the requested action is in progress
- XX refer below table for other status bytes

Command	Status Information	Comment
00	FAIL	This command indicates that the diagnostic command fails because the command was not executed for any other reason that is not described below.
7E	DIAGNOSTICS SESSION ALREADY OPEN	If diagnostic session is already open in other console.
7F	DIAGNOSTICS SESSION NOT OPEN	Before sending any diagnostic command, diagnostic session needs to be open.
F0	BAD CRC	The checksum is not matching to the command
F1	CLIENT APPLICATION NOT ALIVE	Client application is not active (not started / closed due to potential failure)
F2	CLIENT APPLICATION NOT READY	Client application is not ready (not ready to accept the requests)
F3	NOT IMPLEMENTED	Feature not implemented or defined in the configuration file
F4	DELIVERY FAILED	Message delivery failed to Mfg/Client, or between the tester and the UDS engine communication
F5	RESPONSE TIMEOUT	Timeout in receiving the response (Timeout defined in the configuration file)
F6	COMMAND ERROR FORMAT	Value in header #8 (number of data bytes) don't match to the trailing number of data bytes)
F7	FUNCTION NOT SUPPORTED	Current test doesn't contain selected function.
F8	MISMATCH DATA LENGTH	Number of data bytes don't match test configuration.
F9	EXISTING_REQUEST_IN_PROGRESS	Already a request is in progress and a new request has been received

6.1.3 Diagnostics

6.1.3.1 System Features Group (0x00)

6.1.3.1.1 00 01 Manufacturing Diagnostics Session State

PMH-144194 - When the Manufacturing Diagnostics Session is set to active, all applications that can take part of a MFG routine, shall start without the need for additional configuration. The software shall enable the Manufacturing Diagnostics Session upon reception of This command.

Command Type	Prefix	Group ID	Test ID	Operation ID	Status	No. of Data Bytes	Data Byte 1
Request for SET	6D643E	00	01	01 - Set 11 - Set + CS	00	01	Note 2
Response for SET	6D643C	00	01	01 - Set 11 - Set + CS	Note 1	00	

Command Type	Prefix	Group ID	Test ID	Operation ID	Status	No. of Data Bytes	Data Byte 1
Request for GET	6D643E	00	01	00 - Get 10 - Get + CS	00	00	
Response for GET	6D643C	00	01	00 - Get 10 - Get + CS	Note 1	01	Note 2

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - Session state byte can assume one of the following values, depending on product specification:

- 00 Manufacturing Diagnostics Session OFF.
- 01 Manufacturing Diagnostics Session ON.

Example :

"SET" Manufacturing Diagnostics Session State - "Active"

- TX: 6D643E 00 01 00 01 **01**
- RX: 6D643C 00 01 01 01 00

"SET" Manufacturing Diagnostics Session State - "Inactive"

- TX: 6D643E 00 01 00 01 **00**
- RX: 6D643C 00 01 01 01 00

"GET" Manufacturing Diagnostics Session State

- TX: 6D643E 00 01 00 00 00

• APTIV •

- RX: 6D643C 00 01 00 01 01 XX (XX - value depends on the state of ManDiag session being entered or exited.)

6.1.3.1.2 00 04 Operating System Boot Status

00 04 Operating System Boot Status

The software shall get the status of the Operating System plus the Test Applications, upon reception.

Command Type	Prefix	Group ID	Test ID	Operation ID	Status	No. of Data Bytes	Data Byte 1
Request for GET	6D643E	00	04	00 - Get 10 - Get + CS	00	00	
Response for GET	6D643C	00	04	00 - Get 10 - Get + CS	Note 1	01	Note 2

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - This byte indicates the OS boot status, depending on product specification:

- 01 SOC boot completed.
- 00 SOC boot not completed.

Example:

"GET - Operating system Boot status"

- TX: 6D643E 00 04 00 00 00
- RX: 6D643C 00 04 00 01 01 XX

6.1.3.2 Power Features Group (0x0A)

6.1.3.2.1 0A 03 Sleep Mode

PMH 53130 - 0A 03 Sleep Mode

The software shall go to sleep mode upon reception of the DID_Sleep_Mode.

The transition to sleep state should NOT take more than 10 seconds and memory shall NOT be corrupted by this action.

All necessary persistence data must be stored before going into sleep mode

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1
Request 6D643E	0A 03	01 - Set 11 - Set + CS	00	01	Sleep Mode Status Note 2
Response 6D643C	0A 03	01 - Set 11 - Set + CS	Note 1	00	-

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - This byte indicates the Sleep mode status, depending on product specification:

- 00 - Deep Sleep - got to sleep mode in "fast" way,
During Deep Sleep status, the unit power consumption can't be higher than 10mA.

Example

"SET Sleep mode - Deep Sleep"

- TX: 6D643E 0A 03 01 00 01 00
- RX: 6D643C 0A 03 01 01 00

6.1.3.2.2 0A 04 Unit Restart

PMH-53135 - 0A 04 Unit Restart

The software shall perform a controlled restart of the unit upon reception of the DID_Unit_Restart.

DID_Unit_Restart

Prefix	Diagnostics ID	Operation ID	Status	No. of Data Bytes	Data Byte #1
Request 6D643E	0A 04	01 - Set 11 - Set + CS	00	01	Mode, Note 2
Response 6D643C	0A 04	01 - Set 11 - Set + CS	Note 1	00	-

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - This byte indicates the Restart Mode, depending on product specification:

- 01 - Unit restart
- 02 - Boot loader mode

Example

"Unit restart and go into ITS manufacturing SW"

- TX: 6D643E 0A 04 01 00 01 01
- RX: 6D643C 0A 04 01 01 00

6.1.3.2.3 0A 05 Battery Calibration

PMH-53139 - 0A 05 Battery Calibration

The software shall align all the components to a BATT Voltage of 14,4V upon reception of DID_Battery_Calibration.

The ADC Alignment value shall be updated in the system memory and also in run-time usage.

Prefix	Diagnostics ID	Operation ID	Status	No. of Data Bytes	Data Byte 1
Request 6D643E	0A 05	01 - Set 11 - Set + CS	00	01	Calibration ON/OFF, Note 2
Response 6D643C	0A 05	01 - Set 11 - Set + CS	Note 1	01	Calibration Status Note 3

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data	Data Byte 2	Data Byte 3	Data Byte 4
--------	----------------	--------------	--------	-----------------	------	-------------	-------------	-------------

					Byte 1			
Request 6D643E	0A 05	00 - Get 10 - Get + CS	00	00				
Response 6D643C	0A 05	00 - Get 10 - Get + CS	Note 1	04	Voltage, Note 4			Voltage, Note 5

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.

- XX Refer [\[PMH-412826\]](#)

Note 2 - This byte triggers the battery calibration (01).

Note 3 - This byte indicates the result of the calibration operation:

- 00 FAILED
- 01 PASSED

Note 4 - The 2 data bytes returned shall be a hex representation of the measured supply Voltage (ADC Voltage).

Note 5 - The 2 data bytes returned shall be the calibrated voltage with hex representation.

Example

SET (Trigger) Battery Calibration

- TX: 6D643E 0A 05 01 00 01 01
- RX: 6D643C 0A 05 01 01 01 01

GET Battery Voltage

- TX: 6D643E 0A 05 00 00 00
- RX: 6D643C 0A 05 00 01 04 05 AA 05 A0

6.1.3.2.4 0A 06 USB Voltage Output

PMH-53145 - 0A 06 USB Voltage Output

The software shall enable the verification of the USB power circuits upon reception of DID_USB_Voltage_Output.

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1	Data Byte #2
Request 6D643E	0A 06	01 - Set 11 - Set + CS	00	02	USB ID, Note 2	Power Circuits Verification, Note 3
Response 6D643C	0A 06	01 - Set 11 - Set + CS	Note 1	00	-	-

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1	Data Byte #2
Request 6D643E	0A 06	00 - Get 10 - Get + CS	00	01	USB ID, Note 2	
Response 6D643C	0A 06	00 - Get 10 - Get + CS	Note 1	02	USB ID, Note 2	Power circuits verification, Note 3

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.

- XX Refer [\[PMH-412826\]](#)

Note 2 - This byte turns ON/OFF the verification of USB power circuits. Please refer to the below table:

Component	ID	HPCC
USB2.0 (Telematics)	00	NA
USB3.0	01	Applicable

Note 3 - This byte turns ON/OFF the verification of USB power circuits:

- 00 OFF
- 01 ON

SET USB Voltage Output ON

- TX: 6D643E 0A 06 01 00 02 00 01
- RX: 6D643C 0A 06 01 01 00

6.1.3.2.5 0A 07 Phantom Voltage

PMH-53149 - 0A 07 Phantom Voltage

The software shall measure the phantom supply voltages after reception of DID_Phantom_Voltage.

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1	Data Byte #2
Request 6D643E	0A 07	01 - Set 11 - Set + CS	00	02	Phantom Supply Voltage, Note 2	Status, Note 3
Response 6D643C	0A 07	01 - Set 11 - Set + CS	Note 1	00		

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1	Data Byte #2
Request 6D643E	0A 07	00 - Get 10 - Get + CS	00	01	Phantom Supply Voltage, Note 2	
Response 6D643C	0A 07	00 - Get 10 - Get + CS	Note 1	02	Phantom Supply Voltage, Note 2	Status, Note 3

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.

- XX Refer [\[PMH-412826\]](#)

Note 2 - This byte represents the Phantom Supply ID, depending on product specification:

Component	ID
AM/FM	01

A2B1/AB2	02
MIC phantom voltage	03

Note 3 - This byte indicates the Phantom Voltage status:

- 00 OFF
- 01 ON

Example

"SET (turn ON) Phantom Voltage"

- TX: 6D643E 0A 07 01 00 02 03 01
- RX: 6D643C 0A 07 01 01

6.1.3.2.6 0A 09 Enter EDL mode

PMH-234556-0A 09 Enter EDL mode

The software shall enter in to EDL mode Upon reception of DID_Enter_EDL_Mode

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1
Request 6D643E	0A 09	01 - Set 11 - Set + CS	00	00	
Response 6D643C	0A 09	01 - Set 11 - Set + CS	Note 1	00	

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Example

Set EDL mode

- TX: 6D643E 0A 09 01 00 00
- RX: 6D643C 0A 09 01 01 00

6.1.3.3 Bluetooth Features Group (0x3D)

Bluetooth Default State

The software shall set the Bluetooth State to OFF by default.

6.1.3.3.1 3D 01 Bluetooth ON/OFF

PMH-53431 - 3D 01 Bluetooth ON/OFF

The software shall change the state of Bluetooth upon reception of DID_Bluetooth_ON_OFF.

DID_Bluetooth_ON_OFF

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1
Request 6D643E	3D 01	01 - Set 11 - Set + CS	00	01	State, Note 2
		00 - Get 10 - Get + CS	00	00	
		01 - Set 11 - Set + CS	Note 1	00	
		00 - Get 10 - Get + CS	Note 1	01	State, Note 2

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - This byte represents the Bluetooth State:

- 00 OFF
- 01 ON

Example

"SET Bluetooth ON"

- TX: 6D643E 3D 01 01 00 01 01
- RX: 6D643C 3D 01 01 01 00

6.1.3.3.2 3D 02 Bluetooth MAC address

PMH-53435 - 3D 02 Bluetooth MAC address

The software shall check or set the individual MAC Address upon reception of DID_Bluetooth_MAC_Address

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1 .. #6
Request 6D643E	3D 02	00 - Get 10 - Get + CS	00	00	
Response 6D643C	3D 02	00 - Get 10 - Get + CS	Note 1	06	MAC Address, byte 1 ... byte 6 (Note 2)

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - The MAC Address (6 hex values) will be placed on each of the data bytes present in the request command.

Example: MAC Address = "00:11:22:33:44:55"; #1 Data Byte = 00; #2 Data Byte = 11; ... ; #6 Data Byte = 55;

GET Response shall contain the new interface MAC Address

Example

"SET BT MAC address AA.BB.CC.DD.EE.FF"

- TX: 6D643E 3D 02 01 00 06 AA BB CC DD EE FF
- RX: 6D643C 3D 02 01 01 00

6.1.3.3.3 3D 03 Clear Bluetooth Pairing Information**PMH-53439 - 3D 03 Clear Bluetooth Pairing Information**

The software shall trigger the necessary routines to clear all the Bluetooth Pairing Information, upon reception of DID_Clear_Bluetooth_Pairing_Information.

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1
Request 6D643E	3D 03	01 - Set 11 - Set + CS	00	00	
Response 6D643C	3D 03	01 - Set 11 - Set + CS	Note 1	01	Clear Status, Note 2

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - This byte represents the Clear Status operation:

- 00 (Fail) This value shall be returned in case the Pairing information was not eliminated.
- 01 (Pass) This value should be only returned after the Clear has run with success (eliminating all pairing information)

Example:

SET Clear Device Pairing Information (Success response)

- TX: 6D643E 3D 03 01 00 00
- RX: 6D643C 3D 03 01 01 01

6.1.3.4 3D 04 Enable Bluetooth Phone Pairing**PMH-53443 - 3D 04 Enable Bluetooth Phone Pairing**

The software shall enable or disable the possibility to establish Bluetooth connections with other BT devices upon reception of DID_Enable_Bluetooth_Phone_Pairing. Pairing can be initiated from the phone BT menu.

DID_Enable_Bluetooth_Phone_Pairing

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1
Request 6D643E	3D 04	01 - Set 11 - Set + CS	00	01	Enable/Disable, Note 2
		00 - Get 10 - Get + CS	00	00	
Response 6D643C	3D 04	01 - Set 11 - Set + CS	Note 1	00	
		00 - Get 10 - Get + CS	Note 1	01	Enable/Disable, Note 2

Note 1 - This byte indicates the command processing status:

- 01 if the command was executed with success;
- 00 if the diagnostic command failed or was not executed for some reason

Note 2 - This byte allows to enable or disable the possibility to establish Bluetooth connections:

- 00 Disable
- 01 Enable

Example:

GET BT Phone Pairing status (Status = Enable)

- TX: 6D643E 3D 04 00 00 00
- RX: 6D643C 3D 04 00 01 01 01

6.1.3.5 3D 05 Bluetooth RSSI**PMH-53447 - 3D 05 Bluetooth RSSI**

The software shall report the information regarding the Bluetooth RSSI (Received Signal Strength Indication) upon reception of DID_Bluetooth_RSSI.

DID_Bluetooth_RSSI

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1
Request 6D643E	3D 05	01 - Set 11 - Set + CS	00	00	
		00 - Get 10 - Get + CS	00	00	
Response 6D643C	3D 05	01 - Set 11 - Set + CS	Note 3	00	
		00 - Get 10 - Get + CS	Note 1	01	RSSI Info, Note 2

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - Information about the RSSI shall be transmitted in hexadecimal format.

Note 3 - This byte indicates the command processing status:

- AA if the command was executed with the result of pending;
- 00 if the diagnostic command failed or was not executed for some reason

Example:

Trigger (SET) RSSI measurement

- TX: 6D643E 3D 05 01 00 00
- RX: 6D643C 3D 05 01 AA 00 (measurement routine is started, result is pending)

Query unit (GET) about RSSI measurement

- TX: 6D643E 3D 05 00 00 00
- RX: 6D643C 3D 05 00 01 01 XX, where XX is the received signal strength indicator value

6.1.3.6 3D 15 Bluetooth Loop Back Mode**PMH-53471 - 3D 15 Bluetooth Loop Back Mode**

The software shall set the Bluetooth Chip in the Loop back Mode (Internal or external), in order to execute the different tests upon reception of DID_Bluetooth_Loop_Back_Mode.

BT loop back mode **pre-requisite** perform BT OFF/ON before executing the BT Loopback test

DID_Bluetooth_Loop_Back_Mode

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1
Request 6D643E	3D 15	01 - Set 11 - Set + CS	00	01	Note 2
		00 - Get 10 - Get + CS	00	00	
Response 6D643C	3D 15	01 - Set 11 - Set + CS	Note 1	00	
		00 - Get 10 - Get + CS	Note 1	01	Note 2

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2:

- 00 to disable Loopback
- 01 to enable loopback mode

Example:

"Set Loop Back mode"

- TX: 6D643E 3D 15 01 00 01 01
- RX: 6D643C 3D 15 01 01 00

6.1.3.4 Audio Features Group (0x14)**6.1.3.4.1 14 01 Volume****PMH-54073 - 14 01 Volume**

The software shall change the volume (sound-wise) of the system, while performing audio measurements, upon reception of DID_Volume

DID_Volume

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1
Request 6D643E	14 01	01 - Set 11 - Set + CS	00	01	Volume, Note 2
		00 - Get 10 - Get + CS	00	00	
Response 6D643C	14 01	01 - Set 11 - Set + CS	Note 1	00	
		00 - Get 10 - Get + CS	Note 1	01	Volume, Note 2

Note 1 - This byte indicates the command processing status:

- 01 if the command was executed with success;
- 00 if the diagnostic command failed or was not executed for some reason

Note 2 - Data Byte #1 is the representation of the system volume level and shall be in the range [00, 30 steps] -> [00, 1E hex].
 volume should be given in steps.

Step	dB Gain at Volume Step	dB Gain at DSP
0	0	-90
1	19	-71
2	26.25	-63.75
3	32.25	-57.75
4	37.5	-52.5
5	41.75	-48.25
6	45.75	-44.25
7	49.25	-40.75
8	52.5	-37.5
9	55.5	-34.5
10	58.25	-31.75
11	60.75	-29.25
12	63	-27
13	65.25	-24.75
14	67.25	-22.75
15	69.25	-20.75
16	71	-19
17	72.75	-17.25
18	74.5	-15.5
19	76	-14
20	77.5	-12.5
21	79	-11
22	80.5	-9.5
23	81.75	-8.25
24	83	-7
25	84.25	-5.75
26	85.5	-4.5
27	86.75	-3.25
28	87.75	-2.25
29	89	-1
30	90	0

Note 3 - The command shall also work even if the radio is mute, in that case the radio needs to unmute and set the volume.

Example

"SET Volume to 15"

- TX: 6D643E 14 01 01 00 01 0F

• APTIV •

- RX: 6D643C 14 01 01 01 00

6.1.3.4.2 14 02 Fade

PMH-54079 - Fade Values

The software shall update the speaker level with the fader offset upon reception of DID_Fade. Negative Fade values shall make the sound shift to the rear and analogous positive values shall make the sound shift to the front. This means that with the minimum or maximum step value sound shall only be heard from either front or rear. **This applicable only for internal Amp variant.**

DID_Fade

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1
Request 6D643E	14 02	01 - Set 11 - Set + CS	00	01	Note 2
		00 - Get 10 - Get + CS	00	00	
Response 6D643C	14 02	01 - Set 11 - Set + CS	Note 1	00	Note 2
		00 - Get 10 - Get + CS	Note 1	01	

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - Fader Value can take a value on the following range [00, 0C].

Fader Value	Fader Level
00	-6
01	-5
02	-4
03	-3
04	-2
05	-1
06	0
07	1
08	2
09	3
0A	4
0B	5
0C	6

Fader Control			
Level	Rear Side (dB)	Front Side +Center (dB)	Sub-Woofers (dB)
-6(Front End Internal Vehicle)	Rear (RL/RR) -48	0	-6
-5	Rear (RL/RR) -20	0	-5
-4	Rear (RL/RR) -8	0	-4
-3	Rear (RL/RR) -6	0	-3
-2	Rear (RL/RR) -4	0	-2
-1	Rear (RL/RR) -2	0	-1
0	0 (Neutral)	0 (Neutral)	0
1	0	Front (FL/FR) -2	-1
2	0	Front (FL/FR) -4	-2
3	0	Front (FL/FR) -6	-3
4	0	Front (FL/FR) -8	-4
5	0	Front (FL/FR) -20	-5
6 (Rear End Internal Vehicle)	0	Front (FL/FR)-48	-6

Example

"SET Fade to the front completely shifted (00)"

- TX: 6D643E 14 02 01 00 01 00
- RX: 6D643C 14 02 01 01 00

6.1.3.4.3 14 03 Balance

PMH-54083 - 14 03 Balance

The software shall update the speaker level with the balance offset upon reception of DID_Balance.

PMH-54084 - Balance Values

Negative values shall make the sound shift to the right and analogous positive values shall make the sound shift to the left. This means that with the minimum or maximum step value sound shall only be heard from either left or right.

DID_Balance

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1
Request 6D643E	14 03	01 - Set 11 - Set + CS	00	01	Balance Level, Note 2
		00 - Get 10 - Get + CS	00	00	
Response 6D643C	14 03	01 - Set 11 - Set + CS	Note 1	00	Balance Level, Note 2
		00 - Get 10 - Get + CS	Note 1	01	

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2- Acceptable balance values can take one of the values in the following range [0x00,0x0C] hex.

ID	Level
00	-6

01	-5
02	-4
03	-3
04	-2
05	-1
06	0
07	1
08	2
09	3
0A	4
0B	5
0C	6

Balance Control				
	Left Side (dB)	Right Side (dB)	Center (dB)	Sub-Woofers (dB)
-6 (Right End Internal Vehicle)	LCh(FL/RL) -48	0	-6	-6
-5	LCh(FL/RL) -20	0	-5	-5
-4	LCh(FL/RL) -8	0	-4	-4
-3	LCh(FL/RL) -6	0	-3	-3
-2	LCh(FL/RL) -4	0	-2	-2
-1	LCh(FL/RL) -2	0	-1	-1
0	0 (Neutral)	0 (Neutral)	0	0
1	0	RCh(FR/RR) 2	-1	-1
2	0	RCh(FR/RR) -4	-2	-2
3	0	RCh(FR/RR) -6	-3	-3
4	0	RCh(FR/RR) -8	-4	-4
5	0	RCh(FR/RR) -20	-5	-5
6 (Left End Internal Vehicle)	0	RCh(FR/RR) -48	-6	-6

Example:

SET Balance to the right completely shifted

- TX: 6D643E 14 03 01 00 01 0C
- RX: 6D643C 14 03 01 01 00

Example:

*GET Treble Level *

- TX: 6D643E 14 04 00 00 00
- RX: 6D643C 14 04 00 01 02 00 07

6.1.3.4.14 06 Equalizer Settings**PMH-54095 - 14 06 Equalizer Settings**

The software shall change the equalization settings of the AUD upon reception of DID_Equalizer_Settings.

DID_Equalizer_Settings

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1	Data Byte #2	Data Byte #3
Request 6D643E	14 06	01 - Set 11 - Set + CS	00	03	Equalizer setting - BASS , Note 2	Equalizer setting - MID , Note 2	Equalizer setting - TREBLE , Note 2
		00 - Get 10 - Get + CS	00	00			
Response 6D643C	14 06	01 - Set 11 - Set + CS	Note 1	00			
		00 - Get 10 - Get + CS	Note 1	03	Equalizer setting - BASS , Note 2	Equalizer setting - MID , Note 2	Equalizer setting - TREBLE , Note 2

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer: PMH-412826

Note 2- Acceptable balance values can take one of the values in the following range [0x00,0x0E] hex.

ID	BASS Level	MID Level	TREBEL Level
00	-7	-7	-7
01	-6	-6	-6
02	-5	-5	-6
03	-4	-4	-4
04	-3	-3	-3
05	-2	-2	-2
06	-1	-1	-1
07	0	0	0
08	1	1	1
09	2	2	2
0A	3	3	3
0B	4	4	4
0C	5	5	5
0D	6	6	6
0E	7	7	7

Example:

*SET [0 5 -6] equalization *

- TX: 6D643E 14 06 01 00 03 07 0C 01
- RX: 6D643C 14 06 01 01 00

GET Equalization values

• A P T I V •

- 6D643E 14 06 00 00 00
- 6D643C 14 06 00 01 03 07 0C 01

6.1.3.4.5 14 07 Primary Source

PMH-54098 - 14 07 Primary Source

The software must be able to switch between different audio sources upon reception of DID_Primary_Source.

DID_Primary_Source

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1
Request 6D643E	14 07	01 - Set 11 - Set + CS	00	01	Primary Source, Note 2
		00 - Get 10 - Get + CS	00	00	
Response 6D643C	14 07	01 - Set 11 - Set + CS	Note 1	00	
		00 - Get 10 - Get + CS	Note 1	01	Primary Source, Note 2

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - Available options for primary source are, depending on product specification:

ID	Primary Source
01	AM
02	FM
03	USB 3.0
04	BT

Example

"SET Primary audio source to FM"

- TX: 6D643E 14 07 01 00 01 02
- RX: 6D643C 14 07 01 01 00

"GET Primary audio source"

- TX: 6D643E 14 07 00 00 00
- RX: 6D643C 14 07 00 01 01 01

6.1.3.4.6 14 12 VESS Audio Out

14 12 VESS Audio Out

The software must be able to Enable rear/Front speakers upon reception of DID_VESS_Audio_Out.

Prefix Diagnostics ID Operation ID Status # of Data Bytes Data Byte #1 Request 6...

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1
Request 6D643E	14 12	01 - Set 11 - Set + CS	00	01	Note 2
		01 - Set 11 - Set + CS	Note 1	00	
Response 6D643C	14 12	01 - Set 11 - Set + CS			
		01 - Set 11 - Set + CS			

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - This byte indicates the Speaker status:

- 00 OFF
- 01 ON

Example

"SET Enable VESS"

- TX: 6D643E 14 12 01 00 01 01
- RX: 6D643C 14 12 01 01 00

6.1.3.5 Tuner Feature Group (0x1F)

6.1.3.5.1 1F 01 Tuner Band / Frequency

PMH-54103 - 1F 01 Tuner Band / Frequency

The software shall define the tuner frequency upon reception of DID_Tuner_Band_Frequency

DID_Tuner_Band_Frequency

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1	Data Byte #2	Data Byte #3	Data Byte #4
Request 6D643E	1F 01	01 - Set 11 - Set + CS	00	04	Tuner Selection, Note 2	Band, Note 3	Frequency MSB, Note 4	Frequency LSB, Note 4
		00 - Get 10 - Get + CS	00	01	Tuner Selection, Note 2			
Response 6D643C	1F 01	01 - Set 11 - Set + CS	Note1	00				
		00 - Get 10 - Get + CS	Note1	04	Tuner Selection, Note 2	Band, Note 3	Frequency MSB, Note 4	Frequency LSB, Note 4

Note 1 - This byte indicates the command processing status:

- 01 if the command was executed with success;
- 00 if the diagnostic command failed or was not executed for some reason

Note 2 - This byte indicates the selected tuner, depending on product specification:

Tuner	ID
Main Tuner	01

Note 3 - This byte represents the Band, depending on product specification:

Band	ID
FM	00
AM	01

Note 4 - Frequency calculation:

The frequency will be expressed by using 2 bytes and depending on the band (FM or AM) the calculations will vary:

FM=00: frequency [10 kHz steps]
 AM=01: frequency [1 kHz steps]

Example for band == 00 == FM: 98.1 MHz / 10 kHz == 98100 kHz / 10kHz == 9810 == 0x2652

Example for band == 01 == AM: 540 kHz / 1kHz == 540 == 0x021C

Example

GET Band/Frequency Dirana3 Tuner 1 (The Main Tuner 1 is set to FM in the frequency 98.1 MHz)

- TX: 6D643E 1F 01 00 00 01 01
- RX: 6D643C 1F 01 00 01 04 01 00 26 52

6.1.3.5.2 1F 04 Tuner PTY / PI

PMH-54110 - 1F 04 Tuner PTY / PI

The software shall get information from Program Identification (PI) and Program Type data (PTY) upon reception of DID_Tuner_PTY_PI.

DID_Tuner_PTY_PI

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1	Data Byte #2	Data Byte #3	Data Byte #4
Request 6D643E	1F 04	00 - Get 10 - Get + CS	00	01	Tuner, Note 2			
Response 6D643C	1F 04	00 - Get 10 - Get + CS	Note 1	04	Tuner, Note 2	PTY, Note 3	PI (MSB), Note 4	PI (LSB), Note 4

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-41286](#)

Note 2 - This byte indicates the selected tuner, depending on product specification:

- 01 Main Tuner
- and other specific for product (till 0xFF)

Note 3 - This byte indicates the Program Type Number (PTY).

0-31

0 means no PTY.

Note 4 - These two bytes indicate the Program Identification (PI).

As per standard it should be 0x1000-0xffff

0 means no PI

Example

GET PTY/PI for Background Tuner 2

- TX: 6D643E 1F 04 00 00 01 04
- RX: 6D643C 1F 04 00 01 04 04 00 00

6.1.3.5.3 1F 07 Tuner Signal Strength

PMH-54113 - 1F 07 Tuner Signal Strength

The software shall get the tuner signal strength value upon reception of DID_Tuner_Signal_Strength.

DID_Tuner_Signal_Strength

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1	Data Byte #2
Request 6D643E	1F 07	00 - Get 10 - Get + CS	00	01	Tuner, Note 2	
Response 6D643C	1F 07	00 - Get 10 - Get + CS	Note 1	02	Tuner, Note 2	Field Strength Value, Note 3

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-41286](#)

Note 2 - This byte indicates the selected tuner, depending on product specification:

ID	TUNER	HPCC
01	Main Tuner	Applicable

Note 3 - This byte indicates the Field Strength range [00,FF] (dbuV).

6.1.3.6 Media Features Group (0x28)

6.1.3.6.1 28 01 USB Read/Write

PMH-54117 - 28 01 USB Read/Write

The software shall perform a read/write operation on the requested USB device and report the test result upon reception of DID_USB_Read_Write.

DID_USB_Read_Write

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1	Data Byte #2
Request 6D643E	28 01	00 - Get 10 - Get + CS	00	01	Device Index Note 2	
Response 6D643C	28 01	00 - Get 10 - Get + CS	Note 1	02	Device Index Note 2	Test Result Note 3

Note: Before sending this command change unit read and write permissions (mount -no remount rw /) and change usb to host mode.

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-41286](#)

Note 2 - This byte indicates the Device Index, depending on product specification:

ID	Device
00	USB 2.0 (Supports only FAT32)
01	USB 3.0 (Supports only FAT32)

Note 3 - This byte indicates the Result Value:

- 00 FAILED
- 01 PASSED

Example

"GET read/write on USB #1"

- TX: 6D643E 28 01 00 00 01 01
- RX: 6D643C 28 01 00 01 02 01 01

6.1.3.6.2 28 02 USB Presence/Detection

PMH-54121 - 28 02 USB Presence/Detection

The software shall give a status about the presence or not on the external storage devices upon reception of DID_USB_Presence_Detection.

DID_USB_Presence_Detection

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1	Data Byte #2
Request 6D643E	28 02	00 - Get 10 - Get + CS	00	01	Device Index, Note 2	
Response 6D643C	28 02	00 - Get 10 - Get + CS	Note 1	02	Device Index, Note 2	Result Value, Note 3

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - This byte indicates the Device Index, depending on product specification:

Component	ID
USB 2.0	00
USB 3.0	01

Note 3 - This byte indicates the Result Value:

- 00 Device Not Present
- 01 Storage Device Present
- 02 Other Device Present

Example

"GET USB Presence"

- TX: 6D643E 28 02 00 00 01 01
- RX: 6D643C 28 02 00 01 02 02 01

6.1.3.6.3 28 03 USB Track Select

PMH-54125 - 28 03 USB Track Select

The software shall change or check the track selection when playing music from a USB device upon reception of DID_USB_Track_Select.

DID_USB_Track_Select

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1
Request 6D643E	28 03	01 - Set 11 - Set + CS	00	01	Track Number, Note 2
		00 - Get 10 - Get + CS	00	00	
Response 6D643C	28 03	01 - Set 11 - Set + CS	Note 1	00	
		00 - Get 10 - Get + CS	Note 1	01	Track Number, Note 2

Note 1 - This byte indicates the command processing status:

- 01 if the command was executed with success;
- 00 if the diagnostic command failed or was not executed for some reason

Note 2 - This byte indicates the Track number. The track number will take a value represented in a hex base.

Example

"SET track number 10 (10 dec = 0A hex)"

- TX: 6D643E 28 03 01 00 01 0A
- RX: 6D643C 28 03 01 01 00

6.1.3.6.4 28 06 USB Mode Setting

PMH-54129 - 28 06 USB Mode Setting

The software shall switch the USB 3 mode between Host Mode and Device/Peripheral Mode in the unit. Goal is to be able to perform diagnostics on this interface like Read/Write, Presence, and ADB enable disable etc, upon reception of DID_USB_Mode_Setting

DID_USB_Mode_Setting

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #2
Request 6D643E	28 06	01 - Set 11 - Set + CS	00	01	USB Mode Note 2
		00 - Get 10 - Get + CS	00	00	
Response 6D643C	28 06	01 - Set 11 - Set + CS	Note 1	00	
		00 - Get 10 - Get + CS	Note 1	01	USB Mode Note 2

Note 1 - This byte indicates the command processing status:

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- 01 if the command was executed with success;
- 00 if the diagnostic command failed or was not executed for some reason

Note 2 - This byte represents the USB Mode

ID	Interface
00	NONE
01	HOST
02	DEVICE/PERIPHERAL

Example

"SET USB 3 to DEVICE Mode Status (result - ON)"

- TX: 6D643E 28 06 01 00 01 02
- RX: 6D643C 28 06 00 01 00

6.1.3.7 Ethernet Features Group (0x34)

6.1.3.7.1 34 01 Ethernet Run state

PMH-57436 - Ethernet Runstate

The software shall enable or disable the Ethernet interfaces upon reception of DID_Ethernet_Runstate.

DID_Ethernet_Runstate

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1	Data Byte #2
Request 6D643E	34 01	01 - Set 11 - Set + CS	00	02	Interface, Note 2	Runstate status, Note 3
		00 - Get 10 - Get + CS	00	01	Interface, Note 2	
Response 6D643C	34 01	01 - Set 11 - Set + CS	Note 1	00		Runstate status, Note 3
		00 - Get 10 - Get + CS	Note 1	02	Interface, Note 2	

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - This byte represents the Interfaces available, depending on product specification:

- 01 **1000BASE-T1**

Note 3 - This byte represents the Runstate status and can have one of the following values:

- 00 OFF
- 01 ON

Example

"SET Ethernet Runstate ON

- TX: 6D643E 34 01 01 00 02 01 01
- RX: 6D643C 34 01 01 01 00

6.1.3.7.2 34 02 Ethernet MAC Address

PMH-57433 - Ethernet MAC Address

The software must get the mac address from the interface upon reception of DID_Ethernet_MAC_Address.

DID_Ethernet_MAC_Address

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1	Data Byte #2	Data Byte #3	...	Data Byte #7
Request 6D643E	34 02	00 - Get 10 - Get + CS	00	01	Interface, Note 2				
		00 - Get 10 - Get + CS	Note 1	07	Interface, Note 2	MAC Address (byte 1)	MAC Address (byte 2)		MAC Address (byte 6)

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - This byte represents the available Interfaces, depending on product specification:

- 02 SOC

Note 3 - Mac Address changed with this method doesn't overwrite Mac Address from persistence.

Example

"GET MAC ADDRESS OF INTERFACE 2"

- 6D643E 34 02 00 00 01 02
- 6D643E 34 02 01 00 07 02 00 42 4B 11 E F

6.1.3.7.3 34 03 Ethernet Loop Back Test

PMH-57528 - Ethernet Loop Back Test

The software shall perform a Loop Back Test routine at the Ethernet interface and report the result upon reception of DID_Ethernet_Loopback_Test.

DID_Ethernet_Loopback_Test

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1	Data Byte #2	Data Byte #3
Request 6D643E	34 03	00 - Get 10 - Get + CS	00	02	Interface, Note 2	Test, Note 3	
		00 - Get 10 - Get + CS	Note 1	03	Interface, Note 2	Test, Note 3	Result, Note 4

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

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Note 2 - This byte represents the Interfaces available, depending on product specification:
 - 01 - **1000BASE-T1**

Note 3- This byte represents the Ethernet loop back test mode:
 - 01 perform internal loop back test

Note 4- This byte indicates if the test was successful or not:
 - 00 FAILED
 - 01 PASSED

6.1.3.7.4 34 04 Ethernet Link Status

PMH-57532 - 34 04 Ethernet Link Status

The software shall read the link status of a certain Ethernet interface (passed as parameter) upon reception of DID_Ethernet_Link_Status.

DID_Ethernet_Link_Status.

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1	Data Byte #2
Request 6D643E	34 04	00 - Get 10 - Get + CS	00	01	Interface, Note 2	
Response 6D643C	34 04	00 - Get 10 - Get + CS	Note 1	02	Interface, Note 2	Link Status, Note 3

Note 1 - This byte indicates the command processing status:

- 01 if the command was executed with success;
- 00 if the diagnostic command failed or was not executed for some reason
- Other bytes for well defined problem with the command, for more information please read:

Note 2 - This byte represents one of the Interfaces available, depending on product specification:

- 00 - Android
- 01 - HYPERVISOR
- 02 - SOC
- 03 - CV2x
- 04 - TCU

Note 3 - The Link Status byte can take one of the following values:

- 01 Link Down
- 02 Link Up

Example:

GET Ethernet Link Status:

TX: 6D643E 34 04 00 00 01 00
RX: 6D643C 34 04 00 01 02 00 01/01

6.1.3.7.5 34 05 Ethernet IP

PMH-57534 - 34 05 Ethernet IP

The software shall perform all necessary actions to change the IP without the need of a system restart upon reception of DID_Ethernet_IP.

Changes perform to the system shall not persist after a unit restart (change shall affect run-time session only).

DID_Ethernet_IP.

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1	Data Byte #2	Data Byte #3	Data Byte #4	Data Byte #5	Data Byte #6	Data Byte #7	Data Byte #8	Data Byte #9
Request 6D643E	34 05	00 - Get 10 - Get + CS	00	01	Interface, Note 2								
Response 6D643C	34 05	00 - Get 10 - Get + CS	Note 1	09	Interface, Note 2	IP (MSB)	IP	IP	IP (LSB)	Mask (MSB)	Mask	Mask	Mask (LSB)

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - This byte represents one of the Interfaces available, depending on product specification:

- 00 - Android
- 01 - HYPERVISOR
- 02 - SOC
- 03 - CV2x
- 04 - 5G Modem

Example:

"SET interface IP to "192.168.1.34" and Mask to "255.255.255.0"

- TX: 6D643E 34 05 01 00 09 01 C0 A8 01 22 FF FF 00
- RX: 6D643C 34 05 01 01 00

6.1.3.7.6 34 06 Ethernet Configuration

PMH-57539 - Ethernet Configuration

The software shall verify how each interface are configured upon reception of DID_Ethernet_Configuration.

DID_Ethernet_Configuration.

Prefix	Diagnostics ID	Operation ID	Status	# of Bytes	Data Byte #1	Data Byte #2
Request 6D643E	34 06	00 - Get 10 - Get + CS	00	01	Interface, Note 2	
Response 6D643C	34 06	00 - Get 10 - Get + CS	Note 1	02	Configuration, Note 3	

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - This byte represents one of the Interfaces available, depending on product specification: 0x00

Note 3 - This byte represents the configuration, depending on product specification:

- 00 Deactivated
- 01 Slave
- 02 Master
- and other specific for product (till OxFF)

Example

"GET Ethernet Configuration (100 Mb Interface)"

- TX: 6D643E 34 06 00 00 01 00
- RX: 6D643C 34 06 00 01 01 01

6.1.3.8 CAN Feature Group(0x33)

6.1.3.8.1 33 01 CAN Dummy Messages

PMH-57814 - CAN Dummy Messages

Upon receiving the GET command the system shall receive the data from CAN interface (signal). The received data will be send back as data byte in response.

DID_CAN_Dummy_Messages.

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1	Data Byte #2
Request 6D643E	33 01	00 - Get 10 - Get + CS	00	01	CAN Interface, Note 2	
Response 6D643C	33 01	00 - Get 10 - Get + CS	Note 1	02	CAN Interface, Note 2	Data Received, Note 3

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - This byte represents the CAN interface, depending on product specification:

- 00 CAN_FD
- 01 CAN_HS
- and other specific for product (till OxFF)

Note 3 - This byte represents the CAN Message State:

- 00/01/02/03 for CAN_HS
- 00/01/02/03 for CAN_FD

Example

"GET CAN Message on CAN_FD"

- TX: 6D643E 33 01 00 00 01 00
- RX: 6D643C 33 01 00 01 00 01/02

6.1.3.8.2 33 03 CAN Error Status

PMH-57827 - CAN Error Status

The software shall return the CAN Error Status upon reception of DID_CAN_Error_Status.

DID_CAN_Error_Status.

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1	Data Byte #2
Request 6D643E	33 03	00 - Get 10 - Get + CS	00	01	CAN Transceiver Identifier (Note)	
Response 6D643C	33 03	00 - Get 10 - Get + CS	Note 1	02	CAN Transceiver Identifier (Note 2)	Status, Note 3

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - This byte represents the CAN Transceiver Identifier:

CAN Transceiver	ID	HPCC
CAN Transceiver 1	01	Applicable
CAN Transceiver 2	02	Applicable

Note 3 - This byte represents the Status:

In case transceiver TJA1043T we want to know the status of the pin 8

- 00 - LOW
- 01 - HIGH

Example

"Check status of Pin 8"

- TX: 6D643E 33 03 00 00 01 01
- RX: 6D643C 33 03 00 01 02 00 00

6.1.3.9 A2B Feature Group(0x38)

6.1.3.9.1 38 01 A2B Operation Mode

PMH-58191 - A2B Operation Mode

The software shall change the operation mode of the A2B chip / bus upon reception of this command.

Command Type	Prefix	Group ID	Test ID	Operation ID	Status	No. of Data Bytes	Data Byte 1	Data Byte 2
Request for SET	6D643E	38	01	01 - Set 11 - Set + CS	00	02	Note 2	Note 3
Response for SET	6D643C	38	01	01 - Set 11 - Set + CS	Note 1	00		

Command Type	Prefix	Group ID	Test ID	Operation ID	Status	No. of Data Bytes	Data Byte 1	Data Byte 2
Request for GET	6D643E	38	01	00 - Get 10 - Get + CS	00	01	Note 2	
Response for GET	6D643C	38	01	00 - Get 10 - Get + CS	Note 1	02	Note 2	Note 3

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - This byte represents the A2B transceiver device number which will depend on product specification

- 01 for HPCC A2B transceiver
- XX others are invalid

Note 3 - This byte represents the different operational Modes, depending on product specification

ID	Operation Mode
00	A2B BUS in Normal Mode (by default mode)
01	A2B BUS in Line_In_Slave Mode
02	A2B BUS in I _S _Loopback_Mode
03	A2B BUS in line_out_slave mode
04	A2B BUS in Differential output mode

Example:

"SET" A2B Operational Mode to "Line out slave mode - 03 " for A2B transceiver device number "01"

- **TX:** 6D643E 38 01 01 00 02 **01 03**
- **RX:** 6D643C 00 01 01 01 00

"GET" Read the current A2B Operational Mode for A2B transceiver device number "01"

- **TX:** 6D643E 38 01 00 00 01 **01**
- **RX:** 6D643C 38 01 00 01 02 **01 03**

6.1.3.9.2 38 02 A2B Bus Status

PMH-58183 - A2B Bus Status

The software shall return the current bus status and also how many nodes the system has detected in the the A2B network upon reception of this command.

Command Type	Prefix	Group ID	Test ID	Operation ID	Status	No. of Data Bytes	Data Byte 1	Data Byte 2	Data Byte 3	Data Byte 4
Request for GET	6D643E	38	02	00 - Get 10 - Get + CS	00	01	Note 2			
Response for GET	6D643C	38	02	00 - Get 10 - Get + CS	Note 1	04	Note 2	Note 3	Note 4	Note 5

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - This byte represents the A2B transceiver device number which will depend on product specification

- 01 for HPCC A2B transceiver
- XX others are invalid

Note 3 - This byte gives status of A2B bus enable and disable.

- 00 OFF
- 01 ON

Note 4 - This byte gives No. of A2B slaves connected to A2B bus. and Expected Slave count based on configuration.

- 00 Evaluation board Not detected
- 01 Evaluation board detected

Note 5 - This byte displays the Fault Code, depending on product specification

ID	Fault Code
00	Working : No Line Fault
01	Error: Open A2B Interface wire
02	Error: Short between A2B interface wires
03	Error: Short of A2B Interface wire to GND
04	Error: Short of A2B Interface wire to V_Battery
05	Error: Reverse of A2B Interface wires / Defective Node
FF	Error: unknown error

Example:

"GET" Read the current A2B Bus status for A2B transceiver device number "01" - If Evaluation board is NOT connected

- **TX:** 6D643E 38 02 00 00 01 **01**
- **RX:** 6D643C 38 02 00 01 04 01 01 **00 01** - 0 Slave detected with Open A2B wire fault

"GET" Read the current A2B Bus status for A2B transceiver device number "01" - If Evaluation board is connected

- **TX:** 6D643E 38 02 00 00 01 **01**
- **RX:** 6D643C 38 02 00 01 04 01 01 **01 00** - 1 slave detected with No Line fault

6.1.3.9.3 38 07 A2B Audio Loop Back

A2B Audio Loop Back

The software shall set the A2B operational mode to A2B Audio Loop Back mode upon reception of this command.

Command Type	Prefix	Group ID	Test ID	Operation ID	Status	No. of Data Bytes	Data Byte 1
Request for SET	6D643E	38	10	01 - Set 11 - Set + CS	00	01	Note 2
Response for SET	6D643C	38	10	01 - Set 11 - Set + CS	Note 1	00	Note 2

Note 1 - This byte indicates the command processing status:

• A P T I V •

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - This byte represents enable and disable A2B Loop back mode.

- 00 OFF
- 01 ON

Example:

"SET" A2B Loop Back Mode Enable

- TX: 6D643E 38 07 01 00 01 **01**
- RX: 6D643C 38 07 01 01 01 **01**

"SET" A2B Loop Back Mode Disable

- TX: 6D643E 38 07 01 00 01 **00**
- RX: 6D643C 38 07 01 01 01 **00**

6.1.3.10 Video Group Features(0x46)

6.1.3.10.1 46 01 VIDEO Output Pattern

PMH-58452 - VIDEO Output Pattern

After the picture is grabbed (using FrameGrabber), the software shall compare it against a reference picture and check for errors, upon reception of DID_VIDEO_Output_Pattern.

PMH-58449 - Video Output Pattern - Output definitions

The output pattern shall be generated by SOC and transmitted to Video-OUT, via the HDMI lines between them.

DID_VIDEO_Output_Pattern.

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1	Data Byte #2
Request 6D643E	46 01	01 - Set 11 - Set + CS	00	02	Video-OUT ID , Note 2	Output Pattern, Note 3
Response 6D643C	46 01	01 - Set 11 - Set + CS	Note 1	00		

Note 1 - This byte indicates the command processing status:

- 01 if the command was executed with success;
- 00 if the diagnostic command failed or was not executed for some reason
- Other bytes for well defined problem with the command, for more information please read:

Note 2 - This byte represents the Video-OUT Chip, depending on product specification:

Interface	ID
CID	00
PID	01
DID	02

Note 3 - Output Pattern to be used in Video-OUT/APIX interfaces.

Description	ID
Blackmura	00
Black	01
Blue	02
Green	03
Red	04
White	05
Clear Pattern	06

Example

"SET Output pattern - Color Bars (1280 x 720)"

- TX: 6D643E 46 01 01 00 06 01 10 05 00 02 D0
- RX: 6D643C 46 01 01 01 00

"SET Output pattern - Color Bars (1280 x 720)"

- TX: 6D643E 46 01 01 00 06 01 10 05 00 02 D0
- RX: 6D643C 46 01 01 01 00

6.1.3.10.2 46 02 VIDEO Output Routing

PMH-58461 - VIDEO Output Routing

When VIDEO-IN gets a locked (LOCK) signal and there is no error (ERR) or line fault (LFLT) signaled by the Video-IN chip, the input shall be routed through the VIDEO-OUT chip upon reception of DID_VIDEO_Output_Routing.

DID_VIDEO_Output_Routing.

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1	Data Byte #2	Data Byte #3
Request 6D643E	46 02	01 - Set 11 - Set + CS	00	03	Note 2	Note 3	Note 4
Response 6D643C	46 02	01 - Set 11 - Set + CS	Note 1	00			

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2: This byte provides the Input interface number:

Interface	ID	8295	8155-MID	8155-LOW
AHD1	01	NA	Applicable	Applicable
AHD2	02	NA	Applicable	Applicable
AHD3	03	NA	Applicable	NA
AHD4	04	NA	Applicable	NA
DOMS	05	Applicable	NA	NA
SVS input (GMISL tools digital input)	06	Applicable	Applicable	NA

Note 3: This byte provides the Output interface number:

Interface	ID
CID (Infotainment)	01

Note 4- This byte provides routing activation and deactivation:

- 00 Routing deactivated
- 01 Routing activated

Example

"SET Routing Active from Input Interface 1 (AHD1) to Output Interface 1 (CID) "

- TX: 6D643E 46 02 01 00 03 01 01 01
- RX: 6D643C 46 02 01 01 03 01 01 01

6.1.3.10.3 46 04 VIDEO-IN Line Fault Diagnostics

PMH-58763 - VIDEO-IN Line Fault Diagnostics

VIDEO-IN chip has a built-in line-fault detector that monitors line failures such as short to ground, short to battery, and open link for system-fault diagnosis upon reception of DID_VIDEO-IN_Line_Fault_Diagnostics.

DID_VIDEO-IN_Line_Fault_Diagnostics.

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1	Data Byte #2
Request 6D643E	46 04	00 - Get 10 - Get + CS	00	01	Note 2	
Response 6D643C	46 04	00 - Get 10 - Get + CS	Note 1	02	Note 2	Line Fault Status, Note 3

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [\[PMH-412826\]](#)

Note 2 - This byte provides the Input interface number:

Interface- 8295	Interface- 8155 Low	Interface- 8155 Mid	ID
DOMS	NA	NA	01
SVS (Surround View System)	NA	NA	02
NA	AHD_1	AHD_1	03
NA	AHD_2	AHD_2	04
NA	NA	AHD_3	05
NA	NA	AHD_4	06

Note 3- This byte represents the Line Fault Status, depending on product specification:

Fault	ID
Cable wire shorted to supply voltage	00
Cable wire shorted to ground	01
Normal Operation	02
Cable wire disconnected	03

Note 4- AHD Cameras does not support faults "Cable wire Shorted To Ground" and "Cable wire disconnected" individually to get created- Both the conditions of the Faults are indicated by STG byte value.

Example

"Get Line Fault Status"

- TX: 6D643E 46 04 00 00 01 00
- RX: 6D643C 46 04 00 01 02 00 02

6.1.3.10.4 46 05 VIDEO-OUT Line Fault Diagnostics

PMH-58895 - VIDEO-OUT Line Fault Diagnostics

VIDEO-OUT chip has a built-in line-fault detector that monitors line failures such as short to ground, short to battery, and open link for system-fault diagnosis.

This feature enables the trigger/report back such faults, upon reception of DID_VIDEO-OUT_Line_Fault_Diagnostics.

DID_VIDEO-OUT_Line_Fault_Diagnostics.

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1	Data Byte #2
Request 6D643E	46 05	00 - Get 10 - Get + CS	00	01	Display Note 2	
Response 6D643C	46 05	00 - Get 10 - Get + CS	Note 1	02	Note 2	Line Fault Status, Note 3

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [\[PMH-412826\]](#)

Note 2 - This byte provides the output interface number:

Display	ID

CID	00
PID	01
DID	02
ARHUD (not supported)	03

Note 3- This byte indicates the Line Fault Status, depending on product specification:

Fault	ID
Cable wire shorted to supply voltage	00
Cable wire shorted to ground	01
Normal Operation	02
Cable wire disconnected	03

Example

*Get Line Fault Status for CID *

- TX: 6D643E 46 05 00 00 01 00
- RX: 6D643C 46 05 00 01 02 01 03 (Based on Fault it will change)

6.1.3.10.5 46 06 VIDEO Serializer / Deserializer Register Status

PMH-58897 - VIDEO Serializer / Deserializer Register Status

The software shall query (or change the status) a certain register, in order to check (or simulate certain conditions) current values in a manufacturing test system upon reception of DID_VIDEO_Serializer_Deserializer_Register_Status.

DID_VIDEO_Serializer_Deserializer_Register_Status.

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1	Data Byte #2	Data Byte #3 #4	Data Byte #5
Request 6D643E	46 06	01 - Set 11 - Set + CS	00	05	Interface, Note 2	Serializer/De-Serializer Note 3	Register Address Note 4	Register Value
		00 - Get 10 - Get + CS	00	04	Interface, Note 2	Serializer/De-Serializer Note 3	Register Address Note 4	
Response 6D643C	46 06	01 - Set 11 - Set + CS	Note 1	00				
		00 - Get 10 - Get + CS	Note 1	05	Interface, Note 2	Serializer/De-Serializer Note 3	Register Address Note 4	Register Value

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - This byte indicates the interface number, depending on product specification:

Interface	Device	ID-8295	ID-8155
Interface 1	CID	00	00
Interface 2	PID	01	01
Interface 3	DID	02	02
Interface 4	ARHUD	03	NA

Note 3 -

- 00 - Serializer
01 - De-Serializer

Note 4 -

Register Address for serializer and Deserializer can be obtained from the MAXIM Serializer/Deserializer Manual.

Address of registers and its read/write access details can be get it from manual.

Ser - data sheet :

https://spo.aptv.com/sites/0317-10055696/Electrical/008%20DATASHEETS/Serializer%20and%20deserializer/GMSL2_Customers_MAX96745_MAX96747_DS_F1_WM.pdf?CT=1728295296602&OR=ItemsView

De-Ser - data sheet :

<https://spo.aptv.com/sites/0317-10055696/Electrical/Forms/PDP%20Design%20Cycle%20View.aspx?id=%2Fsites%2F0317%2D10055696%2Electrical%2F008%20DATASHEETS%2FSerializer%20and%20deserializer%2FMAX96714%2Epdf&parent=%2Fsites%2F0317%2D10055696%2Electrical%2F008%20DATASHEETS%2FSerializer%20and%20deserializer&p=true&ga=1>

Example

Set Serializer Interface 01 Register 3D Status to 01

- TX: 6D643E 46 06 01 00 05 00 00 3D 01
- RX: 6D643C 46 06 01 01 00

6.1.3.10.6 46 08 VIDEO Deserializer PWDN Control

PMH-58890 - VIDEO Deserializer PWDN Control

The software shall be able to evaluate if the GPIO states are changing accordingly with the state of the Serializer/Deserializer (SerDes). To do it so, it is necessary to be able to control on demand the PWDN input of the SerDes devices.

Note: Special consideration to when there is a request to set the PWDN pin to HIGH, all necessary routines shall be triggered in order to have support for other tests (i.e. OUTPUT Pattern, etc).

DID_VIDEO_Serializer_Deserializer_PWDN_Control

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1
Request 6D643E	46 08	01 - Set 11 - Set + CS	00	01	Interface, Note 2
Response 6D643C	46 08	01 - Set 11 - Set + CS	Note 1	00	

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

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Note 2 - This byte indicates the interface number, depending on product specification:

- 00 - CID
- 01 - PID
- 02 - DID
- 03 - HUD

Example

"SET Serializer PWDN Control HIGH"

- TX: 6D643E 46 08 01 00 01 01
- RX: 6D643C 46 08 01 01 00

6.1.3.11 Diagnostics Part Feature Group(0x50)

6.1.3.11.1 50 01 Temperature Sensors

PMH-59309 - Temperature Sensors

The software shall get the temperatures values from the different sensor upon reception . Temperature values can take both positive and negative value, its necessary to make sure the value reported for temperature are expressed in an absolute way and signal indication is also present on the system response.

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1	Data Byte #2	Data Byte #3	Data Byte n
Request 6D643E	50 01	00 - Get 10 - Get + CS	00	01	ID of Temperature Sensor, Note 2			
Response 6D643C	50 01	00 - Get 10 - Get + CS	Note 1	n, note 6	ID of Temperature Sensor, Note 2	Signal, Note 3	Temperature, Note 4	-- Note 5

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - This byte indicates the Component ID from where the temperature will be measured, depending on product specification:

Sensor	ID	Component	HPCC (8295)	HPCC (8155)
Sensor 1	00	BoardTempSensor Amplifier	Applicable-(VIP)	Applicable-(VIP)
Sensor 2	01	BoardTempSensor Tuner	Applicable-(VIP)	Applicable-(VIP)
Sensor 3	02	BoardTempSensor Memory	N/A	Applicable-(VIP)
Sensor 6	05	SOC	Applicable-(SOC)	Applicable-(SOC)
Sensor 7	06	Crystal/ XO	Applicable-(SOC)	N/A
Sensor 8	07	PMIC	Applicable-(SOC)	Applicable-(SOC)
Sensor 4	03	TCU	Applicable	Applicable
Sensor 5	04	Cv2X	Applicable	Applicable

Note 3 - This by indicates the temperature Signal possible values:

- 00 Positive
- 10 Negative

Note 4 - Temperature value in absolute representation.

Note 5 - In case of SOC Internal Temperatures, can have multiple bytes.

Example: "GET Temperature from TMP451AQDQFRQ1 sensor (Temperature is -10°C)"

- TX: 6D643E 50 01 00 00 01 03
- RX: 6D643C 50 01 00 01 03 03 10 0A

6.1.3.11.2 50 02 Apple Authentication

PMH-59373 - 50 02 Apple Authentication

The software shall evaluate the condition of the Apple Authentication chip upon reception.

SET Operation will start the test and publish the test result in the response .

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1
Request 6D643E	50 02	01 - Set 11 - Set + CS	00	00	
Response 6D643C	50 02	01 - Set 11 - Set + CS	Note 1	01	Test Result, Note 2

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - This byte indicates the Test Result:

- 00 Fail
- 01 Pass.

Example: "SET Apple Authentication"

- TX: 6D643E 50 02 01 00 00
- RX: 6D643C 50 02 01 01 01 01

6.1.3.11.3 50 04 Fan RPM

PMH-59375 - 50 04 Fan RPM

The software shall control and verify the fan's velocity (in RPM) upon reception of DID_FAN_RPM.

DID_FAN_RPM.

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1	Data Byte #2	Data Byte #3
Request 6D643E	50 04	01 - Set 11 - Set + CS	00	01	Operation Mode (Automatic), Note 2		
		03			Operation Mode (Manual), Note 2	RPM Value (MSB, LSB), Note 3	
		00 - Get		00			

Response 6D643C	50 04	10 - Get + CS				
		01 - Set 11 - Set + CS	Note 1	00		
		00 - Get 10 - Get + CS	Note 1	03	Operation Mode, Note 2	RPM Value (MSB, LSB), Note 3

Note 1 - This byte indicates the command processing status:

- 01 if the command was executed with success;
- 00 if the diagnostic command failed or was not executed for some reason.

Note 2 - This byte indicates the Fan Operation Mode:

- 00 Automatic
- 01 Manual

Note 3 - These two bytes show the RPM value:

It shall be expressed by 2 bytes, i.e. 6800 rpm's = 1A90 => #2 Data Byte = "1A" and #3 Data Byte = "90".

Example

"GET Fan RPM (Fan is rotating @ 5000 rpm in Automatic mode)"

- TX: 6D643E 50 04 00 00 00
- RX: 6D643C 50 04 00 01 03 00 13 88
Hex 1388 = Dec 5000

6.1.3.11.4 50 05 iPerf3

PMH-59381 - 50 05 iPerf3

During EOL Tests network interfaces need to be tested. In order to have more detailed data about the performance of such interfaces, we do need to enable iPerf3 so that information related with bandwidth, etc is known. When enabling iPerf3 tool, please call the following command: "iperf3 -s -1". With these options iPerf3 will start as a server and will exit after 1 connection is established.

DID_IPerf

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #2	Data Byte #2
Request 6D643E	50 05	01 - Set 11 - Set + CS	00	02	Iperf device Note 3	Enable/Disable, Note 2
		00 - Get 10 - Get + CS	00	01	Iperf device Note 3	
Response 6D643C	50 05	01 - Set 11 - Set + CS	Note 1	00		
		00 - Get 10 - Get + CS	Note 1	02	Wlan/Ethernet, Note 3	Enable/Disable, Note 2

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - This byte enables or disables the iPerf 2(Android) / iPerf3(QNX):

- 00 OFF
- 01 ON

Note 3 - This byte is for Iperf device

- 00 - WLAN
- 01 - Ethernet

6.1.3.11.5 50 13 ASIL_B Clock Frequency

PMH-155777 - 50 13 ASIL_B Clock Frequency

The software shall return VIP clock frequency upon reception of DID_ASILB_Clock_Frequency

DID_ASILB_Clock_Frequency

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #2 - #3
Request 6D643E	50 13	00 - Get 10 - Get + CS	00	00	
Response 6D643C	50 13	00 - Get 10 - Get + CS	Note 1	02	Clock Frequency, note 2

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 -

This byte indicates the clock frequency in KHz.

First byte is the MSB and Second byte is the LSB.

Example:

TX: 6D643E 50 13 00 00 00
RX: 6D643C 50 13 00 01 02 4B 00 -> 19200 KHz

6.1.3.11.6 50 14 ASIL_B Voltage Monitoring

PMH-155871 - 50 14 ASIL_B Voltage Monitoring

The software shall monitor and return the value of the 8 voltage rails upon reception of DID_ASILB_Voltage_Monitoring.

DID_ASILB_Voltage_Monitoring

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes
Request 6D643E	50 14	00 - Get 10 - Get + CS	00	00
Response 6D643C	50 14	00 - Get 10 - Get + CS	Note 1	20

Data Byte #1 #2	Data Byte #3 #4	Data Byte #5 #6	Data Byte #7 #8	Data Byte #9 #10	Data Byte #11 #12	Data Byte #13 #14	Data Byte #15 #16
Voltage Rail 1 Target, note 2	Voltage Rail 1 Measure, note	Voltage Rail 2 Target, note 2	Voltage Rail 2 Measure, note 2	Voltage Rail 3 Target, note 2	Voltage Rail 3 Measure, note 2	Voltage Rail 4 Target, note 2	Voltage Rail 4 Measure, note 2

2

Note 1: This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2: This byte indicates the voltage rail in mV.

First byte is the MSB and second byte is the LSB.

Note 3: 8155 has 7 voltage rails and 8295 has 8 voltage rails

8155 ASIL			Min	Typ	Max
Voltage Rail 1	PMIC2_VSW_S10C_RC_SENSE		198	252	305
Voltage Rail 2	VREG_S7C_S8C_S9C_0P752_RC_SENSE		198	252	305
Voltage Rail 3	VREG_L18C_0P88_RC_SENSE		198	252	305
Voltage Rail 4	VREG_S1A_S2A_S3A_S10A_0P752_RC_SENSE		242	307	371
Voltage Rail 5	VREG_S4A_1P8_RC_SENSE_MIN		543	555	571
Voltage Rail 6	VREG_S7A_0P6_RC_SENSE_MIN		179	180	195
Voltage Rail 7	VREG_L8C_1P2_RC_SENSE_MIN		357	371	393

Voltage Rail	8295 ASIL Voltage	Min	Typical	Max
1	SIP_VMON_CX_3V3	184	309	345
2	SIP_VMON_L3G_3V3	297	370	446
3	SIP_VMON_MM_3V3	181	309	341
4	SIP_VMON_S4A_3V3	367	309	682
5	SIP_VMON_S3E_3V3	181	313	341
6	SIP_VMON_AP0_3V3	201	344	373
7	SIP_VMON_AP1_3V3	201	344	373
8	PSU_5V0_SW_PGOOD	948	1023	1024

6.1.3.11.7 50 OC Antenna Diagnostics**PMH-59396 - 50 OC Antenna Diagnostics**

The software shall check the current status of each interface upon reception of DID_Antenna_Diagnostics.

The status is based on the Diagnostic Values [mA] of each interface.

DID_Antenna_Diagnostics.

Prefix	Diagnostics ID	Operation ID	Status	#Number of Data Bytes	Data Byte #1	Data Byte #2
Request 6D643E	50 0C	00 - Get 10 - Get + CS	00	01	Note 2	
Response 6D643C	50 0C	00 - Get 10 - Get + CS	Note 1	02	Note 2	Note 3

Note 1: This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2: Antenna

ID	Antenna	Supported Diagnostics
01	AM/EM	All
02	5G Antenna 1	
03	5G Antenna 2	
04	5G Antenna 3	
05	5G Antenna 4	
06	Cv2X Antenna 1	Open & STG
07	Cv2X Antenna 2	
08	GPS	Open & STG

Note 3: Diagnostic Status

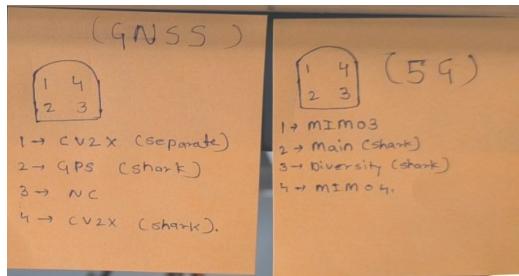
ID	Diagnostic Status
00	Open
01	Normal
02	Short to GND
03	Fault (Short by battery)

Note 4: The Fault levels are configured in MPI for each Fault (Open, STG, Fault), more details on specific address and values needs to be checked with the Development team/EOL MPI team.

Note 4: Pin details:

ID	Antenne	Port	Pin
0x02	5G1	Blue	2
0x03	5G2	Blue	1
0x04	5G3	Blue	4
0x05	5G4	Blue	3
0x06	Cv2x1	Pink	1
0x07	Cv2x2	Pink	4
0x08	GPS	Pink	2

• APTIV •



Example

Get Diagnostic Status of FM2 ONLY Interface on JP Hardware Variant
TX: 6D643E 50 0C 00 00 01 06
RX: 6D643E 50 0C 00 01 02 06 01

6.1.3.11.8 50 OE Thermal Management Limits

PMH-59402 - 50 OE Thermal Management Limits

The software shall Set/Get HKP limits (Max/Min) for temperature management above/below which AP shall be turned off/Not started upon reception of DID_Thermal_Management_Limits.

DID_Thermal_Management_Limits.

Prefix	Test ID	Operation ID	Status	#Data Bytes	#1 Data Byte	#2 Data Byte	#3 Data Byte	#4 Data Byte	#5 Data Byte	#6 Data Byte
Request 6D643E	50 OE	01 - Set 11 - Set + CS	00	06	Min Temp limit Note 2	Max limit for FAN OFF	FAN ON limit #1	FAN ON limit #2	FAN ON limit #3	Max Temp limit Note 3
		00 - Get 10 - Get + CS	00	00						
Response 6D643C	50 OE	01 - Set 11 - Set + CS	Note 1	00						
		00 - Get 10 - Get + CS	Note 1	06	Min Temp limit Note 2	Max limit for FAN OFF	FAN ON limit #1	FAN ON limit #2	FAN ON limit #3	Max Temp limit Note 3

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-41286](#)

Note 2 - This byte indicates Min temperature value. [min temp max value is >-40]

Generally it is a negative value, so though from command passed is real value its interpreted as negative.

Example : 40 has to be interpreted by software and tester as -40.

Note 2 - This byte indicates Max temperature value. [max temp max value is <95]

Important points to be considered while testing.

1. Values updated by this command are not persistent and will be replaced with default values, after sleep cycle.
2. Cannot give two bytes with same max values, this will result in undefined behavior.
3. The max temperatures cannot be greater than 95 degC.
4. Each value in the request is the max value (inclusive) for the corresponding table and should be a continuous range

Example :

TX: 6D643E 50 0E 01 00 07 **40** 44 55 70 85 95

Min Temp (Table A) <= -40
-41 <= Table ON Fan OFF <= 44
45 <= Table ON Fan On <= 55
56 <= Table A <= 70
71 <= Table B <= 85
86 <= Table C <= 95

Details about the Different tables identified here are captured in the Thermal Degradation document in the sahrepoint, sheet : Thermal-Degradation-SBX Thermal_Degradation_Requirement_Reqs-DV

Note 7 : the Recovery temperature limit for each table it considered to be -5 degrees, for 1st Databyte its +5 degrees.

Example

*SET temperature range

- TX: 6D643E 50 0E 01 00 06 **50** 50 65 70 85 90
- RX: 6D643C XX XX 01 01 00

*GET temperature range

- TX: 6D643E 50 0E 00 00 00
- RX: 6D643C XX XX 00 01 06 **50** 50 65 70 85 90

6.1.3.11.9 50 OF Internal Amplifier Fault Status

PMH-59404 - 50 OF Internal Amplifier Fault Status

The software shall perform a test for all loudspeakers upon reception of DID_Internal_Amplifier.

The content of the test shall be the same as the Customer Diagnostic for this component.

DID_Internal_Amplifier.

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1	Data Byte #2	Data Byte #3	...	Data Byte #n
Request 6D643E	50 0F	01 - Set 11 - Set + CS	00	00					
		00 - Get 10 - Get + CS	00	00					
Response 6D643C	50 0F	01 - Set 11 - Set + CS	Note 1	00					
		00 - Get 10 - Get + CS	Note 1	04	Channel 1	Channel 2	Channel 3	...	Channel #n

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-41286](#)

Channel - This byte indicates the status for individual channel:

- bit 0(LSB) -1 -> (Short to Ground) : 0x00 - no error, 0x01 - error, 0x02 - not tested
- bit 2-3 -> (Short to Battery) : 0x00 - no error, 0x01 - error, 0x02 - not tested
- bit 4-5 -> (Circuit Open) : 0x00 - no error, 0x01 - error, 0x02 - not tested
- bit 6-7(MSB) -> (Short to Load) : 0x00 - no error, 0x01 - error, 0x02 - not tested

Note 2 – The channel ID is assigned to a channel name in the product, depending on product specification:

Channel ID	Channel Name	8295	8155
Channel 1	Rear Right	NA	Applicable
Channel 2	Rear Left	NA	Applicable
Channel 3	Front Left	NA	Applicable
Channel 4	Front Right	NA	Applicable
Channel 5	VESS Rear	Applicable	Applicable
Channel 6	VESS Front	Applicable	Applicable

6.1.3.11.9.1 50 13 ASIL B Clock Frequency

PMH-154681 - 50 13 ASIL B Clock Frequency

The software shall return clock frequency upon reception of DID_ASILB_Clock_Frequency

DID_ASILB_Clock_Frequency

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1 - #3
Request 6D643E	50 13	00 - Get 10 - Get + CS	00	00	
Response 6D643C	50 13	00 - Get 10 - Get + CS	Note 1	03	Clock Frequency, note 2

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2: This byte indicates the clock frequency in KHz.

First byte is the MSB and third byte is the LSB.

Example:

TX: 6D643E 50 13 00 00 00

RX: 6D643C 50 13 00 01 03 31 FE A3 -> 3276451 KHz

6.1.3.11.9.2 50 14 ASIL B Voltage Monitoring

50 14 ASIL B Voltage Monitoring

The software shall monitor and return the value of the 8 voltage rails upon reception of DID_ASILB_Voltage_Monitoring.

DID_ASILB_Voltage_Monitoring

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes											
Request 6D643E	50 14	00 - Get 10 - Get + CS	00	00											
Response 6D643C	50 14	00 - Get 10 - Get + CS	Note 1	20											
Data Byte #1 #2	Data Byte #3 #4	Data Byte #5 #6	Data Byte #7 #8	Data Byte #9 #10	Data Byte #11 #12	Data Byte #13 #14	Data Byte #15 #16	Data Byte #17 #18	Data Byte #19 #20	Data Byte #21 #22	Data Byte #23 #24	Data Byte #25 #26	Data Byte #27 #28	Data Byte #29#30	Data Byte #31 #32
Voltage Rail 1 Target, note 2	Voltage Rail 1 Measure, note 2	Voltage Rail 2 Target, note 2	Voltage Rail 2 Measure, note 2	Voltage Rail 3 Target, note 2	Voltage Rail 3 Measure, note 2	Voltage Rail 4 Target, note 2	Voltage Rail 4 Measure, note 2	Voltage Rail 5 Target, note 2	Voltage Rail 5 Measure, note 2	Voltage Rail 6 Target, note 2	Voltage Rail 6 Measure, note 2	Voltage Rail 7 Target, note 2	Voltage Rail 7 Measure, note 2	Voltage Rail 8 Target, note 2	Voltage Rail 8 Measure, note 2

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2: This byte indicates the voltage rail in mV.

First byte is the MSB and second byte is the LSB.

Note 3 : This table below shows the ranges for ASIL voltages:

8295 Table with ADC counts

ADC Pin	ADC count min	ADC count typical	ADC count max
SIP_VMON_CX_3V3	184	309	345
SIP_VMON_L3G_3V3	297	370	446
SIP_VMON_MM_3V3	181	309	341
SIP_VMON_S4A_3V3	367	309	682
SIP_VMON_S3E_3V3	181	313	341
SIP_VMON_AP0_3V3	201	344	373
SIP_VMON_AP1_3V3	201	344	373
PSU_SVO_SW_PGOOD	948	1023	1024

8155 Table with ADC counts

ADC Pin	ADC count min	ADC count typical	ADC count max
PMIC2_VSW_S10C_RC_SENSE	198	252	305
VREG_S7C_S8C_S9C_0P752_RC_SENSE	198	252	305
VREG_L18C_0P88_RC_SENSE	198	252	305
VREG_S1A_S2A_S9A_S10A_0P752_RC_SENSE	242	307	371
VREG_S4A_1P8_RC_SENSE	543	557	571
VREG_S7A_0P6_RC_SENSE	179	187	195
VREG_L8C_1P2_RC_SENSE	357	371	393

6.1.3.11.10 50 15 IMU Malfunction**PMH-210392 - 50 15 IMU Malfunction**

Software shall give the fault status of IMU sensor

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1
Request 6D643E	50 15	00 - Get 10 - Get + CS	00	00	
Response 6D643C	50 15	00 - Get 10 - Get + CS	Note 1	01	Note 2

Note 1 - This byte indicates the command processing status:

- 01 if the command was executed with success;
- 00 if the diagnostic command failed or was not executed for some reason
- Other bytes for well defined problem with the command, for more information please read:

Note 2: Indicates the fault status of IMU(DTCs)

This DTC Status can be interpreted according to the following table (according to ISO 14229):

Bit no. (hex)	Name
00- LSB	Test failed
01	Test failed this monitoring/operational cycle
02	Pending DTC
03	Confirmed DTC
04	Test not completed since last clear
05	Test failed since last clear
06	Test not completed this monitoring/operation cycle
07- MSB	Warning indicator request

Example:

GET Operation:

6D643E 50 15 00 00 00
 6D643C 50 15 00 01 01 2F ---> Status of DTC

6.1.3.11.11 50 16 eSIM Malfunction**PMH-211045 - 50 16 E-SIM Malfunction**

Software shall give the fault status of eSIM

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1
Request 6D643E	50 16	00 - Get 10 - Get + CS	00	00	
Response 6D643C	50 16	00 - Get 10 - Get + CS	Note 1	01	Note 2

Note 1 - This byte indicates the command processing status:

- 01 if the command was executed with success;
- 00 if the diagnostic command failed or was not executed for some reason
- Other bytes for well defined problem with the command, for more information please read:

Note 2: Indicates the fault status of eSIM (DTCs)

This DTC Status can be interpreted according to the following table (according to ISO 14229):

Bit no. (hex)	Name
00- LSB	Test failed
01	Test failed this monitoring/operational cycle
02	Pending DTC
03	Confirmed DTC
04	Test not completed since last clear
05	Test failed since last clear
06	Test not completed this monitoring/operation cycle
07-MSB	Warning indicator request

Example:

GET Operation:

6D643E 50 16 00 00 00
 6D643C 50 16 00 01 01 2F ---> Status of DTC

6.1.3.11.12 50 17 TellTale**50 17 TellTale**

Software shall give the state (On/Off) of the requested feature of TellTale.

DID_TellTale

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1	Data Byte #2
Request 6D643E	50 17	01 - Set 11 - Set + CS	00	02	Note 2	Note 3
		00 - Get 10 - Get + CS	00	01	Note 2	
Response 6D643C	50 17	01 - Set 11 - Set + CS	Note 1	00		
		00 - Get 10 - Get + CS	Note 1	02	Note 2	Note 3

Note 1 - This byte indicates the command processing status:

- 01 if the command was executed with success;
- 00 if the diagnostic command failed or was not executed for some reason
- Other bytes for well defined problem with the command, for more information please read:

Note 2 - This byte indicates DID we want to read/write

- 00 F080
- 01 FOAO
- 02 F081
- 03 FOA1



List of Telltale feature supported under above DID are attached here:

Note 3 - Actual Data to write in HEX.

Need to convert data to hex after assigning bits for any DID

Setting feature 0,1,5 for any DID will give value as 0010 0011--> 13 in Hex

Example:

Setting last four TellTale feature in FOAO DID

6D643E 50 17 01 00 02 01 FO
6D643C 50 17 01 01 00

Reading the state of feature in FOAO DID

6D643E 50 17 00 00 01 01
6D643C 50 17 00 01 02 01 FO

6.1.3.11.13 50 18 Spread Spectrum**PMH-240081 - 50 18 Spread Spectrum**

The software shall enable and Disable spread spectrum for VIP, SOC, A2b. For VIP it will enable spread spectrum for power supplies, for SOC it will enable spread spectrum Serializer (OLDI) and De-serializer (GMSL), For A2b it will enable spread spectrum based on pre set values from ADI.

DID_Spread_Spectrum

Request 6D643E	50 18	01 - Set 11 - Set + CS	00	03	ID, Note 2	Note 3	Value Note 4	
		00 - Get 10 - Get + CS	00	01	ID, Note 2			
Response 6D643C	50 18	01 - Set 11 - Set + CS	Note 1	00				
		00 - Get 10 - Get + CS	Note 1	03	ID, Note 2	Note 3	Value Note 4	

Note 1:

- 00 - Failure
- 01 - Success

Note 2: Spread Spectrum applicable for below IC's

ID	IC-8155	IC-8295
00	CID - De-Ser	CID - De-Ser
01	PID - De-Ser	PID - De-Ser
02	DID - De-Ser	DID - De-Ser
03	ARHUD - NA	ARHUD- Ser and De-Ser
04	ALL Displays - Ser and De-Ser	ALL Displays - Ser and De-Ser
05	ADI - (A2B)	ADI - (A2B)
06	4 CH Amplifier	4 CH Amplifier
07	-	SVS
08	-	DMS & DOMS
12	LVDS Amplitude - CID	LVDS Amplitude - CID
13	LVDS Amplitude - PID	LVDS Amplitude - PID
14	LVDS Amplitude - DID	LVDS Amplitude - DID

Note 3:

- 00 - Disable
- 01 - Enable

Note 4: this is applicable for Display Ser and De-Ser.

4.1) For ID's 00, 01, 03, 04, 06, 07

Spread spectrum Value will be the percentage of the spread required. It would be last 3 bits for modifying. The value can be as in below table:

Value	binary	Spread percentage val
0x01	0000 0001	0.25%
0x02	0000 0010	0.5%
0x03	0000 0011	1%
0x04	0000 0100	2%
0x05	0000 0101	4%
0x06	0000 0110	4%
0x07	0000 0110	4%

4.2) For ID's 02, 05, 08 the spread mode will be

Value	Spread Mode
1	Center Spread
2	Down Spread
3	Reserved

Example:

Enabling VIP Spread spectrum

6D643E 50 18 01 00 02 **00 01** - Enabling the spread spectrum of serializer 1 (CID)

6D643C 50 18 01 **01 00** - Success response

Getting VIP Spread Spectrum Status

6D643E 50 18 00 00 01 **00** - Getting details of Serializer 1 (CID)

6D643C 50 18 00 01 03 **00 01 05**

6.1.3.11.14 50 19 RTC Read/Write

PMH-240081 - 50 19 RTC read/Write

The software shall read or write the RTC values upon reception of this Command request.

Prefix	Test ID	Operation ID	Status	#Data Length	#1 Byte	#2 Byte	#3 byte	#4 byte	#5 byte	#6 byte	#7 byte
Request 6D643E	50 19	01 - Set 11 - Set + CS	00	07	year[LSB]	Month	Day	Hour	Minute	Second	Weekday
		00 - Get 10 - Get + CS	00	00							
Response 6D643C	50 19	01 - Set 11 - Set + CS	Note 1	00							
		00 - Get 10 - Get + CS	Note 1	07	year [LSB]	Month	Day	Hour	Minute	Second	Weekday

Note 1 :

00 - Failure

01 - Success

Example:

GET RTC info - 6D643E 50 19 00 00 00

SET RTC info - 6D643E;6D643E 50 19 01 00 07 20 01 01 02 05 01 01 (set to 2032 1st JAN - 2:05AM)

6.1.3.11.15 50 1A Read SWDL Progress

Read SWDL Progress

CMD Type	Prefix	Group ID	Test ID	Operation ID	Status	No: Data Bytes	Data Byte 1	Data Byte 2	Data Byte 3	Data Byte 4
Request for GET	6D643E	50	1A	00 - Get 10 - Get + CS	00	00				
Response for GET	6D643C	50	1A	00 - Get 10 - Get + CS	Note 1	04	Note 2	Note 3	Note 4	Note 5

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - Installation status

- 0 - Initial
- 1 - Idle
- 2 - Download
- 3 - Ready For Slot Switch
- 4 - Slot Switch
- 5 - Slot Switch Failed
- 6 - Slot Switch Succeeded.
- 7 - Revert
- 8 - Completing Update

Note 3: Error Code

- 0 = Success
- 1 = Error

Note 4: Update type

- 0 = USB
- 1 = OTA
- 2 = UDS
- 3 = Co-Ordinated_OTA
- 4 = Other // e.g Fast boot

Note 5: Percentage in Progress

- 0-0x64 (This will be applicable only download/installation is in progress)

Example : GET Installation status

TX - 6D643E 50 1A 00 00 00
 RX - 6D643C 50 1A 00 01 04 xx xx xx xx

6.1.3.11.16 50 1B SOH Enable/Disable

SOH Enable/Disable

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1
Request 6D643E	50 1B	01 - Set 11 - Set + CS	00	01	Note 2
		00 - Get 10 - Get + CS	00	00	
Response 6D643C	50 1B	01 - Set 11 - Set + CS	Note 1	00	
		00 - Get 10 - Get + CS	Note 1	01	Note 2

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - This byte allows to enable or disable the SOH:

- A5 Disable
- 00 Enable

Example 6D643E 50 1B 01 00 01 A5 - SOH disable

Note:

Current : 0x00 -> Enable, **0x01 -> Disable**

New : 0x00 -> Enable, **0xA5 -> Disable**

6.1.3.11.17 50 1C ARHUD MFG Enable/Disable

This command is used to enable/disable Arhud mfg.

Command Type	Prefix	Group ID	Test ID	Operation ID	Status	# of Data Bytes	Data Byte #1
Request SET	6D643E	50	1C	01 - Set 11 - Set + CS	00	1	Note 2
Response SET	6D643C	50	1C	01 - Set 11 - Set + CS	Note 1	00	

Command Type	Prefix	Group ID	Test ID	Operation ID	Status	# of Data Bytes	Data Byte #1
Request GET	6D643E	50	1C	00 - Get 01 - Get + CS	00	00	
Response GET	6D643C	50	1C	00 - Get 01 - Get + CS	Note 1	01	Note 2

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - This byte indicates the value of Longitudinal Distance

Min value: 00

Max Value: 70

Default value: 0F

Note : Above mentioned value are in Hex, Actual Value will be Hex_value+35

Example: Disable Arhud Mfg 6D643E 50 1C 01 00 01 00

Example:

Disable Arhud Mfg

6D643E 50 1C 01 00 01 00

6.1.3.12 Gyroscope / Accelerometer feature group (0x5B)

6.1.3.12.1 5B 02 Gyroscope / Accelerometer Readout Values

PMH-184383 5B 02 Gyroscope / Accelerometer Readout Values

The software shall read analog values (raw) directly from chip about current readout upon reception of DID_Gyroscope_Accelerometer_Readout_Values.

DID_Gyroscope_Accelerometer_Readout_Values

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1	-	-	Data Byte #13
Request 6D643E	5B 02	00 - Get 10 - Get + CS	00	00				
Response 6D643C	5B 02	00 - Get 10 - Get + CS	Note 1	0D	Note 2			Note 2

Note 1 - This byte indicates the command processing status:

- 01 if the command was executed with success;
- 00 if the diagnostic command failed or was not executed for some reason

Note 2 :

Information	Data Bytes
Reserved	1
Measured Gyro x data	2-3
Measured Gyro y data	4-5
Measured Gyro z data	6-7
Measured ACC data x data	8-9
Measured ACC data y data	10-11
Measured ACC data z data	12-13

Example:

Read Accelerometer/Gyro Values

- TX: 6D643E 5B 02 00 00 00
- RX: 6D643C 5B 02 00 01 0D **79 FD** B6 00 79 FD B6 00 17 3C 17 3C C3

Conversion for Actual Value: 79 FD to decimal 31229 (In some cases value can be negative as well)
 $31229/100 = 321.29$

6.1.3.13 Software Features Group (0x64)**6.1.3.13.1 64 01 Software ID****PMH-157101 - 64 01 Software ID**

The unit shall get information about software in all components capable of inform about its software version upon reception.

If there isn't information regarding the SW ID, then the response value should be a constant fail code.

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1	...	Data Byte #n
Request 6D643E	64 01	00 - Get 10 - Get + CS	00	01	Component ID, Note 2		
Response 6D643C	64 01	00 - Get 10 - Get + CS	Note 1	n Data Bytes	Component ID, Note 2	...	SW ID, Note 3

Note 1 - This byte indicates the command processing status:

- 01 if the command was executed with success;
- 00 if the diagnostic command failed or was not executed for some reason

Note 2 - Component ID.

ID	Component	HPCC
00	BT	Applicable
01	ADB device ID	Applicable
XX	..	Not applicable

Note 3 - Software ID up to n bytes within a range of [00,FF].

Pre condition : BT must be ON for reading SW firmware version for BT (12byte Data) .

Example

*GET SW ID of ADB device ID *

- TX: 6D643E 64 01 00 00 01 01
- RX: 6D643C 64 01 00 01 09 01 33 35 31 31 64 35 36 62

6.1.3.13.2 64 02 Software Version**PMH-218757 - 64 02 Software Version**

The unit shall get information about software in all components capable of inform about its software version upon reception.

If there isn't information regarding the SW Version, then the response value should be a constant fail code.

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1	...	Data Byte #n
Request 6D643E	64 02	00 - Get 10 - Get + CS	00	01	Component ID, Note 2		
Response 6D643C	64 02	00 - Get 10 - Get + CS	Note 1	n Data Bytes	Component ID, Note 2		SW Version, Note 3

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - Component ID.

ID	SW version	Size in Bytes
00	BOOT SOFTWARE IDENTIFICATION (Boot Loader version of the HPC_C, It shall not stored in VIP NVM , it is dynamically read)	27
01	APPLICATION SOFTWARE IDENTIFICATION (VIP, SoC (Android + QNX), CV2X, Telematic , VIP Boot+HSM and Modem as a combined entity, It shall not stored in VIP NVM , it is dynamically read from different component.)	27
02	SYSTEM SUPPLIER ECU SOFTWARE VERSION NUMBER Refer struct: F195	120

Note 3 - Software version up to n bytes within a range of [00,FF].

Example: *GET SW Version of Boot software*

TX: 6D643E 64 02 00 00 01 00

RX: 6D643C 64 02 00 01 1C 00 57 36 31 30 48 50 43 43 41 50 42 48 44 30 30 2E 30 30 2E 30 30 32 34 31 32 30 37

6.1.3.13.3 64 04 Software Checksum

PMH-150074: Requested SW checksum of the various partitions (byte 2) of the flash memory listed in data byte 1. DID_Software_Checksum

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1	Data Byte #2	Data Byte #3	Data Byte #4	Data Byte #5
Request 6D643E	64 04	00 - Get 10 - Get + CS	00	01	Partition, Note 2				
Response 6D643C	64 04	00 - Get 10 - Get + CS	Note 1	5	Partition, Note 2	MSB of checksum	--	--	LSB of checksum

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - This byte represents the Partition Number, depending on product specification:

ID	partition name	used by	Qnx	Android
00	la_super	Android	NA	RO
01	modem_a	Android&QNX	RO	RO
02	modem_b	Android	NA	RO
03	bluetooth_a	Android&QNX	RO	RO
04	bluetooth_b	Android	NA	RO
05	la_vms_a	Android	NA	RO
06	la_vms_b	Android	NA	RO
07	sw_info_a	QNX	RO	RO
08	sw_info_a	QNX	RO	NA
09	vip_a	QNX	RO	NA
0A	vip_b	QNX	RO	NA
0B	if2_a	QNX	RO	NA
0C	if2_b	QNX	RO	NA
0D	system_a	QNX	RO	NA
0E	system_b	QNX	RO	NA

Note: Currently For all variants above table is same.

Example:

GET SW checksum for bluetooth_b

TX: 6D643E 64 04 00 00 01 04

Rx: 6D643C 64 04 00 01 05 04 00 00 20 6C ---> Checksum Value

6.1.3.14 WLAN features - 0x84

6.1.3.14.1 84 01 WLAN Run state

PMH-156623 - 84 01 WLAN Run state

The software shall change the run state and read the current run state of the WLAN upon reception of DID 0x8401 Command.

Note: By default WLAN the Run state (ON/OFF) will be applicable to AP mode (Hotspot). Cannot modify or read WLAN station mode (wi-Fi) state with this command.

Command Type	Prefix	Group ID	Test ID	Operation ID	Status	No. of Data Bytes	Data Byte 1
Request for SET	6D643E	84	01	01 - Set 11 - Set + CS	00	01	Note 2
Response for SET	6D643C	84	01	01 - Set 11 - Set + CS	Note 1	00	

Command Type	Prefix	Group ID	Test ID	Operation ID	Status	No. of Data Bytes	Data Byte 1
Request for GET	6D643E	84	01	00 - Get 10 - Get + CS	00	00	
Response for GET	6D643C	84	01	00 - Get 10 - Get + CS	Note 1	01	Note 2

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - This byte represents the Run state Mode

- 00 OFF
- 01 ON

Example:

"Set WLAN Run State ON of AP mode"

- TX: 6D643E 84 01 00 01 01
- RX: 6D643C 84 01 01 01 00

"Set WLAN Run State OFF of AP mode"

- TX: 6D643E 84 01 00 00 00
- RX: 6D643C 84 01 00 01 01 XX

- XX can be 00 (OFF) or 01 (ON)

6.1.3.14.2 84 02 WLAN MAC Address

PMH-156684 - 84 02 WLAN MAC Address

The software shall read the WLAN MAC address data upon reception of DID 0x8402 Command.

Command Type	Prefix	Group ID	Test ID	Operation ID	Status	No. of Data Bytes	Data Byte 1	Data Byte 2 to 7
Request for GET	6D643E	84	02	00 - Get 10 - Get + CS	00	01	Note 2	
Response for GET	6D643C	84	02	00 - Get 10 - Get + CS	Note 1	07	Note 2	Note 3

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - This byte represents the Interfaces available, depending on product specification:

ID	Interface	HPCC
00	WLAN 0 - Client mode or station mode	NA
01	WLAN 2 - Access Point mode or Hotspot Mode	Applicable

Note 3 - 6 bytes of MAC Address (6 hex values) - MSB to LSB without ()

Example:

Get WLAN MAC Address for AP mode

- TX: 6D643E 84 02 00 00 01 01
- RX: 6D643C 84 02 00 01 07 01 FA 6B 14 06 DD EF -> 250:107:20:06:221:239

6.1.3.14.3 84 03 WLAN Device Mode

84 03 WLAN Device Mode

The software shall write and read WLAN AP mode - SSID and Password upon reception of DID 0x8403 Command.

Command Type	Prefix	Group ID	Test ID	Operation ID	Status	No. of Data Bytes	Data Byte 1	Data Byte 2 to 9	Data Byte 10 to 17	Data Byte 18	Data Byte 19	Data Byte 20 to 21
Request for SET	6D643E	84	03	01 - Set 11 - Set + CS	00	15	Note 2	Note 3	Note 4	Note 5	Note 6	Note 7
Response for SET	6D643C	84	03	01 - Set 11 - Set + CS	Note 1	00						

Command Type	Prefix	Group ID	Test ID	Operation ID	Status	No. of Data Bytes	Data Byte 1	Data Byte 2 to 9	Data Byte 10 to 17	Data Byte 18	Data Byte 19
Request for GET	6D643E	84	03	00 - Get 10 - Get + CS	00	00					
Response for GET	6D643C	84	03	00 - Get 10 - Get + CS	Note 1	Note 8	Note 2	Note 3	Note 4	Note 5	Note 6

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - This byte represents the Interfaces available, depending on product specification

D	Interface	HPCC
00	WLAN 0 - Client mode or station mode	NA
01	WLAN 2 - Access Point mode or Hotspot Mode	Applicable

Note 3 - SSID is 8 bytes fixed, ASCII coded

Note 4 - Password (8 chars) fixed, ASCII coded

Note 6 - Hide SSID
 00 - SSID visible
 01 - SSID hidden

Note 5 - Security Type
 00 - WPA2 personal
 01 - WPA2/WPA3 transition
 02 - WPA3 personal

Note 7 - 2 bytes - only Channel 36 : value 24 37
 ACS - Automatic Channel Selection is available as of now

Note 8 - 1byte data length varies based reading default data or newly set data.
 for default - 21 bytes SSID and 15 bytes Password is set - 0x27 (39) bytes total length
 for custom - 8 bytes SSID and 8 bytes Password is set - 0x13 (19) bytes total length

Example:

Get WLAN MAC Address for AP mode - by default (21 bytes SSID and 15 bytes password)

- TX: 6D643E 84 03 00 00 00
- RX: 6D643C 84 03 00 01 27 01 4D 41 48 49 4E 44 52 41 20 45 2D 53 55 56 4F 53 34 32 30 32 34 33 6B 33 4B 33 4B 6E 4A 71 72 33 43 43 4A 33 00 00

Set WLAN Device mode for AP mode

- TX: 6D643E 84 03 01 00 15 01 4D 41 4E 5F 44 49 41 47 73 72 69 6E 69 76 61 73 00 00 24 37
- RX: 6D643C 84 03 01 01 00

Get WLAN MAC Address for AP mode - After setting new SSID and Password

- TX: 6D643E 84 03 00 00 00
- RX: 6D643C 84 03 00 01 31 01 4D 41 4E 5F 44 49 41 47 73 72 69 6E 69 76 61 73 00 00

6.1.3.14.4 84 08 WLAN IP Address

PMH-158889 - 84 08 WLAN IP Address

The software shall read the WLAN IP address data upon reception of DID 0x8408 Command.

Command Type	Prefix	Group ID	Test ID	Operation ID	Status	No. of Data Bytes	Data Byte 1	Data Byte 2 to 5	Data Byte 6 to 9
Request for GET	6D643E	84	08	00 - Get 10 - Get + CS	00	01	Note 2		
Response for GET	6D643C	84	08	00 - Get 10 - Get + CS	Note 1	09	Note 2	Note 3	Note 4

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - This byte represents the Interfaces available, depending on product specification

D	Interface	HPCC
00	WLAN 0 - Client mode or station mode	NA
01	WLAN 2 - Access Point mode or Hotspot Mode	Applicable

Note 3 - 4bytes of IP Address (4 hex values) - MSB to LSB without (:)

Note 4 - 4bytes of IP Mask bytes (4 hex values) - MSB to LSB

Example:

* GET IP Address (in this case 192.168.5.1) *

- TX: 6D643E 84 08 00 00 01 01
- RX: 6D643C 84 08 00 01 09 01 C0 A8 05 01 FF FF FF 00

6.1.3.14.5 84 10 WLAN IP Ping other Device**PMH-179148 - 84 10 WLAN IP Ping other Device**

The software shall be able to ping via the WLAN interface to other connected devices upon reception of DID 0x8410 command.

Command Type	Prefix	Group ID	Test ID	Operation ID	Status	No. of Data Bytes	Data Byte 1	Data Byte 2 to 5	Data Byte 6
Request for SET	6D643E	84	10	01 - Set 11 - Set + CS	00	06	Note 2	Note 3	Note 4
Response for SET	6D643C	84	10	01 - Set 11 - Set + CS	Note 1	00			

Command Type	Prefix	Group ID	Test ID	Operation ID	Status	No. of Data Bytes	Data Byte 1	Data Byte 2
Request for GET	6D643E	84	10	00 - Get 10 - Get + CS	00	01	Note 2	
Response for GET	6D643C	84	10	00 - Get 10 - Get + CS	Note 1	02	Note 2	Note 5

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - This byte indicates WLAN interface

- 01 for HPCC

Note 3 - This byte indicates IP address.

- 4 Bytes of connected device's IP address

Note 4 - This byte indicates time duration

- time duration for ping – max (0xFF) and min (0x01) in sec

Note 5 - This byte indicates ping status

- 00 Ping Process Failed
- 01 Ping Process Success

Example :

SET Ping device of interface "01" with IP Address *192.168.75.117* = "C0 A8 4B E9" for "0F" == 15 Seconds

- TX: 6D643E 84 10 01 00 06 01 C0 A8 4B E9
- RX: 6D643C 00 01 01 00

GET Read the ping status before 15 seconds

- TX: 6D643E 84 10 00 00 01 01
- RX: 6D643C 84 10 00 01 AA 00 (AA - ping to other device is in Progress).

GET Read the ping status after 15 seconds

- TX: 6D643E 84 10 00 00 01 01
- RX: 6D643C 84 10 00 01 01 XX (XX - value depends on ping is success or not).

6.1.3.14.6 84 0B WLAN Default SSID and Password**84 0B WLAN Default SSID and Password**

The software shall be able to set to default SSID and password of WLAN upon reception of DID 0x840B Command.

Command Type	Prefix	Group ID	Test ID	Operation ID	Status	No. of Data Bytes
Request for GET	6D643E	84	0B	01 - Set 11 - Set + CS	00	00
Response for GET	6D643C	84	0B	01 - Set 11 - Set + CS	Note 1	00

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note: We can verify or read default password and SSID using 84 03 feature.

Example:

SET to default SSID and password for AP mode*

- TX: 6D643E 84 0B 01 00 00
- RX: 6D643C 84 0B 01 01 00

6.1.3.15 8C 01 ADC Feature Group**6.1.3.15.1 8C 01 ADC Read**

PMH-208537 - 8C 01 ADC Read
 The software shall read a single A/D channel (Reference to Internal A/D Reference Voltage) upon reception of DID_ADC_Read. Acquiring readings from the A/D port is most needed, since it will be used to check if the Sense circuits are behaving properly.

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1	Data Byte #2	Data Byte #3	Data Byte #4
Request 6D643E	8C 01	00 - Get 10 - Get + CS	00	02	Processor, Note 2	Channel, Note 3		
Response 6D643C	8C 01	00 - Get 10 - Get + CS	Note 1	04	Processor, Note 2	Channel, Note 3	Reading Value (MSB), Note 4	Reading Value (LSB), Note 4

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - This byte represents the Processor, depending on product specification:

- 00 VIP
- and other specific for product (till 0xFF)

Note 3 - This byte specifies the Channel that we want to interact with, depending on product specification

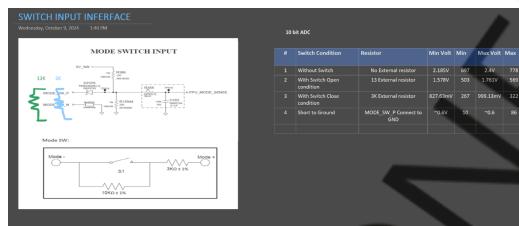
ID	Port	Pin	Signal (8295)	Signal (8155)
0	PORT 0 (AP0_0)	K15	BATTERY_PPU_SENSE	BATTERY_VOL_RC_SENSE
1	PORT 0 (AP0_1)	L17	BOARD_TEMP1_SENSE	BOARD_TEMP_SENSE_PPU
2	PORT 0 (AP0_2)	L16	PMIC_THERM_P	NA TP
3	PORT 0 (AP0_3)	M17	SOC_THERM_P	NA TP
4	PORT 0 (AP0_4)	L15	MEM_THERM_P	ANT_FMAM_CUR_RC_SENSE
5	PORT 0 (AP0_5)	M16	A2B1_I_SENSE	A2B1_CUR_RC_SENSE
6	PORT 0 (AP0_6)	N17	A2B2_I_SENSE	NA TP
7	PORT 0 (AP0_7)	N16	NC	NA TP
8	PORT 0 (AP0_8)	M15	SIP_VMON_CX_3V3	NA TP
9	PORT 0 (AP0_9)	P17	SIP_VMON_MXA_3V3	PBATT_SW_VOL_RC_SENSE
A	PORT 0 (AP0_10)	P16	SIP_VMON_L3G_3V3	SPARE_TEMP_SENSE_PPU
OB	PORT 0 (AP0_11)	N15	RBOOT_PPU_B4_SENSE	RBOOT_PPU_B4_SENSE
OC	PORT 0 (AP0_12)	R17	RBOOT_PPU_B3	RBOOT_PPU_B3
OD	PORT 0 (AP0_13)	P15	RBOOT_PPU_B2	RBOOT_PPU_B2
OE	PORT 0 (AP0_14)	R16	RBOOT_PPU_B1	RBOOT_PPU_B1
OF	PORT 0 (AP0_15)	T17	RBOOT_PPU_B0	RBOOT_PPU_B0
10	PORT 1 (AP1_0)	C17	BOARD_TEMP2_SENSE	VREG_S7A_0P6_RC_SENSE
11	PORT 1 (AP1_1)	D15	PSU_5V0_SW_PGOOD	PMIC2_VSW_S10C_RC_SENSE
12	PORT 1 (AP1_2)	D16	SIP_VMON_LBG_3V3	VREG_STC_S8C_S9C_0P752_RC_SENSE
13	PORT 1 (AP1_3)	D17	SIP_VMON_MM_3V3	VREG_LBC_1P2_RC_SENSE
14	PORT 1 (AP1_4)	F14	PPU_SOS_SW+	VREG_L18C_0P88_RC_SENSE
15	PORT 1 (AP1_5)	E15	NC	VREG_S3A_0P752_RC_SENSE
16	PORT 1 (AP1_6)	E16	SIP_VMON_S4A_3V3	VREG_S1A_S2A_S9A_S10A_0P752_RC_SENSE
17	PORT 1 (AP1_7)	F15	AMFM_CURRENT_SENSE	VREG_S4A_1P8_RC_SENSE
18	PORT 1 (AP1_8)	E17	SIP_VMON_NSP_3V3	A2B2_CUR_RC_SENSE
19	PORT 1 (AP1_9)	F16	SIP_VMON_S3E_3V3	PPU_MODE_SENSE (Note 1)
1A	PORT 1 (AP1_10)	G14	PPU_VESS_SW	USB2_IMON_RC_SENSE
1B	PORT 1 (AP1_11)	G15	SIP_VMON_MXC_3V3	NA TP
1C	PORT 1 (AP1_12)	B16	PPU_FUEL_LEVEL_IND_IN	NA TP
1D	PORT 1 (AP1_13)	C15	SIP_VMON_APC0_3V3	PPU_SOS_SW+
1E	PORT 1 (AP1_14)	B17	PSU_EARLY_VRAIL_3V3_SW_SENSE	NA TP
1F	PORT 1 (AP1_15)	C16	SIP_VMON_APC1_3V3	NC

Note 4 - In these bytes we will have the ADC count value representation measured at the pin.

Example: "GET ADC count of AP0_1 - board_Temp1_sense"

- TX: 6D643E 8C 01 00 00 02 00 01
- RX: 6D643C 8C 01 00 01 04 00 01 01 C2

Note 1:



6.1.3.16 Hardware features Group

6.1.3.16.1 78 01 Components Hardware ID

PMH-60335 - 78 01 Components Hardware ID

The software shall report about the hardware version of the all components (if applicable) upon reception of DID_Components_Hardware_ID.

DID_Components_Hardware_ID.

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1	Data Byte #2	...	Data Byte #n
Request 6D643E	78 01	00 - Get 10 - Get + CS	00	01	Component ID, Note 2			
Response 6D643C	78 01	00 - Get 10 - Get + CS	Note 1	n	Component ID, Note 2	HW ID MSB, Note 3		HW ID LSB, Note 3

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - This byte represents the Component ID, depending on product specification:

ID	HW component	Size (in Bytes)	8295	8155	Comments
00	ECU serial number	13	Yes	Yes	Not Supported Use 66 11 command
01	Main SoC	4	Yes	Yes	
02	UFS 2.1	18	Yes	Yes	Not Supported
03	BT	4	Yes	Yes	BT power OFF-ON cycle needs to be done before reading.
04	MCU / VIP	9	Yes	Yes	
05	A2B Master	8	Yes	Yes	
06	Silverbox version	4	Yes	Yes	

07	Serializer version CID, PID	01	Yes	Yes	
08	Serializer version HUD (only B295), DID	01	Yes	No	
09	De-serializer version	01	Yes	Yes	

iant Value Project MIB3+;

Note 3 - Identification of the Software ID for the component, shall arrive in Hex format, example *OS81118BFR* shall translate to *4f533831313138424652*.

Example

GET HWID Mainboard (variant resistor coding)

Note: Since the ITS is generally reused for multiple projects the response will have following structure *HW01DAB* and avoid project details.

- TX: 6D643E 78 01 00 00 01 00
- RX: 6D643C 78 01 00 01 09 00 48 57 30 31 44 41 42 00

Example:

GET *Mainboard Hardware Version (RBOOT)*

Note: 2 bytes are dedicated to specify RBOOT.

- TX: 6D643E 78 01 00 00 01 01
- RX: 6D643C 78 01 00 01 04 01 WX YZ A0

W -Rboot0 value [true/false]
 X -Rboot1 value [true/false]
 Y -Rboot2 value [true/false]
 Z -Rboot3 value [true/false]
 A - Rboot4 value [true/false]

Example:

GET Hardware ID (Tunerboard)

- TX: 6D643E 78 01 00 00 01 02
- RX: 6D643C 78 01 00 01 08 02 4F 53 38 31 31 31 38 42 46 52

Example:

Get N/A component ID - as 0A is not a component HW ID.

- TX: 6D643E 78 01 00 00 01 0A
- RX: 6D643C 78 01 00 00 00 -

6.1.3.17 Hardware Memory Features Group

6.1.3.17.1 66 01 - Persistent Memory Read / Write

PMH-152064 - 66 01 Persistent Memory Read / Write

The software shall permit to configure the units memory according to EOL MPI and support both reading (GET) and writing (SET) from memory upon cmd reception.

Prefix	Diagnostics ID	Operation ID	Status	No. of Data Bytes	Data Byte #1-#4	Data Byte #5	Data Byte #6-#n
Request 6D643E	66 01	01 - Set 11 - Set + CS	00	Note 2	Memory Address, Note 3	Number of Memory bytes, Note 4	Value, Note 5
		00 - Get 10 - Get + CS	00	05	Memory Address, Note 3	Number of Memory bytes, Note 4	
Response 6D643C	66 01	01 - Set 11 - Set + CS	Note 1	00			
		00 - Get 10 - Get + CS	Note 1	Note 2	Memory Address, Note 3	Number of Memory bytes, Note 4	Value, Note 5

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - length of Number of Data bytes.

Note 3 - Memory Address: 0xFF204400 to FF204D4A

Note 4 - Number of Memory bytes: Number of memory data bytes to read or to write.

Note 5 - Values read from or to be written in memory. Data Byte #6 is MSB.

Note: Supporting Maximum 80 memory read/write data bytes. so cmd will fail if you try read/write more than 80 bytes.

```
/* GET_Emem_Block_Base_Address Nv<_Block_Size
   Mv_Block_Id */\n\n
(0xFF204400,          448,           NvMConf_NvMBlockDescriptor_NvM_Diagnostics_DataBlock_1), \
(0xFF2045C2,          448,           NvMConf_NvMBlockDescriptor_NvM_Diagnostics_DataBlock_2), \
(0xFF204784,          320,           NvMConf_NvMBlockDescriptor_NvM_Diagnostics_DataBlock_3), \
(0xFF2000BC,          32,            NvMConf_NvMBlockDescriptor_NvM_Uart_Salt_Key), \
(0xFF2000DE,          32,            NvMConf_NvMBlockDescriptor_NvM_Uart_Hash_Key), \
(0xFF20312E,          61,            NvMConf_NvMBlockDescriptor_NvM_MCMConnFeatCode), \
(0xFF2031C4,          30,            NvMConf_NvMBlockDescriptor_NvM_MCMSDVFeatCode), \
(0xFF2031E4,          10,            NvMConf_NvMBlockDescriptor_NvM_MCMCV2XFeatCode), \
(0xFF200B40,          36,            NvMConf_NvMBlockDescriptor_NvM_EOL_Mandiag), \
```

Note: To save data into permanent memory or reflect new data changes in functional behavior unit restart or sleep cycle is required.

Example

GET EEPROM data (read 6 bytes from address 0x00102030)

- TX: 6D643E 66 01 00 00 05 00 10 20 30 06
- RX: 6D643C 66 01 00 01 08 00 10 20 30 06 AA BB CC DD EE FF

Write 7Bytes from EEPROM beginning with address 0x00123456:

- TX: 6D643E 66 01 00 0C 00 12 34 56 07 AA AA AA AA AA AA AA
- RX: 6D643C 66 01 01 01 0C 00 12 34 56 07 AA AA AA AA AA AA AA

6.1.3.17.2 66 02 Factory Defaults**PMH-196868 - 66 02 Factory Defaults**

The software shall reset the given EEPROM memory block to ROM defaults upon reception.

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1
Request 6D643E	66 02	01 - Set 11 - Set + CS	00	01	Block Number, Note 2
Response 6D643C	66 02	01 - Set 11 - Set + CS	Note 1	00	

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [\[PMH-412826\]](#)

Note 2 - This byte represents the EEPROM Block Number

Supported block number range is **01 to 09**, and **FF** for all

Example: *Reset the EEPROM Block 02 to default values*

TX: 6D643E 66 02 01 00 01 02

RX: 6D643C 66 02 01 01 00

6.1.3.17.3 66 03 Persistence Memory Check**PMH-196868 - Persistence Memory Check**

The software shall check the VIP SOC persistence memory check and confirm the data are same.

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes
Request 6D643E	66 03	01 - Set 11 - Set + CS	00	00
Response 6D643C	66 03	01 - Set 11 - Set + CS	Note 1	00

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1
6D643E	66 03	00 - Get 10 - Get + CS	00	00	--
6D643C	66 03	00 - Get 10 - Get + CS	Note 1	01	Note 2

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [\[PMH-412826\]](#)

Note 2: This byte indicates the test status:

- **00 FAILED**
- **01 PASSED**

6.1.3.17.4 66 04 Save Persistence**PMH-196868 - Save Persistence**

The Software shall save all information into memory, without the need for a Sleep-Cycle (or Power-Cycle), when this routine is triggered, upon reception of DID_Save_Persistence

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes
Request 6D643E	66 04	01 - Set 11 - Set + CS	00	00
Response 6D643C	66 04	01 - Set 11 - Set + CS	Note 1	00

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [\[PMH-412826\]](#)

6.1.3.17.5 66 06 RAM Self Test**66 06 RAM Self Test**

The software shall load 1MB of data for a free area in RAM memory, read back and compare the data upon reception of DID_Ram_Self_test

DID_RAM_Self_Test Prefix Diagnostics ID Operation ID Status # of Data Bytes Data...

DID_RAM_Self_Test

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1
Request 6D643E	66 06	01 - Set 11 - Set + CS	00	00	
Response 6D643C	66 06	01 - Set 11 - Set + CS	Note 1	01	Note 2

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [\[PMH-412826\]](#)

Note 2: This byte indicates the test status:

- 00 fail
- 01 pass

Example

Execute Ram Self Test:

TX: 6D643E 66 06 01 00 00

RX: 6D643C 66 06 01 01 00/01

6.1.3.17.6 66 11 EOL Parameter Read-Write**66 11 EOL Parameter Read-Write**

The SW shall read/write the data for EOL parameters list based on the request.

Command Type	Prefix	Group ID	Test ID	Operation ID	Status	# of Data Bytes	Data Byte #1	Data Byte #2	Data Byte #3	...	Data Byte #N
Request SET	6D643E	66	11	01 - Set 11 - Set + CS	00	Note 4	Note 2 ID	Note 3	Actual Data		Actual Data
Response SET	6D643C	66	11	01 - Set 11 - Set + CS	Note 1	00					

Command Type	Prefix	Group ID	Test ID	Operation ID	Status	# of Data Bytes	Data Byte #1	Data Byte #2	Data Byte #3	...	Data Byte #N
Request GET	6D643E	66	11	00 - Get 10 - Get + CS	00	01	Note 2 ID				
Response GET	6D643C	66	11	00 - Get 10 - Get + CS	Note 1	Note 3+1	Note 2	Actual Data	Actual Data		Actual Data

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [\[PMH-412826\]](#)

Note 2 -ID/ Note 3-Length

ID	Parameter (Note 2)	Size (hex) (Note 3)
00	SITE_CODE	1
01	SHIFT_ID	1
02	DAILY_SEQUENCE_NUM	4
03	SB Part Identification Code	3
04	SB Supplier Code Number	7
05	PCBA Part No/Reserved	8
06	SB M (Reserve for Manufacturing)	0C
07	MCM_Connectivity Feature code	3D
08	MCM_CV2X Feature code	A
09	Display Customer Partnumber/Reserved_1	10
0A	SB Customer Partnumber	10
0B	SYSTEM_SUPPLIER_IDENTIFIER	10
0C	ECU MANUFACTURING DATE/ PRODUCTION_DATE	6
0D	ECU Serial Number	D
0E	SYSTEM_SUPPLIER PART NUMBER/Aptiv Partnumber	D
0F	VIN-VEHICLE IDENTIFICATION NUMBER	11
10	SYSTEM NAME/ENGINE TYPE	10
11	REPAIR SHOP CODE/TESTER SERIAL NUMBER	10
12	Programming Date	6
13	ECU INSTALLATION DATE	6
14	MODEL NUMBER	12
15	VARIANT CODE	14
16	FEATURE_CODE_IS	3C
17	FEATURE_CODE_IC	3C
18	MESN Number	0A

Note 3 :

The length of the data byte

Note 4 :

Length will depend on ID which we are trying to write.

Note: To save data into permanent memory or reflect new data changes in functional behavior unit restart or sleep cycle is required.

Example :**Set SHIFT_ID**

Tx: 6D643E 66 11 01 00 03 01 01 0A (0A is Shift ID)

Rx: 6D643E 66 11 01 01 00

Get SHIFT_ID

Tx: 6D643E 66 11 00 00 01 01

Rx: 6D643E 66 11 00 01 02 01 0A

6.1.3.18 eMMC / UFS Features Group (0x67)**6.1.3.18.1 67 02 UFS Read / Write****67 02 UFS Read / Write**

The software shall verify if write and read capabilities shall be implemented (routine shall execute as fast and as stable as possible) upon reception of DID_UFS_Read_Write.

DID_UFS_Read_Write

Prefix	Diagnostics ID	Operation ID	Status	No of Data Bytes	Data Byte #1
6D643E	67 02	01- Set	00	00	-
6D643C	67 02	01- Set	Note 1	01	Note 2

Note 1 - This byte indicates the command processing status:

- 01 If the command was executed with success;
- 00 If the diagnostic command failed or was not executed for some reason

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- Other bytes for well defined problem with the command, for more information please read:

Note 2- This byte represents the test result:
- 00 FAILED
- 01 PASSED

Example

- 6D643E 67 02 01 00 00
- 6D643C 67 02 01 01 01 00

6.1.3.19 Security Features Group

6.1.3.19.1 6E 02 UART Lock / Unlock

PMH-193882 - 6E 02 UART Lock / Unlock

The software shall implement a communication blocking mechanism that consist in the introduction a blockage of all messages (both directions) after the UART Lock / Unlock routine is performed.

WHEN Bootstrap status ==0x15 AND UART_Status == unlocked without any password THEN system shall lock with default password- This check has to be done in every system start-up and based on the **Bootstrap status** value UART must lock, without sending DID 6E 02.

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1	Data Byte #2	...	Data Byte #17
Request 6D643E	6E 02	11 - Set + CS	00	11	Unlock/Lock UART, Note 2	UART Key (MSB)		UART Key (LSB)
Response 6D643C	6E 02	11 - Set + CS	Note 1	00				

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - This byte represents the UART locking state:

- 00 Unlock
- 01 Lock

Note: To save data into permanent memory or reflect new data changes in functional behavior sleep and wakeup cycle is required.

When UART is in locked state there are some exceptions for some feature which will work.

1. Enter ManDiag session - 00 01
2. Uart Lock status - 6E 03
3. Uart lock Unlock - 6E 02
4. ManDiag Sleep - 0A 03

Some important points to consider :

- There should be a strong enforcement of login failure checks so that it can comply to handle brute force or intelligent attempts to reverse engineer the method to access logged-in capabilities of VIP console.
- 30 seconds blocked after second unsuccessful retry. After 5 retries, a restart is needed to try again.
- Checksum to be placed in the message to ensure integrity. Must have with lock/unlock messages (therefore only SET+CS is permitted for this feature/command).
- When HKP Uart is Locked, few Commands are still accepted and processed as given below
 - Uart Unlock
 - Uart Lock Status
- If unlock attempt failed more than 5 times, the UART will remain locked for 5 mins
- After every Lock or Unlock in a power cycle Unit sleep must be triggered manually for persistence storage to happen

Example

UART Lock cmd : 6D643E 6E 02 11 00 11 01 EE EE FF FF EE EE EE FF FF FF 30 2D
UART Unlock cmd : 6D643E 6E 02 11 00 11 00 EE EE FF FF FF EE EE EE FF FF FF 20 CF

6.1.3.19.2 6E 03 UART Locked Status

PMH-193886 - 6E 03 UART Locked Status

The software shall verify if all the debug UARTs are locked or not upon reception of DID_UART_Locked_Status.

DID_UART_Locked_Status

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1
Request 6D643E	6E 03	00 - Get 10 - Get + CS	00	00	
Response 6D643C	6E 03	00 - Get 10 - Get + CS	Note 1	01	Locked Status, Note 2

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - This byte represents the UART Locked Status:

- 00 Unlocked
- 01 Locked

Example

Getting status of UART lock.

6D643E 6E 03 00 00 00
6D643E 6E 03 00 01 01 01 - since last byte is 01 it is locked

6E 05 JTAG Lock

The software shall implement a communication blocking mechanism that consist in the introduction a blockage of all messages (both directions) after the JTAG Lock routine is performed (with LOCK option and key) upon reception of DID_ITAG_Lock.

Note: Jtag Unlock can be done using Renesas flash programmer tool.

JTAG Lock

JTAG Lock - Additional Information

This routine will make use of a 128-bit (16 bytes) key ("JTAG Key") for each unit and also the indication of which operation we want to perform ("LOCK").

Depending on product requirements, the Key can be the same for all unit or unique. In case of same key can be used for the products, the following key shall be used: 3677397A244226452948404D63516654
Only HEX characters can be used.

DID_ITAG_Lock

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1	Data Byte #2	...	Data Byte #17
			00	17,	Lock JTAG, Note 3	JTAG Key (MSB)		JTAG Key (LSB)

6.1.3.19.5 6E 12 Data Supplier Feed**PMH-95495 -Data Supplier Feed**

The software shall be able read data supplier feed information upon reception this command.

Command Type	Prefix	Group ID	Test ID	Operation ID	Status	No. of Data Bytes	Data Byte 1	Data Byte (2 to n)
Request for GET	6D643E	6E	12	00 - Get 10 - Get + CS	00	01	Note 2	
Response for GET	6D643C	6E	12	00 - Get 10 - Get + CS	Note 1	Note 3	Note 2	Data bytes

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - This byte indicates data supplier feed ID.

Note 3 - This byte indicates the total length of data bytes including supplier ID bytes.

Parameter Name	ID (Note 2)	Length of Data (Note 3)
ECU Serial Number	0x00	0x0E
MM Part Number	0x01	0x0E
VIP Software Part Number	0x02	0x0E
SoC Software Part Number	0x03	0x10

Example :

"GET" Read the ECU Serial Number of ID "00" and expected data in response is "0E" including supplier ID byte.

- TX: 6D643E 6E 12 00 00 01 00
- RX: 6D643C 38 01 00 01 0A 00 31 32 33 34 2D 54 45 4D 50

6.1.3.19.6 6E 13 Data Supplier Feed Telematics**PMH-99164 - Data Supplier Feed Telematics**

This feature will be used to get data from Telematics Processor and V2X processor (TCU, V2X) like IMEI, eICCID number etc.

Command Type	Prefix	Diagnostics ID	Operation ID	Status	No. of Data Bytes	Data Byte 1
Request for SET	6D643E	6E 13	00 - Get	00	01	Note 2 (ID)
Response for SET	6D643C	6E 13	00 - Get	Note 1	Note 3	

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 :

ID	Parameter	Data Length (Bytes in Decimal)
00	TCU SoftwarePartNumber	12
01	CV2X SoftwarePartNumber	12
02	IMEI Number	15
03	eUICCID Number	32
04	MESN Number NOT SUPPORTED with this cmd (use 0x6611)	NA
05	ICCID Info	20
06	Sim Status	1
07	GPS Status	1
08	IMU Status	1
09	BSP for 5G modem	32
0A	BSP for Cv2x	32
0B	Ethernet MAC for CV2x.	17
0C	Ethernet MAC for 5G Modem	17

Note 3: The length of response is Data length (Note 2) +1

Note:

1. For 09 ,0A data will be available in HEX need to convert to ASCII to get proper values.
2. The features that involves Cv2x tests should only be tested when GPS signal is available (If VIP logs show CV2x temperature as -128 then it is default value, which means actual values are not reported, which mean that CV2x related feature will not work)
3. Some features might take some time to respond back in that case we are sending AA (Pending), which means request is under process once 5 sec (Internally 2.8*2) timer is completed we can send same request and consider that response as final response of the command.

Example:

GET IMEI Number (02)
 6D643E 6E 13 00 00 01 02
 6D643C 6E 13 00 01 0F XX XX XX (IMEI number).

6.1.3.19.7 6E 15 4G Tx Network Test**PMH-165054 - 6E 15 4G Tx Network Test**

This feature will be used to carry 4G Tx network test

SET Operation:

Command Type	Prefix	Diagnostics ID	Operation ID	Status	No. of Data Bytes	Data Byte 1	Data Byte 2	Data Byte 3	Data Byte 4	Data Byte 5	Data Byte 6	Data Byte 7	Data Byte 8	Data Byte 9	Data Byte 10	Data Byte 11		
Request for SET	6D643E	6E 15	01 - Set	00	0B	Note 2	Note 3						Note 4					
Response for SET	6D643C	6E 15	01 - Set	Note 1	01	Note 9												

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.

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- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2:

Type - LTE Configuration:
1 LTE

Note 3:

Band - LTE/WCDMA/GSM Band
3 LTE B3
5 LTE B3
40 LTE B5

Note 4:

Bandwidth - LTE/WCDMA/GSM bandwidth
0 1.4 MHz
1 3 MHz
2 5 MHz
3 10 MHz (Recommended)
4 15 MHz
5 20 MHz
6 40 MHz

Note 5:

Channel - (Divided In LSB and MSB)
LTE B3 19200-19575-19949
LTE B5 20400-20525-20649
LTE B40 38650-39150-39649

Note 6:

Tx_Enable - Enable/disable Tx
0 Disable
1 Enable

Note 7:

Tx_Power
Transmit power. This parameter has a positive correlation with the actual transmit power, and the output power can be adjusted by adjusting this value. It is recommended to set it to 50.

Note 8:

Tx_chain_idx
Transmitting antenna port. Physical antenna number. This parameter is valid only for LTE and default value is used if this parameter is omitted. There is no need to configure this parameter in GSM or WCDMA.
0 MAIN
1 DIV
2 MIMO3
3 MIMO4
4 SIM2.MAIN (Only supported by the modules supporting dual SIM cards)
5 SIM2.DIV (Only supported by the modules supporting dual SIM cards)
6 CV2X_TRXO (Only supported by the modules supporting C-V2X)
7 CV2X_TRX1 (Only supported by the modules supporting C-V2X)

Note 9:

00 - FAIL
01 - PASS

Example:

SET Operation:
6D643E 6E 15 01 00 08 01 00 03 03 00 00 4C 77 01 32 00
6D643C 6E 15 01 01 01 01----- Status is OK

6.1.3.19.8 6E 16 4G Rx Network Test

PMH-165048 - 6E 16 4G Rx Network Test
This feature will be used to carry 4G Rx network test

SET Operation:

Command Type	Prefix	Diagnostics ID	Operation ID	Status	No. of Data Bytes	Data Byte 1	Data Byte 2	Data Byte 3	Data Byte 4	Data Byte 5	Data Byte 6	Data Byte 7	Data Byte 8	Data Byte 9	Data Byte 10	Data Byte 11	
Request for SET	6D643E	6E 16	01 - Set	00	08	Note 2	Note 3		Note 4		Note 5			Note 6		Note 7	
Response for SET	6D643C	6E 16	01 - Set	Note 1	01	Note 9											

GET Operation:

Command Type	Prefix	Diagnostics ID	Operation ID	Status	No. of Data Bytes	Data Byte 1	Data Byte 2	Data Byte 3	Data Byte 4	Data Byte 5	Data Byte 6	Data Byte 7	Data Byte 8
Request for GET	6D643E	6E 16	00 - Get	00	00								
Response for GET	6D643C	6E 16	00 - Get	Note 1	08	Note 7				Note 8			

Note 1

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2:

Type - LTE Configuration:
1 LTE

Note 3:

Band - LTE/WCDMA/GSM Band
3 LTE B3
5 LTE B3
40 LTE B5

Note 4:

Bandwidth - LTE/WCDMA/GSM bandwidth

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0	1.4 MHz
1	3 MHz
2	5 MHz
3	10 MHz (Recommended)
4	15 MHz
5	20 MHz
6	40 MHz

Note 5:

Channel- (Divided In LSB and MSB)
 LTE B3 19200–19575–19949
 LTE B5 20400–20525–20649
 LTE B40 38650–39150–39649

Note 6:

Tx_chain_idx
 Transmitting antenna port. Physical antenna number. This parameter is valid only for LTE and default value is used if this parameter is omitted. There is no need to configure this parameter in GSM or WCDMA.
 0 MAIN
 1 DIV
 2 MIMO3
 3 MIMO4
 4 SIM2.MAIN (Only supported by the modules supporting dual SIM cards)
 5 SIM2.DIV (Only supported by the modules supporting dual SIM cards)
 6 CV2X_TRX0 (Only supported by the modules supporting C-V2X)
 7 CV2X_TRX1 (Only supported by the modules supporting C-V2X)

Note 7:

Expected Rx_Agc
 Expected value of Rx AGC. Test equipment power level in dBm×10. The recommended value is -500. (Send as ASCII of '-' and Hex of 01 F4)

Note 8:

gain : Tested gain. The value is <rx_agc>/10. Unit: dBm.

Note 9:

00 - FAIL
 01 - PASS

Example:

SET Operation:

6D643E 6E 16 01 00 0B 01 00 28 03 00 00 96 FA 00 FE 0C
 6D643C 6E 16 01 01 01----- Status is OK

GET Operation:

6D643E 6E 16 00 00 00
 6D643C 6E 16 00 01 08 XX XX XX YY YY YY YY - Success with XX - rx_agc and YY - gain

6.1.3.19.9 6E 17 5G Tx Network Test

PMH-165051 - 5G Tx Network Test

This feature will be used to carry 5G Tx network test

SET Operation:

Comma nd Type	Prefix	Diagno stics ID	Operati on ID	Status	No. of Data Bytes	Data Byte 1	Data Byte 2	Data Byte 3	Data Byte 4	Data Byte 5	Data Byte 6	Data Byte 7	Data Byte 8	Data Byte 9	Data Byte 10	Data Byte 11	Data Byte 12	Data Byte 13	Data Byte 14	Data Byte 15	
Request for SET	6D643E	6E 17	01 - Set	00	0F	Note 2		Note 3		Note 4			Note 5			Note 6	Note 7	Note 8	Note 9		Note 10
Response for SET	6D643C	6E 17	01 - Set	Note 1	01	Note 11															

Note 1

- This byte indicates the command processing status:
 - 01 The diagnostic command was executed successfully.
 - 00 The diagnostic command failed or was not executed for some reason.
 - XX Refer PMH-412826

Note 2

<type> Integer type. 5G NR configuration.
 2 5G NR

Note 3

<band> Integer type. 5G NR band
 28 n28
 78 n78

Note 4

<bw> Integer type. 5G NR bandwidth.
 0 1.4 MHz
 1 3 MHz
 2 5 MHz
 3 10 MHz (Recommended)
 4 15 MHz
 5 20 MHz
 6 40 MHz
 8 80 MHz
 10 100 MHz
 11 200 MHz
 12 400 MHz
 14 800 MHz
 16 1400 MHz

Note 5

<channel> Integer type.
 n28 140600–149600
 n78 620000–653333

Note 6

<tx_relate> Integer type. To test Tx1 and Tx2 related PRX and DRX.

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- 0 Tx1 related PRX and DRX
1 Tx2 related PRX and DRX

Note 7

<tx_enable> Integer type. Enable/Disable Tx.
0 Disable
1 Enable

Note 8

<RGI> Integer type. Transceiver output gain. Range: 55–65. The recommended value is 65.

Note 9

<PA_bias> Integer type. The value of PA bias voltage. Range: 3500–4000. The recommended value is 4000.

Note 10

<PA_current> Integer type. The value of PA current. Range: 2500–3800. The recommended value is 3000.

Note 11

00 - FAIL
01 - PASS

Example:

SET Operation:

6D643E 6E 17 01 00 0F 02 00 4E 03 00 09 D1 05 00 01 41 0F A0 0B B8
6D643C 6E 17 01 01 01 01 ----- Status is OK

6.1.3.19.10 6E 18 5G Rx Test

5G Rx Test

This feature will be used to carry 5G rx Network test

SET Operation:

Command Type	Prefix	Diagnostics ID	Operation ID	Status	No. of Data Bytes	Data Byte 1	Data Byte 2	Data Byte 3	Data Byte 4	Data Byte 5	Data Byte 6	Data Byte 7	Data Byte 8	Data Byte 9	Data Byte 10	Data Byte 11	Data Byte 12		
Request for SET	6D643E	6E 18	01 - Set	00	08	Note 2	Note 3			Note 4			Note 5			Note 6		Note 7	Note 8
Response for SET	6D643C	6E 18	01 - Set	Note 1	01	Note 9													

GET Operation:

Command Type	Prefix	Diagnostics ID	Operation ID	Status	No. of Data Bytes	Data Byte 1	Data Byte 2	Data Byte 3	Data Byte 4	Data Byte 5	Data Byte 6	Data Byte 7	Data Byte 8				
Request for GET	6D643E	6E 18	00 - Get	00	00												
Response for GET	6D643C	6E 18	00 - Get	Note 1	04		Note 10										

Note 1

- This byte indicates the command processing status:
- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-41282]

Note 2:

Type
2 5G NR

Note 3:

Band :
28 n28
78 n78

Note 4:

Bandwidth:
0 1.4 MHz
1 3 MHz
2 5 MHz
3 10 MHz (Recommended)
4 15 MHz
5 20 MHz
6 40 MHz
8 80 MHz
10 100 MHz
11 200 MHz
12 400 MHz
14 800 MHz
16 1400 MHz

Note 5:

Channel
n28 140600–149600
n78 620000–653333

Note 6:

Rx Chain ID
0 PRX
1 DRX

Note 7:

• APTIV •

Expected value of Rx AGC. Test equipment power level in dBm ×10. The recommended value is -500.

Note 8:

Tx Relate: To test Tx1 and Tx2 related PRX and DRX.
0 Tx1 related PRX and DRX
1 Tx2 related PRX and DRX

Note 9:

Status of 5G Rx
00 - Failure
01 - Success

Note 10:

<rx_agc> Integer type. Tested value of Rx AGC. Unit: dBm.

Example:

Set:
6D643E 6E 18 01 00 0C 02 00 4E 03 00 09 D1 05 00 FE 0C 00
6D643C 6E 18 01 01 01 01 - success

Get:

6D643E 6E 18 00 00 00
6D643C 6E 18 00 01 04 XX XX XX XX -- Gain in dB.

6.1.3.19.11 6E 19 Cv2x RSSI Test

Network Test

This feature will be used to carry Cv2x RSSI test

SET Operation:

Command Type	Prefix	Diagnostics ID	Operation ID	Status	No. of Data Bytes	Data Byte 1
Request for SET	6D643E	6E 19	01 - Set	00	01	Note 2
Response for SET	6D643C	6E 19	01 - Set	Note 1	01	Note 3

GET Operation:

Command Type	Prefix	Diagnostics ID	Operation ID	Status	No. of Data Bytes	Data Byte 1	Data Byte 2	Data Byte 3	Data Byte 4
Request for GET	6D643E	6E 19	00 - Get	00	00				
Response for GET	6D643C	6E 19	00 - Get	Note 1	04				Note 4

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [\[PMH-412826\]](#)

Note 2:

Time in seconds

Note 3:

00 - FAIL
01- PASS

Note 4:

Power in db

Example:

Cv2x rssl set
6D643E 6E 19 01 00 01 10
6D643E 6E 19 01 01 01 10

Cv2x rssl get

6D643E 6E 19 00 00 00
6D643E 6E 19 00 01 03 XX XX (Power in db)

6.1.3.19.12 6E 20 Cv2x TSSI Test

PMH-176560 - Cv2x TSSI Test

This feature will be used to carry Cv2x TSSI test

Command Type	Prefix	Diagnostics ID	Operation ID	Status	No. of Data Bytes	Data Byte 1	Data Byte 2	Data Byte 3
Request for SET	6D643E	6E 20	01 - Set	00	03	Note 2		Note 3
Response for SET	6D643C	6E 20	01 - Set	Note 1	01	Note 4		

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [\[PMH-412826\]](#)

Note 2:

Time in seconds

Note 3:

Power in db (-40 to 20)

Note 4: Cv2x TSSI Status.

00- FAIL
01- PASS

Example:

Cv2x tssi set
6D643E 6E 20 01 00 03 10 00 0A
6D643C 6E 20 01 01 00

6.1.3.19.13 6E 21 Cybersecurity Certificate Provisioning of Public Cert and Private Key**PMH-138244 - Cyber Security Certificate Provisioning**

This feature is for triggering the certificates/Keys provisioning process by Cyber Security component at QNX, VIP, Android, TCU, Cv2X. The keys used will be a public key package and will be downloaded from KMS by CySec team

DID_CyberSecurity_Certificate_Provisioning

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #0	Data Byte #1
Request 6D643E	6E 21	01 - Set 11 - Set + CS	00	01	Note 3 Processor ID	
		00 - Get 10 - Get + CS	00	01	Note 3 Processor ID	
Response 6D643C	6E 21	01 - Set 11 - Set + CS	Note 1	02	Note 3 Processor ID	Set Req status Note 4
		00 - Get 10 - Get + CS	Note 1	02	Note 3 Processor ID	Provisioning Status Note 2

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [\[PMH-412826\]](#)

Note2 : Provisioning Process Status will be provided for TCU and Cv2x Together as byte0 and byte 1. Status can be any of the below values :

- 0x00: STATUS_NOT_PROVISION
- 0x01: STATUS_IN_PROGRESS
- 0x02: STATUS_PROVISION_SUCCESS
- 0x03: STATUS_PROVISION_FAILURE
- 0x05: secure boot is not up yet

Note 3 : Processor ID

ID	Processor	HPCC
00	VIP	NA
01	QNX	Applicable only GET (By default provisioned)
02	Android	Applicable only GET (By default provisioned)
03	TCU	Applicable only GET (By default provisioned)
04	Cv2X	Applicable

Note 4: Set Prov status

- 0x01 - Write success
- 0x02 - Write failure ,
- 0x03 - Invalid data

Example

Set operation is successful and public key provision will be triggered for QNX

Tx - 6D643E 6E 21 01 00 01 01

Rx - 6D643C 6E 21 01 01 02 01 01 - status came as 01

Tx - 6D643E 6E 21 00 00 01 01

Rx - 6D643C 6E 22 00 01 02 01 02 - prov status came as 02

6.1.3.19.14 6E 22 Cybersecurity Forced deprovisioning for bootstrap certificates command using public Key/Cert**PMH-192234 - Cyber Security forced deprovisioning for bootstrap certificates**

This feature is for triggering the Forced deprovisioning for bootstrap certificates for TCU.

DID_CyberSecurity_Certificate_DeProvisioning

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #0	Data Byte #1
Request 6D643E	6E 22	01 - Set 11 - Set + CS	00	01	processor ID Note 3	
		00 - Get 10 - Get + CS	00	01	processor ID Note 3	
Response 6D643C	6E 22	01 - Set 11 - Set + CS	Note 1	02	processor ID Note 3	Set Req status Note 4
		00 - Get 10 - Get + CS	Note 1	02	processor ID Note 3	De Provisioning Status TCU Note 2

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [\[PMH-412826\]](#)

Note 2 : De Provisioning Process Status

- 0x00: STATUS_NOT_PROVISION
- 0x01: STATUS_IN_PROGRESS
- 0x02: STATUS_PROVISION_SUCCESS
- 0x03: STATUS_PROVISION_FAILURE

Note 3 : Processor ID , De provisioning is applicable only for TCU

ID	Processor	HPCC
00	VIP	NA
01	QNX	NA
02	Android	NA
03	5G modem	Applicable
04	Cv2X	NA

Note 4: Set De-Prov status

- 0x01 - Write success
- 0x02 - Write failure ,
- 0x03 - Invalid data

• APTIV •

Example

Get operation is successful and public key de provision status will be returned for 5G modem
 Tx - 6D643E 6E 22 00 00 01 03
 Rx - 6D643C 6E 22 00 01 02 01 02 - prov status came as **01**

SET operation

Tx - 6D643E 6E 22 01 00 01 03
 Rx - 6D643C 6E 22 01 01 02 01 01 - prov status came as 01

6.1.3.19.15 6E 52 Renesas UID for JTAG lock feature

The software shall read the UID renesas chip from upon reception of DID_HPCC_READ_RENESAS_UID

DID_Renesas_UID_JTAG_Lock_Feature

Operation	Diagnostic ID	Operation	Status	# of Data Bytes	# 0 -14 Data Byte
Request	6E 52	GET - 00 GET + CS - 10	0x00	00	
Response	6E 52	GET - 00 GET + CS - 10	0x00 = Fail 0x01 = Pass	0F	UID Value

Example Get operation

Get operation will fetch the UID value for Renesas 15 bytes

Tx - 6D643E 6E 52 00 00 00
 Rx - 6D643C 6E 52 00 01 0F AA BB CC DD EE FF GG HH II JJ KK LL MM NN OO - Random values are kept for sake of example

6.1.3.19.16 6E 59 SHE UID for key Provisioning

PMH-218980 - It is a unique identifier (UID) generated by the VIP Secure Hardware Extension (SHE) for Key provisioning. Pre requisite is setting of master key using 6E10 command. The 64 byte of data can be generated using a python script.

DID_SHE_UID_for_Key_Provisioning

Operation	Diagnostic ID	Operation	Status	# of Data Bytes	# 0 -14 Data Byte
Request	6E 59	GET - 00 GET + CS - 10	0x00	00	
Response	6E 59	GET - 00 GET + CS - 10	0x00 = Fail 0x01 = Pass	0F	SHE UID Value

Example Get operation

Get operation will fetch the SHE UID value for Key Provisioning 15 bytes

Tx - 6D643E 6E 59 00 00 00
 Rx - 6D643C 6E 59 00 01 0F AA BB CC DD EE FF GG HH II JJ KK LL MM NN OO - Random values are kept for sake of example

6.1.3.19.17 6E 60 Secure Boot Status

PMH-218983 - It is used for getting the status of Secure Boot status

DID_Secure_Boot_Status

Operation	Diagnostic ID	Operation	Status	# of Data Bytes	#processor ID	#data byte 1
Request	6E 60	GET - 00 GET + CS - 10	0x00	01	Note 1	
Response	6E 60	GET - 00 GET + CS - 10	0x00 = Fail 0x01 = Pass	02	Note 1	Note 2

Note 1: Processor ID

0x00 - 5G Modem
 0x01 - SOC
 0x02 - CV2X

Note 2: Secure Boot status can be

0x00 - Disabled
 0x01 - Enabled

Example Get operation

Get operation will fetch Secure Boot Status value

Tx - 6D643E 6E 60 00 00 01 01 - For SOC
 Rx - 6D643C 6E 60 00 02 00 01 - Secure Boot Status Enabled

6.1.3.19.18 6E 61 JTAG Status

PMH-227781 - It is used for getting the status of JTAG for various processor

DID_JTAG_Status

Operation	Diagnostic ID	Operation	Status	# of Data Bytes	#processor ID	#data byte 1
Request	6E 61	GET - 00 GET + CS - 10	0x00	01	Note 1	
Response	6E 61	GET - 00 GET + CS - 10	0x00 = Fail 0x01 = Pass	02	Note 1	Note 2

Note 1: Processor ID

0x00 - 5G Modem
 0x01 - SOC
 0x02 - CV2X

Note 2: Jtag status can be

0x00 - Disabled
 0x01 - Enabled

Example Get operation

Get operation will fetch JTAG Status value

Tx - 6D643E 6E 61 00 01 00 - For SOC
 Rx - 6D643C 6E 61 00 02 00 01 - Jtag Status Enabled

NOTE: If Secure Boot Status is Enabled then JTAG Status will be Disabled.

6.1.3.19.19 6E 62 FTM Mode for Network Test

The TCU shall enter into FTM mode to perform 4G and 5G network test and shall exit after test is completed.

Command Type	Prefix	Diagnostics ID	Operation ID	Status	No. of Data Bytes	Data Byte 1	Data Byte 2	Data Byte 3
Request for SET	6D643E	6E 62	01 - Set	02	02	Note 2	Note 3	
Response for SET	6D643C	6E 62	01 - Set	Note 1	03	Note 2	Note 3	Note 4

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [\[PMH-412826\]](#)

Note 2 - This Byte indicates to Turn On or Off the FTM Mode:

- 00 OFF
- 01 ON

Note 3 - This Byte indicates the Network Selection for FTM Mode:

- 01 4G
- 02 5G

Note 4 FTM Status

- 00- FAIL
- 01- PASS

Example:

Turn On FTM mode for 4G Nw Test

Tx: 6D643E 6E 62 01 00 02 01 01
 Rx: 6D643E 6E 62 01 01 03 01 01 01

Turn Off FTM mode for 4G Nw Test

Tx: 6D643E 6E 62 01 00 02 00 01
 Rx: 6D643E 6E 62 01 01 03 00 01 01

6.1.3.19.20 6E 64 - Widevine DRM Enable

This feature is used to provide Widevine L1 certification to the SilverBox

Push Operation

Prefix	Diagnostics ID	Operation ID	Status	Data Length	Data Byte #1	Data Byte #2	Data Byte #3	Data Byte #4	Data Byte #5	...	Data Byte #n
Request 6D643E	6E 64	01 - Set	00	Note 2	00	Note 3	Note 4	Note 4	Note 5	...	Note 5
Response 6D643C	6E 64	01 - Set	Note 1	04	Note 6	Note 6	Note 6	Note 6			

Write Operation

Prefix	Diagnostics ID	Operation ID	Status	Data Length	Data Byte #1	Data Byte #2	Data Byte #3	Data Byte #4
Request 6D643E	6E 64	01 - Set	00	01	01			
Response 6D643C	6E 64	01 - Set	Note 1	04	Note 6	Note 6	Note 6	Note 6

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [\[PMH-412826\]](#)

Note 2:

No of data Bytes from keybox in single frame + 4 [Data byte #1 + Note 3 + Note 4 (2 Bytes)]

Note 3: Frame Number

- 3.1) Starts from 01 to FF.
- 3.2) Each frame supports 80 bytes.

Note 4: Size of Key Box (128 Bytes)

Note 5: Hex data from Keybox.bin .(Max 76 data bytes +4)

Note 6: Status for Write/Push

Operations	Status Bytes
push, write	00 00 00 00 – Failed
Push, write	00 00 00 01 – Success
write	00 00 00 02 – file missing
write	00 00 AA BB – Custom error code from QC utility

Note: To save data into permanent memory or reflect new data changes in functional behavior unit restart or sleep cycle is required.
 perform above step to see updated DRM provisioning status.

Example 1. Push Key Box : First Frame--> 6D643E 6E 64 01 00 39 00 01 00 99 61 7...

Example:

1. Push Key Box :

First Frame-->

6D643E 6E 64 01 00 39 00 01 00 99 61 70 74 69 76 5F 68 70 63 63 5F 38 32 39 35 5F 36 30 31 00 00 00 00 00 00 00 00 EA 41 C9 8C CF C8 10 6B D3 E8 CE 50 74 39 A2 61 00 00 00 02 00

Second Frame--> 6D643E 6E 64 01 00 39 00 02 00 00 00 88 F7 28 28 C5 A3 CC 86 4D 9E 0F 38 F5 88 75 DA 7D BB FA 8D 7A 9C E5 DB 7D 73 35 A4 EF 6B 62 15 E4 19 C9 EC E2 E5 05 A4 6A EA 44 2D ED B4 C0 7D 87 E5 41 B4

Final Frame--> 6D643E 6E 64 01 00 1A 00 FF 00 00 A7 CE E7 85 CC 78 7E EB CA 41 93 51 2C 99 6B 62 6F 78 75 91 53 DB

2. Trigger the Write operation:

• APTIV •

6D643E 6E 64 01 00 01 01

Please refer this doc for more details: [\[A\]](#)
Keybox.bin file: [\[A\]](#)

6.1.3.19.21 6E 65 - Get Widevine Provision Status

This feature is used to get status whether Widevine provision is success or not.

Prefix	Diagnostics ID	Operation ID	Status	Data Length	Data byte 1	Data byte 2	Data byte 3	Data byte 4
Request 6D643E	6E 65	00 - Get	00	00				
Response 6D643C	6E 65	00 - Get	Note 1	04	Note 2	Note 2	Note 2	Note 2

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [\[A\]PMH-412826](#)

Note 2 :

Operations	Status Bytes
query_sts	00 00 00 00 - Failed
query_sts	00 00 00 01 - Pass

Example: Get Provisioning status: Tx: 6D643E 6E 65 00 00 00 Rx: 6D643C 6E 65 00...

Example:

Get Provisioning status:

Tx: 6D643E 6E 65 00 00 00
Rx: 6D643C 6E 65 00 01 04 WW YY ZZ

6.1.3.20 I/O Port Features Group (0x82)

6.1.3.20.1 82 01 I/O Port Features Group

PMH-144212 - 82 01 I/Os Read/Write

The software shall control the output value of the selected bit of the selected GPIO port or read the current value of the selected bit of the selected GPIO port upon reception of DID_I_Os_Read_Write.
All Ports should be implemented for CAN control.

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1	Data Byte #2	Data Byte #3	Data Byte #4
Request 6D643E	82 01	01 - Set 11 - Set + CS	00	04	Chip ID, Note 2	I/O Port, Note 3	Pin Number, Note 4	Value, Note 5
		00 - Get 10 - Get + CS	00	03	Chip ID, Note 2	I/O Port, Note 3	Pin Number, Note 4	
Response 6D643C	82 01	01 - Set 11 - Set + CS	Note 1	00				
		00 - Get 10 - Get + CS	Note 1	04	Chip ID, Note 2	I/O Port, Note 3	Pin Number, Note 4	Value, Note 5

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [\[A\]PMH-412826](#)

Note 2 - This byte represents the Chip ID, depending on product specification:

ID	Chip	HPCC
00	VIP	Applicable
01	SOC	NA
02	FlexRay	NA
03	LIN	NA

Note 3 - This byte represents the I/O Port to interact, depending on product specification:

ID	I/O Port	SOC	VIP
00	PORTE	N/A	Applicable
01	PORT10	N/A	Applicable
02	PORT11	N/A	Applicable
03	PORT20	N/A	Applicable
04	PORT1 (only for 8155)	N/A	Applicable
05	PORT 2 (only for 8155)	N/A	Applicable
06	PORT 12	N/A	Applicable

Note 4 - This byte represents the Pin number to operate, depending on product specification. To verify the applicable pin, please check the electrical SharePoint and the project schematic according to each version.

ID	Port	Pin	Signal (8295)	Port type
0	Port 0 (P0_4)	C3	PPU_IGN_IN	Input
1	Port 0 (P0_7)	C4	PPU_ACC_IN	Input
2	Port 10 (P10_0)	E1	PPU_AR_HUD_OFF	Input
3	Port 10 (P10_1)	E2	PPU_PARKING_BREAK_ENG	Input
4	Port 10 (P10_2)	B8	PPU_WEAR_FRONT_PAD_IN	Input
5	Port 10 (P10_3)	B7	PPU_WEAR_REAR_PAD_IN	Input
6	Port 10 (P10_11)	B3	PPU_TURN_RIGHT_IN	Input
7	Port 10 (P10_12)	C8	PPU_LOW_BRAKE_FLUID_IN	Input
8	Port 11 (P11_1)	B4	PPU_TURN_LEFT_IN	Input
9	Port 11 (P11_12)	E4	PPU_PID_SCREEN_OFF_IN	Input
A	Port 11 (P11_15)	E3	PPU_CID_SCREEN_OFF_IN	Input
B	Port 20 (P20_4)	C9	PPU_CAMERA_SEL_IN	Input
C	Port 12 (P12_0)	B4	PWM2_OUTPUT	Output

ID	Port	Pin	Signal (8155)	Port type
0	Port 0 (P0_8)	E1	PPU_CHARGE_BAT_IND	Input

1	Port 1 (P1_2)	C3	PPU_IGN_IN	Input
2	Port 0 (P0_5)	C4	PPU_ACC_IN	Input
3	Port 0 (P0_7)	E2	PPU_PARKING_BREAK_ENG	Input
4	Port 1 (P1_1)	B3	PPU_TURN_RIGHT_IN	Input
5	Port 10 (P10_11)	C8	PPU_LOW_BRAKE_FLUID_IN	Input
6	Port 11 (P11_7)	B8	PPU_WEAR_FRONT_PAD_IN	Input
7	Port 11 (P11_15)	B7	PPU_WEAR_REAR_PAD_IN	Input
8	Port 1 (P1_0)	B4	PPU_TURN_LEFT_IN	Input
9	Port 2 (P2_0)	E4	PPU_PID_SCREEN_OFF_IN	Input
A	Port 1 (P1_3)	E3	PPU_CID_SCREEN_OFF_IN	Input
B	Port 20 (P20_4)	C9	PPU_CAMERA_SEL_IN	Input
C	Port 10 (P10_4)	B5	PPU_VESS_SWITCH	Input
D	Port 11 (P11_0)	D5	PWM_OUTPUT	Output

Note 5 - This byte indicates the value of the selected pin:

- 00 LOW
- 01 HIGH

Example:

"SET VIP Port 12 Pin 0 (P12_0) to HIGH state" - **8295**

- TX: 6D643E 82 01 01 00 04 00 06 0C 01
- RX: 6D643C 82 01 01 01 00

"GET IGN pin Status" - **8295**

- TX: 6D643E 82 01 00 00 03 00 00 00
- RX: 6D643C 82 01 00 01 04 00 00 00 01

6.1.3.21 87 02 GPS

6.1.3.21.1 87 02 GPS Latitude / Longitude

PMH-197001 - 87 02 GPS Latitude / Longitude

The software shall return the current GPS values upon reception of 87 02 GPS command

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1 ---- Data Byte #40
Request 6D643E	87 02	00 - Get 10 - Get + CS	00	00	
Response 6D643C	87 02	00 - Get 10 - Get + CS	Note 1	28	Note 2

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer PMH-412826

Note 2 - represents (Convert all data in Double)

```
byte 0 -byte 7 latitude;
byte 8-byte 15 longitude;
byte 16-byte 23 altitude;
byte 24-byte 31 gpsSpd;
byte 31-byte 39 heading;
```

Example:

TX: 6D643E 87 02 00 00 00

RX: 6D643C 87 02 00 01 32 XX XX XX XX... ... (40 bytes of data)

For 8155- Convert Hex Data to Double.

For 8295- Change the Endianness for each data and convert to Double

Example for 8295-
 11 22 33 44 55 66 77 88 - Latitude
 99 AA BB CC DD EE FF 00 - Longitude

Convert 88 77 66 55 44 33 22 11 to Double for Latitude

Convert 00 FF EE DD CC BB AA 99 to Double for Longitude

6.1.3.22 Display

6.1.3.22.1 89 04 Display - Internal Temperature

PMH-112739 - 89 04 Display - Internal Temperature

The software shall return the display temperature value upon reception of DID_Display_Internal_Temperature.

DID_Display_Internal_Temperature

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1	Data Byte #2	Data Byte #3
Request 6D643E	89 04	00 - Get 10 - Get + CS	00	01	Display, Note 2		
Response 6D643C	89 04	00 - Get 10 - Get + CS	Note 1	03	Display, Note 2	Note 3	Note 4

Note 1 - This byte indicates the command processing status:

- 01 if the command was executed with success;
- 00 if the diagnostic command failed or was not executed for some reason

Note 2 - This byte indicates the display:

DISPLAY_CID = 0
 DISPLAY_DID = 1

Note 3 - This byte indicates the temperature Signal possible values:

• APTIV •

- 00 Positive
- 10 Negative

Note 4: Temperature value in absolute representation.

Example:

Internal temperature of PID:

Tx: 6D643E 89 04 00 00 01 01 10

Rx: 6D643C 89 04 00 01 03 01 00 XX

6.1.3.22.2 89 05 Display - Back-light level

PMH-112623 - 89 05 Display - Back-light level

The software shall set back-light level upon reception of DID_Display_Backlight_Level.

DID_Display_Backlight_Level

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1	Data Byte #2
Request 6D643E	89 05	01 - Set 11 - Set + CS	00	02	Display, Note 2	back-light, Note 3
		00 - Get 10 - Get + CS	00	01	Display, Note 2	
Response 6D643C	89 05	01 - Set 11 - Set + CS	Note 1	00		back-light, Note 3
		00 - Get 10 - Get + CS	Note 1	02	Display, Note 2	

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - This byte indicates the display:

00 - CID

01 - PID

02 - DID

03 - ALL (ALL Option supports only for set CMD)

Note 3 - This byte indicates the value of back-light level:

Values between 00 to 08HEX (0 to 100%)

Example

Set Backlight level of CID:

Tx: 6D643E 89 05 01 00 02 00 10

Rx: 6D643C 89 05 01 01 02 00 10

6.1.3.22.3 89 06 Display - ADC

PMH-111810 - 89 06 Display - ADC

The software shall read ADC level of display upon reception of DID_Display_ADC.

DID_Display_Supply_ADC

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1	Data Byte #2 and #3
Request 6D643E	89 06	00 - Get 10 - Get + CS	00	01	Display, Note 2	ADC Level, Note 4
		00 - Get 10 - Get + CS	Note 1	03	Display, Note 2	

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [PMH-412826](#)

Note 2 - This byte indicates the display:

00 - CID

01 - PID

02 - DID

Note 4 - These bytes indicates the value of Display power supply ADC level.

Example

ADC Count for PID Display

Tx: 6D643E 89 06 00 00 02 01 00

Rx: 6D643C 89 06 00 01 04 01 00 XX XX (ADC count in Hex)

6.1.3.22.4 89 01 Display - Display - Touch Test

PMH-122814 - 89 01 Display - Touch Test

The software shall count and measure touches on Display triggered via specific UART command upon reception of DID_Display_touch_test.

DID_Display_touch_test

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1	Data Byte #2	Data Byte #3	Data Byte #4	Data Byte #5	Data Byte #6	Data Byte #7	.. Data Byte #n
Request 6D643E	89 01	01 - Set 11 - Set + CS	00	02	Display, Note 3	Time, Note 4						
		00 - Get 10 - Get + CS	00	01	Display, Note 3							
Response 6D643C	89 01	01 - Set 11 - Set + CS	Note 1	00								
		00 - Get 10 - Get + CS	Note 1	Note 2	Display, Note 3	Measured touches, Note 5	X coordinate (MSB), Touch 1	X coordinate (LSB), Touch 1	Y coordinate (MSB), Touch 1	Y coordinate (LSB), Touch 1	X coordinate (MSB), Touch 2	Y coordinate (LSB), Touch 2

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [\[PMH-412826\]](#)

Note 2 - Number of data bytes. This value will vary based on number of touched areas.

#of Data Bytes = Data Byte #1 + Data Byte #2 + (4 x Bytes of Note 5)

Note 3 - This byte indicates the display:

DISPLAY	ID	8295	8155
DISPLAY_CID	0	Applicable	Applicable
DISPLAY_PID	1	Applicable	Applicable

Note 4 - Time (seconds) in which the tester can touch the screen.

- Minimum time: 01 (1 second)
- Maximum time: 1E (30 seconds)

Note 5 - Measured touches on screen during the time frame specified on Set command. Maximum of 16 touches.

Note 6 - Test shall stop if maximum time defined in note 3 is reached or if any touch is removed.

6.1.3.22.5 89 0D Display LVDS Lock Status

PMH-197949 - 89 0D Display LVDS Lock Status

This feature is for checking the connectivity status between silver box and Display. When we make connection with Display it will show status 00 positive and when removed 01 Negative

DID_Display_LVDS_Lock_Status

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1	Data Byte #2
Request 6D643E	89 0D	00 - Get 10 - Get + CS	00	01	Display ID Note 2	
Response 6D643C	89 0D	00 - Get 10 - Get + CS	Note 1	02	Display ID Note 2	LVDS Fault Status, Note 3

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [\[PMH-412826\]](#)

Note 2 : Display information

Display	Display ID	8295	8155
CID	00	Applicable	Applicable
PID	01	Applicable	Applicable
DID	02	Applicable	Applicable
ARHUD	03	Applicable	NA

Note 3 : LVDS Lock status

- 01 - Locked
- 00 - Unlocked

Example:

6D643E 89 0D 00 00 01 01 - Get LVDS lock status for PID
 6D643C 89 0D 00 01 02 01 01 - LVDS locked

6.1.3.23 DTC Features Group (0x51)

6.1.3.23.1 51 01 DTC Monitoring

51 01 DTC Monitoring

This feature will be used for controlling the status of the underlying DTC routines. When enabled, all DTC routines shall perform their usual diagnostics. Otherwise (disable state), the routine shall be stopped and therefore not able to mark DTCs in the system.

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1
Request 6D643E	51 01	01 - Set 11 - Set + CS	00	01	Enable/Disable, Note 2
Response 6D643C	51 01	01 - Set 11 - Set + CS	Note 1	01	Enable/Disable, Note 2

- 01 The diagnostic command was executed successfully.

- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [\[PMH-412826\]](#)

Note 2 - This byte enables/disables the DTC monitoring function:

- 00 Disable
- 01 Enable

Example: *SET DTC routines Status to OFF*

- X: 6D643E 51 01 01 00 01 00
- RX: 6D643C 51 01 01 01 00 0

6.1.3.23.2 51 02 DTC Clear Information

PMH-160737 - 51 02 DTC Clear Information

This routine will clear every record of previous DTCs registered in the system. After the routine has executed, the system shall have no record of any kind of DTC.

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1
Request 6D643E	51 02	01 - Set 11 - Set + CS	00	00	
Response 6D643C	51 02	01 - Set 11 - Set + CS	Note 1	00	

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Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [\[PMH-412826\]](#)

Test sequence:

first attempt - you will get pending response because DTC clearing process takes few seconds based on no. of active DTCs.

TX: 6D643E 51 02 01 00 00
RX: 6D643C 51 02 01 AA 00

Second attempt

TX: 6D643E 51 02 01 00 00
RX: 6D643C 51 02 01 01 00

Example: "Clear every record of Active DTCs"

- X: 6D643E 51 02 01 00 00
- RX: 6D643C 51 02 01 01 00

6.1.3.23.3 51 04 List of DTCs

PMH-160741 -51 04 List of DTCs

This routine shall output a list of all active DTCs in the system upon reception.

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1	Data Byte #2	Data Byte #3	Data Byte #4
Request 6D643E	51 04	00 - Get 10 - Get + CS	00	00				
Response 6D643C	51 04	00 - Get 10 - Get + CS	Note 1	Note 2	DTC1 Byte1, Note 3	DTC1 Byte2, Note 3	DTC1 Byte3, Note 3	DTC1 State, Note 4

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [\[PMH-412826\]](#)

Note 2 - no of Data bytes - This number will depend on the number of elements (DTCs) for the list being returned .

Note 3 - This byte represents the DTC Number. Each DTC will be identified by 3 bytes.

Note 4 - This byte represents the DTC Status.

This DTC Status can be interpreted according to the following table (according to ISO 14229):

Bit no. (hex)	Name
00	Test failed
01	Test failed this monitoring/operational cycle
02	Pending DTC
03	Confirmed DTC
04	Test not completed since last clear
05	Test failed since last clear
06	Test not completed this monitoring/operation cycle
07	Warning indicator request

Example: "Get List of Active DTCs"

TX: 6D643E 51 04 00 00 00
RX: 6D643C 51 04 01 05 01 00 93 94 2F

6.1.3.23.4 51 03 Number of DTCs

51 03 Number of DTCs

This routine shall report the number of DTCs that the system currently detecting upon reception,

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Data Byte #1
Request 6D643E	51 03	00 - Get 10 - Get + CS	00	00 - Get 10 - Get + CS	
Response 6D643C	51 03	00 - Get 10 - Get + CS	Note 1	01 - Get 10 - Get + CS	# of detected DTCs Note 2

Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [\[PMH-412826\]](#)

Note 2 - Count of number of active DTCs.

Example: "GET Number of DTCs"

TX: 6D643E 51 03 00 00 00
RX: 6D643C 51 03 00 01 01 04

6.1.3.23.5 51 05 Read extended DTC Data

51 05 Read extended MBV by DTC Number

This routine will receive a DTC Number and will return the "Extended DTC data" information associated with such DTC.

Prefix	Diagnostics ID	Operation ID	Status	# of Data Bytes	Byte #1	Byte #2	Byte #3	Byte #4
Request 6D643E	51 05	00 - Get 10 - Get + CS	00	02	DTC event ID Note 4			
Response 6D643C	51 05	00 - Get 10 - Get + CS	Note 1	n	DTC1 Byte1	DTC1 Byte2	Extended Data, Note 2	Extended Data, Note 3

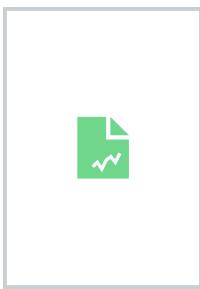
Note 1 - This byte indicates the command processing status:

- 01 The diagnostic command was executed successfully.
- 00 The diagnostic command failed or was not executed for some reason.
- XX Refer [\[PMH-412826\]](#)

Note 2 - This Bytes represent Frequency Counter - how many times the fault has set in current cycle

Note 3 - This Bytes represent Operation Cycle Counter

Note 4 - DTC event ID table.



Example:

Read the Extended data of Antenna open fault DTC.

Tx: 6D643E 51 05 00 00 02 00 19

Rx: 6D643E 51 05 00 00 04 00 19 01 00

6.1.4 Configuration

PMH-44452 - <[TBD] - Insert configuration requirements for the ECU. Each requirement must be a separate row. Configuration requirements should use parameter names if defined. >

Example: The software shall be configurable with respect to the [TBD - parameter name]

[Normal]

6.1.5 Safety and SOTIF

PMH-44454 - < Insert Safety or SOTIF requirements. Each requirement must be a separate row. Requirements should use parameter names, failure names if defined.>

Example: The ECU shall trigger no inadvertent activation of AEB (ASIL = xxx).

[Normal]

6.1.6 Security

NA

6.2 <Software subfunction 2>

6.3 <Software subfunction n>

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7 Non functional Requirements

- The Software coding should adhere to MISRA C.
- Cyclometric complexity of the SWC interfaces should be less than 15

7.1 Development Constraints

The software development shall fulfill with AUTOSAR specifications.

7.2 Memory constraints

Refer the document as PRS-Link : [PDT_PRS_Mahindra_HPCC_ICC_Manufacturing_Diagnostics](#)

7.3 Quality

Software code implementation shall follow the coding guidelines applicable for the project.

7.4 Timing

When the Manufacturing Diagnostics Session is set to active, all applications that can take part of a MFG routine, shall start without the need for additional configuration. The software shall enable the Manufacturing Diagnostics Session upon reception of DID_Manufacturing_Diagnostics_Session_State. Manufacturing Diagnostics Mode is active the system shall keep alive for at least 2 hours.

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7.5 Throughput

NA

7.6 Verification

All the testcases should be captured in the SQTS .

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8 Traceability

Bidirectional traceability is handled in Polarion tool and can be seen in Linked WIs. All the above requirements should link to upward to PRS and downward to SAD, SDD & SQTS for bidirectional traceability.

9 Data Dictionary

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