Software Requirements Specification for Gateway Module of Engine Data Acquisition Unit of Airbus Helicopter Generic Vehicle Monitoring System (GVMS)

Document Number: H398-002-001-GWY

Version No: 2.12

|  |
| --- |
| Proprietary Notice  This document and the information disclosed herein are proprietary data of Howell Instruments, Inc. Neither this document nor the information contained herein shall be reproduced, used, or disclosed to others without the written authorization of Howell Instruments, Inc. |

|  |  |
| --- | --- |
| Written By: | Sruthi D (Lead Engineer, ALTEN Global Technologies Private Limited)  C:\Users\afreen.p.SWSYS\AppData\Local\Microsoft\Windows\INetCache\Content.MSO\A65C1828.tmp |
| Reviewed By: | Priyanka N (Software Engineer, ALTEN Global Technologies Private Limited)    Pravalika K (Quality Engineer – Quality Assurance, ALTEN Global Technologies Private Limited) |
| Approved By: | Devarani R (Manager - Quality Assurance and Management, ALTEN Global Technologies Private Limited) |
| Released By: | Madhuchandra Srinivas (Associate Director- Software, ALTEN Global Technologies Private Limited)  C:\Users\afreen.p.SWSYS\Pictures\SIGNATURE.PNG |

A logo with a triangle and a triangle in a red yellow and blue rectangle

Description automatically generated

**ALTEN Global Technologies Private Limited**

**Table of contents**

[1 Amendment Record 19](#_Toc204345885)

[2 Overview 51](#_Toc204345886)

[3 Objectives 57](#_Toc204345887)

[4 Acronyms, Terms and Definitions 57](#_Toc204345888)

[5 Scope 61](#_Toc204345889)

[6 References 61](#_Toc204345890)

[7 Assumptions 62](#_Toc204345891)

[8 Outstanding Issues 62](#_Toc204345892)

[9 Document Control 62](#_Toc204345893)

[10 Approvals 62](#_Toc204345894)

[11 Distribution 62](#_Toc204345895)

[12 Traceability 62](#_Toc204345896)

[13 Responsibilities 63](#_Toc204345897)

[14 Input 63](#_Toc204345898)

[15 Output 63](#_Toc204345899)

[16 .Software High Level requirements 63](#_Toc204345900)

[16.1 Initialization 63](#_Toc204345901)

[16.1.1 Initialization - Components 63](#_Toc204345902)

[16.1.1.1 Processor 64](#_Toc204345903)

[16.1.1.2 Watchdog timer 65](#_Toc204345904)

[16.1.1.3 System Timer 65](#_Toc204345905)

[16.1.1.4 Onchip CAN peripheral 66](#_Toc204345906)

[16.1.1.5 Nested Vector Interrupt Controller 66](#_Toc204345907)

[16.1.1.6 FSMC 66](#_Toc204345908)

[16.1.1.7 Internal ADC 67](#_Toc204345909)

[16.1.1.8 Internal DAC 67](#_Toc204345910)

[16.1.1.9 Arinc 429 67](#_Toc204345911)

[16.1.1.10 External ADC Initialisation 67](#_Toc204345912)

[16.1.1.11 RS232 Initialisation 68](#_Toc204345913)

[16.2 Modes of Operation 68](#_Toc204345914)

[16.2.1 Operational Modes 68](#_Toc204345915)

[16.2.2 Initialization phase 68](#_Toc204345916)

[16.2.3 Initialization Mode 68](#_Toc204345917)

[16.2.3.1 Initialization mode during Power-On sequence 69](#_Toc204345918)

[16.2.3.2 Detect sensors failures in Initialization mode 69](#_Toc204345919)

[16.2.3.3 Initialization mode during PBIT function 69](#_Toc204345920)

[**16.2.4 Operational mode** 69](#_Toc204345921)

[16.2.4.1 Detect sensors failures in Operational mode 70](#_Toc204345922)

[16.2.4.2 CBIT in Operational mode 70](#_Toc204345923)

[16.2.4.3 Non-Intrusiveness of CBIT Function on Outputs 70](#_Toc204345924)

[**16.2.6 Power off mode** 70](#_Toc204345925)

[16.2.7 Preflight Mode 71](#_Toc204345926)

[16.2.7.1 Preflight Mode perform the following results 71](#_Toc204345927)

[16.2.7.2 external signal 71](#_Toc204345928)

[16.2.7.3 Safe state 71](#_Toc204345929)

[16.2.7.4 P2 inhibition output 71](#_Toc204345930)

[**16.2.8 PFT TEST** 72](#_Toc204345931)

[**16.2.9 Failure Mode** 72](#_Toc204345932)

[**16.2.10 PBIT Mode** 72](#_Toc204345933)

[**16.2.11 Gateway Unit Categorization** 73](#_Toc204345934)

[**16.2.12 Gateway Normal Mode Functionality** 73](#_Toc204345935)

[**16.2.13 Error Mode** 73](#_Toc204345936)

[16.3 Safe States 74](#_Toc204345937)

[16.4 Interfaces 74](#_Toc204345938)

[16.4.1 Serial port for Channel to Channel Cross Link 74](#_Toc204345939)

[**16.4.2 Serial port configuration for cross channel** 75](#_Toc204345940)

[16.4.2.1 RS-232 Baud Rate 75](#_Toc204345941)

[**16.4.3 Cross-Check** 75](#_Toc204345942)

[**16.4.4 Cross-Check data link** 75](#_Toc204345943)

[**16.4.5 Inhibit Cross-Check fault reporting on powerup** 76](#_Toc204345944)

[16.4.7 ARINC 825 interface for inter-system communication 76](#_Toc204345945)

[16.4.8 A429 Interface 76](#_Toc204345946)

[**16.4.9 Discrete Input Interface** 76](#_Toc204345947)

[**16.4.10 Discrete Output Interface** 77](#_Toc204345948)

[**16.4.11 crosstalk link** 77](#_Toc204345949)

[**16.4.12 EIU with separate a processor** 77](#_Toc204345950)

[16.4.13 handling sensors 78](#_Toc204345951)

[**16.4.15 Engine Gas Generator Speed (NG1, NG2)** 78](#_Toc204345952)

[**16.4.16 Engine Gas turbine speed (NG)** 78](#_Toc204345953)

[**16.4.17 Engine 1 EOT validity** 78](#_Toc204345954)

[**16.4.18 Engine 2 EOT validity** 79](#_Toc204345955)

[**16.4.19 Engine 1 EOT operation limits** 79](#_Toc204345956)

[**16.4.20 Engine 2 EOT” Operation Limit Activation** 79](#_Toc204345957)

[16.5 Inputs 80](#_Toc204345958)

[**16.5.1 ARINC 429 Inputs** 80](#_Toc204345959)

[16.5.1.1 A429 Labels Not Received 81](#_Toc204345960)

[16.5.1.2 A429 Input Validity 81](#_Toc204345961)

[16.5.1.3 Invalid SSM 81](#_Toc204345962)

[16.5.1.4 SSM NCD 81](#_Toc204345963)

[16.5.1.5 SSM Value consideration 82](#_Toc204345964)

[16.5.1.6 ARINC 429 Data Format Spare Bits consideration 82](#_Toc204345965)

[16.5.1.7 T4\_Digital\_Value( Label 265-01) 82](#_Toc204345966)

[16.5.1.8 T4\_Digital\_Value (Label 265-10) 84](#_Toc204345967)

[16.5.1.9 T4\_Pointer\_Angle(label 266-01) 85](#_Toc204345968)

[16.5.1.10 T4\_Pointer\_Angle(label 266-10) 86](#_Toc204345969)

[16.5.1.11 T4\_AEO\_YEL(label 270-01) 86](#_Toc204345970)

[16.5.1.12 T4\_AEO\_YEL(label 270-10) 87](#_Toc204345971)

[16.5.1.13 T4\_AEO\_YEL\_REC(label 271-00) 88](#_Toc204345972)

[16.5.1.14 T4\_AEO\_RED(label 272-00) 90](#_Toc204345973)

[16.5.1.15 T4\_AEO\_RED\_DIO(label 273-00) 90](#_Toc204345974)

[16.5.1.16 T4\_OEI\_YEL\_DASH(label 274-00) 92](#_Toc204345975)

[16.5.1.17 T4\_OEI\_RED\_DASH(label 275-00) 93](#_Toc204345976)

[16.5.1.18 T4\_OEI\_RED\_LINE(label 276-00) 94](#_Toc204345977)

[16.5.1.19 T4\_START\_WHI\_TRI(label 300-00) 95](#_Toc204345978)

[16.5.1.20 T4\_START\_RED\_TRI\_LOW(label 301-00) 96](#_Toc204345979)

[16.5.1.21 T4\_START\_RED\_TRI\_HIGH(label 302-00) 97](#_Toc204345980)

[16.5.1.22 Label 074 Checksum Verification 98](#_Toc204345981)

[16.5.1.24 Label 077 Lighting State 99](#_Toc204345982)

[16.5.1.25 Default Unit of Measure 99](#_Toc204345983)

[16.5.1.26 DAU Reconfiguration 100](#_Toc204345984)

[16.5.1.27 reconfiguration mechanism 100](#_Toc204345985)

[16.5.1.28 channel selection 100](#_Toc204345986)

[16.5.1.29 check discrepancies 101](#_Toc204345987)

[16.5.1.30 master channel discrepancy 101](#_Toc204345988)

[16.5.1.31 reconfiguration mode 101](#_Toc204345989)

[16.5.1.32 channel master at every power up 102](#_Toc204345990)

[16.5.1.33 Reconfiguration states 102](#_Toc204345991)

[16.5.1.34 Reconfiguration settings 102](#_Toc204345992)

[16.5.1.35 channel selected 102](#_Toc204345993)

[16.5.1.36 channel selection 103](#_Toc204345994)

[16.5.1.38 select the used reconfiguration 103](#_Toc204345995)

[16.5.1.39 DAU1\_deselection 104](#_Toc204345996)

[16.5.1.40 EIU1\_Deselection 104](#_Toc204345997)

[16.5.1.41 DAU2\_deselection 104](#_Toc204345998)

[16.5.1.42 EIU2\_Deselection 105](#_Toc204345999)

[16.5.1.43 mode N 105](#_Toc204346000)

[16.5.2 Analog Inputs 105](#_Toc204346001)

[16.5.2.1 Analog Inputs from Analog Module 105](#_Toc204346002)

[16.5.2.2 Sensor Conversion Tables 108](#_Toc204346003)

[16.5.2.2.2 Conversion Table for NG Type 4 Sensor 108](#_Toc204346004)

[16.5.2.2.3 Conversion Table for ΔNG Type 3 Sensor 109](#_Toc204346005)

[16.5.2.2.4 Conversion Table for TRQ Type 3 Sensor 109](#_Toc204346006)

[16.5.2.2.5 Conversion Table for EOT Type 6 Sensor 110](#_Toc204346007)

[16.5.2.2.7 Computation of Acquired Electrical Signals 110](#_Toc204346008)

[16.5.2.2.7.2 Valid Range 110](#_Toc204346009)

[16.5.2.2.8 Caution and Warning alerts 111](#_Toc204346010)

[16.5.2.2.9 Engine 1 EOT Digital Value Conversion 111](#_Toc204346011)

[16.5.2.2.10 Engine 2 EOT Digital Value Conversion 112](#_Toc204346012)

[16.5.2.2.11 Engine 1 EOT high red limit 112](#_Toc204346013)

[16.5.2.2.12 Engine 2 EOT high red limit 112](#_Toc204346014)

[16.5.2.2.13 Engine 1 EOT Analog Value Conversion 113](#_Toc204346015)

[16.5.2.2.14 Engine 2 EOT Analog Value Conversion 113](#_Toc204346016)

[16.5.2.2.15 Conversion Table for EOP Type 8 Sensor 114](#_Toc204346017)

[16.5.2.2.16 Engine 1 EOP validity 115](#_Toc204346018)

[16.5.2.2.17 Engine 2 EOP validity 115](#_Toc204346019)

[16.5.2.2.18 Engine 1EOP low red limit 115](#_Toc204346020)

[16.5.2.2.19 Engine 2 EOP low red limit 116](#_Toc204346021)

[16.5.2.2.20 Engine 1 EOP high red limit 116](#_Toc204346022)

[16.5.2.2.21 Engine 2 EOP high red limit 116](#_Toc204346023)

[16.5.2.2.22 Engine 1 EOP Operation Limit Activation 116](#_Toc204346024)

[16.5.2.2.23 Engine 2 EOP Operation Limit Activation 117](#_Toc204346025)

[16.5.2.2.24 Engine 1 EOP Analog Value Conversion 117](#_Toc204346026)

[16.5.2.2.25 Engine 2 EOP Analog Value Conversion 118](#_Toc204346027)

[16.5.2.2.26 FUEL PRESS 1 low red limit 118](#_Toc204346028)

[16.5.2.2.27 FUEL PRESS 1 high red limit 119](#_Toc204346029)

[16.5.2.2.28 FUEL PRESS 2 low red limit 119](#_Toc204346030)

[16.5.2.2.29 FUEL PRESS 2 high red limit 119](#_Toc204346031)

[16.5.2.2.31 T4 (TOT1, TOT2) 119](#_Toc204346032)

[16.5.2.2.33 Conversion Table for MGBT 704A37630017 Sensor 120](#_Toc204346033)

[16.5.2.2.35 Conversion Table for MGBOP Type 7 Sensor 120](#_Toc204346034)

[16.5.2.2.36 Conversion Table for FP Type 5 Sensor 121](#_Toc204346035)

[16.5.2.2.37 Conversion Table for Hydraulic Pressure Type 7 Sensor 122](#_Toc204346036)

[16.5.2.2.42 TOT correction values 122](#_Toc204346037)

[16.5.2.2.43 Engine 1 T4 Raw Data Conversion 123](#_Toc204346038)

[16.5.2.2.44 Engine 1 T4 Corrective 123](#_Toc204346039)

[16.5.2.2.45 Engine 2 T4 Raw Data Conversion 123](#_Toc204346040)

[16.5.2.2.46 Engine 2 T4 Corrective Conversion 124](#_Toc204346041)

[16.5.2.2.47 Engine 1 T4 status 124](#_Toc204346042)

[16.5.2.2.48 Engine 2 T4 status 125](#_Toc204346043)

[16.5.2.2.49 EOT1 status 125](#_Toc204346044)

[16.5.2.2.50 EOT2 status 126](#_Toc204346045)

[16.5.2.3 Fuel Press 126](#_Toc204346046)

[16.5.2.3.1 FUEL PRESS 1 validity 126](#_Toc204346047)

[16.5.2.3.2 FUEL PRESS 2 validity 126](#_Toc204346048)

[16.5.2.3.3 4.4.4.17 Hydraulic Pressure (LHP, RHP) 127](#_Toc204346049)

[16.5.2.3.4 HYD PRESS 1 value 127](#_Toc204346050)

[16.5.2.3.5 HYD PRESS 2 value 128](#_Toc204346051)

[16.5.2.3.6 HYD PRESS 1 validity 128](#_Toc204346052)

[16.5.2.3.7 HYD PRESS 2 validity 129](#_Toc204346053)

[16.5.2.3.8 HYD PRESS 1 low red limit 129](#_Toc204346054)

[16.5.2.3.9 HYD PRESS 1 high red limit 129](#_Toc204346055)

[16.5.2.3.10 HYD PRESS 2 low red limit 129](#_Toc204346056)

[16.5.2.3.11 HYD PRESS 2 high red limit 130](#_Toc204346057)

[16.5.2.3.12 HYD PRESS 1 Operation Limit Activation 130](#_Toc204346058)

[16.5.2.3.13 HYD PRESS 2 Operation Limit Activation 130](#_Toc204346059)

[16.5.2.3.14 HYD PRESS 1 value 131](#_Toc204346060)

[16.5.2.3.15 HYD PRESS 2 value 132](#_Toc204346061)

[16.5.2.3.16 HYD PRESS1 status 132](#_Toc204346062)

[16.5.2.3.17 HYD PRESS2 status 132](#_Toc204346063)

[16.5.2.3.18 Transmission Temperature (MGBT/IGBT/TGBT) 133](#_Toc204346064)

[16.5.2.3.20 Gear Box Oil Pressure (MGBOP) 133](#_Toc204346065)

[16.5.2.3.21 MGB Oil Press validity 133](#_Toc204346066)

[16.5.2.3.22 MGB Oil press low red limit 134](#_Toc204346067)

[16.5.2.3.23 MGB\_Oil\_Press Operation Limits Activation 134](#_Toc204346068)

[16.5.2.3.24 MGB\_Oil\_Press Analog Value Conversion 134](#_Toc204346069)

[16.5.2.3.25 MGB Oil Press status 135](#_Toc204346070)

[16.5.2.3.26 MGB\_Oil\_Temperature Analog Value Conversion 135](#_Toc204346071)

[16.5.2.3.27 MGB\_Oil\_Press Digital Value Conversion 136](#_Toc204346072)

[16.5.2.3.28 MGB Oil Temperature validity 136](#_Toc204346073)

[16.5.2.3.29 MGBOT low red limit 137](#_Toc204346074)

[16.5.2.3.30 MGB Oil Temperature high red limit 137](#_Toc204346075)

[16.5.2.3.31 MGB\_Oil\_Temperature Operation Limit Activation 137](#_Toc204346076)

[16.5.2.3.32 MGB Oil Temperature value 138](#_Toc204346077)

[16.5.2.3.33 MGB Oil Temperature status 138](#_Toc204346078)

[16.5.2.3.34 MGB Main pump low pressure alarm 139](#_Toc204346079)

[16.5.2.3.35 MGB Stby pump low pressure alarm 139](#_Toc204346080)

[16.5.2.3.36 MGB oil temperature alarm 139](#_Toc204346081)

[16.5.2.3.37 TRQ input signal 140](#_Toc204346082)

[16.5.2.3.38 Engine 1 TRQ value 140](#_Toc204346083)

[16.5.2.3.39 "Engine 2 TRQ value 140](#_Toc204346084)

[16.5.2.3.40 Engine 1 TRQ Validity 141](#_Toc204346085)

[16.5.2.3.41 Engine 2 TRQ Validity 141](#_Toc204346086)

[16.5.2.3.42 Computed TRQ1+2 value 141](#_Toc204346087)

[16.5.2.3.43 TRQ OEI CT limit 142](#_Toc204346088)

[16.5.2.3.44 TRQ OEI LO limit 142](#_Toc204346089)

[16.5.2.3.45 TRQ OEI HI limit 143](#_Toc204346090)

[16.5.2.3.46 TRQ MCP limits 143](#_Toc204346091)

[16.5.2.3.47 TRQ TOP limit 143](#_Toc204346092)

[16.5.2.3.48 TRQ MTP limit 143](#_Toc204346093)

[16.5.2.3.49 Computed Torque 1+2 Operation Limits 143](#_Toc204346094)

[16.5.2.3.50 Computed Torque 1+2 Pointer Angle Limits 144](#_Toc204346095)

[16.5.2.3.51 TRQ OEI Diode Visibility 145](#_Toc204346096)

[16.5.2.3.52 Computed Torque 1+2 Pointer Angle Value Conversion 146](#_Toc204346097)

[16.5.2.3.53 Engine 1 TRQ Status 146](#_Toc204346098)

[16.5.2.3.54 Engine 2 TRQ Status 147](#_Toc204346099)

[16.5.2.3.55 Computed TRQ1+2 Status 147](#_Toc204346100)

[16.5.4 DU\_Source\_Selection 148](#_Toc204346101)

[16.5.5 SYSTEM MESSAGE STATUS 148](#_Toc204346102)

[16.5.7 Reconfiguration Discrepancy 149](#_Toc204346103)

[16.5.8 SYSTEM MESSAGE STATUS 149](#_Toc204346104)

[16.5.10 channel master selected 149](#_Toc204346105)

[16.5.11 channel master 149](#_Toc204346106)

[16.5.12 deactivate the reconfiguration 150](#_Toc204346107)

[16.5.13 reconfiguration capability 150](#_Toc204346108)

[16.5.14 reconfiguration discrepancy 150](#_Toc204346109)

[16.5.16 master channel selection 150](#_Toc204346110)

[16.5.17 master channel 151](#_Toc204346111)

[16.5.18 reconfiguration mode 151](#_Toc204346112)

[16.5.19 the reconfiguration request 151](#_Toc204346113)

[16.5.20 Equipment Status(label 11-10) 152](#_Toc204346114)

[16.5.21 reconfiguration state 152](#_Toc204346115)

[16.5.22 reconfiguration fault 152](#_Toc204346116)

[16.5.23 EIU reconfiguration 153](#_Toc204346117)

[16.5.24 reconfiguration state 153](#_Toc204346118)

[16.5.25 reconfiguration state 153](#_Toc204346119)

[16.5.26 Discrete Inputs 154](#_Toc204346120)

[16.5.27 Limitations During an Engine Start 154](#_Toc204346121)

[16.5.28 Limitations during One Engine Inoperable (OEI) 154](#_Toc204346122)

[16.5.29 N1 and T4 gauges 155](#_Toc204346123)

[16.5.30 Limitations with All Engines Operational (AEO) 155](#_Toc204346124)

[16.5.31 Engine State Inputs 155](#_Toc204346125)

[16.5.32 Engine State Logic 156](#_Toc204346126)

[16.5.33 Engine State Priority 157](#_Toc204346127)

[16.5.34 Composite Engine States 157](#_Toc204346128)

[16.5.35 Engine State and Limit Displaying 158](#_Toc204346129)

[16.5.36 RS-232 Inputs/Outputs 159](#_Toc204346130)

[16.5.36.1 Cross Channel Excitation Status 159](#_Toc204346131)

[16.5.36.2 Cross Channel Discrete Input Status 160](#_Toc204346132)

[16.5.36.4 Cross Channel Essential Value 161](#_Toc204346133)

[16.5.36.5 Cross Channel Critical Value 162](#_Toc204346134)

[16.5.36.6 Channel to Channel Cross-Check 163](#_Toc204346135)

[16.5.36.6 discrepancy (EIU1/EIU2) 163](#_Toc204346136)

[16.5.36.7 Parameter Discrepancy 163](#_Toc204346137)

[16.5.36.8 Detected discrepancy 164](#_Toc204346138)

[16.5.36.9 cross-check discrepancy 164](#_Toc204346139)

[16.5.36.10 discrepancy check 164](#_Toc204346140)

[16.5.36.11 discrepancy check 164](#_Toc204346141)

[16.5.36.12 discrepancy identification 165](#_Toc204346142)

[16.5.36.13 cross-check DAU 165](#_Toc204346143)

[16.5.36.14 Cross-Check Values for AS532U2 165](#_Toc204346144)

[16.5.36.15 Cross Channel Analog Input Status 166](#_Toc204346145)

[16.6 Outputs 167](#_Toc204346146)

[16.6.1 ARINC 429 Outputs 167](#_Toc204346147)

[16.6.1.1 A429 Outputs 167](#_Toc204346148)

[16.6.1.3 Aircraft Operating Modes 169](#_Toc204346149)

[16.6.1.3.1 On Ground 169](#_Toc204346150)

[16.6.1.3.2 preflight mode 170](#_Toc204346151)

[16.6.1.4 Discrete Data 170](#_Toc204346152)

[16.6.1.5 Warning and Status Discrete Word 1 170](#_Toc204346153)

[16.6.1.5.1 Warning and Status Discrete Word 1 170](#_Toc204346154)

[16.6.1.6 Warning and Status Discrete Word 1(Label 12 SDI 00) 172](#_Toc204346155)

[16.6.1.7 - Label 12 SDI 00 173](#_Toc204346156)

[16.6.1.8 Label 12 SDI 00 Bits 173](#_Toc204346157)

[16.6.1.9 Engine1 chip 174](#_Toc204346158)

[16.6.1.10 Engine2 chip 174](#_Toc204346159)

[16.6.1.11 Engine PWR.C caution 175](#_Toc204346160)

[16.6.1.12 Engine THRT caution 175](#_Toc204346161)

[16.6.1.13 Engine 1 bleed valve open 175](#_Toc204346162)

[16.6.1.14 Engine 2 bleed valve open 176](#_Toc204346163)

[16.6.1.15 Engine 1 Bleed Valve Offset 176](#_Toc204346164)

[16.6.1.16 Engine 2 Bleed Valve Offset 177](#_Toc204346165)

[16.6.1.17 Engine\_Status 1 (label 356-01) 177](#_Toc204346166)

[16.6.1.18 Engine\_Status 1 (label 356-10) 178](#_Toc204346167)

[16.6.1.19 Engine 1 Training 178](#_Toc204346168)

[16.6.1.20 Engine 2 Training 179](#_Toc204346169)

[16.6.1.21 Engine\_Status 2 (label 357-01) 179](#_Toc204346170)

[16.6.1.22 Label 357 SDI 01 Bits 180](#_Toc204346171)

[16.6.1.23 Label 357 SDI 10 181](#_Toc204346172)

[16.6.1.24 Engine\_Status 2 (label 357-10) 181](#_Toc204346173)

[16.6.1.25 Engine 1 topping 182](#_Toc204346174)

[16.6.1.26 Engine 2 topping 182](#_Toc204346175)

[16.6.1.27 Engine 1 OEI Topping 183](#_Toc204346176)

[16.6.1.28 Engine 2 OEI Topping 183](#_Toc204346177)

[16.6.1.30 Engine 1 GOV caution 184](#_Toc204346178)

[16.6.1.31 Engine 2 GOV caution 184](#_Toc204346179)

[16.6.1.32 Engine 1 START 184](#_Toc204346180)

[16.6.1.33 Engine 2 START 185](#_Toc204346181)

[16.6.1.34 Engine 1 OEI State 185](#_Toc204346182)

[16.6.1.35 Engine 2 OEI State 186](#_Toc204346183)

[16.6.1.36 Engine\_Status (label 356-01): 186](#_Toc204346184)

[16.6.1.37 Engine\_Status (label 356-10) 186](#_Toc204346185)

[16.6.1.38 Label 13 SDI 00 187](#_Toc204346186)

[16.6.1.39 Label 013 Warning and Status Discretes Word 2 188](#_Toc204346187)

[16.6.1.40 Label 011Equipment Status 189](#_Toc204346188)

[16.6.1.41 MGB Chip alarm 191](#_Toc204346189)

[16.6.1.42 IGB oil temperature alarm 191](#_Toc204346190)

[16.6.1.43 TGB Oil Temperature alarm 191](#_Toc204346191)

[16.6.1.44 Hydraulic aux pump low pressure alert 192](#_Toc204346192)

[16.6.1.45 Hydraulic auto pilot circuit pressure alert 192](#_Toc204346193)

[16.6.1.46 Hydraulic 1 main pump low pressure alert 192](#_Toc204346194)

[16.6.1.47 Hydraulic 1 low level alert 193](#_Toc204346195)

[16.6.1.48 Hydraulic 2 pump low pressure alert 193](#_Toc204346196)

[16.6.1.49 Hydraulic 2 low level alert 194](#_Toc204346197)

[16.6.1.50 Hydraulic SERVO alert 194](#_Toc204346198)

[16.6.1.51 Hydraulic 1 aux pump fail alert 194](#_Toc204346199)

[16.6.1.52 Label 074 Checksum 195](#_Toc204346200)

[16.6.1.53 Label 030 Mode Management 195](#_Toc204346201)

[16.6.1.55 Label 64 Software Checksum MSB 196](#_Toc204346202)

[16.6.1.56 Label 65 Software Checksum LSB 197](#_Toc204346203)

[16.6.1.57 DAU BIT 198](#_Toc204346204)

[16.6.1.58 Label 034 System Message Status 199](#_Toc204346205)

[16.6.1.59 Label 035 Discrepancy Report 200](#_Toc204346206)

[16.6.1.60 Label 344 DeltaNG Pointer Angle 201](#_Toc204346207)

[16.6.1.61 Label 344 SDI 10 202](#_Toc204346208)

[16.6.1.62 Label 345 SDI 01 202](#_Toc204346209)

[16.6.1.63 Label 345 SDI 10 203](#_Toc204346210)

[16.6.1.64 Label 346 SDI 00 Details 204](#_Toc204346211)

[16.6.1.65 Label 347 SDI 00 204](#_Toc204346212)

[16.6.1.66 Label 350 SDI 00 205](#_Toc204346213)

[16.6.1.67 Label 351 SDI 00 206](#_Toc204346214)

[16.6.1.68 Label 352 SDI 00 206](#_Toc204346215)

[16.6.1.69 Label 353 SDI 00 207](#_Toc204346216)

[16.6.1.70 Label 357 SDI 01 207](#_Toc204346217)

[16.6.1.71 Label 357 SDI 10 208](#_Toc204346218)

[16.6.1.72 validate the configuration 208](#_Toc204346219)

[16.6.1.73 Label 320 SDI 01 Details 209](#_Toc204346220)

[16.6.1.74 Label 320 SDI 10 Details 209](#_Toc204346221)

[16.6.1.75 Label 321 SDI 01 Details 210](#_Toc204346222)

[16.6.1.76 Label 321 SDI 10 Details 211](#_Toc204346223)

[16.6.1.77 Processing of EOP inputs 212](#_Toc204346224)

[16.6.1.78 Engine 1 EOP Digital Value Conversion 212](#_Toc204346225)

[16.6.1.79 Engine 2 EOP Digital Value Conversion 213](#_Toc204346226)

[16.6.1.80 Label 262 SDI 01 Details 213](#_Toc204346227)

[16.6.1.81 Label 262 SDI 10 Details 214](#_Toc204346228)

[16.6.1.82 Processing of Fuel Pressure 215](#_Toc204346229)

[16.6.1.83 FUEL PRESS 1 Digital Value Conversion 215](#_Toc204346230)

[16.6.1.84 FUEL PRESS 2 Digital Value Conversion 216](#_Toc204346231)

[16.6.1.85 ARINC429 line status 216](#_Toc204346232)

[16.6.1.87 companion labels 216](#_Toc204346233)

[16.6.1.88 companion label 217](#_Toc204346234)

[16.6.1.89 calculate checksum 217](#_Toc204346235)

[16.6.1.91 calculate a checksum 217](#_Toc204346236)

[16.6.1.96 EOT1 Digital Value 218](#_Toc204346237)

[16.6.1.97 EOT2 Digital Value 218](#_Toc204346238)

[16.6.1.98 EOT1 ANALOG VALUE 219](#_Toc204346239)

[16.6.1.99 EOT2 ANALOG VALUE 219](#_Toc204346240)

[16.6.1.100 Engine 1 failure frame 219](#_Toc204346241)

[16.6.1.101 Engine 2 failure frame 220](#_Toc204346242)

[16.6.1.102 ARINC429 line Validity 220](#_Toc204346243)

[16.6.1.104 Engine 1 NG Validity 222](#_Toc204346244)

[16.6.1.105 Engine 2 NG Validity 222](#_Toc204346245)

[16.6.1.106 Engine 1 NG value 222](#_Toc204346246)

[16.6.1.107 Engine 2 NG value 223](#_Toc204346247)

[16.6.1.108 ENG1 NG DIGITAL VALUE 223](#_Toc204346248)

[16.6.1.109 ENG2 NG DIGITAL VALUE 223](#_Toc204346249)

[16.6.1.110 Engine 1 NG Status 224](#_Toc204346250)

[16.6.1.111 Engine 2 NG Status 224](#_Toc204346251)

[16.6.1.112 Engine 1 DeltaNG value 225](#_Toc204346252)

[16.6.1.113 Engine 2 DeltaNG value 225](#_Toc204346253)

[16.6.1.114 Engine 1 DeltaNG Validity 226](#_Toc204346254)

[16.6.1.115 Engine 2 DeltaNG Validity 226](#_Toc204346255)

[16.6.1.116 Engine 1 DeltaNG Operation Limits 226](#_Toc204346256)

[16.6.1.117 Engine 2 DeltaNG Operation limit 227](#_Toc204346257)

[16.6.1.118 DeltaNG Pointer Angle Limits 228](#_Toc204346258)

[16.6.1.119 Engine 1 Delta NG OEI Diode Visibility 228](#_Toc204346259)

[16.6.1.120 DelatNG OEI CT limit 229](#_Toc204346260)

[16.6.1.121 DelatNG OEI LO limit 229](#_Toc204346261)

[16.6.1.122 DelatNG OEI HI limit 230](#_Toc204346262)

[16.6.1.123 DelatNG MCP limit 230](#_Toc204346263)

[16.6.1.124 DelatNG TOP limit 230](#_Toc204346264)

[16.6.1.125 DelatNG MTP limit 230](#_Toc204346265)

[16.6.1.126 ENG1 DeltaNG Pointer Angle 231](#_Toc204346266)

[16.6.1.127 ENG2\_DeltaNG\_Pointer\_Angle 231](#_Toc204346267)

[16.6.1.128 DeltaNG AEO YEL LO 231](#_Toc204346268)

[16.6.1.129 DeltaNG AEO YEL UP 232](#_Toc204346269)

[16.6.1.130 DeltaNG AEO RED 232](#_Toc204346270)

[16.6.1.131 DeltaNG AEO RED DIO 233](#_Toc204346271)

[16.6.1.132 DeltaNG OEI YEL DASH 233](#_Toc204346272)

[16.6.1.133 DeltaNG OEI RED DASH 234](#_Toc204346273)

[16.6.1.134 DeltaNG OEI RED LINE 234](#_Toc204346274)

[16.6.1.135 Engine1 StatusNG 235](#_Toc204346275)

[16.6.1.136 Engine2 StatusNG 235](#_Toc204346276)

[16.6.1.137 ENG1 NG OEI HI Diode 236](#_Toc204346277)

[16.6.1.138 ENG2 NG OEI HI Diode 236](#_Toc204346278)

[16.6.1.139 Engine 2 Delta NG OEI Diode Visibility 236](#_Toc204346279)

[16.6.1.140 Engine 1 DeltaNG Pointer Angle Value Conversion 237](#_Toc204346280)

[16.6.1.141 Engine 2 DeltaNG Pointer Angle Value Conversion 237](#_Toc204346281)

[16.6.1.142 Engine 1 T4 raw Validity 238](#_Toc204346282)

[16.6.1.143 Engine 1 T4 corrective Validity 238](#_Toc204346283)

[16.6.1.144 Engine 1 T4 value Validity 239](#_Toc204346284)

[16.6.1.145 Engine 2 T4 raw Validity 239](#_Toc204346285)

[16.6.1.146 Engine 2 T4 corrective Validity 239](#_Toc204346286)

[16.6.1.147 Engine 2 T4 value Validity 240](#_Toc204346287)

[16.6.1.148 Engine 1 T4 value 240](#_Toc204346288)

[16.6.1.149 Engine 2 T4 value 240](#_Toc204346289)

[16.6.1.150 T4 OEI CT limit 241](#_Toc204346290)

[16.6.1.151 T4 OEI LO limit 241](#_Toc204346291)

[16.6.1.152 T4 MCP limit 242](#_Toc204346292)

[16.6.1.153 T4 TOP limit 242](#_Toc204346293)

[16.6.1.154 T4 START WHITE TRI limit 242](#_Toc204346294)

[16.6.1.155 T4 START RED TRI HIGH limit 242](#_Toc204346295)

[16.6.1.156 Engine 1 T4 Operation Limits 243](#_Toc204346296)

[16.6.1.157 Engine 2 T4 Operation Limits 243](#_Toc204346297)

[16.6.1.158 Engine 1 T4 Pointer Angle Conversion 244](#_Toc204346298)

[16.6.1.159 Engine 2 T4 Pointer Angle Conversion 245](#_Toc204346299)

[16.6.1.160 T4 Pointer Angle Limits 246](#_Toc204346300)

[16.6.1.161 ENG1\_T4\_DIGITAL\_VALUE 247](#_Toc204346301)

[16.6.1.162 ENG2\_T4\_DIGITAL\_VALUE 247](#_Toc204346302)

[16.6.1.163 ENG1\_T4\_POINTER\_ANGLE 248](#_Toc204346303)

[16.6.1.164 ENG2\_T4\_POINTER\_ANGLE 248](#_Toc204346304)

[16.6.1.165 T4\_AEO\_YEL\_LO 249](#_Toc204346305)

[16.6.1.166 T4\_AEO\_YEL\_UP 249](#_Toc204346306)

[16.6.1.167 T4\_AEO\_RED 249](#_Toc204346307)

[16.6.1.168 T4\_OEI\_YEL\_DASH 250](#_Toc204346308)

[16.6.1.169 T4\_OEI\_RED\_DASH 250](#_Toc204346309)

[16.6.1.170 T4\_START\_WHI\_TRI 251](#_Toc204346310)

[16.6.1.171 T4\_START\_RED\_TRI\_HIGH 251](#_Toc204346311)

[16.6.1.172 TRQ 1 DIGITAL VALUE 252](#_Toc204346312)

[16.6.1.173 TRQ 2 DIGITAL VALUE 252](#_Toc204346313)

[16.6.1.174 COMPUTED TRQ1+2 DIGITAL 253](#_Toc204346314)

[16.6.1.175 Total\_TRQ1+2\_Pointer\_Angle 253](#_Toc204346315)

[16.6.1.176 TRQ\_AEO\_YEL\_LO 254](#_Toc204346316)

[16.6.1.177 TRQ\_AEO\_YEL\_UP 254](#_Toc204346317)

[16.6.1.178 TRQ\_AEO\_RED 255](#_Toc204346318)

[16.6.1.179 TRQ\_AEO\_RED\_DIO 255](#_Toc204346319)

[16.6.1.180 TRQ\_OEI\_YEL\_DASH 255](#_Toc204346320)

[16.6.1.181 TRQ\_OEI\_RED\_DASH 256](#_Toc204346321)

[16.6.1.182 TRQ\_OEI\_RED\_LINE 256](#_Toc204346322)

[16.6.1.183 Label 050 SDI 01 Details 257](#_Toc204346323)

[16.6.1.184 Label 050 SDI 10 Details 258](#_Toc204346324)

[16.6.1.185 Label 050 SDI 11 Details 259](#_Toc204346325)

[16.6.1.186 Label 051 SDI 11 Details 260](#_Toc204346326)

[16.6.1.187 Label 052 SDI 01 Details 261](#_Toc204346327)

[16.6.1.188 Label 052 SDI 10 Details 262](#_Toc204346328)

[16.6.1.189 Label 053 SDI 00 Details 262](#_Toc204346329)

[16.6.1.190 Label 054 SDI 00 Details 263](#_Toc204346330)

[16.6.1.191 Label 055 SDI 00 Details 264](#_Toc204346331)

[16.6.1.192 Label 057 SDI 00 Details 265](#_Toc204346332)

[16.6.1.193 Label 060 SDI 00 Details 265](#_Toc204346333)

[16.6.1.194 Label 061 SDI 00 Details 266](#_Toc204346334)

[16.6.1.195 Label 316 SDI 01 Details 267](#_Toc204346335)

[16.6.1.196 Processing of EOT inputs 268](#_Toc204346336)

[16.6.1.197 Label 316 SDI 10 Details 268](#_Toc204346337)

[16.6.1.198 Label 317 SDI 01 Details 269](#_Toc204346338)

[16.6.1.199 Label 317 SDI 10 Details 270](#_Toc204346339)

[16.6.1.200 Label 174 SDI 01 Details 270](#_Toc204346340)

[16.6.1.201 Label 174 SDI 10 Details 271](#_Toc204346341)

[16.6.1.202 Label 175 SDI 01 Details 272](#_Toc204346342)

[16.6.1.203 Label 175 SDI 10 Details 272](#_Toc204346343)

[16.6.1.204 Engine 1 EOP status 273](#_Toc204346344)

[16.6.1.205 Engine 2 EOP status 273](#_Toc204346345)

[16.6.1.206 EOP1 ANALOG VALUE 274](#_Toc204346346)

[16.6.1.207 EOP2 ANALOG VALUE 274](#_Toc204346347)

[16.6.1.208 EOP1 DIGITAL VALUE 275](#_Toc204346348)

[16.6.1.209 EOP2 DIGITAL VALUE 275](#_Toc204346349)

[16.6.1.210 FUEL PRESS1 status 275](#_Toc204346350)

[16.6.1.211 FUEL PRESS2 status 276](#_Toc204346351)

[16.6.1.212 FUEL PRESS 1 DIGITAL VALUE 276](#_Toc204346352)

[16.6.1.213 FUEL PRESS 2 DIGITAL VALUE 276](#_Toc204346353)

[16.6.1.214 HYD 1 DIGITAL VALUE 277](#_Toc204346354)

[16.6.1.215 HYD 2 DIGITAL VALUE 277](#_Toc204346355)

[16.6.1.216 HYD 1 ANALOG VALUE 277](#_Toc204346356)

[16.6.1.217 HYD 2 ANALOG VALUE 278](#_Toc204346357)

[16.6.1.218 Label 176 SDI 01 Details 278](#_Toc204346358)

[16.6.1.219 Label 177 SDI 01 Details 279](#_Toc204346359)

[16.6.1.220 MGB OIL PRESS DIGITAL VALUE 280](#_Toc204346360)

[16.6.1.221 MGB OIL PRESS ANALOG VALUE 280](#_Toc204346361)

[16.6.1.222 Label 200 SDI 01 Details 281](#_Toc204346362)

[16.6.1.223 Label 201 SDI 01 Details 282](#_Toc204346363)

[16.6.1.224 MGB OIL TEMP DIGITAL VALUE 283](#_Toc204346364)

[16.6.1.225 MGB OIL TEMP ANALOG VALUE 283](#_Toc204346365)

[16.6.1.226 lighting modes 283](#_Toc204346366)

[16.6.1.227 ARINC 429 output to DU 284](#_Toc204346367)

[16.6.1.228 A429 message 284](#_Toc204346368)

[16.6.1.229 power supply 284](#_Toc204346369)

[16.6.1.232 status message priority 284](#_Toc204346370)

[16.6.1.233 Label 031 Units 285](#_Toc204346371)

[16.6.1.234 Label 077 Lighting state 286](#_Toc204346372)

[16.6.2 Failure Frame Logic 287](#_Toc204346373)

[16.6.2.1 Engine 1 failure frame 287](#_Toc204346374)

[16.6.2.2 Engine 2 failure frame 287](#_Toc204346375)

[16.6.3 Label 013 Deselection Bits 287](#_Toc204346376)

[16.6.4 DU1 Pressure Units 288](#_Toc204346377)

[16.6.5 DU2 Pressure Units 288](#_Toc204346378)

[16.6.6 Internal General Purpose Outputs 289](#_Toc204346379)

[16.6.6.1 Heartbeat LED 289](#_Toc204346380)

[16.6.6.2 RS-232 loop back test 289](#_Toc204346381)

[16.6.6.3 Status LED 290](#_Toc204346382)

[16.6.7 Discrete Output Processing(Through Discrete Module) 290](#_Toc204346383)

[16.7 discrete signals 290](#_Toc204346384)

[16.7.1 system status message 290](#_Toc204346385)

[16.7.3 Delta NG Threshold Discrete Output Logic 291](#_Toc204346386)

[16.7.4 OEI event 291](#_Toc204346387)

[16.7.7 Backlight Characteristics 292](#_Toc204346388)

[16.7.8 NVG Mode (NORMAL/NVG) 292](#_Toc204346389)

[16.7.11 discrete signals flickering alerts 292](#_Toc204346390)

[16.8 A825 Communication 293](#_Toc204346391)

[16.8.1 Logical Communication Channel 293](#_Toc204346392)

[16.8.2 Invalid A825 message 293](#_Toc204346393)

[16.8.3 NSC Channel 293](#_Toc204346394)

[16.8.3.1 NSC message format 294](#_Toc204346395)

[16.8.3.2 NSC messages 294](#_Toc204346396)

[16.8.3.3 Discrete Outputs 303](#_Toc204346397)

[16.8.3.4 Switch excitation 303](#_Toc204346398)

[16.8.3.5 Reset CPU 303](#_Toc204346399)

[16.8.4 NOC Channel 304](#_Toc204346400)

[16.8.4.1 NOC message format 304](#_Toc204346401)

[16.8.4.2 NOC messages 304](#_Toc204346402)

[16.8.4.3 Acquire Message with DOC ID 0 to Analog and Discrete Module 327](#_Toc204346403)

[16.8.4.4 Discrete inputs received in Doc IDs 100 and 101 328](#_Toc204346404)

[16.8.4.5 Chip Detector inputs received in Doc ID 200 329](#_Toc204346405)

[16.8.4.6 Discrete outputs received in Doc ID 300 330](#_Toc204346406)

[16.8.4.7 Acquire message with DOC ID 2700 to Discrete Module 330](#_Toc204346407)

[16.8.4.8 Acquire message with DOC ID 2700 to Analog Module 331](#_Toc204346408)

[16.8.4.9 Acquire message with DOC ID 2700 to CMU+ Module 331](#_Toc204346409)

[16.8.4.10 ARINC 429 Labels to CMU+(DLU) with DOC ID 16000 332](#_Toc204346410)

[16.8.4.11 Part Numbers to CMU+(DLU) 333](#_Toc204346411)

[16.9 Automatic Excitation Switching 334](#_Toc204346412)

[16.9.1 Cross-channel communication 334](#_Toc204346413)

[16.9.2 Excitation message transfer 334](#_Toc204346414)

[16.10 Engine and Aircraft Parameter Calculations 335](#_Toc204346415)

[16.10.1 Monitoring status Suppression on powerup 335](#_Toc204346416)

[16.11 Built In Test 335](#_Toc204346417)

[16.11.1 Power-On 335](#_Toc204346418)

[16.11.2 PBIT 335](#_Toc204346419)

[16.11.2.1 RAM Test 336](#_Toc204346420)

[16.11.2.2 CPU Test 336](#_Toc204346421)

[16.11.2.3 CRC test 336](#_Toc204346422)

[16.11.2.4 NVRAM test 338](#_Toc204346423)

[16.11.2.5 A825 data from Analog or Discrete missing on power-up 339](#_Toc204346424)

[16.11.2.6 A429 Loopback Test 339](#_Toc204346425)

[16.11.2.7 CMU ACD data CRC check 339](#_Toc204346426)

[16.11.2.8 CMU NVM CRC Check 339](#_Toc204346427)

[16.11.3 CBIT 340](#_Toc204346428)

[16.11.3.1 Stack Test 340](#_Toc204346429)

[16.11.3.2 Data transmitted Cross-Channel Comparison 340](#_Toc204346430)

[16.11.3.3 Cross-Channel Comparison 341](#_Toc204346431)

[16.11.3.4 Resistive Temperature cross channel 341](#_Toc204346432)

[16.11.3.5 Miscompare Logic 341](#_Toc204346433)

[16.11.3.6 Miscompare data Clear 342](#_Toc204346434)

[16.11.3.8 Analog Input Fault Monitor 342](#_Toc204346435)

[16.11.3.9 Analog input 342](#_Toc204346436)

[16.11.3.10 Analog Input Fault state 343](#_Toc204346437)

[16.11.3.11 Analog Input Fault bit error 343](#_Toc204346438)

[16.11.3.12 EDAU Fault Bit Reporting 343](#_Toc204346439)

[16.11.3.13 A825 data from CMU+ missing during CBIT 343](#_Toc204346440)

[16.11.3.14 A825 data from Analog or Discrete missing during CBIT 344](#_Toc204346441)

[16.11.3.15 Discrete Input Fault Monitor 344](#_Toc204346442)

[16.11.3.16 Discrete Input 344](#_Toc204346443)

[16.11.3.17 Discrete Input Fault State 344](#_Toc204346444)

[16.11.3.18 Discrete Input Fault bit error 345](#_Toc204346445)

[16.12 DAU Configuration 345](#_Toc204346446)

[16.12.1 Aircraft Configuration Parameters 345](#_Toc204346447)

[16.12.2 NVRAM Data Parameters 353](#_Toc204346448)

[16.12.3 Hardware Calibration Factors 354](#_Toc204346449)

[16.12.4 Data Logging 355](#_Toc204346450)

[16.13 Module Configuration Data 355](#_Toc204346451)

[16.13.1 Module Configuration Data Table - Definition 355](#_Toc204346452)

[16.14 Kernel and Scheduler 358](#_Toc204346453)

[16.14.1 Kernel/Scheduler - Initializations 358](#_Toc204346454)

[16.14.2 Scheduler - Algorithm 359](#_Toc204346455)

[16.14.3 Tasks 359](#_Toc204346456)

[16.14.4 Semaphores 360](#_Toc204346457)

[16.14.5 Task activation by semaphore 360](#_Toc204346458)

[16.14.6 Task structure 360](#_Toc204346459)

[16.15 Software Part Number - Application Software 360](#_Toc204346460)

[16.16 Resource Utilization 361](#_Toc204346461)

[16.16.1 Memory Usage 361](#_Toc204346462)

[16.16.2 Throughput Usage 361](#_Toc204346463)

**List of Tables**

[Table 1: Amendment Record 19](#_Toc204346464)

[Table 2 :Acronyms and Definition 57](#_Toc204346465)

[Table 3: Reference documents 61](#_Toc204346466)

[Table 4: Red LED Blink Rate 73](#_Toc204346467)

[Table 5 :“Engine 1 EOT” Operation Limit Activation 79](#_Toc204346468)

[Table 6 :“Engine 2 EOT” Operation Limit Activation 80](#_Toc204346469)

[Table 7 - Label 265 SDI 01 Details 83](#_Toc204346470)

[Table 8 - Label 265 SDI 10 Details 84](#_Toc204346471)

[Table 9 - Label 266 SDI 01 Details 85](#_Toc204346472)

[Table 10 - Label 266 SDI 10 Details 86](#_Toc204346473)

[Table 11 - Label 270 SDI 01 Details 86](#_Toc204346474)

[Table 12 - Label 270 SDI 10 Details 88](#_Toc204346475)

[Table 13 - Label 271 SDI 00 Details 89](#_Toc204346476)

[Table 14 - Label 272 SDI 00 Details 90](#_Toc204346477)

[Table 15 : Label 273 SDI 00 Details 91](#_Toc204346478)

[Table 16 : Label 274 SDI 00 Details 92](#_Toc204346479)

[Table 17 : Label 275 SDI 00 Details 93](#_Toc204346480)

[Table 18 - Label 276 SDI 00 Details 94](#_Toc204346481)

[Table 19 - Label 300 SDI 00 Details 95](#_Toc204346482)

[Table 20- Label 301 SDI 00 Details 96](#_Toc204346483)

[Table 21- Label 302 SDI 00 Details 97](#_Toc204346484)

[Table 22 : Label 074, Checksum Verification 98](#_Toc204346485)

[Table 23– Label 077 Lighting State 99](#_Toc204346486)

[Table 24: Default Unit of Measure 99](#_Toc204346487)

[Table 25: ARINC825 Analog Inputs from Analog Module 106](#_Toc204346488)

[Table 26: NG Type 4 Sensor Conversion Table 108](#_Toc204346489)

[Table 27- ΔNG Type 3 Sensor Conversion Table 109](#_Toc204346490)

[Table 28- TRQ Type 3 Sensor Conversion Table 109](#_Toc204346491)

[Table 29 - EOT Type 6 Sensor Conversion Table 110](#_Toc204346492)

[Table 30 - Engine 1 EOT Digital Value Conversion 111](#_Toc204346493)

[Table 31 - Engine 2 EOT Digital Value Conversion 112](#_Toc204346494)

[Table 32- Engine 1 EOT Analog Value Conversion 113](#_Toc204346495)

[Table 33- Engine 2 EOT Analog Value Conversion 114](#_Toc204346496)

[Table 34- EOP Type 8 Sensor Conversion Table 114](#_Toc204346497)

[Table 35- Engine 1 EOP Operation Limit Activation 116](#_Toc204346498)

[Table 36- Engine 2 EOP Operation Limit Activation 117](#_Toc204346499)

[Table 37- Engine 1 EOP Analog Value Conversion 117](#_Toc204346500)

[Table 38- Engine 2 EOP Analog Value Conversion 118](#_Toc204346501)

[Table 39- MGBT 704A37630017 Sensor Conversion Table 120](#_Toc204346502)

[Table 40- MGBOP Type 7 Sensor Conversion Table 120](#_Toc204346503)

[Table 41- FP Type 5 Sensor Conversion Table 121](#_Toc204346504)

[Table 42- Hydraulic Pressure Type 7 Sensor Conversion Table 122](#_Toc204346505)

[Table 43: TOT correction values 123](#_Toc204346506)

[Table 44- Engine 1 T4 Raw Data Conversion 123](#_Toc204346507)

[Table 45- Engine 2 T4 Raw Data Conversion 124](#_Toc204346508)

[Table 46– HYD PRESS 1 Digital Value Conversion 127](#_Toc204346509)

[Table 47– HYD PRESS 2 Digital Value Conversion 128](#_Toc204346510)

[Table 48- HYD PRESS 1 Operation Limit Activation 130](#_Toc204346511)

[Table 49- HYD PRESS 2 Operation Limit Activation 131](#_Toc204346512)

[Table 50 –HYD PRESS 1 analog value Conversion 131](#_Toc204346513)

[Table 51– HYD PRESS 2 analog value Conversion 132](#_Toc204346514)

[Table 52- MGB\_Oil\_Press Operation Limits Activation 134](#_Toc204346515)

[Table 53- MGB\_Oil\_Press Analog Value Conversion 135](#_Toc204346516)

[Table 54- MGB\_Oil\_Temperature Digital Value Conversion 135](#_Toc204346517)

[Table 55- MGB Oil Press Digital Value Conversion 136](#_Toc204346518)

[Table 56- MGB Oil Temperature Operation Limit Activation 137](#_Toc204346519)

[Table 57– MGB Oil Temperature Analog Value Conversion 138](#_Toc204346520)

[Table 58- Computed Torque 1+2 Operation Limits 144](#_Toc204346521)

[Table 59- Computed Torque 1+2 Pointer Angle Limits 144](#_Toc204346522)

[Table 60- TRQ OEI Diode Visibility 145](#_Toc204346523)

[Table 61- Computed Torque 1+2 Pointer Angle Value Conversion 146](#_Toc204346524)

[Table 62- Engine State Inputs 155](#_Toc204346525)

[Table 63- Engine State Logic 156](#_Toc204346526)

[Table 64- Composite Engine States 158](#_Toc204346527)

[Table 65- Engine State and Limit Displaying 158](#_Toc204346528)

[Table 66: Cross channel Excitation Status in RS232 to another Gateway Channel 160](#_Toc204346529)

[Table 67: Cross channel Discrete Input Status in RS232 to another Gateway Channel 161](#_Toc204346530)

[Table 68– Cross-Check Values for AS532U2 165](#_Toc204346531)

[Table 69- SDI Bit Interpretation 167](#_Toc204346532)

[Table 70: A429 Outputs 167](#_Toc204346533)

[Table 71- Aircraft Configuration Parameters 169](#_Toc204346534)

[Table 72- Label 012 Warning and Status Discrete Word 1 170](#_Toc204346535)

[Table 73- Label 12 SDI 00 Bits 17, 18, 19, & 20 Details 172](#_Toc204346536)

[Table 74- Label 12 SDI 00 Bits 11, 12, 15, & 16 Details 173](#_Toc204346537)

[Table 75- Label 12 SDI 00 Bits 13 & 14 Details 174](#_Toc204346538)

[Table 76- Label 356 SDI 01 Details 177](#_Toc204346539)

[Table 77- Label 356 SDI 10 Details 178](#_Toc204346540)

[Table 78- Label 357 SDI 01 Bits 23 & 24 Details 179](#_Toc204346541)

[Table 79- Label 357 SDI 01 Bits 11, 12, 13, 25, & 26 Details 180](#_Toc204346542)

[Table 80- Label 357 SDI 10 Bits 11, 12, 13, 25, & 26 Details 181](#_Toc204346543)

[Table 81- Label 357 SDI 10 Bits 23 & 24 Details 182](#_Toc204346544)

[Table 82- Label 13 SDI 00 187](#_Toc204346545)

[Table 83- Label 013 Warning and Status Discretes Word 2 188](#_Toc204346546)

[Table 84- Label 011Equipment Status 190](#_Toc204346547)

[Table 85- Label 074 Checksum 195](#_Toc204346548)

[Table 86– Label 030 Mode Management 195](#_Toc204346549)

[Table 87- Software Checksum MSB 196](#_Toc204346550)

[Table 88- Software Checksum LSB 197](#_Toc204346551)

[Table 89– DAU BIT 198](#_Toc204346552)

[Table 90- Label 034, System Message Status 199](#_Toc204346553)

[Table 91- Label 035, Discrepancy Report 200](#_Toc204346554)

[Table 92– Label 344 SDI 01Details 202](#_Toc204346555)

[Table 93– Label 344 SDI 10 Details 202](#_Toc204346556)

[Table 94- Label 345 SDI 01 Details 202](#_Toc204346557)

[Table 95- Label 345 SDI 10 Details 203](#_Toc204346558)

[Table 96- Label 346 SDI 00 Details 204](#_Toc204346559)

[Table 97- Label 347 SDI 00 Details 204](#_Toc204346560)

[Table 98- Label 350 SDI 00 Details 205](#_Toc204346561)

[Table 99- Label 351 SDI 00 Details 206](#_Toc204346562)

[Table 100- Label 352 SDI 00 Details 206](#_Toc204346563)

[Table 101- Label 353 SDI 00 Details 207](#_Toc204346564)

[Table 102- Label 357 SDI 01 Details 208](#_Toc204346565)

[Table 103- Label 357 SDI 10 Details 208](#_Toc204346566)

[Table 104- Label 320 SDI 01 Details 209](#_Toc204346567)

[Table 105- Label 320 SDI 10 Details 210](#_Toc204346568)

[Table 106- Label 321 SDI 01 Details 210](#_Toc204346569)

[Table 107- Label 321 SDI 10 Details 211](#_Toc204346570)

[Table 108- Engine 1 EOP Digital Value Conversion 212](#_Toc204346571)

[Table 109- Engine 2 EOP Digital Value Conversion 213](#_Toc204346572)

[Table 110- Label 262 SDI 01 Details 213](#_Toc204346573)

[Table 111- Label 262 SDI 10 Details 214](#_Toc204346574)

[Table 112- FUEL PRESS 1 Digital Value Conversion 215](#_Toc204346575)

[Table 113- FUEL PRESS 2 Digital Value Conversion 216](#_Toc204346576)

[Table 114: Engine 1 NG A429 Reference 221](#_Toc204346577)

[Table 115: Engine 2 Ng A429 Reference 221](#_Toc204346578)

[Table 116- Engine 1 DeltaNG Operation Limits 226](#_Toc204346579)

[Table 117- Engine 2 DeltaNG Operation Limits 227](#_Toc204346580)

[Table 118- DeltaNG Pointer Angle Limits 228](#_Toc204346581)

[Table 119- Engine 1 Delta NG OEI Diode Visibility 229](#_Toc204346582)

[Table 120- Engine 2 Delta NG OEI Diode Visibility 237](#_Toc204346583)

[Table 121- Engine 1 DeltaNG Pointer Angle Value Conversion 237](#_Toc204346584)

[Table 122- Engine 2 DeltaNG Pointer Angle Value Conversion 238](#_Toc204346585)

[Table 123- Engine 1 T4 Operation Limits 243](#_Toc204346586)

[Table 124- Engine 2 T4 Operation Limits 244](#_Toc204346587)

[Table 125- Engine 1 T4 Pointer Angle Conversion 244](#_Toc204346588)

[Table 126- Engine 2 T4 Pointer Angle Conversion 245](#_Toc204346589)

[Table 127- T4 Pointer Angle Limits 246](#_Toc204346590)

[Table 128- T4 Displayed Limits from Display Class 251](#_Toc204346591)

[Table 129 - TRQ Displayed Limits from Display Class 257](#_Toc204346592)

[Table 130- Label 050 SDI 01 Details 257](#_Toc204346593)

[Table 131- Label 050 SDI 10 Details 258](#_Toc204346594)

[Table 132- Label 050 SDI 11 Details 259](#_Toc204346595)

[Table 133- Label 051 SDI 11 Details 260](#_Toc204346596)

[Table 134- Label 052 SDI 01 Details 261](#_Toc204346597)

[Table 135- Label 052 SDI 10 Details 262](#_Toc204346598)

[Table 136- Label 053 SDI 00 Details 263](#_Toc204346599)

[Table 137- Label 054 SDI 00 Details 263](#_Toc204346600)

[Table 138- Label 055 SDI 00 Details 264](#_Toc204346601)

[Table 139- Label 057 SDI 00 Details 265](#_Toc204346602)

[Table 140- Label 060 SDI 00 Details 265](#_Toc204346603)

[Table 141- Label 061 SDI 00 Details 266](#_Toc204346604)

[Table 142- Label 316 SDI 01 Details 267](#_Toc204346605)

[Table 143- Label 316 SDI 10 Details 268](#_Toc204346606)

[Table 144- Label 317 SDI 01 Details 269](#_Toc204346607)

[Table 145- Label 317 SDI 10 Details 270](#_Toc204346608)

[Table 146- Label 174 SDI 01 Details 271](#_Toc204346609)

[Table 147- Label 174 SDI 10 Details 271](#_Toc204346610)

[Table 148- Label 175 SDI 01 Details 272](#_Toc204346611)

[Table 149- Label 175 SDI 10 Details 272](#_Toc204346612)

[Table 150- Label 176 SDI 01 Details 278](#_Toc204346613)

[Table 151- Label 177 SDI 01 Details 279](#_Toc204346614)

[Table 152- Label 200 SDI 01 Details 281](#_Toc204346615)

[Table 153- Label 201 SDI 01 Details 282](#_Toc204346616)

[Table 154– DU1 Pressure Units 288](#_Toc204346617)

[Table 155– DU2 Pressure Units 289](#_Toc204346618)

[Table 156: HeartBeat LED 289](#_Toc204346619)

[Table 157: Status LED 290](#_Toc204346620)

[Table 158 - Backlight Characteristics 292](#_Toc204346621)

[Table 159: List of NSC messages 294](#_Toc204346622)

[Table 160:A825 payload for Discrete Outputs#1 303](#_Toc204346623)

[Table 161: Action for SFC = 49156 303](#_Toc204346624)

[Table 162:List of Document Object Codes 304](#_Toc204346625)

[Table 163: Discrete Inputs 328](#_Toc204346626)

[Table 164: Chip Detector Inputs 329](#_Toc204346627)

[Table 165: Discrete Outputs 330](#_Toc204346628)

[Table 166: List of ARINC 429 Labels 332](#_Toc204346629)

[Table 167: Part Numbers 333](#_Toc204346630)

[Table 168: Aircraft Configuration Parameters 345](#_Toc204346631)

[Table 169*: Audio Configuration – Aircraft Parameters* 346](#_Toc204346632)

[Table 170*: Engine Data Configuration – Aircraft Parameters* 347](#_Toc204346633)

[Table 171*: Air Data Configuration – Aircraft Parameters* 348](#_Toc204346634)

[Table 172*: ARINC429 Input Data Configuration – Aircraft Parameters* 349](#_Toc204346635)

[Table 173 *: ARINC429 Output Binary Data Configuration – Aircraft Parameters* 349](#_Toc204346636)

[Table 174*: ARINC429 Output Discrete Data Configuration – Aircraft Parameters* 350](#_Toc204346637)

[Table 175*: Exceedance Monitoring Data Configuration - Aircraft Parameters* 351](#_Toc204346638)

[Table 176*: Limit Data Configuration* 352](#_Toc204346639)

[Table 177*: Limit Others Entry Data Configuration - Exceedance Monitoring Data Configuration - Aircraft Parameters* 352](#_Toc204346640)

[Table 178: NVM RAM Data 353](#_Toc204346641)

[Table 179: ENGINE FLAGS 353](#_Toc204346642)

[Table 180: ENGINE CONFIG 354](#_Toc204346643)

[Table 181: AIRCRAFT FLAGS 354](#_Toc204346644)

[Table 182: AIRCRAFT CONFIG 354](#_Toc204346645)

[Table 183: HARDWARECALIB 354](#_Toc204346646)

[Table 1847: AIRCRAFT CONFIG FLAGS 354](#_Toc204346647)

[Table 185: Module Configuration Data Table - sections 356](#_Toc204346648)

[Table 186: Serial Port Configuration section - Parameters 356](#_Toc204346649)

[Table 187: Analog Conversion Tables 357](#_Toc204346650)

[Table 188: A429 Channel Configuration 357](#_Toc204346651)

[Table 189: Audio Tone Output Configuration Parameters 357](#_Toc204346652)

[Table 190: Tachometer Signal Configuration 358](#_Toc204346653)

[Table 191: Tasks in Gateway Module 359](#_Toc204346654)

List of Figures

[Figure 1: Functional block diagram - Engine Instrument System 51](#_Toc204346655)

[Figure 2: DAU - decomposition 54](#_Toc204346656)

[Figure 3: Native System Block Diagram 56](#_Toc204346657)

[Figure 4: Mixed System Block Diagram 56](#_Toc204346658)

[Figure 5: Engine 2 T4 pointer angle value 246](#_Toc204346659)

[Figure 6: Deselection Bits 288](#_Toc204346660)

[Figure 7:NSC message format 294](#_Toc204346661)

[Figure 8: NOC message format 304](#_Toc204346662)

# 1 Amendment Record

Table : Amendment Record

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Version No.** | **Description of Amendment** | **Change Request No.** | **Changed By** | **Release Date** |
| 1.1 | Initial Release | NA | Divya Renganathan | 3-Jan-2022 |
| 1.2 | Following Requirements are updated to address review comments  Section 2 Overview  4 Acronyms, Terms and Definitions  H398-SRS-GWY-DRQ-19  H398-SRS-GWY-DRQ-26  H398-SRS-GWY-FNC-616  H398-SRS-GWY-FNC-57  H398-SRS-GWY-FNC-174  H398-SRS-GWY-FNC-370  H398-SRS-GWY-FNC-471  H398-SRS-GWY-FNC-207  H398-SRS-GWY-FNC-186  H398-SRS-GWY-FNC-458  H398-SRS-GWY-FNC-178  H398-SRS-GWY-FNC-168  H398-SRS-GWY-FNC-149  H398-SRS-GWY-FNC-106  H398-SRS-GWY-FNC-80  H398-SRS-GWY-FNC-81  H398-SRS-GWY-FNC-82  H398-SRS-GWY-FNC-83  H398-SRS-GWY-FNC-84  H398-SRS-GWY-FNC-85  H398-SRS-GWY-FNC-87  H398-SRS-GWY-FNC-90  H398-SRS-GWY-FNC-169  H398-SRS-GWY-FNC-235  H398-SRS-GWY-FNC-433  H398-SRS-GWY-FNC-263  H398-SRS-GWY-FNC-271  H398-SRS-GWY-FNC-244  H398-SRS-GWY-FNC-275  H398-SRS-GWY-DRQ-23  H398-SRS-GWY-FNC-166  Following Requirements are deleted  H398-SRS-GWY-FNC-317  H398-SRS-GWY-FNC-196  H398-SRS-GWY-FNC-172  H398-SRS-GWY-FNC-173  H398-SRS-GWY-FNC-112 | 100032 | Divya Renganathan | 5-Feb-2022 |
| 1.3 | Following Requirements are updated to address QA comments and self review comments  H398-SRS-GWY-FNC-57  H398-SRS-GWY-FNC-82  H398-SRS-GWY-FNC-84  H398-SRS-GWY-FNC-506  H398-SRS-GWY-FNC-361  H398-SRS-GWY-FNC-370  H398-SRS-GWY-FNC-383  H398-SRS-GWY-FNC-99  H398-SRS-GWY-FNC-100  H398-SRS-GWY-FNC-101  H398-SRS-GWY-FNC-102  H398-SRS-GWY-DRQ-583  H398-SRS-GWY-DRQ-595  H398-SRS-GWY-DRQ-596  H398-SRS-GWY-DRQ-609  H398-SRS-GWY-DRQ-398  Changed ‘MOPS’ Attribute to the following Requirements  H398-SRS-GWY-FNC-75  H398-SRS-GWY-FNC-76  H398-SRS-GWY-FNC-77  H398-SRS-GWY-FNC-78  H398-SRS-GWY-FNC-628  H398-SRS-GWY-FNC-80  H398-SRS-GWY-FNC-81  H398-SRS-GWY-FNC-82  H398-SRS-GWY-FNC-83  H398-SRS-GWY-FNC-84  H398-SRS-GWY-FNC-87  H398-SRS-GWY-FNC-90 | 100032 | Divya Renganathan | 11-Feb-2022 |
| 1.4 | Updated the following Requirements  for SOI#2 actions  H398-SRS-GWY-FNC-75  H398-SRS-GWY-FNC-76  H398-SRS-GWY-FNC-77  H398-SRS-GWY-FNC-78  H398-SRS-GWY-FNC-628  H398-SRS-GWY-FNC-135  H398-SRS-GWY-FNC-549  H398-SRS-GWY-FNC-106  H398-SRS-GWY-FNC-108  H398-SRS-GWY-FNC-205  H398-SRS-GWY-FNC-206  H398-SRS-GWY-FNC-303  H398-SRS-GWY-DRQ-397  H398-SRS-GWY-FNC-443  H398-SRS-GWY-DRQ-399  H398-SRS-GWY-FNC-441  Updated Verification method for all requirements from ‘None’ To ‘Testing’ | 100040 | Divya Renganathan | 24-Feb-2022 |
| 1.5 | Following Requirement is updated to address QA comments  H398-SRS-GWY-FNC-78 | 100040 | Divya Renganathan | 15-Mar-2022 |
| 1.6 | Updated sections/requirements as mentioned in PR100096 | PR100096 | Divya Renganathan | 27-Dec-2022 |
| 1.7 | The below mentioned requirements are modified as per review comments and based on self review  H398-SRS-GWY-FNC-500 is changed to H398-SRS-GWY-GEN-500  H398-SRS-GWY-DRQ-21  H398-SRS-GWY-FNC-425  H398-SRS-GWY-FNC-661  H398-SRS-GWY-DRQ-399  H398-SRS-GWY-FNC-273  H398-SRS-GWY-FNC-274  H398-SRS-GWY-FNC-459  H398-SRS-GWY-FNC-449  H398-SRS-GWY-FNC-452  H398-SRS-GWY-DRQ-583  H398-SRS-GWY-DRQ-593  H398-SRS-GWY-DRQ-595  H398-SRS-GWY-FNC-468  H398-SRS-GWY-FNC-458  H398-SRS-GWY-FNC-114  H398-SRS-GWY-FNC-695  H398-SRS-GWY-DRQ-33 is changed to  H398-SRS-GWY-FNC-33  Deleted Id:  H398-SRS-GWY-FNC-465  Added Id:  H398-SRS-GWY-FNC-698 | PR100096 | Divya Renganathan | 31-Dec-2022 |
| 1.8 | The below mentioned requirements are modified as per QA comments  H398-SRS-GWY-FNC-686  H398-SRS-GWY-FNC-660  H398-SRS-GWY-FNC-499  The below mentioned requirements are modified as per self-review  H398-SRS-GWY-FNC-106  H398-SRS-GWY-FNC-208  H398-SRS-GWY-FNC-352  H398-SRS-GWY-FNC-353  H398-SRS-GWY-FNC-391  H398-SRS-GWY-FNC-378  H398-SRS-GWY-FNC-226  H398-SRS-GWY-FNC-298  H398-SRS-GWY-FNC-425  H398-SRS-GWY-FNC-479 | PR100096 | Divya Renganathan | 3-Jan-2023 |
| 2.0 | The following requirements are modified:  Section 2 Overview  Section 3 Objectives  Section 4 Acronyms, Terms and Definitions  H398-SRS-GWY-FNC-37  H398-SRS-GWY-FNC-39  H398-SRS-GWY-FNC-628  H398-SRS-GWY-FNC-45  H398-SRS-GWY-FNC-114  H398-SRS-GWY-FNC-301  H398-SRS-GWY-FNC-460  H398-SRS-GWY-FNC-479  H398-SRS-GWY-FNC-629  H398-SRS-GWY-FNC-510  H398-SRS-GWY-FNC-511  H398-SRS-GWY-FNC-516  H398-SRS-GWY-FNC-517  H398-SRS-GWY-FNC-47  H398-SRS-GWY-FNC-616  Section 16.5.2.3 Fuel Press  H398-SRS-GWY-FNC-100  H398-SRS-GWY-FNC-113  H398-SRS-GWY-FNC-513  The following requirements are Added  Section 16.2.2 Initialization mode  H398-SRS-GWY-FNC-706  H398-SRS-GWY-FNC-707  H398-SRS-GWY-FNC-708  H398-SRS-GWY-FNC-709  H398-SRS-GWY-FNC-710  H398-SRS-GWY-FNC-711  H398-SRS-GWY-FNC-712  H398-SRS-GWY-FNC-713  H398-SRS-GWY-FNC-714  Section 16.2.7.1 Preflight Mode perform and display the following results  H398-SRS-GWY-FNC-717  H398-SRS-GWY-FNC-718  Section 16.3 safe states  H398-SRS-GWY-FNC-719  H398-SRS-GWY-FNC-792  H398-SRS-GWY-FNC-793  Section 16.4.13 handling sensors  H398-SRS-GWY-FNC-795  H398-SRS-GWY-FNC-796  H398-SRS-GWY-FNC-797  H398-SRS-GWY-FNC-798  H398-SRS-GWY-FNC-799  H398-SRS-GWY-FNC-800  H398-SRS-GWY-FNC-1016  H398-SRS-GWY-FNC-727  H398-SRS-GWY-FNC-728  H398-SRS-GWY-FNC-729  H398-SRS-GWY-FNC-730  H398-SRS-GWY-FNC-731  H398-SRS-GWY-FNC-732  H398-SRS-GWY-FNC-733  H398-SRS-GWY-FNC-734  H398-SRS-GWY-FNC-735  H398-SRS-GWY-FNC-736  H398-SRS-GWY-FNC-737  H398-SRS-GWY-FNC-738  H398-SRS-GWY-FNC-739  H398-SRS-GWY-FNC-740  H398-SRS-GWY-FNC-741  H398-SRS-GWY-FNC-1139  H398-SRS-GWY-FNC-1140  H398-SRS-GWY-FNC-1141  H398-SRS-GWY-FNC-1094  H398-SRS-GWY-FNC-897  H398-SRS-GWY-FNC-898  H398-SRS-GWY-FNC-899  H398-SRS-GWY-FNC-900  H398-SRS-GWY-FNC-901  H398-SRS-GWY-FNC-903  H398-SRS-GWY-FNC-905  H398-SRS-GWY-FNC-906  H398-SRS-GWY-FNC-907  H398-SRS-GWY-FNC-908  H398-SRS-GWY-FNC-904  H398-SRS-GWY-FNC-909  H398-SRS-GWY-FNC-911  H398-SRS-GWY-FNC-910  H398-SRS-GWY-FNC-912  H398-SRS-GWY-FNC-902  H398-SRS-GWY-FNC-742  H398-SRS-GWY-FNC-743  H398-SRS-GWY-FNC-744  H398-SRS-GWY-FNC-745  H398-SRS-GWY-FNC-1075  H398-SRS-GWY-FNC-1076  Section 16.5.2.2.8 Caution and Warning alerts  H398-SRS-GWY-FNC-1012  H398-SRS-GWY-FNC-1013  H398-SRS-GWY-FNC-1014  H398-SRS-GWY-FNC-1015  H398-SRS-GWY-FNC-1017  H398-SRS-GWY-FNC-1018  H398-SRS-GWY-FNC-746  H398-SRS-GWY-FNC-931  H398-SRS-GWY-FNC-926  H398-SRS-GWY-FNC-1006  H398-SRS-GWY-FNC-1007  H398-SRS-GWY-FNC-1008  H398-SRS-GWY-FNC-1009  H398-SRS-GWY-FNC-1031  H398-SRS-GWY-FNC-1032  H398-SRS-GWY-FNC-1033  H398-SRS-GWY-FNC-1034  H398-SRS-GWY-FNC-1131  H398-SRS-GWY-FNC-747  H398-SRS-GWY-FNC-748  H398-SRS-GWY-FNC-749  H398-SRS-GWY-FNC-750  H398-SRS-GWY-FNC-876  H398-SRS-GWY-FNC-877  H398-SRS-GWY-FNC-878  H398-SRS-GWY-FNC-879  H398-SRS-GWY-FNC-880  H398-SRS-GWY-FNC-881  H398-SRS-GWY-FNC-934  H398-SRS-GWY-FNC-935  H398-SRS-GWY-FNC-988  H398-SRS-GWY-FNC-989  H398-SRS-GWY-FNC-998  H398-SRS-GWY-FNC-999  H398-SRS-GWY-FNC-1000  H398-SRS-GWY-FNC-1001  H398-SRS-GWY-FNC-1035  H398-SRS-GWY-FNC-1036  H398-SRS-GWY-FNC-1037  H398-SRS-GWY-FNC-1038  H398-SRS-GWY-FNC-1039  H398-SRS-GWY-FNC-1040  H398-SRS-GWY-FNC-1132  H398-SRS-GWY-FNC-1054  H398-SRS-GWY-FNC-1055  H398-SRS-GWY-FNC-1056  H398-SRS-GWY-FNC-1061  H398-SRS-GWY-FNC-1127  H398-SRS-GWY-FNC-1062  H398-SRS-GWY-FNC-1063  H398-SRS-GWY-FNC-1064  H398-SRS-GWY-FNC-1065  H398-SRS-GWY-FNC-1070  H398-SRS-GWY-FNC-1071  H398-SRS-GWY-FNC-1072  H398-SRS-GWY-FNC-948  H398-SRS-GWY-FNC-949  H398-SRS-GWY-FNC-950  H398-SRS-GWY-FNC-924  H398-SRS-GWY-FNC-925  H398-SRS-GWY-FNC-951  H398-SRS-GWY-FNC-952  H398-SRS-GWY-FNC-953  H398-SRS-GWY-FNC-954  H398-SRS-GWY-FNC-955  H398-SRS-GWY-FNC-956  H398-SRS-GWY-FNC-957  H398-SRS-GWY-FNC-958  H398-SRS-GWY-FNC-959  H398-SRS-GWY-FNC-960  H398-SRS-GWY-FNC-961  H398-SRS-GWY-FNC-962  H398-SRS-GWY-FNC-963  H398-SRS-GWY-FNC-964  H398-SRS-GWY-FNC-965  H398-SRS-GWY-FNC-864  H398-SRS-GWY-FNC-863  H398-SRS-GWY-FNC-1096  H398-SRS-GWY-FNC-1095  H398-SRS-GWY-FNC-914  H398-SRS-GWY-FNC-1097  H398-SRS-GWY-FNC-915  H398-SRS-GWY-FNC-1112  H398-SRS-GWY-FNC-916  H398-SRS-GWY-FNC-917  H398-SRS-GWY-FNC-918  H398-SRS-GWY-FNC-919  H398-SRS-GWY-FNC-1098  H398-SRS-GWY-FNC-1099  H398-SRS-GWY-FNC-1100  H398-SRS-GWY-FNC-1101  H398-SRS-GWY-FNC-1102  H398-SRS-GWY-FNC-1103  H398-SRS-GWY-FNC-1104  H398-SRS-GWY-FNC-1105  H398-SRS-GWY-FNC-1106  H398-SRS-GWY-FNC-1107  H398-SRS-GWY-FNC-1090  H398-SRS-GWY-FNC-1091  H398-SRS-GWY-FNC-1092  H398-SRS-GWY-FNC-1093  H398-SRS-GWY-FNC-1085  H398-SRS-GWY-FNC-1086  H398-SRS-GWY-FNC-1087  H398-SRS-GWY-FNC-1088  H398-SRS-GWY-FNC-1089  H398-SRS-GWY-FNC-776  H398-SRS-GWY-FNC-777  H398-SRS-GWY-FNC-778  H398-SRS-GWY-FNC-779  H398-SRS-GWY-FNC-780  H398-SRS-GWY-FNC-781  H398-SRS-GWY-FNC-1079  H398-SRS-GWY-FNC-1078  H398-SRS-GWY-FNC-782  H398-SRS-GWY-FNC-783  H398-SRS-GWY-FNC-1080  H398-SRS-GWY-FNC-1111  H398-SRS-GWY-FNC-1136  H398-SRS-GWY-FNC-720  H398-SRS-GWY-FNC-1119  H398-SRS-GWY-FNC-1126  H398-SRS-GWY-FNC-726  H398-SRS-GWY-FNC-751  H398-SRS-GWY-FNC-1117  H398-SRS-GWY-FNC-1118  H398-SRS-GWY-FNC-1122  H398-SRS-GWY-FNC-1123  H398-SRS-GWY-FNC-1124  H398-SRS-GWY-FNC-1125  H398-SRS-GWY-FNC-721  H398-SRS-GWY-FNC-722  H398-SRS-GWY-FNC-752  H398-SRS-GWY-FNC-753  H398-SRS-GWY-FNC-723  H398-SRS-GWY-FNC-1120  H398-SRS-GWY-FNC-1121  H398-SRS-GWY-FNC-724  H398-SRS-GWY-FNC-1113  H398-SRS-GWY-FNC-1114  H398-SRS-GWY-FNC-1128  H398-SRS-GWY-FNC-1129  H398-SRS-GWY-FNC-1130  H398-SRS-GWY-FNC-1115  H398-SRS-GWY-FNC-1116  H398-SRS-GWY-FNC-754  H398-SRS-GWY-FNC-755  H398-SRS-GWY-FNC-865  H398-SRS-GWY-FNC-1143  H398-SRS-GWY-FNC-1108  H398-SRS-GWY-FNC-1144  H398-SRS-GWY-FNC-725  H398-SRS-GWY-FNC-1109  H398-SRS-GWY-FNC-866  H398-SRS-GWY-FNC-756  H398-SRS-GWY-FNC-757  H398-SRS-GWY-FNC-758  H398-SRS-GWY-FNC-759  H398-SRS-GWY-FNC-760  H398-SRS-GWY-FNC-761  H398-SRS-GWY-FNC-762  H398-SRS-GWY-FNC-763  H398-SRS-GWY-FNC-764  H398-SRS-GWY-FNC-765  H398-SRS-GWY-FNC-766  H398-SRS-GWY-FNC-767  H398-SRS-GWY-FNC-768  H398-SRS-GWY-FNC-1137  H398-SRS-GWY-FNC-769  H398-SRS-GWY-FNC-770  H398-SRS-GWY-FNC-1138  H398-SRS-GWY-FNC-771  H398-SRS-GWY-FNC-772  H398-SRS-GWY-FNC-773  H398-SRS-GWY-FNC-846  H398-SRS-GWY-FNC-851  H398-SRS-GWY-FNC-852  H398-SRS-GWY-FNC-853  H398-SRS-GWY-FNC-854  H398-SRS-GWY-FNC-855  H398-SRS-GWY-FNC-856  H398-SRS-GWY-FNC-857  H398-SRS-GWY-FNC-858  H398-SRS-GWY-FNC-859  H398-SRS-GWY-FNC-860  H398-SRS-GWY-FNC-861  H398-SRS-GWY-FNC-812  H398-SRS-GWY-FNC-927  H398-SRS-GWY-FNC-928  H398-SRS-GWY-FNC-996  H398-SRS-GWY-FNC-997  H398-SRS-GWY-FNC-1019  H398-SRS-GWY-FNC-1020  H398-SRS-GWY-FNC-1021  H398-SRS-GWY-FNC-929  H398-SRS-GWY-FNC-930  H398-SRS-GWY-FNC-1028  H398-SRS-GWY-FNC-785  H398-SRS-GWY-FNC-847  H398-SRS-GWY-FNC-809  H398-SRS-GWY-FNC-786  H398-SRS-GWY-FNC-810  H398-SRS-GWY-FNC-811  H398-SRS-GWY-FNC-787  H398-SRS-GWY-FNC-788  H398-SRS-GWY-FNC-789  H398-SRS-GWY-FNC-790  H398-SRS-GWY-FNC-791  H398-SRS-GWY-FNC-801  H398-SRS-GWY-FNC-802  H398-SRS-GWY-FNC-803  H398-SRS-GWY-FNC-804  H398-SRS-GWY-FNC-805  H398-SRS-GWY-FNC-806  H398-SRS-GWY-FNC-807  H398-SRS-GWY-FNC-920  H398-SRS-GWY-FNC-813  H398-SRS-GWY-FNC-814  H398-SRS-GWY-FNC-815  H398-SRS-GWY-FNC-816  H398-SRS-GWY-FNC-817  H398-SRS-GWY-FNC-818  H398-SRS-GWY-FNC-819  H398-SRS-GWY-FNC-820  H398-SRS-GWY-FNC-821  H398-SRS-GWY-FNC-822  H398-SRS-GWY-FNC-823  H398-SRS-GWY-FNC-824  H398-SRS-GWY-FNC-825  H398-SRS-GWY-FNC-826  H398-SRS-GWY-FNC-874  H398-SRS-GWY-FNC-875  H398-SRS-GWY-FNC-827  H398-SRS-GWY-FNC-828  H398-SRS-GWY-FNC-829  H398-SRS-GWY-FNC-830  H398-SRS-GWY-FNC-831  H398-SRS-GWY-FNC-832  H398-SRS-GWY-FNC-833  H398-SRS-GWY-FNC-834  H398-SRS-GWY-FNC-835  H398-SRS-GWY-FNC-836  H398-SRS-GWY-FNC-837  H398-SRS-GWY-FNC-838  H398-SRS-GWY-FNC-839  H398-SRS-GWY-FNC-840  H398-SRS-GWY-FNC-841  H398-SRS-GWY-FNC-842  H398-SRS-GWY-FNC-843  H398-SRS-GWY-FNC-844  H398-SRS-GWY-FNC-845  H398-SRS-GWY-FNC-848  H398-SRS-GWY-FNC-849  H398-SRS-GWY-FNC-850  H398-SRS-GWY-FNC-882  H398-SRS-GWY-FNC-883  H398-SRS-GWY-FNC-884  H398-SRS-GWY-FNC-885  H398-SRS-GWY-FNC-886  H398-SRS-GWY-FNC-887  H398-SRS-GWY-FNC-888  H398-SRS-GWY-FNC-889  H398-SRS-GWY-FNC-890  H398-SRS-GWY-FNC-891  H398-SRS-GWY-FNC-892  H398-SRS-GWY-FNC-893  H398-SRS-GWY-FNC-894  H398-SRS-GWY-FNC-896  H398-SRS-GWY-FNC-921  H398-SRS-GWY-FNC-932  H398-SRS-GWY-FNC-922  H398-SRS-GWY-FNC-923  H398-SRS-GWY-FNC-933  H398-SRS-GWY-FNC-936  H398-SRS-GWY-FNC-937  H398-SRS-GWY-FNC-938  H398-SRS-GWY-FNC-939  H398-SRS-GWY-FNC-940  H398-SRS-GWY-FNC-941  H398-SRS-GWY-FNC-942  H398-SRS-GWY-FNC-943  H398-SRS-GWY-FNC-944  H398-SRS-GWY-FNC-945  H398-SRS-GWY-FNC-947  H398-SRS-GWY-FNC-966  H398-SRS-GWY-FNC-1010  H398-SRS-GWY-FNC-967  H398-SRS-GWY-FNC-968  H398-SRS-GWY-FNC-969  H398-SRS-GWY-FNC-970  H398-SRS-GWY-FNC-971  H398-SRS-GWY-FNC-972  H398-SRS-GWY-FNC-973  H398-SRS-GWY-FNC-974  H398-SRS-GWY-FNC-975  H398-SRS-GWY-FNC-976  H398-SRS-GWY-FNC-977  H398-SRS-GWY-FNC-978  H398-SRS-GWY-FNC-979  H398-SRS-GWY-FNC-980  H398-SRS-GWY-FNC-981  H398-SRS-GWY-FNC-982  H398-SRS-GWY-FNC-983  H398-SRS-GWY-FNC-984  H398-SRS-GWY-FNC-985  H398-SRS-GWY-FNC-986  H398-SRS-GWY-FNC-987  H398-SRS-GWY-FNC-990  H398-SRS-GWY-FNC-1011  H398-SRS-GWY-FNC-991  H398-SRS-GWY-FNC-992  H398-SRS-GWY-FNC-993  H398-SRS-GWY-FNC-1002  H398-SRS-GWY-FNC-1003  H398-SRS-GWY-FNC-1004  H398-SRS-GWY-FNC-1005  H398-SRS-GWY-FNC-1024  H398-SRS-GWY-FNC-1025  H398-SRS-GWY-FNC-994  H398-SRS-GWY-FNC-995  H398-SRS-GWY-FNC-1022  H398-SRS-GWY-FNC-1023  H398-SRS-GWY-FNC-1029  H398-SRS-GWY-FNC-1030  H398-SRS-GWY-FNC-1026  H398-SRS-GWY-FNC-1027  H398-SRS-GWY-FNC-1041  H398-SRS-GWY-FNC-1042  H398-SRS-GWY-FNC-1043  H398-SRS-GWY-FNC-1044  H398-SRS-GWY-FNC-1059  H398-SRS-GWY-FNC-1060  H398-SRS-GWY-FNC-1057  H398-SRS-GWY-FNC-1058  H398-SRS-GWY-FNC-1068  H398-SRS-GWY-FNC-1069  H398-SRS-GWY-FNC-1066  H398-SRS-GWY-FNC-1067  H398-SRS-GWY-FNC-1081  H398-SRS-GWY-FNC-1082  H398-SRS-GWY-FNC-1083  Section 16.6.1.229 power Supply  H398-SRS-GWY-FNC-1074  H398-SRS-GWY-FNC-1110  H398-SRS-GWY-FNC-1073  H398-SRS-GWY-FNC-868  H398-SRS-GWY-FNC-869  H398-SRS-GWY-FNC-870  H398-SRS-GWY-FNC-871  H398-SRS-GWY-FNC-913  H398-SRS-GWY-FNC-1045  H398-SRS-GWY-FNC-1046  H398-SRS-GWY-FNC-1047  H398-SRS-GWY-FNC-1048  H398-SRS-GWY-FNC-1049  H398-SRS-GWY-FNC-1134  H398-SRS-GWY-FNC-1135  H398-SRS-GWY-FNC-1050  H398-SRS-GWY-FNC-1051  H398-SRS-GWY-FNC-1052  H398-SRS-GWY-FNC-1053  H398-SRS-GWY-FNC-1133  Section 16.12.4 Data Logging  H398-SRS-GWY-FNC-1045  H398-SRS-GWY-FNC-1133  H398-SRS-GWY-FNC-1173  H398-SRS-GWY-FNC-1145  H398-SRS-GWY-FNC-1146  H398-SRS-GWY-FNC-1148  H398-SRS-GWY-FNC-1149  H398-SRS-GWY-FNC-1150  H398-SRS-GWY-FNC-1151  H398-SRS-GWY-FNC-1152  H398-SRS-GWY-FNC-1153  H398-SRS-GWY-FNC-1154  H398-SRS-GWY-FNC-1155  H398-SRS-GWY-FNC-1156  H398-SRS-GWY-FNC-1157  H398-SRS-GWY-FNC-1158  H398-SRS-GWY-FNC-1159  H398-SRS-GWY-FNC-1161  H398-SRS-GWY-FNC-1162  H398-SRS-GWY-FNC-1163  H398-SRS-GWY-FNC-1164  H398-SRS-GWY-FNC-1165  H398-SRS-GWY-FNC-1166  H398-SRS-GWY-FNC-1167  H398-SRS-GWY-FNC-1168  H398-SRS-GWY-FNC-1169  H398-SRS-GWY-FNC-1170  H398-SRS-GWY-FNC-1171  H398-SRS-GWY-FNC-1172  H398-SRS-GWY-FNC-1173  H398-SRS-GWY-FNC-1174  H398-SRS-GWY-FNC-1175  H398-SRS-GWY-FNC-1177  H398-SRS-GWY-FNC-1179  H398-SRS-GWY-FNC-1180  H398-SRS-GWY-FNC-1181  H398-SRS-GWY-FNC-1182  The following requirements are Deleted :  H398-SRS-GWY-FNC-49  H398-SRS-GWY-FNC-50  H398-SRS-GWY-FNC-51  H398-SRS-GWY-FNC-53  H398-SRS-GWY-FNC-54  H398-SRS-GWY-FNC-55  H398-SRS-GWY-FNC-56  H398-SRS-GWY-FNC-57  H398-SRS-GWY-FNC-58  H398-SRS-GWY-FNC-59  H398-SRS-GWY-FNC-60  H398-SRS-GWY-FNC-61  H398-SRS-GWY-FNC-62  H398-SRS-GWY-FNC-63  H398-SRS-GWY-FNC-65  H398-SRS-GWY-FNC-66  H398-SRS-GWY-FNC-67  H398-SRS-GWY-FNC-68  H398-SRS-GWY-FNC-678  H398-SRS-GWY-FNC-69  H398-SRS-GWY-FNC-679  H398-SRS-GWY-FNC-70  H398-SRS-GWY-FNC-680  H398-SRS-GWY-FNC-71  H398-SRS-GWY-FNC-72  H398-SRS-GWY-FNC-73  H398-SRS-GWY-FNC-619  H398-SRS-GWY-FNC-74  H398-SRS-GWY-FNC-620  H398-SRS-GWY-FNC-76  H398-SRS-GWY-FNC-77  H398-SRS-GWY-FNC-78  H398-SRS-GWY-FNC-80  H398-SRS-GWY-FNC-81  H398-SRS-GWY-FNC-82  H398-SRS-GWY-FNC-83  H398-SRS-GWY-FNC-84  H398-SRS-GWY-FNC-85  H398-SRS-GWY-FNC-86  H398-SRS-GWY-FNC-87  H398-SRS-GWY-FNC-88  H398-SRS-GWY-FNC-89  H398-SRS-GWY-FNC-90  H398-SRS-GWY-FNC-92  H398-SRS-GWY-FNC-93  H398-SRS-GWY-FNC-94  H398-SRS-GWY-FNC-95  H398-SRS-GWY-FNC-96  H398-SRS-GWY-FNC-640  H398-SRS-GWY-FNC-106  H398-SRS-GWY-FNC-107  H398-SRS-GWY-FNC-108  H398-SRS-GWY-FNC-109  H398-SRS-GWY-FNC-110  H398-SRS-GWY-FNC-111  H398-SRS-GWY-FNC-115  H398-SRS-GWY-FNC-116  H398-SRS-GWY-FNC-117  H398-SRS-GWY-FNC-118  H398-SRS-GWY-FNC-119  H398-SRS-GWY-FNC-120  H398-SRS-GWY-FNC-121  H398-SRS-GWY-FNC-122  H398-SRS-GWY-FNC-123  H398-SRS-GWY-FNC-124  H398-SRS-GWY-FNC-125  H398-SRS-GWY-FNC-126  H398-SRS-GWY-FNC-127  H398-SRS-GWY-FNC-128  H398-SRS-GWY-FNC-129  H398-SRS-GWY-FNC-130  H398-SRS-GWY-FNC-131  H398-SRS-GWY-FNC-132  H398-SRS-GWY-FNC-133  H398-SRS-GWY-FNC-134  H398-SRS-GWY-FNC-135  H398-SRS-GWY-FNC-136  H398-SRS-GWY-FNC-137  H398-SRS-GWY-FNC-138  H398-SRS-GWY-FNC-139  H398-SRS-GWY-FNC-140  H398-SRS-GWY-FNC-141  H398-SRS-GWY-FNC-142  H398-SRS-GWY-FNC-143  H398-SRS-GWY-FNC-146  H398-SRS-GWY-FNC-147  H398-SRS-GWY-FNC-149  H398-SRS-GWY-FNC-150  H398-SRS-GWY-FNC-685  H398-SRS-GWY-FNC-686  H398-SRS-GWY-FNC-151  H398-SRS-GWY-FNC-152  H398-SRS-GWY-FNC-153  H398-SRS-GWY-FNC-154  H398-SRS-GWY-FNC-156  H398-SRS-GWY-FNC-157  H398-SRS-GWY-FNC-158  H398-SRS-GWY-FNC-160  H398-SRS-GWY-FNC-161  H398-SRS-GWY-FNC-162  H398-SRS-GWY-FNC-163  H398-SRS-GWY-FNC-164  H398-SRS-GWY-FNC-166  H398-SRS-GWY-FNC-167  H398-SRS-GWY-FNC-168  H398-SRS-GWY-FNC-169  H398-SRS-GWY-FNC-170  H398-SRS-GWY-FNC-174  H398-SRS-GWY-FNC-175  H398-SRS-GWY-FNC-176  H398-SRS-GWY-FNC-178  H398-SRS-GWY-FNC-179  H398-SRS-GWY-FNC-180  H398-SRS-GWY-FNC-181  H398-SRS-GWY-FNC-696  H398-SRS-GWY-FNC-183  H398-SRS-GWY-FNC-184  H398-SRS-GWY-FNC-185  H398-SRS-GWY-FNC-186  H398-SRS-GWY-FNC-187  H398-SRS-GWY-FNC-188  H398-SRS-GWY-FNC-189  H398-SRS-GWY-FNC-190  H398-SRS-GWY-FNC-193  H398-SRS-GWY-FNC-194  H398-SRS-GWY-FNC-198  H398-SRS-GWY-FNC-199  H398-SRS-GWY-FNC-200  H398-SRS-GWY-FNC-201  H398-SRS-GWY-FNC-202  H398-SRS-GWY-FNC-204  H398-SRS-GWY-FNC-205  H398-SRS-GWY-FNC-206  H398-SRS-GWY-FNC-207  H398-SRS-GWY-FNC-208  H398-SRS-GWY-FNC-209  H398-SRS-GWY-FNC-210  H398-SRS-GWY-FNC-211  H398-SRS-GWY-FNC-212  H398-SRS-GWY-FNC-213  H398-SRS-GWY-FNC-214  H398-SRS-GWY-FNC-216  H398-SRS-GWY-FNC-662  H398-SRS-GWY-FNC-663  H398-SRS-GWY-FNC-217  H398-SRS-GWY-FNC-218  H398-SRS-GWY-FNC-219  H398-SRS-GWY-FNC-220  H398-SRS-GWY-FNC-221  H398-SRS-GWY-FNC-222  H398-SRS-GWY-FNC-697  H398-SRS-GWY-FNC-223  H398-SRS-GWY-FNC-224  H398-SRS-GWY-FNC-226  H398-SRS-GWY-FNC-228  H398-SRS-GWY-FNC-229  H398-SRS-GWY-FNC-231  H398-SRS-GWY-FNC-233  H398-SRS-GWY-FNC-234  H398-SRS-GWY-FNC-235  H398-SRS-GWY-FNC-236  H398-SRS-GWY-FNC-237  H398-SRS-GWY-FNC-238  H398-SRS-GWY-FNC-239  H398-SRS-GWY-FNC-240  H398-SRS-GWY-FNC-241  H398-SRS-GWY-FNC-242  H398-SRS-GWY-FNC-243  H398-SRS-GWY-FNC-244  H398-SRS-GWY-FNC-635  H398-SRS-GWY-FNC-636  H398-SRS-GWY-FNC-637  H398-SRS-GWY-FNC-245  H398-SRS-GWY-FNC-246  H398-SRS-GWY-FNC-247  H398-SRS-GWY-FNC-248  H398-SRS-GWY-FNC-249  H398-SRS-GWY-FNC-250  H398-SRS-GWY-FNC-251  H398-SRS-GWY-FNC-252  H398-SRS-GWY-FNC-253  H398-SRS-GWY-FNC-254  H398-SRS-GWY-FNC-255  H398-SRS-GWY-FNC-256  H398-SRS-GWY-FNC-257  H398-SRS-GWY-FNC-258  H398-SRS-GWY-FNC-259  H398-SRS-GWY-FNC-260  H398-SRS-GWY-FNC-261  H398-SRS-GWY-FNC-262  H398-SRS-GWY-FNC-263  H398-SRS-GWY-FNC-264  H398-SRS-GWY-FNC-266  H398-SRS-GWY-FNC-267  H398-SRS-GWY-FNC-268  H398-SRS-GWY-FNC-269  H398-SRS-GWY-FNC-270  H398-SRS-GWY-FNC-271  H398-SRS-GWY-FNC-273  H398-SRS-GWY-FNC-274  H398-SRS-GWY-FNC-275  H398-SRS-GWY-FNC-276  H398-SRS-GWY-FNC-277  H398-SRS-GWY-FNC-278  H398-SRS-GWY-FNC-279  H398-SRS-GWY-FNC-280  H398-SRS-GWY-FNC-281  H398-SRS-GWY-FNC-282  H398-SRS-GWY-FNC-283  H398-SRS-GWY-FNC-284  H398-SRS-GWY-FNC-285  H398-SRS-GWY-FNC-286  H398-SRS-GWY-FNC-287  H398-SRS-GWY-FNC-288  H398-SRS-GWY-FNC-289  H398-SRS-GWY-FNC-290  H398-SRS-GWY-FNC-291  H398-SRS-GWY-FNC-292  H398-SRS-GWY-FNC-293  H398-SRS-GWY-FNC-294  H398-SRS-GWY-FNC-698  H398-SRS-GWY-FNC-626  H398-SRS-GWY-FNC-295  H398-SRS-GWY-FNC-670  H398-SRS-GWY-FNC-296  H398-SRS-GWY-FNC-627  H398-SRS-GWY-FNC-297  H398-SRS-GWY-FNC-671  H398-SRS-GWY-FNC-298  H398-SRS-GWY-FNC-300  H398-SRS-GWY-FNC-302  H398-SRS-GWY-FNC-303  H398-SRS-GWY-FNC-304  H398-SRS-GWY-FNC-305  H398-SRS-GWY-FNC-306  H398-SRS-GWY-FNC-308  H398-SRS-GWY-FNC-309  H398-SRS-GWY-FNC-310  H398-SRS-GWY-FNC-311  H398-SRS-GWY-FNC-314  H398-SRS-GWY-FNC-315  H398-SRS-GWY-FNC-630  H398-SRS-GWY-FNC-316  H398-SRS-GWY-FNC-318  H398-SRS-GWY-FNC-319  H398-SRS-GWY-FNC-320  H398-SRS-GWY-FNC-322  H398-SRS-GWY-FNC-323  H398-SRS-GWY-FNC-324  H398-SRS-GWY-FNC-325  H398-SRS-GWY-FNC-326  H398-SRS-GWY-FNC-327  H398-SRS-GWY-FNC-328  H398-SRS-GWY-FNC-329  H398-SRS-GWY-FNC-330  H398-SRS-GWY-FNC-331  H398-SRS-GWY-FNC-332  H398-SRS-GWY-FNC-333  H398-SRS-GWY-FNC-334  H398-SRS-GWY-FNC-335  H398-SRS-GWY-FNC-336  H398-SRS-GWY-FNC-337  H398-SRS-GWY-FNC-339  H398-SRS-GWY-FNC-340  H398-SRS-GWY-FNC-341  H398-SRS-GWY-FNC-342  H398-SRS-GWY-FNC-343  H398-SRS-GWY-FNC-344  H398-SRS-GWY-FNC-345  H398-SRS-GWY-FNC-346  H398-SRS-GWY-FNC-347  H398-SRS-GWY-FNC-348  H398-SRS-GWY-FNC-349  H398-SRS-GWY-FNC-634  H398-SRS-GWY-FNC-350  H398-SRS-GWY-FNC-351  H398-SRS-GWY-FNC-352  H398-SRS-GWY-FNC-353  H398-SRS-GWY-FNC-354  H398-SRS-GWY-FNC-355  H398-SRS-GWY-FNC-357  H398-SRS-GWY-FNC-358  H398-SRS-GWY-FNC-359  H398-SRS-GWY-FNC-361  H398-SRS-GWY-FNC-362  H398-SRS-GWY-FNC-363  H398-SRS-GWY-FNC-364  H398-SRS-GWY-FNC-365  H398-SRS-GWY-FNC-366  H398-SRS-GWY-FNC-367  H398-SRS-GWY-FNC-368  H398-SRS-GWY-FNC-369  H398-SRS-GWY-FNC-370  H398-SRS-GWY-FNC-371  H398-SRS-GWY-FNC-372  H398-SRS-GWY-FNC-373  H398-SRS-GWY-FNC-374  H398-SRS-GWY-FNC-375  H398-SRS-GWY-FNC-376  H398-SRS-GWY-FNC-377  H398-SRS-GWY-FNC-378  H398-SRS-GWY-FNC-379  H398-SRS-GWY-FNC-380  H398-SRS-GWY-FNC-381  H398-SRS-GWY-FNC-382  H398-SRS-GWY-FNC-383  H398-SRS-GWY-FNC-384  H398-SRS-GWY-FNC-385  H398-SRS-GWY-FNC-386  H398-SRS-GWY-FNC-387  H398-SRS-GWY-FNC-388  H398-SRS-GWY-FNC-389  H398-SRS-GWY-FNC-390  H398-SRS-GWY-FNC-391  H398-SRS-GWY-FNC-393  H398-SRS-GWY-FNC-394  H398-SRS-GWY-FNC-395  H398-SRS-GWY-FNC-401  H398-SRS-GWY-FNC-402  H398-SRS-GWY-FNC-403  H398-SRS-GWY-FNC-404  H398-SRS-GWY-FNC-405  H398-SRS-GWY-FNC-406  H398-SRS-GWY-FNC-407  H398-SRS-GWY-FNC-408  H398-SRS-GWY-FNC-409  H398-SRS-GWY-FNC-410  H398-SRS-GWY-FNC-411  H398-SRS-GWY-FNC-412  H398-SRS-GWY-FNC-413  H398-SRS-GWY-FNC-414  H398-SRS-GWY-FNC-415  H398-SRS-GWY-FNC-417  H398-SRS-GWY-FNC-419  H398-SRS-GWY-FNC-420  H398-SRS-GWY-FNC-422  H398-SRS-GWY-FNC-424  H398-SRS-GWY-FNC-425  H398-SRS-GWY-FNC-426  H398-SRS-GWY-FNC-427  H398-SRS-GWY-FNC-428  H398-SRS-GWY-FNC-429  H398-SRS-GWY-FNC-430  H398-SRS-GWY-FNC-431  H398-SRS-GWY-FNC-654  H398-SRS-GWY-FNC-432  H398-SRS-GWY-FNC-687  H398-SRS-GWY-FNC-433  H398-SRS-GWY-FNC-660  H398-SRS-GWY-FNC-434  H398-SRS-GWY-FNC-661  H398-SRS-GWY-FNC-435  H398-SRS-GWY-FNC-631  H398-SRS-GWY-FNC-632  H398-SRS-GWY-FNC-633  H398-SRS-GWY-FNC-667  H398-SRS-GWY-FNC-438  H398-SRS-GWY-FNC-439  H398-SRS-GWY-FNC-440  H398-SRS-GWY-FNC-441  H398-SRS-GWY-FNC-442  H398-SRS-GWY-FNC-443  H398-SRS-GWY-FNC-650  H398-SRS-GWY-FNC-651  H398-SRS-GWY-FNC-652  H398-SRS-GWY-FNC-655  H398-SRS-GWY-FNC-656  H398-SRS-GWY-FNC-672  H398-SRS-GWY-FNC-673  H398-SRS-GWY-FNC-674  H398-SRS-GWY-FNC-675  H398-SRS-GWY-FNC-676  H398-SRS-GWY-FNC-677  H398-SRS-GWY-FNC-657  H398-SRS-GWY-FNC-478  H398-SRS-GWY-FNC-482  H398-SRS-GWY-FNC-483  H398-SRS-GWY-FNC-493  H398-SRS-GWY-FNC-494  H398-SRS-GWY-FNC-691  H398-SRS-GWY-FNC-495  H398-SRS-GWY-FNC-496  H398-SRS-GWY-FNC-692  H398-SRS-GWY-FNC-508  H398-SRS-GWY-FNC-509  H398-SRS-GWY-FNC-520  H398-SRS-GWY-FNC-522  H398-SRS-GWY-FNC-523  H398-SRS-GWY-FNC-524  H398-SRS-GWY-FNC-525  H398-SRS-GWY-FNC-526  H398-SRS-GWY-FNC-527  H398-SRS-GWY-FNC-528  H398-SRS-GWY-FNC-529  H398-SRS-GWY-FNC-530  H398-SRS-GWY-FNC-531  H398-SRS-GWY-FNC-532  H398-SRS-GWY-FNC-535  H398-SRS-GWY-FNC-536  H398-SRS-GWY-FNC-537  H398-SRS-GWY-FNC-539  H398-SRS-GWY-FNC-540  H398-SRS-GWY-FNC-542  H398-SRS-GWY-FNC-543  H398-SRS-GWY-FNC-544  H398-SRS-GWY-FNC-546  H398-SRS-GWY-FNC-547  H398-SRS-GWY-FNC-548  H398-SRS-GWY-FNC-549  H398-SRS-GWY-FNC-550  H398-SRS-GWY-FNC-551  H398-SRS-GWY-FNC-552  H398-SRS-GWY-FNC-553  H398-SRS-GWY-FNC-554  H398-SRS-GWY-FNC-555  H398-SRS-GWY-FNC-556  H398-SRS-GWY-FNC-557  H398-SRS-GWY-FNC-558  H398-SRS-GWY-FNC-559  H398-SRS-GWY-FNC-560  H398-SRS-GWY-FNC-561  H398-SRS-GWY-FNC-562  H398-SRS-GWY-FNC-563  H398-SRS-GWY-FNC-565  H398-SRS-GWY-FNC-566  H398-SRS-GWY-FNC-567  H398-SRS-GWY-FNC-568  H398-SRS-GWY-FNC-569  H398-SRS-GWY-FNC-570  H398-SRS-GWY-FNC-571  H398-SRS-GWY-FNC-572  H398-SRS-GWY-FNC-573  H398-SRS-GWY-FNC-576  H398-SRS-GWY-FNC-577  H398-SRS-GWY-FNC-578  H398-SRS-GWY-FNC-579  H398-SRS-GWY-FNC-580  H398-SRS-GWY-FNC-581  H398-SRS-GWY-FNC-873  H398-SRS-GWY-FNC-872  H398-SRS-GWY-FNC-773  H398-SRS-GWY-FNC-775  H393-SRS-GWY-FNC-784  H398-SRS-GWY-FNC-471  H398-SRS-GWY-FNC-477  H398-SRS-GWY-FNC-644  H398-SRS-GWY-FNC-648  H398-SRS-GWY-FNC-470  H398-SRS-GWY-FNC-690  H398-SRS-GWY-FNC-1178  H398-SRS-GWY-FNC-895  H398-SRS-GWY-FNC-946  H398-SRS-GWY-FNC-1176 | PR100169 | Prajwal R | 31-01-2024 |
| 2.1 | Following sections are updated to address review comments:  Section 6 References  Section15 Output  Following Requirements are updated as per self review comments:  H398-SRS-GWY-FNC-499  H398-SRS-GWY-FNC-615  H398-SRS-GWY-DRQ-613  H398-SRS-GWY-DRQ-595  H398-SRS-GWY-FNC-727  H398-SRS-GWY-FNC-728  H398-SRS-GWY-FNC-729  H398-SRS-GWY-FNC-730  H398-SRS-GWY-FNC-731  H398-SRS-GWY-FNC-732 to H398-SRS-GWY-FNC-741  H398-SRS-GWY-FNC-743 | Prajwal R | PR100169 | 12-02-2024 |
| 2.2 | Following Requirements are updated to address QA comments.  H398-SRS-GWY-FNC-767  H398-SRS-GWY-FNC-796  H398-SRS-GWY-FNC-628  Table 181  Following sections are updated to address QA comments.  Section 10 Approvals  Section 13 Responsibilities  14 Input | Prajwal R | PR100169 | 14-02-2024 |
| 2.3 | The following requirements are added  H398-SRS-GWY-FNC-1183  H398-SRS-GWY-FNC-1184  H398-SRS-GWY-FNC-1185  H398-SRS-GWY-FNC-1186  H398-SRS-GWY-FNC-1187  H398-SRS-GWY-FNC-1188  H398-SRS-GWY-FNC-1189  H398-SRS-GWY-FNC-1190  H398-SRS-GWY-FNC-1191  H398-SRS-GWY-FNC-1192  H398-SRS-GWY-FNC-1193  H398-SRS-GWY-FNC-1194  Updated Section 2 Overview  Updated the following requirements:  H398-SRS-GWY-FNC-1119  H398-SRS-GWY-FNC-727  H398-SRS-GWY-FNC-728  H398-SRS-GWY-FNC-927  H398-SRS-GWY-FNC-928  H398-SRS-GWY-FNC-929  H398-SRS-GWY-FNC-930  H398-SRS-GWY-FNC-976  H398-SRS-GWY-FNC-977  H398-SRS-GWY-FNC-978  H398-SRS-GWY-FNC-990  H398-SRS-GWY-FNC-991  H398-SRS-GWY-FNC-1002  H398-SRS-GWY-FNC-1003  H398-SRS-GWY-FNC-1059  H398-SRS-GWY-FNC-1068  H398-SRS-GWY-FNC-1078  H398-SRS-GWY-FNC-1085  H398-SRS-GWY-FNC-793  H398-SRS-GWY-FNC-789  H398-SRS-GWY-FNC-114  H398-SRS-GWY-FNC-921  H398-SRS-GWY-FNC-932  H398-SRS-GWY-FNC-961  H398-SRS-GWY-FNC-798  H398-SRS-GWY-FNC-799  H398-SRS-GWY-FNC-460  H398-SRS-GWY-FNC-1134  H398-SRS-GWY-FNC-1050  H398-SRS-GWY-FNC-769  H398-SRS-GWY-FNC-770  H398-SRS-GWY-FNC-767  H398-SRS-GWY-FNC-1139  H398-SRS-GWY-FNC-458  H398-SRS-GWY-FNC-459  H398-SRS-GWY-FNC-460  H398-SRS-GWY-FNC-1111  H398-SRS-GWY-FNC-847  H398-SRS-GWY-FNC-1088  H398-SRS-GWY-FNC-813  H398-SRS-GWY-FNC-814  H398-SRS-GWY-FNC-825  H398-SRS-GWY-FNC-826  H398-SRS-GWY-FNC-856  H398-SRS-GWY-FNC-933  H398-SRS-GWY-FNC-735  H398-SRS-GWY-FNC-959  H398-SRS-GWY-FNC-974  H398-SRS-GWY-FNC-975  H398-SRS-GWY-FNC-984  H398-SRS-GWY-FNC-716  H398-SRS-GWY-FNC-717  H398-SRS-GWY-FNC-1046  H398-SRS-GWY-FNC-1073  H398-SRS-GWY-FNC-1092  H398-SRS-GWY-FNC-1180  H398-SRS-GWY-FNC-45  H398-SRS-GWY-FNC-1066  H398-SRS-GWY-FNC-1067  H398-SRS-GWY-FNC-768  H398-SRS-GWY-FNC-1141  H398-SRS-GWY-FNC-629  H398-SRS-GWY-FNC-968  H398-SRS-GWY-FNC-979  H398-SRS-GWY-FNC-803  H398-SRS-GWY-FNC-804  H398-SRS-GWY-FNC-754  H398-SRS-GWY-FNC-755  H398-SRS-GWY-FNC-791  H398-SRS-GWY-FNC-771  H398-SRS-GWY-FNC-114  H398-SRS-GWY-FNC-923  H398-SRS-GWY-FNC-979  H398-SRS-GWY-FNC-1131  H398-SRS-GWY-FNC-628  The following requirements are deleted  H398-SRS-GWY-FNC-1137  H398-SRS-GWY-DRQ-693  H398-SRS-GWY-FNC-1074  H398-SRS-GWY-FNC-1110  H398-SRS-GWY-FNC-1130  H398-SRS-GWY-FNC-1140  H398-SRS-GWY-FNC-1080  H398-SRS-GWY-FNC-1047 | Prajwal R | PR100222 | 05-07-2024 |
| 2.4 | The below requirements got modified as per Review comments:  H398-SRS-GWY-FNC-1172  H398-SRS-GWY-FNC-1089  H398-SRS-GWY-FNC-770  H398-SRS-GWY-FNC-812  H398-SRS-GWY-FNC-1134  H398-SRS-GWY-FNC-752  H398-SRS-GWY-FNC-753  H398-SRS-GWY-FNC-460  H398-SRS-GWY-FNC-628  H398-SRS-GWY-FNC-735  H398-SRS-GWY-FNC-510  H398-SRS-GWY-FNC-1173  H398-SRS-GWY-FNC-905  H398-SRS-GWY-FNC-1190  H398-SRS-GWY-FNC-897  H398-SRS-GWY-FNC-914  H398-SRS-GWY-FNC-1187  H398-SRS-GWY-FNC-805  H398-SRS-GWY-FNC-806  H398-SRS-GWY-DRQ-613  section: 2 Overview | Prajwal R | PR100222 | 10-07-2024 |
| 2.5 | The below requirements got modified as per QA Review comments:  Section :1. Amendment Record  In Ver 2.4 H398-SRS-GWY-FNC-613 is updated as H398-SRS-GWY-DRQ-613  In Ver 2.3 the duplicated requirement  H398-SRS-GWY-FNC-628 is modified | Prajwal R | PR100222 | 11-07-2024 |
| 2.6 | The below requirements are updated  H398-SRS-GWY-FNC-1085  H398-SRS-GWY-FNC-870  H398-SRS-GWY-FNC-791  H398-SRS-GWY-FNC-114  H398-SRS-GWY-FNC-888  H398-SRS-GWY-FNC-889  H398-SRS-GWY-FNC-960  H398-SRS-GWY-FNC-962  H398-SRS-GWY-FNC-982  H398-SRS-GWY-FNC-460  H398-SRS-GWY-FNC-1048  H398-SRS-GWY-FNC-1136  H398-SRS-GWY-FNC-771  H398-SRS-GWY-FNC-1139  H398-SRS-GWY-FNC-45  H398-SRS-GWY-FNC-1089  H398-SRS-GWY-FNC-114  H398-SRS-GWY-FNC-875  H398-SRS-GWY-FNC-848  H398-SRS-GWY-FNC-1108  H398-SRS-GWY-FNC-721  H398-SRS-GWY-FNC-722  H398-SRS-GWY-FNC-659  H398-SRS-GWY-FNC-664  H398-SRS-GWY-FNC-628  H398-SRS-GWY-FNC-462  H398-SRS-GWY-FNC-1185  H398-SRS-GWY-FNC-1186  H398-SRS-GWY-FNC-451  H398-SRS-GWY-FNC-639  H398-SRS-GWY-FNC-1086  H398-SRS-GWY-FNC-856  H398-SRS-GWY-FNC-1109  H398-SRS-GWY-FNC-1079  H398-SRS-GWY-FNC-727  H398-SRS-GWY-FNC-449  H398-SRS-GWY-FNC-458  H398-SRS-GWY-FNC-468  H398-SRS-GWY-FNC-985  H398-SRS-GWY-FNC-1120  H398-SRS-GWY-FNC-1121  H398-SRS-GWY-FNC-735  H398-SRS-GWY-DRQ-593  H398-SRS-GWY-FNC-868  H398-SRS-GWY-FNC-869  H398-SRS-GWY-FNC-786  H398-SRS-GWY-FNC-728  H398-SRS-GWY-FNC-733  H398-SRS-GWY-FNC-740  H398-SRS-GWY-FNC-1144  H398-SRS-GWY-FNC-1068  H398-SRS-GWY-FNC-1138  H398-SRS-GWY-DRQ-623  H398-SRS-GWY-FNC-897  H398-SRS-GWY-FNC-900  H398-SRS-GWY-FNC-906  H398-SRS-GWY-FNC-917  H398-SRS-GWY-FNC-918  H398-SRS-GWY-FNC-1087  H398-SRS-GWY-FNC-777  H398-SRS-GWY-FNC-1046  H398-SRS-GWY-FNC-1078  H398-SRS-GWY-FNC-1113  H398-SRS-GWY-FNC-1114  H398-SRS-GWY-FNC-1094  H398-SRS-GWY-FNC-615  H398-SRS-GWY-FNC-681  H398-SRS-GWY-FNC-1179  H398-SRS-GWY-FNC-46  The following requirement is converted to derived requirement  H398-SRS-GWY-FNC-461  The following requirement is changed to General Requirement  H398-SRS-GWY-FNC-793  The following requirements are added  H398-SRS-GWY-FNC-1195  H398-SRS-GWY-FNC-1196  H398-SRS-GWY-FNC-1197  H398-SRS-GWY-FNC-1198  H398-SRS-GWY-FNC-1200  H398-SRS-GWY-FNC-1201  H398-SRS-GWY-FNC-1202  H398-SRS-GWY-FNC-1203  The below requirements are deleted  H398-SRS-GWY-FNC-877  H398-SRS-GWY-FNC-1131  H398-SRS-GWY-FNC-1167  H398-SRS-GWY-FNC-1134  H398-SRS-GWY-FNC-1135  H398-SRS-GWY-FNC-641  H398-SRS-GWY-FNC-795  H398-SRS-GWY-FNC-1149  H398-SRS-GWY-FNC-920  H398-SRS-GWY-FNC-876  H398-SRS-GWY-FNC-1150  H398-SRS-GWY-FNC-847  H398-SRS-GWY-FNC-919  H398-SRS-GWY-FNC-864  H398-SRS-GWY-FNC-863  H398-SRS-GWY-FNC-1132  H398-SRS-GWY-FNC-1177  H398-SRS-GWY-FNC-1193  H398-SRS-GWY-FNC-788  H398-SRS-GWY-FNC-789  H398-SRS-GWY-FNC-712  H398-SRS-GWY-FNC-713  H398-SRS-GWY-FNC-1075  H398-SRS-GWY-FNC-1097  H398-SRS-GWY-FNC-512  H398-SRS-GWY-FNC-1095  H398-SRS-GWY-FNC-1052  H398-SRS-GWY-FNC-653  H398-SRS-GWY-FNC-1189  H398-SRS-GWY-FNC-1187  H398-SRS-GWY-FNC-1199  H398-SRS-GWY-FNC-719 | Prajwal R | PR100247  PR100254 | 13-08-2024 |
| 2.7 | The below requirements are updated as per review comments  H398-SRS-GWY-FNC-1198  H398-SRS-GWY-FNC-1200  H398-SRS-GWY-FNC-1203  H398-SRS-GWY-FNC-47  H398-SRS-GWY-FNC-46  H398-SRS-GWY-FNC-615  H398-SRS-GWY-FNC-1078  H398-SRS-GWY-FNC-786  H398-SRS-GWY-DRQ-593  The following section is updated  16.5.2.2.8 Caution and Warning alerts  The below requirements are updated based on self review  H398-SRS-GWY-FNC-639  H398-SRS-GWY-FNC-1094  H398-SRS-GWY-FNC-1076  H398-SRS-GWY-FNC-614  The below requirements are deleted H398-SRS-GWY-FNC-1053  H398-SRS-GWY-FNC-791  H398-SRS-GWY-FNC-790  H398-SRS-GWY-FNC-908 | Prajwal R | PR100247  PR100254 | 15-08-2024 |
| 2.8 | The below comments are updated as QA review comments H398-SRS-GWY-FNC-868  The below requirement is updated based on self review  H398-SRS-GWY-FNC-100 | Prajwal R | PR100247 | 19-08-2024 |
| 2.9 | The below requirement is updated as per self review  H398-SRS-GWY-FNC-513  H398-SRS-GWY-FNC-1203  H398-SRS-GWY-FNC-898  H398-SRS-GWY-FNC-458  H398-SRS-GWY-FNC-776  H398-SRS-GWY-FNC-782  The below requirement is deleted  H398-SRS-GWY-FNC-811 | Prajwal R | PR100255  PR100254 | 23-08-2024 |
| 2.10 | The below requirement is updated as per review comments  H398-SRS-GWY-FNC-628 | Prajwal R | PR100324 | 10-10-2024 |
| 2.11 | The below requirements are modified.  Modified Requirements  H398-SRS-GWY-FNC-1086 Engine State Conditions  H398-SRS-GWY-FNC-1115  H398-SRS-GWY-FNC-1116  H398-SRS-GWY-FNC-875  H398-SRS-GWY-FNC-848  H398-SRS-GWY-FNC-949  H398-SRS-GWY-FNC-950  H398-SRS-GWY-FNC-924  H398-SRS-GWY-FNC-925  H398-SRS-GWY-FNC-1048  H398-SRS-GWY-FNC-787  H398-SRS-GWY-FNC-961  H398-SRS-GWY-FNC-721  H398-SRS-GWY-FNC-722  H398-SRS-GWY-FNC-1158  H398-SRS-GWY-FNC-1159  H398-SRS-GWY-FNC-951  H398-SRS-GWY-FNC-815  H398-SRS-GWY-FNC-816  H398-SRS-GWY-FNC-783  H398-SRS-GWY-FNC-1061 Changed the Name of the Table 54  H398-SRS-GWY-FNC-1069 (Table 153- Label 201 SDI 01 Details) MGB\_OIL\_TEMP\_ANALOG\_VALUE Changed the unit from % to °C  H398-SRS-GWY-FNC-1138  H398-SRS-GWY-FNC-819  H398-SRS-GWY-FNC-820  H398-SRS-GWY-FNC-1133  H398-SRS-GWY-FNC-114  H398-SRS-GWY-FNC-1010  H398-SRS-GWY-FNC-966  Deleted requirements.  H398-SRS-GWY-FNC-870  H398-SRS-GWY-FNC-871  H398-SRS-GWY-FNC-952 | Sruthi D | PR100354 | 20-06-2025 |
| 2.12 | Updated the following Requirements  H398-SRS-GWY-FNC-813  H398-SRS-GWY-FNC-814  H398-SRS-GWY-FNC-1086  H398-SRS-GWY-FNC-1048  H398-SRS-GWY-FNC-825  H398-SRS-GWY-FNC-826  H398-SRS-GWY-FNC-1128  H398-SRS-GWY-FNC-1129  H398-SRS-GWY-FNC-875  H398-SRS-GWY-FNC-848  H398-SRS-GWY-FNC-783  H398-SRS-GWY-FNC-1171  H398-SRS-GWY-FNC-1133 | Sruthi D | PR100362 | 25-07-2025 |

# 2 Overview

The EIS consist of Display Unit (DU), Engine Data Acquisition Unit (EDAU), Configuration Management Unit plus NVM (CMU+) and Data Logging Unit (DLU). It will be complemented by pilot input devices and interconnecting harness. The EIS will interface with the GVMS engine sensors and other applicable aircraft systems.

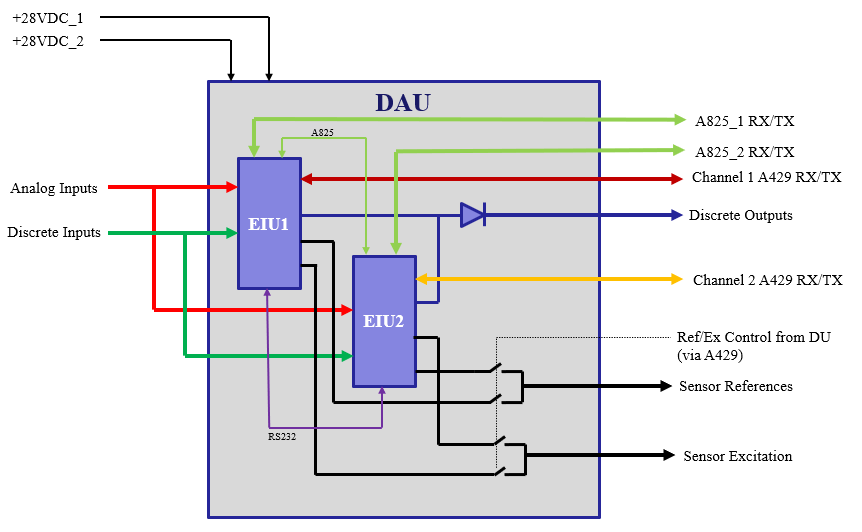
**

Figure : Functional block diagram - Engine Instrument System

**Engine Data Acquisition Unit (EDAU)**

The EDAU shall function to process airframe and engine data and transmit this information to be graphically presented on a cockpit display. The EDAU will process analog and discrete inputs, apply user defined logic to those inputs, and may generate aural and visual Caution and Warning alerts.

The EDAU is utilized to perform the following functions:

1. Provide analog to digital conversion of aircraft and engine systems
2. Provide field loadable software update via maintenance port
3. Process data
4. Filter analog and digital signal data
5. Receive/Transmit data
6. Provide discrete strapping for multiple aircraft and engine configurations

To increase the reliability of the system, EDAU will have two Engine Interface Units (EIU) packed together. Both the Engine Interface Units (EIU) will run the data acquisition application software, process the same inputs and produce same outputs independently at the same time.

The primary function of the EIU will be acquiring analog engine parameters, discrete inputs, and other aircraft system information for processing and converting to a digital format for display via ARINC 429 to four Display Units (DU).

Each DAU will contain three Boards/Modules, each with its own CPU: The Gateway Board (BH35112) for digital buses, the Analog Board (BH35113) for analog inputs and the Discrete Board (BH35114) for discrete I/O and chip burner. Inter-board communication and communication with CMU+ will be on CAN bus based on ARINC 825 protocol.

**Configuration Module Unit Plus NVM (CMU+)**

The CMU+ stores Aircraft Configuration Data (ACD). The ACD includes options related to the engine parameters, sensor interface, and airframe configurations. The EIU accesses CMU+ on system initialization to determine the current configuration and active interfaces.

The CMU+ is utilized to perform the following functions:

1. Provide configuration data to each EIU utilizing separate, isolated hardware for each EIU
2. Support the EIU system configuration so that a replacement EIU will function the same as the EIU being replaced after installation and initialization
3. The EDAU shall provide the capability to support different engine and aircraft configurations.
4. The CMU+ shall store item configuration data for entire EIS
5. The CMU+ shall contain system NVM

The CMU+ is internally redundant with two separate configuration sections packaged into one enclosure (separate power supplies). One section CMU+ #1 is connected to EIU#1 through ARINC825 (CAN #1), and the other section CMU+ #2 is connected to EIU#2 through ARINC825 (CAN #1). Internally CMU+ #1 and CMU+ #2 are connected through an independent ARINC825 (CAN #2).

The CMU+ installed in position #1 will have a USB device interface for programming/accessing configuration information in Maintenance Mode using external tools.

It will incorporate a configuration module for storing and loading the equipment configuration.The configuration module will store the system field installation calibration data and implement a mechanism for memory integrity checks

If a command or data upload from the host fails, the command or data processing stops, an error message will be displayed.If a data parameter to be downloaded from the system is invalid, the system will transmit the data as blanks and report the data as dashes in accordance with the corresponding format (e.g. - -. - for a field specified as format XX.X).

The DAU/System Fault History download command shall cause the system to download the fault flag data. The number of the records to be downloaded will depend on the data recorded in NVM.

**Maintenance Data Bus**

The CMU+ interface with Ground Maintenance Equipment and Software through the Maintenance Bus port to perform the following functions and will only support clearing NVM while in “Maintenance Mode”:

* Download data
  + DAU/System Faults
  + OEI Event
* Upload data
  + Aircraft Data (Airframe No.)
  + Calibration factors
* Clear NVM
  + Memory Erase

Maintenance Bus communication will be originated by a PC based interface (the host). The system will upload / download data upon receipt of a command from the host and it designed such that it will not queue any request while the current request is processing

All Maintenance Bus related commands / requests shall be processed by the system only when “Maintenance Mode” is active (in accordance H398-SRS-GWY-FNC-814) while the system is actively communicating on the maintenance bus.

The DAU will implement a status and error detection method to enhance the Maintenance Bus operation.

The HGS will indicate the success or failure of status of all maintenance bus commands.

DAU - decomposition illustrates the decomposition of the DAU into its various internal modules:

A429

Input

Discrete Input

RS232

Input

Analog Module

Discrete Module

Analog Input

Discrete Input

28V

power Input

Discrete Input

28V

Power Input

Discrete Output

Gateway Module

A429

Output

RS232

Output

CMU

+ Module /

DLU

Module

USB

Input/Output

ARINC825

28V

Power Input

ARINC825

EDAU

Figure : DAU - decomposition

The Gateway Module consists of five components namely, Application Software, Boot Loader, Aircraft Configuration Data, Maintenance Software and Calibration Software. The Boot Loader’s responsibility is to pass control to either Application Software or Maintenance Software at Power On.

The Maintenance Software is responsible for uploading the Aircraft Configuration Data.

The Aircraft Configuration Data is a configuration file which describes the multiple systems/equipment variations as well as engine parameter. This data is needed so that the EIU Application Software can support multiple aircraft configurations.

The Gateway Module Application Software is responsible for reading and processing inputs and provide outputs to Display Unit.

The main functionality of the Gateway Module Application Software is to perform the following:

1. Read and Process ARINC 429 inputs from Display Unit.
2. Read Analog inputs from Analog Module through ARINC 825 and read Discrete Inputs from Discrete Module through ARINC 825 and process them
3. Provide ARINC 429 outputs to Display Unit
4. Provide Flight log data and Exceedance Data to CMU+(DLU) for Logging into NVM.

**Scheduler**

The Application Software uses a kernel to create and schedule jobs. The kernel has a fixed priority pre-emptive scheduler. The scheduler ensures that at any given time, the processor executes the highest priority task of all those tasks that are currently ready to execute. The pre-emptive scheduler has a clock interrupt task that provides the scheduler with an option to switch after the task has had a given period to execute the time slice.

The kernel uses semaphores to synchronize the tasks. Three operations can be performed on a semaphore: Creation, Pending, and Posting. Each task has to run periodically. A unique semaphore is created for every task. A task desiring to run will perform a PEND on its corresponding semaphore. The scheduler is responsible for releasing the semaphores at correct intervals so that the tasks execute at the required frequency. The scheduler releases the semaphore for a task by doing a POST on the semaphore. Once the semaphore is released, the task is made to run. The task then executes its set of instructions and makes the next PEND. It then waits for a POST from the scheduler. This process goes indefinitely.

**System Block Diagram**

The block diagrams shown below in Figure and Figure will illustrate system functional architecture that meets the design goals and the operational requirements detailed within this document.

The GVMS will provide the capability for two different display architectures:

1. 2 x GVMS native displays (Native Architecture, Provisional)
2. 1 x GVMS native display + 1x Third party display (Mixed Architecture)

The GVMS will provide the capability to interface with two display types:

1. GVMS native displays (provide physical value, signal pre-processed information, etc.)
2. Third party display (provide electrical parameter value; raw data, cross-monitor functions, etc)

The Native System architecture consist of one (1) Howell Instruments H398 Data Acquisition Unit (DAU), one (1) Howell Instruments H698 Configuration Management Unit (CMU+), and two (2) Howell Instruments H420 Display Units as shown in Figure.



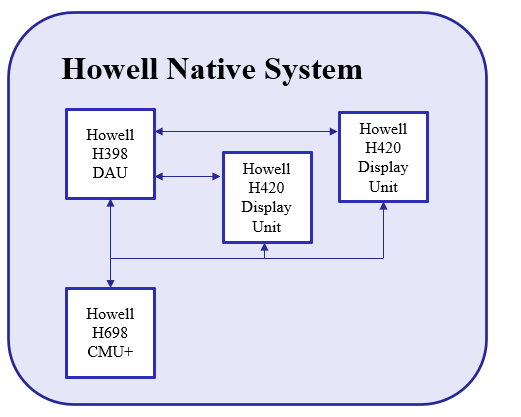


Figure : Native System Block Diagram

The Mixed System architecture consist of one (1) Howell Instruments H398 Data Acquisition Unit (DAU), one (1) Howell Instruments H698 Configuration Management Unit (CMU+), and one (1) Howell Instruments H420 Display Unit, and one (1) additional Display Unit as shown in Figure .The non-H420 DU will be defined relative to its interface requirements.

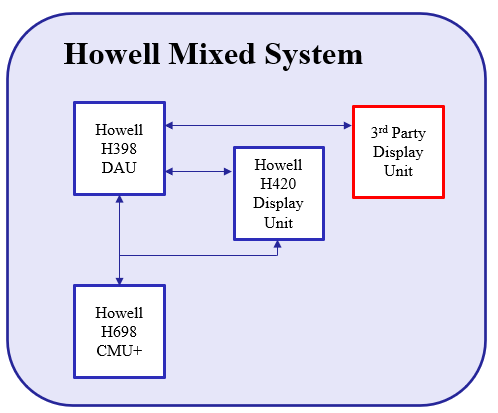


Figure : Mixed System Block Diagram

Howell Ground Station

The Howell Ground Station (HGS) consist of a laptop software tool and provided cables. Data access through the LRU Maintenance port will be protected using a software access routine.The HGS consist of software to be installed on a Laptop computer, an Operations manual, Help screen functionality, and an interface cable between Maintenance Port and Laptop.

The Howell Ground Station software will manage the user interface for system configuration and field programming via the CMU+ USB ports.

# 3 Objectives

The objective of this document is to specify the Software High Level Requirements for the Gateway Module Application Software of the Engine Data Acquisition Unit (EDAU) for Airbus Helicopter model AS532U2.

# 4 Acronyms, Terms and Definitions

The list of Acronyms used in this document are described in Table: Acronyms and Definition.

Table :Acronyms and Definition

|  |  |
| --- | --- |
| **Acronym** | **Description** |
| AC | Alternating Current |
| ADC | Air Data Computer |
| AEO | All Engines Operating |
| AFCS | Automatic Flight Control System |
| AH | Airbus Helicopters |
| ARINC | Aeronautical Radio, Incorporated |
| ARW | Airborne Rotary Wing |
| ASCII | American Standard Code Information Interchange |
| ATA | Air Transport Association |
| AUXHP | Auxiliary Hydraulic Pressure |
| BAT | Battery |
| BD | Board |
| BIT | Built-In Test |
| BITE | Built-In Test Equipment |
| BR | Brazil |
| CAN | Controller Area Network |
| CAT | Catastrophic |
| CBIT | Continuous BIT |
| CBOP | C-Box Oil Pressure |
| CBOT | C-Box Oil Temperature |
| CCA | Circuit Card Assembly |
| CCA | Common Cause Analysis |
| CLP | Collective Pitch |
| CMR | Certification Maintenance Requirement |
| CMU | Configuration Module Unit |
| CMU+ | Configuration Management Unit |
| CRC | Cyclical Redundancy Check |
| CRI | Certification Review Item |
| CS | Certification Specification |
| CVR | Cockpit Voice Recorder |
| DAL | Design Assurance Level |
| DAS | Deliverables and Schedule |
| DAU | Data Acquisition Unit |
| DC | Direct Current |
| DDP | Declaration of Design and Performance |
| DEC | Digital Electronic Control |
| DMU | Digital Mock-Up |
| DU | Display Unit |
| DVL | Document Validity List |
| EAR | Export Administration Regulations |
| ECU | Electrical Control Unit |
| EIU | Engine Instrument Unit |
| EOP | Engine Oil Pressure |
| EOT | Engine Oil Temperature |
| ESD | Electro-Static Discharge |
| ESS | Environmental Stress Screening |
| EUT | Equipment Under Test |
| FAT | Free Air Temperature |
| FDAL | Function Development Assurance Level |
| FF | Fuel Flow |
| FH | Flight Hour(s) |
| FI | Flight Interrupt |
| FMECA | Failure Modes, Effects and Criticality Analysis |
| FP | Fuel Pressure |
| FQ | Fuel Quantity |
| FRACAS | Failure Reporting Analysis And Corrective Action System |
| FRLO | Low Frequency signal |
| FT | Functional Test |
| FW | Failure Warning |
| GBOP | Gear Box Oil Pressure |
| GF | Ground Fixed |
| GI | Ground Interrupt |
| GRFS | General Requirements For Suppliers |
| GSE | Ground Support Equipment |
| GVMS | Generic Vehicle Monitoring System |
| H/C | Helicopter |
| H/W | Hardware |
| HALT | Highly Accelerated Life Testing |
| HASS | Highly Accelerated Stress Screening |
| HAZ | Hazardous |
| HDLC | High-level Data Link Control |
| HIRF | High-Intensity Radiated Field |
| HMI | Human Machine Interface |
| HP | Hydraulic Pressure |
| HS | High Speed |
| IO, I/O | Input /Output |
| IAS | Indicated Airspeed |
| IBF | Inlet Barrier Filter |
| IBIT | Initiated BIT |
| ICS | Inter Communication System |
| IDAL | Item Development Assurance Level |
| IFMECA | Interface Mechanical Characteristics |
| IFR | Instrument Flight Rules |
| IGBT | Intermediate Gear Box Temperature |
| ISO | International Standards Organization |
| ITAR | International Traffic in Arms Regulations |
| KEN | Kenya |
| LHP | Left hand side Hydraulic Pressure |
| LRU | Line Replaceable Unit |
| MCMW | Master Caution Master Warning |
| MCP | Maximum Continuous Power |
| MGBAUXP | Main Gear Box Auxiliary oil Pressure |
| MGBOP | Main Gear Box Oil Pressure |
| MGBT | Main Gear Box Temperature |
| MMEL | Master Minimum Equipment List |
| MOP | Mode of Operation Procedure |
| MTBCF | Mission Time Between Critical Failure |
| MTBF | Mean Time Between Failures |
| MTBUR | Mean Time Between Unscheduled Removal |
| MUX | Multiplexor |
| N/A | Not Applicable |
| N1 (Ng) | Gas Generator Speed |
| N2 (Np) | Engine Power Turbine Speed |
| NCD | Not Computed Data |
| NR | Rotor Speed |
| NTL | Free Turbine speed |
| OAT | Outside Air Temperature |
| OEI | One Engine Inoperable |
| PBIT | Power-up BIT |
| pph | Pounds per hour |
| psia | Pounds per square inch absolute |
| psid | Pounds per square inch differential |
| PTIT | Power Turbine Inlet Temperature |
| PWMC | Current loop duty cycle input |
| PWR | Power |
| QTY | Quantity |
| RAM | Random Access Memory |
| RDGT | Reliability Development/Growth Testing |
| REACH | Registration, Evaluation and Authorization and Restriction of Chemicals Regulation: 1907/2006/EC in the actual version |
| RFID | Radio Frequency Identification |
| RHP | Right hand side Hydraulic Pressure |
| RoHS | Restriction of Hazardous Substances |
| RPM | Revolutions Per Minute |
| RS | Requirement Specification |
| SAE | Society of Automotive Engineers |
| SEE | Single Event Effect |
| SLL | Safe Life Limit |
| TBC | To Be Confirmed |
| TBD | To Be Defined |
| TBO | Time Between Overhaul |
| TGBT | Tail Gear Box Temperature |
| TGT | Turbine Gas Temperature |
| TOT | Exhaust Gas Output Temperature |
| TOTCJ | TOT Cold Junction |
| TRQ | Torque |
| TUR | Turkey |
| UAE | United Arab Emirates |
| UE | Undesired Event |
| VFR | Visual Flight Rules |
| XMSN | Transmission |

# 5 Scope

The Scope of this document is limited to specifying the Software High Level Requirements of the Gateway Module Application Software of the DAU.

# 6 References

The Table: Reference documents provides the Reference documents used for Software High Level Requirements of the Gateway Module Application Software of the EDAU of Airbus AS532U2 Engine Instrument System.

Table : Reference documents

|  |  |  |
| --- | --- | --- |
| **Source** | **Document No.** | **Title** |
| RTCA | DO-178B | Software Considerations in Airborne Systems and Equipment Certification |
| Howell | SYS2160SRS | Airbus Helicopter AS532U2 Engine Instrument System Requirements Specification |
| Howell Instruments, Inc. | HE0398GHA | HARDWARE ARCHITECTURE OF GATEWAY BOARD |
| Howell Instruments, Inc. | BH35112 | PCB ASSEMBLY OF GATEWAY BOARD |
| Aeronautical Radio, Inc. | ARINC SPECIFICATION 825-2 | GENERAL STANDARDIZATION OF CAN (CONTROLLER AREA NETWORK) BUS PROTOCOL FOR AIRBORNE USE |
| ALTEN Global Technologies Private Limited | H398-001-002 | Software Development Plan |
| ALTEN Global Technologies Private Limited | H398-001-006 | Software Requirement Standards |

# 7 Assumptions

None

# 8 Outstanding Issues

None

# 9 Document Control

This document is under change control. After baseline, any changes to this document shall be carried out in accordance with H398-001-004 (Software Configuration Management Plan).

# 10 Approvals

The document will be reviewed to meet the objectives of RTCA DO-178B level A and approved by ALTEN GT QA.

# 11 Distribution

This document will be distributed over a secure File Transfer Protocol server to Howell Instruments Inc.

# 12 Traceability

Traceability to SES (System Equipment Specification) is provided in H398-002-001-GWY.

# 13 Responsibilities

1. Software Development Lead shall write the Software High Level Requirements in ReMa.
2. Reviewers shall review the requirements based on the DO-178B SRS check points provided as attributes in ReMa. Developers to respond to these comments and then change the status to <Looked Into> in ReMa.
3. Once all the comments from Reviewer are made to 'Looked Into' and the requirement status is Closed in ReMa,
4. Project leader is responsible for baselining the document to SVN through ReMa as well as checking in the exported document into the path

http://192.168.1.230/svn/A21HOWBLDAU/V2\_H398/ACCORD/SW/Trunk/Documents/SRS

# 14 Input

* SYS2160SRS
* Software Development Plan (H398-001-002)
* Software Requirements Standards (H398-001-006)

# 15 Output

The Output documents are as mentioned below

 Software Requirements Specification for Gateway Module Application Software of Engine Data Acquisition Unit of Airbus EDAU and CMU+ (H398-002-001-GWAY)

 Traceability Matrix (H398-002-002-GWAY)

# 16 .Software High Level requirements

This section explains the Software High Level Requirements of Gateway Module Application Software of the DAU unit.

## 16.1 Initialization

This section specifies the Software High Level Requirements for the initialization of the Gateway Module after Power On.

### 16.1.1 Initialization - Components

The Gateway Module will initialize the following components after a Power On:

1. Processor
2. Watchdog timer
3. System Timer
4. Onchip CAN peripheral
5. Nested Vector Interrupt Controller
6. FSMC
7. Internal ADC and DAC
8. RS232 ports
9. Arinc 429

#### 16.1.1.1 Processor

Requirement ID: H398-SRS-GWY-DRQ-19

MOPS: No

Safety Requirement: No

Rationale: The Processor initialization required to execute the software is derived from hardware architecture document HE0398GHA and to execute the application software

Verification Method: Testing

The Gateway Module shall initialize the processor as follows :

1.Enable HSE (high speed external clock).

2. Enable power interface clock

3.Configure power regulator voltage scale 1

4.Set CPU clock as System Clock

5.Set PCLK1 = CPU clock / 4

6.Set PCLK2 = HCLK clock/ 2

7.Set 5 wait states as the latency period on Flash

8.Enable instruction cache

9.Enable data cache

10.Enable flash prefectch buffer

11.Set PLLCLK = ((25MHz / PLL\_M) \* PPL\_N) / PLL\_P = 168 MHz.

12.Enable PLL.

13.Select PLL as system clock source.

14.Initialize the interrupt vector table in RAM.

15.Set the Vector Table base address at RAM.

16.Configure the group priority equal sixteen and sub-priority is zero

17.Set the priority of the system tick interrupt as 15

18.Set the priority of the PendSV interrupt as 14

19.Enable CRC peripheral clock

20.Enables automatic hardware state preservation and restoration, for floating-point context, on exception entry and exit and disables automatic lazy state preservation for floating-point context.

21.Enable floating point coprocessor

22.Enable FSMC Clock.

23.Enable system configuration clock.

24.Enable GPIOA clock.

25.Configure GPIO Pin 4 of Port A for output tones (mode = Analog Mode, pull-up/pull-down as output no pull).

26.Enable GPIOB clock.

27.Configure GPIO Pin 2 of Port B for Heartbeat LED (mode = output mode, pull-up/pull-down as pull-up, output type as output no pull).

28.Enable GPIOC clock.

29.Configure GPIO Pin 0 and 1 of Port C for ADC input (mode = Analog mode, pull-up/pull-down as no pull).

30.Configure GPIO Pin 11 (reference mode), 10 (charge control) and 14 (Green LED), 15 (Red LED), of Port C (mode = output mode, pull-up/pull-down as no pull-up, output type as output push pull).

31.Configure GPIO Pin 12 (System select), 13 (System mode) of Port C (mode = input mode, pull-up/pull-down as push-up).

32.Enable GPIOD clock.

33.Configure GPIO pins 0, 1, 8, 9, 10, 14 and 15 of port D as FSMC alternate function output pins for data bus bits 2, 3, 13, 14, 15, 0 and 1 respectively (mode = alternate function mode, pull-up/pull-down as no pull-up/pull down, output type as output push pull)

34.GPIO pins 4, 5 ,7,11,12 and 13 of port D as FSMC OE, FSMC WE FSMC ,FSMC NE1 ,FSMC A16, FSMC A17, FSMC A18 ,alternate function output pins respectively (speed = 50Mhz, mode = alternate function mode, pull-up/pull-down as no pull-up/pull down, output type as output push pull)

35.Enable GPIOE clock.

36.Configure GPIO pins 7, 8, 9, 10, 11, 12, 13, 14 and 15 of port E as FSMC alternate function output pins for data bus bits 0,1,4, 5, 6, 7, 8, 9, 10, 11 and 12 respectively (speed = 50Mhz, mode = alternate function mode, pull-up/pull-down as no pull-up/pull down, output type as output push pull).

37.Enable GPIOF clock.

38.Configure GPIO pins 0,1,2,3,4,5,12,13,14 and 15 of port F as FSMC alternate function output pins for data bus bits 0,1,4, 5, 6, 7, 8, and 9 respectively (speed = 50Mhz, mode = alternate function mode, pull-up/pull-down as no pull-up/pull down, output type as output push pull).

39.Enable GPIOG clock.

40.Configure GPIO pins 0,1,2,3,4,5, and 9 of port G as FSMC alternate function output pins for data bus bits 10,11,12, 13, 14, 15, respectively (speed = 50Mhz, mode = alternate function mode, pull-up/pull-down as no pull-up/pull down, output type as output push pull).

#### 16.1.1.2 Watchdog timer

Requirement ID: H398-SRS-GWY-DRQ-20

MOPS: No

Safety Requirement: No

Rationale: The Watchdog Timer initialization is required to monitor the processor idle state.

Verification Method: Testing

The Gateway Module shall initialize the Watchdog timer to 2 seconds.

#### 16.1.1.3 System Timer

Requirement ID: H398-SRS-GWY-DRQ-21

MOPS: No

Safety Requirement: No

Rationale: The System Timer initialization is required to perform periodic scheduling of tasks.

Verification Method: Testing

The Gateway Module shall initialize the System Timer to generate 1000 interrupts every second.

#### 16.1.1.4 Onchip CAN peripheral

Requirement ID: H398-SRS-GWY-DRQ-22

MOPS: No

Safety Requirement: No

Rationale: The initialization of CAN peripheral is required to communicate to Analog, Discrete and CMU+ module.

Verification Method: Testing

The Gateway Module shall initialize the CAN peripheral as follows:

1. Connect GPIO Pins #11 and #12 of Port A to Alternate Function section #9

2. Configure mode, speed, output type and pull-up/pull-down type of GPIO Pins #11 and #12 as Alternate Function mode, fast speed, Output push-pull, and pull-up respectively

3. Disable the triggered communication mode, automatic wake-up mode, non-automatic retransmission mode, Receive FIFO Locked mode and Transmit FIFO priority

4. Enable Bus-Off recovery

5. Set Baud rate to 1Mbps.

6. Set up filter #0 to allow all messages and attach the filter to FIFO #0.

#### 16.1.1.5 Nested Vector Interrupt Controller

Requirement ID: H398-SRS-GWY-DRQ-23

MOPS: No

Safety Requirement: No

Rationale: The initialization of Nested Vector Interrupt Controller required to execute the software

Verification Method: Testing

The Gateway Module shall initialize the nested vectored interrupt controller for interrupts of CAN, UART, Timer and DMA controller

#### 16.1.1.6 FSMC

Requirement ID: H398-SRS-GWY-DRQ-24

MOPS: No

Safety Requirement: No

Rationale: The FSMC initialization required to interact with external memory

Verification Method: Testing

The Gateway Module shall configure the FSMC as follows:

1. Configure mode, speed, output type and pull-up/pull-down type of GPIO Pins as Alternate Function mode, fast speed, Output push-pull, and no-pull respectively

2. Set FSMC Access mode to A

3. Initialize FSMC to interact with A429 transceivers in Bank#1

4. Initialize FSMC to interact with SRAM in Block 2 of Bank#1

#### 16.1.1.7 Internal ADC

Requirement ID: H398-SRS-GWY-DRQ-25

MOPS: No

Safety Requirement: No

Rationale: The initialization of Internal ADC is required to process the power inputs to monitor

Verification Method: Testing

The Gateway Module shall initialize the internal ADC to monitor the System Power and initialize DMA channel for ADC.

#### 16.1.1.8 Internal DAC

Requirement ID: H398-SRS-GWY-DRQ-26

MOPS: No

Safety Requirement: No

Rationale: The initialization of internal DAC is required to generate audio warning tone

Verification Method: Testing

The Gateway Module shall initialize the internal DAC to generate the audio warning tone.

#### 16.1.1.9 Arinc 429

Requirement ID: H398-SRS-GWY-DRQ-27

MOPS: No

Safety Requirement: No

Rationale: The initialization of ARINC 429 Transceivers is required to communicate to Display units.

Verification Method: Testing

The Gateway Module shall initialize the Arinc 429 transceiver as follows:

1. Enable 32nd bit as Parity bit.

2. Set the transceivers to operate in Normal Mode.

#### 16.1.1.10 External ADC Initialisation

Requirement ID: H398-SRS-GWY-DRQ-622

MOPS: No

Safety Requirement: No

Rationale: The initialization of external ADC is required to process the analog inputs from Tachometer

Verification Method: Testing

The Gateway Module shall initialize the external ADC channels to read the analog inputs from Tach Channels and initialize DMA channels for this ADC channels.

#### 16.1.1.11 RS232 Initialisation

Requirement ID: H398-SRS-GWY-DRQ-623

MOPS: No

Safety Requirement: No

Rationale: The initialization of RS232 is required to process cross-channel communication.

Verification Method: Testing

The Gateway Module shall initialize the RS232 port COM4 for internal RS232 interchannel communication.

## 16.2 Modes of Operation

Gateway Module can work on the following modes

### 16.2.1 Operational Modes

The Gateway Module will have the following operational modes

1. Power-On BIT mode

2. Normal Mode

3. Error Mode

### 16.2.2 Initialization phase

Gateway module will provide the initialization phase to comprise at least the phases listed below or equivalents:

• Phase 1: check system consistency and readiness and associated latency time before failure decision

• Phase 2: deliver the global configuration.

• Phase 3: transfer parametric data from CMU+ to DAU

• Phase 4: move to operational with parameter display.

### 16.2.3 Initialization Mode

Requirement ID: H398-SRS-GWY-FNC-706

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall enter the initialization mode after supplying power to the equipment input.

#### 16.2.3.1 Initialization mode during Power-On sequence

Requirement ID: H398-SRS-GWY-FNC-707

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway Module shall perform initialization of the internal processes and modules during Power-On sequence of the equipment.

#### 16.2.3.2 Detect sensors failures in Initialization mode

Requirement ID: H398-SRS-GWY-FNC-708

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

When in Initialization mode, Gateway module shall perform the following: -

Performs the PBIT function to detect GVMS and associated sensors failures for all GVMS acquisition modules(Analog and Discrete).

#### 16.2.3.3 Initialization mode during PBIT function

Requirement ID: H398-SRS-GWY-FNC-709

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

During PBIT function, Gateway outputs shall keep a safe and coherent state (no emission of signals).

### **16.2.4 Operational mode**

Requirement ID: H398-SRS-GWY-FNC-710

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall enter operational mode, after initialization mode is complete.All functions will be available during operational mode except the maintenance function.

#### 16.2.4.1 Detect sensors failures in Operational mode

Requirement ID: H398-SRS-GWY-FNC-711

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall cyclically performs the CBIT function while in Operational mode to detect associated sensors failures.

#### 16.2.4.2 CBIT in Operational mode

Requirement ID: H398-SRS-GWY-FNC-1201

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall perform CBIT function while in operational mode.

#### 16.2.4.3 Non-Intrusiveness of CBIT Function on Outputs

Requirement ID: H398-SRS-GWY-FNC-1202

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall ensure that the CBIT function is non-intrusive to the outputs.

### **16.2.6 Power off mode**

Requirement ID: H398-SRS-GWY-FNC-714

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module power off mode shall be entered only when power is not supplied.

### 16.2.7 Preflight Mode

#### 16.2.7.1 Preflight Mode perform the following results

Requirement ID: H398-SRS-GWY-FNC-716

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall perform the following results when entering in preflight mode.

* PBIT results.
* CBIT results.
* Software checksum of DAU

#### 16.2.7.2 external signal

Requirement ID: H398-SRS-GWY-FNC-717

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall have the capability of acquiring an external signal that commands the preflight mode.(See H398-SRS-GWY-FNC-1172)

#### 16.2.7.3 Safe state

Requirement ID: H398-SRS-GWY-FNC-1188

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall maintain safe state in all outputs in order to not interfere with other systems when it is in Preflight Mode.

#### 16.2.7.4 P2 inhibition output

Requirement ID: H398-SRS-GWY-FNC-1190

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

During Preflight Mode the Gateway Module shall activate the P2 inhibition output (ΔNgx\_Threshold).

### **16.2.8 PFT TEST**

Requirement ID: H398-SRS-GWY-FNC-1172

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall be able to acquire the discrete signal for initializing preflight mode (PFT\_TEST) from external panel.

### **16.2.9 Failure Mode**

Requirement ID: H398-SRS-GWY-FNC-718

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall incorporate a failure mode where the systems ensure a safe output for the systems interfaced with the GVMS.

avoiding blocking states in communication lines and propagating undesired effects on interfaced systems.

Safe output values for each parameter will be configured in configuration file.

NOTE: Failure mode can be part of the operational mode.

### **16.2.10 PBIT Mode**

Requirement ID: H398-SRS-GWY-DRQ-30

MOPS: No

Safety Requirement: No

Rationale: This is required to identify the PBIT mode of application software

Verification Method: Testing

The Gateway Module shall perform Power-on Built-in Tests during PBIT mode.

### **16.2.11 Gateway Unit Categorization**

Requirement ID: H398-SRS-GWY-DRQ-31

MOPS: No

Safety Requirement: No

Rationale: Required to identify the DAU Unit is considered as Channel A or Channel B

Verification Method: Testing

The Gateway Module shall categorize as follows depending on the System Select Discrete input

1) Gateway Channel A : If the System Select Discrete Input value is zero.

2) Gateway Channel B : If the System Select Discrete Input value is one.

### **16.2.12 Gateway Normal Mode Functionality**

The Gateway Module will perform the following activities in Normal mode:

1. Perform A825 communication.

2. Read Inputs from external Systems.

3. Send Outputs to external Systems.

4. Process inputs and generate outputs.

5. Indicate health and status on HeartBeat and Status LEDs respectively.

6. Sound Audio alerts.

### **16.2.13 Error Mode**

Requirement ID: H398-SRS-GWY-FNC-33

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

In Error mode, the Gateway Module shall perform the following

1. Cease all current activities

2. Log the error to Flash error section and NVM.

3. Switch the HeartBeat LED as Steady On.

4. Flash Red status LED at the rate mentioned in Red LED Blink Rate for the error type generated.

Table : Red LED Blink Rate

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Error Type** | **Error Code** | **Number of blinks in Red status LED** | **HeartBeat LED state** | **Description** |
| Flight Application CRC Error | 1 | 1 | Steady On | Mismatch in the computed and Stored Flight Application CRC value. |
| MCD Application CRC Error | 3 | 3 | Steady On | Mismatch in the computed and Stored MCD Application CRC value. |
| Memory Error | 10 | 10 | Steady On | Failure of RAM test and NVM test in PBIT. |
| Internal A825 Error | 7 | 7 | Steady On | Analog or Discrete Data missing error on powerup |
| BIT Error | 8 | 8 | Steady On | Built In Test Error. |
| INTR Error | 9 | Continuous | Steady On | Failure due to following Fault interrupts : NonMaskable, HardFault, MemManage, BusFault, UsageFault and Spurious interrupt. |
| CMU Error | 12 | 12 | Steady On | Failure on ACD CRC test |
| NVM data CRC error | 11 | 11 | Steady On | Failure on NVM data CRC test |
| A429 loopback Error | 13 | NA | NA | Failure of the A429 Loopback test. |
| RS232 loopback Error | 14 | NA | NA | Failure of the RS232 Loopback test. |
| A825 Periodic BIT Error | 20 | NA | NA | Analog or Discrete Data missing error on Periodic BIT |

## 16.3 Safe States

Gateway module will consider the safe status for outputs, except for those signals in which it is specified otherwise:

* Analog outputs: signal set to 0V.
* Discrete outputs: high impedance.
* Power supply: sensor excitations shall be active.
* Digital outputs: signal sent to value equivalent to 0.

## 16.4 Interfaces

### 16.4.1 Serial port for Channel to Channel Cross Link

The Gateway Module provides a RS-232 channel-to-channel data link which allows EDAU channels to pass and compare data. The data link is fault tolerant such that failure, loss of power, or short circuit at one channel end of the data link does not affect the ability for the other channel to perform its other functions.

### **16.4.2 Serial port configuration for cross channel**

Requirement ID: H398-SRS-GWY-DRQ-694

MOPS: No

Safety Requirement: No

Rationale: This is required to identify the configuration for cross channel port

Verification Method: Testing

The Gateway Module shall configure the RS-232 output port(COM4) as follows:

Start Bit: 1

Data Bits: 8

Parity: None

Stop Bits: 1

Note: This port is used to transmit and Receive cross channel data.

MCD will have this configuration data and based on that Gateway will configure RS-232 port

#### 16.4.2.1 RS-232 Baud Rate

Requirement ID: H398-SRS-GWY-FNC-1194

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

In Gateway module, all RS-232 baud rates shall be 57600.

### **16.4.3 Cross-Check**

Requirement ID: H398-SRS-GWY-FNC-1174

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway channels shall provide the capability for an internal cross channel communication (Cross-Check).

### **16.4.4 Cross-Check data link**

Requirement ID: H398-SRS-GWY-FNC-1175

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Cross-Check data link protocol shall provide the ability for each gateway channel to detect whether the other is operational.

### **16.4.5 Inhibit Cross-Check fault reporting on powerup**

Requirement ID: H398-SRS-GWY-FNC-37

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall inhibit the Cross-Check fault reporting for the first 10 seconds after power-up with the exception of Active Channel Status.

### 16.4.7 ARINC 825 interface for inter-system communication

The Gateway Module provides ARINC 825 communication link for inter-system communications with CMU+, analog and Discrete modules.

### 16.4.8 A429 Interface

### **16.4.9 Discrete Input Interface**

Requirement ID: H398-SRS-GWY-DRQ-42

MOPS: No

Safety Requirement: No

Rationale: The Discrete input initialization required to configure the discrete input that is derived from hardware architecture document HE0398GHA.

Verification Method: Testing

Gateway shall receive the discrete System Select input from the Following Signal

System Select (PC12) GPIO PIN 12 is used to indicate in which position the Gateway is installed.

### **16.4.10 Discrete Output Interface**

Requirement ID: H398-SRS-GWY-DRQ-43

MOPS: No

Safety Requirement: No

Rationale: The Discrete outputs initialization required to configure the discrete outputs that are derived from hardware architecture document HE0398GHA.

Verification Method: Testing

Gateway shall transmit the discrete output through the Following Discrete Signals

1. Internal Heartbeat LED (PB2) is used to toggle a LED on the PCBA that shows that the microcontroller is functioning.

2. Excitation Control (PC10) is used to control the five VDR10 outputs. Drive this pin high to enable VDR10 outputs.

3. RS-232 Test (PC11) is used to connect the RS-XXX port inputs to the RS-XXX port outputs. This is used to facilitate “loop back” testing of the ports. A low on this pin places the ports in loop back mode.

4. Green Status LED (PC14) is connected to the green anode/red cathode of the status LED mounted to the outside of the DAU. Drive high when LED Red is low to produce a green status light. Drive both LED Green and LED Red low at the same time to turn the status LED off.

5. Red Status LED (PC15) is connected to the red anode/green cathode of the status LED mounted to the outside of the DAU. Drive high when LED Green is low to produce a red status light. Drive both LED Green and LED Red low at the same time to turn the status LED off.

### **16.4.11 crosstalk link**

Requirement ID: H398-SRS-GWY-FNC-792

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall provide two communication channels and a crosstalk link between the two communication channels for display needs.

### **16.4.12 EIU with separate a processor**

The Gateway Module shall contain two independent EIU with a separate processor unit in each.

### 16.4.13 handling sensors

Each GVMS gateway EIU will be capable of handling sensors from both engines and the full complement of aircraft sensors. For the signals acquired from sensors, the GVMS gateway will provide the necessary redundancy required by its safety classification avoiding signal duplication outside the equipment.

### **16.4.15 Engine Gas Generator Speed (NG1, NG2)**

Requirement ID: H398-SRS-GWY-FNC-796

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall accept two (2) High Frequency Engine Gas Generator Speed (NG1 and NG2) inputs per channel, the frequency of which is proportional to the speed at which the rotor is driven so that change in the speed of the engine causes the frequency to vary.

### **16.4.16 Engine Gas turbine speed (NG)**

Requirement ID: H398-SRS-GWY-FNC-797

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall have characteristics for input signal Engine Gas turbine speed (NG) depicted in Requirement H398-SRS-GWY-FNC-628

### **16.4.17 Engine 1 EOT validity**

Requirement ID: H398-SRS-GWY-FNC-798

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall set the "Engine 1 EOT validity" to valid if "Engine 1 EOT value" is inside following valid range:

Minimum valid range: EOT\_VAL\_RNG\_MIN (61.8 Ohms)

Maximum valid range: EOT\_VAL\_RNG\_MAX (204 Ohms)

else "Engine 1 EOT validity" is set to invalid.

### **16.4.18 Engine 2 EOT validity**

Requirement ID: H398-SRS-GWY-FNC-799

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall set the "Engine 2 EOT validity" to valid if "Engine 2 EOT value" is inside following valid range:

Minimum valid range: EOT\_VAL\_RNG\_MIN (61.8 Ohms)

Maximum valid range: EOT\_VAL\_RNG\_MAX (204 Ohms)

else "Engine 2 EOT validity" is set to invalid.

### **16.4.19 Engine 1 EOT operation limits**

Requirement ID: H398-SRS-GWY-FNC-800

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall Activate/deactivate following Engine 1 EOT operation limits with reaching limit as shown in Table .

Table :“Engine 1 EOT” Operation Limit Activation

|  |  |
| --- | --- |
| Limit | State |
| Bottom thin red line | False |
| Bottom thin yellow zone upper line | False |
| Top thin yellow zone lower line | False |
| Top thin red line | True |

### **16.4.20 Engine 2 EOT” Operation Limit Activation**

Requirement ID: H398-SRS-GWY-FNC-1016

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall Activate/deactivate following Engine 2 EOT operation limits with reaching limit as shown in Table .

Table :“Engine 2 EOT” Operation Limit Activation

|  |  |
| --- | --- |
| Limit | State |
| Bottom thin red line | False |
| Bottom thin yellow zone upper line | False |
| Top thin yellow zone lower line | False |
| Top thin red line | True |

## 16.5 Inputs

### **16.5.1 ARINC 429 Inputs**

Requirement ID: H398-SRS-GWY-FNC-45

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Each Gateway channel shall provide a minimum of six (6) ARINC 429 inputs. Table 201 represents A429 DAU input labels.

Table 201 - A429 DAU input Labels

| **Label Number** | **Update Rate (ms)** | **Description** |
| --- | --- | --- |
| 011 | 200 | Equipment Status |
| 074 | 200 | Checksum Verification |
| 077 | 200 | Lighting State |

#### 16.5.1.1 A429 Labels Not Received

Requirement ID: H398-SRS-GWY-FNC-46

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway Module shall consider ARINC-429 data for a particular label is “missing” if a valid transmission has not been received from the source for a period no less than 3 times the expected update period,as described in H398-SRS-GWY-FNC-45.

#### 16.5.1.2 A429 Input Validity

Requirement ID: H398-SRS-GWY-FNC-47

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall recognize the data as missing if data has not been received after a period of greater than 6 times the expected update period.

#### 16.5.1.3 Invalid SSM

Requirement ID: H398-SRS-GWY-FNC-48

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway Module shall set ARINC-429 output data SSM to “invalid (Fail/Warn)” when data is “invalid”(due to out of range) unless otherwise specified.

#### 16.5.1.4 SSM NCD

Requirement ID: H398-SRS-GWY-FNC-616

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

When data is unavailable or not supported by the configuration, Gateway Module shall set ARINC-429 output data to “0” and set the label SSMs to NCD.

#### 16.5.1.5 SSM Value consideration

Requirement ID: H398-SRS-GWY-FNC-617

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall consider the following SSM value format if not defined in specific Label Format

SSM Binary Label Format:

[0,0] = Failure Warning (Invalid)

[0,1] = No Computed Data

[1,0] = Functional Test

[1,1] = Normal Operation(Valid)

SSM Discrete Label Format:

[0,0] = Normal Operation(Valid)

[0,1] = No Computed Data

[1,0] = Functional Test

[1,1] = Failure Warning(Invalid)

#### 16.5.1.6 ARINC 429 Data Format Spare Bits consideration

Requirement ID: H398-SRS-GWY-DRQ-618

MOPS: No

Safety Requirement: No

Rationale: This is required to define spare bits in ARINC 429 formats

Verification Method: Testing

The Gateway Module shall consider the empty fields(Bits without any field representation) present in the ARINC 429 Label outputs format as spare fields.

#### 16.5.1.7 T4\_Digital\_Value( Label 265-01)

Requirement ID: H398-SRS-GWY-FNC-727

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data on ARINC 429 PARAMETER BUS OUT OF DAU

(Label 265-01) shown below in Table :

Table - Label 265 SDI 01 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| ENG1\_T4\_Digital\_Value\_Selection\_source | Label 265  SDI 01 | NO |  | bit 11 | 0 = Fadec source  1 = Analog source  Always 1 on RNLAF |
| ENG1\_T4\_Digital\_Value\_NumStatus | bit 12 to bit 13 | 00 = Nominal |
| 01 = Amber |
| 10 = Red |
| 11 = Not used |
| ENG1\_T4\_Digital\_Value\_NumStatusBlink | bit 14  Provision, not used on RNLAF | 0 = Not Blinking  1 = Blinking |
| ENG1\_T4\_Digital\_Value | °C | bit 15 to bit 29  bit 28 = 1024  bit 29 = sign bit | range -2048 to 2048 |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.5.1.8 T4\_Digital\_Value (Label 265-10)

Requirement ID: H398-SRS-GWY-FNC-728

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data on ARINC 429 PARAMETER BUS OUT OF DAU

(Label 265-10) shown below in Table :

Table - Label 265 SDI 10 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| ENG2\_T4\_Digital\_Value\_Selection\_source | Label 265  SDI 10 | NO |  | bit 11 | 0 = Fadec source  1 = Analog source  Always 1 on RNLAF |
| ENG2\_T4\_Digital\_Value\_NumStatus | bit 12 to bit 13 | 00 = Nominal |
| 01 = Amber |
| 10 = Red |
| 11 = Not used |
| ENG2\_T4\_Digital\_Value\_NumStatusBlink | bit 14  Provision, not used on RNLAF | 0 = Not Blinking  1 = Blinking |
| ENG2\_T4\_Digital\_Value | °C | bit 15 to bit 29  bit 28 = 1024  bit 29 = sign bit | range -2048 to 2048 |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.5.1.9 T4\_Pointer\_Angle(label 266-01)

Requirement ID: H398-SRS-GWY-FNC-729

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 266-01) to the DU as shown in below Table :

Table - Label 266 SDI 01 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| ENG1\_T4\_Pointer\_Angle\_Value | Label 266 SDI 01 | NO | ° | bit 18 to bit 29  bit 28 = 90°  bit 29 = sign bit | range -180° to 180° |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.5.1.10 T4\_Pointer\_Angle(label 266-10)

Requirement ID: H398-SRS-GWY-FNC-730

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall transmit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 266-10) to the DU as shown below in Table :

Table - Label 266 SDI 10 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| ENG2\_T4\_Pointer\_Angle\_Value | Label 266 SDI 10 | NO | ° | bit 18 to bit 29  bit 28 = 90°  bit 29 = sign bit | range -180° to 180° |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.5.1.11 T4\_AEO\_YEL(label 270-01)

Requirement ID: H398-SRS-GWY-FNC-731

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall transmit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 270-01) to DU as shown below in Table :

Table - Label 270 SDI 01 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| ENG1\_T4\_AEO\_YEL\_LO\_Visibility | Label 270 SDI 01 | NO |  | bit 11 | 1 = Yellow AEO zone limit displayed on ENG 1 (zone beginning) |
| ENG2\_T4\_AEO\_YEL\_LO\_Visibility | bit 12 | 1 = Yellow AEO zone limit displayed on ENG 2 (zone beginning) |
| T4\_AEO\_YEL\_LO\_Value (zone beginning) | ° | bit 18 to bit 29  bit 28 = 90°  bit 29 = sign bit | Range -180° to 180° |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.5.1.12 T4\_AEO\_YEL(label 270-10)

Requirement ID: H398-SRS-GWY-FNC-732

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall trasnmit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 270-10) to DU as shown below in Table :

Table - Label 270 SDI 10 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| ENG1\_T4\_AEO\_YEL\_UP\_Visibility | Label 270 SDI 10 | NO |  | bit 11 | 1 = Yellow AEO zone limit displayed on ENG 1 (zone end) |
| ENG2\_T4\_AEO\_YEL\_UP\_Visibility | bit 12 | 1 = Yellow AEO zone limit displayed on ENG 2 (zone end) |
| T4\_AEO\_YEL\_UP\_Value (zone end) | ° | bit 18 to bit 29  bit 28 = 90°  bit 29 = sign bit | Range -180° to 180° |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

Note: The value of the AEO YEL UP limit is the same as the AEO RED limit.

#### 16.5.1.13 T4\_AEO\_YEL\_REC(label 271-00)

Requirement ID: H398-SRS-GWY-FNC-733

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall transmit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 271-00) to DU as follows in Table :

Table - Label 271 SDI 00 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| ENG1\_T4\_AEO\_YEL\_REC\_Visibility | Label 271 SDI 00 | NO |  | bit 11 | 1 = Yellow rectangle limit displayed on ENG1  Always 0 on RNLAF |
| ENG2\_T4\_AEO\_YEL\_REC\_Visibility | bit 12 | 1 = Yellow rectangle limit displayed on ENG2  Always 0 on RNLAF |
| T4\_AEO\_YEL\_REC\_Value | ° | bit 18 to bit 29  bit 28 = 90°  bit 29 = sign bit | Range -180° to 180° |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.5.1.14 T4\_AEO\_RED(label 272-00)

Requirement ID: H398-SRS-GWY-FNC-734

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall transmit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 272-00) on DU as per below Table:

Table - Label 272 SDI 00 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| ENG1\_T4\_AEO\_RED\_Visibility | Label 272 SDI 00 | NO |  | bit 11 | 1 = Red limit displayed on ENG1 |
| ENG2\_T4\_AEO\_RED\_Visibility | bit 12 | 1 = Red limit displayed on ENG2 |
| T4\_AEO\_RED\_Value | ° | bit 18 to bit 29  bit 28 = 90°  bit 29 = sign bit | Range -180° to 180° |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.5.1.15 T4\_AEO\_RED\_DIO(label 273-00)

Requirement ID: H398-SRS-GWY-FNC-735

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall transmit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 273-00) to DU as follows:

Table : Label 273 SDI 00 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| ENG1\_T4\_AEO\_RED\_DIO\_Visibility | Label 273 SDI 00 | NO |  | bit 11 | 1 = Red triangle limit displayed on ENG1 |
| ENG2\_T4\_AEO\_RED\_DIO\_Visibility | bit 12 | 1 = Red triangle limit displayed on ENG2 |
| ENG1\_T4\_AEO\_RED\_DIO\_Selection | bit 13 | 0 = triangle display  1 = Diode display on ENG1  Always 0 on RNLAF |
| ENG2\_T4\_AEO\_RED\_DIO\_Selection | bit 14 | 0 = triangle display  1 = Diode display on ENG2  Always 0 on RNLAF |
| T4\_AEO\_RED\_DIO\_Value | ° | bit 18 to bit 29  bit 28 = 90°  bit 29 = sign bit | Range -180° to 180° |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

Note:

For T4 AEO RED DIO refer H398-SRS-GWY-FNC-933

#### 16.5.1.16 T4\_OEI\_YEL\_DASH(label 274-00)

Requirement ID: H398-SRS-GWY-FNC-736

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall transmit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 274-00) as follows:

Table : Label 274 SDI 00 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| ENG1\_T4\_OEI\_YEL\_DASH\_Visibility | Label 274 SDI 00 | NO |  | bit 11 | 1 = Yellow dash limit displayed on ENG1 |
| ENG2\_T4\_OEI\_YEL\_DASH\_Visibility | bit 12 | 1 = Yellow dash limit displayed on ENG2 |
| T4\_OEI\_YEL\_DASH\_Value |  | bit 18 to bit 29  bit 28 = 90°  bit 29 = sign bit | Range -180° to 180° |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.5.1.17 T4\_OEI\_RED\_DASH(label 275-00)

Requirement ID: H398-SRS-GWY-FNC-737

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall transmit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 275-00) as follows:

Table : Label 275 SDI 00 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| ENG1\_T4\_OEI\_RED\_DASH\_Visibility | Label 275 SDI 00 | NO |  | bit 11 | 1 = Red dash limit displayed on ENG1 |
| ENG2\_T4\_OEI\_RED\_DASH\_Visibility | bit 12 | 1 = Red dash limit displayed on ENG2 |
| T4\_OEI\_RED\_DASH\_Value |  | bit 18 to bit 29  bit 28 = 90°  bit 29 = sign bit | Range -180° to 180° |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.5.1.18 T4\_OEI\_RED\_LINE(label 276-00)

Requirement ID: H398-SRS-GWY-FNC-738

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall transmit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 276-00) as follows:

Table - Label 276 SDI 00 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| ENG1\_T4\_OEI\_RED\_LINE\_Visibility | Label 276 SDI 00 | NO |  | bit 11 | 1 = Red limit displayed on ENG1 |
| ENG2\_T4\_OEI\_RED\_LINE\_Visibility | bit 12 | 1 = Red limit displayed on ENG2 |
| T4\_OEI\_RED\_LINE\_Value | ° | bit 18 to bit 29  bit 28 = 90°  bit 29 = sign bit | Range -180° to 180° |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

Note:

For T4 OEI RED LINE refer H398-SRS-GWY-FNC-933

#### 16.5.1.19 T4\_START\_WHI\_TRI(label 300-00)

Requirement ID: H398-SRS-GWY-FNC-739

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall transmit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 300-00) as follows:

Table - Label 300 SDI 00 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| ENG1\_T4\_START\_WHI\_TRI\_Visibility | Label 300 SDI 00 | NO |  | bit 11 | 1 = White triangle limit displayed on ENG1 |
| ENG2\_T4\_START\_WHI\_TRI\_Visibility | bit 12 | 1 = White triangle limit displayed on ENG2 |
| T4\_START\_WHI\_TRI\_Value | ° | bit 18 to bit 29  bit 28 = 90°  bit 29 = sign bit | range -180° to 180° |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.5.1.20 T4\_START\_RED\_TRI\_LOW(label 301-00)

Requirement ID: H398-SRS-GWY-FNC-740

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall transmit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 301-00) as follows:

Table - Label 301 SDI 00 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| ENG1\_T4\_START\_RED\_TRI\_LOW\_Visibility | Label 301 SDI 00 | NO |  | bit 11 | 1 = Red low triangle limit displayed on ENG1  Always 0 |
| ENG2\_T4\_START\_RED\_TRI\_LOW\_Visibility | bit 12 | 1 = Red low triangle limit displayed on ENG2  Always 0 |
| T4\_START\_RED\_TRI\_LOW\_Value | ° | bit 18 to bit 29  bit 28 = 90°  bit 29 = sign bit | range -180° to 180° |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.5.1.21 T4\_START\_RED\_TRI\_HIGH(label 302-00)

Requirement ID: H398-SRS-GWY-FNC-741

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall transmit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 302-00) as follows:

Table - Label 302 SDI 00 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| ENG1\_T4\_START\_RED\_TRI\_HIGH\_Visibility | Label 302 SDI 00 | NO |  | bit 11 | 1 = Red high triangle limit displayed on ENG1 |
| ENG2\_T4\_START\_RED\_TRI\_HIGH\_Visibility | bit 12 | 1 = Red high triangle limit displayed on ENG2 |
| T4\_START\_RED\_TRI\_HIGH\_Value | ° | bit 18 to bit 29  bit 28 = 90°  bit 29 = sign bit | range -180° to 180° |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.5.1.22 Label 074 Checksum Verification

Requirement ID: H398-SRS-GWY-FNC-1139

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The gateway shall receive Label 074 Checksum Verification in the format as shown in Table .

Table : Label 074, Checksum Verification

|  |  |  |  |
| --- | --- | --- | --- |
| **Label 074 Output** | **Checksum Verification** | | |
| **Bit(s)** | **Functional definition** | **Bit Name** | **Logic** |
| bit1 – bit8 | 074 | Label | N/A |
| bit 9 to bit 10 | 00 = N/A  01 = EIU 1  10 – EIU 2  11 – N/A | SDI | N/A |
| bit 11 – bit 12 | 00 – Checksum discrepancy  01 - Not valid  10 - Not Valid  11 – Checksum valid | 8 Bit Checksum failure |  |
| bit 13 – bit 29 | Spare |  |  |
| bit 30 – bit 31 | 00 = Failure Warning  01 = NCD  10 = Functional Test  11 = Normal Operation | SSM | N/A |
| bit 32 |  | Parity |  |

#### 16.5.1.24 Label 077 Lighting State

Requirement ID: H398-SRS-GWY-FNC-1141

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The gateway shall receive Label 077 Lighting State via REMISE in the format as shown in Table .

Table – Label 077 Lighting State

|  |  |  |  |
| --- | --- | --- | --- |
| **Label 077 Output** | **Lighting State** | | |
| **Bit(s)** | **Functional Definition** | **Bit Name** | **Comment** |
| bit1 – bit8 | 077 | Label |  |
| bit 9 to bit 10 | 01 = DU1  10 = DU2 |  |  |
| 11-23 | Spare |  | Note: REMISE display use this bit to transmit data not related with VMS system |
| 24 | 0 = NVG  1 = Normal | NVG/Normal state from displays |  |
| 25 | 0 = Day  1 = Night | Day/Night state from displays |  |
| 26-29 | Spare | Current system mode | Note: REMISE display use this bit to transmit data not related with VMS system |
| bit 30 to bit 31 | 11 = NO |  |  |
| 32 | Parity |  |  |

#### 16.5.1.25 Default Unit of Measure

Requirement ID: H398-SRS-GWY-FNC-1148

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall always send the parameter labels in the unit as shown in Table.

Table : Default Unit of Measure

|  |  |
| --- | --- |
| Parameter Type | Unit of Measure |
| Pressure | Bar |
| Temperature | °C |

#### 16.5.1.26 DAU Reconfiguration

Requirement ID: H398-SRS-GWY-FNC-1181

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: None

The Gateway Module shall define the EIU master channel as the channel which monitors the DAU outputs.

#### 16.5.1.27 reconfiguration mechanism

Requirement ID: H398-SRS-GWY-FNC-1094

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall confirm the master EIU to the display units in Label 034(B11 – 12 and B13 – 14).

#### 16.5.1.28 channel selection

Requirement ID: H398-SRS-GWY-FNC-897

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall use the reconfiguration request signal in the A429 input interface (label 011 bit 21-22) from Display Unit and REMISE display for reconfiguration and new master channel selection.

#### 16.5.1.29 check discrepancies

Requirement ID: H398-SRS-GWY-FNC-898

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall check discrepancies in label 034 bit 25 between the reconfiguration status signal and the actual master channel considered by all display means.

#### 16.5.1.30 master channel discrepancy

Requirement ID: H398-SRS-GWY-FNC-899

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall raise a master channel discrepancy as follows:

* If the selected master channel is not coherent between both DAU channels during 500ms then

A reconfiguration discrepancy is set and the selected master channel before the reconfiguration request is maintained

* else if the selected master channel is the same between both DAU channels during 500ms then

the reconfiguration discrepancy is reset

* else

the previous value is maintained

#### 16.5.1.31 reconfiguration mode

Requirement ID: H398-SRS-GWY-FNC-900

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The gateway shall consider that a reconfiguration is requested (label 011 bit 21-22), if the value of reconfiguration request signal from any display unit is different to the current reconfiguration mode.

#### 16.5.1.32 channel master at every power up

Requirement ID: H398-SRS-GWY-FNC-901

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall change the channel master DAU as follows when at every power up and ON\_GROUND is active:

If channel EIU1 was channel master on previous power off then:

* The DAU will set the channel master to EIU2

Else:

* The DAU will set the channel master to EIU1

Otherwise

The master channel selected will be assigned as default master channel.

#### 16.5.1.33 Reconfiguration states

Requirement ID: H398-SRS-GWY-FNC-903

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall process Reconfiguration with three possible states, N mode , DAU1 mode and DAU2 mode.

#### 16.5.1.34 Reconfiguration settings

Requirement ID: H398-SRS-GWY-FNC-905

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall receive the Reconfiguration report from the DU (Display unit).

#### 16.5.1.35 channel selected

Requirement ID: H398-SRS-GWY-FNC-906

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall use the ARINC429 input Channel\_Selected (Label 011, b13 and b14) refer H398-SRS-GWY-FNC-866 coming from DU as read on the input ARINC429 to define which channel is selected as the master.

Note:

Refer H398-SRS-GWY-FNC-866 for label 011.

#### 16.5.1.36 channel selection

Requirement ID: H398-SRS-GWY-FNC-907

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall change the EIU master as follows:

If a master reconfiguration fault is detected during the reconfiguration by the DAU

EIU master is set to the previous value

Else if EIU\_N\_State is selected

EIU master is set to EIU selected at power up

Else if EIU1\_State is selected and EIU1 channel is valid

EIU master is set to EIU1

Else if EIU2\_State is selected and EIU2 channel is valid

EIU master is set to EIU2

Else

EIU master is set to the previous value

#### 16.5.1.38 select the used reconfiguration

Requirement ID: H398-SRS-GWY-FNC-904

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall use the ARINC429 input Reconfiguration\_request (Label 11, b21 and 22) coming from DU as read on the input ARINC429 to select the used reconfiguration.

#### 16.5.1.39 DAU1\_deselection

Requirement ID: H398-SRS-GWY-FNC-909

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall set "DAU1\_deselection" to true

If

the reconfiguration state is set to channel EIU2\_State.

Else

"DAU1\_deselection" to false.

#### 16.5.1.40 EIU1\_Deselection

Requirement ID: H398-SRS-GWY-FNC-911

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall emit the following data into ARINC429 message "Warning and status discretes 2" (label 013-00):

"EIU1\_Deselection" (bit24) using "DAU1\_deselection"

#### 16.5.1.41 DAU2\_deselection

Requirement ID: H398-SRS-GWY-FNC-910

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall set "DAU2\_deselection" to true

If

the reconfiguration state is set to channel EIU1\_State.

Else

"DAU2\_deselection" to false.

#### 16.5.1.42 EIU2\_Deselection

Requirement ID: H398-SRS-GWY-FNC-912

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The gateway shall emit the following data into ARINC429 message "Warning and status discretes 2" (label 013-00):

"EIU2\_Deselection" (bit25) using "DAU2\_deselection".

#### 16.5.1.43 mode N

Requirement ID: H398-SRS-GWY-FNC-902

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

At the time of system power up, the Gateway module shall set mode N and transfer this mode N to DU along with the default master channel value.

### 16.5.2 Analog Inputs

#### 16.5.2.1 Analog Inputs from Analog Module

Requirement ID: H398-SRS-GWY-FNC-628

MOPS: Yes

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall receive the following Analog Inputs from Analog Module in ARINC825 channel.

Table : ARINC825 Analog Inputs from Analog Module

|  |  |  |
| --- | --- | --- |
| **Signal Name** | | **Helicopter Type** |
| **Super Puma**  **AS532U2** |
| NG (NG1, NG2) | Sensor | Type 4 |
| Sensor PN |  |
| Conversion | Ref:H398-SRS-GWY-FNC-742 |
| Range | 0 - 125 |
| Validity | ≤ 110 (8563.5 Hz) |
| Units | % |
| Characteristics | FRHI |
| ΔNG (ΔNG1, ΔNG2) | Sensor | Type 3 |
| Sensor PN |  |
| Conversion | Ref:H398-SRS-GWY-FNC-743 |
| Range | -8 to 5 |
| Units | % |
| Characteristics | PWMC |
| T4 °C (TOT1, TOT2) | Sensor | Type K |
| Sensor PN |  |
| Conversion | Type K |
| Range | 0 - 900 |
| Units | °C |
| Calibration | Cold Junction |
| Characteristics | THER |
| TRQ (TRQ1, TRQ2  TRQ1+2) | Sensor | Type 3 |
| Sensor PN |  |
| Conversion | Ref: H398-SRS-GWY-FNC-744 |
| Range | 0 - 110 |
| Units | % |
| Characteristics | DC12 |
| \* DC12 characteristic additions:  Cold point: 6V  Sensitivity: 42,98 mV/%  Resolution: 10mV  Linearity: ±0,25%  Deviation: ±4mV  Load impedance ≥2kΩ | | |
| EOT (EOT1, EOT2) | Sensor | Type 6 |
| Sensor PN |  |
| Conversion | Ref: H398-SRS-GWY-FNC-745 |
| Range | -50 - 120 |
| Units | °C |
| Characteristics | R05M |
| MGBT | Sensor |  |
| Sensor PN | 704A37630017 |
| Conversion | Ref:H398-SRS-GWY-FNC-747 |
| Range | -50 - 170 |
| Units | °C |
| Characteristics | P1K |
| EOP (EOP1, EOP2) | Sensor | Type 8 |
| Sensor PN |  |
| Conversion | Ref:H398-SRS-GWY-FNC-746 |
| Range | 0 - 87 |
| Units | PSI |
| Characteristics | DC03 |
| Excitation | VO10V |
| MGBOP | Sensor | Type 7 |
| Sensor PN |  |
| Conversion | Ref:H398-SRS-GWY-FNC-748 |
| Range | 0 – 100 |
| Units | PSI |
| Characteristics | DC12 |
| Excitation | VO10V |
| FP (FP1, FP2) | Sensor | Type 5 |
| Sensor PN |  |
| Conversion | Ref:H398-SRS-GWY-FNC-749 |
| Range | 0 - 30 |
| Units | PSI |
| Characteristics | DC12 |
| Excitation | VO10V |
| LHP | Sensor | Type 7 |
| Sensor PN |  |
| Conversion | Ref:H398-SRS-GWY-FNC-750 |
| Range | 0 - 3500 |
| Units | PSI |
| Characteristics | DC12 |
| Excitation | VO10V |
| RHP | Sensor | Type 7 |
| Sensor PN |  |
| Conversion | Ref:H398-SRS-GWY-FNC-750 |
| Range | 0 - 3500 |
| Units | PSI |
| Characteristics | DC12 |
| Excitation | VO10V |

Note : Ranges and units mentioned here are valid unless they are explicitly stated in specific requirements.

#### 16.5.2.2 Sensor Conversion Tables

Following are the sensor Conversion Tables from Module Configuration Data used for converting sensor value of Analog inputs received from Analog Module through ARINC 825

##### 16.5.2.2.2 Conversion Table for NG Type 4 Sensor

Requirement ID: H398-SRS-GWY-FNC-742

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module defines the NG Type 4 sensor conversion characteristics as shown in below table.

Table : NG Type 4 Sensor Conversion Table

|  |  |  |
| --- | --- | --- |
| **Frequency (Hz)** | **Ng (%)** | **Tolerance (%)** |
| 778.5 | 10.0 | ±0.1 |
| 1946.3 | 25.0 | ±0.1 |
| 3892.5 | 50.0 | ±0.1 |
| 5838.8 | 75.0 | ±0.1 |
| 7785.0 | 100.0 | ±0.1 |
| 9731.3 | 125.0 | ±0.1 |

##### 16.5.2.2.3 Conversion Table for ΔNG Type 3 Sensor

Requirement ID: H398-SRS-GWY-FNC-743

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall define the ΔNG Type 3 sensor conversion characteristics as shown in the table below.

Table - ΔNG Type 3 Sensor Conversion Table

|  |  |  |
| --- | --- | --- |
| **ΔNg (%)** | **Ratio (%)** | **Tolerance (%)** |
| -8 | 10.0 | ±1.6 |
| -5 | 27.1 | ±1.6 |
| -2 | 44.3 | ±1.2 |
| 0 | 55.7 | ±0.8 |
| 2 | 67.1 | ±1.6 |
| 5 | 84.3 | ±1.6 |

##### 16.5.2.2.4 Conversion Table for TRQ Type 3 Sensor

Requirement ID: H398-SRS-GWY-FNC-744

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall define the TRQ Type 3 sensor conversion characteristics as shown in the table below.

Table - TRQ Type 3 Sensor Conversion Table

|  |  |  |  |
| --- | --- | --- | --- |
| **%** | **Input mV** | **Max reading (mV)** | **Min reading (mV)** |
| 0 | 0 | 32 | -32 |
| 10 | 460 | 492 | 428 |
| 35 | 1611 | 1634 | 1588 |
| 60 | 2761 | 2784 | 2738 |
| 70 | 3221 | 3244 | 3198 |

NOTE: the highest value of the range for torque is defined by other requirements and does not correspond to 70%. Successive values until top value of actual range have to be interpolated using this table.

##### 16.5.2.2.5 Conversion Table for EOT Type 6 Sensor

Requirement ID: H398-SRS-GWY-FNC-745

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall define the EOT Type 6 sensor conversion characteristics as shown in the table below.

Table - EOT Type 6 Sensor Conversion Table

|  |  |  |
| --- | --- | --- |
| **Scale Mark (°C)** | **Ω** | **Tolerance (Ω)** |
| -50 | 73 | ±2.2 |
| 0 | 100 | ±2.4 |
| 50 | 130.5 | ±2.7 |
| 80 | 150.8 | ±1.8 |
| 100 | 165.2 | ±3.1 |
| 120 | 180.3 | ±3.2 |

##### 16.5.2.2.7 Computation of Acquired Electrical Signals

Requirement ID: H398-SRS-GWY-FNC-1076

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall perform the computation of the acquired electrical signals to determine the physical values.

###### 16.5.2.2.7.2 Valid Range

Requirement ID: H398-SRS-GWY-FNC-1200

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall check that the parameter value is within its specified valid range for all acquired parameters.

##### 16.5.2.2.8 Caution and Warning alerts

The Gateway Module shall apply defined logic according to aircraft configuration and generate discrete,analog outputs,serial data outputs , aural/visual Caution and Warning alerts according to parameter values.

##### 16.5.2.2.9 Engine 1 EOT Digital Value Conversion

Requirement ID: H398-SRS-GWY-FNC-1012

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall set the "Engine 1 EOT value" signal received using analog input “EOT1” (RS300\_1) in [Ohm] into [°C] according following linear treatment as shown in below table :

Table - Engine 1 EOT Digital Value Conversion

|  |  |
| --- | --- |
| **Resistance (ohm)** | **EOT (°C)** |
| 61.8 | -70 |
| 73 | -50 |
| 100 | 0 |
| 130.5 | 50 |
| 165.2 | 100 |
| 204 | 150 |

##### 16.5.2.2.10 Engine 2 EOT Digital Value Conversion

Requirement ID: H398-SRS-GWY-FNC-1013

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall set the "Engine 2 EOT value" signal received using analog input “EOT2” (RS300\_2) in [Ohm] into [°C] according following linear treatment as shown in below table:

Table - Engine 2 EOT Digital Value Conversion

|  |  |
| --- | --- |
| **Resistance (ohm)** | **EOT (°C)** |
| 61.8 | -70 |
| 73 | -50 |
| 100 | 0 |
| 130.5 | 50 |
| 165.2 | 100 |
| 204 | 150 |

##### 16.5.2.2.11 Engine 1 EOT high red limit

Requirement ID: H398-SRS-GWY-FNC-1014

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall set the Engine 1 EOT high red limit value to 120°C.

##### 16.5.2.2.12 Engine 2 EOT high red limit

Requirement ID: H398-SRS-GWY-FNC-1015

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall set the Engine 2 EOT high red limit value to 120°C.

##### 16.5.2.2.13 Engine 1 EOT Analog Value Conversion

Requirement ID: H398-SRS-GWY-FNC-1017

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall convert the "Engine 1 EOT value" (°C) into "Engine 1 EOT analog value" (%) according to following treatment:

Table - Engine 1 EOT Analog Value Conversion

|  |  |  |
| --- | --- | --- |
| Engine 1 EOT operation limits | Engine 1 EOT value (°C) | Engine 1 EOT analog value (%) |
| Minimum Functional range EOT1 | -50 | 0 |
| Bottom thin red line | Not used on RNLAF | Not used on RNLAF |
| Bottom thin yellow zone upper line | Not used on RNLAF | Not used on RNLAF |
| Middle normal zone | Not used on RNLAF | Not used on RNLAF |
| Top thin yellow zone lower line | Not used on RNLAF | Not used on RNLAF |
| Top thin red line | Engine 1 EOT high red limit (120 °C) | 100 |

Note:

There is no bottom red limit on RNLAF but the conversion shall be linear between "Minimum functional range EOT1" to the "Top thin red line".

The 0% and 50% Engine 1 EOT analog value will be tuned with the analysis of flight data.

##### 16.5.2.2.14 Engine 2 EOT Analog Value Conversion

Requirement ID: H398-SRS-GWY-FNC-1018

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall convert the "Engine 2 EOT value" (°C) into "Engine 2 EOT analog value" (%) according to following treatment:

Table - Engine 2 EOT Analog Value Conversion

|  |  |  |
| --- | --- | --- |
| Engine 2 EOT operation limits | Engine 2 EOT value (°C) | Engine 2 EOT analog value (%) |
| Minimum Functional range EOT2 | -50 | 0 |
| Bottom thin red line | Not used on RNLAF | Not used on RNLAF |
| Bottom thin yellow zone upper line | Not used on RNLAF | Not used on RNLAF |
| Middle normal zone | Not used on RNLAF | Not used on RNLAF |
| Top thin yellow zone lower line | Not used on RNLAF | Not used on RNLAF |
| Top thin red line | Engine 2 EOT high red limit (120 °C) | 100 |

Note:

There is no bottom red limit on RNLAF but the conversion shall be linear between "Minimum functional range EOT2" to the "Top thin red line".

The 0% and 50% Engine 2 EOT analog value will be tuned with the analysis of flight data.

##### 16.5.2.2.15 Conversion Table for EOP Type 8 Sensor

Requirement ID: H398-SRS-GWY-FNC-746

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall define the EOP Type 8 sensor conversion characteristics as shown in the table below.

Table - EOP Type 8 Sensor Conversion Table

|  |  |  |
| --- | --- | --- |
| **PSI** | **mV** | **Tolerance (mV)** |
| 20 | 23 | ±1.5 |
| 40 | 46 | ±1.5 |
| 60 | 69 | ±2.5 |
| 80 | 92 | ±2.5 |

##### 16.5.2.2.16 Engine 1 EOP validity

Requirement ID: H398-SRS-GWY-FNC-931

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall set set the "Engine 1 EOP validity" to valid

if "Engine 1 EOP value" is inside following valid range:

Maximum valid range: EOP\_VAL\_RNG\_MAX (0.120 V)

else "Engine 1 EOP validity" is set to invalid.

##### 16.5.2.2.17 Engine 2 EOP validity

Requirement ID: H398-SRS-GWY-FNC-926

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall set the "Engine 2 EOP validity" to valid

if "Engine 2 EOP value" is inside following validrange:

Maximum valid range: EOP\_VAL\_RNG\_MAX (0.120 V)

else "Engine 2 EOP validity" is set to invalid.

##### 16.5.2.2.18 Engine 1EOP low red limit

Requirement ID: H398-SRS-GWY-FNC-1006

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall set the Engine 1 EOP low red limit value to 1.7 bar.

##### 16.5.2.2.19 Engine 2 EOP low red limit

Requirement ID: H398-SRS-GWY-FNC-1007

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall set the Engine 2 EOP low red limit value to 1.7 bar

##### 16.5.2.2.20 Engine 1 EOP high red limit

Requirement ID: H398-SRS-GWY-FNC-1008

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall set the Engine 1 EOP high red limit value to 6 bar

##### 16.5.2.2.21 Engine 2 EOP high red limit

Requirement ID: H398-SRS-GWY-FNC-1009

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall set the Engine 2 EOP high red limit value to 6 bar.

##### 16.5.2.2.22 Engine 1 EOP Operation Limit Activation

Requirement ID: H398-SRS-GWY-FNC-1152

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall activate/deactivate following Engine 1 EOP operating limits with reaching limit:

Table - Engine 1 EOP Operation Limit Activation

|  |  |
| --- | --- |
| Limit | State |
| Bottom thin red line | True |
| Bottom thin yellow zone upper line | False |
| Top thin yellow zone lower line | False |
| Top thin red line | True |

##### 16.5.2.2.23 Engine 2 EOP Operation Limit Activation

Requirement ID: H398-SRS-GWY-FNC-1153

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall activate/deactivate following Engine 2 EOP operating limits with reaching limit:

Table - Engine 2 EOP Operation Limit Activation

|  |  |
| --- | --- |
| Limit | State |
| Bottom thin red line | True |
| Bottom thin yellow zone upper line | False |
| Top thin yellow zone lower line | False |
| Top thin red line | True |

##### 16.5.2.2.24 Engine 1 EOP Analog Value Conversion

Requirement ID: H398-SRS-GWY-FNC-1154

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall convert the "Engine 1 EOP value" (bar) into "Engine 1 EOP analog value" (%) accordingfollowing treatment:

Table - Engine 1 EOP Analog Value Conversion

|  |  |  |
| --- | --- | --- |
| Engine 1 EOP operation limits | Engine 1 EOP value (bar) | Engine 1 EOP analog value (%) |
| Bottom thin red line | Engine 1 EOP low red limit (1.7 bars) | 0 |
| Top thin red line | Engine 1 EOP high red limit (6 bars) | 100 |

The conversion shall be linear between the Bottom thin red line to the top thin red line.

The 50% Engine 1 EOP analog value will be tuned with the analysis of flight data.

##### 16.5.2.2.25 Engine 2 EOP Analog Value Conversion

Requirement ID: H398-SRS-GWY-FNC-1155

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall convert the "Engine 2 EOP value" (bar) into "Engine 2 EOP analog value" (%) accordingfollowing treatment:

Table - Engine 2 EOP Analog Value Conversion

|  |  |  |
| --- | --- | --- |
| Engine 2 EOP operation limits | Engine 2 EOP value (bar) | Engine 2 EOP analog value (%) |
| Bottom thin red line | Engine 2 EOP low red limit (1.7 bars) | 0 |
| Top thin red line | Engine 2 EOP high red limit (6 bars) | 100 |

The conversion shall be linear between the Bottom thin red line to the top thin red line.

The 50% Engine 2 EOP analog value will be tuned with the analysis of flight data.

##### 16.5.2.2.26 FUEL PRESS 1 low red limit

Requirement ID: H398-SRS-GWY-FNC-1031

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the FUEL PRESS 1 low red limit value to 0.3 bar.

##### 16.5.2.2.27 FUEL PRESS 1 high red limit

Requirement ID: H398-SRS-GWY-FNC-1032

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the FUEL PRESS 1 high red limit value to 1.5 bar.

##### 16.5.2.2.28 FUEL PRESS 2 low red limit

Requirement ID: H398-SRS-GWY-FNC-1033

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the FUEL PRESS 2 low red limit value to 0.3 bar.

##### 16.5.2.2.29 FUEL PRESS 2 high red limit

Requirement ID: H398-SRS-GWY-FNC-1034

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the FUEL PRESS 2 high red limit value to 1.5 bar.

##### 16.5.2.2.31 T4 (TOT1, TOT2)

Requirement ID: H398-SRS-GWY-FNC-1156

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall accept two (2) Exhaust Gas Temperature TOT Type K thermocouple inputs per channel.

The TOT input signal comply with the characteristics depicted in H398-SRS-GWY-FNC-628.

##### 16.5.2.2.33 Conversion Table for MGBT 704A37630017 Sensor

Requirement ID: H398-SRS-GWY-FNC-747

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall define the MGBT 704A37630017 sensor conversion characteristics as shown in the table below.

Table - MGBT 704A37630017 Sensor Conversion Table

|  |  |  |
| --- | --- | --- |
| **Scale Mark (°C)** | **Ω** | **Tolerance (Ω)** |
| -50 | 403.5 | ±8.4 |
| 0 | 502.25 | ±8.4 |
| 50 | 599.25 | ±8.4 |
| 100 | 694.75 | ±8.4 |
| 150 | 788.8 | ±8.4 |
| 170 | 826.5 | ±8.4 |

##### 16.5.2.2.35 Conversion Table for MGBOP Type 7 Sensor

Requirement ID: H398-SRS-GWY-FNC-748

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall define the MGBOP Type 7 sensor conversion characteristics as shown in the table below.

Table - MGBOP Type 7 Sensor Conversion Table

|  |  |  |
| --- | --- | --- |
| **PSI** | **Voltage (mV)** | **Tolerance (mV)** |
| 0 | 1000 | ±80 |
| 5.8 | 1229 | ±80 |
| 10 | 1394.10 | ±80 |
| 20 | 1788.18 | ±80 |
| 30 | 2182.27 | ±80 |
| 40 | 2576.35 | ±80 |
| 50 | 2970.44 | ±80 |
| 60 | 3364.53 | ±80 |
| 70 | 3758.62 | ±80 |
| 80 | 4152.71 | ±80 |
| 90 | 4546.80 | ±80 |
| 100 | 4940.88 | ±80 |

##### 16.5.2.2.36 Conversion Table for FP Type 5 Sensor

Requirement ID: H398-SRS-GWY-FNC-749

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall define the FP Type 5 sensor conversion characteristics as shown in the table below.

Table - FP Type 5 Sensor Conversion Table

|  |  |  |
| --- | --- | --- |
| **PSI** | **Voltage (mV)** | **Tolerance (mV)** |
| 0 | 1000 | ±80 |
| 4.35 | 1600 | ±80 |
| 5 | 1689.65 | ±80 |
| 10 | 2379.31 | ±80 |
| 15 | 3068.96 | ±80 |
| 20 | 3758.62 | ±80 |
| 21.75 | 4000 | ±60 |
| 25 | 4448.27 | ±80 |
| 30 | 5172.41 | ±80 |

##### 16.5.2.2.37 Conversion Table for Hydraulic Pressure Type 7 Sensor

Requirement ID: H398-SRS-GWY-FNC-750

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall define the Hydraulic Pressure Type 7 sensor conversion characteristics as shown in the table below.

Table - Hydraulic Pressure Type 7 Sensor Conversion Table

|  |  |  |
| --- | --- | --- |
| **PSI** | **Voltage (mV)** | **Tolerance (mV)** |
| 0 | 1000 | ±80 |
| 500 | 1551.7 | ±80 |
| 1000 | 2103.4 | ±80 |
| 1500 | 2655.17 | ±80 |
| 1595 | 2760 | ±80 |
| 2000 | 3206.89 | ±80 |
| 2175 | 3400 | ±80 |
| 2500 | 3758.62 | ±80 |
| 2828 | 4120.55 | ±80 |
| 3000 | 4310.3 | ±80 |
| 3045 | 4360 | ±80 |
| 3500 | 4862.07 | ±80 |

##### 16.5.2.2.42 TOT correction values

Requirement ID: H398-SRS-GWY-FNC-1151

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

TOT correction values are valid if the reading is in the following range:

Table : TOT correction values

|  |  |
| --- | --- |
| **TOT correction min. value** | 18 Ohm |
| **TOT correction max. value** | 402 Ohm |

##### 16.5.2.2.43 Engine 1 T4 Raw Data Conversion

Requirement ID: H398-SRS-GWY-FNC-878

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall convert the "Engine 1 T4 raw value" signal received on input "TOT1" in [V] into [°C] according to

the following interpolation table shown below:

Table - Engine 1 T4 Raw Data Conversion

|  |  |
| --- | --- |
| **TOT1 (V)** | **Engine 1 T4 raw value (°C)** |
| -0.00225 | -60 |
| 0.0413 | 1000 |

##### 16.5.2.2.44 Engine 1 T4 Corrective

Requirement ID: H398-SRS-GWY-FNC-879

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall set the "Engine 1 T4 corrective value" signal received on input "AN\_T4\_CORRECTION\_ENG1" in [Ohm].

##### 16.5.2.2.45 Engine 2 T4 Raw Data Conversion

Requirement ID: H398-SRS-GWY-FNC-880

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall convert the "Engine 2 T4 raw value" signal received on input "TOT2" in voltage into [°C] according to

the following interpolation shown below:

Table - Engine 2 T4 Raw Data Conversion

|  |  |
| --- | --- |
| **TOT2 (V)** | **Engine 2 T4 raw value (°C)** |
| -0.00225 | -60 |
| 0.0413 | 1000 |

##### 16.5.2.2.46 Engine 2 T4 Corrective Conversion

Requirement ID: H398-SRS-GWY-FNC-881

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall set the "Engine 2 T4 corrective value" signal received on input "AN\_T4\_CORRECTION\_ENG2" in [Ohm].

##### 16.5.2.2.47 Engine 1 T4 status

Requirement ID: H398-SRS-GWY-FNC-934

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the "Engine 1 T4 status" as follows:

"Red" If

* Engine 1 state is set to OEI or OEI training mode and Engine 1 T4 value is greater than constant T4 OEI LO (870°C)

OR

* Engine 1 state is set to AEO or AEO+OEI mode and Engine 1 T4 value is greater than constant T4 TOP (825°C)

OR

* Engine 1 state is set to START mode and Engine 1 T4 value is greater than constant T4 START RED TRI HIGH (810°C))

"Amber" If not "Red" and

* (Engine 1 state is set to OEI or OEI training mode and computed Engine 1 T4 value is greater than constant T4 OEI CT (840°C)

OR

* Engine 1 state is set to AEO or AEO+OEI mode and Engine 1 T4 value is greater than constant T4 AEO MCP (770°C)).

"Nominal" Otherwise.

##### 16.5.2.2.48 Engine 2 T4 status

Requirement ID: H398-SRS-GWY-FNC-935

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the "Engine 2 T4 status" as follows:

1) "Red" If

* Engine 2 state is set to OEI or OEI training mode and Engine 2 T4 value is greater than constant T4 OEI LO (870°C)

OR

* Engine 2 state is set to AEO or AEO+OEI mode and Engine 2 T4 value is greater than constant T4 TOP (825°C)

OR

* Engine 2 state is set to START mode and Engine 2 T4 value is greater than constant T4 START RED

TRI HIGH (810°C))

2) "Amber" If not "Red" and:

* Engine 2 state is set to OEI or OEI training mode and Engine 2 T4 value is greater than constant T4 OEI CT (840°C).

OR

* Engine 2 state is set to AEO or AEO+OEI mode and Engine 2 T4 value is greater than constant T4 AEO MCP (770°C).

3) "Nominal" Otherwise.

##### 16.5.2.2.49 EOT1 status

Requirement ID: H398-SRS-GWY-FNC-988

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the EOT1 status as follows:

* "Red" If

(Engine 1 EOT value is greater than or equal to the constant "Engine 1 EOT high red limit" (120°C))

* "Nominal" Otherwise

##### 16.5.2.2.50 EOT2 status

Requirement ID: H398-SRS-GWY-FNC-989

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the EOT2 status as follows:

* "Red" If

(Engine 2 EOT value is greater than or equal to the constant "Engine 2 EOT high red limit" (120°C))

* "Nominal" Otherwise

#### 16.5.2.3 Fuel Press

##### 16.5.2.3.1 FUEL PRESS 1 validity

Requirement ID: H398-SRS-GWY-FNC-998

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall set the "FUEL PRESS 1 validity" to valid if "FUEL PRESS 1 value" is inside following valid range:

* Minimum valid range: FUEL\_PRESS\_VAL\_RNG\_MIN (0.8 V)
* Maximum valid range: FUEL\_PRESS\_VAL\_RNG\_MAX (5.37V)

else "FUEL PRESS 1 validity" is set to invalid.

##### 16.5.2.3.2 FUEL PRESS 2 validity

Requirement ID: H398-SRS-GWY-FNC-999

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall set the "FUEL PRESS 2 validity" to valid if "FUEL PRESS 2 value" is inside following valid range:

Minimum valid range: FUEL\_PRESS\_VAL\_RNG\_MIN (0.8 V)

Maximum valid range: FUEL\_PRESS\_VAL\_RNG\_MAX (5.37V)

else "FUEL PRESS 2 validity" is set to invalid.

##### 16.5.2.3.3 4.4.4.17 Hydraulic Pressure (LHP, RHP)

Requirement ID: H398-SRS-GWY-FNC-1160

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall accept two (2) Hydraulic Pressure (LHP, RHP) inputs per channel.

The LHP, RHP input signals comply with the characteristics depicted in H398-SRS-GWY-FNC-628.

##### 16.5.2.3.4 HYD PRESS 1 value

Requirement ID: H398-SRS-GWY-FNC-1161

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall convert the "HYD PRESS 1 value" signal received using analog input "LHP" (VD12\_6) in [V] into [bar] according following linear treatment:

Table – HYD PRESS 1 Digital Value Conversion

|  |  |
| --- | --- |
| Voltage (V) | HYD (bar) |
| 0.8 | 0 |
| 1 | 0 |
| 2.1 | 69 |
| 2.76 | 110 |
| 3.4 | 150 |
| 4.12 | 195 |
| 4.86 | 241.4 |
| 5 | 250 |

##### 16.5.2.3.5 HYD PRESS 2 value

Requirement ID: H398-SRS-GWY-FNC-1162

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall convert the "HYD PRESS 2 value" signal received using analog input "RHP" (VD12\_7) in [V] into [bar] according following linear treatment:

Table – HYD PRESS 2 Digital Value Conversion

|  |  |
| --- | --- |
| Voltage (V) | HYD (bar) |
| 0.8 | 0 |
| 1 | 0 |
| 2.1 | 69 |
| 2.76 | 110 |
| 3.4 | 150 |
| 4.12 | 195 |
| 4.86 | 241.4 |
| 5 | 250 |

##### 16.5.2.3.6 HYD PRESS 1 validity

Requirement ID: H398-SRS-GWY-FNC-1000

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall set the "HYD PRESS 1 validity" to valid if "HYD PRESS 1 value" is inside following valid range:

* Minimum valid range: HYD\_PRESS\_VAL\_RNG\_MIN (0.8 V)
* Maximum valid range: HYD\_PRESS\_VAL\_RNG\_MAX (5 V)

Else "HYD PRESS 1 validity" is set to invalid.

##### 16.5.2.3.7 HYD PRESS 2 validity

Requirement ID: H398-SRS-GWY-FNC-1001

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall set the "HYD PRESS 2 validity" to valid if "HYD PRESS 2 value" is inside following valid range:

* Minimum valid range: HYD\_PRESS\_VAL\_RNG\_MIN (0.8 V)
* Maximum valid range: HYD\_PRESS\_VAL\_RNG\_MAX (5 V)

else "HYD PRESS 2 validity" is set to invalid.

##### 16.5.2.3.8 HYD PRESS 1 low red limit

Requirement ID: H398-SRS-GWY-FNC-1035

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall set the HYD PRESS 1 low red limit value to 110 bar.

##### 16.5.2.3.9 HYD PRESS 1 high red limit

Requirement ID: H398-SRS-GWY-FNC-1036

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall set the HYD PRESS 1 high red limit value to 210 bar.

##### 16.5.2.3.10 HYD PRESS 2 low red limit

Requirement ID: H398-SRS-GWY-FNC-1037

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall set the HYD PRESS 2 low red limit value to 110 bar.

##### 16.5.2.3.11 HYD PRESS 2 high red limit

Requirement ID: H398-SRS-GWY-FNC-1038

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall set the HYD PRESS 2 high red limit value to 210 bar.

##### 16.5.2.3.12 HYD PRESS 1 Operation Limit Activation

Requirement ID: H398-SRS-GWY-FNC-1163

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall activate/deactivate following HYD PRESS 1 operation limits with reaching limit:

Table - HYD PRESS 1 Operation Limit Activation

|  |  |
| --- | --- |
| Limit | State |
| Bottom thin red line | True |
| Bottom thin yellow zone upper line | False |
| Top thin yellow zone lower line | False |
| Top thin red line | True |

##### 16.5.2.3.13 HYD PRESS 2 Operation Limit Activation

Requirement ID: H398-SRS-GWY-FNC-1164

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gatewya shall activate/deactivate following HYD PRESS 2 operation limits with reaching limit:

Table - HYD PRESS 2 Operation Limit Activation

|  |  |
| --- | --- |
| Limit | State |
| Bottom thin red line | True |
| Bottom thin yellow zone upper line | False |
| Top thin yellow zone lower line | False |
| Top thin red line | True |

##### 16.5.2.3.14 HYD PRESS 1 value

Requirement ID: H398-SRS-GWY-FNC-1165

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall convert the "HYD PRESS 1 value" (bar) into "HYD PRESS 1 analog value" (%) according following treatment:

Table –HYD PRESS 1 analog value Conversion

|  |  |  |
| --- | --- | --- |
| HYD PRESS 1 operation limits | HYD PRESS 1 value (bar) | HYD PRESS 1 analog value (%) |
| Bottom thin red line | HYD PRESS 1 low red limit (110 bar) | 0 |
| Middle normal zone | 175 bar | 50 |
| Top thin red line | HYD PRESS 1 high red limit (210 bar) | 100 |

The conversion shall be linear between the Bottom thin red line to the top thin red line.

##### 16.5.2.3.15 HYD PRESS 2 value

Requirement ID: H398-SRS-GWY-FNC-1166

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall convert the "HYD PRESS 2 value" (bar) into "HYD PRESS 2 analog value" (%) according following treatment:

Table – HYD PRESS 2 analog value Conversion

|  |  |  |
| --- | --- | --- |
| HYD PRESS 2 operation limits | HYD PRESS 2 value (bar) | HYD PRESS 2 analog value (%) |
| Bottom thin red line | HYD PRESS 2 low red limit (110 bar) | 0 |
| Middle normal zone | 175 bar | 50 |
| Top thin red line | HYD PRESS 2 high red limit (210 bar) | 100 |

The conversion shall be linear between the Bottom thin red line to the top thin red line.

##### 16.5.2.3.16 HYD PRESS1 status

Requirement ID: H398-SRS-GWY-FNC-1039

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall set the HYD PRESS1 status as follows:

* "Red" If (HYD PRESS 1 value is less than constant "HYD PRESS 1 low red limit" (110 bars) OR HYD PRESS 1 value is greater than constant "HYD PRESS 1 high red limit" (210 bars))
* "Nominal" Otherwise

##### 16.5.2.3.17 HYD PRESS2 status

Requirement ID: H398-SRS-GWY-FNC-1040

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The GATEWAY MODULE shall set the HYD PRESS2 status as follows:

* "Red" If (HYD PRESS 2 value is less than constant "HYD PRESS 2 low red limit" (110 bars)

OR HYD PRESS 2 value is greater than constant "HYD PRESS 2 high red limit" (210 bars))

* "Nominal" Otherwise

##### 16.5.2.3.18 Transmission Temperature (MGBT/IGBT/TGBT)

Requirement ID: H398-SRS-GWY-FNC-1157

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gatewya shall accept three (3) transmission temperatures per channel (MGBT/IGBT/TGBT)

The MGBT/IGBT/TGBT input signals comply with the characteristics depicted in H398-SRS-GWY-FNC-628.

##### 16.5.2.3.20 Gear Box Oil Pressure (MGBOP)

Requirement ID: H398-SRS-GWY-FNC-1182

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: None

The Gateway shall accept one(1) Gear Box Oil Pressure inputs (MGBOP) per channel.

The MGBOP input signal shall comply with the characteristics depicted in H398-SRS-GWY-FNC-628.

##### 16.5.2.3.21 MGB Oil Press validity

Requirement ID: H398-SRS-GWY-FNC-1054

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall set the "MGB Oil Press validity" to valid if "MGB Oil Press value" is inside following valid

range:

* Minimum valid range: XMSN\_OP\_VAL\_RNG\_MIN (0.8V)
* Maximum valid range: XMSN\_OP\_VAL\_RNG\_MAX (5.012V)

else "MGB Oil Press validity" is set to invalid.

##### 16.5.2.3.22 MGB Oil press low red limit

Requirement ID: H398-SRS-GWY-FNC-1055

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall set the MGB Oil press low red limit to 0.4 bar.

##### 16.5.2.3.23 MGB\_Oil\_Press Operation Limits Activation

Requirement ID: H398-SRS-GWY-FNC-1168

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall activate/deactivate following MGB Oil Press operation limits with reaching limit:

Table - MGB\_Oil\_Press Operation Limits Activation

|  |  |
| --- | --- |
| Limit | State |
| Bottom thin red line | True |
| Bottom thin yellow zone upper line | False |
| Top thin yellow zone lower line | False |
| Top thin red line | False |

##### 16.5.2.3.24 MGB\_Oil\_Press Analog Value Conversion

Requirement ID: H398-SRS-GWY-FNC-1169

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall convert the MGB Oil Press value (bar) into MGB Oil Press analog value (%) accordingfollowing treatment:

Table - MGB\_Oil\_Press Analog Value Conversion

|  |  |  |
| --- | --- | --- |
| MGB Oil Press operation limits | MGB Oil Press value (bar) | MGB Oil Press analog value (%) |
| Bottom thin red line | MGB Oil Press low red limit (0.4 bar) | 0 |
| Maximum Functional range of MGB Oil Press | 7 | 100 |

There is no top red limit on RNLAF but the conversion shall be linear between the Bottom thin red line

(0.4 bar) to the Maximum functional range of MGB Oil Press value (corresponding to 7 bars).

The 50% and 100% MGB Oil Press analog value will be tuned with the analysis of flight data.

##### 16.5.2.3.25 MGB Oil Press status

Requirement ID: H398-SRS-GWY-FNC-1056

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall set the MGB Oil Press status as follows:

"Red" If

• MGB Oil Press value is less than constant "MGB Oil Press low red limit" (0.4 bars)

"Nominal" Otherwise

##### 16.5.2.3.26 MGB\_Oil\_Temperature Analog Value Conversion

Requirement ID: H398-SRS-GWY-FNC-1061

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall convert the "MGB Oil Temperature value" signal received using analog

resistance input "MGBT " (RS300\_3) in (Ohm) into [degC] according following Table:

Table - MGB\_Oil\_Temperature Digital Value Conversion

|  |  |
| --- | --- |
| **Resistance (Ohm)** | **MGB Oil Temperature Value (°C)** |
| 403.5 | -50 |
| 502.25 | 0 |
| 599.25 | 50 |
| 694.75 | 100 |
| 788.8 | 150 |
| 826.5 | 170 |

##### 16.5.2.3.27 MGB\_Oil\_Press Digital Value Conversion

Requirement ID: H398-SRS-GWY-FNC-1127

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall convert the "MGB Oil Press value" signal received using analog input "MGBOP" (VD12\_5)in [V] into [PSI] according following linear treatment:

Table - MGB Oil Press Digital Value Conversion

|  |  |
| --- | --- |
| **Voltage (V)** | **MGB Oil Pressure (PSI)** |
| 0.8 | 0 |
| 1 | 0 |
| 2.576 | 40.02 |
| 2.97 | 50.03 |
| 5.012 | 101.5 |

##### 16.5.2.3.28 MGB Oil Temperature validity

Requirement ID: H398-SRS-GWY-FNC-1062

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall set the "MGB Oil Temperature validity" to valid if "MGB Oil Temperature value" is inside following valid range:

* Minimum valid range: XMSN\_OT\_VAL\_RNG\_MIN (403.5 Ohms)
* Maximum valid range: XMSN\_OT\_VAL\_RNG\_MAX (826.5 Ohms)

else "MGB Oil Temperature validity" is set to invalid.

##### 16.5.2.3.29 MGBOT low red limit

Requirement ID: H398-SRS-GWY-FNC-1063

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall set the MGB Oil Temperature (MGBOT) low red limit value to - 10 °C.

##### 16.5.2.3.30 MGB Oil Temperature high red limit

Requirement ID: H398-SRS-GWY-FNC-1064

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall set the MGB Oil Temperature high red limit value to 125 °C.

##### 16.5.2.3.31 MGB\_Oil\_Temperature Operation Limit Activation

Requirement ID: H398-SRS-GWY-FNC-1170

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall activate/deactivate following MGB Oil Temperature operation limits with reaching limit:

Table - MGB Oil Temperature Operation Limit Activation

|  |  |
| --- | --- |
| Limit | State |
| Bottom thin red line | True |
| Bottom thin yellow zone upper line | False |
| Top thin yellow zone lower line | False |
| Top thin red line | True |

##### 16.5.2.3.32 MGB Oil Temperature value

Requirement ID: H398-SRS-GWY-FNC-1171

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall convert the "MGB Oil Temperature value" (°C) into "MGB Oil Temperature analog value"(%) according the following treatment:

Table – MGB Oil Temperature Analog Value Conversion

|  |  |  |
| --- | --- | --- |
| MGB Oil Temperature operation limits | MGB Oil Temperature value (°C) | MGB Oil Temperature analog value (%) |
| Bottom thin red line | MGB Oil Temperature low red limit (-10°C) | 0 |
| Top thin red line | MGB Oil Temperature high red limit (125°C) | 100% |

The conversion shall be linear between the Bottom thin red line (-10°C) to the top thin red line (125°C).

The 50% MGB Oil Temperature analog value will be tuned with the analysis of flight data.

##### 16.5.2.3.33 MGB Oil Temperature status

Requirement ID: H398-SRS-GWY-FNC-1065

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall set the MGB Oil Temperature status as follows:

"Red" If

* (MGB Oil Temperature value is less than constant "MGB Oil Temperature low red limit" (-10°C)

OR

* MGB Oil Temperature value is greater than constant "MGB Oil Temperature high red limit" (125°C))

"Nominal" Otherwise

##### 16.5.2.3.34 MGB Main pump low pressure alarm

Requirement ID: H398-SRS-GWY-FNC-1070

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall set "MGB Main pump low pressure alarm" to true if ("XMSN\_M\_PRESS"

(DI\_19) is active and valid)

Else “MGB Main pump low pressure alarm" to false.

Reference Label 013 (Bit 19) for MGB\_Main\_pump\_low\_pressure\_alarm

##### 16.5.2.3.35 MGB Stby pump low pressure alarm

Requirement ID: H398-SRS-GWY-FNC-1071

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall set "MGB Stby pump low pressure alarm" to true if ("XMSN\_SB\_PRESS"

(DI\_20) is active and valid)

Else "MGB Stby pump low pressure alarm" to false.

Reference Label 013 (Bit 20) for MGB\_Stby\_pump\_low\_pressure\_alarm

##### 16.5.2.3.36 MGB oil temperature alarm

Requirement ID: H398-SRS-GWY-FNC-1072

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall set "MGB oil temperature alarm" to true if ("XMSN\_MGBT" (DI\_21) is

active and valid)

Else "MGB oil temperature alarm" to false.

Reference Label 013 (Bit 18) MGB\_oil\_temperature\_alarm

##### 16.5.2.3.37 TRQ input signal

Requirement ID: H398-SRS-GWY-FNC-948

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall accept two (2) Differential DC Voltage Torque TRQ inputs per channel., the TRQ input signal will comply with the characteristics depicted in H398-SRS-GWY-FNC-628

##### 16.5.2.3.38 Engine 1 TRQ value

Requirement ID: H398-SRS-GWY-FNC-949

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall convert the "Engine 1 TRQ value" signal received on input “TRQ1” (VD12\_1) in [V] into [%] according to the following treatment below:

if ("TRQ1" > 0)

Engine 1 TRQ value (%) = “TRQ1” / 0.046 (V)

else

Engine 1 TRQ value (%) = 0

##### 16.5.2.3.39 "Engine 2 TRQ value

Requirement ID: H398-SRS-GWY-FNC-950

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall convert the "Engine 2 TRQ value" signal received on input “TRQ2” (VD12\_2) in [V] into [%] according to the following treatment show below:-

if ("TRQ2" > 0)

Engine 2 TRQ value (%) = “TRQ2” / 0.046 (V)

else

Engine 2 TRQ value (%) = 0

##### 16.5.2.3.40 Engine 1 TRQ Validity

Requirement ID: H398-SRS-GWY-FNC-924

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the "Engine 1 TRQ Validity" as follow

if the "Engine 1 TRQ value" is lower to TRQ\_MAX\_RNG (120%)

"Engine 1 TRQ Validity" is set to valid.

else

"Engine 1 TRQ Validity" is set to invalid.

##### 16.5.2.3.41 Engine 2 TRQ Validity

Requirement ID: H398-SRS-GWY-FNC-925

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the "Engine 2 TRQ Validity" as follow

if the "Engine 2 TRQ value" is lower to TRQ\_MAX\_RNG (120%):

"Engine 2 TRQ Validity" is set to valid

else

"Engine 2 TRQ Validity" is set to invalid

##### 16.5.2.3.42 Computed TRQ1+2 value

Requirement ID: H398-SRS-GWY-FNC-951

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the "Computed TRQ1+2 value" as follows:

if Engine 1 in Training Flight mode and Engine2 in Training Idle mode

Computed Torque 1+2 value = Engine 1 TRQ value (%)

else if Engine 2 in Training Flight mode and Engine1 in Training Idle mode

Computed Torque 1+2 value = Engine 2 TRQ (%)

else if Engine 1 TRQ validity is valid or Engine 2 TRQ validity is valid then

Computed TRQ1+2 value (%) = Engine 1 TRQ value (%) + Engine 2 TRQ value (%)

else

Computed TRQ1+2 value (%) = 0

If either the Engine 1 or Engine 2 Torque values have a discrepancy or if their validity is invalid, the value of the failed parameter will be computed as zero.

##### 16.5.2.3.43 TRQ OEI CT limit

Requirement ID: H398-SRS-GWY-FNC-953

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the TRQ OEI CT limit value to 68.4%.

##### 16.5.2.3.44 TRQ OEI LO limit

Requirement ID: H398-SRS-GWY-FNC-954

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the TRQ OEI LO limit value to 70.6%

##### 16.5.2.3.45 TRQ OEI HI limit

Requirement ID: H398-SRS-GWY-FNC-955

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the TRQ OEI HI limit value to 74.8%.

##### 16.5.2.3.46 TRQ MCP limits

Requirement ID: H398-SRS-GWY-FNC-956

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the TRQ MCP limits value to 77%.

##### 16.5.2.3.47 TRQ TOP limit

Requirement ID: H398-SRS-GWY-FNC-957

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the TRQ TOP limit value to 100%.

##### 16.5.2.3.48 TRQ MTP limit

Requirement ID: H398-SRS-GWY-FNC-958

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the TRQ MTP limit value to 110%.

##### 16.5.2.3.49 Computed Torque 1+2 Operation Limits

Requirement ID: H398-SRS-GWY-FNC-959

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall control the visibility of each operating limit associated with the Computed Torque 1+2 gauge by turning on the bits visibility in the TRQ limits position labels 052 to 057 and 60 to 61 (those marked with \*\*\* emit a bit forced to 0), and the activation of these bits is described in the following table:

Table - Computed Torque 1+2 Operation Limits

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Computed TRQ1+2 operation limits | Bit at 1 state if display class is | Label | SDI | Bit |
| TRQ AEO YEL LO | AEO or (AEO + OEI) | 052 | 01 | 11 |
| TRQ AEO YEL UP | AEO or (AEO + OEI) | 052 | 10 | 11 |
| TRQ YEL REC\*\*\* | AEO or (AEO + OEI) | 053 | 00 | 11 |
| TRQ AEO RED | AEO or (AEO + OEI) | 054 | 00 | 11 |
| TRQ AEO RED DIO | AEO | 055 | 00 | 11 |
| TRQ OEI YEL DASH | OEI or (AEO + OEI) | 057 | 00 | 11 |
| TRQ OEI RED DASH | OEI or (AEO + OEI) | 060 | 00 | 11 |
| TRQ OEI RED LINE | OEI or (AEO + OEI) | 061 | 00 | 11 |

##### 16.5.2.3.50 Computed Torque 1+2 Pointer Angle Limits

Requirement ID: H398-SRS-GWY-FNC-960

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall transmit the following TRQ parameter limits labels as the angular position of the

corresponding limit in degrees from -180° to 180° on the ARINC 429 parameter bus at intervals as

specified in "Digital Output Interfaces" Doc STC019000053 and the Normal SSM.

Table - Computed Torque 1+2 Pointer Angle Limits

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| TRQ limits value (%) | TRQ pointer angle limits value (deg) | Label | SDI | Bit |
| TRQ MCP (77%) | TRQ\_AEO\_YEL\_LO (182.6) | 52 | 01 | 18 to 29 |
| TRQ TOP (100%) | TRQ\_AEO\_YEL\_UP (222.5) | 52 | 10 | 18 to 29 |
| TRQ\_AEO\_RED (222.5) | 54 | 00 | 18 to 29 |
| TRQ MTP (110%) | TRQ\_AEO\_RED\_DIO (240) | 55 | 00 | 18 to 29 |
| TRQ OEI CT (68.4%) | TRQ\_OEI\_YEL\_DASH (161.6) | 57 | 00 | 18 to 29 |
| TRQ OEI LO (70.6%) | TRQ\_OEI\_RED\_DASH (167.3) | 60 | 00 | 18 to 29 |
| TRQ OEI HI (74.8%) | TRQ\_OEI\_RED\_LINE (178.2) | 61 | 00 | 18 to 29 |

##### 16.5.2.3.51 TRQ OEI Diode Visibility

Requirement ID: H398-SRS-GWY-FNC-961

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall control the visibility of each TRQ Diode associated with the TRQ limitations by turning on

bit visibility in the TRQ OEI limits position labels (60, 61) (those marked with \*\*\* emit a bit forced to 0).

The activation of these bits is described in the following table:

Table 60- TRQ OEI Diode Visibility

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| TRQ diode visibility | Bit at 1 state if OEI topping is | Label | SDI | Bit |
| TRQ OEI CT Diode\*\*\* | N/A on RNLAF | 57 | 00 | 12 |
| TRQ OEI LO Diode\*\*\* | OEI LO selected | 60 | 00 | 12 |
| TRQ OEI HI Diode\*\*\* | OEI HI selected | 61 | 00 | 12 |

##### 16.5.2.3.52 Computed Torque 1+2 Pointer Angle Value Conversion

Requirement ID: H398-SRS-GWY-FNC-962

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gatway module shall convert the "Computed TRQ1+2 value" (%) into "Computed TRQ1+2 pointer angle value"

(deg) according following table shown below:

Table - Computed Torque 1+2 Pointer Angle Value Conversion

|  |  |  |
| --- | --- | --- |
| Area Interpolation | TRQ (%) | TRQ (deg) |
| Area 0 | 0 | 45 |
| Area 1 | 33 | 70 |
| Area 2 | 75.5 | 180 |
| Area 3 | 113 | 245 |
| Area 4 | 120 | 257 |
| Area 5 | 130 | 270 |

##### 16.5.2.3.53 Engine 1 TRQ Status

Requirement ID: H398-SRS-GWY-FNC-963

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall set the Engine 1 TRQ Status as follows:

"Red" If

* Engine 1 state is set to OEI or OEI training mode and computed Engine 1 TRQ value is greater than constant TRQ OEI LO (70.6%)

"Amber" If not "Red" and:

* Engine 1 state is set to OEI or OEI training mode and computed Engine 1 TRQ value is greater than constant TRQ OEI CT (68.4%)

"Nominal" Otherwise

##### 16.5.2.3.54 Engine 2 TRQ Status

Requirement ID: H398-SRS-GWY-FNC-964

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall set the Engine 2 TRQ Status as follows:

"Red" If

* Engine 2 state is set to OEI or OEI training mode and computed Engine 2 TRQ value is greater than constant TRQ OEI LO (70.6%)

"Amber" If not "Red" and:

* Engine 2 state is set to OEI or OEI training mode and computed Engine 2 TRQ value is greater than constant TRQ OEI CT (68.4%)

"Nominal" Otherwise.

##### 16.5.2.3.55 Computed TRQ1+2 Status

Requirement ID: H398-SRS-GWY-FNC-965

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall set the Computed TRQ1+2 Status as follows:

"Red" If

* (Engine state is set to AEO mode and computed Torque 1+2 value is greater than constant TRQ TOP(100%)

OR

* Engine state is set to OEI training mode and computed Torque 1+2 value is greater than constant TRQ OEI LO (70.6%))

"Amber" If not "Red" and:

* (Engine state is set to AEO mode and computed Torque 1+2 value is greater than constant TRQ MCP(77%) and lower than TRQ TOP (100%)

OR

* Engine state is set to OEI training mode and computed Torque 1+2 value is greater than constant TRQ OEI CT (68.4%) and lower than TRQ OEI LO (70.6%))

"Nominal" Otherwise

### 16.5.4 DU\_Source\_Selection

Requirement ID: H398-SRS-GWY-FNC-1096

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall send the data into ARINC429 message "SYSTEM MESSAGE STATUS" (Label 34) as follows:

If the master channel is set to channel EIU1 then

"DU\_Source\_Selection" (bit 11 to 12) is set to "EIU1\_Selected" ('01')

AND

"REMISE\_Source\_Selection" (bit 13 to 14) is set to "EIU1\_Selected" ('01')

else

"DU\_Source\_Selection" is set to "EIU2\_Selected" ('10')

AND

"REMISE\_Source\_Selection" is set to "EIU2\_Selected" ('10')

### 16.5.5 SYSTEM MESSAGE STATUS

Requirement ID: H398-SRS-GWY-FNC-1180

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall emit the data into ARINC429 message "SYSTEM MESSAGE STATUS" (label 34-00) as follow:

If the reconfiguration state is set to channel EIU\_N then

"Reconfiguration\_State" (bit 15 to 16) is set to "EIU\_N\_State" ('00')

else if the reconfiguration state is set to channel EIU1\_State then

"Reconfiguration\_State" (bit 15 to 16) is set to "EIU1\_State" ('01')

else

"Reconfiguration\_State" (bit 15 to 16) is set to "EIU2\_State" ('10')

### 16.5.7 Reconfiguration Discrepancy

Requirement ID: H398-SRS-GWY-FNC-914

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set TRUE the Reconfiguration Discrepancy if

DU\_Source\_Selection or REMISE\_Source\_Selection is different to EIU channel master during 3s

### 16.5.8 SYSTEM MESSAGE STATUS

Requirement ID: H398-SRS-GWY-FNC-1145

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall emit the data into ARINC429 message "SYSTEM MESSAGE STATUS" (label 34) as follows:

If Reconfiguration Discrepancy is set to TRUE,

then Reconfiguration\_Discrepancy (Label 034 bit 25) is set to '1'

Else

Reconfiguration\_Discrepancy (Label 034 bit 25) is set to '0'.

### 16.5.10 channel master selected

Requirement ID: H398-SRS-GWY-FNC-915

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The gateway shall receive the channel master selected from the displays.

### 16.5.11 channel master

Requirement ID: H398-SRS-GWY-FNC-1112

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall emit the channel master to the displays.

### 16.5.12 deactivate the reconfiguration

Requirement ID: H398-SRS-GWY-FNC-916

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall deactivate the reconfiguration for 0.5 seconds and ignore any new reconfiguration command when DAU receives a reconfiguration command signal. After 0.5 seconds, gateway module shall authorize again the reconfiguration and accept new reconfiguration commands

### 16.5.13 reconfiguration capability

Requirement ID: H398-SRS-GWY-FNC-917

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

At every power up on ground, the Gateway shall test the reconfiguration capability. If the test is failed, it will be reported on preflight test and output being set to True in label 062 B24.

### 16.5.14 reconfiguration discrepancy

Requirement ID: H398-SRS-GWY-FNC-918

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

If a reconfiguration discrepancy is sent, the gateway module shall consider reconfiguration lost and set B25 in label 034.

### 16.5.16 master channel selection

Requirement ID: H398-SRS-GWY-FNC-1098

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall determine DU master channel by "DU\_Source\_Selection" Label 034 bit 11 to 12.

The REMISE master channel is determined by "REMISE\_Source\_Selection" Label 034 bit 13 to 14.

### 16.5.17 master channel

Requirement ID: H398-SRS-GWY-FNC-1099

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

When master channel is changed, The Gateway module shall compare the master channel outputs from each channel (EIU1 and EIU2) before sending them to the DU. If after 500 ms the outputs are different:

• The DAU maintains previous value and send it to DU.

• The DAU reports the discrepancy to DU.

Otherwise, the new master channel will be sent.

### 16.5.18 reconfiguration mode

Requirement ID: H398-SRS-GWY-FNC-1100

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

When reconfiguration mode is changed, the Gateway module shall compare the reconfiguration mode outputs from each channel (EIU1 and EIU2) before sending them to the DU. If after 500 ms the outputs are different:

• The DAU maintains previous value and send it to DU.

• The DAU reports the discrepancy to DU.

Otherwise, the new reconfiguration mode will be sent.

### 16.5.19 the reconfiguration request

Requirement ID: H398-SRS-GWY-FNC-1101

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The gateway shall receive the reconfiguration request into ARINC429 message "Equipment Status" (label 11-01) from the DU as follows:

* If the reconfiguration request is EIU\_N\_Request then

"Reconfiguration\_Request" (bit 21 to 22) is set to "EIU\_N\_State" ('00')

* else if the reconfiguration request is EIU1\_Request then

"Reconfiguration\_Request" (bit 21 to 22) is set to "EIU\_1\_State" ('01')

* else if the reconfiguration request is EIU2\_Request then

"Reconfiguration\_Request" (bit 21 to 22) is set to "EIU\_2\_State" ('10')

### 16.5.20 Equipment Status(label 11-10)

Requirement ID: H398-SRS-GWY-FNC-1102

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The gateway shall receive from the REMISE display the reconfiguration request into ARINC429 message "Equipment Status" (label 11-10) as follow:

* If the reconfiguration request is EIU\_N\_Request then

"Reconfiguration\_Request" (bit 21 to 22) is set to "EIU\_N\_State" ('00')

* else if the reconfiguration request is EIU1\_Request then

"Reconfiguration\_Request" (bit 21 to 22) is set to "EIU\_1\_State" ('01')

* else if the reconfiguration request is EIU2\_Request then

"Reconfiguration\_Request" (bit 21 to 22) is set to "EIU\_2\_State" ('10')

### 16.5.21 reconfiguration state

Requirement ID: H398-SRS-GWY-FNC-1103

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The gateway shall compute the reconfiguration state if a reconfiguration request is updated by a display.

### 16.5.22 reconfiguration fault

Requirement ID: H398-SRS-GWY-FNC-1104

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The gateway shall raise a master reconfiguration fault if the DAU can't perform the reconfiguration requested.

### 16.5.23 EIU reconfiguration

Requirement ID: H398-SRS-GWY-FNC-1105

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The gateway shall change the EIU reconfiguration state as follows:

* If a master reconfiguration fault is set

EIU reconfiguration state is set to the previous value.

* Else

EIU reconfiguration state is set to the reconfiguration request.

### 16.5.24 reconfiguration state

Requirement ID: H398-SRS-GWY-FNC-1106

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the reconfiguration state to the displays.

### 16.5.25 reconfiguration state

Requirement ID: H398-SRS-GWY-FNC-1107

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The gateway shall set the reconfiguration state as follows:

If an issue is detected during the reconfiguration by the DAU

The DAU will set the reconfiguration state to the previous value

Else if the reconfiguration request is EIU1\_State

The DAU will set the reconfiguration state to EIU1\_State

Else if the reconfiguration request is EIU2\_State

The DAU will set the reconfiguration state to EIU\_2\_State

Else if the reconfiguration request is EIU\_N\_State

The DAU will set the reconfiguration state to EIU\_N\_State

Else

The reconfiguration state will not change

### 16.5.26 Discrete Inputs

Gateway uses the System select Discrete to indicate that the Gateway is installed in the #1 or primary position or ‘Channel A’, Refer H398-SRS-GWY-DRQ-42.

### 16.5.27 Limitations During an Engine Start

Requirement ID: H398-SRS-GWY-FNC-1090

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall perform the following:

1. During engine Start mode the Gateway module shall remove all limitations from the associated NG gauge.
2. On the associated T4 gauge only the three triangles T4\_START\_WHI\_TRI, T4\_START\_RED\_TRI\_LOW and T4\_START\_RED\_TRI\_HIGH will be enabled.
3. On the TRQ1+2 gauge, if neither engine is operational, no limits will be enabled
4. If one engine is already operational (OEI mode) then the TRQ1+2 gauge displays the OEI limitations

### 16.5.28 Limitations during One Engine Inoperable (OEI)

Requirement ID: H398-SRS-GWY-FNC-1091

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall only enable the OEI limitations on the N1 and T4 gauges associated with the operational engine and the computed TRQ1+2 gauge when one engine is operational and the aircraft is in an OEI state

### 16.5.29 N1 and T4 gauges

Requirement ID: H398-SRS-GWY-FNC-1092

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall perform the following:

1. The two T4 start mode triangles will disappear.
2. The N1 and T4 gauges for the engine in standby mode will be displayed with AEO and OEI limitations except OEI diode and MTP limit.

### 16.5.30 Limitations with All Engines Operational (AEO)

Requirement ID: H398-SRS-GWY-FNC-1093

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall cause AEO, to be displayed on all five Engine gauges (NG 1 and 2, T4 1 and 2 and TRQ) in AEO state.

### 16.5.31 Engine State Inputs

Requirement ID: H398-SRS-GWY-FNC-1085

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall acquire discrete inputs corresponding to former lamp indicators and

alerting also acquires set of signals that are used as inputs in the engine state determination as shown.

in the table below.

Table - Engine State Inputs

|  |  |  |  |
| --- | --- | --- | --- |
| **Item** | **Signal Name** | **Input DAU** | **Signal type** |
| Sensor | ENG\_START1 | DI\_9 | Discrete |
| Sensor | ENG\_START2 | DI\_10 | Discrete |
| Sensor | ENG\_T1 | DI\_15 | Discrete |
| Sensor | ENG\_T2 | DI\_16 | Discrete |
| FADEC | REGM1 | DI\_36 | Discrete |
| FADEC | REGM2 | DI\_37 | Discrete |
| FADEC | MAN1\_IDLE\_DETENT | DI\_38 | Discrete |
| FADEC | MAN2\_IDLE\_DETENT | DI\_39 | Discrete |

### 16.5.32 Engine State Logic

Requirement ID: H398-SRS-GWY-FNC-1086

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall perform the following:

* GVMS set the Engine State according to the table below

Table - Engine State Logic

|  |  |
| --- | --- |
| **Engine State Conditions** | **Engine State** |
| For engine 1:  if Engine 1 NG is valid and  if {[(ENG1\_TRQ < 6%) and (|(ENG1\_NG - ENG2\_NG)| > 7.5%) and REGM2=0 and  ENG2\_Training\_Display=0)]  OR  ((ENG1\_NG lower than 60%)}  For engine 2:  if Engine 2 NG is valid and  if {[(ENG2\_TRQ < 6%) and (|(ENG1\_NG - ENG2\_NG)| > 7.5%) and REGM1 =0 and  ENG1\_Training\_Display=0  OR  ((ENG2\_NG lower than 60%)} | "STANDBY" State |
| For engine 1:  if  ((ENG1\_START\_DISPLAY = 1) and (NG lower than 75% or Engine 1 NG is not valid)  For engine 2:  if  ((ENG2\_START\_DISPLAY = 1) and (NG lower than 75% or Engine 2 NG is not valid) | "START" State |
| For engine 1:  IF (ENG1\_Training\_Display = 1)  For engine 2:  IF (ENG2\_Training\_Display = 1) | "OEI TF" State |
| For engine 1:  IF (ENG2\_Training\_Display = 1)  For engine 2:  If (ENG1\_Training\_Display = 1) | "OEI TI" State |
| For engine 1:  if (REGM1 Discrete input is active and (Engine 1 NG > 10% or Engine 1 NG is not valid ))  For engine 2:  if (REGM2 Discrete input is active and (Engine 2 NG > 10% or Engine 2 NG is not valid )) | "Major Failure" State |
| Otherwise (when not in another state) | "OPERATIONAL" State |

Note: Refer Requirements H398-SRS-GWY-FNC-813 and H398-SRS-GWY-FNC-814 for Engine NG Validity

### 16.5.33 Engine State Priority

Requirement ID: H398-SRS-GWY-FNC-1087

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the Engine State with the following priority:

* START state
* Major Failure State
* STANDBY State
* OEI TF State
* OEI TI State
* Operational State

### 16.5.34 Composite Engine States

Requirement ID: H398-SRS-GWY-FNC-1088

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

In Gateway module, Only the following combinations of ENG1 state and ENG2 state shall be allowed for the composite engines state:

Table - Composite Engine States

|  |  |  |
| --- | --- | --- |
| **Engine States Number** | **Engine 1 State** | **Engine 2 State** |
| 1 | START | START |
| 2 | START | OPERATION |
| 3 | START | Major Failure |
| 4 | START | STANDBY |
| 5 | OPERATION | Major Failure |
| 6 | OPERATION | OPERATION |
| 7 | OPERATION | STANDBY |
| 8 | OEI TF | OEI TI |
| 9 | Major Failure | Major Failure |
| 10 | Major Failure | STANDBY |
| 11 | STANDBY | STANDBY |
| 12 | OPERATION | START |
| 13 | Major Failure | START |
| 14 | STANDBY | START |
| 15 | Major Failure | OPERATION |
| 16 | STANDBY | OPERATION |
| 17 | OEI TI | OEI T |
| 18 | STANDBY | Major Failure |

### 16.5.35 Engine State and Limit Displaying

Requirement ID: H398-SRS-GWY-FNC-1089

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall command the display of limits on the associated DELTA\_NG and T4 gauges and the combined TRQ1+2 gauge in each combination of engine states:

Several display classes of limits are defined: No Limitation, Start, OEI, AEO, OEI\_AND\_AEO.

Table - Engine State and Limit Displaying

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Engine States Number** | **Engine 1 State** | **Engine 2 State** | **Engine 1 DELTA NG** | **Engine 1 T4** | **Engine 2 DELTA NG** | **Engine 2 T4** | **TRQ1+2** |
| **1** | START | START | No limitation | START | No limitation | START | No limitation |
| **2** | START | OPERATION | No limitation | START | OEI | OEI | OEI |
| **3** | START | Major Failure | No limitation | START | OEI\_AND\_AEO | OEI\_AND\_AEO | OEI\_AND\_AEO |
| **4** | START | STANDBY | No limitation | START | OEI\_AND\_AEO | OEI\_AND\_AEO | OEI\_AND\_AEO |
| **5** | OPERATION | Major Failure | OEI | OEI | OEI\_AND\_AEO | OEI\_AND\_AEO | OEI |
| **6** | OPERATION | OPERATION | AEO | AEO | AEO | AEO | AEO |
| **7** | OPERATION | STANDBY | OEI | OEI | OEI\_AND\_AEO | OEI\_AND\_AEO | OEI |
| **8** | OEI TF | OEI TI | OEI | OEI | OEI\_AND\_AEO | OEI\_AND\_AEO | OEI |
| **9** | Major failure | Major Failure | OEI\_AND\_AEO | OEI\_AND\_AEO | OEI\_AND\_AEO | OEI\_AND\_AEO | OEI\_AND\_AEO |
| **10** | Major failure | STANDBY | OEI\_AND\_AEO | OEI\_AND\_AEO | OEI\_AND\_AEO | OEI\_AND\_AEO | OEI\_AND\_AEO |
| **11** | STANDBY | STANDBY | OEI\_AND\_AEO | OEI\_AND\_AEO | OEI\_AND\_AEO | OEI\_AND\_AEO | OEI\_AND\_AEO |
| **12** | OPERATION | START | OEI | OEI | No limitation | START | OEI |
| **13** | Major failure | START | OEI\_AND\_AEO | OEI\_AND\_AEO | No limitation | START | OEI\_AND\_AEO |
| **14** | STANDBY | START | OEI\_AND\_AEO | OEI\_AND\_AEO | No limitation | START | OEI\_AND\_AEO |
| **15** | Major failure | OPERATION | OEI\_AND\_AEO | OEI\_AND\_AEO | OEI | OEI | OEI |
| **16** | STANDBY | OPERATION | OEI\_AND\_AEO | OEI\_AND\_AEO | OEI | OEI | OEI |
| **17** | OEI TI | OEI TF | OEI\_AND\_AEO | OEI\_AND\_AEO | OEI | OEI | OEI |
| **18** | STANDBY | Major Failure | OEI\_AND\_AEO | OEI\_AND\_AEO | OEI\_AND\_AEO | OEI\_AND\_AEO | OEI\_AND\_AEO |

### 16.5.36 RS-232 Inputs/Outputs

Following Are the data formats which Each Gateway Channel will transfer to other side Gateway for Cross channel comparison and Each gateway channel will receive the corresponding data and use for cross channel comparison.

#### 16.5.36.1 Cross Channel Excitation Status

Requirement ID: H398-SRS-GWY-FNC-639

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway Module shall transmit/receive Cross channel Excitation Status in RS232 to/from another Gateway Channel as per the following Frame format

Table : Cross channel Excitation Status in RS232 to another Gateway Channel

|  |  |  |  |
| --- | --- | --- | --- |
| **Byte No.** | **Mnemonic** | **Data Type** | **Units** |
| 1 | Data Link Escape | UINT8 | 10 (hex) |
| 2 | Start of Header | UINT8 | 01 (hex) |
| 3 | Identifier Byte 1 | UINT8 | 02(hex) |
| 4 | Identifier Byte 2 | UINT8 | 0A(hex) |
| 5 | DAU Excited status | UINT8 | TRUE(1) / FALSE(0) |
| 6 | On powerup status | UINT8 | TRUE(On power Up) |
| 7 | RTD FAIL status | UINT8 | FALSE(0) |
| 8 | Excitation toggle condition status | UINT8 | FALSE(0) |
| 9 | Channel change status – Inactive to active | UINT8 | FALSE(0) |
| 10 | Channel change status – Active to Inactive | UINT8 | FALSE(0) |
| 11 | Forced channel change flag | UINT8 | FALSE(0) |
| 12 | Spare | 0 | NA |
| 13 | Footer 1 | UINT8 | 0x0D |
| 14 | Footer 2 | UINT8 | 0x0C |
| 15-18 | CRC | UINT32 | NA |
| 19 | Data Link escape | UINT8 | 10(hex) |
| 20 | End of Transmission | UINT8 | 04(hex) |
| Place Holder Byte 0x50 will be added if data consists of DLE byte (0x10) | | | |

#### 16.5.36.2 Cross Channel Discrete Input Status

Requirement ID: H398-SRS-GWY-FNC-100

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway Module shall transmit/receive Cross channel Discrete Input Status in RS232 to/from another Gateway Channel as per the following Frame format

Table : Cross channel Discrete Input Status in RS232 to another Gateway Channel

|  |  |  |  |
| --- | --- | --- | --- |
| **Byte No.** | **Mnemonic** | **Data Type** | **Units** |
| 1 | Data Link Escape | UINT8 | 10 (hex) |
| 2 | Start of Header | UINT8 | 01 (hex) |
| 3 | Identifier Byte 1 | UINT8 | 01(hex) |
| 4 | Identifier Byte 2 | UINT8 | 0B(hex) |
| 5-20 | Discrete Input Status \* 16 | Discrete(Each bit) | TRUE(1) / FALSE (0) |
| 21-24 | CRC | UINT32 | NA |
| 25 | Data Link escape | UINT8 | 10(hex) |
| 26 | End of Transmission | UINT8 | 04(hex) |
| Place Holder Byte 0x50 will be added if data consists of DLE byte (0x10) | | | |

#### 16.5.36.4 Cross Channel Essential Value

Requirement ID: H398-SRS-GWY-FNC-1185

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway Module shall transmit/receive Cross Channel Essential value in RS232 to/from another Gateway Channel as per the following Frame format

Cross Channel Essential in RS232 to another Gateway Channel

|  |  |  |  |
| --- | --- | --- | --- |
| **Byte No.** | **Mnemonic** | **Data Type** | **Units** |
| 1 | Data Link Escape | UINT8 | 10 (hex) |
| 2 | Start of Header | UINT8 | 01 (hex) |
| 3 | Identifier Byte 1 | UINT8 | 02(hex) |
| 4 | Identifier Byte 2 | UINT8 | 0B(hex) |
| 5-8 | EOP1 Value | FLOAT32 | Bar |
| 9-12 | EOP2 Value | FLOAT32 | Bar |
| 13-16 | EOT1 Temperature Value | FLOAT32 | °C |
| 17-20 | EOT2 Temperature Value | FLOAT32 | °C |
| 21-24 | FP1 Value | FLOAT32 | Bar |
| 25-28 | FP2 Value | FLOAT32 | Bar |
| 29-32 | LHP Value | FLOAT32 | Bar |
| 33-36 | RHP Value | FLOAT32 | Bar |
| 37-40 | MGBOP Value | FLOAT32 | Bar |
| 41-44 | MGBT Temperature Value | FLOAT32 | °C |
| 45-48 | CRC | UINT32 | NA |
| 49 | Data Link escape | UINT8 | 10(hex) |
| 50 | End of Transmission | UINT8 | 04(hex) |
| Place Holder Byte 0x50 will be added if data consists of DLE byte (0x10) | | | |

#### 16.5.36.5 Cross Channel Critical Value

Requirement ID: H398-SRS-GWY-FNC-1186

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway Module shall transmit/receive Cross Channel Critical value in RS232 to/from another Gateway Channel as per the following Frame format

Cross Channel Critical in RS232 to another Gateway Channel

|  |  |  |  |
| --- | --- | --- | --- |
| **Byte No.** | **Mnemonic** | **Data Type** | **Units** |
| 1 | Data Link Escape | UINT8 | 10 (hex) |
| 2 | Start of Header | UINT8 | 01 (hex) |
| 3 | Identifier Byte 1 | UINT8 | 03(hex) |
| 4 | Identifier Byte 2 | UINT8 | 0B(hex) |
| 5-8 | Total Torque value | FLOAT32 | % |
| 9-12 | TRQ 1 Value | FLOAT32 | % |
| 13-16 | TRQ 2 Value | FLOAT32 | % |
| 17-20 | TOT1 Value | FLOAT32 | °C |
| 21-24 | TOT2 Value | FLOAT32 | °C |
| 25-28 | NG1 Value | FLOAT32 | % |
| 29-32 | NG2 Value | FLOAT32 | % |
| 33-36 | Delta NG1 Value | FLOAT32 | % |
| 37-40 | Delta NG2 Value | FLOAT32 | % |
| 41-44 | CRC | UINT32 | NA |
| 45 | Data Link escape | UINT8 | 10(hex) |
| 46 | End of Transmission | UINT8 | 04(hex) |
| Place Holder Byte 0x50 will be added if data consists of DLE byte (0x10) | | | |

#### 16.5.36.6 Channel to Channel Cross-Check

Requirement ID: H398-SRS-GWY-FNC-776

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall not transmit channel crosschecking alerts (Label 062 Bits 20, Label 034 bits 21 and 23), If the reconfiguration mode is mode DAU1 or DAU2 in label 034 (Bit 15 to 16).

#### 16.5.36.6 discrepancy (EIU1/EIU2)

Requirement ID: H398-SRS-GWY-FNC-777

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall only perform a discrepancy test if both EIU1 and EIU2 data sources are available. Refer H398-SRS-GWY-FNC-778, H398-SRS-GWY-FNC-779, H398-SRS-GWY-FNC-780, H398-SRS-GWY-FNC-781, H398-SRS-GWY-FNC-1079, H398-SRS-GWY-FNC-1078.

#### 16.5.36.7 Parameter Discrepancy

Requirement ID: H398-SRS-GWY-FNC-778

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set Parameter Discrepancy bit to ‘1’ (bit 21 of label 34), if an essential parameter (Table mentioned in the Requirement H398-SRS-GWY-FNC-783) discrepancy is detected and persistence period is met.

#### 16.5.36.8 Detected discrepancy

Requirement ID: H398-SRS-GWY-FNC-779

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: NA

As soon as a detected discrepancy on essential or critical parameters or on limitations of these parameters disappears, the Gateway module shall set the corresponding bits of labels 035 (bit 11 to 27) and 034 (bit 22 to 24 ) to 0.

#### 16.5.36.9 cross-check discrepancy

Requirement ID: H398-SRS-GWY-FNC-780

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

If a cross-check detected discrepancy disappears or is not confirmed, the Gateway module shall set Parameter Discrepancy bit to ‘0’ (bit 21 of label 34) if the crosschecking of parameters does not fail. The parameter will be displayed if no other test on that parameter fails.

#### 16.5.36.10 discrepancy check

Requirement ID: H398-SRS-GWY-FNC-781

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The discrepancy check must fail consistently during the parameter persistence period before the gatewayshall confirm the discrepancy.

#### 16.5.36.11 discrepancy check

Requirement ID: H398-SRS-GWY-FNC-1079

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall check that no discrepancy is generated in the data acquired and processed by EIU1 and EIU2 during Initialization and Operational modes. In case of any discrepancies, which is identified in SRS H398-SRS-GWY-FNC-1046, H398-SRS-GWY-FNC-1073.

#### 16.5.36.12 discrepancy identification

Requirement ID: H398-SRS-GWY-FNC-1078

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall send below information to display , If any discrepancy is identified.

* Set Parameter discrepancy (in Label 035, if any bits is 1)
* Parameter discrepancy on critical parameter.

#### 16.5.36.13 cross-check DAU

Requirement ID: H398-SRS-GWY-FNC-782

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall cross-check the data acquisition, supply outputs, discrete outputs and logic outputs values computed by each EIU and report any discrepancy in label 035 for displaying.

#### 16.5.36.14 Cross-Check Values for AS532U2

Requirement ID: H398-SRS-GWY-FNC-783

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall perform cross-check comply with the next check rate, persistence and threshold as shown in table.

Table – Cross-Check Values for AS532U2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Check rate (ms)** | **Persistence (ms)** | **Threshold** | **Unit** |
| NG | 100 | 500 | 4 | % |
| Delta NG | 100 | 500 | 0.7 | % |
| T4 | 100 | 500 | 50 | °C |
| Torque | 100 | 500 | 4 | % |
| Total Torque | 100 | 500 | 4 | % |
| EOP | 400 | 2000 | 0.4 | Bar |
| EOT | 400 | 2000 | 2 | °C |
| MGBT | 400 | 2000 | 2 | °C |
| MGBOP | 400 | 2000 | 0.8 | Bar |
| FP | 400 | 2000 | 0.2 | Bar |
| HP | 400 | 2000 | 10 | Bar |

#### 16.5.36.15 Cross Channel Analog Input Status

Requirement ID: H398-SRS-GWY-FNC-1203

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway Module shall transmit/receive Cross channel Analog Input Status in RS232 to/from another Gateway Channel as per the following Frame format

Table194: Cross channel Analog Input Status in RS232 to another Gateway Channel

|  |  |  |  |
| --- | --- | --- | --- |
| **Byte No.** | **Mnemonic** | **Data Type** | **Units** |
| 1 | Data Link Escape | UINT8 | 10 (hex) |
| 2 | Start of Header | UINT8 | 01 (hex) |
| 3 | Identifier Byte 1 | UINT8 | 05(hex) |
| 4 | Identifier Byte 2 | UINT8 | 0B(hex) |
| 5 | EOP1 and EOP2 Status | UINT8 | NA |
| 6 | EOT1 and EOT2 Status | UINT8 | NA |
| 7 | MGBT Status | UINT8 | NA |
| 8 | FP1 and FP2 Status | UINT8 | NA |
| 9 | LHP and RHP Status | UINT8 | NA |
| 10 | MGBOP Status | UINT8 | NA |
| 11 | TRQ1 and TRQ2 Status | UINT8 | NA |
| 12 | TOT1 and TOT2 Status | UINT8 | NA |
| 13 | NG1 and NG2 Status | UINT8 | NA |
| 14 | DELTA NG1 and DELTA NG2 Status | UINT8 | NA |
| 15 - 18 | CRC | UINT8 | NA |
| 19 | Data Link escape | UINT8 | 10(hex) |
| 20 | End of Transmission | UINT8 | 04(hex) |
| Place Holder Byte 0x50 will be added if data consists of DLE byte (0x10) | | | |

## 16.6 Outputs

### 16.6.1 ARINC 429 Outputs

Requirement ID: H398-SRS-GWY-FNC-113

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall use the general ARINC 429 SDI bit interpretation shown in the following Table ‘SDI Bit interpretation’ unless otherwise indicated

Table - SDI Bit Interpretation

|  |  |  |
| --- | --- | --- |
| **SDI Value** | **Side** | **Channel** |
| 00 | N/A | N/A |
| 01 | Left | Channel 1 |
| 10 | Right | Channel 2 |
| 11 | N/A | N/A |

#### 16.6.1.1 A429 Outputs

Requirement ID: H398-SRS-GWY-FNC-114

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The gateway channel provide a minimum of two (2) A429 outputs.

Gateway Module shall output the labels shown with the minimum transmission rate (can be updated more frequently) in Table ‘A429 Outputs’ to the Display unit using ARINC 429 (High Speed).

Table : A429 Outputs

|  |  |  |  |
| --- | --- | --- | --- |
| **Label Number** | **Update Rate (ms)** | **Description** | **Companion Label Required** |
| 012 | 200 | Warning and Status Discrete Word 1 | X |
| 013 | 200 | Warning and Status Discrete Word 2 | X |
| 030 | 200 | Mode Management | X |
| 031 | 200 | Units |  |
| 034 | 200 | System message status |  |
| 035 | 200 | Discrepancy Report |  |
| 050 | 50 | TRQ Digital Value | X |
| 051 | 50 | Total\_TRQ1+2\_Pointer\_Angle | X |
| 052 | 50 | TRQ\_AEO\_YEL | X |
| 053 | 50 | TRQ\_AEO\_YEL\_REC | X |
| 054 | 50 | TRQ\_AEO\_RED | X |
| 055 | 50 | TRQ\_AEO\_RED\_DIO | X |
| 057 | 50 | TRQ\_OEI\_YEL\_DASH | X |
| 060 | 50 | TRQ\_OEI\_RED\_DASH | X |
| 061 | 50 | TRQ\_OEI\_RED\_LINE | X |
| 062 | 200 | BIT Results |  |
| 064 | 200 | Software CRC MSB |  |
| 065 | 200 | Software CRC LSB |  |
| 074 |  | Companion Label CRC |  |
| 077 | 200 | Lighting State | X |
| 174 | 200 | Hydraulic Digital Value | X |
| 175 | 200 | Hydraulic Analog Value | X |
| 176 | 200 | MGB Pressure Digital Value | X |
| 177 | 200 | MGB Pressure Analog Value | X |
| 200 | 200 | MGB Temperature Digital Value | X |
| 201 | 200 | MGB Temperature Analog Value | X |
| 262 | 200 | Fuel Pressure Digital Value | X |
| 265 | 50 | T4\_Digital\_Value | X |
| 266 | 50 | T4\_Pointer\_Angle | X |
| 270 | 50 | T4\_AEO\_YEL | X |
| 271 | 50 | T4\_AEO\_YEL\_REC | X |
| 272 | 50 | T4\_AEO\_RED | X |
| 273 | 50 | T4\_AEO\_RED\_DIO | X |
| 274 | 50 | T4\_OEI\_YEL\_DASH | X |
| 275 | 50 | T4\_OEI\_RED\_DASH | X |
| 276 | 50 | T4\_OEI\_RED\_LINE | X |
| 300 | 50 | T4\_START\_WHI\_TRI | X |
| 301 | 50 | T4\_START\_RED\_TRI\_LOW | X |
| 302 | 50 | T4\_START\_RED\_TRI\_HIGH | X |
| 316 | 200 | EOT Digital | X |
| 317 | 200 | EOT Analog | X |
| 320 | 200 | EOP Digital | X |
| 321 | 200 | EOP Analog | X |
| 343 | 50 | NG\_Digital\_Value | X |
| 344 | 50 | DeltaNG\_Pointer\_Angle | X |
| 345 | 50 | DeltaNG\_AEO\_YEL | X |
| 346 | 50 | DeltaNG\_AEO\_YEL\_REC | X |
| 347 | 50 | DeltaNG\_AEO\_RED | X |
| 350 | 50 | DeltaNG\_AEO\_RED\_DIO | X |
| 351 | 50 | DeltaNG\_OEI\_YEL\_DASH | X |
| 352 | 50 | DeltaNG\_OEI\_RED\_DASH | X |
| 353 | 50 | DeltaNG\_OEI\_RED\_LINE | X |
| 356 | 100 | Engine\_Status 1 | X |
| 357 | 100 | Engine\_Status 2 | X |

16.6.1.2 Aircraft Configuration Parameters

Requirement ID: H398-SRS-GWY-FNC-1179

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: None

The Gateway shall have the Aircraft Configuration Parameters shown in Table:

Table - Aircraft Configuration Parameters

|  |  |  |
| --- | --- | --- |
| PARAMETER | RANGE OF VALUES | REMARKS |
| Aircraft Type | AS532U2 | Provisional |
| Aircraft Serial Number | Up to 8 Alphanumeric Characters | Provisional |
| Aircraft Registration Number | Up to 8 Alphanumeric Characters | Provisional |

#### 16.6.1.3 Aircraft Operating Modes

The Gateway Module will report aircraft operating modes and data via transmit Label 270. This mode information is also used in other Gateway Module logic. Logic for these modes is defined as follows:

##### 16.6.1.3.1 On Ground

Requirement ID: H398-SRS-GWY-FNC-301

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall use the discrete input “ON\_GROUND” to determine the ground state of the aircraft as follows:

If “ON\_GROUND” (DI\_1) is active then

State is Ground

Else

State is not Ground

##### 16.6.1.3.2 preflight mode

Requirement ID: H398-SRS-GWY-FNC-1111

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The GVMS shall enter preflight mode when the PFT\_TEST and ON\_GROUND discretes are both active. The gateway will then set L030, B23-26 to 0101, which indicates to the DU that preflight mode is active.

#### 16.6.1.4 Discrete Data

#### 16.6.1.5 Warning and Status Discrete Word 1

##### 16.6.1.5.1 Warning and Status Discrete Word 1

Requirement ID: H398-SRS-GWY-FNC-1136

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall send Label 012 Warning and Status Discrete Word 1 map the logic to the CAS messages as shown in Table .

Table - Label 012 Warning and Status Discrete Word 1

|  |  |  |  |
| --- | --- | --- | --- |
| **Label 012 Output** | **Warning and Status Discretes 1** | | |
| **Bit Definitions** | **Functional definition** | **Data Name** | **Logic** |
| bit1 – bit8 | 012 | Label | N/A |
| bit 9 to bit 10 | 00 | SDI | N/A |
| bit 13 | 1 = Caution “CHIP” is displayed amber on ENG1 side | ENG1\_CHIP\_Warning |  |
| bit 14 | 1 = Caution “CHIP” is displayed amber on ENG2 side | ENG2\_CHIP\_Warning |  |
| bit 15 | 1 = Caution "THRT" is displayed amber on ENG1 side | ENG\_THRT\_Warning |  |
| bit 16 | 1 = Caution "PWR.C" is displayed amber on ENG2 side | ENG\_PWRC\_Warning |  |
| bit 17 | 1 = Caution Bleed Valve OFFSET is displayed amber blinking on ENG1 side | ENG1\_Bleed\_Valve\_OFFSET\_Warning |  |
| bit 18 | 1 = Caution Bleed Valve OFFSET is displayed amber blinking on ENG2 side | ENG2\_Bleed\_Valve\_OFFSET\_Warning |  |
| bit 19 | 1 = Caution Bleed Valve Open is displayed amber blinking on ENG1 side | ENG1\_Bleed\_Valve\_Open\_Warning |  |
| bit 20 | 1 = Caution Bleed Valve Open is displayed amber blinking on ENG2 side | ENG2\_Bleed\_Valve\_Open\_Warning |  |
| bit 21 – bit 29 | Always =0 | Spare | N/A |
| bit 30 – bit 31 | 00 = Normal Operation  01 = NCD  10 = Functional Test  11 = Failure Warning | SSM | N/A |
| bit 32 |  | Parity | N/A |

#### 16.6.1.6 Warning and Status Discrete Word 1(Label 12 SDI 00)

Requirement ID: H398-SRS-GWY-FNC-720

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 12-00):

Table - Label 12 SDI 00 Bits 17, 18, 19, & 20 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| ENG1\_Bleed\_Valve\_OFFSET\_Warning | Label 12 SDI 00 |  |  | bit 17 | 0 = not displayed |
| 1 = displayed |
| ENG2\_Bleed\_Valve\_OFFSET\_Warning | bit 18 | 0 = not displayed |
| 1 = displayed |
| ENG1\_Bleed\_Valve\_Open\_Warning | bit 19 | 0 = not displayed |
| 1 = displayed |
| ENG2\_Bleed\_Valve\_Open\_Warning | bit 20 | 0 = not displayed |
| 1 = displayed |

#### 16.6.1.7 - Label 12 SDI 00

Requirement ID: H398-SRS-GWY-FNC-1119

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall emitthe following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 12-00):

Table - Label 12 SDI 00 Bits 11, 12, 15, & 16 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| ENG1\_FADEC\_Warning | Label 12 SDI 00 |  |  | bit 11  Provision, not used on RNLAF | 0 = not displayed |
| 1 = displayed |
| ENG2\_FADEC\_Warning | bit 12  Provision, not used on RNLAF | 0 = not displayed |
| 1 = displayed |
| ENG\_THRT\_Warning | bit 15 | 0 = not displayed |
| 1 = displayed |
| ENG\_PWR.C\_Warning | bit 16 | 0 = not displayed |
| 1 = displayed |

#### 16.6.1.8 Label 12 SDI 00 Bits

Requirement ID: H398-SRS-GWY-FNC-1126

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The gateway shall emit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 12-00):

Table - Label 12 SDI 00 Bits 13 & 14 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| ENG1\_CHIP\_Warning | Label 12 SDI 00 |  |  | bit 13 | 0 = not displayed |
| 1 = displayed |
| ENG2\_CHIP\_Warning | bit 14 | 0 = not displayed |
| 1 = displayed |

#### 16.6.1.9 Engine1 chip

Requirement ID: H398-SRS-GWY-FNC-726

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set "Engine 1 Chip detector" to true

if ("ENG\_CHIP1" (DI\_13) is active and valid)

else

"Engine 1 Chip detector" to false.

Reference Label 012 (Bit 13) ENG1\_CHIP\_WARNING.

#### 16.6.1.10 Engine2 chip

Requirement ID: H398-SRS-GWY-FNC-751

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set "Engine 2 Chip detector" to true

if ("ENG\_CHIP2" (DI\_14) is active and valid)

else

"Engine 2 Chip detector" to false.

Reference Label 012 (Bit 14) ENG2\_CHIP\_WARNING

#### 16.6.1.11 Engine PWR.C caution

Requirement ID: H398-SRS-GWY-FNC-1117

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall set "Engine PWR.C caution" to true

if ("PWR\_C" (DI\_32) is active and valid)

else

"Engine PWR.C caution" to false."

Reference Label 012 (Bit 16) ENG\_PWR.C\_Warning

#### 16.6.1.12 Engine THRT caution

Requirement ID: H398-SRS-GWY-FNC-1118

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall set "Engine THRT caution" to true

if ("THR.T" (DI\_33) is active and valid)

else

"Engine THRT caution" to false.

Reference Label 012 (Bit 15) ENG\_THRT\_Warning

#### 16.6.1.13 Engine 1 bleed valve open

Requirement ID: H398-SRS-GWY-FNC-1122

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall set "Engine 1 bleed valve open" to true

if ("BVALVE, Engine 1" (DI\_6) is active and valid)

else

"Engine 1 bleed valve open" to false.

Reference Label 012 (Bit 19) ENG1\_Bleed\_Valve\_Open\_Warning

#### 16.6.1.14 Engine 2 bleed valve open

Requirement ID: H398-SRS-GWY-FNC-1123

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall set "Engine 2 bleed valve open" to true

if ("BVALVE, Engine 2" (DI\_7) is active and valid)

else

"Engine 2 bleed valve open" to false.

Reference Label 012 (Bit20) ENG2\_Bleed\_Valve\_Open\_Warning

#### 16.6.1.15 Engine 1 Bleed Valve Offset

Requirement ID: H398-SRS-GWY-FNC-1124

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall set "Engine 1 Bleed Valve Offset" to true

if ("ENG\_Bleed\_OS1" (DI\_17) is active and valid)

else

" Engine 1 Bleed Valve Offset " to false.

Reference Label 012 (Bit 17) ENG1\_Bleed\_Valve\_OFFSET\_Warning

#### 16.6.1.16 Engine 2 Bleed Valve Offset

Requirement ID: H398-SRS-GWY-FNC-1125

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall set "Engine 2 Bleed Valve Offset" to true

if ("ENG\_Bleed\_OS2" (DI\_18) is active and valid)

else

" Engine 2 Bleed Valve Offset " to false.

Reference Label 012 (Bit 18) ENG2\_Bleed\_Valve\_OFFSET\_Warning

#### 16.6.1.17 Engine\_Status 1 (label 356-01)

Requirement ID: H398-SRS-GWY-FNC-721

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 356-01):

Table - Label 356 SDI 01 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| ENG1\_Training\_Display | Label 356 SDI 01 |  |  | bit 16 | 0 = not displayed |
| 1 = displayed |
| ENG1\_OEI\_STATE | bit 17 | 0 = not displayed |
| 1 = displayed |
| ENG1\_Failure\_Frame\_Display | bit 21 | 0 = not displayed |
| 1 = displayed |

#### 16.6.1.18 Engine\_Status 1 (label 356-10)

Requirement ID: H398-SRS-GWY-FNC-722

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall shall emit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 356-10):

Table - Label 356 SDI 10 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| ENG2\_Training\_Display | Label 356 SDI 10 |  |  | bit 16 | 0 = not displayed |
| 1 = displayed |
| ENG2\_OEI\_STATE | bit 17 | 0 = not displayed |
| 1 = displayed |
| ENG2\_Failure\_Frame\_Display | bit 21 | 0 = not displayed |
| 1 = displayed |

#### 16.6.1.19 Engine 1 Training

Requirement ID: H398-SRS-GWY-FNC-752

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set "Engine 1 Training" to true

if ("ENG\_T1" (DI\_15) is active and valid)

else

"Engine 1 Training" to false.

Reference Label 356-01(Bit 16) ENG1\_Training\_Display.

#### 16.6.1.20 Engine 2 Training

Requirement ID: H398-SRS-GWY-FNC-753

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set "Engine 2 Training" to true

if ("ENG\_T2" (DI\_16) is active and valid)

else

"Engine 2 Training" to false.

Reference Label 356-10(Bit 16) ENG2\_Training\_Display.

#### 16.6.1.21 Engine\_Status 2 (label 357-01)

Requirement ID: H398-SRS-GWY-FNC-723

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 357-01):

Table - Label 357 SDI 01 Bits 23 & 24 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| ENG1\_START\_Display | Label 357 SDI 01 |  |  | bit 23 | 0 = not displayed |
| 1 = displayed |
| ENG1\_START\_Blinking | bit 24 | 0 = not displayed |
| 1 = displayed |

#### 16.6.1.22 Label 357 SDI 01 Bits

Requirement ID: H398-SRS-GWY-FNC-1120

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The gateway shall emit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 357-01):

Table - Label 357 SDI 01 Bits 11, 12, 13, 25, & 26 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| ENG1\_HI\_Message\_Display | Label 357 SDI 01 |  |  | bit 11 | 0 = not displayed |
| 1 = displayed |
| ENG1\_LO\_Message\_Display | bit 12 | 0 = not displayed |
| 1 = displayed |
| ENG1\_CT\_Message\_Display | bit 13 | 0 = not displayed |
| 1 = displayed |
| ENG1\_GOV\_Warning | bit 25 | 0 = not displayed |
| 1 = displayed |
| ENG1\_GOV\_Blinking | bit 26 | 0 = not displayed |
| 1 = displayed |

Note:

For ENG1 CT Message refer H398-SRS-GWY-FNC-1113

#### 16.6.1.23 Label 357 SDI 10

Requirement ID: H398-SRS-GWY-FNC-1121

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The gateway shall emit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 357-10):

Table - Label 357 SDI 10 Bits 11, 12, 13, 25, & 26 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| ENG2\_HI\_Message\_Display | Label 357 SDI 10 |  |  | bit 11 | 0 = not displayed |
| 1 = displayed |
| ENG2\_LO\_Message\_Display | bit 12 | 0 = not displayed |
| 1 = displayed |
| ENG2\_CT\_Message\_Display | bit 13 | 0 = not displayed |
| 1 = displayed |
| ENG2\_GOV\_Warning | bit 25 | 0 = not displayed |
| 1 = displayed |
| ENG2\_GOV\_Blinking | bit 26 | 0 = not displayed |
| 1 = displayed |

Note:

For ENG2 CT Message refer H398-SRS-GWY-FNC-1114

#### 16.6.1.24 Engine\_Status 2 (label 357-10)

Requirement ID: H398-SRS-GWY-FNC-724

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 357-10):

Table - Label 357 SDI 10 Bits 23 & 24 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| ENG2\_START\_Display | Label 357 SDI 10 |  |  | bit 23 | 0 = not displayed |
| 1 = displayed |
| ENG2\_START\_Blinking | bit 24 | 0 = not displayed |
| 1 = displayed |

#### 16.6.1.25 Engine 1 topping

Requirement ID: H398-SRS-GWY-FNC-1113

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall set the Engine 1 topping with the following priority:

* Engine 1 "HI" message when discrete input "OEI30\_ENG1" (DI\_2) is active (0v).
* Engine 1 "LO" message when discrete input "OEI2\_ENG1" (DI\_4) is active (0v).
* Engine 1 "CT" message (N/A on RNLAF)

Note: Refer H398-SRS-GWY-FNC-1128

#### 16.6.1.26 Engine 2 topping

Requirement ID: H398-SRS-GWY-FNC-1114

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall set the Engine 2 topping with the following priority:

* Engine 2 "HI" message when discrete input "OEI30\_ENG2" (DI\_3) is active (0v).
* Engine 2 "LO" message when discrete input "OEI2\_ENG2" (DI\_5) is active (0v).
* Engine 2 "CT" message (N/A on RNLAF)

Note: Refer H398-SRS-GWY-FNC-1129

#### 16.6.1.27 Engine 1 OEI Topping

Requirement ID: H398-SRS-GWY-FNC-1128

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall set the Engine 1 OEI Topping as follow:

IF OEI30\_ENG1 is set to '1' and OEI2\_ENG1 is set to '0' then

DeltaNG1\_OEI\_HI\_Diode is set to '1' and DeltaNG1\_OEI\_LO\_Diode is set to '0'

else if

OEI30\_ENG1 is set to '0' and OEI2\_ENG1 is set to '1' then

DeltaNG1\_OEI\_LO\_Diode is set to '1' and DeltaNG1\_OEI\_HI\_Diode is set to '0'

else if

OEI30\_ENG1 is set to '0' and OEI2\_ENG1 is set to '0' during 300ms then

DeltaNG1\_OEI\_LO\_Diode is set to '0' and DeltaNG1\_OEI\_HI\_Diode is set to '0'

Else

DeltaNG1\_OEI\_LO\_Diode and DeltaNG1\_OEI\_HI\_Diode keep the previous value

#### 16.6.1.28 Engine 2 OEI Topping

Requirement ID: H398-SRS-GWY-FNC-1129

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall set the Engine 2 OEI Topping as follow:

IF OEI30\_ENG2 is set to '1' and OEI2\_ENG2 is set to '0' then

DeltaNG2\_OEI\_HI\_Diode is set to '1' and DeltaNG2\_OEI\_LO\_Diode is set to '0'

else if

OEI30\_ENG2 is set to '0' and OEI2\_ENG2 is set to '1' then

DeltaNG2\_OEI\_LO\_Diode is set to '1' and DeltaNG2\_OEI\_HI\_Diode is set to '0'

else if

OEI30\_ENG2 is set to '0' and OEI2\_ENG2 is set to '0' during 300ms then

DeltaNG2\_OEI\_LO\_Diode is set to '0' and DeltaNG2\_OEI\_HI\_Diode is set to '0'

else

DeltaNG2\_OEI\_LO\_Diode and DeltaNG2\_OEI\_HI\_Diode keep the previous value

#### 16.6.1.30 Engine 1 GOV caution

Requirement ID: H398-SRS-GWY-FNC-1115

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall set "Engine 1 GOV caution" as follow.

if ("ENG\_GOV1" (DI\_11) is active during more than 300ms and valid)

“Engine 1 GOV caution” is set to true.

else if ("ENG\_GOV1" (DI\_11) is Not active during more than 300ms and invalid)

"Engine 1 GOV caution" is set to false.

else

“Engine 1 GOV caution” is set cyclically to true during 800ms then false during 400ms.

Reference Label 357-01 (Bit 25) ENG1\_GOV\_Warning

#### 16.6.1.31 Engine 2 GOV caution

Requirement ID: H398-SRS-GWY-FNC-1116

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall set "Engine 2 GOV caution" as follow.

if ("ENG\_GOV2" (DI\_12) is active during more than 300ms and valid)

“Engine 2 GOV caution” is set to true.

else if ("ENG\_GOV2" (DI\_12) is Not active during more than 300ms and invalid)

"Engine 2 GOV caution" is set to false.

else

“Engine 2 GOV caution” is set cyclically to true during 800ms then false during 400ms.

Reference Label 357-10 (Bit 25) ENG2\_GOV\_Warning

#### 16.6.1.32 Engine 1 START

Requirement ID: H398-SRS-GWY-FNC-754

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set "Engine 1 START advisory" to true

if ("ENG\_START1" (DI\_9) is active (28V) and valid and “Engine 1 NG” value < 75%)

else

"Engine 1 START advisory" to false.

Reference Label 357-01 (Bit 23) ENG1\_START\_Display

#### 16.6.1.33 Engine 2 START

Requirement ID: H398-SRS-GWY-FNC-755

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set "Engine 2 START advisory" to true

if ("ENG\_START2" (DI\_10) is active (28V) and valid and “Engine 2 NG” value < 75%)

else

"Engine 2 START advisory" to false.

Reference Label 357-10 (Bit 23) ENG2\_START\_Display

#### 16.6.1.34 Engine 1 OEI State

Requirement ID: H398-SRS-GWY-FNC-865

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall set "Engine 1 OEI State**"** to true

if (Engine State is 5, 7, 8, 12)

else

"Engine 1 OEI State" to false.

#### 16.6.1.35 Engine 2 OEI State

Requirement ID: H398-SRS-GWY-FNC-1143

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall set "Engine 2 OEI State**"** to true

if (Engine State is 2, 15, 16, 17)

else

"Engine 2 OEI State" to false.

#### 16.6.1.36 Engine\_Status (label 356-01):

Requirement ID: H398-SRS-GWY-FNC-1108

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall emit the following data into ARINC429 message "Engine\_Status1" (label 356-01):

"ENG1\_OEI\_STATE" (bit17) using Engine 1 OEI State

#### 16.6.1.37 Engine\_Status (label 356-10)

Requirement ID: H398-SRS-GWY-FNC-1144

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall emit the following data into ARINC429 message "Engine\_Status1" (label 356-10) :

"ENG2\_OEI\_STATE" (bit17) using Engine 2 OEI State

#### 16.6.1.38 Label 13 SDI 00

Requirement ID: H398-SRS-GWY-FNC-725

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 13-00):

Table - Label 13 SDI 00

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| MGB\_oil\_temperature\_alarm | Label 13 SDI 00 |  |  | bit 18 | 0 = not displayed |
| 1 = displayed |
| MGB\_Main\_pump\_low\_pressure\_alarm | bit 19 | 0 = not displayed |
| 1 = displayed |
| MGB\_Stby\_pump\_low\_pressure\_alarm | bit 20 | 0 = not displayed |
| 1 = displayed |
| MGB\_Chip\_alarm | Label 13 SDI 00 |  |  | bit 23 | 0 = not displayed |
| 1 = displayed |
| IGB\_oil\_temperature\_alarm | Label 13 SDI 00 |  |  | bit 21 | 0 = not displayed |
| 1 = displayed |
| TGB\_oil\_temperature\_alarm | Label 13 SDI 00 |  |  | bit 22 | 0 = not displayed |
| 1 = displayed |
| Hydraulic\_1\_main\_pump\_low\_pressure\_alert | Label 13 SDI 00 |  |  | bit 13 | 0 = not displayed |
| 1 = displayed |
| Hydraulic\_1\_low\_level\_alert | bit 14 | 0 = not displayed |
| 1 = displayed |
| Hydraulic\_2\_low\_level\_alert | bit 15 | 0 = not displayed |
| 1 = displayed |
| Hydraulic\_2\_pump\_low\_pressure\_alert | bit 16 | 0 = not displayed |
| 1 = displayed |
| Hydraulic\_Aux\_Pump\_alert | bit 17 | 0 = not displayed |
| 1 = displayed |
| Hydraulic\_Servo\_alert | bit 26 | 0 = not displayed |
| 1 = displayed |

#### 16.6.1.39 Label 013 Warning and Status Discretes Word 2

Requirement ID: H398-SRS-GWY-FNC-1109

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall map the logic to the CAS messages as shown in below Table : Label 013, Warning and Status Discretes Word 2.

Table - Label 013 Warning and Status Discretes Word 2

|  |  |  |  |
| --- | --- | --- | --- |
| **Label 013 Output** | **Warning and Status Discretes Word 2** | | |
| **Bit(s)** | **Functional definition** | **Bit Name** | **Logic** |
| bit1 – bit8 | 013 | Label | N/A |
| bit 9 to bit 10 | 00 | SDI | N/A |
| bit 11 | 1 = Caution "AUX.P" is displayed amber | Hydraulic\_aux\_pump \_low\_pressure\_alert | AUX.P\_Warning |
| bit 12 | 1 = Caution "AP.P" is displayed amber | Hydraulic\_auto\_pilot \_circuit\_pressure\_alert | When AP.P = GND,  AP.P\_Warning = 1 |
| bit 13 | 1 = Caution "AM.P" is displayed amber | Hydraulic\_1\_main\_pump\_low pressure\_alert | When AM.P = GND,  AM.P\_Warning = 1 |
| bit 14 | 1 = Caution "AM.LVL" is displayed amber | Hydraulic\_1\_low \_level\_alert | When (M) LVL = GND,  AM.LVL\_Warning = 1 |
| bit 15 | 1 = Caution "RH.LVL" is displayed amber | Hydraulic\_2\_low \_level\_alert | When (RH) LVL = GND,  RHLVL\_Warning = 1 |
| bit 16 | 1 = Caution "RH.P" is displayed amber | Hydraulic\_2\_pump\_low \_pressure\_alert | When RH.P = GND,  RH.P\_Warning = 1 |
| bit 17 | 1 = Caution "AUX.PUMP" is displayed amber | Hydraulic\_Aux \_Pump\_alert | When AUX.PUMP = GND,  AUX.PUMP\_Warning = 1 |
| bit 18 | 1 = Caution "MGB.T" is displayed amber | MGB\_Oil\_temperature\_alarm | When MGB T = GND,  MGB.T\_Warning = 1 |
| bit 19 | 1 = Caution "M.P" is displayed amber | MGB\_Main\_pump\_low\_pressure\_alarm | When M/P = GND,  M.P\_Warning = 1 |
| bit 20 | 1 = Caution "S/B.P" is displayed amber | MGB\_Stby\_pump\_low\_pressure\_alarm | When S/B.P = GND,  S/B.P\_Warning = 1 |
| bit 21 | 1 = Caution "IGB.T" is displayed amber | IGB\_oil\_temperature\_alarm | When IGB.T = GND,  IGB.T\_Warning = 1 |
| bit 22 | 1 = Caution "TGB.T" is displayed amber | TGB\_oil\_temperature\_alarm | When TGB.T = GND,  TGB.T\_Warning = 1 |
| bit 23 | 1 = Caution "CHIP" is displayed amber | MGB\_Chip\_alarm | When CHIP = GND,  CHIP\_Warning = 1 |
| bit 24 | 1 = Caution "EIU1" is displayed amber | EIU1\_Deselection |  |
| bit 25 | 1 = Caution "EIU2" is displayed amber | EIU2\_Deselection |  |
| bit 26 | 1 = Caution "SERVO" is displayed amber | Hydraulic\_SERVO\_alert | Hydraulic Pressure Warning |
| bit 27 – bit 29 | Always =0 | Spare | N/A |
| bit 30 – bit 31 | 00 = Normal Operation  01 = NCD  10 = Functional Test  11 = Failure Warning | SSM | N/A |
| bit 32 |  | Parity |  |

#### 16.6.1.40 Label 011Equipment Status

Requirement ID: H398-SRS-GWY-FNC-866

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The gateway shall send Equipment Status on Label 011 have the format as shown in Table.

Table - Label 011Equipment Status

|  |  |  |  |
| --- | --- | --- | --- |
| **Label 011Output** | **Equipment Status** | | |
| **Bit(s)** | **Functional definition** | **Bit Name** | **Logic** |
| bit1 – bit8 | 011 | Label | N/A |
| bit 9 to bit 10 | 01 = DU  10 = REMISE | SDI | N/A |
| bit 11 | 0 = Line Invalid  1 = Line Valid | EIU\_1\_Line\_Validity |  |
| bit 12 | 0 = Line Invalid  1 = Line Valid | EIU\_2\_Line\_Validity |  |
| bit 13 – bit 14 | 01 = EIU1  10 = EIU2  00 = No\_Master | Channel\_Selected | Matches the selected channel |
| bit 15 – bit 16 | 00 = EIU\_N\_State  01 = EIU\_1\_State  10 = EIU\_2\_State | Reconfiguration\_Selected | Matches the reconfiguration request |
| bit 17 – bit 18 | 00 = Invalid  01 = EIU\_1\_Selected  10 = EIU\_2\_Selected | Source\_Selection\_Sent\_by\_EIU1 | Matches what the master channel sent by EIU1 is set to |
| bit 19 – bit 20 | 00 = Invalid  01 = EIU\_1\_Selected  10 = EIU\_2\_Selected | Source\_Selection\_Sent\_by\_EIU2 | Matches what the master channel sent by EIU2 is set to |
| bit 21 – bit 22 | 00 = EIU\_N\_State  01 = EIU\_1\_State  10 = EIU\_2\_State | Reconfiguration\_Request | Matches the reconfiguration requested |
| bit 23 | 0 = No discrepancy  1 = Discrepancy | Channel\_master\_Discrepancy\_Detected |  |
| bit 24 | 0 = No discrepancy  1 = Discrepancy | Channel\_reconfiguration\_Discrepancy\_Detected |  |
| bit 25-29 | Spare |  |  |
| bit 30 – bit 31 | 00 = Failure Warning  01 = NCD  10 = Functional Test  11 = Normal Operation | SSM | N/A |
| bit 32 | Parity |  |  |

#### 16.6.1.41 MGB Chip alarm

Requirement ID: H398-SRS-GWY-FNC-756

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set "MGB Chip alarm" to true

if ("XMSN\_CHIP" (DI\_22) is active and valid)

else

"MGB Chip alarm" to false.

Reference Label 013 (Bit 23) MGB\_Chip\_alarm

#### 16.6.1.42 IGB oil temperature alarm

Requirement ID: H398-SRS-GWY-FNC-757

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set "IGB oil temperature alarm" to true

if ("XMSN\_IGBT" (DI\_23) is active and valid)

else

"IGB Oil Temperature alarm" to false.

Reference Label 013 (Bit 21) IGB\_oil\_temperature\_alarm

#### 16.6.1.43 TGB Oil Temperature alarm

Requirement ID: H398-SRS-GWY-FNC-758

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set "TGB Oil Temperature alarm" to true

if ("XMSN\_TGBT" (DI\_24) is active and valid)

else

"TGB Oil Temperature alarm" to false.

Reference Label 013 (Bit 22) TGB\_oil\_temperature\_alarm.

#### 16.6.1.44 Hydraulic aux pump low pressure alert

Requirement ID: H398-SRS-GWY-FNC-759

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set "Hydraulic aux pump low pressure alert" to true

if ("HYD\_AUX\_PUMP\_PRESS" (DI\_25) is active and valid)

else

"Hydraulic aux pump low pressure alert" to false.

Reference Label 013 (Bit 11) Hydraulic\_aux\_pump\_low\_pressure\_alert

#### 16.6.1.45 Hydraulic auto pilot circuit pressure alert

Requirement ID: H398-SRS-GWY-FNC-760

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set "Hydraulic auto pilot circuit pressure alert" to true

if ("HYD\_AP\_PRESS" (DI\_26) is active and valid)

else

"Hydraulic aux pump low pressure alert" to false.

Reference Label 013 (Bit 12) Hydraulic\_auto\_pilot\_circuit\_pressure\_alert

#### 16.6.1.46 Hydraulic 1 main pump low pressure alert

Requirement ID: H398-SRS-GWY-FNC-761

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set "Hydraulic 1 main pump low pressure alert" to true

if ("HYD\_MAIN\_PRESS" (DI\_27) is active and valid)

else

"Hydraulic 1 main pump low pressure alert" to false.

Reference Label 013 (Bit 13) Hydraulic\_1\_main\_pump\_low\_pressure\_alert

#### 16.6.1.47 Hydraulic 1 low level alert

Requirement ID: H398-SRS-GWY-FNC-762

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set "Hydraulic 1 low level alert" to true

if ("HYD\_MAIN\_LEVEL" (DI\_28) is active and valid)

else

"Hydraulic 1 low level alert" to false.

Reference Label 013 (Bit 14) Hydraulic\_1\_low\_level\_alert

#### 16.6.1.48 Hydraulic 2 pump low pressure alert

Requirement ID: H398-SRS-GWY-FNC-763

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set "Hydraulic 2 pump low pressure alert" to true

if ("HYD\_RH\_PRESS" (DI\_29) is active and valid)

else

"Hydraulic 2 pump low pressure alert" to false.

Reference Label 013 (Bit 16) Hydraulic\_2\_pump\_low\_pressure\_alert

#### 16.6.1.49 Hydraulic 2 low level alert

Requirement ID: H398-SRS-GWY-FNC-764

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set "Hydraulic 2 low level alert" to true

if ("HYD\_RH\_LOW\_LEVEL" (DI\_30) is active and valid)

else

"Hydraulic 2 low level alert" to false.

Reference Label 013 (Bit 15) Hydraulic\_2\_low\_level\_alert

#### 16.6.1.50 Hydraulic SERVO alert

Requirement ID: H398-SRS-GWY-FNC-765

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set "Hydraulic SERVO alert" to true

if ("SERVO" (DI\_34) is active and valid)

else

"Hydraulic SERVO alert" to false.

Reference Label 013 (Bit 26) Hydraulic\_SERVO\_alert

#### 16.6.1.51 Hydraulic 1 aux pump fail alert

Requirement ID: H398-SRS-GWY-FNC-766

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set "Hydraulic 1 aux pump fail alert" to true

if ("AUX PUMP FAIL" (DI\_35) is active and valid)

else

"Hydraulic 1 aux pump fail alert" to false.

Reference Label 013 (Bit 17) Hydraulic\_1\_aux\_pump\_fail\_alert

#### 16.6.1.52 Label 074 Checksum

Requirement ID: H398-SRS-GWY-FNC-767

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall transmit A429 Output Label 074 (Table shown below) checksum to DU.

Table - Label 074 Checksum

|  |  |  |  |
| --- | --- | --- | --- |
| **Label 074 Output** | **Checksum** | | |
| **Bit(s)** | **Functional definition** | **Bit Name** | **Logic** |
| bit1 – bit8 | 074 | Label | N/A |
| bit 9 to bit 10 | 00 = N/A  01 = EIU 1  10 = EIU 2  11 = N/A | SDI | N/A |
| bit 11 – bit 26 | Checksum and Associated Label ID |  |  |
| bit 27 – bit 28 | Label SDI | Associated label SDI |  |
| bit 29 | Spare |  |  |
| bit 30 – bit 31 | 00 = Failure Warning  01 = NCD  10 = Functional Test  11 = Normal Operation | SSM | N/A |
| bit 32 |  | Parity |  |

#### 16.6.1.53 Label 030 Mode Management

Requirement ID: H398-SRS-GWY-FNC-768

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall transmit A429 Output Label 030 (Table shown below) mode management to DU

Table – Label 030 Mode Management

|  |  |  |  |
| --- | --- | --- | --- |
| **Label 030 Output** | **Mode Management** | | |
| **Bit(s)** | **Functional Definition** | **Bit Name** | **Comment** |
| bit1 – bit8 | 030 | Label |  |
| bit 9 to bit 10 | 01 = DU1  10 = DU2 |  |  |
| 11 | 0 = Day  1 = Night |  | DAY\_NIGHT\_DAU |
| 12 | 0 = NVG  1 = Normal |  | NORMAL\_NVG\_DAU |
| 13-22 | 0 |  | PAD |
| 23-26 | 0 = ENG & VEH  5 = Preflight  6 to 15 spares | Page Mode |  |
| 27-29 | Spare |  |  |
| bit 30 to bit 31 | 00 = FW |  |  |
| 01 = NCD |  |  |
| 10 = FT |  |  |
| 11 = NO |  |  |
| 32 | Parity |  |  |

#### 16.6.1.55 Label 64 Software Checksum MSB

Requirement ID: H398-SRS-GWY-FNC-769

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall have the format as shown in Table for Label 064, Software Checksum MSB

Table - Software Checksum MSB

|  |  |  |  |
| --- | --- | --- | --- |
| **Label 064 Output** | **Software Checksum MSB** | | |
| **Bit(s)** | **Functional definition** | **Bit Name** | **Logic** |
| bit1 – bit8 | 064 | Label | N/A |
| bit 9 to bit 10 | 00 = N/A  01 = EIU 1  10 = EIU 2  11 = N/A | SDI | N/A |
| bit 11 | Spare | Spare |  |
| bit 12 | Spare | Spare |  |
| bit 13 | Spare | Spare |  |
| bit 14 – bit 29 | Value ranging from 0 to 65,535 which represents the the MSB of the checksum. | Data |  |
| bit 30 – bit 31 | 00 = Failure Warning  01 = NCD  10 = Functional Test  11 = Normal Operation | SSM | N/A |
| bit 32 |  | Parity |  |

#### 16.6.1.56 Label 65 Software Checksum LSB

Requirement ID: H398-SRS-GWY-FNC-770

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall have the format as shown in Table for Label 065, Software Checksum LSB

Table - Software Checksum LSB

|  |  |  |  |
| --- | --- | --- | --- |
| **Label 065 Output** | **Software Checksum LSB** | | |
| **Bit(s)** | **Functional definition** | **Bit Name** | **Logic** |
| bit1 – bit8 | 065 | Label | N/A |
| bit 9 to bit 10 | 00 = N/A  01 = EIU 1  10 = EIU 2  11 = N/A | SDI | N/A |
| bit 11 | Spare | Spare |  |
| bit 12 | Spare | Spare |  |
| bit 13 | Spare | Spare |  |
| bit 14 – bit 29 | Value ranging from 0 to 65,535 which represents the LSB of the checksum | Data |  |
| bit 30 – bit 31 | 00 = Failure Warning  01 = NCD  10 = Functional Test  11 = Normal Operation | SSM | N/A |
| bit 32 |  | Parity |  |

Note**:** SCS – System Checksum (Whole system part number with the 32-bit Checksum calculated using 32-bit CRC of all DAL A SW Components in the system)

#### 16.6.1.57 DAU BIT

Requirement ID: H398-SRS-GWY-FNC-1138

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway shall emit the output Label 062 have the following definition:

Table – DAU BIT

|  |  |  |  |
| --- | --- | --- | --- |
| **Label 062 Output** | **DAU BIT** | | |
| **Bit(s)** | **Functional definition** | **Bit Name** | **Logic** |
| bit1 – bit8 | 062 | Label | N/A |
| bit 9 to bit 10 | 00 | SDI | N/A |
| bit 11 | 0 = False  1 =True | ANALOG INPUT FAULT | ANALOG INPUT FAULT or ANALOG MISCOMPARE FAILURE are true |
| bit 12 | 0 = False  1 =True | DISCRETE INPUT FAULT |  |
| bit 13 | Spare |  |  |
| bit 14 | 0 = False  1 =True | DU1 ARINC DATA RX |  |
| bit 15 | 0 = False  1 =True | DU2 ARINC DATA RX |  |
| bit 16 | Spare |  |  |
| bit 17 | Spare |  |  |
| bit 18 | Spare |  |  |
| bit 19 | Always 0 | SPARE |  |
| bit 20 | 0 = False  1 =True | CHANNEL INTER FAILURE |  |
| bit 21 | Spare |  |  |
| bit 22 | Spare |  |  |
| bit 23 | 0 = False  1 = True | IO PROCESSOR FAILURE |  |
| bit 24 | 0 = False  1 = True | RECONFIG FAIL |  |
| bit 25 | Always 0 | Spare |  |
| bit 26 | Always 0 | Spare |  |
| bit 27 | Spare |  |  |
| bit 28 | Spare |  |  |
| bit 29 | 0 = False  1 =True | NVM R/W Failure |  |
| bit 30 – bit 31 | 00 = Failure Warning  01 = NCD  10 = Functional Test  11 = Normal Operation | SSM | N/A |
| bit 32 |  | Parity |  |

#### 16.6.1.58 Label 034 System Message Status

Requirement ID: H398-SRS-GWY-FNC-771

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall have the format as shown in Table for Label 034, System Message Status

Table - Label 034, System Message Status

|  |  |  |  |
| --- | --- | --- | --- |
| **Label 034 Output** | **System Message Status** | | |
| **Bit(s)** | **Functional definition** | **Bit Name** | **Logic** |
| bit1 – bit8 | 034 | Label | N/A |
| bit 9 to bit 10 | 00 | SDI | N/A |
| bit 11 – bit 12 | 01 = EIU 1 selected  10 = EIU 2 selected | DU\_Source\_Selection |  |
| bit 13 – bit 14 | 01 = EIU 1 selected  10 = EIU 2 selected | Remise\_Source\_Selection |  |
| bit 15 – bit 16 | 00 = EIU\_N state  01 = EIU1 state  10 = EIU2 state | Reconfiguration\_State | EIU N State = The function discrepancy is active. |
| bit 17 – bit 20 | 0000 = No message displayed  0001 = "DAU 1 FAIL" displayed  0010 = "DAU 2 FAIL" displayed  0011 = "B/UP VMD FAIL" displayed  0100 = "PRIMARY VMD FAIL" displayed  0101 = "CHECK DAU" displayed | Message\_Display | On red:  See H398-SRS-GWY-FNC-1073  Configuration Failure message "CONFIG FAIL" when :  ? On amber: "CHECK XXX" |
| bit 21 | 1 = Discrepancy detected on one parameter | Crosscheck\_Parameter | Discrepancy detected on essential parameters (EIU1/EIU2 Cross-Check) |
| bit 22 | 1 = Synthesis Discrepancy detected | Synthesis\_Discrepancy | = 1 if bit 21 or bit 23 or bit 24 or bit 25 or bit 27 = 1 |
| bit 23 | 1 = Cross-monitor discrepancy detected on critical parameter (NG, ΔNG, T4, TRQ) | Critical\_Parameter\_Discrepancy | Discrepancy detected on critical parameters (DU/REMISE Cross-monitor) |
| bit 24 | Spare |  |  |
| bit 25 | 1 = Reconfiguration discrepancy detected | Reconfiguration\_Discrepancy |  |
| bit 26 | 1 = Cross talk display failed with other functions valid  Note: This bit means that the crosscheck mechanism between EIU1 and EIU2 is lost. | Crosstalk\_Failed |  |
| bit 27-29 | Spare |  |  |
| bit 30 – bit 31 | 00 = Failure Warning  01 = NCD  10 = Functional Test  11 = Normal Operation | SSM | N/A |
| bit 32 | Parity |  |  |

#### 16.6.1.59 Label 035 Discrepancy Report

Requirement ID: H398-SRS-GWY-FNC-772

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall have the EIU1 to EIU2 discrepancy in Label 035 format as shown in Table

Table - Label 035, Discrepancy Report

|  |  |  |  |
| --- | --- | --- | --- |
| **Label 035 Output** | **Discrepancy Report** | | |
| **Bit(s)** | **Functional definition** | **Bit Name** | **Logic** |
| bit1 – bit8 | 035 | Label | N/A |
| bit 9 to bit 10 | 00 | SDI | N/A |
| bit 11 | 1 = Discrepancy detected by DAU on EOP1 |  |  |
| bit 12 | 1 = Discrepancy detected by DAU on EOP2 |  |  |
| bit 13 | 1 = Discrepancy detected by DAU on EOT1 |  |  |
| bit 14 | 1 = Discrepancy detected by DAU on EOT2 |  |  |
| bit 15 | 1 = Discrepancy detected by DAU on Fuel press 1 |  |  |
| bit 16 | 1 = Discrepancy detected by DAU on Fuel press 2 |  |  |
| bit 17 | 1 = Discrepancy detected by DAU on HYD 1 |  |  |
| bit 18 | 1 = Discrepancy detected by DAU on HYD 2 |  |  |
| bit 19 | 1 = Discrepancy detected by DAU on XMSN oil Press |  |  |
| bit 20 | 1 = Discrepancy detected by DAU on XMSN oil Temp |  |  |
| bit 21 | 1 = Discrepancy detected by DAU on TRQ Total |  |  |
| bit 22 | 1 = Discrepancy detected by DAU on TRQ1 |  |  |
| bit 23 | 1 = Discrepancy detected by DAU on TRQ2 |  |  |
| bit 24 | 1 = Discrepancy detected by DAU on T4 1 |  |  |
| bit 25 | 1 = Discrepancy detected by DAU on T4 2 |  |  |
| bit 26 | 1 = Discrepancy detected by DAU on NG 1 |  |  |
| bit 27 | 1 = Discrepancy detected by DAU on NG 2 |  |  |
| bit 28 | 1 = Discrepancy detected by DAU on Delta NG 1 |  |  |
| bit 29 | 1 = Discrepancy detected by DAU on Delta NG 2 |  |  |
| bit 30 – bit 31 | 00 = Normal Operation  01 = NCD  10 = Functional Test  11 = Failure Warning | SSM | N/A |
| bit 32 |  | Parity |  |

#### 16.6.1.60 Label 344 DeltaNG Pointer Angle

Requirement ID: H398-SRS-GWY-FNC-846

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data on ARINC429 PARAMETER BUS OUT OF DAU (label 344-01):

Table – Label 344 SDI 01Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Data Name** | **Label definition** | **SSM** | **Unit** | **Range** | **Functional definition** |
| ENG1\_DeltaNG\_Pointer\_Angle\_Value | Label 344 SDI 01 | NO | ° | bit 18 to bit 29  bit 28 = 90°  bit 29 = sign bit | range -180° to 180° |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.6.1.61 Label 344 SDI 10

Requirement ID: H398-SRS-GWY-FNC-851

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data on ARINC429 PARAMETER BUS OUT OF DAU (label 344-10):

Table – Label 344 SDI 10 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Data Name** | **Label definition** | **SSM** | **Unit** | **Range** | **Functional definition** |
| ENG2\_DeltaNG\_Pointer\_Angle\_Value | Label 344 SDI 10 | NO | ° | bit 18 to bit 29  bit 28 = 90°  bit 29 = sign bit | range -180° to 180° |
|  |  | FT |  |  |  |
| NCD |  |  |  |
| FW |  |  |

#### 16.6.1.62 Label 345 SDI 01

Requirement ID: H398-SRS-GWY-FNC-852

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data on ARINC429 PARAMETER BUS OUT OF DAU (label 345-01):

Table - Label 345 SDI 01 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Data Name** | **Label definition** | **SSM** | **Unit** | **Range** | **Functional definition** |
| ENG1\_DeltaNG\_AEO\_YEL\_LO\_Visibility | Label 345 SDI 01 | NO |  | bit 11 | 1 = Yellow AEO zone limit displayed on ENG 1 (zone beginning) |
| ENG2\_DeltaNG\_AEO\_YEL\_LO\_Visibility | bit 12 | 1 = Yellow AEO zone limit displayed on ENG 2 (zone beginning) |
| DeltaNG\_AEO\_YEL\_LO\_Value (zone beginning) | ° | bit 18 to bit 29  bit 28 = 90°  bit 29 = sign bit | range -180° to 180° |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.6.1.63 Label 345 SDI 10

Requirement ID: H398-SRS-GWY-FNC-853

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data on ARINC429 PARAMETER BUS OUT OF DAU (label 345-10):

Table - Label 345 SDI 10 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Data Name** | **Label definition** | **SSM** | **Unit** | **Range** | **Functional definition** |
| ENG1\_DeltaNG\_AEO\_YEL\_UP\_Visibility | Label 345 SDI 10 | NO |  | bit 11 | 1 = Yellow AEO zone limit displayed on ENG 1 (Zone End) |
| ENG2\_DeltaNG\_AEO\_YEL\_UP\_Visibility | bit 12 | 1 = Yellow AEO zone limit displayed on ENG 2 (Zone End) |
| DeltaNG\_AEO\_YEL\_UP\_Value (zone end) | ° | bit 18 to bit 29  bit 28 = 90°  bit 29 = sign bit | range -180° to 180° |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

Note: The value of the AEO YEL UP limit is the same as the AEO RED limit.

#### 16.6.1.64 Label 346 SDI 00 Details

Requirement ID: H398-SRS-GWY-FNC-854

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data on ARINC429 PARAMETER BUS OUT OF DAU (label 346-00):

Table - Label 346 SDI 00 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Data Name** | **Label definition** | **SSM** | **Unit** | **Range** | **Functional definition** |
| ENG1\_DeltaNG\_AEO\_YEL\_REC\_Visibility | Label 346 SDI 00 | NO |  | bit 11 | 1 = Yellow rectangle limit displayed on ENG 1 |
| ENG2\_DeltaNG\_AEO\_YEL\_REC\_Visibility | bit 12 | 1 = Yellow rectangle limit displayed on ENG 2 |
| DeltaNG\_AEO\_YEL\_REC\_Value | ° | bit 18 to bit 29  bit 28 = 90°  bit 29 = sign bit | range -180° to 180° |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.6.1.65 Label 347 SDI 00

Requirement ID: H398-SRS-GWY-FNC-855

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data on ARINC429 PARAMETER BUS OUT OF DAU (label 347-00):

Table - Label 347 SDI 00 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Data Name** | **Label definition** | **SSM** | **Unit** | **Range** | **Functional definition** |
| ENG1\_DeltaNG\_AEO\_RED\_Visibility | Label 347 SDI 00 | NO |  | bit 11 | 1 = Red limit displayed on ENG 1 |
| ENG2\_DeltaNG\_AEO\_RED\_Visibility | bit 12 | 1 = Red limit displayed on ENG 2 |
| DeltaNG\_AEO\_RED\_Value | ° | bit 18 to bit 29  bit 28 = 90°  bit 29 = sign bit | range -180° to 180° |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.6.1.66 Label 350 SDI 00

Requirement ID: H398-SRS-GWY-FNC-856

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data on ARINC429 PARAMETER BUS OUT OF DAU (label 350-00):

Table - Label 350 SDI 00 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Data Name** | **Label definition** | **SSM** | **Unit** | **Range** | **Functional definition** |
| ENG1\_DeltaNG\_AEO\_RED\_DIO\_Visibility | Label 350 SDI 00 | NO |  | bit 11 | 1 = Red diode limit displayed on ENG 1 |
| ENG2\_DeltaNG\_AEO\_RED\_DIO\_Visibility | bit 12 | 1 = Red diode limit displayed on ENG 2 |
| ENG1\_DeltaNG\_AEO\_RED\_DIO\_Selection | bit 13 | 0 = Triangle display 1 = Diode display on ENG1  Always 1 on RNLAF |
| ENG2\_DeltaNG\_AEO\_RED\_DIO\_Selection | bit 14 | 0 = Triangle display 1 = Diode display on ENG2  Always 1 on RNLAF |
| DeltaNG\_AEO\_RED\_DIO\_Value | ° | bit 18 to bit 29  bit 28 = 90°  bit 29 = sign bit | range -180° to 180° |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.6.1.67 Label 351 SDI 00

Requirement ID: H398-SRS-GWY-FNC-857

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data on ARINC429 PARAMETER BUS OUT OF DAU (label 351-00):

Table - Label 351 SDI 00 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Data Name** | **Label definition** | **SSM** | **Unit** | **Range** | **Functional definition** |
| ENG1\_DeltaNG\_OEI\_YEL\_DASH\_Visibility | Label 351 SDI 00 | NO |  | bit 11 | 1 = Yellow dash limit displayed on ENG 1 |
| ENG2\_DeltaNG\_OEI\_YEL\_DASH\_Visibility | bit 12 | 1 = Yellow dash limit displayed on ENG 2 |
| DeltaNG\_OEI\_YEL\_DASH\_Value | ° | bit 18 to bit 29  bit 28 = 90°  bit 29 = sign bit | range -180° to 180° |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.6.1.68 Label 352 SDI 00

Requirement ID: H398-SRS-GWY-FNC-858

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data on ARINC429 PARAMETER BUS OUT OF DAU (label 352-00):

Table - Label 352 SDI 00 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Data Name** | **Label definition** | **SSM** | **Unit** | **Range** | **Functional definition** |
| ENG1\_DeltaNG\_OEI\_RED\_DASH\_Visibility | Label 352 SDI 00 | NO |  | bit 11 | 1 = Red dash limit displayed on ENG 1 |
| ENG2\_DeltaNG\_OEI\_RED\_DASH\_Visibility | bit 12 | 1 = Red dash limit displayed on ENG 2 |
| DeltaNG\_OEI\_RED\_DASH\_Value | ° | bit 18 to bit 29  bit 28 = 90°  bit 29 = sign bit | range -180° to 180° |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.6.1.69 Label 353 SDI 00

Requirement ID: H398-SRS-GWY-FNC-859

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data on ARINC429 PARAMETER BUS OUT OF DAU (label 353-00):

Table - Label 353 SDI 00 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Data Name** | **Label definition** | **SSM** | **Unit** | **Range** | **Functional definition** |
| ENG1\_DeltaNG\_OEI\_RED\_LINE\_Visibility | Label 353 SDI 00 | NO |  | bit 11 | 1 = Red limit displayed on ENG 1 |
| ENG2\_DeltaNG\_OEI\_RED\_LINE\_Visibility | bit 12 | 1 = Red limit displayed on ENG 2 |
| DeltaNG\_OEI\_RED\_LINE\_Value | ° | bit 18 to bit 29  bit 28 = 90°  bit 29 = sign bit | range -180° to 180° |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.6.1.70 Label 357 SDI 01

Requirement ID: H398-SRS-GWY-FNC-860

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data on ARINC429 PARAMETER BUS OUT OF DAU (label 357-01):

Table - Label 357 SDI 01 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Data Name** | **Label definition** | **SSM** | **Unit** | **Range** | **Functional definition** |
| ENG1\_NG\_OEI\_CT\_Diode\_Display | Label 357 SDI 01 |  |  | bit 17 | 1 = Diode Displayed(N/A for RNLAF) |
| ENG1\_NG\_OEI\_LO\_Diode\_Display | bit 18 | 1 = Diode Displayed |
| ENG1\_NG\_OEI\_HI\_Diode\_Display | bit 19 | 1 = Diode Displayed |

#### 16.6.1.71 Label 357 SDI 10

Requirement ID: H398-SRS-GWY-FNC-861

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data on ARINC429 PARAMETER BUS OUT OF DAU (label 357-10):

Table - Label 357 SDI 10 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Data Name** | **Label definition** | **SSM** | **Unit** | **Range** | **Functional definition** |
| ENG2\_NG\_OEI\_CT\_Diode\_Display | Label 357 SDI 10 |  |  | bit 17 | 1 = Diode Displayed(N/A for RNLAF) |
| ENG2\_NG\_OEI\_LO\_Diode\_Display | bit 18 | 1 = Diode Displayed |
| ENG2\_NG\_OEI\_HI\_Diode\_Display | bit 19 | 1 = Diode Displayed |

#### 16.6.1.72 validate the configuration

Requirement ID: H398-SRS-GWY-FNC-812

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The gateway shall compare the checksum of the ACD file to validate the configuration and if detects an ACD CRC mismatch, then it stops processing.

#### 16.6.1.73 Label 320 SDI 01 Details

Requirement ID: H398-SRS-GWY-FNC-927

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway shall transmit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 320-01) as shown below:

Table - Label 320 SDI 01 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| EOP1\_SST | Label 320 SDI 01 | NO |  | bit 12 to bit 13 | 00 = Nominal |
| 01 = Amber |
| 10 = Red |
| 11 = Not Used |
| EOP1\_NumStatusBlink | bit 14  "Provision, not used on RNLAF" | 0 = Not Blinking  1 = Blinking |
| EOP1\_DIGITAL\_VALUE | bar | bit 17 to bit 29  bit 28 = 16 | range 0 to 32 |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.6.1.74 Label 320 SDI 10 Details

Requirement ID: H398-SRS-GWY-FNC-928

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall transmit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 320-10) as shown below

in Table :

Table - Label 320 SDI 10 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| EOP2\_SST | Label 320 SDI 10 | NO |  | bit 12 to bit 13 | 00 = Nominal |
| 01 = Amber |
| 10 = Red |
| 11 = Not Used |
| EOP2\_NumStatusBlink | bit 14  "Provision, not used on RNLAF" | 0 = Not Blinking  1 = Blinking |
| EOP2\_DIGITAL\_VALUE | bar | bit 17 to bit 29  bit 28 = 16 | range 0 to 32 |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.6.1.75 Label 321 SDI 01 Details

Requirement ID: H398-SRS-GWY-FNC-996

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall transmit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 321-01) as shown in Table below:

Table - Label 321 SDI 01 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| EOP1\_DISP\_BOT\_RED\_LIM | Label 321 SDI 01 | NO |  | bit 11 | 1 = bottom red limit displayed |
| EOP1\_DISP\_BOT\_YEL\_LIM | bit 12 | 1 = bottom yellow limit displayed |
| EOP1\_DISP\_TOP\_YEL\_LIM | bit 13 | 1 = upper yellow limit displayed |
| EOP1\_DISP\_TOP\_RED\_LIM | bit 14 | 1 = upper red limit displayed |
| EOP1\_ANALOG\_VALUE | % | bit 17 to bit 29  bit 28 = 64 | range 0 to 128  range 0 to 100 is only used |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.6.1.76 Label 321 SDI 10 Details

Requirement ID: H398-SRS-GWY-FNC-997

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall transmit the following data on ARINC 429 PARAMETER BUS OUT OF DAU

(label 321-10) as shown in Table below:

Table - Label 321 SDI 10 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| EOP2\_DISP\_BOT\_RED\_LIM | Label 321 SDI 10 | NO |  | bit 11 | 1 = bottom red limit displayed |
| EOP2\_DISP\_BOT\_YEL\_LIM | bit 12 | 1 = bottom yellow limit displayed |
| EOP2\_DISP\_TOP\_YEL\_LIM | bit 13 | 1 = upper yellow limit displayed |
| EOP2\_DISP\_TOP\_RED\_LIM | bit 14 | 1 = upper red limit displayed |
| EOP2\_ANALOG\_VALUE | % | bit 17 to bit 29  bit 28 = 64 | range 0 to 128  range 0 to 100 is only used |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.6.1.77 Processing of EOP inputs

Requirement ID: H398-SRS-GWY-FNC-1019

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall accept two (2) Engine Oil Pressure EOP inputs per channel.

The EOP input signal comply with the characteristics depicted in H398-SRS-GWY-FNC--628.

#### 16.6.1.78 Engine 1 EOP Digital Value Conversion

Requirement ID: H398-SRS-GWY-FNC-1020

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall convert the "Engine 1 EOP value" signal received using analog input “EOP1” (VDS300m\_1) in [V] into [bar] according to the following linear treatment shown in below Table:

Table - Engine 1 EOP Digital Value Conversion

|  |  |
| --- | --- |
| **Voltage (V)** | **EOP (BAR)** |
| 0 | 0 |
| 0.023 | 1.38 |
| 0.046 | 2.76 |
| 0.069 | 4.14 |
| 0.092 | 5.52 |
| 0.1 | 6 |
| 0.117 | 7 |

#### 16.6.1.79 Engine 2 EOP Digital Value Conversion

Requirement ID: H398-SRS-GWY-FNC-1021

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall convert the "Engine 2 EOP value" signal received using analog input “EOP2”

(VDS300m\_2) in [V] into [bar] according to the following linear treatment shown in below Table:

Table - Engine 2 EOP Digital Value Conversion

|  |  |
| --- | --- |
| **Voltage (V)** | **EOP (BAR)** |
| 0 | 0 |
| 0.023 | 1.38 |
| 0.046 | 2.76 |
| 0.069 | 4.14 |
| 0.092 | 5.52 |
| 0.1 | 6 |
| 0.117 | 7 |

#### 16.6.1.80 Label 262 SDI 01 Details

Requirement ID: H398-SRS-GWY-FNC-929

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall emit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 262 - 01):

Table - Label 262 SDI 01 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Data Name** | **Label definition** | **SSM** | **Unit** | **Range** | **Functional definition** |
| FUEL\_PRESS1\_SST | Label 262 SDI 01 | NO |  | bit 12 to bit 13 | 00 = Normal |
| 01 = Amber |
| 10 = Red |
| 11 = Not used |
| FUEL\_PRESS1\_NumStatusBlink | bit 14  "Provision, not used on RNLAF" | 0 = Not Blinking  1 = Blinking |
| FUEL\_PRESS1\_Digital\_Value | bar | bit 15 to bit 29  bit 28 = 4 | range 0 to 8 |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.6.1.81 Label 262 SDI 10 Details

Requirement ID: H398-SRS-GWY-FNC-930

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall emit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 262 - 10)

Table - Label 262 SDI 10 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Data Name** | **Label definition** | **SSM** | **Unit** | **Range** | **Functional definition** |
| FUEL\_PRESS2\_SST | Label 262 SDI 10 | NO |  | bit 12 to bit 13 | 00 = Normal |
| 01 = Amber |
| 10 = Red |
| 11 = Not used |
| FUEL\_PRESS2\_NumStatusBlink | bit 14  "Provision, not used on RNLAF" | 0 = Not Blinking  1 = Blinking |
| FUEL\_PRESS2\_Digital\_Value | bar | bit 15 to bit 29  bit 28 = 4 | range 0 to 8 |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.6.1.82 Processing of Fuel Pressure

Requirement ID: H398-SRS-GWY-FNC-1028

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall accept two (2) Fuel Pressure (FP1, FP2) inputs per channel.

The FP input signals comply with the characteristics depicted in H398-SRS-GWY-FNC-628.

#### 16.6.1.83 FUEL PRESS 1 Digital Value Conversion

Requirement ID: H398-SRS-GWY-FNC-1158

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall convert the "FUEL PRESS 1 value" signal received using analog input "FP1" (VD12\_3) in[V] into [bar] according following linear treatment:

Table - FUEL PRESS 1 Digital Value Conversion

|  |  |
| --- | --- |
| Voltage (V) | FUEL PRESS (Bar) |
| 0.8 | 0 |
| 1 | 0 |
| 1.6 | 0.299 |
| 3.06896 | 1.03 |
| 4.44827 | 1.72 |
| 5.17241 | 2.07 |
| 5.37 | 2.07 |

#### 16.6.1.84 FUEL PRESS 2 Digital Value Conversion

Requirement ID: H398-SRS-GWY-FNC-1159

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall convert the "FUEL PRESS 2 value" signal received using analog input "FP2" (VD12\_4) in[V] into [bar] according following linear treatment:

Table - FUEL PRESS 2 Digital Value Conversion

|  |  |
| --- | --- |
| Voltage (V) | FUEL PRESS (Bar) |
| 0.8 | 0 |
| 1 | 0 |
| 1.6 | 0.299 |
| 3.06896 | 1.03 |
| 4.44827 | 1.72 |
| 5.17241 | 2.07 |
| 5.37 | 2.07 |

#### 16.6.1.85 ARINC429 line status

Requirement ID: H398-SRS-GWY-FNC-785

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall receive ARINC429 line status information from the DUs on Label 11 bits 11 and 12.

#### 16.6.1.87 companion labels

Requirement ID: H398-SRS-GWY-FNC-809

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall transmit labels as defined in H398-SRS-GWY-FNC-114 as a pair of labels (companion labels).

Note: The transmitted label listed in H398-SRS-GWY-FNC-114 is referred to as the source label and the second label is referred to as the companion label.

#### 16.6.1.88 companion label

Requirement ID: H398-SRS-GWY-FNC-786

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

For each source label, Gateway module shall transmit Label 074 as the companion label.

For each parameter sent, the Gateway module shall transmit to DU on a label (Label 074) containing the associated label ID and SDI.

#### 16.6.1.89 calculate checksum

Requirement ID: H398-SRS-GWY-FNC-810

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall calculate the checksum for each label sent to the DU with the exception of Label 074 and the calculated checksum will be transmitted in Label 074

#### 16.6.1.91 calculate a checksum

Requirement ID: H398-SRS-GWY-FNC-787

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall calculate a 8-bit checksum as follow:

1. Consider the parity bit always as 0
2. Add all 8 nibbles of A429 packet
3. Subtract this quantity from 0xFF + 1

#### 16.6.1.96 EOT1 Digital Value

Requirement ID: H398-SRS-GWY-FNC-801

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall emit the following data into ARINC429 message "EOT1 Digital Value" (label 316-01):

"EOT1\_DIGITAL\_VALUE" using Engine 1 EOT value (°C)

"EOT1\_SST" using Engine 1 EOT status (Red, Nominal)

SSM:

* NO if Engine 1 EOT validity is valid.
* FW in all other cases

#### 16.6.1.97 EOT2 Digital Value

Requirement ID: H398-SRS-GWY-FNC-802

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall emit the following data into ARINC429 message "EOT2 Digital Value" (label 316-10):

"EOT2\_DIGITAL\_VALUE" using Engine 2 EOT value (°C)

"EOT2\_SST" using Engine 2 EOT status (Red, Nominal)

SSM:

* NO if Engine 2 EOT validity is valid.
* FW in all other cases.

#### 16.6.1.98 EOT1 ANALOG VALUE

Requirement ID: H398-SRS-GWY-FNC-803

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall emit the following data into ARINC429 message “EOT1 ANALOG VALUE” (label 317-01):

"EOT1\_ANALOG\_VALUE" using Engine 1 EOT analog value (%)

"EOT1\_DISP\_TOP\_RED\_LIM" using Engine 1 EOT operation limits (Top thin red line)

with the SSM set as follow:

* NO if "Engine 1 EOT validity" is valid
* FW in all other cases.

#### 16.6.1.99 EOT2 ANALOG VALUE

Requirement ID: H398-SRS-GWY-FNC-804

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall emit the following data into ARINC429 message “EOT2 ANALOG VALUE” (label 317-10):

"EOT2\_ANALOG\_VALUE" using Engine 2 EOT analog value (%)

"EOT2\_DISP\_TOP\_RED\_LIM" using Engine 2 EOT operation limits (Top thin red line)

with the SSM set as follow:

* NO if "Engine 2 EOT validity" is valid
* FW in all other cases.

#### 16.6.1.100 Engine 1 failure frame

Requirement ID: H398-SRS-GWY-FNC-805

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall set the following data into ARINC429 message "Engine\_Status 1" (label 356-01) :

"ENG1\_Failure\_Frame\_Display" (bit21) using Engine 1 failure frame.

#### 16.6.1.101 Engine 2 failure frame

Requirement ID: H398-SRS-GWY-FNC-806

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall set the following data into ARINC429 message "Engine\_Status 2" (label 356-10) :

"ENG2\_Failure\_Frame\_Display" (bit21) using Engine 2 failure frame.

#### 16.6.1.102 ARINC429 line Validity

Requirement ID: H398-SRS-GWY-FNC-807

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall receive the results of the ARINC429 line validity tests from the DUs:

Set the DAU A429 line validity (H398-SRS-GWY-FNC-46) Boolean to ‘1’ when the DAU ARINC429 line is declared valid

Set the DAU A429 line validity (H398-SRS-GWY-FNC-46) Boolean to ‘0’ when the DAU ARINC429 line is declared invalid

Engine 1 NG A429 Reference

Requirement ID: H398-SRS-GWY-FNC-1183

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall emit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 343-01):

Table : Engine 1 NG A429 Reference

A white and black document

Description automatically generated with medium confidence

Engine 2 NG A429 Reference

Requirement ID: H398-SRS-GWY-FNC-1184

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall emit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 343-10):

Table : Engine 2 Ng A429 Reference

A white document with black text

Description automatically generated

#### 16.6.1.104 Engine 1 NG Validity

Requirement ID: H398-SRS-GWY-FNC-813

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall Set "Engine 1 NG Validity" to valid when the "Engine 1 NG value" is inside following valid range:

If Engine 1 NG is greater than or equal to 389 Hz (5%) and Engine 1 NG is lower than or equal to NG\_MAX\_RNG

OR

Engine 1 NG is lower than 389 Hz (5%) and (Engine 1 EOP is invalid or lower than 24.6564 PSI).

Else

"Engine 1 NG Validity" is set to invalid

Maximum valid range: NG\_MAX\_RNG = 9731.3 Hz (125%)

#### 16.6.1.105 Engine 2 NG Validity

Requirement ID: H398-SRS-GWY-FNC-814

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall Set "Engine 2 NG Validity" to valid when the "Engine 2 NG value" is inside following valid range:

If Engine 2 NG is greater than or equal to 389 Hz (5%) and Engine 2 NG is lower than or equal to NG\_MAX\_RNG

OR

Engine 2 NG is lower than 389 Hz and (Engine 2 EOP is invalid or lower than 24.6564 PSI).

else

"Engine 2 NG Validity" is set to invalid

Maximum valid range: NG\_MAX\_RNG = 9731.3 Hz (125%)

#### 16.6.1.106 Engine 1 NG value

Requirement ID: H398-SRS-GWY-FNC-815

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The gateway shall Set the "Engine 1 NG" value to 0%

if Engine 1 NG is lower than NG\_FORCED\_0 and (engine state is STAND-BY or engine state is START) with NG\_FORCED\_0 = 5%.

#### 16.6.1.107 Engine 2 NG value

Requirement ID: H398-SRS-GWY-FNC-816

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the "Engine 2 NG" value to 0% if Engine 2 NG is lower than NG\_FORCED\_0 and (engine state is STAND-BY or engine state is START) with NG\_FORCED\_0 = 5%.

#### 16.6.1.108 ENG1 NG DIGITAL VALUE

Requirement ID: H398-SRS-GWY-FNC-817

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data into ARINC429 message. "ENG1\_NG\_DIGITAL\_VALUE" (label 343-01) :

"ENG1\_NG\_Digital\_Value" using Engine 1 NG value (%)

"ENG1\_NG\_Digital\_Value\_NumStatus" using "Engine 1 NG status" (Red, Amber, Nominal)

SSM:

* NO if Engine 1 NG Validity is valid.
* FW in all other cases.

#### 16.6.1.109 ENG2 NG DIGITAL VALUE

Requirement ID: H398-SRS-GWY-FNC-818

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall emit the following data into ARINC429 message "ENG2\_NG\_DIGITAL\_VALUE" (label 343-10) :

"ENG2\_NG\_Digital\_Value" using Engine 2 NG value (%)

"ENG2\_NG\_Digital\_Value\_NumStatus" using "Engine 2 NG status" (Red, Amber, Nominal)

SSM:

* NO if Engine 2 NG Validity is valid.
* FW in all other cases.

#### 16.6.1.110 Engine 1 NG Status

Requirement ID: H398-SRS-GWY-FNC-819

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the Engine 1 NG Status as follows:

"Red" If (Engine 1 state is set to OEI or OEI training mode and Engine 1 DeltaNG value is greater than constant DeltaNG OEI LO (2%) and engine 1 LO message is not set

OR

Engine 1 state is set to AEO mode or AEO+OEI mode and Engine 1 DeltaNG value is greater than constant DeltaNG TOP (0%))

"Amber" If not "Red" and (Engine 1 state is set to OEI or OEI training mode and Engine 1 DeltaNG value is greater than constant DeltaNG OEI CT (1%)

OR

Engine 1 state is set to AEO or AEO+OEI mode and Engine 1 DeltaNG value is greater than constant DeltaNG MPC1 (-2.7%))

"Nominal" Otherwise

#### 16.6.1.111 Engine 2 NG Status

Requirement ID: H398-SRS-GWY-FNC-820

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the Engine 2 NG Status as follows:

"Red" If (Engine 2 state is set to OEI or OEI training mode and Engine 2 DeltaNG value is greater than constant DeltaNG OEI LO (2%) and engine 2 LO message is not set

OR

Engine 2 state is set to AEO mode or AEO+OEI mode and Engine 2 DeltaNG value is greater than constant DeltaNG TOP (0%))

"Amber" If not "Red" and (Engine 2 state is set to OEI or OEI training mode and Engine 2 DeltaNG value is greater than constant DeltaNG OEI CT (1%)

OR

Engine 2 state is set to AEO or AEO+OEI mode and Engine 2 DeltaNG value is greater than constant DeltaNG MPC1 (-2.7%))

"Nominal" Otherwise

#### 16.6.1.112 Engine 1 DeltaNG value

Requirement ID: H398-SRS-GWY-FNC-821

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall convert the "Engine 1 DeltaNG value" signal received on input ΔNG1 (PWC100\_1) into [%] values according to the below expressions:

* Engine 1 DeltaNG value (%) = 17.5\*R - 9.75, Where R (cyclical report) is between 0.1 to 0.9

#### 16.6.1.113 Engine 2 DeltaNG value

Requirement ID: H398-SRS-GWY-FNC-822

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall convert the "Engine 2 DeltaNG value" signal received on input ΔNG2 (PWC100\_2) into [%] values according to the following expressions:

* Engine 2 DeltaNG value (%) = 17.5\*R - 9.75, With R (cyclical report) is between 0.1 to 0.9

#### 16.6.1.114 Engine 1 DeltaNG Validity

Requirement ID: H398-SRS-GWY-FNC-823

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the "Engine 1 DeltaNG Validity" to valid if the "Engine 1 DeltaNG value" is between following valid range:

* Minimum valid range: DeltaNG\_MIN\_RNG (-8%)
* Maximum valid range: DeltaNG\_MAX\_RNG (8)

otherwise "Engine 1 DeltaNG Validity" is set to invalid

#### 16.6.1.115 Engine 2 DeltaNG Validity

Requirement ID: H398-SRS-GWY-FNC-824

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the "Engine 2 DeltaNG Validity" to valid if the "Engine 2 DeltaNG value" is inside the following valid range: -

• Minimum valid range: DeltaNG\_MIN\_RNG (-8%)

• Maximum valid range: DeltaNG\_MAX\_RNG (8%)

otherwise "Engine 2 DeltaNG Validity" is set to invalid.

#### 16.6.1.116 Engine 1 DeltaNG Operation Limits

Requirement ID: H398-SRS-GWY-FNC-825

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall control the visibility of each Engine 1 operating limit associated with the Engine 1 DeltaNG gauge by turning on bit visibility in the Engine 1 DeltaNG limits position labels 345 to 347, 350 to 353 and 357(those one marked with \*\*\* emits a bit forced to 0) and the activation of these bits is described in the following table:

Table - Engine 1 DeltaNG Operation Limits

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Engine 1 DeltaNG Operation limit | Bit at 1 state if display class is | Label | SDI | Bit |
| DeltaNG AEO YEL LO | AEO or (AEO + OEI) | 345 | 01 | 11 |
| DeltaNG AEO YEL UP | AEO or (AEO + OEI) | 345 | 10 | 11 |
| DeltaNG YEL REC\*\*\* | AEO or (AEO + OEI) | 346 | 00 | 11 |
| DeltaNG AEO RED | AEO or (AEO + OEI) | 347 | 00 | 11 |
| DeltaNG AEO RED DIO\* | AEO | 350 | 00 | 11 |
| DeltaNG OEI YEL DASH | OEI or (AEO + OEI) | 351 | 00 | 11 |
| DeltaNG OEI RED DASH | OEI or (AEO + OEI) | 352 | 00 | 11 |
| DeltaNG OEI RED LINE | OEI or (AEO + OEI) | 353 | 00 | 11 |

Note: \*DeltaNG AEO RED DIO visibility is set to true only if PWRC failure is not active

#### 16.6.1.117 Engine 2 DeltaNG Operation limit

Requirement ID: H398-SRS-GWY-FNC-826

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall control the visibility of each Engine 2 operating limit associated with the Engine 2 DeltaNG gauge by turning on bit visibility in the Engine 2 DeltaNG limits position labels 345 to 347, 350 to 353 and 357(those one marked with \*\*\* emits a bit forced to 0).

The activation of these bits is described in the following table:

Table - Engine 2 DeltaNG Operation Limits

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Engine 2 DeltaNG Operation limit | Bit at 1 state if display class is | Label | SDI | Bit |
| DeltaNG AEO YEL LO | AEO or (AEO + OEI) | 345 | 01 | 12 |
| DeltaNG AEO YEL UP | AEO or (AEO + OEI) | 345 | 10 | 12 |
| DeltaNG YEL REC\*\*\* | AEO or (AEO + OEI) | 346 | 00 | 12 |
| DeltaNG AEO RED | AEO or (AEO + OEI) | 347 | 00 | 12 |
| DeltaNG AEO RED DIO\* | AEO | 350 | 00 | 12 |
| DeltaNG OEI YEL DASH | OEI or (AEO + OEI) | 351 | 00 | 12 |
| DeltaNG OEI RED DASH | OEI or (AEO + OEI) | 352 | 00 | 12 |
| DeltaNG OEI RED LINE | OEI or (AEO + OEI) | 353 | 00 | 12 |

Note: \*DeltaNG AEO RED DIO visibility is set to true only if PWRC failure is not active

#### 16.6.1.118 DeltaNG Pointer Angle Limits

Requirement ID: H398-SRS-GWY-FNC-874

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall transmit the following DeltaNG parameter limit labels as the angular position of the corresponding limit in degrees from -180° to 180° on the ARINC 429 parameter bus at intervals as

specified in "Digital Output Interfaces" Doc STC019000053 and the Normal SSM.`

Table - DeltaNG Pointer Angle Limits

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| DeltaNG limits value (%) | DeltaNG pointer angle limits value (deg) | Label | SDI | Bit |
| DeltaNG MCP (-2.7%) | DeltaNG\_AEO\_YEL\_LO (127°) | 345 | 01 | 18 to 29 |
| DeltaNG TOP (0%) | DeltaNG\_AEO\_YEL\_UP (169°) | 345 | 10 | 18 to 29 |
| DeltaNG\_AEO\_RED (169°) | 347 | 00 | 18 to 29 |
| DeltaNG MTP (1.3%) | DeltaNG\_AEO\_RED\_DIO (189°) | 350 | 00 | 18 to 29 |
| DeltaNG OEI CT (1%) | DeltaNG\_OEI\_YEL\_DASH (184.5°) | 351 | 00 | 18 to 29 |
| DeltaNG OEI LO (2%) | DeltaNG\_OEI\_RED\_DASH (200°) | 352 | 00 | 18 to 29 |
| DeltaNG OEI HI (4.5%) | DeltaNG\_OEI\_RED\_LINE (239°) | 353 | 00 | 18 to 29 |

#### 16.6.1.119 Engine 1 Delta NG OEI Diode Visibility

Requirement ID: H398-SRS-GWY-FNC-875

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall control the visibility of each Engine 1 Delta NG Diode associated with the Engine 1 DeltaNG limitations by turning on bit visibility in the Engine status 2 labels 357.

The activation of these bits is described in the following table:

Table - Engine 1 Delta NG OEI Diode Visibility

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Engine 1 DeltaNG diode visibility | Bit at 1 state if OEI topping is | Label | SDI | Bit |
| DeltaNG OEI LO Diode | DeltaNG1\_OEI\_LO\_Diode and ENG1 DeltaNG is valid and ENG1 DeltaNG OEI LO Limit visibility is true | 357 | 01 | 18 |
| DeltaNG OEI HI Diode | DeltaNG1\_OEI\_HI\_Diode and ENG1 DeltaNG is valid and ENG1 DeltaNG OEI HI Limit visibility is true | 357 | 01 | 19 |

Note:

if we are in OEI or (AEO+OEI). (In AEO the bit are forced to 0)

#### 16.6.1.120 DelatNG OEI CT limit

Requirement ID: H398-SRS-GWY-FNC-827

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the DelatNG OEI CT limit value to 1%.

#### 16.6.1.121 DelatNG OEI LO limit

Requirement ID: H398-SRS-GWY-FNC-828

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the DelatNG OEI LO limit value to 2%.

#### 16.6.1.122 DelatNG OEI HI limit

Requirement ID: H398-SRS-GWY-FNC-829

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the DelatNG OEI HI limit value to 4.5%.

#### 16.6.1.123 DelatNG MCP limit

Requirement ID: H398-SRS-GWY-FNC-830

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the DelatNG MCP limit value to -2.7%.

#### 16.6.1.124 DelatNG TOP limit

Requirement ID: H398-SRS-GWY-FNC-831

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the DelatNG TOP limit value to 0%.

#### 16.6.1.125 DelatNG MTP limit

Requirement ID: H398-SRS-GWY-FNC-832

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the DelatNG MTP limit value to 1.3%.

#### 16.6.1.126 ENG1 DeltaNG Pointer Angle

Requirement ID: H398-SRS-GWY-FNC-833

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data into ARINC429 message ENG1\_DeltaNG\_Pointer\_Angle (label 344-01):

"ENG1\_DeltaNG\_Pointer\_Angle\_Value" using "Engine 1 DeltaNG pointer angle value" (deg)

SSM:

* NO if Engine 1 DeltaNG Validity is valid
* FW in all other cases.

#### 16.6.1.127 ENG2\_DeltaNG\_Pointer\_Angle

Requirement ID: H398-SRS-GWY-FNC-834

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data into ARINC429 message ENG2\_DeltaNG\_Pointer\_Angle (label344-10):

"ENG2\_DeltaNG\_Pointer\_Angle\_Value" using "Engine 2 DeltaNG pointer angle value" (deg)

SSM:

* NO if Engine 2 DeltaNG Validity is valid.
* FW in all other cases.

#### 16.6.1.128 DeltaNG AEO YEL LO

Requirement ID: H398-SRS-GWY-FNC-835

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data into ARINC429 message DeltaNG\_AEO\_YEL\_LO (label 345-01):

"ENG1\_DeltaNG\_AEO\_YEL\_LO\_Visibility" using "Engine 1 DeltaNG operating limit" (DeltaNG AEO YEL LO)

"ENG2\_DeltaNG\_AEO\_YEL\_LO\_Visibility" using "Engine 2 DeltaNG operating limit" (DeltaNG AEO YEL LO)

"DeltaNG\_AEO\_YEL\_LO\_Value" using "DeltaNG pointer angle limits value" (DeltaNG\_AEO\_YEL\_LO)

SSM:

* NO if Engine 1 DeltaNG Validity is valid or Engine 2 DeltaNG Validity is valid
* FW in all other cases.

#### 16.6.1.129 DeltaNG AEO YEL UP

Requirement ID: H398-SRS-GWY-FNC-836

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data into ARINC429 message DeltaNG\_AEO\_YEL\_UP (label 345-10):

"ENG1\_DeltaNG\_AEO\_YEL\_UP\_Visibility" using "Engine 1 DeltaNG operating limit" (DeltaNG AEO YEL UP)

"ENG2\_DeltaNG\_AEO\_YEL\_UP\_Visibility" using "Engine 2 DeltaNG operating limit" (DeltaNG AEO YEL UP)

"DeltaNG\_AEO\_YEL\_UP\_Value" using "DeltaNG pointer angle limits value" (DeltaNG\_AEO\_YEL\_UP)

SSM:

* NO if Engine 1 DeltaNG Validity is valid or Engine 2 DeltaNG Validity is valid
* FW in all other cases.

#### 16.6.1.130 DeltaNG AEO RED

Requirement ID: H398-SRS-GWY-FNC-837

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data into ARINC429 message DeltaNG\_AEO\_RED (label 347-00):

"ENG1\_DeltaNG\_AEO\_RED\_Visibility" using "Engine 1 DeltaNG operating limit" (DeltaNG AEO RED)

"ENG2\_DeltaNG\_AEO\_RED\_Visibility" using "Engine 2 DeltaNG operating limit" (DeltaNG AEO RED)

"DeltaNG\_AEO\_RED\_Value" using "DeltaNG pointer angle limits value" (DeltaNG\_AEO\_RED)

SSM:

* NO if Engine 1 DeltaNG Validity is valid or Engine 2 DeltaNG Validity is valid
* FW in all other cases.

#### 16.6.1.131 DeltaNG AEO RED DIO

Requirement ID: H398-SRS-GWY-FNC-838

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data into ARINC429 message DeltaNG\_AEO\_RED\_DIO (label 350-00):

"ENG1\_DeltaNG\_AEO\_RED\_DIO\_Visibility" using "Engine 1 DeltaNG operating limit" (DeltaNG AEO RED DIO)

"ENG2\_DeltaNG\_AEO\_RED\_DIO\_Visibility" using "Engine 2 DeltaNG operating limit" (DeltaNG AEO RED DIO)

"DeltaNG\_AEO\_RED\_DIO\_Value" using "DeltaNG pointer angle limits value" (DeltaNG\_AEO\_RED\_DIO)

SSM:

* NO if Engine 1 DeltaNG Validity is valid or Engine 2 DeltaNG Validity is valid
* FW in all other cases.

#### 16.6.1.132 DeltaNG OEI YEL DASH

Requirement ID: H398-SRS-GWY-FNC-839

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data into ARINC429 message DeltaNG\_OEI\_YEL\_DASH (label 351-00):

"ENG1\_DeltaNG\_YEL\_DASH\_Visibility" using "Engine 1 DeltaNG operating limit" (DeltaNG OEI YEL DASH)

"ENG2\_DeltaNG\_YEL\_DASH\_Visibility" using "Engine 2 DeltaNG operating limit" (DeltaNG OEI YEL DASH)

"DeltaNG\_OEI\_YEL\_DASH\_Value" using "DeltaNG pointer angle limits value" (DeltaNG\_OEI\_YEL\_DASH)

SSM:

* NO if Engine 1 DeltaNG Validity is valid or Engine 2 DeltaNG Validity is valid
* FW in all other cases.

#### 16.6.1.133 DeltaNG OEI RED DASH

Requirement ID: H398-SRS-GWY-FNC-840

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data into ARINC429 message DeltaNG\_OEI\_RED\_DASH (label 352-00):

"ENG1\_DeltaNG\_RED\_DASH\_Visibility" using "Engine 1 DeltaNG operating limit" (DeltaNG OEI RED DASH)

"ENG2\_DeltaNG\_RED\_DASH\_Visibility" using "Engine 2 DeltaNG operating limit" (DeltaNG OEI RED DASH)

"DeltaNG\_OEI\_RED\_DASH\_Value" using "DeltaNG pointer angle limits value" (DeltaNG\_OEI\_RED\_DASH)

SSM:

* NO if Engine 1 DeltaNG Validity is valid or Engine 2 DeltaNG Validity is valid
* FW in all other cases.

#### 16.6.1.134 DeltaNG OEI RED LINE

Requirement ID: H398-SRS-GWY-FNC-841

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data into ARINC429 message DeltaNG\_OEI\_RED\_LINE (label 353-00):

"ENG1\_DeltaNG\_RED\_LINE\_Visibility" using "Engine 1 DeltaNG operating limit" (DeltaNG OEI RED LINE)

"ENG2\_DeltaNG\_RED\_LINE\_Visibility" using "Engine 2 DeltaNG operating limit" (DeltaNG OEI RED LINE)

"DeltaNG\_OEI\_RED\_LINE\_Value" using "DeltaNG pointer angle limits value" (DeltaNG\_OEI\_RED\_LINE)

SSM:

* NO if Engine 1 DeltaNG Validity is valid or Engine 2 DeltaNG Validity is valid
* FW in all other cases.

#### 16.6.1.135 Engine1 StatusNG

Requirement ID: H398-SRS-GWY-FNC-842

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data into ARINC429 message Engine1\_StatusNG (label 357-01):

"ENG1\_NG\_OEI\_LO\_Diode\_Display" using "Engine 1 DeltaNG Diode visibility" (NG OEI LO Diode)

SSM:

* NO if Engine 1 DeltaNG Validity is valid.
* FW in all other cases.

#### 16.6.1.136 Engine2 StatusNG

Requirement ID: H398-SRS-GWY-FNC-843

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data into ARINC429 message Engine2\_StatusNG (label 357-10):

"ENG2\_NG\_OEI\_LO\_Diode\_Display" using "Engine 2 DeltaNG Diode visibility" (NG OEI LO Diode)

SSM:

* NO if Engine 2 DeltaNG Validity is valid.
* FW in all other cases.

#### 16.6.1.137 ENG1 NG OEI HI Diode

Requirement ID: H398-SRS-GWY-FNC-844

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data into ARINC429 message Engine1\_StatusNG (label 357-01):

"ENG1\_NG\_OEI\_HI\_Diode\_Display" using "Engine 1 DeltaNG Diode visibility" (NG OEI HI Diode)

SSM:

* NO if Engine 1 DeltaNG Validity is valid
* FW in all other cases.

#### 16.6.1.138 ENG2 NG OEI HI Diode

Requirement ID: H398-SRS-GWY-FNC-845

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The gateway shall emit the following data into ARINC429 message Engine2\_StatusNG (label 357-10):

"ENG2\_NG\_OEI\_HI\_Diode\_Display" using "Engine 2 DeltaNG Diode visibility" (NG OEI HI Diode)

SSM:

* NO if Engine 2 DeltaNG Validity is valid
* FW in all other cases.

#### 16.6.1.139 Engine 2 Delta NG OEI Diode Visibility

Requirement ID: H398-SRS-GWY-FNC-848

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall control the visibility of each Engine 2 Delta NG Diode associated with the Engine 2 DeltaNG limitations by turning on bit visibility in the Engine status 2 labels 357.

The activation of these bits is described in the following table:

Table - Engine 2 Delta NG OEI Diode Visibility

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Engine 2 DeltaNG diode visibility | Bit at 1 state if OEI topping is | Label | SDI | Bit |
| DeltaNG OEI LO Diode | DeltaNG2\_OEI\_LO\_Diode and ENG2 DeltaNG is valid and ENG2 DeltaNG OEI LO Limit visibility is true | 357 | 10 | 18 |
| DeltaNG OEI HI Diode | DeltaNG2\_OEI\_HI\_Diode and ENG2 DeltaNG is valid and ENG2 DeltaNG OEI HI Limit visibility is true | 357 | 10 | 19 |

Note:

if we are in OEI or (AEO+OEI). (In AEO the bit are forced to 0)

#### 16.6.1.140 Engine 1 DeltaNG Pointer Angle Value Conversion

Requirement ID: H398-SRS-GWY-FNC-849

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall convert the "Engine 1 DeltaNG value"(%) into "Engine 1 DeltaNG pointer angle value" (deg) according following linear treatment:

Table - Engine 1 DeltaNG Pointer Angle Value Conversion

|  |  |  |
| --- | --- | --- |
|  | DeltaNG (%) | DeltaNG (deg) |
| DeltaNG Min | -8 | 45 |
| DeltaNG Max | >=6.5 | 270 |

#### 16.6.1.141 Engine 2 DeltaNG Pointer Angle Value Conversion

Requirement ID: H398-SRS-GWY-FNC-850

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall convert the "Engine 2 DeltaNG value"(%) into "Engine 2 DeltaNG pointer angle value" (deg) according following linear treatment:

Table - Engine 2 DeltaNG Pointer Angle Value Conversion

|  |  |  |
| --- | --- | --- |
|  | DeltaNG (%) | DeltaNG (deg) |
| DeltaNG Min | -8 | 45 |
| DeltaNG Max | >=6.5 | 270 |

#### 16.6.1.142 Engine 1 T4 raw Validity

Requirement ID: H398-SRS-GWY-FNC-882

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the "Engine 1 T4 raw Validity" to valid

if the "Engine 1 T4 raw value" is inside following valid range as below:

* Minimum valid range: T4\_RAW\_MIN\_RNG (-0.00225V)
* Maximum valid range: T4\_RAW\_MAX\_RNG (0.05V)

else "Engine 1 T4 raw Validity" is set to invalid.

#### 16.6.1.143 Engine 1 T4 corrective Validity

Requirement ID: H398-SRS-GWY-FNC-883

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the "Engine 1 T4 corrective Validity" to valid.

If the "Engine 1 T4 corrective value" is inside following valid range:

* Minimum valid range: T4\_CORRECTIVE\_MIN\_RNG (18 Ohms)
* Maximum valid range: T4\_CORRECTIVE\_MAX\_RNG (402 Ohms)

else "Engine 1 T4 corrective Validity" is set to invalid.

#### 16.6.1.144 Engine 1 T4 value Validity

Requirement ID: H398-SRS-GWY-FNC-884

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the "Engine 1 T4 value Validity" to valid

If Engine 1 T4 raw Validity is valid and Engine 1 T4 corrective Validity is valid

else "Engine 1 T4 Validity" is set to invalid.

#### 16.6.1.145 Engine 2 T4 raw Validity

Requirement ID: H398-SRS-GWY-FNC-885

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the "Engine 2 T4 raw Validity" to valid if the "Engine 2 T4 raw value" is inside following valid range:

* Minimum valid range: T4\_RAW\_MIN\_RNG (-0.00225V)
* Maximum valid range: T4\_RAW\_MAX\_RNG (0.05V)

else "Engine 2 T4 raw Validity" is set to invalid.

#### 16.6.1.146 Engine 2 T4 corrective Validity

Requirement ID: H398-SRS-GWY-FNC-886

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the "Engine 2 T4 corrective Validity" to valid if the "Engine 2 T4 corrective value" is inside following valid range:

* Minimum valid range: T4\_CORRECTIVE\_MIN\_RNG (18 Ohms)
* Maximum valid range: T4\_CORRECTIVE\_MAX\_RNG (402 Ohms)

else "Engine 2 T4 corrective Validity" is set to invalid.

#### 16.6.1.147 Engine 2 T4 value Validity

Requirement ID: H398-SRS-GWY-FNC-887

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the "Engine 2 T4 value Validity" to valid

if: Engine 2 T4 raw Validity is valid and Engine 2 T4 corrective Validity is valid,

else "Engine 2 T4 Validity" is set to invalid.

#### 16.6.1.148 Engine 1 T4 value

Requirement ID: H398-SRS-GWY-FNC-888

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the "Engine 1 T4 value" for each engine as follows:

If Engine 1 T4 validity is valid then

* Engine 1 T4 Value (°C) = Engine 1 T4 raw value (°C) x (A x (Engine 1 T4 corrective value)2 + B x Engine 1 T4 corrective value + C)

Else

* Engine 1 T4 Value (C) = 0

With

A = 1.70166347 E-07

B = -5.05615343 E-04

C = 1.07

Note:

Engine 1 T4 Value will be rounded up to precision 5 to avoid flickering. i.e. when the value is [2.5; 7.5) the value displayed is 5.

#### 16.6.1.149 Engine 2 T4 value

Requirement ID: H398-SRS-GWY-FNC-889

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the "Engine 2 T4 value" for each engine as follows:

If Engine 2 T4 validity is valid then

* Engine 2 T4 Value (°C) = Engine 2 T4 raw value (°C) x (A x (Engine 2 T4 corrective value)2 + B x Engine 2 T4 corrective value + C)

Else

* Engine 2 T4 Value (°C) = 0

With

A = 1.70166347 E-07

B = -5.05615343 E-04

C = 1.07

Note:

Engine 2 T4 Value will be rounded up to precision 5 to avoid flickering. i.e. when the value is [2.5; 7.5) the value displayed is 5.

#### 16.6.1.150 T4 OEI CT limit

Requirement ID: H398-SRS-GWY-FNC-890

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the T4 OEI CT limit value to 840°C.

#### 16.6.1.151 T4 OEI LO limit

Requirement ID: H398-SRS-GWY-FNC-891

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the T4 OEI LO limit value to 870°C.

#### 16.6.1.152 T4 MCP limit

Requirement ID: H398-SRS-GWY-FNC-892

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the T4 MCP limit value to 770°C.

#### 16.6.1.153 T4 TOP limit

Requirement ID: H398-SRS-GWY-FNC-893

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the T4 TOP limit value to 825°C.

#### 16.6.1.154 T4 START WHITE TRI limit

Requirement ID: H398-SRS-GWY-FNC-894

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the T4 START WHITE TRI limit value to 750°C.

#### 16.6.1.155 T4 START RED TRI HIGH limit

Requirement ID: H398-SRS-GWY-FNC-896

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set the T4 START RED TRI HIGH limit value to 810°C.

#### 16.6.1.156 Engine 1 T4 Operation Limits

Requirement ID: H398-SRS-GWY-FNC-921

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall control the visibility of each Engine 1 operating limit associated with the Engine 1 T4

gauge by turning on the bit visibility in the Engine 1 T4 limits position labels 270, 272, 274, 275, 300, and 302.

The activation of these bits is described in the following table given.

below:

Table - Engine 1 T4 Operation Limits

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Engine 1 T4 operation limits | Bit at 1 state if display class is | Label | SDI | Bit |
| T4 AEO YEL LO | AEO or (AEO + OEI) | 270 | 01 | 11 |
| T4 AEO YEL UP | AEO or (AEO + OEI) | 270 | 10 | 11 |
| T4 AEO RED | AEO or (AEO + OEI) | 272 | 00 | 11 |
| T4 OEI YEL DASH | OEI or (AEO + OEI) | 274 | 00 | 11 |
| T4 OWI RED DASH | OEI or (AEO + OEI) | 275 | 00 | 11 |
| T4 START WHI TRI | START | 300 | 00 | 11 |
| T4 START RED TRI HIGH | START | 302 | 00 | 11 |

#### 16.6.1.157 Engine 2 T4 Operation Limits

Requirement ID: H398-SRS-GWY-FNC-932

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall control the visibility of each Engine 2 operating limit associated with the Engine 2 T4

gauge by turning on the bit visibility in the Engine 2 T4 limits position labels 270, 272, 274, 275, 300, and 302.

The activation of these bits is described in the following table below:

Table - Engine 2 T4 Operation Limits

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Engine 2 T4 operation limits | Bit at 1 state if display class is | Label | SDI | Bit |
| T4 AEO YEL LO | AEO or (AEO + OEI) | 270 | 01 | 12 |
| T4 AEO YEL UP | AEO or (AEO + OEI) | 270 | 10 | 12 |
| T4 AEO RED | AEO or (AEO + OEI) | 272 | 00 | 12 |
| T4 OEI YEL DASH | OEI or (AEO + OEI) | 274 | 00 | 12 |
| T4 OWI RED DASH | OEI or (AEO + OEI) | 275 | 00 | 12 |
| T4 START WHI TRI | START | 300 | 00 | 12 |
| T4 START RED TRI HIGH | START | 302 | 00 | 12 |

#### 16.6.1.158 Engine 1 T4 Pointer Angle Conversion

Requirement ID: H398-SRS-GWY-FNC-922

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall convert the "Engine 1 T4 value" (°C) into "Engine 1 T4 pointer angle value" (deg)

according to the following table:

Table 125- Engine 1 T4 Pointer Angle Conversion

|  |  |  |
| --- | --- | --- |
| Area Interpolation | T4 (°C) | T4 (°) |
| Area 0 | 0 | 45 |
| Area 1 | 100 | 60 |
| Area 2 | 450 | 61 |
| Area 3 | 600 | 80 |
| Area 4 | 700 | 90 |
| Area 5 | 900 | 270 |

Note: A linear interpolation is applied between the area values.

#### 16.6.1.159 Engine 2 T4 Pointer Angle Conversion

Requirement ID: H398-SRS-GWY-FNC-923

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall convert the "Engine 2 T4 value" (°C) into "Engine 2 T4 pointer angle value" (deg)

according to the following Table:

Table 126- Engine 2 T4 Pointer Angle Conversion

|  |  |  |
| --- | --- | --- |
| Area Interpolation | T4 (°C) | T4 (°) |
| Area 0 | 0 | 45 |
| Area 1 | 100 | 60 |
| Area 2 | 450 | 61 |
| Area 3 | 600 | 80 |
| Area 4 | 700 | 90 |
| Area 5 | 900 | 270 |

Note: A linear interpolation shall be applied between the area values.



Figure : Engine 2 T4 pointer angle value

#### 16.6.1.160 T4 Pointer Angle Limits

Requirement ID: H398-SRS-GWY-FNC-933

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall transmit the following T4 parameter limits labels as the angular position of the

corresponding limit in degrees from -180° to 180° on the ARINC 429 parameter bus at intervals as

specified in "Digital Output Interfaces" Doc STC019000053 and the Normal SSM.

Table 127- T4 Pointer Angle Limits

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| T4 limits value (°C) | T4 pointer angle limits value (deg) | Label | SDI | Bit |
| T4 MCP (770°C) | T4\_AEO\_YEL\_LO (153) | 270 | 01 | 18 to 29 |
| T4 TOP (825°C) | T4\_AEO\_YEL\_UP (202.5) | 270 | 10 | 18 to 29 |
| T4\_AEO\_RED (202.5) | 272 | 00 | 18 to 29 |
| T4 MTP (N/A on RNLAF) | T4\_AEO\_RED\_DIO (N/A on RNLAF) | 273 | 00 | 18 to 29 |
| T4 OEI CT (840°C) | T4\_OEI\_YEL\_DASH (216) | 274 | 00 | 18 to 29 |
| T4 OEI LO (870°C) | T4\_OEI\_RED\_DASH (243) | 275 | 00 | 18 to 29 |
| T4 OEI HI (N/A on RNLAF) | T4\_OEI\_RED\_LINE (N/A on RNLAF) | 276 | 00 | 18 to 29 |
| T4 START WHI TRI (750°C) | T4\_START\_WHI\_TRI (135) | 300 | 00 | 18 to 29 |
| T4 START RED TRI HI (810°C) | T4\_START\_RED\_TRI\_HIGH (189) | 302 | 00 | 18 to 29 |

#### 16.6.1.161 ENG1\_T4\_DIGITAL\_VALUE

Requirement ID: H398-SRS-GWY-FNC-936

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall transmit the following data into ARINC429 message “ENG1\_T4\_DIGITAL\_VALUE”

(Label 265-01) as follows:

* "ENG1\_T4\_Digital\_Value" using "Engine 1 T4 value" (°C)
* "ENG1\_T4\_Digital\_Value\_NumStatus"(bit 12 to bit 13) using "Engine 1 T4 status" (Red, Amber, Nominal) and

SSM:

NO (Normal operation) if Engine 1 T4 Validity is valid.

FW (Failure warning) in all other cases.

#### 16.6.1.162 ENG2\_T4\_DIGITAL\_VALUE

Requirement ID: H398-SRS-GWY-FNC-937

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall transmit the following data into ARINC429 message “ENG2\_T4\_DIGITAL\_VALUE”

(Label 265-10) as follows:

* "ENG2\_T4\_Digital\_Value" using "Engine 2 T4 value" (°C)
* "ENG2\_T4\_Digital\_Value\_NumStatus"(bit 12 to bit 13) using "Engine 2 T4 status" (Red, Amber, Nominal) and

SSM:

1. NO (Normal operation) if Engine 2 T4 Validity is valid.
2. FW (Failure warning) in all other cases.

#### 16.6.1.163 ENG1\_T4\_POINTER\_ANGLE

Requirement ID: H398-SRS-GWY-FNC-938

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall transmit the following data into ARINC429 message ENG1\_T4\_POINTER\_ANGLE

(label 266-01):

"ENG1\_T4\_Pointer\_Angle\_Value" using "Engine 1 T4 pointer angle value" (deg)

SSM:

1. NO if Engine 1 T4 Validity is valid.
2. FW in all other cases.

#### 16.6.1.164 ENG2\_T4\_POINTER\_ANGLE

Requirement ID: H398-SRS-GWY-FNC-939

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall transmit the following data into ARINC429 message ENG2\_T4\_POINTER\_ANGLE

(label 266-10):

"ENG2\_T4\_Pointer\_Angle\_Value" using "Engine 2 T4 pointer angle value" (deg)

SSM:

1. NO if Engine 2 T4 Validity is valid.
2. FW in all other cases.

#### 16.6.1.165 T4\_AEO\_YEL\_LO

Requirement ID: H398-SRS-GWY-FNC-940

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data into ARINC429 message T4\_AEO\_YEL\_LO (label 270-01):

* "ENG1\_T4\_AEO\_YEL\_LO\_Visibility" using "Engine 1 T4 operating limit" (T4 AEO YEL LO)
* "ENG2\_T4\_AEO\_YEL\_LO\_Visibility" using "Engine 2 T4 operating limit" (T4 AEO YEL LO)
* "T4\_AEO\_YEL\_LO\_Value" using "T4 pointer angle limits value" (T4\_AEO\_YEL\_LO)

SSM:

1. NO (Normal operation) if Engine 1 T4 Validity is valid or Engine 2 T4 Validity is valid.
2. FW (Failure warning) in all other cases.

#### 16.6.1.166 T4\_AEO\_YEL\_UP

Requirement ID: H398-SRS-GWY-FNC-941

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall transmit the following data into ARINC429 message T4\_AEO\_YEL\_UP (label 270-10):

* "ENG1\_T4\_AEO\_YEL\_UP\_Visibility " using "Engine 1 T4 operating limit" (T4 AEO YEL UP)
* "ENG2\_T4\_AEO\_YEL\_UP\_Visibility " using "Engine 2 T4 operating limit" (T4 AEO YEL UP)
* "T4\_AEO\_YEL\_UP\_Value " using "T4 pointer angle limits value" (T4\_AEO\_YEL\_UP) and

SSM:

1. NO (Normal operation) if Engine 1 T4 Validity is valid or Engine 2 T4 Validity is valid
2. FW (Failure warning) in all other cases.

#### 16.6.1.167 T4\_AEO\_RED

Requirement ID: H398-SRS-GWY-FNC-942

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall transmit the following data into ARINC429 message T4\_AEO\_RED (label 272-00):

• "ENG1\_T4\_AEO\_RED\_Visibility" using "Engine 1 T4 operating limit" (T4 AEO RED)

• "ENG2\_T4\_AEO\_RED\_Visibility" using "Engine 2 T4 operating limit" (T4 AEO RED)

• "T4\_AEO\_RED\_Value" using "T4 pointer angle limits value" (T4\_AEO\_RED) and

SSM:

1) NO if Engine 1 T4 Validity is valid or Engine 2 T4 Validity is valid

2) FW in all other cases

#### 16.6.1.168 T4\_OEI\_YEL\_DASH

Requirement ID: H398-SRS-GWY-FNC-943

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data into ARINC429 message T4\_OEI\_YEL\_DASH (label 274-00):

• "ENG1\_T4\_YEL\_DASH\_Visibility" using "Engine 1 T4 operating limit" (T4 OEI YEL DASH)

• "ENG2\_T4\_YEL\_DASH\_Visibility" using "Engine 2 T4 operating limit" (T4 OEI YEL DASH)

• "T4\_OEI\_YEL\_DASH\_Value" using "T4 pointer angle limits value" (T4\_OEI\_YEL\_DASH) and

SSM as below:

1) NO (Normal operation) if Engine 1 T4 Validity is valid or Engine 2 T4 Validity is valid

2) FW (Failure warning) in all other cases.

#### 16.6.1.169 T4\_OEI\_RED\_DASH

Requirement ID: H398-SRS-GWY-FNC-944

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data into ARINC429 message T4\_OEI\_RED\_DASH (label 275-00):

* "ENG1\_T4\_RED\_DASH\_Visibility" using "Engine 1 T4 operating limit" (T4 OEI RED DASH)
* "ENG2\_T4\_RED\_DASH\_Visibility" using "Engine 2 T4 operating limit" (T4 OEI RED DASH)
* "T4\_OEI\_RED\_DASH\_Value" using "T4 pointer angle limits value" (T4\_OEI\_RED\_DASH)

and SSM as below:

1) NO if Engine 1 T4 Validity is valid or Engine 2 T4 Validity is valid

2) FW in all other cases.

#### 16.6.1.170 T4\_START\_WHI\_TRI

Requirement ID: H398-SRS-GWY-FNC-945

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall transmit the following data into ARINC429 message T4\_START\_WHI\_TRI (label 300-00):

* "ENG1\_T4\_START\_WHI\_TRI\_Visibility" using "Engine 1 T4 operating limit" (T4 START WHI TRI)
* "ENG2\_T4\_START\_WHI\_TRI\_Visibility" using "Engine 2 T4 operating limit" (T4 START WHI TRI)
* "T4\_START\_WHI\_TRI\_Value" using "T4 pointer angle limits value" (T4\_START\_WHI\_TRI)

and SSM:

1) NO if Engine 1 T4 Validity is valid or Engine 2 T4 Validity is valid

2) FW in all other cases.

#### 16.6.1.171 T4\_START\_RED\_TRI\_HIGH

Requirement ID: H398-SRS-GWY-FNC-947

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall transmit the following data into ARINC429 message T4\_START\_RED\_TRI\_HIGH (label 302-00):

• "ENG1\_T4\_START\_RED\_TRI\_HIGH\_Visibility" using "Engine 1 T4 operating limit" (T4 START RED TRI HIGH)

• "ENG2\_T4\_START\_RED\_TRI\_HIGH\_Visibility" using "Engine 2 T4 operating limit" (T4 START RED TRI HIGH)

• "T4\_START\_RED\_TRI\_HIGH\_Value" using "T4 pointer angle limits value" (T4\_START\_RED\_TRI\_HIGH)

and SSM as below:

1) NO if Engine 1 T4 Validity is valid or Engine 2 T4 Validity is valid

2) FW in all other cases.

Table - T4 Displayed Limits from Display Class

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| T4 ENG1 or 2  Display Class | T4 MCP | T4 TOP | T4 OEI CT | T4 OEI LO | T4 START WHITE TRI | T4 START RED TRI HIGH |
| Display message on ARINC429 DAU to Displays | Label 270  Bit 11 for ENG1  Bit 12 for ENG2 | Label 272  Bit 11 for ENG1  Bit 12 for ENG2 | Label 274  Bit 11 for ENG1  Bit 12 for ENG2 | Label 275  Bit 11 for ENG1  Bit 12 for ENG2 | Label 300  Bit 11 for ENG1  Bit 12 for ENG2 | Label 302  Bit 11 for ENG1  Bit 12 for ENG2 |
| AEO | YES | YES | NO | NO | NO | NO |
| OEI | NO | NO | YES | YES | NO | NO |
| AEO + OEI | YES | YES | YES | YES | NO | NO |
| START | NO | NO | NO | NO | YES | YES |

#### 16.6.1.172 TRQ 1 DIGITAL VALUE

Requirement ID: H398-SRS-GWY-FNC-966

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gatway module shall transmit the following data into ARINC429 message “TRQ 1 DIGITAL VALUE” (label 050-01) :

"TRQ1\_Digital\_Value" using "Engine 1 TRQ value" (%)

"TRQ1\_Digital\_Value\_NumStatus" using "Engine 1 TRQ status" (Red, Amber, Nominal)

SSM:

* NO if Engine 1 TRQ Validity is valid.
* FW in all other cases.

Note:

Engine 1 TRQ Value will be rounded up to precision 0.5 to avoid flickering. i.e. When the value is [0.25; 0.75) the value displayed is 0.5 if the precision is 0.5.

#### 16.6.1.173 TRQ 2 DIGITAL VALUE

Requirement ID: H398-SRS-GWY-FNC-1010

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gatway module shall transmit the following data into ARINC429 message “TRQ 2 DIGITAL VALUE” (label 050-10) :

"TRQ2\_Digital\_Value" using "Engine 2 TRQ value" (%)

"TRQ2\_Digital\_Value\_NumStatus" using "Engine 2 TRQ status" (Red, Amber, Nominal)

SSM:

* NO if Engine 2 TRQ Validity is valid.
* FW in all other cases.

Note:

Engine 2 TRQ Value will be rounded up to precision 0.5 to avoid flickering. i.e. When the value is [0.25; 0.75) the value displayed is 0.5 if the precision is 0.5.

#### 16.6.1.174 COMPUTED TRQ1+2 DIGITAL

Requirement ID: H398-SRS-GWY-FNC-967

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall transmit the following data into ARINC429 message “COMPUTED TRQ1+2 DIGITAL

VALUE” (label 050-11):

* "TRQ1+2\_Digital\_Value" using "Computed TRQ1+2 value" (%)
* "TRQ1+2\_Digital\_Value\_NumStatus" using "Computed TRQ1+2 status" (Red, Amber, Nominal)

with SSM:

1. NO if Engine 1 TRQ Validity is valid or Engine 2 TRQ Validity is valid.
2. FW in all other cases.

Note:

Computed TRQ1+2 Value will be rounded up to precision 0.5 to avoid flickering. i.e. When the value is [0.25; 0.75) the value displayed is 0.5 if the precision is 0.5.

#### 16.6.1.175 Total\_TRQ1+2\_Pointer\_Angle

Requirement ID: H398-SRS-GWY-FNC-968

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall transmit the following data into ARINC429 message Total\_TRQ1+2\_Pointer\_Angle (label

051-11):

* "Total\_TRQ1+2\_Pointer\_Angle\_Value"(bit 18-29) using "Computed Torque 1+2 pointer angle value" (deg) with

SSM as follows:

1. NO (Normal operation) if Engine 1 TRQ Validity is valid or Engine 2 TRQ Validity is valid.
2. FW (Failure warning) in all other cases.

#### 16.6.1.176 TRQ\_AEO\_YEL\_LO

Requirement ID: H398-SRS-GWY-FNC-969

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall transmit the following data into ARINC429 message TRQ\_AEO\_YEL\_LO (label 052-

01):

* "TRQ\_AEO\_YEL\_LO\_Visibility" using "Computed TRQ1+2 operating limit" (TRQ\_AEO\_YEL\_LO)
* "TRQ\_AEO\_YEL\_LO\_Value" using "TRQ pointer angle limits value" (TRQ\_AEO\_YEL\_LO) with

SSM:

NO (Normal operation) if Engine 1 TRQ Validity is valid or Engine 2 TRQ Validity is valid.

FW (Failure warning) in all other cases.

#### 16.6.1.177 TRQ\_AEO\_YEL\_UP

Requirement ID: H398-SRS-GWY-FNC-970

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall emit the following data into ARINC429 message TRQ\_AEO\_YEL\_UP (label 052-10):

* "TRQ\_AEO\_YEL\_UP\_Visibility" using "Computed TRQ1+2 operating limit" (TRQ AEO YEL UP)
* "TRQ\_AEO\_YEL\_UP\_Value" using "TRQ pointer angle limits value" (TRQ\_AEO\_YEL\_UP)

with SSM:

1. NO (Normal operation) if Engine 1 TRQ Validity is valid or Engine 2 TRQ Validity is valid.
2. FW (Failure warning) in all other cases.

#### 16.6.1.178 TRQ\_AEO\_RED

Requirement ID: H398-SRS-GWY-FNC-971

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall transmit the following data into ARINC429 message TRQ\_AEO\_RED (label 054-00):

* "TRQ\_AEO\_RED\_Visibility" using "Computed TRQ1+2 operating limit" (TRQ AEO RED)
* "TRQ\_AEO\_RED\_Value" using "TRQ pointer angle limits value" (TRQ\_AEO\_RED)

with SSM:

1. NO if Engine 1 TRQ Validity is valid or Engine 2 TRQ Validity is valid.
2. FW in all other cases.

#### 16.6.1.179 TRQ\_AEO\_RED\_DIO

Requirement ID: H398-SRS-GWY-FNC-972

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall transmit the following data into ARINC429 message TRQ\_AEO\_RED\_DIO (label 055-00):

* "TRQ\_AEO\_RED\_DIO\_Visibility" using "Computed TRQ1+2 operating limit" (TRQ AEO RED DIO)
* "TRQ\_AEO\_RED\_DIO\_Value" using "TRQ pointer angle limits value" (TRQ\_AEO\_RED\_DIO) with

SSM as follows:

1. NO (Normal operation) if Engine 1 TRQ Validity is valid or Engine 2 TRQ Validity is valid.
2. FW (Failure warning) in all other cases.

#### 16.6.1.180 TRQ\_OEI\_YEL\_DASH

Requirement ID: H398-SRS-GWY-FNC-973

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data into ARINC429 message TRQ\_OEI\_YEL\_DASH (label 057-00):

"TRQ\_YEL\_DASH\_Visibility" using "Computed TRQ1+2 operating limit" (TRQ OEI YEL DASH)

"TRQ\_OEI\_YEL\_DASH\_Value" using "TRQ pointer angle limits value" (TRQ\_OEI\_YEL\_DASH)

SSM:

* NO if Engine 1 TRQ Validity is valid or Engine 2 TRQ Validity is valid.
* FW in all other cases.

#### 16.6.1.181 TRQ\_OEI\_RED\_DASH

Requirement ID: H398-SRS-GWY-FNC-974

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data into ARINC429 message TRQ\_OEI\_RED\_DASH (label 060-00):

"TRQ\_RED\_DASH\_Visibility" using "Computed TRQ1+2 operating limit" (TRQ OEI RED DASH)

"TRQ\_OEI\_RED\_DASH\_Value" using "TRQ pointer angle limits value" (TRQ\_OEI\_RED\_DASH)

SSM:

* NO if Engine 1 TRQ Validity is valid or Engine 2 TRQ Validity is valid.
* FW in all other cases.

#### 16.6.1.182 TRQ\_OEI\_RED\_LINE

Requirement ID: H398-SRS-GWY-FNC-975

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data into ARINC429 message TRQ\_OEI\_RED\_LINE (label 061-00):

"TRQ\_RED\_LINE\_Visibility" using "Computed TRQ1+2 operating limit" (TRQ OEI RED LINE)

"TRQ\_OEI\_RED\_LINE\_Value" using "TRQ pointer angle limits value" (TRQ\_OEI\_RED\_LINE)

SSM:

* NO if Engine 1 TRQ Validity is valid or Engine 2 TRQ Validity is valid.
* FW in all other cases.

Table - TRQ Displayed Limits from Display Class

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| TRQ ENG1 or 2  Display Class | TRQ\_LIM\_MCP | TRQ\_YEL\_REC | TRQ\_LIM\_TOP | TRQ\_LIM\_MTP | TRQ\_LIM\_OEICT | TRQ\_LIM\_OEILO | TRQ\_LIM\_OEIHI |
| Display message on ARINC429 DAU to Displays | Label 052 | Label 053 | Label 054 | Label 055 | Label 057 | Label 060 | Label 061 |
| AEO | YES | YES | YES | YES | NO | NO | NO |
| OEI | NO | NO | NO | NO | YES | YES | YES |
| AEO + OEI | YES | YES | YES | YES | YES | YES | YES |
| START | NO | NO | NO | NO | NO | NO | NO |

#### 16.6.1.183 Label 050 SDI 01 Details

Requirement ID: H398-SRS-GWY-FNC-976

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 050-01):

Table - Label 050 SDI 01 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| TRQ1\_Digital\_Value\_Selection\_Source | Label 050 SDI 01 | NO |  | bit 11 | 0 = num source  1 = analog source  Always 1 on RNLAF |
| TRQ1\_Digital\_Value\_NumStatus | bit 12 to bit 13 | 00 = Nominal |
| 01 = Amber |
| 10 = Red |
| 11 = Not Used |
| TRQ1\_Digital\_Value\_NumStatusBlink | bit 14  "Provision, not used on RNLAF" | 0 = Not Blinking  1 = Blinking |
| TRQ1\_Digital\_Value | % | bit 15 to bit 29 | Range 0 to 256  Bit 28 = 128 |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.6.1.184 Label 050 SDI 10 Details

Requirement ID: H398-SRS-GWY-FNC-977

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 050-10):

Table - Label 050 SDI 10 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| TRQ2\_Digital\_Value\_Selection\_source | Label 050 SDI 10 | NO |  | bit 11 | 0 = num source  1 = analog source  Always 1 on RNLAF |
| TRQ2\_Digital\_Value\_NumStatus | bit 12 to bit 13 | 00 = Nominal |
| 01 = Amber |
| 10 = Red |
| 11 = Not Used |
| TRQ2\_Digital\_Value\_NumStatusBlink | bit 14  "Provision, not used on RNLAF" | 0 = Not Blinking  1 = Blinking |
| TRQ2\_Digital\_Value | % | bit 15 to bit 29 | Range 0 to 256  Bit 28 = 128 |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.6.1.185 Label 050 SDI 11 Details

Requirement ID: H398-SRS-GWY-FNC-978

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 050-11):

Table - Label 050 SDI 11 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| TRQ1+2\_Digital\_Value\_Selection\_source | Label 050 SDI 11 | NO |  | bit 11 | 0 = num source  1 = analog source  Always 1 on RNLAF |
| TRQ1+2\_Digital\_Value\_NumStatus | bit 12 to bit 13 | 00 = Nominal |
| 01 = Amber |
| 10 = Red |
| 11 = Not Used |
| TRQ1+2\_Digital\_Value\_NumStatusBlink | bit 14  "Provision, not used on RNLAF" | 0 = Not Blinking  1 = Blinking |
| TRQ1+2\_Digital\_Value | % | bit 15 to bit 29 | Range 0 to 256  Bit 28 = 128 |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.6.1.186 Label 051 SDI 11 Details

Requirement ID: H398-SRS-GWY-FNC-979

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 051-11):

Table - Label 051 SDI 11 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| TRQ1+2\_Pointer\_Angle\_Value | Label 051 SDI 11 | NO | ° | bit 18 to bit 29  bit 28 = 90°  bit 29 = sign bit | Range -180° to 180° |
| FT |  |  |  |
| NCD |
| FW |

#### 16.6.1.187 Label 052 SDI 01 Details

Requirement ID: H398-SRS-GWY-FNC-980

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 52-01):

Table - Label 052 SDI 01 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| TRQ\_AEO\_YEL\_LO\_Visibility | Label 052 SDI 01 | NO |  | bit 11 | 1 = Yellow AEO zone limit displayed on torque analogic display (zone beginning) |
| TRQ\_AEO\_YEL\_LO\_Value (zone beginning) | ° | bit 18 to bit 29  bit 28 = 90°  bit 29 = sign bit | range -180° to 180° |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.6.1.188 Label 052 SDI 10 Details

Requirement ID: H398-SRS-GWY-FNC-981

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 52-10):

Table - Label 052 SDI 10 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| TRQ\_AEO\_YEL\_UP\_Visibility | Label 052 SDI 10 | NO |  | bit 11 | 1 = Yellow AEO zone limit displayed on Torque analogic display (zone end) |
| TRQ\_AEO\_YEL\_UP\_Value (zone end) | ° | bit 18 to bit 29  bit 28 = 90°  bit 29 = sign bit | range -180° to 180° |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

Note: The value of the AEO YEL UP limit is the same as the AEO RED limit

#### 16.6.1.189 Label 053 SDI 00 Details

Requirement ID: H398-SRS-GWY-FNC-982

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 53-00):

Table - Label 053 SDI 00 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| TRQ\_AEO\_YEL\_REC\_Visibility | Label 053 SDI 00 | NO |  | bit 11 | 1 = Yellow rectangle limit displayed  (This bit is forced to 0) |
| TRQ\_AEO\_YEL\_REC\_Value | ° | bit 18 to bit 29  bit 28 = 90°  bit 29 = sign bit | range -180° to 180° |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.6.1.190 Label 054 SDI 00 Details

Requirement ID: H398-SRS-GWY-FNC-983

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 54-00):

Table - Label 054 SDI 00 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| TRQ\_AEO\_RED\_Visibility | Label 054 SDI 00 | NO |  | bit 11 | 1 = Red limit displayed |
| TRQ\_AEO\_RED\_Value | ° | bit 18 to bit 29  bit 28 = 90°  bit 29 = sign bit | range -180° to 180° |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.6.1.191 Label 055 SDI 00 Details

Requirement ID: H398-SRS-GWY-FNC-984

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 55-00):

Table - Label 055 SDI 00 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| TRQ\_AEO\_RED\_DIO\_Visibility | Label 055 SDI 00 | NO |  | bit 11 | 1 = Red triangle limit displayed |
| TRQ\_AEO\_RED\_DIO\_Selection | bit 12 | 0 = Triangle display  1 = Diode display  Always 0 on RNLAF |
| TRQ\_AEO\_RED\_DIO\_Value | ° | bit 18 to bit 29  bit 28 = 90°  bit 29 = sign bit | range -180° to 180° |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.6.1.192 Label 057 SDI 00 Details

Requirement ID: H398-SRS-GWY-FNC-985

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 57-00):

Table - Label 057 SDI 00 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| TRQ\_OEI\_YEL\_DASH\_Visibility | Label 057 SDI 00 | NO |  | bit 11 | 1 = Yellow dash limit displayed |
| TRQ\_OEI\_CT\_Diode\_Display | bit 12 | 1 = Diode displayed |
| TRQ\_OEI\_YEL\_DASH\_Value | ° | bit 18 to bit 29  bit 28 = 90°  bit 29 = sign bit | range -180° to 180° |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

Note:

For TRQ OEI CT Diode refer H398-SRS-GWY-FNC-961.

#### 16.6.1.193 Label 060 SDI 00 Details

Requirement ID: H398-SRS-GWY-FNC-986

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 60-00):

Table - Label 060 SDI 00 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| TRQ\_OEI\_RED\_DASH\_Visibility | Label 060 SDI 00 | NO |  | bit 11 | 1 = Red dash limit displayed |
| TRQ\_OEI\_LO\_Diode\_Display | bit 12 | 1 = Diode Displayed |
| TRQ\_OEI\_RED\_DASH | ° | bit 18 to bit 29  bit 28 = 90°  bit 29 = sign bit | range -180° to 180° |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.6.1.194 Label 061 SDI 00 Details

Requirement ID: H398-SRS-GWY-FNC-987

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 61-00):

Table - Label 061 SDI 00 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| ENG1\_TRQ\_OEI\_RED\_LINE\_Visibility | Label 061 SDI 00 | NO |  | bit 11 | 1 = Red limit displayed |
| TRQ\_OEI\_HI\_Diode\_Display | bit 12 | 1 = Diode Displayed |
| TRQ\_OEI\_RED\_LINE\_Value | ° | bit 18 to bit 29  bit 28 = 90°  bit 29 = sign bit | range -180° to 180° |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.6.1.195 Label 316 SDI 01 Details

Requirement ID: H398-SRS-GWY-FNC-990

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 316-01):

Table - Label 316 SDI 01 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| EOT1\_SST | Label 316 SDI 01 | NO |  | bit 12 to bit 13 | 00 = Nominal |
| 01 = Amber |
| 10 = Red |
| 11 = Not Used |
| EOT1\_NumStatusBlink | bit 14  "Provision, not used on RNLAF" | 0 = Not Blinking  1 = Blinking |
| EOT1\_DIGITAL\_VALUE | °C | bit 18 to bit 29  bit 28 = 128 | [-256 ; 256] |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.6.1.196 Processing of EOT inputs

Requirement ID: H398-SRS-GWY-FNC-1011

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall accept two (2) RTD Engine Oil Temperature EOT inputs per channel.The EOT input signal comply with the characteristics depicted in H398-SRS-GWY-FNC-628.

#### 16.6.1.197 Label 316 SDI 10 Details

Requirement ID: H398-SRS-GWY-FNC-991

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 316-10):

Table - Label 316 SDI 10 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| EOT2\_SST | Label 316 SDI 10 | NO |  | bit 12 to bit 13 | 00 = Nominal |
| 01 = Amber |
| 10 = Red |
| 11 = Not Used |
| EOT2\_NumStatusBlink | bit 14  "Provision, not used on RNLAF" | 0 = Not Blinking  1 = Blinking |
| EOT2\_DIGITAL\_VALUE | °C | bit 18 to bit 29  bit 28 = 128 | [-256 ; 256] |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.6.1.198 Label 317 SDI 01 Details

Requirement ID: H398-SRS-GWY-FNC-992

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 317-01):

Table - Label 317 SDI 01 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| EOT1\_DISP\_BOT\_RED\_LIM | Label 317 SDI 01 | NO |  | bit 11 | 1 = bottom red limit displayed |
| EOT1\_DISP\_BOT\_YEL\_LIM | bit 12 | 1 = bottom yellow limit displayed |
| EOT1\_DISP\_TOP\_YEL\_LIM | bit 13 | 1 = upper yellow limit displayed |
| EOT1\_DISP\_TOP\_RED\_LIM | bit 14 | 1 = upper red limit displayed |
| EOT1\_ANALOG\_VALUE | % | bit 17 to bit 29  bit 28 = 64 | range 0 to 128  range 0 to 100 is only used |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.6.1.199 Label 317 SDI 10 Details

Requirement ID: H398-SRS-GWY-FNC-993

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 317-10):

Table - Label 317 SDI 10 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| EOT2\_DISP\_BOT\_RED\_LIM | Label 317 SDI 10 | NO |  | bit 11 | 1 = bottom red limit displayed |
| EOT2\_DISP\_BOT\_YEL\_LIM | bit 12 | 1 = bottom yellow limit displayed |
| EOT2\_DISP\_TOP\_YEL\_LIM | bit 13 | 1 = upper yellow limit displayed |
| EOT2\_DISP\_TOP\_RED\_LIM | bit 14 | 1 = upper red limit displayed |
| EOT2\_ANALOG\_VALUE | % | bit 17 to bit 29  bit 28 = 64 | range 0 to 128  range 0 to 100 is only used |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.6.1.200 Label 174 SDI 01 Details

Requirement ID: H398-SRS-GWY-FNC-1002

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall emit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 174 - 01):

Table - Label 174 SDI 01 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Data Name** | **Label definition** | **SSM** | **Unit** | **Range** | **Functional definition** |
| HYD1\_SST | Label 174 SDI 01 | NO |  | bit 12 to bit 13 | 00 = Normal |
| 01 = Amber |
| 10 = Red |
| 11 = Not used |
| HYD1\_NumStatusBlink | bit 14  "Provision, not used on RNLAF" | 0 = Not Blinking  1 = Blinking |
| HYD1\_DIGITAL\_VALUE | bar | bit 17 to bit 29  bit 28 = 256 | range 0 to 512 |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.6.1.201 Label 174 SDI 10 Details

Requirement ID: H398-SRS-GWY-FNC-1003

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall emit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 174 - 10):

Table - Label 174 SDI 10 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Data Name** | **Label definition** | **SSM** | **Unit** | **Range** | **Functional definition** |
| HYD2\_SST | Label 174 SDI 10 | NO |  | bit 12 to bit 13 | 00 = Normal |
| 01 = Amber |
| 10 = Red |
| 11 = Not used |
| HYD2\_NumStatusBlink | bit 14  "Provision, not used on RNLAF" | 0 = Not Blinking  1 = Blinking |
| HYD2\_DIGITAL\_VALUE | bar | bit 17 to bit 29  bit 28 = 256 | range 0 to 512 |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.6.1.202 Label 175 SDI 01 Details

Requirement ID: H398-SRS-GWY-FNC-1004

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall emit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 175 - 01):

Table - Label 175 SDI 01 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Data Name** | **Label definition** | **SSM** | **Unit** | **Range** | **Functional definition** |
| HYD1\_DISP\_BOT\_RED\_LIM | Label 175 SDI 01 | NO |  | bit 11 | 1 = bottom red limit displayed |
| HYD1\_DISP\_BOT\_YEL\_LIM | bit 12 | 1 = bottom yellow limit displayed |
| HYD1\_DISP\_TOP\_YEL\_LIM | bit 13 | 1 = upper yellow limit displayed |
| HYD1\_DISP\_TOP\_RED\_LIM | bit 14 | 1 = upper red limit displayed |
| HYD1\_ANALOG\_VALUE | % | bit 17 to bit 29  bit 28 = 64 | range 0 to 128  range 0 to 100 is only used |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.6.1.203 Label 175 SDI 10 Details

Requirement ID: H398-SRS-GWY-FNC-1005

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall emit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 175 - 10):

Table - Label 175 SDI 10 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Data Name** | **Label definition** | **SSM** | **Unit** | **Range** | **Functional definition** |
| HYD2\_DISP\_BOT\_RED\_LIM | Label 175 SDI 10 | NO |  | bit 11 | 1 = bottom red limit displayed |
| HYD2\_DISP\_BOT\_YEL\_LIM | bit 12 | 1 = bottom yellow limit displayed |
| HYD2\_DISP\_TOP\_YEL\_LIM | bit 13 | 1 = upper yellow limit displayed |
| HYD2\_DISP\_TOP\_RED\_LIM | bit 14 | 1 = upper red limit displayed |
| HYD2\_ANALOG\_VALUE | % | bit 17 to bit 29  bit 28 = 64 | range 0 to 128  range 0 to 100 is only used |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.6.1.204 Engine 1 EOP status

Requirement ID: H398-SRS-GWY-FNC-1024

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall set the Engine 1 EOP status as follows:

"Red" If

* Engine 1 EOP value is less than constant "Engine 1 EOP low red limit" (1.7 bars)

OR

* Engine 1 EOP value is greater than or equal to constant "Engine 1 EOP high red limit" (6 bars))

"Nominal" Otherwise.

#### 16.6.1.205 Engine 2 EOP status

Requirement ID: H398-SRS-GWY-FNC-1025

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall set the Engine 2 EOP status as follows:

"Red" If

* Engine 2 EOP value is less than constant "Engine 2 EOP low red limit" (1.7 bars)

OR

* Engine 2 EOP value is greater than or equal to constant "Engine 2 EOP high red limit" (6 bars))

"Nominal" Otherwise

#### 16.6.1.206 EOP1 ANALOG VALUE

Requirement ID: H398-SRS-GWY-FNC-994

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall transmit the following data into ARINC429 message “EOP1 ANALOG VALUE” (label 321-01) as follows:

* "EOP1\_ANALOG\_VALUE" using Engine 1 EOP analog value (%)
* "EOP1\_DISP\_BOT\_RED\_LIM" and "EOP1\_DISP\_TOP\_RED\_LIM" using Engine 1 EOP operation limits (Bottom thin red line, Top thin red line)

with the SSM set as follow:

1. NO (Normal operation) if "Engine 1 EOP validity" is valid.
2. FW (Failure warning) in all other cases.

#### 16.6.1.207 EOP2 ANALOG VALUE

Requirement ID: H398-SRS-GWY-FNC-995

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway shall emit the following data into ARINC429 message “EOP2 ANALOG VALUE” (label 321-10):

* "EOP2\_ANALOG\_VALUE"(bit 17-29) using Engine 2 EOP analog value (%)
* "EOP2\_DISP\_BOT\_RED\_LIM"(bit 11) and "EOP2\_DISP\_TOP\_RED\_LIM" using Engine 2 EOP operation limits (Bottom thin red line, Top thin red line) with the

SSM set as follow:

1. NO if "Engine 2 EOP validity" is valid.
2. FW in all other cases.

#### 16.6.1.208 EOP1 DIGITAL VALUE

Requirement ID: H398-SRS-GWY-FNC-1022

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall emit the following data into ARINC429 message "EOP1 DIGITAL VALUE" (label 320-01):

* "EOP1\_DIGITAL\_VALUE" using Engine 1 EOP value (bar)
* "EOP1\_SST" using Engine 1 EOP status (Red, Nominal) and

SSM set as below:

* + NO (Normal operation) if Engine 1 EOP validity is valid.
  + FW (Failure warning) in all other cases

#### 16.6.1.209 EOP2 DIGITAL VALUE

Requirement ID: H398-SRS-GWY-FNC-1023

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall emit the following data into ARINC429 message "EOP2 DIGITAL VALUE" (label 320-10):

* "EOP2\_DIGITAL\_VALUE" using Engine 2 EOP value (bar)
* "EOP2\_SST " using Engine 2 EOP status (Red, Nominal) and

SSM set as below:

* + NO (Normal operaion) if Engine 2 EOP validity is valid.
  + FW (Failure warning) in all other cases

#### 16.6.1.210 FUEL PRESS1 status

Requirement ID: H398-SRS-GWY-FNC-1029

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall set the FUEL PRESS1 status as follows:

* "Red" If

(FUEL PRESS 1 value is less than constant "FUEL PRESS 1 low red limit value" (0.3 bar) OR FUEL PRESS 1 value is greater than constant "FUEL PRESS 1 high red limit value" (1.5 bar))

* "Nominal" Otherwise

#### 16.6.1.211 FUEL PRESS2 status

Requirement ID: H398-SRS-GWY-FNC-1030

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall set the FUEL PRESS2 status as follows:

* "Red" If

(FUEL PRESS 2 value is less than constant "FUEL PRESS 2 low red limit value" (0.3 bar) OR FUEL PRESS 2 value is greater than constant "FUEL PRESS 2 high red limit value" (1.5 bar))

* "Nominal" Otherwise

#### 16.6.1.212 FUEL PRESS 1 DIGITAL VALUE

Requirement ID: H398-SRS-GWY-FNC-1026

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall emit the following data into ARINC429 message "FUEL PRESS 1 DIGITAL VALUE" (label 262-01):

"FUEL\_PRESS1\_DIGITAL\_VALUE" using FUEL PRESS 1 value (bar)

"FUEL\_PRESS1\_SST" using FUEL PRESS 1 status (Red, Nominal)

SSM:

* NO if FUEL PRESS 1 validity is valid.
* FW in all other cases.

#### 16.6.1.213 FUEL PRESS 2 DIGITAL VALUE

Requirement ID: H398-SRS-GWY-FNC-1027

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall emit the following data into ARINC429 message "FUEL PRESS 2 DIGITAL VALUE" (label 262-10):

"FUEL\_PRESS2\_DIGITAL\_VALUE" using FUEL PRESS 2 value (bar)

"FUEL\_PRESS2\_SST" using FUEL PRESS 2 status (Red, Nominal)

SSM:

* NO if FUEL PRESS 2 validity is valid.
* FW in all other cases.

#### 16.6.1.214 HYD 1 DIGITAL VALUE

Requirement ID: H398-SRS-GWY-FNC-1041

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data into ARINC429 message "HYD 1 DIGITAL VALUE" (label 174-01):

"HYD1\_DIGITAL\_VALUE" using HYD PRESS 1 value (bar)

"HYD1\_SST" using HYD PRESS 1 status (Red, Nominal)

SSM:

* NO if HYD PRESS 1 validity is valid.
* FW in all other cases

#### 16.6.1.215 HYD 2 DIGITAL VALUE

Requirement ID: H398-SRS-GWY-FNC-1042

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall emit the following data into ARINC429 message "HYD 2 DIGITAL VALUE" (label 174-10):

"HYD2\_DIGITAL\_VALUE" using HYD PRESS 2 value (bar)

"HYD2\_SST" using HYD PRESS 2 status (Red, Nominal)

SSM:

* NO if HYD PRESS 2 validity is valid.
* FW in all other cases.

#### 16.6.1.216 HYD 1 ANALOG VALUE

Requirement ID: H398-SRS-GWY-FNC-1043

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The GATEWAY MODULE shall emit the following data into ARINC429 message “HYD 1 ANALOG VALUE” (label 175-01):

"HYD1\_ANALOG\_VALUE" using HYD PRESS 1 analog value (%)

"HYD1\_DISP\_BOT\_RED\_LIM" and "HYD1\_DISP\_TOP\_RED\_LIM" using HYD PRESS 1 operation limits (Bottom thin red line, Top thin red line) with the SSM set as follow:

* NO if "HYD PRESS 1 validity" is valid.
* FW in all other cases.

#### 16.6.1.217 HYD 2 ANALOG VALUE

Requirement ID: H398-SRS-GWY-FNC-1044

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

 The GATEWAY MODULE shall emit the following data into ARINC429 message “HYD 2 ANALOG VALUE” (label 175-10):

"HYD2\_ANALOG\_VALUE" using HYD PRESS 2 analog value (%)

"HYD2\_DISP\_BOT\_RED\_LIM" and "HYD2\_DISP\_TOP\_RED\_LIM" using HYD PRESS 2 operation limits (Bottom thin red line, Top thin red line) with the SSM set as follow:

* NO if "HYD PRESS 2 validity" is valid.
* FW in all other cases.

#### 16.6.1.218 Label 176 SDI 01 Details

Requirement ID: H398-SRS-GWY-FNC-1059

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall transmit the following data on ARINC 429 PARAMETER BUS

OUT OF DAU (label 176-01):

Table - Label 176 SDI 01 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| MGB\_OIL\_PRESS\_SST | Label 176 SDI 01 | NO |  | bit 12 to bit 13 | 00 = Normal |
| 01 = Amber |
| 10 = Red |
| 11 = Not used |
| MGB\_OIL\_PRESS\_NumStatusBlink | bit 14  "Provision, not used on RNLAF" | 0 = Not Blinking  1 = Blinking |
| MGB\_OIL\_PRESS\_DIGITAL\_VALUE | bar | bit 17 to bit 29  bit 28 = 16 | range 0 to 32  range 0 to 7 is only used (functional range) |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.6.1.219 Label 177 SDI 01 Details

Requirement ID: H398-SRS-GWY-FNC-1060

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall transmit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 177-01):

Table - Label 177 SDI 01 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| MGBP\_DISP\_BOT\_RED\_LIM | Label 177 SDI 01 | NO |  | bit 11 | 1 = bottom red limit displayed |
| MGBP\_DISP\_BOT\_YEL\_LIM | bit 12 | 1 = bottom yellow limit displayed |
| MGBP\_DISP\_TOP\_YEL\_LIM | bit 13 | 1 = upper yellow limit displayed |
| MGBP\_DISP\_TOP\_RED\_LIM | bit 14 | 1 = upper red limit displayed |
| MGB\_OIL\_PRESS\_ANALOG\_VALUE | PSI | bit 17 to bit 29  bit 28 = 64 | range 0 to 128  range 0 to 100 is only used |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.6.1.220 MGB OIL PRESS DIGITAL VALUE

Requirement ID: H398-SRS-GWY-FNC-1057

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall transmit the following data into ARINC429 message "MGB OIL PRESS DIGITAL VALUE" (Label 176-01):

* "MGB\_OIL\_PRESS\_DIGITAL\_VALUE" using MGB Oil Press value (bar)
* "MGB\_OIL\_PRESS\_SST" using MGB Oil Press status (Red, Nominal)

with SSM as below:

* + NO (Normal operation) if MGB Oil Press validity is valid.
  + FW (Failure warning) in all other cases.

#### 16.6.1.221 MGB OIL PRESS ANALOG VALUE

Requirement ID: H398-SRS-GWY-FNC-1058

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall transmit the following data into ARINC429 message “MGB OIL PRESS ANALOG VALUE” (label 177-01):

* "MGB\_OIL\_PRESS\_ANALOG\_VALUE" using MGB Oil Press analog value (%)
* "MGBP\_DISP\_BOT\_RED\_LIM" using MGB Oil Press operation limits (bottom thin red line)

SSM set as follow:

* + NO (Normal operation) if "MGB Oil Press validity" is valid.
  + FW (Failure warning) in all other cases

#### 16.6.1.222 Label 200 SDI 01 Details

Requirement ID: H398-SRS-GWY-FNC-1068

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall transmit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 200-01):

Table - Label 200 SDI 01 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| MGB\_OIL\_TEMP\_SST | Label 200 SDI 01 | NO |  | bit 12 to bit 13 | 00 = Normal |
| 01 = Amber |
| 10 = Red |
| 11 = Not used |
| MGB\_OIL\_TEMP\_NumStatusBlink | bit 14  "Provision, not used on RNLAF" | 0 = Not Blinking  1 = Blinking |
| MGB\_OIL\_TEMP\_DIGITAL\_VALUE | °C | bit 17 to bit 29  bit 28 = 256 | [-256 ; 256] |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.6.1.223 Label 201 SDI 01 Details

Requirement ID: H398-SRS-GWY-FNC-1069

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall transmit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 201-01):

Table - Label 201 SDI 01 Details

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Name | Label definition | SSM | Unit | Range | Functional definition |
| MGBT\_DISP\_BOT\_RED\_LIM | Label 201 SDI 01 | NO |  | bit 11 | 1 = bottom red limit displayed |
| MGBT\_DISP\_BOT\_YEL\_LIM | bit 12 | 1 = bottom yellow limit displayed |
| MGBT\_DISP\_TOP\_YEL\_LIM | bit 13 | 1 = upper yellow limit displayed |
| MGBT\_DISP\_TOP\_RED\_LIM | bit 14 | 1 = upper red limit displayed |
| MGB\_OIL\_TEMP\_ANALOG\_VALUE | °C | bit 17 to bit 29  bit 28 = 64 | range 0 to 128  range 0 to 100 is only used |
| FT |  |  |  |
| NCD |  |  |
| FW |  |  |

#### 16.6.1.224 MGB OIL TEMP DIGITAL VALUE

Requirement ID: H398-SRS-GWY-FNC-1066

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall transmit the following data into ARINC429 message "MGB OIL TEMP DIGITAL VALUE" (Label 200-01):

* "MGB\_OIL\_TEMP\_DIGITAL\_VALUE" using MGB Oil Temperature value (°C)
* "MGB\_OIL\_TEMP\_SST"using MGB Oil Temperature status (Red, Nominal) with SSM:
  + NO (Normal operation) if MGB Oil Temperature validity is valid.
  + FW (Failure warning) in all other cases.
  + NCD case is not used.

#### 16.6.1.225 MGB OIL TEMP ANALOG VALUE

Requirement ID: H398-SRS-GWY-FNC-1067

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall transmit the following data into ARINC429 message "MGB OIL TEMP ANALOG VALUE"

(Label 201-01):

* "MGB\_OIL\_TEMP\_ANALOG\_VALUE" using MGB Oil Temperature analog value (%)
* "MGBT\_DISP\_BOT\_RED\_LIM" and "MGBT\_DISP\_TOP\_RED\_LIM" using MGB Oil Temperature

operation limits (Bottom thin red line, Top thin red line) with the SSM set as follow:

* + NO if "MGB Oil Temperature validity" is valid.
  + FW in all other cases.
  + NCD case is not used.

#### 16.6.1.226 lighting modes

Requirement ID: H398-SRS-GWY-FNC-1081

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall include the capability to acquire signals corresponding to lighting modes (DAY/NIGHT/NVG) and backlighting intensity values from external lighting management system.

#### 16.6.1.227 ARINC 429 output to DU

Requirement ID: H398-SRS-GWY-FNC-1082

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall include the capability of acting as data concentrator and transmit all acquired data through an ARINC 429 output to DU (Display unit).

#### 16.6.1.228 A429 message

Requirement ID: H398-SRS-GWY-FNC-1083

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Each Gateway channel shall receive A429 from both system displays.The following information is transmitted by the displays:

* Equipment status / Failure report
* Reconfiguration mode
* Discrepancy report.

#### 16.6.1.229 power supply

The Gateway module will incorporate redundant 28V power supply inputs and it supply the power needed by sensors as shown in H398-SRS-GWY-FNC-628.

#### 16.6.1.232 status message priority

Requirement ID: H398-SRS-GWY-FNC-1073

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall emit the system status message to the displays with the following priority:

EIU1 Failure message “DAU 1 FAIL” when:

* EIU1 Bus failure is detected by DAU or
* Reconfiguration discrepancy is detected and the channel master is EIU2 or
* Reconfiguration capability test is failed and the channel master is EIU2 or
* Master reconfiguration fault is raised by the DAU and the channel master is EIU2

EIU2 Failure message “DAU 2 FAIL” when:

* EIU2 Bus failure is detected by DAU or
* Reconfiguration discrepancy is detected and the channel master is EIU1 or
* Reconfiguration capability test is failed and the channel master is EIU1 or
* Master reconfiguration fault is raised by the DAU and the channel master is EIU1

Check DAU message “CHECK DAU” when the reconfiguration state is set to N and:

* VMS discrepancy is detected between EIU1 and EIU2 or
* VMS cross-talk loss is detected by DAU.

EIU1&2 Failure message on DU “PRIMARY VMD FAIL” when:

* ARINC429 line failed from PVMD to DAU

EIU1&2 Failure message on second display (backup) "B/UP VMD FAIL" when:

* ARINC429 line failed from REMISE to DAU

No message, otherwise

#### 16.6.1.233 Label 031 Units

Requirement ID: H398-SRS-GWY-FNC-1192

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall have the format as shown in below Table for Label 031, Units

Table - Label 031 Units

| **Label 031 Output** | **Units** | | |
| --- | --- | --- | --- |
| **Bit(s)** | **Functional definition** | **Bit Name** | **Logic** |
| bit1 – bit8 | 031 | Label | N/A |
| bit 9 to bit 10 | 00 = N/A  01 = EIU 1  10 = EIU 2  11 = N/A | SDI | N/A |
| bit 11 – bit 14 | Spare | Spare |  |
| bit 15 | 0 = Bars  1 = psi | Pressure Units |  |
| bit 16 – bit 29 | Spare | Spare |  |
| bit 30 – bit 31 | 00 = Failure Warning  01 = NCD  10 = Functional Test  11 = Normal Operation | SSM | N/A |
| bit 32 |  | Parity |  |

#### 16.6.1.234 Label 077 Lighting state

Requirement ID: H398-SRS-GWY-FNC-1191

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall have the format as shown in below table for lable 077 lighting state.

Table – Label 077 Lighting State

| **Label 077 Output** | **Lighting State** | | |
| --- | --- | --- | --- |
| **Bit(s)** | **Functional Definition** | **Bit Name** | **Comment** |
| bit1 – bit8 | 077 | Label |  |
| bit 9 to bit 10 | 01 = DU1  10 = DU2 |  |  |
| 11-23 | Spare |  | Note: REMISE display use this bit to transmit data not related with VMS system |
| 24 | 0 = NVG  1 = Normal | NVG/Normal state from displays |  |
| 25 | 0 = Day  1 = Night | Day/Night state from displays |  |
| 26-29 | Spare | Current system mode | Note: REMISE display use this bit to transmit data not related with VMS system |
| bit 30 to bit 31 | 11 = NO |  |  |
| 32 | Parity |  |  |

### 16.6.2 Failure Frame Logic

#### 16.6.2.1 Engine 1 failure frame

Requirement ID: H398-SRS-GWY-FNC-868

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set "Engine 1 failure frame" to true when:

((("Engine 2 state" is OEI AND "Engine 1 training" is false) OR "Engine 2 training is true) AND

"Engine 1 START advisory is false AND DAU ARINC429 line is valid)

#### 16.6.2.2 Engine 2 failure frame

Requirement ID: H398-SRS-GWY-FNC-869

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall set "Engine 2 failure frame" to true when:

((("Engine 1 state" is OEI AND "Engine 2 training" is false) OR "Engine 1 training is true) AND "Engine 2 START advisory is false AND DAU ARINC429 line is valid)

### 16.6.3 Label 013 Deselection Bits

Requirement ID: H398-SRS-GWY-FNC-913

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall emit the following data on ARINC 429 PARAMETER BUS OUT OF DAU (label 13-00):

**Label 013 Deselection Bits**

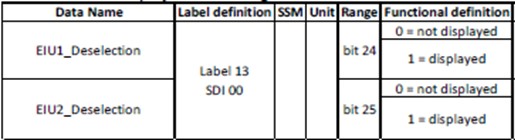


Figure : Deselection Bits

### 16.6.4 DU1 Pressure Units

Requirement ID: H398-SRS-GWY-FNC-1146

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall emit the Pressure unit selected into ARINC429 message “UNITS\_DU1” (label 31-01) as shown in Table:

Table – DU1 Pressure Units

|  |  |
| --- | --- |
| Pressure unit selected\* | Label 31 bit 15 |
| Bar | 0 |
| PSI | 1 |

\*On RNLAF, the Pressure unit selected is always set to 1

### 16.6.5 DU2 Pressure Units

Requirement ID: H398-SRS-GWY-FNC-1147

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall emit the Pressure unit selected into ARINC429 message “UNITS\_DU2” (label 31-10) as shown in Table:

Table – DU2 Pressure Units

|  |  |
| --- | --- |
| Pressure unit selected\* | Label 31 bit 15 |
| Bar | 0 |
| PSI | 1 |

\*On RNLAF, the Pressure unit selected is always set to 1

### 16.6.6 Internal General Purpose Outputs

The following section specifies the General Purpose Output pins used by Gateway Module.

#### 16.6.6.1 Heartbeat LED

Requirement ID: H398-SRS-GWY-DRQ-397

MOPS: No

Safety Requirement: No

Rationale: Required to define HeartBeat LED indication to identify the health status

Verification Method: Testing

The Gateway Module shall use the Heartbeat LED to indicate the execution health status of the Gateway as specified in Table : HeartBeat LED

Table : HeartBeat LED

|  |  |
| --- | --- |
| **LED** | **Meaning** |
| Flashing | Gateway is in Normal Mode |
| Steady On | Gateway is in Error Mode |

Note: Flash the Heartbeat LED at a rate of 1Hz.

#### 16.6.6.2 RS-232 loop back test

Requirement ID: H398-SRS-GWY-DRQ-398

MOPS: No

Safety Requirement: No

Rationale: Required to enable RS232 Loop back test

Verification Method: Testing

To enable the RS-232 ports in loop back mode, the Gateway Module shall set the PC 11 pin to low.

#### 16.6.6.3 Status LED

Requirement ID: H398-SRS-GWY-DRQ-399

MOPS: No

Safety Requirement: No

Rationale: Required to define Status LED actions

Verification Method: Testing

The Gateway Module shall use the Status LED as specified in Table : Status LED

Table : Status LED

|  |  |
| --- | --- |
| **LED** | **Meaning** |
| Flashing Green at 1Hz | Normal Operating Mode - Active Channel (Drive Excitation) |
| Steady Green | Normal Operating Mode - Non Active Channel |
| Steady Red | PBIT Mode |
| Flashing Red at 1Hz | Error Mode |

### 16.6.7 Discrete Output Processing(Through Discrete Module)

Requirement ID: H398-SRS-GWY-FNC-400

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall process the Discrete Signals and send the discrete status to Discrete Module through ARINC 825 message to send the discrete outputs.

## 16.7 discrete signals

Requirement ID: H398-SRS-GWY-FNC-1045

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall read the discrete signals coming from different alerts and light indication systems in-order to display them in the GVMS display system.

### 16.7.1 system status message

Requirement ID: H398-SRS-GWY-FNC-1046

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall set the system status message with the following priority:

EIU1 Failure message “DAU1 FAIL” when indicated by H398-SRS-GWY-FNC-1073.

EIU2 Failure message “DAU2 FAIL” when indicated by H398-SRS-GWY-FNC-1073.

Check DAU message “CHECK DAU” when indicated by H398-SRS-GWY-FNC-1073.

Display Failure message " PRIMARY VMD FAIL " when indicated by H398-SRS-GWY-FNC-1073.

Backup Display Failure message “B/UP VMD FAIL” when indicated by H398-SRS-GWY-FNC-1073.

No message, otherwise

Note :

These messages can appear on both the primary page and the preflight page.

### 16.7.3 Delta NG Threshold Discrete Output Logic

Requirement ID: H398-SRS-GWY-FNC-1048

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall be able to output two Open/Ground with the following logic: -

If "Engine 1 DeltaNG value" or "Engine 2 DeltaNG value" is greater than 1.3%

Output is '1' (0V)

OR

(Engine 1 DeltaNG is invalid or Engine 2 DeltaNG is invalid)

Otherwise,

Output is '0' (Open).

### 16.7.4 OEI event

Requirement ID: H398-SRS-GWY-FNC-1049

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Safe state for P2 valve output shall be 0V in-order to be conservative in case of an OEI event which is

input to the Gateway.

### 16.7.7 Backlight Characteristics

Requirement ID: H398-SRS-GWY-FNC-1050

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall be able to acquire the lighting mode (Day/Night) from an external control panel by reading a discrete signal. Activated signal (0V) corresponds to DAY mode, while deactivated state (28V) corresponds to NIGHT mode.

Table - Backlight Characteristics

|  |  |
| --- | --- |
| Model | AS532 MKII |
| Range | Open/Ground 0V |
| Unit | Voltage |
| Characteristic Details | DI003 |

### 16.7.8 NVG Mode (NORMAL/NVG)

Requirement ID: H398-SRS-GWY-FNC-1051

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway module shall be able to acquire the Normal/NVG mode from an external control panel by reading a discrete signal. Activated signal (0V) corresponds to NVG mode, while deactivated state (28V) corresponds to Normal mode.

### 16.7.11 discrete signals flickering alerts

Requirement ID: H398-SRS-GWY-FNC-1133

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway shall incorporate a 100ms filter time for discrete signals in order to avoid flickering alerts except for these discrete signals

OEI30\_ENG1(HI 1) (DI\_2)

OEI30\_ENG2 (HI 2) (DI\_3)

OEI2\_ENG1 (LO 1) (DI\_4)

OEI2\_ENG2 (LO 2) (DI\_5)

ENG\_GOV1 (DI\_11)

ENG\_GOV2 (DI\_12)

## 16.8 A825 Communication

This section specifies Software High Level Requirements for the A825 communication.

### 16.8.1 Logical Communication Channel

Requirement ID: H398-SRS-GWY-FNC-445

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall use the following Logical Communication Channels to communicate over the A825 bus

1. Node Service Channel (NSC)

2. Normal Operation Channel (NOC)

### 16.8.2 Invalid A825 message

Requirement ID: H398-SRS-GWY-FNC-446

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall ignore an A825 message if it is invalid.

Note: an invalid message is one which does not satisfy the specified NSC/NOC message formats.

### 16.8.3 NSC Channel

This section specifies requirements for messages sent over NSC channel of the A825 bus.

#### 16.8.3.1 NSC message format

The Gateway Module shall use the message structure illustrated in NSC message format while using the NSC channel

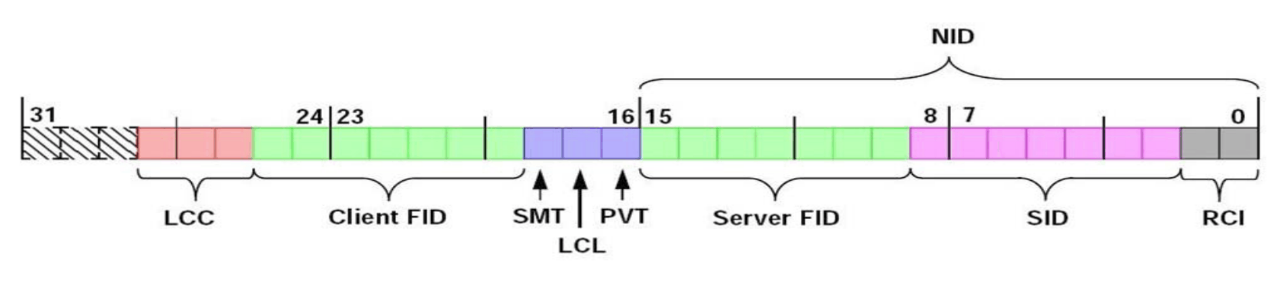


Figure 7:NSC message format

Note:

i. LCC - Indicates the Logical Communication Channel

ii. Client FID - always 42

iii. SMT - Indicates whether message is Request (1) or Response (0)

iv. LCL - messages is designated only for the network the transmitting node resides in - always 1

v. PVT - messages which have no meaning to nodes other than those which are specifically programmed to use them - always 1

vi. Server FID - Always 42

vii. Server ID - Specifies the recipient node for the message

viii. RCI - Redundancy Channel Identifier

#### 16.8.3.2 NSC messages

Requirement ID: H398-SRS-GWY-FNC-449

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall use the Service Function Codes specified in Table: List of NSC messages in its A825 communication over the Node Service Channel

Table : List of NSC messages

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SFC** | **Client FID** | **SMT** | **LCL** | **PVT** | **Server FID** | **Server ID** | **Rx/Tx** | **RCI** | **DLC** | **Description** | **Payload** |
| NSC\_SET\_DOUT1 (49153) | 42 | 1 | 1 | 1 | 42 | 3 | Tx | 0 | 6 | Command to the Discrete Module to set output discrete 1 through 16 to be set to the value indicated by the payload. | The first two bytes of the payload contain the SFC. The next six bytes contain the desired status of discrete outputs 1 thru 16. 0=OFF, 1 = ON, and 2 = FLASH. The status of discrete output number one is contained in the least significant two bits of the third byte of the payload. The status of discrete output number two is contained in the 3rd and 4th least significant bits of the third byte of the payload, etc. |
| NSC\_EXCITE\_SWITCH  (49156) | 42 | 1 | 1 | 1 | HOWELL\_DAS\_FID(42) | MULITCAST\_SID(0) | Tx | 0 | 3 | Command from Gateway to Analog and Discrete Module to switch on/off the excitation | The first two bytes of the payload contain the SFC. The third byte is (OFF = 0, ON = 1). |
| NSC\_RESET (44544) | 42 | 1 | 1 | 1 | HOWELL\_DAS\_FID(42) | MULITCAST\_SID(0) | Rx | 0 | 3 | Command to Gateway Module to reset the Gateway CPU. | The first two bytes of the payload contain the SFC ‘NSC\_RESET'. |
| NSC\_GET\_CM\_RCI  (49155) | 42 | 1 | 1 | 1 | 42 | 6 | Tx | 0 | 2 | Command to the CMU to send its RCI, operation mode, and data validity. | The first two bytes of the payload contain the SFC. |
| NSC\_GET\_CM\_RCI  (49155) | 42 | 0 | 1 | 1 | 42 | 6 | Rx | 0 | 5 | Response by CMU to the SFC = 49155 request | The first two bytes of the payload contain the SFC. The third byte contains the RCI (0 or 1), the fourth byte contains always value 1, the fifth contains the result of a CRC on the data store (0 = FAIL, 1 = PASS). |
| 49164(*NSC\_GETETI)* | 42 | 1 | 1 | 1 | 42 | 1 | Rx | 0 | 2 | Command from CMU+ to gateway to get ETI time | The two bytes of the payload contain the SFC. |
| 49164(*NSC\_GETETI)* | 42 | 0 | 1 | 1 | 42 | 1 | Tx | 0 | 6 | Gateway Responds to GETETI Command from CMU+ with ETI time | The first two bytes of the payload contain the SFC.Next 4 bytes contains ETI time |
| 49163(NSC\_SETETI) | 42 | 1 | 1 | 1 | 42 | 1 | Rx | 0 | 2 | Command from CMU+ to gateway to set ETI time | The first two bytes of the payload contain the SFC.Next 4 bytes contains ETI time to be set. |
| 49163(NSC\_SETETI) | 42 | 0 | 1 | 1 | 42 | 1 | Tx | 0 | 6 | Gateway Responds to SETETI Command from CMU+ with ETI time set | The first two bytes of the payload contain the SFC.Next 4 bytes contains ETI time set. |
| 49165(*NSC\_CLEARLOG)* | 42 | 1 | 1 | 1 | 42 | 5 | Rx | 0 | 2 | Request from CMU+/DLU to clear the faults in NVM | The first two bytes of the payload contain the SFC. |
| 49165(*NSC\_CLEARLOG)* | 42 | 0 | 1 | 1 | 42 | 5 | Tx | 0 | 3 | Response to CMU+/DLU to transmit the status of clear operation of faults in NVM | The first two bytes of the payload contain the SFC. The third byte contains the status of Clear operation on faults in NVM (1= faults in NVM are cleared) |
| 49166(NSC\_GETLOG) | 42 | 1 | 1 | 1 | 42 | 5 | Rx | 0 | 4 | Request from CMU+/DLU to send the faults in NVM | The first two bytes of the payload contain the SFC. |
| 49166(NSC\_GETLOG) | 42 | 0 | 1 | 1 | 42 | 5 | Tx | 0 | 4 | Response to CMU+/DLU to transmit the faults in NVM | The first two bytes of the payload contain the SFC. The third and fourth bytes contain the number of faults in NVM. All the faults are transmitted in Doc ID 2000 NOC message. |
| 3 | 42 | 1 | 1 | 1 | 42 | 6 | Rx | 0 | 8 | Request to CMU to transmit Aircraft Configuration Data Table. | The first two bytes of the payload contain the SFC. The fourth byte contains 2. Other bytes contain 0. |
| 3 | 42 | 0 | 1 | 1 | 42 | 6 | Tx | 0 | 8 | CMU responds to the Gateway with the number of ACD bytes to be downloaded. | The first two bytes of the payload contain the SFC. The third, fourth byte contains 1. Fifth and sixth byte contains the number of bytes acknowledged to the Gateway (5k).  Other bytes contain 0. |
| 3 | 42 | 1 | 1 | 1 | 42 | 6 | Rx | 0 | 8 | Gateway request to CMU with the download size request (5k) | The first two bytes of the payload contain the SFC. The third byte contains 1, fourth byte contains 0. Fifth and sixth byte contains the number of downloaded bytes requested by the Gateway to CMU.  Other bytes contain 0. |
| 3 | 42 | 0 | 1 | 1 | 42 | 6 | Tx | 0 | 8 | CMU response to Gateway with the download size (5k) | The first two bytes of the payload contain the SFC. The third byte contains 1, fourth byte contains 0. Fifth and sixth byte contains the number of downloaded bytes acknowledged by the CMU to Gateway.  Other bytes contain 0. |
| Start of ACD transfer begins | 42 | 0 | 1 | 1 | 42 | 6 | Tx | 0 | 8 | Start of ACD Transfer from CMU side to Gateway | CMU transfer 5k bytes of data to Gateway Sequentially |
| 3 | 42 | 1 | 1 | 1 | 42 | 6 | Rx | 0 | 2 | Gateway acknowledgement to CMU after finish of ACD transfer from CMU | The first two bytes of the payload contain the SFC. The third byte contains 1, Other bytes contain 0. |

Note:

1. Rx/Tx - Indicates whether Gateway module Receives (Rx) or Transmits (Tx) the message

2. DLC - Data Length Count - size of the payload in bytes

#### 16.8.3.3 Discrete Outputs

Requirement ID: H398-SRS-GWY-FNC-451

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall send the values of the Discrete Outputs mentioned in ‘Table: A825 payload for Discrete Outputs#1’ in the payload of the A825 message with LCC = NSC and SFC = 49153 to the Discrete Module to set the discrete output whenever there is a change in any of the discrete output.

Table :A825 payload for Discrete Outputs#1

|  |  |
| --- | --- |
| **Output signal** | **Payload** |
| Byte# | Bit position |
| ΔNG1\_THRESH | 5 | 3, 4 |
| ΔNG2\_THRESH | 5 | 5, 6 |

#### 16.8.3.4 Switch excitation

Requirement ID: H398-SRS-GWY-FNC-452

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall send NSC message to discrete and Analog with LCC = NSC and SFC = 49156 and the payload as per ‘Table: Action for SFC = 49156’ in A825 message to perform the corresponding actions.

Table : Action for SFC = 49156

|  |  |
| --- | --- |
| **Payload Byte#3 value** | **Action** |
| 0 | Switch off excitation to Analog and Discrete Module |
| 1 | Switch on excitation to Analog and Discrete Module |
| Any other value | No action |

#### 16.8.3.5 Reset CPU

Requirement ID: H398-SRS-GWY-DRQ-455

MOPS: No

Safety Requirement: No

Rationale: Resetting the discrete board is required to support software verification activities

Verification Method: Testing

The Gateway Module shall reset the Gateway module CPU when NSC message with SFC = NSC\_RESET (44544) received.

### 16.8.4 NOC Channel

This section specifies Software High Level Requirements for messages sent over NOC channel of the CAN bus.

#### 16.8.4.1 NOC message format

The Gateway Module shall use the message structure illustrated in NOC message format while using the NOC channel

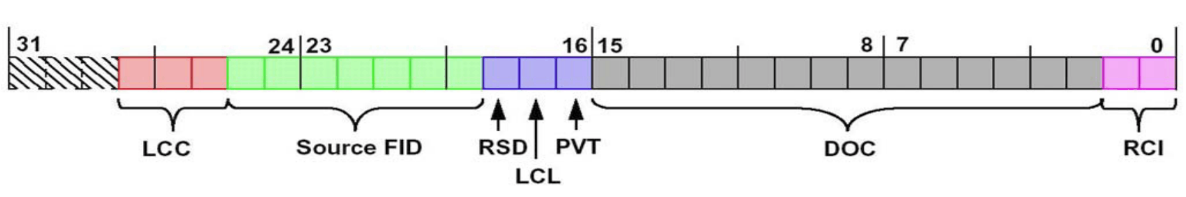


Figure 8: NOC message format

Note:

i. LCC - Indicates the Logical Communication Channel

ii. Source FID - always 42

iii. RSD - Reserved - always 0

iv. LCL - messages is designated only for the network the transmitting node resides in - always 1

v. PVT - messages which have no meaning to nodes other than those which are specifically programmed to use them - always 1

vi. DOC - Data Object Code

vii. RCI - Redundancy Channel Identifier

#### 16.8.4.2 NOC messages

Requirement ID: H398-SRS-GWY-FNC-458

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall use the Document Object Codes specified in Table: List of Document Object Codes in its A825 communication over the Normal Operation Channel:

Table :List of Document Object Codes

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **DOC** | **Source FID** | **RSD** | **LCL** | **PVT** | **RCI** | **Rx/Tx** | **DLC** | **Description** | **Payload** |
| 0 | 42 | 0 | 1 | 1 | Refer note. 3 | Tx | 0 | Gateway to command EDAU Discrete Module to send status of discrete inputs, discrete outputs and analog module to send analog scaled inputs and status of its inputs | NA |
| 100 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Discrete module sends Values of discrete inputs 1 through 64 to Gateway | Each discrete input is reported as a single bit of the payload. Discrete input number 1 appears in the least significant bit of the 1st payload byte. Discrete input number 64 appears in the most significant bit of the 8th payload byte. |
| 101 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 6 | Discrete module sends Values of discrete inputs 65 through 112 to Gateway | Each discrete input is reported as a single bit of the payload. Discrete input number 65 appears in the least significant bit of the 1st payload byte. Discrete input number 112 appears in the most significant bit of the 6th payload byte. |
| 200 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 4 | Discrete Module sends Values of chip detector inputs 1 through 32  to Gateway  (Note: This is not applicable as of now and it is retained for future use) | Each chip detector input is reported as a single bit of the payload. Chip detector input number 1 appears in the least significant bit of the 1st payload byte. Discrete input number 32 appears in the most significant bit of the 4th payload byte. |
| 300 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 6 | Discrete Module sends Present values of discrete output 1 through 16 to Gateway | Each discrete output value is represented by two bits of payload. 0 = OFF, 1 = ON, 2 = FLASH, and 3 is reserved. Discrete output number 1 appears in the least significant two bits of the 1st payload byte. Discrete output number 16 appears in the most significant two bits of the 6th payload byte. |
| 750 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 1 | Discrete Module sends 28V Discrete output monitor status  (Note: This is not applicable as of now and it is retained for future use) | 28V Discrete Output monitor status (True/False) is reported as a first bit of the byte |
| 2700 | 42 | 0 | 1 | 1 | Refer note. 3 | Tx | 0 | Gateway to command Discrete Module and Analog Module to send Application and Configuration Part Number and CRC | NA |
| 2722 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Discrete Module Boot Part number "H108E-21" | Values of Discrete Module Boot Part number first 8 bytes |
| 2723 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Discrete Module Boot Part number "7 -0.XY " | Values of Discrete Module Boot Part number next 8 bytes  Note: X and Y represents software version and varies for every software baseline |
| 2724 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Discrete Module Boot CRC value | 8 bytes containing Hexadecimal Discrete Module Boot CRC value. |
| 2725 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Discrete Module Application Software Part number "H108E-80" | Values of Application Part number first 8 bytes |
| 2726 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Discrete Module Application Software Part number "9 -0.XY " | Values of Application Part number next 8 bytes  Note: X and Y represents software version and varies for every software baseline |
| 2727 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Discrete Module Application Software CRC value | 8 bytes containing Hexadecimal Application CRC value. |
| 2728 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Discrete Module Configuration Part number "H108E-67" | Values of Configuration Part number first 8 bytes |
| 2729 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Discrete Module Configuration Part number "3 -0.XY " | Values of Configuration Part number next 8 bytes  Note: X and Y represents software version and varies for every software baseline |
| 2730 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Discrete Module Configuration CRC value | 8 bytes containing Hexadecimal CRC value. |
| 2731 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Discrete Module Boot Configuration Software Part number "H108E-64" | Values of Boot Configuration Software Part number first 8 bytes |
| 2732 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Discrete Module Boot Configuration Software Part number “8 -0.XY “ | Values of Boot Configuration Software Part number next 8 bytes  Note: X and Y represents software version and varies for every software baseline |
| 2733 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Discrete Module Boot Configuration Software CRC value | 8 bytes containing Hexadecimal CRC value. |
| 2737 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Discrete Module Software Loader Part number " H108E-64" | Values of Discrete Module Software Loader Part number first 8 bytes |
| 2738 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Discrete Module Software Loader Part number "7 -0.XY " | Values of Discrete Module Software Loader Part number next 8 bytes  Note: X and Y represents software version and varies for every software baseline |
| 2739 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Discrete Module Software Loader CRC value | 8 bytes containing Hexadecimal Discrete Module Software Loader CRC value. |
| 500 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Scaled values of the following Analog channels   1. BIT\_1 with resolution of 0.01 volts 2. L\_SENSE\_1 (SPARE\_1) 3. L\_SENSE\_2 (SPARE\_2) 4. LL\_1 (TOT1) with resolution of 0.1ºC   Sent By Analog Module To Gateway Module | Each input is reported as 2 byte of the payload. Analog channel A appears as the first two bytes of the payload. Analog channel B appears as the third and fourth byte, and so on. |
| 501 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Scaled values of the following Analog channels   1. LL\_2 (T0T2) with resolution of 0.1ºC 2. LL\_3 (EOP1) with resolution of 0.01mV 3. LL\_4 (EOP2) with resolution of 0.01mV 4. RTD\_1 (EOT1) with 0.01ohms   Sent By Analog Module To Gateway Module | Each input is reported as 2 byte of the payload. Analog channel A appears as the first two bytes of the payload. Analog channel B appears as the third and fourth byte, and so on. |
| 502 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Scaled values of the following Analog channels  A. BIT\_2 with resolution of 0.01 volts  B. RTD\_2 (EOT2) with 0.01ohms  C. RTD\_3 (SPARE\_3)  D. RTD\_4 (SPARE\_4)  Sent By Analog Module To Gateway Module | Each input is reported as 2 byte of the payload. Analog channel A appears as the first two bytes of the payload. Analog channel B appears as the third and fourth byte, and so on. |
| 503 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Scaled values of the following Analog channels.  A. RTD\_5 (SPARE\_5)  B. RTD\_6 (TOT\_R1) with 0.1ohms  C. RTD\_7 (TOT\_R2) with 0.1ohms  D. RTD\_8 (SPARE\_8)  Sent By Analog Module To Gateway Module | Each input is reported as 2 byte of the payload. Analog channel A appears as the first two bytes of the payload. Analog channel B appears as the third and fourth byte, and so on. |
| 504 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Scaled values of the following Analog channels  A.BIT\_3 with resolution of 0.01 volts  B.RTD\_9 (MGBT) with 0.1ohms  C. HL\_1 (TRQ1) with resolution of 0.001 volts  D.HL\_2 (TRQ2) with resolution of 0.001 volts  Sent By Analog Module To Gateway Module | Each input is reported as 2 byte of the payload. Analog channel A appears as the first two bytes of the payload. Analog channel B appears as the third and fourth byte, and so on. |
| 505 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Scaled values of the following Analog channels  A.HL\_RMS\_01 (EOP1 REF) with resolution of 0.001 volts  B.HL\_RMS\_02 (SPARE\_9)  C.HL\_RMS\_03 (EOP2 REF) with resolution of 0.001 volts  D.HL\_RMS\_04 (SPARE\_10)  Sent By Analog Module To Gateway Module | Each input is reported as 2 byte of the payload. Analog channel A appears as the first two bytes of the payload. Analog channel B appears as the third and fourth byte, and so on. |
| 506 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Scaled values of the following Analog channels  A. BIT\_4 with resolution of 0.01 volt  B.HL\_RMS\_05 (FP1 REF) with resolution of 0.001 volts  C.HL\_RMS\_06 (FP1) with resolution of 0.001 volts  D.HL\_RMS\_07 (FP2 REF) with resolution of 0.001 volts  Sent By Analog  Module To Gateway Module | Each input is reported as 2 byte of the payload. Analog channel A appears as the first two bytes of the payload. Analog channel B appears as the third and fourth byte, and so on. |
| 507 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Scaled values of the following Analog channels  A.HL\_RMS\_08 (FP2) with resolution of 0.01 volts  B.HL\_RMS\_09 (LHP\_REF) with resolution of 0.001 volts  C.HL\_RMS\_10 (LHP) with resolution of 0.001 volts  D.HL\_RMS\_11 (RHP\_REF) with resolution of 0.001 volts  Sent By Analog Module To Gateway Module | Each input is reported as 2 byte of the payload. Analog channel A appears as the first two bytes of the payload. Analog channel B appears as the third and fourth byte, and so on. |
| 508 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Scaled values of the following Analog channels  A.BIT\_5 with resolution of 0.01 volt  B.HL\_RMS\_12 (RHP) with resolution of 0.001 volts  C.HL\_RMS\_13 (MGBOP\_REF) with resolution of 0.001 volts  D.HL\_RMS\_14 (MGBOP) with resolution of 0.001 volts  Sent By Analog Module To Gateway Module | Each input is reported as 2 byte of the payload. Analog channel A appears as the first two bytes of the payload. Analog channel B appears as the third and fourth byte, and so on. |
| 509 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Scaled values of the following Analog channels  A.HL\_RMS\_15 (SPARE\_11)  B.HL\_RMS\_16 (SPARE\_12)  C.HL\_RMS\_17 (SPARE\_13)  D.HL\_RMS\_18 (SPARE\_14)  Sent By Analog Module To Gateway Module | Each input is reported as 2 byte of the payload. Analog channel A appears as the first two bytes of the payload. Analog channel B appears as the third and fourth byte, and so on. |
| 510 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Scaled values of the following Analog channels  A.SPARE  B.DELTA NG1 (Duty Cycle)  C.DELTA NG2 (Duty Cycle)  D.TACH\_1(NG1)  Sent By Analog Module To Gateway Module | Each input is reported as 2 byte of the payload. Analog channel A appears as the first two bytes of the payload. Analog channel B appears as the third and fourth byte, and so on. |
| 511 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Scaled values of the following Analog channels  A.TACH\_2(NG2)  B.TACH\_3(SPARE)  C.TACH\_4(SPARE)  D.TACH\_5(SPARE)  Sent By Analog Module To Gateway Module | Each input is reported as 2 byte of the payload. Analog channel A appears as the first two bytes of the payload. Analog channel B appears as the third and fourth byte, and so on. |
| 512 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Scaled values of the following Analog channels  A.TACH\_6(SPARE)  B.  C.  D.  Sent By Analog Module To Gateway Module | Each input is reported as 2 byte of the payload. Analog channel A appears as the first two bytes of the payload. Analog channel B appears as the third and fourth byte, and so on. |
| 600 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Status of Analog input Parameters from 1 to 32 (Channels 1 – 8 of Bank #1 and Channels 1 – 8 Bank #4)  Sent By Analog Module To Gateway Module | Two bits of status for each channel  Value 00 represents Channel OK, Value 01 represents Range Error, Value 10 represents Channel Error and Value 11 has no meaning. |
| 601 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Status of Analog input Parameter from 33 (Channels 1 – 8 of Bank #5, DeltaNG1, DeltaNG2, Channels 1 – 6 for TACH.  Sent By Analog Module To Gateway Module | Two bits of status for each channel  Value 00 represents Channel OK, Value 01 represents Range Error, Value 10 represents Channel Error and Value 11 has no meaning. |
| 2743 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Analog BootLoader Part number bytes 0-7  Sent By Analog Module To Gateway Module  " H108E-21" | Analog BootLoader Part number bytes 0-7 stored in bootloader memory section |
| 2744 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Analog BootLoader Part number bytes 8-15.  Sent By Analog Module To Gateway Module "7 -1.04 " | Analog BootLoader Part number bytes 8-15 stored in bootloader memory section  Note: X and Y represents software version and varies for every software baseline |
| 2745 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Analog BootLoader 32- bit CRC  Byte 0 to 3: CRC  Byte 4 to 7: 0  Sent By Analog Module To Gateway Module | Analog BootLoader 32- bit CRC is embedded in  Byte 0 is LS Byte 3 is MS Byte. |
| 2746 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Analog Driver Application Part number bytes 0-7  Sent By Analog Module To Gateway Module " H108E-81" | Analog Driver Application Part number bytes 0-7 stored in Analog Driver Application memory section |
| 2747 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Analog Driver Application Part number bytes 8-15  Sent By Analog Module To Gateway Module "0 -1.00 " | Analog Driver Application Part number bytes 8-15 stored in Analog Driver Application memory section  Note: X and Y represents software version and varies for every software baseline |
| 2748 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Analog Driver Application 32- bit CRC  Byte 0 to 3: CRC  Byte 4 to 7: 0  Sent By Analog Module To Gateway Module | Analog Driver Application 32- bit CRC is embedded in  Byte 0 is LS Byte 3 is MS Byte. |
| 2749 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Analog Driver Configuration Part number bytes 0-7  Sent By Analog Module To Gateway Module " H108E-67" | Analog Driver Configuration Part number bytes 0-7 stored in Analog Driver Configuration memory section |
| 2750 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Analog Driver Configuration Part number bytes 8-15  Sent By Analog Module To Gateway Module "4 -1.00 " | Analog Driver Configuration Part number bytes 8-15 stored in Analog Driver Configuration memory section  Note: X and Y represents software version and varies for every software baseline |
| 2751 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Analog Driver Configuration 32- bit CRC  Byte 0 to 3: CRC  Byte 4 to 7: 0  Sent By Analog Module To Gateway Module | Analog Driver Configuration 32- bit CRC is embedded in  Byte 0 is LS Byte 3 is MS Byte. |
| 2752 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Analog Boot Configuration Part number bytes 0-7  Sent By Analog Module To Gateway Module " H108E-66" | Analog Boot Configuration Part number bytes 0-7 stored in Analog Driver Configuration memory section |
| 2753 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Analog Boot Configuration Part number bytes 8-15  Sent By Analog Module To Gateway Module "5 -1.01 " | Analog Boot Configuration Part number bytes 8-15 stored in Analog Driver Configuration memory section  Note: X and Y represents software version and varies for every software baseline |
| 2754 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Analog Boot Configuration 32- bit CRC  Byte 0 to 3: CRC  Byte 4 to 7: 0  Sent By Analog Module To Gateway Module | Analog Boot Configuration 32- bit CRC is embedded in  Byte 0 is LS Byte 3 is MS Byte. |
| 2758 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Analog Software Loader Part number bytes 0-7  Sent By Analog Module To Gateway Module " H108E-64" | Analog Software Loader Part number bytes 0-7 stored in Analog Driver Configuration memory section |
| 2759 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Analog Software Loader Part number bytes 8-15  Sent By Analog Module To Gateway Module "7 -1.02 " | Analog Software Loader Part number bytes 8-15 stored in Analog Driver Configuration memory section  Note: X and Y represents software version and varies for every software baseline |
| 2760 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Analog Software Loader 32- bit CRC  Byte 0 to 3: CRC  Byte 4 to 7: 0  Sent By Analog Module To Gateway Module | Analog Software Loader 32- bit CRC is embedded in  Byte 0 is LS Byte 3 is MS Byte. |
| 2761 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Analog Calibration Software Part number bytes 0-7  Sent By Analog Module To Gateway Module " H108E-65" | Analog Calibration Software Part number bytes 0-7 stored in Analog Driver Configuration memory section |
| 2762 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Analog Calibration Software Part number bytes 8-15  Sent By Analog Module To Gateway Module "1 -1.05 " | Analog Calibration Software Part number bytes 8-15 stored in Analog Driver Configuration memory section  Note: X and Y represents software version and varies for every software baseline |
| 2763 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | Analog Calibration Software 32- bit CRC  Byte 0 to 3: CRC  Byte 4 to 7: 0  Sent By Analog Module To Gateway Module | Analog Calibration Software 32- bit CRC is embedded in  Byte 0 is LS Byte 3 is MS Byte. |
| 2700 | 42 | 0 | 1 | 1 | Refer note. 3 | Tx | 0 | Gateway sends to Trigger for CMU to send its Bootloader Application, Bootloader Configuration, Flight Application’s Part Number and CRC along with Aircraft Configuration Data’s CRC | NA |
| 2806 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | CMU sends its Bootloader Application Part number first 8 bytes to Gateway | Each ASCII character (1-8) of the Bootloader Application Part Number is reported as 1 byte of the payload. |
| 2807 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | CMU sends its Bootloader Application Part number last 8 bytes to Gateway | Each ASCII character (9-16) of the Bootloader Application Part Number is reported as 1 byte of the payload. |
| 2808 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 4 | CMU sends its Bootloader Application CRC(32-Bit) to Gateway | 8 Bits of the Bootloader CRC is reported as 1 byte of the payload. Least significant 8 Bits of the Bootloader CRC appears as the first byte of the payload. Next 8 Bits as second byte of the payload and so on. |
| 2812 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | CMU sends its Bootloader Configuration Part number first 8 bytes to Gateway | Each ASCII character (1-8) of the Bootloader Configuration Part Number is reported as 1 byte of the payload. |
| 2813 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | CMU sends its Bootloader Configuration Part number last 8 bytes to Gateway | Each ASCII character (9-16) of the Bootloader Configuration Part Number is reported as 1 byte of the payload. |
| 2814 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 4 | CMU sends its Bootloader Configuration CRC(32-Bit) to Gateway | 8 Bits of the Bootloader Configuration CRC is reported as 1 byte of the payload. Least significant 8 Bits of the Bootloader CRC appears as the first byte of the payload. Next 8 Bits as second byte of the payload and so on. |
| 2815 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | CMU sends its Flight Application Part number first 8 bytes to Gateway | Each ASCII character (1-8) of the Flight Application Part Number is reported as 1 byte of the payload. |
| 2816 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | CMU sends its Flight Application Part number last 8 bytes to Gateway | Each ASCII character (9-16) of the Flight application Part Number is reported as 1 byte of the payload. |
| 2817 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 4 | CMU sends its Flight Application CRC(32-Bit) to Gateway | 8 Bits of the Flight Application CRC is reported as 1 byte of the payload. Least significant 8 Bits of the Bootloader CRC appears as the first byte of the payload. Next 8 Bits as second byte of the payload and so on. |
| 2818 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 4 | CMU sends Aircraft Configuration Data CRC (32-Bit) to Gateway | 8 Bits of the Aircraft Configuration Data CRC is reported as 1 byte of the payload. Least significant 8 Bits of the Configuration CRC appears as the first byte of the payload. Next 8 Bits as second byte of the payload and so on. |
| 2850 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 4 | CMU Time stamp to Gateway (clock) (32-Bit) | 8 Bits of the CMU Time stamp is reported as 1 byte of the payload. Least significant 8 Bits of the CMU Time stamp appears as the first byte of the payload. Next 8 Bits as second byte of the payload and so on. |
| 3000 | 42 | 0 | 1 | 1 | Refer note. 3 | Tx | 0 | Gateway send to CMU+ to Trigger for CMU+ to send NVM data to Gateway | NA |
| 3001 to 3020 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | Each 8 | NVM data sent from CMU+ to Gateway | CMU Sends NVM Parameters to Gateway. Refer H398-SRS-GWY-DRQ-593 for structure details. |
| 16000 | 42 | 0 | 1 | 1 | Refer note. 3 | Tx | 8 | Gateway Sends ARINC 429 Label data to CMU+(DLU) | Gateway Sends ARINC 429 Labels to CMU+(DLU). Refer H398-SRS-GWY-FNC-468 for Labels to send to CMU+(DLU) |
| 16005 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | DLU Sends ARINC 429 Label data to Gateway to send to DU  (Note: Provisional, This is not applicable for current version) | DLU Sends ARINC 429 Label data to Gateway to send to DU. (Response data related to Packetized Data request) |
| 16001 | 42 | 0 | 1 | 1 | Refer note. 3 | Tx | 8 | Gateway sends Exceedance data to CMU in case of Exceedance event occurs  (Note: Provisional, This is not applicable for current version) | Gateway send Exceedance Event Data(Packed into Labels 300, 301, 303, 306 and 307) to DLU for logging. Each packet packed with 2 Labels and all labels sent in sequence of packets. |
| 16003 | 42 | 0 | 1 | 1 | Refer note. 3 | Rx | 8 | DLU Sends ARINC 429 Label data Date and Time as a random number to Gateway to know that CMU is alive | DLU Sends ARINC 429 Label data(Labels 150 and 260) to Gateway to compare Date and Time received from DU |
| 16004 | 42 | 0 | 1 | 1 | Refer note. 3 | Tx | 8 | Gateway Sends Non ARINC 429 Label data to CMU+(DLU)  (Note: Provisional, This is not applicable for current version) | Gateway Sends following data to CMU+(DLU) to store in NVM :  1)Afcs Axis data - Bit 0 in first byte  2)Filter Clog - Bit 1 in first Byte  3) Forced Channel change Flag - Bit 2 in first Byte  4)Special exceedance NVM Flags -Second Byte  All other Bytes are set to 0. |
| 2701 | 42 | 0 | 1 | 1 | Refer note. 3 | Tx | 8 | Gateway sends its Bootloader Application Part number first 8 bytes to CMU+ | Each ASCII character (1-8) of the Bootloader Application Part Number is reported as 1 byte of the payload. |
| 2702 | 42 | 0 | 1 | 1 | Refer note. 3 | Tx | 8 | Gateway sends its Bootloader Application Part number last 8 bytes to CMU+ | Each ASCII character (9-16) of the Bootloader Application Part Number is reported as 1 byte of the payload. |
| 2703 | 42 | 0 | 1 | 1 | Refer note. 3 | Tx | 4 | Gateway sends its Bootloader Application CRC(32-Bit) to CMU+ | 8 Bits of the Bootloader CRC is reported as 1 byte of the payload. Least significant 8 Bits of the Bootloader CRC appears as the first byte of the payload. Next 8 Bits as second byte of the payload and so on. |
| 2704 | 42 | 0 | 1 | 1 | Refer note. 3 | Tx | 8 | Gateway sends its Flight Application Part number first 8 bytes to CMU+ | Each ASCII character (1-8) of the Flight Application Part Number is reported as 1 byte of the payload. |
| 2705 | 42 | 0 | 1 | 1 | Refer note. 3 | Tx | 8 | Gateway sends its Flight Application Part number last 8 bytes to CMU+ | Each ASCII character (9-16) of the Flight application Part Number is reported as 1 byte of the payload. |
| 2706 | 42 | 0 | 1 | 1 | Refer note. 3 | Tx | 4 | Gateway sends its Flight Application CRC(32-Bit) to CMU+ | 8 Bits of the Flight Application CRC is reported as 1 byte of the payload. Least significant 8 Bits of the Bootloader CRC appears as the first byte of the payload. Next 8 Bits as second byte of the payload and so on. |
| 2707 | 42 | 0 | 1 | 1 | Refer note. 3 | Tx | 8 | Gateway sends its Module Configuration Data first 8 bytes to CMU+ | Each ASCII character (1-8) of the Module Configuration Data Part Number is reported as 1 byte of the payload. |
| 2708 | 42 | 0 | 1 | 1 | Refer note. 3 | Tx | 8 | Gateway sends its Module Configuration Data Part number last 8 bytes to CMU+ | Each ASCII character (9-16) of the Module Configuration Data Part Number is reported as 1 byte of the payload. |
| 2709 | 42 | 0 | 1 | 1 | Refer note. 3 | Tx | 4 | Gateway sends Module Configuration Data CRC (32-Bit) to CMU+ | 8 Bits of the Module Configuration Data CRC is reported as 1 byte of the payload. Least significant 8 Bits of the Configuration CRC appears as the first byte of the payload. Next 8 Bits as second byte of the payload and so on. |
| 2710 | 42 | 0 | 1 | 1 | Refer note. 3 | Tx | 8 | Gateway sends its Bootloader Configuration Part number first 8 bytes to CMU+ | Each ASCII character (1-8) of the Bootloader Configuration Part Number is reported as 1 byte of the payload. |
| 2711 | 42 | 0 | 1 | 1 | Refer note. 3 | Tx | 8 | Gateway sends its Bootloader Configuration Part number last 8 bytes to CMU+ | Each ASCII character (9-16) of the Bootloader Configuration Part Number is reported as 1 byte of the payload. |
| 2712 | 42 | 0 | 1 | 1 | Refer note. 3 | Tx | 8 | Gateway sends its Bootloader Configuration CRC(32-Bit) to CMU+ | 8 Bits of the Bootloader Configuration CRC is reported as 1 byte of the payload. Least significant 8 Bits of the Bootloader CRC appears as the first byte of the payload. Next 8 Bits as second byte of the payload and so on. |
| 2716 | 42 | 0 | 1 | 1 | Refer note. 3 | Tx | 8 | Gateway sends its Embedded Loader Software Part number first 8 bytes to CMU+ | Each ASCII character (1-8) of the Embedded Loader Software Part Number is reported as 1 byte of the payload. |
| 2717 | 42 | 0 | 1 | 1 | Refer note. 3 | Tx | 8 | Gateway sends its Embedded Loader Software Part number last 8 bytes to CMU+ | Each ASCII character (9-16) of the Embedded Loader software Part Number is reported as 1 byte of the payload. |
| 2718 | 42 | 0 | 1 | 1 | Refer note. 3 | Tx | 8 | Gateway sends its Embedded Loader Software CRC(32-Bit) to CMU+ | 8 Bits of the Embedded Loader Software CRC is reported as 1 byte of the payload. Least significant 8 Bits of the Bootloader CRC appears as the first byte of the payload. Next 8 Bits as second byte of the payload and so on. |
| 2719 | 42 | 0 | 1 | 1 | Refer note. 3 | Tx | 8 | Gateway sends its Calibration Software Part number first 8 bytes to CMU+ | Each ASCII character (1-8) of the Calibration Software Part Number is reported as 1 byte of the payload. |
| 2720 | 42 | 0 | 1 | 1 | Refer note. 3 | Tx | 8 | Gateway sends its Calibration Software Part number last 8 bytes to CMU+ | Each ASCII character (9-16) of the Calibration software Part Number is reported as 1 byte of the payload. |
| 2721 | 42 | 0 | 1 | 1 | Refer note. 3 | Tx | 8 | Gateway sends its Calibration Software CRC(32-Bit) to CMU+ | 8 Bits of the Calibration Software CRC is reported as 1 byte of the payload. Least significant 8 Bits of the Bootloader CRC appears as the first byte of the payload. Next 8 Bits as second byte of the payload and so on. |
| 2766 | 42 | 0 | 1 | 1 | Refer note. 3 | Tx | 8 | Gateway sends its System checksum CRC(32-Bit) to CMU+ | 8 Bits of the System checksum CRC is reported as 1 byte of the payload. Least significant 8 Bits of the Bootloader CRC appears as the first byte of the payload. Next 8 Bits as second byte of the payload and so on. |

Note.

1. Rx/Tx - Indicates whether Gateway module Receives (Rx) or Transmits (Tx) the message

2. DLC - Data Length Count - size of the payload in bytes

3. RCI is sent as ZERO by Gateway module and CMU.

Analog module and Discrete Module will use this RCI for ARINC

#### 16.8.4.3 Acquire Message with DOC ID 0 to Analog and Discrete Module

Requirement ID: H398-SRS-GWY-FNC-459

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall send acquire message via A825 bus using LCC = NOC and DOC =0 every 100ms once in Normal Mode to Analog and Discrete Module

Note:

When the Discrete Module receives an A825 message with LCC = NOC and DOC = 0 then it performs the following:

1. Transmit values of all EDAU Discrete inputs to Gateway via A825 bus using LCC = NOC and DOC = {100, 101}
2. Transmit values of all EDAU Chip Detector Inputs to Gateway via A825 bus using LCC = NOC and DOC = {200}
3. Transmit status of all EDAU Discrete outputs to Gateway via A825 bus using LCC = NOC and DOC = {300}

When the Analog Module receives an A825 message with LCC = NOC and DOC = 0 then it performs the following:

1) Transmit values of all EDAU Scaled Analog inputs to Gateway via A825 bus using LCC = NOC and DOC = {500 to 512}

2) Transmit status of all EDAU Analog Inputs to Gateway via A825 bus using LCC = NOC and DOC = {600,601}

#### 16.8.4.4 Discrete inputs received in Doc IDs 100 and 101

Requirement ID: H398-SRS-GWY-FNC-460

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall receive the Discrete Inputs NOC messages with DOC ID as 100 and 101 from Discrete Module as per the following Bit Order when Acquire message is transmitted by Gateway module.

Table : Discrete Inputs

|  |  |  |  |
| --- | --- | --- | --- |
| **Disc Ref** | **Identifier** | **Active State** |  |
| **Super Puma** |
| **AS532U2** |
| DI\_1 | ON\_GROUND | GND | DI003 |
| DI\_2 | OEI30\_ENG1 | GND | DI003 |
| DI\_3 | OEI30\_ENG2 | GND | DI003 |
| DI\_4 | OEI2\_ENG1 | GND | DI003 |
| DI\_5 | OEI2\_ENG2 | GND | DI003 |
| DI\_6 | BVALVE1\_IN | GND | DI003 |
| DI\_7 | BVALVE2\_IN | GND | DI003 |
| DI\_8 | Spare |  |  |
| DI\_91 | DAY/NIGHT | GND = Night | DI003 |
| DI\_40 | Spare |  |  |
| DI\_92 | NORMAL/NVG | GND = Normal | DI003 |
| DI\_9 | ENG\_START1 | 28V | DI28 |
| DI\_10 | ENG\_START2 | 28V | DI28 |
| DI\_11 | ENG\_GOV1 | GND | DI003 |
| DI\_12 | ENG\_GOV2 | GND | DI003 |
| DI\_13 | ENG\_CHIP1 | GND | DI003 |
| DI\_14 | ENG\_CHIP2 | GND | DI003 |
| DI\_15 | T1 | GND | DI003 |
| DI\_16 | T2 | GND | DI003 |
| DI\_17 | BLEED OFFSET 1 | GND | DI003 |
| DI\_18 | BLEED OFFSET 2 | GND | DI003 |
| DI\_19 | XMSN\_M\_PRESS | GND | DI003 |
| DI\_20 | XMSN\_SB\_PRESS | GND | DI003 |
| DI\_21 | XMSN\_MGBT | GND | DI003 |
| DI\_22 | XMSN\_CHIP | GND | DI003 |
| DI\_23 | XMSN\_IGBT | GND | DI100 |
| DI\_24 | XMSN\_TGBT | GND | DI100 |
| DI\_25 | HYD\_AUX.PUMP\_PRESS | GND | DI003 |
| DI\_26 | HYD\_AP\_PRESS | GND | DI003 |
| DI\_27 | HYD\_MAIN\_PRESS | GND | DI003 |
| DI\_28 | HYD\_MAIN\_LEVEL | GND | DI003 |
| DI\_29 | HYD\_RH\_PRESS | GND | DI003 |
| DI\_30 | HYD\_RH\_LOW\_LEVEL | GND | DI003 |
| DI\_31 | PFT\_TEST | GND | DI003 |
| DI\_35 | AUX PUMP FAIL | GND |  |
| DI\_32 | PWR.C | GND | DI003 |
| DI\_33 | THRT | GND | DI003 |
| DI\_34 | SERVO | GND | DI003 |
| DI\_36 | REGM1 |  | DI003 |
| DI\_37 | REGM2 |  | DI003 |
| DI\_38 | MAN1\_IDLE\_DETENT | 28V | DI28 |
| DI\_39 | MAN2\_IDLE\_DETENT | 28V | DI28 |

#### 16.8.4.5 Chip Detector inputs received in Doc ID 200

Requirement ID: H398-SRS-GWY-DRQ-461

MOPS: No

Safety Requirement: No

Rationale: Required to define chip detectors

Verification Method: Testing

The Gateway Module shall receive the Chip Detector Inputs NOC messages with DOC ID as 200 from Discrete Module as per the following Bit Order when Acquire message is transmitted by Gateway module.

Table : Chip Detector Inputs

|  |  |
| --- | --- |
| Chip Detector Output | Signal Name |
| Chip Detector Input #1 (CD150\_1) | Engine 1 Chip Detect |
| Chip Detector Input #2 (CD150\_2) | Engine 2 Chip Detect |
| Chip Detector Input #3 (CD150\_3) | C-BOX Chip Detect |
| Chip Detector Input #4 (CD150\_4) | Mast Chip Detect |
| Chip Detector Input #5 (CD150\_5) | T/R 90 Deg. GB Chip Detect |
| Chip Detector Input #6 (CD150\_6) | T/R 42 Deg. GB Chip Detect |
| Chip Detector Input #7 (CD150\_7) | Monitor Chip Detect |
| Chip Detector Input #8 (CD150\_8) | Planetary Chip Detect |
| Chip Detector Input #9 (CD150\_9) | Engine 2 RGB Chip Detect |
| Chip Detector Input #10 (CD150\_10) | Engine 1 RGB Chip Detect |
| Chip Detector Input #11 (CD150\_11) | Sump Chip Detect |
| Chip Detector Input #12 (CD150\_12) | Spare |

#### 16.8.4.6 Discrete outputs received in Doc ID 300

Requirement ID: H398-SRS-GWY-FNC-462

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall receive the Discrete Output NOC messages with DOC ID as 300 from Discrete Module as per the following Bit Order when Acquire message is transmitted by Gateway module.

Table : Discrete Outputs

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Channel** | **Default value** |
| ΔNG1\_THRESH | Disc. Out #10 (DOG400m\_2) | N/A |
| ΔNG2\_THRESH | Disc. Out #11 (DOG400m\_3) | N/A |

#### 16.8.4.7 Acquire message with DOC ID 2700 to Discrete Module

Requirement ID: H398-SRS-GWY-FNC-464

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall send acquire message via A825 bus using LCC = NOC and DOC =2700 every 1 second once to receive the NOC messages with DOC = {2722, 2723, 2724, 2725, 2726, 2727, 2728, 2729, 2730, 2737, 2738, 2739} from Discrete Module

Note:When the Discrete Module receives an A825 message from Gateway Module with LCC = NOC and

DOC = 2700 then it performs the following:

1) Transmit Part number of Discrete Boot Module via A825 bus using LCC = NOC and DOC = {2722, 2723}

2) Transmit CRC of Discrete Boot Module via A825 bus using LCC = NOC and DOC = {2724}

3) Transmit Part number of Discrete Boot Configuration via A825 bus using LCC = NOC and DOC = {2731, 2732}

4) Transmit CRC of Discrete Boot Configuration via A825 bus using LCC = NOC and DOC = {2733}

5) Transmit Part number of Discrete Application Module via A825 bus using LCC = NOC and DOC = {2725, 2726}

6) Transmit CRC of Discrete Application Module via A825 bus using LCC = NOC and DOC = {2727}

7) Transmit Part number of Discrete Configuration Module via A825 bus using LCC = NOC and DOC = {2728, 2729}

8) Transmit CRC of Discrete Configuration Module via A825 bus using LCC = NOC and DOC = {2730}

9) Transmit Part number of Discrete Software Loader Module via A825 bus using LCC = NOC and DOC = {2737, 2738}

10) Transmit CRC of Discrete Software Loader Module via A825 bus using LCC = NOC and DOC = {2739}

#### 16.8.4.8 Acquire message with DOC ID 2700 to Analog Module

Requirement ID: H398-SRS-GWY-FNC-467

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall send acquire message via A825 bus using LCC = NOC and DOC =2700 every one second once to receive the NOC messages with DOC = {2743, 2744, 2745, 2746, 2747, 2748, 2749, 2750, 2751} from Analog Module

Note:When the Analog Module receives an A825 message from Gateway Module with LCC = NOC and

DOC = 2700 then it performs the following:

1. Transmit Part number of Analog Boot Module via A825 bus using LCC = NOC and DOC = {2743, 2744}

2. Transmit CRC of Analog Boot Module via A825 bus using LCC = NOC and DOC = {2745}

3. Transmit Part number of Analog Boot Configuration via A825 bus using LCC = NOC and DOC = {2752, 2753}

4. Transmit CRC of Analog Boot Configuration via A825 bus using LCC = NOC and DOC = {2754}

5. Transmit Part number of Analog Application Module via A825 bus using LCC = NOC and DOC = {2746, 2747}

6. Transmit CRC of Analog Application Module via A825 bus using LCC = NOC and DOC = {2748}

7. Transmit Part number of Analog Module Configuration via A825 bus using LCC = NOC and DOC = {2749, 2750}

8. Transmit CRC of Analog Configuration Module via A825 bus using LCC = NOC and DOC = {2751}

9. Transmit Part number of Analog software loader via A825 bus using LCC = NOC and DOC = {2758, 2759}

10. Transmit CRC of Analog software loader via A825 bus using LCC = NOC and DOC = {2760}

11. Transmit Part number of Analog Calibration via A825 bus using LCC = NOC and DOC = {2761, 2762}

12. Transmit CRC of Analog software loader via A825 bus using LCC = NOC and DOC = {2763}

#### 16.8.4.9 Acquire message with DOC ID 2700 to CMU+ Module

Requirement ID: H398-SRS-GWY-FNC-638

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall send acquire message via A825 bus using LCC = NOC and DOC =2700 once after successful reception of ACD to receive the NOC messages with DOC = {2806, 2807, 2808, 2812, 2813, 2814, 2815, 2816, 2817, 2818} from CMU Module

Note:

When the CMU Module receives an A825 message from Gateway Module with LCC = NOC and

DOC = 2700 then it performs the following:

1. Transmit Part number of CMU Boot Module via A825 bus using LCC = NOC and DOC = {2806, 2807}

2. Transmit CRC of CMU Boot Module via A825 bus using LCC = NOC and DOC = {2808}

3. Transmit Part number of CMU Boot Config Module via A825 bus using LCC = NOC and

DOC = {2812, 2813}

4. Transmit CRC of CMU Boot Config Module via A825 bus using LCC = NOC and DOC = {2814}

5. Transmit Part number of CMU Application Module via A825 bus using LCC = NOC and

DOC = {2815, 2816}

6. Transmit CRC of CMU Application Module via A825 bus using LCC = NOC and DOC = {2817}

7. Transmit CRC of CMU Aircraft Configuration Data via A825 bus using LCC = NOC and DOC = {2818}

#### 16.8.4.10 ARINC 429 Labels to CMU+(DLU) with DOC ID 16000

Requirement ID: H398-SRS-GWY-FNC-468

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall send the Following list of ARINC 429 input and output Labels via A825 bus using LCC = NOC and DOC =16000 to CMU+(DLU)

Table : List of ARINC 429 Labels

|  |  |
| --- | --- |
| **Labels** | **Remark** |
| Label 062 | Output Binary Label |
| Label 035 | Output Discrete Label |

Note: The Label data transferred will be in Scramble data format as mentioned in Data sheet of A429 Transceiver(HI-3584APQI)

#### 16.8.4.11 Part Numbers to CMU+(DLU)

Requirement ID: H398-SRS-GWY-FNC-614

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall send the Following list of Part numbers via A825 bus using LCC = NOC and mention DOC Ids to CMU+(DLU) when the acquire Part Number command via A825 bus using LCC = NOC and DOC ID as 2700 received from CMU+(DLU)

Table : Part Numbers

|  |  |
| --- | --- |
| **Part Numbers** | **Doc IDs** |
| Gateway BOOT Loader Part Number | 2701, 2702 |
| Gateway BOOT Loader CRC | 2703 |
| Gateway Flight Application Part Number | 2704, 2705 |
| Gateway Flight Application CRC | 2706 |
| Gateway MCD Configuration Part Number | 2707, 2708 |
| MCD Configuration CRC | 2709 |
| Gateway Boot config Part number | 2710, 2711 |
| Gateway Boot config CRC | 2712 |
| Gateway Software Loader Part Number | 2716, 2717 |
| Gateway Software Loader CRC | 2718 |
| Gateway Calibration Software Part Number | 2719, 2720 |
| Gateway Calibration Software CRC | 2721 |
| Discrete BOOT Loader Part Number | 2722, 2723 |
| Discrete BOOT Loader CRC | 2724 |
| Discrete Flight Application Part Number | 2725, 2726 |
| Discrete Flight Application CRC | 2727 |
| Discrete MCD Configuration Part Number | 2728, 2729 |
| Discrete Configuration CRC | 2730 |
| Discrete Boot config Part number | 2731, 2732 |
| Discrete Boot config CRC | 2733 |
| Discrete Software Loader Part Number | 2737, 2738 |
| Discrete Software Loader CRC | 2739 |
| Analog BOOT Loader Part Number | 2743, 2744 |
| Analog BOOT Loader CRC | 2745 |
| Analog Flight Application Part Number | 2746, 2747 |
| Analog Flight Application CRC | 2748 |
| Analog MCD Configuration Part Number | 2749, 2750 |
| Analog Configuration CRC | 2751 |
| Analog Boot config Part number | 2752, 2753 |
| Analog Boot config CRC | 2754 |
| Analog Software Loader Part Number | 2758, 2759 |
| Analog Software Loader CRC | 2760 |
| Analog Calibration Software Part Number | 2761, 2762 |
| Analog Calibration Software CRC | 2763 |
| System checksum (refer note) | 2766 |

Note: Whole system 32-bit Checksum is calculated using 32-bit CRC of all DAL A SW Components in the system i.e, 2's complement of the added value of following CRCs: Analog Application, Discrete Application, CMU+ Application, Gateway Application, Analog module configuration, Discrete module configuration,Gateway module configuration, Gateway Boot, Analog Boot, Discrete Boot, CMU+ Boot, Gateway Boot configuration, Analog Boot configuration, Discrete Boot configuration, CMU+ Boot configuration.

## 16.9 Automatic Excitation Switching

The DAU will use RTDs and chip detect inputs to determine an excitation failure and decide if an automatic switching of the active excitation channel should be done. If the excitation is determined to have failed, the DAU will perform a “forced channel change” and switch the excitation to the other channel. The following requirements determine the conditions and actions that make up a “forced channel change”.

### 16.9.1 Cross-channel communication

Requirement ID: H398-SRS-GWY-FNC-646

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Upon application of power, each Gateway channel shall establish cross-channel communication with the other channel using the RS232 link. (There is a 5 second delay on power up defined by requirement H398-SRS-GWY-FNC-479 to allow each channel the time to power up and establish communication with opposite channel).

### 16.9.2 Excitation message transfer

Requirement ID: H398-SRS-GWY-FNC-647

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Once the RS232 cross-talk communication has been established, each Gateway channel shall provide the other its current status regarding to drive the excitation/references the other channel as either Active or Inactive as per requirement H398-SRS-GWY-FNC-639.

## 16.10 Engine and Aircraft Parameter Calculations

### 16.10.1 Monitoring status Suppression on powerup

Requirement ID: H398-SRS-GWY-FNC-479

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall suppress any channel-to-channel comparison for 5 seconds after power-up of each channel.

## 16.11 Built In Test

This section specifies the Software High Level Requirements for the various Built In Tests performed by the Gateway Module.

### 16.11.1 Power-On

After Power On, the Gateway Module will perform PBIT

### 16.11.2 PBIT

Requirement ID: H398-SRS-GWY-FNC-499

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall perform following PBIT Tests after power on and enter into error mode if the test 1,2,3,4,5, 6 and 8 fails:

1. Perform CRC test on Configuration Section as per H398-SRS-GWY-FNC-506.
2. Perform CRC test on Code Section as per H398-SRS-GWY-FNC-506.
3. Perform Non Volatile Ram Test for Gateway NVM as per H398-SRS-GWY-FNC-505.
4. Perform CRC test on ACD data and NVM Data in Gateway(After receiving from CMU if available) as per H398-SRS-GWY-FNC-688 and H398-SRS-GWY-FNC-689
5. Perform CPU Test as per H398-SRS-GWY-FNC-624
6. Perform Ram Test as per H398-SRS-GWY-FNC-625
7. Perform loopback test on A429 channels as per H398-SRS-GWY-FNC-681.
8. Perform A825 communication check for data from Analog and Discrete as per H398-SRS-GWY-FNC-665

#### 16.11.2.1 RAM Test

Requirement ID: H398-SRS-GWY-FNC-625

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall perform a RAM check as follows:

1. Write the pattern 0xA5A5 to a test buffer

2. Read back the values from the test buffer

3. Write the pattern 0x5A5A to the same test buffer

4. Read back the values from the test buffer

5. If all the values read in Steps #2 and #4 match with the values written in the previous check then the check is a pass else check is failed.

Note: The test buffer is 96-byte buffer marked in the external memory for this specific test.

#### 16.11.2.2 CPU Test

Requirement ID: H398-SRS-GWY-FNC-624

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall perform a CPU test as follows:

1. Perform the following operations with known operands

Arithmetic Operators - addition, subtraction, multiplication, division

Logical Operators - AND, OR, XOR

2. If the obtained result matches with the known result, then the test is pass else it is fail.

Note: Flags - Carry, Overflow, Zero flags are also tested while performing the above operations.

#### 16.11.2.3 CRC test

Requirement ID: H398-SRS-GWY-FNC-506

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall perform the CRC test as follows:

1. Calculate the CRC over the required memory region. (CRC polynomial is X^32+X^26+X^23+X^22+X^16+X^12+X^11+X^10+X^8+X^7+X^5+X^4+X^2+X^1+X^0)

2. Compare the calculated CRC with the CRC present in the memory.

3. If both values match then CRC test is PASS else FAIL

Note:

1. CRC test are performed on Module configuration data region and Internal RAM region.

2. The table used for CRC is

{ 0x00000000, 0x77073096, 0xee0e612c, 0x990951ba, 0x076dc419, 0x706af48f, 0xe963a535, 0x9e6495a3,

0x0edb8832, 0x79dcb8a4, 0xe0d5e91e, 0x97d2d988, 0x09b64c2b, 0x7eb16cbd, 0xe7b82d07, 0x90bf1d91,

0x1db71064, 0x6ab020f2, 0xf3b97148, 0x84be41de, 0x1adad47d, 0x6ddde4eb, 0xf4d4b551, 0x83d385c7,

0x136c9856, 0x646ba8c0, 0xfd62f97a, 0x8a65c9ec, 0x14015c4f, 0x63066cd9, 0xfa0f3d63, 0x8d080df5,

0x3b6e20c8, 0x4c69105e, 0xd56041e4, 0xa2677162, 0x3c03e4d1, 0x4b04d447, 0xd20d85fd, 0xa50ab56b,

0x35b5a8fa, 0x42b2986c, 0xdbbbc9d6, 0xacbcf940, 0x32d86ce3, 0x45df5c75, 0xdcd60dcf, 0xabd13d59,

0x26d930ac, 0x51de003a, 0xc8d75180, 0xbfd06116, 0x21b4f4b5, 0x56b3c423, 0xcfba9599, 0xb8bda50f,

0x2802b89e, 0x5f058808, 0xc60cd9b2, 0xb10be924, 0x2f6f7c87, 0x58684c11, 0xc1611dab, 0xb6662d3d,

0x76dc4190, 0x01db7106, 0x98d220bc, 0xefd5102a, 0x71b18589, 0x06b6b51f, 0x9fbfe4a5, 0xe8b8d433,

0x7807c9a2, 0x0f00f934, 0x9609a88e, 0xe10e9818, 0x7f6a0dbb, 0x086d3d2d, 0x91646c97, 0xe6635c01,

0x6b6b51f4, 0x1c6c6162, 0x856530d8, 0xf262004e, 0x6c0695ed, 0x1b01a57b, 0x8208f4c1, 0xf50fc457,

0x65b0d9c6, 0x12b7e950, 0x8bbeb8ea, 0xfcb9887c, 0x62dd1ddf, 0x15da2d49, 0x8cd37cf3, 0xfbd44c65,

0x4db26158, 0x3ab551ce, 0xa3bc0074, 0xd4bb30e2, 0x4adfa541, 0x3dd895d7, 0xa4d1c46d, 0xd3d6f4fb,

0x4369e96a, 0x346ed9fc, 0xad678846, 0xda60b8d0, 0x44042d73, 0x33031de5, 0xaa0a4c5f, 0xdd0d7cc9,

0x5005713c, 0x270241aa, 0xbe0b1010, 0xc90c2086, 0x5768b525, 0x206f85b3, 0xb966d409, 0xce61e49f,

0x5edef90e, 0x29d9c998, 0xb0d09822, 0xc7d7a8b4, 0x59b33d16, 0x2eb40d81, 0xb7bd5c3b, 0xc0ba6cad,

0xedb88320, 0x9abfb3b6, 0x03b6e20c, 0x74b1d29a, 0xead54739, 0x9dd277af, 0x04db2615, 0x73dc1683,

0xe3630b12, 0x94643b84, 0x0d6d6a3e, 0x7a6a5aa8, 0xe40ecf0b, 0x9309ff9d, 0x0a00ae27, 0x7d079eb1,

0xf00f9344, 0x8708a3d2, 0x1e01f268, 0x6906c2fe, 0xf762575d, 0x806567cb, 0x196c3671, 0x6e6b06e7,

0xfed41b76, 0x89d32be0, 0x10da7a5a, 0x67dd4acc, 0xf9b9df6f, 0x8ebeeff9, 0x16b7be43, 0x60b08ed5,

0xd6d6a3e8, 0xa1d1937e, 0x38d8c2c4, 0x4fdff252, 0xd1bb67f1, 0xa6bc5767, 0x3fb506dd, 0x48b2364b,

0xd80d2bda, 0xaf0a1b4c, 0x36034af6, 0x41047a60, 0xdf60efc3, 0xa867df55, 0x316e8eef, 0x4669be79,

0xcb61b38c, 0xbc66831a, 0x256fd2a0, 0x5268e236, 0xcc0c7795, 0xbb0b4703, 0x220216b9, 0x5505262f,

0xc5ba3bbe, 0xb2bd0b28, 0x2bb45a92, 0x5cb36a04, 0xc2d7ffa7, 0xb5d0cf31, 0x2cd99e8b, 0x5bdeae1d,

0x9b64c2b0, 0xec63f226, 0x756aa39c, 0x026d930a, 0x9c0906a9, 0xeb0e363f, 0x72076785, 0x05005713,

0x95bf4a82, 0xe2b87a14, 0x7bb12bae, 0x0cb61b38, 0x92d28e9b, 0xe5d5be0d, 0x7cdcefb7, 0x0bdbdf21,

0x86d3d2d4, 0xf1d4e242, 0x68ddb3f8, 0x1fda836e, 0x81be16cd, 0xf6b9265b, 0x6fb077e1, 0x18b74777,

0x88085ae6, 0xff0f6a70, 0x66063bca, 0x11010b5c, 0x8f659eff, 0xf862ae69, 0x616bffd3, 0x166ccf45,

0xa00ae278, 0xd70dd2ee, 0x4e048354, 0x3903b3c2, 0xa7672661, 0xd06016f7, 0x4969474d, 0x3e6e77db,

0xaed16a4a, 0xd9d65adc, 0x40df0b66, 0x37d83bf0, 0xa9bcae53, 0xdebb9ec5, 0x47b2cf7f, 0x30b5ffe9,

0xbdbdf21c, 0xcabac28a, 0x53b39330, 0x24b4a3a6, 0xbad03605, 0xcdd70693, 0x54de5729, 0x23d967bf,

0xb3667a2e, 0xc4614ab8, 0x5d681b02, 0x2a6f2b94, 0xb40bbe37, 0xc30c8ea1, 0x5a05df1b, 0x2d02ef8d

}

#### 16.11.2.4 NVRAM test

Requirement ID: H398-SRS-GWY-FNC-505

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall perform the NVRAM test as follows:

1. Fill first 16 bytes of NVRAM Test region with 0x5A pattern.
2. Read back the pattern for all 16 bytes.
3. If all read values = 0x5A then Stage 1 is PASS else Stage 1 FAIL.
4. If Stage 1 is FAIL then goto Step 8.
5. Fill the same 16 bytes of NVRAM Test region with 0xA5 pattern.
6. Read back the pattern for all 16 bytes.
7. If all read values = 0xA5 then Stage 2 is PASS else Stage 2 FAIL.
8. If either Stage 1 or Stage 2 is FAIL then NVRAM test is FAIL else it is PASS.

#### 16.11.2.5 A825 data from Analog or Discrete missing on power-up

Requirement ID: H398-SRS-GWY-FNC-665

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

As part of power on BIT, Gateway module detects missing A825 data from Analog or Discrete module for a period of 3 seconds after initial request(Doc ID 0) sent from

gateway, Gateway Module shall prevents further processing.

#### 16.11.2.6 A429 Loopback Test

Requirement ID: H398-SRS-GWY-FNC-681

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module will monitor the A429 communication using a loopback test on power-up. If the Gateway module detects A429 failure with this loopback test, Gateway module shall set Label 062 B20 to True.

#### 16.11.2.7 CMU ACD data CRC check

Requirement ID: H398-SRS-GWY-FNC-688

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

As part of power on BIT, Gateway Module shall check the CRC of Aircraft Configuration Data received from CMU if available. If Gateway Module detects CRC mismatch, it will prevent further processing.

Note: Gateway will use ACD stored in its memory for CRC check incase of CMU not available and no failure found in CRC test it will continue to use this ACD data.

#### 16.11.2.8 CMU NVM CRC Check

Requirement ID: H398-SRS-GWY-FNC-689

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

As part of power on BIT, Gateway Module shall check the CRC of NVM Data received from CMU.If Gateway Module detects CRC mismatch, it will prevent further processing.

Note: Gateway will use NVM data stored in its memory for CRC check incase of CMU not available and no failure found in CRC test it will continue to use this NVM data.

### 16.11.3 CBIT

The Gateway Module will perform the checks mentioned in this section continuously as part of CBIT(Periodic BIT):

#### 16.11.3.1 Stack Test

Requirement ID: H398-SRS-GWY-FNC-695

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall perform the Stack test for all tasks in H398-SRS-GWY-DRQ-609 as follows:

1. Read the location at 70% of the stack length

2. If the value read is not equal to 0xDEADDEAD then the test is failed else it is passed

3. Prevent further processing if the stack test fails.

Note: Stack is initially filled with 0xDEADDEAD

#### 16.11.3.2 Data transmitted Cross-Channel Comparison

Requirement ID: H398-SRS-GWY-FNC-615

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Each Gateway channel shall provide the following data to the cross-side Gateway channel for comparison:

1. Ground/Open Discrete Inputs
2. 28 Volt/Open Discrete Inputs
3. Torque Inputs
4. Resistive Temperature Device Inputs
5. Active Channel Status
6. NG
7. Delta NG
8. T4
9. EOP
10. MGBT
11. MGBOP
12. FP
13. LHP
14. RHP
15. EOT

#### 16.11.3.3 Cross-Channel Comparison

Requirement ID: H398-SRS-GWY-FNC-507

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Each Gateway channel shall compare its onside active discrete inputs with the cross channel active discrete inputs as part of CBIT.

If the active discrete disagree for more than one (1) second, then Gateway will indicate a Discrete Input Miscompare and report it in bit 12 of Label 062.

#### 16.11.3.4 Resistive Temperature cross channel

Requirement ID: H398-SRS-GWY-FNC-629

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Each Gateway channel shall compare its onside Resistive Temperature Device value with the cross-channel Resistive Temperature Device value as part of CBIT.

#### 16.11.3.5 Miscompare Logic

Requirement ID: H398-SRS-GWY-FNC-510

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway shall clear any miscompare bits in Label 035 one second after its miscompare logic is no longer satisfied.

#### 16.11.3.6 Miscompare data Clear

Requirement ID: H398-SRS-GWY-FNC-511

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway shall clear all miscompare bits in Label 035 if the cross-channel data is lost.

#### 16.11.3.8 Analog Input Fault Monitor

Requirement ID: H398-SRS-GWY-FNC-513

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall report the status of the local analog signals for the purpose of verifying EDAU analog input faults.

#### 16.11.3.9 Analog input

Requirement ID: H398-SRS-GWY-FNC-514

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall set analog input fault when the validity(status) of a local analog signal is different from the validity(status) of the cross-channel analog signal and this condition persists for more than 1 second.

#### 16.11.3.10 Analog Input Fault state

Requirement ID: H398-SRS-GWY-FNC-515

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall clear the analog input fault when the fault condition does not exist for one full second (fault must correct itself for 1 continuous second before SW can clear the fault condition).

#### 16.11.3.11 Analog Input Fault bit error

Requirement ID: H398-SRS-GWY-FNC-516

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

If an analog input fault is detected, then Gateway Module shall report an Analog Input Fault bit error (bit 11) in ARINC-429 label 062.

#### 16.11.3.12 EDAU Fault Bit Reporting

Requirement ID: H398-SRS-GWY-FNC-517

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall report BIT status to the displays in label 062.

#### 16.11.3.13 A825 data from CMU+ missing during CBIT

Requirement ID: H398-SRS-GWY-FNC-659

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall monitor the A825 communication between the DAU and CMU+ during CBIT. If at any time, the Gateway Module detects missing A825 data from CMU+ for a period of 3 seconds, Gateway Module shall set Label 062 B29 to True and remain True until communication has been re-established.

#### 16.11.3.14 A825 data from Analog or Discrete missing during CBIT

Requirement ID: H398-SRS-GWY-FNC-664

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway Module will monitor the A825 communication Analog and Discrete module. If at any time, the Gateway module detects missing A825 data from analog or discrete module for a period of 3 seconds, Label 062 B23 shall be set to True and will remain True until communication has been re-established.

#### 16.11.3.15 Discrete Input Fault Monitor

Requirement ID: H398-SRS-GWY-FNC-1195

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall report the status of the local discrete signals for the purpose of verifying DAU discrete input faults.

#### 16.11.3.16 Discrete Input

Requirement ID: H398-SRS-GWY-FNC-1196

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall set discrete input fault when the validity(status) of a local discrete signal is different from the validity of the cross-channel discrete signal and this condition persists more than 1 second.

#### 16.11.3.17 Discrete Input Fault State

Requirement ID: H398-SRS-GWY-FNC-1197

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Gateway module shall clear the discrete input fault when the fault condition does not exist for one full second (fault must correct itself for 1 continuous second before SW can clear the fault condition).

#### 16.11.3.18 Discrete Input Fault bit error

Requirement ID: H398-SRS-GWY-FNC-1198

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

The Gateway Module shall report Discrete Input Fault bit error (bit 12) in ARINC-429 label 062 when discrete input fault is detected.

## 16.12 DAU Configuration

This section specifies the Software High Level Requirements for the usage of the Configuration Parameters received from CMU by the Gateway Module.

### 16.12.1 Aircraft Configuration Parameters

Requirement ID: H398-SRS-GWY-DRQ-583

MOPS: No

Safety Requirement: No

Rationale: Required to define the various sections of Aircraft Configuration Data used to make the software configurable

Verification Method: Testing

The Gateway Module shall receive the parameters specified in Table: Aircraft Configuration Parameters as part of Aircraft Configuration Parameter data from CMU in ARINC825 message:

Table : Aircraft Configuration Parameters

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Description** | **Range** |
| Aircraft Configuration Software revision Number | Aircraft Configuration(ACD) Part Number | Format:<H108E-713><space><-><x><.><yy><space>  where,  x is major release number  yy is minor release number.  16-character string(16 Bytes) |
| Ohm Offset Channel, 8 | Analog Calculation ohm offset channel | 0x00 to 0xFF (Each 1 Byte) |
| Ohm Offset Value, 8 | Analog Calculation ohm offset value to be used | 0x0000 to 0xFFFF (Each 2 Bytes) |
| VAC Offset Signal, 8 | Analog Calculation VAC offset channel | 0x00 to 0xFF(Each 1 Byte) |
| VAC Offset Reference, 8 | Analog Calculation VAC offset Reference value | 0x00 to 0xFF(Each 1 Byte) |
| Table offset, 128 | Table offset value | 0x00 to 0xFF(Each 1 Byte) |
| Audio Config, 8 | Audio Configuration | Refer Audio Configuration – Aircraft Parameters section |
| CMU ACD Version | Version to track structure changes | 4 Byte version number |
| Offside Analog Offset | Indicates Offside Analog Offset Value | 4 Bytes |
| Number OF Engines | Indicates number of engines installed on the aircraft | 1-2(4 Bytes) |
| Engine Data | Indicates Engine Parameter data | Refer Engine Data – Aircraft Parameters section |
| Air Data | Indicates Air data parameters | Refer Air Data – Aircraft Parameters section |
| Number of ARINC 429 inputs | Indicates Number of ARINC 429 inputs | 0-255 (1 Byte) |
| ARINC429 Input Data | ARINC 429 Input Data parameters | Refer ARINC 429 Input Data – Aircraft Parameters section |
| Number of ARINC 429 Binary Outputs | Indicates Number of ARINC 429 Binary Outputs | 0-255 (1 Byte) |
| ARINC 429 Output Binary Data | ARINC 429 Output Binary Data parameters | Refer ARINC 429 Output Binary Data – Aircraft Parameters section |
| Number of ARINC 429 Discrete Outputs | Indicates Number of ARINC 429 Discrete Outputs | 0-255 (1 Byte) |
| ARINC 429 Output Discrete Data | ARINC 429 Output Discrete Data Parameters | Refer ARINC 429 Output Discrete Data – Aircraft Parameters section |
| Number of exceedance monitoring data | Indicates Number of exceedance monitoring data | 0-255 (1 Byte) |
| Exceedance monitoring data | Indicates Exceedance monitoring Parameters data | Refer Exceedance monitoring data – Aircraft Parameters section |

The Audio Configuration section shall have the parameters specified in Table : Audio Configuration - Aircraft Parameters for each Audio Alerts

Table *: Audio Configuration – Aircraft Parameters*

|  |  |
| --- | --- |
| **Parameter** | **Range** |
| Enable | 0 = Disable  1 = Enable |
| Type | 0 = None  1 = Bell  2 = Cavalry  3 = Cricket  4 = Steady sound  5 = Lyre bird sound  6 = Master Warning sound  7 = Stall warning sound |
| Enable Audio inhibit | 0 = Disable  1 = Enable |
| Audio inhibit | 0 = Disable  1 = Enable |
| Enable Mute | 0 = Disable  1 = Enable |
| Mute | 0 = Sound is muted in this aircraft configuration  1 = Sound is not muted in this aircraft configuration |

The Engine Data Configuration section shall have the parameters specified in Table : Engine Data Configuration - Aircraft Parameters for each of the engine parameters(TOT,EOP\_SIG,,EOT,TRQ,FP,NG,MGBT,LRHP,MGBOP,TOTR)

Table *: Engine Data Configuration – Aircraft Parameters*

|  |  |
| --- | --- |
| **Parameter** | **Range** |
| Enable | 0 = Disable  1 = Enable |
| Input Location | 0 = None  1 = Discrete Input  2 = Discrete Output  3 = Analog Input  4 = A429 Input  5 = A422 Input  6 = Derived signal  7 = Total Loss of Channel |
| Location Number | 1 - 100 |
| Resolution | {1, 10, 100, 1000} |
| Table Number | 0=NONE  1=TOT  2=EOP\_SIG  3=EOT  4=TRQ  5=FP  6=NG  7=MGBT  8=LRHP  9=MGBOP  10=TOTR  11=MAX |
| Filter Type | 0 = None  1 = First Order filter  2 = Averaging filter |
| Filter Constant | 0 to 1 |
| Start Range | -10,000 to +10,000 |
| End Range | -10,000 to +10,000 |

The Air Data Configuration section shall have the parameters specified in Table : Air Data Configuration - Aircraft Parameters for each of the Air Data parameters(MGBT, LHP, RHP, MGBOP)

Table *: Air Data Configuration – Aircraft Parameters*

|  |  |
| --- | --- |
| **Parameter** | **Range** |
| Enable | 0 = Disable  1 = Enable |
| Input Location | 0 = None  1 = Discrete Input  2 = Discrete Output  3 = Analog Input  4 = A429 Input  5 = A422 Input  6 = Derived signal  7 = Total Loss of Channel |
| Location Number | 1 - 100 |
| Resolution | {1, 10, 100, 1000} |
| Table Number | 0=NONE  1=TOT  2=EOP\_SIG  3=EOT  4=TRQ  5=FP  6=NG  7=MGBT  8=LRHP  9=MGBOP  10=TOTR  11=MAX |
| Filter Type | 0 = None  1 = First Order filter  2 = Averaging filter |
| Filter Constant | 0 to 1 |
| Start Range | -10,000 to +10,000 |
| End Range | -10,000 to +10,000 |

The ARINC 429 Input Data Configuration section shall have the parameters specified in Table : ARINC429 Input Data Configuration - Aircraft Parameters for each of the ARINC429 Input Data as specified in the Number of ARINC 429 Inputs.

Table *: ARINC429 Input Data Configuration – Aircraft Parameters*

|  |  |
| --- | --- |
| **Parameter** | **Range** |
| Label | 0 - 255 |
| Channel | 0 – 10 |
| Label Type | 0 = Discrete  1 = BNR  2 = Others |
| Sign Bit | 0 = Used as Sign bit  1 = Used as Data bit  2 = Used for direction  3 = Others |
| sig\_bits | 0-20 |
| Update Rate | 0 – 1000 |
| SDI | 0 = SDI\_0  1 = SDI\_1  2 = SDI\_2  3 = SDI\_3  4 = SDI\_ALL |
| Parity | 0, 1 |
| Resolution | 1-1000 |
| Offset Value | 0 – 10000 |
| Missing Time | 0 – 1000 |
| Default Value | 0 – 10000 |
| Source | 0 = None  1 = Display  2 = Others |

The ARINC 429 Output Binary Data Configuration section shall have the parameters specified in Table : ARINC429 Output Binary Data Configuration - Aircraft Parameters for each of the ARINC429 Output Binary Data as specified in the Number of ARINC 429 Output Binary.

Table  *: ARINC429 Output Binary Data Configuration – Aircraft Parameters*

|  |  |
| --- | --- |
| **Parameter** | **Range** |
| Label | 0 - 255 |
| Channel | 0 – 10 |
| Label Type | 0 = Discrete  1 = BNR  2 = Others |
| Sign Bit | 0 = Used as Sign bit  1 = Used as Data bit  2 = Used for direction  3 = Others |
| Significant Bits | 0-20 |
| SDI | 0 – 4 |
| Parity | 0, 1 |
| Resolution | 1 – 1000 |
| Offset Value | 0 – 10000 |
| Update Rate | 0-1000 |
| Default Value | 0 – 10000 |
| Source | 0 = None  1 = Display  2 = Others |
| rawdataPacketResolution | 0 – 10000 |

The ARINC 429 Output Discrete Data Configuration section shall have the parameters specified in Table : ARINC429 Output Discrete Data Configuration - Aircraft Parameters for each of the ARINC429 Output Discrete Data as specified in the Number of ARINC 429 Output Discrete.

Table *: ARINC429 Output Discrete Data Configuration – Aircraft Parameters*

|  |  |
| --- | --- |
| **Parameter** | **Range** |
| Label | 0 - 255 |
| Channel | 0 – 10 |
| Label Type | 0 = Discrete  1 = BNR  2 = Others |
| Sign Bit | 0 = Used as Sign bit  1 = Used as Data bit  2 = Used for direction  3 = Others |
| Significant Bits | 0-20 |
| SDI | 0 – 4 |
| Parity | 0, 1 |
| Resolution | 1-1000 |
| Offset Value | 0 – 10000 |
| Update Rate | 0-1000 |
| Default Value | 0 – 10000 |
| Source | 0 = None  1 = Display  2 = Others |

The Exceedance Monitoring Data Configuration section shall have the parameters specified in Table : Exceedance Monitoring Data Configuration - Aircraft Parameters for each of the Exceedance Monitoring Parameters.

Table *: Exceedance Monitoring Data Configuration - Aircraft Parameters*

|  |  |
| --- | --- |
| **Parameter** | **Range** |
| CAS Message | 0 = No CAS  1 = ENG1 Exceed  2 = ENG2 Exceed  3 = RTR Overspeed  4 = XMSN OVERTQ  5 = OEI Time Used 1  6 = OEI Time Used 2  7 = Number Of CAS  EOT = Number Of CAS |
| Event ID | 0 = None  1 = 30 sec  2 = 2-5 min  3 = 2 min  4 = OEI Usage  5 = 30 min  7 = Limit Exceed  8 = Start Exceed  10 = 5 min  12 = AEO Exceed  13 = Number of event |
| Parameter ID | 0 = NPNR  1 = TRQ  2 = MGT  3 = NG |
| System ID | 0 = XMSN  1 = ENG1  2 = ENG2  3 = RTR |
| Limit Data | Refer Limit Data Configuration - Exceedance Monitoring Data Configuration - Aircraft Parameters |
| Exceed Flag | 0 = FALSE  1 = TRUE |
| Previous Exceed Flag | 0 = FALSE  1 = TRUE |
| Start Time | 0 |
| End Time | 0 |
| Date | 0 |
| Peak | 0 |
| Duration | 0 |
| Limit Others Entry Data | Refer Limit Others Entry Data Configuration - Exceedance Monitoring Data Configuration - Aircraft Parameters |

Table *: Limit Data Configuration*

|  |  |
| --- | --- |
| **Parameter** | **Range** |
| Limit Type | 0 = High Low  1 = Others |
| Limit Range | 0 = Above  1 = Above Or Equal  2 = Below  3 = Below Or Equal |
| Limit Condition | 0 = STATE\_ALWAYS  1 = STATE\_SHUTDOWN  2 = STATE\_START  3 = STATE\_AEO  4 = STATE\_TAKEOFF  5 = STATE\_OEI1  6 = STATE\_OEI2  7 = STATE\_TAKEOFF\_AEO |
| Limit Value | 0-10000 |
| High Limit Value | 0-10000 |
| Low Value Range | 0-10000 |
| High Value Range | 0-10000 |
| Range Check Variable | 0 = NR  1 = QM  2 = NP1  3 = NG1  4 = QE1  5 = MGT1  6 = NP2  7 = NG2  8 = QE2  9 = MGT2  10 = QE  11 = BLANK |
| Maximum Time | 0 - 300 |
| P Timer | 0 |
| X Timer | 0 |
| Upper Limit Exceed | 0 = FALSE  1 = TRUE |

Table *: Limit Others Entry Data Configuration - Exceedance Monitoring Data Configuration - Aircraft Parameters*

|  |  |
| --- | --- |
| **Parameter** | **Range** |
| Limit Others Type | 0 = Fixed  1 = Range  2 = Nil |
| Limit Others Start Time | 0-300 |
| Limit Others End Time | 0-300 |
| Limit Others value | 0-10000 |
| Limit Others conversion value | -100 to 100 |

### 16.12.2 NVRAM Data Parameters

Requirement ID: H398-SRS-GWY-DRQ-593

MOPS: No

Safety Requirement: No

Rationale: Required to define the various sections of Aircraft Configuration Data used to make the software configurable

Verification Method: Testing

Gateway shall receive the NVM RAM data from CMU as per the parameters defined in Table : NVM RAM Data:

Table : NVM RAM Data

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Description** | **Type** |
| NVM BuiltinTests: DataCbit | Continuous Bit Data | NA |
| NVM BuiltinTests: DataPbit | Power On Bit Data | NA |
| NVM\_AircraftData: AircraftConfig | Aircraft Config data | Refer AIRCRAFT CONFIG table |
| NVM\_AircraftData: AircraftFlags | Aircraft Config flags | Refer AIRCRAFT FLAGS table |
| NVM\_EngineData,[1.. 2]:  EngineConfig | Engine Config Data | Refer ENGINE CONFIG table |
| NVM\_EngineData,[1..2]:  EngineFlags | Engine Config flags | Refer ENGINE FLAGS table |
| NVM\_Calibration: hardware | Hardware Calibration Factors | Refer HARDWARECALIB table |

Table : ENGINE FLAGS

|  |  |
| --- | --- |
| **Parameter** | **type** |
| Reserved | 8 bits |

Table : ENGINE CONFIG

|  |  |
| --- | --- |
| **Parameter** | **Type** |
| Serial number,7 | Each 1 Byte |

Table : AIRCRAFT FLAGS

|  |  |
| --- | --- |
| **Parameter** | **Type** |
| Reserved | 32 bits |

Table : AIRCRAFT CONFIG

|  |  |
| --- | --- |
| **Parameter** | **Type** |
| flags | Refer AIRCRAFT CONFIG FLAGS table |
| eType | (Each 1 Bytes), unsigned |
| tail number, 9 | (Each 1 Byte),unsigned |
| u8SerialNumber,9 | (Each 1 Byte), unsigned |

Table : HARDWARECALIB

|  |  |
| --- | --- |
| **Parameter** | **Type** |
| Offset calibration factor,16 | Each 4 Bytes, Float |

Table 7: AIRCRAFT CONFIG FLAGS

|  |  |
| --- | --- |
| **Parameter** | **Type** |
| u32All | (Each 4 Bytes), unsigned |
| bfPressureUnits | 1 bit |
| Reserved | 15 bits |
| bfFuelQuantityUnits | 2 bits |
| Reserved\_1 | 14 bits |

### 16.12.3 Hardware Calibration Factors

Requirement ID: H398-SRS-GWY-FNC-1173

MOPS: No

Safety Requirement: No

Rationale: NA

Verification Method: Testing

Each Gateway channel shall maintain a set of calibration factors in system NVM specific to the DAU channel hardware. These are:

* Offset calibration factor for Engine #1 Oil Pressure that ranges from -1 to +1 Bar (1 Bar = 14.5 PSI) with 0.1 Bar resolution
* Offset calibration factor for Engine #2 Oil Pressure that ranges from -1 to +1 Bar (1 Bar = 14.5 PSI) with 0.1 Bar resolution
* Offset calibration factor for Engine #1 Oil Temperature that ranges from -10 to +10 °C with 0.1°C resolution
* Offset calibration factor for Engine #2 Oil Temperature that ranges from -10 to +10 °C with 0.1°C resolution
* Offset calibration factor for MGBT that ranges from -10 to +10 °C with 0.1°C resolution
* Offset calibration factor for MGBOP that ranges from -1 to +1 Bar (1 Bar = 14.5 PSI) with 0.1 Bar resolution
* Offset calibration factor for FP1 that ranges from -0.2 to +0.2 bar (1 Bar = 14.5 PSI) with 0.025 bar resolution
* Offset calibration factor for FP2 that ranges from -0.2 to +0.2 bar (1 Bar = 14.5 PSI) with 0.025 bar resolution
* Offset calibration factor for LHP that ranges from -10 to +10 Bar (1 Bar = 14.5 PSI) with 0.1 bar resolution
* Offset calibration factor for RHP that ranges from -10 to +10 Bar (1 Bar = 14.5 PSI) with 0.1 bar resolution

### 16.12.4 Data Logging

The GVMS will provide a minimum of 32 kbytes of non-volatile memory (NVM) data storage.The system will only allow clearing of the NVM while in Maintenance mode using Ground Maintenance Equipment.

## 16.13 Module Configuration Data

This section provides the Software High Level Requirements for the Module Configuration Data for the Gateway Module. This data allows the behavior of the board to be modified without changing the software.

### 16.13.1 Module Configuration Data Table - Definition

Requirement ID: H398-SRS-GWY-DRQ-595

MOPS: No

Safety Requirement: No

Rationale: Required to define the various sections of Module Configuration Data used to make the software configurable.

Verification Method: Testing

Gateway Module shall use the stored Module Configuration Data binary as per the following format and have the sections specified in Table: Module Configuration Data Table - sections

Table : Module Configuration Data Table - sections

|  |  |  |
| --- | --- | --- |
| **Section** | **Description** | **Value** |
| Part Number | Application Software Part Number | Format: <H108E-672><space><-><x><.><yy><space>  Where,  x is major release number  yy is minor release number  16-character string(16 Bytes) |
| Serial Port configuration | NA | Refer Serial Port Configuration section |
| Analog Conversion Tables | NA | Refer Analog Conversion Tables Configuration section |
| A429 channel configuration | NA | ReferA429 Channel Configuration section |
| Number of Audio Tones | Number of audio tones data configured | 0-10 (4 Bytes) |
| Audio Tones output Configuration | NA | ReferAudio Tone Output Configuration section |
| Number of Tachometer Signals | Number of Tachometer signals | 0-5 (4 Bytes) |
| Tachometer signal configuration | NA | ReferTachometer Signal Configuration section |

The Serial Port Configuration section shall have the parameters specified in Table : Serial Port Configuration section - Parameters

Table : Serial Port Configuration section - Parameters

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Description** | **Value** | **Field length (bytes)** |
| Type | Specifies the name of sub system connected. | 0 - COM1  1 - COM2  2 - COM3  3 - COM4  4 - COM6  5-MAX\_COM | 1 |
| Baud | Specifies the baud rate for serial communication | baud rate - 38400, ,9600,12500,19200,57600, 115200 | 4 |
| Start | Specifies the number of start bits | 1-255 | 1 |
| Data bits | Specifies the number of data bits | 1 – 9 | 1 |
| Parity | Specifies the parity to used | 0 – None  1 – Odd  2 – Even | 1 |
| Stop | Specifies the number of stop bits | 1 – 2 | 4 |
| functional state | Indicates whether or not the port is enabled in the current configuration | 1 – ENABLED  0 – DISABLED | 1 |

The Analog Conversion Tables Configuration section shall have the parameters specified in Table : Analog Conversion Tables

Table : Analog Conversion Tables

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Description** | **Value** | **Field length (bytes)** |
| Table x | Pointer to the input of the sensor lookuptable. | Valid reference to Lookup table for Sensor units | 4 |
| Table y | Pointer to the output of the sensor lookuptable. | Valid reference to Lookup table for Sensor units | 4 |

The A429 Channel Configuration section shall have the parameters specified in Table : 429 Channel Configuration

Table : A429 Channel Configuration

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Description** | **Value** | **Field length (bytes)** |
| system connected status | Holds the connection status of the A429 channel. | 0 = NO\_CONNECTION  1 = CONNECTED | 4 |
| functional state | Indicates whether or not the channel is enabled in the current configuration | 0 = DISABLED  1 = ENABLED | 4 |

The Audio Tone Output Configuration section shall have the parameters specified in Table : Audio Tone Output Configuration Parameters

Table : Audio Tone Output Configuration Parameters

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Description** | **Value** | **Field length (bytes)** |
| size | Holds the length of the audio output. | 0 - 4294967296 | 4 |
| data | Holds the valid reference to audio output data. | Valid reference to specific audio tones | 2 |

The Tachometer Signal Configuration section shall have the parameters specified in Table : Tachometer Signal Configuration

Table : Tachometer Signal Configuration

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Description** | **Value** | **Field length (bytes)** |
| Chan State | Specifies the TACH channel is Enable or Disable. | 0 = DISABLE  1 = ENABLE | 1 |
| Default State | Specifies whether the default value can be set for the TACH channel or not. | 0 = DISABLE  1 = ENABLE | 1 |
| Default Val | Specifies the default value of the TACH channel | Value between Minimum and Maximum Value. | 2 |
| Ref Freq | Specifies the Reference frequency for the TACH channel | 70.0 to 71.76 | 4 |
| Scaled | Specifies the Scaled reading at the ence frequency. | 1000 | 2 |
| MinRange | Specifies the minimum limit of the Scaled Reading. | Configurable as per need(As per the corresponding sensor) | 2 |
| MaxRange | Specifies the maximum limit of the Scaled Reading. | Configurable as per need(As per the corresponding sensor) | 2 |
| Resolution | Specifies the input and output values of resolution. | Configurable as per need(As per the corresponding sensor) | 2 |

## 16.14 Kernel and Scheduler

This section specifies the Software High Level Requirements for the kernel and scheduler used in the Gateway Module.

### 16.14.1 Kernel/Scheduler - Initializations

Requirement ID: H398-SRS-GWY-DRQ-607

MOPS: No

Safety Requirement: No

Rationale: This requirement has been derived to ensure proper initialisation of Kernal/Schedular so that all tasks are functioning correctly

Verification Method: Testing

The Gateway Module shall initialize the data structures used by the kernel and scheduler before starting normal mode of operation.

### 16.14.2 Scheduler - Algorithm

Requirement ID: H398-SRS-GWY-DRQ-608

MOPS: No

Safety Requirement: No

Rationale: This requirement has been derived to ensure that all tasks are functioning within time

Verification Method: Testing

The Gateway Module shall use a priority based pre-emptive scheduler.

### 16.14.3 Tasks

Requirement ID: H398-SRS-GWY-DRQ-609

MOPS: No

Safety Requirement: No

Rationale: This requirement has been derived to differentiate the activities that are to be performed by different tasks

Verification Method: Testing

The Gateway Module shall create the tasks described in Table : Tasks in Gateway Module during initialization

Table : Tasks in Gateway Module

|  |  |  |  |
| --- | --- | --- | --- |
| **Tasks** | **Frequency** | **Priority** | **Description** |
| Application Task | 100ms | 9 | This is the main task of the Gateway Module. It performs all the communication and calculation related activities of the Gateway Board. |
| Init Task | 500ms | 18 | This task initializes the peripherals, scheduler, kernel and creates other tasks. |
| Idle Task | - | 63 | It is executed when there are no other Ready tasks. |
| CBIT Task | 100ms | 19 | This task is created to perform stack test as part of Continuous Built-In Test(CBIT). |
| Sound Task | 10ms | 10 | This task provides the audio warning and caution notes. |
| A825 Communication Task 1 | 10ms | 2 | This task processes the transmission and reception of data to/from CMU+ in A825 channel |
| A825 Communication Task 2 | 10ms | 3 | This task processes the transmission and reception of data to/from Discrete and Analog Module in A825 channel |
| A429 Task | 10ms | 4 | This task polls the A429 receivers. |
| A429 Output Task | 10ms | 5 | This task process A429 output Labels and transmit to DU. |
| ETI Timer Task | 100ms | 17 | This task is used to increment seconds |
| Logic Task | 10ms | 6 | This Task processes engine and aircraft data, performs cross channel comparison |
| Logic Task Com 4 | 1ms | 13 | This task receives and transmits data to other gateway channel in RS232(Cross-channel communication) |

### 16.14.4 Semaphores

Requirement ID: H398-SRS-GWY-DRQ-610

MOPS: No

Safety Requirement: No

Rationale: This requirement has been derived to specify the mechanism used for task activation

Verification Method: Testing

The Gateway Module shall use a separate binary semaphore for each task to activate the task.

### 16.14.5 Task activation by semaphore

Requirement ID: H398-SRS-GWY-DRQ-611

MOPS: No

Safety Requirement: No

Rationale: This requirement has been derived to specify the mechanism used for task activation

Verification Method: Testing

The Gateway Module shall use the System Timer interrupt to release the semaphore for tasks as per the timing mentioned in H398-SRS-GWY-DRQ-609.

### 16.14.6 Task structure

Requirement ID: H398-SRS-GWY-DRQ-612

MOPS: No

Safety Requirement: No

Rationale: This has been derived to ensure that all tasks have a common structure for executing their defined activities

Verification Method: Testing

The tasks in Gateway Module shall behave as per the following steps:

1. Wait for the semaphore

2. On semaphore release, perform the activities once

3. Infinitely repeat Steps#1 and #2.

Note: The Idle task is an exception. It is activated when there are no other tasks which are ready.

## 16.15 Software Part Number - Application Software

Requirement ID: H398-SRS-GWY-DRQ-613

MOPS: No

Safety Requirement: No

Rationale: Required to define the Software Part Number to identify the Application Software

Verification Method: Testing

The Gateway Module shall define a 16 character string at a prefixed location in memory (0x0805FFEC) to identify its Software Part Number.

Format: <H108E-808><space><-><x><.><yy><space>

where,

x is major release number

yy is minor release number

## 16.16 Resource Utilization

This section specifies the Software High Level Requirements for the resource utilization of the Gateway Module.

### 16.16.1 Memory Usage

Requirement ID: H398-SRS-GWY-DRQ-683

MOPS: No

Safety Requirement: No

Rationale: This margin is required for future enhancements

Verification Method: Testing

The Gateway Module software shall not utilise more than 80% of the available FLASH and RAM memory for the initial certification of the product.

### 16.16.2 Throughput Usage

Requirement ID: H398-SRS-GWY-DRQ-684

MOPS: No

Safety Requirement: No

Rationale: This margin is required for future enhancements

Verification Method: Testing

The Gateway Module software shall not utilise more than 80% of the available processor throughput for the initial certification of the product.