# Digital Gauges Interface – CGEA 1.3

## Functional Description

This interface specification publishes data needed to populate the Digital Gauges HMI screens. This specification also contains a section that describes additional core logic data transformation. Generic Gauge View and Gauge Selection screens are used as example use cases.

## Interfaces

### Interface Context Diagram (I/O Block Diagram)

**Digital Gauges Context Diagram**



### Inputs

#### IR-REQ-304212/A-Data Sources

|  |  |  |  |
| --- | --- | --- | --- |
| Input\_ID | Input Name | Data Source | Description |
| 01 | Oil\_Pressure\_Gauge | Oil Pressure Gauge – CGEA1.3\_v1.0+ | Virtual pointer position. |
| 02 | EngOil\_Te\_Actl | CAN Signal - Gsdb041+ | Engine oil temperature. |
| 03 | Engine Coolant Temperature Gauge Indication | Engine Coolant Temperature Gauge – CGEA1.3\_v2.0+ | Virtual pointer position. |
| 04 | Temperature | Engine Coolant Temperature Transfer Function-CGEA1.3\_v5.1+ | Engine coolant temperature value. |
| 05 | Virtual\_Gauge\_Pointer\_value | Fuel Level Gauge – CGEA1.3\_v2.2+ | Virtual pointer position. |
| 06 | DTE\_MC\_Value | Distance to Empty Function – CGEA1.3\_v13.0+ | Filtered distance to empty value. |
| 07 | Transmission Temperature Virtual Gauge Indication | Transmission Fluid Temperature Virtual Gauge Display - CGEA1.3\_v1.0+ | Virtual pointer position. |
| 08 | Transmission Temperature Display | Transmission Fluid Temperature Virtual Gauge Display - CGEA1.3\_v1.0+ | Numerical value of the transmission fluid temperature. |
| 09 | Boost\_Gauge | Turbo Boost Gauge – CGEA1.3\_v1.1+ | Virtual pointer position. |
| 10 | BoostValue | Turbo Boost Gauge – CGEA1.3\_v1.1+ | Boost numerical value. |
| 11 | Display\_Units\_MC | Display Unit Selection Control Function - CGEA1.3\_v2.3+ | Requested display units. |
| 12 | Operational\_Mode | Operational Modes and Voltage Range Strategies – CGEA1.3 v3.2+ | Modes of operation. |
| 13 | DEF\_Gauge | Diesel Exhaust Fluid (DEF) Level Virtual Gauge Display CGEA 1.3\_v1.0+ | DEF gauge virtual pointer position |

Each input to the Digital Gauges Interface is an output of its respective STSS listed under the Source column. Consult each specification listed under the Data Source column for units, format, filtering, scaling, behavior, etc. Any data transformation needed is described in Section 1.3.5. Any additional transformation needed to meet HMI requirements must be communicated to the Core Driver Information team.

### Outputs

#### IR-REQ-304211/A-Internal

Provide the HMI layer with data for pointer placement and text values.

\_ \_ \_Txt represents the text for each virtual gauge.

\_ \_ \_PntrPos represents the pointer position information for the virtual gauge.

## Function/Performance

### F-REQ-304218/A-Operational Modes

|  |  |
| --- | --- |
| **Mode** | **Differentiating Vehicle Conditions** |
| Sleep Mode | DG Function Off |
| Limited Mode | DG Function Off |
| Normal Mode | DG Function Functioning |
| Crank Mode | DG Function Functioning |

### Voltage Levels

Refer to Cluster Features table located in Operational Modes and Voltage Range Strategies Section in this SPSS.

### Human-Machine Interface

#### Visual

##### Indicator Graphics / Display Format(Graphics shown are typical examples, use correct images provided by the HMI group)

##### Indicator Color Coordinates

As per Ford Studio Drawing

##### Indicator Characteristics

As per Ford Studio Drawing

#### Audio

None

#### Switch Control Logic

Consumer access to the DG Function’s display shall be as specified in the Menu Structure Section (STSS).

### PFM-REQ-304217/A-System Accuracy

Use each Input\_ID’s Data Source to determine the required update rate for the respective display element.

### Operation: Performance and Functional

#### Subsystem Algorithm Flowchart / State Diagram / View Layout

##### F-REQ-304201/A-CAN Diagnostic Routine



##### F-REQ-304202/A-Oil Pressure Virtual Gauge and Engine Oil Text Routines



##### F-REQ-304203/A-Engine Coolant Virtual Gauge and Text Routines



\**Note: °C/°F handled by Input\_ID\_04*

##### F-REQ-304204/A-Transmission Temperature Virtual Gauge and Text Routines



\**Note: °C/°F handled by Input\_ID\_08*

##### F-REQ-304205/A-Fuel Virtual Gauge and Text Routines



##### F-REQ-304206/A-Boost Virtual Gauge and Text Routines



##### F-REQ-304207/A-DEF Virtual Gauge and Text Routines

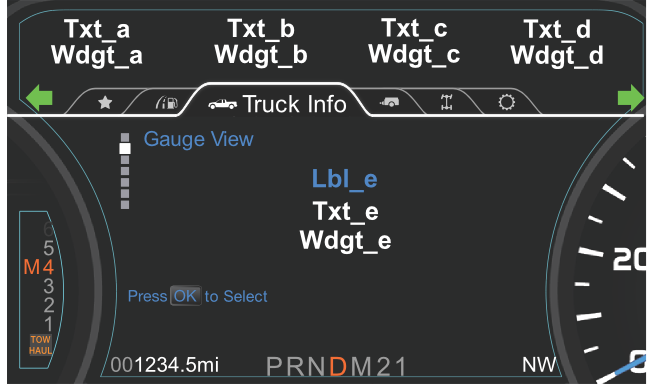


#### Operation Description (supports algorithm flowchart /state diagram)

##### F-REQ-304208/A-Use Cases (supports algorithm flowchart/state chart/layout framework)

The following Gauge View and Gauge Selection screens are used to describe of how this interface specification can be used to populate their respective virtual gauge and text locations. The final HMI screens and animations must be used to implement the gauge and text locations, number of screens, text strings and transitions.

###### Gauge View Generic Layout



##### F-REQ-304200/A-Gauge View Layout Data Sources

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Virtual Gauge | Virtual Gauge Location | Pointer Position Data Source | Text Data Source | Text Location | Label\* | Label Location | Focused |
| oilpress | Wdgt\_a | OilPressurePntrPos | OilTempTxt | Txt\_a | Oil Pressure | - | TRUE |
| engTemp | Wdgt\_b | EngCTempPntrPos | EngCTempTxt | Txt\_b | Engine Coolant Temp | - | TRUE |
| fuel | Wdgt\_c | FuelPntrPos | DTE\_Txt | Txt\_c | Distance to Empty | - | TRUE |
| transTemp | Wdgt\_d  Or  Wdgt\_e | TransTempPntrPos | TransTempTxt | Txt\_d | Transmission Temperature | - | TRUE |
| boost | Wdgt\_d  Or  Wdgt\_e | BoostPntrPos | BoostTxt | Txt\_e | Turbo Boost | Lbl\_e | TRUE |
|  | Wdgt\_d or Wdgt\_e | DEFPntrPos | - | - | Diesel Exhaust Fluid | - |  |

\*Consult HMI requirements for actual label.

##### Determining the Gauges with Widget\_d and Widget\_e

The process of determining the gauge that gets displayed in “Widget\_d” and Widget\_e” involves two steps.

###### F-REQ-304258/A-STEP 1:

All available gauges shall be displayed under the Settings menu. Select one of the available gauges thru the main “Settings” menu.

F-REQ-304192/A-Far Right Minor Gauge Selection Function



###### F-REQ-304259/A-STEP 2:

The user then may traverse to the Truck Info or MyView menu to select a gauge that will be displayed On Demand.All available gauges on demand screens shall be displayed under the Truck Info or MyView list menu. Select one of the gauges to be displayed as an On-Demand screen.

F-REQ-304193/A-On Demand Info Gauge Selection Function



F-REQ-304194/A-Cluster Configured as “Gas”

For cluster part numbers configured as “Gas”, the Transmission temperature Gauge shall be selected as default minor gauge displayed on the far right side of the dedicated display area.

F-REQ-304195/A-Boost Gauge Display as default

If Transmission gauge is configured as Disabled, the Boost gauge shall be displayed as the default gauge.

F-REQ-304196/A-Cluster Configured as “Diesel”

For cluster part numbers configured as “Diesel”, the Boost gauge shall be selected as default minor gauge displayed on the far right side of the dedicated display area.

F-REQ-304197/A-Transmission Temperature Gauge as Default Gauge

If Boost gauge is configured as Disabled, the Transmission temperature gauge shall be displayed as the default gauge.

F-REQ-304198/A-DEF Gauge as Default Gauge

If Transmission gauge is configured as Disabled, the DEF gauge shall be displayed as the default gauge.

F-REQ-304199/A-Only One Gauge Configured

If only one gauge is configured, that shall be displayed as a minor gauge by default. There won’t be any minor gauge selections displayed in the Settings menu or in the Truck Info/ MyView list.

#### FS-REQ-304219/A;1-Function Safety Classification (EMC)

Class B

#### Memory Storage

##### NVM-REQ-304209/A-Parameter Storage Table

| **Parameter Name** | **Description** | **Value at Battery connect** | **Value at**  **Module Wake-up** |
| --- | --- | --- | --- |
| Operational\_Mode | Input to this routine that is a 4 State indicator for cluster operational mode | As per Operational Modes and Voltage Range Strategies Section (STSS) | As per Operational Modes and Voltage Range Strategies Section (STSS) |
| EOTvalue | local variable calculated from the engine oil temperature with offset | 0 | 0 |
| priorEOTvalue | local variable used during hysteresis | 0 | 0 |
| ECTvalue | local variable set to ECT input value | 0 | 0 |
| priorECTvalue | local variable used during hysteresis | 0 | 0 |
| TTvalue | local variable set to Trans Temp input value | 0 | 0 |
| priorTTvalue | local variable used during hysteresis | 0 | 0 |
| enHysteresis | local flag used to enable or disable the hysteresis routine based on internal logic | FALSE | FALSE |

##### NVM-REQ-304210/A-Constants Table

| **Constants** | **Description** | **Value** |
| --- | --- | --- |
| BLANK | data or virtual gauge not visible | empty string, transparent, or replaced with background graphics |
| ENG\_OIL\_TEMP\_OFFSET | engine Oil offset value derived from CAN definition | -60 |
| ENG\_OIL\_TEMP\_HYS | value used for engine oil temperature text hysteresis | 2 |
| ECT\_HYS | value used for engine coolant temperature text hysteresis | 2 |
| TT\_HYS | value used for transmission temperature text hysteresis | 2 |

#### Prove Out

No

#### Reconfigurable Telltale

No

#### Message Center Msg

Refer to Ford Studio Drawing

## Error Handling

### Missing Message Strategy

The signals will be declared missing as per the Diagnostics section of this SPSS.

DTCs states and history will be determined as per the Diagnostics section of this SPSS.

#### SR-REQ-304213/A-Missing Message DTC Logging Configuration

If DG\_I\_Cfg = Disabled (0x0), the cluster shall never log a missing message DTC due to this feature.

### Invalid Data Strategy

See Data Source in REQ-304212 Table.

## Diagnostics

### Self Test

None

### Engineering Test Mode

Reference section “Dealer / Engineering Test Mode (ETM)”

### Part II Performance

#### Supported Diagnostic Trouble Codes (DTCs)

|  |  |
| --- | --- |
| **DTC** | **Description** |
| none | This specification does not contain DTCs but defers all DTC logic to the each Input Source’s specification. |

#### DID-REQ-304214/B-Supported Diagnostic DIDs (Service $22 and $2E)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Number** | **DID / CommonID Name** | **Min** | **Max** | **Res** | **Units** | **Default Value**  **GAS** | **Default Value**  **DIESEL** | **Description** | **DID**  **Type** |
| $FDxx | EOT\_SP1 | 0 | 193 | 1 | °C | 110 | 103 | Oil Temperature Text set point 1 | Numeric |
| EOT\_SP2 | 0 | 193 | 1 | °C | 127 | 112 | Oil Temperature Text set point 2 |
| ECT\_SP1 | 0 | 195 | 1 | °C | 110 | 103 | Engine Coolant Temperature text set point 1 |
| ECT\_SP2 | 0 | 195 | 1 | °C | Eng\_TempHigh | Eng\_TempHigh | Engine Coolant Temperature text set point 2 |
| TT\_SP1 | 0 | 193 | 1 | °C | 125 | 125 | Transmission Temperature text set point 1 |
| TT\_SP2 | 0 | 193 | 1 | °C | 135 | 135 | Transmission Temperature text set point 2 |

#### DCR-REQ-304215/A-DID DE00

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Block**  **Num** | **Block Description** | **Byte(s)** | **Bits** | **State: Description** | **"0"** | **"1"** | **Default** | **Comments/**  **Information** |
| PACKETED BLOCKS | |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| $00 | Option Content (B&A) | \* | 1 | DG\_I\_Cfg | Disabled | Enabled | Disabled |  |
|  |  |  | \*Byte and bit location to be identified in Part II Specification for this cluster | | | | | |

#### DCR-REQ-304216/A-DID DE00

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Block**  **Num** | **Block Description** | **Byte(s)** | **Bits** | **State: Description** | **"00"** | **"01"** | **“10”** | **“11”** | **Default** | **Comments/ Information** |
| PACKETED BLOCKS | |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
| $00 | Option Content (B&A) | \* | 2 | EngOilTempTxt\_Cfg | ALWAYS\_OFF | ALWAYS\_ON | EOT\_SP1 | EOT\_SP2 | ALWAYS\_OFF |  |
| $00 | Option Content (B&A) | \* | 2 | ECT\_Txt\_Cfg | ALWAYS\_OFF | ALWAYS\_ON | ECT\_SP1 | ECT\_SP2 | ALWAYS\_OFF |  |
| $00 | Option Content (B&A) | \* | 2 | TransTempTxt\_Cfg | ALWAYS\_OFF | ALWAYS\_ON | TT\_SP1 | TT\_SP2 | ALWAYS\_OFF |  |
|  |  |  | \*Byte and bit location to be identified in Part II Specification for this cluster | | | | | | | |

## Reference Specification

IS-0344 GENERAL REQUIREMENTS (MSGCENTR)

IS-0379 NORTH AMERICAN WARNINGS AND INDICATORS STRATEGY

Y2012\_CGEA1.3\_CMDB\_v12.20\_Export

Gsdb041

## Revision History

**SPSS Module Revision History**

| **Revision Level** | **Name** | **Change Description** | **Date** |
| --- | --- | --- | --- |
| 1.0 | J.Miloser | Initial Version | 12/17/2012 |
| 1.1 | J.Miloser | Section 1.5.3:  Changed ECT\_SP2 from 127 and 112 to Eng\_TempHigh. See the Engine Temperature RTT STSS for the definition of Eng\_TempHigh. | 8/05/2014 |
| 2.0 | V. Patel | Added DEF gauge to the list of virtual gauges that can be displayed as a minor gauge or an IOD screen.  With addition of the 3rd gauge that could also be displayed as a minor gauge, the logic and HMI had to be changed so that any one of the three could be displayed in the minor gauge position and any one of the three could be displayed as an On Demand Info screen.  The minor gauge display selection is now handled thru a Settings menu.  Section 1.2.1: Added DEF virtual gauge as an output.  Section 1.2.2, table 1: Added DEF as item #13 to the list.  Section 1.3.3.2: Replaced old graphics with the new ones.  Section 1.3.5.1: Added a flowchart (figure 8) to get the DEF gauge displayed (for diesel variants).  Section 1.3.5.2.1:  Table 2: Updated table to add DEF gauge requirements.  Two flowcharts (figure 9, 10) developed to process the selection of the gauge that gets displayed as a minor gauge and IOD screen.  Added requirements below figure 10 to define priority of gauge displays based on configuration and end item (gas vs. diesel). | 10/3/2014 |
| 2.1 | A. Venuturupalli  S. Watkins | Minor update to correct the service ID for supported DIDs  Section 1.5.3 – Updated service $2F to $2E  Per Denso Q&A P558 MY17 #455 | 4/29/2015 |
| 2.2 | A. Mishra | Initial VSEM RM Revision | 03/29/2018 |
| 2.3 | V. Patel | Updating transmission temp gauge set points based on input from transmission team.  DI CC approval: 11/7/2018 (offline)  Change requester: Matt Flis  DID-REQ-304214: Changed TT\_SP1 for gas and diesel to 125 degrees.  Changed TT\_SP2 for gas and diesel to 135 degrees. | 11/14/2018 |