# Compass Display via HSCAN with SETUP – CGEA1.3

## Functional Description

This document describes the interactions between instrument cluster and BCM. In CGEA, there is a LIN based compass that is networked to the SPDJB. The SPDJB acts as a CAN to LIN gateway, and will send compass display information over CAN. The cluster will display the directional heading of the vehicle as one of the following headings: North, Northeast, East, Southeast, South, Southwest, West, or Northwest. It will also display special modes, including calibration and zone setting, as well as the compass zones.

Note that this architecture supports zone and calibration selection through the message center SETUP feature. The compass module itself does not have a button, therefore the message center is the only way for the driver to initiate a zone change or a manual calibration.

This STSS applies to CGEA programs that have decided to have the compass display in the cluster. The first to do so are P473 and U38x Base. Since P473 has a "B" display as well as a large 4.2" LCD display, this STSS applies to both possible display types.

The P415 cluster has to interface with a legacy Cockpit Integrated Display (CID) module, and is described in a different STSS.

## Interfaces

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

**Compass Context Diagram**



### Inputs

#### IR-REQ-344120/A-Internal

##### Operational\_Mode

##### RESET / OK switch event (RESET from Message Center 3 Button Interface STSS, OK from Message Center 5 Button Interface STSS)

##### MC Display Status

#### Mux Message from the CAN bus

##### SIG-REQ-344108/A-CAN Input Signal Details

| **Signal Name** | **Size (bits)** | **Detail** | **Units** | **Res.** | **Offset** | **State Encoded** | **Min** | **Max** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Segment\_MSD | 8 |  | Dimensionless | 1 | 0 |  | 0 (0x0) | 254 (0xFE) |
| Segment\_LSD | 8 |  | Dimensionless | 1 | 0 |  | 0 (0x0) | 254 (0xFE) |
| Compass\_ Display | 1 |  | SED | 1 | 0 |  | 0 (0x0) | 1 (0x1) |
|  |  | Off |  |  |  | 0x0 |  |  |
|  |  | On |  |  |  | 0x1 |  |  |
| Zone\_Icon | 1 |  | SED | 1 | 0 |  | 0 (0x0) | 1 (0x1) |
|  |  | Off |  |  |  | 0x0 |  |  |
|  |  | On |  |  |  | 0x1 |  |  |
| Cal\_Icon | 1 |  |  | 1 | 0 |  | 0 (0x0) | 1 (0x1) |
|  |  | Off |  |  |  | 0x0 |  |  |
|  |  | On |  |  |  | 0x1 |  |  |
|  |  |  |  |  |  |  |  |  |
| Segment\_MSD\_UB | 1 |  | SED | 1 | 0 |  | 0 (0x0) | 1 (0x1) |
|  |  | Unchanged\_data |  |  |  | 0x0 |  |  |
|  |  | Fresh\_data |  |  |  | 0x1 |  |  |
| Segment\_LSD\_UB | 1 |  | SED | 1 | 0 |  | 0 (0x0) | 1 (0x1) |
|  |  | Unchanged\_data |  |  |  | 0x0 |  |  |
|  |  | Fresh\_data |  |  |  | 0x1 |  |  |
| Compass\_ Display\_UB | 1 |  | SED | 1 | 0 |  | 0 (0x0) | 1 (0x1) |
|  |  | Unchanged\_data |  |  |  | 0x0 |  |  |
|  |  | Fresh\_data |  |  |  | 0x1 |  |  |
| Zone\_Icon\_UB | 1 |  | SED | 1 | 0 |  | 0 (0x0) | 1 (0x1) |
|  |  | Unchanged\_data |  |  |  | 0x0 |  |  |
|  |  | Fresh\_data |  |  |  | 0x1 |  |  |
| Cal\_Icon\_UB | 1 |  | SED | 1 | 0 |  | 0 (0x0) | 1 (0x1) |
|  |  | Unchanged\_data |  |  |  | 0x0 |  |  |
|  |  | Fresh\_data |  |  |  | 0x1 |  |  |

Where:

|  |  |  |
| --- | --- | --- |
| **Signal Name** | **Received Byte Value** | **Description** |
| Segment\_MSD | 0x00 | Invalid | |
| 0x20 |  | |
| 0x2D | - | |
| 0X30 | 0 | |
| 0X31 | 1 | |
| 0X32 | 2 | |
| 0X33 | 3 | |
| 0X34 | 4 | |
| 0X35 | 5 | |
| 0X36 | 6 | |
| 0X37 | 7 | |
| 0X38 | 8 | |
| 0X39 | 9 | |
| 0X45 | E | |
| 0x4E | N | |
| 0X53 | S | |
| 0X57 | W | |
| 0xFF | Invalid | |
| Segment\_LSD | 0x00 | Invalid | |
| 0x20 |  | |
| 0x2D | - | |
| 0X30 | 0 | |
| 0X31 | 1 | |
| 0X32 | 2 | |
| 0X33 | 3 | |
| 0X34 | 4 | |
| 0X35 | 5 | |
| 0X36 | 6 | |
| 0X37 | 7 | |
| 0X38 | 8 | |
| 0X39 | 9 | |
| 0X45 | E | |
| 0x4E | N | |
| 0X53 | S | |
| 0X57 | W | |
| 0xFF | Invalid | |

### Outputs

#### IR-REQ-344119/A-INTERNAL:

* Compass\_Display, which is used to control the variables shown in the “COM” section in the message center – INFO displays.

#### MUX message on the CAN bus

##### SIG-REQ-344109/A-CAN Output Signal Details

| **Signal Name** | **Size (bits)** | **Pos. (bits)** | **Detail** | **Units** | **Res.** | **Offset** | **State Encoded** | **Min** | **Max** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SPDJBCompassCmdDesiredZone | 4 | 48 |  | SED | 1 | 0 |  | 0 (0x0) | 15 (0xF) |
|  |  |  | Zone 1 |  |  |  | $01 |  |  |
|  |  |  | Zone 2 |  |  |  | $02 |  |  |
|  |  |  | Zone 3 |  |  |  | $03 |  |  |
|  |  |  | Zone 4 |  |  |  | $04 |  |  |
|  |  |  | Zone 5 |  |  |  | $05 |  |  |
|  |  |  | Zone 6 |  |  |  | $06 |  |  |
|  |  |  | Zone 7 |  |  |  | $07 |  |  |
|  |  |  | Zone 8 |  |  |  | $08 |  |  |
|  |  |  | Zone 9 |  |  |  | $09 |  |  |
|  |  |  | Zone 10 |  |  |  | $0A |  |  |
|  |  |  | Zone 11 |  |  |  | $0B |  |  |
|  |  |  | Zone 12 |  |  |  | $0C |  |  |
|  |  |  | Zone 13 |  |  |  | $0D |  |  |
|  |  |  | Zone 14 |  |  |  | $0E |  |  |
|  |  |  | Zone 15 |  |  |  | $0F |  |  |
|  |  |  |  |  |  |  |  |  |  |
| SPDJBCompassCMDChangeZone | 1 | 52 |  |  |  |  | 0x1 |  |  |
|  |  |  |  |  | 1 | 0 |  | 0 (0x0) | 1 (0x1) |
|  |  |  | No |  |  |  | 0x0 |  |  |
|  |  |  | Yes |  |  |  | 0x1 |  |  |
| SPDJBCompassCMDDecalibrate | 1 | 53 |  |  | 1 | 0 |  | 0 (0x0) | 1 (0x1) |
|  |  |  | No |  |  |  | 0x0 |  |  |
|  |  |  | Yes |  |  |  | 0x1 |  |  |

## Function/Performance

### F-REQ-344127/A-Operational Modes

|  |  |
| --- | --- |
| **Mode** | **Differentiating Vehicle Conditions** |
| Sleep Mode | Compass Function OFF |
| Limited Mode | Compass Function OFF |
| Normal Mode | Compass Function ON |
| Crank Mode | Compass Function OFF |

### Voltage Levels

Refer to the Cluster Features Table located in the Operational Modes and Voltage Range Strategies section of this SPSS.

### Human-Machine Interface

#### Visual

#### HMI-REQ-344118/A-Indicator Graphics / Display Format

For High End Display (SHMI), refer to “<*Program*> Cluster Menu Structure.xls” and Program VAPS Model.

|  |  |  |
| --- | --- | --- |
| Compass > |  |  |
|  | Set Zone > | \* Zone 1 |
|  | \* Zone 2 |
| \* Zone 3 |
| \* Zone 4 |
| \* Zone 5 |
| \* Zone 6 |
| \* Zone 7 |
| \* Zone 8 |
| \* Zone 9 |
| \* Zone 10 |
| \* Zone 11 |
| \* Zone 12 |
| \* Zone 13 |
| \* Zone 14 |
| \* Zone 15 |
| Calibrate | Calibration pop-up |

For "B" Display, refer to Text Message List – BEF Displays 2x14.xls.

Compass Informational displays: Refer to Text Message List – BEF Displays 2x14.xls, Variable Legend

Compass Setup Displays: SU280, SU285, SU290, SU295, SU300

##### Indicator Color Coordinates

Refer to Interior Lighting specification

##### Indicator Characteristics

Refer to Interior Lighting specification

#### Audio

None

#### Switch Control Logic

None

### PFM-REQ-344128/A-System Accuracy

Within 100msec of receiving the CAN message, the cluster shall update the compass\_display value.

### Operation: Performance and Functional

#### Subsystem Algorithm Flowchart / State Diagram

##### F-REQ-344110/A-Compass Configuration Diagnostic Flowchart



##### F-REQ-344111/A-3 Button Interface Flowchart



##### F-REQ-344112/A-5 Button Interface Flowchart



##### F-REQ-344113/A-Compass Diagnostic Routine



##### F-REQ-344114/A- \_CMPS\_FDM\_Info\_Status lookup table

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Operational\_ Mode** | **Segment\_**  **MSD** | **Segment\_**  **LSD** | **Compass\_**  **Display** | **Zone\_**  **Icon** | **Cal\_**  **Icon** | **Compass\_Display** |
| Normal | 0x4E | 0x20 | 0x1 | 0x0 | 0x0 | **NORTH** |
| 0x4E | 0X45 | 0X1 | 0X0 | 0X0 | **NORTHEAST** |
| 0x20 | 0x45 | 0X1 | 0X0 | 0X0 | **EAST** |
| 0X53 | 0X45 | 0X1 | 0X0 | 0X0 | **SOUTHEAST** |
| 0X53 | 0X20 | 0X1 | 0X0 | 0X0 | **SOUTH** |
| 0X53 | 0X57 | 0X1 | 0x0 | 0X0 | **SOUTHWEST** |
| 0X20 | 0X57 | 0X1 | 0X0 | 0X0 | **WEST** |
| 0X4E | 0X57 | 0X1 | 0X0 | 0X0 | **NORTHWEST** |
| 0X20 | 0x20 | 0x1 | 0x0 | 0X1 | **CAL** |
| 0X20 or  0x30 | 0X31 | 0x1 | 0X1 | 0X0 | **ZONE 1** |
| 0X20 or  0x30 | 0X32 | 0X1 | 0X1 | 0X0 | **ZONE 2** |
| 0X20 or  0x30 | 0X33 | 0X1 | 0X1 | 0X0 | **ZONE 3** |
| 0X20 or  0x30 | 0X34 | 0X1 | 0X1 | 0X0 | **ZONE 4** |
| 0X20 or  0x30 | 0X35 | 0X1 | 0X1 | 0X0 | **ZONE 5** |
| 0X20 or  0x30 | 0X36 | 0X1 | 0X1 | 0X0 | **ZONE 6** |
| 0X20 or  0x30 | 0X37 | 0X1 | 0X1 | 0X0 | **ZONE 7** |
| 0X20 or  0x30 | 0X38 | 0X1 | 0X1 | 0X0 | **ZONE 8** |
| 0X20 or  0x30 | 0X39 | 0X1 | 0X1 | 0X0 | **ZONE 9** |
| 0X31 | 0X30 | 0X1 | 0X1 | 0X0 | **ZONE 10** |
| 0X31 | 0X31 | 0X1 | 0X1 | 0X0 | **ZONE 11** |
| 0X31 | 0X32 | 0X1 | 0X1 | 0X0 | **ZONE 12** |
| 0X31 | 0X33 | 0X1 | 0X1 | 0X0 | **ZONE 13** |
| 0X31 | 0X34 | 0X1 | 0X1 | 0X0 | **ZONE 14** |
| 0X31 | 0X35 | 0X1 | 0X1 | 0X0 | **ZONE 15** |
| 0x2D | 0x2D | 0x1 | 0x0 | 0x0 | **--** |
| 0X20 | 0X20 | 0X0 | 0X0 | 0X0 | **OFF (no display)** |
| Declared missing or invalid | | | | | **--** |
| All other cases including never received | | | | | | **OFF (no display)** |

##### Compass Behavior



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

##### F-REQ-344115/A-Operational Mode

* The electronic compass shall be operational when the ignition switch is in the RUN position only.

##### F-REQ-344116/A-Compass calibration

* SU 295 (CIRCLE SLOWLY TO CALIBRATE) shall time out after 180 seconds.

##### F-REQ-344117/A-Default

* On the 5 Button interface, when in the ZONE menu and the compass is declared missing or invalid, the default highlight is Zone 8. The customer can still use the Up/Down arrows to move the highlight.

#### FS-REQ-344129/A-Function Safety Classification (EMC)

Class B

#### Memory Storage

##### NVM-REQ-344121/A-Compass Display Memory Storage

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter Name** | **Description** | **Value at Battery Connect** | **Value at Module Wake-up** |
| SPDJBCompassCmdDesiredZone | Output signal to Compass through SPDJB for desired Zone | 0x0 | 0x0 |
| SPDJBCompassCMDChangeZone | Output signal to Compass through SPDJB to command zone to change | 0x0 (No) | 0x0 (No) |
| SPDJBCompassCMDDecalibrate | Output signal to Compass through SPDJB to command zone to initiate a manual calibration | 0x0 (No) | 0x0 (No) |
| Segment\_MSD | Input CAN signal from SPDJB | 0x20 | 0x20 |
| Segment\_LSD | Input CAN signal from SPDJB | 0x20 | 0x20 |
| Compass\_ Display | Input CAN signal from SPDJB | 0x0 | 0x0 |
| Zone\_Icon | Input CAN signal from SPDJB | 0x0 | 0x0 |
| Cal\_Icon | Input CAN signal from SPDJB | 0x0 | 0x0 |
| Operational\_Mode | 4 state indicator for cluster operational mode | Limited | Limited or Normal or Crank |
| Cal Timer | Defined in Message Center – BEF Display with 3 Button Interface STSS. This is the maximum amount of time that SU295 will stay active. | 0s | 0s |
| Get\_zone flag | Flag used to determine if Zone Mode has been requested via cluster setup | 0 | 0 |

#### Prove Out

No

#### Reconfigurable Telltale

Not applicable.

#### Message Center Msg

Variables as defined in Text Message List – BEF Displays 2x14.xls

## 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-344122/A-Config

If Compass\_Cfg = Disabled (0x0), the cluster shall never log a loss of communication DTC due to this feature.

### Invalid Message Strategy

The signal data will be declared invalid 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-344123/A-Config

If Compass\_Cfg = Disabled (0x0), the cluster shall never log an invalid data DTC due to this feature.

## Diagnostics

### Self Test

None applicable - internal to Compass

### Engineering Test Mode

None

### Part II Performance

#### DTC-REQ-344124/A-Supported Diagnostic Trouble Codes (DTCs)

|  |  |
| --- | --- |
| **DTC** | **Description** |
| C14000 | Lost Communication with Body Control Module missing message |
| C46282 | Invalid Data Received from Compass Module – sequence counter not updated |

#### DCR-REQ-344125/A-DID $DE00

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

#### DIR-REQ-344126/A-Type 1 routine $203B

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Routine #** | **Name** | **Size** | **State** | **Description** | **Comments** |
|
| $203B | Compass Zone  Routine | 8 bits | $01 | Zone 1 |  |
| $02 | Zone 2 |  |
| $03 | Zone 3 |  |
| $04 | Zone 4 |  |
| $05 | Zone 5 |  |
| $06 | Zone 6 |  |
| $07 | Zone 7 |  |
| $08 | Zone 8 |  |
| $09 | Zone 9 |  |
| $0A | Zone 10 |  |
| $0B | Zone 11 |  |
| $0C | Zone 12 |  |
| $0D | Zone 13 |  |
| $0E | Zone 14 |  |
| $0F | Zone 15 |  |
| $10 - $FF, $00 | Invalid | Out of Range |

## Reference Specification

IS-0280 Compass performance (Version 3)

instrum sds instrumentation subsystem (version 26)

Compass w/cid stss (VERSION 4.0 6/16/2006)

## Revision History

**SPSS Module Revision History**

|  |  |  |  |
| --- | --- | --- | --- |
| **Revision Level** | **Name** | **Change Description** | **Date** |
| 1.0 | V.Patel | Updated for CGEA 1.3 based on CGEA STSS v4.0  Section 1.2.2 – Removed table referencing the HS-CAN message that contains the input signals.  Section 1.2.3 – Removed table referencing the HS-CAN message that contains the output signal.  Section 1.4 – Rewritten. Deleted references of specific missing message and invalid data flags and timer. Deleted missing message and invalid data determination flowcharts.  Section 1.5.3 – Deleted DTC logging criteria from table.  Replaced “HS-CAN” with “CAN” or “signal” wherever applicable throughout the document. | 4/8/2010 |
| 1.1 | V. Patel | Initial release for VSEM requirements migration | 2/27/2019 |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |