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CSWM – COMFORT SEAT AND WHEEL MODULE

SUPPORTING CUSW AND POWERNET ARCHITECTURES

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1.0 GENERAL

1.1 Purpose of the Standard

This standard covers the environmental, physical, electrical, mechanical, functional, regulatory and durability requirements for Comfort Seat and Wheel Module – CSWM.

1.2 Component/Commodity Description

The CSWM shall be a 125 kBd CAN-I controller providing up to eleven outputs capable of heating up to four seats, heating the steering wheel, controlling two ventilated seats, and four switch indicators. Different versions of CSWM can be derived by depopulating to lesser features to meet the different vehicle configurations requirements.

The CSWM system has five heat channel outputs, two front heated seats, two rear heated seats and a heated steering wheel. The CSWM also supports two front vented seat control line outputs and a set of rear heat switches, each switch having two LED indicators. The heated seats and heated steering wheel will provide temperature feedback. Refer to vehicle line CSWM System Electrical Diagrams- SED's.

1.2.1 Front and Rear Heated Seats

The CSWM shall directly provide power to the seat heating elements. A thermistor sensor feedback from each seat heating elements to the CSWM shall regulate the heater outputs to prevent any seat temperature to rise above set points. Seat heating has two selectable heat settings which are HI and LO. A calibration lookup table of three high settings and one low setting shall be used. Depending on the thermistor reading, the CSWM shall start the heater output by adjusting the PWM heat level according to the calibration table. Each press of the switch shall change the seat heat setting from OFF to HI, HI to LO, and LO to OFF or else the automatic timer shall turn off the heat cycle. The CSWM shall only turn on the heated seats when the key is in the RUN position, with engine running. The heated seats shall be capable of turning on through diagnostics with the key in the run position and the engine either on or off.

The seat heating and venting are independent systems; however, they cannot be actuated at the same time. Turning the heat on during vent mode shall turn off the heat and vice versa.

1.2.2 Heated Steering Wheel

The CSWM shall directly provide power to the steering wheel heating element. The heated steering

wheel is an option only available with at least the presence of front heated seats. The CSWM shall only turn on the heated steering wheel when the key is in the RUN position and with the engine running. During a diagnostic event the heated steering wheel shall be capable of turning on with the key in the RUN position and with or without the engine running. A thermistor sensor feedback from the steering wheel heating element via the CAN bus to the CSWM shall regulate the heater output to prevent the wheel temperature to rise above the maximum threshold temperature set point. Wheel heating has one selectable heat setting. A calibration lookup table of four heat levels shall be used to maintain heated wheel performance. Depending on thermistor reading, the CSWM shall start the heater output by adjusting the PWM heat level according to the calibration table. Each press of the switch shall change the wheel heat setting from OFF to ON, and ON to OFF, or else the automatic timer shall turn off the heat cycle.

1.2.3 Front Vented Seats

The CSWM shall provide a vented seat control line for the two front seats. The front vented seats are an option only available with at least the presence of front heated seats. The seat venting has two selectable speeds for the fans. For seat venting, each press of the switch button shall cause the seat to change venting modes. The CSWM shall only activate the vented seat control line when the key is in the RUN position and with the engine running. During a diagnostic event the vented seats shall be capable of turning on with the key in the RUN position and with or without the engine running. Seat venting has two selectable vent settings which are HI and LO. A calibration lookup table of one high setting and one low setting shall be used to manage vent level. Each press of the switch shall change the seat vent setting from OFF to HI, HI to LO, and LO to OFF.

The seat heating and venting are independent systems; however, they cannot be actuated at the same time. Turning the vent on during heat mode shall turn off the heat and vice versa.

1.3 Application

This standard is limited in its application to those CAD files (CATIA / NX), drawings or engineering illustrations which call out this standard number, or refer to this standard within some other standard or specification.

The CSWM shall meet the following listed CAD specification requirements.
- **CEP-12697 - CAD STANDARD - NX**
- **PS-9227 - CAD/CAM DATA EXCHANGE POLICY**

1.4 Hazardous Material Control

Products and processes used to manufacture the products listed in this standard must conform to the employee and consumer health, employee safety, regulated substances, recycling and environmental reporting requirements contained in **CS-9003.**

1.5 Mandatory, Recommended or Specified Tests

Mandatory or suggested tests if any provided within this standard are meant to assure compliance to the specification but do not relieve the responsible entity from ensuring that the component or system meets all environmental, physical, electrical, mechanical, functional, regulatory and durability requirements including all applicable system interface requirements as described in the standard for the entire duration of specified design life.

1.6 Test Planning

Recommended sample size planning, test methodologies, analysis methodologies and DVP&R instructions are provided in Chrysler's "**Product Assurance Testing**" manual (**QR-10008**). A test plan (DVP&R) shall be developed to verify and validate all required functions specified at a minimum in this

standard. The responsible entity shall provide any additional testing that's deemed necessary to meet functional requirements. They shall also submit a request for alternative equivalent verification plans for the release engineer's review if they deviate from the Chrysler Group LLC (CG) recommended test plan. DV & PV and CC tables at the end of this document provide summary of all the requirements, and shall be used to develop the DVP&R.

Samples utilized for Design Verification (DV) shall meet specified print tolerance range. Samples for Production Validation (PV) shall meet statistical capabilities for machine and manufacturing processes. Test samples for Production Validation (PV) and Continuous Conformance (CC) testing shall be chosen at random from PSO runs or production lots as applicable. Chrysler's DVP&R form is found in **QR-10021 (DVP&R Template)**. Where necessary, each line item of the DVP&R must be supported by a comprehensive test or laboratory procedure. DVP&R agreement by Chrysler does not relieve the responsible entity from ensuring that the component or system meets all environmental, physical, electrical, mechanical, functional**,** regulatory and durability requirements including all applicable system interface requirements, in the entity's area of responsibility, as described in the standard for the specified design life.

1.7 Correlation with Other Standards

Supplier shall consider following standards for design and development of CSWM as these standards affect functional performance from the mechanical and/ or electrical system interfaces involved.

PS-11687 HEATED/VENTED SEATS SYSTEM FUNCTIONAL VERIFICATION

1.8 Suggested, Recommended or Specified Components and/or Suppliers

Suggested, recommended or specified components and/or suppliers, if any, are still required to comply to the specification and do not relieve the responsible entity from ensuring that the component or system utilizing these suggested, recommended or specified components and/or suppliers meets all environmental, physical, electrical, mechanical, functional, regulatory and durability requirements including all applicable system interface requirements, in the entity's area of responsibility, as described in the standard for the specified design life.

2.0 SPECIAL TEST EQUIPMENT

The CSWM test unit or load box shall be capable of testing all input/output and functional requirements of the module. The test unit shall simulate the electrical environment of a typical vehicle. For DV and PV tests, the appropriate mating connector shall be used.

TABLE 1: SPECIAL TEST EQUIPMENT

Section Number(s)	Function Tested	Test Equipment Specified
Section 3.0	All Tests in Section 3.0	Load Box & Vehicle Simulation Software
Section 4.0	All Tests in Section 4.0	Load Box & Vehicle Simulation Software
Section 5.0	All Tests in Section 5.0	Load Box & Vehicle Simulation Software

3.0 ENVIRONMENTAL REQUIREMENTS

The CSWM shall not show any degradation to component functions stated in section 5.0 when exposed to applicable environmental conditions from Climatic Stresses, Mechanical Stresses, Solid/Fluid Stresses, and Chemical Stresses as defined in sections 3.1 through 3.4 during the vehicle's design/service life.

Compliance to these environmental requirements shall be demonstrated during DV and/or PV phase using Chrysler recommended verification tests specified for these stresses and summarized in Table 4: EE/ EM - COMPONENT SPECIFIC TEST REQUIREMENTS in section 3.5 (EE – Electrical/ Electronics and EM – Electro-Mechanical).

General E/E Component Classification (CS-11982):

Component Classification shall use component weight, application, mounting, location and other pertinent information as listed in the table given below.

TABLE 2: COMFORT SEAT AND WHEEL MODULE - GENERAL E/E COMPONENT CLASSIFICATION	
Classification	Type
Device Type (section 2.1 of **9.90111** or section 2.2 of **CS-11982**)	E3
Function (section 2.2 of **9.90111** or section 2.1 of **CS-11979**)	FC2
Installation (section 2.3 of **9.90111/02** or **CS-11982**)	CI3
Low Temperature (section 2.4 of **9.90111/02** or **CS-11982**)	TN1
High Temperature (section 2.4 of **9.90111/02** or **CS-11982**)	TC1
Weight (section 2.8 of **9.9011/02** or **CS-11982**)	W1
Vibration (section 2.9 of **9.90111/02** or **CS-11982**)	V2
Supply Voltage (section 2.6 of **9.90111** or 4.1.1 of **CS-11979**)	A1B
Transient Interference (section 2.7 of **9.90111**)	SI2
Electrostatic Discharges (section 2.8 of **9.90111**)	SE1
Quiescent Current (section 2.9 of **9.90111** or 4.1.2 of **CS-11979**)	N/A
IP Category (section 2.10 of **9.90111/02** or **CS-11982**)	IP5K2

3.1 Climatic Stresses

The CSWM shall withstand the climatic stresses defined in this section for the component packaging location under one of the front seat in the passenger cabin.

A. Temperatures Classification at the given module packaging location in vehicle shall be as given in Table 3: TEMPERATURE CLASSIFICATION. If the operating temperatures for the module are below default standards due to technological limitations, refer to **SD-12659** for HTOE, PTCE, TS and HTHE test durations.

TABLE 3: TEMPERATURE CLASSIFICATION		
Temperature Extremes	Operating Temperature (°C)	Non-Operating Temperature (°C)
Low Temperature	-40	-40

TABLE 3: TEMPERATURE CLASSIFICATION		
Temperature Extremes	Operating Temperature (°C)	Non-Operating Temperature (°C)
High Temperature	+85	+85

B. A Shipping/ Storage temperature range of -40 °C to +95 °C.

Chrysler recommended verification tests for the climatic stresses experienced by the CSWM are summarized in Table 4: EE/ EM - COMPONENT SPECIFIC TEST REQUIREMENTS in section 3.5.

3.2 Mechanical Stresses

The CSWM shall withstand the mechanical stresses typical for mounting on seat pan or bracket, which is defined as Vibration Class defined in Table 2: COMFORT SEAT AND WHEEL MODULE - GENERAL E/E COMPONENT CLASSIFICATION in section 3.0. Mechanical stresses include exposure to all types of vibration intensities, including mechanical shocks and handling drops experienced during vehicle driving, manufacturing assembly, handling and service.

Chrysler recommended verification tests for the mechanical stresses experienced by the CSWM are summarized in Table 4: EE/ EM - COMPONENT SPECIFIC TEST REQUIREMENTS in section 3.5.

3.3 Solids / Fluid Compatibility

Stresses induced by exposure to dust and fluids that may be encountered in its specified vehicle mounting location. The CSWM shall be classified as IP (International Protection) category IP 5K2 for protection from solid and liquid intrusion.

The CSWM shall be:

- Dust Resistant (IP 5K)
- Resistant to water drips (IP 2)

Chrysler recommended verification tests for the solid/fluid stresses experienced by the CSWM are summarized in Table 4: EE/ EM - COMPONENT SPECIFIC TEST REQUIREMENTS in section 3.5.

3.4 Chemical Resistance

Stresses encountered when exposed to corrosive environmental gases, salt fog from salt on road or in atmosphere experienced in coastal area as well as the fluids and chemicals from the list given in this section:

- Interior cleaning fluid – Armorall Protectant
- Soapy water – 5% soap concentration by weight & water mix
- Hot beverages – Coffee with cream 6ml & sugar 6ml
- Cold beverages – Regular Coke, Diet Coke
- Saline solution - Salt solution 10% salt by weight

The chemicals can be applied as per the test procedure described in **CS-11982** on maximum 5 test samples in any random order up to maximum of five liquids.

Chrysler recommended verification tests for the chemical stresses experienced by the CSWM are summarized in Table 4: EE/ EM - COMPONENT SPECIFIC TEST REQUIREMENTS in section 3.5.

3.5 EE/EM - Component Specific Test Requirements

The requirements listed in the table below represent environmental factors that the component/system shall endure to and must continue to be fully functional. The component/system must remain operable, as defined in the ACCEPTABILITY CRITERIA column, during and after subjecting the part to any of the conditions listed.

TABLE 4: EE/ EM - COMPONENT SPECIFIC TEST REQUIREMENTS			
APPLICABLE ENVIRONMENTAL CONDITIONS	PARAMETERS	TEST DURATION	ACCEPTABILITY CRITERIA (PER APPLICABLE CHRYSLER STANDARDS)
A. Climatic Stresses:			
Thermal Shock (TS)	Tmax & Tmin	300 cycles (**CS-11982**)	Component/ System shall meet specified acceptance criteria – before, during and after test
Powered Thermal Cycle Endurance (PTCE)	Top.max & Top.min	300 cycles (**CS-11982**)	Component/ System shall meet specified acceptance criteria – before, during and after test
High Temperature Operating Endurance (HTOE)	Top.max	950 cycles (**CS-11982**)	Component/ System shall meet specified acceptance criteria – before, during and after test
High Temperature and Humidity Endurance (HTHE)	Temp & %RH	700 cycles (**CS-11982**)	Component/ System shall meet specified acceptance criteria – before, during and after test
Shipping/ Storage Temp. Exposure (SSTE)	SSTE conditions (Sec. 3.1B of this PF)	54 Hours (**CS-11982**)	Component/ System shall meet specified acceptance criteria – before, during and after test
Low Temperature Operating Endurance (LTOE)	Top.min	48 Hours (**CS-11982**)	Component/ System shall meet specified acceptance criteria – before, during and after test
Thermal Humidity Cycle (THC)	Temp & %RH	240 Hours (**CS-11982**)	Component/ System shall meet specified acceptance criteria – before, during and after test
Solar Radiation Soak	N/A		
B. Mechanical Stresses:			
Device Restraint Performance	8x module weight or 20 N at RT	(+/-)3 axis 6 directions total (**CS-11982**)	Component/ System shall meet specified acceptance criteria – before, during and after test
Vibration	Tmax/ Tmin & Vibration Class	12 hours / axis 36 hours total (**CS-11982**)	Component/ System shall meet specified acceptance criteria – before, during and after test
Mechanical Shock	RT	60 Shocks - Test No 1 (**CS-11982**)	Component/ System shall meet specified acceptance criteria – before, during and after test
Mechanical Shock Endurance	N/A		
Handling Drop	Drop height	1 meter drop/axis - Total 6 (**CS-11982**)	Component/ System shall meet specified acceptance criteria – before, during and after test
Mechanical Operational Durability	N/A		
Gravel Bombardment	N/A		
C. Dust/ Water Intrusion:			
Dust Intrusion	IP 5K - Dust Resistant (1 day / non-operational)	1 day (**CS-11982**)	Component/ System shall meet specified acceptance criteria – before, during and after test
Water or Steam Intrusion	IP 2 - Resistant to water drips (1 day / non-operational)	1 day (**CS-11982**)	Component/ System shall meet specified acceptance criteria – before, during and after test
Salt Water Immersion	N/A		
Mud Resistance	N/A		

TABLE 4: EE/ EM - COMPONENT SPECIFIC TEST REQUIREMENTS			
APPLICABLE ENVIRONMENTAL CONDITIONS	PARAMETERS	TEST DURATION	ACCEPTABILITY CRITERIA (PER APPLICABLE CHRYSLER STANDARDS)
D. Chemical Exposure:			
Salt Fog	RT	24 hours - Intermittent Operation (**CS-11982**)	Component/ System shall meet specified acceptance criteria – before, during and after test
Mixed Flowing Gas	N/A		
Chemicals Exposure	Temp (**CS-11982**) Chemicals per Sec 3.4 of this PF	4 days **(CS-11982)**	Component/ System shall meet specified acceptance criteria – before, during and after test
E. Other Requirements:			
EMC - Component	Section # 4.3 of this PF	**(CS-11979)**	Component/ System shall meet specified acceptance criteria – before, during and after test
EE System - Component	Section # 4.2 of this PF	**(CS-11979)**	Component/ System shall meet specified acceptance criteria – before, during and after test
Connector & Wiring	Section # 4.4-A & B of this PF	**(CS-11979)**	Component/ System shall meet specified acceptance criteria – before, during and after test
Solder Evaluation	Section # 3.4 from **CS-11982**	**(CS-11979)**	Component/ System shall meet specified acceptance criteria – before, during and after test
Test-to-Failure (for identified test by Chrysler Engineering or when any test fails DV or PV tests)	Section 7.0 of this PF	(**CS-11982** & **DS-11332**)	Component/ System shall meet specified acceptance criteria – before, during and after test

For any design or process related changes, engineering and supplier shall use the recommended validation requirement suggested in Appendix B, which is based on **SD-12659**.

4.0 PHYSICAL / ELECTRICAL / MECHANICAL REQUIREMENTS

4.1 Physical Requirements

The CSWM shall use a snap-in design to mount under one of the front seats cushion pans or a bracket mounted to one of the seat structures. The CSWM shall be installed inside the passenger compartment to a flat metal body surface for possible heat sinking.

Supplier shall demonstrate dimensional capability of P99C75 or P99C90 during DV and PV phase respectively for any key dimensions identified on CATIA/ NX files or other digital or electronic media describing the module/ component design specifications. Component shall not show any signs of BSR after Vibration, Shock and Handling Drop tests.

4.2 Electrical System Compatibility Requirements

The CSWM shall conform to the applicable Electrical System requirements specified in **CS-11979**. Verification test plans for these requirements shall be developed using Chrysler Electrical and EMC test plan template. The test plans shall be approved by Chrysler Product Release and EMC Engineers. Component level DV and PV validations shall be performed at a Chrysler Recognized EMC Laboratory. Contact E/E Systems Compatibility Department (5140) for the detailed procedure. As a low cost option the EMC/EE Testing may be performed at the Chrysler EMC Laboratory.

The nominal operating voltage for CSWM shall be 13.5V (UTtyp). The supply voltage range shall be 9V (UTmin) to 16 V (UTmax).

4.3 Electromagnetic Compatibility (EMC) Requirements

The CSWM shall conform to the applicable component level EMC requirements specified in **CS-11979**. Verification test plans for these requirements shall be developed using Chrysler Electrical and EMC test plan template. The test plans shall be approved by Chrysler Product Release and EMC Engineers. Component level DV and PV validations shall be performed at a Chrysler Recognized EMC Laboratory. Contact E/E Systems Compatibility Department (5140) for the detailed procedure. As a low cost option the EMC/EE Testing may be performed at the Chrysler EMC Laboratory.

4.4 Mechanical Requirements

Connectors and wire harness (including pigtails) shall be reviewed by Chrysler Release Engineer, EE QRE (Quality Reliability Engineer) and Wiring & Connector responsible engineers for any EE Interface issues with the adjoining sub-systems for compliance to Chrysler Preferred Practices using **SD-12219** "EE Interface Checklist".

The CSWM shall use a snap-in design to mount under one of the front seats cushion pans or a bracket mounted to one of the seat structures. The CSWM shall be installed inside the passenger compartment to a flat metal body surface for possible heat sinking.

4.5 Connector Requirements

If the connector is sourced by **FGA**, it shall meet the requirements of Fiat **9.91320/02**, Fiat **TS-80209/02** and **SAE/USCAR-25**. Approved Fiat connectors can be found in the Fiat Ridbul Catalog. Any deviation must be approved by EE Power & Signal Distribution Package/Design Department – Fiat Group Automobiles (FGA)

If the connector is sourced by **Chrysler**, it shall meet **SAE/USCAR-2** as well as **SAE/USCAR-25** requirements and be selected from the "LIST OF APPROVED DEVICE (Green") CONNECTORS" in **CEP-042**. Any deviation must be approved by EE Power & Signal Distribution Package/Design Department - Chrysler Group LLC.

Both test methods (FGA or CG) are acceptable for parts supplied for the **CUSW** vehicle and the supplier shall pick the method that is the lowest cost to implement. The connectors shall be rated to meet all applicable environmental requirements of Section 3.0 (temperature, fluid / solid intrusion, and vibration).

Irrespective of design lead (FGA or CG), all connectors must meet the ergonomic requirement of **SAE/USCAR-25.**

Component, system or vehicle validation tests shall use mating connectors and harnesses manufactured with wires of correct gauge size and crimping from production intent designs and processes. If the wire harness or connectors used for system or component test are not production intent, the test set-up must be pre-approved by Chrysler Engineering and Wiring Harness Group.

If the connector is pre-selected, it shall be E/E Component supplier's responsibility to obtain test reports from connector supplier to show compliance to connector specific Environmental, Electrical and Mechanical requirements from **SAE/USCAR-2** or other equivalent connector standards. Component or Module supplier shall verify applicable mechanical requirements from **SAE/USCAR-2** including (but not limited to): Terminal to Terminal Engage/ Disengage Force, Terminal - Connector Insertion/ Extraction Force, Connector – Connector: Mating/ Unmating Force, Audible Click, etc. along with Connector orientation to prevent water/liquid ingress, etc. During environmental validation (tests), the production intent approved connectors and wiring harness/ pigtails shall be used.

4.6 Connector Configuration

There shall be a designated connector for each module function.

- Connector 1 shall be designated for CAN communication and front heated seat supply
- Connector 2 shall be designated for the front heated seat outputs
- Connector 3 shall be designated for rear heated seat supply and outputs
- Connector 4 shall be designated for the heated steering wheel supply and output
- Connector 5 shall be designated for vented seat control line outputs
- Connector 6 shall be designated for rear heated seat switch inputs

4.7 Package Size

The CSWM package size shall not exceed 150mm (L) x 50mm (H) x 100mm (W).

The CSWM shall be packaged in a dry area under one of the front seats when the vehicle water line is below the base of the seat structure. In the case where the water line is above the base of the seat structure, the CSWM shall be packaged in a dry area inside the cabin.

The CSWM shall use a three point snap-in design, two feet slide in design on one end and a snap-in tab design on the opposite end.

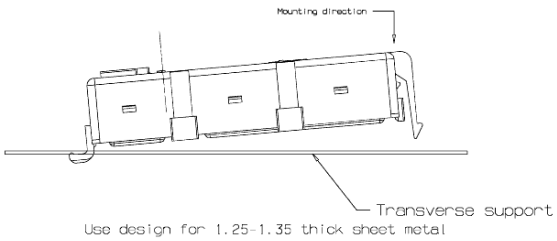


FIGURE 1: CSWM MOUNTING STRATEGY

4.8 Microcontroller

The CSWM shall be flash programmable over the CAN Diagnostic for in-vehicle programming of software and/or calibrations at the vehicle assembly plant or at a service facility.

4.9 PWM Frequency

The heated seat and steering wheel PWM outputs shall run at a frequency of 20Hz.

4.10 Front and Rear Heat Outputs

The front and rear heated seat elements consist of a cushion element connected in parallel with a back element. The combined load shall range from 2.67 ohms to 6.67 ohms. These values do not include the vehicle wiring harness impedance.

4.10.1 Front and Rear Heat Output Overload Current Protection

The CSWM shall have overload current detection to protect against any shorted load condition. When the overload current condition is detected, the CSWM shall shut down the respective output. Each heated seat output shall not exceed 6 amps for more than 2 seconds. If the CSWM detects any heated seat output above 6 amps for greater than 2 seconds the CSWM shall shut down the output and set the heated seat over current DTC.

The CSWM shall have current detection on all heated seat outputs with a minimum resolution of 100mA and an accuracy of 500mA.

4.10.2 Managing Heated Seat Output Load

All seat heater outputs shall be staggered to reduce the vehicle electrical loads. If there are simultaneous requests to turn on heated seats the CSWM shall not turn all the outputs at the same time. There shall be a 80ms +/- 20% delay between the startup of each output.

4.11 Heated Steering Wheel Output

The maximum heated wheel element load shall not draw more than 8.0 amps during normal operation.

4.11.1 Heated Steering Wheel Output Overload Current Protection

The heated steering wheel shall not exceed 8 amps for longer than 1 minute. If the CSWM detects the heated steering wheel output above 8 amps the CSWM shall automatically reduce the heated steering wheel output to a variable duty cycle to maintain 7.5 amps. The CSWM shall continue in the high level at a variable duty cycle until the high level cutoff temperature is reached or until the high level timer expires.

The CSWM shall have overload current detection to protect against any shorted load condition. When the overload current condition is detected, the CSWM shall shut down the respective output. The heated wheel shall not exceed 10 amps for 2 seconds. If the CSWM detects the heated steering wheel above 10 amps for greater than 2 seconds the CSWM shall shut down the system and set the heated steering wheel over current DTC.

The CSWM shall have current detection on the heated wheel output with a minimum resolution of 100mA and an accuracy of 500mA.

4.12 Vented Seat Blower Motors Control Line

The CSWM shall provide two vented seat low-side PWM control signals. Each output shall be capable of sustaining up to 500mA of current. The PWM control will operate at 100Hz +/- 10Hz. The vent control circuit when driven low shall not exceed 0.75V.

4.13 Rear Heated Seat Switch Load

The CSWM shall have inputs and outputs to operate two rear heated seat switches. This includes two LED control circuits per switch as well as one switch input. The rear heated seat switches shall draw no more than 30mA per LED.

5.0 FUNCTIONAL REQUIREMENTS

5.1 Vehicle Specific Functions Requirements

Functional details are in the Vehicle Function (VF) documents in DOORS®. A VF document's list is available for every specification released.

VF065	**FRONT SEAT HEATING**
VF041	**INSTRUMENT LIGHTING**
VF230	**LTM SETUP MANAGEMENT**
VF604	**DIAGNOSIS REQUEST AND RESPONSE MESSAGES**
VF700	**CAN-B NETWORK MANAGEMENT**

5.2 Component Specific Requirements

The CSWM shall meet following listed functional requirements for the entire duration of its service/ design life specified in section 7.0.

For any purchased component / system or new technology features, if the Product Release Engineer is unable to provide the list of function and acceptance criteria, then the table will be left blank and the applicable list of functions and requirements shall be finalized with the selected supplier after the component/ system is sourced. This may include revision to the document including changes to Continuing Conformance tests to prevent any manufacturing spills.

Supplier shall demonstrate compliance to all identified functional requirements before and after completion of all environmental or other applicable endurance and durability tests, EE systems tests and component/ vehicle EMC tests during DV and PV tests. If any functional tests are identified for CC, those will also be completed successfully and reported to Chrysler Engineering & Supplier Quality.

TABLE 5: LIST OF FUNCTIONS				
Function	Unit	Min	Nominal	Max
CAN normal operation (time)	ms	-	VMM	-
CAN normal operation (value)	Hex	-	VMM	-
Heated Seat Request Front Left (Normal Operation)	Hex	-	VMM	-
Heated Seat Request Front Right (Normal Operation)	Hex	-	VMM	-
Heated Seat Request Rear Left (Normal Operation)	Hex	-	VMM	-
Heated Seat Request Rear Right (Normal Operation)	Hex	-	VMM	-
Steering Wheel Heating(Normal Operation)	Hex	-	VMM	-
Vented Seat Front Right (Normal Operation)	Hex	-	VMM	-
Vented Seat Front Left (Normal Operation)	Hex	-	VMM	-
Front Left Heater Voltage - Off	Volts	-0.1	0.0	0.1
Front Left Heater Voltage - On	Volts	UTtyp – 0.5	UTtyp	UTtyp
Front Right Heater Voltage - Off	Volts	-0.1	0.0	0.1
Front Right Heater Voltage - On	Volts	UTtyp – 0.5	UTtyp	UTtyp
Rear Left Heater Voltage - Off	Volts	-0.1	0.0	0.1
Rear Left Heater Voltage - On	Volts	UTtyp – 0.5	UTtyp	UTtyp
Rear Right Heater Voltage - Off	Volts	-0.1	0.0	0.1
Rear Right Heater Voltage - On	Volts	UTtyp – 0.5	UTtyp	UTtyp
Heated Steering Wheel Voltage - Off	Volts	-0.1	0.0	0.1
Heated Steering Wheel Voltage - On	Volts	UTtyp – 0.5	UTtyp	UTtyp
Front Left Vent Voltage - Off	Volts	UTtyp – 0.5	UTtyp	UTtyp
Front Left Vent Voltage - On	Volts	-0.1	0.0	0.75
Front Right Vent Voltage - Off	Volts	UTtyp – 0.5	UTtyp	UTtyp
Front Right Vent Voltage - On	Volts	-0.1	0.0	0.75
Front Left Vented Seat Blower Control Line	mAmp	-	-	20
Front Right Vented Seat Blower Control Line	mAmp	-	-	20
Rear Heated Seat Switch Load (Per LED)	mAmp	-	-	30

5.3 Parametric Evaluation Technique (PET) Requirement

Parametric Evaluation Technique (PET) compares the statistical distribution of the sample population based on desired reliability/ confidence (such as, R95/C90 or R90/C90) to demonstrate conformance to acceptance limits during design validation process. PET analysis shall be done on the identified key functional parameters only. For detailed information on PET analysis, refer to Chrysler's "Product Assurance Testing" manual, **QR-10008**.

For PET analysis, 20 samples shall be identified from the total samples during DV and PV tests (refer to red pentagon in the test flows in Appendix A). Four samples shall be designated from Leg 1, four samples from leg 2 and three each from legs 3 through 6 for a total of 20 samples. These samples shall be measured for key functional parameters before start of any testing (pre-test measurement) and after completion of all tests (post-test measurement) under selected temperature and voltage conditions (9 point checks). Suppliers shall use PET spreadsheet provided by Chrysler document (**SD-12501**) to demonstrate reliability/confidence targets specified in the component specific performance standard.

Three point checks shall be used only for the functional checks (blue diamond in the test flows in Appendix A). Nine or seven point checks shall be used for "Safety or Powertrain" applications and at the minimum five point checks shall be used for convenience applications as part of PET analysis at the start and end of the tests (red pentagon in the test flows in Appendix A).

For any purchased component / system or new technology features, if the Product Release Engineer is unable to provide the list of key system/ component functions and acceptance criteria, then the PARAMETRIC EVALUATION REQUIREMENT table will be left blank and the applicable list of key functions and requirements shall be finalized with the selected supplier after the component/ system is sourced. This may include revision to the document including changes to Continuing Conformance tests to prevent any manufacturing spills.

TABLE 6: PARAMETRIC EVALUATION REQUIREMENT (PET)

Function	Unit	Min	Nominal	Max
Front Left Heater Voltage - Off	Volts	-0.1	0.0	0.1
Front Left Heater Voltage - On	Volts	UTtyp – 0.5	UTtyp	UTtyp
Front Right Heater Voltage - Off	Volts	-0.1	0.0	0.1
Front Right Heater Voltage - On	Volts	UTtyp – 0.5	UTtyp	UTtyp
Rear Left Heater Voltage - Off	Volts	-0.1	0.0	0.1
Rear Left Heater Voltage - On	Volts	UTtyp – 0.5	UTtyp	UTtyp
Rear Right Heater Voltage - Off	Volts	-0.1	0.0	0.1
Rear Right Heater Voltage - On	Volts	UTtyp – 0.5	UTtyp	UTtyp
Front Left Vent Voltage - Off	Volts	UTtyp – 0.5	UTtyp	UTtyp
Front Left Vent Voltage - On	Volts	-0.1	0.0	0.75
Front Right Vent Voltage - Off	Volts	UTtyp – 0.5	UTtyp	UTtyp
Front Right Vent Voltage - On	Volts	-0.1	0.0	0.75
Heated Steering Wheel Voltage - Off	Volts	-0.1	0.0	0.1
Heated Steering Wheel Voltage - On	Volts	UTtyp – 0.5	UTtyp	UTtyp

5.4 Electrical Architecture Requirements

5.4.1 General requirements

Components shall meet the requirements of the Technical Specification (Sourcing, 1A, 2A, etc. releases) for the specific vehicle that may include the following

- Component Electrical Technical Specification (ETS)
- Component Functional Description (VFs by component - ECU.docx)
- Network Transmission Matrix
- Other requirements documents

All components shall meet the 'Engine Cranking Low Voltage – Warm cranking / Stop – Start' requirements per **CS-11979** (i.e., assume all vehicles support the stop start function).

All references (if any) to FGA, Fiat Auto, Fiat organizations, Fiat vehicles, etc. found in program documentation shall in effect be superseded by the equivalent Chrysler Group LLC references, organizations, vehicles, etc. References to Fiat design documents, norms, standards and other design requirements still apply unless explicitly stated otherwise.

5.4.2 Embedded CAN Bus Software Requirements

The standard CAN driver software packages will not be provided by Chrysler for this program and it is the responsibility of the component suppliers to obtain their own from a Chrysler approved BSW partner.

During the sourcing phase the ECU suppliers shall provide the following information regarding their embedded CAN bus Standard/Basic Software (SSW/BSW) strategy:

- Quality assurance plan (timing, deliverables and validation)
- Microcontroller derivative
- Compiler & version
- OS type (or none)
- Use case (single channel, multi-channel, gateway, multiple identity (2 or more DBCs – **D**ata **B**ase **C**AN; chosen at runtime, using same SSW/BSW, or SSW/BSW-adaptive hybrid))

Chrysler reserves the right to request & obtain information pertaining to the above from the supplier and/or the SSW/BSW partners.

5.5 Service Requirements

The CSWM shall meet applicable service requirements given in **SD-11401**.

5.6 Assembly Requirements

The CSWM shall meet all assembly requirements given in **DS-158** and **CS-ROUTING** "Routing Requirements – Tubing, Hose and Cables" and if Electrical applicable, **SAE/USCAR-25** and **CS-11510** "Chrysler Wiring Systems – Design and Packaging Requirements". In addition, specific CSWM Ergonomics Design Standards can be obtained from the Program Ergonomist, New Programs Ergonomics Group.

6.0 REGULATORY REQUIREMENTS

Supplier shall ensure compliance to all applicable regulatory requirements for the CSWM in the markets where the vehicles are sold.

6.1 Substance of Concern (SoC) Requirement

Entity responsible for supply of component or system shall comply with “Substance of Concern” (also sometimes referred as SoC) requirement listed in **CS-9003** and comply with all reporting requirements mandated by Chrysler Engineering for the specified vehicle program(s).

7.0 RELIABILITY / DURABILITY REQUIREMENTS

Reliability/durability tests are required to demonstrate (with a given probability and level of confidence) that a component will perform its intended functions over the expected service/design life, under all anticipated operating conditions and environments as specified in the preceding sections. The tests shall correlate to 95th percentile customer usage as defined by design responsible Engineering Group. The tests must ensure that expected design and process variations are covered, resulting in adequate product robustness. Test to Failure (TTF) is the preferred test methodology. Test planning/methodology, sample size planning and analysis methods for reliability demonstration shall comply with **QR-10008**, **“Product Assurance Testing”.**

A. Vehicle Design or Service Life Requirements: 10 years / 150,000 miles

B. Minimum Reliability and Confidence demonstration: R90 / C90

C. Engine ON / OFF cycles: 41,000 cycles

Ignition On/Off cycles for vehicles without stop-start feature shall be 41,000. Ignition On/Off cycles for vehicles with stop-start feature (including initial starts) shall be 185,000 for MTX and 223,000 for ATX vehicle based on design life of 10 years/ 150,000 miles. EE Component or ECU shall go through engine on/off duty cycles as well as other pertinent duty cycles (ex: switch on/off) for specified design application (including stop-start) during operational sections of long duration tests, such as, HTOE, PTCE, Mechanical Operating Endurance tests.

Thermal Shock/ Powered Thermal Cycle Endurance, High Temperature Operating Endurance, High Temperature Humidity Endurance, Vibration, and Mechanical Operating Endurance Requirements stated in section 3.5 shall be considered as part of ECU reliability/ durability requirement verification as these tests represent life cycle requirements for stated environmental stresses.

Test-to-Failure (TTF) shall be required for new technology or new application for the vehicle program, new supplier, new processes, and high warranty or based on engineering judgment for design robustness. TTF shall also be required to validate design changes resulting from any DV or PV test failures. Supplier shall use **DS-11332** as a reference for conducting TTF using constant load or step-stress as agreed between Chrysler and Supplier Engineering. Purpose of TTF shall be to identify any design weaknesses and use the findings to improve reliability and durability of the component.

7.1 System and Vehicle Level Requirement

Chrysler Engineering shall perform system and vehicle level tests on program phase vehicles (such as, System bench tests, Plywood Buck, Hardware in Loop, Corrosion, PG Driving, BSR, Hot/Cold Trips, etc.) during program development. Chrysler Proving Grounds shall conduct vehicle durability validations such as, PTSR, SXV, PT-7, etc. or reliability validation on 3/36 vehicle fleets to verify EE system interface and customer usage applications during different stages of program development (FDV, VP, PS and Job 1).

Any degradation to functional and/ or performance requirement involving component reliability/ durability issues shall be promptly addressed by component Supplier. Corrective actions shall focus on issue prevention and may involve changes to design including any component validation testing.

8.0 PRODUCT ASSURANCE

The manufacturing facility for a particular component or system shall develop an appropriate product assurance plan, in accordance with the Chrysler Group LLC's "**Process Sign-Off"** manual to assure the part meets the quality, durability, and reliability targets throughout the manufacturing process.

8.1 Chrysler Group LLC Approved

When provided, utilize Chrysler Group LLC Approved Practices, Chrysler Group LLC Lessons Learned, Chrysler Group LLC Standard Operating Procedures and/or Knowledge Based Engineering for the design and development of CSWM per **QR – 10008** Product Assurance Testing (PAT).

9.0 WARRANTY RETURNED PARTS TEST AND ANALYSIS PROCEDURES

The product design, development and manufacturing entities shall comply with **PS-11346 (Warranty Returned Parts and Analysis Procedures)**.

10.0 DEFINITIONS / ABBREVIATIONS / ACRONYMS

ADRESS: Automated Document Retrieval & Engineering Standards System.
BSR: Buzz Squeak and Rattle.
CAN: Controller Area Network
CC: Continuous Conformance.
CG: Chrysler Group LLC.
CUSW: Compact US Wide (new Chrysler vehicle program)
DOORS®: Dynamic Object Oriented Requirements System.
DV: Design Verification.
DVP&R: Design Verification Plan & Report.
E/E: Electrical / Electronic.
EASL: Engineering Approved Source List.
ECU: Electronic Control Unit.
EMC: Electromagnetic Compatibility.
ESSD: Engineering Standards Supplier Distribution.
FGA: Fiat Group Automobiles.
HTHE: High Temperature Humidity Endurance.
HTOE: High Temperature Operating Endurance.
IP: International Protection.
kB/ k Bd: Kilo Baud.
LIN: Local Interconnect Network.
LTOE: Low Temperature Operating Endurance.
PG: Proving Ground.
PTCE: Powered Thermal Cycle Endurance.
PV: Production Validation.
SSTE: Shipping / Storage Temperature Exposure.
Tenv.max: Maximum Environmental Temperature.
Tenv.min: Minimum Environmental Temperature.
THC: Thermal Humidity Cycle.
Top.max: Maximum Operational Temperature.
Top.min: Minimum Operational Temperature.
TH: High Temperature.
TL: Low Temperature.
TS: Thermal Shock
TTF: Test to Failure.
UDS: Unified Diagnostic Services - An enhanced diagnostic protocol.

UTmax: Maximum Operating Voltage.
UTmin: Minimum Operating Voltage.
UTtyp: Typical Operation Voltage.

11.0 GENERAL INFORMATION

Three asterisks "***" after a numbered section or subsection title, table title, or figure title denote single or multiple technical changes. Specific technical changes within a section, subsection, table, or figure may be highlighted in yellow.

Certain important information relative to this standard has been included in separate standards. To assure the parts submitted meet all of Chrysler requirements, it is mandatory that the requirements in the following standards be met.

CS-9800 - Application of this standard, the subscription service, and approved sources
CS-9003 - Regulated substances and recyclability
ISO/TS-16949 – Quality Management Systems
CS-CORROSION

Within Engineering Standards, the Regulatory (Government-mandated) requirements are designated by <S> and <E> which correspond to Safety and Emission Shields respectively. When applicable, the Chrysler mandated requirements are designated by <D> and correspond to the Diamond symbol and by <A> for Appearance related objectives, respectively.

For specific information on this document, please refer to the contact person shown in the "Publication Information" Section of this document. For general information on obtaining Engineering Standards and Laboratory Procedures, see **CS-9800** or contact the Engineering Standards Department at engstds@chrysler.com.

12.0 REFERENCES

TABLE 7: DOCUMENTS AVAILABLE FROM ADRESS AND ESSD			
CEP-042	CEP-12697	CS-11510	CS-11979
CS-11982	CS-9003	CS-9800	CS-CORROSION
CS-ROUTING	DS-11332	DS-158	PS-11346
PS-11687	PS-9227	QR-10008	QR-10021
SD-11401	SD-12219	SD-12501	SD-12659

TABLE 8: DOCUMENTS AVAILABLE FROM OTHER SOURCES
VF065 FRONT SEAT HEATING VF041 INSTRUMENT LIGHTING VF230 LTM SETUP MANAGEMENT VF604 DIAGNOSIS REQUEST AND RESPONSE MESSAGES VF700 CAN-B NETWORK MANAGEMENT - Available in DOORS®
84-231-1227: Process Sign-Off - Available from Lanier Professional Services. Call (248) 564-4748 to request an order form.
ISO/TS-16949 - Quality Management Systems - Particular Requirements for the Application ff ISO 9001:2008 for Automotive Production and Relevant Service Part Organizations - Available at http://www.iso.org
SAE/USCAR-2: Performance Specification for Automotive Electrical Connector Systems SAE/USCAR-25: Electrical Connector Assembly Ergonomic Design Criteria

TABLE 8: DOCUMENTS AVAILABLE FROM OTHER SOURCES
- Available from SAE International at http://www.sae.org
Fiat 9.91320/02 Fiat 80209/02 Fiat 9.90111/02 Fiat 9.90111 - Available from http://norme.orange.fiat.it/

13.0 ENGINEERING APPROVED SOURCE LIST

Not Applicable.

14.0 PUBLICATION INFORMATION

Contact/Phone Number: Brian Schaar - (248) 576-3368
Alternate Contact/Phone Number: John Boldt – (248) 576-3322
Department Name & Department Number/Tech Club/Organization: EE Body and Security, 6180
Date Standard Originally Published: 2013-04-11
Date Published: 2013-04-11
Change Notice:
Description of Change: Initial release

TABLE 9: DESIGN VERIFICATION & PRODUCTION VALIDATION (4)

Function	Section #	Sample Size (1)		Acceptance Criteria		Comments & Responsibility
		DV	PV	DV	PV	
ENVIRONMENTAL	3.0	(2)	(2)	No failure	No failure	Supplier (3)
PHYSICAL, ELECTRICAL and MECHANICAL	4.0	(2)	(2)	No failure	No failure	Supplier
FUNCTIONAL	5.0	(2)	(2)	No failure	No failure	Supplier
REGULATORY	6.0	(2)	(2)	No failure	No failure	Supplier/ Chrysler (as applicable)
RELIABILITY/ DURABILITY	7.0	(2)	(2)	No failure	No failure	Supplier

NOTE 1: If provided, the sample size shown is the Chrysler recommended samples per **QR-10008**, which in conjunction with the analysis method indicated best demonstrates the Acceptance Criteria has been met. The supplier is responsible for meeting the Acceptance Criteria specified and may use other valid sample sizes and analysis methods approved by Chrysler.
NOTE 2: Applicable tests, sample sizes and acceptance criteria shall be per requirements specified in each of these sections (INSTRUCTIONS: Engineers should include sample size, test procedures and acceptance criteria for each of these requirements, if not identified in the component PF or referenced standards, **CS-11982**, **CS-11979**, etc.)
NOTE 3: PET analysis method (refer to section 5.0 for details) is based on the Statistical Tolerance Limits explained in **SD-12501**. PET (shown as a red pentagon in the test flows in Appendix A) shall be completed on test samples at the start and after completion of test for the key functional parameters identified in section 5.0.
NOTE 4: Module qualification for DV & PV shall follow the test flow sequence given in Figure A-1 or A-2.

CONTINUING CONFORMANCE: The Continuing Conformance or CC table below shall include only those tests which are required to ensure on going quality of supplied components. Purpose of CC tests is to identify manufacturing spills before parts leaving the supplier manufacturing locations. Changes resulting from the "Forever Requirements – design or process changes" should not be included. If there are supply-chain related changes to design, process, manufacturing moves or packaging environment, applicable validation requirements from **SD-12659** shown in Appendix-B shall be identified by Chrysler Engineering, Quality and SQA team.

TABLE 10: CONTINUING CONFORMANCE				
Function	Section #	Sample Size	Acceptance Criteria	Frequency
Thermal Shock	3.5	3	No Failure	Quarterly
Vibration	3.5	3	No Failure	Quarterly
Layout Inspection	-	3	No Failure	Yearly
Powered Thermal Cycle Endurance	3.5	5	No Failure	Yearly
CSWM Parametric Tests	5.3	3	No Failure	Yearly
NOTE 1: Above tests are in addition to all the in-process functional verifications identified in the Control Plans to prevent potential Design & Process failures.				

# # # # #

APPENDIX A: RECOMMENDED TEST FLOWS FOR EE COMPONENT VALIDATION

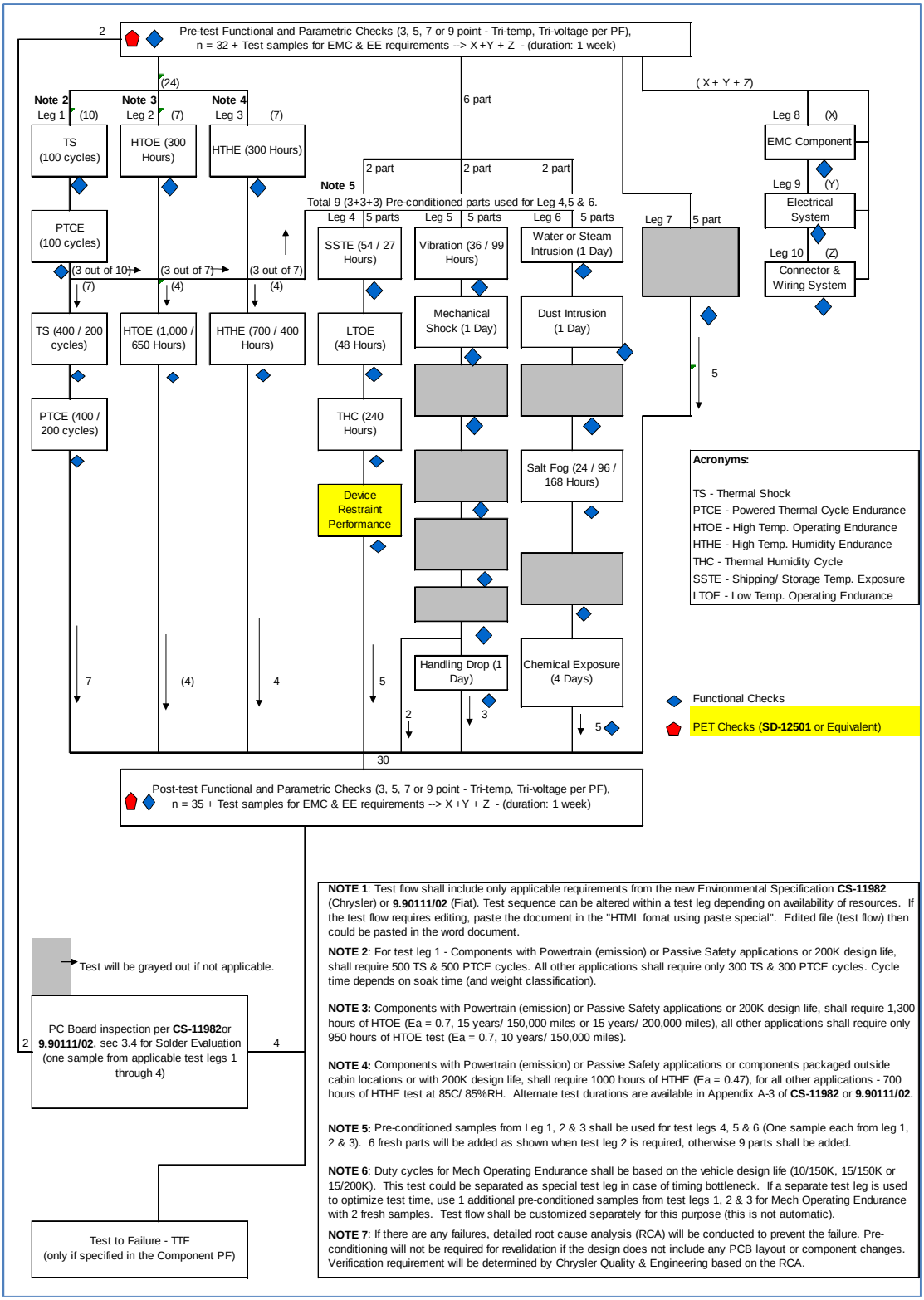


FIGURE A-1: TEST FLOW SEQUENCE FOR EE COMPONENT VALIDATION

(2008-04-07)

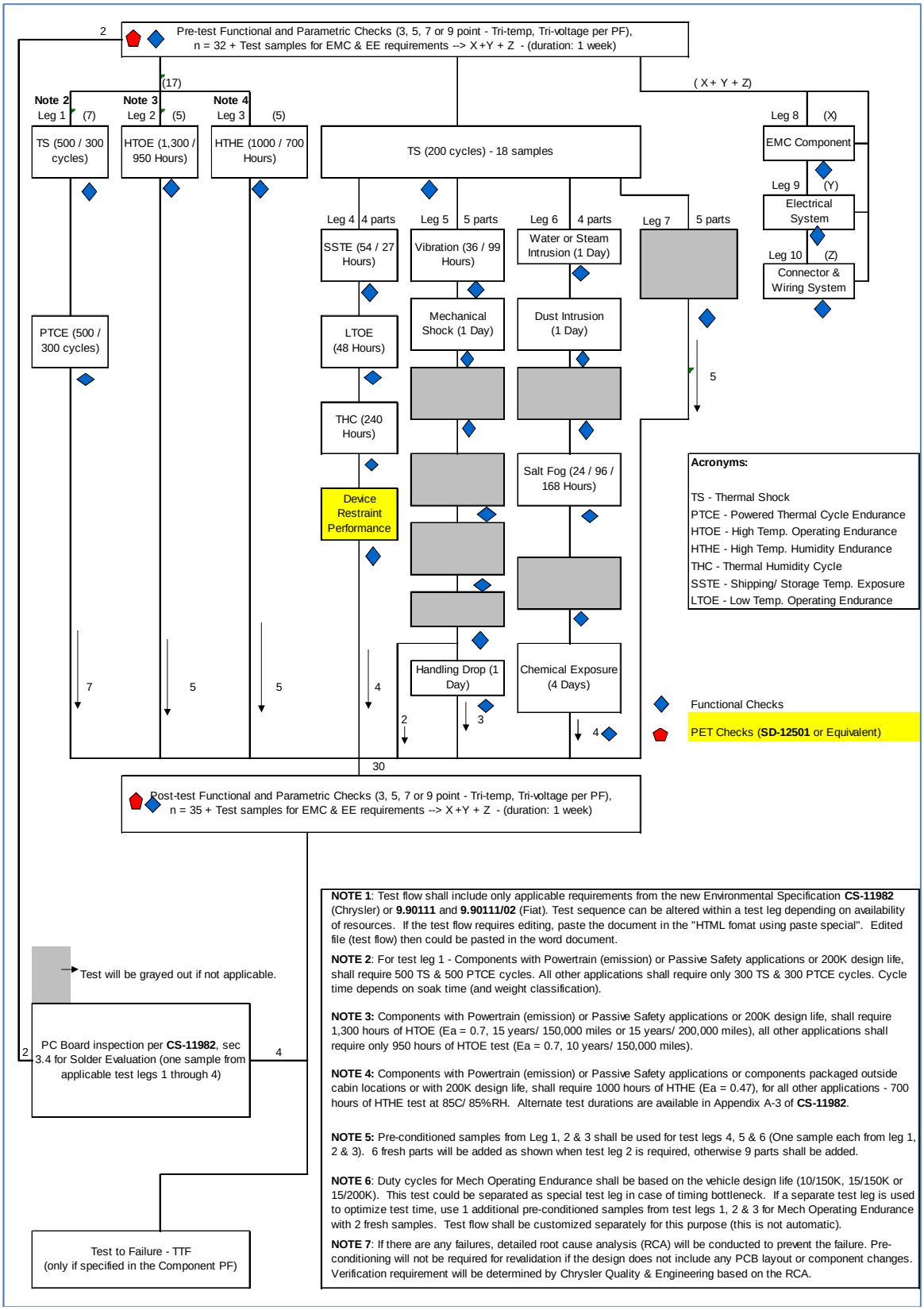
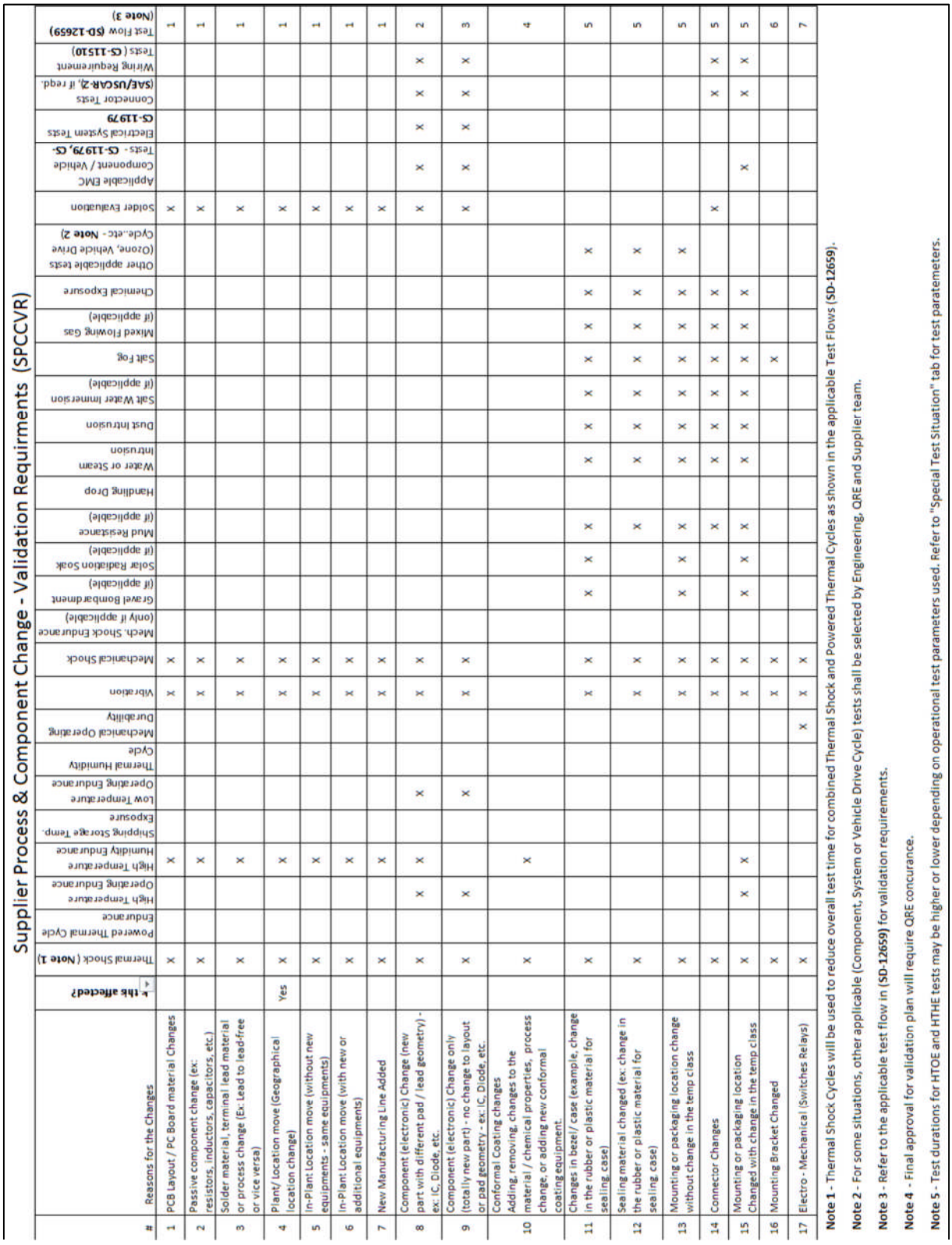


FIGURE A-2: ALTERNATE TEST FLOW SEQUENCE FOR EE COMPONENT VALIDATION

APPENDIX B: SUPPLIER PROCESS & COMPONENT CHANGE - VALIDATION REQUIREMENT



#	Reasons for the Changes	▸ this affected?	Thermal Shock (Note 1)	Powered Thermal Cycle Endurance	High Temperature Operating Endurance	High Temperature Humidity Endurance	Shipping Storage Temp. Exposure	Low Temperature Operating Endurance	Thermal Humidity Cycle	Mechanical Operating Durability	Vibration	Mechanical Shock	Mech. Shock Endurance (only if applicable)	Gravel Bombardment (if applicable)	Solar Radiation Soak (if applicable)	Mud Resistance (if applicable)	Handling Drop	Water or Steam Intrusion	Dust Intrusion	Salt Water Immersion (if applicable)	Salt Fog	Mixed Flowing Gas (if applicable)	Chemical Exposure	Other applicable tests (Ozone, Vehicle Drive Cycle...etc - Note 2)	Solder Evaluation	Applicable EMC Component / Vehicle Tests - CS-11979, CS-Electrical System Tests CS-11979	Connector Tests (SAE/USCAR-2), if readi.	Wiring Requirement Tests (CS-11510)	Test Flow (SD-12659) (Note 3)
1	PCB Layout / PC Board material Changes		X		X						X	X													X				1
2	Passive component change (ex: resistors, inductors, capacitors, etc.)		X		X						X	X													X				1
3	Solder material, terminal lead material or process change (Ex: Lead to lead-free or vice versa)		X		X						X	X													X				1
4	Plant/ Location move (Geographical location change)	Yes	X		X						X	X													X				1
5	In-Plant Location move (without new equipments - same equipments)		X		X						X	X													X				1
6	In-Plant Location move (with new or additional equipments)		X		X						X	X													X				1
7	New Manufacturing Line Added		X		X						X	X													X				1
8	Component (electronic) Change (new part with different pad / lead geometry) - ex: IC, Diode, etc.		X	X	X		X				X	X													X	X	X		2
9	Component (electronic) Change only (totally new part) - no change to layout or pad geometry - ex: IC, Diode, etc.		X	X		X					X	X													X	X	X		3
10	Conformal Coating changes Adding, removing, changes to the material / chemical properties, process change, or adding new conformal coating equipment.		X		X																								4
11	Changes in bezel/ case (example, change in the rubber or plastic material for sealing case)		X								X	X		X	X	X		X	X	X	X	X	X						5
12	Sealing material changed (ex: change in the rubber or plastic material for sealing case)		X								X	X				X		X	X	X	X	X	X						5
13	Mounting or packaging location change without change in the temp class		X								X	X		X	X	X		X	X	X	X	X	X						5
14	Connector Changes		X								X	X				X		X	X	X	X	X	X			X	X	X	5
15	Mounting or packaging location Changed with change in the temp class		X		X	X					X	X		X	X	X		X	X	X	X	X	X		X	X	X	X	5
16	Mounting Bracket Changed		X								X	X									X								6
17	Electro - Mechanical (Switches Relays)		X							X	X	X																	7

Note 1 - Thermal Shock Cycles will be used to reduce overall test time for combined Thermal Shock and Powered Thermal Cycles as shown in the applicable Test Flows (**SD-12659**).

Note 2 - For some situations, other applicable (Component, System or Vehicle Drive Cycle) tests shall be selected by Engineering, QRE and Supplier team.

Note 3 - Refer to the applicable test flow in (**SD-12659**) for validation requirements.

Note 4 - Final approval for validation plan will require QRE concurance.

Note 5 - Test durations for HTOE and HTHE tests may be higher or lower depending on operational test parameters used. Refer to "Special Test Situation" tab for test paratemeters.

FIGURE B-1: TEST SELECTION GUIDELINE FOR SUPPLY-CHAIN CHANGES

(2008-04-07)