EMC & ELECTRICAL TEST LABORATORY CAPABILITY

FLEXTRONICS
FLEX Automotive
EMC & ELECTRICAL TEST LABORATORY
213 Harry Walker Parkway South, Newmarket, Ontario, L3Y 8T3, Canada

How to use this document (if saved in pdf format):

- Click-on the desired OEM icon on this page (CHRYSLER, GM, or FORD) to open a summary of EMC & Electrical test capability.
- From the OEM summary list select (click-on) the desired EMC (blue labels) or Electrical (light-green labels) test.
- From a specific test page you can:
  - Click-on OEM SPEC REF label to open that document saved on a shared network drive.
  - Click-on TEST FOR OEM label to return to the summary page.
- To return to introductory page click-on the home-button at the bottom.

Another method to browse this HTML document is available from “Go to page” panel on the left. Select from the combo-box the desired OEM file and click-on the green arrow. The user can also zoom in/out the previewed file and can hide the panel.

EMC & ELECTRICAL TEST LABORATORY CAPABILITY FOR CHRYSLER (DC10614A & DC10615A) REQUIREMENTS (apply to 2006 and beyond vehicle model year)

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EMISSIONS	RADIATED	RF	CISPR 25 RE	76 TO 1000 MHz CISPR-25 ALSE method LP-388C-73	8 h
		MAGNETIC FIELD	MAGNETIC RE	15 Hz TO 30 KHz method LP-388C-71	8 h
	CONDUCTED	PIN CONDUCTED RF	PCE or CISPR25 CE (V&I)	150 KHz TO 110/200 MHz LP-388C-41 OR CISPR-25 V & I	4 h
		TRANSIENT	TRANSIENT CE	method ISO 7637-2 voltage probe on power lines LP-388C-30	4 h
IMMUNITY	RADIATED	RF	ALSE ISO/SAE w/wo gp	200 to 3200 MHz ISO 1145-2 ALSE, LP-388C-35	24 h
			TEM Cell	1 to 200 MHz ISO 11452-3, LP-388C-34	8 h
		MAGNETIC FIELD	Magnetic Susceptibility	15 Hz to 30 KHz MIL-STD-461E, LP-388C-58	8 h
	CONDUCTED	RF	BCI or DRFI	1 to 400 MHz ISO 11452-4 BCI LP-388C-72 OR LP-388C-32 method	24 h
		TRANSIENT DISTURBANCES	POWER LINES	PULSES 1, 2, 3a 3b, ISO 7637-2, LP-388C-39	24 h
			Fast/Slow I/O sensor line	PULSES a, b, 2, ISO 7637-3 Coupling Clamp	24 h
ESD			ESD - DC-10614	Handling ISO 10605, ± 8 kV (case), ± 4 kV (pins)	8 h
				Powered IEC 61000-4-2, Air ± 25 kV, Contact ± 8 kV	8 h
ELECTRICAL	Electrical System Operating Environment		Supply Voltage Range	DC-10611 ,Group A, B, C, D, LP-388C-69	4 h
			Ignition Off Current Draw	(IOD) DS-156, <0.1 mA, LP-388C-69	1 h
			Supply Voltage Ripple	15 Hz to 30 KHz, SAE J1113-2, LP-388C-33	12 h
	Supply Voltage Variations		Supply Switch Deactivation	feedback on any non batt input line shall fall to < 1 mA within 1 s max	4 h
			Supply Voltage Dropout	10 µs to 2 s, LP-388C-38	6 h
			Supply Voltage Dips	100 µs, 1 ms, 10 ms and 500 ms , LP-388C-38	6 h
			Engine Cranking Low Voltage	6.5 to 8.5 volts peak to peak, LP-388C-68	4 h
			Supply Voltage Ramp-Down	LP-388C-68 , PF-9326	6 h
			Supply Voltage Ramp-Up	LP-388C-68 , PF-9326	4 h
	Supply Over Voltage and Reverse Voltage		Defective Regulation (Alternator)	18 V to all supply voltage lines for 60 minutes	4 h
			Jump Start	27 V to all DUT supply voltage lines for 1 minute	1 h
			Load Dump	5 pulses a minimum of 2 minutes apart, LP-388C-36	2 h
			Reverse Supply Voltage	-16 V for 1 minute to the DUT supply voltage lines	1 h
	Electrical System Compatibility Requirements		Immunity to Short Circuits	Supply Voltage Input, Load Output, AND I/O Signal Lines	4 h
			Supply Voltage Offset	± 1 V offset (1 volt maximum offset relative to 13.5 V)	4 h
			Ground Reference Offset	± 1 V ground offset (maximum 1 volt ground to ground offset)	4 h
			Resistance to Overload	Melting Fuse, Fusible (Wire) Link, Circuit Breakers, Electronic Fuse	4 h
	Motors and Inductive Devices		Operating and Voltage Stress	DC-10615	4 h
			Stall	Supply 12.6 V - stall (or locked) condition for one (1) hour	4 h

Test-time nr of pins dependent

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705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
CHRYSLER	DC-10614A	LP-388C-41	EMISSIONS	CONDUCTED	PIN CONDUCTED RF
TEST TITLE:	**PIN CONDUCTED RF EMISSIONS (PCE) 150 KHz TO 110/200 MHz OR CISPR-25 Voltage and Current Methods**				

TEST PROCEDURE DESCRIPTION

Active devices and electronically controlled motors (categories A and ECM) shall be tested from 150 kHz to 1GHz unless otherwise specified in the product specification.

For categories A and ECM, either Pin Conducted Emissions (PCE) testing shall be performed or both CISPR 25 voltage on supply lines and CISPR 25 current measurement on all lines shall be performed in the frequency range from 150 kHz to 110 MHz. For high voltage (HV) electric vehicle (EV) or hybrid electric vehicle (HEV) components, the CISPR 25 voltage measurement is not required. For components without a wiring harness, the CISPR 25 voltage and current measurements are not required. CISPR 25 radiated emissions shall be performed from 76 MHz to 1 GHz.

Components that use a low power RF link (e.g. RF remote keyless entry) require special considerations for emission testing at their operating frequency, refer to DC-10614A Annex E.

Brush commutated electric motors (category BCM) and pulsed inductive devices (category IP) shall be tested for RF broadband emissions (no narrowband) over the frequency range from 150 kHz to 200 MHz using either Pin Conducted Emissions (PCE) or the CISPR 25 voltage method. See DC-10614A Tables-6,7,8 for PCE RF emissions basic limit levels.

TEST METHOD EQUIPMENT LIST

Reverberation Chamber
RF POWER AMPLIFIER, AMPLIFIER RESEARCH, 50W1000
RF SIGNAL GENERATOR 5 KHz - 3 GHz, RHDOE & SCHWARZ, SMT03, (S/N: 829889/003)
RF Voltage Probe, 1KOHM || 1.5 p, 150 KHz at 500 MHz, P6158, (S/N: 2493128P302/2)
SPECTRUM ANALYSER, HEWLETT PACKARD, 8591A, (S/N: 3009A00951)
BROADBAND ARTIFICIAL NETWORK, FISCHER CUSTOM COMMUNICATIONS INC., FCC-BAN-30-2, (S/N: 99137)
Attenuator 3 – 20 dB, +/- 0.5 dB in the testing frequency range
DC Blocking Capacitor 0.047 uF, Tektronix, 015-0221-00
Ferrite Clamp Z=130 OHM at 25 MHz, 275 OHM at 100 MHz, Type 43 material., Steward, 28A2025/0A0
Ground Plane, Brass, 0.5 mm thickness

Air-compressed system for input switches activation
GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

CISPR-25 Conducted RF Emissions - (Voltage on Supply Lines) and CISPR-25 Conducted RF Emissions - (Current on all Lines in Harness) are less time consuming then PCE test method.

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705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	**OEM SPEC REF:**	**OEM PROCEDURE REF:**	**REQUIREMENT TYPE:**	**TEST SUBGROUP-1:**	**TEST SUBGROUP-2:**
CHRYSLER	DC-10614A	CISPR-25	EMISSIONS	RADIATED	RF

TEST TITLE: **CISPR-25 Radiated Emissions (76 TO 1000 MHz ALSE method)**

TEST PROCEDURE DESCRIPTION

The emission of components shall be measured in accordance with CISPR 25 in an absorber-lined shielded enclosure with an antenna or antennas in the frequency range of 76 MHz to 1000 MHz (unless otherwise specified in the product specification). The measurements shall be made in the frequency range from 76 to 1000 MHz with a measurement bandwidth of 100 or 120 kHz except where additional narrowband measurements with 9/10 kHz bandwidth are specified. The measured values shall be below the limit values in Tables 15, 16 and 17. The test setup is given in detail in CISPR 25. Deviating from CISPR 25, the use of 50 ohm BANs as a substitute for the ANs is acceptable. The outer surface of the DUT with the greatest disturbance emission, if known, shall be facing the antenna.

TEST METHOD EQUIPMENT LIST

CISPR-25 ALSE, BRADEN SHIELDING SYSTEMS, (S/N: 241431)
Amplifier 9KHz-1300MHz, HEWLETT PACKARD, 8447F OPT H64, (S/N: 2805A02756)
LISN 5uH/50A/600VDC Artificial Network (AN), SOLAR ELECTRONICS, Type 9117-5-TS-50-N, (S/N: 0310294)
BICONICAL ANTENNA, SCHWARZBECK, BBA 9106, (S/N:)
CURRENT PROBE (150 kHz to 200 MHz), EATON, 94111-1, (S/N: 1340)
LOG PERIODIC ANTENNA 200MHz – 1GHz, SCHAFFNER-CHASE EMC, UPA6109, (S/N: 1065)
AGILENT Preamplifier 87405A 10-3000 MHz +13dBm max input
HP 8596E Spectrum Analyzer 9KHz - 12.8 GHz (s/n: 3826A01436)
Ground Plane, Brass, 0.5 mm thickness

Fluke 27 Multi-meter
RF 50 Ohm Load, 2 x EMI Terminator 50 OHM
Automotive Battery
Styrofoam test bench, Insulated support 50 mm thick
Test Harness 1700 mm (+300/-0 mm)
Double-shielded coaxial cable, Bulkhead connector
Air-compressed system for input switches activation
GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

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TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
CHRYSLER	DC-10614A	LP-388C-71	EMISSIONS	RADIATED	MAGNETIC FIELD
TEST TITLE:	**Magnetic Field Emissions**				

TEST PROCEDURE DESCRIPTION

Electrical and electronic motors and components generate a magnetic field proportional to current that falls off with distance. This magnetic field emissions requirement is based on a minimum separation of 250 mm between the DUT and a magnetically sensitive module (e.g. blower motor to radio/cassette unit). Small motors (current draw less than 0.5 A) or motors that are an integral part of a module with magnetically sensitive components (e.g. drive motors contained in radio/cassette unit) are expected to be compatible with the overall function of the module and are not evaluated for this requirement. The magnetic flux density measured at a distance of 250 mm from the periphery of the DUT shall not exceed 160 + 20 log(D/250) dBpT (dB picotesla) from 15 Hz to 60 Hz and above 60 Hz this shall decrease at a rate of 12 dB per octave to 52 + 20 log(D/250) dBpT at 30 kHz where 'D' represents the distance in millimeters from the periphery of the DUT to the nearest magnetically sensitive module. The measurements shall be performed at all six sides of the DUT to detect the position with the highest emission levels.

TEST METHOD EQUIPMENT LIST

DDM, FLUKE, 8060A, (S/N: TBD)
MAGNETIC FIELD PICKUP COIL, EMCO, 7604, (S/N: 9904-2462)
Power Supply 35V/30A, Kikusui, PAD 35-30L, (S/N: TBD)
Spectrum Analyzer 10Hz - 150 MHz, HEWLETT PACKARD, 3588A, (S/N: 3337A01383)
Tektronix TDS TDS754D/2M Digitizing Oscilloscope, (S/N: B022455)
Audio Amplifier ELECTRO-METRICS Model AA-SUS 20 Hz - 100 kHz, (S/N: 218417)
Helmholtz Coil System Model 6403.
Magnetic Field Strength Meter Model EM-7530 20 Hz - 50 KHz.
Magnetic Field Sensor Probe EM 7356 (60 - 120 dBpT).
Magnetic Field Sensor Probe EM 7357 (100 - 160 dBpT).

Air-compressed system for input switches activation
GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

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TEST FOR OEM:	**OEM SPEC REF:**	**OEM PROCEDURE REF:**	**REQUIREMENT TYPE:**	**TEST SUBGROUP-1:**	**TEST SUBGROUP-2:**
CHRYSLER	DC-10614A	LP-388C-30	EMISSIONS	CONDUCTED	TRANSIENT

TEST TITLE: **Conducted Transient Emissions (ISO 7637-2)**

TEST PROCEDURE DESCRIPTION

Inductive devices (Category R or IP) are to be tested with any intended parallel suppression in place. If this suppression is remotely located at a driver in a module, the inductive device must be tested as a system with the module or with the suppression simulated across the inductive device. Conducted transient emissions shall be measured in accordance with ISO 7637-2.

The transients for 12 and 42 V systems are limited to +/- 80 volts regardless of their waveshape. The transients for 24 V systems are limited to +80 volts and –150 volts.

Representative loading shall be used for the DUT whenever possible. Vehicle system switches and relays are subject to deterioration with accumulated operating time. This can result in the generation of transients with faster rise times or higher peak voltages. Therefore, the switch or relay used should represent 'worst case' to preclude later system problems.

TEST METHOD EQUIPMENT LIST

LISN 57uH/50A/600VDC Artificial Network (AN), SOLAR ELECTRONICS, Type 6338-57-TS-50-N, (S/N: 927238)
Relay, Potter Brumfield, PRD-11DG0-12DC
Ground Plane, Brass, 0.5 mm thickness
OSCILLOSCOPE, TEKTRONIX, TDS754D /2M, (S/N: B022455)
Power Supply HP 6286A 20V/20A, HEWLETT PACKARD, 6286A
Vehicle Battery (12.6 V)
Momentary closed pushbutton switch
Tektronix P6139A voltage probe

Air-compressed system for input switches activation
GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

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TEST FOR OEM:	**OEM SPEC REF:**	**OEM PROCEDURE REF:**	**REQUIREMENT TYPE:**	**TEST SUBGROUP-1:**	**TEST SUBGROUP-2:**
CHRYSLER	DC-10614A	LP-388C-72	IMMUNITY	CONDUCTED	RF
TEST TITLE:	**Bulk Current Injection (BCI) Test (ISO 11452-4)**				

TEST PROCEDURE DESCRIPTION

The BCI immunity performance requirements are specified in Tables 24 to 27 and in Figure B.4 of Annex B.4 Due to changes with respect to ISO 11452-4, refer to Figure 8 for a schematic diagram of the test setup. Deviating from ISO 11452-4, the test harness shall be 1700 (+ 300, 0) mm long and routed 50 mm above the ground plane (this harness can also be used for CISPR 25 Radiated Emission testing). Wherever possible, production intent vehicle switching devices and sensors shall be used. A current injection probe shall be used; a current monitoring probe is optional. Use substitution method with forward power. The distance between the test setup and all other conductive structures (such as the walls of the shielded enclosure) with the exception of the ground plane shall be no less than 500 mm. The current injection probe shall be located on the test harness at two points, a distance of 150 mm and at 750 mm from the DUT. Where the harness has a number of branches, the test shall be repeated, so that the current injection probe shall be attached around each branch.

TEST METHOD EQUIPMENT LIST

Reverberation Chamber
LISN 5uH/50A/600VDC, Solar Electronics, Type 9117-5-TS-50-N, (S/N: 17551)
ATTENUATOR 100W/3dB 2 GHz, Delta OHM, 09-208-032, (S/N: AR-307468/MFG P-13)
FCC-BCICF-1 Calibration Fixture 10 KHz - 400 MHz, FISCHER C.C., FCC-BCICF-1, (S/N: AR-307467/MFG 448)
F-55 RF CURRENT PROBE 10KHz - 500 MHz, FISCHER C.C.., F-55, (S/N: AR-307470/MFG 64)
F-130A-1 BULK CURRENT INJECTION PROBE 10KHz - 400 MHz, FISCHER C.C., F-130A-1, (S/N: 11)
CWS500D RF Conducted Immunity Generator (BCI), EM Test, CWS500D, (S/N: AR-307466/MFG 0803-01)
Fiber-optic video-camera, 2-meter fixture for harness, Automotive Battery.

EM Test SOFTWARE
Air-compressed system for input switches activation
GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

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705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	**OEM SPEC REF:**	**OEM PROCEDURE REF:**	**REQUIREMENT TYPE:**	**TEST SUBGROUP-1:**	**TEST SUBGROUP-2:**
CHRYSLER	DC-10614A	LP-388C-32	IMMUNITY	CONDUCTED	RF
TEST TITLE:	**Direct RF Power Injection (DRFI) (ISO 11452-7) 1 TO 400 MHz**				

TEST PROCEDURE DESCRIPTION

Select either DRFI (refer to 7.2) or BCI (refer to 7.3) for conducted immunity testing from 1 MHz to 400 MHz. For high voltage (HV) electric vehicle (EV) or hybrid electric vehicle (HEV) components, BCI shall be used. DRFI (Direct Radio Frequency Injection) involves isolating the DUT so that the RF coupling path is controlled. This test is also referred to as single line injection (SLI). The DRFI immunity performance requirements are specified in Tables 22 and 23 and in Figure B.3 of Annex B. This test uses a 50 ohm, 10 dB attenuator in the injection network and a broadband isolator (BAN - see Annex C) between each DUT line and its termination, except that low impedance (less than 50 ohm) dedicated sensor or load lines shall be injected at the DUT without using an isolator. The maximum allowable length of the wiring from the DUT to point 3 on the BAN shall be 150 mm. Refer to ISO 11452-7 and Figure 7 for test setup. Balanced lines shall be injected with a common mode signal. DUT with multiple grounds are subject to injection on one ground relative to another.

TEST METHOD EQUIPMENT LIST

RF SIGNAL GENERATOR 5 KHz - 3 GHz, ROHDE & SCHWARZ, SMT03, Cal.No.INV1522, (S/N: 829889/003)
COAXIAL ATTENUATOR JFW Industries, 10 dB, 30 Watts, 50FH-010-30N.
Tektronix DC Blocking Capacitor, 0.047 uF, 015-0221-00.
RF AMPLIFIER 25 W, KALMUS, 737LC-CE, Cal.No.INV1467, (S/N: 8638-1)
BAN, FISCHER CUSTOM COMMUNICATIONS, FCC-BAN-.5-4, (0.5A, 4 LINES), (S/N: 99126)
BAN, FISCHER CUSTOM COMMUNICATIONS, FCC-BAN-2-4, (2 A, 4 LINES, Cal.No.INV1518), (S/N: 99135)
BAN, FISCHER CUSTOM COMMUNICATIONS, FCC-BAN-30-2, (30 A, 2 LINES, Cal.No.INV1519), (S/N: 99138)
SPECTRUM ANALYSER, HEWLETT PACKARD, 8596E, (S/N: 3826A01436)
BOONTON Dual Channel Power Meter with 51013(4E) Diode Sensor, 4232-02, Cal.No.INV1470, (S/N: 18101)
SCHAFFNER COAXIAL CABLES RG58.
RF SIGNAL SAMPLING TEE, 30 dB ISOLATION, MICROLAB FXR, HM-30N.
BATTERY, Exerciser separated Power Supply
Tile Software, (CIS 9942 IMMUNITY SOFTWARE alternate software method)
Air-compressed system for input switches activation
GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

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TEST FOR OEM:	**OEM SPEC REF:**	**OEM PROCEDURE REF:**	**REQUIREMENT TYPE:**	**TEST SUBGROUP-1:**	**TEST SUBGROUP-2:**
CHRYSLER	DC-10614A	LP-388C-35	IMMUNITY	RADIATED	RF
TEST TITLE:	**ALSE without a Ground Plane (SAE J1113-21) 200 to 3200 MHz**				

TEST PROCEDURE DESCRIPTION

The test levels and functional status requirements by frequency range and functional group are specified in Table 28. For a schematic diagram of the test setup refer to Figure 11. Use substitution method with forward power and specified uniformity. The antenna shall be sighted on the DUT. DUT to point “A” (Fig-11) is an unshielded wiring harness of 600 +/- 50 mm in length. From point “A”, the harness goes vertically 1 meter to the floor and along the floor to the wall bulkhead feedthrough filter. The DUT shall be 1 meter above the floor. The DUT shall be a minimum of 1 meter from the antenna and any other conductive surface and a minimum of 1 meter from any absorber. Vertical polarization shall be used. The DUT shall be tested in three mutually perpendicular orientations (principal planes): (i) with the main circuit board in the DUT parallel to the chamber floor (vehicle mounting surface down), (ii) with the main circuit board perpendicular to the chamber floor edge on to the antenna and (iii) with the main circuit board perpendicular to the chamber floor and broadside to the antenna. These three orientations shall be chosen from the six possible orthogonal orientations, to allow visibility of the DUT, if required, and to maintain a consistent and repeatable routing of the DUT harness and direct exposure of DUT apertures to the antenna.

TEST METHOD EQUIPMENT LIST

Anechoic Chamber Braden Shielding Systems	AR DC6080, Dual Directional Coupler, 80 MHz to 1 GHz
Rohde & Schwarz SMT 03, Signal Generator, 5 KHz to 3 GHz, (S/N: 829889/003)	AR DC7144, Dual Directional Coupler, 800 MHz to 4.2 GHz
Rohde & Schwarz SMP 02, Signal Generator, 2 GHz to 20 GHz, (S/N: 829839/004)	AR DC7144, Dual Directional Coupler, 800 MHz to 4.2 GHz
AR 200W1000AM1, Power Amplifier, 200 W, 200 MHz to 1 GHz.	AR FM5004, Field Probe Mainframe.
AR 200T1G2, Power Amplifier, 200 W, 1 GHz to 2 GHz.	AR FP5083, Field Probe, 80 MHz to 40 GHz.
AR 200T2G4, Power Amplifier, 200 W, 2 GHz to 4 GHz.	Bulkhead filter Tusonix 4201-001, Storm Low Loss Microwavw Coaxial Cables.
Boonton 4232-02, Dual Channel Power Meter	Tile Immunity Software.
AR AT4000, Horn Antenna AR AT4000, 200 MHz to 1 GHz.	Air-compressed system for input switches activation
EMC Test Systems 3115, Horn Antenna, 1 GHz to 18 GHz.	GRYPHON, HW/SW & CAN fiber-optic support
Bulkhead filter Tusonix 4201-001.	Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

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TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
CHRYSLER	DC-10614A	LP-388C-35	IMMUNITY	RADIATED	RF
TEST TITLE:	**ALSE with a Ground Plane (ISO 11452-2) 200 to 3200 MHz**				

TEST PROCEDURE DESCRIPTION

The test levels and functional status requirements by frequency range and functional group are specified in Table 28. Due to changes with respect to ISO 11452-2, refer to Figures 9 and 10 for schematic diagrams of the test setups. Use substitution method with forward power. For frequencies =< 1 GHz, the antenna shall be positioned in front of the middle of the harness (refer to Figure 9). For frequencies above 1 GHz, the antenna shall be sighted on the DUT (refer to Figure 10). For modules in a metal case, the DUT connector(s) should be oriented toward the antenna. Production intent vehicle sensors and loads shall be used as peripheral devices wherever possible. The test shall be carried out with vertical antenna polarization only up to 400 MHz and with vertical and horizontal antenna polarization above 400 MHz.

TEST METHOD EQUIPMENT LIST

Anechoic Chamber Braden Shielding Systems	AR DC6080, Dual Directional Coupler, 80 MHz to 1 GHz
Rohde & Schwarz SMT 03, Signal Generator, 5 KHz to 3 GHz, (S/N: 829889/003)	AR DC7144, Dual Directional Coupler, 800 MHz to 4.2 GHz
Rohde & Schwarz SMP 02, Signal Generator, 2 GHz to 20 GHz, (S/N: 829839/004)	AR DC7144, Dual Directional Coupler, 800 MHz to 4.2 GHz
AR 200W1000AM1, Power Amplifier, 200 W, 200 MHz to 1 GHz.	AR FM5004, Field Probe Mainframe.
AR 200T1G2, Power Amplifier, 200 W, 1 GHz to 2 GHz.	AR FP5083, Field Probe, 80 MHz to 40 GHz.
AR 200T2G4, Power Amplifier, 200 W, 2 GHz to 4 GHz.	Bulkhead filter Tusonix 4201-001, Storm Low Loss Microwavw Coaxial Cables.
Boonton 4232-02, Dual Channel Power Meter	Tile Immunity Software.
AR AT4000, Horn Antenna AR AT4000, 200 MHz to 1 GHz.	Ground Plane, Air-compressed system for input switches activation
EMC Test Systems 3115, Horn Antenna, 1 GHz to 18 GHz.	GRYPHON, HW/SW & CAN fiber-optic support
Bulkhead filter Tusonix 4201-001.	Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

FLEXTRONICS
FLEX Automotive
EMC & ELECTRICAL TEST LABORATORY
213 Harry Walker Parkway South, Newmarket, Ontario, L3Y 8T3, Canada

EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
CHRYSLER	DC-10614A	LP-388C-34	IMMUNITY	RADIATED	RF
TEST TITLE:	**TEM Cell Test (ISO 11452-3) 1 to 200 MHz**				

TEST PROCEDURE DESCRIPTION

The TEM Cell immunity performance requirements are specified in Tables 29 and 30. Details on the test setup are given in ISO 11452-3 and in Figure 12. The forward power required to achieve the specified field strengths shall be calculated with the formula in ISO 11452-3 using the actual impedance over frequency as measured for the TEM cell being used. To verify this calculation, the field strength achieved in an empty cell shall be measured using a field strength probe. The use of a feedthrough filter assembly is not optional but required. The DUT shall be connected to the filter assembly with an unshielded wiring harness of 600 50 mm in length running diagonally from the DUT connector(s) to the TEM cell bulkhead connectors. The orientation of this harness in the TEM cell shall be controlled and documented. Any excess DUT harness shall be fastened with nonconductive tape to the TEM cell floor at the bulkhead connector end. The DUT shall be located in the approximate center of the TEM cell, midway between the septum and floor; it may be shifted off center to allow for a direct harness routing but it shall remain in the center two thirds volume of the cell. The position of the DUT shall be consistent and documented.

TEST METHOD EQUIPMENT LIST

Signal Generator 5 KHZ to 3 GHZ, Rohde & Schwartz, SMT 03, (S/N: 829889/003)
Power Amplifier 250A250AM1, 250 W, 10 KHz to 250 MHz, Amplifier Research.
Dual Channel Power Meter, 4232A, Boonton, (S/N: 18101)
Dual Directional Coupler, 10 KHZ to 250 MHz, C5086, Werlatone
TEM Cell, 10 KHz to 200 MHz, FCC-TEM-48/34/15-200, (S/N: 9909)
Field Probe Mainframe, FM5004, Amplifier Research
Field Probe, 10 KHz to 1 GHz, FP5000, Amplifier Research.
Coaxial Termination, DC to 1 GHz, 200 W
Tile Immunity Software.

Air-compressed system for input switches activation
GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

FLEXTRONICS
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EMC/ELECTRICAL TEST REFERENCES

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705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
CHRYSLER	DC-10614A	LP-388C-58	IMMUNITY	RADIATED	MAGNETIC FIELD
TEST TITLE:	**Magnetic Field Immunity**				

TEST PROCEDURE DESCRIPTION

Subcategory MS DUTs shall not be affected by a magnetic flux density of 160 dBpT (dB picotesla) from 15 Hz to 60 Hz and above 60 Hz this flux density shall decrease at a rate of 6 dB per octave to 106 dBpT at 30 kHz. Subcategory MS DUTs in severe magnetic environments (e.g. located within 0.5 meter of a battery cable or other power feed carrying 50 A or more of current) shall not be affected by a flux density of 160 dBpT from 15 Hz to 30 kHz. Refer to Figure 13 for test setup. Test frequency steps shall be at least 10 per decade (corresponding to a maximum expected Q of 4). The DUT shall be exposed to a flux density of 160 dBpT from 15 Hz to 60 Hz using a sine wave test signal. For DUTs not in a severe magnetic field environment, the DUT shall be exposed to a 60 Hz square wave test signal that generates 160 dBpT amplitude of the 60 Hz component of the test signal. For DUTs not in a severe magnetic field environment, the sine wave scan using the 6 dB per octave decreasing limit shall be performed only if there are effects noted during the square wave test. For DUTs not in a severe magnetic field environment, the sine wave scan using the 6 dB per octave decreasing limit shall be performed only if there are effects noted during the square wave test.

TEST METHOD EQUIPMENT LIST

Tektronix TDS 754-D Digitizing Oscilloscope.
HP 8116 Function Generator
Audio Amplifier Model AA-SUS 20 Hz - 100 kHz.
Tektronix A503B Current Probe
Helmholtz Coil ETS Model 6403.

Air-compressed system for input switches activation
GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

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EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	**OEM SPEC REF:**	**OEM PROCEDURE REF:**	**REQUIREMENT TYPE:**	**TEST SUBGROUP-1:**	**TEST SUBGROUP-2:**
CHRYSLER	DC-10614A	LP-388C-39	IMMUNITY	TRANSIENT DISTURB.	POWER LINES

TEST TITLE: **Transient Disturbances Conducted along Supply Lines (ISO 7637-2) Pulses 1, 2, 3a, 3b**

TEST PROCEDURE DESCRIPTION

The DUT shall be monitored during operation while being subjected to the supply voltage transients as specified for the appropriate system voltage in Tables 32, 33, 34 and 35. These pulses are applied simultaneously to the battery and ignition lines and any inputs or outputs supplied from battery or ignition voltage as configured in a DUT's complete system. The DUT shall also be tested in a powered-down state, if appropriate, to check for inadvertent turn on (applies to modules that have logic power-up capability). The DUT shall be tolerant of transient voltages generated by the operation of its own system (Status I). Refer to Table 31. For devices with one supply voltage connection, refer to ISO 7637-2 for the test setup. Figure 14 illustrates the test setup for devices with 2 supply voltage connections. See Test Pulse #1 (Fig-16, Table-32), Test Pulse #2 (Fig-17, Table-33), Test Pulse #3a (Fig-18, Table-34), Test Pulse #3b (Fig-19, Table-35),

TEST METHOD EQUIPMENT LIST

Vehicle Suppression Network (per PF-9326)
OSCILLOSCOPE, TEKTRONIX, TDS754D /2M, (S/N: B022455)
Power Supply HP 6286A 20V/20A, HEWLETT PACKARD, 6286A
LD200B1 LOAD DUMP GENERATOR, EM Test, LD200B1, (S/N: AR-307713/MFG 0901-05)
MPG200B MICROPULSE GENERATOR, EM Test, MPG200B, (S/N: AR-307717/MFG0503-14)
PFS200B2 POWER FAIL SIMULATOR, EM Test, PFS200B2, (S/N: AR-307715/MFG 0803-01)
RDS200 16 VDC PROG. SUPPLY, EM Test, RDS200, (S/N: AR-307712/MFG 0803-01)
EFT200B BURST GENERATOR, EM Test, EFT200B, (S/N: AR-307718/MFG 0803-02)
Amplifier Research / TEGAM / EM Test Model 2714A,
ISMISO software

5 uH LISN (for DUT with two power supplies)
C = 0.1 microfarad for pulse 2 (+ and -), C = 0.0033 microfarad for pulse a & b
Shaffner CDN 500 Capacitive Coupling Clamp for automotive electronics with 50 OHM attenuator.
50 OHM, 50 cm, Coaxial cable to the Pulse Generator, 50 OHM Coaxial Cable to Oscilloscope.
Ground Plane, Brass, 0.5 mm thickness
0.5 meters harness, 20 cm wire for suppression network
Air-compressed system for input switches activation
GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

FLEXTRONICS
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EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	**OEM SPEC REF:**	**OEM PROCEDURE REF:**	**REQUIREMENT TYPE:**	**TEST SUBGROUP-1:**	**TEST SUBGROUP-2:**
CHRYSLER	DC-10614A	LP-388C-39	IMMUNITY	TRANSIENT DISTURB.	FAST/SLOW I/O SENSOR LINES

TEST TITLE: **Transient Disturbances Conducted along I/O or Sensor Lines (ISO 7637-3 Coupling Clamp) Pulse a, b, 2**

TEST PROCEDURE DESCRIPTION

For subcategory S modules, testing with Pulse #2 using both positive and negative polarity and direct capacitive coupling is also required. For a schematic diagram of the capacitive coupling clamp test setup refer to ISO 7637-3. This method applies for Pulses a and b only. Supply voltage lines are not included in the clamp for this test. Direct capacitive coupling may be used replacing the capacitive coupling clamp for Pulses a and b, and is required to couple Pulse 2 (+and-) to the DUT. Refer to Figure 20 for the test setup and LP-388C-39 for test procedure.

See Test Pulse 2, Positive and Negative Polarity in Figures 21 and 22 and in Tables 37 and 38. Test Pulse “a” it is defined by Figure 23 and Table 39. Test Pulse “b” it is defined by Figure 24 and Table 40.

TEST METHOD EQUIPMENT LIST

Vehicle Suppression Network (per PF-9326)
OSCILLOSCOPE, TEKTRONIX, TDS754D /2M, (S/N: B022455)
Power Supply HP 6286A 20V/20A, HEWLETT PACKARD, 6286A
LD200B1 LOAD DUMP GENERATOR, EM Test, LD200B1, (S/N: AR-307713/MFG 0901-05)
MPG200B MICROPULSE GENERATOR, EM Test, MPG200B, (S/N: AR-307717/MFG0503-14)
PFS200B2 POWER FAIL SIMULATOR, EM Test, PFS200B2, (S/N: AR-307715/MFG 0803-01)
RDS200 16 VDC PROG. SUPPLY, EM Test, RDS200, (S/N: AR-307712/MFG 0803-01)
EFT200B BURST GENERATOR, EM Test, EFT200B, (S/N: AR-307718/MFG 0803-02)
Amplifier Research / TEGAM / EM Test Model 2714A,
ISMISO software

5 uH LISN (for DUT with two power supplies)
C = 0.1 microfarad for pulse 2 (+ and -), C = 0.0033 microfarad for pulse a & b
Shaffner CDN 500 Capacitive Coupling Clamp for automotive electronics with 50 OHM attenuator.
50 OHM, 50 cm, Coaxial cable to the Pulse Generator, 50 OHM Coaxial Cable to Oscilloscope.
Ground Plane, Brass, 0.5 mm thickness
0.5 meters harness, 20 cm wire for suppression network
Air-compressed system for input switches activation
GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

FLEXTRONICS
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EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
CHRYSLER	DC-10614A	LP-388C-42	ESD		
TEST TITLE:	**Electrostatic Discharge (ESD) ISO 10605 and IEC 61000-4-2**				

TEST PROCEDURE DESCRIPTION

ESD Handling Test is a direct contact discharge test. Refer to Table 41 for the requirements. For a diagram of the Handling test setup, refer to Figure 25.

There are two ESD Operating Tests, Direct Coupled and Field Coupled. This test applies to components that are readily accessible in the cabin, underhood or in the trunk. DUT that are accessible to occupants inside the vehicle shall be tested using an ESD simulator with a discharge network of 330 pF and 330 ohms. For DUT that are in underhood or trunk locations use a discharge network of 150 pF and 330 ohms. The DUT shall be monitored during operation. There shall be no lockups of the DUT requiring power off reset and Group C and D functions of the DUT shall not be affected by the ESD (Status I), Group A and B functions are allowed Status II. Refer to Table 42 for test levels and Figure 27 for the test setup. ESD Field Coupled Operating Test Requirements applies to all components. For the field coupled test, the DUT shall be operating (powered) and shall be monitored during operation. There shall be no lockups of the DUT requiring power off reset, Group C and D functions of the DUT shall not be affected by the ESD (Status I) and Group A and B functions are allowed Status II. Refer to Table 43 for test levels and Figure 28 for the test setup.

TEST METHOD EQUIPMENT LIST

ESD Power Supply KeyTek Series 2000, PSC-1, Cal.No.INV1P16	DUT Exerciser & Loads
Keytek Model PSC-1/150 pF/2K and 330pF-probe head tip DT-2	GRYPHON, HW/SW & CAN fiber-optic support
Sensitive Research ESH Electrostatic Voltmeter INV1744	Netway SW/HW CAN support, SDD16 SW/HW
Omega Ambient Chart Cal.No.INV1626	
Ground Plane and insulator block.	
ESD discharge islands – copper or brass, 80 mm in diameter, 0.25 mm thick	
ESD field coupling strip – copper or brass, 1.54 m long (± 5%), 40 mm wide (± 5%), 0.5 to 1 mm thick	
Wiring harness support – made of wood or other nonconductive material, 1.7 m long, 100 to 150 mm wide, 64 mm high, 85 mm radius cut in top resulting in ~14 mm channel depth & net height of 50 mm (see Figure 26b)	
DUT support – made of wood or other nonconductive material	

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

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213 Harry Walker Parkway South, Newmarket, Ontario, L3Y 8T3, Canada

EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	**OEM SPEC REF:**	**OEM PROCEDURE REF:**	**REQUIREMENT TYPE:**	**TEST SUBGROUP-1:**	**TEST SUBGROUP-2:**
CHRYSLER	DC-10615A	LP-388C-69	ELECTRICAL	SYSTEM	OPERATING ENVIRONMENT

TEST TITLE: **IGNITION OFF CURRENT DRAW (IOD)**

TEST PROCEDURE DESCRIPTION

The purpose of these requirements is to control the consumption of electrical power after the ignition switch is turned off.

Standby Battery Energy Draw - The total allowable energy draw from the vehicle battery input is 0.12 Wh. Measurement shall be made with 12.6 V applied to the DUT.

IOD Sleep Mode - The average IOD for all DUTs shall be 0.1 mA or less. If technical limitations do not allow achieving this IOD, the product specification shall specify these limitations and the achievable IOD. See the review requirements in section 6.2. This measurement shall be time averaged over a minimum of 3 cycles or as defined in the product specification. The supply voltage for this test shall be 12.6 V.

TEST METHOD EQUIPMENT LIST

Power Supply DCS33-36E (33V/36A), Sorensen	GRYPHON, HW/SW & CAN fiber-optic support Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

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EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
CHRYSLER	DC-10615A	LP-388C-69	ELECTRICAL	SYSTEM	OPERATING ENVIRONMENT
TEST TITLE:	**Supply Voltage Range**				

TEST PROCEDURE DESCRIPTION

Components shall retain full functionality while performing within the defined voltage range, Functional Performance Status I for all Functional Groups.

The test duration shall be sufficient to verify the specified DUT functions at each voltage level.

The test shall be performed at three different temperatures: −40° C, 23° C and Tmax, where Tmax is defined in DC-10611, Section 3, Temperature Classification. This is not intended to be a temperature shock test, so the DUT shall be tested at 23° C between the cold and hot test. The five Temperature Classes are listed in Table 3.

TEST METHOD EQUIPMENT LIST

Power Supply DCS33-36E (33V/36A), Sorensen
Temperature Chamber Thermotron

GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

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EMC/ELECTRICAL TEST REFERENCES

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705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	**OEM SPEC REF:**	**OEM PROCEDURE REF:**	**REQUIREMENT TYPE:**	**TEST SUBGROUP-1:**	**TEST SUBGROUP-2:**
CHRYSLER	DC-10615A	LP-388C-33	ELECTRICAL	SYSTEM	OPERATING ENVIRONMENT
TEST TITLE:					

TEST PROCEDURE DESCRIPTION

This test verifies immunity to supply voltage ripple. The voltage ripple shall be superimposed on the normal supply voltage of 13.5 V. Use the test set up as shown in SAE J1113-2 and the superimposed alternating voltage ripple as defined in Figure 1 over the frequency ranges indicated. Frequency sweep or steps as defined below may be used. Source impedance is ≤ 0.5 ohms (verify source impedance as described in SAE J1113-2 Appendix B).

Requirement - Functional Performance Status I for all Functional Groups.

TEST METHOD EQUIPMENT LIST

Kikusui Power Supply 35V/20A, PAD 35-30L
Tektronix TDS754D /2M Digitizing Oscilloscope, (S/N: B022455)
Tektronix AM503B Current Probe, (S/N: B032905)
HP 8116 Function Generator, (S/N: 3134G17341)
Audio Isolation Transformer 6220-1A, 100 Watts, 30 Hz to 250 KHz, Solar Electronics
TILE Software

GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

FLEXTRONICS
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EMC/ELECTRICAL TEST REFERENCES

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705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	**OEM SPEC REF:**	**OEM PROCEDURE REF:**	**REQUIREMENT TYPE:**	**TEST SUBGROUP-1:**	**TEST SUBGROUP-2:**
CHRYSLER	DC-10615A	DC-10615A	ELECTRICAL	SUPPLY	VOLTAGE VARIATIONS

TEST TITLE: **Supply Switch Deactivation**

TEST PROCEDURE DESCRIPTION

These tests validate component behavior when the supply voltage switch is turned to off.

Requirement - When the ignition (or switched) line(s) are turned off, feedback on any non battery input line shall fall to < 1 mA within 1 s max.

A test voltage of 13.5 V shall be applied to the DUT supply voltage lines. Turn the ignition (or switched) line(s) off, and monitor feedback on any non-battery input line(s). Five test cycles are required.

TEST METHOD EQUIPMENT LIST

Power Supply DCS33-36E (33V/36A), Sorensen
Fluke 45 Dual Display Multimeter, (S/N: 7246011)

GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

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705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	**OEM SPEC REF:**	**OEM PROCEDURE REF:**	**REQUIREMENT TYPE:**	**TEST SUBGROUP-1:**	**TEST SUBGROUP-2:**
CHRYSLER	DC-10615A	LP-388C-38	ELECTRICAL	SUPPLY	VOLTAGE VARIATIONS
TEST TITLE:	**Supply Voltage Drop Out**				

TEST PROCEDURE DESCRIPTION

This test verifies normal operation of the DUT during brief supply voltage interruptions. The supply voltage shall drop out from 11 V to 0 V and return to 11 V. The duration of the drop out increases from 10 µs to 2 s in increments as shown in Table 4. Test levels are set open circuit (≥ 1 kohm load) with fall time and rise time less than 1.5 µs each. The DUT operation shall be monitored during the test and the interval time between dropouts shall be sufficient to verify normal DUT operation.

Functional Groups A and B: Functional Performance Status I for drop outs ≤ 100 µs; Functional Performance Status II for dropouts > 100 µs.

Functional Groups C and D: Functional Performance Status I for drop outs ≤ 1 ms; Functional Performance Status II for dropouts > 1 ms.

No spurious or undesirable active response by the component is allowed.

TEST METHOD EQUIPMENT LIST

OSCILLOSCOPE, TEKTRONIX, TDS754D /2M, (S/N: B022455)
RDS200 16 VDC PROG. SUPPLY, EM Test, (S/N: AR-307712/MFG 0803-01)
VDS200B2 VOLTAGE DUMP SIMULATOR, EM Test, (S/N: AR-307710/MFG 0903-02)
Amplifier Research / TEGAM / EM Test Model 2714A
ISMISO software
Vehicle Battery (12.6 V)
Power Supply 35V/30A, Kikusui

GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

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EMC/ELECTRICAL TEST REFERENCES

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705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	**OEM SPEC REF:**	**OEM PROCEDURE REF:**	**REQUIREMENT TYPE:**	**TEST SUBGROUP-1:**	**TEST SUBGROUP-2:**
CHRYSLER	DC-10615A	LP-388C-38	ELECTRICAL	SUPPLY	VOLTAGE VARIATIONS
TEST TITLE:	**Supply Voltage Dips**				

TEST PROCEDURE DESCRIPTION

During the normal course of vehicle usage, many electrical and electronic devices are user activated, automatically controlled or are automatically controlling other loads in the electrical system. These load variations, or fuse activation, can result in rapid fluctuations of the supply voltage. Voltage shall be applied to the supply voltage lines. A dip is from 11 V to the dip voltage for the specified duration and then back to 11 V. The dip voltages are: 5.5 V, 5.0 V, 4.5 V, 4.0 V, 3.5 V and 3.0 V. Dips to each voltage level are for 100 µs, 1 ms, 10 ms and 500 ms durations. The DUT operation shall be monitored during the dip test and the interval time between dips shall be sufficient to verify normal DUT operation. At each dip voltage, run through the range of dip durations. Each supply voltage line shall be dipped individually and as a grouping of all of the supply lines together.

Functional Groups A and B: Functional Performance Status I for dips ≤ 100 µs; Functional Performance Status II for dips > 100 µs.

Functional Groups C and D: Functional Performance Status I for dips ≤ 1 ms; Functional Performance Status II for dips > 1 ms. No spurious or undesirable active response by the component is allowed.

TEST METHOD EQUIPMENT LIST

OSCILLOSCOPE, TEKTRONIX, TDS754D /2M, (S/N: B022455)	GRYPHON, HW/SW & CAN fiber-optic support
RDS200 16 VDC PROG. SUPPLY, EM Test, (S/N: AR-307712/MFG 0803-01)	Netway SW/HW CAN support, SDD16 SW/HW
VDS200B2 VOLTAGE DUMP SIMULATOR, EM Test, (S/N: AR-307710/MFG 0903-02)	
Amplifier Research / TEGAM / EM Test Model 2714A	
ISMISO software	
Vehicle Battery (12.6 V)	
Power Supply 35V/30A, Kikusui	

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

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EMC/ELECTRICAL TEST REFERENCES

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705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
CHRYSLER	DC-10615A	LP-388C-68	ELECTRICAL	SUPPLY	VOLTAGE VARIATIONS
TEST TITLE:	**Engine Cranking Low Voltage**				

TEST PROCEDURE DESCRIPTION

During starting (cranking of the engine) the battery voltage will fall to a low voltage for a short time period and then rise slightly. Most components will be briefly energized just prior to cranking and some will be deactivated during the crank and subsequently re-energized after the start when the engine is running. This test verifies normal operation under these conditions. All inputs and outputs shall be connected to representative loads or networks to simulate the in-vehicle configuration. The test pulse simulates the voltage dip during the start operation and is defined by Figure 2 and Table 5. If the DUT has stored initialization data or memory data in volatile storage then initialize and/or store data before beginning the test. With the run only and accessory lines at 0 V, subject the DUT to the Engine Cranking Test Pulse in Figure 2 on battery, run/start and start lines simultaneously. The DUT operation shall be monitored during the test. Return all DUT supply voltage lines to VB and confirm normal functioning after each test. This is one (1) cycle; five (5) test cycles are required. Functional Group A & B – Status II during the test, C (operation required during start) – Status II during the time of the ramp below 6.0 V, Status I at and above 6.0 V, C for operation not required during start – Status II, D – Status II during the time of the ramp below 6.0 V, Status I at and above 6.0 V

TEST METHOD EQUIPMENT LIST

OSCILLOSCOPE, TEKTRONIX, TDS754D /2M, (S/N: B022455)	GRYPHON, HW/SW & CAN fiber-optic support
RDS200 16 VDC PROG. SUPPLY, EM Test, (S/N: AR-307712/MFG 0803-01)	Netway SW/HW CAN support, SDD16 SW/HW
VDS200B2 VOLTAGE DUMP SIMULATOR, EM Test, (S/N: AR-307710/MFG 0903-02)	
Amplifier Research / TEGAM / EM Test Model 2714A	
ISMISO software	
Vehicle Battery (12.6 V)	
Power Supply 35V/30A, Kikusui	

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

FLEXTRONICS
FLEX Automotive
EMC & ELECTRICAL TEST LABORATORY
213 Harry Walker Parkway South, Newmarket, Ontario, L3Y 8T3, Canada

EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	**OEM SPEC REF:**	**OEM PROCEDURE REF:**	**REQUIREMENT TYPE:**	**TEST SUBGROUP-1:**	**TEST SUBGROUP-2:**
CHRYSLER	DC-10615A	LP-388C-68	ELECTRICAL	SUPPLY	VOLTAGE VARIATIONS

TEST TITLE: **Supply Voltage Ramp Up**

TEST PROCEDURE DESCRIPTION

The purpose of this test is to verify that the component power up sequence is not adversely affected by a slow supply voltage ramp up. The test shall be performed at three different temperatures: −40° C, 23° C and Tmax, where Tmax is defined in DC-10611, Section 3, Temperature Classification (see also section 6.1.2 and Table 3). This is not intended to be a temperature shock test, so the DUT shall be tested at 23° C between the cold and hot test. The time intervals for the supply voltage ramp up are: 100, 200, 500 and 1600 milliseconds. Test duration, t3 as required to evaluate DUT functions. Refer to figure 3 for waveforms.

Within the normal operating voltage range: Function Performance Status I for all Functional Groups. Outside the normal operating voltage range: Function Performance Status II for all Functional Groups.

No spurious or undesirable action or response on the part of the component is allowed regardless of voltage progression.

TEST METHOD EQUIPMENT LIST

OSCILLOSCOPE, TEKTRONIX, TDS754D /2M, (S/N: B022455)
RDS200 16 VDC PROG. SUPPLY, EM Test, (S/N: AR-307712/MFG 0803-01)
VDS200B2 VOLTAGE DUMP SIMULATOR, EM Test, (S/N: AR-307710/MFG 0903-02)
Amplifier Research / TEGAM / EM Test Model 2714A
ISMISO software
Vehicle Battery (12.6 V)
Power Supply 35V/30A, Kikusui
Temperature Chamber Thermotron

GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

FLEXTRONICS
FLEX Automotive
EMC & ELECTRICAL TEST LABORATORY
213 Harry Walker Parkway South, Newmarket, Ontario, L3Y 8T3, Canada

EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	**OEM SPEC REF:**	**OEM PROCEDURE REF:**	**REQUIREMENT TYPE:**	**TEST SUBGROUP-1:**	**TEST SUBGROUP-2:**
CHRYSLER	DC-10615A	LP-388C-68	ELECTRICAL	SUPPLY	VOLTAGE VARIATIONS

TEST TITLE: **Supply Voltage Ramp Down**

TEST PROCEDURE DESCRIPTION

This test simulates a slow reduction in supply voltage due to loss of charging capability and is aimed at detecting spurious and undesirable responses and the thresholds at which malfunctions begin.

Power up the DUT at the minimum voltage for its group and verify normal operation. Monitor the DUT for effects and linearly ramp down the voltage from the minimum operating voltage to 0 V or use 50 mV max steps, over a 10 minute interval, hold for 10 s minimum or as long as is required to confirm DUT is fully powered down. Return the supply voltage to minimum operating voltage and confirm normal operation. This is one (1) cycle; five (5) cycles are required.

Within the normal operating voltage range: Function Performance Status I for all Functional Groups. Outside the normal operating voltage range: Function Performance Status II for all Functional Groups.

No spurious or undesirable action or response on the part of the component is allowed regardless of voltage progression. No spurious BUS messages shall be transmitted.

TEST METHOD EQUIPMENT LIST

OSCILLOSCOPE, TEKTRONIX, TDS754D /2M, (S/N: B022455)
RDS200 16 VDC PROG. SUPPLY, EM Test, (S/N: AR-307712/MFG 0803-01)
VDS200B2 VOLTAGE DUMP SIMULATOR, EM Test, (S/N: AR-307710/MFG 0903-02)
Amplifier Research / TEGAM / EM Test Model 2714A
ISMISO software
Vehicle Battery (12.6 V)
Power Supply 35V/30A, Kikusui

GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

FLEXTRONICS
FLEX Automotive
EMC & ELECTRICAL TEST LABORATORY
213 Harry Walker Parkway South, Newmarket, Ontario, L3Y 8T3, Canada

EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
CHRYSLER	DC-10615A	DC-10615A	ELECTRICAL	SUPPLY	OVER VOLTAGE, REVERSE VOLTAGE
TEST TITLE:	**Defective Regulation (Full-Fielded Alternator)**				

TEST PROCEDURE DESCRIPTION

Confirm normal functioning of the DUT at 13.5 V. Apply 18 V to all supply voltage lines for 60 minutes and monitor functioning of the DUT. Return the DUT to 13.5 V and confirm normal functioning.

Functional Performance Status II for Functional Groups A, B and C.

Functional Performance Status I for Functional Group D.

TEST METHOD EQUIPMENT LIST

Power Supply DCS33-36E (33V/36A), Sorensen	GRYPHON, HW/SW & CAN fiber-optic support Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

FLEXTRONICS
FLEX Automotive
EMC & ELECTRICAL TEST LABORATORY
213 Harry Walker Parkway South, Newmarket, Ontario, L3Y 8T3, Canada

EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	**OEM SPEC REF:**	**OEM PROCEDURE REF:**	**REQUIREMENT TYPE:**	**TEST SUBGROUP-1:**	**TEST SUBGROUP-2:**
CHRYSLER	DC-10615A	DC-10615A	ELECTRICAL	SUPPLY	OVER VOLTAGE, REVERSE VOLTAGE
TEST TITLE:	**Jump Start**				

TEST PROCEDURE DESCRIPTION

Confirm normal functioning of the DUT at 13.5 V. Apply 27 V to all DUT supply voltage lines for 1 minute. Return the DUT to 13.5 V and confirm normal operation.

Functional Performance Status II for all Functional Groups.

TEST METHOD EQUIPMENT LIST

Power Supply DCS33-36E (33V/36A), Sorensen	GRYPHON, HW/SW & CAN fiber-optic support Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

FLEXTRONICS
FLEX Automotive
EMC & ELECTRICAL TEST LABORATORY
213 Harry Walker Parkway South, Newmarket, Ontario, L3Y 8T3, Canada

EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
CHRYSLER	DC-10615A	DC-10615A	ELECTRICAL	SUPPLY	OVER VOLTAGE, REVERSE VOLTAGE
TEST TITLE:	**Load Dump**				

TEST PROCEDURE DESCRIPTION

The DUT shall be subjected to the load dump voltage transient test pulse illustrated in Figure 4 simultaneously on each supply voltage input. The test pulse defined in Figure 4 and Table 6 represents alternators or generators with integral load dump protection. The DUT operation shall be monitored during the test. Return the DUT to 13.5 V and confirm normal functioning after each test pulse. The test shall consist of 5 pulses a minimum of 2 minutes apart.

Requirement: Functional Performance Staus II for all Functional Groups. No spurious or undesirable action or response on the part of the DUT is allowed.

TEST METHOD EQUIPMENT LIST

OSCILLOSCOPE, TEKTRONIX, TDS754D /2M, (S/N: B022455)
RDS200 16 VDC PROG. SUPPLY, EM Test, (S/N: AR-307712/MFG 0803-01)
VDS200B2 VOLTAGE DUMP SIMULATOR, EM Test, (S/N: AR-307710/MFG 0903-02)
Amplifier Research / TEGAM / EM Test Model 2714A
ISMISO software
Vehicle Battery (12.6 V)
Power Supply 35V/30A, Kikusui

GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

FLEXTRONICS
FLEX Automotive
EMC & ELECTRICAL TEST LABORATORY
213 Harry Walker Parkway South, Newmarket, Ontario, L3Y 8T3, Canada

EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
CHRYSLER	DC-10615A	DC-10615A	ELECTRICAL	SUPPLY	OVER VOLTAGE, REVERSE VOLTAGE
TEST TITLE:	**Reverse Supply Voltage**				

TEST PROCEDURE DESCRIPTION

There shall be no damage to the DUT and it shall operate as specified, without effect on stored data, after being subjected to a reverse voltage test of -16 V for 1 minute. None of the DUT's components may exceed their power ratings. This reverse voltage is applied to the DUT supply voltage lines. Loss of vehicle battery powered memory is allowed. For DUT integrated in a vehicle that provides reverse voltage isolation for the DUT external to the DUT (e.g. powered through relay isolated circuits or protected using a reverse diode/fuse for non-critical functions) this test does not apply. Return the DUT to 13.5 V and confirm normal operation. The power supply shall be capable of providing at least 100 A of current.

Requirement: Functional Performance Status I for all Functional Groups after the test and reset or replacement of any fuse protection.

TEST METHOD EQUIPMENT LIST

100 A/20A HP Power Supply Amplifier Research / TEGAM / EM Test Model 2714A	GRYPHON, HW/SW & CAN fiber-optic support Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

FLEXTRONICS
FLEX Automotive
EMC & ELECTRICAL TEST LABORATORY
213 Harry Walker Parkway South, Newmarket, Ontario, L3Y 8T3, Canada

EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
CHRYSLER	DC-10615A	DC-10615A	ELECTRICAL	SYSTEM	COMPATIBILITY REQUIREMENTS
TEST TITLE:	**Immunity to Short Circuits in the Supply Voltage Input and Load Output Lines**				

TEST PROCEDURE DESCRIPTION

With a supply voltage of 13.5 V, verify normal operation. All supply voltage lines (including sourced output lines) where technically feasible are to individually survive connection to 13.5 V and/or a short to ground. Disconnect the power supply and connect the DUT supply input line to ground for 5 s. Remove the short to ground and return 13.5 V to confirm normal operation.

Requirement: Functional Performance Status II for all Functional Groups with automatic reset of the protective mechanism.

Requirement: Functional Performance Status IV for all Functional Groups with manual resetting of the protective mechanism

TEST METHOD EQUIPMENT LIST

Power Supply DCS33-36E (33V/36A), Sorensen	GRYPHON, HW/SW & CAN fiber-optic support Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

FLEXTRONICS
FLEX Automotive
EMC & ELECTRICAL TEST LABORATORY
213 Harry Walker Parkway South, Newmarket, Ontario, L3Y 8T3, Canada

EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
CHRYSLER	DC-10615A	DC-10615A	ELECTRICAL	SYSTEM	COMPATIBILITY REQUIREMENTS
TEST TITLE:	**Immunity to Short Circuits in I/O Signal Lines**				

TEST PROCEDURE DESCRIPTION

This test verifies the DUT's immunity to short circuits in control and bus signal lines as well as in signal I/O lines. All signal input and output lines shall be tested by short circuiting the individual lines to ground and to 13.5 V. The individual short-circuit currents shall be recorded. Signal lines shall remain permanently resistant to short circuits. Paired control/bus signal lines shall remain permanently resistant to mutual short circuits as well as shorts to supply voltage and ground.

Requirement: Functional Performance Status II for all Functional Groups. Individual short-circuit currents shall not exceed 200 mA in a steady state condition without approval from the releasing engineer, refer to section 1.1.

TEST METHOD EQUIPMENT LIST

Power Supply DCS33-36E (33V/36A), Sorensen	GRYPHON, HW/SW & CAN fiber-optic support
Fluke 45 Dual Display Multimeter, (S/N: 7246011)	Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

FLEXTRONICS
FLEX Automotive
EMC & ELECTRICAL TEST LABORATORY
213 Harry Walker Parkway South, Newmarket, Ontario, L3Y 8T3, Canada

EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
CHRYSLER	DC-10615A	DC-10615A	ELECTRICAL	SYSTEM	COMPATIBILITY REQUIREMENTS
TEST TITLE:	**Resistance to Overload**				

TEST PROCEDURE DESCRIPTION

This requirement applies only if specifically called out in the product specification and the appropriate circuit protection is defined.

Melting Fuse, Fusible (Wire) Link, Circuit Breakers - verifies overload resistance for a short circuit to ground at the output lines. The output lines shall withstand the currents commensurate with the circuit protection rating as shown in the Table 7 and labeled “Max”. The test times are calculated from the circuit protection device response curve, based on the upper tolerance limit plus 10%. All current protected output lines shall be tested for overload in activated and non-activated states. Functional Performance Status IV for all Functional Groups. The test shall not lead to destruction of the output circuits, and the E/E component shall revert to full and unimpaired functionality following termination of the test.

Electronic Fuse - refers to solid state protective devices that have controlled resetability, e.g. PTC’s, high side drivers with output overload protection. Functional Performance Status IV for all Functional Groups.

TEST METHOD EQUIPMENT LIST

Power Supply DCS33-36E (33V/36A), Sorensen
Fluke 45 Dual Display Multimeter, (S/N: 7246011)
OSCILLOSCOPE, TEKTRONIX, TDS754D /2M, (S/N: B022455)

GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

FLEXTRONICS
FLEX Automotive
EMC & ELECTRICAL TEST LABORATORY
213 Harry Walker Parkway South, Newmarket, Ontario, L3Y 8T3, Canada

EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
CHRYSLER	DC-10615A	DC-10615A	ELECTRICAL	SYSTEM	COMPATIBILITY REQUIREMENTS
TEST TITLE:	**Supply Voltage Offset**				

TEST PROCEDURE DESCRIPTION

The primary purpose of the voltage offset test is to verify compatibility with different electrical potentials at the power-supply input lines if two (2) or more inputs in the normal run condition are being supplied by different circuits. For instance, an "ignition on" supply line and a standby/IOD supply on a different supply line to an E/E component.

Note: Data integrity for communications is not covered by this test.

The voltages shall be measured at the DUT. All input and output lines shall be connected to representative loads or networks to simulate the in-vehicle configuration. Using 13.5 V for supply voltage confirm normal operation. Test by setting up another supply line for ± 1 V offset (1 volt maximum offset relative to 13.5 V). The test duration is as long as it takes to confirm normal DUT operation. Repeat for each battery and switched ignition line until all combinations are tested. This is one (1) cycle; three (3) cycles are required.

Requirement: Functional Performance Status I for all Functional Groups - There shall be no malfunction or latch up of the DUT.

TEST METHOD EQUIPMENT LIST

Power Supply DCS33-36E (33V/36A), Sorensen	GRYPHON, HW/SW & CAN fiber-optic support
Fluke 45 Dual Display Multimeter, (S/N: 7246011)	Netway SW/HW CAN support, SDD16 SW/HW
OSCILLOSCOPE, TEKTRONIX, TDS754D /2M, (S/N: B022455)	

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

FLEXTRONICS
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EMC & ELECTRICAL TEST LABORATORY
213 Harry Walker Parkway South, Newmarket, Ontario, L3Y 8T3, Canada

EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
CHRYSLER	DC-10615A	DC-10615A	ELECTRICAL	SYSTEM	COMPATIBILITY REQUIREMENTS
TEST TITLE:	**Ground Reference Offset**				

TEST PROCEDURE DESCRIPTION

The ground reference offset test serves to verify reliable operation of a component when two (2) or more ground paths exist. For instance a component may have a power ground and a signal ground that are outputs on different circuits; or there may be a hard wired ground and a case ground. Note: Data integrity for communications is not covered by this test. All inputs and outputs shall be connected to representative loads or networks to simulate the in-vehicle configuration. Apply 13.5 V supply voltage to the DUT and confirm normal operation. Establish a voltage difference between the ground points of the DUT equal to ± 1 V ground offset (maximum 1 volt ground to ground offset). The voltages shall be measured at the DUT. The test duration is as long as it takes to confirm normal operation. Repeat for each ground path and combinations of ground paths until all combinations are tested. This is one (1) cycle; three (3) cycles are required.

Requirement: Functional Performance Status I for all Functional Groups - There shall be no malfunction or latch up of the DUT.

TEST METHOD EQUIPMENT LIST

Power Supply DCS33-36E (33V/36A), Sorensen
Bipolar Operational Power Supply/Amplifier, Kikusui, PAD 35-20L
Fluke 45 Dual Display Multimeter, (S/N: 7246011)
OSCILLOSCOPE, TEKTRONIX, TDS754D /2M, (S/N: B022455)

GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

FLEXTRONICS
FLEX Automotive
EMC & ELECTRICAL TEST LABORATORY
213 Harry Walker Parkway South, Newmarket, Ontario, L3Y 8T3, Canada

EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
CHRYSLER	DC-10615A		ELECTRICAL		MOTORS & INDUCTIVE DEVICES
TEST TITLE:	**Operating and Voltage Stress**				

TEST PROCEDURE DESCRIPTION

This section applies to motors and inductive devices including solenoids, electromechanical relays, buzzers and horns unless otherwise defined in a DaimlerChrysler product specification. It applies to brush commutated and electronically controlled or commutated dc electric motors without integral electronics and/or solid state components other than for RF or transient voltage suppression or self-protection. This is a continuously running test. Test the motor/inductive device in the following sequence: operate at the minimum voltage for its Functional Group for 10 minutes, then step up the supply voltage in 1 volt increments operating for 1 minute at each increment up to 12 V, then at 13.5 V for 5 minutes, then at the maximum voltage for its Functional Group for 10 minutes. Within 1 minute, ramp up to 18 V and run for 10 minutes and then within 1 minute ramp up to 27 V and run for 1 minute. Within 1 minute, ramp down to 13.5 V and run for 10 minutes. Verify that there is no degradation of the motor/inductive device and that it performs as specified. DUTs without an internal protection device: Functional Performance Status I for all Functional Groups. DUTs with an internal protection device: Functional Performance Status II for all Functional Groups.

TEST METHOD EQUIPMENT LIST

Power Supply DCS33-36E (33V/36A), Sorensen
ARBITRARY WAVEFORM GENERATOR, SONY/TEKTRONIX, AWG2021, (S/N: J320687)
Bipolar Operational Power Supply/Amplifier, Kikusui, PAD 35-20L
Fluke 45 Dual Display Multimeter, (S/N: 7246011)
OSCILLOSCOPE, TEKTRONIX, TDS754D /2M, (S/N: B022455)

GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

FLEXTRONICS
FLEX Automotive
EMC & ELECTRICAL TEST LABORATORY
213 Harry Walker Parkway South, Newmarket, Ontario, L3Y 8T3, Canada

EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	**OEM SPEC REF:**	**OEM PROCEDURE REF:**	**REQUIREMENT TYPE:**	**TEST SUBGROUP-1:**	**TEST SUBGROUP-2:**
CHRYSLER	DC-10615A		ELECTRICAL		MOTORS & INDUCTIVE DEVICES
TEST TITLE:	**Stall**				

TEST PROCEDURE DESCRIPTION

This test simulates a locked rotor or solenoid armature failure mode and only applies to motors and solenoids. A protective response mechanism may be triggered. The power supply for this test shall be capable of maintaining the voltage between 12.4 V and 12.8 V during the test while supplying at least 100 A. A low ripple 50 A minimum power supply may be used in parallel with a fully charged automotive battery. Battery chargers are not an acceptable alternative.

TEST METHOD EQUIPMENT LIST

Power Supply HP 6011A 0-20V/120A, 1000W
ARBITRARY WAVEFORM GENERATOR, SONY/TEKTRONIX, AWG2021, (S/N: J320687)
Bipolar Operational Power Supply/Amplifier, Kikusui, PAD 35-20L
Fluke 45 Dual Display Multimeter, (S/N: 7246011)
OSCILLOSCOPE, TEKTRONIX, TDS754D /2M, (S/N: B022455)

GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY CAPABILITY FOR CHRYSLER (PF-10540-A & PF-10541-A) REQUIREMENTS (apply to 2004-2006 vehicle model year)

FLEXTRONICS
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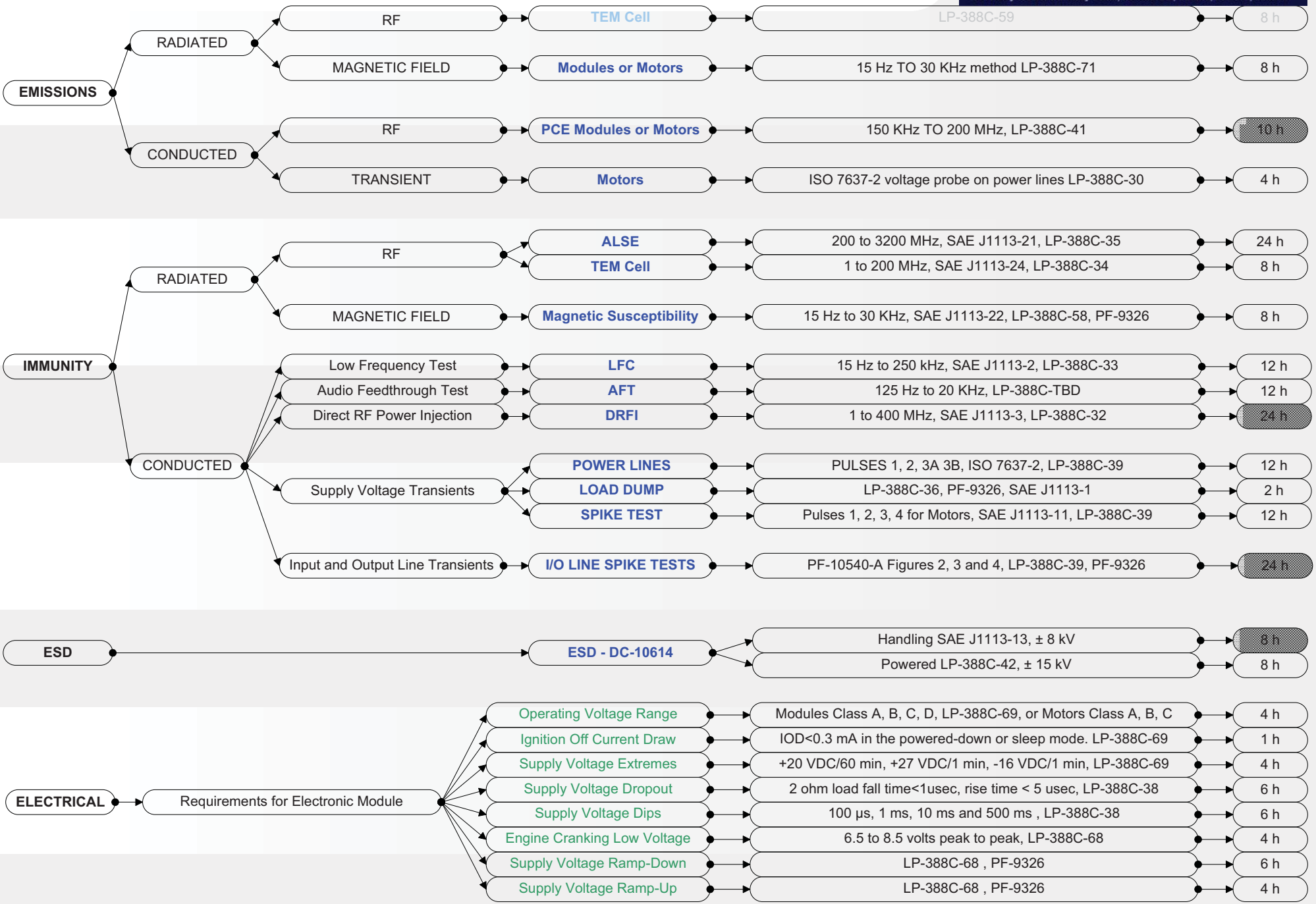
EMC & ELECTRICAL TEST LABORATORY
213 Harry Walker Parkway South, Newmarket, Ontario, L3Y 8T3, Canada



Test-time nr of pins dependent

EMC & ELECTRICAL TEST LABORATORY CAPABILITY FOR FORD MOTOR COMPANY (ES-XW7T-1A278-AC)

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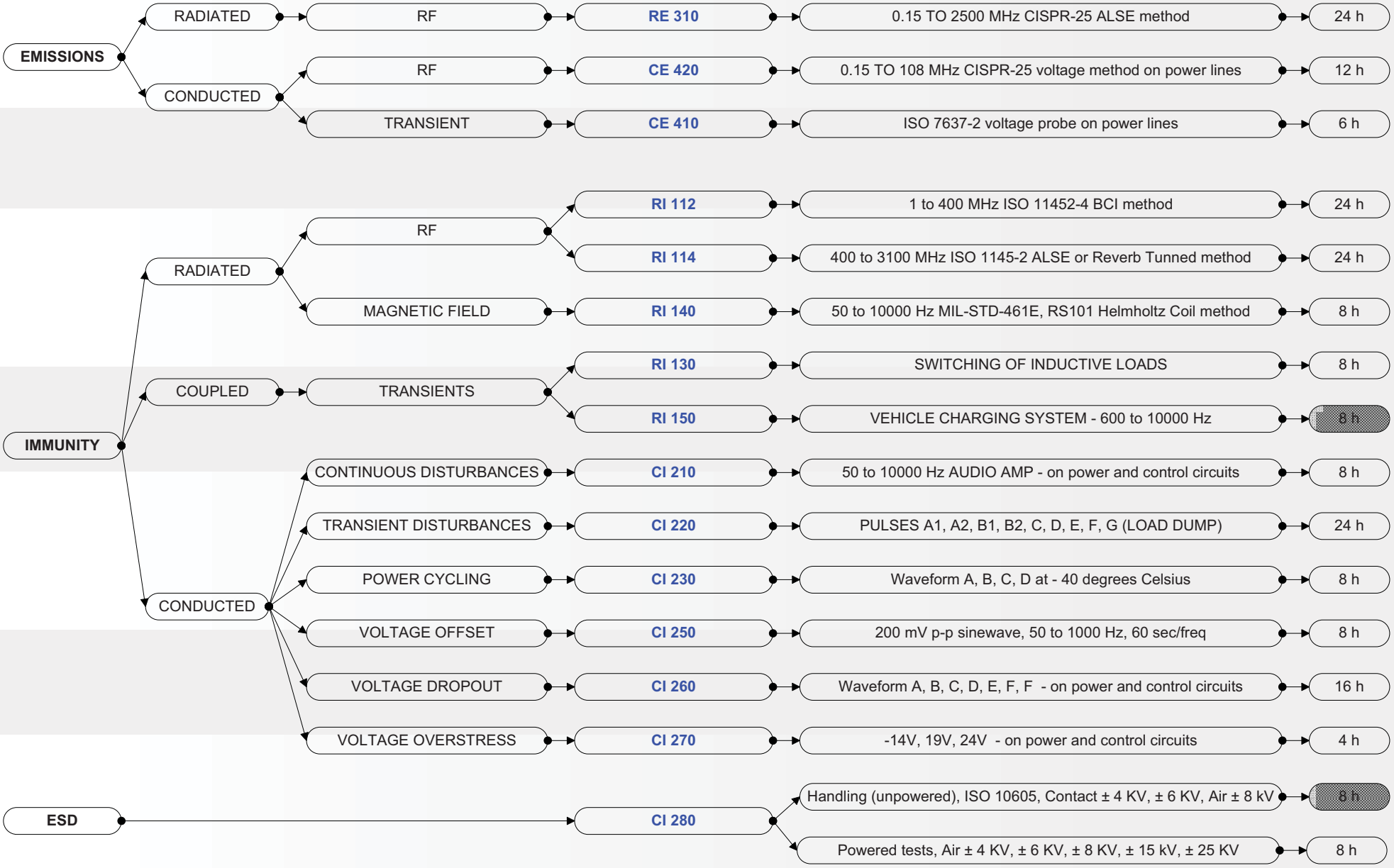

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

FLEXTRONICS
FLEX Automotive
EMC & ELECTRICAL TEST LABORATORY
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EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
FORD MOTOR COMPANY	ES-XW75-1A278-AC	RE-310	EMISSIONS	RADIATED	RF
TEST TITLE:	**RADIATED RF EMISSIONS (RE-310)**				

TEST PROCEDURE DESCRIPTION

Test per ES-XW75-1A278-AC (October 10, 2003) page 15 following the requirements delineated in Table 7-1 and 7-2 depending on the component type (A, AS, AM, AX, AY, EM, BM).

Test Verification and Test Set-up per CISPR 25 Edition2, ALSE method. Radiated emissions requirements cover the frequency range from 0.15 to 2500 MHz.

TEST METHOD EQUIPMENT LIST

BRADEN SHIELDING SYSTEMS CISPR-25 ALSE (Serial 241431)
Automotive Battery
Styrofoam test bench & Ground Plane
Insulated support 50 mm thick
Test Harness 1700 mm (+300/-0 mm)
SOLAR ELECTRONICS LISN 5uH/50A/600VDC TYPE 9117-5-TS-50-N (S/N: 0310294)
2 x EMI Terminator 50 OHM
AGILENT Preamplifier 87405A 10-3000 MHz +13dBm max input (S/N: 3950M00632)
HP8447F OPT H64 Amplifier 9KHz - 1300 MHz (S/N: 2805A02756)
Receiving Antennas: Monopole, Biconical BBA 9106, Log Periodic 3146 (S/N: 2762), Horn 3115 (S/N: 5734)
Double-shielded coaxial cable
Bulkhead connector
HP 8596E Spectrum Analyzer 9KHz - 12.8 GHz (S/N: 3826A01436)
Tile Software
Fiber Optic Link.
Air-compressed system for input switches activation
GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

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EMC/ELECTRICAL TEST REFERENCES

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705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	**OEM SPEC REF:**	**OEM PROCEDURE REF:**	**REQUIREMENT TYPE:**	**TEST SUBGROUP-1:**	**TEST SUBGROUP-2:**
FORD MOTOR COMPANY	ES-XW75-1A278-AC	CE-420	EMISSIONS	CONDUCTED	RF
TEST TITLE:	**CONDUCTED RF EMISSIONS (CE-420)**				

TEST PROCEDURE DESCRIPTION

The requirements of CISPR 25 (Edition 2), voltage method shall be used for verification of the component performance except where noted in ES-XW75-1A278-AC specification.

Test per ES-XW75-1A278-AC (October 10, 2003) page 21 following the requirements delineated in Table 8-1, Table 8-2, and Table 8-3 depending on the component type (A, AS, AM, AX, AY, EM, BM).

For electric motors that operate with intermittent duration AND with direct operator control, this requirement may be relaxed or waived with written approval from the vehicle program chief engineer or their designate prior to program approval.

TEST METHOD EQUIPMENT LIST

BRADEN SHIELDING SYSTEMS CISPR-25 ALSE (Serial 241431)	Double-shielded coaxial cable
Automotive Battery	Bulkhead connector
Styrofoam test bench & Ground Plane	HP 8596E Spectrum Analyzer 9KHz - 12.8 GHz (serial 3826A01436)
Insulated support 50 mm thick	Tile Software
Test Harness 1700 mm (+300/-0 mm)	Fiber Optic Link.
SOLAR ELECTRONICS LISN 5uH/50A/600VDC TYPE 9117-5-TS-50-N (serial 0310294)	Air-compressed system for input switches activation
2 x EMI Terminator 50 OHM	GRYPHON, HW/SW & CAN fiber-optic support
AGILENT Preamplifier 87405A 10-3000 MHz +13dBm max input (serial 3950M00632)	Netway SW/HW CAN support, SDD16 SW/HW
HP8447F OPT H64 Amplifier 9KHz - 1300 MHz (serial 2805A02756)	
Receiving Antennas: Monopole, Biconical BBA 9106, Log Periodic 3146 (2762), Horn 3115 (5734	

TEST NOTES

Check for latest FORD EMC specs at http://www.fordemc.com

Check for Invotronics EMC tet capability at \\exchcluster\APPS\e-ECN\EMCLAB\emc_capability.htm

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

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EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
FORD MOTOR COMPANY	ES-XW75-1A278-AC	CE-420	EMISSIONS	CONDUCTED	RF
TEST TITLE:	**CONDUCTED RF EMISSIONS (CE-420)**				

TEST PROCEDURE DESCRIPTION

Test per ES-XW75-1A278-AC (October 10, 2003) page 21 following the requirements delineated in Table 8-1, Table 8-2, and Table 8-3 depending on the component type (A, AS, AM, AX, AY, EM, BM).

The requirements of CISPR-25 (Edition 2) Voltage Method shall be used for verification of the component performance except where noted in ES-XW75-1A278-AC specification.

The Conducted RF Emissions requirements cover the frequency range from 0.15 to 108 MHz CISPR-25 Voltage Method on Power Lines.

For electric motors that operate with intermittent duration AND with direct operator control, this requirement may be relaxed or waived with written approval from the vehicle program chief engineer or their designate prior to program approval.

TEST METHOD EQUIPMENT LIST

BRADEN SHIELDING SYSTEMS CISPR-25 ALSE (Serial 241431)
Automotive Battery
Styrofoam test bench & Ground Plane
Insulated support 50 mm thick
Test Harness 1700 mm (+300/-0 mm)
SOLAR ELECTRONICS LISN 5uH/50A/600VDC TYPE 9117-5-TS-50-N (S/N: 0310294)
HP-11947A Transient Limiter (9KHz to 200 MHz) (S/N: 2820A00365)
2 x EMI Terminator 50 OHM

Double-shielded coaxial cable
Bulkhead connector
HP 8596E Spectrum Analyzer 9KHz - 12.8 GHz (serial 3826A01436)
Tile Software
Fiber Optic Link.
Air-compressed system for input switches activation
GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

FLEXTRONICS
FLEX Automotive
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EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	**OEM SPEC REF:**	**OEM PROCEDURE REF:**	**REQUIREMENT TYPE:**	**TEST SUBGROUP-1:**	**TEST SUBGROUP-2:**
FORD MOTOR COMPANY	ES-XW75-1A278-AC	CE-410	EMISSIONS	CONDUCTED	TRANSIENTS
TEST TITLE:	**CONDUCTED TRANSIENT EMISSIONS (CE-410)**				

TEST PROCEDURE DESCRIPTION

Test per ES-XW75-1A278-AC (October 10, 2003) page 24 and the test setup shown in Figure 9-1 applicable to the following component categories: AX, AY, EM, BM, R.

The Conducted Transients Emissions requirements cover the frequency range from 0.15 to 108 MHz ISO 7637-2 Voltage Probe on Power Lines.

TEST METHOD EQUIPMENT LIST

Automotive Relay (30A) & Snap Switch, Potter Brumfield Relay VF4-75F11
Automotive Battery
Insulated support 50 mm thick
OSCILLOSCOPE, TEKTRONIX, TDS754D /2M, (S/N: B022455)
P5205 100 MHz High Voltage Differential Probe, TEKTRONIX, P5205, High Impedance Probe (> 1 MOHM, C < 4 pF)
SOLAR ELECTRONICS LISN 5uH/50A/600VDC TYPE 9117-5-TS-50-N (S/N: 0310294) 150 KHz – 1 GHz
SOLAR ELECTRONICS LISN 5uH/50A/600VDC TYPE 6338-5-TS-50-N (S/N: 927238) 150KHz – 65 MHz
Tile Software
Fiber Optic Link.
Air-compressed system for input switches activation
GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

FLEXTRONICS
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EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
FORD MOTOR COMPANY	ES-XW75-1A278-AC	RI-112	IMMUNITY	RADIATED	RF
TEST TITLE:	**RADIATED RF IMMUNITY (RI-112) BCI test method**				

TEST PROCEDURE DESCRIPTION

Test per ES-XW75-1A278-AC (October 10, 2003) page 26 following the RF Immunity acceptance criteria per Table 10-1 and using the test frequency steps shown in Table 10-2.

Test verification and test set-up shall be in accordance with the BCI method (ISO 11452-4) except where noted in ES-XW75-1A278-AC specification.

BCI test method requirements cover the frequency range from 1 to 400 MHz using the current levels and modulation listed shown in Figure 10-1.

TEST METHOD EQUIPMENT LIST

Reverberation Chamber
Automotive Battery
FCC-BCICF-1 Calibration Fixture 10 KHz - 400 MHz, FISCHER., FCC-BCICF-1 (S/N: AR-307467/MFG 448)
F-55 RF CURRENT PROBE 10KHz - 500 MHz, FISCHER, F-55 (S/N: AR-307470/MFG 64)
F-130A-1 BULCK CURRENT INJECTION PROBE 10KHz - 400 MHz, FISCHER., F-130A-1 (S/N: TBD)
CWS500D RF Conducted Immunity Generator (BCI), EM Test, CWS500D (S/N: AR-307466/MFG 0803-01)
SPECTRUM ANALYSER, HEWLETT PACKARD, 8596E (S/N: 3826A01436)
ATTENUATOR 100W/3dB 2 GHz, Delta OHM, 09-208-032, S/N: AR-307468/MFG P-13
SOLAR ELECTRONICS LISN 5uH/50A/600VDC TYPE 9117-5-TS-50-N (S/N: 0310294) 150 KHz – 1 GHz

Fiber-optic video-camera
2-meter fixture for harness
Tile Software
Fiber Optic Link.
Air-compressed system for input switches activation
GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

FLEXTRONICS
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EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
FORD MOTOR COMPANY	ES-XW75-1A278-AC	RI-114	IMMUNITY	RADIATED	RF
TEST TITLE:	**RADIATED RF IMMUNITY (RI-114)**				

TEST PROCEDURE DESCRIPTION

Test per ES-XW75-1A278-AC (October 10, 2003) page 30 following the RF Immunity acceptance criteria per Table 10-1 and using the test frequency steps shown in Table 10-2.

Test verification and test set-up shall be in accordance with the Reverberation Mode Tunned Method (IEC 61000-4-21) except where noted in ES-XW75-1A278-AC.

Ri-114 test method requirements cover the frequency range from 400 to 3100 MHz per Table 10-3.

TEST METHOD EQUIPMENT LIST

Reverberation Chamber
Automotive Battery
ETS LINDGREN Model 2090 Multi Device Controller ("Z" Tuner assy), ETS EMC Test Systems, (S/N: MFG 00029059)
HORN ANTENNA, AMPLIFIER RESEARCH, AT4000 (S/N: 25075)
LOG PERIODIC ANTENNA, SCHAFFNER-CHASE EMC, UPA6109 (S/N: 1065)
LOG PERIODIC ANTENNA, ETS, 3146 (S/N: TBD)
RF AMPLIFIER, AMPLIFIER RESEARCH, 200W1000AM1 (S/N: 25128)
RF AMPLIFIER, AMPLIFIER RESEARCH, 200T1G2M4 (S/N: 22527)
RF POWER METER, BOONTON, 4232A (S/N: 18101)
RF SIGNAL GENERATOR 5 KHz - 3 GHz, RHDOE & SCHWARZ, SMT03 (S/N: 829889/003)
PE7017-10 10dB/25W DC 18 GHz attenuator, Pasternack, PE7017-10, (S/N: TBD)
DIRECTIONAL COUPLER, AMPLIFIER RESEARCH, DC7144, (S/N: 25043)
DIRECTIONAL COUPLER, AMPLIFIER RESEARCH, DC6080, (S/N: 25097)
PE7017-10 10dB/25W DC 18 GHz attenuator, Pasternack, PE7017-10, (S/N: TBD)
Fiber-optic video-camera
Tile Software
Fiber Optic Link.
Air-compressed system for input switches activation
GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

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EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
FORD MOTOR COMPANY	ES-XW75-1A278-AC	RI-140	IMMUNITY	RADIATED	MAGNETIC FIELD
TEST TITLE:	**MAGNETIC FIELD IMMUNITY (RI-140)**				

TEST PROCEDURE DESCRIPTION

Test per ES-XW75-1A278-AC (October 10, 2003) page 34 following the requirements shown in Table 11-1 and applicable only for Electronic Modules (component category AM)

Verification of component performance shall be verified using the test method delineated in MIL-STD-461E, RS101 except where noted in ES-XW75-1A278-AC.

Ri-140 test method requirements cover the frequency range from 50 to 10,000 Hz.

The test verification uses the frequency requirements shown in Table 11-2 and test set-up per Figure 11-1 for Radiating Loop Method, and Figure 11-2 for Helmholtz Coil Method.

TEST METHOD EQUIPMENT LIST

Automotive Battery
Ground Plane
Helmholtz Coil, EMCO, (S/N: TBD)
AUDIO AMPLIFIER, ELECTRO-METRICS, AA-SUS, (S/N: 218417)
CURRENT PROBE AMPLIFIER, TEKTRONIX, AM503, (S/N: B090380)
SOLAR ELECTRONICS LISN 5uH/50A/600VDC TYPE 9117-5-TS-50-N (S/N: 0310294) 150 KHz – 1 GHz

Air-compressed system for input switches activation
GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

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705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
FORD MOTOR COMPANY	ES-XW75-1A278-AC	RI-130	IMMUNITY	COUPLED	TRANSIENTS
TEST TITLE:	**COUPLED IMMUNITY (RI-130) - Immunity from Inductive Transients**				

TEST PROCEDURE DESCRIPTION

Test per ES-XW75-1A278-AC (October 10, 2003) page 38 following the requirements shown in Table 12- 1 (Coupled Immunity Requirements) and applicable for component categories A, AS, AM, AX, AY, and EM. Verification shall be performed using the test set-ups shown in Figure 12-1 and Annex H for specifications of the relay used.

TEST METHOD EQUIPMENT LIST

Automotive Battery
Ground Plane
Insulated support 50 mm thickness
OSCILLOSCOPE, TEKTRONIX, TDS754D /2M, (S/N: B022455)
Relay Potter &Brumfield, PRD-11DG0-12DC, (S/N: TBD)
Relay Potter & Brumfield, KUP-14A15-12, (S/N: TBD)
Power Supply HP 6286A 20V/20A, HEWLETT PACKARD, 6286A, (S/N: TBD)
Air-compressed system for input switches activation
GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

FLEXTRONICS
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EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
FORD MOTOR COMPANY	ES-XW75-1A278-AC	RI-150	IMMUNITY	COUPLED	TRANSIENTS
TEST TITLE:	**COUPLED IMMUNITY (RI-150) - Immunity from Charging System**				

TEST PROCEDURE DESCRIPTION

Test per ES-XW75-1A278-AC (October 10, 2003) page 38 following the requirements shown in Table 12- 1 (Coupled Immunity Requirements) and applicable for component categories A, AS, AM, AX, AY, and EM. Verification shall be performed using the test set-ups shown in Figure 12-2.

TEST METHOD EQUIPMENT LIST

Automotive Battery
Ground Plane
Insulated support 50 mm thickness
OSCILLOSCOPE, TEKTRONIX, TDS754D /2M, (S/N: B022455)
AUDIO AMPLIFIER, ELECTRO-METRICS, AA-SUS, (S/N: 218417)
PULSE/FUNCTION GENERATOR, HEWLETT PACKARD, 8116A, (S/N: 3134G17341)
Power Supply HP 6286A 20V/20A, HEWLETT PACKARD, 6286A, (S/N: TBD)

Air-compressed system for input switches activation
GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

FLEXTRONICS
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213 Harry Walker Parkway South, Newmarket, Ontario, L3Y 8T3, Canada

EMC/ELECTRICAL TEST REFERENCES

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705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
FORD MOTOR COMPANY	ES-XW75-1A278-AC	CI-210	IMMUNITY	CONDUCTED	CONTINUOUS DISTURBANCES
TEST TITLE:	**IMMUNITY FROM CONTINUOUS DISTURBANCES (CI-210)**				

TEST PROCEDURE DESCRIPTION

Test per ES-XW75-1A278-AC (October 10, 2003) page 42 following the requirements applicable for component categories A, AM, AX, AY, and EM.

The test verification uses the requirements for continuous disturbances shown in Figure 13- 1, the test set-up per Figure 13-2, and the frequency steps shown in Table 13-1.

TEST METHOD EQUIPMENT LIST

Automotive Battery
Ground Plane
Helmholtz Coil, EMCO, (S/N: TBD)
AUDIO AMPLIFIER, ELECTRO-METRICS, AA-SUS, (S/N: 218417)
CURRENT PROBE AMPLIFIER, TEKTRONIX, AM503, (S/N: B090380)
SOLAR ELECTRONICS LISN 5uH/50A/600VDC TYPE 9117-5-TS-50-N (S/N: 0310294) 150 KHz – 1 GHz

Air-compressed system for input switches activation
GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

FLEXTRONICS
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EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	**OEM SPEC REF:**	**OEM PROCEDURE REF:**	**REQUIREMENT TYPE:**	**TEST SUBGROUP-1:**	**TEST SUBGROUP-2:**
FORD MOTOR COMPANY	ES-XW75-1A278-AC	CI-220	IMMUNITY	CONDUCTED	TRANSIENT DISTURBANCES
TEST TITLE:	**IMMUNITY FROM TRANSIENT DISTURBANCES (CI-220)**				

TEST PROCEDURE DESCRIPTION

Test per ES-XW75-1A278-AC (October 10, 2003) page 44 following the requirements applicable for component categories A, AM, AX, AY, EM, and P.

The component shall be immune to voltage transients present on its power supply and control circuits as listed in Table 14-1 (Supply Voltage Transients - Immunity Requirements).

Verification of component performance shall be in accordance with ISO 7637-2 except where noted in ES-XW75-1A278-AC.

Test pulses D, E, F, and G shall be generated using any standard transient generator capable of producing standard test pulses per ISO 7637-2.

Test pulses A, B, and C shall be generated using the test circuit shown in Annex G.

The test set-up shall be done as shown in Figure 14-5 (devices with a Single power supply Circuit), Figure 14-6 (devices with two power supply connections), Figure 14-7 (devices with control Circuits), Figure 14-8 (control circuits using pull-Up resistors), and Figure 14-9 (pulse 5).

TEST METHOD EQUIPMENT LIST

Automotive Battery
Ground Plane
Insulated support 50 mm thickness
LD200B1 LOAD DUMP GENERATOR, EM Test, LD200B1, (S/N: AR-307713/MFG 0901-05)
MPG200B MICROPULSE GENERATOR, EM Test, MPG200B, (S/N: AR-307717/MFG0503-14)
MPG200S13 MICROPULSE GENERATOR, EM Test, MPG200S13, (S/N: AR-307714/MFG 0803-01)
MPG200S7 MICROPULSE GENERATOR, EM Test, MPG200S7, (S/N: AR-307711/MFG 0803-01)
OSCILLOSCOPE, TEKTRONIX, TDS754D /2M, (S/N: B022455)

Air-compressed system for input switches activation
GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

FLEXTRONICS
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EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
FORD MOTOR COMPANY	ES-XW75-1A278-AC	CI-230	IMMUNITY	CONDUCTED	POWER CYCLING

TEST TITLE: **IMMUNITY TO POWER CYCLING (CI-230)**

TEST PROCEDURE DESCRIPTION

Test per ES-XW75-1A278-AC (October 10, 2003) page 50 following the requirements applicable for component categories A, AM, AX, AY, and EM.

The component shall be immune to voltage fluctuations, which occur when the vehicle's engine is started (see the voltage waveforms representing these fluctuations in Figure 15-1).

Application requirements for each waveform are listed in Table 15-1 along with the performance requirements for the component.

Testing shall be performed using the test set-up shown in Figure 15-2. All waveforms shall be applied simultaneously to all power supply and control circuits per the timing sequence shown in Figure 15-1.

TEST METHOD EQUIPMENT LIST

Automotive Battery, Ground Plane, Insulated support 50 mm thickness,
Thermal Chamber Thermotron Model S12 MINIMAX (S/N: 1390)
LD200B1 LOAD DUMP GENERATOR, EM Test, LD200B1, (S/N: AR-307713/MFG 0901-05)
MPG200B MICROPULSE GENERATOR, EM Test, MPG200B, (S/N: AR-307717/MFG0503-14)
MPG200S13 MICROPULSE GENERATOR, EM Test, MPG200S13, (S/N: AR-307714/MFG 0803-01)
MPG200S7 MICROPULSE GENERATOR, EM Test, MPG200S7, (S/N: AR-307711/MFG 0803-01)
OSCILLOSCOPE, TEKTRONIX, TDS754D /2M, (S/N: B022455)
Power Supply HP 6286A 20V/20A, HEWLETT PACKARD, 6286A, (S/N: TBD)
ARBITRARY WAVEFORM GENERATOR, SONY/TEKTRONIX, AWG2021, (S/N: J320687)
AUDIO AMPLIFIER, ELECTRO-METRICS, AA-SUS, (S/N: 218417)

Air-compressed system for input switches activation
GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

FLEXTRONICS
FLEX Automotive
EMC & ELECTRICAL TEST LABORATORY
213 Harry Walker Parkway South, Newmarket, Ontario, L3Y 8T3, Canada

EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	**OEM SPEC REF:**	**OEM PROCEDURE REF:**	**REQUIREMENT TYPE:**	**TEST SUBGROUP-1:**	**TEST SUBGROUP-2:**
FORD MOTOR COMPANY	ES-XW75-1A278-AC	CI-250	IMMUNITY	CONDUCTED	VOLTAGE OFFSET

TEST TITLE: **IMMUNITY TO VOLTAGE OFFSET (CI-250)**

TEST PROCEDURE DESCRIPTION

Test per ES-XW75-1A278-AC (October 10, 2003) page 53 following the requirements applicable for component categories A, AM, AX, AY, and EM.

This requirement is not applicable to components with a dedicated power return back to another module (e.g. sensors).

The component shall be immune to AC ground voltage offset. Circuits affected include all power and signal returns that may be spliced to other subsystem components.

CI-250 requirements are delineated in Table 16-1. Testing shall be performed using the standard test set-up shown in Figure 16-1. Figure 16-2 illustrates the test set-up to be used if the DUT is connected to another module, sensor or electrical load that has a separate ground connection to the vehicle. Application of the offset waveforms is not required only if the module or sensor has a dedicated return back to the DUT. The waveform shall be applied to one ground circuit at a time unless analysis demonstrates that testing each circuit individually is unnecessary. The analysis shall be documented in the EMC test plan and approved by the FMC EMC department prior to commencement of testing.

TEST METHOD EQUIPMENT LIST

Automotive Battery, Ground Plane, Insulated support 50 mm thickness
LD200B1 LOAD DUMP GENERATOR, EM Test, LD200B1, (S/N: AR-307713/MFG 0901-05)
MPG200B MICROPULSE GENERATOR, EM Test, MPG200B, (S/N: AR-307717/MFG0503-14)
MPG200S13 MICROPULSE GENERATOR, EM Test, MPG200S13, (S/N: AR-307714/MFG 0803-01)
MPG200S7 MICROPULSE GENERATOR, EM Test, MPG200S7, (S/N: AR-307711/MFG 0803-01)
OSCILLOSCOPE, TEKTRONIX, TDS754D /2M, (S/N: B022455)
Power Supply HP 6286A 20V/20A, HEWLETT PACKARD, 6286A, (S/N: TBD)
ARBITRARY WAVEFORM GENERATOR, SONY/TEKTRONIX, AWG2021, (S/N: J320687)
AUDIO AMPLIFIER, ELECTRO-METRICS, AA-SUS, (S/N: 218417)
Air-compressed system for input switches activation
GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

FLEXTRONICS
FLEX Automotive
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213 Harry Walker Parkway South, Newmarket, Ontario, L3Y 8T3, Canada

EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
FORD MOTOR COMPANY	ES-XW75-1A278-AC	CI-260	IMMUNITY	CONDUCTED	VOLTAGE DROPOUT
TEST TITLE:	**IMMUNITY TO VOLTAGE DROPOUT (CI-260)**				

TEST PROCEDURE DESCRIPTION

Test per ES-XW75-1A278-AC (October 10, 2003) page 55 following the requirements applicable for component categories A, AM, AX, AY, and EM.

The component shall be immune to momentary voltage dropouts, which may occur over the life of the vehicle. Circuits affected include all power supply and control circuits. These requirements also apply to components that are connected to a regulated power provided by another module (e.g. sensors). Requirements are listed in Table 17-1 (waveforms figures 17-1 to 17-7).

Testing shall be performed using the test set-ups shown in Figure 17-8 through 17-10.

TEST METHOD EQUIPMENT LIST

Automotive Battery, Ground Plane, Insulated support 50 mm thickness
LD200B1 LOAD DUMP GENERATOR, EM Test, LD200B1, (S/N: AR-307713/MFG 0901-05)
MPG200B MICROPULSE GENERATOR, EM Test, MPG200B, (S/N: AR-307717/MFG0503-14)
MPG200S13 MICROPULSE GENERATOR, EM Test, MPG200S13, (S/N: AR-307714/MFG 0803-01)
MPG200S7 MICROPULSE GENERATOR, EM Test, MPG200S7, (S/N: AR-307711/MFG 0803-01)
OSCILLOSCOPE, TEKTRONIX, TDS754D /2M, (S/N: B022455)
Power Supply HP 6286A 20V/20A, HEWLETT PACKARD, 6286A, (S/N: TBD)
ARBITRARY WAVEFORM GENERATOR, SONY/TEKTRONIX, AWG2021, (S/N: J320687)
AUDIO AMPLIFIER, ELECTRO-METRICS, AA-SUS, (S/N: 218417)
Thermal Chamber Thermotron Model S12 MINIMAX (S/N: 1390)
Air-compressed system for input switches activation
GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

FLEXTRONICS
FLEX Automotive
EMC & ELECTRICAL TEST LABORATORY
213 Harry Walker Parkway South, Newmarket, Ontario, L3Y 8T3, Canada

EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
FORD MOTOR COMPANY	ES-XW75-1A278-AC	CI-260	IMMUNITY	CONDUCTED	VOLTAGE OVERSTRESS
TEST TITLE:	**IMMUNITY TO VOLTAGE OVERSTRESS (CI-270)**				

TEST PROCEDURE DESCRIPTION

Test per ES-XW75-1A278-AC (October 10, 2003) page 55 following the requirements applicable for component categories A, AM, AX, AY, EM, P, and R.

The component shall be immune to momentary voltage dropouts, which may occur over the life of the vehicle. Circuits affected include all power supply and control circuits. These requirements also apply to components that are connected to a regulated power provided by another module (e.g. sensors). Requirements are listed in Table 17-1 (waveforms figures 17-1 to 17-7).

Testing shall be performed using the test set-ups shown in Figure 17-8 through 17-10.

TEST METHOD EQUIPMENT LIST

Automotive Battery
OSCILLOSCOPE, TEKTRONIX, TDS754D /2M, (S/N: B022455)
Power Supply SORENSEN DCS33-36E, 0-33 V, 0-33 A, (S/N: 0331801456)
Power Supply HP 6286A 20V/20A, HEWLETT PACKARD, 6286A, (S/N: TBD)

Air-compressed system for input switches activation
GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

FLEXTRONICS
FLEX Automotive
EMC & ELECTRICAL TEST LABORATORY
213 Harry Walker Parkway South, Newmarket, Ontario, L3Y 8T3, Canada

EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
FORD MOTOR COMPANY	ES-XW75-1A278-AC	CI-280	IMMUNITY	ESD	

TEST TITLE: **Electro Static Discharge (CI-280)**

TEST PROCEDURE DESCRIPTION

Test per ES-XW75-1A278-AC (October 10, 2003) page 63 following the requirements applicable for component categories A, AM, AX, AY, EM, and P.

The component shall be immune to ESD events that occur during normal handling and assembly. These requirements are listed in Table 19-1. The component shall be immune to ESD events that can occur during normal operation (i.e. powered). These requirements are listed in Table 19-2. After exposure to ESD events listed in Tables 19-1 and 19-2, component I/O parametric values (e.g., resistance, capacitance, leakage current, etc.) shall remain within their specified tolerances. Testing shall be performed in accordance with ISO 10605 except were noted in ES-XW75-1A278-AC. The test facility shall be maintained at an ambient temperature at (23 ±3) °C and a relative humidity from 20 % to 40 % (20 °C and 30 % relative humidity preferred).

ESD handling tests shall be performed before any other EMC testing.

Test setup per Figure 19-1 for ESD Handling and Figure 19-2 for ESD Powered.

TEST METHOD EQUIPMENT LIST

Automotive Battery
ESD SYSTEM, KEYTEK, SERIES 2000, (S/N: 8706322)
DN-7A Discharge Network 2000 ohms, 330pF-probe head and 150pF-probe head.
Ground plane - brass, 1mm thickness, 1m²
Static Dissipative Material, 50 mm thick insulating support
Bleed Off resistor used to bleed charge from discharge points

Air-compressed system for input switches activation
GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY CAPABILITY
FOR GENERAL MOTORS COMPANY (GMW3100, GMW 3097, and GMW3172) REQUIREMENTS

FLEXTRONICS
FLEX Automotive
EMC & ELECTRICAL TEST LABORATORY
213 Harry Walker Parkway South, Newmarket, Ontario, L3Y 8T3, Canada

EMISSIONS	RADIATED	RF	RE (ALSE)	0.15 to 1583 MHz, CISPR-25 Spark & Non-spark requirements	24 h
	CONDUCTED	RF	CE	Artificial Network (AN) CISPR-25 Spark & Non-spark requirements	8 h
		TRANSIENT	CE MOTORS	slow or fast pulses , ISO 7637-1, ISO 7637-2.3	8 h
IMMUNITY	RADIATED	MAGNETIC FIELD	Power Lines	15 Hz to 30 KHz SAE J1113/22 Helmholtz Coil, MIL-STD-461E	8 h
		RF	RI (BCI)	1 to 400 MHz, CBCI and DBCI method, ISO 11452-1, ISO 11452-4	24 h
			RI (Anechoic Chamber)	400 MHz to 2 GHz, ISO 11452-1, ISO 11452-2	24 h
			OR RI (Reverb Chamber)	400 to 2000 MHz, Mode Tuning	24 h
	CONDUCTED	TRANSIENTS	CI (Power Lines)	ISO/DIS 7637-2.3, pulses 1, 2a, 2b, 3a, 3b, 4, 5b, 7	24 h
			CI (I/O Lines)	ISO/DIS 7637-3, pulses 3a, 3b	4 h
			CI (DCC Sensor Lines)	ISO/DIS 7637-2.3, Direct Capacitor Coupling (sensors), pulse 2a	4 h
			CI (85V DCC)	ISO/DIS 7637-2.3, pulse 2a (+/- 85V peak)	4 h
ESD	Electrostatic Discharge		Powered-On Mode	ISO 10605, ±15KV (C=330pF, R=2k) , ±25KV (C=150pF, R=2k)	8 h
			Remote I/O	ISO 10605, ±15KV (C=330pF, R=2k) , ±25KV (C=150pF, R=2k)	8 h
			Handling of Devices	ISO 10605, (unpowered) ±6 KV contact, ±8 KV air	8 h
ELECTRICAL	Requirements for Electronic Module		Jump Start and Reverse Polarity	+26 ± 0.5 1 minute, –13.5 +1/–0.5 2 minutes	4 h
			Over-Voltage	+18 ± 0.2 V / 60 minutes	4 h
			Power/Ground Test Connection	power offsets of ± 1.0 V, ground offsets of ± 0.8 V	4 h
			Voltage Drop Test	Pulse Figure-31 GMW3172	6 h
			Battery Voltage Dropout	Pulse Figure-32 GMW3172	66 h
			Superimposed Alternating V	Pulse Figure-33 GMW3172	12 h
			Short Circuit Endurance	Intermittent & Continuous Short Circuit	232 h
			Load Circuit Over-Current	required for outputs without internal protection	4 h
			Short-to-Battery Test	apply (14.0 ± 0.1) V for 2 min, to all inputs and outputs	4 h
			Short-to-Ground Test	apply GND for 2 min, to all inputs and outputs	4 h
			Open Circuit Tests	apply open circuit for 2 min, to all inputs and outputs	4 h
			Isolation Resistance	apply a test voltage of 500 V DC for 60 s to the DUT at +70 C	6 h
			Parasitic Current Measurement	Estimate the average parasitic current over 42 days period.	1008 h
			Puncture Strength	insulation in applications involving high voltages	8 h

Test-time nr of pins dependent

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

FLEXTRONICS
FLEX Automotive
EMC & ELECTRICAL TEST LABORATORY
213 Harry Walker Parkway South, Newmarket, Ontario, L3Y 8T3, Canada

EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
GENERAL MOTORS	GMW3097	CISPR-25	EMISSIONS	RADIATED	RF
TEST TITLE:	**RE, Absorber Lined Shielded Enclosure (ALSE) (0.15 to 1583 MHz)**				

TEST PROCEDURE DESCRIPTION

Prior to measurement of the DUT emissions, test setup ambient levels (i.e. load/box, simulator energized without DUT), the ambient levels shall not be above the limit and should be 6 dB below the limit.

Noise is divided into two different types:

• Non-spark generated noise: Noise generated by electronic sources, such as microprocessors, clocks, PWM etc.

• Spark generated noise: Noise generated by sparks, such as ignition systems, short and long duration brush type motors etc.

Quasi-Peak (QP) detector is typically used for measurement of “Spark” generated emissions.

Below 30 MHz one DUT orientation (as in the vehicle if known) is required, above 30 MHz three orthogonal DUT orientations are required. The maximum level at each frequency shall be reported.

For the frequency range (1...2) GHz the receiving antenna shall be moved 0.75 m parallel to the front edge of the ground plane towards the DUT in order to point at the DUT instead of the center of the wiring harness. Requirements: The field strength level of the radiated emissions shall not exceed the levels of Table 3, Table 4 and Table 5.

TEST METHOD EQUIPMENT LIST

BRADEN SHIELDING SYSTEMS CISPR-25 ALSE Chamber (S/N: 241431)	Double-shielded coaxial cable
Automotive Battery,	Bulkhead connector
Styrofoam test bench & Ground Plane	HP 8596E Spectrum Analyzer 9KHz - 12.8 GHz
Insulated support 50 mm thick	Tile Software
Test Harness 1700 mm (+300/-0 mm)	Air-compressed system for input switches activation
SOLAR ELECTRONICS LISN 5uH/50A/600VDC (TYPE 9117-5-TS-50-N	GRYPHON, HW/SW & CAN fiber-optic support
2 x EMI Terminator 50 OHM	Netway SW/HW CAN support, SDD16 SW/HW
AGILENT Preamplifier 87405A 10-3000 MHz +13dBm max input	
HP8447F OPT H64 Amplifier 9KHz - 1300 MHz	
Receiving Antennas: Monopole, Biconical, Log Periodic, Horn	

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

FLEXTRONICS
FLEX Automotive
EMC & ELECTRICAL TEST LABORATORY
213 Harry Walker Parkway South, Newmarket, Ontario, L3Y 8T3, Canada

EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
GENERAL MOTORS	GMW3097	CISPR-25	EMISSIONS	CONDUCTED	RF
TEST TITLE:	**CE, Artificial Network (AN)**				

TEST PROCEDURE DESCRIPTION

Use test method IEC CISPR 25 with the following exception:

For the length of the power lines within the wiring harness the requirements of IEC CISPR 25 apply. For other wires within the wiring harness alternatively a length of (1700 +300/-0) mm can be chosen.

All DUT B+ and switched B+ shall be commonly connected to the output of the artificial network.

Requirements: The voltage level of the conducted emissions shall not exceed the levels of Table 6 and Table 7. The limits apply for artificial networks without correction factors applied.

Table 6: Conducted Emissions Artificial Network (AN) Non-Spark Requirements.

Table 7: Conducted Emissions Artificial Network (AN) Spark Requirements.

TEST METHOD EQUIPMENT LIST

BRADEN SHIELDING SYSTEMS CISPR-25 ALSE Chamber (S/N: 241431)
Automotive Battery
Styrofoam test bench & Ground Plane
Insulated support 50 mm thick
Test Harness 1700 mm (+300/-0 mm)
SOLAR ELECTRONICS LISN 5uH/50A/600VDC (TYPE 9117-5-TS-50-N
HP-11947A Transient Limiter (9KHz to 200 MHz), HEWLETT PACKARD, HP-11947A
2 x EMI Terminator 50 OHM

Double-shielded coaxial cable
Bulkhead connector
HP 8596E Spectrum Analyzer 9KHz - 12.8 GHz
Tile Software
Air-compressed system for input switches activation
GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

FLEXTRONICS
FLEX Automotive
EMC & ELECTRICAL TEST LABORATORY
213 Harry Walker Parkway South, Newmarket, Ontario, L3Y 8T3, Canada

EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	**OEM SPEC REF:**	**OEM PROCEDURE REF:**	**REQUIREMENT TYPE:**	**TEST SUBGROUP-1:**	**TEST SUBGROUP-2:**
GENERAL MOTORS	GMW3097	ISO 11452-1, ISO 11452-4	IMMUNITY	RADIATED	RF
TEST TITLE:	**RI, Bulk Current Injection (BCI) (1 to 400 MHz)**				

TEST PROCEDURE DESCRIPTION

The test equipment shall comply with ISO 11452-1 and ISO 11452-4. Use test frequencies according to Table 13. In the frequency range 1MHz...30 MHz ground wires that are power returns (B+/ IGN) directly or indirectly (through load box/simulator) shall be routed outside of the injection probe, this is called Differential-Mode BCI (DBCI). In the frequency range 30 MHz...400 MHz all wires of the DUT wiring harness shall be routed inside of the injection probe, this is called Common-Mode BCI (CBCI). Three fixed injection probe positions are defined (150 mm, 450 mm and 750 mm). Use only 150 mm and 450 mm injection probe positions when performing DBCI and only 450 mm and 750 mm injection probe positions when performing CBCI. Use wiring harness length of (1700 +300/-0) mm. The injection probe shall be insulated from the ground plane. The negative lead of the power supply for the DUT shall be attached to the ground plane with a low RF impedance connection.

Requirements: DUT functions may only deviate above the levels according to Table 14 and Figure 3.

TEST METHOD EQUIPMENT LIST

Reverberation Chamber
SPECTRUM ANALYSER, HEWLETT PACKARD, 8596E (S/N: 3826A01436)
LISN 5uH/50A/600VDC, Solar Electronics, Type 9117-5-TS-50-N
ATTENUATOR 100W/3dB 2 GHz, Delta OHM, 09-208-032, (S/N: AR-307468/MFG P-13)
FCC-BCICF-1 Calibration Fixture 10 KHz - 400 MHz, FISCHER C.C., FCC-BCICF-1 (S/N: AR-307467/MFG 448)
F-55 RF CURRENT PROBE 10KHz - 500 MHz, FISCHER C.C., F-55 (S/N: AR-307470/MFG 64)
F-130A-1 BULCK CURRENT INJECTION PROBE 10KHz - 400 MHz, FISCHER C.C., F-130A-1
CWS500D RF Conducted Immunity Generator (BCI), EM Test, CWS500D (S/N: AR-307466/MFG 0803-01)

Fiber-optic video-camera
2-meter fixture for harness.
Air-compressed system for input switches activation
GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

FLEXTRONICS
FLEX Automotive
EMC & ELECTRICAL TEST LABORATORY
213 Harry Walker Parkway South, Newmarket, Ontario, L3Y 8T3, Canada

EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
GENERAL MOTORS	GMW3097	ISO 11452-1, ISO 11452-2	IMMUNITY	RIATEDAD	RF
TEST TITLE:	**RI, Anechoic Chamber (400 MHz to 2 GHz)**				

TEST PROCEDURE DESCRIPTION

The substitution method shall be used. In the frequency range 400 MHz...1 GHz the field-generating device (antenna) shall be oriented as described in ISO 11452-2.

For the frequency range 1...2 GHz the field-generating device (antenna) shall be moved 0.75 m parallel to the front edge of the ground plane towards the DUT. Horizontal and vertical polarization shall be used. The DUT shall be tested in a minimum of three orientations.

For calibration and during the actual test of a DUT, forward power shall be used as reference parameter. Use test frequencies according to Table 13.

DUT functions may only deviate above the levels according to Table 15.

Only Momentary, resettable deviations are allowed up to and including Level 2. Pulsed field strength requirements are peak V/m (maximum RMS) levels.

TEST METHOD EQUIPMENT LIST

Anechoic Chamber Braden Shielding Systems
Rohde & Schwarz SMT 03, Signal Generator, 5 KHz to 3 GHz
Rohde & Schwarz SMP 02, Signal Generator, 2 GHz to 20 GHz
AR 200W1000AM1, Power Amplifier, 200 W, 200 MHz to 1 GHz.
AR 200T1G2, Power Amplifier, 200 W, 1 GHz to 2 GHz.
AR 200T2G4, Power Amplifier, 200 W, 2 GHz to 4 GHz.
Boonton 4232-02, Dual Channel Power Meter
AR DC6080, Dual Directional Coupler, 80 MHz to 1 GHz
AR DC7144, Dual Directional Coupler, 800 MHz to 4.2 GHz
AR AT4000, Horn Antenna AR AT4000, 200 MHz to 1 GHz.

EMC Test Systems 3115, Horn Antenna, 1 GHz to 18 GHz.
AR FM5004, Field Probe Mainframe.
AR FP5083, Field Probe, 80 MHz to 40 GHz.
Power Supply Kikusui PAD 35-20L (o to 35 V, 0 to 20 A)
Bulkhead filter Tusonix 4201-001.
Tile Immunity Software.
Air-compressed system for input switches activation
GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

FLEXTRONICS
FLEX Automotive
EMC & ELECTRICAL TEST LABORATORY
213 Harry Walker Parkway South, Newmarket, Ontario, L3Y 8T3, Canada

EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
GENERAL MOTORS	GMW3097	ISO 11452-1, ISO 11452-2	IMMUNITY	RADIATED	RF
TEST TITLE:	**RI, Reverberation Chamber, Mode Tuning (400 MHz to 2 GHz)**				

TEST PROCEDURE DESCRIPTION

Use test frequencies according to Table 13. The test set up is shown in Figure B.1. All modulation dwell time (i.e., time that RF is applied for per modulation type) shall be at least 2 s. Electric field probes and Ground planes shall not be used in this test. For DUTs that have no power return wire, a ground strap no wider than 13mm may be used to connect the DUT to the battery. The DUT shall be at least 0.25 m from the chamber walls, tuner, transmit antenna, and receive antenna. The test chamber must have been calibrated according to Annex B, section B.1.1 (Field Uniformity Validation). Prior to collecting data, the procedures of Annex B, section B.2 (Calibration) shall be performed.A (1700 +300/-0) mm harness shall be used unless otherwise specified in the test plan. The DUT shall be exposed to each field level and frequency at each mode tuner position. DUT functions may only deviate above the levels according to Table 16. Only Momentary, resettable deviations are allowed up to and including Level 2. Pulsed field strength requirements are peak V/m (maximum RMS) levels.

TEST METHOD EQUIPMENT LIST

Reverberation Chamber, (S/N: TBD)	PE7017-10 10dB/25W DC 18 GHz attenuator, Pasternack, PE7017-10, (S/N: TBD)
ETS LINDGREN Model 2090 Multi Device Controller ("Z" Tuner assy),	DIRECTIONAL COUPLER, AMPLIFIER RESEARCH, DC7144, (S/N: 25043)
ETS EMC Test Systems, ETS2090 (S/N: MFG 00029059)	DIRECTIONAL COUPLER, AMPLIFIER RESEARCH, DC6080, (S/N: 25097)
EMC Test Systems 3115, Horn Antenna, 1 GHz to 18 GHz.	PE7017-10 10dB/25W DC 18 GHz attenuator, Pasternack, PE7017-10, (S/N: TBD)
LOG PERIODIC ANTENNA, SCHAFFNER-CHASE EMC, UPA6109 (S/N: 1065)	PULSE/FUNCTION GENERATOR, HEWLETT PACKARD, 8116A, (S/N: 3134G17341)
LOG PERIODIC ANTENNA, ETS, 3146 (S/N: TBD)	Fiber-optic video-camera
RF AMPLIFIER, AMPLIFIER RESEARCH, 200W1000AM1 (S/N: 25128)	2-meter fixture for harness.
RF AMPLIFIER, AMPLIFIER RESEARCH, 200T1G2M4 (S/N: 22527)	Air-compressed system for input switches activation
RF POWER METER, BOONTON, 4232A (S/N: 18101)	GRYPHON, HW/SW & CAN fiber-optic support
RF SIGNAL GENERATOR 5 KHz - 3 GHz, RHDOE & SCHWARZ, SMT03 (S/N: 829889/003)	Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

We cannot perform RI, Reverberation Chamber, Mode Stirring, method that remains applicable only till July 2005. The stirrer was replaced by a tuner in our Reverb chamber.

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

FLEXTRONICS
FLEX Automotive
EMC & ELECTRICAL TEST LABORATORY
213 Harry Walker Parkway South, Newmarket, Ontario, L3Y 8T3, Canada

EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
GENERAL MOTORS	GMW3097	SAE J1113/22	IMMUNITY	RADIATED	MAGNETIC FIELDS
TEST TITLE:	**Immunity to Power Line Magnetic Fields**				

TEST PROCEDURE DESCRIPTION

Lower operating frequency of the equipment shall be at least 16 2/3 Hz. Upper operating frequency of the equipment shall be at least 180 Hz. Sine wave generator shall be used. Use the RMS current through the magnetic coils as the reference parameter for calibration and test. At each field intensity level expose the DUT for a minimum of 30 seconds. Use the test frequencies and waveforms according to Table 18. The use of one or two amplifiers is allowed. Test three orthogonal DUT orientations. The harness shall be routed parallel to the coil. If deviations are observed, the magnetic field level shall be reduced until the DUT functions normally. Then the magnetic field level shall be increased until the deviation occurs. This level shall be reported as the deviation threshold. DUT functions may only deviate above the requirements in Table 18 (Magnetic Field Requirements).

TEST METHOD EQUIPMENT LIST

Tektronix TDS 754-D Digitizing Oscilloscope, (S/N: B022455)
Audio Amplifier Model AA-SUS 20 Hz - 100 kHz, (S/N:218417)
EMCO Helmholtz Coil System Model 6403.
Magnetic Field Strength Meter Model EM-7530 20 Hz - 50 KHz, (S/N: 133)
Magnetic Field Sensor Probe EM 7356 (60 - 120 dBpT).
Magnetic Field Sensor Probe EM 7357 (100 - 160 dBpT).

Fiber-optic video-camera
GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

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EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
GENERAL MOTORS	GMW3097	ISO 7637-1, ISO 7637-2.3	EMISSIONS	CONDUCTED	TRANSIENT
TEST TITLE:	**CE, Transients (+100 V, -150V)**				

TEST PROCEDURE DESCRIPTION

For each type of pulse (slow or fast) the test shall be performed according to ISO/DIS 7637-2.3 (refer to Annex A), Figure 1b, but without the shunt resistor Rs. Motors and actuators that may stall during normal operation shall, in addition, be tested in “stall” condition. The stall should not be held longer than one second. This is to prevent activation of in-line protection devices that would interrupt current to the DUT. Transients shall be measured directly at the motor terminals for category “AX” device (electronic module that controls an inductive device) with integrated inductive device powered by B+ and/or switched B+ and controlled by an internal relay. This may require probes being placed inside the assembly. The voltage levels of Conducted Transients shall not exceed the levels of Table 19 when the DUT is evaluated in accordance with ISO/DIS 7637-2.3 (refer to Annex A). The conducted transient emissions requirements are established with the knowledge that they are not identical to the conducted transient immunity requirements. This difference is attributable to a) the emission measurements are obtained on the DUT side of the switch, and b) the attenuation of the DUT emission related to the switch contact arcing and the losses associated with wiring harnessing.

TEST METHOD EQUIPMENT LIST

LISN 5uH/50A/600VDC, Solar Electronics, Type 9117-5-TS-50-N, (S/N: TBD)
LISN, SOLAR ELECTRONICS, 6338-5-TS-50-N, (S/N: 927238)
OSCILLOSCOPE, TEKTRONIX, TDS754D /2M, (S/N: B022455)
P5205 100 MHz High Voltage Differential Probe, TEKTRONIX, P5205, (S/N: TBD)
Potter Brumfield Relay VF4-75F11, Potter Brumfield, VF4-75F11, (S/N: TBD)
Automotive Relay (30A) & Snap Switch

Fiber-optic video-camera
GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

Applies to Inductive devices [R]= relays and solenoids and horns, [AX]= an electronic module that controls an inductive device (e.g. electric or electronically controlled motor(s), solenoids, etc.) internal or external to its package, [BM]= a brush commutated electric motor, and [EM]= an electronically controlled or commutated electric motor.

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

FLEXTRONICS
FLEX Automotive
EMC & ELECTRICAL TEST LABORATORY
213 Harry Walker Parkway South, Newmarket, Ontario, L3Y 8T3, Canada

EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
GENERAL MOTORS	GMW3097	ISO 7637-1, ISO 7637-2.3	EMISSIONS	CONDUCTED	TRANSIENT
TEST TITLE:	**CI, Transients on Power Lines**				

TEST PROCEDURE DESCRIPTION

This test applies to module categories “D”, “A”, “AM”, “AX”, and “EM”. This test procedure applies to battery+ (B+) and switched battery lines (e.g. Ignition, Accessory). It also applies to I/O lines that are connected to an inductive load, where that load is fed by B+ or switched battery. Use test methods according to the relevant sections of ISO/DIS 7637-2.3 (See Annex A) with the following specifications:

- Perform the test using pulses 1, 2a, 2b, 3a, 3b, and 4 in accordance with ISO/DIS 7637-2.3 (See Annex A).
- Pulse 1 and 2b are only applicable to switched battery lines.
- The waveform amplitude for Pulse 3a, 3b is determined from the average of the waveform peak voltages.
- Pulse 4 is only applicable to B+ and switched battery lines which are powered during cranking.

Additionally, test pulses 5b (table 20) and 7 (Figure 4) shall also be performed. Use Table 22 to determine the number of pulses or test time for pulses 1...7.

TEST METHOD EQUIPMENT LIST

LISN 5uH/50A/600VDC, Solar Electronics, Type 9117-5-TS-50-N, (S/N: TBD)	Test Files Transient Generator, EM/AR Test software
LISN 5uH, SOLAR ELECTRONICS, 6338-5-TS-50-N, (S/N: 927238)	GRYPHON, HW/SW & CAN fiber-optic support
OSCILLOSCOPE, TEKTRONIX, TDS754D /2M, (S/N: B022455), Fluke 8060A Multimeter.	Netway SW/HW CAN support, SDD16 SW/HW
Kikusui PAD 35-20L Power Supply, Battery (13V).	
Amplifier Research / TEGAM / EM Test Model 2714A,	
LD 200 B1 Load Dump Generator	
VDS 200 B2 Voltage Drop Generator	
MPG 200 B Transient Generator	
VDS 200 B2 Transient Generator	
EFT 200 B Transient Generator	

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

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EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	**OEM SPEC REF:**	**OEM PROCEDURE REF:**	**REQUIREMENT TYPE:**	**TEST SUBGROUP-1:**	**TEST SUBGROUP-2:**
GENERAL MOTORS	GMW3097	ISO 7637-1, ISO 7637-3	EMISSIONS	CONDUCTED	TRANSIENT
TEST TITLE:	**CI, Coupling to I/O other than power supply lines (Pulse 3a, 3b)**				

TEST PROCEDURE DESCRIPTION

This test applies to module categories “A”, “AS”, “AM”, “AX”, and “EM”. Use test methods according to the relevant sections of ISO 7637-3 with the following specification: Use only test pulse 3a and 3b.

Note: Consistent with ISO 7637-3, but different than prior GMW revisions, the coupling clamp method shall route the B+ and B- outside the clamp, if not otherwise stated in the test plan. Direct pin capacitive coupling (DCC) method using a 220 pF capacitor is an alternative to the coupling clamp (refer to Section 3.5.4 for test setup and procedure).

Requirements: DUT functions may only deviate at peak levels greater than those shown in Table 24 (Pulse 3a and 3b, levels established into a 50 Ω load).

TEST METHOD EQUIPMENT LIST

OSCILLOSCOPE, TEKTRONIX, TDS754D /2M, (S/N: B022455), Fluke 8060A Multimeter.
Shaffner CDN 500 Capacitive Coupling Clamp for automotive electronics with 50 OHM attenuator.
50 OHM, 50 cm, Coaxial cable to the Pulse Generator., 50 OHM Coaxial Cable to Oscilloscope.
Amplifier Research / TEGAM / EM Test Model 2714A, Transient Generator

Test Files Transient Generator, EM/AR Test software
GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

FLEXTRONICS
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EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
GENERAL MOTORS	GMW3097	ISO 7637-1, ISO 7637-2.3	EMISSIONS	CONDUCTED	TRANSIENT
TEST TITLE:	**CI, Direct Capacitor Coupling to Sensor Lines (Pulse 2a)**				

TEST PROCEDURE DESCRIPTION

This test applies to sensors, category AS devices, (powered from regulated power supplies in other modules). The purpose of this test is to identify potential sensitivities to transients that may occur as a result of wiring harness coupling (e.g. cross talk). Refer to GMW3097 Figure 5 - Setup for Direct Capacitor Coupling (DCC). The transient shall be capacitively coupled from generator to the applicable DUT pin by inserting a series ceramic capacitor between the generator (+) output pin and the applicable DUT pins. The generator (-) shall be directly connected to the DUT ground reference. These pulses shall be applied to all inputs, outputs, and power, line by line. The test pulse voltages are set open circuit and are referenced to module ground. The injection point shall be within 5 cm of the DUT connector and they are applied for 5 minutes each.

Requirements: DUT functions may only deviate at peak levels greater than those shown in Table 25 (Pulse 2a, levels established into an open circuit; 2Ω transient generator internal source impedance).

TEST METHOD EQUIPMENT LIST

OSCILLOSCOPE, TEKTRONIX, TDS754D /2M, (S/N: B022455), Fluke 8060A Multimeter.
Amplifier Research / TEGAM / EM Test Model 2714A, Transient Generator
Direct Capacitor Coupling (DCC)

Test Files Transient Generator, EM/AR Test software
GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

Direct pin capacitive coupling (DCC) method using a 220 pF capacitor is an alternative to the coupling clamp (refer to GMW3097 Section 3.5.4 for test setup and procedure).

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

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EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
GENERAL MOTORS	GMW3097	ISO 7637-1, ISO 7637-2.3	EMISSIONS	CONDUCTED	TRANSIENT
TEST TITLE:	**CI, 85V Direct Capacitor Coupling (OPTIONAL TEST) – (Pulse 2a)**				

TEST PROCEDURE DESCRIPTION

The purpose of this test is to identify potential sensitivities to excessive transients that may occur as a result of unique wiring harness coupling (e.g. cross talk).

This direct-pin transient injection test may be required on very select I/O connector pins with the DUT in a powered and fully functional mode. The specific pin(s), if applicable, will be identified during the review of the circuit schematics within the EMC process per GMW3103, using the experience-base of the manufacturer's EMC expert and any knowledge of the platform architecture.

Procedure: Refer to section GMW3097 3.5.4 for test setup and procedure.

Requirements: see GMW3097 Table 26 Requirements of 85V Direct Capacitor Coupling – Pulse 2a.

TEST METHOD EQUIPMENT LIST

OSCILLOSCOPE, TEKTRONIX, TDS754D /2M, (S/N: B022455), Fluke 8060A Multimeter.
Amplifier Research / TEGAM / EM Test Model 2714A, Transient Generator
Direct Capacitor Coupling (DCC)

Test Files Transient Generator, EM/AR Test software
GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

GMW3097 3.5.4 CI, Direct Capacitor Coupling to Sensor Lines.

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

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EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
GENERAL MOTORS	GMW3097	ISO 10605	ESD		
TEST TITLE:	**ESD, Test during Operation of the Device (Power-On Mode)**				

TEST PROCEDURE DESCRIPTION

Test each exposed shaft, button switch or surface of electrical / electronic devices normally accessible to an occupant inside the vehicle while seated inside the vehicle using the contact discharge method (contact discharge tip) and the 330 pF capacitor and the air discharge method (air discharge tip) and the 330 pF capacitor according to the test sequence in Table 27 for test number 1...7.

For test number 8, test each exposed shaft, button switch or surface of electrical / electronic devices which can be conveniently accessed when standing outside the vehicle and reaching inside without touching any other part of the vehicle (e.g. any door open, trunk open), using only the air discharge method (air discharge tip) and the 150 pF capacitor according to Table 27. Test number 8 is not applicable to inputs/outputs that are connected to the communication bus.

Requirements: The DUT functions may deviate according to Table 27. The DUT I/O parametric values (e.g., resistance, capacitance, leakage current, etc.) shall be verified before the test and after test completion. If, after completing the test, the parametric values have exceeded their specified limits, the DUT is non-compliant.

TEST METHOD EQUIPMENT LIST

ESD SYSTEM, KEYTEK, SERIES 2000,(S/N: 8706322)
DN-7A Discharge Network 2000 ohms, 330pF-probe head and 150pF-probe head.
Battery (13V).
Ground plane - brass, 1mm thickness, 1m².
2 meters harness (DUT to exerciser)
Static Dissipative Material and Insulating material 25 mm height..

GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

Maintain the ambient temperature at (23 ±3) °C and the relative humidity from 20 % to 40 % (20 °C and 30 % relative humidity preferred) during testing.

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

FLEXTRONICS
FLEX Automotive
EMC & ELECTRICAL TEST LABORATORY
213 Harry Walker Parkway South, Newmarket, Ontario, L3Y 8T3, Canada

EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
GENERAL MOTORS	GMW3097	ISO 10605	ESD		
TEST TITLE:	ESD, Remote Inputs/ Outputs				

TEST PROCEDURE DESCRIPTION

This test method specifies a procedure for testing of components attached to data communication buses (e.g. ALDL) or to inputs/outputs (e.g. through switches, sensors, etc.) of devices that are accessible by vehicle occupants or may be subject to ESD from an indirect charged source (e.g. wheel speed sensor inputs, airbag control lines from mounting brackets, etc.).

The test setup shall be configured according to Figure 6. The ESD discharge shall be applied to the bus connector pins individually. When discharging to a specific pin a 2.5cm long solid core wire should be connected to extend it, if required. Test number 8 (25 KV) is not applicable to bus connectors. For communication buses the verification tool must present the maximum bus load.

Requirements: the DUT functions may deviate according to Table 28. Three discharges are to be applied at each type, polarity and level.

TEST METHOD EQUIPMENT LIST

ESD SYSTEM, KEYTEK, SERIES 2000,(S/N: 8706322)
DN-7A Discharge Network 2000 ohms, 330pF-probe head and 150pF-probe head.
Battery (13V).
Ground plane - brass, 1mm thickness, 1m².
2 meters harness (DUT to exerciser)
2.5 cm solid core wire
Static Dissipative Material and Insulating material 25 mm height..

GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

Maintain the ambient temperature at (23 ±3) °C and the relative humidity from 20 % to 40 % (20 °C and 30 % relative humidity preferred) during testing.

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

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213 Harry Walker Parkway South, Newmarket, Ontario, L3Y 8T3, Canada

EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	**OEM SPEC REF:**	**OEM PROCEDURE REF:**	**REQUIREMENT TYPE:**	**TEST SUBGROUP-1:**	**TEST SUBGROUP-2:**
GENERAL MOTORS	GMW3097	ISO 10605	ESD		
TEST TITLE:	**ESD, Handling of Devices**				

TEST PROCEDURE DESCRIPTION

Test each connector pin (recessed pins in metalized connectors are exempt), case, button, switch, display, case screw and case opening of the DUT that is accessible during handling.

Requirements: the DUT functions may deviate according to Table 29.

TEST METHOD EQUIPMENT LIST

ESD SYSTEM, KEYTEK, SERIES 2000,(S/N: 8706322)
DN-7A Discharge Network 2000 ohms, 150pF-probe head.
Battery (13V).
Ground plane - brass, 1mm thickness, 1m².
2.5 cm solid core wire
Static Dissipative Material and Insulating material 25 mm height..

GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

Maintain the ambient temperature at (23 ±3) °C and the relative humidity from 20 % to 40 % (20 °C and 30 % relative humidity preferred) during testing.

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

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EMC/ELECTRICAL TEST REFERENCES

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705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
GENERAL MOTORS	GMW3172		ELECTRICAL		
TEST TITLE:	Parasitic Current Measurements				

TEST PROCEDURE DESCRIPTION

Parasitic current is defined as the current drawn by electrical devices when the vehicle ignition switch is in the OFF position and all electrical accessories are turned OFF. Evaluate the possibility of vehicle battery drain due to excessive parasitic current. The DUT should be equipped as installed in the vehicle. All inputs, outputs, and sensors are to be electrically connected and in their normal inactive state. Connect the DUT to a variable power supply and adjust the input voltage to (12.6 +/-1) volts. The system should be at a temperature of 25 Celsius. The average parasitic current should be calculated as the average current flow over a 40-day period. The maximum allowable average parasitic current shall be 0.250 mA if not provided in the CTS. The test report must include the following information: a) Parasitic current draw when in OFF-Asleep, b) Parasitic current draw under all OFF-Awake conditions and their time period, c) Calculated average parasitic current draw over 40 days, and d) Parasitic current over the voltage range from 12.6 down to 0 volts.

TEST METHOD EQUIPMENT LIST

OSCILLOSCOPE, TEKTRONIX, TDS754D /2M, (S/N: B022455), Fluke 8060A Multimeter.
Sorensen DCS 33-36 E Power Supply, 0-33 V; 0-36 A

GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

FLEXTRONICS
FLEX Automotive
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EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	**OEM SPEC REF:**	**OEM PROCEDURE REF:**	**REQUIREMENT TYPE:**	**TEST SUBGROUP-1:**	**TEST SUBGROUP-2:**
GENERAL MOTORS	GMW3172		ELECTRICAL		
TEST TITLE:	**Jump Start And Reverse Polarity Test**				

TEST PROCEDURE DESCRIPTION

This test specifies the procedure for testing the immunity of E/E devices to positive over-voltage and reverse polarity voltage on the power inputs of the device.

The continuous supply source shall have an internal resistance less than 0.01 OHMDC. The output voltage shall not deviate more than 1 V from 0 to maximum load (including inrush current) and shall recover 63 % of its maximum excursion within 100 us. The super-imposed ripple voltage shall not exceed 0.2 V peak-to-peak and have a minimum frequency of 400 Hz.

Test voltages: +26 +/- 0.5 V for 1 minute and -13.5 +1/-0.5 V.

No damage to the system or DUT is allowed. A blown fuse shall be considered a deviation unless otherwise stated in the CTS. All functions needed to start the engine must be available at +26 volts, if not stated differently in the CTS.

TEST METHOD EQUIPMENT LIST

OSCILLOSCOPE, TEKTRONIX, TDS754D /2M, (S/N: B022455), Fluke 8060A Multimeter.
Kikusui PAD 35-20L Power Supply

GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

Maintain the ambient temperature at (23 ±3) °C and the relative humidity from 20 % to 40 % (20 °C and 30 % relative humidity preferred) during testing.

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

FLEXTRONICS
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213 Harry Walker Parkway South, Newmarket, Ontario, L3Y 8T3, Canada

EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
GENERAL MOTORS	GMW3172		ELECTRICAL		
TEST TITLE:	Over Voltage Test				

TEST PROCEDURE DESCRIPTION

This test evaluates possible damage to the E/E device with the application of excessive voltage. Perform a Functional/Parametric Test prior to application of each over-voltage event.

The DUT shall operate without any failure under the following conditions:

Test Voltage (V): Sweep between +16 to 18 +/- 0.2 at 1 volt per minute for devices that are over voltage protected. Test Time (min): 60 minutes.

Test Voltage (V): Provide a constant 18 volts when no over voltage protection is provided. Test Time (min): 60 minutes.

A blown fuse will be considered a deviation unless otherwise stated in the CTS.

TEST METHOD EQUIPMENT LIST

OSCILLOSCOPE, TEKTRONIX, TDS754D /2M, (S/N: B022455), Fluke 8060A Multimeter.
Polynomial Waveform Synthesizer Model 2020.
Bipolar Operational Power Supply/Amplifier.

GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

The continuous supply source shall have an internal resistance less than 0.01 OHM DC and an internal impedance for frequencies less than 400 Hz. The output voltage shall not deviate more than 1 V from 0 to maximum load (including inrush current) and shall recover 63 % of its maximum excursion within 100 s. The super-imposed ripple voltage shall not exceed 0.2 V peak-to-peak and have a minimum frequency of 400 Hz.

EMC & ELECTRICAL TEST LABORATORY TEST PROCEDURE

FLEXTRONICS
FLEX Automotive
EMC & ELECTRICAL TEST LABORATORY
213 Harry Walker Parkway South, Newmarket, Ontario, L3Y 8T3, Canada

EMC/ELECTRICAL TEST REFERENCES

EMC LAB DOC#:	AUTHOR:	RELEASE DATE:	CURRENT REVISION:	CURRENT REVISION DATE:	DOC CONTROL APPROVAL REF#:
705304	CHRISTIAN ROSU	04/04/2005	REV-B	06/14/2011	E05140
TEST FOR OEM:	OEM SPEC REF:	OEM PROCEDURE REF:	REQUIREMENT TYPE:	TEST SUBGROUP-1:	TEST SUBGROUP-2:
GENERAL MOTORS	GMW3172		ELECTRICAL		
TEST TITLE:	Power/Ground Connect Test				

TEST PROCEDURE DESCRIPTION

Determine if the device is able to suffer no damage due to incomplete power/ground connections and to determine if the part functions properly immediately after the completion of the power/ground connections. This test shall also determine if the device functions properly when subjected to power offsets of 1.0 V, ground offsets of 0.8 V between platform modules, 1.0 V between platform modules and the powertrain or as specified in the CTS. Communication devices, Class 2, and CAN (Single and Dual Wire) shall meet the requirements defined in “NAO Corporate Class 2 Functional Communications Specification” and GMW3098, “GM Local Area Network System Requirements for Serial Data Communication in GM Vehicles”, respectively.

Power/Ground Connection Test, Ground Offset Test (+/- 1 V offset relative to the DUT ground), Power Offset Test (+/- 1 V offset relative to the DUT power Vmax & Vmin).

The DUT shall suffer no damage, degradation in performance or inadvertent actuation of any function. The DUT shall pass all Functional/Parametric Tests.

TEST METHOD EQUIPMENT LIST

OSCILLOSCOPE, TEKTRONIX, TDS754D /2M, (S/N: B022455), Fluke 8060A Multimeter.
Kepco Bipolar Operational Power Supply/Amplifier BOP 20-20M
Kikusui PAD 35-20L Power Supply.

GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

TEST NOTES

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GENERAL MOTORS	GMW3172		ELECTRICAL		
TEST TITLE:	Voltage Drop Test				

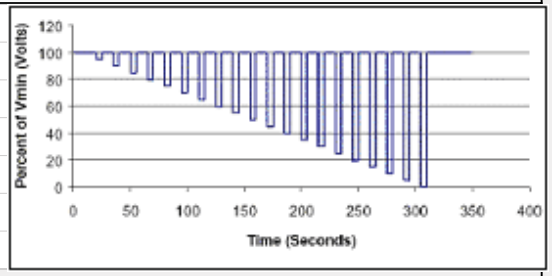
TEST PROCEDURE DESCRIPTION

Apply the test pulse to all relevant inputs and check the reset behavior of the DUT. Decrease the supply voltage by 5 % from Vmin to 0.95 Vmin. Hold this voltage for at least 10 seconds and perform a functional test. Raise the voltage to Vmin. Hold Vmin for at least 10 seconds and perform a functional test. Then decrease the voltage to 0.90 Vmin. Continue with steps of 5 % as shown in Figure 1 until the lower value has reached 0 V. Then raise the voltage to Vmin again. The DUT shall pass all Functional/Parametric Tests. The DUT shall meet the specified FSC during each and every pulse.

TEST METHOD EQUIPMENT LIST

OSCILLOSCOPE, TEKTRONIX, TDS754D /2M, (S/N: B022455), Fluke 8060A Multimeter.
ISMISO software
PFS200B2 POWER FAIL SIMULATOR, EM Test, PFS200B2, (S/N: AR-307715/MFG 0803-01)
Kikusui Power Supply 35V/20A.
Polynomial Waveform Synthesizer Model 2020.
OPERATIONAL BIPOLAR POWER SUPPLY, KEPCO, BOP-20-20M, (S/N: E143175)

GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW



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GENERAL MOTORS	GMW3172		ELECTRICAL		
TEST TITLE:	Battery Voltage Dropout Test				

TEST PROCEDURE DESCRIPTION

The purpose of this test is to determine if the E/E device is immune to decreases (engine cranking and battery rundown) and increases (battery charging) in the battery voltage. This test is intended primarily for E/E devices with a regulated power supply or a voltage regulator. The various conditions identified as “A” through “D” in the table above portray different rates of discharge and charge.

Criteria: the DUT shall suffer no damage, degradation in performance, or inadvertent actuation of any function. The DUT shall pass all Functional/Parametric Tests.

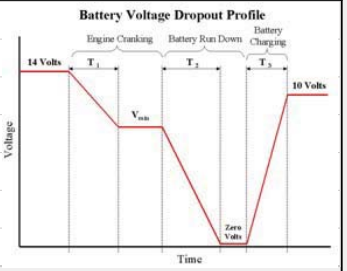
Soak the DUT un-powered until its temperature has stabilized to T-min. Power up the DUT and inject the battery voltage dropout test waveform with the following parameters from variation A. Perform a Functional Check at Vmin, between the t1 and t2 time intervals. Perform a Functional/Parametric Test after the t3 time interval at 10 volts. Repeat steps for the variations B, C, and D.

TEST METHOD EQUIPMENT LIST

OSCILLOSCOPE, TEKTRONIX, TDS754D /2M, (S/N: B022455), Fluke 8060A Multimeter.
Kikusui Power Supply 35V/20A
Polynomial Waveform Synthesizer Model 2020.
OPERATIONAL BIPOLAR POWER SUPPLY, KEPCO, BOP-20-20M, (S/N: E143175)
Thermotron S-1.2 MINI-MAX Temperature Chamber.
EM TEST SW/HW

GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

	Time (s)		
Variations	T_1	T_2	T_3
A	0.01	10	1
B	0.1	600	10
C	0.5	3600	120
D	1	28800	7200



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TEST FOR OEM:	**OEM SPEC REF:**	**OEM PROCEDURE REF:**	**REQUIREMENT TYPE:**	**TEST SUBGROUP-1:**	**TEST SUBGROUP-2:**
GENERAL MOTORS	GMW3172	ISO1670-2	ELECTRICAL		
TEST TITLE:	Superimposed Alternating Voltage Test				

TEST PROCEDURE DESCRIPTION

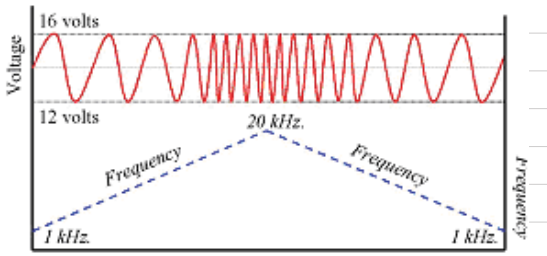
The purpose of this test is to verify the performance of the E/E device when the supply voltage is super-imposed with a sinusoidal alternating voltage. This simulates the output of a poorly damped alternator over a full range of engine RPMS.

Criteria: the DUT shall suffer no damage or degradation in performance. The DUT shall pass all Functional/Parametric Tests.

TEST METHOD EQUIPMENT LIST

OSCILLOSCOPE, TEKTRONIX, TDS754D /2M, (S/N: B022455), Fluke 8060A Multimeter.
Temperature Chamber, THERMOTRON S-1.2 MINI-MAX
Amplifier Research / TEGAM / EM Test Model 2714A, Transient Generator
ISMISO software

GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW



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GENERAL MOTORS	GMW3172		ELECTRICAL		
TEST TITLE:	Short Circuit Endurance Tests				

TEST PROCEDURE DESCRIPTION

To determine if the E/E device is able to meet specified requirements when subjected to both intermittent and continuous short circuit conditions. This test is only required for outputs that are specified to be short circuit protected by the means of electronic current limiting.

Perform Operating Type test shall be performed on one of each type of short circuit protected outputs per DUT, Test for Intermittent Short Circuit, and Test for Continuous Short Circuit.

Criteria: confirm the correct operation of the outputs with normal loads. The DUT shall suffer no permanent damage or degradation (i.e., no burnt, damaged or failed circuit board traces, connections, components or materials). The external short circuit fault shall not prevent any other interface from meeting requirements. It is also required that the tested outputs be included in parametric measurements. These measurements shall be capable of detecting potential output degradation such as unacceptable current draw and voltage drop changes.

TEST METHOD EQUIPMENT LIST

OSCILLOSCOPE, TEKTRONIX, TDS754D /2M, (S/N: B022455), Fluke 8060A Multimeter.
HP 6011A DC Power Supply 0-20 V/ 0-120A/1000W
Kikusui Electronic Load PLZ 1002W
Temperature Chamber, THERMOTRON S-1.2 MINI-MAX

GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

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GENERAL MOTORS	GMW3172		ELECTRICAL		
TEST TITLE:	Load Circuit Over-Current Test				

TEST PROCEDURE DESCRIPTION

The purpose of this test is to determine if the DUT is able to meet specified requirements when subjected to maximum current allowable by the protection fuse.

Load Circuit Over Current Procedure For Bused Electrical Centers.

Criteria: the DUT shall suffer no permanent damage or degradation (i.e., no burnt, damaged or failed circuit board traces, connections, components or materials). It is also required that the tested outputs be included in parametric measurements. These measurements shall be capable of detecting potential output degradation such as unacceptable current draw and voltage drop changes. These measurements shall be made and compared to the same output types not tested under this Procedure.

TEST METHOD EQUIPMENT LIST

OSCILLOSCOPE, TEKTRONIX, TDS754D /2M, (S/N: B022455), Fluke 8060A Multimeter.
Temperature Chamber, THERMOTRON S-1.2 MINI-MAX
HP 6011A DC Power Supply 0-20 V/ 0-120A/1000W
Kikusui Electronic Load PLZ 1002W

GRYPHON, HW/SW & CAN fiber-optic support
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GENERAL MOTORS	GMW3172		ELECTRICAL		
TEST TITLE:	Short-To-Battery Test				

TEST PROCEDURE DESCRIPTION

Verify immunity of the E/E device to short-to-battery voltage. This test shall be performed on all DUT inputs and outputs except those specific inputs and outputs previously tested in the short circuit endurance test or the load circuit over-current test. The testing shall include all untested inputs and outputs of the same circuit type. DUT battery and ground feeds shall not be tested. All outputs shall be in their active state when tested. Apply (14.0 +/- 0.1) V for 2 min, to all inputs and outputs unless specified otherwise in the CTS. Perform a Functional/Parametric Test.

Criteria: the DUT shall return to normal operation as specified in the CTS after the short circuit condition is removed. The short to battery fault shall not prevent any other interface from meeting its requirements. The DUT shall pass all Functional/Parametric Tests.

TEST METHOD EQUIPMENT LIST

OSCILLOSCOPE, TEKTRONIX, TDS754D /2M, (S/N: B022455), Fluke 8060A Multimeter.
HP 6011A DC Power Supply 0-20 V/ 0-120A/1000W
Kikusui Electronic Load PLZ 1002W

GRYPHON, HW/SW & CAN fiber-optic support
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GENERAL MOTORS	GMW3172		ELECTRICAL		
TEST TITLE:	Short-To-Ground Test				

TEST PROCEDURE DESCRIPTION

Verify immunity of the E/E device to a short-to-ground condition. This test shall be performed on all DUT inputs and outputs except those specific inputs and outputs previously tested in the short circuit endurance test or the load circuit over-current test. The testing shall include all untested inputs and outputs of the same circuit type. DUT battery and ground feeds shall not be tested. All outputs shall be in their active state when tested.

Apply ground for 2 min, unless requirements in the CTS specify otherwise, to all inputs and outputs. Perform a Functional/Parametric Test.

Criteria: the DUT shall return to normal operation as specified in the CTS after the short circuit condition is removed. The short to ground fault shall not prevent any other interface from meeting its requirements. The DUT shall pass the Functional/Parametric Test.

TEST METHOD EQUIPMENT LIST

OSCILLOSCOPE, TEKTRONIX, TDS754D /2M, (S/N: B022455), Fluke 8060A Multimeter.
HP 6011A DC Power Supply 0-20 V/ 0-120A/1000W
Kikusui Electronic Load PLZ 1002W

GRYPHON, HW/SW & CAN fiber-optic support
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GENERAL MOTORS	GMW3172		ELECTRICAL		
TEST TITLE:	Open Circuit Test				

TEST PROCEDURE DESCRIPTION

This test shall be performed on all DUT inputs and outputs. DUT battery and ground feeds shall not be tested. All outputs shall be in their active state when tested.

Apply an open circuit for 2 min, unless CTS requirements specify otherwise, to each input and output. Reconnect the circuit. Perform a Functional/Parametric Test.

Criteria: the DUT shall return to normal operation as specified in the CTS after the open circuit condition is removed. The open circuit fault shall not prevent any other interface from meeting its requirements. The DUT shall pass the Functional/Parametric Test.

TEST METHOD EQUIPMENT LIST

OSCILLOSCOPE, TEKTRONIX, TDS754D /2M, (S/N: B022455), Fluke 8060A Multimeter.
Kikusui PAD 35-20L Power Supply

GRYPHON, HW/SW & CAN fiber-optic support
Netway SW/HW CAN support, SDD16 SW/HW

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GENERAL MOTORS	GMW3172		ELECTRICAL		
TEST TITLE:	Isolation Evaluation (Optional)				

TEST PROCEDURE DESCRIPTION

The loss of insulation quality due to reduced spacing of traces or the degradation of dielectric material can create performance problems. This test quantifies the resistance between critical elements after the degrading effects of moisture. Higher voltage circuits near low voltage circuits are of most importance, however, this test applies to the entire DUT. EXAMPLE: This would apply to a 5 volt circuit adjacent to a 30 or higher volt circuit. This test also applies to a device that drives power to an external VF display. This test does not apply to the simple intermixing of 12 volt and 5 volt circuits. This test shall be performed after each humid heat test. All drying activities are intended to prevent surface moisture and are not intended to dehydrate the base dielectric material.

Criteria: measure the current flow with 500 volts applied and calculate the resistance. The isolation resistance shall be > 1 Million OHM.

Special Note: The resistance value is the criteria of interest. Less voltage (<100) can be used with electronic devices to prevent damage to susceptible components such as capacitors.

TEST METHOD EQUIPMENT LIST

OSCILLOSCOPE, TEKTRONIX, TDS754D /2M, (S/N: B022455), Fluke 8060A Multimeter.	GRYPHON, HW/SW & CAN fiber-optic support Netway SW/HW CAN support, SDD16 SW/HW

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GENERAL MOTORS	GMW3172		ELECTRICAL		
TEST TITLE:	Puncture Strength (Optional)				

TEST PROCEDURE DESCRIPTION

Quantify the possibility of breakdown of insulation in applications involving high voltages. This test applies to circuits that exceed 100 volts and is not applicable to lesser voltage circuits. The use of 500 volts in this test is used to determine the insulation design margin.

Criteria: there shall be no puncture or arcing through the insulator.

TEST METHOD EQUIPMENT LIST

OSCILLOSCOPE, TEKTRONIX, TDS754D /2M, (S/N: B022455), Fluke 8060A Multimeter.	GRYPHON, HW/SW & CAN fiber-optic support Netway SW/HW CAN support, SDD16 SW/HW

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