



## 3110 Standards Waveform Generator

The AE Techron 3110 Standards Waveform Generator offers a comprehensive library of test waveforms and routines for Automotive and Aviation EMC testing. The list below shows the tests available in the 3110 Standards Library (V1.3.0).

### Automotive Tests

<u>ANSI ASAE EP455 (Feb03)</u>		
	5.1.1	Operating Temperature
	5.1.2	Storage Temperature
	5.1.3	Thermal Shock
	5.2.1	Altitude, Operating
	5.2.2	Altitude, Storage
	5.3	Dust
	5.5	Immersion
	5.6	Wash
	5.7	Particle Impact
	5.8.1	Spray Exposure
	5.8.2	Brush Exposure
	5.8.9	Salt Exposure
	5.10.2	Over-Voltage
	5.10.3	Reverse Polarity
	5.10.4	Short Circuit Protection
	5.10.5	Memory Retention
	5.10.6	Starting Voltage
	5.10.7	Power-up Operational Requirements
	5.11.1	Accessory Noise
	5.13.1	Humidity, Exposure
	5.13.2	Humidity, Soak
	5.14	Mechanical Shock
	5.15	Mechanical Vibration
	5.17	Combined Environments
<u>Audi I-EE-32 (2006-06)</u>		
	1	Test Voltage
	2	Start Voltage Dip, 1
	2	Start Voltage Dip, 2
	2	Start Voltage Dip, 3
	2	Start Voltage Dip, 4

	2	Start Voltage Dip, 5
	6	Generator Disorders (sine wave sweep)
	11.1	Load Analysis, Single Occupancy
	11.2	Load Analysis, Full Capacity Utilization
	11.3	Load Analysis, Short Circuit Test
	11.4	Ground Potential Difference
	11.5	Overload Test
	13	Voltage Ramp per VW80101
	13	Fast Voltage Ramp
	14	Overvoltage 26V
	15	Overvoltage 17V
	17	Contact Test, Bounce 1
	17	Contact Test, Bounce 2
	17	Contact Test, Bounce 3
	18	Dips (Voltage Drops)
<b>BMW GS 95003-2 (2010-01)</b>		
	5.2.1.1	Testing for Immunity to 18V Transient
	5.2.1.3.1	Slow Decreasing and Increasing of Operating Voltage
	5.2.1.3.1	Slow Decreasing and Increasing of Operating Voltage, alternate
	5.2.1.3.2	Slow Decreasing and Fast Rise of Operating Voltage
	5.2.1.3.3	IGR, Development of Voltage
	5.2.1.5	Cranking Profile, Level I
	5.2.1.5	Cranking Profile, Level Ip
	5.2.1.5	Cranking Profile, Level II
	5.2.1.5	Cranking Profile, Level Iip
	5.2.1.5	Cranking Profile, Level III
	5.2.1.6	Very Brief Voltage Dip
	5.2.1.7	Brief Voltage Dip
	5.3.3.1	Protection Against Polarity Reversal
	5.3.3.2	Protection Against Polarity Reversal for Semiconductor Power Circuit
	5.3.4	Interruption
	5.3.5.1	Testing of Inputs and Outputs without Load Circuits
<b>BMW GS 95024-2-1 (2010-01)</b>		
	4.1	E-01 Long Term Surge
	4.2	E-02 Transient Surge, Short

	4.2	E-02 Transient Surge, Endurance Test
	4.3	E-03 Transient Undervoltage
	4.4	E-04 Jump Start
	4.6	E-06 Superimposed AC Voltage
	4.7	E-07 Slow Decrease and Increase of Supply Voltage, code a
	4.7	E-07 Slow Decrease and Increase of Supply Voltage, code b
	4.7	E-07 Slow Decrease and Increase of Supply Voltage, code c
	4.7	E-07 Slow Decrease and Increase of Supply Voltage, code d
	4.8	E-08 Slow Decrease and Rapid Increase of Supply Voltage, code a
	4.8	E-08 Slow Decrease and Rapid Increase of Supply Voltage, code b
	4.8	E-08 Slow Decrease and Rapid Increase of Supply Voltage, code c
	4.8	E-08 Slow Decrease and Rapid Increase of Supply Voltage, code d
	4.9	E-09 Reset Behavior, code a, test sequence 1
	4.9	E-09 Reset Behavior, code a, test sequence 2
	4.9	E-09 Reset Behavior, code b, test sequence 1
	4.9	E-09 Reset Behavior, code b, test sequence 2
	4.9	E-09 Reset Behavior, code c, test sequence 1
	4.9	E-09 Reset Behavior, code c, test sequence 2
	4.9	E-09 Reset Behavior, code d, test sequence 1
	4.9	E-09 Reset Behavior, code d, test sequence 2
	4.10	E-10 Short Interruptions
	4.11	E-11 Start Pulse, Cold Start, Normal
	4.11	E-11 Start Pulse, Cold Start, Sharp
	4.11	E-11 Start Pulse, Warm Start, Long Test Sequence
	4.11	E-11 Start Pulse, Warm Start, Short Test Sequence
	4.12	E-12 Voltage Curve with Intelligent Generator Control
	4.13	E-13 Interrupt Pin, Loose Contact 1
	4.14	E-14 Connector Interruption
	4.17	E-17 Short Circuit of Signal Lines and Load Circuits, code a
	4.17	E-17 Short Circuit of Signal Lines and Load Circuits, code b
	4.17	E-17 Short Circuit of Signal Lines and Load Circuits, code c
	4.17	E-17 Short Circuit of Signal Lines and Load Circuits, code d
	4.19	E-19 Quiescent Current
	4.21	E-21 Reverse Power

BMW GS 95024-2-2 (2011-01)		
	8.1	E-01 Long Term Surge
	8.2	E-02 Transient Surge, Short Test
	8.2	E-02 Transient Surge, Endurance Test
	8.3	E-03 Transient Undervoltage
	8.4	E-04 Jump Start
	8.6	E-06 Superimposed AC Voltage
	8.7	E-07 Slow Decrease and Increase of Supply Voltage, code a
	8.7	E-07 Slow Decrease and Increase of Supply Voltage, code b
	8.7	E-07 Slow Decrease and Increase of Supply Voltage, code c
	8.7	E-07 Slow Decrease and Increase of Supply Voltage, code d
	8.8	E-08 Slow Decrease and Rapid Increase of Supply Voltage, code a
	8.8	E-08 Slow Decrease and Rapid Increase of Supply Voltage, code b
	8.8	E-08 Slow Decrease and Rapid Increase of Supply Voltage, code c
	8.8	E-08 Slow Decrease and Rapid Increase of Supply Voltage, code d
	8.9	E-09 Reset Behavior, code a, test sequence 1
	8.9	E-09 Reset Behavior, code a, test sequence 2
	8.9	E-09 Reset Behavior, code b, test sequence 1
	8.9	E-09 Reset Behavior, code b, test sequence 2
	8.9	E-09 Reset Behavior, code c, test sequence 1
	8.9	E-09 Reset Behavior, code c, test sequence 2
	8.9	E-09 Reset Behavior, code d, test sequence 1
	8.9	E-09 Reset Behavior, code d, test sequence 2
	8.10	E-10 Short Interruptions
	8.11	E-11 Start Pulse, Cold Start, Normal
	8.11	E-11 Start Pulse, Cold Start, Sharp
	8.11	E-11 Start Pulse, Warm Start, Long Test Sequence
	8.11	E-11 Start Pulse, Warm Start, Short Test Sequence
	8.12	E-12 Voltage Curve with Intelligent Generator Control
	8.13	E-13 Interrupt Pin, Loose Contact 1
	8.14	E-14 Connector Interruption
	8.17	E-17 Short Circuit of Signal Lines and Load Circuits, code a
	8.17	E-17 Short Circuit of Signal Lines and Load Circuits, code b
	8.17	E-17 Short Circuit of Signal Lines and Load Circuits, code c
	8.17	E-17 Short Circuit of Signal Lines and Load Circuits, code d

	8.19	E-19 Quiescent Current
	8.21	E-21 Reverse Power
	9.1	E-40 Very Brief Voltage Drop
	9.3.2	E-42b Low-Resistance Voltage Impulse on Charge Wire
<b>Case New Holland ENS0310 (12-2-2010)</b>		
	9.1.1	High Temperature Soak Tests, 12 VDC
	9.1.1	High Temperature Soak Tests, 24 VDC
	9.1.2	Low Temperature Soak Tests, 12 VDC
	9.1.2	Low Temperature Soak Tests, 24 VDC
	9.1.4	Temperature Shock Tests, 12 VDC
	9.1.4	Temperature Shock Tests, 24 VDC
	9.2.1	Shock Tests, 12 VDC
	9.2.1	Shock Tests, 24 VDC
	9.2.2	Vibration Tests, 12 VDC
	9.2.2	Vibration Tests, 24 VDC
	9.3.1	Altitude Tests, 12 VDC
	9.3.1	Altitude Tests, 24 VDC
	9.3.2	Dust Ingress Test, 12 VDC
	9.3.2	Dust Ingress Test, 24 VDC
	9.3.3	Water Ingress Test, 12 VDC
	9.3.3	Water Ingress Test, 24 VDC
	9.3.3.6	Water Ingress Test, Rain/Shine, 12VDC
	9.3.3.6	Water Ingress Test, Rain/Shine, 24VDC
	9.4.1	Humidity Test, 12 VDC
	9.4.1	Humidity Test, 24 VDC
	9.4.2	Salt Spray Test, 12 VDC
	9.4.2	Salt Spray Test, 24 VDC
	9.4.3	Chemical Resistance Test, 12 VDC
	9.4.3	Chemical Resistance Test, 24 VDC
	9.6.5	Electrical Steady State Tests, Over-Voltage, 12 VDC
	9.6.5	Electrical Steady State Tests, Over-Voltage, 24 VDC
	9.6.6	Electrical Steady State Tests, Reverse Polarity, 12 VDC
	9.6.6	Electrical Steady State Tests, Reverse Polarity, 24 VDC
	9.6.7	Electrical Steady State Tests, Short Circuit to Ground, 12 VDC
	9.6.7	Electrical Steady State Tests, Short Circuit to Ground, 24 VDC

	9.6.8	Electrical Steady State Tests, Short Circuit to Supply, 12 VDC
	9.6.8	Electrical Steady State Tests, Short Circuit to Supply, 24 VDC
	9.6.9	Electrical Steady State Tests, Short Circuit to Ground - Key On, 12 VDC
	9.6.9	Electrical Steady State Tests, Short Circuit to Ground - Key On, 24 VDC
	9.6.10	Electrical Steady State Tests, Short Circuit to Supply - Key On, 12 VDC
	9.6.10	Electrical Steady State Tests, Short Circuit to Supply - Key On, 24 VDC
	9.6.11	Electrical Steady State Tests, Power Up Operational Requirements, 12 VDC
	9.6.11	Electrical Steady State Tests, Power Up Operational Requirements, 24 VDC
	9.6.12	Electrical Steady State Tests, Quiescent Current Classification, 12VDC
	9.6.12	Electrical Steady State Tests, Quiescent Current Classification, 24VDC
	9.7.7	EMC Tests, Cranking Test, 12 VDC
	9.7.7	EMC Tests, Cranking Test, 24 VDC
	9.8.4	Combined Environment Tests, 12 VDC
	9.8.4	Combined Environment Tests, Crawlers, 12 VDC
	9.8.4	Combined Environment Tests, Wheeled Vehicles, 12 VDC
	9.8.5	Combined Environment Tests, Cranking Combined Environment, 12 VDC
	9.8.5	Combined Environment Tests, Cranking Combined Environment, 24 VDC
<b>Chrysler CS-11809 (2009-05-29)</b>		
	4.1.1	Supply Voltage Range, 6-16VDC
	4.1.1	Supply Voltage Range, 8-16VDC
	4.1.1	Supply Voltage Range, 9-16VDC
	4.1.2	Ignition Draw Off, 12VDC
	4.2.1	Sneak Path, 12VDC
	4.2.2	Supply Voltage Drop Out, 12VDC
	4.2.3	Supply Voltage Dips, 12VDC
	4.2.4	Engine Cranking Low Voltage, Cold Cranking, 12VDC
	4.2.6	Supply Voltage Ramp Up, 12VDC
	4.2.7	Supply Voltage Ramp Down, 6VDC
	4.2.7	Supply Voltage Ramp Down, 8VDC
	4.2.7	Supply Voltage Ramp Down, 9VDC
	4.3.1	Defective Regulation (full-fielded alternator), 12VDC
	4.3.2	Jump Start, 12VDC
	4.4.1	Immunity to Short Circuits in the Supply Voltage Input and Load Output Lines, 12VDC
	4.4.2	Immunity to Short Circuits in the I-O Signal Lines, 12VDC

	4.4.4	Ground Reference Offset, 12VDC
<b>Chrysler CS-11979 (2010-04-13)</b>		
	4.1.1	Supply Voltage Range, 4.5-16VDC
	4.1.1	Supply Voltage Range, 6-16VDC
	4.1.1	Supply Voltage Range, 8-16VDC
	4.1.1	Supply Voltage Range, 9-16VDC
	4.1.1	Supply Voltage Range, 10-16VDC
	4.1.2	Ignition Draw Off (IOD), 12VDC
	4.1.3	Supply Voltage Ripple (superimposed alternating voltage), 12VDC
	4.2.1	Sneak Path, 12VDC
	4.2.3	Power Supply Disconnection, 12VDC
	4.2.4	Reset Behavior at Voltage Drop, 12VDC, Code A
	4.2.4	Reset Behavior at Voltage Drop, 12VDC, Code B
	4.2.4	Reset Behavior at Voltage Drop, 12VDC, Code C
	4.2.4	Reset Behavior at Voltage Drop, 12VDC, Code D
	4.2.6	Engine Cranking Low Voltage, Resembling Cold Cranking, 12VDC
	4.2.7	Engine Cranking Low Voltage, Warm Cranking Start-Stop, 12VDC
	4.2.8	Slow Decrease and Increase of Supply Voltage, 12VDC, Code A
	4.2.8	Slow Decrease and Increase of Supply Voltage, 12VDC, Code B
	4.2.8	Slow Decrease and Increase of Supply Voltage, 12VDC, Code C
	4.2.8	Slow Decrease and Increase of Supply Voltage, 12VDC, Code D
	4.2.8	Slow Decrease and Increase of Supply Voltage, 12VDC, Code A, B, C, D
	4.3.1	Supply Over Voltage-Defective Regulation, 12VDC
	4.3.1	Supply Over Voltage-Jump Start, 12VDC
	4.3.2	Reverse Supply Voltage, 12VDC
	4.4.1	Immunity to Short Circuits in the Supply Voltage Input and Load Output Lines, 12VDC
	4.4.2	Immunity to Short Circuits in I-O Signal Lines, 12VDC

<b>Claas CN 05 0215 (2004-12)</b>		
	4.1.2	Slow Decrease and Increase of Supply Voltage, 12VDC
	4.1.2	Slow Decrease and Increase of Supply Voltage, 24VDC
	4.1.3	Reset Behavior on Voltage Drop, test level 1, 12VDC
	4.1.3	Reset Behavior on Voltage Drop, test level 1, 24VDC
	4.1.3	Reset Behavior on Voltage Drop, test level 1a, 12VDC

	4.1.3	Reset Behavior on Voltage Drop, test level 2, 12VDC
	4.1.3	Reset Behavior on Voltage Drop, test level 2, 24VDC
	4.1.4	Current Input, 12VDC
	4.1.4	Current Input, 24VDC
	4.1.5	Short Circuit Rating, 12VDC
	4.1.5	Short Circuit Rating, 24VDC
	4.1.6	Superimposed Alternating Voltage, 12VDC
	4.1.6	Superimposed Alternating Voltage, 24VDC
<b>Cummins 14269 (06201-028)</b>		
	4.1	Overvoltage, 12VDC
	4.1	Overvoltage, 24VDC
	4.1	Overvoltage, Low Voltage
	4.2	Reverse Voltage, 12VDC
	4.2	Reverse Voltage, 24VDC
	4.2	Reverse Voltage, Low Voltage
	4.3	Short Circuit, 12VDC
	4.3	Short Circuit, 24VDC
	4.4	Open Circuits, 12VDC
	4.4	Open Circuits, 24VDC
	4.7	Electrical Isolation
	5.3.8.2	Temperature Cycling, Heat Soak, 12VDC
	5.3.8.2	Temperature Cycling, Heat Soak, 24VDC
	5.7	Conducted Transient Immunity, Pulse 4, Cranking, 12VDC
	5.7	Conducted Transient Immunity, Pulse 4, Cranking, 24VDC
<b>Cummins 14387 (102020-119)</b>		
	5.2.1	Miswiring Protection Tests, 12VDC
	5.2.1	Miswiring Protection Tests, 24VDC
	5.2.1.1	Loss of Power Return Connection, 12VDC
	5.2.1.1	Loss of Power Return Connection, 24VDC
	5.2.1.2	Loss of Power Supply Connection, 12VDC
	5.2.1.2	Loss of Power Supply Connection, 24VDC
	5.2.1.3	Reverse Polarity, 12VDC
	5.2.1.3	Reverse Polarity, 24VDC
	5.2.1.4	Miswiring Failures, 12VDC
	5.2.1.4	Miswiring Failures, 24VDC



	5.2.2.1	Continuous Operating Voltage, 12VDC
	5.2.2.1	Continuous Operating Voltage, 24VDC
	5.2.2.2	Under -Voltage, 12VDC
	5.2.2.2	Under -Voltage, 24VDC
	5.2.2.3	Over-Voltage, 12VDC
	5.2.2.3	Over-Voltage, 24VDC
	5.2.2.4	Survival Voltage, 12VDC
	5.2.2.4	Survival Voltage, 24VDC
	5.2.2.5	Power Supply Current, 12VDC
	5.2.2.5	Power Supply Current, 24VDC
	5.3.1.1	Water Intrusion Test - Atmospheric, 12VDC
	5.3.1.1	Water Intrusion Test - Atmospheric, 24VDC
	5.3.4	Steam, 12VDC
	5.3.4	Steam, 24VDC
	5.3.7.3	Short Duration Temperature Spikes, 12VDC
	5.3.7.3	Short Duration Temperature Spikes, 24VDC
	5.3.8.1.1	Temperature Cycling (Segments 1 & 3), 12VDC
	5.3.8.1.2	Temperature Cycling (Segments 1 & 3), 12VDC
	5.3.9	Combined Environment, 12VDC
	5.3.9	Combined Environment, 24VDC
	5.3.12	Salt Fog, 12VDC
	5.3.12	Salt Fog, 24VDC
<b>DAF BSL-003 (1998-12)</b>		
	101.1	Supply Voltage Requirements
	101.2	Damage Level
	102.1	Reversing Polarity
	102.2	Open and Short Circuiting
<b>DAF BSL-006 (2009-04)</b>		
	2.1	Minimum and Maximum Voltage, 24VDC
	2.2	Jump Start
	2.3	Voltage Drain Test
	3	Minimal Currents and Switches
	4.1	Reversing Polarity
	4.2	Open and Short Circuiting

Daimler Chrysler DC-10842 (2003-12)		
	4.2	Overvoltage, 12VDC
	4.2	Overvoltage, 24VDC
	4.3.1	Failure of Alternator, 12VDC
	4.3.1	Failure of Alternator, 24VDC
	4.3.2	Series Charging of Batteries, 12VDC
	4.4	Superimposed Alternating Voltage, severity 1, 12VDC
	4.4	Superimposed Alternating Voltage, severity 1, 24VDC
	4.4	Superimposed Alternating Voltage, severity 2, 12VDC
	4.4	Superimposed Alternating Voltage, severity 2, 24VDC
	4.4	Superimposed Alternating Voltage, severity 3, 24VDC
	4.5.4	Test 3 - Starting Profile, 24VDC
	4.5.4	Test 3 - Starting Profile, Level I, 12VDC
	4.5.4	Test 3 - Starting Profile, Level II, 12VDC
	4.5.4	Test 3 - Starting Profile, Level III, 12VDC
	4.5.4	Test 3 - Starting Profile, Level IV, 12VDC
	4.6.2.1	Reversed Voltage, Case 1, 12VDC
	4.6.2.1	Reversed Voltage, Case 3, 12VDC
	4.6.2.1	Reversed Voltage, Case 4, 12VDC
	4.7	Open Circuit Test, 12VDC
	4.7	Open Circuit Test, 24VDC
	4.8	Short Circuit Test, 12VDC
	4.8	Short Circuit Test, 24VDC
	4.11	Unintentional Current Flows and Voltage Potentials, 12VDC
	4.11	Unintentional Current Flows and Voltage Potentials, 24VDC
	4.12	Supply Voltage Ramp Up Test
	4.13	Supply Voltage Ramp Down Test, code a, 12VDC
	4.13	Supply Voltage Ramp Down Test, code b, 12VDC
	4.13	Supply Voltage Ramp Down Test, code c, 12VDC
	4.13	Supply Voltage Ramp Down Test, code d, 12VDC
	4.17	Standby Mode - Sleep Mode - IOD Requirements, 12VDC
	4.17	Standby Mode - Sleep Mode - IOD Requirements, 24VDC
Daimler Chrysler PF-9326 Change D		
	3.2	Operating Voltage Range, class A
	3.2	Operating Voltage Range, class B

	3.2	Operating Voltage Range, class C
	3.2	Operating Voltage Range, class D
	3.3	Ignition Off Current Draw
	3.4	Supply Voltage Extremes, A
	3.4	Supply Voltage Extremes, B
	3.4	Supply Voltage Extremes, C
	3.5.7	Supply Voltage Ramp Down Test
	4.2	Operating Voltage Range, class A
	4.2	Operating Voltage Range, class B
	4.2	Operating Voltage Range, class C
	4.2	Operating Voltage Range, class D
<b><u>Fiat 9-90110 Issue 13 (2007-03)</u></b>		
	3.9.5.1	Reset Behavior at Voltage Drop, Class A1
	3.9.5.1	Reset Behavior at Voltage Drop, Class A2
	3.9.5.1	Reset Behavior at Voltage Drop, Class A4
	3.9.5.3	Immunity to Micro Interruptions, Ref A
	3.9.5.3	Immunity to Micro Interruptions, Ref B
	3.9.5.3	Immunity to Micro Interruptions, Ref C
<b><u>Ford CS-2009.1 (2-11-2010)</u></b>		
	CI210	Immunity From Continuous Power Line Disturbances, 12VDC
	CI210	Immunity From Continuous Power Line Disturbances, 12VDC (sweep)
	CI230	Immunity From Power Cycling, Waveform A
	CI230	Immunity From Power Cycling, Waveform B
	CI230	Immunity From Power Cycling, Waveform C
	CI230	Immunity From Power Cycling, Waveform D
<b><u>Ford FMC1278 (2-11-2010)</u></b>		
	CI210	Immunity From Continuous Power Line Disturbances, 12VDC, Level 1, 13.5V
	CI210	Immunity From Continuous Power Line Disturbances, 12VDC, Level 1, 27V
	CI210	Immunity From Continuous Power Line Disturbances, 12VDC, Level 2, 13.5V
	CI210	Immunity From Continuous Power Line Disturbances, 12VDC, Level 2, 27V
	CI230	Immunity from Power Cycling, Waveform A
	CI230	Immunity from Power Cycling, Waveform B
	CI231	Immunity from Power Cycling, 24VDC
	CI250	Immunity to Ground Voltage Offset Continuous Disturbances
	CI260	Waveform A, 13.5V, 2 msec

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	CI260	Waveform A, 13.5V, 5 msec
	CI260	Waveform A, 13.5V, 10 msec
	CI260	Waveform A, 13.5V, 30 msec
	CI260	Waveform A, 13.5V, 50 msec (by loop)
	CI260	Waveform A, 13.5V, 50 msec
	CI260	Waveform A, 13.5V, 100 usec (by loop)
	CI260	Waveform A, 13.5V, 100 usec
	CI260	Waveform A, 13.5V, 300 usec
	CI260	Waveform A, 13.5V, 500 usec
	CI260	Waveform A, 27V, 2 msec
	CI260	Waveform A, 27V, 5 msec
	CI260	Waveform A, 27V, 10 msec
	CI260	Waveform A, 27V, 30 msec
	CI260	Waveform A, 27V, 50 msec
	CI260	Waveform A, 27V, 100 usec
	CI260	Waveform A, 27V, 300 usec
	CI260	Waveform A, 27V, 500 usec
	CI260	Waveform B, 13.5V, 2 msec (by loop)
	CI260	Waveform B, 13.5V, 5 msec (by loop)
	CI260	Waveform B, 13.5V, 10 msec
	CI260	Waveform B, 13.5V, 30 msec (by loop)
	CI260	Waveform B, 13.5V, 50 msec (by loop)
	CI260	Waveform B, 13.5V, 50 msec (by loop)
	CI260	Waveform B, 13.5V, 100 usec (by loop)
	CI260	Waveform B, 13.5V, 100 usec (by loop)
	CI260	Waveform B, 13.5V, 300 usec (by loop)
	CI260	Waveform B, 13.5V, 500 usec (by loop)
	CI260	Waveform B, 27V, 2 msec
	CI260	Waveform B, 27V, 5 msec
	CI260	Waveform B, 27V, 10 msec
	CI260	Waveform B, 27V, 30 msec
	CI260	Waveform B, 27V, 50 msec
	CI260	Waveform B, 27V, 100 usec
	CI260	Waveform B, 27V, 300 usec
	CI260	Waveform B, 27V, 500 usec

	CI260	Waveform C, 13.5V, 100 usec
	CI260	Waveform C, 13.5V, 300 usec
	CI260	Waveform C, 13.5V, 500 usec
	CI260	Waveform C, 27V, 100 usec
	CI260	Waveform C, 27V, 300 usec
	CI260	Waveform C, 27V, 500 usec
	CI260	Waveform D, 13.5V, 2 msec (by loop)
	CI260	Waveform D, 13.5V, 5 msec (by loop)
	CI260	Waveform D, 13.5V, 10 msec (by loop)
	CI260	Waveform D, 13.5V, 30 msec (by loop)
	CI260	Waveform D, 13.5V, 50 msec (by loop)
	CI260	Waveform D, 13.5V, 100 usec (by loop)
	CI260	Waveform D, 13.5V, 300 usec (by loop)
	CI260	Waveform D, 13.5V, 500 usec (by loop)
	CI260	Waveform D, 27V, 2 msec (by loop)
	CI260	Waveform D, 27V, 5 msec (by loop)
	CI260	Waveform D, 27V, 10 msec (by loop)
	CI260	Waveform D, 27V, 30 msec (by loop)
	CI260	Waveform D, 27V, 50 msec (by loop)
	CI260	Waveform D, 27V, 100 usec (by loop)
	CI260	Waveform D, 27V, 300 usec (by loop)
	CI260	Waveform D, 27V, 500 usec (by loop)
<b>General Motors GMW3172_H (July 2010)</b>		
	8.2.1	Jump Start
	8.2.2	Reverse Polarity
	8.2.3	Overvoltage (with overvoltage protection)
	8.2.3	Overvoltage (without overvoltage protection)
	8.2.4	State Change Waveform Characterization
	9.2.1	Parasitic Current
	9.2.2	Power Supply Interruptions, 12V, Code A
	9.2.2	Power Supply Interruptions, 12V, Code B
	9.2.2	Power Supply Interruptions, 12V, Code C & D
	9.2.2	Power Supply Interruptions, 12V, Code E
	9.2.2	Power Supply Interruptions, 12V, Code F
	9.2.3	Battery Voltage Dropout, 12VDC, Code A

	9.2.3	Battery Voltage Dropout, 12VDC, Code B
	9.2.3	Battery Voltage Dropout, 12VDC, Code C & D
	9.2.3	Battery Voltage Dropout, 12VDC, Code E
	9.2.3	Battery Voltage Dropout, 12VDC, Code F
	9.2.4	Sinusoidal Superimposed Voltage, 12VDC
	9.2.5	Pulse Superimposed Voltage, 12VDC, U(p) only
	9.2.7	Continuous Short Circuit to Battery and to Ground, 12VDC, Code A
	9.2.7	Continuous Short Circuit to Battery and to Ground, 12VDC, Code B
	9.2.7	Continuous Short Circuit to Battery and to Ground, 12VDC, Code C
	9.2.7	Continuous Short Circuit to Battery and to Ground, 12VDC, Code D
	9.2.7	Continuous Short Circuit to Battery and to Ground, 12VDC, Code E
	9.2.7	Continuous Short Circuit to Battery and to Ground, 12VDC, Code F
	9.2.8	Ground Interconnect Short to Battery, 12VDC, Code A, B, C, E, F
	9.2.8	Ground Interconnect Short to Battery, 12VDC, Code D
	9.2.17	Crank Pulse Capability and Durability, Severity I, Functional, 12VDC
	9.2.17	Crank Pulse Capability and Durability, Severity I, Durability, 12VDC
	9.2.17	Crank Pulse Capability and Durability, Severity II, Ua=2.5V, Functional, 12VDC
	9.2.17	Crank Pulse Capability and Durability, Severity II, Ua=2.5V, Durability, 12VDC
	9.2.17	Crank Pulse Capability and Durability, Severity II, Ua=3V, Functional, 12VDC
	9.2.17	Crank Pulse Capability and Durability, Severity II, Ua=3V, Durability, 12VDC
	9.2.17	Crank Pulse Capability and Durability, Severity III, Ua=2.5V, Functional, 12VDC
	9.2.17	Crank Pulse Capability and Durability, Severity III, Ua=2.5V, Durability, 12VDC
	9.2.17	Crank Pulse Capability and Durability, Severity III, Ua=3V, Functional, 12VDC
	9.2.17	Crank Pulse Capability and Durability, Severity III, Ua=3V, Durability, 12VDC
	9.2.17	Crank Pulse Capability and Durability, Severity III, Ua=4V, Functional, 12VDC
	9.2.17	Crank Pulse Capability and Durability, Severity III, Ua=4V, Durability, 12VDC
	9.2.17	Crank Pulse Capability and Durability, Severity IV, Ua=2.5V, Functional, 12VDC
	9.2.17	Crank Pulse Capability and Durability, Severity IV, Ua=2.5V, Durability, 12VDC
	9.2.17	Crank Pulse Capability and Durability, Severity IV, Ua=3V, Functional, 12VDC
	9.2.17	Crank Pulse Capability and Durability, Severity IV, Ua=3V, Durability, 12VDC
	9.2.17	Crank Pulse Capability and Durability, Severity IV, Ua=4V, Functional, 12VDC
	9.2.17	Crank Pulse Capability and Durability, Severity IV, Ua=4V, Durability, 12VDC
	9.2.17	Crank Pulse Capability and Durability, Severity IV, Ua=5V, Functional, 12VDC
	9.2.17	Crank Pulse Capability and Durability, Severity IV, Ua=5V, Durability, 12VDC
	9.2.17	Crank Pulse Capability and Durability, Waveform 1, Functional, 12VDC

	9.2.17	Crank Pulse Capability and Durability, Waveform 1, Durability, 12VDC
	9.2.17	Crank Pulse Capability and Durability, Waveform 2, Functional, 12VDC
	9.2.17	Crank Pulse Capability and Durability, Waveform 2, Durability, 12VDC
	9.2.17	Crank Pulse Capability and Durability, Waveform 3, Functional, 12VDC
	9.2.17	Crank Pulse Capability and Durability, Waveform 3, Durability, 12VDC
	9.2.17	Crank Pulse Capability and Durability, Waveform 4, Functional, 12VDC
	9.2.17	Crank Pulse Capability and Durability, Waveform 4, Durability, 12VDC
	9.2.17	Crank Pulse Capability and Durability, Waveform 5, Functional, 12VDC
	9.2.17	Crank Pulse Capability and Durability, Waveform 5, Durability, 12VDC
	9.2.17	Crank Pulse Capability and Durability, Waveform 6, Functional, 12VDC
	9.2.17	Crank Pulse Capability and Durability, Waveform 6, Durability, 12VDC
	9.3.1	Vibration with Thermal Cycling, 12VDC
	9.3.2	Post Thermal Fatigue Vibration, 12VDC
	9.3.3	Mechanical Shock - Pothole, 12VDC
	9.3.5	Mechanical Shock - Closure Slam, 12VDC
	9.3.9	Connector Installation Abuse - Side Force, 12VDC
	9.3.10	Connector Installation Abuse - Foot Load, 12VDC
	9.4.1	High Temperature Degradation, 12VDC
	9.4.3	Power Temperature Cycle, 12VDC
	9.4.5	Humid Heat Cyclic, 12VDC
	9.4.6	Humid Heat Constant, 12VDC
	9.4.8	Salt Spray, IP Water Code 3 or 6K, wet side of door interior, 12VDC
	9.4.8	Salt Spray, IP Water Code 6K or 8 or 9K, non-interior component without direct exposure to salt spray, 12VDC
	9.4.8	Salt Spray, IP Water Code 6K or 8 or 9K, non-interior component with direct exposure to salt spray, 12VDC
	9.5.3	Seal, 12VDC
	9.5.4	Water Freeze, 12VDC
	9.5.5	Sugar Water Function Impairment, 12VDC

## Honda 7794Z-SAAA-000 (28.12.2004)

	2	Temperature Characteristic Test
	3	Test at Starting Voltage, Chattering Waveform Application A, 13.5VDC
	3	Test at Starting Voltage, Chattering Waveform Application B, 13.5VDC
	3	Test at Starting Voltage, Chattering Waveform Application C, 13.5VDC
	3	Test at Starting Voltage, Gradual Increase Voltage Application, 8VDC
	3	Test at Starting Voltage, Gradual Increase Voltage Application, 13.5VDC

	3	Test at Starting Voltage, Gradual Increase Voltage Application, 16VDC
	3	Test at Starting Voltage, Ignition Noise Overriding, 13.5VDC
	3	Test at Starting Voltage, Instantaneous Voltage, 8VDC
	3	Test at Starting Voltage, Instantaneous Voltage, 13.5VDC
	3	Test at Starting Voltage, Instantaneous Voltage, 16VDC
	3	Test at Starting Voltage, Sine Wave Application A, 13.5VDC
	3	Test at Starting Voltage, Sine Wave Application B, 13.5VDC
	3	Test at Starting Voltage, Sine Wave Application C, 13.5VDC
	3	Test at Starting Voltage, Sine Wave Application D, 13.5VDC
	13	Horn Function Noise Injection Test, 13.5VDC
	15	Abnormal Power Supply Voltage, Excess Voltage Injection Test (Class A), 13.5VDC
	15	Abnormal Power Supply Voltage, Excess Voltage Injection Test (Class B), 13.5VDC
	15	Abnormal Power Supply Voltage, Excess Voltage Injection Test (Class C), 13.5VDC
	15	Abnormal Power Supply Voltage, Reverse Voltage Injection Test, 13.5VDC
	18	Standard Moisture Test, 13.5VDC
	19	High Temperature Functional Endurance Test, 13.5VDC
	20	Low Temperature Functional Endurance Test, 13.5VDC
	21	Dew Condensation Test, 13.5VDC
	22	Temperature Cycle Test, 13.5VDC
	24	Complex Endurance Test, 13.5VDC
	25	Vibrating Test, 13.5VDC
	29	Intermittent Function Durability Test, Test Waveform A, 8VDC
	29	Intermittent Function Durability Test, Test Waveform B, 13.5VDC
	29	Intermittent Function Durability Test, Test Waveform C, 16VDC
	32	Temperature and Humidity Cycle, 13.5VDC
<b>Hyundai ES 39110-00 (2005-08)</b>		
	CI 210-B1	Abnormal Sinewave
	CI 230-A	Power Cycle, Run
	CI 230-B1	Power Cycle, Start
	CI 230-B2	Power Cycle, Battery via Relay
	CI 230-C	Power Cycle, Battery Direct
	CI 250-B	Groundshift, Sinewave
	CI 260-A	Power Dropout High (T=1ms)



	CI 260-A	Power Dropout High (T=3ms)
	CI 260-A	Power Dropout High (T=5ms)
	CI 260-A	Power Dropout High (T=7ms)
	CI 260-A	Power Dropout High (T=10ms)
	CI 260-A	Power Dropout High (T=12ms)
	CI 260-A	Power Dropout High (T=18ms)
	CI 260-A	Power Dropout High (T=20ms)
	CI 260-A	Power Dropout High (T=25ms)
	CI 260-A	Power Dropout High (T=50ms)
	CI 260-A	Power Dropout High (T=100us)
	CI 260-A	Power Dropout High (T=200us)
	CI 260-A	Power Dropout High (T=400us)
	CI 260-A	Power Dropout High (T=700us)
	CI 260-C	Power Dropout Single
	CI 260-D	Power Dip (Sag) (T=1ms)
	CI 260-D	Power Dip (Sag) (T=3ms)
	CI 260-D	Power Dip (Sag) (T=5ms)
	CI 260-D	Power Dip (Sag) (T=7ms)
	CI 260-D	Power Dip (Sag) (T=10ms)
	CI 260-D	Power Dip (Sag) (T=12ms)
	CI 260-D	Power Dip (Sag) (T=18ms)
	CI 260-D	Power Dip (Sag) (T=20ms)
	CI 260-D	Power Dip (Sag) (T=25ms)
	CI 260-D	Power Dip (Sag) (T=50ms)
	CI 260-D	Power Dip (Sag) (T=100us)
	CI 260-D	Power Dip (Sag) (T=200us)
	CI 260-D	Power Dip (Sag) (T=400us)
	CI 260-D	Power Dip (Sag) (T=700us)
	CI 260-E	Battery Recovery
<b>Hyundai ES 95400-10 (2007-11-14)</b>		
	3.4.2	Dark Current
	3.4.3	Reverse Polarity Test of Power
	3.4.4	Over-Voltage Test, Test 1
	3.4.4	Over-Voltage Test, Test 2
	3.4.5	Change Test of Power Voltage When Starting, Test 1

	3.4.5	Change Test of Power Voltage When Starting, Test 2
	3.4.6	Change Test of Power Voltage When Operating Electric Load, Test 1
	3.4.6	Change Test of Power Voltage When Operating Electric Load, Test 2
	3.4.6	Change Test of Power Voltage When Operating Electric Load, Test 3
	3.4.7	Power Voltage Interruption Test
	3.4.8	Short Circuit Test
	3.4.9	Intermittent Test of Power Voltage, Test 1
	3.4.9	Intermittent Test of Power Voltage, Test 2
	3.4.10	Charge and Discharge of Batteries
	3.4.11	Overvoltage, Test 1
	3.4.11	Overvoltage, Test 2
	3.5.1	High-Temperature Exposure Operation Test
	3.5.2	Low-Temperature Exposure Operation Test
	3.5.3	85-85 High Temperature & High Humidity Test on Bias
	3.5.4	Temperature and Humidity Cycle Test
	3.5.5	Temperature Cycle Test
	3.5.6	Dew Condensation Test
	3.5.9-2	Dust Operation Test
	3.5.12	Water Resistance Test
	3.5.13-1	Salt Water Spray Test
	3.5.13-2	Salt Water Spray Test
	3.6.2-1	Vibration Endurance Test
	3.6.3-2	Complex Environment Endurance Test
	3.8.2	Operation Test, High Limit
	3.8.2	Operation Test, Low Limit

## Hyundai ES 96100-02 (2006-11-16)

	4.5.1	Operating Voltage
	4.5.3	Power Reverse Polarity Test
	4.5.4	Over-Voltage, Test 1
	4.5.4	Over-Voltage, Test 2
	4.5.5	Power Voltage Fluctuation When Starting Up Engine, Test 1
	4.5.5	Power Voltage Fluctuation When Starting Up Engine, Test 2
	4.5.6	Power Voltage Fluctuation Test on Electric Load Operation
	4.5.7	Power Voltage Interruption Test
	4.5.8	Short Circuit Test

	4.5.9	Power Voltage Intermittent, Test 1
	4.5.9	Power Voltage Intermittent, Test 2
	4.5.10	Battery Charging-Discharging, Test 1
	4.5.10	Battery Charging-Discharging, Test 2
	4.5.11	AC Wave Inflow Test
	4.6.3	High Temperature Operation Test
	4.6.4	Low Temperature Operation Test
	4.6.6	Temperature-Humidity Cycle Test
	4.6.9	Dew Condensation Test
	4.8.2	Endurance Test at Normal Temperature
<b>ISO 7637-2 (2004) (E)</b>		
	5.6.4	Transient Immunity, Test Pulse 4, 12VDC
	5.6.4	Transient Immunity, Test Pulse 4, 24VDC
<b>ISO 7637-2 (2011) (E)</b>		
	5.6.4	Transient Immunity, Test Pulse 2b, 12VDC
	5.6.4	Transient Immunity, Test Pulse 2b, 24VDC
<b>ISO 16750-2 (2012-11) (E)</b>		
	4.2	Direct Current Supply Voltage, 12VDC, Code A
	4.2	Direct Current Supply Voltage, 12VDC, Code B
	4.2	Direct Current Supply Voltage, 12VDC, Code C
	4.2	Direct Current Supply Voltage, 12VDC, Code D
	4.2	Direct Current Supply Voltage, 12VDC, Code E
	4.2	Direct Current Supply Voltage, 12VDC, Code F
	4.2	Direct Current Supply Voltage, 12VDC, Code G
	4.2	Direct Current Supply Voltage, 12VDC, Code H
	4.3.1.1	Overvoltage, Hot, 12VDC
	4.3.1.2	Overvoltage, Room Temperature, 12VDC
	4.3.2.2	Overvoltage, Hot, 24VDC
	4.4	Superimposed Alternating Current, 12VDC, Severity 1
	4.4	Superimposed Alternating Current, 12VDC, Severity 2
	4.4	Superimposed Alternating Current, 12VDC, Severity 4
	4.4	Superimposed Alternating Current, 24VDC, Severity 1
	4.4	Superimposed Alternating Current, 24VDC, Severity 2
	4.4	Superimposed Alternating Current, 24VDC, Severity 3
	4.5	Slow Decrease and Increase of Supply Voltage, 12VDC, Code A

	4.5	Slow Decrease and Increase of Supply Voltage, 12VDC, Code B
	4.5	Slow Decrease and Increase of Supply Voltage, 12VDC, Code C
	4.5	Slow Decrease and Increase of Supply Voltage, 12VDC, Code D
	4.5	Slow Decrease and Increase of Supply Voltage, 24VDC, Code E
	4.5	Slow Decrease and Increase of Supply Voltage, 24VDC, Code F
	4.5	Slow Decrease and Increase of Supply Voltage, 24VDC, Code G
	4.5	Slow Decrease and Increase of Supply Voltage, 24VDC, Code H
	4.6.1	Momentary Drop in Supply Voltage, 12VDC, Code A
	4.6.1	Momentary Drop in Supply Voltage, 12VDC, Code B
	4.6.1	Momentary Drop in Supply Voltage, 12VDC, Code C
	4.6.1	Momentary Drop in Supply Voltage, 12VDC, Code D
	4.6.1	Momentary Drop in Supply Voltage, 24VDC, Code E
	4.6.1	Momentary Drop in Supply Voltage, 24VDC, Code F
	4.6.1	Momentary Drop in Supply Voltage, 24VDC, Code G
	4.6.1	Momentary Drop in Supply Voltage, 24VDC, Code H
	4.6.3	Starting Profile, 12VDC, Level I
	4.6.3	Starting Profile, 12VDC, Level II
	4.6.3	Starting Profile, 12VDC, Level III
	4.6.3	Starting Profile, 12VDC, Level IV
	4.6.3	Starting Profile, 24VDC, Level I
	4.6.3	Starting Profile, 24VDC, Level II
	4.6.3	Starting Profile, 24VDC, Level III
	4.7.2.2	Reversed Voltage, 12VDC, Case 1
	4.7.2.3	Reversed Voltage, 12VDC, Case 2
	4.7.2.3	Reversed Voltage, 24VDC, Case 2
	4.8.2	Ground Reference and Supply Offset, 12VDC
	4.8.2	Ground Reference and Supply Offset, 24VDC
	4.9.1	Open Circuit Test, 12VDC
	4.9.1	Open Circuit Test, 24VDC
	4.10	Short Circuit Protection, 12VDC
	4.10	Short Circuit Protection, 24VDC
	4.11	Withstand Voltage, 12VDC
	4.11	Withstand Voltage, 24VDC
<b>JASO D 001-94 (1994-03-31)</b>		
	5.1	Normal Power Supply Voltage Test, 12VDC

	5.1	Normal Power Supply Voltage Test, 24VDC
	5.2	Test for Power Supply Voltage upon Engine Starting, Method 1, Class 1, 12VDC
	5.2	Test for Power Supply Voltage upon Engine Starting, Method 1, Class 2, 12VDC
	5.2	Test for Power Supply Voltage upon Engine Starting, Method 1, 24VDC
	5.2	Test for Power Supply Voltage upon Engine Starting, Method 2, Class 1, 12VDC
	5.2	Test for Power Supply Voltage upon Engine Starting, Method 2, Class 2, 12VDC
	5.2	Test for Power Supply Voltage upon Engine Starting, Method 2, 24VDC
	5.3	Power Source Micro Interruption Test, 12VDC
	5.3	Power Source Micro Interruption Test, 24VDC
	5.4	Power Supply Inverse Polarity Connection Test, 12VDC
	5.4	Power Supply Inverse Polarity Connection Test, 24VDC
	5.5	Overvoltage Test ( A Method), 12VDC
	5.5	Overvoltage Test ( A Method), 24VDC
	5.5	Overvoltage Test ( B Method), 12VDC
	5.5	Overvoltage Test ( B Method), 24VDC
	5.11	Temperature Characteristic Test, 12VDC
	5.11	Temperature Characteristic Test, 24VDC
	5.13	Low Temperature Operation Test, 12VDC
	5.13	Low Temperature Operation Test, 24VDC
	5.15	High Temperature Operation Test, 12VDC
	5.15	High Temperature Operation Test, 24VDC
	5.16	Heat Cycle Test, 12VDC
	5.16	Heat Cycle Test, 24VDC
	5.18	Temperature and Humidity Cycle Test, 12VDC
	5.18	Temperature and Humidity Cycle Test, 24VDC
	5.19	Constant High Humidity Test, 12VDC
	5.19	Constant High Humidity Test, 24VDC
<b>Mazda MES PW67600 (1995-07)</b>		
	7.2.1	Low Temperature Exposure, 12 VDC
	7.2.1	Low Temperature Exposure, 24 VDC
	7.2.2	Low Temperature Operation, 12VDC
	7.2.2	Low Temperature Operation, 24 VDC
	7.2.3	High Temperature Exposure, 12VDC

	7.2.3	High Temperature Exposure, 24 VDC
	7.2.4	High Temperature Operation, 12VDC
	7.2.4	High Temperature Operation, 24 VDC
	7.2.5	Thermal Cycle, 12VDC
	7.2.5	Thermal Cycle, 24 VDC
	7.2.6	Thermal Shock Resistance, 12VDC
	7.2.6	Thermal Shock Resistance, 24 VDC
	7.2.8	Humidity-Temperature Cycle, 12VDC
	7.2.8	Humidity-Temperature Cycle, 24 VDC
	7.2.9	Water/Fluids Ingress, 12VDC
	7.2.9	Water/Fluids Ingress, 24 VDC
	7.2.10	Dust, 12VDC
	7.2.10	Dust, 24 VDC
	7.3.1	Vibration, 12VDC
	7.3.1	Vibration, 24 VDC
	7.3.3	Mechanical Shock, 12VDC
	7.3.3	Mechanical Shock, 24 VDC
	7.3.4	Connector & Lead/Lock Strength, 12VDC
	7.3.4	Connector & Lead/Lock Strength, 24 VDC
	7.4	Chemical Environment , 12VDC
	7.4	Chemical Environment, 24VDC
	7.5	Endurance, 12VDC
	7.5	Endurance, 24 VDC
	7.7.1	Power Line Ripple Noise, C101-1a, 12VDC
	7.7.1	Power Line Ripple Noise, C101-1a, 24VDC
	7.7.1	Power Line Ripple Noise, C101-1b, 12VDC
	7.7.1	Power Line Ripple Noise, C101-1b, 24VDC
	7.7.1	Power Line Ripple Noise, C101-1c, 12VDC
	7.7.1	Power Line Ripple Noise, C101-1c, 24VDC
	7.7.1	Power Line Ripple Noise, C101-2a, 12VDC
	7.7.1	Power Line Ripple Noise, C101-2a, 24VDC
	7.7.1	Power Line Ripple Noise, C101-2b, 12VDC
	7.7.1	Power Line Ripple Noise, C101-2b, 24VDC
	7.7.2.1	Inductive Switching, C102-1a, 12VDC
	7.7.2.1	Inductive Switching, C102-1a, 24VDC

	7.7.2.1	Inductive Switching, C102-1b, 12VDC
	7.7.2.1	Inductive Switching, C102-1b, 24VDC
	7.7.2.1	Inductive Switching, C102-1c, 12VDC
	7.7.2.1	Inductive Switching, C102-1c, 24VDC
	7.7.6	Stress, C103-1 Reverse Battery, 12VDC
	7.7.6	Stress, C103-1 Reverse Battery, 24VDC
	7.7.6	Stress, C103-2 Overvoltage, 12VDC
	7.7.6	Stress, C103-2 Overvoltage, 24VDC
	7.7.6	Stress, C103-3 Jump Start, 12VDC
	7.7.6	Stress, C103-3 Jump Start, 24VDC
	7.7.6	Stress, C103-4 Offset Supply Voltage, 12VDC
	7.7.6	Stress, C103-4 Offset Supply Voltage, 24VDC
	7.7.8	Stress, Ignition Spark Arc over, 12VDC
	7.7.8	Stress, Ignition Spark Arc over, 24VDC

## Mitsubishi ES-X82010 Rev Q (2007-01)

	4.1	Normal Power Supply Voltage Test, 12VDC
	4.2.1	Voltage Fluctuation Under Electric Load (Waveform 1-1), 12VDC
	4.2.1	Voltage Fluctuation Under Electric Load (Waveform 1-2), 12VDC
	4.2.1	Voltage Fluctuation Under Electric Load (Waveform 1-2), 14VDC
	4.2.1	Voltage Fluctuation Under Electric Load (Waveform 1-3), 12VDC
	4.2.2	Voltage Fluctuation upon Engine Starting, Waveform 2-1, 12VDC
	4.2.2	Voltage Fluctuation upon Engine Starting, Waveform 2-2, 12VDC
	4.2.3	Keeping Memory Contents (clocks and displays), 12VDC
	4.3.1	Battery Power Supply Chattering Test (Waveform 3-1), 12VDC
	4.4	Supply Voltage Reverse Connection Test, 12VDC
	4.6	Supply Voltage Instantaneous Interruption, 12 VDC
	4.7.4	Transient Voltage Impression Test, 12VDC

## Mitsubishi ES-X82115 Rev C (2009-03)

	6.1	Supply Voltage Range, Group A
	6.1	Supply Voltage Range, Group B
	6.1	Supply Voltage Range, Group C
	6.1	Supply Voltage Range, Group D
	6.2	Ignition Off Draw
	6.3	Supply Voltage Ripple
	7.2	Supply Voltage Drop Out

	7.4	Engine Cranking Low Voltage
	8.1	Defective Regulation (Full-Fielded Alternator)
	8.2	Jump Start
	8.4	Reverse Supply Voltage
	8.4	Reverse Supply Voltage (with Reverse Voltage Isolation)
	9.1	Immunity to Short Circuits in the Supply Voltage Input and Load Output Lines
	9.2	Immunity to Short Circuits in I/O Signal Lines
	10.1	Operating and Voltage Stress, Group A
	10.1	Operating and Voltage Stress, Group B
	10.1	Operating and Voltage Stress, Group C
	10.1	Operating and Voltage Stress, Group D
	10.2	Stall
<b><u>Nissan 28400NDS02 Rev 3 (1999-07)</u></b>		
	3	Resistance to Power Source Voltage Fluctuation (step fluctuation)
<b><u>Nissan 28400NDS03 Rev 3 (2005-08)</u></b>		
	1	Low Frequency Surge Resistance (battery dump surge), Test Method A, AP-1
	1	Low Frequency Surge Resistance (battery dump surge), Test Method A, AP-2
	1	Low Frequency Surge Resistance (battery dump surge), Test Method B, AP-1
	1	Low Frequency Surge Resistance (battery dump surge), Test Method B, AP-2
<b><u>Nissan 28401NDS02 Rev 4 (2008-08)</u></b>		
	6.1.2	EQ/TE 02: Resistance to slow Decrease and Increase of Power Supply Voltages
	6.1.4	EQ/TE 04: Resistance to Non Usual Power Supply Voltages
	6.1.5	EQ/TE 05: Resistance to Ground and positive Supply Voltages Short Circuit
	6.1.10	EQ/IC 04: Resistance to Power Supply Micro-Interruptions, 10us micro-interruption
	6.1.10	EQ/IC 04: Resistance to Power Supply Micro-Interruptions, 100us micro-interruption
	6.1.10	EQ/IC 04: Resistance to Power Supply Micro-Interruptions, 5ms micro-interruption
	6.1.10	EQ/IC 04: Resistance to Power Supply Micro-Interruptions, 50ms micro-interruption, EUT not Operational
	6.1.10	EQ/IC 04: Resistance to Power Supply Micro-Interruptions, 300ms micro-interruption
	6.1.11	EQ/IC 05: Resistance to Starting Profile, No. I
	6.1.11	EQ/IC 05: Resistance to Starting Profile, No. II
	6.1.11	EQ/IC 05: Resistance to Starting Profile, No. III
	6.1.12	EQ/IC 06: Resistance to On-Board Power System Voltage Ripples, 2Vpp



	6.1.12	EQ/IC 06: Resistance to On-Board Power System Voltage Ripples, 4Vpp
<b>SAE J1113-2 JUL2004</b>		
	Appendix B	Limit Levels for Conducted Immunity, 15 Hz to 250 kHz, Level 1, 0.15 Vp-p
	Appendix B	Limit Levels for Conducted Immunity, 15 Hz to 250 kHz, Level 2, 0.50 Vp-p
	Appendix B	Limit Levels for Conducted Immunity, 15 Hz to 250 kHz, Level 3, 1.0 Vp-p
	Appendix B	Limit Levels for Conducted Immunity, 15 Hz to 250 kHz, Level 4, 3.0 Vp-p
<b>SAE J1113-11 JUN2007</b>		
	Test Pulse 4	Single Pulse, (I.e., starter motor engagement disturbance), 12VDC
	Test Pulse 4	Single Pulse, (I.e., starter motor engagement disturbance), 24VDC
<b>SAE J2139 SEP2005</b>		
	4.8	Voltage Regulation Tolerance Testing, 12VDC
	4.8	Voltage Regulation Tolerance Testing, 24VDC
<b>SAE J2628 JUL2007</b>		
	4.3	Voltage Dropouts and Dips, Test A
	4.3	Voltage Dropouts and Dips, Test C
<b>Toyota TSC70212G (2007-06)</b>		
	5.2	Waveform 1 (ACC & IG) Battery Connect and Disconnect, Test Pattern I, 12VDC
	5.2	Waveform 1 (ACC & IG) Battery Connect and Disconnect, Test Pattern I, 24VDC
	5.2	Waveform 1 (B+) Battery Connect and Disconnect, Test Pattern I, 12VDC
	5.2	Waveform 1 (B+) Battery Connect and Disconnect, Test Pattern I, 24VDC
	5.2	Waveform 1 (ACC & IG) Battery Connect and Disconnect, Test Pattern 2, 12VDC
	5.2	Waveform 1 (ACC & IG) Battery Connect and Disconnect, Test Pattern 2, 24VDC
	5.2	Waveform 1 (B+) Battery Connect and Disconnect, Test Pattern 2, 12VDC
	5.2	Waveform 1 (B+) Battery Connect and Disconnect, Test Pattern 2, 24VDC
	5.2	Waveform 2 Battery Terminal Chattering, 12VDC
	5.2	Waveform 2 Battery Terminal Chattering, 24VDC
	5.2	Waveform 3 Repeated Turning On-Off of IG Switch, Test Pattern 1, 12VDC
	5.2	Waveform 3 Repeated Turning On-Off of IG Switch, Test Pattern 1, 24VDC
	5.2	Waveform 3 Repeated Turning On-Off of IG Switch, Test Pattern 2, 12VDC
	5.2	Waveform 3 Repeated Turning On-Off of IG Switch, Test Pattern 2, 24VDC
	5.2	Waveform 4 Instantaneous Disconnection of IG Switch Connector and IG 1 and 2, 12VDC
	5.2	Waveform 4 Instantaneous Disconnection of IG Switch Connector and IG 1 and 2, 24VDC

	5.2	Waveform 5 Instantaneous Disconnection when switching on IGN, 12VDC
	5.2	Waveform 5 Instantaneous Disconnection when switching on IGN, 24VDC
	5.2	Waveform 6 ON-OFF Operation of IGN Switch, 12VDC
	5.2	Waveform 6 ON-OFF Operation of IGN Switch, 24VDC
	5.2	Waveform 8 (ACC & IG) Cranking 1, 12VDC
	5.2	Waveform 8 (ACC & IG) Cranking 1, 24VDC
	5.2	Waveform 8 (+B) Cranking 1, 12VDC
	5.2	Waveform 8 (+B) Cranking 1, 24VDC
	5.2	Waveform 9 (ACC & IGN) Cranking 2, 12VDC
	5.2	Waveform 9 (ACC & IGN) Cranking 2, 24VDC
	5.2	Waveform 9 (B+) Cranking 2, 12VDC
	5.2	Waveform 9 (B+) Cranking 2, 24VDC
	5.2	Waveform 10, Cranking 3, 12VDC
	5.2	Waveform 10, Cranking 3, 24VDC
	5.2	Waveform 11 (ACC & IGN) Cranking 4, 13VDC
	5.2	Waveform 11 (B+) Cranking 4, 13VDC
	5.2	Waveform 12 (ACC & IGN) Dead Batt, 12VDC
	5.2	Waveform 12 (ACC & IGN) Dead Batt, 24VDC
	5.2	Waveform 12 (B+) Dead Batt, 12VDC
	5.2	Waveform 12 (B+) Dead Batt, 24VDC
	5.2	Waveform 13 Jump-Start part 1 (t=0) 12VDC
	5.2	Waveform 13 Jump-Start part 2 (t=50, 100 ms) 12VDC
	5.2	Waveform 13 Jump-Start part 3 (t=1000 ms) 12VDC
	5.2	Waveform 14 (ACC & IG) IG Operation When Battery Voltage Dropped, 12VDC
	5.2	Waveform 14 (ACC & IG) IG Operation When Battery Voltage Dropped, 24VDC
	5.2	Waveform 14 (+B) IG Operation When Battery Voltage Dropped, 12VDC
	5.2	Waveform 14 (+B) IG Operation When Battery Voltage Dropped, 24VDC
	5.2	Waveform 15 (ACC) Switching over IG1 and 2, 12VDC
	5.2	Waveform 15 (ACC) Switching over IG1 and 2, 24VDC
	5.2	Waveform 15 (IG1) Switching over IG1 and 2, 12VDC
	5.2	Waveform 15 (IG1) Switching over IG1 and 2, 24VDC
	5.2	Waveform 15 (IG2) Switching over IG1 and 2, 12VDC
	5.2	Waveform 15 (IG2) Switching over IG1 and 2, 24VDC

	5.2	Waveform 16 (ACC) Battery Connect and Disconnect, Instantaneous Disconnect, Test Pattern 1, 12VDC
	5.2	Waveform 16 (ACC) Battery Connect and Disconnect, Instantaneous Disconnect, Test Pattern 1, 24VDC
	5.2	Waveform 16 (ACC) Battery Connect and Disconnect, Instantaneous Disconnect, Test Pattern 2, 12VDC
	5.2	Waveform 16 (ACC) Battery Connect and Disconnect, Instantaneous Disconnect, Test Pattern 2, 24VDC
	5.2	Waveform 16 (+B) Battery Connect and Disconnect, Instantaneous Disconnect, Test Pattern 1, 12VDC
	5.2	Waveform 16 (+B) Battery Connect and Disconnect, Instantaneous Disconnect, Test Pattern 1, 24VDC
	5.2	Waveform 16 (+B) Battery Connect and Disconnect, Instantaneous Disconnect, Test Pattern 2, 12VDC
	5.2	Waveform 16 (+B) Battery Connect and Disconnect, Instantaneous Disconnect, Test Pattern 2, 24VDC
	5.2	Waveform 16 (IG1, 2) Battery Connect and Disconnect, Instantaneous Disconnect, Test Pattern 1, 12VDC
	5.2	Waveform 16 (IG1, 2) Battery Connect and Disconnect, Instantaneous Disconnect, Test Pattern 1, 24VDC
	5.2	Waveform 16 (IG1, 2) Battery Connect and Disconnect, Instantaneous Disconnect, Test Pattern 2, 12VDC
	5.2	Waveform 16 (IG1, 2) Battery Connect and Disconnect, Instantaneous Disconnect, Test Pattern 2, 24VDC
	5.2	Waveform 17 (SW) Repeated Turning ON-OFF of Switch, 12VDC
	5.2	Waveform 19 (ACC) Cranking 1, 12VDC
	5.2	Waveform 19 (ACC) Cranking 1, 24VDC
	5.2	Waveform 19 (+B) Cranking 1, 12VDC
	5.2	Waveform 19 (+B) Cranking 1, 24VDC
	5.2	Waveform 19 (IG1) Cranking 1, 12VDC
	5.2	Waveform 19 (IG1) Cranking 1, 24VDC
	5.2	Waveform 19 (IG2) Cranking 1, 12VDC
	5.2	Waveform 19 (IG2) Cranking 1, 24VDC
	5.2	Waveform 19 (SW) Cranking 1, 12VDC
	5.2	Waveform 19 (SW) Cranking 1, 24VDC
	5.2	Waveform 20 (ACC) Cranking 1, 12VDC
	5.2	Waveform 20 (ACC) Cranking 1, 24VDC
	5.2	Waveform 20 (+B) Cranking 1, 12VDC
	5.2	Waveform 20 (+B) Cranking 1, 24VDC
	5.2	Waveform 20 (IG1) Cranking 1, 12VDC
	5.2	Waveform 20 (IG1) Cranking 1, 24VDC
	5.2	Waveform 20 (IG2) Cranking 1, 12VDC

	5.2	Waveform 20 (IG2) Cranking 1, 24VDC
	5.2	Waveform 20 (SW) Cranking 1, 12VDC
	5.2	Waveform 20 (SW) Cranking 1, 24VDC
	5.2	Waveform 21 (ACC) Cranking 1, 12VDC
	5.2	Waveform 21 (ACC) Cranking 1, 24VDC
	5.2	Waveform 21 (+B) Cranking 1, 12VDC
	5.2	Waveform 21 (+B) Cranking 1, 24VDC
	5.2	Waveform 21 (IG1) Cranking 1, 12VDC
	5.2	Waveform 21 (IG1) Cranking 1, 24VDC
	5.2	Waveform 21 (IG2) Cranking 1, 12VDC
	5.2	Waveform 21 (IG2) Cranking 1, 24VDC
	5.2	Waveform 21 (SW) Cranking 1, 12VDC
	5.2	Waveform 21 (SW) Cranking 1, 24VDC
	5.2	Waveform 22 (+B, ACC, IG1 & IG2) ST Operation When Battery Voltage is Dropped, 12VDC
	5.2	Waveform 22 (+B, ACC, IG1, IG2) ST Operation When Battery Voltage is Dropped, 12VDC
	5.2	Waveform 22 (+B, ACC, IG1, IG2) ST Operation When Battery Voltage is Dropped, 24VDC
	5.2	Waveform 22 (SW) ST Operation When Battery Voltage is Dropped, 12VDC
	5.2	Waveform 22 (SW) ST Operation When Battery Voltage is Dropped, 24VDC
<b>Volkswagen VW 80101 (2009-03)</b>		
	3.2	Operating Voltage Dips, Curve 1, 12VDC
	3.2	Operating Voltage Dips, Curve 1, 24VDC
	3.2	Operating Voltage Dips, Curve 2, 12VDC
	3.2	Operating Voltage Dips, Curve 2, 24VDC
	3.2	Operating Voltage Dips, Curve 3, 12VDC
	3.2	Operating Voltage Dips, Curve 3, 24VDC
	3.2	Operating Voltage Dips, Curve 4, 12VDC
	3.2	Operating Voltage Dips, Curve 4, 24VDC
	3.2	Operating Voltage Dips, Curve 5, 12VDC
	3.2	Operating Voltage Dips, Curve 5, 24VDC
	3.2	Operating Voltage Dips, Curve 6, 12VDC
	3.2	Operating Voltage Dips, Curve 6, 24VDC
	3.2	Operating Voltage Dips, Curve 7, 12VDC
	3.2	Operating Voltage Dips, Curve 7, 24VDC

	3.2	Operating Voltage Dips, Curve 8, 12VDC
	3.2	Operating Voltage Dips, Curve 8, 24VDC
	3.2	Operating Voltage Dips, Curve 9, 12VDC
	3.2	Operating Voltage Dips, Curve 9, 24VDC
	3.2	Operating Voltage Dips, Curve 10, 12VDC
	3.2	Operating Voltage Dips, Curve 10, 24VDC
	3.4	Backfeed to Terminal 15, 12VDC
<b>Volkswagen VW 80000 (2009-10)</b>		
	2.6.1	Parameter Test (small), a, 6VDC min
	2.6.1	Parameter Test (small), b, 8VDC min
	2.6.1	Parameter Test (small), c, 9VDC min
	2.6.1	Parameter Test (small), d, 9.8VDC min
	2.6.2	Parameter Test (large), a, 6VDC min
	2.6.2	Parameter Test (large), b, 8VDC min
	2.6.2	Parameter Test (large), c, 9VDC min
	2.6.2	Parameter Test (large), d, 9.8VDC min
	2.6.3	Parameter Test (functional), a, 6VDC min
	2.6.3	Parameter Test (functional), b, 8VDC min
	2.6.3	Parameter Test (functional), c, 9VDC min
	2.6.3	Parameter Test (functional), d, 9.8VDC min
	4.1	E-01 Long Term Overvoltage
	4.2	E-02 Transient Overvoltage, short test
	4.2	E-02 Transient Overvoltage, endurance test
	4.3	E-03 Transient Undervoltage
	4.4	E-04 Jump Start
	4.6	E-06 Superimposed Alternating Voltage, Severity 1
	4.6	E-06 Superimposed Alternating Voltage, Severity 2
	4.7	E-07 Slow Decrease and Increase of the Supply Voltage, a, 6VDC min
	4.7	E-07 Slow Decrease and Increase of the Supply Voltage, b, 8VDC min
	4.7	E-07 Slow Decrease and Increase of the Supply Voltage, c, 9VDC min
	4.7	E-07 Slow Decrease and Increase of the Supply Voltage, d, 9.8VDC min
	4.8	E-08 Slow Decrease, Quick Increase of the Supply Voltage, a, 6VDC min
	4.8	E-08 Slow Decrease, Quick Increase of the Supply Voltage, b, 8VDC min
	4.8	E-08 Slow Decrease, Quick Increase of the Supply Voltage, c, 9VDC min
	4.8	E-08 Slow Decrease, Quick Increase of the Supply Voltage, d, 9.8VDC min

	4.10	E-10 Short Interruptions
	4.11	E-11 Start Pulses, Cold Start, Normal
	4.11	E-11 Start Pulses, Cold Start, Severe
	4.11	E-11 Start Pulses, Warm Start, Short
	4.11	E-11 Start Pulses, Warm Start, Long
	4.12	E-12 Voltage Curve with Intelligent Generator Control, Test Setup 2
	4.17	E-17 Short Circuit in Signal Circuit and Load Circuits, a, 6VDC min
	4.17	E-17 Short Circuit in Signal Circuit and Load Circuits, b, 8VDC min
	4.17	E-17 Short Circuit in Signal Circuit and Load Circuits, c, 9VDC min
	4.17	E-17 Short Circuit in Signal Circuit and Load Circuits, d, 9.8VDC min
	4.18	E-18 Insulation Resistance
	4.19	E-19 Closed Circuit Current
	4.20	E-20 Dielectric Strength
	4.21	E-21 Backfeeds
	5.5.1	Parameter Test (small)
	5.5.2	Parameter Test (large), a, 6VDC min
	5.5.2	Parameter Test (large), b, 8VDC min
	5.5.2	Parameter Test (large), c, 9VDC min
	5.5.2	Parameter Test (large), d, 9.8VDC min
	5.5.3	Parameter Test (functional), a, 6VDC min,
	5.5.3	Parameter Test (functional), b, 8VDC min,
	5.5.3	Parameter Test (functional), c, 9VDC min,
	5.5.3	Parameter Test (functional), d, 9.8VDC min
	8.1	M-01 Free Fall, Operating Range a
	8.1	M-01 Free Fall, Operating Range b
	8.1	M-01 Free Fall, Operating Range c
	8.1	M-01 Free Fall, Operating Range d
	8.2	M-02 Stone Impact Test
	8.3	M-03 Dust
	8.4	M-04 Vibration
	8.5	M-05 Mechanical Shock
	8.6	M-06 Endurance Shock Test
	9.1	K-01 High-Low Temperature Storage, Operating Range a
	9.1	K-01 High-Low Temperature Storage, Operating Range b
	9.1	K-01 High-Low Temperature Storage, Operating Range c

	9.1	K-01 High-Low Temperature Storage, Operating Range d
	9.2	K-02 Incremental Temperature Test, Operating Range a
	9.2	K-02 Incremental Temperature Test, Operating Range b
	9.2	K-02 Incremental Temperature Test, Operating Range c
	9.2	K-02 Incremental Temperature Test, Operating Range d
	9.3	K-03 Low Temperature Operation
	9.4	K-04 Repainting Temperature
	9.5	K-05 Temperature Shock (component), Operating Range a
	9.5	K-05 Temperature Shock (component), Operating Range b
	9.5	K-05 Temperature Shock (component), Operating Range c
	9.5	K-05 Temperature Shock (component), Operating Range d
	9.6	K-06 Salt Spray Test with Operation, Exterior
	9.7	K-07 Salt Spray Test with Operation, Interior
	9.8	K-08 Humid Heat, Cyclic
	9.9	K-09 Humid Heat, Cyclic (with frost)
	9.10	K-10 Water Protection - IPX0 to IPX6
	9.11	K-11 High-Pressure Cleaning
	9.12	K-12 Temperature Shock with Splash Water
	9.13	K-13 Temperature Shock - Immersion
	9.14	K-14 Humid Heat - Constant
	9.15	K-15 Condensation Test with Electrical Assemblies
	9.16	K-16 Temperature Shock (without housing)
	9.17	K-17 Sun Radiation, Operating Range a
	9.17	K-17 Sun Radiation, Operating Range b
	9.17	K-17 Sun Radiation, Operating Range c
	9.17	K-17 Sun Radiation, Operating Range d
	9.18	K-18 Harmful Gas Test, Operating Range a
	9.18	K-18 Harmful Gas Test, Operating Range b
	9.18	K-18 Harmful Gas Test, Operating Range c
	9.18	K-18 Harmful Gas Test, Operating Range d
	10.1	Chemical Tests
	11.1	L-01 Life Test - Mechanical-Hydraulic Endurance Test
	11.1	L-01 Life Test - Mechanical-Hydraulic Endurance Test, a
	11.1	L-01 Life Test - Mechanical-Hydraulic Endurance Test, b
	11.1	L-01 Life Test - Mechanical-Hydraulic Endurance Test, c

	11.1	L-01 Life Test - Mechanical-Hydraulic Endurance Test, d
	11.2	L-02 Life Test -High Temperature Endurance Test
	11.2	L-02 Life Test -High Temperature Endurance Test, a
	11.2	L-02 Life Test -High Temperature Endurance Test, b
	11.2	L-02 Life Test -High Temperature Endurance Test, c
	11.2	L-02 Life Test -High Temperature Endurance Test, d

## Industry Tests

### IEC 6100-4-16 (2015)

	5.2	Continuous Disturbance at 16.67 Hz, Level 1
	5.2	Continuous Disturbance at 16.67 Hz, Level 2
	5.2	Continuous Disturbance at 16.67 Hz, Level 3
	5.2	Continuous Disturbance at 16.67 Hz, Level 4
	5.2	Continuous Disturbance at 50 Hz, Level 1
	5.2	Continuous Disturbance at 50 Hz, Level 2
	5.2	Continuous Disturbance at 50 Hz, Level 3
	5.2	Continuous Disturbance at 50 Hz, Level 4
	5.2	Continuous Disturbance at 60 Hz, Level 1
	5.2	Continuous Disturbance at 60 Hz, Level 2
	5.2	Continuous Disturbance at 60 Hz, Level 3
	5.2	Continuous Disturbance at 60 Hz, Level 4
	5.2	Continuous Disturbance at DC, Level 1
	5.2	Continuous Disturbance at DC, Level 2
	5.2	Continuous Disturbance at DC, Level 3
	5.2	Continuous Disturbance at DC, Level 4
	5.2	Short Duration Disturbance at 16.67 Hz, Level 1
	5.2	Short Duration Disturbance at 16.67 Hz, Level 2
	5.2	Short Duration Disturbance at 16.67 Hz, Level 3
	5.2	Short Duration Disturbance at 50 Hz, Level 1
	5.2	Short Duration Disturbance at 50 Hz, Level 2
	5.2	Short Duration Disturbance at 50 Hz, Level 3
	5.2	Short Duration Disturbance at 60 Hz, Level 1
	5.2	Short Duration Disturbance at 60 Hz, Level 2
	5.2	Short Duration Disturbance at 60 Hz, Level 3
	5.2	Short Duration Disturbance at DC, Level 1



	5.2	Short Duration Disturbance at DC, Level 2
	5.2	Short Duration Disturbance at DC, Level 3
	5.3	15 Hz to 150 kHz Frequency Range Test, Level 1
	5.3	15 Hz to 150 kHz Frequency Range Test, Level 2
	5.3	15 Hz to 150 kHz Frequency Range Test, Level 3
	5.3	15 Hz to 150 kHz Frequency Range Test, Level 4

**Disclaimer:**

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