



Product Validation Plan and Report

VVP Number _____	Dept# 2962	Global Automotive Division, America's North
Plan Date 3-20-14	Plan Originator	Randy Simmons ,TE Connectivity
Concurrence _____ (Concurrence Signatures on File)	Manager Appv'l _____	
Source TEC Electronics	Report Date 6/26/2014	Reporting Engineer Randy Simmons

Component GET 1X4 with Generation Y terminal	P/N 2203535-1	UPG Number
Model Year 2015	Applications Replace Current GET 1X4 2 piece product	Controlling Document SAE/USCAR-2 Rev. 6 (Feb 2013), IEC 60529 second edition

TEST PLAN										TEST REPORT				NOTES	
Item No.	Procedure Or Standard	Test Description	Acceptance Criteria	Target Requirements	Test Responsibility	Test Stage	Sample		Timing		Samples Tested				Actual Results
							Qty	Type	Start	Compl	Qty	Type	Phase		
USCAR Connector System Mechanical Tests (TEST FLOW 5.9.5)															
4	SAE/USCAR2 5.4.1	Terminal – Connector Insertion/Extraction Force	USCAR Test sequence D										G3		
4a	SAE/USCAR2 5.1.8	Visual Inspection	Inspect for defects.	No defects	TEC	PV	40	D	5/28/14	5/28/14	40	P	Passed	20 GET Plugs 20 Generation Y Plugs 40 Caps	
4b	SAE/USCAR2 5.4.1	Terminal Insertion Force	30 N max.	No failures	TEC	PV	40	E	5/28/14	5/28/14	40	P	$F_{(max)} = 9.95$ $F_{(min)} = 2.37$ $F_{(mean)} = 5.8$		
4c	SAE/USCAR2 5.4.1	Terminal Push Through Force	50 N min. or column strength of the conductor.	No failures	TEC	PV	40	E	5/28/14	5/28/14	40	P	$F_{(max)} = 50.07$ $F_{(min)} = 34.53$ $F_{(mean)} = 45.86$	All wires buckled at these forces	
4d	SAE/USCAR2 5.4.1	Terminal Extraction Force (Primary lock only.)	40N min.	No failures	TEC	PV	20	E	5/28/14	5/28/14	20	P	$F_{(max)} = 92.75$ $F_{(min)} = 66.37$ $F_{(mean)} = 78.69$		
4e	SAE/USCAR2 5.4.1	Terminal Extraction Force (Primary lock & TPA before Moisture conditioning.)	70 N min.	No failures	TEC	PV	20	E	5/28/14	5/28/14	20	P	$F_{(max)} = 108.34$ $F_{(min)} = 77.69$ $F_{(mean)} = 89.60$		
4f	SAE/USCAR2 5.4.1	Terminal Extraction Force (Primary lock & TPA after Temp/Humidity/and HTE)	50 N min.	No failures	TEC	PV	40	E	6/3/14	6/6/14	40	P	$F_{(max)} = 113.7$ $F_{(min)} = 74.52$ $F_{(mean)} = 88.8$		

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							Qty	Type	Start	Compl	Qty	Type	Phase		
4g	SAE/US CAR2 5.1.8	Visual Inspection	Inspect for defects	No defects	TEC	PV	40	E	6/6/14	6/6/14	40	P		Passed	
5	SAE/US CAR2 5.4.4	Misc. Component Engage/Disengage Force	USCAR Test sequence E										G3		
5a	SAE/US CAR2 5.1.8	Visual Inspection	Inspect for defects	No defects	TEC	PV	10	E	5/28/14	5/28/14	10	P		Passed	
5b	SAE/US CAR2 5.4.5	Misc. Component Engage/Disengage Force: Insertion to lock (ISL)	25N min 60N max	No failures	TEC	PV	10	E	5/28/14	5/28/14	10	P		F _(max) = 32.27 F _(min) = 28.46 F _(mean) = 29.89	
5c	SAE/US CAR2 5.4.5	Misc. Component Engage/Disengage Force: Extraction, retainer engaged (ILS)		No failures	TEC	PV	10	E	5/28/14	5/28/14	10	P		F _(max) = 34.73 F _(min) = 25.52 F _(mean) = 31.15	
5d	SAE/US CAR2 5.1.8	Visual Inspection	Inspect for defects.	No defects	TEC	PV	10	E	5/28/14	5/28/14	10	P		Passed	
6	SAE/US CAR2 5.4.7	Connector to-Connector Audible Click	USCAR Test sequence F										G3		
6a	SAE/US CAR2 5.1.8	Visual Inspection	Inspect for defects.	No defects	TEC	PV	10	E	6/9/14	6/9/14	10	P		Passed	
6b	SAE/US CAR2 5.4.7	Connector to-Connector Audible Click	7db for un-conditioned and 5db for conditioned	No defects	TEC	PV	10	E	6/9/14	6/9/14	10	P		Passed	
6c	SAE/US CAR2 5.1.8	Visual Inspection	Inspect for defects.	No defects	TEC	PV	10	E	6/9/14	6/9/14	10	P		Passed	
7	SAE/US CAR2 5.4.2	Connector-Connector Mating/ Un-mating (non-mechanical assist)	USCAR Test sequence G										G3		
7a	SAE/US CAR2 5.1.8	Visual Inspection	Inspect for defects.	No defects	TEC	PV	20	E	5/6/14	5/6/14	20	P		Passed	

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							Qty	Type	Start	Compl	Qty	Type	Phase		
7b	SAE/USCAR2 5.4.2	Mating Force	USCAR-25	No failures	TEC	PV	20	E	5/6/14	5/6/14	20	P		F _(max) = 22.96 F _(min) = 19.26 F _(mean) = 21.64	
7c	SAE/USCAR2 5.4.2	Un-mating Force, Primary lock engaged	≥ 110 N	No failures	TEC	PV	5	E	5/6/14	5/6/14	20	P		F _(max) = 157.36 F _(min) = 153.48 F _(mean) = 155.79	
7d	SAE/USCAR2 5.4.2	Force to disengage Primary Lock without CPA engaged	>10 N and ≤ 70 N	No failures	TEC	PV	5	E	5/6/14	5/6/14	20	P		F _(max) = 19.22 F _(min) = 17.8 F _(mean) = 18.58	
7e	SAE/USCAR2 5.4.2	Force to disengage Primary Lock with CPA engaged	>50 N	No failures	TEC	PV	5	E	5/6/14	5/6/14	20	P		F _(max) = 135.81 F _(min) = 121.57 F _(mean) = 129.72	
7f	SAE/USCAR2 5.4.2	Un-mating Force, Primary lock disengaged	75 N max.	No failures	TEC	PV	5	E	5/6/14	5/6/14	20	P		F _(max) = 13.73 F _(min) = 9.47 F _(mean) = 12.14	
7g	SAE/USCAR2 5.1.8	Visual Inspection	Inspect for defects.	No defects	TEC	PV	20	E	5/6/14	5/6/14	20	P		Passed	
8	SAE/USCAR2 5.4.4	Polarization Feature Effectiveness	USCAR Test sequence H										G3		
8a	SAE/USCAR2 5.1.8	Visual Inspection	Inspect for defects.	No defects	TEC	PV	20	E	5/8/14	5/8/14	20	P		Passed	
8b	SAE/USCAR2 5.4.4	Connector Mated Turned 180°	No mating 150 N	No failures	TEC	PV	20	E	5/8/14	5/8/14	20	P		Passed	1 per cavity, one half GET plugs, other half Generation Y plugs
8c	SAE/USCAR2 5.4.4	Wrong Keying	No mating 150N	No failures	TEC	PV	20	E	5/8/14	5/8/14	20	P		Passed	1 per cavity, one half GET plugs, other half Generation Y plugs
8d	SAE/USCAR2 5.1.8	Visual Inspection	Inspect for defects.	No defects	TEC	PV	20	E	5/8/14	5/8/14	20	P		Passed	
9	SAE/USCAR2 5.4.8	Connector Drop	USCAR Test sequence I										G3		
9a	SAE/USCAR 5.1.8	Visual Inspection	Inspect for defects	No defects	TEC	PV	3	E	5/16/14	5/16/14	3	P		Passed	

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							Qty	Type	Start	Compl	Qty	Type	Phase		
9b	SAE/USCAR2 5.4.8	Connector Drop Test	Visual Inspection	No failures	TEC	PV	3	E	5/16/14	5/16/14	3	P		Passed	
9c	SAE/USCAR2 5.1.8	Visual Inspection	Inspect for defects	No defects	TEC	PV	3	E	5/16/14	5/16/14	3	P		Passed	
10	SAE/USCAR2 5.4.9	Cavity Damage	USCAR Test sequence J		TEC								G3		
10a	SAE/USCAR2 5.1.8	Visual Inspection	Inspect for defects	No defects	TEC	PV	8	E	5/28/14	5/28/14	8	P		Passed	
10b	SAE/USCAR2 5.4.9	Cavity Damage	Extraction forces per 5.4.1.4	No failures	TEC	PV	8	E	5/28/14	5/28/14	8	P		$F_{(max)} = 60N$	
10c	SAE/USCAR2 5.1.8	Visual Inspection	Inspect for defects	No defects	TEC	PV	8	E	5/28/14	5/28/14	8	P		Passed	
12	SAE/USCAR2 5.7.2	Mounting Feature Mechanical Strength	USCAR Test sequence L										G3		
12a	SAE/USCAR2 5.1.8	Visual Inspection	Inspect for defects	No defects	TEC	PV	15	E	5/7/14	5/7/14	15	P		Passed	
12b	SAE/USCAR2 5.7.2	Mounting Feature Mechanical Strength	>50 N	No failures	TEC	PV	15	E	5/7/14	5/7/14	15	P		$F_{(max)} = 50N$	
12c	SAE/USCAR2 5.1.8	Visual Inspection	Inspect for defects.	No defects	TEC	PV	15	E	5/7/14	5/7/14	15	P		Passed	
USCAR Connector System Electrical Tests (TEST FLOW 5.9.6)															
13	USCAR2 5.4.6	Vibration/Mechanical Shock	USCAR Test sequence M										G3		
13a	USCAR2 5.1.8	Visual Inspection	Inspect for defects.	No defects	TEC	PV	10	E	6/2/14	6/2/14	10	P		Passed	
13b	USCAR2 5.1.7	Connector Cycling			TEC	PV	10	E	6/2/14	6/2/14	10	P		Passed	

13c	USCAR2 5.3.1	Dry Circuit Resistance	$R_T \leq 15m\Omega$		TEC	PV	10 10	E	6/2/14	6/2/14	10 10	P		GET Plug $R_{T(max)} = 3.48m\Omega$ $R_{T(min)} = 2.65m\Omega$ $R_{T(mean)}=3.09m\Omega$ Generation Y Plug $R_{T(max)} = 5.03m\Omega$ $R_{T(min)} = 3.87m\Omega$ $R_{T(mean)}=4.14m\Omega$	
13d	USCAR2 5.4.6	Mechanical Shock V1	Per USCAR 5.1.9.4		TEC	PV	10 10	E	6/2/14	6/2/14	10 10	P			
13e	USCAR2 5.4.6	Vibration V1	Per USCAR 5.1.9.4		TEC	PV	10 10	E	6/2/14	6/4/14	10 10	P			
13f	USCAR2 5.3.1	Dry Circuit Resistance	$R_T \leq 15 m\Omega$	No failures	TEC	PV		E	6/17/14	6/17/14	10	P		GET Plug $R_{T(max)} = 5.14m\Omega$ $R_{T(min)} = 3.13m\Omega$ $R_{T(mean)}=3.78m\Omega$ Generation Y Plug $R_{T(max)} = 7.39m\Omega$ $R_{T(min)} = 4.13m\Omega$ $R_{T(mean)}=4.93m\Omega$	
13g	USCAR2 5.3.2	Nominal Current Resistance (Voltage drop)	$R_T \leq 15 m\Omega$	No failures	TEC	PV	10 10	E	6/17/14	6/17/14	10 10	P		GET Plug $R_{T(max)} = 5.32m\Omega$ $R_{T(min)} = 3.21m\Omega$ $R_{T(mean)}=3.86m\Omega$ Generation Y Plug $R_{T(max)} = 8.53m\Omega$ $R_{T(min)} = 4.27m\Omega$ $R_{T(mean)}=4.97m\Omega$	
13h	USCAR2 5.1.8	Visual Inspection	Inspect for defects.	No defects	TEC	PV	10 10	E	6/17/14	6/17/14	10 10	P		Passed	
14	USCAR2 5.6.1	Thermal Shock Test	USCAR Test sequence N										G3		
14a	USCAR2 5.1.8	Visual Inspection	Inspect for defects.	No defects	TEC	PV	10 10	E	5/8/14	5/8/14	10 10	P		Passed	
14b	USCAR2 5.1.7	Connector Cycling					10 10		5/8/14	5/8/14	10 10	P		Passed	

14c	USCAR2 5.3.1	Dry Circuit Resistance	$R_T \leq 15m\Omega$	No failures	TEC	PV	10	E	5/8/14	5/8/14	10	P		GET Plug $R_{T(max)} = 3.55m\Omega$ $R_{T(min)} = 2.65m\Omega$ $R_{T(mean)} = 3.26m\Omega$ Generation Y Plug $R_{T(max)} = 4.31m\Omega$ $R_{T(min)} = 3.69m\Omega$ $R_{T(mean)} = 4.02m\Omega$	
14d	USCAR2 5.6.1	Thermal Shock Test	Per USCAR 5.1.9.4	No failures	TEC	PV	10	E	5/9/14	5/13/14	10	P			
14e	USCAR2 5.3.1	Dry Circuit Resistance	$R_T \leq 15 m\Omega$	No failures	TEC	PV	10	E	5/14/14	5/14/14	10	P		$R_{T(max)} = 5.22m\Omega$ $R_{T(min)} = 2.95m\Omega$ $R_{T(mean)} = 4.04m\Omega$ Generation Y Plug $R_{T(max)} = 6.43m\Omega$ $R_{T(min)} = 3.95m\Omega$ $R_{T(mean)} = 4.75m\Omega$	
14f	USCAR2 5.3.2	Nominal Current Resistance (Voltage Drop)	$R_T \leq 15 m\Omega$	No failures	TEC	PV	10	E	5/14/14	5/14/14	10	P		GET Plug $R_{T(max)} = 5.67m\Omega$ $R_{T(min)} = 3.10m\Omega$ $R_{T(mean)} = 4.34m\Omega$ Generation Y Plug $R_{T(max)} = 6.73m\Omega$ $R_{T(min)} = 4.05m\Omega$ $R_{T(mean)} = 4.92m\Omega$	
14g	USCAR2 5.1.8	Visual Inspection	Inspect for defects.	No defects	TEC	PV	10	E	5/14/14	5/14/14	10	P		Passed	
15	USCAR2 5.6.2	Temp./Humidity Cycling	USCAR Test sequence O										G3		
15a	USCAR2 5.1.8	Visual Inspection	Inspect for defects.	No defects	TEC	PV	10	E	4/24/14	4/24/14	10	P		Passed	
15b	USCAR2 5.1.7	Connector Cycling			TEC	PV	10	E	4/24/14	4/24/14	10	P		complete	

15c	USCAR2 5.3.1	Dry Circuit Resistance	$R_T \leq 15 \text{ m}\Omega$	No failures	TEC	PV	10	E	4/24/14	4/24/14	10	P		GET Plug $R_{T(\text{max})} = 3.48\text{m}\Omega$ $R_{T(\text{min})} = 2.71\text{m}\Omega$ $R_{T(\text{mean})} = 3.21\text{m}\Omega$ Generation Y Plug $R_{T(\text{max})} = 4.43\text{m}\Omega$ $R_{T(\text{min})} = 3.70\text{m}\Omega$ $R_{T(\text{mean})} = 4.01\text{m}\Omega$	
15d	USCAR2 5.6.2	Temperature/Humidity Cycling T2			TEC	PV	10	E	4/25/14	5/10/14	10	P		Class II Temp / Humidity Cycling	
15e	USCAR2 5.3.1	Dry Circuit Resistance	$R_T \leq 15 \text{ m}\Omega$	No failures	TEC	PV	10	E	5/12/14	5/12/14	10	P		GET Plug $R_{T(\text{max})} = 6.55\text{m}\Omega$ $R_{T(\text{min})} = 3.39\text{m}\Omega$ $R_{T(\text{mean})} = 4.44\text{m}\Omega$ Generation Y Plug $R_{T(\text{max})} = 5.84\text{m}\Omega$ $R_{T(\text{min})} = 3.95\text{m}\Omega$ $R_{T(\text{mean})} = 4.66\text{m}\Omega$	
15f	USCAR2 5.3.2	Nominal Current Resistance (Voltage Drop)	$R_T \leq 15 \text{ m}\Omega$	No failures	TEC	PV	10	E	5/12/14	5/12/14	10	P		GET Plug $R_{T(\text{max})} = 7.56\text{m}\Omega$ $R_{T(\text{min})} = 3.51\text{m}\Omega$ $R_{T(\text{mean})} = 4.793\text{m}\Omega$ Generation Y Plug $R_{T(\text{max})} = 7.28\text{m}\Omega$ $R_{T(\text{min})} = 4.02\text{m}\Omega$ $R_{T(\text{mean})} = 5.05\text{m}\Omega$	
15g	USCAR2 5.5.1	Isolation Resistance (Separate samples per USCAR-2 flow chart note 11) (required if test sequences Q, R, S, T, and U are not performed: unsealed)	$R > 20 \text{ Mohms @}$ 500 VDC	No failures	TEC	PV	10 10	E	5/12/14	5/12/14	10	P		Passed	
15h	USCAR2 5.4.1	Terminal Extraction Force (Primary lock only.)	40 N min.	No failures	TEC	PV	10	E	5/15/14	5/15/14	10	P		$F_{(\text{max})} = 104.24$ $F_{(\text{min})} = 68.23$ $F_{(\text{mean})} = 88.65$	
15i	USCAR2 5.4.1	Terminal Extraction Force (Primary lock & ISL)	50 N min	No failures	TEC	PV	10	E	5/15/14	5/15/14	10	P		Passed	

15j	USCAR2 5.1.8	Visual Inspection	Inspect for defects.	No defects	TEC	PV	10	E	5/15/14	5/15/14	10	P		
16	USCAR2 5.6.3	High Temperature Exposure	USCAR Test sequence P										G3	
16a	USCAR2 5.1.8	Visual Inspection	Inspect for defects.	No defects	TEC	PV	10	E	4/10/14	4/10/14	10	P		Passed
16b	USCAR2 5.1.7	Connector Cycling							4/10/14	4/10/14	10	P		10 cycles
16c	USCAR2 5.3.1	Dry Circuit Resistance	$R_T \leq 15 \text{ m}\Omega$	No failures	TEC	PV	10	E	4/10/14	4/10/14	10	P		GET Plug $R_{T(\text{max})} = 3.54\text{m}\Omega$ $R_{T(\text{min})} = 2.75\text{m}\Omega$ $R_{T(\text{mean})} = 3.2\text{m}\Omega$ Generation Y Plug $R_{T(\text{max})} = 4.64\text{m}\Omega$ $R_{T(\text{min})} = 3.76\text{m}\Omega$ $R_{T(\text{mean})} = 4.07\text{m}\Omega$
16d	USCAR2 5.6.3	High Temperature Exposure (Class T2)		No failures	TEC	PV	10	E	4/11/14	5/23/14	10	P		
16e	USCAR2 5.3.1	Dry Circuit Resistance	$R_T \leq 15 \text{ m}\Omega$	No failures	TEC	PV	10	E	5/26/14	5/26/14	10	P		GET Plug $R_{T(\text{max})} = 5.40\text{m}\Omega$ $R_{T(\text{min})} = 3.28\text{m}\Omega$ $R_{T(\text{mean})} = 3.64\text{m}\Omega$ Generation Y Plug $R_{T(\text{max})} = 10.29\text{m}\Omega$ $R_{T(\text{min})} = 4.04\text{m}\Omega$ $R_{T(\text{mean})} = 5.710\text{m}\Omega$
16f	USCAR2 5.3.2	Nominal Current Resistance (Voltage Drop)	$R_T \leq 15 \text{ m}\Omega$	No failures	TEC	PV	10	E	5/26/14	5/26/14	10	P		GET Plug $R_{T(\text{max})} = 7.39\text{m}\Omega$ $R_{T(\text{min})} = 3.56\text{m}\Omega$ $R_{T(\text{mean})} = 4.61\text{m}\Omega$ Generation Y Plug $R_{T(\text{max})} = 11.15\text{m}\Omega$ $R_{T(\text{min})} = 4.96\text{m}\Omega$ $R_{T(\text{mean})} = 7.58\text{m}\Omega$
16g	USCAR2 5.1.8	Visual Inspection	Inspect for defects.	No defects	TEC	PV	10	E	5/26/14	5/26/14	10	P		

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