

DELPHI PACKARD ELECTRIC SYSTEMS
WARREN, OHIO 44486

DWG STATUS					ZONE	REVISION HISTORY				AUTH	DR	CK	APVD
DATE	STG	REV	N/P	CHG									
20MR13	R	06	--	--		ADDED SHEET 1 SHT 1 OF 3 WAS SHT 1 OF 2; ALL PARTS - DWG UPDATED TO LATEST PRINT; REVISE NOTES & CHART				325424	LB	LB	SM

- NOTES:
- REF FRAMATOME CONNECTORS - DUAT & RIETZ P/N SEE CHART
 - DELPHI PACKARD ELECTRIC SYSTEMS IS NOT RESPONSIBLE FOR DESIGN CONTROL OF PURCHASED "OFF SHELF" COMPONENTS.
 - SUPPLIER SHOULD COMPLY WITH DELPHI SPECIFICATION (SHEET 3)

PART NO.	REV	N/P	STATUS	SUP FRAMATOME CONNECTORS DUAT & RIETZ P/N
15488627	01	AC	ACTIVE	54200221
15488626	01	AC	ACTIVE	54200220
13896059	01	AB	ACTIVE	F130500
13863838	01	AC	ACTIVE	54200220N

DWG TYPE:	PART DRAWING
STYLE:	N/A
VOLUME (CM):	N/A
DISTR CODE:	D
AutoCAD	

DELPHI

DELPHI PACKARD ELECTRIC SYSTEMS
WARREN, OH

THIS DRAWING IS NOT A PROPRIETARY DESIGN OF
DELPHI AUTOMOTIVE SYSTEM.

DATE		20MR13
DR:	BONILLA, LILIANA	20MR13
APVD1:	BONILLA, LILIANA	20MR13
APVD2:	MELERO, SALVADOR	21MR13
APVD3:		
APVD4:		
APVD5:		

SUBSTANCES OF CONCERN AND RECYCLED
CONTENT PER DELPHI - A 10949001

MATERIAL:	SEE DWG
DRAWING NAME:	TAXI CONN 2 F 2.8 APEX
DRAWING NUMBER:	13535828

SIZE:	A0	SCALE:	NONE	FRAME NO:	1 OF 1	SHEET NO:	1 OF 3	STG:	R	REV:	06	N/P:	--
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DELPHI SUPPLIER MUST MEET DELPHI MANUFACTURABILITY SPECIFICATIONS FOR CONNECTION SYSTEM

DWG STATUS				REVISION HISTORY				AUTH	DR	CK	APVD
DATE	STG	REV	CHG	ZONE							
20JUN11	R	03	---	---	ADDED SHEET 2		318300	JJD	JJD	JEP	
22ESEL11	R	04	---	---	13896059 - RELEASED		319283	ABD	ABD	DT	
15NOV11	R	05	---	---	ALL PARTS - DWG UPDATED TO LATEST PRINT		320370	LB	JJD	ED	
20MR13	R	06	---	---	ADDED SHEET 1: 'SHT 3' WAS 'SHT 2', ALL PARTS - DWG UPDATED TO LATEST PRINT, REVISE NOTES & CHART		325424	LB	LB	SM	

Delphi. Manufacturability Specifications for Connections Systems

Spec No.	Category	Specification Description	Acceptance Criteria	USCAR 2 or other Specification		
1a	Terminal-Connector	Terminal insertion force to Connector	For terminals with 1.0mm wire, the engagement force to fully seat and lock the terminal shall be 15N max. Neither the conductor nor the terminal may buckle during the test. The Forward stop must withstand a force greater than the force required to insert the terminal into its cavity.	5.4.1.3		
2a	Terminal-Connector		For terminals with 1.0mm wire, the engagement force to fully seat and lock the terminal shall be 20N max. Neither the conductor nor the terminal may buckle during the test. The Forward stop must withstand a force greater than the force required to insert the terminal into its cavity.	5.4.1.3		
3a	Terminal-Connector		For terminals with 1.0mm wire, the engagement force to fully seat and lock the terminal shall be 30N max. Neither the conductor nor the terminal may buckle during the test. The Forward stop must withstand a force greater than the force required to insert the terminal into its cavity.	5.4.1.3		
10a	Terminal-Connector	Terminal retention force on Connector	Terminal Size	Primary Lock only (N Min)	With Secondary lock (N Min)	
11a	Terminal-Connector		050	20	30	Delphi
12a	Terminal-Connector		064	30	60	5.4.1.4
13a	Terminal-Connector		≤1.5	45	70	5.4.1.4
14a	Terminal-Connector		≤2.8	60	100	5.4.1.4
15a	Terminal-Connector		≤4.8	60	100	5.4.1.4
16a	Terminal-Connector		≤6.3	80	120	5.4.1.4
17a	Terminal-Connector		≤9.5	100	150	5.4.1.4
20a	Terminal-Connector	Terminal/Cavity Polarization (do not allow incorrect orientation of terminal on the connector)	For any Non symmetrical designs: Terminals inserted in any incorrect orientation shall not fit into a connector cavity beyond the insulation wings (grips) or cable seal at a force 1.5 times the normal insertion force, 15N, or the column strength of the largest applicable wire size, whichever is greater.	5.4.10		
21a	Terminal-Connector	Terminal-Connector Cavity Fit	Terminal should not move or rotate excessively inside the connector cavity so that damage could occur when Mating connection. Example: Female terminals should NOT bend or damage male blades/terminals.	Delphi		
22a	Terminal-Connector	Unseated Terminals	Design connectors with a feature to detect and/or correct partially seated terminals (like PLR)	USCAR 12, E.10		
40a	Terminal-Connector	Terminal should not damage Connector seal (Matt seal)	Terminal insertion into connectors: 1.- Should not cut or damage the matt seal 2.- Should not left any Matt seal material on terminal or connector.	USCAR 12, E.12 Delphi		
1g	Terminal	Terminal Crimp Validation	Production crimps shall be tested, validated and approved per SAE/USCAR-21 Performance Specification for Cable-to-Terminal Electrical Crimps based on wire size, stranding, and insulation wall thickness.	5.1.6		
2g	Terminal	Terminal contact protection	Design the female terminal with hoods, shrouds, or sleeves to protect the electrical contacts.	USCAR 12, Terminals 19		
3g	Terminal	Male terminals blades should have coining	Coining to ease insertion efforts and minimize the possibility of stubbing. The flat on the tip of the male terminal should not exceed 65% of the material or effective blade thickness.	USCAR 12, F.4		
1h	Terminal-Cable Seal	Cable Seal retention on terminal crimp	Design the terminal and seals to prevent individual cable seals from moving along the wire and away from the terminal during assembly and handling (Seal must stay within the crimp)	USCAR 12, C.4		
1b	Connector	Connector with mixed terminal designs	Terminal and connector cavity design should avoid ability to insert a terminal (within the same Connector). Any inserted terminal insertion shall not fit into a connector cavity beyond the insulation wings (grips) or at a force 1.5 times the normal insertion force, 15N, or the column strength of the largest applicable wire size, whichever is greater.	Delphi		
2b	Connector	Connector Family designs indexing	Connector Family design should have an index to differentiate physically between each connector part number within Connector family or series.	Delphi		
3b	Connector	Open access for wire/terminal assembly	Connector should have open access for Terminal/Wire assembly. Example: Lever should not be obstructing terminal/wire plugging area.	Delphi		
4b	Connector	Peripheral Seal retention on Connector	Design connectors with a shroud to completely protect seals and connector seal surfaces. Design connectors with a seal retaining feature so it prevents "handing" rollers or excessive movement of the peripheral seal during mating, un-mating connectors and connection handling overall.	USCAR 12, C.5 & 6		
5b	Connector	Retention of Blocked cavities on Connector	Blocked cavities on connector should support 30N min applied directly to the cavity. No damage or plastic removal should occur.	Delphi		
10b	Connector	Connector to Connector mating force (with all contacts installed)	75 N Max or Acceptance criteria defined on USCAR25 Table 4.1	USCAR 25		
11b	Connector	Connector to Connector Un-mating force	110 N Min with locks (lever) enable except CPA	5.4.2		
12b	Connector	Connector (or Housing) to Connector Mis-mated Prevention test.	The connection system must withstand either a minimum mis-mating force of 150 N or 3 times the normal connector to connector mating force (with all contacts installed)	5.4.4		
20b	Connector	Cavities Terminal insertion direction	Provide all cavities in the same direction of terminal insertion. If not, terminal and connector cavity should avoid attempt to plug on any incorrect orientation	Delphi		
21b	Connector	Terminal Forward Stop	Must provide a terminal forward stop that supports a force of 50N minimum on the biggest wire size buckles.	5.4.1		
22b	Connector	Access for Electrical test	Provide access for the harness future continuity probe in the connector housing assembly. Access must locate correct final position and orientation of terminal into connector cavity. If there is particular requirement for Electrical Test of the connection, supplier must provide all related information to Delphi.	USCAR 12, E.14		
30b	Connector	Housing Inserting force	24N Max	Honda HES D 3217-99A		
31b	Connector	Housing Retention force	49N Min	Honda HES D 3217-99A		

40b	Connector	Connector Cavity Identification	Connector should have cavities identified (starting and end point of cavity rows)	USCAR 12, Q2 Delphi		
1c	Cavity Plug	Connector Cavity Plug insertion	Cavity Plug should be assembled with a force of 20N Max (by hand or with a manual tool)	Delphi		
1d	Locks	PLR detect/correct Unseated Terminals	The TPA/PLR or Secondary Lock must not seat in its final position with an unseated terminal(s). Note: Close PLR/TPA or Secondary Lock by adding 40 Newton to the maximum force required to seat the device when all the terminals are located properly. The minimum force is 40 Newton for ≥ 1.5 Terminal size and 60 Newton for < 1.5 terminal size as apply.	5.4.9		
2d	Locks	Cavity damage susceptibility (after closing secondary lock with unseated terminal)	Terminal extraction force with secondary lock should meet Delphi specifications after attempting to close a secondary lock with unseated terminal(s). Note: Remove the force applied to secondary lock on test 1d and seat the terminal in its normal position, seat the secondary lock and verify that terminal retention meets the specifications 10a thru 18a.	5.4.9		
10d	Locks	PLR/TPA Insertion force (from pre-stage to lock)	60N Max with terminals installed	5.4.5.4		
11d	Locks		15N Min without terminals installed	5.4.5.4		
12d	Locks	TPA Insertion force (from insert to lock)	60N Max with all terminals installed	5.4.5.4		
13d	Locks	PLR/TPA Extraction force (remove from pre-stage)	25N Min	5.4.5.4		
14d	Locks		60N Max (with terminals installed in all available cavities) 18N Min	5.4.5.4		
15d	Locks	PLR/TPA extraction force (from lock to pre-stage)	18N Min after initial removal	5.4.5.4		
20d	Locks	Insertion force PLR/TPA with one or more incorrectly oriented terminals assembled	The TPA/PLR or Secondary Lock must not seat in its final position with an unseated terminal(s). Note: Close PLR/TPA or Secondary Lock by adding 40 Newton to the maximum force required to seat the device when all the terminals are located properly. The minimum force is 40 Newton for ≥ 1.5 Terminal size and 60 Newton for < 1.5 terminal size as apply.	5.4.9		
30d	Locks	CPA Insertion force (insert to lock position)	60N Min (w/connector un-mated) 22N max w/connector mated (force pl. CPA)	5.4.5.4		
31d	Locks	CPA Insertion force (pre-stage to lock position)	60N Min (w/connector un-mated) 22N max w/connector mated	5.4.5.4		
32d	Locks	CPA extraction force (lock to pre-stage position)	10N Min; 30N Max	5.4.5.4		
33d	Locks	CPA extraction force (from pre-stage position)	60N Min.	5.4.5.4		
40d	Locks	Lever retention force on pre-stage (shipping position)	Force to maintain on pre-stage (shipping) position, 50N Min	5.4.5.4		
41d	Locks	Lever insertion force from pre-stage (shipping) to final stage (lock)	If the Maximum Assembly Force is:	Then the Minimum Contact Area must be at least:	Typical Operator Hand Posture During Assembly:	USCAR 25
42d	Locks		<22N	Non minimum requirement	One-finger press	USCAR 25
43d	Locks		≤45N	10mm x 20mm	thumb/2 or more fingers press	USCAR 25
43d	Locks		≤75N	10mm x 35mm	Two thumbs or palm/heel of hand press	USCAR 25
50d	Locks	Secondary Lock (TPA, PLR, etc.) should not overlaps with terminal when terminal is at final assembled position into Connector	Should not overlap	Delphi		
1e	General	Components (with positive retention force, like Connector Clips, Cover, etc.) Insertion force	60N Max	5.4.5.4		
2e	General	Components (with positive retention force, like Connector Clips, Cover, etc.) Retention force	110N Min	5.4.5.4		
3e	General	Connection drop Test	Test 10 connection system, 3 times each one with parts except cable and terminals. Drop from a 1m distance the connector to a hard surface, change orientation to expose all parts. The device under test must not show any evidence of deterioration, cracks, deformities, etc. that could affect their functionality. This test evaluates the ability of the connection to withstand impact due to dropping on a hard surface.	5.4.8		
4e	General	Components attached to connector should have a Contrasting color	Attached parts to connector (Connector seal, secondary locks, PLR, CPA, Matt seal, Cable seal, etc.) should have a contrasting color to the connector	USCAR 12, E, F		
5e	General	All connection systems parts should be free from defects.	Mechanical Performance Exterior shall be free from detrimental cracking, rust, play, flex, deformation, flash and/or other defects; this prior and during usage.	Delphi		
6e	General	Service an Repair	Connection systems components should be serviceable and repairable without functional damage	Delphi		
7e	General	Components requiring assembly to Connector, incorrect orientation prevention test.	All components requiring assembly to connector (like Cover, TPA, Clip, CPA, Lever, Housing, etc.) shall not be incorrectly assembled (incorrect orientation) by hand or minimum mis-mating force of 150 N or 3 times the normal assembly force. This is NOT applicable for symmetrical designs.	Delphi		
1f	Testing	Equipment capability of providing a constant Velocity	50mm/min	Delphi		
2f	Testing	Accuracy of measurement	±0.05%	Delphi		
3f	Testing	Tolerance for all tests	±10%	Delphi		

Notes:
Red & Bold Text denotes changes compared with previous Revision Date
USCAR can be used as reference on how to perform each test.
SAE/USCAR-25 Revision 5 November 2007
SAE/USCAR-12
SAE/USCAR-25 Revision 1 September 2008
Honda HES D 3217-99A Rev 2

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DR	DATE
DIAZ, JUAN J	20JUN11
DIAZ, JUAN J	20JUN11
ENRIQUEZ PUENTES, JORGE	20JUN11
APVD3:	
APVD4:	
APVD5:	

SUBSTANCES OF CONCERN AND RECYCLED CONTENT PER DELPHI -A 10949001	
MATERIAL:	SEE DWG
DRAWING NAME:	TAXI CONN 2 F 2.8 APEX
DRAWING NUMBER:	13535828
SIZE:	A0
SCALE:	NONE
FRAME NO:	1 OF 1
SHEET NO:	3 OF 3
STG:	R
REV:	06
N/P:	---

DWG TYPE: PART DRAWING
STYLE: N/A
VOLUME (CM3): N/A
DISTR CODE: D
AutoCAD

X-ON Electronics

Largest Supplier of Electrical and Electronic Components

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