

MITSUBISHI
4/6/2005
LETTER TO ODI
ATTACHMENT
DOCUMENT NO. 1 - 12
PART 2 OF 4

* : M: Meeting Minutes, R: Report, D: Document

No.	TYPE	Document Date	Created by	Title	Content
1	D	04/27/01	AMP	Sending 3 pole shield base connector data (E-mail correspondence)	Information from supplier regarding female terminal gap control valves and contact loading rates when wiggle.
2	D	04/27/01	Yagaki	Head Lamp Connector Table	Results of test conducted at Yagaki to compare connectors manufactured by AMP and Yazaki
3	M	04/27/01	MMC	Meeting minutes : J881-B071	Meeting minutes of 1st meeting with supplier regarding information obtained from market with respect to connector melting damage
4	M	05/12/01	MMC	Meeting minutes : J881-B078	Meeting minutes for 2nd meeting conducted with supplier to try and clarify cause
5	M	05/15/01	MMC	Meeting minutes : XL16-180049	Meeting minutes for 3rd meeting conducted with supplier regarding measurement results for recovered parts
6	R	05/15/01	Yazaki	Investigate whether harness manufacturing mistake is root cause of head lamp melting	Results of investigation into terminal clamp control at harness supplier manufacturing plant. Checking standards met at all control points according to random sample inspections.
7	D	05/16/01	Yazaki	H/Lamp connector terminal picture	Exterior pictures of terminals from recovered parts with melting damage
8	D	05/17/01	Yazaki	Head Lamp Connector melt part-wire cross section confirmation	Confirmation results for checking portion of recovered parts with melting damage. Checking portion is not the cause of melting damage.
9	R	05/17/01	MMC	Draft protocol for Headlamp Temperature Measurement Test Method	Draft temperature measurement test method when lamps illuminated to clarify cause of terminal temperature increases after terminal wiggle
10	R	06/08/01	MMC	Investigation of Temperature around Head Lamp for Other MMC Vehicles	Atmospheric temperature measurements from around headlamps at idle and driving for other MMC-manufactured models.
11	M	06/18/01	MMC	Meeting minutes : XL10-180185	Meeting minutes for 4th meeting conducted with supplier to discuss results of investigation into terminal gap when the connector is wiggle and then connected. Compared to the ST41 connector fitting operation, the workability of the ST245 lamp base is more difficult since one has to bend their arm.
12	R	06/07/01	MMC	Investigation of Temperature around P45 Head Lamp	Results of investigation into temperature around headlamps for P45 (Montano Sport) since ST248/41 uses the same connector. Idling test conducted under unusually severe conditions whereby lamps left illuminated for 30 or 40 minutes after being driven at high speed. Accordingly, measured temperature data values are for comparison and reference.
13	M	06/31/01	MMC	Meeting minutes : J901-B061	Meeting minutes for 5th meeting conducted with supplier to clarify cause
14	R	06/31/01	Yazaki	MMMA Headlamp Connector Melting Damage Report	Results of investigation into terminal clamp control at harness supplier manufacturing plant.
15	R	05/22/01	Yagaki	Investigation of parts recovered from market	Results of investigation parts recovered from market
16	R	05/31/01	Yagaki	Investigation Report related to MMMA Headlamp connector melt	Thermal stress relaxation test results from Yagaki for connector samples manufactured by AMP
17	R	05/31/01	MMC	Comparison of Temperature around Headlamps with Other Vehicles	Results for temperatures measured around headlamps from other models taking into account potential secondary factors in terminal temperature increases for ST246/25. Idling test conducted under unusually severe conditions whereby lamps left illuminated for 30 or 40 minutes after being driven at high speed. Accordingly, the measured data values are for comparison purposes and reference.
18	R	05/28/01	Yazaki	Head Lamp Connector Terminal Wiggle Confirmation Test on Actual vehicles	Test results to see if terminal wiggle by vibrating on actual vehicles. In order to investigate difference by bulb and connector, the temperature increase values at headlamp base compared for each vehicle on bench when temperature stored. Accordingly, measured temperature data values are for comparison and reference.
19	R	05/28/01	Yazaki	Investigation of Temperature around Head Lamp	List summarizing comparison between ST243 and other models in-use as well as temperature measurement results from bench.
20	R	05/31/01	MMC	Investigation of Headlamp Connector Temperatures	Idling test conducted under unusually severe conditions whereby lamps left illuminated for 30 or 40 minutes after being driven at high speed. Measured temperature data values are for comparison purposes and reference.
21	R	06/30/01	Shanley	H82 Bulb Temperature Measurement Result	Results for bulb temperature measurements from bench. Idling test conducted under unusually severe conditions whereby lamps left illuminated for 30 or 40 minutes after being driven at high speed, which in measured temperature data values are for comparison purposes and reference.
22	D	06/31/01	MMC	Engine Room Various Vehicle Temperature Investigation	List summarizing atmospheric temperatures around the headlamp at idle as well as according an idling for each model when ambient temperatures constant at 40°C. Accordingly, the measured temperature data values are for reference.
23	R	06/31/01	MMC	ST245/ST41 head lamp problems per month	Graph of number of cases of connector melting by month for ST24/41 from Mitsubishi R&D of America
24	D	05/31/01	MR40	Apparatus analysis per month	Results of analysis for ST245/41 monthly production
25	M	06/06/01	MMC	Meeting minutes : J901-B057	Meeting minutes for 6th meeting conducted with supplier regarding parts recovered from market for 7 cases
26	R	06/08/01	MMC	Result of overtop head LP H/L&L simultaneous ON test at vehicle	Results of measurement for lamp terminal temperatures under abusive condition whereby both H and L headlamps are illuminated at the same time
27	D	06/26/01	Yazaki	Head Lamp connector Q test(AMP) sample longevity analysis by Yazaki	Results from longevity analysis when connector manufactured by AMP is wiggle and then connected
28	M	06/27/01	MMC	Request to Process Pre-Production EO for ST41/24/25 Head Light connector BODY ST24 Headlight wire harness investigation	Local communication regarding design change
29	R	07/31/01	MRDA	Investigation	Results of investigation into regular vehicle conducted by Mitsubishi R&D of America
30	M	06/26/01	MMC	Meeting Minutes 01-June Monthly Quality Meeting	Meeting minutes from Monthly Quality Meeting in June 2001 (summarizes past investigation results)
31	M	07/23/01	MMC	Meeting Minutes 01-July Monthly Quality Meeting	Meeting minutes from Monthly Quality Meeting in July 2001 (summarizes past investigation results)
32	D	03/28/05	MMC	ST245/ST41/41 front light related wiring diagram	Wiring diagram for front light (head lamp, turn signal, stop and side marker lamp) and structure illustration for these lamps
33	R	03/30/05	Yagaki	Graph relating head lamp temperature to terminal resistance	It shows the relation between the terminal resistance of the head lamp, voltage ON duration or terminal resistance increment based on the terminal temperature on the reproduction bench test.
34	R	04/01/05	MMC	ST245 Head Lamp connector failure mode confirmation	This is test that confirmed the failure mode after melting and reproduced headlamp connector melting damage on bench by using a wiggle connector. It was also confirmed that fire does not occur at the connector and/or the parts surrounding the connector.

Document No. 1

From : Sukeyoshi Nakashima, MMC Date:01/4/27 18:08
 Transfer to: Yuji Kamiya, Yuji Tozuka, Minoru Tatemoto,
 Title: Sending 8 pole shield beam connector data

Body of letter:

This is Isobata from Tyco electronics AMP.

Here is the report of investigation for your question.

(1) Possibility of trial forming the anti-heat terminal material:

Currently the production is in Shizuoka Prefecture (Japan). After the study, it turned out to be possible by adjusting the dimension due to the spring back.

We are planning to use low tin phosphorous bronze as material, but the dimension does not match, therefore, need to make from the sheet metal. It will take 8 weeks to get the material.

We will try to expedite this.

(2) Sending document (by fax separately):

Material 1 Terminal spring performance:

Gap control value: 0.54 ± 0.05 (0.49 - 0.59mm)
 Tab width recommended value: 0.76 ± 0.04 (0.72 - 0.80mm)
 Deformation: 0.18 - 0.81mm (Nominal 0.22mm)

Then,

One side contact force: 880 - 1820g

Overall (both side) contact force: 1720 - 3640g

Limit of maximum gap on design is 0.72mm. (If the tab width is minimum, it may be zero contact force)

The contact force will be 400g at 0.70mm Gap vs 0.76mm Tab. The contact force marginal value will be 400g and if it will be less than this, it will be in the risky range.

With the wiggling test: Initial: 0.51 - 0.55mm (Gap dimension)

1 time wiggle: 0.61 - 0.64mm

50 time wiggle: 0.68 - 0.78mm

The total electrical resistance (including cramping portion) for 0.70mm is $2m\Omega$ (Initial),

Then the resistance may be unstable if the gap is extended more than this.

Material 2 - Temperature raise

Material 2-1 - Permissive current

Material 3 - Tab dimension

Material 4 - Terminal pull out force (for several type)

Material 4-1, 4-2 - Data,

Material 4-3, 4 Brass tab insertion force, summary

Material 5 Wiggling test, Initial, First, 50 times data

We will fax these. We would appreciate that. (The faxes does not exist in our file)

Document No.2

ヘッドランプコネクタ一覧表
Head Lamp Connector Table

メーカー Car Manufacturer		MMC 7113126	TOYOTA トヨタ 7113126	NISSAN 日産	MAZDA マツダ
製造メーカー Connector Supplier		AMP	Terminal ターミナル-住友-Sumitomo Housing ハウジング-矢崎-Yazaki	矢崎 Yazaki	矢崎 Yazaki
矢崎品番 Yazaki Part No.	ターミナル	7118-3211, -3212	7118-5330	7118-3400-02	7118-3402-02, -3403
	ハウジング	7123-3230-30	7125-3230-30	7123-3233-30	7123-3234-30
形状 Shape					
	部品点数 Component Qty	1	1	1	1
	材質・板厚 Plate	Brass 黄銅, t=0.32 Snめっき Tin Plate	Brass 黄銅, t=0.4 無し No Plate	Copper Alloy 銅合金, t=0.4 Snめっき Tin Plate	Copper Alloy 銅合金, t=0.4 Snめっき Tin Plate
構成 Structure					
	ハウジング Housing	66ナイロン 66 Nylon	66ナイロン 66 Nylon	PBT	PBT
材質 Material	カバー Cover	—	PP	—	—

発行
2001.4.27
株式会社

P製子

→挿入方向
Insertion



双端子打ち出し部 Oマップ



有り(2) With	106.6	98.0	162.7	132.4		C99-AA-2
---------------	-------	------	-------	-------	--	----------

無し	109.8	103.7	165.1	149.4		C99-AA-2
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有り
With

有り(1) With	107.1	97.8	148.0	117.2	<ul style="list-style-type: none"> ・O検出量少ない。Little oxide ・振動少ない。Little vibration 	C99-AA-2
---------------	-------	------	-------	-------	--	----------

→挿入方向
Insertion



双端子打ち出し部 Oマップ

有り(2) With	106.8	97.5	159.2	132.4		C99-AA-25
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無し	104.5	100.4	149.2	134.8		C99-AA-25
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無し
W/o

有り(1) With	108.5	100.9	119.4	111.3	<ul style="list-style-type: none"> ・Oが若干検出された。Little oxide 但し、試験中の温度上昇は、低い為、正常な接触であると考える。 ・振動少ない 	C99-AA-25
---------------	-------	-------	-------	-------	---	-----------

挿入方向
Insertion



双端子インデント部 Oマップ

有り(2) With	109.6	102.0	116.0	108.3		C99-AA-29
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無し	108.6	103.4	120.4	115.8		C99-AA-29
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有り
With

有り(1) With	104.7	96.8	154.4	117.8	<ul style="list-style-type: none"> ・O検出量少ない。Little oxide ・振動少ない。Little vibration 	C99-AA-29
---------------	-------	------	-------	-------	--	-----------

挿入方向
Insertion



双端子インデント部 Oマップ

有り(2) With	105.7	99.6	162.0	109.3		C99-AA-29
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無し	108.5	102.6	153.8	118.1	・無垢面に茶褐色の部分が見られる。	C99-AA-29
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P製子

Document No. 3

Meeting Minutes : Document Number J801-B071

Approved by: Interior Design Dept. Mr. Nakajima Manager

Created: 01.4.27 Electrical System Design Gr. Mr. Tozuka

Location : Design main building Lobby

< Meeting Minutes regarding MMNA ST Headlamp Connector Melting Damage >

Study Results Summary: obtained PQR for the concerned connector melting damage, had meeting with supplier in order to obtain detailed connector information

1. Connector for MMC: made from 66 nylon, Terminal: Brass +tin plating, Faston design
(Nissan's Connector: PBT, Terminal: copper alloy (no plating), hair pin spring design)
2. Yazaki Corp. conducted melting damage reproduction testing (AMP manufactured, Yazaki Corp. manufactured, grease/no grease)
AMP manufactured with no grease had temperatures increase to approximately 170°C
(connector does not experience thermal deformation at this temperature)
Contact force lower limit for Brass +tin plate terminal was 0.8kgf/m² (at about 120°C)
←→In MMC Electronics Testing, degree of temperature difference between 111°C+actual vehicle
3. Connector melting damage (past FTAs for other vehicles refer to attachment)
 - Terminal gap widens (due to wiggling, etc.) resistance increases
 - Thermal stress relaxation percentage does not reach 100% with Brass, but reduce contact force.
4. Test Results of MMC Electronics Testing: (on board temperature increase test and electrical resistance measurements of the system) refer to attached mail
5. Future Steps
 - 1) Send lamp parts from MMC, Yazaki Corp conducts bench reproduction test, limit test (1 week from obtaining parts)
 - 2) Obtain actual problem parts (already requested by MRDA to PSC)
 - 3) Terminal fabrication investigation, measurements for contact force changes when abusive wiggling, connector type change schedule, etc.
 - 4) Temperature effect countermeasure for Bulb, harness (Body Exterior Design, Electrical System Design)
 - 5) Future prevention, summary

<MMNA ST Series Headlamp Connector Melting Damage Meeting>

01/4/27

1. Problem explanation, improvement request to Yazaki Corp.

More contacts for connector melting damage than before, but no reaction with respect to this

Action to handle problem information at Yazaki seems slow. Action such as sample acquisition from Philippine factory, problem parts collection, FTA, desire contact resistance analysis, to proceed expeditiously without waiting for MMC action, is requested.

2. Yazaki Corp. Report (refer to attachment)

	MMC	Toyota	Nissan (Mazda)
Housing :	66 Nylon	66 Nylon	PBT
Terminal :	Brass	←	copper alloy
	Faston design	Generally Faston design?	
		Weak for high temp or wiggling?	

3. Yazaki Corp. Reproduction Test (attachment)

- Grease keeps oxidation lower and is effective in reducing temperature
- Grease may reduce the insertion force

In the case of tin plating, necessary contact force is 600 to 700gf → thermal stress relaxation percentage 70%

The connector used by MMC has around 120°C (Brass) upper limit (=70%=600 to 700gf)

In Electronics Testing Gr. test. 111°C (+Arizona 60°C) ⇒ 171°C

4. Connector melting damage (FTA created in 98)

- 1) Resistance increases due to enlarged gap (from connect & disconnect, etc.)

Specification : 0.5~0.55

In terms of design believe the same requirements at every 3-terminal location (Lo, Hi, Com) (Yazaki Corp.)

- 2) Thermal stress relaxation 100% (gap and contact pressure 0)
does not make gap(=space)

Melting Damage Temperature

- Thermal deformation start temperature
PBT: 170°C or more , 66 nylon (AMP connector) : 200°C or more
- Ignition temperature

PBT : ____ °C , 66 nylon: ____ °C

Probability as of today:

Enlargement of Gap by connector wiggling ⇒ Temperature increase at contact (terminal portion) ⇒ Coating melt causes short spark ⇒ melting damage?

Nissan Information

Around May 1998 (?), separation wall and lock change added to connector ⇒ after which Nissan also changed the terminal

5. MMC Test Results (outside air temperature 20°C, measured at engine off and Head light Lo)

	ST41	ST28	CK	Camry
Connector	111°C	97°C	86°C	89°C
Bulb Body	134°C	130°C	112°C	115°C

⇒ Under normal conditions, lamp heat does not reach melting temperatures//

Future Steps

1. Yazaki Corp. bench test both AMP and Yazaki types (apply vibration, reproduce non-illumination conditions)

(Taking changes to Nissan type into consideration)

- Supply bulb and lamp assembly to Yazaki (arrange for only representative samples)
- Conduct limit test

Terminal deformation at Yazaki electrical conductivity check... Factory detail process to be reported

Data available for contact force relaxation . . . report for gap detail process control

Cramping portion seems no problem from MMC resistance data

Contact force change when repeatedly inserting and taking off is done

Report on contact force change for abusive wiggling of Yazaki NQ terminal

2. Connector Type Change Schedule (approximate cost +1 yen/unit)

Proceed with drawing preparation (Yazaki Corp.)

3. Countermeasure for reducing bulb temperature (Body Exterior Design)

4. Acquisit problem parts (PSC→MRDA)

5. Send problem information (MMC→Yazaki Corp.)

6. As a recurrence prevention, study from both harness and lamp side (MMC)

★電圧降下法での測定

Y-R/B

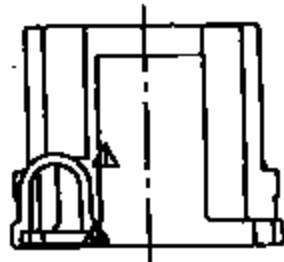
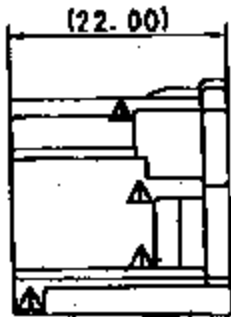
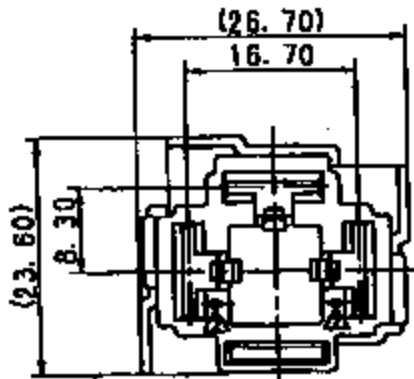
丹羽・坂本

H/LP Hi-Lo 4kV 3A の
電流を流し、各端子 (ピン) 間の
電圧を測定。

接触抵抗 = $\frac{\text{端子間電圧}}{\text{電流 3A}}$

	75-7	120-	松山 (MΩ)
	COM	H3-	LO
1	(8.0) 5	(3.9) 3.1	(7.5) 9.1
2	(5.7) 4.1	(3.3) 2.7	(8.4) 6.1
3	(3.8) 3.5	(3.4) 3.2	(8.2) 6.0
4	(4.1) 4.5	(3.2) 3.2	(7.4) 4.8
5	4.7	3.1	5.5
6	3.9	2.9	4.5
7	4.5	2.5	4.0
8	3.7	2.4	3.2
9	3.4	2.4	4.3
10	4.0	2.9	3.9
11	3.9	2.4	4.6
12	5.0	2.3	4.7
13	3.2	2.3	4.1
14	4.4	2.3	4.5
15	3.1	2.6	6.1
16	4.4	2.4	3.9
17	3.1	2.4	6.4
18	3.8	2.3	5.2
19	3.7	2.2	4.7
20	3.6	2.4	6.2
Average	4.0	2.6	5.1

PART NO. AND CH. CODE	COLOR
7125-3236	NATURAL
△ 7125-3236-30	BLACK
7125-3236-40	LIGHT GRAY
△ 7125-3236-80	BROWN



注意

- 1. 適用規格: 7116-5330
- 2. 適用カバー: 7157-4128 ETC.

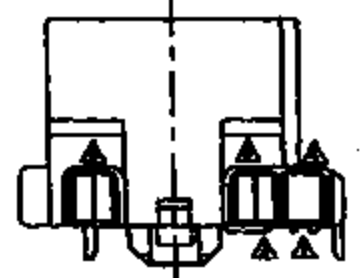
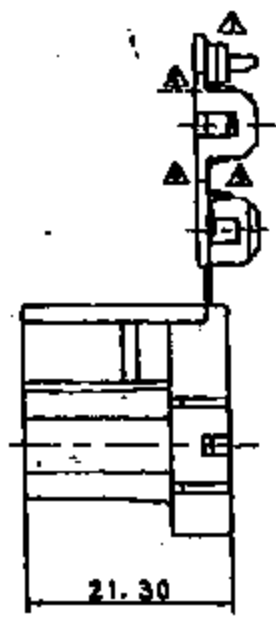
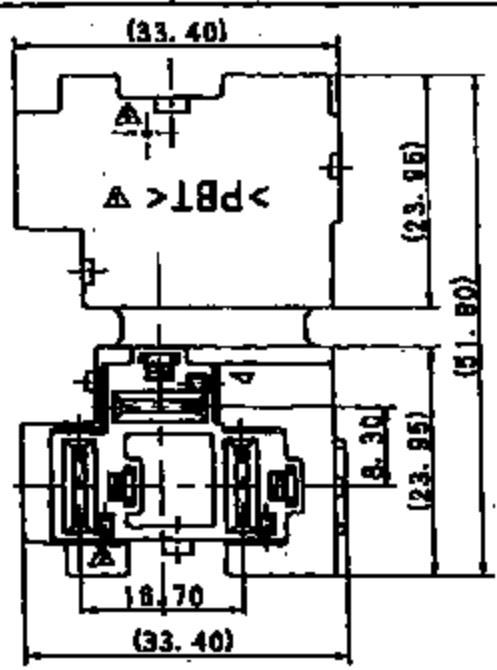
NOTES

- 1. APPLICABLE TERMINAL NO.: 7116-5330
- 2. APPLICABLE COVER NO.: 7157-4128 ETC.

下

ISSUE MARK

REV	DATE	REVISION RECORD	NO.	CHKD	VENDOR	NATL. SPEC.	PAGE	TREAT. & FIN.	NAME					
△	99.05.28	ADDED COLOR NO.	C99-L794	T. M	CUSTOMER				HEAD LAMP CONNECTOR HOUSING 3P					
△	99.05.07	CORRECT ALL ERRORS	C98-MQ21	T. M	CUSTOMER PART NO.									
△	98.08.17	CHANGED FORM	C98-H333	T. M					7125-3236 ETC.					
△	98.03.18	NEW	C98-L443	N. Y	OFFICE					7125-3236:R				
LET	DATE	REVISION RECORD	NO.	CHKD	VENDOR				SET DWG NO.					
GENERAL TOLERANCE						YAZAKI CORPORATION								
10MAX	50MAX	100MAX	250MAX	500Vφ	ANGLE	ECCENT	DWG TYPE	DWG SOURCE	DWG DATE	UNIT	SCL	ANGLE	PART NO. CH. CODE	SET DWG NO.
A	±0.15	±0.2	±0.3	±0.5	±0.75	±30'	0.1	8	NEW	99.03.19	7/1	3	7125-3236 ETC.	
B	±0.2	±0.3	±0.55	±0.95	±1.4	±30'	0.1	APPROVED	CHECKED	CHECKED	DESIGN	DRAWN	7125-3236:R	
(C)	±0.3	±0.5	±0.8	±1.4	±2	±30'	0.15	承認	川梨	三輪	TANISHITA	S. KUYOU		
SPECIFIED						99.06.11				99.05.10	99.06.04	98.02.18	99.05.28	

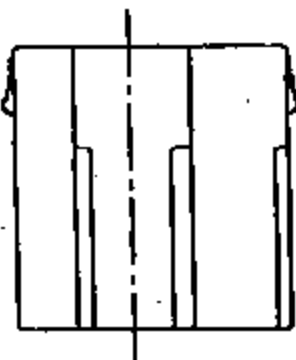


△ I. NUMBER : 7116-3400-00 ETC.

NOTE
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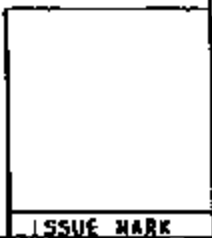
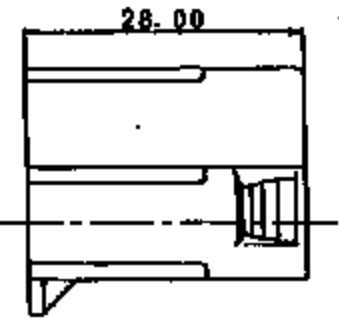
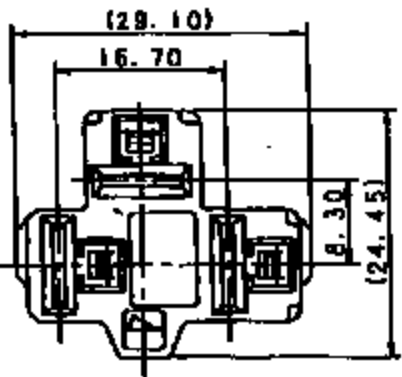
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△ 00.10.04	CHANGED FORM.	C80-7121	N. Y	CUSTOMER PART NO.		NAME NO TYPE CONNECTOR HOUSING	
△ 00.04.00	CHANGED FORM.	C80-1472	N. Y	CUSTOMER DWG NO.		FEMALE	
00.01.21	NEW	C80-8438	N. Y	TRIAL PART NO.			
LET. DATE	REVISION RECORD NO.	NO.	CHKD	VENDOR			
GENERAL TOLERANCE				VENDOR NO.			
A	±0.15	±0.2	±0.3	±0.5	±0.75	±0.0	±0.0
B	±0.2	±0.3	±0.5	±0.75	±1.4	±0.0	±0.0
∅	±0.3	±0.5	±0.8	±1.4	±2	±0.0	±0.0
SPECIFIED				MASS			
DWG TYPE		DWG SOURCE		DWG DATE		UNIT	
R		NEW		00.01.21		77.770 2/1 3	
APPROVER		CHECKER		CHECKED		DESIGN	
H		—		H. YAMAMOTO		木村	
00.01.19		00.01.08		00.01.21		00.01.08	
PART NO. 7123-3233-30. E				SET DWG NO.			
DWG NO. 7123-3233-30:R				YAZAKI CORPORATION			

PART NO. AND CH. CODE	COLOR
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7123-3234-30	BLACK

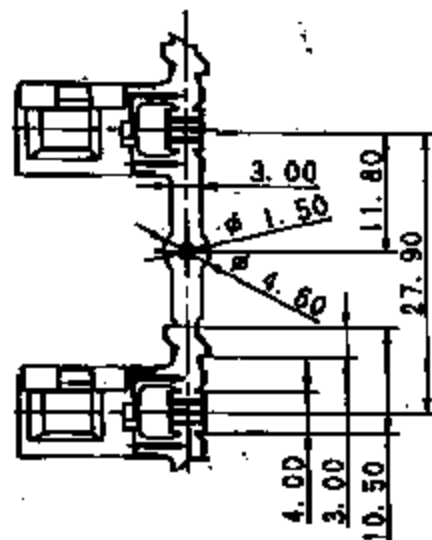
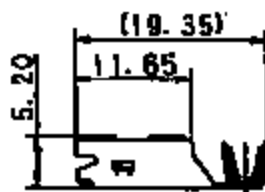
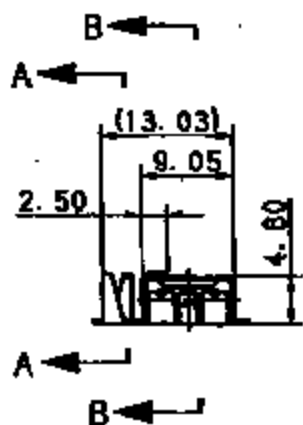
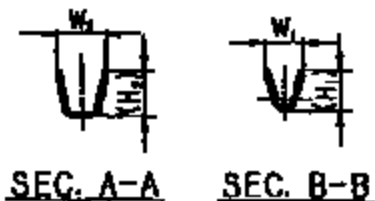


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NOTE
1. APPLICABLE TERMINAL NO.: 7116-3402-02 ETC.



				CUSTOMER				MATERIAL				TREAT.							
				CUSTOMER PART NO.				SPEC.				PBT				& FIN.			
98.11.17				NEW				C99-8685				S. K. OFFICE				TOTAL PART NO.			
LET DATE				REVISION RECORD				NO. CHG				VENDOR				NAME HEAD LAMP CONNECTOR HOUSING			
				GENERAL TOLERANCE				VENDOR NO.				FEMALE							
	10MAX	50MAX	100MAX	250MAX	2500V	ANGLE	ECCENT	QWG TYPE	QWG SOURCE	QWG DATE	UNIT	SC1	ANGLE	PART NO.	7123-3234 ETC.				
A	±0.15	±0.2	±0.3	±0.5	±0.75	±30°	0.1	B	NEW	98.11.17	mm	2/1	3	CH. CODE					
B	±0.2	±0.3	±0.55	±0.95	±1.4	±30°	0.1	APPROVED	CHECKED	CHECKED	DESIGN	DRAWN	QWG NO.	7123-3234-R					
(C)	±0.3	±0.5	±0.8	±1.4	±2	±30°	0.15	加藤	加藤	経	S. KODAMA	SUGAWARA	SET QWG NO.						
SPECIFIED				MASS								YAZAKI CORPORATION							
								98.11.18				98.06.23							



PART NO. AND CH. CODE	W	H	(H ₁)	(H ₂)	WIRE SIZE
7116-3400-02	2.90	4.00	2.90	4.00	CAVUS 0.5-AVS 0.85
7116-3401-02	3.65	4.60	3.85	4.60	CAVUS 1.25-AVS 2

2 2

1. 適用ハウジング品番: 7123-3233-30

NOTE

1. APPLICABLE HOUSING NO. : 7123-3233-30

ISSUE MARK

				CUSTOMER		MATERIAL: COPPER ALLOY		TREAT.		
				CUSTOMER PART NO.		SPEC: I=0.40 (TIN PLATING & FIN.)				
				CUSTOMER DWG NO.		NAME		NO TYPE TERMINAL FEMALE		
08.12.20	NEW	C98-M450	H.Y	OFFICE	TRIAL PART NO.					
LET	DATE	REVISION RECORD	NO	CHKD	YENDOR					
GENERAL TOLERANCE										
	10MAX	50MAX	100MAX	250MAX	2500V	ANGLE	ECCENT	DWG TYPE	DWG SOURCE	
A	±0.15	±0.2	±0.3	±0.5	±0.75	±30'	0.1	8	NEW	
B	±0.2	±0.3	±0.55	±0.95	±1.4	±30'	0.1	APPROVED	CHECKED	
(C)	±0.3	±0.5	±0.8	±1.4	±2	±30'	0.15			
SPECIFIED							MASS			
				87.12.23		87.12.21	88.08.08	88.12.20		
						H. YANAMOTO	MIYAZAKI	7116-3400-02 ETC.		
								7116-3400-02:R		
						YAZAKI CORPORATION				

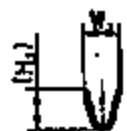
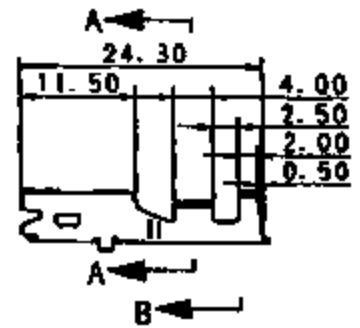
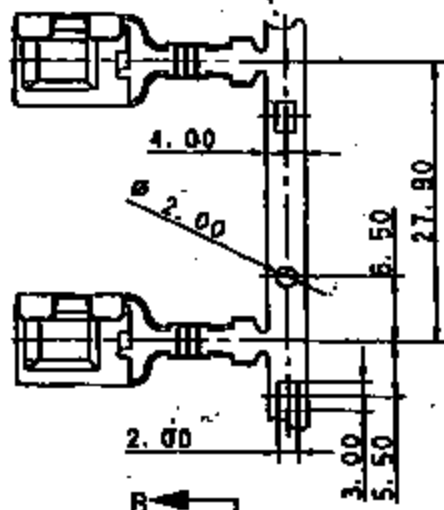
PART NO. AND CH. CODE	W ₁	W ₂	H ₁	H ₂	WIRE SIZE
7116-3402-02	2.80	3.70	2.90	4.10	CAVUS 0.5-AVS 0.85 AVSS 0.5f-AVSS 0.75f
7116-3403-02	3.60	4.80	4.10	5.10	CAVUS 1.25-AVS 2 AVSS 1.25f-AVSS 2.0f

注

1. 適用ハウジング: 7123-3234 ETC.

NOTE

1. APPLICABLE HOUSING NO. : 7123-3234 ETC.



SEC. A-A

SEC. B-B

				CUSTOMER		MATERIAL: COPPER ALLOY		TREAT.							
				CUSTOMER PART NO.		SPEC. TIN PLATING (t=0.4μm)									
				OFFICE		NAME HEAD LAMP TERMINAL FEMALE									
				VENDOR											
				VENDOR NO.											
GENERAL TOLERANCE															
	10MAX	50MAX	100MAX	250MAX	7500V	ANGLE	ECCEN	BWG TYPE	BWG SOURCE	BWG DATE	UNIT	SCI	ANGLE	PART NO.	7116-3402-02 ETC.
A	±0.15	±0.2	±0.3	±0.5	±0.75	±30'	0.1		NEW	99.11.09	mm	2/1	3	CH. CODE	
B	±0.2	±0.3	±0.55	±0.85	±1.4	±30'	0.1	APPROVED	CHECKED	CHECKED	DESIGN	DRAWN		DMG NO.	7116-3402-02-R
C	±0.3	±0.5	±0.8	±1.4	±2	±30'	0.15				S. KODANA	SUGAWARA		SET DMG NO.	
SPECIFIED				MASS										YAZAKI CORPORATION	
				DATE											

Document No. 4

Meeting Minutes : Document Number J801-B076
 Approved by Interior Design Dept. Mr. Nakashima
 Created on 01.6.12 by Mr. Harada

<MMNA Production Vehicle Headlamp Connector>

Attendees :

Refer to attached list

Place held :

Design main building S42 Meeting Room

Contents :

The root cause could not be identified from today's study results. Thus parts recovered from the market will be checked and to clarify the cause and propose countermeasures by May 18th.

Future Steps (refer to attachment for meeting details)

- 1)312 terminal creep characteristics Yazaki Corp. schedule to be set separately
- 2)ST22 actual vehicles test Electronics Testing Gr. by 5/30
- 3)Add vehicle factors to FTA Electronics Testing Gr. by 5/30
- 4)Measure temperatures at lamp assembly for 6 models
- 5)Investigate engine room temperatures for all models Electronics Testing Gr. by 5/30
- 6)List up lamp body/bulb type for all models Body Exterior Design ~5/30
- 7)Develop test method draft based on 8) Electronics Testing Gr. by 5/18
- 8)Investigate market information (all destinations, all models) QA, by 5/30
- 9)Recover actual parts 10sets MRDA B/N→PSC, by 5/18
Japan 5/12 2 units acquainted
- 10)MMMA confirm line process Electrical System Design→MRDA B/N
Japan 5/12 information obtained

The following are the inferences drawn from the results of this meeting as well as checking samples from 2 vehicles obtained on Saturday May 12th.

- Enlargement of the terminal gap and, due to vehicle body vibration, the connector plastic and wire insulation melted
- Necessary to clarify what is the cause of terminal gap enlargement
Maintenance or external force by work operation? Deformation from heat?
Due to some chemical substance? Combined cause?

Related Documents: refer to documents distributed at meeting by Yazaki Corp. and Stanley

Remark: Expedite to find out defect mechanism

ST MMMA Headlamp Connector

01.5.11 from 13:00
At S42 Meeting Room

1. Market Problem Status MRDA-B/N

① 3 instances for ST24S returned for common ground terminal melting damage

PQR data 2000/3 } approximately 20,000 miles
2000/2 }② ST24 45/107 } headlamp connector has "melting damage"
ST41 8/30 }

2. Results of Vehicle Temperature Measurements . . . Electronics Testing Gr. documents distributed at meeting

	ST41	ST28	Toyota Camry
Lamp Term :	121°C (111)	88.5°C (97)	92.5°C (89)
Lamp Base :	147°C (134)	119.4°C (180)	117.5°C (118)

Figures in brackets () denote measurements at a fixed voltage 13.3V with engine off

⇒ Generally, ST has terminal temperatures approximately 20°C higher than Camry.

Conducted reproduction tests based on assumption of salt damage. As of today, melting damage phenomena has not occurred.

3. Bench Test Results Yazaki Corp. distributed at meeting

① Test of bulb alone

No heat dissipation difference by contact resistance. $3\text{ m}\Omega \times (5\text{A})^2 = \text{approx. } 75\text{mW}$

② Headlamp Connector

MMC,	T Corp.	N Corp.	M Corp.
Faston	Faston	box + cantilever	box + cantilever

4. FTA Analysis . . . Yazaki Corp.

Since the documents distributed at the meeting focus on the connector itself, vehicle-side factors (lamp, heat generation, heat dissipation, engine room temperature, harness heat conductivity, harness tension) will be added.

5. Bulb temperature Measurement Results . . . Stanley

Results from the same test show there is no temperature difference by manufacturer at the lamp housing.

No measurements were taken by changing the lamp housing shape.

6. Investigate terminal deformation at wiring harness manufacturing process . . . Yazaki Corp.

Issue "terminal gap enlargement prevention" check sheet, and confirming all processes.
There is an extremely low probability of oversight

7. Other Test Results

①70°C×14 days approximately 70°C temperature increase

②J41 Patrol Car headlamp connector melting damage test

- Conducting reproduction bench testing based on assumption that melting damage is by terminal gap enlargement.
- Add significant vibration to clearance between male and female, wire insulation of single electrode got melting damage
- Confirmed wire insulation melted due to intermittent short between male and female

Connector spark unconfirmed. Continue until spark.

8. Future Steps

- 1) 312 type creep characteristics Yazaki Corp, schedule to be set separately
- 2) ST22 actual vehicle test Electronics Testing Gr., by 5/30
- 3) Add vehicle body factor to FTA Electronics Testing Gr. by 5/30
- 4) Measure temperatures at lamp assembly for 6 models Yazaki Corp.
 - ST41, ST28, CK, Toppo, Dion, Chariot separate schedule
 - bulbs are GE's HB2
- 5) Investigate engine room temperatures for all models Electronics Testing Gr by 5/30
- 6) List up lamp body/hull type for all models Body Exterior Design by 5/30
- 7) Develop test method draft based on 3) Electronics Testing Gr. by 5/18
- 8) Investigate market information (all destinations, all models) QA, by 5/30
- 9) Recover actual parts 10sets MRDA B/N→PSC, by 5/18
- 10) Confirm MMMA line process Electrical System Design→MRDA B/N

Focus on differences between ST248 and ST41 by 5/18

Document No. 5

Meeting Minutes : Document Number XL15-180049

Approved by Kamiya, Tatemoto

Created on 01.5.18 by Electronics Testing Gr. Yasuhiro Sakamoto

<Yazaki Corp. Technical Center (Washizu) Business Trip Report>

Headlamp Connector Melting Damage Meeting

1. Investigation of Recovered Parts

- a. Measurement of contact resistance levels
- b. Measurement of cramping resistance
- c. Breakdown analysis (damage yes/no)
- d. Measurement of each dimension

History of Recovered Parts	
①RO: 256713	malfunction date 01.4.12
②RO : 256491	malfunction date 01.4.11

• Measurement results for wire insulation hardness

Sample: Lo terminal for recovered parts vehicle traveled 400,000km in 3 years
insertion depth (200gf loading)

4mm→185 μ m

<Reference, AVS1.25>

10mm→136 μ m

0 mm 50 μ m

16mm→162 μ m

100mm 70 μ m

500mm 90 μ m

Note : In order to investigate whether or not there was a thermal impact on the Lo terminal wiring, which passes close to the COM terminal connection with melting damage, the degree of hardness of the wire insulation was measured.

The results indicated no thermal degradation.

• Measurement Results

		Sample ①	Sample ②
Contact Resistance (Cramp portion) mΩ	COM	cannot measure (0.48)	× (1.17)
	LO	4.28(1.27)	146.8(1.07)
	Hi	9.8(0.71)	206.8(0.78)
Qualitative Analysis			
Gap Dimensions (mm) Initial 0.54±0.05	COM	A 1.40 entry B 0.85 1.08 deep	1.94 entry 0.87 1.27 deep
	Lo	0.66 0.66	0.73 0.71
	Hi	0.65 0.63	0.76 0.70

Results of Qualitative Analysis

- A : significant amount Ca, Cu, Sn ← strong possibility included
 small amount C, O, Mg, S, Cl, K, Zn ← weak possibility
- B : significant Amount Cu, Sn
 small amount C, O, Mg, Cl

Note : terminal contact resistance was measured on condition of Head lamp bulb inserted in the terminal.

Note : Gap dimensions were measured with a gap gauge
 Production management value is $0.54\text{mm} \pm 0.05$
 (bulb side terminal thickness 0.74 mm)

Future Actions

- Pursue cause for increase in contact resistance values
- ① Thermal factors or corrosion
 - Sample analysis after MMC bench test → compare with analysis results this time (Yazaki Corp.) by 5/18
 - Additional analysis for recovered parts → (Yazaki Corp.) by 5/18
 - For parts that experienced an increase in contact resistance, test by loading actual power and increase temperature → compare with nominal parts (Yazaki Corp.) by 5/18
- ② Deformation of terminal (left-right balance, front-rear balance)
 - Mitsubishi will try to reproduce with actual vehicles (connect at an angle) → after conducting test, Yazaki Corp. will investigate
 - Assess simulated connection operation for ST24, ST41 → compare AMP and Yazaki Corp. (Yazaki Corp.)
 Conduct after coordinating schedule with MMC. Target date 5/18 still being coordinated

Notes: Check actual vehicles for terminal gap enlargement with respect to twisting behavior

Preparing 100 units for connector and bulb (Yazaki, MMC Body Exterior Design)

- ③ Verify no problem with wire clamp portion
 - investigate wire compression ratio for contact cross-section
 - Check whether there is cracking at the wire clamp portion
- } by 5/18
- ④ Other
 - Breakdown analysis for terminal → open the connection and observe contact surface condition (Yazaki Corp.) by 5/18
 - Pictures taken this time will be sent addressed to Mr. Tatemoto, Manager at MMC.

Document No.6

Subject: Investigate whether harness manufacturing mistake (terminal clamping mistake) is root cause of head lamp melting (Harness supplier clamping control investigation)

Date of Issue: May 18, 2001

Report No.: N/A

Author: EMI QA Y. Takatauka

Date of Test: Unknown (close to June 8, 2001)

Test Place: EMI (Philippines)

Test Vehicle and Sample

Vehicle: Model(s): ST24S, ST41

Model Year: 01MY, 02MY

Sample: headlamp connector & wire assembly

Circuit	P/N	
	01MY	02MY
Lo, Com	7116-3212-02	7116-3355-02
Hi	7116-3211-02	7116-3355-02

Scope(s)

Investigate terminal clamp control at harness supplier manufacturing facility

Confirm terminal clamp control for both old and new parts, since terminal change made from '02 model by request from Yazaki manufacturing.

Summary of Test Conditions and Test Results

• Conclusion:

(1) The terminal clamping mistake cannot be the cause due to following reason for GND terminal melt is most severe among 3 circuit at head lamp in market

1) Same part used with other head lamp circuits (Hi, Lo)

2) Same clamping machine has been used to fix other 2 terminals

(2) The conductivity check is not by male connector, but by jig which is identical to that in the factories in Japan. Have the the actual jig being checked, no problem found.

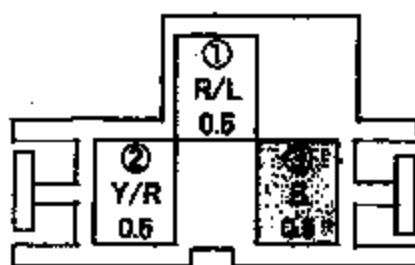
(3) This terminal cramping standard has been officially released. The recovered part C/H (cramp height), C/W (crimp width), resistance at cramp, section shape at cramp has been checked and no problem found.

• Measurements and/or Inspections:

01 model									
Terminal P/N 7116-3212-02					Terminal P/N 7116-3212-02				
Standard C/H 1.20 ~ 1.30					Standard C/H 1.20 ~ 1.30				
Standard C/W 2.30 ~ 2.50					Standard C/W 2.30 ~ 2.50				
Clamp shape B-type (no rear feet overlap)					Clamp shape B-type (no rear feet overlap)				
No	C/H	C/W	Resistance (m ohm)	Judgment	No	C/H	C/W	Resistance (m ohm)	Judgment
1	1.25	2.38	0.2	OK	1	1.26	2.37	0.4	OK
2	1.25	2.40	0.4	OK	2	1.28	2.38	0.4	OK
3	1.26	2.39	0.3	OK	3	1.25	2.40	0.3	OK
4	1.24	2.38	0.2	OK	4	1.28	2.39	0.3	OK
5	1.24	2.38	0.3	OK	5	1.26	2.41	0.3	OK
02 model									
Terminal P/N 7116-3355-02					Terminal P/N 7116-3355-02				
Standard C/H 1.20 ~ 1.30					Standard C/H 1.20 ~ 1.30				
Standard C/W 1.90 ~ 2.00					Standard C/W 1.90 ~ 2.00				
Clamp shape C-type (no rear feet overlap)					Clamp shape C-type (no rear feet overlap)				
No	C/H	C/W	Resistance (m ohm)	Judgment	No	C/H	C/W	Resistance (m ohm)	Judgment
1	1.25	1.98	0.4	OK	1	1.26	2.00	0.3	OK
2	1.25	1.98	0.3	OK	2	1.26	2.00	0.3	OK
3	1.25	1.98	0.3	OK	3	1.26	2.00	0.4	OK
4	1.24	1.98	0.2	OK	4	1.28	2.00	0.3	OK
5	1.24	1.98	0.3	OK	5	1.28	2.00	0.3	OK

Comments

1. H/Lコネクタ一覽状



購入先	AMP
購入先品番	0-177720-2
矢崎品番	7125-3135-30

コネクタキャパティ-	電線品種・サイズ	01モデル		02モデル	
		端子品番		端子品番	
穴位 NO ①③	CAVS 0.5	7116-3212-02	7116-3356-02	7116-3211-02	7116-3355-02
穴位 NO ②	CAVS 0.5	7116-3211-02	7116-3355-02	7116-3212-02	7116-3356-02

2. H/L各種測定データ

01モデル									
端子品番 7116-3212-02					端子品番 7116-3211-02				
規格値 C/H 1.20~1.30					規格値 C/H 1.20~1.30				
規格値 C/W 2.30~2.50					規格値 C/W 2.30~2.50				
加締め形状 B型(後足重なりなし)					加締め形状 B型(後足重なりなし)				
NO	C/H	C/W	抵抗値(mΩ)	判定	NO	C/H	C/W	抵抗値(mΩ)	判定
1	1.25	2.38	0.2	○	1	1.28	2.37	0.4	○
2	1.25	2.40	0.4	○	2	1.26	2.38	0.4	○
3	1.25	2.39	0.3	○	3	1.25	2.46	0.3	○
4	1.24	2.38	0.2	○	4	1.28	2.39	0.3	○
5	1.24	2.39	0.3	○	5	1.26	2.41	0.3	○

02モデル									
端子品番 7116-3356-02					端子品番 7116-3355-02				
規格値 C/H 1.20~1.30					規格値 C/H 1.20~1.30				
規格値 C/W 1.90~2.00					規格値 C/W 1.90~2.00				
加締め形状 C型(後足重なりあり)					加締め形状 C型(後足重なりあり)				
NO	C/H	C/W	抵抗値(mΩ)	判定	NO	C/H	C/W	抵抗値(mΩ)	判定
1	1.25	1.98	0.4	○	1	1.26	2.00	0.3	○
2	1.25	1.98	0.3	○	2	1.26	2.00	0.3	○
3	1.25	1.98	0.3	○	3	1.26	2.00	0.4	○
4	1.25	1.98	0.2	○	4	1.26	2.00	0.3	○
5	1.25	1.98	0.3	○	5	1.26	2.00	0.3	○

測定条件: 測定温度 20℃, 測定速度 1mm/s, 測定圧力 10N

5. 端子設計変更

01モデル		02モデル	
7116-3212-02	0.5~2.0SQ	7116-3356-02	0.5~0.85SQ
		7116-3212-02	1.25~2.0SQ
7116-3211-02	0.5~2.0SQ	7116-3355-02	0.5~0.85SQ
		7116-3211-02	1.25~2.0SQ

CHECKER FIXTURE



*Normal checker fixture
type A*

TRIAL CONTENT



*Trial # 1:
Simulate stuck-up pin of
checker fixture*

RESULT

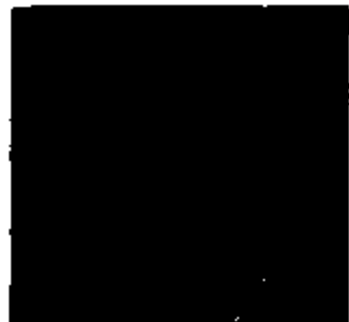


*Terminal is still good.
(Not loose)*



*Fixture with big pin
type B*

*Trial #2:
Simulate wrong insertion
of connector to checker
fixture*



*Terminal is still good.
(Not loose)*



*Positive Lock
Terminal Removal Jig*



*Trial #3
Improper use of
terminal removal jig*



*Terminal is still good.
(Not loose)*



128102

140 1012

1000

174

170 1011

48

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Document No. 7

外觀調査結果 Visual check result

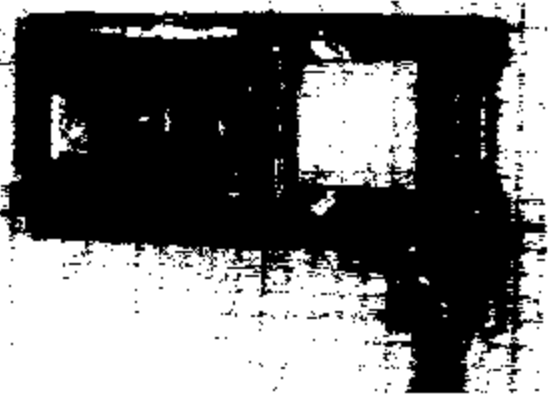
【サンプル No. 2 端子外觀】

Terminal visual picture Sample ②

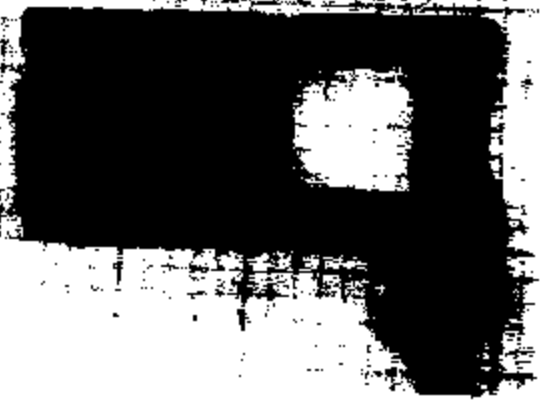
Hi端子 - Hi-terminal



Lo端子 - Lo-terminal



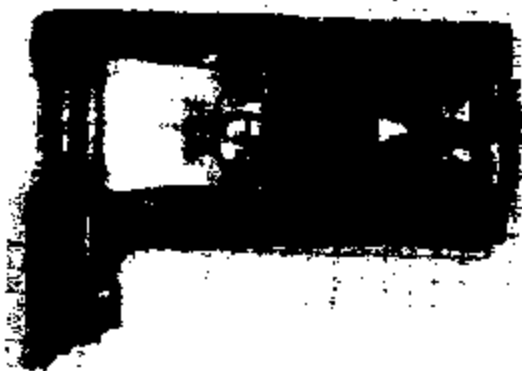
COM端子 - COM-terminal



外觀調査結果 - Visual Check Result

【サマ No.1 端子外觀】

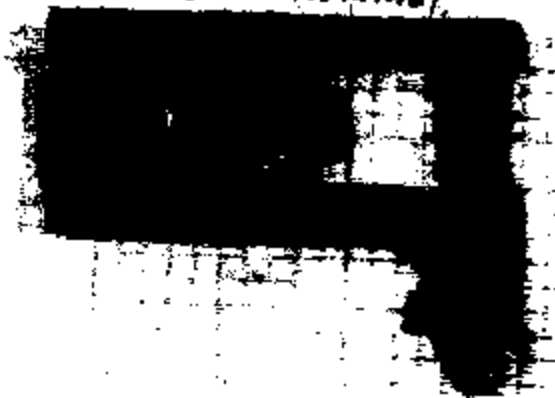
Hi端子 - Hi-Terminal Terminal / visual picture - sample ①



Lo端子 - Lo-Terminal



COM端子 - Com-Terminal



Document No. 8

W Lamp Connector Melt part Wire Clamp Section Confirmation >>
 ツドランプ用コネクタ溶接不具合品 溶接圧着部断面確認
 (端子: 7116-3211 電線: CAVS 0.5)
 Terminal Wire

01.5.17 Yaeti: Rrt
 矢崎部品課 Connector Develop D
 コネクタ開発設計(車) 接続技術部



Sample ②
 サンプル②: HI >

Measurement Result 測定結果	Clamp portion View 圧着部外観 (X11.0)				Clamp portion Front Foot Section 圧着部前足断面 (X26.6)
	Top 上面	Right side 側面(右)	Bottom 底面	Left side 側面(左)	
Front Foot H (mm) : 1.28 W (mm) : 2.41 厚 (%) : 77.2 press rate Back Foot H (mm) : 2.40 W (mm) : 3.73					

サンプル③: GOM S

Measurement Result 測定結果	Clamp portion View 圧着部外観 (X11.0)				Clamp portion Front Foot Section 圧着部前足断面 (X26.9)
	Top 上面	Right side 側面(右)	Bottom 底面	Left side 側面(左)	
Front Foot H (mm) : 1.25 W (mm) : 2.41 厚 (%) : 75.8 press rate Back Foot H (mm) : 2.38 W (mm) : 3.77					

Document No. 9

Company	Mitsubishi Motors Corporation
Subject: Draft Proposal for Headlamp Temperature Measurement Test Method (Headlamp temperature increase test) Date of Issue: May 17, 2001 Report No.: XLJ2-180688 Author: Tetemoto, Kamiya, Sakamoto Date of Test: - Test Place: -	
Test Vehicle and Sample Vehicle: Model(s): - Model Year: - Sample: -	
Scope(a) Terminal temperature increases after wiggling terminal could be the secondary cause of connector melting. Headlamp body heat radiation, engine room atmospheric temperature, harness wire diameter, connector heat conductivity are listed as potential factors in increasing temperatures. These factors are compared between ST24S, ST41, other MMC vehicles, and also other car manufacturers' vehicle.	
Summary of Test Conditions and Test Results • Conclusion: - (This documents only specifies the test method) • Measurements and/or Inspections: (1) Test Conditions ① Lamp condition: lamp body fixed ② Applied lamp voltage: 13.3V ③ Lamp mode: Lo, HI ④ Test temperature: atmospheric (room temp (windless)) (2) Measurement locations ① Headlamp bulb body temperature: 2 places ② Lamp body rear surface temperature: 4 places ③ Connector terminal temperature: 1 place each for HI, Lo, Common ④ Atmospheric temperature: 20mm behind the connector ⑤ Harness surface temperature: 1 place 50mm away from terminal clamp ⑥ Terminal contact resistance: 1 place each for HI, Lo, Common	
Comments	

Document No.10

Company	Mitsubishi Motors Corporation
Subject: Investigation of Temperature around Head Lamp for Other MMO Vehicles (Head Lamp Temperature Increase Test) Date of Issue: June 5, 2001 Report No.: XLJ2-160743 Author: Tatemoto, Inoue Date of Test: Unknown (close June 5, 2001) Test Place: MMC Okazaki	
Test Vehicle Vehicle: Model(s) and Model year: 03P45, 02Q45, 03OK45, 02KR45	
Scope(s) Investigate and compare differences in bulb terminal temperature ranges by model (P45, Q45, OK45, KR45). Bulb terminal temperature could be one of the secondary causes.	
Summary of Test Conditions and Test Results <ul style="list-style-type: none"> • Conclusion: <ul style="list-style-type: none"> (1) P45 (same connector used for ST24S and ST41) Atmospheric temperature around headlamp connector at idle: approximately 92 deg Celsius Decreased to less than 80 deg Celsius when driven (2) KR has lowest temperature around headlamp connector compared to other vehicles • Measurements and/or Inspections: <ul style="list-style-type: none"> (1) Power source Actual battery used (2) Measurement level Record stable saturated temperature by monitoring with hybrid recorder (3) Measuring condition At idle: other electrical loads off, engine room hood: closed 	
Comments	

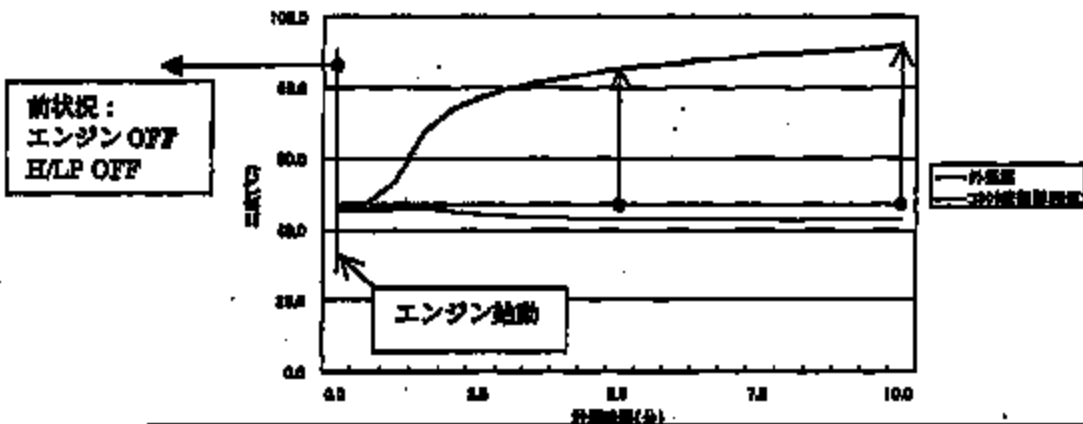
機種名
 車種
 型式

車種1 (P45) : 08 P45 NAS 6G74 2WD 4AT
 車種2 (Q) : 02 Q45 EU 4D56 BMT
 車種3 (CK) : 08 CE45 NAS 6G74 5AT
 車種4 (KR) : 02 KR45 EU 4G94 BMT

コックピット後部雰囲気温度<°C>
 (端子温度<°C> : Lo, Hi, COM)

表 アイドル、又は走行時のコックピット後部雰囲気温度と端子温度 (試験条件: 高湿度)

	P45	Q	CK	KR
仕向地	アイドル			
H/LP OFF	91.9 (71.4, 77.2, 76.4)	88.5 (86.7, 89.5, 70.3)	88.4 (76.1, 78.5, 77.6)	-
H/LP Lo 点灯	-	-	-	88.0 (89.8, 88.8, 95.0)
走行状態	120km/h	100~120km/h	100km/h	120km/h
他社名	H/LP OFF	85.4 (88.8, 85.7, 86.6)	48.0 (45.9, 48.0, 46.1)	-
H/LP Lo 点灯	56.8 (75.0, 68.7, 77.5)	-	-	85.3 (50.9, 49.1, 54.8)
H/LP Hi 点灯	86.2 (72.0, 70.5, 77.1)	87.8 (51.5, 48.7, 61.8)	-	-



G長
 1 内装
 中島
 G長
 電装
 1 機体
 G長
 1 座本
 G長
 燃入

資料番号
 KLJ 2-16Q743

Document No.11

Meeting Minutes : Document Number XL10-130129

Approved by Mr. Tatemoto

Created on 01.5.18 by Electronics Testing Mr. Yasuhiro Sakamoto

<ST28/41 Headlamp Wiggling Test>

Location

MMC Concurrent Bldg

- | | | |
|--|---|------------------|
| <ul style="list-style-type: none"> 1. Test details 2. Test results & considerations 3. Future steps 4. Design measures 5. Identification of problem mechanism | } | Discussion items |
|--|---|------------------|

1. Test details

Vehicles: conducted for both ST28(=ST24S) and ST41

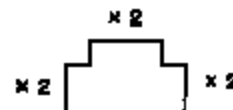
- 1) -Add wiggling for both left and right one time respectively, insert, and measure terminal gap. Conduct for all 5 samples.

- | | | |
|--|---|---|
| <ul style="list-style-type: none"> • 5 sample breakdown | { | <ul style="list-style-type: none"> 1. Inserted straight 2. and 3. Wiggle up/down and insert 4. and 5. Wiggle left/right and insert |
|--|---|---|

- Conduct test with both AMP connector (former) and Yazaki Corp. connector (parts used by N Corp, new)

2 (models) × 5 (samples) × 2 (connector types) × 2 (left/right) = 80 patterns

- 2) Measured when inserted by firmly pushing on the assigned area



3 (locations) × 2 (number of times) × 2 (models) = 12 patterns (right only)

2. Test results & considerations (manufactured by AMP) }

- 1) If left/right lamp are inserted 1 time

<Considerations>

- 1. No difference observed between left and right lamps
- 2. Condition more readily occurs when COM terminal wiggled left /right and Lo terminal is wiggled up/down

With respect to the max 0.59 of the drawing value, over by +0.10

- 3. Even if inserted straight, terminal gap enlarged up to the maximum value
- 4. Bulb terminal side slant (detailed analysis not complete)

1) Up/down wiggling made Bulb-Lo terminal upper side bend

⇒ Similar to pictures of recovered parts from New York

2) Left/right wiggling made COM terminal outer side bend (push COM terminal and insert)

5. Infer contact force from terminal gap

X : Initial	0.54	-0.76	=	-0.22(wrap)
After insertion	0.69 (worst value)	-0.76	=	-0.07
	0.60 (normal value)	-0.76	=	-0.16

Initial values between 18 and 20N ⇒ assume drop of 6 to 7N ⇒ approximately 14N

		Test Values		
		Worst Values X(mm)		
Drawing Values		○	◇	□
		Straight	Left/Right Wiggle	Up/Down Wiggle
ST41	Upper Limit	0.60 (Lo, Com)	0.62 (Com)	0.69 (Lo)
	0.59	~	~	~
	Center 0.54	0.56 Hi	0.55 Hi	0.55 Hi
	Lower Limit	0.82 (Lo)	0.66 (Com)	0.68 (Lo)
0.49	~	~	~	
ST28	○ Values	0.60 (Lo, Com)	0.69 (Com)	0.69 (Lo)
	over	~	~	~
	Left Side	0.55 Hi	0.67 Hi	0.67 Hi
	Right Side	0.60 (Lo, Com)	0.69 (Lo)	0.66 (Lo)
		~	~	~
		0.58 Hi	0.58 Hi	0.55 Hi

6. Difference between ST41 and ST24S/28

- 1) No difference in results when same insertion method used
- 2) There is a difference in workability since the ST24S/28 lamp is relatively larger than ST41 and makes assembly more difficult by having to bend one's arm to perform the operation.
- 3) According to the differences in workability in 1) and 2), it is possible to anticipate a higher rate of occurrence for ST24S/28 than ST41.

2. Test results considerations (made by Yazaki Corp.)

- 1) When left/right lamp inserted 1 time

< Considerations >

1. Difference between left and right lamp: none for both ST4 and ST28
2. Maximum gap depending on direction of wiggling
Cannot attribute to terminal location
3. Over drawing values: occurred in 8 pattern
Over values by +0.01, +0.02
4. Bulb side slant (no details)
The direction of the terminal bending cannot be determined by visual observation
5. Infer contact force from terminal gap

$$\begin{array}{l}
 \bar{X} : \text{at start} \quad 0.35 \quad -0.76 = -0.41 \\
 \text{After insertion} \left\{ \begin{array}{l} 0.42 \text{ (worst value)} \quad -0.76 = -0.34 \\ 0.38 \text{ (normal value)} \quad -0.76 = -0.38 \end{array} \right.
 \end{array}$$

Value at start 38N \Rightarrow dropped to 32N level percent reduction is minor

		Test Values		
		Worst Values x (mm)		
Drawing Values		○ Straight	◇ Left/Right Wiggle	□ Up/Down Wiggle
ST41	Upper Limit	0.40 (Hi, Lo, Com)	0.40 (Com)	0.40 Hi
	0.40	~	~	~
	Center 0.35	Vehicle Left Side 0.37 Hi	0.37 Lo, Hi	0.37 Com
	Lower Limit	0.39 (Lo)	0.41 Hi	0.39 Hi
ST28	0.30	~	~	~
	○ Values	Right Side 0.37 Hi, Lo	0.37 Hi, Lo, Com	0.37 Hi, Lo, Com
	Over	0.39 (Hi, Com)	0.39 Lo	0.42 Com
	Left Side	~	~	~
		0.37 Lo	0.37 Hi	0.37 Lo
		0.39 (Lo, Com)	0.39 Hi	0.41 Lo
		~	~	~
		Right Side 0.37 Hi	0.37 Hi, Lo	0.37 Hi, Lo

6. Difference between ST41 and ST24S/28

- 1) No difference in results when same insertion method used
- 2) Due to the difference in workability characteristics between ST24S/28 than ST41, same as AMP bulb study, it is possible to anticipate a higher rate of occurrence for ST24S/28 than ST41.

2. Test results, considerations

Abusive connecting test : add force at approximate 45°



- 1) Made by AMP: worst value of 0.74 (Hi terminal) = gap widening about the same as the male terminal thickness value (Hi terminal deformed on bulb side, wiggled)
- 2) Made by Yazaki Corp.: Worst value was 0.39 (Hi, Lo, Com) for terminals and within drawing value

3. Future Steps

1. Investigate details of today's results and check whether the main cause of terminal gap enlargement is from wiggle. Yazaki Corp. by 5/25
2. Impact of wiggling on bulb side, summarize results
3. Investigate regarding connector made by Yazaki Corp.
 - Particular characteristics of thermal stress relaxation according to temperature increases
 - Submit verification test report
 - Clarify specifications
housing: PBT terminal: Copper alloy NB-109 : Yazaki Corp, by 5/21
4. Confirmation testing of other MMC vehicles : coordinate on test method by MMC Electrical System Design, Electronics Testing
5. Report these results to MMMA/MRDA : MMC Electrical System Design by 5/21

4. Design measures

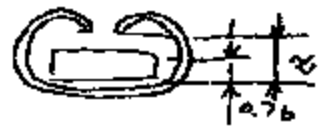
- (1) With respect to ST manufactured by MMMA, proceed with preparations to change to connector manufactured by Yazaki Corp. (determine after obtaining verification test report)
 - Connector arrangements, supply from Philippines, contact in advance of harness production preparation : Yazaki Corp.
 - Revise ST harness drawings (41/24/28)
After obtaining verification test reports, inform of EO in line with verification
☆ Implementation : G

(2) Other MMC vehicles

undertake study at Electrical System Design ⇒ contact Yazaki Corp. as to results

5. Identify problem mechanism

Continue investigation including thermal damage items and summarize results.
Electronics Testing



試驗值

最急值 X (mm)

圓筒值

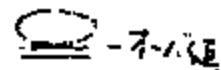
上限 0.59
中央 0.54
下限 0.49

車体
左側

0.60 @ Lo
0.56 @ Hi

0.62 @ Com
0.55 @ Hi

0.69 @ Lo
0.55 @ Hi



右側

0.62 @ Lo
0.57 @ Hi

0.66 @ Com
0.58 @ Lo

0.68 @ Lo
0.56 @ Hi

左側

0.60 @ Lo
0.55 @ Hi

0.69 @ Com
0.57 @ Hi

0.69 @ Lo
0.57 @ Hi

右側

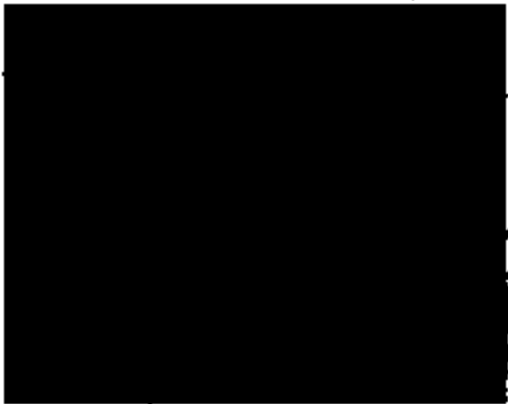
0.60 @ Lo
0.52 @ Hi

0.69 @ Lo
0.52 @ Hi

0.66 @ Lo
0.55 @ Hi

S
T
4
S
T
2
8

〈 卷 記 〉



平均推定

0.54

最急傾

0.69

通常区

0.60

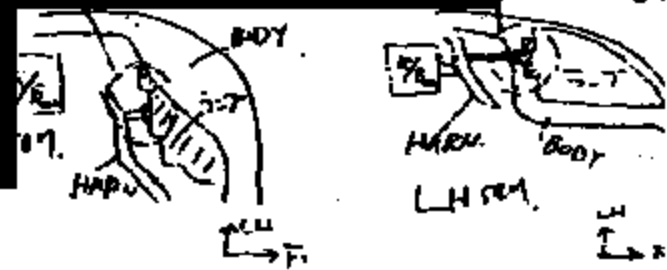
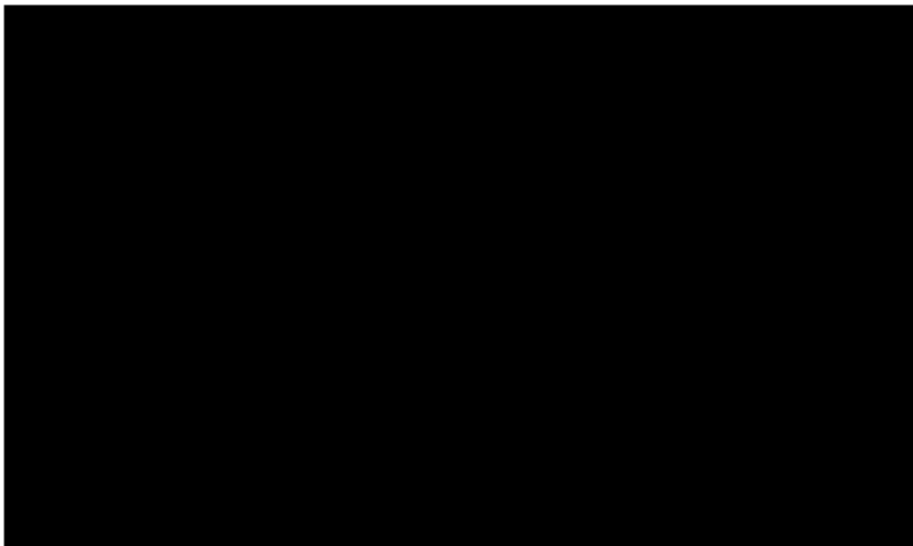
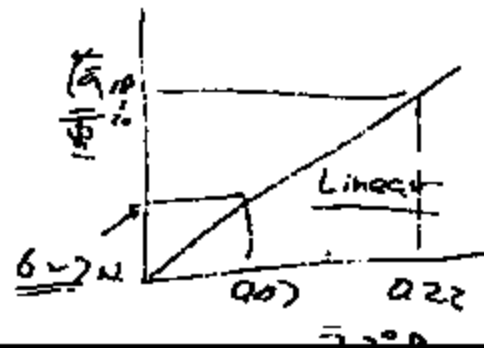
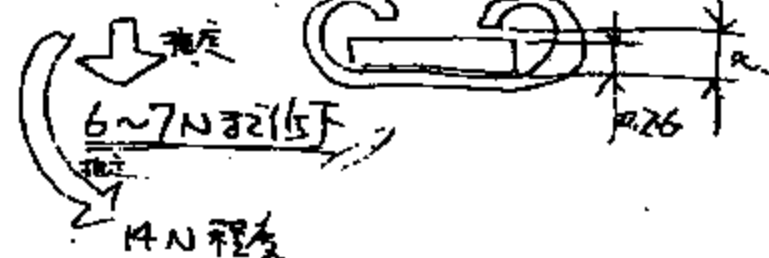
$$-0.76 = -0.22$$

$$-0.76 = -0.07$$

$$-0.76 = -0.16$$

13

初期傾 18~20N



STEP

ST 29/28

< TOP VIEW OF ENG BAR



試驗值

最急值 χ (mm)

四面值

上限 0.40
中央 0.35
下限 0.30

○ = 不正確

ST
FI
ST
NO

	○ 平均	◇ 左右 (C1)	□ 上下 (C1)
車体 左側	0.40 @ $\begin{matrix} Hi \\ Lo \\ Com \end{matrix}$? 0.37 @ Hi	0.40 @ Com ? 0.37 @ $\begin{matrix} Hi \\ Lo \end{matrix}$	0.40 @ Hi ? 0.37 @ Com
右側	0.39 @ Lo ? 0.37 @ $\begin{matrix} Hi \\ Lo \end{matrix}$	0.41 @ Hi ? 0.37 @ $\begin{matrix} Hi \\ Lo \\ Com \end{matrix}$	0.39 @ Hi ? 0.37 @ $\begin{matrix} Hi \\ Lo \\ Com \end{matrix}$
左側	0.39 @ $\begin{matrix} Hi \\ Com \end{matrix}$? 0.37 @ Lo	0.39 @ Lo (0.37 @ Hi	0.42 @ Com) 0.37 @ Lo
右側	0.39 @ $\begin{matrix} Lo \\ Com \end{matrix}$ (0.37 @ Hi	0.39 @ Hi (0.37 @ Hi	0.41 @ Lo) 0.37 @ $\begin{matrix} Hi \\ Lo \end{matrix}$

6

Document No.12

Company	Mitsubishi Motors Corporation
Subject: Investigation of Temperature around P45 Head Lamp (Headlamp temperature increase test) Date of Issue: June 7, 2001 Report No.: XLJ2-180748 Author: Tatemoto, Inoue, Sakamoto Date of Test: Unknown (close to June 8, 2001) Test Place: MMG Okazaki	
Test Vehicle and Sample Vehicle: Model(s) and Model year: 98P45	
Scope(s) Investigate and compare differences in bulb terminal temperature ranges for P45 using the same connector. Bulb terminal temperature could be one of the secondary causes.	
Summary of Test Conditions and Test Results • Conclusion: (1) Max temperature at idle* with headlamps in HI mode is 129.4 deg Celsius at the P45 right Lo terminal. Max temperature at idle* with headlamps in HI mode is 151.7 deg Celsius at the ST41 right ground terminal. (2) For P45, about 50°C decrease by driving (right hand lamp in Lo mode: Lo Terminal 108.7°C at idle → Lo Terminal 57.7°C at driving) For ST41, about 77°C decrease by driving (right hand lamp in Lo mode: Ground Terminal 135.0°C at idle → GND Terminal 57.5°C at driving) (3) P45 connector atmospheric temperature is (5-8 deg) lower at both idle and at driving compared with ST41 * Max temperature at idle : Drive until temperature saturates and soak at idle condition until saturated again. Reference value only since such long idle soak with headlamps on rarely occurs. (perhaps a few times in its useful life) • Measurements and/or Inspections: (1) Power source Engine off: Fixed 13.3V from stabilize power source Idle and driving: actual battery used (2) Measurement level Record stable saturated temperature by monitoring with hybrid recorder (3) Driving conditions Drive until temperature saturated and then leave at idle till temperature saturated again P45: Drive on high-speed test course at 100km/h for 25 min and then idle for 40 minutes ST41: Driving on high-speed test course at 100km/h for 30 min and then idle for 30 minutes (4) Measuring conditions At Engine off: other electrical loads off, engine room hood: open At idle: other electrical loads off, engine room hood: closed Idle after driving: other electrical loads off except for A/C on, engine room hood: closed	
Comments	

機種 6G74 車名

車種 P45

年式 98

仕向地 DOM

SBMY P45 DOM 6G74 AT											
(OSMY ST41 4G84 AT)			(OSMY ST41 4G84 AT)			(OSMY ST41 4G84 AT)			(OSMY ST41 4G84 AT)		
小倉製作所 H4											
AMP 20°C											
(AMP 20°C)											
車体左側						車体右側					
Exp OFF	7ヶ所		走行時		-70%減	Exp OFF	7ヶ所		走行時		-70%減
Lo点灯	Lo点灯	Hi点灯	Lo点灯	Lo点灯	Lo点灯	Lo点灯	Lo点灯	Hi点灯	Lo点灯	Lo点灯	Lo点灯
28.9°C	27.2°C	28.7°C	24.0°C	22.4°C	29.0°C	27.2°C	25.7°C	24.0°C	22.4°C		
(25.0)	(25.0)	(25.0)	(25.0)	(25.0)	(24.5)	(24.5)	(24.5)	(-)	(-)		
82.8%	106.7%	126.4%	87.7%	101.8%	97.8%	108.8%	126.8%	86.8%	106.8%		
(112.3)	(124.7)	(128.0)	(86.0)	(121.0)	(116.0)	(121.8)	(129.8)	(-)	(-)		
84.5%	89.4%	120.7%	42.7%	83.8%	29.7%	100.9%	120.8%	81.8%	104.8%		
(108.1)	(128.0)	(121.7)	(67.0)	(114.0)	(104.7)	(123.8)	(124.0)	(-)	(-)		
82.2%	82.4%	121.8%	46.7%	83.4%	28.3%	103.8%	122.1%	81.8%	106.8%		
(88.7)	(118.5)	(147.0)	(88.0)	(88.0)	(84.8)	(109.8)	(127.8)	(-)	(-)		
108.8%	121.8%	125.8%	75.8%	115.8%	113.1%	121.8%	122.8%	84.8%	121.8%		
(140.8)	(100.8)	(125.5)	(102.0)	(148.7)	(143.7)	(129.4)	(120.4)	(-)	(-)		
105.8%	118.8%	120.8%	74.8%	115.8%	110.8%	121.8%	122.1%	70.8%	120.8%		
(112.2)	(124.7)	(128.0)	(120.5)	(147.0)	(111.1)	(124.8)	(149.8)	(-)	(-)		
48.8%	76.0%	82.8%	29.0%	73.8%	49.0%	73.0%	24.8%	22.7%	20.4%		
(60.8)	(89.2)	(86.0)	(61.5)	(76.0)	(47.8)	(68.7)	(69.2)	(-)	(-)		
20.8%	71.4%	77.0%	26.7%	71.1%	22.8%	72.8%	77.8%	25.8%	74.8%		
(27.4)	(78.0)	(81.4)	(29.0)	(70.0)	(28.2)	(77.4)	(77.9)	(-)	(-)		

田 G基