Title:	**R-134a and HCR-188C testing**
Author:	Herb Woodard
Approver:	Craig Sundlov
Test Date:	6/21/2007 through 6/22/2007
Report Date:	7/9/2007
Report #:	WTR 1491
Revision #:	1
Lab:	Valeo Engine Cooling Vehicle Wind Tunnel 233 Blackstone Ave. Jamestown, NY 14701
Customer:	ASTrust 0 0
Requestor:	Richard Maruya (808) 235-1890 richard@astrust.com
WT Veh. #:	1491a
Vehicle:	2007 Toyota Camry

ISO/IEC 17025:1999
ISO 9002:1994
Certificate Number: L 2038.1

LABORATORY ACCREDITATION BUREAU *ACCREDITED*

MFD. BY: TOYOTA MOTOR MANUFACTURING,
KENTUCKY, INC. 05/07
GVWR 4345LB GAWR FR 2668LB RR 2359LB
THIS VEHICLE CONFORMS TO ALL APPLICABLE
FEDERAL MOTOR VEHICLE SAFETY AND
THEFT PREVENTION STANDARDS IN EFFECT ON
THE DATE OF MANUFACTURE SHOWN ABOVE.
4T1BE46K57U161291 PASS. CAR
C/TP:3R3/FB40 ACV40L-CEANKA
A/TM:-03A/U250E 17871

TIRE AND LOADING INFORMATION
SEE OWNER'S MANUAL FOR ADDITIONAL INFORMATION
RENSEIGNEMENTS RELATIFS AUX PNEUS ET A LA CHARGE DU VEHICULE
CONSULTER LE GUIDE DU PROPRIETAIRE POUR DE PLUS AMPLES RENSEIGNEMENTS

SEATING CAPACITY / NOMBRE DE PLACES	TOTAL / TOTAL : 5	FRONT / AVANT : 2	REAR / ARRIÈRE : 3

The combined weight of occupants and cargo should never exceed 410kg or 900lbs.
La charge du véhicule occupants et bagages ne doit jamais dépasser 410kg ou 900lbs.

ORIGINAL TIRE SIZE / DIMENSIONS DES PNEU D'ORIGINE	COLD TIRE INFLATION PRESSURE / PRESSION DE GONFLAGE À FROID
FRONT/AVANT P215/60R16	FRONT/AVANT 210 kPa, 30PSI
REAR/ARRIÈRE P215/60R16	REAR/ARRIÈRE 210 kPa, 30PSI
SPARE TIRE / PNEU DE SECOURS T135/70D17	COLD TIRE INFLATION PRESSURE / PRESSION DE GONFLAGE À FROID 420 kPa, 60PSI

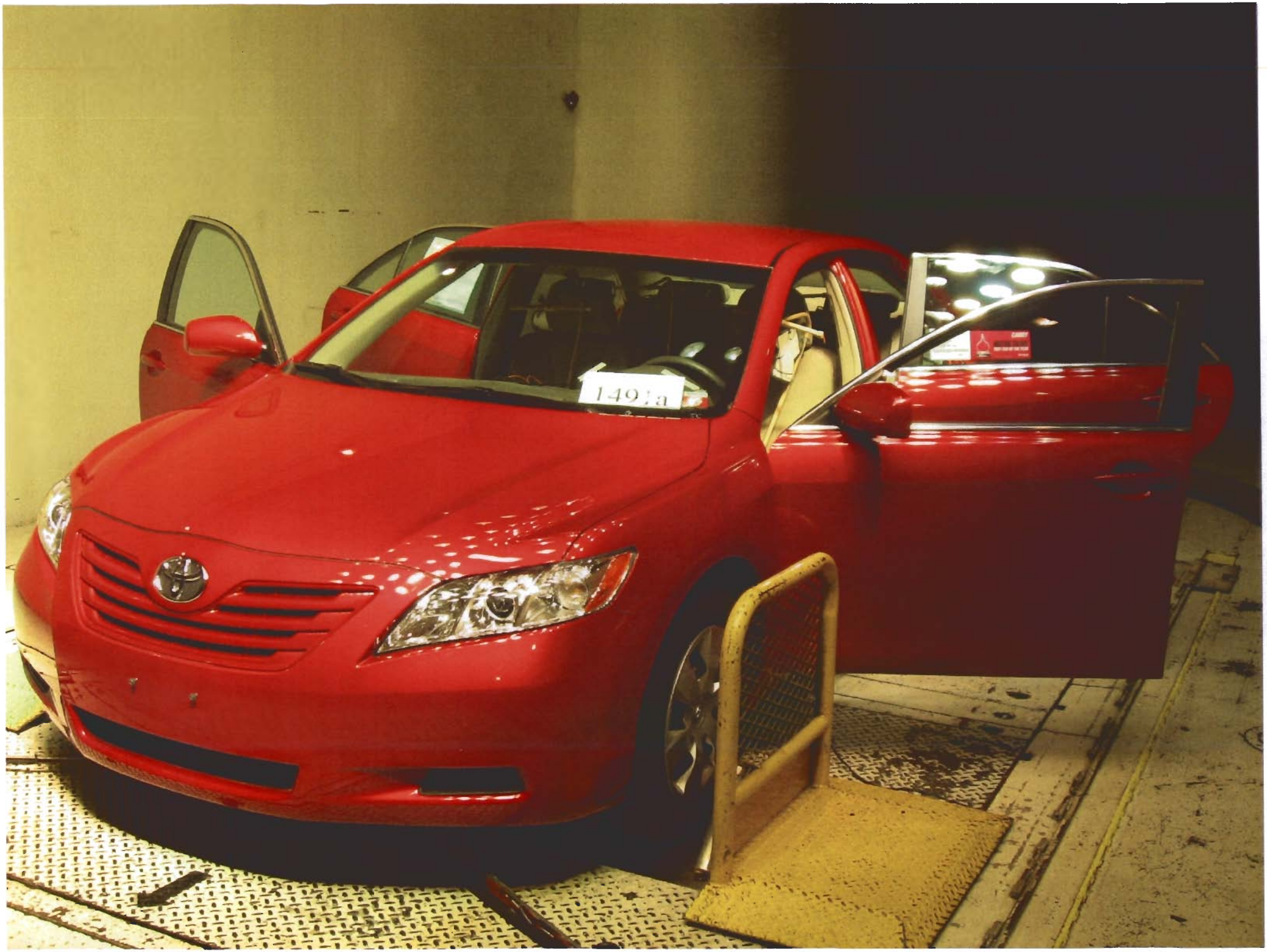
3M 42661-06482

CAUTION
ATTENTION

SRS SIDE AIRBAG

- DO NOT LEAN AGAINST THE FRONT DOOR TO AVOID POTENTIAL DEATH OR SERIOUS INJURY WHEN THE SIDE AIRBAG INFLATES.
- SEE OWNER'S MANUAL FOR DETAILS.
- NE PAS S'APPUYER CONTRE LA PORTIÈRE AVANT; L'AIRBAG POURRAIT SE GONFLER ET DONNER LIEU À UNE BLESSURE GRAVE OU MORTELLE.
- POUR PLUS DE DÉTAILS, VOIR LE MANUEL DU PROPRIÉTAIRE.


CAUTION REFRIGERANT UNDER HIGH PRESSURE
Improper service methods may cause injury.
Air conditioning system should be serviced
by qualified personnel. See Repair Manual.
Refrigerant
HFC134a
USE ONLY
Max. 0.55kg(1.21lbs.)
Min. 0.45kg(0.99lbs.)
oil
ND-OIL
OR EQUIVALENT
8
SAE
J-639
MFD. BY DENSO MANUFACTURING MICHIGAN INC.
ATTENTION
Un entretien
Le systeme de
une personne
Refrigerant
HFC134a
UNIQUEMENT
FABRIQUE PAR


149:a

Vehicle# / File #: 149/A
Desc.: Toyota Camry 2007
Sheet #: 01 **Date:** 6-21-07

Valeo Vehicle Wind Tunnel Test Log

(refer to PCD-1860)

Heavy Truck & dyno Set Points
15 MPH @ Cup: NA
30 MPH @ Cup: NA
Cup Distance to Grille: NA
ATB: NA Fan ratio: NA

TEST #	Segment	TEST DESCRIPTION	LENGTH (MIN)	START TIME / LOG RATE	TUNNEL TEMP	REL. HUM.	SPEED / CUP	ENGINE RPM	HP REQ	HP SET	GEAR SEL / RUN	SOLAR LOAD	FAN DRIVE STATUS	Vehicle Wt	Trailer Wt	Trailer Fr. Area	FILE #
1	1	Charge DeT	AR	14:00	110	20	25	1216	2.7	5.4	OD	100%	VEH	4345	—	—	1
	2			10			25						ELEC				
	3																

A/C SETTINGS: A/C X | Heater | Off | TEMP. SETTING COLD X HOT | AIR SOURCE OSA X RECIRC | BLOWER High WINDOW UP MODE PNL | Rr Blower | TESTER INIT. HLW

COMMENTS/CHANGES:
SPEC. A
134A Start at 10.6 oz
.4oz Comp 40m = 17.6 4min = 12.6 oz 47m = 18.6 17min = 13.6 oz 54m - 19.6 24min = 14.6 58m - 20.6 30min = 15.6 63m - 21.6 35min 16.6

TEST #	Segment	TEST DESCRIPTION	LENGTH (MIN)	START TIME / LOG RATE	TUNNEL TEMP	REL. HUM.	SPEED / CUP	ENGINE RPM	HP REQ	HP SET	GEAR SEL / RUN	SOLAR LOAD	FAN DRIVE STATUS	Vehicle Wt	Trailer Wt	Trailer Fr. Area	FILE #
2	1	Chrysler Cooldown	70	17:12	110	20	0-55		R/L	MODE	OD	100%	VEH	4345	—	—	2
	2			10									ELEC				
	3																

A/C SETTINGS: A/C X | Heater | Off | TEMP. SETTING COLD X HOT | AIR SOURCE OSA RECIRC X | BLOWER High WINDOW UP MODE PNL | Rr Blower | TESTER INIT. HLW

COMMENTS/CHANGES:
SPEC. A
charged To 17.6 oz + .4 oz Comp for a Total of 18 oz

6-22-07

TEST #	Segment	TEST DESCRIPTION	LENGTH (MIN)	START TIME / LOG RATE	TUNNEL TEMP	REL HUM.	SPEED / CUP	ENGINE RPM	HP REQ	HP SET	GEAR SEL / RUN	SOLAR LOAD	FAN DRIVE STATUS	Vehicle Wt	Trailer Wt	Trailer Fr. Area	FILE #
1	1	CHARGE DETERM.	AR	7:56	110F	20%	25	1215	2.7	5.4	OD	100%	VEH	4345	—	—	3
	2	25MPH RL		10									ELEC				
	3																

A/C SETTINGS: A/C X | Heater | Off | TEMP. SETTING COLD X HOT | AIR SOURCE OSA X RECIRC | BLOWER HIGH WINDOW UP MODE PNL | Rr Blower | TESTER INIT. JJ

COMMENTS/CHANGES:
SPEC. B
start 3.6 oz. AC comp RATIO 1.29:1

TEST #	Segment	TEST DESCRIPTION	LENGTH (MIN)	START TIME / LOG RATE	TUNNEL TEMP	REL HUM	SPEED / CUP	ENGINE RPM	HP REQ	HP SET	GEAR SEL / RUN	SOLAR LOAD	FAN DRIVE STATUS	Vehicle Wt	Trailer Wt	Trailer Fr. Area	FILE #
2	1	Chrysler Cooldown	70	11:03	110F	20%	VARIES	VARIES	ROAD		OD	100%	VEH	4345			4
	2	COOLDOWN.CTR		10					LOAD				ELEC				
	3								MODE								

A/C SETTINGS: A/C X | Heater | Off | TEMP. SETTING COLD X HOT | AIR SOURCE OSA RECIRC X | BLOWER HIGH WINDOW UP MODE PNL | Rr Blower | TESTER INIT. JJ

COMMENTS/CHANGES:
SPEC. B
Soak to 140°F stickmen AV

TEST #	Segment	TEST DESCRIPTION	LENGTH (MIN)	START TIME / LOG RATE	TUNNEL TEMP	REL. HUM.	SPEED / CUP	ENGINE RPM	HP REQ	HP SET	GEAR SEL / RUN	SOLAR LOAD	FAN DRIVE STATUS	Vehicle Wt	Trailer Wt	Trailer Fr. Area	FILE #
3	1	65 R-L	20	12:35	110	19	65	2060	17.41	13.4	OD	100%	VEH	4345	—	—	5
	2	25 R-L	20	10			25	2	2.7	5.5	OD		ELEC				
	3	P-I	30				0		—	—	P						

A/C SETTINGS: A/C X | Heater | Off | TEMP. SETTING COLD X HOT | AIR SOURCE OSA X RECIRC | BLOWER High WINDOW UP MODE PNL | Rr Blower | TESTER INIT. HLW

COMMENTS/CHANGES:
SPEC. B

Vehicle# / File #: 1491A

Desc.: Toyota Camry

Sheet #: 02 Date: 6-22-07

Valeo Vehicle Wind Tunnel Test Log

(refer to PCD-1860)

Heavy Truck & dyno Set Points
15 MPH @ Cup: NA
30 MPH @ Cup: NA
Cup Distance to Grille: NA
ATB: NA Fan ratio: NA

TEST #	Segment	TEST DESCRIPTION	LENGTH (MIN)	START TIME / LOG RATE	TUNNEL TEMP	REL HUM	SPEED / CUP	ENGINE RPM	HP REQ	HP SET	GEAR SEL / RUN	SOLAR LOAD	FAN DRIVE STATUS	Vehicle Wt	Trailer Wt	Trailer Fr. Area	FILE #
4	1	65 R-L	20	14:10	110	40	65		17.41	13.4	OD	100%	VEH	4345	—	—	6
	2	25 R-L	20				25		2.7	5.4	OD		ELEC				
	3	P-I	30	10			0		—	—	P						

A/C SETTINGS: A/C X | Heater | Off
TEMP. SETTING: COLD | X | HOT
AIR SOURCE: OSA | X | RECIRC
BLOWER High WINDOW UP MODE PNL
Rr Blower

TESTER INIT: HCL

COMMENTS/CHANGES:

SPEC: B

TEST #	Segment	TEST DESCRIPTION	LENGTH (MIN)	START TIME / LOG RATE	TUNNEL TEMP	REL HUM.	SPEED / CUP	ENGINE RPM	HP REQ	HP SET	GEAR SEL / RUN	SOLAR LOAD	FAN DRIVE STATUS	Vehicle Wt	Trailer Wt.	Trailer Fr. Area	FILE #
	1																
	2																
	3																

A/C SETTINGS: A/C | Heater | Off
TEMP. SETTING: COLD | HOT
AIR SOURCE: OSA | RECIRC
BLOWER ___ WINDOW ___ MODE ___
Rr Blower

TESTER INIT

COMMENTS/CHANGES:

SPEC:

TEST #	Segment	TEST DESCRIPTION	LENGTH (MIN)	START TIME / LOG RATE	TUNNEL TEMP	REL HUM.	SPEED / CUP	ENGINE RPM	HP REQ	HP SET	GEAR SEL / RUN	SOLAR LOAD	FAN DRIVE STATUS	Vehicle Wt	Trailer Wt.	Trailer Fr. Area	FILE #
	1																
	2																
	3																

A/C SETTINGS: A/C | Heater | Off
TEMP. SETTING: COLD | HOT
AIR SOURCE: OSA | RECIRC
BLOWER ___ WINDOW ___ MODE ___
Rr Blower

TESTER INIT

COMMENTS/CHANGES:

SPEC:

TEST #	Segment	TEST DESCRIPTION	LENGTH (MIN)	START TIME / LOG RATE	TUNNEL TEMP	REL. HUM	SPEED / CUP	ENGINE RPM	HP REQ	HP SET	GEAR SEL / RUN	SOLAR LOAD	FAN DRIVE STATUS	Vehicle Wt.	Trailer Wt	Trailer Fr. Area	FILE #
	1																
	2																
	3																

A/C SETTINGS: A/C | Heater | Off
TEMP. SETTING: COLD | HOT
AIR SOURCE: OSA | RECIRC
BLOWER ___ WINDOW ___ MODE ___
Rr Blower

TESTER INIT

COMMENTS/CHANGES:

SPEC:

TEST #	Segment	TEST DESCRIPTION	LENGTH (MIN)	START TIME / LOG RATE	TUNNEL TEMP	REL. HUM.	SPEED / CUP	ENGINE RPM	HP REQ	HP SET	GEAR SEL / RUN	SOLAR LOAD	FAN DRIVE STATUS	Vehicle Wt.	Trailer Wt	Trailer Fr. Area	FILE #
	1																
	2																
	3																

A/C SETTINGS: A/C | Heater | Off
TEMP. SETTING: COLD | HOT
AIR SOURCE: OSA | RECIRC
BLOWER ___ WINDOW ___ MODE ___
Rr Blower

TESTER INIT

COMMENTS/CHANGES:

SPEC:

Valeo
Engine Cooling

VEHICLE WIND TUNNEL
VEHICLE INFORMATION AND TRACKING CHECKLIST

(refer to: PCD-1860)

Vehicle #
1491A

Cust. Veh. #	Make		Model		VIN			Year
	Toyota		Camry		4T1BE46K57U161291			2007
Color	Odometer Before	Odometer After	Outside Track Width Front	Outside Track Width Rear	Nose to Wheel	Wheel-Base	AV	Charge Level
Red	232	454	69" 24.5	69" 24.5	37"	109"	17.6	19.2 oz
Trucks	Engine		Transmission		Axle Ratio		Tire Size	
	I4 2.4L		5spd AuTo				P215/60R16	
Floor Plate Configuration:	1-7-3-4-R-5-2-10-8-9						Tire Pressure L: 32	R: 32
					25	Dyno Cal. Offset Check		Warm [ ]
						~~12.5~~ mph average counts		
						Constant coeff used		714.72

15.84 oz
1.09 min
1.21 max
19.36 oz

PROCEDURE	INITIAL	DATE
Log Vehicle Into Database and Logbook	HLW	6-13-07
Fill With Fuel if Required	HLW	6-13-07
Clean Vehicle Inside And Out	HLW	6-13-07
Take Photos of Vehicle	HLW	6-13-07
Inspect Vehicle For Damage Inside And Out (Check contents of dump box)	HLW	6-13-07
Describe Car Covers: NA	HLW	6-13-07
Comments: GVWR 4345 lb		
Check A/C and Other Systems	HLW	6-13-07
Fill Out Fan Measurement Sheet (Heavy Trucks) NA	HLW	6-13-07
Log In Parts Installed In Vehicle Or Sent With The Vehicle For Testing NA	HLW	6-13-07
Instrument Vehicle	HLW JJD	6/14-18/07
Comments On Vehicle Prep: Richard Maruya EMail - Richard@Maruya.net Richard@ASTrust.com ·-·3-1596 Cond-TXV 94.72 Evap-Comp 67.05		
Add Logsheets and Summary To Vehicle Folder	HLW	6-22-07
Verify Test Time Log is Up To Date	HLW	6-22-07
Deinstrument Vehicle		
Re-Inspect Vehicle For Damage		
Record Vehicle Odometer Reading Above	HLW	6-25-07
Log Out Parts Installed In Vehicle Or To Be Shipped With Vehicle		
Log Vehicle Out Of Database and Logbook		
Scan Test Log		
Place "Good To Go" Sticker On Windshield		
Reinstall Car Covers		
Comments:		

E-mail: Data X, Log Sheets Scan X, Fan Sheet Scan NA, Test Plan Final Revision X, and Customer Survey X to Customer	HLW	6-25-07
Vehicle File Completion Sign Off		

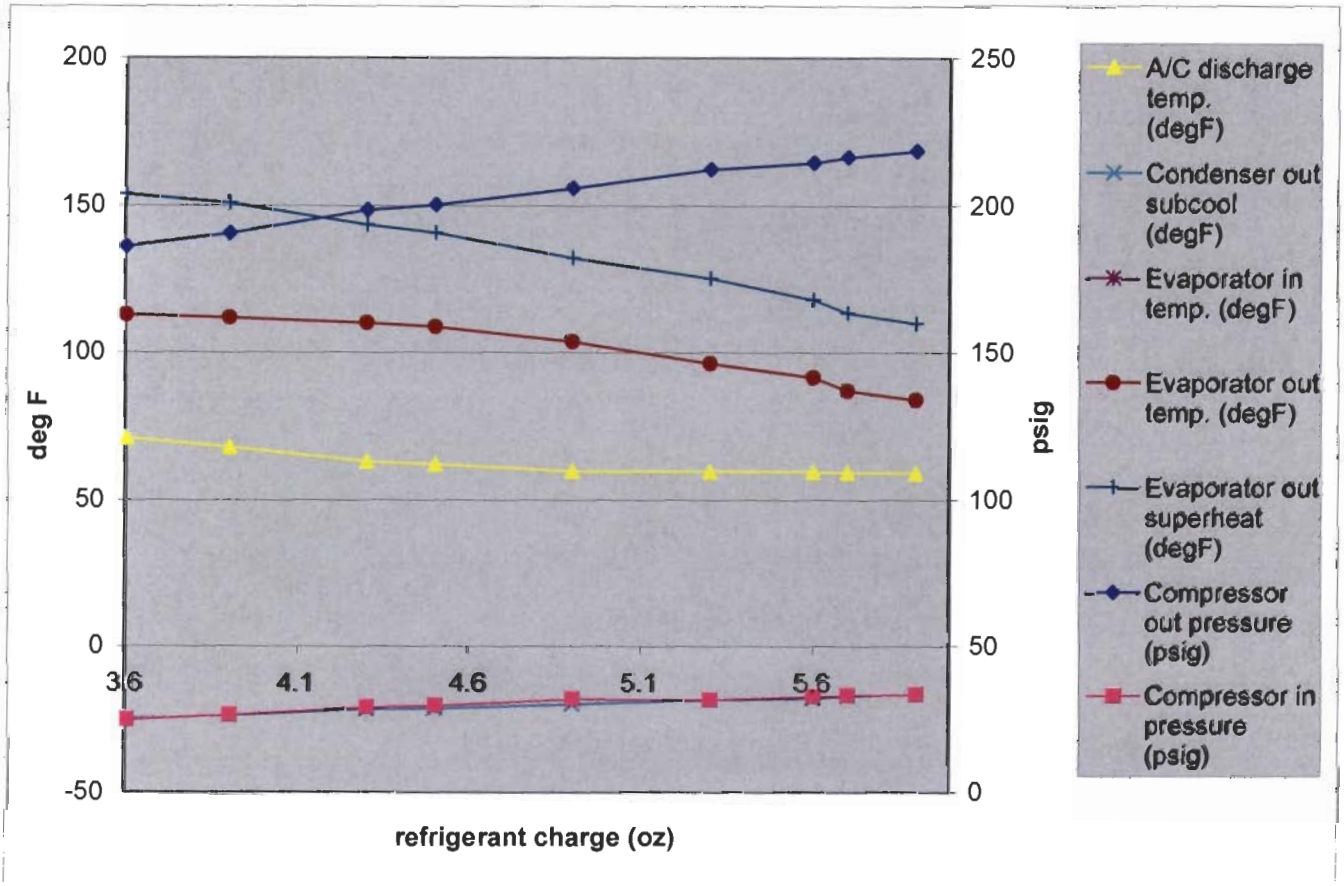
A/C Charge Determination Plot

Vehicle #	1491a	Make:	Toyota	Model:	Camry
Spec #	B	Comment:	HCR 188C		

refrigerant charge (oz)	Compressor out pressure (psig)	Compressor in pressure (psig)	A/C discharge temp. (degF)	Evaporator in temp. (degF)	Evaporator out temp. (degF)	Evaporator out superheat (degF)	Condenser out subcool (degF)
3.6	186.3	25.29	71		113	154	-24.4
3.9	190.7	26.89	67.8		112	151	-23.4
4.3	198.6	29.52	63		110.3	143.7	-21.4
4.5	200.4	30.07	62		108.9	140.9	-21.2
4.9	206.1	32.32	59.8		103.9	132.4	-19.6
5.3	212.5	32.06	59.6		96.5	125.6	-18
5.6	214.7	33.34	59.6		91.9	118.4	-17.6
5.7	216.6	33.62	59.2		87.3	113.8	-16.7
5.9	218.8	33.98	59.1		84.3	110.4	-15.9

Superheat and subcool values are calculations based on bubble point curve provided to Valeo VWT on 6/22/07 by Richard Maruya for the MESA gas mixture

Procedure: PCD 1895 Revision: 3



Valeo Engine Cooling Vehicle Wind Tunnel

Test Name	AC Cooldown (D/C)				
Veh #	1491a	Engine	2.4L I4	Test Date	6/22/2007
Year	2007	Transmission	Auto 5 spd.	Spec	B
Make	Toyota	Axle Ratio		Test Weight	4345
Model	Camry	CdA	7.50	Tester	jj

Spec Desc.	All baseline

Comments	HCR 188C

		AC Cooldown (D/C)				
Parameter	*Units*	*Max*	*EOT*	*6 Scan Avg.*		
Roll HP	HP	2.09	-11.99	-12.08		
RollSpeed	MPH	59.3	55.1	55.0		
WindVel	MPH	55.0	54.7	54.8		
AirTemp1	DegF	112.0	110.9	110.9		
AirTemp2	DegF	112.5	110.7	110.8		
AirTempAvg	DegF	111.9	110.8	110.8		
WallTemp	Deg F	109.1	109.0	108.9		
Humidity	%	22.8	20.1	20.0		
Barometer	mBar	980.5	973.8	972.8		
RadCltIn1	Deg F	197.5	192.8	192.5		
RadCltIn2	Deg F	197.7	192.8	192.6		
RadCltOut	Deg F	182.7	162.1	162.1		
TranSump	Deg F	190.1	190.1	189.9		
CompOut	Deg F	221.1	199.1	198.6		
CondOut	Deg F	142.7	119.4	119.3		
CompIn	Deg F	128.9	60.6	60.8		
EvapAirIn	Deg F	129.0	79.4	79.1		
ACDischLt	Deg F	146.2	42.8	42.8		
ACDischLtC	Deg F	164.6	40.2	40.3		
ACDischRtC	Deg F	160.4	41.3	41.2		
ACDischRt	Deg F	151.0	44.5	44.5		
EngOilSump	Deg F	226.6	226.6	226.3		
Spare1	Deg F	0.00		#DIV/0!		
Spare2	Deg F	0.00		#DIV/0!		
Spare3	Deg F	0.00		#DIV/0!		
Spare4	Deg F	0.00		#DIV/0!		
RadCoolFlow	GPM	9.21	3.17	3.12		
RefrigFlow	GPM	0.00		#DIV/0!		
LeftFanRPM	RPM	2682	955.8	980.6		
RightFanRPM	RPM	2556	956.1	956.7		
EngineRPM	RPM	2881	1747	1744		
ACComprRPM	RPM	3717	2256	2251		
HeadP	PSIG	242.8	193.6	193.5		
CondOutP	PSIG	231.5	183.0	183.0		
CompInP	PSIG	110.2	18.0	18.0		
RadCltInAvg	Deg F	197.6	192.8	192.6		
EngHeatRej	BTU/Min	1102	701.0	686.3		
RadCltMFlow	Lb/Min	78.7	27.2	26.8		
RadCltDeltaT	Deg F	60.3	30.7	30.5		
ATB	Deg F	204.3	153.0	153.3		
ACDischAv	Deg F	155.5	42.2	42.2		
CompOutSHeat	Deg F	108.8	97.1	96.6		
CompInSHeat	Deg F	144.8	118.6	118.8		
SubCool	Deg F	-21.55	-22.50	-22.36		
CndInGridAv	Deg F	134.1	110.4	110.3		
CndOutGridAv	Deg F	150.5	128.9	128.7		
FrtDrvStckAv	Deg F	139.9	73.5	73.3		
FrtPasStckAv	Deg F	142.9	67.2	66.9		
RrDrvStckAv	Deg F	138.6	67.9	67.9		
RrPasStckAv	Deg F	140.2	64.6	64.5		
StickManAv	Deg F	140.2	68.3	68.2		

Valeo Engine Cooling Vehicle Wind Tunnel

Test Name	AC Charge Determination				
Veh #	1491a	**Engine**	2.4L I4	**Test Date**	6/22/2007
Year	2007	**Transmission**	Auto 5 spd.	**Spec**	B
Make	Toyota	**Axle Ratio**		**Test Weight**	4345
Model	Camry	**CdA**	7.50	**Tester**	jj

Spec Desc. All baseline

Comments HCR 188C

		25 MPH RL				
Parameter	***Units***	***Max***	***EOT***	***6 Scan Avg.***		
Roll HP	HP	-2.13	-2.62	-2.58		
RollSpeed	MPH	25.3	25.2	25.1		
WindVel	MPH	25.0	24.4	24.7		
AirTemp1	DegF	111.0	110.7	110.8		
AirTemp2	DegF	110.9	110.6	110.7		
AirTempAvg	DegF	110.9	110.7	110.7		
WallTemp	Deg F	108.0	107.6	107.7		
Humidity	%	20.2	19.9	19.9		
Barometer	mBar	980.9	972.2	972.8		
RadCltIn1	Deg F	194.4	194.3	194.2		
RadCltIn2	Deg F	194.5	194.3	194.2		
RadCltOut	Deg F	150.8	150.5	150.0		
TranSump	Deg F	178.5	178.5	178.1		
CompOut	Deg F	231.8	202.4	202.0		
CondOut	Deg F	124.6	123.7	123.8		
CompIn	Deg F	113.8	84.5	84.6		
EvapAirIn	Deg F	124.3	123.8	123.8		
ACDischLt	Deg F	83.1	60.4	60.2		
ACDischLtC	Deg F	79.2	57.2	57.4		
ACDischRtC	Deg F	60.4	57.7	57.7		
ACDischRt	Deg F	63.6	60.7	60.7		
EngOilSump	Deg F	220.8	220.1	220.0		
Spare1	Deg F	0.00		#DIV/0!		
Spare2	Deg F	0.00		#DIV/0!		
Spare3	Deg F	0.00		#DIV/0!		
Spare4	Deg F	0.00		#DIV/0!		
RadCoolFlow	GPM	1.54	1.40	1.39		
RefrigFlow	GPM	0.00		#DIV/0!		
LeftFanRPM	RPM	2647	2532	2533		
RightFanRPM	RPM	2469	2379	2385		
EngineRPM	RPM	1220	1214	1197		
ACComprRPM	RPM	1574	1564	1543		
HeadP	PSIG	219.1	218.9	218.5		
CondOutP	PSIG	206.9	206.7	206.5		
CompInP	PSIG	34.4	33.8	34.0		
RadCltInAvg	Deg F	194.4	194.3	194.2		
EngHeatRej	BTU/Min	487.6	442.5	443.6		
RadCltMFlow	Lb/Min	13.2	12.1	12.0		
RadCltDeltaT	Deg F	57.3	43.8	44.2		
ATB	Deg F	153.3	151.4	151.5		
ACDischAv	Deg F	71.4	59.0	59.0		
CompOutSHeat	Deg F	133.2	89.0	88.9		
CompInSHeat	Deg F	154.8	110.5	110.2		
SubCool	Deg F	-15.58	-15.72	-15.87		
CndInGridAv	Deg F	112.0	111.6	111.6		
CndOutGridAv	Deg F	134.2	134.0	134.0		
FrtDrvStckAv	Deg F	96.2	85.0	85.1		
FrtPasStckAv	Deg F	89.4	80.2	80.3		
RrDrvStckAv	Deg F	90.7	79.1	79.2		
RrPasStckAv	Deg F	86.0	77.3	77.3		
StickManAv	Deg F	90.5	80.4	80.5		

Valeo Engine Cooling Vehicle Wind Tunnel

Test Name	65 R/L, 25 R/L, P/I				
Veh #	1491a	**Engine**	2.4L I4	**Test Date**	6/22/2007
Year	2007	**Transmission**	Auto 5 spd.	**Spec**	B
Make	Toyota	**Axle Ratio**		**Test Weight**	4345
Model	Camry	**CdA**	7.50	**Tester**	HLW

Spec Desc. All baseline with HCR188C

Comments HCR 188C, 100% solar

		65 R/L			25 R/L			P/I		
Parameter	***Units***	***Max***	***EOT***	***6 Scan Avg.***	***Max***	***EOT***	***6 Scan Avg.***	***Max***	***EOT***	***6 Scan Avg.***
Roll HP	HP	-17.52	-17.53	-17.53	-1.64	-2.87	-2.79	0.37	0.13	0.13
RollSpeed	MPH	65.2	65.0	65.0	63.9	25.1	25.0	25.2	0.03	0.02
WindVel	MPH	65.0	64.8	64.6	63.8	24.8	24.9	24.8	0.00	0.00
AirTemp1	DegF	111.3	110.6	110.5	112.2	110.4	110.4	110.7	109.0	109.0
AirTemp2	DegF	111.1	110.2	110.2	112.2	110.2	110.2	111.4	111.3	111.3
AirTempAvg	DegF	111.2	110.4	110.4	112.1	110.3	110.3	110.8	110.1	110.1
WallTemp	Deg F	109.5	109.5	109.4	109.4	109.3	109.3	109.3	108.5	108.6
Humidity	%	19.2	19.1	18.9	19.8	18.8	18.8	22.8	20.5	20.5
Barometer	mBar	979.7	973.4	972.7	979.3	972.4	974.0	978.4	973.6	974.1
RadCltIn1	Deg F	193.1	192.9	192.7	194.7	193.7	193.7	198.9	198.6	198.7
RadCltIn2	Deg F	192.9	192.4	192.5	194.5	193.7	193.7	199.4	199.1	199.1
RadCltOut	Deg F	160.4	160.2	160.1	160.2	150.0	150.0	186.9	186.7	186.5
TranSump	Deg F	196.7	196.5	196.3	196.7	182.8	183.0	190.2	190.1	190.0
CompOut	Deg F	230.6	229.6	229.8	229.4	213.9	214.0	245.4	245.2	245.3
CondOut	Deg F	119.7	118.2	118.4	124.7	123.0	123.1	153.8	153.3	153.4
CompIn	Deg F	91.7	90.0	90.3	100.2	99.2	99.5	130.3	129.6	129.6
EvapAirIn	Deg F	118.1	117.0	116.8	123.4	123.1	123.1	145.7	144.6	144.5
ACDischLt	Deg F	55.4	54.5	54.3	61.0	60.2	60.1	84.3	84.3	84.0
ACDischLtC	Deg F	52.7	52.0	51.7	58.1	57.1	57.3	79.9	79.9	79.6
ACDischRtC	Deg F	53.4	52.3	52.3	58.7	57.9	58.0	76.3	76.1	76.2
ACDischRt	Deg F	56.1	55.1	55.0	61.2	60.7	60.8	79.2	78.9	78.8
EngOilSump	Deg F	232.9	231.5	232.0	231.8	213.5	213.8	215.3	215.3	215.2
Spare1	Deg F	0.00		#DIV/0!	0.00		#DIV/0!	0.00		#DIV/0!
Spare2	Deg F	0.00		#DIV/0!	0.00		#DIV/0!	0.00		#DIV/0!
Spare3	Deg F	0.00		#DIV/0!	0.00		#DIV/0!	0.00		#DIV/0!
Spare4	Deg F	0.00		#DIV/0!	0.00		#DIV/0!	0.00		#DIV/0!
RadCoolFlow	GPM	3.68	3.57	3.58	2.98	1.42	1.48	4.06	3.97	4.02
RefrigFlow	GPM	0.00		#DIV/0!	0.00		#DIV/0!	0.00		#DIV/0!
LeftFanRPM	RPM	2742	2626	2625	2663	2527	2532	2627	2487	2487
RightFanRPM	RPM	2548	2529	2530	2571	2427	2425	2425	2401	2387
EngineRPM	RPM	2067	2058	2058	1796	1205	1198	1210	859.2	859.7
ACComprRPM	RPM	2667	2655	2656	2317	1554	1545	1561	1107	1108
HeadP	PSIG	195.4	193.1	193.1	203.2	199.9	199.7	267.9	267.3	267.3
CondOutP	PSIG	183.7	181.3	181.3	192.4	189.0	188.7	260.7	260.4	260.1
CompInP	PSIG	20.5	20.1	20.1	35.9	29.9	30.0	48.8	48.4	48.3
RadCltInAvg	Deg F	193.0	192.7	192.6	194.6	193.7	193.7	199.1	198.9	198.9
EngHeatRej	BTU/Min	870.5	835.8	836.9	778.1	445.4	465.1	465.6	348.1	360.9
RadCltMFlow	Lb/Min	31.7	30.7	30.7	25.6	12.2	12.7	34.6	33.9	34.3
RadCltDeltaT	Deg F	33.4	32.4	32.5	51.0	43.6	43.7	45.7	12.1	12.4
ATB	Deg F	154.8	152.7	152.8	154.9	151.6	151.6	151.9	146.3	146.2
ACDischAv	Deg F	54.3	53.5	53.3	59.6	59.0	59.0	79.8	79.8	79.7
CompOutSHeat	Deg F	128.9	127.8	128.0	128.9	108.9	109.1	113.1	112.5	112.6
CompInSHeat	Deg F	144.1	143.1	143.3	138.7	132.1	132.1	134.7	133.9	134.0
SubCool	Deg F	-21.73	-22.10	-22.27	-21.64	-23.14	-23.39	-23.00	-23.30	-23.47
CndInGridAv	Deg F	110.6	109.7	109.8	112.8	111.5	111.5	137.1	136.3	136.5
CndOutGridAv	Deg F	128.1	127.2	127.2	133.2	131.6	131.6	161.7	161.2	161.3
FrtDrvStckAv	Deg F	80.1	78.6	78.7	82.1	82.1	82.0	96.9	96.9	96.7
FrtPasStckAv	Deg F	76.2	74.4	74.4	78.8	78.3	78.4	94.6	94.6	94.6
RrDrvStckAv	Deg F	75.1	73.1	73.1	77.6	77.4	77.5	95.6	95.6	95.5
RrPasStckAv	Deg F	73.0	71.3	71.3	75.8	75.6	75.7	92.9	92.8	92.7
StickManAv	Deg F	76.1	74.4	74.4	78.5	78.3	78.4	95.0	95.0	94.9

Valeo Engine Cooling Vehicle Wind Tunnel

Test Name	65 R/L, 25 R/L, P/I				
Veh #	1491a	**Engine**	2.4L I4	**Test Date**	6/22/2007
Year	2007	**Transmission**	Auto 5 spd.	**Spec**	B
Make	Toyota	**Axle Ratio**		**Test Weight**	4345
Model	Camry	**CdA**	7.50	**Tester**	HLW

Spec Desc. All baseline with HCR188C

Comments HCR 188C, 100% solar, 40% RH

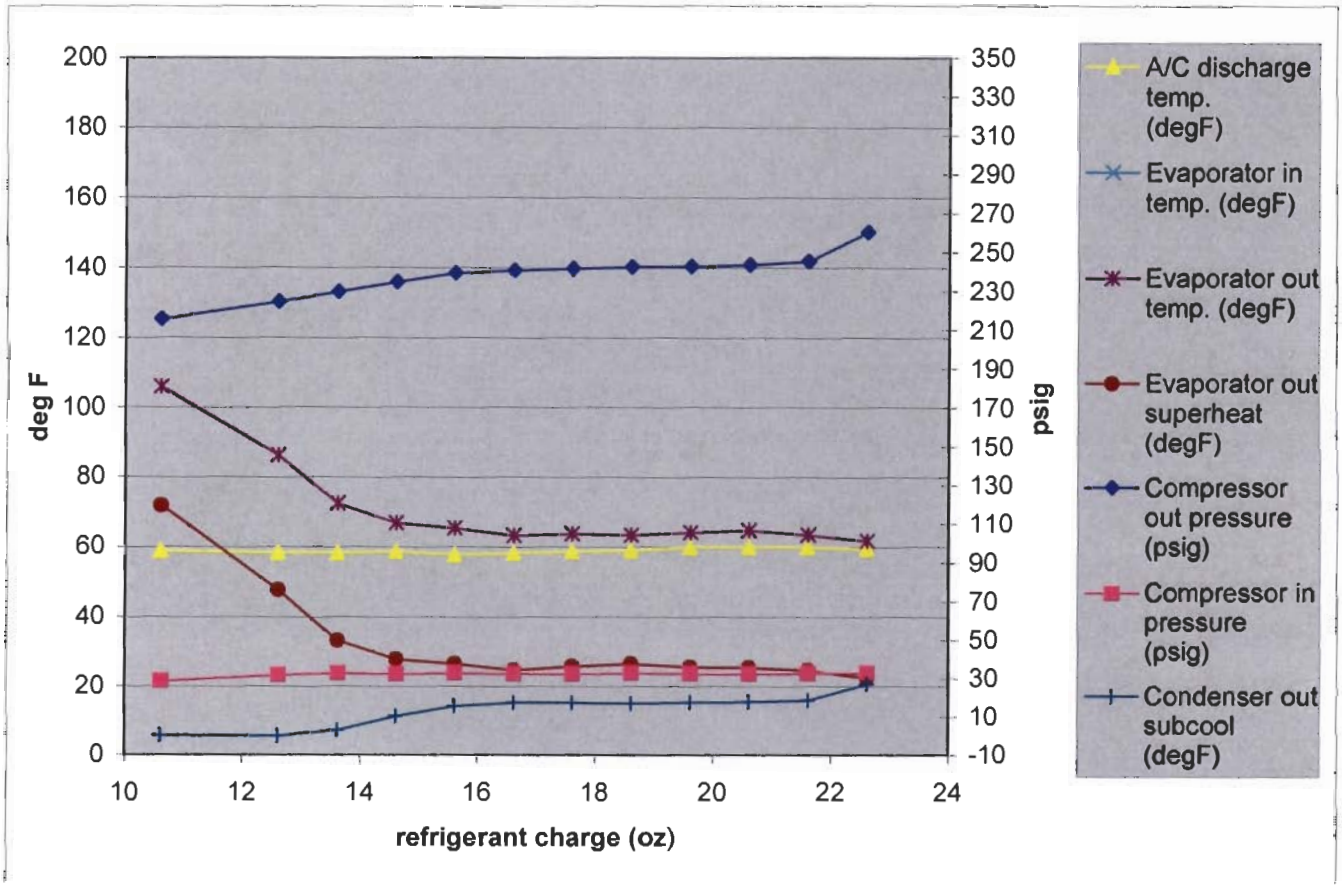
		65 R/L			25 R/L			P/I		
Parameter	***Units***	***Max***	***EOT***	***6 Scan Avg.***	***Max***	***EOT***	***6 Scan Avg.***	***Max***	***EOT***	***6 Scan Avg.***
Roll HP	HP	-17.27	-17.77	-17.61	-2.14	-2.62	-2.66	0.14	0.14	0.13
RollSpeed	MPH	65.2	64.9	64.9	65.0	25.2	25.0	25.3	0.03	0.03
WindVel	MPH	65.0	64.7	64.8	64.7	24.8	24.8	24.2	0.00	0.00
AirTemp1	DegF	110.7	110.3	110.4	112.1	110.5	110.4	110.5	108.6	108.7
AirTemp2	DegF	110.6	110.0	110.2	112.1	110.3	110.3	111.4	111.2	111.3
AirTempAvg	DegF	110.6	110.2	110.3	112.1	110.4	110.3	110.9	109.9	110.0
WallTemp	Deg F	109.4	109.2	109.1	109.4	108.7	108.8	109.2	109.1	109.0
Humidity	%	40.1	39.8	39.9	40.9	40.1	40.0	41.9	39.9	40.0
Barometer	mBar	978.9	972.3	972.8	975.2	974.1	973.4	978.7	972.5	973.3
RadCltIn1	Deg F	193.0	192.8	192.7	194.5	192.7	192.7	198.8	198.4	198.3
RadCltIn2	Deg F	193.0	192.5	192.5	194.7	192.8	192.7	198.9	198.9	198.8
RadCltOut	Deg F	163.0	162.7	162.8	164.7	152.9	153.3	186.2	185.7	185.8
TranSump	Deg F	196.4	196.0	196.0	196.8	184.7	184.9	190.1	190.1	189.9
CompOut	Deg F	243.1	242.8	242.8	242.8	222.2	221.9	246.3	246.0	245.9
CondOut	Deg F	120.9	120.1	120.3	126.6	124.7	124.7	154.5	153.3	153.9
CompIn	Deg F	103.5	102.2	102.0	109.4	108.8	108.8	131.0	131.0	130.8
EvapAirIn	Deg F	119.3	117.5	117.5	124.2	124.0	123.9	146.7	145.6	146.0
ACDischLt	Deg F	70.7	69.2	69.4	76.6	75.8	75.7	86.2	85.9	86.0
ACDischLtC	Deg F	67.1	66.2	66.3	74.0	72.9	72.8	81.4	81.3	81.3
ACDischRtC	Deg F	64.6	63.8	63.7	70.5	69.8	69.7	79.5	79.3	79.4
ACDischRt	Deg F	67.4	66.3	66.3	72.1	71.5	71.6	82.4	82.1	82.3
EngOilSump	Deg F	233.1	232.6	232.0	233.0	213.6	213.7	215.6	215.4	215.4
Spare1	Deg F	0.00		#DIV/0!	0.00		#DIV/0!	0.00		#DIV/0!
Spare2	Deg F	0.00		#DIV/0!	0.00		#DIV/0!	0.00		#DIV/0!
Spare3	Deg F	0.00		#DIV/0!	0.00		#DIV/0!	0.00		#DIV/0!
Spare4	Deg F	0.00		#DIV/0!	0.00		#DIV/0!	0.00		#DIV/0!
RadCoolFlow	GPM	3.99	3.89	3.89	3.87	1.70	1.68	4.00	3.87	3.86
RefrigFlow	GPM	0.00		#DIV/0!	0.00		#DIV/0!	0.00		#DIV/0!
LeftFanRPM	RPM	2775	2652	2648	2763	2567	2563	2689	2504	2510
RightFanRPM	RPM	2576	2573	2574	2575	2475	2473	2473	2410	2408
EngineRPM	RPM	2064	2055	2056	2057	1227	1207	1214	842.6	834.4
ACComprRPM	RPM	2663	2651	2652	2654	1582	1557	1565	1085	1075
HeadP	PSIG	197.4	195.5	195.7	207.5	204.5	204.2	268.5	266.6	267.6
CondOutP	PSIG	186.6	184.6	184.6	196.1	193.3	193.2	261.2	259.4	260.3
CompInP	PSIG	23.2	23.1	23.2	37.9	33.1	33.6	49.7	48.8	49.2
RadCltInAvg	Deg F	192.9	192.6	192.6	194.6	192.8	192.7	198.8	198.7	198.6
EngHeatRej	BTU/Min	862.0	838.4	835.2	840.4	487.5	475.7	475.6	361.9	355.7
RadCltMFlow	Lb/Min	34.2	33.4	33.4	33.2	14.6	14.4	34.1	33.0	33.0
RadCltDeltaT	Deg F	30.8	29.9	29.7	47.7	39.8	39.4	39.4	13.0	12.8
ATB	Deg F	153.8	152.5	152.7	154.2	152.6	152.6	152.8	146.3	146.4
ACDischAv	Deg F	67.4	66.4	66.4	73.2	72.5	72.5	82.3	82.1	82.2
CompOutSHeat	Deg F	140.0	139.9	139.8	139.7	115.2	115.0	115.4	113.6	113.2
CompInSHeat	Deg F	150.0	148.4	148.2	148.3	136.0	135.2	135.6	134.9	134.0
SubCool	Deg F	-21.94	-22.38	-22.55	-21.86	-22.81	-22.86	-22.70	-23.65	-23.92
CndInGridAv	Deg F	110.0	109.6	109.6	112.9	111.2	111.2	138.1	137.1	137.6
CndOutGridAv	Deg F	130.6	130.0	130.1	135.3	133.4	133.4	162.4	161.6	162.0
FrtDrvStckAv	Deg F	99.1	92.3	92.3	94.5	94.3	94.3	103.0	103.0	103.0
FrtPasStckAv	Deg F	94.6	87.5	87.5	90.5	90.1	90.2	99.8	99.8	99.7
RrDrvStckAv	Deg F	92.6	85.9	85.9	89.8	89.6	89.6	100.0	100.0	99.7
RrPasStckAv	Deg F	90.0	83.8	83.8	87.6	87.3	87.3	97.3	97.3	97.3
StickManAv	Deg F	94.0	87.4	87.4	90.6	90.3	90.4	100.0	100.0	99.9

A/C Charge Determination Plot

Vehicle #	1491a	Make:	Toyota	Model:	Camry
Spec #	A	Comment:	R-134A		

refrigerant charge (oz)	Compressor out pressure (psig)	Compressor in pressure (psig)	A/C discharge temp. (degF)	Evaporator in temp. (degF)	Evaporator out temp. (degF)	Evaporator out superheat (degF)	Condenser out subcool (degF)
10.6	216	29.3	59		106	72	0.56
12.6	225	32.4	58.5		86.5	48	0.31
13.6	230	33.5	58.5		72.6	33.4	3.3
14.6	235	33	58.8		67	28	10.7
15.6	239.6	33.4	57.9		65.5	26.7	16
16.6	241	32.9	58.4		63.4	24.9	17.7
17.6	242	32.9	58.8		64	26	17.7
18.6	242.7	33.4	59.1		63.6	26.7	17.5
19.6	243.1	33.2	60		64.3	25.8	17.9
20.6	244	33	60		65	25.6	18.3
21.6	245.8	33.3	60		63.7	24.9	19
22.6	260.7	33.6	59.6		62	22.7	27.5
23.6	286.6	34.2	59.9		60.7	21.5	37.2

Procedure: PCD 1895 Revision: 3



Valeo Engine Cooling Vehicle Wind Tunnel

Test Name	Charge Determination				
Veh #	1491a	**Engine**	2.4L I4	**Test Date**	6/21/2007
Year	2007	**Transmission**	Auto 5 spd.	**Spec**	A
Make	Toyota	**Axle Ratio**		**Test Weight**	4345
Model	Camry	**CdA**	7.50	**Tester**	HLW

Spec Desc. All baseline with R134A

Comments 100% solar

		Charge Determination				
Parameter	***Units***	***Max***	***EOT***	***6 Scan Avg.***		
Roll HP	HP	-1.90	-2.14	-2.63		
RollSpeed	MPH	25.4	25.2	25.0		
WindVel	MPH	25.0	24.9	24.8		
AirTemp1	DegF	111.4	110.7	110.7		
AirTemp2	DegF	111.6	110.7	110.7		
AirTempAvg	DegF	111.5	110.7	110.7		
WallTemp	Deg F	103.6	103.4	103.4		
Humidity	%	20.8	20.6	20.6		
Barometer	mBar	976.0	967.4	968.2		
RadCltIn1	Deg F	194.8	194.5	194.4		
RadCltIn2	Deg F	195.1	194.5	194.4		
RadCltOut	Deg F	153.4	152.8	152.8		
TranSump	Deg F	180.9	180.3	180.3		
CompOut	Deg F	234.8	202.2	201.7		
CondOut	Deg F	135.7	117.9	117.9		
CompIn	Deg F	106.5	61.4	61.3		
EvapAirIn	Deg F	124.6	124.4	124.4		
ACDischLt	Deg F	60.8	60.6	60.4		
ACDischLtC	Deg F	58.9	58.5	58.5		
ACDischRtC	Deg F	61.1	59.1	59.2		
ACDischRt	Deg F	63.5	61.7	61.8		
EngOilSump	Deg F	214.0	213.8	213.5		
Spare1	Deg F	0.00	#DIV/0!	#DIV/0!		
Spare2	Deg F	0.00	#DIV/0!	#DIV/0!		
Spare3	Deg F	0.00	#DIV/0!	#DIV/0!		
Spare4	Deg F	0.00	#DIV/0!	#DIV/0!		
RadCoolFlow	GPM	1.66	1.62	1.60		
RefrigFlow	GPM	0.00	#DIV/0!	#DIV/0!		
LeftFanRPM	RPM	2641	2473	2478		
RightFanRPM	RPM	2543	2429	2427		
EngineRPM	RPM	1231	1211	1198		
ACComprRPM	RPM	1586	1561	1544		
HeadP	PSIG	287.8	287.1	286.2		
CondOutP	PSIG	281.3	280.6	279.8		
CompInP	PSIG	35.1	34.1	34.2		
RadCltInAvg	Deg F	194.9	194.5	194.4		
EngHeatRej	BTU/Min	506.2	484.7	480.3		
RadCltMFlow	Lb/Min	14.3	13.9	13.8		
RadCltDeltaT	Deg F	50.4	41.6	41.6		
ATB	Deg F	152.7	151.2	151.3		
ACDischAv	Deg F	60.4	60.0	60.0		
CompOutSHeat	Deg F	99.0	45.4	45.1		
CompInSHeat	Deg F	72.2	21.9	21.6		
SubCool	Deg F	37.5	37.1	36.9		
CndInGridAv	Deg F	112.3	111.6	111.6		
CndOutGridAv	Deg F	138.3	138.2	138.2		
FrtDrvStckAv	Deg F	82.8	82.6	82.7		
FrtPasStckAv	Deg F	79.5	79.2	79.1		
RrDrvStckAv	Deg F	78.8	78.6	78.7		
RrPasStckAv	Deg F	76.7	76.6	76.6		
StickManAv	Deg F	79.4	79.2	79.3		

Valeo Engine Cooling Vehicle Wind Tunnel

Test Name	AC Cooldown (Daimler/Chrysler)				
Veh #	1491a	Engine	2.4L I4	Test Date	6/21/2007
Year	2007	Transmission	Auto 5 spd.	Spec	A
Make	Toyota	Axle Ratio		Test Weight	4345
Model	Camry	CdA	7.50	Tester	HLW/JJP

Spec Desc.	All baseline with R134A

Comments	100% solar

		Cooldown				
Parameter	*Units*	*Max*	*EOT*	*6 Scan Avg.*		
Roll HP	HP	2.33	-11.67	-11.68		
RollSpeed	MPH	59.4	55.3	54.9		
WindVel	MPH	54.9	54.9	54.8		
AirTemp1	DegF	111.3	110.4	110.4		
AirTemp2	DegF	111.7	110.1	110.3		
AirTempAvg	DegF	111.3	110.2	110.3		
WallTemp	Deg F	107.8	107.8	107.7		
Humidity	%	21.6	19.9	20.0		
Barometer	mBar	976.6	969.9	969.8		
RadCltIn1	Deg F	196.8	193.5	193.3		
RadCltIn2	Deg F	197.1	193.2	193.2		
RadCltOut	Deg F	172.3	145.0	144.9		
TranSump	Deg F	183.6	183.3	183.4		
CompOut	Deg F	208.3	174.6	173.9		
CondOut	Deg F	144.1	114.3	114.4		
CompIn	Deg F	129.9	35.4	35.0		
EvapAirIn	Deg F	133.0	79.1	79.3		
ACDischLt	Deg F	145.0	43.5	43.5		
ACDischLtC	Deg F	163.9	41.1	41.3		
ACDischRtC	Deg F	159.5	41.9	41.9		
ACDischRt	Deg F	149.8	44.9	45.0		
EngOilSump	Deg F	224.9	223.3	224.0		
Spare1	Deg F	0.00	#DIV/0!	#DIV/0!		
Spare2	Deg F	0.00	#DIV/0!	#DIV/0!		
Spare3	Deg F	0.00	#DIV/0!	#DIV/0!		
Spare4	Deg F	0.00	#DIV/0!	#DIV/0!		
RadCoolFlow	GPM	3.82	2.00	1.93		
RefrigFlow	GPM	0.00	#DIV/0!	#DIV/0!		
LeftFanRPM	RPM	2731	2571	2593		
RightFanRPM	RPM	2552	2457	2448		
EngineRPM	RPM	2619	1753	1743		
ACComprRPM	RPM	3410	2263	2251		
HeadP	PSIG	305.8	206.4	206.7		
CondOutP	PSIG	297.5	202.0	202.3		
CompInP	PSIG	140.3	20.0	20.0		
RadCltInAvg	Deg F	196.9	193.3	193.2		
EngHeatRej	BTU/Min	980.3	696.1	671.8		
RadCltMFlow	Lb/Min	32.7	17.3	16.7		
RadCltDeltaT	Deg F	60.9	48.3	48.3		
ATB	Deg F	197.9	151.9	152.1		
ACDischAv	Deg F	154.6	42.8	42.9		
CompOutSHeat	Deg F	55.2	42.0	41.2		
CompInSHeat	Deg F	67.0	12.6	12.2		
SubCool	Deg F	26.1	16.8	16.8		
CndInGridAv	Deg F	133.0	109.7	109.7		
CndOutGridAv	Deg F	149.9	123.3	123.2		
FrtDrvStckAv	Deg F	140.2	74.1	73.9		
FrtPasStckAv	Deg F	143.1	67.5	67.5		
RrDrvStckAv	Deg F	138.5	68.8	68.8		
RrPasStckAv	Deg F	141.3	65.2	65.1		
StickManAv	Deg F	140.3	68.9	68.8		