Safari Temperature Gauges Read Low

I did extensive testing on the water temperature gauges on my 98 Sahara and found the readings to be low. The gauge manufacturer support rep suggested adding a shunt resistor of around 500 ohms.

Safari used a GM sensor and the resistance vs temperature curve does not match the Teleflex gauges. I created a graph to show this.

After trying several values, I settled for a 680 ohm resistor from the "S" (sender) terminal on the back of the gauge to ground and the readings were very close. I would recommend a 1 watt resistor. This shunt worked on both the dash and service bay gauges.

This brought the curves much closer and nearly perfect at normal running temperature. It served me well over the years.

The problem is not the location of the sensors, it is the calibration curve of the actual sensor. The water temperature sensors (2) are in the thermostat neck which is normal. I added a similar shunt resistor to the trans temp gauge.

Jim Exler, Nampa, ID

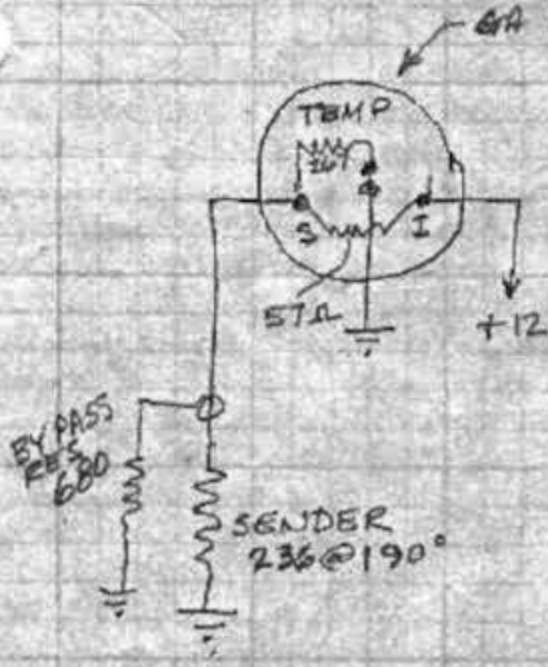
Here are the gauges and senders installed in my 98 Sahara

Gauges	Manufacturer	Model	Range	Sender
Speedometer	Teleflex	59297	0-85	ECM pulse(30kPPM)
Tachometer	Teleflex	59298	0-4000	ECM pulse (alt calib)
Turbo Boost`	Teleflex	59446	0-30	Tubing
Fuel	Teleflex	10151 (10131?)	E-F	TransFlow 90 ohm
Volt	Teleflex	10130	8-18	N/A
Oil Press	Teleflex	10181	0-100	
Water Temp	Teleflex	10645	100-280	52320-011
Trans Temp	Teleflex	10655	100-320	

For those interested, the next page has the calculations I used to finalize the resistor and my graph of the gauge vs sender values.

I have also included a data sheet for the sender. The temps are in centigrade. 190 F = 88 C

SAFARI WATER TEMP GA



$$\frac{E}{I \mid R}$$

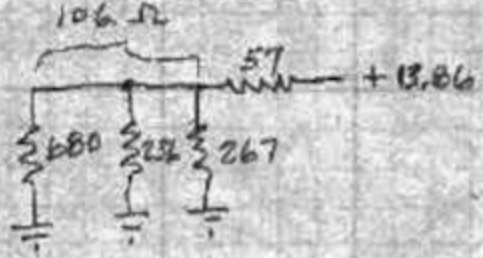
190°

57 + 236 = 293 Ω

$\frac{14\,V}{293} = 0.048\,a = 0.67\,w$ (NORMAL OEM)

57 + 680 = $\frac{14}{737}$ = 0.019 a = 0.27 w (BYPASS RES)

W/ BYPASS

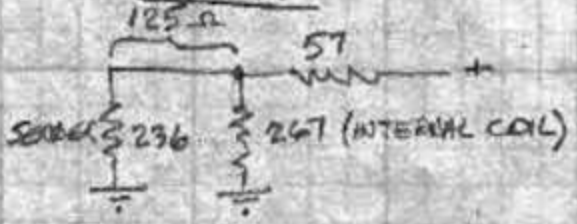


$$R = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2}} \cdot \frac{1}{\frac{1}{680} + \frac{1}{236}} = 175.2\ \Omega$$ (01)

$R_T = 163$

$I = .085$

STOCK



$R_T = 182$

DELPHI
Packard Electric Systems

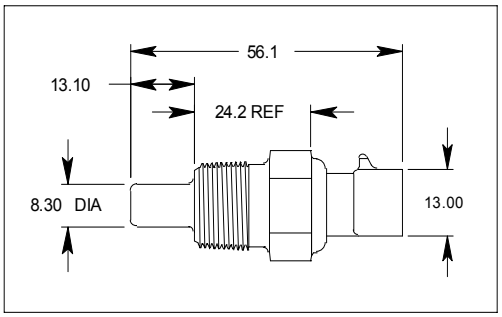
TEMPERATURE SENSOR
PRODUCT DATA

COOLANT TEMPERATURE SENSOR

PART NUMBER 12146312

FEATURES

- Design for Manufacturability
- Cost Effective
- Robust Design
- Few Components & Assembly Processes
- Thermistor Technology
- 100% Calibration Certified



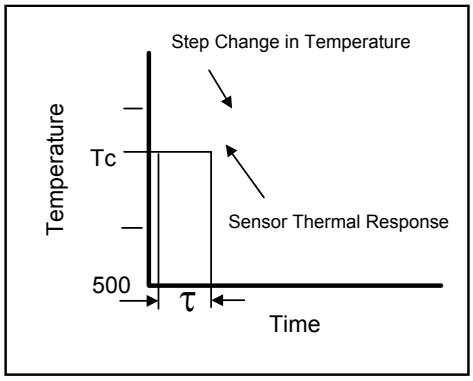
Thermal & Electrical Properties

Typical Voltage Supply		5V dc
Operating Temperature		-40°C to 135°C
Resistive Range(Ω)		See Table
Dissipation Constant	‡	24 mW/°C
Thermal Time Constant	‡‡	20 to 30 seconds
Accuracy		See Table

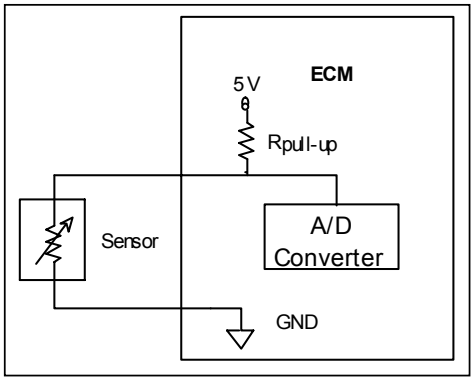
Mechanical Characteristics

Sensor Body Material	Brass Housing
Connector	PBT 30% GF
Hex Size	18.90mm (3/4")
Thread Size	3/8" - 18 NPTF
Thread Sealant	GM09985473
Validated Sealing Pressu ‡‡‡	145 kPa
Mating Connector & Seal	12162193
Installation Torque	20 N-m, dynamic
Overall Weight	39.5g

Thermal Time Constant ‡‡



Circuit Schematic



‡ The ratio, at a specified ambient temperature, of the change in the power dissipation of the sensor to the resultant temperature change of the thermistor. Test medium: silicone oil.

‡‡ The time required for the sensor to achieve 63.2% of its steady state value when subjected to a step change in ambient temperature [Tc=(Tf-Ti)*63.2%+Ti]. Test medium: silicone oil.

‡‡‡ Test fixture fitted with 3/8"-18 NPSF Internal Threads.

TEMPERATURE SENSOR

PRODUCT DATA

DELPHI
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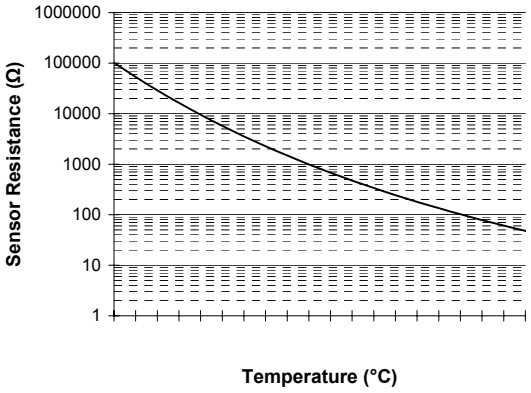
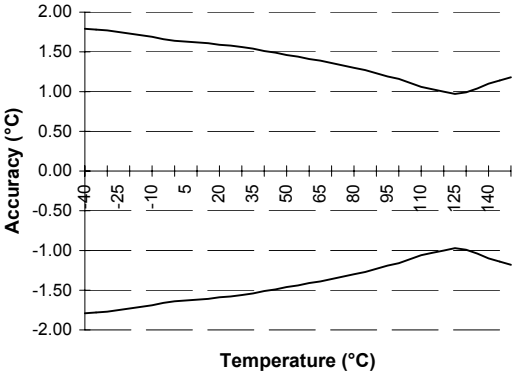
Unload Resistance-Temperature Characteristic Chart



Temperature Accuracy Chart



Note: Temperature Sensor Calibration Resistance Guaranteed by 100 % Automated Calibration Certification.

Unloaded Resistance-Temperature Characteristic Table

Temp (°C)	R(Ω)*	R (±%)	Ref. Acc. (±°C)	Temp (°C)	R(Ω)*	R (±%)	Ref. Acc. (±°C)	Temp (°C)	R(Ω)*	R (±%)	Ref. Acc. (±°C)
-40	102,122	12.04	1.8	25	2,830	7.09	1.6	90	244.8	3.87	1.2
-35	73,340	11.58	1.8	30	2,268	6.81	1.6	95	209.7	3.66	1.2
-30	53,249	11.12	1.8	35	1,828	6.53	1.5	100	180.3	3.45	1.2
-25	39,064	10.67	1.8	40	1,483	6.25	1.5	105	155.6	3.22	1.1
-20	28,939	10.24	1.7	45	1,210	5.97	1.5	110	134.7	3.02	1.1
-15	21,637	9.81	1.7	50	992	5.70	1.5	115	117.1	2.84	1.0
-10	16,321	9.39	1.7	55	819	5.45	1.4	120	102.2	2.69	1.0
-5	12,413	8.97	1.7	60	679	5.21	1.4	125	89.4	2.57	1.0
0	9,516	8.57	1.6	65	566	4.98	1.4	130	78.5	2.54	1.0
5	7,354	8.27	1.6	70	475	4.75	1.4	135	69.1	2.62	1.0
10	5,728	7.97	1.6	75	400	4.52	1.3	140	61.1	2.69	1.1
15	4,496	7.67	1.6	80	338	4.30	1.3	145	54.1	2.73	1.1
20	3,555	7.38	1.6	85	287	4.08	1.3	150	48.1	2.76	1.2

Important: The values above are for the unloaded thermistor, as shipped from Packard Electric, and does not reflect the effects of application system errors and aging.

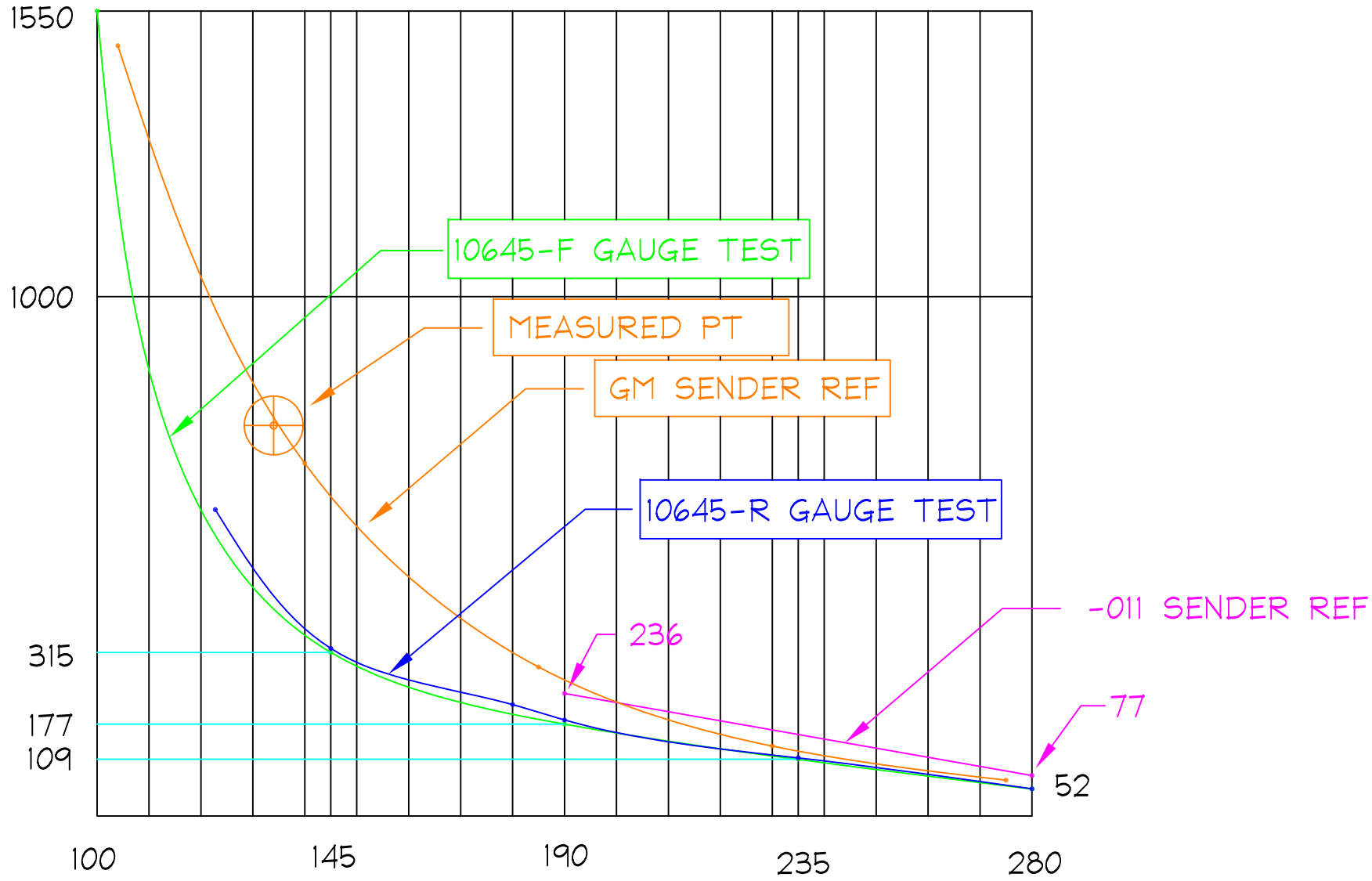
*Note: Please contact PE Engineering for the resistance vs. temperature curve for your temperature sensor application. Due to self-heating effects of the thermistor, the resistance is dependent on the application.

Since thermistors are "continuous function devices", resistance vs. temperature data is available for numbers beyond those specified above.

For more information contact:

Delphi Packard Electric Systems
Sensor Business Segment, M/S 93B
408 Dana Street
Warren, OH 44486

Phone: (330) 373-3689
(330) 373-3069
Fax: (330) 373-4147



NOTE: EXTERNAL RESISTANCE ADJUSTED TO MOVE POINTER TO POINTS ON THE FACE AND THEN MEASURED WITH OHMETER. POWER WAS 13.86 VDC

Check dash gauge to determine	SCALE:N/A	PROJECT:SAFARI MOTORHOME		TITLE:TELEFLEX 10645 WATER TEMP GA
resistance vs reading. Add 2nd gauge	DRAWN:JIM X	LOC: CAMARILLO, CA		DRG:10645-T1 REVISION 0
and overlay sender data	DATE: 8/20/08	JOB NO:N/A	GaugeWater.dwg	

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