

## Gen 2 Prius Fuel Gauge

Gen 2 Prius Fuel gauge is originally inaccurate as design feature which Prius drivers need to compromise.

Therefore, Prius drivers must react properly referring to "Appropriate gas refill timing" below. If not, you will face severe empty gas accident.

Refer to Technical Service Bulletins issued by Toyota, "[TSB-EL010-04 Revised](#)" issued on 8/24/2004 and "[TSB-0163-08](#)" issued on 8/5/2008.

### Recommendation on TSB from Toyota

More than 3 gallons must be refilled at least because the fuel gauge is not updated due to the existence of a bladder fuel tank. Toyota has been insisting on saying "It is not a design flaw. Installing an additional flexible capacity bladder tank had to be installed for only North America model not to spill and scatter evaporated gas". Is it effective for keeping clean air? It is similar to Freon gas spillage prohibition. Is there any certified evidence by authority?

Then, Prius drivers must guess how much fuel is actually in a sub-tank a fuel sensor is attached. The guess is not simple and easy.

A sub-tank and a bladder tank can store total 11.9 gallons in optimum condition, temperature-wise. Due to the side effect of bladder tank, when putting in gas up to a little more 8 gallons from gas empty condition reaches in full condition, a gas pump at gas station stops supplying gas. Guess why.

### Appropriate gas refill timing

(Reaction 1) When fuel gauge bars reached down to 4 bars (Trip meter reset and refill in full are not necessary)

This is a simplest way because the fuel gauge bars are linearly updated if the bars are in range of 9 to 4 (Be careful that bars under 3 are in erratic dangerous zone).

Only the range of 10 down to 4, not 10 down to 1, is applicable. Prius fuel gauge feature! Good or bad?

(Reaction 2) When the trip meter (TRIP A) reached 300 miles (Trip meter reset and refill in full are necessary)

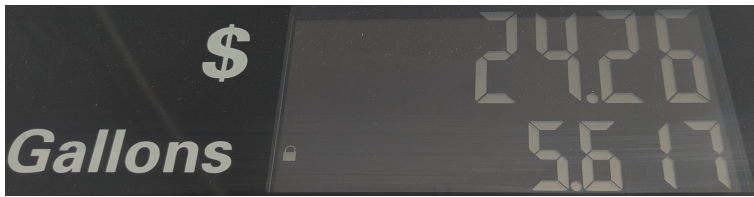
Guess that the mileage is 40 miles per gallon and 7.5 gallons are consumed for running 300 miles. Refill time has come. What a good guess! Enjoy.

### How to clear "TRIP A" to zero

- Go to "RUN" (Press "Power" once with "brake") or "IG-ON" (Press "Power" twice without "Brake")
- Press "ODO TRIP" until "TRIP-A" is displayed and keep holding "ODO TRIP" until getting "0.0 MI".

**"Fuel gauge bars" and "actual drive distance" relationship (Trial #1)**

	Fuel gauge bars						
	10	9	8	7	6	5	4
<b>Evidence</b>							
<b>Trip meter</b>	0	96.2	108.9	131.3	158.7	181.4	211.1
<b>Drive distance</b>	0 (Gas in full)	96.2	12.7	22.4	27.4	22.7	29.7



Mileage

$$212.7 / 5.617 = 37.867 \text{ (miles/gallon)}$$

$$212.7 / 24.26 = 8.768 \text{ (miles/\$)}$$

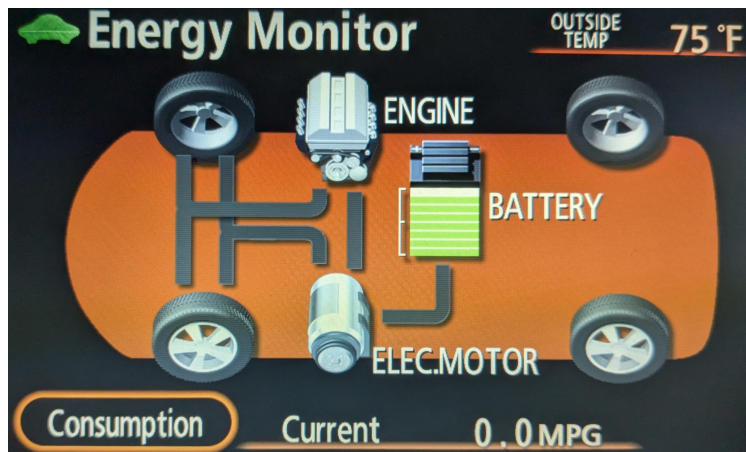


Just after filled up



Cleared Trip A to zero

The mileage of 37.867 (miles/gallon) is so so. The power of 1.5 liter gasoline engine looks a bit weak but sufficient for most occasions.



7 green bars (HV battery & charger are healthy)



Uniform HV voltages (HV battery is healthy)

Because battery on EV is an exclusive leading role, the battery life is so short. The life span is under 10 years. Remind that the short life span of notebook PC battery. After death, AC adapter must be connected all the time. HV battery on Prius is a supporting role which can survive much longer (over 10 years) due to the less stress. Age of my Prius is 19 years old!


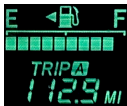

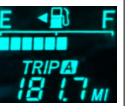
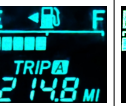






In Japan, battery assisted bicycles which combined regular bicycle with battery & motor are very popular among homemakers who are raising kids for shopping and going to kindergarten.

Toyota probably obtained the principle idea from the battery assisted bicycle and made Prius. Prius is a battery assisted combustion engine car although it is proficiently named as "hybrid".

When I joined NEC in 1971, hybrid IC (Integrated Circuit) which integrated plural functional elements on one substrate existed already. The word of "hybrid" is not a new name invented but nice naming that hits somebody.

## "Fuel gauge bars" and "actual drive distance" relationship (Trial #2)

	Fuel gauge bars									
	10	9	8	7	6	5	4	3	2	1
<b>Evidence</b>										
<b>Trip meter</b>	0	112.9	---.-	164.5	181.7	214.8	227.1	269.2	295.2 (Exp)	321.2 (Exp)
<b>Drive distance</b>	0	112.9	*25.8	*25.8	17.2	33.1	12.3	42.1	26.0 (Exp)	26.0 (Exp)
<b>Averaged</b>			<*25.8	*25.8>	<*25.15	*25.15>	<*27.2	*27.2>	<*26.0 (Exp)	*26.0> (Exp)

\*; Averaged between "8" and "7" bars, "6" and "5" bars, and "4" and "3" bars. I take \*26.0 as the average.  
Exp; Expectation number

The accuracy of gauge bars seems to be 2 bars, not 1 bar. There is a certain gauge level dependency which makes it nonlinear. Probably, MCU roughly determines the number of bars and locks it without sufficiently considered averaging scheme.

At this trial #2, I plan to check when gas becomes complete empty ending up engine stop at which fuel gauge bar position. I bring an extra gas tank on vehicle in order to react the emergency of running out of gas.

I hope that the fuel gauge goes down to 1 and starts blinking as defined function of the fuel gauge noted on Prius operation manual.

I am feeling that the circumstances of running out of gas is getting ready. It may happen when the bar is "3".

Eventually, the fuel gauge bars have entered the dangerous zone of "3" to "1". Let's see what will happen next. Interesting!

In case of EV, never try this kind of trial. Resurrection from complete discharge never happens just as a case of airplane that incurs a catastrophic consequences.

## Fuel gauge bars vs. Sender resistance

Fuel gauge bars	Sender resistance ( $\Omega$ )	Fuel tank connector
10	4	
9	36	
8	45	
7	52	
6	58	
5	65	
4	72	
3	78	
2	85	
1	91	

### Initialize Fuel inclination (A complicated procedure most people dislike)

(1) Choose "TRIP A" mode

- Press "Power" twice with no Brake ("IG-ON").
- Press "ODO TRIP" until "TRIP A" is chosen.
- Press "Power" once ("Power OFF").

(2) Clear "TRIP A" mileage & Reset fuel inclination sensor

- Press and hold "ODO TRIP" ON.
- Press "Power" twice with no Brake ("IG-ON").
- Turn "ODO TRIP" OFF - ON - OFF - ON - OFF - ON within 5 seconds.
- Wait until "TRIP A" becomes "XXXXXX" 6 digits hex numbers, Release "ODO TRIP" OFF.
- Press and hold "ODO TRIP" ON.
- Wait until "TRIP A" becomes "XX1XX" 5 digits hex numbers, Release "ODO TRIP" OFF.
- "TRIP A" display is cleared to "0.0" MI as well as fuel inclination data is initialized background.

### Specification of 5 digits Hex numbers

5 digits HEX numbers on "TRIP A" display				
X	X	X	X	X
Vertical (Longitudinal) Fuel Inclination Data	<b>Data Write Status</b>			Horizontal (Lateral) Fuel Inclination Data
	0	In progress		
	1	Completed		
	2	Error		
	3	Canceled		