K.I.T.T. Speedometer

Manual revision: 1.2   for hardware rev 2.1 and firmware V16
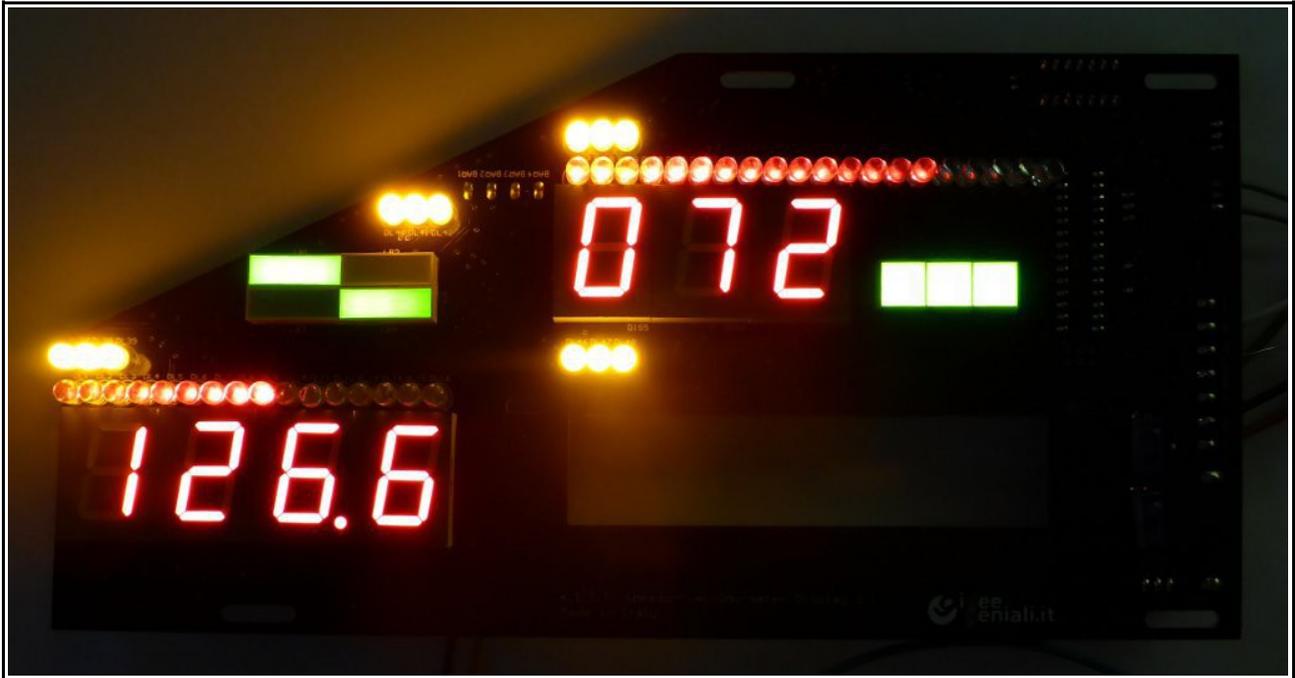
On a single electronic board find many functions for K.I.T.T. dash
- fuel level in the tank on led bar and numerical display
- estimated miles (or km) remaining with tank fuel level
- fuel reservoir (low fuel) with alternate flashing leds
- vehicle speed on led bar and numerical display (in kmh or mph)
- turn indicators left and right
- high lights and low lights indicators
- trip computer partial resettable odometer up to 999.9 miles (or km)
- total odometer total miles of vehicle up to 999,999 miles (or km)

New features and upgrades towards 1.0 hardware revision:
- resettable partial trip computer
- total odometer vehicle miles counting
- speed adjust trimmer range extended to accommodate two kind of speed sending units
- fuel signal dumped in electronics for stable readings
- numerical speed display readout stable
- led bar speed reactive
- enhanced 7 segments display brightness
- no multiplex drive at displays or leds: flicker free video shooting
- micro switching power supply on board, regenerates power supply rail, lower power/current consumption (1/3 than before), less heat produced (¼ than before), higher brightness, board stands fluctuating, reducing or noisy power supply keeping brightness stable
- integral protection from reverse polarity power supply
- lower board profile; no parts protruding high on back side, no heat sinks
- only visualization parts mounted on top side, all other parts on bottom side
- protection fuse on board
- passive analogical filters on supply rails and on car sensor inputs, higher immunity to electrical noise

User push button functionality

All user interaction is controlled via the single user push button. A short press will cyclic change display between three functionality (FUEL/TRIP/TOT) that we examine in detail:

FUEL: on multifunction display FUEL is shown for one second, then it's shown continuously the estimate distance (in miles or km) left with the remaining fuel in the tank. Distance is shown in miles+tenth_of_miles (or km+hectometers), with a decimal dot in third position.
Example: estimate distance with remaining fuel in the tank: 113.7 (113 miles and 7 tenth of a mile), multifunction display will show FUEL and then 113.7

TRIP: on multifunction display TRIP is shown for one second, then it's shown continuously the distance since last reset of trip computer partial odometer. Distance is shown in miles+tenth_of_miles (or km+hectometers), with decimal dot in third position.

While trip computer is shown, it's possible to press long on the user push button to reset it.

Example: the distance since last resetting the trip computer is 34.6 miles (34 miles + 6 tenth of miles), on display it's shown TRIP then 034.6
Example: do a long press of the user push button: the trip computer count is reset and display shows 000.0

TOT: on multifunction display TOT is shown for one second, then for two seconds the thousands of miles (or km) followed by an trailing underscore, then the residual part of miles (or km) proceeded by an heading underscore.
Example: total odometer vehicle distance is 46234 miles, on display it's shown TOT then 046_ then _234 and counting.

While the total odometer is show, a long press on the user push button will enter programming mode for total count. The first of the 6 digits will flash to tell it can be modified. A short press will change the flashing digit cycling numbers from 0 to 9. A long press will move the flashing on the next digit. At the end, after adjusting the 6th digit, another long press on the push button will exit programming mode.

When board is powered off, a non volatile memory will hold total and partial distance of the odometer, as well as the last mode (FUEL/TRIP/TOT) the boards was in. After restoring power, the board will start in the last used function.

K.I.T.T. Speedo-Fuel-Odo-meter Display 2.1
Made in Italy
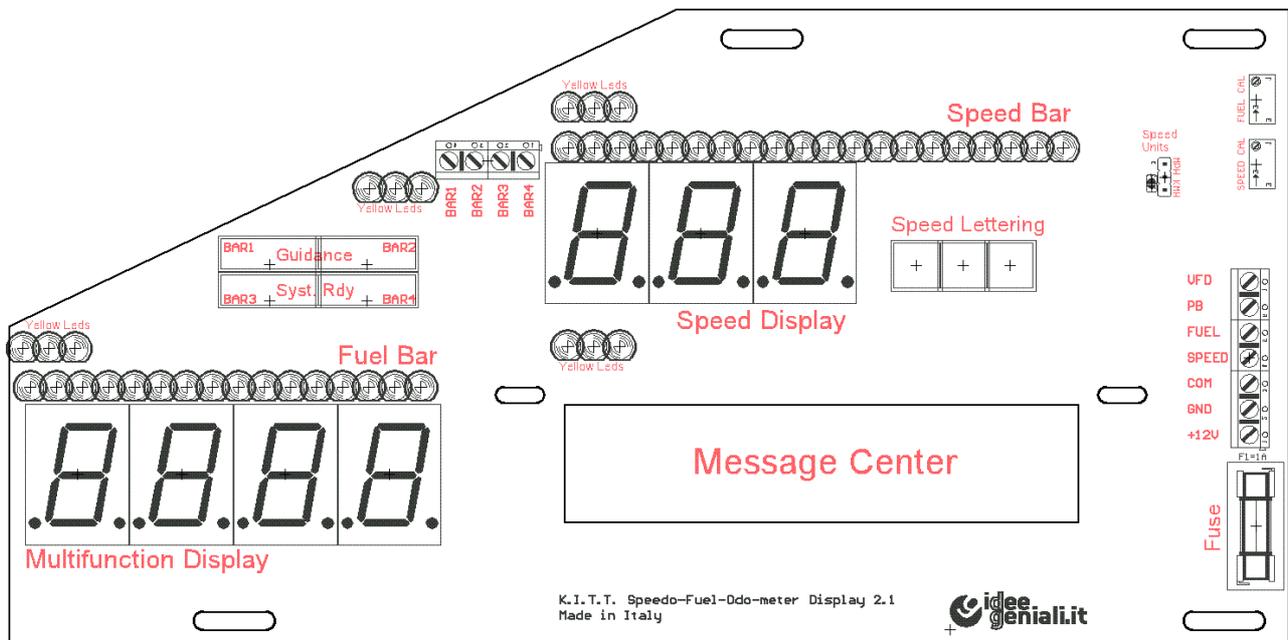
Indications

Speed bar: vehicle speed indication with a bar of 20 red leds with "slow decay" functionality

Speed display: vehicle speed numerical readout on three digits display with "anti flicker" functionality

Speed lettering: green light, always lit, area for the MPH lettering on adhesive or overlay

Fuel Bar: graphical fuel in the tank indication with 16 red leds bar

First two leds on the left will alternate flash when on reservoir (low fuel) condition

Multifunction Display: 4 alphanumerical character display, this shows at user selection:

FUEL: estimated miles (or km) with fuel left in the tank

TRIP: resettable trip computer for distance since last reset up to 999.9 miles (or km)

TOT: total odometer vehicle miles (or km) up to 999,999

Guidance: the two green lamps BAR1 and BAR2 are connected to turn lights indicators

Syst.Rdy: the two green lamps BAR3 and BAR4 are connected to low lights and high lights

Yellow Leds: four groups of three yellow leds each, are always lit

Settings

Speed Units: it's possible to use a jumper to set the board in miles or km (default with no jumper: miles)

Speed Cal: trimmer to adjust speed calibration (on a 30cm wire)

Fuel Cal: trimmer to adjust fuel level calibration (on board)

Protections

Fuse: 5x20mm 1Ampere cylindrical replaceable fuse

Mounting

Mounting eyelets: four of them for 4-40 screws and spacers, please always use washers

Message Center: an opening and two more eyelets for message center (optional)

Connections

4 ways screw terminal: BAR1 BAR2 BAR3 BAR4

7 ways screw terminal: VFD, PB, FUEL, SPEED, COM, GND, +12V
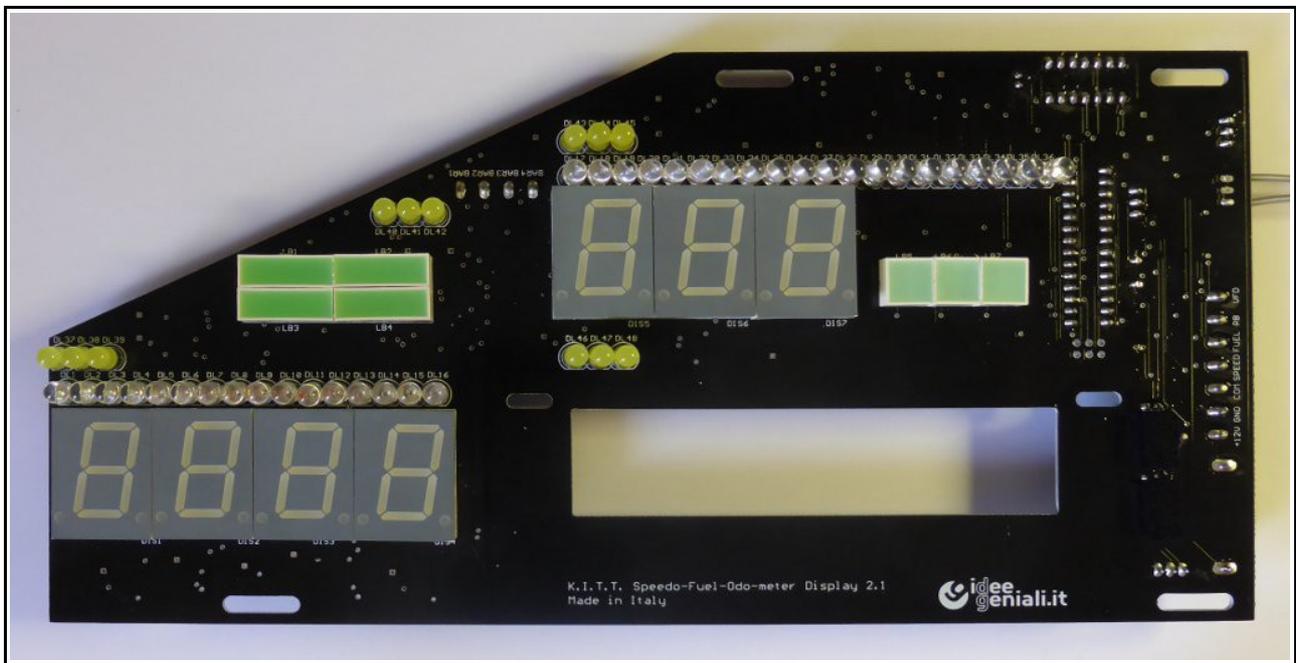
Note on mounting eyelets

There are four eyelets to the overlay and two eyelets for the message center. Around the eyelets there's a clearance area without any trace on board, this is enough clearance for typical 4-40 washers. Please always use washers. Please don't use extremely large washers or they'll touch traces and pads shortening out the board (damage or even fire hazard!). We suggest using 4-40 screws, 4-40 hexagonal spacers 3/8", 4-40 washers. Don't apply too much force when screwing in. Did I already say to always use washers between printed circuit board and screws and printed circuit board and spacers? Washers are your friends: use them. 4-40 screws (common in U.S.A.and other countries) can be replaced by M3 screws, M3 washers, M3x8 hex spacers (common in Europe and other countries). So use 4-40's or M3's.

Note on mounting/installing

Back side of board is populated with delicate electronic parts, pads and traces. The area behind the board must be clear of conductive bodies such as flying wires, metallic objects and such, that could short circuit traces/pads and damage the board (fire hazard!).
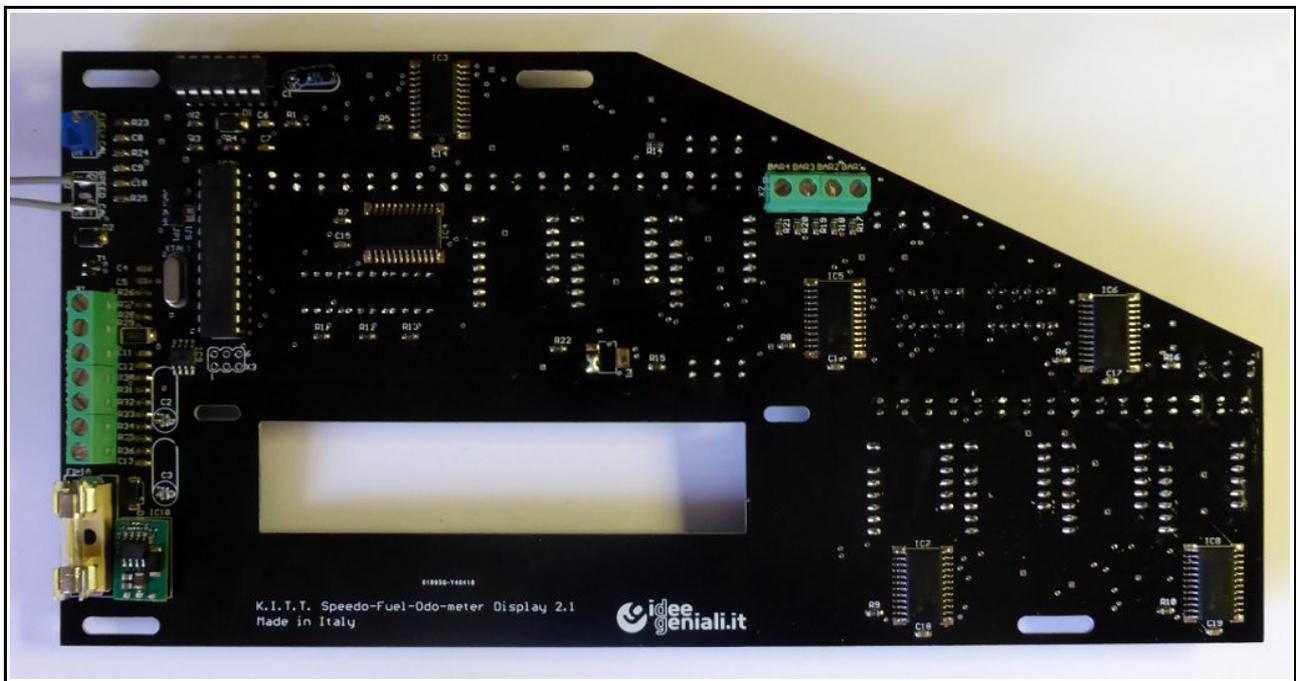
Jumper setting, calibrating with trimmers and fuse protection

The **jumper kmh/mph** is to be inserted in one of the two positions to select km or miles readouts. When there is no jumper at all, the board firmware defaults to miles. To select km, insert the jumper in kmh position. If you prefer, you can use a drop of melted solder (use your soldering iron) instead of the jumper: there are two exposed PADs just next to the jumper that you can use.

The setting in miles or km in single, and will affect all miles-km related functions on board: actual vehicle speed (in miles per hour or km per hour), the distance for trip computer and total odometer (in miles or km), the estimate distance left with remaining fuel in the tank (in miles+tenth_of_miles or km+hectometers).

The multiturn **Fuel Cal trimmer** will adjust/calibrate/fine-tune the fuel level indication. This trimmer is usually mounted directly on board. This is set in manufacture and typically doesn't need further user adjustment.

The multiturn **Mph Cal trimmer** will adjust/calibrate/fine-tune the speed reading. This trimmer is usually mounted on 12" of cable for facilitate operations. This trimmer is set in manufacture and typically doesn't need further user adjustment.

The **fuse** will melt in case of over-current or short circuit conditions e.g. due to accidental contact with GND with parts of the board, or wrong power connection, reverse polarity and similar. If the fuse melts, remove the cause of the problem, then replace with a identical kind of fuse: 5x20mm, 1Ampere.

Electrical connections

Supply (+12V, GND): please provide a supply 12VDC (max 13.8 VDC) between +**12V** and **GND**. The red wire (+12V) is connected to +12V screw terminal, the black wire (0V) is connected to GND screw terminal. When the board is powered up with no other connections than supply, the speed shows 000, fuel level is at maximum, guidance and syst.rdy are off, the yellow leds and green area for mph are lit.
SPEED: connect speed sensing unit (frequency signal)
FUEL: connect fuel level sensor (resistance signal)
VFD: connect to VFD screw terminal on message center
COM: reserved for future use, don't connect anything to COM screw terminal
PB: push button: multifunctional user key. Connect one end of the push button to PB the other end to GND

BAR1, BAR2: connect +12V to light up the left and right half of Guidance
BAR3, BAR4: connect +12V to light up the left and right half of Syst.rdy

Let's sum up the connection on the 7 ways screw terminal:

VFD	Fuel low / Fuel reservoir condition, connect to VFD on message center (sold separately)
PB	User momentary push button: one end to PB the other end to GND
FUEL	Fuel tank level sensor, resistive signal
SPEED	Vehicle speed sensor, frequency signal
COM	Reserved. No Connection
GND	Power supply, black wire: 0V
+12V	Power supply, red wire: +12V

Let's sum up the connection on the 4 ways screw terminal:

BAR1	Left half of Guidance: connect +12V to light up (left turn indicator)
BAR2	Right half of Guidance: connect +12V to light up (right turn indicator)
BAR3	Left half of Syst.rdy: connect +12V to light up (high lights)
BAR4	Right half of Syst.rdy: connect +12V to light up (low lights)

# Connection points on car electrical plant

On 1982-1984 electrical plant, you must remove all original instruments (oem gauges), except the speed, that must be kept on position (mounted). Please leave connected the yellow box for speed signal conditioning as well. This is necessary, and present on cruise control equipped vehicles. If your car doesn't have cruise control, must purchase and mount a speed sensor like cyberdine 8901 or equivalent.

On 1985-1992 electrical plant, you must leave all original instruments (oem gauges) in place, and must remove the screws marked with a yellow cross or FUEL, EGT and OIL won't work.

Disclaimer: verify compatibility between signals of your vehicle and this board inputs and vice versa. We don't assume any responsibility or liability for erroneous connections and/or damage of vehicle electrical plant and/or electronic board. We put maximum efforts when writing this manual to provide accurate information, but we give no guarantee, express or implicit, on the faithful of provided information, on the suitability of this board for any purpose, including the information knowing or not knowing which, may result in damage of things or injury of persons. Using this board, any modification to vehicle electric plants, to operate in safe conditions, is in full charge of user / installer. It could be a legal requirement for the user/installer to get the necessary authorizations to use the apparatus described in this manual. Pontiac brand and other brands are property of respective owners..
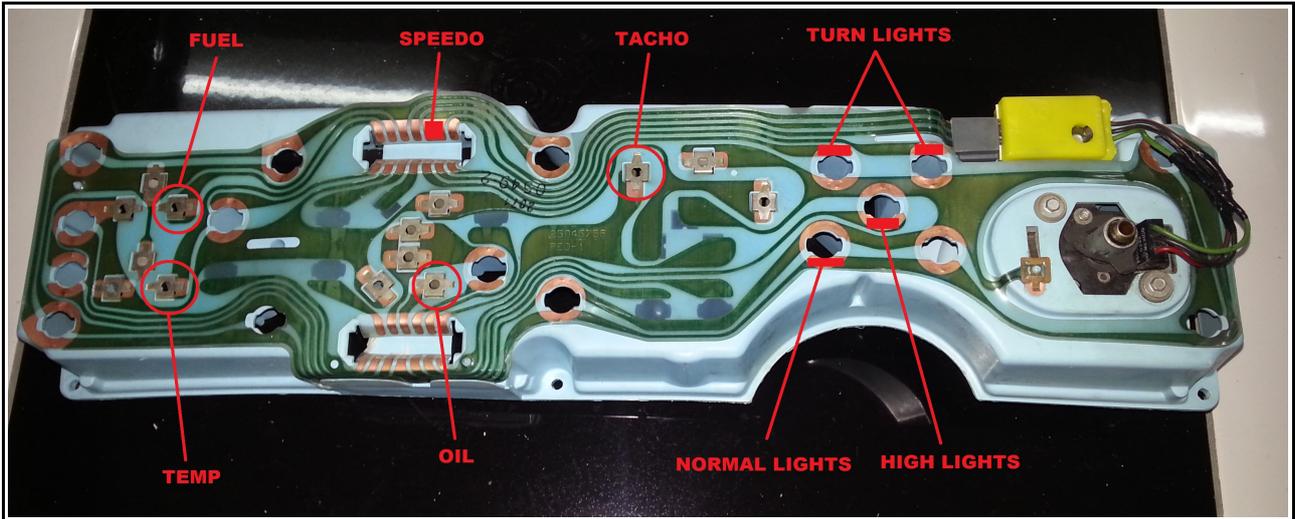
Point of connection on Pontiac 1982-1984 electrical plant
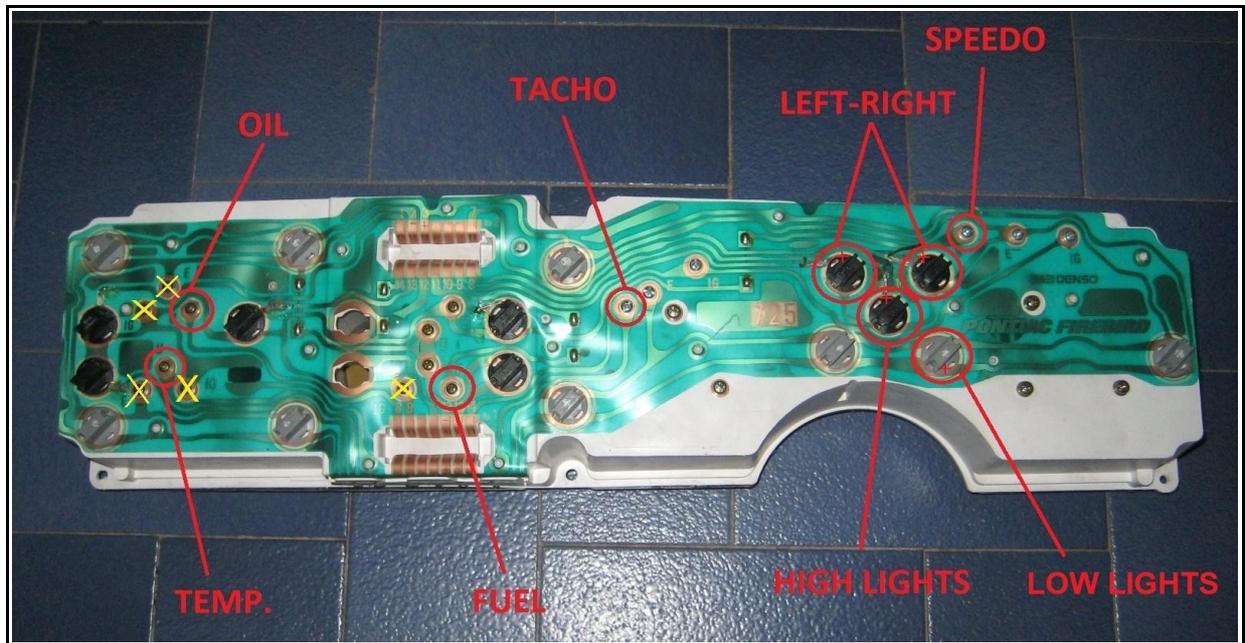
Point of connection on Pontiac 1985-1992 electrical plant

SPEEDO	Vehicle speed sensor, connect to **SPEED**
FUEL	Fuel in the tank level sensor, connect to **FUEL**
LEFT	Left turn indicator, connect the + to **BAR1**
RIGHT	Right turn indicator, connect the + to **BAR2**
HIGH LIGHTS	High lights indicator, connect the + to **BAR3**
LOW LIGHTS	Low lights indicator, connect the + to **BAR4**
TACHO	Engine rotation per minute sensor, connect to **TACH** (on Tacho board)
OIL	Oil pressure sensor, connect to **OIL** (on Tacho board)
TEMP	Engine refrigerant temperature sensor, connect to **EGT** (on Tacho board)