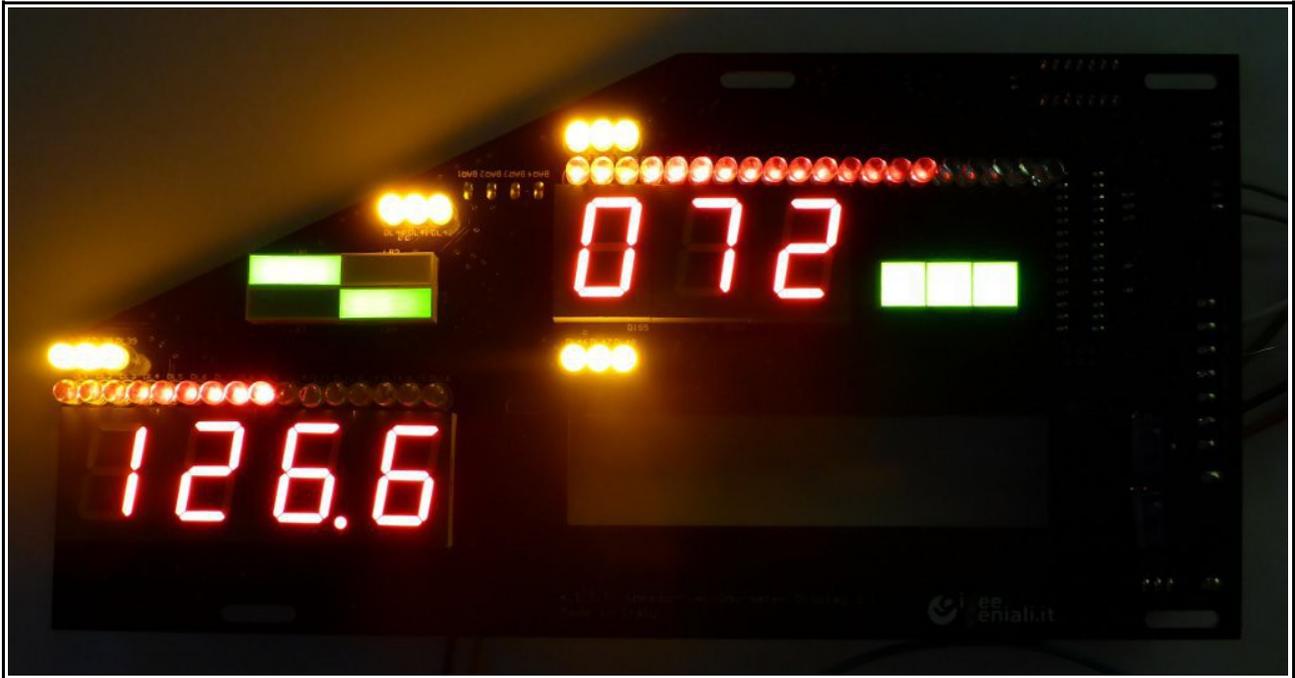


# K.I.T.T. Speedometer

Manual revision: 1.1 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 (1/4 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**

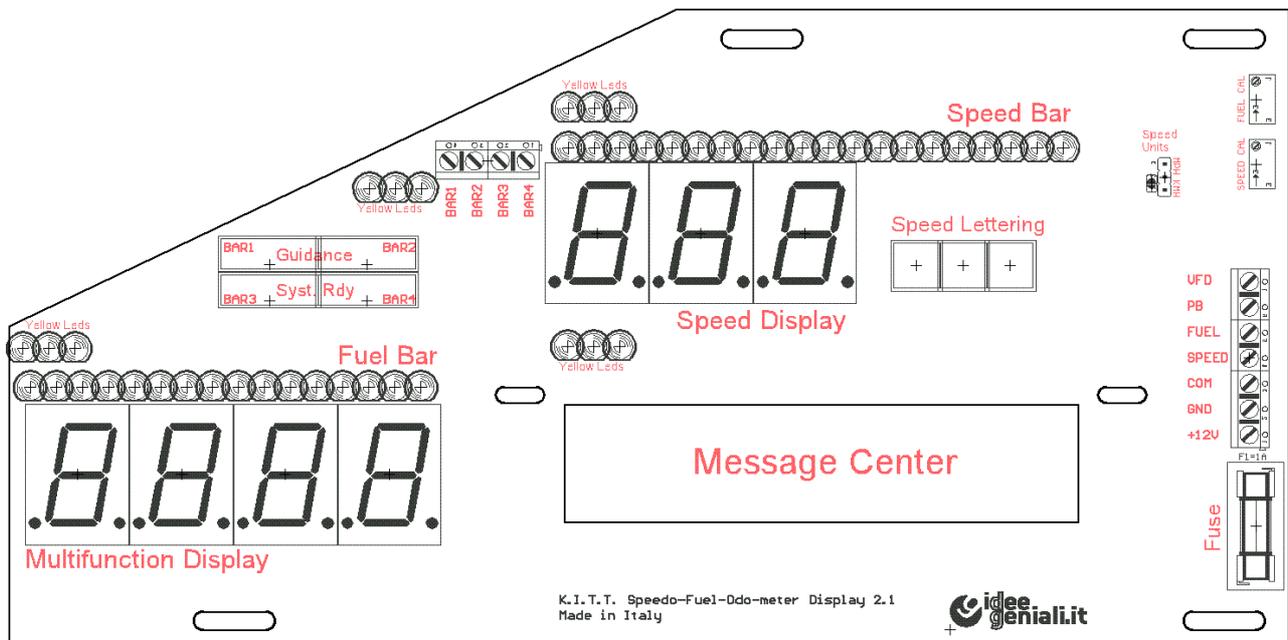
Example: do a long press of the user push button: the trip computer count is reset and display shows **000.0**

**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 6<sup>th</sup> 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.



## 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

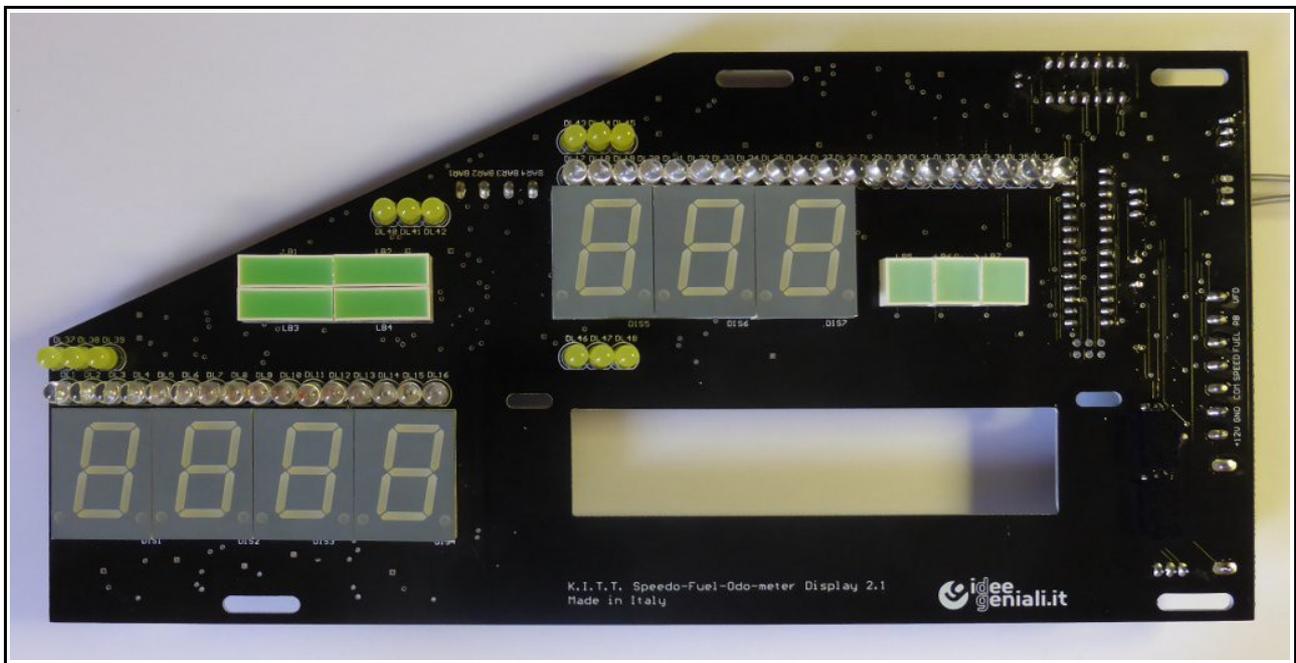
**Mounting eyelets:** four of them for 4-40 screws and spacers, please always use washers

**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

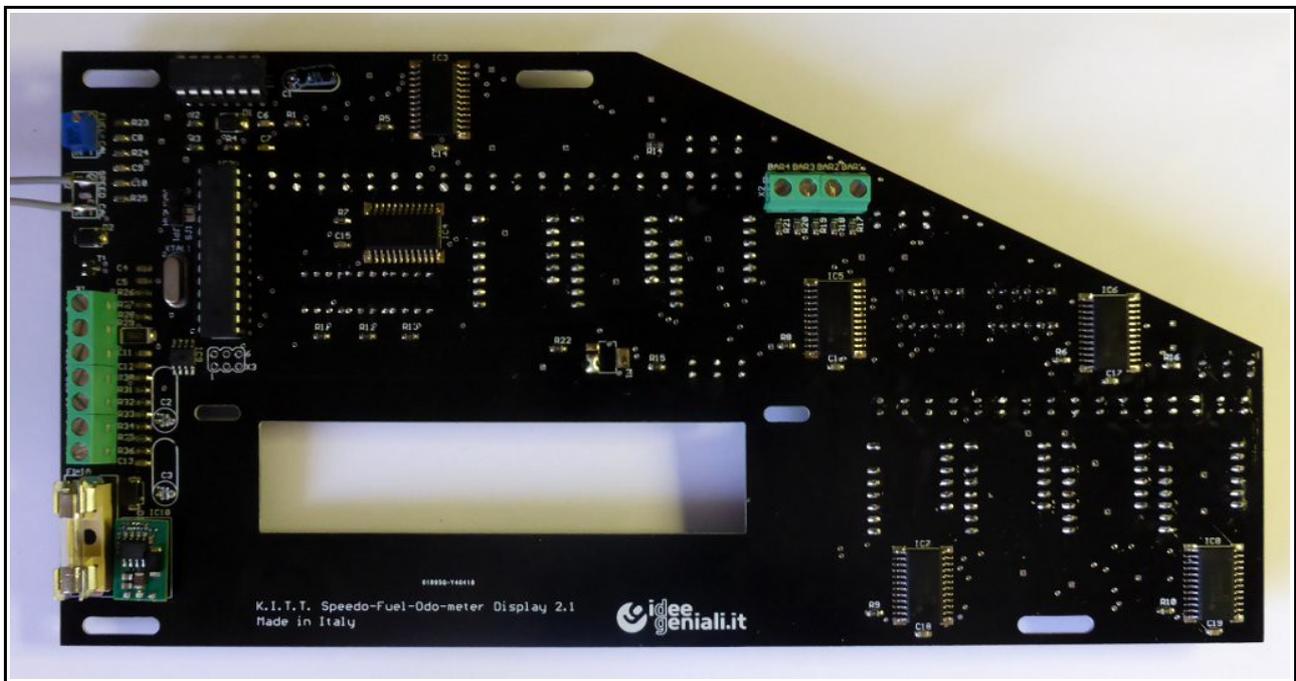


### **Note on mounting eyelets**

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:

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

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

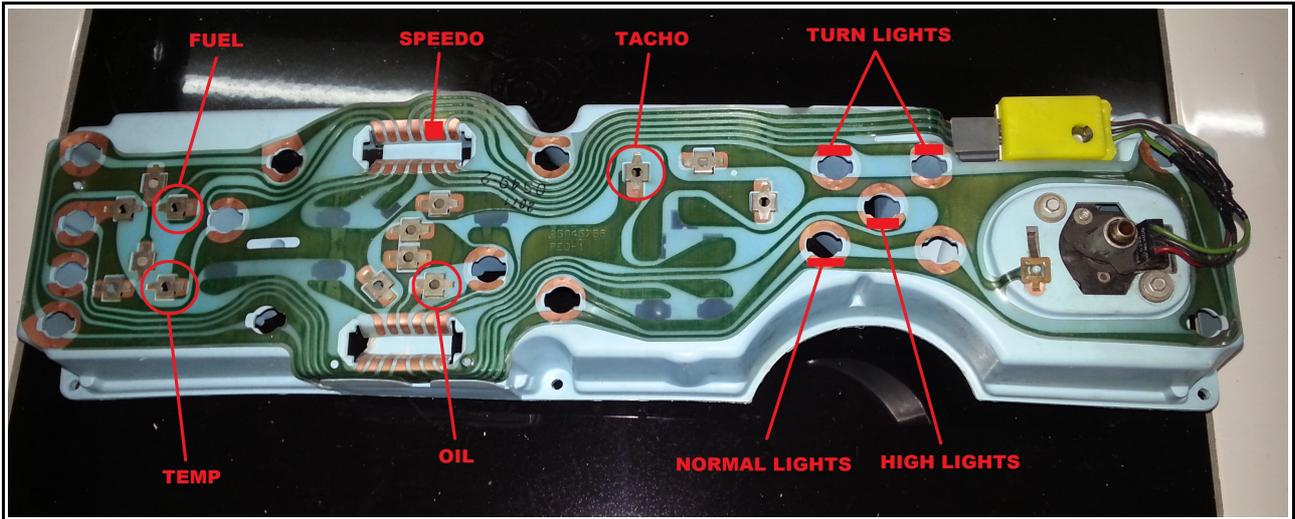
<b>BAR1</b>	Left half of Guidance: connect +12V to light up (left turn indicator)
<b>BAR2</b>	Right half of Guidance: connect +12V to light up (right turn indicator)
<b>BAR3</b>	Left half of Syst.rdy: connect +12V to light up (high lights)
<b>BAR4</b>	Right half of Syst.rdy: connect +12V to light up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

## Connection points on car electrical plant

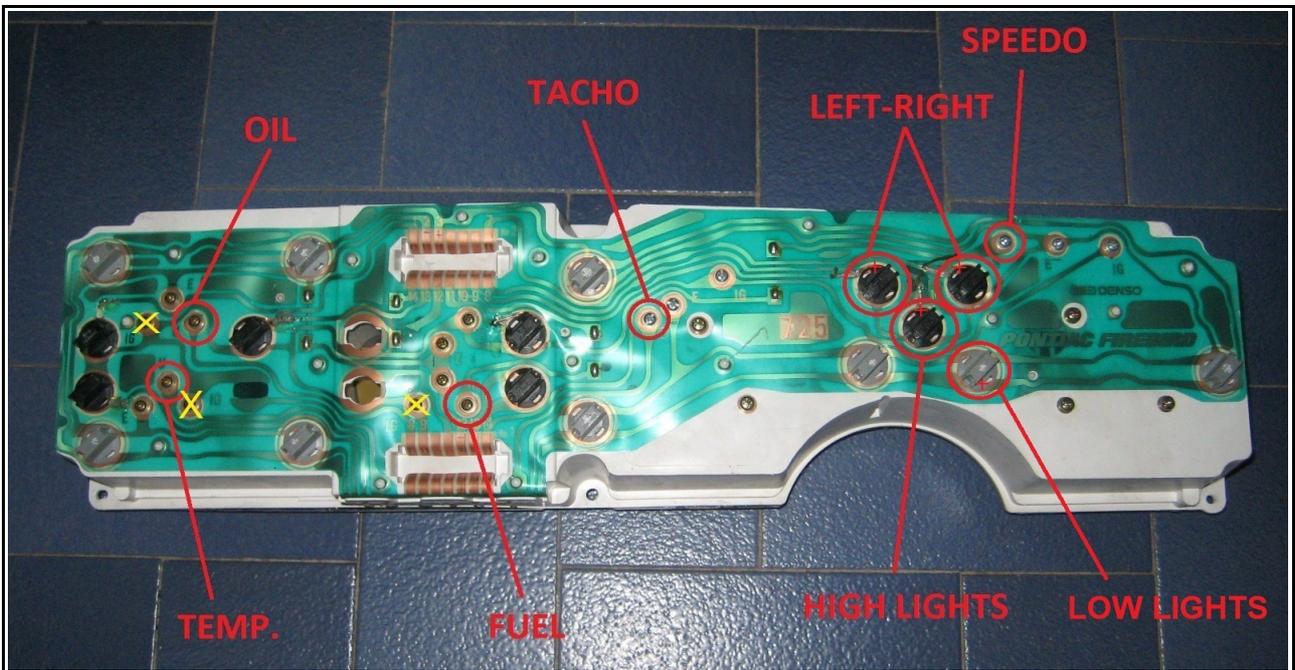
On 1982-1984 electrical plant, must remove all original instruments, except the speed, that must be kept on position (mounted). Please leave connected the yellow box for speed signal conditioning as well. This is necessary, and present on cruise control equipped vehicles. If your car doesn't have cruise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

On 1985-1992 electrical plant, it's possible to leave all original instruments in place, but must remove the screws marked with a yellow cross so that FUEL, EGT and OIL will 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*

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

# Message center

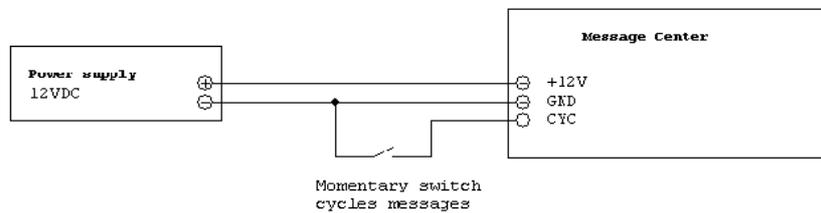
Rev b4



Display dimensions: 13x96mm; Board dimensions: 53x134mm

## Wiring

### Message Center Wiring



Red Wire, Pad +12V: +12V power supply

Black Wire, Pad GND: 0V power supply

White Wire, Pad CYC: momentary to GND, use a normally-open switch

## Features and functionality

At power up: welcome message, scrolling text 'I'M THE KNIGHT INDUSTRIES TWO THOUSAND'

Short key press: cycle to next message

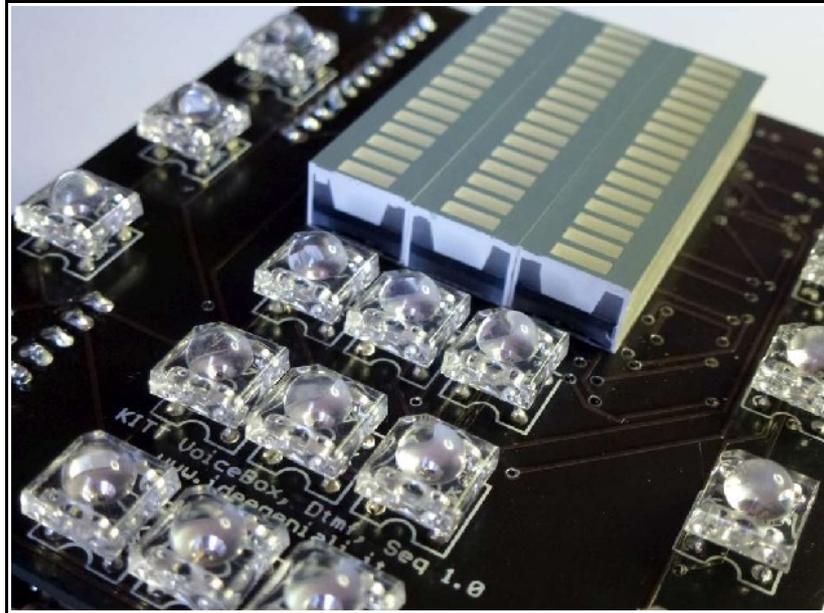
Long key press: auto change message ON or OFF shows ^AUTO ON^ and ^AUTO OFF^

## Messages list

I'M THE KNIGHT INDUSTRIES TWO THOUSAND				
CALIBRATE	L. TURBINE	R. TURBINE	MASS FLOW	FUEL FLOW
OIL PRESS	VOLTS	AMPS	INLET TEMP	INT TEMP
EXT TEMP	EXH TEMP	RANGE MILE	BOOST LBS	FT IMAGING
LATITUDE	LONGITUDE	HEADING	SATELLITE	LASER AIM
LASER FIRE	CRUISE CTL	AUTO MODE	TURBO MODE	EJT LEFT
EJT RIGHT	SYNTHESIZE	AUTO ROOF	OXYGEN	OVERRIDE
OILSLICK	AUTOSCAN	RADAR	HARMONICS	BLOOD ANALY
DNA	AUTO SUCK	AUTO CAL	PRESS IND.	ACCY VOLTS
FUEL RESRV	FUEL PRESS	TURBINE OK	RPM SET	DEG INC
IAT RDG	EXT PRESS	EXH PRESS	PRESS MIB	SHUTE TEST
SHUTE OK	MAIN PRESS	MAIN ENG		

# K.I.T.T. Voicebox 2011 with DTMF tones and Sequencer

Hardware revision: 1.0 User manual revision: 1.2



## Main features

Thanks for buying Voicebox 2011 with D.T.M.F. tones and sequencer. You purchased an advanced electronic device, full of innovative features that will make the best out of your K.I.T.T. replica, or that you can operate anywhere you find suits your needs. Main features:

- Audio input transformer for total isolation and safety of audio plant
- Trimmer for audio input volume/sensitivity
- True miniature speaker 8ohm with magnetic coil, no cheap piezo buzzer
- True linear audio amplifier for DTMF tones, no square waves
- Trimmer for fine-tuning amp gain for DTMF tones
- 4 step sequencer with DTMF tones on start up sequence
- Drives 4 external lamps for count-down in sync with sequencer
- Knight Rider theme at start up (can be enabled/disabled at wish)
- DTMF request input: a momentary switch to ground on this input, will have the voicebox produce a random DTMF tone for any button on your replica
- Inputs for Auto/Normal/Pursuit momentary switches. They're are totally managed by voicebox circuitry, with memory on the latest inserted function.
- Can drive external lamps for P.A.N.P. keys without any external electronic.
- 16-segments Bargraph, 100% tv-show accurate, and not cheap 20-segments bargraph found elsewhere
- Hi-Flux, square, extreme angle 120°, leds, with lens, assure optimum illumination without circle shapes on indicators
- Overall dimensions compatible with Knight Rider World overlay (BoBox)
- K.I.T.T. or K.A.R.R. versions available at same price (default: KITT)
- Led Bargraph led color red, green or yellow at option, same price (default: RED)
- Compact design: sandwich of only two boards, not three as competitors
- Available ready to use, or in assembly kit: printed circuit board + parts, solder it yourself.

Please follow this user guide direction for optimal performance during use.

## **Wire connected directly on pads or through screw terminals**

General info about connections. It is possible to connect directly copper wires by soldering (ironing) them to the pads on board. Or you may solder screw terminals on pads, and then use the screw terminals to secure copper wires. Direct wires occupy less volume. But screw terminals are somehow more practical. Please specify what you prefer while ordering, if you cannot later modify it back & forth yourself using a soldering iron.

## **Basic use**

You only need 4 wires for basic use. Power supply rated 12VDC or 13,8VDC between +12V and GND pads. Please mind the correct polarity! We suggest using red wire for +12V and black wire for GND. This color scheme is standard among the industry. Then you also need a audio source at speaker level, to be connected between AUDIO pads. We suggest gray wire for this connection. Typically you just connect in parallel to the left speaker of your car audio system. Trimmer AUDIO will fine-tune the input sensitivity of audio input. The other trimmer: DTMF sets volume/gain of generated DTMF tones. For basic use, that's all you need to know! Have fun!

## **Basic functions**

At start-up, voicebox plays knight rider theme from the tv-show. After the theme, it emits a 4 step start-up sequence, with DTMF tones, and lights up the 8 side lamps. After that, NORMAL CRUISE indicator gets lit as well. Where there is an audio signal on AUDIO pads, the triple bargraph vumeter will start flashing at the audio level, with mirror visualization, KIRR or KARR style depending on your model.

# **Advanced functions**

Advanced functions are for advanced / experienced users. A wrong connection may damage Voicebox or external circuitry. In case of doubts, please contact us BEFORE trying something or linking two wires together.

## **Cut off initial theme from tv-show**

If you don't like the initial theme from tv-show, it can be excluded by putting a wire / jumper between the COM and GND pads. Sometime you get the voicebox with this mod already done. In this case, no initial tune plays, but you can recover it by cutting the jumper wire between COM and GND off. You may also wire up an external switch between COM and GND, so that this function can be activated/deactivated at wish, via the external switch. When initial theme is off (jumper wire present / switch from COM to GND closed), at start-up the voicebox will go directly into the 4 step sequencing.

## **Shift between auto-normal-pursuit**

Please attach three normally open momentary switches to GND, at A N P pads on the 4 pads group labelled DTMF A N P. When you (momentary) close A to GND, you shift to "AUTO"; when you (momentary) close N to GND, you shift to "NORMAL"; when you (momentary) close P to GND, you shift to "PURSUIT". At mode change, a DTMF tone emits and the right lamp gets lit on – and it maintain this status: this voicebox stores in internal memory the latest state. Please take a moment to differentiate between the A N P pads for the momentary switches, and the A N P pads for the "External Lamp Drive", on opposite side. BEWARE! A wrong connection of external lamp where external switches are supposed, or vice-versa, can damage voicebox!

## **DTMF tone request**

Voicebox can emit random DTMF tones at the request by an external momentary switch or other electronic devices via a relay or optocoupler. Just connect a momentary switch that closes towards GND to the DTMF pad in the DTMF A N P group. When the switch (momentary) closes, the

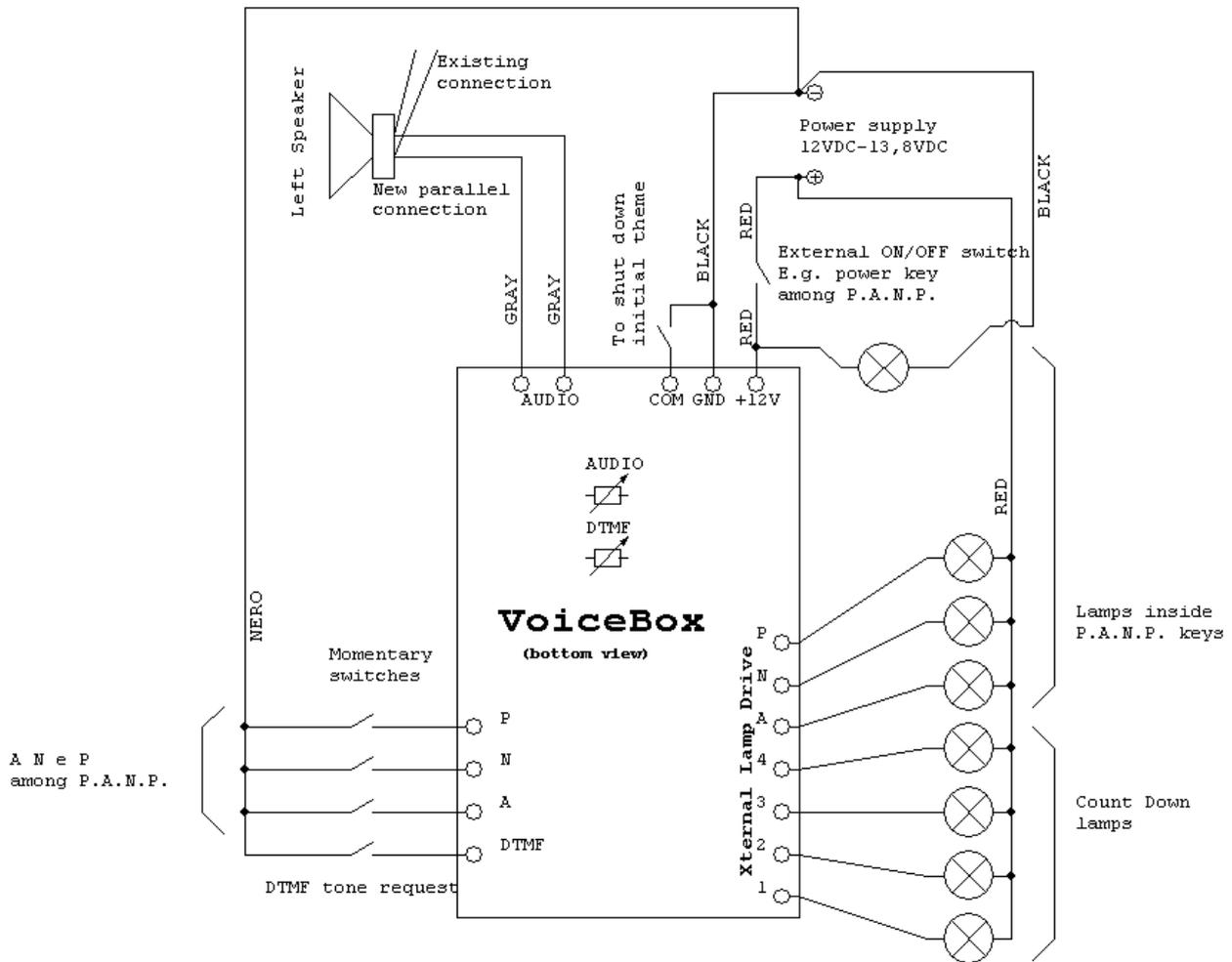
voicebox emits a random DTMF tone. To connect other circuitry, just use a normally open contact of a relay, or the transistor side of an optocoupler. Please don't connect external electronics directly! BEWARE! Wrong connections on DTMF inputs can damage voicebox.

## External Lamp Drive

This voicebox can drive 4 external lamps for the count-down sequence. These will be in sync with initial start-up sequence. A typical use of this feature is to light up the count-down display. This Voicebox will also drive three more external lamps, for the AUTO, NORMAL, PURSUIT conditions. A typical use of this feature is to light up the lamps inside the P.A.N.P. keys. This way, you don't need any external circuitry to operate the P.A.N.P. keys. Ideegeniali voicebox does it all! Please note that Power lamp of the P.A.N.P. keys is wired independently of the voicebox, and gets lit by its switch alone. Note also that instead, the lamps inside Auto Normal Pursuit keys are controlled by voicebox circuitry and are not to be wired to their own switch.

The 7 pads for External Lamp Drive (4 for count-down, and 3 for auto-normal-pursuit) work all the same way: they can sink a maximum of 250mA of current from a pole of the lamp, the other pole of the lamp must be wired to +12V. Please note that other circuits output +12V instead. This one does not. This circuit sinks the negative side of the lamp load. BEWARE. A wrong connection can damage your voicebox or external circuitry! You can drive lamps of 3W or less directly. Use a relay for more powerful loads.

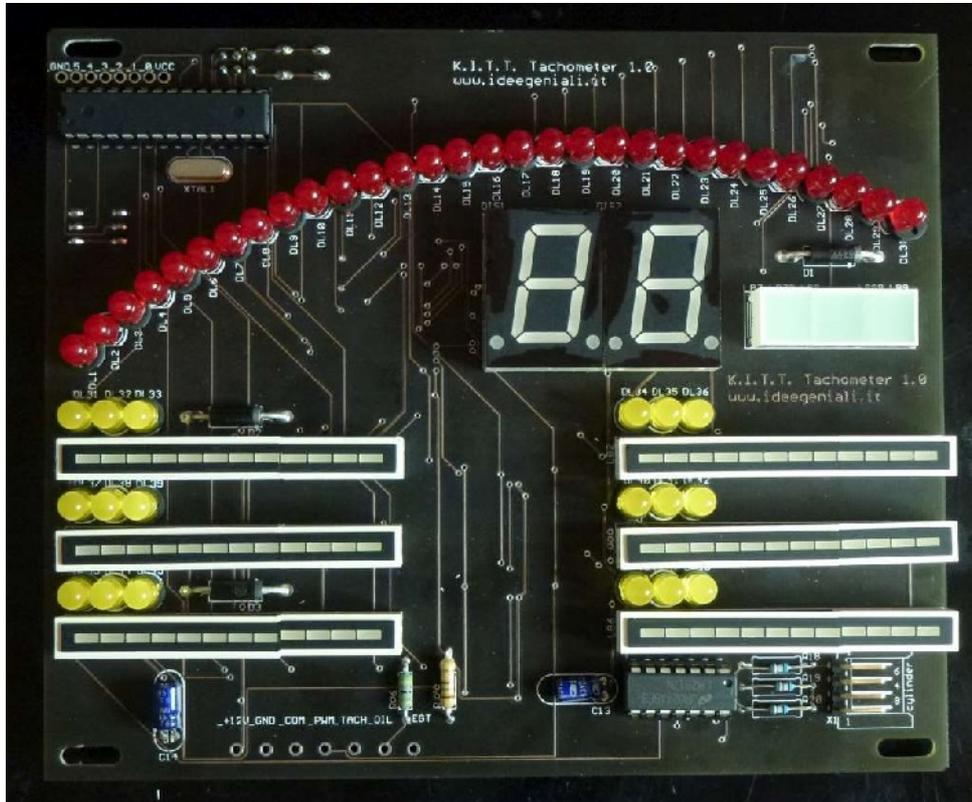
## Voicebox wiring scheme





# K.I.T.T. Tachometer

Hardware revision: b2  
Firmware revision: V3  
User manual revision: b1.3

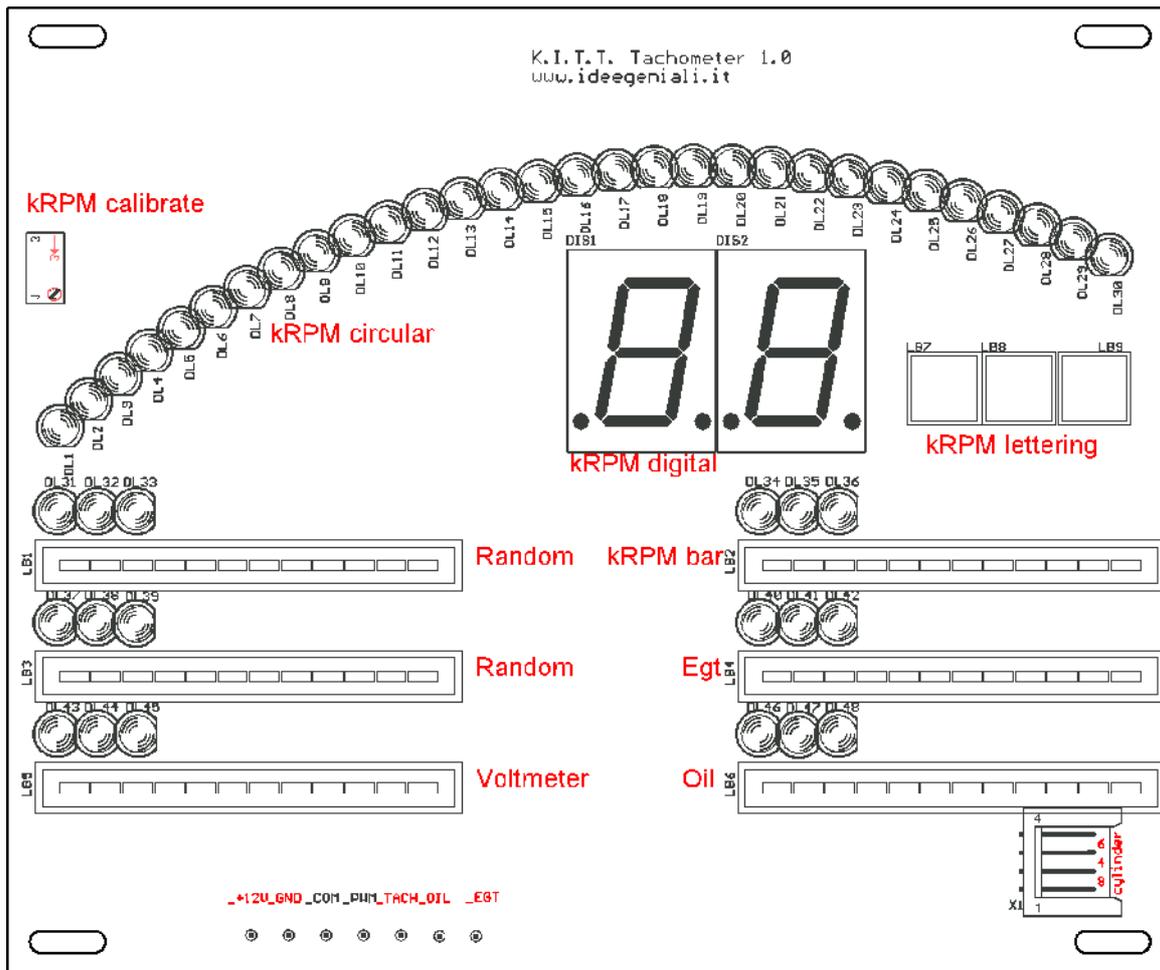


Tachometer board K.for K.I.T.T. dash

Several functions for K.I.T.T. dash display are found on a single electronic board. Namely we have: kRPM circular, kRPM digital, kRPM bar, kRPM lettering, Engine Temperature, Oil Press, Voltmeter, Random display #1, Random display #2.

**Please note:** rear side of board has delicate electronic parts and traces. Area behind the board must be clear of conducting bodies such as flying wires, metal objects, and similar: they could damage the board by short-circuiting board traces or linking together different protruding electronic parts.

**Please note:** protruding electronic parts on the rear side of the board dissipate heat into the air. They are therefore not to be blended against the board, but must be kept away from it. Board and particularly these protruding parts produce heat, please allow at least one inch of free air behind the board for heat flow via air convection.



## Items

Engine rotation per minute are shown three times:

**kRPM circular:** 30 red light leds, in circular bar shape, special function “slowed fall back”

**kRPM digital:** 2 digits numerical readout, special function “anti flicker”

**kRPM bar:** bargraph display (upper right bar) with proportional lighting up

**kRPM lettering:** this zone is lighted in green for the lettering “kRPM” found on overlay or label

**EGT Bar:** right side, middle, 12 led segment bargraph shows “Engine Temperature”, as read from the resistive coolant temperature sending unit

**OIL Bar:** right side, lower, 12 led segment bargraph shows oil pressure, as read form the resistive oil pressure sending unit

**Volt:** battery voltage (12,0V – 13,8V typical) is shown on 12 led segment bargraph on the left side, lower.

**Random:** the other two bars on left side (upper and middle) show random light games while K.I.T.T. does its calculations.

**18 yellow leds** complete the Tachometer display. These are always-on.

## Jumpers setting and calibration

In the **cylinder** zone find a jumper to set the Engine kind, number of cylinders. You may choose between 4, 6 and 8 cylinders, by inserting the jumper on the proper location. This is typically the only customization needed.

The multiple rotations trimmer kRPM calibrate, find on the rear side of the board, lets you the fine calibration of the numerical readout of engine rotation per minute. This is calibrated in factory and typically doesn't need any adjustment. Please pay attention if rotating this trimmer. Use a small screwdriver and be very sensitive with fingers: this kind of trimmer is very precise, but very delicate/weak, they can easily get damaged, especially when arriving to the last allotted turn: don't turn behind the weak mechanical stop!

## Electrical wire up

**Power supply (+12V, GND):** connect a 12VDC power supply (max 13,8VDC) between +12V and GND. Red wire (+12V) is connected to +12V screw terminal; black wire (0V) is connected to GND screw terminal. The board has a protection against inverted polarity, but you are advised to respect correct polarity. When board is powered, kRPM digital, circular and bar go to zero, Egt is full off, Oil is full on, Voltmeter will start working immediately, showing current battery voltage, Random bar start their light games, kRPM lettering and yellow leds are on.

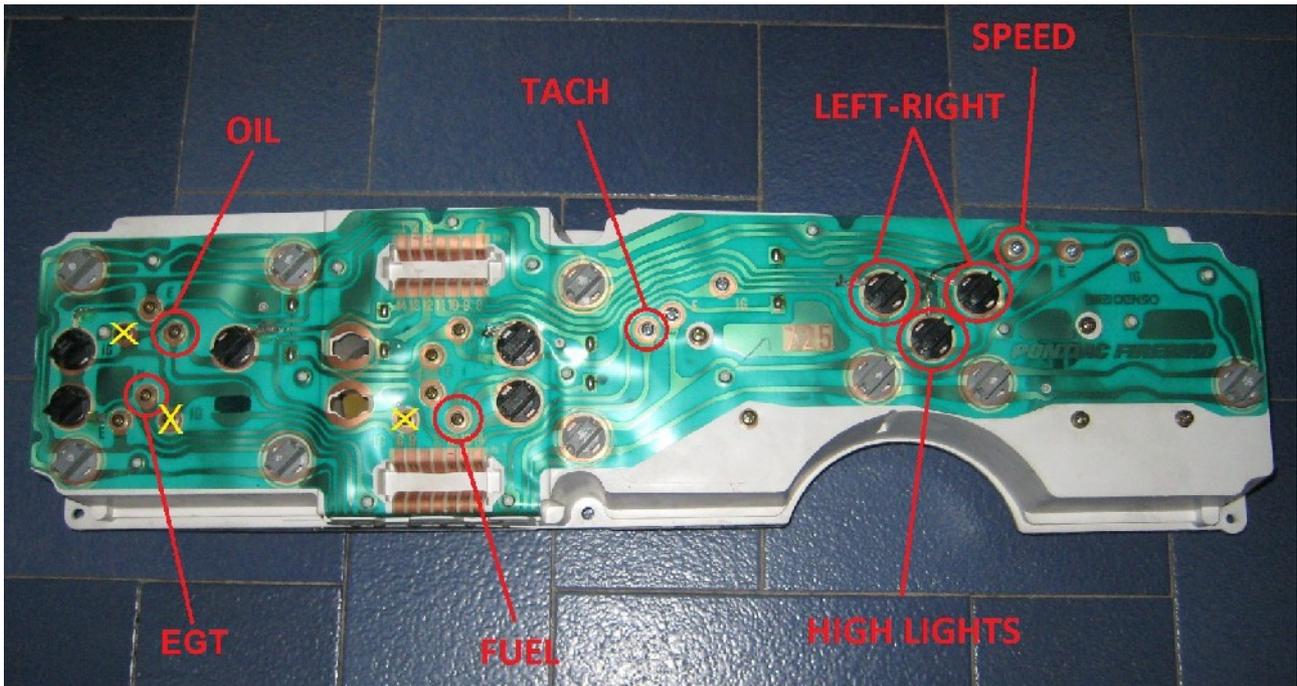
**Tach, Oil, Egt:** connect respectively: rpm frequency sending unit, oil pressure resistive sending unit, engine temperature resistive sending unit.

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

+12V	Power supply, Red wire: +12V
GND	Power supply, Black wire: 0V
COM	Reserved. Don't use. Don't connect anything.
PWM	Reserved. Don't use. Don't connect anything.
TACH	Rotation per minute sensing unit, frequency kind
OIL	Oil pressure sending unit, resistive kind
EGT	Engine temperature sending unit, resistive kind

It's 5 connections: 2 for supply, and 3 for sensors. The other screw terminals are no-connect.

## Connection points on vehicle



Connection points on Pontiac 1985-1992 electrical plant

Among the numerous connection present, the ones useful for speed and fuel display are these:

<b>EGT</b>	Engine temperature sensing unit, connected to <b>EGT</b>
<b>OIL</b>	Oil pressure sensing unit, connected to <b>OIL</b>
<b>TACH</b>	Engine rotation per minute sensing unit, connect to <b>TACH</b>

Remaining (**LEFT-RIGHT SPEED HIGH-LIGHTS FUEL**) are useful to connect to Speedometer and Fuel display.

Get rid of the screws marked with a yellow cross to let **FUEL EGT OIL**.work as expected.

For 1982-1984 Pontiac, please refer to the scheme provided separately, not in this manual.

*Disclaimer: verify compatilby between signals of your vehicle and this board inputs and viceversa. We don't assume any responsibility or liability for erroneus connections and/or damage of vehicle electrical plant and/or electronic board. We put maximum efforts when writing this manual to provide accurate informations, but we give no garante, 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 wich, 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 autorizations to use the appartus described in this manual. Pontiac brand and other brands are property of respective owners.*