

650GS 00-09 Dash Panel Information

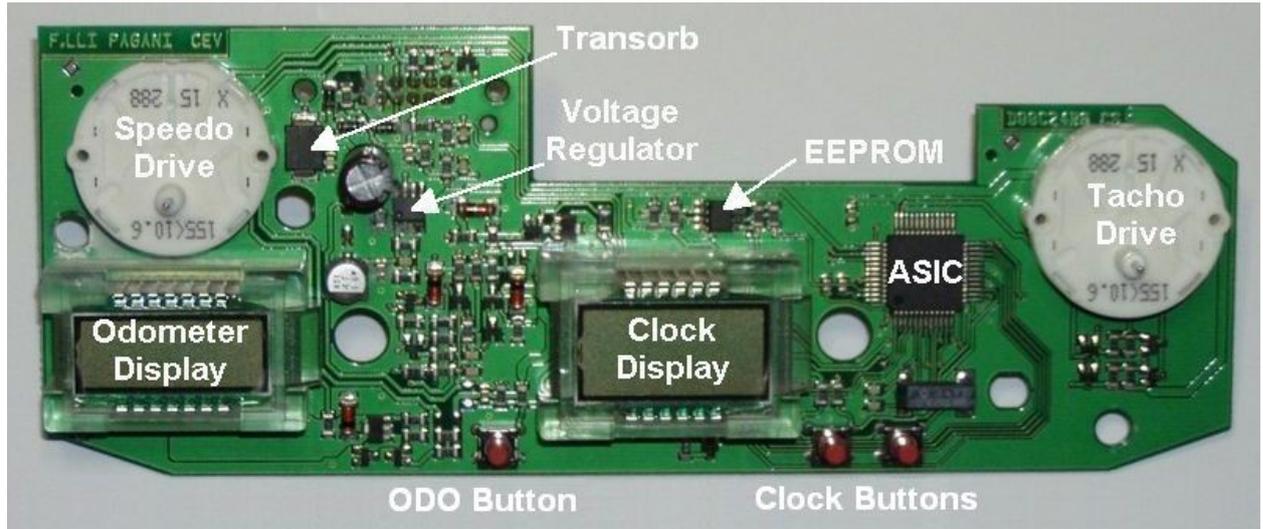
The dash on these models is the same basic design, there are some revisions of PCB and firmware over the period of production. A pic with the components labelled is below.

A single ASIC processor IC provides all functions of the dash including the odometer and clock.

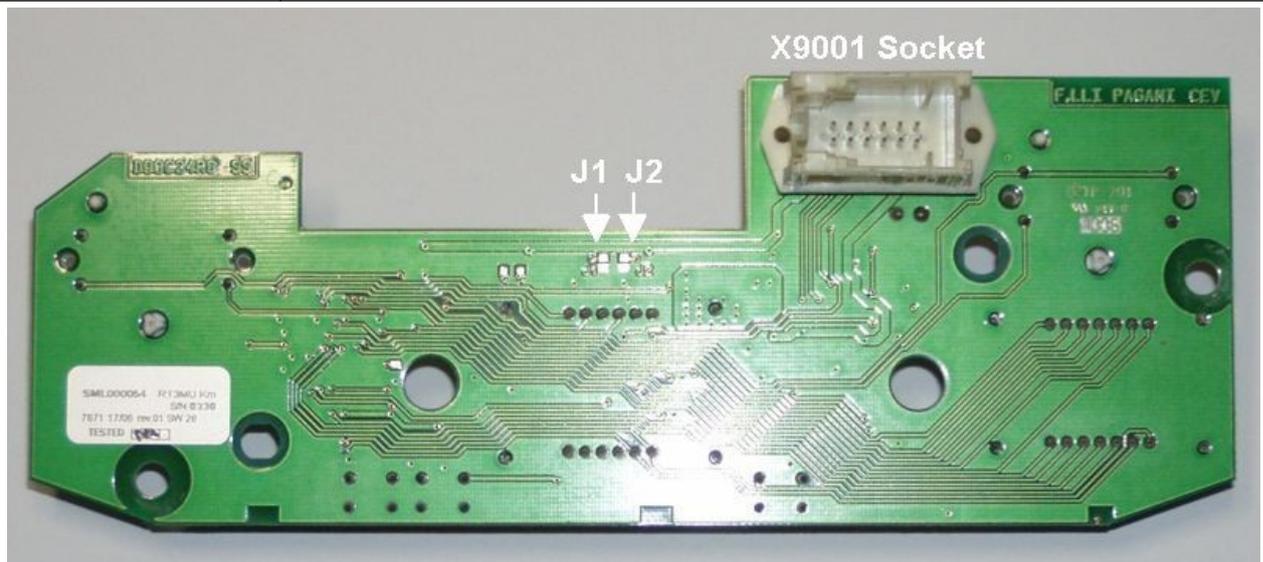
There are different fascias and light diffusers for the different models and MPH/KPH

Dash PCB Part No's

Description	F650GS 00-04	F650GS 05-07	G650GS 08-09
Speedometer/Rev Counter & pcb-KM/H	62 11 7 650 277	62 11 7 677 044	62 11 7 677 044
Speedometer/Rev Counter & pcb-MPH	62 11 7 650 278	62 11 7 677 062	62 11 7 677 062



Dash ICs & Parts	ASIC - Fujitsu MB89943 - 8 bit Automotive Dash Processor Voltage Regulator - 04BA 2951 ACMA EEPROM - ATMEL 040 24C02N - 2 Wire Serial EEPROM Transorb - General Semiconductor marked GEW or GEX (SMCJ22 or SMCJ23) Stepper Motors - Juken X15.288 / X25.288 / X27.288 available from https://www.mte.net
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PCB Jumpers J1 and J2	J1 - 12/24 Hr clock - Open = 24 Hr, closed 12 Hr J2 - Unknown, perhaps Miles/KM for interpreting ODO storage on the CS only
Compatibility	A dual spark dash has been tested on a single spark and it worked Single spark dashes have been fitted to dual spark & have worked CS firmware is different to the GS, no KM/MPH pcb markings, not tested on a GS

Firmware Versions

The firmware version is on the label at the rear of the pcb, with separate miles or kms versions

00-04 GS - 5.02, 5.04 EU or US

05-07 GS - 5.08, 5.21 EU or US

08-08 GS - 5.28 EU or US

Note – Firmware version 5.04 may not provide visual check of fuel lamp when ignition is turned on

Dash Operation

Internally the dash operates at 5v, switched and unswitched power comes in and goes through diodes to the circuitry with detection circuitry for switched power to enable the dash to go into sleep mode.

A single Fujitsu processor performs the majority of the dash functions including the clock and directly multiplexes the segments for the display of clock and the ODO.

Power up

On initial power (unswitched battery connection) the dash goes through a routine of setting the stepper motors to 0, this is the clicking sound heard when re assembling a bike or fitting a new battery. It is unknown whether the ODO and trip meter values held in the on board EEPROM are read into processor memory on initial power up or when the ignition is turned on.

Ignition Off

When the ignition is turned off the dash takes the ODO and trip meter values and writes these to the on board EEPROM. The dash processor also goes through a routine of checking the speedo/tacho are at 0. This is the clicking sound heard. During this time the dash will draw between 50 and 70 milliamps.

After a short period the dash goes into sleep mode and power consumption reduces to 1 to 2 milliamps.

Note. Since the ODO value is written to EEPROM when ignition is turned off it would be advisable not to turn ignition off/on quickly. There would be a possibility of corruption of the ODO EEPROM.

Operation Notes	The operation of the discrete circuitry near the input socket and voltage regulator has not been fully researched & documented as the faults investigated and repaired have not required it.
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Fault Symptoms

The known faults and their likely causes are listed below. Not all faults have been documented and the causes are all a work in progress as more people investigate the faults.

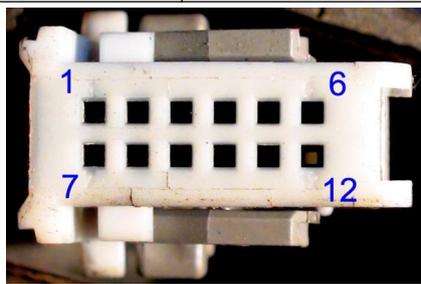
Fault	Cause
Dead Dash	Dirt on the circuit board shorting out the voltage regulator causing the over current protection to shut the regulator down.
ODO and clock digits cycling	Dirt causing high current through the 5v regulator. It can indicate the processor is starting and then restarting. Repair - Clean circuit board The 5v 47uF supply rail capacitor is faulty – Replace the capacitor
Not all digit segments displayed	Loose plastic Clock/ODO mounts have worn through the circuit board tracks causing loss of signal to the segments Resolution – Remove clock/ODO and repair tracks
ODO displays dashes	The processor is unable read the EEPROM or ODO data is corrupted
Dash does not retain trip mileage Dash does not retain ODO mileage	The processor is unable to store the data in the on board EEPROM when the ignition is turned off, check X9001 pin 1 to ensure there is +12v
Dash displays 00000 on ODO	The processor is unable to retrieve ODO data from the EEPROM
Tacho is higher than actual rpm	Check wiring connections and crank position sensor
Repair Notes	There can be unexpected results in needle position when the ignition is turned on if the dash did not perform the unswitched power on routines & the Speedo/Tacho needles have been moved on the spindles during fault investigation. The EEPROM is either an Atmel 24C01 or ST ST24C02 and has a limit of 1 million write cycles Check the Transorb for cracks, it protects the pcb from spikes & voltages above 25v.

Dash Lamp Test Procedures

The neutral, oil pressure, high beam and indicator lamps do not route through the main dash assembly they are operated direct from the switches to the 10 pin connector X9028 at the end of the dash.

The dash back lamps are also driven direct from switched power through the 10 pin connector to the lamps.

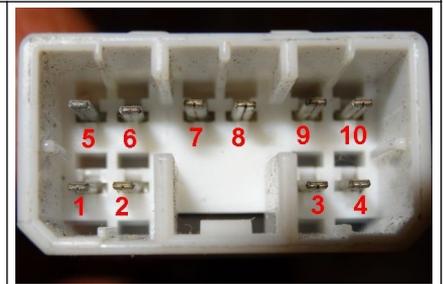
Fuel Lamp	Disconnect the socket on top of the fuel tank with the White/Blue wire in it, put an earth on White/Blue & the dash lamp should light. (White/Blue is Pin 7 of the 10 pin plug) There is a time delay in operation, it latches on after the delay, turn ignition off to reset lamp The lamp can be tested with putting earth on pin 9 of the 10 pin lamp connector
Neutral Lamp	Disconnect Brown/Black wire at neutral switch, put earth on the wire, lamp should light
Oil Lamp	Disconnect Brown/White wire from pressure switch, put earth on wire, lamp should light
Coolant Lamp	A diagnostic system like GS911 can be used to trigger the lamp or disconnect the BMSC socket and put an earth on pin 19 (violet wire)
ABS Lamp	Turning off the ABS system should bring up the lamp, disconnecting the ABS connector and putting an earth on pin 21 (White/Yellow wire) should bring up lamp. The lamp can also be tested at pin 11 of the 12 pin dash connector X9001.
High Beam	Power on pin 3 of the 10 pin lamp connector will light the lamp
Indicators	Power on either pin 4 or pin 5 of the 10 pin lamp connector will light the lamp



Wiring Harness Connectors

Dash X9001 is on the left

Lamps X9028 is on the right



Dual Spark Dash Assemblies

The clock and ODO on all 650GS models up to 2009 are mounted on plastic mounts. The plastic mounts have pins going into the circuit board to hold them in place. On the later dash assemblies the plastic pins have found to be broken off presumably during assembly so the mounts are free to move around. This wears through the enamel on the pcb and then the copper tracks on the circuit boards resulting in failure of the clock & or ODO.

A little preventative maintenance of sliding thin pieces of plastic under the corners of the mounts and then using some silicone or contact adhesive to hold the mounts in place to prevent wearing on the tracks would stop the dash failures.

The issue was first noticed in South Africa by Jughead and posted into wild dog forum there. I have now had a number of dash assemblies apart here in Oz and can confirm his observations. Repair of the tracks is painful so preventative maintenance is a better before it becomes a problem.

Flat Battery Situations

Where it is suspected the battery is low it is best to check & resolve it without turning on the ignition.

The dash reads the EEPROM ODO/Trip values when ignition is turned on then updates the EEPROM ODO/Trip when the ignition is turned off, if power is lost while the EEPROM is being updated there is the possibility of corrupting the EEPROM contents.

A common factor in a number of “dashes in ODO” faults has been a flat battery situation prior to the fault.

Dash Repair

The two most common faults are dirt build up on the dash circuit board causing the dash to shut down and degrading of the 5v power supply electrolytic capacitor. The repair process is below.

1/ Remove the dash from the bike

2/ Clean the exterior of the dash to eliminate dirt affecting the repair

3/ Remove the three screws holding the front cover



4/ Remove the three screws holding the front perspex cover

5/ Remove the front perspex cover and inner black cover

Note there are 2 thin black lengths of tube cushioning the front perspex from the rear cover, dont lose them

6/ Remove the three screws at the rear of the dash

7/ Use a jewellers screwdriver to release the 12 pin connector tabs

8/ Remove the circuit board assembly from the rear dash case



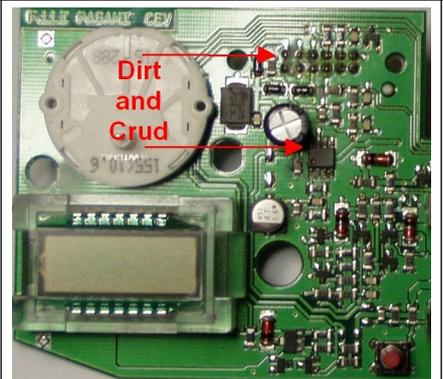
9/ Loosen the two screws holding the circuit board to the dash fascia

10/ While holding the fascia and circuit board apart use a small screwdriver at the base of the speedo and tacho needle shafts between the pcb and fascia to release the needles. A twisting motion works well

11/ separate the fascia and the circuit board

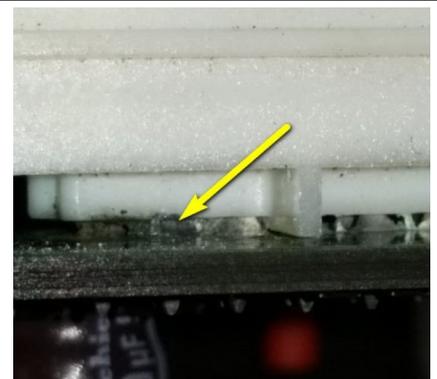
12/ Clean the circuit board on both sides with isopropyl alcohol

Note a soft cloth and cotton buds are best. A soft toothbrush can be used but care should be taken not to dislodge the small surface mount components.



The areas of the circuit board to especially ensure are clean are the area around the socket and the voltage regulator as shown in the pic on left

Also look under the socket to check for corrosion and crud as shown in the pic on the right



Notes

When refitting speedo & Tacho needles place them onto the shafts lightly, turn the needles anti clockwise to engage the 0 position stopper internal to the stepper motors and continue turning anti clockwise until the needles align with 0 on the fascia then push the needles firmly onto the shafts.

Capacitor Replacement

This part is only needed if the dash shows ODO and clock digits cycling on start up.

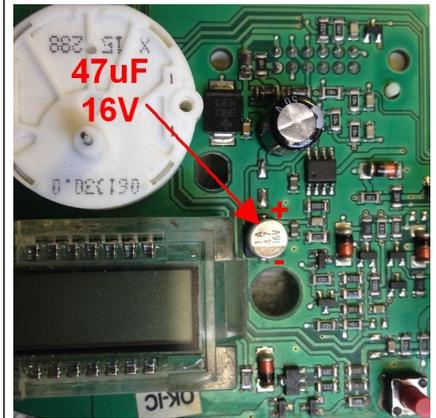
The capacitor is the smaller silver component shown on the RHS

The capacitor is a surface mount component and care is needed not to damage the circuit board tracks when removing it.

The capacitor is 47uF and rated to 16v, a higher value or voltage rating capacitor could be fitted but the physical size should be kept small.

More robust through hole capacitors can be used as a replacement.

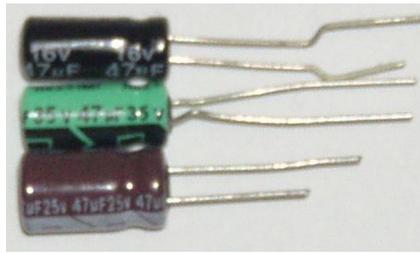
The capacitor is polarity sensitive so must be installed correctly as shown in the pic on the RHS. Where it is connected reversed it may explode and the spikes on the 5v supply may damage ICs.



To replace the capacitor grip the alloy body of the capacitor with long nose pliers and gently twist backwards and forward to release the pins internal to the capacitor until the body of the capacitor releases leaving the pins soldered to the circuit board. Be gentle in this step.

Desolder the pins from the circuit board with a small tip soldering iron

Take care not to overheat the pcb tracks or they will lift off the pcb



Purchase new 47uF through hole capacitors and bend the legs so they mount above the circuit board against the ODO display (see pic below).

The capacitor needs to be glued or mounted to the ODO display for support or the solder joint will fail with vibration. it is best to use some contact adhesive or silicone on the ODO Display to prevent chafing.

The negative lead of the capacitors is marked with a black line.

Either solder the capacitor into place and then glue the capacitor to the ODO display or glue the capacitor to the ODO display then solder the capacitor to the circuit board.

A small tip temperature controlled soldering iron is needed.



Reassembly

Reassemble in reverse order of disassembly, use the pic's on the disassembly page where unsure.

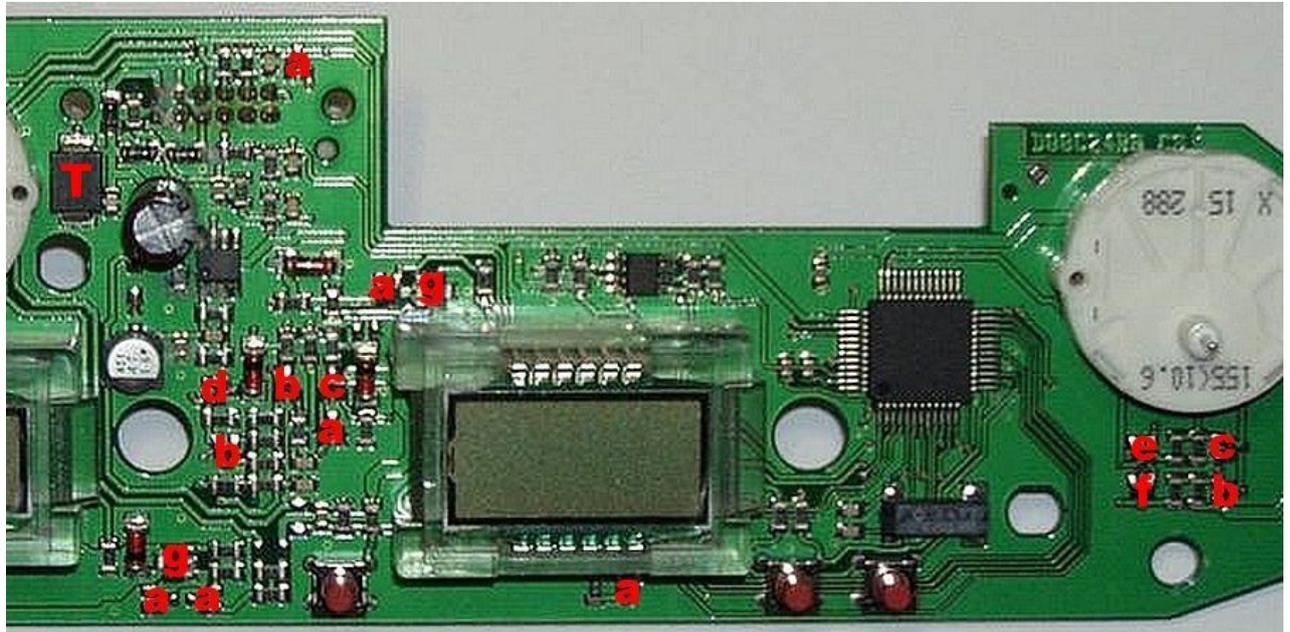
- 1/ Refit front Fascia panel with the two screws
- 2/ Refit pcb and Fascia into the rear dash case with the three screws
- 3/ Press Speedo & Techo needles onto shafts slightly above zero and twist to align to zero before final press
- 4/ Refit Front Perspex cover with the three screws
- 5/ Refit the silver front fascia panel with the three screws

Notes

Discrete Component Information

Component marking on surface mount components is problematic due to the small size of the components so manufacturers use abbreviated codes with little standardisation between manufacturers which makes identification difficult. On the dash pcb 7 different types of discrete components have been identified & from SMD identification lists available on the web the best guess of what the components are is below.

Type	Qty	Pkg	00-03 pcb	04-07 pcb	08-09 pcb	Description
a	6	SOT-23	A7p	A7u	Q7w	Dual Diode Philips BAV99W ?
b	3	SOT-23	313	3Bs	3BW	PNP Transistor Siemens BC856B ?
c	2	SOT-23	EG s	EG	EG	NPN Transistor Infineon BCW66G ?
d	1	SOT-23	R1E	R1E	R1E	Voltage Reference 1.25v ?
e	1	SOT-23	A1t	?	?	Dual Diode Philips BAW56 ?
f	1	SOT-23	Z16	Z16	KZG	Zener Diode 2.7-4.1v BZX84C3V9 ?
g	2	SOT-89	BP P11	BLP S41	BL P02	NPN Transistor Philips BCX56-16 ?



Resistor Markings

Resistor markings on SMD resistors has some inconsistency, examples are below

3 Digit - 103 = 10 000 ohms
 3 Chars - 3R9 = 3.9 ohms
 4 Digit - 5620 = 56.2 ohm

4 Digit - 1000 = 100.0 ohm
 4 Digit - 5621 = 56.2 kohm
 4 Digit - 3092 = 30.9 kohm

4 Digit - 4702 = 47.0 kohm
 4 Digit - 1003 = 100.0 kohm
 4 Digit - 4992 = 49.9 kohm

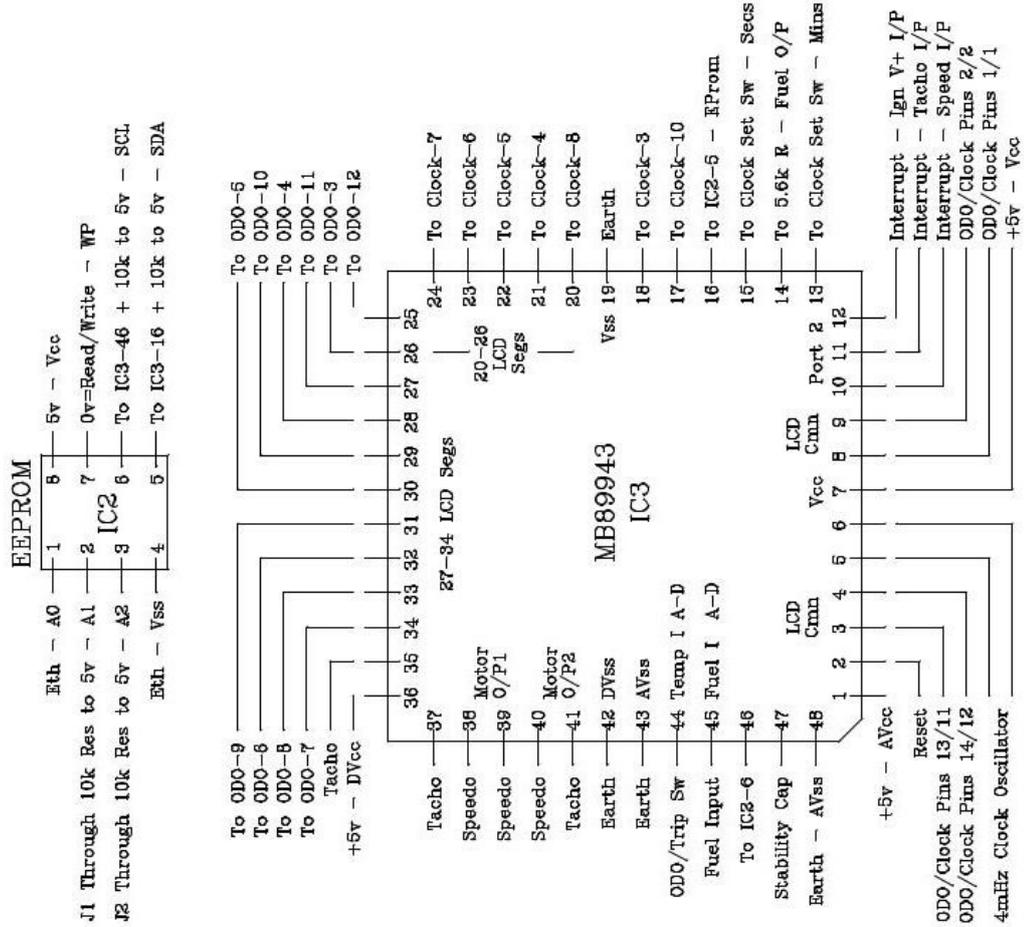
Transzorb Markings

(Marked T above) The IC markings vary on pcb's

ST - 410 GEX, EFUN C515
 GS - 333 GEX, GEW 04E, LL GEX, GEX 03
 GS - GEW 08E, GEW 13E, 525 GEX

Notes

Dash Processor, LCD & IC Pin Information



Notes