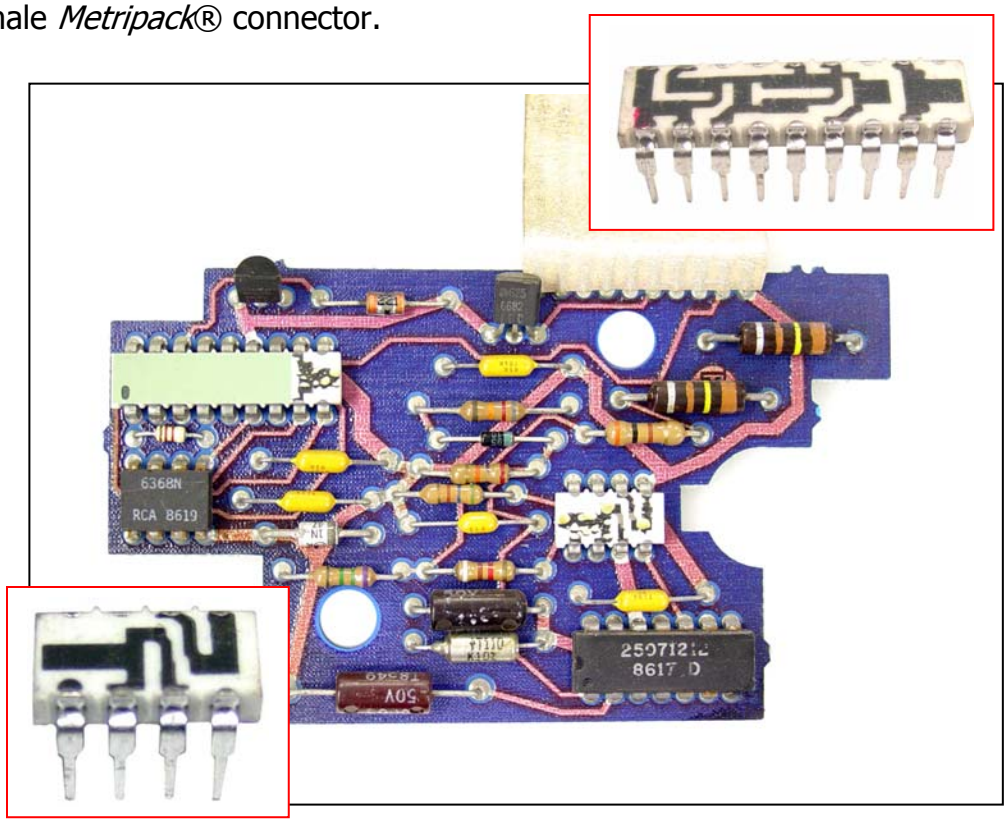
T E C H N I C A L I N F O R M A T I O N

Grand National – T-Type Analog Dash Cluster
Tach/Boost Gauge -- GM Part Number 25077018

This article is written to explain some of the "genetic" defects associated with the bar-graph display in the lower right corner of the standard dash on the 1984-1987 turbo Regal. Specifically, it explains the persistent calibration problem where the bars light all the way up to 6000 RPM, displaying erroneous readings even when the car is idling. Other symptoms include inaccurate RPM readings and inaccurate BOOST readings along with missing or burned out segments.

The Tach/Boost module consists of three PC boards mounted into an assembly, and electrically connected by ribbon jumper cables. The upper PC board has five custom 10-segment LED bar displays along with some LED driver logic chips. The middle PC board has the A/D conversion circuitry, custom resistor network DIP chips, and is the PC board that we will discuss here. The lower PC board consists mainly of the power supply, filter and regulation circuitry, an LED driver IC, and a number of "hot" components. The three PC boards are "clam-shelled" together to form the display module. There is a wiring harness measuring about 13 in. long with eight wires attached and terminated by an eight-cavity female *Metripack*® connector.

This is the middle PC board which has the custom resistor network chips. The chip that controls boost is the larger chip in the upper left corner with the green top. The chip that controls the tach is the smaller white top chip in the center right.

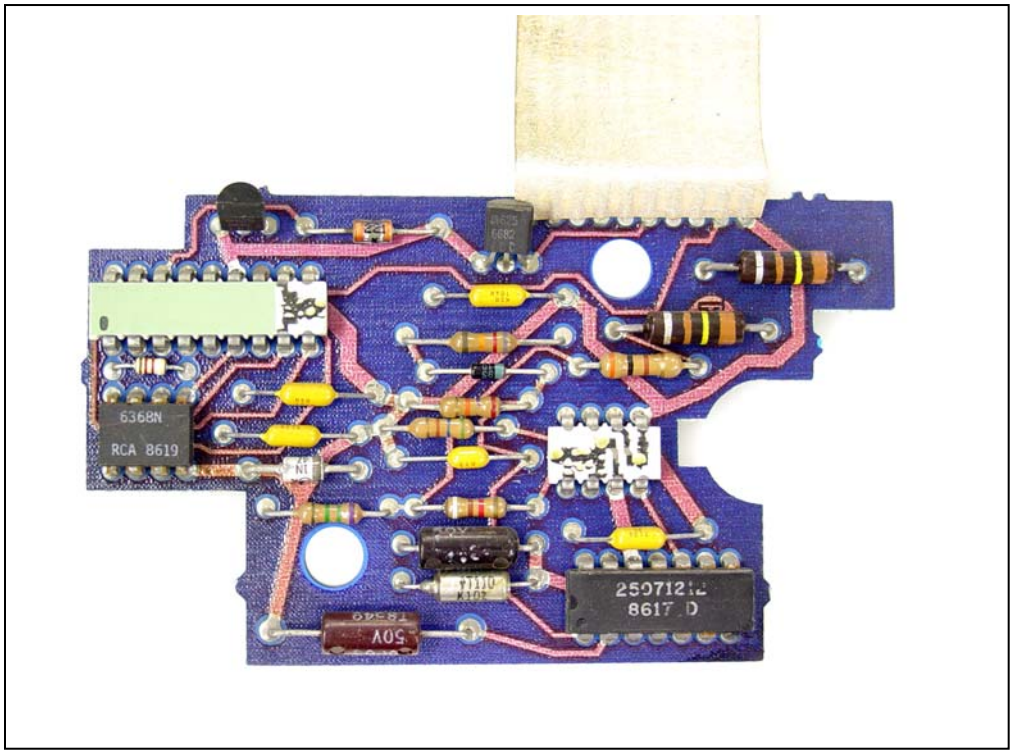


When this module was originally produced by GM for the turbo cars, it was assembled with these two resistor network chips prior to calibration. Once the module was ready to test, the two chips required calibration prior to final assembly. The calibration consisted of a fixture which the PC board was connected to, a "bed of nails" electrical connection system, and necessary test equipment. The technician would calibrate each network chip with a high power laser which would burn a very narrow path out of the calibration section of the network, providing necessary precise resistance in the circuit to enable the display to read RPM and boost properly and accurately.

Let's fast forward fifteen-plus years later. We now see the effects of old technology and its characteristic problems related to aging components. The dash display that worked flawlessly when

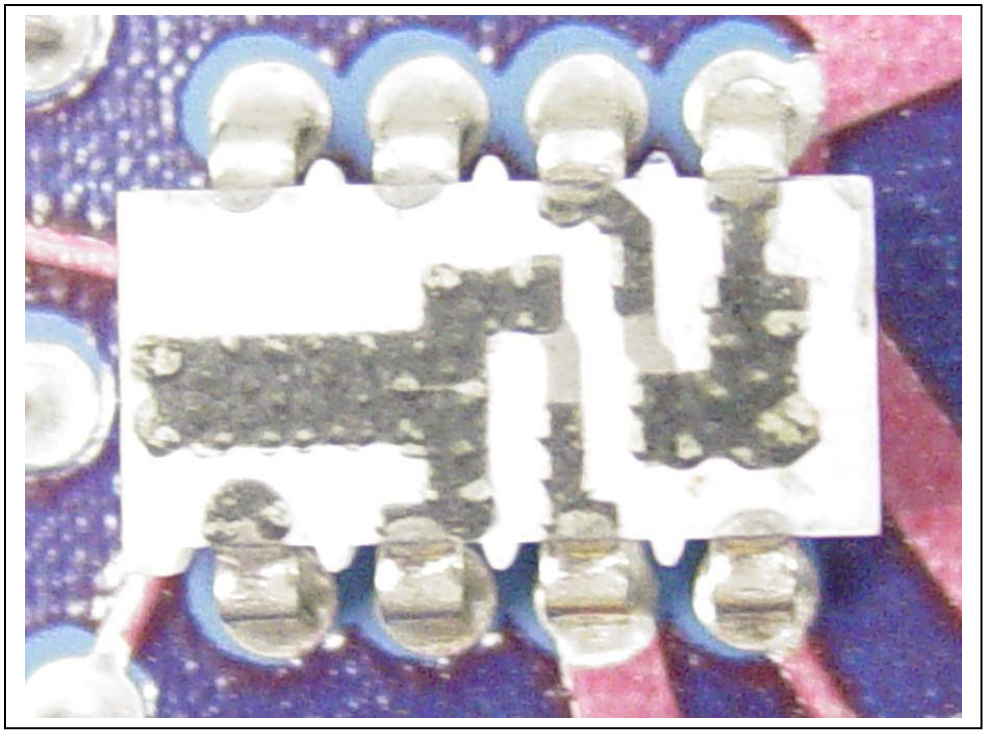
the car was new is not working so good now. The boost display shows 5 or 6 lbs. of boost at idle, which is not possible, and the tach display shows 3600 rpm when the engine is barely idling. This is a classical symptom of calibration drift. The drift, however is caused by something very hard to explain but easy to see. We have observed physical deterioration to the un-protected layers of carbon that forms the resistance in the network chips.

The deterioration to these network chips can be seen here. Look closely at the two calibration network chips; you'll see blistering on the carbon traces in the un-protected areas of the chips.



This happens because the carbon traces are exposed to air, moisture, and pollutants in the air. The carbon elements heat slightly during normal operation and when they cool, tend to collect slight amounts of moisture and salt deposits (particularly in climates near salt water). The effect causes the carbon to de-compose, leaving oxidized traces on the ceramic substrate of the network chip, and increasing the resistance to place the circuit completely out of calibration. We have also observed oxidation and conductive growth within the laser-etched area of the calibration slots.

Here is a closer look at the surface damage on the carbon traces of the network chip. Notice the bubbling areas where oxide has formed, changing the resistance of the carbon patch areas.



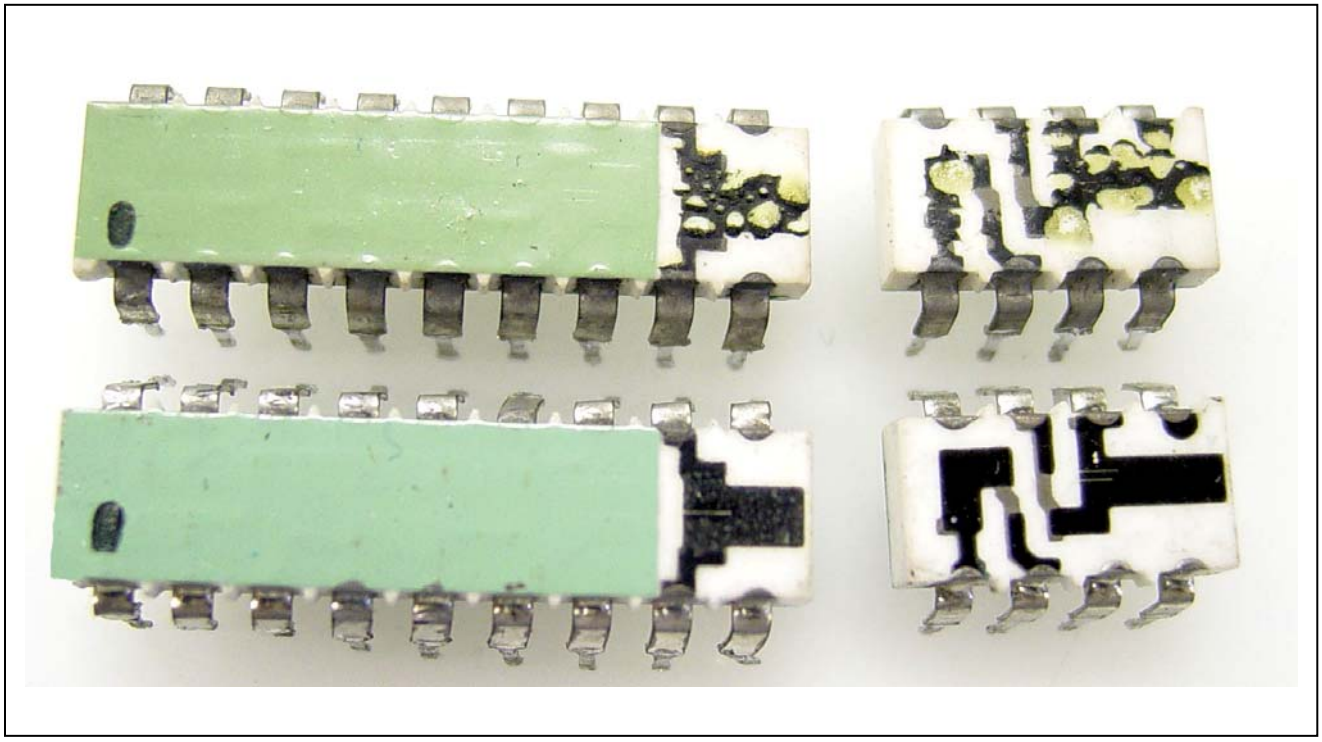
This problem seems to happen fairly consistently with the age of the vehicle. It now appears to be a very common problem that eventually will happen to each and every turbo car fitted with this display. The tach section seems to be more prone to failure than the boost readout, and for an obvious reason. If you look at the larger boost control network chip, you will notice that most of the carbon traces on the ceramic substrate are coated with a green paint-like coating. Only the critical calibration resistance pad is exposed.

The tach control network chip (the smaller one) is fully exposed and prone to much more deterioration than the coated chip. Because these network chips weren't coated with any type of paint or sealant after calibration, they became prone to moisture damage. This is why the failure rate on these components is so high. And considering how it happens, it is likely that the failure trend will continue.

It is quite probable that each and every
Boost/Tach module ever produced will require service!

We do offer hope, however. We have tooled up for both of these resistor networks and can replace and calibrate the modules. The gauge module can be repaired and put back into proper function using new network chips and will restore your dash to the original fully functioning condition.

Here is a "before and after" view of these chips



The repair and recalibration involves replacing both network chips, then recalibrating both the boost and tach sections of the module on the bench using a calibration standard. The calibration is performed using a diamond cutting tool instead of a laser, since the diamond tool doesn't exhibit extreme heat in the region of the resistor pad. The chips are then fully sealed with a coating after the calibration process.

The result is a fully functioning and calibrated Tach/Boost module that restores the originality of the turbo Buick. The additional surface coating will extend the integrity of the calibration procedure.