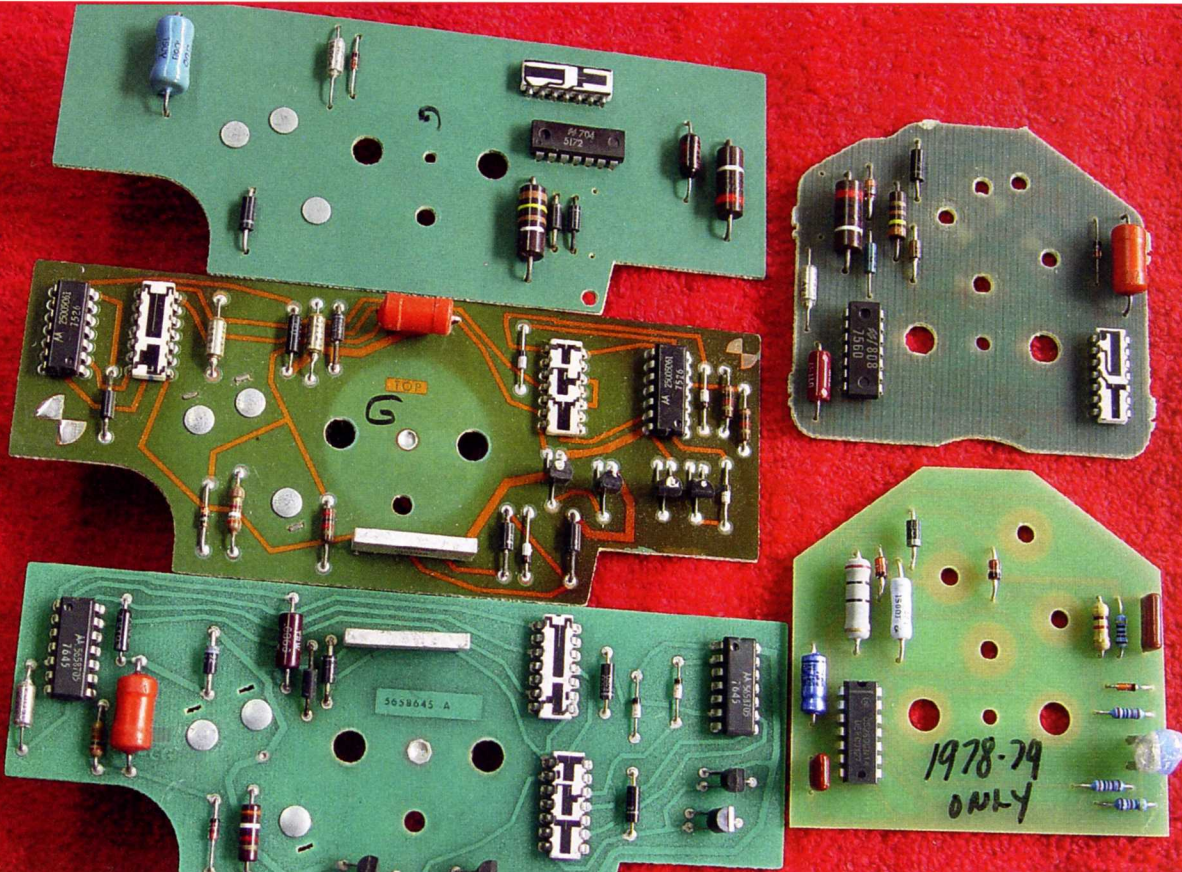


# MEMBERS OF THE BOARD

YOUR TACH SAYS A LOT. MAKE SURE IT'S RIGHT.

BY TOM RUSSO



**ABOVE:** Four boards in this photo are original tach circuit boards installed in 1975-82 Corvettes, but only one is a restoration board. Which is a reproduction?

**HIGH-ENERGY IGNITION (HEI) WAS INTRODUCED IN 1975 AND “SPARKED” 35-PERCENT HIGHER VOLTAGE THAN THE CONVENTIONAL IGNITION COIL. THE RESULT WAS A HOTTER AND MORE RELIABLE SPARK THROUGHOUT THE COMBUSTION CYCLE, CONTRIBUTING TO A HIGHER PERCENTAGE OF HYDROCARBONS COMBUSTED, WHILE PRODUCING FEWER EMISSIONS.**

Today, we see Corvettes with dramatic horsepower gains, still keeping with emission standards. But to match HEI in the mid 70s, Chevrolet had to mate a circuit board that could handle those “high-tech” electronics and keep rpms reading normally. Today’s later-model C3 owners enjoy Corvette’s foray into electronic ignition but also deal with its circuitry limitations.

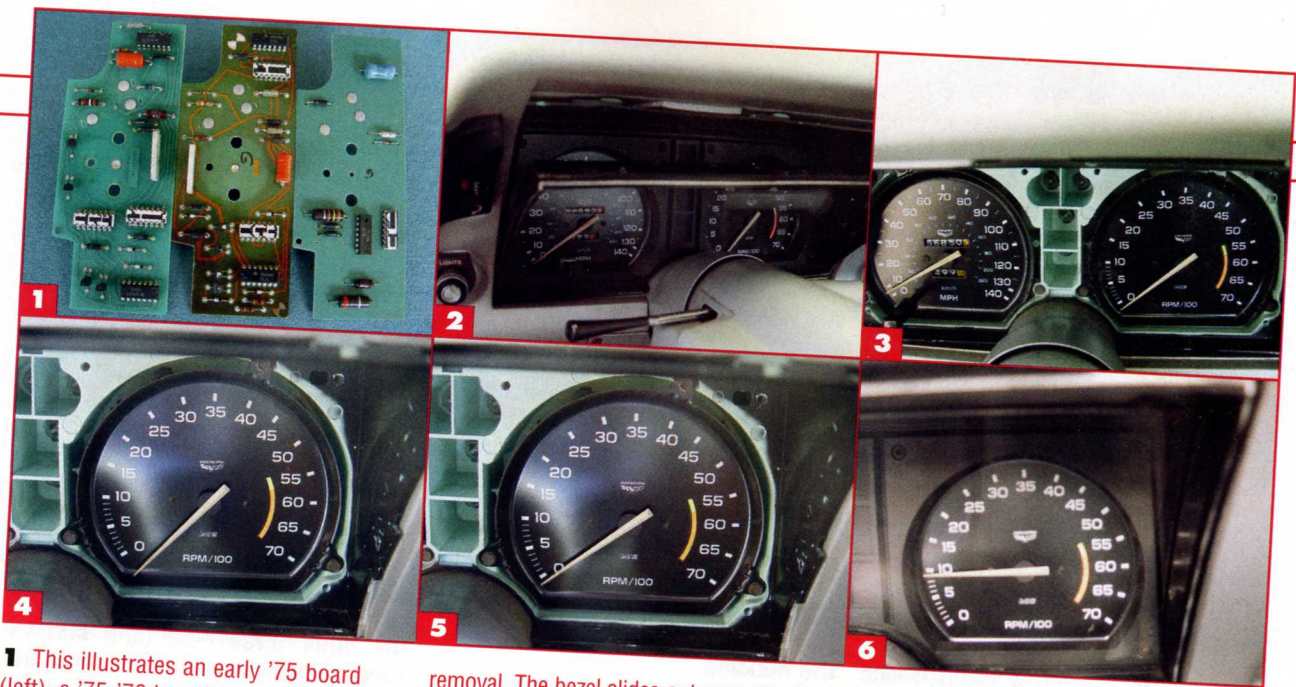
Many C3 owners have been

plagued by many items, like a dash design that discourages access, lack of precise tach board calibration (or none at all), boards that do not work, boards that short out and other “low-tech” glitches. In all fairness, many of these problems have been worked out, but boards are still sold and owners still have problems. Plus, many are still not clear how best to proceed after board installation when

that tachometer needle doesn’t reflect engine rpm. We’ll explore the issues of buying a 1975-82 tach board, troubleshooting tips, what is meant by calibration and steps for installing a 1978-82 board.

**WHAT’S THE PROBLEM?** The first challenge is to correctly diagnose the cause for a non-functioning tachometer, but if you go with board replacement,

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**1** This illustrates an early '75 board (left), a '75-'76 board (center) and a 1977 board (right). Note the component counts (Boards courtesy of John Gardner).

**2** Tachometer/speedometer bezel and lens

removal. The bezel slides out, exposing the lens and instrument cluster.

**3** Tachometer/speedometer cluster housing with bezel and lens removed. The tach removes from the front with three hex-head screws.

**4** Power off. Note needle location and "0" mark.

**5** Power on, engine not running. Note needle aligns with "0" mark.

**6** Power on, engine running at idle.

your guesswork will move you much closer to solving the problem. Vendors report that the most common problem is the tach circuit board, and 95 percent of the time replacement will correct a faulty tachometer. And, if you go with board replacement, the key to a successful and uneventful installation may be not only the board you buy, but also the vendor from whom you buy it, as we explain later.

Other problems that can cause a tach to not work include a lack of ground as well as power and/or signal from the distributor. A faulty tachometer filter can prevent the distributor signal from reaching the tach circuit board, and replacing the board will not correct for a bad filter. Problems can even be in the floppy circuit card located behind the speedometer/tachometer cluster. This is where vendor selection is important. They know their product, and the service-oriented vendor will assist the buyer. Some vendors include instructions ... others don't, so pick a vendor who will service their product after the purchase and/or provides instructions. The bottom line is that once the board is replaced and the tach needle isn't moving with the engine running, you will know where to turn for help.

**TACH BOARD DIFFERENCES:** Differences exist in tach board design and functionality so there are considerations not only in purchase, but in installation. A 1978-82 Corvette board replacement can be done in a few hours. However, if the problem is replacing a 1975-77 tach board, you are looking at hours - more like a full day or weekend - depending on your mechanical ability and confidence level. In 1978, the interior upgrade for the 25th anniversary model simplified access to the speedometer/tachometer cluster, eliminating the need to pull dash components and drop the steering column before removing the speedometer/tach cluster. A '75-'77 Corvette has the circuit board buried in the dash, a design that dates back to 1968.

Tach circuit boards for 1975-76 are an "early" design and were made with more than twice as many components as later years (twenty-six to be exact), therefore, more could go wrong. By 1977, the design got efficient and only eleven components were used on a board. So, a 1977 Corvette has the updated board design but the repair challenge of an early C3 dash. That's all the more reason if you are replacing the board in a 1975-77

Corvette, you will want to do the job one time. That makes board selection, installation and troubleshooting with a precise, tested and well-written set of instructions even more critical.

Not only do the boards vary in appearance and component count, but they are calibrated differently as well. What this means is that boards are not interchangeable among the '75-'82 years. A buyer must specify model year to ensure the board is calibrated correctly for their specific Corvette.

**INSTALLATION:** There are four steps for 1978-82 Corvette tach board replacement.

**Speedometer/tachometer lens removal:** If you haven't disconnected battery power, do so at this time. The lens cover is held in place with five screws. Remove them all. Three additional small screws that secure the lens to the cluster housing can be left in place. Remove the lens by tilting from the top while sliding it past the trip odometer reset button.

**Speedometer/tachometer bezel removal:** The bezel cover protects both the tach and the speedometer and is held in place by hex screws. If you plan to purchase the correct

# BUYING A TACH CIRCUIT BOARD? BUYER BEWARE!

The aftermarket for 1975-82 tach circuit boards over the years has not been particularly kind to the novice Corvette enthusiast who wishes to get his tach working again. To keep costs low, design (or lack of) is outsourced throughout the globe. With no instructions, the installer is left with few options if it doesn't work. A Corvette enthusiast for forty years, John Gardner, who has been making these boards for decades, offers a few insights into board selection, as well as what to do if it does not work as expected.

The aftermarket board was made overseas and is sold by popular aftermarket vendors who did not fully understand its functionality. Look at the holes and note that there's no solder around

them in the original board, but the aftermarket one came supplied with solder surrounding those holes. Once sold over the counter, consumers complained because they shorted out. Later, the insulation washers (fiberboard) were supplied with the intent that they would be used between the board and the tach. However, instructions were not included and so an installer must guess whether to include them or not. Without instructions and when comparing to an original ... what would you do?

Here are three questions to ask a vendor when purchasing a tach circuit board:

- Is the circuit board calibrated for your model year Corvette?
- Are instructions included to reset the

needle to zero and a troubleshoot guide?

- Does the one-year warranty cover replacement of electronic parts including the board?

The key to mating a circuit board with a specific Corvette year is calibration, and it is advised that even if you are offered an NOS (new old stock) board ... avoid it! They did not come calibrated, and you are better off with a new board that is properly calibrated. Components are fresh, and age will not have had a chance to crack or break the circuit of copper pathways.

In contrast to the original board, you'll see a 14-pin, black-and-white chip-type component that was used to calibrate the original tach

hex wrench, pick up a 9/64-inch with a long shaft. A long hex wrench will help to avoid scratching the lens liner. Remove the screws, and the bezel cover will lift out.

**Tachometer removal:** The tach is held in place with three screws. Remove and slide the tachometer out from the cluster. Note that it plugs into three clips at the back of


the housing.

**Tachometer circuit board removal:** As you work with the tachometer, exercise caution to avoid catching the needle and bending, breaking or disrupting its location. With the tachometer upside down, remove the nuts on the back side of the circuit board. Note that three nuts secure it to the tachometer, while

the other three nuts (and screws) serve as terminals and plug into the cluster housing. Save both screws and nuts.

With the tach board removed, compare it to your replacement. Look for a burned spot, which typically confirms a bad board as the cause for your tach not working. This is more obvious for

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board, whereas the aftermarket board has a potentiometer install for calibration. As early replacement boards were produced and disbursed into the aftermarket manufacturing sector, calibration was not understood by Corvette vendors. So boards were sold over the counter, without the capacity to calibrate the board. Later, this component was added to the aftermarket board design. Again, the aftermarket "chased" the engineering specifications, but these boards may still be sold so ... buyer beware!

Vendors report that circuit board replacement will fix 95 percent of non-working tachometers. So how do you troubleshoot if your \$60 investment doesn't fix the problem? Look for a vendor that can assist or includes tachometer troubleshooting

instructions with your purchase. Tachometer problems can stem from any one of several causes. A comprehensive set of instructions will explain not only how to reset the needle to zero, but also how to troubleshoot in the event the needle does not reset to zero with the power on.

Corvette owners have found themselves in a parts trap when the board doesn't work because it shorts out. You call weeks or months after the purchase and learn the warranty exempts replacement of electronic parts. Ask the vendor if the circuit board carries a warranty and for how long. If they have confidence in their product, a one-year warranty is not unrealistic to expect.

Gardner offers additional tips to troubleshooters as well. For example, how

to understand normal needle behavior with and without 12 volts. The needle doesn't "set" until 12 volts is applied. That means it could settle over "0" or below "0" when no voltage is applied. Once power is applied (ignition on), the needle should set at zero. If it does not, then instructions should direct the installer how to reset the needle to zero (carefully remove by lifting and install at the "0" mark).

Corvette owners should expect a vendor to service the product they sell with both technical instruction and replacement, if the situation calls for that. Corvette vendors are working harder than ever before to service what they sell, and it behooves the consumer to make the effort and permit a vendor to correct a problem situation.

early boards than later boards. This is also a good time to replace bad bulbs. If you did not think to do operations checks before taking the dash apart, turn your power back on and do so. Leave the tach out and you can see whether all bulbs mounted behind the tach are working. Perform likewise checks for the speedometer lighting. Also

check the directional bulbs, parking brake and high-beam indicator.

**REASSEMBLY:** Simply reverse the steps listed above. Start with the tachometer, but once secured with the three screws into the housing cluster, test the tach before proceeding with the lens and bezel installation. Turn the battery power

on and note where the needle points on the rpm scale before turning ignition on. (See the "Buyer Beware" sidebar for more information). Turn the ignition on, but do not start the engine. What is the reading? The needle should register at zero. If not, then use the instructions to reset the needle to zero.

With the needle at zero, start the car.

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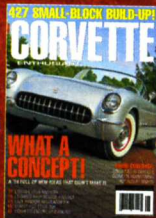
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## CALIBRATION REVEALED

The way vendors describe "calibration" you would think it's a code for a proprietary method of assembly. It is used throughout this article, but what exactly does that mean? Calibration is adjusting the tachometer board for a given power team configuration so that its reading is consistent with a known, calibrated source or a tachometer meter. This is accomplished by adjusting the variable resistor or potentiometer so that the optimum resistance is set and the rpm readings of the tach board are consistent with the meter rpm reading. Once set, Gardner drops a glob of wax on the pot to discourage the novice from adjusting the tach calibration setting.

Original boards used a 14-pin black-and-white chip-type fixed resistor network called a Dual In-line Package (DIP). The DIP ruthenium oxide component saw service on tach circuit boards through 1996, so these devices had a pretty good run. If you look at the circuitry, five resistors make up the network, but a single resistor is responsible for holding the calibration. Its resistance can be tested with an ohmmeter. Set the meter at 100k ohms and place the meter leads on pins 4 and 10. A proper reading for an eight cylinder is about 190K ohms.

Over time, a tachometer will begin to show a higher rpm level than the rpm at which the motor is running. Eventually, the tach quits. This is an early indication the tach is going, and there is no way to return it to the initial calibration.

Today's boards use a semi-fixed variable resistor or potentiometer which permits the technician to set a precise calibration. Gardner reports that his boards have used this type of device for calibration over the past ten years with no problems reported.

Does the needle show an approximate idle speed? If it's a cold start, allow the vehicle to warm up. Kick down the idle and check the tachometer rpm again. If the tach is correctly calibrated and the needle is set at zero (engine not running), the needle should register at the correct idle rpm. If you are comfortable that you have been successful with the tach board installation and testing, and the needle is set at zero, then proceed with installing the lens bezel and cover.

But the erosion of calibration is just one problem that happens with original boards. Early boards (1975-76) had 26 components with a number of diodes and electrolytic capacitors. Diodes will fail and capacitors will leak and degrade over time. Diode failure is common among alternators. On early design boards, one diode was particularly sensitive to changes in polarity, and the slightest miscue would burn out the diode, rendering the tach no longer functional. In effect, the burned-out diode is denoted by a burn spot on the board. For example, a miscue would be a charger cable touched momentarily on the wrong terminal while attempting to jump the battery. New boards are more robust to absorb the impact of such miscues.

The 1975-76 original boards operate with a less efficient design. For example, the copper wiring paths are thin and eventually burned out. The copper path acts like a fuse, which protects the components but renders the board dead. The instability of those circuit designs contributed to the loss of tachometer functionality. Today's boards are much more robust in solder path wiring, component reliability and resistor stability. Therefore, they will provide greater longevity than the original boards. In addition, 1978-82 models are built with a fuse in the tach circuit to protect the tach from miscues.

You can begin to understand why tach circuit board design and functionality changed often between 1975 and 1982 and also why each new model year resulted in improved tachometer functionality and sustainability. It also helps to underscore why today's boards use 21st century materials to produce restoration boards with improved reliability, dependable components and precise calibration to mate with those late-model C3 tachometers. The best part ... it is one place where those NCRS/Bloomington Gold judges can't get to!

**THE BOTTOM LINE:** Today's C6 Corvettes have twenty computers that send data, interact and direct the mechanical operations of a Corvette. If you drive and maintain a 21st century Corvette, you understand the interdependence of electronics with operations. But, in the mid-to-late 70s, a tach board circuit was really high tech (in contrast to mechanical drive tachometers) as it was mated to the HEI distributor. Of course by 1981, we began to see greater integration of

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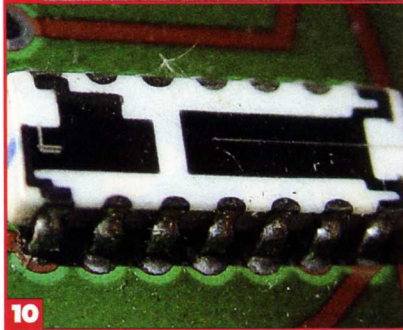
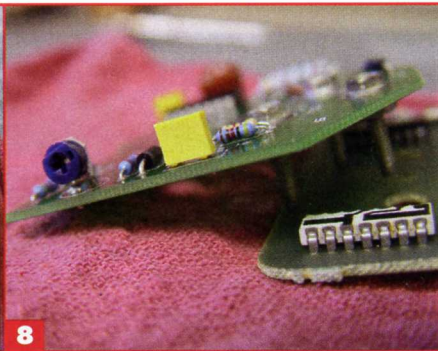
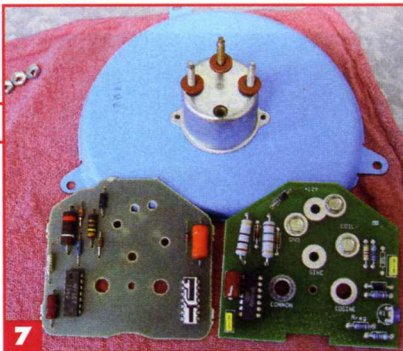
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**7** The board on the left is a 1978 tach board. Board on the right is a 2008 restoration board. Note the solder around the tach mount holes. Solder on the component side requires the use of the insulation washers (fiberboard).

**8** The blue device is a potentiometer, and the screw slot is used to calibrate this 2008 board. The black-and-white

chip is the fixed resistor used to calibrate a 1978 board.

**9** Copper trace wire burned through this '76 board. Early tach boards had no fuse in the tach circuit to protect the board. A fuse was added later in the circuit to protect the board.

**10** This 14-pin black-and-white chip was used to calibrate tach boards.

computer systems to manage fuel/air and emission systems.

The Corvette aftermarket provides a great service to restorers who wish to avoid late model electronic repair by offering a highly dependable tachometer circuit board using quality materials at a modest value. But the

key to a successful experience is buyer awareness and understanding a few basic concepts of the HEI/ tachometer operation. Armed with this knowledge, the Corvette enthusiast can navigate his way through the dash maze and enjoy the full functionality of his C3 electronic tachometer. ■

### FOR YOUR INFORMATION:

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