

KITCAR CHAPTER FIVE

DASH GAUGES

Recently we received an email from a builder asking how much a set of gauges were. It seemed at first a simple request and the short answer is from about \$500 up to \$1,000, or as much more than that as you want to spend. That is a poor answer as it does not narrow it down much. The problem is that, like so often seems to happen, we have been asked to define a price before we have defined the product. Thinking about it further, there are at least 37 questions that need to be answered before arriving at a price for a basic six gauge instrument cluster. This article will address those questions.

The first question is the type of gauge, analog or digital. Analog is a conventional sweep with a pointer while digital displays the actual number, usually through LED lights. Both are about the same in price but there is less of a selection for digital. One advantage of digital is that several companies offer a complete six gauge cluster, an impressive dash installation.

There is, however, one huge drawback to digital, and a good reason why racecars and performance cars use old school analog. Here is an example. When accelerating, a glance at the tach shows 4,000RPM. A fraction of a second later, another glance shows 5,000RPM. Intuition automatically tells that in another same fraction of a second it will be time to shift, as the sweep of the pointer gives a visual cue, thus connecting the abstract of time to the travel of the pointer. Digital does not offer this visual cue and a driver is left with the impossible challenge of quickly doing the math. The same can be said about glancing at a speedometer while decelerating for a corner, watching a falling oil pressure, or watching a rising water temperature. The remainder of this article will be referenced to analog but much of the info will also refer to digital.

The next question is number and type of gauge. A typical six instrument cluster consists of a speedometer, tachometer, oil pressure, water temperature, voltage, and fuel gauge. We recommend this at a minimum. Others such as boost, vacuum, air-fuel ratio, and even a clock may be added but the basic six are quite sufficient and again, even though we will limit this article to the six, much of the info will apply to the others.

Now comes the sizing. All instruments, regardless of manufacturer, come in a few basic sizes. This size refers to their mounting hole and the actual outside dimension of the face is slightly larger. Those sizes are 2-1/16", 2-5/8", 3-3/8", and 5". There are also 3-1/2" and 3-3/4" sizes but they are not nearly as common. An existing dash size or layout may influence this selection. Amount of room available may also play a factor. Two 5" gauges with four more 3-3/8" units mounted side by side would take a dash over two feet wide to install! That gets very big in a small exotic car. Most pre-packaged sets use a 3-3/8" tach and speedo with 2-1/16" sizing for the other four. These sizes are the most common and have the greatest selection of options.

Sizing may also be determined by the location of the mounting, do not assume that they will all go into the dash. If a tach is pedestal mounted, such as on a steering column for a retro look, it may want to be 5". If instruments are mounted in a pod on the a-pillar, 2-1/16" is the maximum. We will talk more

about electrical vs. mechanical senders later but keep in mind that it may be a necessity to use electrical senders should some mount locations, such as the a-pillar, be selected.

Next the bezel and face color is selected. Bezels can be chrome, brushed or polished aluminum, black or even colors in some lines. The face can be white, black, or even white that changes to black at night. Colored lighting can be used to illuminate in any color desired. One company even has color selection by the touch of a button, allowing a different color for every day of the week. All of this is strictly individual preference and what looks right for the particular interior.

Not all of these combinations are available for each gauge. Each manufacturer has different lines of gauges with different styles. By now, a direction on an appropriate line and style should be forming. If a line has a brass bezel, Roman numerals, and a pointer that looks like it came off of a grandfather clock, it may look more appropriate in the dash of the S.S. Minnow, as opposed to an Italian exotic supercar. Keep in mind that various color combinations are often available within the same series.

Make sure that the sweep is the same on all of them. This is the amount of total travel for the pointer. There are short sweeps (usually about 90 degrees) and long sweeps (usually about 270 degrees). A speedo and tach are always long sweep but the other four smaller instruments can be either way. We prefer long sweep because they are easier to read but it is again a matter of preference and availability in the selected series, just make sure the small four are all the same.

This concludes all of our aesthetic considerations and now we will turn our attention to the characteristics of each individual gauge. Beginning with the speedometer, they fall into two categories, mechanical and electrical. Most older transmissions and transaxles used a cable which rotated inside a sheath to connect to the speedometer. The speedo then translated this rotation speed into the MPH display. Like all moving parts this cable eventually breaks and that is the cause of most speedometer failure on older cars. Since the speedo is not programmable, the rotation of the cable is fine tuned by changing a small driver gear within the tranny to compensate for changes in tire size and gear ratio. This is not a precise art and pretty close is usually good enough.

In recent years, they have been outdated by electrical pieces that have a sender unit on the tranny which replaces the cable. The potential problems are compounded with the cable because on a conventional auto the cable is a few feet long, where on a mid-engine exotic it may have to be twelve feet in order to reach. All of the twists and turns along the way make this custom made and expensive cable even more prone to failure. Besides the electric version being more reliable, there are other benefits. The calibration is made at the speedometer and it is much easier and more precise. It can also easily be recalibrated should something affect it such as a change in gear ratio.

Sender units are available to convert most mechanical trannys to electric but an electric transmission cannot be converted to mechanical, not that there would ever be a desire for that anyway. Sender units in all of the common trannys are either magnetic or Hall Effect and most electric speedos will work with both, but it is still important to make sure that the components of the total system can all talk to each other.

Another consideration on the speedometer is the MPH range. Most have a 0-120MPH range and look silly in a supercar. Some have a 0-160MPH range and are much more correct looking. A few have a 0-220MPH but they are scarce and even more difficult to find in the style and size required. Regardless of range, most come with built-in odometers and trip odometers.

Moving to the Tachometer, all of them are electric and some of them have multiple connection options. Compatibility is not an issue here. Again the ranges will vary between 0-4,000rpm and 0-10,000RPM. Most of the 5" ones and almost all of the smaller ones are 0-10,000RPM. It may not need to go quite that high, even for a performance car, but stay away from the 0-4,000RPM model intended for a diesel truck. The 0-10,000RPM is likely the only option to fit the size and style, and that is plenty acceptable.

Several tachs come with additional built-in features as well as add-ons. Shift lights and memory recall are among these and come both ways. They are both impressive features but typically left to the serious competitor. Keep in mind that a tach with all of the bells and whistles could set you back more than a typical tach and all of the other instruments combined!

Now going to the smaller instruments, first is the oil pressure gauge. They also come two ways, electrical and mechanical. The electrical piece has a sending unit and the signal is delivered to the gauge via wire. The mechanical one uses a tube, usually nylon or copper, to connect the oil galley in the motor to the pressure sensor in the gauge. On a conventionally configured car this line is a few feet long where with a mid-engine car this line would again have to be perhaps 12 feet long. Even if this line changes to an expensive braided line, there is a good and obvious reason why most racing rules do not allow these lines which carry hot oil under pressure into the interior of the car. Once more it is difficult and expensive to route and this time dangerous.

Price for the two types is similar. The electric one should have a matched sending unit included but make sure this is not a separate part number. Most oil pressure gauges read 0-100PSI but a few go as high as 0-250PSI. We cannot imagine a situation where the 0-100PSI would not be the logical choice.

Moving to the water temperature gauge, they too come in electrical or mechanical. The tube that connects the mechanical piece is not as dangerous as hot water does not actually travel in it but there is another problem. This tube is built into the gauge and it is usually about six feet long. This is plenty adequate for a conventional layout but will not reach for a mid-engine car, and it cannot be spliced.

These read typically from 100 to 250 degrees. If this is not adequate, there are a lot bigger problems than the range of the gauge. Again the cost of the two types is similar and again make sure a matched sender unit is included.

The voltmeter is the easiest to explain. Two wires hook it up and all of them are electric (imagine that for a voltmeter!). Just make sure the range is 8-18V instead of the 24 volt units commonly used in the marine industry.

Finally there is the fuel gauge. All of them are electric and all of them have the same full to empty sweep (duh!). It is the sender unit that needs attention here. Some gauges are calibrated to use a 240-33 ohm sender like found in AMC cars, while others use a 90-0 sender per GM, and still others use the 73-10 found with Ford and Chrysler. All are readily available and about the same price. The GM is the most common and there may be another reason to select it. If the build is based on a Fiero chassis and there is an existing sender in an existing tank, there is no need to change it. On the other hand, if the tank is being custom built, all three are the same size and fit in the same manner. For a third time make sure that there is a matched sender unit included with the fuel instrument.

Our final thought is on the “idiot light” vs. the gauge. Years ago, before instrumentation became popular, it was hard to miss a big red light that said there was no oil pressure or that the radiator was boiling. It is easy to overlook a gauge that does not so boldly signal that there is a problem. This has prompted several manufacturers to incorporate an idiot light into the gauge, thus getting the best of both. If the series of instruments selected does not have this feature, there is another way to accomplish it and we recommend the added security. Where the oil sender tap is in the block, put a plumbing “tee” and plumb the sender into one side and a standard idiot light sender into the other side. Connect that sender to a big red LED light beside the oil pressure gauge. Do the same with a tee at the water jacket and wire another big red LED beside the water temperature gauge. The total cost should be under twenty bucks and it bought way more than that in insurance and piece of mind.

Now, back to our original question, an adequate set of instruments should cost about \$500 to \$600.