

Add an External Spin-On Oil Filter

For BMW Isetta 600 — by Gary Rannefeld

The tiny Mann H53 oil filter cartridge is still available for the BMW 600 (Bill Rogers can supply these.), but I wanted a larger, spin-on filter that would be easier to change. This modification allows the mechanic to change the oil filter easily, and without having eventually to replace the canister gasket. A bonus in my mind was that a spin-on filter can be pre-filled with clean oil before it is installed, minimizing the time required for the tiny oil pump to re-fill the OEM canister. Also it increases the total volume of oil and the remote location of the spin-on provides a little extra oil cooling. Finally the spin-on provided a convenient place to install a small oil pressure gauge.

Background and Overview.

Years ago, I bought a remote spin-on filter adapter that was designed to be mounted to a vertical surface. The one I bought was a Fram brand, but I've seen several of these more recently at good auto parts and auto performance stores. Mine is designed to accept a Fram PH 8A spin-on or equal, but I decided to use a smaller version of this filter, the equivalent of a Fram PH 3682 filter. These are Ford filters, but other adapters are available for other filter brands. This type of filter adapter should *not* have any kind of internal bypass/relief valve—it's not needed and would duplicate the one on the engine.

I mounted the spin-on filter adapter up inside the right rear fender well where it would not be visible by an ordinary observer. I used plated carriage bolts from inside the engine compartment. Here is a picture of the installed filter assembly with oil pressure gauge and elbow fittings that end up as hose barbs for 3/8" ID hose.



Spin-on filter mounted under right rear fender; with pressure gauge on outlet.

The 3/8" hose is covered with slightly larger flexible aluminum conduit, both to protect it from the sharp edge in the picture above, but also from the heat radiating from the muffler as the hoses pass over on their way to the OEM canister location. Be sure to add ferrules to each end of the conduit to cover sharp edges.

Hose connections to the engine involve a small amount of lathe work, both to the existing cover bolt for the oil canister (Plate 1, Key 137) and to a pair of brass connectors (purchased) that connect the hose to

the filter canister cover (Plate 1, Key 135). Careful work with a drill press is probably sufficient for the brass connectors, but a lathe-drilled hole in the bolt assures that the hole is in the center of the part and not too near one side to cause a leak.

Parts Required.

In addition to a spin-on filter adapter, spin-on element and hose barb adapters as pictured above, you will need the following parts:

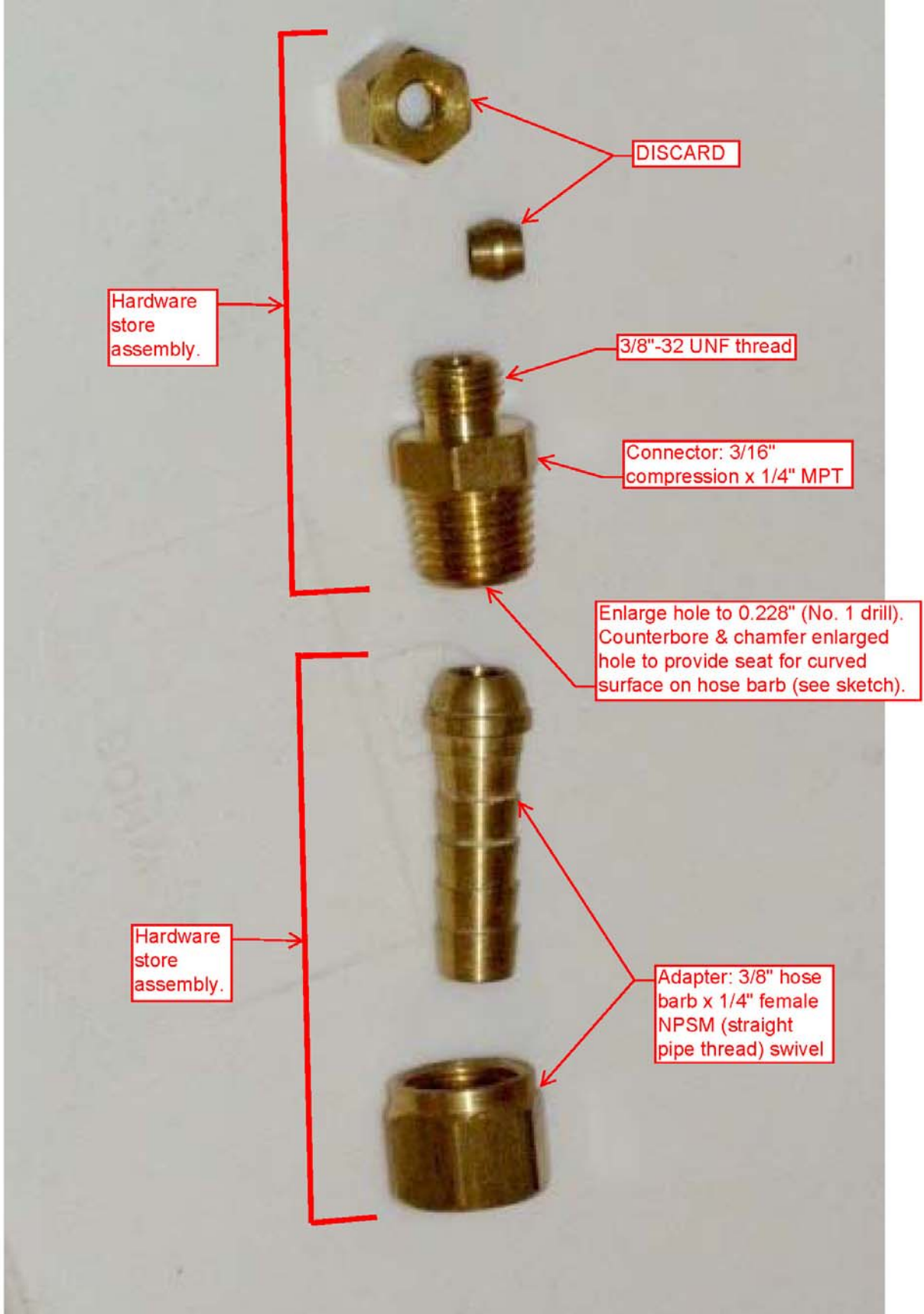
- 36 inches of 3/8" ID rubber hose, oil compatible, rated at least for 100 psig.
- 4 each hose clamps for 3/8" ID rubber hose.
- Somewhat less than 36 inches of flexible aluminum conduit, sized to fit over the rubber hose, with ferrules for 4 ends to cover burrs. You will also need a pair of single-hole straps to hold the conduit in place (see photo above).
- 2 each brass connector: 3/16" compression tubing x 1/4" MPT; to be modified.
- 2 each brass adapter: 3/8" hose barb x 1/4" female NPSM (straight pipe thread) swivel.
- 1 each cover bolt for the oil canister (Plate 1, Key 137); to be modified.
- 1 each filter canister cover (Plate 1, Key 135); to be modified.
- 1 piece of 3/8" pipe, black or brass, not threaded, somewhat longer than Mann H53 oil filter; to be modified.
- OEM o-rings, spring, spring retainer and gaskets (Plate 1, Key 132, 133, 134, 136 and 138).

Here's a picture of the engine end of the completed spin-on oil filter installation:



Engine is resting on a wooden test stand. For details of this item, see separate article by Bill Rogers.

The following picture shows the brass parts that were purchased at a hardware store. The compression tubing connector body must be modified.



Brass fittings from hardware store before modification. Two (2) of each assembly are required.

Oil Pressure Improvement.

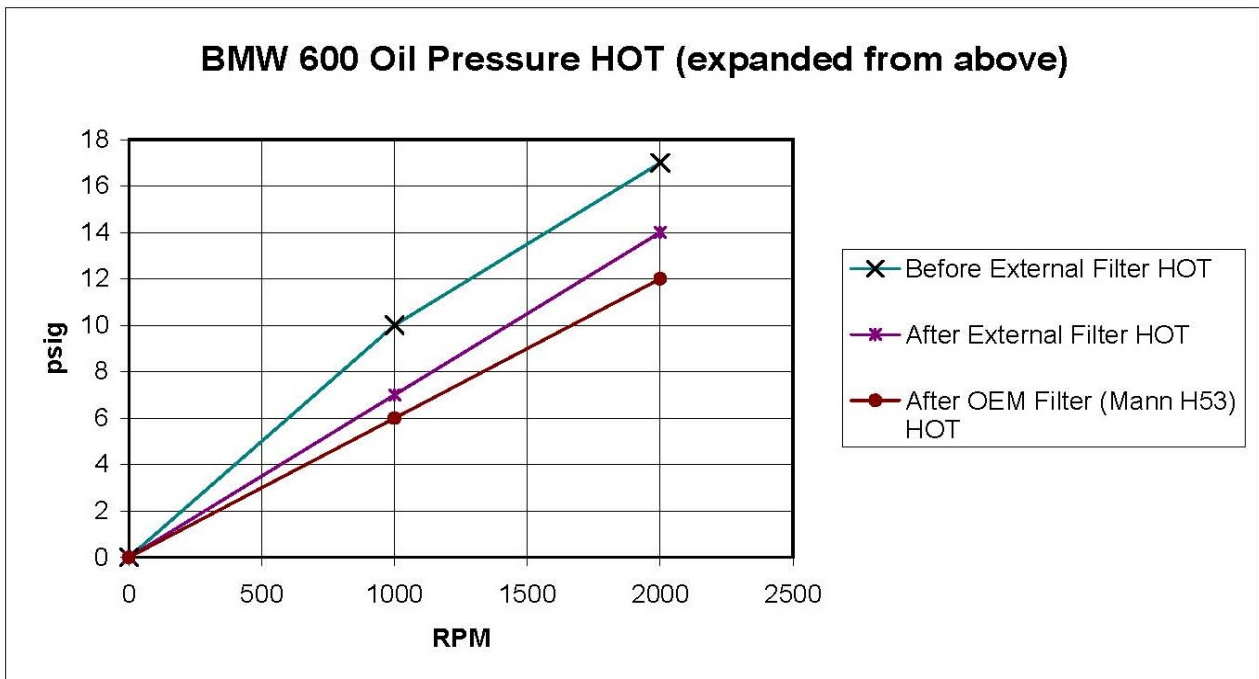
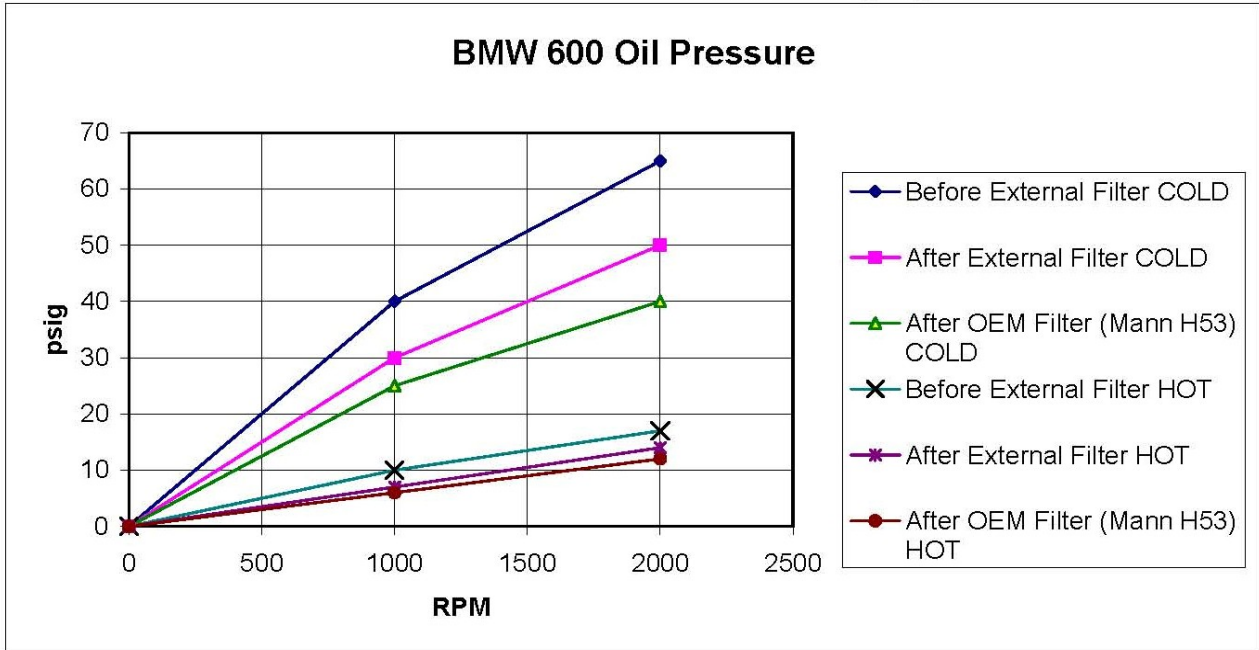
The following test data was recorded with my engine on a test stand before it was installed in the car.

BMW 600 Oil Pressure Data

Gary Rannefeld
December 4, 2010

| PSIG | | 0 | 1000 | 2000 |
|-----------------------------|--------|---|------|------|
| Location & Temp | RPM>>> | | | |
| Before External Filter | COLD | 0 | 40 | 65 |
| After External Filter | COLD | 0 | 30 | 50 |
| After OEM Filter (Mann H53) | COLD | 0 | 25 | 40 |
| Before External Filter | HOT | 0 | 10 | 17 |
| After External Filter | HOT | 0 | 7 | 14 |
| After OEM Filter (Mann H53) | HOT | 0 | 6 | 12 |

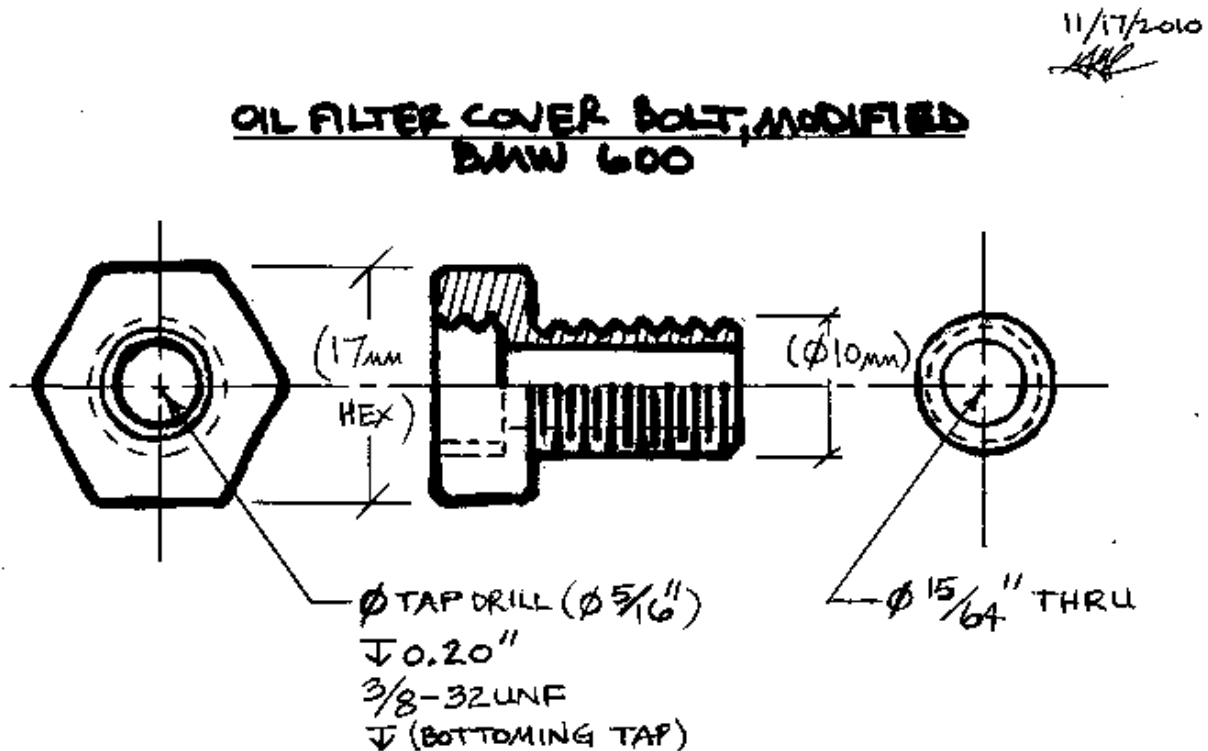
- Notes:**
1. External filter is SuperTech ST3682 Spin-On
 2. External filter connected with 3/8" ID hose x 36" L (total)
 3. Oil temperature ~ 65° F COLD; oil HOT after 20 minutes of 1500 RPM idle
 4. Oil: SAE 15W-40
 5. Approximately 39,000 miles on engine
 6. Oil filters new at beginning of tests



To see the benefit of adding this external filter to the BMW 600 engine, I compared the oil pressures measured *after* the filter (the pressure that is being supplied to the engine). For example at 2000 RPM with a hot engine, the OEM filter supplied 12 psig to the engine during my tests; the external spin-on filter supplied 14 psig, a gain of 2 psig or about a 17 percent increase. That may not seem like much, but considering how low the hot oil pressure is to begin with, any improvement would seem to be beneficial. And the other benefits mentioned in the first paragraph above also make this conversion a worthwhile effort for me.

Parts Modification and Assembly.

Oil Filter Canister Cover Bolt. This bolt (Plate 1, Key 137) must be modified to provide a path to get the externally filtered oil back into the engine. Here is a sketch of the modifications I made to this bolt. This modification was done on a lathe to make sure that the thru hole ($15/64$ " diameter) was centered within the external threads since a pilot hole was not present in the bolt. You should remove the seal gasket from this bolt until you have finished the assembly; the heat used in soldering will damage it.



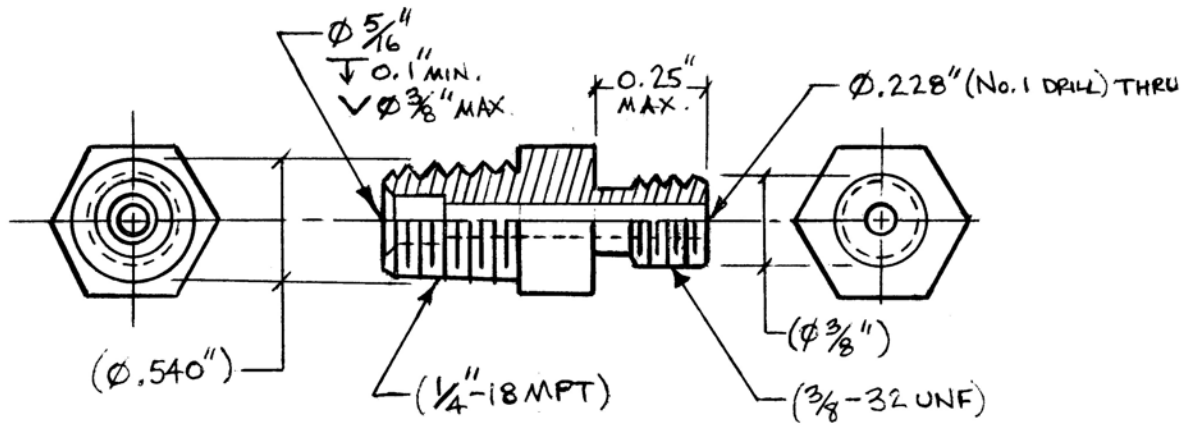
This modified bolt will provide a path for the externally filtered oil to be supplied to the engine.

Note: Dimensions in parentheses () are reference only and/or are not to be modified.

Connector, Brass (2 required). The following brass connectors are modified to provide dirty and clean oil NPT pipe connections to the engine oil system. One of these modified connectors will be assembled (soldered) to the modified canister cover bolt (above); the other one will be assembled directly to the modified cover (Plate 1, Key 135) itself (below the next sketch).

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CONNECTOR: 3/16" COMPRESSION x 1/4" MPT
BMW 600 - 2 EA. REQD



This modified connector provides 1/4" male NPT connections for oil hoses to and from the external filter.

Assembly of Modified Bolt and Modified Connector. The 3/8"-UNF (fine) thread on one of the above modified connectors is meant to be screwed firmly into the 3/8" female thread of the modified oil canister cover bolt and soldered. Particularly with half of this assembly being steel, be sure all surfaces to be soldered are very clean, use a heavy duty solder flux (acid type) and make sure everything to be soldered is coated with flux (Be sure to include the threads.). If you haven't already done so, remove the seal gasket from the bolt before soldering.

With the threads soldered, the completed assembly should be strong enough to withstand some wrench torque but it's best to use the steel hex to install the oil canister cover later. Be sure to test the completed assembly for leaks.

Assembly of Modified Connector to Oil Canister Cover (to be modified). Refer to the photo on Page 2 above. You can see the soldered assembly described above coming out of the center of the oil canister cover. To the right of center on the cover, I drilled a 5/16" diameter hole (tap drill), then tapped this hole (3/8"-UNF) to accept the remaining modified brass connector (above) so that the remaining modified connector could be installed directly into the oil canister cover. I then added a thin 3/8"-UNF nut on the inside of the cover to help support the connector where it is threaded into the cover. I positioned the threaded hole so that the inside nut would not interfere with the center bolt nor would it interfere with the gasket that seals the cover to the engine block.

Once all the parts were very clean, coated generously with solder flux and assembled tightly into the cover, I soldered the modified brass connector onto the cover to seal against any oil leakage. I did not attempt to solder the nut on the inside, but I made sure that the nut provided most of the support for the fitting, leaving the threads cut into the cover for sealing. Again as above, remove the seal gasket from the cover before soldering.

Brass Adapters (3/8" Hose Barb x 1/4" Female NPSM Swivel). These parts do not require modification and are used to connect 3/8" ID hoses to the modified oil canister cover. No pipe dope or thread tape is used because these adapters form a tight metal-to-metal seal. In addition the female

swivel feature allows the hoses to be easily removed from the cover without disturbing the hose barbs or hose clamps.

Diverting Oil Flow to the New External Spin-On Oil Filter. When the OEM oil filter is removed, a barrier must be installed inside the canister to prevent oil from bypassing the new external filter. This barrier is left in place and you probably will never look at it again. But the installation of this pipe is critical to the proper operation of the external filter.

Start with a non-threaded piece of brass or black 3/8" pipe that is slightly longer than the original OEM filter. Data supplied by Mann for the original H53 element type says that the element is 64 mm (2.52") long. This should be the final length of the modified pipe with each end cut square and smooth, and the ID reamed out to remove any burrs.

You are going to install this pipe in place of the original H53 filter element, using an original type o-ring at each end (Plate 1, Key 138) plus the spring and spring retainer (Plate 1, Key 133 & 134) under the modified cover with gasket (Plate 1, Key 132 & 135). The presence of this pipe in place of the original filter element will divert all the oil flow through the external filter (unless the engine's internal relief valve [Plate 1, Key 19, 20 & 21] is functioning).

Final Assembly.

Once the original filter cover is tightened in place with the pipe inside to divert the flow of oil to the new external filter, you are ready to install the hoses to the male pipe connections on the modified cover. The female swivel fittings allow the hoses to be connected without rotating the hoses or disturbing the hose barb/clamp on each hose. Remember that the oil (dirty oil) leaves the oil pump and would normally enter the space around the center post inside the original filter canister. With the pipe barrier in place, the dirty oil is diverted into the brass connection that is installed to one side of the original canister cover. Be sure that this dirty oil enters the external spin-on filter on the outside of the element (This port should be marked "in" or something similar.) as it once did with the original filter.

I put flexible aluminum conduit over each hose for the distance that it travels above the muffler and past the sharp edge of the sheet metal in the fender well where the spin-on is mounted (See the photo on Page 1.). I clamped the pair of shielded hoses to the sheet metal near the external filter with single-hole straps (Again, see the photo on Page 1.). At this writing I have put about 900 miles on the car with the external oil filter in service and it works exactly as I had hoped.

Be sure to pre-fill the spin-on element with clean oil when it is first installed and each time the filter element is changed. I installed a pressure gauge on the clean oil side of the external filter so I could verify/monitor the pressure supplied to the engine. (A more ambitious mechanic could bring this pressure gauge inside to be viewed by the driver.) Once the engine oil is warmed up, you will be able to verify that oil is flowing through the new filter because the filter will become quite warm, even if no pressure gauge is installed.

As I have said in another article, my philosophy, where practical, is not to permanently modify my 600 unless there is no other way to achieve some desired improvement. I did need to drill a few unobtrusive holes in my car and make small modifications to a couple of original parts, but the benefit was worth it to me. This entire modification is best done with the car's muffler not in place. A future article that I have planned shows how to make that process a lot easier.

Note: My thanks to Bill Rogers of South Carolina for all his help and encouragement with my BMW 600 project. As this article was written, Bill's Isetta website is <http://www.isettadoc.com>. For questions or comments about this article, please contact me at Rannefeld@aol.com.