

F&M Oil Filter Adapter and Filter Notes

Filter made by F&M Co., Borger Texas, 1-806-273-7857, Model TAF
STC SE7562SW for the C-75, C-85, C-90, and STC SE7559SW for the O-200

Purpose and Capabilities:

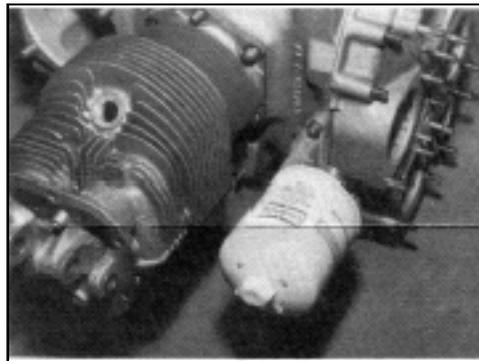
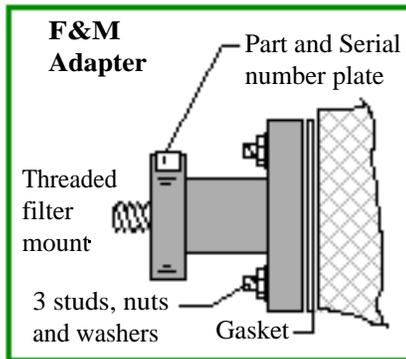
Using the F&M filter system on the C-engines and the O-200 is a good idea. As one owner said: "its the best thing you can do for the airplane/engine". The engines come with an oil screen which is effective in catching the big carbon bits but cannot stop and hold the smaller pieces which can do the most damage to the engine. From a later picture, you can see that the mesh openings in the screen are relatively large. The F&M filter catches the big and the small particles.

Some contemporaries argue that the filter "does no good", but the information from Champion's product manager is this: "Typically, the filter media catches almost 100% of the particles over 40 microns in size. From there, it catches, in diminishing percentages, particles all the way down to about 5 microns in size. It's the particles over 40 microns in size that cause engine damage/wear." 40 microns = 0.0016 of an inch. The oil screen would catch none of these particles because the openings in the screen are a measured 0.015 X 0.015 square.

I know of not one person who would take the filter off his tractor, boat, or motorcycle engine or his auto/pickup engine because he believed that it was "not doing anything worthwhile". I would expect any manufacturer of autos or new airplane engines would instantly void the warranty of any engine from which the oil filter system had been deleted. Engine deterioration which would not occur with a filter costs you, not the anti-user. From a recent AVWEB article, this wisdom: "Oil filter inspection is probably the single most important tool for monitoring the health of a piston aircraft engine. If your engine isn't equipped with a full-flow filter, it's worth adding one simply for the diagnostic value."

Engines newer than our C and O-200 and all have filters Even just a few hours of extended engine life would repay the cost of the system.

The F&M Adapter:



On the left is how the adapter appears...male type. To install, the bypass plate at the left rear engine pad is removed (save it), the gasket cleaned off, and the new adapter installed on the same three studs. On the right is the installation attached to a new engine. The adapter has no internal bypass feature, but the 48108-1 filter provides the bypass function. The purpose of the bypass feature is to ensure oil flow via the bypass in the event the filter gets so plugged that oil cannot go through it or it might be that very cold oil would not go through the filter element, so the bypass capability is a necessity.

"What is the bypass pressure threshold in the 48108-1?" Answered by Champion as 8 to 11 pounds. That means that if the pressure between the oil input and the oil output is greater than a particular filter's threshold in that range because of the filter paper being blocked or the oil being very cold and stiff, then the oil will flow through the bypass of the filter and not through the filter paper. Bypassing, an important feature, does not change engine lubrication.

The 48108-1 and 48109-1 are the only two Champion filters with the bypass feature. The adapter has a little part number and serial number plate which states: "Use full flow bypass filter only". Filters don't tell you they are or are not full flow but the 48108-1 is.

The kit comes with a tiny plasticine envelope with some silicone grease for application to the filter's Neoprene gasket. From then on, if you want to emulate that (it does not come with the 48108-1 filter itself), you need to buy some Dow-Corning silicone and use it. What many do is to apply some of the engine oil to the filter gasket before installation and that is sanctioned because it appears as a step in the installation cartoon on the filter exterior. But, the manager of the Champion division which sells the filters recommends that the Dow DC-4 always be used. The kit includes the STC paperwork, the adapter, a first filter, and a gasket which goes between the adapter and the engine pad, but wisdom suggests buying a spare gasket and 3 new nuts and washers.

The new versions of Champion filters are dash ones (-1) to denote the changes made in the filters. According to the press release presented later, they are stronger (so they won't crush when being removed) and accomplish better filtering. The dash ones of newest manufacture have a better flapper valve as an anti-flowback feature so a significant proportion of the oil stays in the filter when the engine stops running. The primary advantage of that feature is to avoid having to pump oil to refill an empty filter at startup before any oil moves through the engine.

The Filters, Why Gender Counts:

The reason for the intense study about the first F&M installation in our group was a failure of the adapter in a unique way which likely would have caused an in-flight failure and emergency landing except for the lucky occurrences during the event, explained in the failure section.



It is critical to understand the difference in the filters since they all look the same, but differ as to the internal features as well as the "gender" of their attachments. On the far left, the "female" 48108-1 model which is the one meant to be used with the F&M filter adapter. On the right, the "male" 48110 filter, showing that it comes with the threaded fitting. Its image is larger to show more detail but they are actually the same

size as the 48108-1's. The 48110's are required for use with the Cessna-authorized filter adapter which installs in the oil screen hole.

CHAMPION SPIN-ON OIL FILTERS

AIRCRAFT	MODEL	FILTER P/N
Cessna	120, 140, 170, 180 182, 185, 205, 210, 310	CH48110-1

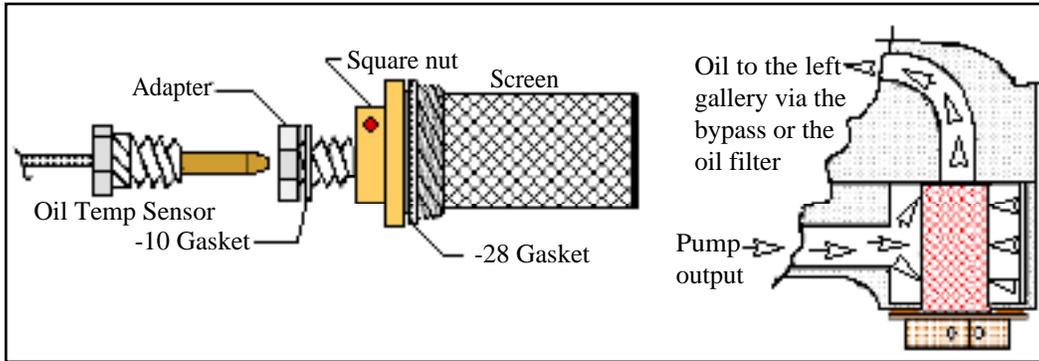
FILTER P/N	OUR PRICE (2005)
CH48108-1	\$16.25

This table is from the 2005 Spruce catalog, clarified, illustrating that most catalog callouts assume that the filter adapter is the Cessna-supplied type; if you ordered the "120, 140 type", you would get the CH48110-1, the wrong style.

Leave the Screen in or not?

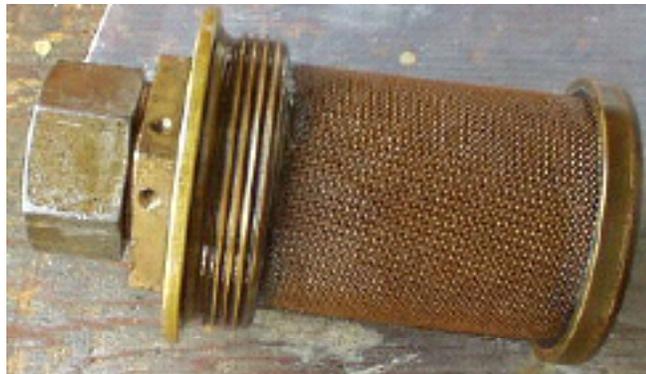
The STC states it is optional to remove or leave the oil screen when you install the filter. Make sure you decide rather than leaving it for the A&X to determine and annotate the STC so nobody forgets or overlooks its status. Some owners read the same information and state: "...must' remove the screen" because that is what they did. My O-200 came with the filter adapter and it still had the screen. The O-200, maintained by an FBO in Oklahoma, left the screen in, but had never checked it in the 200 hours since overhaul. When removed, the screen was absolutely covered with gross carbon clods. That is one of the reasons for writing down whether the screen was removed, and what the complete new oil change sequence should be.

The consensus today is that there seems to be no advantage to leaving the screen in.



The figure shows the oil flow path from the pump through the screen and out of the screen. The figure in the parts manual is poor and depicts the oil entering the inside of the screen and exiting the outside of the screen. Also shown is the stackup of parts of the oil sensor, adapter, gaskets, and screen subassembly.

If you leave the screen in, it should be removed for inspection and cleaning at each oil change. If the screen has been desoldered and discarded according to the STC, there is still a good reason to drain the oil from the screen chamber at the oil change intervals. Disassembly allows drainage of the screen chamber and the channel from the screen chamber to the oil bypass pad.



The actual amount of oil that comes out of the screen chamber is shown in the measuring cup, about two thirds of a cup. If you leave that amount of dirty oil in place, along with the oil captivated in the galleries (you cannot drain them), you immediately get a contamination of the clean new oil with the chemically active old oil. Your choice.

Whichever you plan, at the time of installation of the filter system, remove the screen for an inspection and make sure you replace the crushable gaskets with new when re-installing. Those AN type gaskets are the crushable type and should not be reused.

The Failure:

Sometimes, a story has to be repeated to ensure the points are taken. A failure of manufacture of an F&M adapter happened and this section is to keep you aware such that you pay attention to the gender and exact part number of the filter. The first in our group to have the F&M filter did the first time oil and filter change. When he removed the 48108 filter, the threaded stud which should have been secured in the adapter came out along with the filter but he had no idea that something unusual had happened. He took the filter to the local pilot's supply store and asked for "one of these". **What he was holding in his hand now looked like a 48110, with the protruding threaded stud!!**



He was given a 48110 filter, an apparent match, and installed and torqued it. He made a short hop, only about 5 miles, to the airport where two more 140 owners were working. The A&E there noted the “leak that started it all” and commented on it. He and the owner went back to the home airport and did some re-torquing. Seemed to stop the leak and then it started again. That grounded the plane and the owner went after another replacement filter, a 48110, right? Same thing. This time, the filter and the adapter came off for a bench inspection. A special setup to apply air to the adapter was made so a leak could be discerned that way instead of with messy oil. The filter gasket was not being compressed, only kissing the surface of the adapter.

Our conclusion? The adapter had been made with threads which were not deep enough to accept the threaded stud of the 48110! Sure this was the fault, a phone call to El Reno, and got the response: “Not our fault.” No assistance.

We kept digging and found that the true fault was that the threaded stud which came out with the filter but which should have stayed in the adapter had not been secured in such a fashion as to stay there. A replacement threaded stud to put back in the adapter and a new 48108 filter were needed. Naive, we had expected a quick shipment of a replacement adapter, but F&M was not interested in that cure.

I re-called F&M; the not-so-sterling advice was something like this: “.chuckle, chuckle, ‘ol XXX must have forgotten to put the Loctite on that one. Tee, hee. What you need is a new threaded stud and the “tool” to install it”. “It will cost you two dollars”. That to cure the problem they created, a strange way to handle complaints by a customer who was given bad product by the maker. (The fact that they knew of the problem and had the “cures” ready to ship shows unequivocally that it had happened before!!!)

I asked: which Loctite? “Oh, the red stuff from the auto supply store.”. This was the beginning of our education that “PMA” and “STC” and “FAA oversight” can be meaningless. There are about ten variations of RED Loctite. Going to the local Loctite source and learning which Loctite to use, the toughest Loctite still holds the stud in with many filter changes since.

The effort and cost and risk of the incomplete assembly of the filter adapter was borne by us, rather than the maker. The investigation effort was necessary to get to the bottom of the fault and find what had really happened. It created a permanent bias against F&M after that no-help event and it still rankles that F&M did not jump right on the problem, ship a known-good adapter instantly and do their own troubleshooting!!! A better design of the adapter would be a pinned stud. I asked F&M Floyd if they were going to improve the design: He said: “we have been making them the same way for 27 years, so why make them super good?”.

One wonders how many “ol XXX” skipped without the Loctite. The purpose of this section is to alert you to the possibility (errors in manufacture are seldom singular) and for you to make sure the replacement filter is always the CH48108-1.

If the plane with the leaking wrong filter had lost enough oil on a trip to Lake Tahoe over the mountains, you can bet the NTSB report would explain: “Pilot error”.

Removal:

Sometimes, we have found the filters so hard to remove that we now keep both the one inch sockets on the torque wrenches and the band style filter strap wrench handy. Even if using the torque wrench to tighten it to the 16 Ft-Lbs noted on the can, it sometimes will be much tighter than that at the time of removal. I have learned to try the torque wrench with the foot long handle on the first try to remove it; if it does not budge when I hit 40 Ft-Lbs, I use two wrenches, the torque wrench with the socket and the strap type. The best way to remove a can that crushes when using the socket only is to drive a hefty screwdriver through the can near its base but missing the threaded stud of the adapter and use that driver as the removal tool. Messy but possible. The -1 filter model is supposed to be stronger and so the crushing should not occur with those, but you have been alerted.

The present Champion product manager believes that we should not have difficulty getting the filters off if the Dow is used, so that is an open question. To help resolve it, feed back the information about how much torque is required for removal and I will update the discussion and pass along any useful information to Champion.

Capacity and Anti-Flowback:

From the manager of the filter division of Champion, the capacity of the filter is 0.475 qt, which is close enough to a pint to say: add a pint to compensate for the filter at oil changes. Others prefer to put in the usual, do the runup check for leaks, wait a while, wipe the oil level probe, test again, note that the level is below Full, and add. There is at least one who advocates not adding extra oil, but the oil in the filter is not “in work” IN THE ENGINE as is the rest of the oil. If all the oil was lost to the point there was no more to pump, there would still be a quart in the filter. Compensate for the filter by adding. Not adding means you are starting out half a quart low.

An internet string in August of '05 noted that the 48108-1 filter (used with the F&M filter system) had an anti-flowback flapper valve. There was some controversy as to whether or not that was true, so I asked the Champion oil filter Product Manager whether the 48108-1 filters had an anti-flowback feature. He confirmed that both the 48108-basic and 48108-1 filter have an anti-flowback feature.

Thanks to investigations and tests by John C and Victor Grahn, there is a difference between those made before December '04 and those made from December '04. Victor Grahn followed through and took very good pictures of the feature and he checked all the filters in his stockroom to confirm visually. Queried again, the manager of filters at Champion responded that they made a change in the anti-flowback seals and the newer are more limber and will seal more consistently.

As Victor Grahn pointed out, when you remove one of the new 48108-1 filters with the anti-flowback feature, you have to pierce the filter to get all the oil out. What I am looking forward to is getting a recently manufactured dash one to see how effective it is to not get oil all over (me) when removing the hot hot filter.

Here are the Champion responses:

Yes, the CH48108-1 has a anti-flowback valve in it. Only the CH48108-1 and the CH48109-1 filters have this valve. As you've stated, it was designed to make sure that oil will stay in the filter after the engine is shut down.

Let me know if you have any other questions.

Regards,

Alex Feil

Piston & Power Supplies Products Manager, Champion

Alex Feil, the Manager at Champion, responded to the next query about whether the anti-flowback seals were changed based on what John C had observed and the comparison between “old...June '04” manufacture to “new...Dec '04”. His response is: “In the newer versions of the -1's, we improved the valves so that they would seat better.”

Alex subsequently confirmed that, due to the large quantities of parts on hand, it took until November or December of '04 to change over to the filters with the new style anti-backflow seals. Alex sent along some great pictures of the 48108-1 units, but by the time I reduced the size to fit here, the clarity disappeared.

And Alex confirmed the quantity of oil the filter holds; 0.475 quart. Rounding, measure out a pint.

Here are some of the great pictures Victor Grahn took, reduced in size and consolidated. The black Neoprene seal is limber and forms the anti-flowback seal by contact with the multi-holed steel bottom plate. Oil coming into the filter via the circle of holes will deflect the seal out of the way and go through the filter element and out via the center large hole. When the engine stops, the light pressure of the seal over the circle of holes prevents the oil from draining back.



Per Alex of Champion, those filters manufactured December of '04 and after will be the newer type; the older filters have only four inlet holes whereas the newer have the eight holes shown here, and the latest also have the more limber anti-flowback for better sealing, .

We have learned to write the tach/hobbs/date on the outside of the filter using a Marks-A-Lot or Sharpie pen when it is still dry and not yet oily, so as to make "when did I change it?" easy to answer with the data there. Some write on the can and then cover it with see-through Scotch tape. There are spaces on the outside to write the date and tach or Hobbs time of change, but it usually ends up on the wrong side of the can and so we write after the installation so it is always visible, and of course writing on the end before mounting solves all.

Champion added features to the CH48108 filter and the new model is the CH48108-1. Here is the release which explains the changes made in the -1. **Nov. 11, 2003** Reduced in size to fit Word.

“You Can’t Fly A Better Filter”

Sales Bulletin

Next Generation Shorter Champion Oil Filter With Improved Performance Hits the Market

Liberty, SC – Over the past 3 years, we have worked to add significant design improvements to our filter. This is a list of the specific improvements made to the new filter:

- Shorter Installed Filter Height (Easier installation for confined areas)
- Thicker-Walled Can (Exceeds industry standards for burst ratings)
- Improved Internal Spring (Holds element firmly in place)
- New Inlet Design (Greater inlet flow area)
- New Zinc-Plated Stud (Best rust protection in the industry)
- Improved Base Plate Thread (Rolled threads improved retention)
- Stronger Center Tube (Collapsed pressures are doubled)
- New & Improved Wrench Flats (Easier removal and installation)
- The Only Filter Approved by Both TCM and Lycoming

Following are the FAA Approved Part Numbers: (Neal. There was a table noting several models. I deleted all but the one of interest)

Current Filter CH48108 New Filter CH48108-1

Prices and Sources:

If you prefer the Cessna-sanctioned filter adapter, you can still find it in the catalogs for just under \$1,000.

Prices for the F&M filter assembly range from \$199.00 to \$239.00 in 2005, depending on the source. Skyport Services of New York, 518-797-3064 (International member), also has the kits for \$199. Wag-Aero \$199, Chief not listed, \$239 from F&M & \$224 from Spruce. In 2005, prices for the 48108-1 filters are about \$16 from Spruce and as much as \$32 from FBO’s and between that at pilot shops. Kelly says its 48108 is “the same” but no one knows the relative merits of those or a third vendor.

And now, 19 August, this from Victor Grahn:

Just had a chance today to inspect a removed CH48108-1 filter.

It appears the oil in the center of the filter that has already passed through the filter medium will drain out as expected. As you tip the filter upside-down and as the oil drains through the filter medium it continues to drain, slowly.

As far as the oil running out through the "in" holes, that it will not do. I've even tried to use small punches and other tools to push an edge down on the rubber seal, it still will not drain out.

So as long as the filter is more or less upright and not upside down, a majority of the oil, at least half, will always stay in the filter.

Neal

Thanks to John C., Victor Grahn, and Alex Feil of Champion.

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