



Thank you for purchasing your RV-14 Brake and Fuel Line Kit. Please note that these directions are updated periodically as required and the current version will always be located on our website.

These instructions are meant to serve as a general guide for the installation of these packages. However, the builder is responsible for verifying that this kit is installed in a safe manner for their aircraft. As always, if you have any questions, we are available for telephone or email support.

This kit is available in several different versions. This manual will cover the complete kit. If you have only purchased a partial kit, you only need to follow the directions for the components that you purchased.

Items Included in kit: FOLLOWING ARE THE BRAKE LINE RETROFIT KIT ITEMS

- 1. -3 size 90 degree AN fittings (QTY 10 for RV-14A, and QTY 8 for RV-14)
- 2. -3 size AN Tee (QTY 1 for RV 14A and QTY 1 for RV-14)
- 3. -3 size 45 degree AN Fittings (QTY 2 for RV-14 Only)
- 4. F14116B-L QTY 1
- 5. F14116B-R QTY 1
- 6. F14116C-L QTY 1 in RV-14A Kit only
- 7. F14116C-R QTY 1 in RV-14A Kit only
- 8. F14116D-L QTY 1 in RV-14 Kit only
- 9. F14116D-R QTY 1 in RV-14 Kit only
- 10.F14116A-L QTY 1
- 11.F14116A-R QTY 1
- 12. In RV14/14A kits with Parking brake installation, F14116C-L, C-R, D-L, and D-R are replaced. Parking brake installations use two hoses from the pedal to the parking brake valve, and two hoses from the parking brake valve out to the respective gear assemblies.

FOLLOWING ARE THE FUEL LINE RETROFIT KIT ITEMS

1. F14109-C – QTY 1 (This is a flex hose in our kit)

- 2. F14109-B QTY 1 Rigid Tube Assembly
- 3. F14109A-L QTY 1 Rigid Tube Assembly
- 4. F14109B-L QTY 1 Rigid Tube Assembly
- 5. Note that Duplex valve installations are a bit more custom. F 14109-B will be custom replaced. F14109A-L and F14109B-L are each replaced with two rigid tube assemblies.

#### FUEL LINE KIT INSTALLATION

Our non duplex fuel line installation package consists of 3 rigid tubes and one flex hose. The flex hose goes from the pump to the firewall, and the three rigid tubes are used from the valve to the pump and also from the valve to the respective wing fittings.

All the lines are very straightforward to install and will save countless hours over fabricating your own tubes.

If you are installing the Type 7 Valve Kit, you will have a drill template plate included in your kit. The type 7 valve utilizes a different hole mounting configuration than the standard valve. Cleco the doubler plate to the existing plate and use the template to drill new mounting holes that will allow you to install your Type 7 valve into the stock included mounting plate.

For the rigid tube assemblies that go from the valve to the wings, we recommend the following.

- Hand tighten the assembly at the valve first. (Critical for the Type 7 Valve)
- Make sure that the AN fitting at the wing root is loose so that it can swing freely and make attachment easier.
- Attach the tube at the wing root
- Tighten everything up

Note: The rigid tubing is 5052 aluminum, which is a soft grade of aluminum but of a much higher quality than the 3003 soft tubing that it supplied with the kit. A very slight amount of pre load may be necessary to install the tubing in your aircraft. The important thing is that the tube attaches perpendicular to the fittings and fits well. The tolerances are very tight, and we are able to build these tubes with a very high amount of repeatability. All of our beta testers reported that these tubes "drop right in." Any slight variance should be such that you can attach everything and it will allow it to fall into place during final tightening. If you have any questions during the installation, please feel free to contact us.

Note 2: For duplex valve installations, we are finalizing a COMPLETE drop in component kit. This kit will include required Rigid tubes, new clips for the spar, a new valve mounting bracket, cover plate, and doubler.

## RV-14 Brake and Fuel Line Installation Package Rev 11 9-17-20 Following are pictures of the fuel line assemblies for a non duplex valve standard setup.















#### Andair Type 7 Valve installation

The Andair Type 7 valve can easily be installed in the RV14/14A aircraft utilizing this installation kit. It includes 3 rigid tubes, one flex hose and one Valve Mount drill template. To start the installation, you utilize the included drill template to transfer the the holes to the existing valve mounting plate. This ensures that the type 7 valve mount holes are in the correct location. Once these holes have been drilled, you can mount your Type 7 valve.

Next, you will want to install the two long tubes from the vale to the outboard fuselage. Hand tighten the tubes at the VALVE END FIRST. Then, a gentle push should slide them right into place into the valve clips and the outboard AN attach points. Once this is complete, don't forget to final tighten all your fittings. You can install the remaining rigid tube and flex hose whenever it is convenient.



**Note-** The picture below shows the type 7 valve and the complex bend geometry to make the turn tight to the valve and yet clear everything and then make the bends through the tunnel out to the wings.



#### BRAKE LINE KIT INSTALLATION (For Beringer install, go to page 19)

The brake line kit is designed as an extremely compact, lightweight and very high quality alternative to the standard plastic RV-14 lines. This kit when ordered in its complete form comes with ALL the hoses and fittings required to complete this installation. The non parking brake installation includes everything required. The parking brake installation consists of fittings and hoses ONLY and requires fabrication of brackets as well as purchasing the valve and valve actuator assemblies.

Tim Olson was our initial beta tester and did a very detailed installation description on his website with a multitude of pictures. We are including that writeup at the end of this document for use as a guide when installing this package.

Below are a few important notes:

- 1. We have shortened the long hoses by several inches from the initial beta test show in Tim's pictures. This allows for an even better fit with less excess hose.
- 2. The RV-14 rudder pedals can be permanently mounted in one of three different locations forward and aft. We build your hoses so that they will fit in any of the three positions. This means that if the pedals are moved to one of the forward two positions, the hoses will be slightly long and may need to be zip tied for a better appearance.
- 3. Please remember to utilize a thread sealant on the NPT portion of the fittings. No thread sealant is needed on the flare portion of the fittings.
- 4. If you want to adapt a parking brake, we are including pictures immediately below which show this.
- 5. PARKING BRAKE INSTALLATION \*IMPORTANT\* We highly recommend attaching all hoses by hand to your parking brake valve BEFORE fabricating and determining your exact final parking brake mounting. This will ensure that the angle and orientation of the valve will allow the hoses to sit nicely and move freely with the pedals throughout the full range of motion. The hoses are long enough to allow a bit of flexibility in the mounting locations, but we have found that the nicest and easiest installations have mounted the park valve AFTER attaching all hoses by hand to determine the absolute best placement. You will notice that the fore/aft placement of the parking brake valve varies slightly in some of the these pictures. It depends on which pedal position you utilize.
- 6. List of Items to purchase for a parking brake installation:
  - 1. Matco PVPV-D Parking Brake valve
  - 2. A-730 Glide Free control (This is what some of our beta testers utilized for a parking brake valve cable. It can be purchased from Spruce)
  - 3. Spruce Part # 05-16245 This is the end that mounts into the parking brake valve and fits with the A-730 glide cable.

When installing with a parking brake, please note that an angle bracket will require fabrication to mount the valve. Shown in this picture is the angle bracket

fabricated by the builder. The builder will also need to fabricate a mounting angle to hold the adel clamp and actuator cable in place.



PARKING BRAKE INSTALLATION IN RV-14A. Valve location 1. Mounting bracket needs to be fabricated. Valve not included, but all hoses and AN fittings are.



PARKING BRAKE INSTALLATION IN RV-14. Valve location 1. Mounting bracket needs to be fabricated. Valve not included, but all hoses and AN fittings are. Please note that both valve mounting locations will utilize the same length hoses. Builder is responsible for determining how to mount valve, but this approximate location works with the hose lengths.





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PARKING BRAKE INSTALLATION IN RV-14. Valve location 2. Mounting bracket needs to be fabricated. Valve not included, but all hoses and AN fittings are. Please note that both valve mounting locations will utilize the same length hoses. Builder is responsible for determining how to mount valve, but this approximate location works with the hose lengths.



Pictured below are images of how some beta installers mounted their valve as well as routed their parking brake actuator cable.









Here is an image of the RV-14 Tailwheel Cabin hoses WITHOUT a parking Brake.



Here is an image of the RV-14A Nosewheel Installation without a parking brake valve.



Pictured below is the AN tee that mounts into the reservoir as well as the correct orientation for the hoses that come out of it down to the copilot brake pedals. Please note that the orientation of the 90 degree fitting when tightened down will affect how much "slack" is in that hose. So, if it appears to be too "loose", you can move the 90 degree fitting a little bit "up" and vice versa. This will give you a nice fit and a great looking final assembly.



### **BERINGER CABIN INSTALLATION:**

ASF is an OEM supplier for Beringer for the RV14/14A cabin and gear leg hose components. Beringer supplies an installation manual which can be found here. <u>https://www.beringer-aero.com/sites/beringer-aero.com/files/page/342/brg-mm-00214a.pdf</u>

This is the current manual as of 7-23-19. You can check the Beringer Website for more current information.

We offer 8 different packages for Beringer.

- 1. RV14 Cabin Brake kit with PB and Anti Skid Valve. (H1-H10)
- 2. RV14 Cabin Brake kit with PB and no Anti Skid Valve. (H1,H2,H3,H4,H9,H10,H11,H12)
- 3. RV14 Cabin Brake kit with No PB or Anti Skid Valve. (H1,H2,H3,H4, H13, H14)
- RV14A Cabin Brake kit with PB and Anti Skid Valve. (H1-H8, H15, H16)
- 5. RV14A Cabin Brake kit with PB and no Anti Skid Valve. (H1, H2, H3, H4, H11, H12, H15, H16)
- 6. RV14A Cabin Brake kit with NO PB or Anti Skid Valve. (H1, H2, H3, H4, H17, H18)
- 7. RV14 Gear Leg Hoses.
- 8. RV14A Gear Leg hoses.

Following is a list of hoses as well as their installation locations on your Beringer System. The Cabin hoses all start with "ASF146-" They all end with "H" followed by a number. Not all hoses will be included with your package.

- H1 Reservoir to Copilot Right Master Cylinder In.
- H2- Reservoir to Copilot left Master Cylinder In.
- H3- Crossover Hose
- H4 Crossover Hose (Same as H3)
- H5- Pilot Right Master Cylinder Out To Anti Skid Regulator In #2
- H6 Pilot Left Master Cylinder Out to Anti Skid Regulator In #1
- H7 Regulator out #1 to Park Brake In (Bottom)

H8- Regulator out #2 to Park Brake In (Top)
H9- Park Brake Out (Top) – Firewall Right (Tailwheel)
H10 – Park Brake Out (Bottom) – Firewall Left (Tailwheel)
H11- Pilot Left Master Cylinder Out- Parking Brake In (Bottom)
H12 – Pilot Right Master Cylinder Out- Parking Brake in (Top)
H13- Pilot Left Master Cylinder – Firewall
H14- Pilot Right Master Cylinder – Firewall
H15- PB Valve – Fuselage Exit
H16 – PB Valve – Fuselage Exit
H17-Master Cylinder – Fuselage Exit
H18- Master Cylinder – Fuselage Exit
ASF147H1 and H2 – RV14A Gear Leg Hoses
ASF148H2 and H2 – RV14 Gear Leg Hoses

In addition, you will receive the following fittings with your Cabin Hoses

- 1. TW Cabin Hoses AN816-3D Qty 2, AN826-3D Qty 1 (The Tee is the reservoir fitting, and the AN816-3D fittings go into the firewall) Remember to utilize thread sealant on the NPT portion.
- 2. NW Cabin Hoses AN822-3d qty 2, AN826-3d Qty 1, 04-05753 snap bushing (Qty 12) (Utilize the 826 at the reservoir, the AN822 fittings go into the holes that transition from inside the fuselage to outside. Remember to utilize thread sealant on the NPT Threads. Utilize the snap bushings as per Tim Olson's writeup (starts page 30) at the end of this document. You may slit them in order to get the fittings through the bushings.
- 3. TW Gear Leg Hoses- AN823-3d Qty 2, MS21919WDG6 Clamp-Qty 6, MS51957-45 Screw (Qty 6), AN960-8L Qty 12, MS21045-08-Qty 6 (Install as per images)
- 4. NW Gear Leg Hoses AN816-3d Qty 2 (Install as per images)

PLEASE NOTE – The three pictures below are of the TW aircraft in the three configurations. For the nosewheel aircraft, the hoses do not terminate at the firewall but instead route through the center

PICTURE 1 – Beringer Kit with PB Valve and Anti Skid Valve



## Picture 2 – Beringer Kit with Park Brake Valve and NO antiskid Valve



## Picture 3- Beringer Kit with NO PB or Anti-SKID



GEAR LEG HOSE KIT RV-14 and RV-14A

Your RV-14 Gear Leg hose kit comes with the following components:

- 1. 2 hoses (one for each gear leg)
- 2. Qty 2 816-3d fittings (RV-14A for top of gear leg fitting)
- 3. Qty 2 823-3d fittings (RV-14A caliper fittings)
- 4. QTY 4 823-3d fittings (RV-14 Tailwheel only. 45 degree fittings used at top of gear leg and at caliper)
- 5. WDG Clamps and installation hardware for the wrap of hose at caliper.

Please utilize the following pictures as a guide for your installation. The first two pictures are the RV-14A installation. The second set of pictures shows the RV-14 Tailwheel install. Ensure that there is enough slack in hose to allow for normal movement as well as to ensure that no undue force is being placed on the calipers.



Here is the location used by our beta tester for the clamp. It is 2.25" from the edge and 1/4" down



The pictures shown below are for the RV14 Tailwheeel install.













# RV-14 Brake and Fuel Line Installation Package Rev 11 9-17-20 BERINGER RV14A Gear Leg Hose installation





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# Tim Olson Writeup on package installation

One thing I knew going into the fuel and brake line section was that I wasn't going to be using the included fuel and brake lines by Van's. Van's uses plastic tubing for the brake lines, which I personally consider inadequate, even if they do hold the pressure. There isn't enough chafe protection, I want more durability, I want more resistance from becoming brittle, and I want something that will hold up far better. Solid lines aren't really a good option for brakes in the RV14 due to the routing they take. In the RV-10 I had switched to -3 sized stainless braided teflon hoses, with a clear vinyl over protection cover, and I wanted to do the same thing in the RV-14, so I contacted Steve at Aircraft Speciatly and Tom at TS Flightlines. Steve is in Wisconsin like I am, so I knew turnaround time would be good, and Steve and Tom often collaborate to work out good packages for RV's. I knew they could make me the braided brake hoses I wanted. \

I also remembered from the RV-10 how much easier it was to work with flex fuel lines, so I wanted to do some of that on the RV-14 as well. First of all, the Van's supplied aluminum tube I found much harder to get good lines out of in my last build. I ran into one batch of tubing that wanted to crack and split a lot, so ordered another roll which wasn't as bad. But, the tubing is very soft and flexible which made it nick real easily with the tubing bender. I wanted to avoid all of that so I intended to use flex hoses which would be strong, last a lifetime, and perhaps route easier. What I found in the end is that flex teflon may not be the perfect thing in some areas of the RV-14. In the RV-14 you're probably better off going with hard lines for the side wall to fuel valve, and a Teflon hose, although it did work, was flexed in a tighter bend radius than I wanted when going from valve to fuel pump. So that was a good place for a hard line too. In regards to the tubing, the hard lines I felt would be acceptable if they were done in 5052-O. Steve has been working at getting a CNC bender all set up for making hard lines, so that would be a great project for him that would save me some time.

The one line I did want flex was the line to the firewall from the fuel pump. This one would be real easy to make in solid tube, but the firewall in the RV-14 is very thin, and if there were ever any sort of landing incident, that line could easily be bent out of position and cracked, spraying fuel into the cabin. So I really wanted to go with a good stainless braided flex line to the firewall for that reason, keeping in mind that my daughters may be flying this plane.



The first thing I had to do to switch to teflon brake lines was figure out where to route them. On the forward side, no big deal, but through the spar there were 2 .375" holes drilled per side, .5" center to center, and the plans had you run both hoses though the holes on the Right side of the plane. I'm sure this makes routing up the the wire chase to the panel area convenient. The problem is, the

teflon hoses need .5" holes for the nuts that are preinstalled, whereas van's uses cheap compression fittings on plastic hose that can be cut and threaded through BEFORE the ends are put on. You can't drill those 2 holes to .5" because the holes will start to run together and leave no room for snap bushings.

Without knowing the other things coming in the finishing kit, I had to take what I knew and make some educated guesses as to alternative ways to run the lines. I could drill more holes but I wanted to avoid that if possible. Also, those holes were in great places.

It didn't appear that those holes on the left side of the plane would be used for wires, due to the other places I could see that were for running wires. It did appear that those could be for a pitot or static line, but those would be easily run through any of the 4 holes. So I decided that rather than run the brake lines only on the right side, and then cross one line under the center pushrods to the left of the plane, I'd use the bottom hole on each side, keeping the left hose on the left and the right on the right. This allows you to drill the holes out to .5" and preserve 2 other holes as .375" as before. I may end up having to route my static or pitot lines on the upper hole on either side if that's what is coming, but I'm kind of guessing that nothing will run though those holes anyway. Certainly nothing major and non-changeable like flight controls.



Some of the pictures above show the holes in question. Above are also photos of the flex lines, and one of the prototype lines from valve to fuel filter. Steve made that line fit perfectly the first time...I was very impressed.

You'll notice that when I enlarged the holes for the brake lines, I was able to do it with a hex shaft unibit and hex drill extension. This allowed me to drill a 1/2" hole and then pass the bit through the spar to the gap between front and rear half of the spar, and continue drilling. I used a right angle drill to enlarge the holes out to the side walls through the seat ribs.



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As I got the final fit brake and fuel hoses, I took some good pictures of them. Above are the hoses to the firewall. A 90 degree fitting was used on one of the hoses to give a nicer route with it's straight hose-mate down to the rudder pedals. The 2nd photo shows the final valve to fuel pump hose that also fit perfectly. The 3rd photo shows the flex line to the firewall. And the other photos above and below show the brake lines and routing. it's a nice clean package. The -3 sized brake lines are only about .275" or so, so not much larger than the .25" plastic.



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Above are lots more pictures of the brake and fuel lines. The above line is the fuel valve to side wall line that was bent in 5052-O by Aircraft Specialty. It also fit perfectly the first time and fit

right in the Van's provided plastic fuel line standoffs.

The photos 2 rows below show the brake hose package again. One thing to make note of...I drilled a 2nd hole though the center rudder pedal brace, to fit a second SB750 snap bushing for the brake lines. Those snap bushings have to get slit, as do the SB500-6 bushings that you have to use in the .5" holes to the aft portion of the plane. (Mine is a nose wheel plane) So altogether it requires the hoses, -3 elbows and a -3 Tee fitting, and some new snap bushings for routing the hoses. It is well worth the effort. It took me only about 5-10 minutes to enlarge all of the required holes and I had the whole brake line package installed within about 45 minutes.



On behalf of Aircraft Specialty and TS Flightlines. Thank you for purchasing our package. We appreciate you allowing us to earn your business, and we look forward to continuing to develop and innovate new products and working with you in the future.