



**RAUCH & SPIEGEL**

# **TECHNICAL INFORMATION**

**0709.3**

## **REPLACEMENT SYNCHRONIZER HUBS**

### **APPLICATION AND INSTALLATION NOTES**

**DESCRIPTION** Rauch & Spiegel Replacement Synchronizer Hubs (also known as “Dog Rings”, “Synchro Hubs”, “Gear Teeth”, etc.) are a family of parts with unique properties which differentiate them from the original equipment in several ways. This document is intended to aid the Installer in understanding these unique differences and how they affect the application and installation parameters.

**ADVANTAGES**

- \* Designed from the ground up to be replacement parts.
- \* Extend the useful service life of gearsets.
- \* Less likelihood of catastrophic engagement tooth failure.
- \* Less likelihood of dimensional distortion to free-gear hub bore.
- \* R&S synchro hubs have the full complement of internal spline teeth.
- \* Proper tooth geometry for better ring, brake and energizer operation.

## INSTALLATION NOTES and TIPS

**SAFETY FIRST.** These operations involve the pressing of hardened components which may shatter unexpectedly under the considerable forces applied. ALWAYS wear appropriate personal protective safety equipment, especially safety glasses, while performing the following operations. ALWAYS keep bystanders a safe distance away from any of these operations. ALWAYS know and follow the manufacturer's safe operating procedures for the equipment and tools that you will be using. ALWAYS keep your tools and equipment in a well-maintained and safe operating condition.

### INSPECT THE GEARSET

Carefully inspect the gearset for any signs of excessive wear or damage. Inspect the free-gear bearing bore for any signs of impending needle bearing failure (thin dark axial lines on the bearing bore surface).

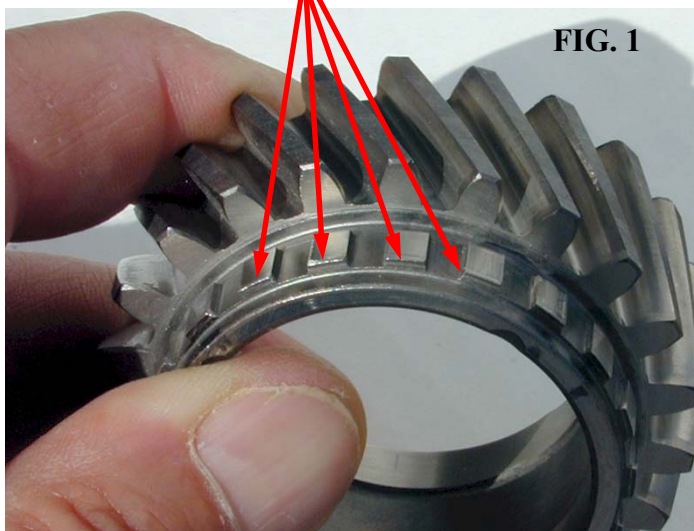
### REMOVAL OF OLD SYNCHRO HUB

1) Use only a tool designed especially for the purpose of press removal of the synchro hub following the manufacturer's directions. It is EXTREMELY IMPORTANT to make certain that your press set-up is "square" (That is to say that the vector of force created by the press ram is exactly perpendicular to the free-gear face in 2 distinct vertical planes 90° apart radially)

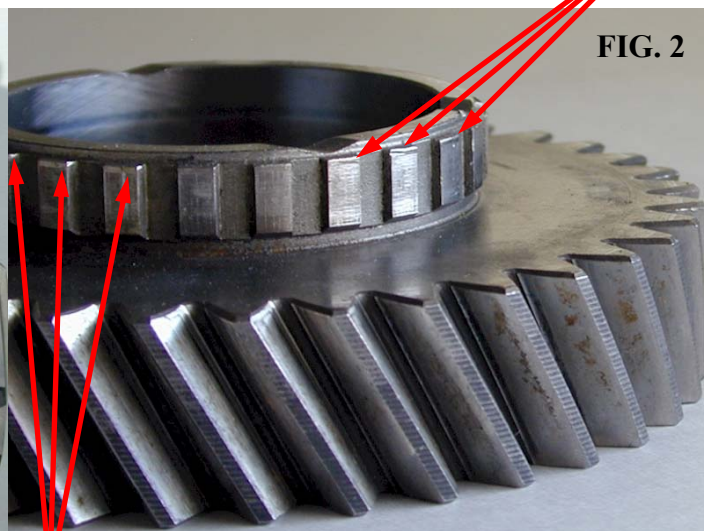
### PREPARATION OF THE FREE-GEAR HUB

In addition to the press-fit of the synchro hub splines onto the free-gear hub splines, most of these assemblies were post-press swaged together during their manufacture. When the original synchro hub is removed (pulled off) of the free-gear hub, the action of forcing the harder synchro hub splines through the swages extrudes the softer free-gear hub spline material towards the outside end of the hub. **This extrusion creates sharp edges at the outer ends of the free-gear hub splines that will interfere with installation of a new synchro hub. If not removed, these burrs and sharp edges can also damage the new synchro hub during the installation process (see FIG. 1).**

Sharp edges, chips and extruded material on Free-gear hub splines-



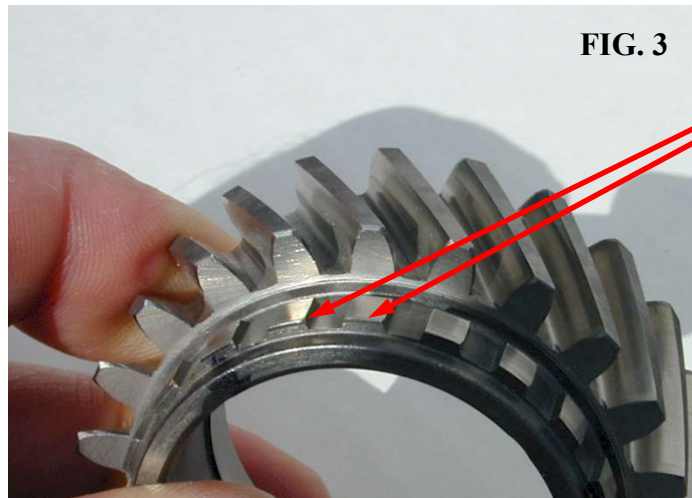
"Bump" material and sharp edges not removed



"Bump" material and sharp edges removed with file.

1) With the old synchro hub removed, use a small fine toothed finishing file or a small diamond-plated file to carefully remove any sharp edges from the free-gear hub spline ends. This includes the ends of the flanks of the splines as well as the splines' major diameter arc ends. Either a chamfer of .1—.2 mm (.004" - .008") x 45° or a similarly small radius should do just fine (see **FIG. 3**). Removal of any "bump" material (see **FIG. 2**) behind the area that you are chamfering is optional unless it is excessive, but if you decide to remove it, don't alter the original shape or size of the splines in any way.

Ready for synchro hub installation, these spline ends have been de-burred, "de-bumped" and cleaned.



### **INSTALLATION OF THE NEW SYNCHRO HUB**

1) "Clock" the new synchro hub onto the de-burred end of the free-gear hub splines with light hand pressure to find the best natural rotational alignment between the two parts. If, at some point in the clocking process, you don't feel the synchro hub splines "lock" into the free-gear hub splines, re-check for any incomplete de-burring of the free-gear hub splines. (Most clocking failures can be traced back to sharp edges or burrs on the free-gear hub). Remember that the major diameter of the free-gear hub splines is slightly larger than the major diameter of the synchro hub splines. In the next operation you will be essentially "stretching" the new synchro hub over the free-gear hub (which will also "shrink" slightly).

2) Transfer the clocked assembly to your "squared" press set-up and carefully press the synchro hub **straight** onto the free-gear hub until it just fully seats. **IT IS EXTREMELY IMPORTANT** to always make sure, at every step along the way, that the synchro hub does not get "cocked" on the free gear hub. That is to say that from start to finish of the press operation that the flat backside of the synchro hub always remains co-planer with the face of the free-gear. (see **FIG. 4**) At no time should the press force exceed 6,000 pounds. Please Note that this is the force actually exerted by the press ram, NOT the hydraulic line pressure (unless your hydraulic ram piston has an area of exactly 1 square inch). Exceeding the force limit can damage the snap-ring groove. So if your press gauge reads in pounds per square inch (P.S.I.) line pressure, you will need to calculate the limiting line pressure at 6,000 pounds of force based upon the area of your particular press ram's piston area.

It is also strongly suggested that aluminum press blocks, both under the free-gear and on top of the synchro hub, be used to avoid damaging these parts during the pressing-on operation.

**NEVER, EVER attempt to install a synchro hub by beating it on with a hammer or anything else!**

**NEVER** heat a synchro hub directly on a hot plate or other device with high localized temps. because of the danger of ruining the heat-treatment or warping or “potato-chipping”. Instead, if you feel you must heat it, do so in an oil bath so that you can control the temperature evenly.

In **FIG. 4** below, this synchro hub is co-planar with free-gear face. Note that space between the two parts should be kept equal all the way around as they are being pressed together.



3) Carefully inspect for and remove any swarf that may appear at the splined interface between the synchro hub and the free-gear hub. Sometimes, no matter how carefully de-burred the free-gear hub, a small amount of metal may be ejected from the spline interface during the pressing-on operation. This is normal and the resulting “swarf” or small metal chips are easily removed with a pick or the point of a file and compressed air. It is important to completely remove them however, so that they can’t circulate through other transmission components during operation. (see **Fig. 5** )

Small metal chips ejected at the spline interface that need to be removed

