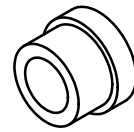
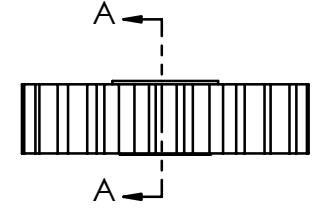
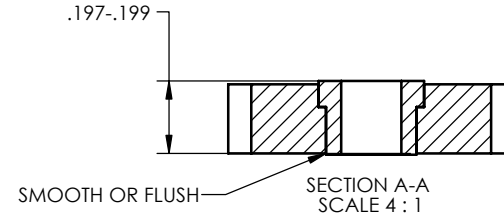
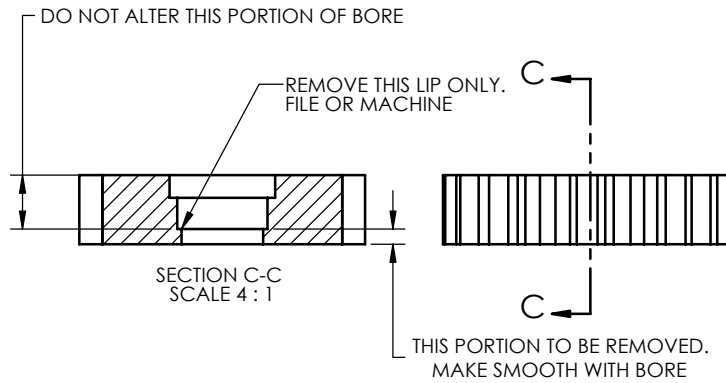
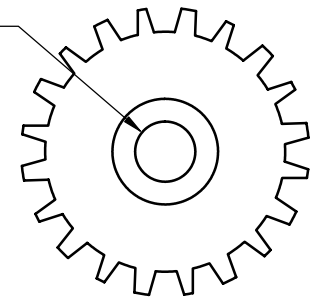


THIS REWORK IS NOT DIFFICULT. HOWEVER, IF UNSURE OF YOUR ABILITY, CONSULT A LOCAL MACHINIST OR MECHANIC WHO CAN ASSIST.



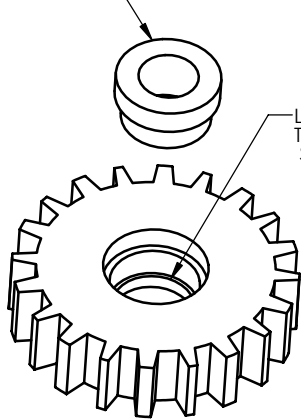
NEW BUSHING:
BRONZE

THIS BORE MUST SLIDE SMOOTHLY ON 4MM SHAFT



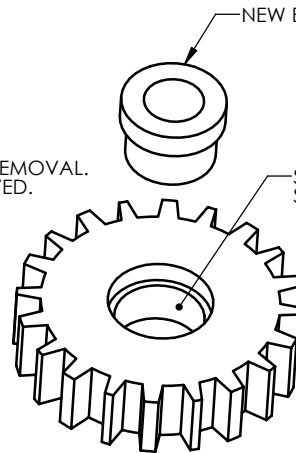
FINISHED BUSHING

ORIGINAL BUSHING



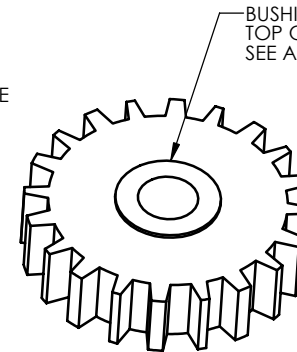
ORIGINAL TAMIYA GEAR:
POORLY SUPPORTED ON NARROW BUSHING

LIP THAT REQUIRES REMOVAL.
THIS IS TO BE REMOVED.
SEE ABOVE.



UPGRADE:
A WIDER BUSHING THAT SUPPORTS FULL LOAD OF GEAR, PREVENTING
TORQUING OF GEAR AND PREMATURE WEAR OF TEETH

SMOOTH BORE
SEE CUT-AWAY ABOVE



BUSHING PRESSED IN ALL THE WAY
TOP OF BUSHING SITS ABOVE GEAR.
SEE ABOVE SECTION A-A "FINISHED BUSHING"

ALWAYS WASH YOUR HANDS AFTER HANDLING BRASS AND METAL SHAVINGS.

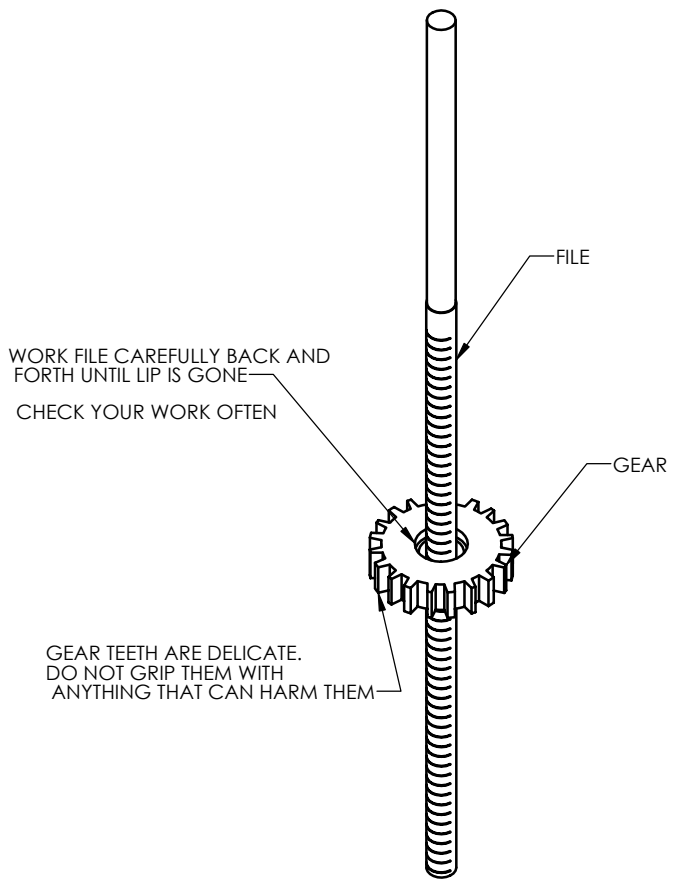
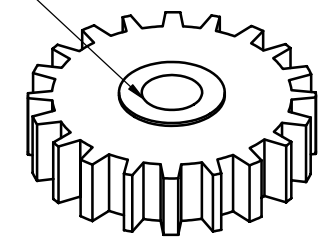
PROPER EYE, BREATHING, AND HAND PROTECTION IS REQUIRED WHEN USING TOOLS, POWER EQUIPMENT, AND CUTTERS. DO NOT BREATHE DUST PARTICLES.

KEEP ALL HOBBY PRODUCTS AWAY FROM SMALL CHILDREN AND PETS.

		DESCRIPTION BUSHING REWORK TAMIYA GEARBOXES	
		MATERIAL	
		FINISH	
DRAWING NO.		EDTN.	PART NUMBER
DRAWN BY		DATE	SIZE C
EDTN	DESCRIPTION	APPR.	DATE

4MM SHAFT MUST ROTATE SMOOTH IN BORE OF BUSHING BEFORE YOU REASSEMBLE GEARBOX

THIS REWORK IS NOT DIFFICULT. HOWEVER, IF UNSURE OF YOUR ABILITY, CONSULT A LOCAL MACHINIST OR MECHANIC WHO CAN ASSIST.



REMOVING LIP WITH FILE

ALWAYS WASH YOUR HANDS AFTER HANDLING BRASS AND METAL SHAVINGS.
PROPER EYE, BREATHING, AND HAND PROTECTION IS REQUIRED WHEN USING TOOLS, POWER EQUIPMENT, AND CUTTERS.
DO NOT BREATHE DUST PARTICLES.
KEEP ALL HOBBY PRODUCTS AWAY FROM SMALL CHILDREN AND PETS.

RECOMMENDED TOOLS:

1. SAFETY EQUIPMENT: EYE PROTECTION ESPECIALLY
2. NEEDLE NOSE PLIERS
3. TWEEZERS
4. SMALL METAL OR WOOD OR PLASTIC ROD, ABOUT 1/8 INCH DIAMETER, AND ABOUT 3 INCHES LONG. THIS IS TO ACT AS A ALIGNMENT GUIDE WHEN YOU REMOVE THE GEAR SHAFT. IT CAN BE A TOOTHPICK, BOBBY PIN, AN OLD GEAR SHAFT, DOWEL, OR SCRAP METAL ROD, COAT HANGAR WIRE, ETC.
5. SCREWDRIVERS (WHATEVER YOU NORMALLY USE FOR TANK MAINTENANCE) I USE A VERY SMALL FLAT HEAD SCREWDRIVER TO REMOVE E-CLIPS. I USE MY FINGER TO RETAIN THE E-CLIP. YOU CAN USE A SMALL CLEAN RAG TO TRAP IT. THEY TEND TO FLY FAR WHEN THEY ARE RELEASED FROM THEIR SHAFT.
6. SMALL ROUND FILE. 1/8 INCH TO 5/32.
7. OLD TOOTHBRUSH TO CLEAN METAL SHAVINGS OFF PARTS. WORKS WELL FOR GEARS.
8. PLASTIC SAFE OIL (DO NOT USE AUTOMOTIVE GRADE LUBRICANTS, THESE CAN ATTACH PLASTIC PARTS ON THE TANKS). THE LUBRICANT YOU USE SHOULD BE SAFE FOR PLASTICS.
9. SMALL BIT OF SANDPAPER OR EMORY CLOTH OR FINE STEEL WOOL FOR POLISHING 4MM SHAFT AND BUSHING. FILE CAN BE USED ALSO WITH CARE.
10. THESE INSTRUCTIONS. PLEASE UNDERSTAND THE WORK INVOLVED. IT IS NOT HARD BUT I HOPE TO GUIDE YOU THROUGH SOMETHING THAT NORMALLY REQUIRES A LATHE AND A MACHINIST TO ACCOMPLISH
11. THE END RESULT IS AN UPGRADE THAT VASTLY IMPROVES A SERIOUS ENGINEERING FLAW IN THE DESIGN OF THE TAMIYA GEARBOXES.

TANK TIP:

DO NOT PANIC IF YOU ENLARGE THE GEAR BORE TOO MUCH AND THE BUSHING DROPS IN AND SPINS . USE GLUE TO HOLD BUSHINGS IN PLACE. CYANOACRYLATE (CA) WORKS WELL. THIS IS A GENERAL RULE FOR ANY BUSHING THAT MUST ROTATE ON A SHAFT YET IT STILL SPINS IN IT'S OWN BORE.

PROCEDURE- READ ONCE BEFORE ATTEMPTING WORK

1. WORK IN A CLEAN SPACE. WEAR EYE PROTECTION TO PROTECT YOURSELF FROM FLYING DEBRIS. REMOVE THE BRASS OUTDRIVE GEAR. DO THIS BY REMOVING "E" CLIP ON OUTSIDE OF GEARBOX, AND PUSH OUT THE 4MM SHAFT.
DO THIS IN AN AREA WHERE THE E-CLIP CAN NOT GET LOST.
2. CAREFULLY EXTRACT THE GEAR. YOU CAN KEEP THE OTHER PARTS (CLUSTER GEAR, SPACERS) ALIGNED BY USING A PIECE OF WIRE OR ROD ACTING AS A "DUMMY" SHAFT. THE FINAL DRIVE GEAR CAN THEN BE ROTATED OUT THROUGH THE BOTTOM OF THE GEARBOX OPENING. KEEP YOUR ROD IN PLACE.
3. ONCE REMOVED, EXAMINE THE GEAR.
IF THE GEAR IS WORN EXCESSIVELY, I DO NOT RECOMMEND REBUILDING THE GEARBOX. START WITH A FRESH, NEW GEARBOX OR ONE THAT HAS MINIMUM WEAR ON THE GEAR.
4. FOLLOW INSTUCTIONS ON PAGE ONE TO REMOVE THE LIP FROM INSIDE THE GEAR. TRY NOT TO DAMAGE THE WIDER AREA OF THE BORE. ONLY THE LIP NEEDS TO BE REMOVED.
5. CLEAN THE BORE OF THE GEAR OF ALL TRACES OF BRASS DUST.
6. PRESS ON OR TAP THE NEW BUSHING IN WITH A HAMMER. YOU CAN ALSO USE A VISE, OR USE AN ARBOR PRESS. USE SCRAP PLASTIC OR WOOD TO HELP PROTECT THE BUSHING AND THE GEAR FROM IMPACT OR VISE JAW MARKS REGARDLESS OF HOW YOU PRESS THE BUSHING IN.

7. THE BUSHING SHOULD PRESS IN ALL THE WAY TO THE WIDE SHOULDER OF THE BUSHING. THE NARROW END OF THE BUSHING SHOULD BE FLUSH OR SLIGHTLY BEYOND THE OUTSIDE OF THE GEAR. IT CAN ALSO BE SLIGHTLY INSIDE THE GEAR BUT IT MAY NOT BE SEATED ALL THE WAY IF THAT IS THE CASE.
8. TEST FIT THE 4MM SHAFT INTO THE BUSHING. IF THE SHAFT WILL NOT SLIDE SMOOTHLY, USE A SMALL FILE OR SMALL PIECE OF EMORY PAPER TO POLISH THE BORE UNTIL IT SLIDES ON. THIS WON'T TAKE MUCH. BE SURE TO CHAMFER (ANGLE OR BEVEL) THE BUSHING EDGES TO ENSURE NO SHARP EDGES.
9. IF THE BUSHING IS TOO TIGHT ON THE SHAFT, DO NOT FIT IT UNTIL THE SHAFT RUNS SMOOTH IN THE BUSHING.
10. ONCE THE BUSHING/GEAR ROTATES SMOOTH ON THE SHAFT, REINSTALL IT INTO THE GEARBOX. THE WIDE PART OF THE BUSHING FACES THE ALUMINUM SIDE OF THE GEARBOX. ROTATING IT THROUGH THE BOTTOM OPENING AS YOU REMOVED IT IS THE BEST WAY. IT MUST BE ROTATED AS YOU SLIDE IT PAST THE EDGE OF THE GEARBOX.
11. WITH NEEDLE NOSE PLIERS OR TWEEZERS, ALIGN THE GEARS AND SPACERS AS YOU PASS THE 4MM SHAFT BACK THROUGH THEM ALL. IF YOU USED A ROD OR STIFF WIRE THIS WILL BE EASY TO DO. ALIGN THE SPACERS AND PUSH THE 4MM SHAFT BACK THROUGH THE GEARS AND THE SPACERS, THEN FINALLY INTO YOUR NEW BUSHING AND GEAR. REATTACH E-CLIP.
A DROP OF PLASTIC-SAFE OIL IS RECOMMENDED ON THE NEW BUSHING.
12. THE GEAR AND BUSHING SHOULD FIT EXACTLY WHERE IT CAME FROM. THE WIDTH OF THE GEAR AND BUSHING MUST NOT EXCEED .199 INCHES.
13. DOUBLE CHECK ALL OF YOUR WORK, CLEAN UP ANY METAL DUST, AND REINSTALL GEARBOXES INTO MODEL.

TANK TIP:

PERIODIC CLEANING AND LUBRICATION OF THE TAMIYA TANK GEARBOXES IS VITAL TO THEIR LONG LIFE. GRIT MUST BE REMOVED AND ALL OLD LUBRICANT MUST BE CLEANED WHEN DOING MAINTANENCE.

ALSO, ADD A DROP OF OIL TO THE ELECTRIC MOTOR BUSHINGS. THEY BENEFIT HIGHLY FROM A DROP OF OIL ONCE IN A WHILE. YOU WILL NOTICE AN INCREASE IN RUN TIME FROM ONE BATTERY, AS WELL AS BETTER SPEED AND TORQUE WHEN YOU NEED IT.