

## PROVIDING SOME MISSING LINKS FOR YOUR QUEST TO BETTER MODELING

NWSL manufactures, imports and markets products that make model building and crafts more fun in many scales and railroad gauges. NWSL tools and other products are prized by custom builders, custom kit manufacturers, as well as manufacturers of medical instruments, security devices, computer peripherals, etc. where economy, quality and functionality are highly valued. Below is a quick reference general guide to what product types are offered and their general applicability. Most products are listed and/or described in the following catalog pages, however, a few limited availability items can be found only by calling direct. Many NWSL products can be custom assembled to your special gauge or other requirement - inquire with full requirement detail for appropriate custom charges.

Railroad Modeling																Minia- tures	Doll house	R/C etc.
Product	all	Z	N	TT	HO	HOn3	HOn30	OO	S	Sn3	O	On3	On2	#1	Std			
Interurban body kits					—													
Drive units																		
Gearboxes																		
Gears																		
Metric Hdwr																		
Motors																		
Tools																		
Universals																		
Wheelsets																		

### General SCALE/CRAFT Product Applicability

*C=custom manufacture to order.*

All prices shown are subject to change without notice. NWSL continually evaluates products for improvement in function, value and economy for the modeler and therefore reserves the right to revise specifications or availability of any product at any time without notice or liability. All products are believed useful and safe but user assumes all liability for application and suitability for use of any product for any specific use. NWSL, having no control over application and use of any product, assumes no liability beyond repair or replacement, at NWSL's option, of NWSL product defective in manufacture.

You can purchase NWSL products at your regular local or convenient hobby dealer. If you are unable to conveniently obtain NWSL products from your regular hobby sources, NWSL will accept orders directly via mail, telephone (406-375-7555), FAX (406-375-7559), email: sales@osorail.com, or online at www.nwsl.com. NWSL does NOT operate a showroom or retail store. An order form is included with this catalog for your convenience in remembering needed items, but is not required to place an order. To place an order with your dealer or NWSL just provide the information sufficient such that your dealer or NWSL can accurately identify what item(s) you desire, where to ship the order and enclose remittance or bankcard charge information.

### HOBBY DEALERS

There ARE good hobby shops. Many hobby shops are the locally owned labor of love of a frustrated hobbyist trying to provide better product availability than they previously experienced. But it is a foreboding task because of the vast choices and specialties. As a result, your local hobby dealer must depend on your feedback and purchases to both know what to stock and to have the income to be able to provide you these neat specialty products that enhance your hobby and skill.

### WHEN ORDERING DIRECT

We accept Visa, MasterCard, Discover and American Express, Paypal and Check and Money Order. Most orders are shipped via US Postal Service First Class Mail or Priority Mail, both of which offer tracking information. International orders are shipped US Postal Service Int'l First Class Mail (under 4 pounds) or Int'l Priority Mail (over 4 pounds). UPS shipping is available upon request. We do not ship via Fed Ex.

All orders are fulfilled at current list price at time of order receipt. Orders are fulfilled as accurately as we can interpret your information. If we cannot identify ordered items or if there are apparent discrepancies or misunderstanding of product, we will fulfill your order to the best of our understanding or query you for clarification. Our objective is to supply you with quality product that achieves your hobby or professional enjoyment. If your order is not as you understand or desire, return for exchange as appropriate within 30 days (local hobby dealer policy may be different, check with them). Returns after 30 days will incur a 20% restocking fee. Damaged, used or otherwise unsellable returns cannot be accepted. Please call before returning products.

## THE NORTHWEST SHORT LINE CATALOG

Our first priority has always been the making available of products that make modeling and model building more enjoyable and productive. In concentrating our efforts in that direction, printed matter and catalog projects have been often delayed beyond our expectations. In some instances, just the rapid improvement and development of products, often with the kind assistance and cooperation of other modelers, has rendered completed catalog pages obsolete before they could be released. So, with these things in mind, we have assembled this catalog not as a beautiful piece of art but to provide you a glimpse, or more, of our current useful products along with comments to assist you in understanding options, procedures and techniques involved in model and mechanism building, all to aid your enjoyment of your skills. Some older and no longer manufactured products are still found here, but the purpose is to provide you with information for a product you may still have or come across in a hobby shop (we not infrequently get an inquiry regarding a product that the modeler just bought “new” at the hobby shop—a product that has been sold out for 5, 10, 20 or more years! But is still useful and desired by the modeler). Keep in mind that NWSL is a live group of people continually improving current products where necessary and adding new products that are derived from our own modeling requirements as well as suggestions and requests of model builders such as you. This cooperation helps us to keep costs and prices low so we all can enjoy modeling more economically.

There is a diversity and breadth of products manufactured, imported and marketed by NWSL. The products are generally indexed by product categories. This provides a quick reference access when searching for a category of product but you'll still probably have to browse through additional pages in that area to fully explore useful products.

Some products may continue to be shown in this catalog when they are no longer available because such limited production items are often still available at some hobby shops. This is especially true of limited production brass models, both imported and those manufactured in the USA by NWSL. Though they are no longer manufactured, they are occasionally found at hobby shops, magazine listings and internet auctions.

While most NWSL products are anticipated to be manufactured indefinitely, some of our products such as custom manufactured gears, special wheelsets, model upgrade kits, etc. are of very limited production that matches the very limited number of serious modelers who understand and demand quality components and operation of their models, whether scratch built, kit-bashed, or mass production model.

NWSL products are available at many quality hobby shops throughout the world. If your local or convenient hobby dealer does not stock the items you require, he may obtain them for you on special order upon your request (and in many instances he will then stock the product(s) for your future needs). However, if you are unable to conveniently obtain the desired products, NWSL will be pleased to accept your direct order. There is an order form with this catalog that may be used for ordering from your hobby dealer or direct from NWSL, however no form is necessary to place an order - just provide the necessary information so we can accurately identify what you want and where to send it.

Prices, where shown in this catalog, as well as magazine advertising, must be considered a value guide and not necessarily the current price at the time you decide to purchase. This is a regrettable circumstance of changing economic conditions. As always, NWSL does endeavor to keep prices as low as possible commensurate with our high quality standards. In some instances we have discontinued marketing products because component or manufacturing costs made the required sales price too high to provide good value. Orders are processed at the price in effect at the time of receipt of the order. If that price or the product are not satisfactory, you may return the product, within 10 days, for full refund of the amount paid NWSL (your local or convenient dealer may have different sales policies, check with them - products purchased from them cannot be refunded or credited direct by NWSL).

Best wishes for more enjoyment from your hobby. If we can help, we're pleased. And once again, a very big thank you to all modelers and enthusiasts who have helped us make better products available for your enjoyment for more than 50 years. Without their help, many of our fine models and 'creative latitude' modeling products would have been much more expensive and/or never would have become available.

*NorthWest Short Line*

# BITS OF KNOWLEDGE FOR SHARING

*Compliments of modeler letters and the NWSL staff*

**ECCENTRICITY** A wheel, gear or other part with its center hole not accurately centered will run eccentric. In the case of an eccentric wheel, the axle, and therefore the model, will rise and fall as the wheel turns. In the case of a gear, the gear mesh will be uneven, usually resulting in binding at one point causing the mechanism to slow and/or stop at one point in the gear revolution. Drilling or boring a hole on true center is not easy. Enlarging a wheel or gear bore by re-drilling to a larger desired size often results in eccentricity. See also 'wobble'. Eccentricity of wheels that are not sprung or equalized can cause loss of electrical pickup (contact) as well as traction and/or derailment, particularly on curves and switches.

**INTERFERENCE FIT** See 'Press-fit'

**NOISE** Markedly different noise levels between forward and reverse locomotive operation can almost always be traced to end thrust problems. Either there is excessive endplay in one or more shafts or thrust surfaces are poorly made or damaged (a 'thrust surface' is a bearing surface and therefore should be of bearing quality). Motors which are noisier in one direct than the other can usually be corrected by adding thrust washers to the armature shaft until a minimum of end play is achieved. Gearboxes which are noisier in one direction usually have worm problems of some sort caused by rough end surfaces, excessive end play or poorly made bearing surfaces. Remove the worm and bearings and inspect for damage to the end surfaces including burrs in the area near the intersection of the worm and shaft or near the bearing bore. Frequently, a clean-up of these surfaces along with the addition of thrust/shim washer(s) will solve the problem. In severe cases, the worm or bearings may need to be trued on a lathe or replaced. The same problem and solution is less frequently observed in the worm gear.

**KNURL** A process used to increase the effective diameter of a shaft to obtain a tighter fit to a gear, wheel, etc. bore. Usually accomplished on a machine, sometimes can be successfully accomplished by rolling the shaft between the edges of two flat files while applying pressure. Knurling can be eccentric to the shaft, particularly if applied by the file method. Sometimes referred to as 'upsetting'. This is an easy and inexpensive alternate to precision interference fit. (see also 'Press-fit').

**PRESS-FIT** Also referred to as 'Interference fit.' This type fit is usually used to assemble gears or wheels to axles or shafts and is generally intended to be secure without solder or other bonding material. This can be a highly accurate assembly method, avoiding the eccentricity and/or wobble sometimes induced by other methods such as knurling, soldering, etc. This fit is accomplished by making the dimensions 'overlap' approximately .0005-.0010" (ie. a gear to be press-fit on a shaft with true 0.1250" diameter should be bored and reamed to a 0.1240-0.1245" hole). This type fit calls for very precise tolerances and generally the two parts must be made specifically for each other. For instance, a mill run 1/8" (supposedly 0.1250") rod cannot be expected to press-fit to an item listed as 1/8" press-fit bore, although it MAY do so. Because of the high cost of assuring the tolerance required for proper press-fit, many items are instead knurled and pressed. A disadvantage of this method, as noted above, is the possibility of introducing eccentricity (measured as TIR).

**REAMER, REAM** The common twist drill is not able to provide the highly accurate dimensional hole required for press-fit and other precision jobs. In our experience, twist drills commonly drill a hole larger than their specified size. A reamer is used to ream a drilled hole to a precision finished size such as required for press-fits, shaft bearings, etc. Before using the reamer, the hole must be drilled, using a twist drill, etc., to a size slightly smaller than the desired finished (reamed) size. The less the material the reamer must remove, the longer the reamer will be able to provide you with accurate bores.

**TIR (also T.I.R.)** Total Indicated Runout is a measure of eccentricity. The lower the number, the more perfect (concentric) the assembly (ie: excessive TIR in a drill press (drilling machine) can cause holes to be drilled in incorrect locations, to be drilled oversize, and/or will cause excessive drill wear and breakage). In a mechanism, excessive TIR can cause gear noise, excess gear wear, uneven operating speed, binding and lurching, etc. In a model car or locomotive, it will cause the vehicle to rise and fall as the model progresses down the track. in the case of a locomotive driver, this phenomena can cause the driver to loose contact with the rail and thus lose tractive effort.

**UPSET** This is more than your mood when a project doesn't work properly, but it may save the project. It is a process to increase the effective diameter of a shaft (see also 'Knurl'). A simple method of upsetting a shaft is to apply center punch or wire cutter pressure in the desired area adequate to indent the shaft slightly thereby upsetting (expanding) some shaft material. This method, while often successful, can sometimes cause eccentricity. It should be used only as a last resort and where the amount of upsetting required is minimal to achieve a desired or useful fit of the parts.

**WOBBLE** A wheel, gear, or any other part not assembled (whether press-fit or otherwise) squarely on the shaft or axle will wobble. This can cause derailments or short circuits (if the wheel is the insulated side and the tire can touch a grounded part of the model such as a brake hanger) or allow a gear to mis-engage or bind against a gearbox wall (see also 'Eccentricity'). Besides, it looks like heck! Often wobble and eccentricity both occurs at the same time, and they can also be confused as 'each other.' See the *Aligner* tools for checking and elimination of wobble.

# PRESS-FIT OF PARTS FOR PRECISION OPERATION

## The Professional Choice

Press fitting of precision machine components provides the highest reliability for achieving concentric, wobble-free, smooth running mechanical components. While bushings and other 'make-fit' components can help achieve a mechanical fit, every component has its own imprecision to a greater or lesser degree and the addition of these added imprecision's rapidly deteriorates the precision of the total assembly leading to eccentricity, wobble, vibrations, noise, shortened mechanical life, etc. Inaccurate assembly of press-fit components can also lead to these problems. Care must be taken to assure proper fit and proper alignment of the component being assembled. While the NWSL **The Puller** can be successfully used to assemble components, the lack of alignment control makes this a virtual 'last choice' method. Use of an arbor press such as **The Sensipress+**, which provides a sensitive feel of how the parts are fitting together as well as better alignment control, can provide greater reliability in achieving desired precision fits. The **Aligner** tools can also assist by checking the assembly for wobble and in many instances can be used to remove wobble in an assembly.

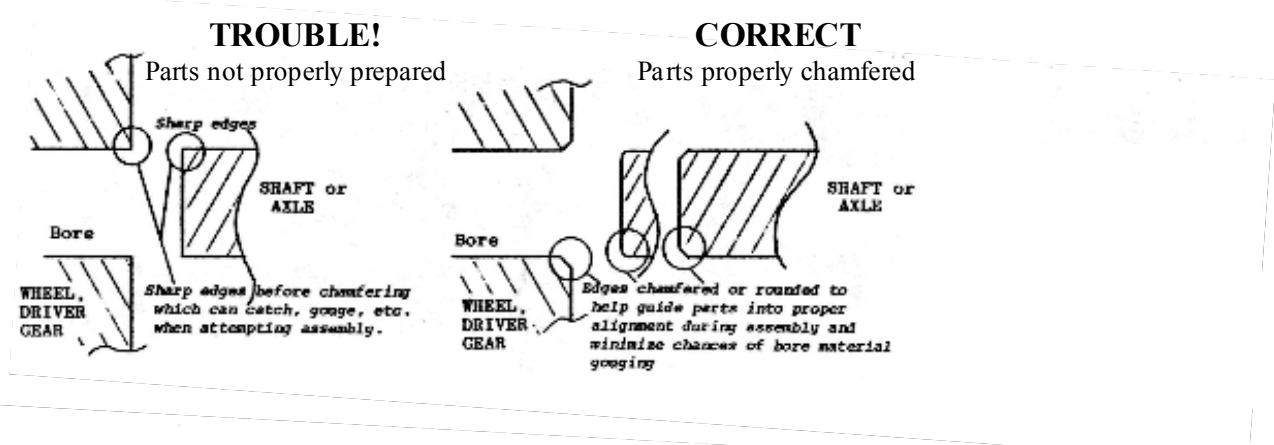
Pressure applied by:  
 1st choice—The SENSIPRESS+  
 2nd choice—The PULLER  
 checked by—The ALIGNER

*\*Caution: When using a rotating pressing force such as the economical Puller tools, make sure that the pressing point contact is made at the CENTER of the rotating force....if it is made off-center (illustrated above—see arrow), the pressed part (shaft) will be forced out of alignment as the screw turns.*

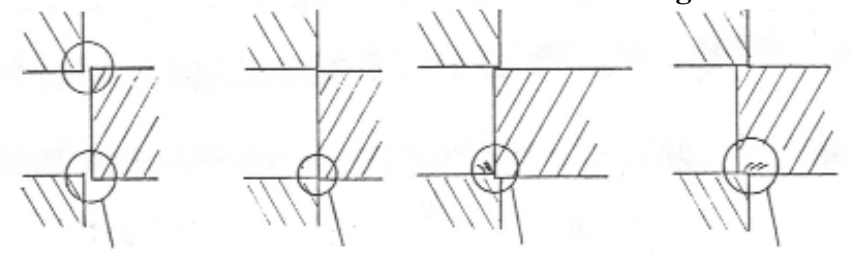
If this occurs, two things can happen:

- (1) Shaft enters gear or wheel at a skew and scores the bore causing gear or wheel wobble (because bore material is gouged away—see illustrations below—it may be impossible to achieve proper alignment again).
- (2) If part being pressed provides high resistance to side movement, such as occurs when attempting to press an axle out of a driver, the excess side pressure on the press-pin will bend and/or break the press-pin.

A solution—use the appropriate size **Professional Precision Press Tool** accessory set (#4539-4) for **The Puller** which enables this economical, simple tool to achieve better life and precision comparable to heavier tools such as the **Sensipress+**.



### ASSEMBLY OF PRECISION FITTING COMPONENTS -things that can happen



Parts unchamfered prior to press-fit (note overlap\* of parts dimensions needed to achieve this 'interference' fit).

Misalignment on assembly causes edge of shaft to strike bore edge.

As pressing is continued, the bad edge match gouges material from bore.

Alternately or in too tight a fit, material is scraped from shaft/axle.

In either above situation the 'lost' material means wobble and/or eccentricity in the finished assembly—which usually cannot be corrected by re-assembly because of 'lost' material.

\*sizes exaggerated for clarity.

#50-4 The SENSIPRESS+	#45-4 The PULLER	#55-4 The PULLER II
#4539-4 PULLER Professional Precision Press tool set		

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