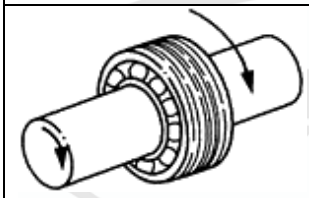
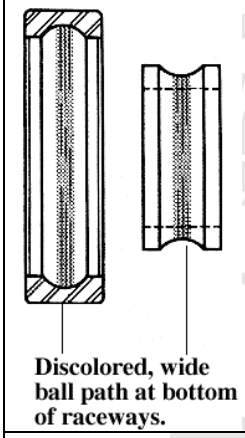
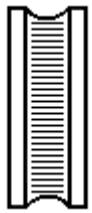
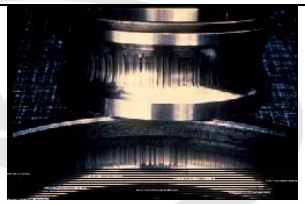
TECH TIPS

Bearing Failure Analysis

Have you ever looked at an alternator core or customer return with the bearings destroyed and questioned what the possible causes are? For years I had questioned how can I tell if it was the way the bearing was installed, the bearing or a vehicle related issue? Of course, when I would return bearings to a supplier I would get really vague feedback, typically something along the lines of "it was not the bearing." ***Emerson Bearing*** had put together a really excellent *Bearing Failure Analysis* presentation that was easy enough for me to follow. They were kind enough to allow me to pass on their information.

Sketch of Failure	Picture of Failure	Description	Cause
		**Loose fit**, causing inner or outer race to move, resulting in *fretting.* Fretting occurs when fine metal particles oxidize that result in a telltale brownish colour.	Shaft worn and undersized or housing bore worn and oversized
		**Preload failures** will appear as heavy, wide wear patterns in the bearing races.	Typically an oversized shaft or an undersized housing bore would cause this. The excessive interference fit generates a preload on the bearing and results in abnormal heat and wear on the race.
		**Electrical Fluting** will appear as lines perpendicular to the bearing race.	This will occur if current flows through the bearing instead of a proper ground route

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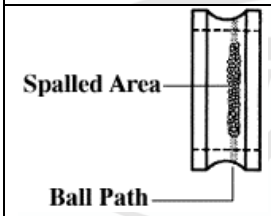
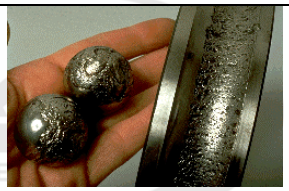
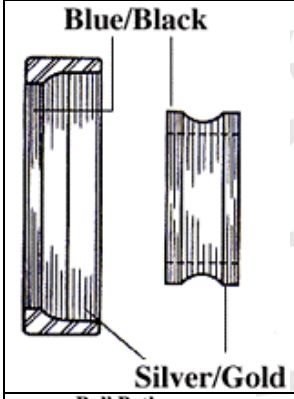
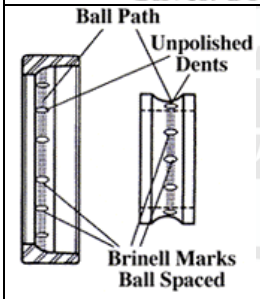
		**Excessive Load**	A failed automatic belt tensioner or incorrect tension applied (manual application) or another component in the belt drive system failing resulting in an overload condition.
		**Overheating**	Typically occurs when the wrong bearing is used in a high heat or high speed application
		**True brinneling** will appear as small indentations see also false brinneling	Brinneling occurs when the load exceeds the elastic limit of the ring material. Using a hammer to install a bearing, dropping a bearing or pressing on the wrong ring during assembly cause this type of damage.

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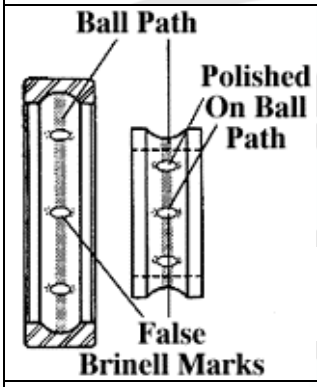
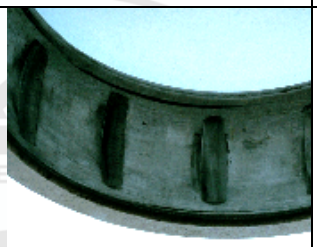
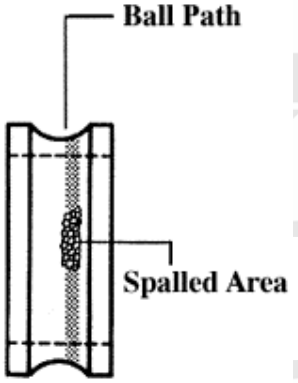
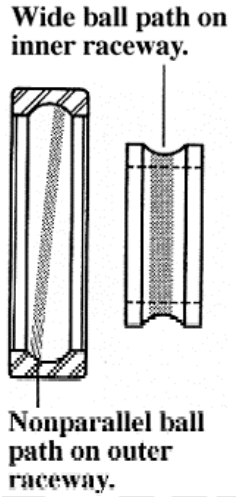
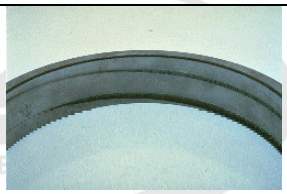
		**False brinneling** will appear as elliptical indentations but they will be wider and longer then true brinelling	This will most likely not appear in the auto-electric applications, this would occur when the shaft is rocking back and forth in the bearing when the shaft is not rotating.
	Not Available at this time	**Normal wear** is characterized by spalding, or the fracture of the running surface and the subsequent removal of small discrete particles of material. Spalding will show up on the races and/or balls.	Use over time
		**Misalignment** can be observed on the raceway of the non-rotating race. The wear pattern will not be consistent from the edge of the bearing.	Typical causes are bent shafts **or** spacers that are crooked with either steel shot under them or varnish (particularly on the alternator). In addition aftermarket spacers have been observed with too small of a mating surface to properly mate with the bearing surface.

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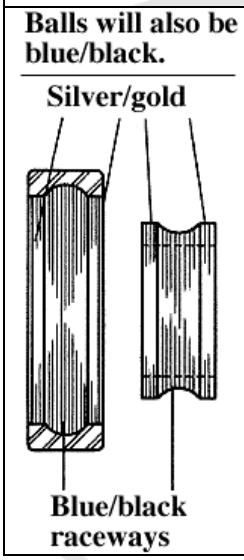	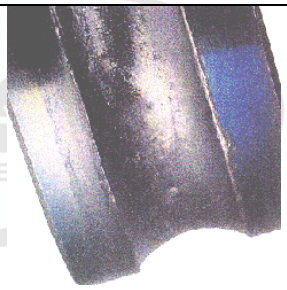	**Lubrication breakdown** will appear as discoloured balls and races.	Typically caused by the wrong bearing for the applications (excessive heat for the type of grease used).

Source, with permission*:* www.emersonbearing.com/technical.htm