SECTION II

PREVENTIVE MAINTENANCE

The success of an operator, safe operation and life of this equipment depend upon regular preventive maintenance. Prior to operating any mechanical equipment, a thorough inspection of all parts should be made. The following suggestions are offered to extend the useful life of your bus and provide for safe operation.

D A I L Y C H E C K

Check for tampering.

Check brake system for operation.

Check voltage output.

Check lighting system.

Check tools, equipment, and safety apparatus.

Check tires for proper inflation and possible damage.

Check all lines for leakage.

Check oil level and water.

Check all wheel and rim nuts.

1,000 and 2,000 MILE CHECK

Check lubrication as per lubrication guide.

Tighten all body tie-down bolts.

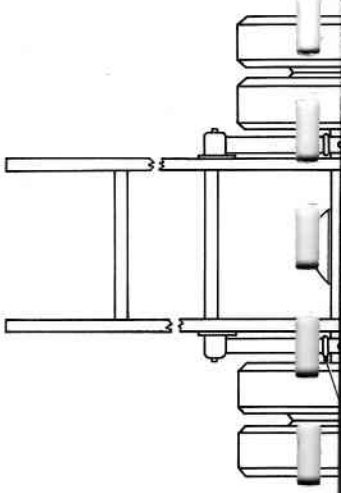
Tighten all body to cowl bolts.

Inspect tires for uneven wear.

Check travel on brakes and adjust if necessary.

Inspect all hose and tube lines.

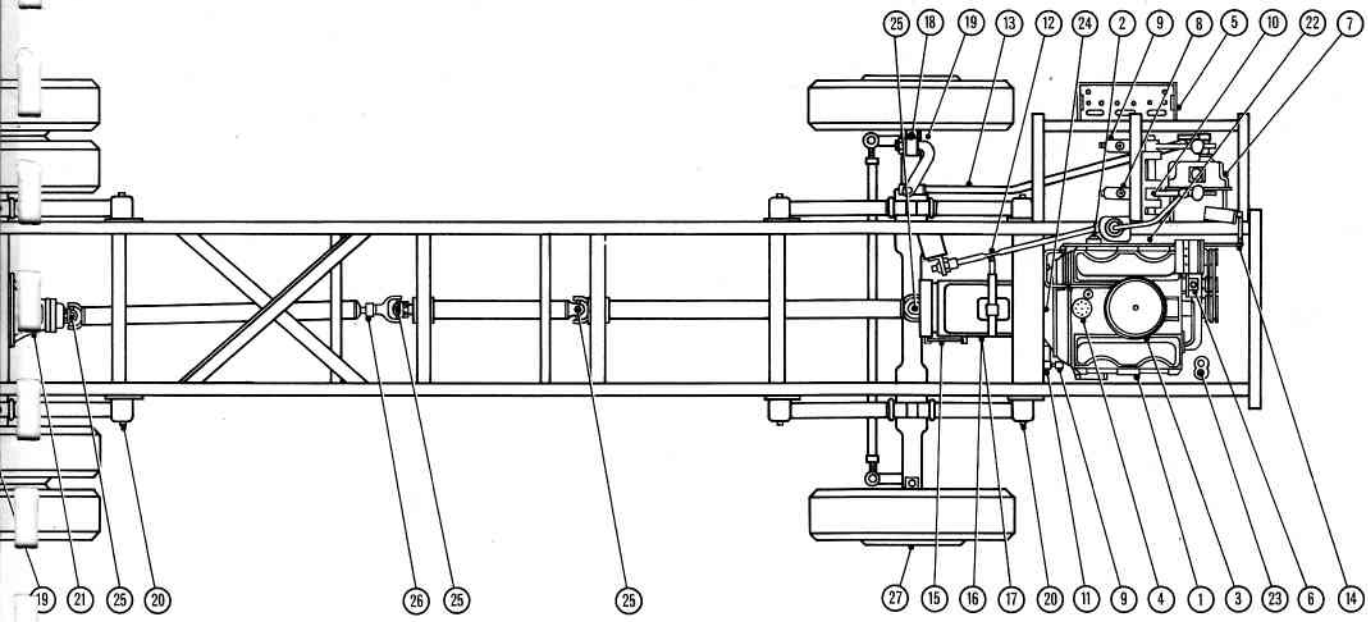
LUBRICATION GUIDE



FOR THE NEW BLUE BIRD CHASSIS

Service Period	Refer. No.	Chassis Part	General Instructions	Recommended Lubricant
Daily	1.	Engine	Check level	Havoline Motor Oil (Follow engine manufacturer's recommendations for SAE grade)
500 to 1,000 Miles	2.	Engine Oil Filter	.....	Follow engine manufacturer's recommendation
	3.	Oil Bath Air Cleaner	Clean and refill	Engine Oil (Follow engine manufacturer's recommendations for SAE grade)
	4.	Distributor	Lubricate breaker cam sparingly with petroleum jelly or other suitable lubricant. Fill oil cup with engine oil	Grease – Texaco Marfak All Purpose Oil – Engine Oil
	5.	Battery	Add distilled water to 3/8" above plates. Coat terminals with lubricant	.....
	6.	Hydraulic Power Steering Pump	Check level	Texaco Texamatic Fluid (Type A Suffix A)
	7.	Steering Gear	Keep oil to level of filler plug	Texaco Universal Gear Lubricant EP 9(
	8.	Brake Master Cylinder	Fill to 1/2" from top	Texaco Brake Fluid
	9.	Clutch Master Cylinder & Clutch Slave Cylinder	Fill to 1/2" from top. Adjust clutch periodically	Texaco Brake Fluid
	10.	Brake & Clutch Shaft	5 – Fittings	Texaco Marfak All Purpose
	11.	Clutch Release Fork Shaft (when applicable)	2 – Fittings. Lubricate sparingly	Texaco Marfak All Purpose
	12.	Remote Gearshift Controls	4 – Fittings	Texaco Marfak All Purpose
	13.	Steering Linkage: Manual Hydraulic Power Air Power	 4 – Fittings 6 – Fittings 5 – Fittings	Texaco Marfak All Purpose

The Texaco products recommended above are products manufactured by Texaco and are available in all principal countries of the world.



Service Period	Refer. No.	Chassis Part	General Instructions	Recommended Lubricant
500 to 1,000 Miles (Cont'd)	14.	Carburetor Linkage	.....	Engine Oil
	15.	Emergency Brake Linkage	.....	Engine Oil
	16.	Manual Transmission	Keep oil to level of filler plug. Drain and refill at 20,000 mile intervals	Texaco Universal Gear Lubricant EP 90
	17.	Automatic Transmission (Allison)	Check level while hot. Change fluid and filter after first 6,000 miles. Drain and refill at 24,000 mile intervals; 12,000 if in severe service	Texaco Texamatic Fluid (Type A Suffix A)
	18.	Knuckle Pins	4 – Fittings	Texaco Marfak All Purpose
	19.	Brake Camshaft (Air Brakes only)	4 – Fittings	Texaco Marfak All Purpose
	20.	Spring Pins	12 – Fittings	Texaco Marfak All Purpose
	21.	Rear Axle	Keep oil to level of filler plug, drain and refill at 24,000 mile intervals or every 6 months, whichever occurs first	Texaco Universal Gear Lubricant EP 90
	22.	Retarder Rocker Arm (Allison)	1 – Fitting	Texaco Marfak All Purpose
3,000 to 5,000 Miles	23.	Shutterstat (Air)	1 ounce shutter fluid every 3,000 miles or whenever chassis is lubricated	Kysor Shutter Fluid
	24.	Clutch Release Bearing	1 – Fitting (when applicable) Lubricate sparingly	Texaco Marfak All Purpose
	25.	Propellor Shaft Universal Joints	1 – Fitting each joint Use low pressure	Texaco Marfak All Purpose
	26.	Propellor Shaft Slip Joint	1 – Fitting Use low pressure	Texaco Marfak All Purpose
10,000 to 15,000 Miles	27.	Wheel Bearings	Clean and repack	Texaco Marfak All Purpose

LUBRICATION

INTRODUCTION

The efficiency and life of mechanical equipment is as dependent on proper lubrication as on proper engineering design. The importance of proper lubrication is increased because of greater gear tooth and bearing pressures and higher speeds in present day vehicles. For this reason, we are vitally interested in promoting widespread usage of the best possible lubricants for our products.

It is advisable to consider the reputation of the refiner or vendor when selecting a lubricant. He is responsible, to a great extent, for the quality and correct application of his product. A high quality lubricant incorrectly applied may greatly reduce the maximum service built into our product. Past experience has proven that a large portion of service problems can be traced to an improper lubricant or to an incorrect lubricant application.

Our purpose in compiling these specifications is to provide a guide to aid in the selection of a lubricant which will render the most satisfactory service.

DEFINITIONS and TERMS

It is important to define certain terms and describe tests generally used by the petroleum industry to better understand the necessity for and qualifications of a good lubricant. Many different types of tests are employed; some of them are used to control quality during production, while others are simulated performance tests and are used to regulate the product or formalize specifications. It is significant to note that a single test result is of no value in determining a qualified lubricant, and that all tests cannot be used on all varieties of lubricants. Some of these tests are of laboratory value only and are not generally performed in the field. A speaking knowledge of the major terms and most commonly used tests are covered in the following brief definitions:

STRAIGHT MINERAL OIL

A *straight mineral oil* is a refined petroleum product used as a fluid lubricant. Corrosion and oxidation inhibitors, anti-foam agents, etc., are frequently added to mineral oils to provide additional properties. These lubricants are classified by S.A.E. as "regular-type gear lubricants."

COMPOUNDED OILS

There are many different types of *compounded oils* and *lubricants* such as cutting, soluble and rust preventing oils used in common machine practice; internal combustion engine oils and gear lubricants. Compounded oils commonly used for automotive gear lubrication may be classified in two general groups: (1) oils combined with non-corrosive lubricity additives, S.A.E. "worm-type gear lubricant," and (2) oils combined with extreme pressure or multi-purpose type additives, S.A.E. "multipurpose-type gear lubricants."

Non-corrosive fats, waxes or soaps are frequently combined with high quality straight mineral oils to make a lubricant that has increased load carrying ability due to greater oiliness and film strength.

Extreme pressure or multipurpose lubricants are designed to carry the greatest load. They are usually formed by combining high quality straight mineral oil with chemical additives such as sulphur, chlorine and lead or phosphorus in addition to the usual oiliness additives. These chemicals, under heat and pressure, react with the metal surfaces or with themselves to form a coating. This coating is microscopically thin, an excellent bearing surface that acts as a lubricant and is self perpetuating. The liquid lubricant not only carries the additives, but serves as a coolant for the assembly.

Compounded oils usually oxidize more rapidly than straight mineral oils. Thus the increase in load carrying ability is obtained at a sacrifice of lubricant life. It is important not to operate vehicles beyond the established safe lubricant change interval.

VISCOSITY

The *viscosity* designation of a lubricant indicates its internal resistance to flow. Lubricants with high viscosity numbers, such as S.A.E. 140, are thicker and flow more slowly than those with lower viscosity numbers, such as S.A.E. 90. Viscosity is rated in S.S.U. (Seconds Saybolt Universal) and is the time (in seconds) required for a given volume of fluid to pass through a given orifice at a given temperature. This value does not indicate which oil will serve best under all conditions; but it does indicate that a slow flowing lubricant has a higher viscosity number.

Viscosity is important to the user because it is a positive guide to the selection of the lubricant that will perform best in a specified temperature range. The lubricant viscosity must be high enough to provide a protective film and yet low enough to flow freely to all parts requiring lubrication.

VISCOSITY INDEX

The *viscosity index* is a calculated figure representing the tendency of a lubricant to change viscosity with changes in temperature. The higher the index number the less the viscosity change for a given change in temperature. A lubricant with a high index number should be used when a wide range of lubricant operating temperatures is encountered. A lubricant with a viscosity index of 85 or higher is desirable because it will have a wider temperature range in which there will be little change in viscosity.

POUR POINT — CHANNELING POINT

The *pour point* is the lowest (coldest) temperature at which an unagitated lubricant will flow.

The *channeling point* of a lubricant occurs when it thickens to the extent that when a channel is formed through it, the sides of the channel fail to meet within a specified time. This temperature is approximately 15°F below the pour point.

Both the pour point and channeling point should be considered when operating or storage temperatures are low. The pour point of the lubricant should be lower than the lubricant temperature during operation. The channeling point should be lower than the minimum starting or storage temperature.

FILM STRENGTH

Film strength is defined as the tendency of oil molecules to cling together. It is the ability of those molecules to resist separation under pressure between two metals and to hold these metal surfaces apart.

OILINESS OR LUBRICITY

Oiliness is a measure of the coefficient of friction of a lubricant. Oiliness or lubricity depends on the adhering characteristics of an oil. It is determined by the attraction between the molecules of the oil and the molecules of another material. Of two oils having the same viscosity but different degrees of fluid friction, the one with the lower friction index has the higher degree of oiliness.

GRAVITY A.P.I.

Gravity A.P.I. (American Petroleum Institute) is a numerical value reported in degrees A.P.I. and determines the weight of a known volume of the product. The value of pure water is taken as 10, lighter liquids have values greater than 10, and heavier liquids have values less than 10. Most gasolines have A.P.I. gravities of 50 to 60 while lubricating oils have values of 12 to 30 A.P.I. The A.P.I. gravity number is of no value to the ultimate user, but is of value to the laboratory.

FLASH POINT — FIRE POINT

The *flash point* is the lowest temperature at which a lubricant will give off vapors that will ignite or flash but will not continue to burn even though a flame is present.

The *fire point* is the temperature at which the lubricant vapors will continue to burn following ignition. Fire points are usually 30°F to 50°F higher than flash points.

A high flash and fire point indicates less lubricant loss by evaporation during usage and a low flash and fire point sometimes indicates the lubricant has been diluted to artificially lower viscosity. An undiluted low viscosity lubricant will usually give better service than a high viscosity lubricant diluted to a lower viscosity value.

CARBON RESIDUE

The *carbon residue* test determines the weight of the carbon left after an oil has been evaporated under specific conditions of high temperature. This test cannot be used on compounded oils but is satisfactory for straight mineral oils. It is totally unreliable as an index to carbon forming tendencies of a lubricating oil during operation. The results of this test are of laboratory value only.

COLOR

The result of the *color* test is expressed as a number which is determined by comparing an oil sample with a color standard. The No. 1 color standard is water white, No. 2 is straw color and a higher number such as 8 is a dark brown. Color determination is valuable during refining but does not indicate the quality of the finished product and is of no value to the user.

PRECIPITATION NUMBER

The *precipitation number* is determined from the volume of solid sediment remaining in a given amount of lubricant and naphtha after the mixture has been whirled in a centrifuge.

An unused straight mineral oil type lubricant that has a large percentage of sediment made up of carbon particles, fillers, water and other filterable material is not desirable. A used lubricant of either the straight mineral oil or compounded types may have a high precipitation number due to a high percentage of foreign matter such as metal particles, water and sludge caused by condensation or lubricant oxidation. Such a lubricant is unfit for further service.

NEUTRALIZATION OR ACID NUMBER

A *neutralization* or *acid* number indicates the presence of acids in a petroleum product. The number is the actual weight in milligrams of the amount of alkali necessary to neutralize the acid in one gram of lubricant. The test is of value primarily in the laboratory to determine the rate of oil deterioration. Other laboratory tests are required to determine the kind and type of acid, whether or not it is harmful, its source, effect and means of prevention.

A high quality straight mineral oil lubricant is usually neutral (no acid number) while a compounded lubricant may have a low acid number. Lubricants that have been in service may have a higher number caused by oxidation due to heat and water. Generally a lubricant with high neutralization or acid number is undesirable.

MOISTURE — CORROSION

The *moisture* test is performed in the laboratory where a known quantity of the lubricant sample is heated in a special distilling apparatus and the water removed in vapor form (steam). The vapor condenses in a graduated measuring vessel so the volume of water can be accurately determined. As a rule, unused high quality lubricants have very low moisture contents.

The *metal corrosion* tests employ polished soft steel, bronze and/or copper plates immersed or partially immersed in a lubricant sample under specified conditions. The plates are removed and examined for discoloration that may indicate corrosive action of ingredients. This is a laboratory test to determine whether the lubricant contains any corrosive ingredients.

A *rust proofing* test is frequently employed to determine the ability of a lubricant to prevent rust. A portion of a soft steel pin is dipped in the lubricant sample, then placed in a humidity chamber. After exposure for a given length of time, the lubricant is removed from the pin and a comparison of exposed and unexposed surfaces is made to ascertain the degree of protection offered by the lubricant.

The *moisture corrosion* test is performed in the laboratory where the unwashed metal test pieces used in lubricant physical testing machines are exposed to high humidity under controlled conditions. This test reveals the potential corrosive tendencies of a lubricant caused by chemical activity under simulated service conditions.

SAPONIFICATION NUMBER

The *saponification* test is used to determine the amount of saponifiable oils or fats in a lubricant. By measuring the amount of potassium hydroxide needed to remove these fats, the amount of saponifiable fats contained in the sample can be determined. This test is of value only to the laboratory.

FREE FATTY ACID

A *free fatty acid* is an acid liberated when animal or vegetable fat decomposes. A small percentage of non-rancid fat oils are sometimes added to mineral oils to increase the oiliness and film strength of the lubricant. If they become fatty acids, they attack and pit bearing surfaces.

PHYSICAL TESTS

Oils

Physical (mechanical) tests are performed on oils to aid in evaluating load carrying capacity or film strength. The most popular laboratory devices used for this purpose at this time are the Timken Roller Bearing Co., S.A.E. and Four Ball Machines, the Navy Gear Wear Tester and the Almen, Floyd and Falex test devices.

Greases

Mechanical tests are also made on greases to determine how the physical characteristics may change in service. Changes in consistency (hardness) and bleeding are of particular interest. The most popular laboratory devices used at the present time in these tests are the Bearing Tester, Grease Worker and Shell Roll Tester.

LUBRICATING GREASE

A *lubricating grease* is a semi-solid material composed of a lubricating oil combined with a thickening agent.

THICKENING AGENT

A *thickening agent* changes a fluid lubricant to a semi-solid lubricating grease. Common thickeners used in the manufacture of grease are the metallic soaps such as sodium, calcium, aluminum and lithium; jelling agents or densifiers such as bentones, silicates and silicones.

CONSISTENCY

Consistency of grease is its hardness or firmness. It is determined by the depth in millimeters to which the cone of a penotrometer sinks into a sample under specified conditions. Consistency of grease may be influenced by the type and amount of thickener, viscosity of oil, working and other factors.

TEXTURE OF GREASE

The *texture of grease* is a physical characteristic resulting from the mixing of types and amounts of ingredients, thickening agents and lubricating oils in the product. Texture may be described as smooth or buttery (no apparent fiber), short fiber (slightly stringy), and medium fiber, etc., depending upon apparent stringiness.

FIBER OF GREASE SOAP

Soaps are of a *fibrous* nature. Under a high power microscope different soap fibers resemble the common natural fibers used in textiles. These entrap large amounts of the lubricating oil much as a cloth holds water.

DROPPING POINT

The *dropping point* of a grease is the lowest temperature at which the first drop of melted grease is released from a given sample under specific test conditions. Obviously, it is important to use a grease that has a dropping point higher than the operating temperature. This eliminates the possibility of the grease melting and running out of the assembly.

BLEEDING

Bleeding is the partial separation of a liquid from a solid or semi-solid material such as oil from grease. A small amount of bleeding is permissible and under certain circumstances, desirable.

THICKENING AGENTS COMMONLY USED IN GREASES

A *sodium* or *soda soap* grease is usually fibrous in texture and is generally used in wheel bearings. It can be used to temperatures of 300°F. It cannot be used where it will be exposed to the weather because it readily absorbs water. Short-fiber sodium greases are used generally in anti-friction bearings and long-fiber sodium greases in lower-speed journal bearings.

A *calcium* or *lime soap* grease is usually smooth with short fibers and is frequently used as a cup grease where loads are moderate. The more common type can be used only at temperatures below 150°F, but the newer calcium complex products are multipurpose and can be used over a wide range of temperatures as a general purpose grease. They do not readily absorb water.

An *aluminum soap* grease is usually smooth. It is an excellent chassis lubricant because it adheres extremely well. It is not suitable for use at temperatures above 160°F.

Lithium soap grease characteristics vary greatly depending on the compounding of ingredients. It is a relatively new grease of wide potential application.

NON-SOAP THICKENING AGENTS

These are relatively new thickeners that are not soaps but are being used as such to suspend lubricating oils. They are being compounded to withstand many special conditions such as high temperature, high acidity and high resistance to moisture. The principal ones are the silicates, silicones and bentones.

RECOMMENDED LUBRICATION PRACTICES

COMPARISON OF SPECIFICATIONS

Most reliable petroleum refiners, blenders and marketers may furnish, on request, "certified specifications" of automotive type lubricants. These itemize physical characteristics such as viscosity, viscosity index, channel point, etc., and chemical properties that have a material influence upon lubricant performance and life. We suggest a careful comparison of Rockwell recommended specifications and the "certified specifications" of the lubricant vendor. A number of suppliers have more than one brand of gear oil—in every instance we recommend using the best brand.

INITIAL LUBRICANT DRAIN

The axle lubricant should be drained at the end of the driveaway prior to putting the vehicle in regular service, or before the maximum of 3,000 miles. Completely drain the original axle lubricant while the assembly is warm and refill with recommended Rockwell lubricant.

MAGNETIC DRAIN PLUGS

Any drive axle, while it is working, generates wear particles at a fairly steady rate. These wear particles are very fine but hard. If these hard wear particles are allowed to circulate in the lubricant, the anti-friction bearings will wear at a faster rate than they would if the hard wear particles were removed as they are generated.[1]

Magnetic drain plugs perform the vital function of trapping these small metallic particles that circulate in the lubricant, through the gears and bearings, causing rapid wear and premature failure. The magnet must be strong enough to firmly hold the particles under service conditions. We recommend plugs with elements having a minimum pickup capacity of 2 pounds of low carbon steel in plate or bar form.

Magnets will rapidly lose effectiveness as collected material bridges the gap between the two poles. Change plugs before this occurs. It may be necessary to change plugs one or more times between complete lubrication changes. The removed plugs can be cleaned and re-used.

LUBRICANT CHANGE SCHEDULE

A regular schedule for changing the axle lubricant in a particular vehicle and operation can be accurately determined by analysis of samples taken from the assembly at specified intervals or mileages. The lubricant supplier frequently makes available his laboratory facilities for determining the useful life of his product under actual service conditions. The finally recommended schedule may be correlated, for economic reasons, with lubricant changes governed by climatic conditions and magnetic drain plug maintenance. Lubricant changes must be made as climatic temperatures demand, regardless of vehicle mileage or established change schedule.

If it is desirable to select an arbitrary lubricant change schedule, we recommend changing the lubricant at 25,000 to 30,000 mile intervals when the yearly mileage accumulation is in excess of 60,000 miles. When yearly mileage accumulation is less than 60,000 miles, we recommend changing the lubricant twice yearly (spring and fall) irrespective of mileage.

[1] *W. A. Johnson, S.A.E. 1959 preprint #S198*

The normal operating temperature of compounded lubricants during the summer season is approximately 160°F to 190°F. The chemicals and additives that give these lubricants increased load carrying capacity and oiliness oxidize faster at higher temperatures, above approximately 220°F, contributing to more rapid lubricant deterioration. For this reason, lubricants of this type that operate continuously at high temperatures must be changed more frequently to realize the inherent advantages they offer.

TEMPERATURE INDICATOR

Many Rockwell tandem axles, particularly the larger ones, have a ½" pipe tap hole for the installation of a lubricant temperature thermocouple. We recommend indicators be installed in these axles, especially worm, hypoid and spiral bevel thru-drive units. A sudden upward change in lubricant temperature may indicate tire or mechanical trouble that can be corrected, avoiding expensive repair. When the lubricant temperature reaches 250°F, the vehicle should be immediately stopped to find the cause of overheating.

S.A.E. VISCOSITIES

For service purposes and the convenience of description in this Field Maintenance Manual, the term "Standard" indicates a lubricant of S.A.E. 140 viscosity. The term "optional" denotes a lubricant of similar characteristics, but of different viscosity, which may be required for extreme temperatures or unusual operating conditions.

"Standard" S.A.E. 140 viscosity lubricants are to be used in drive units that operate under average conditions, except where atmospheric temperatures require the use of the lower viscosity S.A.E. 90.

"Optional" S.A.E. 90 viscosity lubricants should be used when starting or storage temperatures fall below the channel point of the particular S.A.E. 140 viscosity lubricant being used.

Generally speaking, the "Standard" lubricants will render satisfactory service in most areas of the continental United States.

Unusual temperature or operating conditions may require other or more specific lubricant recommendations. The Transmission and Axle Division will review these circumstances, upon request, and make optional gear oil or grease recommendations. It is essential that all details of vehicle operation, loads, area temperatures, etc., are clearly and completely stated when applying to our Engineering Department for an optional lubricant recommendation.

DRIVE UNIT LUBRICANTS

WORM GEAR DRIVE UNITS

A Worm Type Gear Lubricant (H.D.) is recommended for worm gear drive units. Straight mineral oil may be used when these units operate under light duty conditions. "Multipurpose" gear lubricants, which depend upon chemical reaction with the metal for the extreme pressure characteristics, are not to be used with worm gears.

SPIRAL BEVEL GEAR DRIVE UNITS

A "Multipurpose" gear lubricant or a "GL 4" gear lubricant of CRC 10 level or better is recommended for spiral bevel gears in single and double reduction drive units. For light duty operation, an oil compounded with oiliness or lubricity additives may be used in these assemblies.

HYPOID GEAR DRIVE UNITS

The design of hypoid gear teeth, which mesh with a sliding action, enables them to withstand higher unit pressures. Therefore, the lubricant used must have properties that provide high film strength and maximum oiliness. *"Multipurpose" gear lubricants or "GL 4" gear lubricants of CRC 10 level or better best meet these requirements.*

ROCKWELL—STANDARD SPECIFICATIONS OF RECOMMENDED LUBRICANTS

Material specifications of lubricants recommended by the Transmission and Axle Division are as follows:

DRIVE UNITS

Worm Gears

Regular Duty
Worm Type Gear Lubricant H.D.
Standard 0-73; Optional 0-72

Light Duty
Straight Mineral Oil Gear Lubricant
Standard 0-63; Optional 0-62

Hypoid Gears (Single and Double Reduction)

All Duty
Multipurpose Gear Lubricant
Standard 0-65; Optional 0-64

GEAR CASES

Transfer Cases, Torque Dividers

Standard 0-63; Optional 0-62

Spiral Bevel Gears (Single and Double Reduction)

Regular Duty
Multipurpose Gear Lubricant
Standard 0-65; Optional 0-64

Light Duty
Worm Type Gear Lubricant H.D.
Standard 0-73; Optional 0-72

MISCELLANEOUS LUBRICANTS, GREASES

Wheel bearings	0-610
Chassis parts	0-614
Brake parts	0-616
Front driving axle universal joints	0-610
Spring seats	
Bushing type	0-74
Roller bearing type	0-610

ROCKWELL—STANDARD LUBRICANT SPECIFICATIONS

WORM DRIVE GEAR LUBRICANTS (H.D.)

Lubricants purchased under these specifications shall be well refined mineral oils, properly compounded with lubricity additives and/or load carrying ingredients. They shall be stable and contain no abrasive or corrosive ingredients. Fillers or any other substances which produce an artificial viscosity are not permitted.

They shall have the following chemical and physical properties:

"STANDARD" SPECIFICATION 0-73* GRADE 140

Viscosity at 210°F (S.S.U.)[1]	125-180
Viscosity Index[2]	70 min.
Channel Point[3]	+20°F max.
Flash Point[5]	+350°F min.
Moisture[7]	.1% max.
Heating Test[25]	
Evaporation Loss	10% max.
Viscosity Increase	10% max.
Moisture Corrosion Test[20]	Negative
Rust Proof Test[21]	Negative
Bronze Corrosion Test[23]	Negative
Steel Corrosion Test[24]	Negative
Load Carrying Capacity[19]	
Timken Test Lever Load	30 lbs. min.

This is a heavy duty worm gear lubricant for use where ambient operating temperatures are above 0°F and where storage or parking temperatures are above +20°F. These temperatures are suggested as a guide only. The viscosity range used should be the heaviest which will still permit the lubricant to flow freely to all parts of the axle under all conditions to which the vehicle is subjected.

† "OPTIONAL" SPECIFICATION 0-72* GRADE 90

Viscosity at 210°F (S.S.U.)[1]	75-115
Viscosity Index[2]	80 min.
Channel Point[3]	0°F max.
Flash Point[5]	+350°F min.
Moisture[7]	.1% max.
Heating Test[25]	
Evaporation Loss	10% max.
Viscosity Increase	10% max.
Moisture Corrosion Test[20]	Negative
Rust Proof Test[21]	Negative
Bronze Corrosion Test[23]	Negative
Steel Corrosion Test[24]	Negative
Load Carrying Capacity[19]	
Timken Test Lever Load	30 lbs. min.

*Number following specification detail indicates test standard. See Pages 11 and 12.

† See Page 7.

This is a heavy duty worm gear lubricant for use where ambient operating temperatures are above −10°F and where storage or parking temperatures are above 0°F. These temperatures are suggested as a guide only. The viscosity range used should be the heaviest which will still permit the lubricant to flow freely to all parts of the axle under all conditions to which the vehicle is subjected.

STRAIGHT MINERAL OIL GEAR LUBRICANTS

Lubricants purchased under these specifications shall be well refined mineral oils, free from water, sediment, acid or any other substance detrimental to the proper performance of the lubricant.

They shall have the following chemical and physical properties:

"STANDARD" SPECIFICATION 0-63* GRADE 140

Viscosity at 210°F (S.S.U.)[1]	125-180
Viscosity Index[2]	85 min.
Flash Point[5]	+500°F min.
Fire Point[6]	+575°F min.
Channel Point[3]	+20°F max.
Color (N.P.A.)[14]	8 max.
Carbon Residue[9]	.2% max.
Free Fatty Acid (as Oleic)[11]	.05% max.
Precipitation Number[10]	.10 max.
Heating Test[25]	
Evaporation Loss	5.0% max.
Viscosity Increase	10% max.
Precipitation Number	.40 max.

This is a straight mineral oil and does not have E.P. characteristics. It is for lubricating worm drive axles where ambient operating temperatures are above +10°F and where storage and parking temperatures are above +20°F. These temperatures are suggested as a guide only. The viscosity range used should be the heaviest which will still permit the lubricant to flow freely to all parts of the axle under all conditions to which the vehicle is subjected.

† "OPTIONAL" SPECIFICATION 0-62* GRADE 90

Viscosity at 210°F (S.S.U.)[1]	75-115
Viscosity Index[2]	85 min.
Flash Point[5]	+500°F min.
Fire Point[6]	+575°F min.
Channel Point[3]	−10°F max.
Color (N.P.A.)[14]	8 max.
Carbon Residue[9]	.2% max.
Free Fatty Acid (as Oleic)[11]	.05% max.
Precipitation Number[10]	.10 max.
Heating Test[25]	
Evaporation Loss	5.0% max.
Viscosity Increase	10% max.
Precipitation Number	.40 max.

This is a straight mineral oil and does not have E.P. characteristics. It is for lubricating worm drive axles where ambient operating temperatures are above −20°F and where storage and parking temperatures are above −10°F. These temperatures are suggested as a guide only. The viscosity range used should be the heaviest which will still permit the lubricant to flow freely to all parts of the axle under all conditions to which the vehicle is subjected.

MULTIPURPOSE GEAR LUBRICANTS

Lubricants purchased under these specifications shall be well refined oil, properly compounded with load carrying ingredients. They shall be stable and contain no abrasive or corrosive ingredients. Fillers or any other substances which produce an artificial viscosity are not permitted.

They shall have the following chemical and physical properties:

"STANDARD" SPECIFICATION 0-65* GRADE 140

Viscosity at 210°F (S.S.U.)[1]	125-180
Viscosity Index[2]	70 min.
Channel Point[3]	+20°F max.
Flash Point[5]	+350°F min.
Moisture[7]	.2% max.
Heating Test[25]	
Evaporation Loss	10% max.
Viscosity Increase	10% max.
Moisture Corrosion Test[20]	Negative
Rust Proof Test[21]	Negative
Copper Corrosion Test[22]	No Scaling No Blackening
Load Carrying Capacity[19]	
Timken Test Lever Load	50 lbs. min.
Timken Abrasion Test (Total Loss)	5 mg. max.

*Number following specification detail indicates test standard. See Pages 11 and 12. † See Page 7.

This is a heavy duty lubricant suitable for spiral bevel, hypoid and double reduction axles where ambient operating temperatures are above 0°F and where storage or parking temperatures are above +20°F. These temperatures are suggested as a guide only. The viscosity range used should be the heaviest which will still permit the lubricant to flow freely to all parts of the axle under all conditions to which the vehicle is subjected.

† "OPTIONAL" SPECIFICATION 0-64*
GRADE 90

Viscosity at 210°F (S.S.U.)[1]	75-115
Viscosity Index[2]	80 min.
Channel Point[3]	0°F max.
Flash Point[5]	+350°F min.
Moisture[7]	.2% max.
Heating Test[25]	
Evaporation Loss	10% max.
Viscosity Increase	10% max.
Moisture Corrosion Test[20]	Negative
Rust Proof Test[21]	Negative
Copper Corrosion Test[22]	No Scaling No Blackening
Load Carrying Capacity[19]	
Timken Test Lever Load	50 lbs. min.
Timken Abrasion Test (Total Loss)	5 mg. max.

This is a heavy duty lubricant suitable for spiral bevel, hypoid and double reduction axles where ambient operating temperatures are above −10°F and where storage or parking temperatures are above 0°F. These temperatures are suggested as a guide only. The viscosity range used should be the heaviest which will still permit the lubricant to flow freely to all parts of the axle under all conditions to which the vehicle is subjected.

MISCELLANEOUS LUBRICANTS

WHEEL BEARING GREASE
SPECIFICATION 0-610*
(NLGI Grade No. 2)

This grease shall be a homogeneous combination of refined mineral oil and sodium soap, with a maximum of 2% calcium soap permissible. This grease shall not contain any fillers which adversely affect the lubricating qualities of the product. It may have additives that give a high degree of protection against corrosion of metals and oxidation of the grease. It shall be free of any disagreeable odor.

The product shall be a non-corrosive, medium fiber grease of excellent mechanical and storage stability.

The mineral oil shall meet the following specifications:

Viscosity at 210°F (S.S.U.)[1]	80-100
Viscosity Index[2]	65 min.
Flash Point[5]	+400°F min.
Pour Point[4]	+25°F max.

The grease shall have the following physical and chemical properties:

Penetration, Worked (60 strokes) Units[16]	265-295
Penetration Change after 10,000 Strokes[18]	15% max.
Dropping Point[17]	+350°F min.
Sodium Soap[15]	9-14%
Free Fatty Acid (as Oleic)[11]	0.3% max.
Water[8]	0.25% max.

Application: Automotive wheel bearings.

The supplier assumes all responsibility of product and patent liability.

CHASSIS GREASE
SPECIFICATION 0-614*
(NLGI Grade No. 0)

This grease shall be a homogeneous combination of refined mineral oil and metallic soap or a mixture of metallic soaps. The grease shall not contain any fillers which adversely affect the lubricating qualities of the product. It may have additives that give a high degree of protection against corrosion of metal parts and oxidation of grease. It shall be free of any disagreeable odor.

The product shall be a non-corrosive, and may be water resistant but not water proof, smooth fiber grease of excellent mechanical and storage stability.

The mineral oil shall meet the following specifications:

Viscosity at 100°F (S.S.U.)[1]	275-325
Viscosity Index[2]	65 min.
Flash Point[5]	+350°F min.
Pour Point[4]	−15°F max.

The grease shall have the following physical and chemical properties:

Penetration Worked (60 strokes) Units[16]	355-385
Penetration Change after 10,000 Strokes[18]	15% max.
Dropping Point[17]	+220°F min.
Metallic Soap[15]	10% max.
Water[8]	1.5% max.

*Number following specification detail indicates test standard. See Pages 11 and 12. †See Page 7.

Ash as Sulfates[12] ..... 3.5% max.
Free Alkali (as NaOH)[13] ..... 0.2% max.
Free Fatty Acid (as Oleic)[11] ..... 0.3% max.
Application: General chassis lubricant.

The supplier assumes all responsibility of product and patent liability.

HIGH TEMPERATURE GREASE
(Water Proof)
SPECIFICATION 0-616*
(NLGI Grade No. 1)

This grease shall be a homogeneous combination of refined mineral oil and non-soap jelling agent or thickener. The grease shall not contain any fillers which adversely affect the lubricating qualities of the product. It may have additives that give a high degree of protection against corrosion of metal parts and oxidation of the grease. It shall be free of any disagreeable odor.

The product shall be a non-corrosive, highly water resistant, smooth fiber grease of excellent mechanical and storage stability.

The grease shall have the following physical and chemical properties:

Penetration, Worked (60 strokes) Units[16] . 310-340
Penetration Change
after 10,000 Strokes[18] ..... 15% max.
Dropping Point[17] ..... None
Soap[15] ..... None
Water[8] ..... None

Application: Brake parts or other parts where a high temperature grease of this consistency is considered applicable. Do not lubricate brake shoe rollers or roller pins.

The supplier assumes all responsibility of product and patent liability.

SPRING SEAT LUBRICANT
SPECIFICATION 0-74*
GRADE 250

The lubricant purchased under this specification shall be a well refined mineral oil, properly compounded with lubricity additives and/or load carrying ingredients. It shall be stable and contain no abrasive or corrosive ingredients. Fillers or any other substances which produce an artificial viscosity are not permitted.

It shall have the following chemical and physical properties:

Viscosity at 210°F (S.S.U.)[1] 200-300
Viscosity Index[2] ..... 70 min.
Channel Point[3] ..... +50°F max.
Flash Point[5] ..... +350°F min.
Moisture[7] ..... .1% max.
Heating Test[25]
Evaporation Loss ..... 10% max.
Viscosity Increase ..... 10% max.
Moisture Corrosion Test[20] ..... Negative
Rust Proof Test[21] ..... Negative
Bronze Corrosion Test[23] ..... Negative
Steel Corrosion Test[24] ..... Negative
Load Carrying Capacity[19]
Timken Test Lever Load ..... 30 lbs. min.

This is a heavy duty worm gear lubricant.

DESCRIPTIONS OF TESTS

1	Viscosity	ASTM D	88-53	1
2	Viscosity Index	ASTM D	576-53	2
3	Channel Point	CRC L	15-445	3
4	Pour Point	ASTM D	97-47	4
5	Flash Point	ASTM D	92-52	5
6	Fire Point	ASTM D	92-46	6
7	Moisture	ASTM D	95-46	7
8	Water	ASTM D	128-47	8
9	Carbon Residue	ASTM D	189-52	9
10	Precipitation Number	ASTM D	91-52	10
11	Free Fatty Acid	ASTM D	128-47	11
12	Ash as Sulfates	ASTM D	128-47	12
13	Free Alkali (as NaOH)	ASTM D	128-47	13
14	Color	ASTM D	155-45T	14
15	Soap	ASTM D	128-47	15
16	Penetration (one penetration unit=$^1/_{10}$ mm.)	ASTM D	217-52T	16
17	Dropping Point	ASTM D	566-42	17
18	Grease Worker, Mechanical Stability	ASTM D	217-A	18
19	Load Carrying Capacity and Abrasion Test Timken Roller Bearing Company	ASTM	Bul. No. 181 (Dated 4-52)	19

20 Moisture Corrosion Test: Place unwashed test pieces from Almen, Falex, Floyd, Four Ball, S.A.E. or Timken machines immediately on watch glass beside beaker of distilled water under bell jar. After 48 hours, clean with solvent and examine for corrosion.

21 Rust Proof Test: Polish clean a specimen of S.A.E.-1010-1020 steel with Grade No. 1 emery cloth or paper. Solvent rinse in petroleum naphtha. Immerse the specimen in the test lubricant and allow excess to drain for ten minutes at room temperature. Hang in humidity chamber

*Number following specification detail indicates test standard. See Pages 11 and 12.

(set at 100±5°F and 95 min. relative humidity and through which air is bubbled at the rate of about one liter per minute) for 48 hours. Remove, rinse with petroleum naphtha (do not wipe) and examine the previously cleaned areas for corrosion.

22 Copper Corrosion Test: ASTM D 130-50T

23 Bronze Corrosion Test: Micro polish (use 0.1 micron levigated alumina) one or more surfaces of a convenient size specimen of S.A.E. 65 bronze (approximately ¾" cube).
Immerse in the test lubricant and then adjust level so that one-half of the polished surface is exposed above the lubricant. Maintain at 250°F for three hours. Remove, rinse with petroleum naphtha (do not wipe) and examine under 40 power microscope for dendritic pattern of intergranular corrosion and a maximum corrosion scale number 1 according to ASTM D 130-50T.

24 Steel Corrosion Test: Proceed same as in No. 23 except use sample of 8620 or 94 B 17 steel. Examine under 40 power microscope for intergranular corrosion.

25 Heating Test: Heat 200 grams of the lubricant in a 400 ml beaker for 100 hours at 300°F.

LUBRICANT CAPACITIES OF ROCKWELL-STANDARD AXLES

Lubricant capacities are given as a guide only. All measurements are taken still filled, with the pinion shaft on the horizontal centerline (unless otherwise stated♦), to top of filler neck on earlier models and bottom of the tapped level hole on later models.

The lubricant capacities of two similar axles in the same series may vary considerably due to design changes and the vehicle manufacturer's installation. The actual service capacity may be accurately determined by carefully measuring the amount of specified lubricant necessary to fill the assembly to the correct level and measuring the lubricant again as it is drained from the unit. The vehicle should be on a level floor when this inspection is made.

"Make-up" quantities are less than ½ unit capacity.

LIGHT WEIGHT TANDEM

MODEL			CAPACITY U.S. Pints	SPECIFICATIONS Standard	†Optional
♦ SDHD	forward	DHD	‡ 16	O-65	O-64
	rear	DHR	16	O-65	O-64
♦ SFHD	forward	FHD	‡ 17	O-65	O-64
	rear	FHR	16½	O-65	O-64
♦ SHHD	forward	HHD	‡ 26	O-65	O-64
	rear	HHR	25	O-65	O-64
♦ SLHD	forward	LHD	‡ 32½	O-65	O-64
	rear	LHR	32	O-65	O-64
♦ SQHD	forward	QHD	‡ 34	O-65	O-64
	rear	QHR	31	O-65	O-64
SRHD	forward carrier	(at 3°)	‡ 42	O-65	O-64
SSHD	forward carrier	(at 3°)	‡ 42	O-65	O-64

SINGLE AXLES

MODEL	CAPACITY U.S. Pints		SPECIFICATIONS Standard	†Optional
A-150	5½		O-65	O-64
B-100	10		O-65	O-64
B-140	12		O-65	O-64
B-150	3½		O-65	O-64
C-100	12½		O-65	O-64
D-100	12½		O-65	O-64
E-100	15		O-65	O-64
E-105	12½		O-65	O-64
E-150	9		O-65	O-64
E-300	13	*	O-65	O-64
E-350	22	*	O-65	O-64
E-370	22	*	O-65	O-64
F-30	6		O-65	O-64
F-35	7		O-65	O-64
F-37	7		O-65	O-64
F-38	10		O-65	O-64
F-46	10		O-65	O-64
F-50	10		O-65	O-64
F-53	12		O-65	O-64
F-54	11		O-65	O-64
F-56	14		O-65	O-64
F-58	15		O-65	O-64
F-75	9		O-65	O-64
F-77	10		O-65	O-64
F-100	13		O-65	O-64
F-140	14		O-65	O-64
F-200	12		O-65	O-64
F-223	16		O-65	O-64
F-233	23		O-65	O-64
F-234	23		O-65	O-64
F-235	23		O-65	O-64
F-300	16		O-65	O-64
F-337	24		O-65	O-64
F-340	16	*	O-65	O-64
F-400	16		O-65	O-64
F-409	28		O-65	O-64
F-501	10		O-65	O-64
F-544	10		O-65	O-64
F-551	11		O-65	O-64
F-552	11		O-65	O-64
F-580	15		O-65	O-64
F-583	15		O-65	O-64
F-2090	12		O-65	O-64
F-3100	16		O-65	O-64
F-3110	26		O-65	O-64
F-3200	22		O-65	O-64
F-4700	40		O-65	O-64
F-4710	32		O-65	O-64
F-7900	40		O-65	O-64
F-7910	32		O-65	O-64
FS-4711	32		O-65	O-64
FDS-750	7		O-65	O-64
FDS-1800	35		O-65	O-64

* Add one pint of lubricant to pinion cage when new or reconditioned drive unit is installed.
‡ Add two pints of lubricant to inter-axle differential housing when new or reconditioned drive unit is installed in addition to specified amount of lubricant in housing.
† "Optional," see Page 7.
♦ Pinion shaft 6° above horizontal centerline.

SINGLE AXLES—Continued

MODEL	CAPACITY U.S. Pints		SPECIFICATIONS Standard	†Optional
G-161	21		O-65	O-64
G-340	24	*	O-65	O-64
G-341	22	*	O-65	O-64
G-361	21	*	O-65	O-64
H-100	20		O-65	O-64
H-140	18		O-65	O-64
H-150	11		O-65	O-64
H-162	20		O-65	O-64
H-200	28	*	O-65	O-64
H-240	22	*	O-65	O-64
H-262	23		O-65	O-64
H-300	26	*	O-65	O-64
H-340	22	*	O-65	O-64
H-350	24	*	O-65	O-64
H-360	24	*	O-65	O-64
H-370	24	*	O-65	O-64
L-100	23		O-65	O-64
L-140	24		O-65	O-64
L-200	31	*	O-65	O-64
L-240	22	*	O-65	O-64
L-300	29	*	O-65	O-64
L-340	22	*	O-65	O-64
L-350	24	*	O-65	O-64
L-370	32	*	O-65	O-64
LT-200	31	*	O-65	O-64
LT-300	29	*	O-65	O-64
QT-140	24		O-65	O-64
QT-200	31	*	O-65	O-64
QT-230 §	44	*	O-65	O-64
QT-240	34	*	O-65	O-64
QT-300	29	*	O-65	O-64
QT-330 §	44	*	O-65	O-64
QT-340	32	*	O-65	O-64
Q-100	31		O-65	O-64
Q-200	34	*	O-65	O-64
Q-245	34	*	O-65	O-64
Q-300	32	*	O-65	O-64
Q-345	32	*	O-65	O-64
Q-350	34	*	O-65	O-64
Q-370	34	*	O-65	O-64
Q-380	36	*	O-65	O-64
Q-390	36	*	O-65	O-64
RT-240	32	*	O-65	O-64
RT-340	32	*	O-65	O-64
R-100	30		O-65	O-64
R-140	28		O-65	O-64
R-160	28		O-65	O-64
R-163	34		O-65	O-64
R-170	43		O-65	O-64
R-200	36	*	O-65	O-64
R-230	36	*	O-65	O-64
R-230 §	45	*	O-65	O-64
R-300	34	*	O-65	O-64
R-330	35	*	O-65	O-64
R-330 §	44	*	O-65	O-64
R-390	60	*	O-65	O-64
R-2090	10		O-65	O-64
R-3100	20		O-65	O-64
S-200	38	*	O-65	O-64
S-300	39	*	O-65	O-64
U-200	38	*	O-65	O-64
U-300	39	*	O-65	O-64
46-R	10		O-65	O-64
1300	16		O-65	O-64
1700	16		O-65	O-64
59000	26		O-65	O-64
63000	8		O-73	O-72
64800	9		O-73	O-72
65200	10		O-73	O-72
1900	16		O-65	O-64
7578	28		O-65	O-64
7579	28		O-65	O-64
7580	28		O-65	O-64
7581	28		O-65	O-64
7582	28		O-65	O-64
51500	3½		O-65	O-64
53300	15		O-65	O-64
53500	6		O-65	O-64
53521	9		O-65	O-64
53547	9		O-65	O-64
53600	7		O-65	O-64
53625	4¾		O-65	O-64
54400	15		O-65	O-64
55400	20		O-65	O-64
55600	20		O-65	O-64
56219	22		O-65	O-64
56400	20		O-65	O-64
56410	20		O-65	O-64
56434	13		O-65	O-64
56450	26		O-65	O-64
56461	26		O-65	O-64
58200	21		O-65	O-64
58300	21		O-65	O-64
58415	26		O-65	O-64
58822	22		O-65	O-64
59722	26		O-65	O-64
65300	14		O-73	O-72
65356	23		O-73	O-72
65400	17		O-73	O-72
65456	17		O-73	O-72
65700	12		O-73	O-72
66700	20		O-73	O-72
67000	20		O-73	O-72
68700	20		O-73	O-72
72200	15	*	O-65	O-64
72300	21	*	O-65	O-64
73300	8	*	O-65	O-64
74400	9	*	O-65	O-64
74878	12	*	O-65	O-64
75300	20	*	O-65	O-64
75357	20	*	O-65	O-64
75400	20	*	O-65	O-64
75700	24	*	O-65	O-64
76400	18	*	O-65	O-64
76700	26	*	O-65	O-64
76784	26	*	O-65	O-64
76790	28	*	O-65	O-64
78000	20	*	O-65	O-64
79000	24	*	O-65	O-64
79721	24	*	O-65	O-64
93440	20	*	O-65	O-64
94440	20	*	O-65	O-64
96710	25	*	O-65	O-64
98415	41	*	O-65	O-64

§ Housing cover 6½" deep overall.

TANDEM AXLES

MODEL	CAPACITY U.S. Pints		SPECIFICATIONS Standard	†Optional
SQTT-335	* 44		O-65	O-64
SRT-235	* 45		O-65	O-64
SRT-335	* 44		O-65	O-64
SLD	28		O-65	O-64
SLDD	‡ 28		O-65	O-64
SQD	22		O-65	O-64
SQDD	‡ 22		O-65	O-64
SRD	22		O-65	O-64
SRDD	‡ 22		O-65	O-64
SUDD forward	‡ 46		O-65	O-64
SUDD rear	44		O-65	O-64

* Add one pint of lubricant to pinion cage when new or reconditioned drive unit is installed.

‡ Add two pints of lubricant to inter-axle differential housing when new or reconditioned drive unit is installed in addition to specified amount of lubricant in housing.

† "Optional," see Page 7.

TANDEM AXLES—Continued

MODEL	CAPACITY U.S. Pints	SPECIFICATIONS Standard	†Optional
4600, SFD	28	O-65	O-64
4600, SFDD ‡	28	O-65	O-64
4700, SFD	28	O-65	O-64
4700, SFDD ‡	28	O-65	O-64
75, SFD	16	O-65	O-64
157, SFD	9	O-65	O-64
353, SD	24	O-65	O-64
375, SFD	23	O-65	O-64
450, SFD	36	O-65	O-64
454, SD	26	O-65	O-64
456, SW	28	O-73	O-72
457, SW	28	O-73	O-72
460, SW	28	O-73	O-72
460, SFD	29	O-65	O-64
SQW	33	O-73	O-72
SQW §	40	O-73	O-72
3010, SD	19	O-65	O-64
3010, SW	14	O-73	O-72
3013, SW	23	O-73	O-72
3020, SD	31	O-65	O-64
3020, SFD	31	O-65	O-64
3020, SFDD ‡	31	O-65	O-64
3020, SW	28	O-73	O-72
3022, SW	27	O-73	O-72
472, SD	28	O-65	O-64
473, SD	28	O-65	O-64
700, SBD ▲	7	O-65	O-64
760, SBD ▲	5	O-65	O-64
1000, SBD ▲	8	O-65	O-64
1055, SBD ▲	19	O-65	O-64
1500, SBD ▲	12	O-65	O-64
1555, SBD ▲	26	O-65	O-64
3000, SD	19	O-65	O-64
3000, SW	19	O-73	O-72
3002, SW	17	O-73	O-72
3456, SW	24	O-73	O-72
3458, SW	33	O-73	O-72

‡ Add two pints of lubricant to inter-axle differential housing when new or reconditioned drive unit is installed in addition to specified amount of lubricant in housing.

§ Housing cover 6½" deep overall. ▲See "Lubrication Chart," paragraph 10, "Pillow Blocks."

PLANETARY STEERING AND RIGID

MODEL	PLANETARY OUTER ENDS CAPACITY PER END U.S. Pints	SPECIFICATIONS	HOUSING BOWL CENTER CAPACITY U.S. Pints	SPECIFICATIONS Standard	†Optional
PS-100 Series	3½	O-64	20	O-65	O-64
PR-100 Series	3½	O-64	22	O-65	O-64
PS-150 Series	5	O-64	22	O-65	O-64
PR-150 Series	5	O-64	21	O-65	O-64
PS-200 Series	6	O-64	38	O-65	O-64
PR-200 Series	6	O-64	40	O-65	O-64
PS-250 Series	6	O-64	42	O-65	O-64
PS-310 Series	14	O-64	36	O-65	O-64
PR-400 Series	16	O-64	32	O-65	O-64
PS-500 Series	29	O-64	58	O-65	O-64
PR-700 Series	30	O-64	64	O-65	O-64

TRANSFER CASES

The capacities of Transfer Cases are given in the vertical—transverse and horizontal—fore and aft position. Transfer Cases may be mounted at various approved angles by the vehicle manufacturer and normally should be filled to the top of the filler neck or bottom of the tapped hole.

Capacities will vary depending upon the angle of mounting and should be obtained from the vehicle manufacturer.

MODEL	CAPACITY U.S. Pints	SPECIFICATIONS Standard	†Optional
T-32	4	O-63	O-62
T-50	8½	O-63	O-62
T-59	2	O-63	O-62
T-70	24	O-63	O-62
T-73	24	O-63	O-62
T-76	4	O-63	O-62
T-77	7	O-63	O-62
T-79	6	O-63	O-62
T-96	7	O-63	O-62
T-98	46	O-63	O-62
T-99	2½	O-63	O-62
T-136	14	O-63	O-62
T-138	14	O-63	O-62
T-152	5	O-63	O-62
T-154	9½	O-63	O-62
T-167	10	O-63	O-62
T-179	1½	O-63	O-62
T-180	2	O-63	O-62
T-212	2	O-63	O-62
T-221	4	O-63	O-62
T-223	5	O-63	O-62
T-226	7	O-63	O-62
T-228-D	21	O-63	O-62
T-228-PD	24	O-63	O-62
T-236	22	O-63	O-62

LUBRICATION CHART

† "Optional," see Page 7.

1. FRONT AXLE KNUCKLE PINS AND BUSHINGS, METAL AND NYLON; also
2. STEERING CROSS TUBE END ASSEMBLY AND DRAG LINK BALL SOCKETS

Lubricate every 1,000 to 2,000 miles with chassis lubricant, Specification O-614.

Note: Pressure gun should be held on fitting until new grease appears. This will assure that all the old contaminated grease has been forced out.

3. BRAKE CAM SHAFT BUSHINGS, METAL AND NYLON, AND ANCHOR PINS
(Equipped with Lubrication Fittings)

3. SLACK ADJUSTERS
Lubricate every 1,000 to 2,000 miles with Specification O-616.

4. WHEEL BEARINGS
The frequency of lubricant changes depends upon individual operating conditions, speeds and loads. Changes are recommended every 10,000 to 15,000 miles of vehicle operation and twice a year (spring and fall). Clean and repack bearings and hub cavity even with the inside diameter of bearing cups, also pack cavity at hub ends of drive axles between outer bearing and oil seal, and hub caps on front axles and trailer axles, with wheel bearing lubricant, Specification O-610.

5. FRONT DRIVING AXLE UNIVERSAL JOINTS, ROLLER BEARING AND BUSHING KNUCKLE PINS
Clean and repack at same intervals as wheel bearings, using wheel bearing lubricant, Specification O-610.

6. SPRING SEAT—BUSHING, METAL AND NYLON*
Keep reservoir filled with oil, Specification O-74 Standard.

7. SPRING SEAT—BEARING
Clean and repack at same intervals as wheel bearings, using wheel bearing lubricant, Specification O-610.

8. TORQUE DIVIDER
Check every 1,000 miles and drain and refill every 12,000 to 25,000 miles with oil, Specification O-63, Standard; O-62, †Optional.

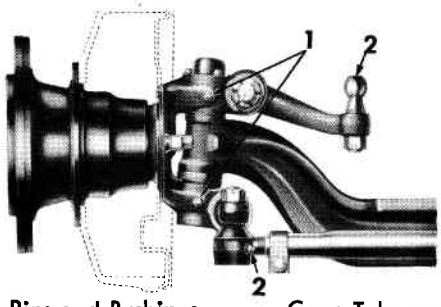
9. TRANSFER CASE
Check every 500 miles and drain and refill every 12,000 to 25,000 miles with oil, Specification O-63, Standard; O-62, †Optional.

10. PILLOW BLOCKS
Lubricate unit type pillow blocks such as SBB-700 initially with 1 pint oil. Check every 1,000 miles, drain and refill every 12,000 to 25,000 miles. Lubricate integral pillow blocks such as SBD-1000, SBD-1055, SBD-1500 and SBD-1555 initially and following overhaul with ½ pint oil. Use same lubricant as in axle housing.

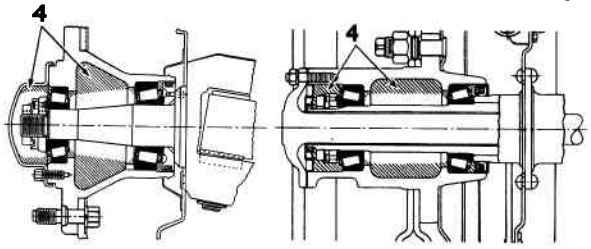
11. DIFFERENTIAL
Check every 1,000 miles. Drain as required and refill to top of filler neck or bottom of tapped hole; refer to "Recommended Lubrication Practices," Page 6 of Manual.

*Use Spec. O-73 (Grade 140) if Spec. O-74 (Grade 250) is not available. Check lubricant level more frequently when using lighter grade.

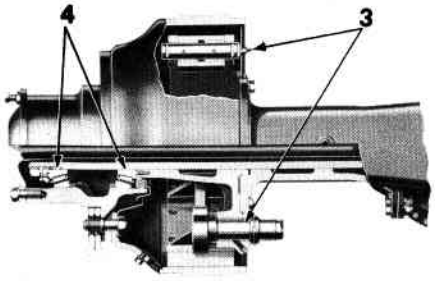
†Optional, see Page 7.



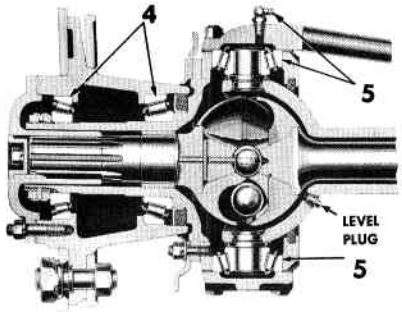
Knuckle Pins and Bushings Cross Tube and Drag Link



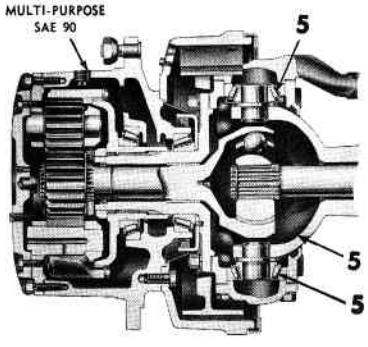
Non-Drive Hub Assemblies, Drive Hub Assemblies
The shading in each indicates the recommendation for the correct amount of grease.



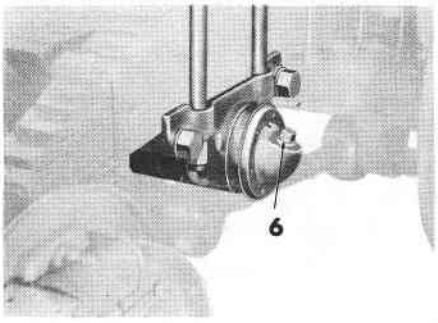
Brakes Wheel Bearings



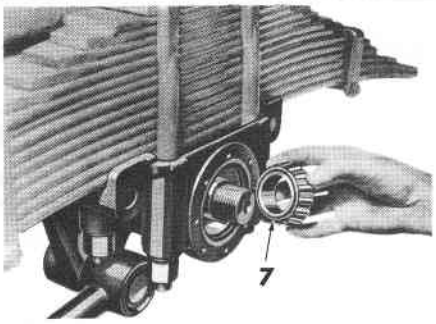
Wheel Bearings
Front Driving Axle Universal Joints, Roller Bearing & Bushing Knuckle Pins



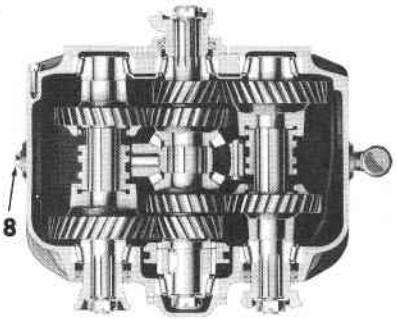
Planetary Outer Ends



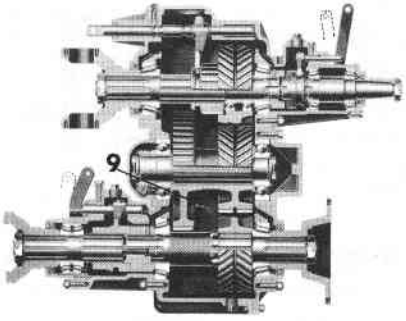
Spring Seat – Bushing



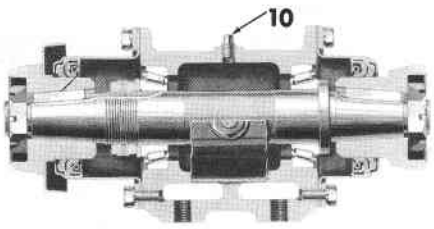
Spring Seat – Bearing



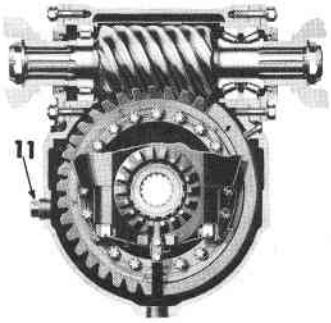
Torque Divider



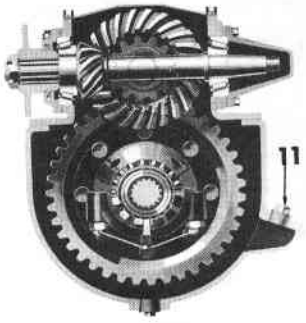
Transfer Case



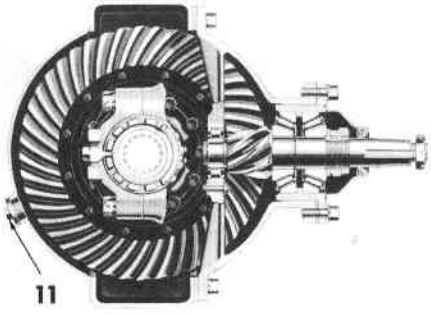
Pillow Block



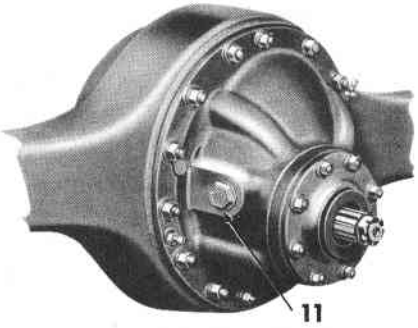
Worm Drive – Top Mounted



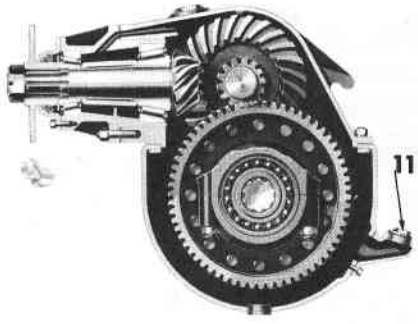
Through Shaft – Top Mounted



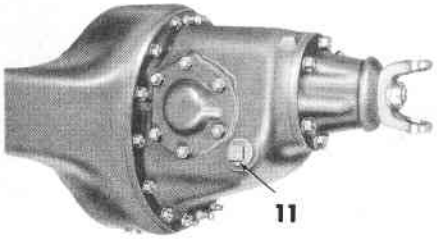
Spiral Bevel Single Reduction



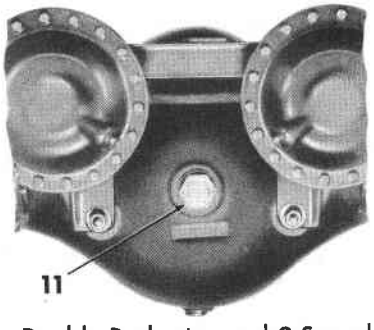
Hypoid Single Reduction



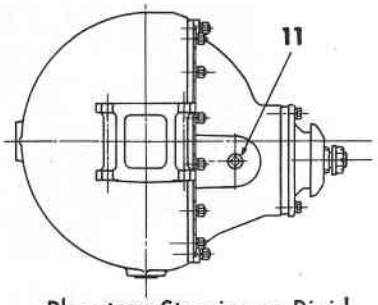
Double Reduction – Top Mounted



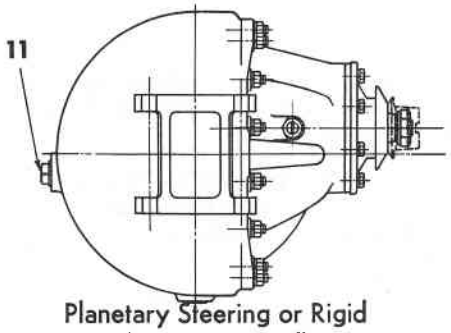
Double Reduction and 2-Speed
Double Reduction – Front Mounted
(Plug in Carrier)



Double Reduction and 2-Speed
Double Reduction – Front Mounted
(Plug in Housing)



Planetary Steering or Rigid
(Pinion Standard)



Planetary Steering or Rigid
(Pinion Inverted)

FIELD MAINTENANCE MANUAL No. 1

LUBRICATION

Use Only Genuine TIMKEN-DETROIT Parts

ROCKWELL–STANDARD CORPORATION
TRANSMISSION AND AXLE DIVISION
DETROIT, MICHIGAN 48232

2M—REV. 2-60 PRINTED IN U.S.A.

THE NEW BLUE BIRD
ALL AMERICAN
and
ALL CANADIAN

LUBRICATION GUIDE

BLUE BIRD BODY COMPANY

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Section III

Lubrication

The Blue Bird Chassis is like all other fine transportation equipment -- it responds to good care. Treat it carefully and lubricate it regularly as recommended and you will have many years of trouble-free service.

ALWAYS GIVE PART NUMBERS FOR EACH PART AND COMPLETE DESCRIPTION AND MANUFACTURER WHEN ORDERING PARTS.