TAYLOR-DUNN®

The Best Way
To Go
About Your
Business

B0-015-00

MX-016-00

Models Inlcuded:

B0-015-00 (B 1-50) Load Master
MX-016-00 (MX 1600) Maintenance Expediter

MANUAL MB-150-02

Operation, Troubleshooting and
Replacement Parts Manual

Published: 11/26/2002
Revision: G, 10/20/2016

Serial number range: 129029–203800

Taylor-Dunn Contact information

Service, Parts, Sales:

Taylor-Dunn has a network of dealers distributed around the globe to support our vehicles. Information regarding vehicle sales, replacement parts, or service should be obtained through your local dealer. A dealer locator can be found on the Taylor-Dunn website at www.taylor-dunn.com.

If you do not have access to the internet, you can call the factory direct at:

01 (714) 956-4040

Feedback regarding this or any Taylor-Dunn vehicle manual can be sent to:

Taylor-Dunn Manufacturing
Attn: Tech Writer
2114 West Ball Road
Anaheim, CA 92804

The Taylor-Dunn Corporation:

Leading Provider of Commercial & Industrial Vehicles since 1949

TAYLOR-DUNN®
Commercial and Industrial Vehicles Since 1949

Taylor-Dunn Manufacturing:

From the day we shipped our first vehicle in 1949, we have pursued a singular goal: to build tough, rugged, dependable vehicles to help our customers move personnel, equipment, and materials. It's that simple. For over sixty years, our standard and custom vehicles - Burden Carriers, Personnel Carriers, Stock Chasers, Electric Carts, Tow Tractors & more - have been the leading solution for customers in a broad range of industrial, commercial, and ground-support markets.

Decades of experience are an invaluable asset, and it is an asset we cherish and protect. Our guiding principle is to provide application-specific solutions, which are reliable, efficient, and economical.

Our domestic and international network of quality Taylor-Dunn Dealers and Parts & Service Support keeps our customers moving.

Tiger Tractor:

Tiger manufacturing has become a leading manufacturer of internal combustion industrial tractors and ground support equipment. With tractor capacities ranging from 3,000 - 12,000 pounds drawbar pull, they are ideal for industrial applications as well as aircraft ground support. As with all Taylor-Dunn vehicles; quality, service, support and reliability are built into all Tiger Tractor products.

Shown below is just a small sample of what Taylor-Dunn has to offer to keep your business moving:

Taylor-Dunn®

Model B0-015-00, MX-016-00

Operator and Service Manual Section Index

This quick reference section index guide will assist you in locating a desired topic or procedure.

Refer to each sectional Table of Contents for the page number location for specific topics or procedures.

A small sample of the many types of vehicles offered by Taylor-Dunn®

B 2-48-36 Equipped with optional hydraulic dump bed

B 1-00 Personnel carrier

BT 2-80 Eight passenger tram

MX 1600 Equipped with optional ladder rack and weld tanks

C 4-25 Huskey tow tractor

Introduction

Table of Contents

ABOUT THIS MANUAL

The purchase of this vehicle shows a belief in high quality products manufactured in the USA. Taylor-Dunn®, a leading manufacturer of electric burden and personnel carriers since 1949, wants to be sure this vehicle provides years of reliable service. Please continue to read this manual and enjoy this high quality Taylor-Dunn® vehicle.

This manual is to serve as a guide for the service, repair, and operation of Taylor-Dunn® vehicles and is not intended as a training guide. Taylor-Dunn® has made every effort to include as much information as possible about the operation and maintenance of this vehicle.

Included in this manual are:

- Vehicle Description
- Safety Rules and Guidelines
- Operational Information
- Operator Responsibilities
- Owner Responsibilities
- Control Operation and Location Information
- Maintenance and Troubleshooting Information
- Standard Parts List

Before servicing, operating, training or performing maintenance on this or any other Taylor-Dunn® vehicle, read the appropriate Taylor-Dunn® manual.

Each Taylor-Dunn® manual references the applicable models and serial numbers on the front cover.

Please, be aware of all cautions, warnings, instructions, and notes contained in this manual.

WHO SHOULD READ THIS MANUAL

This manual is intended for use by anyone who is going to operate, own, perform maintenance on, service, or order parts for this Taylor-Dunn® vehicle. Each person should be familiar with the parts of this manual that apply to their use of this vehicle.

RESPONSIBILITIES

Of the Owner...

The owner of this or any Taylor-Dunn® vehicle is responsible for the overall maintenance and repairs of the vehicle, as well as the training of operators. Owners should keep a record of conducted training and maintenance performed on the vehicle. (OSHA Regulation, 29 CFR 1910.178 Powered Industrial Truck Operator Training).

Of the Operator...

The operator is responsible for the safe operation of the vehicle, preoperational and operational checks on the vehicle, and the reporting of any problems to service and repair personnel.

Of the Service Personnel...

The service personnel are responsible for the service and maintenance of the vehicle. At no time should a service person allow any untrained personnel to service or repair this or any Taylor-Dunn® vehicle. For the purposes of training, a qualified service person may oversee the repairs or services being made to a vehicle by an individual in training. At no time should an untrained individual be allowed to service or repair a vehicle without supervision. This manual is not a training guide.

Of the Passengers ...

The passengers are responsible to remain fully seated, keeping their hands, arms, and legs inside the vehicle at all times. Each passenger should be fully aware of the vehicle's operation. All forms of recklessness are to be avoided. Do not engage in horseplay.

HOW TO USE THIS MANUAL

This manual is organized into five main sections:

INTRODUCTION

This section describes how to use this service manual and how to identify your vehicle.

Safety Rules and Operating Instructions

This section outlines the safety and operational issues, location and operation of controls, and the operational checks that are to be performed on this vehicle. It also includes various subjects that should be included in the operator and service training program.

Maintenance Service and Repair

This section gives specific information on the servicing of the vehicle and a schedule for maintenance checks.

Electrical and Charger Troubleshooting

This section identifies the troubleshooting procedures for testing the electrical system and battery charger.

Illustrated Parts

This section provides an illustrated view of various assemblies. The illustrations are accompanied by tables identifying the parts.

Conventions

Symbols and/or words that are used to define warnings, cautions, instructions, or notes found throughout this manual:

⚠WARNING

or,

⚠ WARNING

A shaded box with the word "Warning" on its left denotes a warning. A warning alerts the reader of a hazard that may result in injury to themself or others. Be sure to follow any instructions contained within a warning and exercise extreme care while performing the task.

⚠CAUTION

The symbol at the left and the bold text contained within a box denotes a "Caution" and is used to inform the reader that property damage may occur. Be sure to exercise special care and follow any instructions contained with in a caution.

NOTE: Alerts the reader to additional information about a subject.

HOW TO IDENTIFY YOUR VEHICLE

This manual applies to vehicles with the same model and serial numbers listed on the front cover.

These vehicles are designed for driving on smooth surfaces in and around facilities such as industrial plants, nurseries, institutions, motels, mobile home parks, and resorts. They are not to be driven on public highways.

⚠WARNING

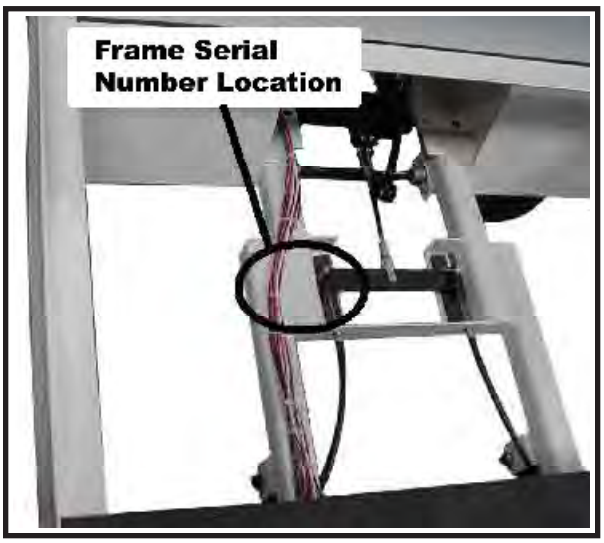
This vehicle is not designed to be driven on public roads or highways. It is available in maximum designed speeds ranging from 7 to 15 mph. Do not exceed the maximum designed speed. Exceeding the maximum designed speed may result in steering difficulty, motor damage, and/or loss of control. Do not exceed locally imposed speed limits. Do not tow at more than 5 mph.

This vehicle conforms to requirements for Type E vehicles as described in O.S.H.A. Standard Section 1910.178 (Powered Industrial Trucks) and with all applicable portions of the American National Standard for Personnel and Burden Carriers (ANSI B56.8).

The locations of the model and serial numbers are illustrated below:

B 1-50 and MX 1600

B 1-50 and MX 1600



B 1-50

MX 1600

TAKING DELIVERY OF YOUR VEHICLE

Inspect the vehicle immediately after delivery. Use the following guidelines to help identify any obvious problems:

- Examine the contents of all packages and accessories that may have come in separate packages with the vehicle.
- Make sure everything listed on the packing slip is there.
- Check that all wire connections, battery cables, and other electrical connections are secure.
- Check battery cells to be sure they are filled.
- Check the tire pressure, tightness of lug nuts, and for any signs of damage.

Check the operation of each of the following controls:

- Accelerator
- Brake
- Parking Brake
- Key-Switch
- Forward/Reverse Switch
- Reverse Beeper (if equipped)
- Front Headlight Switch
- Steering Wheel
- Horn

What To Do If a Problem is Found

If there is a problem or damage as a result of shipping, note the damage or problem on the bill of lading and file a claim with the freight carrier. The claim must be filed within 48 hours of receiving the vehicle and its accessories. Also, notify your Taylor-Dunn® dealer of the claim.

If there is a problem with the operation of the vehicle, DO NOT OPERATE THE VEHICLE. Immediately contact your local Taylor-Dunn® distributor and report the problem. The report must be made within 24 hours of receiving the vehicle and its accessories.

The only personnel authorized to repair, modify, or adjust any part of this or any Taylor-Dunn® vehicle is a factory authorized service technician.

⚠WARNING

The only personnel authorized to repair, modify, or adjust any part of this or any Taylor-Dunn® vehicle is a factory authorized service technician. Repairs made by unauthorized personnel may result in damage to the vehicles systems which could lead to an unsafe condition resulting in severe bodily injury and/or property damage. Unauthorized repairs may also void the vehicles warranty.

Notes:

Safety Rules and Operating Instructions

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*STANDARD SPECIFICATIONS**

ITEM	MODEL	VOLTAGE	SPECIFICATION
Occupancy			Driver and one passenger
Dimensions	B 1-50		274.2L X 112.5W X 120.7H Centimeters 107.95L X 44.29 X 47.5H Inches
	MX 1600		274.2L X 112.5W X 207.6H Centimeters 107.95L X 44.29 X 81.75H Inches
Turning Radius			279.4 Centimeters (110 inches)
Dry Weight Without Batteries	B 1-50 MX 1600		376.5 kg (830 lbs) 469.9 kg (1036 lbs)
Min/Max Battery Weights			166 kg to 212 kg (366 lbs to 468 lbs)
Maximum Load	B 1-50 MX 1600		726 kg (1600 lbs) 454 kg (1000 lbs)
Electrical System		36 Volt	6-217 Amp Hour, 6 Volt, Lead Acid Batteries, Solid State Speed Control, 275 Amp
Transmission			Helical Gear, Oil Bath, Direct Drive
Motor, DC Series Wound			36 volt 6 hp @1200 RPM for 5 minutes 2 hp @ 2800 RPM for 60 min
Maximum Recommended Speed			19.3 kph (12 mph)
Brakes			Rear Wheel Mechanical Drum, Foot Operated Park Brake
Steering			Automotive Steering 24:1
Tires			5.70 X 8 Load Range B, Tire Pressure 60 psi max
Frame	B 1-50		Steel Unitized Body, Heavy Duty 16 Gauge Steel, Diamond Plate
	MX 1600		Steel Unitized Body, Heavy Duty 16 Gauge Steel, Tool Box, Ladder Rack, Vise, Work Bench, Gas Weld Tank Compartment
Instrumentation			Battery Status Indicator, Key Switch, Horn Button, Forward/Reverse Switch, Brake Light
Light Accessories	B 1-50 MX 1600	12 Volt 12 Volt	Brake Light Headlight, Tail/Brake Light
Charger		36 Volt	110 Volt 12 Amp AC, 25 Amp DC, Built-In, Automatic with Control system Interlock Relay

** - Specifications are subject to change without notice.*

SAFETY RULES AND GUIDELINES

It is the responsibility of the owner of this vehicle to assure that the operator understands the various controls and operating characteristics of this vehicle. As well as, obeying the following safety rules and guidelines (extracted from the American National Standards Institute Personnel and Burden Carriers ANSI B56.8).

These vehicles are designed for driving on smooth surfaces in and around facilities such as industrial plants, nurseries, institutions, motels, mobile home parks, and resorts. They are not to be driven on public highways.

⚠WARNING

This vehicle is not designed to be driven on public roads or highways. It is available in maximum designed speeds ranging from 7 to 15 mph. Do not exceed the maximum designed speed. Exceeding the maximum designed speed may result in steering difficulty, motor damage, and/or loss of control. Do not exceed locally imposed speed limits. Do not tow at more than 5 mph.

⚠WARNING

Read and follow all of the guidlines listed below. Failure to follow these guidelines may result in severe bodily injury and/or property damage.

- Do not drive this vehicle unless you are a qualified and trained operator.
- Keep all body parts (head, arms', legs') inside the vehicle while it is moving.
- Drive slowly when making a turn especially if the ground is wet, slippery or when driving on an incline.
- This vehicle may overturn easily if turned sharply, driven at high speeds, or when on an incline.
- Drive only on level surfaces or on surfaces having an incline of no more than 10% (5.6 degrees).
- Do not drive over loose objects, holes, or bumps.
- Observe all traffic regulations and speed limits (see speed warning above).
- Keep to the right under normal conditions.
- Maintain a safe distance from all objects.
- Keep the vehicle under control at all times.
- Yield right of way to pedestrians, ambulances, fire trucks, or other vehicles in emergencies.
- Do not overtake another vehicle at intersections, blind spots, or other dangerous locations.
- Keep a clear view ahead at all times.

⚠WARNING

Before working on a vehicle:

1. **Make sure the key-switch is in the "OFF" position, then remove the key.**
2. **Place the forward-reverse switch in the center "OFF" position.**
3. **Set the park brake.**
4. **Place blocks under the front wheels to prevent vehicle movement.**
5. **Disconnect the main positive and negative cables at the batteries.**

DRIVER TRAINING PROGRAM

As per ANSI B56.8, the owner of this vehicle shall conduct an Operator Training program for all those who will be operating this vehicle. The training program shall not be condensed for those claiming to have previous vehicle operation experience. Successful completion of the Operator Training program shall be required for all personnel who operate this vehicle.

The Operator Training program shall include the following:

- Operation of this vehicle under circumstances normally associated with your particular environment.
- Emphasis on the safety of cargo and personnel.
- All safety rules contained within this manual.
- Proper operation of all vehicle controls.
- A vehicle operation and driving test.

Driver Qualifications.

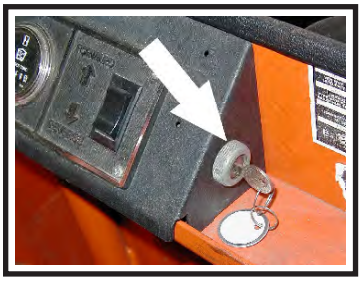
Only those who have successfully completed the Operator Training program are authorized to drive this vehicle. Operators must possess the visual, auditory, physical, and mental ability to safely operate this vehicle as specified in the American National Standards Institute Controlled Personnel and Burden Carriers ANSI B56.8.

The following are minimum requirements necessary to qualify as an operator of this vehicle:

- Demonstrate a working knowledge of each control.
- Understand all safety rules and guidelines as presented in this manual.
- Know how to properly load and unload cargo.
- Know how to properly park this vehicle.
- Recognize an improperly maintained vehicle.
- Demonstrate ability to handle this vehicle in all conditions.

VEHICLE CONTROLS

Key-Switch

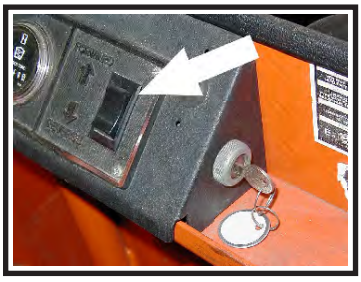


A key-switch, located on the right side of the instrument panel, turns on the vehicle. Rotate the key clockwise to turn the vehicle power on, counterclockwise to turn the vehicle power off.

The key-switch should be in the “OFF” position whenever the operator leaves the driver’s seat.

This switch is also designed to secure and disable the vehicle. The key can only be removed when the key-switch is in the “OFF” position.

Forward-Off-Reverse Switch



The forward-Off-reverse switch, located on the right side of the instrument panel, determines the direction of travel of the vehicle. Push the top of the switch to engage the forward direction. Push the bottom of the switch to engage the reverse direction.

DO NOT SHIFT from forward to reverse or vice-versa while the vehicle is in motion. Make sure the vehicle is completely stopped before shifting.

The forward-reverse switch should be in the center “OFF” position, with key-switch off and the park brake set whenever the operator leaves the driver’s seat.

Accelerator Pedal

The accelerator pedal is located to the right of the brake pedal. It controls the speed of the vehicle and operates similar to the accelerator pedal in an automobile. Depress the pedal to increase speed and release the pedal to decrease speed.

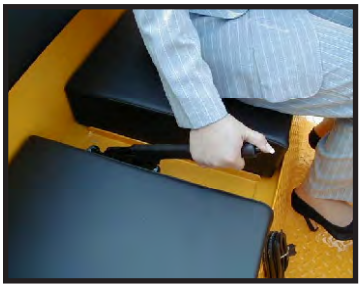
Steering

The steering wheel and steering system are similar to an automobile. To turn right, turn the steering wheel clockwise. To turn left, turn the steering wheel counter-clockwise.

Foot Brake Pedal

The foot brake pedal, is located to the right of the steering column, it is for operation with the right foot only. It works similar to the brake in an automobile. Applying pressure to the brake pedal slows the vehicle according to the amount of pressure applied. Relieving pressure from the pedal releases the braking action.

Park Brake



The parking brake is actuated with a hand lever, which is located between the driver and passenger seats. To set the parking brake, push down on the brake pedal and pull the lever up until it locks. To release the park brake, depress the foot brake pedal, pull up on the park brake handle, push the release button, and lower the handle.

Horn Switch

The horn switch is located to the left of the steering column. Depress the switch with your left foot to sound the horn, release it to turn it off.

Seat Interlock Switch

A switch located under the driver's seat disables the power to the vehicle when the driver leaves the seat. The driver must be seated for the vehicle to operate.

Whenever the driver leaves the seat, they should turn the key-switch off, place the forward-reverse switch in the center "OFF" position, and set the park brake.

⚠WARNING

The seat interlock switch is only one part of the vehicle safety system. The interlock switch should not be relied upon as the only safety feature used to disable or disengage this vehicle. Doing so could result in unexpected movement of the vehicle causing severe bodily injury and/or property damage.

Headlight Switch

The headlight switch is located on the far left side of the instrument panel. Push the top of the switch to turn the lighs on. Push the bottom of the switch to turn the light off.

Hour Meter (Optional)

The hour meter is located to the right of the battery status indicator. It records the number of hours the vehicle has been in operation.

Charger Interlock

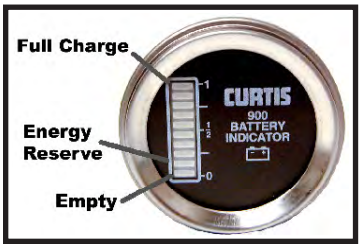
The charger interlock is designed to disable the vehicle from being driven while the AC charger cord is plugged into a functioning power source.

NOTE: The interlock shown is mounted external of the charger. Some vehicles may have the interlock built into the charger.

Battery Status Indicator, Analog

The battery status indicator is located to the left of the hour meter. The normal operating range is in the green zone. Park the vehicle for a few minutes for an accurate reading. The vehicle needs charging if it is in the yellow zone. During and immediately following charging, the needle will be in the red zone to the right. The needle will move through the green zone toward the yellow zone as the batteries discharge. Charge the batteries when the needle is in the yellow zone. If it is in the red zone to the left, the batteries are empty and the truck should be taken out of service and charged to avoid damaging the batteries.

Battery Status Indicator, Digital Bargraph



The battery status indicator is located to the left of the hour meter. The battery status indicator has a LED bar graph that indicates the relative state of charge of the battery. The top LED will light only when connected to a fully charged battery or after completing a charging cycle. Successive lower LED's will light as the battery charge diminishes. When the second from the bottom LED flashes the battery energy status is in energy reserve and should be placed on charge as soon as possible. When the two bottom LED's are alternately flashing the batteries are empty and the truck should be taken out of service and charged to avoid damaging the batteries.

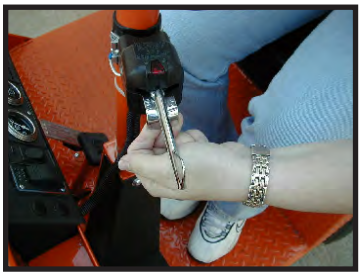
Reverse or Motion Alarm (Optional)

The reverse alarm is located in the electronics compartment mounted on the speed control panel or on the rear panel of the vehicle. The reverse alarm is activated when the Key switch is in the "ON" position and the Forward-Reverse switch is in the reverse position. The alarm makes a repeated audible sound.

Directional Signals (Optional)

The turn signal lever is located on the left side of the steering column. Push the lever forward to activate the right turn signal and pull the lever back to activate the left turn signal.

Hazard Light Switch (Optional)



The hazard light switch is located on the left side of the steering column. The switch is a small tab. To activate the hazard lights, pull the tab out. To turn the hazard lights off, push forward or pull back the directional signal lever.

Accessory Switch (Optional)

The accessory switch is located on the left side of the instrument panel and to the right of the headlight switch. Push the top of the switch to turn on an accessory. Push the bottom of switch to turn off the accessory. The accessory can be turned on with the key switch in the “OFF” position. If a vehicle is equipped with windshield wipers and one or more accessories, the windshield wipers are controlled from this switch. Other accessories are controlled from the auxiliary switch.

Auxiliary Switch (Optional)

The auxiliary switch is located on the left side of the instrument panel and to the left of the headlight switch. Push the switch up to turn on an accessory. Push the switch down to turn off the accessory. The accessory can be turned on with the key switch in the “OFF” position. If a vehicle is equipped with windshield wipers and one or more accessories, the auxiliary switch will control the other accessories.

VEHICLE OPERATIONAL GUIDELINES

Driving

- Slow down and sound the horn to warn pedestrians or when approaching a corner or other blind intersection.
- No reckless driving.
- Do not drive this vehicle on steep inclines or where prohibited.
- Immediately report any accidents or vehicle problems to a supervisor.

Loading and Unloading

- Do not carry more than the maximum number of passengers allowed for this vehicle.
- Do not exceed the cargo load capacity.
- Do not load cargo that can fall off.
- Be careful when handling cargo that is longer, wider, or higher than this vehicle, be sure to properly secure all loads.

Parking

Before leaving the vehicle:

- Set the parking brake.
- Set the forward-reverse switch to the center “OFF” position.
- Turn the key switch to the “OFF” position and remove the key.

In addition:

- If parking this vehicle on an incline, turn the wheels to the curb, or block the wheels.
- Do not block fire aisles, emergency equipment, stairways, or exits.

Towing

To tow this vehicle, attach a tow strap to the front bumper tow-bar.

NOTE: If the vehicle is equipped with an automatic electric brake, do not tow the vehicle with the drive wheels on the ground.

Use another driver to steer this vehicle while it is being towed. Be sure the driver uses the brakes when the towing vehicle slows or stops. Do not tow the vehicle faster than 5 m.p.h. or its maximum designed speed, whichever is lower.

If at all possible, this vehicle should be placed on a carrier, rather than towing it.

CHARGING YOUR VEHICLE

⚠WARNING

Explosive mixtures of Hydrogen gas are present within battery cells at all times. Do not work with or charge battery in an area where open flames (including gas furnace or water heater pilots), sparks, cigarettes, or any other sources of combustion are present. Always provide ample ventilation in rooms where batteries are being charged. Failure to do so may result in severe bodily injury and/or property damage.

Signet Charger Operation, Model HB Series

The Signet® HB series chargers use a semi-automatic charging system. The charger will turn itself ON when the AC power cord is connected to the AC power source and turn itself OFF when the batteries are fully charged. Refer to the data plate on the charger for the voltage and type power required for the charger.

Typical Signet® Built In

There is a series of LED's on the faceplate of the charger that serve two functions:

1. Status of charge. The LED's will display an approximate percent of charge during the charging cycle. Refer to the table below.
2. Error condition. All three LED's flashing is an indication of a charging problem (charger will also be beeping). Refer to the ***Charger Troubleshooting*** section for information on error codes.

Charging State	LED1	LED2	LED3
0 to 50%	Blinking	OFF	OFF
50% to 75%	ON	Blinking	OFF
75% to 100%	ON	ON	Blinking
Cycle complet	ON	ON	ON

⚠WARNING

Battery electrolyte is poisonous and dangerous. It contains sulfuric acid. Avoid contact with skin eyes or clothing. Wear rubber gloves and safety glasses while servicing batteries. DO NOT INGEST! This may result in severe bodily injury.

⚠CAUTION

The key switch must be in the "OFF" position when charging the batteries. Failure to turn the key switch "OFF" may result in damage to the vehicles electrical system.

Signet Charger Operation, Model HBS series

The Signet® HBS series chargers are fully automatic. The charger will turn itself ON when the AC power cord is connected to the AC power source and turn itself OFF when the batteries are fully charged. Once the charge cycle is complete, the charger will continue to monitor the batteries. If the battery voltage drops during storage, the charger will start a new cycle to keep the batteries fully charged.

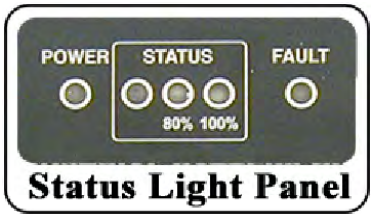
Typical Signet® HBS

NOTE: If the charger restarts during a short time period of storage, then it would be an indication of faulty batteries.

Refer to the data plate on the charger for the voltage and type power required for the charger.

There is a series of LED's on the faceplate of the charger that serve two functions:

1. Status of charge. The ***STATUS*** LED's will display an approximate percent of charge during the charging cycle. Refer to the table below.
2. Error condition. The ***FAULT*** LED flashing is an indication of a charging problem (charger may also be beeping). Refer to the ***Charger Troubleshooting*** section for information on error codes.



Status Light Panel

Lestronic II Charger Operation

The Lestronic II® charger is a semi-automatic charging system. The charger will turn itself ON when the AC power cord is connected to the AC power source and turn itself OFF when the batteries are fully charged. Refer to the data plate on the charger for the voltage and type power required for the charger. When plugged in, the charger assumes that the batteries require charging and will charger for a minimum of approximately 4-hours. This charger should not be plugged in until the batteries are discharged beyond 50% or the batteries may be overcharged..

New Battery Break in

New batteries require a break in period of up to 40-cycles. The batteries will not have their full capacity during this break in period and may require longer charging times.

To obtain the maximum battery life:

Charge the batteries only after they reach a normal discharge as indicated on the Battery Status Indicator (BSI). Failure to follow this guideline could result in the batteries entering an overcharge state, which will reduce the life of the batteries. If you find it necessary to charge the batteries before they are completely discharged we recommend waiting until they are discharged a minimum of 25% to reduce the possibility of overcharging. Refer to Vehicle Controls in this section for information on how to read the BSI.

Do not discharge the batteries beyond a normal discharge as indicated on the BSI. Refer to Vehicle Controls in this section for information on how to read the BSI.

Check the battery electrolyte once a week. Do not charge the batteries if the battery electrolyte is low. Charging when the electrolyte is low will damage the batteries and shorten their life-span. Only authorized personnel should perform battery maintenance including maintaining the battery electrolyte level. Refer to Section ***Maintenance, Service and Repair*** for battery maintenance information.

Do not interrupt the charging cycle. When the charger is plugged in, allow it to turn off before disconnecting. Interrupting the charging cycle could lead to overcharging or discharging the batteries too deep. Both circumstances will shorten the life of the batteries.

Charging Time

Average charging time is 8 to 10-hours. The time required to fully charge your batteries will vary depending on:

- Capacity of the batteries, higher capacity requires longer charge time.
- Output of the charger, higher output requires less charge time.
- Depth of discharge, the deeper a battery is discharged, the longer it takes to charge.
- Temperature, low temperatures require longer charge time.

It is not unusual for charge times to exceed 15-hours, especially with new batteries.

Charging time is limited to 20-hours (HBS) or 18-hours (HB). A fault will occur if the charging time exceeds the 20-hour limit.

STORING AND RETURNING TO SERVICE

Both storing your vehicle and returning it to service should only be performed by authorized personnel.

Storing your Vehicle

- Clean the batteries, then fill and charge before putting the vehicle in storage. Do not store batteries in a discharged condition.
- Lube all grease fittings.
- Clean, dry, and check all exposed electrical connections.
- Inflate tires to proper pressure (if applicable).
- For extended storage, the vehicle should be elevated so that the tires do not touch the ground.

If stored for a prolonged period, the batteries should be charged as follows:

Storage Temperature (F)	Charging Interval (months)
Over 60	1
Between 40 and 60	2
Below 40	6

Returning To Service

- Check the battery's state of charge and charge if required.
- Perform ALL maintenance checks in the periodic checklist.
- Remove any blocks from the vehicle and/or place the vehicle down on to the ground.
- Test drive before putting into normal service.

PERIODIC MAINTENANCE CHECKLIST

Taylor-Dunn
Preventative Maintenance Schedule for Dana Drive

Date: _____ Model #: _____ Hour Meter: _____
Inspected By: _____ Serial #: _____
Serviced By: _____ Unit ID#: _____

Interval (hours) [1]	Inspected[2]	Service Required	Service Complete	Item Description
Operator Daily Checklist				Master cylinder fluid level
				Parking brake for secure hold
				Battery water level
				Tire inflation (pneumatic tires)
				Tire tread / damage
				All lights (head, tail, brake, warning, dash panel)
				Steering (hard steering, excessive play, unusual noises)
				Inspect brake and throttle pedal (play, binding, noise)
				Horn
				Motion alarm (if equipped)
				Fluid leaks (brakes, rear axle, battery, hydraulic system)
500				Adjust service and park brake systems
				Inspect all steering linkages and hardware
				Tighten steering shaft to steering gear coupler (if equipped)
				Lubricate the vehicle
				Wash batteries and clean terminals
				Inspect for fluid leaks
				Check all electrical interlocks for proper operation
				Inspect wheel bearings for play and noise
				Inspect front fork collar bearings for play and noise (3-wheel vehicle only)
				Inspect and tighten all hardware (first 500 hours only, then 1000 hours and every 1000 hours)
1000				Inspect and tighten all hardware
				Clean and repack front wheel bearings, replace grease seals
				Inspect all electrical connections for signs of overheating
				Tighten all electrical connections
				Inspect all wiring for cracks, fraying or wear
				Blow carbon from motor
				Inspect motor brushes and commutator
				Inspect steering king pins for play
				Align front end
2000				Change rear axle oil
				Flush hydraulic brake system
				Inspect suspension bushings (spring, shock)
				Inspect suspension bumpers
				Replace brake pedal/treadle return spring
				Inspect frame for damage

Notes (1) and (2), Refer to “Maintenance Guidelines for Severe Duty” in the vehicles service manual

Form PM-0005, Revision A
1/3/2007

NOTE: A full page copy of the Periodic Maintenance Checklist is on the Vehicle Documentation CD under the [Misc] sub folder.

⚠WARNING

Only properly trained and authorized technicians should perform maintenance or repairs to this vehicle. Repairs or maintenance by improperly trained or unauthorized personnel could cause improper operation of the vehicle or premature failure of components resulting in severe bodily injury and/or property damage.

Daily Visual inspection:

Tire condition and pressure.

External frame damage (body).

Operation of all lights and warning alarms and/or horns.

Smooth and proper operation of all controls such as but not limited to:

- Accelerator pedal, Brake pedal, Steering, Parking brake, etc.
- Proper operation of all locking devises such as but not limited to:
- Tool box, Removable battery trays, Cargo box, Cab doors, etc.
- Proper operation of all interlocking switches such as but not limited to:
- Key switch, Seat interlock switch, Charger interlock switch, etc.

Inspect for leaking fluids or grease.

MAINTENANCE GUIDELINES FOR SEVERE DUTY APPLICATIONS

1. This maintenance checklist is based on the average application. If the vehicle is operated under "severe conditions", service procedures should be conducted more frequently than specified. The frequency of service under severe conditions is determined by the use of the vehicle. The owner/ operator must evaluate the operating environment to determine the increase in maintenance frequency.

In addition, the whole vehicle should be inspected monthly for signs of damage. The damage must be repaired immediately.

The following list is meant as a guide and is not all-inclusive of a "severe duty" application.

- Extreme temperature.
- Bumpy, dusty, or ill maintained roads.
- Excessively wet areas.
- Corrosive or contaminated areas.
- Frequent loading of vehicle at/near capacity.
- Use on multiple shifts.

2. Any deficiencies found during an inspection should corrected before the vehicle is returned to service.
3. Battery water level should be inspected on a weekly schedule.

Notes:

General Maintenance

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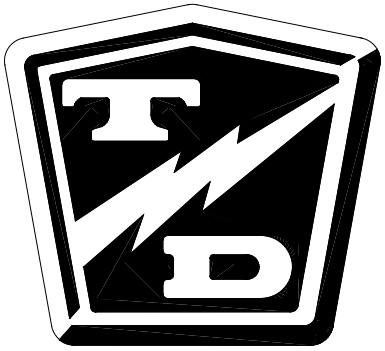


MAINTENANCE GUIDELINES

⚠WARNING

Periodic maintenance and service must be performed on this vehicle. Failure to complete these scheduled maintenance and service procedures can result in severe bodily injury and/or property damage. It is the owner and/or operators responsibility to insure that proper service and maintenance is performed on the vehicle, described in this manual.

⚠WARNING

Before starting any repairs:

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

⚠WARNING

Read and follow all of the guidlines listed below. Failure to follow these guidelines may result in severe bodily injury and/or property damage.

- Avoid fire hazards and have fire protection equipment present in the work area. Conduct vehicle performance checks in an authorized area where safe clearance exists.
- Before starting the vehicle, follow the recommended safety procedures in Section 2, "Safety Rules and Operational Information."
- Ventilate the work area properly.
- Regularly inspect and maintain in a safe working condition, brakes, steering mechanisms, speed and directional control mechanisms, warning devices, lights, governors, guards, and safety devices.
- Inspect and maintain battery limit switches, protective devices, electrical conductors, and connections in conformance with Taylor-Dunn's recommended procedures.
- Keep the vehicle in clean condition to minimize fire hazards and facilitate detection of loose or defective parts.
- Do not use an open flame to check level or leakage of battery electrolyte.
- Do not use open pans of fuel or flammable fluids for cleaning parts.
- Only properly trained and authorized technicians should perform maintenance or repairs to this vehicle.

MAINTENANCE GUIDELINES FOR VEHICLES USED IN SEVERE CONDITIONS

If this vehicle is operated in severe conditions all maintenance items listed in the Periodic Maintenance Table should be carried out twice as often as stated. In addition, the entire vehicle should be inspected monthly for signs of damage. If any damage is found, the vehicle should be immediately removed from service and repaired.

The following list is meant as a guide and is not all inclusive:

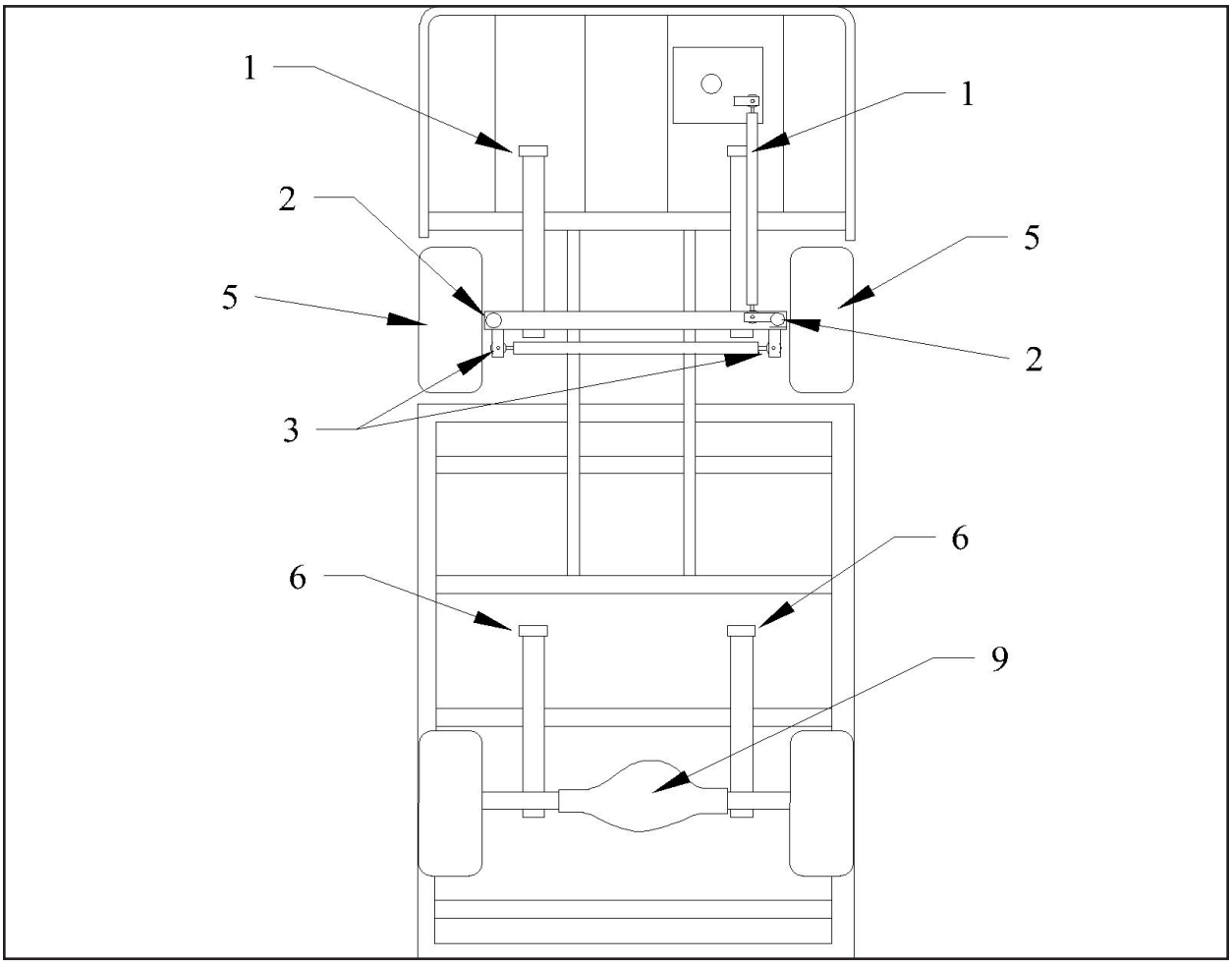
SEVERE CONDITIONS refer to operation:

- In extreme temperatures
- On bumpy, dusty, or poorly maintained roads
- In excessively wet areas
- In corrosive or contaminated areas
- At or near maximum capacity for more than 50% of the operating time
- On multiple shifts

TROUBLESHOOTING GUIDE

Symptom	Probable Cause
Steering Pulls in One Direction	Front End Out of Alignment
	Low Tire Pressure
Hard Steering	Dry Lube Points in Steering Linkage
	Damaged King Pin/Ball Joint
	Low Tire Pressure
Excessive Steering Play	Worn Ball Joints
	Mis-Adjusted or Worn Steering Gear
	Loose Steering Linkage
Lack of Power or Slow Operation	Brakes or Parking Brakes Dragging
	Worn Drive Gears
	Front End Out of Alignment
	Defective Speed Control
Abnormal Noise	Worn Drive Gears or Bearings
	Worn Front /Rear Axle Bearings
	Loose Lug Nuts
	Motor Bearings Worn
Oil Leak in Rear Bearing Area	Rear Wheel Bearing and/or Gasket Failed
	Drive Over Filled
Brake Pedal Soft or Spongy	Air in Brake Lines
Brake Pedal Low	Brake Worn (1/16” Wear Limit)
	Brake Fluid Low
	Brakes Out of Adjustment
Braking Power Low	Brake Worn (1/16” Wear Limit)
	Brake Pads Contaminated with Fluid
	Brake Pedal Linkage Binding
	Brakes Out of Adjustment
	Air in Brake Lines

LUBRICATION CHART



#	Description	Locations	Lubricant Type
1	Front Leaf Springs		General Purpose Grease
2	King Pin		General Purpose Grease
3	Ball Joints		General Purpose Grease
5	Front Wheel Bearings		High Temperature Wheel Bearing Grease
6	Rear Leaf Springs		General Purpose Grease
9	Drive Fill Plug		11 oz. 30 wt Motor Oil

Notes:

Front Axle Service

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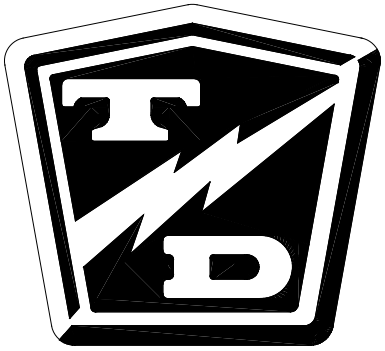


INSPECT THE FRONT WHEEL BEARINGS AND KIN PIN

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

4. Place blocks under the rear wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Raise the front of the vehicle and support with jack stands.

⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

7. Grab the top and bottom of the tire/wheel assembly. Feel for any movement or play while pulling and pushing on the top and bottom of the tire. Any movement or play is indication of loose wheel bearings or king pin.

NOTE: Refer to the **Adjust Front Wheel Bearings** *section for information regarding the adjustment of the wheel bearings.*

NOTE: If the king pin is loose, then refer to **Replace the King Pins and Bushings** *for information regarding replacing the king pin bushings. There are no adjustments for the king pin or bushings.*

8. Spin the wheel and listen for any grinding noise. Any grinding noise may be an indication of worn or damaged wheel bearings.

NOTE: Refer to the **Replace Front Wheel Bearings** *section for information regarding the replacement of the wheel bearings.*

9. Lower the vehicle.
10. Reconnect the main positive and negative cables at the batteries.
11. Remove the blocks from behind the wheels.
12. Release the park brake and test drive the vehicle.

ADJUST FRONT WHEEL BEARINGS

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

4. Place blocks under the rear wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

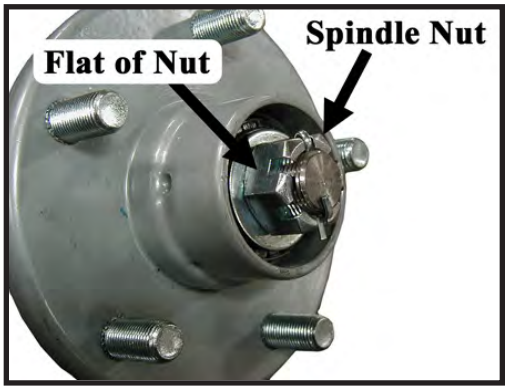
6. Raise the front of the vehicle and support with jack stands.

⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

7. Remove the hub dust cap and cotter pin.
8. While rotating the hub, tighten the spindle nut to 30 ft-lbs. This seats the bearings.
9. Back off the spindle nut one flat until the hub turns, but is not loose.
10. Spin the wheel and listen for any grinding noise. Any grinding noise may be an indication of worn or damaged wheel bearings.

    NOTE: Refer to the **Replace Front Wheel Bearings** *section for information regarding the replacement of the wheel bearings.*



Hub with Dust Cap Removed

11. Install a new cotter pin.
12. Install the dust cap.
13. Lower the vehicle.
14. Reconnect the main positive and negative cables at the batteries.
15. Remove the blocks from behind the wheels.
16. Release the park brake and test drive the vehicle.

FRONT AXLE REMOVAL AND INSTALLATION

Removal

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

4. Place blocks under the rear wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Raise the front of the vehicle and support with jack stands.

⚠WARNING

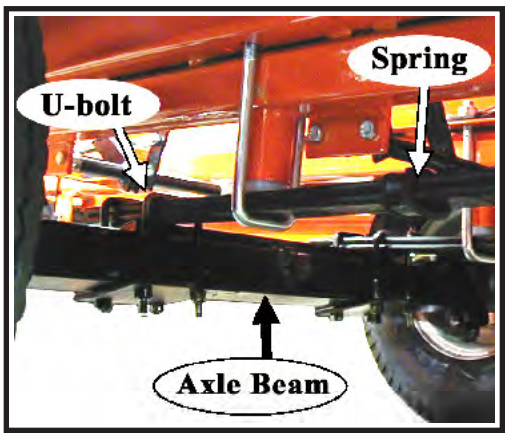
Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

7. Remove both front wheels. Refer to ***Tires and Wheels*** section for information regarding removing the front wheels.
8. Tie up or support the front axle so it can not fall out of the vehicle.
9. Disconnect the drag link ball joint or rod end from the steering knuckle or the steering gear pitman arm.

   NOTE: Refer to the **Replacing the Ball Joints** *section for information regarding the removal of the ball joints or rod ends.*

10. If equipped with front brakes, disconnect the hydraulic brake lines from the brake bodies.
11. Disconnect the front axle beam from the front springs and remove the axle from the vehicle.

    NOTE: In some configurations the front springs and or shocks will have to be removed in order to remove the axle beam. Refer to section **Front Suspension** *for information regarding removing the springs and shocks.*



Installation

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

4. Place blocks under the rear wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Raise the front of the vehicle and support with jack stands.

⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

7. Install the front axle in reverse order of removal.

   NOTE: Use all new cotter pins.

   NOTE: Refer to the **Replacing the Ball Joints** *section for information regarding the installation of the ball joints or rod ends.*

   NOTE: Refer to **Tires and Wheels** *section for information regarding removing the front wheels.*

8. Realign the front wheels. Refer to ***Steering Component Service*** section for information regarding realigning the front wheels.
9. If equipped with front brakes, bleed the brakes. Refer to ***Brake Service*** section for information regarding bleeding the brakes.
10. Lower the vehicle.
11. Reconnect the main positive and negative cables at the batteries.
12. Remove the blocks from behind the wheels.
13. Release the park brake and test drive the vehicle.

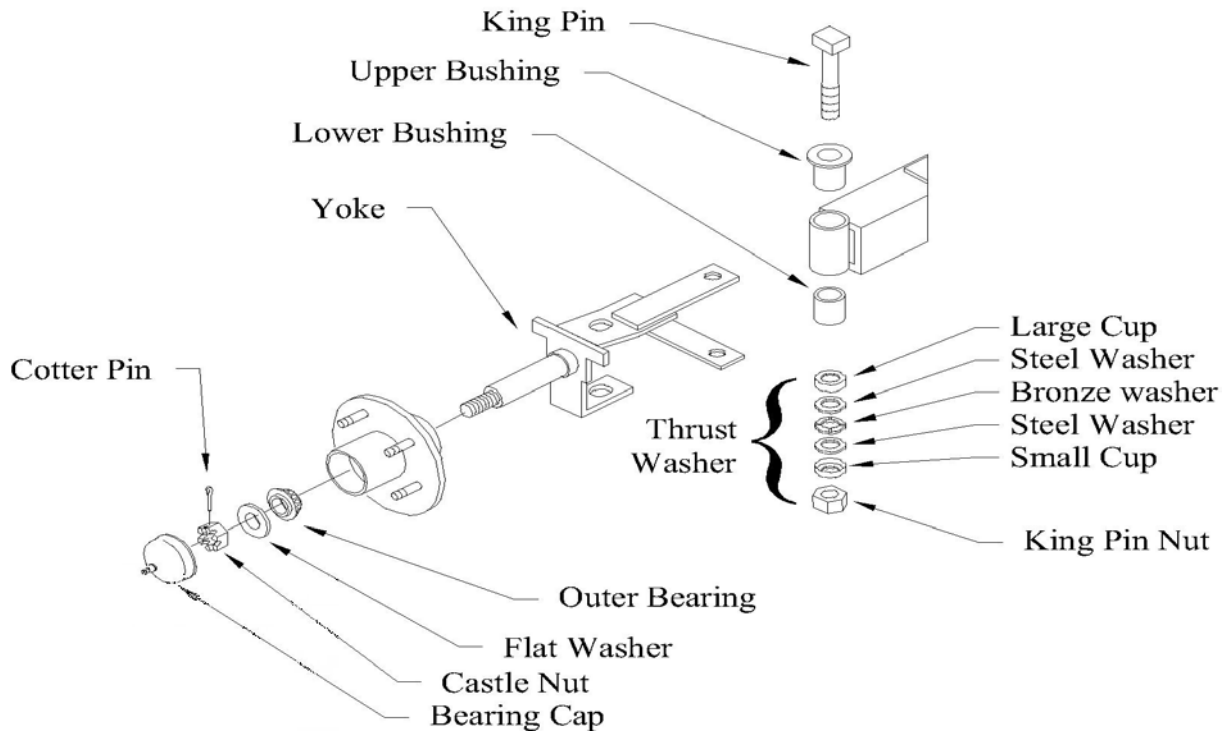
FRONT AXLE DISASSEMBLY AND ASSEMBLY

Disassembling and reassembling involves removing and replacing the left and right steering knuckles and king pin bushings. Refer to the following sections for information regarding these procedures:

Replace the Steering Knuckle

Replace the King Pins and Bushings

NOTE: The front axle does not have to be removed unless the axle beam must be replaced. Refer to **Front Axle Removal and Installation** *for information regarding removing the front axle.*



REPLACE FRONT WHEEL BEARINGS

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

4. Place blocks under the rear wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Raise the front of the vehicle and support with jack stands.

⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

7. Remove the tire/wheel assembly from the hub. Refer to ***Replace the Steering Knuckle*** for information regarding removing the steering knuckle.
8. Remove the hub dust cap, cotter pin, and spindle nut.
9. Remove the hub from the steering knuckle.

   NOTE: For a front disc brake option you must remove the brake body before removing the hub. Refer to the **Brakes** *section for information regarding the removal of the brake body.*

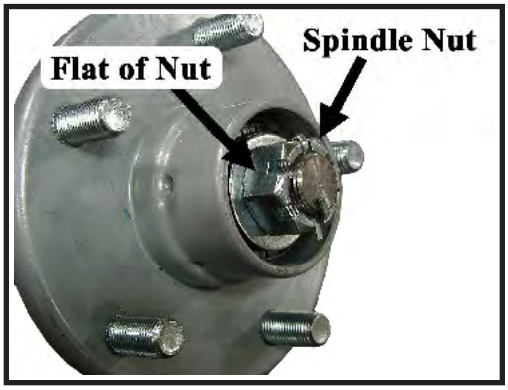
   NOTE: Catch the outer bearing as it falls out.

10. Thoroughly clean all grease from the inside of the hub and the bearings.
11. Inspect and replace the races and bearings as a set.

    NOTE: It is recommended to replace all four bearings and races in the left and right wheels as a set.

12. Assemble in reverse order, using new grease seals.
    a. Pack inner and outer bearings with grease.
    b. While rotating the hub, tighten the spindle nut to 30 ft-lbs. This seats the bearings.
    c. Back off the spindle nut one flat until the hub turns, but is not loose.
    d. Install a new cotter pin.
13. Install the hub dust cap.

Hub with Dust Cap Removed



Hub with Dust Cap Removed

14. Reinstall the brake body and the tire/wheel assembly.

    NOTE: Refer to the **Brakes** *section for information regarding the installation of the brake body.*

15. Lower the vehicle.
16. Reconnect the main positive and negative cables at the batteries.
17. Remove the blocks from behind the wheels.
18. Release the park brake and test drive the vehicle.

REPLACE THE BALL JOINTS, TIE RODS, AND DRAG LINK

This section will refer to two different types of ball joints. One type is has a grease fitting and a tapered shaft where it is installed on the steering arm or pitman arm. The second cannot be greased and has a straight shaft. See the illustrations to the right. Depending on the configuration of your vehicle, it may be equipped one or both types of ball joints.

In this text:
The first type will be referred to as a “Ball Joint.”
The second type will be referred to as a “Rod End.”

NOTE: If a rod end or ball joint is worn out, we recommend replacing all of the ball joints and/or rod ends as a set.

Rod End

Ball Joint

Replacing a Rod End

⚠WARNING

1. Make sure the key-switch is in the “OFF” position, then remove the key.
2. Place the forward-reverse switch in the center “OFF” position.
3. Set the park brake.
4. Place blocks under the rear wheels to prevent vehicle movement.
5. Disconnect the main positive and negative cables at the batteries.

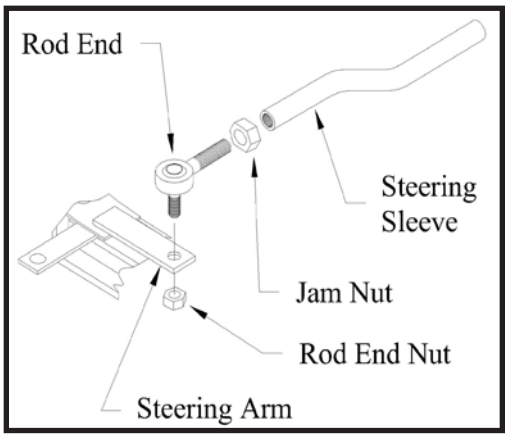
6. Raise the front of the vehicle and support with jack stands.

⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

7. Loosen the rod end jam nut or clamp on the steering sleeve.
8. Remove the rod end nut.
9. Remove the rod end from the steering arm.

   HINT: Count the number of turns required to remove the rod end from the steering sleeve. This will make it easier to realign the wheels.



10. Install the new rod end into the steering sleeve. Screw it into the sleeve the same number of turns counted in the previous step. Do not tighten the rod end clamp or jam nut at this time.
11. Install the rod end into the steering arm. Tighten the rod end nut to 20-25 ft-lbs.
12. Realign the front wheels.

    NOTE: Refer to the **Steering** *section for information regarding realignment of the front wheels.*

13. Lower the vehicle.
14. Reconnect the main positive and negative cables at the batteries.
15. Remove the blocks from behind the wheels.
16. Release the park brake and test drive the vehicle.

Replacing a Ball Joint

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

4. Place blocks under the rear wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Raise the front of the vehicle and support with jack stands.

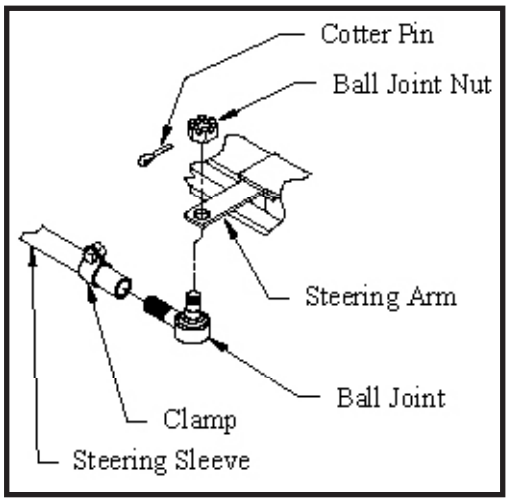
⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

7. Loosen the ball joint clamp on the steering sleeve.
8. Remove the cotter pin and ball joint nut.
9. Using a pickle fork, remove the ball joint from the steering arm.
10. Remove the ball joint from the steering sleeve.

    HINT: Count the number of turns required to remove the ball joint from the sleeve. This will make it easier to realign the wheels.

11. Install the new ball joint into the steering sleeve. Screw it into the sleeve the same number of turns counted in the previous step. Do not tighten the ball joint clamp at this time.
12. Install the ball joint into the steering arm. Tighten the ball joint nut to 40-45 ft-lbs. and install a new cotter pin.



13. Realign the front wheels.

    NOTE: Refer to the **Steering** *section for information regarding realignment of the front wheels.*

14. Lower the vehicle.
15. Reconnect the main positive and negative cables at the batteries.
16. Remove the blocks from behind the wheels.
17. Release the park brake and test drive the vehicle.

Replacing the Drag Link

The Drag Link is the linkage that connects the steering gear pitman arm to the steering knuckle. Refer to the illustration on the following page.

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.
2. Place the forward-reverse switch in the center "OFF" position.
3. Set the park brake.
4. Place blocks under the rear wheels to prevent vehicle movement.
5. Disconnect the main positive and negative cables at the batteries.

6. Raise the front of the vehicle and support with jack stands.

⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

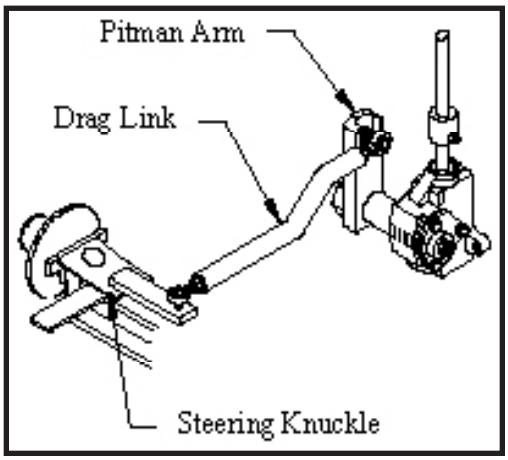
7. Remove the ball joints or rod ends from the steering knuckle and pitman arm.

   NOTE: Refer to the **Replacing the Ball Joints** *section for information regarding the removal of the ball joints or rod ends.*

8. Remove the drag link as an assembly.
9. Install in reverse order.
10. Realign the front wheels.

    NOTE: Refer to the **Steering** *section for information regarding realignment of the front wheels.*

11. Lower the vehicle.
12. Reconnect the main positive and negative cables at the batteries.
13. Remove the blocks from behind the wheels.
14. Release the park brake and test drive the vehicle.



Typical Drag Link

Replacing the Tie Rod

The Tie Rod is the linkage that connects the two steering knuckles together. Refer to the illustration on the following page.

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

4. Place blocks under the rear wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Raise the front of the vehicle and support with jack stands.

⚠WARNING

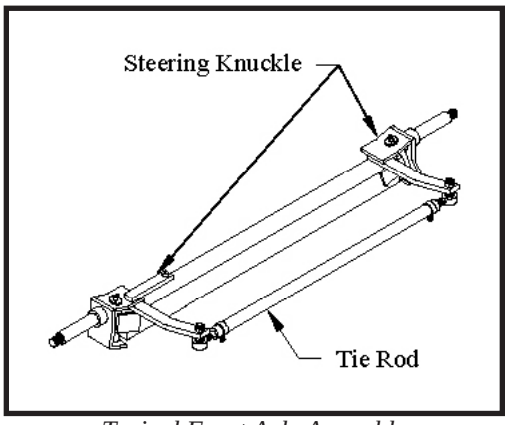
Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

7. Remove the ball joints or rod ends from the steering knuckles.

   NOTE: Refer to the **Replacing the Ball Joints** *section for information regarding the removal of the ball joints or rod ends.*

8. Remove the tie rod as an assembly.
9. Install in reverse order.
10. Realign the front wheels.

    NOTE: Refer to the **Steering** *section for information regarding realignment of the front wheels.*



Typical Front Axle Assembly

11. Lower the vehicle.
12. Reconnect the main positive and negative cables at the batteries.
13. Remove the blocks from behind the wheels.
14. Release the park brake and test drive the vehicle.

REPLACE THE KING PINS AND BUSHINGS

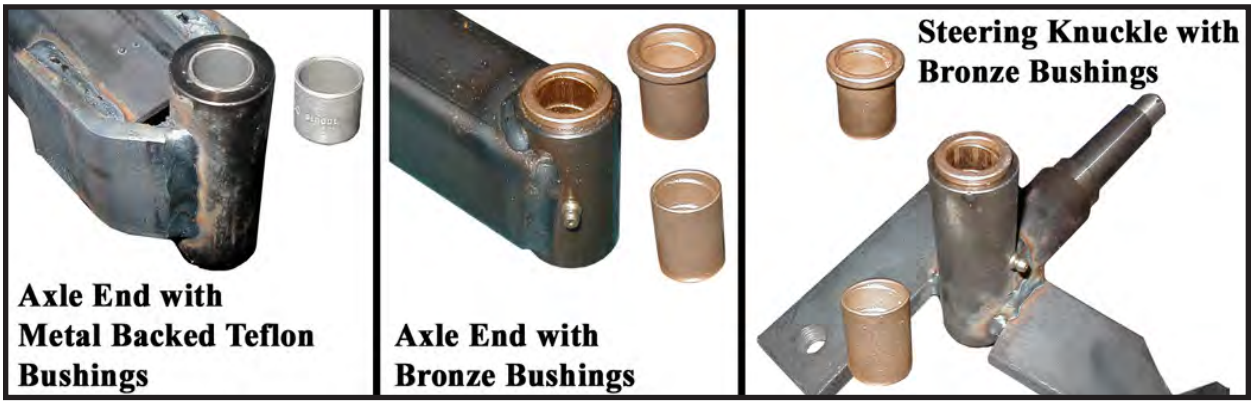
There are different types of king pin bushings depending on the configuration of your vehicle.

- Bronze bushings in the axle beam.
- Bronze bushings in the steering knuckle.
- Metal backed teflon bushings in the axle beam.

⚠WARNING

The bronze bushings must be reamed or broached to the proper diameter after they are pressed into the axle beam or steering knuckle. Failure to broach or ream the bushings may result in steering dificulty and loss of control of the vehicle causing severe bodily injury and / or property damage.

Refer to the illustration below for the type of bushing in your vehicle.



⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

4. Place blocks under the rear wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Raise the front of the vehicle and support with jack stands.

⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

7. Remove the steering knuckle. Refer to ***Replace the Steering Knuckle*** for information regarding removing the steering knuckle.

   NOTE: It is not necessary to remove the tie rod or drag link for this procedure.

8. Press the king pin bushings out from the axle or steering knuckle.
9. Press new bushings into the axle or steering knuckle.

⚠WARNING

The bronze bushings must be reamed or broached to the proper diameter after they are pressed in to the axle beam or steering knuckle. Failure to broach or ream the bushings may result in steering difficulty and loss of control of the vehicle causing severe bodily injury and / or property damage.

10. Ream or broach the bronze bushings to 0.878 ± 0.001 inches.
11. Inspect the king pin for damage or wear. If any damage or wear is noted then the king pin must be replaced.
12. Reassemble in reverse order.

    *NOTE: Refer to **Replace the Steering Knuckle** for information on installing the steering knuckle.*

    NOTE: It is recommended that the thrust washers or bearing be replaced whenever replacing the king pin bushings. Refer to the **Replacement Parts** *section for the orientation of the bearing or washers in your vehicle.*

13. Grease the bushings (bronze only).

14. Lower the vehicle.
15. Reconnect the main positive and negative cables at the batteries.
16. Remove the blocks from behind the wheels.
17. Release the park brake and test drive the vehicle.

REPLACE THE STEERING KNUCKLE

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

4. Place blocks under the rear wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Raise the front of the vehicle and support with jack stands.

⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

7. Remove the tire/wheel assembly. Refer to ***Tires and Wheels*** section for information regarding removing the tire/wheel assembly.
8. Remove the hub bearing cap, cotter pin and nut, then remove the hub from the steering knuckle.

   NOTE: For a front disc brake option you must remove the brake body before removing the hub. Refer to the **Brakes** *section for information regarding the removal of the brake body. Do not remove the hydraulic brake line from the brake body. If the brake line is removed then it will be necessary to bleed the brakes.*

   NOTE: Catch the outer bearing as it falls out.

Hub with Dust Cap Removed

9. Remove the drag link and/or tie rod from the steering knuckle. Refer to ***Replace the Ball Joints, Tie Rods, Drag Link*** in this section for information regarding removal of the drag link or tie rod.
10. While supporting the knuckle, remove the king pin and thrust bearing.
11. Remove the knuckle from the axle.
12. Thoroughly clean and/or replace all bearings, nuts, washers, and bushings.

13. Assemble in reverse order.
14. Pack the thrust bearing with grease.

    NOTE: Refer to the **Replacement Parts** *section for the orientation of the thrust bearing or washers in your vehicle.*

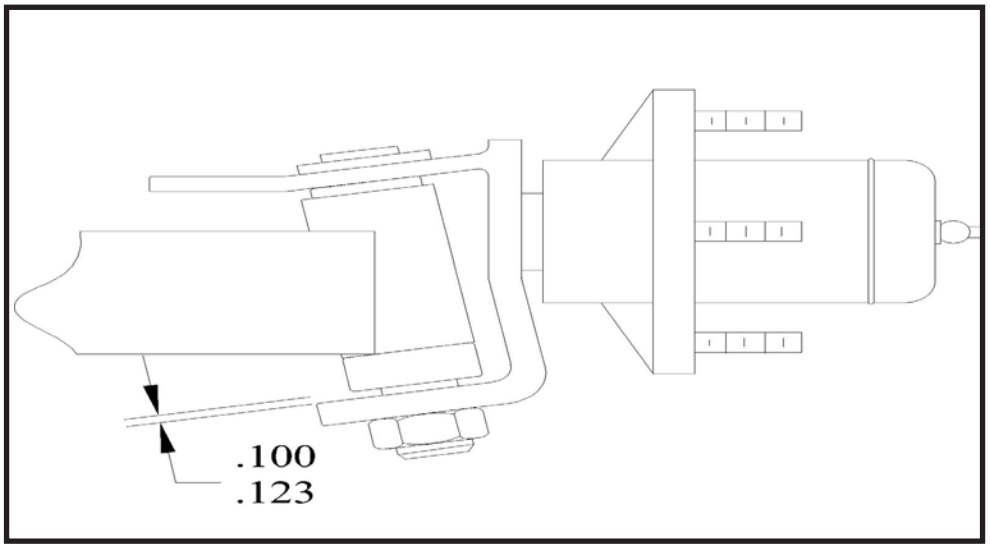
15. Tighten the king pin nut until there is 0.1 to 0.123 inches clearance as shown in the illustration below.

    NOTE: Refer to **Replace Front Wheel Bearings** *for information regarding proper tightening of the spindle nut*

16. Install new cotter pins.
17. Realign the wheels.

    NOTE: Refer to the **Steering** *section for information regarding realignment of the front wheels.*

18. Lower the vehicle.
19. Reconnect the main positive and negative cables at the batteries.
20. Remove the blocks from behind the wheels.
21. Release the park brake and test drive the vehicle.



Yoke clearance after tightening the king pin

Notes:

Steering Components

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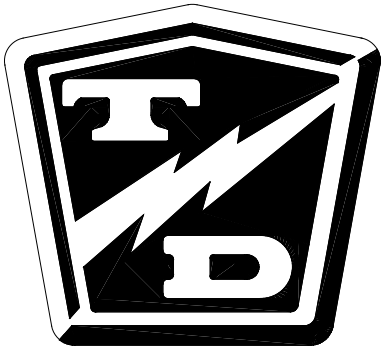


FRONT END ALIGNMENT

This section will refer to two different types of ball joints. One type is has a grease fitting and a tapered shaft where it is fitted to the steering arm or pitman arm. The second type cannot be greased and has a straight shaft. See the illustrations to the right. Depending on the configuration of your truck, it may be equipped with one or both types of ball joints.

In this text:
The first type has a grease fitting and will be referred to as a “Ball Joint.”
The second type has no grease fitting and will be referred to as a “Rod End.”

Ball Joint

Rod End

Center the Steering

⚠WARNING

1. Make sure the key-switch is in the “OFF” position, then remove the key.

2. Place the forward-reverse switch in the center “OFF” position.

3. Set the park brake.

4. Place blocks under the rear wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

6. Raise the front of the vehicle and support with jack stands.
7. Turn the front wheels so that they are in the straight ahead position and then tie off the wheels so that they cannot turn from the straight ahead position.
8. Disconnect the drag link from the pitman arm.

   NOTE: Refer to **Replace the Ball Joints** *section for information regarding removing the ball joint or rod end from the drag link.*

9. Center the steering gear and tie off the steering wheel so that it cannot rotate.

   NOTE: Refer to **Adjust the Steering Gear** *section for information regarding centering of the steering gear.*

10. At this point both the steering wheel ***and*** the front wheels should be tied up and held in position. If one or the other is not tied up then you must start from the beginning.

⚠WARNING

Do not drive the vehicle while the steering wheel or front wheels are tied in position. Driving the vehicle while the steering wheel or front wheels tied in the position may cause loss of control of the vehicle resulting in severe bodily injury and/or property damage.

11. Loosen the ball joint clamps or the rod end jam nuts on the drag link.

    NOTE: Remember the position and orientation of the clamps.

12. Adjust the drag link so that it can be easily inserted into the pitman arm.
13. Tighten the ball joint or rod end nut as specified below:
    Ball joint - 40-45 ft-lbs.
    Rod end - 20-25 ft-lbs.
14. If equipped with ball joints, position the ball joint clamps in their original location and orientation.
15. Tighten the ball joint clamps or the rod end jam nuts on the drag link.
16. Untie the steering wheel and the front wheels.
17. Reconnect the main positive and negative cables at the batteries.
18. Rotate the steering wheel from a full left turn to a full right turn and make sure that the ball joint clamps do not contact any other component.

⚠WARNING

If the clamps are positioned so that they contact other components, it may result in steering failure and loss of control of the vehicle causing property damage and/or severe bodily injury.

19. Remove the blocks from behind the wheels.
20. Release the parking brake and test drive the vehicle.

Front wheel alignment

NOTE: It is recommended to center the steering before aligning the front wheels. Refer to the **Center the Steering** *section for information.*

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

4. Place blocks under the rear wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

⚠WARNING

Do not drive the vehicle while the steering wheel or front wheels are tied in position. Driving the vehicle while the steering wheel or front wheels tied in the position may cause loss of control of the vehicle resulting in severe bodily injury and/or property damage.

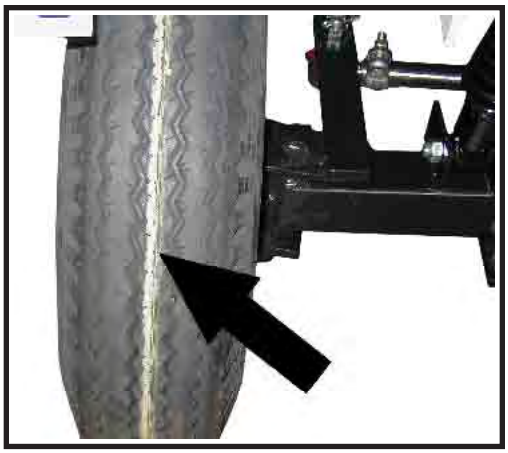
6. Raise the front of the vehicle and support with jack stands.
7. Turn the front wheels so that they are in the straight ahead position and tie off the steering wheel so that it cannot rotate.
8. Using a piece of chalk, mark a line around the center of both front tires.

   HINT: Hold the chalk on the center of the tire and rotate the tire to mark the line.

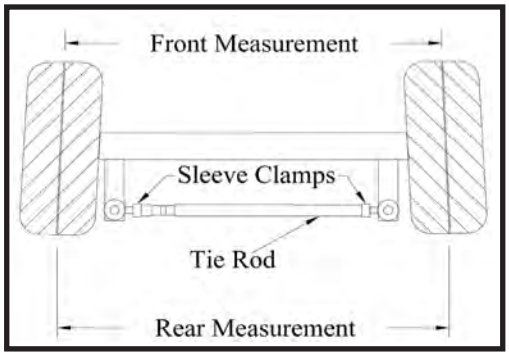
9. Loosen the ball joint clamps or the rod end jam nuts on the tie rod.

   NOTE: Remember the position and orientation of the ball joint clamps.

10. Lower the front wheels to the ground and push the vehicle back and forth a few feet to settle the suspension.



11. Measure the distance between the lines at the front of the tires.
12. Measure the distance between the lines at the rear of the tires.
13. Adjust the tie rod so that the distance at the front and rear of the tires is the same.
14. If equipped with ball joints, position the ball joint clamps in their original location and orientation.
15. Tighten the ball joint clamps or the rod end jam nuts.
16. Untie the steering wheel.



⚠WARNING

Rotate the steering wheel from a full left turn to a full right turn and make sure that the ball joint clamps do not contact any other component. Clamps positioned so that they contact other components may result in steering failure and loss of control of the vehicle causing severe bodily injury and/or property damage.

17. Reconnect the main positive and negative cables at the batteries.
18. Remove the blocks from behind the wheels.
19. Release the parking brake and test drive the vehicle.

ADJUST THE STEERING GEAR

NOTE: In some vehicle configurations it may be necessary to remove the steering gear to perform this procedure. Refer to **Replace the Steering Gear** *for information regarding removing the steering gear.*

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.
2. Place the forward-reverse switch in the center "OFF" position.
3. Set the park brake.
4. Place blocks under the rear wheels to prevent vehicle movement.
5. Disconnect the main positive and negative cables at the batteries.

⚠WARNING

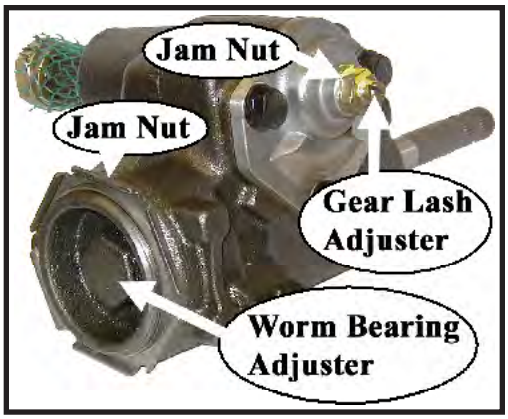
Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in serious bodily injury.

6. Raise the front of the vehicle and support with jack stands.

7. Disconnect the drag link from the pitman arm.

   NOTE: Refer to **Replace the Ball Joints** *section for information regarding removing the ball joint from the drag link.*

8. Loosen the gear lash jam nut and the worm bearing adjuster jam nut.
9. Unscrew the gear lash adjuster all of the way to the stop.
10. Loosen the worm bearing adjuster and then tighten just enough to remove all end play from the input shaft and then an additional 1/8 turn more.
11. While holding the worm bearing adjuster so that it cannot turn, tighten the worm bearing adjuster jam nut.



12. Find the center position of the steering shaft:
    A. Turn the steering shaft all of the way in one direction.
    B. While counting the rotations, turn the steering shaft all of the way in the opposite direction.
    C. Turn the steering shaft 1/2 the number of turns in the original direction.
13. While rotating the input shaft back and forth through its centered position, adjust the gear lash adjusting screw so that there is a slight drag as the steering gear is rotated through its centered position.
14. While holding the gear lash adjusting screw so that it cannot turn, tighten the gear lash adjusting screw jam nut.
15. Reconnect the main positive and negative cables at the batteries.
16. Remove the blocks from behind the wheels.
17. Release the parking brake and test drive the vehicle.

REPLACE THE STEERING SHAFT

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

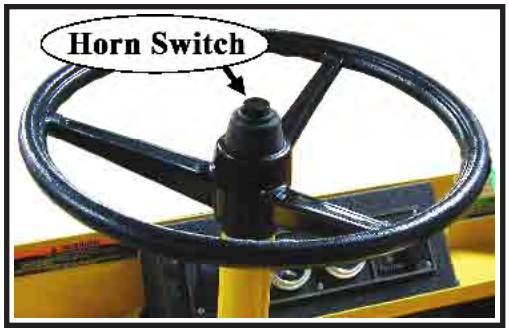
3. Set the park brake.

4. Place blocks under the front wheels to prevent vehicle movement.

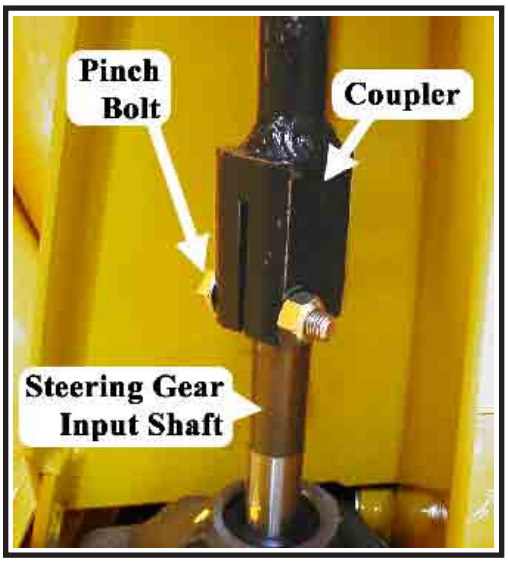
5. Disconnect the main positive and negative cables at the batteries.

6. If equipped with a horn switch in the steering wheel, remove the switch, disconnect the wires from the switch and cut the terminals off of the wires.
7. Remove the steering wheel.

NOTE: Refer to **Replace the Steering Wheel** *section for information regarding removing the steering wheel.*



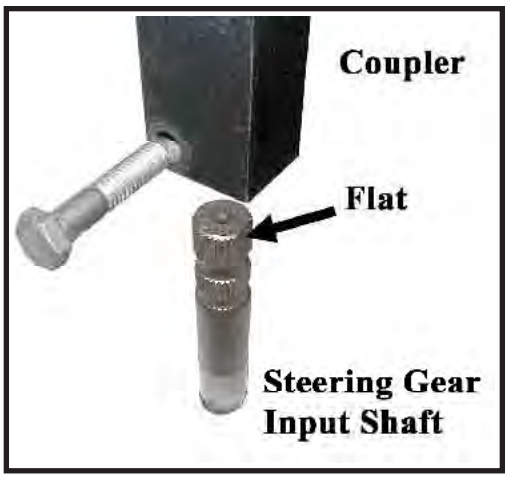
8. Remove the upper steering shaft bushing or bearing from the steering column.
9. Remove the steering gear access cover from the steering column (if equipped).



10. Remove and discard the pinch bolt and nut from the steering shaft coupler.

NOTE Most vehicle configurations will now allow the steering shaft to slide off of the steering gear input shaft and then back down out of the steering column. If there is not enough clearance for this procedure then the steering gear must be removed. Refer to **Replace the Steering Gear** *for information regarding removing the steering gear.*

11. Remove the steering shaft from the vehicle.
12. Lightly grease the input shaft splines, steering wheel splines and the upper steering shaft bushing.
13. Install the steering shaft in reverse order using a new pinch bolt. Orientate the shaft so that the pinch bolt is opposite the flat in the steering gear shaft. See the illustration to the right.



⚠WARNING

Make sure that the pinch bolt is not aligned with the flat on the steering shaft. Aligning the bolt with the flat could result in failure of the steering and loss of control of the vehicle. This could lead to property damage and/or severe bodily injury.

⚠WARNING

Do not use the original pinch bolt and nut. Failure to replace the pinch bolt and nut may result in failure of the steering causing loss of control of the vehicle. This could lead to property damage and/or severe bodily injury.

14. Tighten the pinch bolt to 24-26 ft-lbs.
15. Reconnect the main positive and negative cables at the batteries.
16. Remove the blocks from behind the wheels.
17. Release the parking brake and test drive the vehicle.

REPLACE THE STEERING WHEEL

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

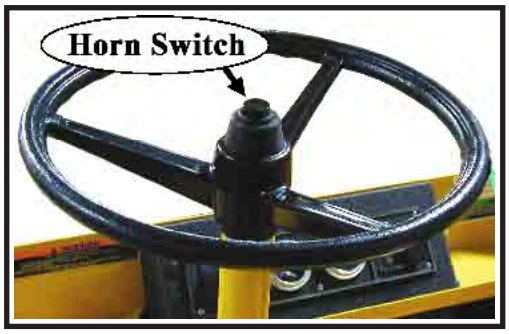
2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. If equipped with a horn switch in the steering wheel, remove the switch and disconnect the wires from the switch.
7. Remove the steering wheel nut.
8. Using a steering wheel puller, remove the steering wheel.
9. Position the front wheels in the straight ahead position.
10. Lightly grease the steering wheel splines and install the replacement steering wheel orientated as shown in the illustration to the right.
11. Tighten the steering wheel nut to 50-60 ft-lbs
12. Reinstall the horn switch (if equipped).
13. Reconnect the main positive and negative cables at the batteries.
14. Remove the blocks from behind the wheels.
15. Release the parking brake and test drive the vehicle.



REPLACE THE STEERING GEAR

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

4. Place blocks under the rear wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Remove the steering wheel.

   NOTE: Refer to **Replace the Steering Wheel** *section for information regarding removing the steering wheel.*

7. Remove the steering shaft.

   NOTE: Refer to **Replace the Steering Shaft** *section for information regarding removing the steering shaft.*

8. Remove the pitman arm using a pickle fork.

   NOTE: On some vehicle configurations it may be required to remove the drag link from the pitman arm. Refer to **Replace the Ball Joints** *section for information regarding removing the ball joint from the pitman arm.*

9. Support the steering gear so that it cannot fall out of the vehicle.

⚠WARNING

Failure to support the steering gear will result in the steering gear falling out of the vehicle and could cause property damage and/or severe bodily injury.

Steering Gear with Pitman Arm

10. Remove the bolts holding the steering gear to the vehicle frame and remove the steering gear from the vehicle.
11. Install in reverse order. Torque the pitman arm nut to75-100 ft-lbs.
12. Reconnect the main positive and negative cables at the batteries.
13. Remove the blocks from behind the wheels.
14. Release the parking brake and test drive the vehicle.

REPAIR THE STEERING GEAR

Disassembly

NOTE: The steering gear must be removed from the vehicle for this procedure. Refer to **Replace the Steering Gear** *section for information regarding removing the steering gear.*

NOTE: The steering gear is packed with grease. Only perform maintenance on the steering gear in an area that will contain any grease that may spill out of the steering gear when it is disassembled.

Refer to the illustration at the end of this section for a blown up view of the steering gear assembly.

1. Center the steering gear.
   A. Turn the steering shaft all of the way in one direction.
   B. While counting the rotation, turn the steering shaft all of the way in the opposite direction.
   C. Turn the steering shaft 1/2 the number of turns in the original direction.
2. Remove the worm bearing adjuster locking ring and the worm bearing adjuster.

3. Remove the side cover/pitman shaft assembly by removing the three side cover bolts and then pulling the assembly out of the housing.

   NOTE: The side cover/pitman shaft assembly normally does not have to be disassembled.

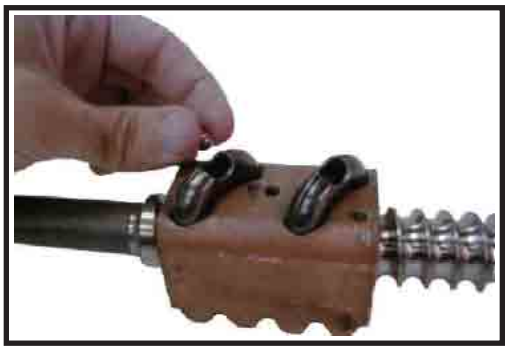
4. Remove the worm shaft and ball nut assembly from the bottom of the housing.
5. Remove the worm shaft seal.
6. Remove the pitman shaft seal.
7. Remove the upper worm bearing and bearing cup from the housing.

8. The ball nut assembly consists of two sets of ball bearings that recirculate in two channels in the ball nut housing. The bearings may fall out once the bearing guides are removed. Be careful not to lose any of the bearings.
9. Remove the ball guide clamps, ball guides and all of the ball bearings.
10. Remove the ball nut from the worm shaft.
11. Thoroughly clean and inspect all parts for signs of corrosion, damage or wear and replace as required.

Reassembly

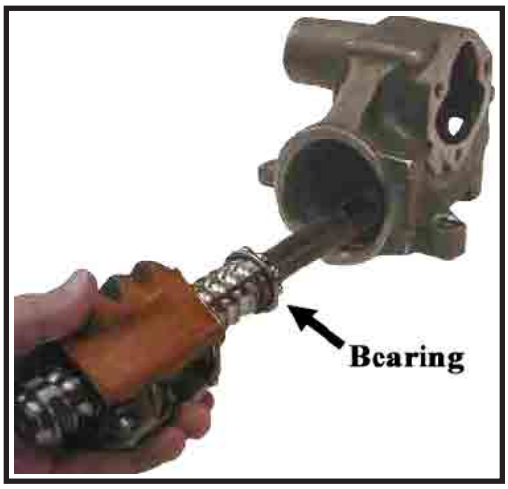
1. Lightly lubricate all parts before reassembly.
2. Install a new worm shaft seal and pitman shaft seal into the housing.
3. Install the upper worm bearing cup.
4. Divide the ball bearing into two equal groups.
5. Position the ball nut onto the worm as shaft as shown in the illustration.
6. Insert the ball guides into the ball nut.
7. Insert each group of bearings into the ball guides.

   NOTE: Do not rotate the worm shaft while installing the bearings. This may cause one or more of the bearings to enter the crossover passage in the ball nut, causing improper operation.



8. Install the ball guide clamp.

9. Place the upper worm bearing on the worm shaft and install the worm shaft/ball nut assembly into the housing being careful not to damage the worm shaft seal.

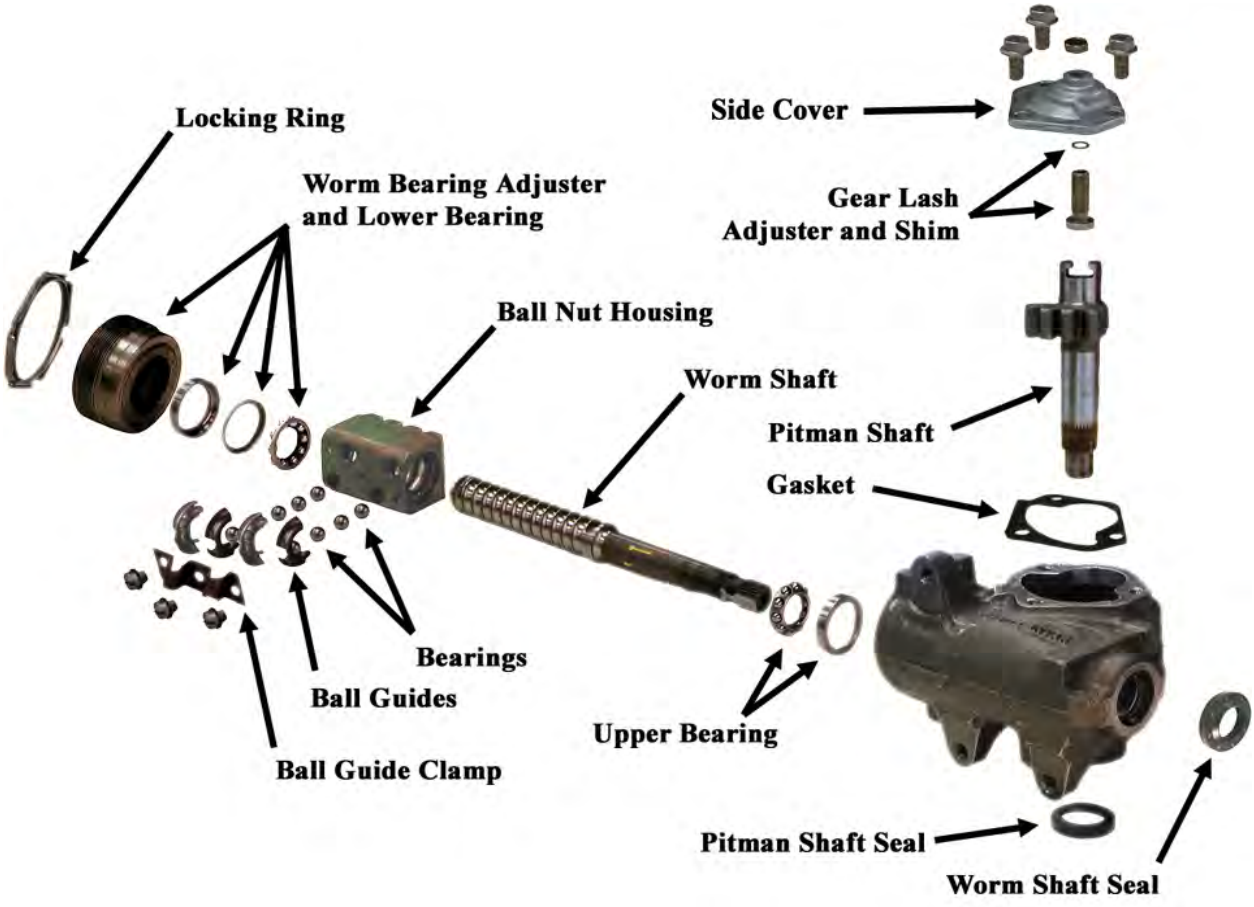


10. Install the assembled worm bearing adjuster into the housing and tighten just enough to remove all play in the worm shaft.
11. Install, but do not tighten the worm bearing adjuster lock nut.
12. Rotate the worm shaft to center the ball nut in the housing.
13. Place a new gasket onto the housing and install the assembled pitman shaft/side cover onto the housing using two of the three mounting bolts.
14. Pack the steering gear with grease through the open side cover bolt hole and then install the bolt.
15. Adjust the steering gear.

    NOTE: Refer to **Adjust the Steering** *gear section for information regarding adjusting the steering gear.*

16. Once the adjustments are completed, make sure that the locking ring and jam nut are tight.

Exploded View of Steering Gear



Brake Service

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INSPECT THE SERVICE BRAKE

NOTE: Front brakes are optional

Front Disc Brake Pads

⚠WARNING

Current Taylor-Dunn® brakes are asbestos free. However, there is the possibility that the original brakes were replaced with aftermarket parts containing asbestos. Since this possibility exists, all brake parts should be handled as if they contain asbestos. Refer to Appendix C for recommended handling precautions.

NOTE: The brake pad must be removed to accurately measure the lining thickness. Refer to **Replace the Front Pads** *section for information on removing the brake pads.*

Measure the brake pad lining at the thinnest point on the pad. If the brake pad lining is 1/16-inch or less then the brake pad must be replaced.

It is recommended to replace the left and right side brake pads as a set.

Front Disc Brake Rotor

⚠WARNING

Do not use a rotor that is worn beyond its service limits. A rotor worn beyond its service limits could fail and cause loss of brakes resulting in severe bodily injury and/or property damage.

NOTE: The front brake rotor is an integral part of the front hub. If the brake rotor is worn beyond its service limits, then the front hub must be replaced. Refer to **Front Axle Service** *for information on replacing the front hub.*

NOTE: The wheel must be removed to accurately measure the rotor thickness. Refer to **Tires and Wheels** *section for information on removing the wheel.*

1. Measure the run out of the rotor at its maximum diameter. If the run out exceeds 0.005, then the rotor must be machined. Do not machine the rotor beyond its service limits.
2. Measure the thickness of the brake rotor in 3 places. If the brake rotor thickness is less than 0.20-inches, then the rotor must be replaced.

Measuring pad thickness

Rear Brake Shoes

⚠WARNING

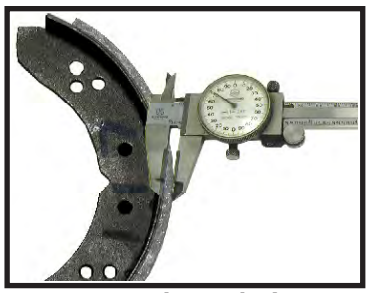
Current Taylor-Dunn® brakes are asbestos free. However, there is the possibility that the original brakes were replaced with aftermarket parts containing asbestos. Since this possibility exists, all brake parts should be handled as if they contain asbestos. Refer to Appendix C for recommended handling precautions.

NOTE: The wheel must be removed to accurately measure the brake shoes. Refer to **Tires and Wheels** *section for information on removing the wheel.*

Measure the brake shoe lining at the thinnest point on the shoe. If this is 1/16-inch or less then the brake shoe must be replaced.

NOTE: If this is a riveted lining, then the measurement must be to the top of the rivets.

It is recommended to replace the left and right side brake shoes as a set.


Measuring lining thickness

Rear Brake Drum

⚠WARNING

Current Taylor-Dunn® brakes are asbestos free. However, there is the possibility that the original brakes were replaced with aftermarket parts containing asbestos. Since this possibility exists, all brake parts should be handled as if they contain asbestos. Refer to Appendix C for recommended handling precautions.

NOTE: The wheel must be removed to accurately measure the brake drum. Refer to **Tires and Wheels** *section for information on removing the wheel.*

The service limit for the inside diameter of the brake drum is 7.060 inches.

If the brake drum is grooved or worn beyond the service limit then the brake drum must be replaced.

Measure the inside diameter of the brake drum in 3-places.

If the difference between any of the measurements exceeds 0.010-inches then the brake drum must be replaced.

⚠WARNING

Do not use a brake drum that is worn beyond its service limits. A drum worn beyond its service limits could fail and cause loss of brakes resulting in severe bodily injury and/or property damage.

INSPECT THE PARKING BRAKE

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

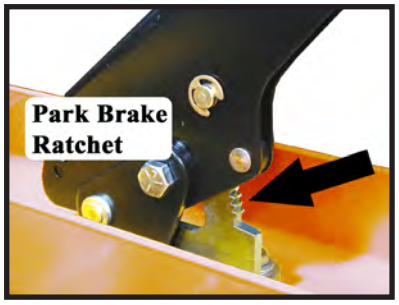
2. Place the forward-reverse switch in the center "OFF" position.

3. Confirm the electric park brake is set.

4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Release the park brake.
7. Inspect the brake shoes. The parking brake shoes are the same as the service brake shoes. Refer to ***Inspect the Service Brake*** section to inspect the brake shoes.
8. Inspect all brake cables and linkages for any signs of damage or missing cotter pins.
9. Inspect the park brake ratchet for any signs of damage or wear.
10. Set the park brake.
11. Reconnect the main positive and negative cables at the batteries.
12. Remove the blocks from the wheels



ADJUST THE SERVICE BRAKES

Mechanical and Hydraulic Drum Brakes

The mechanical and hydraulic brake assemblies are identical except for hydraulic fittings. The adjustment procedure is the same for both the mechanical and hydraulic brakes.

NOTE: The brake adjustment is inside of the left and right brake. Do not adjust the brake by means of the brake cables as this will cause mis-operation of the brakes. If you hear a single "clunking" noise while braking it may be due to mis-adjustment of the brake cables or linkage. Refer to **Replace Brake Linkages/Cables** *for information regarding proper adjustment of the cables and linkages.*

⚠WARNING

Adjusting the brakes by means of the brake cables could cause a hard brake pedal with little or no braking power. This could cause loss of control of the vehicle resulting in property damage and/or severe bodily injury.

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. Confirm the electric park brake is set.

4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

6. Raise the wheel off of the ground and support with jack stands.
7. Release the park brake.
8. Remove the tire/wheel assembly.

NOTE: Refer to **Tires and Wheels** *section for information on removing the wheel.*

9. Align the adjusting access slot in the brake drum with the adjusting star wheel at the bottom of the brake.
10. While rotating the brake drum back and forth, rotate the brake adjuster star wheel until the brake is tight enough so that brake drum cannot be rotated.
11. Back off the star wheel just enough so that the brake drum rotates freely.
12. Install the tire/wheel assembly.
13. Repeat this procedure for the opposite side brake.
14. Set the park brake.
15. Reconnect the main positive and negative cables at the batteries.
16. Remove blocks from behind the wheels.
17. Release the park brake and test drive the vehicle.

Brake drum shown with the access slot aligned with the adjusting star wheel .

Adjust the Mechanical Brake Linkages

⚠WARNING

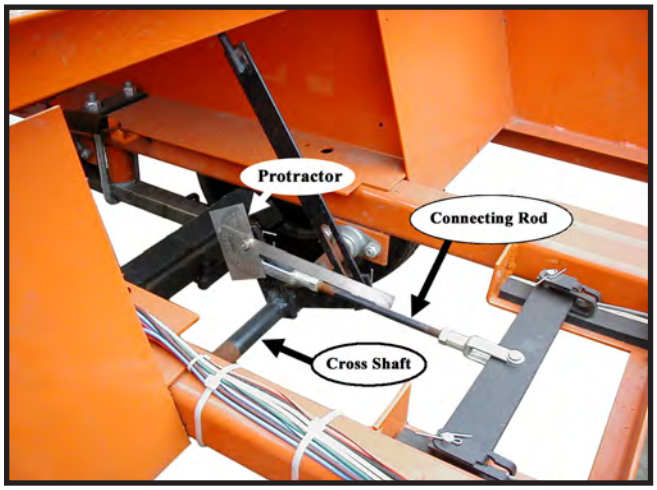
Adjusting the brakes by means of the brake cables could cause a hard brake pedal with little or no braking power. This could cause loss of control of the vehicle resulting in severe bodily injury and/or property damage.

Do not use this procedure to adjust the brakes. This procedure should only be performed when replacing any of the mechanical brake linkages or cables or it is found that the cables or linkages have been adjusted incorrectly.

⚠WARNING

1. **Make sure the key-switch is in the "OFF" position, then remove the key.**
2. **Place the forward-reverse switch in the center "OFF" position.**
3. **Confirm the electric park brake is set.**
4. **Place blocks under the front wheels to prevent vehicle movement.**
5. **Disconnect the main positive and negative cables at the batteries.**

6. Release the park brake.
7. Loosen the clevis jam nuts on the main brake cable and connecting rod (refer to illustration on previous page.
8. Loosen the brake cable and connecting rod.
9. Adjust the park brake linkage so that the angle between the connecting rod and the cross shaft tab is at 60 degrees.
10. Tighten the brake cable so that all slack is removed from the cable, but not so much so that the cross shaft rotates.
11. Tighten the connecting rod so that all slack is removed from the brake cables, but not so much as to actuate the brakes.
12. Tighten the jam nuts on the brake cable, connecting rod, and park brake linkage.
13. Set the park brake.
14. Reconnect the main positive and negative cables at the batteries.
15. Remove blocks from behind the wheels.
16. Release the park brake and test drive the vehicle.



Brake linkage with protractor in place at 60 degrees

ADJUST THE PARKING BRAKE

Wheel Park Brake (mechanical drum standard)

Trucks equipped with mechanical drum brakes do not have a separate adjustment for the parking brake. If the parking brake requires adjustment, then the entire brake system is in need of adjustment. Refer to ***Adjust the Service Brake*** section for information regarding adjusting the brakes.

Wheel Park Brake (hydraulic drum)

NOTE: Hydraulic brakes are optional. The service brake must be properly adjusted before attempting to adjust the parking brake. Refer to **Adjust the Service Brakes** *for information regarding adjusting the service brakes.*

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

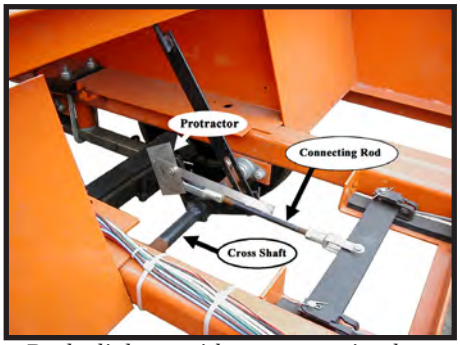
2. Place the forward-reverse switch in the center "OFF" position.

3. Confirm the electric park brake is set.

4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Release the park brake.
7. Loosen the clevis jam nuts on the connecting rod (refer to illustration on next page).
8. Loosen the connecting rod.
9. Adjust the park brake linkage so that the angle between the connecting rod and the cross shaft tab is at 60 degrees.
10. Tighten the connecting rod so that all slack is removed from the brake cables, but not so much as to actuate the brakes.
11. Tighten the jam nuts on the connecting rod and park brake linkage.
12. Set the park brake.
13. Reconnect the main positive and negative cables at the batteries.
14. Remove blocks from behind the wheels.
15. Release the park brake and test drive the vehicle.



Brake linkage with protractor in place at 60 degrees

CHECK MASTER CYLINDER FLUID

⚠WARNING

Do not ingest brake fluid or allow contact with skin or eyes. Always wear protective clothing and a face shield when working with or around brake fluid.

SKIN CONTACT

Flush area immediately with water for several minutes. If a rash or skin irritation develops, get medical attention immediately.

EYE CONTACT

Immediately flush the eye with water for 15 minutes and call physician.

INGESTION

Get medical attention immediately.

⚠WARNING

- **Only use DOT 3 brake fluid from a new sealed container.**
- **DOT 3 brake fluid is corrosive and will damage paint finishes.**
- **Dispose of brake fluid in accordance with local state and federal regulations.**
- **Read and follow all warnings on the brake fluid container.**

⚠WARNING

1. **Make sure the key-switch is in the "OFF" position, then remove the key.**
2. **Place the forward-reverse switch in the center "OFF" position.**
3. **Set the park brake.**
4. **Place blocks under the front wheels to prevent vehicle movement.**
5. **Disconnect the main positive and negative cables at the batteries.**

6. Thoroughly clean the area around the master cylinder cap.
7. Remove the master cylinder cap.
8. If the fluid in the master cylinder is contaminated then the entire brake system must be flushed. Refer to ***Bleed the Brakes*** for information regarding flushing the brake system.
9. Fill with brake fluid from a new sealed container to within 1/4-inch of the top of the master cylinder chamber and reinstall the cap.
10. Reconnect the main positive and negative cables at the batteries.
11. Remove blocks from behind the wheels.
12. Release the parking brake and test drive the vehicle.

BLEED THE BRAKE SYSTEM

⚠WARNING

Do not ingest brake fluid or allow contact with skin or eyes. Always wear protective clothing and a face shield when working with or around brake fluid.

SKIN CONTACT

Flush area immediately with water for several minutes. If a rash or skin irritation develops, get medical attention immediately.

EYE CONTACT

Immediately flush the eye with water for 15 minutes and call physician.

INGESTION

Get medical attention immediately.

⚠WARNING

- **Only use DOT 3 brake fluid from a new sealed container.**
- **DOT 3 brake fluid is corrosive and will damage paint finishes.**
- **Dispose of brake fluid in accordance with local state and federal regulations.**
- **Read and follow all warnings on the brake fluid container.**

NOTE: Hydraulic brakes are optional. Start this procedure at the wheel furthest from the master cylinder, then work toward the wheel closest to the master cylinder.

6. Thoroughly clean the area around the master cylinder cap and remove the cap.
7. Add brake fluid from a new sealed container to the master cylinder. Fill to 1/4” from the top of the master cylinder chamber.
8. The master cylinder fluid level will drop as the brakes are bled. Periodically check and fill the master cylinder during this procedure. Do not allow the fluid level in the master cylinder to drop too low as this will allow air into the brake lines.
9. Attach a clear hose to the bleeder valve on the brake cylinder that is to be bled. Route the hose into a clear container for waste brake fluid.
10. Pump the brake pedal a few times and then press and hold light pressure to the brake pedal.
11. Open the bleeder valve on the hydraulic brake body.
12. Depress the foot pedal to the floor and then close the bleeder valve. Do not release pressure on the brake pedal until the bleeder valve is closed.
13. Slowly release the foot pedal, allowing it to return to its released position.

NOTE: Check and fill the master cylinder frequently during the bleeding process. Do not allow the fluid level in the master cylinder to drop low enough to allow air to enter the brake lines. If air enters the brake lines during the bleeding process, then you will have to start again from the beginning.

14. Repeat the above steps until you are sure that all of the air is expelled from the brake line. Any air bubbles that can be seen in the clear hose attached to the bleeder is an indication that there is still air in the brake lines.
15. Repeat this process with each of the other wheels.

NOTE: When finished, top off the master cylinder with fluid. See **Check Master Cylinder Fluid** *for information on filling the master cylinder.*

16. Reconnect the main positive and negative cables at the batteries.
17. Remove the blocks from behind the wheels.
18. Release the park brake and test drive the vehicle.

Typical bleeder valve

FLUSH THE BRAKE SYSTEM

⚠WARNING

Do not ingest brake fluid or allow contact with skin or eyes. Always wear protective clothing and a face shield when working with or around brake fluid.

SKIN CONTACT

Flush area immediately with water for several minutes. If a rash or skin irritation develops, get medical attention immediately.

EYE CONTACT

Immediately flush the eye with water for 15 minutes and call physician.

INGESTION

Get medical attention immediately.

⚠WARNING

1. **Make sure the key-switch is in the "OFF" position, then remove the key.**
2. **Place the forward-reverse switch in the center "OFF" position.**
3. **Confirm the electric park brake is set.**
4. **Place blocks under the front wheels to prevent vehicle movement.**
5. **Disconnect the main positive and negative cables at the batteries.**

⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

NOTE: Hydraulic brakes are optional.

6. Raise the rear wheels off of the ground and support with jack stands.
7. If equipped with front brakes, raise the front wheels off of the ground and support with jack stands.
8. Release the park brake.

⚠WARNING

- **Only use DOT 3 brake fluid from a new sealed container.**
- **DOT 3 brake fluid is corrosive and will damage paint finishes.**
- **Dispose of brake fluid in accordance with local state and federal regulations.**
- **Read and follow all warnings on the brake fluid container.**

9. Remove both rear wheels and, if equipped with front brakes, the front wheels. Refer to ***Tires and Wheels*** section for information regarding removing the wheels.
10. Remove the wheel cylinders from each axle. Refer to ***Replace the Wheel Cylinder*** section for information regarding removing the wheel cylinder.
11. Attach a clear hose to the bleeder valve on each of the wheel cylinders and route the hoses into a container for waste brake fluid.
12. Position the wheel cylinders so that the bleeder screw is pointing to the ground and open all bleeder screws.
13. Pump the master cylinder until all fluid has been pumped from the brake lines and all wheel cylinders.
14. Close all bleeder screws.
15. Fill the master cylinder with fluid.
16. Open one of the bleeder screws and pump the master cylinder until all fluid has been pumped from the master cylinder and close the bleeder screw.
17. Repeat the above two steps for each wheel cylinder.
18. Reinstall the wheel cylinders and bleed the brakes. Refer to ***Bleed the Brakes*** for information regarding bleeding the brakes.
19. Set the park brake.
20. Install the wheels and lower the vehicle to the ground.
21. Reconnect the main positive and negative cables at the batteries.
22. Release the park brake and test drive the vehicle.

REPLACE FRONT DISC BRAKE PADS

⚠WARNING

Current Taylor-Dunn® brakes are asbestos free. However, there is the possibility that the original brakes were replaced with aftermarket parts containing asbestos. Since this possibility exists, all brake parts should be handled as if they contain asbestos. Refer to Appendix C for recommended handling precautions.

NOTE: Front brakes are optional. It is recommended that both the left and right brake pads be replaced as a set.

NOTE: Installing new brake pads will raise the brake fluid level in the master cylinder.

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. Confirm the electric park brake is set.

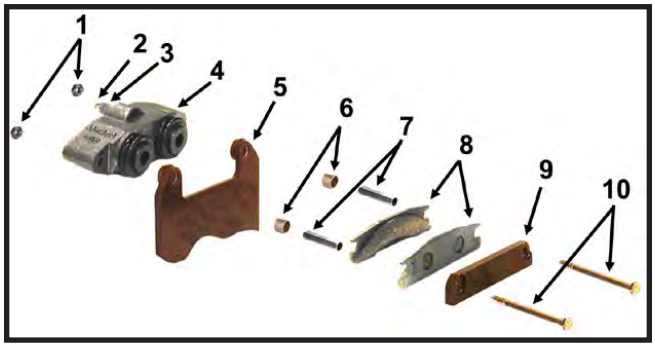
4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

6. Thoroughly clean the area around the master cylinder cap.
7. Remove fluid from the master cylinder until it is 1/2 full.
8. Raise the front of the vehicle and support with jack stands.
9. Remove the tire/wheel assembly. Refer to ***Tires and Wheels*** section for information on removing the tire and wheel assembly.



NOTE: Refer to the illustration above for the following steps.

10. Remove the brake body bolts (10) and discard the lock nuts (1) and brake pads (8).
11. Remove the spacer bushings (6) from the mounting bracket (5) and discard the bushings.
12. Inspect the brake rotor. See ***Inspect the Service Brakes*** section for information regarding inspecting the brake rotor.
13. Inspect the spacers (7) and replace if any wear or damage is found.
14. Install new spacer bushings in the mounting bracket.
15. Install new brake pads in reverse order. Torque the mounting bolts to 11 ft-lbs.
16. Repeat this procedure for the other wheel.
17. Install the tire/wheel assembly and lower the vehicle to the ground.
18. Fill the master cylinder to the proper level. Refer to ***Check Master Cylinder Fluid*** section for information on the proper master cylinder fluid level.
19. Reconnect the main positive and negative cables at the batteries.
20. Remove the blocks from behind the wheels.
21. Release the park brake and test drive the vehicle.

REPLACE REAR BRAKE SHOES

⚠WARNING

Current Taylor-Dunn® brakes are asbestos free. However, there is the possibility that the original brakes were replaced with aftermarket parts containing asbestos. Since this possibility exists, all brake parts should be handled as if they contain asbestos. Refer to Appendix C for recommended handling precautions.

⚠WARNING

1. **Make sure the key-switch is in the "OFF" position, then remove the key.**
2. **Place the forward-reverse switch in the center "OFF" position.**
3. **Confirm the electric park brake is set.**
4. **Place blocks under the front wheels to prevent vehicle movement.**
5. **Disconnect the main positive and negative cables at the batteries.**

⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

NOTE: It is recommended that both the left and right brake pads be replaced as a set.

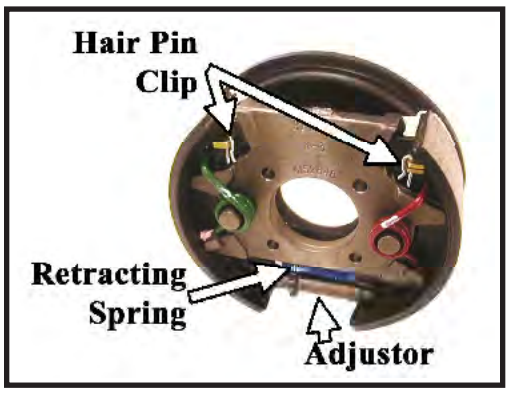
6. Release the park brake.
7. Raise the rear wheels off of the ground and support with jack stands.
8. Remove the tire/wheel assembly. Refer to ***Tires and Wheels*** section for information on removing the wheel.
9. Remove and inspect the brake drum. Refer to ***Inspect the Service Brake*** section for information regarding inspecting the brake drum.
10. Remove the retracting springs and torsion springs from the brake shoes.
11. Remove the hair pin clips from the actuating arms and discard.
12. Remove the brake shoes and brake adjustor assembly from the backing plate.
13. Thoroughly clean and inspect the adjustor assembly. Replace parts as required.

⚠WARNING

Do not allow grease to contact any of the braking surfaces. Braking surfaces contaminated with grease may cause the brakes to fail resulting in property damage and/or severe bodily injury.

14. Apply a *very light* coating of high temperature grease to the adjustor screw threads.
15. Install in reverse order.
16. Repeat for the opposite side.
17. Adjust the brakes. See ***Adjust the Service Brakes*** section for information regarding adjusting the brakes.
18. Set the park brake.
19. Reconnect the main positive and negative at the batteries.
20. Lower the wheels to the ground.
21. Remove the blocks from behind the wheels.
22. Release the park brake and test drive the vehicle.

Brake Adjuster Assembly



REPLACE THE FRONT CYLINDER

NOTE: Front brakes are optional.

⚠WARNING

Do not ingest brake fluid or allow contact with skin or eyes. Always wear protective clothing and a face shield when working with or around brake fluid.

SKIN CONTACT

Flush area immediately with water for several minutes. If a rash or skin irritation develops, get medical attention immediately.

EYE CONTACT

Immediately flush the eye with water for 15 minutes and call physician.

INGESTION

Get medical attention immediately.

⚠WARNING

1. **Make sure the key-switch is in the "OFF" position, then remove the key.**
2. **Place the forward-reverse switch in the center "OFF" position.**
3. **Confirm the electric park brake is set.**
4. **Place blocks under the front wheels to prevent vehicle movement.**
5. **Disconnect the main positive and negative cables at the batteries.**

⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

6. Release the park brake.
7. Raise the wheel off of the ground and support with jack stands.
8. Remove the tire/wheel assembly. Refer to ***Tires and Wheels*** section for information on removing the tire and wheel assembly.
9. Thoroughly clean the area around the brake body.
10. Remove the brake body bolts and discard the lock nuts.
11. Inspect the brake rotor. Refer to ***Inspect the Service Brake*** section for information regarding inspecting the brake rotor.

⚠WARNING

Current Taylor-Dunn® brakes are asbestos free. However, there is the possibility that the original brakes were replaced with aftermarket parts containing asbestos. Since this possibility exists, all brake parts should be handled as if they contain asbestos. Refer to Appendix C for recommended handling precautions.

12. Disconnect the brake hose from the brake body.
13. Install the new brake body assembly in reverse order.
    - Use teflon tape thread sealant on the brake hose fitting.
    - Torque the brake body bolts to 11 ft-lbs.
14. Bleed the brakes. Refer to ***Bleed the Brakes*** section for information regarding bleeding the brakes.
15. Set the park brake.
16. Reconnect the main positive and negative cables at the batteries.
17. Lower the wheel to the ground.
18. Remove the blocks from behind the wheels.
19. Release the park brake and test drive the vehicle.

REPAIR THE BRAKE BODY

⚠WARNING

Hydraulic brake system components must be kept clean. Make sure your work area is free from dirt and debris and will contain any brake fluid spills. Any debris or contaminates left in the brake system could lead to brake failure and result in property damage and/or severe bodily injury.

⚠WARNING

Do not ingest brake fluid or allow contact with skin or eyes. Always wear protective clothing and a face shield when working with or around brake fluid.

SKIN CONTACT

Flush area immediately with water for several minutes. If a rash or skin irritation develops, get medical attention immediately.

EYE CONTACT

Immediately flush the eye with water for 15 minutes and call physician.

INGESTION

Get medical attention immediately.

⚠WARNING

1. **Make sure the key-switch is in the "OFF" position, then remove the key.**
2. **Place the forward-reverse switch in the center "OFF" position.**
3. **Set the park brake.**
4. **Place blocks under the front wheels to prevent vehicle movement.**
5. **Disconnect the main positive and negative cables at the batteries.**

6. Remove the brake body from the vehicle.

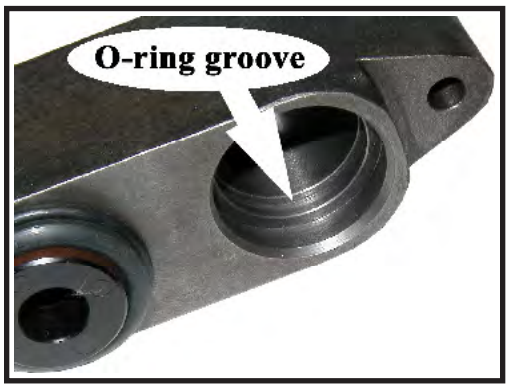
NOTE: Refer to **Replace the Brake Body Assembly (front or rear)** *section for information on removing the brake body.*

7. Pull the pistons out of the brake body.
8. Remove the piston rubber boot.
9. Remove the piston o-ring from inside of the brake body.
10. Inspect and replace parts as required.

⚠WARNING

The pistons are very fragile. If the piston is damaged it must be replaced. Failure to replace a damaged piston could lead to brake failure and result in property damage and/or severe bodily injury.

11. Lubricate the brake parts with clean brake fluid from a sealed container.
12. Install the o-rings into the brake body. Make sure that the o-rings are installed into the second groove and that they are not twisted.



13. Using tool #41-350-13, slide the rubber boots onto the pistons as shown. The boot should be hanging off of the end of the piston.

14. Insert the rubber boot/piston into the brake body making sure that the boot is properly seated in the groove.

15. Press the pistons all the way down into the brake body making sure that the boot seats properly into the upper groove on the piston.
16. Install any fittings or plugs that were removed from the brake body using teflon tape thread sealant.
17. If the brake body assembly is not to be immediately installed onto a vehicle, plug the brake hose fitting hole to prevent any contaminates from entering the brake body.

REPLACE THE MASTER CYLINDER

⚠WARNING

- **Only use DOT 3 brake fluid from a new sealed container.**
- **DOT 3 brake fluid is corrosive and will damage paint finishes.**
- **Dispose of brake fluid in accordance with local state and federal regulations.**
- **Read and follow all warnings on the brake fluid container.**

⚠WARNING

1. **Make sure the key-switch is in the "OFF" position, then remove the key.**
2. **Place the forward-reverse switch in the center "OFF" position.**
3. **Confirm the electric park brake is set.**
4. **Place blocks under the front wheels to prevent vehicle movement.**
5. **Disconnect the main positive and negative cables at the batteries.**

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

NOTE: Most vehicle configurations do not require lifting the vehicle to remove the master cylinder. Lifting the vehicle may not be required.

6. If required, raise the vehicle and support with jack stands.
7. Place a drain pan under the master cylinder.
8. Disconnect the brake line(s) to the master cylinder and pump out the fluid in the master cylinder by depressing the pedal several times.
9. Remove the master cylinder bolts and remove the master cylinder from the vehicle.
10. Install in reverse order.
11. Adjust the master cylinder push rod so that it is approximately 1/8 inch away from the master cylinder plunger when the brake pedal is up.

⚠WARNING

Do not ingest brake fluid or allow contact with skin or eyes. Always wear protective clothing and a face shield when working with or around brake fluid.

SKIN CONTACT

Flush area immediately with water for several minutes. If a rash or skin irritation develops, get medical attention immediately.

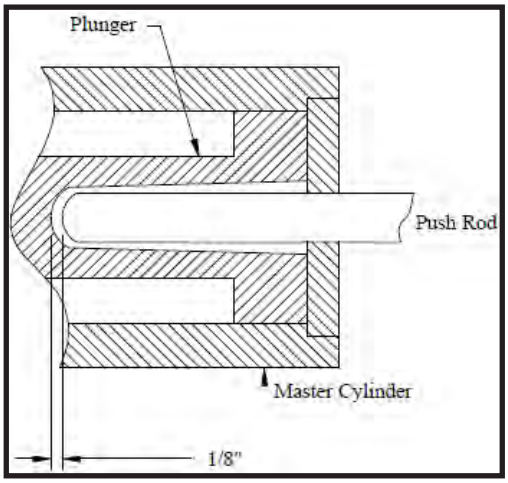
EYE CONTACT

Immediately flush the eye with water for 15 minutes and call physician.

INGESTION

Get medical attention immediately.

12. Fill the master cylinder with brake fluid from a sealed container.
13. Pump the brake pedal a short distance of one to two inches until no bubbles are seen coming from the inlet ports inside of the master cylinder chamber.
14. If the vehicle was raised, lower it to the ground.
15. Bleed the brakes. refer to ***Bleed the Brakes*** section for information regarding bleeding the brakes.
16. Reconnect the main positive and negative cables at the batteries.
17. Remove the blocks from behind the wheels.
18. Release the park brake and test drive the vehicle.



Cutaway of typical master cylinder showing the push rod clearance

REPAIR THE MASTER CYLINDER

NOTE: Hydraulic brake system components must be kept clean. Make sure your work area is free from dirt and debris and will contain any brake fluid spills.

Remove the master cylinder from the vehicle. See ***Replace the Master Cylinder*** section .

Drain all fluid from the master cylinder and discard.

Remove the rubber boot.

Depress the plunger and remove the plunger spring clip retainer.

Pull the plunger and all seals out of the master cylinder bore.

Thoroughly clean, inspect and replace parts as required.

If any damage is found in the bore of the master cylinder then it must be replaced.

Lubricate all parts with clean brake fluid from a sealed container.

Reassemble in reverse order.

If the master cylinder is not to be immediately installed onto a vehicle, plug the brake line fitting hole to prevent any contaminates from entering the master cylinder.

Motor Service

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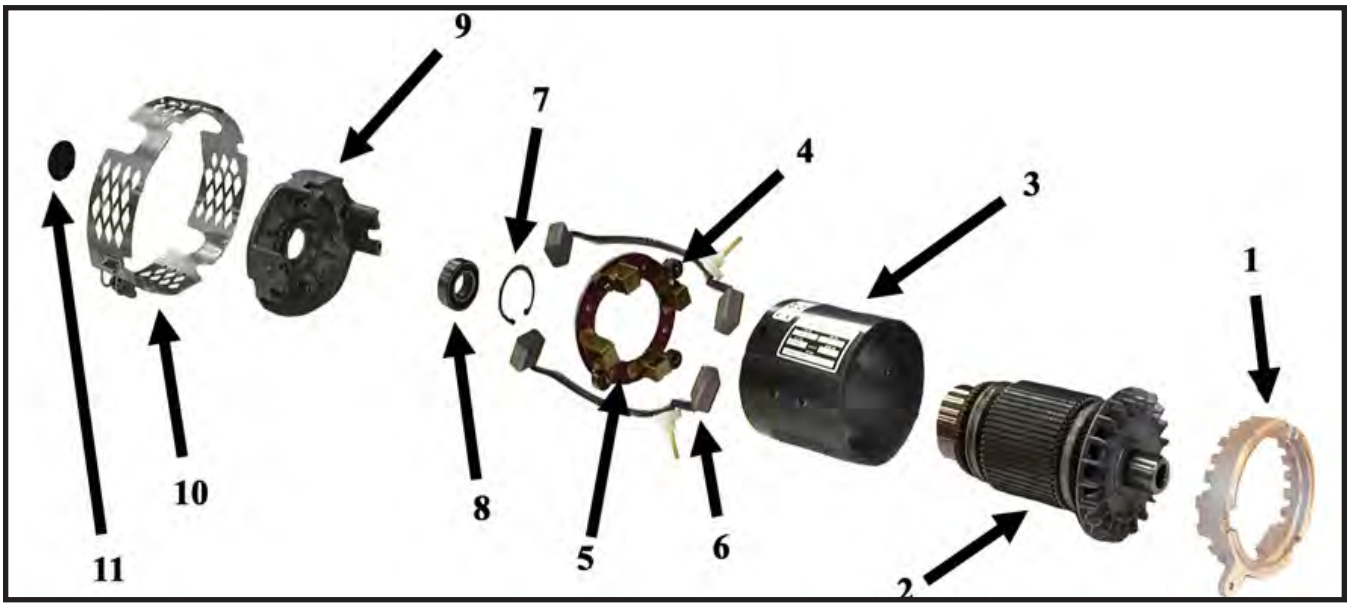
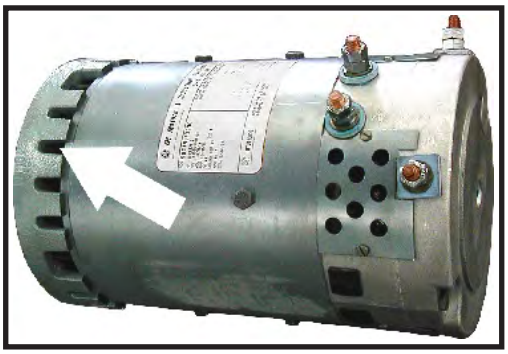


Typical Exploded Motor

INSPECTING THE MOTOR BRUSHES



Typical motor with cooling fan indicated by the arrow

Motors with internal cooling fans

NOTE: There are four brushes in the motor. The brushes will not wear at the same rate. It is recommended that all four brushes are inspected at the same time.

NOTE: In some vehicle configurations it may not be possible to inspect all four brushes while the motor is in the vehicle. Refer to **Transmission Service** *section for information on removing the motor.*

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Look through the brush cover and compare the top of the brush to the top of the brush holder. If it is even with or below the top of the brush holder then the brushes should be removed and measured. Refer to ***Replacing the Brushes*** section for information regarding removing the motor brushes.
7. If any one brush is less than or equal to the service limit specified in ***Service Limits***, then all four brushes should be replaced.
8. Reconnect the main positive and negative cables at the batteries.
9. Remove the blocks from behind the wheels, release the park brake and test drive.

Typical brush and brush holder

Enclosed Motors (GE, no cooling fan)

General Electric Motors

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

NOTE: Some motors may not have the brush inspection holes. In this case, the motor must be disassembled to inspect the brushes. For future inspections, holes msy be drilled into the motor housing after it has been disassembled.

6. Insert a 0.035" diameter wire through the brush inspection hole above each brush until it contacts the top of the brush.
7. Mark the wire to indicate how far it was inserted into the motor housing.
8. Remove the wire and measure how far into the motor the wire was inserted.
9. If any one wire insertion length exceeds the length specified in ***Service Limits***, then all four brushes should be replaced. Refer to ***Replacing the Brushes*** section for information regarding replacing the motor brushes.
10. Reconnect the main positive and negative cables at the batteries.
11. Remove the blocks from behind the wheels, release the park brake and test drive.

Advanced DC Motors

The enclosed Advanced DC motors must be disassembled to inspect the motor brushes. Refer to ***Motor Inspection*** for information regarding disassembling the motor.

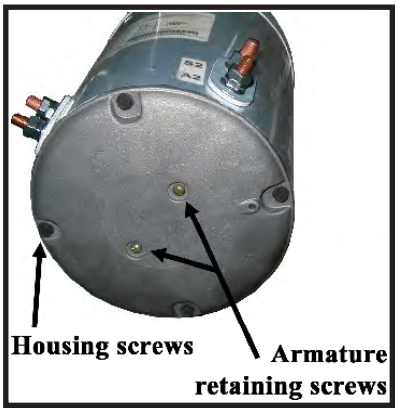
MOTOR REMOVAL AND INSTALLATION

See the ***Transmission*** section for information on removing or installing the motor.

MOTOR INSPECTION

Disassembly

1. Remove the motor from the vehicle. See the ***Transmission*** section for information on removing the motor.
2. Remove the housing screws from the rear and/or front of the motor.
3. Remove the armature retaining screws from the rear housing (if equipped).

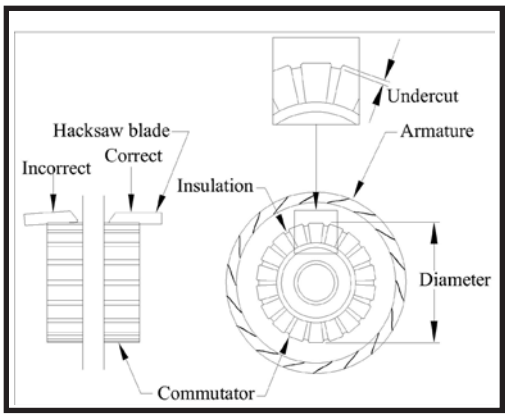


4. If this is an enclosed motor, remove the front housing end.
5. Pull the armature out of the front end of the motor housing.
6. Remove the nuts off of all of the terminals in the rear motor housing.
7. Remove the rear motor housing being careful not to damage the field coil wires.

Inspection

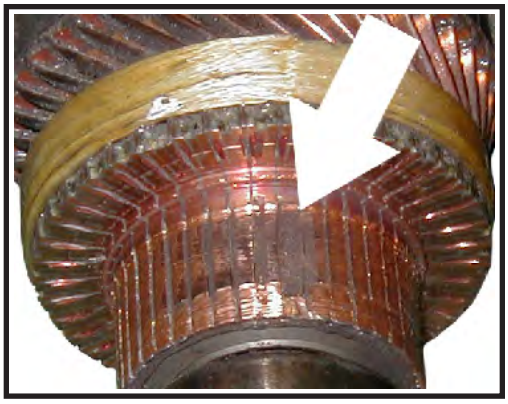
1. Measure the length of each motor brush.
   - If any one brush is less than or equal to the service limit specified in section ***Service Limits***, then all four brushes should be replaced. Refer to ***Replacing the Brushes*** section for information regarding replacing the motor brushes.
2. Measure the diameter of the commutator.
   - If the commutator is less than the minimum diameter specified in section ***Service Limits,*** then the motor must be replaced.

3. Measure the commutator undercut depth in 5-places around the commutator.
   - If any one of the measurements is less than the minimum undercut depth specified in ***Service Limits*** above, then the commutator must be undercut. Refer to ***Repair Commutator*** section for information regarding undercutting the commutator.



4. Inspect the commutator for grooves.
   - If the commutator is groved then it must be machined on a lathe. Do not machine the commutator past the minimum diameter specified in ***Service Limits*** section. Refer to ***Repair Commutator*** section for information regarding machining the commutator.

5. Inspect the commutator for burn marks.
   - Burn marks and/or raised commutator segments 90 or 180 degrees apart is evidence of a shorted armature. A tool called a growler is required to reliably test for a shorted armature.



Typical burn mark on a shorted armature

6. Inspect the commutator for raised segments. Raised segments could be a result of a stalled motor or shorted armature. A tool called a growler is required to reliably test for a shorted armature.
   - If the armature is not shorted then the raised segments can be removed by machining the commutator. Do not machine the commutator past the minimum diameter specified in ***Service Limits*** section. Refer to ***Repair Commutator*** section for information regarding machining the commutator.
7. Visually inspect the armature windings for burnt insulation. Burnt insulation is a direct result of motor overheating and could lead to a shorted armature.
   - If the insulation is cracked or burnt, then it is recommend that the armature or motor be replaced.

NOTE: If the armature has been burnt then there is a good possibility that the field windings may also be burnt. Symptoms indicating a shorted field include high motor current, lack of power and possibly excessive speed.

8. Using a growler, test the armature for shorts.
   - If the armature is shorted, then we recommend that the armature or motor be replaced.
9. Using the continuity function of digital multi meter, check the continuity around the entire commutator by placing one test lead against one of the commutator segments and the other test lead against all of the other segments one at a time. There should be continuity around the entire commutator. If any segment indicates an open circuit, then the motor must be replaced.
10. Using the continuity function of digital multi meter, check the continuity from any one of the commutator segments and the armature frame. If it is not an open circuit, then the armature is shorted and the motor must be replaced.
11. Rotate the motor bearing(s) by hand.
    - The bearing should not 'freewheel' but should come to a smooth stop when rapidly spun by hand. If the bearing freewheels, then grease is no longer present in the bearing and it must be replaced. Refer to ***Replacing the Bearings*** section for information regarding replacing the armature bearings.
    - Feel for any roughness when the bearing is rotated. If any roughness or grinding is noticed then the bearing must be replaced. Refer to ***Replacing the Bearings*** section for information regarding replacing the armature bearings.

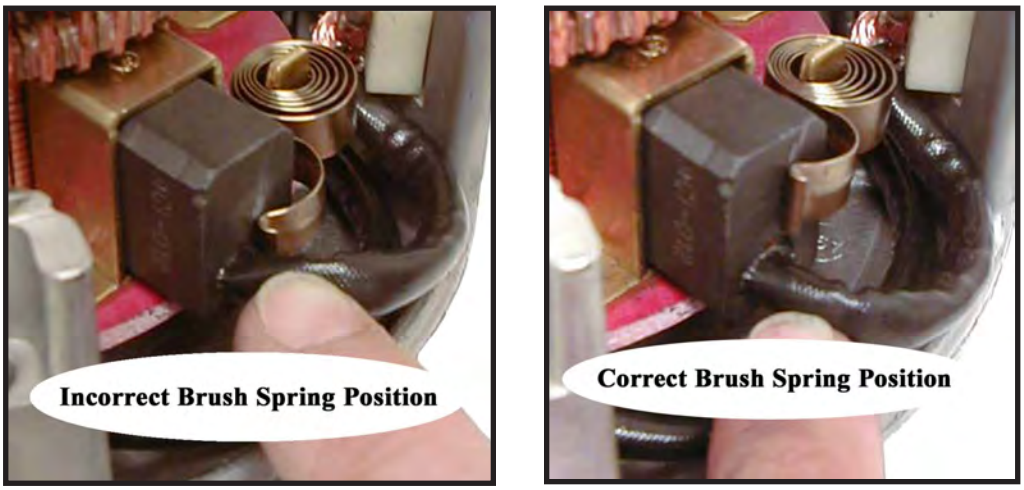
Assembly

NOTE: If this is an enclosed motor on a vehicle with a Power Traction primary reduction, then it is recommended to replace the armature shaft seal any time the motor is disassembled.

1. Push the motor brushes just far enough out of the brush holder so that the brush springs hold them in place away from the commutator. See the illustration to the right.
2. Install the rear motor housing to the stator housing.
3. Lightly grease the outside diameter of the armature bearings.
4. Insert the armature through the stator housing and seat the bearing into the rear housing.
5. If equipped with armature retaining screws, install and tighten them at this time.
6. If this is an enclosed motor, lightly grease the armature shaft seal and install the front motor housing.

NOTE: If the vehicle is equipped with a belt type primary reduction then the spring on the motor seal should be removed. Failure to remove the spring may result in a high pitched squeal from the seal.

7. Push the motor brushes into the brush holder until the brush spring snaps into place. Be certain that the spring does not rest up against the brush wire. See the illustrations below.



Brush Spring Orientation

REPLACING THE BRUSHES

NOTE: It is recommended that all four brushes be replaced as a set.

NOTE: Motors without removable brush covers must be disassembled to replace the brushes. Refer to **Motor Inspection-Disassembly** *section for information on taking the motor apart.*

NOTE: Some motors are equipped with brush pairs. These motors must be disassembled to replace the brushes. Refer to **Motor Inspection-Disassembly** *section for information on taking the motor apart. Refer to the* **Motor Parts List** *for your vehicles brush configuration.*

NOTE: Some motors have brush leads that are routed through or behind the brush holder assembly. In this case, the brush holder assembly must be removed to replace the brushes.

NOTE: The motor must be removed from the vehicle for this procedure. Refer to **Transmission Service** *section for information on removing the motor.*

Motors with brush covers and brushes with termination screws

1. Remove the brush covers.
2. Loosen the brush wire retaining screw and remove the brush from the brush holder. Be careful with the brush spring and do not let it slip off of the spring mount. If the spring comes off, then the motor must be disassembled. Refer to ***Motor Inspection-Disassembly*** section for information on taking the motor apart.
3. Install the new brushes in reverse order.
4. Be certain that the brush springs do not rest up against the brush wires. Refer to illustrations in ***Motor Inspection-Assembly*** for proper brush spring position.

Motors with brush pairs or not equipped with brush covers

1. Disassemble the motor. Refer to ***Motor Inspection-Disassembly*** section for information on taking the motor apart.
2. Remove the brush holder.

Note: Remember the position and routing of the brush crossover leads. They must be reinstalled in the same position.

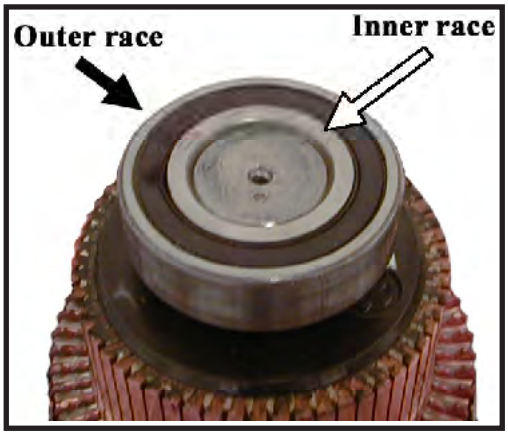
3. Remove the brush termination screws or the armature studs and remove the brushes from the brush holder.
4. Install the new brushes in reverse order.
5. Reassemble the motor. Refer to ***Motor Inspection-Assembly*** for information regarding reassembling the motor.

REPLACING THE BEARINGS

1. The motor must be removed from the vehicle for this procedure. Refer to ***Transmission Service*** section for information on removing the motor.
2. Remove the armature. Refer to ***Motor Inspection-Disassembly*** section for information on taking the motor apart.
3. Press the armature bearing(s) off of the armature shaft.
4. Press new bearing(s) onto the shaft.

⚠CAUTION

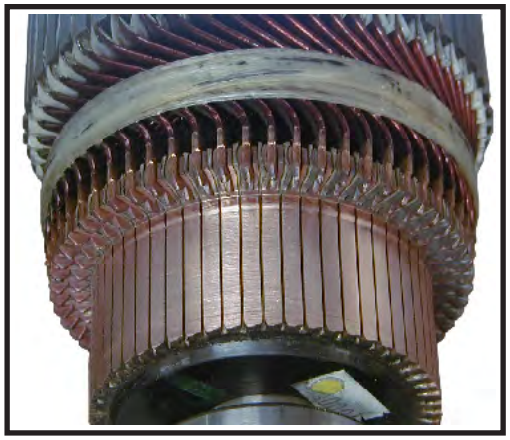
Do not press against the outer race of the bearing. Pressing against the outer race will damage the bearing and may result in premature failure of the bearing. See the illustration below



5. Reassemble the motor.

REPAIRING THE COMMUTATOR

1. The motor must be removed from the vehicle for this procedure. Refer to ***Transmission Service*** section for information on removing the motor.
2. The armature must be removed from the motor for this procedure. Refer to ***Motor Inspection-Disassembly*** section for information on taking the motor apart.
3. Using a lathe, cut the armature just enough to remove all grooves, depressions or ridges.
4. Measure the diameter of the commutator. If the commutator is less than the minimum diameter specified in ***Service Limits,*** then the motor must be replaced.
5. Thoroughly clean all copper debris from between the commutator segments.
6. Measure the commutator undercut depth in 5-places around the commutator. If any one of the measurements is less than the minimum undercut depth specified in ***Service Limits***, then the commutator must be undercut.



Example of freshly cut commutator

7. While still in the lathe, smooth the commutator with fine emery cloth.

Undercutting the commutator

1. Using a small straight cut saw blade, cut the commutator insulation to the proper depth. Refer to undercut depth in ***Service Limits***.
2. Once all segments have been properly undercut, mount the armature in a lathe and smooth the commutator with fine emery cloth.
3. Inspect the armature for shorts. Refer to ***Motor Inspection*** section for information on testing the armature.

NOTE: Copper debris in the undercut area can give a reading of a shorted armature.

Properly undercut and cleaned commutator segments

SERVICE LIMITS

Motor Specification Number	Undercut Depth		Commutator Diameter (min)		Brush Length (min)		Wire Depth (max)	
	mm	inches	mm	inches	mm	inches	mm	inches
5BC58JBS6129A	0.635	0.025	66.75	2.625	19.05	0.75	38.1	1.5
5BC58JBS6129B	0.635	0.025	66.75	2.625	19.05	0.75	38.1	1.5
5BC58JBS6129C	0.635	0.025	66.75	2.625	19.05	0.75	38.1	1.5
5BC49JB399C	0.635	0.025	78.97	3.109	19.05	0.75	-	-
5BC58JBS6110C	0.635	0.025	78.97	3.109	19.05	0.75	38.1	1.5

Notes:

Transmission

TABLE OF CONTENTS

CHECK OIL LEVEL

Park the vehicle on a level surface.

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Place a drain pan that can hold a minimum of 2-quarts of oil under the transmission level plug.
7. Remove the level plug. When the plug is removed, a small amount of oil should come out. This indicates that the transmission has the correct amount of oil.
8. If no oil comes out, then add oil as required through the level plug hole.
9. Reconnect the main positive and negative cables at the batteries.
10. Remove blocks from behind the wheels.
11. Test drive the vehicle

Transmission Oil Level Plug

⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

CHANGE OIL

Changing the transmission oil requires removal of the transmission cover. Refer to transmission disassembly later in this section.

MOTOR

Removal

NOTE: *In some vehicle configurations the transmission assembly will have to be removed to allow clearance to remove the motor. Refer to* **Transmission** *section for information on removing the transmission assembly from the vehicle.*

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

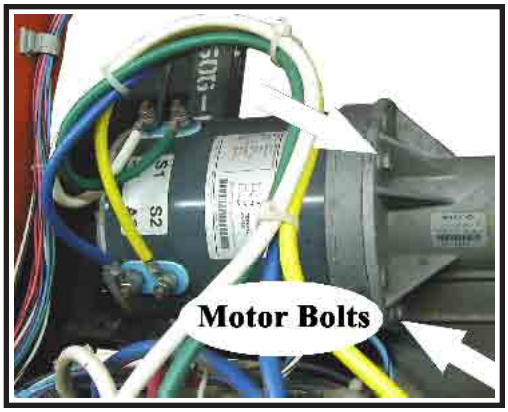
4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Remove the motor wires from the motor.

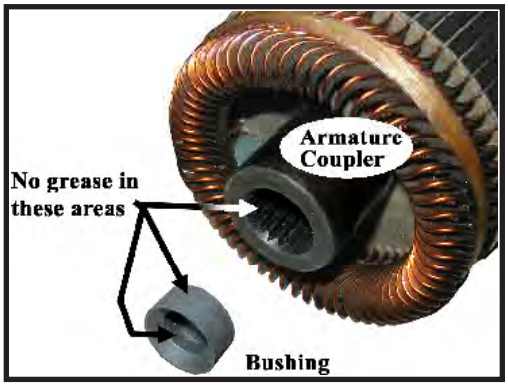
   HINT: Tag each wire with the number of the terminal it was removed from.

7. Remove the bolts holding the motor to the transmission housing (see illustration).
8. Slide the motor off of the transmission input shaft.



Installation

1. Remove the rubber bushing from inside of the motor armature coupling.
2. Thoroughly clean all grease from the transmission input shaft, rubber bushing and the motor armature coupling.
3. Install the rubber bushing back into the motor armature coupling.
4. Lightly grease the transmission input shaft only (see caution below).
5. Install the motor in reverse order.
6. Torque the motor mounting bolts to 6-8 ft-lbs.



⚠CAUTION

Do not apply grease to the armature coupler, rubber bushing or the end of the transmission input shaft. Grease applied to these areas may result in premature failure of the armature bearing.

REAR HUB WITH BRAKE DRUM

Removal and Installation

NOTE: Some vehicle configurations do not have a removable hub. The hub is an integral part of the rear axle. See the illustrations to the right to identify the hub on your vehicle.

Integral hub

Removable hub

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

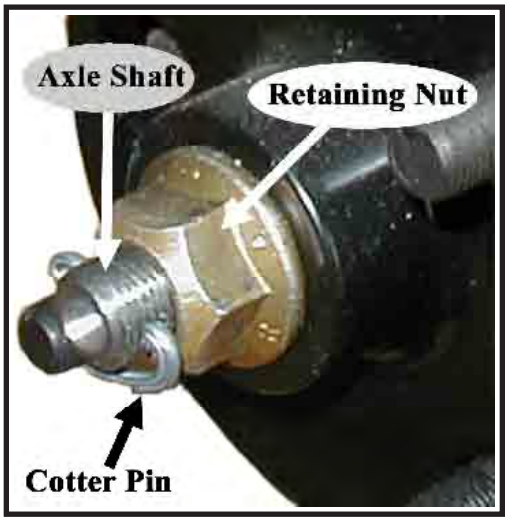
2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Remove the rear wheel. Refer to ***Replace the Rear Tire/Wheel*** section for information regarding removing the rear wheel.
7. Remove the cotter pin from the axle shaft.
8. Remove the hub retaining nut and remove the hub from the axle shaft.
9. Install in reverse order.
10. Lightly grease the axle shaft splines.



⚠WARNING

Too much grease on the axle splines could contaminate the braking surfaces resulting in loss of braking power. This could lead to severe bodily injury and/or property damage.

11. Tighten the axle hub retaining nut to 95-115 ft-lbs.
12. Install the wheel. Refer to ***Replace the Rear Tire/Wheel*** section for information regarding installing the rear wheel.
13. Reconnect the main positive and negative cables at the batteries, remove the blocks from the wheels, and test drive.

REAR AXLE

Your vehicle is configured with one of two types of rear hubs. One can be removed from the rear axle and the other is an integral part of the rear axle. The service of both of these axles is addressed in this section as follows:

The removable hub will be referred to as “Removable Hub.”
The non-removable hub will be referred to as “Non-Removable Hub.”

Refer to the illustrations on the previous page to identify the type of hub on your vehicle.

NOTE: The tire/wheel assembly must be removed for these procedures. Refer to **Tires and Wheels** *section for information on removing the tire and wheel assembly.*

Remove and Install Axle - Removable Hub

⚠WARNING

1. Make sure the key-switch is in the “OFF” position, then remove the key.

2. Place the forward-reverse switch in the center “OFF” position.

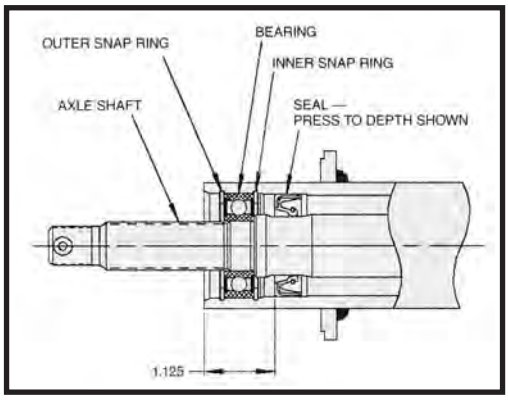
3. Set the park brake.

4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Remove the rear wheel. Refer to ***Replace the Rear Tire/Wheel*** section for information regarding removing the rear wheel.
7. Remove the axle hub. Refer to ***Rear Hub/Brake Drum*** section for information on removing the hub.
8. Remove the outer snap ring from the axle housing.
9. Remove the axle from the transmission assembly.

   HINT: Use a slide hammer threaded onto the end of the axle shaft.



10. Remove the inner snap ring.
11. Remove the axle seal from the axle housing.
12. Install the axle in reverse order using a new axle seal.
13. Refer to ***Rear Hub/Brake Drum*** section for information on installing the hub.
14. Reconnect the main positive and negative at the batteries, remove the blocks from the wheels, and test drive.

Remove and Install Axle - Non - Removable Hub

NOTE: The brake assembly is retained by the axle bearing and must be removed along with the axle assembly.

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

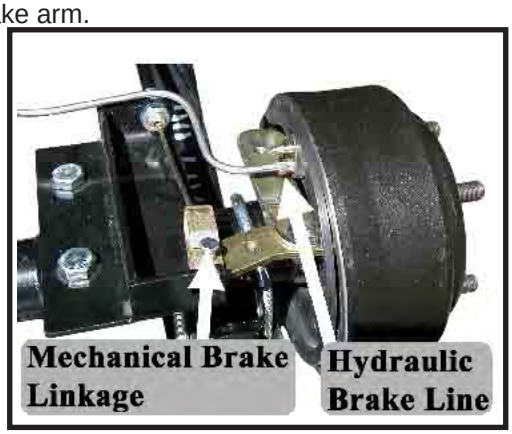
4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Remove the rear wheel. Refer to ***Replace the Rear Tire/Wheel*** section for information regarding removing the rear wheel.
7. Remove the brake drum.
8. Remove the mechanical brake linkage from the brake arm.
9. If equipped with hydraulic brakes, disconnect the brake line from the wheel cylinder.
10. Remove the four bolts holding the axle/brake assembly to the axle housing.
11. Remove the axle/brake assembly from the transmission assembly.

    HINT: Use a slide hammer threaded onto one of the wheel studs.

12. If the axle bearing is to be replaced, remove the bearing race from inside of the axle housing.
13. Remove the axle seal from the axle housing and discard.



14. Install in reverse order using a new axle seal.
15. If equipped with hydraulic brakes, bleed the brakes. Refer to ***Brake Service-Bleed the Brakes*** section for information on bleeding the brake system.
16. Reconnect the main positive and negative at the batteries, remove the blocks from the wheels, and test drive.

Replace the Axle Bearing

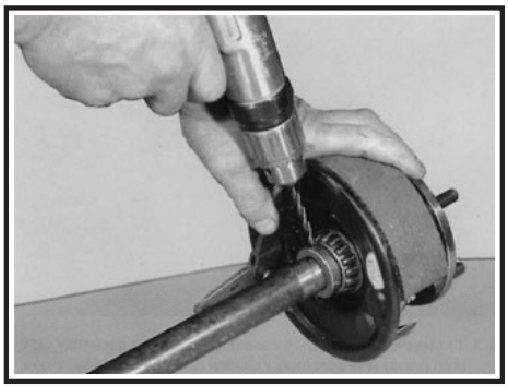
NOTE: The axle must be removed from the transmission for this procedure. Refer to **Remove and Install Axle** *for information regarding removing the rear axle.*

Removable Hub:

1. Remove the hub from the axle shaft. Refer to ***Rear Hub/Brake Drum*** for information regarding removing the hub.
2. Press the axle bearing off of the axle shaft and discard.
3. Press a new bearing onto the axle shaft.
4. If the axle is not to be immediately installed into a vehicle, pack the bearing with grease and wrap it in plastic to prevent corrosion.

Non-Removable Hub

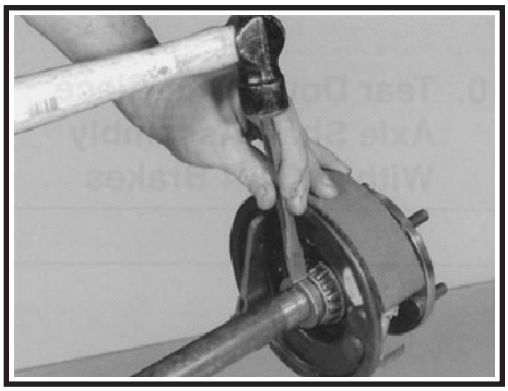
1. Drill a 1/4" hole to a depth of approximately 3/4 the thickness of the retaining ring.



⚠WARNING

Do not drill all of the way through the retainer into the axle shaft. Drilling into the axle shaft will weaken the axle shaft and could cause the axle to fail resulting in severe bodily injury and/or property damage.

2. Use a chisel to split the retainer and remove the retainer from the axle shaft.



3. Press the bearing and brake assembly off of the axle shaft.
4. Press a new bearing/race assembly onto the axle shaft.
5. If the axle is not to be immediately installed into a vehicle, pack the bearing with grease and wrap it in plastic to prevent corrosion.

TRANSMISSION

Removal

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

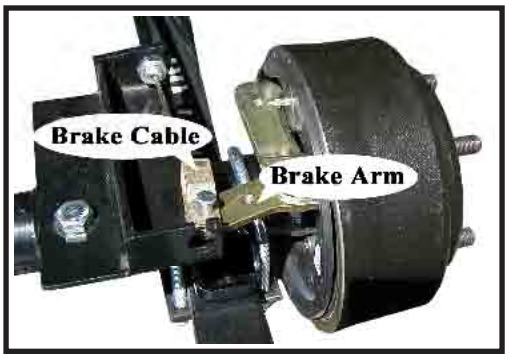
2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Remove the motor from the transmission. Refer to Remove Motor section for information regarding removing the motor.
7. Disconnect the brake cables from the left and right brake arm and cable mounting bracket.
8. Support the frame of the vehicle so it will not drop.
9. Remove the bolts and nuts holding the transmission to the springs.
10. Lift the vehicle frame and remove the transmission out from under the vehicle.



⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

⚠WARNING

Do not let the vehicle hang from a hoist or leave the vehicle supported only by the lifting device. Once the transmission is removed, support the vehicle frame with jackstands of adequate capacity. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

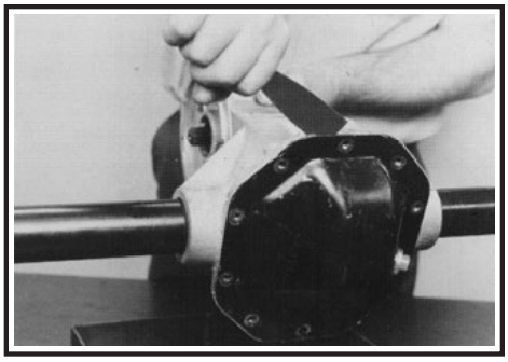
Installation

1. Install in reverse order.
2. Adjust the brakes. Refer to ***Adjust the Service Brakes*** section for information regarding adjusting the brakes.
3. Reconnect the main positive and negative at the batteries, remove the blocks from the wheels, and test drive.

DIFFERENTIAL CASE

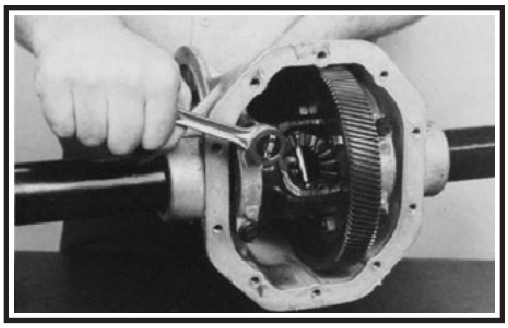
Disassemble

1. Remove the transmission from the vehicle. Refer to ***Transmission-Removal*** section for information on removing the transmission.
2. Thoroughly clean the transmission assembly before disassembly.
3. Remove the left and right axles from the transmission assembly. Refer to ***Rear Axle*** section for information on removing the axles.
4. Suspend the differential case over a drain pan that can hold a minimum of 2-quarts of oil.
5. Remove the differential case cover being careful not to bend or damage the case cover flange or the sealing surface of the differential case.

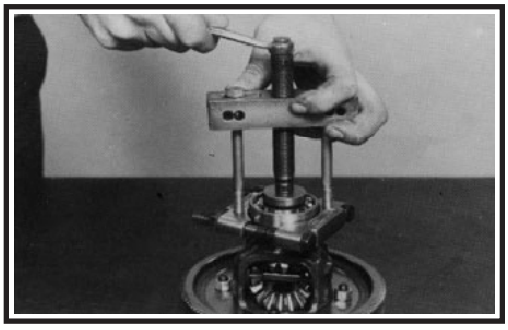


6. Remove the differential bearing caps and remove the differential assembly from the housing.

   NOTE: The bearing caps are marked for identification. When the transmission is reassembled they must be installed in their original position.

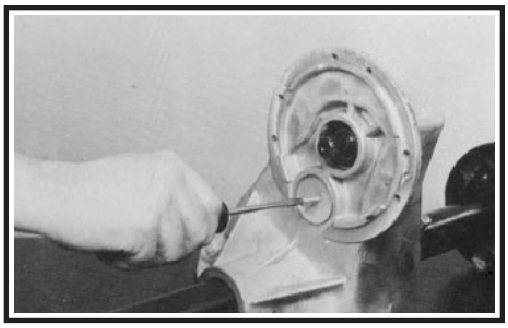


7. Remove both bearings from the differential case.

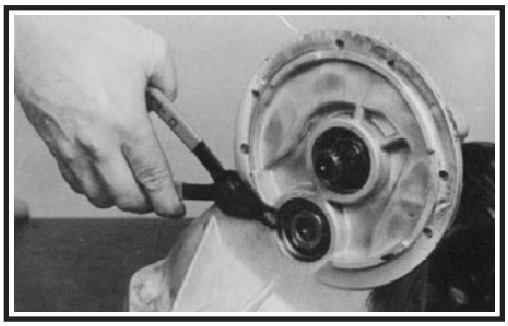


8. Remove the final drive gear from the differential housing.

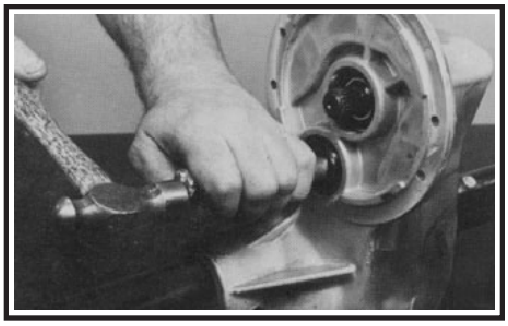
9. Punch or drill a small hole into the center of both of the intermediate shaft bore plugs.
10. Thread a sheet metal screw into each plug until the bore plug is forced out.



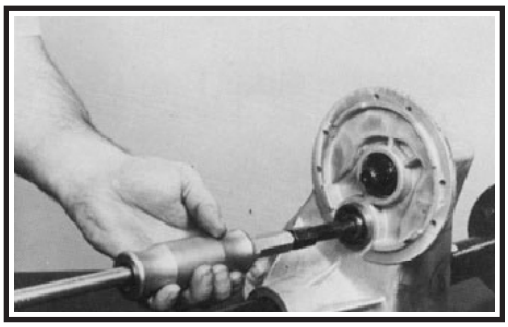
11. Remove both snap rings from the intermediate shaft bore.



12. Using a soft metal or hard wood dowel, drive the intermediate shaft through the bearing just enough to allow clearance for an ID bearing puller. Do not attempt to drive the shaft out of the opposite end of the transmission.



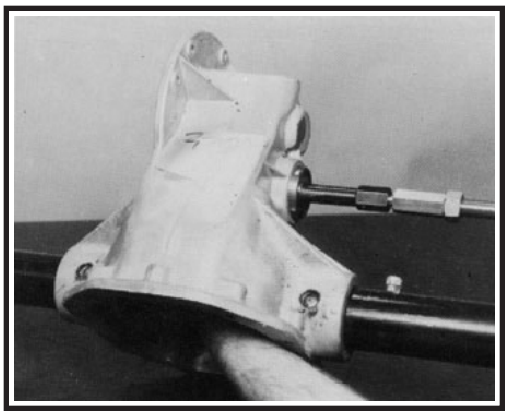
13. Remove the intermediate bearing with an ID bearing puller.



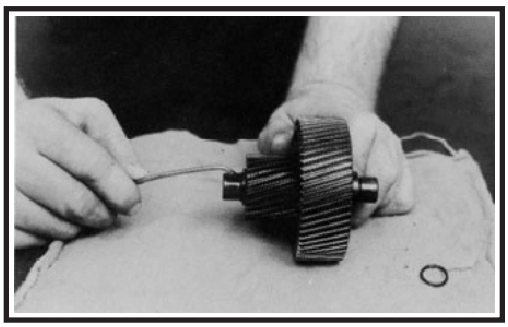
⚠CAUTION

The shaft and gear assembly must be supported by hand during the next step. Failure to properly support the shaft and gear assembly could result in damage to the gear teeth.

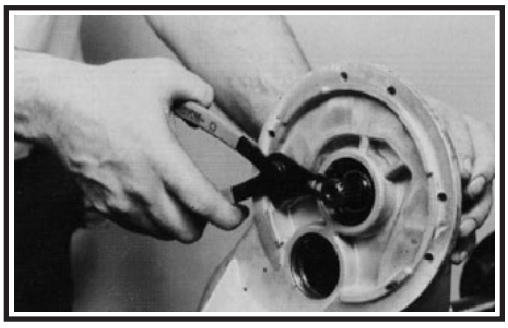
14. While supporting the shaft and gear assembly, repeat steps #12 and #13 for the opposite side bearing and remove the intermediate shaft from the housing.



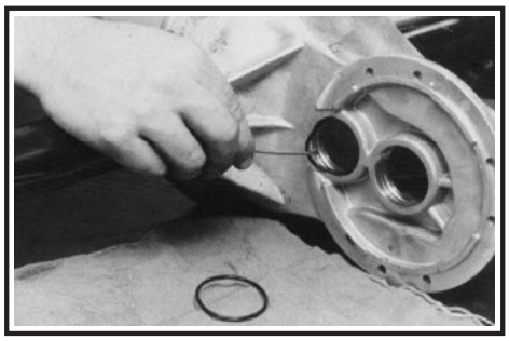
15. Remove the o-rings from each end of the intermediate shaft.



16. Remove the circlip from the input shaft.
17. Remove the input shaft from the housing.
18. Press the bearings off of the input shaft.



19. Remove the o-rings from both sides of the intermediate shaft bore and the input shaft bore and discard the o-rings.



Assemble

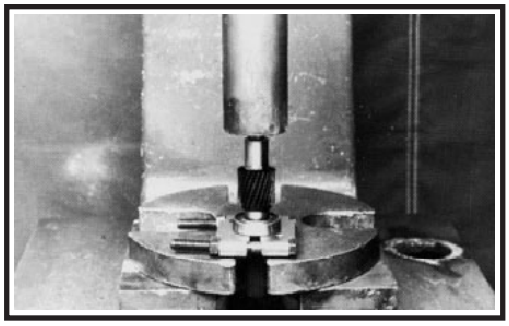
NOTE: When pressing bearings, do not press against or support the outer race as this will damage the bearing.

NOTE: All snap rings should fit tightly into their grooves. If a snap ring is loose, then it must be replaced.

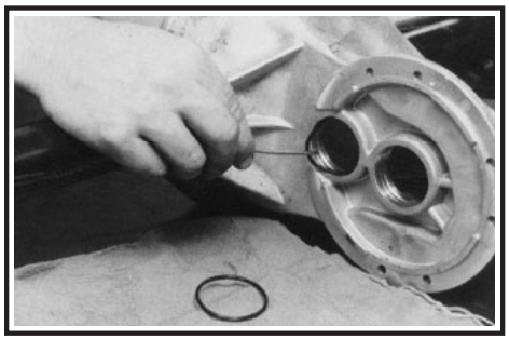
NOTE: All internal components should fit easily together. Do not hit any shaft or component with a hard metal hammer or punch.

NOTE: Pre-lube all bearings, seals and o-rings before assembly.

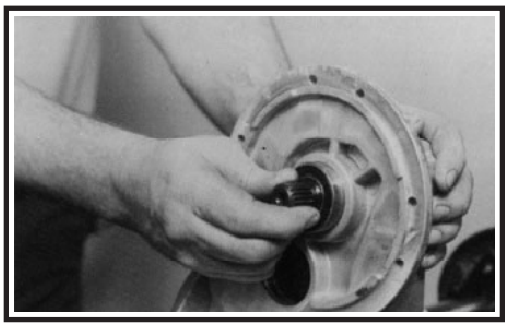
1. Thoroughly clean all components as well as the inside of the housing.
2. Press new bearings onto the input shaft and differential case.



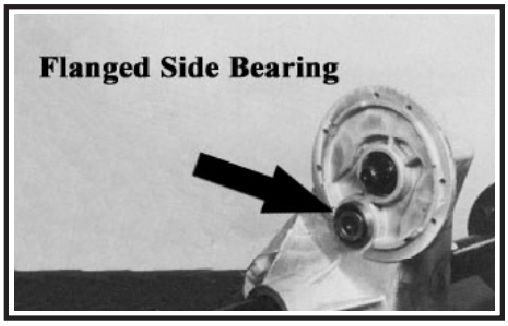
3. Insert new o-rings into both sides of the intermediate shaft bore, the input shaft bore and the intermediate shafts.



4. Install the input shaft into the housing and install the snap ring.



5. Insert the intermediate shaft into the housing and support in place.
6. Insert the flanged side bearing into the bearing bore. Press in just past the snap ring grove and install the snap ring.



⚠CAUTION

Use a hard wood dowel the same diameter as the bearing bore to drive the bearing into place. Do not drive against the inner race as this will damage the bearing.

7. Repeat the above step for the opposite bearing.
8. Thoroughly clean both sides of the intermediate bore. All contaminates must be removed.
9. Apply Loctite #RC 609 to both sides of the intermediate bore and install new bore plugs.

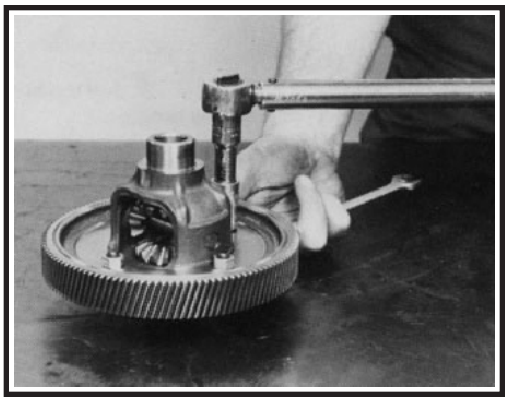
   NOTE: Drive the bore plugs until they are firmly seated against the snap rings.

10. Install the final drive gear onto the differential housing. Torque the nuts to 35-45 ft-lbs.
11. Install the differential assembly into the drive housing and install the bearing caps. Torque the bolts to 35-45 ft-lbs.

    NOTE: The bearing caps are marked for identification and must be installed in their original locations.

12. Place a small bead of non-acidic silicone sealant to the bottom flange of the housing.

    NOTE: The sealant bead should be on the inside of the cover plate mounting holes.



13. Install the cover plate. Torque the bolts to 18-28 ft-lbs.
14. Install the axles using new axle seals. Refer to ***Rear Axle*** section for information on installing the axles.
15. Fill with 11 ounces of oil. Refer to the ***Lubrication Table*** for the proper type of oil.

Suspension

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REPLACE THE REAR SPRINGS

Leaf

If a spring has failed or is fatigued, then it is recommended that both rear springs are replaced as a set.

HINT : In most vehicles it will be easier if the springs are replaced one at a time.

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

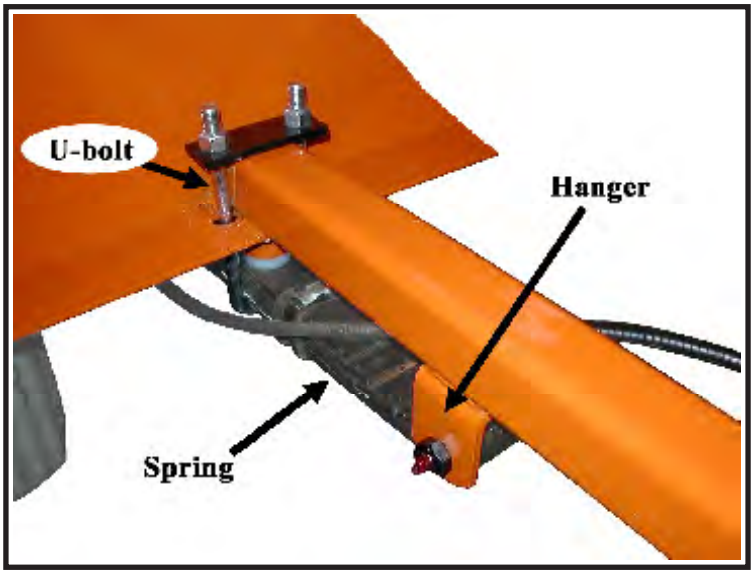
4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

6. Raise the rear of the vehicle and support with jack stands.
7. Tie up or support the rear axle so it cannot fall out of the vehicle.
8. Unbolt the spring from the axle housing.
9. Support the spring so that it cannot fall out of the vehicle.
10. Remove the remaining hardware retaining the spring to the frame.
11. Remove the spring from the vehicle.



12. Inspect the spring bolts and spring hangers for signs of wear or damage. If any wear or damage is found, then they must be replaced.

⚠WARNING **Damaged or worn spring bolts or hangers could result in sudden failure of the suspension causing severe bodily injury or property damage.**

13. Install the new spring in reverse order.
14. If the spring hanger bolts do not have a grease fitting, lube the spring bushings before installing the spring.
15. Tighten the spring hanger bolts securely, but not so tight as to bind the spring.
16. Lower the vehicle.
17. Reconnect the main positive and negative cables at the batteries.
18. Remove the blocks from behind the wheels.
19. Release the parking brake and test drive the vehicle.

REPLACE THE FRONT SPRINGS

Leaf

If a spring has failed or is fatigued, then it is recommended that both front springs are replaced as a set.

HINT : In most vehicles it will be easier if the springs are replaced one at a time.

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

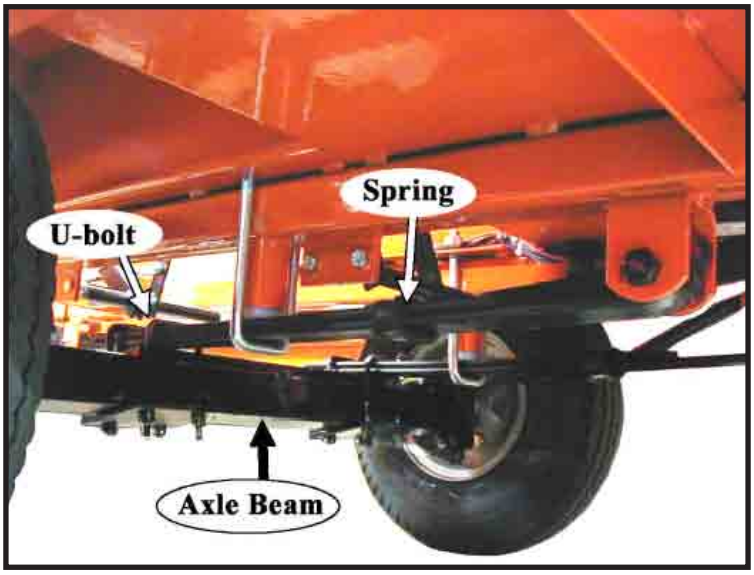
4. Place blocks under the rear wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

6. Raise the front of the vehicle and support with jack stands.
7. Tie up or support the front axle so it cannot fall out of the vehicle.
8. Unbolt the spring from the front axle beam.
9. Support the spring so that it cannot fall out of the vehicle.
10. Remove the remaining hardware retaining the spring to the frame.



12. Inspect the spring bolts and spring hangers for signs of wear or damage. If any wear or damage is found, then they must be replaced.

⚠WARNING **Damaged or worn spring bolts or hangers could result in sudden failure of the suspension causing severe bodily injury or property damage.**

13. Install the new spring in reverse order.
14. If the spring hanger bolts do not have a grease fitting, lube the spring bushings before installing the spring.
15. Tighten the spring hanger bolts securely, but not so tight as to bind the spring.
16. Lower the vehicle.
17. Reconnect the main positive and negative cables at the batteries.
18. Remove the blocks from behind the wheels.
19. Release the parking brake and test drive the vehicle.

REPLACE THE SPRING BUSHINGS

It is recommended that all front spring bushings are replaced as a set.

Your vehicle will be equipped with one of two types of spring bushings, internal and external (see illustration to the right):

- The internal bushing is a plastic insert that is pressed into the spring eye. There are one of these bushings for each spring eye.
- The external bushing consists of two plastic bushings on each end of the spring eye.
- Refer to the parts list to identify the bushings used in your vehicle.

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

4. Place blocks under the front/rear wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily

6. Raise the front or rear of the vehicle depending on which spring is to be removed and support with jack stands.
7. Remove the spring from the vehicle.
   NOTE: Refer to **Replace the Front Springs** *section for information regarding removing the front springs.*
8. If the vehicle is equipped with spring hangers, remove the spring hanger bolt from the vehicles frame.
9. Remove the spring bushing(s):
   - For internal bushing, press the spring bushings out of the two spring eyes and from the mounting eye on the vehicles frame.
   - For external bushing, Remove the bushings from the spring eye.
10. Install the new bushings in reverse order.
    HINT: Apply a light coating of grease to the

bushing before pressing into the spring eye.

11. Install the spring onto the vehicle.

    NOTE: Refer to **Replace the Front Springs** *section for information regarding installing the front springs.*

12. Repeat for the other spring.
13. Lower the vehicle.
14. Reconnect the main positive and negative cables at the batteries.
15. Remove the blocks from behind the wheels.
16. Release the parking brake and test drive the vehicle.

REPLACE THE SHOCKS

Front

It is recommended to replace both front shocks as a set.

NOTE: On some vehicles it may be required to remove the front wheel to gain access to the shock mounting bolts. Refer to **Tires and Wheels** *section for information regarding removing the front wheels.*

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily

6. Some vehicles may require that the wheels be lifted off of the ground and supported with jack stands to replace the shocks.
7. Remove the upper and lower shock bolts.

8. Remove the shock from the vehicle.

   NOTE: If the shock that was removed is to be reinstalled:

   A. Inspect the shaft where it enters the shock body for any signs of leakage. If any sign of leakage is seen, then the shock must be replaced.

   B. Inspect the upper and lower shock bushings. If any signs of damage or wear are seen, then the shock must be replaced.

9. Install the shock in reverse order.
10. Lower the vehicle.
11. Reconnect the main positive and negative cables at the batteries.
12. Remove the blocks from behind the wheels.
13. Release the parking brake and test drive the vehicle.

Battery Service

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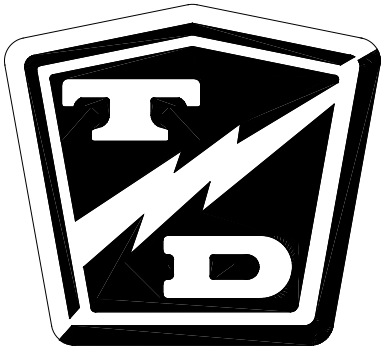


CLEANING

⚠WARNING

Explosive mixtures of Hydrogen gas are present within battery cells at all times. Do not work with or charge battery in an area where open flames (including gas furnace or water heater pilots), sparks, cigarettes, or any other sources of combustion are present. Always provide ample ventilation in rooms where batteries are being charged. Failure to do so may result in severe bodily injury and/or property damage.

⚠WARNING

Battery electrolyte is poisonous and dangerous. It contains sulfuric acid. Avoid contact with skin eyes or clothing. Wear rubber gloves and safety glasses while servicing batteries. DO NOT INGEST! This may result in severe bodily injury.

⚠WARNING

A battery is a live electrical source. It cannot be disconnected or neutralized. Do not drop any tool or conductive object onto the battery. A conductive object that comes in contact with the battery terminals will initiate a short circuit of the battery. This could cause the battery to explode resulting in severe bodily injury and/or property damage.

⚠CAUTION

Battery electrolyte will stain and corrode most surfaces. Immediately and thoroughly clean any surface outside of the battery that the battery electrolyte comes in contact with. Failure to clean may result in property damage.

⚠WARNING

1. **Make sure the key-switch is in the "OFF" position, then remove the key.**
2. **Place the forward-reverse switch in the center "OFF" position.**
3. **Set the park brake.**
4. **Place blocks under the front wheels to prevent vehicle movement.**
5. **Disconnect the main positive and negative cables at the batteries.**

6. Dry dirt can be readily blown off with low-pressure air or brushed off.
7. Wetness or wet dirt on the batteries indicates battery acid. Using a nonmetallic brush with flexible bristles, wash the batteries off with a strong solution of baking soda and hot water (1 lb. of soda to a gallon of water). Continue until all fizzing stops, which indicates that the acid has been neutralized. Then rinse thoroughly with clear water. DO NOT get any of the solution into the battery cells.
8. Reconnect the batteries, remove the blocks from the wheels and test drive.

TESTING

NOTE: A combination of the Load Test and Specific Gravity Test should be used to accurately determine the condition of the batteries.

⚠WARNING

Explosive mixtures of Hydrogen gas are present within battery cells at all times. Do not work with or charge battery in an area where open flames (including gas furnace or water heater pilots), sparks, cigarettes, or any other sources of combustion are present. Always provide ample ventilation in rooms where batteries are being charged. Failure to do so may result in severe bodily injury and/or property damage.

⚠WARNING

Battery electrolyte is poisonous and dangerous. It contains sulfuric acid. Avoid contact with skin eyes or clothing. Wear rubber gloves and safety glasses while servicing batteries. DO NOT INGEST! This may result in severe bodily injury.

⚠WARNING

A battery is a live electrical source. It cannot be disconnected or neutralized. Do not drop any tool or conductive object onto the battery. A conductive object that comes in contact with the battery terminals will initiate a short circuit of the battery. This could cause the battery to explode resulting in severe bodily injury and/or property damage.

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

Load Test (6-volt batteries only)

NOTE: The batteries must be fully charged before performing this test.

1. Clean the batteries. Refer to ***Cleaning the Batteries*** section for information on cleaning the batteries.
2. Load test each battery using a battery load test meter (available at most auto parts distributors). Follow the instructions provided with the test meter.
   - If any battery fails the load test, then it should be replaced.

     NOTE: If the batteries are over one year old, it is recommended to replace them as a set.

   - If all batteries fail the test you should check the charging system before replacing the batteries. Refer to ***Charger Troubleshooting*** section for information on checking the charging system.

Specific Gravity Test

NOTE: The batteries must be fully charged before performing this test.

The specific gravity of a cell is an indication of the actual state of charge of the cell. A fully charged cell should have a reading of 1275 to 1300 (see the illustration to the right). A discharged battery will read 1100. Ideally, all cells in a battery pack will have the same reading. Any cells in a battery pack that vary by more than 30-points may be an indication of a bad cell.

Typical Hydrometer Float

Clean the batteries. Refer to ***Cleaning the Batteries*** section for information on cleaning the batteries.

Using part number **77-200-00** hydrometer, check and record the specific gravity of each cell in the battery pack.

If, after charging, none of the cells exceed a hydrometer reading of 1250 then there may be a fault in the charging system. If the charging system checks OK then the batteries are no longer accepting a charge and should be replaced.

NOTE: Refer to **Charger Troubleshooting** *for information on checking the charging system.*

The highest reading will be the cell that is accepting the most charge. This reading will be used to gauge all other cells.

Compare the specific gravity readings to the highest reading, if the difference between any of the cells is more than 30-points, then that battery should be replaced.

NOTE: If the batteries are over one year old, it is recommended to replace them as a set.

Reconnect the batteries, remove the blocks from the wheels and test drive.

WATERING

NOTE: The electrolyte level in a battery rises while charging and will be close to its highest level after the end of a charging cycle. It is recommended to fill the batteries at the end of a charging cycle. If the electrolyte is below the top of the battery plates then fill just enough to cover the plates and then top off when the charging cycle is complete.

⚠WARNING

Explosive mixtures of Hydrogen gas are present within battery cells at all times. Do not work with or charge battery in an area where open flames (including gas furnace or water heater pilots), sparks, cigarettes, or any other sources of combustion are present. Always provide ample ventilation in rooms where batteries are being charged. Failure to do so may result in severe bodily injury and/or property damage.

⚠WARNING

Battery electrolyte is poisonous and dangerous. It contains sulfuric acid. Avoid contact with skin eyes or clothing. Wear rubber gloves and safety glasses while servicing batteries. DO NOT INGEST! This may result in severe bodily injury.

⚠WARNING

A battery is a live electrical source. It cannot be disconnected or neutralized. Do not drop any tool or conductive object onto the battery. A conductive object that comes in contact with the battery terminals will initiate a short circuit of the battery. This could cause the battery to explode resulting in severe bodily injury and/or property damage.

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

⚠WARNING

Do not overfill the batteries. Over filling the batteries may cause the batteries to boil over and result in severe bodily injury or property damage.

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

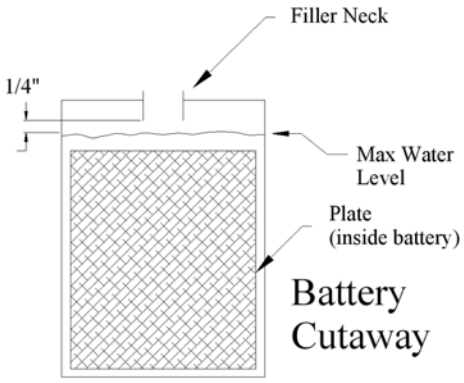
2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Clean the batteries. Refer to ***Cleaning the Batteries*** section for information on cleaning the batteries.
7. Check the electrolyte level in all battery cells. If low, fill to the correct level with distilled water using part number **77-201-00** battery filler, never add additional battery electrolyte to the batteries.
8. Reconnect the batteries, remove the blocks from the wheels and test drive.



Battery Cutaway

CHARGING

Refer to ***Charging Your Vehicle*** in section ***Safety Rules and Operating Instructions***.

REPLACING (6-VOLT BATTERIES ONLY)

⚠WARNING

Explosive mixtures of Hydrogen gas are present within battery cells at all times. Do not work with or charge battery in an area where open flames (including gas furnace or water heater pilots), sparks, cigarettes, or any other sources of combustion are present. Always provide ample ventilation in rooms where batteries are being charged. Failure to do so may result in severe property damage and or serious

⚠WARNING

Battery electrolyte is poisonous and dangerous. It contains sulfuric acid. Avoid contact with skin eyes or clothing. Wear rubber gloves and safety glasses while servicing batteries. DO NOT INGEST! This may result in serious bodily injury.

⚠WARNING

A battery is a live electrical source. It cannot be disconnected or neutralized. Do not drop any tool or conductive object onto the battery. A conductive object that comes in contact with the battery terminals will initiate a short circuit of the battery. This could cause the battery to explode resulting in property damage and/or bodily injury.

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

NOTE: If the batteries are over one year old, it is recommended to replace them as a set.

6. Thoroughly clean the batteries and battery compartment. Refer to ***Cleaning*** in this section for information regarding cleaning the batteries.

⚠CAUTION

Battery electrolyte will stain and corrode most surfaces. Immediately and thoroughly clean any surface outside of the battery that the battery electrolyte comes in contact with. Failure to clean may result in property damage.

7. Remove the battery hold downs.
8. Inspect the battery hold downs for corrosion. If any signs of corrosion are seen then the battery hold downs should be replaced.
9. Remove all battery jumpers from both posts of the battery or batteries being replaced.

   NOTE: It is recommended to replace the battery jumpers when replacing the batteries.

10. Remove the batteries from the vehicle.

⚠WARNING **Do not leave cables on batteries that have been removed from the vehicle. Cables left on batteries could cause a short circuit resulting in battery explosion, severe bodily injury and/or property damage.**

11. Inspect the battery compartment for signs of corrosion.
12. If minimal signs of corrosion are seen, then the damaged paint should be stripped off and the entire battery compartment prepped and repainted.
13. If there are excessive signs of corrosion, then it may be necessary to replace some of the frame members or completely rebuild the battery compartment.
14. Inspect the main positive and negative cables and terminals, charger cables and terminals and 12-volt tap wiring. If any of the terminals or wires show signs of corrosion, then they must be repaired or replaced.
15. Install the batteries in reverse order. Refer to the ***Illustrated Parts List*** for battery cable routing.
16. It is recommended to replace the battery terminal hardware when replacing the batteries.
17. Torque the terminal hardware to 7-8 ft.-lbs.
18. Tighten the hold downs so that the batteries are secure but not so tight as to deform the batteries.

⚠CAUTION **When torquing battery hardware, use a backup wrench on the battery bolt and tighten the nut. Failure to use a backup wrench may damage the battery post.**

19. Remove the blocks from the wheels and test drive.

Moist Charge Batteries

⚠WARNING

Explosive mixtures of Hydrogen gas are present within battery cells at all times. Do not work with or charge battery in an area where open flames (including gas furnace or water heater pilots), sparks, cigarettes, or any other sources of combustion are present. Always provide ample ventilation in rooms where batteries are being charged. Failure to do so may result in severe property damage and or serious

⚠WARNING

Battery electrolyte is poisonous and dangerous. It contains sulfuric acid. Avoid contact with skin eyes or clothing. Wear rubber gloves and safety glasses while servicing batteries. DO NOT INGEST! This may result in serious bodily injury.

⚠WARNING

A battery is a live electrical source. It cannot be disconnected or neutralized. Do not drop any tool or conductive object onto the battery. A conductive object that comes in contact with the battery terminals will initiate a short circuit of the battery. This could cause the battery to explode resulting in property damage and/or bodily injury.

Moist charged batteries are shipped without battery electrolyte. This allows for a much greater shelf life of the battery. Moist charged batteries must be filled with electrolyte and charged before putting into service. Battery electrolyte is a solution of acid and water that is formulated to be used in wet lead acid batteries and is available at most automotive parts distributors that carry batteries.

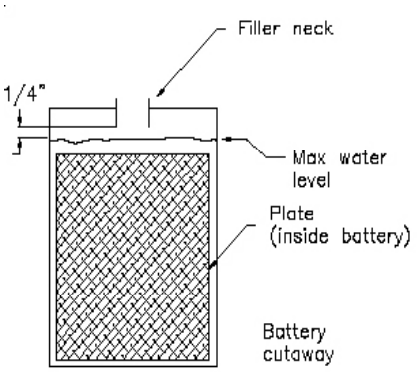
⚠CAUTION

Do not operate or charge a vehicle equipped with moist charged batteries until the batteries have been filled with electrolyte and charged. Operating or charging moist charged batteries before filling and charging will damage the batteries resulting in premature failure of the batteries.

⚠WARNING

1. **Make sure the key-switch is in the “OFF” position, then remove the key.**
2. **Place the forward-reverse switch in the center “OFF” position.**
3. **Set the park brake.**
4. **Place blocks under the front wheels to prevent vehicle movement.**
5. **Disconnect the main positive and negative cables at the batteries.**

6. Fill all battery cells with electrolyte to the proper level.
7. Thoroughly clean any spilled electrolyte from the batteries or the ground. Refer to ***Cleaning the Batteries*** for information on cleaning the batteries.
8. Reconnect the battery cables, connect the batteries to the charger and allow the charger to complete one charging cycle.
9. Remove the blocks from the wheels and test drive. The batteries are now ready to be put into service.



⚠CAUTION

Battery electrolyte will stain and corrode most surfaces. Immediately and thoroughly clean any surface outside of the battery that the battery electrolyte comes in contact with. Failure to clean may result in property damage.

STORAGE AND RETURNING TO SERVICE

Storage

⚠CAUTION

If the batteries are removed from the vehicle, do not place them directly on the ground, concrete or solid metal surface. It is recommended to store them on a wooden pallet or equivalent. Storing on the ground, concrete or solid metal surface will cause the batteries to discharge and may result in premature failure of the batteries.

Thoroughly clean the batteries and battery compartment. Refer to ***Cleaning*** in this section for information regarding cleaning the batteries.

Check the electrolyte level and charge the batteries. Refer to ***Watering*** in this section for information regarding checking the electrolyte level.

Store the vehicle or batteries in a cool, dry, well ventilated area.

If storing for more than one month, the batteries should be charged as follows:

Storage Temperature (F)	Charging Interval (months)
Over 60	1
Between 40 and 60	2
Below 40	6

Returning to Service

⚠WARNING

Explosive mixtures of Hydrogen gas are present within battery cells at all times. Do not work with or charge battery in an area where open flames (including gas furnace or water heater pilots), sparks, cigarettes, or any other sources of combustion are present. Always provide ample ventilation in rooms where batteries are being charged. Failure to do so may result in severe property damage and or serious

⚠WARNING

Battery electrolyte is poisonous and dangerous. It contains sulfuric acid. Avoid contact with skin eyes or clothing. Wear rubber gloves and safety glasses while servicing batteries. DO NOT INGEST! This may result in serious bodily injury.

⚠WARNING

A battery is a live electrical source. It cannot be disconnected or neutralized. Do not drop any tool or conductive object onto the battery. A conductive object that comes in contact with the battery terminals will initiate a short circuit of the battery. This could cause the battery to explode resulting in property damage and/or bodily injury.

⚠WARNING

1. **Make sure the key-switch is in the "OFF" position, then remove the key.**
2. **Place the forward-reverse switch in the center "OFF" position.**
3. **Set the park brake.**
4. **Place blocks under the front wheels to prevent vehicle movement.**
5. **Disconnect the main positive and negative cables at the batteries.**

6. Thoroughly clean the batteries and battery compartment. Refer to ***Cleaning*** in this section for information regarding cleaning the batteries.

⚠CAUTION

Battery electrolyte will stain and corrode most surfaces. Immediately and thoroughly clean any surface outside of the battery that the battery electrolyte comes in contact with. Failure to clean may result in property damage.

7. Check the electrolyte level and charge the batteries. Refer to ***Watering*** in this section for information regarding checking the electrolyte level.
8. Test the batteries. Refer to ***Testing*** section for information on testing the batteries.
9. The batteries are now ready to be put back into service.

Notes:

Tires and Wheels

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TIRE INFLATION

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

There are many tire options available with varying tire pressures. Refer to the side wall of your tire for information regarding the tire pressure for your tires.

The illustration to the right is an example of the side wall information on a tire.

Tire pressures must be checked when the tire is cold.

TIRE INSPECTION

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Check the tire pressure. Refer to ***Tire Inflation*** section for information on checking the tire pressure.
7. Inspect the tire tread depth. Minimum recommended tread depth is 1/16-inch. There are a series of tread depth wear indicators around the circumference of the tire. They will appear as 1/2-inch bands across the tread as the tire approaches its wear limit (see illustration to the right). Replace the tire if any tread depth indicator can be seen or any part of the tread depth is 1/16-inch or less. Refer to ***Replace the Tire*** section for information regarding replacing the tire.

8. Inspect for uneven tire wear on the front tires. Uneven tire wear could be a result of an improperly inflated tire or a misaligned or damaged front end.
   NOTE: Refer to **Tire Inflation** *section or* **Steering Component Service** *section for information on proper tire inflation or front end wheel alignment.*
9. Inspect the inner and outer side walls for cracks. If any cracks are seen, then the tire should be replaced. Refer to ***Replace the Tire*** section for information regarding replacing the tire.
10. Inspect the valve stem for cracks. If any cracks are seen, then the valve stem should be replaced. It is also recommended that the valve stem be replaced whenever the tire is replaced.
    NOTE: Refer to **Replace the Tire** *section for information regarding replacing the valve stem.*
11. Inspect the tread and side walls for debris in the rubber that could lead to a puncture. If any debris is found it should be removed and the tire inspected for a leak.

REPLACE THE REAR TIRE/WHEEL

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

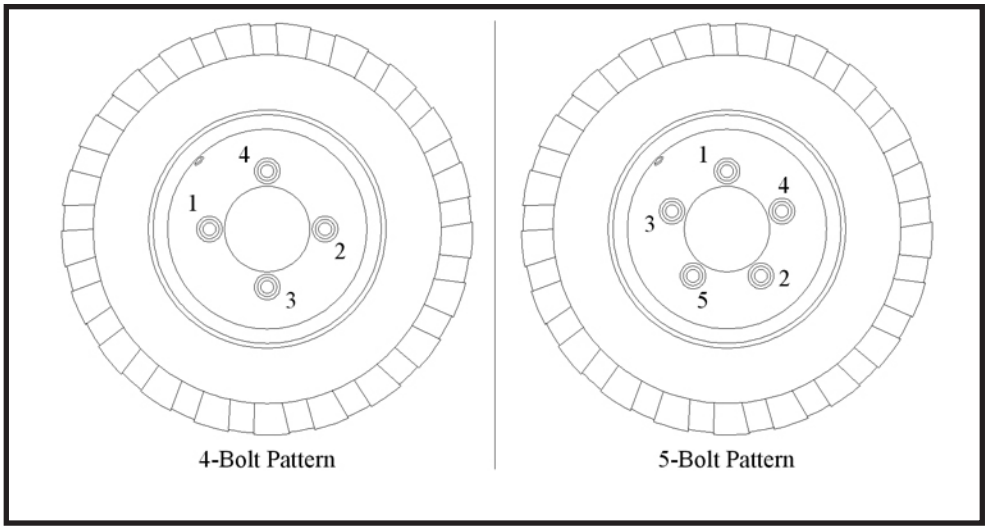
2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Raise the wheel to be replaced off of the ground and support with jack stands.
7. Remove the 4 or 5 wheel nuts and remove the wheel.
8. Install in reverse order.
9. Following the pattern shown on the following page, cross tighten the wheel nuts in two stages as follows:
   1st stage to approximately 20 ft-lbs.
   2nd stage to 80-90 ft-lbs.
10. Reconnect the main positive and negative cables at the batteries.
11. Lower the wheel to the ground.
12. Remove the blocks from behind the wheels.
13. Release the parking brake and test drive the vehicle.



Pattern for tightening the wheel nuts

⚠WARNING

Re-torque all wheel nuts to their final value after 1-week (20-hours) of operation. Failure to re-torque the wheel nuts may result in the wheel coming off of the vehicle causing severe bodily injury and/or property damage.

REPAIR THE TIRE

⚠WARNING

Do not attempt to repair a tire with a damaged side wall or a slice in the tread. This type of repair could fail prematurely resulting in severe bodily injury and/or property damage.

NOTE: To properly repair a puncture, the tire must be removed from the wheel. Refer to **Replace the Tire** *section for information on removing the tire from the wheel.*

It is recommended to repair a tire with a combination vulcanized plug and internal patch.

Tire repairs should only be performed by personnel trained in tire repair.

The tire repair procedure will be unique to the type of repair equipment or repair components used. Refer to the instructions provided with your equipment or repair components.

REPLACE THE TIRE (PNEUMATIC)

NOTE; To replace the tire, the tire/wheel assembly must be removed from the vehicle. Refer to **Replace the Tire/Wheel** *section for information on removing the tire/wheel assembly.*

⚠WARNING

Explosion Hazard. Fully deflate the tire before attempting to remove the tire from the wheel. Do not over inflate the tire when seating the bead. Failure to deflate the tire or over inflating the tire to seat the bead may cause explosive failure of the tire resulting in severe bodily injury or death.

Tire replacement should only be performed by personnel trained in tire replacement.

The tire replacement procedure will be unique to the type of replacement equipment being used. Refer to the instructions provided with your equipment.

Always use a new valve stem when replacing a tire.

1. Remove the tire from the wheel.
2. Cut the old valve stem off of the wheel.
3. Remove the valve stem cap from the new valve stem.
4. Lubricate the valve stem with liquid soap.
5. Install a new valve stem using a valve stem tool.
   NOTE: The valve stem tool is available at most auto repair shops.
6. Install the tire onto the wheel following the instructions provided with your tire replacement equipment.
7. Inflate the tire to the proper pressure and check for leaks.
8. Install the valve stem cap.

Notes:

Motor Controller

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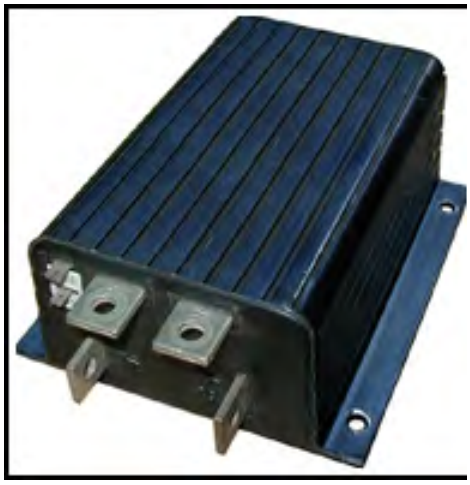
Motor Controller

⚠WARNING

This section is one section of a complete service manual. Before starting any procedure, read all warnings and instructions that are located in the Service Guidelines chapter.



REMOVE/INSTALL

⚠WARNING

This section is one section of a complete service manual. Before starting any procedure, read all warnings and instructions that are located in the Service Guidelines chapter.

NOTICE

Use a backup wrench on the terminal bolts. Failure to use a backup wrench may result in breaking the terminal seal and premature failure of the controller.

It may be required to remove the control panel from the vehicle for this procedure.

Remove

1: Turn the start switch OFF.
2: Disconnect the batteries.
3: Using a backup wrench, remove the four terminal bolts and wires.
4: Disconnect the wires from the KSI and #2 terminals.
5: If equipped with the 7-pin in-line connector, disconnect it.
6: Remove the four bolts holding the controller to the panel and remove the controller.

Install

1: Thoroughly clean the controller base and mounting plate.
2: Install the controller to the mounting plate.
3: Attach the wires to the studs and, using a backup wrench, torque per specification listed in the table at the end of this section.
4: If equipped with the 7-pin in-line connector, install silicon dielectric grease (94-422-10: 5.3 ounce tube) into the harness plug before connecting to the controller.

INSPECT

⚠WARNING

This section is one section of a complete service manual. Before starting any procedure, read all warnings and instructions that are located in the Service Guidelines chapter.

Inspect the area around all of the terminals for cracked or separated potting compound.

Inspect the surface of each terminal for corrosion.

Any cracks or corrosion may be an indication that the terminal seal is broken and may result in premature failure of the controller.

Check the adjustment screw plugs for correct torque.

TROUBLESHOOTING

Troubleshooting the control system is not included in this manual.

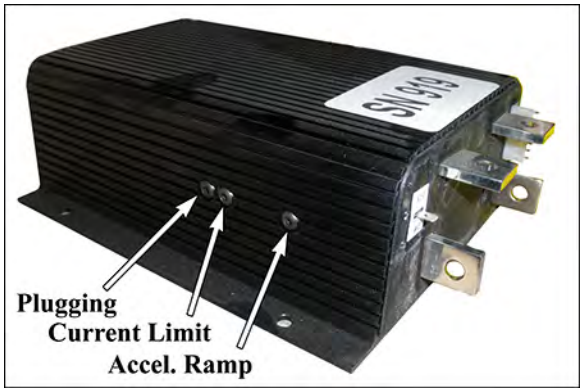
All electrical troubleshooting information is included in a separate manual “Troubleshooting Electric Vehicles” part number M7-001-69.

The troubleshooting manual was provided on the original vehicle documentation CD. A replacement CD or hard copy can be purchased from your authorized Taylor-Dunn distributor or can be downloaded from the Taylor-Dunn web site.

REPAIR/ADJUSTMENTS

⚠WARNING

This section is one section of a complete service manual. Before starting any procedure, read all warnings and instructions that are located in the Service Guidelines chapter.



Repairs

There are no internally serviceable components in the motor speed controller. If a controller is faulty then it must be replaced.

Note: Opening or disassembling a controller will void the controller warranty.

Adjustments

There are two or three adjustments available:

1: Acceleration Ramp: How fast the controller ramps up to full power.
2: Plugging Current: How much current is provided when reversing direction.
3: Current Limit: Maximum current (not available on all controls).

These adjustments are accessed by removing the button head screws in the housing. The control may need to be removed from the panel to gain access to the screws.

The adjustment potentiometers (pots) are located just under the screws. Use an insulated potentiometer adjustment tool to turn the pots. Each pot has built in stops. DO NOT turn past the stops or the pot may be damaged.

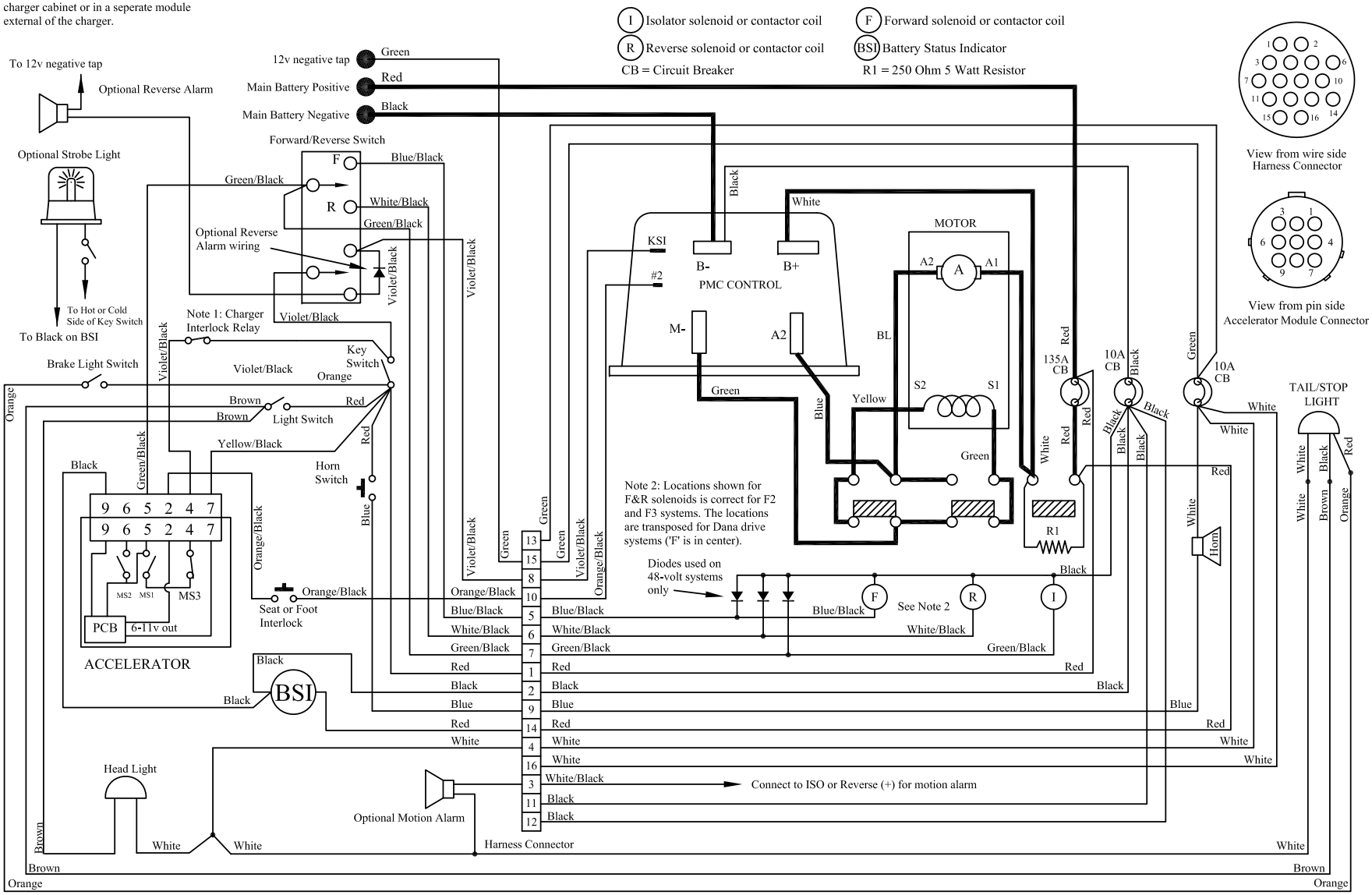
1: Acceleration Ramp: Turn clockwise for faster acceleration.
2: Plugging Current: Turn clockwise for harder plugging..
3: Current Limit: Turn counterclockwise to lower maximum current.

HARDWARE TORQUE

If hardware is not listed here, refer to standard torque values in the appendix.

Description	Inch Pounds	Newton Meters
Terminal hardware	72	8.13
Adjustment plugs	8	0.90

Notes:



Typical Curtis PMC Control System

SCH-00026, 3/19/2012, Revision C

Typical diagram shown. May not include special order options or accesori

Wire Diagram

Notes:

Battery Charger

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GLOSSARY

FLA: ---------- "Flooded Lead Acid" A battery using plates made of lead immersed in an acid electrolyte. The battery is vented with removable caps for maintaining the electrolyte.

Wet: ---------- Same as FLA.

SLA: ---------- "Sealed Lead Acid" is a battery using plates made of lead immersed in an acid electrolyte. The battery is sealed and the electrolyte cannot be maintained. Sometimes referred to as VRLA "Valve Regulated Lead Acid."i

GEL: ---------- Type of SLA battery.

AGM: ---------- "Absorbed Glass Mat" is a type of sealed battery (see SLA).

SCR: ---------- "Silicon Controlled Rectifier" is a type of semi conductor switch..

AC: ---------- "Alternating Current" used when referring to the charger power source.

DC: ---------- "Direct Current" used when referring to the charger output voltage.

LED: ---------- "Light Emitting Diode" is a type of lamp.

DMM: ---------- "Digital Multi Meter"

VPC: ---------- Volts Per Cell = Voltage for each cell in a battery pack. for example, one 6 volt battery has 3 cells.

Battery Volts: Voltage at the batteries at the time of test.

INDUSTRIAL CHARGERS

Industrial chargers are typically specified by, or provided by the end user. For troubleshooting or repair information, refer to the documentation provided with the charger or contact the charger manufacturer.

⚠CAUTION

SLA batteries must be charged with a charger configured for SLA batteries. Use of any other charger will result in damage to the batteries and premature failure of the batteries.

TESTING THE INTERLOCK RELAY

Operation

The Interlock Relay disables the vehicle from running whenever the charger is connected to a working AC power source. When the charger is plugged in, the relay contacts open and break the Key Switch connection to the speed controller. The Interlock Relay is available for built-in chargers only. Not all built-in chargers are equipped with this relay. To identify chargers that are equipped with the Interlock Relay:

- Inspect the charger wire harness where it enters the charger cabinet for two Violet/Black wires. If these wires are present then the charger is equipped with the Interlock Relay.

Testing

⚠WARNING

1. Make sure the start switch is in the "OFF" position, then remove the key.
2. Place the forward-reverse switch in the center "OFF" position.
3. Set the park brake.
4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the charger from the AC power source.
6. Disconnect the two Violet/Black wires at the charger.
7. Set the DMM to check for continuity and connect the DMM leads to the Violet/Black wires going into the charger.
   - The DMM should indicate a closed circuit. If the DMM indicates an open circuit, then the relay or the wires to the relay have failed. Stop here and repair the problem.
8. Connect the charger to a working AC power source.
   - The charger should turn on. If the charger does not turn on then their may be a problem with the AC power source or the AC wiring to the charger. Refer to the beginning of this section for charger troubleshooting. DO NOT continue until you have confirmed that the AC power source is working.
   - The DMM should indicate an open circuit. If it still indicates a closed circuit, then the relay or the wires to the relay have failed. Stop here and repair the problem.
   - If the DMM indicates an open circuit then the interlock relay is functioning normally.

REPLACING THE CHARGER

⚠CAUTION

Only used OEM components from Taylor-Dunn.

Chargers not tested by Taylor-Dunn (or intended for use on other Taylor-Dunn vehicles) may have unanticipated interaction and/or interference with the vehicles control system resulting in unsafe operation or damage to the electrical system.

The charger should only be replaced with the same type originally equipped with the vehicle or a charger approved by Taylor-Dunn for use with this vehicle.

The motor control system is equipped with a charger interlock circuit. It disables the control system when the charger is plugged in. The interlock is built in to the charger and/or is incorporated in the portable charger receptacle.

The interlock serves two purposes:

1) Disables the motor control system preventing the vehicle from operating while the charger cord is connected.
2) Turns off the motor control system protecting it from electrical interference generated by the charger.

Note: The Signet charger comes equipped with a long fully insulated AC cord that can be cut to length as needed for the vehicle application. Do not cut the AC cord and splice to the existing AC cord in the vehicle.

Cutting and splicing the Signet AC cord will void the charger warranty

⚠CAUTION

SLA batteries must be charged with a charger configured for SLA batteries. Use of any other charger will result in damage to the batteries and premature failure of the batteries.

LESTRONIC II CHARGER

⚠CAUTION

SLA batteries must be charged with a charger configured for SLA batteries. Use of any other charger will result in damage to the batteries and premature failure of the batteries.

Built-In

Test Equipment Required for Troubleshooting

- Digital Multi-Meter (DMM) with diode and capacitor test function, FLUKE 79® model shown in the troubleshooting illustrations.
- Clamp on DC ammeter to measure up to 40-Amps.

Important Notes and Instructions

- This troubleshooting guide assumes a familiarity with the use of a digital multi-meter including, voltage tests, continuity tests, and diode testing. If you are not familiar with any part of these tests, refer testing to a qualified technician.
- Make sure that the AC electrical outlet is in good working condition.
- Make sure that the AC voltage at the electrical outlet is the same as the AC voltage on the charger nameplate.
- Make sure the batteries are in good condition and no less than 80% discharged as per hydrometer reading.
- The battery voltage must be above approximately 65% of the chargers rated DC voltage. If the batteries are below approximately 65% of the chargers rated DC voltage, the charger will not turn on.
- If the charger exhibits intermittent problems, it must be in the failed mode for troubleshooting.
- Battery volts = Full voltage available at the batteries at the time of the test being performed.
- This test procedure must be performed in the order it was written. If starting in the middle or skipping sections when not instructed to do so, the proper results will not occur. If the test result is good, then proceed to the next test or go to the next section if instructed to do so.

Portable

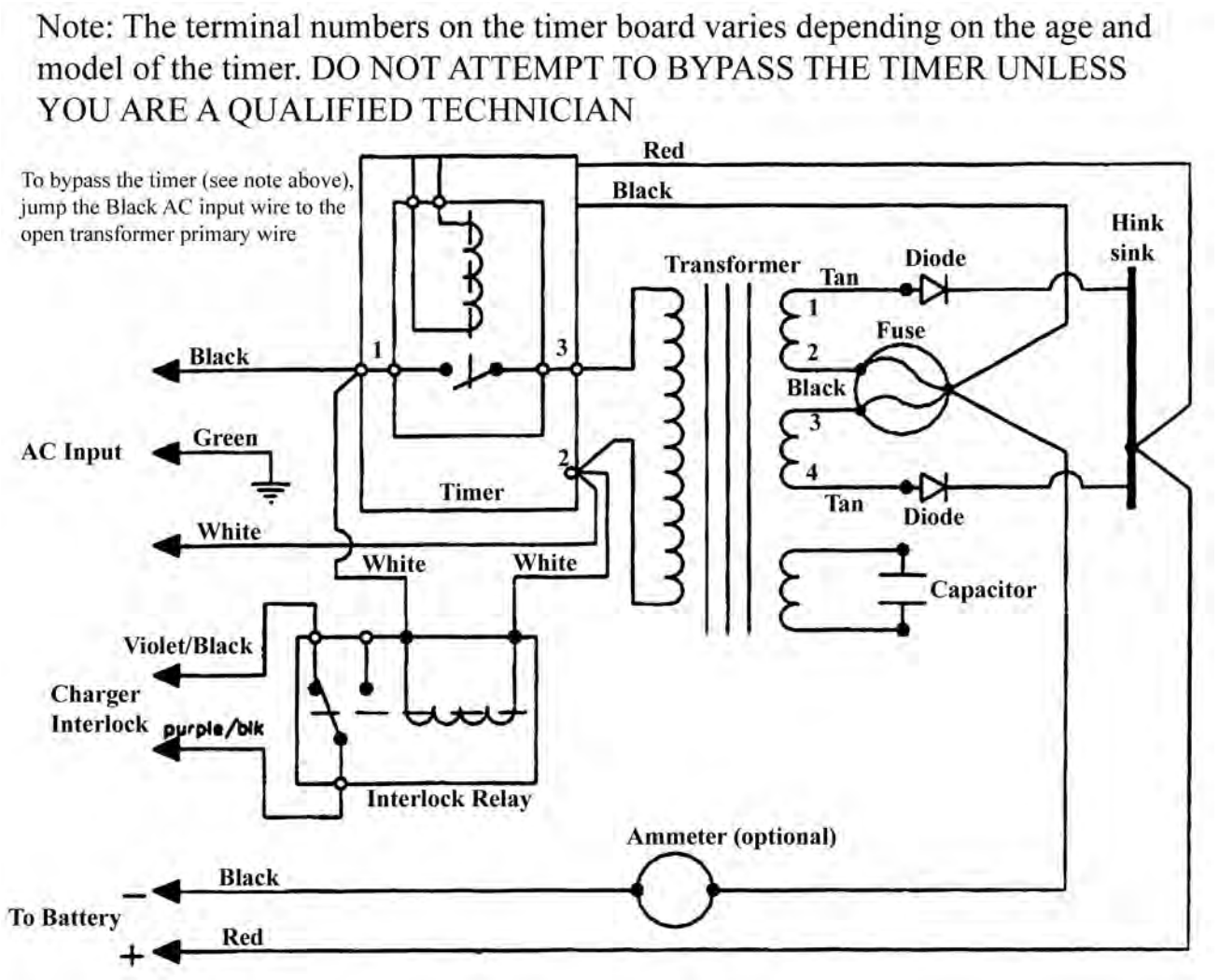
Operating Instructions and Theory of Operation

The Lestronic II® chargers are designed as semiautomatic chargers. The Lestronic II® charger turns itself on when the “built- in” charger is plugged into the wall outlet, or when the “portable” charger is plugged into the batteries. As the battery charges, the battery voltage rises. The charger periodically checks the battery voltage and compares it to the previous reading. When the battery voltage stops rising a predetermined amount, then the batteries are no longer accepting a charge and the charger shuts off. The charger will not start again unless the AC cord on a “built-in” charger is disconnected from the wall outlet, or the DC plug on a portable charger is disconnected from the batteries.

The charger does not check the current state of charge when it is plugged in, it assumes that the batteries require charging when it is connected. For this reason, it is recommended to discharge the batteries approximately 50% (1175-1200 as indicated on a hydrometer) before connecting the charger. If the charger is connected before the batteries are discharged 50%, the batteries may enter an overcharge state before the charger can sense that the batteries are no longer accepting a charge. This could result in overcharging and damaging the batteries.

The relay that operates the charger is powered by the batteries being charged. If the voltage on the batteries to be charged is less than approximately 65% of the rated charger DC voltage, the relay will not pick up and the charger will not turn on. In this situation, a manual charger would have to be used to bring the battery voltage up so that the Lestronic® charger can sense that they are connected and turn itself on.

Internal Wire Diagram



⚠WARNING

While connected to an AC outlet, the charger cabinet must remain electrically grounded. Disconnect both of the battery leads and unplug the charger from the AC source before disconnecting any electrical component or wire. Failure to do so may result in serious bodily injury.

Troubleshooting, Built-in Charger

⚠WARNING

1. **Make sure the start switch is in the "OFF" position, then remove the key.**
2. **Place the forward-reverse switch in the center "OFF" position.**
3. **Set the park brake.**
4. **Place blocks under the front wheels to prevent vehicle movement.**

5. Disconnect the charger from the AC power source.
6. Locate the charger harness connectors where the charger harness is connected to the vehicle's control harness. There will be two 10 gauge and two or four 14 gauge wires.
7. Slide the insulators off the connectors on the two 10 gauge wires and perform the following tests:
   - Test the voltage from the vehicle harness red wire to main battery negative terminal. This voltage should be equal to the battery voltage. If the voltage is less than the battery voltage, then this wire is broken or has a faulty connection. Stop here and repair the problem.
   - Test the voltage from the vehicle harness red wire to the other 10 gauge wire (white or black depending on model). This voltage should be equal to the battery voltage. If the voltage is less than the battery voltage, then the white (or black) wire is broken or has a faulty connection. Stop here and repair the problem.
8. Slide the insulators back onto the connectors on the two 10 gauge wires.
9. Slide the insulators off the connectors on the Black and White 14 gauge wires.

⚠WARNING

High Voltage. Do not touch the 14-gauge wires and make sure these two wires do not come into electrical contact with any other object. Failure to do so may result in serious bodily injury.

10. Re-Connect the charger to the AC source and perform the following tests:
    - Test the voltage across the Black and White 14 gauge wires. This voltage should be the same as the voltage at the AC receptacle (rated voltage of the charger). If the voltage is less than the rated AC voltage of the charger then the 14 gauge white or black wire(s) is broken or has a bad connection between the charger connectors and the AC plug. Stop here and repair the problem.
11. Disconnect the charger from the AC power source.
12. Disconnect the batteries.
13. Remove the charger from the vehicle.
14. Remove the charger cover and perform the following tests:
    - Inspect the internal wiring of the charger and repair as required.
    - Check the continuity of both fuse links and replace if faulty.
    - Disconnect one transformer lead from the capacitor. Test the capacitor using the capacitor test function of the meter. It is a 6 microfarad capacitor. If the capacitor is bad, it must be replaced. Stop here and repair the problem.
    - Reconnect the transformer lead to the capacitor and disconnect one transformer lead from one of the diodes. Test each of the diodes using the diode test function of your meter. If either one of the diodes are bad, replace the diode assembly. Stop here and repair the problem.
15. Reconnect the lead to the diode.

⚠WARNING

High Voltage inside the charger. Do not touch any internal components while the charger is plugged in. Touching internal components may result in electric shock causing severe bodily injury or death.

16. Reconnect the charger to the vehicle's harness and slide the wiring insulators back into place. Connect the charger to the AC source and perform the following tests:
    - Test the voltage from the fuse assembly (-) to the diode block common terminal (+). This voltage should be equal to the battery voltage. If the voltage is less than the battery voltage, then the wires from the harness connectors to the charger are bad. Stop here and repair the problem.
    - Test the voltage across the white and black wires that are connected to the timer board. This voltage should be the same as the rated AC voltage of the charger. If the voltage is less than the rated AC voltage of the charger, then the wires from the harness connectors to the charger are bad. Stop here and repair the problem.
    - If the timer relay does not pickup (click) when the AC source is connected, then the timer control circuit or the relay is bad (refer to Timer Relay Test). Stop here and repair the problem.
    - Test the AC voltage across the transformer primary circuit. The transformer primary consists of the two solid wires with the brown fiber insulator that are connected to the timer board. This voltage should be the same as the rated AC voltage of the charger. If the voltage is less than the rated AC voltage of the charger, then the timer relay is bad. Stop here and repair the problem.
    - Test the AC voltage across the transformer low voltage secondary circuit. The transformer low voltage secondary circuit can be tested at the two solid wires with the brown fiber insulator that are connected to the anodes on the two diodes. The voltage here will vary depending on the state of charge in the batteries. The voltage should be between 208% and 250% of the rated DC voltage of the charger. If the voltage is not between 208% and 250% of the rated DC voltage of the charger, the transformer is bad and must be replaced. Stop here and repair the problem.

⚠WARNING

While connected to an AC outlet, the charger cabinet must remain electrically grounded. Disconnect both of the battery leads and unplug the charger from the AC source before disconnecting any electrical component or wire. Failure to do so may result in serious bodily injury.

Troubleshooting, Portable Charger

1. Disconnect the charger from the AC outlet and the batteries and perform the following tests:
   - Test the voltage from the positive terminal on the vehicles DC receptacle to main battery negative. This voltage should be equal to the battery voltage. If the voltage is less than the battery voltage then this wire is broken or has a bad connection. Stop here and repair the problem.
   - Test the voltage from the positive terminal on the DC receptacle to the negative terminal on the DC receptacle. This voltage should be equal to the battery voltage. If the voltage is less than the battery voltage, then the wire on the negative terminal of the DC receptacle is broken or has a bad connection. Stop here and repair the problem.
2. Remove the charger cover and perform the following tests:
   - Inspect the internal wiring of the charger and repair as required.
   - Check the continuity of both fuse links and replace if bad.
   - Disconnect one lead from the capacitor. Test the capacitor using the capacitor test function on the meter. If the capacitor is bad, it must be replaced. Stop here and repair the problem.
   - Reconnect the lead to the capacitor and disconnect one transformer lead from one of the diodes. Test each of the diodes using the diode test function on the meter. If either one of the diodes are bad, replace the diode assembly. Stop here and repair the problem.
3. Reconnect the lead to the diode.

⚠WARNING

High Voltage inside the charger. Do not touch any internal components while the charger is plugged in. Failure to do so may result in serious bodily injury.

4. Connect the charger to the AC source. Insert the DC charger plug into the DC receptacle and perform the following tests:
   - Test the voltage from the fuse assembly (-) to the diode block common terminal (+). This voltage should be equal to the battery voltage. If the voltage is less than the battery voltage, then the DC cord is bad. Stop here and repair the problem.
   - Test the voltage across the white and black wires that are connected to the timer board. This voltage should be the same as the rated AC voltage of the charger. If the voltage is less than the rated AC voltage of the charger then the AC cord is bad. Stop here and repair the problem.

Note: If the above tests are good and the timer relay does not pickup (click) within 5 seconds of connecting the DC charger plug, then the timer control circuit or the relay is bad (refer to Timer Relay Test). Stop here and repair the problem.

   - Test the AC voltage across the transformer primary circuit. This voltage should be the same as the rated AC voltage of the charger. If it is less than the rated AC voltage of the charger, then the timer relay is bad. Stop here and repair the problem.
   - Test the AC voltage across the transformer secondary circuit. The voltage here will vary depending on the state of charge in the batteries. The voltage should be between 208% and 250% of the rated DC voltage of the charger. If the voltage is not between 208% and 250% of the charge's rated DC voltage, the transformer is bad and must be replaced. Stop here and repair the problem.

LESTER X-SERIES CHARGER

⚠CAUTION

SLA batteries must be charged with a charger configured for SLA batteries. Use of any other charger will result in damage to the batteries and premature failure of the batteries.

Test Equipment Required for Troubleshooting

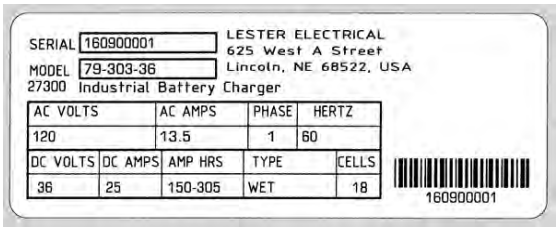
- Digital Multi Meter (DMM)
- Clamp on DC ammeter to measure up to 20-Amps.
- Small 12 volt battery
- 12 volt test light
- 300 Ohm resistor
- Oscilloscope

Important Notes and Instructions

- This troubleshooting guide assumes a familiarity with the use of a digital multimeter including, voltage tests, continuity tests, and diode testing. If you are not familiar with any part of these tests, refer testing to a qualified technician.
- Make sure that the AC electrical outlet used is in good working condition.
- Make sure that the AC voltage at the electrical outlet is the same as the AC voltage specified on the charger nameplate.
- Make sure the batteries are in good condition.
- If the charger exhibits intermittent problems, it must be in the failed mode for troubleshooting.

Theory of Operation

1 Stop/Start switch
2 Status LED
3 Low Voltage Start switch
4 Diagnostic LED
5 AC Circuit Breaker
6 DC Ammeter
7 Self Diagnostic Switch
8 DC Fuse


SERIAL 160900001
MODEL 79-303-36
27300 Industrial Battery Charger
LESTER ELECTRICAL
625 West A Street
Lincoln, NE 68522, USA

AC VOLTS	AC AMPS	PHASE	HERTZ
120	13.5	1	60

DC VOLTS	DC AMPS	AMP HRS	TYPE	CELLS
36	25	150-305	WET	18

160900001

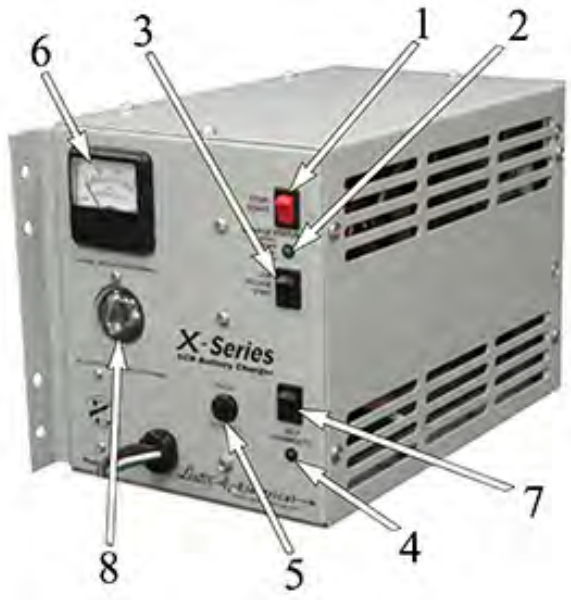
Typical specification plate (reference only, specifications will vary for different chargers)

The X-Series charger is a fully automatic microprocessor controlled SCR switching charger.

The charger turns itself on when it is plugged into the AC electrical outlet and turns off when the batteries are fully charged. Once the charging cycle is complete, the charger will monitor the battery voltage. If the voltage drops below a threshold voltage, the charger will turn on again for a short cycle to keep the charge fresh.

It is possible that the charger will not turn on if the battery is severely discharged. Should this occur, then the Low Voltage Start switch can be used to manual start the charger. Refer to the Operation Chapter in the Owner Operator manual for details on operation of the Low Voltage Start switch.

Fault and Diagnostic Error Code Table



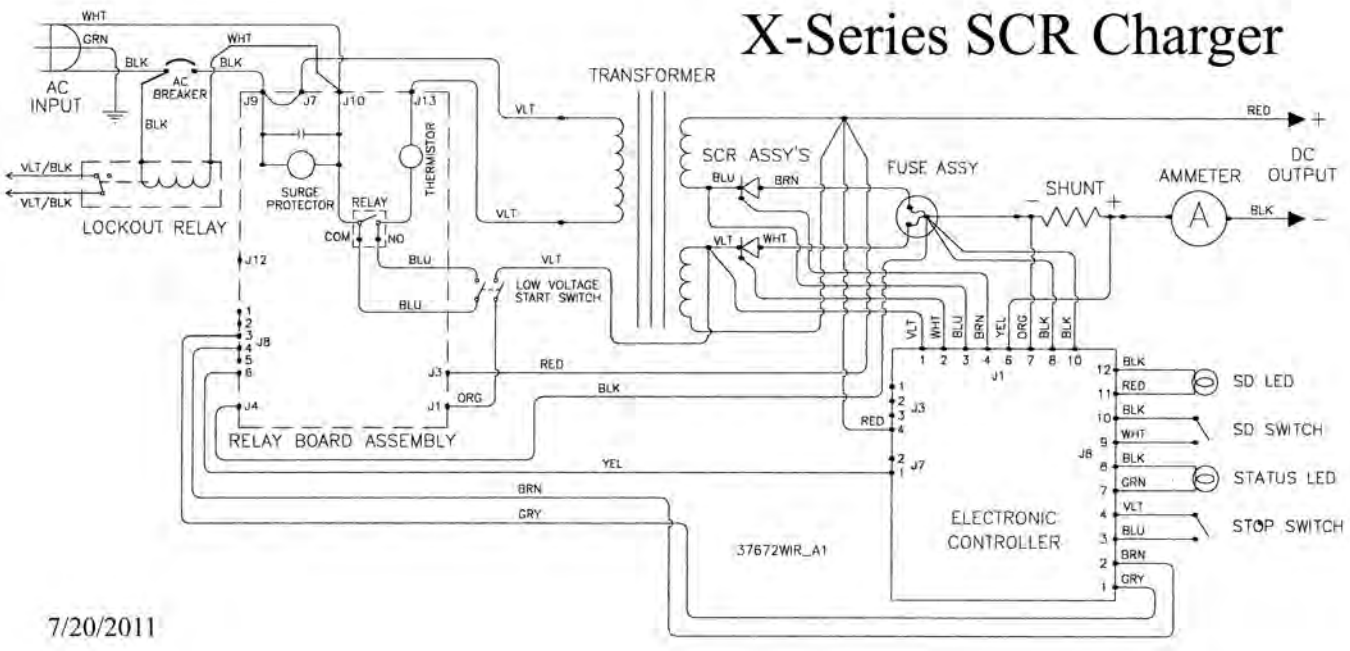
Fault Chart

B = Blinking, S = Solid, O = Off

LED 4	LED 2	Fault
O	O	OK
B	B	Battery voltage out of range or battery capacity is too high
S	O	Control Board faulty
B	S	Current Sensor faulty
S	B	AC voltage incorrect
S	S	DC current out of range
B	O	Internal jumper missing

Note: Fault codes are not conclusive of the actual problem.

Internal Wiring Diagram



Testing the Charging Cycle

Before starting this procedure:

- Confirm that the battery voltage is above 1.7 x Number of Cells (36 volts = 18 cells = 1.7 x 18 = 30.6 volts). If the battery voltage is low, the charger may have to be started manually by pressing the Low Voltage start switch.
- Confirm that the AC outlet used is functioning properly.

Charge Profile	Wet /FLA	AGM / SLA
Charge Profile Type	Constant Current–Voltage Slope–Constant Current	Constant Current–Constant Voltage
Start/Bulk Current*	17.0 A	17.0 A
Minimum Voltage	1.83 V/cell	1.83 V/cell
Minimum Voltage Time	10 minutes	10 minutes
Maximum Time in Start	12 hours	12 hours
Knee #1 Plateau/Absorption Voltage	2.32 V/cell	2.45 V/cell
Knee #2 Plateau/Absorption Voltage	2.36 V/cell	2.45 V/cell
Maximum Time in Plateau	5 hours	No Maximum
Finish Current	5.5 A	--
Maximum Time in Finish	8 hours	--
Charge Termination Method (Primary)	DV/DT	DI/DT
Maximum Total Time	20 hours	20 hours
Maximum Voltage	2.82 V/cell	2.70 V/cell
*The starting current may drop significantly after only a short time depending on the discharge level of the battery		

Connect a volt meter to the batteries to monitor charging voltage during procedure.

The charging cycle has multiple stages depending on the battery profile selected.

Flooded Lead Acid battery profile (FLA, Wet):

Stage 1: Constant Current (start)

Stage 2: Voltage Slope

Stage 3: Constant Current (finish)

Sealed battery profile (AGM, SLA):

Stage 1: Constant Current

Stage 2: Constant Voltage

Note: Each stage has a maximum time interval. If the maximum time interval is reached in any stage, then the charge cycle is terminated and a fault is registered.

1. Connect the charger to the AC power source.
2. The charger should automatically start as indicated by the flashing Status LED.
   - If the charger does not start, try pressing the Low Voltage Start switch for 10 seconds.
   - If the charger still does not start:
     > Check the AC and DC wiring to the charger.
     > Check the charger fuse. Note: A blown fuse is typically due to faulty charger components or reversed polarity charger DC wiring.
     > Check the internal charger components.
3. **Constant Current Mode:** The starting current should be close to the value in the table but may drop soon after starting depending on the discharge level of the battery.
4. If the battery voltage does not reach the Minimum Voltage in the Minimum Voltage Time, then the charge cycle is terminated and a fault is registered.
5. The battery voltage will rise until the Knee #1 Plateau voltage is achieved (see table) then switch to the next stage.

The following stages will depend on the type of charging profile selected:

AGM Profile

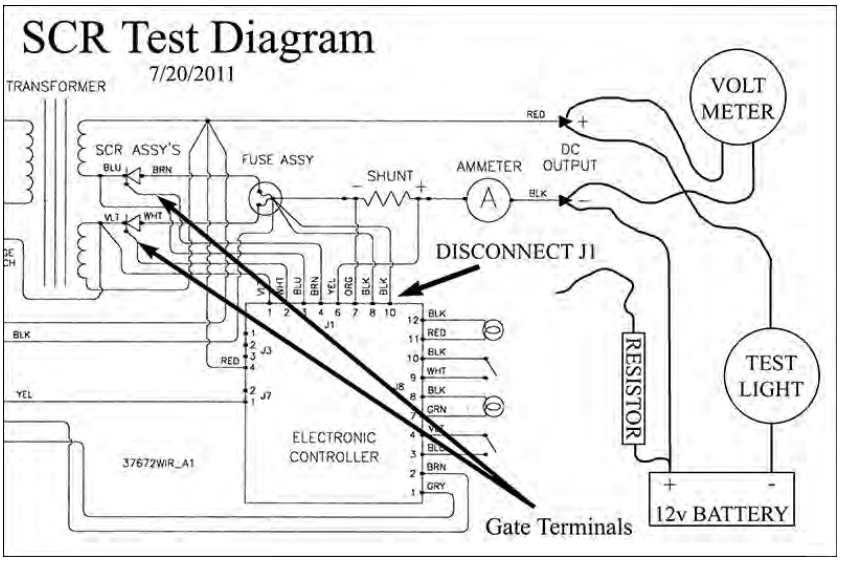
6. **Constant Voltage Mode:** The battery voltage is held at Knee #2 Plateau voltage. Once in this stage, the charger monitors the charging current and terminates the charge cycle when the current remains constant for a preset time period. This is called DI/DT which means the Change in Current over the Change in Time.

FLA Profile

6. **Voltage Slope Mode:** The voltage is allowed to rise slowly as the current is decreased until the Knee #2 Plateau voltage is achieved. It holds this voltage until the current has decreased to the Finish Current value then switches to the next stage.
7. **Constant Current Mode (finish):** The current is held at the Finish Current value. Once in this stage, the charger monitors the charging current and terminates the charge cycle when the battery voltage remains constant for a preset time period. This is called DV/DT which means the Change in Voltage over the Change in Time.

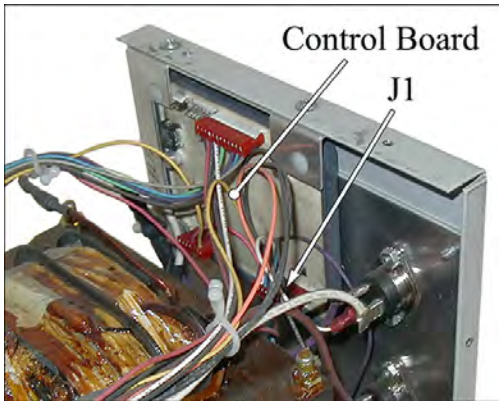
Troubleshooting

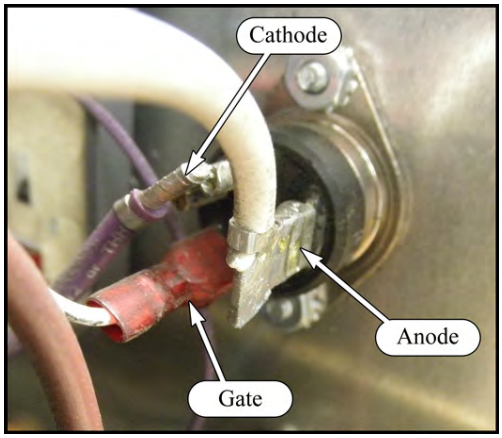
SCR Assembly



Note: Both SCR's must be replaced as a set.

Note: This test passes current through the transformer and fuse. Confirm both the transformer and fuse are good before continuing.





Tools required for this test:

12 volt battery, Test light, Volt meter, 300 Ohm resistor.

Test Setup:

1. Remove the charger form the vehicle.
2. Remove the charger cover.
3. Disconnect the Gate wires from both SCR's.

Note: The other wires are soldered and cannot be removed.

4. Disconnect the control board J1 connector.
5. Connect the 12 volt battery positive to the charger DC output Black wire.

   Connect one lead of the resistor to the 12 volt battery positive. The resistor should be on a wire long enough to reach the SCR's.'
6. Connect the 12 volt battery negative to one of the test light leads.
7. Connect the other test light lead to the charger DC output Red wire.
8. Connect a voltmeter to the charger Black and Red output wires.

Test:

Perform the test setup before starting this procedure.

1. The test light should be OFF. If the light is ON then one of the SCR's is shorted. Skip ahead to Gate Test.
2. Momentarily touch the resistor to one of the gate terminals.
3. The test light should turn ON and stay ON when the resistor is removed. The voltmeter should read 0.88 volts (nominal). If the light does not turn ON then the SCR has failed. Skip ahead to Gate Test.
4. Disconnect then reconnect the battery and repeat the test on the other SCR.

Gate Test:

This test should only be performed if it has been determined that one of the SCR's have failed.

Perform the following on BOTH SCR's.

1. Disconnect the 12 volt battery and all test leads.
2. Measure the resistance from the SCR Anode terminal (+) to the Gate terminal (-).
3. The resistance should be high, around 15 meg Ohms.
4. If the reading is low, then the gate is shorted. If the gate has shorted on either SCR, then it is likely that the control board has been damaged and must also be replaced.

Transformer

⚠WARNING

While connected to an AC outlet, the charger cabinet must remain electrically grounded. Disconnect both of the battery leads and unplug the charger from the AC source before disconnecting any electrical component or wire. Failure to do so may result in serious bodily injury.

1. Remove the charger from the vehicle.
2. Remove the charger cover.
3. Connect an AC volt meter to the transformer secondary winding accessed at the Cathode on each SCR (blue and violet wires). Set the meter to read up to 150 volts RMS.

⚠WARNING

High Voltage inside the charger. Do not touch any internal components while the charger is plugged in. Touching internal components may result in electric shock causing severe bodily injury or death.

⚠CAUTION

Make sure that the meter leads do not touch any other component or wire. Other components will be damaged if the leads touch any other component or wire.

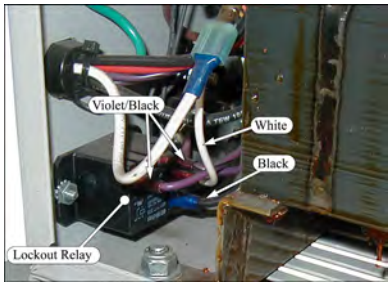
4. Connect the charger AC wires to a power outlet.
5. Depress the Low Voltage Start switch and record the voltage indicated on the meter.
6. Disconnect the charger from the AC power source and remove all test leads.
7. The transformer secondary RMS AC voltage should be approximately 2.1 times the rated DC voltage of the charger.

Note: Typically, the secondary voltage of a failed transformer will be significantly below specification.

Lock Out Relay

Before continuing, Refer to Testing the Interlock Relay procedure in this section. This is an external test to confirm if the relay is functioning properly.

This test should only be performed if it has been determined that the relay is not closing by the procedure indicated above.



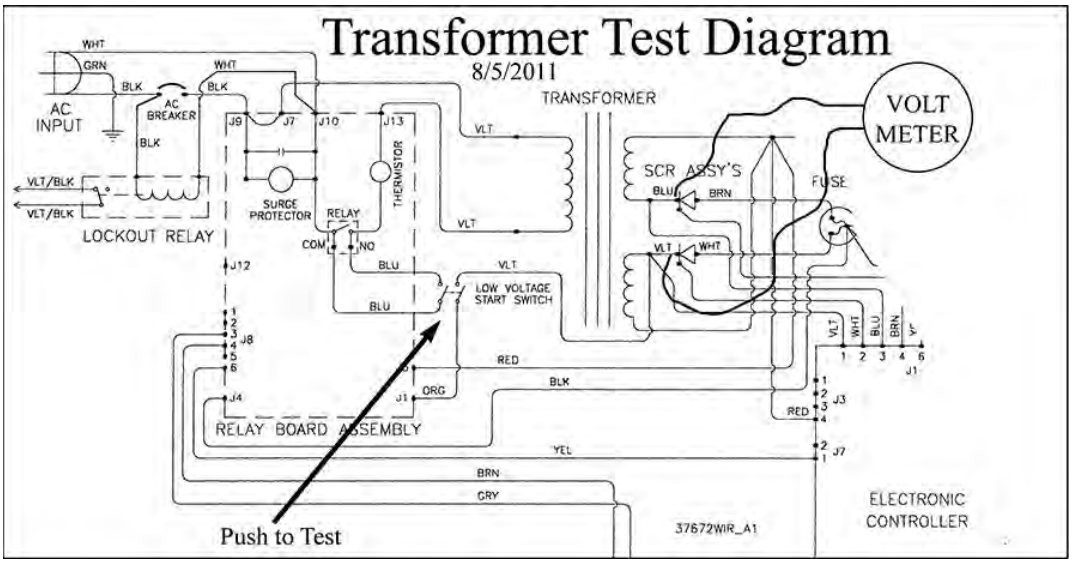
1. Remove the charger form the vehicle.
2. Remove the charger cover.
3. Disconnect the black and white relay coil wires from the relay.
4. Measure the resistance across the relay coil terminals.
   - 120 volt charger: 2,700 Ohms (nominal)
   - 220 volt charger: 11k Ohms (nominal)

   If out of specification then the relay is faulty.
4. Reconnect the wires to the relay.
5. Disconnect the Violet/Black wires from the relay.
6. Connect an Ohm meter across the relay terminals.

⚠WARNING

High Voltage inside the charger. Do not touch any internal components while the charger is plugged in. Touching internal components may result in electric shock causing severe bodily injury or death.

7. Connect the charger AC wires to a power outlet. The relay should “click” and the meter should indicate a closed circuit.
   - If the relay does not “click” then check the wiring to the relay coil.
   - If the meter does not indicate a closed circuit, then the relay is faulty.
   - If the relay tests OK, check continuity of the Violet/Black wires.
8. Disconnect then charger from the AC power source and remove all test leads.



Relay Board Assembly

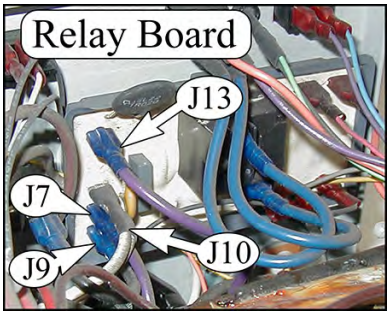
Note: To perform this procedure, the battery must have a static voltage above 1.2 volts per cell. If not available, a variable DC power supply can be used in place of the battery. The power supply voltage should be set to 12% higher then the rated charger DC voltage. If using the power supply, the charger may report an out of range voltage fault after about 10 seconds of operation. Should this occur, turn the power supply OFF, then ON to continue testing.

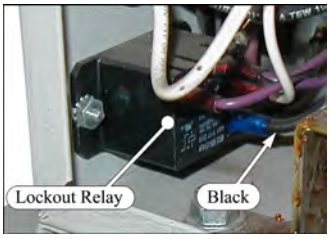
⚠WARNING

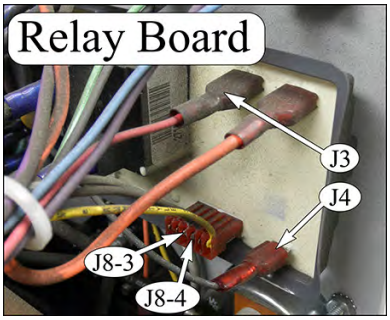
While connected to an AC outlet, the charger cabinet must remain electrically grounded. Disconnect both of the battery leads and unplug the charger from the AC source before disconnecting any electrical component or wire. Failure to do so may result in serious bodily injury.

⚠WARNING

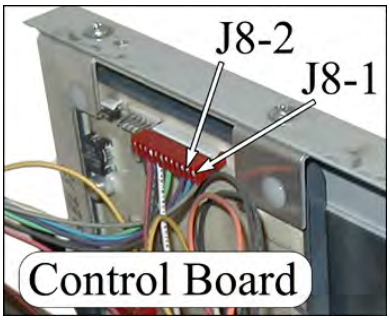
High Voltage inside the charger. Do not touch any internal components while the charger is plugged in. Touching internal components may result in electric shock causing severe bodily injury or death.





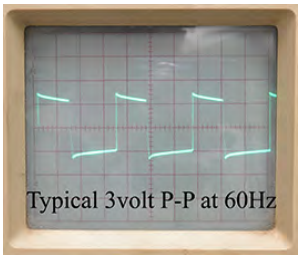


1. Remove the charger from the vehicle.
2. Disconnect the charger from the AC power source.
3. Remove the charger cover.
4. Disconnect the Black wire from the Lockout Relay (reconnect when testing is completed).
5. Connect the charger to the AC power source and check voltage at Relay Board terminals J9 and J10. Should be the rated AC voltage of the charger. If not, then check the AC power source and wiring to the Relay Board.
6. Check the AC voltage across Relay Board terminals J7 and J10. Should be the rated AC voltage of the charger. If not, then replace the Relay Board.
7. Connect the charger to the battery. The relay should close (click). If the relay does not close then skip the next test.
8. Check AC voltage across Relay Board terminals J7 and J13. Should be the rated AC voltage of the charger. If not then replaced the Relay Board.



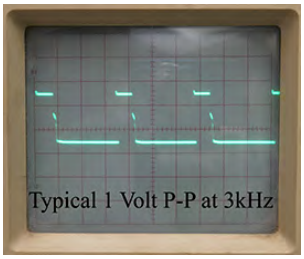
Continue ONLY if the Relay did not close.

9. Disconnect the charger from the AC power source and test DC voltage across Relay Board terminals J3 (+) and J4 (-). This should be the same as battery volts. If this voltage is low, then check wiring to the batteries.
10. Disconnect the charger from the battery.
11. Connect the charger to the AC power source.
12. Connect an oscilloscope to Control Board J8-2 terminal (use Relay Board J4 as ground). Should see a 3 volt P-P square wave at 60 Hz. Note: This signal is only present with the battery connected AND the charger is not ON.
    - If out of specification, repeat the test at ***Relay Board*** J8-4. If still bad, replace the Relay Board. If good, check the charger wiring.



Continue ONLY if test at J8-2 was Good.

13. Connect an oscilloscope to Control Board J8-1 terminal (use Relay Board J4 as ground). Should see a 1 volt P-P square wave at 3 kHz.
    - If out of specification then check all wiring to the Control board. If wiring OK, replace the Control Board.
    - If OK, repeat test at Relay Board J8-3. If bad, check charger wiring. If good, then replace the Relay Board.



Don't forget to reconnect the Lockout Relay when testing is completed!

Control Board Assembly

There is no test for the control board assembly.

Test all other components and confirm all wiring is OK. If all components test good, then it is likely that the control board has failed.

Profile Setting

⚠WARNING

Disconnect the charger from the AC power source before removing the charger cover. Failure to disconnect the AC power source may result in electric shock causing personal injury or death.

⚠CAUTION

SLA batteries must be charged with a charger configured for SLA batteries. Use of any other charger will result in damage to the batteries and premature failure of the batteries.

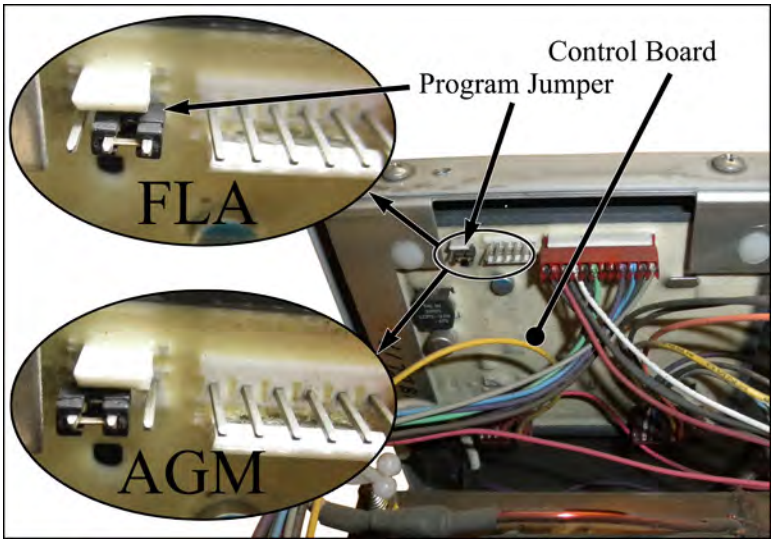
⚠CAUTION

The type of charger is indicated on the charger specification plate on the charger cover. If the charger type is changed, then the charger cover must be permanently marked to indicate the change.

This charger can be set for WET/FLA or SLA/AGM type batteries. The program setting is determined by the location of the program jumper as shown in the illustration.

The type of charger is indicated on the charger specification plate on the charger cover. If the charger type is changed, then the charger cover should be permanently marked to indicate the new type.

Note: The Taylor-Dunn AGM charging profile has been optimized for Full River ® VRLA AGM DC Series batteries.



SIGNET HBS CHARGER

⚠CAUTION

SLA batteries must be charged with a charger configured for SLA batteries. Use of any other charger will result in damage to the batteries and premature failure of the batteries.

Test Equipment Required for Troubleshooting

- Digital Multi Meter (DMM).
- Clamp on DC ammeter to measure up to 20-Amps.

Important Notes and Instructions

- This troubleshooting guide assumes a familiarity with the use of a digital multimeter including, voltage tests, continuity tests, and diode testing. If you are not familiar with any part of these tests, refer testing to a qualified technician.
- Make sure that the AC electrical outlet used is in good working condition.
- Make sure that the AC voltage at the electrical outlet is the same as the AC voltage specified on the charger nameplate.
- Make sure the batteries are in good condition.
- If the charger exhibits intermittent problems, it must be in the failed mode for troubleshooting
- There are no internally serviceable components in the charger. If the charger has failed then it must be replaced.

Definitions:

Volts Per Cell = Voltage for each cell in a battery pack. for example, one 6-volt battery has 3-cells.

Term	Value	Condition
V1:	See Chart	FLA batteries
	2.383 Volts Per Cell	SLA Batteries
V2:	2.08 Volts Per Cell	All batteries
A1:	2 to 4 Amps	All batteries

All voltages are nominal.

V1: Voltages are temperature compensated relative to the temperature of the charger at the time the charge cycle is started.

Starting Temperature (C)	V1 Volts Per Cell
Less than -4	2.64
-4 to 2	2.61
2 to 8	2.59
8 to 14	2.56
14 to 21	2.54
21 to 35	2.52
Greater than 35	2.44

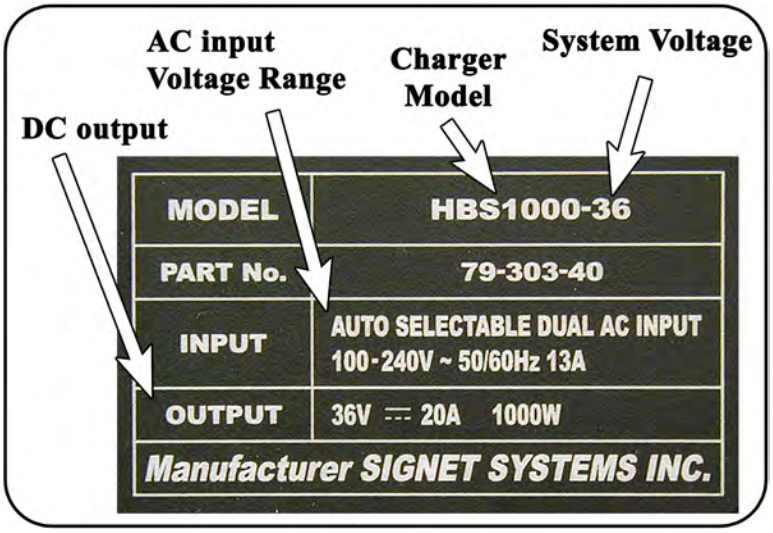
⚠CAUTION

This charger is rated for 115 VAC or 230 VAC operation (nominal). When switching from one input voltage to the other, wait until all LED's are off. Switching voltage when any of the LED's are on will result in damage to the charger.

⚠CAUTION

SLA batteries must be charged with a charger configured for SLA batteries. Use of any other charger will result in damage to the batteries and premature failure of the batteries.

Operating Instructions and Theory of Operation



Typical specification plate
(reference only, specifications will vary for different chargers)

The model HBS 600W® and HBS 1000W® chargers are designed as automatic chargers. The charger turns itself on when it is plugged into the wall outlet and turns off when the batteries are fully charged. Once the charging cycle is complete, the charger will monitor the battery voltage. If the battery voltage drops below a specific value (V2), the charger will turn on again for a short cycle.

Both the HBS 600W® and HBS 1000W® are two stage chargers. The first stage is a constant current mode. It Maintains a constant current until the battery reaches a terminal voltage (V1) and then switches to the second stage, constant voltage. At the second stage the charger decreases the charger current while holding the batteries at the terminal voltage until the charging cycle is complete. The charging cycle is complete when the current is down to A1

On the charger face plate, there is a status light panel that displays the current status of the charger.

The first light (***POWER***) should be ON when the AC cord is connected to a proper AC power source.

The three ***STATUS*** lights will indicate the current charging condition as follows:

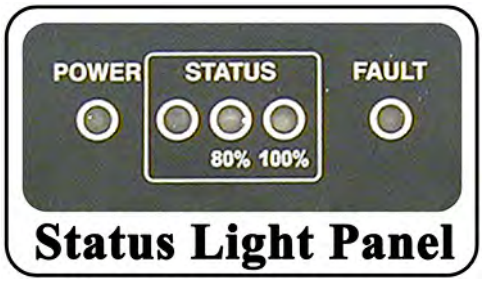
Left: Charge cycle is ON and is in constant current mode.

Left & Middle (80%): Charge cycle is ON and is in constant voltage mode.

Right (100%): Charge cycle completed.

The ***FAULT*** light will turn ON and flash a fault code only when an abnormal charging condition has occurred. Refer to the fault code table for more information.

NOTE: Critical faults will be accompanied with an audible beeping.



Status Light Panel

Testing the Charging Cycle

In typical installations, The charge cycle will be completed in 8 to 12 hours depending on the state of charge of the batteries when the charge cycle was started.

NOTE: The charge cycle time is limited to 20-hours (max). A fault will occur if charging time exceeds the time limit. Refer to the fault code table for more information.

A charger could remain on for longer than 12 hours if:

- The vehicle is equipped with batteries larger than 220 Amp hour capacity.
- The charging cycle is interrupted at any time during the charging cycle.
- Defective batteries causing a fluctuating DC voltage that confuses the charger.
- One or more defective cells in the battery pack.
- A brownout (drop in AC line voltage) during the charging cycle.
- An electrically noisy charging environment.

NOTE: This charger has a maintenance mode that will restart the charger if the battery voltage drops below a threshold after the charge cycle is complete. In some cases, it may appear that the charger is not turning off due to that the charger has restarted. Fully test the battery pack before assuming that the charger is not turning off or running too long.

A charger could turn off in less than 12 hours, but still show symptoms of overcharging if:

- The electrolyte in the batteries is too high (boil over).
- The electrolyte in the batteries is too low (excessive gassing or sulfur smell).

To test the charger to see if it is turning off correctly, monitor the battery voltage and charging current during the charging cycle as indicated below.

Using a digital voltmeter and clamp on DC ammeter, monitor the battery voltage and current during the charging cycle. The charging current should remain within 10% of the DC output current (see previous page) until the battery voltage reaches V1. When the voltage reaches V1, the charging current will drop significantly and slowly taper off (voltage will remain constant). The charger should turn off within 2 to 4 hours after entering the second stage when the charging current is down to A1.

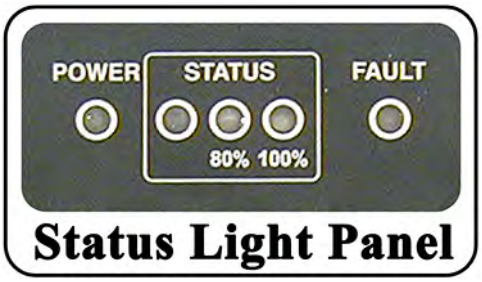
⚠WARNING

While connected to an AC outlet, the charger cabinet must remain electrically grounded. Disconnect both of the battery leads and unplug the charger from the AC source before disconnecting any electrical component or wire. Failure to do so may result in serious bodily injury.

Status Light Error Code Table

If the Fault light is ON or flashing, it indicates a problem has occurred during the charging cycle. If the light is flashing, it will flash from 2 to 6 times before a pause. This is the fault code.

Refer to the table below.



Fault Code	Description	Action Required
1 (no flash)	Time out	Charge cycle time exceeded the time limit. Test batteries for possible defective cells.
2*	Open circuit or reverse polarity to battery	Check battery wiring.
3*	Battery voltage too high	Wrong voltage charger or batteries installed. 24v charger: Battery voltage must be less than 33.7v 36v charger: Battery voltage must be less than 43.2v 48v charger: Battery voltage must be less than 57.6v
4	Overheated	Inspect for dirt or debris on the charger cooling fins and clean as required.
5*	AC line voltage too high or too low	Check the input voltage. It must be within 85-137VAC or 170-264VAC
6	Low battery voltage	Extremely discharged battery, defective battery, miswired battery. When this fault occurs, the charger will operate in a low current mode until the battery voltage is built up. This fault will reset once the battery voltage is normal. If the battery voltage does not come up: > Test the batteries > Check battery wiring
*	These faults will be accompanied by an audible beep and indicates that the charge cycle was terminated before completion.	

Troubleshooting

NOTE: There are no internally serviceable components in the charger.

To test charger operation:

1. Connect a DC volt meter to the main battery positive and negative terminals.
2. Attach a clamp on DC Ammeter to one of the charger DC output wires.
3. Plug the charger into an AC outlet.
4. Wait for charger to start (up to 15 seconds), the ammeter should display the DC Amp rating of the charger (plus or minus 10%) indicating that the charger is on (constant current mode).
5. The ammeter should continue to display the DC Amp rating of the charger until the battery voltage equals V1. When the battery voltage equals V1 the charger will switch to the constant voltage mode. At this point, the charging current will be reduced and will taper off until the batteries are fully charged. The batteries are fully charged when the charging current is down to A1.
6. If the charger does not turn on, there are no faults, ***and*** the POWER light is ON, then the charger has failed and must be replaced.
7. If the POWER light is OFF, then check the AC power source, AC power cable and connections. If the source, cable and connections are good, then the charger has failed and must be replaced.

The charger comes equipped with a long fully insulated AC cord that can be cut to length as needed for the vehicle application. Do not cut the AC cord and splice to the existing AC cord in the vehicle. **Cutting and splicing the AC cord will void the charger warranty.**

⚠WARNING

While connected to an AC outlet, the charger cabinet must remain electrically grounded. Disconnect both of the battery leads and unplug the charger from the AC source before disconnecting any electrical component or wire. Failure to do so may result in serious bodily injury.

SIGNET HB CHARGER

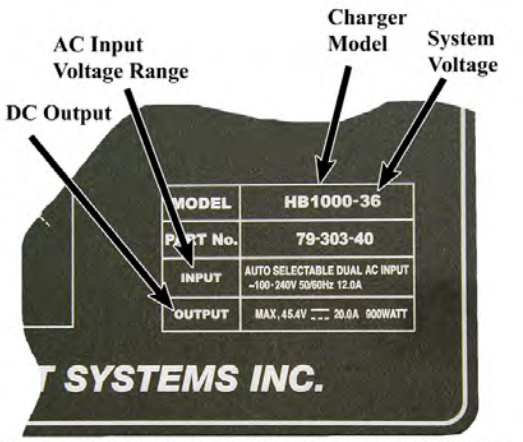
Operating Instructions and Theory of Operation

The model HB600W® and HB1000W® chargers are designed as semiautomatic chargers. The charger turns itself on when it is plugged into the wall outlet and turns off when the batteries are fully charged.

Both the HB600W® and HB1000W® are two stage chargers. The first stage is a constant current mode. It Maintains a constant current until the battery reaches a terminal voltage and then switches to the second stage, constant voltage. At the second stage the charger decreases the charger current while holding the batteries at the terminal voltage until the charging cycle is complete.

The charger faceplate has three status LED's that monitor the charging status. Refer to the chart and illustration below for the function of these LED's.

If an error occurs during charging, the charger will beep, and display an error code by flashing the status LED's. Refer to the Status LED error code table later in this section.

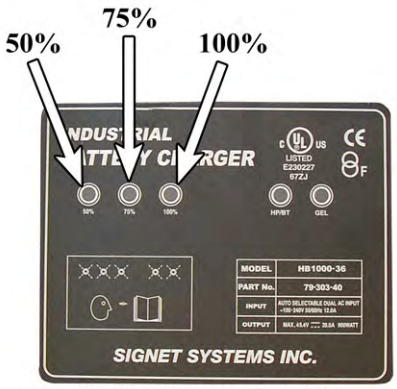


Typical Data Plate (your data plate may be different)

⚠CAUTION

SLA batteries must be charged with a charger configured for SLA batteries. Use of any other charger will result in damage to the batteries and premature failure of the batteries.

Charge Status Lights



Typical Charger Data Plate
(your data plate may vary)

Charging Status	Left (50%)	Middle (75%)	Right (100%)
0-50%	**FLASHING**	OFF	OFF
50%-75%	ON	**FLASHING**	OFF
75%-100%	ON	ON	**FLASHING**
Charging Cycle complete	ON	ON	ON
Error, refer to troubleshooting	**FLASHING**	**FLASHING**	**FLASHING**
Charger Time Out	OFF	OFF	**FLASHING**

HB/PT and GEL Indicator Lamps

NOTE: Your charger may not be equipped with these lamps.

HB/PT Lamp

If the HB/PT lamp is “ON”, then the charger has overheated and has entered a proportionally reduced output. The charging cycle will terminate if the temperature continues to rise. If the charging cycle is terminated, the charger will automatically restart once it has cooled.

The charging cycle is limited to 18-hours. If the HB/PT lamp is flashing, then the charging time has exceeded 18-hours (time is limited to 18-hours). If any of the status lamps are flashing, then the charge cycle did not complete.

GEL Lamp

This LED will only be “ON” if the charger is configured for GEL batteries. Using a GEL charger with non-GEL batteries may result in an incomplete charge or long charge times.

Typical Charger Data Plate
(your data plate may vary)

Testing the Charging Cycle

In typical installations, the charger will remain on for up to 12 hours depending on the state of charge of the batteries when the charge cycle was started.

NOTE: Charging time is limited to 18 hours (max). An error occurs if charging time exceeds 18 hours. See table on previous page.

A charger could remain on for longer than 12 hours if:

- The vehicle is equipped with batteries larger than 220 Amp hour capacity.
- The charging cycle is interrupted at any time during the charging cycle.
- Defective batteries causing a fluctuating DC voltage that confuses the charger.
- One or more defective cells in the battery pack.
- A brownout (drop in AC line voltage) during the charging cycle.
- An electrically noisy charging environment.

A charger could turn off in less than 12 hours, but still show symptoms of overcharging if:

- The electrolyte in the batteries is too high (boil over).
- The electrolyte in the batteries is too low (excessive gassing or sulphur smell).

To test the charger to see if it is turning off correctly, monitor the battery voltage and charging current during the charging cycle as indicated below.

Using a digit digital voltmeter and clamp on DC ammeter, monitor the battery voltage and current during the charging cycle. The charging current should remain within 10% of the DC output current (see previous page) until the battery voltage reaches 2.55 VPC. When the voltage reaches 2.55 VPC, the charging current will drop significantly and slowly taper off (voltage will remain constant). The charger should turn off within 2 to 4 hours after entering the second stage.

Status LED Error Code Table

There are three status lights (LED's) on the charger name plate. These LED's normally indicate the current operating state of the charger. If all three LED's are flashing, it indicate an error has occurred in the charging cycle. See the table below for an explanation of the error codes:

Note: If only the 100% LED is flashing and all others are OFF then the charger has exceeded its maximum charging time and shut off before the batteries were fully charged.

This could be a result of:

- Defective battery or batteries
- Excessively discharged batteries
- Oversize batteries

Error Code	Description	Action Required
1*	Reverse polarity or open circuit to the batteries	Check wiring for corrosion, loose connections. broken wires and proper connection to the batteries
2	AC line voltate too high or too low	Check the input voltage. It must be within 96-132VAC or 196-266VAC
3	Charger overheated	Wait for charger to cool, the charger will automaticaly restart. Inspect for dirt or debris on the charger cooling fins and clean as required.
4	Input or Output over current	Charger will automaticaly correct for this condition and restart

* - In many cases fault 1 will only be displayed for a short amount of time and then the charger will attempt to restart. Typically, the fault will repeat 8 times and then the charger will start the boot up process with the 50% light on. If the charger cannot restart then the fault loop will start again, repeating the fault 1.

This fault could be a result of an open connection between the charger and batteries, an open connection on one or more of the battery cables, or an open connection internal of the charger.

Before replacing the charger, confirm all battery wiring is good.

Typical Charger Data Plate
(your data plate may vary)

TROUBLESHOOTING

Test Equipment Required for Troubleshooting

Digital Multi-Meter.

Clamp on DC Ammeter to measure up to 20 Amps.

Important Notes and Instructions

- This troubleshooting guide assumes a familiarity with the use of a digital multi-meter including, voltage tests, continuity tests and diode testing. If not familiar with any part of these tests, refer testing to a qualified technician.
- Make sure that the AC electrical socket the charger is plugged into is in good working condition.
- Make sure that the AC voltage at the electrical socket is the same as the AC voltage on the charger nameplate.
- Make sure the batteries are in good condition.
- If the charger exhibits intermittent problems, it must be in the failed mode for troubleshooting.
- There are no internally serviceable components in the charger. If the charger has failed then it must be replaced.

To test charger operation:

Connect a DC volt meter to the main battery positive and negative terminals.

Attach a clamp on DC Ammeter to one of the charger DC output wires.

Plug the charger into an AC outlet.

Wait for charger to start (up to 15 seconds), the ammeter should display the DC Amp rating of the charger (plus or minus 10%) indicating that the charger is on (constant current mode).

The ammeter should continue to display the DC Amp rating of the charger until the battery voltage equals 2.55 VPC. When the battery voltage equals 2.55 VPC the charger will switch to the constant voltage mode. At this point the charging current will be reduced and will taper off until the batteries are fully charged.

⚠CAUTION

This charger is rated for 115 VAC or 230 VAC operation. When switching from one input voltage to the other, wait until all three status LED's are off. Switching voltage when any of the LED's are on will result in damage to the charger.

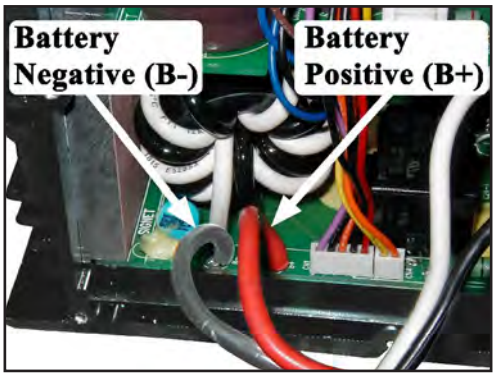
Perform the following if the charger does not turn on:

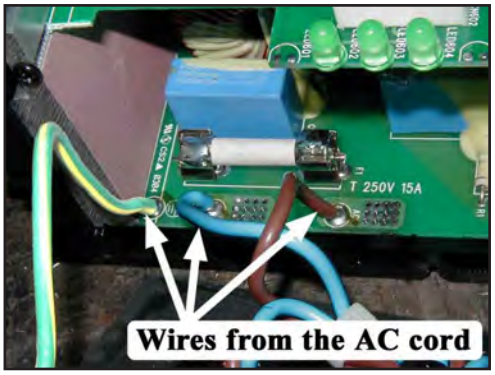
⚠WARNING

1. **Make sure the start switch is in the "OFF" position, then remove the key.**
2. **Place the forward-reverse switch in the center "OFF" position.**
3. **Set the park brake.**
4. **Place blocks under the front wheels to prevent vehicle movement.**

5. Disconnect the charger from the AC source.
6. Remove the charger end cap where the DC wires enter.
7. Test the voltage across the Battery Positive (red) and Battery Negative (black) wires at the lower left of the charger circuit board. This voltage should be equal to the battery voltage. If the voltage is less than the battery voltage, then the wires to the batteries have been damaged. Stop here and repair the problem.
8. Reinstall the charger end cap where the DC wires enter.
9. Remove the charger end cap where the AC wires enter.
10. Test the continuity of all three AC wires from the circuit board to the AC plug. If you find an open circuit in any one of the three wires then the AC cord or plug has been damaged. Stop here and repair the problem.
11. Install the charger end cap where the AC wires enter.

If both the AC and DC tests are good then the charger has failed. There are no internally serviceable components in the charger. If the charger has failed then it must be replaced.





Illustrated Parts

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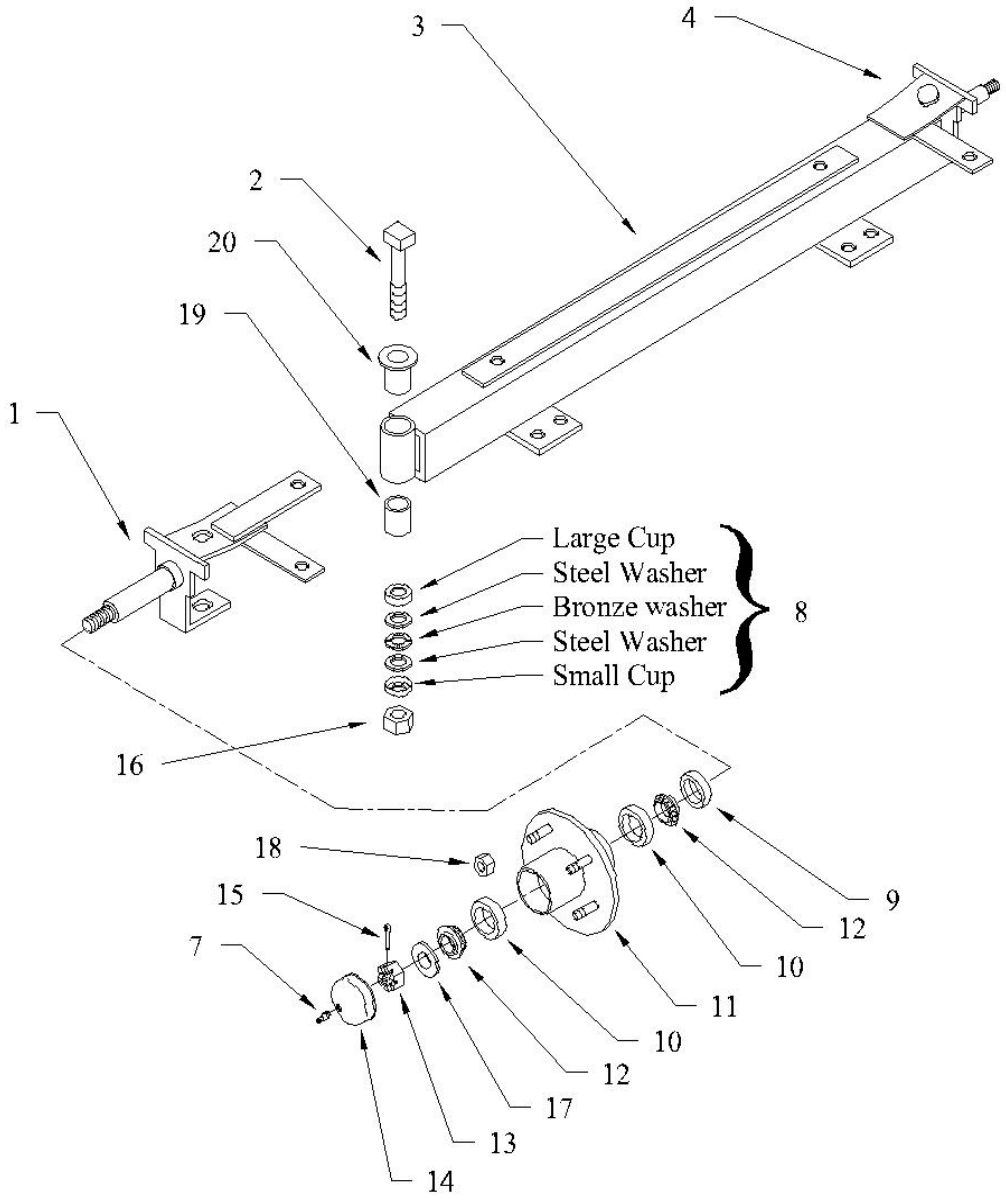
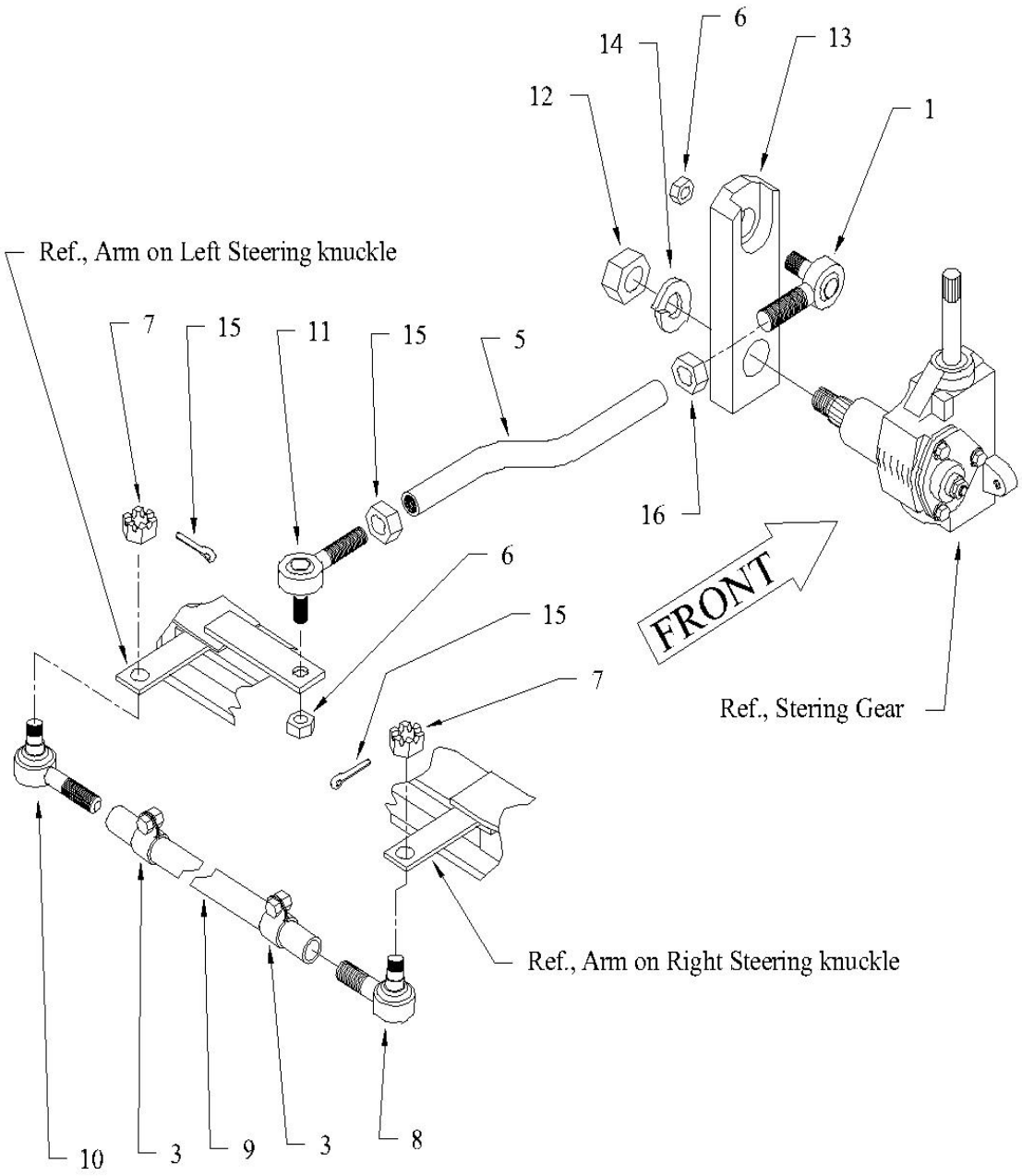
NOTE: Parts lists are for both the MX 1600 and B 1-50 unless otherwise specified.

Front Axle/Steering Knuckle



Front Axle/Steering Knuckle			
ITEM #	PART #	DESCRIPTION	QTY
	15-200-40	Complete Front Axle Assembly. Includes Hubs, Tire Rod and Spring (no brakes)	
	00-240-21	Complete Front Axle Assembly. Includes Hubs, Tire Rod and Spring (Disc brakes)	
1	14-240-06	Left Steer Knuckle, no brake	1
	14-240-04	Left Steer Knuckle, disc brake	1
2	21-009-10	King Pin	2
3	01-240-74	Axle Beam . Includes #19 and #20 (no brakes)	1
	01-240-75	Axle Beam . Includes #19 and #20 (disc brakes)	1
4	14-240-05	Right Steer Knuckle, no brake	1
	14-240-03	Right Steer Knuckle, disc brake	1
5	-	-	-
6	-	-	-
7	87-074-00	Grease Fitting	2
8	80-309-10	Thrust Bearing	2
9	45-338-00	Grease seal	2
10	80-103-00	Race	4
11	12-124-00	Hub (includes #9, #10 and 1 of #12)	2
	12-158-10	Hubwith disc rotor (includes #9, #10 and 1 of #12)	2
12	80-017-00	Bearing	4
13	88-239-85	3/4-NF Castle Nut	2
14	92-104-00	Bearing cover	2
15	88-527-14	1/8 x 1-1/2 Cotter Pin	2
16	88-289-81	7/8-NF Thin Pattern Hex Locknut	2
17	88-228-61	3/4-SAE Flat Washer	2
18	97-236-00	Wheel Nut	10
19	32-204-00	King Pin Bushing	2
20	32-200-00	King Pin Bushing	2

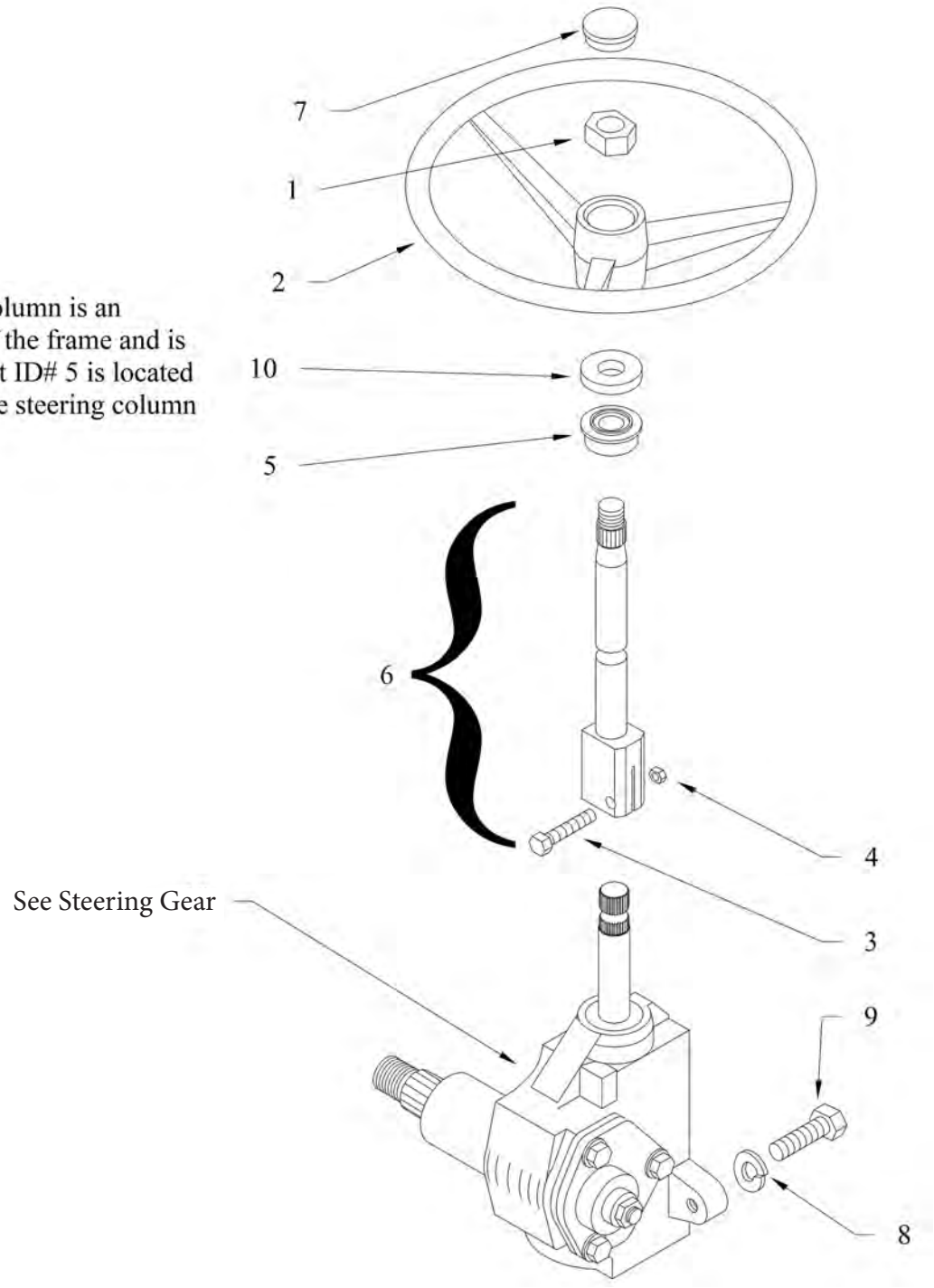
Steering Linkage



Steering Linkage			
ITEM #	PART #	DESCRIPTION	QTY
1	86-518-01	Rod end (LH)	1
2	--	-	-
3	86-510-00	Ball Joint Clamp	2
4	-	-	-
5	50-002-03	Drag Link	1
6	88-119-81	3/8-NF Hex Locknut	2
7	88-159-85	1/2-NF Hex Castle Nut	2
8	86-501-98	Ball Joint (left thread)	1
9	18-041-05	Tie Rod Sleeve (18-057-20 assembled with ball jointsand clamps	1
10	86-501-99	Ball Joint (right thread)	1
11	86-518-00	Rod End (RH)	1
12	88-279-82	7/8-NF Hex Jam Nut	1
13	18-640-00	Pitman Arm	1
14	88-268-62	7/8 Split Lock Washer	1
15	88-527-11	1/8 x 1 Cotter Pin	2
16	97-202-50	3/8-NF Left Thread Nut	1
17	88-119-80	3/8-NF Hex Nut	1

Steering Column

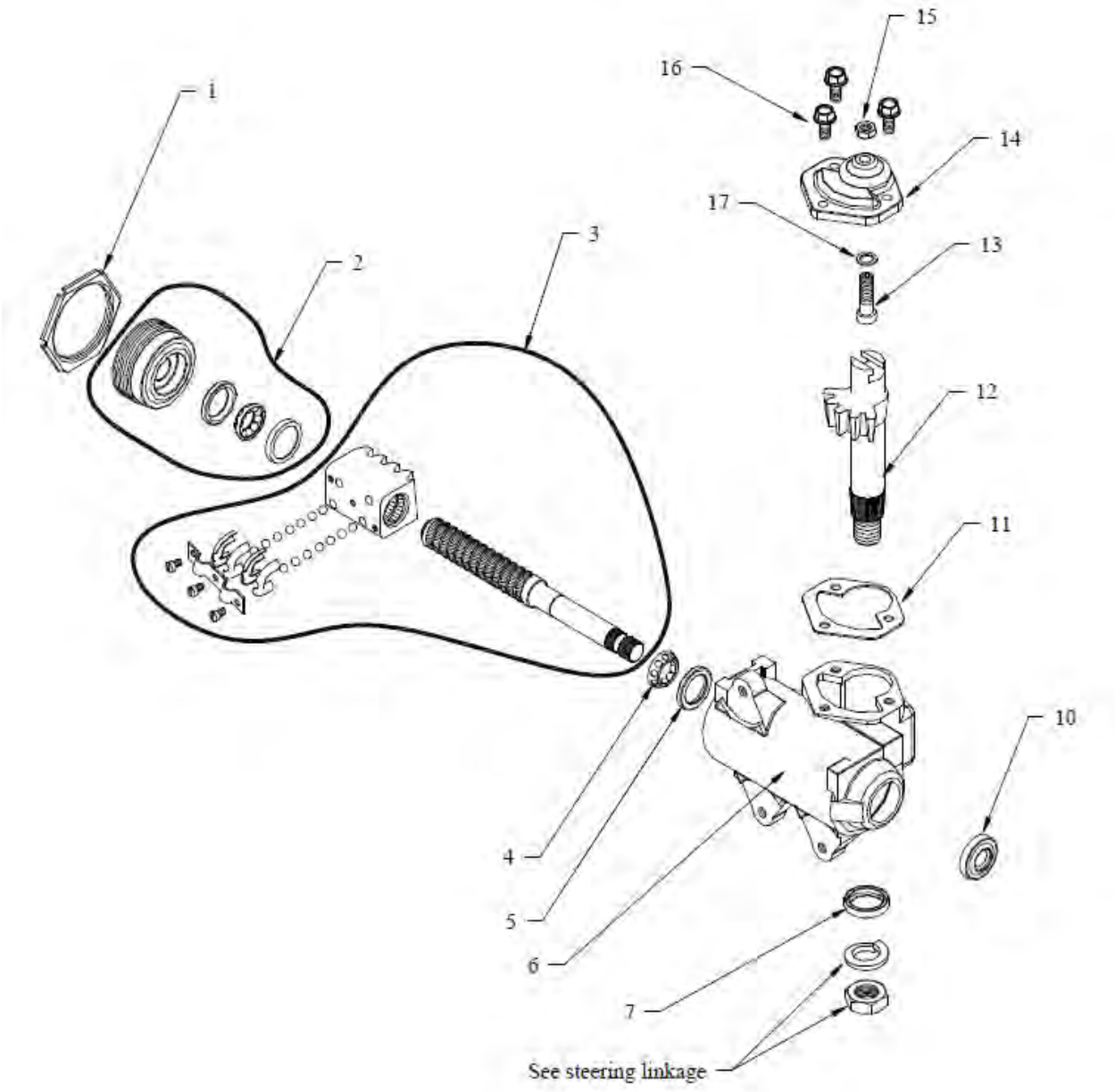
The steering column is an integral part of the frame and is not shown. Part ID# 5 is located in the top of the steering column tube.



Steering Column

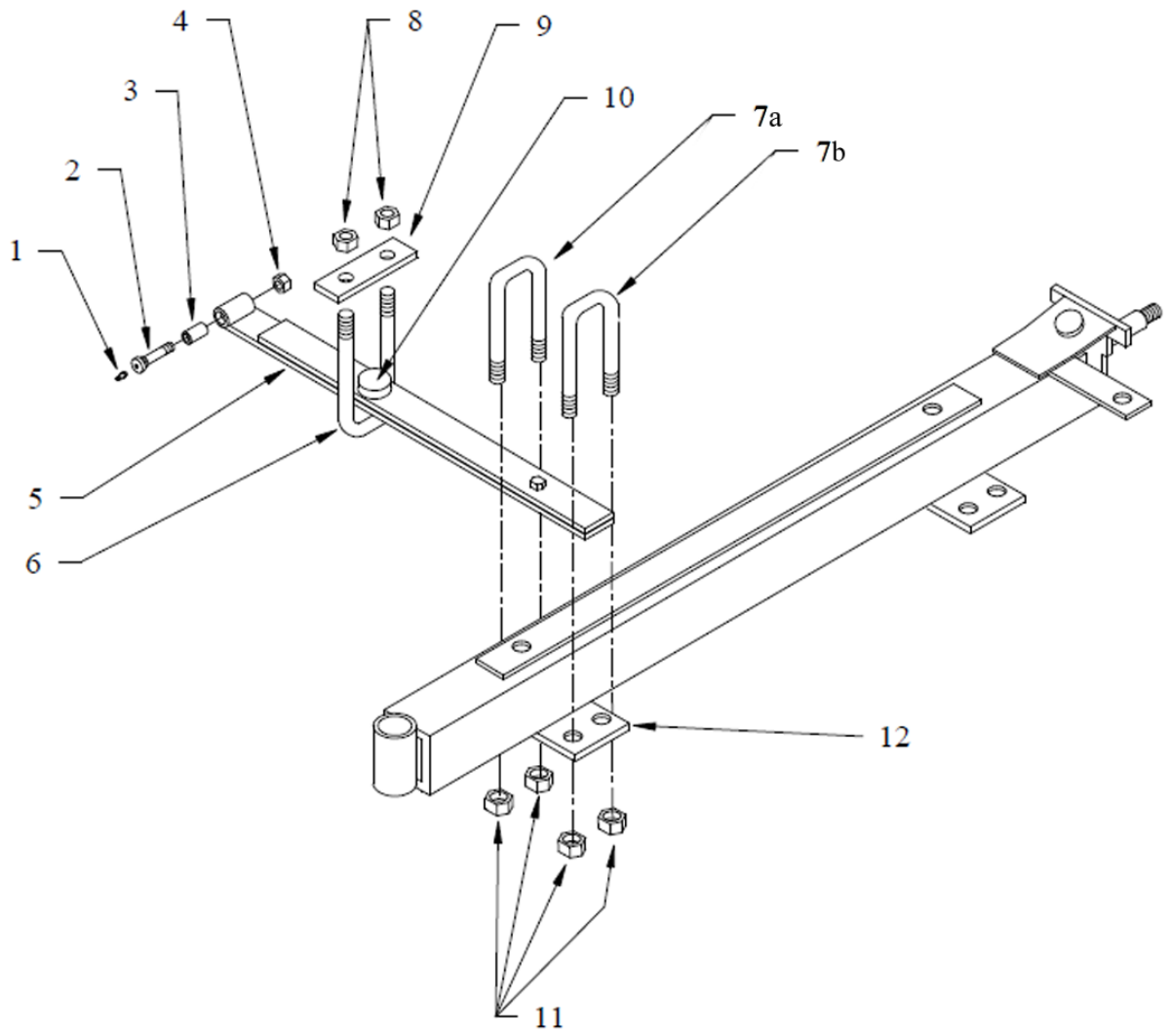
ITEM #	PART #	DESCRIPTION	QTY
1	88-199-82	5/8-NF Hex Jam Nut	1
2	19-011-20	Steering Wheel	1
3	88-081-14	Bolt, Plated (grade 8)	1
4	88-089-84	Nut, Plated (grade 8)	1
5	80-400-10	Bushing	1
6	20-031-64	Steering shaft (includes #3, #4)	1
7	19-011-25	Steering Wheel Cover	1
8	88-128-62	7/16 Split Lock Washer	3
9	88-120-15	7/16-NC x 1-1/2 Hex Bolt, Grade 5	3
10	97-200-00	Dust Wasjer	1
Not Shown	01-200-84	Steering Column Cover	1

Steering Gear



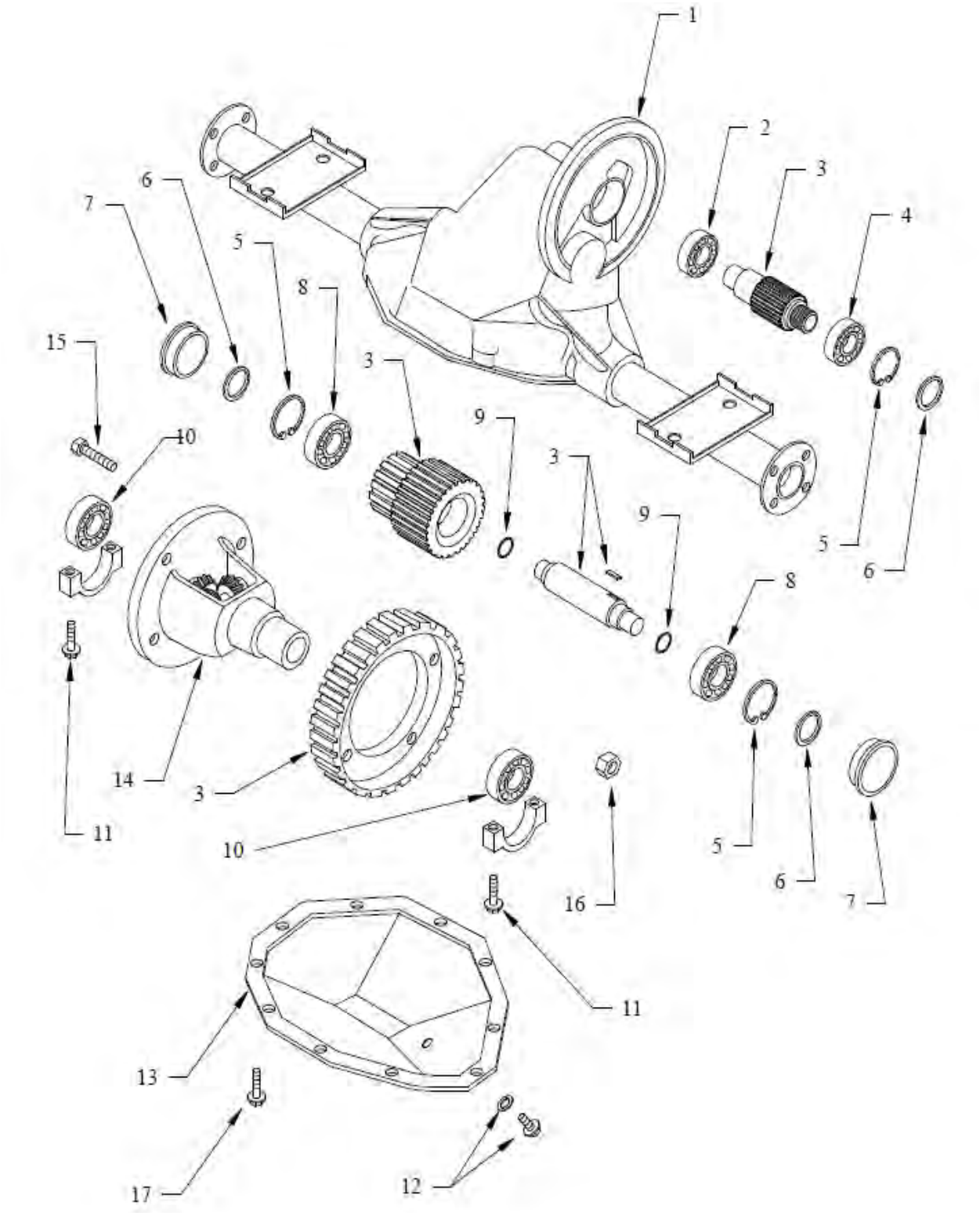
Steering Gear			
ITEM #	PART #	DESCRIPTION	QTY
	18-308-21	Steeering Gear Assembly	1
1	18-308-70	Locking Ring	1
2	18-308-71	Adjuster	1
3	18-308-72	Worm Shaft/Ball Nut Assembly	1
4	18-308-23	Upper Worm Shaft Bearing	1
5	18-308-22	Upper Worm Shaft Cup	1
6	18-308-77	Housing	1
7	18-308-78	Pinion Shaft Seal	1
8	-	-	-
9	-	-	-
10	18-308-79	Worm Shaft Seal	1
11	18-308-82	Gasket	1
12	18-308-76	Pinion Shaft	1
13	18-308-75	Gear Lash Adjuster	1
14	18-308-84	Side Cover	1
15	18-308-86	Lock Nut	1
16	18-308-83	Side Cover Screws	3
17	18-308-85	Shim Kit	1

Front Suspension



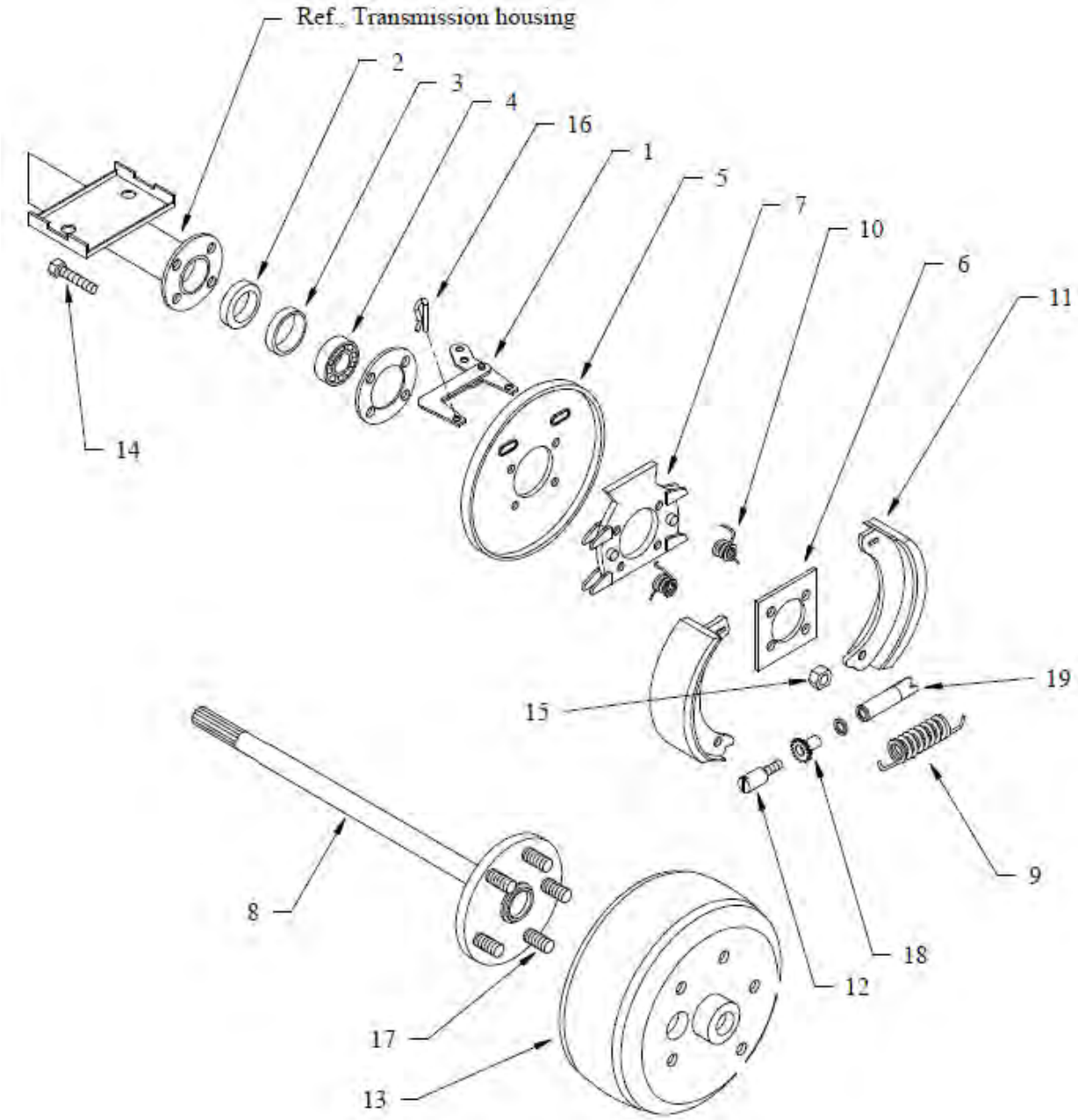
Front Suspension			
ITEM #	PART #	DESCRIPTION	QTY
1	87-074-00	Grease Fitting	2
2	96-248-01	Spring Eye Bolt (includes #1)	2
3	32-213-00	Spring Eye Bushing	2
4	88-169-82	9/16-NF Lock nut, Grade C	2
5	85-506-05	Leaf Spring (includes #3)	2
6	96-118-00	1/2-NC x 1.87 x 6.5L U-bolt	2
7a	96-123-00	3/8-NC x 2.06 x 4L U-bolt	2
7b	96-123-02	3/8-NC x 2-1/16 x 4.75 U-bolt	2
8	88-149-81	1/2-NC Lock nut	4
9	16-872-03	Shackle Strap	2
10	01-200-63	Spring Support	2
11	88-109-81	3/8-NC Locknut	8
12	16-865-06	Spring Plate	2

Transmission Differential Case



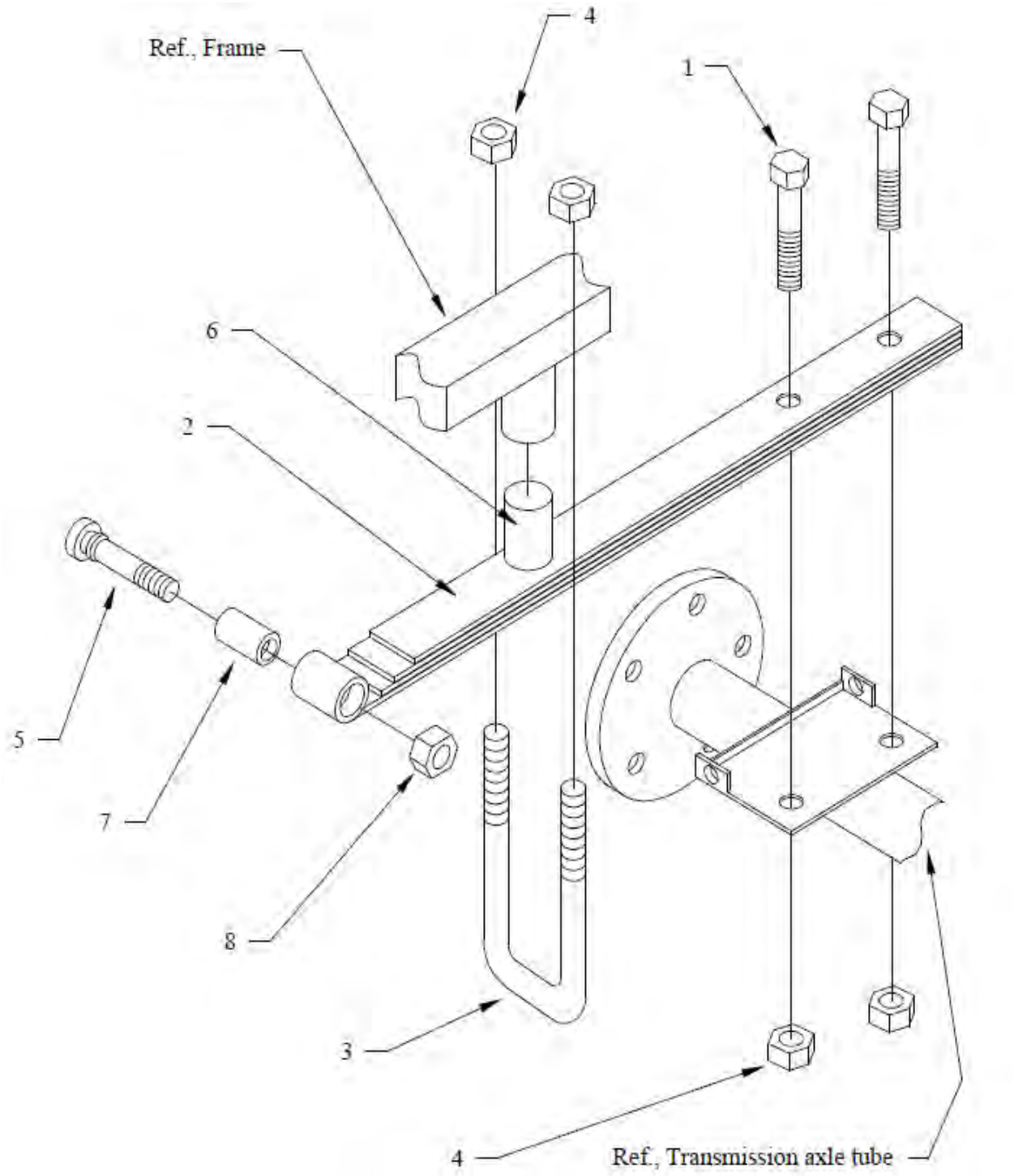
Transmission			
ITEM #	PART #	DESCRIPTION	QTY
	4C-150-00	Complete Transmission Assembly Including Mechanical Brakes (Dana spec 012AJ310-1)	
	4C-150-10	Complete Transmission Assembly Including Hydraulic Brakes (Dana spec 012AJ309-1)	
1	Special order	Housing	1
2	80-480-10	Inner Input Shaft Bearing	1
3	31-265-00	Gear set	1
4	80-480-15	Outer Input Shaft Bearing	1
5	88-840-12	Snap Ring	3
6	80-715-10	O-ring	3
7	41-973-00	Bore Plug	2
8	66-610-35	Intermeadiate Shaft Bearing	2
9	80-715-00	O-ring	2
10	80-480-00	Differential Bearing	2
11	96-330-10	Bearing Cap Screw	2
12	41-127-94	Fill/Drain Plug	1
13	41-127-64	Gear Case Cover (012AJ310-1)	1
14	66-610-04	Differential	1
15	Special order	Bolt, Final Gear	4
16	Special order	Nut, Final Gear	4
17	66-610-68	Bolt, Cover Plate	10

Rear Axle and Brakes



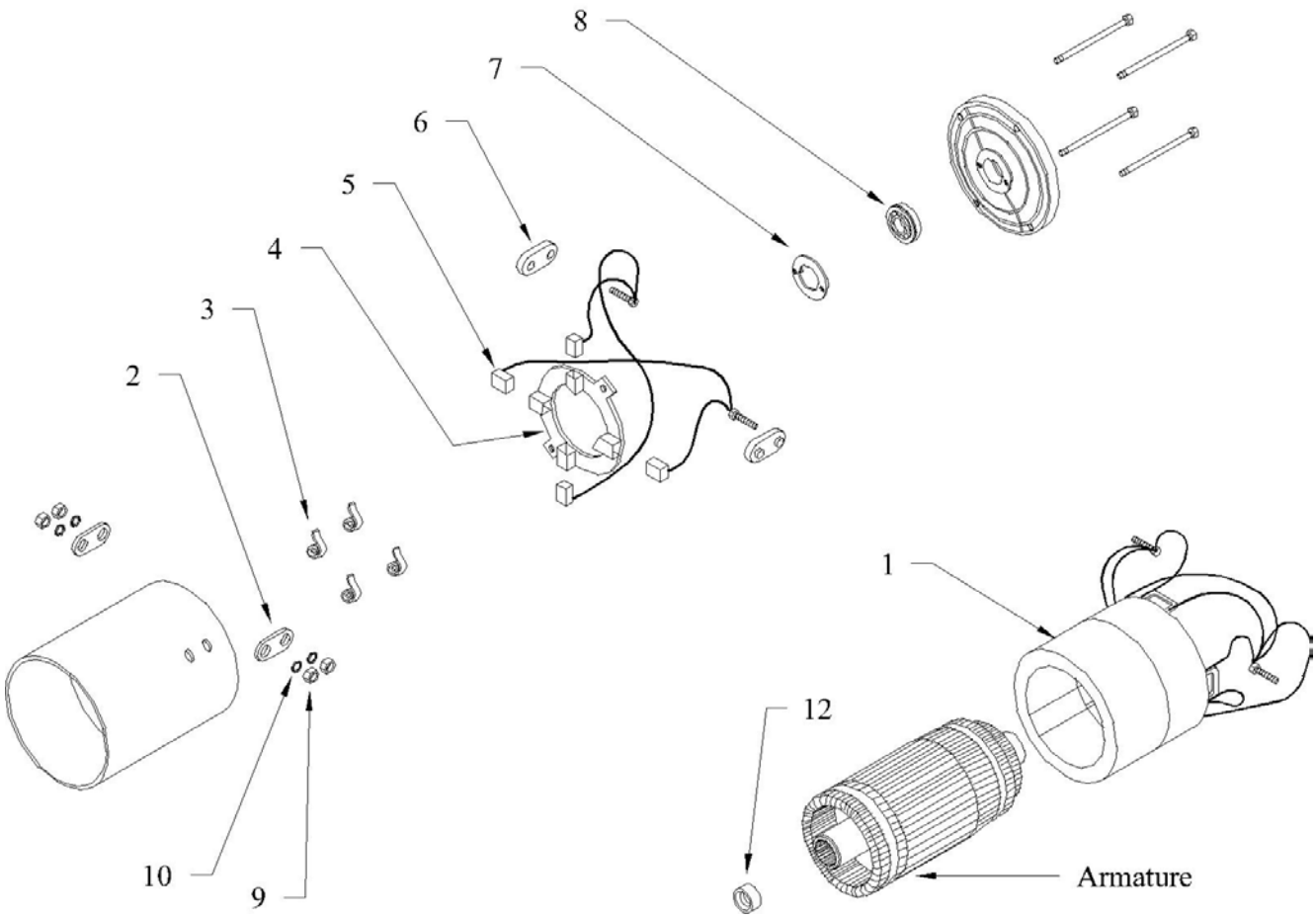
Rear Axle and Brakes			
ITEM #	PART #	DESCRIPTION	QTY
	41-347-98	Complete Brake Assembly (left), includes 1, 5, 7, 9, 10, 11, 12, 16	1
	41-347-99	Complete Brake Assembly (right), includes 1, 5, 7, 9, 10, 11, 12, 16	1
1	41-347-15	Brake Arm	2
2	45-303-00	Seal	2
3	32-509-10	Bearing retainer	2
4	80-505-10	Bearing/Race assembly	2
5	41-347-00	Backing Plate	2
6	45-303-10	Dust seal	2
7	41-347-25	Spider, Mechanical Brake	2
	41-347-36	Spider, Hydraulic Brake	2
8a	41-171-10	Axle shaft (right), does not include #17 wheel stud	1
8b	41-170-10	Axle Shaft (Left), does not include #17 wheel stud	1
9	85-215-00	Spring	2
10a	85-411-10	Spring (green)	2
10b	85-411-15	Spring (red)	2
11	41-635-00	Brake Shoe Set (1-wheel)	2
12	41-347-31	Adjusting Screw	2
13	41-516-00	Brake Drum	2
14	66-610-79	Bolt	8
15	66-610-80	Nut	8
16	41-347-34	Hairpin Clip	4
17	66-610-28	Wheel Stud	10
18	41-347-33	Adjusting Screw Nut	2
19	41-347-30	Adjusting Screw Socket	

Rear Suspension



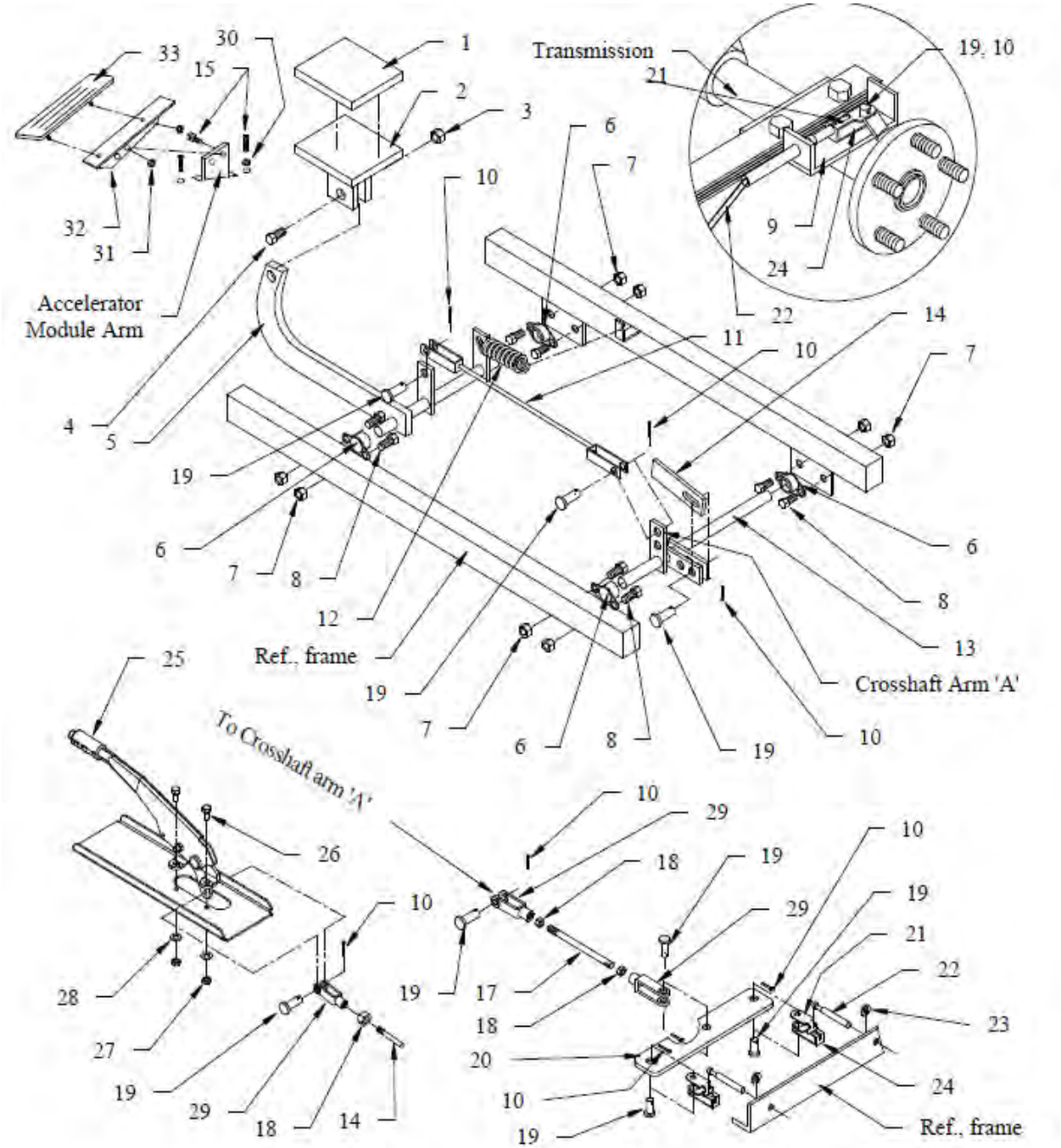
Rear Suspension			
ITEM #	PART #	DESCRIPTION	QTY
1	88-140-17	Bolt	4
2	85-506-10	Leaf Spring (includes #7)	2
3	96-118-00	U-bolt	2
4	88-149-81	Nut	8
5	96-248-01	Spring Bolt	2
6	01-200-62	Spring Support	2
7	32-213-00	Spring Eye Bushing	2
8	88-169-82	Nut	2

Motor



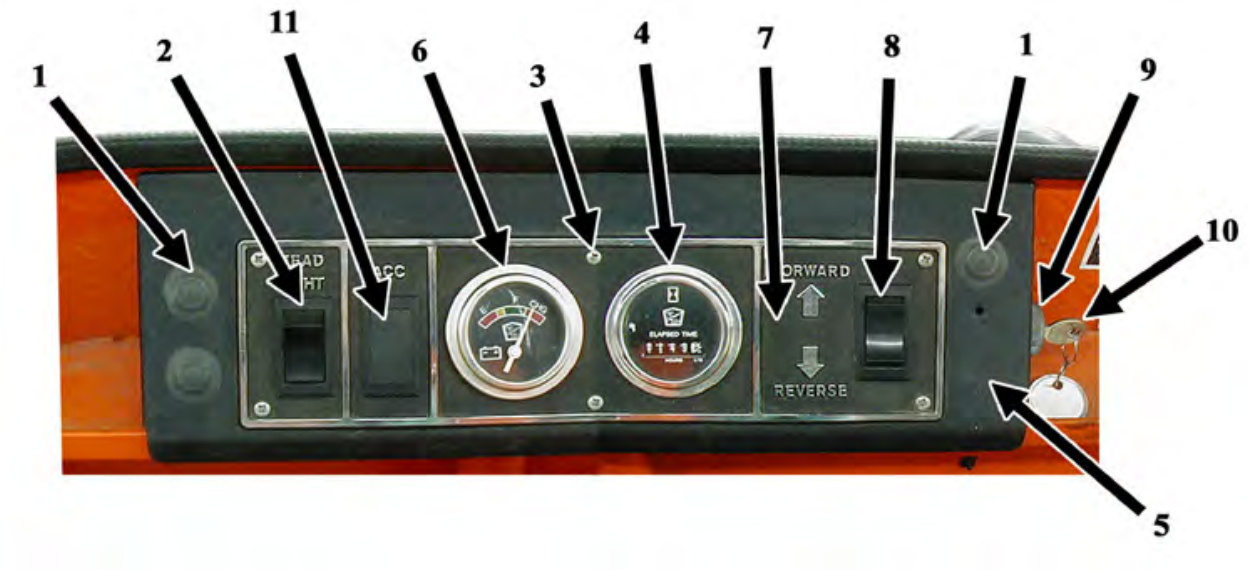
Motor GE spec#BC58JBS6129A			
ITEM #	PART #	DESCRIPTION	QTY
	70-049-05	Complete Motor Assembly	
1	70-201-15	Field Coil/Stator Assembly	1
2	70-210-51	Insulator	2
3	85-412-00	Brush Spring	4
4	70-172-15	Brush Holder (includes #3)	1
5	70-104-15	Brush Pair	2
6	70-210-51	Insulator	2
7	32-508-15	Bearing Retainer	1
8	80-209-00	Bearing	1
9	70-049-06	Rubber Bushing	1
Not Shown	88-060-12	1/4-NC x 1-1/8 Motor Mounting Bolt	3
Not Shown	88-068-62	1/4 Split Lock Washer	3

Brake and Accelerator Pedal and Linkage



Brake and Accelerator Pedal and Linkage			
ITEM #	PART #	DESCRIPTION	QTY
1	98-200-00	Brake Pedal Pad	1
2	01-432-98	Brake Pedal	1
3	88-089-81	Nut	1
4	88-080-11	Bolt	1
5	00-200-45	Brake Pedal Arm	1
6	80-410-20	Bushing	4
7	88-109-81	Nut	8
8	88-100-09	Bolt	8
9	01-200-49	Brake Cable Mounting Bracket	2
10	88-517-11	Cotter Pin	8
11	96-818-10	Brake Cable	1
12	85-250-00	Spring	1
13	00-200-49	Brake Cross Shaft	1
14	00-200-48	Park Brake Linkage	1
15	88-065-09	1/4-NC x 3/4 Truss Head Machine Screw	3
16	-	-	-
17	50-002-01	Brake Rod	1
18	88-099-80	Nut	2
19	96-773-00	5/16 x 1 Clevis Pin	7
20	01-200-47	Brake Equalizer	1
21	96-826-09	Cable Lock	4
22	96-826-12	Brake Cable	2
23	88-847-06	E-clip	2
24	96-754-00	Brake Cable Clevis	4
25	51-344-80	Park Brake Handle	1
26	88-080-11	Bolt	2
27	88-089-81	Nut	2
28	88-088-61	Flat Washer	2
29	96-763-00	Clevis	3
31	88-069-81	1/4-NC Nylon Locknut	3
32	98-254-25	Accelerator Pedal Mounting Bracket	1
33	98-254-00	Accelerator Pedal	1

Instrument Panel (dash)



Instument Panel (dash)			
ITEM #	PART #	DESCRIPTION	QTY
1a	95-913-00	Hole Plug	1
1b	71-100-00	Toggle Switch	Option
2	71-039-11	Rocker Switch (ON-OFF)	1
3	88-817-08	Screw	8
4	74-000-00	Hour Meter	1
5	01-200-75	Dash Housing	1
6	74-009-00	Battery Status Meter	1
7	94-304-10	Dash Plate	1
8	71-039-02	F&R Switch	1
9	71-120-00	Key Switch, keyed alike (standard)	1
9a	71-121-00	Key Switch, keyed unalike	Option
10	71-120-80	Extra Keys for #9 (71-120-00)	
11	71-039-20	Hole Plug	2
Not Shown	71-501-00	Horn Switch	Option
Not Shown	88-060-09	Dash mounting bold	2
Not Shown	97-211-20	U-nut for Dash Mounting Bolt	2

Wheels and Tires

There are many tire/wheel options available.
This is a generic listing of the most common tires and wheels available.
Refer to your original sales order for the tires and wheels installed on your vehicle.

Tires

Item No.	Part No.	Description
-	10-075-00	4.80 x 8 LR B Pneumatic
-	10-076-00	4.80 x 8 LR C Pneumatic
-	10-081-00	5.70 x 8 LR B Pneumatic
-	10-082-00	5.70 x 8 Extra Grip
-	10-083-00	5.70 x 8 LR C
-	10-093-00	8.50 x 8 LR B
-	10-091-10	8.50 x 8 Knobby
-	10-092-00	8.50 x 8 LR C
-	10-074-00	4.00 x 8 Man-Toterwith ribs
-	10-074-10	4.00 x 8 Man-Toterwith ribs (non-marking)
-	10-086-00	5.00 x 8 Man-Toterwith lugs
-	10-264-00	20 x 8 x 10 LR E
-	10-250-00	16 x 4 x 12 Solid rubber

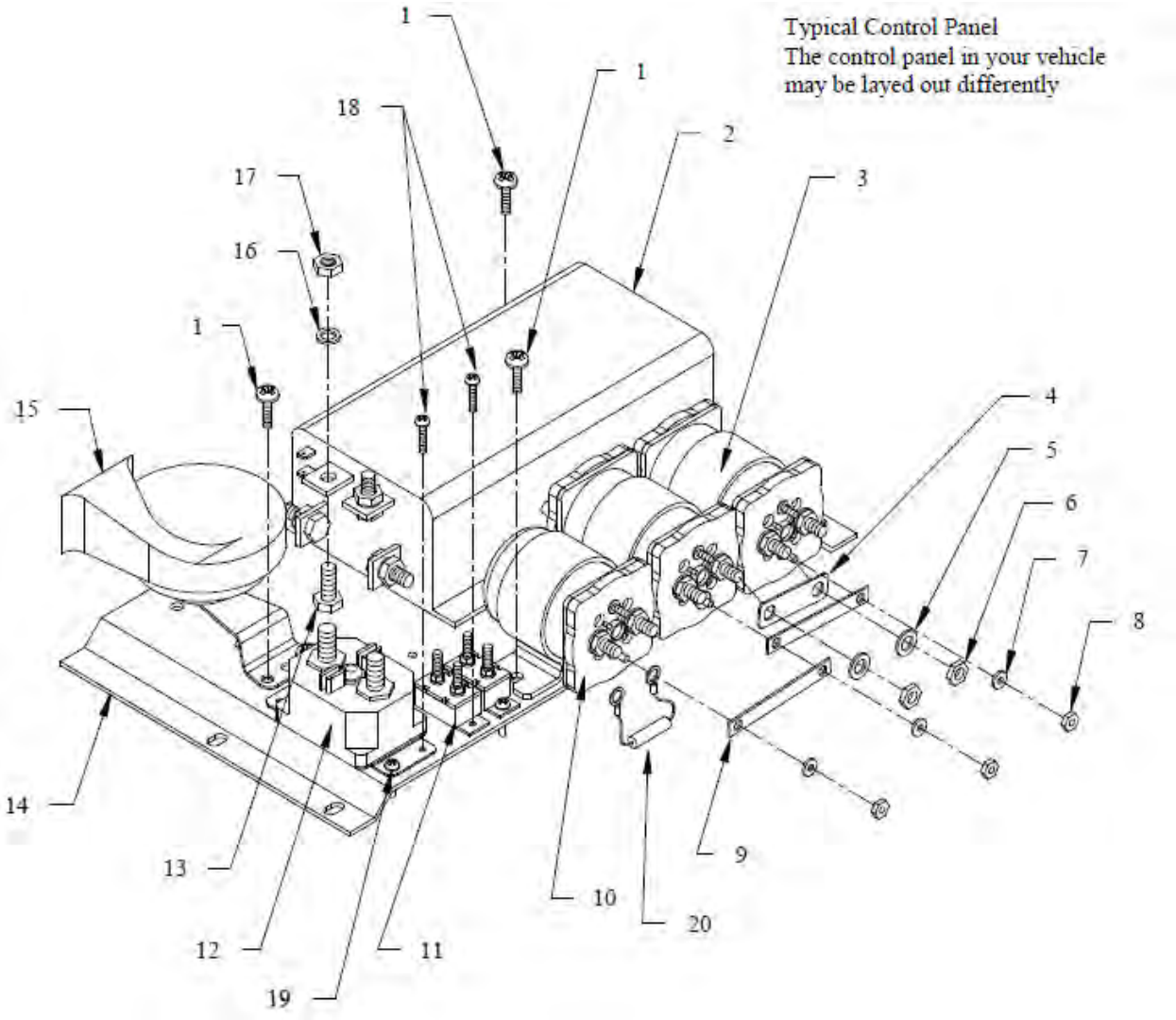
Tubes

Item No.	Part No.	Description
-	11-030-00	4.80 x 8
-	11-040-00	5.70 x 8
-	11-041-00	8.50 x 8, 9.50 x 8

Wheels

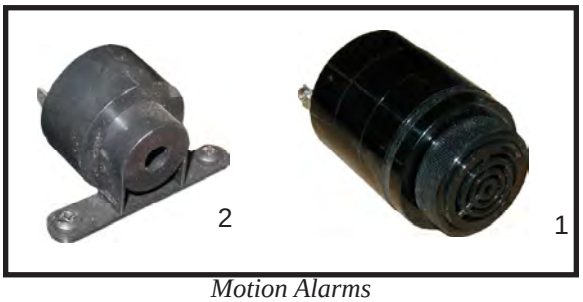
Item No.	Part No.	Description
-	12-012-00	5 x 8 tubeless, 5-hole
-	12-022-10	5 x 8 tubeless, 4-hole
-	12-020-00	8.50 x 8 tubeless, 5-hole
-	12-022-04	8.50 x 8 tubeless, 4-hole Chrome
-	12-030-01	16 x 6 Steel, 8-holes
-	12-041-00	Split Wheel Assembly, 8 x 2.5” Bead, 5-hole
-	12-042-00	Split Wheel Assembly, 8 x 3.75” Bead, 5-hole
-	12-042-20	Split Wheel Assembly, 8”, 5-holes
-	12-050-00	Wheel, Cast Iron, 12-1/8, 5-hole
-	12-0054-00	Wheel, Cast Iron, 11-1/4, 5-hole
-	12-055-00	Wheel, Cast Iron, 14, 8-hole
-	12-055-10	Wheel, Cast Iron, 14, 5-hole
-	12-056-00	Wheel, Cast Iron, 15, 8-hole
-	13-089-00	Valve Stem, tubeless wheel
-	97-236-00	Wheel Nut, 1/2”

Speed Control Panel



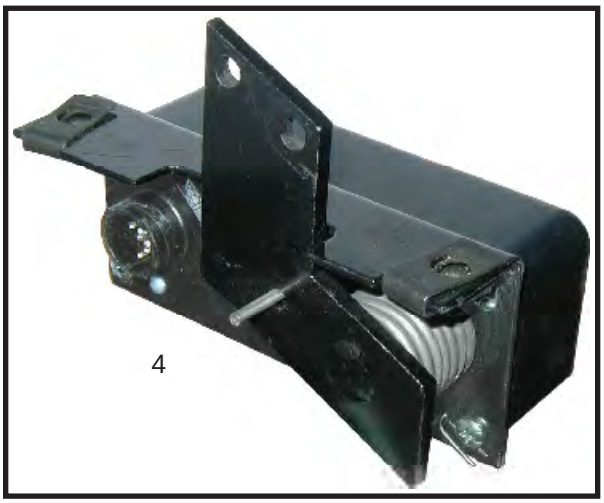
Speed Control Panel			
ITEM #	PART #	DESCRIPTION	QTY
	62-019-00	Complete Control Panel Assembly	1
1	88-838-06	#14 x 1/2 Pan Head Screw Type D Thread	10
2	62-204-00	PMC Speed control	1
3	72-501-39	Solenoid (forward or reverse)	2
4	61-838-41	Bus Bar	2
5	88-088-62	5/16 Split Lock washer	10
6	88-099-91	5/16-NF Thin Pattern Nut	10
7	88-048-62	#10 Split Lock Washer	3
8	88-049-80	10-32 Hex Nut	3
9	61-838-42	Bus Bar	2
10	72-501-38	ISO Solenoid	1
11	79-840-00	Small Circuit Breaker	2
12	79-844-00	Large Circuit Breaker	1
13	88-080-11	5-16-NC x 1 Hex Bolt	4
14	01-534-80	Mounting Panel	1
15	73-004-20	Horn	1
16	88-088-62	5/16 Split Lock Washer	4
17	88-089-80	5/16-NC Hex Nut	4
18	88-818-06	#8 x 1/2 Pan Head Screw Type B Thread	4
19	88-817-09	#8 x 3/4 Phillips Head Sheet Metal Screw	2
20	78-302-50	250 ohm 5W resistor	1
Not Shown	88-060-09	1/4-NC x 3/4 Pamel Mounting Bolt	3
Not Shown	88-069-81	1/4-NC Nylon Locknut (panel mounting)	3
Not Shown	75-148-25	Control Panel Harness	1

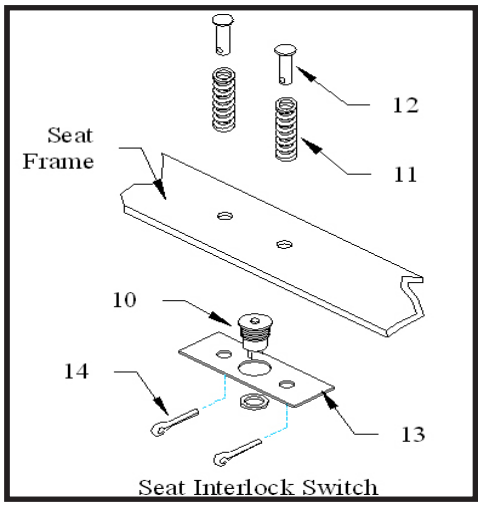
Miscellaneous Electrical



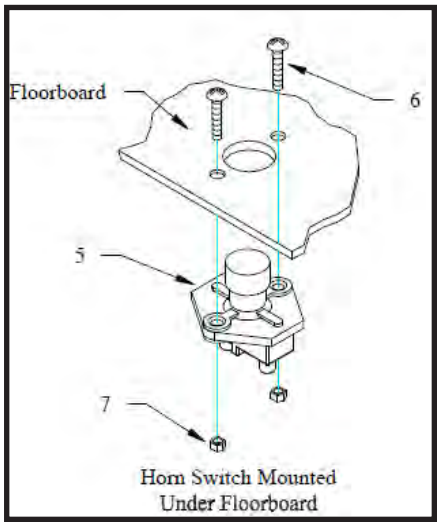
Motion Alarms

Miscellaneous Wire Harness Clamps

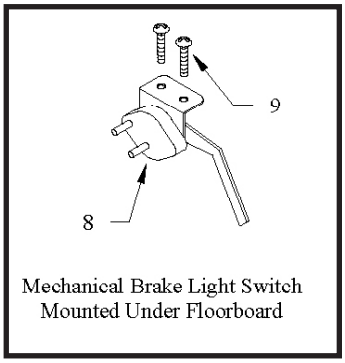




Seat Interlock Switch



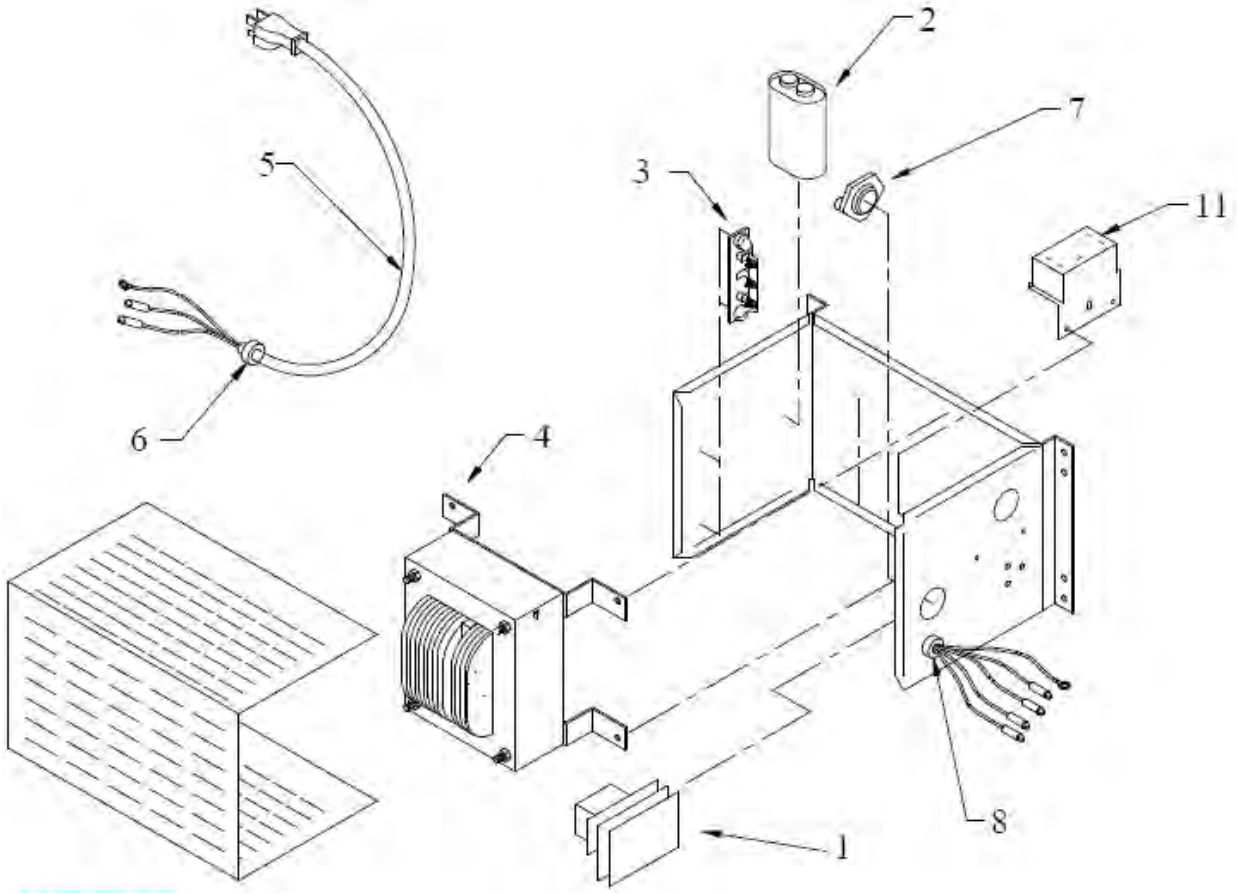
Horn Switch Mounted
Under Floorboard

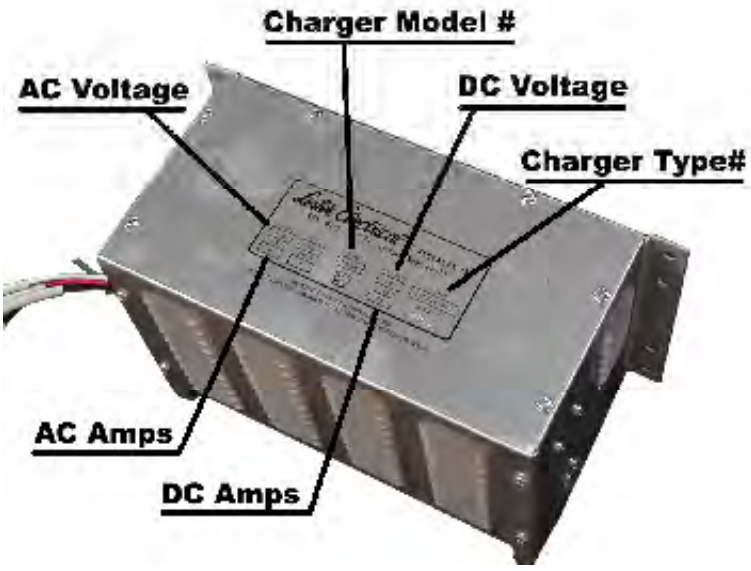


Mechanical Brake Light Switch
Mounted Under Floorboard

Miscellaneous Electrical			
ITEM #	PART #	DESCRIPTION	QTY
Not Shown	75-148-79	Chassie Control Harness	1
Not Shown	75-149-79	Power Harness, B 1-50	1
Not Shown	75-149-82	Power Harness, MX 1600	1
Not Shown	98-599-15	Plastic grommet for 1.75 hole	
Not Shown	98-599-20	Plastic Grommet for 2.5 hole	
Not Shown	75-114-20	Windsheild Wiper Harness	1
Not Shown	75-148-81	Headligh Harness	1
Not Shown	75-148-80	Harness for Pole Mounted Strobe Light	1
Not Shown	75-107-10	Potratble Charger Harness	1
Not Shown	76-013-00	Portable Charger Receptacle	1
1	73-005-05	Reverse Warning alarm	1
2	96-650-01	Wire Harness Clip, stick on	
3	96-642-00	Wire ahrness Clip, push mount	
4	62-033-00	Accelerator Module	1
5	71-122-20	Horn Switch	1
6	88-065-06	1/4-NC x 21/2 Phillips Truss Head Screw, Horn Switch	2
7	88-069-81	1/4-NC Hex Nylon Locknut, Horn Switch	2
8	71-111-00	Brake Light Switch	1
9	88-045-06	10-32 x 1/2 Machine Screw, brake light switch	2
10	71-102-10	Seat interlock Switch	1
11	85-030-00	Spring	2
12	96-773-00	Clevis Pin	2
13	02-610-18	Mounting Plate	1
14	88-527-11	Cotter Pin	2
15	96-640-00	Clamp, 3/16 Push Mount	
16	96-629-80 (not shown)	Clamp, Rubber Lined 3/16 ID	
	96-630-00 (not shown	Clamp, Rubber Lined 5/8 ID	
	96-630-50 (not shown	Clamp, Rubber Lined 5/8 ID (.265 mounting hole)	
	96-631-00 (not shown	Clamp, Rubber Lined 3/4 ID	
	96-631-10 (shown)	Clamp, Rubber Lined 1.0 ID	
	96-631-15 (not shown	Clamp, Rubber Lined 1-1/2 I	
17	96-624-00	Clamp, 1/4 Jiffy Clip	
	96-625-00 (not shown)	Clamp, 5/16 Jiffy Clip	
18	96-626-00	Clamp, 7/8 Jiffy Clip	

Charger, Lestronic





Charger Identification

Charger Lester Model# 22740			
ITEM #	PART #	DESCRIPTION	QTY
	79-303-15	Complete Charger Assembly	
1	79-805-67	Timer Assembly	
1a	79-808-00	Timer Relay (not shown)	
2	79-902-00	Capacitor	1
3	79-749-13	Diode Assembly	1
4	79-644-31	Transformer	1
5	*	AC cord	
6	*	Strain Releif	
7	79-831-00	Fuse	1
8	79-530-00	Strain Releif	1
9	-		
10	-		
11	79-809-60	Interlock Relay	1

Charger Lester Model# 11860-225(export)			
ITEM #	PART #	DESCRIPTION	QTY
	79-304-65	Complete Charger Assembly	
1	79-805-82	Timer Assembly	1
1a	Special Order	Timer Relay (not shown)	1
2	79-902-00	Capacitor	1
3	79-745-10	Diode Assembly	1
4	Special order	Transformer	1
5	*	AC cord	
6	*	Strain Releif	
7	79-831-00	Fuse	1
8	79-530-00	Strain Releif	1
9	-		
10	-		
11	79-306-23	Interlock Relay	1

*- See ***Seat Cushions, Deck and Lights***

Charger, Signet

Model HBS series charger shown

Model HBS for Flooded Batteries	
PART #	DESCRIPTION
79-303-41	36 volt Charger assembly (see note)
79-309-42	48 volt charger assembly (see note)

Model HB for Flooded Batteries	
PART #	DESCRIPTION
79-302-20	24 volt Charger Assembly (see note)
79-303-40	36 volt Charger assembly (see note)
79-309-40	48 volt charger assembly (see note)

Model HBS for GEL Batteries	
PART #	DESCRIPTION
79-303-42	36 volt Charger assembly (see note)
79-309-43	48 volt charger assembly (see note)

Model HB for GEL Batteries	
PART #	DESCRIPTION
*	24 volt Charger Assembly (see note)
K4G-CH-003	36 volt Charger assembly (see note)
79-309-41	48 volt charger assembly (see note)

** - Not available at time of printing*

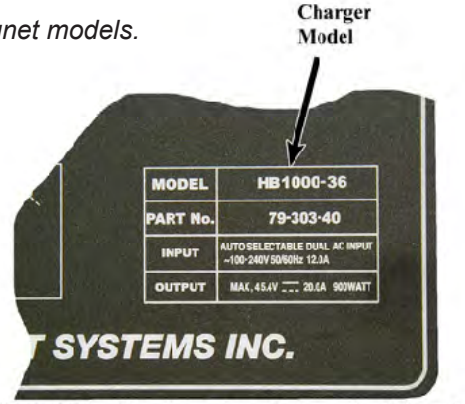
NOTE: There are no user serviceable components inside the charger

NOTE: The charger AC cord is an intergral part of the charger. When replacing the charger, do not cut and splice the AC cord. ***Cutting the AC cord will void the charger warranty.***

NOTE: The Signet model HBS series charger replaces all previous Signet models.

NOTE: The harness connectors and AC plug are not included with the charger.

QTY	PART #	DESCRIPTION
2	75-318-20	Butt splice
2	75-320-51	Knife connector
1	76-200-00	AC plug, 115v domestic



Typical Data Plate (your data plate may be different)

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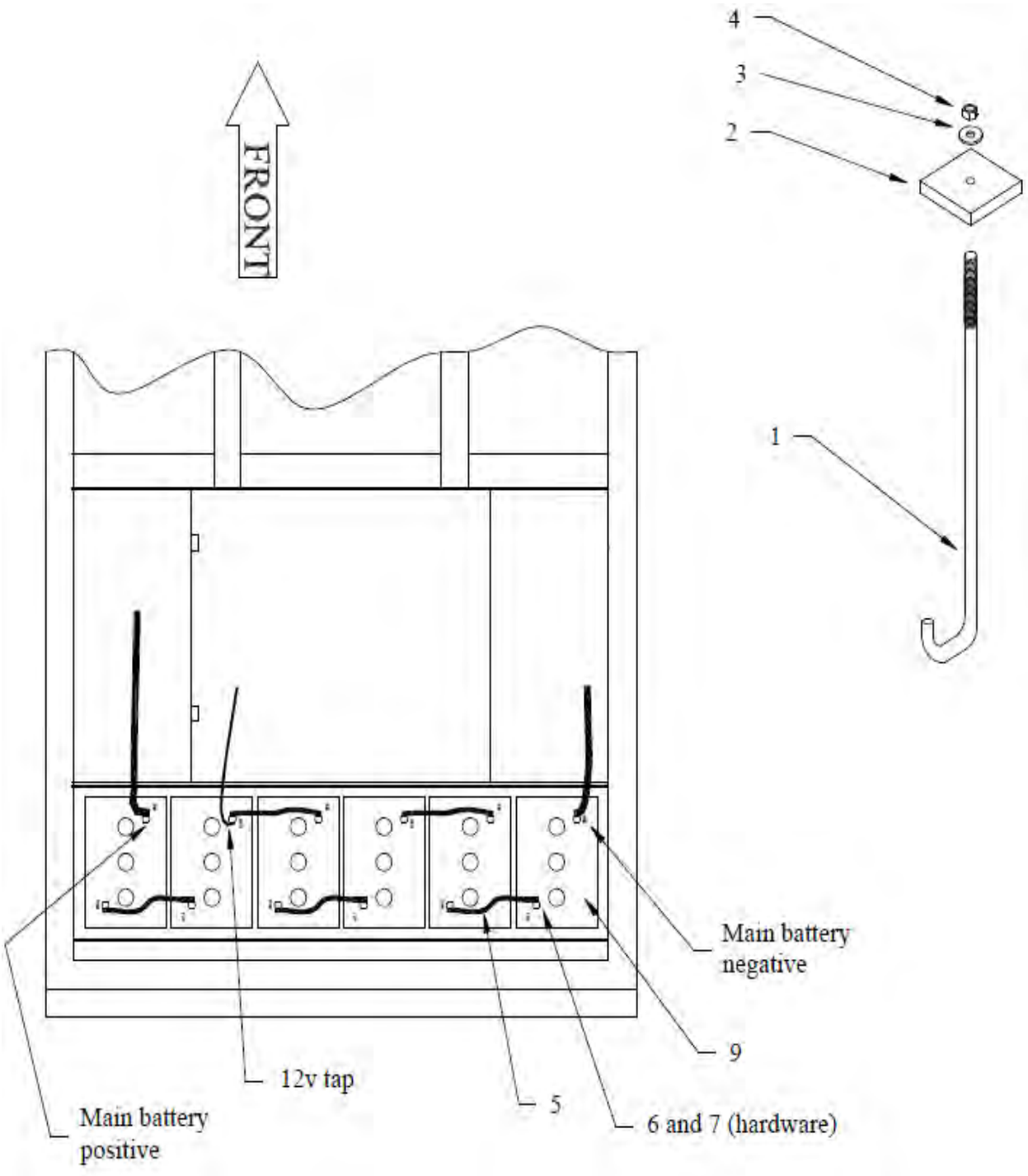
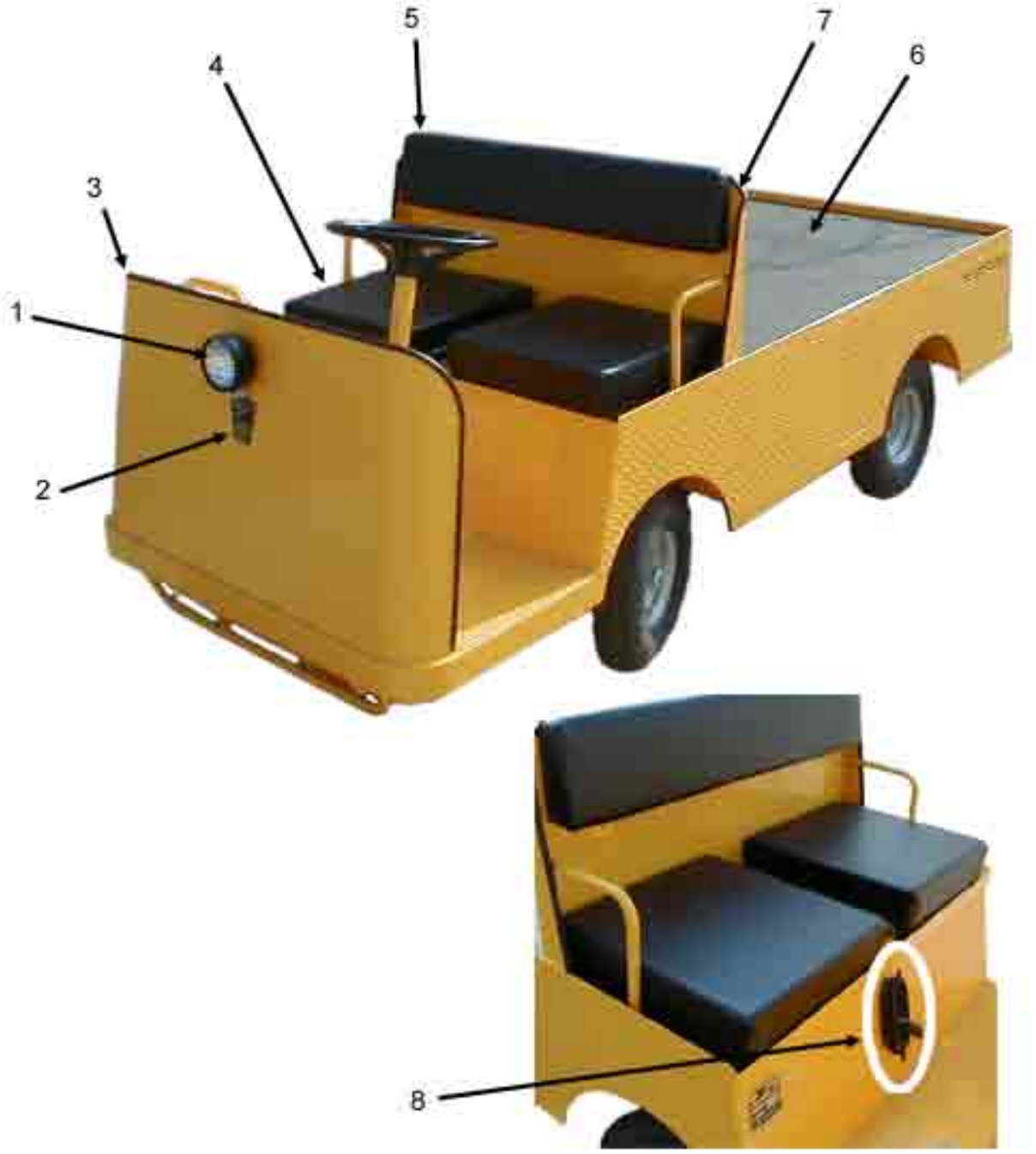
Batteries


4
3
2
1
FRONT
Main battery negative
9
12v tap
5
6 and 7 (hardware)
Main battery positive

Batteries			
ITEM #	PART #	DESCRIPTION	QTY
1	50-243-10	Battery Hold Down Rod	3
2	50-250-00	Bat-Lok	3
3	88-088-66	Flat Washer	3
4	88-069-81	Nut	3
5	75-235-08	Battery Jumper	5
6	88-081-12	Bolt	12
7	88-089-80	Nut	12
8	-	-	
9	77-042-00	T 105, 217AH Battery (standard)	6
	77-042-50	TD217, 217AH Battery	
	77-042-80*	217AH Moist Charge	
	77-044-00	T 125, 230AH Battery	
	77-047-00	T 145, 244AH Battery	
	77-047-50	TD 250, 250AH Batter	
	77-047-80*	244AH Moist Charge	
	77-048-00	J250, 250AH Battery	
	77-048-80	J250, 250AH Moist Charge	
Not Shown	77-055-01	Low Level Electrolyte Alarm	

*- Moist charge batteries must be filled with battery electrolyte before being put into service.

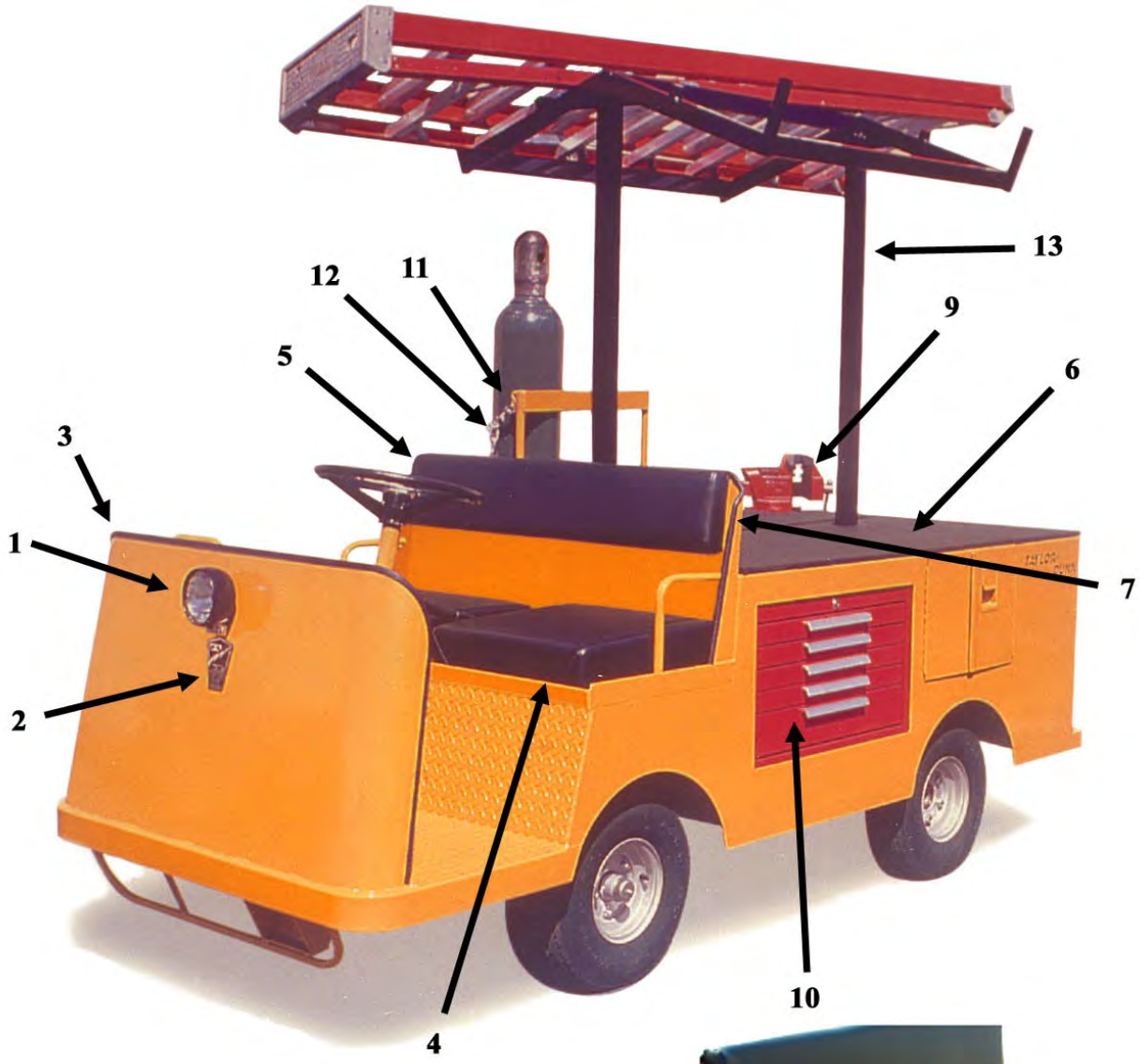
Seat Cushions, Deck and Lights, B 1-50



Seat Cushions, Deck and Lights, B 1-50			
ITEM #	PART #	DESCRIPTION	QTY
1	72-005-00	Head Light Assembly	1
1a	72-072-00	Replacement Bulb only	1
Not Shown	98-603-00	Wiring Grommet	1
2	94-201-00	T/D Emblem	1
2a	88-567-91	Emblem Mounting Clips	3
3	94-035-01	Cowl Moulding	8’
4	90-147-00	Seat Cushion	2
5	90-179-00	Seat Backrest	1
Not Shown	88-837-09	Backrest Mounting Screws	6
6	90-444-50	Deck Board (standard)	1
6	*	Deck Board (Cab)	1
7	94-035-01	Seat Back Moulding	7
8	79-575-30	Charger AC Cord	1
8a	79-511-00	Mounting Bracket	1
8b	88-065-06	Mounting Bracket Screws	2
8c	88-069-81	Mounting Brackt Nuts	2
8e	79-530-00	AC Cord Strain Releif	1
8f	76-200-00	Replacement AC Plug only	1
Not Shown	72-022-00	Tai light (includes mounting grommet and pigtail)	1
Not Shown	72-022-51	Tail light mounting grommet	1
Not Shown	72-022-52	Tail light pigtail	1

*- For fiberglass cab option, order standard deck board (#6) and cut to 60-3/8 inches long.

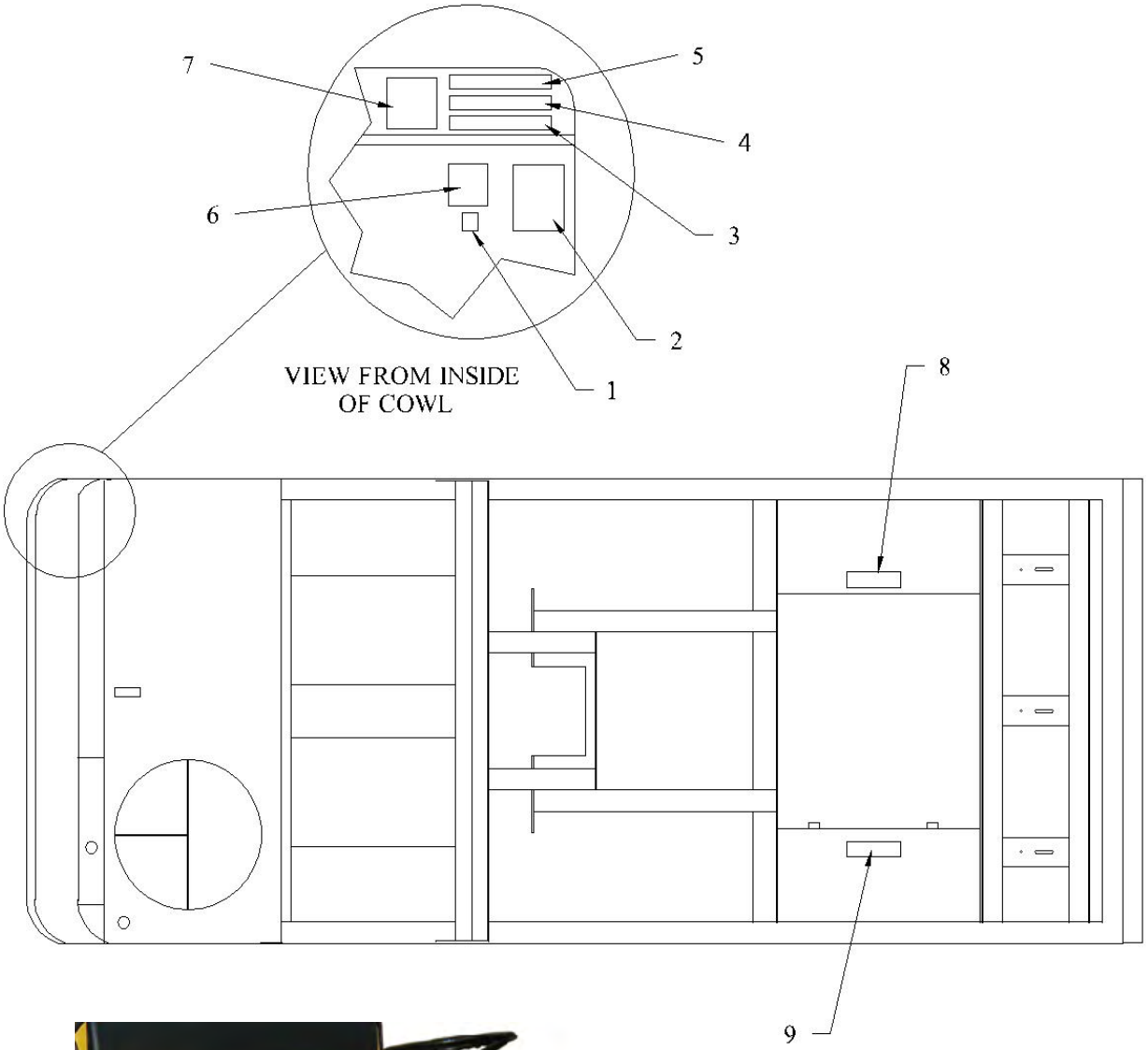
Seat Cushions, Deck and Lights, MX 1600



Weld Bottle and Ladder not inculded with the vehicle and are shown for reference only

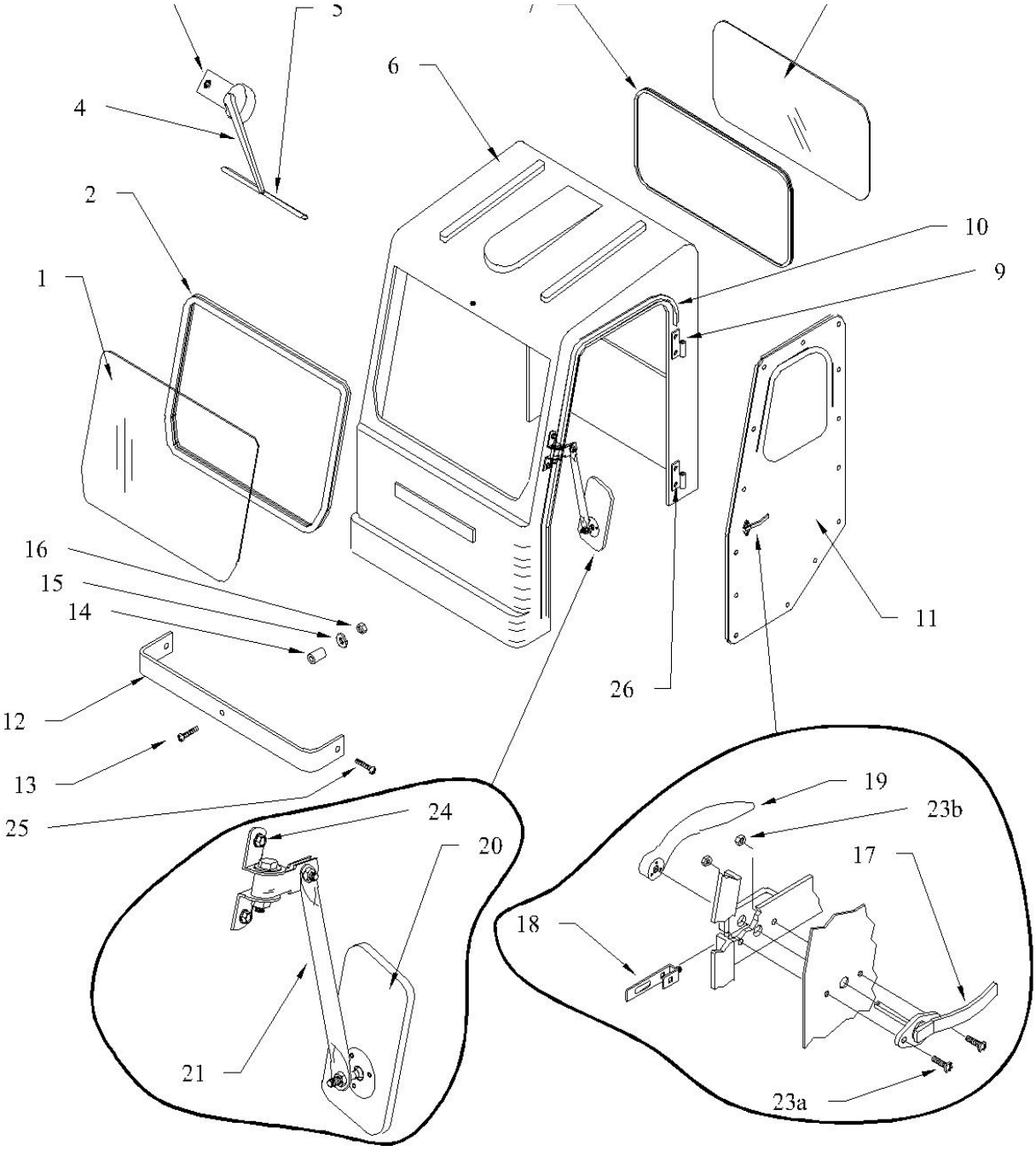
Seat Cushions, Deck and Lights, MX 1600			
ITEM #	PART #	DESCRIPTION	QTY
1	See B 1-50	Head Light Assembly	1
1a	See B 1-50	Replacement Bulb only	1
Not Shown	See B 1-50	Wiring Grommet	1
2	See B 1-50	T/D Emblem	1
2a	See B 1-50	Emblem Mounting Clips	3
3	See B 1-50	Cowl Moulding	8’
4	See B 1-50	Seat Cushion	2
5	See B 1-50	Seat Backrest	1
Not Shown	See B 1-50	Backrest Mounting Screws	6
6	90-443-10	Deck Board (front)	1
6a	90-443-11	Deck Board (rear)	1
6b	90-443-12	Tool box cover plate (steel)	1
7	See B 1-50	Seat Back Moulding	7
8	See B 1-50	Charger AC Cord	1
8a	See B 1-50	Mounting Bracket	1
8b	See B 1-50	Mounting Bracket Screws	2
8c	See B 1-50	Mounting Brackt Nuts	2
8e	See B 1-50	AC Cord Strain Releif	1
8f	See B 1-50	Replacement AC Plug only	1
9	97-840-01	Vise	1
9a	88-080-16	5/16NC x 2 Hex Bolt (vise)	3
10	91-340-25	Tool Box	1
11	91-530-00	Chain Hook	2
12	30-552-00	1/4 Coil Chain (by the foot)	-
13	02-200-05	Ladder Rack	1
13a	88-140-20	1/2 x 3 NC Hex Bolt (ladder rack)	4
13b	88-148-61	1/2 SAE Flat Washer (ladder rack)	8
13c	88-149-81	1/2 NC Hex Lock Nut (ladder rack)	4
Not Shown	See B 1-50	Tai light (includes mounting grommet and pigtail)	1
	See B 1-50	Tail light mounting grommet	1
	See B 1-50	Tail light pigtail	1
	94-301-54	Decal, Tipover (applied to center of ladder rack)	2

Decals, B 1-50



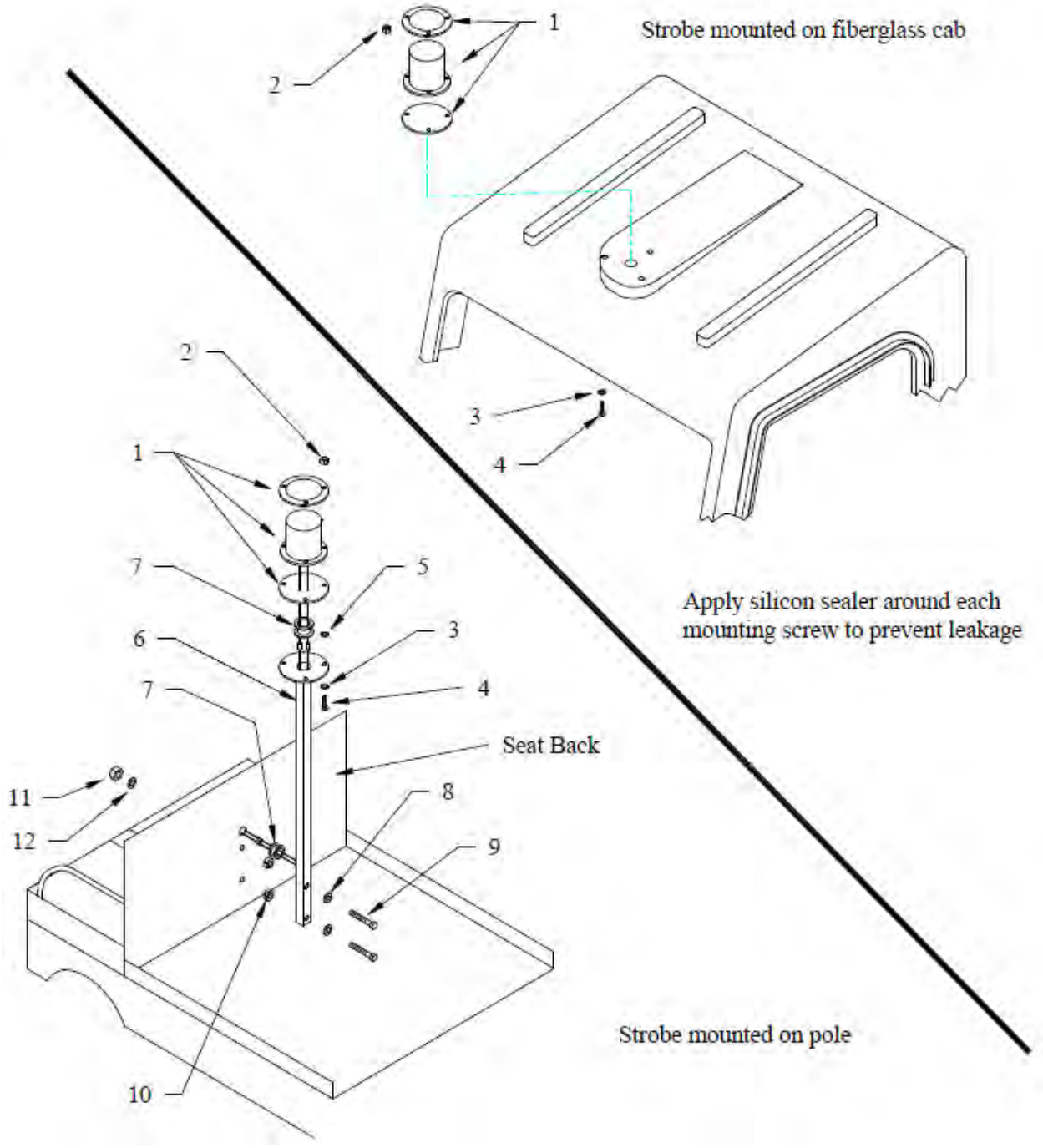
Decals, B 1-50			
ITEM #	PART #	DESCRIPTION	QTY
1	94-333-00	FM, ending serial number 201066	1
2	94-313-20	Safety Warning	1
3	94-384-01	Not a Motor Vehicle	1
4	94-309-00	Park Brake	1
5	94-384-14	Leaving Vehicle	1
6	94-373-10	Vinyl Data Plate	1
	94-373-70	Metal Data Plate	1
7	94-301-42	Arms and Legs	1
8	94-319-00	Battery Disconnect	1
9	94-313-00	Battery Warning	1

Fiberglass Cab, Doors, Mirrors



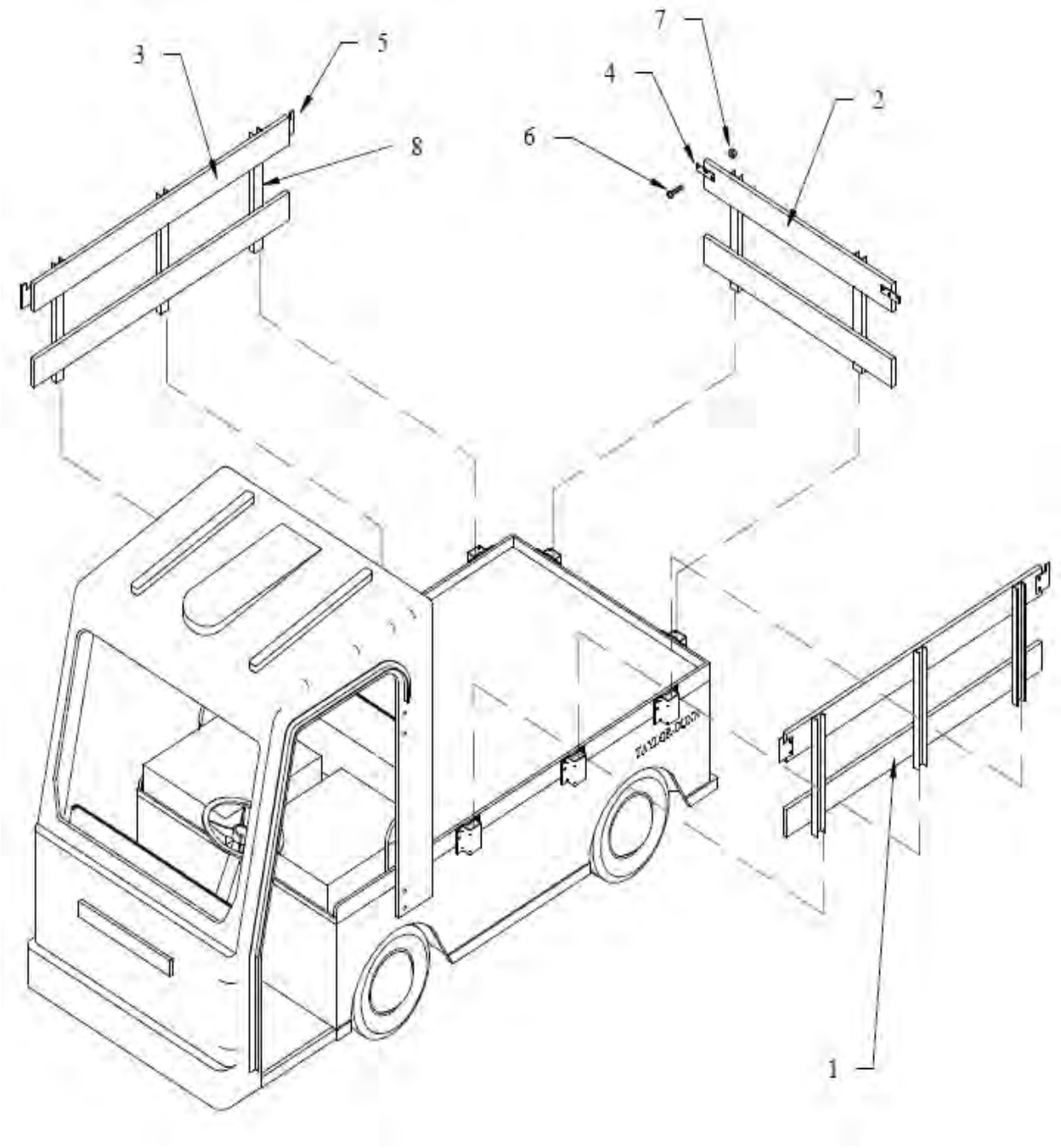
Fiberglass Cab, Doors, Mirrors			
ITEM #	PART #	DESCRIPTION	QTY
1	90-852-30	Front Windshield	1
2	98-310-10	Windshield Gasket (by the foot)	
3	74-050-00	Windshield Wiper Motor	1
4	74-051-00	Windshield Wiper Arm	1
5	74-052-00	Windshield Wiper Blade	1
6	91-008-00	Fiberglass Cab, B 1-50	1
6a	91-008-20	Fiberglass Cab, MX 1600	1
7	98-310-10	Rear Window Gasket (by the foot)	1
8	90-850-10	Rear Window	1
9a	91-814-11	Door Hinge(right)	2
9b	91-814-10	Door Hing (left)	
10	94-036-00	Door Moulding	13’
11a	90-924-96	Door Cover (left)	1
11b	90-923-10	Door Frame (left)	1
11c	90-924-97	Door Cover (right)	1
11d	90-923-20	Door Frame (right)	1
12	01-200-73	Front Bumper	1
13	88-102-17	Bolt	1
14	16-206-00	Spacer	1
15	88-108-62	Split Lock Washer	3
16	88-109-80	Nut	3
17	97-315-53	Outer Door Handle	2
18	97-315-51	Door Latch	2
19	97-315-54	Inner Door Handle	2
20	92-202-00	Mirror	2
21	92-201-00	Mirror Mounting Bracket	2
22	-	-	-
23a	88-025-08	Screw	4
23b	88-029-86	Nut	4
24a	88-065-08	Bolt	4
24b	88-069-81	Nut	4
25	88-102-13	Bolt	2
26a	88-082-09	Bolt	8
26b	88-089-81	Nut	8
Not Shown	01-200-70	Rear Support Angle, B 1-50	1
Not Shown	01-200-89	Rear Support Angle, MX 1600	
Not Shown	01-200-72	Front Cover (between cab and cowl)	1
Not Shown	90-186-10	Velcro (on door frame)	

Strobe Light



Strobe Light			
ITEM #	PART #	DESCRIPTION	QTY
1a	72-023-20	Strobe Light	1
1b	72-023-21	Replacement Bulb	1
1c	72-023-22	Replacement lens (amber)	1
1d	72-023-24	Replacement Lens (red)	1
2	88-029-80	Nut	3
3	88-028-62	Flat Washer	3
4	88-025-08	Screw	4
5	88-048-61	Washer	3
6	72-023-41	Mounting Pole	1
7	98-603-00	Rubber Grommet	2
8	88-108-60	Flat Washer	2
9	88-101-16	Bolt	2
10	17-104-00	Spacer	2
11	88-109-81	Nut	2
12	88-108-60	Flat Washer	2

Stake Sides, B 1-50



Stake Sides, B 1-50			
ITEM #	PART #	DESCRIPTION	QTY
1	90-542-20	Side Gate	1
2	90-542-22	End Gate	1
3	90-542-20	Side Gate	1
4	90-540-00	Gate Hook	6
5	90-540-00	Gate Hook	6
6	88-065-13	Bolt	44
7	88-069-81	Nut	44
8	90-543-00	Mounting Channel	8

Hydraulic Brake Lines and Fittings (optional)

Illustration not available

REAR BRAKES

50-009-00	PUSH ROD, MASTER CYLINDER
96-762-00	3/8 IN.CLEVIS CAST
96-772-00	PIN,CLEVIS,3/8 X 1 1/8 IN.
99-510-02	MASTER CYLINDER
99-564-00	UNION T, 3/16 INV FLARE
99-566-00	BANJO FITTING, MASTER CYLINDER
99-571-00	COPPER GASKET, 0.813OD, 0.500ID
99-572-00	COPPER GASKET, 0.813OD, 0.594ID
99-575-00	BRAKE LINE COUPLER
99-576-00	BRAKE LINE CLIP
99-579-00	BOLT, MASTER CYLINDER
99-603-50	BRAKE LINE, LEFT AND RIGHT REAR
99-605-80	BRAKE LINE, REAR BRAKES (FRONT)
99-608-57	BRAKE LINE, REAR BRAKES (REAR)

FRONT BRAKES

99-559-00	FITTING, MASTER CYLINDER
99-564-00	UNION T, 3/16 INV FLARE
99-580-20	HOSE,BRAKE,W/1/8PM& 3/16TF
99-603-53	BRAKE LINE LEFT AND RIGHT, FRONT
99-605-81	BRAKE LINE, FRONT BRAKE

Appendixes

TABLE OF CONTENTS

APPENDIX A: TOOL LIST

The tools shown here are generic for servicing Taylor-Dunn vehicles. Not all tools will be required for servicing this vehicle.

62-027-32: Throttle Module Analyzer

Tests the throttle module in or out of the vehicle

43-201-50: Pinion Seal Installation Tool

Used to install the pinion seal on all vehicles equipped with the Power Traction primary reduction and a pinion brake or speed sensor.

62-027-00: Test Light

Used for testing electrical circuits. Switchable for 12, 24, 36, 48 volt systems.

Required to complete troubleshooting provided in the vehicle service manuals.

62-027-61 and -62: Sevcon System Handset

Diagnostics and adjustments (-62 only) of the Sevcon Power Pak and Micro Pak control systems.

62-027-64 and -65: Curtis AC System Handset

Diagnostics and adjustments (-65 only) of the Curtis AC control system.

96-500-43: PMT/C Meter Reset Module

Required to reset the PMT/C maintenance meter (special order option).

41-532-50: Chain Case Centering Tool

Used to center the chain case cover on all vehicles equipped with the Power Traction primary reduction and a pinion brake or speed sensor. Includes instructions.

Molex # 11-300-02: Pin Removing Tool

Removes 0.062 diameter pins from Molex rectangular harness connectors. Not available from Taylor-Dunn. Purchase from any local electronics distributor.

Molex # 11-300-06: Pin Removing Tool

Removes 0.093 diameter pins from Molex rectangular harness connectors. Not available from Taylor-Dunn. Purchase from any local electronics distributor.

75-442-55: Pin Removing Tool

Removes pins from Molex Mini-Fit harness connectors.

41-350-13: Disc Brake Boot Installation Tool

Assists in installing the rubber boot onto the disc brake piston.

70-440-55: Pin Removing Tool

Removes pin from Amp circular harness connectors.

77-200-00: Hydrometer

Used for testing battery electrolyte. Illustration is of a typical hydrometer, actual hydrometer type may vary.

72-201-00: Battery Filler

Used to safely add water to batteries. Equipped with splash guard and auto-shutoff when cell is full.

96-500-48: GT Drive Oil Fill Plug Tool

Used to remove the oil fill plug on GT drives. It is used with a 3/8” drive extension (not included).

75-089-00: Throttle Module Test Harness

Used in conjunction with a volt meter to test the throttle module. The module must be installed in a working control system.

Note: Part # 62-027-31 includes instructions

APPENDIX B: SUGGESTED TORQUE LIMITS FOR STANDARD HARDWARE

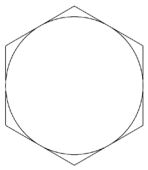
HARDWARE IDENTIFICATION

Standard Head Markings

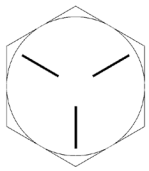
NOTE: Torque value used should be for lowest grade of hardware used. If a grade 2 nut is used on a grade 8 bolt, use grade 2 torque value.

NOTE: Toque values specified are for clean dry threads.

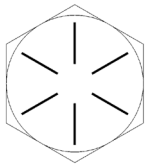
Hex Bolts



S.A.E. Grade 2



S.A.E. Grade 5



S.A.E. Grade 8

L'9

The grade of a metric bolt is cast directly on the head. Below is an example of a 10.9. The location and style of the text will vary.

Other Bolts

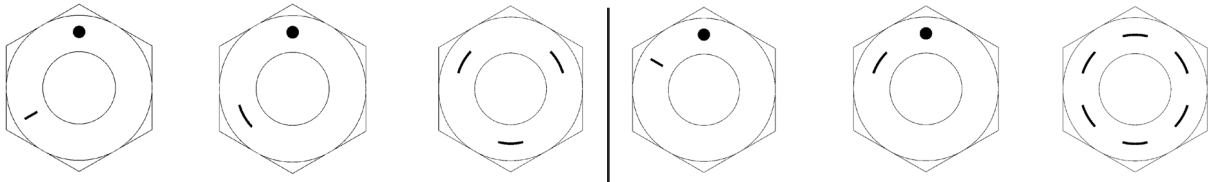
Truss Head, grade 2

Carriage Bolt, grade 2 (unless marked as above)

*Not available at time of printing

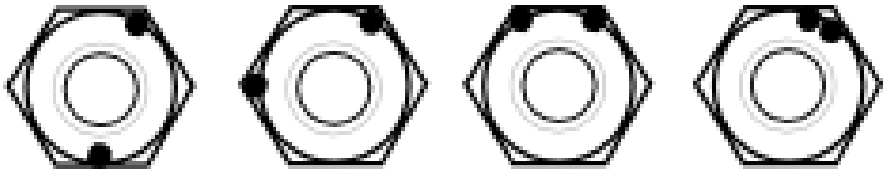
Hex Nuts

Nuts with no markings are to be treated as S.A.E. Grade 2



S.A.E. Grade 5

S.A.E. Grade 8



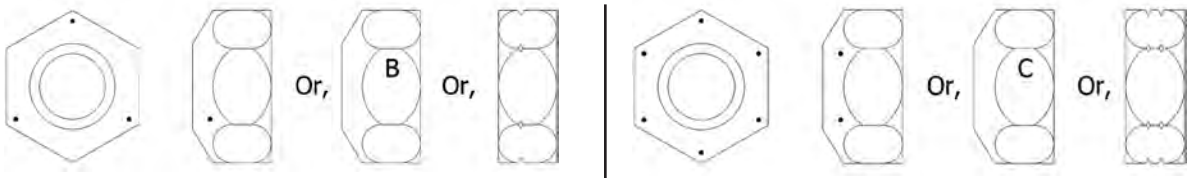
5.8 8.8 10.9 12.9

Metric Nuts

Hex Lock Nuts (stover)

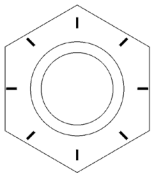
Lock nuts use a letter to indicate the grade of the nut. Grade A' locknuts would be the equivelent of Grade '2' hex nuts, Grade 'B' as Grade '5' and Grade 'C' as Grade '8'.

NOTE: Nuts with no markings are to be treated as S.A.E. Grade A



S.A.E. Grade B

S.A.E. Grade C



Grade L'9

Other Nuts

Other nuts used by Taylor-Dunn® should be treated as S.A.E. grade A

*Not available at time of printing

Generic Torque Values

All torque values are for clean dry zinc plated threads in noncritical steel assemblies of the same hardess specification. Reduce torque approximately 10-15% for lubricated threads.

Refer to the service section assembly procedure for critical torque values.

Imperial (inch), Foot Pounds

		Grade, SAE			
Dia.	Pitch	2	5	8	L9
#4	40	*	*	*	*
#6	32	*	*	*	*
#8	32	*	*	*	*
#10	32	*	*	*	*
#12	32	*	*	*	*
1/4	20	5.5	8.5	12.5	11
	28	6.5	10.5		
5/16	18	12.0	17.5	24.5	22
	24	12.5	19.0	*	*
3/8	16	20	30	43	40
	24	22.5	33	50	45
7/16	14	27	50	70	65
	20	36	55	77	70
1/2	13	49	75	106	95
	20	55	85	120	110
9/16	12	70	109	153	140
	18	78	121	171	160
5/8	11	97	150	212	195
	18	110	170	240	225
3/4	10	172	275	376	350
	16	192	297	420	390
7/8	9	278	429	593	565
	14	306	473	818	625
1	8	416	644	909	850
	14	466	721	1018	930
1-1/8	7	590	794	1287	1700
	12	662	891	1444	1850
1-1/4	7	832	1120	1817	2950
	12	922	1241	2012	3330

Imperial (inch), Newton Meters

		Grade, SAE			
Dia.	Pitch	2	5	8	L9
#4	40	*	*	*	*
#6	32	*	*	*	*
#8	32	*	*	*	*
#10	32	*	*	*	*
#12	32	*	*	*	*
1/4	20	7.4	11.5	16.9	14.9
	28	8.8	14.2		
5/16	18	16.2	23.7	33.2	29.8
	24	16.9	25.8	*	*
3/8	16	27.1	41	58	54
	24	30.5	45	68	61
7/16	14	37	68	95	88
	20	49	75	104	95
1/2	13	66	102	144	129
	20	75	115	163	149
9/16	12	95	148	614	190
	18	106	164	232	217
5/8	11	132	203	287	264
	18	149	230	325	305
3/4	10	233	373	510	475
	16	260	403	569	529
7/8	9	377	582	804	766
	14	415	641	1109	847
1	8	564	873	1232	1152
	14	632	978	1380	1261
1-1/8	7	800	1076	1744	2304
	12	897	1208	2364	2508
1-1/4	7	1128	1518	2463	4000
	12	1250	1682	2727	4514

Conversion Formulas:

Foot Pounds = Newton Meters x 0.737562149
Newton meters = Foot Pounds x 1.355817948

*Not available at time of printing

All torque values are for clean dry zinc plated threads in noncritical steel assemblies of the same hardess specification. Reduce torque approximately 10-15% for lubricated threads.

Refer to the service section assembly procedure for critical torque values.

Metric, Newton Meters

		Grade, N-m			
Dia.	Pitch	4.6	8.8	10.9	12.9
3	0.50	0.51	*	*	*
4	0.70	0.95	3.1	*	*
5	0.80	2.28	6.1	*	*
6	1.00	3.92	10.4	15.5	*
8	1.00	*	27.0	*	*
	1.25	9.48	25.0	37.0	*
10	1.00	*	57.0	*	*
	1.25	*	54.0	*	*
	1.50	19.1	51.0	75.0	*
12	1.25	*	96.0	*	*
	1.50	*	92.0	*	*
	1.75	32.6	87.0	160	*
14	1.50	*	150	*	*
	2.00	51.9	140	205	*
16	1.50	*	*	*	*
	2.00	79.9	215	310	*
18	1.50	*	*	*	*
	2.00	*	*	*	*
	2.50	110	300	*	*
20	1.50	*	*	*	*
	2.00	*	*	*	*
	2.50	156	430	*	*
22	1.50	*	*	*	*
	2.00	*	*	*	*
	2.50	211	580	*	*
24	2.00	*	*	*	*
	3.00	270	740	*	*
27	3.00	*	*	*	*
	3.00	398	*	*	*
30	2.00	*	*	*	*
	3.50	540	*	*	*

Metric, Foot Pounds

		Grade, N-m			
Dia.	Pitch	4.6	8.8	10.9	12.9
3	0.50	0.38	*	*	*
4	0.70	0.7	2.3	*	*
5	0.80	1.7	4.5	*	*
6	1.00	2.9	7.7	11.4	*
8	1.00	*	19.9	*	*
	1.25	7	18.4	27.3	*
10	1.00	*	42	*	*
	1.25	*	40	*	*
	1.50	14.1	38	55	*
12	1.25	*	71	*	*
	1.50	*	68	*	*
	1.75	24	64	118	*
14	1.50	*	111	*	*
	2.00	38	103	151	*
16	1.50	*	*	*	*
	2.00	60	158	229	*
18	1.50	*	*	*	*
	2.00	*	*	*	*
	2.50	81	221	*	*
20	1.50	*	*	*	*
	2.00	*	*	*	*
	2.50	115	317	*	*
22	1.50	*	*	*	*
	2.00	*	*	*	*
	2.50	156	428	*	*
24	2.00	*	*	*	*
	3.00	199	524	*	*
27	3.00	*	*	*	*
	3.00	293	*	*	*
30	2.00	*	*	*	*
	3.50	398	*	*	*

*Not available at time of printing

APPENDIX C: BRAKE LINING HANDLING PRECAUTIONS

⚠WARNING

Taylor-Dunn does not currently supply asbestos fiber-brake pads/shoes with any vehicle. However, there is the possibility that the original brake pads/shoes were replaced with aftermarket pads/shoes containing asbestos. Since this possibility does exist, the brake pads/shoes should be handled as if they do contain asbestos.

Never use compressed air or dry brush to clean the brake assemblies. Use an OSHA approved vacuum cleaner or any alternate method approved by OSHA to minimize the hazard caused by airborne asbestos fibers and brake dust.

Do not grind, sand, break, or chisel the brake pads/shoes, as this will cause unnecessary dust, possibly releasing asbestos fibers in the air.

Always wear protective clothing and a respirator when working on the brake pads/shoes or their associated components.

Inhaled asbestos fibers have been found to cause cancer and respiratory diseases.

Do not drive the vehicle if any worn or broken part is detected in any part of the brake system. The cause of the damage must be repaired immediately.

⚠WARNING

CALIFORNIA

Proposition 65 Warning

Engine exhaust and some of its constituents are known to the state of California to cause cancer, birth defects, and other reproductive harm.

There are chemicals contained in the operating systems of this vehicle that are known to the state of California to cause cancer, birth defects, and other reproductive harm

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