

The Best Way
To Go
About Your
Business

Published: 12/15/2003
Revision: E

[®]
TAYLOR-DUNN



B 1-00



B 1-25

Models Included:

B0-011-00 (B 1-00) Tour Master

B0-011-25 (B 1-25) Carry Master

MANUAL MB-100-00

Operation, Troubleshooting and
Replacement Parts Manual

Serial number Starting: 142833

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





B2-48 With Dump Bed Option



B2-10 Ambulance



*B2-48 with Steel Cab, Foldaway
4-Passenger Seat and Stake Sides*



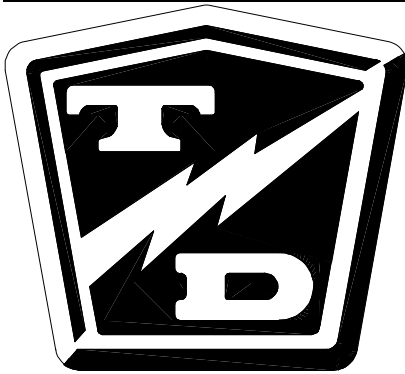
P2-50 30,000 Pound Tow Tractor



ET 3000



ET1-50 Full Size Truck



Taylor-Dunn®

Model B0-011-00 and B0-011-25

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



Introduction

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B 1-00 shown with optional luggage rack





INTRODUCTION

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.



*Model B 2-10 shown with stake sides
and steel cab with doors options*



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.



Model R 3-80 shown equipped with a cargo box and steel cab with doors options

Conventions

Symbols and/or words that are used to define warnings, cautions, instructions, or notes found throughout this manual. Refer to the examples below.

⚠ WARNING

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

⚠ WARNING

A shaded box with and the word "Warning" and the symbol ⚠ above denotes a warning. This warning alerts the reader of a high voltage hazard that may result in injury to themselves or others. Be sure to follow any instructions contained within a warning and exercise extreme care while performing the task.

⚠ CAUTION

A box with the word "CAUTION" and the symbol ⚠ above 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.



Model B 2-48 equipped with the Dump Bed option



INTRODUCTION

HOW TO IDENTIFY YOUR VEHICLE

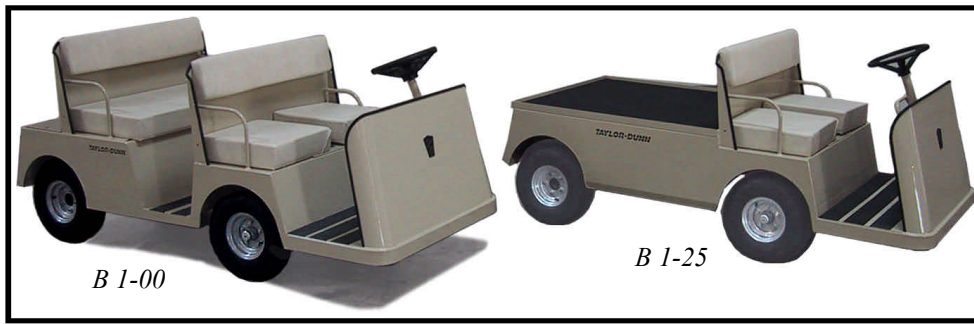
This manual applies to vehicles with the same model and serial numbers listed on the front cover.

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.

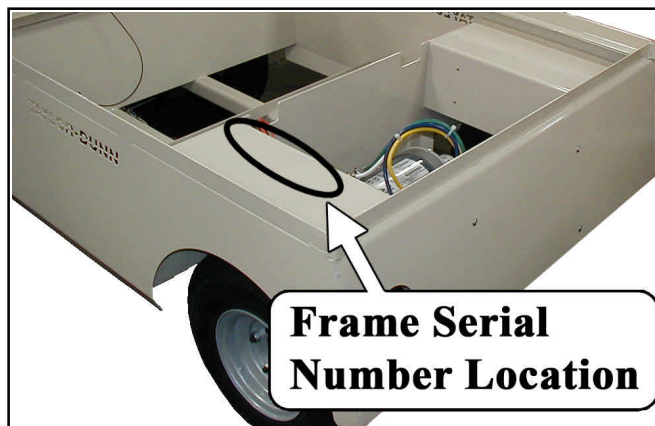
⚠ WARNING

This vehicle is not designed to be driven on public roads or highways. It is available in maximum designed speed of 12 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 this vehicle at more than 5 mph.

This vehicle conforms to requirements for Type E vehicles as described in O.S.H.A. Standard Section 29 CFR 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. The location of the data plate will be in one of two locations:



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

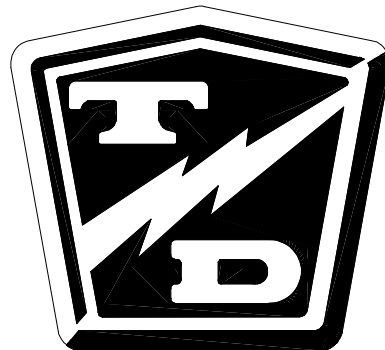
The only personnel authorized to repair, modify, or adjust any part of this or any Taylor-Dunn® vehicle is a factory authorized service technician. Repairs made by unauthorized personnel may result in damage to the vehicles systems which could lead to an unsafe condition resulting in severe bodily injury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



Model B 2-10 Ambulance

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Safety Rules and Operating Instructions



SAFETY RULES AND OPERATING INSTRUCTIONS

STANDARD* SPECIFICATIONS

ITEM	MODEL	SPECIFICATION
Occupancy	B 1-00 B 1-25	Driver + 3-passengers Driver + 1-passenger
Dimensions		241L x 112W centimeters (94.875L x 44.25W inches)
Turning Radius		335 Centimeters (132 Inches)
Dry Weight (no batteries)	B 1-00 B 1-25	336 kg (741 lbs) 334 kg (737 lbs)
Min/Max Battery Weights		174 kg to 195 kg (384 lbs to 432 lbs)
Maximum Load Deck dimensions	B 1-00 B 1-25	363 kg (800 lbs) (none) 110.5W x 121.9L Centimeters 43.5W x 48L Inches)
Electrical System		Six 217 Amp Hour, 6 Volt, Lead Acid Batteries, Solid State Speed Control, 275 Amp
Transmission		Helical Gear, Oil Bath, Automotive Type Hypoid Differential.
Motor, DC		4.47 kW, (6 Horse Power) intermittent duty
Brakes		Rear Wheel Mechanical Drum , Hand Operated Park Brake
Steering		Automotive Steering 24:1
Tires		5.70 x 8 Load Range B
Frame		Steel Unitized Body, Heavy Duty 16 Gauge Steel, Diamond Plate
Instrumentation		Key Switch, Horn Button, Forward/Reverse Switch
Light Accessories		Brake Lights
Charger		Built In 1kW, dual voltage (110 - 220 vac) 15-Amp

* - Specifications are subject to change without notice

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).



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 (extracted from the American National Standards Institute Personnel and Burden Carriers ANSI B56.8). As well as, following the safety rules and guidelines outlined in ANSI B56.8 and listed below.

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 speed of 12 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 this vehicle at more than 5 mph.

Refer to **Vehicle Operational Guidelines, Safety Guidelines** section for important safety information regarding operating this vehicle.

⚠ WARNING

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

⚠ 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

According to 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 at the front of the instrument panel, turns on the vehicle. Rotate the key clockwise to turn the vehicle on, counterclockwise to turn the vehicle 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-Reverse Switch

The forward-reverse switch, located on the instrument panel, determines the direction of travel of the vehicle. Push the top of the switch to make the vehicle travel forward. Push the bottom of the switch to travel in reverse.

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 the same way as the accelerator pedal in an automobile. Depress the pedal to increase speed and release the pedal to decrease speed.



Seat Interlock Switch

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

The switch is a part of the vehicle safety system. It should not be relied upon as the sole safety feature used to disable or disengage this vehicle.

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.



Steering

The steering wheel and steering system is an automotive type. To turn right, turn the steering wheel clockwise. To turn left, turn the steering wheel counter clockwise.



Foot Brake Pedal

The foot brake pedal, located to the right of the steering column, is for operation with the right foot only. It works the same as 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 part of the foot brake pedal.

To set the parking brake, push down on the lower half of the brake pedal until the pedal locks in the down position.

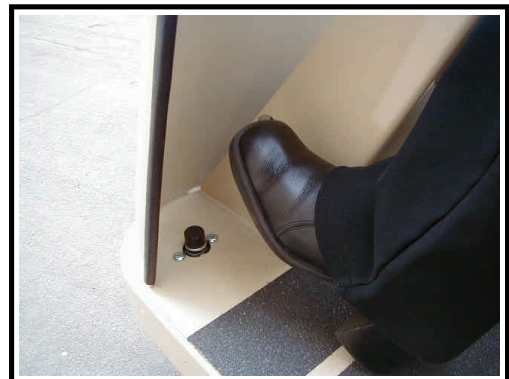
To release the park brake, apply pressure on the upper half of the brake pedal until the pedal disengages from the lock position.



Set park brake

Horn Button

The horn button is located on the floor to the left of the steering column. Depress the button to sound the horn, release it to turn it off.



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.



SAFETY RULES AND OPERATING INSTRUCTIONS

Headlights and Accessories (optional)

The headlight switch is located to the rear of the instrument panel, between the seats. An accessory switch, if any, is adjacent and to the left of the light switch.



Accessory switch location



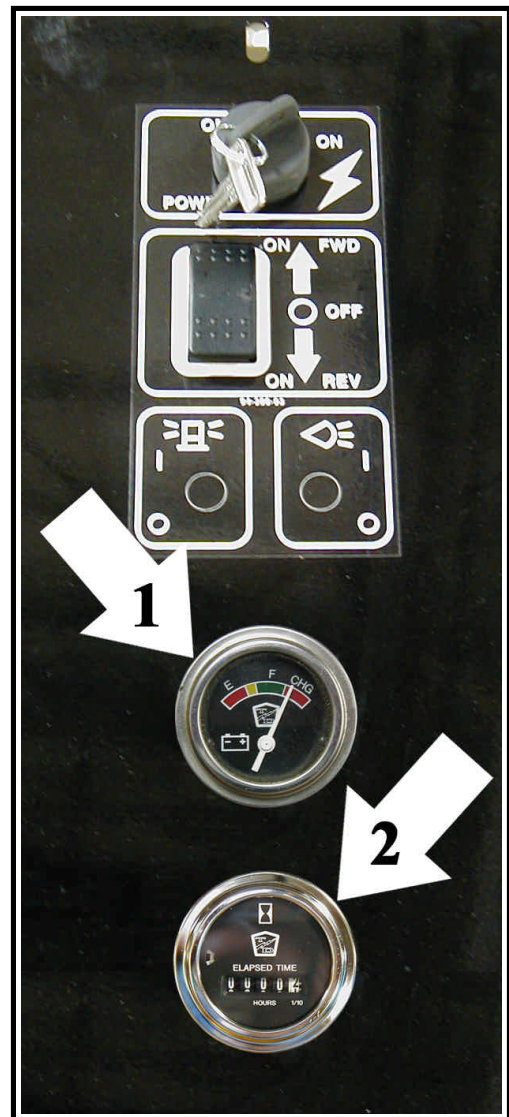
Head light switch location

Hour Meter (2) (optional)

The hour meter is located below the battery status indicator. This tracks the number of hours the vehicle has been in operation.

Battery Status Indicator (1) (optional)

The battery status indicator is located above the hour meter. The normal operating range is in the green zone. The vehicle needs charging if it is in the yellow zone. If it is in the red zone, the vehicle should be taken out of service immediately to be charged.





VEHICLE OPERATIONAL GUIDELINES

Safety Guidelines

- Only qualified and trained operators may drive this vehicle.
- Drive only on level surfaces or on surfaces having an incline of no more than 10% (5.6 degrees).
- Drive slowly when making a turn, especially if the ground is wet or when driving on an incline.
- This vehicle may overturn easily if turned sharply or when driven at high speeds.
- Observe all traffic regulations and speed limits.
- Keep all body parts (head, arms, legs) inside this vehicle while it is moving.
- 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.
- Do not drive over loose objects, holes, or bumps.
- Yield right of way to pedestrians and emergencies vehicles.
- Stay in your driving lane under normal conditions, maintaining a safe distance from all objects.
- Keep a clear view ahead at all times.

Starting:

Perform all necessary vehicle preparation steps, inspections, or maintenance before operating this vehicle.

1. Make sure the forward-off-reverse switch is in the center "OFF" position.
2. Set the parking brake.
3. Hold down the foot brake.
4. Rotate the ON-OFF switch to the "ON" position.
5. Release the parking brake.
6. Release the foot brake.
7. Slowly depress the accelerator pedal.

While driving:

- Slow down and sound the horn to warn pedestrians or when approaching a corner or other 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.

Towing Loads:

- Do not exceed the towing capacity of the tractor.
- Do not exceed the load capacity of the trailer. Refer to documentation supplied with your trailer for information regarding load capacity of the trailer.
- Make sure all loads are securely tied down. Refer to documentation supplied with your trailer for information regarding attaching loads to the trailer.
- Do not back up when towing more than one trailer.
- Drive slowly when towing loads with a high center of gravity.
- When turning, be sure to allow for "corner cutting" of the trailer.
- Allow for longer stopping distances when towing heavy loads.
- Allow for longer stopping distances when driving down a grade.



SAFETY RULES AND OPERATING INSTRUCTIONS

Parking

Before leaving the vehicle:

- Set the parking brake.
- Set the forward-off-reverse switch to the "OFF" position.
- Rotate the start switch to the "OFF" position.

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 This Vehicle

⚠ CAUTION

This vehicle is equipped with regenerative braking. Follow these steps before towing this vehicle.

- 1. To tow this vehicle the start switch must be in the "OFF" position.**
- 2. Place the forward/reverse switch in the center "OFF" position.**

Failure to follow these instructions may result in damage to the vehicle.

⚠ WARNING

The park brake should be disabled for servicing or towing procedures only. Do not operate the vehicle while the automatic park brake is disabled. Operating the vehicle with the automatic park brake disabled could lead to severe bodily injury and/or property damage.

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.



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.

⚠ 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 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 complete	ON	ON	ON

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.



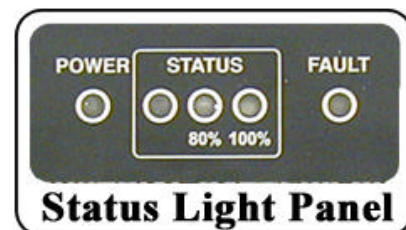
Typical Signet® HBS

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.





SAFETY RULES AND OPERATING INSTRUCTIONS

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 charge 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 / 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:

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.

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



PERIODIC MAINTENANCE CHECKLIST

Maintenance Item ^{2,3}	Weekly (20hrs)	Monthly (80hrs)	Quarterly (250hrs)	Semi - Annual (500hrs)	Annually (1000hrs)
Check Condition of Tires and Tire Pressure	●				
Check All Lights, Horns, BEEPERS and Warning Devices	●				
Check and Fill Batteries	●				
Check Brake System		●			
Check Steering System		●			
Check for Fluid Leaks		●			
Lubricate Vehicle			●		
Clean and Tighten All Wire Connections			●		
Wash and Service Batteries			●		
Check Park Brake				●	
Check Motor Brushes and Blow Out Motor				●	
Check Front Wheel Bearings				●	
Check Rear Axle Oil				●	
Change Rear Axle Oil					●
Check and Tighten all Nuts and Bolts					●
Clean and Repack Front Wheel Bearings					●

1, 2, 3 - See notes on following pages.

⚠ 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.



SAFETY RULES AND OPERATING INSTRUCTIONS

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 devices 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.



Section 3 - Maintenance and Repair

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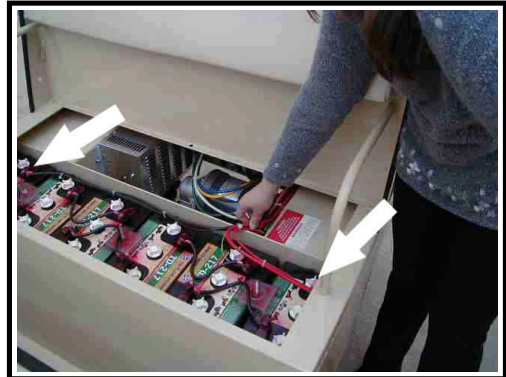
MAINTENANCE GUIDELINES

Allow only qualified and authorized personnel to maintain, repair, adjust, or inspect the vehicle.

- Before starting any repairs or maintenance, immobilize the vehicle.
- Turn the key switch “off” and remove the key.
- Set the park brake.
- Place the forward-reverse switch in the center “off” position.



- Disconnect both of the main battery leads before working on or disconnecting any electrical component or wire.



- Block the chassis with jack stands before working under a raised vehicle.
- Conduct vehicle performance checks in an authorized area where safe clearance exists.
- Tighten all nuts and bolts in accordance with the “Recommended Torque Values Chart” found in Appendix C.
- Avoid fire hazards and have fire protection equipment present in the work area. 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.
- Ventilate the work area properly.



- Brakes, steering mechanisms, speed and directional control mechanisms, warning devices, lights, governors, guards, and safety devices should be regularly inspected and maintained.
- 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. Be sure to detect any loose or defective parts.



Severe Duty Guidelines

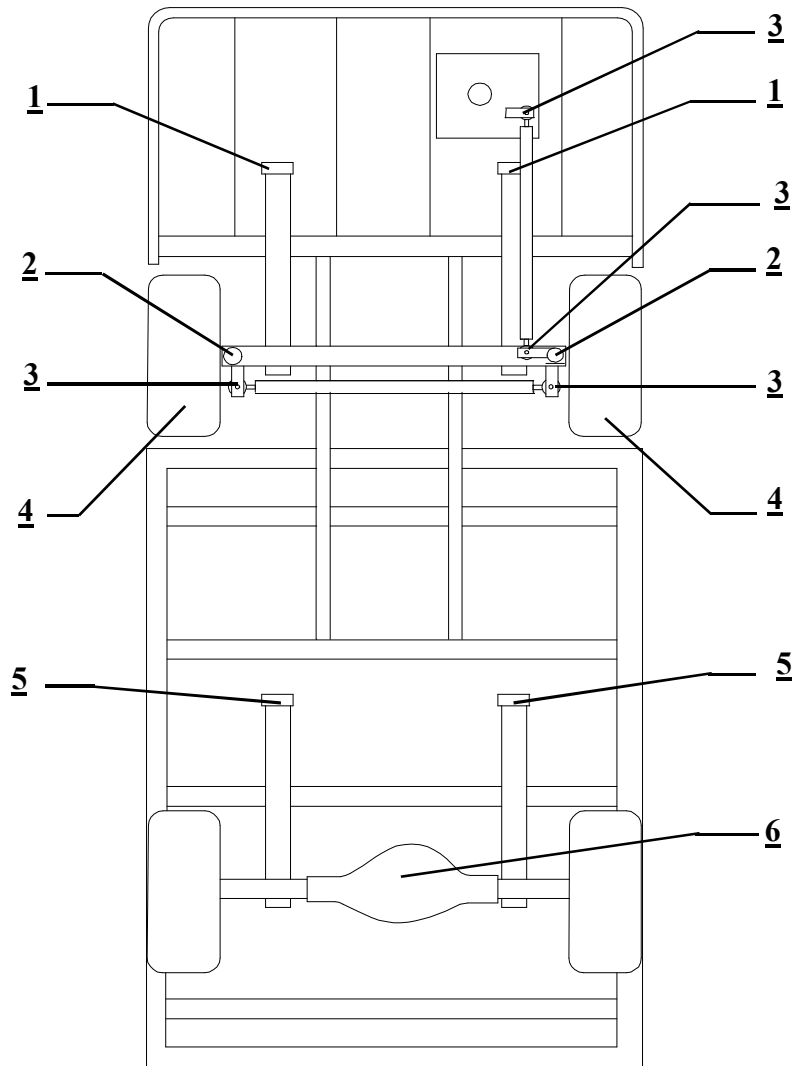
If the vehicle is operated under “severe conditions,” service procedures should be conducted more frequently than specified in the “Periodic Maintenance Checklist.” The frequency of service under severe conditions is determined by the use of the vehicle. The owner/operator must evaluate the operating 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:

- In extreme temperature.
- On bumpy, dusty, or ill maintained roads.
- In excessively wet areas.
- In corrosive or contaminated areas.
- Frequent loading of vehicle at/near capacity.
- On multiple shifts.

LUBRICATION CHART

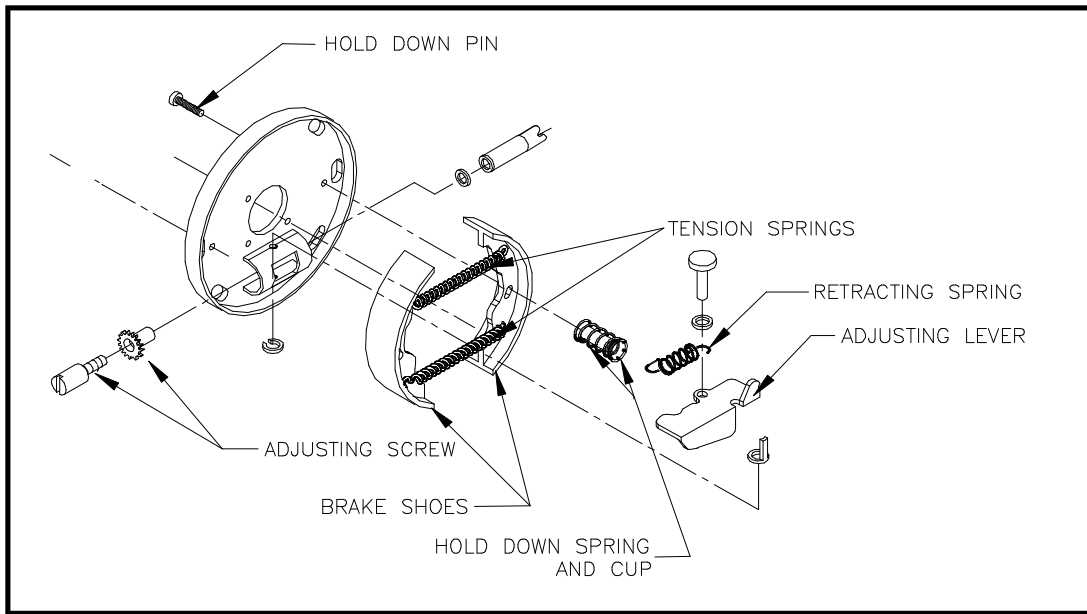


#	Description	Lubricant Type
1	Front Leaf Springs	General Purpose Grease
2	King Pin	General Purpose Grease
3	Ball Joints	General Purpose Grease
4	Front Wheel Bearings	High Temperature Wheel Bearing Grease
5	Rear Leaf Springs	General Purpose Grease
6	Drive Drain Plug	10 oz. 30 wt. Motor Oil

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
	Steer Gear Needs Adjusting
	Steer Gear Needs To Be Replaced
Excessive Steering Play	Worn Ball Joints
	Mis-Adjusted or Worn Steering Gear
	Loose Steering Linkage
	Steer Gear Needs Adjusting
	Steer Gear Needs To Be Replaced
Lack of Power or Slow Operation	Brakes or Parking Brakes Dragging
	Worn Drive Gears
	Front End Out of Alignment
	Defective Speed Control or Motor
	Defective Batteries or Charger
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 Low	Brake Worn (1/16" Wear Limit)
	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

MECHANICAL DRUM BRAKES



⚠ 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.

AUTO-ADJUST BRAKE MECHANISM THEORY OF OPERATION

The auto-adjust mechanism is located on the bottom of the brake assembly and accessible through the oval slot in the brake drum. As the brake pad material wears down, the distance the brake shoes travel to engage the brake drum becomes longer. When the travel becomes long enough, the brake lever engages the auto-adjust lever and causes it to index a tooth on the star wheel adjuster. This rotates the adjuster, which decreases the travel needed for the brake shoes to engage the brake drum.

NOTE: The only time the brakes should be manually adjusted is when an internal component of the braking system has been removed.

NOTE: The brakes will not require manual adjustment if any part of the external mechanical linkages or cables have been removed.

NOTE: The symptom of a low brake pedal may indicate that the auto adjuster is not working or the brake cable is not adjusted properly. Remove the vehicle from service and repair the 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 misoperation of the brakes. If you hear a single “clunking” noise while braking it may be due to misadjustment 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 severe bodily injury and /or property damage.

Inspecting the Auto Adjuster

⚠ WARNING

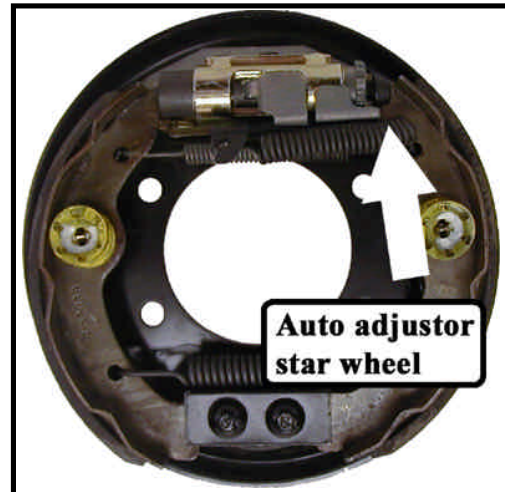
1. Make sure the key-switch is in the "OFF" position, then remove the key.
2. Place the forward-reverse switch in the center "OFF" position.
3. Set the park brake.
4. Place blocks under the front wheels to prevent vehicle movement.
5. Disconnect the main positive and negative cables at the batteries.

6. Raise the rear 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 serious bodily injury.

7. Using the appropriate procedure, remove the brake drum.
8. Release the park brake.
9. Back off the auto adjuster star wheel one or two turns.
10. Reinstall the brake drum and depress the brake pedal.
11. As the brake pedal is depressed, the auto adjuster indexes the star wheel adjuster causing a click.
12. Lower the vehicle.
13. Reconnect the main positive and negative at the batteries.
14. Remove the blocks from behind the wheels.
15. Test drive the vehicle.



Brake assembly

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Replacing the Brake Shoes

⚠ 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 rear 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 serious bodily injury.

7. Using the appropriate procedure, remove the brake drum.
8. Release the park brake.
9. Remove the tension springs.
10. Remove the hold down springs.
11. Remove the auto-adjust lever spring.
12. Apply this procedure in reverse order to install the new brake shoes.

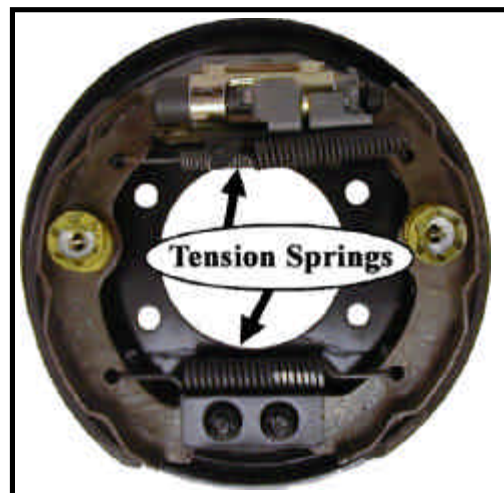
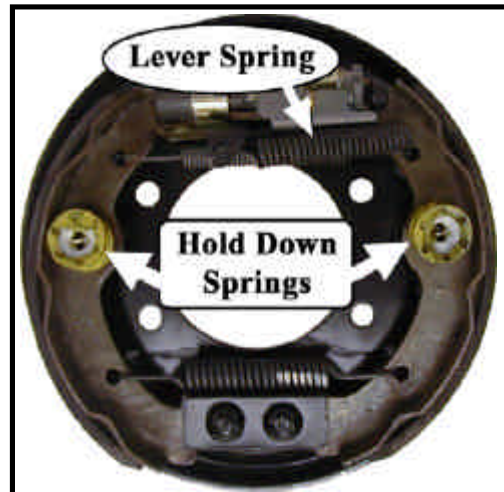
NOTE: Be sure all the parts are thoroughly cleaned.

NOTE: Be sure that the anchor points on the brake shoes are given a light coat of hi-temp grease.

13. Lower the vehicle.
14. Reconnect the main positive and negative at the batteries.
15. Remove the blocks from behind the wheels.
16. Test drive the vehicle.

⚠ 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.



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Replacement and Inspection of Park Brake Lock

⚠ WARNING

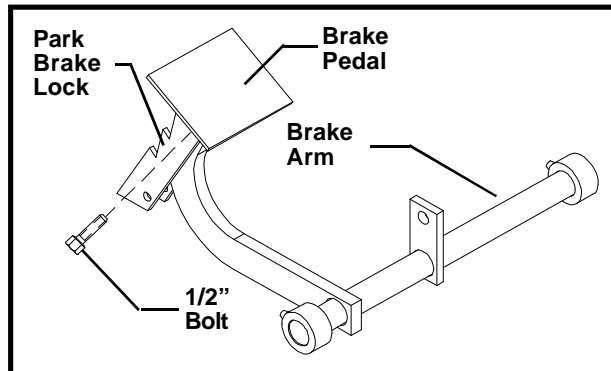
1. Make sure the key-switch is in the "OFF" position, then remove the key.
2. Place the forward-reverse switch in the center "OFF" position.
3. Set the park brake.
4. Place blocks under the front wheels to prevent vehicle movement.
5. Disconnect the main positive and negative cables at the batteries.

6. Raise the rear 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 serious bodily injury.

7. With the brake pedal in its fully extended position, remove the 1/2" bolt and locknut from under the pedal.
8. Remove the pedal and park brake lock assembly from the brake arm.



9. Install a new pedal and park brake lock assembly.

⚠ WARNING

Always use new locknuts. Locknuts become less effective if used more than once. Failure to replace the locknuts may result in the locknuts or bolts coming loose causing property damage and/or severe bodily

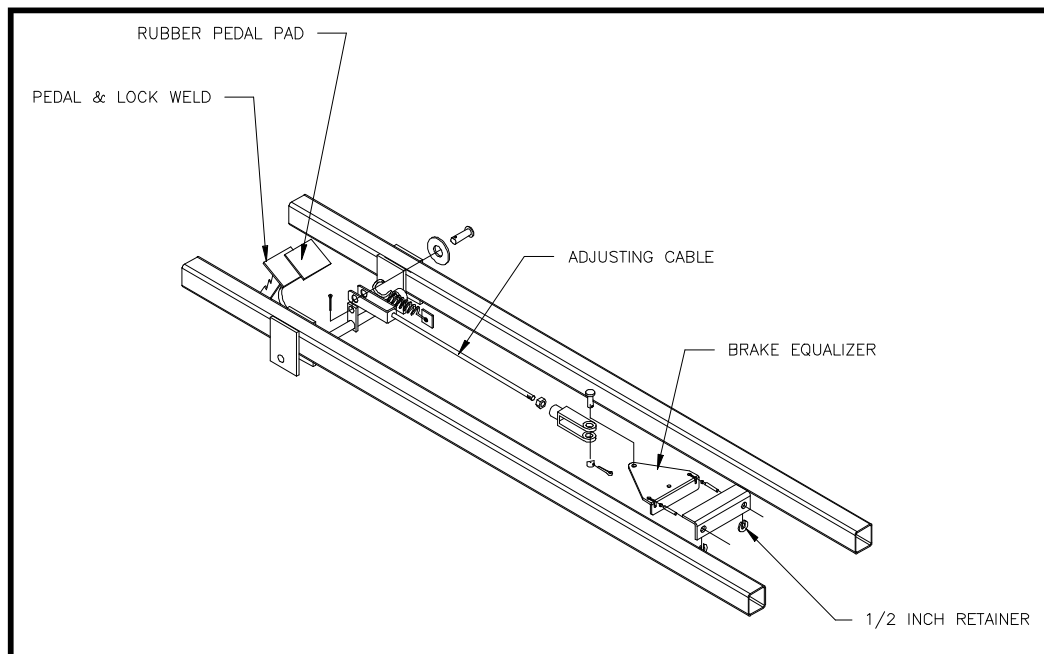
10. Lower the vehicle.
11. Reconnect the main positive and negative at the batteries.
12. Remove the blocks from behind the wheels.
13. Release the park brake and test drive the vehicle.

Wear Limits:

If the park brake lock does not catch, or it slips easily, it must be replaced.

Press on the lower half of the pedal. If the park brake lock engages with little effort on the upper most notch, check the linkage adjustments and adjust as needed.

BRAKE PEDAL LINKAGE





Adjusting the Brake Pedal Linkage

⚠ 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.

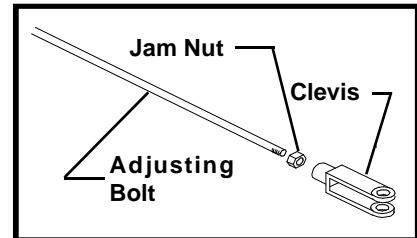
6. Raise the front of the vehicle and support with jack stands.

⚠ 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 serious bodily injury.

7. Release the park brake.
8. Loosen the jam nut on the brake linkage.
9. Tighten the adjusting bolt until most of the slack is removed from the cables.

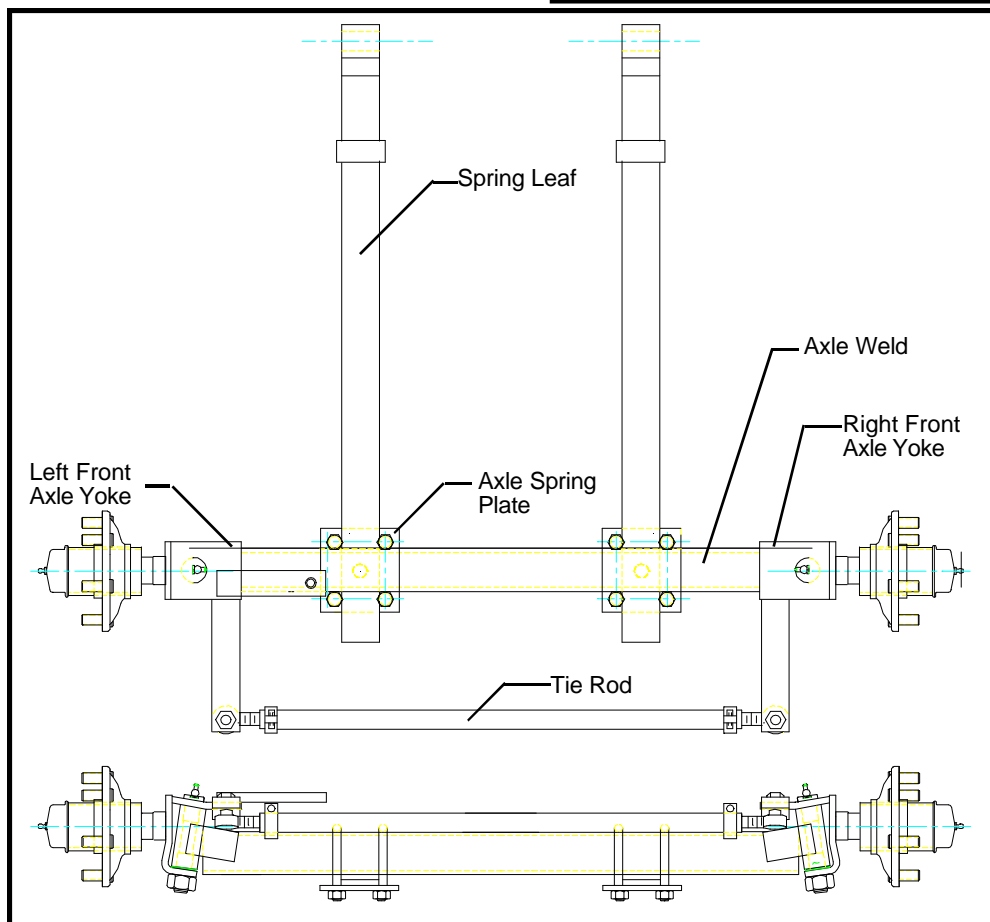
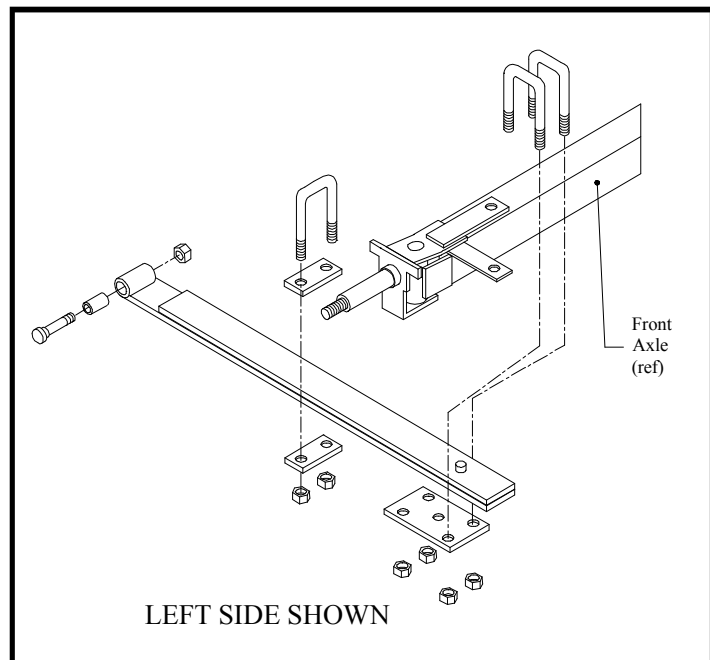
NOTE: There should be some slack in the brake cables. Do not overtighten the brake cables. Overtightening of the adjusting bolt and the cables will result in brake drag and premature failure of the brake shoes.



10. Tighten the jam nut against the clevis and lower the vehicle.
11. Check the brake pedal to see that the park brake lock engages with medium pressure on the lower half of the pedal.
12. Check the travel of the brake pedal. It should have about 1/2" of travel before it engages the brakes.
13. Lower the vehicle.
14. Set the park brake.
15. Reconnect the main positive and negative at the batteries.
16. Remove the blocks from behind the wheels.
17. Test drive the vehicle.



FRONT AXLE AND STEERING



Front Axle Removal and 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 front 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 serious bodily injury.

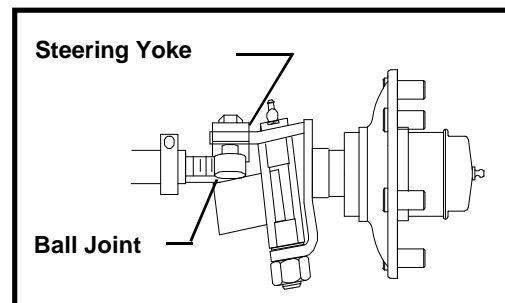
7. Remove both front wheels.
8. Remove the tie rod from the steering yokes.
9. Remove the bolts holding the leaf springs to the frame.

NOTE: Support the axle with additional stands.

10. Remove the axle from the vehicle.

NOTE: If the leaf springs were removed from the axle, be sure to leave the u-bolts loose until the axle is mounted to the frame.

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



ALIGNING THE FRONT END

Adjusting the Toe-In

⚠ WARNING

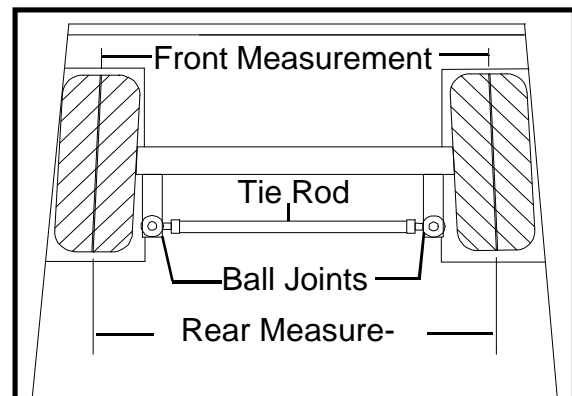
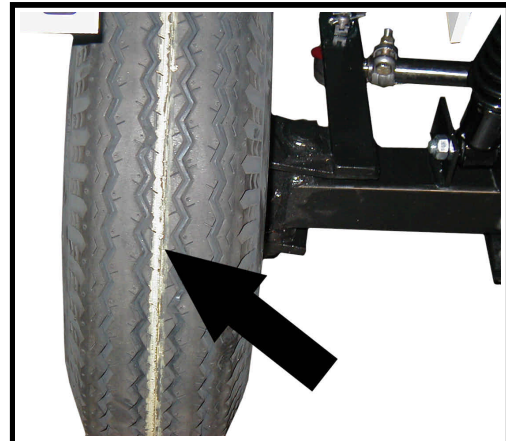
1. Make sure the key-switch is in the "OFF" position, then remove the key.
2. Place the forward-reverse switch in the center "OFF" position.
3. Set the park brake.
4. Place blocks under the front wheels to prevent vehicle movement.
5. Disconnect the main positive and negative cables at the batteries.

6. Raise the 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 serious bodily injury.

7. With a piece of chalk, mark a line around the center of both tires.
8. Loosen the ball joint clamps at each end of the tie rod so the adjusting sleeve can be turned.
9. With the wheels in the straightforward direction, measure the distance between chalk lines at the front and the rear of the tires.
10. Adjust the tie rod until the distance from mark to mark across the front of the tires is the same as the distance from mark to mark across the rear. Refer to the illustration below.
11. Tighten the ball joint clamp.
12. Lower the vehicle.
13. Reconnect the main positive and negative at the batteries.
14. Remove the blocks from behind the wheels.
15. Release the park brake and test drive the vehicle.



Centering the Steering Gear

⚠ WARNING

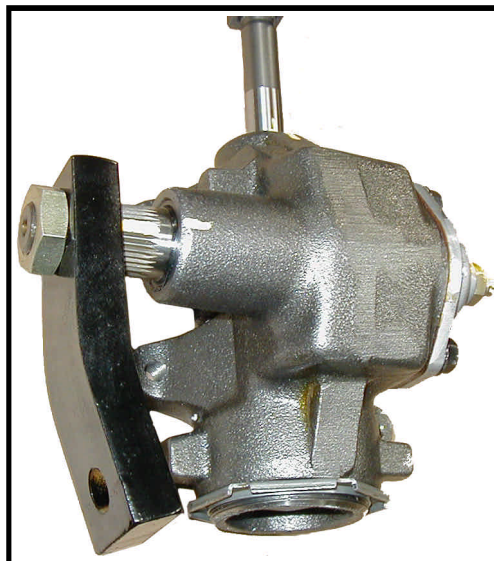
1. Make sure the key-switch is in the "OFF" position, then remove the key.
2. Place the forward-reverse switch in the center "OFF" position.
3. Set the park brake.
4. Place blocks under the front wheels to prevent vehicle movement.
5. Disconnect the main positive and negative cables at the batteries.

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 serious bodily injury.

7. Turn the steering gear all the way to the left.
8. Turn the steering gear back three turns and secure it so it can not move.
9. In order to align the wheels, adjust the drag link.
10. Lower the vehicle.
11. Reconnect the main positive and negative at the batteries.
12. Remove the blocks from behind the wheels.
13. Release the park brake and test drive the vehicle.



Typical steering gear and pitman arm

REPAIRING THE FRONT AXLE

Steering Yoke/Bushings

⚠ 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 front of the vehicle and support with jack stands.

⚠ WARNING

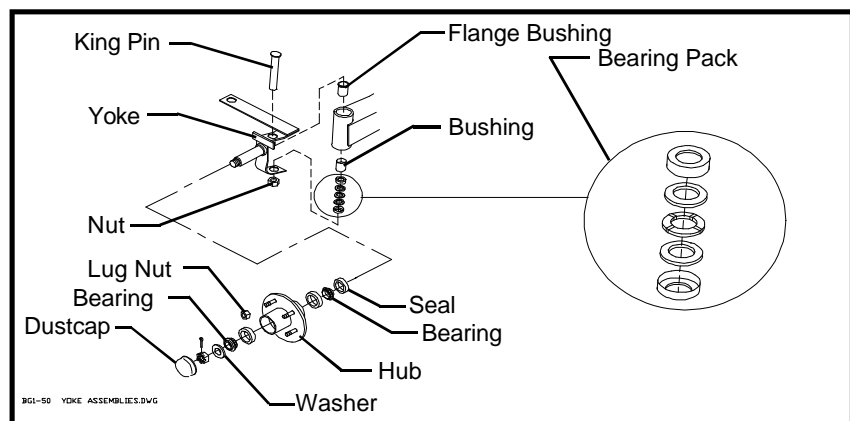
Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in serious bodily injury.

7. While supporting the yoke, remove the king pin nut, king pin, and thrust washers.
8. Remove the yoke from the axle.
9. Clean and/or replace all bearings, nuts, washers, and bushings.

NOTE: Bushings must be reamed.

NOTE: Both the left and right side bearings should be replaced as a set.

10. Using new cotter pins, install in reverse order.
11. Lower the vehicle.
12. Reconnect the main positive and negative at the batteries.
13. Remove the blocks from behind the wheels.
14. Release the park brake and test drive the vehicle.



Ball Joints

It is recommended to replace the left and right side ball joints as a set.

⚠ 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 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 serious bodily injury.

7. Loosen the ball joint clamp.

NOTE: Remember its position on the sleeve.

8. Remove the ball joint nut, then remove the ball joint.

NOTE: Count the number of turns while removing the ball joint from the drag link or tie rod.

9. Install a new ball joint into the tie rod.

NOTE: Lightly lubricate the threads on the new ball joint.

NOTE: Count the same number of turns as when removed.

10. Install the ball joint into the steering arm.

11. Lube the new ball joint.

12. Realign the front wheels.

13. Tighten the ball joint clamps.

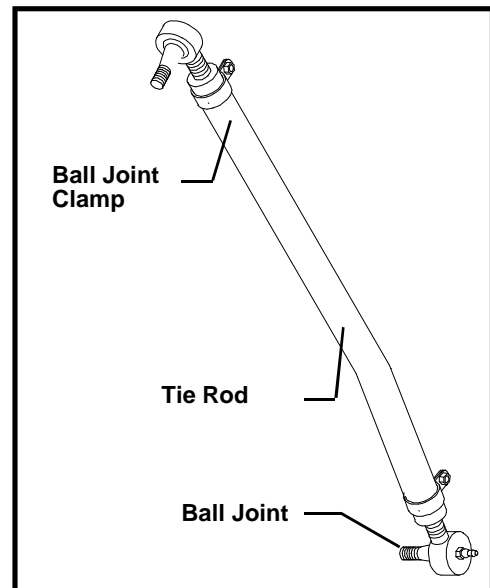
NOTE: Make sure the clamps are in their original position noted above. Turn the steering all the way from left to right to make sure there is no interference.

14. Lower the vehicle.

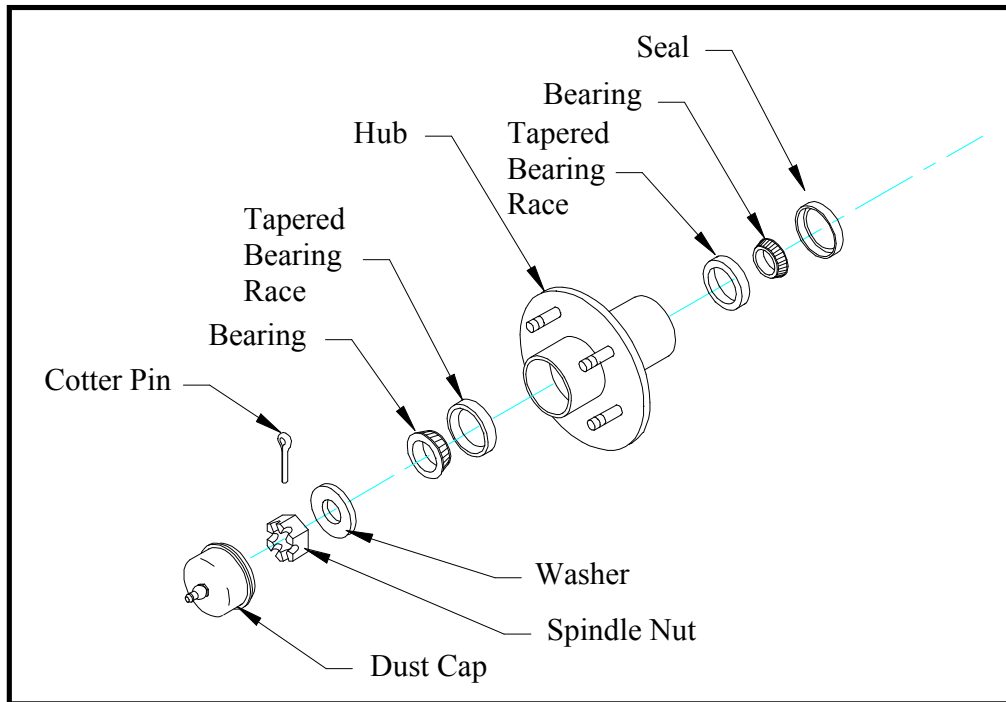
15. Reconnect the main positive and negative at the batteries.

16. Remove the blocks from behind the wheels.

17. Release the park brake and test drive the vehicle.



Typical drag link assembly



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 front 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 serious bodily injury.

7. Remove the tire/wheel assembly
8. Remove the dust cap and spindle nut.
9. Remove the hub from the axle yoke.

NOTE: Catch the outer bearing as it falls out.



10. Clean all grease from the inside of the hub and bearings.
11. Inspect and replace the races and bearings as a set.
NOTE: It is recommended to replace both the left and right wheel bearings at the same time.
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. to seat the bearings.
 - c. Back off spindle nut one flat until the hub turns, but is not loose, then install a new cotter pin.
13. Install the dust cap.
14. Reinstall the brake bodies and the tire/wheel assembly.
15. Lower the vehicle.
16. Reconnect the main positive and negative at the batteries.
17. Remove the blocks from behind the wheels.
18. Release the park brake and test drive the vehicle.

Removal and Installation of the Steering Gear Assembly

⚠ WARNING

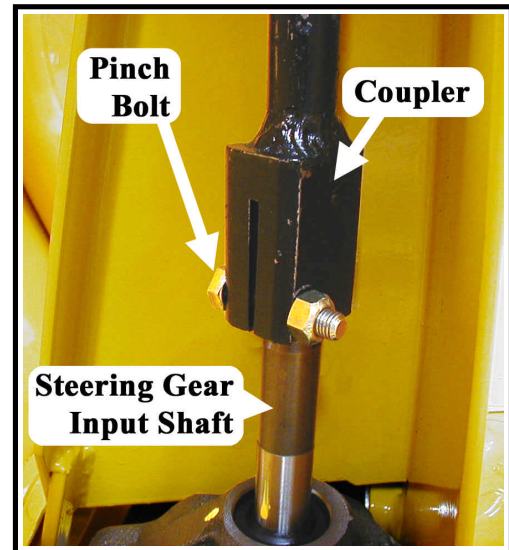
1. Make sure the key-switch is in the "OFF" position, then remove the key.
2. Place the forward-reverse switch in the center "OFF" position.
3. Set the park brake.
4. Place blocks under the front wheels to prevent vehicle movement.
5. Disconnect the main positive and negative cables at the batteries.

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

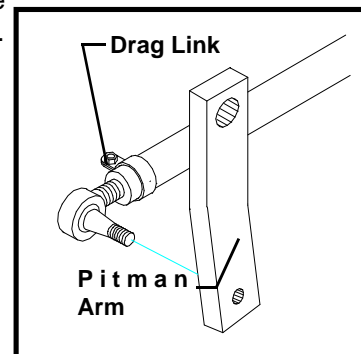
⚠ WARNING

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 serious bodily injury.

7. Remove the pinch bolt.
8. Disconnect the drag link from the pitman arm.



9. Remove the three bolts connecting the steering gear to the steering column and remove the steering column from the vehicle.

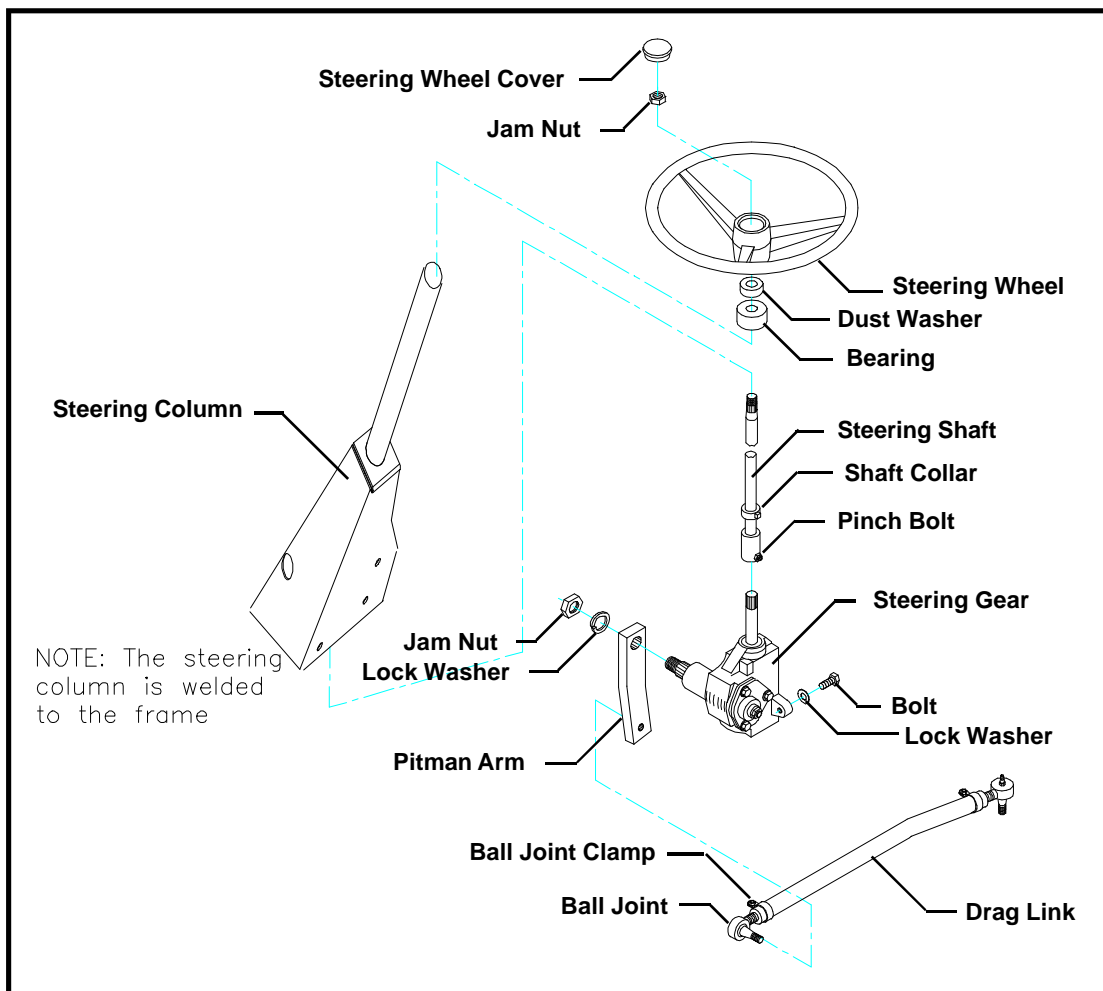


10. Reinstall the steering gear by performing this procedure in reverse order.

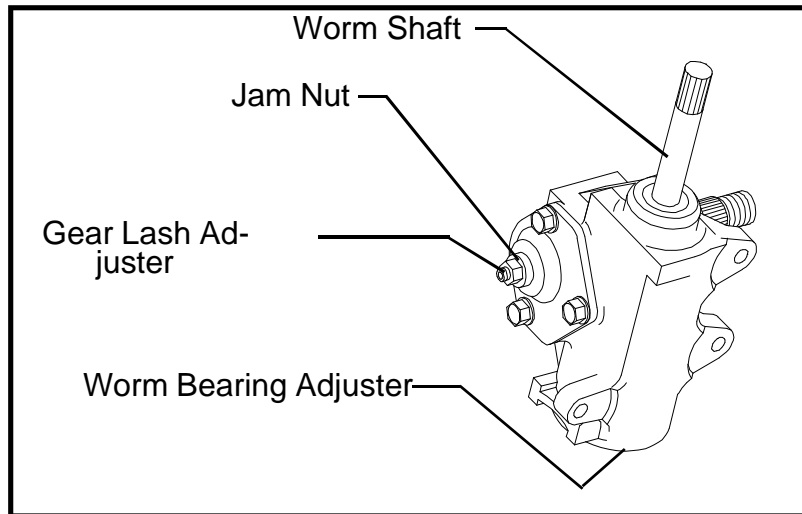
⚠ WARNING

Always use new locknuts. Locknuts become less effective if used more than once. Failure to replace the locknuts may result in the locknuts or bolts coming loose causing property damage and/or severe bodily

11. Using the appropriate procedure, center the steering gear.
12. Check the front wheels to be sure that they are straight and realign as necessary.
13. Lower the vehicle.
14. Reconnect the main positive and negative at the batteries.
15. Remove the blocks from behind the wheels.
16. Release the park brake and test drive the vehicle.



STEERING GEAR ADJUSTMENT



Input Shaft Endplay

⚠ 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 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 serious bodily injury.

7. Using the appropriate procedure, remove the steering gear.
8. Loosen the worm bearing adjuster locknut.
9. Tighten the worm bearing adjuster so that there is no endplay or wobble in the input shaft.
10. Using the appropriate procedure, reinstall the steering gear.
11. Lower the vehicle.
12. Reconnect the main positive and negative at the batteries.
13. Remove the blocks from behind the wheels.
14. Release the park brake and test drive the vehicle.



Gear Lash

⚠ 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 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 serious bodily injury.

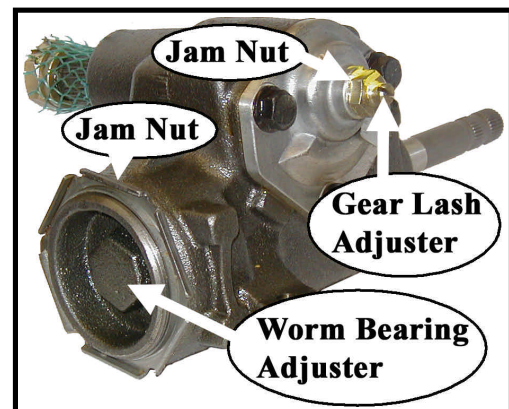
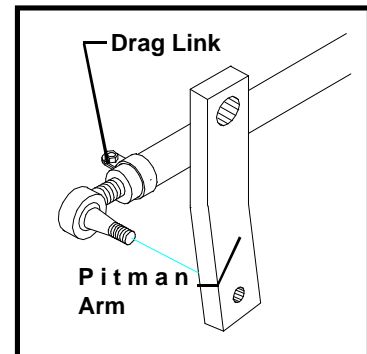
7. Using the appropriate procedure, remove the steering gear.
8. Remove the drag link from the pitman arm.
9. Loosen the jam nut for the gear lash adjuster.
10. To adjust the gear lash, loosen or tighten the setscrew

NOTE: there should be a slight drag when the steering gear passes through the center of its travel.

11. Tighten the jam nut.

NOTE: Do not allow the setscrew to turn while tightening.

12. Install the drag link.
13. Using the appropriate procedure, reinstall the steering gear.
14. Lower the vehicle.
15. Reconnect the main positive and negative at the batteries.
16. Remove the blocks from behind the wheels.
17. Release the park brake and test drive the vehicle.



STEERING GEAR DISASSEMBLY AND REPAIR

Disassembly

*NOTE: The steering gear must be removed from the vehicle for this procedure. Refer to **Removal and Installation of the Steering Gear Assembly** 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 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.

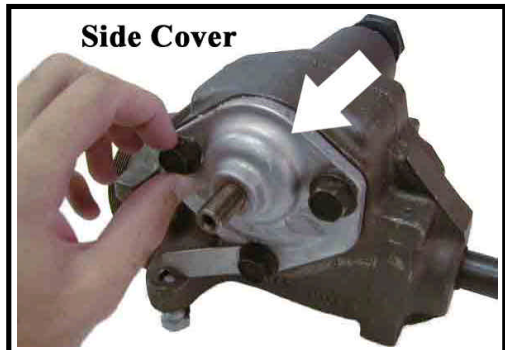
Worm Bearing Adjuster



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.

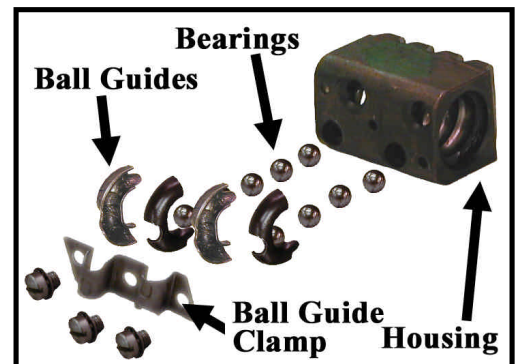
Side Cover



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. These bearings may fall out once the bearing guides are removed. Be careful not to lose any of these 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

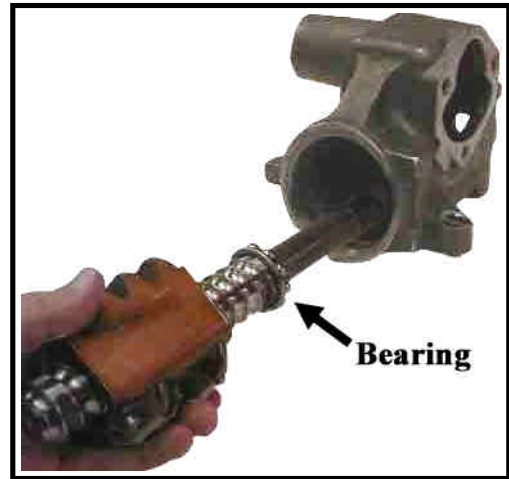
1. Lightly lubricate all parts before reassembly.
2. Install a new worm shaft seal and pitman shaft seal into the housing.
3. Install the upper worm bearing cup.
4. Divide the ball bearing into two equal groups.
5. Position the ball nut onto the worm as shaft as shown in the illustration.
6. Insert the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

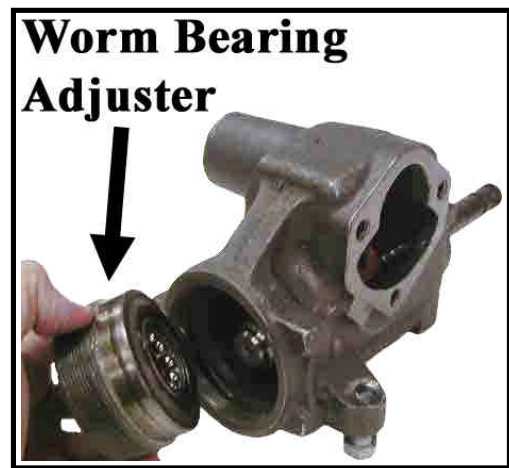
8. Install the ball guide clamp.



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.



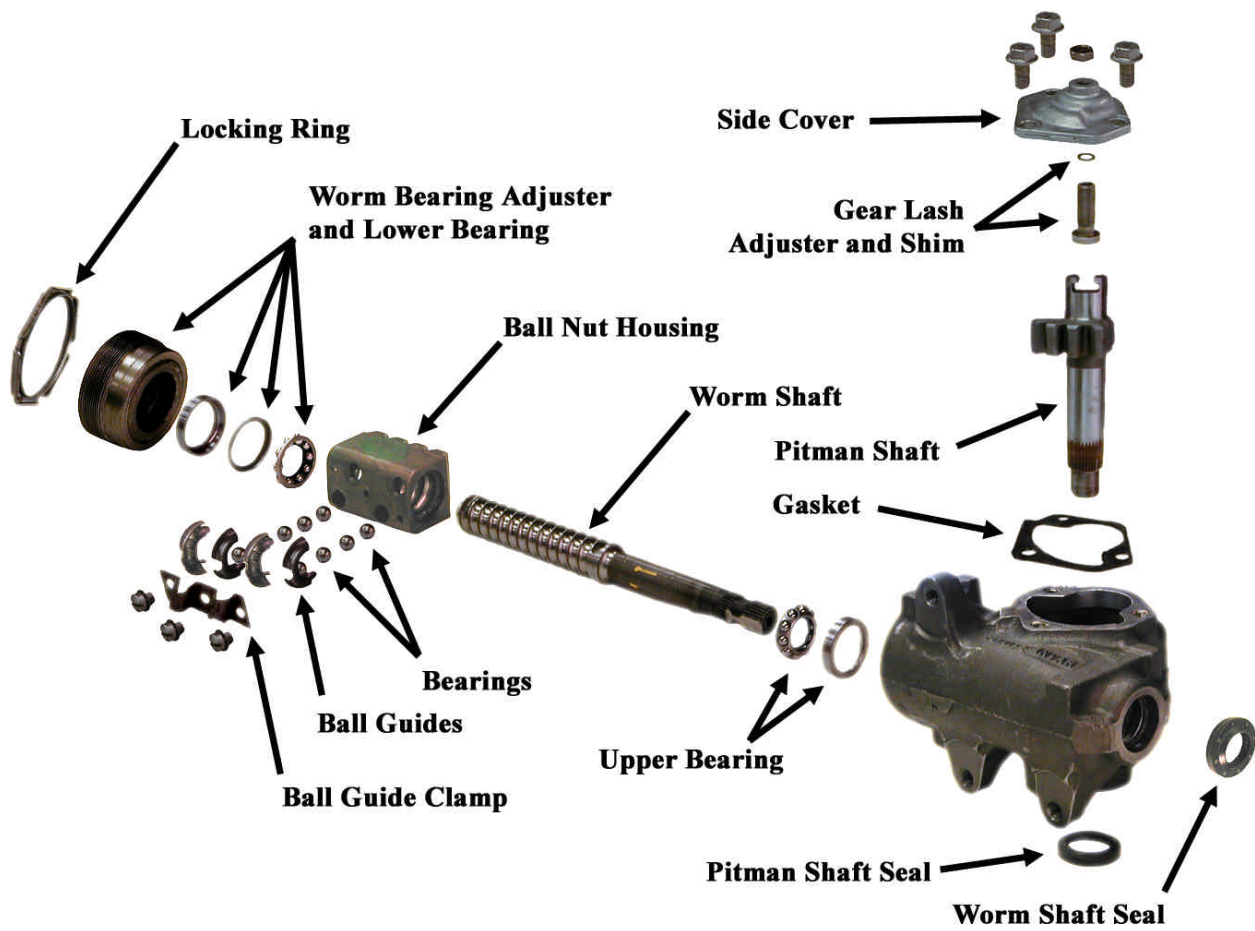
10. Install the assembled worm bearing adjuster into the housing and tighten just enough to remove all play in the worm shaft.
11. Install, but do not tighten the worm bearing adjuster lock nut.
12. Rotate the worm shaft to center the ball nut in the housing.
13. Place a new gasket onto the housing and 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 **Steering Gear Adjustment** 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



DRIVE SERVICE

Removing the Rear Axles

NOTE: This procedure does not require that the rear end or drive assembly be removed 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. Raise the rear 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 serious bodily injury.

7. Remove the tire and wheel assembly.
8. Disconnect the brake cable.
9. Remove the four bolts holding the brake backing plate to the housing.
10. Remove the outer circlip from the housing and pull the axle out of the housing.

⚠ WARNING

If the bearings are removed from the axle, the axle retainer and bearings must be replaced with new ones. Failure to replace the bearings and retainer could result in the axle coming out of the vehicle while driving, causing severe bodily injury and/or property damage.

11. Inspect all bearings for roughness or play.
12. Install in reverse order.
13. Adjust the brakes.
14. Lower the vehicle.
15. Reconnect the main positive and negative at the batteries.
16. Remove the blocks from behind the wheels.
17. Release the park brake and test drive the vehicle.

Servicing the Differential

⚠ WARNING

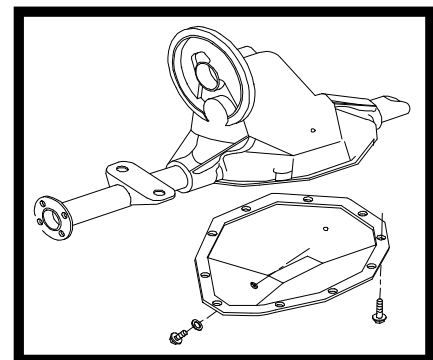
1. Make sure the key-switch is in the "OFF" position, then remove the key.
2. Place the forward-reverse switch in the center "OFF" position.
3. Set the park brake.
4. Place blocks under the front wheels to prevent vehicle movement.
5. Disconnect the main positive and negative cables at the batteries.

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

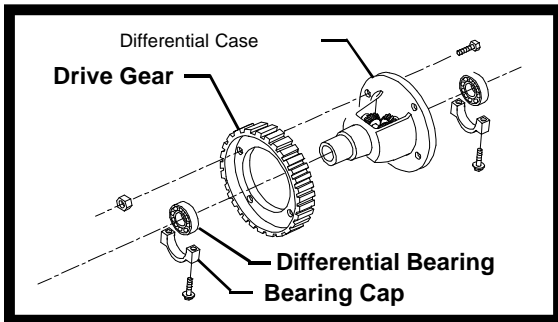
⚠ WARNING

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 serious bodily injury.

7. Remove the complete drive from the vehicle.
8. Remove the motor.
9. Drain the oil from the differential into the appropriate receptacle.
10. Remove the axle shafts from the differential.
11. Remove the cover plate from the differential and let the remaining oil drain from the housing.
12. Dispose of the old oil in accordance with local regulations.



Cover Plate Assembly



Differential Case Assembly

13. Remove the bearing cap screws and bearing caps.

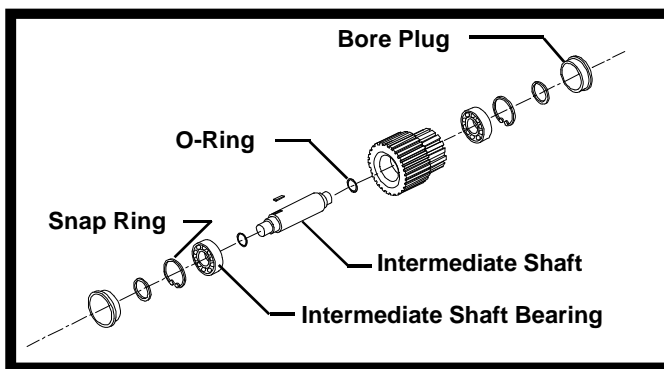
NOTE: Bearing caps are marked for identification. During reassembly, make sure they are put back in their original position.

14. Remove the differential case assembly from the housing.

15. Remove the differential bearings from each side of the differential case.

16. Remove the drive gear from the differential case.

17. Punch or drill a 1/8" hole in the center of each bearing bore plug.



Intermediate Shaft Assembly

18. Insert a #10 x 1.25" sheet metal screw into the hole until the bore plug is forced out of the bearing bore.

19. Remove the snap ring from each bearing bore.

20. Drive the intermediate shaft from the flange side of the housing.

21. Remove the intermediate shaft bearings from the housing.

22. Remove the O-rings from the intermediate shaft.

23. Remove the snap ring from the input shaft bore plug.

24. Pull the input shaft assembly from the housing.



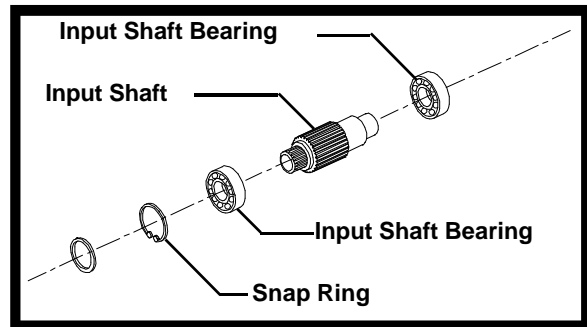
25. Remove the bearings from the input shaft.
26. Remove the O-rings from the outer input bearing bore and both intermediate bearing bores.
27. Inspect all parts for signs of wear or damage.

Note: Bearing, seal and gear surfaces should be inspected for pitting, wear, overheating or scoring. Replace these parts as needed.

28. Reinstall or replace all parts using this procedure in reverse order.

NOTE: Be sure to pre-lube all of the bearings with 30 weight motor oil.

29. Fill the differential with oil.
30. Adjust the brakes.
31. Lower the vehicle.
32. Reconnect the main positive and negative at the batteries.
33. Remove the blocks from behind the wheels.
34. Release the park brake and test drive the vehicle.



Input Shaft Assembly

Changing the Differential Oil

⚠ 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.**

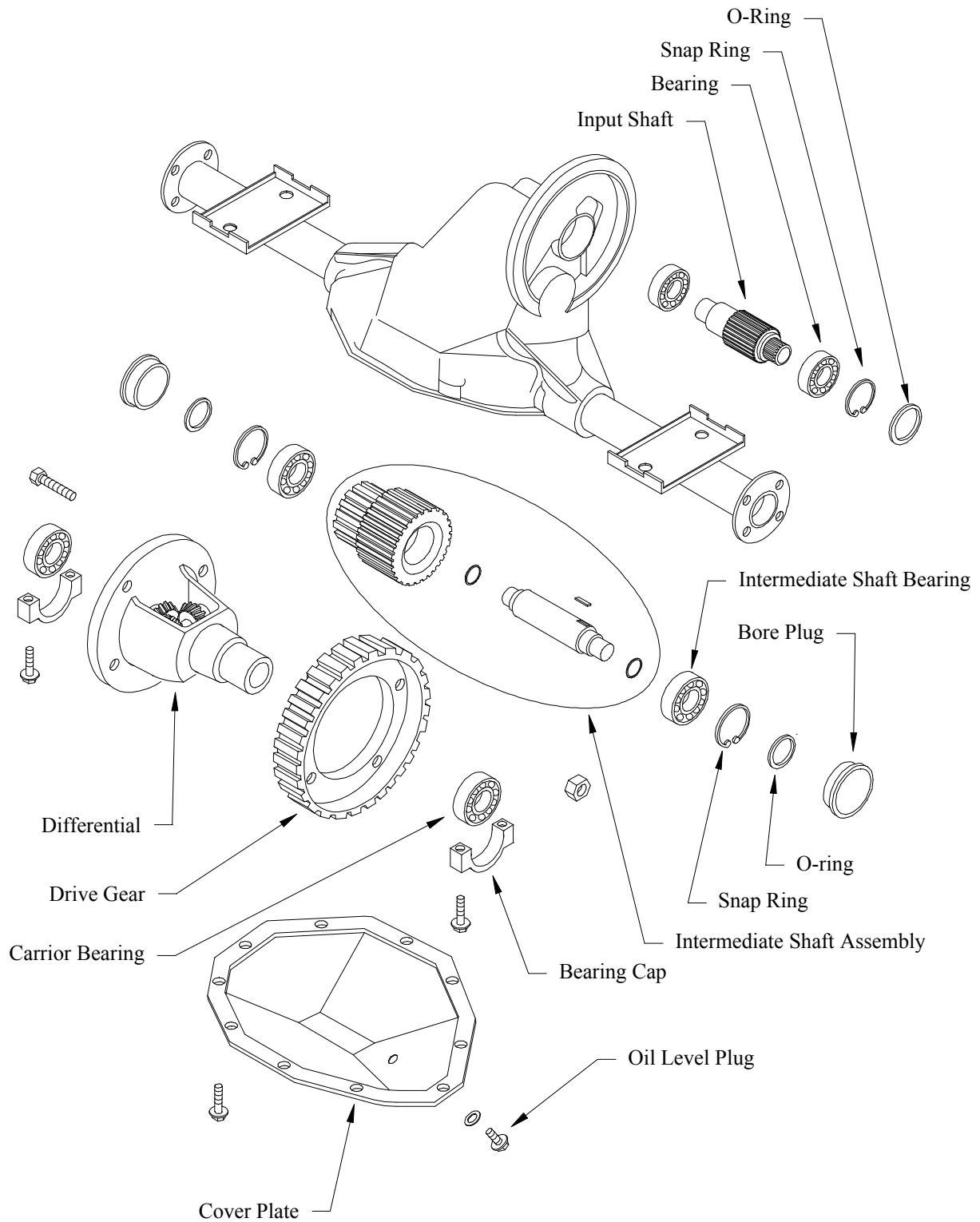
6. Raise the rear of the vehicle and support with jack stands.

⚠ 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 serious bodily injury.

7. Place a drain pan under the center of the drive assembly that is capable of holding 2 pints of oil.
8. Remove the differential case cover from the differential case and let the oil run into the drain pan.
9. Clean all of the old sealant from the cover.
10. Apply new sealant and reinstall the cover.
11. Open the fill plug and fill the differential with 10 oz. of SAE 30 motor oil.
12. Replace the fill plug.
13. Lower the vehicle.
14. Reconnect the main positive and negative at the batteries.
15. Remove the blocks from behind the wheels.
16. Release the park brake and test drive the vehicle.

Differential Assembly



Motor Removal

NOTE: It is not necessary to remove the drive assembly to perform this procedure in most cases. However, if the vehicle is equipped with an optional cargo box, it may be necessary to lower the drive assembly in order to access the motor.

⚠ WARNING

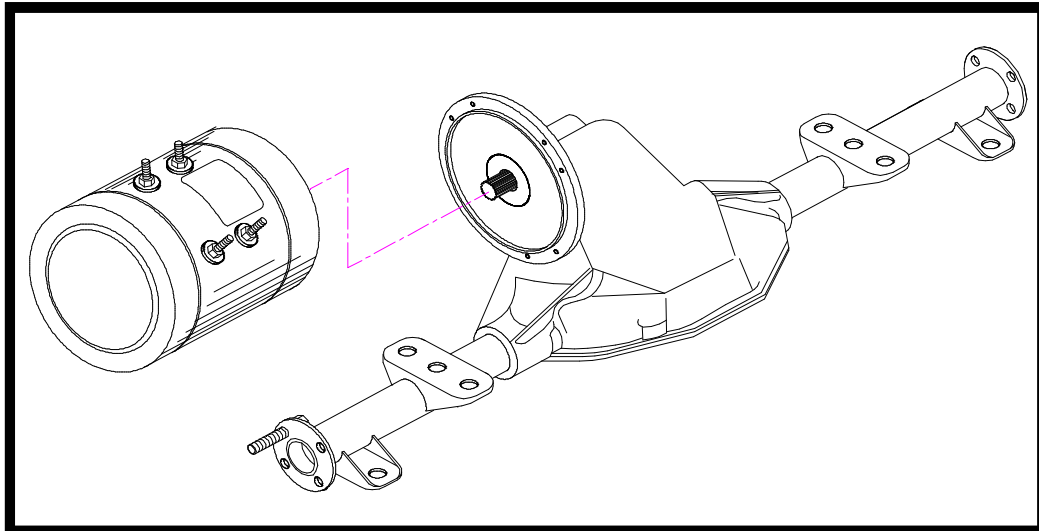
- 1. Make sure the key-switch is in the "OFF" position, then remove the key.**
- 2. Place the forward-reverse switch in the center "OFF" position.**
- 3. Set the park brake.**
- 4. Place blocks under the front wheels to prevent vehicle movement.**
- 5. Disconnect the main positive and negative cables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

6. Remove the wires from the motor.

NOTE: Label the wires connected to the motor to insure that they are returned to their proper location on the motor during reassembly.

7. Remove the motor mounting bolts from the drive and slide the motor off of the input shaft.
8. Install the new motor or reassemble in reverse order.

NOTE: Apply grease to the input shaft.



Armature 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. Remove the motor from the drive.
7. Remove the two armature retaining screws from the rear cover.
8. Pull the armature out from the open end of the motor housing.
9. Check the inside of the motor housing and around the commutator for bits of solder.

Note: If there are signs of solder either around the inside of the motor housing or the commutator, then the motor must be replaced. The presence of solder in either of the two areas indicates that the armature was overheated.

10. Inspect the armature for grooves.

Note: If the armature is grooved, then the grooves may be removed with the use of a lathe.

11. Measure the diameter of the commutator.

Note: The wear limit of the commutator is 2.625 inches. If the commutator is less than 2.625 inches, then it is worn out and the motor must be replaced.

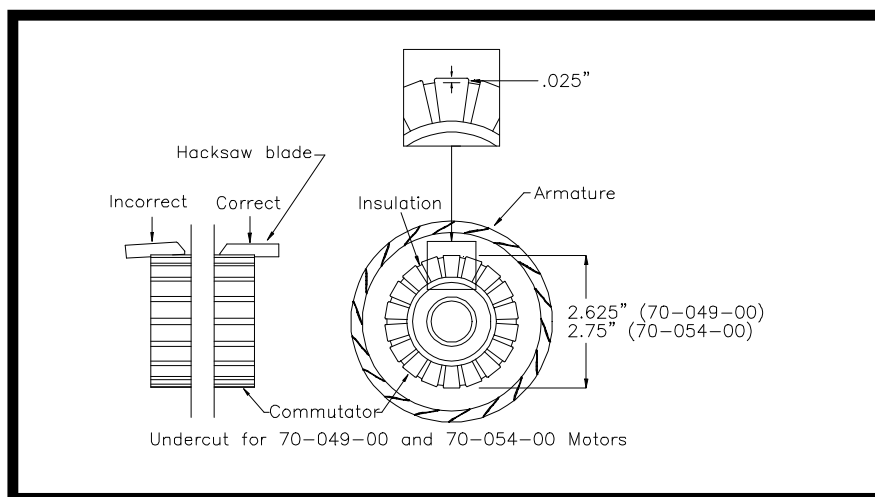
12. Measure the undercut depth on the commutator.

Note: The undercut depth is .025 inches. If the undercut depth is less than .025 inches, the mica can be recut to the proper depth.

13. Spin the bearing by hand. If any vibration or roughness is felt, it must be replaced.

14. Reassemble the motor in reverse order.

15. Install the motor.



Undercut Figure: The left side shows how to properly cut the mica using a hacksaw blade. The right side of the figure shows the minimum diameter of the commutator and the proper mica depth.

Replacing the Brushes

⚠ 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 armature.
7. Remove the four cover retaining screws.



8. Remove the end cap from the motor, revealing the brush holder and brushes.



9. Unfasten the brush holder retainer screws and remove the brush holder.

NOTE: Be sure to remember the position of the crossover wires.





10. Push the brushes out of the holder until the torsion spring snaps out of position and pull the brush out of the holder.



11. Install the new brushes into the brush holder.

NOTE: Do not insert the brush all the way into the holder.

12. Install the brush holder.
13. Reassemble the motor.
14. Install the motor.



Inspecting the Motor Brushes

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.

General Electric Motors

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 may be drilled into the motor housing after it has been disassembled. Minimum brush length is 0.75 inches (19.05 mm)

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 1.5 inches (38.1 mm) 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.

Minimum brush length is 0.62 inches (16 mm).

BATTERY

⚠ 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.

⚠ 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.

Cleaning

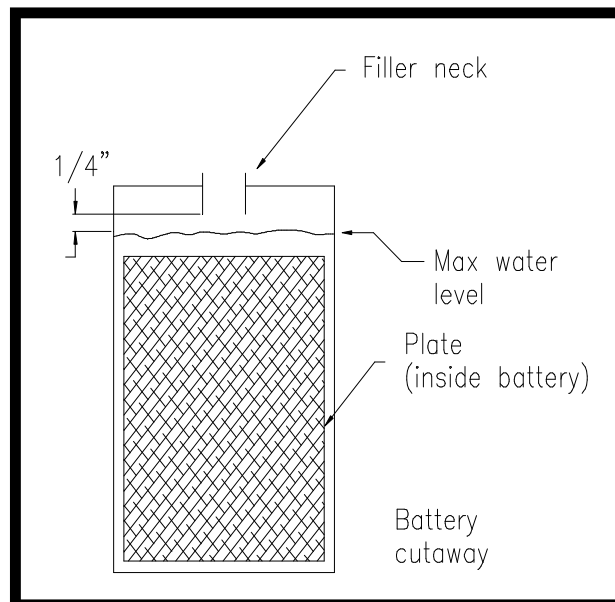
1. Make sure the key-switch is in the “off” position, then remove the key.
2. Place the forward-reverse switch in the center “off” position.
3. Set the park brake.
4. Place blocks under the front wheels to prevent vehicle movement.
5. Disconnect the main positive and negative at the batteries.
6. Dry 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 it off with a strong solution of baking soda and hot water (1 lb. of soda to gallon of water). Continue until all fizzling 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.

Servicing

⚠ 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 battery.
7. Check the electrolyte level in all batteries. If low, fill with distilled water up to the correct level using 77-201-00 battery filler.



Battery Fill Level: This figure shows the proper fill

8. Clean the cell posts connectors and battery box with water.
9. Reconnect the main positive and negative at the batteries.
10. Remove the blocks from behind the wheels.
11. Release the park brake and test drive the vehicle.



Battery Storage

The following pointers will help extend the life of the battery when storing the vehicle for the winter season:

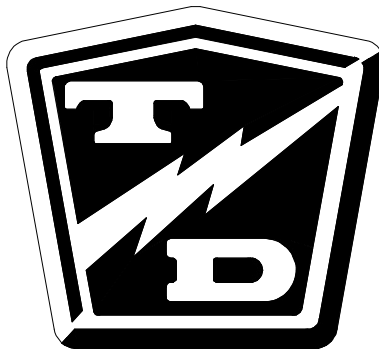
- Clean and check the electrolyte level and charge level of the battery.
- Do not store a battery low in electrolyte or in a low state of charge.
- Recharge a battery in accordance to the chart found in section 2 "Storing and Returning to Service."
- If possible, store the vehicle in a cool dry place.

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.

Electrical Troubleshooting

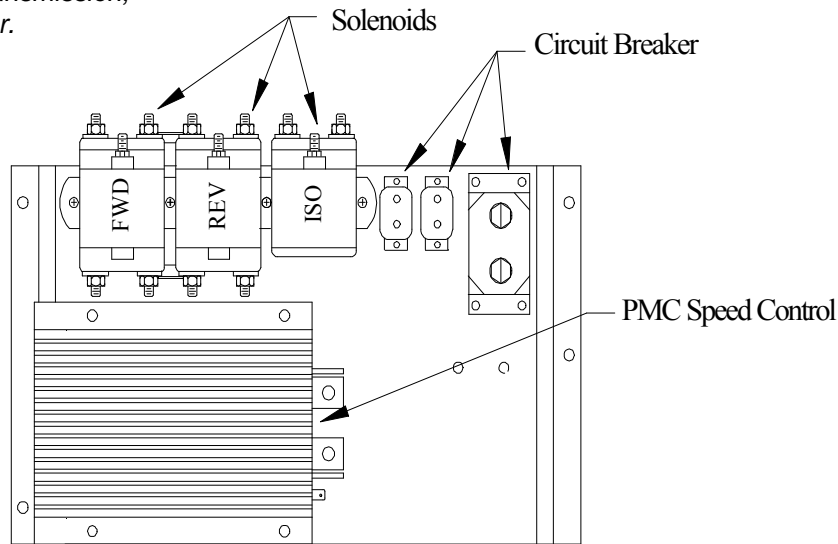
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*Note: Vehicles with Dana H12 transmission,
Forward solenoid is in the center.*



Typical Control Panel

SYMPTOMS:

If your vehicle exhibits any of the following symptoms then skip the main troubleshooting sequence and proceed to **Symptom Troubleshooting** later in this section.

- Runs slow in both directions plus high armature and field current in both directions. NOTE: Armature and field current should be equal.
- Runs slow in both directions plus high armature current in both directions. NOTE: Field current will be very low.
- Runs normal in one direction only plus runs slow or lacks power in the opposite direction with high armature current in the opposite direction or;
- Accelerates slowly and exceeds normal speed in the opposite direction with high armature current only. NOTE: Field current will be very low in the opposite direction.
- Accelerates slowly and exceeds normal speed in both directions plus high armature current. NOTE: Field current will be very low.
- Full speed only.
- Does not run in either direction plus there is noise from motor (hum or whine) with high field current and low armature current.
- Jumps into high speed when direction is selected after depressing the accelerator pedal. Excessive spark when connecting battery
- Does not run or runs very slow with low motor current and high battery current.
- Jumps into high speed when direction is selected after depressing the accelerator pedal.

If your vehicle does not exhibit any of the above symptoms then continue with the main troubleshooting sequence on the following pages.

READ THIS FIRST

Test Equipment Required:

- Digital multimeter (DMM) with diode test function, FLUKE 79 model used in illustrations.
- Shunt or clamp-on DC Ammeter to measure up to 400 amps.
- Test light with a rated voltage equal to or exceeds maximum battery voltage or Taylor-Dunn test light part number #62-027-00 for systems up to 48 volts.
- Throttle Module Analyzer, Taylor-Dunn #62-027-32.
- These tools are available through your local Taylor-Dunn parts distributor.

IMPORTANT NOTES and INSTRUCTIONS

- This troubleshooting guide assumes that the vehicle is wired correctly. It is not intended to diagnose a vehicle that is not wired correctly.
- This troubleshooting guide is not written to be able to locate a problem if there are multiple component failures.
- This troubleshooting guide assumes the batteries are good. Charge and test the batteries before troubleshooting the control system.
- **DO NOT** start in the middle of this troubleshooting guide. Start at the beginning and complete each test in the order that they are written. **DO NOT** skip any test unless instructed to do so. Once a problem is found, stop testing and repair the indicated problem. When the repair is completed it is recommended that the control system be retested before lowering the drive wheels to the ground.
- This troubleshooting guide requires the use of a test light rated at the battery voltage of the truck and the Taylor-Dunn Throttle Module Analyzer. **Troubleshooting CANNOT be completed without these tools.**

⚠ CAUTION

These test procedures must be performed in the order they were written. If the test result is good, then proceed to the next test or go to the next section. Failure to do so may result in incorrect test results.



Definitions:

- “MS-1” = The first switch in the accelerator module.
- “Battery volts” = The voltage at the batteries at the time the test is completed.
- “Pick up” = Energizing a solenoid or contactor.
- “F&R” = Forward and Reverse.
- “ISO” = Isolator.
- “Battery negative” = Main negative battery post.
- “Battery positive” = Main positive battery post.
- “PMC” = Speed control module (black box).
- “HOT terminal” = The side of a switch or solenoid that is connect to the power source.
- “COLD terminal” = The side of a switch or solenoid that power is switched to.

DURING ALL TESTS

⚠ WARNING

After any repairs are made, completely retest the vehicle before lowering the drive wheels to the ground. Failure to retest the vehicle could result in unexpected movement of the vehicle resulting in severe bodily injury and/or property damage.

⚠ WARNING

The rear drive wheels may rotate during some of the following tests. Block the front wheels, raise the rear drive wheels off the ground, and support the vehicle with jack stands. Failure to do so may cause the vehicle to move and cause severe bodily injury and/or property damage.

⚠ WARNING

Rotating rear drive wheels are a potential hazard. Keep hands, arms, legs and loose clothing away from the rear drive wheels while conducting tests. Failure to do so may cause serious bodily injury.

⚠ WARNING

Disconnect both of the battery leads during any maintenance or before disconnecting any electrical component or wire. Failure to do so may cause severe bodily injury and/or property damage.

START:

Read all warnings above before continuing.

If the vehicle runs normal in one direction but does not run in the opposite direction then go to the **Solenoids** sequence.

If none of the three solenoids pick up (click) when the accelerator pedal is depressed then go to the **Forward & Reverse Switch** sequence.

Power Output Test

⚠ WARNING

The rear drive wheels may rotate during some of the following tests. Block the front wheels, raise the rear drive wheels off the ground, and support the vehicle with jack stands. Failure to do so may cause the vehicle to move and cause severe bodily injury and/or property damage.

Rotating rear drive wheels are a potential hazard. Keep hands, arms, legs and loose clothing away from the rear drive wheels while conducting tests. Failure to do so may cause serious 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.

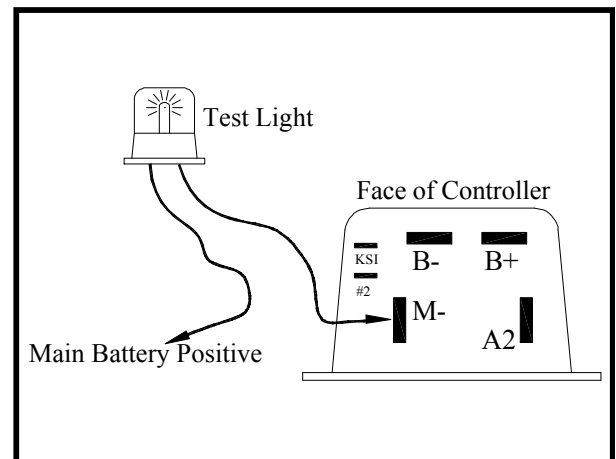
Set the test light voltage to the same voltage as the battery volts.

Connect the test light from the PMC 'M-' Terminal to battery positive.

Close all interlock switches, turn the Key Switch ON, and place the F&R Switch in Forward.

Depress the accelerator pedal fully.

- If the light comes ON then go to the Motor sequence.
- If the light does not come ON then continue with the next test.





Control Wire Inputs

⚠ WARNING

The rear drive wheels may rotate during some of the following tests. Block the front wheels, raise the rear drive wheels off the ground, and support the vehicle with jack stands. Failure to do so may cause the vehicle to move and cause severe bodily injury and/or property damage.

Rotating rear drive wheels are a potential hazard. Keep hands, arms, legs and loose clothing away from the rear drive wheels while conducting tests. Failure to do so may cause serious bodily injury.

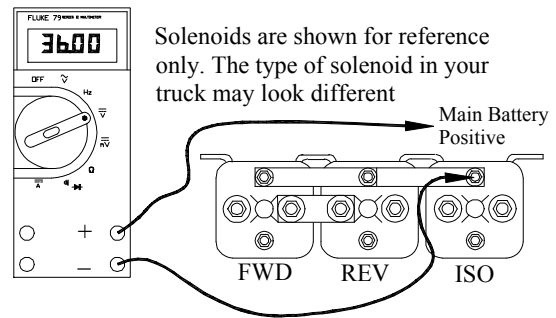
⚠ WARNING

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.

Connect a voltmeter across the Solenoid Negative Buss Bar and battery positive.

- If the voltage is not at battery volts then check the wiring to battery negative and the negative circuit breaker. Stop trouble shooting here and repair the problem. When the repair is completed, completely retest the vehicle before lowering the drive wheels to the ground.

The voltage shown is for illustration only. The actual voltage may vary.



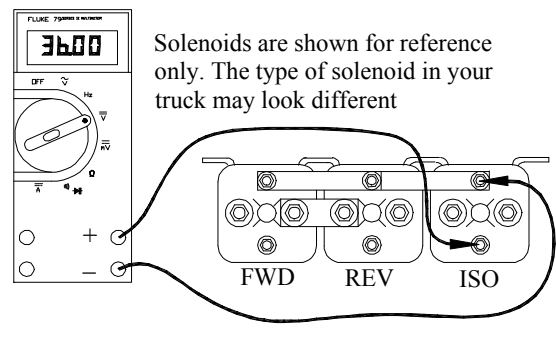
Connect a voltmeter across the ISO solenoid coil terminals.

Close all interlock switches and turn the Key Switch ON.

Depress the accelerator pedal to engage MS-1 only.

- If the voltage is not at battery volts then go to the **Key Switch** sequence.
- If the voltage is at battery volts and the ISO solenoid does not pick up (click) then the ISO solenoid has failed. Stop trouble shooting here and repair the problem. When the repair is completed, completely retest the vehicle before lowering the drive wheels to the ground.

The voltage shown is for illustration only. The actual voltage may vary.



Note: Vehicles with Dana H12 transmission, Forward solenoid is in the center.

Connect a voltmeter across the PMC #2 terminal and battery negative.

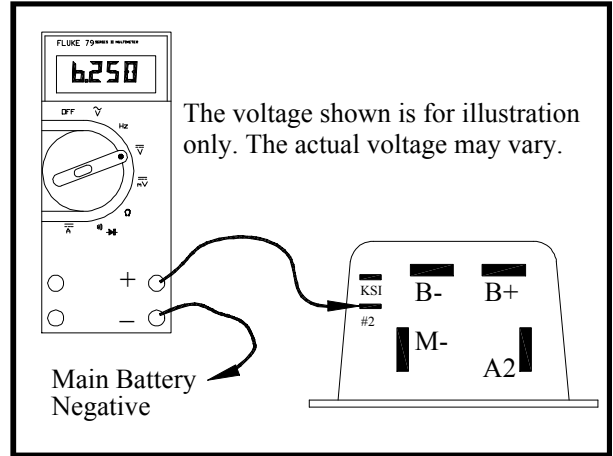
Close all interlock switches, turn the Key Switch ON, and place the F&R Switch in Forward.

Depress the accelerator pedal to engage MS-1 only.

- If the voltage is not between 6.0 and 6.5 volts then go to the **Accelerator** sequence.

Depress the pedal fully.

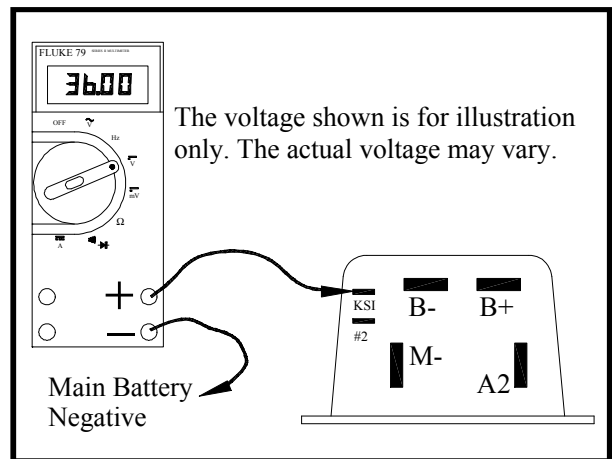
- If the voltage is not between 11.0 and 11.5 volts then go to the **Accelerator** sequence.



Connect voltmeter across the PMC KSI terminal and battery negative.

With the pedal still fully depressed:

- If the voltage is not at battery volts then go to the **Key Switch** sequence.
- If the voltage is at battery volts then continue with the next test.



Power Wire Inputs

⚠ WARNING

The rear drive wheels may rotate during some of the following tests. Block the front wheels, raise the rear drive wheels off the ground, and support the vehicle with jack stands. Failure to do so may cause the vehicle to move and cause severe bodily injury and/or property damage.

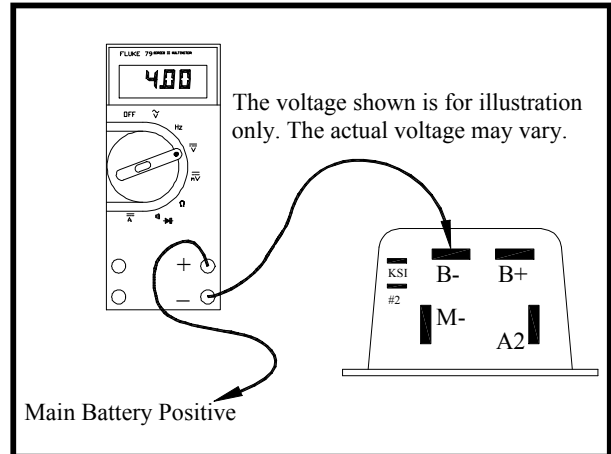
Rotating rear drive wheels are a potential hazard. Keep hands, arms, legs and loose clothing away from the rear drive wheels while conducting tests. Failure to do so may cause serious bodily injury.

⚠ 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.

Connect a voltmeter to the PMC 'B-' terminal and battery positive.

- If the voltage is not the same as battery volts then there is an open circuit in the wire from 'B-' to the battery. Stop troubleshooting here and repair the problem. When the repair is completed, completely retest the vehicle before lowering the drive wheels to the ground.

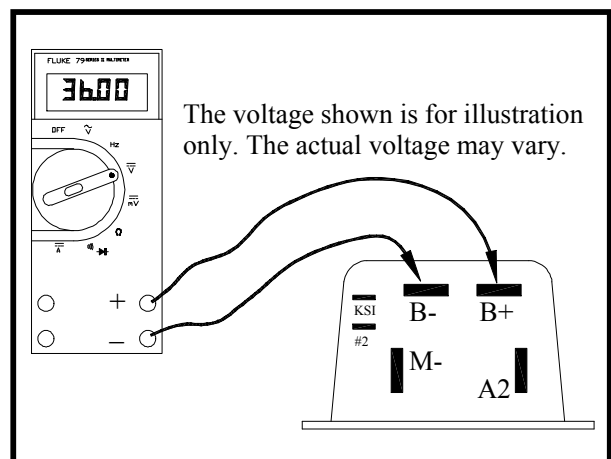


Connect a voltmeter across the PMC 'B-' terminal and the PMC 'B+' terminal.

Close all interlock switches, turn the Key Switch ON, and place the F&R Switch in Forward.

Depress the accelerator pedal to engage MS-1 only.

- If the voltage is not the same as battery volts then go to the Solenoids sequence.
- If the voltage is the same as battery volts then the PMC controller has failed. Stop trouble shooting here and repair the problem. When the repair is completed, completely retest the vehicle before lowering the drive wheels to the ground.



Motor

⚠ WARNING

The rear drive wheels may rotate during some of the following tests. Block the front wheels, raise the rear drive wheels off the ground, and support the vehicle with jack stands. Failure to do so may cause the vehicle to move and cause severe bodily injury and/or property damage.

Rotating rear drive wheels are a potential hazard. Keep hands, arms, legs and loose clothing away from the rear drive wheels while conducting tests. Failure to do so may cause serious bodily injury.

⚠ WARNING

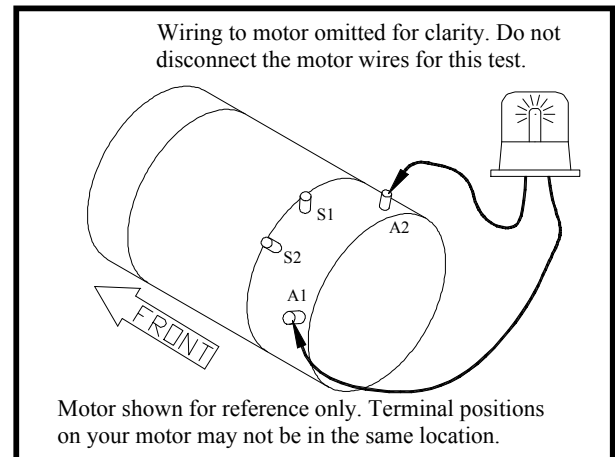
1. Make sure the key-switch is in the "OFF" position, then remove the key.
2. Place the forward-reverse switch in the center "OFF" position.
3. Set the park brake.
4. Place blocks under the front wheels to prevent vehicle movement.

Set the test light voltage to the same voltage as the battery volts.

Connect the test light across the motor 'A1' and 'A2' terminals.

Close all interlock switches, turn the Key Switch ON, and place the F&R Switch in Forward.
Depress the accelerator fully.

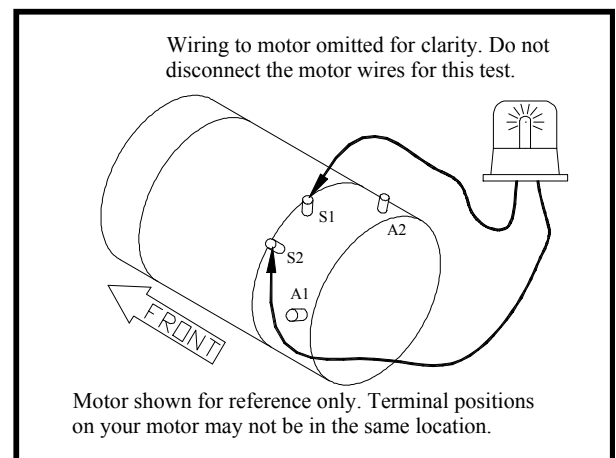
- If the light comes on then the motor armature windings are open and the motor must be repaired or replaced. Stop trouble shooting here and repair the problem. When the repair is completed, completely test the vehicle before lowering the drive wheels to the ground.



Connect the test light across the motor 'S1' and 'S2' terminals.

Close all interlock switches, turn the Key Switch ON, and place the F&R Switch in Forward.
Depress the accelerator fully.

- If the light comes on then the motor field windings are open and the motor must be repaired or replaced. Stop trouble shooting here and repair the problem. When the repair is completed, completely retest the vehicle before lowering the drive wheels to the ground.
- If the test light did not come on during either test then go to the **F/R Switch** sequence.





Accelerator

⚠ WARNING

The rear drive wheels may rotate during some of the following tests. Block the front wheels, raise the rear drive wheels off the ground, and support the vehicle with jack stands. Failure to do so may cause the vehicle to move and cause severe bodily injury and/or property damage.

Rotating rear drive wheels are a potential hazard. Keep hands, arms, legs and loose clothing away from the rear drive wheels while conducting tests. Failure to do so may cause serious 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.

With the power switch OFF, connect a throttle module to the analyzer.

Position the power switch to the 6-11 volt range.

All but the power lamp should be OFF. If the FS-1, FS-3 or OV lamp (Over Voltage) are ON, then the module is faulty.

Depress the lever on the module. The FS-1 lamp should be ON with no more than a few degrees of rotation. If the FS-1 lamp does not come on, then the module is faulty (see note2 below).

The voltage on the digital display should vary with the position of the module arm, starting at approximately 6-volts and ending at approximately 11-volts.

If the module is equipped with the FS-3 switch, the FS-3 lamp should come ON when the module arm is rotated to the full speed position. If the lamp does not come ON then the module is faulty.

Note1: Current versions of the throttle module do not have additional switched output (FS-3 fully depressed). additional switched output was only used on PT-II cc systems and Power-Tron 240, 350, or 480 systems that equipped with the Power Plus module.

If the OV lamp comes ON at any time, then the module is

If the Low battery lamp is ON, then the analyzer battery be replaced.

Additional information regarding the analyzer can be found in the instructions provided with the analyzer (D0-110-53)

If the module functions correctly with the analyzer but not on the vehicle it is likely that there is a fault in the vehicle wiring.



NOTE2: Failures of the FS-1 circuit indicate a possible vehicle wiring fault that has resulted in a short circuit across FS-1. BEFORE REPLACING THE MODULE: Confirm that there are no shorts in the vehicle wiring or components. Installing a replacement module in a vehicle with faulty wiring will burn out the new module.

Key Switch

⚠ WARNING

The rear drive wheels may rotate during some of the following tests. Block the front wheels, raise the rear drive wheels off the ground, and support the vehicle with jack stands. Failure to do so may cause the vehicle to move and cause severe bodily injury and/or property damage.

Rotating rear drive wheels are a potential hazard. Keep hands, arms, legs and loose clothing away from the rear drive wheels while conducting tests. Failure to do so may cause serious 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.

Test all interlock switches and/or interlock relays (if equipped) for continuity. Depending on the model of your vehicle, it may have a seat interlock, Foot interlock, Charger interlock, special order interlock or any combination of the above. Refer to the wire diagram at the end of this section for location of the interlocks.

NOTE: Due to the many different configurations possible for special order interlocks, they will not be included in this text. Refer to the option list for your truck or contact your Taylor-Dunn® Representative for more information.

If you do not know how to test for continuity, refer test to a qualified technician.

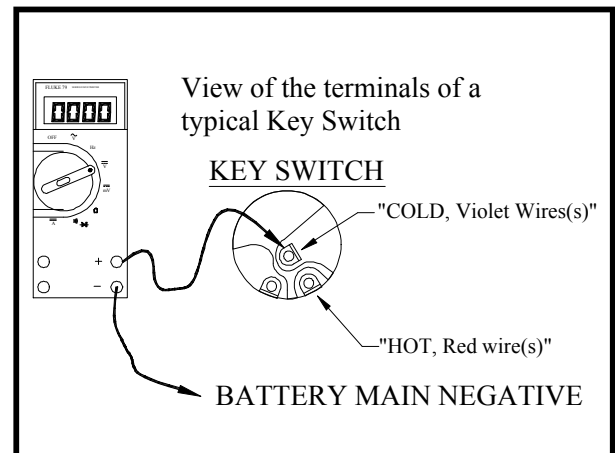
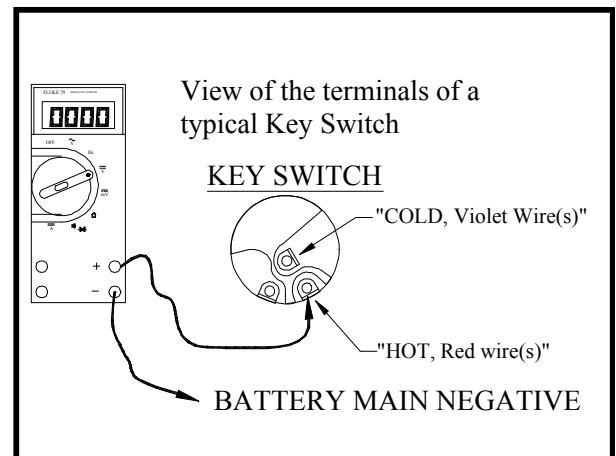
Connect a voltmeter across the HOT terminal of the key switch and battery negative.

- If the voltage is not at battery volts then check the wire between the key switch and battery positive. Stop trouble shooting here and repair the problem. When the repair is completed, completely retest the vehicle before lowering the drive wheels to the ground.

Connect a voltmeter across the COLD terminal of the key switch and battery negative.

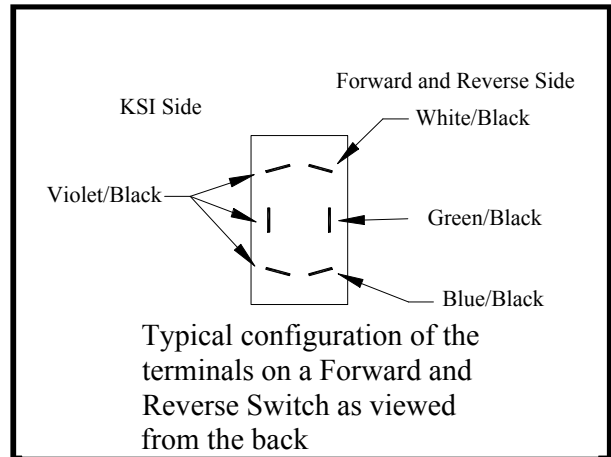
Turn the key switch ON.

- If the voltage is not at battery volts then the key switch has failed. Stop trouble shooting here and repair the problem. When the repair is completed, completely retest the vehicle before lowering the drive wheels to the ground.
- If the voltage is at battery volts but the previous test at pin #4 in the Accelerator section failed then check the wire from the key switch to pin #4 at the accelerator module. Stop trouble shooting here and repair the problem. When the repair is completed, completely retest the vehicle before lowering the drive wheels to the ground.





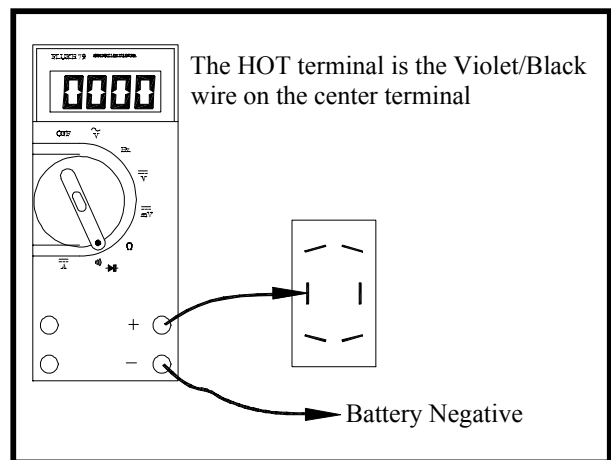
For your reference, shown at the right are the Forward and Reverse switch wire connections for a typical control system.



Connect a voltmeter across the HOT terminal of the KSI side of the F&R switch and battery negative.

Turn the key switch ON.

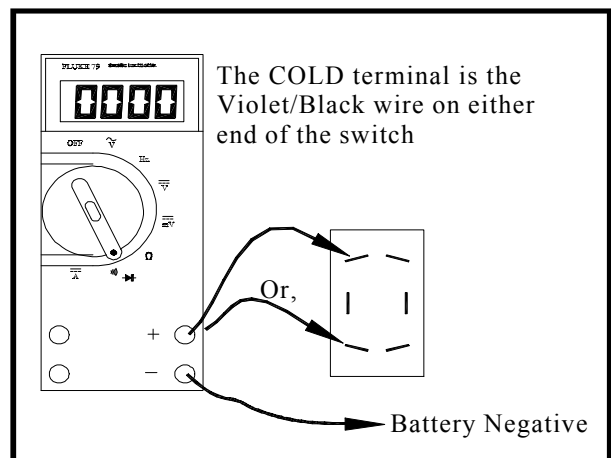
- If the voltage is not at battery volts then go to the **Accelerator** sequence.



Connect a voltmeter across one of the COLD terminals of the KSI side of the F&R switch and battery negative.

Close all interlock switches, turn the Key Switch ON, and place the F&R Switch in Forward.

- If the voltage is not at battery volts then the F&R switch has failed. Stop trouble shooting here and repair the problem. When the repair is completed, completely retest the vehicle before lowering the drive wheels to the ground.
- If the voltage is at battery volts and the test at the PMC KSI terminal in the Control Wire Inputs section failed then check the wiring between COLD terminals of the KSI side of the F&R switch and the PMC KSI terminal. Stop trouble shooting here and repair the problem. When the repair is completed, completely retest the vehicle before lowering the drive wheels to the ground.



F/R switch

⚠ WARNING

The rear drive wheels may rotate during some of the following tests. Block the front wheels, raise the rear drive wheels off the ground, and support the vehicle with jack stands. Failure to do so may cause the vehicle to move and cause severe bodily injury and/or property damage.

Rotating rear drive wheels are a potential hazard. Keep hands, arms, legs and loose clothing away from the rear drive wheels while conducting tests. Failure to do so may cause serious bodily injury.

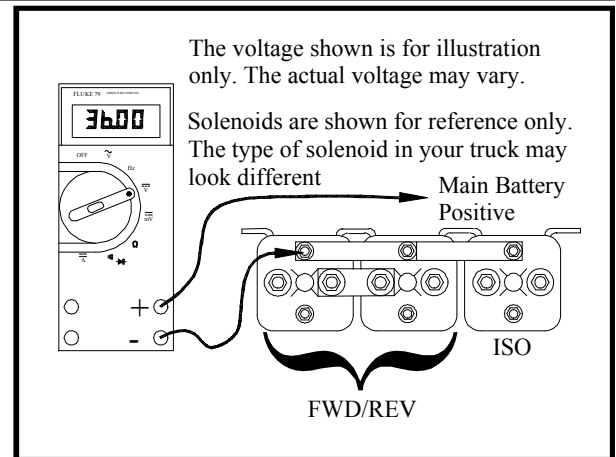
⚠ WARNING

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.

Connect a voltmeter across the Solenoid Negative Buss Bar and battery positive.

NOTE: You may skip this test if it was completed in a previous section

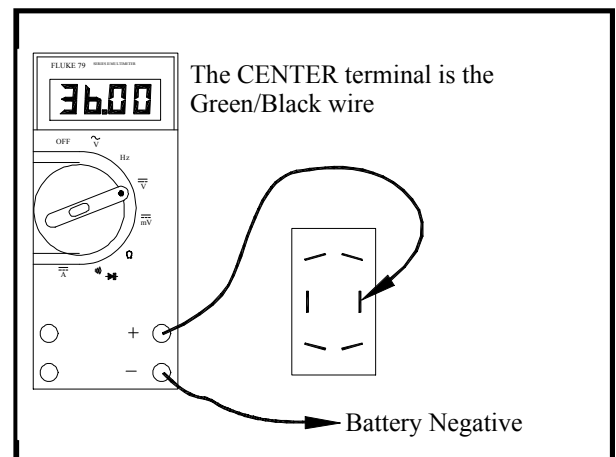
- If the voltage is not at battery volts then check the wiring to battery negative and the negative circuit breaker. Stop trouble shooting here and repair the problem. When the repair is completed, completely retest the vehicle before lowering the drive wheels to the ground.



Connect a voltmeter across the center terminal of the forward and reverse side of the F&R switch and battery negative.

Close all interlock switches, turn the Key Switch ON, and place the F&R Switch in Forward.
Depress the accelerator pedal fully.

- If the voltage is not at battery volts then go to the Accelerator sequence.



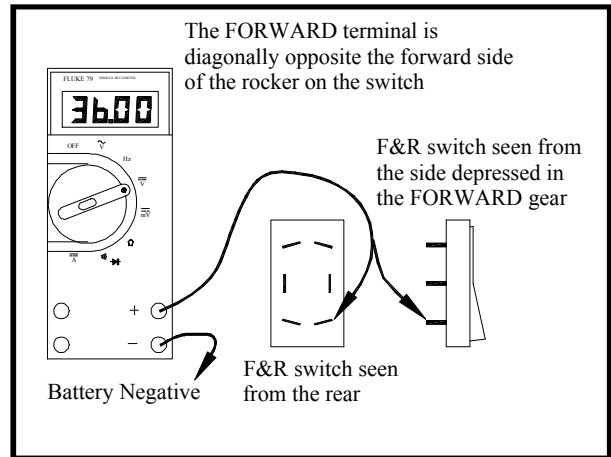


Connect a voltmeter across the forward terminal of the forward and reverse side of the F&R switch and battery negative.

Close all interlock switches, turn the Key Switch ON, and place the F&R Switch in forward.

Depress the accelerator pedal fully.

- If the voltage is not at battery volts then the F&R switch has failed. Stop trouble shooting here and repair the problem. When the repair is completed, completely retest the vehicle before lowering the drive wheels to the ground.

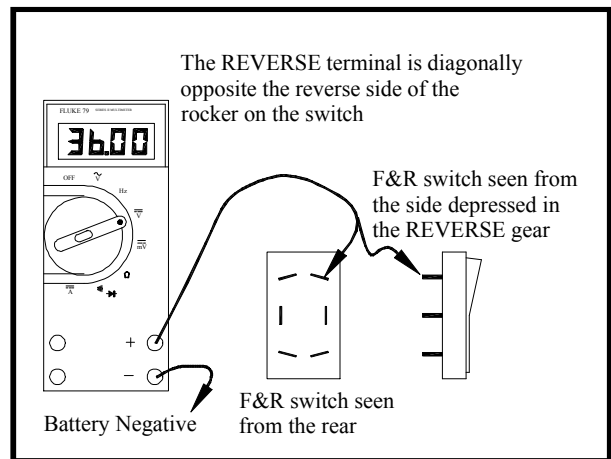


Connect a voltmeter across the reverse terminal of the forward and reverse side of the F&R switch and battery negative.

Close all interlock switches, turn the Key Switch ON, and place the F&R Switch in reverse.

Depress the accelerator pedal fully.

- If the voltage is not at battery volts then the F&R switch has failed. Stop trouble shooting here and repair the problem. When the repair is completed, completely retest the vehicle before lowering the drive wheels to the ground.
- If all tests in this section were good then check the wiring from the F&R switch to the Forward and Reverse solenoids and both the forward and reverse solenoid coils. Stop trouble shooting here and repair the problem. When the repair is completed, completely retest the vehicle before lowering the drive wheels to the ground.





Solenoids

⚠ WARNING

The rear drive wheels may rotate during some of the following tests. Block the front wheels, raise the rear drive wheels off the ground, and support the vehicle with jack stands. Failure to do so may cause the vehicle to move and cause severe bodily injury and/or property damage.

Rotating rear drive wheels are a potential hazard. Keep hands, arms, legs and loose clothing away from the rear drive wheels while conducting tests. Failure to do so may cause serious 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.

If the vehicle runs in forward only then skip ahead to the test sequence:

Forward (does not run in reverse).

If the vehicle runs in reverse only then skip ahead to the test sequence:

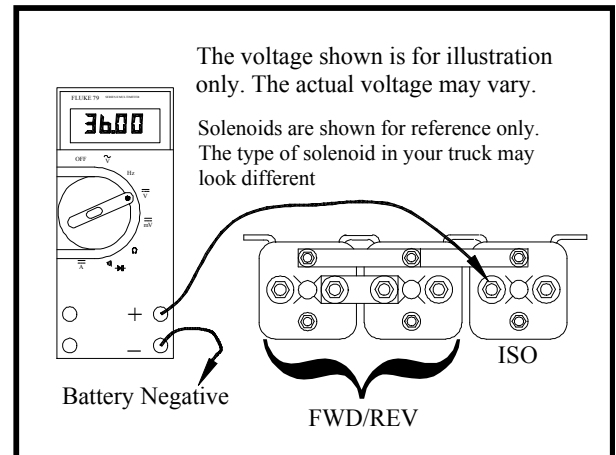
Reverse (does not run in forward).

Connect a voltmeter across the ISO solenoid COLD terminal and battery negative.

Close all interlock switches and turn the Key Switch ON.

Depress the accelerator pedal fully.

- If the voltage is at battery volts then the wire from the ISO solenoid to the PMC is bad. Stop trouble shooting here and repair the problem. When the repair is completed, completely retest the vehicle before lowering the drive wheels to the ground.

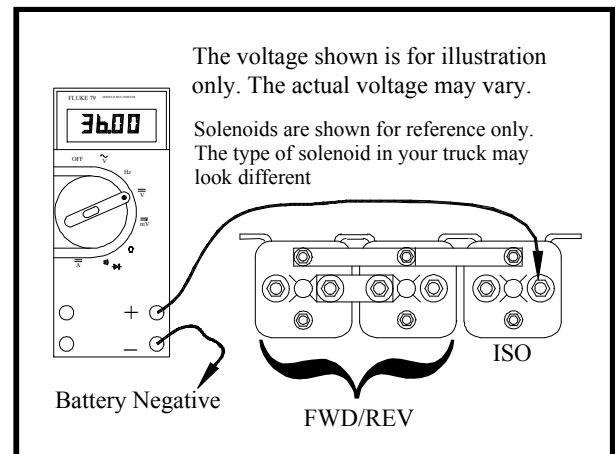


Connect a voltmeter across the ISO solenoid HOT terminal and battery negative.

Close all interlock switches and turn the Key Switch ON.

Depress the accelerator pedal fully.

- If the voltage is at battery volts then the ISO solenoid has failed. Stop trouble shooting here and repair the problem. When the repair is completed, completely retest the vehicle before lowering the drive wheels to the ground.
- If the voltage is not at battery volts then check the wiring to battery positive and the main circuit breaker. Stop trouble shooting here and repair the problem. When the repair is completed, completely retest the vehicle before lowering the drive wheels to the ground.



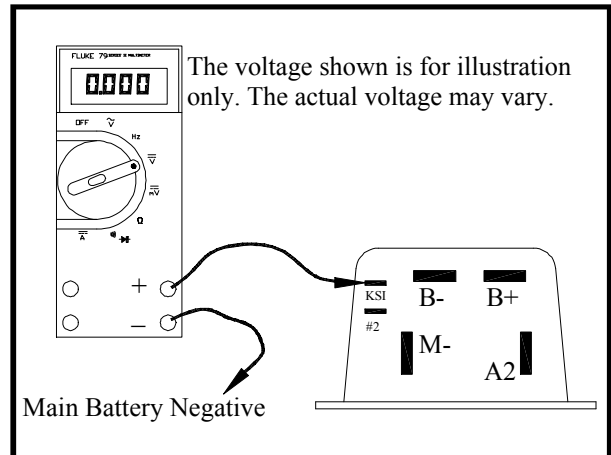


Forward (does not run in reverse)

Connect a voltmeter across the PMC KSI terminal and battery negative.

Close all interlock switches, turn the Key Switch ON, and place the F&R Switch in reverse.

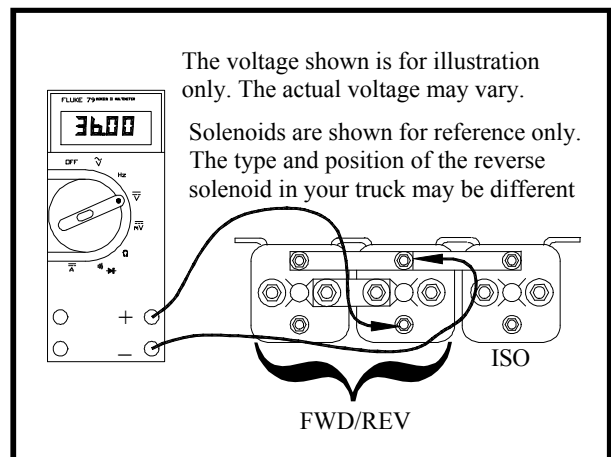
- If the voltage is not at battery volts then go to the **Key Switch** sequence.



Connect a voltmeter across the Reverse Solenoid coil terminals. Refer to your vehicles wiring diagram to identify the position of the reverse solenoid.

Close all interlock switches, turn the Key Switch ON, and place the F&R Switch in reverse. Depress the accelerator pedal fully.

- If the voltage is not at battery volts then go to the **F/R Switch** sequence.

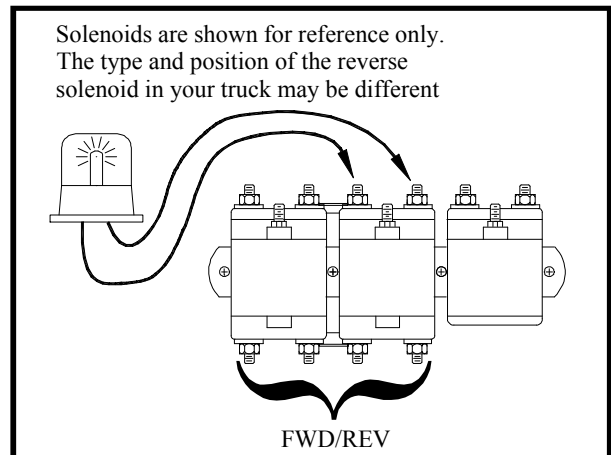


Set the test light voltage to the same voltage as the battery volts.

Connect the test light across the normally open contacts of the reverse solenoid. Refer to your vehicles wiring diagram to identify the position of the reverse solenoid.

Close all interlock switches, turn the Key Switch ON, and place the F&R Switch in reverse. Depress the accelerator pedal fully.

- If the light comes on then the Reverse solenoid has failed. Stop trouble shooting here and repair the problem. When the repair is completed, completely retest the vehicle before lowering the drive wheels to the ground.



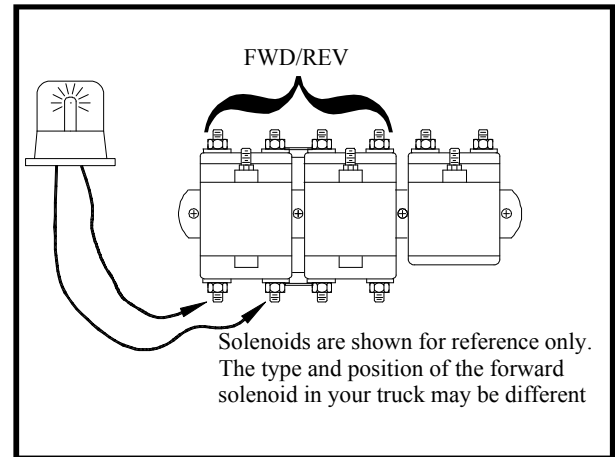


Connect the test light across the Normally Closed contacts of the Forward solenoid. Refer to your vehicles wiring diagram to identify the position of the forward solenoid.

Close all interlock switches, turn the Key Switch ON, and place the F&R Switch in Reverse.

Depress the accelerator pedal fully.

- If the light comes on then the Forward solenoid has failed. Stop trouble shooting here and repair the problem. When the repair is completed, completely retest the vehicle before lowering the drive wheels to the ground.



STOP

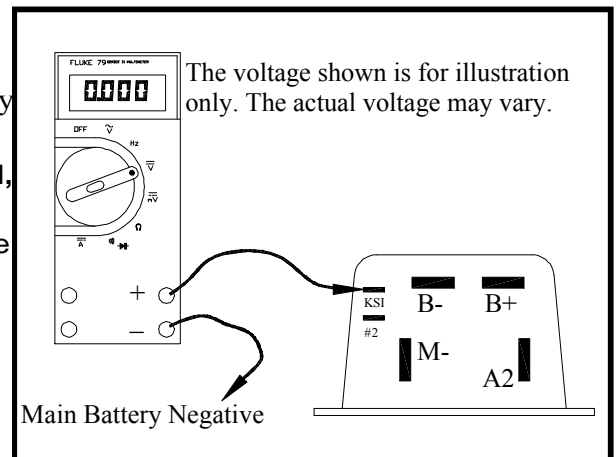
Stop, do not continue. If you reached this point without a solution, then you may have an unanticipated problem or have made an error during testing. It is important to review the trouble shooting steps that have led to this point. The tests may need to be repeated.

Reverse (does not run in forward)

Connect a voltmeter across the PMC KSI terminal and battery negative.

Close all interlock switches, turn the Key Switch ON, and place the F&R Switch in forward.

- If the voltage is not at battery volts then go to the **Key Switch** sequence.

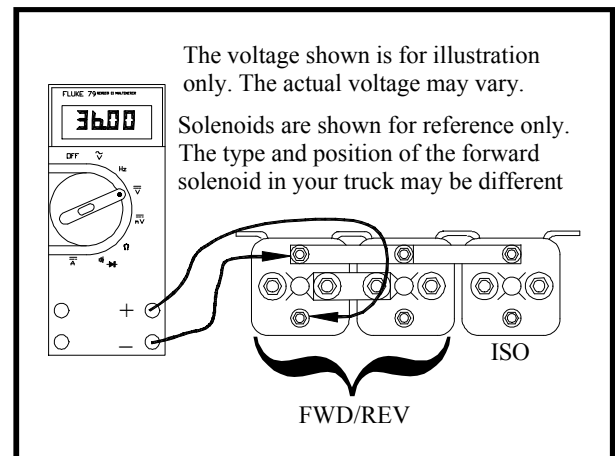


Connect a voltmeter across the Forward Solenoid coil terminals. Refer to your vehicles wiring diagram to identify the position of the forward solenoid.

Close all interlock switches, turn the Key Switch ON, and place the F&R Switch in forward.

Depress the accelerator pedal fully.

- If the voltage is not at battery volts then go to the **F/R Switch** sequence.





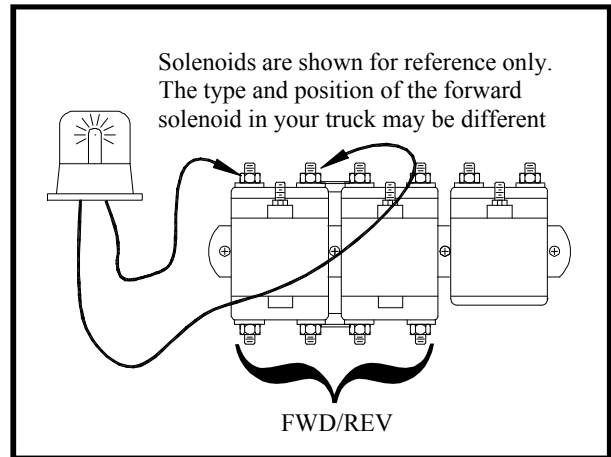
Set the test light voltage to the same voltage as the battery volts.

Connect the test light across the Normally Open contacts of the Forward solenoid. Refer to your vehicles wiring diagram to identify the position of the forward solenoid.

Close all interlock switches, turn the Key Switch ON, and place the F&R Switch in forward.

Depress the accelerator pedal fully.

- If the light comes on then the Forward solenoid has failed. Stop trouble shooting here and repair the problem. When the repair is completed, completely retest the vehicle before lowering the drive wheels to the ground.



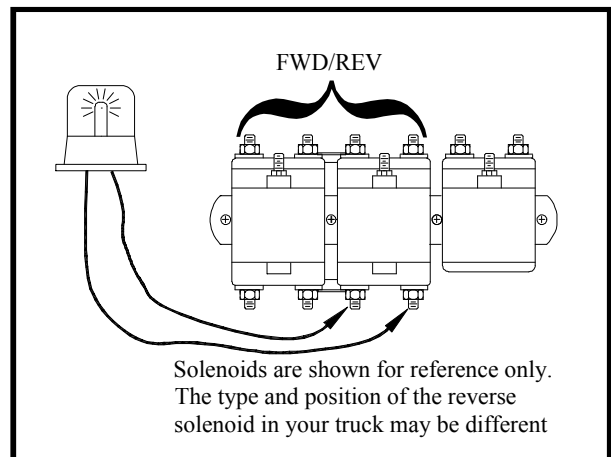
Set the test light voltage to the same voltage as the battery volts.

Connect the test light across the Normally Closed contacts of the Reverse solenoid. Refer to your vehicles wiring diagram to identify the position of the Reverse solenoid.

Close all interlock switches, turn the Key Switch ON, and place the F&R Switch in Forward.

Depress the accelerator pedal fully.

- If the light comes on then the Reverse solenoid has failed. Stop trouble shooting here and repair the problem. When the repair is completed, completely retest the vehicle before lowering the drive wheels to the ground.



STOP

Stop, do not continue. If you reached this point without a solution, then you may have an unanticipated problem or have made an error during testing. It is important to review the trouble shooting steps that have led to this point. The tests may need to be repeated.

SYMPTOM TROUBLESHOOTING GUIDE

This section is specific to the symptoms listed below. Each troubleshooting sequence assumes that all listed symptoms are present. Do not use this section unless the truck has all listed symptoms.

SYMPTOMS		GO TO
➤	Runs slow in both directions plus high armature and field current in both directions. NOTE: Armature and field current should be equal.	MOTOR
➤	Runs slow in both directions plus high armature current in both directions. NOTE: Field current will be very low.	SOLENOIDS
➤	Runs normal in one direction only plus runs slow or lacks power in the opposite direction with high armature current in the opposite direction or; Accelerates slowly and exceeds normal speed in the opposite direction with high armature current only. NOTE: Field current will be very low in the opposite direction.	SOLENOIDS
➤	Accelerates slowly and exceeds normal speed in both directions plus high armature current. NOTE: Field current will be very low.	SOLENOIDS
➤	Full speed only.	PMC CONTROL
➤	Does not run in either direction plus there is noise from motor (hum or whine) with high field current and low armature current.	PLUGGING DIODE
➤	Excessive spark when connecting battery	ISO
➤	Does not run or runs very slow with low motor current and high battery current.	FREEWHEEL DIODE
➤	Jumps into high speed when direction is selected after depressing the accelerator pedal.	HPD

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PMC CONTROL

⚠ 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

The rear drive wheels may rotate during some of the following tests. Block the front wheels, raise the rear drive wheels off the ground, and support the vehicle with jack stands. Failure to do so may cause the vehicle to move and cause severe bodily injury and/or property damage.

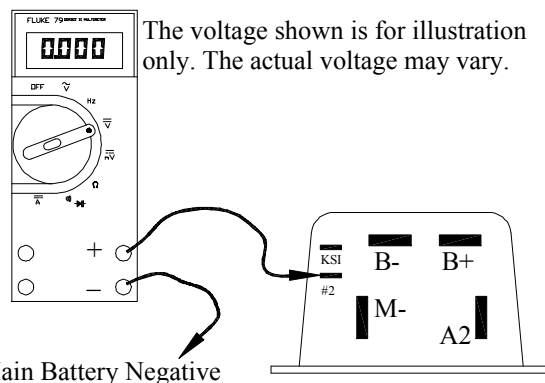
⚠ WARNING

Rotating rear drive wheels are a potential hazard. Keep hands, arms, legs and loose clothing away from the rear drive wheels while conducting tests. Failure to do so may cause serious bodily injury.

Disconnect the wire from the 'M-' terminal on the PMC control and tape it off to prevent electrical contact. Connect a volt meter across the PMC #2 terminal and battery negative.

Turn the key-switch on, close all interlock switches (if equipped), depress the accelerator pedal to engage the first micro switch only (creep speed), then perform the following tests:

- The meter reading should be between 6 and 6.5 volts.
- If the voltage at pin #2 is not 6 to 6.5 volts, then go to the **ACCELERATOR** sequence in the Main Troubleshooting Sequence, otherwise continue with the next test.

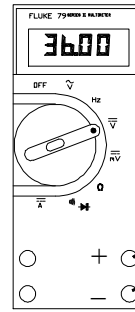




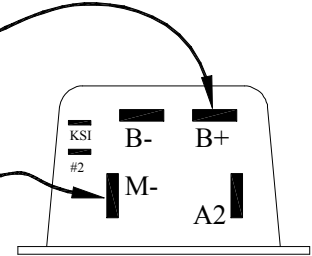
Connect a volt meter across the PMC B+ and PMC M- terminals.

Turn the key-switch on, close all interlock switches (if equipped), depress the accelerator pedal to engage the first micro switch only (creep speed), then perform the following tests:

- The meter reading should not be equal to the battery voltage.
- If you have full battery voltage then the PMC control is shorted and must be replaced. Stop trouble shooting here and repair the problem. When the repair is completed, completely retest the vehicle before lowering the drive wheels to the ground, otherwise continue with the next test.



The voltage shown is for illustration only. The actual voltage may vary.



If the voltage at pin #2 is correct and the voltage at 'M-' is correct, then there is a short in the harness between the wire connected to the PMC 'M-' and main battery negative. Stop trouble shooting here and repair the problem. When the repair is completed, completely retest the vehicle before lowering the drive wheels to the ground.

STOP

Stop, do not continue. If you reached this point without a solution, then you may have an unanticipated problem or have made an error during testing. It is important to review the trouble shooting steps that have led to this point. The tests may need to be repeated.



PLUGGING DIODE

⚠ 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

The rear drive wheels may rotate during some of the following tests. Block the front wheels, raise the rear drive wheels off the ground, and support the vehicle with jack stands. Failure to do so may cause the vehicle to move and cause severe bodily injury and/or property damage.

⚠ WARNING

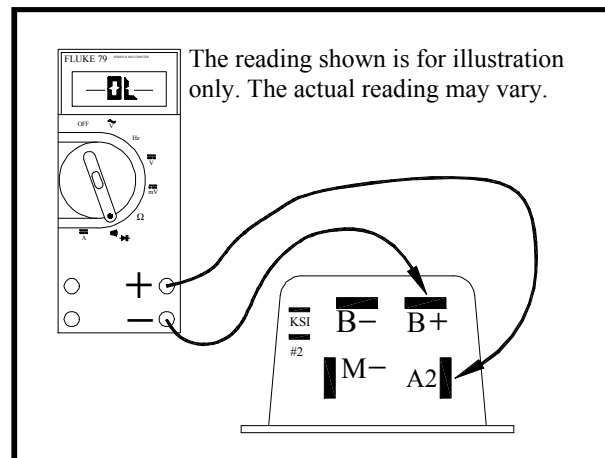
Rotating rear drive wheels are a potential hazard. Keep hands, arms, legs and loose clothing away from the rear drive wheels while conducting tests. Failure to do so may cause serious bodily injury.

Remove the wires from the 'B+' and 'A2' terminals on the PMC control and perform the following test:

Using the diode test function on the DMM check for the presence of a diode across 'B+' and 'A2' on the PMC control..

If you do not know how to test for a diode, refer test to a qualified technician.

- If the diode is open or shorted, then the PMC control must be replaced. Stop trouble shooting here and repair the problem. When the repair is completed, completely retest the vehicle before lowering the drive wheels to the ground.



STOP

Stop, do not continue. If you reached this point without a solution, then you may have an unanticipated problem or have made an error during testing. It is important to review the trouble shooting steps that have led to this point. The tests may need to be repeated.

FREEWHEEL DIODE

⚠ 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

The rear drive wheels may rotate during some of the following tests. Block the front wheels, raise the rear drive wheels off the ground, and support the vehicle with jack stands. Failure to do so may cause the vehicle to move and cause severe bodily injury and/or property damage.

⚠ WARNING

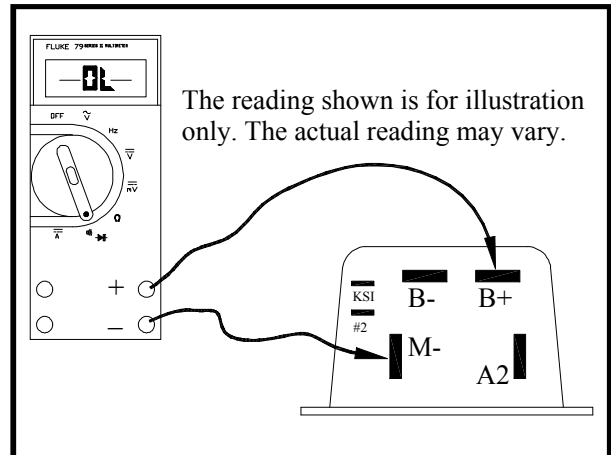
Rotating rear drive wheels are a potential hazard. Keep hands, arms, legs and loose clothing away from the rear drive wheels while conducting tests. Failure to do so may cause serious bodily injury.

Remove the wires from the 'B+' and 'M-' terminals on the PMC control and perform the following test:

Using the diode test function on the DMM check for the presence of a diode across 'B+' and 'M-' on the PMC control. Refer to Diode Figure 2.

If you do not know how to test for a diode, refer test to a qualified technician.

- If the diode is open or shorted, then the PMC control must be replaced. Stop trouble shooting here and repair the problem. When the repair is completed, completely retest the vehicle before lowering the drive wheels to the ground.



STOP

Stop, do not continue. If you reached this point without a solution, then you may have an unanticipated problem or have made an error during testing. It is important to review the trouble shooting steps that have led to this point. The tests may need to be repeated.



ISO

⚠ 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

The rear drive wheels may rotate during some of the following tests. Block the front wheels, raise the rear drive wheels off the ground, and support the vehicle with jack stands. Failure to do so may cause the vehicle to move and cause severe bodily injury and/or property damage.

⚠ WARNING

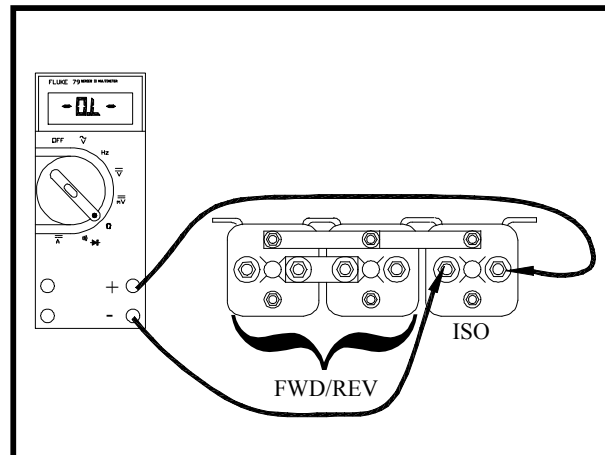
Rotating rear drive wheels are a potential hazard. Keep hands, arms, legs and loose clothing away from the rear drive wheels while conducting tests. Failure to do so may cause serious bodily injury.

Remove the wires and the resistor from the ISO solenoid and perform the following tests:

Test continuity across the ISO power contacts.

If you do not know how to test for continuity, refer test to a qualified technician.

- This should be an open circuit. If it is not an open circuit then the contactor should be replaced. Stop trouble shooting here and repair the problem. When the repair is completed, completely retest the vehicle before lowering the drive wheels to the ground, other wise continue to the next test.

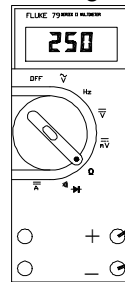




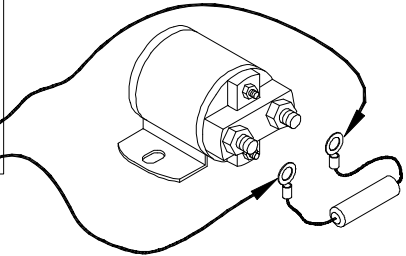
Connect the meter to each end of the resistor that was removed from the ISO solenoid and measure its resistance.

- The meter reading should be 250 Ohms (+/-10%). If it is not 250 ohms (+/-10%), then replace the resistor. Stop trouble shooting here and repair the problem. When the repair is completed, completely retest the vehicle before lowering the drive wheels to the ground.

Reading is plus or minus 10%



ISO solenoid is shown for reference only. The type of solenoid in your truck may look different



STOP

Stop, do not continue. If you reached this point without a solution, then you may have an unanticipated problem or have made an error during testing. It is important to review the trouble shooting steps that have led to this point. The tests may need to be repeated.

SOLENOIDS

There is a very slight possibility that a failure in the motor could cause these symptoms. Perform the tests covered in the MOTOR section first. If the motor is OK, continue with the following tests.

⚠ 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

The rear drive wheels may rotate during some of the following tests. Block the front wheels, raise the rear drive wheels off the ground, and support the vehicle with jack stands. Failure to do so may cause the vehicle to move and cause severe bodily injury and/or property damage.

⚠ WARNING

Rotating rear drive wheels are a potential hazard. Keep hands, arms, legs and loose clothing away from the rear drive wheels while conducting tests. Failure to do so may cause serious bodily injury.

Remove the wires from the 'S1' and 'S2' terminals on the motor. Remove the wire from the 'M-' terminal on the PMC control. Make sure none of these wires can come into electrical contact with the frame or any other wire.

Reconnect the batteries.

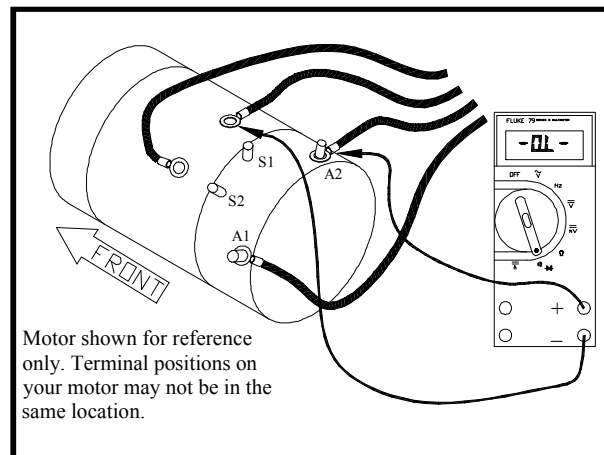
With the key-switch on and the forward and reverse switch in neutral, perform the following tests:

- Check continuity from the motor 'A2' terminal to the wire that was connected to the motor 'S1' terminal. DO NOT make this test to the 'S1' terminal, just the wire. Refer to Solenoid Figure 1.

If you do not know how to test for continuity, refer test to a qualified technician.

- This should be an open circuit, if it reads as a short, then one of the following has occurred:

- A) The reverse solenoid is shorted.
- B) The wire connected to the motor 'S1' terminal is shorted to the wire connected to the motor 'A2' terminal.
- C) The wire connected to the motor 'S1' terminal is shorted to the wire connected to the PMC 'A2' terminal.



Stop trouble shooting here and repair the problem. When the repair is completed, completely retest the vehicle before lowering the drive wheels to the ground, otherwise continue with the next test.

- Check continuity from the motor 'A2' terminal to the wire that was connected to the motor 'S2' terminal. DO NOT make this test to the 'S2' terminal, just the wire.

If you do not know how to test for continuity, refer test to a qualified technician.

- This should read as an open circuit. If it reads as a short then one of the following has occurred:

- A) The forward solenoid is shorted.
- B) The wire connected to the motor 'S2' terminal is shorted to the wire connected to the motor 'A2' terminal.
- C) The wire connected to the motor 'S2' terminal is shorted to the wire connected to the PMC 'A2' terminal.

Stop trouble shooting here and repair the problem. When the repair is completed, completely retest the vehicle before lowering the drive wheels to the ground, otherwise continue with the next test.

With the key-switch on and the F&R switch in forward, depress the accelerator pedal and perform the following tests:

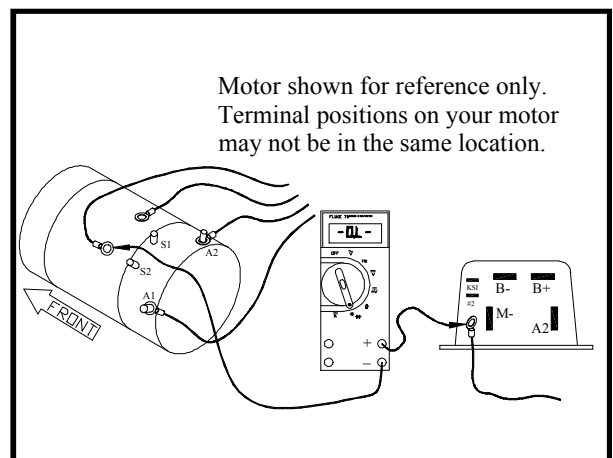
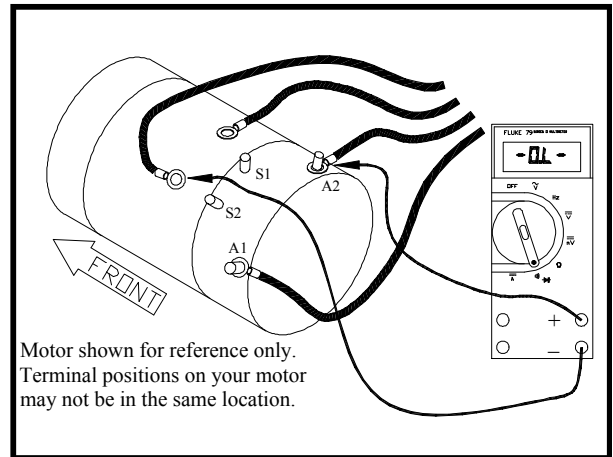
- Check continuity from the wire that was connected to the PMC 'M-' terminal to the wire that was connected to the motor 'S2' terminal.

If you do not know how to test for continuity, refer test to a qualified technician.

- This should read as an open circuit. If it reads as a short, then one of the following has occurred:

- A) The forward solenoid is shorted.
- B) The wire connected to the PMC 'M-' terminal is shorted to the wire connected to the motor 'S2' terminal.

Stop trouble shooting here and repair the problem. When the repair is completed, completely retest the vehicle before lowering the drive wheels to the ground, otherwise continue with the next test.





With the key-switch on and the F&R switch in reverse, depress the accelerator pedal and perform the following tests:

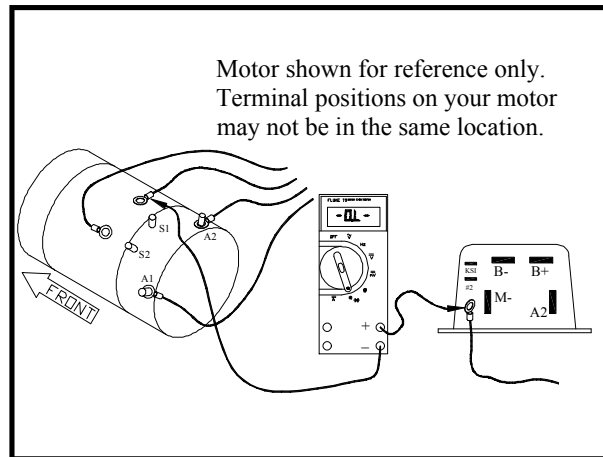
- Check continuity from the wire that was connected to the PMC 'M-' terminal to the wire that was connected to the motor 'S1' terminal.

If you do not know how to test for continuity, refer test to a qualified technician.

- This should read as an open circuit. If it reads as a short, then one of the following has occurred:

- A) The reverse solenoid is shorted.
- B) The wire connected to the PMC 'M-' terminal is shorted to the wire connected to the motor 'S1' terminal.

Stop trouble shooting here and repair the problem. When the repair is completed, completely retest the vehicle before lowering the drive wheels to the ground



STOP

Stop, do not continue. If you reached this point without a solution, then you may have an unanticipated problem or have made an error during testing. It is important to review the trouble shooting steps that have led to this point. The tests may need to be repeated.



MOTOR

High motor current in both the field and the armature, accompanied with a lack of power, would indicate a shorted armature and/or field.

Another symptom that may exist is jumping or stuttering at low speeds and/or the motor will not run unless the armature is manually rotated. If this symptom exists, it indicates that there may be open segments in the armature. Visually inspect the brushes, if they are OK, continue with the testing below.

⚠ 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

The rear drive wheels may rotate during some of the following tests. Block the front wheels, raise the rear drive wheels off the ground, and support the vehicle with jack stands. Failure to do so may cause the vehicle to move and cause severe bodily injury and/or property damage.

⚠ WARNING

Rotating rear drive wheels are a potential hazard. Keep hands, arms, legs and loose clothing away from the rear drive wheels while conducting tests. Failure to do so may cause serious bodily injury.

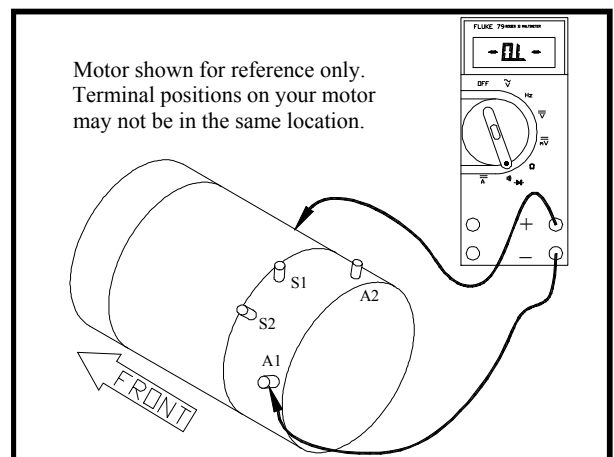
Disconnect the four motor wires and perform the following tests:

Check continuity from 'A1' to the frame of the motor..

If you do not know how to test for continuity, refer test to a qualified technician.

- This should be an open circuit. If there is continuity from 'A1' to the frame of the motor, then the motor armature or armature circuit (brushes) are shorted.

Stop trouble shooting here and repair the problem. When the repair is completed, completely retest the vehicle before lowering the drive wheels to the ground, otherwise continue with the next test.

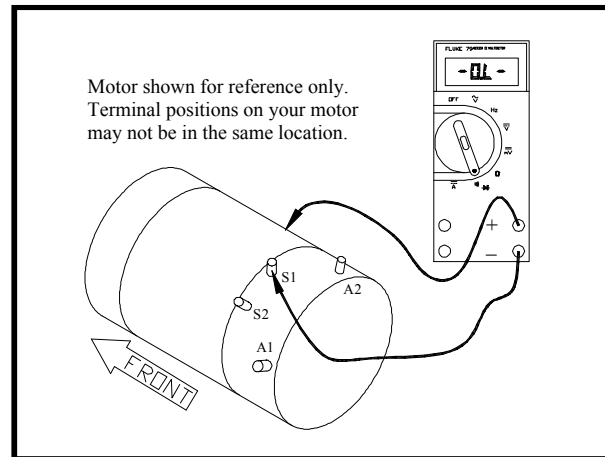




Check continuity from 'S1' to the frame of the motor.

If you do not know how to test for continuity, refer test to a qualified technician.

This should be an open circuit. If there is continuity from 'S1' to the frame of the motor, then the motor field is shorted. Stop trouble shooting here and repair the problem. When the repair is completed, completely retest the vehicle before lowering the drive wheels to the ground, otherwise continue to Motor Inspection.

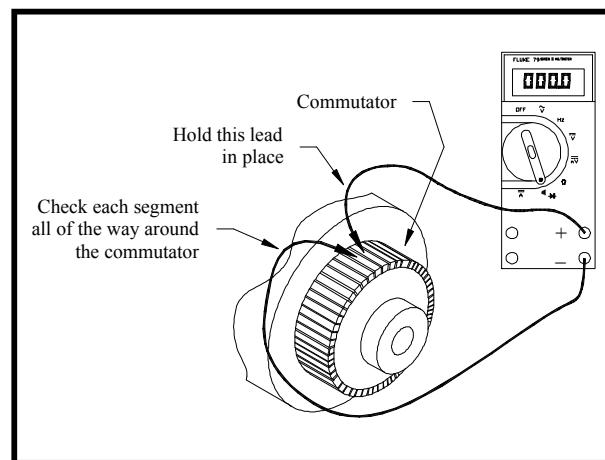


Motor Inspection

1. Remove and disassemble the motor.
2. Visually inspect the inside of the brush end housing. If there are any silver specs of metal around the inside of the housing, it indicates that the armature has overheated and melted the solder around the commutator. The armature is bad and the motor must be replaced. Stop here and repair the problem, otherwise continue with the next test.
3. Visually inspect the armature wires where they loop around at the shaft end of the armature. The insulation should be a light to medium reddish brown color. If the insulation is dark brown to black or the insulation is cracked and peeling, then the armature has been overheated and burnt. The motor must be replaced. Stop here and repair the problem, otherwise continue with the next test.
4. Perform a continuity test around the armature commutator. Place one of the test leads on a single commutator segment. While holding the first test lead on the segment, check the continuity to the other segments around the commutator.

If you do not know how to test for continuity, refer test to a qualified technician.

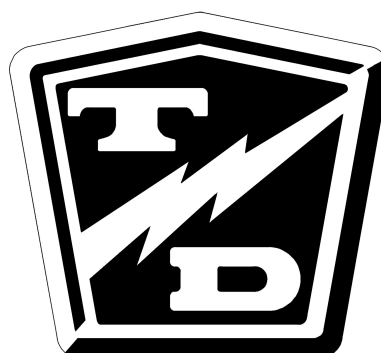
- There should be continuity on each commutator segment. If an open segment is found, the armature is bad and the motor must be replaced. Stop trouble shooting here and repair the problem. When the repair is completed, completely retest the vehicle before lowering the drive wheels to the ground.



STOP

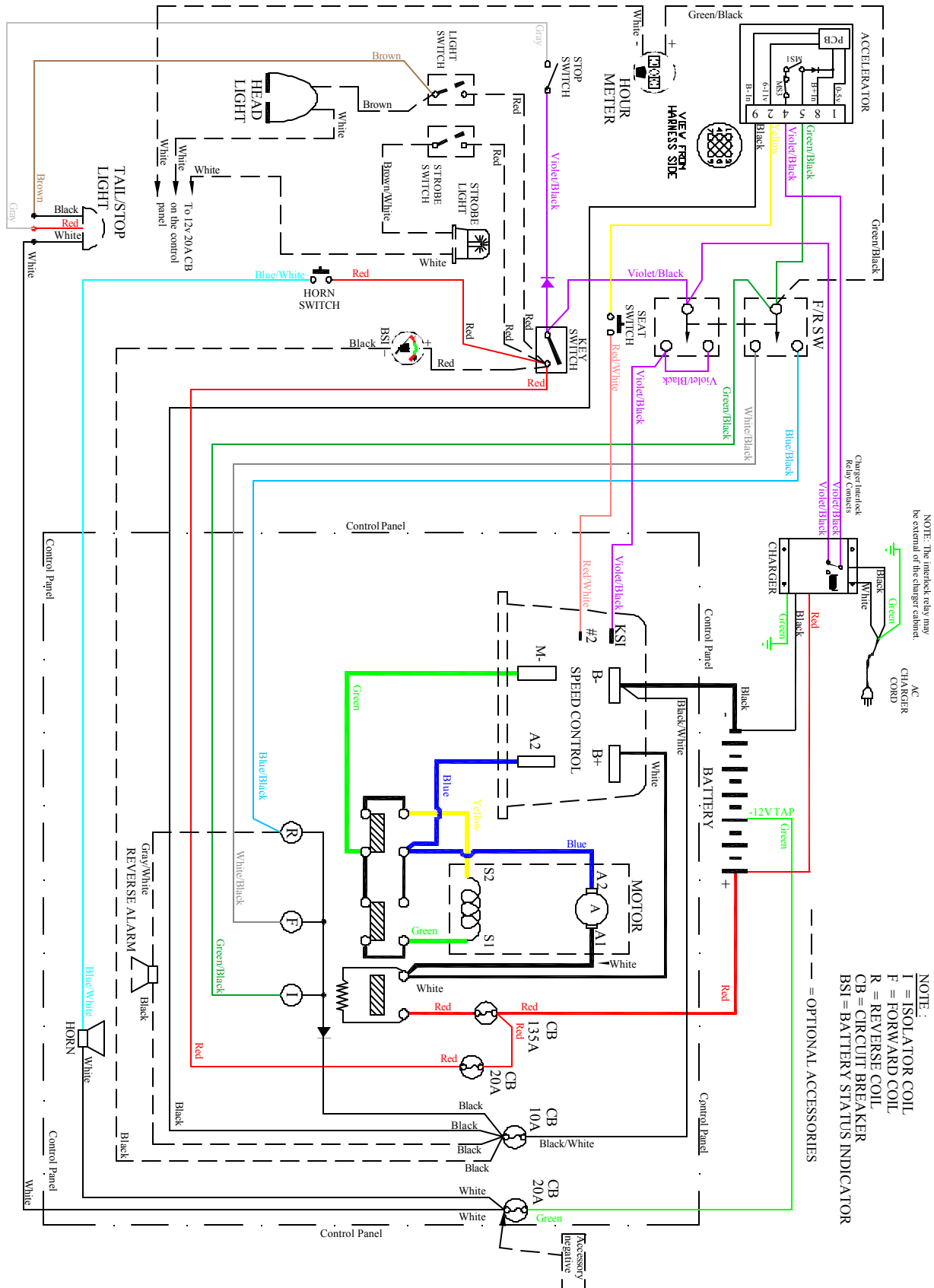
Stop, do not continue. If you reached this point without a solution, then you may have an unanticipated problem or have made an error during testing. It is important to review the trouble shooting steps that have led to this point. The tests may need to be repeated.

Wire Diagrams





Wire Diagrams



Typical wiring diagram for model B 1-00 and B 1-25



Lestronic II® Charger Troubleshooting

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Important Notes and Instructions	4
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Testing The Timer Relay	9
Testing the Interlock Relay	10

⚠ CAUTION

Turn the Key switch OFF **BEFORE** disconnecting the batteries. Disconnecting the batteries with the key switch ON may corrupt the controller programming resulting in a fault code 1 (refer to fault table).



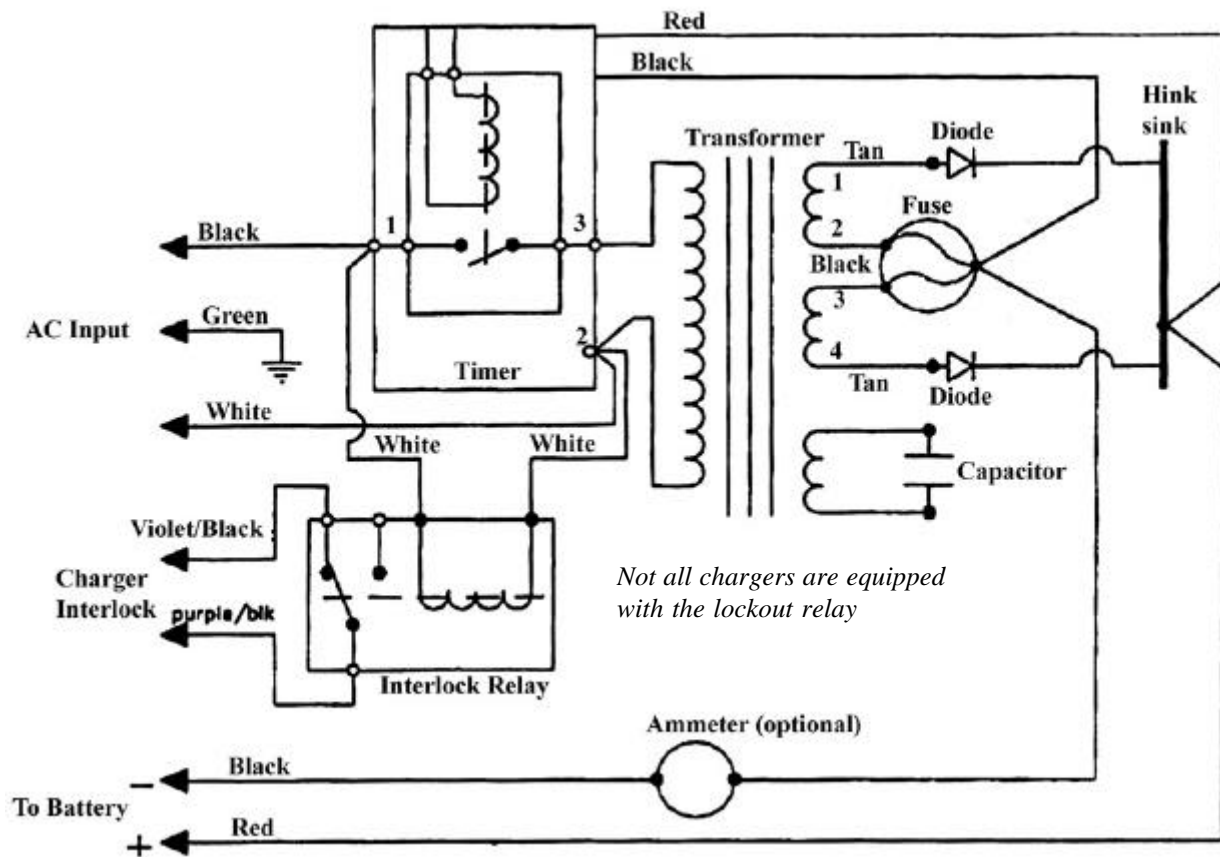


OPERATING INSTRUCTIONS AND THEORY OF OPERATION

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.



Typical Charger Internal Wire Diagram

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 battery when the charge cycle was started.

A charger could remain on for longer than 12 hours if:

- The charging cycle is interrupted at any time during the charging cycle.
- Defective batteries causing a fluctuating DC voltage that confuses the charger.
- 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 batteries were not discharged to 50% before connecting the charger.
- 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 the electrolyte specific gravity during the charging cycle as indicated below.

Specific Gravity

Using a hydrometer take the specific gravity reading of several cells, at 1 hour intervals while charging. If the specific gravity of the electrolyte does not rise for three consecutive readings and the charger does not shut off, then the charger is running too long.

Battery Voltage

Using an accurate 5-1/2 digit digital voltmeter, monitor the battery voltage during the charging cycle. Take readings every 30 minutes. If the battery voltage does not increase 0.012 volts in two consecutive readings, then the charger is running too long.



TEST EQUIPMENT REQUIRED FOR TROUBLESHOOTING

Digital Multi Meter (DMM) with diode and capacitor test function, FLUKE 79® model shown at right and in the troubleshooting illustrations.



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 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 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.

During All Tests

WARNING

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 FOR BUILT-IN CHARGER

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 charger from the AC source.

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 14 gauge wires.

Slide the insulators off the connectors on the two 10 gauge wires and perform the following tests:

CAUTION

Make sure that these two wires do not come into electrical contact with any other object.

6. Test the voltage from the red wire to the 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.**
7. Test the voltage from the red 10 gauge 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 bad connection. **Stop here and repair the problem.**

Slide the insulators back onto the connectors on the two 10 gauge wires.

Slide the insulators off the connectors on the two 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.

Re-Connect the charger to the AC source.

8. Test the voltage across the two 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.**



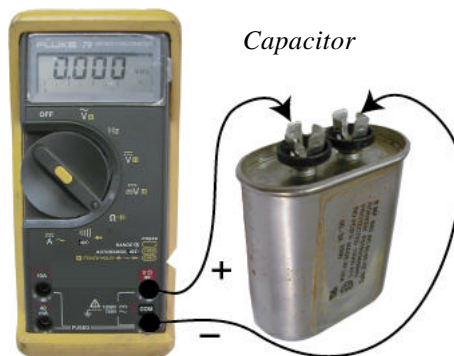
- Disconnect the charger from the AC source.
- Disconnect the batteries.
- Disconnect the charger from the vehicle's harness.
- Remove the charger from the vehicle.

WARNING

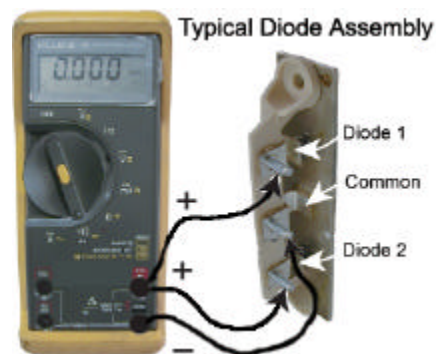
HIGH VOLTAGE may be stored in the capacitor. Discharge the capacitor before continuing. Connect a 2k ohm resistor across the capacitor terminals for 10 seconds. Do not touch the capacitor terminals with your hands. The resistor should be held with a pair of insulated pliers. Failure to do so may cause serious bodily injury

Remove the charger cover and perform the following tests:

1. Inspect the internal wiring of the charger and repair as required.
2. Check the continuity of both fuse links and replace if bad.
3. 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.**



4. 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.**
5. Reconnect the lead to the diode.
6. 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:



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.



- Test the voltage from the fuse assembly (-) to the diode block (+). 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.**





TROUBLESHOOTING FOR PORTABLE CHARGER

Disconnect the charger from the AC outlet and the batteries.

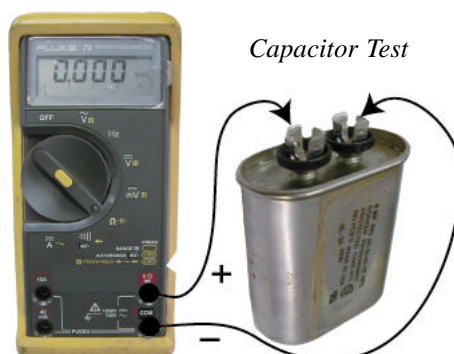
1. Test the voltage from the positive terminal on the vehicles DC receptacle to main battery negative. This voltage should be equal to the battery voltage. If the voltage is less than the battery voltage then this wire is broken or has a bad connection. **Stop here and repair the problem.**
2. Test the 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.**

Remove the charger cover and perform the following tests:

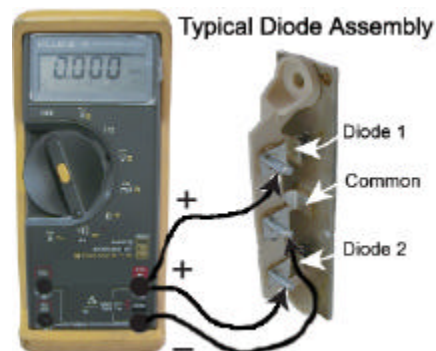
WARNING

HIGH VOLTAGE may be stored in the capacitor. Discharge the capacitor before continuing. Connect a 2k ohm resistor across the capacitor terminals for 10 seconds. Do not touch the capacitor terminals with your hands. The resistor should be held with a pair of insulated pliers. Failure to do so may cause serious bodily injury

1. Inspect the internal wiring of the charger and repair as required.
2. Check the continuity of both fuse links and replace if bad.
3. 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.**



4. 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.**





5. Reconnect the lead to the diode.
6. Connect the charger to the AC source. Insert the DC charger plug into the DC receptacle and perform the following tests:

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.

- Test the voltage from the fuse assembly (-) to the diode block (+). 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.**
- If 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.**



Transformer Secondary Circuit

TESTING THE TIMER RELAY

Test 1:

1. Connect the batteries to the charger.
 2. Plug the charger into the AC source.
 3. Wait 5 seconds, then test the voltage at the timer relay coil terminals.
NOTE: This voltage should be close to the battery volts.
- If the voltage is close to the battery volts, then skip to test 2.
 - If the voltage is not close to the battery volts, then the timer control circuit has failed and the timer must be replaced.

Test 2:

1. Disconnect the batteries.
2. Unplug the charger from the AC source.
3. Discharge the capacitor (see warning on previous page).



4. Disconnect the wires from the contact terminals on the timer relay.
 5. Reconnect the batteries.
 6. Wait 5 seconds, then test the continuity across the timer relay contact terminals.
- If this is a closed circuit, then the timer start up circuit is functioning normally.
 - If there is an open circuit, then the timer relay has failed and the relay must be replaced.

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 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. Disconnect the charger from the AC power source.
 7. Disconnect the two Violet/Black wires at the charger harness knife connectors.
 8. Set the DMM to check for continuity and connect the DMM leads to the 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.**
 9. Connect the charger to a working AC power source.
 - The charger should turn on. If the charger does not turn on then there 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.

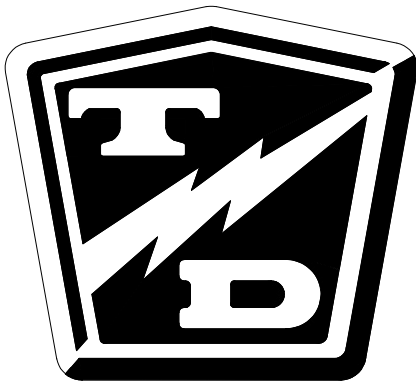
Signet® Charger Troubleshooting

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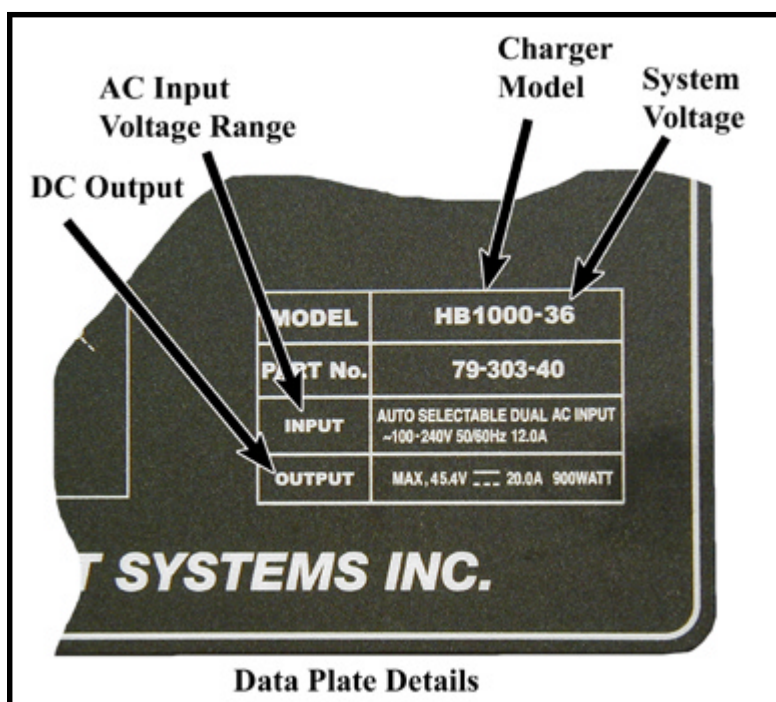
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HB/PT and GEL Indicator Lamps	3
Testing the Charging Cycle	3
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⚠ CAUTION

Turn the Key switch OFF **BEFORE** disconnecting the batteries. Disconnecting the batteries with the key switch ON may corrupt the controller programming resulting in a fault code 1 (refer to fault table).



OPERATING INSTRUCTIONS AND THEORY OF OPERATION

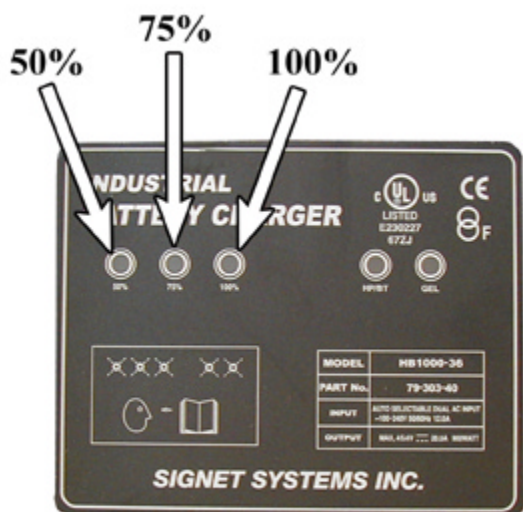


The model HB600W® and HB1000W® chargers are designed as semiautomatic chargers. The charger turns itself on when it is plugged into the wall outlet and turns off when the batteries are fully charged.

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.



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.

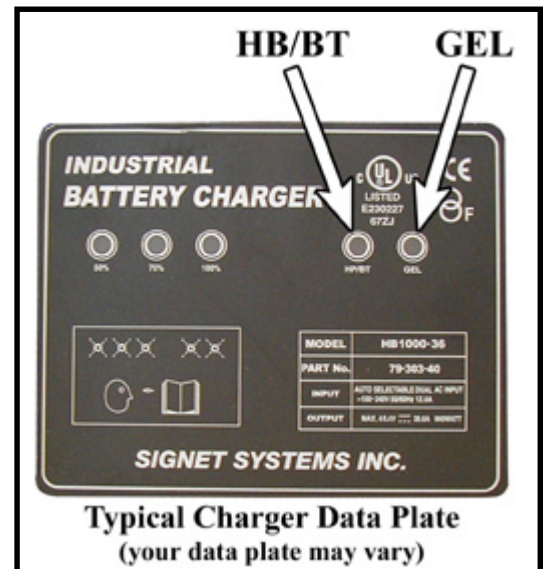
HB/PT Lamp

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.



⚠ CAUTION

GEL batteries must be charged with a charger configured for GEL batteries. Use of any other charger will result in damage to the batteries and premature failure of the batteries.

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 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 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 volts per cell. When the voltage reaches 2.55 volts per cell, 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.

TEST EQUIPMENT REQUIRED FOR TROUBLESHOOTING

Digital Multi Meter (DMM), FLUKE 79® model shown at right and in the troubleshooting illustrations.

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 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.
- Battery volts = Full voltage available at the batteries at the time of the test being performed.
- There are no internally serviceable components in the charger. If the charger has failed then it must be replaced.

⚠ 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.



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:

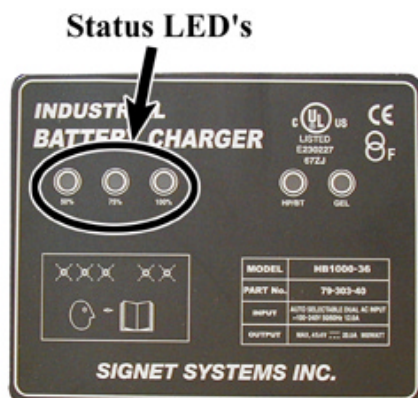
- Defective battery or batteries
- Excessively discharged batteries
- Oversize batteries

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 voltage 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 automatically restart. Inspect for dirt or debris on the charger cooling fins and clean as required.
4	Input or Output over current	Charger will automatically 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

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).

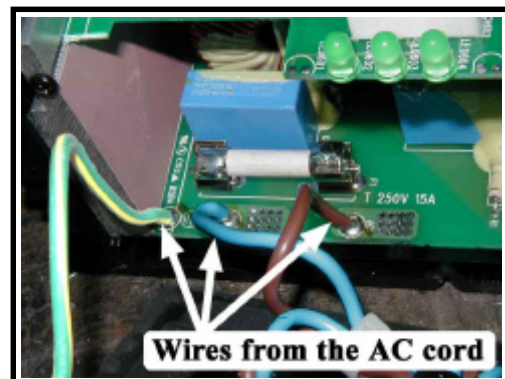
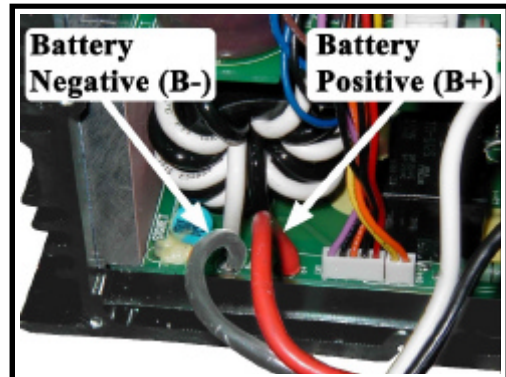
The ammeter should continue to display the DC Amp rating of the charger until the battery voltage equals 2.55 VPC. When the battery voltage equals 2.55 VPC the charger will switch to the constant voltage mode. At this point the charging current will be reduced and will taper off until the batteries are fully charged.

Perform the following if the charger does not turn on:

⚠ 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 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.

Signet® Charger Troubleshooting

Charger Models:

HBS 600

HBS 1000

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⚠ CAUTION

Turn the Key switch OFF **BEFORE** disconnecting the batteries. Disconnecting the batteries with the key switch ON may corrupt the controller programming resulting in a fault code 1 (refer to fault table).

⚠ CAUTION

GEL batteries must be charged with a charger configured for GEL batteries. Use of any other charger will result in damage to the batteries and premature failure of the batteries.





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	Flooded batteries
	2.383 Volts Per Cell	Gel 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

⚠ 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

GEL batteries must be charged with a charger configured for GEL batteries. Use of any other charger will result in damage to the batteries and premature failure of the batteries.

TEST EQUIPMENT REQUIRED FOR TROUBLESHOOTING

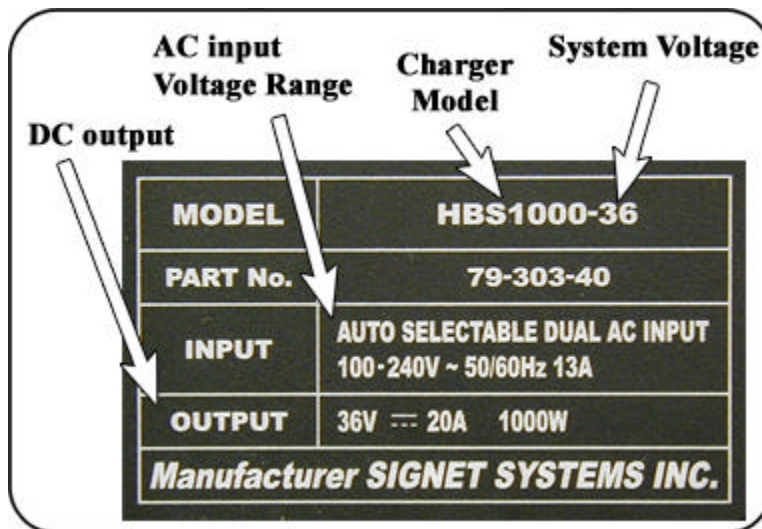
Digital Multi Meter (DMM), calibrated and accurate down to 0.00001 volts.

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 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.

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:

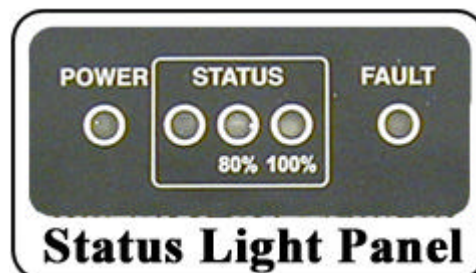
Left: Charge cycle is ON and is in constant current mode.

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.





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.

⚠ CAUTION

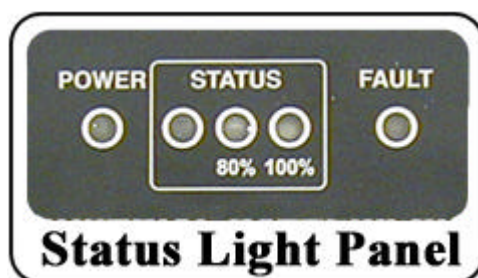
GEL batteries must be charged with a charger configured for GEL batteries. Use of any other charger will result in damage to the batteries and premature failure of the batteries.



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:

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 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.

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.

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**

⚠ CAUTION

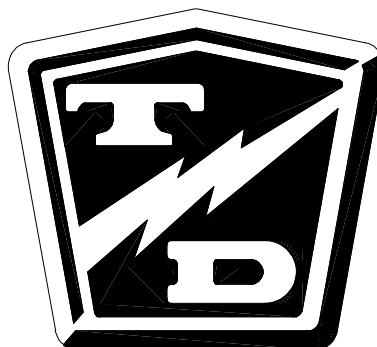
GEL batteries must be charged with a charger configured for GEL batteries. Use of any other charger will result in damage to the batteries and premature failure of the batteries.



Illustrated Parts

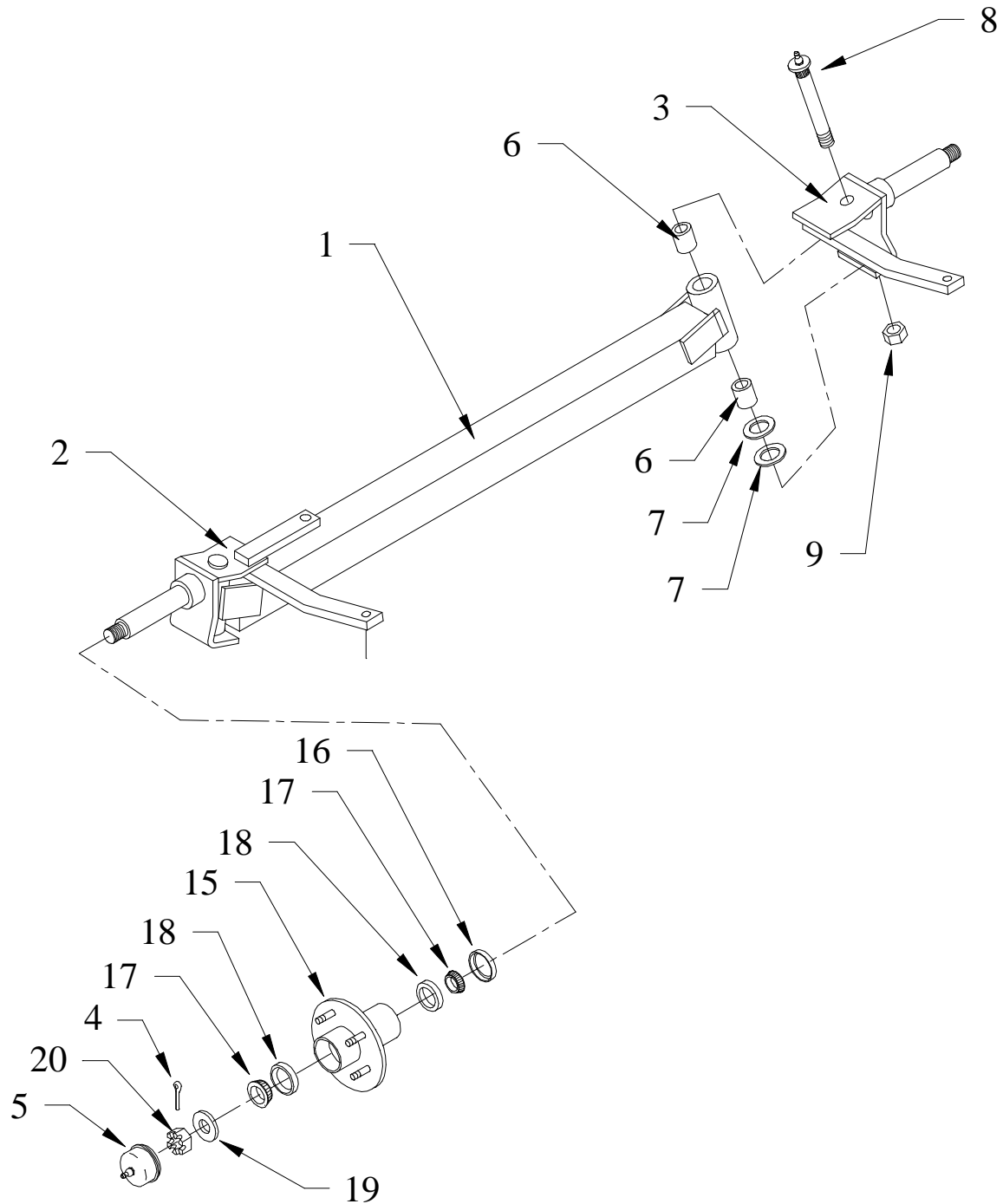
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Front Axle and Steering Knuckle



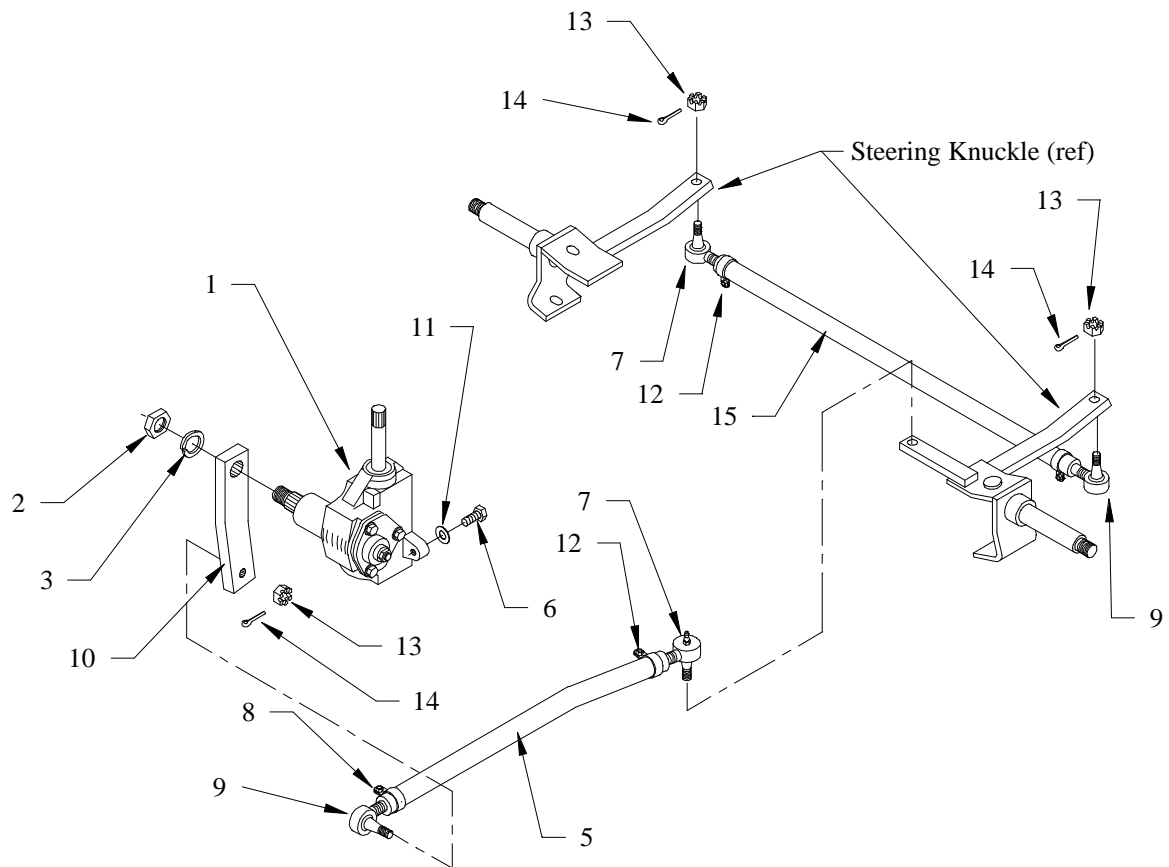


Front Axle and Steering			
ITEM #	PART #	DESCRIPTION	QTY
1	15-210-00	Axle beam	1
2	14-210-98	Left side yoke	1
3	14-210-99	Right side yoke	1
4	88-527-11	Cotter pin	2
5	92-104-00	Bearing cap	2
6	32-240-55	King pin bushing	4
7	97-180-55	Thrust washer	4
8	21-020-15	King pin	2
9	88-189-81	Nut	2
10	-	-	-
11	-	-	-
12	-	-	-
13	-	-	-
14	-	-	-
15	12-124-00	Hub (includes #16, 18 and one of #17)	2
16	45-338-00	Grease seal	2
17	80-017-00	Bearing	4
18	80-103-00	Race	4
19	88-228-61	3/4 SAE Flat washer	2
20	88-239-85	3/4NF Castle nut	2





Steering Linkage

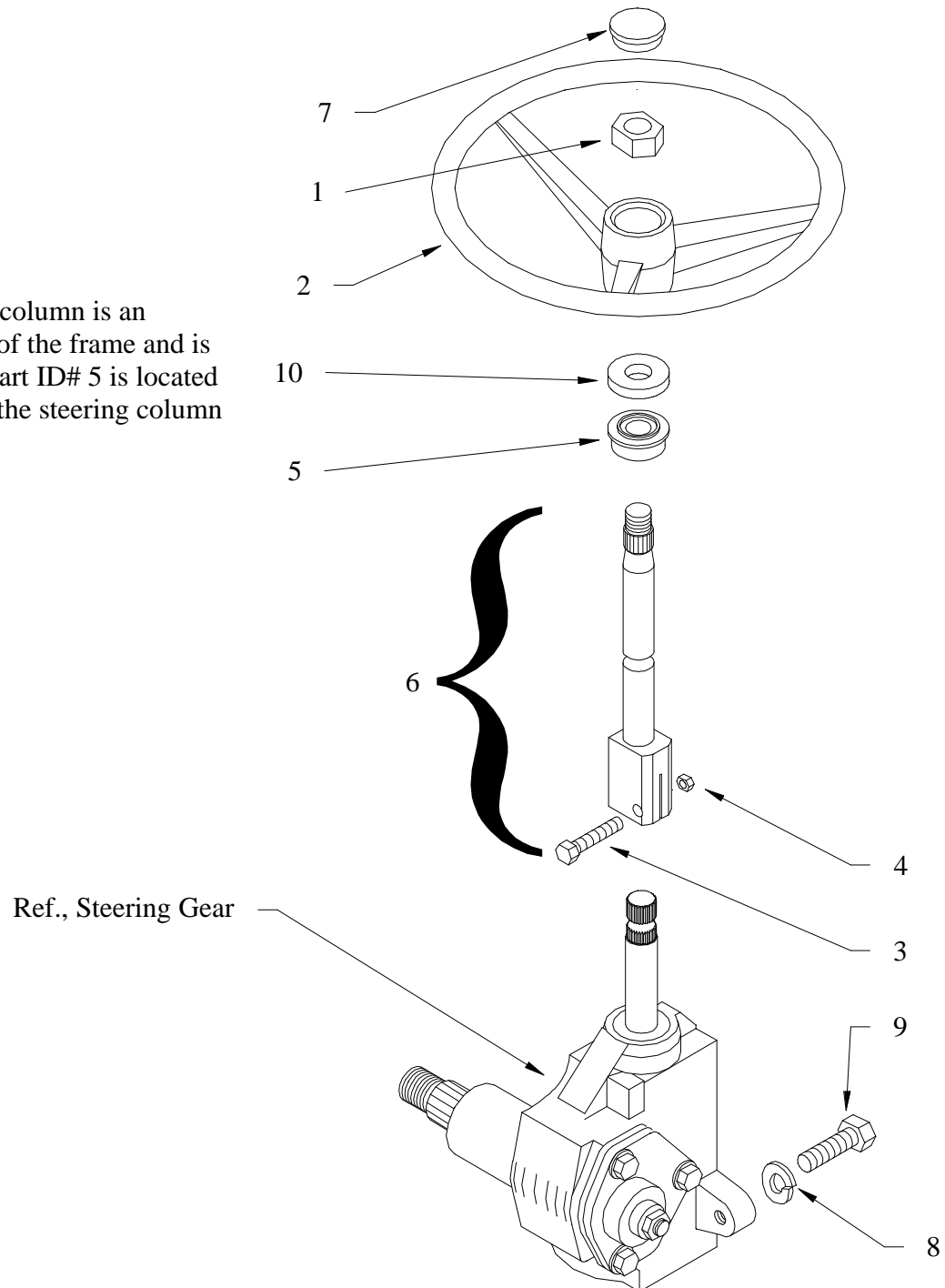


Steering Linkage			
ITEM #	PART #	DESCRIPTION	QTY
1	18-308-21	Steering gear box	1
2	88-279-82	7/8NF Hex nut	1
3	88-268-62	7/8 Split lock washer	1
4	-	-	-
5	01-110-21	Drag link	1
6	See Steering Column	-	3
7	86-501-98	Ball joint	2
8	86-510-00	Ball joint clamp	4
9	86-501-99	Ball joint	2
10	18-111-30	Pitman arm	1
11	See Steering Column	-	3
12	-	See #8	-
13	88-159-85	1/2NF Castle nut	4
14	88-527-11	Cotter pin	4
15	18-041-00	Stering linkage	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.



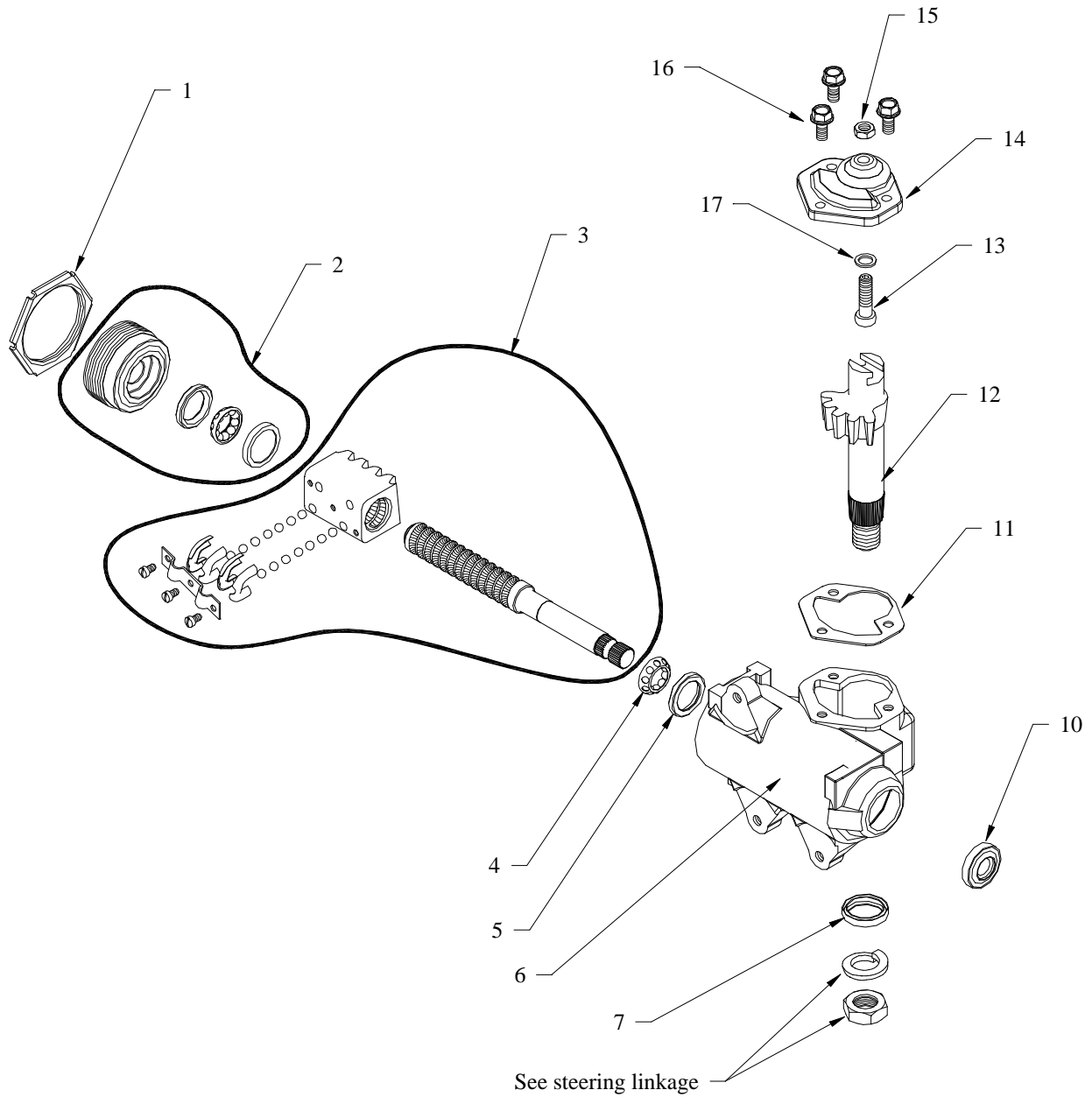


Steering Column			
ITEM #	PART #	DESCRIPTION	QTY
1	88-199-82	5/8-NF Hex Jam Nut	1
2	19-011-30	Steering Wheel	1
3	88-081-14	Bolt, Plated (grade 8)	1
4	88-089-84	Nut, Plated (grade 8)	1
5	80-400-10	Bushing	1
6	20-031-63	Steering shaft (includes #3, #4)	1
7	19-011-35	Steering Wheel Cover	1
8	88-128-62	7/16 Split Lock Washer	3
9	88-120-11	7/16-NC x 1 Hex Bolt, Grade 5	3
10	97-200-00	Dust Washer	1
Not Shown	01-200-84	Steering Column Cover	1





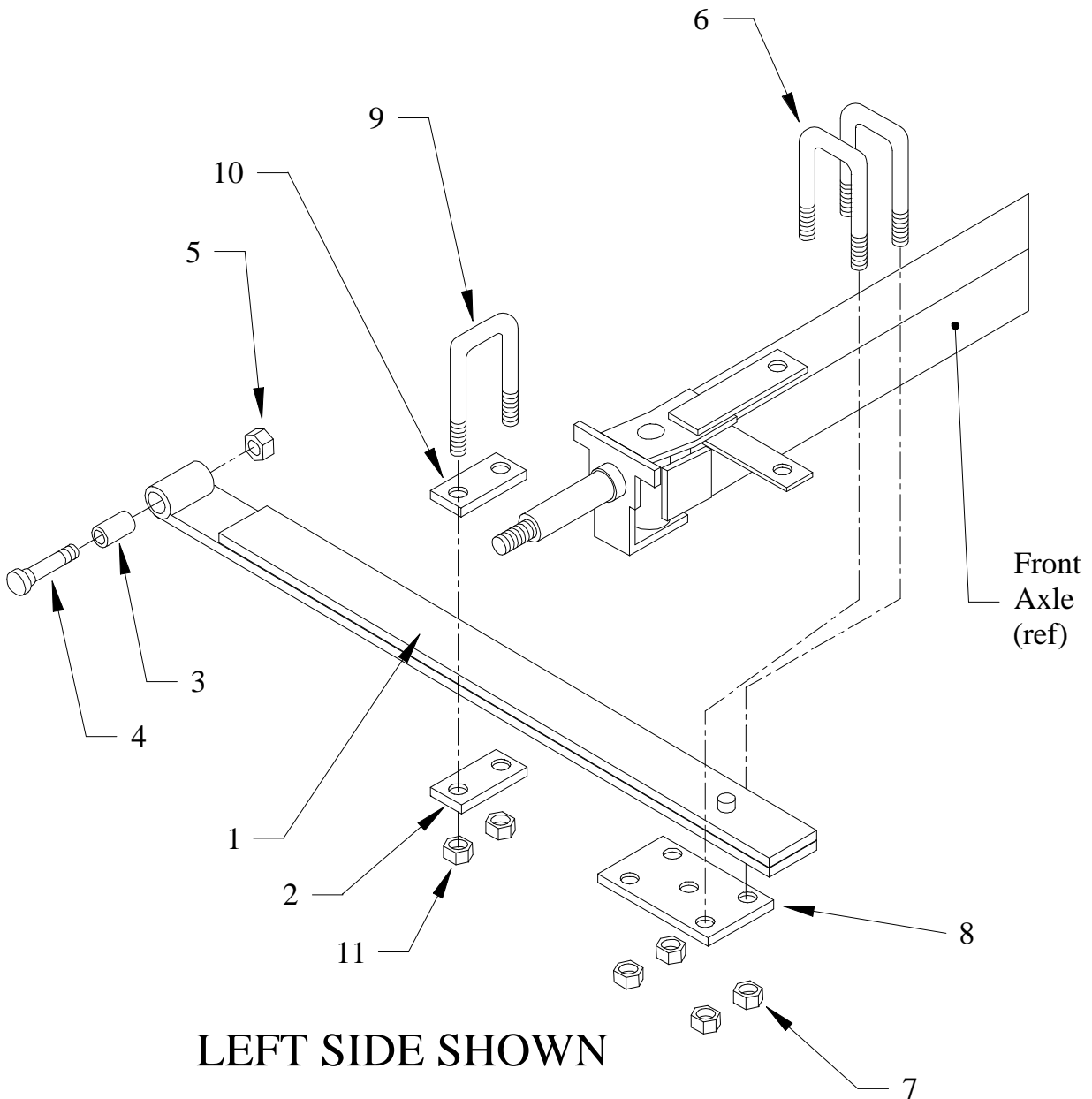
Steering Gear



Steering Gear			
ITEM #	PART #	DESCRIPTION	QTY
	18-308-21	Steering 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



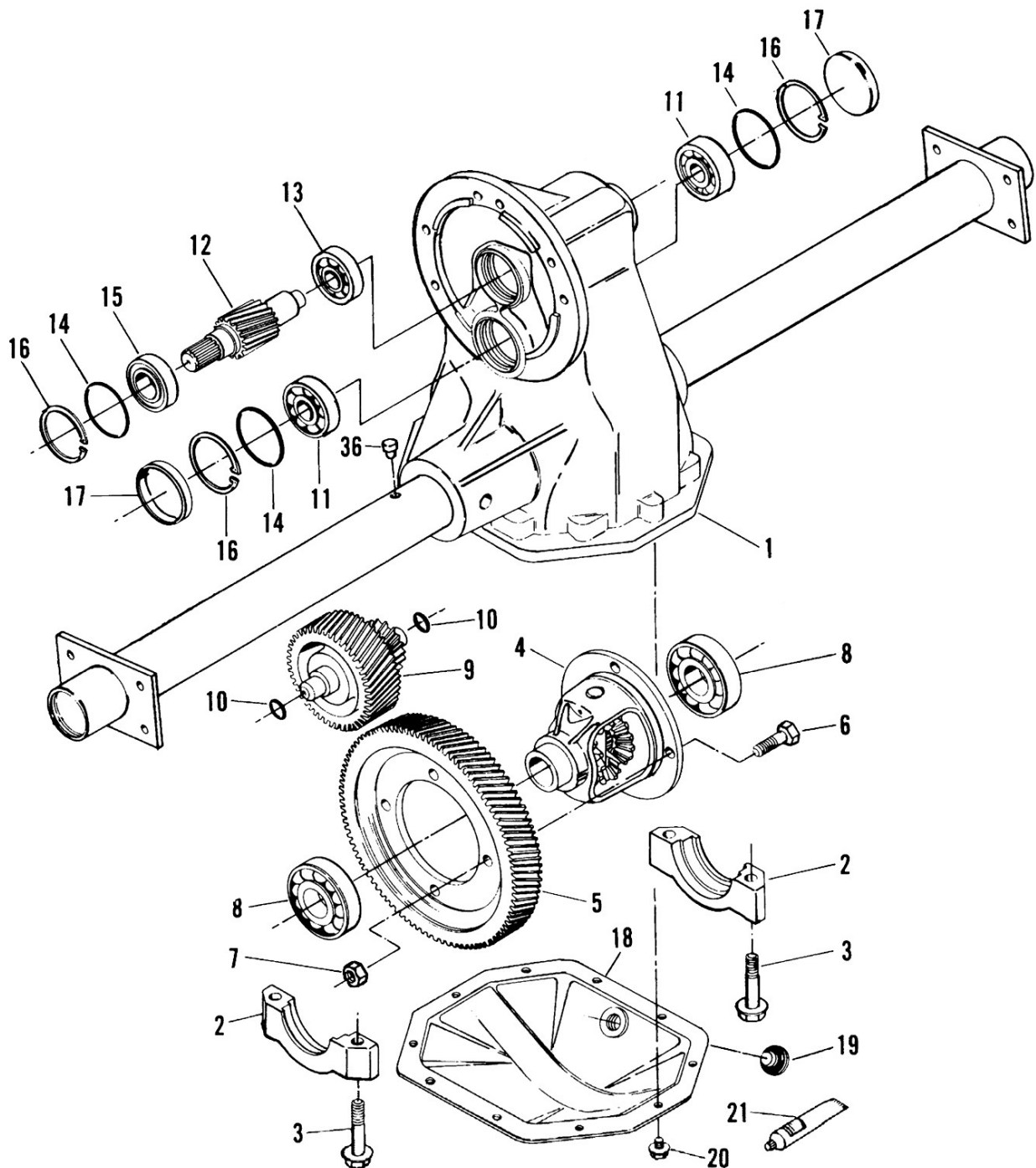


Front Suspension			
ITEM #	PART #	DESCRIPTION	QTY
1	85-506-05	Spring	2
2	50-460-00	Strap	2
3	32-213-00	Spring eye bushing	2
4	96-243-10	9/16NF x 3-1/2 Hex bolt, grade 5	2
5	88-169-82	9/16NF Hex nut, grade C	2
6	96-123-00	3/8 NC x 2.06 x 4 U-bolt	4
7	88-109-82	3/8NC Hex lock nut, grade C	8
8	16-865-02	Spring plate	2
9	96-120-00	1/2NC x 1-7/8 x 2 U-bolt	2
10	01-110-32	Spring mount pad	2
11	88-149-81	1/2NC Hex lock nut	4





Transmission Differential Case

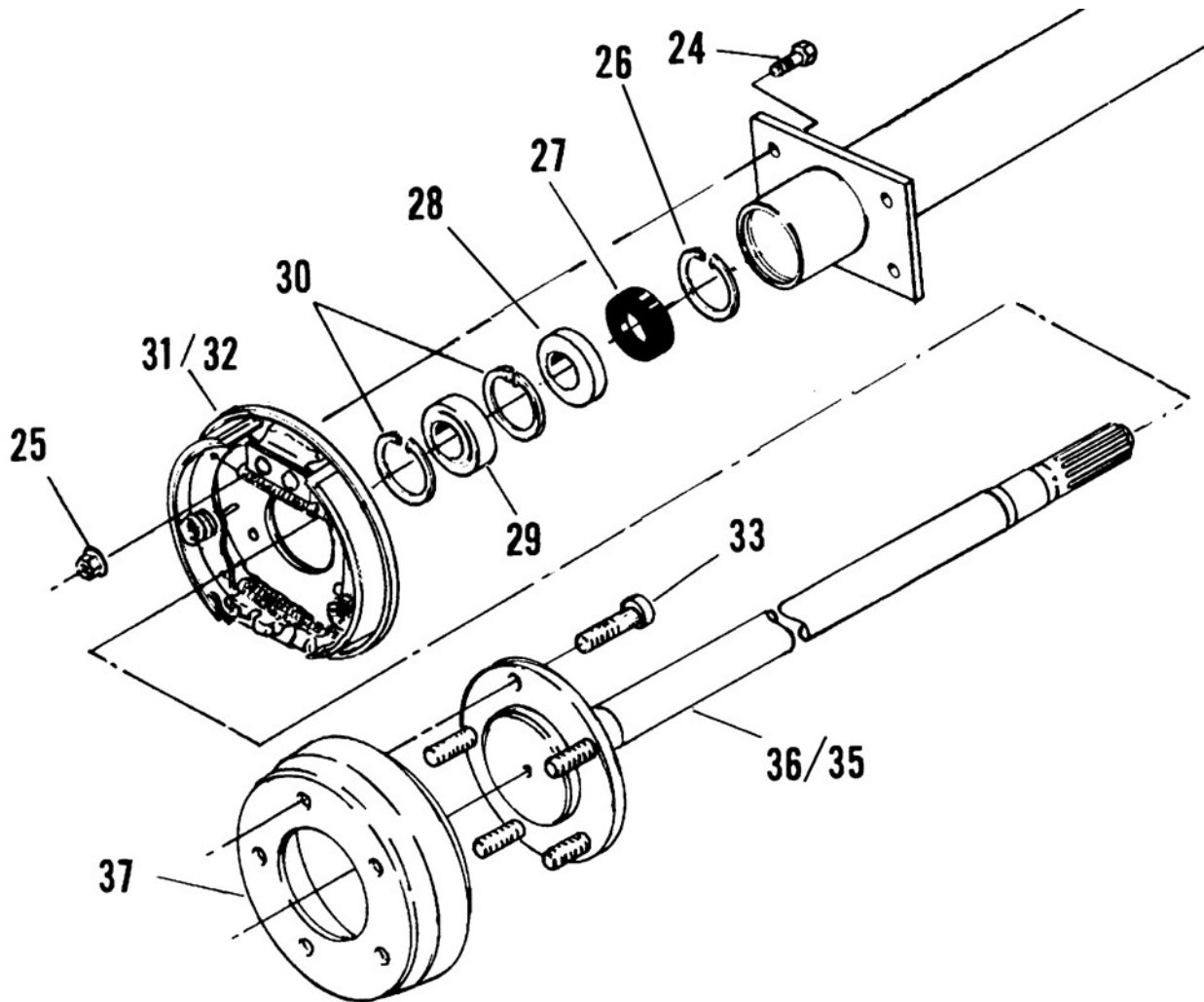


Transmission (Dana Spec# 012AJ308-1)			
ITEM #	PART #	DESCRIPTION	QTY
	4C-100-00	Complete Transmission Assembly Including Brakes	
1	Special order	Housing	1
2	-	Carrier bearing cap, included with #1	2
3	96-330-10	Carrier bearing cap bolt	4
4	66-610-04	Carrier assembly	1
5	**	Final Gear	1
6	*	Final gear bolt	4
7	*	Final gear nut	4
8	80-480-00	Carrier bearing	2
9	**	Intermediate shaft	1
10	80-715-00	O-ring	2
11	66-610-35	Intermediate shaft bearing	2
12	**	Input shaft	1
13	80-480-10	Input shaft bearing	1
14	80-715-10	O-ring	1
15	80-480-15	Input shaft bearing	1
16	88-840-12	Snap ring	1
17	41-973-00	Bore plug	1
18	***	Cover plate	1
19	41-127-94	Fill plug	1
20	66-610-68	Cover screw	10
**	*	Gear kit, includes #5, 9 and 12	
***	41-127-64	Cover plate kit, includes #18 and 19	

* - Not available at time of printing



Rear Axle and Brakes

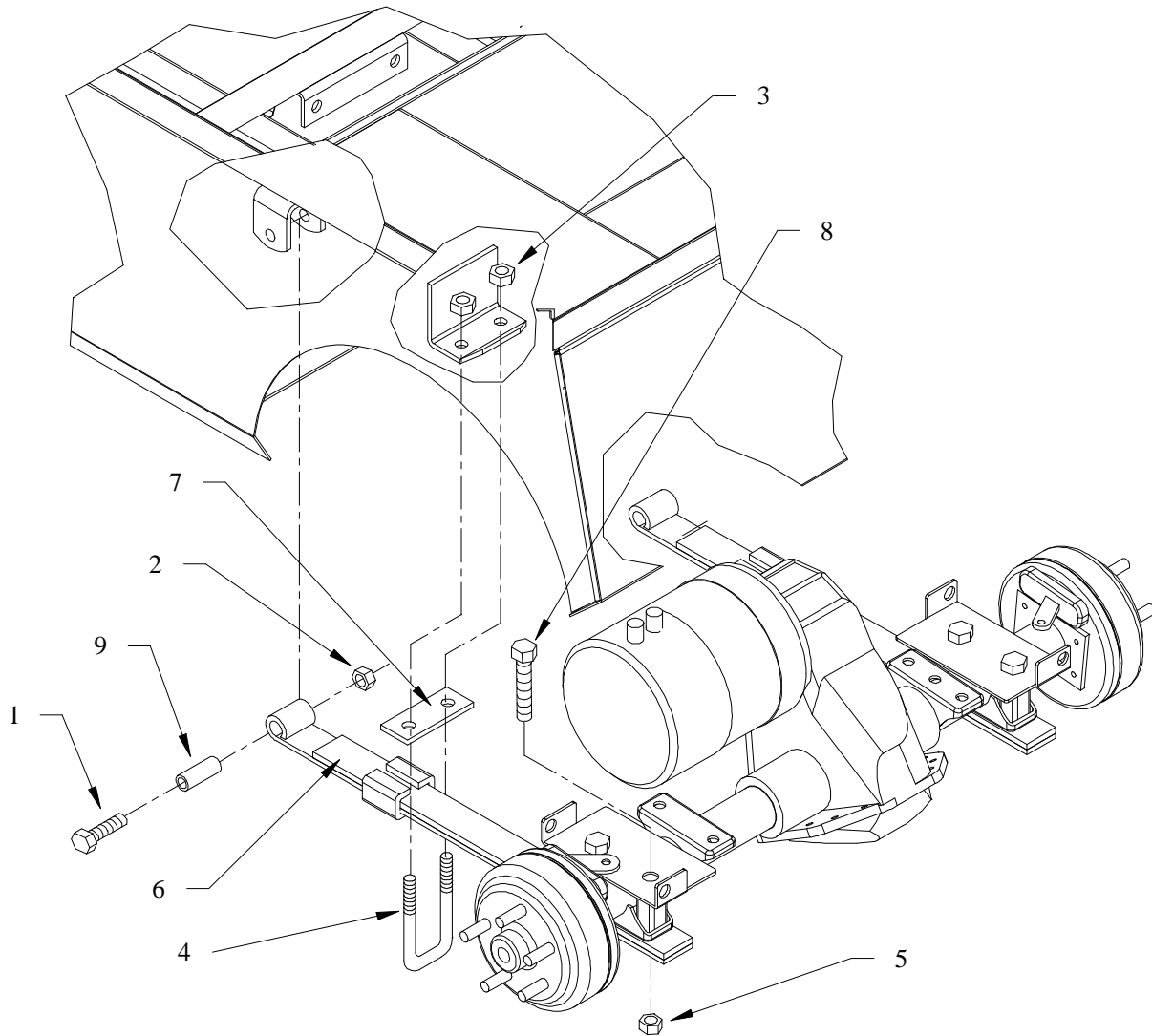


Rear axle and Brakes (Dana Spec# 012AJ308-1)			
ITEM #	PART #	DESCRIPTION	QTY
24	66-611-00	Axle bolt	8
25	66-610-97	Axle nut	8
26	66-611-10	Retaining ring	2
27	45-303-40	Oil seal	2
28	66-611-11	Retaining ring	2
29	66-611-12	Axle bearing	2
30	66-611-13	Snap ring	4
31	41-344-98	Brake assembly (L)	1
32	41-344-99	Brake assembly (R)	1
33	66-611-14	Wheel stud	10
35	41-126-96	Axle shaft (L)	1
36	41-126-97	Axle shaft (R)	1
37	41-519-00	Brake drum, 5.70 x 8 one piece wheels	2
	*	Brake drum, 8.50 x 8 and spit rim wheels	
Not Shown	*	Brake shoe kit	2
	*	Brake spring kit	2

*- Not available at time of printing



Rear Suspension



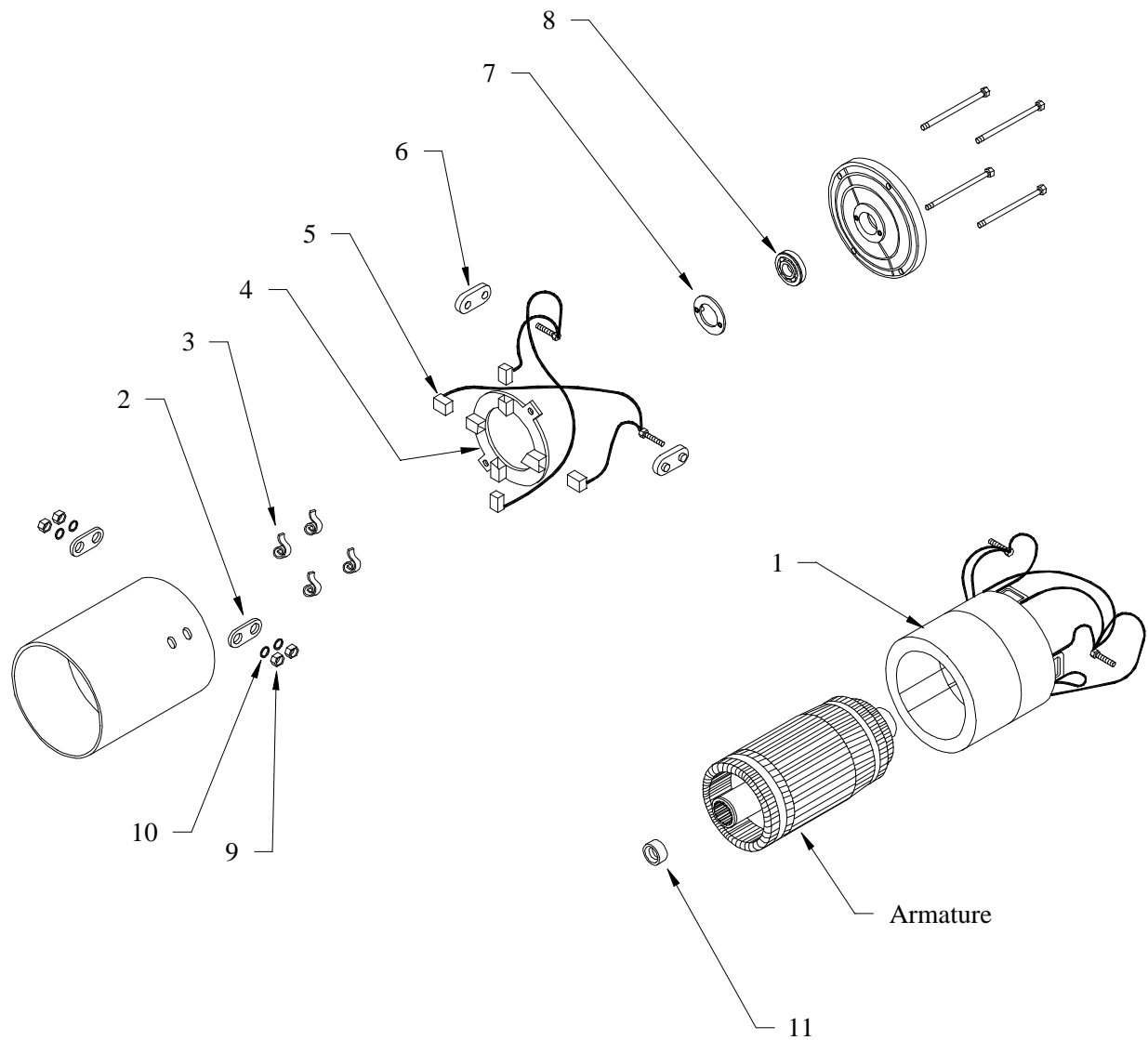


Rear Suspension			
ITEM #	PART #	DESCRIPTION	QTY
1	96-248-00	9/16NF x 3 Bolt	2
2	88-169-82	9/16NF Hex lock nut, grade C	2
3	88-149-81	1/2NC Hex lock nut	4
4	96-120-00	1/2NC x 1-7/8 x 2 U-bolt	2
5	88-149-81	1/2NC Hex lock nut	4
6	85-506-15	Leaf spring	2
7	01-110-32	Spacer	2
8	88-140-25	1/2NC x 4-1/2 Hex bolt	4
9	32-213-00	Spring eye bushing	2





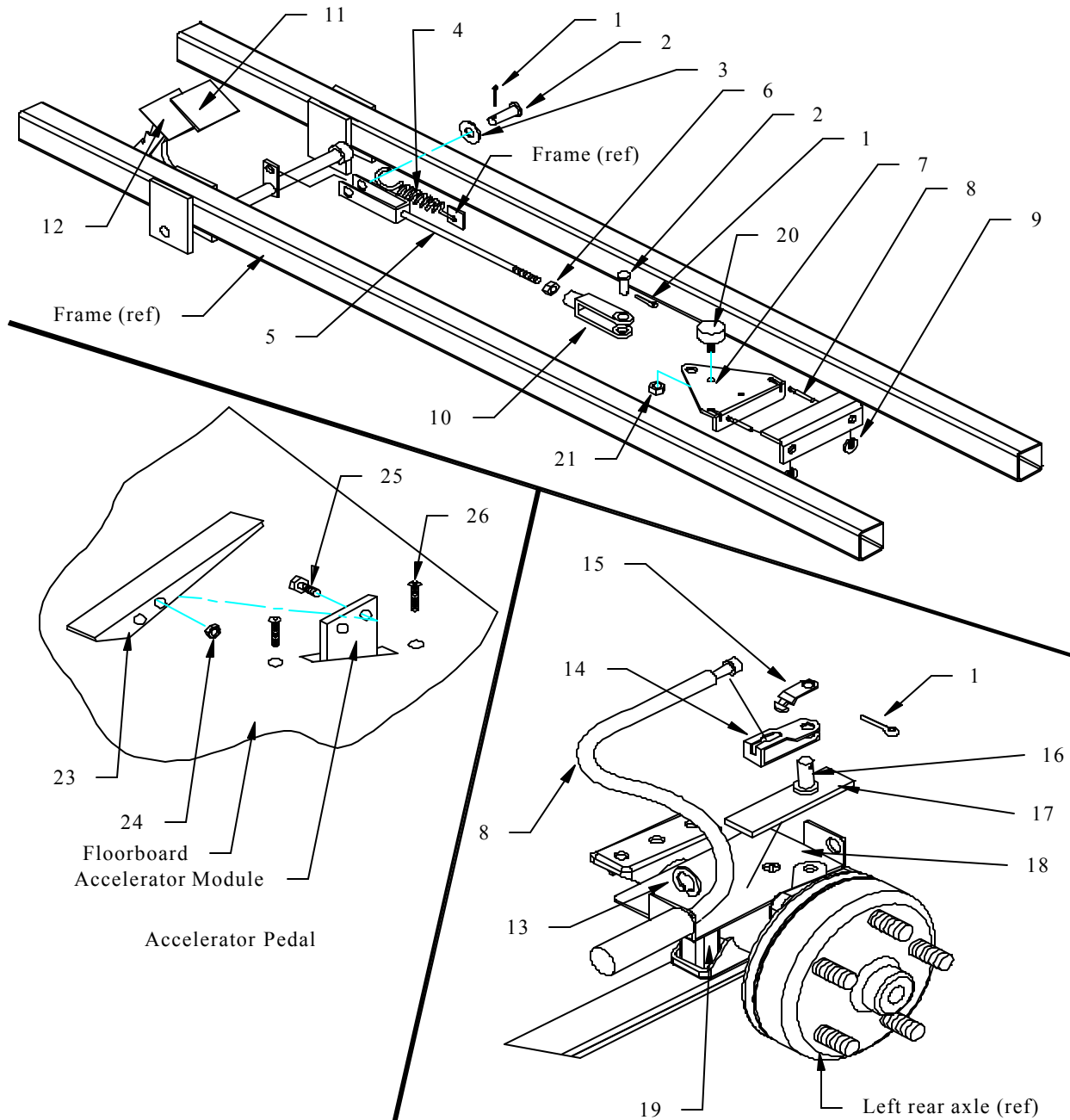
Motor



Motor GE spec# 5BC58JBS6129A			
ITEM #	PART #	DESCRIPTION	QTY
	70-049-05	Complete motor assembly (does not include #11)	
1	70-201-15	Field coils (mounted in motor housing)	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	Motor brush (2)	2
6	70-210-51	Insulator	2
7	32-508-15	Bearing retainer	1
8	80-209-00	Bearing	1
9	88-089-91	5/16NC Jam nut	4
10	88-088-61	5/16 SAE Flat washer	4
11	70-049-06	Bushing spacer	1

NOTE: The armature is not available seperatly

Brake/Accelerator Linkage



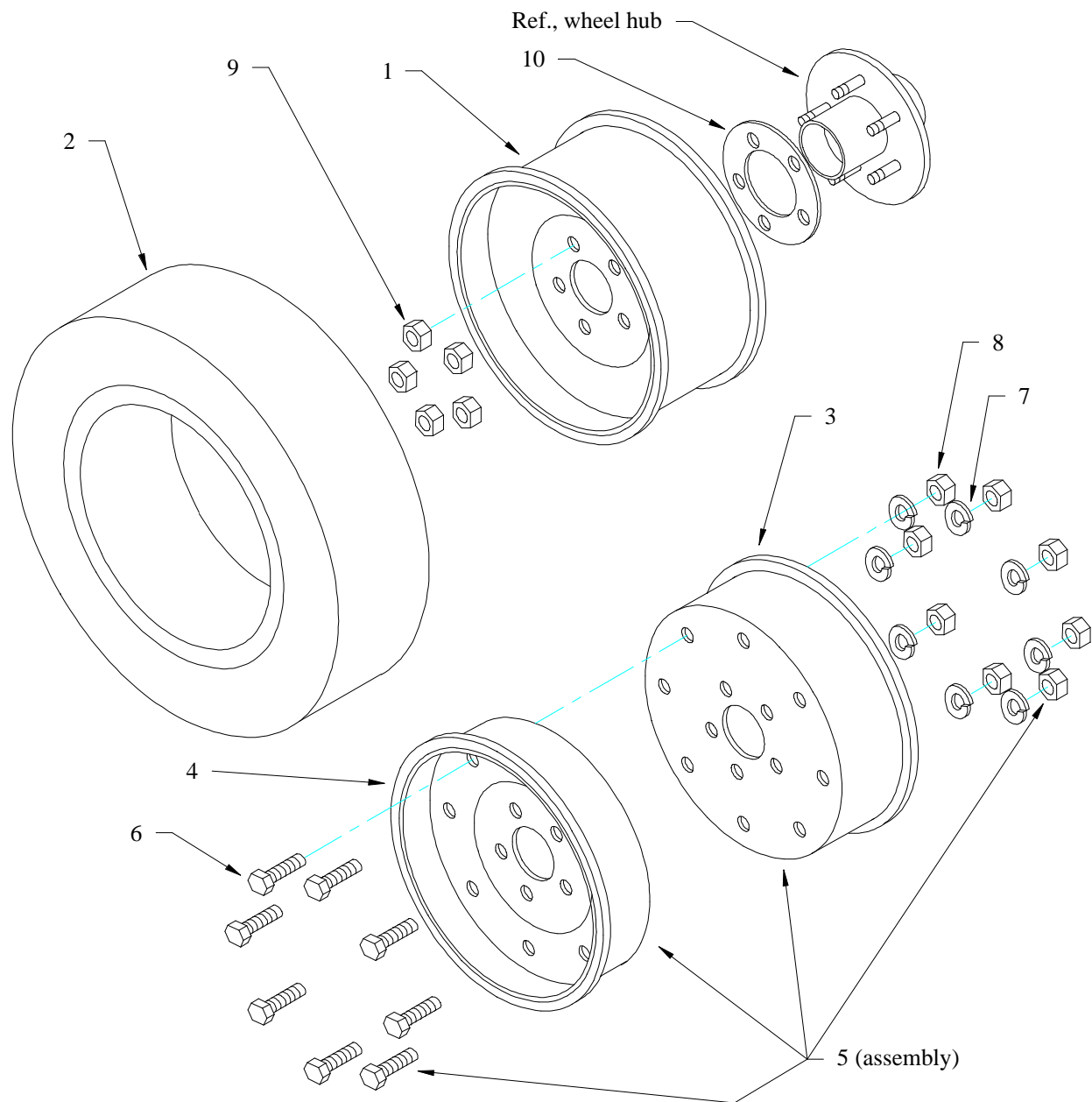


Brake/Accelerator Linkage			
ITEM #	PART #	DESCRIPTION	QTY
1	88-517-11	3/32 x 1 cotter pin	4
2	96-772-00	3/8 x 1-1/8 Clevis pin	1
3	88-106-61	3/8 SAE Flat washer	1
4	85-233-00	Spring	1
5	96-820-01	Cable	1
6	Included with #8	Hex nut	1
7	01-110-22	Equilizer	1
8	96-826-12	Brake cable	2
9	88-847-06	E-Ring	2
10	Included with #8	Clevis	1
11	98-200-00	Brake pedal pad	1
12	02-536-09	Brake pedal	1
13	88-847-08	5/8 E-Ring	2
14	96-754-00	Clevis	2
15	96-826-09	Cable lock	2
16	96-773-00	5/16 x 1 Clevis pin	2
17	98-451-11	Foam tape	2 x 6"
18	01-110-33	Brake cable bracket	2
19	01-110-34	Brake cable mount support	2
20	98-753-05	Rubber bumper (B1-00 only)	0 or 1
21	88-109-81	3/8NC lock nut (B 1-00 only)	0 or 1
22	96-771-00	3/8 x 3/4 clevis pin	1
23	01-110-20	Accelerator pedal	1
24	88-069-81	1/4NC Nylon lock nut	2
25	88-065-09	1/4NC x 3/4 Hex bolt	2
26	88-065-12	1/4NC x 3/4 Truss head bolt	2





Wheels and Tires



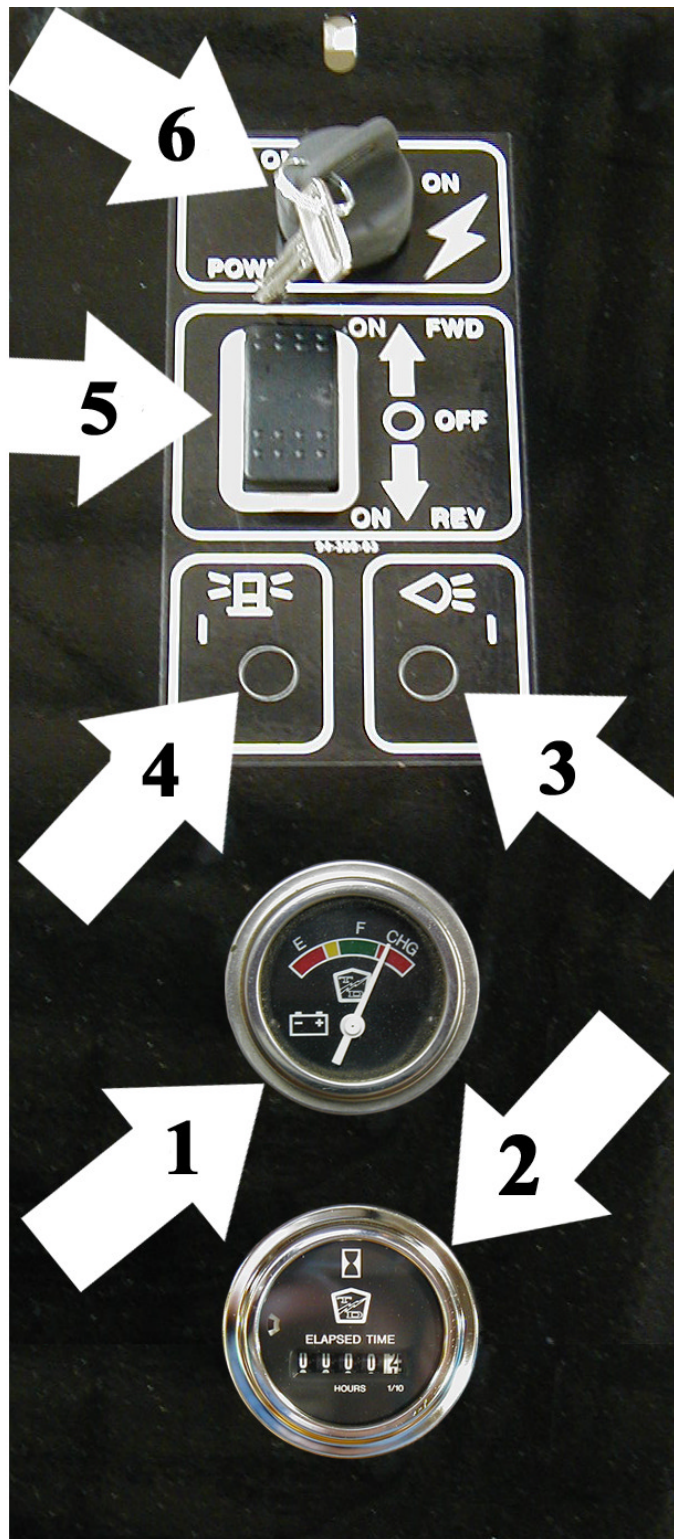


Wheels and Tires			
ITEM #	PART #	DESCRIPTION	QTY
1	Tubeless Wheels		
	12-012-00	5 x 8" Tubeless (standard)	4
	12-020-00	8.5 x 8 Tubeless	4
2	Tires		
	10-081-00	5.70 x 8 (standard)	4
	10-082-00	5.70 x 8 Extra Grip	4
	10-083-00	5.70 x 8 LR C	4
	10-093-00	8.50 x 8 LR B	4
	10-091-10	8.50 x 8 Knobby	4
	10-092-00	8.50 x 8 LR C	4
	10-086-00	5.00 x 8 Man-Toterswith lugs (soft solid)	4
	Split Rim Wheels		
3	12-041-12	Inner Wheel (2.5 bead)	4
4	12-041-13	Outer Wheel (2.5 bead)	4
5	12-041-00	Wheel Assembly, 2.5 bead width (includes #3, #4, #6, #7, #8)	4
3a	12-042-12	Inner Wheel (12-bolt)	4
4a	12-042-13	Outer Wheel (12-bolt)	4
5a	12-042-00	Wheel Assembly, 3.75 bead width (includes #3a, #4a, #6, #7, #8)	4
6	88-110-09	3/8 x 3/4-NF Hex Bolt, grade 5	4
7	88-109-62	3/8 Split Lock Washer	4
8	88-119-80	3/8-NF Hex Nut	4
9	97-236-00	Wheel Nut	20
Not Shown	13-989-00	Valve stem, tubless tire only	
Not Shown	11-041-00	8.50 x 8 Tube	
Not Shown	11-040-00	5.70 x 8 Tube	
	Tire and Wheel Assemblies		
	13-742-00	5.70 x 8 (standard)	4
	13-742-40	5.70 x 8 Man-Toter	
	13-742-11	5.70 x 8 Split Rim	
	13-746-10	8.50 x 8	
10	16-051-00	Spacer, used on rear 8.50 x 8 and split rim wheels only	0 or 2



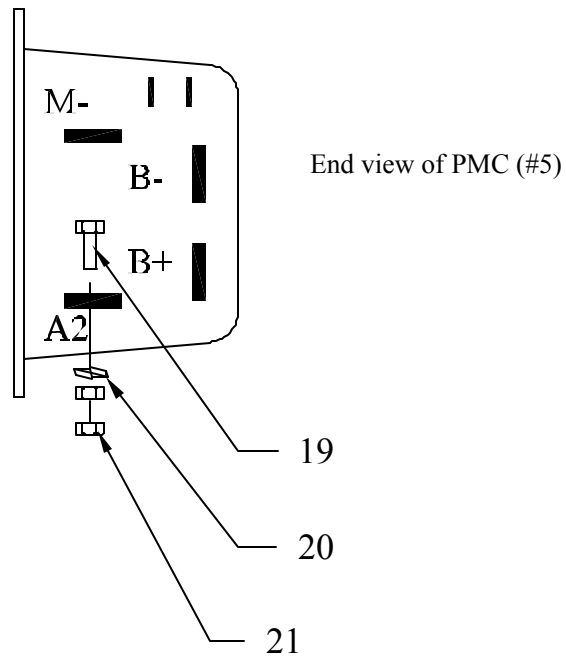
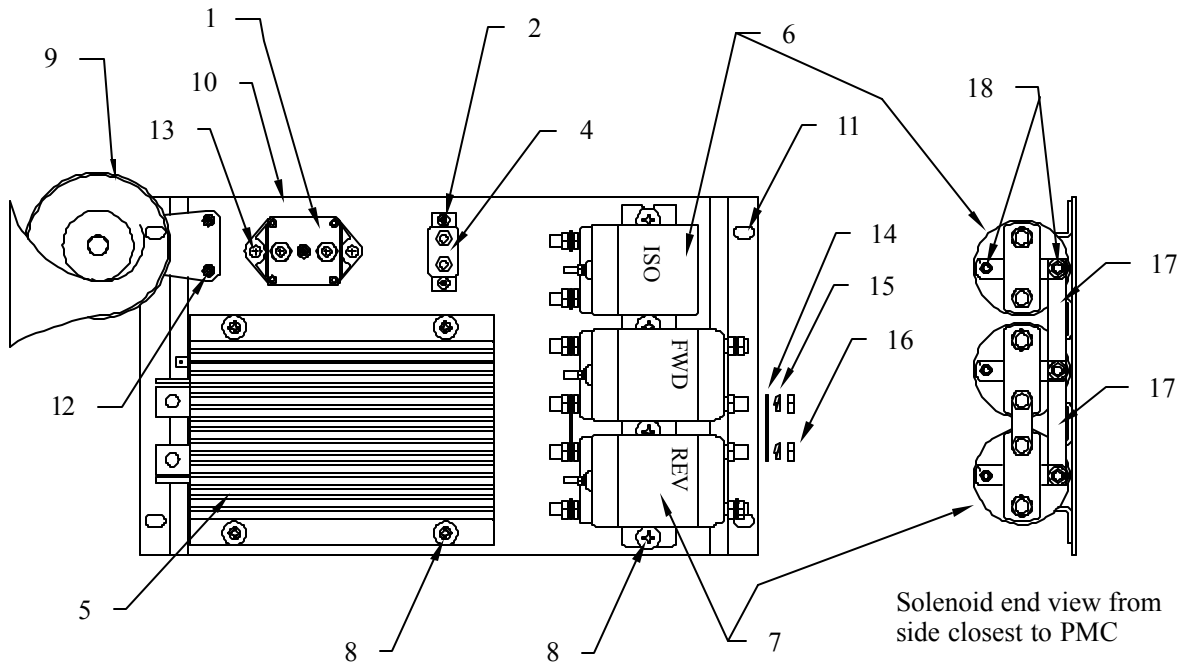


Instrument Panel



Instrument Panel			
ITEM #	PART #	DESCRIPTION	QTY
1	74-009-00	Battery status indicator	1
2	74-000-00	Hour meter	1
3	71-100-00	Accessory switch	1
4	71-100-00	Accessory switch	1
5	71-039-02	Forward and reverse switch	1
6	71-120-10	Key switch	1
-	01-110-30	Mounting plate	1
-	94-386-03	Mounting plate decal	1
Not shown	88-065-09	1/4NC x 3/4 Phillips truss head bolt (Mounting plate bolt)	2
Not shown	97-211-20	Mounting plate nut	2

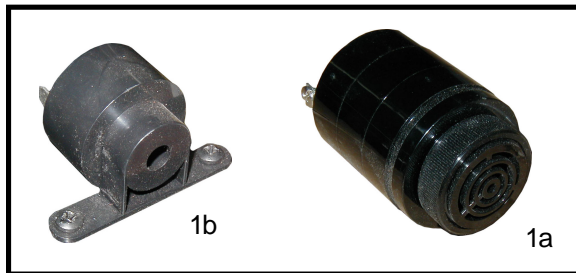
Speed Control Panel



Speed Control Panel			
ITEM #	PART #	DESCRIPTION	QTY
1	79-844-00	Circuit breaker	1
2	88-818-06	#8 x 1/2 Pan head screw, type B thread	6
3	79-840-00	Circuit breaker	1
4	79-840-20	Circuit breaker	2
5	62-204-00	PMC speed control	1
6	72-501-36	ISO Solenoid (SPST), includes #15, 16 and 18	1
7	72-501-37	Forward or Reverse solenoid (SPDT, includes #15, 16 and 18	2
8	88-838-06	#14 x 1/2 Pan head screw, type D thread	8
9	73-004-20	Horn	1
10	01-110-35	Mounting panel	1
11	97-211-20	14NC U-nut	4
12	88-838-06	#14 x 1/2 Pan head screw, type D thread	2
13	88-817-09	#8 x 3/4 Phillips head sheet metal screw	2
14	61-838-41	Buss bar	2
15	88-088-62	5/16 Split lock washer	10
16	88-099-91	Hex thin pattern nut	10
17	61-838-42	Buss bar	2
18	88-049-80	10-32 Hex nut	6
18a	88-048-62	#10 Split lock washer	6
19	88-080-11	5/16NC x 1 Hex bolt	4
20	88-088-62	5/16 Split lock washer	4
21	88-089-80	5/16NC Hex nut, stainless steel	4
Not shown	03-110-01	Splash gaurd, B 1-00 uses 1, B 1-25 uses 2	1 or 2
Not shown	78-302-50	ISO resistor assembly	1
Not shown	75-224-10	Jumper with diode	1



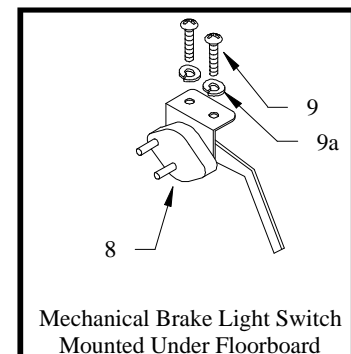
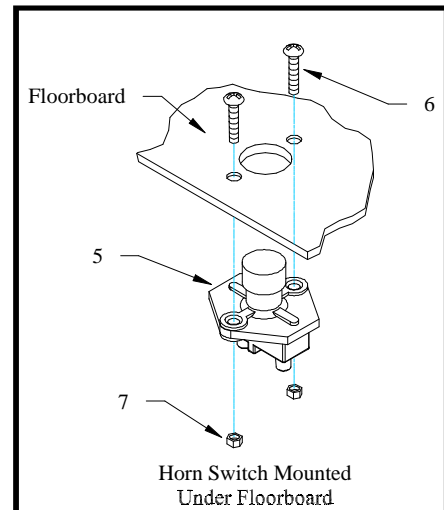
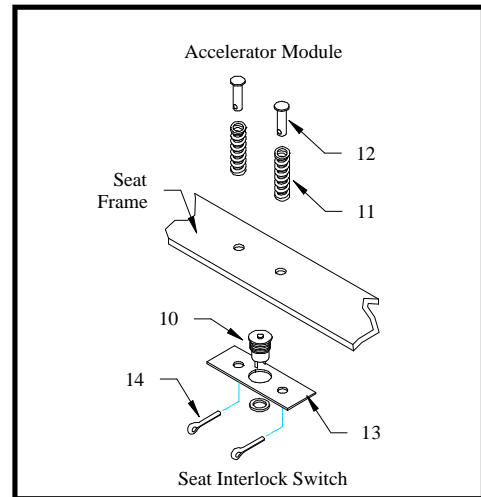
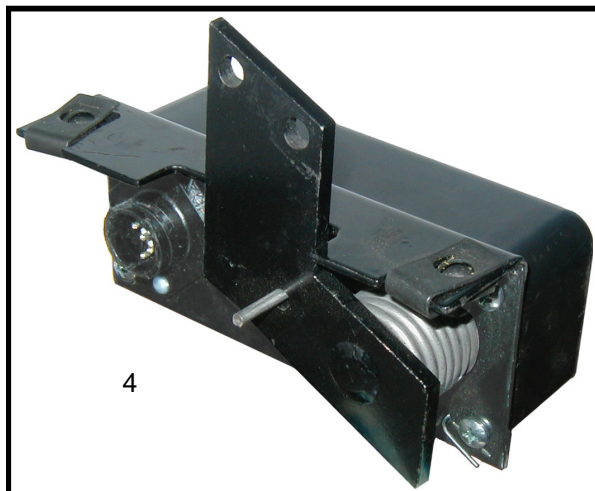
Miscellaneous Electrical



Motion Alarms



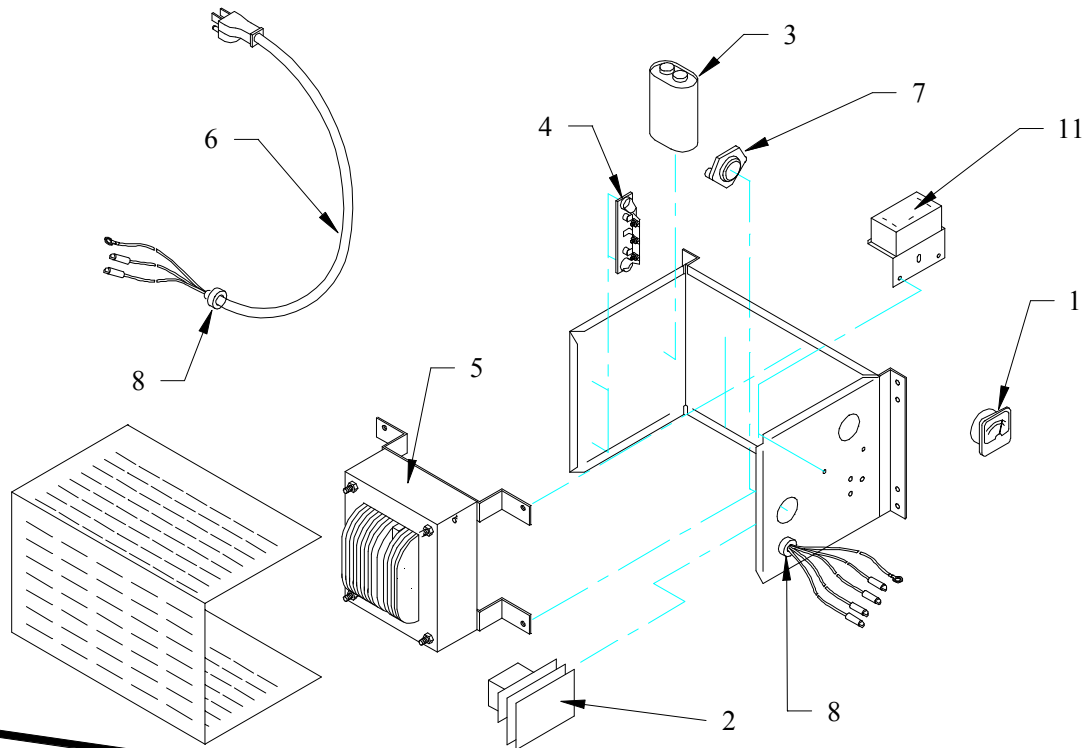
Miscellaneous Wire Harness Clamps



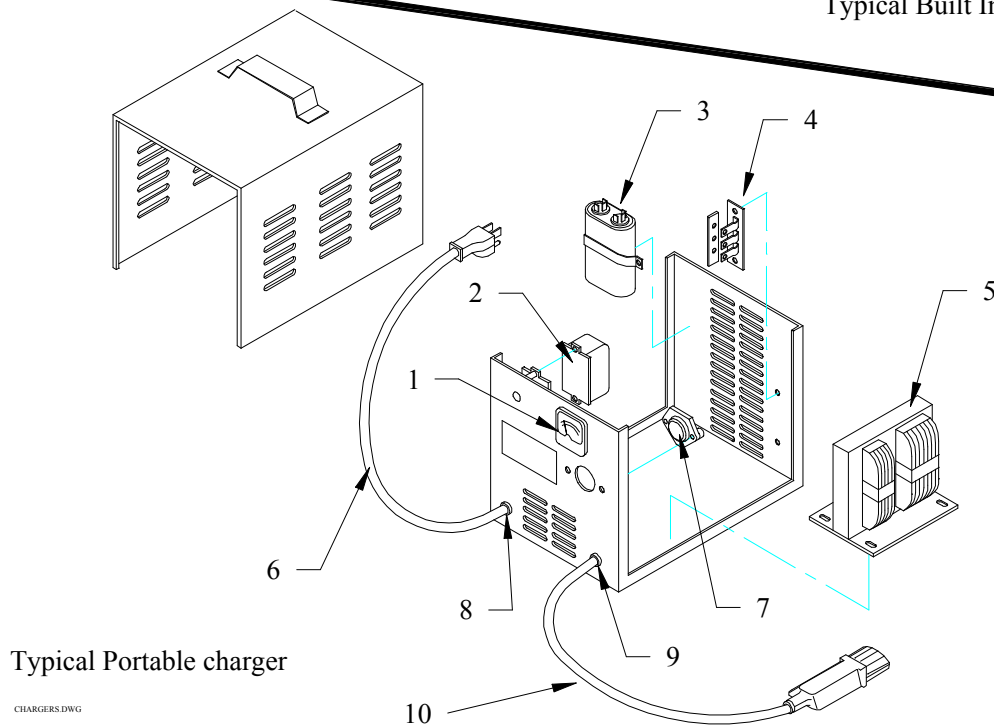
Miscellaneous Electrical			
ITEM #	PART #	DESCRIPTION	QTY
Not Shown	75-148-06	Chassie vontrol harness	1
Not Shown	75-149-85	Power harness	1
Not Shown	98-599-15	Plastic grommet for 1.75 hole	-
Not Shown	98-599-20	Plastic grommet for 2.5 hole	-
Not Shown	95-917-00	Plastic plug for 7/8 hole	-
Not Shown	75-166-36	Headlight harness	1
Not shown	98-603-00	Rubber grommet, 3/8 ID for 1/2 to 9/16 hole	-
Not Shown	75-107-10	Potratble charger harness	1
Not Shown	76-013-00	Portable charger receptacle	1
Not shown	79-306-23	Charger interlock module, 230-volt	0 or 1
1a	73-005-05	Reverse warning alarm	0 or 1
1b	73-005-01	Reverse warning alarm	0 or 1
2	96-650-01	Wire harness clip, stick on	-
3	96-642-00	Wire harness 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 headsScrew, 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	2
9a	88-048-62	#10 Split lock washer	2
10	71-102-10	Seat interlock switch	1
11	85-030-00	Spring	2
12	96-773-10	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 ID	-
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	-



Lester Charger



Typical Built In charger



Typical Portable charger

CHARGERS.DWG



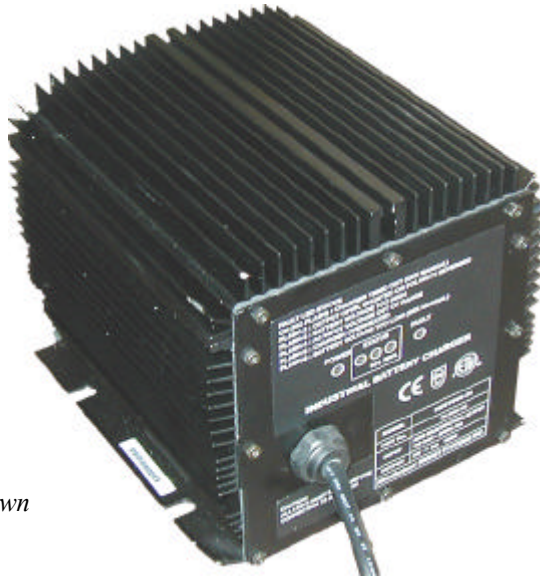
CHARGERS											
ITEM #	DESCRIPTION	Charger Model # Charger Part #									
		22740 79-303-15	7710-32 79-305-20	11860 79-304-65E	22640 79-303-20	9695 79-309-00	1C4820 79-307-98	9475-31 79-306-21			
	Charger Type	36LC25-8ET	36LC25-8ET	36LC25-8ET	36LC40-8ET	48LC25-8ET		36LC40-8ET			
1	Ammeter	-	79-851-10	79-851-10	79-852-00	79-851-10	-	79-852-00			
2	Timer/Circuit Board	79-805-67	79-805-69	79-805-72	79-805-67	79-805-65	S/O	79-805-67			
3	Capacitor	79-902-00	79-902-00	79-902-00	79-902-00	79-902-00	-	79-902-00			
4	Diode Assembly	79-749-13	79-749-13	79-749-11	79-749-10	79-749-13	S/O	79-749-10			
5	Transformer	79-644-31	S/O	S/O	S/O	S/O	S/O	S/O			
6	AC Cord	79-575-30	S/O	79-575-26	79-575-30	79-575-10	S/O	79-575-10			
7	Fuse Assembly	79-831-00	79-831-00	79-831-00	79-831-10	79-831-00	S/O	79-831-00			
8	Strain Relief	79-530-00	79-531-00	79-530-00	79-530-00	79-730-00	S/O	79-530-00			
9	Strain Relief	-	79-530-00	-	-	79-730-00	S/O	79-531-00			
10	DC Cord	-	79-566-10	-	-	79-566-10	-	S/O			
11	Interlock Relay	79-809-60	-	79-306-23	79-809-50	-	-	-			
-	Replacement AC Plug	76-200-00	76-200-00	-	76-200-00	76-200-00	76-200-00	76-200-00			

S/O = Special Order





Signet Charger



Model HBS series charger shown

Model HBS for Flooded Batteries

PART #	DESCRIPTION
*	24 volt Charger Assembly (see note)
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
*	24 volt Charger Assembly (see note)
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

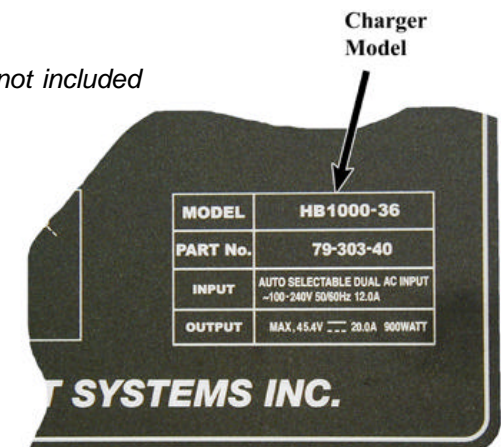
NOTE: There are no user serviceable components inside the charger

*NOTE: The charger AC cord is an integral 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.

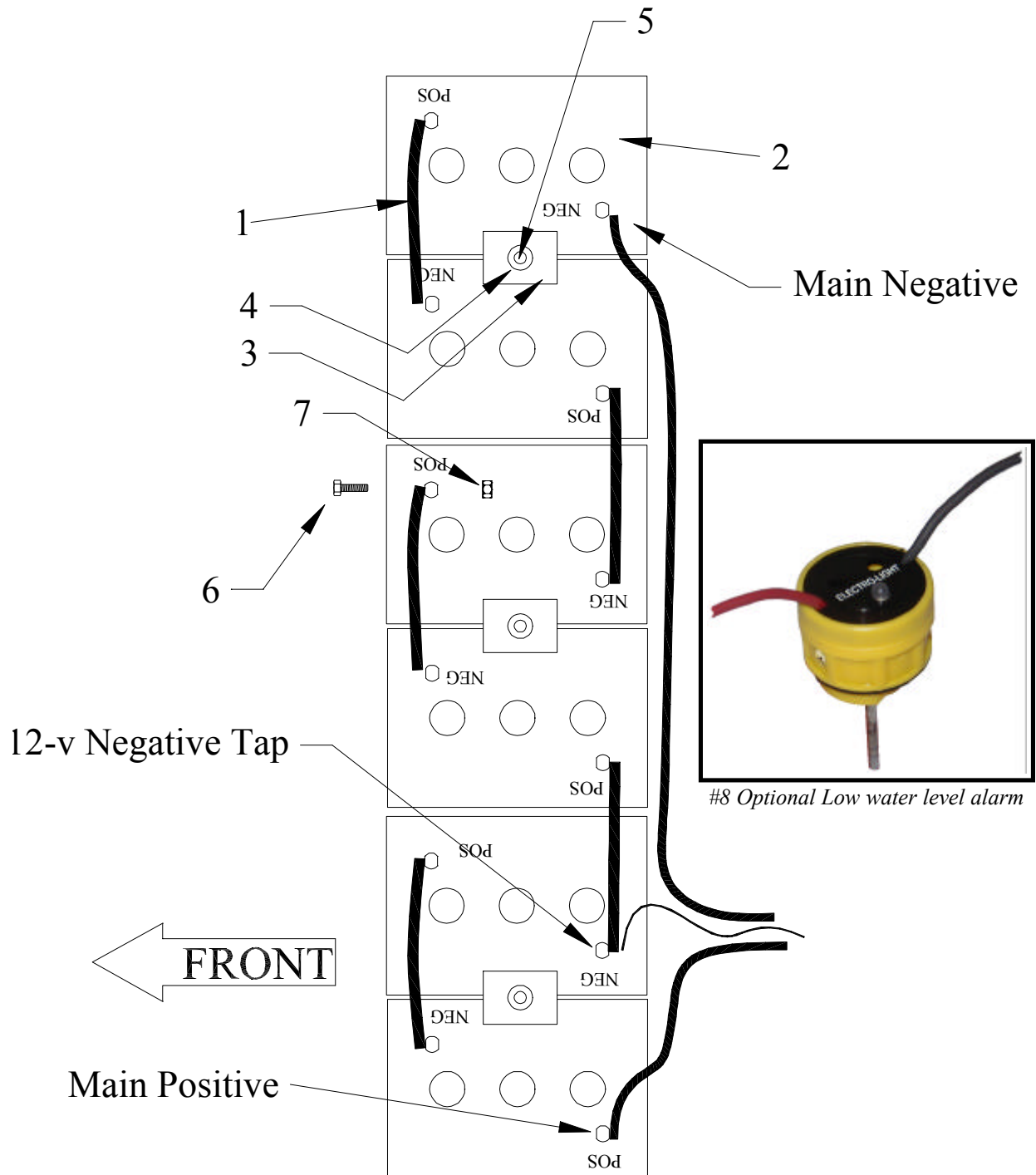
QTY	PART #	DESCRIPTION
2	75-318-20	Butt splice
2	75-320-51	Knife connector
1	76-200-00	AC plug, 115v domestic



Typical Data Plate (your data plate may be different)



Batteries



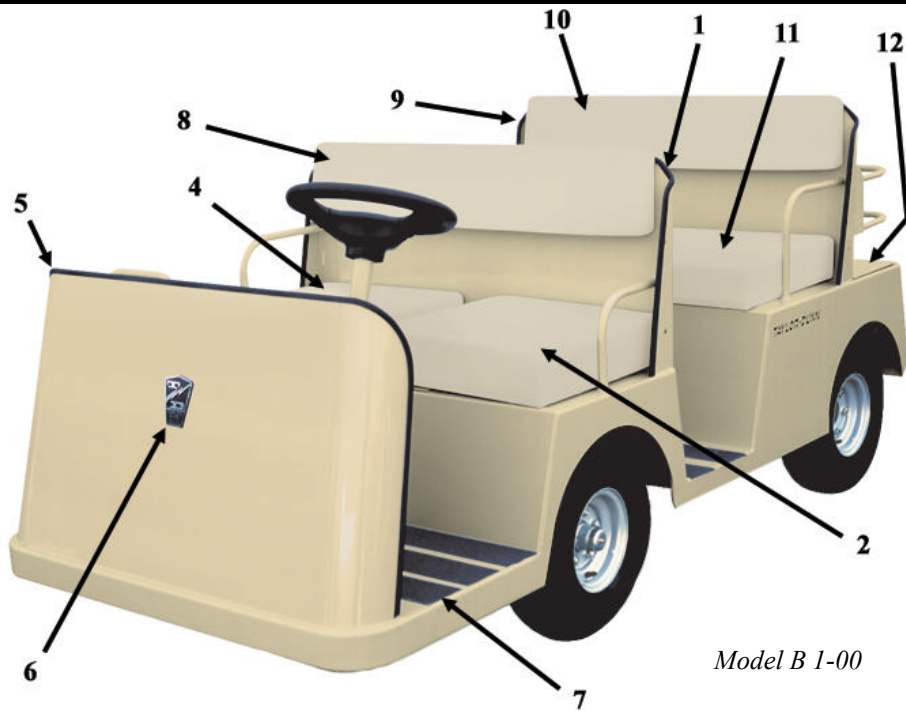


Batteries			
ITEM #	PART #	DESCRIPTION	QTY
1	75-231-00	Jumper cable	5
2	77-042-80	T105 Battery	0 or 6
2	77-042-50	TD 217 Battery	0 or 6
2	77-047-50	TD 250 Battery	0 or 6
2	77-047-00	T145 Battery	0 or 6
3	50-250-00	Bat-Loc battery hold down	3
4	88-088-66	5/16 x 1.5OD Tin/lead plated flat washer	3
5a	50-243-10	Battery rod	3
5b	88-069-81	1/4NC Nylon lock nut	3
6	88-081-12	5/16NC x 1 Hex head bolt, stainless stel	12
7	88-089-80	5/16NC Hex nut stainless steel	12
8	77-055-01	Low water level alarm	0 or 1





Seat Cushions, Lights and Deck



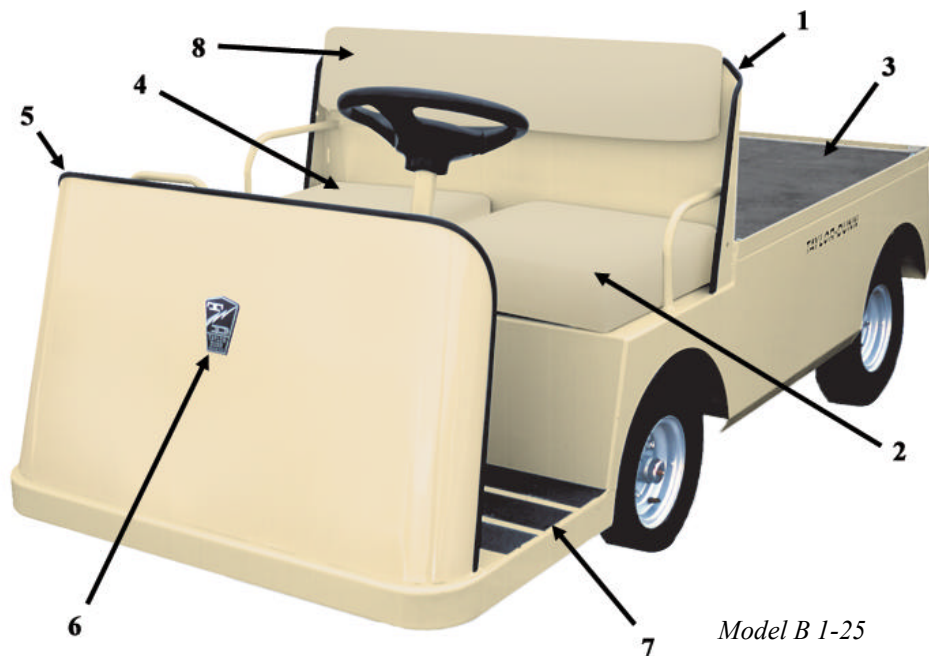
Model B 1-00



Tail light on rear panel



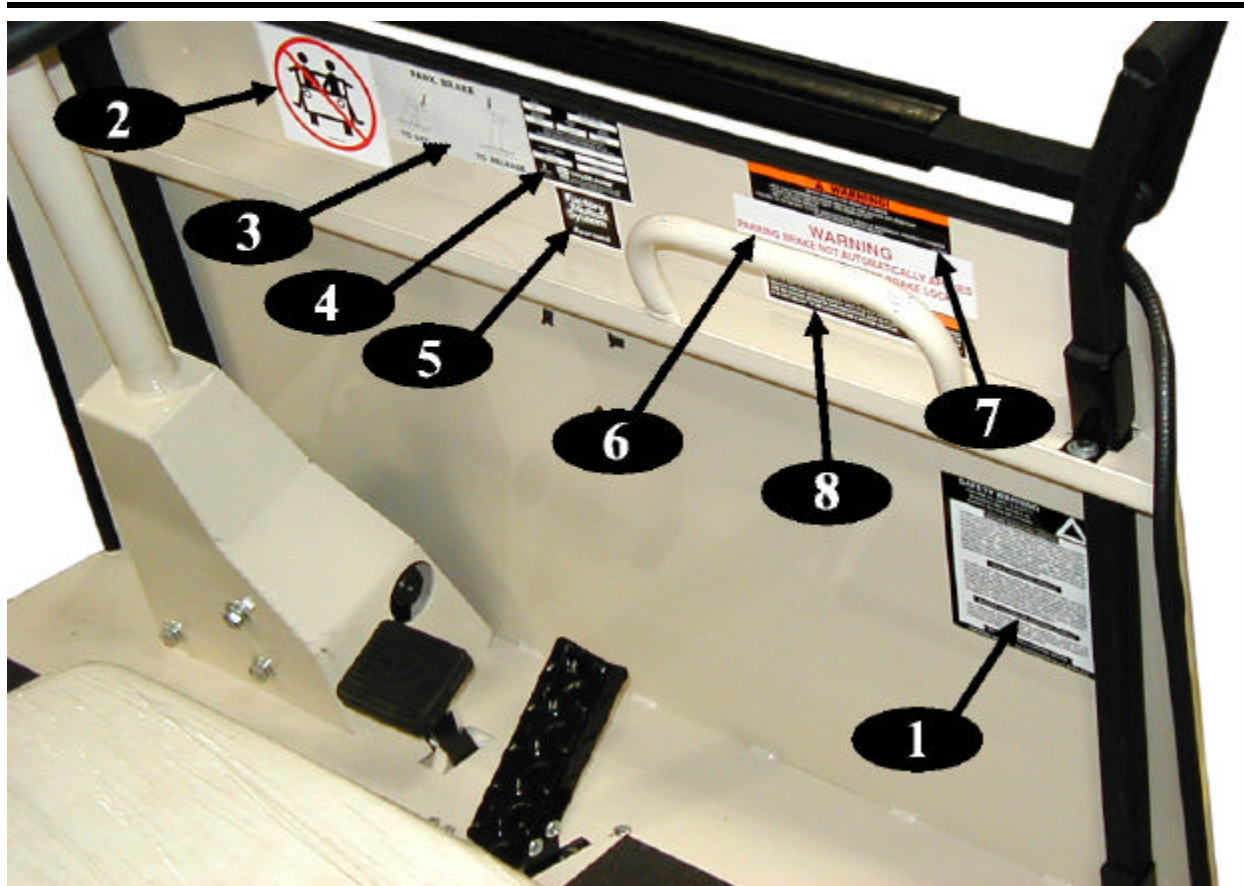
#13 Headlight assembly



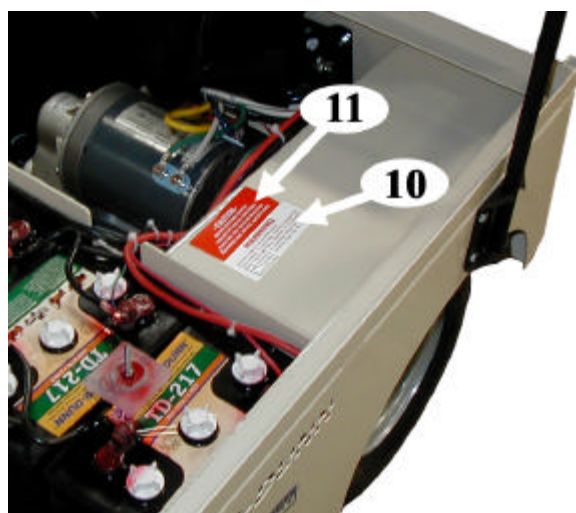
Model B 1-25

Seat Cushions, Deck and Lights			
ITEM #	PART #	DESCRIPTION	QTY
1	94-035-01	Trim strip	7'
2a	90-147-10	Seat cushion, black	0 or 1
2b	90-147-20	Seat cushion, tan	0 or 1
3	90-411-25	Deck board	1
4a	90-147-10	Seat cushion, black	0 or 1
4b	90-147-20	Seat cushion, tan	0 or 1
5	94-035-01	Trim strip	11'
6	94-201-00	T/D Emblem	1
Not shown	88-567-91	Push clips for #6	3
7	98-240-04	Anti skid tape	16'
8a	90-179-10	Seat back, tan	0 or 1
8b	90-179-00	Seat back, black	0 or 1
9	94-035-01	Trim strip	7'
10a	90-179-10	Seat back, tan	0 or 1
10b	90-179-00	Seat back, black	0 or 1
11a	90-134-10	Bench seat, Tan	0 or 1
11b	90-134-05	Bench seat, black	0 or 1
12	01-110-16	Cover plate	1
Not shown	88-837-09	Seat back screws	6 or 12
13	72-005-00	Headlight assembly (includes a, b, c, d, e and bracket)	1
13a	88-089-80	5/16NC Hex nut	2
13b	88-088-62	5/16 Split lock washer	2
13c	88-080-16	5/16NC x 2 Hex bolt	1
13d	88-082-09	5/16NC x 5/8 Carriage bolt	1
13e	72-072-00	Replacement bulb	1
14	72-022-00	Tail light (includes #15 and #16)	1
15	72-022-51	Tail light gasket	1
Not shown	72-022-52	Tail light pigtail	1

Decals



Front Cowl Decals

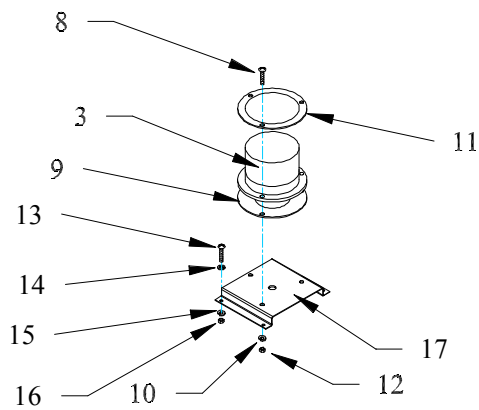
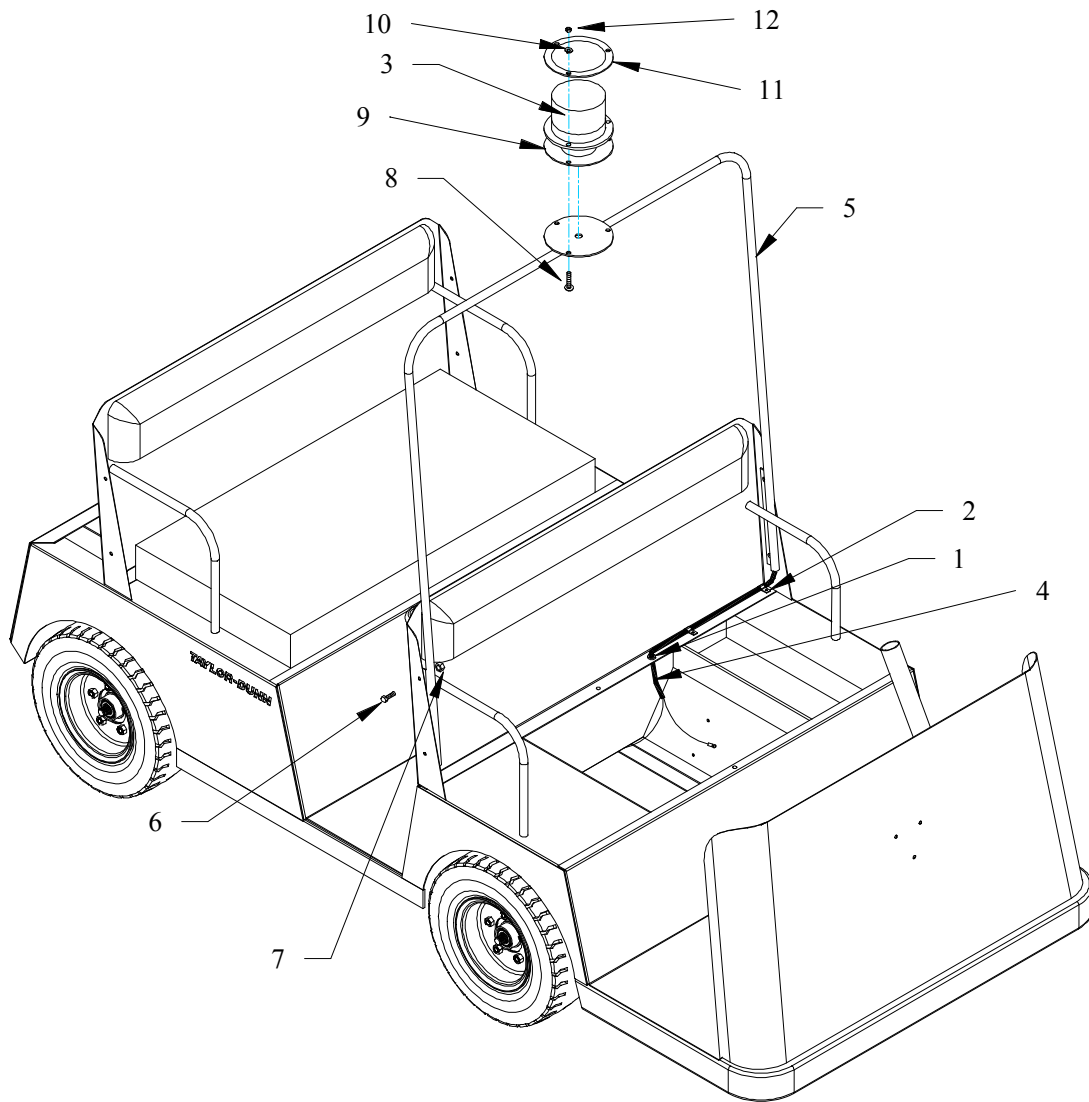


Left Rear Wheel Well

Decals			
ITEM #	PART #	DESCRIPTION	QTY
1	94-313-20	Safety warnings	1
2	94-301-42	Keep arms and legs inside	1
3	94-384-00	Apply park brake	1
4	* 94-373-10	Vehicle data plate	1
5	94-333-00	FM approved	1
6	94-309-00	Brake warning	1
7	94-384-14	Turn key off	1
8	94-384-01	Not a motor vehicle	1
9	-	-	1
10	94-319-00	Battery disconnect	1
11	94-313-00	Battery warning	1
Not shown	94-301-50	Cary Master decal, B 1-25 only	2



Strobe Light



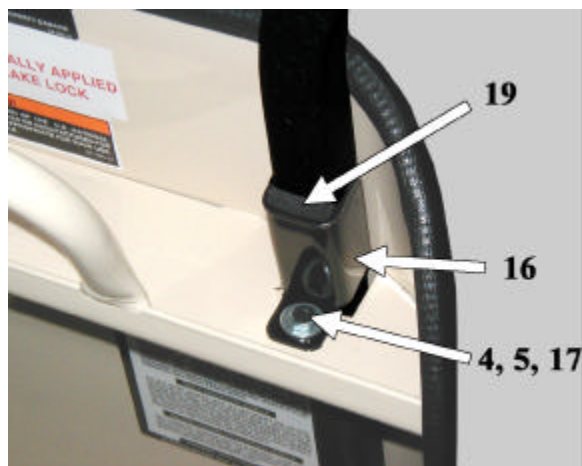
Mount for Strobe Light on Sun Top

Strobe Light			
ITEM #	PART #	DESCRIPTION	QTY
1	98-603-00	Grommet	1
2	96-624-00	Wire clip	2
Not shown	88-737-09	Pop rivet for #2	2
3	72-023-20	Strobe light assembly (includes #9 and #11)	1
Not shown	72-023-21	Flash tube for #3	
Not shown	72-023-22	Amber lens for #3	
Not shown	72-023-23	Red lense for #3	
4	75-110-10	Harness	1
5	91-028-67	Pole	1
6	88-065-13	1/1NC x 1-1/4 Phillips head truss screw	4
7	88-069-82	1/4NC NC lock nut	4
8	88-025-08	8-32 x 5/8 Machine screw	3
9	Included in #3	Gasket	
10	88-028-62	#8 Split lock washer	3
11	Included in #3	Metal ring	
12	88-029-80	#8 Hex nut	3
13	*88-065-08	1/4NC x 5/8 Phillips Truss head screw	4
14	88-068-61	1/4 SAE flat washer	4
15	88-068-62	1/4 Split lock waser	4
16	88-069-83	1/4NC Acorn nut	4
17	72-023-27	Mounting bracket for sun top	1

**-Seal 1/4" hardware with 94-400-02 sealant to prevent leaks through the sun top*



Sun Top and Windshield

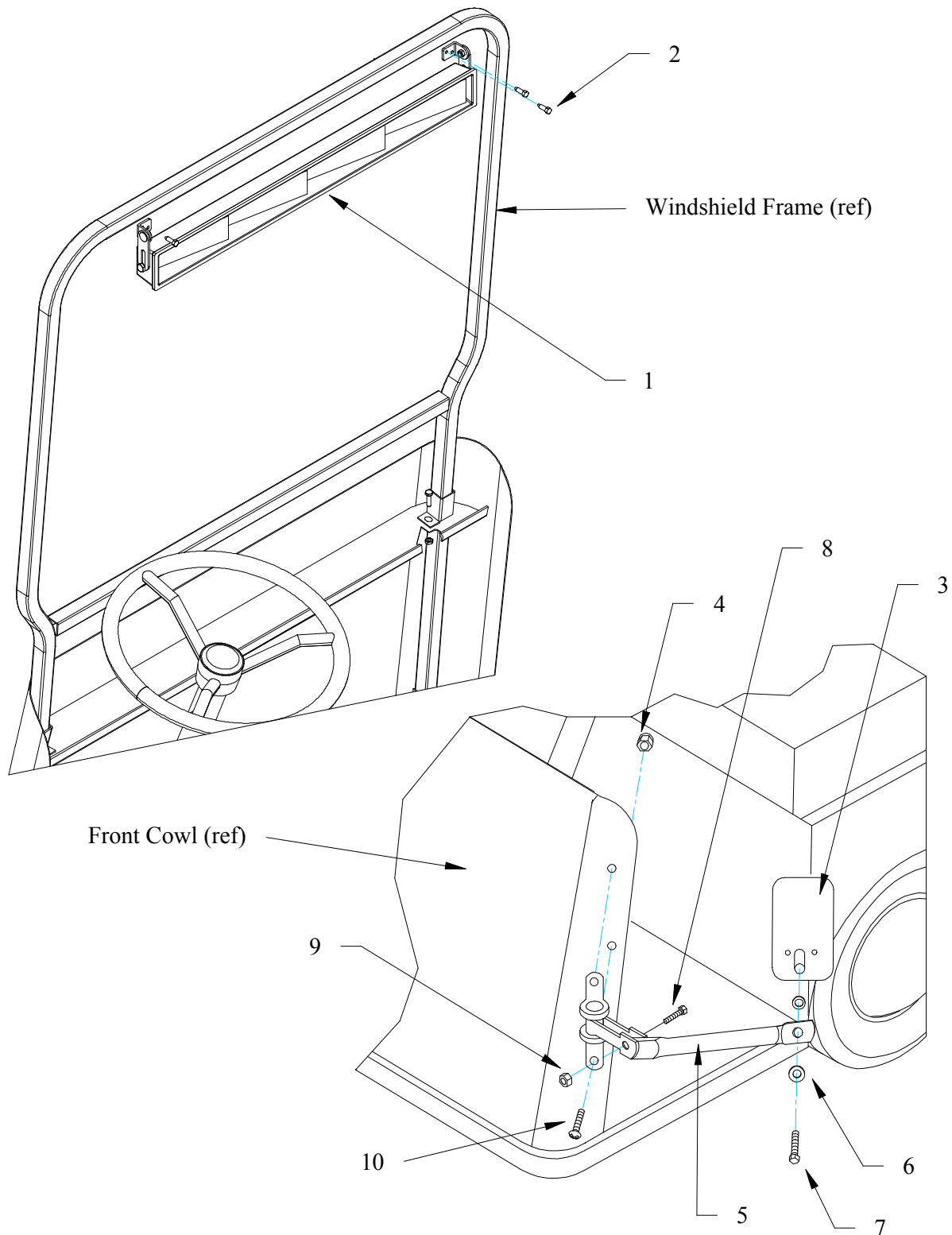


*Windshield mounting bracket (1 of 4)
Top left shown*

Sun Top and Windshield			
ITEM #	PART #	DESCRIPTION	QTY
1	88-060-11	1/4NC x 1 Hex bolt	8
2	88-060-15	1/4NC x 1-3/4 Hex bolt	4
3	88-060-18	1/4NC x 2-1/2 Hex bolt	4
4	88-068-60	1/4 Cut flast washer	16
5	88-069-81	1/4NC Nylon lock nut	8
6	91-028-73	Front	1
7	91-028-75	Spacer	2
8	91-110-00	Sun top	1
9	97-211-20	1/4NC U-nut	8
10a	91-028-10	Rear support (B 125)	0 or 1
10b	91-028-73	Rear support (B 100)	0 or 1
11	88-080-11	5/16NC x 1 Hex bolt (B 125)	8
12	88-080-60	5/16 Cut flat washer (B 125)	8
13	88-089-81	5/16NC Lock nut (B 125)	8
14	90-825-71	Windshield (includes plastic brackets)	1
15	90-547-12	Windshield frame	1
16	90-810-07	Windshield frame brackets	4
17	88-060-09	1/4NC x 3/4 Hex bolt	4
18	88-828-09	#10 x 3/4 Sheet metal screw (holds plastic bracket to windshield frame)	2
19	98-454-00	Foam Tape	by the foot



Mirrors



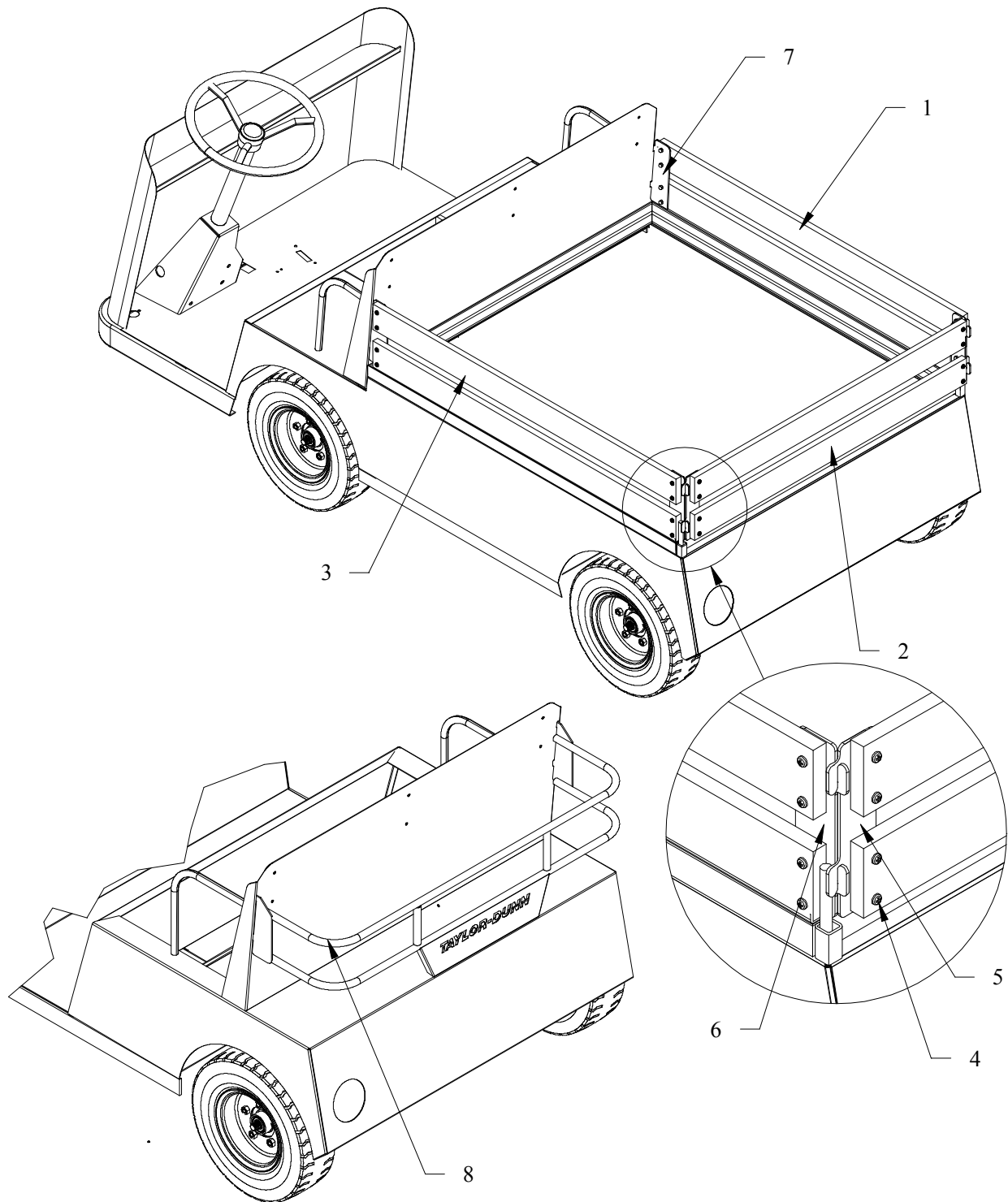


Mirrors			
ITEM #	PART #	DESCRIPTION	QTY
1	92-207-02	Multi panel mirror	1
2	88-828-09	#10 x 3/4 self drilling screw	4
3	92-201-00	Side mirror (includes #7, #6)	2
4	88-069-61	1/4NC Nylon lock nut	4
5	92-202-00	Mirror bracket (includes #8 and #9)	2
6	-	Included with #3	-
7	-	Included with #3	-
8	-	Included with #5	-
9	-	Included with #5	-
10	88-065-08	1/4NC x 5/8 Hex bolt	4





B 125 Stake Sides/B 100 Luggage Rack

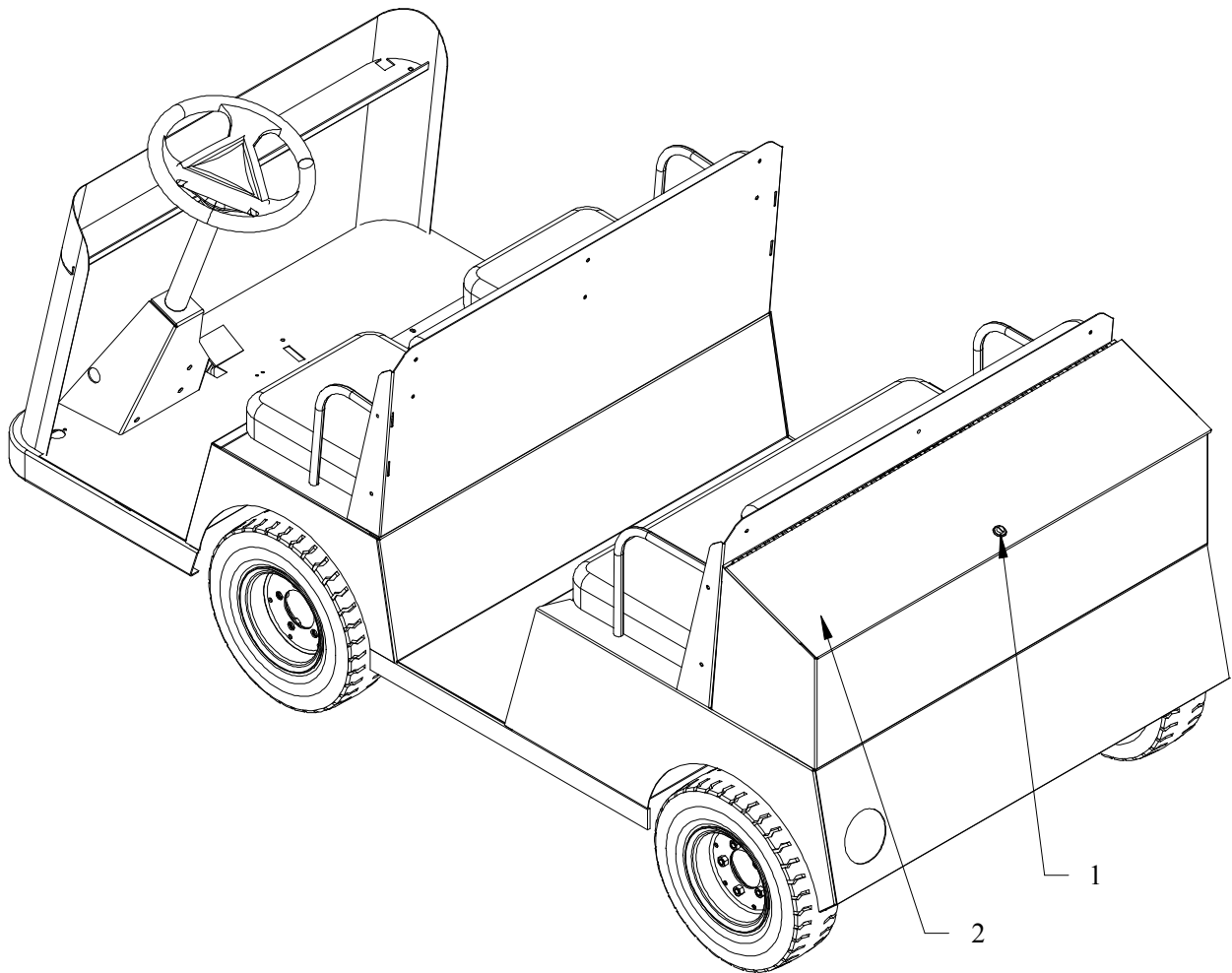


Stake Sides			
ITEM #	PART #	DESCRIPTION	QTY
1	90-547-08	Stake side, right	1
2	90-547-10	Rear gate	1
3	90-547-06	Stake side, left	1
4	88-065-13	1/4NC x 1-1/4 Truss head bolt	24
	88-069-83	1/4NC Acorn nut	24
5	90-547-04	Gate hook, rear gate	2
6	90-547-02	Gate hook, rear left	1
	90-547-03	Gate hook, rear right	1
7	90-547-00	Gate hook, front	2

Luggage Rack			
ITEM #	PART #	DESCRIPTION	QTY
8	90-547-11	Luggage rack	1
Not shown	88-065-13	1/4NC x 1-1/4 Phillips truss head bolt	2
Not shown	97-211-20	1/4NC U-nut	2



Tool Box B 100





Tool Box (B 1-00)			
ITEM #	PART #	DESCRIPTION	QTY
1	71-040-95	Lock assembly	1
2	90-547-14	Tool box	1
Not shown	88-065-13	1/4NC x 1-1/4 Phillips truss head screw	4
Not shown	97-211-20	1/4NC U-nut	4





Signet Charger



Signet® Charger

ITEM #	PART #	DESCRIPTION	QTY
	79-303-40	Charger assembly (see note on facing page)	1
	79-575-60	Replacement cover w/AC cord and gasket	1

Note: There are no user serviceable components inside the charger

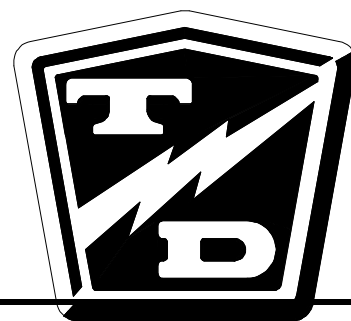
NOTE: The harness connectors are not included with the charger. When replacing the charger order 2 each of the following:

PART #	DESCRIPTION
75-318-20	Butt splice
75-320-51	Knife connector

Appendixes

Contents

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Limits for Standard Hardware	3
Hardware Identification	3
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Other Bolts	3
Hex Nuts	4
Hex Lock Nuts (stover)	4
Other Nuts	4
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Appendix C: Brake Lining	
Handling Precautions	7





APPENDIX A: SPECIAL TOOLS

DESCRIPTION	PURPOSE	PART NUMBER
Pinion Seal Installation Tool	Used to install the pinion seal on all chain drive trucks with the band style brake or the speed sensor on the chain case cover.	43-201-50
Chain Case Centering Tool	Used to center the chain case on the pinion shaft on all chain drive trucks with the band style brake or the speed sensor on the chain case cover. Includes instructions.	41-532-50
Test Light	Used for testing electrical circuits. Powered by the truck batteries, switchable for 12, 24, 36, and 48 volts.	62-027-00
Accelerator Test Harness	Used to test the solid state accelerator module part number series 62-033-XX.	62-027-31
PMC Test Kit	Includes 62-027-00, 62-027-31, and supplementary troubleshooting manual M3-001-06. For controllers equipped with pins labeled KSI and #2 only.	62-027-60
Curtis® PMC Handheld Programmer	Used to test and program the 62-215-00 PMC speed control used on early model C4-25 Huskey.	62-027-10
GE® EV1 Analyzer	Used to test the GE® EV1 speed control.	62-027-20
PMT/C Meter Reset Module	Used to reset the PMT/C maintenance meter after a maintenance is completed.	96-500-43
Sevcon® Handset Analyzer (read only)	Used to test the Sevcon® control systems and reset the Smart View display (includes instructions).	62-027-61
Sevcon® Handset Analyzer with Speed Adjust Capability	Same as 62-027-61 (above) plus allows a limited range of speed adjustment.	62-027-62
Disc Brake Boot Installation Tool	Used to install the rubber boot on all disc brake bodies.	41-350-13
Pin Removing Tool	Used to remove pins and sockets from AMP connectors.	75-440-55
Pin Removing Tool	Used to remove pins and sockets from MOLEX connectors.	75-442-55
Hydrometer	Used to check the specific gravity of battery electrolyte.	77-200-00
Battery Filler	Used to safely add water to batteries.	77-201-00
Retaining Plate Depressor	Used to hold down the retaining plate when disassembling the steering gear on trucks equipped with the tilt steering.	96-500-39
Fork Collar Weld Jig	Used when replacing the fork collar on models MX-600 and SS5-36.	96-500-40
Secondary Sheave Holder	Used to hold the secondary sheave (pulley) from turning on models R6-80 and B6-10 with the Yamaha drive.	96-500-14
Solder Kit For Field Stud	Used to solder the aluminum field wire to the field stud. For use on motors with soldered connections only.	70-210-63
Pinion Gear Holding Tool	Used to align the Pinion Gear and Case during assembly and disassembly.	96-500-42

APPENDIX B: SUGGESTED TORQUE LIMITS FOR STANDARD HARDWARE

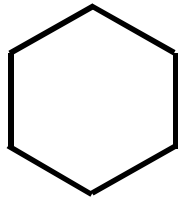
HARDWARE IDENTIFICATION

Standard Head Markings

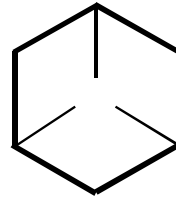
NOTE: Torque value used should be for lowest grade of hardware used. If a grade 2 nut is used on a grade 8 bolt, use grade 2 torque value.

NOTE: Torque values specified are for clean dry threads.

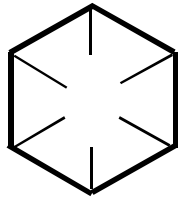
Hex Bolts



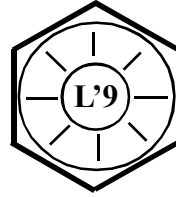
S.A.E. Grade 2



S.A.E. Grade 5



S.A.E. Grade 8



L'9

Other Bolts



Truss Head, grade 2

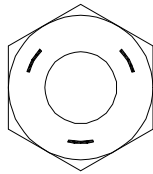
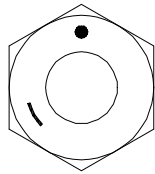
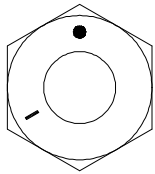


*Carriage Bolt, grade 2
(unless marked as above)*

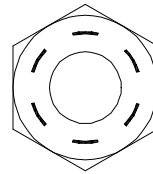
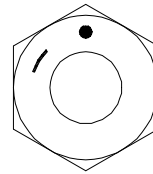
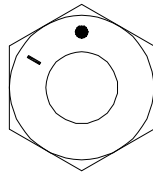


Hex Nuts

Nuts with no markings are to be treated as S.A.E. Grade 2



S.A.E. Grade 5

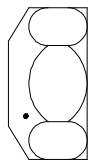
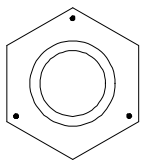


S.A.E. Grade 8

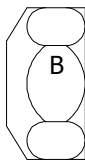
Hex Lock Nuts (stover)

Lock nuts use a letter to indicate the grade of the nut. Grade A' locknuts would be the equivalent of Grade '2' hex nuts, Grade 'B' as Grade '5' and Grade 'C' as Grade '8'.

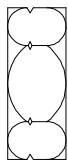
NOTE: Nuts with no markings are to be treated as S.A.E. Grade A



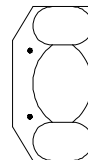
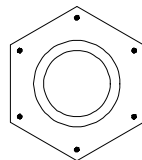
or,



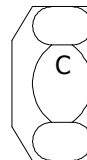
or,



S.A.E. Grade B



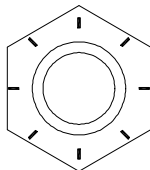
or,



or,



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

Suggested Torque Values (non-critical hardware)

Diameter and TPI	Grade 2 Tightening Torque (ft-lb)	Grade 5 Tightening Torque (ft-lb)	Grade 8 Tightening Torque (ft-lb)	L'9 Tightening Torque (ft-lb)
1/4-20	4-7	7-10	10-14	11
1/4-28	5-8	8-12	11-16	12
5/16-18	9-14	14-21	20-29	22
5/16-24	10-15	15-23	22-33	25
3/8-16	16-24	25-37	35-52	40
3/8-24	18-27	28-42	40-59	45
7/16-14	26-38	40-59	56-84	65
7/16-20	29-43	44-66	62-93	70
1/2-13	39-59	60-90	85-128	95
1/2-20	44-66	68-102	96-144	110
9/16-12	56-84	87-131	123-184	140
9/16-18	63-94	97-146	137-206	160
5/8-11	78-117	120-180	170-254	195
5/8-18	88-132	136-204	192-288	225
3/4-10	138-207	213-319	301-451	350
3/4-16	154-231	238-357	336-504	390
7/8-9	222-334	344-515	485-728	565
7/8-14	245-367	379-568	534-802	625
1-8	333-500	515-773	727-1091	850
1-14	373-560	577-866	815-1222	930
1.125-7	472-708	635-953	1030-1545	1700
1.125-12	530-794	713-1069	1156-1733	1850
1.25-7	666-999	896-1344	1454-2180	2950
1.25-12	738-1107	993-1489	1610-2414	3330



Suggested Torque Values (critical hardware)

Torque Table

Group	Description	Ft-Lbs	Torque Range	
			In-Lbs	Nm
Brakes - - - - -				
	Brake bolt (disc brake body)	11 - 11	132 - 132	15 - 15
	Brake line tube nut fittings	12 - 13	144 - 156	16.3 - 17.7
	Brake spider bolts (Dana 160mm hyd brakes)	25 - 35	300 - 420	34 - 47.6
	Brake spider bolts (Dana 160mm mech brakes)	15 - 19	180 - 228	20.4 - 25.8
	Brake spider bolts (Dana 7x1-3/4 brakes)	16 - 20	192 - 240	21.8 - 27.2
Electrical - - - - -				
	Battery terminals	8 - 9	96 - 108	10.9 - 12.2
Front Axle - - - - -				
	Front spindle nut	-	-	-
	Note: Refer to maintenance section in the service manual			
	King pin	-	-	-
	Note: Refer to maintenance section in the service manual			
Rear Axle/Transmission - - - - -				
	3rd member Gear case cover (GT drive)	45 - 50	540 - 600	61.2 - 68
	Axle bolt (GT drive)	275 - 275	3300 - 3300	374 - 374
	Axle hub nut (Dana)	95 - 115	1140 - 1380	129.2 - 156.4
	Axle tube to center section (Dana F-N-R)	25 - 35	300 - 420	34 - 47.6
	Carrier cap bolts (Dana)	100 - 120	1200 - 1440	136 - 163.2
	Differential Cover plate (Dana H12)	18 - 25	216 - 300	24.5 - 34
	Drain plug (Dana H12)	25 - 40	300 - 480	34 - 54.4
	Drain plug (GT drive)	21 - 25	252 - 300	28.6 - 34
	Gear case to 3rd member (GT drive)	18 - 20	216 - 240	24.5 - 27.2
	Motor mounting (GT/Dana)	6.5 - 7	78 - 84	8.8 - 9.5
	Pinion nut (F2/F3)	175 - 175	2100 - 2100	238 - 238
	Pinion nut (GT drive)	154 - 169	1848 - 2028	209.4 - 229.8
	Ring gear (Dana)	35 - 45	420 - 540	47.6 - 61.2
	Wheel lug nut	75 - 90	900 - 1080	102 - 122.4
Steering - - - - -				
	Ball joint clamp	28 - 32	336 - 384	38.1 - 43.5
	Ball joint nut	40 - 45	480 - 540	54.4 - 61.2
	Pitman nut (18-308-21 steering gear)	75 - 100	900 - 1200	102 - 136
	Pitman nut (18-308-25 steering gear)	181 - 217	2172 - 2604	246.2 - 295.1
	Rod end nut	20 - 25	240 - 300	27.2 - 34
	Steering shaft pinch bolt	24 - 26	288 - 312	32.6 - 35.4
	Steering wheel nut (18-308-21 steering gear)	28 - 32	336 - 384	38.1 - 43.5
	Steering wheel nut (18-308-25 steering gear)	72 - 86	864 - 1032	97.9 - 117
Suspension - - - - -				
	Leaf spring hangers	-	-	-
	Note: Refer to maintenance section in the service manual			



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.

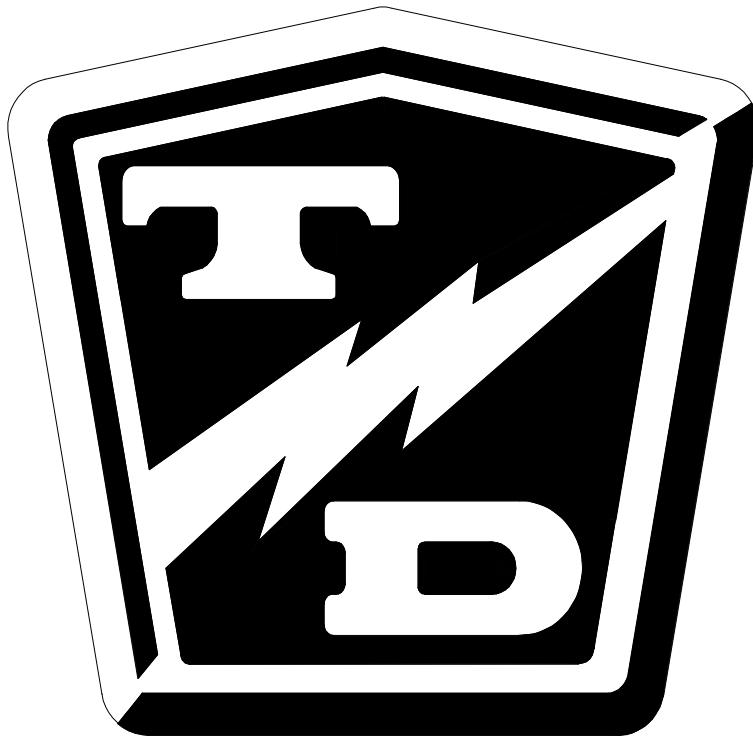
Always wear protective clothing and a respirator when working on the brake pads/shoes or their associated components.

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.



Model B 1-00



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