

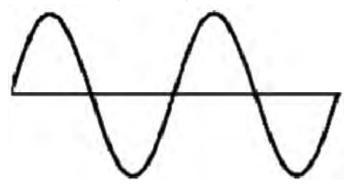
The Best Way To Go About Your Business (\mathbf{e}) $\mathbf{\hat{<}}$

TAYLOR TRUCK



Model: T-48

Models Inlcuded: B0-T48-48AC (T-48, 48 volt system) B0-T48-72AC (T-48, 72 volt system) ET-030-48AC (ET-3000)



Equipped with AC Motor Speed Control

MANUAL MB-T48-02

Operation, Troubleshooting and Replacement Parts Manual

Serial Number Starting: 172581 Ending Serial Number: See Introduction Chapter

Revision: E 10/22/2013

Taylor-Dunn Contact information

Service, Parts, Sales:

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

If you do not have access to the internet, you can call the factory direct at: 01 (714) 956-4040

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

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



The Taylor-Dunn Corporation: Leading Provider of Commercial & Industrial Vehicles since 1949

Taylor-Dunn Manufacturing:

AYLOR-DUNN The best way to go about your business

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

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

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

Tiger Tractor:

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

Metro Crown International (MCI):

Metro Crown International, located in Lee's Summit, Missouri is one of the world's leading suppliers of replacement parts for industrial applications and the airline ground support industry. MCI is the factory authorized OEM distributor for parts for Tiger Tractor, United Tractor, Kalamazoo, and FMC Challenger Belt Loader brands. Both domestic and international customers have come to depend upon MCI to provide quality, personalized service and to count on them for accurate, reliable answers.

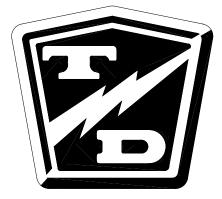
Shown below is just a small sample of what Taylor-Dunn has to offer to keep your business moving:



T-48 AC / ET 3000

Section Index 🙀





R **Taylor-Dunn**

Operator and Service Manual Section Index

Introduction Safety Rules and Operating Instructions **General Maintenance Front Axle Steering Component Brakes** Motor Transmission Suspension **Tires and Wheels Battery** Wire diagram **Motor Controller** Chargers **Illustrated Parts**

Appendix

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

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

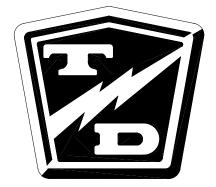
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ABOUT THIS MANUAL

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

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

Included in this manual are:

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

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

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

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



WHO SHOULD READ THIS MANUAL

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



RESPONSIBILITIES

Of the Owner...

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

Of the Operator...

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

Of the Service Personnel...

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

Of the Passengers ...

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

HOW TO USE THIS MANUAL

This manual is organized into five main sections:

Introduction

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

Safety Rules and Operating Instructions

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

Maintenance Service and Repair

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

Electrical and Charger Troubleshooting

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

Illustrated Parts

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



Conventions

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

AWARNING

or,

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

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

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





HOW TO IDENTIFY YOUR VEHICLE

This manual applies to vehicles with the same model and serial numbers listed on the front cover. If the ending serial number is blank, then this manual was for current production vehicles when printed.

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.

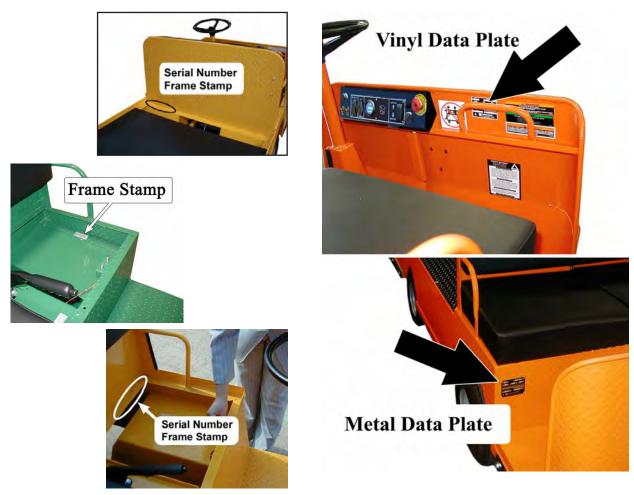
This vehicle conforms to requirements for Type E vehicles as described in O.S.H.A. Standard Section 1910.178 (Powered Industrial Trucks) and with all applicable portions of the American National Standard for Personnel and Burden Carriers (ANSI B56.8).

AWARNING

These vehicles are not designed to be driven on public roads or highways. They are available in maximum designed speeds ranging from 6 to 16 mph. Do not exceed the maximum designed speed. Exceeding the maximum designed speed may result in steering **difficulty, motor damage, and/or loss of control. Do not exceed locally** imposed speed limits. Do not tow at more than 5 mph.

The locations of the model number are illustrated below:

Note: Serial number can be found in 1 of 3 locations shown below.





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.

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

Notes:



Safety Rules and Operating Instructions

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STANDARD SPECIFICATIONS*

ITEM	Model	SPECIFICATION
Min/Max Battery Weights		48 volt system - 225 kg to 261 kg (496 lbs to 576 lbs) 72 volt system - 337 kg to 392 kg (743 lbs to 564 lbs)
Transmission		Helical Gear, Oil Bath, Automotive Type Hypoid Differential
Brakes		Four Wheel Hydraulic Disc, Automatically Applied Park Brake
Steering		Automotive Steering 24:1
Frame		Steel Unitized Body, Heavy Duty 14 Gauge Steel
Instrumentation		Combination Display (Battery Status Indicator, Hour Meter, System Status Monitor), Key Switch, Horn Button, Speed select Switch, Forward/Reverse Switch, Headlight Switch, Emergency Stop Switch
Light Accessories		Dual Headlight, Dual Tail/Brake Lights
Charger		48 volt - 120/240 VAC, 13/6.5 Amp, 50 or 60 Hz, 17 Amp DC 72 volt - 220 VAC, 13 Amp, 60 Hz, 25 Amp DC
Occupancy		2 Passenger
Electrical System		Eight (48v) or twelve (72v)-250 Amp Hour, 6 Volt, Lead Acid Batteries, 500 Amp Solid State Self Diagnostic AC Speed Control, Battery Voltage to 12 volt DC-DC converter
Frame Dimensions	T-48 ET-3000	318 L x 127 W x 119 H cm (125 L x 50 W x 47 H Inches) Not available at time or printing
Deck dimensions	T-48 ET-3000	104.75 W x 191 L cm (41.25 W x 75.25 L Inches) 125 W x 200 L cm (49.25 W x 78.75 L inches)
Turning Radius		368 Centimeters (145 Inches)
Tires		20.5 x 8 x 10 Load Range E
Dry Weight Without Batteries	T-48 ET-3000	608 kg (1,340 lbs) Not available at time or printing
Maximum Load		1,360 kg (3,000 pounds)
Speed Limit (depends on gear ratio installed)		29-kph (18-mph)
Motor, AC		48 volt system - 12.8 kW, (17.1 hp) for for 5 min (intermittent duty)

These vehicles conform 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.

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

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

These vehicles are not designed to be driven on public roads or highways. They are available in maximum designed speeds ranging from 6 to 16 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.

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.**

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

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

Dash Up to Serial #179999

1) Horn Switch

The horn switch is located on the right side of the instrument panel. Depress the switch to sound the horn, release it to turn it off.

2) Forward-Off-Reverse Switch

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

DO NOT SWITCH from forward to reverse or vice-versa while the vehicle is in motion.

Make sure the vehicle is completely stopped before shifting.

The forward-off-reverse switch should be in the center "OFF" position, with the key-switch off and the park brake set whenever the operator leaves the vehicle.

3a) Light Switch

The headlight switch is located on the top left of the instrument panel. Push the right side of the switch to turn the lights on. Push the left side of the switch to turn the light off.

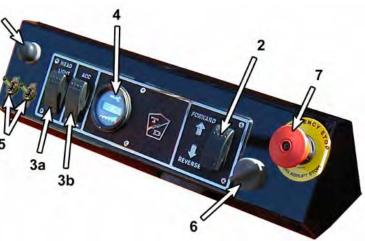
3b) Hi-Low Switch

The high-low switch is located on the lower left of the instrument panel. Toggle the switch lever up for normal speed. Toggle the switch lever down for slow speed.

4) Combination Display

Functions for the Combination display are listed on the following pages.

Do not depress the Emergency Disconnect Switch while the vehicle is in motion unless the vehicle must be stopped in an emergency. Depressing **the switch will immediately apply the park brake**, stopping the vehicle. The abrupt stopping of the vehicle may result in severe bodily injury.



5) Accessory Switches (optional)

The optional accessory switches are located on the left side of the instrument panel. The function of the optional accessory switches will vary depending how the vehicle is equipped.

6) Key-Switch

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

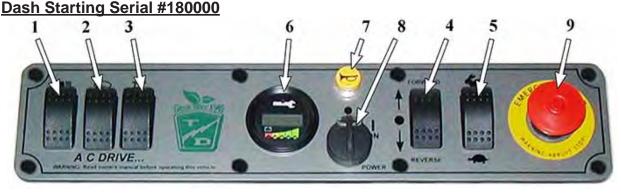
The key-switch should be in the "OFF" position whenever the operator leaves the vehicle.

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.

7) Emergency Stop Switch

The emergency stop switch will immediately and abruptly stop the vehicle.

The Emergency Stop Switch will stop the vehicle but will still allow some functions to work such as the parking brake bypass switch.



Do not depress the Emergency Disconnect Switch while the vehicle is in motion unless the vehicle must **be stopped in an emergency. Depressing the switch will immediately apply the park brake, stopping** the vehicle. The abrupt stopping of the vehicle may result in severe bodily injury.

1) Headlight Switch

The headlight switch is located on the top left of the instrument panel. Push the right side of the switch to turn the lights on. Push the left side of the switch to turn the light off.

2) Wiper Switch (Optional)

The wiper switch is located on the left side of the instrument panel and to the right of the headlight switch. Push the top of the switch to turn on the wiper. Push the bottom of switch to turn off the wiper. The wiper can be turned on with the key switch in the "OFF" position.

3) Strobe Switch (Optional)

The strobe switch is located on the left side of the instrument panel and to the right of the wiper switch. Push the top of the switch to turn on the strobe. Push the bottom of switch to turn off the strobe. The strobe can be turned on with the key switch in the "OFF" position.

4) Forward-Off-Reverse Switch

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

DO NOT SWITCH from forward to reverse or viceversa while the vehicle is in motion. Make sure the vehicle is completely stopped before shifting.

The forward-off-reverse switch should be in the center "OFF" position, with the key-switch off and the park brake set whenever the operator leaves the vehicle.

5) Hi-Low Switch (optional)

The high-low switch is located on the lower left of the instrument panel. Toggle the switch lever up for normal speed. Toggle the switch lever down for slow speed.

6) Combination Display

Refer to details later in this chapter.

7) Horn Switch

The horn switch is located on the right side of the instrument panel. Depress the switch to sound the horn, release it to turn it off.

8) Key-Switch

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

The key-switch should be in the "OFF" position whenever the operator leaves the vehicle.

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.

9) Emergency Stop Switch

The emergency stop switch will immediately and abruptly stop the vehicle.

The Emergency Stop Switch will stop the vehicle but will still allow some functions to work such as the parking brake bypass switch.

Combination Dash Display

Battery Status Indicator-bar graph

There are five LED's at the bottom of the gauge. Each LED represents an approximate state of charge as listed below:

#5 green: Indicates 84% to 100% charge remaining.

#4 green: Indicates 68%-84% charge remaining.

#3 green: Indicates 52%-67% charge remaining.

#2 yellow: Indicates 36%-52% charge remaining.

#1 red: Indicates 20%-36% charge remaining. When flashing represents 0%-20% charge remaining.

If the #1 LED is flashing, the vehicle or battery should be immediately removed from service to be recharged. Discharging beyond 20% Will damage the battery.

Once discharged, the indicator will not reset to full until the battery is charged AND the battery voltage exceeds the reset voltage threshold programmed in the controller. The reset voltage threshold can be viewed using the controller handset, it is part of the Battery parameter set.

Battery Status Indicator-digital

Displays total charge remaining in percent. The example above indicates that the vehicle has 100% charge remaining (fully charged).

Speedometer

Indicates the vehicles current rate of travel in miles per hour.

Hour Meter

Displays total time (whole hours) vehicle has been in operation. Time is accumulated only while the vehicle is moving. The example to the right indicates that the vehicle has been in operation for 2,114 hours.

System Fault Monitor

The gauge has an alpha numeric display that monitors the system status. If the system detects a fault, an abbreviated fault message will be displayed. Refer to the table below for the abbreviated fault message and description.

Fault Code	Description	Note
CTRL FLT	Speed controller internal fault or wiring fault	1
CTRL TMP	Speed controller overheated	3
EMB FLT	Electric brake fault	1
FB OR	Foot brake switch is closed	1
HIGH V	High battery voltage	
LOW V	Low battery voltage	
MOTR TMP	Motor overheated	3
MOTR FLT	Faulty motor or wiring	1
SEAT OFF	Seat interlock switch is open	1
SRO FLT	Operator error	2
STALL	Motor stalled	4

- 1: Check position of brake bypass switch, refer repair to a qualified technician.
- 2: Switches used to operate vehicle may have been selected in the incorrect sequence. Refer to operator instructions in this section.
- 3: Wait for component to cool. Vehicle may be overloaded.
- 4: Vehicle overloaded, faulty motor, or possible locked up brakes or transmission. If vehicle is not overloaded, Refer repair to a qualified technician







Accelerator Pedal

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



Foot Brake Pedal

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



<u>Steering</u>

The steering wheel and steering system are similar to an automobile. To turn right, turn the steering wheel clockwise. To turn left, turn the steering wheel counter-clockwise. If equipped with tilt steering, the release lever is located on the lower left of the steering column. Pull the lever up to reposition the steering wheel.



Directional Signals (Optional)

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



Hazard Light Switch (Optional)

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

Park Brake, Automatic

Refer to Towing This Vehicle for information on temporarily disabling the automatic park brake.

Vehicles manufactured up to 4/1/2007:

The automatic park brake is immediately applied when the key switch is turned off or the batteries are disconnected. The automatic brake will also be applied when the driver gets up off of the drivers seat. If the driver gets off of the seat while the vehicle is in motion, the vehicle will rapidly decelerate and then apply the automatic brake.

The automatic park brake should be disabled for servicing or towing procedures <u>only</u>. 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.

WARNING

Do not get off of the driver seat while the vehicle is in motion, this will result in rapid deceleration and application of the automatic park brake.

Vehicles manufactured after 4/1/2007:

The automatic park brake is immediately applied when the key switch is turned off or the batteries are disconnected.

The automatic brake will be applied when ever the vehicle is not in motion. While coasting or using the foot brake, the motor speed control monitors the motor rpm, the automatic brake will be applied only after the motor stops rotating.

The automatic brake will be applied when the driver gets up off of the drivers seat. If the driver gets off of the seat while the vehicle is in motion, the vehicle will rapidly decelerate and then apply the automatic brake.

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



Seat Interlock Switch

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

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

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.



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

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.

WARNING

Do not get off of the seat while the vehicle is in motion. Getting off of the seat will activate the seat interlock, rapidly slowing the vehicle and applying the park brake. The abrupt slowing of the vehicle may result in severe bodily injury.

Starting:

- 1: Make sure the forward-off-reverse witch is in the center "OFF" position.
- 2: Hold down the foot brake.
- 3: Insert the key and turn it to the "ON" position.
- 4: Wait 1-second then place the forward-offreverse switch in the desired direction of travel.
- 5: Release the foot brake.
- 6: 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.
- Use the low speed model while towing heavy loads. While towing heavy loads, the low speed mode will increase the efficiency of the system and extend running time between charges.

Do not turn off the key switch while the vehicle is in motion unless the vehicle must be stopped in an emergency. Turning the key switch off will **immediately apply the park brake, stopping the** vehicle. The abrupt stopping of the vehicle may result in severe bodily injury.

Loading and Unloading

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

Parking_

Before leaving the vehicle:

- Set the forward-off-reverse switch to the ` "OFF" position.
- Turn the key switch to the "OFF" position and remove the key.
- If equipped with optional hand parking brake, set the park brake.

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 is equipped with a standard automatic electric parking brake. The brake is automatically applied when the vehicle is stopped. There is a parking brake bypass switch located on the right side of the control box (see illustration). Place this switch in the UP position to tow the vehicle (see note below). This switch should be in the UP position only while towing the vehicle. The switch should be placed in the DOWN position immediately after the towing is completed. Leaving the switch in the UP position will discharge the battery.

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

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.

Note: The automatic electric brake is powered by the vehicles battery. The brake may not disengage if the battery is severely discharged. A battery must be installed to tow the vehicle.



Adjustable Controller Parameters

WARNING

Improper programming may cause unexpected operation of the vehicle and/or damage the electrical components. This could result in severe bodily injury and/or property damage

A limited number of controller parameters can be adjusted by your dealer. The values of these parameters will vary depending on the vehicle model and/or configuration.

A list of the adjustable parameters and their function is listed on the following pages along with their typical default factory settings.

Default factory settings are subject to change without notice. It is highly recommended that you record current settings in the controller before making any adjustments.

* - The Maintenance Meter Function is optional. When equipped, the Maintenance Meter Function will notify the operator when a scheduled maintenance is due. Refer to the supplementary Maintenance Meter manual for more information.

Speed Calculation Formulas:

 $RPM = (20172 / T_d) * (MPH / 60) * R$

 $RPM = (31837 / T_d) * (KPH / 60) * R$

Where:

RPM = motor RPM

 $T_d = Tire \ diameter \ (inches \ or \ cm)$

MPH = Miles Per Hour

KPH = Kilometers per hour

 $\mathbf{R} = Rear axle ratio$

Do not increase the governed speed RPM beyond the maximum recommended speed of the vehicle. Exceeding the maximum recommended speed of the vehicle may result in loss of control and severe bodily injury or property damage.

Refer to Vehicle Specifications for vehicle speed limit.

8-volt equipped with 18:1 drive ratio						
Acceleration Parameters	(norma	l mode	e)			
Function	Value	Unit	Description			
FwdAS LS	2.5	S	Time to accelerate to ~15% of full speed			
FwdAc HS	4.2	S	Time to accelerate to full speed			
RevAc LS	5.2	S	Time to accelerate to from Fw- dAC LS to full			
RevAc HS	5.2	S	Time to accelerate to full speed			
Acceleration Parameters (low speed mode)						
FwdAS LS	2.6	S	Time to accelerate to ~15% of full speed			
FwdAc HS	4.2	S	Time to accelerate to full speed			
RevAc LS	5.7	S	Time to accelerate to from Fw- dAC LS to full			
RevAc HS	7.4	S	Time to accelerate to full speed			
Deceleration Settings	-					
Brake Multiplier	50	%	Brake regen multiplier is acti- vated by the brake switch			
Normal Decl HS	9.5	S	Time to decelerate to 0 when above 20% of full speed			
Normal Decl LS	8.5	S	Time to decelerate when below 20% of full speed			
Tow Decl HS	9.5	S	Time to decelerate to 0 when above 20% of full speed			
Tow Decl LS	9.0	S	Time to decelerate when below 20% of full speed			
Maintenance Meter Function						
Service Timer	0	н	Refer to Maintenance Meter supplementary manual			
Speed Limits						
Max (see warning)	5,400	RPM	Governed speed (see formula)			
Tow	60	%	Percentage of Max speed when Tow Switch is ON			
Rev	40	%	Percentage of Max speed when in reverse			
Low Batt	65	%	Percentage of Max speed when low battery warning is ON			
Service Due	25	%	Percentage of Max speed when service is due. See maintenance Meter Function			
Battery Characteristics						
Full Volts	2.165	v	Battery must exceed this voltage to be considered fully charged			
Empty Volts	1.730	v	Voltage of a fully discharged battery			
BDI Level for Batt Spd	15	%	Low battery warning is ON whe battery is discharged below this level			
BDI Reset %	80	%	Battery must be discharged belo this value before the BDI will be allowed to reset			
Reset Volts	2.10	v	Battery voltage must be above this value to reset the BDI. Modi fied by the 'BDI Reset %' above			
Discharge Time	60	М	Estimated battery discharge rate			
Miscellaneous		_				
SRO Min Speed	1,500	RPM	Motor must be below this RPM to change directions with the throttle pedal depressed			

72-volt equipped with 18:1 drive ratio						
Acceleration Parameters	Acceleration Parameters (normal mode)					
Function	Value	Unit	Description			
FwdAS LS	3.5	S	Time to accelerate to ~15% of full speed			
FwdAc HS	4.0	S	Time to accelerate to full speed			
RevAc LS	6.0	S	Time to accelerate to from FwdAC LS to full			
RevAc HS	6.0	S	Time to accelerate to full speed			
Acceleration Parameters (low speed mode)						
FwdAS LS	4.0	S	Time to accelerate to ~15% of full speed			
FwdAc HS	4.0	S	Time to accelerate to full speed			
RevAc LS	5.0	S	Time to accelerate to from FwdAC LS to full			
RevAc HS	7.4	S	Time to accelerate to full speed			
Deceleration Settings						
Brake Multiplier	50	%	Brake regen multiplier is activated by the brake switch			
Normal Decl HS	9.0	S	Time to decelerate to 0 when above 20% of full speed			
Normal Decl LS	11.0	S	Time to decelerate when below 20% of full speed			
Tow Decl HS	9.5	S	Time to decelerate to 0 when above 20% of full speed			
Tow Decl LS11.0STime to decelerate when below 20% of full speed						
Maintenance Meter Function						
Service Timer	0*	Н	Refer to Maintenance Meter supplementary manual			
Speed Limits						
Max (see warning)	5,400	RPM	Governed speed (see formula)			
Tow	56	%	Percentage of Max speed when Tow Switch is ON			
Rev	40	%	Percentage of Max speed when in reverse			
Low Batt	35	%	Percentage of Max speed when low battery warning is ON			
Service Due	25	%	Percentage Max speed when service is due. See maintenance Meter Function			
Battery Characteristics						
Full Volts	2.165	v	Battery must exceed this voltage to be considered fully charged			
Empty Volts	1.730	v	Voltage of a fully discharged battery			
BDI Level for Batt Spd	15	%	Low battery warning is ON when battery is discharged below this level			
BDI Reset %	80	%	Battery must be discharged below this value before the BDI will be allowed to reset			
Reset Volts	2.10	v	Battery voltage must be above this value to reset the BDI. Modified by the 'BDI Reset %' above)			
Discharge Time	60	М	Estimated battery discharge rate			
Miscellaneous		-				
SRO Min Speed	1,500	RPM	Motor must be below this RPM to change directions with the throttle pedal depressed			

Acceleration Parameters	s (norm	al mod	le)		
Function	Value		Description		
FwdAS LS	2.5	S	Time to accelerate to ~15% of full speed		
FwdAc HS	4.0	S	Time to accelerate to full speed		
RevAc LS	8.0	s	Time to accelerate to from FwdAC LS to full		
RevAc HS	7.0	S	Time to accelerate to full speed		
Aceleration Parameters (low speed mode)					
FwdAS LS	4.0	s	Time to accelerate to ~15% of full speed		
FwdAc HS	5.5	S	Time to accelerate to full speed		
RevAc LS	8.0	S	Time to accelerate to from FwdAC LS to full		
RevAc HS	7.0	S	Time to accelerate to full speed		
Deceleration Settings		-			
Brake Multiplier	40	%	Brake regen multiplier is activated by the brake switch		
Normal Decl HS	8.0	s	Time to decelerate to 0 when abov 20% of full speed		
Normal Decl LS	10.0	s	Time to decelerate when below 20% of full speed		
Tow Decl HS	8.5	s	Time to decelerate to 0 when abov 20% of full speed		
Fow Decl LS	8.0	S	Time to decelerate when below 20% of full speed		
Maintenance Meter Function					
Service Timer	0	Н	Refer to Maintenance Meter supplementary manual		
Speed Limits			·		
Max (see warning)	5,500	RPM	Governed speed (see formula)		
Tow	60	%	Percentage of Max speed when Tow Switch is ON		
Rev	45	%	Percentage of Max speed when in reverse		
Low Batt	40	%	Percentage of Max speed when low battery warning is ON		
Service Due	20	%	Percentage of Max speed when service is due. See maintenance Meter Function		
Battery Characteristics					
Full Volts	2.105	v	Battery must exceed this voltage to be considered fully charged		
Empty Volts	1.730	v	Voltage of a fully discharged bat- tery		
BDI Level for Batt Spd	15	%	Low battery warning is ON when battery is discharged below this level		
BDI Reset %	80	%	Battery must be discharged below this value before the BDI will be allowed to reset		
Reset Volts	2.10	v	Battery voltage must be above this value to reset the BDI. Modified b the 'BDI Reset %' above)		
Discharge Time	60	М	Estimated battery discharge rate		
Miscellaneous					

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72-volt equipped with 24:1 drive ratio						
Acceleration Parameters	s (norm	al mod	e)			
Function	Value	Unit	Description			
FwdAS LS	3.2	s	Time to accelerate to ~15% of full speed			
FwdAc HS	3.2	S	Time to accelerate to full speed			
RevAc LS	5.2	S	Time to accelerate to from FwdAC LS to full			
RevAc HS	5.2	S	Time to accelerate to full speed			
Acceleration Parameters (low speed mode)						
FwdAS LS	4.0	S	Time to accelerate to ~15% of full speed			
FwdAc HS	4.0	S	Time to accelerate to full speed			
RevAc LS	5.0	S	Time to accelerate to from FwdAC LS to full			
RevAc HS	7.4	S	Time to accelerate to full speed			
Deceleration Settings						
Brake Multiplier	50	%	Brake regen multiplier is activated by the brake switch			
Normal Decl HS	8.0	S	Time to decelerate to 0 when above 20% of full speed			
Normal Decl LS	8.0	S	Time to decelerate when below 20% of full speed			
Tow Decl HS	7.0	S	Time to decelerate to 0 when above 20% of full speed			
Tow Decl LS	7.0	S	Time to decelerate when below 20% of full speed			
Maintenance Meter Function						
Service Timer	0	Н	Refer to Maintenance Meter supplementary manual			
Speed Limits						
Max (see warning)	5,900	RPM	Governed speed (see formula)			
Tow	43	%	Percentage of Max speed when Tow Switch is ON			
Rev	43	%	Percentage of Max speed when in reverse			
Low Batt	40	%	Percentage of Max speed when low battery warning is ON			
Service Due	25	%	Percentage of Max speed when service is due. See maintenance Meter Function			
Battery Characteristics						
Full Volts	2.165	v	Battery must exceed this voltage to be considered fully charged			
Empty Volts	1.173	v	Voltage of a fully discharged bat- tery			
BDI Level for Batt Spd	15	%	Low battery warning is ON when battery is discharged below this level			
BDI Reset %	80	%	Battery must be discharged below this value before the BDI will be allowed to reset			
Reset Volts	2.1	v	Battery voltage must be above this value to reset the BDI. Modified by the 'BDI Reset %' above)			
Discharge Time	60	М	Estimated battery discharge rate			
Miscellaneous						
SRO Min Speed	1,500	RPM	Motor must be below this RPM to change directions with the throttle pedal depressed			

Acceleration Parameters	s (norma	al mod	le)
Function	Value	Unit	Description
FwdAS LS	2.6	s	Time to accelerate to ~15% of speed
FwdAc HS	4.0	S	Time to accelerate to full spee
RevAc LS	8.0	s	Time to accelerate to from Fw LS to full
RevAc HS	7.0	S	Time to accelerate to full spee
Acceleration Parameters	s (low s _]	peed n	node)
FwdAS LS	4.0	s	Time to accelerate to ~15% of speed
FwdAc HS	5.5	S	Time to accelerate to full spee
RevAc LS	8.0	s	Time to accelerate to from Fw LS to full
RevAc HS	7.0	S	Time to accelerate to full spee
Deceleration Settings			
Brake Multiplier	40	%	Brake regen multiplier is activ by the brake switch
Normal Decl HS	8.0	S	Time to decelerate to 0 when a 20% of full speed
Normal Decl LS	10.0	S	Time to decelerate when below 20% of full speed
Tow Decl HS	8.5	S	Time to decelerate to 0 when 20% of full speed
Tow Decl LS	8.0	S	Time to decelerate when belov 20% of full speed
Maintenance Meter Fun	ction		
Service Timer	0	Н	Refer to Maintenance Meter supplementary manual
Speed Limits			
Max (see warning)	5,500	RPM	Governed speed (see formula)
Tow	60	%	Percentage of Max speed whe Tow Switch is ON
Rev	45	%	Percentage of Max speed whe reverse
Low Batt	40	%	Percentage of Max speed whe battery warning is ON
Service Due	20	%	Percentage of Max speed whe service is due. See maintenand Meter Function
Battery Characteristics			
Full Volts	2.165	v	Battery must exceed this volta be considered fully charged
Empty Volts	1.730	v	Voltage of a fully discharged tery
BDI Level for Batt Spd	15	%	Low battery warning is ON w battery is discharged below th level
BDI Reset %	80	%	Battery must be discharged be this value before the BDI will allowed to reset
Reset Volts	2.1	v	Battery voltage must be above value to reset the BDI. Modifi the 'BDI Reset %' above)
Discharge Time	60	М	Estimated battery discharge ra
Miscellaneous			

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Acceleration Parameters (
Function	Value	Unit	Description Time to accelerate to ~15% of full		
FwdAS LS	3.2	S	speed		
FwdAc HS	3.2	S	Time to accelerate to full speed		
RevAc LS	5.2	S	Time to accelerate to from FwdAC LS to full		
RevAc HS	5.2	S	Time to accelerate to full speed		
Acceleration Parameters (low speed mode)					
FwdAS LS	4.0	S	Time to accelerate to ~15% of full speed		
FwdAc HS	4.0	S	Time to accelerate to full speed		
RevAc LS	5.0	S	Time to accelerate to from FwdAC LS to full		
RevAc HS	7.4	S	Time to accelerate to full speed		
Deceleration Settings					
Brake Multiplier	50	%	Brake regen multiplier is activated by the brake switch		
Normal Decl HS	8.0	S	Time to decelerate to 0 when above 20% of full speed		
Normal Decl LS	8.0	S	Time to decelerate when below 20% of full speed		
Tow Decl HS	9.5	S	Time to decelerate to 0 when above 20% of full speed		
Tow Decl LS	11.0	S	Time to decelerate when below 20% of full speed		
Maintenance Meter Function					
Service Timer	0	Н	Refer to Maintenance Meter supple- mentary manual		
Speed Limits					
Max (see warning)	5,900	RPM	Governed speed (see formula)		
Tow	50	%	Percentage of Max speed when Tow Switch is ON		
Rev	50	%	Percentage of Max speed when in reverse		
Low Batt	40	%	Percentage of Max speed when low battery warning is ON		
Service Due	25	%	Percentage of Max speed when service is due. See maintenance Meter Functio		
Battery Characteristics					
Full Volts	2.165	v	Battery must exceed this voltage to be considered fully charged		
Empty Volts	1.730	V	Voltage of a fully discharged battery		
BDI Level for Batt Spd	15	%	Low battery warning is ON when bat- tery is discharged below this level		
BDI Reset %	80	%	Battery must be discharged below this value before the BDI will be allowed to reset		
Reset Volts	2.1	v	Battery voltage must be above this value to reset the BDI. Modified by the 'BDI Reset %' above)		
Discharge Time	60	М	Estimated battery discharge rate		
Miscellaneous					
SRO Min Speed	2,000	RPM	Motor must be below this RPM to change directions with the throttle peda depressed		



CHARGING YOUR VEHICLE

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

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.

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.

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.

Charging Time

Average charging time is 8 to 12-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.

Industrial Charger Operation

If equipped with an industrial charger, it is either specified by or provided by the end user. Refer to the operating instruction supplied with your charger or contact the charger manufacturer for more information.

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.

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.

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.

Lestronic II[®] Charger Operation

The Lestronic II[®] charger is a semiautomatic 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.

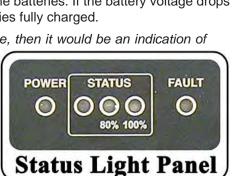
When the charger is plugged in, it should turn on within a few seconds. To determine if the charger is on, listen for a humming sound from the charger. If the charger does not turn on, then there may be a fault in the AC line voltage or in the charger. Refer troubleshooting to a qualified technician.

Typical charging times are eight to twelve hours depending on the how deep the

batteries are discharged. Charging times exceeding 16-hours may be a result of faulty batteries, faulty charger, noisy or fluctuating AC line voltage, or momentarily interrupting the charging cycle. Refer troubleshooting to a gualified technician.



Typical Lestronic II[®] Built In Charger



Taylor-Dunn X-Series Charger

This charger is rated for 115 VAC or 230 VAC operation (nominal). Confirm the charger installed is correct for the AC voltage power source before connecting the charger.

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



The X-Series 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.

There is a user interface on the charger. The interface consists the following:

- Ammeter: Indicates the current flowing into the battery during the charging cycle.
- Start/stop switch: When depressed, the charging cycle will be terminated or restarted.
- Low voltage start switch: When depressed, will start the charge cycle if the battery voltage is too low for an automatic start.
- Self diagnostic switch: Starts the charger self diagnosis procedure.
- Charging status light: Indicates the current status of the charging cycle. The light will start flashing when the charging cycle is started. It will stop flashing and remain ON when the cycle has completed. Also used for fault indication along with the fault light.
- Fault light.: Displays faults after self diagnosis is completed.

Self Diagnosis Procedure

If you suspect a battery charging problem press the self diagnostic switch to start the charger self diagnostic procedure. Any faults found by the procedure will be displayed by the two LED's. Refer to the table below for the fault codes.

Note: To run this procedure, a battery that is not severely discharged must be connected to the charger.

Fault LED	Status LED	Action Required			
OFF	OFF	No faults found.			
Flashing	Flashing	 Battery voltage either too high or too low. Confirm that the correct battery and charger is installed in the vehicle. Faulty battery, will not accept a charge. Battery installed is too large (Amp Hours). 			
ON	OFF or Dim • *Faulty charger				
Flashing	ON	N • *Faulty charger			
ON	 **AC input voltage is out of range. Confirm that the AC outlet has the correct voltage for the charger. *Charger circuit breaker tripped. Reset the breaker by pushing th button. If the fault reoccurs, then it indicates a faulty charger. 				
ON	ON	 *Faulty charger. 			
Flashing	OFF	***Charger programmed incorrectly.			
*	Refer charger repair to a qualified technician				
**	Only a qualified electrician should check the AC line voltage.				
***	Continued use of the charger may damage your batteries. Refer charger repair to a qualified technician				

Charging with the X-Series Charger

charging cycle.

Note: Opportunity charging is not recommended. For maximum battery life, it is recommended that the batteries be discharged a minimum of 30% (7 bars showing on the BSI) before starting a

This charger requires a standard household electrical circuit rated at 15 to 20 Amps. Consult an authorized electrician if you do not know the configuration of your circuits. **See warning to the right.**

Park the vehicle at an authorized charging station. Refer to Parking in the Driving section.

Connect the charging cord to the vehicle charging port and then plug the cord into the AC power receptacle.

The charger should start automatically.

If the charger does not start, then depress and hold the "Low Voltage Start" switch for a 10-seconds. If the charger does not remain ON after releasing the switch, then try again. If the charger refuses to start, then have the batteries and charger tested by an qualified technician.

WARNING

This charger requires a standard household 15 Amp electrical circuit. Before plugging the charger in, confirm that your charging station is configured correctly.

DO NOT attempt to charge two vehicles on one standard household 15A circuit.

Failure to confirm the proper charging station configuration or attempting to charge two vehicles may result in fire.

WARNING

The charger must be connected to a properly grounded AC receptacle. Improper connection will increase the risk of electric shock and can cause severe personal injury or death.

Do not attempt to operate the vehicle while the charger is plugged in. Operating the charger and vehicle at the same time may lead to damage to the charger and/or the vehicle resulting in personal injury and/or property damage.

DO NOT disassemble the charger. There are no user serviceable components in the charger. Refer all repairs to a qualified technician. Incorrect repair or reassembly of the charger can result in an explosion, electric shock, or fire.

WARNING

Explosive mixtures of Hydrogen gas are present within battery cells at all times. Do not work with or charge a 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.

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.

STORING AND RETURNING TO SERVICE

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

Storing Your Vehicle

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

If stored for a prolonged period, the batteries should be charged per the table to the right.

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

Taylor-Dunn

Preventative Maintenance Schedule for GT Drive with AC Motor

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

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

Form PM-0002 GT Drive / AC Motor, Revision A 07/11/2006

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

Daily Visual inspection:

Tire condition and pressure.

External frame damage (body).

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

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

- Accelerator pedal, Brake pedal, Steering, Parking brake, etc.
- Proper operation of all locking devises such as but not limited to:

Tool box, Removable battery trays, Cargo box, Cab doors, etc.

- Proper operation of all interlocking switches such as but not limited to:
- Key switch, Seat interlock switch, Charger interlock switch, etc.

Inspect for leaking fluids or grease.

MAINTENANCE GUIDELINES FOR SEVERE DUTY APPLICATIONS

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

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

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

- Extreme temperature.
- Bumpy, dusty, or ill maintained roads.
- Excessively wet areas.
- · Corrosive or contaminated areas.
- · Frequent loading of vehicle at/near capacity.
- Use on multiple shifts.
- 2: Any deficiencies found during an inspection should corrected before the vehicle is returned to service.
- 3: Battery water level should be inspected on a weekly schedule.

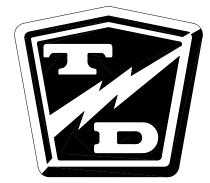
Only properly trained and authorized technicians should perform maintenance or repairs to this vehicle. Repairs or maintenance by improperly trained or unauthorized personnel could cause improper **operation of the vehicle or premature failure of components resulting in severe bodily injury and/or**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

General Maintenance

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General Maintenance

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MAINTENANCE GUIDELINES

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

Before starting any repairs:

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

AWARNING

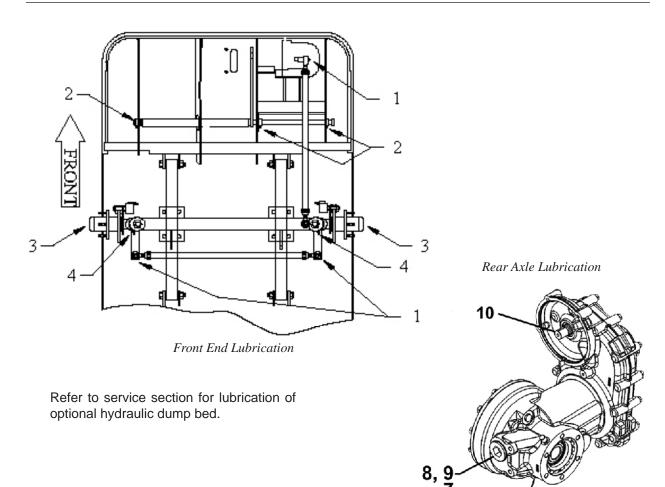
Read and follow all of the guidelines listed below. Failure to follow these guidelines may result in severe bodily injury and/or property damage.

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

TROUBLESHOOTING GUIDE

Symptom	Probable Cause		
Steering Dulle in One Direction	Front End Out of Alignment		
Steering Pulls in One Direction	Low Tire Pressure		
	Dry Lube Points in Steering Linkage		
Hard Steering	Damaged King Pin/Ball Joint		
	Low Tire Pressure		
	Worn Ball Joints		
Excessive Steering Play	Mis-Adjusted or Worn Steering Gear		
	Loose Steering Linkage		
	Brakes or Parking Brakes Dragging		
	Worn Drive Gears		
	Front End Out of Alignment		
Lack of Power or Slow Operation	Speed Control System Fault		
	Speed Control System Overheated		
	High/Low Speed Switch in Low or wiring to the Switch is Faulty		
	Low Speed Cutback Due to Maintenance Meter Trip (optional)		
	Worn Drive Gears or Bearings		
Abnormal Noise	Worn Front /Rear Axle Bearings		
Adnormal Noise	Loose Lug Nuts		
	Motor Bearings Worn		
Oil Look in Door Dooring Aroo	Rear Wheel Bearing and/or Gasket Failed		
Oil Leak in Rear Bearing Area	Drive Over Filled		
Brake Pedal Soft or Spongy	Air in Brake Lines		
	Brake Worn (1/16" Wear Limit)		
Brake Pedal Low	Brake Fluid Low		
	Brakes Out of Adjustment		
	Brake Worn (1/16" Wear Limit)		
Braking Power Low	Brake Pads Contaminated with Fluid		
	Brake Pedal Linkage Binding		
	Brakes Out of Adjustment		
	Air in Brake Lines		
	Trailer Brake System Faulty (optional)		

LUBRICATION CHART



#	Description	Locations	Lubricant Type
1	Ball Joints	4	General Purpose Grease
2	Pedal Linkages	3	General Purpose Grease
3	Front Wheel Bearings	2	High Temperature Wheel Bearing Grease
4	King Pin	2	General Purpose Grease
7	Drive Drain Plug	1	
8	Drive Level Plug	1	
9	Drive Fill Plug	1	SAE 80W90 Gear Oil
10	Motor Coupler		Part Number 94-421-34, Moly Paste Grease

Front Axle Service

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INSPECT THE FRONT WHEEL BEARINGS AND KING PIN

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. If equipped with a hand operated park brake, set the brake.
- 4. Place blocks under the rear wheels to prevent vehicle movement.
- 5. Disconnect the main positive and negative cables at the batteries.

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

- 6. Raise the front of the vehicle and support with jack stands.
- 7. Grab the top and bottom of the tire/wheel assembly. Feel for any movement or play while pulling and pushing on the top and bottom of the tire. Any movement or play is an indication of loose wheel bearings or king pin.
 - Note: Refer to the Adjust Front Wheel Bearings section for information regarding the adjustment of the wheel bearings.
 - Note: If the king pin is loose, then refer to **Replace the King Pins and Bushings** for information regarding replacing the king pin bushings. There are no adjustments for the king pin or bushings.
- 8. Spin the wheel and listen for any grinding noise. Any grinding noise may be an indication of worn or damaged wheel bearings.

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

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



Spindle Nut

ADJUST FRONT WHEEL BEARINGS

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. If equipped with a hand operated park brake, set the brake.
 - 4. Place blocks under the rear wheels to prevent vehicle movement.
 - 5. Disconnect the main positive and negative cables at the batteries.

AWARNING

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

- 6. Raise the front of the vehicle and support with jack stands.
- 7. Remove the hub dust cap and cotter pin.
- 8. While rotating the hub, tighten the spindle nut to 30 ft-lbs. This seats the bearings.
- 9. Back off the spindle nut one flat until the hub turns, but is not loose.
- 10. Spin the wheel and listen for any grinding noise. Any grinding noise may be an indication of worn or damaged wheel bearings.
 - Note: Refer to the **Replace Front Wheel Bearings** section for information regarding the replacement of the wheel bearings.



Flat of Nut

11. Install a new cotter pin.

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

Hub with Dust Cap Removed



FRONT AXLE REMOVAL AND INSTALLATION

<u>Removal</u>

- 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. If equipped with a hand operated park brake, set the brake.

- 4. Place blocks under the rear wheels to prevent vehicle movement.
- 5. Disconnect the main positive and negative cables at the batteries.

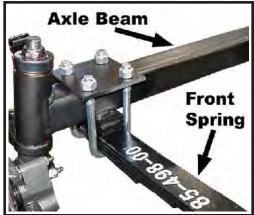
AWARNING

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

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

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

- 10. If equipped with front brakes, disconnect the hydraulic brake lines from the brake bodies.
- 11. Disconnect the front axle beam from the front springs and remove the axle from the vehicle.
 - Note: In some configurations the front springs and or shocks will have to be removed in order to remove the axle beam. Refer to section **Front Suspension** for information regarding removing the springs and shocks.





Installation

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. If equipped with a hand operated park brake, set the brake.
 - 4. Place blocks under the rear wheels to prevent vehicle movement.
 - 5. Disconnect the main positive and negative cables at the batteries.

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

- 6. Raise the front of the vehicle and support with jack stands.
- 7. Install the front axle in reverse order of removal.
 - Note: Use all new cotter pins.
 - Note: Refer to the **Replacing the Ball Joints** section for information regarding the installing the ball joints or rod ends.
 - *Note: Refer to* **Tires and Wheels** *section for information regarding removing the front wheels.*
- 8. Realign the front wheels. Refer to **Steering Component Service** section for information regarding realigning the front wheels.
- 9. If equipped with front brakes, bleed the brakes. Refer to **Brake Service** section for information regarding bleeding the brakes.
- 10. Lower the vehicle.
- 11. Reconnect the main positive and negative cables at the batteries.
- 12. Remove the blocks from behind the wheels.
- 13. Release the park brake and test drive the vehicle.



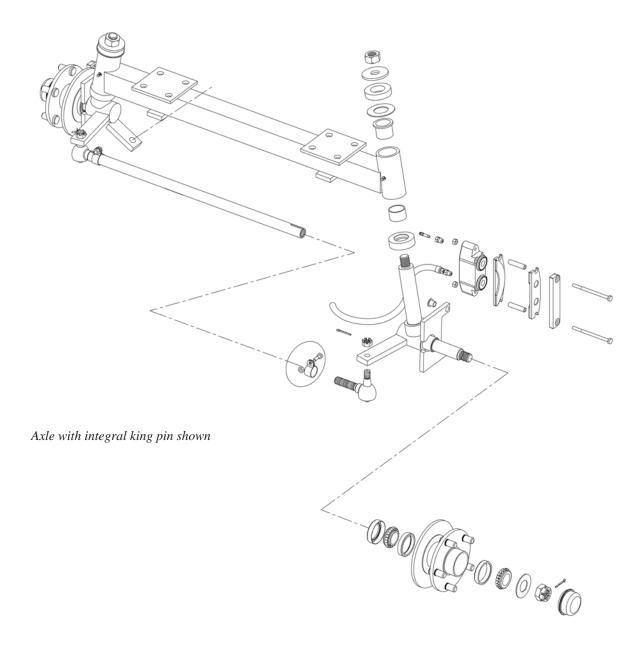
FRONT AXLE DISASSEMBLY

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

Replace the Steering Knuckle

Replace the King Pins and Bushings

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





REPLACE FRONT WHEEL BEARINGS

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. If equipped with a hand operated park brake, set the brake.
- 4. Place blocks under the rear wheels to prevent vehicle movement.
- 5. Disconnect the main positive and negative cables at the batteries.

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

- 6. Raise the front of the vehicle and support with jack stands.
- 7. Remove the tire/wheel assembly from the hub. Refer to **Replace the Steering Knuckle** for information regarding removing the steering knuckle.
- 8. Remove the hub dust cap, cotter pin, and spindle nut.
- 9. Remove the hub from the steering knuckle.
 - Note: For a front disc brake option you must remove the brake body before removing the hub. Refer to the **Brakes** section for information regarding the removal of the brake body.

Note: Catch the outer bearing as it falls out.

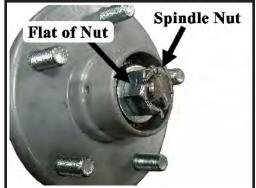
- 10. Thoroughly clean all grease from the inside of the hub and the bearings.
- 11. Inspect and replace the races and bearings as a set.

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

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



Hub with Dust Cap Removed



Hub with Dust Cap Removed



- 13. Install the hub dust cap.
- 14. Reinstall the brake body and the tire/wheel assembly.

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

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





REPLACE THE KING PINS AND BUSHINGS

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

- Bronze bushings in the axle beam.
- Bronze bushings in the steering knuckle.
- Metal backed teflon bushings in the axle beam or suspension arm.
 - Note: Bronze bushings must be reamed or broached to the proper diameter after they are pressed into the axle beam or steering knuckle.

Failure to correctly broach or ream bronze bushings may result in steering difficulty and loss of control of the vehicle causing severe bodily injury and /or property damage.

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

AWARNING

- 2. Place the forward-reverse switch in the center "OFF" position.
- 3. If equipped with a hand operated park brake, set the brake.
- 4. Place blocks under the front wheels to prevent vehicle movement.
- 5. Disconnect the main positive and negative cables at the batteries.

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

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

- 6. Raise the front of the vehicle and support with jack stands.
- 7. Remove the steering knuckle. Refer to **Replace the Steering Knuckle** for information regarding removing the steering knuckle.





- Note: It is not necessary to remove the tie rod or drag link for this procedure.
- 8. Press the king pin bushings out from the axle, steering knuckle or suspension arm.
- 9. Press new bushings into the axle, steering knuckle or suspension arm. Ream or broach bronze bushings to 1.25" +/- 0.001".
- 10. Inspect the king pin for damage or wear. If any damage or wear is noted then the king pin must be replaced.

AWARNING

Failure to correctly broach or ream bronze bushings may result in steering difficulty and loss of control of the vehicle causing severe bodily injury and/or property damage.

- 11. Reassemble in reverse order.
 - Note: Refer to **Replace the Steering Knuckle** for information on installing the steering knuckle.
 - Note: It is recommended that the thrust washers or bearing be replaced whenever replacing the king pin bushings. Refer to the **Replacement Parts** section for the orientation of the bearing or washers in your vehicle.
- 12. Grease the bushings (bronze only).
- 13. Lower the vehicle.
- 14. Reconnect the main positive and negative cables at the batteries.
- 15. Remove the blocks from behind the wheels.
- 16. Release the park brake and test drive the vehicle.



REPLACE THE STEERING KNUCKLE

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

- 2. Place the forward-reverse switch in the center "OFF" position.
- 3. If equipped with a hand operated park brake, set the brake.
 - 4. Place blocks under the front wheels to prevent vehicle movement.
 - 5. Disconnect the main positive and negative cables at the batteries.

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

- 6. Raise the front of the vehicle and support with jack stands.
- 7. Remove the tire/wheel assembly. Refer to *Tires and Wheels* section for information regarding removing the tire/wheel assembly.
- 8. Remove the hub bearing cap, cotter pin and nut, then remove the hub from the steering knuckle.
 - Note: For a front disc brake option you must remove the brake body before removing the hub. Refer to the **Brakes** section for information regarding the removal of the brake body. Do not remove the hydraulic brake line from the brake body. If the brake line is removed then it will be necessary to bleed the brakes.



Hub with Dust Cap Removed

Note: Catch the outer bearing as it falls out.

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



- 12. Thoroughly clean and/or replace all bearings, nuts, washers, and bushings.
 - Note: Both the left and right side bushings and thrust bearings should be replaced as a set.
- 13. Assemble in reverse order.
- 14. Pack the thrust bearing with grease.
- 15. Tighten the king pin nut until all of the up and down play is removed and the yoke rotates freely. The rubber washer must compress slightly to create a seal for the grease.
 - Note: Refer to **Replace Front Wheel Bearings** for information regarding proper tightening of the spindle nut
- 16. Install new cotter pins.
- 17. Realign the wheels.
 - Note: Refer to the **Steering** section for information regarding realignment of the front wheels.
- 18. Lower the vehicle.
- 19. Reconnect the main positive and negative cables at the batteries.
- 20. Remove the blocks from behind the wheels.
- 21. Release the park brake and test drive the vehicle.

Steering

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FRONT END ALIGNMENT

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

In this text:

The first type has a grease fitting and will be referred to as a "Ball Joint."

The second type has no grease fitting and will be referred to as a "Rod End."

Center the Steering



- 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. If equipped with a hand operated park brake, set the brake.
- 4. Place blocks under the rear wheels to prevent vehicle movement.
- 5. Disconnect the main positive and negative cables at the batteries.

AWARNING

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

- 6. Raise the front of the vehicle and support with jack stands.
- 7. Turn the front wheels so that they are in the straight ahead position and then tie off the wheels so that they cannot turn from the straight ahead position.
- 8. Disconnect the drag link from the pitman arm.
 - Note: Refer to **Replace the Ball Joints** section for information regarding removing the ball joint or rod end from the drag link.
- 9. Center the steering gear and tie off the steering wheel so that it cannot rotate.
 - Note: Refer to **Center the Steering Gear** section for information regarding centering of the steering gear.



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



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

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

Note: Remember the position and orientation of the clamps.

- 12. Adjust the drag link so that it can be easily inserted into the pitman arm.
- 13. Tighten the ball joint or rod end nut as specified in the Hardware Torque Table at the end of this section.
- 14. If equipped with ball joints, position the ball joint clamps in their original location and orientation.



- 15. Tighten the ball joint clamps as specified in the Hardware Torgue Table at the end of this section or the rod end jam nuts on the drag link.
- 16. Untie the steering wheel and the front wheels.
- 17. Reconnect the main positive and negative cables at the batteries.
- 18. Rotate the steering wheel from a full left turn to a full right turn and make sure that the ball joint clamps do not contact any other component.



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

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



Front wheel alignment

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

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. If equipped with a hand operated park brake, set the brake.
- 4. Place blocks under the rear wheels to prevent vehicle movement.
- 5. Disconnect the main positive and negative cables at the batteries.

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

AWARNING

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

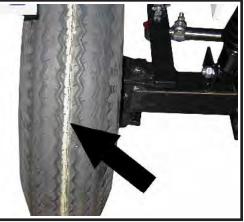
- 6. Raise the front of the vehicle and support with jack stands.
- 7. Turn the front wheels so that they are in the straight ahead position and tie off the steering wheel so that it cannot rotate.
- 8. Using a piece of chalk, mark a line around the center of both front tires.

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

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

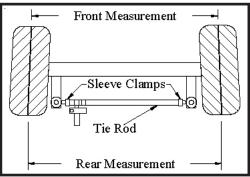
Note: Remember the position and orientation of the ball joint clamps.

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





- 11. Measure the distance between the lines at the front of the tires.
- 12. Measure the distance between the lines at the rear of the tires.
- 13. Adjust the tie rod so that the distance at the front and rear of the tires is the same.
- 14. If equipped with ball joints, position the ball joint clamps in their original location and orientation.
- 15. Tighten the ball joint clamps to the specified amount listed in the Hardware Torque Table at the end of this section or the rod end jam nuts.





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

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



INSPECT BALL JOINTS

Note: A set of ball joints and/or rod ends will wear at the same rate. If a ball joint and or rod end is worn out, then all should be replaced as a set.

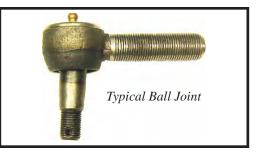
> 1. Make sure the key-switch is in the "OFF" position, then remove the key.

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

- 3. If equipped with a hand operated park brake, set the brake.
- 4. Place blocks under the rear wheels to prevent vehicle movement.
- 5. Disconnect the main positive and negative cables at the batteries.

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

- 6. Tie off the front wheels so that they cannot turn.
- 7. While watching the ball joints, rapidly rotate the steering wheel to the left and right.
- 8. If the ball joint housing moves up or down then the ball joint is worn out and should be replaced. Refer to section *Replacing a Ball Joint* for information regarding replacing ball joints.
- 9. Untie the front wheels.
- 10. Reconnect the main positive and negative cables at the batteries.
- 11. Remove the blocks from behind the wheels.
- 12. Release the parking brake and test drive the vehicle.





INSPECT ROD ENDS

Note: A set of ball joints and/or rod ends will wear at the same rate. If a ball joint and or rod end is worn out, then all should be replaced as a set.

> 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. **AWARNING**

- 3. If equipped with a hand operated park brake, set the brake.
- 4. Place blocks under the rear wheels to prevent vehicle movement.
- 5. Disconnect the main positive and negative cables at the batteries.

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

- 6. Visually inspect each rod end for any signs of play between the ball and the nylon or brass bushing in the housing.
- 7. If any play is evident, then the rod end is worn out and should be replaced. Refer to section *Replace* the Ball Joints, Tie Rods, and Drag Link for information regarding replacing ball joints.
- 8. Reconnect the main positive and negative cables at the batteries.
- 9. Remove the blocks from behind the wheels.
- 10. Release the parking brake and test drive the vehicle.



Typical rod end. Studded rod end shown, your vehicle may be equipped with spherical rod ends that do not have a stud.





ADJUST THE STEERING GEAR

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

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. If equipped with a hand operated park brake, set the brake.
- 4. Place blocks under the rear wheels to prevent vehicle movement.
- 5. Disconnect the main positive and negative cables at the batteries.

AWARNING

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

- 6. Raise the front of the vehicle and support with jack stands.
- 7. Disconnect the drag link from the pitman arm.
 - Note: Refer to **Replace the Ball Joints** section for information regarding removing the ball joint from the drag link.
- 8. Loosen the gear lash jam nut and the worm bearing adjuster jam nut.
- 9. Unscrew the gear lash adjuster all of the way to the stop.
- Jam Nut Jam Nut Gear Lash Adjuster Worm Bearing Adjuster
- 10. Loosen the worm bearing adjuster and then tighten just enough to remove all end play from the input shaft and then an additional 1/8 turn more.
- 11. While holding the worm bearing adjuster so that it cannot turn, tighten the worm bearing adjuster jam nut.
- 12. Find the center position of the steering shaft:
 - A. Turn the steering shaft all of the way in one direction.
 - B. While counting the rotations, turn the steering shaft all of the way in the opposite direction.
 - C. Turn the steering shaft 1/2 the number of turns in the original direction.



- 13. While rotating the input shaft back and forth through its centered position, adjust the gear lash adjusting screw so that there is a slight drag as the steering gear is rotated through its centered position.
- 14. While holding the gear lash adjusting screw so that it cannot turn, tighten the gear lash adjusting screw jam nut.
- 15. Reconnect the main positive and negative cables at the batteries.
- 16. Remove the blocks from behind the wheels.
- 17. Release the parking brake and test drive the vehicle.





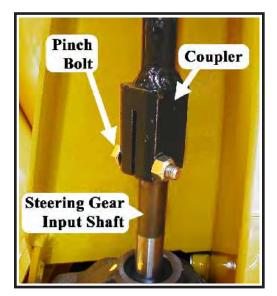
REPLACE THE STEERING SHAFT

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. If equipped with a hand operated park brake, set the brake.
- 4. Place blocks under the front wheels to prevent vehicle movement.
- 5. Disconnect the main positive and negative cables at the batteries.
- 6. If equipped with a horn switch in the steering wheel, remove the switch, disconnect the wires from the switch and cut the terminals off of the wires.
- 7. Remove the steering wheel.
 - Note: Refer to **Replace the Steering Wheel** section for information regarding removing the steering wheel.
- 8. Remove the upper steering shaft bushing or bearing from the steering column.



- 9. Remove the steering gear access cover from the steering column (if equipped).
- 10. Remove and discard the pinch bolt and nut from the steering shaft coupler.



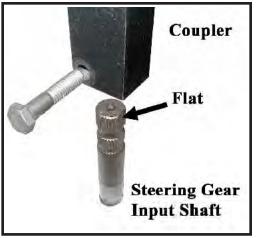


Note: Most vehicle configurations will now allow the steering shaft to slide off of the steering gear input shaft and then back down out of the steering column. If there is not enough clearance for this procedure then the steering gear must be removed. Refer to **Replace the Steering Gear** for information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



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

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



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

- 14. Tighten the pinch bolt to the specified amount listed in the Hardware Torque Table at the end of this section.
- 15. Reconnect the main positive and negative cables at the batteries.
- 16. Remove the blocks from behind the wheels.
- 17. Release the parking brake and test drive the vehicle.



REPLACE THE STEERING WHEEL

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. If equipped with a hand operated park brake, set the brake.
- 4. Place blocks under the front wheels to prevent vehicle movement.
- 5. Disconnect the main positive and negative cables at the batteries.
- 6. If equipped with a horn switch in the steering wheel, remove the switch and disconnect the wires from the switch.
- 7. Remove the steering wheel nut.
- 8. Using a steering wheel puller, remove the steering wheel.
- 9. Position the front wheels in the straight ahead position.
- 10. Lightly grease the steering wheel splines and install the replacement steering wheel orientated as shown in the illustration to the right.
- 11. Tighten the steering wheel nut to the specified amount listed in the Hardware Torque Table at the end of this section.
- 12. Reinstall the horn switch (if equipped).
- 13. Reconnect the main positive and negative cables at the batteries.
- 14. Remove the blocks from behind the wheels.
- 15. Release the parking brake and test drive the vehicle.







REPLACE THE STEERING GEAR

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. If equipped with a hand operated park brake, set the brake.
- 4. Place blocks under the rear wheels to prevent vehicle movement.
- 5. Disconnect the main positive and negative cables at the batteries.
- 6. Remove the steering wheel. Refer to **Replace the Steering Wheel** section for information regarding removing the steering wheel.
- 7. Remove the steering shaft. Refer to **Replace the Steering Shaft** section for information regarding removing the steering shaft.
- 8. Remove the pitman arm using a pickle fork.
 - Note: On some vehicle configurations it may be required to remove the drag link from the pitman arm. Refer to **Replace the Ball Joints** section for information regarding removing the ball joint from the pitman arm.
- 9. Support the steering gear so that it cannot fall out of the vehicle.
- 10. Remove the bolts holding the steering gear to the vehicle frame and remove the steering gear from the vehicle.

AWARNING

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



Steering Gear with Pitman Arm

- 11. Center the steering gear. Refer to **Center the Steering Gear** section for information regarding centering the steering gear.
- 12. Install in reverse order. Torque the pitman arm nut to the specified amount listed in the Hardware Torque Table at the end of this section.
- 13. Reconnect the main positive and negative cables at the batteries.
- 14. Remove the blocks from behind the wheels.
- 15. Release the parking brake and test drive the vehicle.



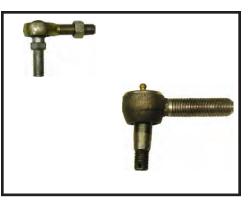


REPLACE THE BALL JOINTS, TIE RODS, AND DRAG LINK

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

In this text:

The first type will be referred to as a "Ball Joint." The second type will be referred to as a "Rod End." Note: If a rod end or ball joint is worn out, we recommend replacing all of the ball joints and/or rod ends as a set.



Replacing a Rod End

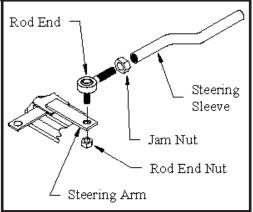
- 1. Make sure the key-switch is in the "OFF" **position, then remove** the key.
- 2. Place the forward-reverse switch in the center "OFF" position.

- 3. If equipped with a hand operated park brake, set the brake.
- 4. Place blocks under the rear wheels to prevent vehicle movement.
- 5. Disconnect the main positive and negative cables at the batteries.

AWARNING

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

- 6. Raise the front of the vehicle and support with jack stands.
- 7. Loosen the rod end jam nut or clamp on the steering sleeve.
- 8. Remove the rod end nut.
- 9. Remove the rod end from the steering arm.
 - Hint: Count the number of turns required to remove the rod end from the steering sleeve. This will make it easier to realign the wheels.





- 10. Install the new rod end into the steering sleeve. Screw it into the sleeve the same number of turns counted in the previous step. Do not tighten the rod end clamp or jam nut at this time.
- 11. Install the rod end into the steering arm. Tighten the rod end nut to the specified amount listed in the Hardware Torque Table at the end of this section.
- 12. Realign the front wheels.
 - Note: Refer to the **Steering** section for information regarding realignment of the front wheels.
- 13. Lower the vehicle.
- 14. Reconnect the main positive and negative cables at the batteries.
- 15. Remove the blocks from behind the wheels.
- 16. Release the park brake and test drive the vehicle.

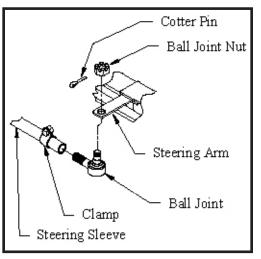
Replacing a Ball Joint

- 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. If equipped with a hand operated park brake, set the brake.
- 4. Place blocks under the rear wheels to prevent vehicle movement.
- 5. Disconnect the main positive and negative cables at the batteries.

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

- 6. Raise the front of the vehicle and support with jack stands.
- 7. Loosen the ball joint clamp on the steering sleeve.
- 8. Remove the cotter pin and ball joint nut.
- 9. Using a pickle fork, remove the ball joint from the steering arm.
- 10. Remove the ball joint from the steering sleeve.
 - Hint: Count the number of turns required to remove the ball joint from the sleeve. This will make it easier to realign the wheels.
- 11. Install the new ball joint into the steering sleeve. Screw it into the sleeve the same number of turns counted in the previous step. Do not tighten the ball joint clamp at this time.





- 12. Install the ball joint into the steering arm. Tighten the ball joint nut to 40-45 ft-lbs. and install a new cotter pin.
- 13. Realign the front wheels.
 - Note: Refer to the **Steering** section for information regarding realignment of the front wheels.
- 14. Lower the vehicle.
- 15. Reconnect the main positive and negative cables at the batteries.
- 16. Remove the blocks from behind the wheels.
- 17. Release the park brake and test drive the vehicle.

Replacing the Drag Link

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

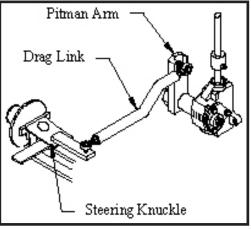
- 1. Make sure the key-switch is in the "OFF" **position, then remove** the key.
- 2. Place the forward-reverse switch in the center "OFF" position.

- 3. If equipped with a hand operated park brake, set the brake.
- 4. Place blocks under the rear wheels to prevent vehicle movement.
- 5. Disconnect the main positive and negative cables at the batteries.

AWARNING

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

- 6. Raise the front of the vehicle and support with jack stands.
- 7. Remove the ball joints or rod ends from the steering knuckle and pitman arm.
 - Note: Refer to the **Replacing the Ball Joints** section for information regarding the removal of the ball joints or rod ends.
- 8. Remove the drag link as an assembly.
- 9. Install in reverse order.
- 10. Realign the front wheels.
 - Note: Refer to the **Steering** section for information regarding realignment of the front wheels.



Typical Drag Link



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

Replacing the Tie Rod

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

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

- Place the forward-reverse switch in the center "OFF" position.
 If equipped with a hand operated park brake, set the brake.
- 4. Place blocks under the rear wheels to prevent vehicle movement.
- 5. Disconnect the main positive and negative cables at the batteries.

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

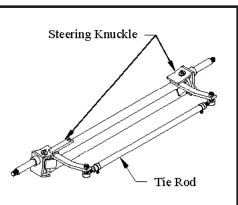
- 6. Raise the front of the vehicle and support with jack stands.
- 7. Remove the ball joints or rod ends from the steering knuckles.

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

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

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

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



Typical Front Axle Assembly



CENTER THE STEERING GEAR

- 1. Remove the pitman arm.
- 2. Rotate the input shaft clockwise until it stops.
- 3. While counting the rotations, rotate the input shaft counter clockwise until it stops.
- 4. Rotate the input shaft clockwise 1/2 the rotations counted in the previous step.
- 5. Mark the steering gear input shaft and pitman shaft in relation to the housing for reference.

PITMAN SHAFT ALIGNMENT

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. If equipped with a hand operated park brake, set the brake.
- 4. Place blocks under the rear wheels to prevent vehicle movement.
- 5. Disconnect the main positive and negative cables at the batteries.

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

- 6. Raise the front of the vehicle and support with jack stands.
- 7. Center the steering gear. Refer to **Center the Steering Gear** section for information regarding centering the steering gear.
- 8. Screw both steering stops all of the way in.
- 9. Install the pitman arm so that it is centered between the steering stops.
- 10. Realign the front wheels. Refer to *Front End Alignment* section for information regarding aligning the front wheels.
- 11. Adjust the steering stops so that the front wheels do not contact any part of the frame, suspension or steering linkages and the left and right turning radiuses are equal.
- 12. Tighten the steering stop jam nuts.
- 13. Lower the vehicle.
- 14. Reconnect the main positive and negative cables at the batteries.
- 15. Remove the blocks from behind the wheels.
- 16. Release the park brake and test drive the vehicle.



REPAIR THE STEERING GEAR

Disassembly

- Note: The steering gear must be removed from the vehicle for this procedure. Refer to **Replace the Steering Gear** section for information regarding removing the steering gear.
- Note: The steering gear is packed with grease. Only perform maintenance on the steering gear in an area that will contain any grease that may spill out of the steering gear when it is disassembled.

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

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



- 3. Remove the side cover/pitman shaft assembly by removing the three side cover bolts and then pulling the assembly out of the housing.
 - Note: The side cover/pitman shaft assembly normally does not have to be disassembled.





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



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



Reassembly

- 1. Lightly lubricate all parts before reassembly.
- 2. Install a new worm shaft seal and pitman shaft seal into the housing.
- 3. Install the upper worm bearing cup.
- 4. Divide the ball bearing into two equal groups.
- 5. Position the ball nut onto the worm as shaft as shown in the illustration.
- 6. Insert the ball guides into the ball nut.
- 7. Insert each group of bearings into the ball guides.
 - Note: Do not rotate the worm shaft while installing the bearings. This may cause one or more of the bearings to enter the crossover passage in the ball nut, causing improper operation.
- 8. Install the ball guide clamp.



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

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

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

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



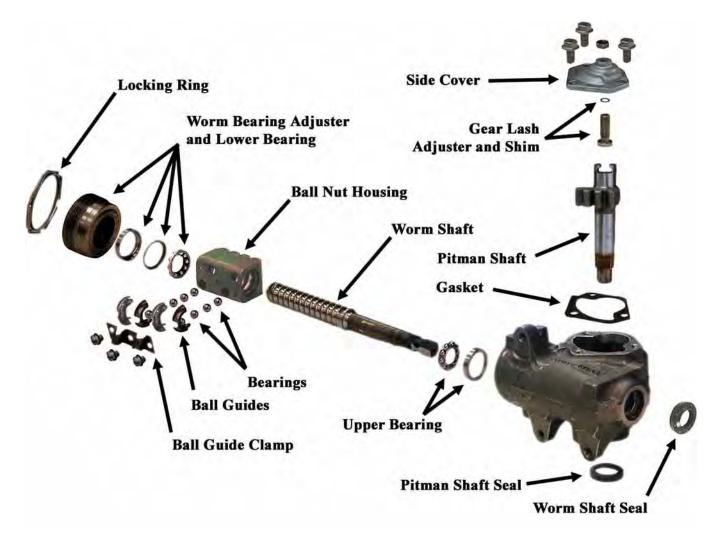






T-48 AC / ET 3000

Exploded View of Steering Gear



HARDWARE TORQUE

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

Description	Foot Pounds
Ball Joint	40-45
Rod End Nut	20-25
Ball Joint Clamps	28-32
Pinch Bolt	24-26
Steering Wheel Nut	28-32
Pitman Arm Nut	75-100

Brakes

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Brakes

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INSPECT THE SERVICE BRAKE

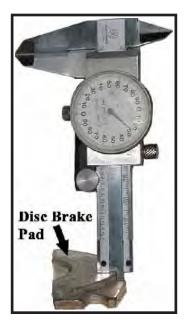
Disc Brake Pads

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

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

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

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



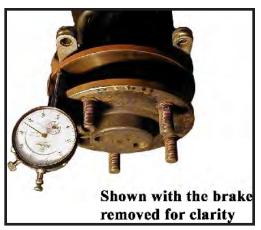


Disc Brake Rotor

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

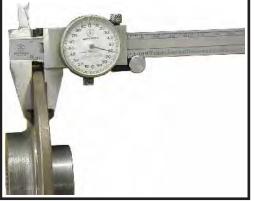
- Note: The front brake rotor is an integral part of the front hub. If the brake rotor is worn beyond its service limits, then the front hub must be replaced. Refer to **Front Axle Service** for information on replacing the front hub.
- Note: Depending on the rear axle configuration, the rear brake rotor may be an integral part of the rear axle. If the brake rotor is worn beyond its service limits, then the rear axle must be replaced. Refer to **Transmission** section for information regarding replacing the rear axle
- Note: The wheel must be removed to accurately measure the rotor thickness. Refer to **Tires and Wheels** section for information on removing the wheel.
- 1. Measure the run out of the rotor at its maximum diameter. If the run out exceeds 0.005, then the rotor must be machined. Do not machine the rotor beyond its service limits.

Note: A bent axle or damaged rear axle could cause excessive brake rotor run out.



2. Measure the thickness of the brake rotor in 3 places. If the brake rotor thickness is less than 0.20-inches, then the rotor must be replaced.

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



Rotor removed for clarity. The rotor does not have to be removed for this procedure.



INSPECT THE AUTOMATIC PARKING BRAKE

The parking brake is located inside of the motor and is electromagnetically operated. To inspect operation of the parking brake, disconnect the harness to the parking brake and push the vehicle to confirm that the brake is applied.

The rubber band dust seal should fit snug around the brake. Inspect the seal for any indications of cracking or fatigue.

Refer to the **Motor Section** for information on the motor brake.

ADJUST THE AUTOMATIC PARKING BRAKE

The parking brake is electromagnetically operated and is either fully applied or off, there are no adjustments. The brake is OFF when power is applied to the brake.

ADJUST THE SERVICE BRAKES

The hydraulic disc brake system is automatically adjusted. A low brake pedal or lack of braking power could be caused by:

- Brake fluid level low in the master cylinder. See Check the Master Cylinder Fluid section.
- Air in the brake lines. See **Bleed the Brakes** section.
- Worn brake pads. See *Inspect the Service Brake* section.
- Worn brake rotor. See Inspect the Service Brake section.
- Binding brake pedal linkage.

If you are experiencing a low brake pedal or lack of braking power, the entire brake system should be inspected.



CHECK MASTER CYLINDER FLUID

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

SKIN CONTACT

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

EYE CONTACT

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

INGESTION

Get medical attention immediately.

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

AWARNING

- 2. Place the forward-reverse switch in the center "OFF" position.
- **3.** If equipped with a hand operated park brake, set the brake.
- 4. Place blocks under the front wheels to prevent vehicle movement.
- 5. Disconnect the main positive and negative cables at the batteries.
- 6. Thoroughly clean the area around the master cylinder cap.
- 7. Remove the master cylinder cap.
- 8. If the fluid in the master cylinder is contaminated then the entire brake system must be flushed. Refer to **Bleed the Brakes** for information regarding flushing the brake system.
- Fill with brake fluid from a new sealed container to within 1/4-inch of the top of the master cylinder chamber and reinstall the cap.
- 10. Reconnect the main positive and negative cables at the batteries.
- 11. Remove blocks from behind the wheels.



Master cylinder is located between the front seats.

12. Release the parking brake and test drive the vehicle.

• Only use DOT 3 brake fluid from a new sealed container.

• DOT 3 brake fluid is corrosive and will damage paint finishes.

- **Dispose of brake fluid in accordance with local state and federal** regulations.
- Read and follow all warnings on the brake fluid container.



BLEED THE BRAKE SYSTEM

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

SKIN CONTACT

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

EYE CONTACT

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

INGESTION

Get medical attention immediately.

- Note: Start this procedure at the wheel furthest from the master cylinder, then work toward the wheel closest to the master cylinder.
 - 1. Make sure the key-switch is in the "OFF" **position, then remove** the key.

AWARNING

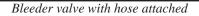
- 2. Place the forward-reverse switch in the center "OFF" position.
- 3. If equipped with a hand operated park brake, set the brake.
- 4. Place blocks under the front wheels to prevent vehicle movement.
- 5. Disconnect the main positive and negative cables at the batteries.
- 6. Thoroughly clean the area around the master cylinder cap and remove the cap.
- 7. Add brake fluid from a new sealed container to the master cylinder. Fill to 1/4" from the top of the master cylinder chamber.



Master cylinder is located between the front seats. Dual reservoir shown.

- Only use DOT 3 brake fluid from a new sealed container.
- DOT 3 brake fluid is corrosive and will damage paint finishes.

- **Dispose of brake fluid in accordance with local state and federal** regulations.
- Read and follow all warnings on the brake fluid container.
- 8. The master cylinder fluid level will drop as the brakes are bled. Periodically check and fill the master cylinder during this procedure. Do not allow the fluid level in the master cylinder to drop too low as this will allow air into the brake lines.
- 9. Attach a clear hose to the bleeder valve on the brake cylinder that is to be bled. Route the hose into a clear container for waste brake fluid.
- 10. Pump the brake pedal a few times and then press and hold light pressure to the brake pedal.
- 11. Open the bleeder valve on the hydraulic brake body.
- 12. Depress the foot pedal to the floor and then close the bleeder valve. Do not release pressure on the brake pedal until the bleeder valve is closed.
- 13. Slowly release the foot pedal, allowing it to return to its released position.
 - Note: Check and fill the master cylinder frequently during the bleeding process. Do not allow the fluid level in the



master cylinder to drop low enough to allow air to enter the brake lines. If air enters the brake lines during the bleeding process, then you will have to start again from the beginning.

Always use brake fluid from a new sealed container. Never reuse any brake fluid that has been removed from the brake system. Use of contaminated brake fluid will degrade the braking performance and may cause property damage or severe bodily injury.

- 14. Repeat the above steps until you are sure that all of the air is expelled from the brake line. Any air bubbles that can be seen in the clear hose attached to the bleeder is an indication that there is still air in the brake lines.
- 15. Repeat this process with each of the other wheels.
 - Note: When finished, top off the master cylinder with fluid. See **Check Master Cylinder Fluid** for information on filling the master cylinder.
- 16. Reconnect the main positive and negative cables at the batteries.
- 17. Remove the blocks from behind the wheels.
- 18. Release the park brake and test drive the vehicle.



Bleeder

Valve

1116

Brakes



FLUSH THE BRAKE SYSTEM

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. If equipped with a hand operated park brake, set the brake.
 - 4. Place blocks under the front wheels to prevent vehicle movement.
 - 5. Disconnect the main positive and negative cables at the batteries.

AWARNING

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



REPLACE FRONT DISC BRAKE PADS

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

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

- Note: Installing new brake pads will raise the brake fluid level in the master cylinder.
 - 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.** If equipped with a hand operated park brake, set the brake.
- 4. Place blocks under the rear wheels to prevent vehicle movement.
- 5. Disconnect the main positive and negative cables at the batteries.
- 6. Thoroughly clean the area around the master cylinder cap.
- 7. Remove fluid from the master cylinder until it is 1/2 full.



Master cylinder is located between the front seats. Dual reservoir shown.

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

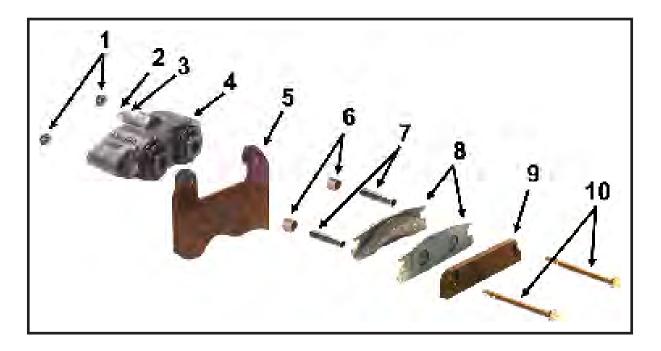


Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

9. Remove the tire/wheel assembly. Refer to *Tires and Wheels* section for information on removing the tire and wheel assembly.

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





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



REPLACE REAR BRAKE PADS

Hydraulic Disc

AWARNING

AWARNING

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

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

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. If equipped with a hand operated park brake, set the brake.

- 4. Place blocks under the front wheels to prevent vehicle movement.
- 5. Disconnect the main positive and negative cables at the batteries.

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

- 6. Thoroughly clean the area around the master cylinder cap.
- Remove fluid from the master cylinder until it is 1/2 full.



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

Master cylinder is located between the front seats. Dual reservoir shown.

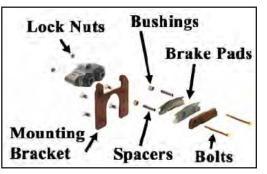
AWARNING



9. Remove the tire/wheel assembly.

- 10. Release the park brake (wheel brake only).
- 11. Remove the brake body bolts and discard the lock nuts and brake pads.
- 12. Remove the spacer bushings from the mounting bracket and discard.
- 13. Inspect the brake rotor. Refer to **Inspect the Service Brake** section for information regarding inspecting the brake rotor.
- 14. Inspect the spacers and replace if any wear or damage is found.
- 15. Install new spacer bushings in the mounting bracket.
- 16. Back off the parking brake adjustment (wheel park brake only).
- 17. Install new brake pads in reverse order. Torque the mounting bolts to the specified amount listed in the Hardware Torque Table at the end of this section.
- 18. Repeat this procedure for the other wheel.
- 19. Install the tire/wheel assembly and lower the vehicle to the ground.
- 20. Fill the master cylinder to the proper level. Refer to **Check Master Cylinder Fluid** section for information regarding the correct master cylinder fluid level.
- 21. Set the park brake.
- 22. Reconnect the main positive and negative cables at the batteries.
- 23. Remove the blocks from behind the wheels.
- 24. Release the park brake and test drive the vehicle.





Note: Refer to **Tires and Wheels** *section for information on removing the tire and wheel assembly.*



REPLACE THE WHEEL CYLINDER

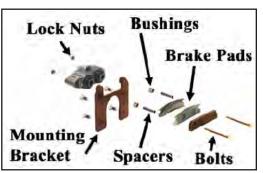
Disc Brake Body Assembly (front or rear)

& WARNING	Current Taylor-Dunn [®] brakes are asbestos free. However, there is the possibility that the original brakes were replaced with aftermarket parts containing asbestos. Since this possibility exists, all brake parts should be handled as if they contain asbestos. Refer to appendix C for recommended handling precautions.
A WARNING	Do not ingest brake fluid or allow contact with skin or eyes. Always wear protective clothing and a face shield when working with or around brake fluid. SKIN CONTACT Flush area immediately with water for several minutes. If a rash or skin irritation develops, get medical attention immediately. EYE CONTACT Immediately flush the eye with water for 15 minutes and call physician. INGESTION Get medical attention immediately.
& WARNING	 Make sure the key-switch is in the "OFF" position, then remove the key. Place the forward-reverse switch in the center "OFF" position. If equipped with a hand operated park brake, set the brake. Place blocks under the wheels to prevent vehicle movement. Disconnect the main positive and negative cables at the batteries.
 Release th Raise the 	e park brake. wheel off of the ground and support with jack stands.

AWARNING



- 8. Remove the tire/wheel assembly. Refer to *Tires and Wheels* section for information on removing the tire and wheel assembly.
- 9. Thoroughly clean the area around the brake body.
- 10. Remove the brake body bolts and discard the lock nuts.
- 11. Inspect the brake rotor. Refer to **Inspect the Service Brake** section for information regarding inspecting the brake rotor.
- 12. Disconnect the brake hose from the brake body.
- 13. Install the new brake body assembly in reverse order.
 - Use teflon tape thread sealant on the brake hose fitting.



- Torque the brake body bolts to the specified amount listed in the Hardware Torque Table at the end of this section.
- 14. Bleed the brakes. Refer to **Bleed the Brakes** section for information regarding bleeding the brakes.
- 15. Set the park brake.
- 16. Reconnect the main positive and negative cables at the batteries.
- 17. Lower the wheel to the ground.
- 18. Remove the blocks from behind the wheels.
- 19. Release the park brake and test drive the vehicle.





REPLACE THE MASTER CYLINDER

A WARNING	Do not ingest brake fluid or allow contact with skin or eyes. Always wear protective clothing and a face shield when working with or around brake fluid. SKIN CONTACT Flush area immediately with water for several minutes. If a rash or skin irritation develops, get medical attention immediately. EYE CONTACT Immediately flush the eye with water for 15 minutes and call physician.
	INGESTION
	Get medical attention immediately.
-	
	1. Make sure the key-switch is in the "OFF" position, then remove the key.
A WARNING	the key.
AWARNING	the key. 2. Place the forward-reverse switch in the center "OFF" position.
& WARNING	the key.2. Place the forward-reverse switch in the center "OFF" position.3. If equipped with a hand operated park brake, set the brake.

AWARNING

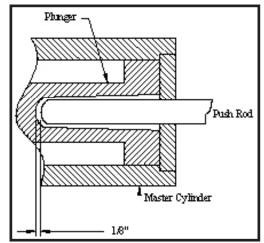
- 6. If required, raise the vehicle and support with jack stands.
- 7. Place a drain pan under the master cylinder.
- 8. Disconnect the brake line(s) to the master cylinder and pump out the fluid in the master cylinder by depressing the pedal several times.
- 9. Remove the master cylinder bolts and remove the master cylinder from the vehicle.
- 10. Install in reverse order.
- 11. Adjust the master cylinder push rod so that it is approximately 1/8 inch away from the master cylinder plunger when the brake pedal is up.
- 12. Fill the master cylinder with brake fluid from a sealed container.
- 13. Pump the brake pedal a short distance of one to two inches until no bubbles are seen coming from the inlet ports inside of the master cylinder chamber.
- 14. If the vehicle was raised, lower it to the ground.
- 15. Bleed the brakes. refer to **Bleed the Brakes** section for information regarding bleeding the brakes.
- 16. Reconnect the main positive and negative cables at the batteries.



- 17. Remove the blocks from behind the wheels.
- 18. Release the park brake and test drive the vehicle.

AWARNING

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



Cutaway of typical master cylinder showing the push rod clearance

REPAIR THE MASTER CYLINDER

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

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

Drain all fluid from the master cylinder and discard.

Remove the rubber boot.

Depress the plunger and remove the plunger spring clip retainer.

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

Thoroughly clean, inspect and replace parts as required.

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

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

Reassemble in reverse order.

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

HARDWARE TORQUE

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

Description	Foot Pounds
Mounting Bolts	11
Brake Body Bolts	11

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Motor

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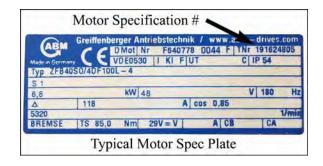




MOTOR IDENTIFICATION

Shown below is a typical motor specification decal that is applied to the motor.

The specification number on this illustration is for reference only. Use the motor specification number on your motor for parts and service information.



INSPECTION

Refer to the table at the end of this section for service limits and specifications.

Thermal Sensor

The thermal sensor is a temperature sensitive resistor buried deep within the phase windings.

Testing the thermal sensor consists of checking the resistance.

The tested resistance of the thermal sensor will vary depending on the current temperature of the sensor. In most cases, failure of the thermal sensor will result in a significant deviation of the resistance from the standard specification.

The resistance specification and motor connector details can be found at the end of this chapter.

Disconnect the sensor cable wires from the motor

Connect an Ohm meter to the Black(+) and White(-) wires to the motor and measure the resistance.

A replacement kit for the thermal sensor is available. Refer to the Parts section for details.

Phase Windings

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

The diagram below shows a simplified schematic of a 3-phase AC motor.

Static testing of the motor consists of checking the resistance of the phase windings. Failure of any of the phase windings typically results in a significant deviation of the normal resistance of the windings or a short to the motor frame.

The internal junction of the windings is not accessible so all tests will be testing two windings in series.

A milliohm meter is required to test the phase winding resistance.

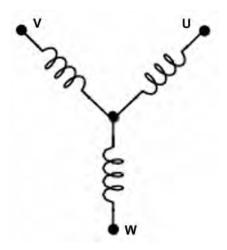
Disconnect all three wires and test the resistance across the 3 phases as follows:

U	to	V
U	to	W
V	to	W

All three test results should be within the service limit specified at the end of this section.

Test the resistance from all three terminals to the frame of the motor. All should be an open circuit.

If the motor fails any test, then the motor should be replaced.



Motor Phase Windings

MOTOR BRAKE

Disconnect the motor brake pigtail from the vehicle harness and check the coil resistance.

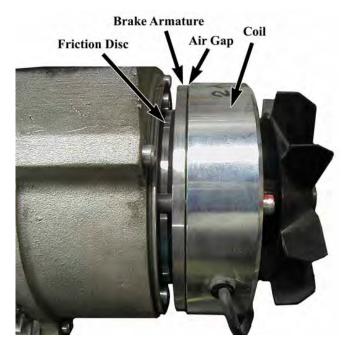
• The brake coil resistance should be within 10% of specification.

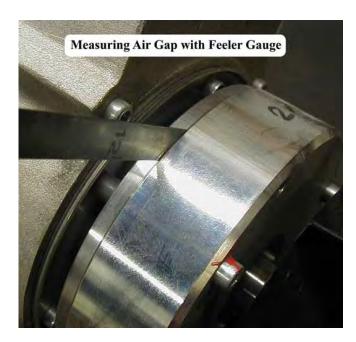
Remove the rear motor cover and the rubber band sealing gasket from around the brake.

- Note: A large amount of brake dust under the band is an indication of improper operation of the vehicle or an electrical problem with the brake circuit.
 - Measure the air gap between the brake coil and the brake armature. If the gap is larger than the wear limit then the brake needs to be rebuilt. The air gap specification can be found at the end of this section.

Connect a 48 volt, 2 Amp variable power supply to the brake coil.

- Set the voltage to 10 volts and measure the current. The current should be equal to the Voltage divided by the coil resistance. Example: If the coil resistance is 20 Ohms, then 10/20 = 0.5 Amps. If the current is not correct, then there is a problem in the magnet coil wires.
- Slowly increase the voltage until the brake releases. The voltage should be less than the minimum pull in voltage specified at the end of this section.
- Slowly decrease the voltage until the brake releases. The voltage should be lower than the maximum release voltage specified at the end of this section.
- If the pull in or release voltage is out of specifications AND the air gap is good, then there is a mechanical problem with the brake. Disassemble and clean all brake components. If the problem is not fixed then replace the brake.





Bearing and Sensor

Note: The bearing in Motor spec DLGF112150-4 consists of a combination bearing and armature rotation sensor.

Bearing

- Note: An "experienced ear" will be required to use this procedure. If your are not familiar with the normal sounds that emanate from a drive axle, then the motor must be disassembled to inspect the bearing.
 - 1. Raise the rear wheels off of the ground and support with jack stands.
 - 2. Place a mechanics stethoscope on the rear motor housing and listen to the bearing noise.
 - 3 A faulty bearing will typically sound like a high pitch grinding noise or squeal.

Rotation Sensor

A regulated 5 volt power supply is required for this procedure.

It is recommended to use analog volt meters for this procedure.

The motor connector details can be found at the end of this chapter.

- 1. Disconnect the sensor cable from the motor.
- 2. Connect the positive lead of one volt meter to terminal #2.
- 3. Connect the positive lead of another volt meter to terminal #3.
- 4. Connect the negative lead of both volt meters to the power supply negative.
- 5. Connect the regulated 5 volt power source to terminal #1 (+) and terminal #4 (-)
- 6. <u>SLOWLY</u> push the vehicle while monitoring the volt meters.
- 7. Each volt meter should alternately pulse as the motor armature rotates (approximately 0.6 volts).

DISASSEMBLE

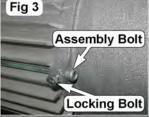
- Note: If the motor does not have the fan or brake, skip to step #9.
- 1. Remove the fan housing.
- Remove the circlip retaining the fan (Fig 1) and then remove the fan from the armature shaft. The fan is a slip fit and should be able to be removed by hand.
- Install two 10-32 x 2" machine screws into the

two open holes in the brake assembly. These screws will hold the assembly together when it is removed from the motor.

- 4. Remove the rubber seal ring from around the brake.
- 5. Mark the brake housing and motor housing so that the brake can be reinstalled in the correct orientation.
- 6. Remove the three screws holding the brake assembly to the motor and remove the electric motor brake assembly.
- 7. Remove the three brake assembly spacers.
- 8. Remove the brake friction plate assembly.
- 9. Remove the nuts from the three cable terminals.
- 10. Mark the cable terminal cover so that it can be reinstalled in the correct orientation.
- 11. Remove the cable terminal cover.
- 12. There are six cable assemblies attached in pairs to the three studs. The center 'V' phase cables (Fig 2) must be removed from the stud to enable removal of the housing.



- Remove the locking bolts (Fig 3) for the four motor assembly bolts.
- 14. Remove the motor assembly bolts (Fig 3) holding the end housing to the field housing and while carefully pushing the cables through the



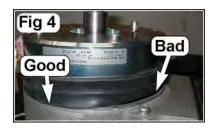
opening, remove the end housing/armature assembly from the field housing.



T-48 AC / ET 3000

Reassemble

- 1. Insert the armature/housing assembly into the field housing' while carefully pulling the field cable assemblies through the opening.
- 2. Install the sensor bearing and thermal sensor grommets into their respective slots on the end housing and bolt the end housing to the field housing.
- 3. Connect the two 'V' phase wire to the terminal stud.
- 4. Install the terminal cover and terminal nuts. Make sure the cover is aligned with the marks made during disassembly
- 5. Install the friction plate assembly with extended hub facing out.
- 6. Place the electric brake spacers onto the motor assembly.
- Install the electric brake assembly. Make sure the brake is aligned with the marks made during disassembly.
- 8. Install the rubber seal ring around the brake. Make sure it is seated correctly (Fig 4).
- 9. Remove the two 10-32 machine screws holding the brake assembly together.
- 10. Install the fan, fan circlip, and fan housing.
- 11. Install the locking bolts for the four motor assembly bolts (Fig 3).

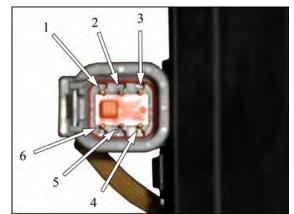


MOTOR CONNECTOR

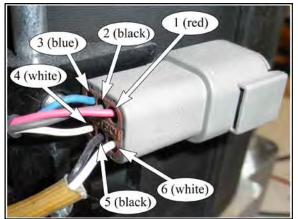
Spec 191624805 and 806



Spec 191649703



Motor Connector, Pin Side



Motor Connector, Wire Side



MOTOR SERVICE LIMITS AND SPECIFICATIONS

Phase Winding resistance:

0.3 Ohms, all phases (nominal)

Thermal sensor resistance:

581 Ohms @ 20 degrees C

Brake Coil Resistance:

20 Ohms @ 20 degrees C

Brake Air gap:

New: 0.012 Inches (0.3 mm) Wear Limit: : 0.0276 Inches (0.7 mm)

Minimum Brake Pull In Voltage:

24 Volts @ 20 degrees C

Maximum Brake Release Voltage:

12 Volts @ 20 degrees C

HARDWARE TORQUE

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

Description	Foot Pounds	Newton Meters
Terminal Studs	7.14	10

Transmission

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CHECK OIL LEVEL

The oil flows freely between the main gear case (3rd member) and the primary reduction gear case. It is only necessary to check the oil level of the 3rd member.

Park the vehicle on a level surface.

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

- Place the forward-reverse switch in the center "OFF" position.
 If equipped with a hand operated park brake, set the brake.
- 4. Place blocks under the front wheels to prevent vehicle movement.
- 5. Disconnect the main positive and negative cables at the batteries.

- 6. Place a level on top of the motor. Raise the rear of the vehicle until the level indicates that the drive is level with the ground.
- 7. Place an oil drain pan underneath the 3rd member.
- 8. Remove the fill/level plug.
- 9. The oil level should be very close to the bottom of the level plug opening.
 - a. If the oil level is below the bottom of the opening, add oil as required until level with the bottom of the opening. Refer to the *Lube Chart* section for information regarding type of oil.
 - b. If oil comes out of the opening, allow to drain until level with the bottom of the opening.
- 10. Replace the fill/level plug.
- 11. Reconnect the main positive and negative cables at the batteries.
- 12. Remove the blocks from the wheels.
- 13. Release the park brake and test drive the vehicle.



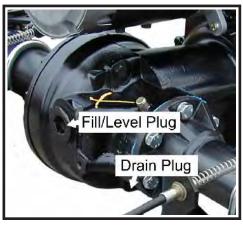


CHANGE OIL

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

AWARNING

- 2. Place the forward-reverse switch in the center "OFF" position.
- 3. If equipped with a hand operated park brake, set the 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.
- 7. Place a four quart drain pan under the drive assembly.
- 8. Remove the drain plugs from the differential case and gear case.
- 9. Once the oil has drained, replace the drain plugs and lower the vehicle to the ground.
- Remove the fill/level plug and fill the differential up to the bottom of the level plug opening. Refer to the *Lube Chart* section for information regarding type of oil.
- 11. Replace the fill plug.
- 12. Reconnect the main positive and negative cables at the batteries.
- 13. Remove the blocks from the wheels.
- 14. Release the park brake and test drive the vehicle.





MOTOR REMOVAL AND INSTALLATION

Note: Some applications will require removing the drive assembly from the vehicle to remove the motor. Refer to **Removing and Installing the Drive Assembly** for information on removing the drive assembly.

Some vehicles are equipped with an automatic electric brake. The automatic electric brake is sandwiched between the drive motor and the gear case. The electric brake is retained by the drive motor mounting screws. Once the motor is removed the electric brake will no longer be retained by any hardware.

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

AWARNING

- 2. Place the forward-reverse switch in the center "OFF" position.
- 3. If equipped with a hand operated park brake, set the 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 motor wires with the number of the motor terminal before they are removed from the motor.
- 7. If equipped, remove the motor support bracket u-bolt (only used on larger motors).
- 8. Remove the motor mounting bolts and slide the motor off of the input shaft.
- 9. Install the motor in reverse order. Make sure that the motor coupler o-ring is properly installed on the transmission input shaft.
 - Note: Apply a light coating of part number 94-421-34 moly paste grease to the splines on the transmission input shaft only.
- 10. Reconnect the main positive and negative cables at the batteries.
- 11. Remove the blocks from behind the wheels.
- 12. Release the park brake and test drive the vehicle.



Support bracket u-bolt



Transmission input shaft



REAR HUB OR ROTOR

Note: The torque specification for the axle hub bolt is listed in the Hardware Torque Table at the end of this section. An impact wrench will be required to remove the bolt.

- Note: The axle hub bolt has a special thread locking compound applied to the threads. If this bolt is removed, it must be replaced.
 - 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. If equipped with a hand operated park brake, set the brake.
- 4. Place blocks under the front wheels to prevent vehicle movement.
- 5. Disconnect the main positive and negative cables at the batteries.

AWARNING

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

- 6. Raise the wheel off of the ground.
- 7. Remove the tire/wheel assembly, Refer to *Tires and Wheels* section for information regarding removing the tire/wheel assembly.
- 8. Remove the axle hub bolt and washer and remove the hub from the axle.
- Remove the outer brake pad. Refer to section *Brake Service* for information regarding removing the brake pads.
- 10. Remove the rotor.
- 11. Install in reverse order.
 - a. Lightly grease the axle splines.



- b. Refer to section **Brake Service** for information regarding installing the brake pads.
- c. Thoroughly clean the threads in the axle shaft.
- d. Using a new bolt, torque the axle hub bolt to the specified number found in the Hardware Torque Table at the end of this section.
- e. Refer to Tires and Wheels section for information regarding installing the tire/wheel assembly.



The axle retaining plate bolts have a pre-applied thread locking compound. They are intended for one time use only. If removed they must be replaced. Reusing the original bolts could cause loss of brakes resulting in severe bodily injury and/or property damage.

Refer to section Rear Brakes in Illustrated Parts for the part number of the bolt.

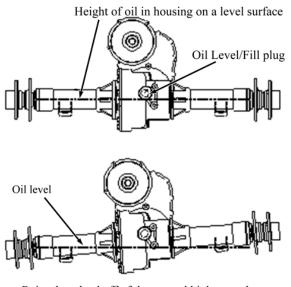
- 12. Lower the wheel to the ground.
- 13. Reconnect the main positive and negative cables at the batteries.
- 14. Remove the blocks from behind the wheels, release the park brake and test drive the vehicle.



REMOVING AND INSTALLING THE REAR AXLES (DISC BRAKES)

The oil level in the housing is above the bottom of the axle flange. To minimize oil spills, raise the side of the vehicle high enough so that the oil level is below the bottom of the axle flange. If both axles are to be removed, you must drain all of the oil from the housing.

- Note: This procedure does not require that the rear end or drive assembly be removed from the vehicle.
- Note: The axle hub bolt has a special thread locking compound applied to the threads. If this bolt is removed, it must be replaced.

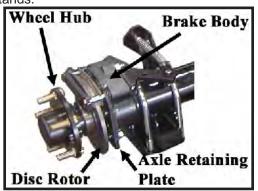


Raise the wheel off of the ground high enough so that the oil level is below the axle housing flange

- 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. If equipped with a hand operated park brake, set the brake.
- 4. Place blocks under the front wheels to prevent vehicle movement.
- 5. Disconnect the main positive and negative cables at the batteries.

- 6. If required, drain the oil from the 3rd member.
- 7. Raise the rear of the vehicle and support with jack stands.
- 8. Release the park brake.
- Remove the tire and wheel assembly. Refer to section *Tires and Wheels* for information regarding removing the tire and wheel assembly.
 - a. If the axle shaft, hub or bearing is to be replaced then remove the hub bolt, wheel hub and disc rotor at this time.
- 10. Remove the four bolts attached to the axle retaining plate.







- 11. Remove the axle retaining plate and brake body assembly as one unit.
- 12. Secure the brake body assembly, do not let it hang by the brake hose.
- 13. Pull the axle out of the housing.
- 14. Inspect all bearings for roughness or play, replace as needed.
- 15. Install in reverse order, lubricate the o-ring.

Note: Be sure not to damage the o-ring.

16. Use new bolts for the axle retaining plate.



The axle retaining plate bolts have a pre-applied thread locking compound. They are intended for one time use only. If removed they must be replaced. Reusing the original bolts could cause loss of brakes resulting in severe bodily injury and/or property damage.

Refer to section Rear Brakes in Illustrated Parts for the part number of the bolt.

- 17. If the wheel hub was removed, install the hub and rotor. Torque the hub bolt to specified amount shown in the Hardware Torque Table at the end of the section.
- 17. Fill with oil to the level of the fill plug threads. Refer to Changing the Differential Oil.
- 18. Lower the vehicle.
- 19. If equipped with a hand operated park brake, set the brake.
- 20. Reconnect the main positive and negative cables at the batteries.
- 21. Remove the blocks from behind the wheels.
- 22. Release the park brake and test drive the vehicle.



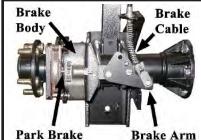
TRANSMISSION ASSEMBLY

Remove and Install

- 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.

AWARNING

- 3. If equipped with a hand operated park brake, set the brake.
- 4. Place blocks under the front wheels to prevent vehicle movement.
- 5. Disconnect the main positive and negative cables at the batteries.
- 6. If equipped with a hand operated park brake, release the brake and remove the park brake cables from the spring axle mounting brackets and brake arms.
- 7. Disconnect the wiring from the motor.
- 8. Disconnect the hydraulic brake lines from the left and right brake bodies.



R Brake Pin Brake Arm Extension

- 9. Remove the u-bolts holding the leaf springs to the frame as shown in the illustration to the right. Do not remove the u-bolts on the axle housing.
- 10. Remove the lower shock mounting bolts and the front spring mounting bolts.
- 11. Raise the rear of the vehicle, lifting the frame up and off of the drive assembly. Support the rear of the vehicle with jack stands.



AWARNING

- 12. Reinstall the drive in reverse order.
- 13. Bleed the brake system. Refer to **Bleed the Brake System** for information regarding bleeding the brakes.
- 14. If equipped with a hand operated park brake, set the brake.
- 15. Lower the vehicle.
- 16. Reconnect the main positive and negative cables at the batteries.
- 17. Remove the blocks from the wheels, release the park brake and test drive the vehicle.



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

AWARNING

- Place the forward-reverse switch in the center "OFF" position.
 If equipped with a hand operated park brake, set the brake.
- 4. Place blocks under the front wheels to prevent vehicle movement.
- 5. Disconnect the main positive and negative cables at the batteries.

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

- 6. Raise the rear of the vehicle and support with jack stands.
- 7. Place a drain pan under the gear case that is capable of holding four quarts of oil and drain the oil from the front gear case.
- 8. If required, remove the drive assembly from the vehicle
 - Note: Refer to **Removing and Installing the Drive Assembly** for information on removing the drive from the vehicle.
- 9. Remove the motor only if the entire drive is to be disassembled.
 - Note: Refer to **Motor Removal and Installation** for information on removing the motor.



Transmission 😰

Oil Drain Plug

- 10. Remove the cover retaining bolts.
- 11. Remove the cover plate from the differential and let the remaining oil drain from the housing.



Be careful not to damage the sealing surfaces on the housings. Damage to the sealing surface may lead to an oil leak resulting in damage to the internal parts of the drive.





T-48 AC / ET 3000

12. Remove the circlip from the idler gear.

 Remove the input shaft/bearing assembly and idler gear/ bearing assembly from the gear case cover at the same time.

- 14. Remove the pinion nut from the output gear and remove the output gear from the pinion shaft.
 - Note: If necessary, remove the seal from the input shaft bore at this time.

- 15. Mark the gear case position in relation to the 3rd member housing so that it will be reassembled in the same position.
- 16. Remove the six retaining bolts holding the gear case to the 3rd member housing.
 - Note: Make note of the angle of the gear case.
- 17. Remove the gear case housing from the 3rd member housing.
- 18. Inspect all parts for signs of wear or damage.













Lubricate all parts with gear oil before installation. Failure to pre-lube the parts may result in premature failure.

- 19. Assemble the gear case in reverse order.
 - Note: Torque the drain plug to the specified amount listed in the Hardware Torque Table at the end of this section.
 - Note: Torque the gear case to 3rd member retaining bolts to the specified amount listed in the Hardware Torque Table at the end of this section.
 - Note: Torque the pinion nut to the specified amount listed in the Hardware Torque Table at the end of this section.
 - Note: Apply gasket sealer (#94-430-05) to the front flange on the 3rd member and gear case cover.
 - Note: Pack the motor seal with non-acetic based grease.
- 20. Fill the differential with oil.
 - *Note:* Refer to **Changing the Differential Oil** for information on filling the drive with oil.
- 21. Lower the vehicle.
- 22. Reconnect the main positive and negative cables at the batteries.
- 23. Remove the blocks from behind the wheels.
- 24. Test drive the vehicle.





DISASSEMBLING THE 3RD MEMBER

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

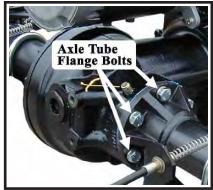
- 2. Place the forward-reverse switch in the center "OFF" position.
- **3.** If equipped with a hand operated park brake, set the brake.
- 4. Place blocks under the front wheels to prevent vehicle movement.
- 5. Disconnect the main positive and negative cables at the batteries.

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

- 6. Raise the rear of the vehicle and support with jack stands.
- 7. Remove the complete drive from the vehicle.

Note: Refer to **Removing and Installing the Drive Assembly** for information on removing the drive from the vehicle.

- 8. Place a drain pan under the gear case that is capable of holding four quarts of oil and drain the oil from the front gear case and 3rd member.
- 9. Place the 3rd member on an appropriate stand.
- 10. Remove the axle shafts and tubes as an assembly from the 3rd member by removing the six axle tube flange bolts on each axle tube.
- Remove the primary reduction gear case. Refer to *Disassembly and reassembly of the Primary Reduction Gear Case* for information on removing the gear case.
- 12. Remove the 12 side plate bolts, then remove the side plate.





13. Remove the carrier bearing adjusting nut roll pin and adjusting nut from the side plate.

14. Turn the side plate over and remove the carrier bearing race from the side plate.

15. Remove the differential assembly from the 3rd member housing.

- 16. Remove the carrier bearing adjusting nut roll pin from the 3rd member housing, then remove the carrier adjusting nut.
 - Roll Pin











Page 3





17. Remove the carrier bearing race from the 3rd member housing.

- 18. Remove the front bearing from the input shaft.
 - Note: The input shaft may have to be driven out to perform this procedure.
- 19. Remove the input shaft's shims and spacer.

- 20. Remove the pinion shaft from the 3rd member.
- 21. Remove the front and rear pinion bearing races.
- 22. Inspect all parts for signs of wear or damage.
- 23. Thoroughly clean all parts.











ASSEMBLING THE 3RD MEMBER

- 1. Temporarily install the pinion gear (hand tighten only).
- 2. Install the carrier bearing race ring nuts into the housing and cover.





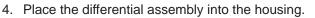
Housing

3. Install the carrier bearing races into the housing and cover.





Housing



- 5. Tighten the housing carrier bearing race ring nut so that the ring gear is not in binding against the pinion gear.
- 6. Remove the differential assembly.

Note: Do not allow the ring nut to rotate.

- 7. Remove the pinion gear and then reinstall the differential assembly.
- 8. Install the cover onto the housing using 4-bolts in a cross pattern and torque to the specified amount listed in the Hardware Torque Table at the end of this section.
- 9. Pre set the carrier bearing preload by tightening the housing carrier bearing race ring nut until it requires 1.5 to 3.3 ft-lbs to rotate the differential assembly.
 - Note: Rotate the carrier assembly whenever adjusting the ring nuts.





Transmission 🔞



- 10. Mark the position of each carrier bearing ring nut in relation to the drive housing and cover and then remove the differential assembly, do not allow the ring nuts to rotate.
- 11. Install the pinion gear. Re-shim if required.

If the ring and pinion gears or bearings are replaced then the pinion gear must be reshimmed. Improper pinion gear shims will result in drive noise and premature failure. **Refer to Pinion Gear Shimming Instructions.**

- 12. Install the pinion gear holding tool (96-500-42) and tighten the pinion nut enough to keep the pinion gear from rotating
- 13. Install the differential assembly.
- 14. Install the cover and all of the cover bolts. Torque to the specified amount listed in the Hardware Torque Table at the end of this section.
- 15. Check the gear lash between the ring and pinion gears. The gear lash should be 0.005 to 0.007 inches.
- 16. Adjust the gear lash if needed by tightening or loosening the carrier bearing race ring nuts. The two ring nuts must be turned equally in opposite directions.
 - Note: To move the ring gear closer to the pinion: Loosen the housing carrier bearing race ring nuts and tighten the cover carrier bearing race ring nut equally.
 - Note: To move the ring gear away from the pinion: Loosen the cover carrier bearing race ring nut and tighten the housing carrier race ring nut equally.

The two ring nuts must be turned the same amount in opposite directions. This allows the carrier assembly to be positioned with the proper gear lash without upsetting the bearing preload. If the ring nuts are not turned the same amount, then the bearing preload will no longer be correct and will result in drive noise and premature failure.









ACAUTION



- 17. Install the locking roll pins into the housing and cover to lock the ring nuts in place.
- 18. Remove the pinion gear holding tool.
- 19. Install the primary reduction gear case, axles and housings, motor, and install the complete drive onto the vehicle.
- 20. Fill the drive with oil. Refer to the *Lube Chart* section for information regarding type of oil. Refer to *Change Oil* section for information regarding the proper oil level..
- 21. Lower the vehicle.
- 22. Reconnect the main positive and negative cables at the batteries.
- 23. Remove the blocks from behind the wheels.
- 24. Test drive the vehicle.



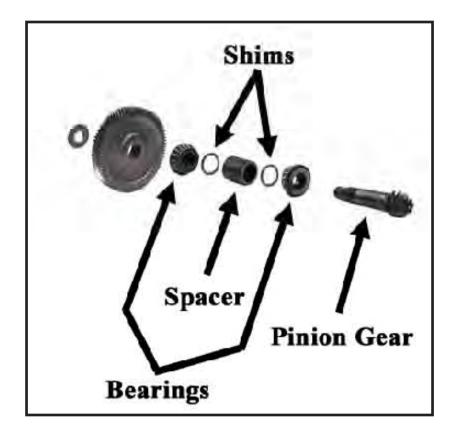


Pinion Bearing Preload

Note: The pinion gear depth must be set before the preload. Refer to **Setting the Pinion Gear Depth**.

- 1. Install the pinion gear, spacer, and shims into the housing.
- 2. Install the outer pinion bearing.
- 3. Install the main gear onto the pinion shaft and torque the pinion nut to *the specified amount listed in the Hardware Torque Table at the end of this section.*
- 4. Measure the torque required to rotate the pinion shaft in the housing.
- 5. The torque required to rotate the pinion shaft should be between 1.1 and 2.9 ft-lbs. If the torque is not within specifications then add or subtract from the total shim thickness and repeat this procedure until the proper preload is obtained.

Note: Add shims to decrease torque.





PINION GEAR SHIMMING INSTRUCTIONS

- Note: This procedure is required only when replacing the front or rear pinion bearings and races or the ring and pinion gears.
- Note: To perform this procedure, all parts must be clean and the bearings lightly lubricated.

Setting the Pinion Gear Depth

This formula is used to calculate the amount of shims that are required:

C - B - A + (DV) = Pinion Shim (mm) where,

DV = The number on the face of the pinion gear.

A = The distance in millimeters from the face of the pinion gear to the top of the inner pinion bearing race (see below)

B = 54.

C = The number on the edge of the differential side plate closest to the input shaft (see next page).

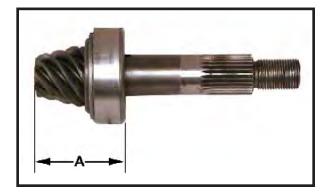
D = The number on the edge of the differential side plate farthest from the input shaft (see next page).

E = The distance in millimeters from the rear of the drive housing to the face of the pinion gear (see next page).

Once a shim has been selected and the pinion gear is installed, confirm that: **E** - **D** = **B** + (**DV**)



Face of pinion gear



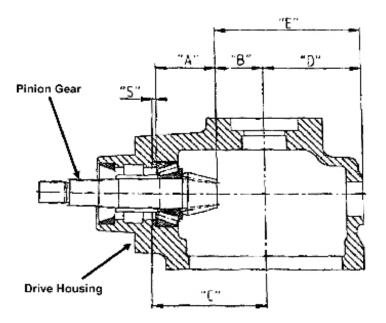


Number on face of pinion gear





Note: Values shown are for reference only



HARDWARE TORQUE

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

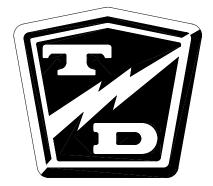
Description	Foot Pounds	Newton Meters
Pinion nut	154-169	209-229
Drain plug	21-25	28.4-33
Gear case to 3rd member	18-20	24.4-27
3rd Member cover bolts	45-50	54-67.5
Axle hub bolt	275	392

Suspension

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Hardware Torque	







REPLACE THE REAR SPRINGS

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

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

AWARNING

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

- 6. Raise the rear of the vehicle and support with jack stands.
- 7. Tie up or support the rear axle so it cannot fall out of the vehicle.
- 8. Unbolt the spring from the axle housing.
- 9. Support the spring so that it cannot fall out of the vehicle.
- 10. Remove the remaining hardware retaining the spring to the frame.
- 11. Remove the spring from the vehicle.
- 12. Inspect the spring bolts and spring hangers for signs of wear or damage. If any wear or damage is found, then they must be replaced.

AWARNING

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

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



REPLACE THE FRONT SPRINGS

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

- *Hint:* In most vehicles it will be easier if the springs are replaced one at a time.
 - 1. Make sure the key-switch is in the "OFF" **position, then remove** the key.

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

- 3. Set the park brake.
 - 4. Place blocks under the rear wheels to prevent vehicle movement.
- 5. Disconnect the main positive and negative cables at the batteries.

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

- 6. Raise the front of the vehicle and support with jack stands.
- 7. Tie up or support the front axle so it cannot fall out of the vehicle.
- 8. Unbolt the spring from the front axle beam.
- 9. Support the spring so that it cannot fall out of the vehicle.
- 10. Remove the lower bolt from the spring hanger.
- 11. Remove the spring bolt from the other end of the spring and remove the spring from the vehicle.
- 12. Inspect the spring bolts and spring hangers for signs of wear or damage. If any wear or damage is found, then they must be replaced.
- 13. Install the new spring in reverse order.
- 14. If the spring hanger bolts do not have a grease fitting, lube the spring bushings before installing the spring.
- 15. Torque the spring hanger bolts to the specified amount listed in the Hardware Torque Table at the end of this section.
- 16. If the spring bolts are equipped with grease fittings, lube them at this time.
- 17. Lower the vehicle.
- 18. Reconnect the main positive and negative cables at the batteries.
- 19. Remove the blocks from behind the wheels.
- 20. Release the parking brake and test drive the vehicle.



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





REPLACE THE SPRING BUSHINGS

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

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

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



- 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.

AWARNING

- 3. Set the park brake.
- 4. Place blocks under the front/rear wheels to prevent vehicle movement.
- 5. Disconnect the main positive and negative cables at the batteries.

AWARNING

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

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





- 10. Install the new bushings in reverse order.
 - *Hint:* Apply a light coating of grease to the bushing before pressing into the spring eye.
- 11. Install the spring onto the vehicle.
 - Note: Refer to **Replace the Front Springs** section for information regarding installing the front springs.
- 12. Repeat for the other spring.
- 13. Lower the vehicle.
- 14. Reconnect the main positive and negative cables at the batteries.
- 15. Remove the blocks from behind the wheels.
- 16. Release the parking brake and test drive the vehicle.





REPLACE THE SHOCKS

It is recommended to replace all shocks as a set.

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

AWARNING

- 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.

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

- 6. Some vehicles may require that the wheels be lifted off of the ground and supported with jack stands to replace the shocks.
- 7. Remove the upper and lower shock bolts.
- 8. Remove the shock from the vehicle.
 - Note: If the shock that was removed is to be reinstalled:
 - A. Inspect the shaft where it enters the shock body for any signs of leakage. If any sign of leakage is seen, then the shock must be replaced.
 - B. Inspect the upper and lower shock bushings. If any signs of damage or wear are seen, then the shock must be replaced.
- 9. Install the shock in reverse order.
- 10. Lower the vehicle.
- 11. Reconnect the main positive and negative cables at the batteries.
- 12. Remove the blocks from behind the wheels.
- 13. Release the parking brake and test drive the vehicle.

HARDWARE TORQUE

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

Description	Foot Pounds	Newton Meters
Spring Hanger Bolts	20	



Tires and Wheels

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Tires and Wheels

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AWARNING

TIRE INFLATION

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

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

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

Tire pressures must be checked when the tire is cold.



TIRE INSPECTION

- 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.

AWARNING

- 3. Set the park brake.
- 4. Place blocks under the front wheels to prevent vehicle movement.
- 5. Disconnect the main positive and negative cables at the batteries.
- 6. Check the tire pressure. Refer to *Tire Inflation* section for information on checking the tire pressure.
- 7. Inspect the tire tread depth. Minimum recommended tread depth is 1/16-inch. There are a series of tread depth wear indicators around the circumference of the tire. They will appear as 1/2-inch bands across the tread as the tire approaches its wear limit (see illustration to the right). Replace the tire if any tread depth indicator can be seen or any part of the tread depth is 1/16-inch or less. Refer to *Replace the Tire* section for information regarding replacing the tire.



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

REPLACE THE TIRE/WHEEL

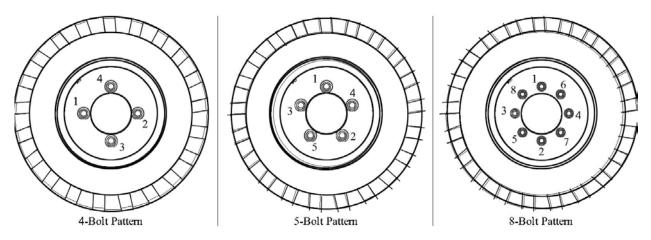
- 1. Make sure the key-switch is in the "OFF" **position, then remove** the key.
- 2. Place the forward-reverse switch in the center "OFF" position.

AWARNING

- 3. Set the park brake.
- 4. Place blocks under the front wheels to prevent vehicle movement.
- 5. Disconnect the main positive and negative cables at the batteries.
- 6. Raise the wheel to be replaced off of the ground and support with jack stands.
- 7. Remove the 4 or 5 wheel nuts and remove the wheel.
- 8. Install in reverse order.
- 9. Following the pattern shown on the following page, cross tighten the wheel nuts in two stages as follows:

1st stage to approximately 20 ft-lbs. 2nd stage to 80-90 ft-lbs.

- 10. Reconnect the main positive and negative cables at the batteries.
- 11. Lower the wheel to the ground.
- 12. Remove the blocks from behind the wheels.
- 13. Release the parking brake and test drive the vehicle.



Pattern for tightening the wheel nuts

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

REPAIR THE TIRE (PNEUMATIC)

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

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

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

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

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

REPLACE THE TIRE (PNEUMATIC)

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

AWARNING

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

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

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

Always use a new valve stem when replacing a tire.

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



Notes:



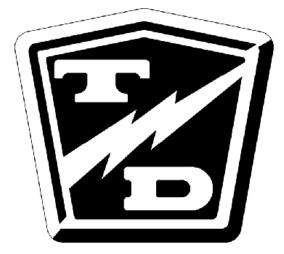
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AWARNING

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





CLEANING

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- 1. Make sure the start switch is in the "OFF" position, then remove the key.
- 2. Place the forward-reverse switch in the center "OFF" position.
- 3. Set the park brake.
- 4. Place blocks under the front wheels to prevent vehicle movement.
- 5. Disconnect the main positive and negative battery leads.
- 6. Dry dirt can be readily blown off with low-pressure air or brushed off.
- 7. Wetness or wet dirt on the battery indicates battery acid. Using a nonmetallic brush with flexible bristles, wash the battery off with a strong solution of baking soda and hot water (1 lb. of soda to a gallon of water). Continue until all fizzing stops, which indicates that the acid has been neutralized. Then rinse thoroughly with clear water. DO NOT get any of the solution into the battery cells.
- 8. Reconnect the battery, remove the blocks from the wheels and test drive.

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.

TESTING

AWARNING

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

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.

DO NOT attempt the test the specific gravity of a sealed battery. Removing the caps of a sealed battery will damage the battery resulting in premature failure.

Specific Gravity

Note: The battery must be fully charged before performing this test.

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



Batter

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

Typical Hydrometer Float

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

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

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

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

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

Note: Contact the battery manufacturer for information regarding replacing individual cells in the battery.

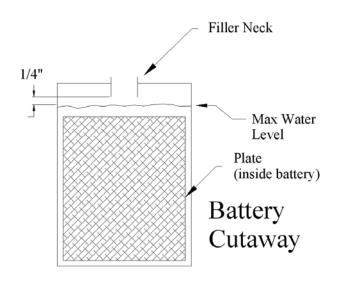


WATERING

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

ACAUTION

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.



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

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

DO NOT attempt add water to a sealed battery. Removing the caps of a sealed battery will damage the battery resulting in premature failure.

- Note: The electrolyte level in a battery rises while charging and will be close to its highest level after the end of a charging cycle. It is recommended to fill the battery at the end of a charging cycle. If the electrolyte is below the top of the battery plates then fill just enough to cover the plates and then top off when the charging cycle is complete.
- 6. Clean the battery. Refer to *Cleaning* section for information on cleaning the battery.
- Check the electrolyte level in all battery cells. If low, fill to the correct level with distilled water using part number 77-201-00 battery filler, never add additional battery electrolyte to the batteries.
- 8. Reconnect the battery, remove the blocks from the wheels and test drive.





CHARGING

Refer to the Operator Section for charging information.

- 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.
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- 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.

STORING

Storage

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

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

Store the vehicle or battery (if removed) in a cool, dry, well ventilated area.

If storing for more than one month, the battery should be charged per the table below.

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

Returning to Service

- 1. Make sure the start switch is in the "OFF" **position, then remove the key.**
- 2. Place the forward-reverse switch in the center "OFF" position.
- 3. Set the park brake.
- 4. Place blocks under the front wheels to prevent vehicle movement.
- 5. Disconnect the main positive and negative battery leads.
- 6. Thoroughly clean the battery and battery compartment. Refer to *Cleaning* in this section for information regarding cleaning the battery.
- 7. Check the electrolyte level and charge the battery. Refer to *Watering* in this section for information regarding checking the electrolyte level.
- 8. Test the battery. Refer to **Testing** section for information on testing the battery.
- 9. The battery is now ready to be put back into service.

REMOVE/INSTALL

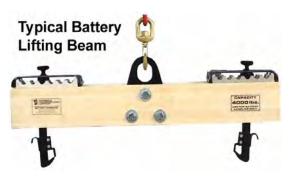
Batterv

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

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

Industrial Battery or Lift Out Battery Pack

- 6. Thoroughly clean the battery and battery compartment. Refer to *Cleaning* in this section for information regarding cleaning the batteries.
- 7. Using a hoist or forklift equipped with a proper battery lifting device (see illustration), slowly raise the battery out of the vehicle.
- 8. Inspect the battery compartment for signs of corrosion.
- 9. If minimal signs of corrosion are seen, then the damaged paint should be stripped off and the entire battery compartment cleaned and repainted.
- 10. If there are excessive signs of corrosion, then it may be necessary to replace some of the frame members or completely rebuild the battery compartment.
- 11. Inspect the battery cables and terminals. If any of the cables or terminals show signs of corrosion, then they must be repaired or replaced.
- 12. Install the battery in reverse order.
- 13. Remove the blocks from the wheels and test drive.





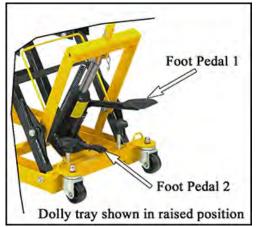


T-48 AC / ET 3000 Roll Out Battery Box (ROBB) with battery Dolly

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

Remove

- 6. Disconnect the battery cable from the ROBB.
- 7. Position the ROBB dolly as close as possible to the vehicle, aligned with the battery box.
- 8. Using the ROBB handle, twist to unlock the box from the frame and pull the box out 6 inches.
- 9. Pump foot pedal 1 to raise the dolly tray until it is in contact with the bottom the ROBB.
- 10. While pushing the dolly up against the vehicle, pull the ROBB out of the vehicle and onto the dolly tray.



- 11. Tie the ROBB to the tray so that it cannot roll off.
- 12. SLOWLY depress foot pedal 2 until the tray starts to lower and allow to lower all of the way down.

<u>Install</u>

- 1. Confirm the start switch is OFF and the parking brake is set.
- 2. The ROBB should be tied to the dolly tray so that it can not roll off.
- 3. Position the ROBB dolly as close as possible to the vehicle, aligned with the battery box.
- 4. Pump foot pedal 1 to raise the dolly tray until it is slightly above its location in the vehicle.

- 5. Untie the ROBB from the dolly and push forward until it starts to enter the vehicle.
- 6. Using the foot pedal 1 and/or foot pedal 2, adjust the vertical position of the dolly tray until the ROBB can be easily pushed into the vehicle.
- 7. Lock the ROBB in place.
- 8. Connect the battery cable.

Individual Batteries

ACAUTION

Individual batteries can weight up to 80 pounds. **To avoide injury, use proper lifting tecniques or** a hoist to remove the battery.

AWARNING

Do not allow the loose battery cables to contact any other parts of the vehicle as this could cause in a short circuit resulting severe bodily injury or damage to the vehicle.

- 1. Make sure the start switch is in the "OFF" position, then remove the key.
- 2. Place the forward-reverse switch in the center "OFF" position.
- 3. Set the park brake.
- 4. Place blocks under the front wheels to prevent vehicle movement.
- 5. Using an insulated wrench, disconnect the cables from the battery to be removed.
- 6. Using a lifting strap or hoist, remove the battery from the vehicle.
- 7. Inspect the battery compartment for corrosion. If there is significant corrosion, all batteries should be removed and the compartment cleaned and painted.
- 8. Install the battery and torque the battery terminal hadware per torque listed in the Hardware Torque table at the end of this section.

HARDWARE TORQUE

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

Description	Inch Pounds	Newton Meters
Battery Terminal (clamp)	48-60	5.4-6.7
Battery Terminal (stud)	120-130	13.5-14.5

T-48 AC / ET 3000

Battery Notes:

Green Since 1949

The vehicle wiring diagram is too large to be legible when printed at this size. A full size diagram (22 x 16) is included on the CD in PDF format. You can access the diagram from a button on the CD menu.

The diagram # is SCH-00021

Charger AC Cords:

If you are not familiar with standard AC power wiring, then refer repair to a qualified licensed electrician.

AWARNING

Charger AC power source is High Voltage. Only personnel qualified for work high voltage AC power lines should repair the charger AC power cord. Improper repair or incorrect wiring may result in an electrical shock hazard causing severe bodily injury or death by electrocution.

Depending on the charging system, two different color codes are used for the AC power source.

United States Standard 120 Volt:

White - Neutral

Black - Hot

Green -Ground

European Standard:

Blue - Neutral

Brown - Hot

Green/Yellow - Ground



Notes:



Motor Controller

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AWARNING

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





Motor Controller REMOVE/INSTALL

- 1) Place the Forward/Reverse switch in the center "OFF" position (neutral).
- 2) Turn the Start switch OFF.
- 3) Confirm the automatic park brake is set.
- 4) Place blocks under the front or rear wheels to prevent vehicle movement.
- 5) Disconnect the battery main positive and negative cables or disconnect the main battery plug.

Do not allow the wires to rotate while removing terminal hardware.

Internal electrical connection will be damaged if the terminal stud rotates.

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

<u>Remove</u>

- 6: Turn the start switch OFF.
- 7: Disconnect the batteries.
- 8: While holding the wires so that they do not rotate, remove the terminal bolts.
- 9: Disconnect the logic connector.
- 10: Remove the four bolts holding the controller to the panel and remove the controller.
- Note: If a heat sink is installed, then these bolts may also hold the heat sink to the panel.

<u>Install</u>

- 1: Thoroughly clean the controller base, mounting plate, and heat sink.
- 2: Apply thermal transfer compound to the controller base and heat sink.
- 3: Install the controller to the mounting plate.
- 4: Attach the wires to the studs and torque per specification listed in the table at the end of this section.
- Note: DO NOT allow the wires to rotate while torquing the bolts (see notice above).
- 5: Install silicon dielectric grease (94-422-10, 5.3 ounce tube) into the harness receptacle and reconnect to the controller.
- 6: Reconnect the batteries and test drive.

INSPECT

T-48 AC / ET 3000

Receptacles

The inside of each receptacle should be clean and free of any debris. Use aerosol electrical cleaner if required.

Base Plate

The base plate should be flat. If required, sand with 150 wet sandpaper to remove any raised areas.

Terminal Ends

The wire insulation at each terminal should be smooth and free of any sign of heat. Any indication of heat is a result of a loose connection at the terminal. This could have been a loose bolt or a faulty crimp. It is recommend to replace the cable terminal end.

Note: A loose bolt could result in damaging the terminal crimp.

TROUBLESHOOTING

Troubleshooting control system is not included in this manual.

All electrical troubleshooting information is included in a separate manual "Troubleshooting Electric Vehicles".

The manual part number is M7-001-69 and was provided on the original vehicle CD. A hard copy can be purchased from your authorized Taylor-Dunn distributor or can be downloaded from the Taylor-Dunn web site.

NOTICE

These motor controls are programmed to match the vehicle configuration.

DO NOT move a control to another vehicle unless the vehicle configurations are identical.

Any changes to the vehicle configuration may require reprogramming the controller.

Installing a controller that is not programmed correctly may result in damage to the controller or electrical system.

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

Repairs

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

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

Programming

Taylor-Dunn does not support field modifications to the controller parameters.

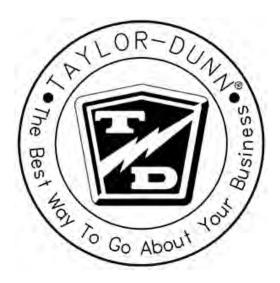
Complete vehicle parameters are available by e-mail and can be uploaded to the controller using a laptop or PC with the 1314 application and cable. Refer to the Tools section for part numbers.

If you have a special application that may require modified parameters, contact your local authorized Taylor-Dunn distributor to submit a request to the factory. Note: There may be a fee to created a custom parameter set.

Instructions for obtaining parameter sets and how to upload to the controller are included with the application.

HARDWARE TORQUE

If hardware is not listed here, refer to standard torque
values in the appendix.DescriptionInch PoundsNewton MetersTerminal stud859.6



Motor Controller

T-48 AC / ET 3000

Notes:



Chargers

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AWARNING

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



Chargers <u>REMOVE/INSTALL</u> AWARNING

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

HIGH VOLTAGE.

Disconnect the batteries and make sure that the AC power cord has been unplugged before disconnecting any wires or removing the cover of the charger.

Failure to follow this instruction may result in serious injury due to electric shock and/or property damage.

There are many charger options available for this model. The different charger may have different wiring connections.

Disconnect the batteries and make sure that the AC power cord has been unplugged before disconnecting any charger wires or cords.

Some charger models have disconnects close to the charger and some have full length wire and molded cords. When replacing chargers with full length wires and molded cords, DO NOT cut and splice the wires or cord. Cutting the wires or cord will void the charger warranty and may result in incorrect operation of the charger or premature failure.

TROUBLESHOOTING

Troubleshooting control system is not included in this manual.

All electrical troubleshooting information is included in a separate manual "Troubleshooting Electric Vehicles".

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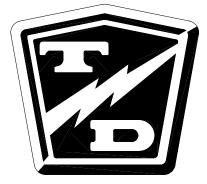


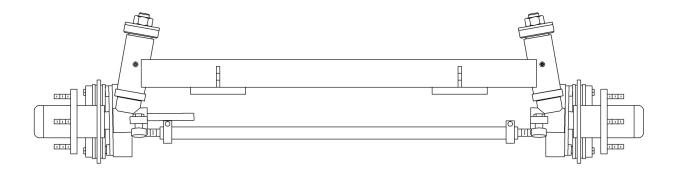
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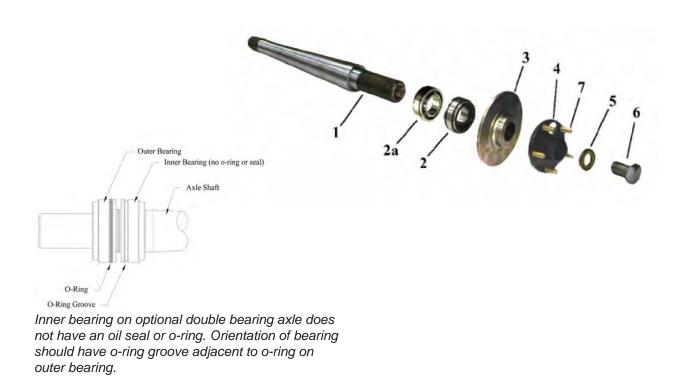
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Front Axle

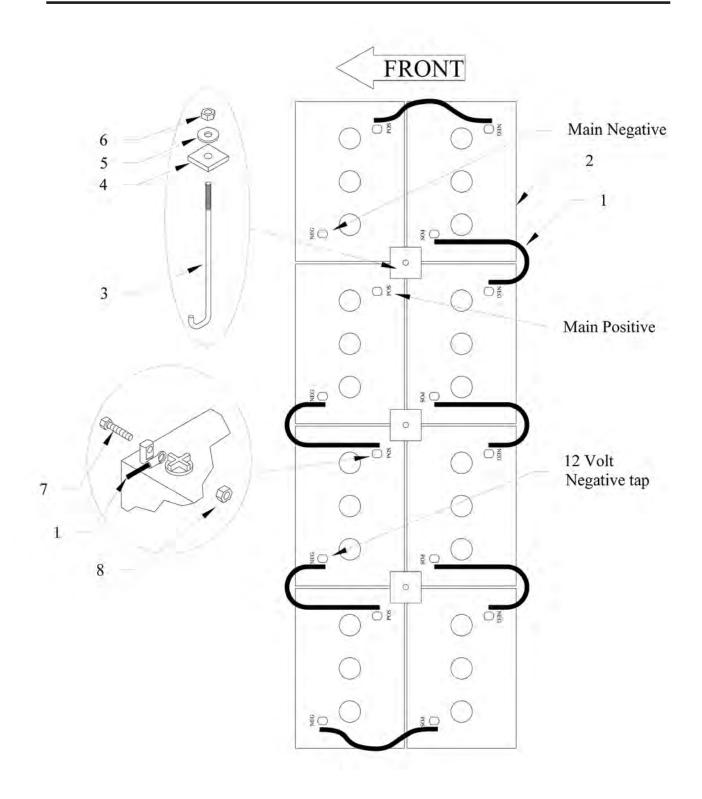
Item No.	Part No.	Description	Qty
-	15-210-70	Axle Beam, B 2-48, BT 2-48, B 2-54	1
	15-049-15	Complete axle assembly	1



Rear Axle

Item No.	Part No.	Description	Qty
1	41-154-15	Axle shaft	2
2	80-505-20	Bearing, outer	2
2a	80-505-30*	Bearing, inner	2
3	41-490-11	Disc brake rotor	2
4	41-172-21	Hub	2
5	88-268-63	Flat washer	2
6	88-268-30	7/8-14 x 1.5 Bolt, grade 5	2
7	96-329-10	Wheel stud	10
Not show	wn		
	92-104-10	Hub cover	2
	41-290-66	Axle housing, left	1
	41-290-67	Axle housing, right	1
	89-113-30	M12 x 1.75 x 30mm Hex bolt (axle housing to center section)	6
	89-113-60	M12 Split lock washer (axle housing to center section)	6

Batteries





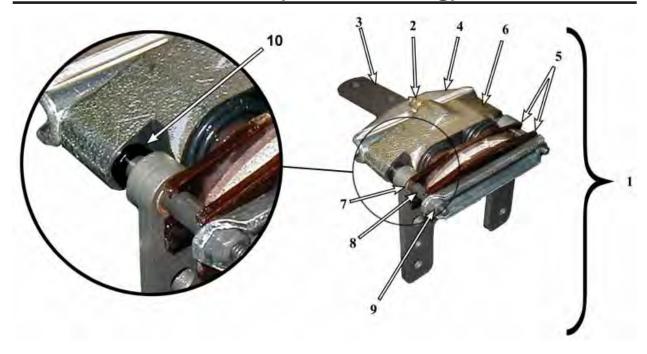
		Batteries	
Item No.	Part No.	Description	Qty
1	75-237-00	Battery jumper	*
2	77-042-00	217AH, T-105	*
	77-042-50	217AH, TD-217	*
	77-042-80	217AH, T-105 Moist charge (dry)	*
	77-044-00	230AH, T-125	*
	77-044-10	195AH, Mainenance free (Note: requires special charger)	*
	77-047-00	244AH, T-145	*
	77-047-50	250AH, TD-250	*
	77-047-80	244AH, T-145 Moist charge (dry)	*
	77-048-00	250AH, J-250	*
	77-048-80	250AH, J-250 Moist charge (dry)	*
	77-051-00	160AH Gell (Note: requires special charger)	*
3	50-243-10	Battery rod	*
4	50-250-00	Battery hold down	*
5	88-088-66	Flat washer, tin/lead plated	*
6	88-069-81	1/4NC Nylon lock nut	*
7	88-081-12	5/16NC x 1 Square bolt, stainless steel	*
8	88-089-80	5/16NC Hex nut, stainless steel	*
9	88-089-70	5/16 Split lock washer, stainless steel	*
Not show	wn		
	77-055-15	Battery watering system for Trojan batteries (optional)	
	77-055-12	Battery watering system for Exide or Taylor-Dunn batteries (optional)	
	77-055-13	BATTERY FILLING GUN, used with watering systems (optional)	
	01-534-43	Battery locator (angle in bottom of battery box, 72 v only)	2



Brake Identification

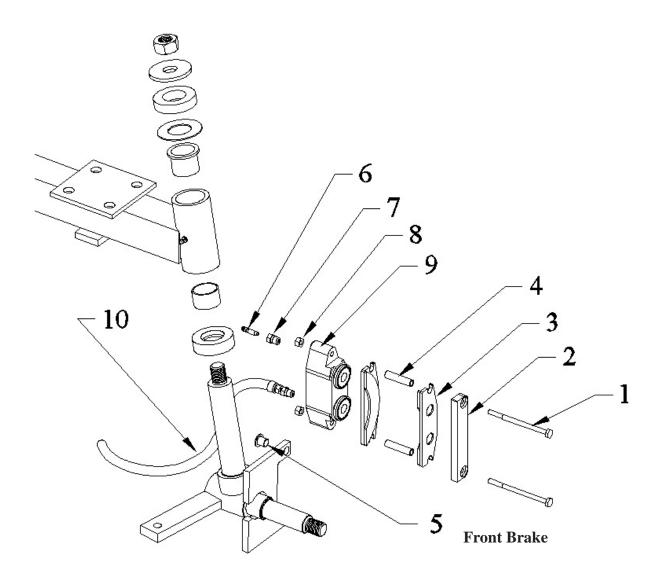


Brakes (Short Bushing)



Rear Brakes

tem No.	Part No.	Description	Qty
1	-	-	-
2	99-588-00	Bleeder valve	2
	99-588-01	Bleeder adaptor	2
3	-	-	-
4	-	-	-
5	41-348-70	Brake pad	4
6	41-351-30	Brake body assembly (includes 3, 4, 5, 8, 9, 10)	2
7	32-240-41	Bushing	4
8	41-348-57	Spacer	4
9	88-067-21	Bolt	4
	88-069-82	Nut	4
10	97-126-05	Flat Washer	4
11	41-350-28	Mounting bracket	2
Not Sho	wn		
	96-327-10	3/8X3/4,NF,2A THD,GRD5,LOC (brake bracket to drive)	8
	41-886-00	PLUG, 1/8 PIPE, HEX SOCKET	2

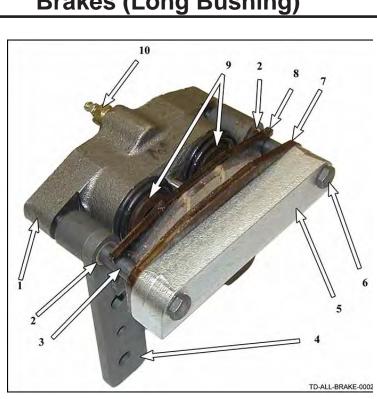




Front Brake

Item No.	Part No.	Description	Qty
1	88-067-29	Bolt, 1/4 X 3-3/4" NC, Hex Head, Gr. 8	4
2	41-350-91	Plate, Secondary, Hydraulic Disc	2
3	41-348-70	Pad, Disc Brake	4
4	41-348-57	Spacer, Disc Brake	4
5	32-240-41	Bearing TeflonR Coated	4
6	99-588-00	Bleeder screw	2
7	99-588-01	Bleeder screw adapter	2
8	88-069-82	Locknut, 1/4" NC, Gr. 8 Do Not Reuse	4
9	41-350-30	Hydraulic Brake Body Front Assembly	2
10	See Brake Lines	Brake hose	
Not show	vn		
	See Steering Knuckle 41-886-00	Front hub and rotor 1/8" Pipe plug	2

Note: Brake Body (#9) has no internally serviceable parts.

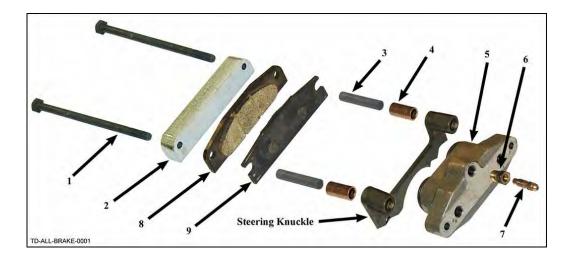


Brakes (Long Bushing)

Rear Brake

em No.	Part No.	Description	Qty
-	41-351-35	Brake assembly (Mounting bracket 41-350-35 not included)	2
1	*	Brake body	1
2	32-208-01	Bushing (included in rebuild kit)	4
3	41-348-52	Spacer (included in rebuild kit)	4
4	41-350-35	Mounting Bracket (rear brake only)	2
5	41-350-91	Secondary Plate	2
6a	88-067-29	Bolt	4
6b	88-069-82	Nut	4
7	See rebuild kit	Brake pad, Outer	2
8	See rebuild kit	Brake pad, Inner	2
9	41-351-16	Piston	2
10	99-588-00	Bleeder valve	2
	99-588-01	Bleeder adaptor	2
Not Sho	wn		
	41-886-00	PLUG, 1/8 PIPE, HEX SOCKET	2
	41-348-63	Kit, Brake rebuild (one side), includes #2, 3, 6b, 7, 8	
	41-351-15	Kit, Boots and piston O-rings (one cylinder)	

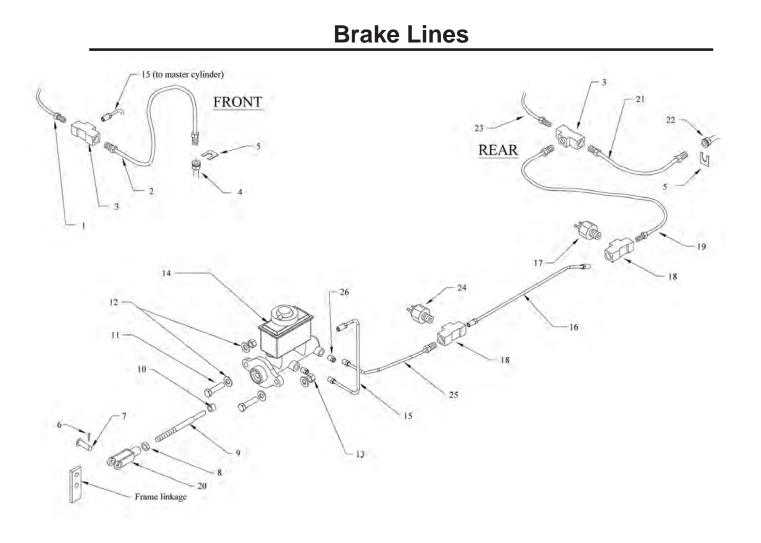




Front Brakes

Item No.	Part No.	Description	Qty
1a	88-067-29	Bolt	4
1b	88-069-82	Nut	4
2	41-350-91	Plate, Secondary	2
3	41-348-52	Spacer	4
4	32-208-01	Bushing (included in rebuild kit)	4
5	*	Brake body assembly (no internally serviceable parts)	2
6	99-588-01	Bleeder adaptor	2
7	99-588-00	Bleeder valve	2
8	See rebuild kit	Brake pad, Inner	2
9	See rebuild kit	Brake pad, Outer	2
Not Sho	wn		
	41-886-00	PLUG, 1/8 PIPE, HEX SOCKET	2
	41-351-16	Piston	4
	41-348-63	Kit, Brake rebuild (one side only), includes #1b, 3, 4, 8, 9	
	41-351-15	Kit, Boots and piston O-rings (one cylinder)	

Illustrated Parts

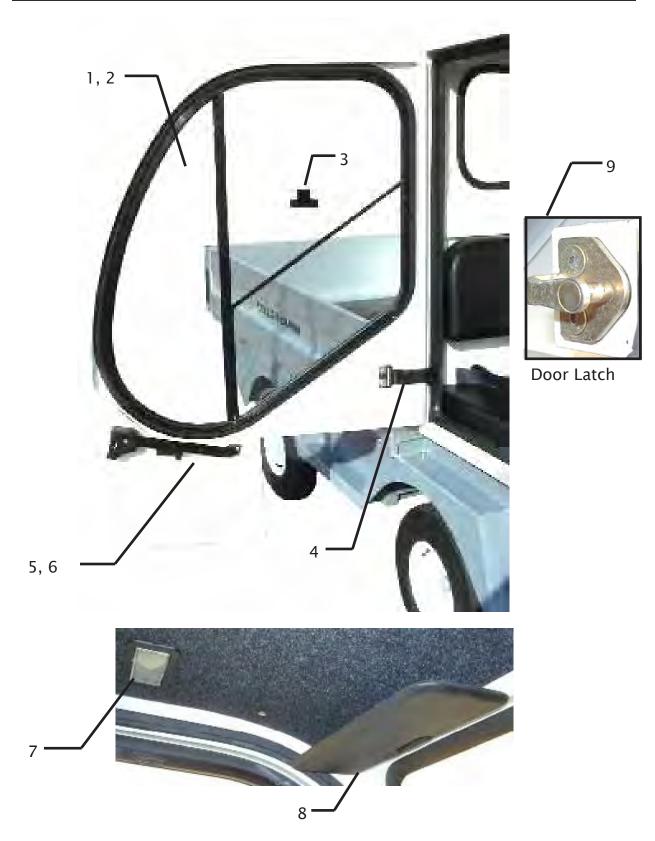




		Brake Lines	
tem No.	Part No.	Description	Qty
1	99-648-52	BRAKE LINE, FORMED, FRT, RIGHT	1
2	99-648-51	BRAKE LINE, FORMED, FRT, LEFT	1
3	99-564-00	UNION T, 3/16 INV FLARE	2
4	99-580-10	HOSE,BRK,W/3/8-24M &3/16MTF	2
5	99-576-00	Clip	4
6	88-527-11	Cotter pin	1
7	96-772-00	Clevis pin	1
8	88-119-80	Nut	1
9	50-009-05	Master cylinder push rod	1
10	17-104-00	Collar for push rod	1
11	88-080-14	Bolt, 5/16"" X 1-1/2"" NC, Hex Head	2
12	88-088-61	Washer, 5/16""	4
13	88-089-81	Locknut, 5/16""	2
14	99-511-20	Master Cylinder (includes cap and seal)	1
	99-511-52	Cap Seal, Master Cylinder	1
	99-511-53	Cap, Master Cylinder	1
15	99-605-77	BRK LINE FORMED, FRONT MCYL.	1
16	99-603-73	BRAKE LINE, FRONT, FORMED, CENTER	1
17	71-110-00	SWITCH,BRAKE LIGHT,HYD.	1
18	99-591-00	FEMALE TEE 3/16TX1/8 PIPE652X3	2
19	99-603-72	BRAKE LINE, REAR, FORMED, CENTER	1
20	96-762-00	Clevis for push rod	1
21	99-603-71	BRAKE LINE, REAR, FORMED, LEFT	1
22	99-580-20	HOSE,BRAKE,W/1/8PM& 3/16TF	2
23	99-603-70	BRAKE LINE,REAR,FORMED,RIGHT	1
24	71-110-00	SWITCH,REGEN	1
25	99-603-74	BRAKE LINE,FORMED,FRONT	1
26	99-575-32	ADAPTER,3/16T X M10-1.0 FLARE	2
Not show	wn		
	99-510-51	Rubber Boot, Master Cylinder	1
	99-575-10	ADAPTER,M,3/16T X 1/8 NPT (front brake body)	2
	85-250-00	Brake pedal return spring	1

T-48 AC / ET 3000







		Cab Components	
Item No.	Part No.	Description	Qty
1	90-854-10	Window, Door, Left, 3 Pieces	1
2	90-854-20	Window, Door, Right, 3 Pieces	1
3	90-854-01	Latch, Window, Door	1
4	91-017-02	Strap, Door, Brackets Included	1
5	91-017-31	Handle, Inside, Door, Left	1
6	91-017-32	Handle, Inside, Door, Right	1
7	72-015-10	Light, Dome, Interior	1
8	91-017-15	Visor	1
9	91-017-01	Door Latch	1
Not Sho	wn		
	91-017-10	Mirror, Rear View	1
	91-017-50	Door hinge	4

Cab Options



Cab, ET-3000



Fiberglass cab, T-48





Cab (ET 3000)

Item No.	Part No.	Description	Qty
	91-017-60	Fiberglass cab	1
-	90-854-10	Window, Door, Left, 3 Pieces	1
-	90-854-20	Window, Door, Right, 3 Pieces	1
-	90-854-01	Latch, Window, Door	1
-	91-017-02	Strap, Door, Brackets Included	1
-	91-017-31	Handle, Inside, Door, Left	1
-	91-017-32	Handle, Inside, Door, Right	1
-	72-015-10	Light, Dome, Interior	1
-	91-017-15	Visor	1
-	91-017-01	Door Latch	1
-	91-017-10	Mirror, Rear View (Not Shown)	1

Fiberglass Cab (T-48)

Item No.	Part No.	Description	Qty
-	91-008-10	Fiberglass cab	1
-	90-852-30	Front windshield	1
-	90-850-10	Rear window	1
-	98-310-10	Rubber windshield gasket (by the foot)	-
-	94-035-01	Plastic door trim (by the foot)	-
-	02-248-88	Bumper	1

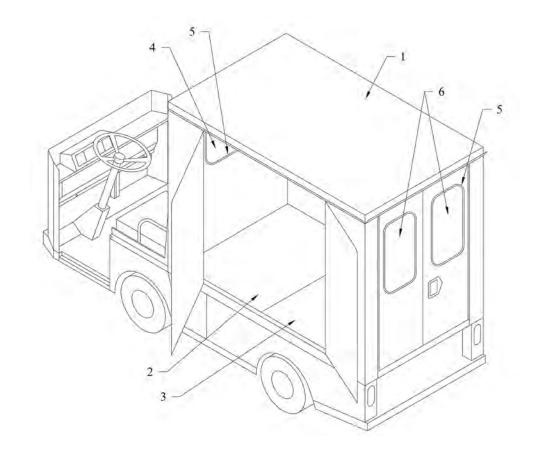
Steel Cab

Item No.	Part No.	Description	Qty
-	91-012-00	Steel cab (unpainted)	1
-	90-852-30	Front windshield	1
-	90-850-10	Rear window	1
-	98-310-00	Rubber windshield gasket (by the foort)	-

Windshield Wiper (T-48)

Item No.	Part No.	Description	Qty
	74-050-00	Wiper motor	1
	74-051-00	Wiper arm	1
	74-052-00	Wiper blade	1
	75-152-09	Harness	1

Cargo Box, Rear

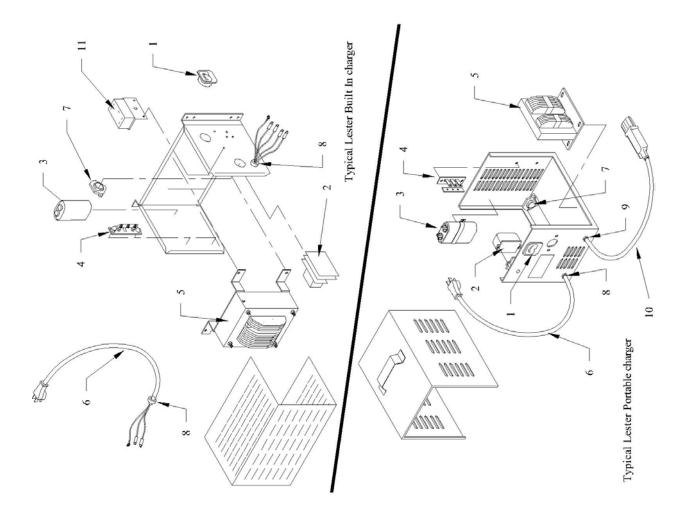




Item No. Part No. Description Qty							
tern No.	Fait NO.	Description	Qly				
1	91-333-02	Cargo box (unpainted)	1				
2	90-471-00	Front deck board	1				
3	90-472-00	Rear deck board	1				
4	90-850-10	Front window	1				
5	98-310-00	Rubber window gasket (by the foot)	-				
6	90-851-00	Rear window	2				
Not show	wn						
	94-320-10	Load line decal	1				

Chargers

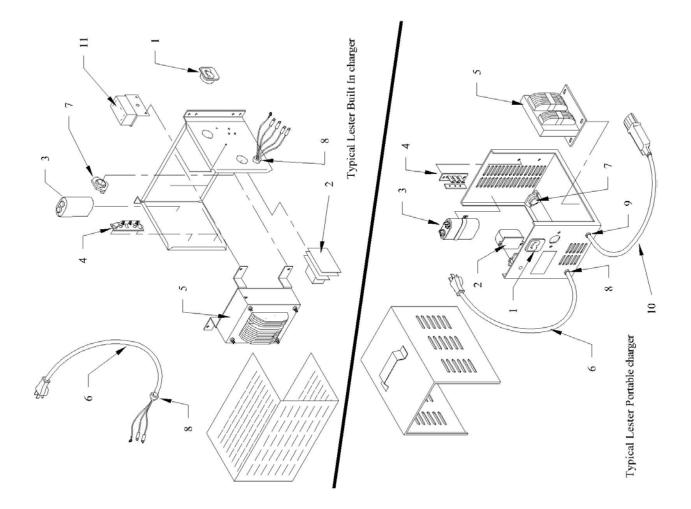
Lestronic® Charger (Page 1)



		<u>16920</u> 79-309-20	48LC25-8ET	230/50/na	48/25	Built-In		S/O	79-808-20	79-902-00	79-749-13	S/O	N/A	79-831-00	79-530-00				N/A
		<u>22620</u> 79-303-25	48LC25-8ET 4	115/60/15 2	48/25	Built-In		79-805-68	79-808-20	79-902-00	79-749-13	79-603-10		79-831-00	79-530-00			79-809-50	76-200-00
		<u>16910</u> 79-309-10	48LC25-8ET	115/60/15	48/25	Built-In	•	79-805-68	79-808-20	79-902-00	79-749-13	S/O		79-831-00	79-530-00	•			76-200-00
		<u>9475-31</u> 79-306-21	36LC40-8ET	115/60/17	36/40	Portable	79-852-00	79-805-67	79-808-00	79-902-00	79-749-10	S/O	79-575-10	79-831-00	79-530-00	79-531-00	S/O		76-200-00
	<u>Charger Model #</u> Charger Part #	<u>9695</u> 79-309-00	48LC25-8ET	115/60/15	48/25	Portable	79-851-10	79-805-65	79-808-20	79-902-00	79-749-13	S/0	79-575-10	79-831-00	79-730-00	79-730-00	79-566-10		76-200-00
CHARGERS		<u>22640</u> 79-303-20	36LC40-8ET	150/60/16	36/40	Built-In	79-852-00	79-805-67	79-808-00	79-902-00	79-749-10	S/O		79-831-10	79-530-00			79-809-50	76-200-00
		<u>11860</u> 79-304-65E	36LC25-8ET	230/50/na	36/25	Built-In	79-851-10	79-805-72	79-808-00	79-902-00	79-749-11	S/O		79-831-00	79-530-00			79-306-23	
		<u>7710-32</u> 79-305-20	36LC25-8ET	115/60/12	36/25	Portable	79-851-10	79-805-69	79-808-00	79-902-00	79-749-13	S/O	S/O	79-831-00	79-531-00	79-530-00	79-566-10		76-200-00
		<u>22740</u> 79-303-15	36LC25-8ET	115/60/12	36/25	Built-In		79-805-67	79-808-00	79-902-00	79-749-13	79-644-31		79-831-00	79-530-00			79-809-60	76-200-00
		DESCRIPTION	Charger Type	AC Voltage/ Amps	DC Voltage/ Amps	Style	Ammeter	Timer Assembly	Relay for #2	Capacitor	Diode Assembly	Transformer	AC Cord	Fuse Assembly	Strain Relief	Strain Relief	DC Cord	Interlock Relay Assy.	Replacement AC Plug
	ITEM	#					-	5		с,	4	5	9	7	~	6	10	11	ı



Lestronic® Charger (Page 2)



7030 12315 79-304-60 79-306-90	36LC25-8ET 36LC40-8ET	230/50/7 230/50/8	3625 36/40	Portable Portable	79-851-10 79-852-00	K4-071-87 K4-071-87	79-808-00 79-808-00	79-902-00 79-902-00	79-749-13 79-749-10	S/0 S/0	S/0 S/0	79-831-00 79-831-00	79-532-00 79-532-00	79-530-00 79-530-00	S/O 79-567-10		
$\begin{array}{c c} \hline 22730 \\ \hline 79.303.05 \\ \hline 79.3 \\ \hline 79.3 \\ \hline 79.3 \\ \hline \end{array}$	24LC25-8ET 36LC2	115/60/8 230	24/25 36	Built-In Por	- 79-8	79-805-66 K4-0	79-808-10 79-8	79-902-00 79-9	79-749-13 79-7	S/O S		79-831-10 79-8	79-531-00 79-5	- 79-5	S	79-809-60	76-200-00
<u>13760</u> 79-302-15	24LC40-8ET 2	115/60/13	24/40	Built-In	•	79-805-66	79-808-10	79-902-00	79-749-13	S/O	•	79-831-10	79-531-00	•	•		76-200-00
<u>9513-31</u> 79-302-10	24LC40-8ET	115/60/13	24/40	Portable	79-852-00	79-805-64	79-808-10	79-902-00	79-749-13	S/O	79-575-10	79-831-10	79-531-00	79-530-00	S/O		76-200-00
$\frac{13110}{79-301-10}$	24LC25-8ET	115/60/9	24/25	Portable	79-851-10	79-805-64	79-808-10	79-902-00	S/O	S/O	S/0	79-831-00	79-532-00	79-530-00	79-566-10		76-200-00
<u>12750</u> 79-300-55E	24LC25-8ET	230/50/4	24/25	Built-In		79-805-70	79-808-10	79-902-00	79-749-13	79-644-08		79-831-00	79-530-00		•	79-306-23	•
<u>7105-01</u> 79-300-50	24LC25-8ET	230/50/4	24/25	Portable	79-851-10	79-805-64	79-808-10	79-902-00	79-749-13	S/0	S/0	79-831-00	79-532-00	79-530-00	79-566-10		
<u>14400-31</u> 79-302-50	24LC40-8ET	230/50/7	24/40	Portable	79-852-00	S/0	79-808-10	79-902-00	S/O	S/0	S/0	79-831-10	S/0	S/0	79-567-10		
DESCRIPTION	Charger Type	AC Voltage/Hz/ Amps	DC Voltage/ Amps	Style	Ammeter	Timer Assembly	Relay for #2	Capacitor	Diode Assembly	Transformer	AC Cord	Fuse Assembly	Strain Relief	Strain Relief	DC Cord	Interlock Relay Assy.	Replacement AC Plug
ITEM #					1	2		ŝ	4	5	9	7	~	6	10	11	I

Signet® Charger (Page 1)



Model HBS series charger shown

	Chargers for Flooded Batteries
PART #	DESCRIPTION
79-309-42	48 volt charger assembly (see note)

	Chargers for GEL Batteries
PART #	DESCRIPTION
79-309-43	48 volt charger assembly (see note)

- * Not available at time of printing
- Note: There are no user serviceable components inside the charger
- Note: The charger AC cord is an intergral part of the charger. When replacing the charger, do not cut and splice the AC cord. **Cutting the AC cord will void the charger warranty.**
- Note: The Signet model HBS series charger replaces all previous Signet models.
- Note: The harness connectors and AC plug are not included with the charger.

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

X-Series Charger

** - AC cord has integral NEMA plug. (





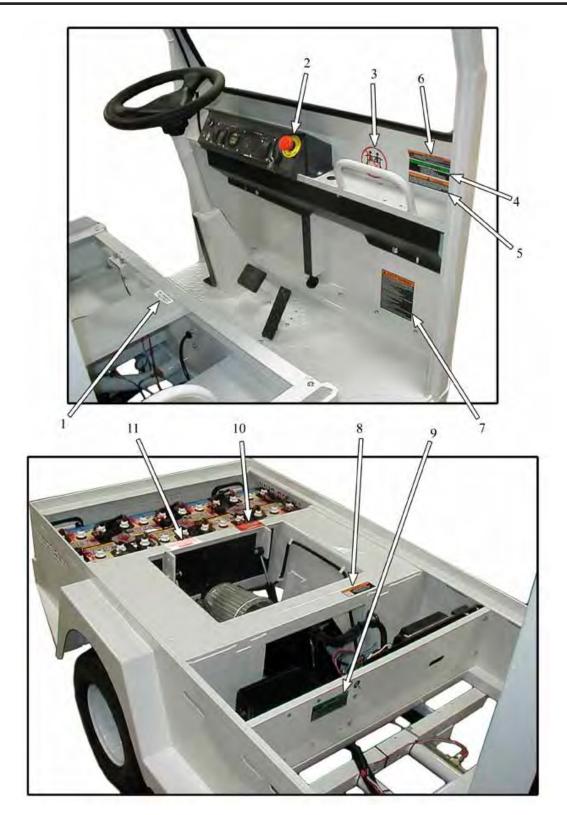
Item No.	Part No.	Description	Qty
	79-303-49	Charger Assembly, X-Series, 48 volt	1
	79-831-00	Fuse	
	79-809-61	Relay board assembly	
	*	Control board assembly	
	79-749-14	SCR assembly	
	79-840-02	Circuit breaker	
	79-848-01	Ammeter	
	79-810-01	Switch kit (start/stop, low voltage, self diagnostic)	
	79-575-41	AC cord (includes bushing)	
	79-566-21	DC cord (includes bushing)	
	79-809-50	Interlock relay	
	79-722-03	Wiring kit (includes LED's)	
	79-575-06	AC Cord**	0 or 1

Charger Wiring, Portable

	Portable Charger Wiring					
Item No.	Part No.	Description	Qty			
-	75-107-10	HRNSS, PORTABLE/LESS CHRGER	1			
-	JF3-86181-00-00	RECEPTACLE, W/INTERLOCK	1			
-	90157-05M19-00	Mounting hardware for receptacle	2			
-	92907-05100-00	Mounting hardware for receptacle	4			
-	92907-05600-00	Mounting hardware for receptacle	4			
-	98507-05035-00	Mounting hardware for receptacle	2			



Decals



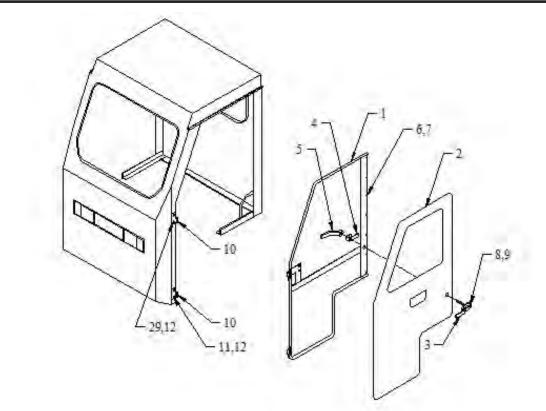


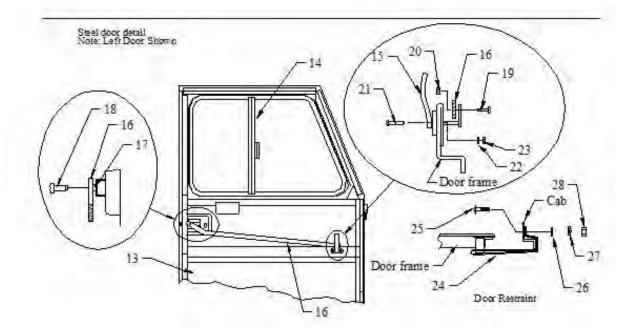
		Decals	
Item No.	Part No.	Description	Qty
1	94-301-41	Brake fluid	1
2	94-384-24	Emergency stop	1
3	94-301-42	Arms and legs	1
4	94-384-21	Brake warning	1
5	94-384-01	Not a motor vehicle	1
6	94-384-14	When leaving vehicle warning	1
7	94-313-20	Safety warning	1
8	94-384-17	Do not wash	1
9	94-384-06	Emergency brake bypass switch	1
10	94-319-00	Battery disconnect	1 or 2
11	94-313-00	Battery warning	1 or 2
Not Sho	wn		
	94-301-04	"TAYLOR TRUCK" (installed on front cowl)	1
	94-384-15	Low Speed (installed under low high/low switch)	1

Covers

Top Covers					
Item No.	Part No.	Description	Qty		
-	91-151-00	Fiberglass top	1		
-	00-248-35	Mounting post	4		
-	00-248-36	Top frame	1		
-	94-035-01	PLASTIC TRIM STRIP, SNAP-ON	29'		
-	91-028-25	Z-BRACKET	6		
-	96-124-00	U-BOLT,1.75L X 1W X 1/4NC	6		
-	97-176-00	WASHER, NEOPRENE 3/8X3/4X3/	12		









Cab Doors Naugahyde (Steel Cab)

Item No.	Part No.	Description	Qty
1	90-923-98	Door Frame, Left	1
2	90-924-98	Side Curtain, Left	1
3	97-315-53	Handle Assembly, Outer	2
4	97-315-51	Door Latch	2
5	97-315-54	Handle Assembly Inside	2
6	97-303-03	Snap Fastener	14
7	88-727-06	Rivet, 5/32 X 5/8"	14
8	88-025-08	Screw, #8-32 X 5/8", Truss Head	4
9	88-029-86	Locknut, #8-32"	4
10	91-814-10	Hinge, Female, Left (naugahyde and steel doors)	2
11	88-082-09	Bolt, 5/16 X 5/8", Carriage	8
12	88-089-81	Locknut, 5/16" NC	8
Not show			
	91-814-11	Hinge, Female, Right (naugahyde and steel doors)	2
	90-924-99	Side Curtain Right	1
	90-923-99	Door Frame, Right	1

Cab Doors Steel (Steel Cab)

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1,12) 1
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1

Kit, Cab Door, Right, Specify Color (includes #10, 11,12)

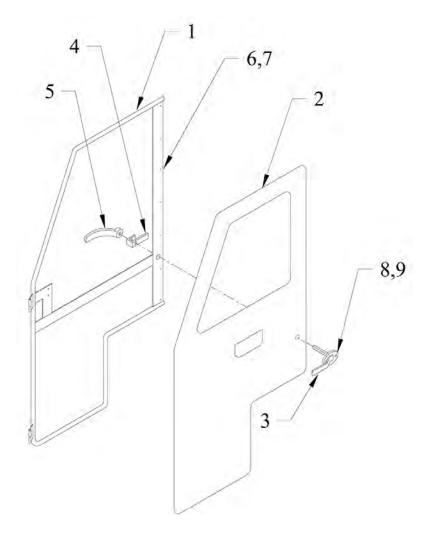
Kit, Cab Door, Right, Specify Color (includes #10, 11,12)

91-011-67

91-011-69

1

1



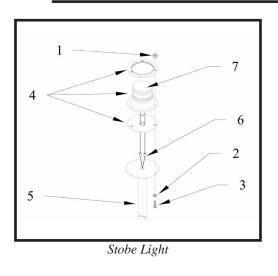
Cab Doors Naugahyde (Fiberglass Cab, T-48)

tem No.	Part No.	Description	Qty
1	00-248-37	Door Frame, Left	1
	00-248-38	Door Frame, Right	1
	98-451-11	Weather seal tape (by the foot)	-
2	90-909-97	Side Curtain, Left	1
	90-909-96	Side Curtain Right	1
3	97-315-59	Handle Assembly, Outer	2
4	97-315-51	Door Latch	2
5	97-315-54	Handle Assembly Inside	2
6	97-304-50	Snap Fastener	12
7		Rivet, 5/32 X 5/8"	14
8	88-029-86	Locknut, #8-32"	4
9	88-025-08	Screw, #8-32 X 5/8", Truss Head	4
Not show	wn		
	94-036-00	Drip moulding	1
	91-814-10	Hinge, Left	2
	91-814-11	Hinge, right	2

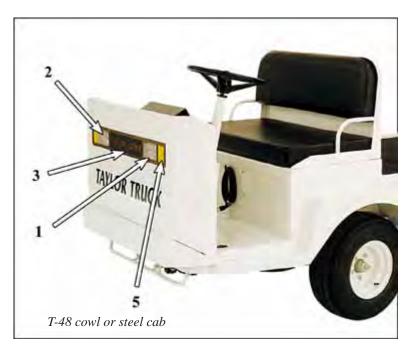




Illustrated Parts



Electrical, Lighting

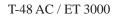






T-48 fiberglass cab

MB-T48-02





Strobe Light

Item No.	Part No.	Description	Qty
1	88-029-80	8-32 Hex nut	3
2	88-028-62	#8 lock washer	3
3	88-025-06	8-32 x 1/2 Machine screw	3
4	72-023-20	Strobe assembly (amber)	1
5	*	Mounting pole or mounting plate	1
6	*	Harness	1
7	72-023-22	Amber lens	1
	72-023-23	Red lens	1
Not show	wn		
	72-023-21	Replacement bulb	1

* -There are many special order types of mounting configurations. Contact your Taylor-Dunn distributor with the serial number of the vehcle for more information.

Head and Tail Lights

Item No.	Part No.	Description	Qty
1	94-050-10	Rectangular light , left , T-48 cowl or steel cab	1
2	94-050-11	Rectangular light, right, -48 cowl or steel cab	1
-	72-082-01	Replacement bulb, -48 cowl or steel cab	2
-	94-050-04	Retainer, headlight, -48 cowl or steel cab	4
3	94-201-10	Name plate, -48 cowl or steel cab	1
	94-201-11	Retainer, nameplate, -48 cowl or steel cab	2
4	72-025-00	Tail light	2
	72-025-51	Tail light rubber grommet	2
	72-022-52	Tail light pigtail	2
Not Sho	wn		
	72-025-03	Headlight assembly, T-48 fiberglass cab	2
	72-005-20	Headlight assembly, left, ET-3000	1
	72-005-25	Headlight assembly, right, ET-3000	1
	72-005-21	Support, headlight, ET-3000	1

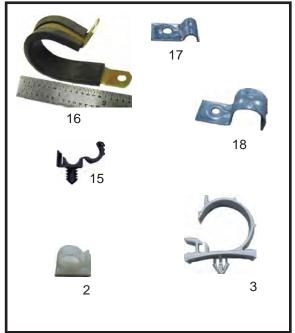
Turn Signals

Item No.	Part No.	Description	Qty
5	72-082-10	Front bulb, T-48 steel cowl or cab	2
	72-082-20	Light socket	2
Not Sho	wn		
	72-025-02	Light assembly, T-48 fiberglass cab	2
	71-141-22	Turn signal switch (includes flasher)	1
	98-330-50	Insulator for turn signal switch	1
	71-900-05	Flasher	1
	72-052-00	Lens, turn signal, right, ET-3000	1
	72-052-10	Lens, turn signal, left, ET-3000	1

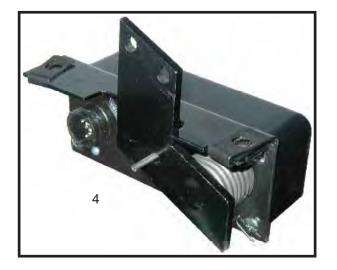
Electrical, Miscellaneous

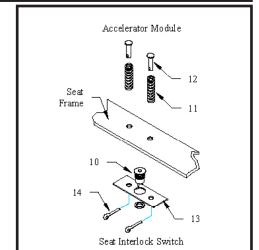


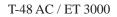
Motion Alarms



Miscellaneous Wire Harness Clamps









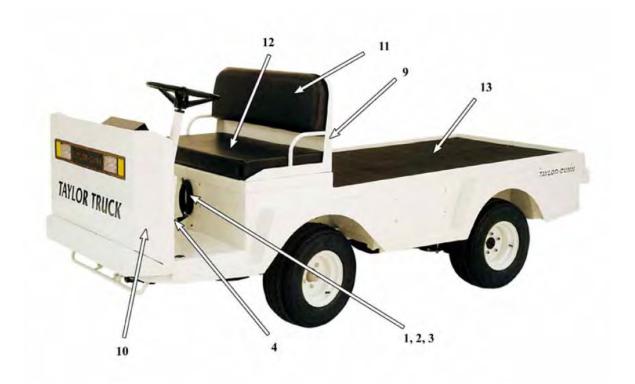
		Miscellaneous Electrical	
tem No.	Part No.	Description	Qty
1	73-005-05	Reverse Warning alarm	1
2	96-650-01	Wire Harness Clip, stick on	
3	96-642-00	Wire harness Clip, push mount	
4	62-033-48 62-033-47	Throttle Module, 48-volt system Throttle module, 72-volt system	1
5	71-122-20	Horn Switch	1
6	88-065-06	1/4-NC x 21/2 Phillips Truss Head Screw, Horn Switch	2
7	88-069-81	1/4-NC Hex Nylon Locknut, Horn Switch	2
8	-		-
9	-	-	-
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	96-631-10 (shown) 96-629-80 (not shown) 96-630-00 (not shown 96-630-50 (not shown 96-631-00 (not shown 96-631-15 (not shown	Clamp, Rubber Lined 1.0 ID Clamp, Rubber Lined 3/16 ID Clamp, Rubber Lined 5/8 ID Clamp, Rubber Lined 5/8 ID (.265 mounting hole) Clamp, Rubber Lined 3/4 ID Clamp, Rubber Lined 1-1/2 ID	
17	96-624-00 96-625-00 (not shown)	Clamp, 1/4 Jiffy Clip Clamp, 5/16 Jiffy Clip	
18	96-626-00 73-005-10 77-055-01	Clamp, 7/8 Jiffy Clip Alarm,Rev,Bullard MPA-II, 97DB (optional) Low battery water level alarm (optional)	
Not Sho			
	98-599-15 98-599-20 75-107-10 JF3-86181-00-00 72-015-00 78-321-10	Plastic grommet for 1.75 hole Plastic Grommet for 2.5 hole Portable Charger Harness Portable Charger Receptacle Dome light (optional) (75-105-25 - harness) (optional)	1 1 1
	75-105-25	Harness, Dome light	1





Miscellaneous Frame Components (ET 3000)

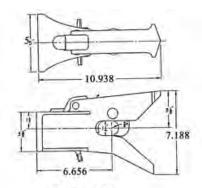
em No.	Part No.	Description	Qty
1	90-854-50	Window, Rear	1
2	98-319-00	Molding, Window, Rear	1
3	91-017-11	Mirror, Door, Left	1
4	91-017-12	Mirror, Door, Right	1
5	91-017-33	Handle, Outside, Door, Left	1
6	91-017-34	Handle, Outside, Door, Right	1
7	72-025-00	Tail and Brake Light (Rubber Seal Included)	2
	Aluminum Side panels		
8		Header, Front, Left	1
9	90-556-49	Aluminum Front Panel	1
10	90-556-74	Aluminum Side Panel	2
11	90-556-48	Aluminum Rear Gate	1
12		Header, Rear, Left	1
13		Post, Right, Side Panel	2
14		Cap, 1-1/8 X 1-1/4	4
15		Cap, 1-1/8 X 1-3/4	4
16		Post, Left, Side Panel	2
17		Header, Rear, Right	1
18		Latch	4
19	89-080-16	Bolt, 8mm X 16	12
20		Hinge, Aluminum	6
21		Aluminum T-Hinge	6
22		Plate, Threaded, 8mm	6
23	88-081-11	Bolt, 5/16 X 1NC Hex Head	16
24	88-088-61	Washer, 5/16	28
25	88-089-81	Locknut, 5/16NC	14
26	99-556-07	Support, Forward Panel, Right	1
26	99-556-06	Support, Forward Panel, Left	1
27	88-737-10	Rivet, Aluminum, 3/16 X 1, Bulb Type	37
2.	Aluminum Side panel Kit*		01
	90-556-60	Kit, Latch and Hardware (Includes 7,11,12,13,14,15,16,17,19,20,21) *NOTE: The kit does not include the side panels.	1
Not Show	wn		
	Deck Board standard Optic		
	88-607-09	Rivet, 1/4 X 1/2, Starpin	16
	90-440-10 90-440-66	Deckboard, 41-1/4 X 56-1/8 Deckboard, Diamond, 41-1/4 X 56-1/8	1 1
	90-440-66 90-440-67	Deckboard, Diamond, 41-1/4 X 50-1/8 Deckboard, Diamond, 17-1/2 X 41-1/4	1
	90-440-76	Deckboard, 17-1/2 X 41-1/4	1



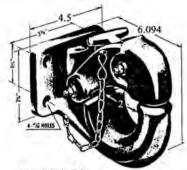
Miscellaneous Frame Components (T-48)

Item No.	Part No.	Description	Qty
1	79-511-00	Charger AC cord holder	1
2	79-530-00	Charger AC cord strain relief	1
3	79-575-25	Charger cord, Lester charger only	1
4	30-807-00	COVER, STEERING GEAR SUPT	1
-	01-110-20	Throttle pedal	1
-	98-200-00	Rubber brake pedal pad	1
-	02-210-25	Angle, harness cover, cowl	1
-	91-513-00	Clip for 02-210-25	2
9	00-248-31	Seat bullhead	1
10	00-610-08 00-248-34	Front cowl, T48 no cab Front cowl, T-48 fiberglass cab	1 1
-	02-248-91 02-248-91	Front light guard T-48 cowl or steel cab Light guard, T-48 fiberglass cab	1 1

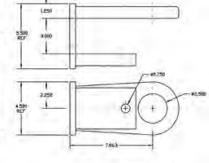
Hitches



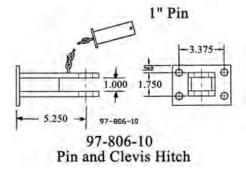
97-808-00 Automatic Coupling Hitch



97-804-01 Pintle Hitch



Hook Pin and Eye Hitch 97-809-00

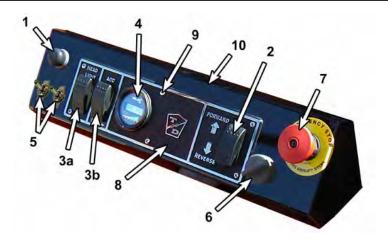




Ball Hitch Mount 97-805-00 (1-7/8") 97-807-00 (2")

Trailer Hitches			
Item No.	Part No.	Description	Qty
	97-811-00	1-7/8 inch Ball	
	97-821-00	2-inch Ball	
	88-140-14	1/2NC x 1-1/2 Hex bolt	4
	88-149-80	1/2NC Hex nut	4
	88-148-62	1/2 Split lock washer	4

Instrument Panel



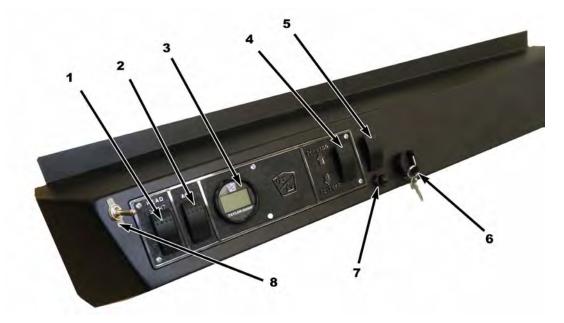
Instrument Panel (Up To S/N 179999)

Item No.	Part No.	Description	Qty
1	71-102-15	Horn switch	1
2	71-039-02	F&R switch	1
3a 3b	71-039-11	Light switch High / Low speed switch	1 1
4	74-010-20	Gauge, Spy Glass	1
5	71-100-00	Auxiliary switches	0, 1, 2
6	71-120-10 71-119-99 71-121-20	Start switch (standard) Spacer Start switch (keyed unalike, optional)	1 1 1
7	71-120-14	Emergency stop switch	1
8	94-304-11	Dash panel	1
9	88-817-07	Screw	6
10	02-546-02	Dash housing	1
Not show	wn		
	97-211-20	U-Nut	2
	91-313-00	Plug, 1/2" hole	0, 1, 2
	01-203-90	Hood, Dash cover	1



Instrument Panel (S/N Starting 180000)

Item No.	Part No.	Description	Qty
1	71-039-11	Light switch	1
2	71-039-11	Wiper Switch	0, 1
3	71-039-11	Strobe switches	0, 1
4	71-039-02	F&R switch	1
5	71-039-11	High / Low speed switch	1
6	74-010-20	Gauge, Spy Glass	1
7	71-102-15	Horn switch	1
8	71-120-10 71-121-20 71-119-99	Start switch (standard) Start switch (keyed unalike, optional) Spacer	1
9	71-120-14	Emergency stop switch	1
10	88-607-06	Rivet, push in	8
11	94-303-90	Dash panel	1
Not show	wn		
	02-546-05	Dash housing	1
	97-211-20	U-Nut	2
	01-203-91	Hood, Dash cover	1



Instrument Panel, ET 3000 (Starting 180000)

Part No.	Description	Qty
71-039-11	Light switch	1
71-039-11	Accessory (Wiper)	0, 1
74-010-00	Gauge, Smart View	1
71-039-02	F&R switch	1
71-039-11	Accessory	0, 1
71-120-10	Start Switch	1
71-102-15	Horn Switch	1
71-070-00	Toggle Switch	0, 1
	71-039-11 71-039-11 74-010-00 71-039-02 71-039-11 71-120-10 71-102-15	71-039-11 Light switch 71-039-11 Accessory (Wiper) 74-010-00 Gauge, Smart View 71-039-02 F&R switch 71-039-11 Accessory 71-120-10 Start Switch 71-102-15 Horn Switch



Mirrors



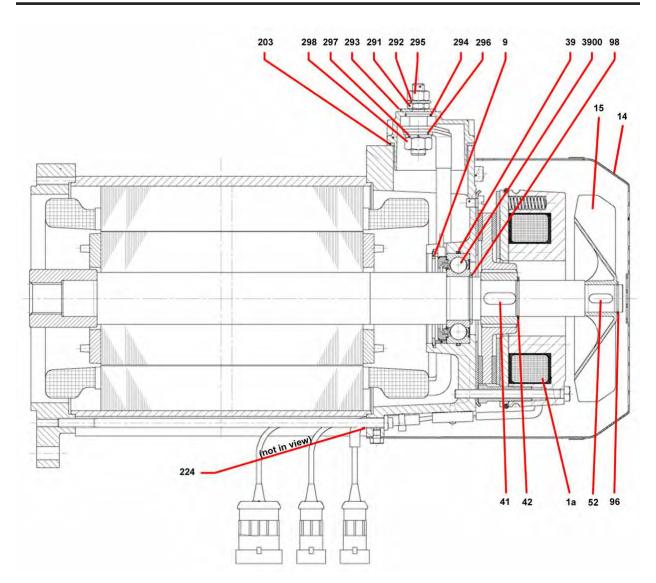
Mirrors

Item No.	Part No.	Description	Qty
1	92-202-21	Arm	1
2	92-202-23	Bracket	2
3	92-202-22	Joint	1
4	88-080-14	5/16NC x 1-1/2 Hex bolt	1
5	88-088-61	5/16 SAE flat washer	4
6	88-089-81	5/16NC Lock nut	1
7	88-088-62	5/16 Split lock washer	1
8	88-089-80	5/16NC Hex nut	1
9	88-080-14	5/16NC x 1-1/2 Hex bolt	1

Not Shown

92-201-00	Mirror, rectangular, 4-1/2 x 8-1/2 (side view)	1
92-202-12	Mounting bracket, left, Steel cab	1
92-202-13	Mounting bracket, right, Steel Cab	1
91-814-16	Hinge, left (used with 92-202-12)	1
91-814-17	Hinge, right (used with 92-202-13	1
92-202-15	Spacer (used with 92-202-12 and -13)	1
92-207-00	Mirror, multi-panel (inside cab)	1
91-810-00	Mounting tab for multi-panel mirror	2
97-176-00	Washer, Neoprene	2
92-206-00	Mirror, rectangular, 5-1/2 x 8 (inside cab)	1
02-210-70	Bracket for 92-206-00	1
02-201-11	BRACKET,MIRROR,LEFT,BOTTOM, Fiberglass cab)	1
02-201-10	BRACKET, MIRROR, LEFT, TOP (fiberglass cab)	1
02-201-12	TUBE,MIRROR MOUNT,RIGHT (fiberglass cab)	1
92-202-00	Mirror mounting bracket assembly, Fiberglass cab	

Motor

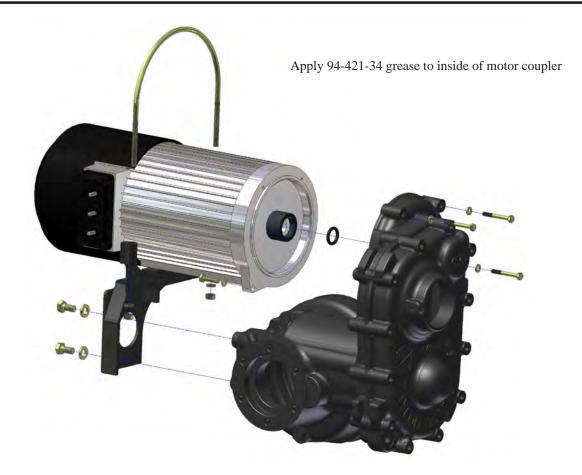




ltem No.	Part No.	Description	Qty
1a	41-354-05	Brake	1
9	70-400-14	Snap ring	1
14	70-400-12	Fan Shroud	1
15	70-400-11	Fan	1
39	70-400-15	O-ring	1
41	70-400-16	Кеу	1
42	70-400-17	Snap ring	1
52	70-400-21	Кеу	1
96	70-400-18	Snap ring	1
98	70-400-19	Snap ring	1
203	70-400-13	Seal	1
224	70-400-09	Rubber Grommet	2
206	70-260-00	Terminal stud	3
291	70-260-00	Hex nut	3
292	70-260-00	Washer	3
293	70-260-00	Washer	3
294	70-260-00	O-ring	3
295	70-260-00	Hex nut	3
296	70-260-00	Washer	3
297	70-260-00	Lock washer	3
298	70-260-00	hex nut	3
3900	80-216-05	Sensor bearing	1
Not Sho	wn		
	45-308-30	Rubber seal around brake	1

70-059-41 Motor Spec # ZFB40SO/4 DF100L-4

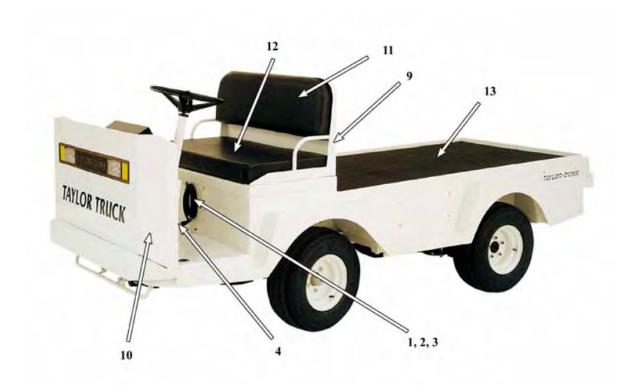
Motor Mount



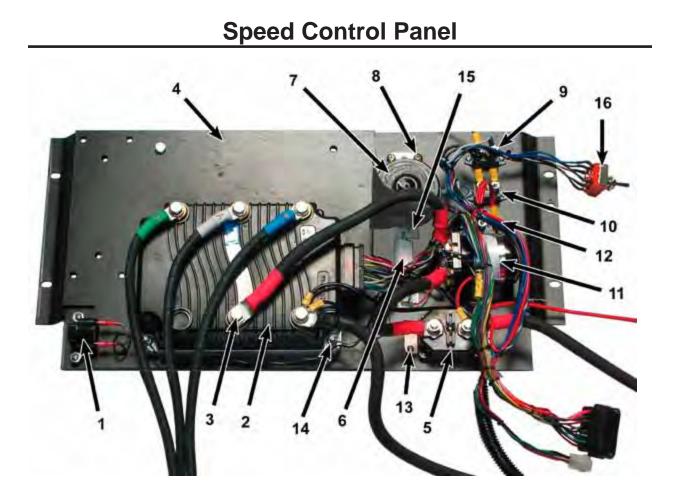
		Motor Mount	
Item No.	Part No.	Description	Qty
1	See Motor	Motor	1
2	96-114-12	U-bolt	1
3	80-714-05	O-ring	1
4	88-068-62	1/4 Split lock washer	4
5	89-060-11	6mm x 1.0 x 50 Hex bolt	3
6	89-111-27	10mm x 1.5 x 20 Hex bolt	2
7	88-128-62	7/16 Split lock washer	2
8	70-456-03	Mounting bracket	1
9	88-067-17	1/4NC x 1-1/4 Hex bolt	1
10	88-099-80	5/16NF hex nut	2
11	88-088-62	5/16 Split lock washer	2



Seat Cushions and Deck



Seats and Deck			
Item No.	Part No.	Description	Qty
11	90-140-00	Backrest, standard	1
	90-179-00	Backrest, Steel Cab	1
12	90-150-00	Seat Cushion, standard	2
	90-172-00	Seat cushion, steel cab	2
13	90-444-00	Deck board, standard	1
	90-466-10	DECKBOARD, 19.500 X 41.000	1
	90-467-10	DECKBOARD, 55-3/4 X 41	1
	90-440-54	COVER, DECK, 55-3/4 X 41	1
	90-440-50	COVER, DECK, 19.500 X 41.000	1
	88-607-09	RIVET, DRIVE, 1/4X1/2STARPIN	16



Typical, 48 volt shown

Resetting the Maintenance Meter Function

NOTE: The Maintenance meter function is optional.

The controller handset is required to reset the Maintenance meter. Refer to the Appendix for the part number of the handset.



Speed Control Panel			
tem No.	Part No.	Description	Qty
1	73-005-01	Motion alarm	1
2	62-400-40	Motor speed control, 48 volt	1
	62-400-05	Motor speed control, 72 volt	1
3	89-080-16	8mm x 1.25 x 16mm Hex bolt	5
	89-060-17	8mm Lock washer	5
4	02-425-17	Controller base, 1/4 plate	1
	02-425-18	Mounting panel	1
5	79-844-20	Circuit breaker, Main 200A (48 volt system) used up to serial number 173	30641
	79-829-10	Fuse, Main,325A (48 volt system) used starting serial number 173065	1
	79-829-06	Fuse, Main 355A (72 volt system)	1
6	78-307-25	Resistor (included with harness), 48 volt	2
	78-3001-00	Resistor (included with harness), 72 volt	1
7	73-004-20	Horn	1
8	88-838-06	#14 x 1/2 Screw	4
9	79-840-20	Circuit breaker, 12-volt 20A	1
10	79-840-00	Circuit breaker, B- 10A	1
11	71-300-02	Line contactor, 48 volt	1
	71-300-01	Bracket for 71-300-02	1
	71-210-12	Line contactor, 72 volt	1
	71-210-11	Bracket for 71-210-12	1
12	79-840-20	Circuit breaker, B+ 20A	1
13	88-818-06	#8 x 1/2 Screw	10
14	88-060-14	1/4 X 1-1/2 NC HEX HD SCR	4
	88-069-81	Hex nut	4
	88-068-61	1/4 SAE Flat washer	4
15	96-650-02	Clip	2
16	71-120-30	Brake bypass switch	1
	71-120-32	Bracket, Brake bypass switch, 72 volt only	1
Not show	wn		
	75-442-64	Support, Harness connector	1
	73-012-30	DC-DC converter, 48 volt	1
	73-012-35	DC-DC converter, 72 volt	1
	92-202-23	Bracket, resistor, 72 volt only	1
	79-840-30	Standoff, fuse, used starting serial number 173065	2

* - Use 94-422-21 Heat sink paste on base of controller and controller base



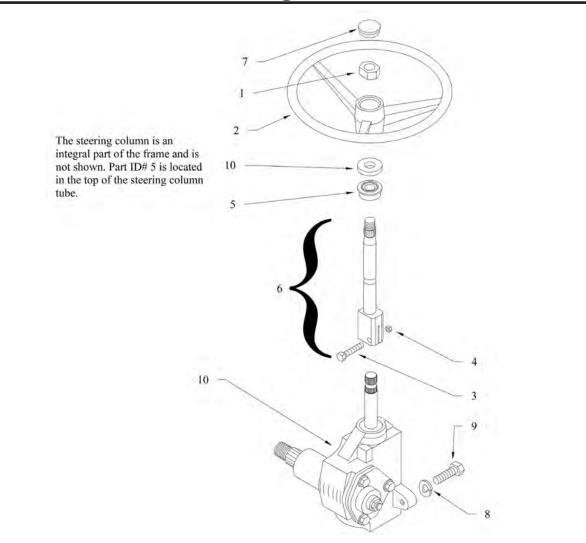
Stake Sides (T-48)
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Item No.	Part No.	Description	Qty
	90-542-01	GATE, END, W/HOOKS 42-3/4	1
	90-542-08	GATE SIDE, LT, TT, W/F G CAB	1
	90-542-09	GATE SIDE, RT, TT, W/F G CAB	1





Steering Column

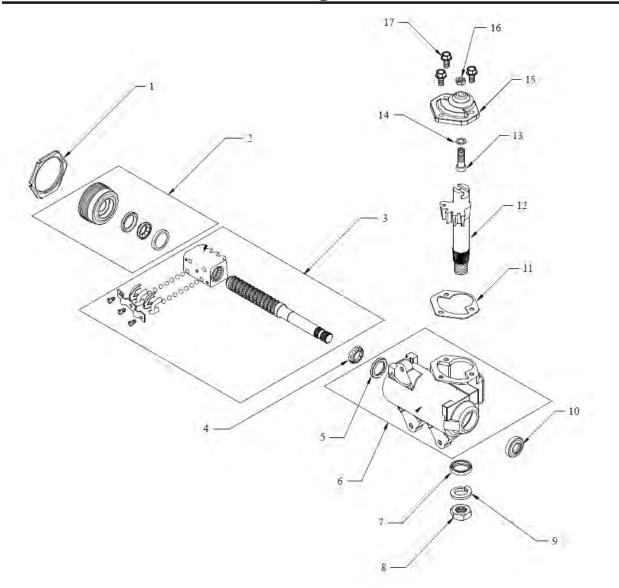


Steering Column

tem No.	Part No.	Description	Qty
1	88-199-82	5/8NF Hex nut	1
2	19-011-20	Steering wheel	1
3	88-081-14	5/16NF x 1-1/2 Hex bolt, grade 8	1
4	88-089-84	5/16NF Hex lock nut, grade C	1
5	32-248-10	Upper bushing	1
6	20-031-65	Steering shaft assembly (incl. 3 and 4)	1
7	19-011-25	Steering wheel cap	1
8	88-128-62	7/16 Split lock washer	3
9	88-120-15	7/16 x 1 Hex bolt	3
Not Sho	wn		
	88-279-82	7/8NF Thin pattern hex nut, Pitman shaft	1
	88-268-62	7/8 Split lock washer, pitman shaft	1

Illustrated Parts

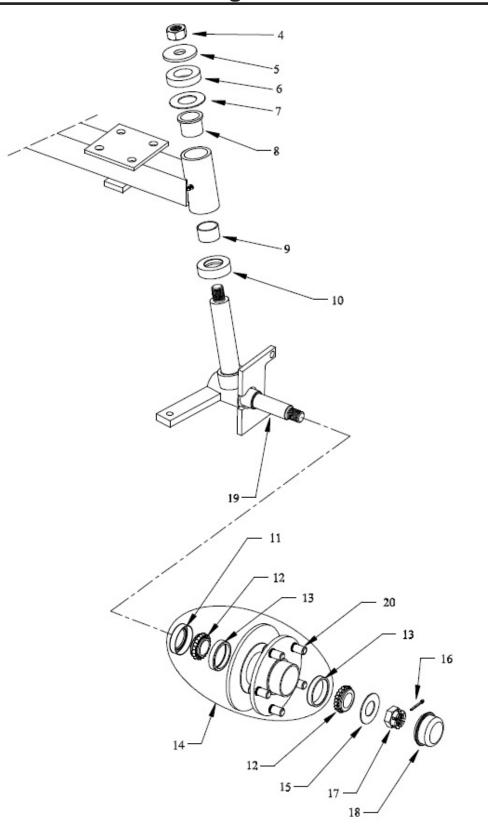
Steering Gear

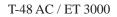




Steering Gear 18-308-21			
Item No.	Part No.	Description	Qty
1	18-308-70	Locknut	1
2	18-308-71	Adjuster assembly	1
3	18-308-72	Worm assembly	1
4	18-308-23	Upper worm bearing	1
5	18-308-22	Upper worm bearing race	1
6	18-308-77	Housing	1
7	18-308-78	Seal, pitman shaft	1
8	18-308-80	Nut, pitman shaft	1
9	18-308-81	Lock washer	1
10	18-308-79	Seal, input shaft	1
11	18-308-82	Gasket	1
12	18-308-76	Pitman shaft	1
13	18-308-75	Gear lash adjuster	1
14	18-308-85	Shim kit	1
15	18-308-84	Side cover	1
16	18-308-86	Jam nut	1
17	18-308-83	Bolt, side cover	3

Steering Knuckle

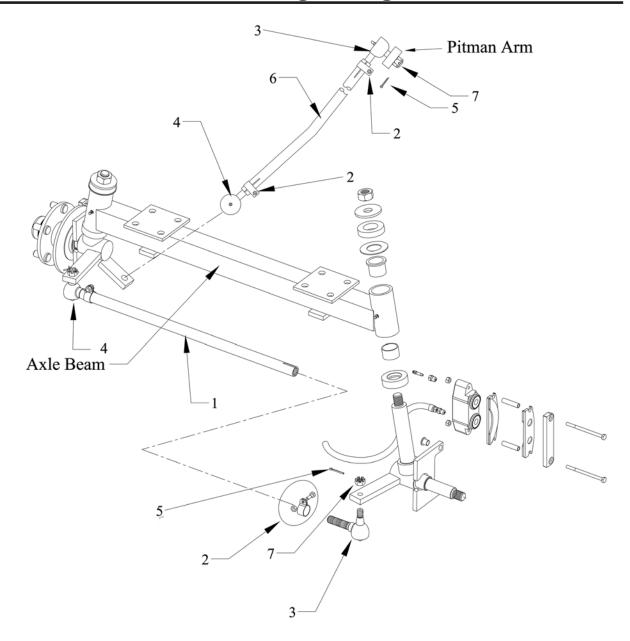






Steering Knuckle			
Item No.	Part No.	Description	Qty
-			
-			
-			
4	88-239-86	3/4-NF Hex Slotted Nut	2
5	88-228-60	3/4 Cut Flat Washer	2
6	98-603-07	Rubber Bushing	2
7	01-220-99	Washer	2
8	32-240-44	Bushing	2
9	32-240-43	Bushing	2
10	80-309-12	Thrust Bearing	2
11	45-338-00	Grease Seal	2
12	80-017-00	Tapered Bearing	4
13	80-103-00	Tapered Bearing Race	4
14	12-158-10	Wheel Hub W/Rotor (incl 1-#12, 1-#11, 1-#13)	2
15	88-228-61	3/4 SAE Flat Washer	2
16	88-527-14	1/8 x 1-1/2 Cotter Pin	2
17	88-239-85	3/4-NF Hex Slotted Nut	2
18	92-104-01	Bearing cap	2
19	21-020-18	Right Steering knuckle	1
	21-020-17	Left Steering Knuckle	1
20	96-329-00	Wheel stud	10

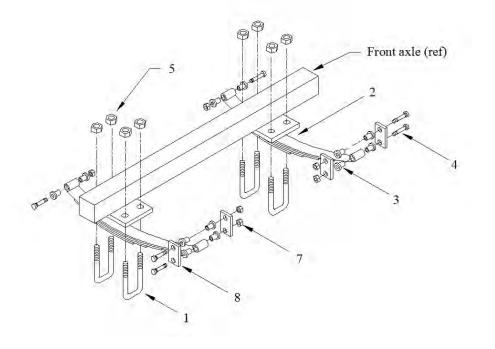
Steering Linkage





Steering Linkage			
Item No.	Part No.	Description	Qty
1	18-057-00	Tie rod	1
2	86-510-00	Ball joint clamp	4
3	86-501-98	Ball joint (left)	2
4	86-501-99	Ball joint (right)	2
5	88-527-11	1/8 x 1 Cotter pin	4
6	18-037-00	Drag link	1
7	88-159-85	1/2NF Castle nut	4
	18-104-00	Pitman Arm	1

Suspension



Front Suspension

Item No.	Part No.	Description	Qty
1	96-121-00	U-bolt	4
2	85-498-00	Leaf spring	2
3	32-214-50	Bushing	12
4	96-240-00	1/2NC x 4 Hex bolt	6
5	88-149-81	1/2NC Lock nut	8
6	-	-	-
7	88-149-81	1/2NC Lock nut	6
8	16-872-00	Spring hanger	4
Not show	wn		
	86-015-00	Shock	2



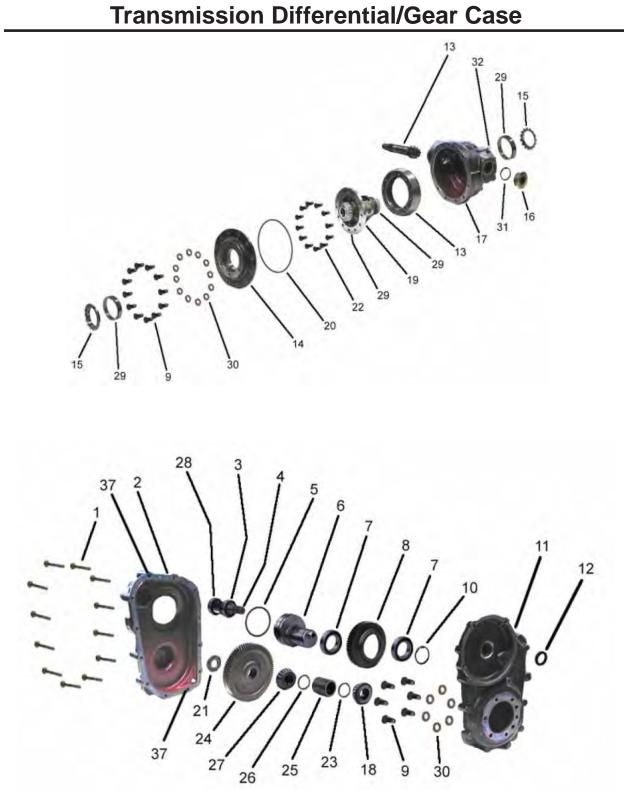




Rear Suspension

ltem No.	Part No.	Description	Qty
14	85-510-17	Leaf spring	2
15	16-861-46	Spring mounting plate (left)	1
	16-861-47	Spring mounting plate (right)	1
16	96-114-00	U-bolt	4
	88-159-84	1/2NC Nylon lock nut	8
18	-	-	-
19	96-103-00	U-bolt	2
20	88-149-81	1/2NC Lock nut	4
21	50-460-00	Strap	2
22	98-002-00	Rubber overload spring (optional)	2
23	86-602-00	Shock	2
24	88-120-17	7/16NC x 2-1/4 Hex bolt	2
	88-129-81	7/16NC Lock nut	2
	88-128-60	7/16 Flat washer	2
Not show	wn		
	96-240-00	1/2NC x 4 Spring bolt (front of the leaf spring)	2
	32-214-50	Spring bushing (front of the leaf spring)	4

T-48 AC / ET 3000





Transmission Differential/Gear Case			
Item No.	Part No.	Description	Qty
1	GT-71682	M8 x 60 bolt	12
2	GT-3287563	Gear case cover	1
3	GT-71259	Bearing	1
4	GT-3287513	Input shaft, 30:1	0 or 1
	GT-3287523 GT-3287533	Input shaft, 24:1 Input shaft, 18:1	0 or 1 0 or 1
5	GT-71982	O-ring	1
6	GT-3287503	Eccentric shaft	1
7	GT-72005	Bearing	2
8	GT-3287493	Idler gear	1
9	GT-70302	M10 x 30 Bolt	6
10	GT-71715	Snap ring	1
10	GT-3287553	Gear case housing	1
12	GT-72019	Seal	1
12	GT-3287183	Ring and pinion gear set	1
13	GT-3297193	Differential case cover	1
			2
15	GT-3287133 GT-70417	Adjusting ring	
16		Fill/Level plug	1
17	GT-3287113 GT-71979	Differential housing	1
18		Bearing Differential case	1
19 20	GT-3287143 GT-72013	O-ring	1
20	GT-3273633	Pinion nut	1
21	GT-71896	M10 x 25 Bolt	12
23	See Note 1, previous page	Spacer	12
23	GT-3287453	Output gear, 30:1	0 or 1
24	GT-3287463	Output gear, 30.1 Output gear, 24:1	0 or 1
	GT-3287473	Output gear, 18:1	0 or 1
25	GT-3287813	Spacer, 46.100mm	1
	GT-3289403	Spacer, 46.125mm	0 or 1
	GT-3289413 GT-3289423	Spacer, 46.150mm Spacer, 46.175mm	0 or 1 0 or 1
26	GT-3287903	Shim, 0.100mm	0 or 1
20	GT-3287883	Shim, 0.400mm	0 or 1
	GT-3287893	Shim, 0.500mm	0 or 1
	GT-3287853	Shim, 0.600mm	0 or 1
	GT-3287863	Shim, 0.700mm	0 or 1
07	GT-3287873	Shim, 0.800mm	0 or 1
27	GT-71068	Bearing	1
28	GT-72022	Bearing	1
29	GT-71978	Bearing and race	2
30	GT-70299	10mm Washer	12
31	GT-71881	Seal	1
32	GT-70052	Vent	1





Wheels and T	ires
--------------	------

Item No.	Part No.	Description	Qty
	Wheels		
-	12-025-00	8 x 10 Wheel	
	Tires		
-	10-264-00	TIRE, 20.5X8X10 LR-E, tubeless	
-	97-236-00	Wheel Nut	
-	13-989-00	Valve stem, tubeless tire only	
	Tire and Wheel Assemblies	3	
-	13-746-14	TIRE,ASSY, 20.5X8X10,LD RNG E	

Wire Harnesses

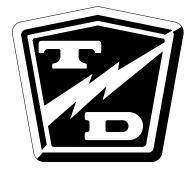
Item No.	Part No.	Description	Qty
	75-153-08	Dash harness	1
	75-153-04	Cable, Spy Glass	1
	75-153-07	Main control harness	1
	75-153-09	Control panel, 48 volt	1
	75-153-12	Control panel, 72 volt	1
	75-153-06	Power, 48 volt	1
	75-153-11	Power, 72 volt	1
	75-149-02	Harness, Fiberglass cab, T-48	1

Appendixes

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APPENDIX A: SPECIAL TOOLS

Note: This is a listing of all tools available. Not all tools would be required for all vehicles. Refer to the Maintenance, Repair, and Troubleshooting sections for information on tools required.



62-027-32: Throttle Module Analyzer Tests the throttle module in or out of the vehicle



75-089-00: Throttle Module Test Harness Used in conjunction with a volt meter to test the throttle module. The module must be installed in a working control system.

Note: Part # 62-027-31 includes instructions



41-532-50: Chain Case Centering Tool

Used to center the chain case cover on all vehicles equipped with the Power Traction primary reduction and a pinion brake or speed sensor. Includes instructions.



43-201-50: Pinion Seal Installation Tool

Used to install the pinion seal on all vehicles equipped with the Power Traction primary reduction and a pinion brake or speed sensor.



62-027-61 and -62: Sevcon System Handset

Diagnostics and adjustments (-62 only) of the Sevcon Power Pak and Micro Pak control systems.



62-027-64 and -65: Curtis AC System Handset

Diagnostics and adjustments (-65 only) of the Curtis AC control system.



62-027-00: Test Light

Used for testing electrical circuits. Switchable for 12, 24, 36, 48 volt systems.

Required to complete troubleshooting provided in the vehicle service manuals.



96-500-43: PMT/C Meter Reset Module Required to reset the PMT/C maintenance meter (special order option).

Appendix 👔

APPENDIX A: SPECIAL TOOLS



75-442-55: Pin Removing Tool Removes pins from Molex Mini-Fit harness connectors.



41-350-13: Disc Brake Boot Installation Tool Assists in installing the rubber boot onto the disc brake piston.



77-200-00: Hydrometer

Used for testing battery electrolyte. Illustration is of a typical hydrometer, actual hydrometer type may vary.



Used to safely add water to batteries. Equipped with splash guard and autoshutoff when cell is full.



70-440-55: Pin Removing Tool Removes pin from Amp circular harness connectors.



Extension Not Included

96-500-48: GT Drive Oil Fill Plug Tool Used to remove the oil fil plug on GT drives. It is used with a 3/8" drive extension (not included).



Molex # 11-300-02: Pin Removing Tool

Removes 0.062 diameter pins from Molex rectangular harness connectors. Not available from Taylor-Dunn. Purchase from any local electronics distributor.



Molex # 11-300-06: Pin Removing Tool

Removes 0.093 diameter pins from Molex rectangular harness connectors. Not available from Taylor-Dunn. Purchase from any local electronics distributor.



APPENDIX B: SUGGESTED TORQUE LIMITS FOR STANDARD HARDWARE

HARDWARE IDENTIFICATION

Standard Head Markings

- Note: Torque value used should be for lowest grade of hardware used. If a grade 2 nut is used on a grade 8 bolt, use grade 2 torque value.
- *Note:* Toque values specified are for clean dry threads.

Hex Bolts





S.A.E. Grade 2







The grade of a metric bolt is cast directly on the head. Below is an example of a 10.9. the location and style of the text will vary.



Other Bolts





Truss Head, grade 2

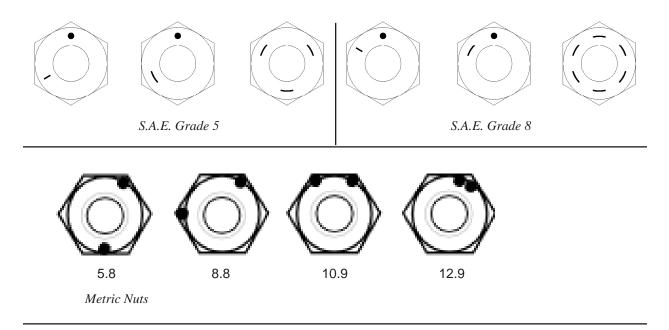


Carriage Bolt, grade 2 (unless marked as above)



Hex Nuts

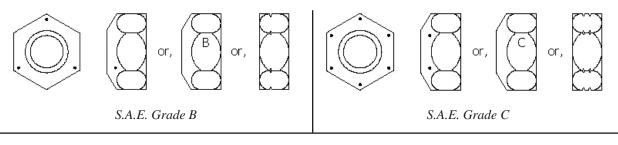
Nuts with no markings are to be treated as S.A.E. Grade 2



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





Other Nuts

Other nuts used by Taylor-Dunn[®] should be treated as S.A.E. grade A



<u>Generic Torque Values</u> All torque values are for clean dry zinc plated threads in noncritical steel assemblies of the same hardess specification. Reduce torque approximately 10-15% for lubricated threads.

Refer to the service section assembly procedure for critical torque values.

	Imperial (inch), Foot Pounds					Imperial (inch), Newton Meters						
		·	Grade, SAE				-	· ·	Grade, SAE			
<u>Dia.</u>	Pitch	2	5	8	L9	<u>Dia.</u>	Pitch	2	5	8	L9	
<u>#4</u>	40	*	*	*	*	<u>#4</u>	40	*	*	*	*	
<u>#6</u>	32	*	*	*	*	<u>#6</u>	32	*	*	*	*	
<u>#8</u>	32	*	*	*	*	<u>#8</u>	32	*	*	*	*	
<u>#10</u>	32	*	*	*	*	<u>#10</u>	32	*	*	*	*	
<u>#12</u>	32	*	*	*	*	<u>#12</u>	32	*	*	*	*	
1/4	20 28	5.5 6.5	8.5 10.5	12.5	11	1/4	20 28	7.4 8.8	11.5 14.2	16.9	14.9	
5/16	18 24	12.0 12.5	17.5 19.0	24.5 *	22 *	5/16	18 24	16.2 16.9	23.7 25.8	33.2 *	29.8 *	
3/8	16 24	20 22.5	30 33	43 50	40 45	3/8	16 24	27.1 30.5	41 45	58 68	54 61	
7/16	14 20	27 36	50 55	70 77	65 70	7/16	14 20	37 49	68 75	95 104	88 95	
1/2	13 20	49 55	75 85	106 120	95 110	1/2	13 20	66 75	102 115	144 163	129 149	
9/16	12 18	70 78	109 121	153 171	140 160	9/16	12 18	95 106	148 164	614 232	190 217	
5/8	11 18	97 110	150 170	212 240	195 225	5/8	11 18	132 149	203 230	287 325	264 305	
3/4	10 16	172 192	275 297	376 420	350 390	3/4	10 16	233 260	373 403	510 569	475 529	
7/8	9 14	278 306	429 473	593 818	565 625	7/8	9 14	377 415	582 641	804 1109	766 847	
1	8 14	416 466	644 721	909 1018	850 930	1	8 14	564 632	873 978	1232 1380	1152 1261	
1-1/8	7 12	590 662	794 891	1287 1444	1700 1850	1-1/8	7 12	800 897	1076 1208	1744 2364	2304 2508	
1-1/4	7 12	832 922	1120 1241	1817 2012	2950 3330	1-1/4	7 12	1128 1250	1518 1682	2463 2727	4000 4514	

Conversion Formulas:

Foot Pounds = Newton Meters x 0.737562149 Newton meters = Foot Pounds x 1.355817948



All torque values are for clean dry zinc plated threads in noncritical steel assemblies of the same hardess specification. Reduce torque approximately 10-15% for lubricated threads.

Refer to the service section assembly procedure for critical torque values.

Metric, Newton Meters					Metric, Foot Pounds						
			Grade, N-m					—	Grade, N-m		
<u>Dia.</u>	Pitch	4.6	8.8	10.9	12.9	<u>Dia.</u>	Pitch	4.6	8.8	10.9	12.9
3	0.50	0.51	*	*	*	3	0.50	0.38	*	*	*
4	0.70	0.95	3.1	*	*	4	0.70	0.7	2.3	*	*
5	0.80	2.28	6.1	*	*	5	0.80	1.7	4.5	*	*
6	1.00	3.92	10.4	15.5	*	6	1.00	2.9	7.7	11.4	*
8	1.00 1.25	* 9.48	27.0 25.0	* 37.0	*	8	1.00 1.25	* 7	19.9 18.4	* 27.3	*
10	1.00 1.25 1.50	* * 19.1	57.0 54.0 51.0	* * 75.0	* * *	10	1.00 1.25 1.50	* * 14.1	42 40 38	* * 55	* * *
12	1.25 1.50 1.75	* * 32.6	96.0 92.0 87.0	* * 160	* * *	12	1.25 1.50 1.75	* * 24	71 68 64	* * 118	* * *
14	1.50 2.00	* 51.9	150 140	* 205	*	14	1.50 2.00	* 38	111 103	* 151	*
16	1.50 2.00	* 79.9	* 215	* 310	*	16	1.50 2.00	* 60	* 158	* 229	*
18	1.50 2.00 2.50	* * 110	* * 300	* * *	* * *	18	1.50 2.00 2.50	* * 81	* * 221	* * *	* * *
20	1.50 2.00 2.50	* * 156	* * 430	* * *	* * *	20	1.50 2.00 2.50	* * 115	* * 317	* * *	* * *
22	1.50 2.00 2.50	* * 211	* * 580	* *	* * *	22	1.50 2.00 2.50	* * 156	* * 428	* * *	* * *
24	2.00 3.00	* 270	* 740	*	*	24	2.00 3.00	* 199	* 524	*	*
27	3.00 3.00	* 398	*	*	*	27	3.00 3.00	* 293	*	*	*
30	2.00 3.50	* 540	*	*	*	30	2.00 3.50	* 398	*	*	*

APPENDIX C: BRAKE LINING HANDLING PRECAUTIONS

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.

Notes: Green Since 1949



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