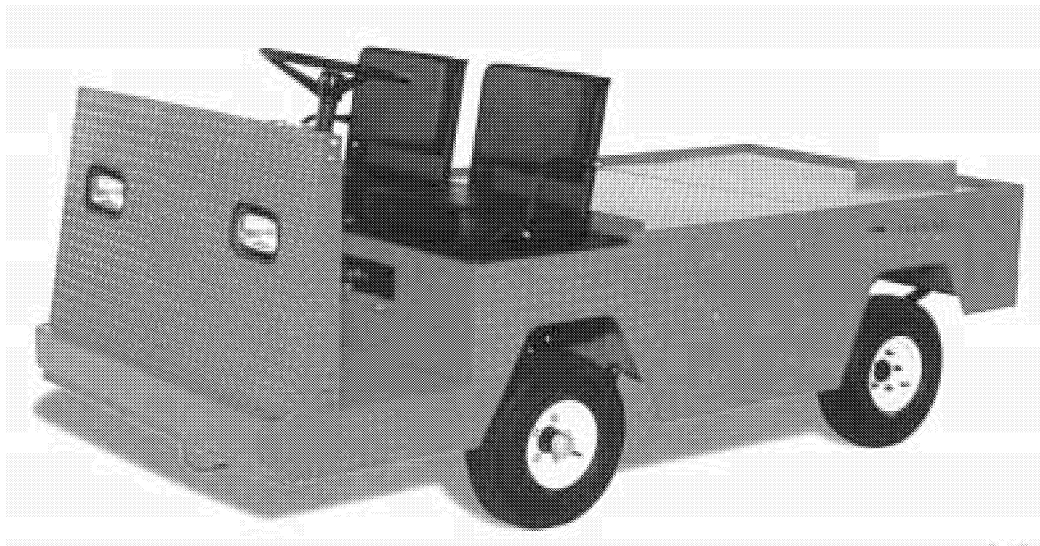




Industrial & Commercial Vehicles

Burden Carriers

BC3-21 to BC7-20XB



Operation and Maintenance Manual With Illustrated Parts List

Issued: January 2001

Part No. 99486-00

FOREWORD

This service manual has been prepared with two purposes in mind. First, it will introduce the trained maintenance professional to the latest field-tested and factory-approved major repair methods. Secondly, it will acquaint the reader with the construction of Columbia Industrial & Commercial vehicles and assist him/her in performing basic maintenance and repair. We sincerely believe that this manual will make your association with Columbia Industrial & Commercial Vehicles more pleasant and profitable.

In addition to the information given in this Operation, Maintenance, Service and Parts Manual, Service Bulletins are issued to Columbia Industrial & Commercial Vehicle Dealers from time to time, which cover interim engineering changes and supplementary information. Service Bulletins should be consulted for complete information on the models covered by this manual.

To insure the safety of those servicing Columbia Industrial & Commercial Vehicles, and to protect the vehicles from possible damage resulting from improper service or maintenance, the procedures followed in this manual should always be followed exactly as outlined. Execution of the procedures and troubleshooting tips as outlined will ensure the best possible service from the vehicle(s). To reduce the chance of personal injury and/or property damage, carefully observe **NOTES, CAUTIONS, WARNINGS** and **DANGER** recommendations through out this manual. See chapter 1 for additional detail.

PREPARATION FOR SERVICE

Proper preparation is very important for efficient service work. A clean work area at the start of each job will allow you to perform the repair as easily and quickly as possible, and reduce the incidence of misplaced tools and parts. Columbia Industrial & Commercial Vehicles that are excessively dirty should be cleaned before work begins. Cleaning will occasionally uncover trouble sources. Tools, instruments and parts needed for the job should be gathered before work is started. Interrupting a job to locate tools or parts is a needless delay. Special tools required for a job are listed at the front of each section.

MODEL IDENTIFICATION

Always give the full vehicle identification number when ordering parts or making inquiries about your Columbia Industrial & Commercial vehicle.

Use of the full and complete vehicle identification number (VIN) information will assure your dealer or service provider is supplying you with the correct parts for your vehicle. See chapter 1 for vehicle identification information.

USE GENUINE REPLACEMENT PARTS



WARNING: When replacement parts are required, use only genuine Columbia Industrial & Commercial Vehicle parts or parts with equivalent characteristics including type, strength and material. Failure to do so may result in product malfunction and possible injury to the operator and/or passenger.

To ensure a satisfactory and lasting repair job, follow the service manual instructions carefully and use only genuine Columbia Industrial & Commercial Vehicle replacement parts. This is your insurance that the parts you are using will fit right, operate properly and last longer. When you use genuine Columbia Industrial & Commercial Vehicle parts, you use the best.

PRODUCT REFERENCES

When reference is made in this manual to a specific brand name product, tool or instrument, an equivalent product, tool or instrument may be used in place of the one mentioned.

Dear Owner,

Congratulations on your purchase of Columbia Industrial & Commercial Vehicle Model Burden Carrier. At Columbia Industrial & Commercial Vehicle, we pride ourselves on manufacturing electric personnel and burden carriers that are second to none in terms of designs, quality of materials, and workmanship. While our vehicles are designed and built for maximum efficiency, durability, performance and safety, proper maintenance and operator knowledge will nevertheless play a vital role in your long-term product satisfaction.

Thus, the information in this manual should be closely read, studied, and understood prior to operating your vehicle. If you do not clearly understand any portion of this manual, see your authorized Columbia Industrial & Commercial Vehicle Dealer for clarification. The manual contains the most current information available at the time of publication. However, as our Research and Engineering Department continually work to improve our products. It is possible that models produced subsequent to the publication of the manual may include improvements that are not referenced in this manual. Our Dealers can advise you of any updating of our recommended service and maintenance procedures that may have transpired subsequent to your purchase.

Should you have questions or encounter problems which our Dealer is unable to answer or resolve, we encourage you to contact us at the address below:

Columbia ParCar Corp.
350 N. Dewey Avenue * P.O. Box 30
Reedsburg, WI 53959
Phone: (608) 524-8888 * Fax: (608) 524-8380
(800) 222-4653 * Web: www.parcars.com
E-Mail: info@parcars.com

Your decision to invest in a Columbia Industrial & Commercial Vehicle is very gratifying to us and we wish you many years of satisfaction

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About this manual

This manual contains information to safely operate and maintain the Burden Carrier manufactured by Columbia Industrial & Commercial Vehicles. Only trained maintenance professionals should repair or service this vehicle. Persons doing even simple repairs or service should have working knowledge and experience in general electrical and mechanical repair. Follow all procedures exactly and observe all warnings and cautions stated in this manual. Use caution and common sense.

It is also necessary that every individual who will operate this vehicle receive adequate training that assures the safe operation and use of this particular vehicle. This manual contains the following major chapters:

Chapter 1 INTRODUCTION

Contains Warnings, cautions, a description of the Burden Carrier, important information about taking delivery of the vehicle and lifting instructions.

Chapter 2 OPERATOR INFORMATION

Provides safety rules and guidelines, describes the driver training program, explains the operation of each control, operating instructions and storage of the Burden Carrier.

Chapter 3 MAINTENANCE / SERVICE

Shows a scheduled maintenance checklist, lubrication instructions, minor maintenance procedures.

Chapter 4 ILLUSTRATED PARTS LIST

Includes an exploded view illustration and detailed parts list for each assembly or component group that has replaceable parts for the Burden Carrier.

Chapter 5 APPENDICES

Includes any additional information that we may receive from our vendors on the components of the Burden Carrier and/or troubleshooting flowcharts.

CHAPTER 1

Introduction	Page #
Warnings & Dangers	2
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DANGERS, WARNINGS, CAUTIONS AND NOTES

Statements in this manual preceded by the words DANGER, WARNING, CAUTION or NOTE and printed in bold face are very important. We recommend you take special notice of these items.

It is important to note that some warnings against the use of specific service methods, which could damage the vehicle or render it unsafe, are stated in this service manual. However, please remember that these warnings are not all inclusive. Since Columbia Industrial Vehicle could not possibly know, evaluate and advise servicing personnel of all possible ways in which service might be done or of the possible hazardous consequences of each way, we have not undertaken any such broad evaluation. Accordingly, anyone who uses a service procedure or tool which is not recommended by Columbia Industrial Vehicle must first thoroughly satisfy himself that neither his nor the operator's safety will be jeopardized by the service methods selected.

! DANGER: Danger indicates an immediate hazard that will result in severe personal injury or death.

! WARNING: Warnings will indicate an immediate hazard, which could result in severe personal injury.

! CAUTION: Cautions indicate hazards or unsafe practices, which could result in minor personal injury, damage to the vehicle or to other property.

NOTE: Notes will provides key information to assure procedures are more easily understood or implemented.

It is Columbia Industrial Vehicle's specific recommendation that the following warnings must be observed at all times. Not all are repeated throughout this manual, but the recommendations included must be observed whenever these subjects (indoor vehicle operation hazards, gasoline and fuel system hazards, battery hazards, etc.) are encountered.

Be a safe operator. Electric Industrial vehicles are only as safe as the person who is at the controls. If accidents are to be prevented, and they most certainly can be prevented, operators must accept their full measure of responsibility. While the designer, the manufacturer and the safety engineer can help minimize the possibility of an accident, their combined efforts can be erased by a single careless act.

It is said, "The best kind of safety device is a careful operator." We ask you to be that kind of person.

! CAUTION: To prevent possible injury, always disconnect batteries before working on the vehicle. Remove both the positive and the negative battery cables as shown in Fig. 1 & 2.

DISCONNECT METHODS:

Operational Installation: Standard

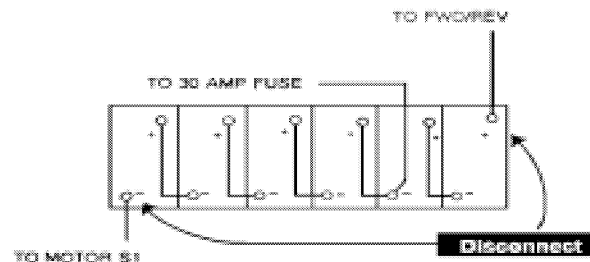


Figure 1 - Standard Installation

Optional Installation: Push Pull Battery Pack

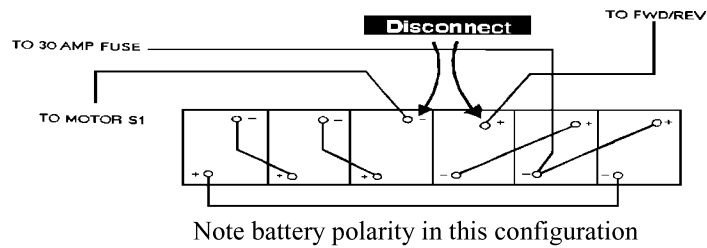


Figure 2a – Push-Pull Batteries







CAUTION: No modifications or additions, which affect the mechanical or electrical integrity and the safe operation of the unit, shall be made without the written approval of the manufacturer. If in doubt about any modification, contact your local Columbia Industrial & Commercial Dealer or Columbia ParCar Corp. Customer Service.



Figure 2b – Push-Pull Batteries Installed

ALL VEHICLES

<div style="text-align: center;">  DANGER </div>	<ul style="list-style-type: none"> ➤ Any modifications or changes to the vehicle that affect the stability or that results in increased speed beyond factory specifications could result in severe personal injury or death. ➤ Always remove key and disconnect the battery(s) before servicing or repairing your vehicle. See Batteries, chapter 3 for details ➤ All batteries used in gas or electric vehicles can explode! Always wear full-face shield when working on or near batteries. Hydrogen fumes are a natural byproduct of charging and discharging and are extremely explosive. Do not smoke. Keep sparks and flames away from batteries. Battery charging should only be done in a well-ventilated area. See Batteries, chapter 3 for details. ➤ When working around or servicing batteries use care to prevent an accidental arc which could cause an explosion. Use only approved insulated tools, remove jewelry such as rings, watches, chains etc. and place an insulating material (wood, plastic, rubber etc.) over all battery connections. ➤ BATTERY – Is poisonous! Contains acid! Causes severe burns. Avoid contact with skin, eyes, or clothing. ➤ Antidotes: ➤ EXTERNAL: Flush with water. Call a physician immediately. ➤ INTERNAL: Drink large quantities of milk or water. Follow with milk of magnesia or vegetable oil. call a physician immediately ➤ - EYES: Flush with water for fifteen minutes. call physician immediately ➤ If any problems are found during scheduled maintenance or inspections, DO NOT operate vehicle until repairs are made. Failure to make necessary repairs could result in fire, property damage, severe personal injury, or death.
<div style="text-align: center;">  WARNING </div>	<ul style="list-style-type: none"> ➤ Only trained maintenance professionals should repair or service this vehicle. Persons doing even simple repairs or service should have working knowledge and experience in general electrical and mechanical repair. Follow all procedures exactly and observe all warnings stated in this manual. Use caution and common sense ➤ Proper service and repair is important for the safe, reliable operation of all Columbia Industrial Vehicles. The service procedures recommended and described in this service manual are effective methods for performing service operations. Some of these service operations require the use of tools specially designed for the purpose. These special tools should be used when and as recommended. ➤ Moving parts hazard! When operating any vehicle in a stationary position, avoid spinning clutches, belts and wheels which could snag clothing or cause sever injury to body parts. A running vehicle must be worked on with the greatest care. Use caution and common sense. ➤ Working on Columbia Industrial Vehicles without following proper procedures and using proper lifting equipment may result in vehicle damage or personal injury. See lifting instructions in chapter 1 for detailed instructions. ➤ Failure to maintain vehicle properly could result in decreased vehicle performance, reliability or causes severe personal injury.

<u>ALL VEHICLES</u>	
 WARNING	➤ Any Modifications or changes to the vehicle that affect the stability or that results in increased speed beyond factory specifications could result in severe personal injury or death
	➤ Always wear safety glasses or approved eye protection while servicing vehicle. Wear a full face shield when working with batteries
	➤ Exceeding rated vehicle load capacities could result in possible severe injury or property damage.
	➤ Always turn key switch to OFF, remove key, block tires and disconnect the battery negative (-) cable before performing any vehicle service to avoid accidental start-up of vehicle and possible injury
	➤ HOT! - DO NOT attempt to service hot motor or resistors. Failure to observe this warning could result in severe burns.
 CAUTION	➤ ➤ Cautions appear throughout this manual indicating possible hazards or unsafe practices that may result in minor personal injury, damage to vehicles or property.
NOTES	➤ Notes appear throughout this manual to provide key information to assure procedures are more easily understood or implemented.

Vehicle Description and Specifications

The Burden Carrier is a two-passenger vehicle involving cargo-hauling operation. This vehicle is designed to be driven on smooth surfaces in and around industrial plants, nurseries, institutions, motels, mobile home parks, resorts, etc.

This vehicle is not designed to be driven on public highways. The Burden Carrier travels on level surfaces at a maximum rated speed of 8 to 20 mph, depending upon vehicle battery voltage. Do not exceed this maximum rated speed. Exceeding this speed may result in steering difficulty, motor damage, and loss of vehicle control.

See Vehicle Specifications Table on page 7 for vehicle rated capacity. The Vehicle identification label will indicate model and rated capacity. Do not exceed this rated capacity. This rated capacity includes optional equipment, cargo, passenger and driver.

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 1993 Part III).


To insure prompt service when repairs or adjustments are required, your Columbia Industrial Vehicle Dealer must have the following information.

For your own personal reference, fill in the space provided below:

VIN# _____

The VIN Nameplate attached to the dashboard near the steering column, indicates the power system, model code designation, and factory modifications/options. For security reasons, the serial number is also stamped on the left square frame tube under the driver's seat.

⚠ CAUTION: Do not remove any nameplate, warnings, or instructions affixed to your Columbia Industrial Vehicle

COLUMBIA ParCar 

Electric Utility Vehicle Information:
Vehicle Identification Number (V.I.N.) 4KS-12345
Rated Capacity Including Passengers and Operator 3000lbs.
(1362kg)

Operating Weight: 1604 lbs. (728kg)
Without Batteries: 1224 lbs. (556kg)
Maximum Service Weight of Batteries: 380 lbs. (173kg)
This Carrier is Designed for 36 V (Normal)

Designed To Conform With The Mandatory Requirements Of
ASME/ANSI B56.8 Part III, ANSI/UL 583 Type E And
OSHA 1910.178

Reedsburg, WI USA

Figure 3 - VIN Name Plate

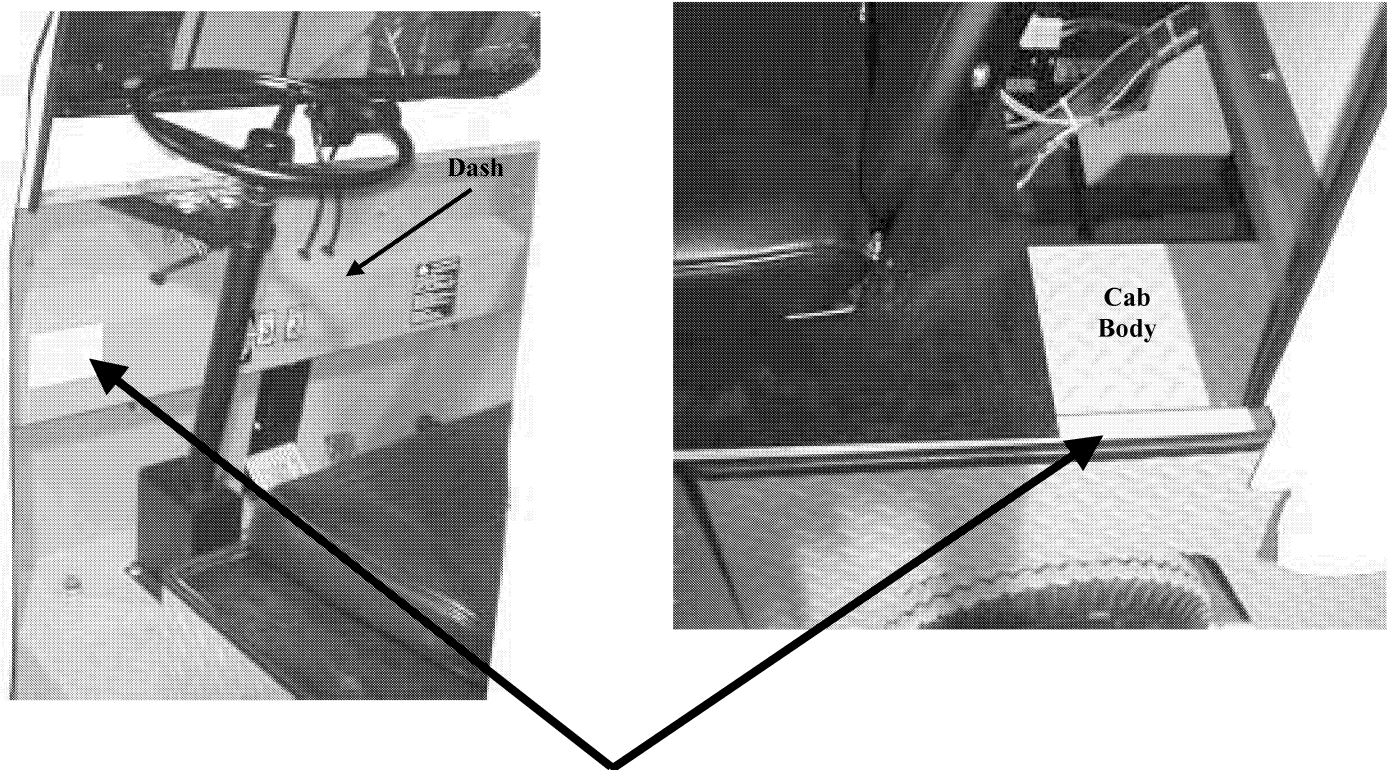


Figure 4 - Vehicle Identification Nameplate

VIN Number
Locations

VIN Matrix

VIN PREFIX, FOUR CHARACTER SYSTEM			SEQUENTIAL SERIAL NUMBER	SUFFIX (WHEN USED)
1st Character Power System	2 nd Character Model Code Designation	3 rd & 4 th (when used) Factory Modifications/ Options	Five Numeric Characters	SP when used indicates there is a special Vehicle having been significantly modified from the model indicated by the model prefix. It is critical when ordering parts for any vehicle with an SP prefix to give the entire VIN number to customer service to ensure correct service parts are ordered and shipped
4= Std XP Power System	G= Burden carrier (62 inch bed)	K=3000# (36 volt) or 2500# (48 volt)		
	K= Burden Carrier (76 inch bed)	L= 1700# (36 Volt)		
		M=2100# (36 volt) or 1800# (48 volt)		
		N=4000# (36 volt) or 3500# (48 volt)		
		O=5000# (36 volt) or 4500# (48 volt)		
		X= 4 wheel hydraulic disc brakes		
		Y= Rear wheel hydraulic disc brakes		

Burden Carrier Vehicle Specifications

Model #	System voltage	Rated Capacity	Towing Capacity	Maximum Speed	Bed Size
BC3-21	36 Volts	2100 lbs.	5500 lbs.	14.0 mph	62 inch series
BC3-30	36 Volts	3000 lbs.	9000 lbs.	11.0 mph	62 inch series
BC3-40	36 Volts	4000 lbs.	10500 lbs.	11.0 mph	62 inch series
BC3-50	36 Volts	5000 lbs.	12250 lbs.	7.0 mph	62 inch series
BC4-18	48 Volts	1800 lbs.	6500 lbs.	17.0 mph	62 inch series
BC4-25	48 Volts	2500 lbs.	10000 lbs.	15.0 mph	62 inch series
BC4-35	48 Volts	3500 lbs.	12000 lbs.	15.0 mph	62 inch series
BC4-45	48 Volts	4500 lbs.	14000 lbs.	14.8 mph	62 inch series
BC3-21XB	36 Volts	4500 lbs.	14000 lbs.	14.0 mph	76 inch series
BC3-30XB	36 Volts	3000 lbs.	9000 lbs.	11.0 mph	76 inch series
BC3-40XB	36 Volts	4000 lbs.	10500 lbs.	11.0mph	76 inch series
BC3-50XB	36 Volts	5000 lbs.	12250 lbs.	7.0 mph	76 inch series
BC4-18XB	48 Volts	1800 lbs.	6500lbs.	17.0 mph	76 inch series
BC4-25XB	48 Volts	2500 lbs.	10000 lbs.	15.0 mph	76 inch series
BC4-35XB	48 Volts	3500 lbs.	12000 lbs.	15.0 mph	76 inch series
BC4-45XB	48 Volts	4500 lbs.	14000 lbs.	8.0 mph	76 inch series
BC7-20XB	72 Volts	2000 lbs.	15000 lbs.	20.0 mph	76 inch series

Note: All burden carriers are built to carry 2 people only and cargo.

Upon Delivery of your Burden Carrier

Note: This vehicle should be inspected immediately after delivery. Use the following guidelines to make sure there are no obvious problems.

Inspecting the vehicle

Examine the contents of all packages and accessories that may have come in separate packages with this vehicle. Make sure everything listed on the packing slip is there. Items should not be broken or damaged. Examine any visible wiring for obvious signs of damage. Check that all connections are secure. Check that battery connections are tight and all cells are filled to above plates. Inspect the tires for obvious wear or damage. Check the tire pressure, keep tires inflated to the specifications labeled on the sidewall. Initial factory setting is between 35 to 50 psi. Make sure that all wheel lugs are secure. Check the body, seats, trim and other external parts for obvious damage.

Operate each of the following controls **BEFORE** turning on the key-switch:

- Accelerator Pedal for smooth operation
- Braking Pedal, assure presence of a firm pedal with minimal travel
- Directional selector lever
- Steering, check for responsiveness and little play
- Horn, check for proper operation

Each control should operate smoothly and easily without sticking or requiring undue effort.

What to do if you find a problem:

1. If vehicle has just been delivered, report any physical damage or missing items to the Shipping Company and your local Columbia Industrial Vehicle Dealer.
 - Look for body damage, jagged edges etc. that may cause personal injury.
 - Check for damaged or leaking batteries.
 - Verify fenders are attached properly, bent out or are not protruding.
2. Consider what affect the problem has on the safe operation of the vehicle.
 - If the safe operation of the vehicle is affected, remove the vehicle from service until the problem has been corrected. Report the problem to the individual(s) responsible for correction and/or repair.
 - If the safe operation of the vehicle is not affected, record the problem and report it to the individual(s) responsible for correction and/or repair.
3. Report any service item problems to the individual(s) responsible for correction and/or repair or contact your local Columbia Industrial Vehicle Dealer for service.



DANGER: If any problems are found, **DO NOT** operate vehicle until repairs are made. Failure to make necessary repairs could result in fire, severe personal injury, property damage or death. Consult your local Columbia ParCar Dealer for professional service.

Lifting Instructions



WARNING: Use extreme caution lifting or working on or around lifted vehicle. Vehicle should be lifted only when on a flat, hard and level surface.

Lifting Instructions (cont)

When lifting the vehicle for service, use a sturdy lifting device such as a hoist, floor jack or hydraulic lift. ALWAYS block wheels and set parking brake of the vehicle to keep it from rolling. When using a lifting device, lift only on sturdy underbody parts, an example being the frame. When using a floor jack, lift only on sturdy underbody parts, an example being the frame or axle housing. After the vehicle is lifted to a 10° to 25° angle, place jack stands under vehicle rear unibody to support vehicle weight for added safety. Refer to figure 5.

Note: Be careful and watch for cables, linkages or wire harness.



CAUTION: Jack stands should be of sufficient rated weight capacity to hold the vehicle safely. See general vehicle specifications for empty weights.



CAUTION: If any vehicle is raised while loaded, check that the load is secured before lifting vehicle. Failure to do so could cause damage to vehicle, load or cause personal injury.

Hoist lifts:



CAUTION: Before lifting ALWAYS block wheels and set parking brake.

If a hoist lift is used to lift the vehicle, check that the hoist is rated at a lifting capacity greater than the vehicle weight. Lift the vehicle sufficiently from the floor, to a 10° to 25° angle, to allow the placement of jack stands and to support the weight of the vehicle during service.

To lift the rear, connect the lifting eyes/hooks to the rear frame at the right and left sides. DO NOT use the bumper as a lifting point. Place jack stands under the unibody at the right and left sides to allow working on the vehicle. Then lower vehicle to allow working on the vehicle. When work is completed again lift and then remove jack stands and lower vehicle to the floor.

To lift the front, connect the lifting eyes/hooks to the front undercarriage, by leaf springs. DO NOT use the leaf springs or front housing to lift the vehicle. Place jack stands under the unibody at the right and left sides. Then lower vehicle to allow working on the vehicle. When work is completed again lift and then remove jack stands and lower vehicle to the floor.

Floor jack:



CAUTION: Before lifting ALWAYS Wedge wheels and set parking brake.

If a floor jack is used to lift the vehicle, check that the hoist is rated at a lifting capacity greater than the vehicle weight. Lift the vehicle sufficiently from the floor, 10° to 25° angle, to allow the placement of jack stands to hold the weight of the vehicle during service.

To lift the rear, place the floor jack under the rear axle housing and lift vehicle until jack stands can be placed under the rear unibody at the right and left sides to allow working on the vehicle. Lower vehicle onto stands and remove floor jack. When work is completed reuse floor jack, lift and then remove jack stands and lower vehicle to the floor.

To lift the front, place the floor jack under axle beam and lift. Place jack stands under the frame at the right and left sides to allow working on the vehicle. Lower vehicle onto stands and remove floor jack. When work is completed reuse floor jack, lift and then remove jack stands and lower vehicle to the floor.

Hydraulic floor lift – Frame lift:

Position vehicle over lift. Place lift arms under the frame of the vehicle and lift to service the vehicle.

Jack stands:

Jack stands need to be of sufficient load capacity to hold the full listed weight capacity, from the vehicle description and specifications section.

⚠ WARNING: DO NOT work under your vehicle unless it is firmly secured on jack stands.

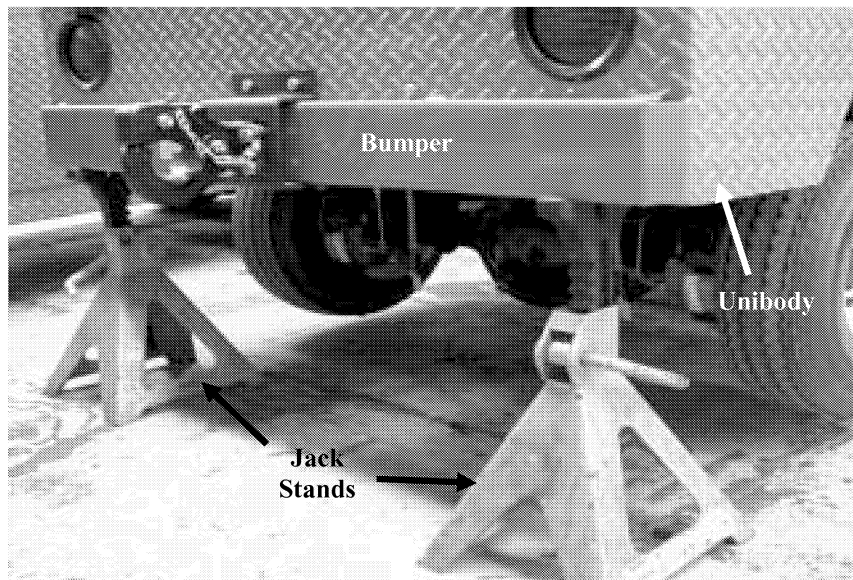


Figure 5 – Jack stands under

Chapter 2

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Operator Safety Instructions

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

⚠ WARNING: This vehicle is not designed to be driven on public highways. The Burden Carrier travels on level surfaces at a maximum rated speed of 8.5 mph. **DO NOT** exceed this speed. Exceeding this speed may result in steering difficulty, motor damage, and/or loss of control.

Safety Rules & Guidelines:

This vehicle is designed to be driven over smooth surfaces in and around places such as warehouses, factories, industrial sites, motels, parks, and resorts. Before you drive this vehicle, please observe the following safety rules and guidelines.

- Do not drive this vehicle unless you are a qualified and trained operator.
- Keep all body parts (head, arms' and legs') inside this vehicle while it is moving.
- This vehicle may overturn, if turned sharply when driven at high speeds, especially when on an incline.
- Keep the vehicle under control at all times.
- No horseplay or dangerous driving.
- Do not drive this vehicle in hazardous areas unless this vehicle is approved and labeled for such operation.
- Immediately report any accident or vehicle problem to your supervisor.

Driver Training Program:

The owner of this vehicle shall conduct an Operator Training program for all those who will be operating this vehicle. The training program shall be in accordance with O.S.H.A.'s 29 CFR 1910.178 Powered Industrial Truck Training (PITOT) standard. 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.
- Re-evaluation on the above criteria and retraining at least once every three (3) years.

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

Safety Instructions (cont.)

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.

Safety Committee

If the Industrial Vehicles are to be operated by renters or company employees. We recommend that a safety committee be appointed. The primary concern of this committee should be the safe operation of the vehicles.

Subjects which must be considered include, but are not limited to, the following:

- Define where the vehicles should be driven and utilized.
- Ensure all proper warnings as to driving hazards are properly displayed and visible.
- Safety signage concerning hills, ramps, turns, blind crossings, intersections, etc is highly recommended.
- Define who should and who should not drive the vehicles
- Enforcement of safe driving and operating rules.
- Provide driver training for first time operators and review safe operating recommendations regularly.
- Maintain vehicles in a safe operating condition, maintain a schedule for daily, weekly, monthly, quarterly, semi-annually and annual vehicle inspections.
- Who, when and how should pre-operation inspections be conducted.
- What to do should an unsafe condition or operating problem be discovered.

These basic rules of operation, combined with courtesy and common sense, will help make driving your Columbia Industrial vehicle a safe and pleasant experience. The safety committee should be made up of managers and/or supervisors in charge or responsible for the operation and maintenance of the vehicles.

Operating Controls

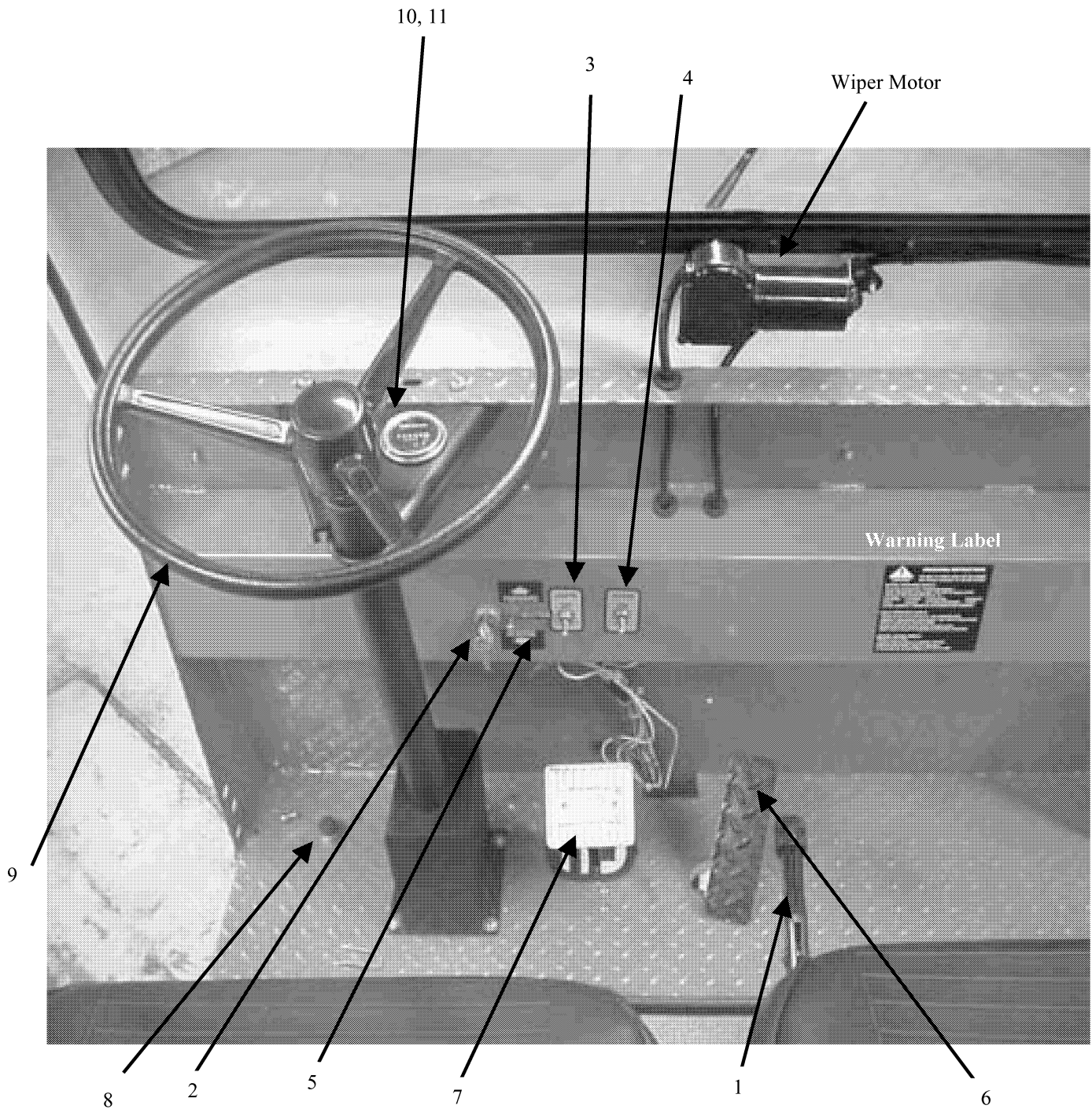


Figure 1 – Operating Controls

Operating Controls (cont.)

1 - Parking Brake:

The vehicles with a Dana axle have a parking brake that is part of the foot (service) brake. To lock the parking brake, press downward on the upper section of the pedal. Press the bottom of the pedal to release the brake lock (not shown).

The models with the modified automotive axle are equipped with a parking brake lever located on the kickpanel between the driver and the passenger seats. To operate, pull up and back to engage; push forward and down to disengage.



CAUTION: Parking brake must be engaged whenever vehicle is left unattended.

2 – Key Switch:

The key switch is located next to the directional selector. When the key switch is in the vertical position, the vehicle's speed control system is turned OFF. Turn key to the right to turn vehicle on. Always take the key out of the switch when leaving the vehicle.

3 – Light Switch:

The light switch is a two-position toggle switch located on the switch plate to the right of the electric shift toggle. Move switch up to activate headlight and taillights, down to turn off.

4 - Wiper Switch: (Optional with cabs)

The wiper switch is a two-position toggle switch located on the switch plate to the right of the light switch. Move switch up to operate windshield wiper, down to turn off.

5 – Electric Shift Switch:

The electric shift toggle switch is a three (3) position switch located on the right of the steering column. Move switch up to go forward, middle for neutral and park and down for reverse.

6 – Accelerator Pedal:

The pedal controls the speed of the vehicle in the same manner as a conventional automobile.



CAUTION: Speed in reverse should ALWAYS be kept at a minimum

7 – Brake Pedal:

To operate service brakes, depress pedal. Depressing pedal also activates brakelights at rear on models so equipped.

8 – Horn Button

The horn button is located in the center of the steering wheel. Press button to sound the horn.

9 – Steering Wheel

The steering wheel controls the path of the vehicle exactly the same as a conventional automobile wheel.

Operating Controls (cont.)

10, 11 – Indicators Battery Discharge Indicator and Hour Meter:

The Battery Discharge Indicator (BDI) is located on the support panel in front of the steering wheel column. The BDI indicates the batteries “state of charge” and is to the right of the Hour Meter. This item may not be included on all vehicles.

The Hour Meter is located on the support panel in front of the steering wheel column. It indicates the total number of hours the vehicle has been operating. This item may not be included on all vehicles.

13 – Charger Ammeter:

The Ammeter is located on the charger faceplate and is located below the passenger seat. The meter indicates the rate of charge that the batteries are receiving. (See Chapter 3 for charger operation).

14 – Charger Receptacle:

The charger receptacle is located on the charger faceplate and is located below the passenger seat. The AC cord is plugged in here for battery charging.

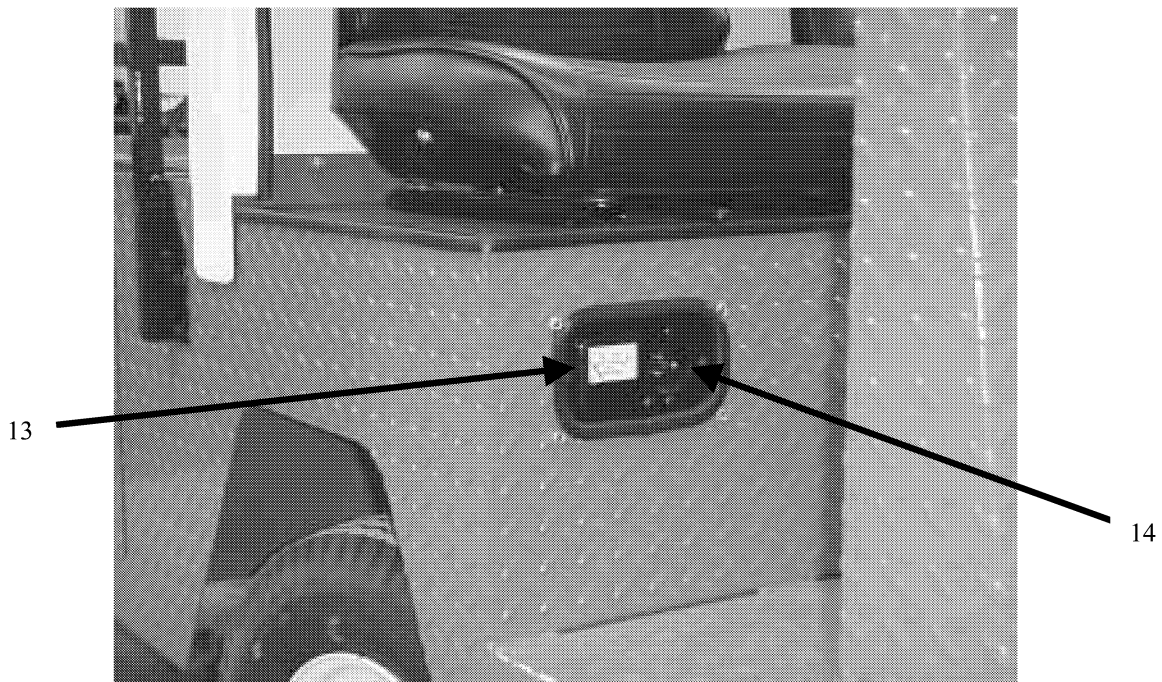


Figure 2 Charger Faceplate

NOTE: Items 13 and 14 may be relocated to accommodate customer needs.



CAUTION: DO NOT attempt to recharge batteries with a charger not designed for your vehicle.

NOTE: If a portable charger is provided the receptacle is located on the dash panel. The DC cord is plugged in there for battery charging.

Operating Instructions



CAUTION: Before operating the vehicle always check the following items. Should any item malfunction or need adjustment **DO NOT** operate vehicle until the problem has been corrected.

Table 1 - Pre-Operation Checklist	
Item	Procedure
Batteries	Check to assure they are fully charged or adequately charged to provide sufficient energy for duration of operations.
	Assure the AC cord is disconnected from the vehicle.
	Check to assure the electrolyte level in each cell covers the top of cell plates.
	Check that batteries are free of corrosion.
	Check for loose terminals or connections.
Tire Pressure	Check for proper inflation, keep tires inflated to the specifications labeled on the sidewall. Tire size 5.70 x 8, Factory setting is 35 to 50 psi.
Lights & Horn	Turn lights on and make sure they illuminate.
	Depress horn button to sound horn.
Brakes	Check brake pedal for a firm pedal pressure with minimal travel
	Check parking brake for proper engagement and release.
Steering	Check for steering responsiveness and the absence of excessive free play
Cargo	Check to make sure cargo is secured to the bed platform
	Check to make sure load is balanced and not top heavy
Obstacles	Check path of intended travel for obstructions and underside is clear.
Seat Belts (If Equipped)	Make sure driver and passenger is secured by seatbelt before moving vehicle.



CAUTION: **DO NOT** overload the vehicle. Never exceed Maximum payload as specified on the vehicle data plate.



CAUTION: Your safety and the safety of others depend on your safe operation and maintenance of this vehicle. Prior to operation, you, the operator, must be thoroughly familiar with this and all other sections of this manual.

Operational Safeguards:

- Study controls and be familiar with their function before operating vehicle.
- Allow only authorized and trained personnel to operate vehicle.
- Remain seated with seat belts fastened (if so equipped) when vehicle is in operation
- Allow only one occupant per seat. **DO NOT** carry any other persons on the vehicle, unless vehicle is designed and equipped for such purpose.
- Keep arms, legs and feet inside vehicle at all times when vehicle is moving.
- Keep a clear view of the path of travel. Observe general traffic laws and maintain a safe clearance.
- Signal turns and stops far in advance of intended action.
- Keep vehicle clear of hazardous or explosive locations.
- Drive slowly when making turns.
- Drive slowly and straight up and down slopes.
- **DO NOT** make turns on steep hills or inclines.
- Maintain a safe distance from the edge of ramps and platforms.

Operating Instructions (cont.)

- Set parking brake before leaving vehicle also remove key when vehicle is unattended.
- Block wheels of vehicle if left on an incline.

Driving The Vehicle:

- Fasten seat belts (if vehicle is so equipped).
- Insert key in switch, depress brake pedal firmly, turn key to "ON" position.
- Switch electric shift switch to the direction of desired travel.
- Release the parking brake and brake pedal.
- Slowly depress accelerator pedal to obtain desired vehicle speed.
- To slow or stop vehicle, remove foot from accelerator and depress brake pedal.

Note: Never rest your foot on brake pedal while operating the vehicle. This wears brake pads, creates drag and causes excess battery discharge.

- When parking the vehicle, move switch to the "Neutral" position, engage parking brake, turn key to "OFF" and remove.



CAUTION: Never leave the vehicle until you are fully stopped. Set the parking brake, positioned the direction switch to "Neutral," turned the key switch to "Off" and remove the key if vehicle is left unattended.



CAUTION: When parking headed downhill, turn the front wheel(s) into the curb or toward the side of the road and engage parking brake.



CAUTION: When parking headed uphill, turn the front wheel(s) away from the curb and let the vehicle roll back a few inches until the rear of one front wheel gently touches the curb and engage parking brake.

Vehicle Storage

Storage:

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

Table 2 - Battery storage charging times	
Storage Temperature	Charge at
Below 40 ⁰ F	Every 6 months
40 ⁰ – 60 ⁰ F	Every 2 months
Above 60 ⁰ F	Once a month

Note: Batteries "self-discharge" when not in use. The specific gravity of the electrolyte should be checked every 6 to 8 weeks using a hydrometer. See chapter 3 for further details. The batteries should be recharged as necessary to resume specific gravity to fully recharged levels-approximately 1.260. Fully charged batteries should be stored in a cool environment.



Warning: Turn key switch "OFF" and remove key during storage to prevent unintentional starting of vehicle.

Vehicle Storage (cont.)



Caution: Batteries in a low state of charge will freeze at higher temperatures than fully charged batteries.



WARNING: DO NOT attempt to charge a battery that is frozen or if battery case is excessively bulged. Properly dispose of battery, because frozen batteries can explode.

If battery terminals are or wires are damaged or corroded, they should be cleaned or replaced as necessary. Failure to do so may cause them to overheat during operation.

Preparing vehicle for extended storage:

Electric vehicles stored over six (6) to eight (8) weeks must be protected to maintain battery life. Several guidelines should be observed when storing your electric vehicle.

1. Fully charge batteries. With electrolyte full in all cells, store batteries in as cool place. If stored above 50 degrees F (27⁰ C), Check State of charge every four (4) to six (6) weeks and charge as necessary to maintain 1.250 to 1.270 specific gravity. If vehicles are stored in temperatures below 40⁰ F check state of charge every fifteen (15) to eighteen (18) weeks. Use figure 4 to determine freezing point of batteries and maximum recommended storage temperature. Refer to Appendix C for charging procedure.
2. Wash off any corrosion around the terminals with a solution of baking soda and water. DO NOT allow this solution to enter batteries.
3. Store vehicle in a cool dry place to prevent battery discharge.
4. Keep tires inflated to the specifications labeled on the sidewall. Factory tire pressure set at 35 to 50 psi for 5.70 x 8 tires.
5. Grease suspension and continue quarterly lubrication during storage period.
6. Clean vehicle body, seats, battery compartment and vehicle underside.
7. DO NOT engage park brake. Block wheels to prevent movement.

Returning vehicle to service:

1. Fully recharge batteries.
2. Check tire pressure and keep tires inflated to the specifications labeled on the sidewall. readjust if necessary.
3. Perform initial maintenance per service and maintenance schedule chapter 3.

Specific Gravity and Freeze Point										
Specific Gravity	1.260		1.230		1.200		1.117		1.110	
Freezing Point of Electrolyte	F -70	C -57	F -39	C -38	F -16	C -26	F -2	C -19	F +17	C -8

Figure 4 – Freezing point of batteries

Chapter 3

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MAINTENANCE GUIDELINES

To ensure that the Burden Carrier is kept in a safe and correct operating condition, the vehicle must be inspected and maintained on a regular basis. Proper lubrication, electrical control adjustments, safety feature inspections, etc. must be performed at recommended intervals to prevent damage or failure, while providing optimum performance.



WARNING: No modifications or additions, which affect the mechanical or electrical integrity and the safe operation of the unit, shall be made without the written approval of the manufacturer. If such modifications are approved, the capacity, operation, and maintenance instruction markings shall be changed accordingly. In no case shall the safety factors be reduced below those specified in this manual or the manufacturers design factors, whichever is greater.

This section explains how to perform maintenance procedures and use the maintenance checklist to determine how often you should perform each procedure. Follow the guidelines below to assure proper maintenance of your Burden Carrier.

- Allow only trained maintenance personnel to maintain, repair, and inspect the vehicle.
- Before starting any repairs or maintenance, immobilize the vehicle by turning the key switch off, removing the key and setting the park brake.
- Disconnect both of the main battery leads before working on or disconnecting any electrical component or wire.
- Support the chassis with jack stands before working under a raised vehicle.
- Conduct vehicle performance checks in an authorized area where a safe clearance exists.
- Before starting the vehicle, follow the recommended safety procedures in Chapter 2, (Operator Information).
- Avoid fire hazards and have fire protection equipment present in the work area.
- DO NOT use an open flame to check level or leakage of battery electrolyte.
- DO NOT use open fuel or flammable fluids for cleaning parts.
- Work in a properly ventilated work area.
- Regularly inspect and maintain in safe working condition the brakes, steering mechanisms, speed and directional control mechanisms, warning devices, guards and safety devices.
- Inspect and maintain battery limit switches, protective devices, electrical conductors and connections in conformance with the manufacturer's recommended procedures.
- Keep the vehicle in a clean condition to minimize fire hazards and facilitate detection of loose or defective parts.

CHECKLIST

A good planned maintenance program is important for the safe, reliable operation of all Columbia Industrial & Commercial Vehicles. The recommended procedures described in this service manual are effective methods for performing periodic maintenance and repair.

Note: Some procedures require the use of special tools. These special tools should be used when and where recommended.

Note: When performing Monthly, Quarterly, Semi-Annual or Annual maintenance, insure that Daily and Weekly inspections are included.

CHECKLIST (cont.)

Note: The environment that your vehicle operates in can vary widely. Severe conditions or duty cycles will require the periodic maintenance recommendations to be adjusted to more frequent time intervals. Examples of severe service operations include (but are not limited to) the following:

1. Dusty or Sandy locations such as cement plant, lumber or flourmills, coal dust or stone-crushing areas.
2. High Temperature Areas such as steel mills, foundries, etc.
3. Sudden Temperature changes such as continuous indoor-outdoor movement, as in refrigeration plants, etc.

Periodic Service Calendar		
JANUARY Monthly	FEBRUARY Monthly	MARCH Quarterly
APRIL Monthly	MAY Monthly	JUNE Semi-Annual
JULY Monthly	AUGUST Monthly	SEPTEMBER Monthly
OCTOBER Monthly	NOVEMBER Monthly	DECEMBER Annual

Note: Daily maintenance is performed daily before operation of the vehicle by the owner or operator. Weekly maintenance should be performed on a weekly basis to include all daily maintenance and should be performed by the owner, operator or trained maintenance personnel.

Service & Maintenance Schedule						
Item	Operation *	Weekly	Monthly	Quarterly	Semi-Annual	Annual
Batteries	Clean Terminals and wash battery case	Page 10				
	Check electrolyte level	Page 10				
	Spot check Battery Specific Gravity	Page 8				
	Inspect Batteries for Corrosion, Loose Connections & Broken or Frayed Cables	Page 10				
Tires	Tie Rods/Linkage - Check for excessive movement, tightness of hardware	Test Drive				
	Tire Pressure – 35 – 50 psi for 5.70 x 8 (Initial Factory Setting) Not to exceed tire sidewall rated capacity of 75 psi at full load	Page 16				

Service & Maintenance Schedule						
Item	Operation *	Weekly	Monthly	Quarterly	Semi-Annual	Annual
Electrical System	Electrical wires - Check for tightness or damage	Visual				
	Grounding wires - Check for tightness or damage	Visual				
	Inspect Motor Brushes & Brush Springs, Replace if Necessary			Page 7		
	Check the General Condition of the Electrical System (Loose connections, Frayed or Broken Cables, Shorts, etc.)			Visual		
Brakes	Check Brake Fluid Level (If applicable)			Visual		
	Parking Adjustment			Page 13		
	Check Brake Pads, Replace if necessary				Page 14	
Drive	Check Drive Chain Tension			Page 12		
Body and Frame	Inspect for Loose Hardware (Bolts & Nuts, etc.)	Visual				
	Clean Body and Seats, Wash as needed		Page 17			
	Wash engine compartment and undercarriage			Page 17		
Lube	Wheel Bearings, Grease or replace if Necessary					Page 16
	Steering Gear Grease					Page 16
	Pivot Points with Grease Fittings				Page 16	
	Pivot Points without Grease Fittings			Page 17		
	Check Differential Grease (Always check upon receipt of vehicle)				Page 16	
* Refer to individual maintenance sections of this manual for details of Service / Maintenance Operations.						

Before operating the vehicle inspect vehicle for damage, check operating controls (including Reverse Warning Alarm), check tires for proper inflation and test drive.

TROUBLESHOOTING HINTS



CAUTION: To prevent possible injury, always disconnect batteries and remove key before working on vehicle

Troubleshooting Hints Chart		
Problem	Possible Cause	Remedy *
Vehicle will not run	Key Switch	Check for loose wires or faulty switch.
	Batteries	Check for loose terminals or corrosion. Check distilled water level. Check battery state of charge.
	Motor	Check for loose wires, open circuits or worn brushes
	Speed Control	See troubleshooting guide in appendix F.
Vehicle runs slow	Batteries	Check for loose terminals or corrosion. Check distilled water level. Check battery state of charge.
	Brakes	Check for dragging brakes.
	Tires	Check for underinflated or flat tires.
	Wheels	Check to see that wheels are not binding and spin freely.
* If these test procedures do not resolve your vehicle problem, Contact your authorized Columbia Industrial & Commercial Vehicle Dealer		

The Service and Maintenance section that follows contains the most current information available at the time of publication. The Service / Maintenance operations outlined in this manual are intended only as a guide and highlight major points only. It is not intended as a Shop Manual. If you need more information regarding specific item or encounter problems contact your local Columbia Industrial & Commercial Vehicle Dealer or Columbia ParCar Corp. Technical Services.

GENERAL SAFETY PRECAUTIONS



CAUTION: To prevent possible injury, always disconnect batteries before performing any maintenance; see "Safety Precautions" for disconnect method.



CAUTION: To prevent the possibility of a runaway vehicle and/or damaged components after work is performed on the drive train, speed control or electrical system in general:

- 1) Raise both rear wheels off the ground and block the front wheels. Place jack stands as needed.
- 2) Reconnect battery pack, positive cable first.
- 3) Test vehicle function(s) before lowering vehicle to the ground and attempting vehicle operation.



CAUTION: When replacing any part or fastener, use only Columbia Industrial Vehicle replacement parts, or parts that are equivalent in terms of rated strength, capacity, material, etc. and that are certified for the purpose intended. Failure to do so could cause vehicle malfunction and possible personal injury. A convenient chart summarizing the frequency of service requirements and the type of maintenance required is included on page 4 (Service / Maintenance Schedule). To perform many of the maintenance items listed, as well as many of the service and general repair jobs detailed in the following pages, it will be necessary to remove either one or both of the Deckboards.

Handlifts have been incorporated into the deckboards to ease the removal operation. To prevent possible injury, care should be exercised while removing deckboard (s).

ELECTRICAL SYSTEM

MOTOR BRUSHES

See chapter 4 for exploded view and parts list. Check the motor brushes every 3 months for wear and spring tension. Visually inspect brushes for cracks, chips or wear to a length of 3/4" or less. Whenever brushes are replaced, replace the entire set. Check each brush for free movement in its holder. Replace any weak brush springs. Extensive motor repair work, if needed, should be handled through your local Columbia Industrial & Commercial Vehicle dealer or Columbia ParCar Corp. Technical Services.

⚠ CAUTION: The motor is heavy! Use correct lifting procedures to avoid back injury.

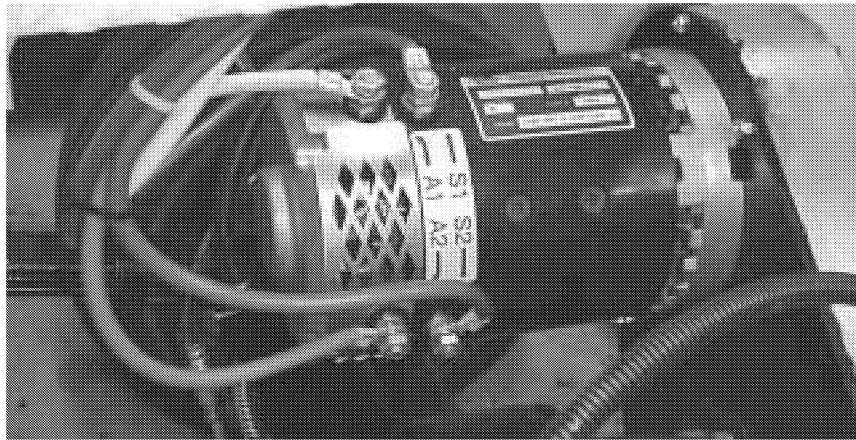


Figure 1 - Motor

MOTOR REMOVAL

- 1) Disconnect all wires from the motor. Label the leads for easy identification when replacing the motor.
- 2) Remove chain cover.
- 3) Support the motor using a Sling or Strap.
- 4) Loosen the motor mounting bolts, inside chain cover.
- 5) Rotate CCW adjuster cam allowing the motor to move downward, relieving tension on chain.
- 6) The chain may now be removed by lifting it off of the sprockets.
- 7) Remove the motor mounting bolts and lift the motor out of vehicle.

BATTERIES

Battery Care

Electric Vehicle Battery

The storage battery receives, stores, and delivers electrical power. This receiving, storing, and delivering of electrical power is called a cycle.

- Receive - Charging vehicle batteries.
- Store - Vehicle standing idle.
- Deliver - Driving vehicle.

The type of battery used in a Columbia Industrial & Commercial Vehicle has a service requirement which is quite different from that of an automotive battery.

BATTERIES (cont.)

The electric vehicle battery supplies all of the power to drive the vehicle, and during operation the "power" stored in the batteries is expended. While the amperage drain rate can vary greatly depending on the type of service, the duration of use and the number of "starts" and "stops" made during a day, the batteries nevertheless progress through each duty cycle from "fully charged" to an almost depleted state. This type of service is known as "deep cycle" service and electric vehicle batteries are specifically designed to handle this type of service. Proper performance of your Columbia Industrial Vehicle can only be obtained from specified deep cycle, electric vehicle batteries.



CAUTION: Automotive batteries should never be used for "deep cycle" application, as their useful life will be very short.



CAUTION: Use extreme caution when working on or near batteries. Gases escaping from charging batteries are extremely explosive and battery electrolyte is a strong acid. For "Proper Care and Maintenance of Electric Vehicle Industrial Batteries," described in this section.



WARNING: Batteries contain sulfuric acid, which is highly corrosive and can cause chemical burns. Avoid contact with skin, eyes or clothing. Always, wear approved eye protection when working around batteries.

Antidote:

- External- Flush with water.
- Internal - Drink large quantities of milk or water, followed by Milk of Magnesia, vegetable oil or beaten eggs. CALL DOCTOR IMMEDIATELY.
- Eyes - Flush with water, get immediate medical attention.

Battery Testing

Specific Gravity Test:

It is possible to estimate a battery's ability to perform by measuring the specific gravity of each cell with a hydrometer. The hydrometer readings indicate two things:

- a. State of Charge- The amount of electrical power stored in the battery.
- b. Condition- The ability of battery to store and deliver power.

Note: Always fully charge batteries before performing specific gravity tests to determine battery condition.

State of Charge	Specific Gravity (80° F)
100%	1.250-1.270
75%	1.220-1.240
50%	1.190-1.210
25%	1.160-1.180
Specific Gravity Taken from at Least 2 Cells of Each Battery	

Using the Hydrometer:

1. Squeeze rubber bulb and insert nozzle into cell, release bulb, slowly drawing electrolyte up into barrel.
2. Adjust electrolyte level in barrel so float rises free of bottom but is not striking top of barrel.
- 3.

BATTERY TESTING (cont.)

4. Hold hydrometer vertically, making sure float moves freely and is not contacting sides of barrel. Read electrolyte level in relation to the scale printed on the float.
5. Record the reading.
6. Return electrolyte to cell from which it was removed.
7. Repeat these steps on all battery cells.

Note: ALWAYS rinse the hydrometer in “Fresh” clean water after use.

The temperature of the electrolyte being tested affects hydrometer readings. Measure the temperature of the electrolyte and correct your readings as follows:

Above 80° F- Add .004 to the specific gravity readings for each 10° above 80° F.

Below 80° F- Subtract .004 from the specific gravity readings for each 10° below 80° F.

Interpretation of Hydrometer Readings:

State of charge: Check specific gravity of each cell. Refer to tables below:

State of Charge	Specific Gravity (80° F)
100%	1.250-1.270
75%	1.220-1.240
50%	1.190-1.210
25%	1.160-1.180

Condition: If the difference between the highest and lowest cell is .050 (50 points) or more, the battery is nearing the end of its useful life. The batteries should be replaced as a set.

Note: If the highest cell reads less than 1.200, the test for condition is questionable. Recharge battery and perform test again.

Inspection and Maintenance:

- New batteries should be given a full charge before their first use because it is difficult to know how long the batteries have been in storage without a charge.
- Limit use of new batteries between charges for the first 5 cycles. New batteries and older batteries, which have been in storage, are not capable of their rated output until they have been discharged and charged a number of times.
- During the first month of use, particularly when temperatures are below 60°F, new batteries should be given an extra full charge once a week. The ampere-hours of energy those batteries can deliver and the rate at which they charge varies directly with battery temperature. Lower temperatures will require lower charge cycles.
- The charge rate will taper down to the specified finish charge rate near the end of the charge cycle, then will shut off automatically. All cells in a set of batteries do not react identically to the same discharge, and charge current. In a normal charge, the last 1 to 3 hours at the low finish charge rate equalizes these cells for better battery life.
- When batteries age to the point where the charge rate will no longer taper into the low finish rate, the batteries should be tested to see if they are nearing the end of their useful life.

BATTERIES (cont.)

- Add distilled water carefully to the proper level in cells as required only after they have been fully charged. Do not fill them so high that they bubble over while charging. New batteries require very little addition of distilled water, whereas very old batteries may require additional distilled water two or three times a week. Water (electrolyte) levels drop as batteries are discharged and rises during charge. Adding water when batteries are fully charged will reduce the probability of overfilling. See Figure 2.

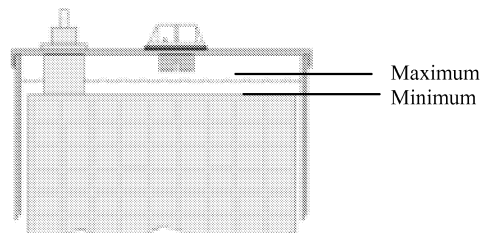


Figure 2 - Electrolyte Level

- When the temperature falls below 65°F, batteries should be placed on charge as soon after use as possible. In these low temperatures an additional equalizing charge once a week will improve the state of charge and battery life.
- Be sure battery hold downs are properly tightened. A loose hold down may allow the battery to become damaged from vibration or jarring. A hold down that is too tight may buckle or crack the battery case.
- Batteries must be clean and dry. Dirt and electrolyte on top of batteries will cause batteries to self discharge. Clean battery top with baking soda (sodium bicarbonate) and water solution (5 teaspoons baking soda per quart water). Do not allow solution to enter cap vent holes.
- Check to see that battery cap vent holes are clear. Plugged vent holes will not permit gas to escape from the cell and could result in battery damage.
- Inspect battery posts, clamps and cables for breakage, loose connections and corrosion. Remove cables to clean battery posts and clamps when signs of corrosion appear..
- Inspect battery case for cracks or leaks.

Battery Removal:

1. Remove battery negative (-) cables.
2. Remove battery positive (+) cables.
3. Remove battery hold down .
4. Remove batteries from vehicle.



WARNING: Use care not to drop batteries because the case may crack spilling battery acid, causing severe burns.

NOTE: Negative battery posts face the vehicle rear and Positive posts face the vehicle front.

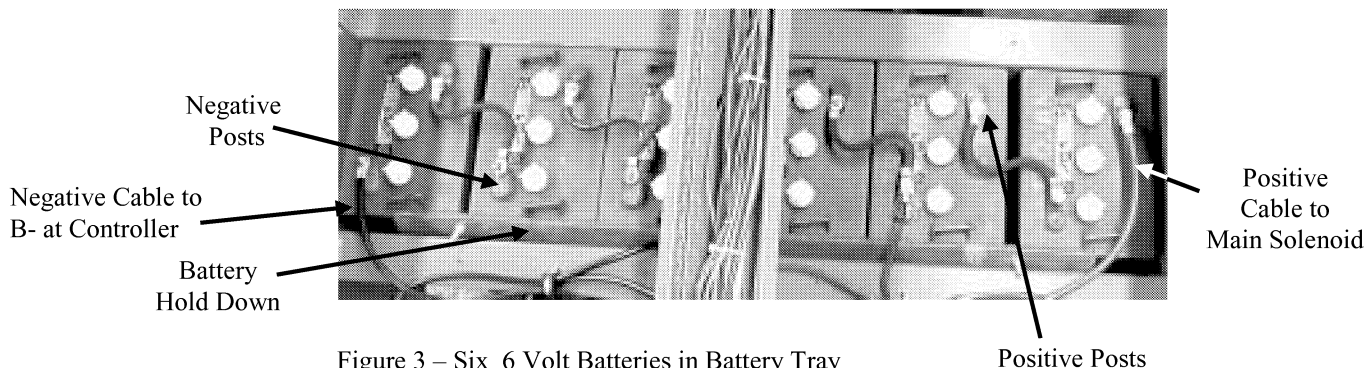


Figure 3 – Six 6 Volt Batteries in Battery Tray

BATTERIES (cont.)

Installation:

To install the batteries, reverse the removal procedure with the negative cable being attached last.

AUTOMATIC BATTERY CHARGER



CAUTION: When charging your Columbia Industrial & Commercial Vehicle, provide adequate ventilation during the charging cycle. Do not allow open flames or sparks near batteries during charging cycle. Hydrogen gas is generated during the charging process and can be explosive.

Automatic Battery Charger Operating Instructions:



CAUTION: Use this charger only on circuits provided with a maximum of 20 ampere branch circuit protection in accordance with the National Electrical Code, ANSI/NFPA 70, and all local codes and regulations. Improper AC supply circuit protection may result in a fire.



WARNING: Chargers can ignite flammable materials and vapors. Do not use near fuels, solvents, grain dust, or other flammables. Batteries generate gasses, which can be explosive. Keep sparks and open flame away from the batteries, No smoking!



WARNING: To reduce the risk of an electric shock, connect only to properly grounded outlets. Keep the charger dry. Do not expose it to rain. For storage, keep the charger in a building.

- 1) Connect the AC supply cord to a properly grounded three-wire outlet of the proper voltage and frequency as shown on the front of the charger. Charger will start automatically in 3 to 5 seconds.



CAUTION: Do not leave the charger on while unattended for more than two days in a row. Severe overcharging and damage to the batteries may result if the charger does not turn off.

- 2) Monitor the ammeter for the correct charge rate. The initial charge rate will vary from 14 to 22 amps depending on how much the batteries have been discharged. The charge rate will taper gradually to a finish rate of 6 to 12 amps if the batteries are in good condition. The charger will shut off automatically when the batteries are fully charged.
- 3) After the charger has turned off, disconnect the AC cord from the vehicle.

Charging Batteries Outside Vehicle for Units Equipped with Additional Battery Sets and Portable Charger:



CAUTION: Before proceeding with battery removal, check that key is off and removed from switch and all electrically operated accessories are turned off. Failure to do so may cause a spark as the battery pack is disconnected igniting potentially explosive battery gases.

When a vehicle contains optional roll-out battery racks, the batteries are charged by a portable charger that is plugged into the batteries after they have been rolled out onto an appropriate battery transfer stand.

- 1) Be sure the battery stand is in place before starting to roll the battery rack out of the vehicle.
- 2) Pull the rack out far enough so the large disconnect plug swings into view.
- 3) Continue to pull the battery rack onto the stand. The disconnect plug will automatically be pulled apart by the momentum of the rack.

BATTERIES & ELECTRICAL (cont.)



Caution: DO NOT use anything to pry the two halves apart. The plug can be broken or a short can result from trying to pry the plug apart.

- 4) Plug the charger cords into the battery pack and the charger into an AC outlet at the designated charging station.

There may also be a separate manual, which accompanied the charger when delivered with any portable charger you receive. Refer to the charger manual for additional information.

Lamps, Fuse and Flasher

REPLACEMENT CHART	
Item	Part No.
Lamps	
Headlight	69731-00
Taillight, Stoplight, Rear Turn Signal	69798-00
Kit, Front Turn Signal & Hazard Lights	68860-00
Front Turn Signal & Hazard Lights, Amber	68501-00
Fuses (Located Under The Seat Board)	
Main 12v / 30 Amp Neg.	69702-00
Auxiliary / 10 Amp Circuits	69717-00
Flasher	
Hazard & Turn Signal Flasher	71975-87

DRIVE SYSTEM

Drive Chain Adjustment

- 1) Remove chain cover.
- 2) Loosen the 4 motor mounting bolts slightly (see Figure 5)
- 3) Rotate adjuster cam counterclockwise until chain is correctly tensioned (see Figure 5). The chain should defied 1/8" to 3/16" when pressed down at the middle of the span (see Figure 5).
- 4) Tighten motor mounting bolts and re-check chain tension.
- 5) Replace the chain cover, using a silicon sealant between the cover and backing plate (GE. RTV 012 equivalent). Replace approximately 3 to 5 lbs. of grease with 86T sprocket (Molufa - Alloy #0 or equivalent),
- 6) Thoroughly clean the area of the backing plate around the motor. Re-apply a bead of silicone sealant to the joint between the motor and the backing plate. Be sure to fill any newly exposed portions of the slotted motor mounting holes.

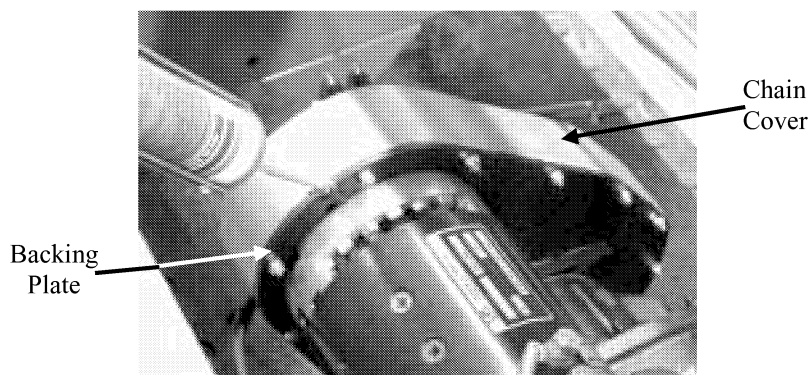


Figure 4 Motor and Backing

DRIVE SYSTEM (cont.)

Chain and/or Sprocket Replacement

- 1) Remove chain cover.
- 2) Loosen the 4 motor mounting bolts.
- 3) Rotate the adjuster cam allowing the motor to move downward, relieving tension on chain.
- 4) The chain may now be removed by lifting it off of the sprockets.
- 5) The lower sprocket may be replaced by removing the four sprocket mounting bolts.
- 6) The upper sprocket may be replaced by loosening the two setscrews in the sprocket hub and removing the sprocket from the motor shaft with a gear puller.
- 7) After the required parts have been replaced, follow steps 3 through 6 under "Drive Chain Adjustment."

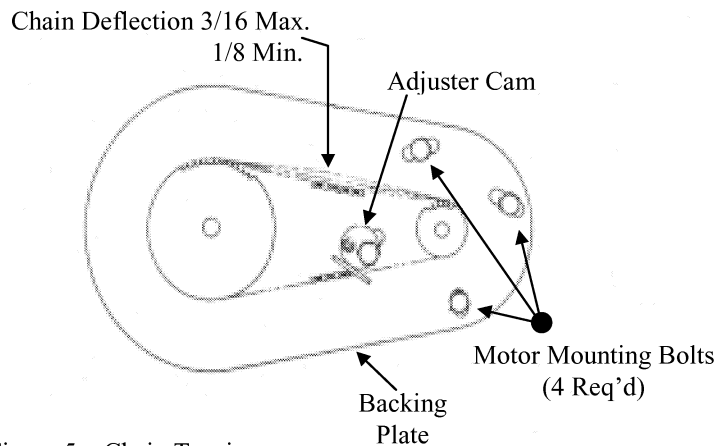


Figure 5 – Chain Tension

BRAKE SYSTEM

Handbrake - Parkbrake Arm Adjustment

As the brake pads wear thinner, one MUST adjust the park brake (See Figure 6) to preserve proper hand brake operation. Be very cautious when performing this adjustment or doing any work on your brakes. Handbrake-Parkbrake adjustment is made to hold the vehicle, load capacity and driver on 15% grade for 15 minutes (ASME B56.8).

- 1) Loosen the lock screw on the hand-parkbrake knob
- 2) Rotate the knob clockwise to loosen brake or counter clockwise to tighten braking.

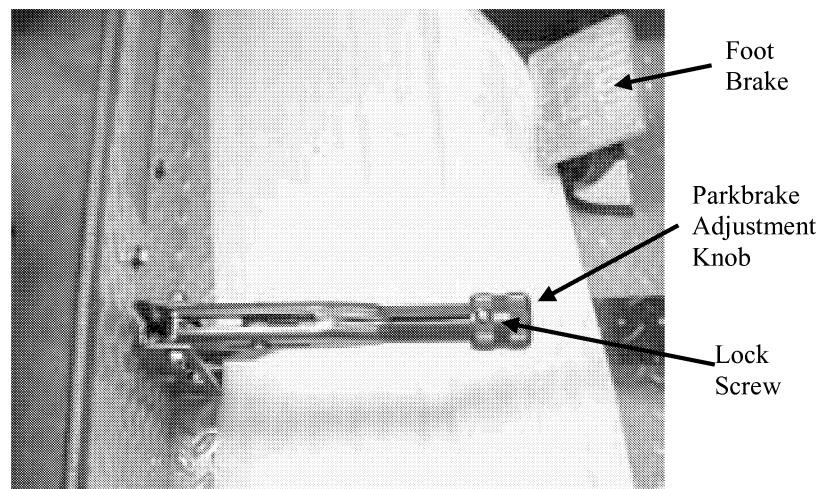


Figure 6 - Handbrake

BRAKE SYSTEM (cont.)

Disc Brakes

Most common complaint is noise when brakes are applied and vehicle is rolling slowly.

- Brake pads may require replacement.
- Brake disc may require resurfacing.

Adjustment — Disc Brakes

The disc brakes require no adjustment as they are self aligning and self adjusting.

Pads should be checked for wear periodically and at least every six (6) months. Replace as necessary.

Disc Brake Pad — Replacement (See Chapter 4 Page 19 and 20 for exploded views).



CAUTION: Disconnect batteries and Raise the end of the vehicle to be worked on off the ground and block the wheels on the opposite end of the vehicle.

- 1) Remove wheel and tire.
- 2) Remove parkbrake cable from park brake arm on the caliper.
- 3) Remove the two 5/16" bolts from the brake caliper mounting bracket.
- 4) Remove caliper assembly by sliding off rotor. Do not disconnect hydraulic line from caliper.
- 5) Slide the caliper carrier out from the caliper housing exposing the brake pads.
- 6) Remove brake pads from caliper dead side housing and from pistons. DO NOT remove pistons from caliper housing.
- 7) When replacing brake pads —push into housing.
- 8) Re-assemble by reversing steps 1 through 7, using new brake pads.
- 9) Use caution when remounting the brake calipers. Tighten each of the 5/16" bolts gradually alternating from one to the other. As you tighten the bolts be certain that the pads are parallel to the disk—if they are not, a "spongy" brake pedal may result. Also be sure that the caliper can still move back and forth in the caliper housing mounting—if it can't, uneven pad wear will result.
- 10) If rear brake pads are replaced — adjustment of park brake will be necessary. (See "Handbrake - Parkbrake Arm Adjustment.")
- 11) Reinstall wheel and tire. Tighten the lug nuts evenly in a star pattern until the nuts are all seated and torque to 50-60 ft. lbs.

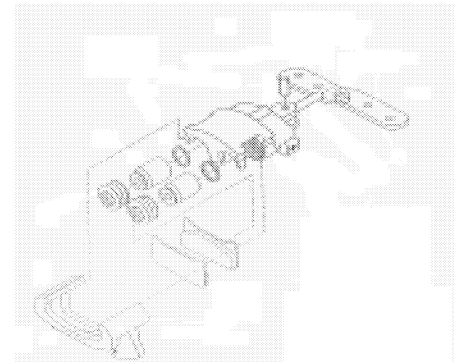


Figure 7 – Rear Brake Caliper Assembly

NOTE: Do not press on the brake pedal when the disc brake pads are not in place.

Rotor Replacement — Front Wheel



CAUTION: Disconnect batteries and block rear wheels and raise front of vehicle off the ground. See chapter 1 for lifting instructions.

- 1) Remove wheel and tire.
- 2) Remove parkbrake cable from park brake arm on the caliper.
- 3) Remove the two 5/16" bolts from the brake caliper mounting bracket.
- 4) Remove caliper assembly by sliding off rotor. Do not disconnect hydraulic line from caliper.
- 5) The rotor may now be removed from the spindle by removing the dust cover, cotter pin and spindle nut.
- 6) At this point the rotor may be either resurfaced (See "Rotor Wear Limits") or replaced with a new rotor.
- 7) To replace rotor, reverse steps 1 through 5.

ROTOR REPLACEMENT (cont.)

- 8) Use caution when remounting the brake calipers. Tighten each of the 5/16" bolts gradually alternating from one to the other. As you tighten the bolts be certain that the pads are parallel to the disk—if they are not, a "spongy" brake pedal may result. Also be sure that the caliper can still move back and forth in the caliper housing mounting—if it can't, uneven pad wear will result.
- 9) Reinstall wheel and tire. Tighten the lug nuts evenly in a star pattern until the nuts are all seated and torque to 50-60 ft. lbs.

Rotor Replacement — Rear Wheel



CAUTION: Disconnect batteries and block front wheels and raise rear of vehicle off the ground. See chapter 1 for lifting instructions.

- 1) Remove wheel and tire.
- 2) Remove parkbrake cable from park brake arm on the caliper.
- 3) Remove the two 5/16" bolts from the brake caliper mounting bracket.
- 4) Remove caliper assembly by sliding off rotor. Do not disconnect hydraulic line from caliper.
- 5) Remove the four 3/8" lock nuts from the inside face of the axle-housing flange accessible through slots in the brake rotor.
- 6) The axle shaft may now be removed with a slidehammer puller.
- 7) Remove the four 5/16" bolts from the brake rotor mounting flange and remove rotor.
- 8) At this point the rotor may be either resurfaced (See "Rotor Wear Limits") or replaced with a new rotor.
- 9) Complete re-assembly by reversing steps 1 through 7.
- 10) Use caution when remounting the brake calipers. Tighten each of the 5/16" bolts gradually alternating from one to the other. As you tighten the bolts be certain that the pads are parallel to the disk — if they are not, a "spongy" brake pedal may result. Also be sure that the caliper can still move back and forth on the mounting pins — if it can't, uneven pad wear will result.
- 11) Reinstall wheel and tire. Tighten the lug nuts evenly in a star pattern until the nuts are all seated and torque to 50-60 ft. lbs.

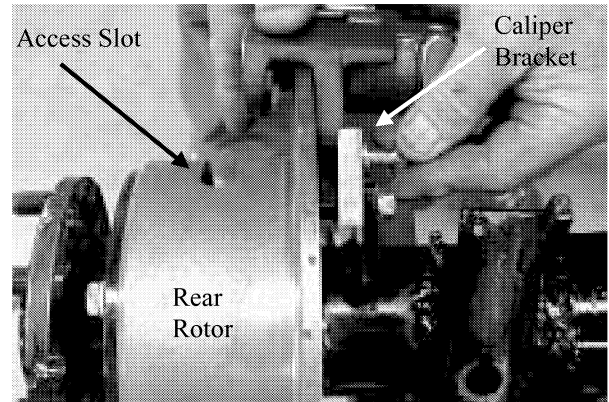


Figure 8 – Rear Rotor

Rotor Wear Limits

The limits for resurfacing of the brake rotor are 1/32 inch per side for a total of 1/16 inch. The overall thickness of the rotor should be no less than 3/16 inch.

HYDRAULIC SYSTEM

Check the brake fluid in the master cylinder periodically (under normal conditions, every 3 months). The master cylinder is located under the front deckboard and seat assembly.

Brake Fluid Maintenance

Note: Use DOT 3 Motor Vehicle Brake Fluid



CAUTION: Do not handle hydraulic system parts with greasy hands or permit parts to come in contact with oil or grease. Just a trace of grease or oil in the hydraulic system may cause damage to rubber parts.

HYDRAULIC SYSTEM (cont.)

Brake Fluid Maintenance (cont.)

- 1) Maintain fluid level within $\frac{1}{4}$ " of master cylinder filler opening.
- 2) Changing Brake Fluid
 - a) As a result of use, brake fluid loses some of its original qualities and may become contaminated. When performing major brake work to the hydraulic system, remove old fluid, and replace it with clean brake fluid.
 - b) Brake fluid must be changed following extended usage or contamination. Anytime fluid looks milky or dark, there are contaminants in the fluid.
 - c) If any of the hydraulic system parts are corroded or the fluid is discolored, flush the hydraulic system to remove old fluid; then fill with clean brake fluid.
- 3) Contamination. Soft or swollen rubber parts or milky or discolored fluid indicate the brake fluid is contaminated.
 - a) Drain old fluid from the system.
 - b) Replace cups and seals.
 - c) Flush hydraulic system with clean brake fluid.
 - d) Refill system with clean brake fluid.
- 4) Handling and Storing Brake Fluid
 - a) Keep the brake fluid clean. . Do not allow any foreign material in the fluid.
 - b) Prevent any petroleum product (gasoline, kerosene, oil, grease, etc.) from contaminating the brake fluid.
 - c) Use only clean containers for dispensing brake fluid. Do not use containers contaminated with dirt, oil, grease, rust, etc.
 - d) Always, cover or cap brake fluid containers when not actually dispensing the fluid. If containers are left open or uncovered, the fluid absorbs moisture from the air.
 - e) Never reuse old brake fluid drained from hydraulic system. Used brake fluid is contaminated to some extent.
 - f) Store brake fluid containers in a clean, dry place.



CAUTION: Before bleeding the hydraulic system, the cause of the problem should be diagnosed and properly repaired. If you find it necessary to bleed the brake system for any reason, check the fluid level in the master cylinder and add fluid as required. Use "DOT 3" fluid only.



CAUTION: Do not allow fluid to get on brake pads/rotors.

Bleeding The Hydraulic System



WARNING: Brake fluid can cause irritation of eyes and skin and may be harmful if swallowed. If fluid is swallowed, induce vomiting by administering two tablespoons of salt in a glass of warm water. Call a doctor. In case of contact with skin or eyes, flush with plenty of water. Get medical attention for eyes. **KEEP BRAKE FLUID OUT OF THE REACH OF CHILDREN!**

- 1) If any line or cylinder has been opened when servicing brake system or when satisfactory brake adjustment is unobtainable or pedal is spongy, bleed air from hydraulic system as follows:
- 2) Insert the end of a length of appropriate size plastic tubing over wheel cylinder bleeder nipple, located next to wheel cylinder line connection.
- 3) Place the other end in any clear glass jar containing about $\frac{1}{2}$ inch of clean brake fluid.

HYDRAULIC SYSTEM (cont.)

Brake Fluid Maintenance (cont.)

- 4) Bleed right wheel first. Open bleeder nipple by rotating it counterclockwise about $\frac{1}{2}$ turn. With master cylinder full of fluid at all times, slowly depress foot pedal repeatedly until fluid flows from bleeder nipple free of air bubbles.
- 5) Add fluid to master cylinder to bring to $\frac{1}{4}$ inch from cover. Close bleeder nipple. Repeat above Add fluid to master cylinder to bring to $\frac{1}{4}$ inch from cover. Close bleeder nipple. Repeat above procedure on left wheel.
 - a) Do not re-use fluid unless it is clear and free of sediment. If it is impossible to bleed all air from system, master cylinder is faulty and a master cylinder repair kit should be installed.
- 6) To purge the hydraulic system of remaining air bubbles, remove the bolts securing the caliper mounting bracket. Without removing the caliper and pads from the disc, rotate the caliper to position the bleed nipple in a vertical position. While holding caliper in this position, bleed system one last time.
- 7) Remount caliper to caliper mounting bracket. See Figure 8.

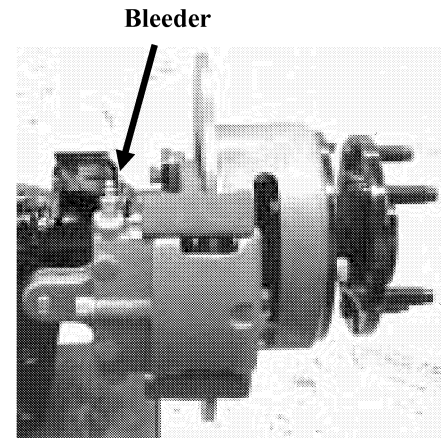


Figure 9 - Bleeder

WHEEL AND TIRE SERVICE

Wheel & Tire Removal

- 1) Place blocks ahead of and behind the wheels that will remain on ground.
- 2) Slightly loosen lug nuts.
- 3) Place a jack under the side of the vehicle just ahead of the rear wheel or behind the front wheel so it will come in contact with the frame. Raise the vehicle until the tire clears the ground.
- 4) Place Jack Stand's under unibody for additional safety.
- 5) Remove lug nuts and wheels.

Wheel & Tire Replacement

- 1) To install wheel to hub, reverse above procedures and run the lug nuts up to the wheel by hand until all nuts are snug against the wheel and the wheel is up against the brake drums.
- 2) Tighten the lug nuts evenly in a star pattern until the nuts are all seated and torque to 50-60 ft. lbs.



CAUTION: The lug nuts must be lightly snugged in a star pattern, then torqued in a crossing pattern or the wheel may be bent, causing it to wobble.



CAUTION: Replacement tires must be of the same size as original equipment. Increased tire load ratings are permissible but the tire rating does not increase the vehicles rated load carrying capacity of the vehicle.

Tire Care

Improper inflation will shorten the life of your tires and will adversely affect performance. Keep tires inflated to the specifications labeled on the sidewall. Initial factory setting is 35 to 50 psi. Not to exceed tire sidewall rated capacity of 75 psi at full load

LUBRICATION

Differential

The lubricant level in the differential should be checked upon receipt of vehicle, then every 6 months. If lubricant is needed, use SAE 80 gear oil. Do not overfill. Lubricant should not go above the bottom of the filler plug hole when the vehicle is level.

Wheel Bearings

Clean, inspect and lubricate wheel bearings every 6 months. Use "Texaco Marfax" heavy duty #2 or equivalent. Replace worn bearings as needed.

Steering Gear

Check yearly; add grease as required (Molub-Alloy #0 or equivalent).

Chain Cover

Check yearly, add grease in center along length as required (Molub-Alloy #0 or equivalent).

Pivot Points With Grease Fittings

There are 6 lubrication points with grease fittings on the front end of the vehicle — one on each of the four tie rod ends and one on each side of the front axle (kingpin pivot). Under normal conditions, these points should be greased every 6 months with chassis lube

Pivot Points Without Grease Fittings

The handbrake mechanism, parking brake linkage and brake pedal lever pivot should be lubricated every 3 months. Use light machine oil or motor oil.

BODY AND CAB MAINTENANCE

Body

Frequent washings with mild soap will preserve the luster and finish of your vehicle. For stubborn and imbedded dirt, a soft bristle brush may be used. Tar, asphalt, creosote and the like should be removed immediately to prevent staining of paint.



WARNING: Avoid direct hose spray on electrical components.

Upholstery

Clean gently with mild soap suds and a soft cloth.

Cab

The Columbia Industrial Vehicle cab (optional) is constructed of reinforced fiberglass. Use a mild soap or detergent with a sponge or soft cloth for normal cleaning.

BODY AND CAB MAINTENANCE (cont.)



WARNING: Do not use harsh detergents, abrasives or cleaning solvents that contain ammonia, aromatic solvents or alkaline material to clean cab.

Windows

Normal window cleaners may be used on glassed areas of cab.

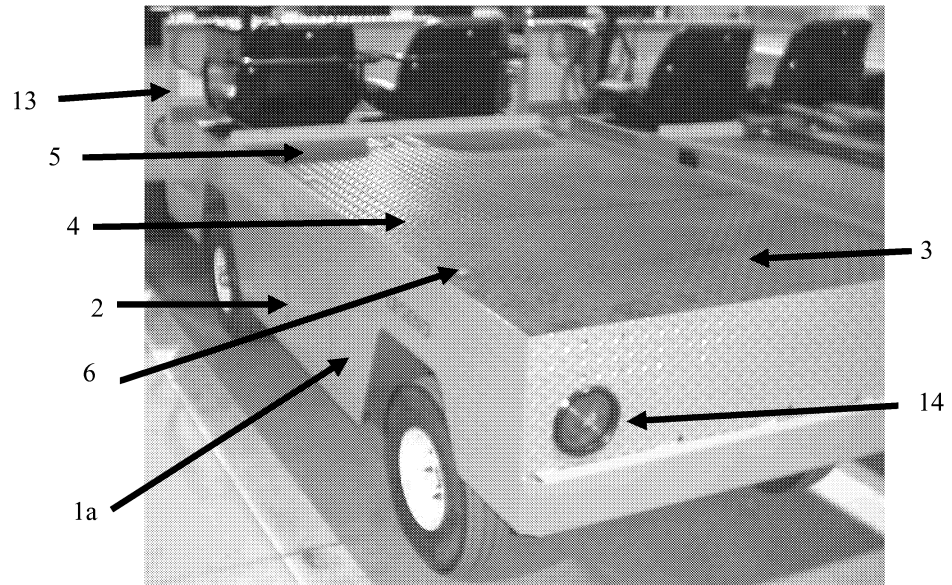
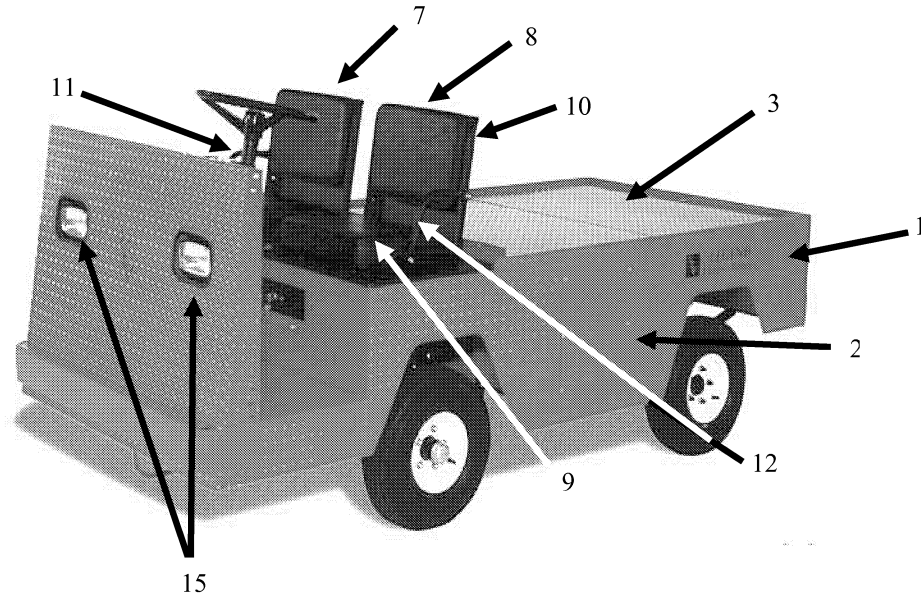
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Parts List

Note: The Burden Carriers come in two bed lengths Standard (62 inches length) and the Extended Bed (XB, 76 inches in length). For ease in recognition they will be designated in some parts list tables as STD and XB.



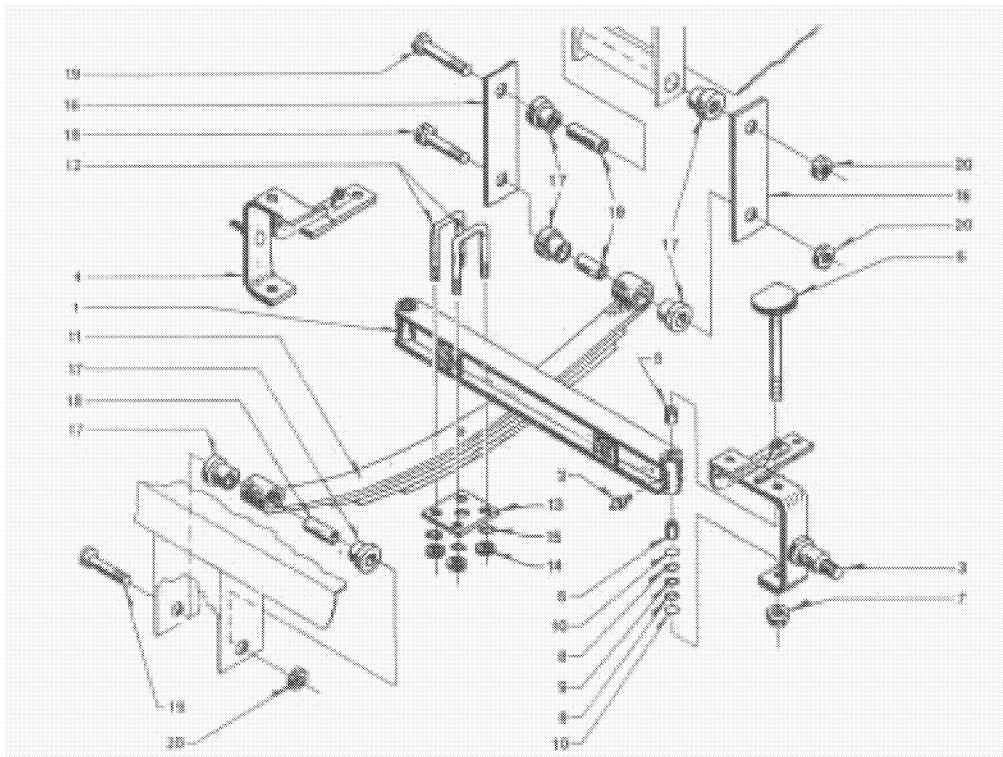
Body Items

Body Items				
Item	Part #	Description	Qty Used	
			STD	XB
1	48000-00	Body Frame, Complete 62" Bed	1	
1a	19501-00	Body Frame, Complete 76" Bed		1
2	47993-00	Cover Battery Compartment	2	4
	8211	Rivet, Cover Mounting	12	24
3		Deckboard or Cover Assy., Rear 2854A75A01	1	1
4		Deckboard or Cover Assy., Center 2854A75A01	1	
		Deckboard or Cover Assy., Center 2854A75A02		1
5		Deckboard or Cover Assy., Front 2854A82A01	1	1
	46801-00	Decal Forward, Neutral & Reverse (Not Shown)	1	1
	53284-00	Decal, Operating Instructions	1	1
6		Latch, Deckboard 60171	1	1
	2774	Screw, 1/4-20 x 5/8	4	4
		Nut 1/4-20 (Jam) 00353	4	4
7		Seat Assy., RH, Complete (Includes Cushions & Armrest) 2854A11G01	1	1
8		Seat Assy., LH, Complete (Includes Cushions & Armrest) 2854A11G02	1	1
		Seat Base Assy., (Does not include Cushions & Armrest) 2854A12A01	2	2
	4017	Bolt, 5/16-18 x 1" (Seat Base to Deckboard)	6	6
9	51702-00	Seat Cushion, Bottom	2	2
	2774	Screw, 1/4-20 x 5/8 (Seat Bottom to Seat Base)	4	4
10		Seat Cushion, Back 40708	2	2
	2774	Screw, 1/4-20 x 5/8 (Seat Bottom to Seat)	6	6
		Armrest Assy., RH, Complete (Includes Cushion) (Not Shown) 2854A13A01	1	1
11		Armrest Assy., RH, (Does Not Include Cushion) 2908B35H01	1	1
		Armrest Assy., LH, Complete (Includes Cushion) (Not Shown) 2854A13A02	1	1
12		Armrest Assy., LH, (Does Not Include Cushion) 2908B35H02	1	1
	2774	Screw, 1/4-20 x 5/8 (Armrest to Seat Base)	8	8
	7742	Nut, 1/4-20 Lock (Armrest to Seat Base)	8	8
	7036-B	Washer 1/4 Flat (Armrest to Seat Base)	8	8
		Armrest Cushion 40638	2	2
	2774	Screw, 1/4-20 x 5/8 (Cushion to Armrest)	4	4
	7036-B	Washer 1/4 Flat (Cushion to Armrest)	4	4
13		VIN Name Plate	1	1
	8302	Rivet, Data Plate Mounting	4	4
		Rivet, Serial No. Plate Mounting 00197	2	2
		Bumper Cap (Front & Rear) (Not Shown) 61236	4	4
		Screws #14 X 1" (Bumper Cap Mounting) 00228	14	14
	3787-B	Bolt, 1/4-20 x 3/4 (Bumper Cap Mounting, Upper front side)	2	2
	6031	Washer, #10 Flat (Bumper Cap Mounting)	16	16
	7742	Nut, 1/4-20 Lock (Bumper Cap Mounting)	2	2
14		Tail/Stoplight 2856A27H01	2	2
	2592	Screw Machine 10-24 x 1/2, (Tail/Stoplight Mounting)	6	6
	7118	Washer, Lock Shakeproof #4 (Tail/Stoplight Mounting)	6	6
	7620-W	Nut, Tail/Stoplight Mounting	6	6
15	67724-91	Headlight	2	2

Body Items				
Item	Part #	Description	Qty Used	
			STD	XB
		Insulator, Headlight Bracket 70791	2	2
		Insulator, Headlight Mounting 70801	1	1
		Lamp, Headlight 62161	1	1
		Lens Only 62541	1	1
16	68860-00	Kit, Turn Signal (Includes wires, Connectors, Switch & Lights) (Not Shown)	1	1
	68500-96	Lamp, Amber	2	2
	69837-00	Grommet, W/ Pigtail Kit	2	2
17	48880-ZZ	Windlace Trim (Order by foot)	*	*
18	11491	Plug, 2 3/32" (When Hour Meter is not used) (-not shown)	1	1
19	11491	Plug, 3" (When Battery Discharge Indicator is not used) (not shown)	1	1
20	51324-00	Cover, Cowl Wiring – (Not Shown)	1	1
	3767-B	Bolt, 1/4-20 x 5/8	2	2
	7742	Nut, 1/4-20 Lock	2	2

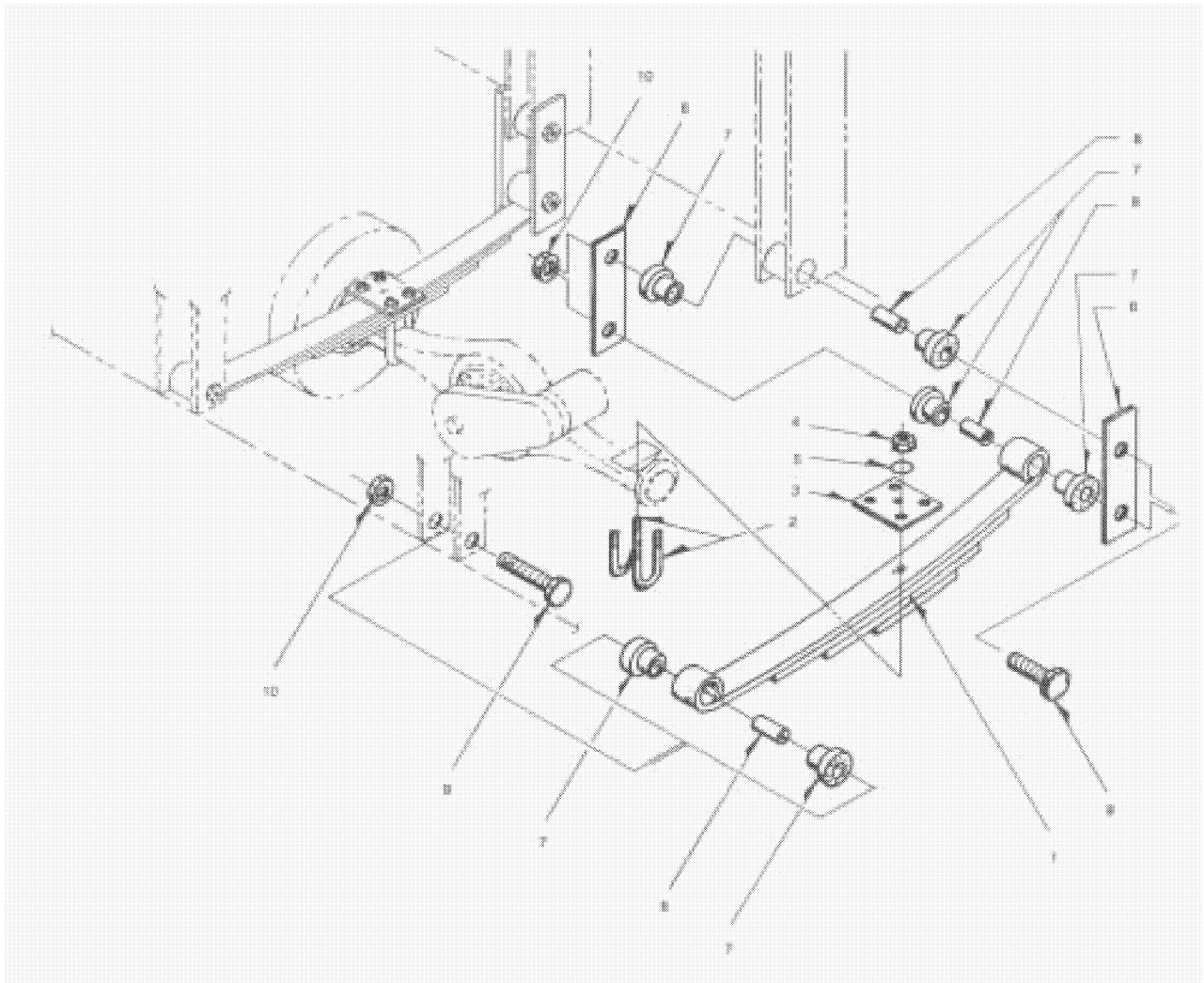
Front Axle & Suspension

Front Axle & Suspension (Applicable to vehicles produced after July 1994)			
Item	Part #	Description	Qty
	19503-00	Front Suspension Group	
1	54827-00	Assembly, Axle Beam	1
2	9800	Fitting, Grease (Axle)	2
3	56864-00	Assembly, Spindle LH (No Front Brakes)	1
		Assembly, Spindle LH (8" Wheel, 10" Disc) 0028246	1
		Assembly, Spindle LH (10" Wheel, 8" Disc) 0028233	1
4	56863-00	Assembly, Spindle RH (No Front Brakes)	1
		Assembly, Spindle RH 8" Wheel, 10" Disc) 0028245	1
		Assembly, Spindle RH (10" Wheel, 8" Disc) 0028232	1
5	9083	Bushing, Kingpin	4
6	56843-00	Assembly, Kingpin	2
7	7513	Nut, Kingpin	2
8	6042	Washer, Thrust	4
9	9085	Bearing, Thrust	2
10	11100	"O" Ring	4
11		Assembly, Spring (4 Leaf, Normal – XB, A-B) 3977C64A01	2
		Assembly, Spring (6 Leaf, Normal – XB, C) 3977C64A02	2
		Assembly, Spring (7 Leaf, Normal – XB, D) 3977C64A03	2
12	5203	"U" Bolt, Front Axle (4 Leaf Spring, Normal – XB, A-B)	4
	5209	"U" Bolt, Front Axle (6 & 7 Leaf Spring, Normal – XB, C-D)	4
13	54800-00	Plate (Spring to Front Axle)	2
14	7880	Nut ("U" Bolt to Spring)	8
	7068	Washer ("U" Bolt to Spring)	8
16	54801-00	Shackle (Spring to Frame)	4
17	10505	Bushing (Spring to Frame)	12
18	5711	Spacer(Spring to Frame)	6
19	3453	Bolt 3/8-16 x 3 3/4" (Spring to Frame)	10
20	7778	Nut 3/8-16, Lock (Spring to Frame)	6



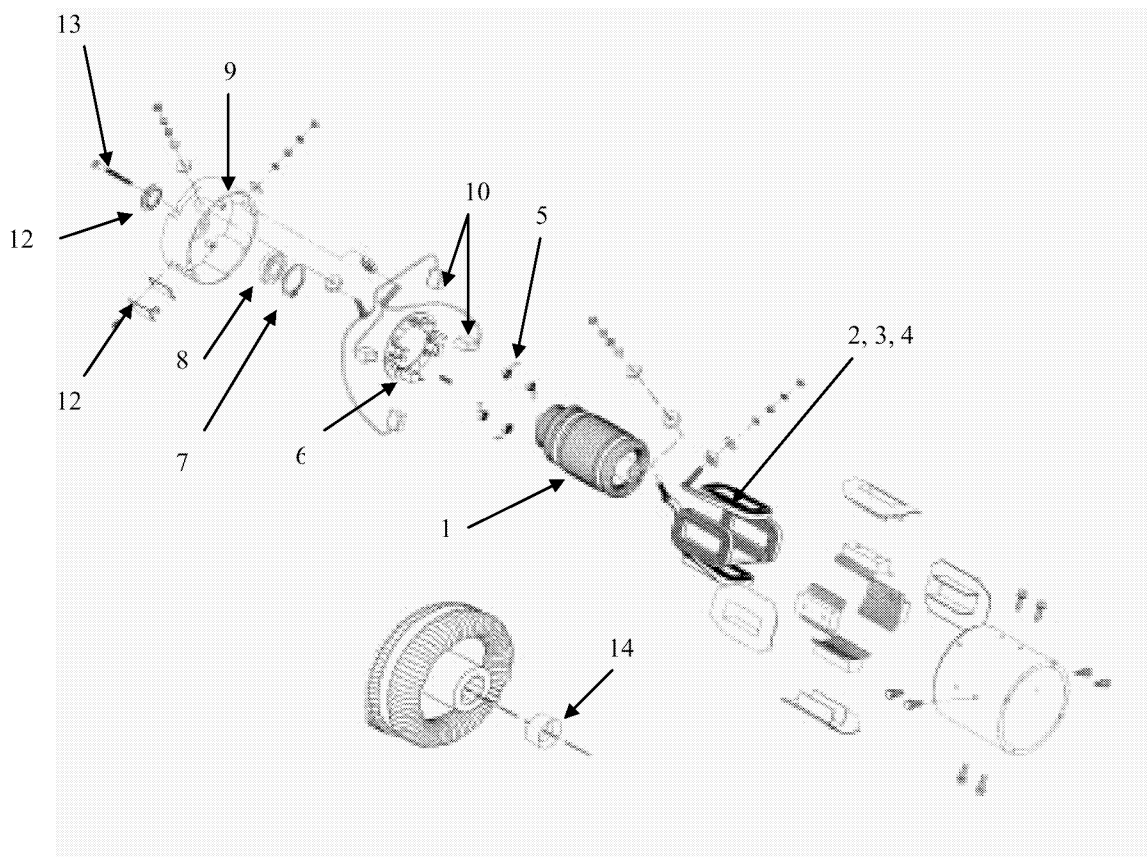
Rear Suspension

Rear Suspension				
Item	Part #	Description		Qty
1		Spring Assy., 4 Leaf (Std on 280A, 280B & 282B)	3977C64A01	2
		Spring Assy., 6 Leaf (Std on 280C & 282C)	3977C64A02	2
		Spring Assy., 7 Leaf (Std on 280D & 282D)	3977C64A03	2
2	5204	"U" Bolt, Rear Axle (All Leaf sizes)		4
3	54815-00	Plate, Spring to Rear Axle		2
4	7880	Nut, "U" Bolt to Spring		8
5	7068	Washer, "U" Bolt to Spring		8
6	54801-00	Shackle, Spring to Frame		4
7	10505	Bushing, Spring to Frame		12
8	5711	Spacer, Spring to Frame		6
9	3453	Bolt 3/8-16 x 3.75", Spring to Frame		10
10	7778	Nut, Lock 3/8-16, Spring to Frame		6



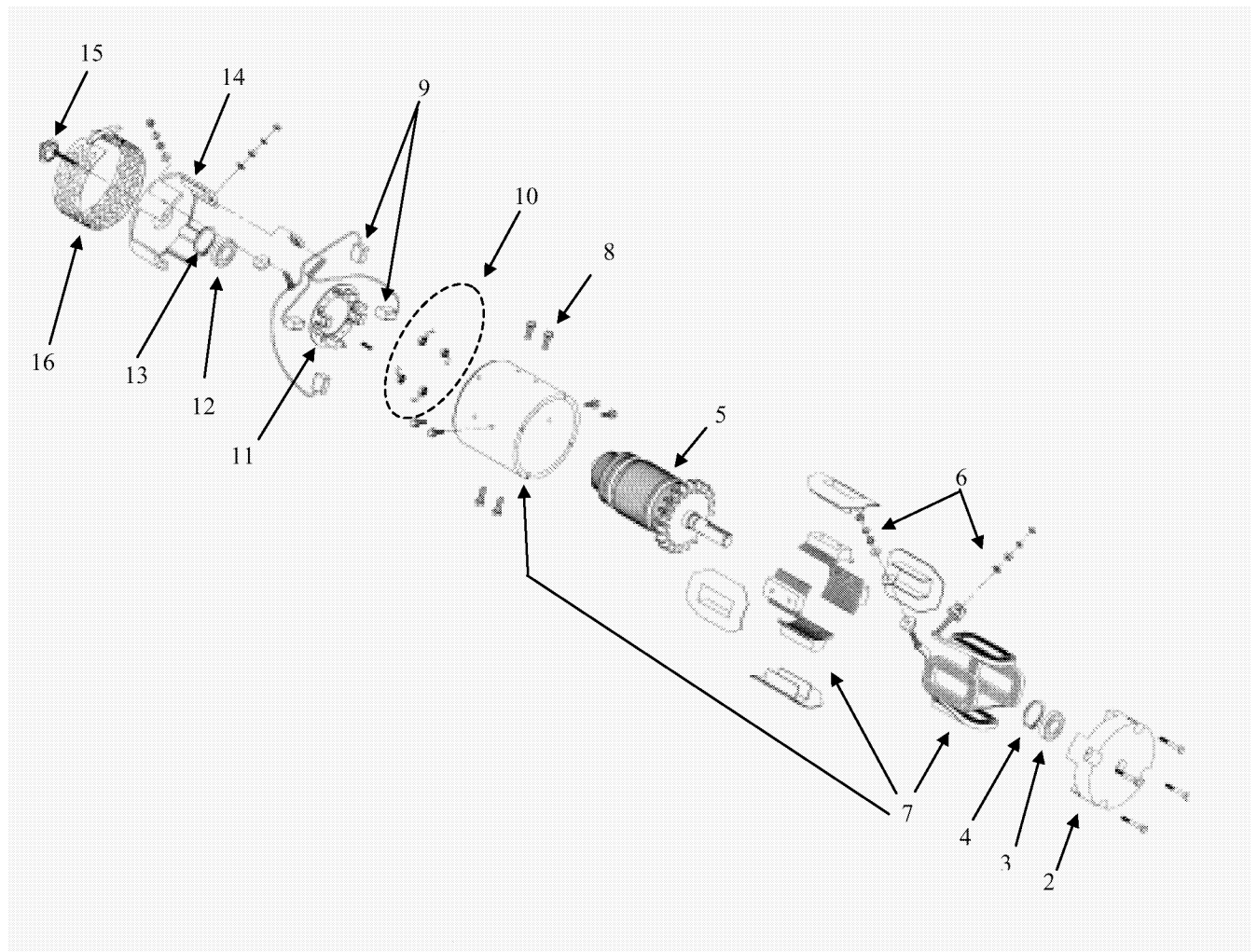
Motor, Advanced

Motor, Advanced (69200-89A) (Serial # 280A92H019 and Newer)			
Item	Part #	Description	Qty
	69200-89A	Motor, Complete	
1	83281-89A	Armature Assy.	1
2, 3, 4	83282-89A	Kit, Field Coil	1
5	83287-89A	Spring, Brush	4
6	83284-89A	Brush Plate & Box Assy.	1
7	83285-89A	Ring, Snap	1
8	83286-89A	Bearing	1
9	83288-89A	Commutator, Endhead	1
10	83283-89A	Set, Brush	2
11		Cover Plate Assy.	1
12	83290-89A	Plug, End Cap	1
13	83291-89A	Bolt, End Cap	2
14	11423	Resilient Bumper, Electric Motor	1



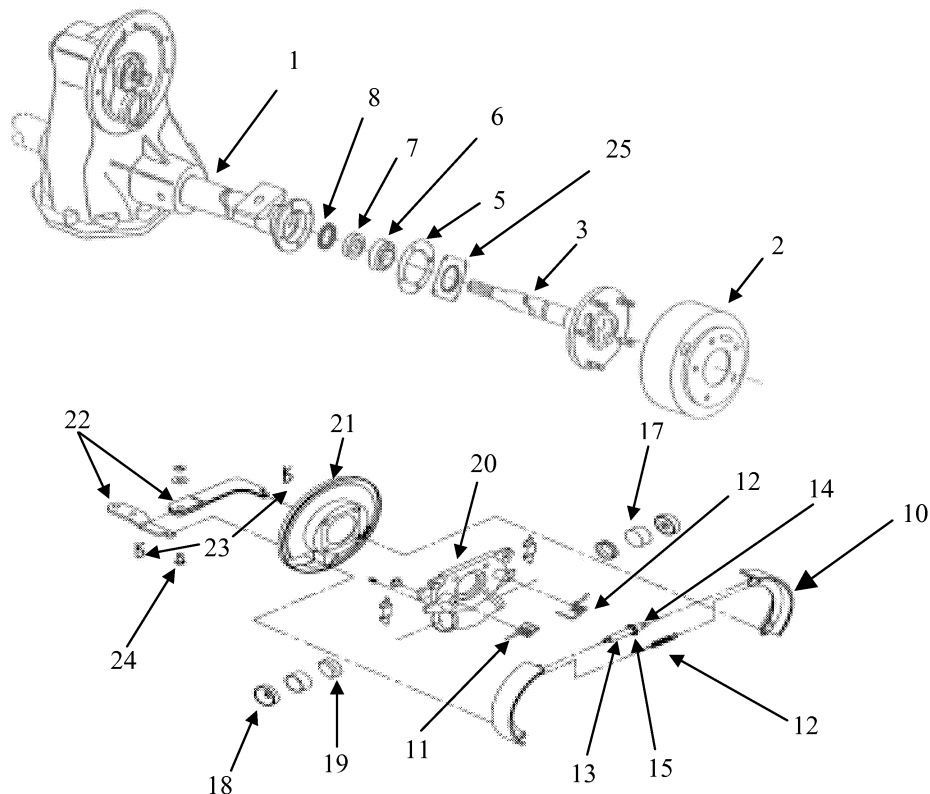
Motor, Advanced

Motor, Advanced (69401-00)			
Item	Part #	Description	Qty
	69401-00	Motor, Complete	1
1		Seal (Not Shown)	12307
2		Endhead, Drive	75064
3, 12	83286-89A	Bearing	2
4	83285-89A	Ring, Snap	1
5		Armature & Fan Assy.	75074
6		Nut & Washer Package (Not Shown)	20408
7		Frame & Field Coil Assy.	75084
8		Screw, Pole	01633
9	83301-00	Brush	4
9a	83283-89A	Kit, Lead Assembly	4
10	11839	Spring, Brush	4
11	83284-89A	Brush Plate & Box Assy.	1
13		Washer, Wavy	10886
14		Commutator Endhead	75104
15	83290-89A	Plug	1
16		Headband Assy	1



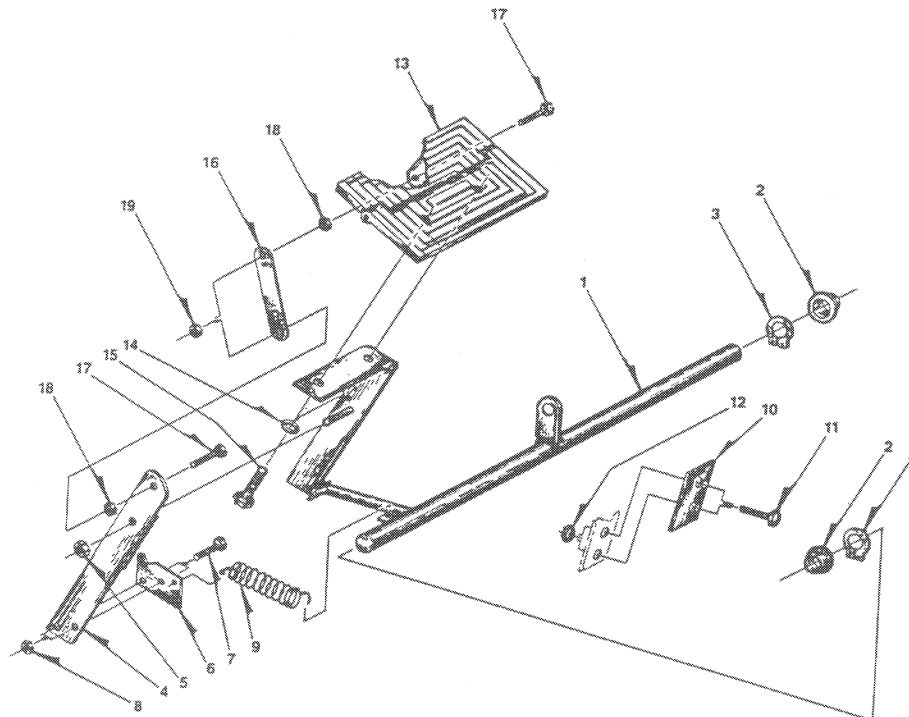
Differential & Brakes, Drive System

Differential & Brakes , Drive System (Serial # 280A92H019 and Newer)				
Item	Part #	Description		Qty
		Rear Axle Assy., Complete (Includes Motor & Brakes)	2867A93G01	1
1		Rear Axle Assy. (Less Motor)	2867A91A01	1
2	41249-00	Drum, Brake		2
3		Axle Shaft, LH (Long)	18718	1
4		Axle Shaft, RH (Short) (Not Shown)	18728	1
5		Gasket, Axle	18748	2
6	82739-87	Bearing, Axle		2
7	83167-93	Retainer, Bearing		2
8	83160-93	Seal, Inner		2
9	41298-00	Set, Brake Shoes (Set Only)		2
10	41914-93	Spring, Shoe Return LH (Green)		2
11	41916-93	Spring, Shoe Return RH (Red)		2
12	41918-93	Spring, Adjusting Screw (Blue)		2
13	41878-93	Adjusting Screw		2
14	41882-93	Socket, Adjusting Screw		2
15	41880-93	Pivot Nut, Adjusting Screw		2
17		Piston		2
18	41890-93	Piston Dust Boot		2
19	41892-93	Wheel Cylinder Cup		2
20	41884-93	Torque Spider & Wheel Cylinder		2
21	41926-93	Cover, Dust		2
22	41894-93	Assembly, Strut Lever Parking Brake		2
23	41920-93	Retainer Prkg Brake		4
24	41898-93	Retainer Prkg Brake Lever Pin		2
25	82811-93	Outer Seal, Axle		



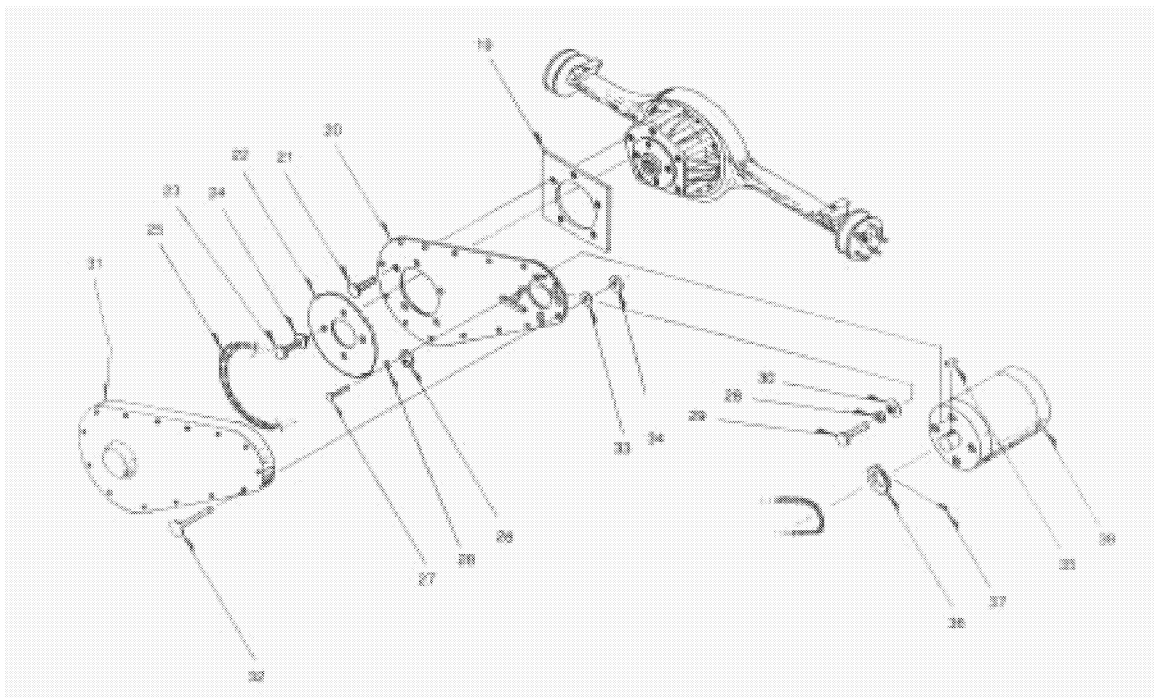
Brake Cross-Shaft & Brake Pedal

Brake Cross-Shaft & Brake Pedal (Serial # 280A02H019 and Newer)			
Item	Part #	Description	Qty
1	41271-00	Brake Cross-Shaft Assy.	1
2	12538	Bushing, Cross-Shaft to Frame	2
3	11003	Ring, Retaining, Cross-Shaft	2
4	41273-00	Catch Lever	1
5	7739	Nut 5/16-18 Lock, Catch Lever to Pedal mount	1
6	41274-00	Catch, Parking Brake	1
7	3787-B	Screw 1/4-20 x 3/4, Catch to Catch Lever	2
8	7742	Nut 1/4-20 Lock, Catch to Catch Lever	2
9	11838	Spring, Catch Lever Return	1
10	41277-00	Latch, Parking Brake (Mounts to Frame)	1
11	3787-B	Screw 1/4-20 x 3/4, Latch to Frame	2
12	7742	Nut 1/4-20 Lock, Latch to Frame	2
13	41228-00	Brake Pedal Plate	1
14	7742	Washer 5/16 Lock, Pedal Mount	2
15	3987-BS	Screw 5/16-18 x 3/4"	2
16		Connector, Link, Catch Lever to Pedal 2849A64H01	1
17	2551-W	Screw 1/4-20 x 1"	2
18	7688-B	Nut 1/4-20Hex, Connector Link Mount	2
19	7742	Nut 1/4-20 Lock, Connector Link Mount	2
NEW BRAKE PAD			
	2008	Screw, 1/4-20x5/8"	2
	41350-00	Plate, Brake Pedal Pad	1
	42407-00	Pad, Brake Pedal	1
	7724-B	Locknut, Flange 1/4-20	2
	8128	Speednut, 1/4"	



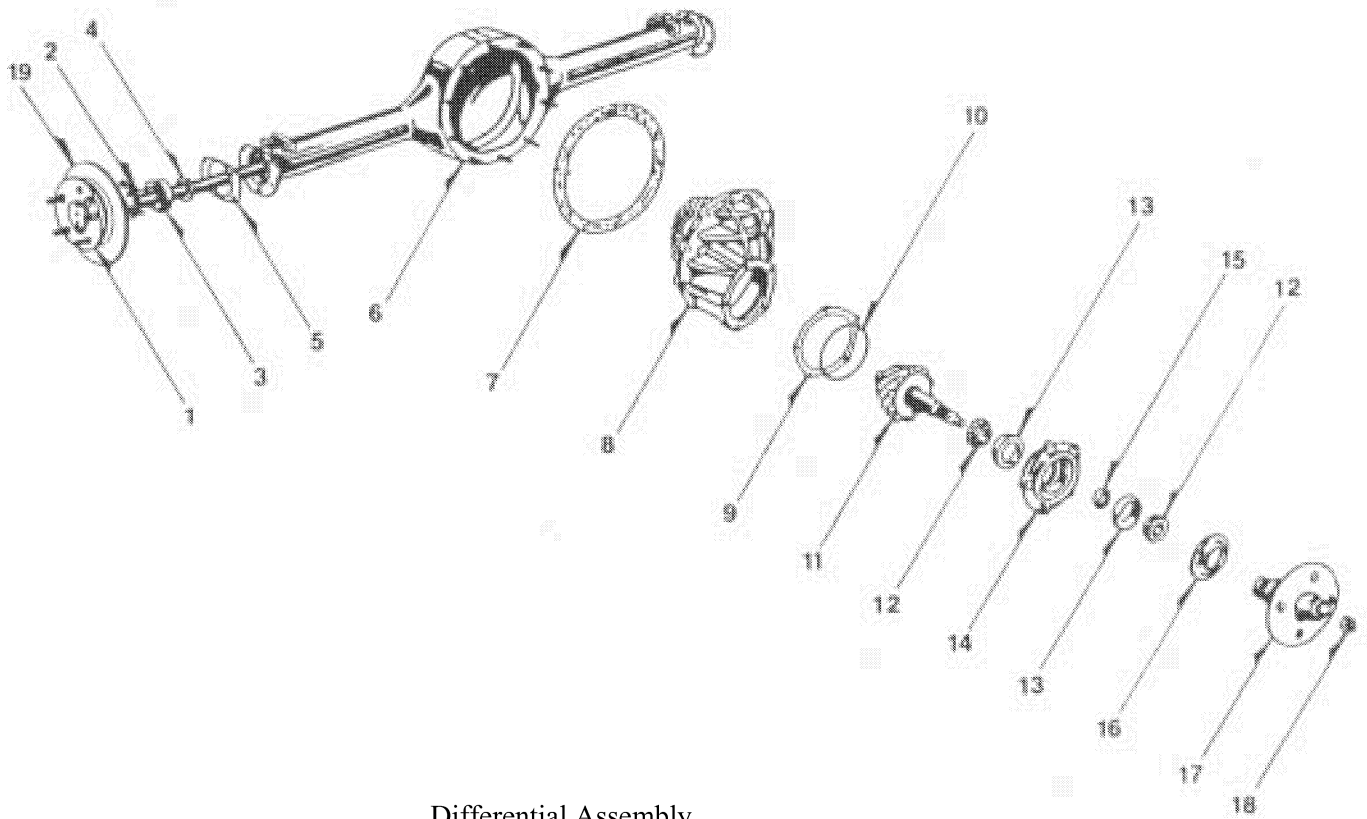
Drive System Sprockets/Motor/Chain Assembly

Sprockets/Motor/Chain Drive System (B-C-D)			
Item	Part #	Description	Qty
19	33414-00	Plate, Adapter (Backing Plate to Differential)	1
20	33415-00	Backing Plate, Chain Housing	1
21	4740-b	Screw, Cap 3/8-16 x 2" (Backing Plate to Differential)	1
22	33432-00	Sprocket, 67 Tooth	1
	33417-00	Sprocket, 86 Tooth	1
23	2879-W	Screw, Cap 3/8-16 x 1" (Sprocket to Flange)	4
24	7038-b	Washer, Lock(Sprocket to Flange)	4
25	33441-00	Chain, 45 Link	1
	33407-00	Chain, 52 Link	1
	33475-00	Chain, 53 Link	1
		Link, Master 11577	1
26		Adjuster, Chain Tension 2527B80A01	1
27	4716-w	Screw, Cap 3/8-16 x 1 1/4"	1
28	7038-b	Washer, Lock 3/8	4
29	2879-W	Screw, Cap 3/8-16 x 1"	3
30	7119	Washer, Flat 3/8	3
31	33405-00	Housing, Chain	1
32	3413	Screw, Cap 1/4-20 x 3 1/4"	14
33	6040	Washer, Flat 1/4	14
34	7742	Nut, Lock 1/4 x 20	14
35		Key, Sprocket to Motor 2854A33H01	1
36	33411-00	Sprocket, 17 Tooth	1
	33472-00	Sprocket, 19 Tooth	1
		Sprocket, 21 Tooth 2568B39H04	1
37	2247	Screw, Set, Sprocket to Motor	1
38		Motor (See "Motor" Page 8 for Details)	1



Differential Assembly

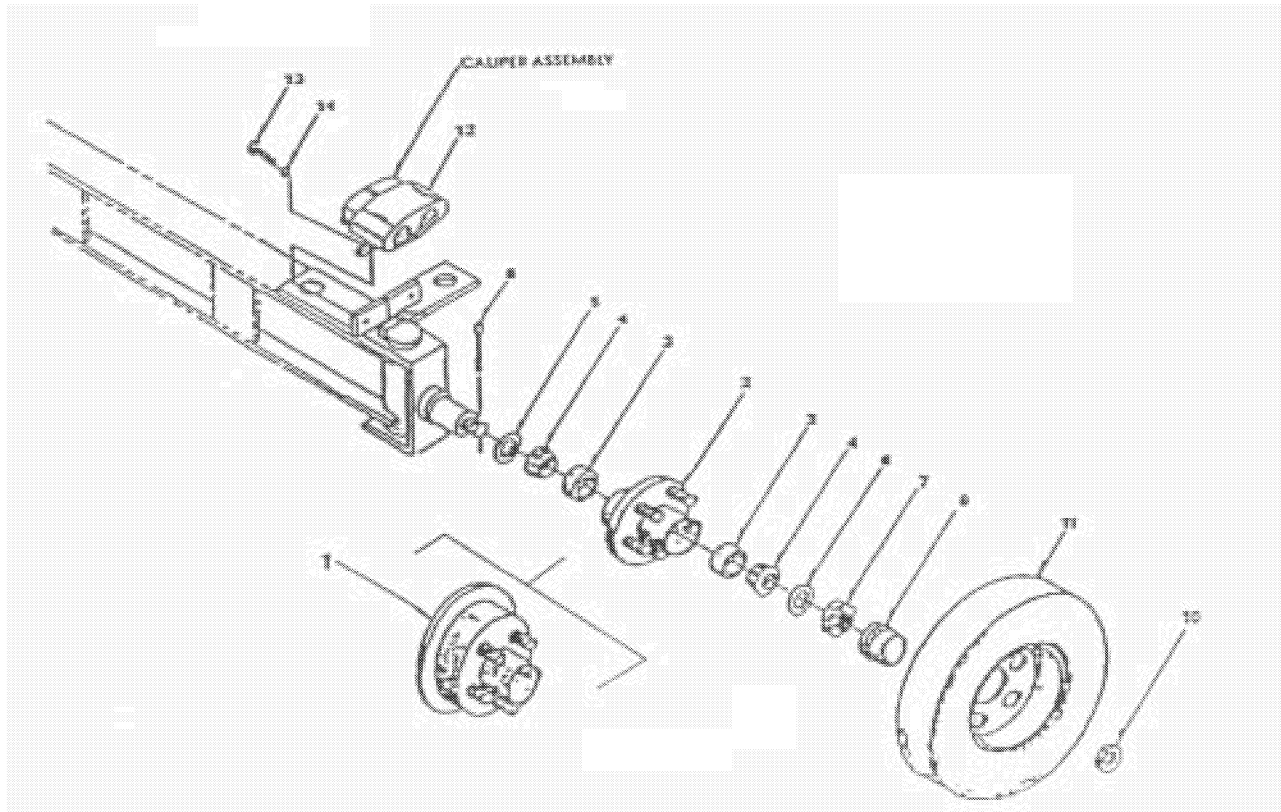
Assembly, Differential (Vehicles February, 1992 and Newer)				
Item	Part #	Description		Qty
1		Axle Shaft (Only) LH – Long (Not Shown) (With Wheel Studs)	17808	1
		Axle Shaft (Only) RH – Short (W/O Wheel Studs)	17798	1
		Wheel Studs 1/2-20	00324	10
		LH, 37" Track (10" Wheel, 8" Disc)	19208	1
		RH, 37" Track (10" Wheel, 8" Disc)	19198	1
		LH, 48" Track (10" Wheel, 8" Disc)	19178	1
		RH, 48" Track (10" Wheel, 8" Disc)	19168	1
2	82516-00	Axle/Bearing Retainer		2
		Retainer (10" Wheel, 8" Disc)	19218	2
	2879-W	Screw 3/8-16 x 1", Cap		8
	7038-b	Washer 3/8, Lock (10" Wheel, 8" Disc)		12
	2878	3/8-16 x 1" Socket Head (10" Wheel, 8" Disc)		4
3	9082	Bearing, Axle		2
4	9082	Retainer Ring, Bearing (Supplied with Bearings)		2
5	82507-00	Gasket, Plate (To Housing) (Not required for 10" Wheel)		2
6		Housing, Axle	2910B29A01	1
	7778	Nut 3/8-16, Lock (Axle/Bearing Retainer to Housing)		8
7		Gasket Carrier (To Housing)	13987	1
8		Assembly, Carrier Only (Order by number stamped on top of casting)	7430D01A01	1
	8884	Bearing, Carrier (Not Shown)		2
	8885	Race, Carrier Bearing (Not Shown)		2
9	-	Shim (Supplied with Center Section)		1
10	82505-00	"O" Ring		1
11	-	Pinion, Drive (Supplied with Center Section)		1
12	9084	Bearing, Pinion		2
13	9024	Race, Pinion Bearing		2
14	-	Retainer, Pinion (Supplied with Center Section)		1
15	82504-00	Sleeve		1
16	12013	Seal, Pinion		1
17	33418-00	Flange, Sprocket		1
18	-	Nut, Sprocket Flange (Supplied with Center Section)		1
19	41238-00	Rotor		2
	3987-BS	Bolt 5/16-18 x 3/4, Rotor Mounting		8
	7041-B	Washer 5/16, Lock, Rotor Mounting		8
20		Adapter Plate (Not required for 10" Wheel) (Not Shown)	0128220	2
21	3437	Bolt 5/16-18 x 1" (Not required for 10" Wheel) (Not Shown)		4
22	7739	Nut 5/16-18, Lock (Not required for 10" Wheel) (Not Shown)		4



Differential Assembly

Front Rotor, Hub, Wheels & Tires

Front Rotor, Hub, Wheel & Tires (Vehicles 1994 and Newer)			
Item	Part #	Description	Qty
1	41291-00	Assembly, Rotor (With front wheel brakes)(Includes Rotor, Studs & Bearing Cups)	2
	11716	Studs, Wheel 1/2-20 (Vehicles Built before June 2001)	10
	41200-94	Lug Bolts, Wheel (Vehicles built after June 1, 2001)	10
		Rotor (10" Wheel, 8" Disc Not Shown) 19158	2
	3437	Bolt 5/16 x 1" (10" Wheel, 8" Disc Not Shown)	10
	7041-B	Washer 5/19-6 (10" Wheel, 8" Disc Not Shown)	10
	7748-B	Nut 5/16(10" Wheel, 8" Disc Not Shown)	10
2	33419-00	Assembly, Hub (Without)(Includes Hub, Bearing, Seal Dustcap & Lug Nuts))	2
		Studs, 1/2-20 Wheel 00304	10
		Hub (10" Wheel, 8" Disc Not Shown) 19148	2
3	9028	Cup, Bearing	4
4	9087	Cone, Bearing	4
5	12020	Seal	2
6	6038	Washer (Bearing Retainer)	2
7	7510	Nut, Spindle 1"-14	2
8	561	Pin, Cotter	2
9	33438-00	Cover, Dust	2
10	43152-66	Nut, Lug 1/2-20	10
11	40999-00	Wheel & Tire 18" 5.70/500 x 8 Range "B"	4
	40998-00	Wheel & Tire 18" 5.70/500 x 8 Range "C"	4
		Wheel & Tire 18" 5.70 x 8 Steel Guard Range "D" (Option) 10745	4
	41010-00	Kit, Wheel & Tire 18" 8.50 x 8 Range "B" (option, Vehicles without front wheel Brakes)	4
		Tire, Solid 3.75/500 x 8 (Used with split wheel) 10815	4
		Wheel, Split, 3.75/500 x 8 Used with Solid Tire – 10705	4
	41000-00	Wheel 3.75 x 8	4
	41011-00	5 Hole high speed Industrial Tire & Wheel Assembly (Optional)	4
	41012-00	Tire 5-Hole high speed Industrial 5.30 x 12 1045lbs Max Load, Max TP 80psi (Optional)	4
	41013-00	5-Hole 12" Industrial Wheel (Optional)	4
	40993-00	Tire & Wheel Assy. Solid Tire, Lug Tread (Optional)	4
	85488-00	5.00 x 8 Solid Tire, Lug Tread (Optional)	4
	85485-00	5.00 x 8 Wheel Assembly (5-Hole Mount) (Optional)	4
	19368-00	Kit, Front Brakes	2
12	41267-00	Caliper, Left Front (For Front Wheel Brake Option Only)	1
	41268-00	Caliper, Right Front (For Front Wheel Brake Option Only)	1
13	2878	Bolt, Socket Head 3/8-16 x 1" (For Front Wheel Brake Option Only)	4
14	7038-b	Washer 3/8, Lock (For Front Wheel Brake Option Only)	4

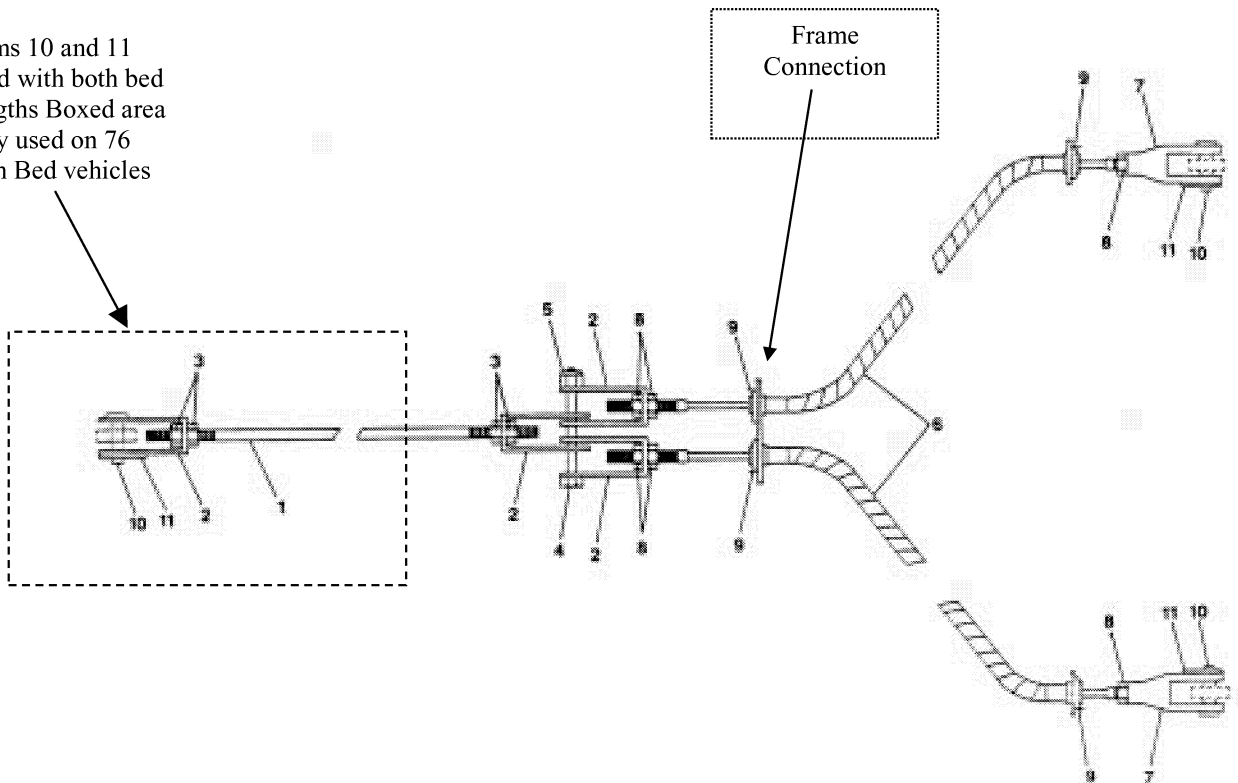


Note: See Pages 19 and 20 for Caliper Assembly exploded

Parking Brake Linkage

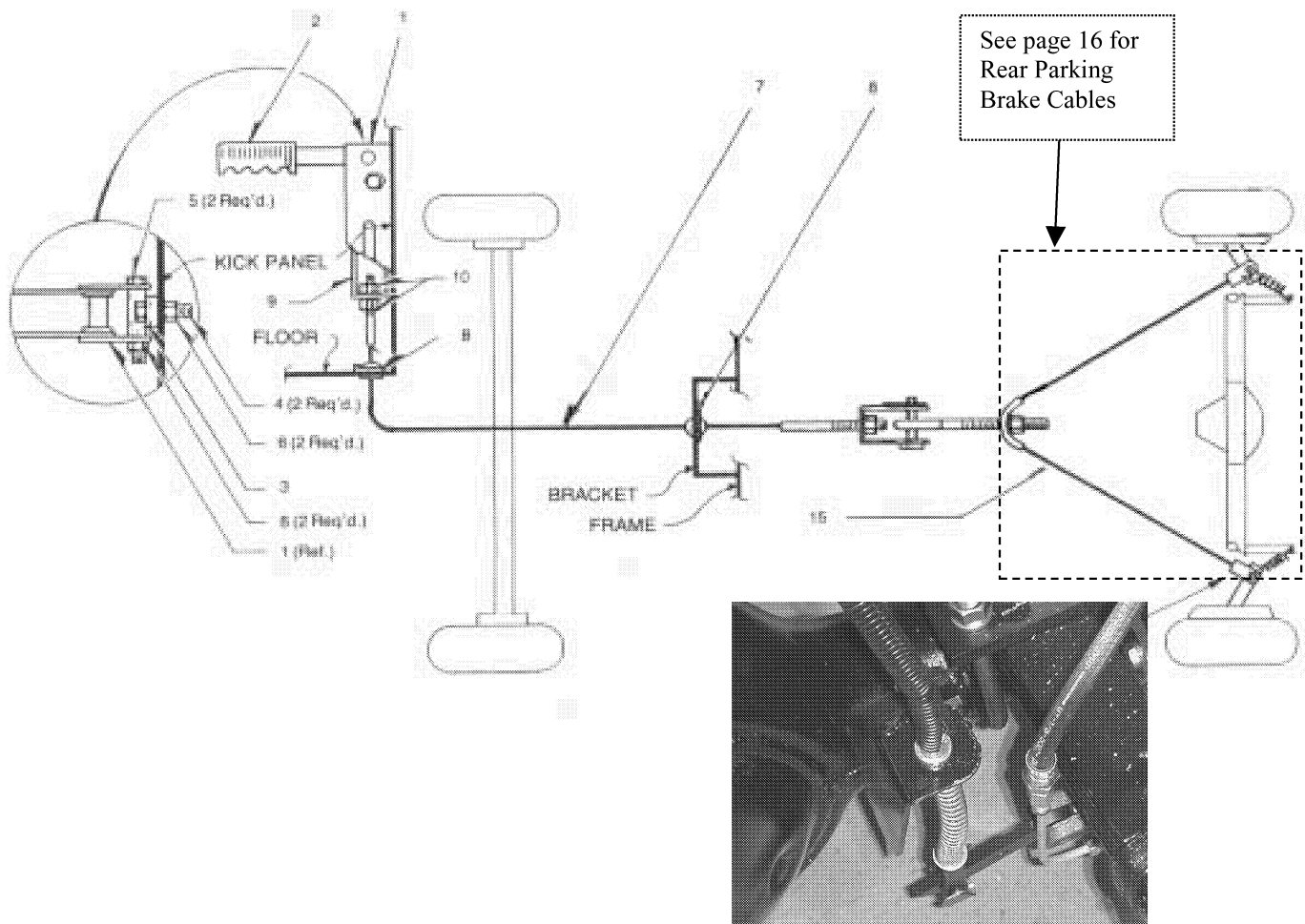
Brake Linkage (Serial # 280A92H019 and Newer)			
Item	Part #	Description	Qty
1	41342-00	Rod, Pull	1
2	73065-00	Clevis	4
3	7748-B	Nut 5/16-18	4
4	3419	Screw, Cap, 5/16-18 x 2 1/4"	1
5	7739	Nut, Lock 5/16-18	1
6	41314-00	Cable, Brake Rear (Dana Axle)	2
	41215-00	Cables, Brake (Rear & Park Brake handle, see page 17)	3
7	73059-96	Clevis	2
8	7753	Nut 5/16-24	6
9	41209-00	Clip, Brake Cable	4
10	495	Pin, Clevis 5/16x1 1/8"	3
11	520-w	Pin, Cotter 1/8x1"	3

Items 10 and 11
used with both bed
lengths Boxed area
only used on 76
inch Bed vehicles



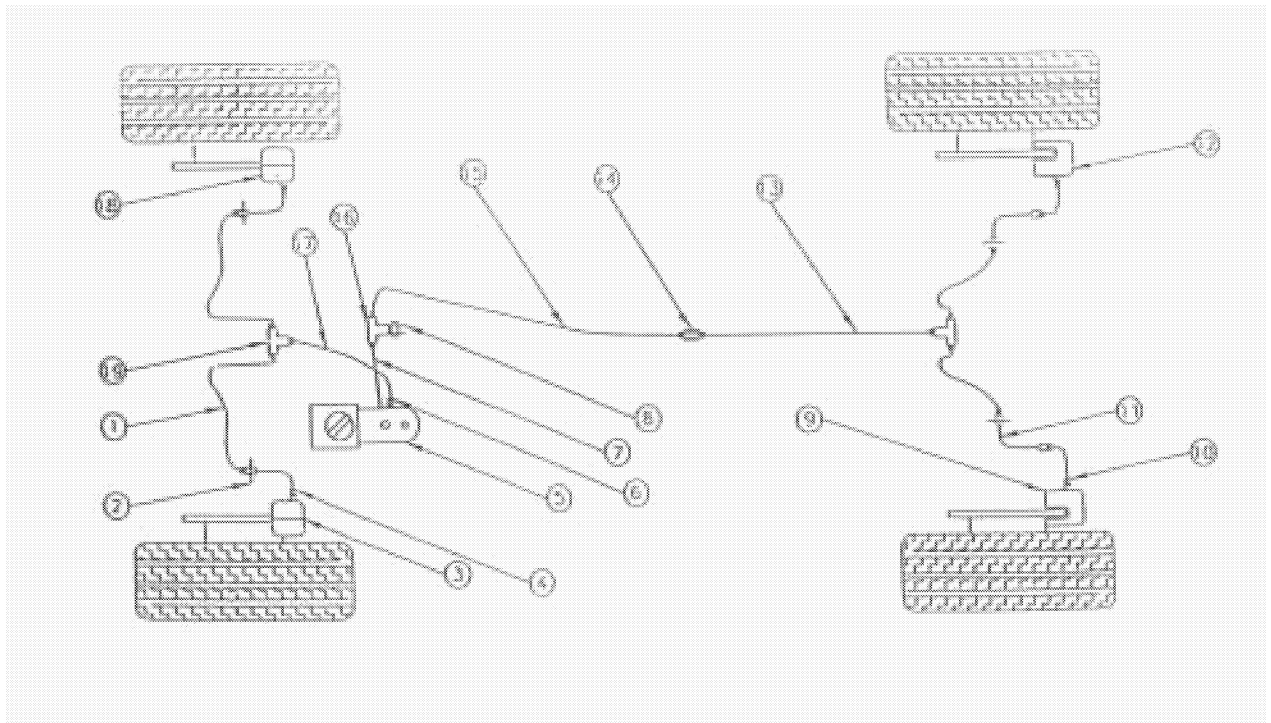
Brake - Hand / Parking

Hand and Parking Brake			
Item	Part #	Description	Qty
1	41213-00	Assembly, Hand Brake	1
	56818-00	Grip, Handbrake	1
3	41231-00	Bracket, Handbrake Mount	1
4	3987-BS	Bolt 5/16-18 x 3/4", Bracket to Kick Panel	2
5	2818	Bolt 5/16-18 x 1 1/2", Lever to Bracket	2
6	7739	Nut Lock 5/16-18, Bracket to Lever & Kickpanel	5
7	41215-00	Cable, Handbrake to Rear Cable	1
8	41209	Clip, Cable to Frame	2
15		Cable, Rear Brakes (62 inch Bed) (See Page 16)	2
		Cable, Rear Brakes (76 inch Bed2) (See Page 16)	2



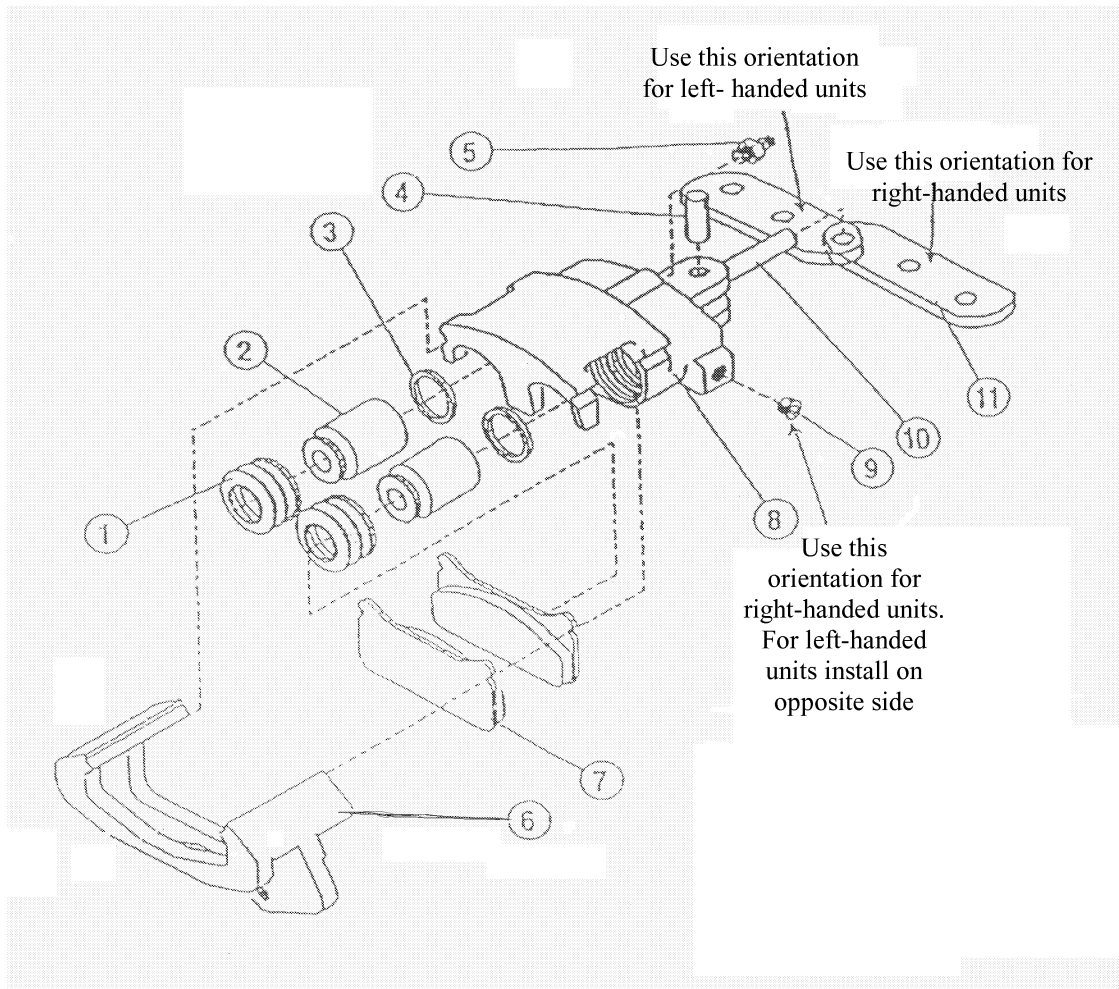
Brake - Hydraulic System

Hydraulic Disc Brake System (Vehicles July, 1994 and Newer)			
Item	Part #	Description	Qty
1	41222-00	Brake Line, 20" (Front/Rear)	4
2	9959	Clip, Hose (Hose to Frame)	4
3	41267-00	Caliper, L Front Brake	1
4	41275-00	Elbow, Male (Brake Line to Caliper)	2
5	41259-00	Master Cylinder	1
6	41221-00	Reducer, Adapter (Master Cylinder to Brake Line)	2
7	41223-00	Brake Line 6" (Master Cylinder, 2 in the Rear)	3
8	41212-00	Switch, Stoplight	1
9	41225-00	Caliper, L Rear Brake	1
10	41224-00	Connector, Brass (Brake Line to Caliper Rear)	2
11	41216-00	Hose, Brake Hydraulic	4
12	41226-00	Caliper, R Rear Brake	1
13	41210-00	Brake Line 30"	1
14	41206-00	Union, Inverted Flair (Mid, Rear)	3
15	41220-00	Brake Line 60" (XB Only)	1
	41269-00	Brake Line 51" (Normal Only)	1
16	41333-00	T-Fitting Hydraulic W/Brkt (To Stoplight Switch)	1
17	41219-00	Brake Line 10"	1
18	41268-00	Caliper, R Front Brake	1
19	41289-00	Frame, Tee w/Clip	2



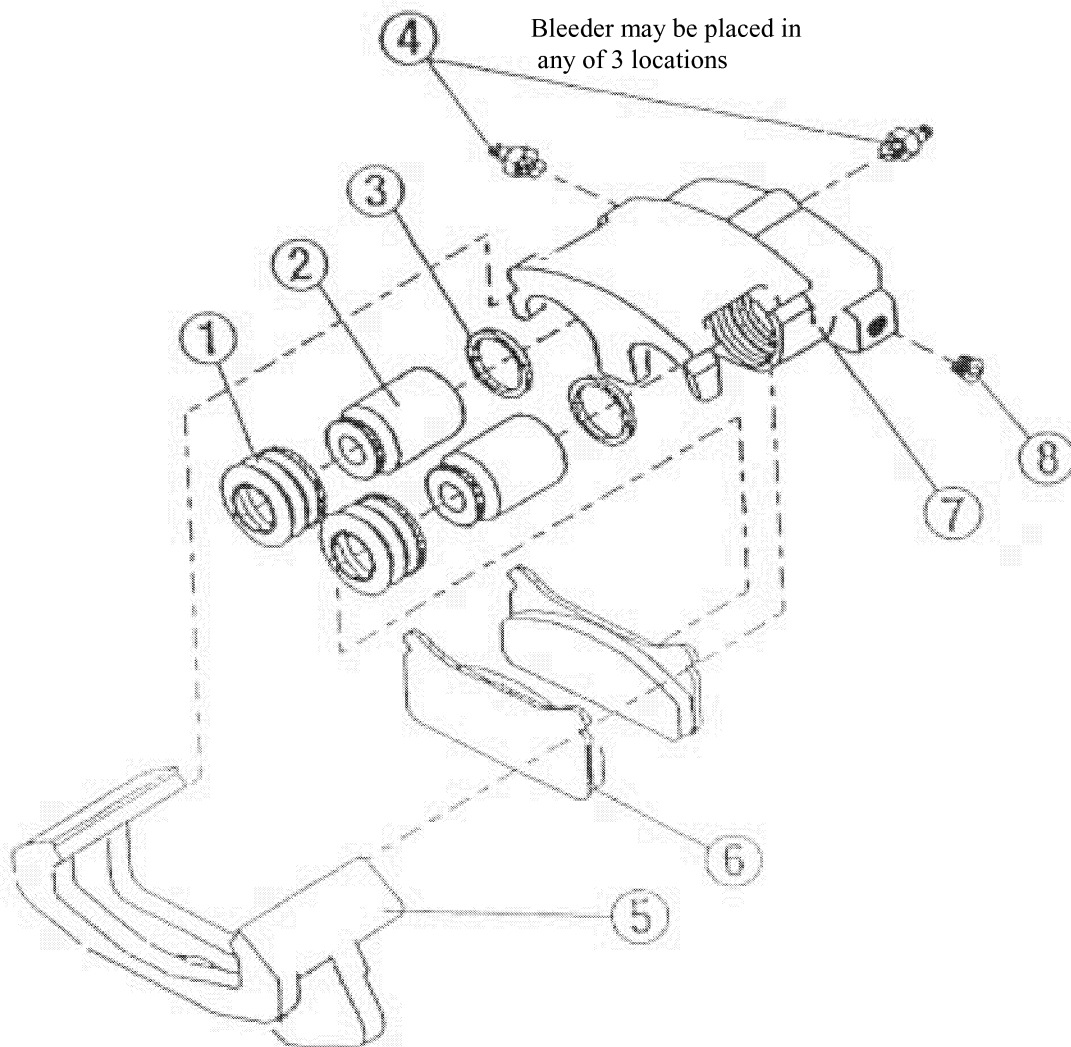
Caliper Assembly Brakes, Rear

Calipers, Rear Brake (Vehicles July, 1994 and Newer)			
Item	Part #	Description	Qty
	41225-00	Assembly, Caliper L Rear	1
	41226-00	Assembly, Caliper R Rear	1
1	41361-00	Boot, Dust	2
2	41259-00	Piston	2
3	41360-00	"O" Ring	2
4		Pin 19098	1
5	41313-00	Bleeder	1
6		Caliper Carrier, Lower	1
7	41297-00	Brake Pads	2
8		Caliper Carrier, Upper	1
9	41224-00	Connector, Male Brass	1
10		Parking Brake Actuating Pin 19078	1
11	41257-00	Lever	1



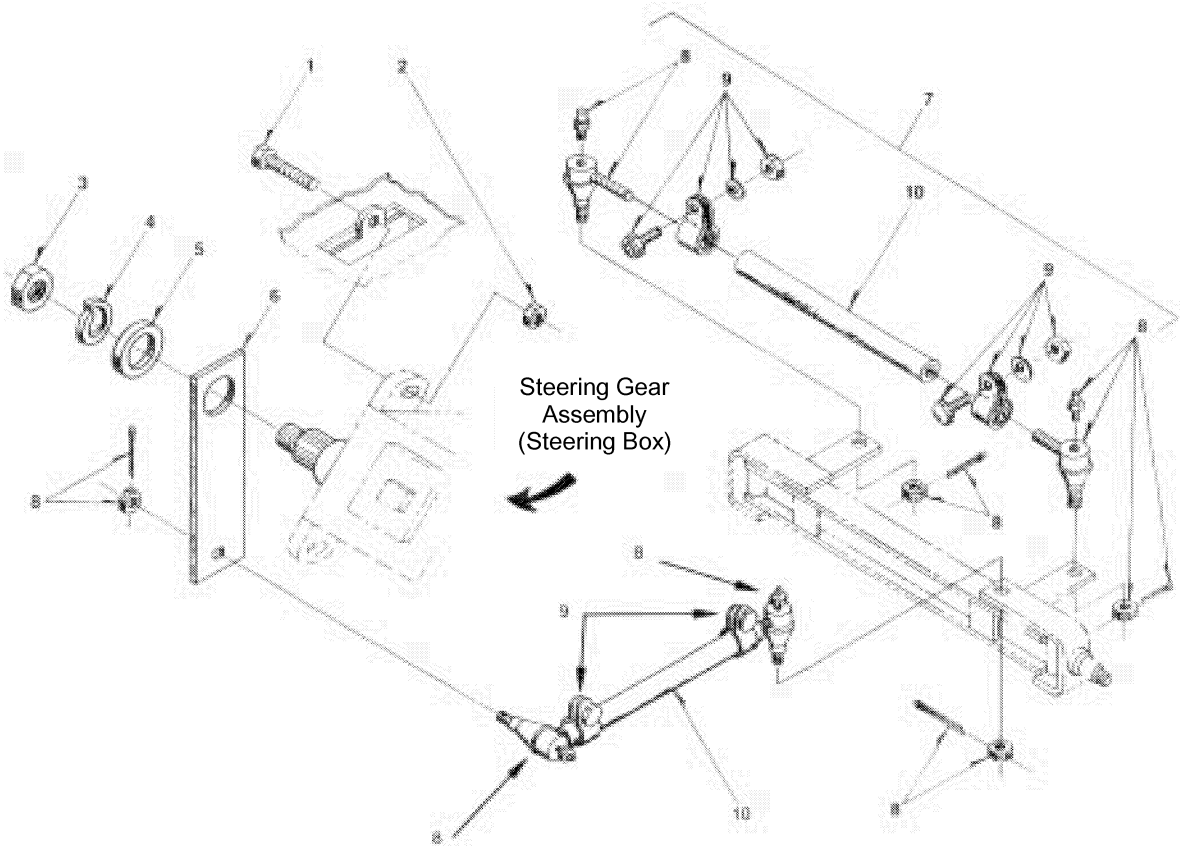
Caliper Assembly Brakes, Front

Calipers, Front Brake (Vehicles July, 1994 and Newer)			
Item	Part #	Description	Qty
	41267-00	Assembly, Caliper L Front	1
	41268-00	Assembly, Caliper R Front	1
1	41361-00	Boot, Dust	2
2	41359-00	Piston	2
3	41360-00	"O" Ring	2
4	41313-00	Bleeder	1
5		Caliper Carrier, Lower	1
6	41297-00	Brake Pads	2
7		Caliper Carrier, Upper	1
8	41224-00	Connector, Male Brass	1



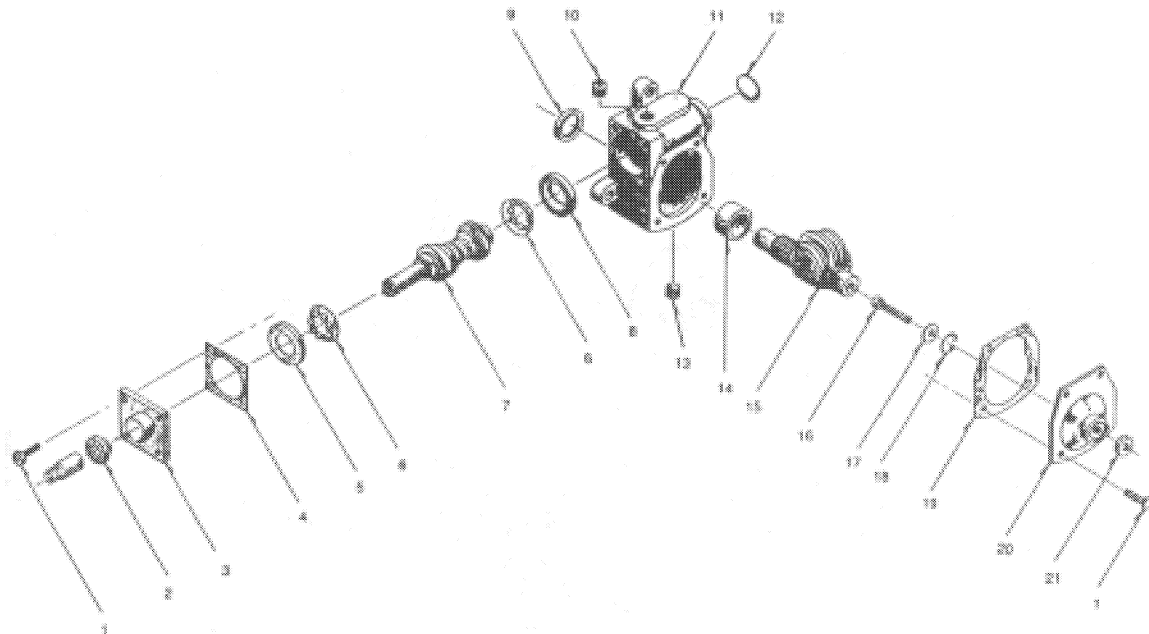
Steering Linkage

Steering Linkage			
Item	Part #	Description	Qty
1	4740-b	Bolt 7/16-14 x 1 1/2", Steering Gear Mounting	3
2	7827-W	Nut, Lock 7/16-14	3
3		Nut (Supplied with Steering Box) 01405	1
4		Washer, Lock (Supplied with Steering Box) 00756	1
5		Spacer, Pittman Arm to Shaft 11378	1
6	56817-00	Pittman Arm	1
7		Drag Link, Complete (Includes Ends & Clamps) 2523B50A04	1
8	56802-00	Tie Rod End, RH (Includes Boot, Lube Fitting, Nut, & Cotter Pin)	2
	56804-00	Tie Rod End, LH (Includes Boot, Lube Fitting, Nut, & Cotter Pin)	2
9	56847-00	Assembly, Clamp (Includes Clamp, Nut, Bolt & Washer)	4
10	56814-00	Center Tube Only	2



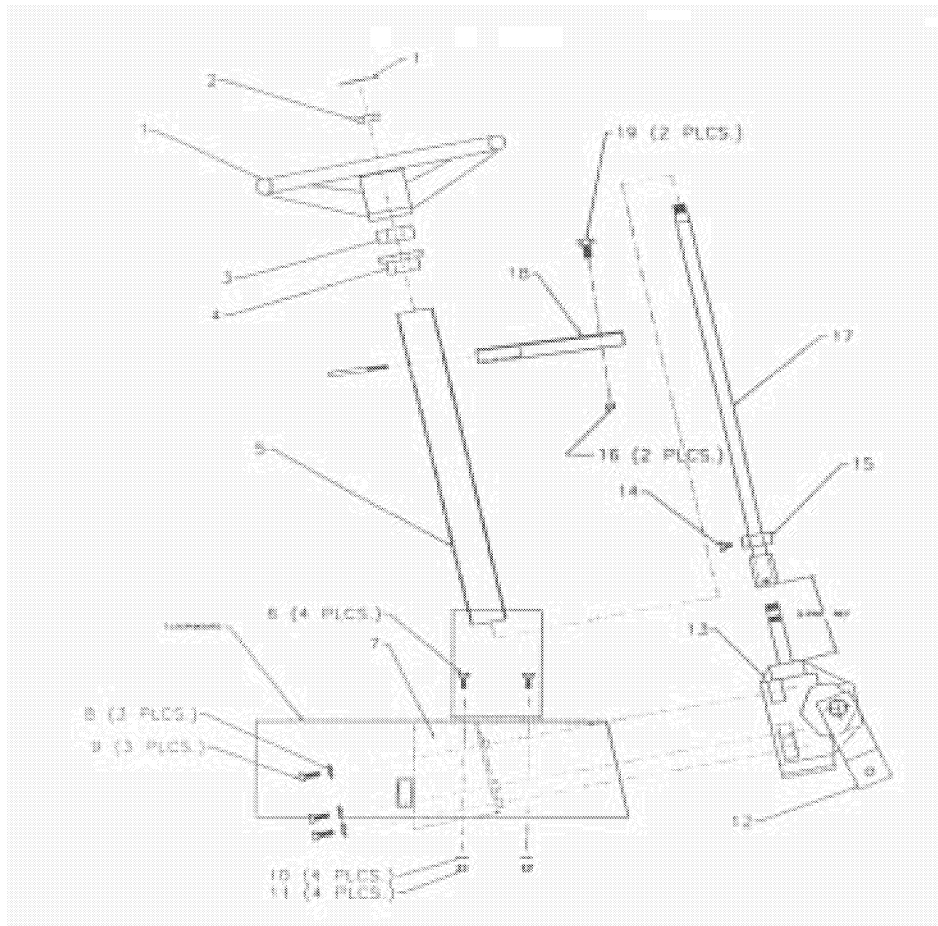
Steering Gear Assembly

Steering Gear Assembly (Steering Box)			
Item	Part #	Description	Qty
	56805-00	Assembly, Steering Gear	1
		Steering Column (See Page 23 for details)	17158 1
1		Bolt, Special	17368 8
2		Seal	18028 1
3		Cover, Worm	18038 1
4		Kit, Shim	17388 1
5		Adjuster, Ball Cap	12117 1
6		Assembly, Ball Bearing	12107 2
7		Assembly, Worm	18048 1
8		Ball Cup	12097 1
9		Seal	12207 1
10		Plug, Vent	18068 1
11		Housing	18078 1
12		Expansion Plug	18088 1
13		Plug 3/8-20. Pipe	18098 1
14		Bushing	12067 1
15		Assembly Shaft	17278 1
16		Screw, Adjustment	17308 1
17		Washer, Thrust	17318 1
18		Ring, Snap	17328 1
19		Gasket	17358 1
20		Cover, Shaft	17338 1
21		Nut, 1/2-20, Lock	01415



Steering Column

Steering Column (Vehicles July, 1994 and Newer)			
Item	Part #	Description	Qty
1	56810-00	Wheel, Steering 14", With Cap	1
2	7947-W	Nut 5/8-18	1
3	56874-00	Cover, Dust	1
4	10504	Bushing .75 ID, Plastic	1
5	56811-00	Weldment, Steering Column	1
6	2551-W	Bolt 1/4-20 x 1, Carriage	4
7	56872-00	Steering Mount, Frame Member	1
8	7039	Washer 7/16, Lock	3
9	3769	Screw, 7/16-14 x 1 1/2, Cap	3
10	6703-B	Washer 1/4	4
11	7742	Nut 1/4-20, Lock	4
12	56817-00	Pitman Arm	1
13	56805-00	Steering Gear Box	1
14	3987-BS	Screw 5/16 UNC x 3/4"	1
15	56873-00	Collar, Shaft 3/4 x 1 1/4	1
16	7778	Nut 3/8-19, Lock	2
17	56807-00	Steering Shaft 25" Long	1
18	56813-00	Support, Steering Column	1
19	2879-W	Screw 3/8-16 x 1", Cap	2



Electrical System

Electrical System (Vehicles February, 1992 and Newer)			
Item	Part #	Description	Qty
1	74891-96	Speed Controller	1
	74833-87	Speed Controller (Optional)	1
2	69764-00	Main Solenoid	1
3	69723-00	Resistor	1
4	74886-67	Diode	1
5	69768-00	Switch, Forward / Reverse	1
6	69401-00	Drive Motor	1
	69404-00	Drive Motor (Optional)	1
*	69843-00	Fuse Holder Assy (Fuse Block, Buss Bar & Terminal Fast Tab)	1
7	69700-00	Assembly, Fuse Block	1
8	69700-00	Assembly, Fuse Block	1
9	69702-00	Fuse, 30 AMP	1
10	69717-00	Fuse, 10 AMP	4
11	69811-00	Horn	1
12	69706-00	Switch, Key	1
	69799-00	Key Only	1
13	69705-00	Switch, Wiper	1
14	69705-00	Switch, Light	1
15	69731-00	Head Light	1
16		Assembly Tail Light / Stop Light 2856A27H01	2
17	69801-00	Horn Button	1
18		Electrical System, Wiper (Optional with Cab) (Includes Wiper, Motor, Switch & Harness) 2855A16G01	1
19	41212-00	Switch, Stop Light	1
20	74883-87	Pot Box (Includes Safety Switch)	1
	69742-00	Switch, Safety	1
21	69766-00	Charger Receptacle (Optional)	1
		Assembly, Lead (Charger Receptacle + To Solenoid)	1
		Assembly, Lead (Charger Receptacle - To PMC B -)	1
22	66606-00	Charger with Console (Std Bed Optional)	1
23	69743-00	Charger Console	1
24		Charger Harness 2911B94A02	1
25	69710-00	Assembly, Charger DC Plug / Lead	1
26		Wire Harness (Auxiliary Circuits) 2912B26A01	1
27		Wire Harness (Tail Lights) 2912B27A01	1
28		Assembly, Lead (Forward/Reverse J1 to Motor S1) 04BLK0950DD	1
29		Assembly, Lead (Forward/Reverse J2 to Motor S2) 04BLK0910DD	1
30		Assembly, Lead (Forward/Reverse S3 to PMC M -) 04BLK0160DD	1
31		Assembly, Lead (Forward/Reverse S4 to PMC A2) 04BLK0160DD	1
32		Assembly, Lead (Main Solenoid to PMC B +) 04BLK0090DD	1
33		Assembly, Lead (PMC A2 to Motor A2) 04BLK0910DD	1
34		Assembly, Lead (Main Solenoid to Motor A1) 04BLK0950DD	1
35		Assembly, Lead (PMC B - to Battery Negative (-) 04BLK0950DD	1
36		Assembly, Lead (Main Solenoid to Battery Positive +) 04BLK0950DD	1
37		Assembly, Lead (Battery Jumper) 04BLK0090DD	5
38	66014-84	Battery, 6 Volt, 220 Ah (STD)	6/8
	66016-96	Battery, 6 Volt, 244Ah	8
	66020-00	Battery, 8 Volt	6
39	69725-00	Switch, Toggle (Forward/Reverse)	1

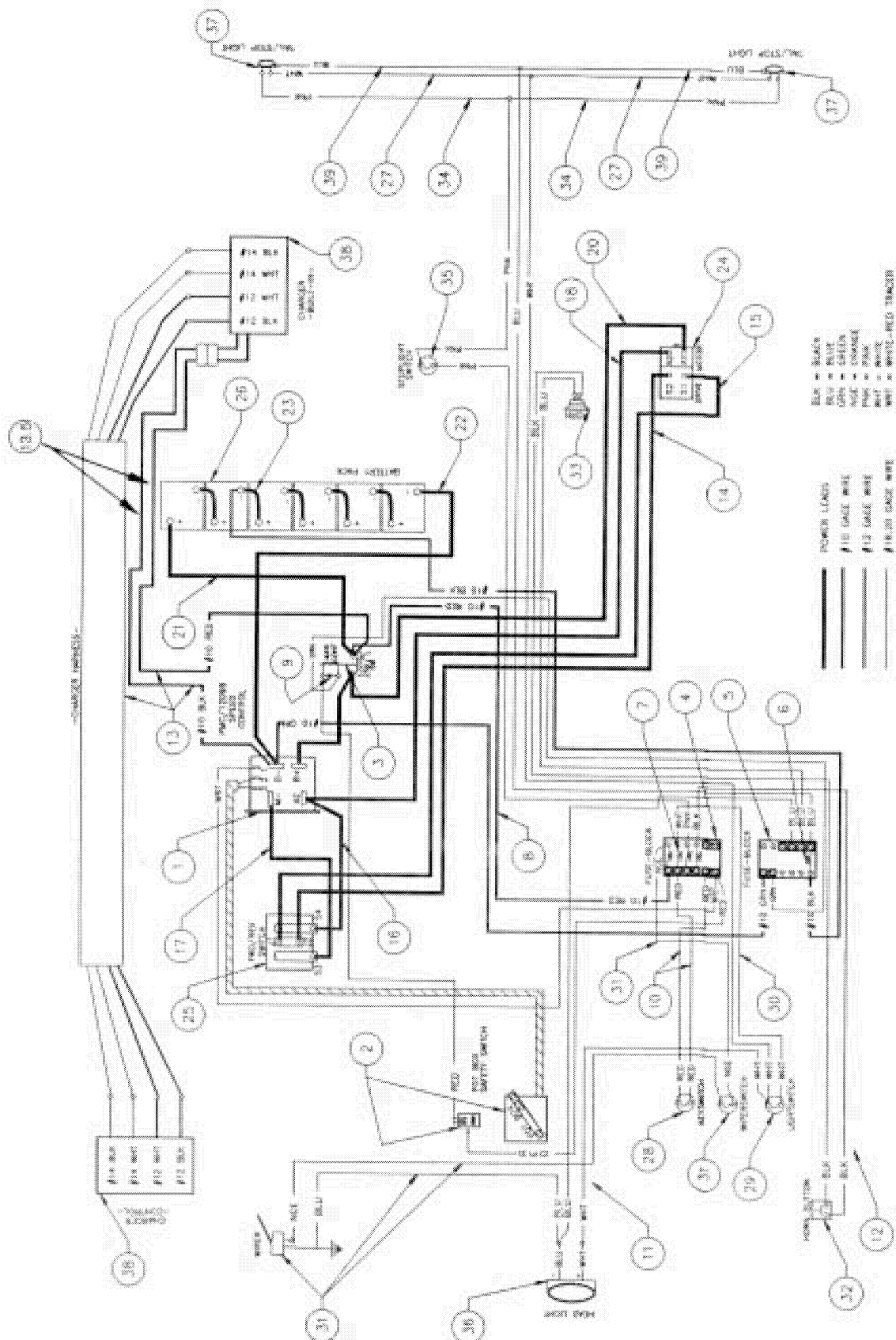


Speed Control

Speed Control -36V				
Item	Part #	Description	Qty	
			STD	XB
		Kit, Electrical System 3980C97G01	1	-
		Kit, Electrical System 3980C97G02	-	1
1	74891-96	Speed Control		
2	74882-87	Pot Box (Includes Safety Switch)	1	1
	69742-00	Safety Switch	1	1
3	69783-00	Assembly, Main Solenoid / Diode	1	1
	69764-00	Main Solenoid	1	1
*	69843-00	Fuse Holder Assy (Fuse Block, Buss Bar & Terminal Fast Tab)	1	1
4	69700-00	Fuse Block, Positive	1	1
5	69700-00	Fuse Block, Negative	1	1
6	69702-00	Fuse, 30 AMP	1	1
7	69717-00	Fuse, 10 AMP (4 th fuse for optional Wiper)	3 (4)	3 (4)
8		Lead, Main Solenoid Positive – Fuse Holder + 10RED0060BD	1	1
9		Diode 70385	1	1
10		Lead, Key Switch to Fuse Holder 16RED0060KK	2	2
11		Wire Harness, LDI/Headlight 3980C95A01	1	1
12		Wire Harness, Auxiliary Circuits 3980C47A02	1	-
		Wire Harness, Auxiliary Circuits 3980C47A01	-	1
13		Wire Harness, Charger - Controls 2911B94A02	1	-
14		Lead, Forward/Reverse, (J2 to Motor S2) 04BLK0800DD	1	-
		Lead, Forward/Reverse, (J2 to Motor S2) 04BLK0940DD	-	1
15		Lead, Forward/Reverse, (J1 to Motor S1) 04BLK0800DD	1	-
		Lead, Forward/Reverse, (J1 to Motor S1) 04BLK0940DD	-	1
16		Lead, Forward/Reverse, (S4 to PMC A2) 04BLK0140DD	1	1
17		Lead, Forward/Reverse, (S3 to PMC M -) 04BLK0140DD	1	1
18		Lead, PMC (A2 to Motor A2) 04BLK0820DD	1	-
		Lead, PMC (A2 to Motor A2) 04BLK0960DD	-	1
19		Lead, Main Solenoid (to PMC B +) 04BLK0500DD	1	1
20		Lead, Main Solenoid (to Motor A1) 04BLK0800DD	1	-
		Lead, Main Solenoid(to Motor A1) 04BLK0940DD	-	1
21		Lead, Battery Positive (+) (to Main Solenoid) 04BLK0800DD	1	-
		Lead, Battery Positive (+) (to Main Solenoid) 04BLK0940DD	-	1
22		Lead, Battery Negative (-) (to PMC B -) 04BLK0770DD	1	.*
		Lead, Battery Negative (-) (to PMC B -) 04BLK0910DD	-	1
23		Lead, Battery Jumper 04BLK0900DD	5	5
24	74264	Motor, Drive	1	1
25	69725-00	Switch, Forward/Reverse	1	1
26	66014-84	Battery (220 Ah Std)	6	6
27		Lead, Harness Auxiliary (to Tail light) 16WHT0160AA	2	2
28	69706-00	Switch Key	1	1
	69799-00	Key Only (Specify Number)	1	1
29	69705-00	Switch, Light	1	1
30		Lead, Light Switch (to Fuse Holder) 16WHT0090EE	1	1
31		Electrical System, Wiper (Optional with Cab, (Includes Wiper, Motor, Switch & Harness) 2855A16G01	1	1
32	71807-80	Button, Horn	1	1
33	69811-00	Horn	1	1
34		Lead, Auxiliary Harness (to Stop Light) 16PNK0160AA	2	2

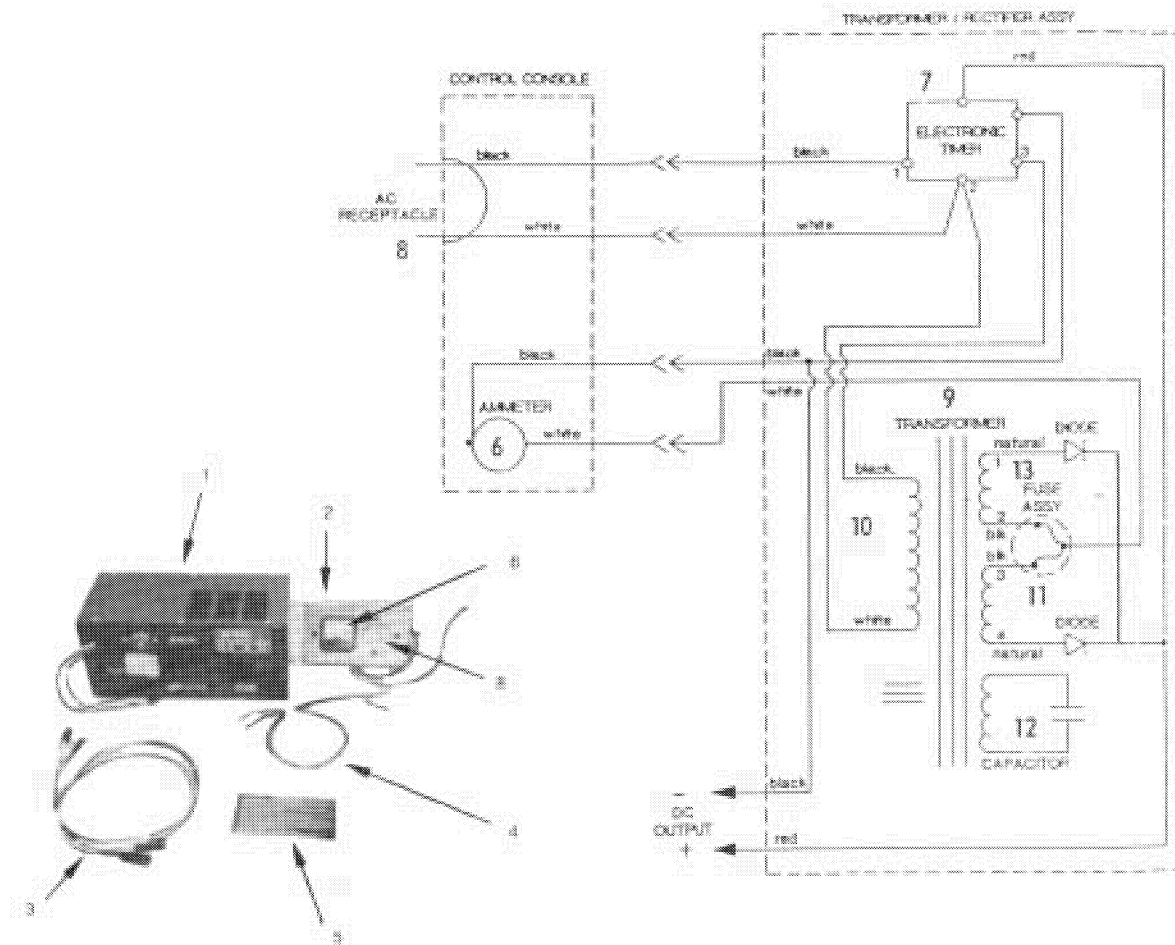
Speed Control -36V				
Item	Part #	Description	Qty	
			STD	XB
35	41212-00	Switch, Stop Light	1	1
36	69731-00	Assembly, Head Light	1	1
37		Assembly, Tail Light / Stop Light 2856A27H01	2	2
38		Charger, Built-in with Console (Std) 70898	1	1
39		Lead, Auxiliary Harness (to Tail Light) (Ground) 16BLU0200AE	2	2
40	69723-00	Resistor, 250 Ohm (SW)	1	1
41		Lead, Main Solenoid Negative (-) (to Fuse) 16GRN0180EE	1	1
42		Lead, Main Solenoid (to Safety Switch) 16RED0200EU	1	1
43		Lead,Safety Switch (to Fuse) 16RED0340KU	1	1

Speed Control (cont.)



Battery Charger

Battery Charger			
Item	Part #	Description	Qty
1	66606-00	Charger, 36 Volt, Complete (Less Wire harness)	1
2	69743-00	Control Console Only	1
3		Wire Harness (Charger to Control Console)	2911B95A02
4		Wire Harness, DC (With PMC/HDI Controller)	2911B95A03
		Wire Harness, DC (With Solenoid Controller)	2863A52A01
5	61924	Decal	1
6	69802-00	Ammeter	1
7	66610-00	Assembly, Electronic Timer	1
8	69735-00	Receptacle, AC Line Cord	1
9	66552-83	Assembly, Heat Sink (Transformer/Rectifier)	1
10		Assembly, Transformer	74984
11		Assembly, Heat Sink (with Diodes)	70295
12		Capacitor (4.0 mfd, 660Volts)	75004
13	66515-76	Assembly, Fuse	1
14		Line Cord, AC (Not Shown)	70773



Optional Items Part Lists

Cargo Retainer				
Item	Part #	Description	Qty	
			STD	XB
		Kit, Cargo Retainer 8" 2855A05G01	1	-
		Kit, Cargo Retainer 8" 2855A05G02	-	1
1		Assembly, Side Panel 2855A06A01	2	-
		Assembly, Side Panel 2855A06A02	-	2
2		Side Panel Only 2908B61H01	2	-
		Side Pane Only 2908B62H01	-	2
3		Stake Only 2855A03H01	8	8
	2871-W	Bolt 5/16-18 x 1 1/4" (Stake to Side & End Panels)	24	24
	3252	Washer, Flat 5/16 (Stake to Side & End Panels)	24	24
	7742	Washer, Lock 5/16 (Stake to Side & End Panels)	24	24
	7748-B	Nut 5/16-18 (Stake to Side & End Panels)	24	24
4		Assembly, End Panel 2855A07A01	1	1
5		End Panel Only 2908B63H01	1	1
6		Bracket (End Panel to Side Panel) 2855A04H01	2	2
	3987-BS	Bolt 5/16-18 x 3/4 (Bracket to End Panel)	6	6
	3252	Washer, Flat 5/16 (Bracket to End Panel)	6	6
	7742	Washer, Lock 5/16 (Bracket to End Panel)	6	6
	7748-B	Nut 5/16-18 (Bracket to End Panel)	6	6
7	51373-00	Stake Pocket	8	8
	2774	Bolt 1/4-20 x 5/8"	32	32
	7036-B	Washer, Lock 1/4	32	32
	7688-B	Nut 1/4-20	32	32
*	51320-00	Deckboard, Short	1	1
	51321-00	Deckboard, Long	1	1

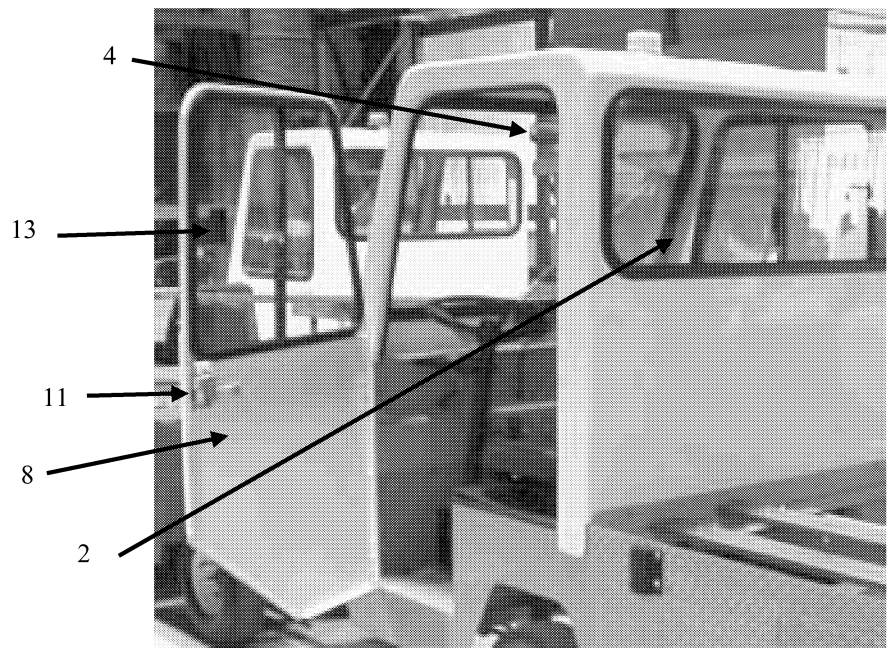
NOTE: Other cargo retainer styles may be available. Contact your local dealer.



Cab Items

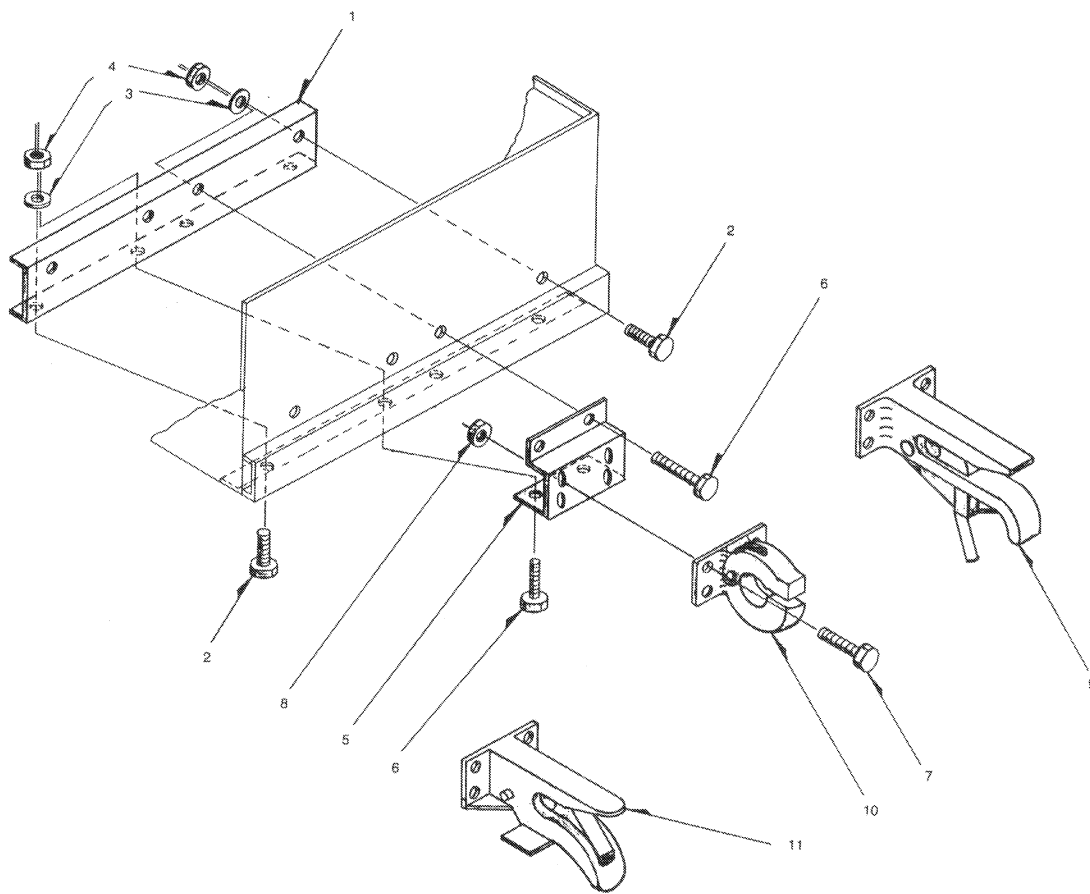
Cab Items			
Item	Part #	Description	Qty
	90122-00	Kit, Cab, Complete Fiberglass(Includes Doors & Wiper)	1
	90123-00	Cab, Complete w/o Doors	1
		Assembly, Cab Complete (Does Not Include Doors, Wiper & Protector Panel) 2859A45G01	1
	3787-B	Bolt 1/4-20 x 3/4, Cab Front (Cowl Mounting)	4
	7036-B	Washer, Flat 1/4, Cab Front (Cowl Mounting)	4
	7742	Nut 1/4-20 Lock, Cab Front (Cowl Mounting)	4
1	90118-00	Windshield	1
	8305	Rivet, Pop Black Oxide Coated (Window Mounting)	14
	6004	Washer (Window Mounting)	14
2	90117-00	Window, Rear	1
	6004	Washer (Window Mounting)	12
3	48882-ZZ	Trim (Cab Front) (Order by Foot) (Not Shown)	-
	8305	Rivet, Pop Black Oxide Coated (Window Mounting) (Trim Mounting)	2
	6004	Washer (Trim Mounting)	2
4	84120-92F	Mirror, Rear View	1
	2592	Screw, Machine 10-24 x 1/2" (Mirror Mounting)	2
	7998	Nut (Mirror Mounting)	2
5	90134-00	Panel, Protector (Rear Cab) (Not Shown)	1
	3987-BS	Bolt 5/16-18 x 3/4 (Protector Panel to Cab)	3
	4017	Bolt 5/16-18 x 1 (Panel to Cab to Frame)	5
	3252	Washer 5/16, Flat (Panel to Cab to Frame)	8
	7739	Nut 5/16-18, Lock(Panel to Cab to Frame)	8
6	90132-00	Trim, Door Opening, LH) (Not Shown)	1
	90133-00	Trim, Door Opening, RH) (Not Shown)	1
	8305	Rivet, Pop Black Oxide Coated (Window Mounting)Trim Mounting	26
	6004	Washer (Trim Mounting)	26
7	60046	Weather-strip, Door Opening (Order by Foot)	-
8	90125-00	Assembly, Door Complete LH	1
	90124-00	Assembly, Door LH (Does not include Latch, Hinges & Window)	1
9	90127-00	Assembly, Door Complete RH	1
	90126-00	Assembly, Door RH (Does not include Latch, Hinges & Window)	1
10	51355-00	Door, Handle, Outer	2
	2592	Screw, Machine 10-24 x 1/2"	4
	7118	Washer, Lock Shakeproof #4	4
11	20933	Door Handle/Latch LH	1
	20943	Door Handle/Latch RH	1
	2530	Screw, Inside Door Handle/Latch Mounting	8
	11742	Nut, Tinnerman (Inside Door Handle/Latch Mounting)	8
12	10653-00	Hinge, Cab Door	4
	3767-B	Bolt 1/4-20 x 5/8 (Hinge to Door & Hinge to Cowl)	24
	6031	Washer #10, Flat (Hinge to Door)	12
	7036-B	Washer 1/4, Flat(Hinge to Cowl)	12
	7036-B	Washer 1/4, Lock (Hinge to Door & Hinge to Cowl)	24
	7688-B	Nut 1/4-20 Hex (Hinge to Door & Hinge to Cowl)	24
13	61266	Assembly, Door Window LH	1
14	61276	Assembly, Door Window RH	1
	2532	Screw, Sheet Metal (Window Mounting)	24

Cab Items			
Item	Part #	Description	Qty
15	84114-92	Wiper, Arm Adjustable (Option)	1
16	84113-92	Wiper, Blade 18" (Option)	1
17	84111-92	Wiper Motor 2" 12V (Option - Not Shown)	1
18	90131-00	Striker Plate, Cab Door (Not Shown)	2
	74131-00	Kit, Burden Carrier Dome Light	1
	2602	Screw, Machine 10-24 x 1/4" Plate Mounting	4
	1005	Screw, Striker Plate Mounting	2
	7998	Nut, Striker Plate Mounting	6



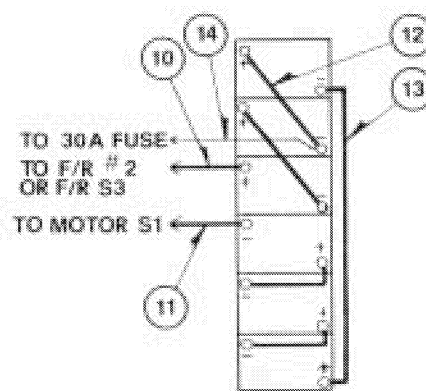
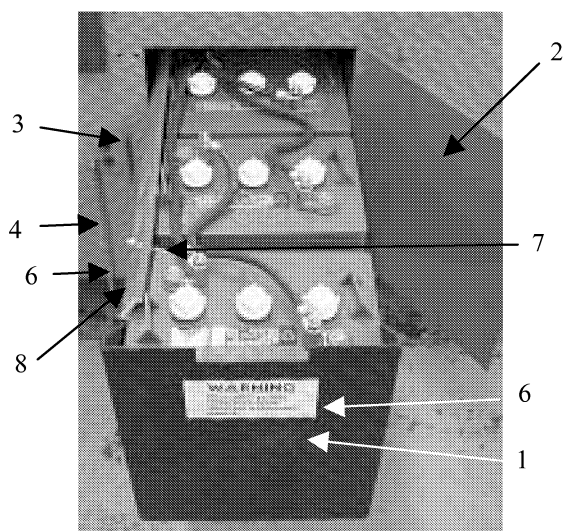
Options (cont.)

Hitches			
Item	Part #	Description	Qty
	57318-00	Kit, Pintle Hitch	
		Kit, hitch Mounting (Does not include Hitch) 2854A20G01	1
1	57307-00	Reinforcing Bracket	1
2	2879-W	Bolt 3/8-16 x 1"	4
3	7119	Washer, Flat 3/8	8
4	7778	Nut 3/8-16, Lock	8
5	57308-00	Hitch Mounting Bracket	1
6	4716-w	Bolt 3/8-16 x 1 1/4	4
7	4010	Bolt 1/2-20 x 1 1/4	4
8		Nut 1/2-20, Lock 00345	4
9	14388	Hitch, Automatic type (To 26,000 lbs.)	1
10	57315-96	Hitch, Pintle Type (Harval #T60AL)(Aerol #82003)	1
11	12598	Hitch, Automatic Type (To 10,000 lbs.)	1



Options (cont.)

Battery Push-Pull Kit				
Item	Part #	Description	Qty	
			STD	XB
	51357-00	Kit, Push-Pull Battery Box	-	1
		Kit, Push-Pull 36 Volt, Complete 2908B85G02	1	-
1	51358-00	Assembly, Box Push-Pull	1	1
2	51362-00	Assembly, Door (1 Each Side)	2	2
	51360-00	Door, Push-Pull	1	1
	51361-00	Hinge, Push-Pull	1	1
	8211	Rivet (Body to Door)	2	2
	3787-B	Bolt (Body to Door)	4	4
	1013	Washer (Body to Door)	4	4
	7688-B	Nut (Body to Door)	4	4
3		Assembly, Latch 2856A15H01	2	2
	3787-B	Bolt (Latch to Body)	4	4
	2551-W	Bolt (Chain to Latch to Body)	2	2
	6031	Washer (Chain to Latch to Body)	2	2
	7036-B	Washer(Latch to Body)	4	4
	7688-B	Nut (Latch to Body)	6	6
4		Chain 2856A59H01	2	2
5	314	Assembly, Latch Pin for Push-Pull Kits	2	2
6	60824	Decal "WARNING Disconnect Batteries"	4	4
7	66561-90	Rod 5/16-18, Battery Hold-Down	2	2
	3252	Washer 5/16, Flat, Battery Hold-Down	2	2
	7739	Nut 5/16-18, Lock, Battery Hold-Down	2	2
8	66605-00	Retainer, Battery	1	1
9	9090	Roller, 1 1/4 (Not Shown)	4	4
	6005	Washer / Spacer Cut 1/2	8	8
10		Lead Assembly, Battery Positive (+) (Forward/Reverse Control) 04BLK0680DD	-	1
		Lead Assembly, Battery Positive (+) (Forward/Reverse Control) 04BLK0540DD	1	-
11		Lead Assembly, Battery Negative (-) (To Motor S1) 04BLK0720DD	1	1
12		Lead Assembly, Jumper 04BLK0130DD	2	2
13		Lead Assembly, Jumper 04BLK0430DD	1	1
14		Lead Assembly, Battery Negative (-) (To 12 Volt) 10BLK0430DD	1	1
15	66605-00	Wire Protector (Not Shown)	1	1



Push-Pull Battery Wiring Diagram

CHAPTER 5

Appendices	Page #
Appendix E Forward & Reverse 36V Electrical Troubleshooting Guide	2
Appendix F Solid State Speed Control Troubleshooting Guide	3

Forward & Reverse 36 Volt Electric Troubleshooting Guide

TROUBLESHOOTING GUIDE	
Vehicle Reaction	Check or Replace
Vehicle will not move	Turn on Key Switch
	Put Toggle Switch in Direction
Key Switch Is on and Toggle Switch is in Direction, Vehicle will Not Move Either Forward or Reverse	Key Switch
	Toggle Switch
	Check Wire Connection
	Speed Control Unit
Vehicle Will Move Only Forward	Check Wire Connections
	Toggle Switch
	Forward Solenoid
Vehicle Will Move Only Reverse	Check Wire Connections
	Toggle Switch
	Reverse Solenoid
If these test procedures do not resolve your vehicle problem, contact your Columbia Industrial Vehicle Dealer for service.	

Solid State Speed Control Troubleshooting Flow chart



WARNING: Before beginning to test the vehicle, securely support the vehicle upon jack stands (with the rear wheels off of the ground) to prevent the vehicle from moving and causing accident, injury, or possible death.

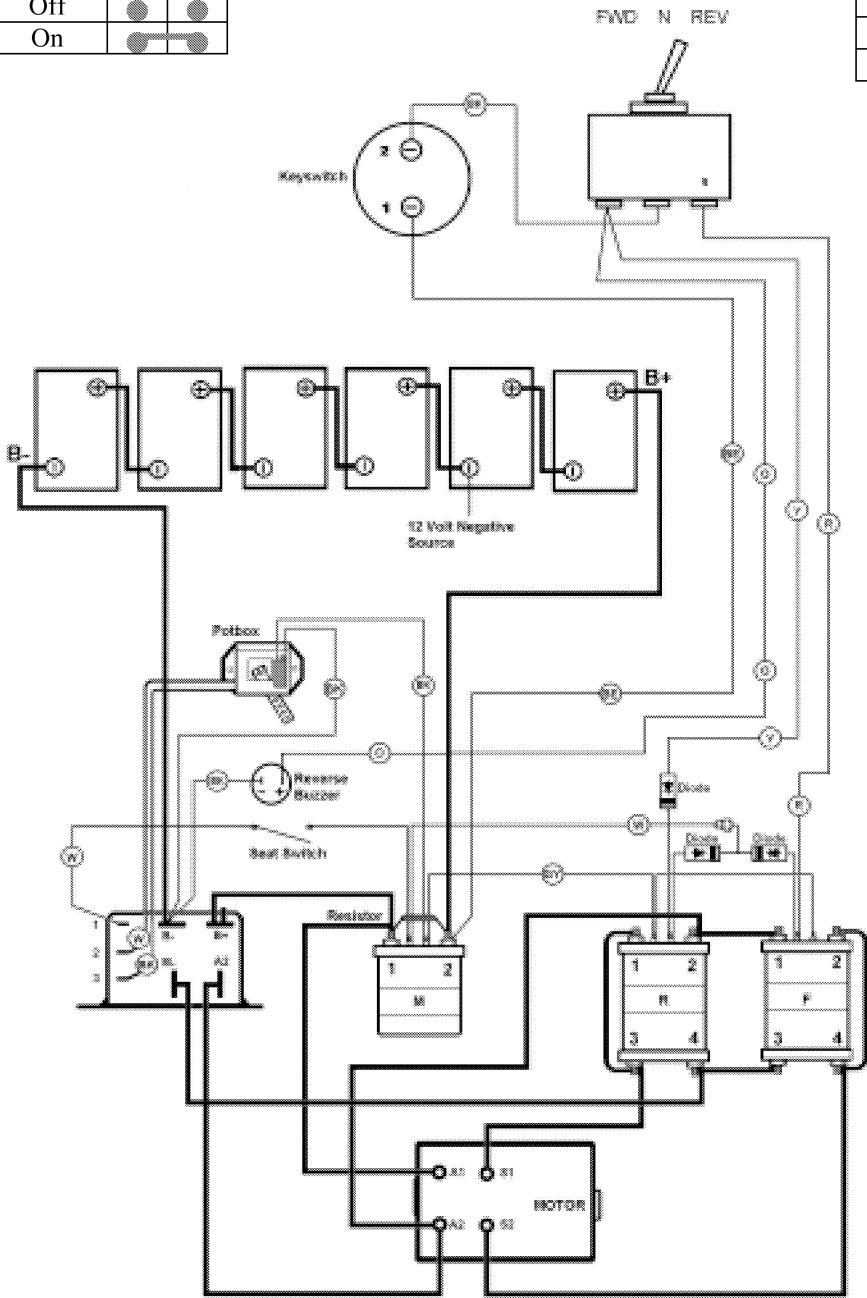
Testing Battery Circuit				
Key switch off				
Test	Result	If no	If yes	
Check battery voltage (Battery B+ and Controller B- terminals)	Proper system voltage (36 or 48 volts)	Discharged, miswired, or defective batteries	Continue to next step	
Check voltage at controller (B+ and B- terminals)	One to five volts <u>less</u> than battery voltage (36 or 48 volts)	If high: welded 4 terminal solenoid	Battery circuit ok	
		If low: bad 250-ohm resistor		
Testing Control Wiring				
Key switch in forward or reverse, press accelerator until solenoids "click"				
Test	Result	If no	If yes	
Check F&R solenoids for voltage at small terminals of each	If in forward; battery voltage (36 or 48 volts) at F solenoid, not at R solenoid	If full battery voltage at both F & R solenoid terminals, shorted diode	Continue to next test	
		If no voltage at F&R solenoid terminals, check key switch, diodes fuses, and switch wiring		
	If in reverse; battery voltage (36 or 48 volts) at R solenoid, not at F solenoid	If full battery voltage at both F & R solenoid terminals, shorted diode		
		If no voltage at F&R solenoid terminals, check key switch and switch wiring		
Check 4 terminal solenoid for voltage at Two small terminals	Full battery voltage (36 or 48 volts)	Defective accelerator micro switch, diode, key switch, or control circuit wiring	Continue to next test	
Check voltage at controler terminal #1 to B-	Full battery voltage (36 or 48 volts)	Defective wiring from 4 terminal solenoid to # 1 terminal	Control wiring ok	

Testing Speed switch (Pot box)			
Key switch off, remove switch wires from controller (#2 and#3 terminals)			
Test	Result	If no	If yes
Check resistance at Speed Switch wires where (disconnected from controller)	0 to 50 OHMS	Speed switch out of adjustment, defective, or broken lead wire	Continue to next test
Test	Result	If no	If yes
Depress accelerator pedal, checking resistance at Speed Switch wires (Disconnected from controller)	Resistance rises without indication of 'dead spots' in range of travel	Speed switch(Pot Box) out of adjustment, defective, or shorted lead wires	Continue to next test
	Resistance rises to 4500 to 5500 OHMS,		
Release accelerator pedal, check resistance from speed switch wires to frame	At least 1 MEG OHM minimum	If lower than 1 megohm, speed switch or wires are defective.	Speed switch ok
Check voltage from B-terminal to terminal 2	Pedal up, should be 3.6 to 4.2 volts	Acid contamination of terminals, shorted or damaged pot box	Speed switch ok
	Pedal down, should be 9.1 to 10.3 volts		
Testing controller output			
Key switch in direction being tested (forward or reverse)			
Test	Result	If no	If yes
Check voltage from B+ terminal to M- terminal	Pedal up, volts less than full battery voltage	Bad controller	Continue to next test
	Pedal down, volts = full battery voltage		
With a current tester, test for current passing through the M- cable	Current should be present	If no current flows; open circuit in F&R contactors, motor (field or armature), or motor circuit wiring	Ok
		If current flows; but motor does not turn, shorted F & R solenoids, motor, or bad controller	

MOTOR & CONTROL DIAGNOSTICS DIAGRAM

Key Switch Connection		
Position	1	2
Off	<div></div>	<div></div>
On	<div></div>	<div></div>

Electrical Shift Switch Connection			
Position	1	2	3
Forward	<div></div>	<div></div>	<div></div>
Neutral	<div></div>	<div></div>	<div></div>
Reverse	<div></div>	<div></div>	<div></div>



COLOR CODE	
R	- RED
O	- ORANGE
Y	- YELLOW
W	- WHITE
BE	- BLUE
BK	- BLACK
GY	- GRAY
All Unspecified Cables are Black	



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