

# UpRight

---



***AB46 Electric  
& Bi-Energy***

**WORK PLATFORMS  
EUROPEAN SPECIFICATIONS**

**Service &  
Parts Manual**

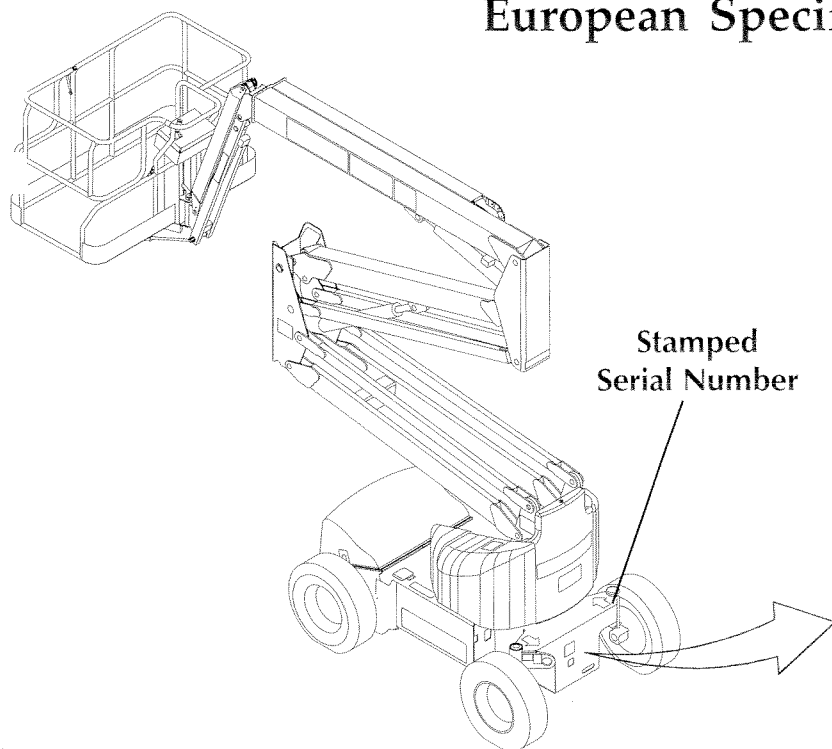
# SERVICE & PARTS MANUAL

## AB46

### Electric and Bi Energy Models

Serial Numbers 1000 to current

European Specification



When contacting UpRight for service or parts information, be sure to include the MODEL and SERIAL NUMBERS from the equipment nameplate. Should the nameplate be missing the SERIAL NUMBER is also stamped on top of the chassis above the front axle pivot.

| UpRight Inc.  |                      |
|---|----------------------|
| 1775 PARK ST. SELMA CALIFORNIA 93662 USA  |                      |
| Model: _____  | Serial number: _____ |
| GVW: _____ lbs. _____ kg.   | Mfg. date: _____     |
| Maximum allowable incline of machine when elevated: _____ deg.                      |                      |
| Occupants and equipment must not exceed the rated maximum load: _____ lbs. _____ kg |                      |
| Maximum platform occupants: _____   |                      |
| Maximum allowable side force on platform: _____ lbs. _____ N                        |                      |
| Maximum platform height: _____ ft. _____ m  |                      |
| Maximum platform reach: _____ ft. _____ m   |                      |
| Maximum allowable wind speed: _____ mph _____ km/h                                  |                      |
| Maximum hydraulic system pressure: _____ psi _____ bar                              |                      |
| Maximum system voltage: _____ vdc   |                      |
| This machine is manufactured to comply with ANSI A92.5-1992.                        |                      |
| CAUTION: CONSULT OPERATOR'S MANUAL BEFORE USE.                                      |                      |
| THIS PLATFORM IS NOT ELECTRICALLY INSULATED   |                      |

# UpRight

UpRight Ireland, Ltd.  
Pottery Road  
Dun Laoire  
Ireland  
TEL: +353-1-202-4100  
FAX: +353-1-202-4105

UpRight, Inc.  
1775 Park Street  
Selma, California 93662  
TEL: 209/891-5200  
FAX: 209/896-9012  
PARTS: 1-888-UR-PARTS  
PARTSFAX: 209/896-9244

068343-020

068343-020 9805 .5 D



# Forward

## Introduction

### HOW TO USE THIS MANUAL

This manual is divided into 6 sections. The right hand pages of each section is marked with a black tab that lines up with one of the thumb index tabs on the right side of this page. You can quickly find each section without looking through the table of contents which follows this page. The section number printed at the top corner of each page can also be used as a quick reference guide.

### SPECIAL INFORMATION



#### **DANGER**



Indicates the hazard or unsafe practice *will* result in severe injury or death.



#### **WARNING**



Indicates the hazard or unsafe practice *could* result in severe injury or death.



#### **CAUTION**



Indicates the hazard or unsafe practice could result in *minor* injury or property damage.

NOTES: Give helpful information.

### WORKSHOP PROCEDURES

**CAUTION:** Detailed descriptions of standard workshop procedures, safety principles and service operations are not included. Please note that this manual does contain warnings and cautions against some specific service methods which could cause personal injury, or could damage a machine or make it unsafe. Please understand that these warnings cannot cover all conceivable ways in which service, whether or not recommended by UpRight, Inc., might be done, or of the possible hazardous consequences of each conceivable way, nor could UpRight Inc. investigate all such ways. Anyone using service procedures or tools, whether or not recommended by UpRight Inc., must satisfy themselves thoroughly that neither personal safety nor machine safety will be jeopardized.

All information contained in this manual is based on the latest product information available at the time of printing. We reserve the right to make changes at any time without notice. No part of this publication may be reproduced, stored in retrieval system, or transmitted, in any form by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of the publisher. This includes text, figures and tables.

AB46 Work Platform

## Introduction & Specifications

General description and machine specifications.

1.0

## Operation

Operating instructions and safety rules.

2.0

## Maintenance

Preventative maintenance and service information.

3.0

## Troubleshooting

Causes and solutions to typical problems.

4.0

## Schematics

Schematics and valve block diagram with description and location of components.

5.0

## Illustrated Parts Breakdown

Complete parts lists with illustrations.

6.0



# Forward

## *NOTES*

## 1.0 Introduction

### PURPOSE

The purpose of this service and parts manual is to provide instructions and illustrations for the operation and maintenance of the AB 46 Work Platform manufactured by UpRight, Inc. of Selma, California.

### SCOPE

The manual includes procedures for proper operation, maintenance, adjustment, and repair of this product as well as recommended maintenance schedules and troubleshooting.

## 1.1 General Description

The AB46 Work Platform consists of the platform, controller, elevating assembly, power module, control module, and chassis.

### Platform

The platform has a reinforced steel floor, 43.5 inch (1.11 m) high guardrails with midrail, 6 inch (152 mm) toeboards and an entrance gate at the side of the platform.



### WARNING



**DO NOT** use the maintenance platform without guardrails properly assembled and in place.

### Platform Controller

The platform controller contains the controls to operate the machine. It is located at the front of the platform cage. The foot switch must be depressed to operate any function from the platform. A complete explanation of control functions can be found in *Section 2*.

### Elevating Assembly

The platform is raised and lowered by the elevating assembly; an articulated boom powered by two single stage lift cylinders. The hydraulic pump, driven by the batteries, powers the cylinders. Solenoid operated valves control raising and lowering.

### Chassis

The chassis is a structural frame that supports all the components of the AB46 Work Platform. It contains the engine (BiEnergy models), batteries, hydraulic power unit, and electric drive motors.

### PURPOSE OF EQUIPMENT

The objective of the AB46 Work Platform is to provide a quickly deployable, self propelled, variable height work platform to elevate personnel and materials to overhead work areas.

### SPECIAL LIMITATIONS

Travel with the platform raised is limited to a creep speed range.

The machine will not travel when the platform is raised above eight meters (26.2 ft.).

Elevating of the Work Platform is limited to firm, level surfaces **only**. Any degree of slope greater than 5° will sound a warning alarm when machine is elevated. If machine is lowered, a light will illuminate on platform control box.

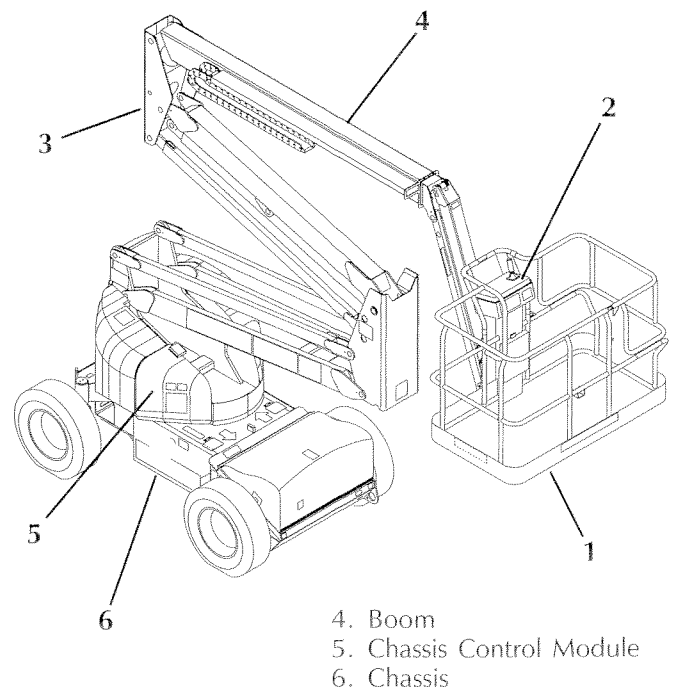


### DANGER



The elevating function shall **ONLY** be used when the work platform is level and on a firm surface. The work platform is **NOT** intended to be driven over uneven, rough or soft terrain when elevated.

1. Platform
2. Platform Controller Assembly
3. Elevating Assembly



4. Boom
5. Chassis Control Module
6. Chassis

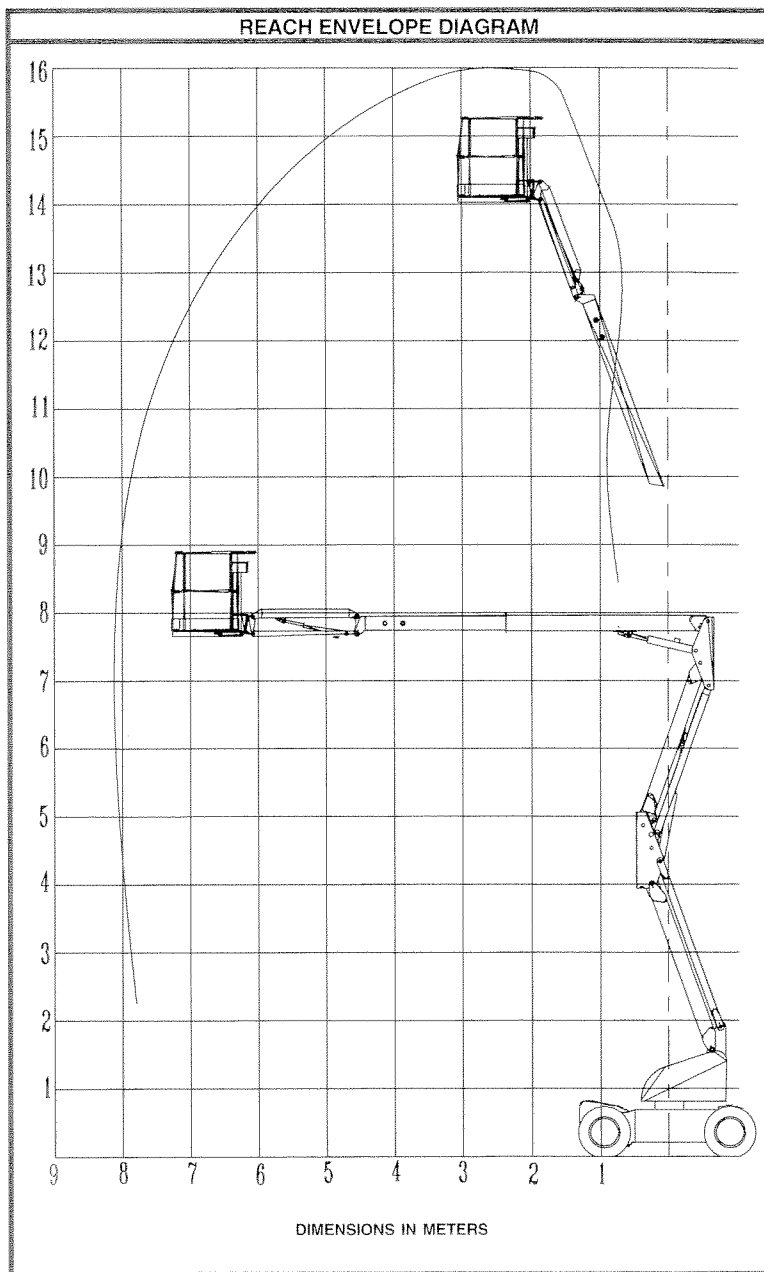
Figure 1-1: AB46 Work Platform

# Introduction & Specifications

## 1.2 Specifications

Table 1-1: Specifications

| ITEM                       | SPECIFICATION  |
|----------------------------|--|
| Height                     |  |
| Working height maximum     | 15.8 m [52 ft.]  |
| Platform height maximum    | 13.98 m [46 ft.]   |
| Platform step in height    | 22.86 cm [9 in.]   |
| Up and over height         | 7.6 m [25 ft.]   |
| Drivable height            | 13.98 m [46 ft.]   |
| Horizontal outreach        | 7.44 m [24 ft. 6 in.]  |
| Turret rotation            | 360 deg. non-continuous  |
| Platform rotation          | 160 deg.   |
| Tail swing                 | None   |
| Jib length                 | 1.52 m [5 ft.]   |
| Jib arc                    | 140 deg.   |
| Inside turning radius      | .61 m [2 ft.]  |
| Outside turning radius     | 2.98 m [9 ft. 10 in.]  |
| Drive speed (lowered)      | 5.63 kph [3.5 mph]   |
| Drive speed (elevated)     | .55 kph [.34 mph]  |
| Gradeability               | 30% / 16.7°  |
| Dimensions (boom stowed)   |  |
| Platform Size              | 1.75 m x .99 m [69 in. x 39 in.]   |
| Guardrail height           | 1.10 m [43 1/2 in.]  |
| Toeboards                  | 15.24 cm [6 in.]   |
| Maximum platform capacity  | 226.8 kg [500 lbs.]  |
| Maximum no. of occupants   | 2  |
| Weight                     | 6486.4 kg [14,300 lbs.]  |
| Overall height             | 1.97 m [6 ft 6 in.]  |
| Overall length             | 5.41 m [17 ft. 10 in.]   |
| Overall width              | 1.75 m [5 ft. 9 in.]   |
| Wheel base                 | 1.85 m [73 in.]  |
| Wheel track                | 1.5 m [59 in.]   |
| Ground Clearance           | 15.24 cm [6 in.]   |
| Power source               | Eight 6V, 350 AH Batteries<br>One Kubota 12 HP Diesel<br>(BiEnergy models) |
| System voltage             | 48VDC  |
| Maximum Hyd. Pressure      | 172.4 bar [2500 psi]   |
| Controls                   | Electric Proportional  |
| Tires                      | 9.5x16.5 10 ply highway tread  |
| Fuel tank - BiEnergy model | 30 l [8 US gal.]   |
| Generator output-BiE model | 85amps   |
| Charger output             | 40 amps  |
| Hydraulic tank             | 22.7 l [6 US gal.]   |
| Maximum Drivable Height    | 8 m [26.2 ft.]   |



\* Specifications subject to change without notice.

Meets or exceeds all applicable requirements of OSHA and ANSI A92.5-1992

# Contents

## Table of Contents

| Section No.                                  | Page No. | Section No.  | Page No. |
|--|----------|--|----------|
| <b>1.0 Introduction &amp; Specifications</b> |          |  |          |
| 1.0 Introduction .....                       | 1-1      | 3.1 Preventative Maintenance .....                 | 3-1      |
| Purpose .....                                | 1-1      | Preventative Maintenance Table Key .....           | 3-2      |
| Scope .....                                  | 1-1      | 3.2 Blocking Elevating Assembly .....              | 3-3      |
| 1.1 General Description .....                | 1-1      | Installation .....                                 | 3-3      |
| Platform .....                               | 1-1      | Removal .....                                      | 3-3      |
| Controller .....                             | 1-1      | 3.3 Battery Maintenance .....                      | 3-4      |
| Elevating Assembly .....                     | 1-1      | Battery Inspection and Cleaning .....              | 3-4      |
| Chassis .....                                | 1-1      | Battery Charging .....                             | 3-4      |
| Purpose of Equipment .....                   | 1-1      | 3.4 Lubrication .....                              | 3-5      |
| Special Limitations .....                    | 1-1      | Grease Fittings .....                              | 3-5      |
| 1.2 Specifications .....                     | 1-2      | Hydraulic Oil and Filter .....                     | 3-5      |
|  |          | Fluid Level .....                                  | 3-5      |
| <b>2.0 Operation</b>                         |          | Oil and Filter Replacement .....                   | 3-5      |
| Safety Rules .....                           | 2-1      | Torque Hubs .....                                  | 3-6      |
| 2.1 Introduction .....                       | 2-2      | 3.5 Setting Hydraulic Pressures .....              | 3-7      |
| Pre-Operation and Safety Inspection .....    | 2-2      | High Relief Valve .....                            | 3-7      |
| System Function Inspection .....             | 2-2      | Low Relief Valve .....                             | 3-7      |
| Controls and Indicators .....                | 2-3      | Counterbalance Valves .....                        | 3-7      |
| Operation .....                              | 2-4      | 3.6 Proportional Controller .....                  | 3-8      |
| Emergency Stop .....                         | 2-4      | Joystick Handle .....                              | 3-8      |
| Service Horn .....                           | 2-4      | Proportional Control Adjustment .....              | 3-8      |
| Driving .....                                | 2-5      | Rotary Control for Boom Functions .....            | 3-9      |
| With Boom Lowered .....                      | 2-5      | Drive Control .....                                | 3-9      |
| With Boom Elevated .....                     | 2-5      | Platform Down Limit Switch .....                   | 3-9      |
| Steering .....                               | 2-5      | Tilt Sensor .....                                  | 3-9      |
| Positioning The Platform .....               | 2-5      | 3.7 Hydraulic Manifold .....                       | 3-10     |
| Multifunction Controls .....                 | 2-5      | Removal .....                                      | 3-10     |
| Lower Controls Operation .....               | 2-5      | Disassembly .....                                  | 3-10     |
| Leveling the Platform .....                  | 2-6      | Cleaning and Inspection .....                      | 3-10     |
| Rotating the Turret .....                    | 2-6      | Assembly .....                                     | 3-10     |
| Elevating the Riser .....                    | 2-6      | Installation .....                                 | 3-10     |
| Elevating the Upper Boom .....               | 2-6      | 3.8 Hydraulic Power Unit .....                     | 3-12     |
| Extending the Upper Boom .....               | 2-6      | Removal .....                                      | 3-12     |
| Elevating the Jib .....                      | 2-6      | Installation .....                                 | 3-12     |
| Rotating the Platform .....                  | 2-6      | 3.9 Hydraulic Brakes, Drive Motors, And Hubs ..... | 3-12     |
| Emergency Operation .....                    | 2-7      | Removal .....                                      | 3-12     |
| Lowering Elevating Assembly .....            | 2-7      | Seal Replacement .....                             | 3-13     |
| Rotating Turret .....                        | 2-7      | Installation .....                                 | 3-13     |
| Emergency Towing .....                       | 2-7      | 3.10 Electric Motors .....                         | 3-14     |
| After Use Each Day .....                     | 2-7      | Drive Motors .....                                 | 3-12     |
| Battery Charging .....                       | 2-7      | Removal .....                                      | 3-14     |
| Transportation .....                         | 2-8      | Installation .....                                 | 3-14     |
| By Crane .....                               | 2-8      | Pump Motor .....                                   | 3-14     |
| By Truck or Trailer .....                    | 2-8      | Removal .....                                      | 3-14     |
| Maintenance .....                            | 2-9      | Installation .....                                 | 3-14     |
| Tires .....                                  | 2-9      | Drive Motor Brushes .....                          | 3-14     |
| Battery Charging .....                       | 2-9      | 3.11 Front Wheel Bearings .....                    | 3-15     |
| Battery Maintenance .....                    | 2-9      | Removal .....                                      | 3-15     |
| Hydraulic Oil .....                          | 2-9      | Installation .....                                 | 3-15     |
| Lubrication .....                            | 2-9      | 3.12 Torque Hub .....                              | 3-16     |
|  |          | Removal .....                                      | 3-16     |
| <b>3.0 Maintenance</b>                       |          | Installation .....                                 | 3-16     |
| 3.0 Introduction .....                       | 3-1      | Seal Replacement .....                             | 3-17     |
| Terminology .....                            | 3-1      | Roll and Leak Testing .....                        | 3-17     |
| Date Code Identification on Hoses .....      | 3-1      | Roll Test .....                                    | 3-17     |
| Lower Control Box .....                      | 3-1      | Leak Test .....                                    | 3-17     |
| Special Tools .....                          | 3-1      | Pressing Tools .....                               | 3-17     |

## Table of Contents (cont.)

| Section No.                                    | Page No. | Section No.                                    | Page No. |
|--|----------|--|----------|
| 3.12 Torque Hub (continued)                    |          | 4.5 Calibrator Settings .....                  | 4-9      |
| Disassembly .....                              | 3-17     | 4.6 MOS90 Fault Finding Flow Charts .....      | 4-10     |
| Assembly .....                                 | 3-17     |  |          |
| Main Assembly .....                            | 3-18     | <b>5.0 Schematics</b>                          |          |
| 3.13 Master Cylinder .....                     | 3-23     | 5.0 Introduction .....                         | 5-1      |
| Removal .....                                  | 3-23     | 5.1 Hydraulic Schematics .....                 | 5-2      |
| Disassembly .....                              | 3-23     | 5.2 Electrical Schematics .....                | 5-8      |
| Assembly .....                                 | 3-23     | 5.3 Upper Control Box Component Location ..... | 5-13     |
| Installation .....                             | 3-23     | 5.4 Lower Control Box Component Location ..... | 5-15     |
| 3.14 Slave Cylinder .....                      | 3-24     | 5.5 Relay Panel Component Location .....       | 5-18     |
| Removal .....                                  | 3-24     |  |          |
| Disassembly .....                              | 3-24     | <b>6.0 Illustrated Parts Breakdown</b>         |          |
| Assembly .....                                 | 3-24     | 6.0 Introduction .....                         | 6-1      |
| Installation .....                             | 3-24     | 6.1 Index .....                                | 6-1      |
| 3.15 Cage Rotate Cylinder .....                | 3-25     | 6.2 Illustrated Parts Breakdown .....          | 6-2      |
| Removal .....                                  | 3-25     | Final Assembly, AB46 Electric                  |          |
| Disassembly .....                              | 3-25     | 068300-000 .....                               | 6-2      |
| Assembly .....                                 | 3-25     | Final Assembly, AB46 Electric                  |          |
| Installation .....                             | 3-25     | Drawing 1 of 4 .....                           | 6-3      |
| 3.16 Steering Cylinder .....                   | 3-26     | Final Assembly, AB46 Electric                  |          |
| Removal .....                                  | 3-26     | Drawing 2 of 4 .....                           | 6-4      |
| Disassembly .....                              | 3-26     | Final Assembly, AB46 Electric                  |          |
| Assembly .....                                 | 3-26     | Drawing 3 of 4 .....                           | 6-5      |
| Installation .....                             | 3-26     | Final Assembly, AB46 Electric                  |          |
| 3.17 Jib Cylinder .....                        | 3-27     | Drawing 4 of 4 .....                           | 6-6      |
| Removal .....                                  | 3-27     | Final Assembly, AB46 Bi-Energy                 |          |
| Disassembly .....                              | 3-27     | 068310-000 .....                               | 6-8      |
| Assembly .....                                 | 3-27     | Final Assembly, AB46 Bi-Energy                 |          |
| Installation .....                             | 3-27     | Drawing 1 of 4 .....                           | 6-9      |
| 3.18 Boom Raise and Boom Riser Cylinders ..... | 3-28     | Final Assembly, AB46 Bi-Energy                 |          |
| Removal .....                                  | 3-28     | Drawing 2 of 4 .....                           | 6-10     |
| Disassembly .....                              | 3-28     | Final Assembly, AB46 Bi-Energy                 |          |
| Assembly .....                                 | 3-28     | Drawing 3 of 4 .....                           | 6-11     |
| Installation .....                             | 3-28     | Final Assembly, AB46 Bi-Energy                 |          |
| 3.19 Boom Extend Cylinder .....                | 3-29     | Drawing 4 of 4 .....                           | 6-12     |
| Removal .....                                  | 3-29     | Basic Assembly, AB46 Electric                  |          |
| Disassembly .....                              | 3-29     | 068303-000 .....                               | 6-14     |
| Assembly .....                                 | 3-29     | Basic Assembly, AB46 Bi-Energy                 |          |
| Installation .....                             | 3-30     | 068313-000 .....                               | 6-16     |
| 3.20 Long Term Storage .....                   | 3-31     | Basic Assembly, AB46 Electric                  |          |
| Preservation .....                             | 3-31     | 068313-000 .....                               | 6-17     |
| 3.21 Torque Specifications .....               | 4-31     | Chassis Assembly, AB46 Electric                |          |
| Fasteners .....                                | 4-31     | 068320-000 .....                               | 6-18     |
| Hydraulic Components .....                     | 4-31     | Chassis Assembly, AB46 Electric                |          |
| <b>4.0 Troubleshooting</b>                     |          | Drawing 1 of 2 .....                           | 6-20     |
| 4.0 Introduction .....                         | 4-1      | Chassis Assembly, AB46 Electric                |          |
| General Procedure .....                        | 4-1      | Drawing 2 of 2 .....                           | 6-21     |
| 4.1 Operational Theory .....                   | 4-2      | Chassis Assembly, AB46 Bi-Energy               |          |
| 4.2 Troubleshooting Guide .....                | 4-4      | 068317-000 .....                               | 6-22     |
| 4.3 Troubleshooting the MOS90 .....            | 4-8      | Chassis Assembly, AB46 Bi-Energy               |          |
| 4.4 Using the Calibrator .....                 | 4-8      | Drawing 1 of 3 .....                           | 6-24     |
|  |          | Chassis Assembly, AB46 Bi-Energy               |          |
|  |          | Drawing 2 of 3 .....                           | 6-25     |
|  |          | Chassis Assembly, AB46 Bi-Energy               |          |
|  |          | Drawing 3 of 3 .....                           | 6-26     |
|  |          | Lower Boom Linkage Assembly, AB46              |          |
|  |          | 068323-000 .....                               | 6-28     |

## Table of Contents (cont.)

|   |      |   |      |
|---|------|---|------|
| Lower Boom Linkage Assembly, AB46<br>068323-000 .....                       | 6-29 | AB46 Electric Controller Installation<br>068339-001 .....   | 6-60 |
| Upper Boom Linkage Assembly, AB46<br>068322-000 .....                       | 6-30 | AB46 Bi-Energy Controller Installation<br>068339-011 .....  | 6-61 |
| Upper Boom Linkage Assembly, AB46<br>068322-000 .....                       | 6-31 | AB46 Electric Controller, Platform<br>068329-000 .....      | 6-62 |
| Turret Assembly, AB46 Electric & Bi-Energy<br>068330-000 & 068330-003 ..... | 6-32 | AB46 Electric Controller, Platform<br>Drawing 1 of 2 .....  | 6-63 |
| Turret Assembly, AB46 Electric & Bi-Energy<br>068330-000 & 068330-003 ..... | 6-33 | AB46 Electric Controller, Platform<br>Drawing 2 of 2 .....  | 6-64 |
| Power Unit Assembly, AB46 Electric<br>068326-000 .....                      | 6-34 | AB46 Bi-Energy Controller, Platform<br>068329-010 .....     | 6-66 |
| Brake Valve Block Assembly<br>068324-000 .....                              | 6-35 | AB46 Bi-Energy Controller, Platform<br>Drawing 1 of 2 ..... | 6-67 |
| Engine Assembly, AB46 Bi-Energy<br>068951-000 .....                         | 6-36 | AB46 Bi-Energy Controller, Platform<br>Drawing 2 of 2 ..... | 6-68 |
| Engine Assembly, AB46 Bi-Energy<br>Drawing 1 of 2 .....                     | 6-37 | Hose Kit, AB46 Electric<br>068336-000 .....                 | 6-70 |
| Engine Assembly, AB46 Bi-Energy<br>Drawing 2 of 2 .....                     | 6-38 | Hose Kit, AB46 Electric<br>068336-000 .....                 | 6-71 |
| Power Unit Assembly, AB46 Bi-Energy<br>068326-001 .....                     | 6-39 | Hose Kit, AB46 Bi-Energy<br>068336-002 .....                | 6-72 |
| Brake Valve Block Assembly, AB46 Bi-Energy<br>068326-001 .....              | 6-40 | Hose Kit, AB46 Bi-Energy<br>068336-002 .....                | 6-73 |
| Valve Block Assembly<br>068348-000 .....                                    | 6-42 | Battery Module Assembly, AB46<br>068321-001,002 .....       | 6-74 |
| Valve Block Assembly<br>068348-000 .....                                    | 6-43 | Tire & Wheel Assembly, AB46<br>068327-000 .....             | 6-75 |
| Ground Control Box Assembly, AB46 Electric<br>068328-000 .....              | 6-44 | Cable Assembly, AB46<br>068333-000 .....                    | 6-76 |
| Ground Control Box Assembly, AB46 Electric<br>Drawing 1 of 3 .....          | 6-45 | Cage "B" Assembly<br>068325-001 .....                       | 6-78 |
| Ground Control Box Assembly, AB46 Electric<br>Drawing 2 of 3 .....          | 6-46 | Cage "B" Assembly<br>068325-001 .....                       | 6-79 |
| Ground Control Box Assembly, AB46 Electric<br>Drawing 3 of 3 .....          | 6-47 | Cage "A"<br>068500-000 .....                                | 6-80 |
| Ground Control Box Assembly, AB46 Bi-Energy<br>068328-003 .....             | 6-48 | 4 FT. Cage<br>068500-003 .....                              | 6-81 |
| Ground Control Box Assembly, AB46 Bi-Energy<br>Drawing 1 of 3 .....         | 6-49 | Label Kit, AB46 Electric<br>068335-000 .....                | 6-82 |
| Ground Control Box Assembly, AB46 Bi-Energy<br>Drawing 2 of 3 .....         | 6-50 | Label Kit, AB46 Bi-Energy<br>068335-003 .....               | 6-82 |
| Ground Control Box Assembly, AB46 Bi-Energy<br>Drawing 3 of 3 .....         | 6-51 | Label Kit, AB46 Electric<br>068335-000 .....                | 6-83 |
| Relay Panel Assembly, AB46 Electric<br>068346-000 .....                     | 6-52 | Label Kit, AB46 Bi-Energy<br>068335-003 .....               | 6-83 |
| Relay Panel Assembly, AB46 Electric<br>Drawing 1 of 2 .....                 | 6-53 | Motion Alarm/Flashing Beacon - Option<br>068294-000 .....   | 6-84 |
| Relay Panel Assembly, AB46 Electric<br>Drawing 2 of 2 .....                 | 6-54 | Motion Alarm/Flashing Beacon - Option<br>068294-000 .....   | 6-85 |
| Relay Panel Assembly, AB46 Bi-Energy<br>068346-001 .....                    | 6-56 | Battery Charge Indicator - Option<br>068297-000 .....       | 6-86 |
| Relay Panel Assembly, AB46 Bi-Energy<br>Drawing 1 of 2 .....                | 6-57 |   |      |
| Relay Panel Assembly, AB46 Bi-Energy<br>Drawing 2 of 2 .....                | 6-58 |   |      |
| Speed Control Panel Assembly, AB46 Bi-Energy<br>068321-000 .....            | 6-59 |   |      |

# Contents

## List of Illustrations

| Figure No. | Title   | Page No. |
|------------|---|----------|
| 1-1:       | AB46 Work Platform .....                      | 1-1      |
| 2-1A:      | Chassis Controls, Bi-Energy .....             | 2-3      |
| 2-2B:      | Platform Controls, Bi-Energy .....            | 2-3      |
| 2-1B:      | Chassis Controls, Electric .....              | 2-3      |
| 2-2B:      | Platform Controls, Electric .....             | 2-3      |
| 2-2:       | Transporting Work Platform .....              | 2-1      |
| 2-3:       | Fall Restraint Ancorage Point .....           | 2-4      |
| 2-4:       | Emergency Control Operation .....             | 2-7      |
| 2-5:       | Manual Turret Rotation .....                  | 2-7      |
| 2-6:       | Securing the Machine for Transportation ..... | 2-8      |
| 2-7:       | Battery Charger .....                         | 2-9      |
| 2-8:       | Batteries .....                               | 2-9      |
| 2-9:       | Hydraulic Oil Filler .....                    | 2-9      |
| 3-1:       | Blocking Elevating Assembly .....             | 3-3      |
| 3-2:       | Lubrication Chart .....                       | 3-5      |
| 3-3:       | Torque Hub .....                              | 3-6      |
| 3-4:       | Valve Manifold .....                          | 3-7      |
| 3-5:       | Proportional Controller .....                 | 3-8      |
| 3-6:       | Upper Control Box .....                       | 3-8      |
| 3-7:       | Platform Down Limit Switch .....              | 3-9      |
| 3-8:       | Tilt Sensor .....                             | 3-9      |
| 3-9:       | Hydraulic Manifold, Exploded View .....       | 3-11     |
| 3-10:      | Hydraulic Power Unit .....                    | 3-12     |
| 3-11:      | Rear Axle Assembly .....                      | 3-12     |
| 3-12:      | Brake Assembly .....                          | 3-13     |
| 3-13:      | Replacing Drive Motor Brushes .....           | 3-14     |
| 3-14:      | Front Axle Assembly .....                     | 3-15     |
| 3-15:      | Torque Hub Assembly .....                     | 3-16     |
| 3-16:      | Measuring Hub End Play .....                  | 3-18     |
| 3-17:      | Torque Hub .....                              | 3-19     |
| 3-18:      | Seal Pressing Tool .....                      | 3-20     |
| 3-19:      | Bearing Cone Pressing Tool .....              | 3-21     |
| 3-20:      | Bearing Cup Pressing Tool .....               | 3-22     |
| 3-21:      | Master Cylinder .....                         | 2-23     |
| 3-22:      | Slave Cylinder .....                          | 3-24     |
| 3-23:      | Cage Rotate Cylinder .....                    | 3-25     |
| 3-24:      | Steering Cylinder .....                       | 3-26     |
| 3-25:      | Jib Cylinder .....                            | 3-27     |
| 3-26:      | Boom Raise Cylinder .....                     | 3-28     |
| 3-27:      | Removing Boom Extend Cylinder .....           | 3-29     |
| 3-28:      | Boom extend Cylinder .....                    | 3-30     |
| 4-1:       | MOS90 Pin Out Designation .....               | 4-16     |
| 4-2:       | Tachometer Board .....                        | 4-17     |

## List of Illustrations (continued)

| Figure No. | Title  | Page No. |
|------------|--|----------|
| 5-1:       | Electrical Schematic, Electric Model .....                   | 5-3      |
| 5-2:       | Electrical Schematic, Bi-Energy Model<br>S/N 1000-1331 ..... | 5-5      |
| 5-3:       | Electrical Schematic, Bi-Energy Model<br>S/N 1331- .....     | 5-6      |
| 5-4:       | Kubota Engine Diagram S/N 1000-1331 .....                    | 5-7      |
| 5-5:       | Kubota Engine Diagram S/N 1331- .....                        | 5-8      |
| 5-6:       | Hydraulic Valve Ports .....                                  | 5-9      |
| 5-7:       | Check Ports .....  | 5-10     |
| 5-8:       | Hydraulic Schematic .....                                    | 5-13     |
| 5-9:       | Valve Block Assembly .....                                   | 5-14     |
| 5-10:      | Upper Controller .....                                       | 5-15     |
| 5-11:      | Electrical Diagram, Upper Control Box, Elec. ....            | 5-16     |
| 5-12:      | Electrical Diagram, Upper Control Box, Bi-E. ....            | 5-16     |
| 5-13:      | Lower Control Box Cover .....                                | 5-17     |
| 5-14:      | Terminal Strip, Relay Identification .....                   | 5-17     |
| 5-15:      | Electrical Diagram - Lower Control Box, Elec. ....           | 5-18     |
| 5-16:      | Electrical Diagram - Bi-Energy Model<br>S/N 1000-1331 .....  | 5-19     |
| 5-17:      | Electrical Diagram - Bi-Energy Model<br>S/N 1331- .....      | 5-20     |
| 5-18:      | Relay Panel .....  | 5-21     |
| 5-19:      | Relay Panel Schematic .....                                  | 5-22     |

## List of Tables

| Table No. | Title   | Page No. |
|-----------|---|----------|
| 1-1       | Specifications .....                              | 1-2      |
| 3-1       | Preventative Maintenance Checklist .....          | 3-2      |
| 3-3       | Bolt Torque .....                                 | 3-31     |
| 3-4       | Hydraulic Component Torque .....                  | 3-31     |
| 4-1       | Troubleshooting Guide-Hydraulics .....            | 4-4      |
| 4-2       | Troubleshooting Guide-Electrical .....            | 4-5      |
| 4-3       | Calibrator Settings .....                         | 4-9      |
| 4-4       | Test Display .....                                | 4-9      |
| 4-5       | Calibrator Diagnostics .....                      | 4-15     |
| 5-1       | Hydraulic Schematic Legend .....                  | 5-4      |
| 5-2       | Electrical Schematic Legend, Electric Model ..... | 5-8      |
| 5-3       | Electrical Schematic Legend, Bi-Energy Model ..   | 5-10     |
| 5-4       | Engine Assembly - Kubota ZB600C .....             | 5-12     |
| 5-5       | Upper Controller Components .....                 | 5-13     |
| 5-6       | Lower Controller Components .....                 | 5-15     |

# Operation

Section  
2.1

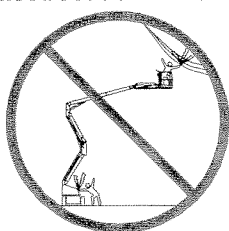
## AB-46 Electric & Bi-Energy

### WARNING

All personnel shall carefully read, understand and follow all safety rules, operating instructions, and the Scaffold Industry Association's MANUAL OF RESPONSIBILITIES (ANSI A92.5) before operating or performing maintenance on any UpRight boom supported aerial work platform.

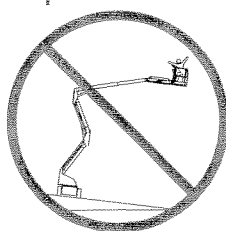
### SAFETY RULES

Electrocution Hazard



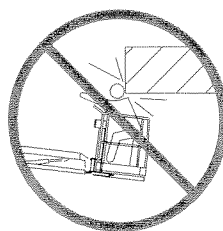
**NEVER** operate the machine within ten (10) feet of power lines. **THIS MACHINE IS NOT INSULATED.**

Tip Over Hazard



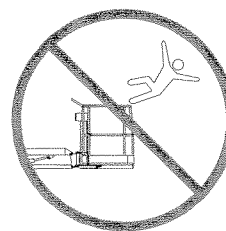
**NEVER** operate the boom or drive with platform elevated unless on firm level surface.

Collision Hazard



**NEVER** position the platform without first checking for overhead obstructions or other hazards.

Fall Hazard



**NEVER** climb, stand or sit on platform guardrails or midrail.

**ALL** occupants must wear an approved fall restraint properly attached to designated platform anchorage point. Attach only one fall restraint to each anchorage point.

**NEVER** exceed maximum platform load of 500 lbs. (225 kg) and two (2) occupants.

**NEVER** exceed 45 lbs. (200 N) of side force per occupant.

**DISTRIBUTE** all platform loads evenly on the platform.

**NEVER** operate the machine without first surveying the work area for surface hazards such as holes, drop-offs, bumps, curbs, or debris; and avoiding them.

**OPERATE** machine only on surfaces capable of supporting wheel loads.

**NEVER** elevate the machine when wind speeds exceed 28 mph (12.5 m/sec.).

**IN CASE OF EMERGENCY** push emergency stop button to cut power to all machine functions.

**ALWAYS** close and secure gate after entering platform.

**NEVER** exit or enter platform while elevated.

**NEVER** use ladders, scaffolding, or other items to gain height; work only from the platform floor.

**NEVER** climb down elevating assembly while platform is elevated.

**INSPECT** the machine thoroughly for cracked welds, loose or missing hardware, hydraulic leaks, loose wire connections, and damaged cables or hoses before using.

**VERIFY** that all labels are in place and legible before using.

**NEVER** use a machine that is damaged, not functioning properly, or has damaged or missing labels.

**IF ALARM SOUNDS** while boom is elevated, **STOP**, carefully retract boom and lower platform without rotating. Move machine to a firm, level surface.

**NEVER** attach overhanging loads or use boom as a crane.

**NEVER** alter operating or safety systems without manufacturers written consent.

**NEVER** charge battery near sparks or open flame. Charging batteries emit explosive hydrogen gas.

**NEVER** replace any component or part with anything other than original UpRight replacement parts without the manufacturer's written consent.

**NEVER** tow the machine. Transport by truck or trailer only.

**AFTER USE**, secure the work platform from unauthorized use by turning both key switches off and removing all keys.

**DONOT** turn key switch to the brake release position unless Emergency Towing procedures are first followed (page 2-7).



## Introduction

This section covers the operation of Electric and Bi-Energy powered models of the AB-46.

## Pre-Operation and Safety Inspection

Carefully read, understand and follow all safety rules, labels, and operating instructions, then perform the following steps each day before use.

Perform a complete visual inspection of the entire unit prior to operating. Check the following areas for discrepancies:

1. Open panels and check hydraulic components / hoses for damage or leaks. Check electrical components / wiring for damage or loose connections.
2. Inspect chassis, axles, hubs, and steering linkage for damage, deformation, buckled paint, loose or missing hardware, and cracked welds.
3. Check tires for damage, punctures, and inflation; tire pressure must be 5.17 bar (75 psi).
4. Check all hoses / cables for wear.
5. Inspect elevating assembly for damage, deformation, buckled paint, loose or missing hardware, and cracked welds.
6. Inspect platform and guardrails for damage, deformation, buckled paint, loose or missing hardware, and cracked welds. Insure that gate operates freely and latches securely.

7. Check Hydraulic fluid level with platform fully lowered.
8. Check battery fluid level (see battery maintenance, page 2-8).
9. Check fuel level, add fuel if necessary.
10. Ensure that radiator is cold, check coolant level. Add if necessary.



### WARNING



NEVER remove the cap from a hot radiator. Hot coolant can cause severe burns.



### WARNING



DO NOT use a machine that is damaged or malfunctioning. Tag and remove the unit from service until it is repaired.

11. From platform; raise machine above Eight meters (26.2 ft.). Verify that machine will not drive when elevated above Eight meters (26.2 ft.).



### WARNING



If machine drives while above Eight meters (26.2 ft.), remove machine from service until Eight meter cutout system is repaired.

## SYSTEM FUNCTION INSPECTION

**Note:** Refer to Figures 2 and 3 for chassis and platform control locations.

1. Before performing the following tests, check area around machine and overhead for obstructions, holes, drop-offs, and debris.
2. Turn chassis key switch to chassis, and turn on (rotate clockwise) emergency stop switches at the chassis control panel and at the platform control panel.

**Note:** Bi-Energy machines may be powered by batteries or by engine. To power the machine by engine, press engine start button to crank engine; release when engine starts. If engine is cold: press the preheat button and hold for six seconds prior to starting diesel models.

3. Push in the chassis emergency stop button and operate any function switch at the chassis control panel, function should NOT activate. Repeat for platform emergency stop button, operating chassis controls. Return both emergency stop switches to the on position.
4. Operate each function switch to raise / lower, extend / retract, rotate left / right, each section of the elevating assembly and observe the operation of the machine. All functions should operate through full cycle smoothly.
5. Turn chassis key switch to platform.
6. Mount the platform, close and latch the gate, and attach approved fall restraint to designated platform anchorage point. Attach only one fall restraint to each point.
7. Without depressing the foot switch, move the drive control handle, machine should not function.
8. Depress the foot switch and move the drive control handle forward and reverse. Observe that proportional functions operate smoothly, and that brakes apply quickly after control is released.
9. While depressing foot switch, operate steer switch to left and right. Observe that steering wheels turn properly.
10. While depressing foot switch, turn function speed control knob to desired setting, and operate boom controls. Observe that boom operates smoothly, and that upper boom, jib, turret rotation, platform level, and platform rotation controls operate proportionally in conjunction with function speed control knob. Observe that platform maintains level when boom is elevated.
11. With the upper boom elevated one foot, operate drive control handle. Observe that drive speed is limited to creep (1/2 foot [.15m] per second). Lower upper boom to stowed position.
12. Press the service horn button. Observe that horn is audible.

## Operation

Before operating work platform insure that:

Pre-operation and safety inspection has been completed, and any discrepancies have been corrected.

The operator has been thoroughly trained on the operation of the machine.

The work area is clear of all obstructions, holes, drop-offs, or persons in the route of travel.

The surface is capable of supporting wheel loads.

Refer to figures one and two for control locations.



### Emergency Stop

At any time during operation, press the emergency stop button to stop all functions in an emergency.



### Service Horn

At any time during operation, press service horn button to sound an audible warning if necessary.



## WARNING



**Always** wear an approved fall restraint properly attached to designated platform anchorage point when driving or elevating the machine (see Figure 2-3).

Attach only one fall restraint to each anchorage point.

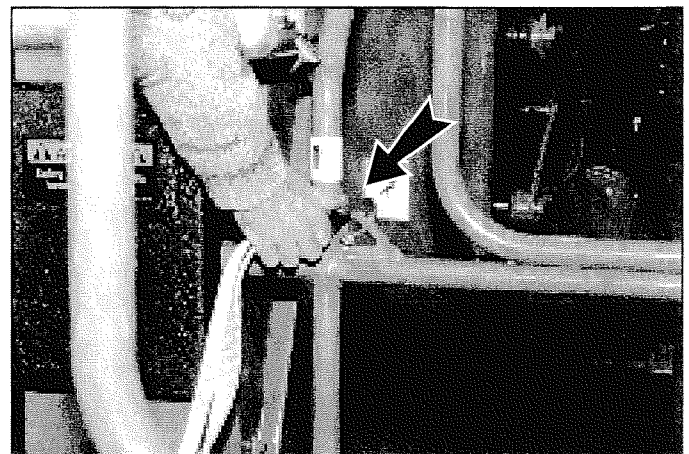


Figure 2-1: Typical Fall Restraint Anchorage Point

## Bi-Energy Model Controls and Indicators

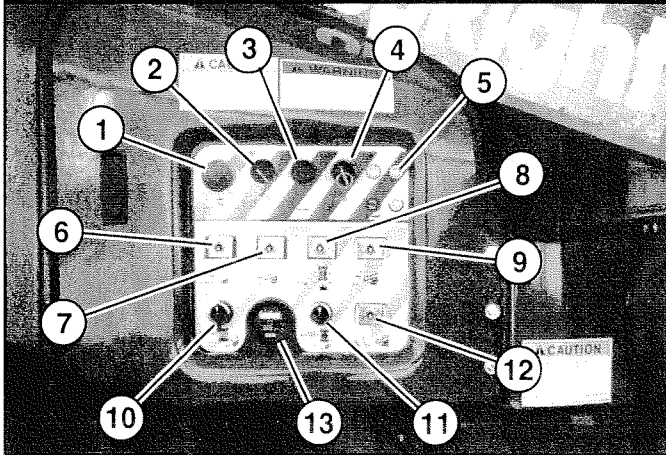


Figure 2-2A: Chassis Controls

Note: The following list corresponds to the numbered items in figures 1A and 2A.

1. Emergency stop.
2. Diesel Engine start.
3. Glow Plug button.
4. Keyswitch
5. Control fuses.
6. Riser control.
7. Upper boom control.
8. Boom extension control.
9. Jib control.
10. Turret rotation control.
11. Platform rotation control.
12. Platform level control.
13. Battery condition indicator & Hourmeter.
14. Service horn button.
15. Drive control handle.
16. Function speed control.
17. Foot switch (located on platform floor).
18. Out of level indicator.
19. Low Voltage indicator.

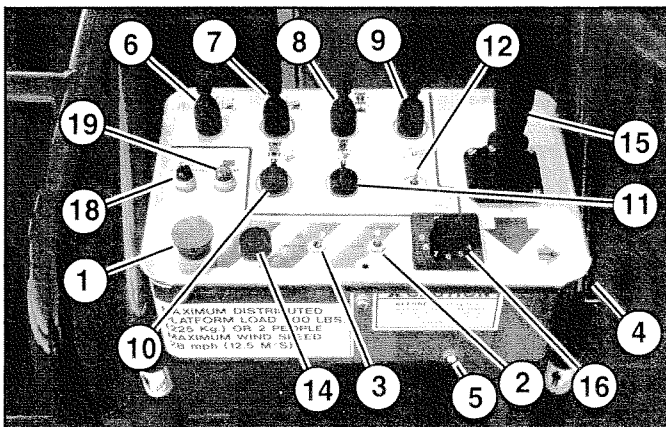


Figure 2-3A: Platform Controls

## Electric Model Controls and Indicators

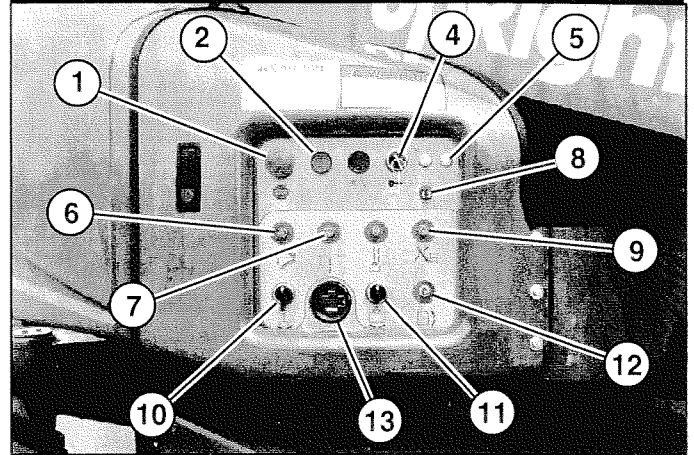


Figure 2-2B: Chassis Controls

Note: The following list corresponds to the numbered items in figures 1A and 2A.

1. Emergency stop.
2. Electric motor start.
3. Low Voltage Indicator.
4. Keyswitch
5. Control fuses.
6. Riser control.
7. Upper boom control.
8. Boom extension control.
9. Jib control.
10. Turret rotation control.
11. Platform rotation control.
12. Platform level control.
13. Hourmeter.
14. Service horn button.
15. Drive control handle.
16. Function speed control.
17. Foot switch (located on platform floor).
18. Out of level indicator.

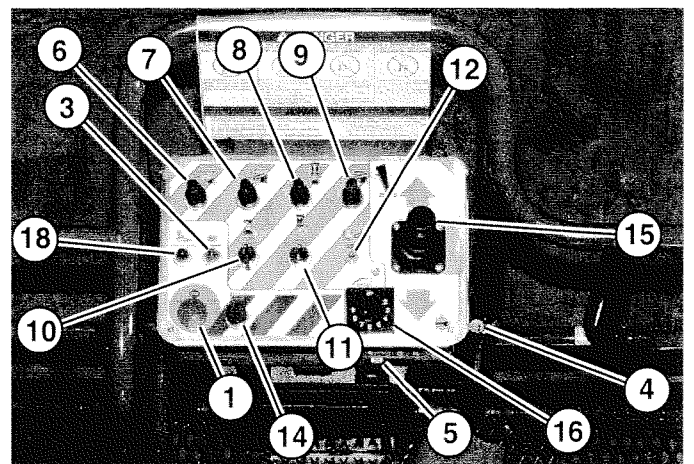
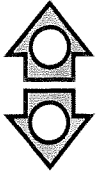


Figure 2-3B: Platform Controls

AB46 Work Platform



## Driving

### With Boom Lowered

1. Turn chassis key switch to platform, and turn on (turn clockwise) the chassis emergency stop switch.
2. Mount the platform, close and latch the gate.
3. Attach approved fall restraint to designated platform anchorage point. Attach only one fall restraint to each point.
4. Check that the area around and above the work platform is clear of obstructions, holes, drop-offs, persons in the route of travel, and the surface is capable of supporting wheel loads.
5. Depress the foot switch and move the drive control handle forward to travel forward and reverse to travel in the reverse direction.

**Note:** When the boom is rotated to the front of the chassis (steering wheels aft) directions of travel and steering will be reversed. Observe the color coded arrows on the control panel near the drive control handle, and on the chassis. They will indicate the direction of travel when the drive control handle is moved.

### With Boom Elevated

**Travel with boom elevated is restricted to firm level surfaces only.**

When driving with boom elevated, the machine will travel at creep speed (1/2 foot [.15 m] per second).

The machine will not travel when the platform is elevated above Eight meters (26.2 ft.). Lower platform below Eight meters (26.2 ft.) to move machine.

## Steering

1. While depressing the foot switch, push the steering switch (located on top of the control handle) to the left to turn left, and right to turn right.

**Note:** Steering is not self centering. Wheels must be returned to the straight ahead position by operating the steering switch.

## POSITIONING THE PLATFORM

Positioning the platform as close as possible to the work area requires some planning. First, you must survey the work site to find a suitable place to park the machine. This must be a firm level area as close as possible to the work area. Take into consideration all obstructions on the ground and overhead and avoid them.

Once you have moved the machine to a firm level surface as near as possible to the work area, follow the instructions on page 2-6 to position the platform.

Always, before operating any function, check the area around and overhead for any obstructions or electrical conductors.

## Multifunction Controls

The UpRight AB-46 employs the use of multifunction controls. This means that riser or boom extension will function at full speed while simultaneously operating upper boom, jib, turret, or rotating the platform.

The turret may be rotated while driving if necessary to make turns in tight areas. All other boom functions will not operate while driving.

## Lower Control Operation

All boom functions will operate at fixed speed.

1. Turn chassis keyswitch to chassis controls.
2. Operate boom control switches to position the platform.



## Leveling the Platform



### WARNING



DO NOT operate the machine if the platform does not maintain level when elevated.

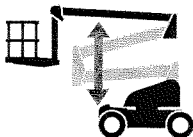
**Note:** Platform leveling can be performed only with the boom stowed and should be done only to calibrate the automatic leveling system.

1. Set the function speed control dial to the desired setting. Rotate the dial clockwise to increase speed, counterclockwise to decrease. If you are not sure what speed to use, start out slow; the speed can be varied while operating the function.
2. While depressing the foot switch, push the platform level control switch forward to swing the platform upward, rearward to swing the platform downward. Release the switch to stop leveling.



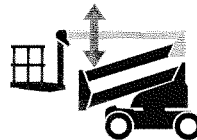
## Rotating the Turret

1. Set the function speed control dial to the desired setting. Rotate the dial clockwise to increase speed, counterclockwise to decrease. If you are not sure what speed to use, start out slow; the speed can be varied while operating the function.
2. While depressing the foot switch, turn the turret rotation control switch counterclockwise to rotate left, clockwise to rotate right. Release the switch to stop rotation. Observe the area around the boom when rotating the turret to avoid any obstructions.



## Elevating the Riser

1. While depressing the foot switch, push the riser control lever forward to elevate the riser, rearward to lower the riser. Release the control lever to stop elevating / lowering. The riser will function at a constant speed, function speed control setting is not necessary.



## Elevating the Upper Boom

1. Set the function speed control dial to the desired setting. Rotate the dial clockwise to increase speed, counterclockwise to decrease. If you are not sure what speed to use, start out slow; the speed can be varied while operating the function.
2. While depressing the foot switch, push the upper boom control lever forward to elevate the upper boom, rearward to lower the upper boom. Release the control lever to stop elevating / lowering.



## Extending the Upper Boom

1. While depressing the foot switch, push the boom extension control lever rearward to extend the boom, forward to retract the boom. Release the control lever to stop extending / retracting. The boom extension will function at a constant speed, function speed control setting is not necessary.



## Elevating the Jib

1. Set the function speed control dial to the desired setting. Rotate the dial clockwise to increase speed, counterclockwise to decrease. If you are not sure what speed to use, start out slow; the speed can be varied while operating the function.
2. While depressing the foot switch, push the jib control lever forward to elevate the jib, rearward to lower the jib. Release the control lever to stop elevating / lowering.



## Rotating the Platform

1. Set the function speed control dial to the desired setting. Rotate the dial clockwise to increase speed, counterclockwise to decrease. If you are not sure what speed to use, start out slow; the speed can be varied while operating the function.
2. While depressing the foot switch, turn the platform rotation control switch counterclockwise to rotate left, clockwise to rotate right. Release the switch to stop rotation.

## EMERGENCY OPERATION

In the event of powered function failure, the elevating assembly may be lowered manually by the following procedure.



### WARNING



**NEVER** climb down the elevating assembly. If controls do not respond, ask someone on the ground to lower the boom manually.

## Lowering Elevating Assembly

1. Open the cover on the hydraulic module (opposite side of the turret from the chassis control panel).
2. Remove the wire loop retainer from the hand pump lever, and extend the handle upward to gain leverage.
3. Operate the manual override (knurled knob) on the appropriate valve (see figure 2-5). Push in to lower / extend, pull out to raise / retract as required.
4. While holding the appropriate valve in position, pump the handle in and out until that section of the elevating assembly is lowered / retracted.
5. Repeat as necessary operating each valve until the elevating assembly is fully lowered.

## Rotating Turret

1. Obtain a  $\frac{7}{8}$  inch ratcheting wrench.
2. Place the socket of the wrench onto the hex shaft stub of the turret rotation gearbox.
3. Turn the wrench clockwise to rotate the turret counterclockwise, turn counterclockwise to rotate the turret clockwise.

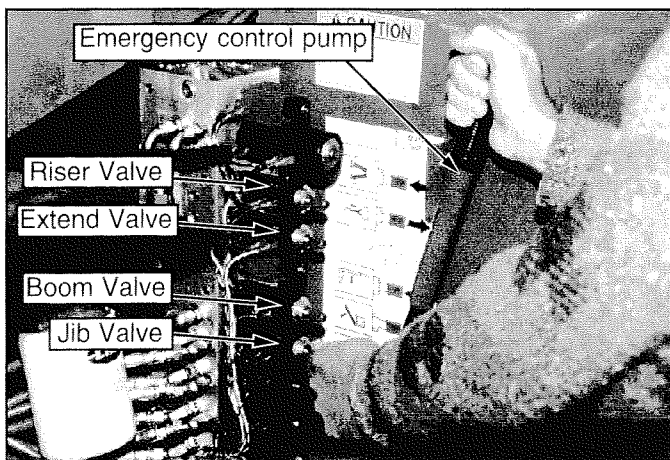


Figure 2-4: Emergency Control Operation

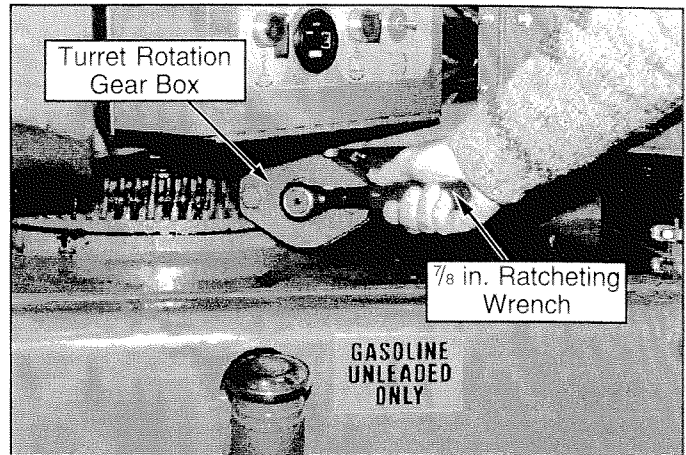


Figure 2-5: Manual Turret Rotation

## EMERGENCY TOWING



### WARNING



DO NOT release the brakes unless machine is on level ground or safely blocked and secured. Machine rolls easily with brakes released and can "Freewheel" out of control.

Perform the following only when the machine will not operate under its own power and it is necessary to move the machine or when winching onto a trailer for transportation.

1. Insure that the platform is fully lowered, and that the turret is rotated so the platform is to the rear of the machine.
2. Attach chain / cable of sufficient strength for towing the machine to front or rear tie down lugs.
3. Turn the keyswitch to the parking brake release position. Alarm will sound.
4. Operate the emergency control pump four full strokes to release brakes.
5. After moving the machine, return the keyswitch to the off position and remove the key to prevent unauthorized operation. Brakes are now reset. Alarm will stop.



### CAUTION



DO NOT move the machine faster than 3 mph. Faster speeds will damage drive components and void warranty.



## AFTER USE EACH DAY

1. Ensure that the platform is fully lowered.
2. Park the machine on level ground, preferably under cover, secure against vandals, children or unauthorized operation.
3. Turn the key switch to **OFF** and remove all keys to prevent unauthorized operation.

## Transportation

### LIFTING BY CRANE

#### ⚠ WARNING ⚠

Stand clear of machine when lifting.

Check specifications on page 1-2, be sure that crane and slings are of correct capacity to lift weight of unit.

1. Be sure that boom is fully lowered and retracted.
2. Attach straps to chassis lifting lugs only. Insure that straps are adjusted properly to keep unit level when lifting.

### BY TRUCK OR TRAILER

1. Insure that boom is fully lowered and retracted.
2. Maneuver the machine onto bed of truck / trailer.

**NOTE:** It may be necessary to raise the jib while loading the machine.

3. When winching, follow instructions for emergency towing on page 2-7. Attach winch cable to front tie down lugs.



#### CAUTION



Do not winch machine faster than 3 mph.

4. After winching, be sure that brakes are set.
5. Secure the machine to the transport vehicle using chains / straps of adequate load capacity (refer to specifications, page 1-2) attached to chassis tie down lugs (see Figure 2-6).
6. Place a wooden block 19 cm x 10 cm x 71 cm (7.5" x 4" x 28") under platform support braces as shown (see Figure 2-6).
7. Attach ratchet strap; under platform floor grating, over support braces (see Figure 2-6). Tighten securely, do not overtighten.



#### WARNING



NEVER elevate the machine while on a truck or trailer.

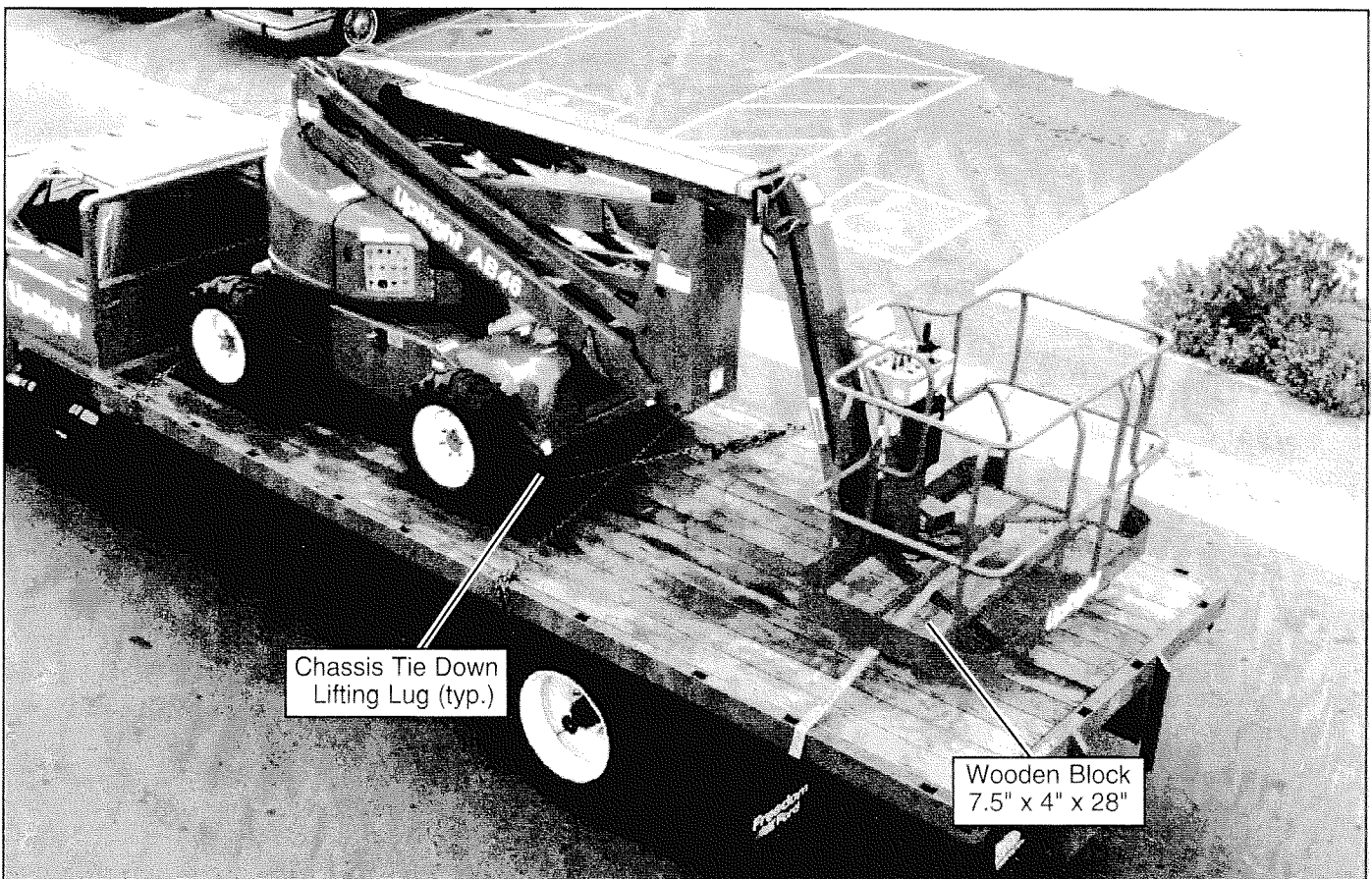


Figure 2-6: Securing the Machine for Transportation

AB46 Work Platform

## Maintenance

### TIRES

Tire selection can affect the stability of the machine. Use only tires supplied by UpRight unless approved by the manufacturer in writing.

### BATTERY CHARGING



#### WARNING



Charge batteries only in a well ventilated area.

Hazard of explosive gas mixture. Keep sparks, flame and smoking materials away from batteries.

Always wear safety glasses when working with batteries.

Battery fluid is highly corrosive. Rinse away any spilled fluid thoroughly with clean water.

Always replace batteries with UpRight batteries or manufacturer approved replacements weighing 54.43 kg (120 lbs.) each.

Charge batteries as follows:

1. Check the batteries fluid level. If the electrolyte level is lower than  $\frac{3}{8}$  in. (10 mm) above the plates, add clean, distilled water only.
2. Verify charger voltage switch is set to the correct voltage.
3. Connect extension cord (minimum 12 gauge (1.5 mm) conductor and maximum 50 ft. (15 m) in length) to charger plug located through the opening in front of the chassis (Figure 2-7). Connect extension cord to properly grounded outlet of proper voltage and frequency.
3. The charger will turn on automatically.
4. When the batteries are fully charged, the charger will turn off automatically.

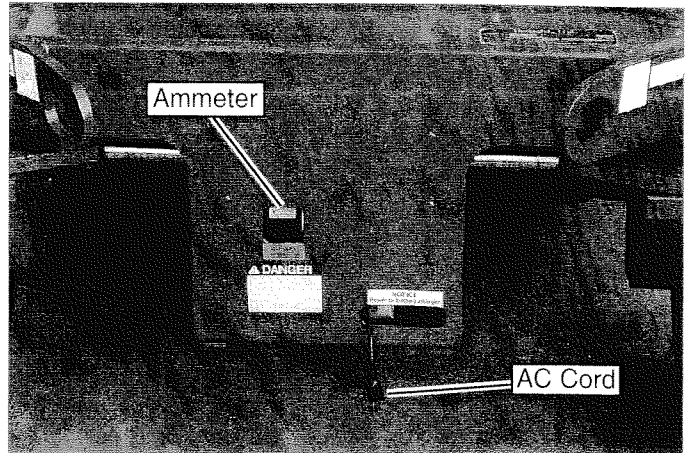


Figure 2-7: Battery Charger

### BATTERY MAINTENANCE

Check battery fluid level daily, especially if work platform is being used in a warm, dry climate.

If electrolyte level is lower than  $\frac{3}{8}$  in. (10 mm) above plates add distilled water only. DO NOT use tap water it will shorten battery life.

Keep terminals and top of battery clean.

### HYDRAULIC OIL

1. Check oil level at dipstick and/or sight gauge inside engine compartment left hand side with the platform fully lowered.
2. Lift flap located on top of chassis left side (see Figure 2-9).
3. Open filler / breather cap.
4. If necessary, fill to capacity with clean ISO 46 compatible hydraulic oil.
5. Replace cap.

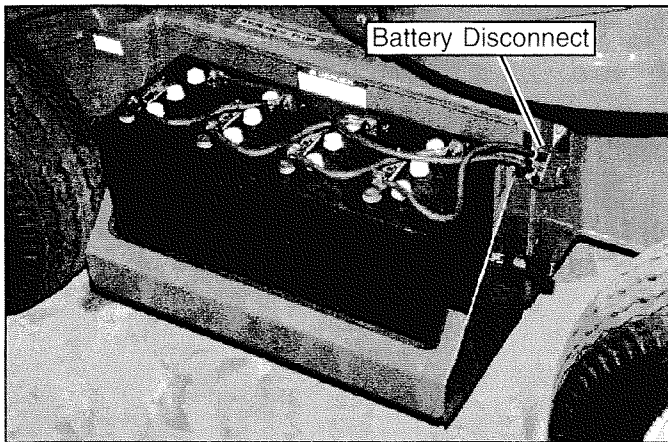
### EIGHT METER CUTOUT

Check fluid level in Eight meter cutout tank (rear of platform) daily. If fluid is low, fill tank using antifreeze solution.

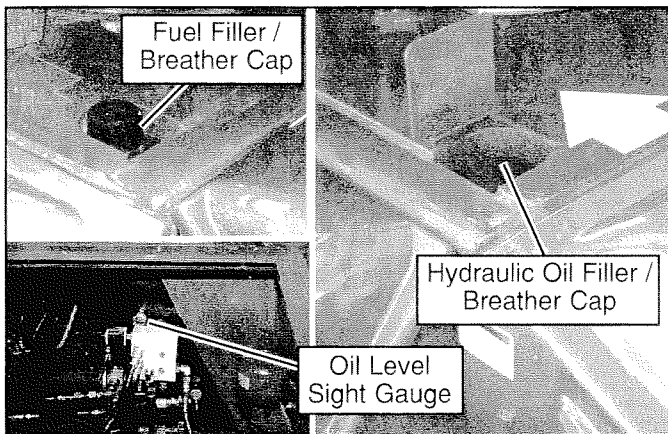


## LUBRICATION

Refer to service manual for lubrication chart and guidelines.



**Figure 2-8: Batteries (Typical Both Sides)**



**Figure 2-9: Hydraulic Oil Filler / Breather Cap, Fuel Filler / Breather Cap, and Oil Level Sight Gauge**

## 3.0 Introduction

This section contains procedures for the operation inspection, adjustment, scheduled maintenance, and repair/removal of the AB46.



### WARNING



Be sure to read, understand and follow all information in the *Operation Section* of this manual before attempting to operate or perform service on any AB46 Work Platform.

**NOTE:** Bi-Energy models - For service Information on the engine, refer to your engine manual.

**NOTE:** Torque all hardware to torques listed on page 3-31 unless otherwise specified.

## TERMINOLOGY

**TERMINAL BLOCKS:** Located in upper and lower control boxes. Designated by **TB##**. (##) designates the number of the block which is written on the terminal block. "R" (right) or "L" (left) may follow the number.

**DIODE BLOCKS:** Located in upper and lower control boxes. Designated by **DB##**. (##) designates the number of the block which is written on the diode block

**WIRE COLOR:** Indicated by **color/color**. First color refers to insulation color and second color indicates stripe. If second color is not given there is no stripe.

**FORWARD:** Front of machine indicated by yellow arrows on chassis.

**AFT:** Rear of machine indicated by orange arrows on machine.

## GENERAL PROCEDURES

**CONTACT BLOCKS:** Removed by inserting a flat screwdriver into the slot at either end of block and prying outward. Installed by pressing into an empty slot.

**SWITCH MOUNT BASE:** Assembled to back of switch actuator. Removed by rotating the small black lever counterclockwise and lifting off base.

**TERMINAL BLOCKS:** Remove wires by inserting a small flat bladed screwdriver into square beside wire. Install wires by stripping 1/2" of insulation, inserting screwdriver in square and inserting wire. Be sure no strands are bend backwards. Replace wires with same rating and type.

**LOWER CONTROL BOX:** Disconnect battery connectors at front of each battery box. Bi-Energy machines, disconnect negative lead from starter battery in chassis. With left battery cover in place to prevent shorting, remove hardware which secures control box cover and rest on battery cover.

## DATE CODE IDENTIFICATION ON HOSES

Gates uses a Five digit code: Year, Month, Day.  
6 11 29 - means 1996, month 11 (November), day 29.

Parker uses a 10 digit code: Plant, month, day, year.  
XXXX 11 29 96 - means plant XXXX, month 11, day 29, year 1996.

Dayco stamps month, day and year on each hose.

## SPECIAL TOOLS

The following is a list of special tools which may be required to perform certain maintenance procedures on the AB46 work platform.

0-1000 PSI Hydraulic Pressure Gauge  
with Adapter Fittings (UpRight P/N 014124-010)

0-3000 PSI Hydraulic Pressure Gauge  
with Adapter Fittings (UpRight P/N 014124-030)

0-30 Gallon Hydraulic Flow Meter  
With 0-3000 P.S.I. Simulated Load and Adapter Fittings (UpRight P/N 67040-000)

Adapter Fitting (UpRight P/N 063965-002)

Inclinometer (UpRight P/N 010119-000)

MOS90 Calibrator (UpRight P/N 057128-000)

Crimping Tool (UpRight P/N 028800-009)

Terminal Removal Tool (P/N 028800-006)

## 3.1 Preventative Maintenance (Table 3-1)



### WARNING



Before performing preventative maintenance, familiarize yourself with the operation of the machine.

Always block the elevating assembly whenever it is necessary to perform maintenance while the platform is elevated.

The complete inspection consists of periodic visual and operational checks, together with all necessary minor adjustments to assure proper performance. Daily inspection will prevent abnormal wear and prolong the life of all systems.

# Maintenance

The inspection and maintenance schedule is to be performed at regular intervals. Inspection and maintenance shall be performed by personnel who are trained and familiar with mechanical and electrical procedures.

The preventative maintenance table has been designed to be used primarily for machine service and maintenance repair. Please photocopy this page and use the table as a checklist when inspecting the machine for service.

Preventative Maintenance Table Key

## Interval

Daily=each shift or every day

50h/30d=every 50 hours or 30 days

250h/6m=every 250 hours or 6 months

1000h/2y=every 1000 hours or 2 years

Y=Yes/Acceptable

N=No/Not Acceptable

R=Repaired/Acceptable

## Preventative Maintenance Report

Date: \_\_\_\_\_

Owner: \_\_\_\_\_

Model No: \_\_\_\_\_

Serial No: \_\_\_\_\_

Serviced By: \_\_\_\_\_

Service Interval: \_\_\_\_\_

Table 3-1: Preventative Maintenance Checklist

| COMPONENT                  | INSPECTION OR SERVICES  | INTERVAL | Y | N | R |
|----------------------------|---|----------|---|---|---|
| Eight meter                | Check antifreeze level  | Daily    |   |   |   |
| Cut-out tank               |   |          |   |   |   |
| Battery                    | Check electrolyte level   | 6M       |   |   |   |
|                            | Check specific gravity  | 6M       |   |   |   |
|                            | Clean exterior  | 6M       |   |   |   |
|                            | Check battery cable condition                                     | Daily    |   |   |   |
|                            | Clean terminals   | 6M       |   |   |   |
| Engine Oil and Filter      | Check level and condition   | Daily    |   |   |   |
|                            | Check for leaks   | Daily    |   |   |   |
|                            | Change oil and filter   | 100H     |   |   |   |
| Engine Fuel System         | Check fuel level  | Daily    |   |   |   |
|                            | Check for leaks   | Daily    |   |   |   |
|                            | Replace fuel filter   | 6M       |   |   |   |
|                            | Check air cleaner   | Daily    |   |   |   |
| Engine Coolant             | Check coolant level (with engine cold)                            | Daily    |   |   |   |
|                            | Replace coolant   | 400H     |   |   |   |
| Hydraulic Oil              | Check oil level   | Daily    |   |   |   |
|                            | Change filter   | 6M       |   |   |   |
|                            | Drain and replace oil   | 2Y       |   |   |   |
| Hydraulic System           | Check for leaks   | Daily    |   |   |   |
|                            | Check hose connections  | 30D      |   |   |   |
|                            | Check hoses for exterior wear                                     | 30D      |   |   |   |
| Emergency Hydraulic System | Operate the emergency lowering valve and check for serviceability | Daily    |   |   |   |
| Controller                 | Check switch operation  | Daily    |   |   |   |
| Control Cable              | Check the exterior of the cable for pinching, binding or wear     | Daily    |   |   |   |
| Platform Deck and Rails    | Check fasteners for proper torque                                 | Daily    |   |   |   |
|                            | Check welds for cracks  | Daily    |   |   |   |
|                            | Check condition of deck   | Daily    |   |   |   |
| Wheels                     | Check for damage  | Daily    |   |   |   |
|                            | Check air pressure (75 psi [5.2 bar])                             | Daily    |   |   |   |
|                            | Check lug nuts (torque to 90 ft. lbs. [123 Nm])                   | 30D      |   |   |   |

Table 3-1: Preventative Maintenance Checklist (cont'd.)

| COMPONENT          | INSPECTION OR SERVICES                                     | INTERVAL | Y | N | R |
|--------------------|--|----------|---|---|---|
| Hydraulic Pump     | Check for leaks at mating surfaces                         | 30D      |   |   |   |
|                    | Check for hose fitting leaks                               | Daily    |   |   |   |
|                    | Check mounting bolts for proper torque                     | 30D      |   |   |   |
| Drive Motors       | Check for operation  | Daily    |   |   |   |
| Torque Hubs        | Check for leaks  | Daily    |   |   |   |
|                    | Check Oil level  | 250H/6M  |   |   |   |
|                    | Change Oil after break-in                                  | 50H/30D  |   |   |   |
|                    | Change Oil   | 1000H/2Y |   |   |   |
| Steering System    | Check hardware & fittings for proper torque                | 6M       |   |   |   |
|                    | Grease pivot pins  | 30D      |   |   |   |
|                    | Oil king pins  | 30D      |   |   |   |
|                    | Check steering cylinder for leaks                          | 30D      |   |   |   |
| Elevating Assembly | Inspect for structural cracks                              | Daily    |   |   |   |
|                    | Check pivot points for wear                                | 30D      |   |   |   |
|                    | Check mounting pin pivot bolts for proper torque           | 30D      |   |   |   |
|                    | Check elevating arms for bending                           | 6M       |   |   |   |
|                    | Grease linkage pins  | 30D      |   |   |   |
| Chassis            | Check hoses for pinch or rubbing points                    | Daily    |   |   |   |
|                    | Check component mounting for proper torque                 | 6M       |   |   |   |
|                    | Check welds for cracks                                     | Daily    |   |   |   |
| Lift Cylinder      | Check the cylinder rod for wear                            | 30D      |   |   |   |
|                    | Check mounting pin pivot bolts for proper torque           | 30D      |   |   |   |
|                    | Check seals for leaks                                      | 30D      |   |   |   |
|                    | Inspect pivot points for wear                              | 30D      |   |   |   |
|                    | Check fittings for proper torque                           | 30D      |   |   |   |
| Steering Cylinder  | Check the cylinder rod for wear                            | 30D      |   |   |   |
|                    | Check mounting pin pivot bolts for proper torque           | 30D      |   |   |   |
|                    | Check seals for leaks                                      | 30D      |   |   |   |
|                    | Inspect pivot points for wear                              | 30D      |   |   |   |
|                    | Check fittings for proper torque                           | 30D      |   |   |   |
| Entire Unit        | Check for and repair collision damage                      | Daily    |   |   |   |
|                    | Check fasteners for proper torque                          | 3M       |   |   |   |
|                    | Check for corrosion-remove and repaint                     | 6M       |   |   |   |
|                    | Lubricate  | 30D      |   |   |   |
| Labels             | Check for peeling, missing, or unreadable labels & replace | Daily    |   |   |   |
| Turret             | Lubricate teeth  | 30D      |   |   |   |
|                    | CHECK BOLTS FOR TORQUE                                     | 150HR    |   |   |   |
|                    | GREASE GEARBOX   | 150HR    |   |   |   |

## 3.2 Blocking Elevating Assembly (Figure 3-1)

|   |
|---|
| <b>⚠ WARNING ⚠</b>  |
| Never perform service on the work platform in the elevating assembly area while platform is elevated without first blocking the elevating assembly. |
| DO NOT stand in elevating assembly area while deploying or storing brace.   |

### Installation

1. Park the work platform on firm level ground.
2. Fully retract upper boom.
3. Verify platform emergency stop switch is ON.
4. Turn platform/chassis switch to **CHASSIS**.
5. Using the raise button, elevate platform 8-12 inches.
6. Connect a crane or overhead hoist capable of supporting elevating assembly to front of elevating assembly.
7. Install brace capable of supporting elevating assembly under upper boom as shown.
8. Push lower button and gradually lower platform until brace is supporting the platform.
9. Push electric motor start button to stop electric motor.

### Removal

1. Using chassis controls, gradually raise platform until upper boom is off brace.
2. Remove brace and unhook chain from front of upper boom.
3. Push lower button to completely lower platform.

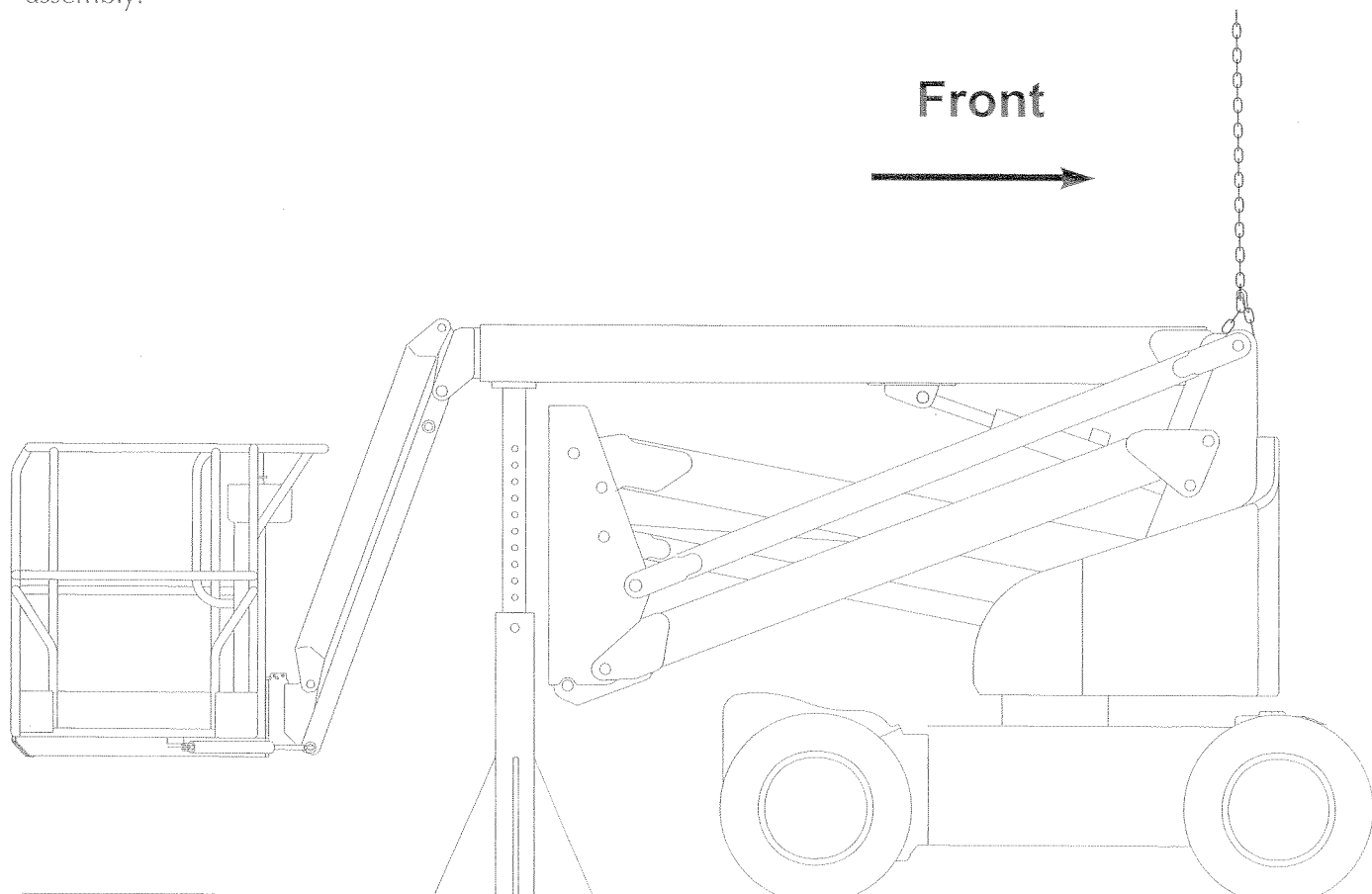


Figure 3-1: Blocking Elevating Assembly

## 3.3 Battery Maintenance

### **WARNING**

Hazard of explosive gas mixture. Keep sparks, flame, and smoking material away from battery.

Always wear safety glasses when working with batteries.

Battery fluid is highly corrosive. Thoroughly rinse away any spilled fluid with clean water.

### BATTERY INSPECTION AND CLEANING

Check battery fluid level daily, especially if work platform is being used in a warm, dry climate. If required, add distilled water ONLY. Use of tap water will shorten battery life.

The batteries should be inspected regularly for signs of cracks in the case, electrolyte leakage and corrosion of the terminals. Inspect cables for worn spots or breaks in the insulation and for broken cable terminals.

Clean the batteries when they show signs of corrosion at the terminals or when electrolyte has overflowed during charging. Use a baking soda solution to clean the batteries, taking care not to get the solution inside the cells. Rinse thoroughly with clean water. Clean battery and cable contact surfaces to a bright metal finish whenever a cable is removed.

### **WARNING**

Hazard of explosive gas mixture. Keep sparks, flame, and smoking material away from battery.

Always wear safety glasses when working with batteries.

Battery fluid is highly corrosive. Thoroughly rinse away any spilled fluid with clean water.

### BATTERY CHARGING

Charge batteries at the end of each work shift or sooner if the batteries have been discharged.

### **WARNING**

Charge the batteries only in a well ventilated area.

Do not charge the batteries when the work platform is in an area containing sparks or flames.

Permanent damage will result if the batteries are not immediately recharged after discharging.

Never leave the charger unattended for more than two days.

Never disconnect the cables from the batteries when the charger is operating.

Keep the charger dry.

Charge batteries as follows:

1. Check the fluid level. If the electrolyte level is lower than 3/8 in. (10mm) above the plates, add clean, distilled water only.
2. Connect the charger plug to a properly grounded outlet of the proper voltage and frequency.
3. The charger turns on automatically after a short delay.
4. The charger turns off automatically when the batteries are fully charged.

### EIGHT METER CUTOUT SYSTEM

The machine will not travel when raised above Eight meters.

1. Check the fluid level in the Eight meter cutout tank daily. The tank is located at the rear of the platform.
2. If fluid level is low, fill tank to "FULL" mark using a 50% antifreeze solution.

### **WARNING**

If the machine drives when elevated above Eight meters (26.2 ft.), remove the machine from service until the Eight meter cutout system is repaired.

## 3.4 Lubrication

Refer to Table 3-1 for the lubrication intervals and Figure 3-2 for location of items that require lubrication service. Refer to the appropriate sections for lubrication information on the Steering Linkage, Torque hubs, Hydraulic Oil, Filter, and Engine Oil and Filter.

### GREASE FITTINGS

Wipe each grease fitting before and after greasing. Using multipurpose grease in a grease gun, pump the grease into the fitting until grease just begins to appear at the edges of the pivot, wipe off any excess grease.

### HYDRAULIC OIL AND FILTER

#### Fluid Level

With the platform fully lowered, check oil level on dipstick (sight gauge - Electric models). If the oil is NOT visible, add hydraulic fluid until oil is visible on dipstick or visible in sight gauge. DO NOT fill above operating range or when the platform is elevated.

#### Oil and Filter Replacement

1. Operate the platform for 10-15 minutes to bring the hydraulic oil up to normal operating temperature.



### CAUTION



The hydraulic oil may be hot enough to cause burns. Wear safety gloves and safety glasses when handling hot oil.

2. Provide a suitable container to catch the drained oil. The hydraulic tank has a capacity of 19 l (5.0 US gallons).
3. Remove the drain plug and allow all oil to drain into the container. Be sure to dispose of oil properly.
4. Reinstall the drain plug.
5. Remove filter element from filter head (located beside valve block).
6. Apply a thin film of clean hydraulic oil (ISO No. 46) to the gasket of the replacement filter.
7. Thread replacement filter onto the filter head until the gasket makes contact then rotate 3/4 of a turn further.
8. Fill the hydraulic oil tank to operating level on dipstick (sight gauge -Electric model) with ISO #46 hydraulic oil.

**IMPORTANT: Bi-Energy models - For service Information on the engine refer to your engine manual (located in platform manual box or available from UpRight Inc).**

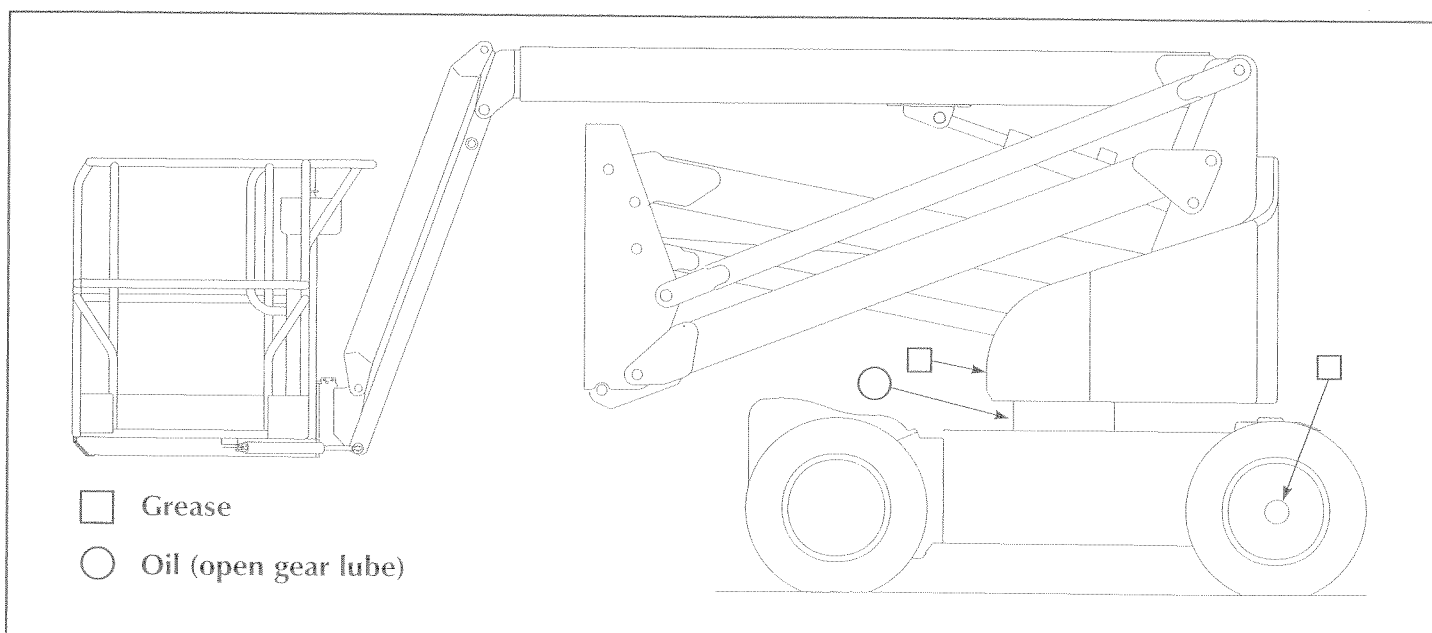


Figure 3-2: Lubrication Chart

## TORQUE HUBS

**Note:** Change oil in torque hubs after the first 50 hours of operation. Change every 2000 hours thereafter.

1. Remove torque hub from drive assembly (refer to section 3-12).
2. Remove drain plug from underside of torque hub and drain oil from unit.
3. Replace drain plug.
4. Remove fill plug from top side of torque hub.
5. Remove fill level plug from side of hub.
6. Fill unit with SAE 90 gear oil until oil comes out fill level plug opening(1/2 full).
7. Replace fill level plug. Replace fill plug.

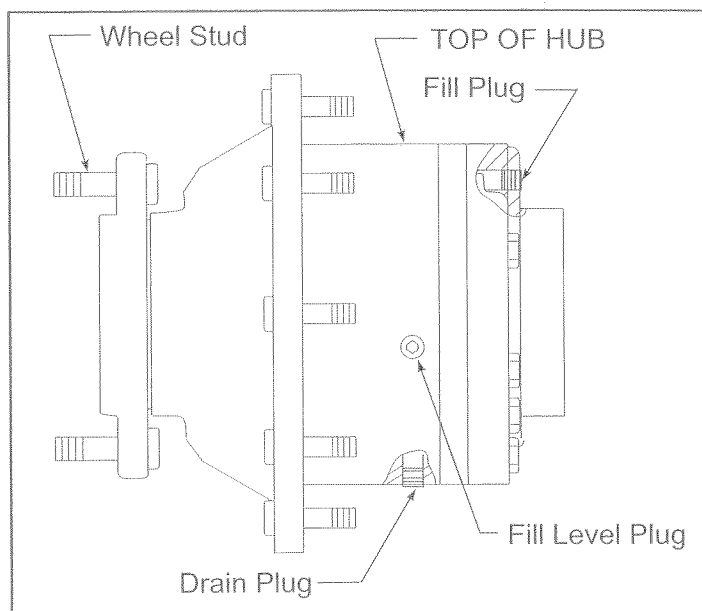


Figure 3-3: Torque Hub

## 3.5 Setting Hydraulic Pressures

Figure (3-9) shows complete hydraulic manifold assembly.

**Note:** Check hydraulic pressures whenever the pump, manifold or any relief valve has been serviced or replaced.

### HIGH RELIEF VALVE (Figure 3-4)

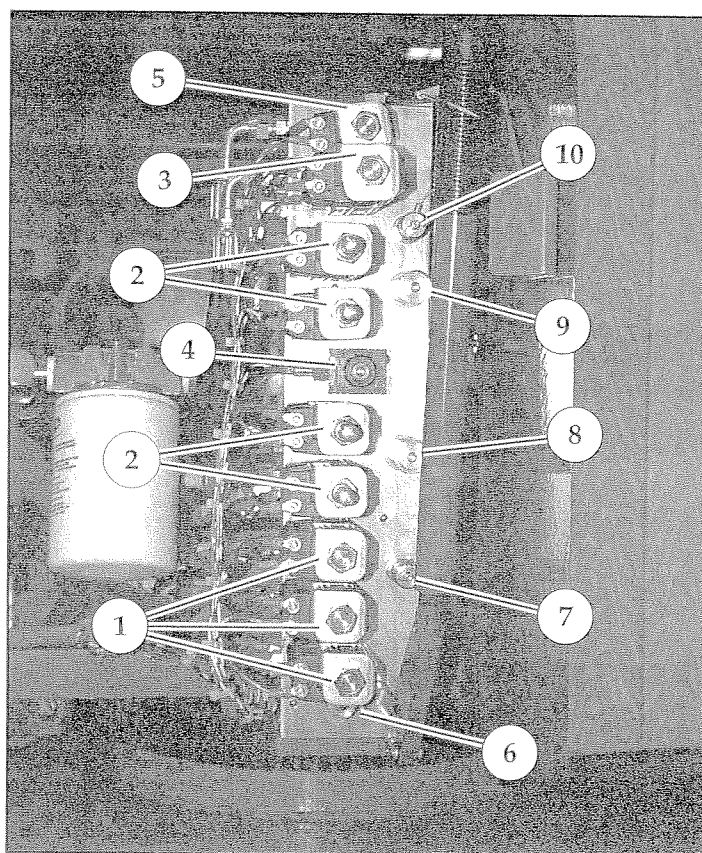
1. Operate the hydraulic system 10-15 minutes to warm the oil.
2. Remove the high relief gauge port plug and install a 0-250 bar (0-3000 PSI) pressure gauge assembly.
3. Remove the plug in the end of the high relief valve to expose the adjusting screw.
4. Operate Jib raise function until jib is completely raised.
5. While activating the jib raise switch, set the pressure to 2500 PSI (173 bar) maximum by slowly turning the adjusting screw. Turning the adjusting screw clockwise increases pressure and counterclockwise decreases pressure.
6. Remove the pressure gauge and reinstall all plugs.

### LOW RELIEF VALVE

1. Operate the hydraulic system 10 - 15 minutes to warm the oil.
2. Remove the low relief gauge port plug and install a 0-250 bar (0-3000 PSI) pressure gauge assembly.
3. Remove the plug in the end of the low relief valve to expose the adjusting screw.
4. Turn the low relief valve adjustment screw counterclockwise two full turns.
5. Operate jib lower function until jib is completely lowered.
6. While activating the jib lower switch, set the pressure to 1500 PSI (104 bar) maximum by slowly turning the adjusting screw. Turning the adjusting screw clockwise increases pressure and counterclockwise decreases pressure.
7. Remove the pressure gauge and reinstall all plugs.

## OVERCENTER RELIEF VALVES

1. If any overcenter relief valve is faulty, completely lower the jib, boom and elevating assembly and remove the overcenter valve.
2. Replace or recalibrate (bench set) the overcenter valve.
3. Slowly cycle function related to replaced overcenter valve several times to remove air from system.



1. Motor Spool 4 way Valve, 3 position
2. Closed Center 4 way Valve, 3 position
3. Tandem Center 4 way, 3 position Valve
4. Low Flow Valve
5. High Flow Valve
6. Counterbalance Valve
7. Low Relief Gage Port Plug
8. Low Relief 1500 PSI
9. High Relief 2500 PSI
10. High Relief Gage Port Plug

Figure 3-4: Valve Manifold



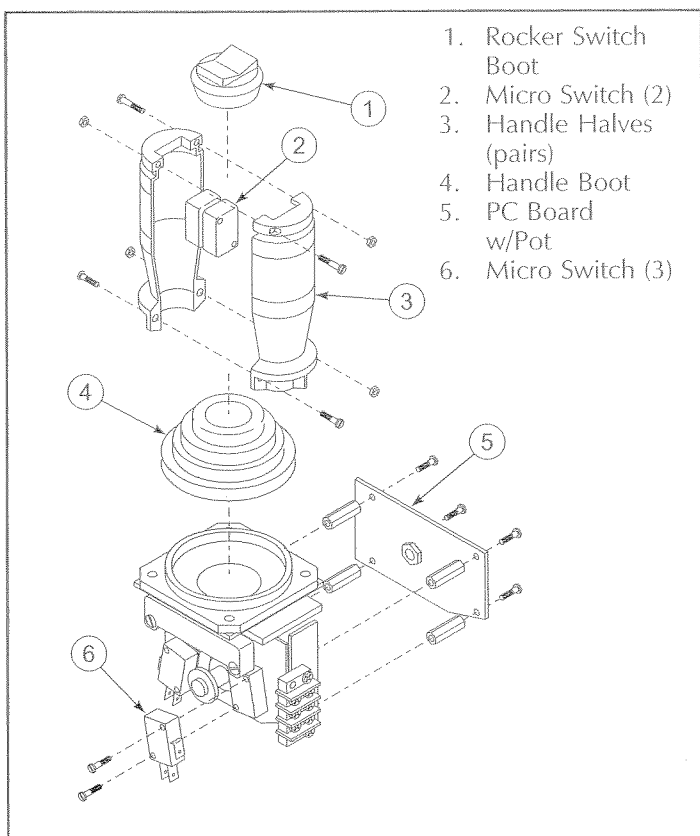


Figure 3-5: Proportional Controller

## 3.6 Proportional Controller JOYSTICK HANDLE (FIGURE 3-5)

1. If necessary, remove handle assembly from control box.
2. Remove and replace defective parts.
3. If replacing PC board with pot (5), note pot adjustment (number of turns clockwise or anticlockwise) and adjust new pot to match old pot setting.

**NOTE:** Check that pot operates correctly when handle is pushed completely forward and reverse.

Refer to pages 6-62 (Electric) and 6-66 (Bi-Energy) for repair part numbers.

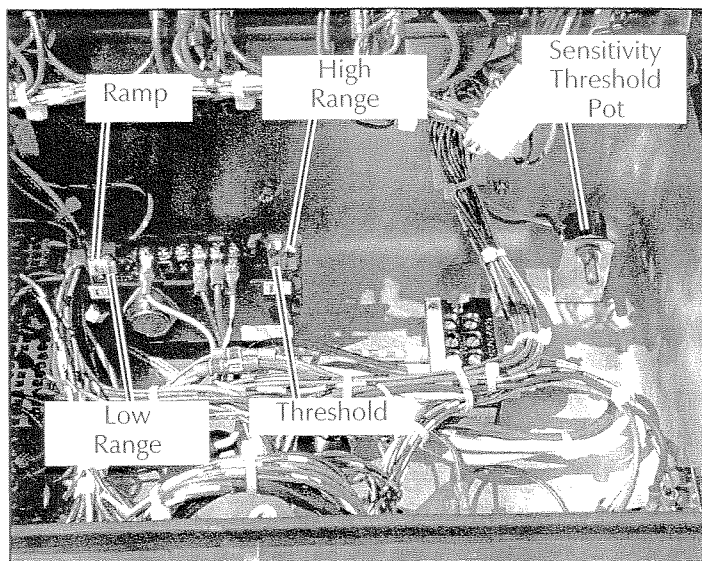


Figure 3-6: Upper Control Box

## PROPORTIONAL CONTROL ADJUSTMENT (Figure 3-6)

**NOTE:** Refer to "TROUBLESHOOTING" section for detailed MOS90 pin configuration. Refer to page 4-15 for test procedure.

Potentiometers are sealed to protect sensitive adjustments from vibrations, or from tampering. Remove sealant, adjust pot and reapply after adjustment.

**NOTE:** Do not use silicone sealer; it will damage potentiometers.

Use a small screwdriver or special adjustment tool to set adjustment pots. Pots can be easily damaged.

Pots have 15 turns of adjustment, more than one turn will often be required to complete the adjustment. If pots have been previously set, reset by turning no more than 1 turn at a time. If they have not been previously set, preset to about mid range and start from there.

Turn pot clockwise (CW) to increase settings.

Turn pot counterclockwise (CCW) to decrease settings.

Adjust pots only in sequence as outlined in this procedure.

## Rotary Control for Boom Functions

**IMPORTANT:** Back out ramp trimpot 10 turns (counter clockwise) before making any adjustments.

1. Verify that batteries are fully charged.
2. Connect ammeter in series at "A" terminal.

3. Set threshold so upper boom elevates with rotary speed adjustment set on 2 and raise function switch actuated.
4. Set high range at .44 amps or so upper boom functions operate with speed adjustment on 9 or highest speed position. Check for proportional valve vibration. Valve is fully closed when it does not vibrate when energized. Do not over adjust.
5. Set low range so machine slews 180 degrees in 45 seconds with speed control set at position 9 or full speed.
6. Turn ramp trimpot back in 10 turns. Set ramp trimpot until machine has a smooth start or upper boom delays 2 seconds with raise switch actuated and speed control set at position 9 or full speed.

## Drive Control

1. Adjust sensitivity threshold pot (located in upper control box) to obtain an equal threshold between forward and reverse directions (Figure 3-6).
2. Set Sevcon motor values. Drive adjustments are made through the motor control calibrator.

## PLATFORM DOWN LIMIT SWITCH (Figure 3-7)

The Platform Down Switch bypasses the Tilt Sensor when the platform is fully lowered and closes the circuit to the Platform Down Relay, which allows high speed travel, cage trim function and turret rotation.

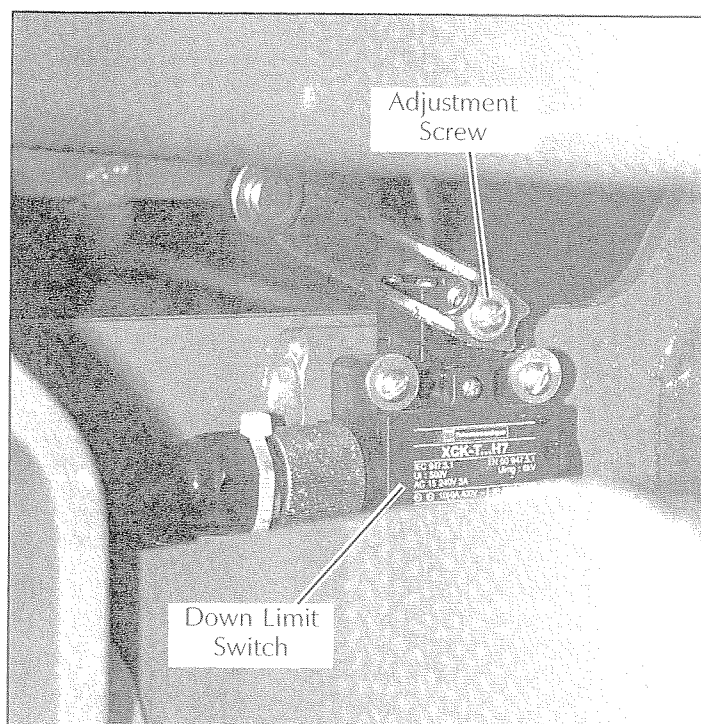


Figure 3-7: Platform Down Limit Switch

**⚠ WARNING ⚠**

DO NOT attempt to adjust Limit Switches without first blocking the elevating assembly (see section 3.1).

1. Lower the Platform completely.
2. With the Platform / Chassis switch on Chassis, push the Tilt Sensor base to test the alarm circuit.
3. If the alarm sounds, elevate the platform and adjust the position of the switch arm by loosening the adjustment screw and repositioning the arm. Lower the platform and retest. If down limit switch is properly adjusted, the tilt alarm will not sound.
4. With platform elevated, repeat step 2. When switch is properly adjusted, alarm will sound.

## TILT SENSOR (FIGURE 3-8)

The Tilt Sensor has four wires; red-power (12v in), black-ground, white-output (12v out) and green (to controller). To verify the sensor is working properly there are two LED's under the sensor; green indicates the sensor is on (has power), red indicates the sensor is level and the white wire is 'hot' (12v out).

1. Check tires for proper pressure.
2. Place machine on firm level surface  $\pm 1/4^\circ$ .
3. Use Inclinator to ensure that the front and rear of the chassis are level within  $\pm 1/4^\circ$ .
4. Adjust the three leveling locknuts until the bubble is centered in the circle on the attached bubble level.
5. Elevate the platform until down limit switch opens and push the tilt sensor base to test the alarm circuit. Alarm should sound.

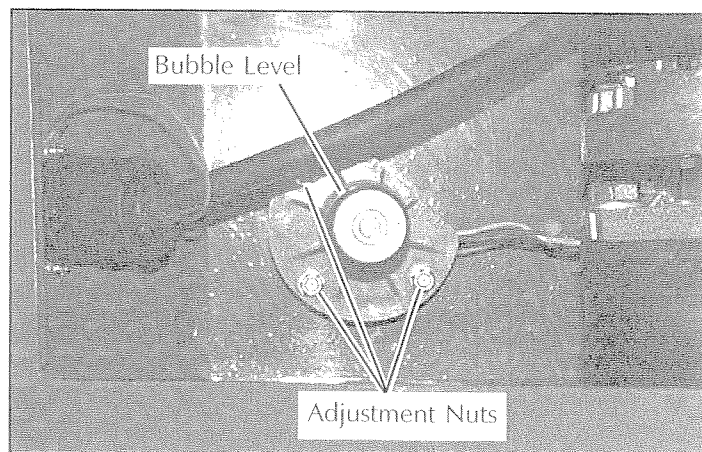


Figure 3-8: Tilt Sensor

## 3.7 Hydraulic Manifold (Figure 3-9)

It is not necessary to remove the manifold to perform all maintenance procedures. Prior to performing maintenance, determination if the manifold needs to be removed.

### REMOVAL

1. Unplug the batteries.
2. Tag and disconnect the solenoid valve leads from the terminal strip.
3. Tag, disconnect and plug hydraulic hoses.
4. Remove the bolts that hold the manifold to the mounting bracket.
5. Remove manifold block.

### DISASSEMBLY

**NOTE:** Mark all components as they are removed so as not to confuse their location during assembly. Refer to Figure 3-9 often to aid in disassembly and assembly.

1. Remove coils from solenoid valves.
2. Remove spool valve cover and spool valve.
3. Remove solenoid valves, lift relief valve, counterbalance valves and divider combiner valve.
4. Remove fittings, plugs, springs, balls and orifices.

### CLEANING AND INSPECTION

1. Wash the manifold in cleaning solvent to remove built up contaminants and then blow out all passages with clean compressed air.
2. Inspect the manifold for cracks, thread damage and scoring where O-rings seal against internal and external surfaces.
3. Wash and dry each component and check for thread damage, torn or cracked O-rings and proper operation.
4. Replace parts and O-rings found unserviceable.

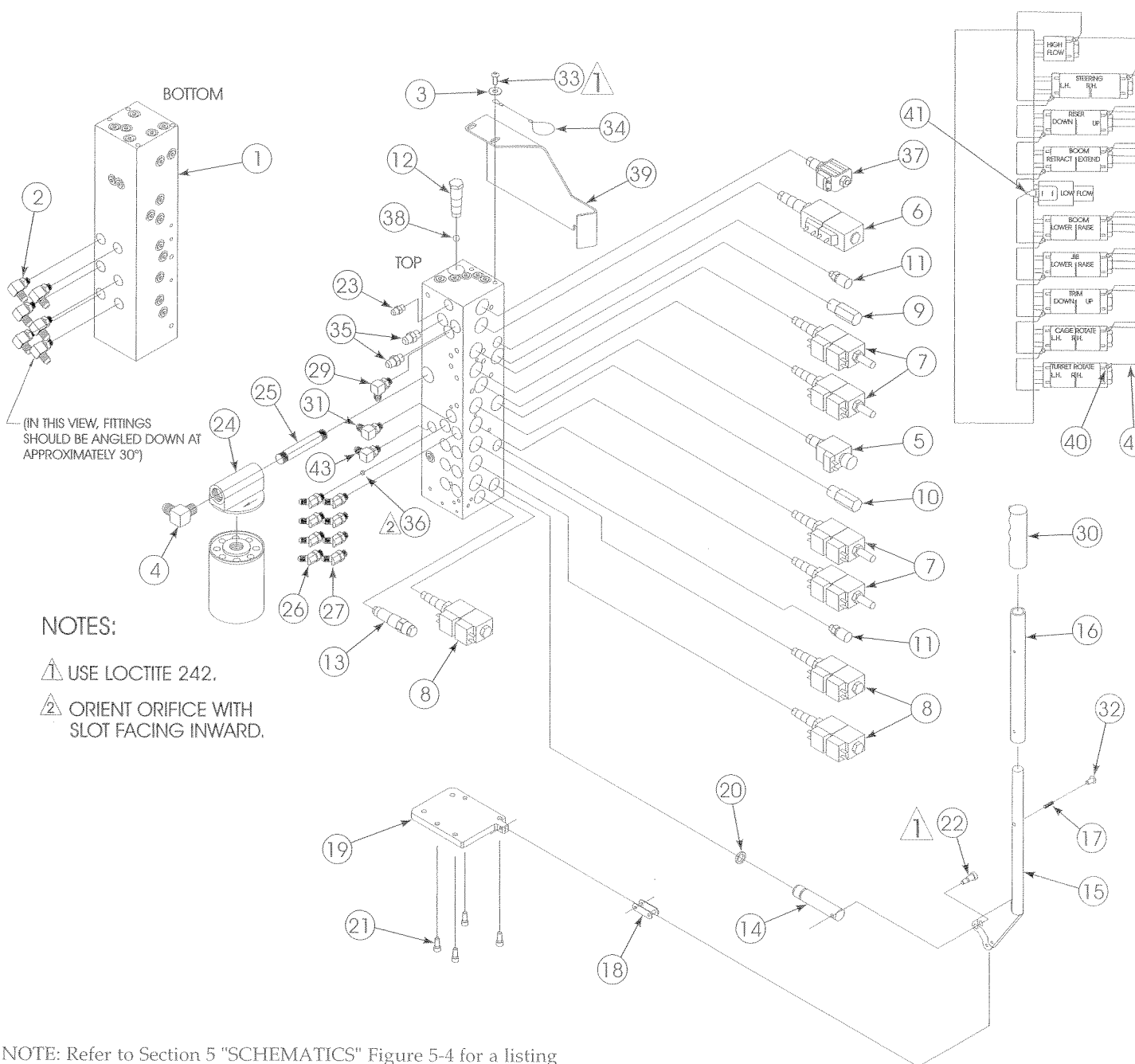
### ASSEMBLY

**NOTE:** Lubricate all O-rings before installation to prevent damage to O-rings. Seat all balls in manifold block by lightly tapping on the ball with a brass drift punch.

1. Install fittings, plugs, springs, balls and orifices. Use one drop of Loctite #242 on each screw-in orifice.
2. Install solenoid valves, lift relief valve, counterbalance valves, divider combiner valve, and spool valve.
3. Install coils on solenoid valves (refer to torque specs page 3-31).

### INSTALLATION

1. Attach manifold assembly to mounting plate with bolts.
2. Connect Solenoid leads to terminal strip (as previously tagged).
3. Connect hydraulic hoses. Be certain to tighten hoses to manifold (refer to torque specs page 3-31).
4. Plug in batteries.
5. Operate each hydraulic function and check for proper operation and leaks.
6. Adjust lift relief and counterbalance valve pressures according to instructions in Section 3-5.



NOTE: Refer to Section 5 "SCHEMATICS" Figure 5-4 for a listing of hydraulic valve ports.

- |                                  |                          |                      |                      |
|----------------------------------|--------------------------|----------------------|----------------------|
| 1. Valve Block                   | 11. Plug (Pressure Port) | 21. Screw, 5/16-18   | 32. Screw, 10-20     |
| 2. Fitting                       | 12. Diverter Valve       | 22. Screw, 3/8 x 5/8 | 33. Screw, 5/16-18   |
| 3. Washer, 5/16 Flat             | 13. Counterbalance Valve | 23. Fitting          | 34. Lanyard          |
| 4. Fitting, Elbow                | 14. Piston               | 24. Filter Assembly  | 35. Fitting Adapter  |
| 5. Low Flow Valve (Proportional) | 15. Lever                | 25. Pipe Adapter     | 36. Orifice          |
| 6. Steering Valve                | 16. Extension            | 26. Fitting Elbow    | 37. High Flow Valve  |
| 7. 4-Way Closed Center           | 17. Detent               | 27. Fitting, Elbow   | 38. Steel Ball, 7/16 |
| 8. 4-Way Motor Spool             | 18. Pivot Link           | 28. Fitting, Elbow   | 39. Bracket          |
| 9. Relief Valve                  | 19. Mounting Plate       | 29. Fitting Elbow    | 40. Connector Ring   |
| 10. Relief Valve                 | 20. Seal                 | 30. Grip             | 41. Connector Female |
|                                  |                          | 31. Fitting Elbow    | 42. Wire             |
|                                  |                          |                      | 43. Fitting, Elbow   |

Figure 3-9: Hydraulic Manifold, Exploded View

## 3.8 Hydraulic Power Unit (Figure 3-10)

**NOTE:** Brushes on the electric motor can be replaced without removing the hydraulic power unit from the chassis by raising and securely blocking the chassis and work from underneath the chassis.

**NOTE:** Power unit may be removed through the front of the chassis by moving the relay panel out of the way or through the bottom of the chassis by raising and securely blocking the chassis. Drain the hydraulic tank before removing power unit.

### REMOVAL

1. Mark, disconnect and plug the hose assemblies.
2. Mark and disconnect the electric cables.
3. Remove hardware which secures power unit and remove from chassis.

### INSTALLATION

1. Install power unit using hardware previously removed.
2. Unplug and reconnect the hydraulic hoses.
3. Reconnect the electric cables.
4. Fill the tank with clean hydraulic fluid.
5. Check the oil level in the hydraulic tank before operating the work platform.
6. Operate the pump and check for leaks and proper operation.
7. Replenish hydraulic fluid if necessary.

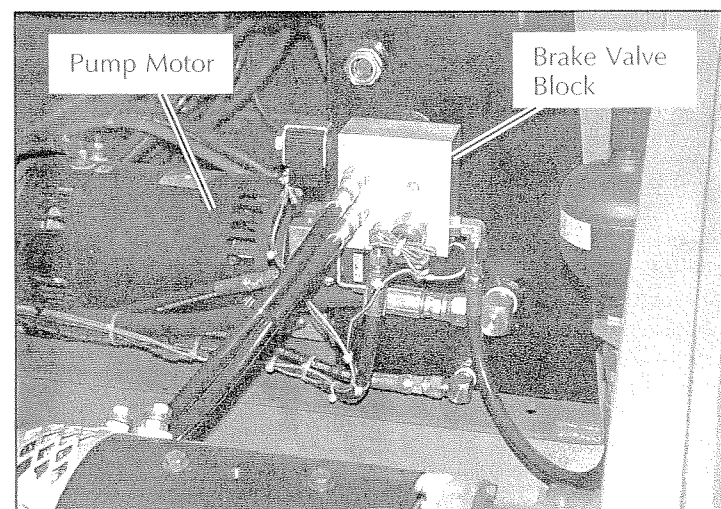


Figure 3-10: Hydraulic Power Unit  
(Electric Model Shown)

## 3.9 Hydraulic Brakes

### Removal

1. Park the work platform on firm level ground and block the wheels to prevent the work platform from rolling.
2. Disconnect the hydraulic brake lines.
3. Tag and disconnect electric cables from drive motors.

|   |
|---|
| <b>⚠ CAUTION ⚠</b>  |
| <p>Clean all fittings before disconnecting the hose assemblies.</p> <p>Plug all port holes and hose assemblies IMMEDIATELY to prevent contamination from dust and debris.</p> |

4. Remove capscrews and washers holding the motor and brake to torque hub.
5. Remove the motor.
5. Remove the brake.

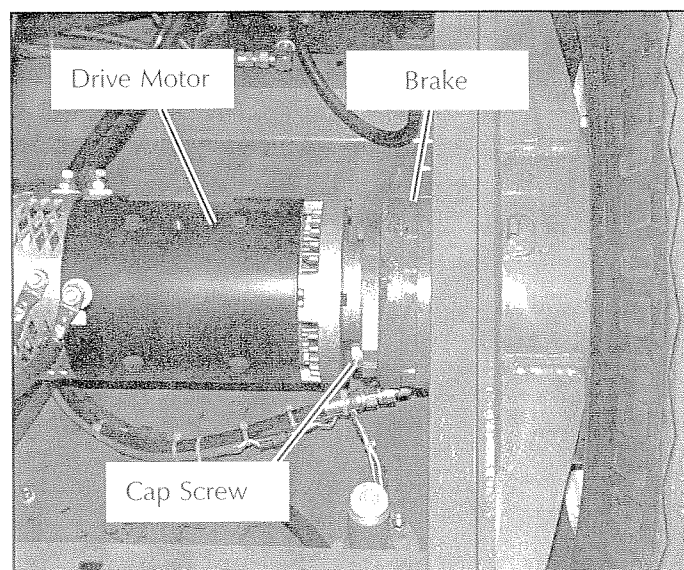


Figure 3-11: Rear Axle Assembly

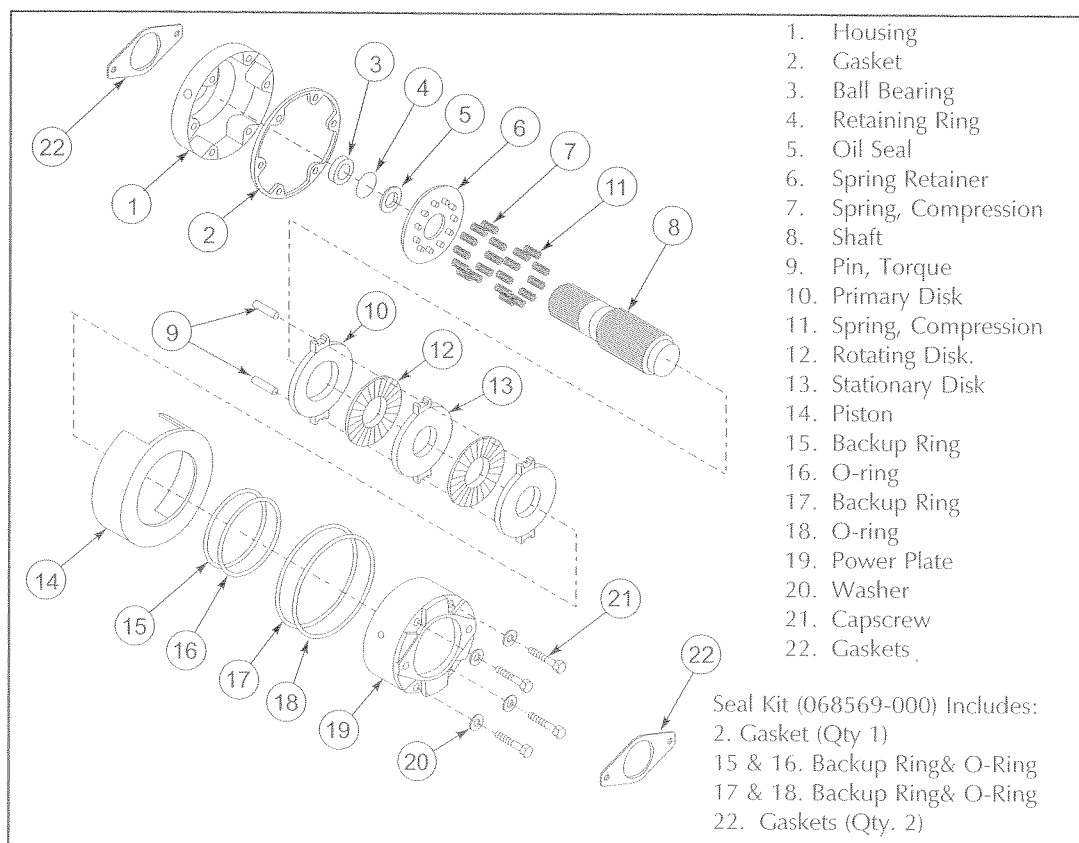
**NOTE:** Torque all hardware to torques listed on page 3-32 unless otherwise specified.

## Brake Seal Replacement(Figure 3-12)

1. With shaft protruding downward remove capscrews (21) and washers (20) from brake assembly.
2. Remove power plate (19) from housing (1). Remove the gasket (2).
3. Remove piston (14) from power plate (19) by introducing low pressure air 1 bar (15 psi) into the hydraulic inlet. Make sure piston is not pointed at anyone.
4. Remove o-rings (16 & 18) and backup rings (15 & 17) from inner and outer diameter grooves of piston.
5. Clean piston (14) and power plate (19) assemblies with solvent. Inspect the sealing surfaces of the piston (14) and power plate (19). Inspect seal grooves in the piston. Replace brake assembly if they are damaged or scratched deeply. Lubricate piston (14), power plate (19), and seals (15, 16, 17, & 18) with clean hydraulic oil prior to assembly.
6. Install the backup rings (15 & 17) and o-rings (16 & 18) into the seal grooves in the piston.
7. Install piston into power plate using a shop press. Be careful not to damage the seals during assembly. Center cutouts in piston with torque pin holes in the power plate. Press piston to a depth no less than flush, but not exceeding 0.120 in. below the surface of the power plate at cutouts in piston. This depth is critical. The brake will not hold if it is exceeded.
8. Install gasket (2).
9. Install power plate/piston assembly (14 & 19) to housing (1) using capscrews (21) and washers (20). Tighten sequentially, one turn at a time, to press the two assemblies together. Torque capscrews 50 - 60 ft.-lbs.

## Installation

1. Coat output shafts of brake and drive motor with high pressure molybdenum grease and install gasket (22) and brake onto torque hub.
2. Install gasket (22) and drive motor. Align holes and install the two cap screws and lock washers.
3. Reinstall cables to drive motor and hoses to the brake.
4. Install the wheel. Torque the wheel nuts to 90 ft. lbs. (122 Nm).
5. Remove the jack stands and lower chassis to the ground.
6. Position chassis switch to parking brake release position. Alarm will sound.
7. Energize brake hydraulic system.
8. Check for leaks and bleed air out of brake hydraulic system using bleed valve located on brake housing.





## 3.10 Drive Motors

### Removal

1. Disconnect battery negative terminals or Anderson connectors (both sides).
2. Tag and disconnect electric cables from motor.
3. Remove and save hardware which secures drive motor to torque hub.

### Installation

**NOTE: Torque all hardware to torques listed on page 3-31 unless otherwise specified.**

1. Install drive motor to torque hub using original hardware.
2. Connect electric cables to motor.
3. Connect Anderson connectors or negative terminals on batteries.

## 3.11 PUMP MOTOR

### Removal

1. Disconnect battery negative terminals or Anderson connectors (both sides).
2. Tag and disconnect electric cables from motor.
3. Remove and save hardware which secures pump motor to pump assembly.

### Installation

**NOTE: Torque all hardware to torques listed on page 3-32 unless otherwise specified.**

1. Install motor using original hardware.
2. Connect electric cables to motor.
3. Connect Anderson connectors or negative terminals on batteries.

## REPLACING MOTOR BRUSHES (Figure 3-13)

1. If necessary, remove electric motor (Refer to previous section).
2. Release latch and remove headband.
3. Pull back brush spring and latch on hook.
4. Remove screw and set aside.

**IMPORTANT: Be sure screw does not fall inside motor.**

5. Remove old brush and replace with new brush.
6. Replace screw, unhook brush spring and return to original position.
7. Install and relatch headband.

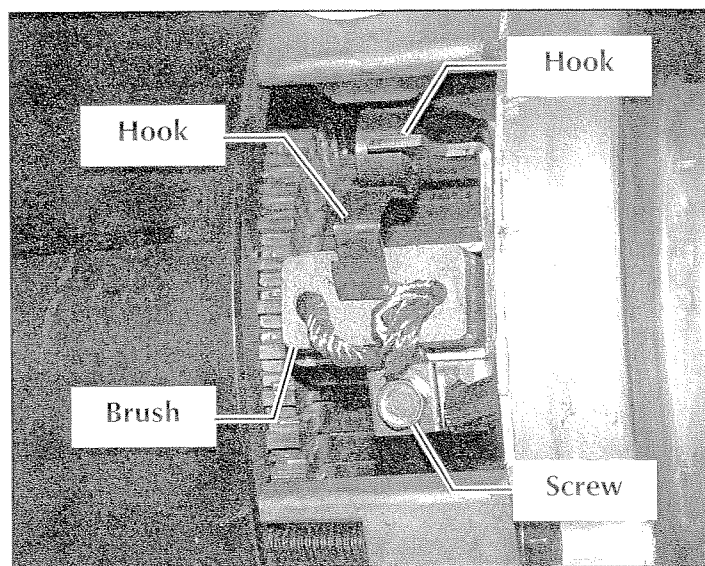


Figure 3-13: Replacing Drive Motor Brushes  
(P/N 068573-010)

## 3.11 FRONT WHEEL BEARINGS

### Removal

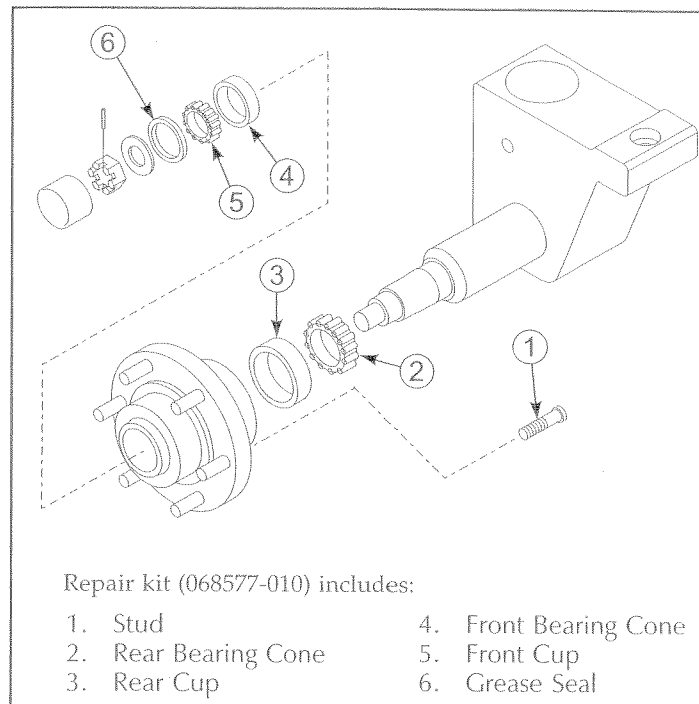
1. Disconnect battery negative terminals and/or Anderson connectors (both sides on electric model).
2. Loosen wheel lug nuts.
3. Raise front axle using 2-ton jack. Support front axle using two 2-ton jack stands.
4. Remove wheel lug nuts and remove wheel.
5. Remove axle dust cap.
6. Remove cotter pin, hub nut, and washer.
7. Remove hub assembly.
8. Clean all parts using a suitable solvent.
9. Inspect bearings, cones and cups for wear and replace if necessary.

**NOTE: Cups do not need to be replaced if they are not damaged.**

### Installation

**NOTE: Torque all hardware to torques listed on page 3-31 unless otherwise specified.**

1. Apply a liberal coating of grease to each cup.
2. Pack the inside bearing with a liberal amount of multi purpose grease and position it in the hub. Install new grease seal.
3. Apply a thin coating of grease to the spindle and slide the hub onto the spindle.
4. Pack the outside bearing cone with multi purpose grease and slide it onto the spindle until it seats in the outer bearing cup.



**Figure 3-14: Front Axle Assembly**

5. Install the washer and hub nut. While rotating the hub, tighten the hub nut until the hub drags. Then back the nut off until a slot lines up with the hole in the spindle.
6. Install a new cotter pin and bend the end up over the nut.
7. Install the dust cap and wheel. Torque the lug nuts to 90 ft. lbs. (123 N-m).
8. Remove jack stands and lower the axle to the ground.
9. Connect battery negative terminals and/or Anderson connectors.



## .12 TORQUE HUB

### removal

Park the work platform on firm level ground and block the wheels to prevent the work platform from rolling.

Disconnect battery negative terminals or Anderson connectors (both sides on electric model).

Loosen the wheel lug nuts on the torque hub to be removed.

Raise the rear of the work platform using a 2-ton jack.

Position two 2-ton jack stands under the rear axle to prevent the work platform from falling if the jack fails.

Remove the wheel nuts and wheel.

Disconnect hydraulic brake line from brake.



### CAUTION

Clean all fittings before disconnecting the hose assemblies.

Plug all port holes and hose assemblies IMMEDIATELY to prevent contamination from dust and debris.

Remove 90° fitting from side of torque hub.

Tag and remove electric cables from drive motors.

1. Remove mounting bolts from electric motor.

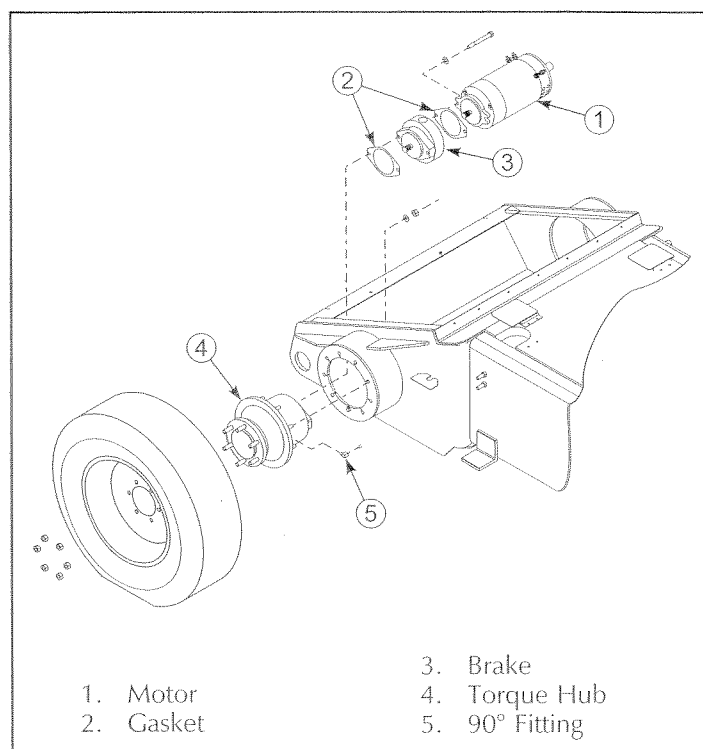
2. Separate electric motor from brake. Discard gasket.

3. Separate brake from torque hub. Discard gasket.

4. Remove 1/2-20 nuts and washers from torque hub.

5. Remove torque hub.

**IMPORTANT:** Note position of 90° fitting on torque hub body. Hub must be installed with fitting in same position.



- 1. Motor
- 2. Gasket

- 3. Brake
- 4. Torque Hub
- 5. 90° Fitting

Figure 3-15: Torque Hub Assembly

### Installation

**IMPORTANT:** Hub must be installed with 90° fitting in same position as when it was removed.

**NOTE:** Torque all hardware to torques listed on page 3-31 unless otherwise specified.

1. Install torque hub using 1/2-20 nuts and 1/2 washers.
2. Remove plug from 90° fitting and install fitting in side of torque hub. Point fitting towards rear of hub.
3. Using 90 weight gear lube with EP additive, fill torque hub through top plug hole in rear cover until oil comes out of 90° fitting in side. Plug 90° fitting and top of rear cover.
4. Install new gasket and brake.
5. Install new gasket and electric motor.
6. Secure assembly using washers and bolts.
7. Connect hydraulic brake lines.
8. Connect electric cables to drive motors.
9. Install wheels. Torque lug nuts to 90ft. lbs. (123 Nm).
10. Bleed brake lines if necessary (refer to 3-13).
11. Remove jack stands and lower rear end.
12. Connect battery terminals or Anderson connectors.
13. Check function of brake.

## *Seal Replacement Torque Hubs*

### **ROLL AND LEAK TESTING**

**IMPORTANT:** Torque hubs should always be roll and leak tested before disassembly and after assembly to make sure gears and sealants are working properly.

#### **ROLL TEST**

Gears should be able to rotate by applying a constant force to the axle. Some gear packages roll with more difficulty than others. Do not be concerned if gears seem to roll hard as long as they roll with consistency. If you feel more drag only at certain points the gears are not rolling freely and should be checked for improper installation or defects.

#### **LEAK TEST**

The purpose of a leak test is to make sure the unit is air tight. Pressurize hub to .3 bar (5 PSI). Torque hub has a leak if the air pressure starts to fall after hub has been pressurized. Use soap and water on hub to detect location of leaks. If a leak is detected, seal or "O" ring must be replaced.

#### **PRESSING TOOLS**

The seal, cup and cone pressing tools are illustrated on pages 20, 21 and 23. Use pressing tools identical in size or fabricate them using the dimensions shown.

#### **DISASSEMBLY (Figure 3-17)**

**CAUTION:** Safety glasses should be used during disassembly of hub.

1. Remove two pipe plugs in cover and drain the oil from the unit.
2. Loosen and remove shoulder bolts and cap screws from cover. Remove cover from hub.
3. Remove "O" ring. Remove thrust washer from counterbore in cover.
4. Remove input gear from planet gears.
5. Using a punch, remove retaining ring from groove around inside of input gear.
6. Lift carrier sub-assembly from hub. Lift ring gear from hub. Remove "O" ring from counterbore in hub.
7. Remove pipe plugs from side of hub body.
8. Apply a preload to output shaft to remove retaining ring. Follow steps a & b.

- a. Place bearing cone pressing tool on retaining ring.
  - b. Apply pressure to fixture using a hydraulic ram or by striking the fixture with a soft face hammer. Pressure should be applied until hub rotates with difficulty.
9. Using retaining ring pliers remove retaining ring. Remove spacer from output shaft.
  10. Place spacer under hub so output shaft will fall through bottom when pressed out.
  11. Press output shaft out of hub. Output shaft may come out with bearing cone and seal attached. Remove seal and discard. Use a punch and hammer to remove bearing cone. Be careful not to strike shaft with punch.
  12. If seal and cone remain in hub, press them out using a pressing tool.
  13. Lift bearing cone out of hub.
  14. Stand hub on its small end. Using a punch and hammer, remove bearing cup from counterbore of hub. Be careful not to strike counterbore with punch.
  15. Turn hub over on larger end. Using a punch and hammer, remove bearing cup from counterbore of hub. Be careful not to strike counterbore.

**NOTE:** Carrier sub-assembly does not need to be disassembled to replace seals.

#### **ASSEMBLY**

**NOTE:** Torque all hardware to torques listed on page 3-31 unless otherwise specified.

1. Oil output shaft and bearing cone. Using cone press, press bearing cone onto end of output shaft with retaining ring groove.
3. Stand hub on its small end. Using bearing cup pressing tool press bearing cup down into hub.

**NOTE:** Make sure cup sits square with counterbore.

4. Turn hub over so it sit on large end. Using bearing cup pressing tool press bearing cup into small end of hub.

**NOTE:** Make sure cup sits square with counterbore.

5. Place output shaft into hub so end of shaft with retaining ring groove points down.
6. Oil output shaft. Using seal pressing tool press seal into counterbore in small end of hub. The closed face of the seal should be up.

## 3.12 Seal Replacement Torque Hubs (Continued)

7. Turn hub over so small end points down. Using bearing cone pressing tool, press bearing cone onto output shaft. Rotate hub while pressing bearing. Stop pressing when hub starts to resist rotating.
8. Place spacer onto output shaft so it rests on top of bearing cone. Using retaining ring pliers, place retaining ring to make sure it is seated.
9. Hit the end of output shaft once or twice with a soft face hammer. Turn the shaft in both clockwise and counter clockwise directions while hitting. This will seat the bearing cone against the spacer and retaining ring allowing necessary endplay in the hub-shaft sub-assembly.
10. Turn hub over so it rests on large end. Measure endplay in hub-shaft sub-assembly. Follow steps a-c.
  - a. Mount a dial indicator on hub. Locate the dial rod on top of output shaft.
  - b. Lift up on output shaft until the needle on the dial stops moving.

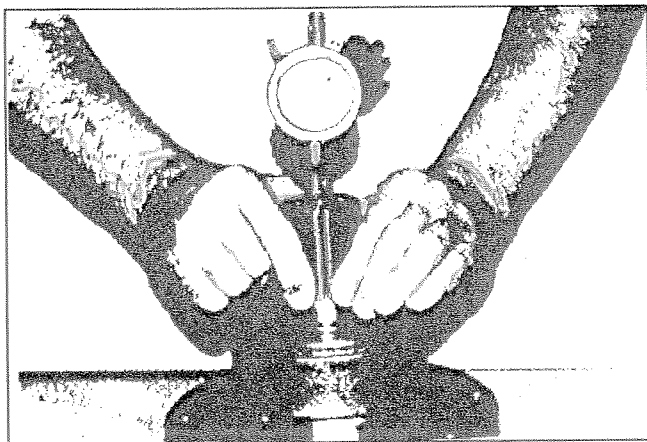


Figure 3-16: Measuring Hub End Play

- c. Read the dial. Reading should be no greater than .008 in.
  - If dial reads less than .008 in. continue on to step 11.
  - If dial reads more than .008 in. repeat step 8-15 of "DISASSEMBLY" section.
- d. Remove spacer and replace it with thicker spacer (SK91 068570-011).
- e. Repeat steps 7-10 and remeasure end play.
11. Apply a light coat of "Never Seize" to the pipe plugs and install into pipe plug holes in hub.

**NOTE:** Leave hole for 90° fitting open.

## MAIN ASSEMBLY

1. Position hub on its output shaft so that hubs small diameter end points down.
2. Using a marker, mark the four shoulder bolt holes in hub.
3. Grease "O" ring and place in counterbore in hub.

**NOTE:** "O" rings may be stretched or squeezed together in order to fit exactly in counterbore.

4. Oil all exposed surfaces inside hub. Oil carrier sub-assembly.
5. Place carrier sub-assembly, with spline connections down, into mesh with output shaft.
6. Place ring gear, with squared shoulder down, into mesh with the planet gears of the carrier sub-assembly. Make sure that marked shoulder bolt hole on ring gear aligns with any of the marked shoulder bolt holes on the hub. "X" mark should be on the cover side of ring gear.
7. Start one half of retaining ring into groove inside input gear. Use a soft punch to press the remaining half of the retaining ring into the groove.
8. Insert input gear, with large diameter end down, into mesh with planet gears.
9. Place large thrust washer over input gear so it rests on carrier housing. Oil all exposed surfaces inside hub.
10. Grease "O" ring and place into counterbore of cover.

**NOTE:** "O" rings may be stretched or squeezed together in order to fit exactly in counterbore.

11. Place cover on top of ring gear so the fill hole will be at top of hub when it is installed.
12. Install four shoulder bolts into shoulder bolt holes and tighten.
13. Install eight cap screws in remaining holes and tighten.
14. Apply 23-27 ft. lbs. of torque to all bolts.
15. Apply a light coat of "Never Seize" to both pipe plugs and install into the two holes in cover.
16. Roll test the unit in both clockwise and counter-clockwise directions. Turn hub nine full revolutions in each direction.
17. Leak test the hub at .3 bar (5 PSI) for two to three minutes.

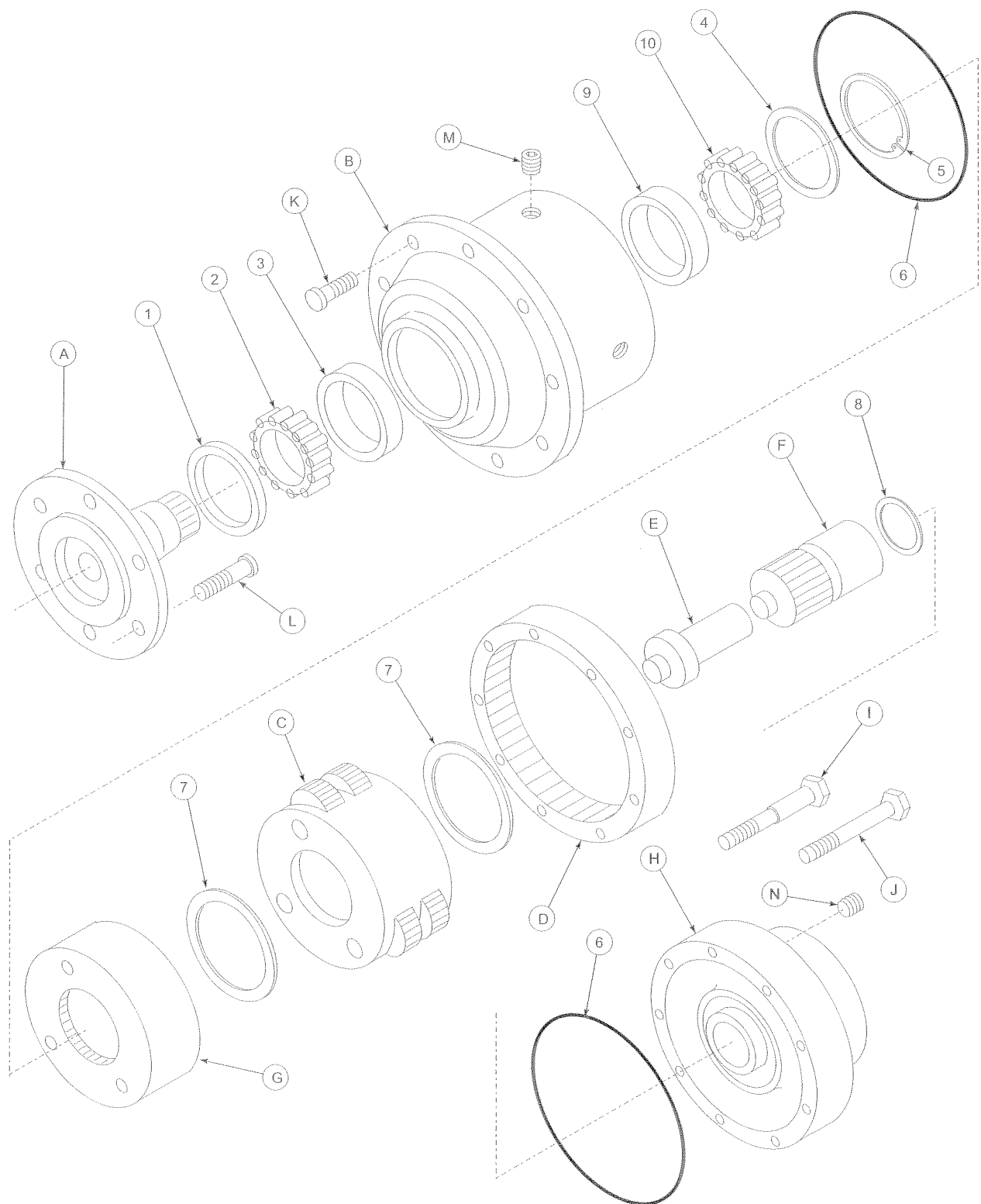


Figure 3-17: Torque Hub

- |                  |                   |
|------------------|-------------------|
| A. Spindle       | F. Sun Gear       |
| B. Housing       | G. Gear, Internal |
| C. Carrier Assy  | H. Cover          |
| D. Gear Ring     | I. Shoulder Bolt  |
| E. Spacer, Input | J. Bolt           |

- |              |
|--------------|
| K. Stud      |
| L. Stud      |
| M. Pipe Plug |
| N. Pipe Plug |

Repair Kit (068570-010) contains:

- |                   |                                      |
|-------------------|--------------------------------------|
| 1. Lip Seal       | 7. Thrust Washer (2)                 |
| 2. Bearing, Cone  | 8. Thrust Washer - SK91 (068570-011) |
| 3. Bearing, Cup   | 9. Bearing, Cup                      |
| 4. Thrust Washer  | 10. Bearing, Cone                    |
| 5. Retaining Ring |                                      |
| 6. O-Ring (2)     |                                      |

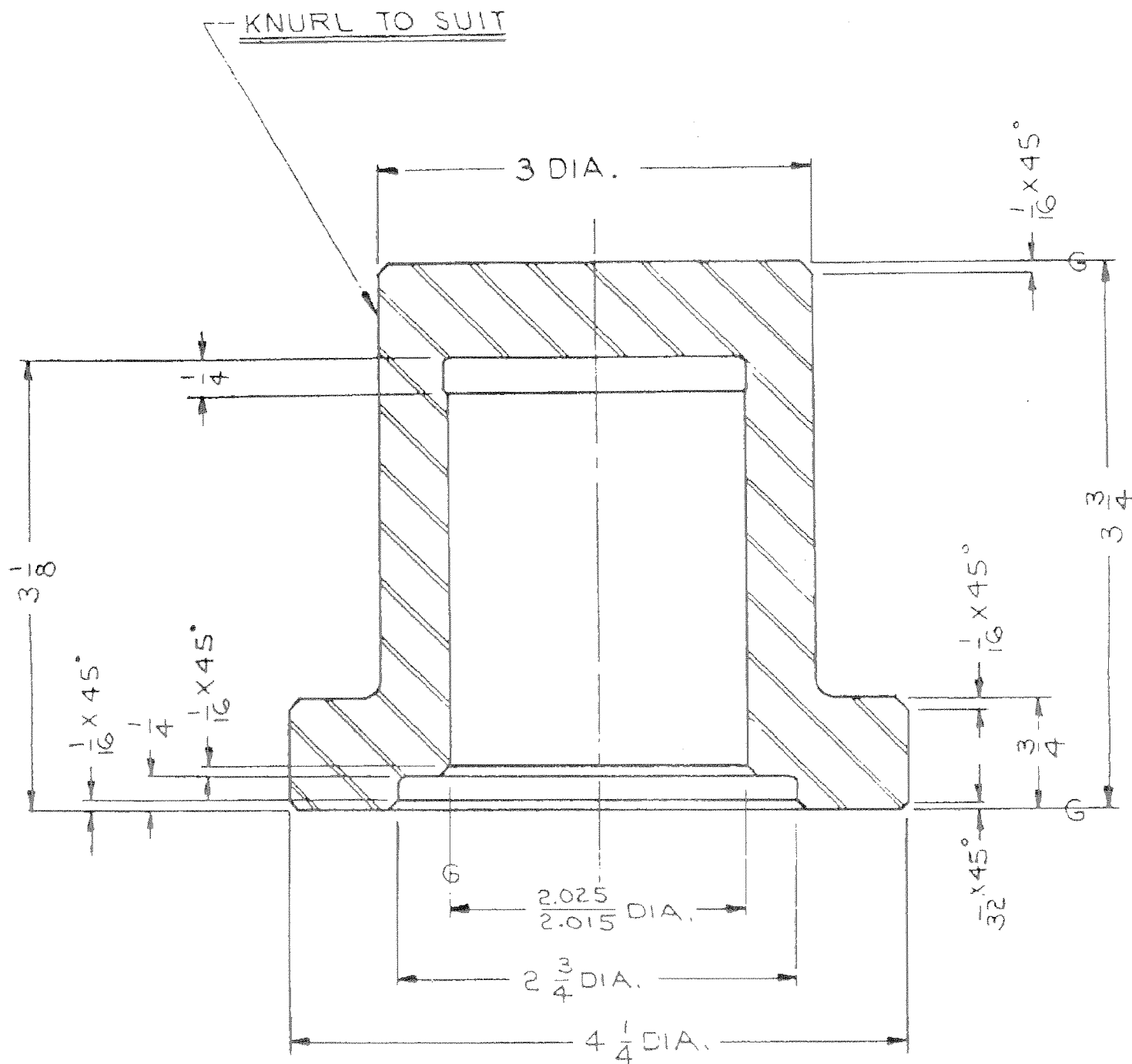


Figure 3-18: Seal Pressing Tool  
SEAL PRESSING FIXTURE  
Used with seal

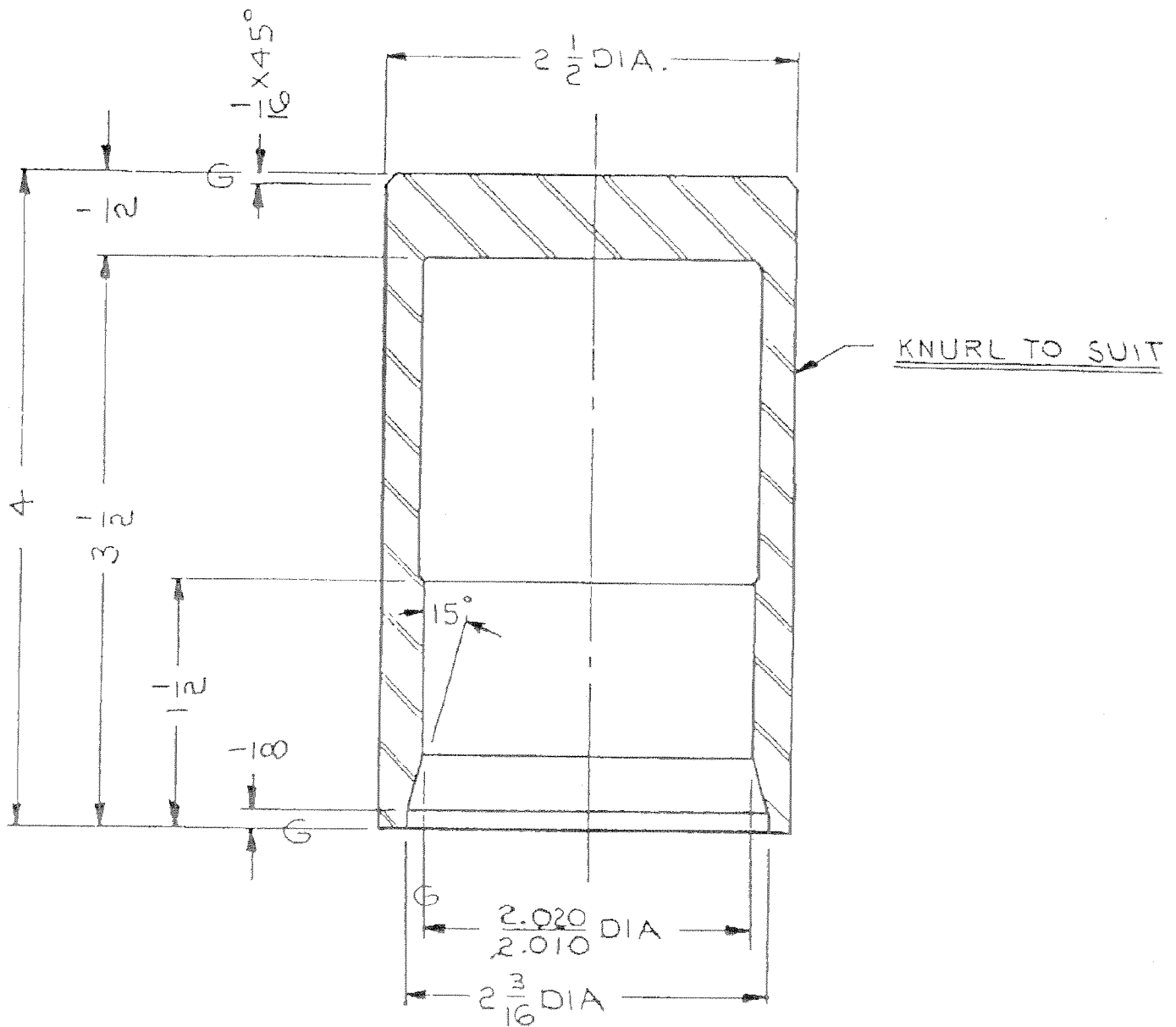


Figure 3-19: Bearing Cone Pressing Tool

## BEARING CONE PRESSING FIXTURE

Used with bearing cones

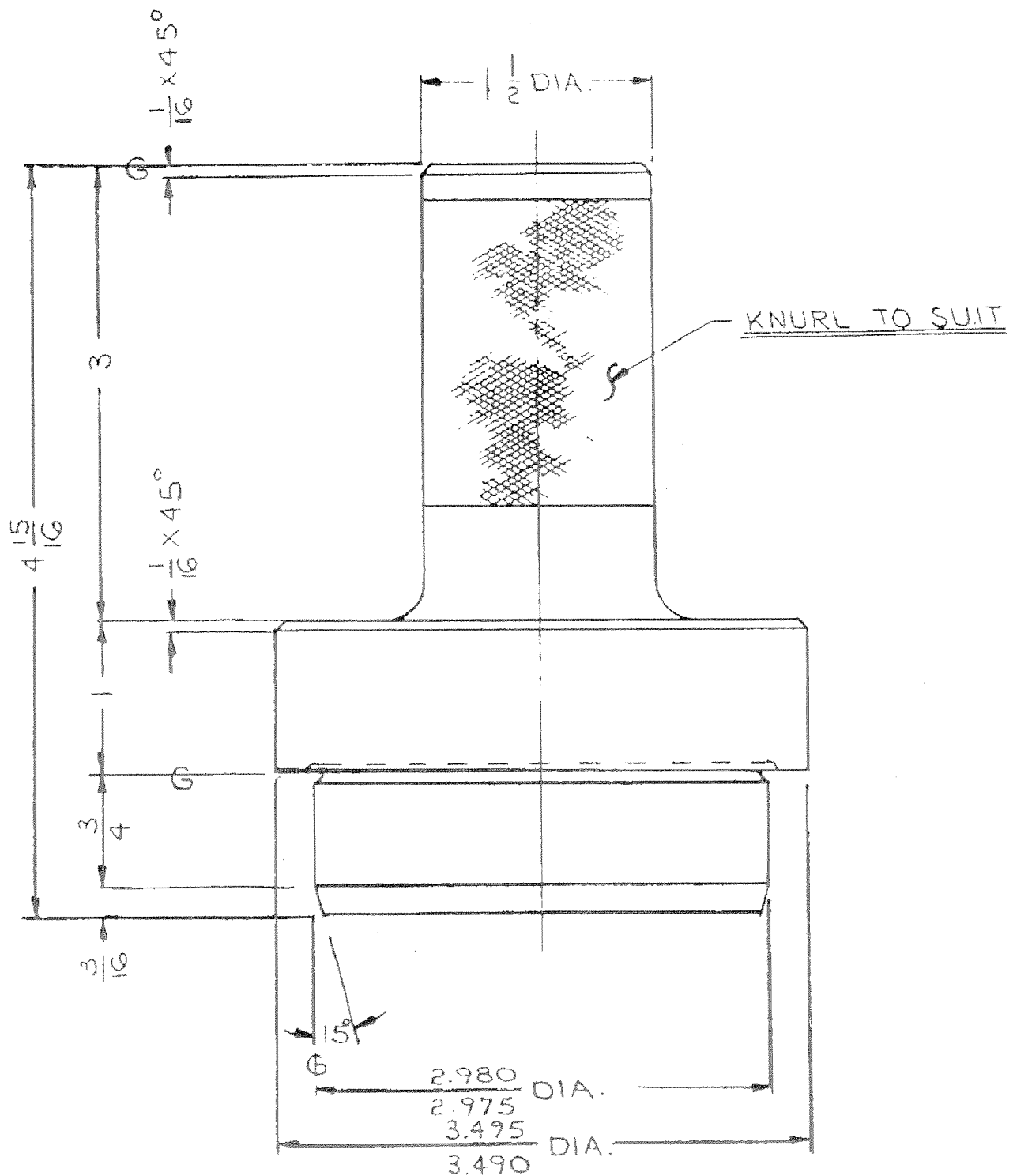


Figure 3-20: Bearing Cup Pressing Tool  
BEARING CUP PRESSING FIXTURE  
Used with bearing cups

## 3.13 Master Cylinder

### REMOVAL

1. Raise elevating assembly until master cylinder pins are accessible.
2. Support the cage assembly (refer to Figure 3-1).
3. Remove rod end retaining bolt and rod end pin.
4. Mark and disconnect hoses and immediately cap the openings to prevent contamination.
5. Using a metal drift, remove rod end pin.
6. Remove base end pin retaining bolt and pin.
7. Carefully remove master cylinder.

### DISASSEMBLY

**Note:** Provide a clean work area for this operation, and observe clean assembly practices. Seals and hydraulic cylinder components are highly sensitive to contamination that may not be visible to the naked eye.

1. Remove set screw from cylinder tube and unscrew head from cylinder.
2. Carefully pull rod assembly from cylinder.
3. Clamp rod end in vise and turn piston off of rod.

**NOTE:** Piston is loctited (Loctite #277) onto rod.

4. Slide the head off of the rod.
5. Remove seal kit components (wipers, rod seals, o-rings and backup rings) from head and piston.
6. Thoroughly clean all parts with solvent. Rinse the inside of the tube and allow to drain. A high pressure rinse and wipe with a lint free rag is preferable.
7. Inspect the rod, head, piston, and tube for scratches, pits, or polishing. Check seal grooves and sealing surfaces. Scratches or pits deep enough to catch the fingernail are unacceptable, replace the cylinder. Polishing is a sign of uneven loading. When this occurs, the surface should be checked for roundness. Cylinders not round within .178 mm (.007 in.) should be replaced.

### ASSEMBLY

**NOTE:** Torque all hardware to torques listed on page 3-31 unless otherwise specified.

1. Lubricate all components and seals with clean hydraulic oil prior to assembly.

**Note:** To avoid cutting the seals, do not use sharp edged tools during seal replacement. After installing seals allow at least one hour for the seals to elastically restore to their original shape before assembling cylinder.

2. Install new seal kit to piston and head.
3. Lubricate rod wiper and seal with hydraulic oil and slide head onto rod.
4. Clean threaded end of rod using loctite primer.
5. Using loctite #277, install piston onto rod.
6. Lubricate seals on piston and head with hydraulic oil.
7. Carefully slide rod assembly into cylinder.
8. Thread head into cylinder. Be sure hole for set screw aligns with hole in cylinder tube.
9. Clean set screw in loctite primer. Install set screw using loctite #242.

### INSTALLATION

1. Follow steps from "REMOVAL" section in reverse order to install cylinder.
2. Remove boom support.
3. Slowly raise and lower boom several times. Check hydraulic connections for leaks. Check for proper slave cylinder operation.

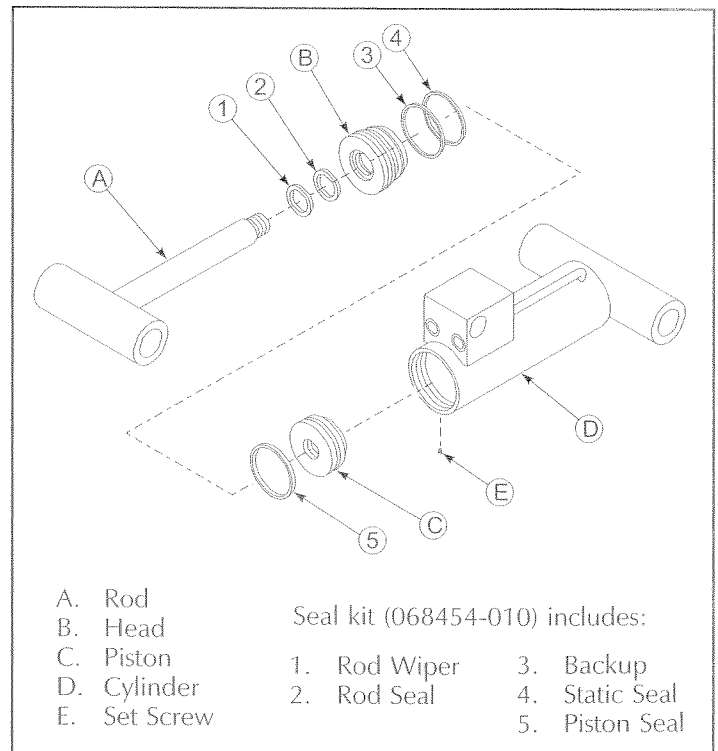


Figure 3-21: Master Cylinder



## 3.14 Slave Cylinder

### REMOVAL

1. Extend boom until slave cylinder trunion pins are accessible. Support the cage assembly.
2. Remove rod end pin retaining bolt.
3. Mark and disconnect hoses and immediately cap the openings to prevent contamination.
4. Using a metal drift, remove rod end pin.
5. Remove trunion pin retaining bolts and using a pin puller, remove trunion pins.
6. Carefully remove slave cylinder.

### DISASSEMBLY

**Note:** Provide a clean work area for this operation, and observe clean assembly practices. Seals and hydraulic cylinder components are highly sensitive to contamination that may not be visible to the naked eye.

1. Remove set screw from cylinder tube and unscrew head from cylinder.
2. Carefully pull rod assembly from cylinder.
3. Clamp rod end in vise and turn off rod extension. Slide piston off of rod.

**NOTE:** Rod extension is loctited (Loctite #262) onto rod.

4. Slide the head off of the rod.
5. Remove 1/4 inch socket head cap screws from rod end of cylinder and remove internal seal block from cylinder.
6. Remove seal kit components (wipers, rod seals, o-rings and backup rings) from head, piston and seal block.
7. Thoroughly clean all parts with solvent. Rinse the inside of the tube and allow to drain. A high pressure rinse and wipe with a lint free rag is preferable.
8. Inspect parts for scratches, pits, or polishing. Check seal grooves and sealing surfaces. Scratches or pits deep enough to catch the fingernail are unacceptable; replace the cylinder. Polishing is a sign of uneven loading. When this occurs, the surface should be checked for roundness. Cylinders not round within .178 mm (.007 in.) should be replaced.

### ASSEMBLY

**NOTE:** Torque all hardware to torques listed on page 3-31 unless otherwise specified.

1. Lubricate all components and seals with clean hydraulic oil prior to assembly.

**Note:** To avoid cutting the seals, do not use sharp edged tools during seal replacement. After installing seals allow at least one hour for the seals to elastically restore to their original shape before assembling cylinder.

2. Install new seal kit items to piston, head and internal block.
3. Lubricate rod wiper and seal with hydraulic oil and slide head onto rod.
4. Clean threaded end of rod and rod extension using loctite primer.
5. Using loctite #262, install rod extension onto rod.
6. lubricate seal block static seal and carefully push seal block into cylinder. Secure seal block using 1/4 socket head cap screws.
7. Lubricate seals on piston, head and seal block with hydraulic oil.
8. Carefully slide rod assembly into cylinder.
9. Thread head into cylinder. Be sure hole for set screw aligns with hole in cylinder tube.
10. Clean set screw in loctite primer. Install set screw using loctite #242.

### INSTALLATION

1. Follow steps from "REMOVAL" section in reverse order to install cylinder.
2. Remove boom support.
3. Slowly raise and lower boom several times. Check hydraulic connections for leaks. Check for proper slave cylinder operation.

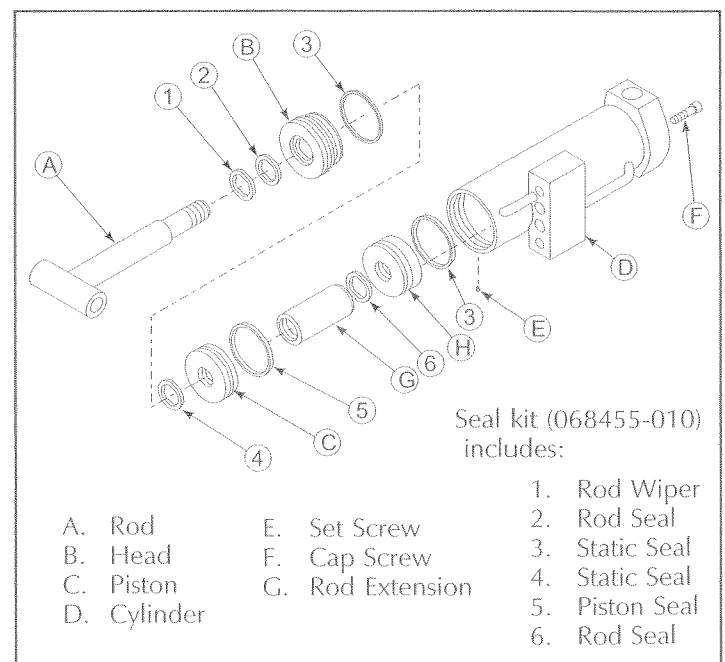


Figure 3-22: Slave Cylinder  
AB46 Work Platform

## 3.15 Cage Rotate Cylinder

### REMOVAL

1. Support the cage assembly at a convenient working height.
2. Mark and disconnect hoses and immediately cap the openings to prevent contamination.
3. Remove hardware which secures cage rotate cylinder. Remove cage rotate cylinder.

### DISASSEMBLY

**Note:** Provide a clean work area for this operation, and observe clean assembly practices. Seals and hydraulic cylinder components are highly sensitive to contamination that may not be visible to the naked eye.

1. Unscrew head from cylinder
2. Carefully pull shaft assembly from cylinder.
3. Secure rod end and turn piston off of rod.

**NOTE:** Piston is loctited (Loctite #262) onto rod.

4. Slide the head off of the rod.
5. Remove seal kit components (wipers, rod seals, o-rings and backup rings) from head and piston.
6. Thoroughly clean all parts with solvent. Rinse the inside of the tube and allow to drain. A high pressure rinse and wipe with a lint free rag is preferable.
7. Inspect cylinder parts for scratches, pits, or polishing. Check seal grooves and sealing surfaces. Scratches or pits deep enough to catch the fingernail are unacceptable, replace the cylinder. Polishing is a sign of uneven loading. When this occurs, the surface should be checked for roundness. Cylinders not round within .178 mm (.007 in.) should be replaced.

### ASSEMBLY

**NOTE:** Torque all hardware to torques listed on page 3-31 unless otherwise specified.

1. Lubricate all components and seals with clean hydraulic oil prior to assembly.

**Note:** To avoid cutting the seals, do not use sharp edged tools during seal replacement. After installing seals allow at least one hour for the seals to elastically restore to their original shape before assembling cylinder.

2. Install new seal kit items to piston and head.

3. Lubricate rod wiper and seal with hydraulic oil and slide head onto rod.
4. Clean threaded end of rod using loctite primer.
5. Using loctite #262, install piston onto rod.
6. Lubricate seals on piston and head with hydraulic oil.
7. Carefully slide rod assembly into cylinder.
8. Thread head into cylinder.

### INSTALLATION

1. Follow steps from "REMOVAL" section in reverse order to install cylinder.
2. Slowly cycle cage rotate cylinder several times. Check hydraulic connections for leaks. Check for proper cylinder operation.

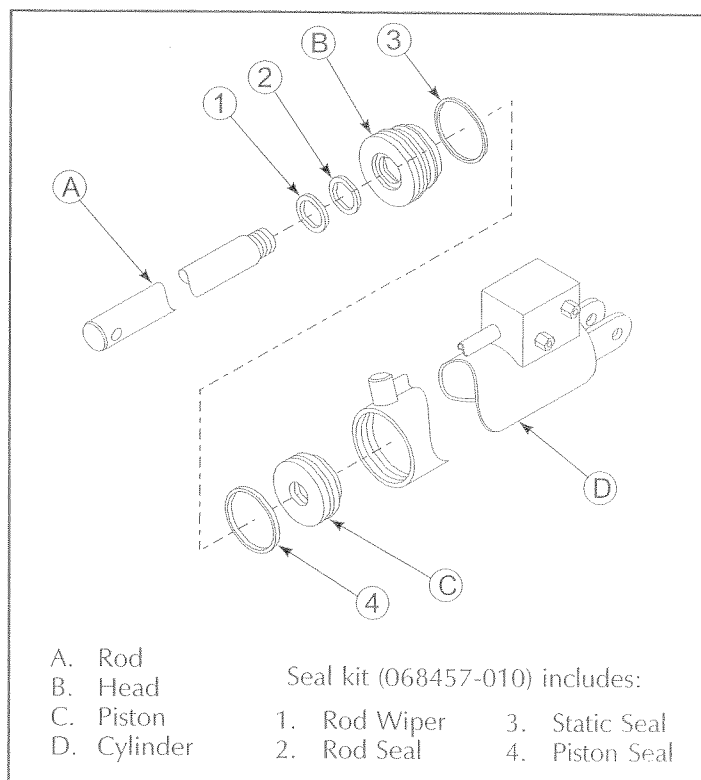


Figure 3-23: Cage Rotate Cylinder

## 3.16 Steering Cylinder

### REMOVAL

1. Position steering wheels straight ahead.
2. Mark and disconnect hoses and immediately cap the openings to prevent contamination.
3. Remove hardware which secures the steering arms to the spindles.
4. Remove hardware which secures steering cylinder to the chassis. Remove steering cylinder.
5. Mark steering arms for position on cylinder. Remove hardware which secures steering arms to rod ends. Using a hammer and drift, remove the roll pins which secure the steering arms to the rod ends.

### DISASSEMBLY

**Note:** Provide a clean work area for this operation, and observe clean assembly practices. Seals and hydraulic cylinder components are highly sensitive to contamination that may not be visible to the naked eye.

1. Mark heads for position on cylinder. Unscrew heads from cylinder.

**IMPORTANT:** Heads must be installed onto same end of cylinder as they were removed from.

2. Carefully pull rod assembly from cylinder.
3. Remove one snap ring and piston lock.
4. Slide the piston off of the rod.
5. Remove seal kit components (wipers, rod seals, o-rings and backup rings) from heads and piston.
6. Thoroughly clean all parts with solvent. Rinse the inside of the tube and allow to drain. A high pressure rinse and wipe with a lint free rag is preferable.
7. Inspect cylinder parts for scratches, pits, or polishing. Check seal grooves and sealing surfaces. Scratches or pits deep enough to catch the fingernail are unacceptable, replace the cylinder. Polishing is a sign of uneven loading. When this occurs, the surface should be checked for roundness. Cylinders not round within .178 mm (.007 in.) should be replaced.

### ASSEMBLY

**NOTE:** Torque all hardware to torques listed on page 3-31 unless otherwise specified.

1. Lubricate all components and seals with clean hydraulic oil prior to assembly.

**Note:** To avoid cutting the seals, do not use sharp edged tools during seal replacement. After installing seals allow at least one hour for the seals to elastically restore to their original shape before assembling cylinder.

2. Install new seal kit items to piston and heads.
3. Lubricate seals on piston. Slide piston on rod and secure using piston lock and snap ring.
4. Carefully slide rod assembly into cylinder.
5. Thread heads into cylinder.

**IMPORTANT:** Heads must be installed onto same end of cylinder as they were removed from.

### INSTALLATION

1. Follow steps from "REMOVAL" section in reverse order to install cylinder.
2. Slowly steering cylinder several times. Check hydraulic connections for leaks. Check for proper cylinder operation.

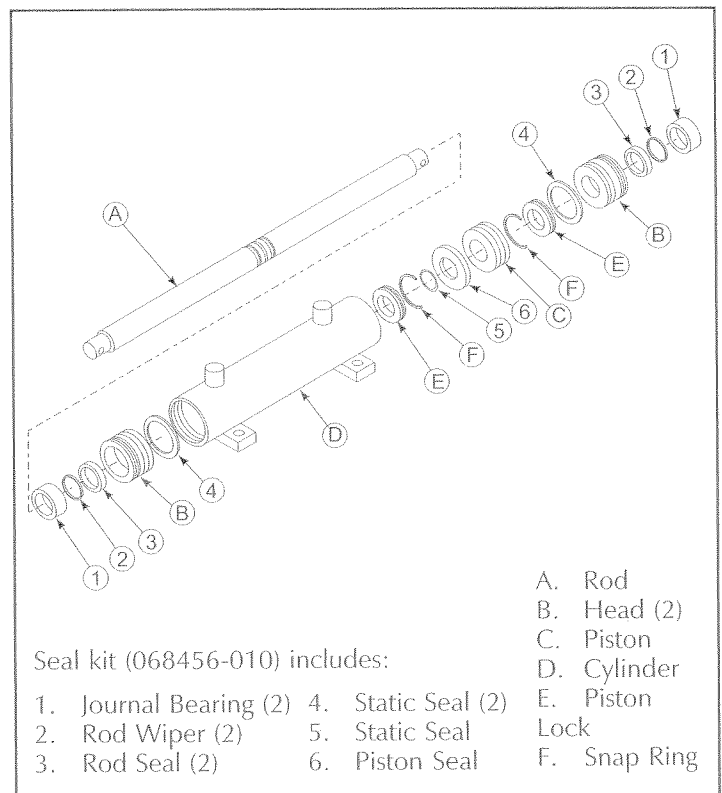


Figure 3-24: Steering Cylinder

## 3.17 Jib Cylinder

### REMOVAL

1. Using an overhead hoist or crane, support the cage assembly at a convenient working height.
2. Mark and disconnect hoses and immediately cap the openings to prevent contamination.
3. Remove hardware which secures jib cylinder pins.

**⚠ CAUTION ⚠**

Jib cylinder is heavy. Take appropriate measures to support cylinder.

4. Remove jib cylinder pins. Remove jib cylinder.

### DISASSEMBLY

**Note:** Provide a clean work area for this operation, and observe clean assembly practices. Seals and hydraulic cylinder components are highly sensitive to contamination that may not even be visible to the naked eye.

1. Remove counterbalance valve from cylinder.
2. Unscrew head from cylinder.
3. Carefully pull shaft assembly from cylinder.
4. Secure rod end and turn piston off of rod.

**NOTE:** Piston is loctited (Loctite #277) onto rod.

4. Slide the head off of the rod.
5. Remove seal kit components (wipers, rod seals, o-rings and backup rings) from head and piston.
6. Thoroughly clean all parts with solvent. Rinse the inside of the tube and allow to drain. A high pressure rinse and wipe with a lint free rag is preferable.
7. Inspect cylinder parts for scratches, pits, or polishing. Check seal grooves and sealing surfaces. Scratches or pits deep enough to catch the fingernail are unacceptable, replace the cylinder. Polishing is a sign of uneven loading. When this occurs, the surface should be checked for roundness. Cylinders not round within .178 mm (.007in.) should be replaced.

### ASSEMBLY

**NOTE:** Torque all hardware to torques listed on page 3-31 unless otherwise specified.

1. Lubricate all components and seals with clean hydraulic oil prior to assembly.

**Note:** To avoid cutting the seals, do not use sharp edged tools during seal replacement. After installing seals allow at least one hour for the seals to elastically restore to their original shape before assembling cylinder.

2. Install new seal kit items to piston and head.
3. Lubricate rod wiper and seal with hydraulic oil and slide head onto rod.
4. Clean threaded end of rod using loctite primer.
5. Using loctite #277, install piston onto rod.
6. Lubricate seals on piston and head with hydraulic oil.
7. Carefully slide rod assembly into cylinder.
8. Thread head into cylinder.

### INSTALLATION

1. Follow steps from "REMOVAL" section in reverse order to install cylinder.
2. Slowly cycle jib cylinder several times. Check hydraulic connections for leaks. Check for proper cylinder operation.

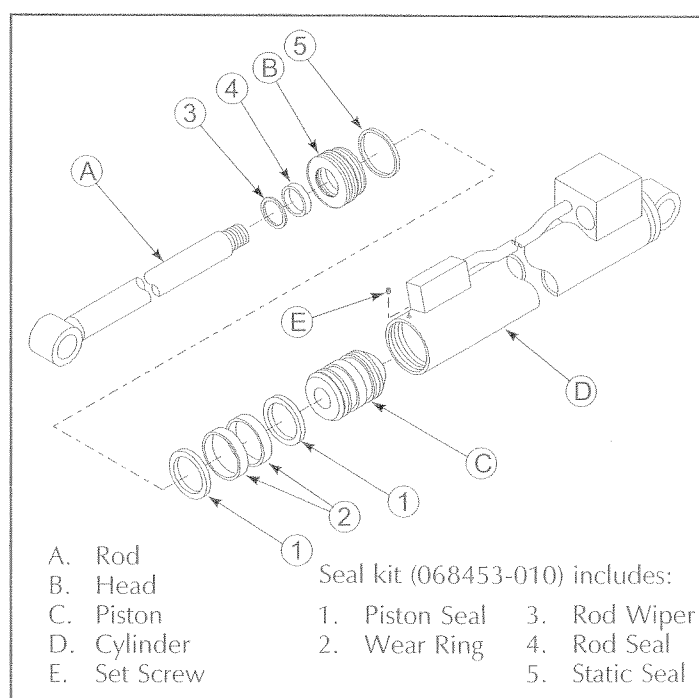


Figure 3-25: Jib Cylinder

## 3.18 Boom Raise & Boom Riser Cylinders

### REMOVAL

1. Raise elevating assembly until cylinder pins are accessible.
1. Support the elevating assembly(refer to Figure 3-1).
2. Mark and disconnect hoses and immediately cap the openings to prevent contamination.
3. Remove hardware which secures cylinder. Remove cylinder.

### DISASSEMBLY

**Note:** Provide a clean work area for this operation, and observe clean assembly practices. Seals and hydraulic cylinder components are highly sensitive to contamination that may not be visible to the naked eye.

1. Remove set screw from cylinder tube and unscrew head from cylinder.
2. Unscrew head from cylinder
3. Carefully pull shaft assembly from cylinder.
4. Remove 3/16 set screw which secures piston to rod.

**NOTE:** Set screw is loctited (Loctite #242) into piston.

2. Secure end of rod and turn piston off of rod.
4. Slide stop tube and head off of the rod.
5. Remove seal kit components (wipers, rod seals, o-rings and backup rings) from head and piston.
6. Thoroughly clean all parts with solvent. Rinse the inside of the tube and allow to drain. A high pressure rinse and wipe with a lint free rag is preferable.
7. Inspect cylinder parts for scratches, pits, or polishing. Check seal grooves and sealing surfaces. Scratches or pits deep enough to catch the fingernail are unacceptable, replace the cylinder. Polishing is a sign of uneven loading. When this occurs, the surface should be checked for roundness. Cylinders not round within .178 mm (.007 in.) should be replaced.

### ASSEMBLY

**NOTE:** Torque all hardware to torques listed on page 3-31 unless otherwise specified.

1. Lubricate all components and seals with clean hydraulic oil prior to assembly.

**Note:** To avoid cutting the seals, do not use sharp edged tools during seal replacement. After installing seals allow at least one hour for the seals to elastically restore to their original shape before assembling cylinder.

2. Install new seal kit items to piston and head.
3. Lubricate rod wiper and seal with hydraulic oil and slide head onto rod.
4. Slide stop tube onto rod.
5. Thread piston onto rod. Be sure set screw hole lines up with hole on end of rod.
6. Using loctite #242, secure piston to rod with 3/16 set screw.
7. Lubricate seals on piston and head with hydraulic oil.
8. Carefully slide rod assembly into cylinder.
9. Thread head into cylinder. Be sure hole for setscrew aligns with hole in cylinder tube.
10. Clean set screw in loctite primer. Install set screw using loctite #242.

### INSTALLATION

1. Follow steps from "REMOVAL" section in reverse order to install cylinder.
2. Slowly cycle cylinder several times. Check hydraulic connections for leaks. Check for proper cylinder operation.

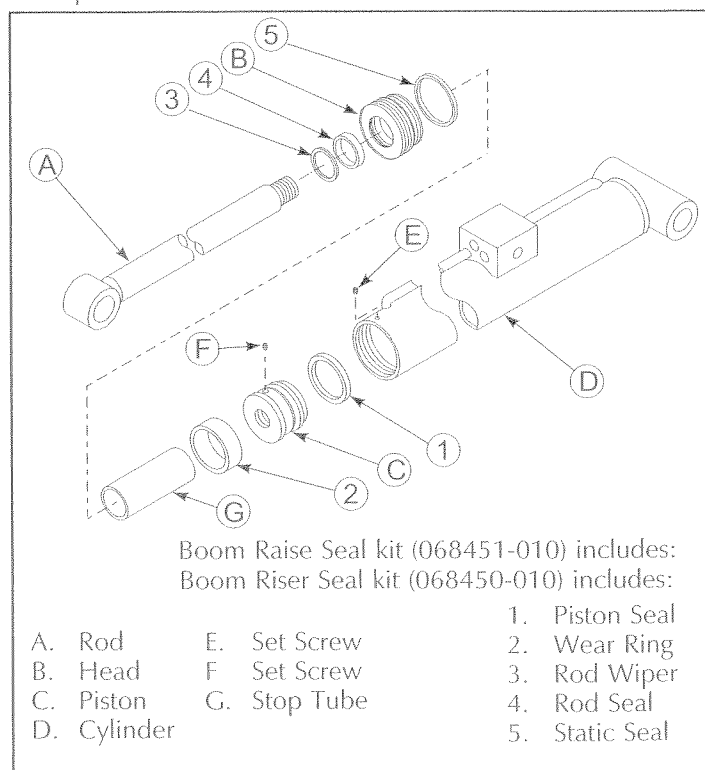


Figure 3-26: Boom Riser Cylinder (shown)

## 3.19 Boom Extend Cylinder

### REMOVAL

1. Lower boom completely. Extend boom until front boom extend cylinder pin is accessible.
1. Use an overhead hoist or crane to support the rear of the boom (Figure 3-27).
2. Remove rear boom pivot pin.
3. Remove clips which secure front boom extend cylinder pin. Remove pin.
4. Mark and disconnect boom extend cylinder hoses and immediately cap the openings to prevent contamination.
5. Using overhead hoist, slightly raise rear of boom.

**NOTE:** This will extend master cylinder and allow room to remove boom extend cylinder. It may be necessary to remove a counterbalance valve to allow master cylinder to extend.

|   |                |   |
|---|----------------|---|
| ⚠   | <b>WARNING</b> | ⚠ |
| Boom extend cylinder is heavy. Take appropriate measures to support cylinder. |                |   |

6. Remove rear boom extend cylinder pin. Carefully remove boom extend cylinder. Measure length of extended boom cylinder.

**IMPORTANT:** Boom extend cylinder must be extended to the same length when it is reinstalled.

### DISASSEMBLY

**Note:** Provide a clean work area for this operation, and observe clean assembly practices. Seals and hydraulic cylinder components are highly sensitive to contamination that may not be visible to the naked eye.

1. Remove set screw and unscrew head from cylinder.
3. Carefully pull shaft assembly from cylinder.
4. Secure rod end and turn piston off of shaft.

**NOTE:** Piston is loctited (Loctite #277) onto rod.

4. Slide the head off of the rod.
5. Remove seal kit components (wipers, rod seals, o-rings and backup rings) from head and piston.

6. Thoroughly clean all parts with solvent. Rinse the inside of the tube and allow to drain. A high pressure rinse and wipe with a lint free rag is preferable.
7. Inspect cylinder parts for scratches, pits, or polishing. Check seal grooves and sealing surfaces. Scratches or pits deep enough to catch the fingernail are unacceptable, replace the cylinder. Polishing is a sign of uneven loading. When this occurs, the surface should be checked for roundness. Cylinder not round within .178 mm (.007 in.) should be replaced.

### ASSEMBLY

**NOTE:** Torque all hardware to torques listed on page 3-31 unless otherwise specified.

1. Lubricate all components and seals with clean hydraulic oil prior to assembly.

**Note:** To avoid cutting the seals, do not use sharp edged tools during seal replacement. After installing seals allow at least one hour for the seals to elastically restore to their original shape before assembling cylinder.

2. Install new seal kit items to piston and head.
3. Lubricate rod wiper and seal with hydraulic oil and slide head onto rod.
4. Clean threaded end of rod using loctite primer.

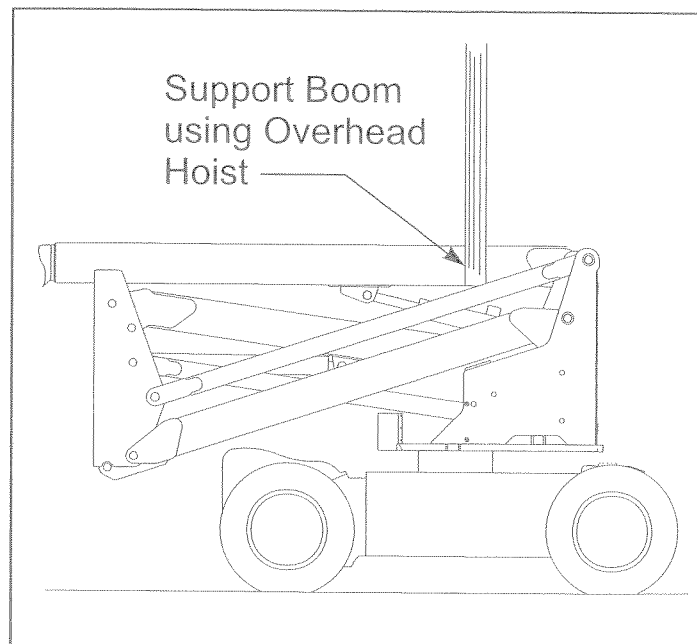


Figure 3-27: Removing Boom Extend Cylinder

5. Using loctite #277, install piston onto rod.
6. Lubricate seals on piston and head with hydraulic oil.
7. Carefully slide rod assembly into cylinder.
8. Thread head into cylinder. Using loctite #242, install set screw.

## INSTALLATION

1. Follow steps from "REMOVAL" section in reverse order to install cylinder.

**IMPORTANT:** Boom extend cylinder must be extended to the same length it was when it was removed.

2. Slowly cycle cylinder several times. Check hydraulic connections for leaks. Check for proper cylinder operation.

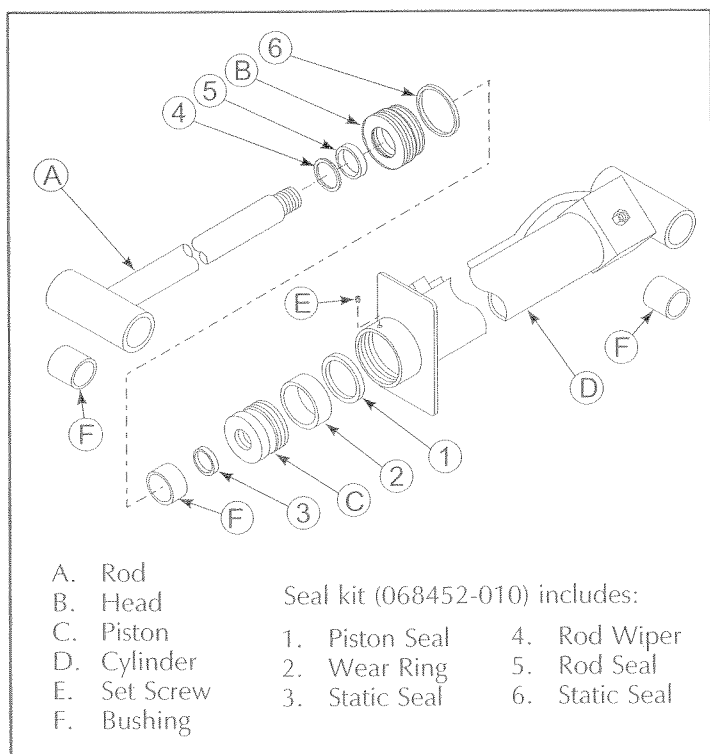


Figure 3-28: Boom Extend Cylinder



## 3.20 LONG TERM STORAGE

If the work platform is to be placed in long term storage (dead storage) follow these recommended preservation procedures.

### PRESERVATION

1. Clean painted surfaces. If paint is damaged, repaint.
2. Fill the hydraulic tank to operating level. Fluid will be visible at the dipstick (BiEnergy models) or on sight gauge (Electric models).

**IMPORTANT:** Do not fill the hydraulic tank while the platform is elevated.

**NOTE:** Do not drain the hydraulic system prior to long term storage.

3. Coat exposed portions of cylinder rods with a preservative such as multipurpose grease and wrap with a barrier material.
4. Coat all exposed unpainted metal surfaces with preservative.
5. Service the engine according to the manufacturers recommendations.
6. Remove the batteries and place in alternative service.

## 3.21 Torque Specifications (Tables 3-3 & 3-4)

### FASTENERS

Use the following values to torque fasteners used on UpRight Work Platforms unless a specific torque value is called out for the part being installed.

Table 3-3: Bolt Torque

| THREAD<br>SIZE<br><small>American National<br/>Std.-UNC (course)<br/>Grade 5</small> | WIDTH<br>ACROSS<br>FLATS | TORQUE<br>VALUE |         |
|--|--------------------------|-----------------|---------|
|  |                          | ENGLISH         | METRIC  |
| 1/4  | 7/16                     | 110 In/Lbs      | 12 N·m  |
| 5/16   | 1/2                      | 190 In/Lbs      | 22 N·m  |
| 3/8  | 9/16                     | 30 Ft/Lbs       | 41 N·m  |
| 7/16   | 5/8                      | 50 Ft/Lbs       | 68 N·m  |
| 1/2  | 3/4                      | 75 Ft/Lbs       | 102 N·m |
| 5/8  | 1 5/16                   | 150 Ft/Lbs      | 203 N·m |
| 3/4  | 1 1/8                    | 250 Ft/Lbs      | 339 N·m |
| 7/8  | 1 15/16                  | 400 Ft/Lbs      | 542 N·m |
| 1  | 1 1/2                    | 600 Ft/Lbs      | 813 N·m |

### HYDRAULIC COMPONENTS

Use the following values to torque hydraulic components used on UpRight Work Platforms.

**Note:** Always lubricate threads with clean hydraulic oil prior to installation.

Table 3-4: Hydraulic Component Torque

| TYPE:<br>SAE PART<br>SERIES | CARTRIDGE<br>POPPET |         | FITTINGS |         | HOSES     |         |
|-----------------------------|---------------------|---------|----------|---------|-----------|---------|
|                             | (Ft/Lbs)            | (Nm)    | (Ft/Lbs) | (Nm)    | (In/Lbs)  | (Nm)    |
| #4                          | N/A                 | N/A     | N/A      | N/A     | 135-145   | 15-16   |
| #6                          | N/A                 | N/A     | 10-20    | 14-27   | 215-245   | 24-28   |
| #8                          | 25-30               | 34-41   | 25-30    | 34-41   | 430-470   | 49-53   |
| #10                         | 35-40               | 47-54   | 35-40    | 47-54   | 680-750   | 77-85   |
| #12                         | 85-90               | 115-122 | 85-90    | 115-122 | 950-1050  | 107-131 |
| #16                         | 130-140             | 176-190 | 130-140  | 176-190 | 1300-1368 | 147-155 |

**Coil nuts: 30 IN/Lbs (3 Nm)**

NOTES:

## 4.0 Introduction

The following section on troubleshooting provides guidelines on the types of problems users may encounter in the field, helps determine the cause of problems, and suggests proper corrective action.

Careful inspection and accurate analysis of the symptoms listed in the Troubleshooting Guide will localize the trouble more quickly than any other method. This manual cannot cover all possible problems that may occur. If a specific problem is not covered in this manual, call our toll free number for service assistance.

Referring to *Section 2.0* and *5.0* will aid in understanding the operation and function of the various components and systems of the AB46 and help in diagnosing and repair of the machine.

### GENERAL PROCEDURE

Use the charts on the following pages to help determine the cause of a fault in your UpRight AB46.

1. Verify your problem.  
Do a full function test from both platform controls and chassis controls and note all functions that are not operating correctly.
2. Narrow the possible causes of the malfunction.  
Use the troubleshooting guide to determine which components are common to all circuits that are not functioning correctly.
3. Identify the problem component.  
Test components that are common to all circuits that are not functioning correctly. Remember to check wires and terminals between suspect components. Be sure to check connections to battery negative.
4. Repair or replace component found to be faulty.
5. Verify that repair is complete.  
Do a full function test from both platform and chassis controls to verify that all functions are operating correctly and machine is performing to specified values.

Follow the fault finding charts to diagnose problems with the MOS90 drive system.

**NOTE:** Spike protection diodes at components have been left out of the charts to eliminate confusion.



### WARNING



When troubleshooting, ensure that the work platform is resting on a firm, level surface.

When performing any service which requires the platform to be raised, the Elevating Assembly must be blocked.

Disconnect the battery ground cable when replacing or testing the continuity of any electrical component.

FOR SERVICE ASSISTANCE, IN EUROPE, CALL:

**353-1-202-4105**

FOR SERVICE ASSISTANCE, IN THE U.S.A., CALL:

**1-800-926-5438**

FROM OUTSIDE THE USA, CALL 1-209-896-5150

## 4.1 OPERATIONAL THEORY

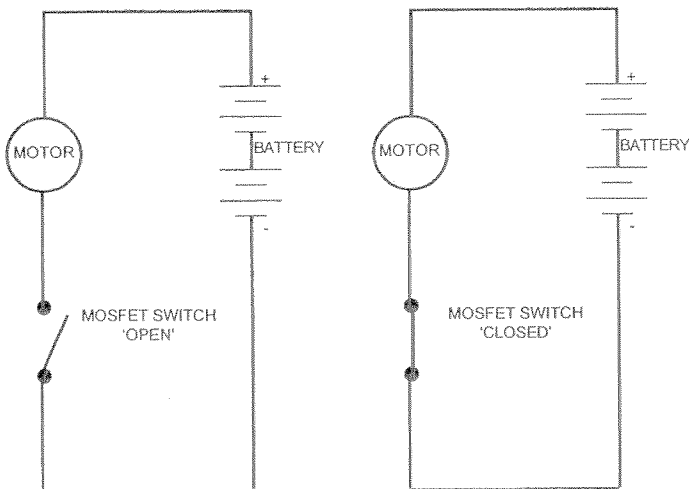
The DC motor controller has four connections: Positive (B+), Battery Negative (B-), Motor Field Negative and Field Negative (S).

The electric motor has continuous battery positive (B+) over the main fuse. Inside the controller are high current MOSFET transistors and capacitors and the control circuitry.

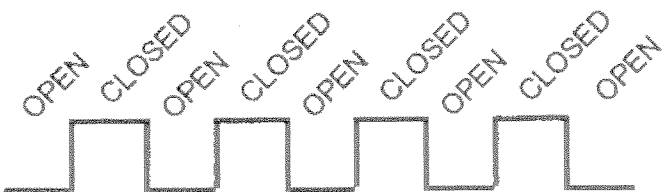
The controller acts as a switch. The amount of time Battery Negative (B-) and Motor Field Negative (A) are "connected" controls the RPM of the electric motor.

- If (B-) and (A) are connected all the time the motor will turn at 100%.
- If (B-) and (A) are not connected the motor will turn at 0%.
- The percentage of connection controls the speed of the motor.

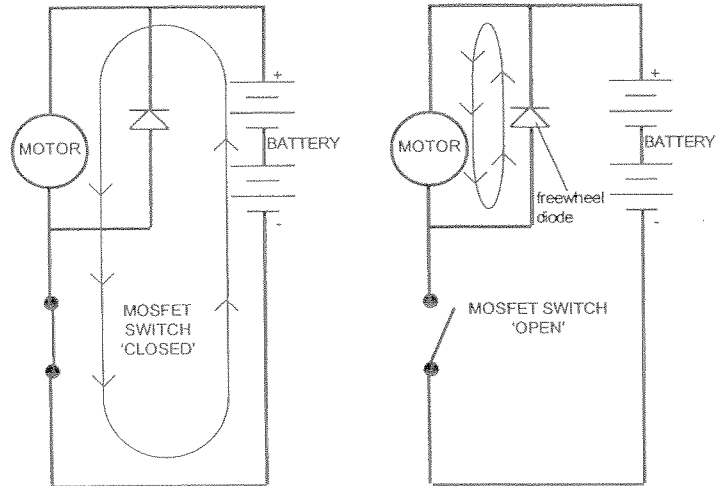
The controller acts as a switch which has the ability to open and close (pulse) very rapidly.



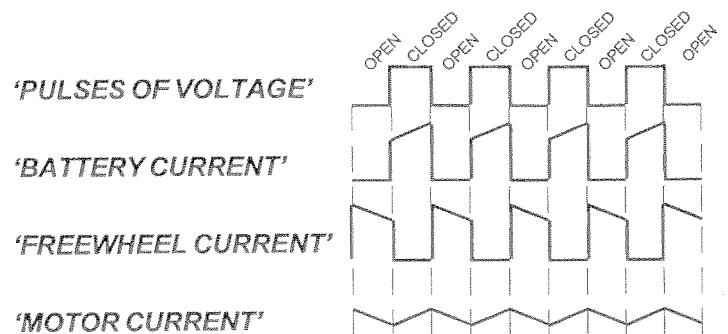
The number of pulses determines the voltage to the motor.



The motor is equipped with a "freewheel diode". During open cycle of MOS90 a current is produced by the motor. The freewheel diode collects this current and sends it back through the motor.



Equal pulses of open and closed drive the motor at half speed.

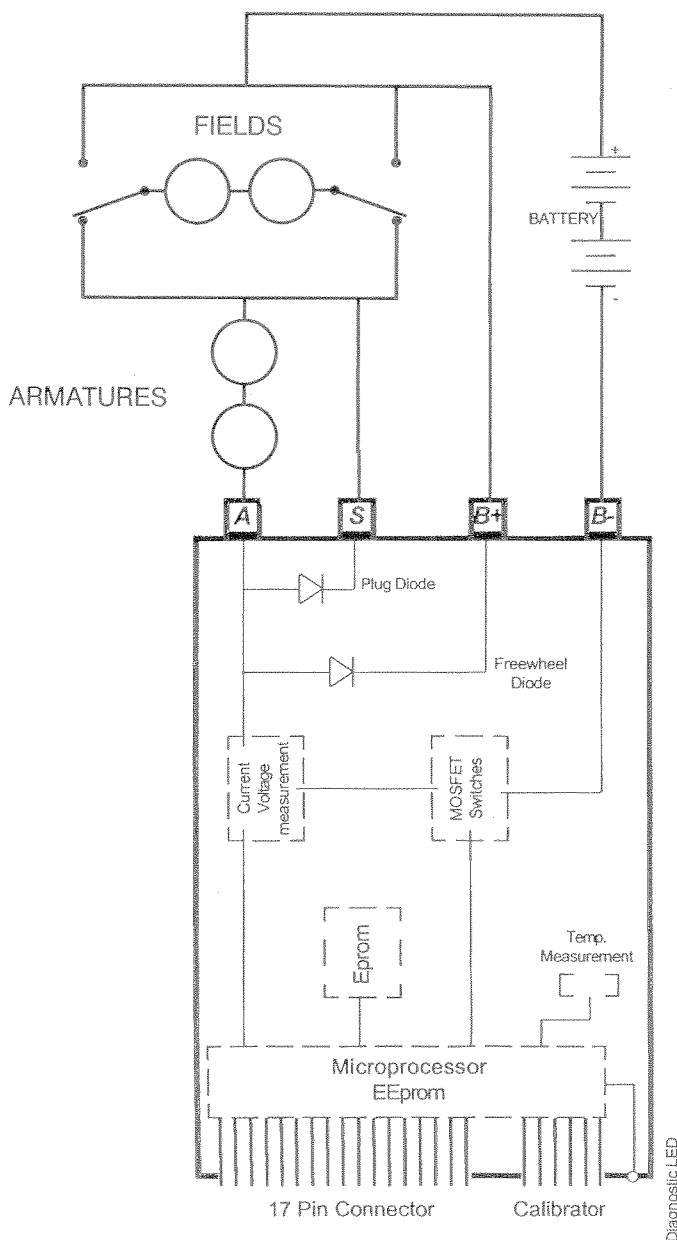


At low speed the MOSFET is mostly open and most of the current is from freewheel. At high speed the mosfet is mostly closed and most of the current is from the battery.

The motor armatures and fields are in series.

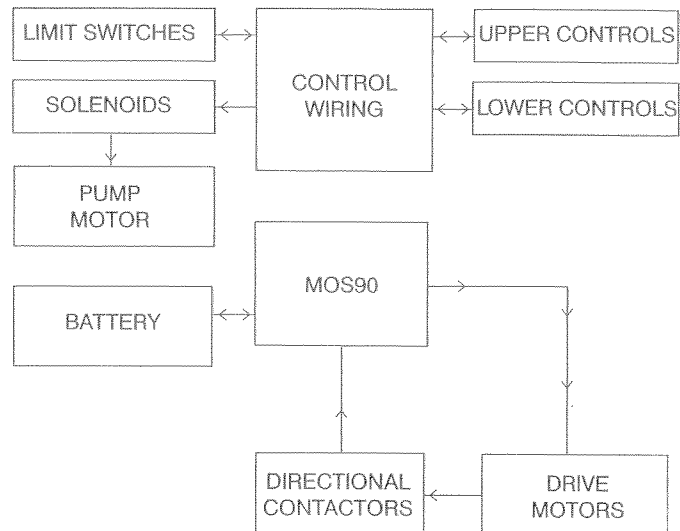
Forward and reverse are achieved by using directional contactors to control the direction of current in the drive motors.

Terminal (S) connects the "Drive Motor Armatures" to a diode inside the MOS90. When the machine stops, a signal is given to apply the brakes.



The illustration below shows a block diagram of the machines electrical system.

Refer to section 5 "SCHEMATICS" for a detailed electrical schematic.



# Troubleshooting

Table 4-1 Troubleshooting Guide - Hydraulic Schematic

| Component<br>Function  | Steer | Riser | Boom Extend | Boom Raise | Jib | Cage Level | Cage Rotate | Slew | Drive | Brake Release | Parking Brake Release |
|--|-------|-------|-------------|------------|-----|------------|-------------|------|-------|---------------|-----------------------|
| Pump   | X     | X     | X           | X          | X   | X          | X           | X    |       |               |                       |
| Steer Valve  | X     |       |             |            |     |            |             |      |       |               |                       |
| Steer Cylinder   | X     |       |             |            |     |            |             |      |       |               |                       |
| High Relief  | X     | X     | X           | X          | X   | X          | X           | X    |       |               |                       |
| Relief Check Valves  | X     | X     | X           | X          | X   | X          | X           | X    |       |               |                       |
| High Dump  | 1     | X     | X           |            |     |            |             |      |       |               |                       |
| Diverter Valve   | 2     | 2     | 2           | 2          | 2   | 2          | 2           | 2    |       |               |                       |
| Riser Valve  |       | X     |             |            |     |            |             |      |       |               |                       |
| Riser Cylinder   |       | X     |             |            |     |            |             |      |       |               |                       |
| Riser C/B Valve  |       | X     |             |            |     |            |             |      |       |               |                       |
| Riser CK Valve   |       | X     |             |            |     |            |             |      |       |               |                       |
| Boom Extend Valve  |       |       | X           |            |     |            |             |      |       |               |                       |
| Boom Extend Cylinder   |       |       | X           |            |     |            |             |      |       |               |                       |
| Boom Extend C/B Valve  |       |       | X           |            |     |            |             |      |       |               |                       |
| Boom Extend CK Valve   |       |       | X           |            |     |            |             |      |       |               |                       |
| Boom Raise Valve   |       |       |             | X          |     |            |             |      |       |               |                       |
| Boom Raise Cylinder  |       |       |             | X          |     |            |             |      |       |               |                       |
| Boom Raise C/B Valve   |       |       |             | X          |     |            |             |      |       |               |                       |
| Boom Raise CK Valve  |       |       |             | X          |     |            |             |      |       |               |                       |
| Proportional Valve   |       |       |             | X          | X   | X          | X           | X    |       |               |                       |
| Jib Valve  |       |       |             |            | X   |            |             |      |       |               |                       |
| Jib Orifice  |       |       |             |            | X   |            |             |      |       |               |                       |
| Jib Cylinder   |       |       |             |            | X   |            |             |      |       |               |                       |
| Jib C/B Valve  |       |       |             |            | X   |            |             |      |       |               |                       |
| Jib CK Valve   |       |       |             |            | X   |            |             |      |       |               |                       |
| Master Cylinder  |       |       |             |            |     | X          |             |      |       |               |                       |
| Master Cylinder C/B Valves   |       |       |             |            |     | X          |             |      |       |               |                       |
| Master Cylinder CK Valves  |       |       |             |            |     | X          |             |      |       |               |                       |
| Slave Cylinder   |       |       |             |            |     | X          |             |      |       |               |                       |
| Slave Cylinder CB Valves   |       |       |             |            |     | X          |             |      |       |               |                       |
| Trim Level Valve   |       |       |             |            |     | X          |             |      |       |               |                       |
| Low Relief Valve   |       | X     | X           | X          | X   | X          | X           | X    |       |               |                       |
| Cage Rotate Cylinder   |       |       |             |            |     |            | X           |      |       |               |                       |
| Cage Rotate Valve  |       |       |             |            |     |            | X           |      |       |               |                       |
| Cage Rotate C/B Valve  |       |       |             |            |     |            | X           |      |       |               |                       |
| Cage Rotate CK Valve   |       |       |             |            |     |            | X           |      |       |               |                       |
| Slew Motor   |       |       |             |            |     |            |             | X    |       |               |                       |
| Turret Rotate Valve  |       |       |             |            |     |            |             | X    |       |               |                       |
| Turret Rotate CK Valve   |       |       |             |            |     |            |             | X    |       |               |                       |
| 1000 PSI Relief  |       |       |             |            |     |            |             | X    |       |               |                       |
| Brake Valve  |       |       |             |            |     |            |             |      | X     | X             | X                     |
| Brake Orifices   |       |       |             |            |     |            |             |      | X     | X             | X                     |
| Brakes   |       |       |             |            |     |            |             |      | X     | X             | X                     |
| 1. High dump is not activated by steering. It will close for other functions while steering. |       |       |             |            |     |            |             |      |       |               |                       |
| 2. Diverter valve is not activated during normal operation. Only for hand pump operation.    |       |       |             |            |     |            |             |      |       |               |                       |
| 3. Bypass valve is not energized during normal operation.                                    |       |       |             |            |     |            |             |      |       |               |                       |

# Troubleshooting

Section  
4.2

Table 4-2 Troubleshooting Guide - Electrical Schematics

| Component                    | Function | Upper Control Functions | Lower Control Functions | Steer Right | Steer Left | Riser Elevate | Riser Descend | Boom Extend | Boom Retract | Boom Raise | Boom Lower | Jib Up | Jib Down | Cage Level Up | Cage Level Down | Cage Rotate CCW | Cage Rotate CW | Slew CCW | Slew CW | Drive Forward | Drive Reverse | Parking Brake Release | Tilt Alarm | Tilt Light | Battery Charger |
|------------------------------|----------|-------------------------|-------------------------|-------------|------------|---------------|---------------|-------------|--------------|------------|------------|--------|----------|---------------|-----------------|-----------------|----------------|----------|---------|---------------|---------------|-----------------------|------------|------------|-----------------|
| Battery                      |          | X                       | X                       |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            | X               |
| Battery Disconnect           |          | X                       | X                       |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            | X               |
| Battery Charger              |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            | X               |
| Main Power Relay Coil        |          | X                       | X                       |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Main Power Relay Contacts NC |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Main Power Relay Contacts NO |          | X                       | X                       |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            | X               |
| 25 A Fuse                    |          | X                       | X                       |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Chassis EM Stop Switch       |          | X                       | X                       |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Chassis Key Switch           |          | X                       | X                       |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| 10 Amp Circuit Breaker CB1   |          | X                       | X                       |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               | X                     |            |            |                 |
| 10 Amp Circuit Breaker CB3   |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         | X             | X             |                       |            |            |                 |
| 10 Amp Circuit Breaker CB2   |          | X                       | X                       |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Platform EM Stop Switch      |          | X                       | X                       |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| 10 Amp Control Box Fuse      |          | X                       |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Control Box Key Switch       |          | X                       |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode DB20                   |          | X                       |                         | X           | X          | X             | X             | X           | X            | X          | X          | X      | X        | X             | X               | X               | X              | X        | X       |               |               |                       |            |            |                 |
| Diode DB19                   |          |                         | X                       |             |            | X             | X             | X           | X            |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode DB18                   |          |                         |                         | X           | X          | X             | X             | X           | X            | X          | X          | X      | X        | X             | X               | X               | X              | X        | X       |               |               |                       |            |            |                 |
| Diode DB14                   |          | X                       |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode DB13                   |          | X                       |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode DB25                   |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               | X                     |            |            |                 |
| Diode DB9                    |          |                         | X                       |             |            |               |               |             |              |            |            | X      | X        |               |                 | X               | X              | X        | X       |               |               |                       |            |            |                 |
| Diode DB10                   |          |                         | X                       |             |            | X             | X             | X           | X            |            |            |        |          | X             | X               |                 |                |          |         |               |               |                       |            |            |                 |
| Diode DB11                   |          |                         | X                       |             |            |               |               |             |              | X          | X          |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode DB3                    |          |                         |                         |             | X          |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode DB2                    |          |                         |                         | X           |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode DB5                    |          | X                       |                         |             |            | X             | X             | X           | X            |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode DB6                    |          |                         | X                       |             |            | X             | X             | X           | X            |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode 1                      |          | X                       |                         |             |            |               |               |             |              |            |            |        |          | X             |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode 2                      |          | X                       |                         |             |            |               |               |             |              |            |            |        |          |               | X               |                 |                |          |         |               |               |                       |            |            |                 |
| Diode 3                      |          | X                       |                         |             |            |               |               |             |              |            |            | X      |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode 4                      |          | X                       |                         |             |            |               |               |             |              |            |            |        | X        |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode 5                      |          | X                       |                         |             |            |               |               |             |              | X          |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode 6                      |          | X                       |                         |             |            |               |               |             |              |            | X          |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode 7                      |          | X                       |                         |             |            |               |               | X           |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode 8                      |          | X                       |                         |             |            |               |               |             | X            |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode 9                      |          | X                       |                         |             |            | X             |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode 10                     |          | X                       |                         |             |            |               | X             |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode 11                     |          | X                       |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode 12                     |          | X                       |                         |             |            |               |               |             |              |            |            |        |          |               |                 | X               |                |          |         |               |               |                       |            |            |                 |
| Diode 13                     |          | X                       |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         | X             |               |                       |            |            |                 |
| Diode 14                     |          | X                       |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode 1                      |          |                         | X                       |             |            |               |               |             |              |            |            |        |          | X             |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode 2                      |          |                         | X                       |             |            |               |               |             |              |            |            |        |          |               | X               |                 |                |          |         |               |               |                       |            |            |                 |
| Diode 3                      |          |                         | X                       |             |            |               |               |             |              |            |            | X      |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode 4                      |          |                         | X                       |             |            |               |               |             |              |            |            |        | X        |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode 5                      |          |                         | X                       |             |            |               |               |             |              | X          |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode 6                      |          |                         | X                       |             |            |               |               |             |              |            | X          |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode 7                      |          |                         | X                       |             |            |               |               | X           |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode 8                      |          |                         | X                       |             |            |               |               |             | X            |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode 9                      |          |                         | X                       |             |            | X             |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode 10                     |          |                         | X                       |             |            |               | X             |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode 11                     |          |                         | X                       |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode 12                     |          |                         | X                       |             |            |               |               |             |              |            |            |        |          |               |                 |                 | X              |          |         |               |               |                       |            |            |                 |
| Diode 13                     |          |                         | X                       |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         | X             |               |                       |            |            |                 |
| Diode 14                     |          |                         | X                       |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode DB16                   |          | X                       |                         |             |            |               |               |             |              | X          | X          |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode DB17                   |          | X                       |                         |             |            |               |               |             |              |            |            | X      | X        | X             | X               | X               | X              | X        | X       |               |               |                       |            |            |                 |
| Diode DB18                   |          | X                       |                         |             |            | X             | X             | X           | X            |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode DB18B                  |          | X                       |                         |             |            | X             | X             | X           | X            |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode DB9                    |          | X                       |                         |             |            |               |               |             |              | X          | X          |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode DB10                   |          | X                       |                         |             |            |               |               |             |              |            |            | X      | X        | X             | X               | X               | X              | X        | X       |               |               |                       |            |            |                 |
| Diode DB11                   |          |                         | X                       |             |            |               |               |             |              | X          | X          |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode DB12                   |          |                         | X                       |             |            | X             | X             | X           | X            | X          | X          | X      | X        | X             | X               | X               | X              | X        | X       |               |               |                       |            |            |                 |
| Diode DB12B                  |          |                         | X                       |             |            | X             | X             | X           | X            | X          | X          | X      | X        | X             | X               | X               | X              | X        | X       |               |               |                       |            |            |                 |
| Diode DB14                   |          | X                       |                         |             |            |               |               |             |              |            |            | X      | X        | X             | X               | X               | X              | X        | X       |               |               |                       |            |            |                 |
| Low Tilt Relay Coil          |          | X                       | X                       |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       | X          | X          |                 |
| Low Tilt Relay Contacts      |          | X                       | X                       |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       | X          | X          |                 |



# Troubleshooting

Table 4-2 Troubleshooting Guide - Electrical Schematics (continued)

| Component                            | Function | Upper Control Functions | Lower Control Functions | Steer Right | Steer Left | Riser Elevate | Riser Descend | Boom Extend | Boom Retract | Boom Raise | Boom Lower | Jib Up | Jib Down | Cage Level Up | Cage Level Down | Cage Rotate CCW | Cage Rotate CW | Slew CCW | Slew CW | Drive Forward | Drive Reverse | Parking Brake Release | Tilt Alarm | Tilt Light | Battery Charger |
|--------------------------------------|----------|-------------------------|-------------------------|-------------|------------|---------------|---------------|-------------|--------------|------------|------------|--------|----------|---------------|-----------------|-----------------|----------------|----------|---------|---------------|---------------|-----------------------|------------|------------|-----------------|
| Tilt Light off for normal functions  |          | X                       | X                       |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Tilt Alarm off for normal operation  |          | X                       | X                       |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Brake Relay contacts                 |          | X                       | X                       |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Tilt Sensor (red wire)               |          | X                       | X                       |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Tilt Sensor (white wire)             |          | X                       | X                       |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       | X          | X          |                 |
| Tilt Sensor (green wire)             |          | X                       | X                       |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         | X             | X             |                       |            |            |                 |
| Horn Relay contacts                  |          | X                       | X                       |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Down Limit Switch                    |          | X                       | X                       |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Down Relay coil                      |          | X                       | X                       |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Chassis Control Power Relay coil     |          | X                       | X                       |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Chassis Control Power Relay contacts |          | X                       | X                       |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Lower Turret Rotate Switch           |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                | X        | X       |               |               |                       |            |            |                 |
| Lower Cage Rotate Switch             |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 | X               | X              |          |         |               |               |                       |            |            |                 |
| Lower Trim Switch                    |          |                         |                         |             |            |               |               |             |              |            |            |        |          | X             | X               |                 |                |          |         |               |               |                       |            |            |                 |
| Lower Jib Switch                     |          |                         |                         |             |            |               |               |             |              | X          | X          |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Lower Boom Elevate Switch            |          |                         |                         |             |            |               |               | X           | X            |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Lower Boom Extend Switch             |          |                         |                         |             |            |               |               | X           | X            |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Lower Riser Switch                   |          |                         |                         |             |            | X             | X             |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode DB16                           |          |                         |                         |             |            |               |               |             |              |            |            | X      | X        | X             | X               | X               | X              | X        | X       |               |               |                       |            |            |                 |
| Diode DB8                            |          |                         |                         |             |            |               |               |             |              |            |            | X      | X        | X             | X               | X               | X              | X        | X       |               |               |                       |            |            |                 |
| Diode DB8.1                          |          |                         |                         |             |            |               |               |             |              |            |            | X      | X        | X             | X               | X               | X              | X        | X       |               |               |                       |            |            |                 |
| Boom Speed Relay coil                |          |                         |                         |             |            |               |               |             |              |            |            | X      | X        | X             | X               | X               | X              | X        | X       |               |               |                       |            |            |                 |
| Boom Speed Relay contacts            |          |                         |                         |             |            |               |               |             |              |            |            | X      | X        | X             | X               | X               | X              | X        | X       |               |               |                       |            |            |                 |
| Turtle / Rabbit Knob                 |          |                         |                         |             |            |               |               |             |              |            |            | X      | X        | X             | X               | X               | X              | X        | X       |               |               |                       |            |            |                 |
| Diode DB17                           |          |                         |                         |             |            | X             | X             | X           | X            |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode DB18                           |          |                         |                         |             |            |               |               |             |              | X          | X          |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Foot Switch                          |          |                         |                         | X           | X          | X             | X             | X           | X            | X          | X          | X      | X        | X             | X               | X               | X              | X        | X       | X             | X             |                       |            |            |                 |
| Upper Turret Rotate Switch           |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                | X        | X       |               |               |                       |            |            |                 |
| Upper Cage rotate Switch             |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 | X               | X              |          |         |               |               |                       |            |            |                 |
| Upper Trim Switch                    |          |                         |                         |             |            |               |               |             |              |            |            |        |          | X             | X               |                 |                |          |         |               |               |                       |            |            |                 |
| Upper Jib Switch                     |          |                         |                         |             |            |               |               |             |              |            |            | X      | X        |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Lower Boom Elevate Switch            |          |                         |                         |             |            |               |               |             |              | X          | X          |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Upper Boom Extend Switch             |          |                         |                         |             |            |               |               | X           | X            |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Upper Riser Switch                   |          |                         |                         |             |            | X             | X             |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Turret Drive Relay contacts          |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 | X               | X              | X        | X       |               |               |                       |            |            |                 |
| Boom Disconnect Relay contacts       |          |                         |                         |             |            | X             | X             | X           | X            | X          | X          | X      | X        |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode DB7                            |          |                         |                         |             |            |               |               |             |              |            |            | X      | X        | X             | X               | X               | X              | X        | X       |               |               |                       |            |            |                 |
| Diode DB6                            |          |                         |                         |             |            |               |               |             |              | X          | X          |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode DB11                           |          |                         |                         |             |            |               |               |             |              |            |            | X      | X        | X             | X               | X               | X              |          |         |               |               |                       |            |            |                 |
| Diode DB3                            |          |                         |                         |             |            | X             | X             | X           | X            |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode DB2                            |          |                         |                         |             |            | X             | X             | X           | X            |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode DB9                            |          |                         |                         |             |            |               |               |             |              | X          | X          |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode DB23L                          |          |                         |                         | X           | X          | X             | X             | X           | X            | X          | X          | X      | X        | X             | X               | X               | X              | X        | X       | X             | X             |                       |            |            |                 |
| Diode DB23R                          |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         | X             |               |                       |            |            |                 |
| Diode DB24                           |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       | X          |            |                 |
| Speed Control Knob                   |          |                         |                         |             |            |               |               |             |              | X          | X          | X      | X        | X             | X               | X               | X              | X        | X       |               |               |                       |            |            |                 |
| Boom Speed Relay contacts            |          |                         |                         |             |            |               |               |             |              | X          | X          | X      | X        | X             | X               | X               | X              | X        | X       |               |               |                       |            |            |                 |
| Boom Speed Relay coil                |          |                         |                         |             |            |               |               |             |              |            |            | X      | X        | X             | X               |                 |                |          |         |               |               |                       |            |            |                 |
| Drive Enable Relay coil              |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         | X             |               |                       |            |            |                 |
| Drive Enable Relay contacts          |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         | X             |               |                       |            |            |                 |
| Steer Right Switch                   |          |                         |                         | X           |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Steer Left Switch                    |          |                         |                         |             | X          |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Down Relay contacts                  |          |                         |                         |             |            |               |               |             |              |            |            |        |          | X             | X               |                 |                |          |         |               |               |                       |            |            |                 |
| Down Relay contacts                  |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               | X                     |            |            |                 |
| Down Relay contacts                  |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               | X                     | X          |            |                 |
| Boom Extend Drive Interlock Switch   |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         | X             | X             |                       |            |            |                 |
| Boom Disconnect Relay coil           |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         | X             | X             |                       |            |            |                 |
| Turret Drive Relay coil              |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         | X             | X             |                       |            |            |                 |
| Drive Joystick                       |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         | X             | X             |                       |            |            |                 |
| Right Drive motor                    |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         | X             | X             |                       |            |            |                 |
| Left Drive Motor                     |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         | X             | X             |                       |            |            |                 |
| Mos 90 Motor Controller              |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         | X             | X             |                       |            |            |                 |
| Forward Contactor                    |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         | X             |               |                       |            |            |                 |
| Reverse Contactor                    |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               | X             |                       |            |            |                 |
| Power Unit                           |          |                         |                         | X           | X          | X             | X             | X           | X            | X          | X          | X      | X        | X             | X               | X               | X              | X        | X       |               |               |                       |            |            |                 |
| Boom Pump Relay coil                 |          |                         |                         | X           | X          | X             | X             | X           | X            | X          | X          | X      | X        | X             | X               | X               | X              | X        | X       |               |               |                       |            |            |                 |
| Boom Pump Relay contacts             |          |                         |                         | X           | X          | X             | X             | X           | X            | X          | X          | X      | X        | X             | X               | X               | X              | X        | X       |               |               |                       |            |            |                 |
| Brake Pressure Switch                |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         | X             | X             |                       |            |            |                 |

# Troubleshooting

Section  
4.2

Table 4.2 Troubleshooting Guide - Electrical Schematics (continued)

| Component                          | Function | Upper Control Functions | Lower Control Functions | Steer Right | Steer Left | Riser Elevate | Riser Descend | Boom Extend | Boom Retract | Boom Raise | Boom Lower | Jib Up | Jib Down | Cage Level Up | Cage Level Down | Cage Rotate CCW | Cage Rotate CW | Slew CCW | Slew CW | Drive Forward | Drive Reverse | Parking Brake Release | Tilt Alarm | Tilt Light | Battery Charger |
|------------------------------------|----------|-------------------------|-------------------------|-------------|------------|---------------|---------------|-------------|--------------|------------|------------|--------|----------|---------------|-----------------|-----------------|----------------|----------|---------|---------------|---------------|-----------------------|------------|------------|-----------------|
| Brake Release Pressure Switch      |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               | X                     |            |            |                 |
| Tach Card                          |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         | X             | X             |                       |            |            |                 |
| Resistor Pack                      |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         | X             | X             |                       |            |            |                 |
| Tach-Gen (2)                       |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         | X             | X             |                       |            |            |                 |
| Brake Valve NO                     |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         | X             | X             | X                     |            |            |                 |
| Brake Valve NC                     |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         | X             | X             |                       |            |            |                 |
| Controller Off Switch              |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         | X             | X             |                       |            |            |                 |
| Forward Switch                     |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         | X             | X             |                       |            |            |                 |
| Reverse Switch                     |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         | X             | X             |                       |            |            |                 |
| 5K Resistor                        |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         | X             | X             |                       |            |            |                 |
| Trim Up Solenoid Valve             |          |                         |                         |             |            |               |               |             |              |            |            |        |          | X             |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Trim Down Solenoid Valve           |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               | X               |                 |                |          |         |               |               |                       |            |            |                 |
| Trim Up Upper Control Diode        |          |                         |                         |             |            |               |               |             |              |            |            |        |          | X             |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Trim Up Relay Lower Control Diode  |          |                         |                         |             |            |               |               |             |              |            |            |        |          | X             |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Trim Down Upper Control Diode      |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               | X               |                 |                |          |         |               |               |                       |            |            |                 |
| Trim Down Lower Control Diode      |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               | X               |                 |                |          |         |               |               |                       |            |            |                 |
| Jib Up Solenoid Valve              |          |                         |                         |             |            |               |               |             |              |            |            | X      |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Jib Down Solenoid Valve            |          |                         |                         |             |            |               |               |             |              |            |            |        | X        |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Jib Up Upper Control Diode         |          |                         |                         |             |            |               |               |             |              |            |            | X      |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Jib Up Relay Lower Control Diode   |          |                         |                         |             |            |               |               |             |              |            |            | X      |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Jib Down Upper Control Diode       |          |                         |                         |             |            |               |               |             |              |            |            |        | X        |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Jib Down Relay Lower Control Diode |          |                         |                         |             |            |               |               |             |              |            |            |        | X        |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Boom Up Solenoid Valve             |          |                         |                         |             |            |               |               |             |              | X          |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Boom Down Solenoid Valve           |          |                         |                         |             |            |               |               |             |              |            | X          |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Boom Up Upper Control Diode        |          |                         |                         |             |            |               |               |             |              | X          |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Boom Up Lower Control Diode        |          |                         |                         |             |            |               |               |             |              | X          |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Boom Down Upper Control Diode      |          |                         |                         |             |            |               |               |             |              |            | X          |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Boom Down Lower Control Diode      |          |                         |                         |             |            |               |               |             |              |            | X          |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Boom Extend Solenoid Valve         |          |                         |                         |             |            |               |               | X           |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Boom Retract Solenoid Valve        |          |                         |                         |             |            |               |               |             | X            |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Boom Extend Upper Control Diode    |          |                         |                         |             |            |               |               | X           |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Boom Extend Lower Control Diode    |          |                         |                         |             |            |               |               | X           |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Boom Retract Upper Control Diode   |          |                         |                         |             |            |               |               |             | X            |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Boom Retract Lower Control Diode   |          |                         |                         |             |            |               |               |             | X            |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Riser Up Solenoid Valve            |          |                         |                         |             | X          |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Riser Down Solenoid Valve          |          |                         |                         |             |            | X             |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Riser Up Upper Control Diode       |          |                         |                         |             | X          |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Riser Up Lower Control Diode       |          |                         |                         |             | X          |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Riser Down Upper Control Diode     |          |                         |                         |             |            |               | X             |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Riser Down Lower Control Diode     |          |                         |                         |             |            |               | X             |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Cage Right Solenoid Valve          |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 | X              |          |         |               |               |                       |            |            |                 |
| Cage Left Solenoid Valve           |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 | X               |                |          |         |               |               |                       |            |            |                 |
| Cage Right Upper Control Diode     |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 | X              |          |         |               |               |                       |            |            |                 |
| Cage Right Lower Control Diode     |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 | X              |          |         |               |               |                       |            |            |                 |
| Cage Left Upper Control Diode      |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 | X               |                |          |         |               |               |                       |            |            |                 |
| Cage Left Lower Control Diode      |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 | X               |                |          |         |               |               |                       |            |            |                 |
| Turret Right Solenoid Valve        |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                | X        |         |               |               |                       |            |            |                 |
| Turret Left Solenoid Valve         |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                | X        |         |               |               |                       |            |            |                 |
| Turret Right Upper Control Diode   |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          | X       |               |               |                       |            |            |                 |
| Turret Right Lower Control Diode   |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          | X       |               |               |                       |            |            |                 |
| Turret Left Upper Control Diode    |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                | X        |         |               |               |                       |            |            |                 |
| Turret Left Lower Control Diode    |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                | X        |         |               |               |                       |            |            |                 |
| Steer Right Solenoid Valve         |          |                         | X                       |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Steer Right Diode                  |          |                         | X                       |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Steer Left Solenoid Valve          |          |                         |                         | X           |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Steer Left Diode                   |          |                         |                         | X           |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Proportional Valve                 |          |                         |                         |             |            |               |               |             |              | X          | X          | X      | X        | X             | X               | X               | X              | X        | X       |               |               |                       |            |            |                 |
| High Flow Valve                    |          |                         |                         |             |            | X             | X             | X           | X            |            |            |        |          |               |                 |                 |                |          |         |               |               |                       |            |            |                 |
| Diode DB21                         |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               | X                     |            |            |                 |
| Bypass Solenoid Valve              |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               | X                     |            |            |                 |
| Diode DB25                         |          |                         |                         |             |            |               |               |             |              |            |            |        |          |               |                 |                 |                |          |         |               |               | X                     | X          |            |                 |

## 4.3 Troubleshooting the MOS90

Important basics applicable to the motor control unit.

- The MOS90 has a green diagnostics L.E.D. in the front panel.
- The green L.E.D. will turn on and shine continuously when the MOS90 is powered up and working correctly.
- The green L.E.D. will be off if no power is supplied to the MOS90.
- The green L.E.D. will flash a sequence of flashes if the MOS90 is damaged or is receiving an improper signal. An explanation of the flash sequences "flash faults" is shown on the following pages.
- The MOS90 is high temperature protected by "thermal cutback". The cutback operates between 80°C (176°F) and 90°C (194°F). Powered functions will gradually operate slower and slower until 90°C (194°F). The MOS90 will shut down at 90°C (194°F). Continued operation at high temperature will damage the MOS90.
- The MOS90 is low voltage protected by "low voltage cutout". The MOS90 shuts down at 14.0 VDC. Powered functions suddenly stop. When input voltage goes above 14.0 VDC turns back on.

### WHEN A FLASH ERROR OCCURS

#### Step 1.

Disconnect the 17 pin connector from the MOS90. Wait Five (5) seconds and plug it back in again. If the flash error repeats go to step Two (2). If the green L.E.D. lights up and stays on continuously - operate machine. Note which functions are being used when problem repeats itself.

#### Step 2.

Disconnect the 17 pin connector from the MOS90. Connect pin Six (6) to a fused battery supply (14.0 VDC minimum) and observe the green L.E.D. If flash error stays, replace MOS90. If green L.E.D. lights up and remains on continuously, check wiring.

**NOTE: Troubleshoot the possible cause of the flash error before replacing the MOS90, for example an Eight (8) flash error will cure itself when the MOS90 cools down.**

## 4.4 Using the Calibrator

The calibrator has 20 L.E.D. segments marked as shown.

### TRACTION

|        |  |      |
|--------|--|------|
| IMAX   |  | AMP  |
| PLUG   |  | AMP  |
| ACCEL  |  | SEC  |
| CREEP  |  | %VB  |
| BYPASS |  | AMP  |
| SPEED  |  | %MAX |
| SPEED1 |  | %    |
| SPEED2 |  | %    |
| F.WEAK |  | AMP  |
| TIMER  |  | SEC  |
| SEAT   |  | SEC  |
| X2     |  |      |
| X3     |  |      |
| X4     |  |      |
| X5     |  |      |
| BATT   |  | V    |
| MOTOR  |  | V    |
| MOTOR  |  | AMP  |
| TEMP   |  | C    |
| TEST   |  |      |

The values which should be expected when checking the machine are shown on the following page.

There are three buttons on the calibrator:

**increment**, marked +  
**decrement**, marked -  
**select**

When select is pressed, each L.E.D. will light in sequence until the select button is released. Each setting can be incremented or decremented using the + or - buttons when the adjacent L.E.D. is lit.

When "Test" L.E.D. is lit, the state of the MOS90 inputs is displayed. The first input displayed is the accelerator which can vary from 0-100%. When the + button is pressed once the switch Input 1 is displayed. This will be seen as "1.OP" until the switch Input voltage changes. "1.CL" will then be displayed. This is repeated for all the switch inputs.

# Troubleshooting

Section  
4.5

When BATTV, MOTORV, MOTORA and TEMPC are selected, the controller shows their values. When BATTV is selected and the "+" button is held in, the highest voltage that the MOS90 has recorded will be displayed. When TEMPC is selected and the "+" button is held in, the highest temperature that the MOS90 has recorded will be displayed. The "-" button will display the lowest values.

When the MOS90 is first powered up, the recorded minutes of run time is displayed. The "+" button display thousands of hours and the "-" button displays hundreds of hours. When the MOS90 is pulsing (being used) run time is being incremented and stored. The "dot" in the time display is blinking when MOS90 is being used, steady when idle.

## 4.5 Calibrator Settings

Table 4-3 Calibrator Settings

| LED    | Function  | Unit    | Setting   | Comments   |
|--------|---|---------|-----------|--|
| IMAX   | MOS90 Maximum Amp. Capacity                           | Amps    | 600       |  |
| PLUG   | Acceleration Delay                                    | Seconds | 2.0       |  |
| ACCEL  | Deceleration Delay                                    | Seconds | 0.5       |  |
| CREEP  | Not Used  | %       | 0         |  |
| BYPASS | Stowed Max. Drive Speed, Level                        | %       | 100       |  |
| SPEED  | Elevated Drive Speed, Level                           | 5       | 20        | Elevated Drive Speed, Off-Level => Alarm On. No Drive    |
| SPEED1 | Stowed Max. Drive Speed, Off-Level First Tilt Setting | %       | 75        | Drive Speed is reduced when Off-Level in Stowed Position |
| SPEED2 | Stowed Max. Drive Speed, Off-Level                    | %       | 25        | Drive Speed is reduced when Off-Level in Stowed Position |
| F.WEAK | Max. Plugging Current                                 | Amps    | 750       |  |
| TIMER  | Not Used  |         |           |  |
| SEAT   | Not Used  |         |           |  |
| X3     | Not Used  |         |           |  |
| X4     | Not Used  |         |           |  |
| X5     | Not Used  |         |           |  |
| BATT   | Battery Voltage at pin #6 on MOS90                    | Volts   | Real Time |  |
| MOTOR  | Voltage across Motor Contacts                         | Volt    | Real Time |  |
| MOTOR  | Amperage Across Motor Contacts                        | Amp     | Real Time |  |
| TEMP   | Internal Temp of Controller                           | Celsius | Real Time |  |
| TEST   | Switch Activation and Status                          | OP/CL % |           | Open=Unactivated Closed=Activated %=Percentage           |

Table 4-4 Upright Traction Controller Calibration Diagnostics

| Sequence No. | Test            | Display    | Input # |
|--------------|-----------------|------------|---------|
| -            | Acc. Input      | 0-100%     | 14      |
| 1            | Reverse         | CL/OP      | 8       |
| 2            | Forward         | CL/OP      | 11      |
| 3            | Tach Input      | 0-100%     | 12      |
| 4            | Hvy Tlt Input   | CL=Level   | 7       |
|              | Speed3 Sw       | OP=Tilt    |         |
| 5            | Minor Tlt Input | CL=Level   | 16      |
|              | Speed2 Sw       | OP=Tilt    |         |
| 6            | Brake Applied   | CL= Brk On | 16      |

|    |                 |            |    |
|----|-----------------|------------|----|
| 7  | Act. Direction  | OP=FWD     | 2  |
|    | Tacho Output    | CL=REV     | 2  |
| 8  | Boom Up Sw      | CL=Lowered | 13 |
|    | Speed1 Sw       | OP=Raised  |    |
| 9  | Not             | Used       |    |
| 10 | Last Fault Code | 1-12       | -  |

NOTE: CL = Switch Closed  
OP = Switch Open

\*\* If both tilt and boom-up condition, then FWD. and REV. is cleared

## 4.6 MOS90 Fault Finding Flow Charts

At battery connection, the LED should not illuminate. At key ON, the LED should illuminate steadily. If the LED illuminates and remains steady, but no drive can be selected, the calibrator can be used to test the wiring harness.

### 1 Flash

- Power up/Fail-safe Fault
- EEPROM data corrupted on key

Fault appears at key switch on.

Replace MOS90 Controller

### 2 Flashes

- Procedure Fault
  - Illegal Startup Sequence.
- Two directions selected together, direction and lift selected together or lift and ground selected together
- Drive inhibited
  - Flashes until fault is cleared

Check for correct startup sequence. Was direction or lift selected at power up?

Retry

Check that both directions are not selected. Check direction switches and wiring. Use calibrator test mode and check Fwd/Rev/Lift switch inputs and wiring.

Rectify

Replace MOS90 Controller

### 3 Flashes

- Point "A" less than 7V in neutral, or less than 7V for 15mS in drive, or contactor coil short circuit.
- Drive inhibited.
- Recycle to neutral to clear.

NOTE: If recycling to neutral does not clear the fault, then the fail-safe is due to a S/C contactor coil and the keyswitch must be recycled (and the coil replaced).

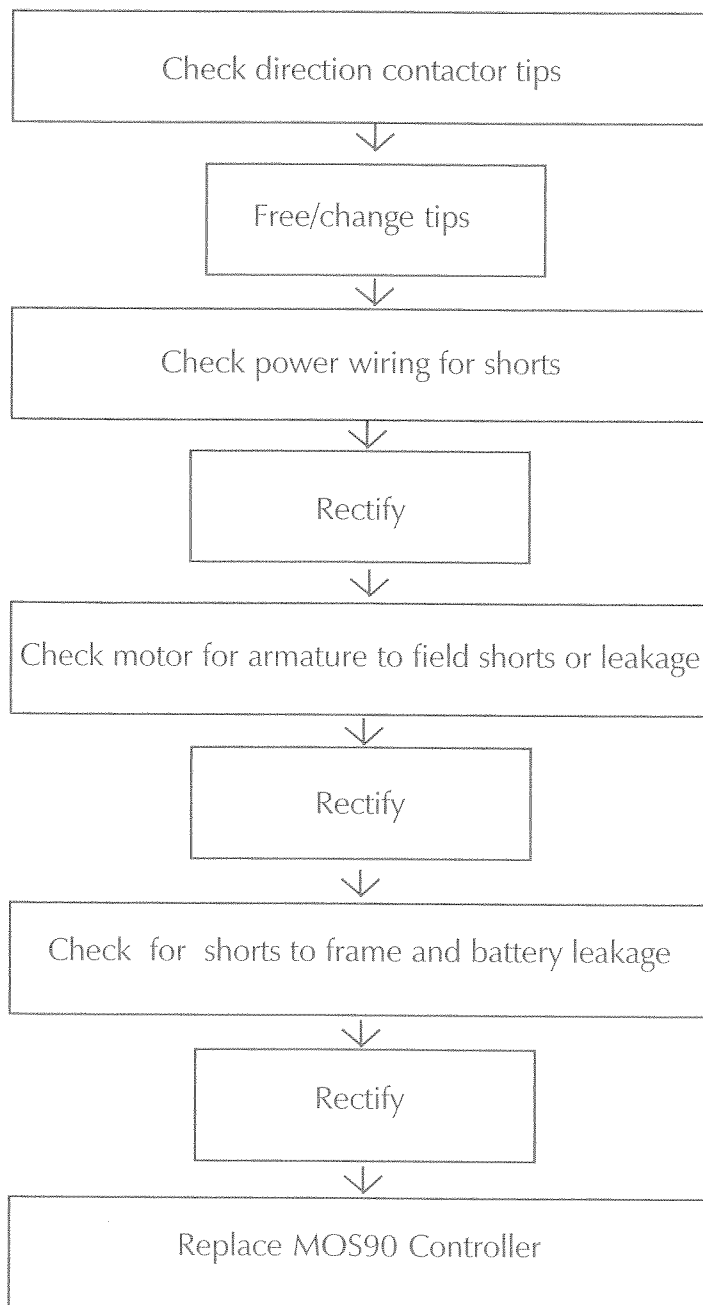
Check power and control wiring for shorts

Rectify

Replace Controller

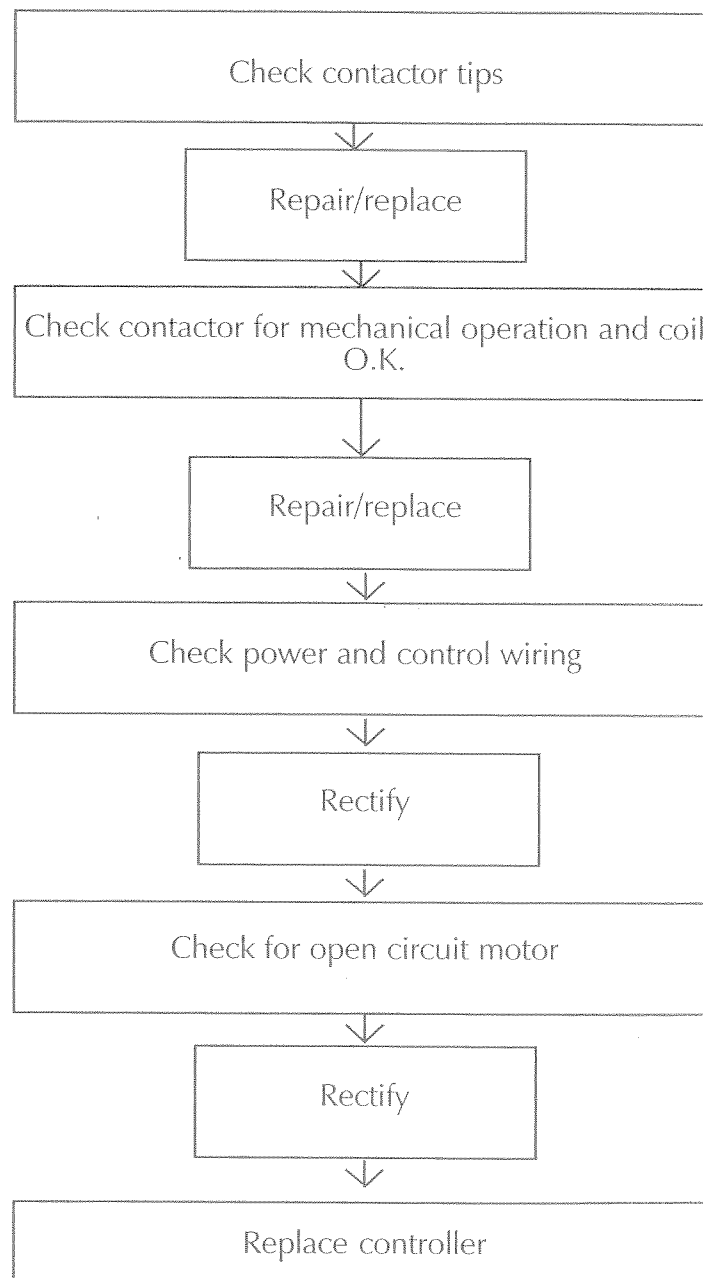
## 4 Flashes

- Direction contactor welded. Point "A" within 6V of B+ve in neutral)
- Leakage between motor armature and field.
- Drive inhibited.
- Flashes in neutral until fault is cleared



## 5 Flashes

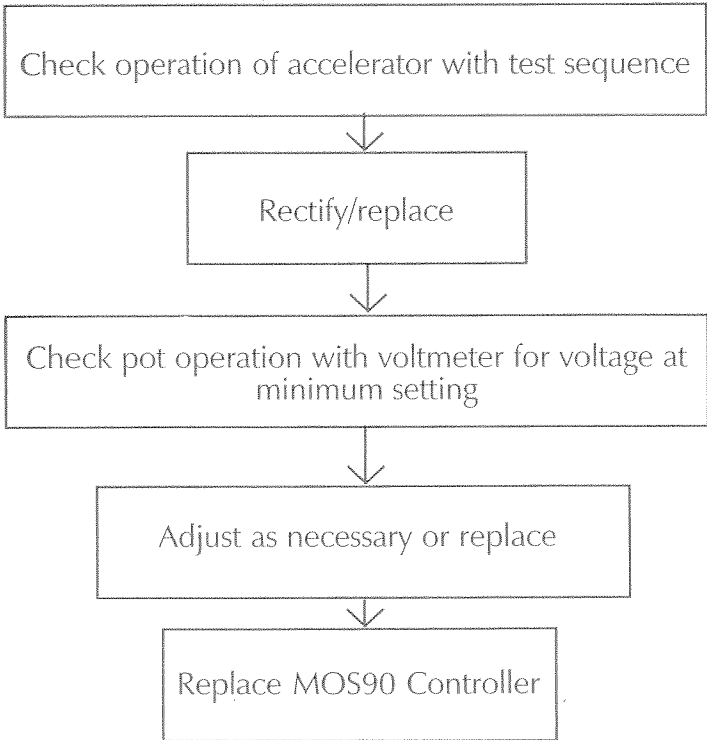
- Direction contactors (or line contactor) did not close.
- Motor armature or field open circuit.
- Point "A" not within 6V of B+ve within one second of selecting direction.
- Drive inhibited.
- Flashes until fault is cleared, when contactor closes.



# Troubleshooting

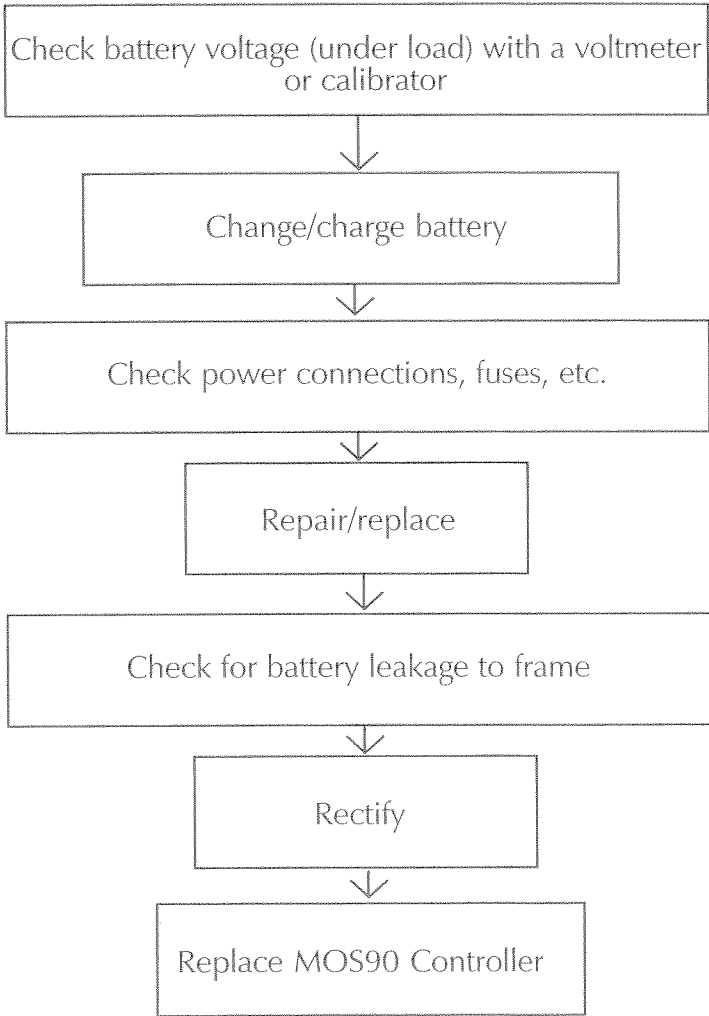
## 6 Flashes

- Accelerator faults
- 3.5 Volts to 0 Volts = Min. to Max. Speed on accelerator input (pin 14). Greater than 4.5 volts can mean an open accelerator pot. Less than 2.5 Volts on power up, indicates more than 30% demand
- Controller pulses at creep setting
- Flashes until fault cleared



## 7 Flashes

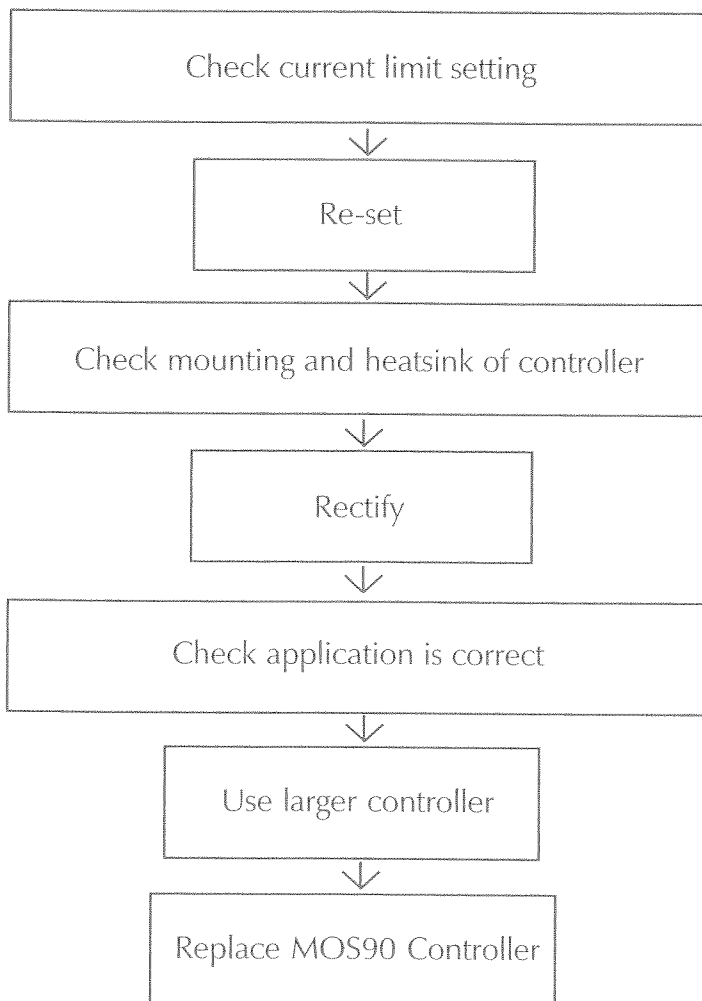
- Battery voltage dipped below 14 volts
- Drive inhibited
- Turn key switch off and on to clear flash





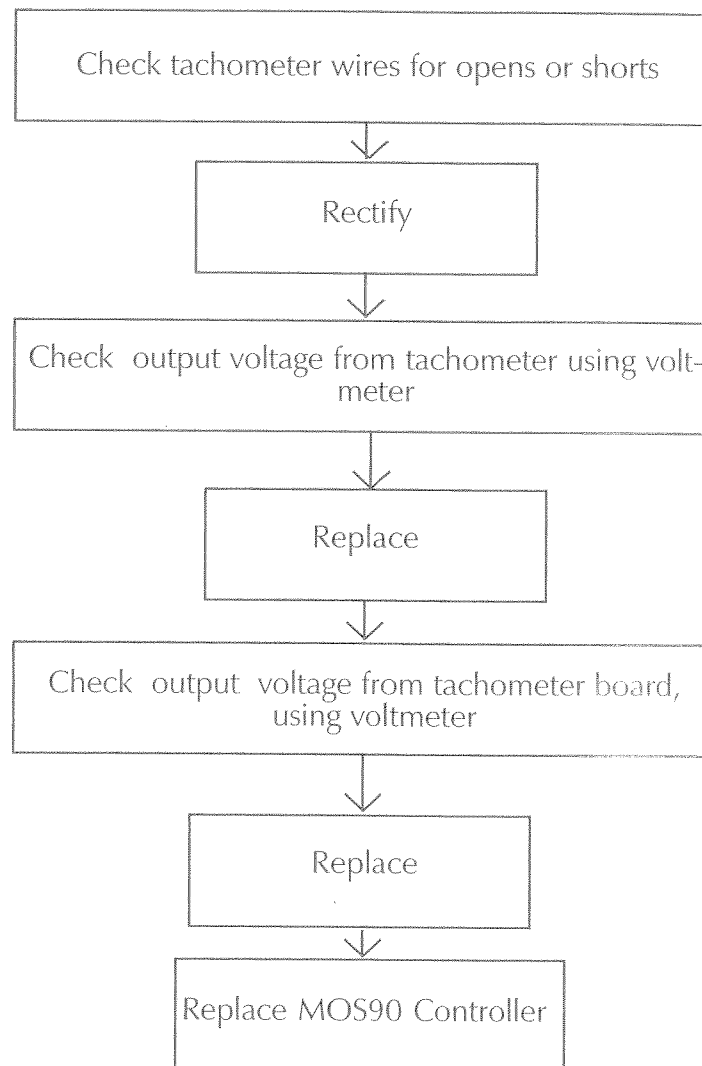
## 8 Flashes

- Thermal cutback
- Heatsink temperature less than 80°C (176°F) (Current limit will be zero at 90°C (194°F))
- Allow unit to cool down, to clear flashing



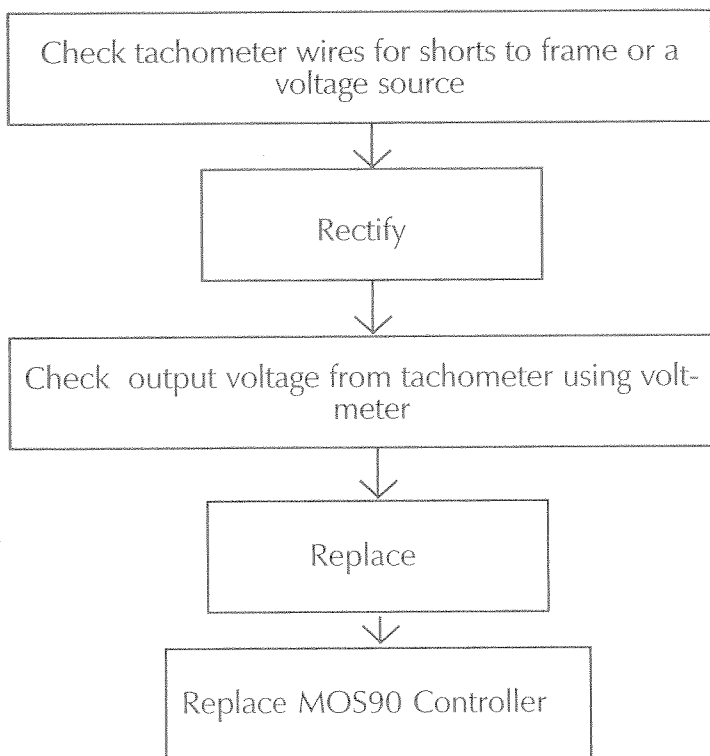
## 10 Flashes

- Tachometer fault
- Drive inhibited
- Recycle key to clear fault



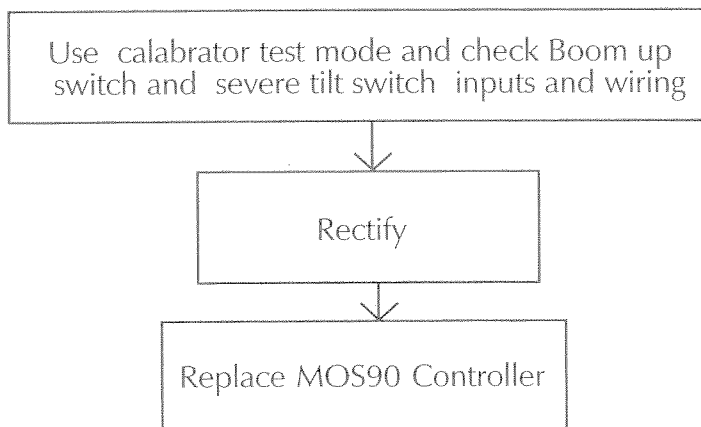
## 11 Flashes

- Tachometer signal out of range
- Drive inhibited
- Flashes until fault cleared



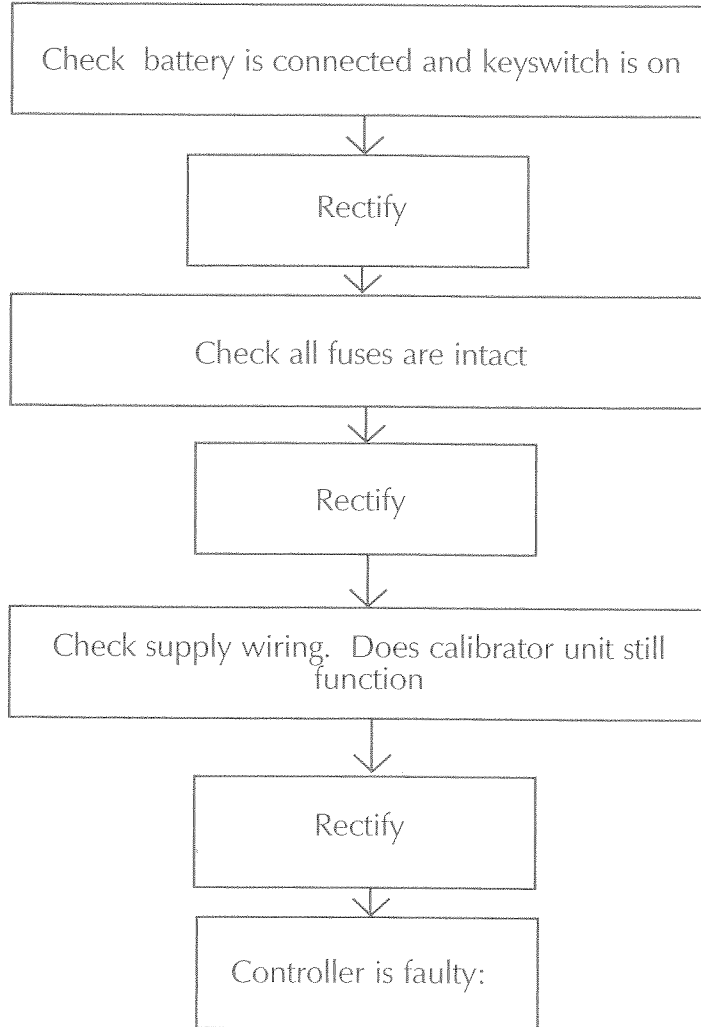
## 12 Flashes

- Boom up and vehicle in severe tilt condition
- "Boom up" and "severe tilt" switches both opened (N.C. switches)
- Vehicle goes into emergency stop (forced neutral state) and plug brakes to a stop
- Lower boom and recycle key to clear fault



## LED off

- Unit not powered up or controller faulty, or LED faulty



- a) Auto fail-safe check failed. LED turns off when a direction is first selected after power up. Recycle keyswitch.
- b) Contactor drive S/C. LED resets itself if short circuit clears.
- c) Mosfets did not turn on. Recycle direction to neutral to clear fault indication.

Replace controller

## ACTIVATING "TEST"

Position red LED at TEST. Press "+" or "-" to select the switch to be viewed.

The zero position input "-" should read zero and is set by adjusting the sensitivity threshold trim pot in the upper control box. Step on the foot switch and keeping the joystick centered, adjust the pot to give a readout of 1 or 2. Slowly back the pot down until the reading has just dropped to zero.

Connect voltmeter between B- and pin 14 on MOS90. Voltage at pin 14 in neutral should not be lower than +3.5 volts D.C. 3.5 VDC = 0% speed input, 0.0 VDC=100% speed input.

If set at an extremely high value MOS90 will read as fault and shut down.

Properly set the AB46 should start to move slowly with a small movement of the joystick after a very small "deadband" zone.

# Troubleshooting

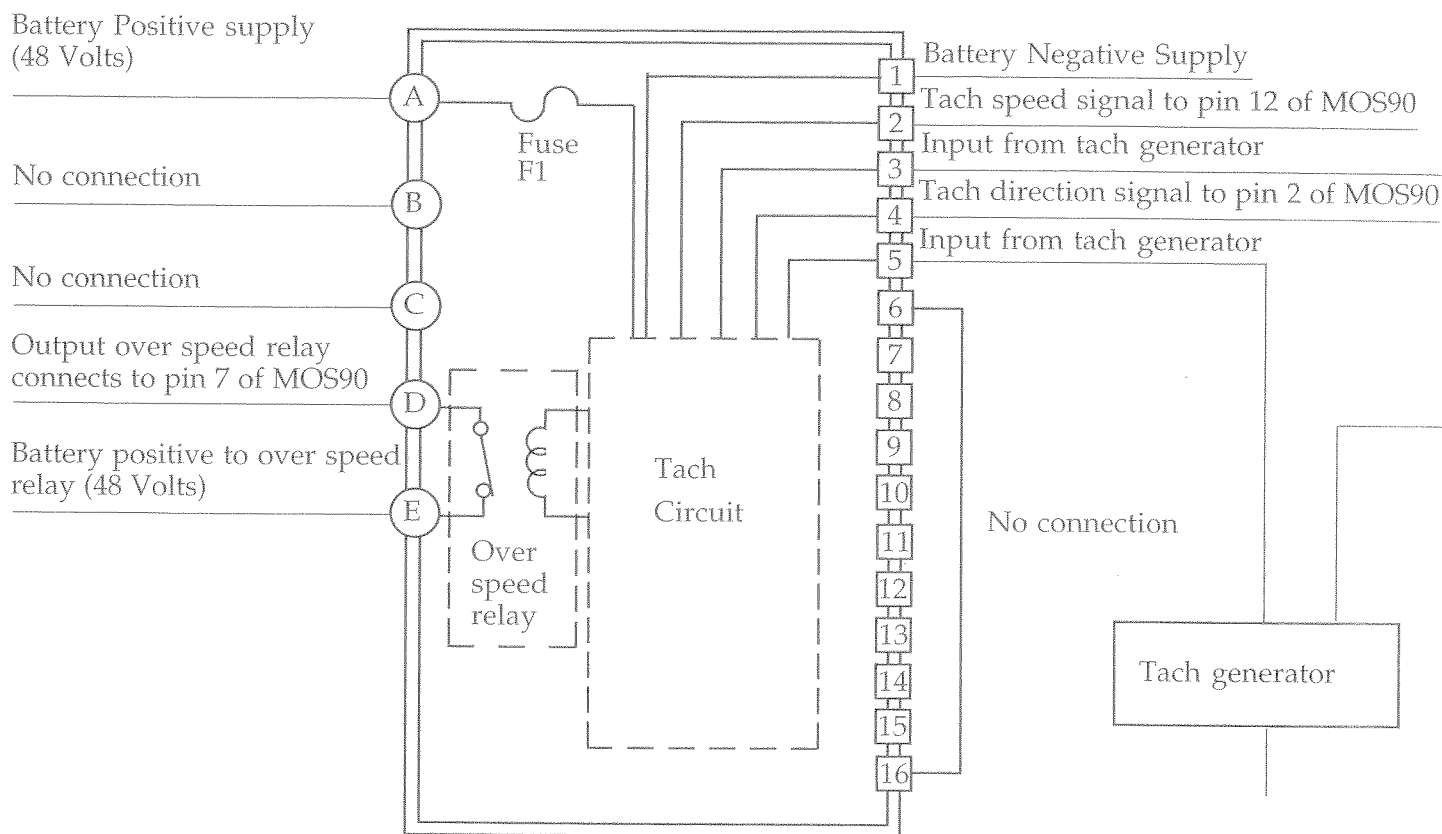
Figure 4-1 MOS90 17 WAY CONNECTOR PIN OUT DESIGNATION

|  |    |               |       |
|--|----|---------------|-------|
| Brake relay driver (48 Volts = brake on & 0 Volts = brake off)   | 1  | Black         | MOS90 |
| Tachometer direction input from tach board (18 Volts = rev. & 0 Volts = FWD)                             | 2  | Brown         |       |
| No connection  | 3  | Red (spare)   |       |
| Tilt switch input (48 Volts = no tilt & 0 Volts = tilt)  | 4  | Orange        |       |
| Battery + side of direction & brake contactors for coil suppression (48 Volts)                           | 5  | Yellow        |       |
| + 48 Volt supply to power up controller  | 6  | Green         |       |
| Over speed relay (48 Volts = no over speed & 0 Volts = over speed condition)                             | 7  | Blue          |       |
| 48 Volts when forward is selected & 0 Volts in neutral   | 8  | Purple        |       |
| No connection  | 9  | Grey (spare)  |       |
| No connection  | 10 | White (spare) |       |
| 48 Volts when reverse is selected & 0 Volts in neutral   | 11 | Pink          |       |
| Tach signal from tach board (7.5 Volts to 15 Volts = FWD. 0-100% and 7.5 Volts to 0 Volts = REV. 0-100%) | 12 | White/Purple  |       |
| Boom up switch (48 Volts = boom down & 0 Volts = boom up)  | 13 | White/Red     |       |
| Traction accelerator signal (3.5 Volts to 0 Volts = min. to max. speed)                                  | 14 | White/Black   |       |
| Forward contactor driver - goes to battery negative to energize contactor                                | 15 | White/Yellow  |       |
| Brake applied input (48 Volts = brake on & 0 Volts = brake off)  | 16 | White/Blue    |       |
| Reverse contactor driver - goes to battery negative to energise contactor                                | 17 | White/Green   |       |

# Troubleshooting

Section  
4.6

Figure 4-2 UPRIGHT TACHOMETER BOARD



(D) 48 Volts = no over speed condition  
0 Volts = over speed condition

2 Tach speed signal from tach board  
7.5 Volts to 15 volts = 0-100% speed in FWD.  
7.5 Volts to 0 volts = 0-100% speed in REV.

4 Tach direction signal  
18 Volts = REV.  
0 Volts = FWD.

3

5 Output of tach generator  
0 to +50 Volts = 0-100% speed in FWD.  
0 to -50 Volts = 0-100% speed in REV.

# Troubleshooting

NOTES:

## 5.0 Introduction

This section contains electrical and hydraulic power schematics, and associated information for maintenance purposes.

The diagrams are to be used in conjunction with Section 4 "Troubleshooting". They allow understanding of the makeup and functions of the systems for checking, tracing, and faultfinding during trouble analysis.

The components that comprise the electrical and hydraulic systems are given a reference designation and are explained as to function and location in the following tables.

### *Section 5.1 Hydraulic Schematics*

Figure 5-1: Hydraulic Valve Ports

Figure 5-2: Check Ports

Figure 5-3: Hydraulic Schematic, Electric/Bi-Energy Models

Figure 5-4: Valve Block Assembly

### *Section 5.2 Electrical Schematics*

Figure 5-5: Electrical Schematic, Electric Model  
068341-006

Figure 5-6: Electrical Schematic, BiEnergy Model

Figure 5-7: Engine Assembly - Kubota ZB600C

### *Section 5.3 Upper Controller*

Figure 5-8: Upper Controller

Figure 5-9: Electrical Diagram - Upper Controller, Electric Model

Figure 5-10: Electrical Diagram - Upper Controller, Bi-Energy Model

### *Section 5.4 Lower Controller*

Figure 5-11: Lower Control Box Cover

Figure 5-12: Terminal Strip, Relay Identification

Figure 5-13: Electrical Diagram - Lower Control Box, Electric Model

Figure 5-14: Electrical Diagram - Lower Control Box, Bi-Energy Model

### *Section 5.5 Relay Panel*

Figure 5-15: Relay Panel (Electric Model Shown)

Figure 5-16: Relay Panel Schematic

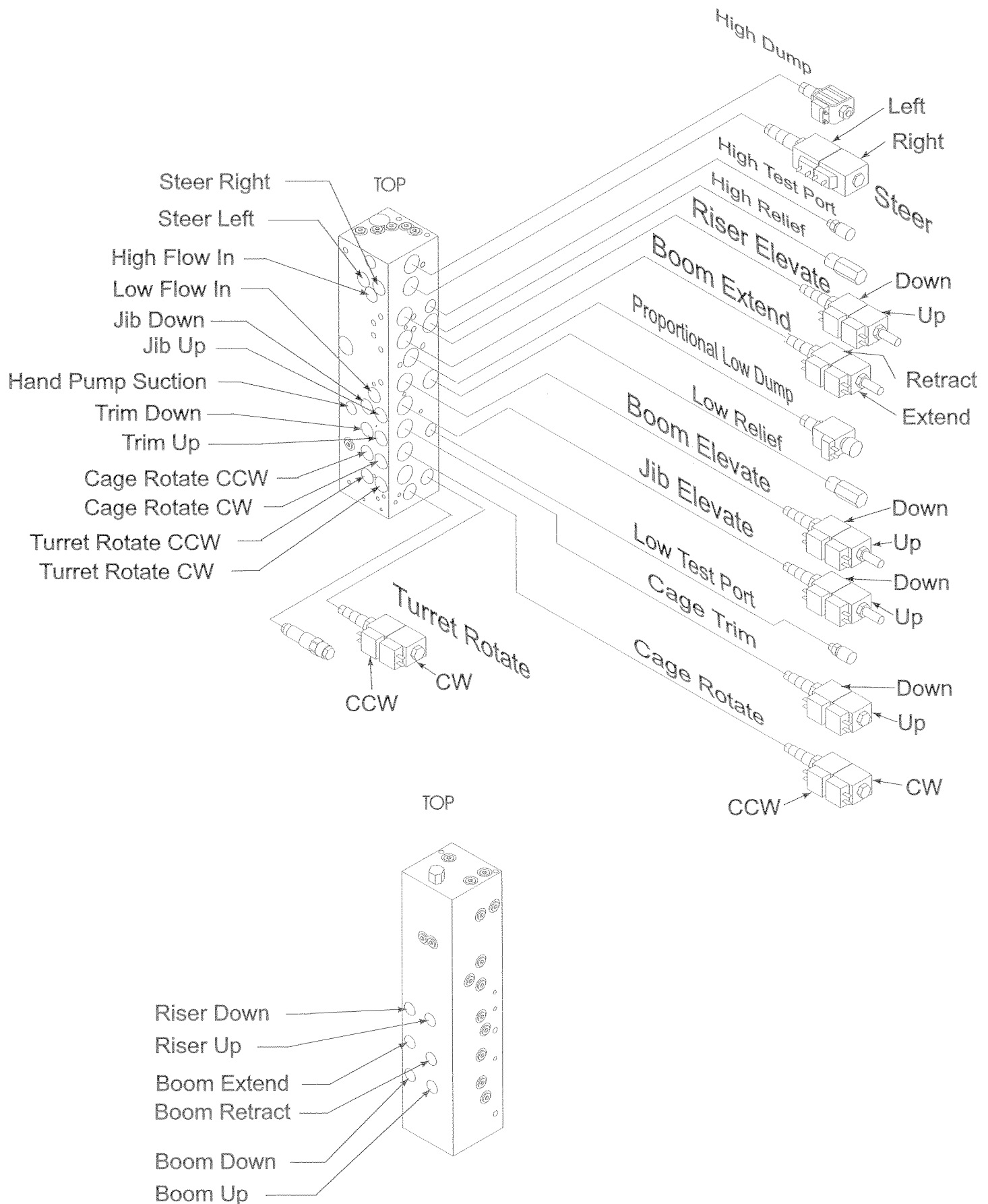


Figure 5-1: Hydraulic Valve Ports



BOTTOM VIEW  
Valve is shown upside down

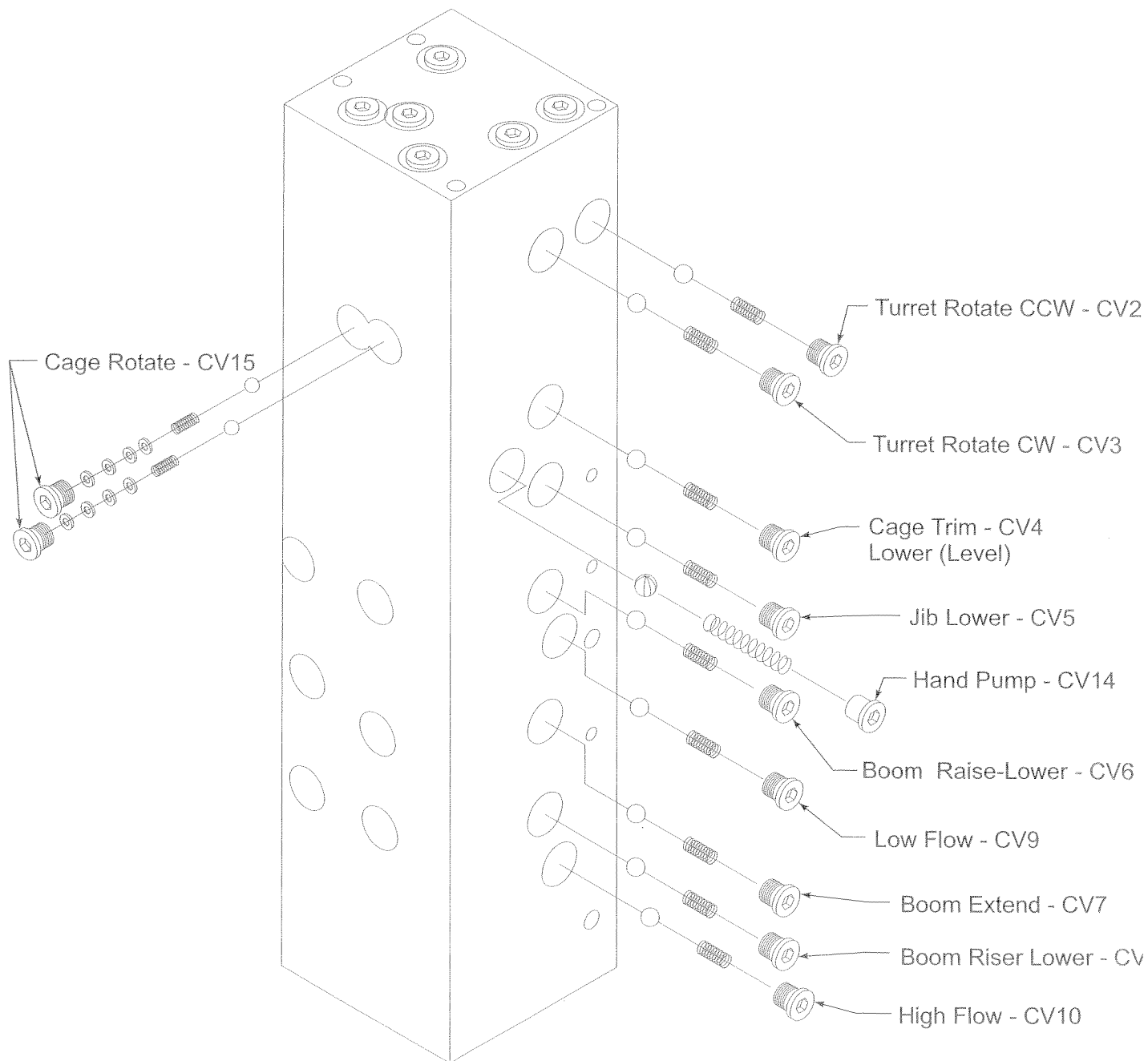


Figure 5-2: Check Ports

# Schematics

Table 5-1: Hydraulic Schematic Legend

| REFERENCE DESIGNATION        | NAME                       | FUNCTION  | LOCATION  |
|------------------------------|----------------------------|---|---|
| BA1<br>(Electric Model only) |                            | Brake Accumulator   | Stores pressure to keep brakes released             |
| CV1 & CV2                    | Check Valve, Brake         | Allows free flow from brakes around pressure reducing valve | Rear of Chassis                                     |
| CV3                          | Check Valve, Turret Rotate | Flow Check  | Hydraulic Manifold                                  |
| CV4                          | Check Valve, Trim          | Flow Check  | Hydraulic Manifold                                  |
| CV5                          | Check Valve, Jib           | Flow Check  | Hydraulic Manifold                                  |
| CV6                          | Check Valve, Boom Raise    | Flow Check  | Hydraulic Manifold                                  |
| CV7                          | Check Valve, Boom Extend   | Flow Check  | Hydraulic Manifold                                  |
| CV8                          | Check Valve, Riser         | Flow Check  | Hydraulic Manifold                                  |
| CV9                          | Check Valve, High Relief   | Flow Check  | Hydraulic Manifold                                  |
| CV10                         | Check Valve, High Relief   | Flow Check  | Hydraulic Manifold                                  |
| CV11                         | Check Valve, Brake Release | Flow Check  | Hydraulic Manifold                                  |
| CV12                         | Check Valve, Pump 1        | Flow Check  | Hydraulic Manifold                                  |
| CV13                         | Check Valve, Pump 2        | Flow Check  | Hydraulic Manifold                                  |
| CV14 (2)                     | Check Valve, Hand Pump     | Stops flow from hand pump through diverter valve            | Hydraulic Manifold                                  |
| CV15 (2)                     | Check Valve,               | Reduces pressure for smooth cage rotate operation           | Hydraulic Manifold                                  |
| CV16                         | Check Valve, jib Lower     | Sends oil through OR2 to slow jib lowering                  | Hydraulic Manifold                                  |
| CYL1                         | Steering Cylinder          | Actuates steering linkage to steer front wheels.            | Front axle assembly                                 |
| CYL2                         | Riser Cylinder             | Raise Elevating Assembly                                    | Elevating Assembly                                  |
| CYL3                         | Boom Extend Cylinder       | Extend Boom   | Inside Boom   |
| CYL4                         | Boom Raise Cylinder        | Raise Elevating Assembly                                    | Elevating Assembly                                  |
| CYL5                         | Jib Cylinder               | Raise Jib   | Jib   |
| CYL6                         | Master Cylinder            | Maintain cage level   | Rear of Boom  |
| CYL7                         | Slave Cylinder             | Maintain cage level   | Front of Boom                                       |
| CYL8                         | Cage Rotate Cylinder       | Rotate cage   | Between cage and jib                                |
| CYL9                         | Left Brake Cylinder        | Release left brake  | Left brake  |
| CYL10                        | Right Brake Cylinder       | Release right brake   | Right brake   |
| FL1                          | Filter, Return             | Keep oil clean  | Hydraulic tank                                      |
| FI2                          | Filter, Suction Strainer   | Keep oil clean  | Pump  |
| MOT1                         | Motor, Slew                | Turns Turret  | Bottom of turret                                    |
| ORF1                         | Brake Orifice              | Allows brakes to release quickly and apply slowly.          | Left side top of manifold under fitting in port 12. |
| ORF2                         | Jib Down Orifice           | Limits the descent speed of the jib.                        |   |
| PMP1                         | Hydraulic Pump High Flow   | Provides fluid power for hydraulic system.                  | Power module  |
| PMP2                         | Hydraulic Pump Low Flow    | Provides fluid power for hydraulic system.                  | Power module  |
| PMP3                         | Hand Pump                  | Pump up brakes for towing                                   | Hydraulic manifold                                  |
| PS1                          | Pressure Switch            | Measure brake hydraulic pressure                            | Right brake   |
| PS2                          | Pressure Switch            | Provides overpressure protection for steering components.   | Front of manifold, port marked 'A'.                 |

| REFERENCE DESIGNATION | NAME                       | FUNCTION                                  | LOCATION                           |
|-----------------------|----------------------------|---|------------------------------------|
| RV1                   | High Pressure Relief Valve | Limits maximum pressure                   | Hydraulic manifold                 |
| RV2                   | Low Pressure Relief Valve  | Limits minimum pressure                   | Hydraulic manifold                 |
| RV3                   | Turret Rotate Relief Valve | Limit pressure to turret rotate motor     | Hydraulic manifold                 |
| RV4                   | Riser Relief Valve         | Limit pressure to riser cylinder          | Riser cylinder                     |
| RV5                   | Boom Extend Relief Valve   | Limit pressure to boom extend cylinder    | Boom extend cylinder               |
| RV6                   | Boom Raise Relief Valve    | Limit pressure to boom raise cylinder     | Boom raise cylinder                |
| RV7                   | Jib Relief Valve           | Limit pressure to jib cylinder            | Jib cylinder                       |
| RV8 (2)               | Master Relief Valve        | Limit pressure to master cylinder         | Master cylinder                    |
| RV9 (2)               | Slave Relief Valve         | Limit pressure to slave cylinder          | Slave cylinder                     |
| RV10 (2)              | Cage Rotate Relief Valve   | Limit pressure to cage rotate cylinder    | Cage rotate cylinder               |
| V1                    | Steering Valve             | Controls oil flow to steering cylinder    | Top of manifold, ports marked 'D'. |
| V2                    | Riser Valve                | Controls oil flow to Riser Cylinder       | Front of manifold, port            |
| V3                    | Boom Extend Valve          | Controls oil flow to Boom Extend Cylinder | Hydraulic manifold                 |
| V4                    | Boom Raise Valve           | Controls oil flow to Boom Raise Cylinder  | Hydraulic manifold                 |
| V5                    | Jib Valve                  | Controls oil flow to Jib Cylinder         | Hydraulic manifold                 |
| V6                    | Trim/Level Valve           | Controls oil flow to Master Cylinder      | Hydraulic manifold                 |
| V7                    | Cage Rotate Valve          | Controls oil flow to Cage Rotate Cylinder | Hydraulic manifold                 |
| V8                    | Turret Rotate Valve        | Controls oil flow to Slew Motor (MOT1)    | Hydraulic manifold                 |
| V9                    | Brake Apply Valve          | Apply brakes                              | Brake valve block                  |
| V10                   | Brake Release Valve        | Release brakes                            | Brake valve block                  |
| V11                   | Low Rate Valve             | Flow control                              | Hydraulic manifold                 |
| V12                   | High Dump Rate             | Power to riser and boom extend cylinders  | Hydraulic manifold                 |
| V13                   | Diverter Valve             | Allows hand pump to function              | Hydraulic manifold                 |

Note: See Figure 5-1 for hydraulic valve locations.

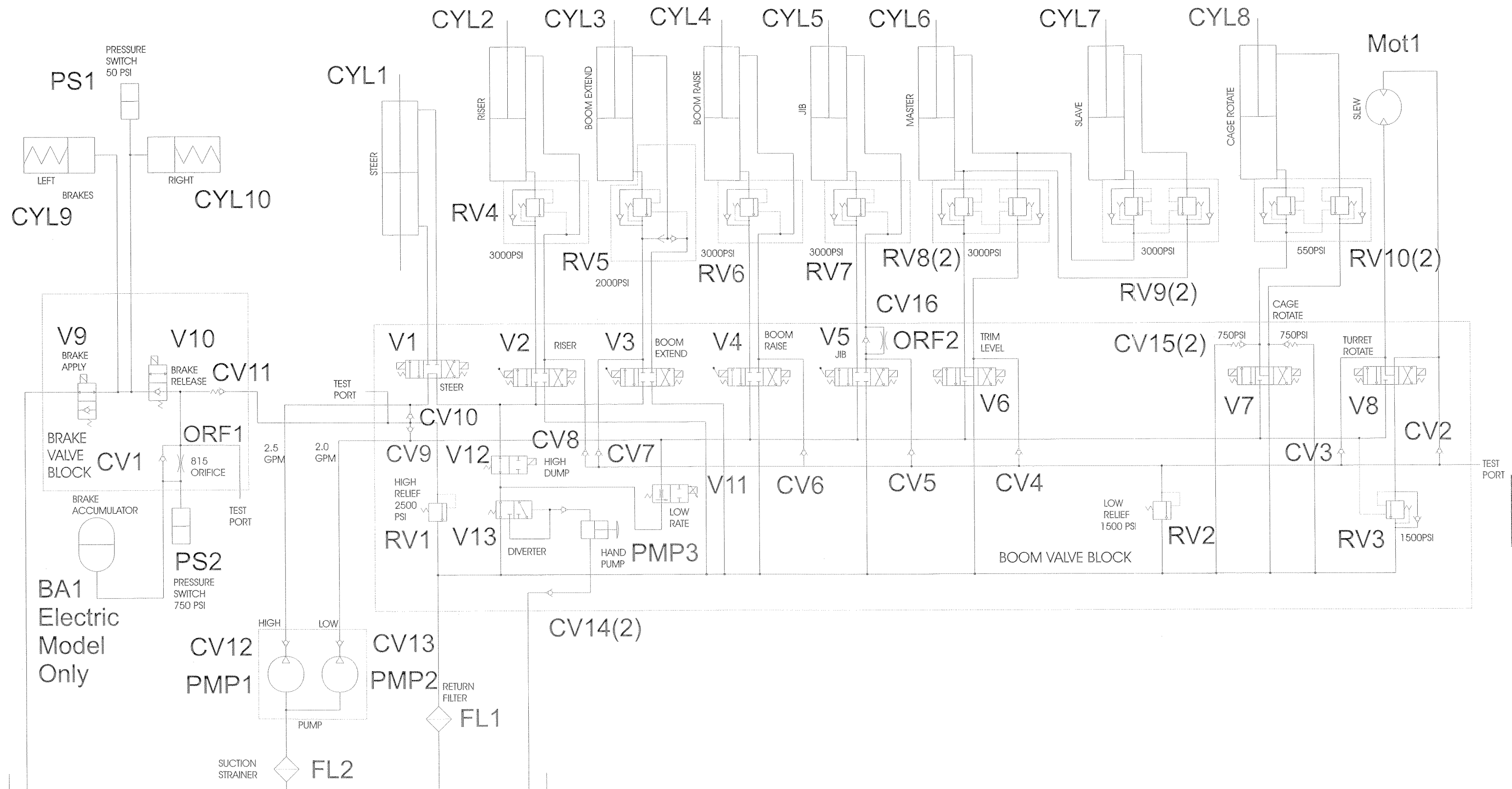
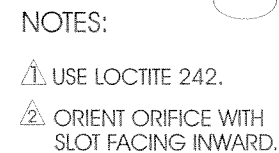


Figure 5-3: Hydraulic Schematic AB46 (068340-001)



## VALVE BLOCK ASSEMBLY

| ITEM | DESCRIPTION                        |
|------|------------------------------------|
| 24.  | FILTER ASSEMBLY                    |
| 25.  | PIPE NIPPLE, 3/4 SCHD 40 X 4       |
| 26.  | FITTING, 45° 6MB-4MJ               |
| 27.  | FITTING, 45° SWIVEL EL. 4MB-4MJ    |
| 28.  | FITTING, 90° 4MB-6MJ               |
| 29.  | FITTING, 90° EL. 6MB-6MJ           |
| 30.  | HAND GRIP, VINYL                   |
| 31.  | FITTING, 2062-6-45                 |
| 32.  | SCREW BUTT HEAD 1/4-20 UNC X 1/2   |
| 33.  | SCREW BUTT HEAD, 5/16-18 UNC X 3/4 |
| 34.  | LANYARD ASSEMBLY                   |
| 35.  | FITTING 202702-6-65                |
| 36.  | ORFICE                             |
| 37.  | VALVE                              |
| 38.  | STEEL BALL 7/16 DIA                |
| 39.  | BRACKET                            |
| 40.  | CONNECTOR RING, 18-14 GA. #8       |
| 41.  | CONNECTOR, FEMALE, PUSH, .25       |
| 42.  | WIRE, 16 GA. BLACK                 |

NOTES:



Electrical Schematic Electrical Model-European

Table 5-2: Electrical Schematic Legend, Electric Model - 068341-006

| REFERENCE DESIGNATION | NAME          | FUNCTION   | LOCATION                                     |
|-----------------------|---------------|--|--|
| ALM 1                 | Horn          | Warning sound  | Front of chassis                             |
| ALM 2                 | Alarm, Tilt   | Provides warning sound when slope of machine exceeds 3° side to side, or fore and aft. | Upper control box, exterior upper left side. |
| CONT1                 | Controller    | Controls operating speed of various functions  | Upper control box                            |
| CRD1                  | Tach Card     | Supplies speed information to controller   | Relay Panel                                  |
| D1                    | Diode (Block) | Supplies power to up trim solenoid.  | Lower Controller                             |
| D2                    | Diode (Block) | Supplies power to down trim solenoid.  | Lower Controller                             |
| D3                    | Diode (Block) | Supplies power to up jib solenoid.   | Lower Controller                             |
| D4                    | Diode (Block) | Supplies power to down jib solenoid.   | Lower Controller                             |
| D5                    | Diode (Block) | Supplies power to up boom solenoid.  | Lower Controller                             |
| D6                    | Diode (Block) | Supplies power to down boom solenoid.  | Lower Controller                             |
| D7                    | Diode (Block) | Supplies power to extend boom solenoid.  | Lower Controller                             |
| D8                    | Diode (Block) | Supplies Power to retract boom solenoid.   | Lower Controller                             |
| D9                    | Diode (Block) | Supplies power to up riser solenoid.   | Lower Controller                             |
| D10                   | Diode (Block) | Supplies power to down riser solenoid.   | Lower Controller                             |
| D11                   | Diode (Block) | Supplies power to cage right solenoid.   | Lower Controller                             |
| D12                   | Diode (Block) | Supplies power to cage left solenoid.  | Lower Controller                             |
| D13                   | Diode (Block) | Provides power to turret right solenoid.   | Lower Controller                             |
| D14                   | Diode (Block) | Provides power to turret left solenoid.  | Lower Controller                             |
| D15                   | Diode         | Provides power to steer right solenoid.  | Lower Controller                             |
| D16                   | Diode         | Provides power to steer left solenoid  | Lower Controller                             |
| D17                   | Diode         | Power to high flow solenoid from platform  | Lower Controller                             |
| D18                   | Diode         | Power to high flow solenoid from chassis   | Lower Controller                             |
| D19                   | Diode         | Power to brake release relay R7  | Lower Controller                             |
| D20                   | Diode         | Power to power relay R6 from foot switch   | Lower Controller                             |
| D21                   | Diode         | Power to   | Lower Controller                             |
| D22                   | Diode         | Power to tilt alarm ALM1   | Lower Controller                             |
| D23                   | Diode         | Power to brake solenoids   | Lower Controller                             |

| REFERENCE DESIGNATION | NAME  | FUNCTION                              | LOCATION         |
|-----------------------|-------|---------------------------------------|------------------|
| D24                   | Diode | Power to tilt alarm ALM1              | Lower Controller |
| D25                   | Diode | Power to boom pump                    | Lower Controller |
| D26                   | Diode | Power to boom pump                    | Lower Controller |
| D27                   | Diode | Power to high flow solenoid           | Lower Controller |
| D28                   | Diode | Power to brake relay                  | Lower Controller |
| D29                   | Diode | Power to hour meter                   | Lower Controller |
| D30                   | Diode | Power to hour meter                   | Lower Controller |
| D31                   | Diode | Power to boom elevate speed relay R10 | Upper Controller |
| D32                   | Diode | Power to speed controller CONT1       | Upper Controller |
| D33                   | Diode | Power to speed controller CONT1       | Upper Controller |
| D34                   | Diode | Power to speed controller CONT1       | Upper Controller |
| D35                   | Diode | Power to speed controller CONT1       | Upper Controller |
| D36                   | Diode | Power to high flow solenoid SOL18     | Upper Controller |
| D37                   | Diode | Power to hour meter MTR               | Upper Controller |
| D38                   | Diode | Power to hour meter MTR               | Upper Controller |
| D39                   | Diode | Power to hour meter MTR               | Upper Controller |
| D40                   | Diode | Power to boom elevate relay R10       | Upper Controller |
| D41                   | Diode | Power to high flow solenoid           | Lower Controller |
| D42                   | Diode | Power to high flow solenoid           | Lower Controller |
| D43                   | Diode | Power to high flow solenoid           | Lower Controller |
| FU1                   | Fuse  | Lift Circuit 125 AMP                  | Relay Panel      |
| FU2                   | Fuse  | Main Fuse 350 AMP                     | Relay Panel      |
| FU3                   | Fuse  | Brake Circuit 10 AMP                  | Lower Controller |
| FU4                   | Fuse  | Platform Controls 10 AMP              | Upper Controller |
| FU5                   | Fuse  | Power Relay 10 AMP                    | Lower Controller |
| FU6                   | Fuse  | Emergency Stop 25 AMP                 | Lower Controller |
| FU7                   | Fuse  | Chassis Controls 10 AMP               | Lower Controller |

Table 5-2: (cont.)

| REFERENCE DESIGNATION | NAME                     | FUNCTION                                       | LOCATION                               |
|-----------------------|--------------------------|--|--|
| MOT1                  | Motor, Electric          | Left Drive Motor                               | Rear of Chassis                        |
| MOT2                  | Motor, Electric          | Right Drive Motor                              | Rear of Chassis                        |
| MOT3                  | Motor, Electric          | Powers Hydraulic Pump                          | Hydraulic Power Unit                   |
| MTR1                  | Meter, Hour              | Displays number of hours Machine is turned on. | Chassis Control Panel, Bottom          |
| R1                    | Main Power Relay         | Isolates Batteries for Charging                | Relay Panel                            |
| R2                    | Boom Pump Relay          | Power to Hydraulic Pump                        | Lower Control box                      |
| R3                    | Brake Relay              | Power to Brake controls                        | Lower Control box                      |
| R4                    | Horn Relay               | Power to Horn                                  | Lower Control box                      |
| R5                    | Low Tilt Relay           | Disenables Drive Functions                     | Lower Control box                      |
| R6                    | Power Relay              | Power to Controller                            | Lower Control box                      |
| R7                    | Brake Release Relay      | Releases Brake for towing                      | Lower Control box                      |
| R8                    | Down Relay               | Power to Hydraulic Pump                        | Lower Control box                      |
| R9                    | Boom Disconnect Relay    | Power to Upper Controller                      | Upper Control box                      |
| R10                   | Boom Elevate Speed Relay | Power to Speed Controller                      | Upper Control box                      |
| R11                   | Turret Drive Relay       | Power to Turret Rotate Solenoid                | Upper Control box                      |
| R12                   | Drive Enable Relay       | Power to Upper Control box                     | Upper Control box                      |
| R13                   | Forward Relay            | Powers Drive Motors Forward                    | Relay Panel                            |
| R14                   | Reverse Relay            | Powers Drive Motors Backward                   | Relay Panel                            |
| RES1                  | Resistor                 | Trim resistor                                  | Upper control box.                     |
| RES2                  | Resistor                 | Speed control                                  | Joystick control                       |
| S1                    | Trim Switch, (two)       | Power to Trim Solenoid                         | Lower Control box<br>Upper Control box |
| S2                    | Jib Switch, (two)        | Power to Jib Solenoid                          | Lower Control box<br>Upper Control box |
| S3                    | Boom Switch (two)        | Power to Boom Lift Solenoid                    | Lower Control box<br>Upper Control box |
| S4                    | Boom Extend Switch (two) | Power to Boom Extend Solenoid                  | Lower Control box<br>Upper Control box |
| S5                    | Riser Switch (two)       | Power to Riser Solenoid                        | Lower Control box<br>Upper Control box |
| S6                    | Cage Switch (two)        | Power to Cage Rotate Solenoid                  | Lower Control box<br>Upper Control box |
| S7                    | Turret Switch (two)      | Power to Turret Rotate Solenoid                | Lower Control box<br>Upper Control box |
| S8                    | Control Switch           | Control Handle                                 | Control Handle                         |

| REFERENCE DESIGNATION | NAME                           | FUNCTION  | LOCATION  |
|-----------------------|--------------------------------|---|---|
| S9                    | Forward-Reverse Switch         | FWD-Reverse   | Upper control box                               |
| S10                   | Steer Switch                   | Power to left steer and right steer relays            | Upper control box, top of joystick.             |
| S11                   | Brake Switch                   | Power to MOS90, brakes released.                      | Relay Panel                                     |
| S12                   | Pressure Stop Switch           | Cuts power to hydraulic pump if low pressure          | Relay Panel                                     |
| S13                   | Platform/Chassis Switch        | Supplies power to Platform/Chassis                    | Lower control box                               |
| S14                   | Down Limit Switch              | Controls travel speed Slow/Fast                       | Turret at boom attachment                       |
| S15                   | Chassis Emergency Stop Switch  | Emergency Stop  | Lower control box,                              |
| S16                   | Brake Release Switch           | Release Brakes for Towing                             | Lower Controller                                |
| S17                   | Foot Switch                    | Enables operation from platform                       | Floor of platform                               |
| S18                   | Platform Emergency Stop Switch | Emergency Stop  | Platform control box                            |
| S19                   | Platform Key Switch            | Enables operation from platform                       | Platform control box                            |
| S20                   | Horn Switch                    | Sounds horn   | Platform control Box                            |
| S21                   | Boom Extend Drive Interlock    | Controls travel speed Slow/Fast                       | On Boom   |
| SNSR                  | Level Sensor                   | Provides power to cutout relay when machine is level. | Control module.                                 |
| SOL1                  | Trim UP Solenoid.              | Controls lift valve.                                  | Right side of manifold, port marked 'J'.        |
| SOL2                  | Trim Down Solenoid.            | Controls lift valve.                                  | Right side of manifold, port marked 'J'.        |
| SOL3                  | Jib Up Solenoid.               | Controls lift valve.                                  | Right side of manifold, port marked 'J'.        |
| SOL4                  | Jib Down Solenoid.             | Controls lift valve.                                  | Right side of manifold, port marked 'J'.        |
| SOL5                  | Boom Up Solenoid.              | Controls lift valve.                                  | Right side of manifold, port marked 'J'.        |
| SOL6                  | Boom Down Solenoid.            | Controls lift valve.                                  | Right side of manifold, port marked 'J'.        |
| SOL7                  | Boom Extend Solenoid           | Controls reverse valve.                               | Right s   |
| SOL8                  | Boom Retract Solenoid.         | Controls lift valve.                                  | Right side of manifold, port marked 'J'.        |
| SOL9                  | Riser Up Solenoid.             | Controls lift valve.                                  | Right side of manifold, port marked 'J'.        |
| SOL10                 | Riser Down Solenoid            | Controls series / parallel valves.                    | Front side of manifold, ports marked 'Q' & 'R'. |
| SOL11                 | Cage Right Solenoid.           | Controls lift valve.                                  | Right side of manifold, port marked 'J'.        |
| SOL12                 | Cage LeftSolenoid              | Controls down valve.                                  | Lift cylinder, lower end.                       |
| SOL13                 | TurretRight Solenoid           | Controls steer valve when steering right.             | Top of manifold, on steer valve.                |
| SOL14                 | TurretLeft Solenoid            | Controls steer valve when steering left.              | Top of manifold, on steer valve.                |
| SOL15                 | Steer Right Solenoid           | Controls engine throttle.                             | Power module, engine, right side.               |
| SOL16                 | Steer LeftSolenoid             | Controls engine choke.                                | Power module, engine, right side.               |
| SOL17                 | Low Flow                       | Controls lift valve.                                  | Right side of manifold, port marked 'J'.        |
| SOL18                 | High Flow                      | Controls lift valve.                                  | Right side of manifold, port marked 'J'.        |
| SOL19                 | Brake N.O.                     | Controls Brakes                                       | Relay Panel                                     |
| SOL20                 | Brake N.C.                     | Controls Brakes                                       | Relay Panel                                     |
| TG1                   | Tach generator - left          | Generates speed signal                                | Left drive motor                                |
| TG2                   | Tach generator - right         | Generates speed signal                                | Right drive motor                               |

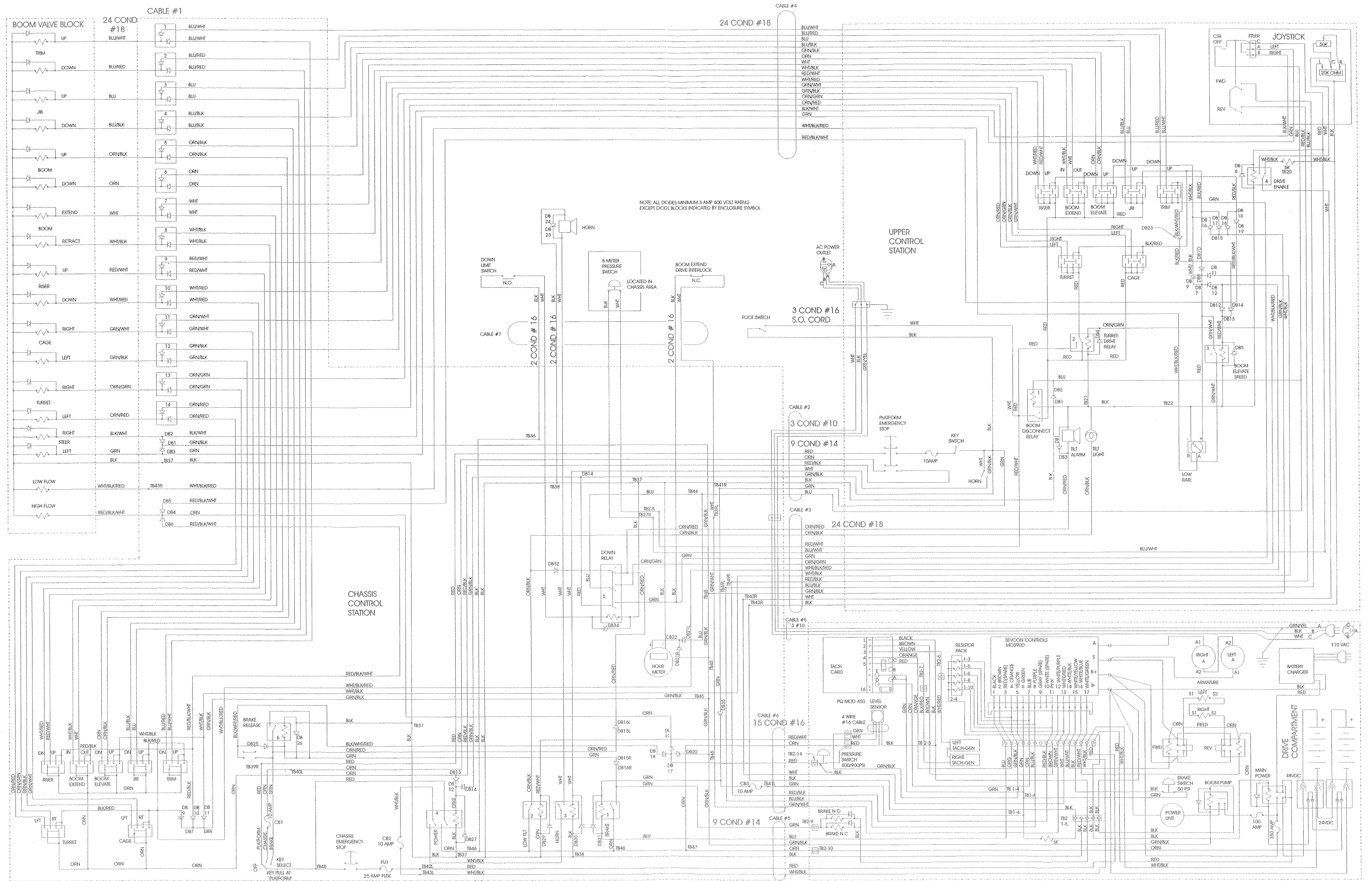


Figure 5-5: Electrical Schematic, Electrical Model - 068341-006

lectrical Schematics BiEnergy Model - European

Table 5-3: Electrical Schematic Legend, BiEnergy Model - 068341-008

| ERENCE<br>IGNATION | NAME          | FUNCTION   | LOCATION                                     |
|--------------------|---------------|--|--|
| ALM 1              | Alarm, Tilt   | Provides warning sound when slope of machine exceeds 3° side to side, or fore and aft. | Upper control box, exterior upper left side. |
| CONT1              | Controller    | Controls operating speed of boom functions   | Upper control box                            |
| D1                 | Diode (Block) | Supplies power to up trim solenoid.  | Lower Control box                            |
| D2                 | Diode (Block) | Supplies power to down trim solenoid.  | Lower Control box                            |
| D3                 | Diode (Block) | Supplies power to up jib solenoid.   | Lower Control box                            |
| D4                 | Diode (Block) | Supplies power to down jib solenoid.   | Lower Control box                            |
| D5                 | Diode (Block) | Supplies power to up boom solenoid.  | Lower Control box                            |
| D6                 | Diode (Block) | Supplies power to down boom solenoid.  | Lower Control box                            |
| D7                 | Diode (Block) | Supplies power to extend boom solenoid.  | Lower Control box                            |
| D8                 | Diode (Block) | Supplies Power to retract boom solenoid.   | Lower Control box                            |
| D9                 | Diode (Block) | Supplies power to up riser solenoid.   | Lower Control box                            |
| D10                | Diode (Block) | Supplies power to down riser solenoid.   | Lower Control box                            |
| D11                | Diode (Block) | Supplies power to cage right solenoid.   | Lower Control box                            |
| D12                | Diode (Block) | Supplies power to cage left solenoid.  | Lower Control box                            |
| D13                | Diode (Block) | Provides power to turret right solenoid.   | Lower Control box                            |
| D14                | Diode (Block) | Provides power to turret left solenoid.  | Lower Control box                            |
| D15                | Diode         | Provides power to steer right solenoid   | Lower Control box                            |
| D16                | Diode         | Provides power to steer left solenoid  | Lower Control box                            |
| D17                | Diode         | Power to high flow solenoid from platform  | Lower Control box                            |
| D18                | Diode         | Power to high flow solenoid from chassis   | Lower Control box                            |
| D19                | Diode         | Power to brake release relay R7  | Lower Control box                            |
| D20                | Diode         | Power to power relay R6 from foot switch   | Lower Control box                            |
| D21                | Diode         | Power to   | Lower Control box                            |
| D22                | Doide         | Power to tilt alarm ALM1   | Lower Control box                            |
| D23                | Diode         | Power to brake solenoids   | Lower Control box                            |

| REFERENCE<br>DESIGNATION | NAME            | FUNCTION                          | LOCATION             |
|--------------------------|-----------------|-----------------------------------|----------------------|
| D24                      | Diode           | Power to tilt alarm ALM1          | Lower Control box    |
| D25                      | Diode           | Power to boom pump                | Lower Control box    |
| D26                      | Diode           | Power to boom pump                | Lower Control box    |
| D27                      | Diode           | Power to high flow solenoid       | Lower Control box    |
| D28                      | Diode           | Power to brake relay              | Lower Control box    |
| D29                      | Diode           | Power to hour meter               | Lower Control box    |
| D30                      | Diode           | Power to hour meter               | Lower Control box    |
| D31                      | Diode           | Power to boom elevate relay R10   | Upper Control box    |
| D32                      | Diode           | Power to speed controller CONT1   | Upper Control box    |
| D33                      | Diode           | Power to speed controller CONT1   | Upper Control box    |
| D34                      | Diode           | Power to speed controller CONT1   | Upper Control box    |
| D35                      | Diode           | Power to speed controller CONT1   | Upper Control box    |
| D36                      | Diode           | Power to high flow solenoid SOL18 | Upper Control box    |
| D37                      | Diode           | Power to hour meter MTR           | Upper Control box    |
| D38                      | Diode           | Power to hour meter MTR           | Upper Control box    |
| D39                      | Diode           | Power to hour meter MTR           | Upper Control box    |
| D40                      | Diode           | Power to boom elevate relay R10   | Upper Control box    |
| D41                      | Diode           | Power to high flow solenoid       | Lower Control box    |
| D42                      | Diode           | Power to high flow solenoid       | Lower Control box    |
| D43                      | Diode           | Power to high flow solenoid       | Lower Control box    |
| FU1                      | Fuse            | Lift Circuit 125A                 | Relay Panel          |
| FU2                      | Fuse            | Main Fuse 350A                    | Relay Panel          |
| FU3                      | Fuse            | Brake Ciruit 10A                  | Lower Control box    |
| FU4                      | Fuse            | Platform Controls 10A             | Upper Control box    |
| FU5                      | Fuse            | Power Relay 10A                   | Lower Control box    |
| FU6                      | Fuse            | Emergency Stop 25A                | Lower Control Box    |
| FU7                      | Fuse            | Chassis Controls 10A              | Lower Control Box    |
| MOT1                     | Motor, Electric | Left Drive Motor                  | Rear of Chassis      |
| MOT2                     | Motor, Electric | Right Drive Motor                 | Rear of Chassis      |
| MOT3                     | Motor, Electric | Powers Hydraulic Pump             | Hydraulic Power Unit |

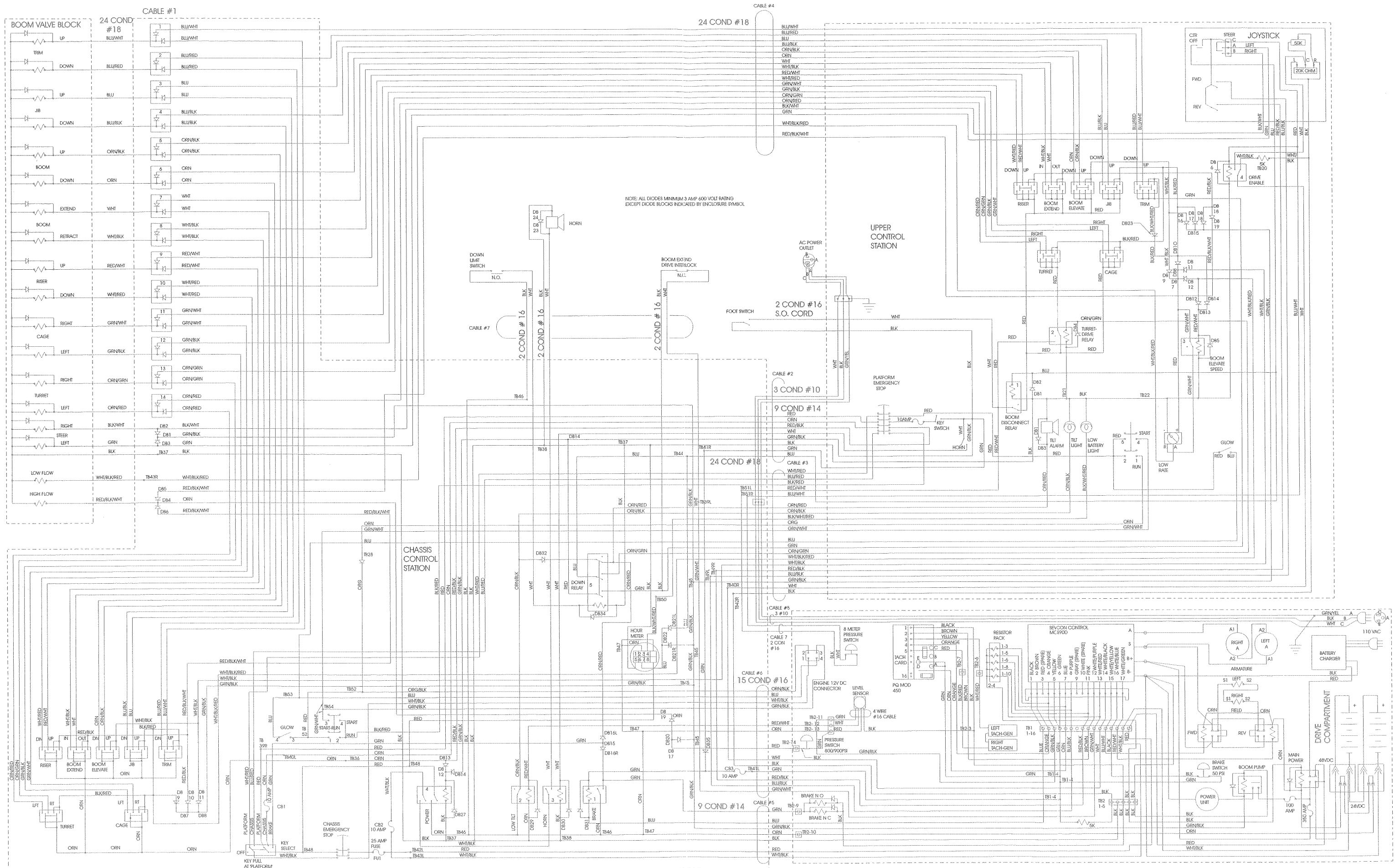
First page on foldout

Table 5-3: (cont.)

| REFERENCE<br>DESIGNATION        | NAME                     | FUNCTION                                       | LOCATION                               |
|---------------------------------|--------------------------|--|--|
| MTR                             | Meter, Hour              | Displays number of hours Machine is turned on. | Chassis Control Panel, Bottom          |
| R1                              | Main Power Relay         | Isolates Batteries for Charging                | Relay Panel                            |
| R2                              | Boom Pump Relay          | Power to Hydraulic Pump                        | Lower Control Box                      |
| R3                              | Brake Relay              | Power to Brake controls                        | Lower Control Box                      |
| R4                              | Horn Relay               | Power to Horn                                  | Lower Control Box                      |
| R5                              | Low Tilt Relay           | Disenables Drive Functions                     | Lower Control Box                      |
| R6                              | Power Relay              | Power to Controller                            | Lower Control Box                      |
| R7                              | Brake Release Relay      | Releases Brake for towing                      | Lower Control Box                      |
| R8                              | Down Relay               | Power to Hydraulic Pump                        | Lower Control Box                      |
| R9                              | Boom Disconnect Relay    | Power to Upper Control Box                     | Upper Control Box                      |
| R10                             | Boom Elevate Speed Relay | Power to Speed Controller                      | Upper Control Box                      |
| R11                             | Turret Drive Relay       | Power to Turret Rotate Solenoid                | Upper Control Box                      |
| R12                             | Drive Enable Relay       | Power to Upper Control Box                     | Upper Control Box                      |
| R13                             | Forward Relay            | Powers Drive Motors Forward                    | Relay Panel                            |
| R14                             | Reverse Relay            | Powers Drive Motors Backward                   | Relay Panel                            |
| R15<br>*not used after S/N 1331 | Start Engine Relay       | Power to Start Engine                          | Relay Panel                            |
| RES1                            | Resistor                 | Drive Threshold                                | Upper Control Box                      |
| RES2                            | Resistor, Drive          | Speed Control                                  | Joystick Controller                    |
| S1                              | Trim Switch, (two)       | Power to Trim Solenoid                         | Lower Control Box<br>Upper Control Box |
| S2                              | Jib Switch, (two)        | Power to Jib Solenoid                          | Lower Control Box<br>Upper Control Box |
| S3                              | Boom Switch (two)        | Power to Boom Lift Solenoid                    | Lower Control Box<br>Upper Control Box |
| S4                              | Boom Extend Switch (two) | Power to Boom Extend Solenoid                  | Lower Control Box<br>Upper Control Box |
| S5                              | Riser Switch (two)       | Power to Riser Solenoid                        | Lower Control Box<br>Upper Control Box |
| S6                              | Cage Switch (two)        | Power to Cage Rotate Solenoid                  | Lower Control Box<br>Upper Control Box |
| S7                              | Turret Switch (two)      | Power to Turret Rotate Solenoid                | Lower Control Box<br>Upper Control Box |
| S8                              | Control Switch           | Enables Joystick Functions                     | Joystick Handle                        |
| S9                              | FWD/REV Switch           | FWD/REV Switch                                 | Upper Control Box                      |
| S10                             | Steer Switch             | Power to left steer and right steer relays     | Upper control box, top of joystick.    |

| REFERENCE<br>DESIGNATION | NAME                           | FUNCTION  | LOCATION  |
|--------------------------|--------------------------------|---|---|
| S11                      | Brake Switch                   | Power to MOS90, brakes released.                      | Relay Panel   |
| S12                      | Pressure Stop Switch           | Cuts power to hydraulic pump if low pressure          | Relay Panel   |
| S13                      | Platform/Chassis Switch        | Supplies power to Platform/Chassis                    | Lower control box,                                  |
| S14                      | Down Limit Switch              | Controls travel speed Slow/Fast                       | Turret at boom attachment                           |
| S15                      | Chassis Emergency Stop Switch  | Emergency Stop  | Lower control box,                                  |
| S16                      | Brake Release Switch           | Release Brakes for Towing                             | Lower Controller                                    |
| S17                      | Foot Switch                    | Enables operation from platform                       | Floor of platform                                   |
| S18                      | Platform Emergency Stop Switch | Emergency Stop  | Platform control box,                               |
| S19                      | Throttle Switch                | Supplies power to throttle relay.                     | Lower control box, in panel, top, first from right. |
| S20                      | Platform Key Switch            | Enables Operation from Platform                       | Platform Control Box                                |
| S21                      | Boom Extend Drive Interlock    | Controls travel speed Slow/Fast                       | On Boom   |
| SEN1                     | Level Sensor                   | Provides power to cutout relay when machine is level. | Control module.                                     |
| SOL1                     | Trim UP Solenoid.              | Controls lift valve.                                  | Right side of manifold, port marked 'J'.            |
| SOL2                     | Trim Down Solenoid.            | Controls lift valve.                                  | Right side of manifold, port marked 'J'.            |
| SOL3                     | Jib Up Solenoid.               | Controls lift valve.                                  | Right side of manifold, port marked 'J'.            |
| SOL4                     | Jib Down Solenoid.             | Controls lift valve.                                  | Right side of manifold, port marked 'J'.            |
| SOL5                     | Boom Up Solenoid.              | Controls lift valve.                                  | Right side of manifold, port marked 'J'.            |
| SOL6                     | Boom Down Solenoid.            | Controls lift valve.                                  | Right side of manifold, port marked 'J'.            |
| SOL7                     | Boom Extend Solenoid           | Controls reverse valve.                               | Right s   |
| SOL8                     | Boom Retract Solenoid          | Controls lift valve.                                  | Right side of manifold, port marked 'J'.            |
| SOL9                     | Riser Up Solenoid.             | Controls lift valve.                                  | Right side of manifold, port marked 'J'.            |
| SOL10                    | Riser Down Solenoid            | Controls series / parallel valves.                    | Front side of manifold, ports marked 'Q' & 'R'.     |
| SOL11                    | Cage Right Solenoid.           | Controls lift valve.                                  | Right side of manifold, port marked 'J'.            |
| SOL12                    | Cage LeftSolenoid              | Controls down valve.                                  | Lift cylinder, lower end.                           |
| SOL13                    | TurretRight Solenoid           | Controls steer valve when steering right.             | Top of manifold, on steer valve.                    |
| SOL14                    | TurretLeft Solenoid            | Controls steer valve when steering left.              | Top of manifold, on steer valve.                    |
| SOL15                    | Steer Right Solenoid           | Controls engine throttle.                             | Power module, engine, right side.                   |
| SOL16                    | Steer LeftSolenoid             | Controls engine choke.                                | Power module, engine, right side.                   |
| SOL17                    | Low Flow                       | Controls lift valve.                                  | Right side of manifold, port marked 'J'.            |
| SOL18                    | High Flow                      | Controls lift valve.                                  | Right side of manifold, port marked 'J'.            |
| SOL19                    | Brake N.O.                     | Controls Brakes                                       | Relay Panel   |
| SOL20                    | Brake N.C.                     | Controls Brakes                                       | Relay Panel   |
| TG1                      | Tach Generator - left          | Generates speed signal                                | Left drive motor                                    |
| TG2                      | Tach generator - right         | Generates speed signal                                | Right drive motor                                   |
|                          |                                |   |   |





NOTE:  
1. RED WIRES FROM RECTIFIER MAY BE REVERSED WITHOUT EFFECT.

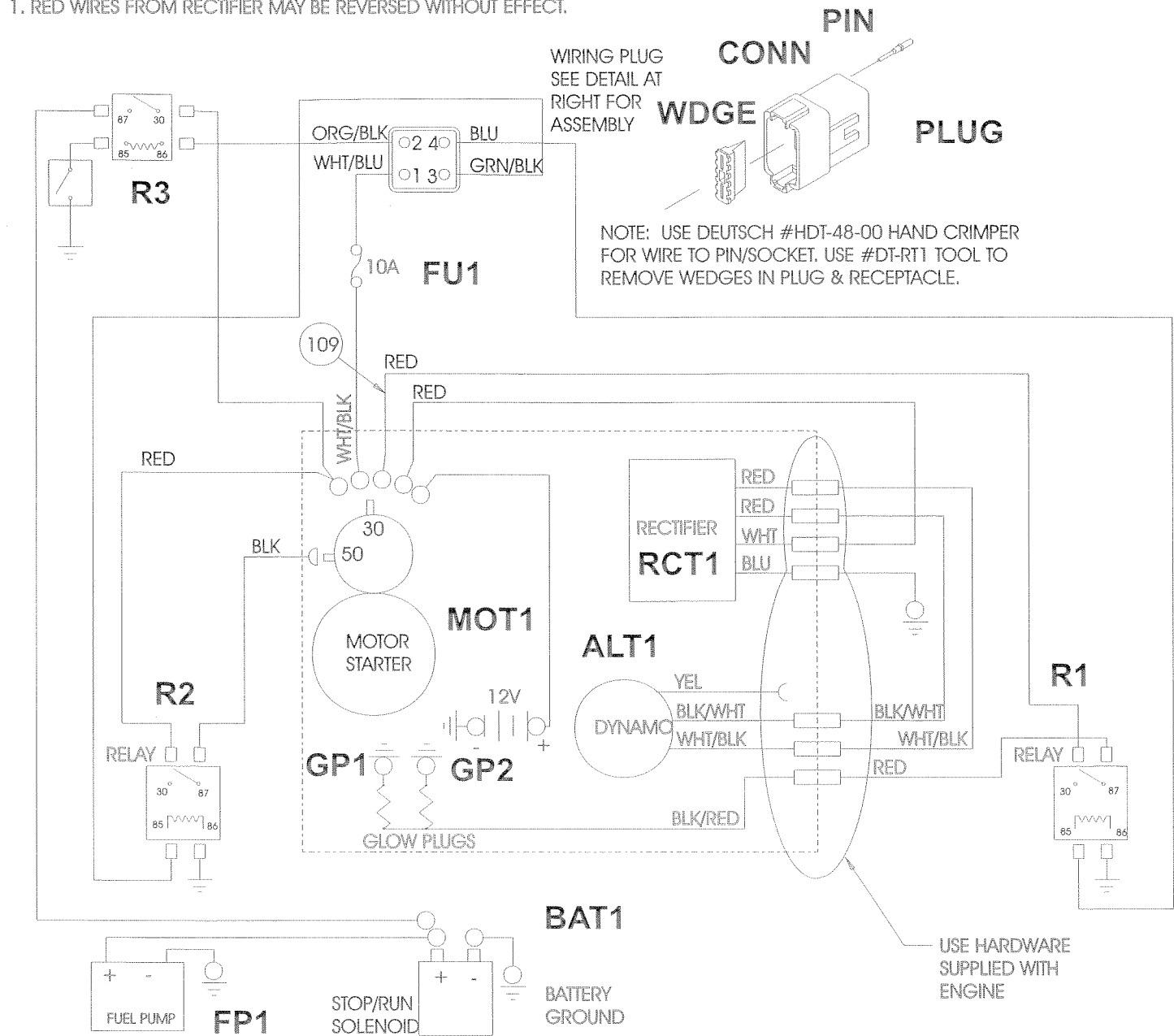


Figure 5-7: Kubota Engine Diagram

Table 5-4: Engine Assembly - Kubota ZB600C

| REFERENCE DESIGNATION | NAME       | FUNCTION                                 | LOCATION                                    |
|-----------------------|------------|--|---|
| ALT1                  | Alternator | Power to charge battery BAT1             | Side of engine                              |
| BAT1                  | Battery    | Powers starter motor                     | Side of engine                              |
| CONN                  | Connector  | Connects engine assembly to machine      | On wire harness between engine and machine  |
| FP1                   | Fuel Pump  | Provides fuel to the engine              | Side of engine                              |
| FU1                   | Fuse 10A   | Overload protection for starter solenoid | Wiring harness between connector and engine |
| GP1                   | Glow Plug  | Provide heat for engine startup          | Top of engine                               |

|      |               |                                       |                  |
|------|---------------|---------------------------------------|------------------|
| GP2  | Glow Plug     | Provide heat for engine startup       | Top of engine    |
| MOT1 | Starter Motor | Starts Engine                         | Side of engine   |
| PIN  | Pin           | Connection between engine and machine | Inside connector |
| PLUG | Plug          | Seals connector                       | Inside connector |
| RCT1 | Rectifier     | Controls charging of battery          | Side of engine   |
| R1   | Relay         | Glow plug relay                       | Side of engine   |
| R2   | Relay         | Starter Relay                         | On starter motor |
| R3   | Relay         | Starter Relay                         | Side of engine   |
| WDC  | Wedge         | Secures connector pins                | Inside connector |

5.3 Upper Control Box Component Location

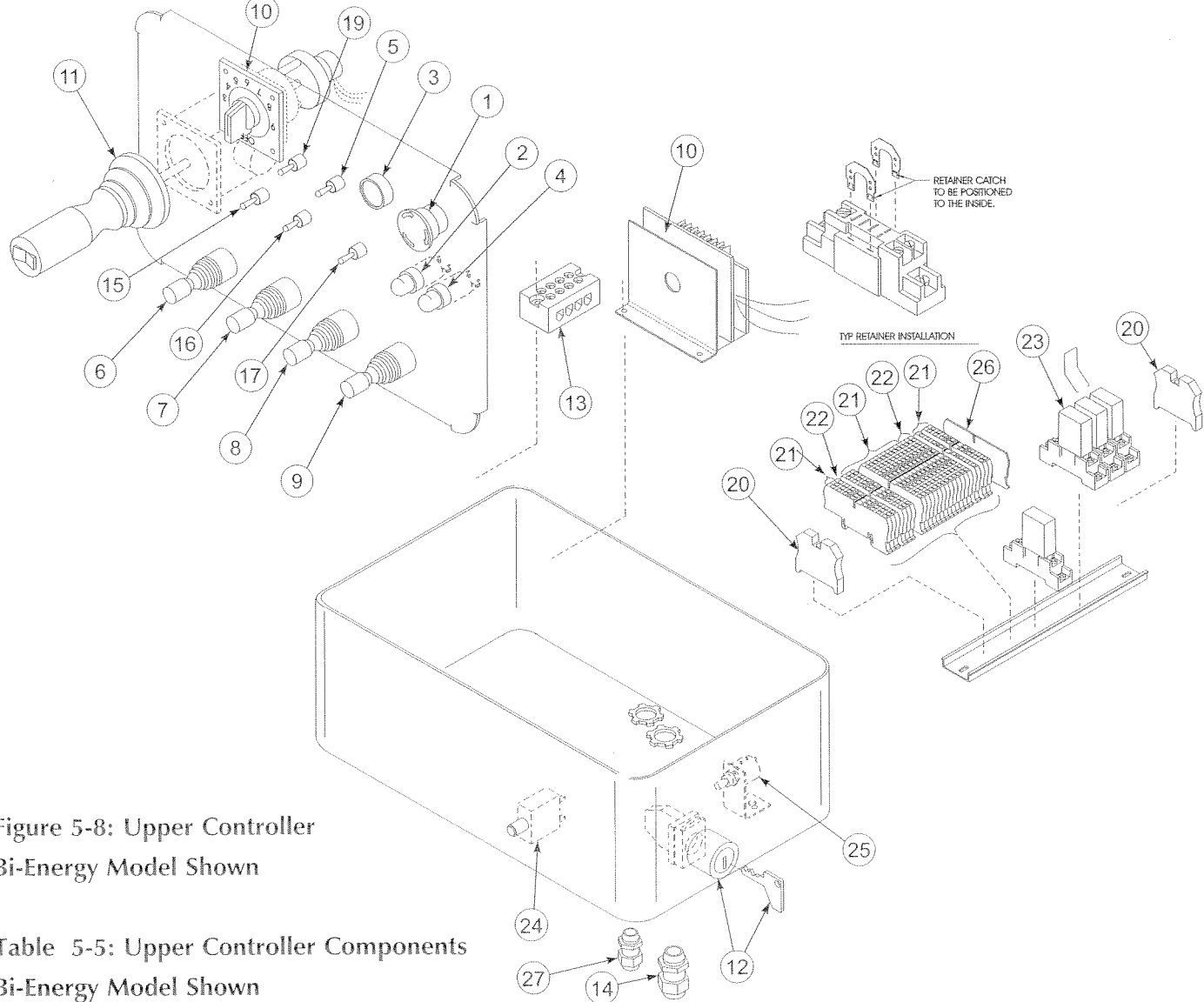


Figure 5-8: Upper Controller  
Bi-Energy Model Shown

Table 5-5: Upper Controller Components  
Bi-Energy Model Shown

|                          | Electric Model | BiEnergy Model |
|--------------------------|----------------|----------------|
| 1. Emergency Stop Button | X              | X              |
| 2. Lamp                  | X              | X              |
| 3. Horn                  |                | X              |
| 4. Lamp                  | X              | X              |
| 5. Switch, Glow Plug     |                | X              |
| Switch, Motor Start      | X              |                |
| 6. Switch, Jib Control   | X              | X              |
| 7. Switch, Boom Extend   | X              | X              |
| 8. Switch, Upper Boom    | X              | X              |
| 9. Switch, Riser Control | X              | X              |
| 10. Rheostat, Controller | X              | X              |
| 11. Joystick             | X              | X              |
| 12. Key Switch           | X              | X              |
| 13. Terminal Strip       | X              | X              |
| 14. Cable Connector, 3/4 | X              | X              |

|                             | Electric Model | BiEnergy Model |
|-----------------------------|----------------|----------------|
| 15. Switch, Platform Level  | X              | X              |
| 16. Switch, Platform Rotate | X              | X              |
| 17. Switch, Turret Rotate   |                | X              |
| 18. Cable Connector, 1/2    | X              | X              |
| 19. Switch, Engine Start    |                | X              |
| 20. Terminal End            | X              | X              |
| 21. Terminal Block, Tan     | X              | X              |
| 22. Terminal Block, Blue    | X              | X              |
| 23. Relay, SPDT, 48 Volt    | X              | X              |
| 24. Circuit Breaker, 10 amp | X              | X              |
| 25. Potentiometer, 10 turn  | X              | X              |
| 26. End Cap, Contact Block  | X              | X              |
| 27. Cable Connector, 1/2    | X              | X              |
|                             |                |                |

# Schematics

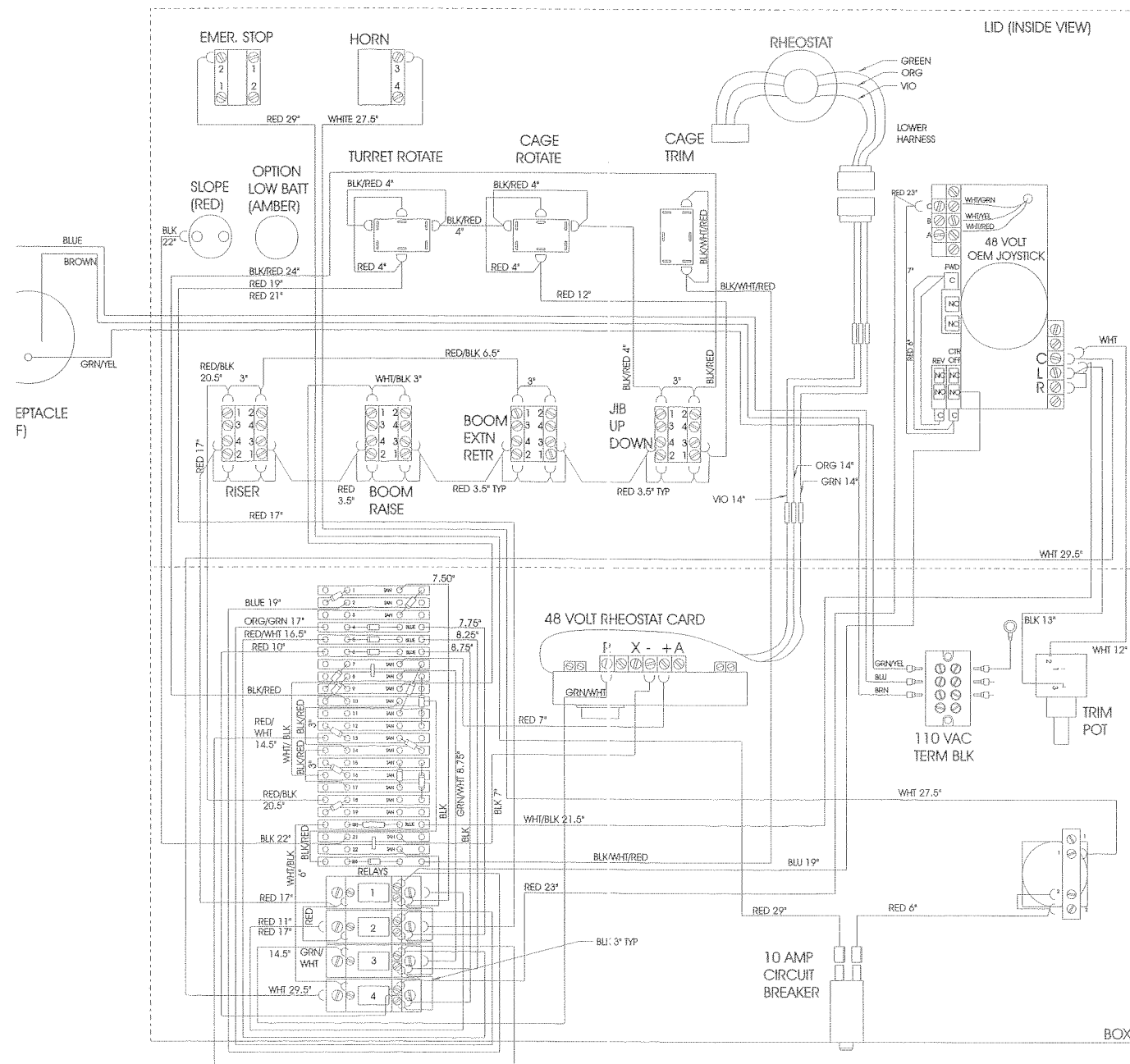


Figure 5-9: Electrical Diagram - Upper Control Box  
Electric Model - 068329-003#2

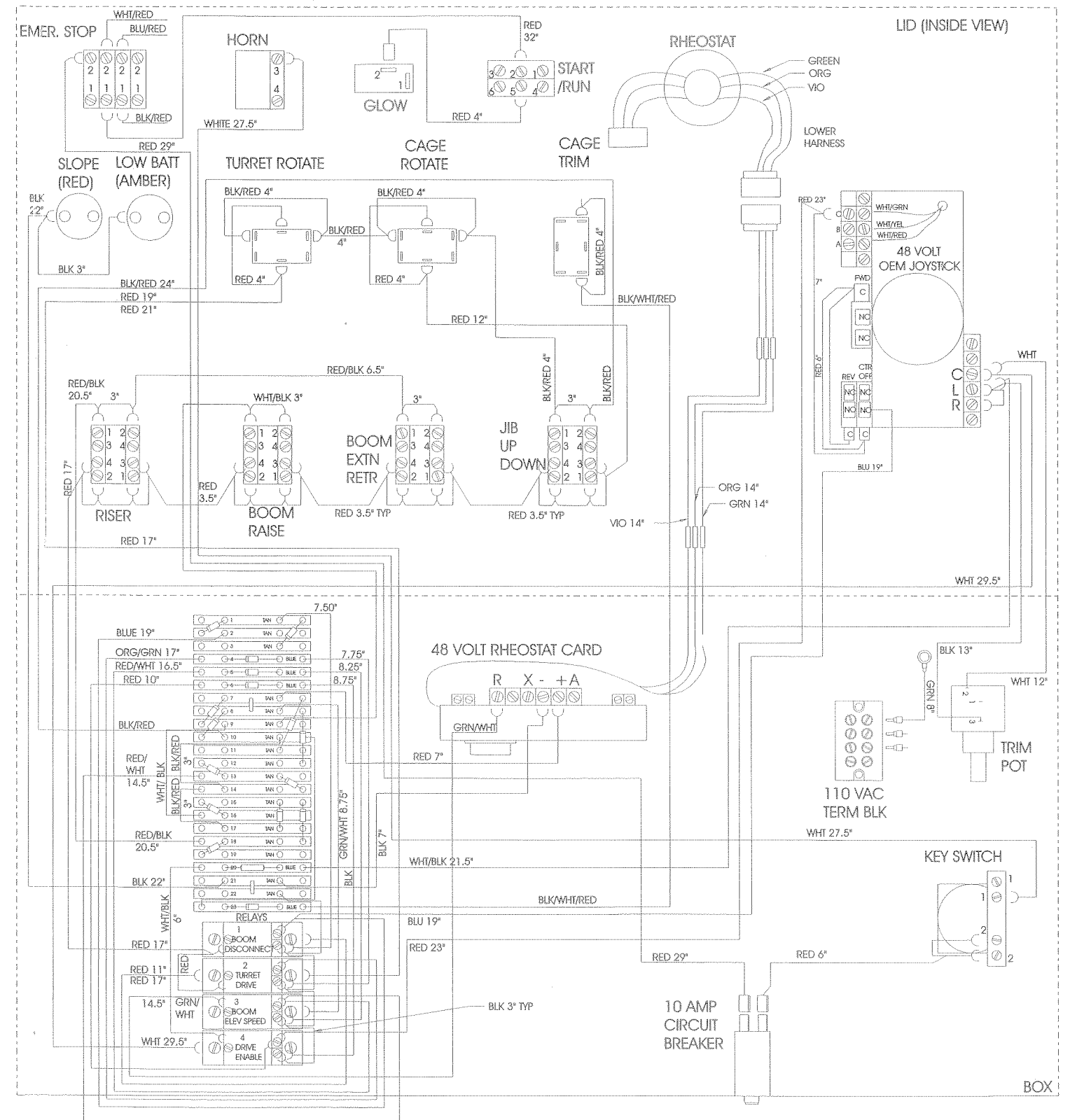


Figure 5-10: Electrical Diagram - Upper Control Box  
BiEnergy Model - 068329-011#2

5.4 Lower Control Box Component Location

Table 5-6: Upper Controller Components

|                          | Electric Model | BiEnergy Model |
|--------------------------|----------------|----------------|
| 1. Emergency Stop Button | X              | X              |
| 2. Operator Switch       | X              | X              |
| 3. Glow Plug Button      |                | X              |
| Motor Start Button       | X              | X              |
| 4. Engine Start Switch   |                | X              |
| 5. Circuit Breakers      | X              | X              |
| 6. Jib Extend Switch     | X              | X              |
| 7. Cage Level Switch     | X              | X              |
| 8. Cage Rotate Switch    | X              | X              |
| 9. Hour Meter            | X              | X              |
| 10. Fuse                 | X              | X              |
| 11. Boom Extend Switch   | X              | X              |
| 12. Boom Raise Switch    | X              | X              |
| 13. Riser Switch         | X              | X              |

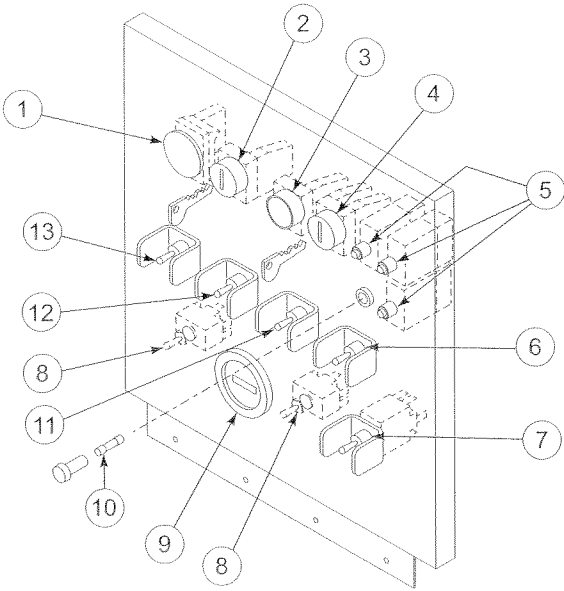


Figure 5-11: Lower Control Box Cover

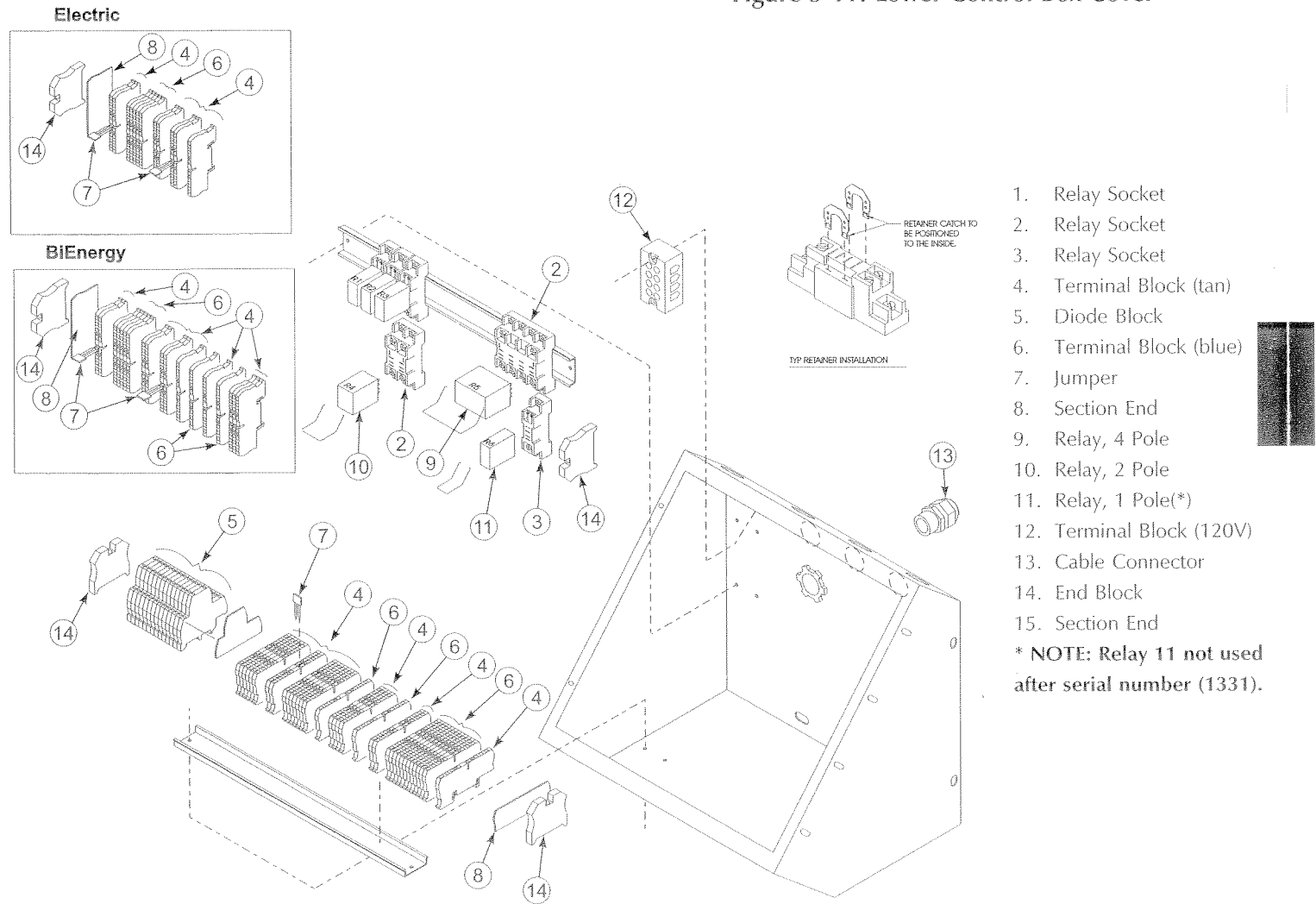


Figure 5-12: Terminal Strip, Relay Identification

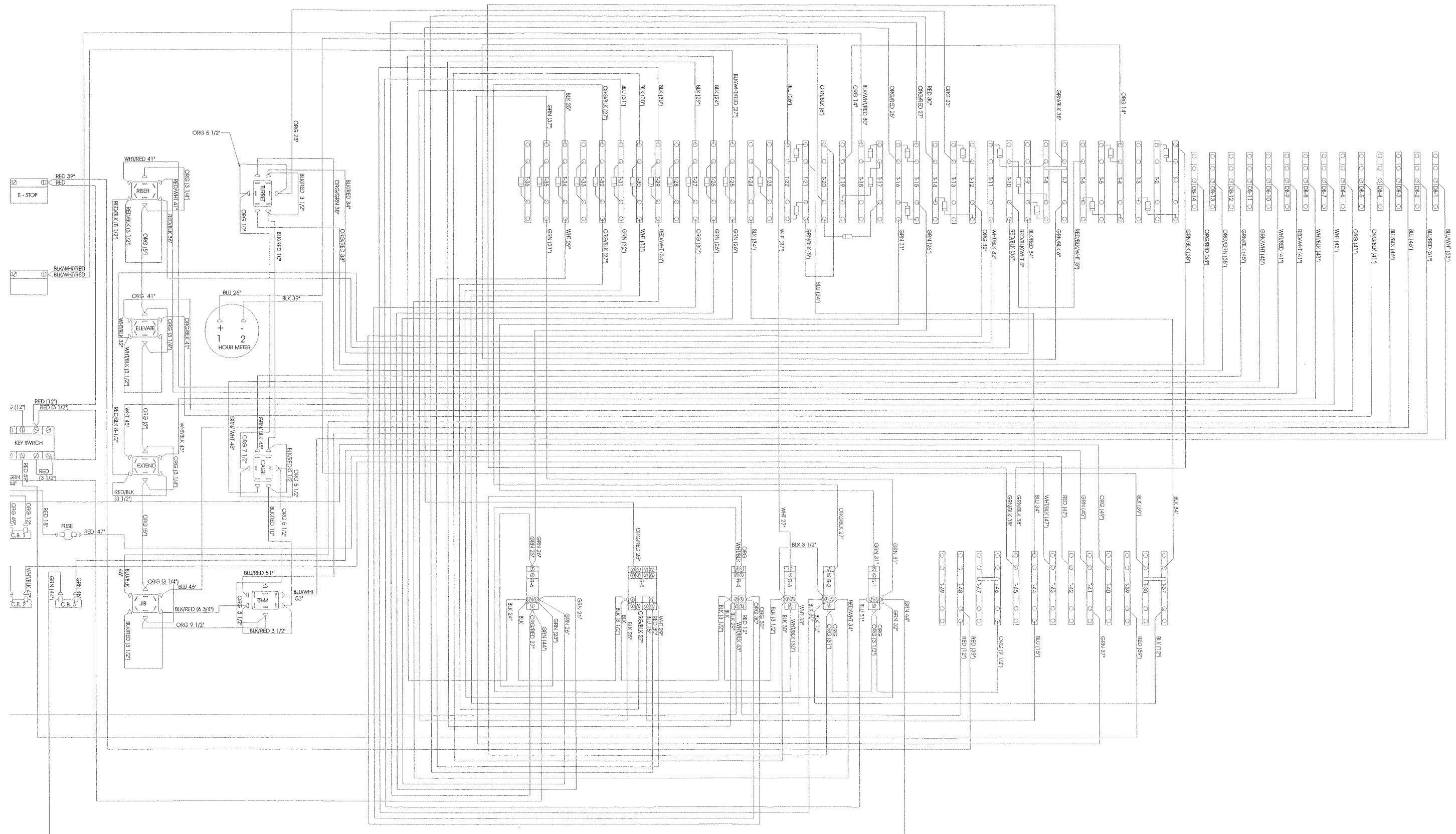


Figure 5-13: Electrical Diagram - Lower Control Box - Electric Model



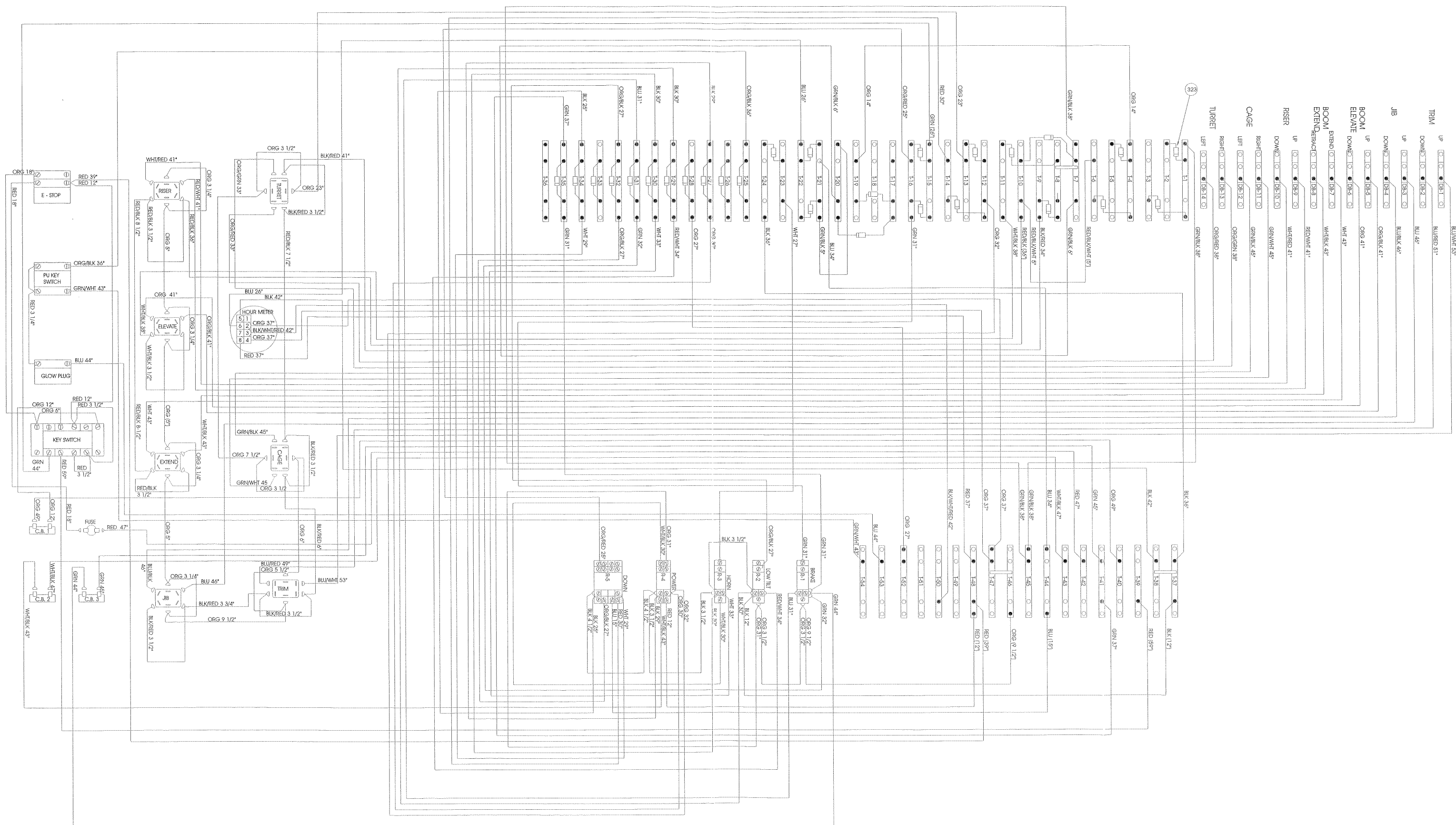
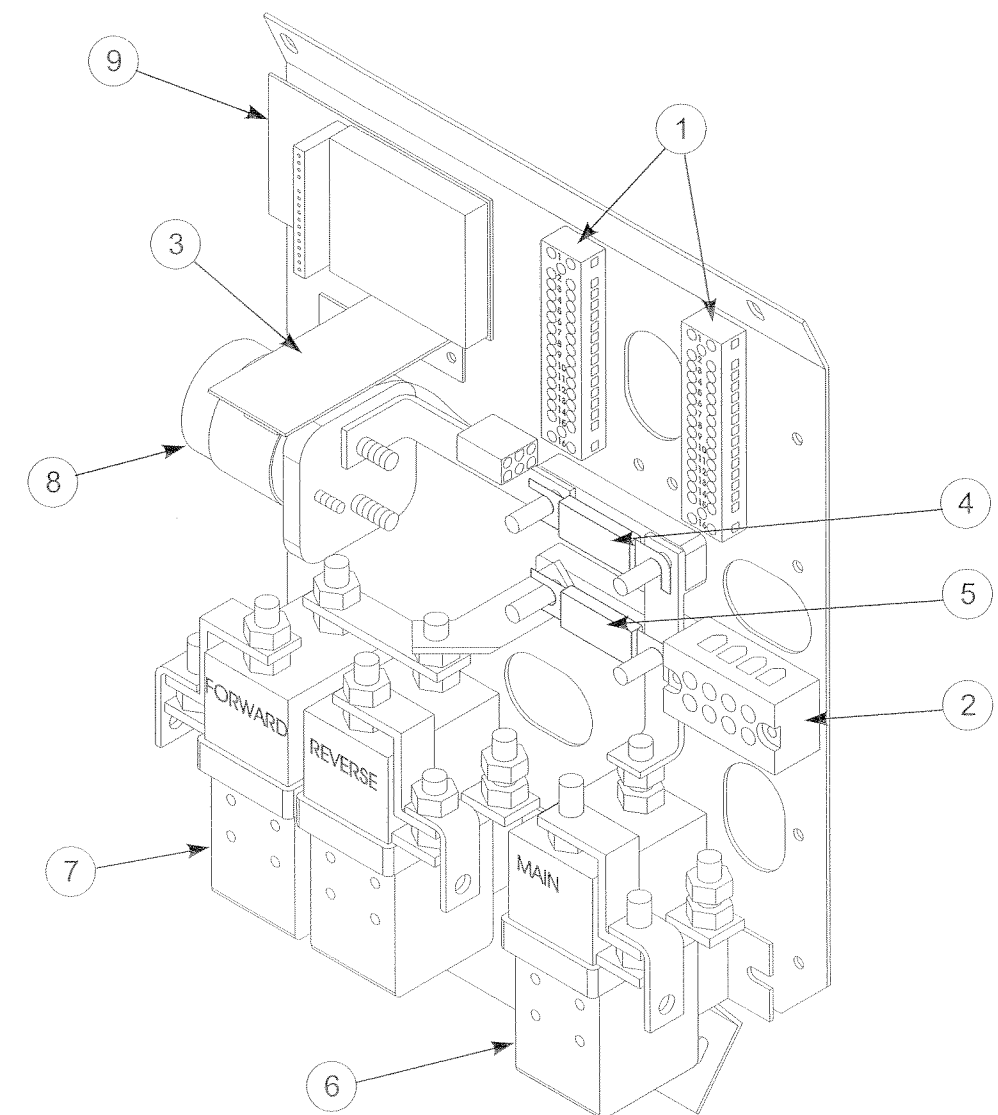


Figure 5-14: Electrical Diagram - Lower Control Box - Bi-Energy Model



- |                              |                                   |
|------------------------------|-----------------------------------|
| 1. Terminal Block            | 6. Relay, 48 VDC (Single Contact) |
| 2. Terminal Block            | 7. Relay, 48 VDC (Double Contact) |
| 3. Resistor Bracket Assembly | 8. Relay, 48 VDC                  |
| 4. Fuse (Buss ANN-125)       | 9. Tach Board Assembly            |
| 5. Fuse (Buss ANN-350)       | Fuse #1 [6.3amp 250volts]         |
|                              | Fuse #2 [MDA20]                   |

Figure 5-15: Relay Panel (Electric model shown)



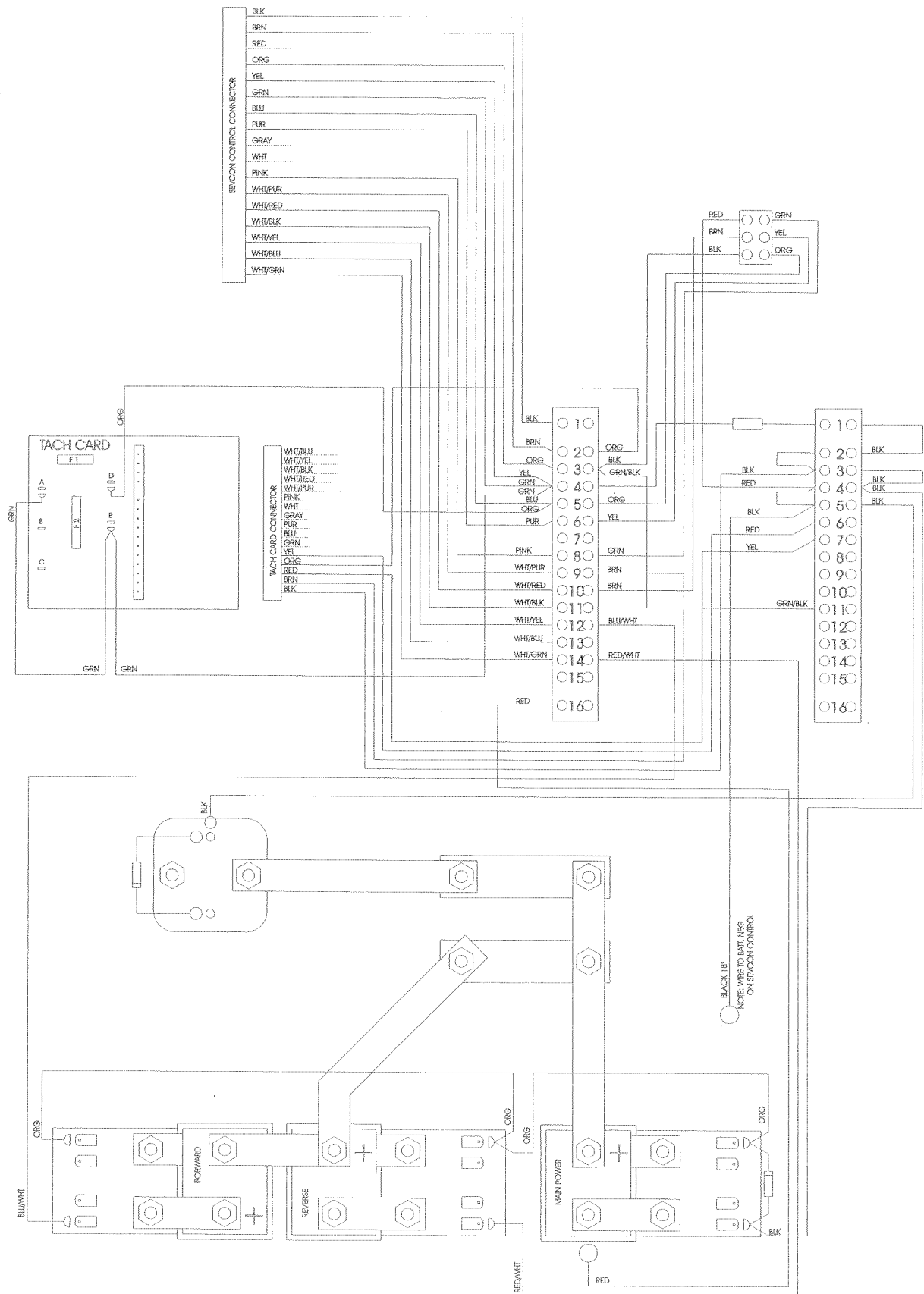


Figure 5-16: Relay Panel Schematic

NOTES:

## 6.0 Introduction

This section lists and illustrates the replaceable assemblies and parts of the AB46 Electric & Bi-Energy Work Platform, as manufactured by UpRight, Inc.

Each parts list contains the component parts for that assembly indented to show relationship where applicable.

## 6.1 Index

| Assembly   | Page |
|--|------|
| Final Assembly, AB46 Electric                          |      |
| 68300-001 .....  | 6-2  |
| Final Assembly, AB46 Bi-Energy                         |      |
| 68310-001 .....  | 6-10 |
| Basic Assembly, AB46 Electric                          |      |
| 68303-000 .....  | 6-18 |
| Basic Assembly, AB46 Bi-Energy                         |      |
| 68313-000 .....  | 6-20 |
| Chassis Assembly, AB46 Electric                        |      |
| 68320-000 .....  | 6-22 |
| Chassis Assembly, AB46 Bi-Energy                       |      |
| 68317-000 .....  | 6-26 |
| Lower Boom Linkage Assembly, AB46 Electric & Bi-Energy |      |
| 68323-000 .....  | 6-32 |
| Upper Boom Linkage Assembly, AB46 Electric & Bi-Energy |      |
| 68322-000 .....  | 6-34 |
| Turret Assembly, AB46 Electric                         |      |
| 68330-000 .....  | 6-36 |
| Turret Assembly, AB46 Bi-Energy                        |      |
| 68330-003 .....  | 6-36 |
| Power Unit Assembly, AB46 Electric                     |      |
| 68326-000 .....  | 6-38 |
| Brake Valve Block Assembly, AB46 Electric              |      |
| 68324-000 .....  | 6-39 |
| Engine Assembly, Kubota, AB46 Bi-Energy                |      |
| 68951-000 .....  | 6-40 |
| Power Unit Assembly, AB46 Bi-Energy                    |      |
| 68326-001 .....  | 6-43 |
| Brake Valve Block Assembly, AB46 Bi-Energy             |      |
| 68324-001 .....  | 6-44 |
| Valve Block Assembly, AB46 Electric & Bi-Energy        |      |
| 68348-000 .....  | 6-46 |
| Ground Control Box Assembly, AB46 Electric             |      |
| 68328-000 .....  | 6-48 |
| Ground Control Box Assembly, AB46 Bi-Energy            |      |
| 68328-003 .....  | 6-52 |
| Relay Panel Assembly, AB46 Electric                    |      |
| 68346-000 .....  | 6-56 |
| Relay Panel Assembly, AB46 Bi-Energy                   |      |
| 68346-001 .....  | 6-60 |
| Speed Control Panel Assembly, AB46 Bi-Energy           |      |
| 68321-000 .....  | 6-63 |
| Controller Installation, AB46 Electric                 |      |
| 68339-004 .....  | 6-64 |
| Controller Installation, AB46 Bi-Energy                |      |
| 68339-012 .....  | 6-65 |
| Controller Assembly - Platform, AB46 Electric          |      |
| 68329-003 .....  | 6-66 |
| Controller Assembly - Platform, AB46 Bi-Energy         |      |
| 68329-011 .....  | 6-70 |

| Assembly  | Page |
|---|------|
| Hose Kit, AB46 Electric   |      |
| 68336-000 .....   | 6-74 |
| Hose Kit, AB46 Bi-Energy  |      |
| 68336-002 .....   | 6-76 |
| Battery Module Assembly, AB46 Electric & Bi-Energy                |      |
| 68331-001,002 .....   | 6-78 |
| Tire and Wheel Assembly, AB46 Electric & Bi-Energy                |      |
| 68327-000 .....   | 6-79 |
| Cable Assembly, AB46 Electric & Bi-Energy                         |      |
| 68333-000 .....   | 6-80 |
| Cage "B" Assembly, AB46 Electric & Bi-Energy                      |      |
| 68325-001 .....   | 6-81 |
| Cage "A" Assembly, AB46 Electric & Bi-Energy                      |      |
| 68500-000 .....   | 6-82 |
| 4 FT. Cage Assembly, AB46 Electric & Bi-Energy                    |      |
| 68500-003 .....   | 6-83 |
| Label Kit, AB46 Electric  |      |
| 68335-100 .....   | 6-84 |
| Label Kit, AB46 Bi-Energy   |      |
| 68335-103 .....   | 6-84 |
| Motion Alarm/Flashing Beacon Option,<br>AB46 Electric & Bi-Energy |      |
| 68294-000 .....   | 6-86 |
| Battery Charge Indicator (Electric Only)                          |      |
| 68297-000 .....   | 6-88 |

# Illustrated Parts Breakdown

FINAL ASSEMBLY, AB46

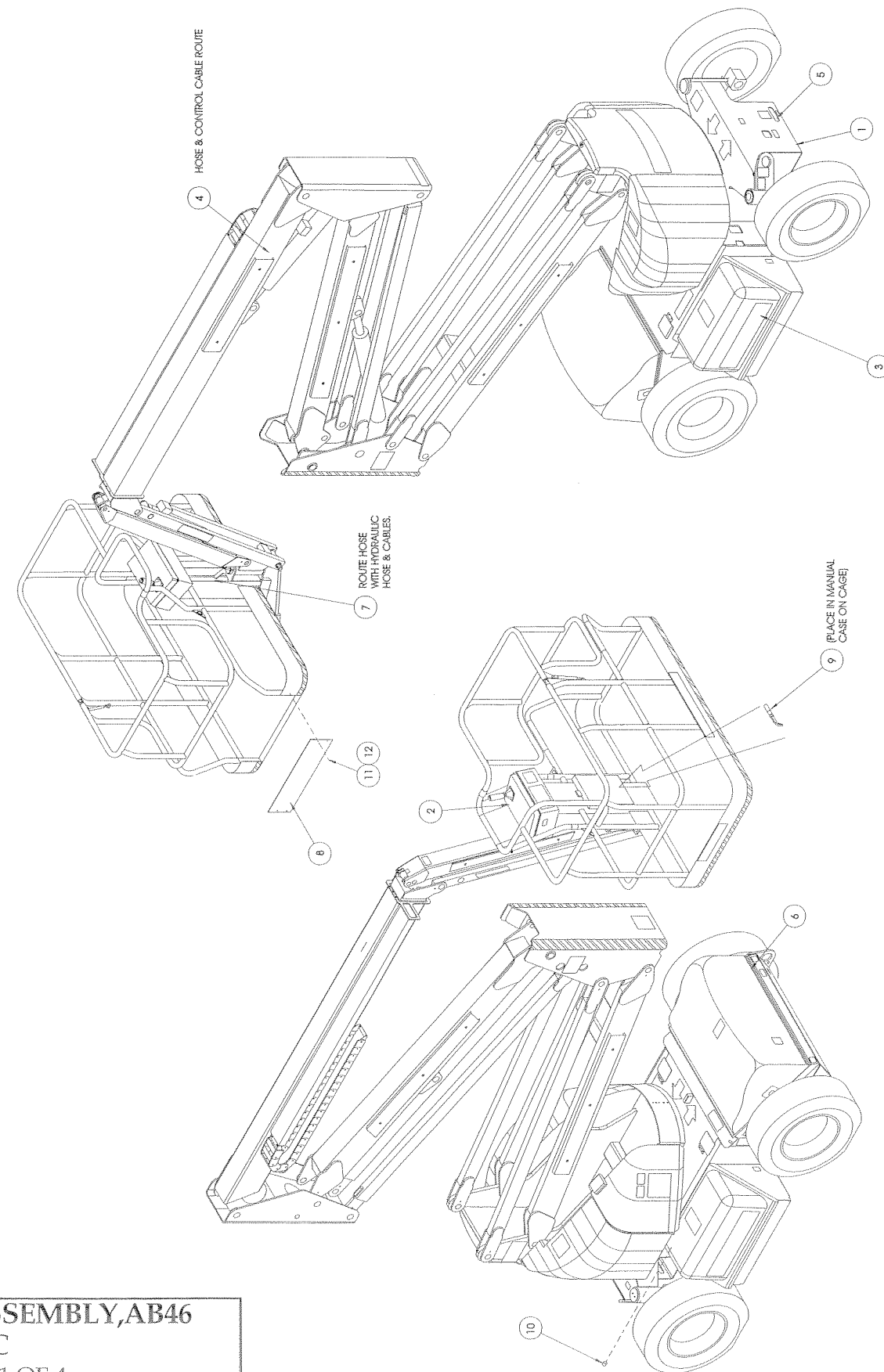
ELECTRIC - EURO

68300-001

| ITEM | PART      | DESCRIPTION                         | QTY.  |
|------|-----------|-------------------------------------|-------|
| 1    | 68303-000 | BASIC ASSY. AB46-E                  | 1     |
| 2    | 68339-004 | CONTROLLER INSTL-ELEC. EURO.        | 1     |
| 3    | 68335-100 | LABEL KIT/INSTL - ELEC EURO.        | 1     |
| 4    | 68336-000 | HOSE KIT/INSTL-ELECNOT SHOWN        | 1     |
| 5    | 68338-001 | CHARGER-EURO.NOT SHOWN              | 1     |
| 6    | 29945-016 | LEVEL SENS P-Q EURO ELNOT SHOWN     | 1     |
| 7    | 68810-000 | KIT, 8-METER DRIVE CUT-OUT          | 1     |
| 8    | 68821-001 | TOEBOARD, CAGE ENTRY-EURO           | 1     |
| 9    | 68830-000 | RATCHET, TURRET ROTATE              | 1     |
| 10   | 68834-000 | CAP, VINYL                          | 1     |
| 11   | 11252-006 | SCREW HHC GR5 1/4-20 X 3/4" LG      | 4     |
| 12   | 11248-004 | NUT HEX ESNA 1/4-20                 | 4     |
| 13   | 68340-001 | HYDRAULIC SCHEMATIC AB46 ELECTRIC   | REF   |
| 14   | 68341-006 | ELECTRIC SCHEMATIC AB46 ELEC (EURO) | REF   |
| 201  | 29433-099 | CABLE, 24 COND. 18 GA.              | 11 FT |
| 202  | 29434-099 | CABLE, 3-10 GA. / 9-14 GA.          | 63 FT |
| 203  | 29433-099 | CABLE, 24 COND. 18 GA.              | 63 FT |
| 204  | 29433-099 | CABLE, 24 COND. 18 GA.              | 63 FT |
| 205  | 29434-099 | CABLE, 3-10 GA. / 9-14 GA.          | 11 FT |
| 206  | 60214-099 | CABLE, 15 COND. 16 GA.              | 11 FT |
| 207  | 29496-099 | WIRE, 2 COND. 16 GA.                | 5 FT  |
| 208  | 29496-099 | WIRE, 2 COND. 16 GA.                | 26 FT |
| 209  | 29496-099 | WIRE, 2 COND. 16 GA.                | 37 FT |
| 210  | 29496-099 | WIRE, 2 COND. 16 GA.                | 15 FT |
| 211  | 68814-000 | TERMINAL, PIN                       | 18    |
| 212  | 29610-006 | TERMINAL, FORK 16-18 GA. #6         | 39    |
| 301  | 29601-005 | TERMINAL, RING 18-22 GA. #10        | 23    |
| 302  | 29931-003 | TERMINAL, FEM. 16-14                | 9     |
| 303  | 29435-099 | WIRE, 3 COND. 14 GA. (EURO)         | 6 FT  |
| 401  | 29496-099 | WIRE, 3 COND. 14 GA.                | 2 FT  |
| 402  | 29496-099 | WIRE, 2 COND. 16 GA.                | 8 FT  |
| 403  | 29435-099 | WIRE, 3 COND. 14 GA. (EURO)         | 2 FT  |

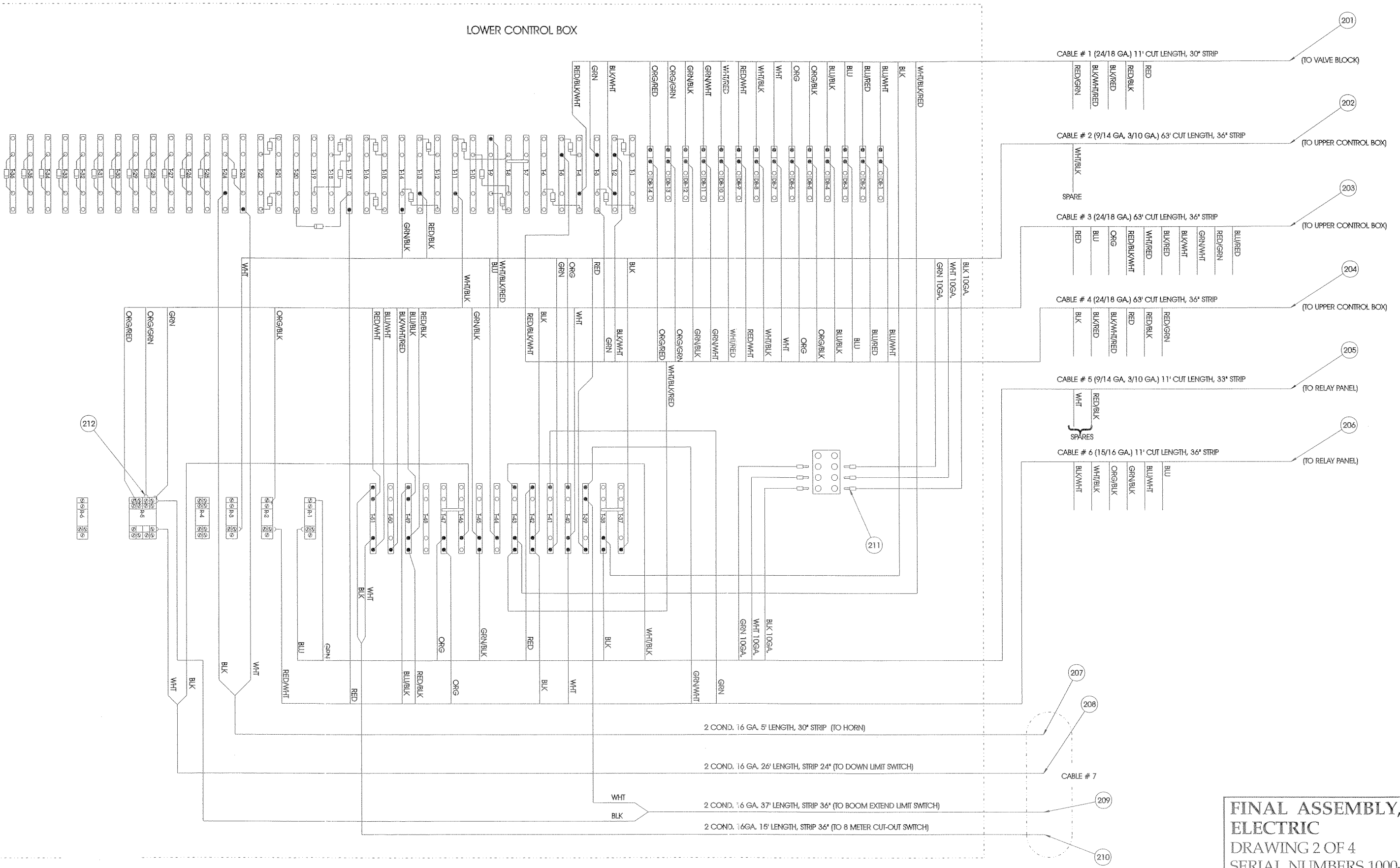
# Illustrated Parts Breakdown

Section  
6.2

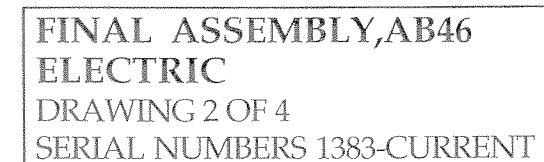


FINAL ASSEMBLY, AB46  
ELECTRIC  
DRAWING 1 OF 4

# Illustrated Parts Breakdown



FINAL ASSEMBLY, AB46  
ELECTRIC  
DRAWING 2 OF 4  
SERIAL NUMBERS 1000-1382

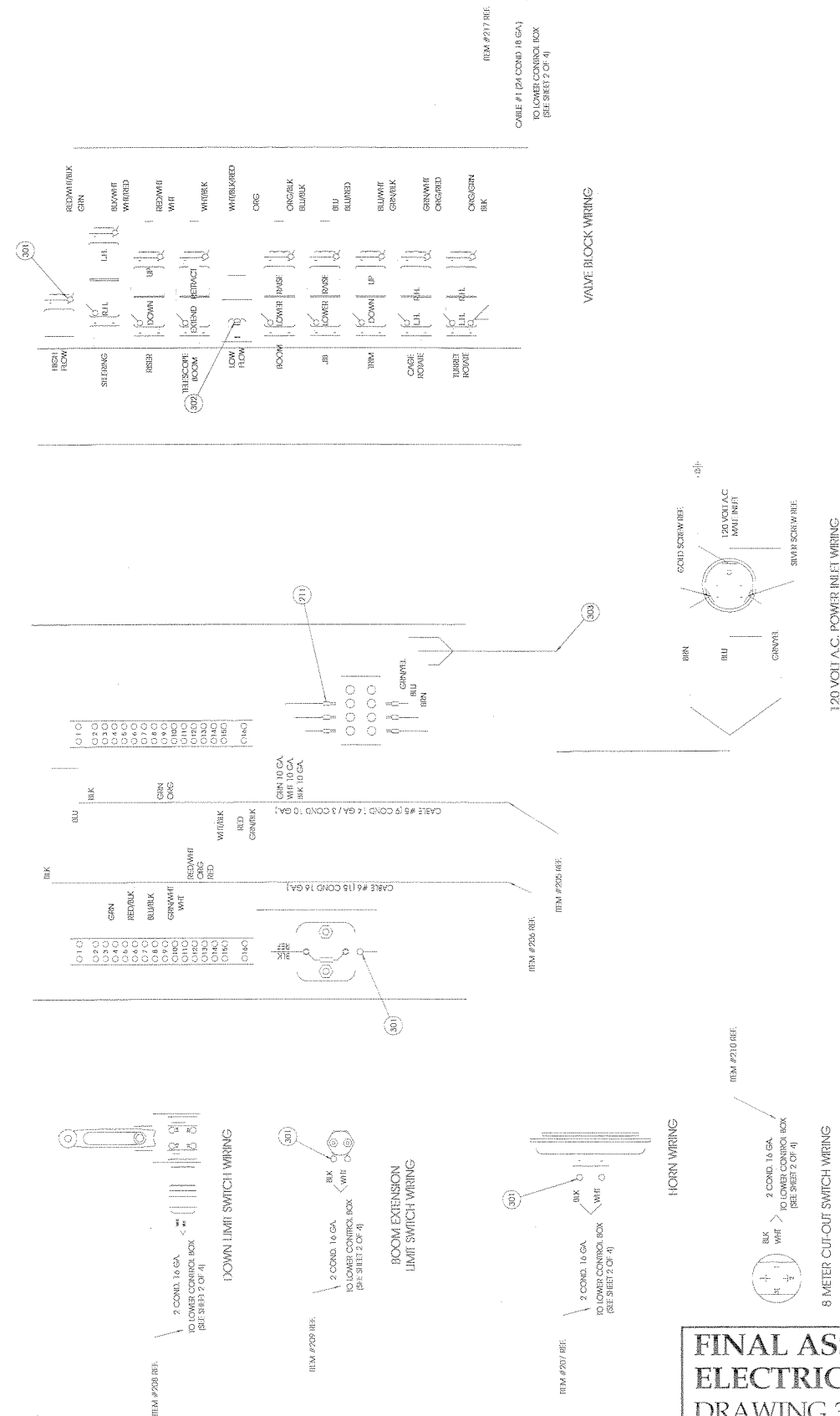






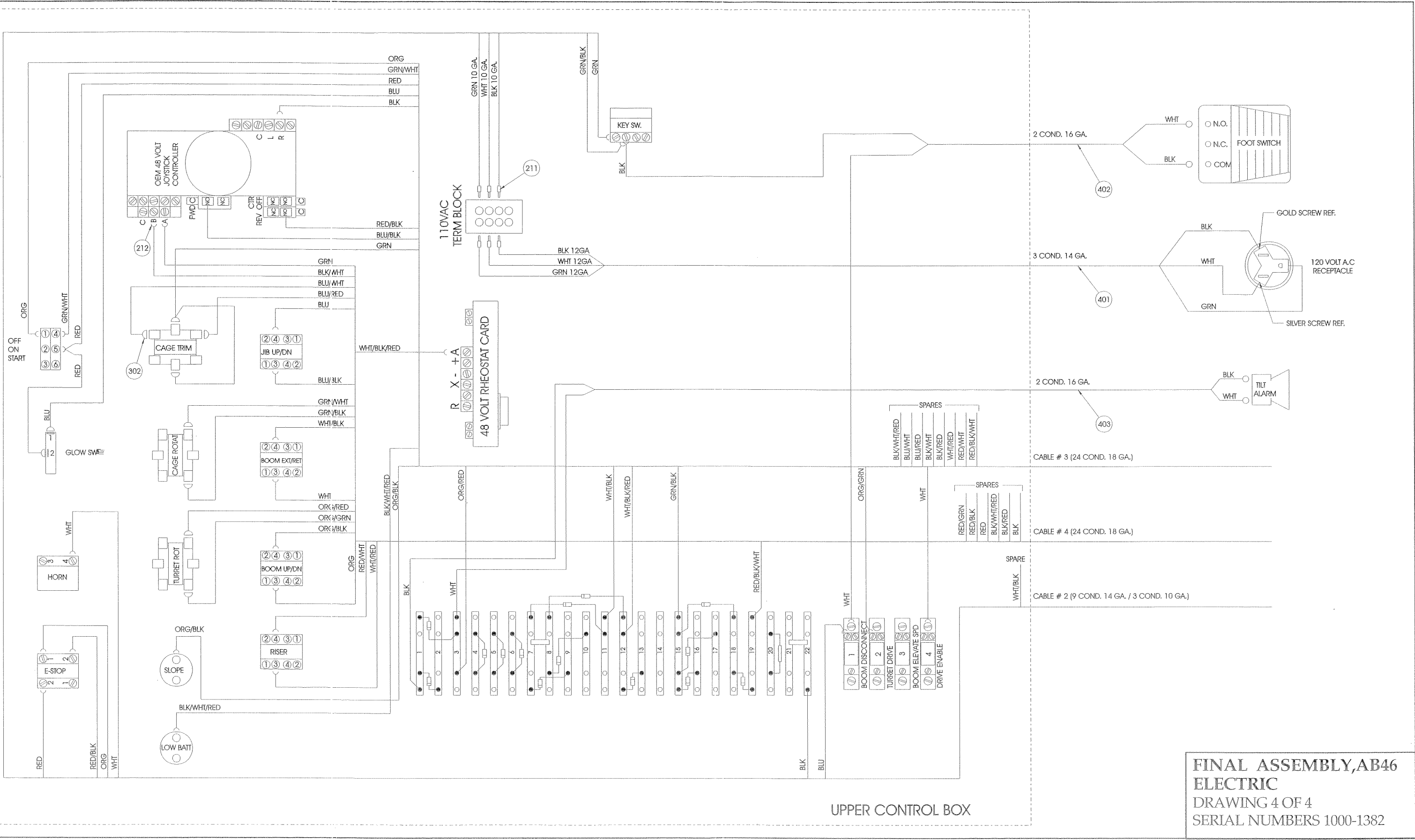
# Illustrated Parts Breakdown

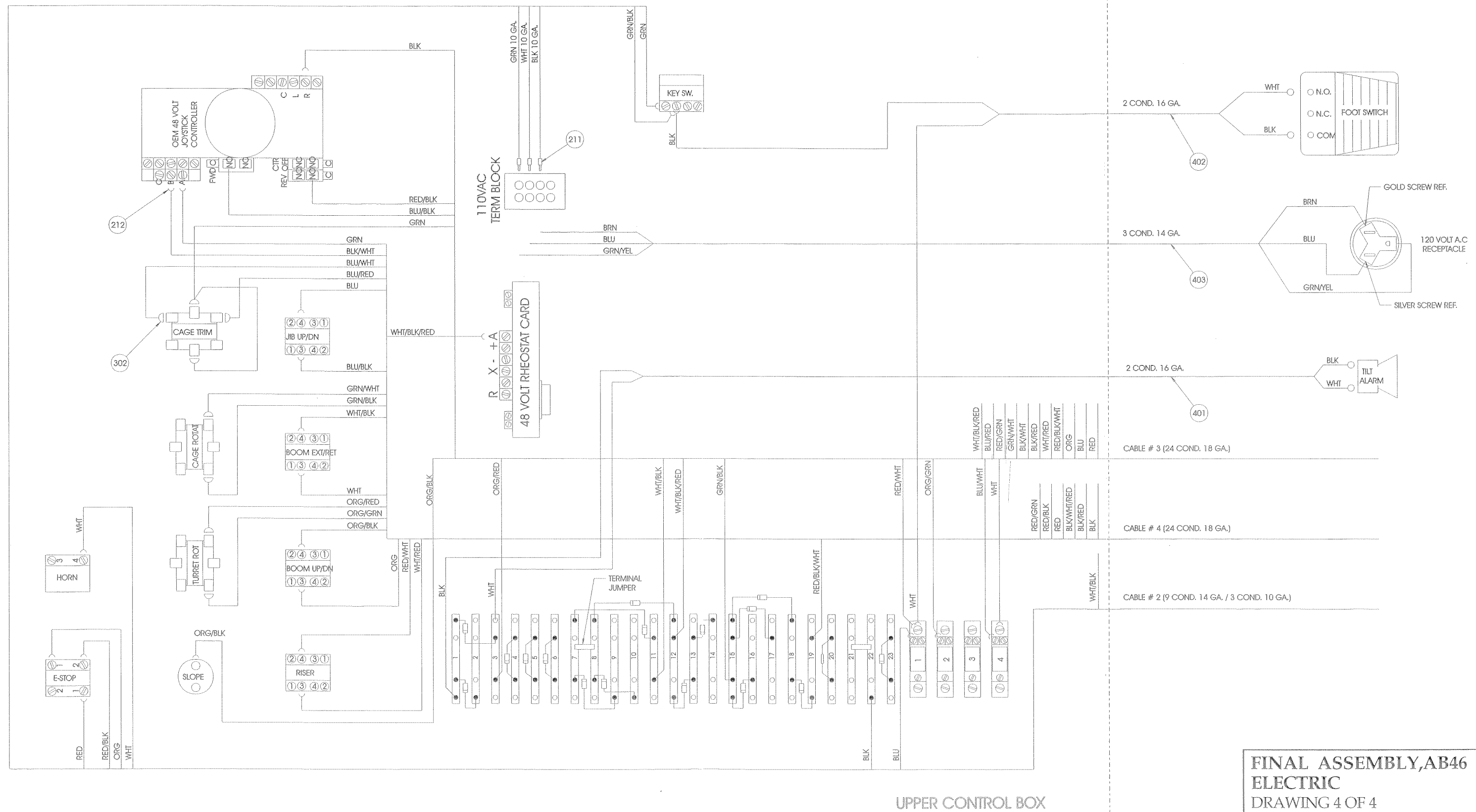
Section  
6.2



FINAL ASSEMBLY, AB46  
ELECTRIC  
DRAWING 3 OF 4  
SERIAL NUMBERS 1383-CUR

# Illustrated Parts Breakdown





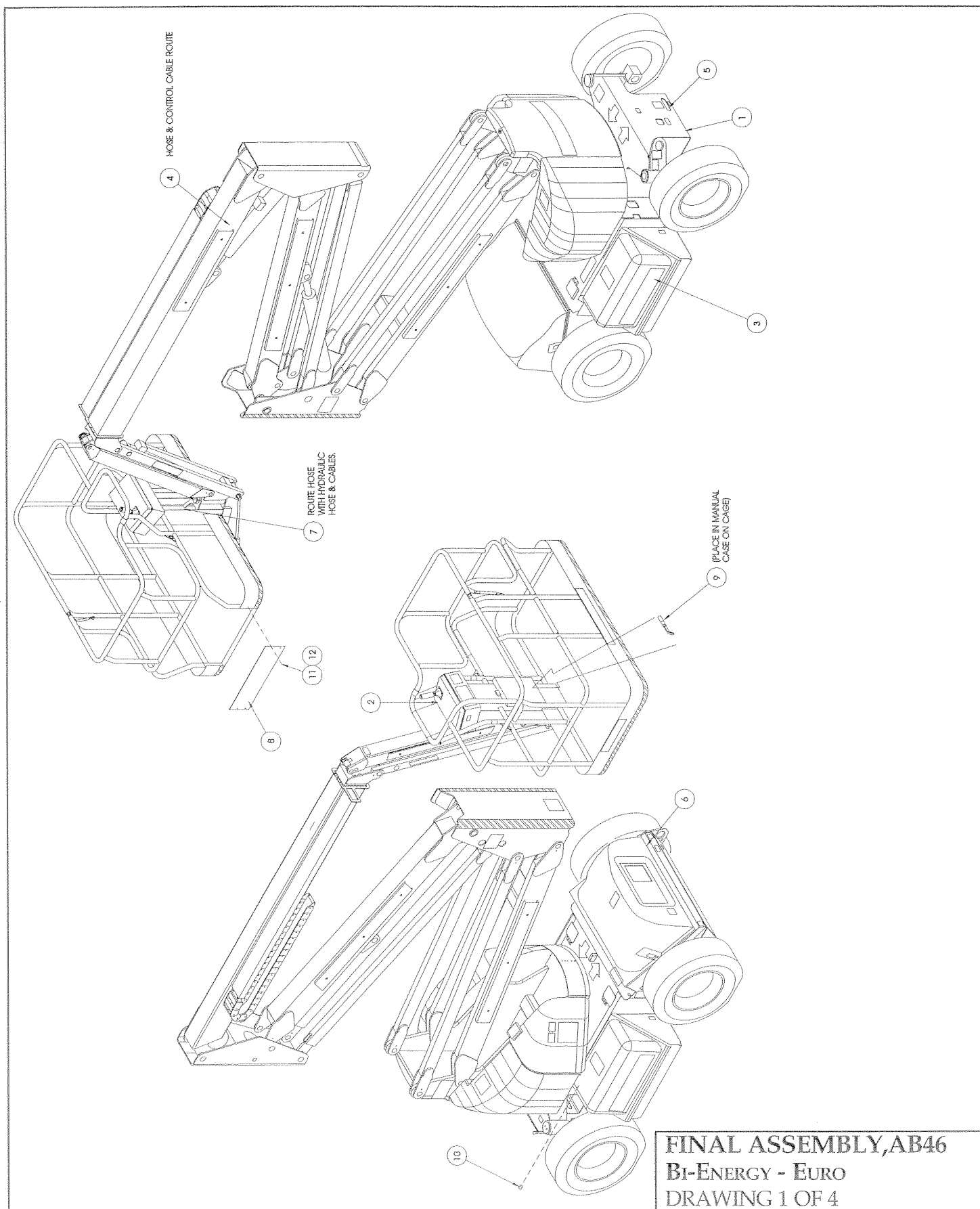
**FINAL ASSEMBLY, AB46**  
**ELECTRIC**  
 DRAWING 4 OF 4  
 SERIAL NUMBERS 1383-CUR

## FINAL ASSEMBLY, AB46 BI-ENERGY - EURO 68310-001

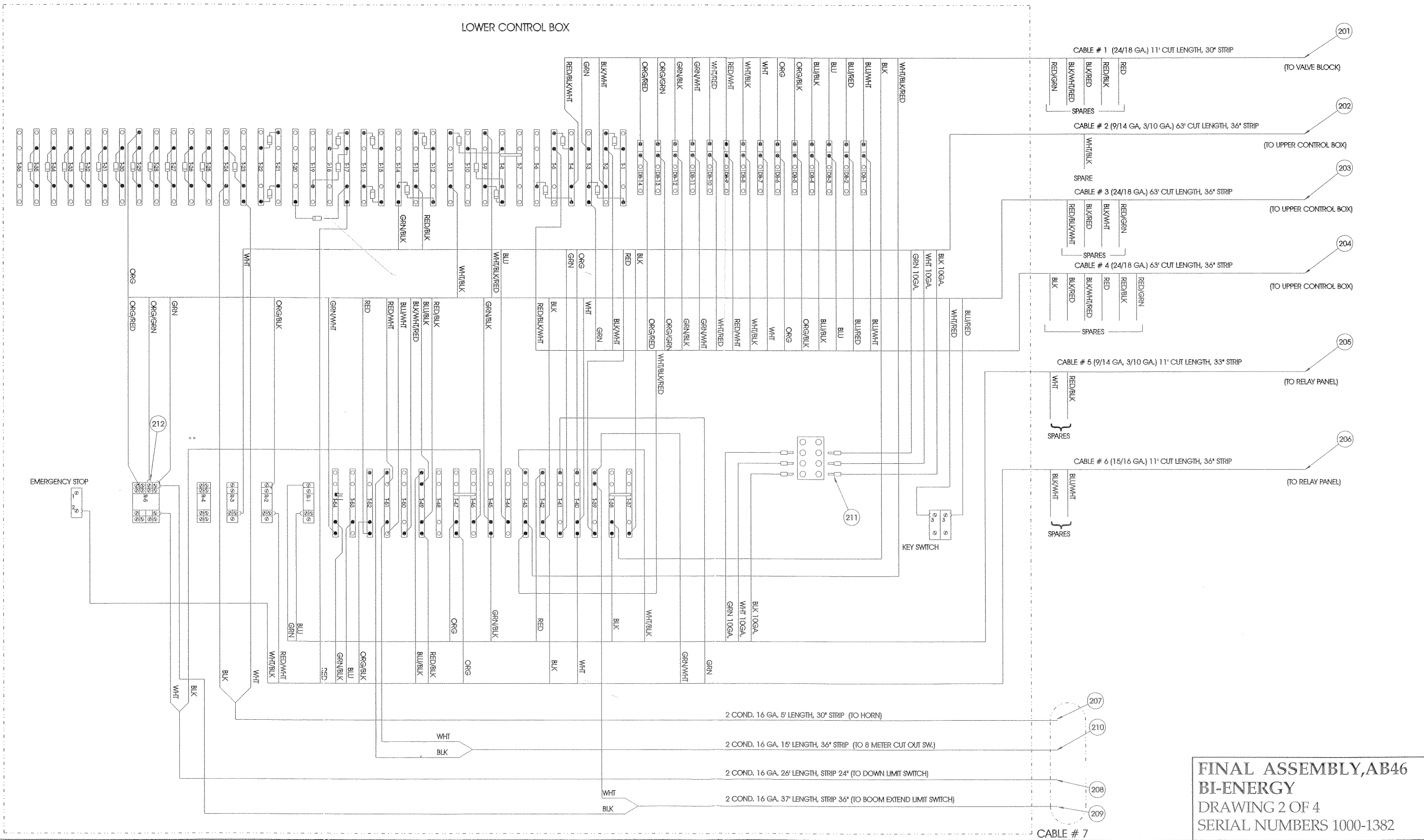
| ITEM | PART      | DESCRIPTION                       | QTY.  |
|------|-----------|-----------------------------------|-------|
| 1    | 68313-000 | BASIC ASSY. AB46 BI-ENERGY        | 1     |
| 2    | 68339-012 | CONTROLLER INSTL BI-ENG EURO.     | 1     |
| 3    | 68335-103 | LABEL KIT/INSTL - EURO. BI-ENERGY | 1     |
| 4    | 68336-002 | HOSE KIT/INSTL-ELECNOT SHOWN      | 1     |
| 5    | 68338-001 | CHARGER-EURO.NOT SHOWN            | 1     |
| 6    | 29945-016 | LEVEL SENS P-Q EURO ELNOT SHOWN   | 1     |
| 7    | 68810-000 | KIT, 8-METER DRIVE CUT-OUT        | 1     |
| 8    | 68821-001 | TOEBOARD, CAGE ENTRY-EURO         | 1     |
| 9    | 68830-000 | RATCHET, TURRET ROTATE            | 1     |
| 10   | 68834-000 | CAP, VINYL                        | 1     |
| 11   | 11252-006 | SCREW HHC GR5 1/4-20 X 3/4" LG    | 4     |
| 12   | 11248-004 | NUT HEX ESNA 1/4-20               | 4     |
| 201  | 29433-099 | CABLE, 24 COND. 18 GA.            | 11 FT |
| 202  | 29434-099 | CABLE, 3-10 GA. / 9-14 GA.        | 63 FT |
| 203  | 29433-099 | CABLE, 24 COND. 18 GA.            | 63 FT |
| 204  | 29433-099 | CABLE, 24 COND. 18 GA.            | 63 FT |
| 205  | 29434-099 | CABLE, 3-10 GA. / 9-14 GA.        | 11 FT |
| 206  | 60214-099 | CABLE, 15 COND. 16 GA.            | 11 FT |
| 207  | 29496-099 | WIRE, 2 COND. 16 GA.              | 5 FT  |
| 208  | 29496-099 | WIRE, 2 COND. 16 GA.              | 26 FT |
| 209  | 29496-099 | WIRE, 2 COND. 16 GA.              | 37 FT |
| 210  | 29496-099 | WIRE, 2 COND. 16 GA.              | 15    |
| 211  | 68814-000 | TERMINAL, PIN                     | 18    |
| 212  | 29610-006 | TERMINAL, FORK 18-16 GA. #6       | 38    |
| 301  | 29601-005 | TERMINAL, RING 18-22 GA. #10      | 23    |
| 302  | 29931-003 | TERMINAL, FEM. PUSH-ON 16-14      | 9     |
| 303  | 29435-099 | WIRE, 3 COND. 14 GA. (EURO)       | 6 FT  |
| 401  | 29495-099 | WIRE, 3 COND. 14 GA.              | 2 FT  |
| 402  | 29496-099 | WIRE, 2 COND. 16 GA.              | 8 FT  |
| 403  | 29496-099 | WIRE, 2 COND. 16 GA.              | 2 FT  |

# Illustrated Parts Breakdown

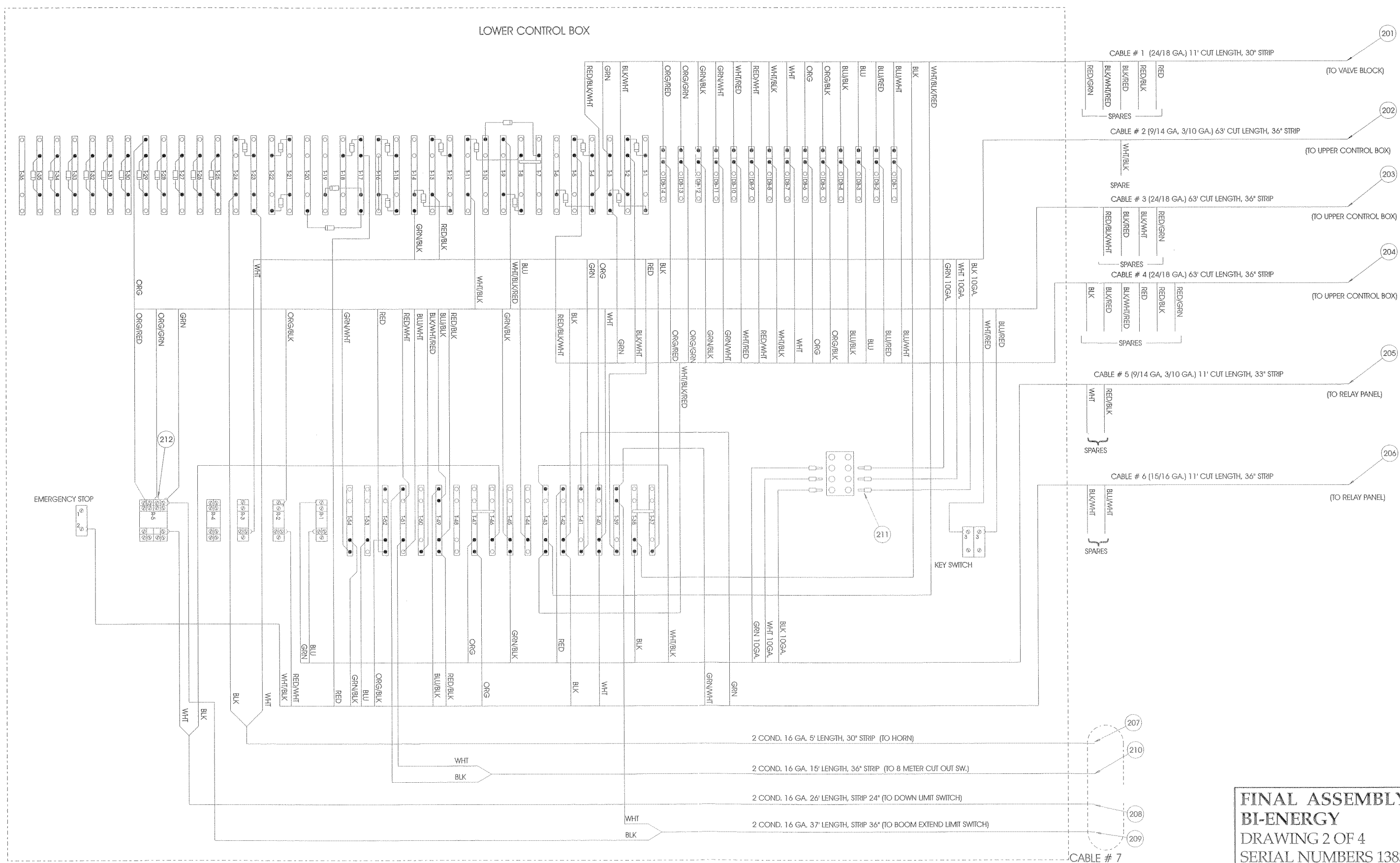
Section  
6.2



# Illustrated Parts Breakdown



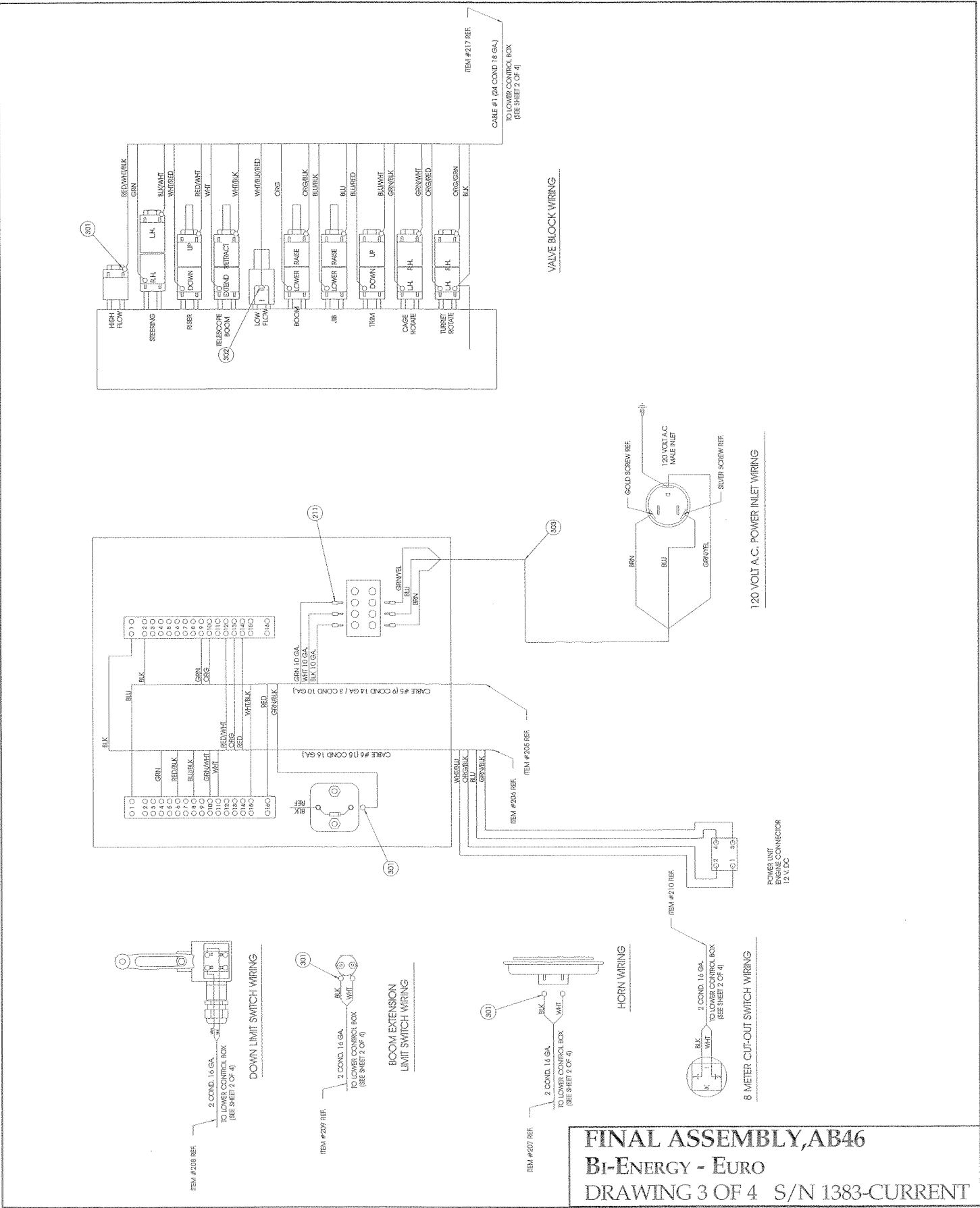
# Illustrated Parts Breakdown



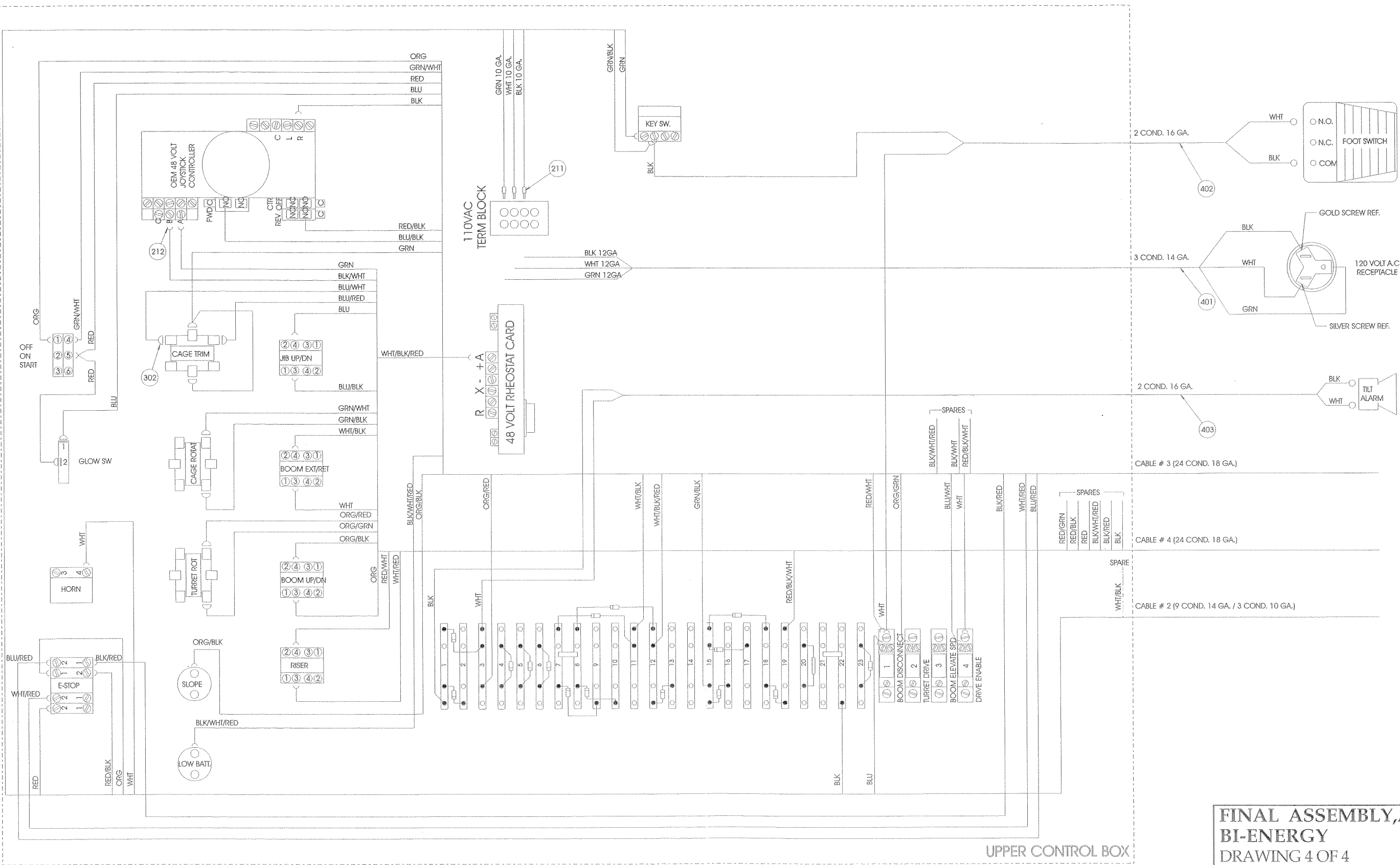
FINAL ASSEMBLY, AB46  
BI-ENERGY  
DRAWING 2 OF 4  
SERIAL NUMBERS 1383-CUR











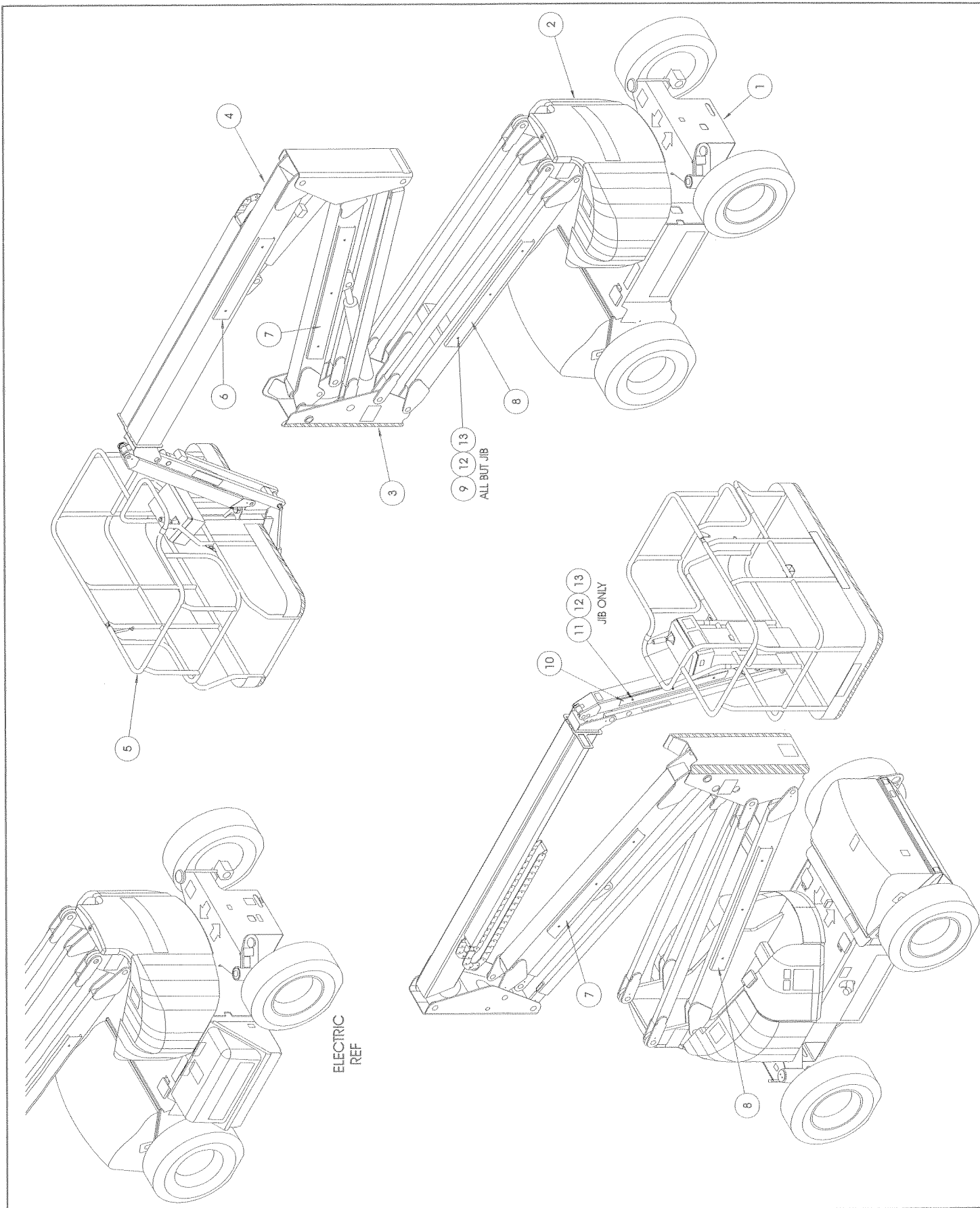
FINAL ASSEMBLY, AB46  
BI-ENERGY  
DRAWING 4 OF 4  
SERIAL NUMBERS 1383 - CURRENT

BASIC ASSEMBLY, AB46  
ELECTRIC - EURO  
68303-000

| ITEM | PART      | DESCRIPTION             | QTY. |
|------|-----------|-------------------------|------|
| 1    | 68320-000 | CHASSIS ASSY. AB46-ELEC | 1    |
| 2    | 68330-000 | TURRET ASSY-ELEC        | 1    |
| 3    | 68323-000 | LOWER LINKAGE ASSY      | 1    |
| 4    | 68322-000 | UPPER LINKAGE ASSY      | 1    |
| 5    | 68325-001 | CAGE "B" ASSY           | 1    |
| 6    | 68703-000 | HOSE GUARD              | 1    |
| 7    | 68704-000 | HOSE GUARD (58")        | 2    |
| 8    | 68705-000 | HOSE GUARD (68")        | 2    |
| 9    | 68706-000 | HOSE CLAMP              | 14   |
| 10   | 68731-000 | HOSE GUARD-JIB          | 1    |
| 11   | 68732-000 | HOSE CLAMP-JIB          | 3    |
| 12   | 11248-004 | NUT HEX ESNA 1/4-20 UNC | 17   |
| 13   | 11240-004 | WASHER 1/4 STD FLAT     | 17   |

# Illustrated Parts Breakdown

Section  
6.2



# Illustrated Parts Breakdown

BASIC ASSEMBLY, AB46

BI-ENERGY - EURO

68313-000

| ITEM | PART      | DESCRIPTION                  | QTY. |
|------|-----------|------------------------------|------|
| 1    | 68317-000 | CHASSIS ASSY. AB46 BI-ENERGY | 1    |
| 2    | 68330-003 | TURRET ASSY BI-ENERGY        | 1    |
| 3    | 68323-000 | LOWER LINKAGE ASSY           | 1    |
| 4    | 68322-000 | UPPER LINKAGE ASSY           | 1    |
| 5    | 68325-001 | CAGE "B" ASSY                | 1    |
| 6    | 68703-000 | HOSE GUARD                   | 1    |
| 7    | 68704-000 | HOSE GUARD (58")             | 2    |
| 8    | 68705-000 | HOSE GUARD (68")             | 2    |
| 9    | 68706-000 | HOSE CLAMP                   | 14   |
| 10   | 68731-000 | HOSE GUARD-JIB               | 1    |
| 11   | 68732-000 | HOSE CLAMP-JIB               | 3    |
| 12   | 11248-004 | NUT HEX ESNA 1/4-20 UNC      | 17   |
| 13   | 11240-004 | WASHER 1/4 STD FLAT          | 17   |

## Section 6.2



# Illustrated Parts Breakdown

## CHASSIS ASSEMBLY, AB46

### ELECTRIC - EURO

68320-000

| ITEM | PART      | DESCRIPTION                     | QTY. |
|------|-----------|---------------------------------|------|
| 1    | 68381-001 | CHASSIS WELDMENT (ELECTRIC)     | 1    |
| 2    | 11256-012 | SCR, HHC 1/2-13 UNC X 1 1/2     | 2    |
| 3    | 11238-008 | LOCKWASHER, SPLIT RING 1/2"     | 2    |
| 4    | 11240-008 | WASHER, FLAT 1/2"               | 2    |
| 5    | 68370-000 | SPINDLE WELDMENT (L.H.)         | 1    |
| 6    | 68370-001 | SPINDLE WELDMENT (R.H.)         | 1    |
| 7    | 68368-000 | STEERING PIVOT SHAFT            | 2    |
| 8    | 11257-040 | SCR, HHC. 5/8-11 UNC X 5        | 2    |
| 9    | 11248-010 | LOCKNUT, 5/8-11 UNC. (ESNA)     | 2    |
| 10   | 68456-000 | STEERING CYLINDER               | 1    |
| *    | 68456-010 | SEAL KIT                        | 1    |
| 11   | 68702-000 | BOLT, "SPECIAL LENGTH" 5/16-18  | 2    |
| 12   | 11239-005 | WASHER, 5/16" ASTM A-325        | 4    |
| 13   | 11740-014 | ROLL PIN Ø 1/2 X 1 3/4 LG.      | 2    |
| 14   | 11248-005 | LOCKNUT, 5/16-18 UNC. (ESNA)    | 2    |
| 15   | 68372-000 | STEERING ARM                    | 2    |
| 16   | 11239-008 | WASHER, 1/2" ASTM A-325         | 24   |
| 17   | 62642-033 | BUSHING, Ø 1.25 X 1.00 (20DU16) | 4    |
| 18   | 68380-000 | STEERING PIN (SHORT)            | 2    |
| 19   | 68378-000 | STEERING PIN (LONG)             | 2    |
| 20   | 14996-008 | WASHER, FLAT 1/2" S.A.E.        | 8    |
| 21   | 11256-030 | SCR, HHC. 1/2-13 UNC X 3 3/4    | 2    |
| 22   | 68338-000 | BATTERY CHARGER,                | 1    |
| 23   | 10092-014 | THRUST WASHER, GARLOCK G 28 DU  | 2    |
| 24   | 68576-001 | BUSHING, GARLOCK #GF4852-40     | 4    |
| 25   | 11788-001 | SEAL, GARLOCK #71 X 6308        | 2    |
| 26   | 13888-224 | O-RING, 1.75 I.D. X .125 SECT   | 2    |
| 27   | 68373-000 | CAP, STEERING PIN               | 2    |
| 28   | 11253-006 | SCR, HHC. 5/16-18 UNC X 3/4     | 4    |
| 29   | 68577-000 | FRONT HUB ASSY.                 | 2    |
| *    | 68577-010 | FRONT HUB REPAIR KIT            | 1    |
| *    | 68577-008 | STUD BOLTS                      | 1    |
| *    | 68577-007 | WHEEL NUTS                      | 1    |
| 30   | 11979-008 | O-RING                          | 1    |
| 31   | 11297-010 | BELLEVILLE WASHER, 5/8 DIA.     | 18   |
| 32   | 11469-005 | LUG NUT 90° 9/16-18 UNF         | 24   |
| 33   | 68570-000 | PLANETARY DRIVE                 | 2    |
| *    | 68570-010 | TORQUE HUB REPAIR KIT           | 1    |
| *    | 68570-011 | THRUST WASHER                   | 1    |
| 34   | 68569-000 | BRAKE, "OSCO"                   | 2    |
| *    | 68569-010 | SEAL KIT                        | 1    |
| 35   | 68573-000 | MOTOR, ELECTRIC 24 VOLT D.C.    | 2    |
| 36   | 68757-001 | LATCH, DRAW                     | 2    |
| 37   | **        | GASKET                          | 4    |
| 38   | 10150-005 | FITTING, BULKHEAD 8MJ-8MJ       | 1    |
| 40   | 68565-000 | ACCUMULATOR                     | 1    |
| 41   | 29945-VAR | LEVEL SENSOR, (SEE FINAL ASSY)  | 1    |
| 42   | 13969-002 | FITTING, 4MJ-8FJ                | 1    |
| 44   | 68388-000 | COVER PLATE                     | 1    |
| 45   | 68575-000 | MOTOR, HYDRAULIC                | 1    |
| 46   | 68571-000 | DRIVE, WORM GEAR                | 1    |
| 47   | 14576-026 | SCR, HHC. GR8 5/8-18UNF X 3 1/4 | 18   |

| ITEM | PART      | DESCRIPTION                   | QTY. |
|------|-----------|-------------------------------|------|
| 48   | 11941-038 | FITTING, STR 10MB-4MJ         | 2    |
| 49   | 68326-000 | HYDRAULIC POWER UNIT ASSY.    | 1    |
| 50   | 68346-000 | RELAY PANEL ASSY.             | 1    |
| 51   | 68333-000 | CABLE ASSY.                   | 1    |
| *    | 29902-001 | ANDERSON CONNECTOR            | -    |
| 52   | 68727-000 | ANGLE, BATTERY TRAY MOUNT     | 4    |
| 53   | 68331-001 | BATTERY MODULE ASSY           | 1    |
| 54   | 68331-002 | BATTERY MODULE ASSY           | 1    |
| 55   | 61692-099 | GROMET MATERIAL               | 7 FT |
| 56   | 11252-014 | SCR. HHC 1/4-20 UNC X 1 3/4   | 4    |
| 57   | 11254-010 | SCR. HHC 3/8-16 UNC X 1 1/4   | 10   |
| 58   | 11248-008 | LOCKNUT, HEX 1/2-13 UNC ESNA  | 10   |
| 59   | 11240-006 | WASHER, FLAT 3/8"             | 8    |
| 60   | 11248-006 | LOCKNUT, HEX. 3/8-16 UNC ESNA | 9    |
| 61   | 11256-036 | SCR, HHC. 1/2-13 UNC X 4 1/4  | 4    |
| 62   | **        | WASHER, FLAT 7/8"             | 2    |
| 63   | **        | NUT, HEX CASTLE 7/8-14 UNF.   | 2    |
| 64   | **        | COTTER PIN 1/8" DIA. X 2 LG.  | 2    |
| 65   | 11934-026 | FITTING, 90° ELBOW 4MB-6MJ    | 1    |
| 67   | 11715-004 | SCREW, #6-32 X 1/2            | 4    |
| 68   | 11240-001 | WASHER, FLAT #6               | 4    |
| 69   | 11248-047 | LOCKNUT, #6-32 ESNA           | 6    |
| 70   | 11252-006 | SCREW HHC 1/4-20 X 3/4        | 12   |
| 71   | 11240-004 | WASHER 1/4 FLAT STD           | 10   |
| 72   | 11248-004 | LOCKNUT, 1/4-20 ESNA          | 14   |
| 73   | 14252-004 | NUT-SERT 1/4 - 20 UNC         | 6    |
| 74   | 11256-014 | SCR, HHC 1/2-13 UNC X 1 3/4   | 4    |
| 75   | 11252-016 | SCRW HHC GR5 1/4-20 X 2       | 4    |
| 76   | 11238-004 | WASHER SPLIT LOCK 1/4         | 6    |
| 77   | 11249-008 | LOCKNUT, 1/2-20 UNF. ESNA     | 18   |
| 78   | 68658-001 | COVER, ENGINE COMPARTMENT     | 1    |
| 79   | 68327-000 | TIRE & WHEEL ASSY.            | 4    |
| 81   | 68321-000 | SPEED CONTROL PANEL ASSY.     | 1    |
| 82   | 68551-001 | TACH ASSY. KIT (ITEMS 82-87)  | 2    |
| 84   | **        | MOUNTING PLATE                | 2    |
| 85   | **        | SCREW R.H. #2-56 X 1/4        | 6    |
| 86   | **        | WASHER                        | 6    |
| 87   | **        | COUPLING                      | 2    |
| 88   | 68680-007 | FITTING, 90° ELBOW            | 2    |
| 94   | 11254-006 | SCREW HHC 3/8-16 X 3/4        | 1    |
| 95   | 11238-006 | WASHER, SPLIT LOCK 3/8        | 5    |
| 96   | 11240-006 | WASHER, FLAT STD 3/8          | 1    |
| 97   | 03495-000 | 90° ELBOW STREET 6MB - 6FJ    | 2    |
| 98   | 29961-000 | INLET FLANGE, MALE            | 1    |
| 99   | 68386-000 | COVER PLATE (L.H.)            | 1    |
| 100  | 68386-001 | COVER PLATE (R.H.)            | 1    |
| 101  | 68788-000 | COVER, ELECTRICAL             | 1    |
| 102  | 11936-001 | FITTING, TEE 4MJ-4MJ-4MB      | 1    |
| 103  | 14048-010 | FITTING, ADAPT 4FP-4FJ        | 1    |
| 104  | 63921-007 | PRESSURE SWITCH               | 1    |
| 105  | 68783-000 | PRESSURE SNUBBER              | 1    |
| 106  | 29961-001 | SEAL, HUBBELL #6017           | 1    |



# Illustrated Parts Breakdown

Section  
6.2

## CHASSIS ASSEMBLY, AB46 ELECTRIC - EURO 68320-000

| ITEM | PART      | DESCRIPTION                         | QTY. |
|------|-----------|-------------------------------------|------|
| 201  | 68776-001 | CABLE ASSY. X 20" (3/8 X 3/8 LUG)   | 1    |
| 202  | 68776-002 | CABLE ASSY. X 35" (3/8 X 3/8 LUG)   | 1    |
| 203  | 68776-003 | CABLE ASSY. X 24" (3/8 X 3/8 LUG)   | 1    |
| 204  | 68776-004 | CABLE ASSY. X 30" (3/8 X 3/8 LUG)   | 1    |
| 205  | 68777-001 | CABLE ASSY. X 41" (5/16 X 3/8 LUG)  | 1    |
| 206  | 68777-002 | CABLE ASSY. X 47" (5/16 X 3/8 LUG)  | 1    |
| 207  | 68777-003 | CABLE ASSY. X 25" (5/16 X 3/8 LUG)  | 1    |
| 208  | 68777-004 | CABLE ASSY. X 20" (5/16 X 3/8 LUG)  | 1    |
| 209  | 68334-003 | CABLE ASSY. X 27" (5/16 X 5/16 LUG) | 1    |
| 210  | 68334-004 | CABLE ASSY. X 24" (5/16 X 5/16 LUG) | 1    |
| 211  | 29452-099 | WIRE, 16 GA. BLACK                  | 5 FT |
| 212  | 29451-099 | WIRE, 16 GA. WHITE                  | 5 FT |
| 213  | 29454-099 | WIRE, 16 GA. RED                    | 5 FT |
| 214  | 29457-099 | WIRE, 16 GA. GREEN                  | 5 FT |
| 215  | 29453-099 | WIRE, 16 GA. ORANGE                 | 5 FT |
| 216  | 29355-099 | WIRE, 16 GA. BLACK / RED            | 5 FT |
| 217  | 29356-099 | WIRE, 16 GA. WHITE / RED            | 5 FT |
| 218  | 14914-001 | CONN. MALE PUSH, 14-16 .25          | 1    |
| 219  | 29931-003 | CONN. FEM. PUSH, 14-16 .25          | 2    |
| 220  | 29601-012 | CONN. RING, 14-16 #8                | 8    |
| 221  | 29601-015 | CONN. RING, 14-16 Ø 3/8             | 1    |
| 222  | 29825-002 | DIODE, 3 AMP, 400 VOLT              | 2    |
| 223  | 29440-099 | CABLE, 12 GA. 3 COND. S.O           | 6 FT |
| 224  | 68814-00  | TERMINAL, PIN                       | 3    |
| 225  | 29361-099 | WIRE 16GA WHT/BLK                   | 5 FT |

\*Not Shown

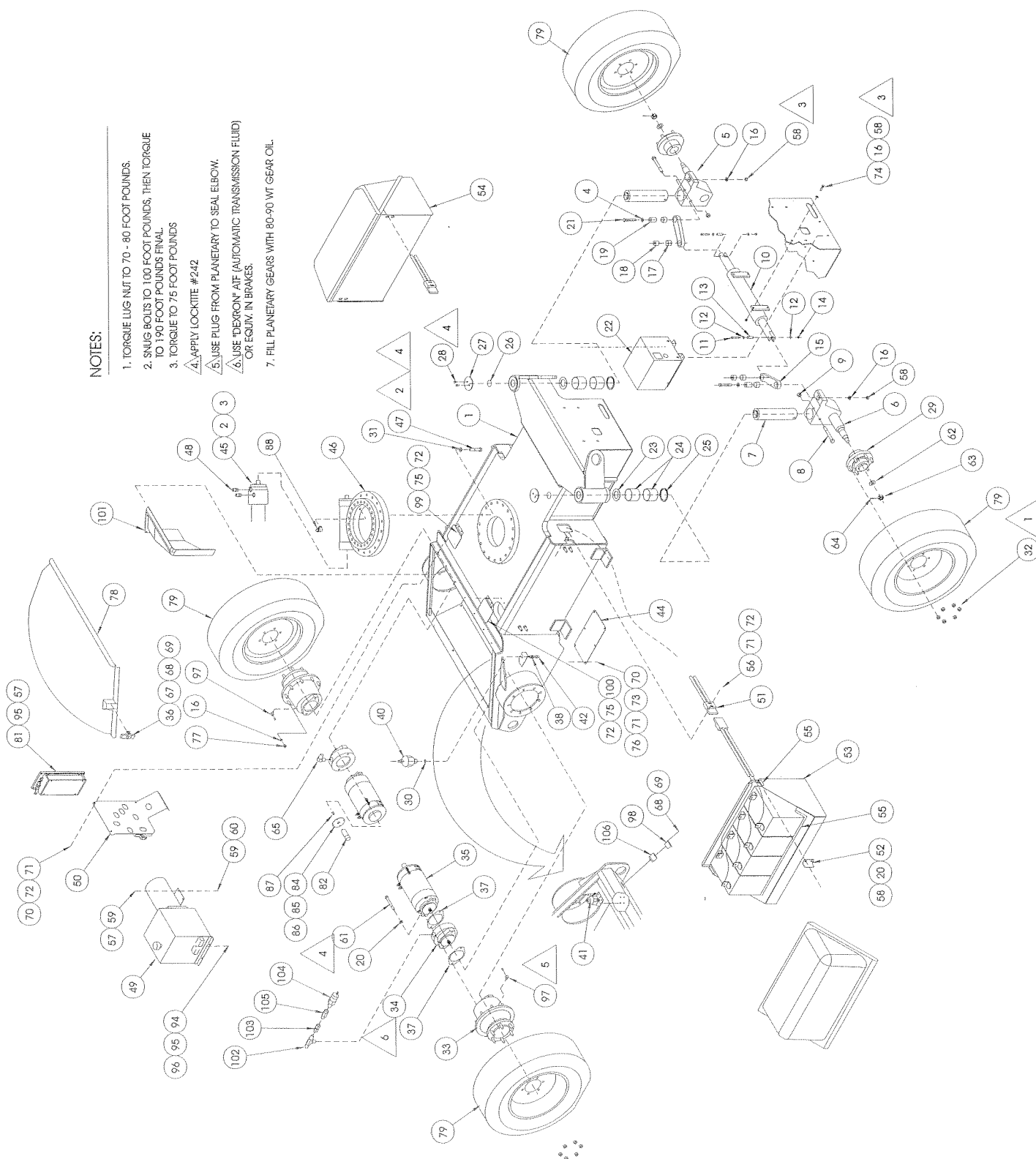
- \*\*Items 62 - 64, included with item 6.
- Items 84 - 87 included with item 82.
- Item 37 included with item 34.

See page 3-15 for detail of  
Front Hub Repair Kit

# Illustrated Parts Breakdown

## NOTES:

1. TORQUE LUG NUT TO 70 - 80 FOOT POUNDS.
2. SNUG BOLTS TO 100 FOOT POUNDS, THEN TORQUE TO 190 FOOT POUNDS FINAL.
3. TORQUE TO 75 FOOT POUNDS
4. APPLY LOCKTITE #242
5. USE PLUG FROM PLANEARY TO SEAL ELBOW.
6. USE "DEXRON" ATF (AUTOMATIC TRANSMISSION FLUID) OR EQUIV. IN BRAKES.
7. FILL PLANETARY GEARS WITH 80-90 WT GEAR OIL.

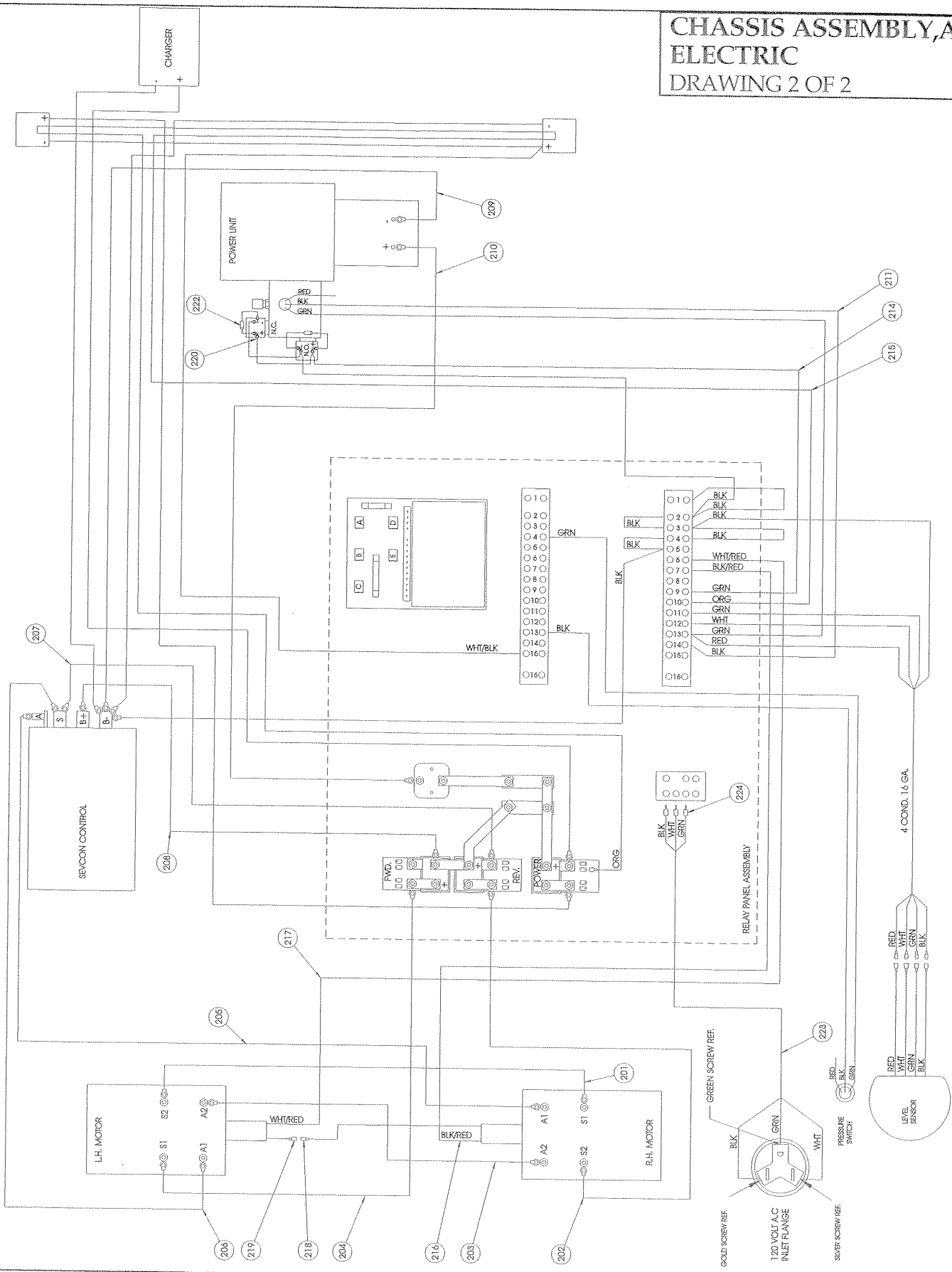


CHASSIS ASSEMBLY, AB46  
ELECTRIC  
DRAWING 1 OF 2

# Illustrated Parts Breakdown

Section  
6.2

CHASSIS ASSEMBLY, AB46  
ELECTRIC  
DRAWING 2 OF 2



# Illustrated Parts Breakdown

## CHASSIS ASSEMBLY, AB46 BI-ENERGY - EURO 68317-000

| ITEM | PART      | DESCRIPTION                     | QTY. |
|------|-----------|---------------------------------|------|
| 1    | 68929-000 | CHASSIS WELDMENT BI-ENERGY      | 1    |
| 2    | 11256-012 | SCR, HHC 1/2-13 UNC X 1 1/2     | 2    |
| 3    | 11238-008 | LOCKWASHER, SPLIT RING 1/2"     | 2    |
| 4    | 11240-008 | WASHER, FLAT 1/2"               | 2    |
| 5    | 68370-000 | SPINDLE WELDMENT (L.H.)         | 1    |
| 6    | 68370-001 | SPINDLE WELDMENT (R.H.)         | 1    |
| 7    | 68368-000 | STEERING PIVOT SHAFT            | 2    |
| 8    | 11257-040 | SCR, HHC. 5/8-11 UNC X 5        | 2    |
| 9    | 11248-010 | LOCKNUT, 5/8-11 UNC. (ESNA)     | 2    |
| 10   | 68456-000 | STEERING CYLINDER               | 1    |
| *    | 68456-010 | SEAL KIT                        | 1    |
| 11   | 68702-000 | BOLT, "SPECIAL LENGTH" 5/16-18  | 2    |
| 12   | 11239-005 | WASHER, 5/16" ASTM A-325        | 4    |
| 13   | 11740-014 | ROLL PIN Ø 1/2 X 1 3/4 LG.      | 2    |
| 14   | 11248-005 | LOCKNUT, 5/16-18 UNC. (ESNA)    | 2    |
| 15   | 68372-000 | STEERING ARM                    | 2    |
| 16   | 11239-008 | WASHER, 1/2" ASTM A-325         | 24   |
| 17   | 62642-033 | BUSHING, Ø 1.25 X 1.00 (20DU16) | 4    |
| 18   | 68380-000 | STEERING PIN (SHORT)            | 2    |
| 19   | 68378-000 | STEERING PIN (LONG)             | 2    |
| 20   | 14996-008 | WASHER, FLAT 1/2" S.A.E.        | 8    |
| 21   | 11256-030 | SCR, HHC. 1/2-13 UNC X 3 3/4    | 2    |
| 22   | 68338-000 | BATTERY CHARGER,                | 1    |
| 23   | 10092-014 | THRUST WASHER, GARLOCK G 28 DU  | 2    |
| 24   | 68576-001 | BUSHING, GARLOCK #GF4852-40     | 4    |
| 25   | 11788-001 | SEAL, GARLOCK #71 X 6308        | 2    |
| 26   | 13888-224 | O-RING, 1.75 I.D. X .125 SECT   | 2    |
| 27   | 68373-000 | CAP, STEERING PIN               | 2    |
| 28   | 11253-006 | SCR, HHC. 5/16-18 UNC X 3/4     | 4    |
| 29   | 68577-000 | FRONT HUB ASSY.                 | 2    |
| *    | 68577-010 | FRONT HUB REPAIR KIT            | 1    |
| *    | 68577-008 | STUD BOLTS                      | 1    |
| *    | 68577-007 | WHEEL NUTS                      | 1    |
| 31   | 11297-010 | BELLEVILLE WASHER, 5/8 DIA.     | 18   |
| 32   | 11469-005 | LUG NUT 90° 9/16-18 UNF         | 24   |
| 34   | 68575-000 | MOTOR, HYDRAULIC                | 1    |
| 35   | 68571-000 | DRIVE, WORM GEAR                | 1    |
| 36   | 14576-026 | SCR, HHC. GR8 5/8-18UNF X 3 1/4 | 18   |
| 37   | 11941-038 | FITTING, STR 10MB-4MJ           | 2    |
| 38   | 68333-000 | CABLE ASSY.                     | 1    |
| 39   | 68727-000 | ANGLE, BATTERY TRAY MOUNT       | 4    |
| 40   | 68331-001 | BATTERY MODULE ASSY             | 1    |
| 41   | 68331-002 | BATTERY MODULE ASSY             | 1    |
| 42   | 61692-099 | GROMMET MATERIAL                | 7 FT |
| 43   | 11252-014 | SCR, HHC 1/4-20 UNC X 1 3/4     | 4    |
| 44   | 11248-008 | LOCKNUT, HEX 1/2-13 UNC ESNA    | 10   |
| 45   | **        | WASHER, FLAT 7/8"               | 2    |
| 46   | **        | NUT, HEX CASTLE 7/8-14 UNF.     | 2    |
| 47   | **        | COTTER PIN 1/8" DIA. X 2 LG.    | 2    |
| 53   | 11248-004 | NUT HEX ESNA 1/4-20             | 12   |
| 55   | 11256-014 | SCR, HHC 1/2-13 UNC X 1 3/4     | 4    |
| 56   | 11252-016 | SCRW HHC GR5 1/4-20 X 2         | 2    |
| 58   | 68327-000 | TIRE & WHEEL ASSY               | 4    |
| 59   | 68680-007 | FITTING 90° ELBOW               | 2    |

| ITEM | PART      | DESCRIPTION                     | QTY.    |
|------|-----------|---------------------------------|---------|
| 60   | 68386-000 | COVER PLATE (L.H.)              | 1       |
| 62   | 68788-000 | COVER ELECTRICAL                | 1       |
| 201  | 68929-000 | CHASSIS WELDMENT BI-ENERGY      | 1       |
| 202  | 68951-000 | ENGINE ASSY KUBOTA 2 CYL        | 1       |
| 203  | 68326-001 | HYD. POWER UNIT ASSY, BI-ENERGY | 1       |
| 204  | 68346-001 | RELAY PANEL ASSY BI-ENERGY      | 1       |
| 205  | 68321-000 | SPEED CONTROL PANEL ASSY        | 1       |
| 206  | 68658-002 | COVER, ENGINE COMPART.          | 1       |
| 208  | 68570-000 | PLANETARY DRIVE                 | 2       |
| *    | 68570-010 | TORQUE HUB REPAIR KIT           | 1       |
| *    | 68570-011 | THRUST WASHER                   | 1       |
| 209  | 68569-000 | BRAKE, AUSCO                    | 2       |
| *    | 68569-010 | SEAL KIT                        | 1       |
| 210  | 68573-000 | MOTOR, ELECTRIC 24 VOLT D.C.    | 2       |
| *    | 68573-010 | BRUSHES, (PAIR)                 | 1       |
| 211  | **        | COUPLING                        | 2       |
| 212  | **        | MOUNTING PLATE                  | 2       |
| 213  | **        | SCREW R.H. #2-56 X 1/4          | 6       |
| 214  | **        | WASHER                          | 6       |
| 215  | 68551-001 | TACH ASSY KIT (ITEMS 211 - 214) | 2       |
| 216  | **        | GASKET                          | 4       |
| 217  | 10070-099 | SEAL STRIP, GASKET              | 2.13 FT |
| 218  | 03495-000 | 90° ELBOW, STREET 6MB-6FJ       | 2       |
| 219  | 11936-001 | FITTING, TEE 4MJ-4MJ-4MB        | 1       |
| 220  | 14048-010 | FITTING ADAPT 4FP-4FJ           | 1       |
| 221  | 68783-000 | PRESSURE SNUBBER                | 1       |
| 222  | 63921-007 | PRESSURE SWITCH                 | 1       |
| 223  | 11715-004 | SCREW RD HD #6-32 X 1/2         | 2       |
| 224  | 11248-047 | NUT #6-32 HEX                   | 2       |
| 225  | 29961-000 | INLET                           | 1       |
| 226  | 29961-001 | SEAL                            | 1       |
| 227  | 29945-VAR | LEVEL SENSOR (SEE FINAL ASSY)   | REF     |
| 229  | 68982-000 | FUEL CAP, DIESEL                | 1       |
| 230  | 68969-000 | FUEL TANK, BI-ENERGY PLASTIC    | 1       |
| 232  | 68940-000 | AIR INLET DUCT WELDMENT         | 1       |
| 233  | 63674-012 | SCREW HHC M6 X 1.0 X 12 MM      | 6       |
| 234  | 20541-013 | HOSE CLAMP, GEAR TYPE #28       | 2       |
| 235  | 20331-000 | FUEL FILTER                     | 1       |
| 236  | 68946-000 | OIL FILL TUBE                   | 1       |
| 237  | 11238-006 | WASHER, SPLIT LOCK 3/8          | 5       |
| 238  | 11254-010 | SCREW, HHC 3/8-16 UNC X 1 1/4   | 14      |
| 239  | 68757-001 | LATCH, DRAW                     | 2       |
| 240  | 11715-004 | SCREW, #6-32 X 1/2              | 4       |
| 241  | 11240-001 | WASHER, FLAT #6                 | 4       |
| 242  | 11248-047 | LOCK NUT, #6-32 ESNA            | 6       |
| 243  | 11240-005 | WASHER, 5/16 FLAT               | 6       |
| 244  | 11250-005 | NUT, HEX 5/16-18 UNC            | 2       |
| 245  | 68549-000 | BATTERY HOLD-DOWN BAR           | 1       |
| 246  | 12039-000 | ROD, BATTERY HOLD-DOWN          | 2       |
| 247  | 64275-048 | BATTERY CABLE                   | 2       |
| 248  | 62299-002 | BATTERY 12V DC                  | 1       |
| 249  | 11240-004 | WASHER, 1/4 FLAT STD            | 29      |

\*\*Item 211 - 214 included with item 215.

\* Not Shown

\*\* Item 45,46,47 included with item 6.

See page 3-15 for detail of Front Hub  
Repair Kit

# Illustrated Parts Breakdown

Section  
6.2

## CHASSIS ASSEMBLY, AB46 BI-ENERGY - EURO 68317-000

| ITEM | PART      | DESCRIPTION                      | QTY. |
|------|-----------|----------------------------------|------|
| 250  | 11248-004 | LOCKNUT, 1/4-20 ESNA             | 17   |
| 251  | 11252-008 | SCREW, HHC 1/4-20 X 1            | 4    |
| 252  | 68933-001 | GENERATOR BRACKET                | 1    |
| 253  | 68933-002 | GENERATOR ADJUSTING STRAP        | 1    |
| 254  | 68933-000 | GENERATOR                        | 1    |
| 255  | 68967-001 | MUFFLER                          | 1    |
| 256  | 68971-000 | AIR FILTER INLET HOSE            | 1    |
| 257  | 68974-000 | WELDMENT, EXHAUST PIPE BI-ENER.  | 1    |
| 258  | 68973-000 | EXHAUST TAIL PIPE                | 1    |
| 259  | 13259-006 | 1-1/2 MUFFLER CLAMP              | 2    |
| 260  | 68947-001 | SPROCKET - 38 TOOTH              | 1    |
| 261  | 14806-008 | BUSHING 7/8" "SH"                | 1    |
| 262  | 68947-000 | SPROCKET - 64 TOOTH              | 1    |
| 263  | 14806-009 | BUSHING 1-7/16" "SK"             | 1    |
| 264  | 68948-000 | BELT, HTD DRIVE                  | 1    |
| 265  | 68968-000 | FUEL TANK BRACKET                | 2    |
| 266  | 11240-007 | WASHER, FLAT STD 7/16            | 4    |
| 267  | 11255-020 | SCREW HHC 7/16-14 X 2 1/2 LG     | 2    |
| 268  | 11248-007 | NUT, 7/16-14 HEX                 | 2    |
| 269  | 11923-001 | REDUCER, PIPE 1/4 - 1/8          | 1    |
| 270  | 10178-001 | FITTING, BARB 1/8NPT X 3/16 HOSE | 1    |
| 271  | 10178-003 | FITTING, BARB 1/4NPT X 1/4 HOSE  | 1    |
| 272  | 11253-006 | SCREW HHC 5/16-18 X 3/4          | 4    |
| 273  | 11252-006 | SCREW HHC 1/4-20 X 3/4           | 2    |
| 274  | **        | WASHER, FLAT STD 1/2             | 1    |
| 275  | **        | SCREW HHC 1/2-13 X 1 1/2         | 1    |
| 276  | **        | SCREW HHC 1/2-13 X 5 1/2         | 1    |
| 277  | **        | NUT, HEX 1/2-13                  | 1    |
| 278  | 11252-008 | SCREW HHC 1/4-20 X 1             | 7    |
| 279  | 11240-006 | WASHER, FLAT STD 3/8             | 8    |
| 280  | 11248-006 | LOCKNUT 3/8-16 ESNA              | 1    |
| 281  | 11238-006 | LOCKWASHER 3/8"                  | 1    |
| 282  | 11254-006 | SCREW 3/8-16 X 3/4               | 1    |
| 283  | 14252-004 | NUT SERT, 1/4-20UNC              | 10   |
| 284  | 11252-004 | SCREW, 1/4-20 X 1/2              | 8    |
| 285  | 68981-000 | COVER PLATE (BOTTOM)             | 1    |
| 286  | 11238-004 | WASHER, 1/4 SPLIT LOCK           | 4    |

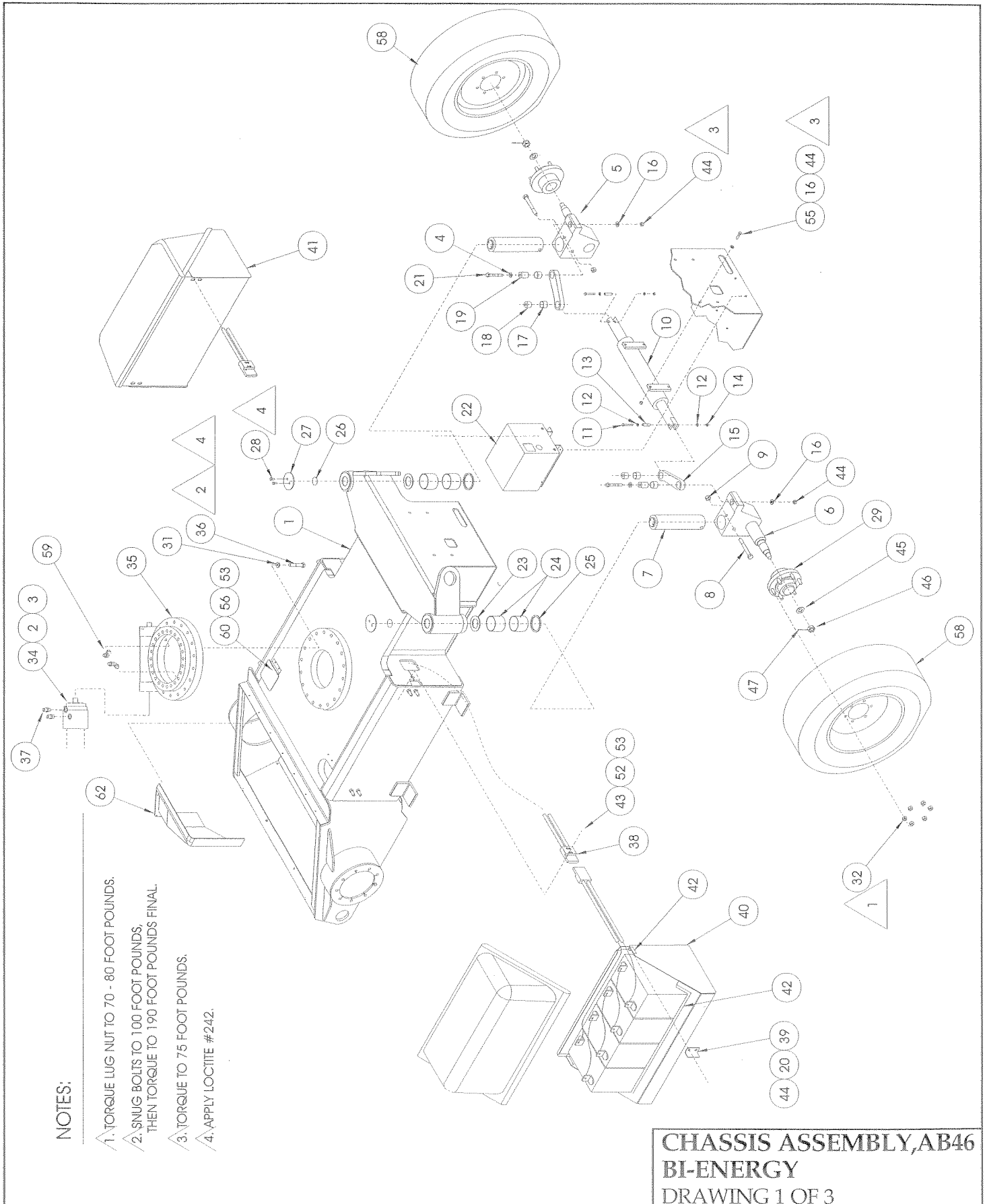
| ITEM | PART       | DESCRIPTION                  | QTY.    |
|------|------------|------------------------------|---------|
| 287  | 11250-004  | NUT, HEX 1/4-20 UNC          | 4       |
| 288  | 68788-000  | COVER, ELECTRICAL            | 1       |
| 289  | 12739-099  | HOSE, 1/4" I.D. FUEL         | 2.13 FT |
| 290  | 20541-001  | HOSE CLAMP #1                | 6       |
| 291  | 12736-099  | HOSE, 3/16" I.D.             | 3 FT    |
| 292  | 11934-026  | FITTING, 4MJ-4MJ 90°         | 1       |
| 293  | 11937-001  | FITTING, 4MJ-4FJ 90°         | 1       |
| 294  | 11256-010  | SCREW HHC 1/2-13 X 1 1/4     | 4       |
| 295  | 11240-008  | WASHER, FLAT STD 1/2         | 8       |
| 296  | 11248-008  | NUT, HEX 1/2-13 ESNA         | 4       |
| 297  | 69206-000  | HEAT SHIELD (BI-ENERGY)      | 1       |
| 301  | 068776-001 | CABLE ASSY. X 20" 3/8        | 1       |
| 302  | 068776-002 | CABLE ASSY. X 35" 3/8        | 1       |
| 303  | 068776-003 | CABLE ASSY. X 24" 3/8        | 1       |
| 304  | 068776-004 | CABLE ASSY. X 30" 3/8        | 1       |
| 305  | 068777-001 | CABLE ASSY. X 41" 5/16 X 3/8 | 1       |
| 306  | 068777-002 | CABLE ASSY. X 47" 5/16 X 3/8 | 1       |
| 307  | 068777-003 | CABLE ASSY. X 25" 5/16 X 3/8 | 1       |
| 308  | 068777-004 | CABLE ASSY. X 20" 5/16 X 3/8 | 1       |
| 309  | 068334-005 | CABLE ASSY. X 60" 5/16       | 1       |
| 310  | 068334-006 | CABLE ASSY. X 48" 5/16       | 1       |
| 311  | 029452-099 | WIRE, 16 GA. BLACK           | 5 FT    |
| 312  | 029451-099 | WIRE, 16 GA. WHITE           | 5 FT    |
| 213  | 029454-099 | WIRE, 16 GA. RED             | 5 FT    |
| 314  | 029457-099 | WIRE, 16 GA. GREEN           | 5 FT    |
| 315  | 029453-099 | WIRE, 16 GA. ORANGE          | 5 FT    |
| 316  | 029355-099 | WIRE, 16 GA. BLACK / RED     | 5 FT    |
| 317  | 029356-099 | WIRE, 16 GA. WHITE / RED     | 5 FT    |
| 318  | 014914-001 | CONN. MALE PUSH, 14-16 .25   | 1       |
| 319  | 029931-003 | CONN. FEM. PUSH, 14-16 .25   | 2       |
| 320  | 029601-012 | CONN. RING, 14-16 #8         | 8       |
| 321  | 029601-015 | CONN. RING, 14-16 Ø 3/8      | 1       |
| 322  | 029825-002 | DIODE, 3 AMP, 400 VOLT       | 2       |
| 323  | 029440-099 | CABLE, 12 GA. 3 COND. S.O    | 6 FT    |
| 324  | 068814-000 | TERMINAL, PIN                | 3       |
| 325  | 029361-099 | WIRE 16GA WHT/BLK            | 5 FT    |
| 326  | 068334-007 | CABLE ASSY X 35" 5/16        | 2       |

\*Not Shown

Item 216 included with item 210.

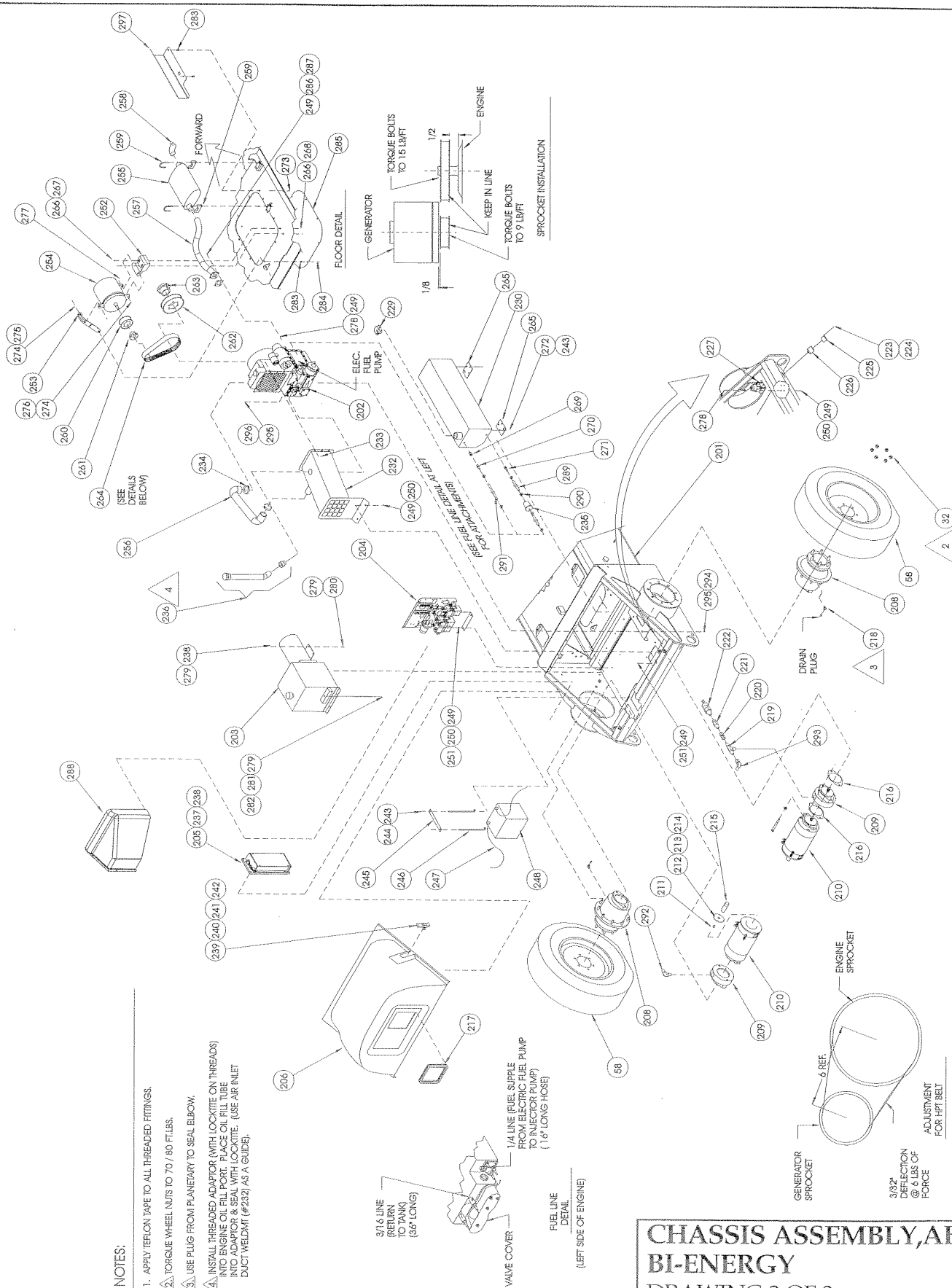
Item 274 - 277 included with item 254.

# Illustrated Parts Breakdown



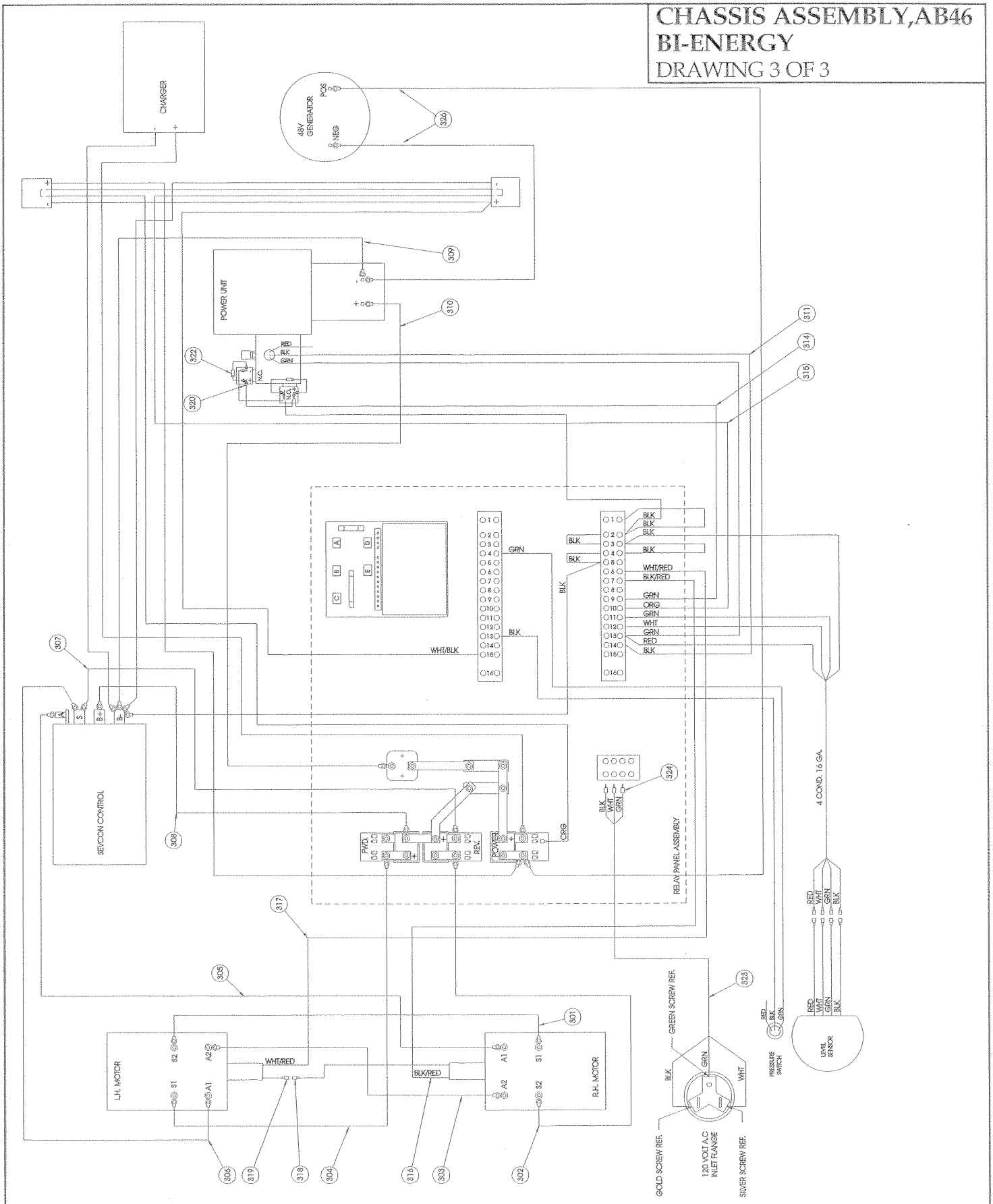
# Illustrated Parts Breakdown

Section  
6.2



# Illustrated Parts Breakdown

CHASSIS ASSEMBLY, AB46  
BI-ENERGY  
DRAWING 3 OF 3





# Illustrated Parts Breakdown

Section  
6.2

NOTES:

## LOWERBOOM LINKAGE ASSEMBLY

AB46

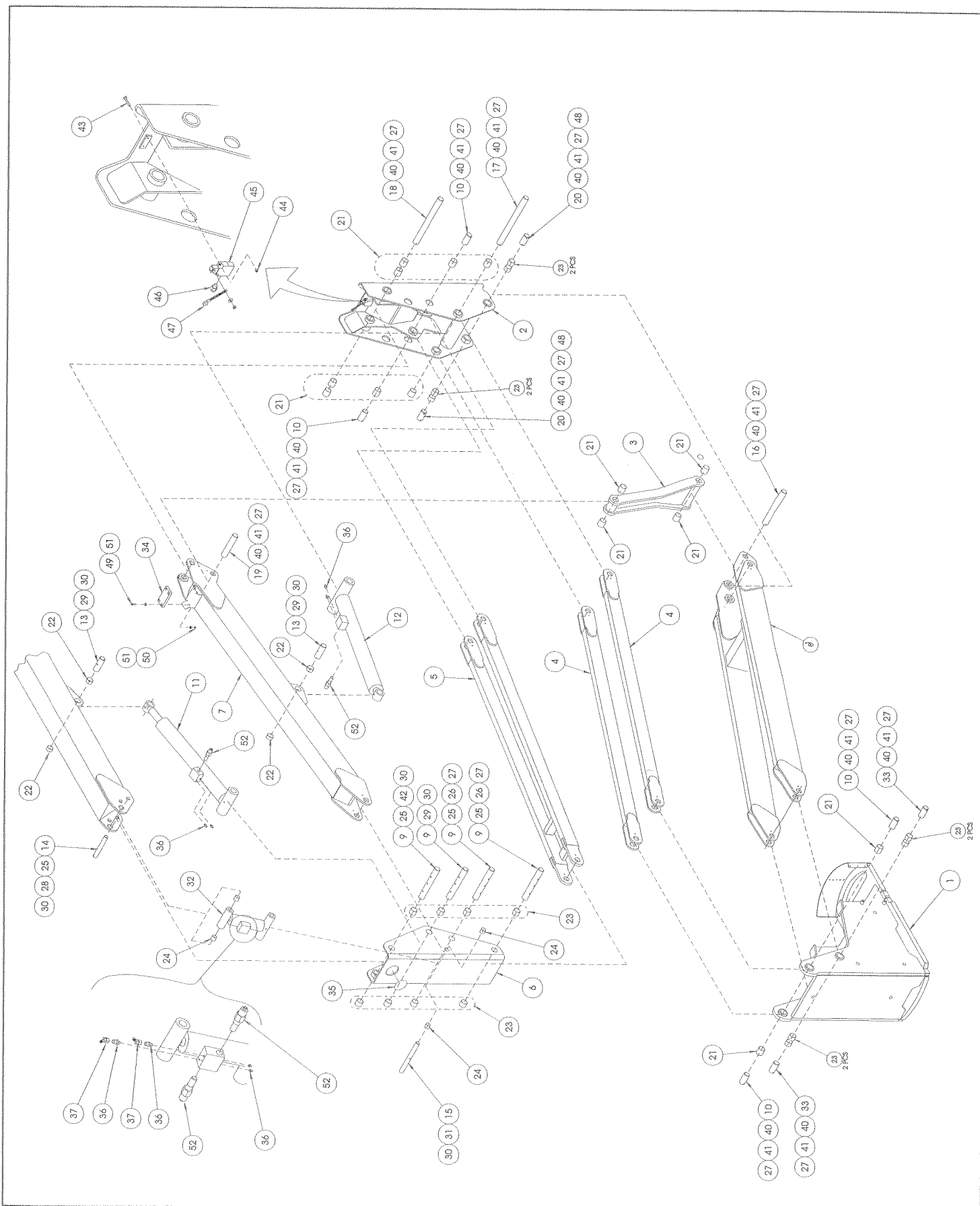
68323-000

| ITEM | PART      | DESCRIPTION                     | QTY. |
|------|-----------|---------------------------------|------|
| 1    | 68330-000 | TURRET ASSEMBLY                 | REF  |
| 2    | 68397-000 | RISER POST WELDMENT             | 1    |
| 3    | 68399-000 | TENSION LINK WELDMENT           | 1    |
| 4    | 68400-000 | 1ST. TENSION RAIL WELDMENT      | 2    |
| 5    | 68543-000 | 2ND. TENSION RAIL WELDMENT      | 1    |
| 6    | 68412-000 | FRONT RISER WELDMENT            | 1    |
| 7    | 68415-000 | 2ND. RISER BOOM WELDMENT        | 1    |
| 8    | 68417-000 | 1ST. RISER BOOM WELDMENT        | 1    |
| 9    | 68475-000 | PIN, 1.75 DIA. X 12.25 LG.      | 4    |
| 10   | 68477-001 | PIN, 1.75 DIA. X 3.75 LG.       | 4    |
| 11   | 68451-000 | CYLINDER, BOOM RAISE            | 1    |
| *    | 68451-010 | SEAL KIT, BOOM                  | 1    |
| 12   | 68450-000 | CYLINDER, BOOM RISER            | 1    |
| *    | 68450-010 | SEAL KIT, RISER                 | 1    |
| 13   | 68477-007 | PIN, 1.75 DIA. X 5.00 LG.       | 2    |
| 14   | 68796-002 | PIN, 1.50 DIA. X 8.50 LG.       | 1    |
| 15   | 68796-001 | PIN, 1.50 DIA. X 12.25 LG.      | 1    |
| 16   | 68477-005 | PIN, 1.75 DIA. X 13.75 LG.      | 1    |
| 17   | 68477-003 | PIN, 1.75 DIA. X 19.50 LG.      | 1    |
| 18   | 68477-002 | PIN, 1.75 DIA. X 16.50 LG.      | 1    |
| 19   | 68477-006 | PIN, 1.75 DIA. X 8.63 LG.       | 1    |
| 20   | 68794-000 | PIN, 1.75 DIA. X 5.88 LG.       | 2    |
| 21   | 62642-034 | BUSHING, Ø 1.75 X 2 (28DU32)    | 14   |
| 22   | 62642-028 | BUSHING, Ø 1.75 X 1 (28DU16)    | 4    |
| 23   | 62642-031 | BUSHING, Ø 1.75 X 1.50 (28DU24) | 16   |
| 24   | 62642-036 | BUSHING, Ø 1.50 X 1.25 (24DU20) | 4    |
| 25   | 65214-000 | ROD END (PIN RETAINER) 3/8"     | 4    |
| 26   | 11254-006 | SCR, HHC 3/8-16UNC X 3/4        | 14   |
| 27   | 11238-006 | LOCKWASHER, SPLIT RING 3/8      | 14   |
| 28   | 11254-012 | SCR, HHC 3/8-16UNC X 1 1/2      | 2    |
| 29   | 11254-028 | SCR, HHC 3/8-16UNC X 3 1/2      | 3    |
| 30   | 11248-006 | LOCKNUT, HEX 3/8-16UNC (ESNA)   | 6    |
| 31   | 11254-024 | SCR, HHC 3/8-16UNC X 3          | 1    |
| 32   | 68454-000 | MASTER CYLINDER                 | 1    |
| *    | 68454-010 | SEAL KIT, MASTER                | 1    |
| 33   | 68477-008 | PIN, 1.75 DIA X 4.75 LG.        | 2    |
| 34   | 68660-000 | REST PAD                        | 1    |
| 35   | 66516-004 | CAP, 4"                         | 1    |
| 36   | 11941-004 | FITTING, STR 6MB-4MJ            | 6    |
| 37   | 11932-001 | FITTING, 45° 4FJX-4MJ           | 2    |
| 40   | 65214-001 | ROD END (PIN RETAINER) 1/2"     | 12   |
| 41   | 11254-010 | SCREW HHC 3/8-16UNC X 1-1/4"    | 12   |
| 42   | 11254-014 | SCREW HHC 3/8-16UNC X 1-3/4"    | 1    |
| 43   | 11709-014 | SCREW RD HD 10-24 X 1-3/4"      | 2    |
| 44   | 11248-003 | NUT, 10-24 ESNA                 | 2    |
| 45   | 68556-000 | SWITCH                          | 1    |
| 46   | 29925-000 | STRAIN RELIEF                   | 1    |
| 47   | 68556-001 | LEVER                           | 1    |
| 48   | 11739-020 | ROLL PIN 3/8 X 2-1/2            | 2    |
| 49   | 11253-010 | SCREW HHC 5/16-18 UNC X 1 1/4   | 4    |
| 50   | 11248-005 | LOCKNUT HEX 5/16-18 UNC ESNA    | 4    |
| 51   | 14996-005 | WASHER 5/16 SAE FLAT            | 8    |
| 52   | 68778-000 | VALVE, COUNTERBALANCE           | 4    |

\* Not Shown

# Illustrated Parts Breakdown

Section  
6.2



## UPPER BOOM LINKAGE ASSEMBLY

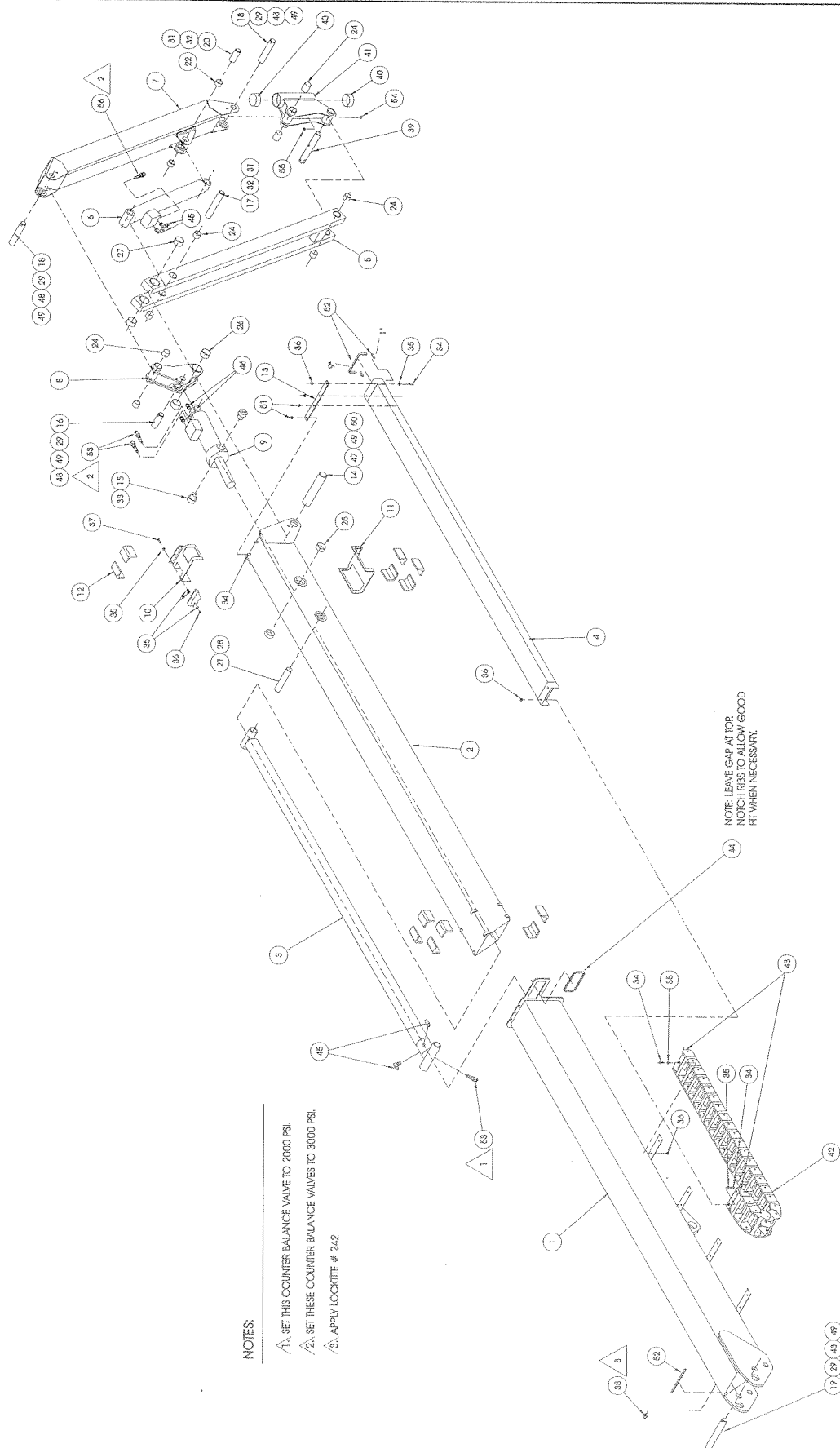
AB46

68322-000

| ITEM | PART      | DESCRIPTION                      | QTY.    |
|------|-----------|----------------------------------|---------|
| 1    | 68497-000 | TOP (OUTER) BOOM WELDMENT        | 1       |
| 2    | 68496-000 | TOP (INNER) BOOM WELDMENT        | 1       |
| 3    | 68452-000 | BOOM EXTEND CYLINDER             | 1       |
| *    | 68452-010 | SEAL KIT, EXTEND                 | 1       |
| 4    | 68479-000 | EXTENSION TUBE WELDMENT          | 1       |
| 5    | 68447-000 | LEVELING TUBE WELDMENT           | 1       |
| 6    | 68453-001 | JIB CYLINDER                     | 1       |
| *    | 68453-010 | SEAL KIT, JIB CY.                | 1       |
| 7    | 68439-000 | JIB BOOM WELDMENT                | 1       |
| 8    | 68438-000 | SWINGING FRAME WELDMENT          | 1       |
| 9    | 68455-000 | SLAVE CYLINDER                   | 1       |
| *    | 68455-010 | SEAL KIT, SLAVE                  | 1       |
| 10   | 68436-000 | UPPER BEARING PAD CASSETTE       | 1       |
| 11   | 68435-000 | LOWER BEARING PAD CASSETTE       | 1       |
| 12   | 68423-000 | WEAR PAD                         | 12      |
| 13   | 68492-000 | EXT. TUBE MTC. BRACKET           | 1       |
| 14   | 68477-006 | PIN, JIB ASSY. PIVOT             | 1       |
| 15   | 68473-000 | PIN, SLAVE CYL. TRUNNION         | 2       |
| 16   | 68476-005 | PIN, SLAVE CYL. ROD END          | 1       |
| 17   | 68476-006 | PIN, JIB CYL. BASE               | 1       |
| 18   | 68476-003 | PIN, BOOM PIVOT                  | 2       |
| 19   | 68476-002 | PIN, TELESCOPIC CYL. BASE        | 1       |
| 20   | 68476-004 | PIN, JIB CYL. ROD END            | 1       |
| 21   | 68474-000 | PIN, TELESCOPIC CYL. ROD END     | 1       |
| 22   | 62642-024 | BUSHING, Ø 1.25 X .75 (20DU12)   | 2       |
| 24   | 62642-025 | BUSHING, Ø 1.25 X 1.75 (20DU28)  | 8       |
| 25   | 62642-027 | BUSHING, Ø 1.75 X .75 (28DU12)   | 2       |
| 26   | 62642-031 | BUSHING, Ø 1.75 X 1.50 (28DU24)  | 2       |
| 27   | 62642-029 | BUSHING, Ø 1.75 X 1.75 (28DU28)  | 2       |
| 28   | 11764-120 | RETAINING RING, TRUARC #5100-125 | 2       |
| 29   | 65214-000 | ROD END (PIN RETAINER)           | 4       |
| 31   | 11248-006 | LOCKNUT, HEX. 3/8-16 UNC (ESNA)  | 2       |
| 32   | 11254-020 | SCR, HHC 3/8-16 UNC X 2 1/2      | 2       |
| 33   | 12553-014 | SCR, SOC HD. 1/4-20 UNC X 1 3/4  | 4       |
| 34   | 11822-006 | SCR, BUTT. HD. 5/16-18 UNC X 3/4 | 8       |
| 35   | 14996-005 | WASHER, FLAT 5/16 S.A.E.         | 30      |
| 36   | 11248-005 | LOCKNUT, HEX. 5/16-18 UNC (ESNA) | 12      |
| 37   | 11253-010 | SCR, HHC. 5/16-18 X 1 1/4        | 6       |
| 38   | 62881-000 | SWITCH, BALL DETENT              | 1       |
| 39   | 68508-000 | PIN, LOWER                       | 1       |
| 40   | 62642-040 | BUSHING, Ø 2.50 X 1.00 (40DU16)  | 2       |
| 41   | 68470-000 | PIVOT BRACKET WELDMENT           | 1       |
| 42   | 68691-022 | CAT TRACK (22 LINKS)             | 1       |
| 43   | REF.      | MOUNTING BRACKET (SET)           | 1       |
| 44   | 68701-099 | WEAR STRIP, POLYETHYLENE         | 1.33 FT |
| 45   | 11934-003 | FITTING 6-4                      | 4       |
| 46   | 11941-001 | FITTING 6-4                      | 2       |
| 47   | 65214-001 | ROD END                          | 1       |
| 48   | 11254-010 | SCREW HHC 3/8-16UNC X 1 1/4      | 4       |
| 49   | 11238-006 | WASHER, 3/8 SPLIT LOCK           | 5       |
| 50   | 11254-008 | SCREW, HHC 3/8-16UNC X 1         | 1       |
| 51   | 11246-005 | NUT, HEX ESNA 5/16-18UNC         | 2       |
| 52   | 61692-099 | GROMMET (EDGE COVER)             | 1.5 FT  |
| 53   | 68778-000 | VALVE, COUNTER BALANCE           | 3       |
| 54   | 11253-020 | SCREW HHC 5/16-18 X 2 1/2        | 1       |
| 55   | 11248-005 | NUT HEX ESNA 5/16-18UNC          | 1       |
| 56   | 68778-001 | VALVE, COUNTER BALANCE           | 1       |

# Illustrated Parts Breakdown

Section  
6.2



# Illustrated Parts Breakdown

## TURRET ASSEMBLY, AB46 ELECTRIC - EURO 68330-000

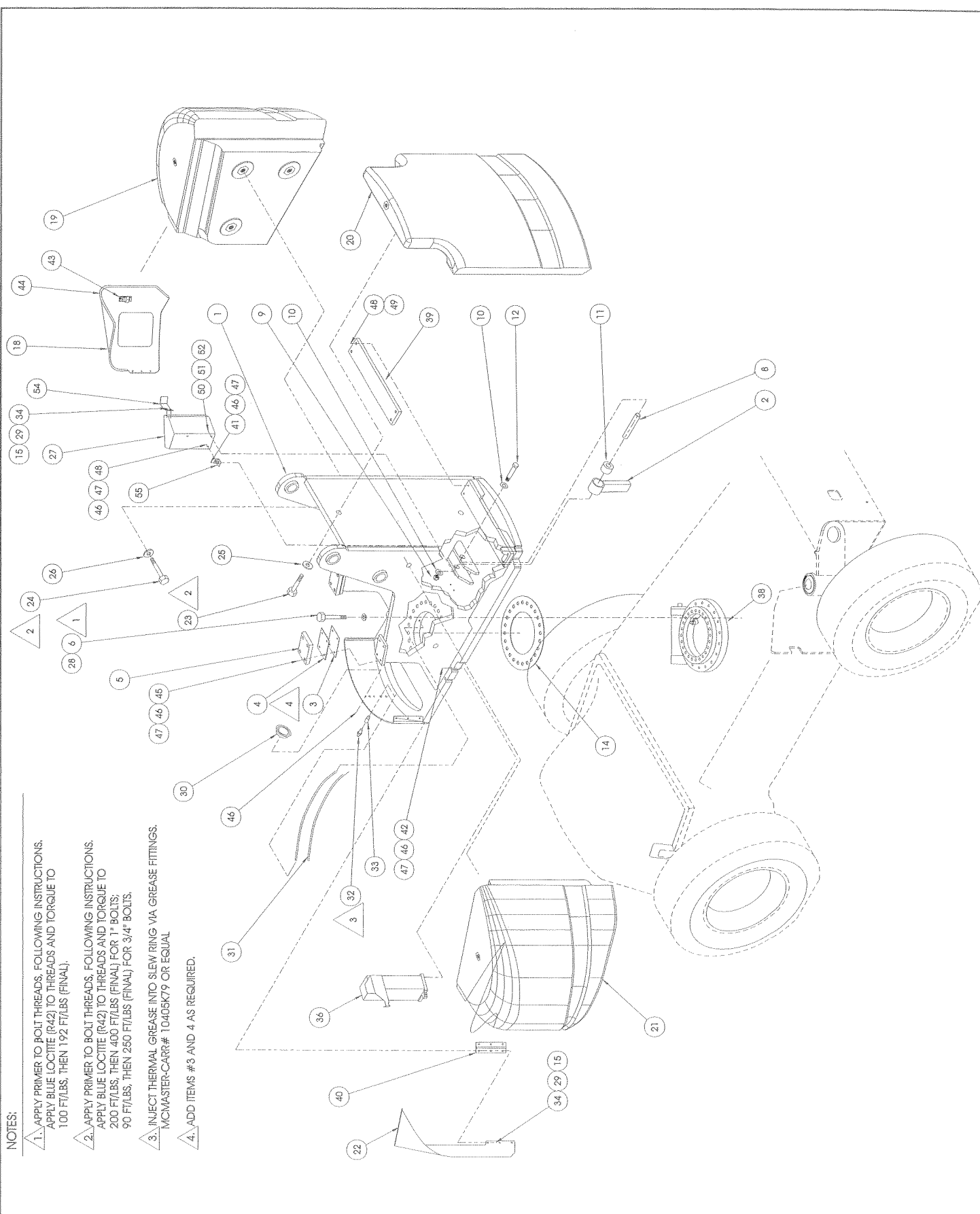
| ITEM | PART      | DESCRIPTION                         | QTY. |
|------|-----------|-------------------------------------|------|
| 1    | 68392-000 | TURRET POST WELDMENT                | 1    |
| 2    | 68485-000 | STOP WELDMENT                       | 1    |
| 3    | 68319-000 | SHIM, 16GA, REST PAD                | 4    |
| 4    | 68319-001 | SHIM, 10GA, REST PAD                | 4    |
| 5    | 68660-000 | REST PAD                            | 2    |
| 6    | 11291-032 | SCREW, HHC 5/8-11 X 4 GR 8          | 24   |
| 8    | 68478-000 | TUBE, STL 1"O.D. X .120W X 3.10" LG | 1    |
| 9    | 11248-012 | NUT, HEX ESNA 3/4-10 ESNA           | 1    |
| 10   | 11240-012 | WASHER 3/4 STL                      | 2    |
| 11   | 68720-002 | NEOPRENE SPRING CYLINDER-POLY.      | 1    |
| 12   | 14099-036 | SCREW, HHC 3/4-10 X 4-1/2           | 1    |
| 14   | 68472-000 | SHIM RING                           | 1    |
| 15   | 11248-004 | NUT, HEX ESNA 1/4-20                | 16   |
| 18   | 68656-000 | COVER TRIM, GROUND CONTROL          | 1    |
| 19   | 68653-000 | COUNTER WEIGHT, LEFT SIDE           | 1    |
| 20   | 68652-000 | COUNTER WEIGHT, REAR                | 1    |
| 21   | 68654-000 | COUNTER WEIGHT, RIGHT SIDE          | 1    |
| 22   | 68657-000 | COVER TRIM, VALVE BLOCK             | 1    |
| 23   | 14099-012 | SCREW HHC, 3/4-10UNC X 1-1/2        | 2    |
| 24   | 14918-020 | SCREW HHC, 1-8UNC X 2-1/2           | 6    |
| 25   | 11239-012 | WASHER FLAT ASTM 3/4" A325          | 2    |
| 26   | 11240-016 | WASHER FLAT 1" STD                  | 6    |
| 27   | 68328-000 | LOWER CONTROL BOX-ELEC              | 1    |
| 28   | 11297-010 | BELLEVILLE WASHER 5/8 DIA           | 24   |
| 29   | 11240-004 | WASHER, 1/4 FLAT STD                | 30   |
| 30   | 29958-000 | HORN, 24 VOLT                       | 1    |
| 31   | 68678-024 | TUBING, POLYURETHANE 24"            | 2    |
| 32   | 13336-001 | FITTING, GREASE                     | 2    |
| 33   | 68679-003 | FITTING, BULKHEAD                   | 2    |
| 34   | 11252-006 | SCREW, HHC 1/4-20 X 3/4             | 14   |
| 36   | 68348-000 | VALVE BLOCK ASSY-ELEC               | 1    |
| 38   | REF       | DRIVE WORM GEAR (68571)             | REF  |
| 39   | 68660-001 | REST PAD                            | 1    |
| 40   | 68759-000 | HINGE, TURRET COVER                 | 2    |
| 41   | 11253-018 | SCRW HHC GR5 5/16-18 X 1-1/2        | 1    |
| 42   | 11253-022 | SCRW HHC GR5 5/16-18 X 2-3/4        | 2    |
| 43   | 68757-002 | LATCH, SOUTHCO                      | 2    |
| 44   | 61692-099 | GROMMET MATERIAL                    | 10FT |
| 45   | 11253-012 | SCRW HHC GR5 5/16-18 X 1-1/2        | 8    |
| 46   | 11248-005 | NUT HEX 5/16-18 ESNA                | 13   |
| 47   | 14996-005 | WASHER 5/16 FLAT SAE                | 22   |
| 48   | 11253-006 | SCRW HHC GR5 5/16-18 X 3/4          | 5    |
| 49   | 11238-005 | WASHER, SPLIT LOCK 5/16             | 4    |
| 50   | 11254-006 | SCRW HHC GR5 3/8-16 UNC X 3/4       | 6    |
| 51   | 11238-006 | WASHER, SPLIT LOCK 3/8              | 6    |
| 52   | 14996-006 | WASHER, 3/8 FLAT SAE                | 6    |
| 54   | 68792-000 | BRACKET                             | 1    |
| 55   | 68793-000 | BRACKET                             | 1    |

## TURRET ASSEMBLY, AB46 BI-ENERGY - EURO 68330-003

| ITEM | PART      | DESCRIPTION                         | QTY. |
|------|-----------|-------------------------------------|------|
| 1    | 68392-000 | TURRET POST WELDMENT                | 1    |
| 2    | 68485-000 | STOP WELDMENT                       | 1    |
| 3    | 68319-000 | SHIM, 16GA, REST PAD                | 4    |
| 4    | 68319-001 | SHIM, 10GA, REST PAD                | 4    |
| 5    | 68660-000 | REST PAD                            | 2    |
| 6    | 11291-032 | SCREW, HHC 5/8-11 X 4 GR 8          | 24   |
| 8    | 68478-000 | TUBE, STL 1"O.D. X .120W X 3.10" LG | 1    |
| 9    | 11248-012 | NUT, HEX ESNA 3/4-10 ESNA           | 1    |
| 10   | 11240-012 | WASHER 3/4 STL                      | 2    |
| 11   | 68720-002 | NEOPRENE SPRING CYLINDER-POLY.      | 1    |
| 12   | 14099-036 | SCREW, HHC 3/4-10 X 4-1/2           | 1    |
| 14   | 68472-000 | SHIM RING                           | 1    |
| 15   | 11248-004 | NUT, HEX ESNA 1/4-20                | 16   |
| 18   | 68656-000 | COVER TRIM, GROUND CONTROL          | 1    |
| 19   | 68653-000 | COUNTER WEIGHT, LEFT SIDE           | 1    |
| 20   | 68652-000 | COUNTER WEIGHT, REAR                | 1    |
| 21   | 68654-000 | COUNTER WEIGHT, RIGHT SIDE          | 1    |
| 22   | 68657-000 | COVER TRIM, VALVE BLOCK             | 1    |
| 23   | 14099-012 | SCREW HHC, 3/4-10UNC X 1-1/2        | 2    |
| 24   | 14918-020 | SCREW HHC, 1-8UNC X 2-1/2           | 6    |
| 25   | 11239-012 | WASHER FLAT ASTM 3/4" A325          | 2    |
| 26   | 11240-016 | WASHER FLAT 1" STD                  | 6    |
| 27   | 68328-003 | LOWER CONTROL BOX BI-ENERGY         | 1    |
| 28   | 11297-010 | BELLEVILLE WASHER 5/8 DIA           | 24   |
| 29   | 11240-004 | WASHER, 1/4 FLAT STD                | 30   |
| 30   | 29958-000 | HORN, 24 VOLT                       | 1    |
| 31   | 68678-024 | TUBING, POLYURETHANE 24"            | 2    |
| 32   | 13336-001 | FITTING, GREASE                     | 2    |
| 33   | 68679-003 | FITTING, BULKHEAD                   | 2    |
| 34   | 11252-006 | SCREW, HHC 1/4-20 X 3/4             | 14   |
| 36   | 68348-000 | VALVE BLOCK ASSY-ELEC               | 1    |
| 38   | REF       | DRIVE WORM GEAR (68571)             | REF  |
| 39   | 68660-001 | REST PAD                            | 1    |
| 40   | 68759-000 | HINGE, TURRET COVER                 | 2    |
| 41   | 11253-018 | SCRW HHC GR5 5/16-18 X 1-1/2        | 1    |
| 42   | 11253-022 | SCRW HHC GR5 5/16-18 X 2-3/4        | 2    |
| 43   | 68757-002 | LATCH, SOUTHCO                      | 2    |
| 44   | 61692-099 | GROMMET MATERIAL                    | 10FT |
| 45   | 11253-012 | SCRW HHC GR5 5/16-18 X 1-1/2        | 8    |
| 46   | 11248-005 | NUT HEX 5/16-18 ESNA                | 13   |
| 47   | 14996-005 | WASHER 5/16 FLAT SAE                | 22   |
| 48   | 11253-006 | SCRW HHC GR5 5/16-18 X 3/4          | 5    |
| 49   | 11238-005 | WASHER, SPLIT LOCK 5/16             | 4    |
| 50   | 11254-006 | SCRW HHC GR5 3/8-16 UNC X 3/4       | 6    |
| 51   | 11238-006 | WASHER, SPLIT LOCK 3/8              | 6    |
| 52   | 14996-006 | WASHER, 3/8 FLAT SAE                | 6    |
| 54   | 68792-000 | BRACKET                             | 1    |
| 55   | 68793-000 | BRACKET                             | 1    |

# Illustrated Parts Breakdown

Section  
6.2



# Illustrated Parts Breakdown

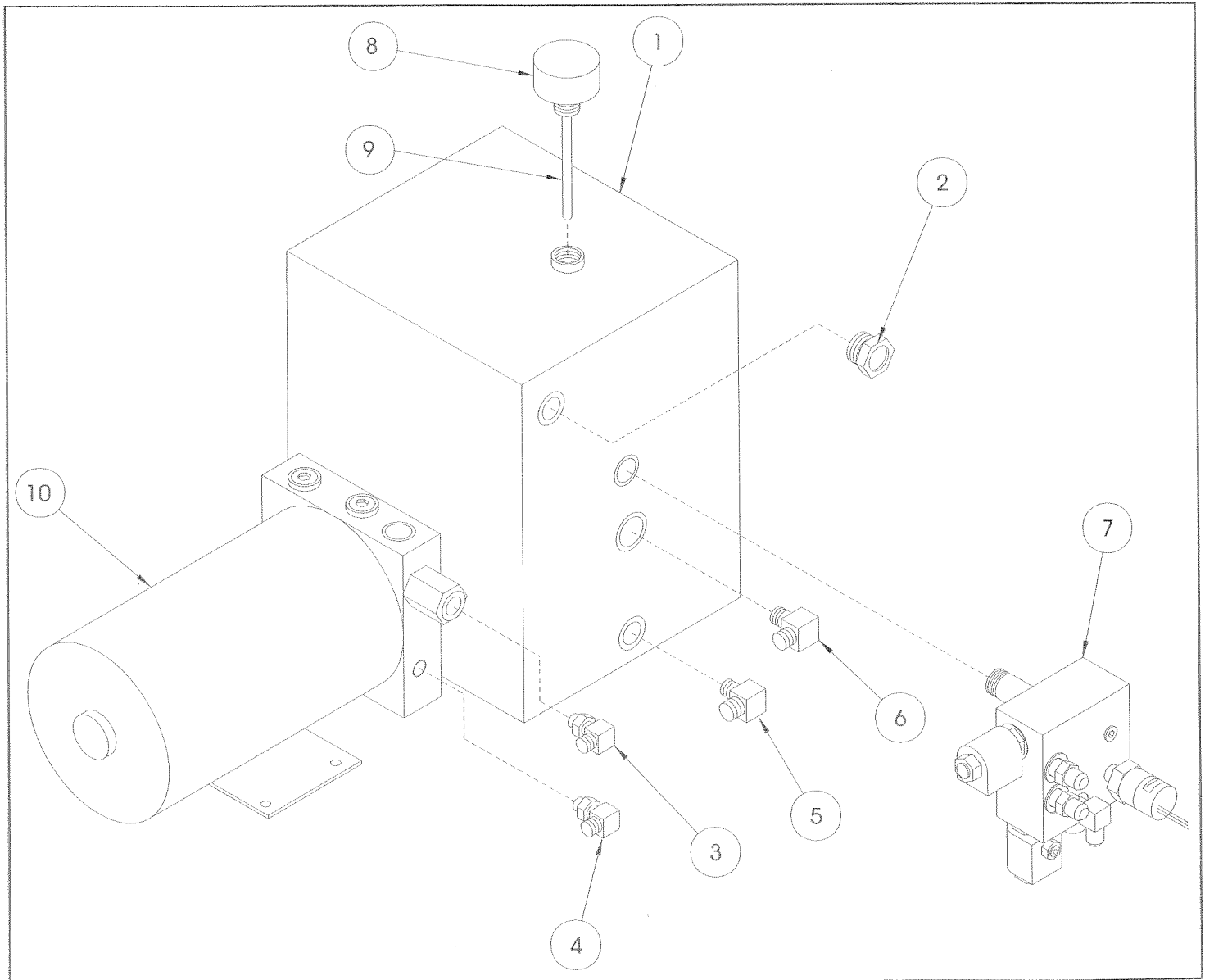
## POWER UNIT ASSEMBLY, AB46

### ELECTRIC

68326-000

| ITEM | PART      | DESCRIPTION             | QTY. |
|------|-----------|-------------------------|------|
| 1    | 68554-000 | POWER UNIT & TANK       | 1    |
| *    | 68554-012 | PUMP                    | 1    |
| 2    | 63979-006 | CAGE, LUBE SIGHT        | 1    |
| 3    | 11934-003 | FITTING 90° 6MB - 4MJ   | 1    |
| 4    | 11934-004 | FITTING 90° 6MB - 6MJ   | 1    |
| 5    | 11940-010 | FITTING 90° 6MP - 6MJ   | 1    |
| 6    | 11940-019 | FITTING 90° 12MP - 10MJ | 1    |
| 7    | 68324-000 | BRAKE VALVE BLOCK ASSY  | 1    |
| 8    | 68554-019 | BREATHER                | 1    |
| 9    | 68554-018 | DIPSTICK                | 1    |
| 10   | 68554-010 | ELECTRIC MOTOR          | 1    |
| *    | 68554-011 | BRUSHES                 | 1    |

\* Not Shown



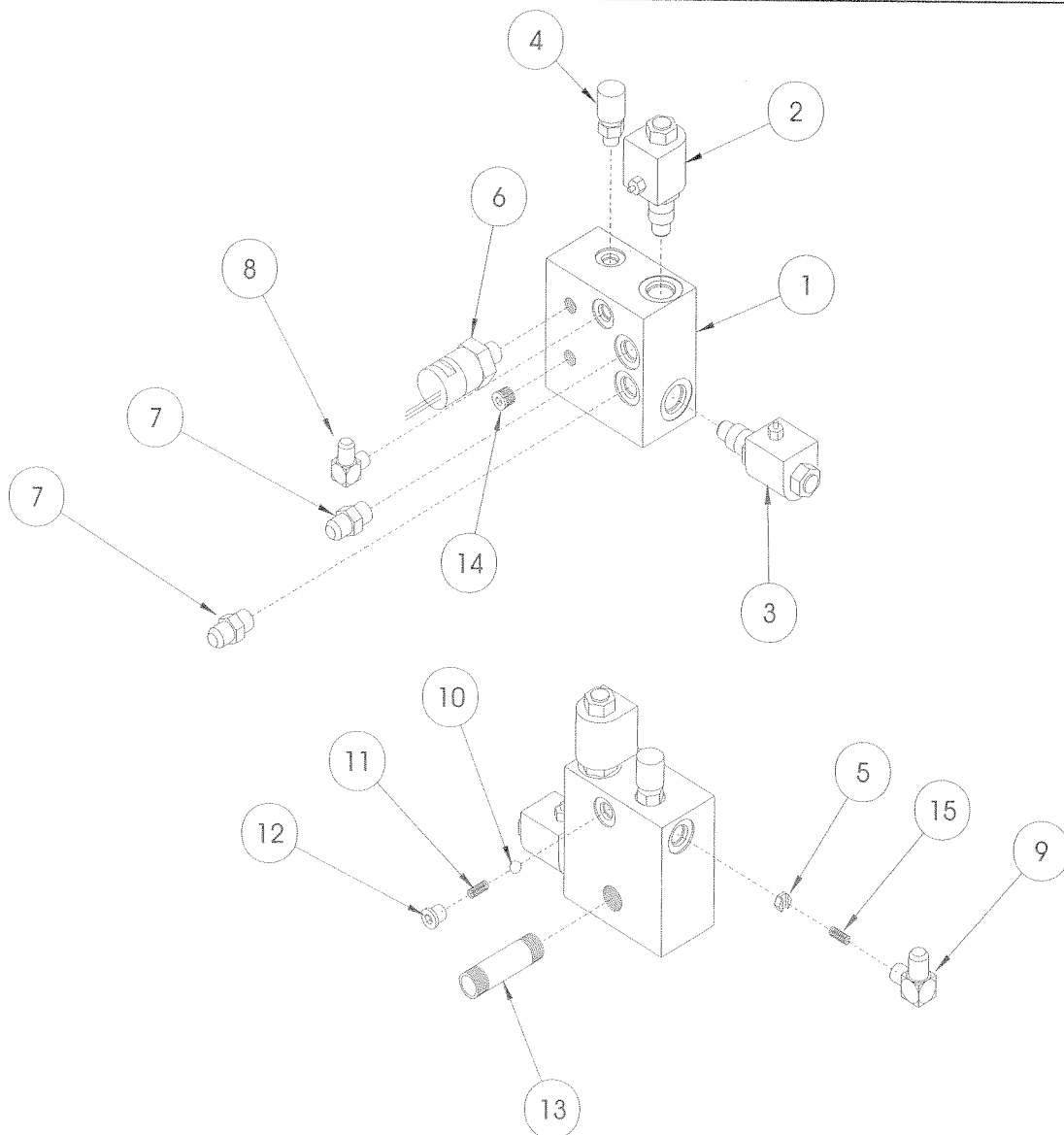


# Illustrated Parts Breakdown

Section  
6.2

## BRAKE VALVE BLOCK ASSEMBLY AB46, ELECTRIC 68324-000

| ITEM | PART      | DESCRIPTION                          | QTY. |
|------|-----------|--------------------------------------|------|
| 1    | 68481-000 | VALVE BLOCK, BRAKE                   | 1    |
| 2    | 68553-000 | VALVE, POPPET N.C. 48VDC             | 1    |
| 3    | 68674-000 | VALVE, POPPET N.O. 48VDC             | 1    |
| 4    | 63965-001 | PLUG, GUAGE PORT                     | 1    |
| 5    | 15919-002 | ORIFICE, CESSNA 815                  | 1    |
| 6    | 63921-010 | PRESSURE SWITCH,                     | 1    |
| 7    | 11941-005 | STR. ADAPTER #6 SAE - #6 JIC         | 2    |
| 8    | 11934-001 | ELBOW 90° #4 SAE - #4 JIC            | 1    |
| 9    | 11934-004 | ELBOW 90° #6 SAE - #6 JIC            | 1    |
| 10   | 05135-000 | STEEL BALL, 5/16" DIA.               | 1    |
| 11   | 13987-009 | SPRING, 1/4 DIA. X 19/32 LG.         | 1    |
| 12   | 12004-004 | PLUG, #4 SAE                         | 1    |
| 13   | 14021-005 | PIPE NIPPLE 1/2" SCH 40 X 2 1/2" LG. | 1    |
| 14   | 11920-002 | PLUG, PIPE SOC HD 1/4-18 NPTF        | 1    |
| 15   | 68798-001 | SPRING 3/8 OD .035WIRE X 1 1/4 LG    | 1    |



# Illustrated Parts Breakdown

## ENGINE ASSEMBLY, KUBOTA AB46, BI-ENERGY 68951-000

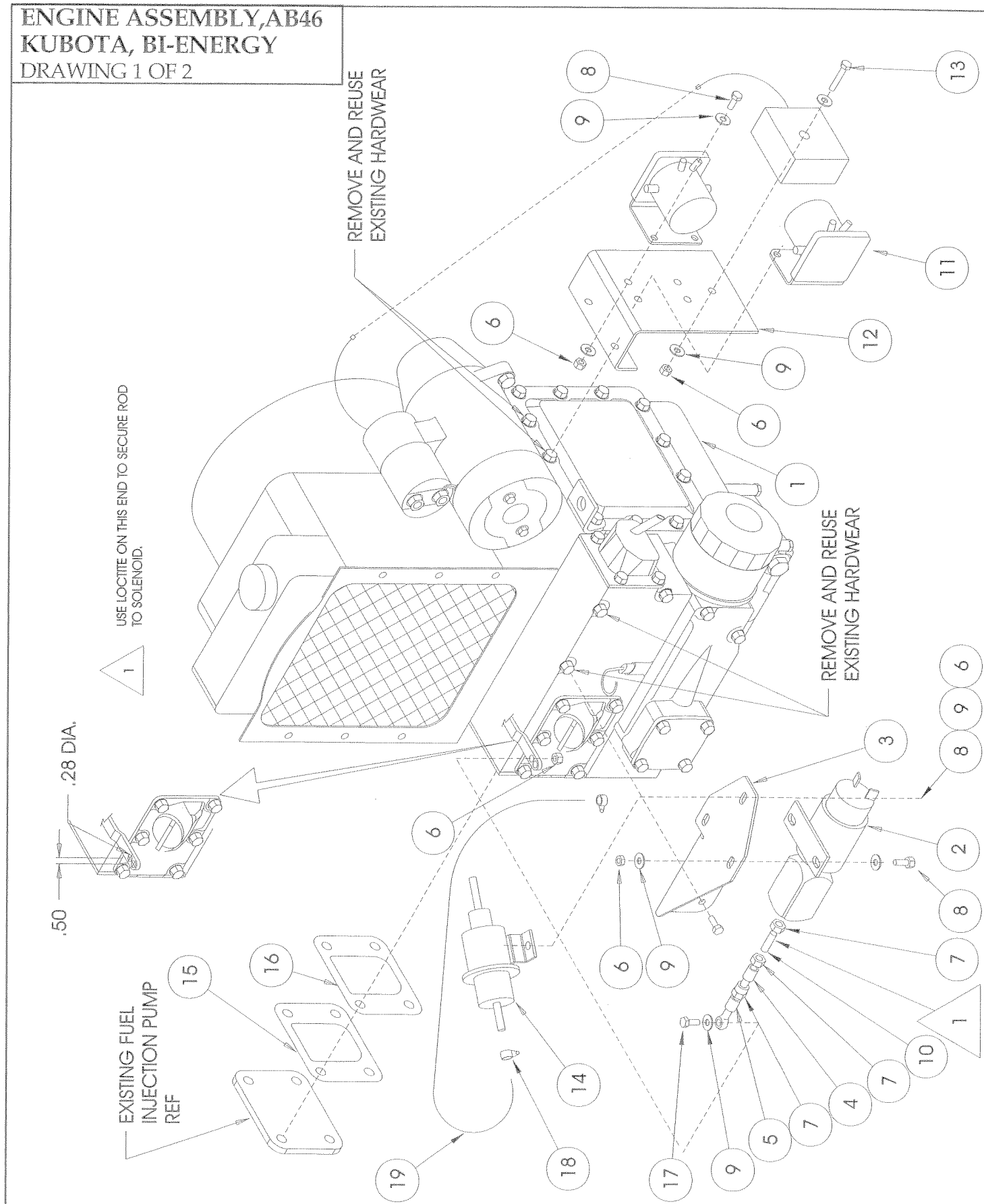
| ITEM | PART       | DESCRIPTION                        | QTY. |
|------|------------|------------------------------------|------|
| 1    | 068932-000 | ENGINE                             | 1    |
| *    | 68951-006  | AIR CLEANER ELEMENT                | 1    |
| *    | 68951-007  | FUEL FILTER                        | 1    |
| *    | 68951-008  | OIL FILTER ELEMENT                 | 1    |
| *    | 68951-009  | FAN BELT                           | 1    |
| 2    | 063941-011 | SOLENOID WITH INTERNAL THREADS     | 1    |
| 3    | 068936-000 | SOLENOID BRACKET                   | 1    |
| 4    | 064423-000 | INLINE SWIVEL                      | 1    |
| 5    | 011760-004 | ROD END BEARING                    | 1    |
| 6    | 011248-004 | NUT HEX ESNA 1/4-20UNC             | 9    |
| 7    | 020495-004 | NUT HEX JAM 1/4-28UNF              | 3    |
| 8    | 011252-006 | SCREW HHC 1/4-20UNC X 3/4          | 7    |
| 9    | 011240-004 | WASHER 1/4 STD FLAT                | 17   |
| 10   | 016776-003 | ROD, THREADED 1/4-24UNF X 3-3/4"LG | 1    |
| 11   | 027972-000 | STARTER SOLENOID                   | 2    |
| 12   | 068978-000 | STARTER SOLENOID BRACKET           | 1    |
| 13   | 011252-012 | SCREW HHC 1/4-20UNC X 1-1/2        | 1    |
| 101  | 029602-026 | CONN RING #2 3/8 DIA               | 6    |
| 102  | 029601-039 | CONN RING 12-10 GA. 5/16           | 2    |
| 103  | 029601-013 | CONN RING 16-14 GA. # 10           | 7    |
| 104  | 029702-000 | FUSE HOLDER                        | 1    |
| 105  | 029704-010 | FUSE 10 AMP                        | 1    |
| 107  | 029477-099 | WIRE 16 AWG ORG/BLK                | 6 FT |
| 109  | 029480-099 | WIRE 10 AWG RED                    | 2 FT |
| 110  | 029601-008 | CONN RING 18-22 GA 5/16            | 6    |
| 111  | 029620-002 | CONN BUTT 16-14 GA                 | 6    |
| 112  | 029620-003 | CONN BUTT 12-10 GA                 | 1    |
| 113  | 029351-099 | WIRE 16 AWG BLK/WHT                | 6 FT |
| 114  | 029450-099 | WIRE 16 AWG BLU                    | 6 FT |
| 115  | 029452-099 | WIRE 16 AWG BLK                    | 5 FT |
| 116  | 005491-099 | WIRE 16 AWG GRN/BLK                | 6 FT |
| 117  | 029479-099 | WIRE 16 AWG WHT/BLK                | 6 FT |
| 118  | 029454-099 | WIRE 16 AWG RED                    | 5 FT |
| 119  | 68762-000  | PIN - CONTACT                      | 5    |
| 121  | 68764-000  | PLUG - SEALING 12-14 GA.           | 7    |
| 122  | 068760-001 | CONNECTOR                          | 1    |
| 123  | 68761-000  | LOCK WEDGE - RECEPTACLE            | 1    |

\* Not Shown

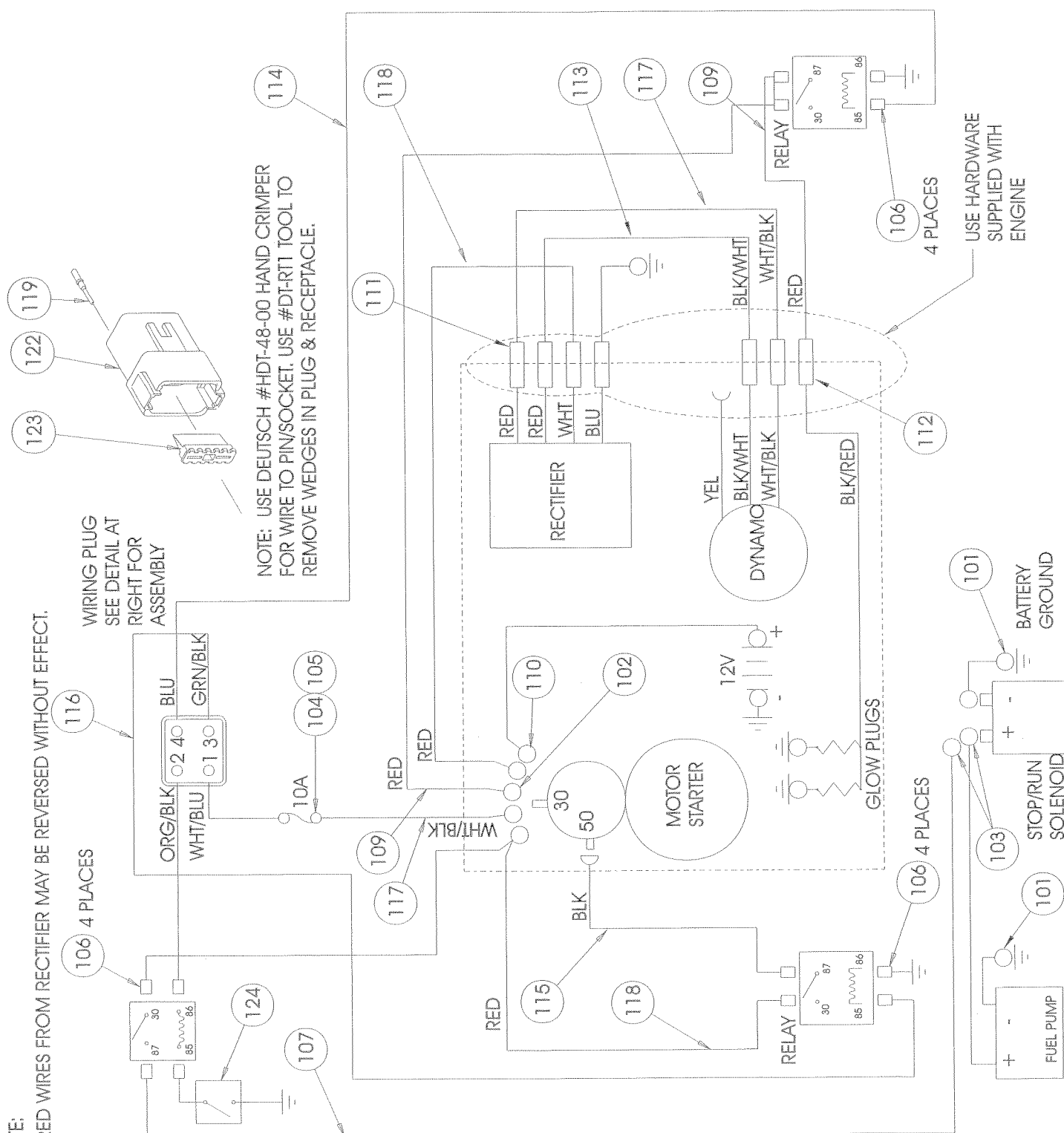
# Illustrated Parts Breakdown

Section  
6.2

ENGINE ASSEMBLY, AB46  
KUBOTA, BI-ENERGY  
DRAWING 1 OF 2



# Illustrated Parts Breakdown



ENGINE ASSEMBLY, AB46  
KUBOTA, BI-ENERGY  
DRAWING 2 OF 2

# Illustrated Parts Breakdown

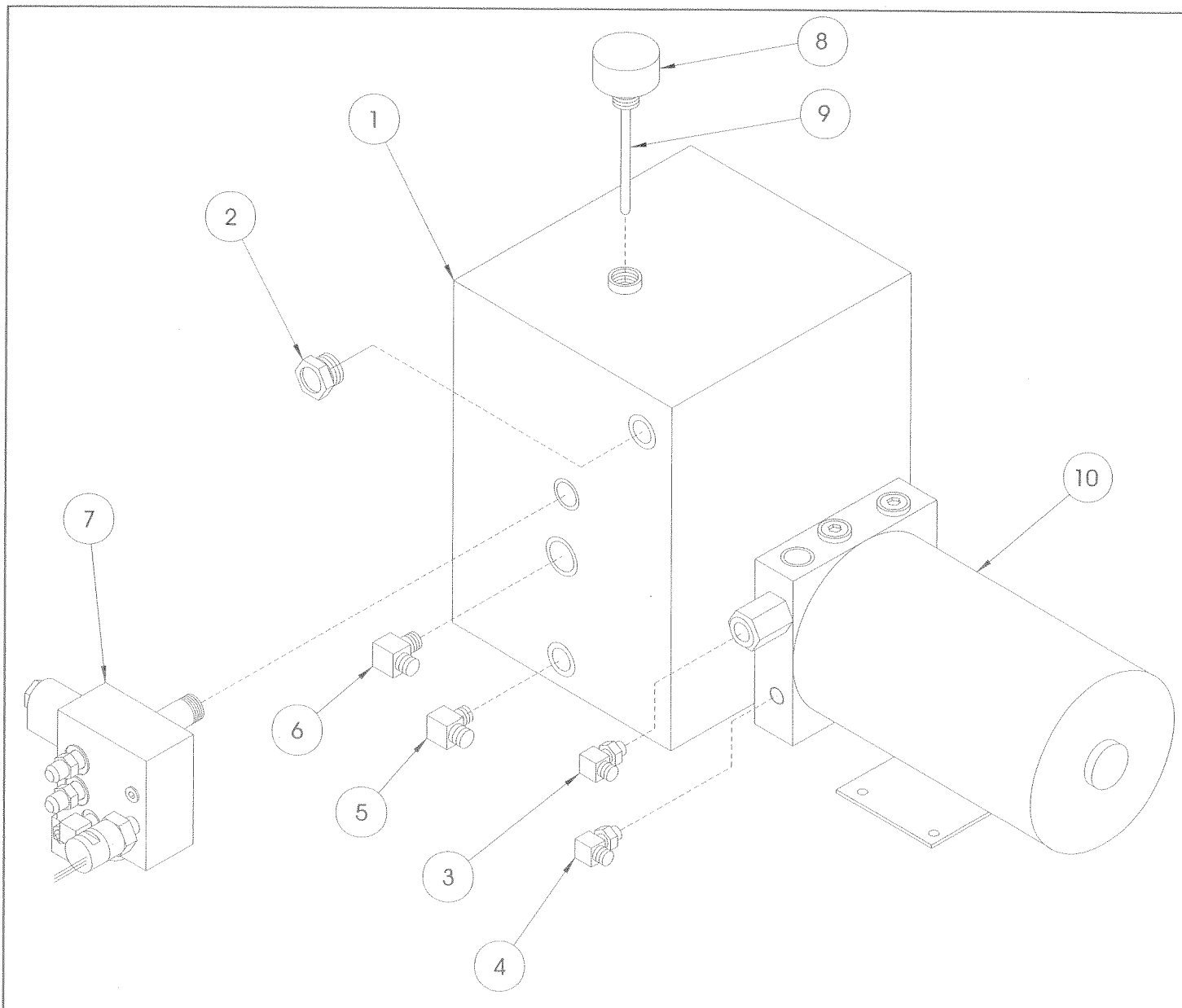
Section  
6.2

## POWER UNIT ASSEMBLY, AB46 BI-ENERGY

68326-001

| ITEM | PART      | DESCRIPTION                      | QTY. |
|------|-----------|----------------------------------|------|
| 1    | 68931-000 | POWER UNIT & TANK BI-ENERGY      | 1    |
| *    | 68554-012 | PUMP                             | 1    |
| 2    | 63979-006 | GAGE, LUBE SIGHT                 | 1    |
| 3    | 11934-003 | FITTING 90° 6MB - 4MJ            | 1    |
| 4    | 11934-004 | FITTING 90° 6MB - 6MJ            | 1    |
| 5    | 11940-010 | FITTING 90° 6MP - 6MJ            | 1    |
| 6    | 11940-019 | FITTING 90° 12MP - 10MJ          | 1    |
| 7    | 68324-001 | BRAKE VALVE BLOCK ASSY BI-ENERGY | 1    |
| 8    | 68554-019 | BREATHER                         | 1    |
| 9    | 68554-018 | DIPSTICK                         | 1    |
| 10   | 68554-010 | ELECTRIC MOTOR                   | 1    |
| *    | 68554-011 | BRUSHES                          | 1    |

\* Not Shown



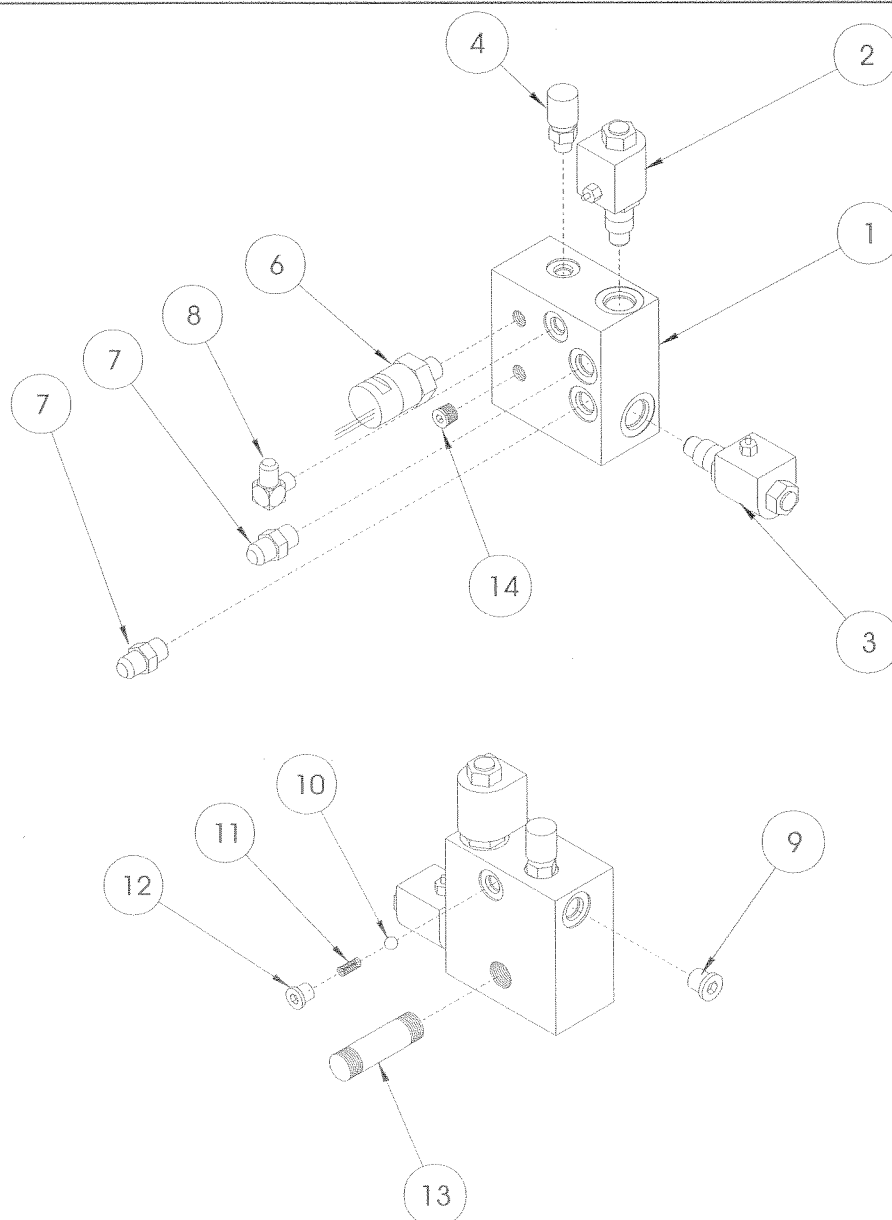
# Illustrated Parts Breakdown

## BRAKE VALVE BLOCK ASSEMBLY

### AB46 BI-ENERGY

68324-001

| ITEM | PART      | DESCRIPTION                          | QTY. |
|------|-----------|--------------------------------------|------|
| 1    | 68481-000 | VALVE BLOCK, BRAKE                   | 1    |
| 2    | 68553-000 | VALVE, POPPET N.C. 48VDC             | 1    |
| 3    | 68674-000 | VALVE, POPPET N.O. 48VDC             | 1    |
| 4    | 63965-001 | PLUG, GAUGE PORT                     | 1    |
| 6    | 63921-010 | PRESSURE SWITCH,                     | 1    |
| 7    | 11941-005 | STR. ADAPTER #6 SAE - #6 JIC         | 2    |
| 8    | 11934-001 | ELBOW 90° #4 SAE-#4 JIC              | 1    |
| 9    | 12004-006 | PLUG #6 SAE                          | 1    |
| 10   | 05135-000 | STEEL BALL, 5/16" DIA.               | 1    |
| 11   | 13987-009 | SPRING, 1/4 DIA. X 19/32 LG.         | 1    |
| 12   | 12004-004 | PLUG, #4 SAE                         | 1    |
| 13   | 14021-005 | PIPE NIPPLE 1/2" SCH 40 X 2 1/2" LG. | 1    |
| 14   | 11920-002 | PLUG, PIPE SOC HD 1/4-18 NPTF        | 1    |



# Illustrated Parts Breakdown

Section  
6.2

NOTES:

# Illustrated Parts Breakdown

## VALVE BLOCK ASSEMBLY

AB46

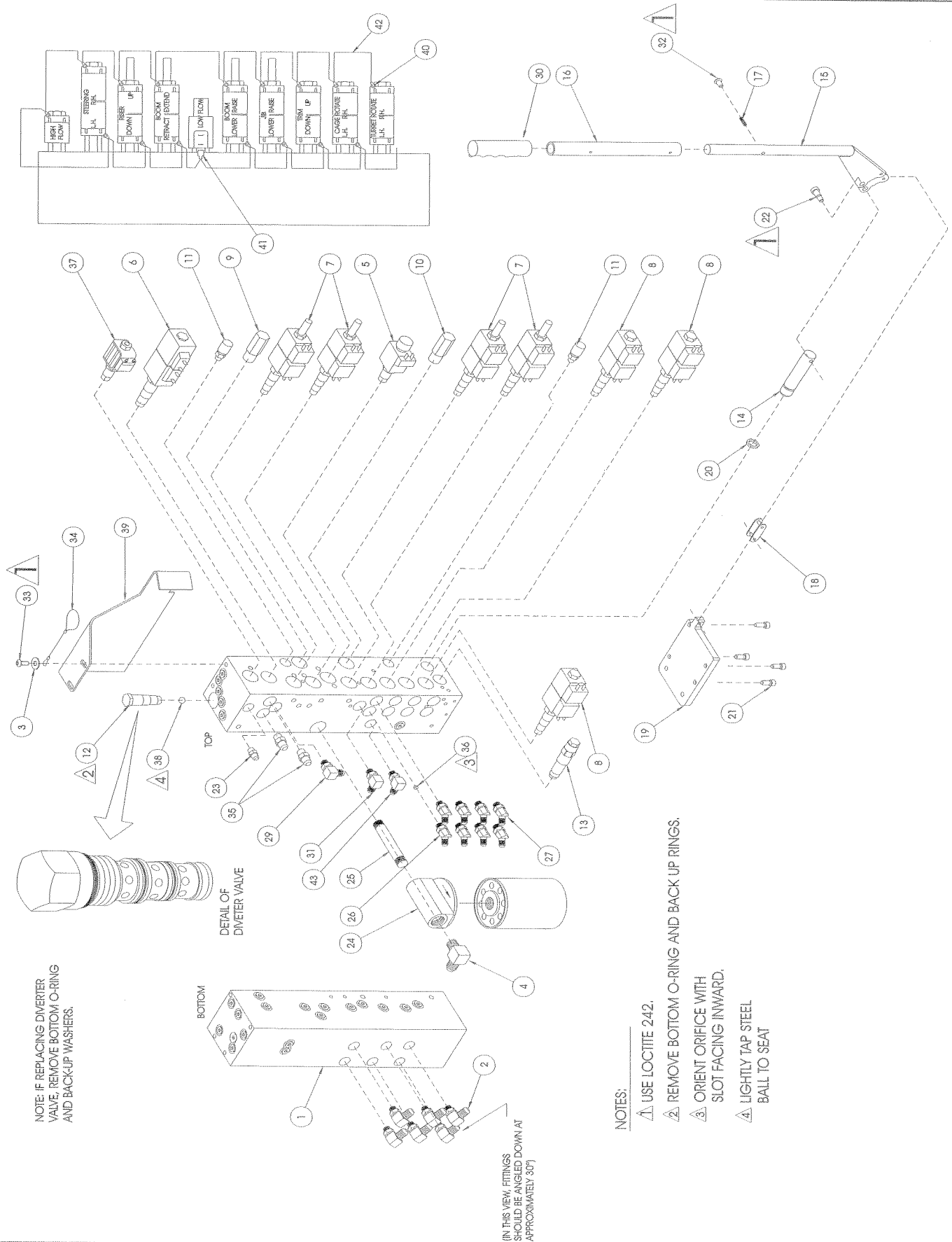
68348-000

| ITEM | PART      | DESCRIPTION                       | QTY. |
|------|-----------|-----------------------------------|------|
| 1    | 68349-000 | VALVE BLOCK SUB-ASSY.             | 1    |
| 2    | 11934-001 | FITTING, 2062-4-4S                | 6    |
| 3    | 11240-005 | WASHER 5/16 FLAT                  | 2    |
| 4    | 11940-019 | 90° ELBOW 3/4NPT X 3/4 JIC        | 1    |
| 5    | 63986-003 | FLOW CNTRL, WATERMAN              | 1    |
| 6    | 68559-000 | 3 POS, 4 WAY, TANDEM CENTER       | 1    |
| 7    | 68560-000 | 4 WAY, CLOSED CENTER              | 4    |
| 8    | 68561-000 | 4 WAY, MOTOR SPOOL                | 3    |
| 9    | 60390-020 | RELIEF VALVE, 2540 PSI            | 1    |
| 10   | 60390-021 | RELIEF VALVE, 1450 PSI            | 1    |
| 11   | 63965-001 | PLUG, GAGE PORT                   | 2    |
| 12   | 68558-000 | DIVERTER VALVE                    | 1    |
| 13   | 68778-000 | COUNTERBALANCE VALVE              | 1    |
| 14   | 68430-000 | PISTON, HAND PUMP                 | 1    |
| 15   | 68428-000 | LEVER WELDMENT, HAND PUMP         | 1    |
| 16   | 68429-000 | LEVER EXTENSION, HAND PUMP        | 1    |
| 17   | 68564-001 | DETENT BALL / SPRING              | 1    |
| 18   | 68566-000 | PIVOT LINK                        | 1    |
| 19   | 68425-000 | MOUNTING PLATE, VALVE BLOCK       | 1    |
| 20   | 12499-016 | SEAL, POLYPAK #12500625           | 1    |
| 21   | 14334-004 | SCREW, SOC. HD. 5/16-18 UNC X 1/2 | 4    |
| 22   | 15936-005 | SCREW, SHOULDER Ø 3/8 X 5/8 LG    | 1    |
| 23   | 11941-002 | FITTING 202702-4-6S               | 1    |
| 24   | 05154-001 | FILTER ASSY.                      | 1    |
| *    | 05154-002 | ELEMENT, REPLACEMENT              | -    |
| 25   | 14028-008 | PIPE NIPPLE, 3/4 SCHD 40 X 4      | 1    |
| 26   | 11935-013 | FITTING 45° 6MB-4MJ               | 1    |
| 27   | 11935-001 | FITTING, 45° SWIVEL EL. 4MB-4MJ   | 7    |
| 29   | 11934-004 | FITTING 90° EL. 6MB-6MJ           | 1    |
| 30   | 68700-000 | HAND GRIP, VINYL                  | 1    |
| 31   | 11934-003 | FITTING 2062-6-4S                 | 1    |
| 32   | 11821-004 | SCRW BUTT HEAD 1/4-20UNC X 1/2    | 1    |
| 33   | 11822-006 | SCRW BUTT HEAD 5/16-18 UNC X 3/4  | 2    |
| 34   | 63783-002 | LANYARD ASSY                      | 1    |
| 35   | 11941-005 | FITTING 202702-6-6S               | 2    |
| 36   | 15919-000 | ORFICE                            | 1    |
| 37   | 68781-000 | VALVE                             | 1    |
| 38   | 61827-000 | STEEL BALL 7/16 DIA               | 1    |
| 39   | 68791-000 | BRACKET                           | 1    |
| 40   | 29601-012 | CONN. RING, 18-14 GA. #8          | 16   |
| 41   | 29616-002 | CONN. FEM. PUSH, .25              | 1    |
| 42   | 29452-099 | WIRE, 16 GA. BLACK                | 3 FT |
| 43   | 11934-026 | FITTING 90° 4MB-6MJ               | 1    |



# Illustrated Parts Breakdown

Section  
6.2



# Illustrated Parts Breakdown

## GROUND CONTROL BOX ASSEMBLY

### AB46 ELECTRIC

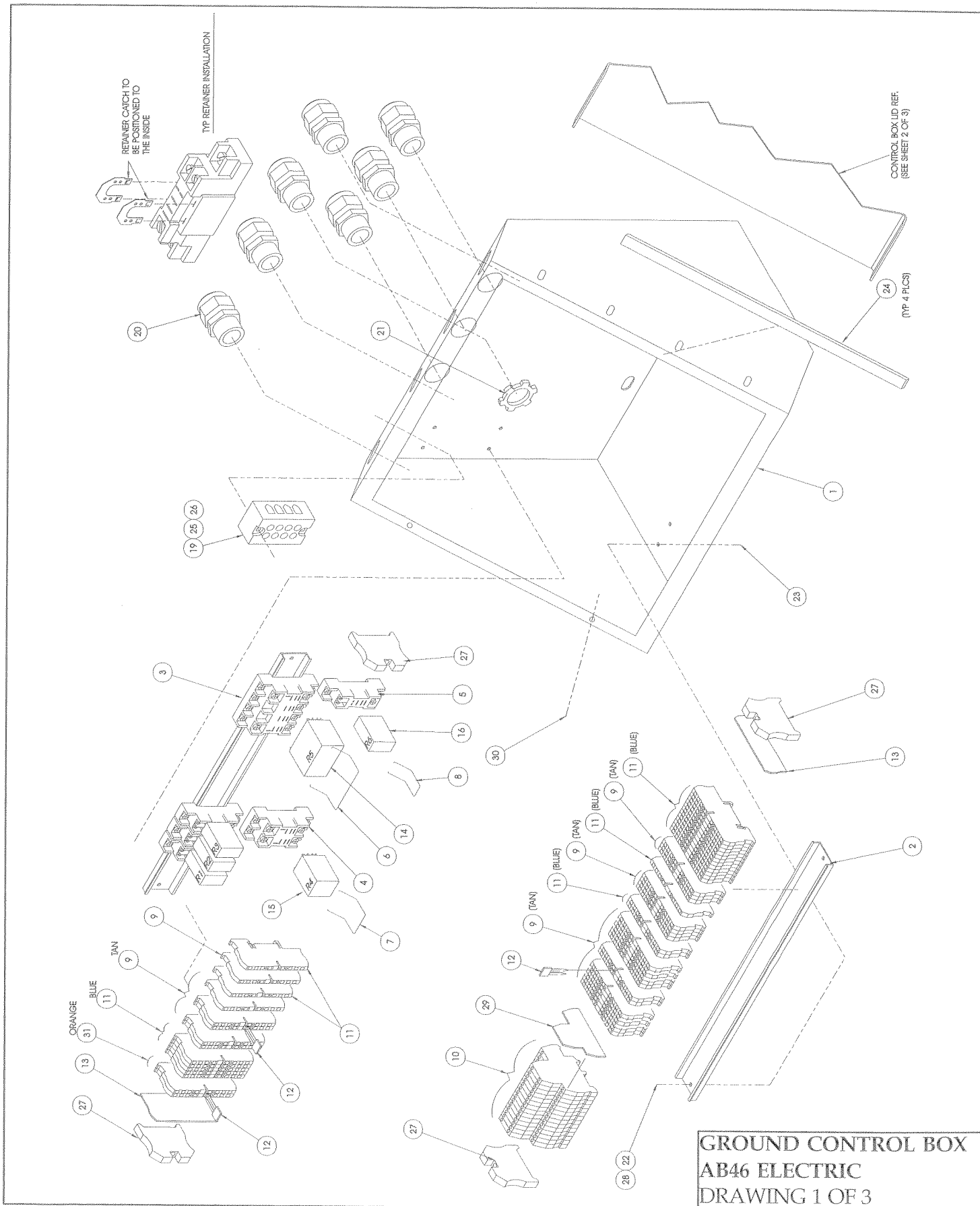
68328-000

| ITEM | PART      | DESCRIPTION                    | QTY.   |
|------|-----------|--------------------------------|--------|
| 1    | 68717-000 | BOX, GROUND CONTROL            | 1      |
| 2    | 67893-002 | DIN RAIL, 14" LONG             | 2      |
| 3    | 67662-004 | SOCKET, RELAY                  | 1      |
| 4    | 67662-002 | SOCKET, RELAY                  | 1      |
| 5    | 67662-001 | SOCKET, RELAY                  | 4      |
| 6    | 67662-007 | RETAINER CLIP,                 | 1      |
| 7    | 67662-006 | RETAINER CLIP,                 | 1      |
| 8    | 67662-005 | RETAINER CLIP,                 | 4      |
| 9    | 68698-001 | TERMINAL BLOCK (TAN)           | 27     |
| 10   | 68733-000 | DIODE BLOCK                    | 14     |
| 11   | 68698-002 | TERMINAL BLOCK (BLUE)          | 22     |
| 12   | 68773-002 | JUMPER 2 PIN                   | 3      |
| 13   | 68698-004 | END SECTION                    | 2      |
| 14   | 68756-004 | RELAY, 4 POLE 48VDC            | 1      |
| 15   | 68756-002 | RELAY, 2 POLE 48VDC            | 1      |
| 16   | 68756-001 | RELAY, 1 POLE 48VDC            | 4      |
| 19   | 68734-004 | TERMINAL BLOCK (120 V)         | 1      |
| 20   | 29925-001 | CONNECTOR, CABLE               | 7      |
| 21   | 29939-003 | LOCKNUT, 3/4 NPT               | 7      |
| 22   | 11715-003 | SCR, RD. HD. 6-32 X 3/8        | 4      |
| 23   | 11248-047 | LOCKNUT, 6-32 ESNA             | 4      |
| 24   | 68889-099 | WEATHERSTRIP 1/2" X 3/16" FOAM | 4.5 FT |
| 25   | 11248-003 | LOCKNUT, 10-24 ESNA            | 2      |
| 26   | 11709-010 | SCR, RD. HD. 10-24 X 1 1/4     | 2      |
| 27   | 67660-006 | END BLOCK, TERMINAL            | 4      |
| 28   | 11240-001 | WASHER, FLAT #6                | 4      |
| 29   | 68733-001 | END SECTION                    | 1      |
| 30   | 14252-004 | NUT SERT 1/4-20UNC             | 2      |
| 31   | 68698-000 | TERMINAL BLOCK (ORANGE)        | 2      |
| 201  | 68719-000 | CONTROL BOX LID                | 1      |
| 202  | 64446-003 | EMERGENCY STOP BUTTON          | 1      |
| 204  | 15752-000 | HOUR METER,                    | 1      |
| 206  | 12798-004 | SWITCH, TOGGLE DPDT MOM.       | 7      |
| 207  | 68582-010 | CIRCUIT BREAKER, 10 AMP        | 3      |
| 208  | 64443-001 | CONTACT BLOCK, N.O.            | 1      |
| 209  | 64443-002 | CONTACT BLOCK, N.C.            | 1      |
| 210  | 64417-001 | FLANGE, 3 CONTACT              | 2      |

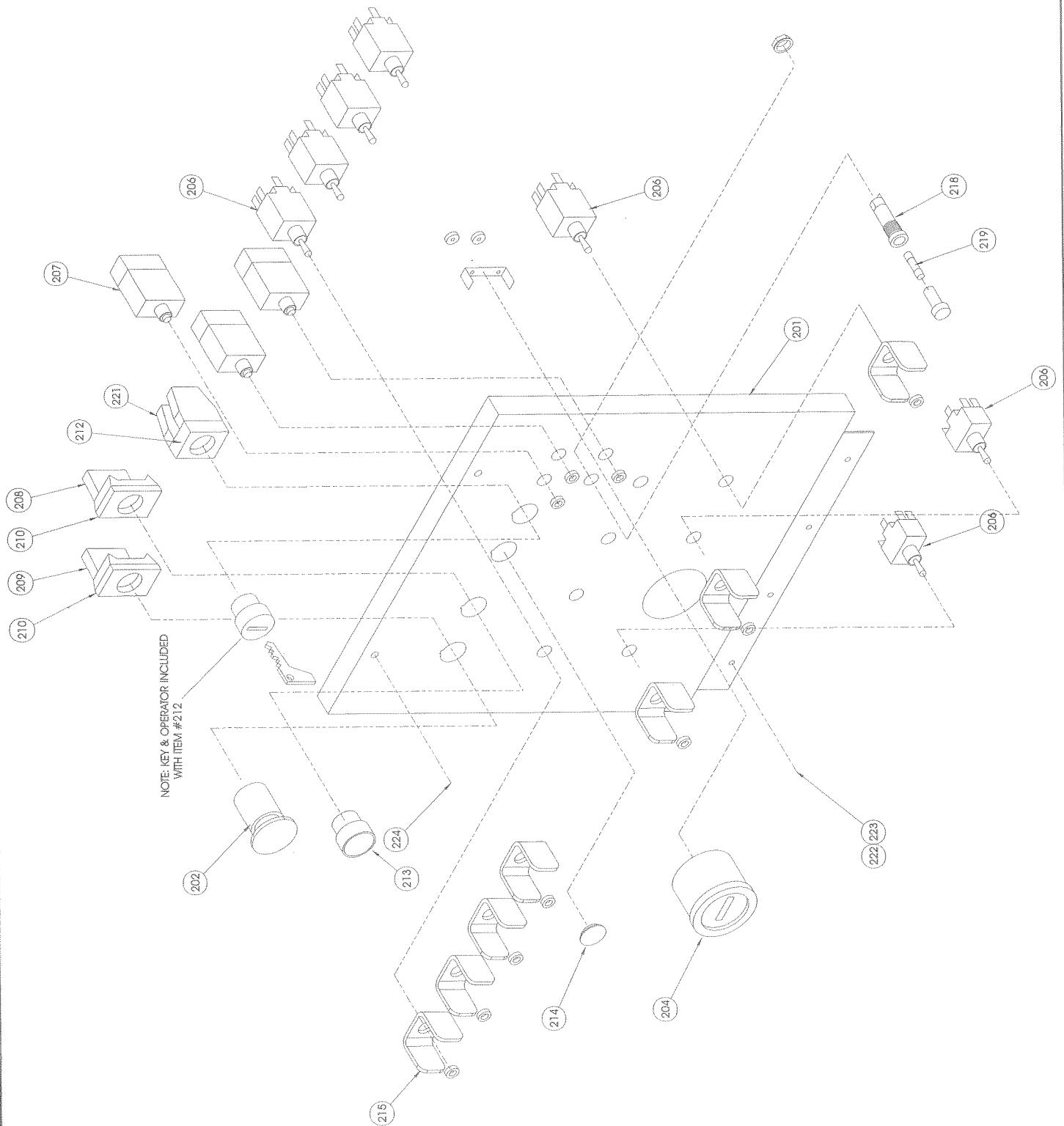
| ITEM | PART      | DESCRIPTION                               | QTY.  |
|------|-----------|---|-------|
| 212  | 68588-001 | SWITCH, KEY OPERATED                      | 1     |
| 213  | 67652-000 | PUSH BUTTON OPERATOR, GREEN               | 1     |
| 214  | 66516-006 | HOLE PLUG 7/8" DIA.                       | 1     |
| 215  | 08271-001 | GUARD, TOGGLE SWITCH                      | 7     |
| 218  | 29701-000 | FUSE HOLDER                               | 1     |
| 219  | 29704-025 | FUSE, 25AMP                               | 1     |
| 221  | 66805-012 | CONTACT BLOCK, N.O./N.C.                  | 2     |
| 222  | 11709-004 | SCRW MACH RD HD 10-24UNC X 1/2            | 4     |
| 223  | 11248-003 | NUT HEX ESNA 10-24 UNC                    | 4     |
| 224  | 11821-005 | SCRW,BUTT.HD SOC.1/4-20 X 5/8 LG          | 2     |
| 301  | 29452-099 | WIRE, 16 GA. BLACK                        | 23 FT |
| 302  | 29451-099 | WIRE, 16 GA. WHITE                        | 14 FT |
| 303  | 29454-099 | WIRE, 16 GA. RED                          | 22 FT |
| 304  | 29457-099 | WIRE, 16 GA. GREEN                        | 33 FT |
| 305  | 29453-099 | WIRE, 16 GA. ORANGE                       | 27 FT |
| 306  | 29450-099 | WIRE, 16 GA. BLUE                         | 13 FT |
| 307  | 29479-099 | WIRE, 16 GA. WHITE/BLACK                  | 17 FT |
| 308  | 29478-099 | WIRE, 16 GA. RED/BLACK                    | 5 FT  |
| 309  | 05491-099 | WIRE, 16 GA. GREEN/BLACK                  | 8 FT  |
| 310  | 29477-099 | WIRE, 16 GA. ORANGE/BLACK                 | 8 FT  |
| 311  | 29475-099 | WIRE, 16 GA. BLUE/BLACK                   | 4 FT  |
| 312  | 29362-099 | WIRE, 16 GA. RED/BLK/WHT                  | 1 FT  |
| 313  | 29483-099 | WIRE, 16 GA. RED/WHITE                    | 7 FT  |
| 314  | 29482-099 | WIRE, 16 GA. GREEN/WHITE                  | 5 FT  |
| 315  | 29459-099 | WIRE, 16 GA. BLUE/WHITE                   | 5 FT  |
| 316  | 29355-099 | WIRE, 16 GA. BLACK/RED                    | 6 FT  |
| 317  | 29356-099 | WIRE, 16 GA. WHITE/RED                    | 4 FT  |
| 318  | 29357-099 | WIRE, 16 GA. ORANGE/RED                   | 8 FT  |
| 319  | 29358-099 | WIRE, 16 GA. BLUE/RED                     | 5 FT  |
| 321  | 29360-099 | WIRE, 16 GA. ORANGE/GREEN                 | 4 FT  |
| 322  | 29361-099 | WIRE, 16 GA. BLACK/WHITE/RED              | 5 FT  |
| 323  | 29825-002 | DIODE, 3 AMP. 400 VOLT                    | 29    |
| 324  | 13283-002 | CABLE MOUNT                               | 9     |
| 325  | 29610-002 | CONN FORK TERM 16-14<br>(#8 STUD) LOCKING | 10    |
| 326  | 29931-003 | CONN FEM PUSH TERM 16-14 (1/4")           | 50    |
| 327  | 29616-001 | CONN FEM PUSH TERM 16-14 (3/16)           | 4     |
| 328  | 29610-006 | CONN FORK TERM 16-14<br>(#6 STUD) LOCKING | 57    |

# Illustrated Parts Breakdown

Section  
6.2



# Illustrated Parts Breakdown



GROUND CONTROL BOX  
AB46 ELECTRIC  
DRAWING 2 OF 3



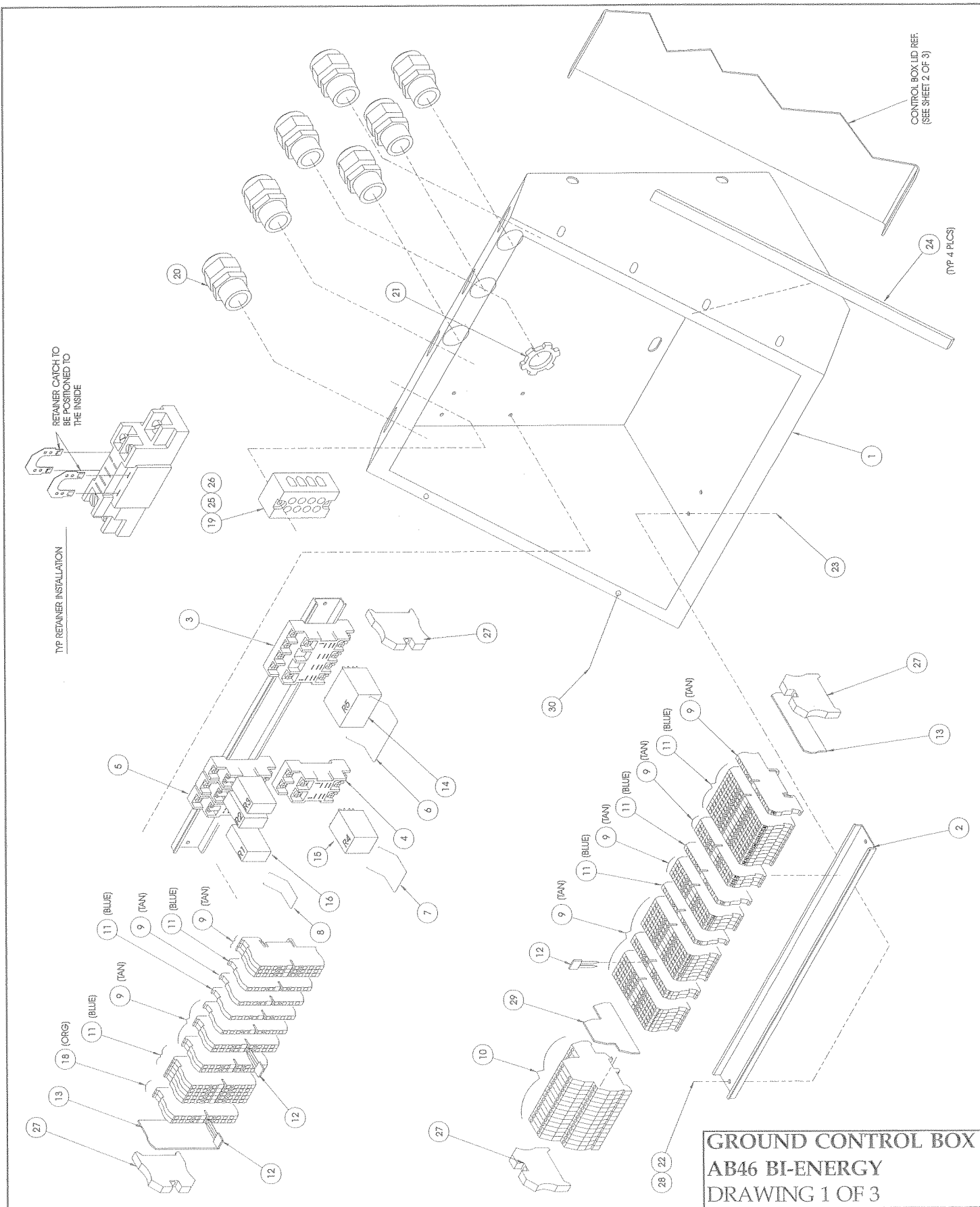
## GROUND CONTROL BOX ASSEMBLY AB46 BI-ENERGY 68328-003

| ITEM | PART      | DESCRIPTION                    | QTY.   |
|------|-----------|--------------------------------|--------|
| 1    | 68717-000 | BOX, GROUND CONTROL            | 1      |
| 2    | 67893-002 | DIN RAIL, 14" LONG             | 2      |
| 3    | 67662-004 | SOCKET, RELAY                  | 1      |
| 4    | 67662-002 | SOCKET, RELAY                  | 1      |
| 5    | 67662-001 | SOCKET, RELAY                  | 3      |
| 6    | 67662-007 | RETAINER CLIP,                 | 1      |
| 7    | 67662-006 | RETAINER CLIP,                 | 1      |
| 8    | 67662-005 | RETAINER CLIP,                 | 3      |
| 9    | 68698-001 | TERMINAL BLOCK (TAN)           | 32     |
| 10   | 68733-000 | DIODE BLOCK                    | 14     |
| 11   | 68698-002 | TERMINAL BLOCK (BLUE)          | 20     |
| 12   | 68773-002 | JUMPER 2 PIN                   | 3      |
| 13   | 68698-004 | END SECTION                    | 2      |
| 14   | 68756-004 | RELAY, 4 POLE 48VDC            | 1      |
| 15   | 68756-002 | RELAY, 2 POLE 48VDC            | 1      |
| 16   | 68756-001 | RELAY, 1 POLE 48VDC            | 3      |
| 18   | 68698-000 | TERMINAL BLOCK (ORANGE)        | 2      |
| 19   | 68734-004 | TERMINAL BLOCK (120 V)         | 1      |
| 20   | 29925-001 | CONNECTOR, CABLE               | 7      |
| 21   | 29939-003 | LOCKNUT, 3/4 NPT               | 7      |
| 22   | 11715-003 | SCR, RD. HD. 6-32 X 3/8        | 4      |
| 23   | 11248-047 | LOCKNUT, 6-32 ESNA             | 4      |
| 24   | 68889-099 | WEATHERSTRIP 1/2" X 3/16" FOAM | FT 4.5 |
| 25   | 11248-003 | LOCKNUT, 10-24 ESNA            | 2      |
| 26   | 11709-010 | SCR, RD. HD. 10-24 X 1 1/4     | 2      |
| 27   | 67660-006 | END BLOCK, TERMINAL            | 4      |
| 28   | 11240-001 | WASHER, FLAT #6                | 4      |
| 29   | 68733-001 | END SECTION                    | 1      |
| 30   | 14252-004 | NUT-SERT 1/4-20 UNC            | 2      |
| 201  | 68719-000 | CONTROL BOX LID                | 1      |
| 202  | 64446-003 | EMERGENCY STOP BUTTON          | 1      |
| 204  | 68581-001 | HOUR METER/BATTERY LEVEL IND.  | 1      |
| 206  | 12798-004 | SWITCH, TOGGLE DPDT MOM.       | 7      |
| 207  | 68582-010 | CIRCUIT BREAKER, 10 AMP        | 3      |
| 208  | 64443-001 | CONTACT BLOCK, N.O.            | 1      |
| 209  | 64443-002 | CONTACT BLOCK, N.C.            | 2      |
| 210  | 64417-001 | FLANGE, 3 CONTACT              | 1      |
| 211  | 68819-000 | SWITCH KEY OPERATOR            | 1      |

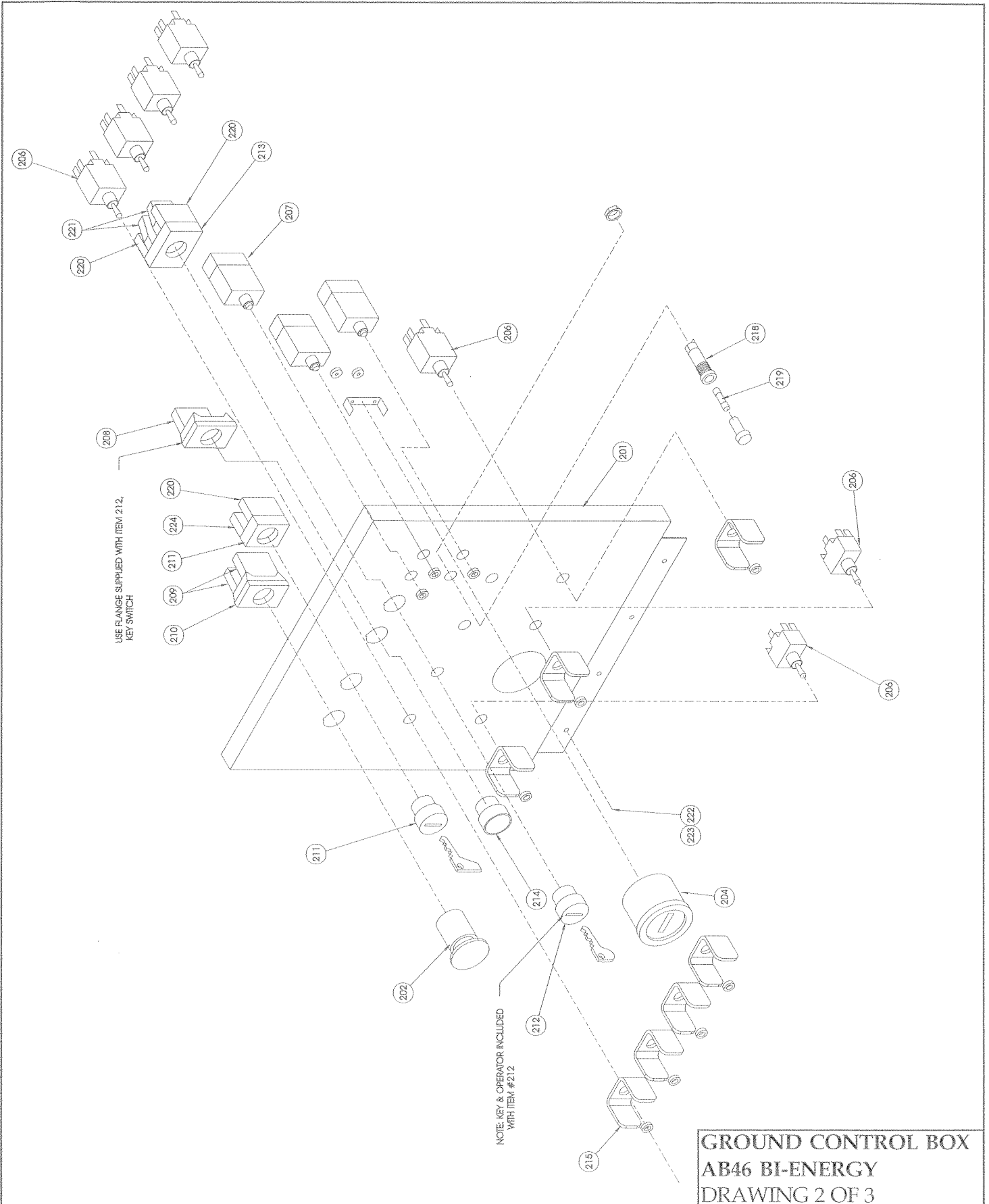
| ITEM | PART      | DESCRIPTION                               | QTY.  |
|------|-----------|---|-------|
| 212  | 68588-001 | SWITCH, KEY OPERATED                      | 1     |
| 213  | 68585-000 | FLANGE, 5 CONTACT                         | 1     |
| 214  | 67654-000 | PUSH BUTTON, BLACK                        | 1     |
| 215  | 08271-001 | GUARD, TOGGLE SWITCH                      | 7     |
| 218  | 29701-000 | FUSE HOLDER                               | 1     |
| 219  | 29704-025 | FUSE, 25AMP                               | 1     |
| 220  | 66805-010 | CONTACT BLOCK, N.O.                       | 3     |
| 221  | 66805-012 | CONTACT BLOCK, N.O./N.C.                  | 2     |
| 222  | 11709-004 | SCRW MACH RD HD 10-24UNC X 1/2            | 4     |
| 223  | 11248-003 | NUT HEX ESNA 10-24 UNC                    | 4     |
| 224  | 66805-011 | CONTACT BLOCK 1 N.C.                      | 1     |
| 301  | 29452-099 | WIRE, 16 GA. BLACK                        | 23 FT |
| 302  | 29451-099 | WIRE, 16 GA. WHITE                        | 14 FT |
| 303  | 29454-099 | WIRE, 16 GA. RED                          | 22 FT |
| 304  | 29457-099 | WIRE, 16 GA. GREEN                        | 33 FT |
| 305  | 29453-099 | WIRE, 16 GA. ORANGE                       | 27 FT |
| 306  | 29450-099 | WIRE, 16 GA. BLUE                         | 13 FT |
| 307  | 29479-099 | WIRE, 16 GA. WHITE/BLACK                  | 17 FT |
| 308  | 29478-099 | WIRE, 16 GA. RED/BLACK                    | 5 FT  |
| 309  | 05491-099 | WIRE, 16 GA. GREEN/BLACK                  | 8 FT  |
| 310  | 29477-099 | WIRE, 16 GA. ORANGE/BLACK                 | 8 FT  |
| 311  | 29475-099 | WIRE, 16 GA. BLUE/BLACK                   | 4 FT  |
| 312  | 29362-099 | WIRE, 16 GA. RED/BLK/WHT                  | 1 FT  |
| 313  | 29483-099 | WIRE, 16 GA. RED/WHITE                    | 7 FT  |
| 314  | 29482-099 | WIRE, 16 GA. GREEN/WHITE                  | 5 FT  |
| 315  | 29459-099 | WIRE, 16 GA. BLUE/WHITE                   | 5 FT  |
| 316  | 29355-099 | WIRE, 16 GA. BLACK/RED                    | 6 FT  |
| 317  | 29356-099 | WIRE, 16 GA. WHITE/RED                    | 4 FT  |
| 318  | 29357-099 | WIRE, 16 GA. ORANGE/RED                   | 8 FT  |
| 319  | 29358-099 | WIRE, 16 GA. BLUE/RED                     | 5 FT  |
| 321  | 29360-099 | WIRE, 16 GA. ORANGE/GREEN                 | 4 FT  |
| 322  | 29361-099 | WIRE, 16 GA. BLACK/WHITE/RED              | 5 FT  |
| 323  | 29825-002 | DIODE, 3 AMP. 400 VOLT                    | 27    |
| 324  | 13283-002 | CABLE MOUNT                               | 9     |
| 325  | 29610-002 | CONN FORK TERM 16-14<br>(#8 STUD) LOCKING | 10    |
| 326  | 29931-003 | CONN FEM PUSH TERM 16-14 (1/4")           | 50    |
| 327  | 29616-001 | CONN FEM PUSH TERM 16-14 (3/16)           | 4     |
| 328  | 29610-006 | CONN FORK TERM 16-14<br>(#6 STUD) LOCKING | 57    |

# Illustrated Parts Breakdown

Section  
6.2

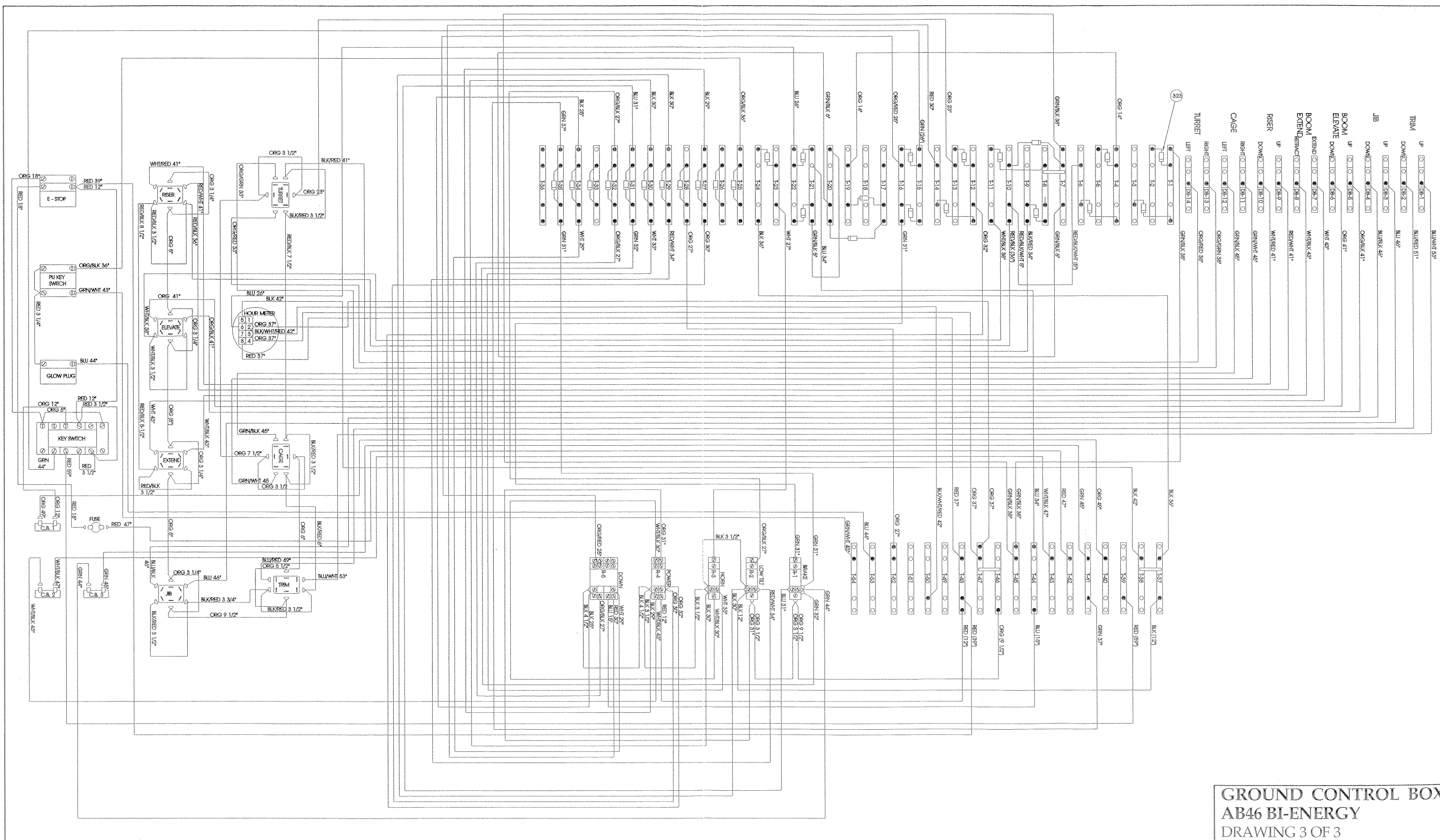


# Illustrated Parts Breakdown





# Illustrated Parts Breakdown

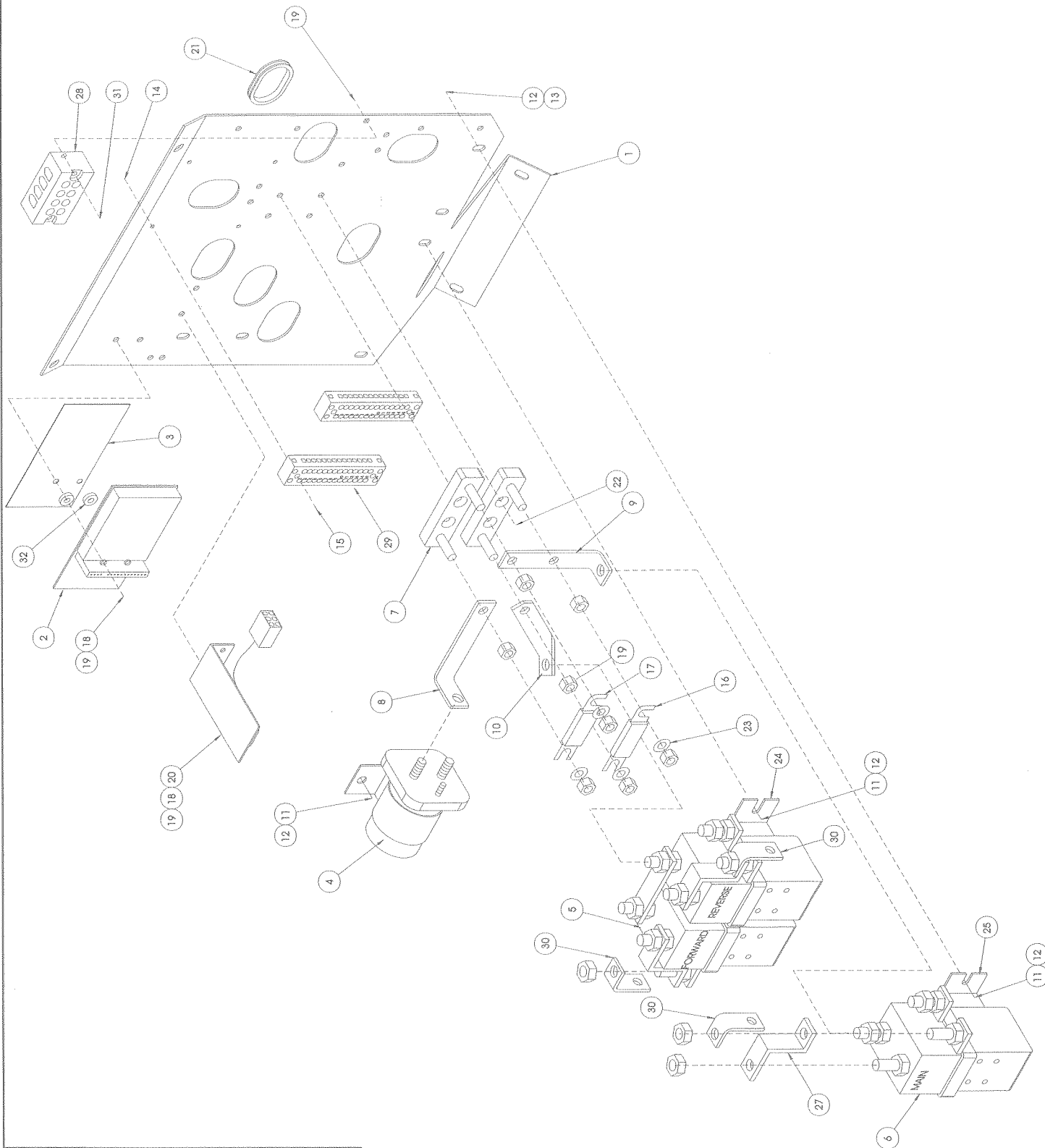


## RELAY PANEL ASSEMBLY, AB46 ELECTRIC 68346-000

| ITEM | PART      | DESCRIPTION                       | QTY.   |
|------|-----------|-----------------------------------|--------|
| 1    | 68490-000 | RELAY MOUNT                       | 1      |
| 2    | 68550-016 | TACH BOARD ASSY.                  | 1      |
| *    | 68550-022 | FUSE #1 [6.3A 250 VOLTS]          | -      |
| *    | 68550-023 | FUSE #2 [MDA 20]                  | -      |
| 3    | 68550-017 | INSULATION SHEET                  | 1      |
| 4    | 10122-002 | RELAY, 48 VDC                     | 1      |
| 5    | 68552-001 | RELAY, 48 VDC DOUBLE CONTACT      | 1      |
| 6    | 68552-000 | RELAY, 48 VDC SINGLE CONTACT      | 1      |
| 7    | 10149-000 | FUSE BLOCK                        | 2      |
| 8    | 68626-003 | BUSS BAR                          | 1      |
| 9    | 68626-004 | BUSS BAR                          | 1      |
| 10   | 68626-005 | BUSS BAR                          | 1      |
| 11   | 11252-006 | SCREW, HHC 1/4-20 UNC X 3/4       | 6      |
| 12   | 11240-004 | WASHER, FLAT STD. 1/4"            | 12     |
| 13   | 11248-004 | LOCKNUT, HEX 1/4-20 UNC ESNA      | 6      |
| 14   | 11248-047 | LOCKNUT, HEX #6-32 UNC ESNA       | 4      |
| 15   | 11715-008 | SCREW, RD HD #6-32 UNC X 1        | 4      |
| 16   | 10148-003 | FUSE, BUSS ANN-350                | 1      |
| 17   | 10148-002 | FUSE, BUSS 125 AMP                | 1      |
| 18   | 11709-004 | SCREW FLT HD #10-24 UNC X 1/2     | 4      |
| 19   | 11248-003 | LOCKNUT, HEX #10-24 UNC ESNA      | 10     |
| 20   | 68550-018 | RESISTOR BRACKET ASSY.            | 1      |
| 21   | 12956-002 | GROMMET                           | 8      |
| 22   | 11709-006 | SCRW RD HD MACH 10-24 UNC X 3/4   | 4      |
| 23   | 11240-005 | WASHER, FLAT STD 5/16             | 4      |
| 24   | 68550-015 | BRACKET, SIDE MOUNT               | 1      |
| 25   | 68550-014 | BRACKET, VERT. MOUNT              | 1      |
| 27   | 68550-013 | TERMINAL LINK                     | 1      |
| 28   | 68734-004 | TERMINAL BLOCK                    | 1      |
| 29   | 68818-000 | TERMINAL BLOCK                    | 2      |
| 30   | 68626-002 | BUSS BAR                          | 3      |
| 31   | 11709-010 | SCR. RD. HD. #10 - 24 UNC X 1 1/4 | 2      |
| 32   | 20328-001 | WASHER, NYLON                     | 2      |
| 201  | 68550-021 | CONNECTOR, RESISTOR PACK          | 1      |
| 202  | 68550-019 | CONNECTOR, SEVCON CONTROL         | 1      |
| 203  | 68550-020 | CONNECTOR, TACH CARD              | 1      |
| 204  | 29825-002 | DIODE                             | 1      |
| 205  | 68758-000 | 5K RESISTOR                       | 1      |
| 206  | 29601-015 | CONN. RING, 16-14 Ø 3/8           | 1      |
| 207  | 29601-013 | CONN. RING, 16-14 #10             | 3      |
| 208  | 29931-003 | CONN. FEM. PUSH, 16-14 .25        | 8      |
| 209  | 29601-040 | CONN. RING, 16-14 Ø 5/16          | 1      |
| 210  | 29452-099 | WIRE, 16 GA. BLK.                 | 6 FT   |
| 211  | 29454-099 | WIRE, 16 GA. RED                  | 2 FT   |
| 212  | 29457-099 | WIRE, 16 GA. GRN.                 | 1 FT   |
| 213  | 29453-099 | WIRE, 16 GA. ORG.                 | 3 FT   |
| 214  | 29352-099 | WIRE, 16 GA. RED/WHT              | 1.5 FT |
| 215  | 29454-099 | WIRE, 16 GA. BLU/WHT              | 2.2 FT |

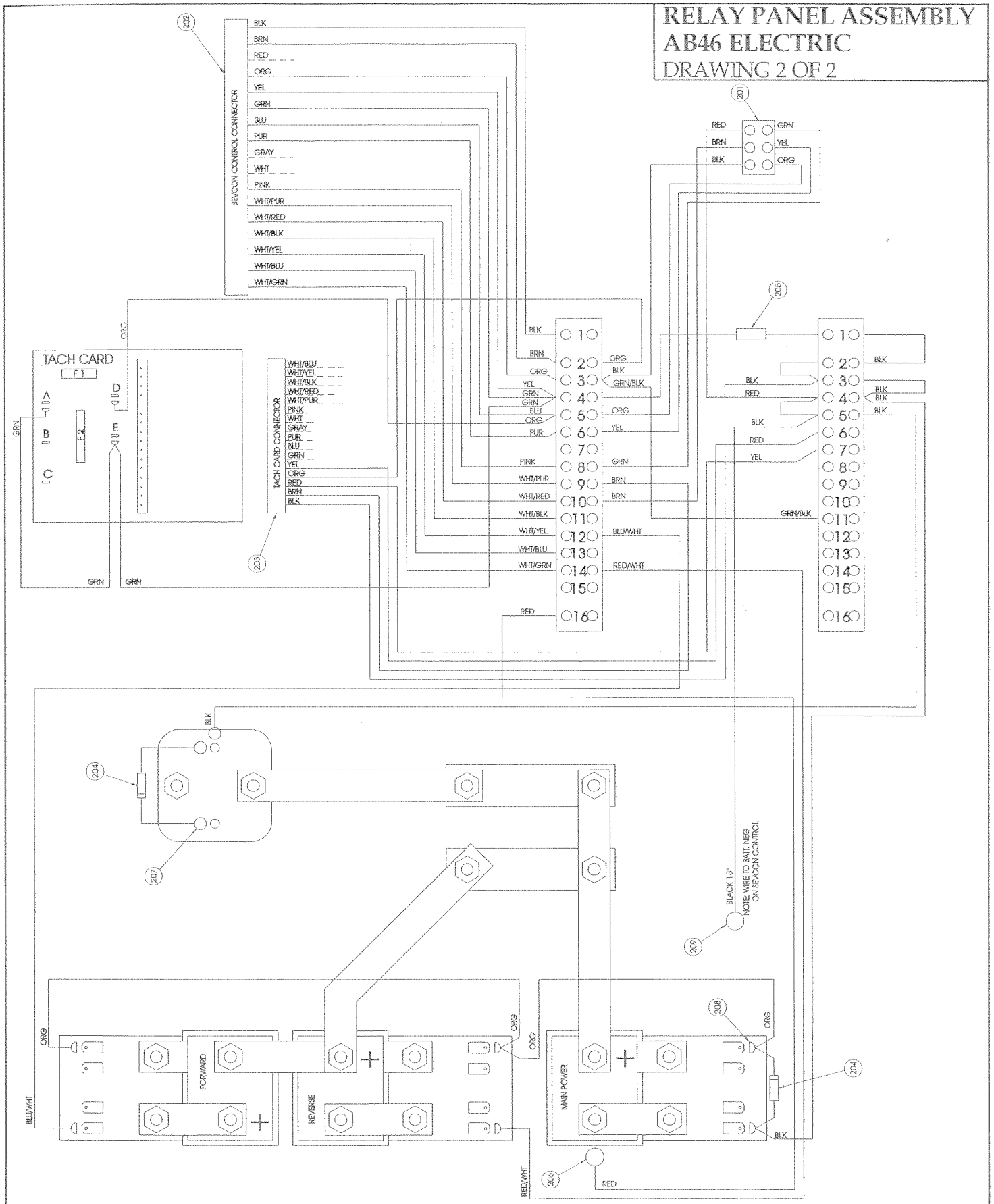
# Illustrated Parts Breakdown

Section  
6.2



**RELAY PANEL ASSEMBLY**  
**AB46 ELECTRIC**  
DRAWING 1 OF 2

# Illustrated Parts Breakdown



# Illustrated Parts Breakdown

Section  
6.2

NOTES:

# Illustrated Parts Breakdown

## RELAY PANEL ASSEMBLY, AB46

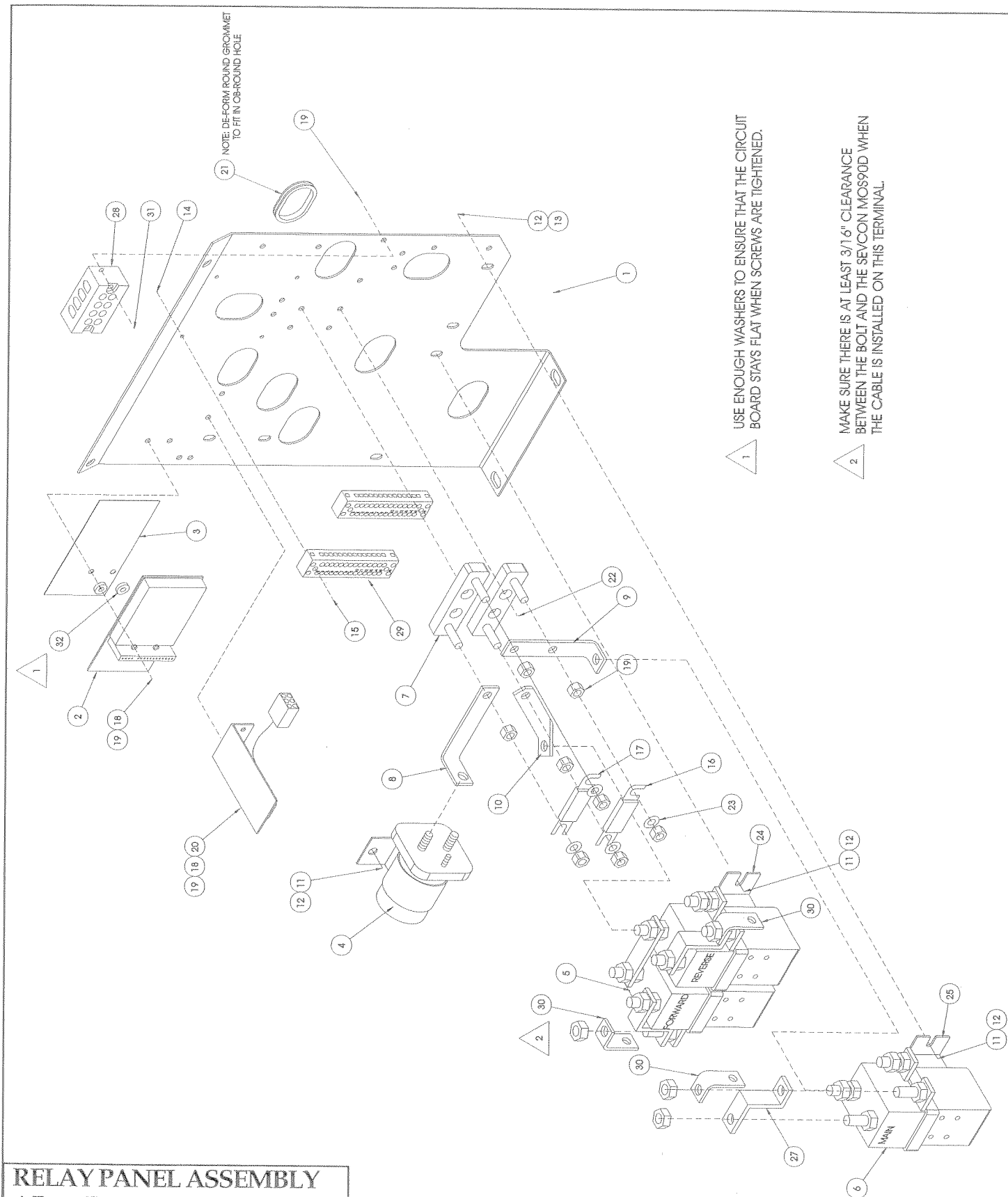
### BI-ENERGY

68346-001

| ITEM | PART      | DESCRIPTION                       | QTY.   |
|------|-----------|-----------------------------------|--------|
| 1    | 68921-000 | RELAY MOUNT, BI-ENERGY            | 1      |
| 2    | 68550-016 | TACH BOARD ASSY.                  | 1      |
| *    | 68550-022 | FUSE #1 [6.3 AMP 250 VOLTS]       | -      |
| *    | 68550-023 | FUSE #1 [MDA20]                   | -      |
| 3    | 68550-017 | INSULATION SHEET                  | 1      |
| 4    | 10122-002 | RELAY, 48 VDC                     | 1      |
| 5    | 68552-001 | RELAY, 48 VDC DOUBLE CONTACT      | 1      |
| 6    | 68552-000 | RELAY, 48 VDC SINGLE CONTACT      | 1      |
| 7    | 10149-000 | FUSE BLOCK                        | 2      |
| 8    | 68626-003 | BUSS BAR                          | 1      |
| 9    | 68626-004 | BUSS BAR                          | 1      |
| 10   | 68626-005 | BUSS BAR                          | 1      |
| 11   | 11252-006 | SCREW, HHC 1/4-20 UNC X 3/4       | 6      |
| 12   | 11240-004 | WASHER, FLAT STD. 1/4"            | 12     |
| 13   | 11248-004 | LOCKNUT, HEX 1/4-20 UNC ESNA      | 6      |
| 14   | 11248-047 | LOCKNUT, HEX #6-32 UNC ESNA       | 4      |
| 15   | 11715-008 | SCREW, RD HD #6-32 UNC X 1        | 4      |
| 16   | 10148-003 | FUSE, BUSS ANN-350                | 1      |
| 17   | 10148-004 | FUSE, BUSS 125 AMP                | 1      |
| 18   | 11709-004 | SCREW FLT HD #10-24 UNC X 1/2     | 4      |
| 19   | 11248-003 | LOCKNUT, HEX #10-24 UNC ESNA      | 10     |
| 20   | 68550-018 | RESISTOR BRACKET ASSY.            | 1      |
| 21   | 12956-002 | GROMMET                           | 8      |
| 22   | 11709-006 | SCRW RD HD MACH 10-24 UNC X 3/4   | 4      |
| 23   | 11240-005 | WASHER, FLAT STD 5/16             | 4      |
| 24   | 68550-015 | BRACKET, SIDE MOUNT               | 1      |
| 25   | 68550-014 | BRACKET, VERT. MOUNT              | 1      |
| 27   | 68550-013 | TERMINAL LINK                     | 1      |
| 28   | 68734-004 | TERMINAL BLOCK                    | 1      |
| 29   | 68818-000 | TERMINAL BLOCK                    | 2      |
| 30   | 68626-002 | BUSS BAR                          | 3      |
| 31   | 11709-010 | SCR. RD. HD. #10 - 24 UNC X 1 1/4 | 2      |
| 32   | 20328-001 | WASHER, NYLON                     | 2      |
| 201  | 68550-021 | CONNECTOR, RESISTOR PACK          | 1      |
| 202  | 68550-019 | CONNECTOR, SEVCON CONTROL         | 1      |
| 203  | 68550-020 | CONNECTOR, TACH CARD              | 1      |
| 204  | 29825-002 | DIODE                             | 1      |
| 205  | 68758-000 | 5K RESISTOR                       | 1      |
| 206  | 29601-015 | CONN. RING, 16-14 Ø 3/8           | 1      |
| 207  | 29601-013 | CONN. RING, 16-14 #10             | 3      |
| 208  | 29931-003 | CONN. FEM. PUSH, 16-14 .25        | 8      |
| 209  | 29601-040 | CONN. RING, 16-14 Ø 5/16          | 1      |
| 210  | 29452-099 | WIRE, 16 GA. BLK.                 | 6 FT   |
| 211  | 29454-099 | WIRE, 16 GA. RED                  | 2 FT   |
| 212  | 29457-099 | WIRE, 16 GA. GRN.                 | 1 FT   |
| 213  | 29453-099 | WIRE, 16 GA. ORG.                 | 3 FT   |
| 214  | 29352-099 | WIRE, 16 GA. RED/WHT              | 1.5 FT |
| 215  | 29459-099 | WIRE, 16 GA. BLU/WHT              | 2.2 FT |

# Illustrated Parts Breakdown

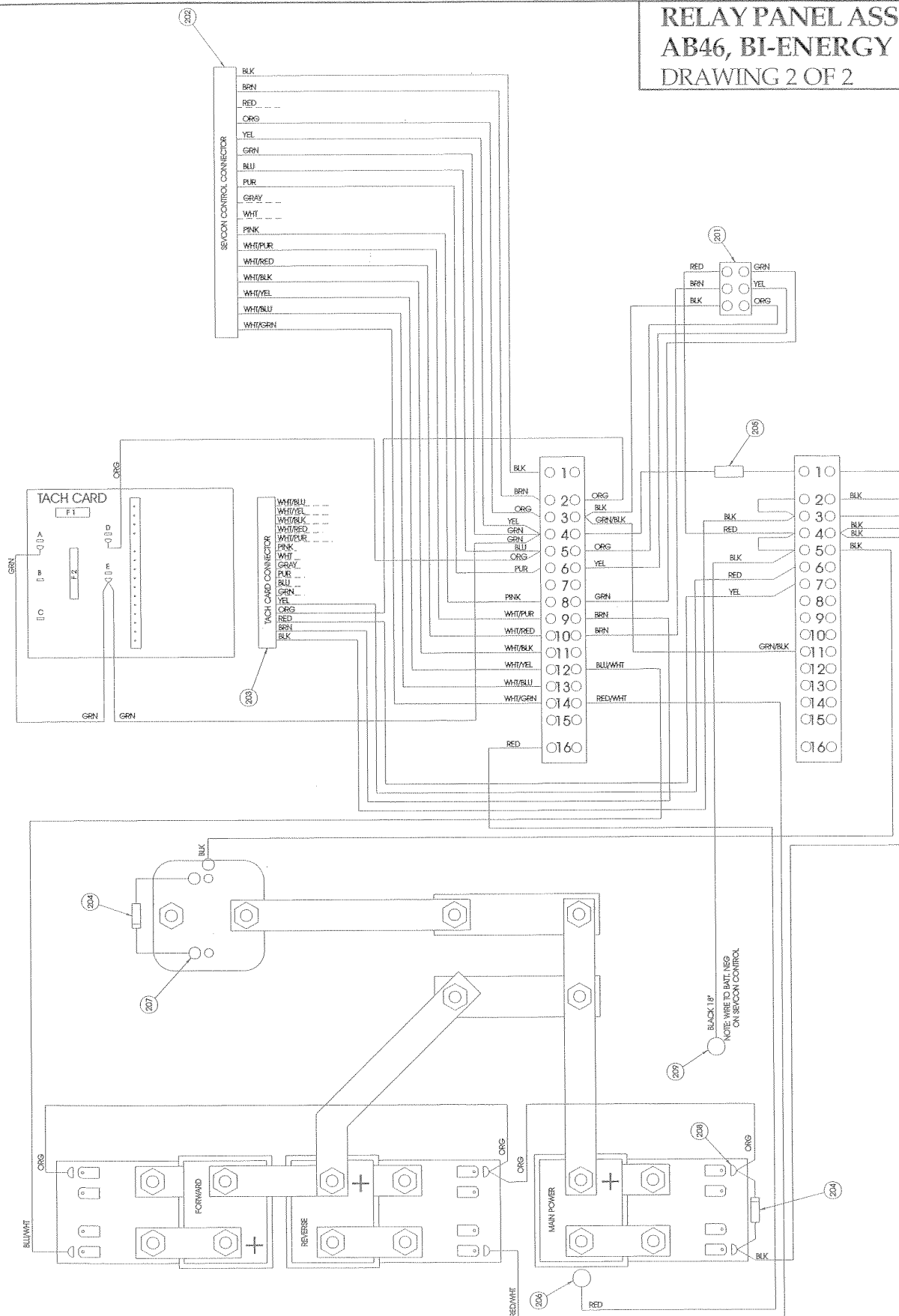
Section  
6.2



**RELAY PANEL ASSEMBLY**  
**AB46, BI-ENERGY**  
DRAWING 1 OF 2

# Illustrated Parts Breakdown

## RELAY PANEL ASSEMBLY AB46, BI-ENERGY DRAWING 2 OF 2



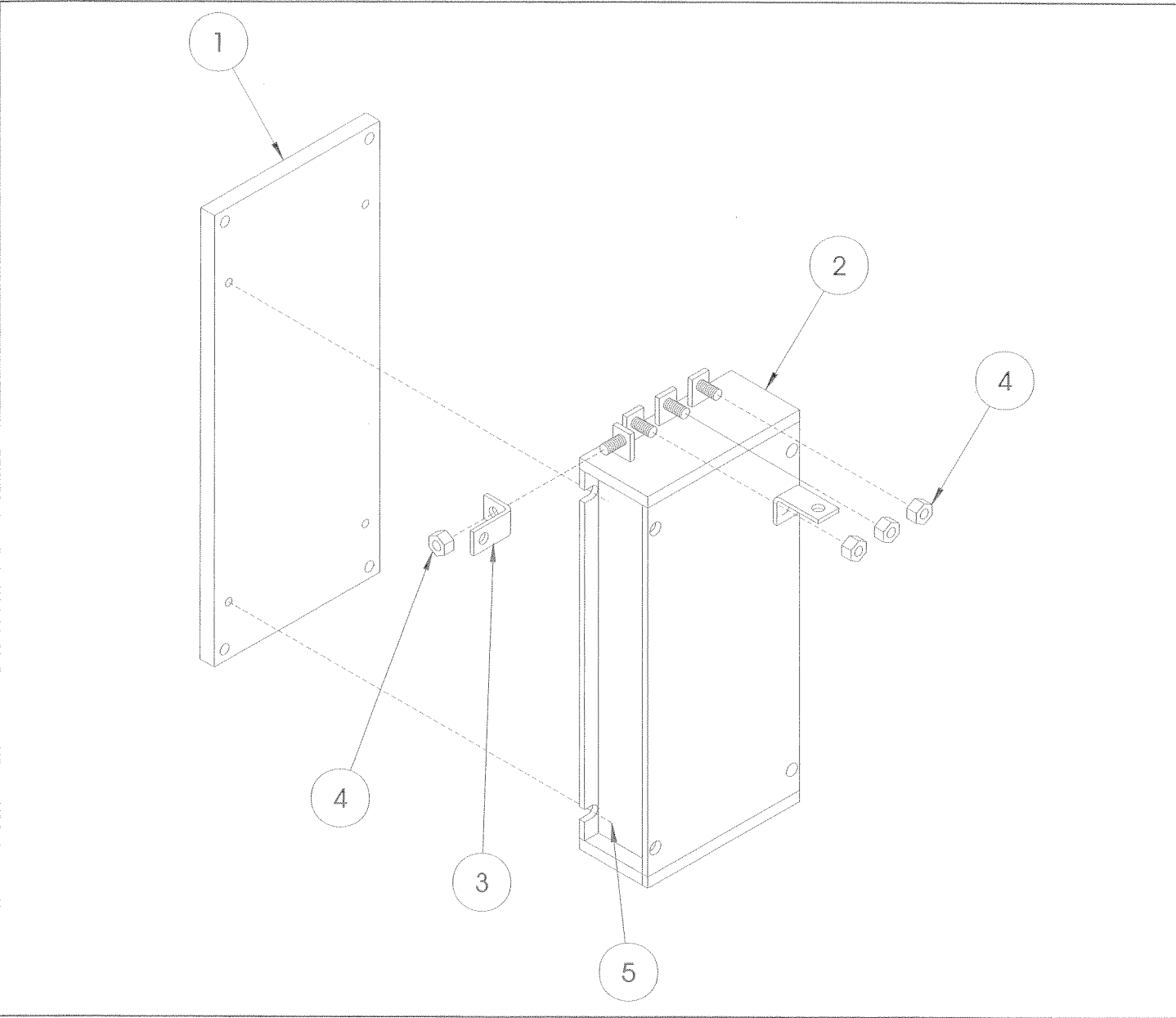


# Illustrated Parts Breakdown

Section  
6.2

## SPEED CONTROL PANEL ASSEMBLY AB46, BI-ENERGY 68321-000

| ITEM | PART      | DESCRIPTION                     | QTY. |
|------|-----------|---------------------------------|------|
| 1    | 68489-001 | CONTROL MOUNT                   | 1    |
| 2    | 68550-000 | MOTION CONTROL, SEVCON          | 1    |
| 3    | 68626-002 | BUSS BAR                        | 2    |
| 4    | 63947-008 | NUT, HEX. REG. M8 X 1.25        | 4    |
| 5    | 11821-004 | SCREW, BTN HD. 1/4-20 UNC X 1/2 | 4    |

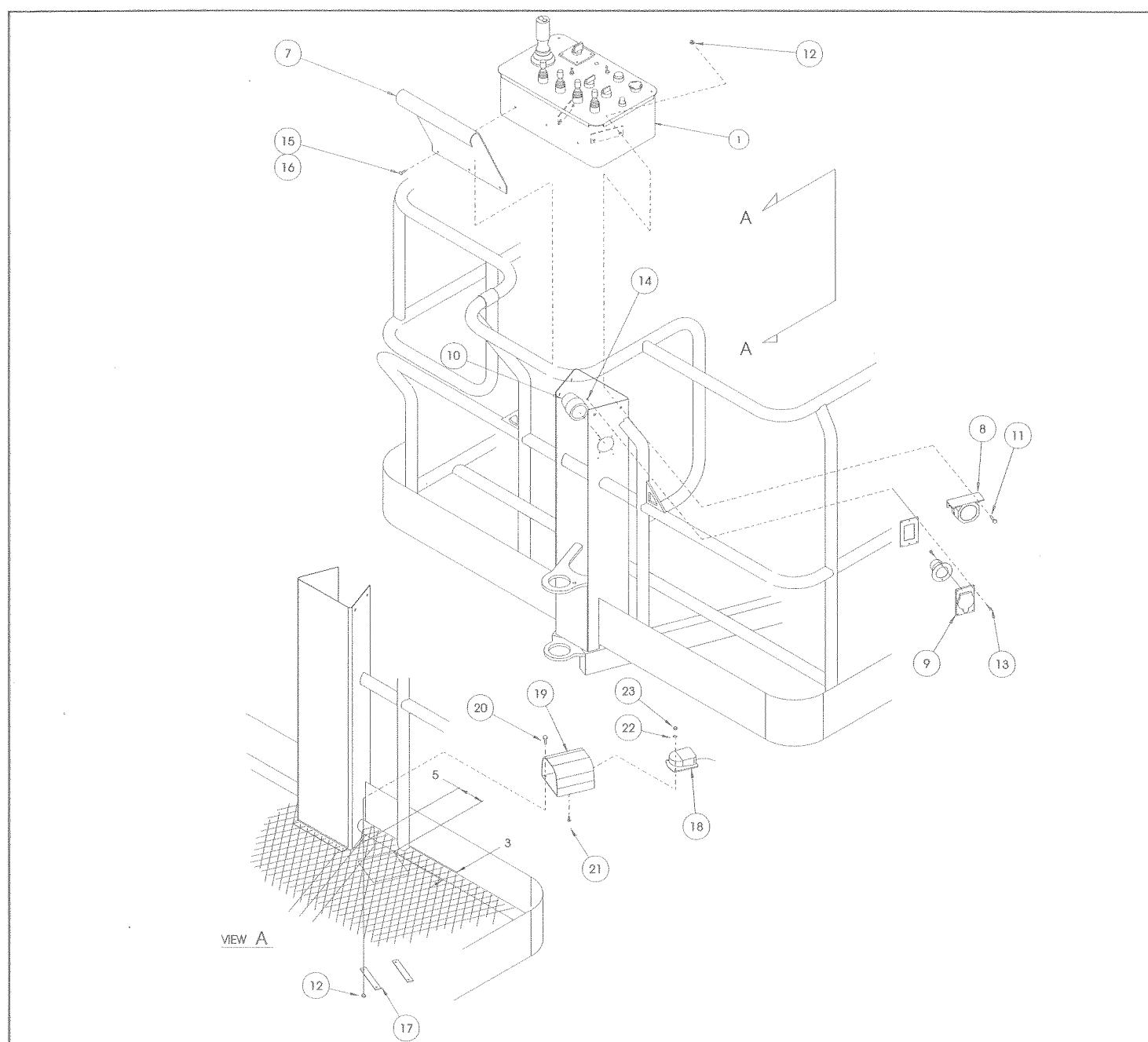


# Illustrated Parts Breakdown

## CONTROLLER INSTALLATION AB46 ELECTRIC - EURO 68339-004

| ITEM | PART      | DESCRIPTION                    | QTY. |
|------|-----------|--------------------------------|------|
| 1    | 68329-000 | CONTROLLER ASSY - EURO. (ELEC) | 1    |
| 7    | 68750-000 | DECAL MOUNT                    | 1    |
| 8    | 63778-001 | ALARM                          | 1    |
| 9    | 08942-001 | FEMALE RECEPTACLE              | 1    |
| 10   | 29961-001 | SEAL                           | 1    |
| 11   | 11252-008 | SCREW HHC 1/4-20 UNC X 1       | 4    |
| 12   | 11248-004 | NUT HEX 1/4-20 UNC ESNA        | 8    |
| 13   | 11715-006 | SCREW RD HD 6-32 UNC X 3/4     | 4    |
| 14   | 11248-047 | NUT HEX 6-32 UNC ESNA          | 4    |
| 15   | 11709-006 | SCREW RD HD 10-24 UNC X 3/4    | 3    |

| ITEM | PART      | DESCRIPTION                      | QTY. |
|------|-----------|----------------------------------|------|
| 16   | 11248-003 | NUT HEX 10-24 UNC ESNA           | 3    |
| 17   | 68820-000 | RETAINING STRAP-FOOTSWITCH       | 2    |
| 18   | 63906-000 | FOOT SWITCH CLPR                 | 1    |
| 19   | 64479-000 | SWITCH GUARD, FOOT               | 1    |
| 20   | 11252-012 | SCREW HHC 1/4-20 UNC X 1 1/2     | 4    |
| 21   | 66695-006 | SCREW FLAT HD 10-24 UNC X 3/4    | 2    |
| 22   | 13949-003 | WASHER, #10 STAR, EXTERNAL TOOTH | 2    |
| 23   | 11250-003 | HEX NUT 10-24 UNC                | 2    |



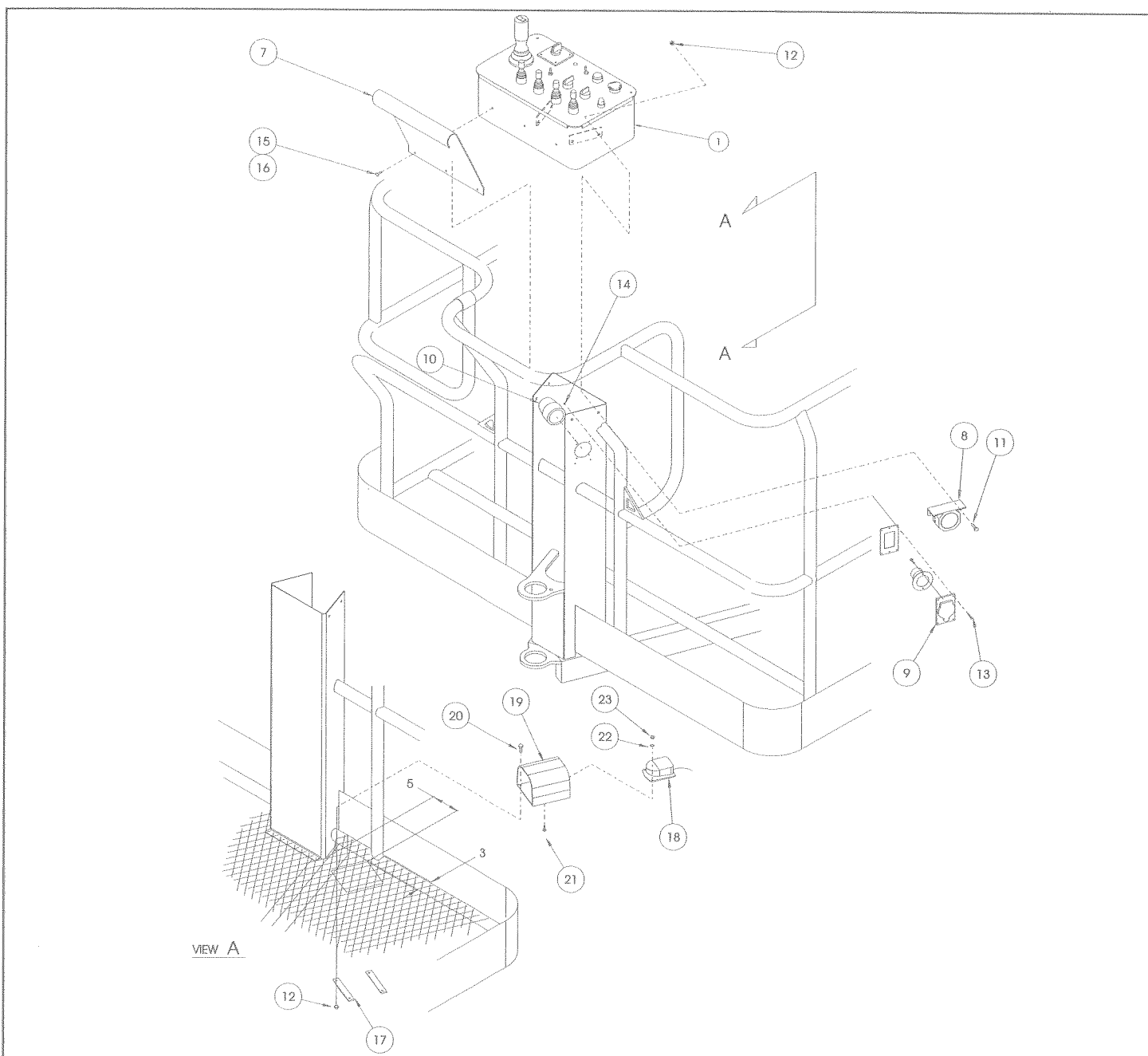
# Illustrated Parts Breakdown

Section  
6.2

## CONTROLLER INSTALLATION AB46 BI-ENERGY - EURO 68339-012

| ITEM | PART      | DESCRIPTION                        | QTY. |
|------|-----------|------------------------------------|------|
| 1    | 68329-011 | CONTROLLER ASSY - DOM. (BI-ENERGY) | 1    |
| 7    | 68750-000 | DECAL MOUNT                        | 1    |
| 8    | 63778-001 | ALARM                              | 1    |
| 9    | 08942-001 | FEMALE RECEPTACLE                  | 1    |
| 10   | 29961-001 | SEAL                               | 1    |
| 11   | 11252-008 | SCREW HHC 1/4-20 UNC X 1           | 4    |
| 13   | 11715-006 | SCREW RD HD 6-32 UNC X 3/4         | 4    |
| 12   | 11248-004 | NUT HEX 1/4-20 UNC ESNA            | 8    |
| 14   | 11248-047 | NUT HEX 6-32 UNC ESNA              | 4    |
| 15   | 11709-006 | SCREW RD HD 10-24 UNC X 3/4        | 3    |

| ITEM | PART      | DESCRIPTION                      | QTY. |
|------|-----------|----------------------------------|------|
| 16   | 11248-003 | NUT HEX 10-24 UNC ESNA           | 3    |
| 17   | 68820-000 | RETAINING STRAP-FOOTSWITCH       | 2    |
| 18   | 63906-000 | FOOT SWITCH CLPR                 | 1    |
| 19   | 64479-000 | SWITCH GUARD, FOOT               | 1    |
| 20   | 11252-012 | SCREW HHC 1/4-20 UNC X 1 1/2     | 4    |
| 21   | 66695-006 | SCREW FLAT HD 10-24 UNC X 3/4    | 2    |
| 22   | 13949-003 | WASHER, #10 STAR, EXTERNAL TOOTH | 2    |
| 23   | 11250-003 | HEX NUT 10-24 UNC                | 2    |



# Illustrated Parts Breakdown

## CONTROLLER ASSEMBLY-PLATFORM AB46 ELECTRIC - EURO 68329-003

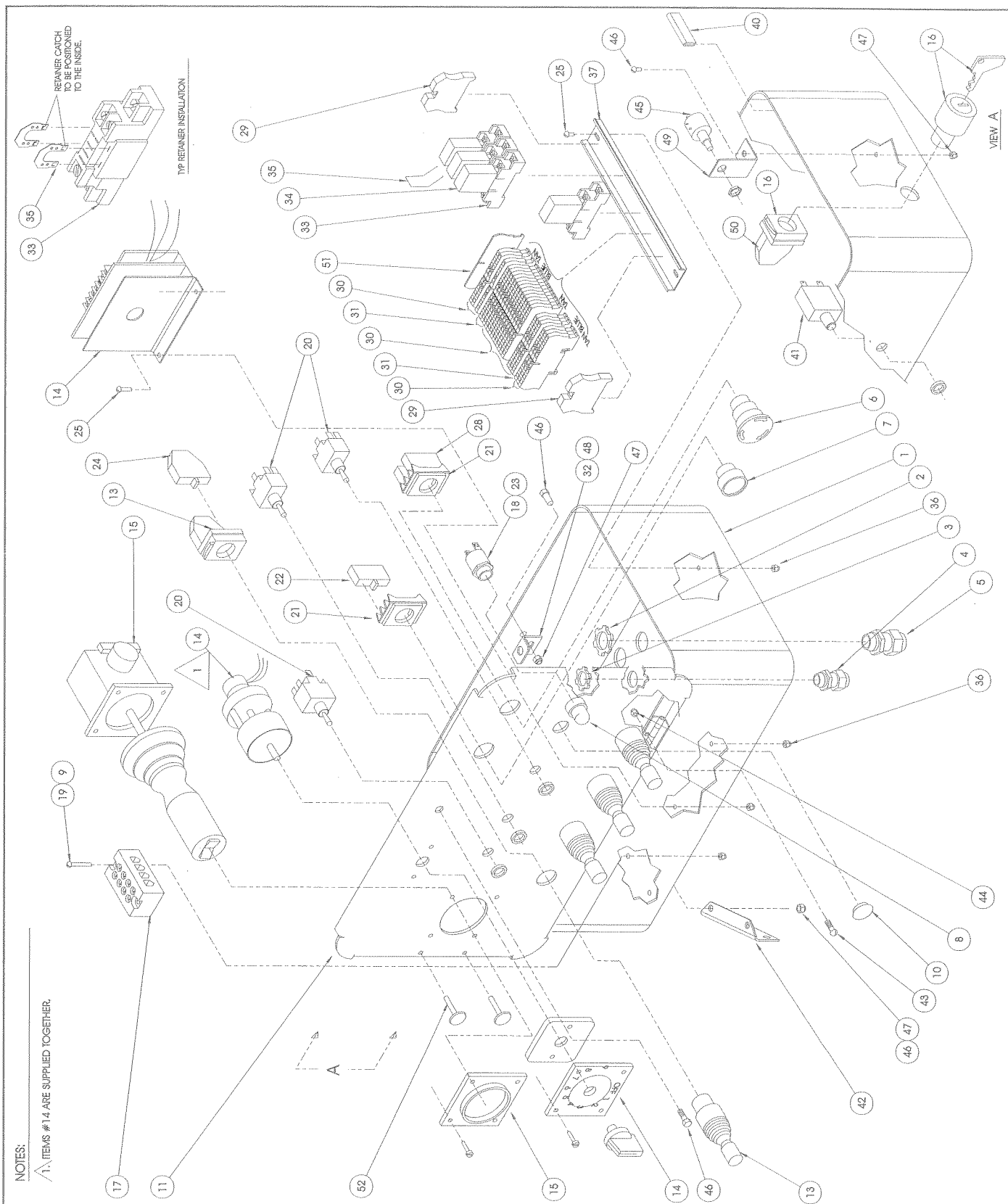
| ITEM | PART      | DESCRIPTION                    | QTY.   |
|------|-----------|--------------------------------|--------|
| 1    | 68589-001 | BOX, ENCLOSURE                 | 1      |
| 2    | 29939-003 | LOCKNUT 3/4" NPT               | 4      |
| 3    | 29939-002 | LOCKNUT 1/2" NPT               | 1      |
| 4    | 29925-000 | CONNECTOR CABLE 1/2" NPT       | 1      |
| 5    | 29925-001 | CONNECTOR CABLE 3/4" NPT       | 4      |
| 6    | 64446-003 | EMERGENCY STOP BUTTON          | 1      |
| 7    | 67654-000 | PUSH BUTTON FLUSH (BLACK)      | 1      |
| 8    | 68595-001 | LENS, RED                      | 1      |
| 9    | 11249-003 | NUT, HEX 10-32 ESNA            | 2      |
| 10   | 66516-005 | HOLE PLUG 11/16                | 1      |
| 11   | 68800-000 | LID ASSY, CONTROLLER           | 1      |
| 13   | 68594-000 | JOYSTICK - OPERATOR            | 4      |
| 14   | 68593-000 | RHEOSTAT - CONTROLLER (48VOLT) | 1      |
| 15   | 68592-000 | JOYSTICK OEM/SEVCON (48V)      | 1      |
| *    | 68592-005 | ROCKER SWITCH BOOT             | 1      |
| *    | 68592-006 | MICRO SWITCH                   | 2      |
| *    | 63913-005 | HANDLE HALVES (PAIR)           | 1      |
| *    | 63913-001 | HANDLE BOOT                    | 1      |
| *    | 68592-007 | PC BOARD W/POT                 | 1      |
| *    | 68592-008 | MICRO SWITCH                   | 3      |
| 16   | 68807-000 | KEYSWITCH & KEY                | 1      |
| *    | 68807-010 | KEY                            | 1      |
| 17   | 68734-004 | TERMINAL STRIP, 120V AC        | 1      |
| 18   | 68590-000 | BASE INDICATOR (LAMP)          | 1      |
| 19   | 11826-012 | SCREW RD HD 10-32 X 1-1/2      | 2      |
| 20   | 12798-004 | TOGGLE SWITCH, MOMENTARY       | 3      |
| 21   | 64417-001 | FLANGE MOUNT                   | 2      |
| 22   | 64443-001 | CONTACT BLOCK, N.O.            | 1      |
| 23   | 68591-000 | LAMP T-2-1/2                   | 1      |
| 24   | 66805-012 | CONTACT BLOCK, N.O./N.C.       | 8      |
| 25   | 11715-003 | SCREW RD HD 6-32 X 3/8         | 4      |
| 28   | 64443-002 | CONTACT BLOCK N.C.             | 2      |
| 29   | 67660-006 | TERMINAL END                   | 2      |
| 30   | 68698-001 | TERMINAL BLOCK (TAN)           | 18     |
| 31   | 68698-002 | TERMINAL BLOCK (BLUE)          | 4      |
| 32   | 68799-000 | ANGLE, CONTROLLER              | 1      |
| 33   | 67662-001 | RELAY SOCKET                   | 4      |
| 34   | 68756-001 | RELAY, SPDT 48 VOLT            | 4      |
| 35   | 67662-005 | RETAINING CLIP & WIRE          | 4      |
| 36   | 11250-001 | NUT HEX 6-32                   | 4      |
| 37   | 67893-003 | MOUNTING RAIL, DIN 8-1/4"      | 1      |
| 40   | 68897-099 | GASKET, BLACK RUBBER           | 3.25FT |
| 41   | 68582-010 | CIRCUIT BREAKER 10 AMP         | 1      |

| ITEM | PART       | DESCRIPTION                     | QTY.   |
|------|------------|---------------------------------|--------|
| 42   | 68767-000  | BRACKET, UPPER CONTROLLER       | 2      |
| 43   | 11708-004  | SCREW 8-32 X 1/2                | 2      |
| 44   | 11248-002  | NUT, HEX ESNA 8-32 UNC          | 2      |
| 45   | 68769-000  | POTENTIOMETER 10 TURN           | 1      |
| 46   | 11252-005  | SCREW HEX HD 1/4-20UNC X 5/8    | 6      |
| 47   | 11246-004  | NUT HEX ESNA 1/4-20UNC          | 6      |
| 48   | 14252-004  | NUT SERT 1/4-20                 | 1      |
| 49   | 068804-000 | BRACKET, POT MOUNT              | 1      |
| 50   | 68860-001  | DOUBLE CONTACT BLOCK GE 2 N.C.  | 1      |
| 51   | 68698-004  | END CAP, CONTACT BLOCK          | 1      |
| 52   | 10080-006  | CLIP, TREE                      | 2      |
| 202  | 29454-099  | WIRE 16GA RED 1 FT              | 21     |
| 203  | 29482-099  | WIRE 16GA GREEN/WHT             | 3 FT   |
| 204  | 68735-099  | WIRE 16GA BLACK/RED             | 5 FT   |
| 205  | 29452-099  | WIRE 16GA BLACK                 | 9.3 FT |
| 206  | 29610-006  | TERM FORK 18-14GA #6            | 60     |
| 207  | 29620-002  | BUTT CONNECTOR 18-14GA          | 6      |
| 210  | 29451-099  | WIRE 16GA WHITE                 | 5.8 FT |
| 211  | 29931-003  | CONN FEMALE PUSH .25 (16-14GA)  | 12     |
| 212  | 29450-099  | WIRE 16GA BLUE                  | 4.1 FT |
| 213  | 29825-002  | DIODE 3 AMP 400V                | 16     |
| 214  | 29478-099  | WIRE 16GA RED/BLACK             | 3.5 FT |
| 215  | 29457-099  | WIRE 16GA GREEN                 | 1.5 FT |
| 216  | 29616-001  | CONN FEMALE PUSH .187 (16-14GA) | 3      |
| 217  | 29360-099  | WIRE 16GA ORANGE/GREEN          | 2 FT   |
| 218  | 29453-099  | WIRE 16GA ORANGE                | 1.2 FT |
| 217  | 29360-099  | WIRE 16GA ORANGE/GREEN          | 2 FT   |
| 218  | 29453-099  | WIRE 16GA ORANGE                | 1.2 FT |
| 219  | 29458-099  | WIRE 16GA PURPLE                | 1.2 FT |
| 220  | 29479-099  | WIRE 16GA WHITE/BLACK           | 4 FT   |
| 221  | 68758-000  | RESISTOR 5000 OHM               | 1      |
| 222  | 29483-099  | WIRE 16GA RED/WHITE             | 2.5 FT |
| 223  | 29601-039  | RING TERM                       | 1      |
| 224  | 29361-099  | WIRE 16GA BLK/WHT/RED           | 2      |
| 225  | 68773-000  | JUMPER                          | 2      |
| 226  | 68814-000  | PIN TERMINAL                    | 6      |
| 227  | REF        | RECEPTACLE                      | 1      |
| 228  | 29464-099  | WIRE 14GA GREEN                 | .5 FT  |

\* Not Shown

# Illustrated Parts Breakdown

Section  
6.2



**CONTROLLER ASSEMBLY  
AB46 ELECTRIC - EURO**  
DRAWING 1 OF 2



# Illustrated Parts Breakdown

Section  
6.2

NOTES:

# Illustrated Parts Breakdown

## CONTROLLER ASSEMBLY - PLATFORM AB46 BI-ENERGY - EURO 68329-011

| ITEM | PART      | DESCRIPTION                               | QTY. |
|------|-----------|---|------|
| 1    | 68589-001 | BOX, ENCLOSURE                            | 1    |
| 2    | 29939-003 | LOCKNUT 3/4" NPT                          | 4    |
| 3    | 29939-002 | LOCKNUT 1/2" NPT                          | 1    |
| 4    | 29925-000 | CONNECTOR CABLE 1/2" NPT                  | 1    |
| 5    | 29925-001 | CONNECTOR CABLE 3/4" NPT                  | 4    |
| 6    | 64446-003 | EMERGENCY STOP BUTTON                     | 1    |
| 7    | 67654-000 | PUSH BUTTON FLUSH (BLACK)                 | 1    |
| 8    | 68595-001 | LENS, RED                                 | 1    |
| 9    | 11249-003 | NUT, HEX 10-32 ESNA                       | 2    |
| 10   | 68595-002 | LENS, AMBER                               | 1    |
| 11   | 68800-000 | LID ASSY, CONTROLLER                      | 1    |
| 12   | 12798-003 | TOGGLE SWITCH, 2 POS, MOM                 | 1    |
| 13   | 68594-000 | JOYSTICK - OPERATOR                       | 4    |
| 14   | 68593-000 | RHEOSTAT - CONTROLLER (48VOLT)            | 1    |
| 15   | 68592-000 | JOYSTICK OEM/SEVCON (48V)                 | 1    |
| *    | 68592-005 | ROCKER SWITCH BOOT                        | 1    |
| *    | 68592-006 | MICRO SWITCH                              | 2    |
| *    | 63913-005 | HANDLE HALVES (PAIR)                      | 1    |
| *    | 63913-001 | HANDLE BOOT                               | 1    |
| *    | 68592-007 | PC BOARD W/POT                            | 1    |
| 16   | 68807-000 | KEYSWITCH & KEY                           | 1    |
| *    | 68807-010 | KEY                                       | 1    |
| 17   | 68734-004 | TERMINAL STRIP, 120V AC                   | 1    |
| 18   | 68590-000 | BASE INDICATOR (LAMP)                     | 2    |
| 19   | 11826-012 | SCREW RD HD 10-32 X 1-1/2                 | 2    |
| 20   | 12798-004 | TOGGLE SWITCH, MOMENTARY                  | 3    |
| 21   | 64417-001 | FLANGE MOUNT                              | 2    |
| 22   | 64443-001 | CONTACT BLOCK, N.O.                       | 1    |
| 23   | 68591-000 | LAMP T-2-1/2                              | 2    |
| 24   | 66805-012 | CONTACT BLOCK, N.O./N.C.                  | 8    |
| 25   | 11715-003 | SCREW RD HD 6-32 X 3/8                    | 4    |
| 26   | 68986-000 | TOGGLE SWITCH,<br>3 POS (HOLD, HOLD, MOM) | 1    |
| 28   | 64443-002 | CONTACT BLOCK N.C.                        | 4    |
| 29   | 67660-006 | TERMINAL END                              | 2    |
| 30   | 68698-001 | TERMINAL BLOCK (TAN)                      | 18   |
| 31   | 68698-002 | TERMINAL BLOCK (BLUE)                     | 4    |
| 32   | 68799-000 | ANGLE, CONTROLLER                         | 1    |
| 33   | 67662-001 | RELAY SOCKET                              | 4    |
| 34   | 68756-001 | RELAY, SPDT 48 VOLT                       | 4    |

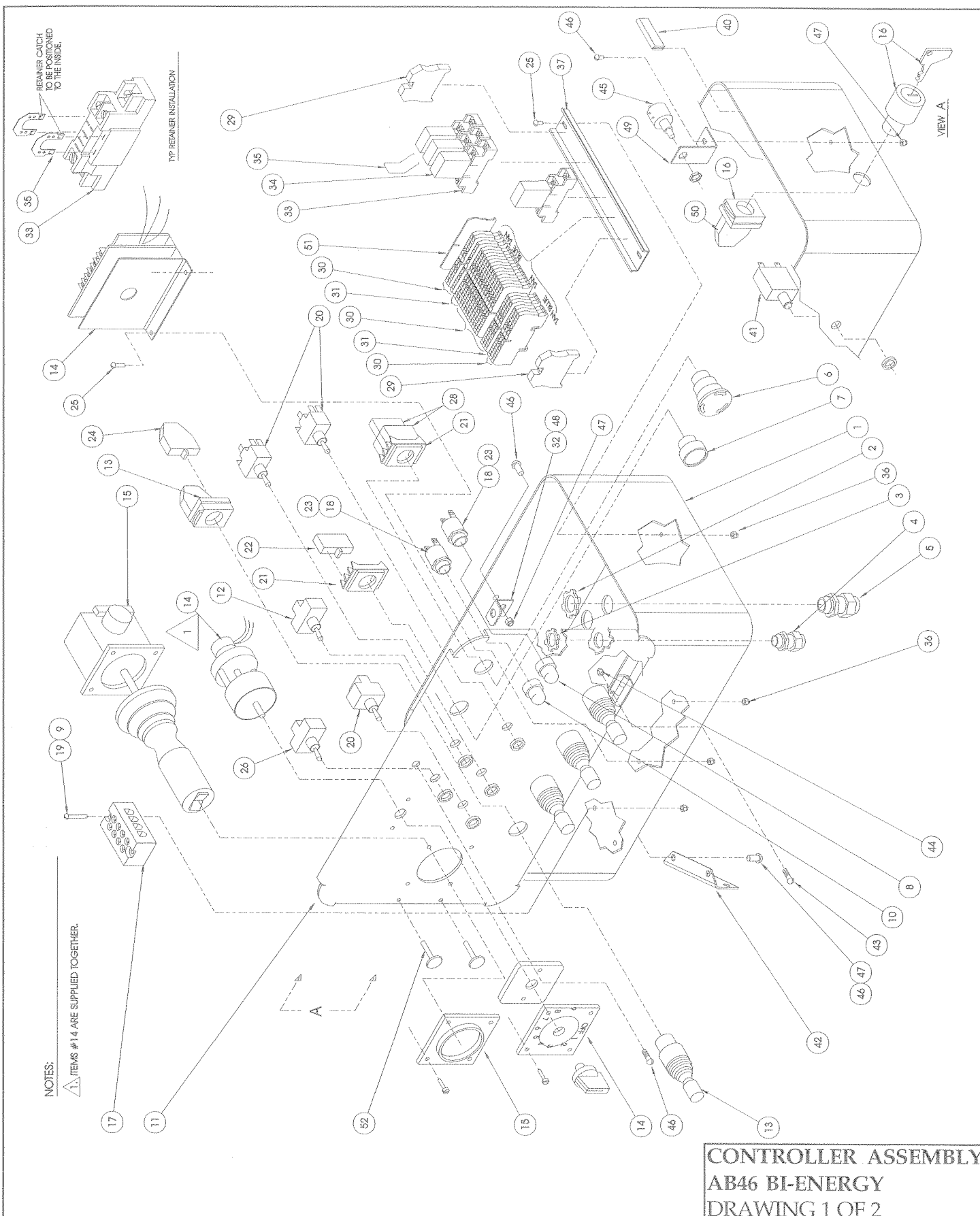
| ITEM | PART       | DESCRIPTION                     | QTY.    |
|------|------------|---------------------------------|---------|
| 35   | 67662-005  | RETAINING CLIP & WIRE           | 4       |
| 36   | 11250-001  | NUT HEX 6-32                    | 4       |
| 37   | 67893-003  | MOUNTING RAIL, DIN 8-1/4"       | 1       |
| 40   | 68897-099  | GASKET, BLACK RUBBER            | 3.25 FT |
| 41   | 68582-010  | CIRCUIT BREAKER 10 AMP          | 1       |
| 42   | 68767-000  | BRACKET, UPPER CONTROLLER       | 2       |
| 43   | 11708-004  | SCREW 8-32 X 1/2                | 2       |
| 44   | 11248-002  | NUT, HEX ESNA 8-32 UNC          | 2       |
| 45   | 68769-000  | POTENTIOMETER 10 TURN           | 1       |
| 46   | 11825-006  | SCREW RD HD 1/4-20UNC X 3/4     | 6       |
| 47   | 11246-004  | NUT HEX ESNA 1/4-20UNC          | 6       |
| 48   | 14252-004  | NUT SERT 1/4-20                 | 1       |
| 49   | 68804-000  | BRACKET, POT MOUNT              | 1       |
| 50   | 068860-001 | DOUBLE CONTACT BLOCK GE 2 N.C.  | 1       |
| 51   | 68698-004  | END CAP, CONTACT BLOCK          | 1       |
| 52   | 10080-006  | CLIP, TREE                      | 2       |
| 202  | 29454-099  | WIRE 16GA RED                   | 21 FT   |
| 203  | 29482-099  | WIRE 16GA GREEN/WHT             | 3 FT    |
| 204  | 68735-099  | WIRE 16GA BLACK/RED             | 5 FT    |
| 205  | 29452-099  | WIRE 16GA BLACK                 | 9.3 FT  |
| 206  | 29610-006  | TERM FORK 18-14GA #6            | 63      |
| 207  | 29620-002  | BUTT CONNECTOR 18-14GA          | 6       |
| 210  | 29451-099  | WIRE 16GA WHITE                 | 5.8 FT  |
| 211  | 29931-003  | CONN FEMALE PUSH .25 (16-14GA)  | 13      |
| 212  | 29450-099  | WIRE 16GA BLUE                  | 4.1 FT  |
| 213  | 29825-002  | DIODE 3 AMP 400V                | 16      |
| 214  | 29478-099  | WIRE 16GA RED/BLACK             | 3.5 FT  |
| 215  | 29457-099  | WIRE 16GA GREEN                 | 1.5 FT  |
| 216  | 29616-001  | CONN FEMALE PUSH .187 (16-14GA) | 3       |
| 217  | 29360-099  | WIRE 16GA ORANGE/GREEN          | 2 FT    |
| 218  | 29453-099  | WIRE 16GA ORANGE                | 1.2 FT  |
| 219  | 29458-099  | WIRE 16GA PURPLE                | 1.2 FT  |
| 220  | 29479-099  | WIRE 16GA WHITE/BLACK           | 4 FT    |
| 221  | 68758-000  | RESISTOR 5000 OHM               | 1       |
| 222  | 29483-099  | WIRE 16GA RED/WHITE             | 2.5 FT  |
| 223  | 29601-039  | RING TERM                       | 1       |
| 225  | 68773-000  | JUMPER                          | 2       |
| 226  | 68814-000  | PIN TERMINAL                    | 6       |
| 228  | 29464-099  | WIRE 14GA GREEN                 | .5 FT   |
| 229  | 29361-099  | WIRE 16GA BLK/WHT/RED           | 2 FT    |

\* Not Shown

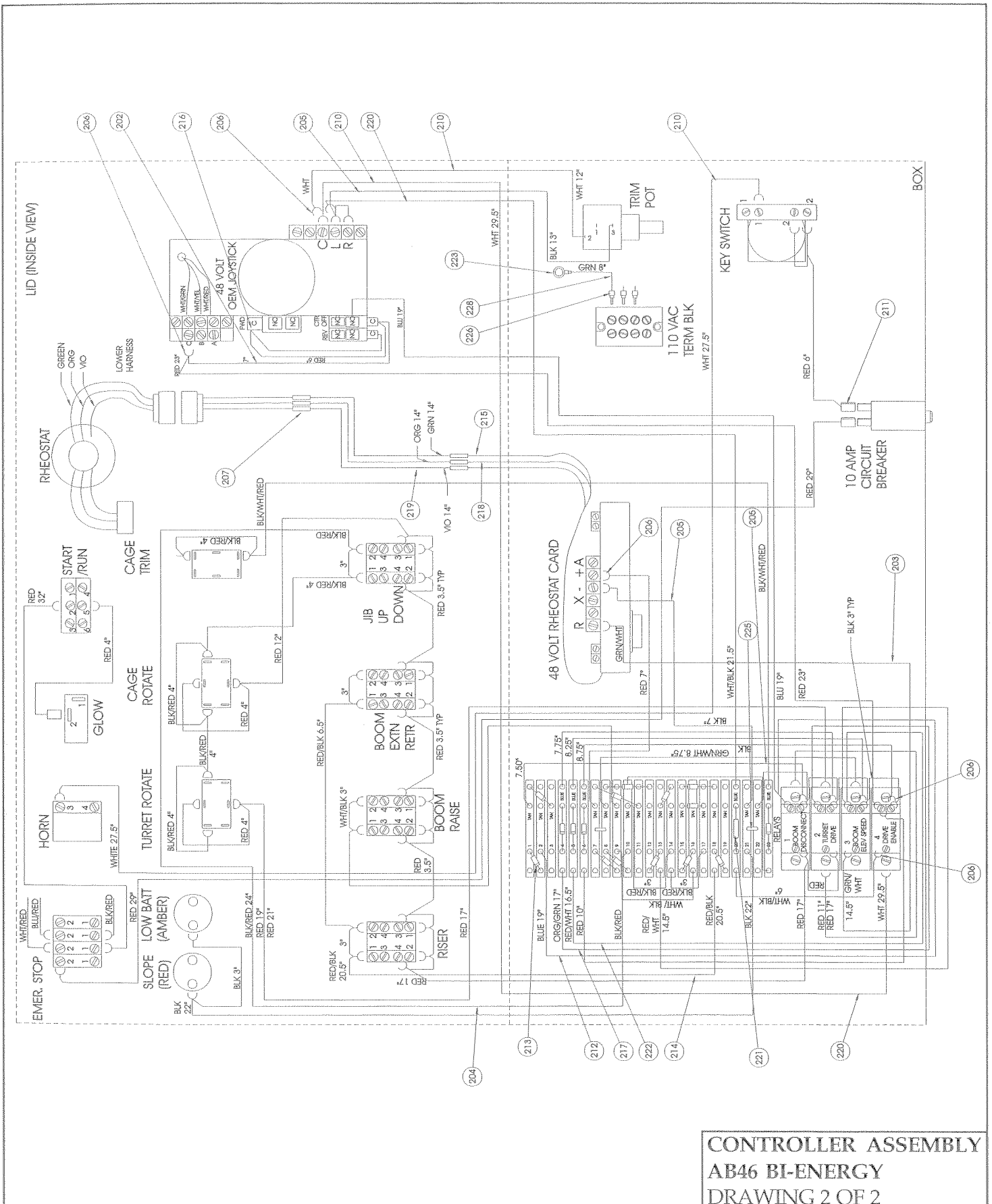


# Illustrated Parts Breakdown

Section  
6.2



# Illustrated Parts Breakdown



# Illustrated Parts Breakdown

Section  
6.2

NOTES:

# Illustrated Parts Breakdown

## HOSE KIT AB46 ELECTRIC 68336-000

| ITEM | PART      | DESCRIPTION                       | QTY. |
|------|-----------|-----------------------------------|------|
| 1    | 68737-324 | 1/4 HOSE ASSY X 324" 4FJX-4FJX    | 2    |
| 2    | 68736-019 | 3/16 HOSE ASSY X 19" 4FJX-4FJX    | 1    |
| 3    | 68737-720 | 1/4 HOSE ASSY X 720" 4FJX-4FJX    | 2    |
| 4    | 68809-264 | 1/4 HOSE ASSY X 264" 4FJX-4FJX    | 2    |
| 5    | 68736-021 | 3/16 HOSE ASSY X 21" 4FJX-4FJX    | 1    |
| 6    | 68736-604 | 3/16 HOSE ASSY X 604" 4FJX-4FJX   | 2    |
| 7    | 68736-350 | 3/16 HOSE ASSY X 350" 4FJX-4FJX   | 2    |
| 8    | 68763-036 | 1/4 HOSE ASSY X 36" 6FJX-4FJX     | 1    |
| 9    | 68737-312 | 1/4 HOSE ASSY X 312" 4FJX-4FJX    | 2    |
| 10   | 68737-177 | 1/4 HOSE ASSY X 177" 4FJX-4FJX    | 2    |
| 11   | 68753-089 | 1/4 HOSE ASSY X 89" 4FJX-6FJX 90° | 2    |
| 12   | 68741-036 | 1/4 HOSE ASSY X 36" 6FJX-6FJX     | 1    |
| 13   | 68741-079 | 1/4 HOSE ASSY X 79" 6FJX-6FJX     | 1    |
| 14   | 68737-075 | 1/4 HOSE ASSY X 75" 4FJX-4FJX     | 1    |
| 15   | 68740-090 | 1/2 HOSE ASSY X 90" 10FJX-10FJX   | 1    |
| 16   | 68753-084 | 1/4 HOSE ASSY X 84" 4FJX-6FJX 90° | 1    |
| 17   | 68763-016 | 1/4 HOSE ASSY X 16" 6FJX-4FJX     | 1    |
| 18   | 68741-085 | 1/4 HOSE ASSY X 85" 6FJX-6FJX     | 1    |

## Section 6.2



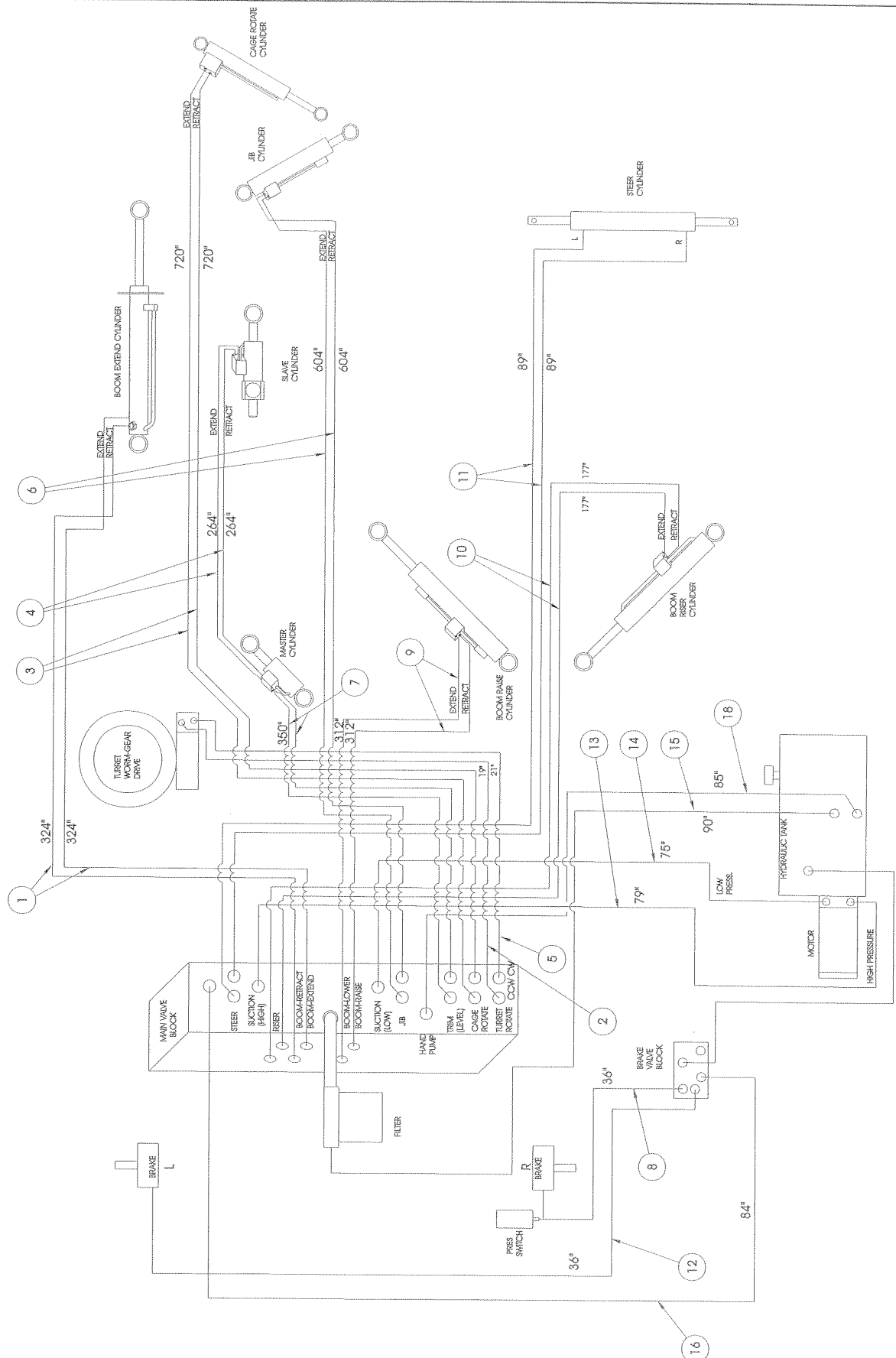
# Illustrated Parts Breakdown

## HOSE KIT AB46 BI-ENERGY 68336-002

| ITEM | PART      | DESCRIPTION                       | QTY. |
|------|-----------|-----------------------------------|------|
| 1    | 68737-324 | 1/4 HOSE ASSY X 324" 4FJX-4FJX    | 2    |
| 2    | 68736-019 | 3/16 HOSE ASSY X 19" 4FJX-4FJX    | 1    |
| 3    | 68737-720 | 1/4 HOSE ASSY X 720" 4FJX-4FJX    | 2    |
| 4    | 68809-264 | 1/4 HOSE ASSY X 264" 4FJX-4FJX    | 2    |
| 5    | 68736-021 | 3/16 HOSE ASSY X 21" 4FJX-4FJX    | 1    |
| 6    | 68736-604 | 3/16 HOSE ASSY X 604" 4FJX-4FJX   | 2    |
| 7    | 68736-350 | 3/16 HOSE ASSY X 350" 4FJX-4FJX   | 2    |
| 8    | 68763-036 | 1/4 HOSE ASSY X 36" 6FJX-4FJX     | 1    |
| 9    | 68737-312 | 1/4 HOSE ASSY X 312" 4FJX-4FJX    | 2    |
| 10   | 68737-177 | 1/4 HOSE ASSY X 177" 4FJX-4FJX    | 2    |
| 11   | 68753-089 | 1/4 HOSE ASSY X 89" 4FJX-6FJX 90° | 2    |
| 12   | 68741-036 | 1/4 HOSE ASSY X 36" 6FJX-6FJX     | 1    |
| 13   | 68741-079 | 1/4 HOSE ASSY X 79" 6FJX-6FJX     | 1    |
| 14   | 68737-075 | 1/4 HOSE ASSY X 75" 4FJX-4FJX     | 1    |
| 15   | 68740-090 | 1/2 HOSE ASSY X 90" 10FJX-10FJX   | 1    |
| 16   | 68753-084 | 1/4 HOSE ASSY X 84" 4FJX-6FJX 90° | 1    |
| 18   | 68741-085 | 1/4 HOSE ASSY X 85" 6FJX-6FJX     | 1    |

# Illustrated Parts Breakdown

Section  
6.2



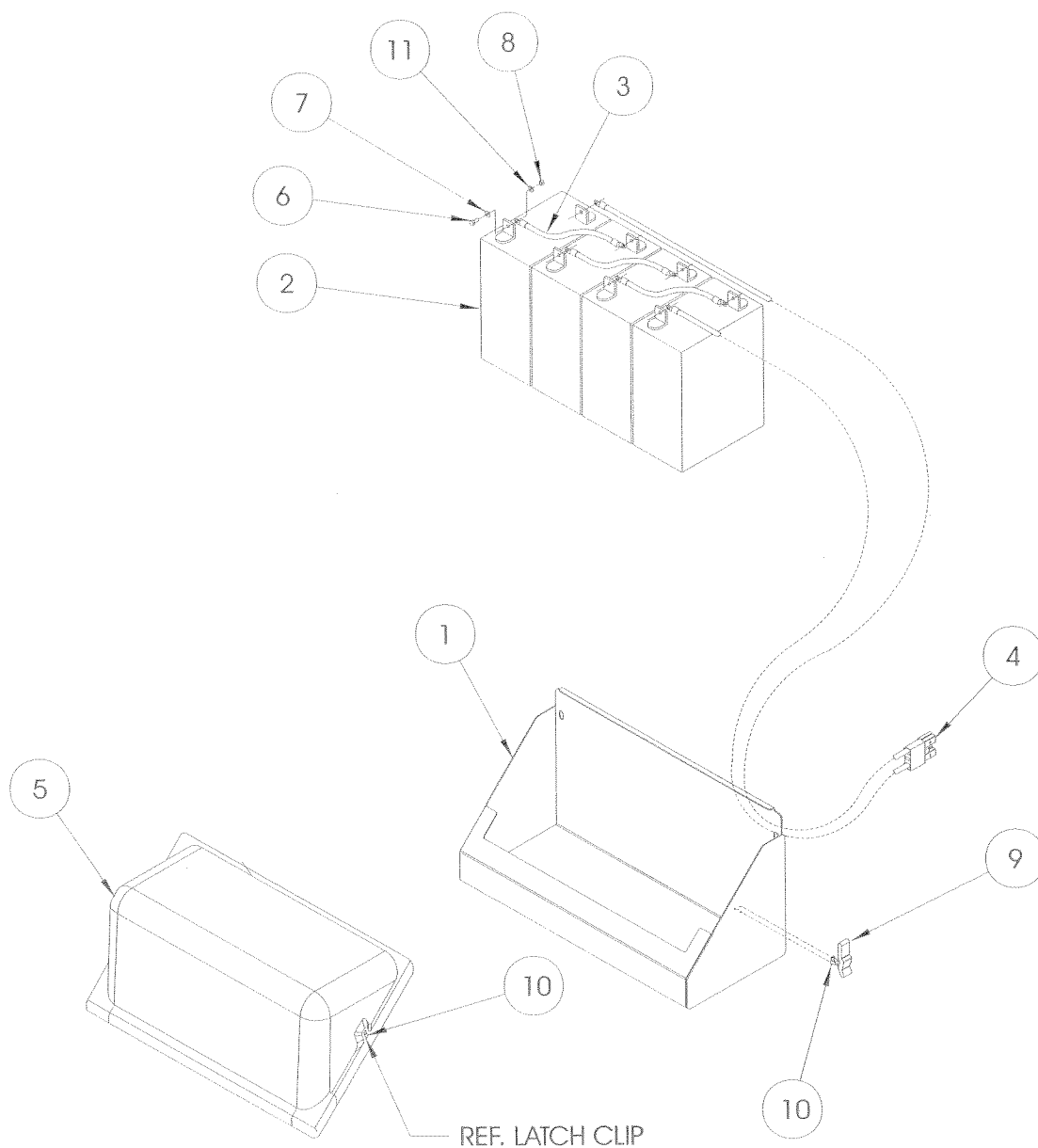
# Illustrated Parts Breakdown

## BATTERY MODULE ASSEMBLY

AB46

68331-001,002

| ITEM | PART      | DESCRIPTION                        | QTY. |
|------|-----------|------------------------------------|------|
| 1    | 68726-000 | BATTERY TRAY WELDMENT              | 1    |
| 2    | 68568-000 | BATTERY, 6 VOLT 350 AMP HR.        | 4    |
| *    | 68568-001 | BATTERY, HIBERNATED (for shipping) | -    |
| 3    | 68334-001 | CABLE ASSEMBLY                     | 3    |
| 4    | 68332-002 | CABLE ASSEMBLY                     | 1    |
| 5    | 68659-000 | COVER, BATTERY TRAY                | 1    |
| 6    | 11253-007 | SCREW, HHC 5/16-18 UNC X 7/8       | 8    |
| 7    | 14996-005 | WASHER, 5/16 DIA. S.A.E.           | 8    |
| 8    | 11250-005 | NUT, HEX 5/16-18 UNC               | 8    |
| 9    | 68757-000 | LATCH, SOUTHCO                     | 2    |
| 10   | 26552-005 | POP RIVET,                         | 8    |
| 11   | 11238-005 | WASHER, SPLIT LOCK 5/16            | 8    |





# Illustrated Parts Breakdown

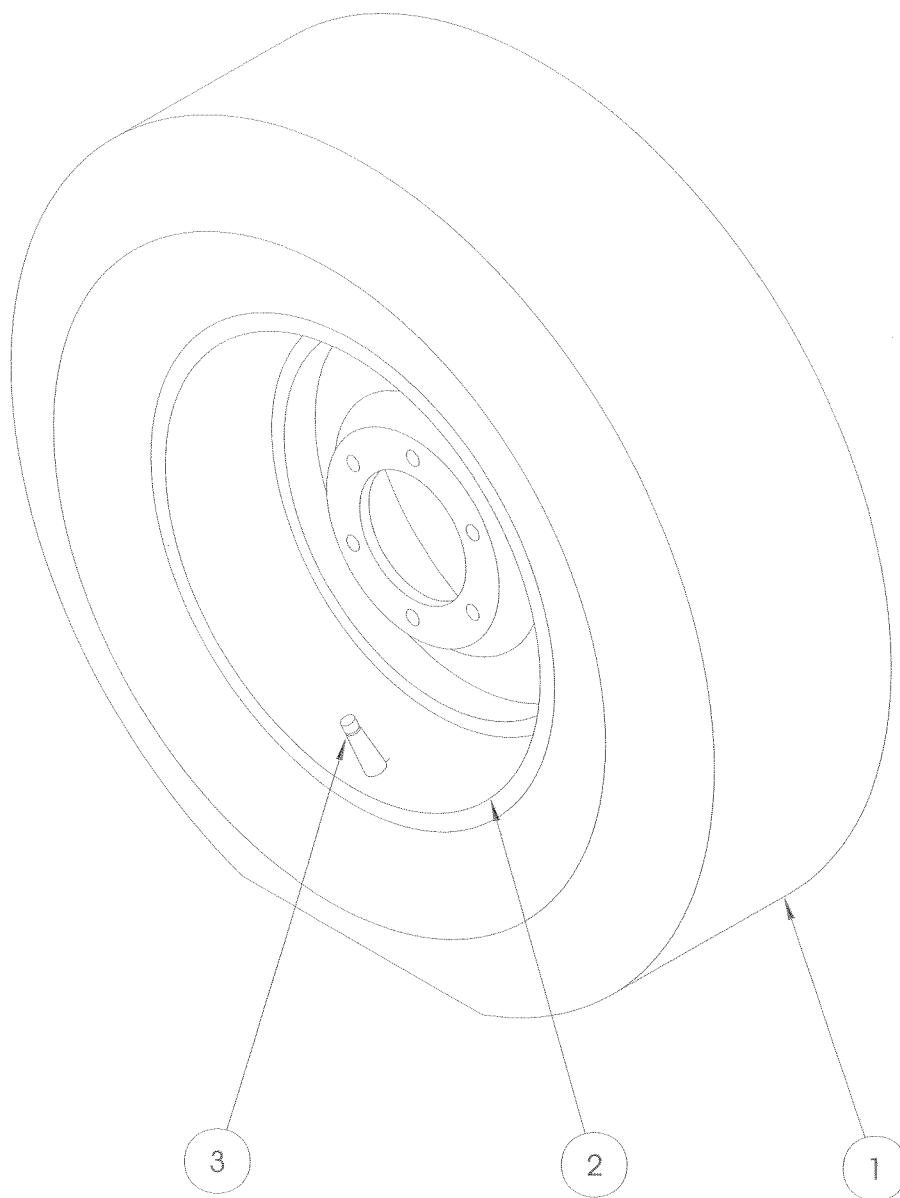
Section  
6.2

## TIRE & WHEEL ASSEMBLY

AB46

68327-000

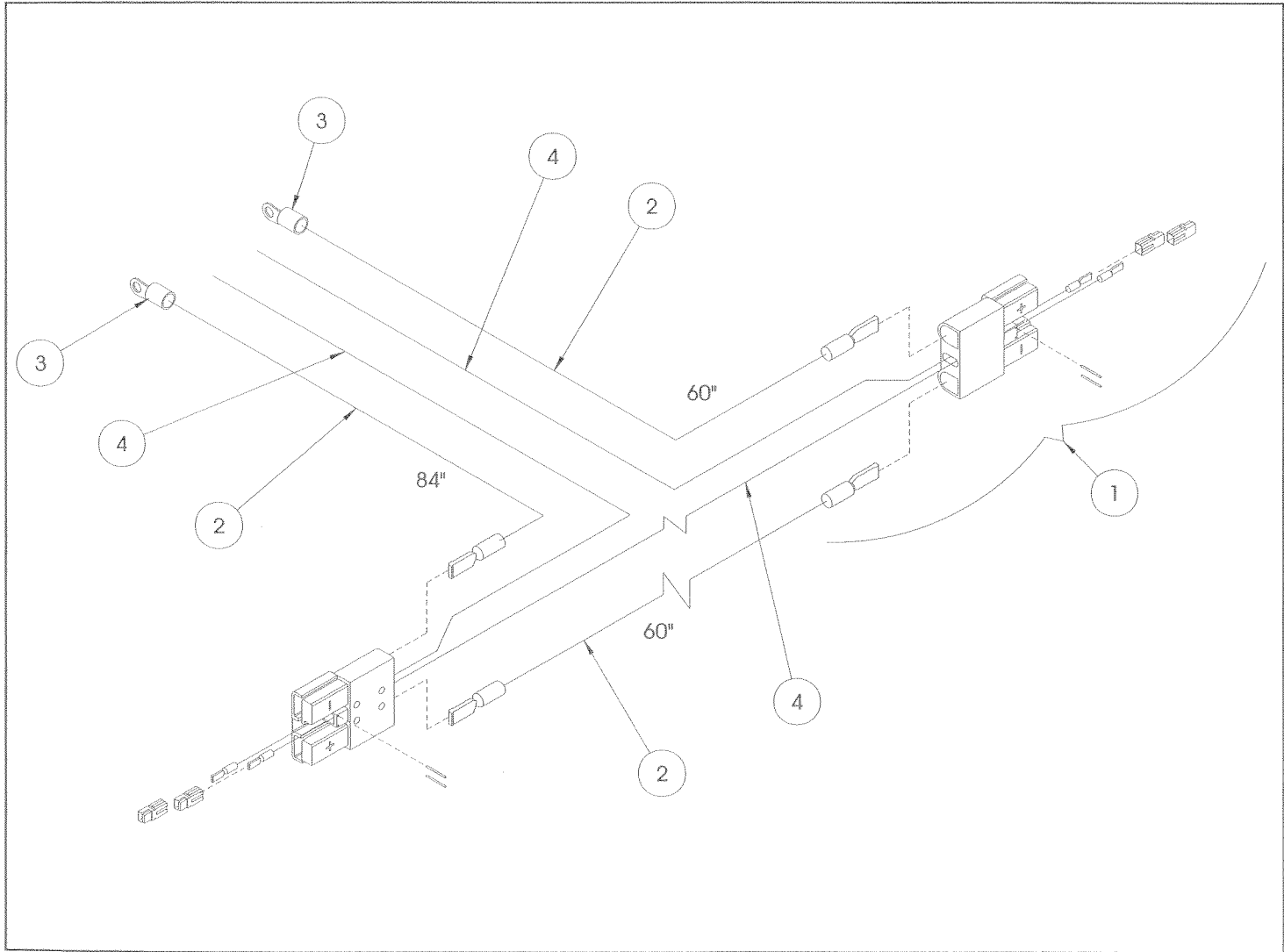
| ITEM | PART      | DESCRIPTION                          | QTY. |
|------|-----------|--------------------------------------|------|
| 1    | 68555-000 | TIRE 16.5 X 9.50 10 PLY              | 1    |
| 2    | 67609-000 | WHEEL 16.5 X 8.25, 6 HOLE ON 6" B.C. | 1    |
| 3    | 12282-001 | VALVE STEM                           | 1    |



# Illustrated Parts Breakdown

CABLE ASSEMBLY  
AB46  
68333-000

| ITEM | PART      | DESCRIPTION                         | QTY.  |
|------|-----------|-------------------------------------|-------|
| 1    | 29902-001 | CONNECTOR, ANDERSON (SBX175AMP)     | 2     |
| 2    | 68580-099 | CABLE, 1/0 A.W.G. WELDING           | 17 FT |
| 3    | 29602-024 | CONNECTOR, RING 1/0 A.W.G. X Ø 5/16 | 2     |
| 4    | 29453-099 | WIRE, 16 GA. ORANGE                 | 18 FT |



# Illustrated Parts Breakdown

Section  
6.2

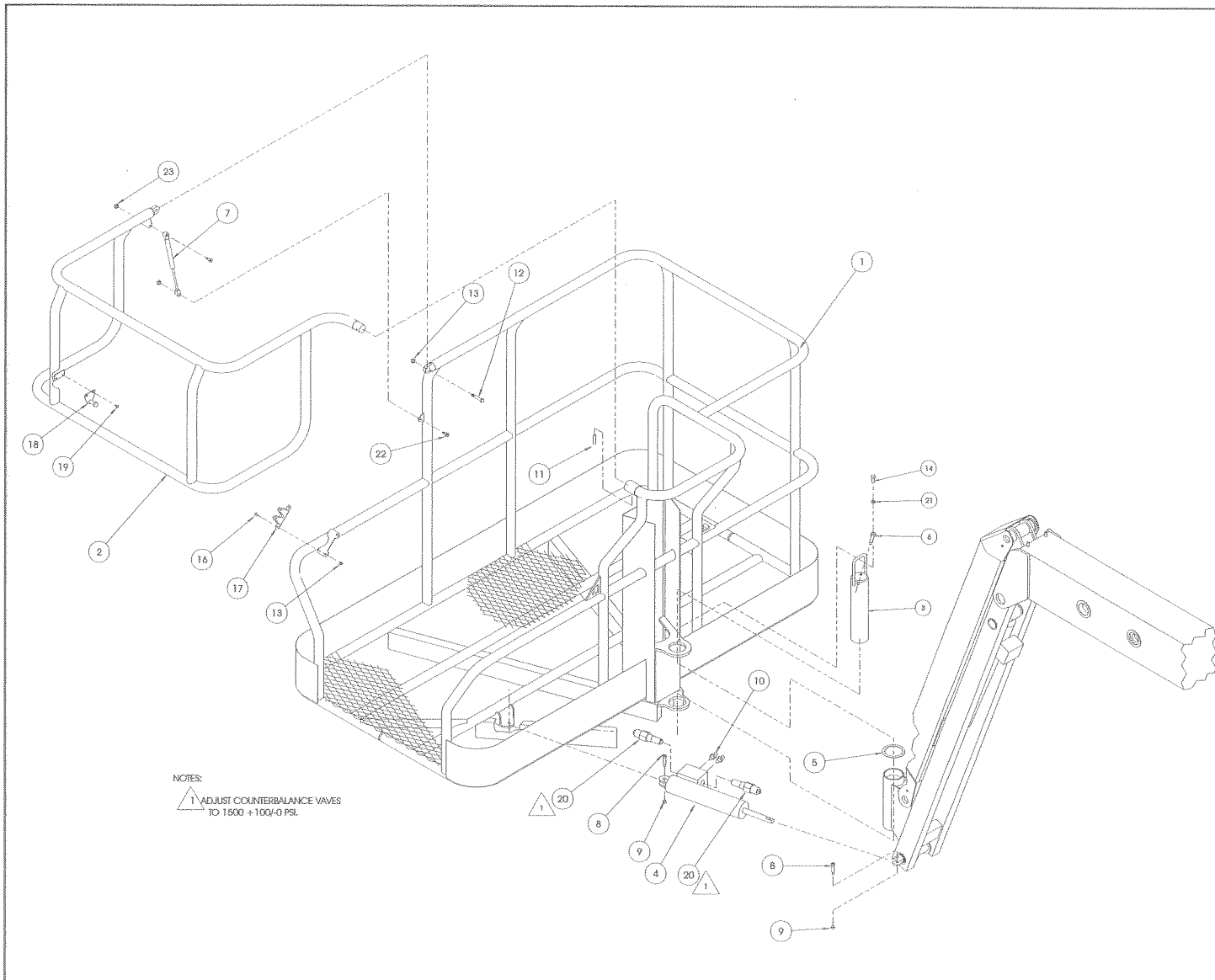
## CAGE "B" ASSEMBLY

AB46

68325-001

| ITEM | PART      | DESCRIPTION                    | QTY. |
|------|-----------|--------------------------------|------|
| 1    | 68500-001 | CAGE "B" WELDMENT              | 1    |
| 2    | 68532-000 | LIFT-UP GATE WELDMENT          | 1    |
| 3    | 68775-000 | BASKET PIN WELDMENT            | 1    |
| 4    | 68457-000 | CYLINDER, CAGE ROTATION        | 1    |
| *    | 68457-010 | SEAL KIT, CAGE ROTATE          | 1    |
| 5    | 68651-000 | THRUST WASHER G32DU (MODIFIED) | 1    |
| 6    | 65214-000 | PIN RETAINER                   | 1    |
| 7    | 63650-012 | GAS SPRING                     | 1    |
| 8    | 15936-010 | SHOULDER BOLT                  | 2    |
| 9    | 11248-005 | LOCKNUT                        | 2    |
| 10   | 11939-004 | FITTING, 4MP-4MJ               | 2    |
| 11   | 11737-012 | ROLLPIN 1/4" X 1-1/2"          | 1    |

| ITEM | PART      | DESCRIPTION                      | QTY |
|------|-----------|----------------------------------|-----|
| 12   | 11703-008 | SCREW, HHC 1/4-20 X 1-1/2        | 1   |
| 13   | 11248-004 | NUT HEX 1/4-20                   | 3   |
| 14   | 11254-008 | SCREW HHC 3/8-16 X 1             | 1   |
| 16   | 11821-005 | SCREW BUTTON HD 1/4-20 UNC X 5/8 | 2   |
| 17   | 68277-000 | LATCH ROTARY                     | 1   |
| 18   | 68806-000 | STRIKER WELDMENT                 | 1   |
| 19   | 11709-004 | SCREW RND HD 10-24 UNC X 1/2     | 2   |
| 20   | 68778-000 | VALVE COUNTERBALANCE (550 PSI)   | 2   |
| 21   | 11238-006 | LOCKWASHER 3/8 SPLIT             | 1   |
| 22   | 15936-005 | SHOULDER BOLT 3/8 X 5/8 LG       | 2   |
| 23   | 11248-005 | NUT, ESNA 5/16-18                | 2   |



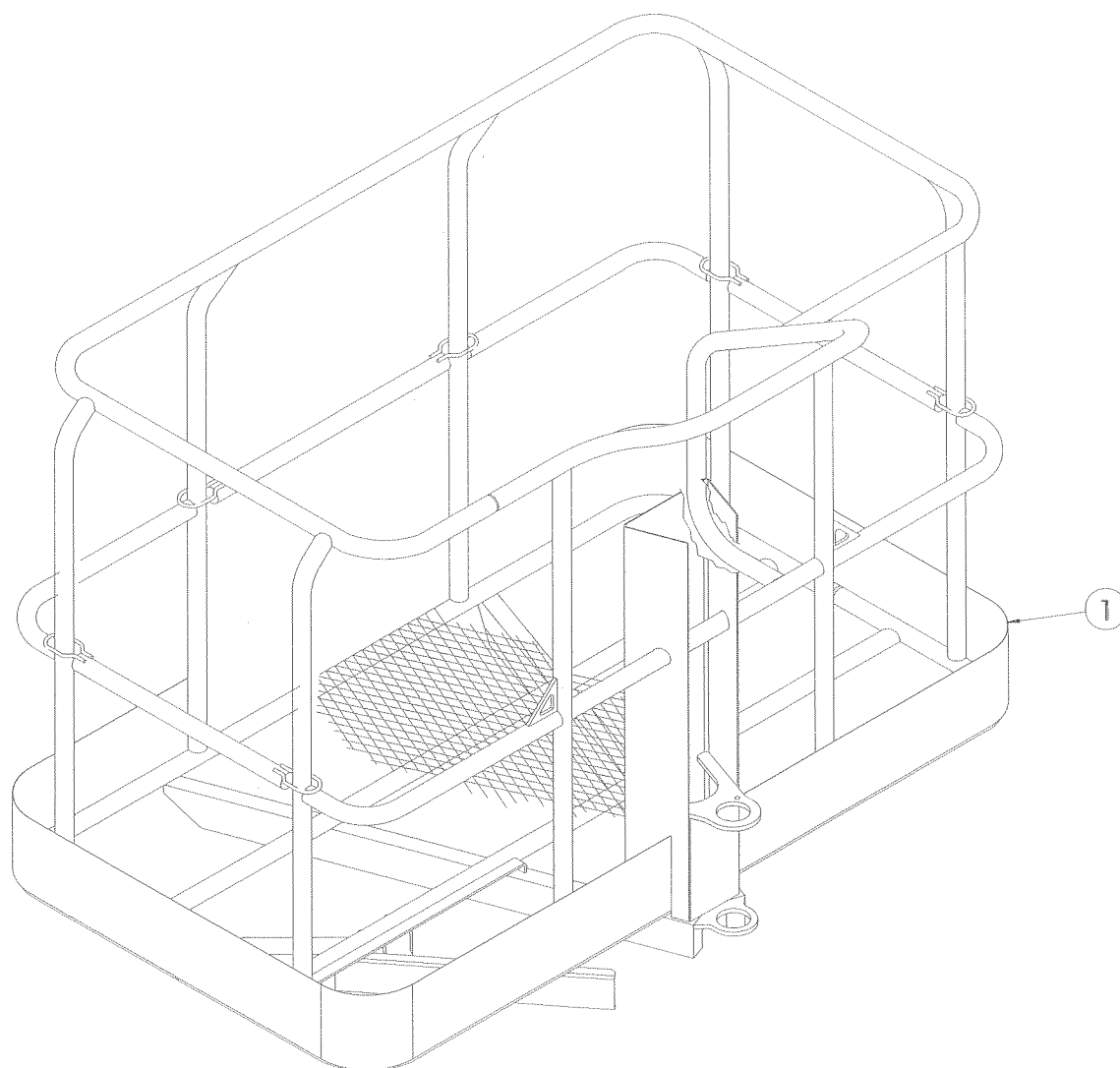
# Illustrated Parts Breakdown

CAGE "A"

AB46

68500-000

| ITEM | PART      | DESCRIPTION       | QTY. |
|------|-----------|-------------------|------|
| 1    | 68500-000 | CAGE "A" WELDMENT | 1    |

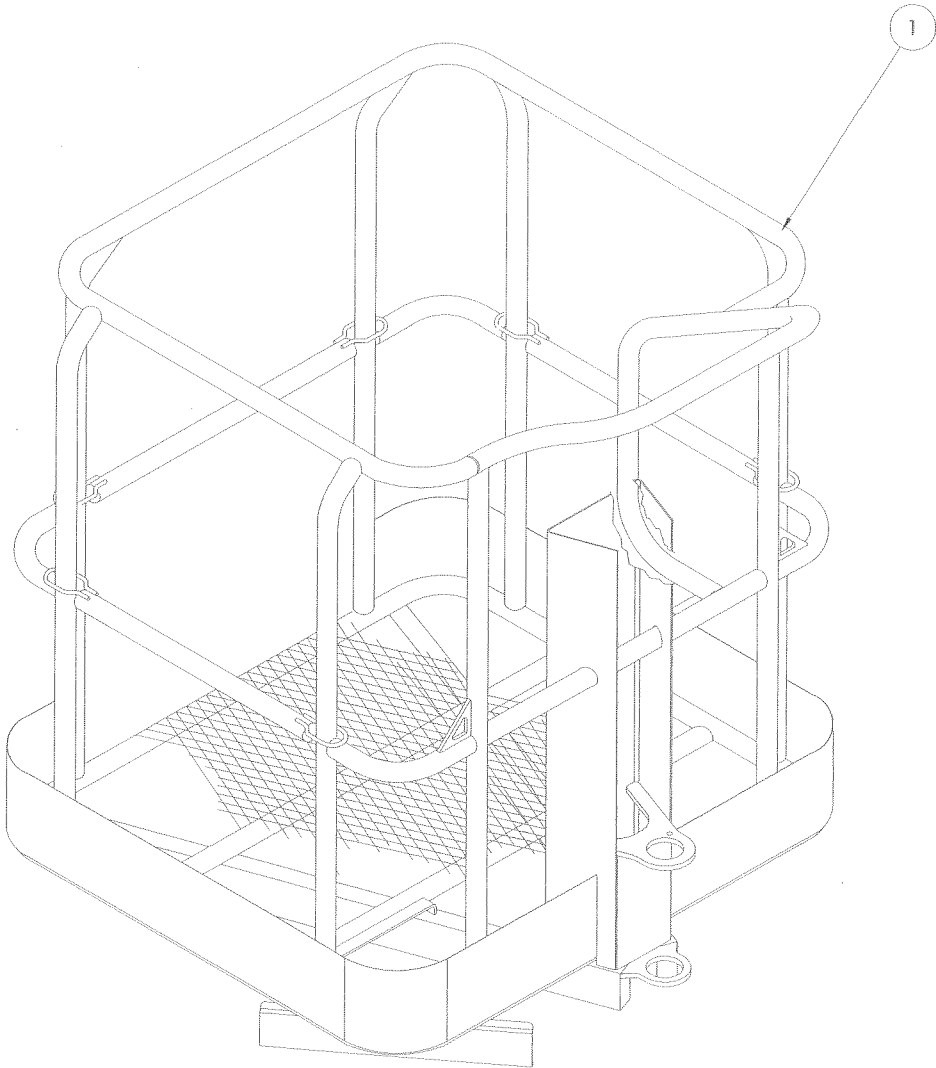


# Illustrated Parts Breakdown

Section  
6.2

4 FT. CAGE  
AB46  
68500-003

| ITEM | PART      | DESCRIPTION        | QTY. |
|------|-----------|--------------------|------|
| 1    | 68500-003 | CAGE WELDMENT 4 FT | 1    |



# Illustrated Parts Breakdown

**LABEL KIT, AB46**  
**ELECTRIC - EURO**  
68335-100

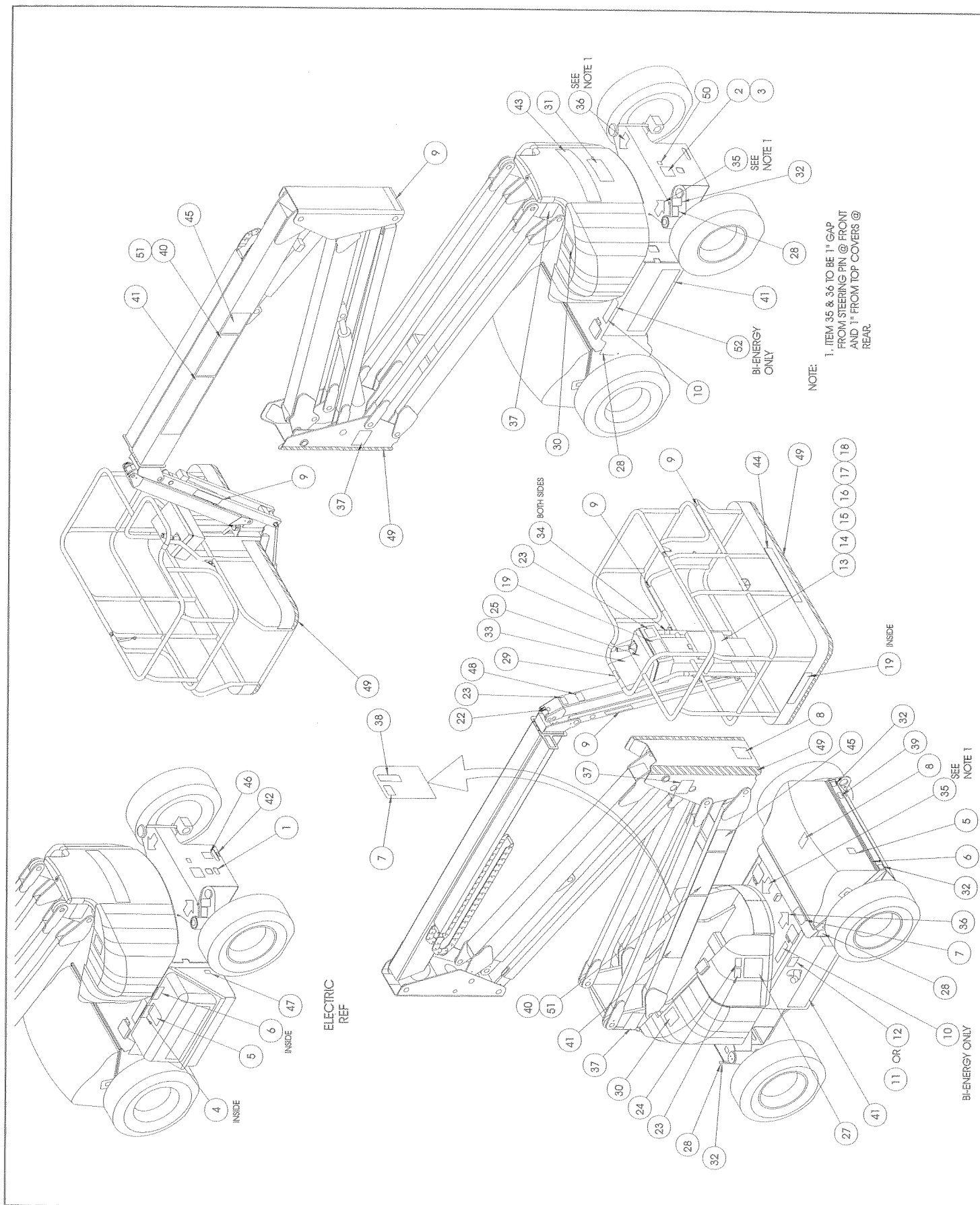
| ITEM | PART       | DESCRIPTION                       | QTY. |
|------|------------|-----------------------------------|------|
| 1    | 066522-000 | LABEL BATTERY CHARGER             | 1    |
| 2    | 061205-002 | NAME PLATE / BOOM                 | 1    |
| 3    | 065368-000 | TACK                              | 4    |
| 4    | 062562-002 | LABEL BATTERY 120LBS EA           | 2    |
| 5    | 066552-000 | LABEL EXPLOSIVE GAS               | 2    |
| 6    | 005221-000 | LABEL BATTERY LEVEL               | 2    |
| 7    | 066555-000 | LABEL LIMIT SWITCH                | 2    |
| 8    | 066556-000 | LABEL PINCH POINT                 | 2    |
| 9    | 066553-001 | LABEL PINCH POINT                 | 5    |
| 10   | 060197-000 | LABEL HYDRAULIC FLUID             | 1    |
| 13   | 010076-000 | MANUAL CASE                       | 1    |
| 14   | 010076-001 | LABEL ATTENTION                   | 1    |
| 15   | 068342-020 | USER MANUAL EURO ELEC             | 1    |
| 17   | 011248-004 | NUT HEX ESNA 1/4-20UNC            | 4    |
| 18   | 011252-008 | SCREW HHC X 1/4-20 X 1            | 4    |
| 19   | 062557-012 | MAX LOAD 500 Lb / 225 Kg          | 2    |
| 22   | 064444-000 | LABEL USA                         | 1    |
| 23   | 066554-000 | LABEL BEFORE OPERATION            | 3    |
| 24   | 068641-001 | LABEL WARNING BRAKE RELEASE-ELEC  | 1    |
| 25   | 068586-011 | LABEL UPPER CONTROLS ELEC.        | 1    |
| 27   | 068587-010 | LABEL LOWER CONTROLS              | 1    |
| 28   | 066562-001 | TIRE PSI                          | 4    |
| 30   | 066568-000 | LABEL CRUSHING HAZARD             | 2    |
| 32   | 068632-000 | LABEL HOLD DOWN                   | 4    |
| 33   | 068633-000 | LABEL READ & UNDERSTAND           | 1    |
| 34   | 068635-000 | LABEL HARNESS POINT               | 2    |
| 35   | 068637-000 | LABEL ARROW YELLOW                | 2    |
| 36   | 068637-001 | LABEL ARROW ORANGE                | 2    |
| 37   | 066553-004 | LABEL PINCH POINT                 | 4    |
| 38   | 068638-000 | LABEL EMERGENCY LOWER             | 1    |
| 39   | 068639-000 | LABEL POWER TO PLATFORM           | 1    |
| 40   | 068634-001 | LABEL AB46                        | 2    |
| 41   | 061683-005 | LABEL UPRIGHT                     | 4    |
| 42   | 068640-000 | LABEL POWER TO CHARGER            | 1    |
| 43   | 061683-007 | LABEL UPRIGHT                     | 1    |
| 44   | 061683-004 | LABEL UPRIGHT                     | 1    |
| 46   | 068636-000 | LABEL EXPLOSIVE GAS/CHARGER INSTL | 1    |
| 47   | 068631-000 | LABEL BATTERY DISCONNECT          | 2    |
| 48   | 068649-000 | LABEL CAUTION - RAISE JIB BOOM    | 1    |
| 49   | 068833-099 | TAPE, 2" WIDE RED/WHT STRIPE      | .5   |
| 50   | 030768-001 | LABEL CE                          | 1    |

**LABEL KIT, AB46**  
**BI-ENERGY - EURO**  
68335-103

| ITEM | PART       | DESCRIPTION                       | QTY. |
|------|------------|-----------------------------------|------|
| 1    | 066522-000 | LABEL BATTERY CHARGER             | 1    |
| 2    | 061205-002 | NAME PLATE / BOOM                 | 1    |
| 3    | 065368-000 | TACK                              | 4    |
| 4    | 062562-002 | LABEL BATTERY 120LBS EA           | 2    |
| 5    | 066552-000 | LABEL EXPLOSIVE GAS               | 3    |
| 6    | 005221-000 | LABEL BATTERY LEVEL               | 3    |
| 7    | 066555-000 | LABEL LIMIT SWITCH                | 2    |
| 8    | 066556-000 | LABEL PINCH POINT                 | 2    |
| 9    | 066553-001 | LABEL PINCH POINT                 | 5    |
| 10   | 060197-000 | LABEL HYDRAULIC FLUID             | 1    |
| 13   | 010076-000 | MANUAL CASE                       | 1    |
| 14   | 010076-001 | LABEL ATTENTION                   | 1    |
| 15   | 068342-022 | USER MANUAL EURO BI               | 1    |
| 17   | 011248-004 | NUT HEX ESNA 1/4-20UNC            | 4    |
| 18   | 011252-008 | SCREW HHC X 1/4-20 X 1            | 4    |
| 19   | 062557-012 | MAX LOAD 500 Lb / 225 Kg          | 2    |
| 22   | 064444-000 | LABEL USA                         | 1    |
| 23   | 066554-000 | LABEL BEFORE OPERATION            | 3    |
| 24   | 068641-000 | LABEL WARNING BRAKE RELEASE-I/C   | 1    |
| 25   | 068586-012 | LABEL UPPER CONTROLS BI           | 1    |
| 27   | 068587-011 | LABEL LOWER CONTROLS              | 1    |
| 28   | 066562-001 | TIRE PSI                          | 4    |
| 30   | 066568-000 | LABEL CRUSHING HAZARD             | 2    |
| 32   | 068632-000 | LABEL HOLD DOWN                   | 4    |
| 33   | 068633-000 | LABEL READ & UNDERSTAND           | 1    |
| 34   | 068635-000 | LABEL HARNESS POINT               | 2    |
| 35   | 068637-000 | LABEL ARROW YELLOW                | 2    |
| 36   | 068637-001 | LABEL ARROW ORANGE                | 2    |
| 37   | 066553-004 | LABEL PINCH POINT                 | 4    |
| 38   | 068638-000 | LABEL EMERGENCY LOWER             | 1    |
| 39   | 068639-000 | LABEL POWER TO PLATFORM           | 1    |
| 41   | 061683-005 | LABEL UPRIGHT                     | 4    |
| 42   | 068640-000 | LABEL POWER TO CHARGER            | 1    |
| 43   | 061683-007 | LABEL UPRIGHT                     | 1    |
| 44   | 061683-004 | LABEL UPRIGHT                     | 1    |
| 46   | 068636-000 | LABEL EXPLOSIVE GAS/CHARGER INSTL | 1    |
| 47   | 068631-000 | LABEL BATTERY DISCONNECT          | 2    |
| 48   | 068649-000 | LABEL CAUTION - RAISE JIB BOOM    | 1    |
| 49   | 068833-099 | TAPE, 2" WIDE RED/WHT STRIPE      | .5   |
| 50   | 030768-001 | LABEL CE                          | 1    |
| 51   | 068983-000 | LABEL BI-ENERGY                   | 2    |
| 52   | 27898-001  | LABEL DIESEL FUEL                 | 1    |

# Illustrated Parts Breakdown

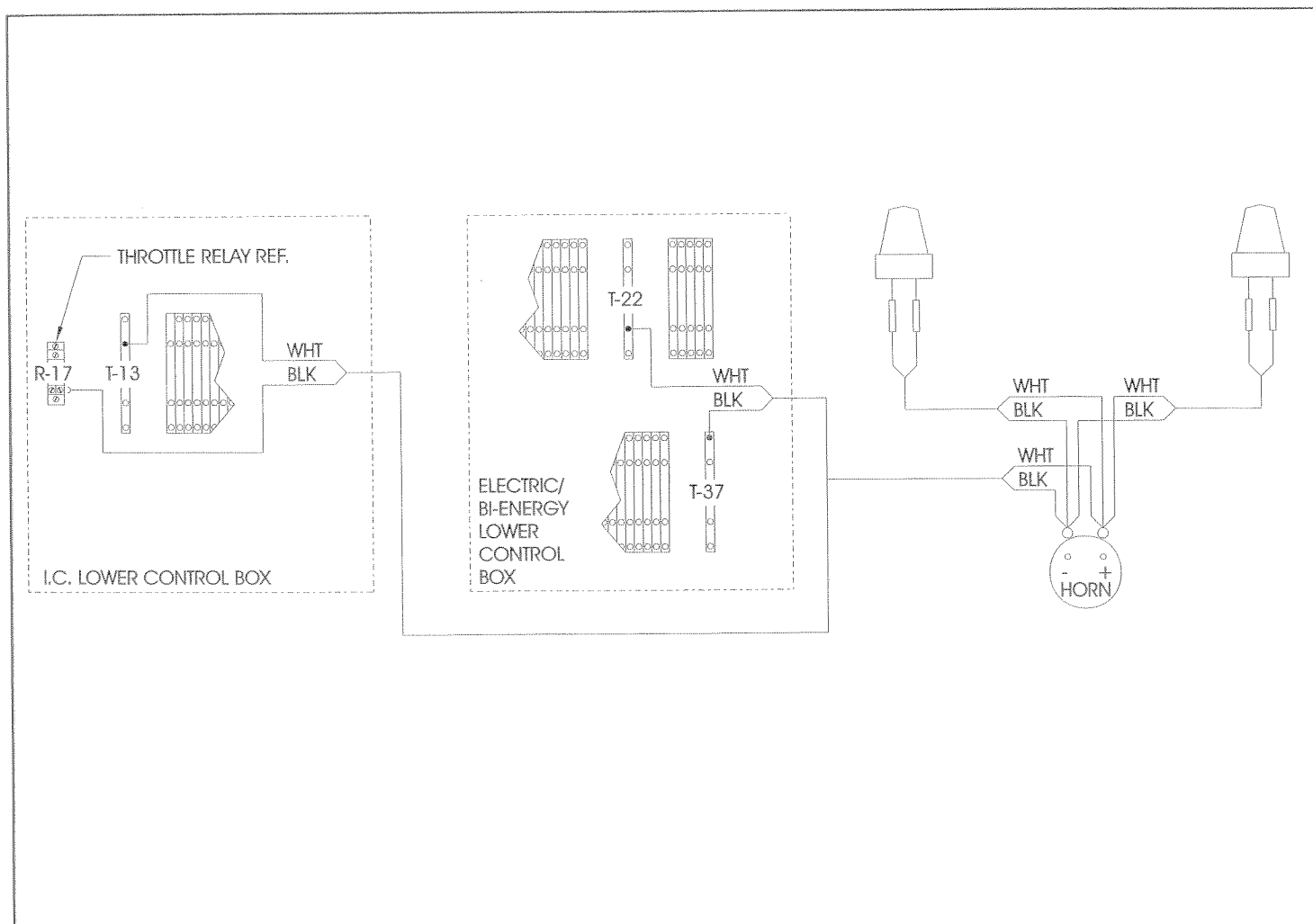
Section  
6.2



# Illustrated Parts Breakdown

## MOTION ALARM/FLASHING BEACON OPTION - AB46 68294-000

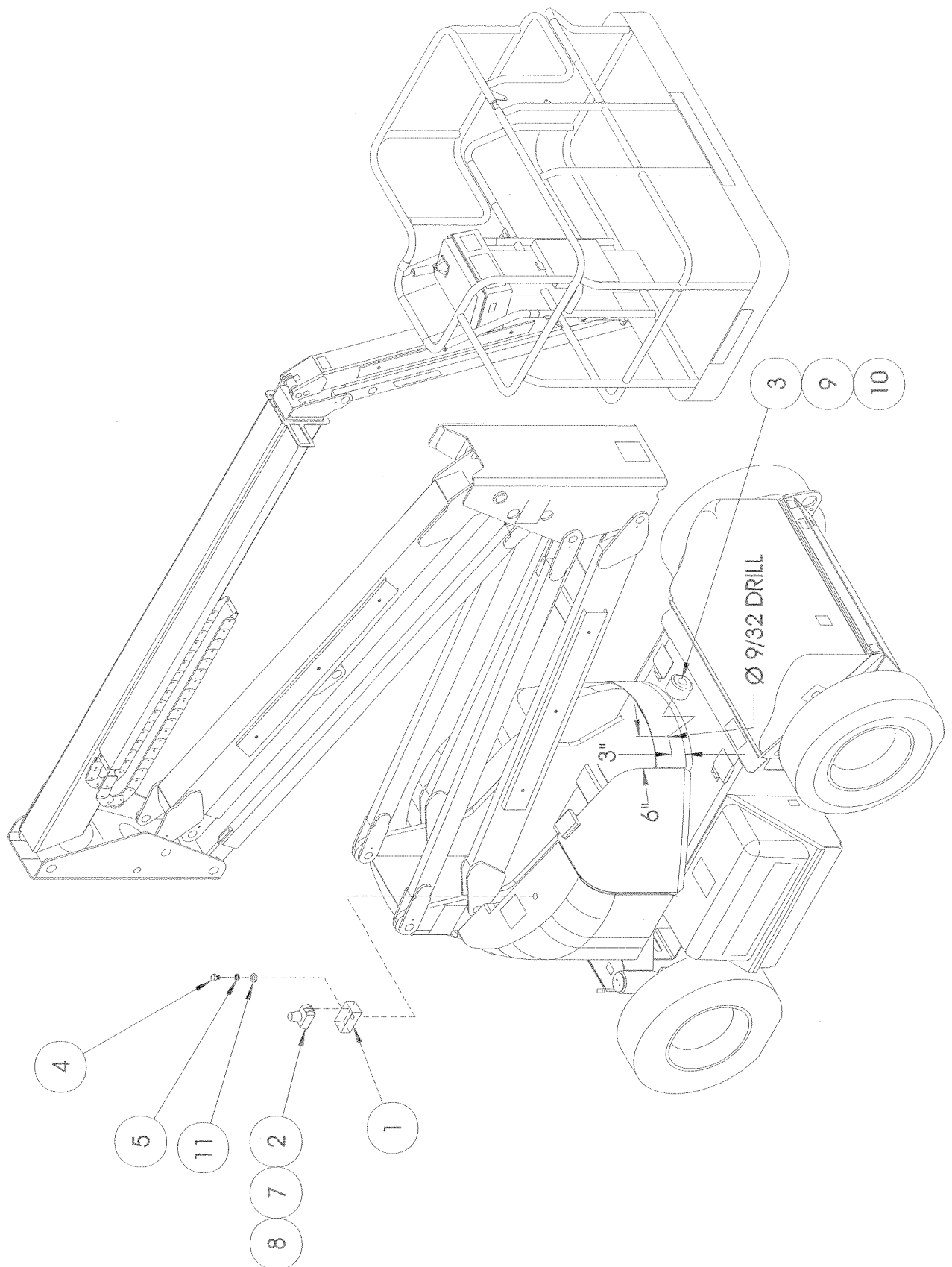
| ITEM | PART      | DESCRIPTION                     | QTY. |
|------|-----------|---------------------------------|------|
| 1    | 66817-000 | STROBE MOUNT WELDMENT           | 2    |
| 2    | 12848-004 | FLASHING STROBE LIGHT           | 2    |
| 3    | 66807-000 | HORN                            | 1    |
| 4    | 11258-008 | SCR. HHC 3/4-10 UNC X 1         | 1    |
| 5    | 11238-016 | WASHER, SPLIT LOCK              | 1    |
| 6    | 29496-099 | WIRE, C COND. 16 GA.            | 8 FT |
| 7    | 11709-004 | SCREW # 10-24 UNC X 1/2" LG     | 4    |
| 8    | 11248-003 | LOCKNUT # 10-24 UNC ESNA        | 4    |
| 9    | 11252-006 | SCREW, HHC 1/4-20UNC X 3/4" LG. | 1    |
| 10   | 11239-004 | LOCKWASHER, 1/4" SPLIT RING     | 1    |
| 11   | 11240-012 | FLATWASHER STD 3/4"             | 2    |





# Illustrated Parts Breakdown

Section  
6.2

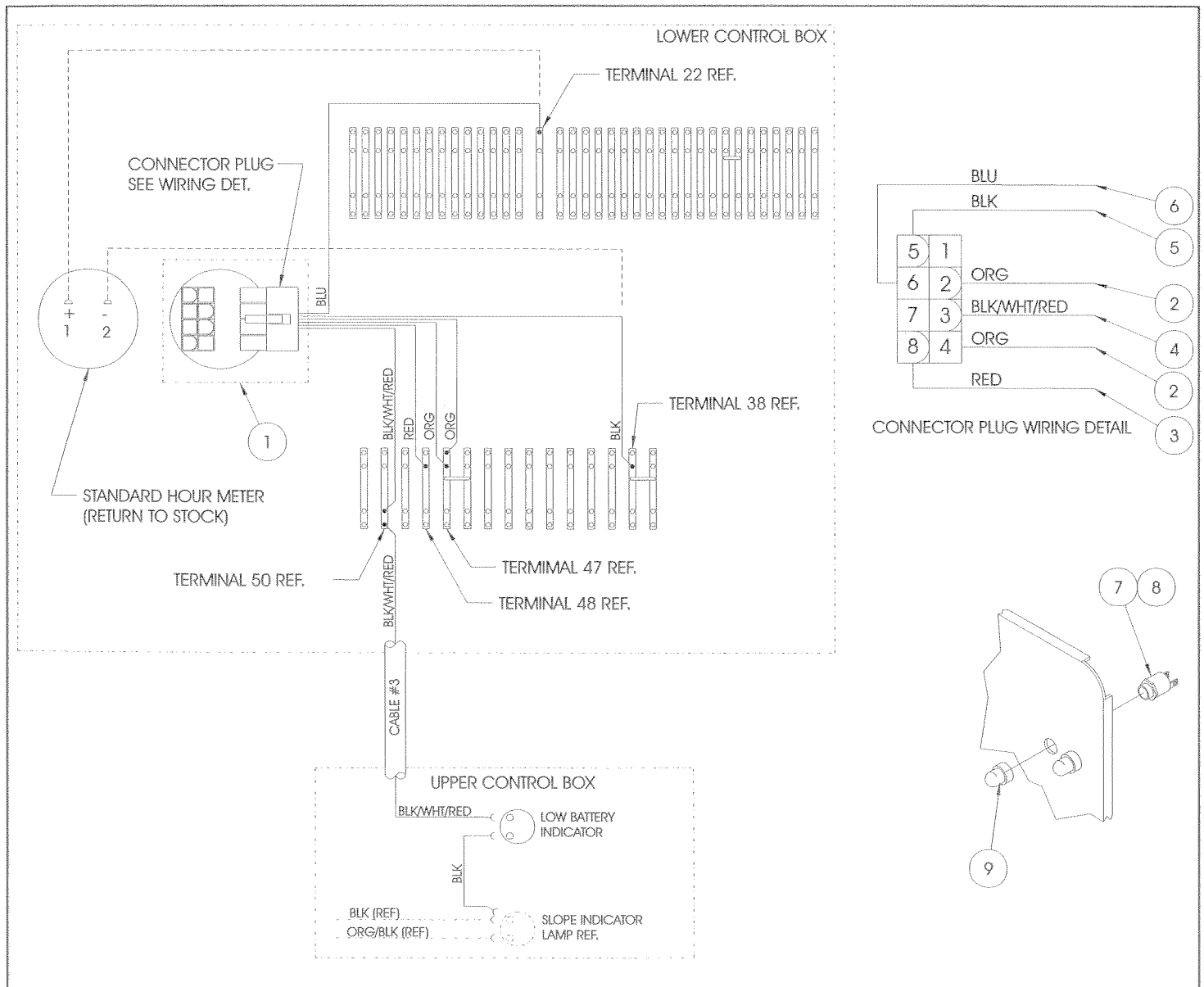


# Illustrated Parts Breakdown

## BATTERY CHARGE INDICATOR OPTION - AB46 (ELECTRIC ONLY)

68297-000

| ITEM | PART      | DESCRIPTION                       | QTY. |
|------|-----------|-----------------------------------|------|
| 1    | 68581-001 | BATTERY FUEL / HOUR METER         | 1    |
| 2    | 29453-099 | WIRE, 16 GA. ORANGE (2 PCS. @ 3') | 6 FT |
| 3    | 29454-099 | WIRE, 16 GA. RED                  | 3 FT |
| 4    | 29361-099 | WIRE, 16 GA. BLACK/WHITE/RED      | 3 FT |
| 5    | 29452-099 | WIRE, 16 GA. BLACK                | 3 FT |
| 6    | 29450-099 | WIRE, 16 GA. BLUE                 | 3 FT |
| 7    | 68590-000 | BASE, INDICATOR LIGHT             | 1    |
| 8    | 68591-000 | LAMP, 48 VOLT                     | 1    |
| 9    | 68595-002 | LENS, AMBER                       | 1    |



# Illustrated Parts Breakdown

Section  
6.2

NOTES:

## Illustrated Parts Breakdown

NOTES:

# UpRight

**UpRight Ireland, Ltd.**

Pottery Road  
Dun Laoire  
Ireland

TEL: +353-1-202-4100  
FAX: +353-1-202-4105

**UpRight, Inc.**

1775 Park Street  
Selma, California 93662  
TEL: 209/891-5200

FAX: 209/896-9012  
PARTS: 1-888-UR-PARTS  
PARTSFAX: 209/896-9244

**068343-020**

068343-020 9805 .5 D