OPERATION & SERVICE MANUAL

Models: eJP-3, eJP-3L
Electric Towbarless Tug

CE

03/2018 – Rev. 01

Tronair, Inc.
1 Air Cargo Pkwy East
Swanton, OH 43558

Phone: (419) 866-6301 | 800-426-6301
Web: www.tronair.com
Email: sales@tronair.com

REVISION	DATE	TEXT AFFECTED
01	03/2018	Original Release

TABLE OF CONTENTS

PAGE

1.0 PRODUCT INFORMATION 1
1.1 DESCRIPTION 1
1.2 MODEL & SERIAL NUMBER 1
1.3 MANUFACTURER 1
1.4 GENERAL 1
2.0 SAFETY INFORMATION 1
2.1 USAGE AND SAFETY INFORMATION 1
2.2 OPERATING SAFETY GUIDELINES 1
2.3 BATTERY SAFETY GUIDELINES 2
2.4 GROUND POWER UNIT SAFETY GUIDELINES 2
2.5 SAFETY GUIDELINES 2
3.0 TRAINING 3
3.1 TRAINING REQUIREMENTS 3
3.2 TRAINING PROGRAM 3
3.3 OPERATOR TRAINING 3
4.0 SPECIFICATIONS 4
4.1 DIMENSIONS 4
4.2 BATTERIES 4
4.3 GROUND POWER UNIT 4
4.4 CAPACITY 4
4.5 STANDARD EQUIPMENT 4
4.6 OPTIONAL EQUIPMENT AVAILABLE 4
4.7 ADD ON KITS 4
5.0 TECHNICAL DATA 5
5.1 FRAME AND COMPONENTS 5
5.2 DRIVE MOTOR 5
5.3 MOTOR SPEED CONTROL 5
5.4 POWER TRANSMISSION 5
5.5 BATTERIES 5
5.6 GROUND POWER UNIT 5
5.7 BATTERY CHARGER 5
5.8 BRAKING 5
5.9 PARKING BRAKE 5
5.10 WINCH 5
5.11 LIFT CRADLE 5
5.12 STEERING AXLE 5
5.13 STEERING 5
5.14 LIGHTING 6
5.15 DRIVE TIRES 6
5.16 OPERATORS PLATFORM 6
6.0 OPERATING INSTRUCTIONS 6
6.1 LOADING AIRCRAFT 6
6.2 UNLOADING AIRCRAFT 7
7.0 GROUND POWER UNIT 8
7.1 DESCRIPTION 8
7.2 CONNECTION TO AIRCRAFT 8
7.3 DETERMINING PROPER VOLTAGE 8
8.0 BATTERY CARE 9
8.1 WATER 9
8.2 CHARGING 9
8.3 PRECAUTIONS 9
8.4 BATTERY MAINTENANCE 9
9.0 TROUBLESHOOTING 10
9.1 GENERAL TROUBLESHOOTING 10
9.1.1 If The Tug Will Not Run 10
9.1.2 If Tug Runs But Lacks Sufficient Power 10
9.2 BATTERY CHARGER TROUBLE SHOOTING 10
9.3 CRADLE UP OR DOWN DOESN'T WORK 10
10.0 MAINTENANCE 11
10.1 GENERAL MAINTENANCE 11
10.2 LUBRICATION 11
10.3 NYLON STRAPS 12
10.4 COMPONENT WEAR 12
10.5 REPAIRS 12

11.0 PRE-SHIFT CHECKLIST 13
12.0 PROVISION OF SPARES 14
12.1 SOURCE OF SPARE PARTS 14
12.2 RECOMMENDED SPARE PARTS LISTS 14
13.0 IN SERVICE SUPPORT 14
14.0 GUARANTEES/LIMITATION OF LIABILITY 14
15.0 APPENDICES 14

This product can not be modified without the written approval of Tronair, Inc. Any modifications done without written approval voids all warranties and releases Tronair, Inc., its suppliers, distributors, employees, or financial institutions from any liability from consequences that may occur. Only Tronair OEM replacement parts shall be used.

1.0 PRODUCT INFORMATION

1.1 DESCRIPTION

Electric towbarless tug for moving aircraft 30,000 lbs or less.

1.2 MODEL & SERIAL NUMBER

Reference nameplate on unit

1.3 MANUFACTURER

TRONAIR, Inc.
1 Swanton Cargo Pkwy East
Swanton, Ohio 43558 USA

Telephone: (419) 866-6301 or 800-426-6301
Fax: (419) 867-0634
E-mail: sales@tronair.com
Website: www.tronair.com

1.4 GENERAL

Model Numbers: eJP-3, eJP-3L

Battery:
Type: Deep Cycle
Voltage: 6 V (48V System)
Amp Hours: 235 (eJP-3), 470 (eJP-3L) (20 hr rate)

Battery Charger:
Type: Quick Charge
Rating: 25 amp (eJP-3), 40 amp (eJP-3L)

WARNING

Failure to comply with this warning may result in personal injury or death and may cause significant damage to the aircraft and/or tug

CAUTION

Pay careful attention to avoid damage to tug and/or aircraft

2.0 SAFETY INFORMATION

2.1 USAGE AND SAFETY INFORMATION

To insure safe operations please read the following statements and understand their meaning. Also refer to your equipment manufacturer's manual for other important safety information. This manual contains safety precautions which are explained below. Please read carefully.

WARNING! — Warning is used to indicate the presence of a hazard that ***can cause severe personal injury, death, or substantial property damage*** if the warning notice is ignored.

CAUTION! — Caution is used to indicate the presence of a hazard that ***will or can cause minor personal injury or property damage*** if the caution notice is ignored.

2.2 OPERATING SAFETY GUIDELINES

1. **Under normal circumstances do not use the Parking Brake Hand Button to stop the tug while moving.** The Parking Brake Hand Button is provided to set the parking brake faster when stopped on an Incline. When stopping the tug on an incline, hold the vehicle to a stop using the Joystick. Press and hold the Parking Brake Hand Button before releasing the Joystick. This will eliminate the time lapse between releasing the Joystick and the automatic setting of the parking brake.
2. Tug motion is normally stopped by moving the Joystick to the Neutral (upright) position. Moving the Joystick through Neutral and into the opposite direction will supply the same braking effort as moving it to the Neutral position.

WARNING

Available stopping torque is reduced when the transmission is set for high gear. Stopping distances may be longer when the transmission is set for high gear.

3. Always use the safety strap and tighten snugly. This will prevent the aircraft from rolling forward if a sudden stop occurs.
4. Accelerate slowly. Always operate the tug as smoothly as possible to prevent damage to the nose wheel strut of the towed aircraft.
5. Do not leave tug unattended when children are present.
6. Do not allow anyone to "sit", or "ride", on the deck of the tug while in motion.

2.2 Operating safety guidelines continued on following page.

2.2 OPERATING SAFETY GUIDELINES *(continued)*

7. The tug is equipped with a safety brake which prevents the vehicle from moving when the systems are off. However, the tug can be moved or towed by putting the transaxle into neutral. Standing on the cradle looking aft, the shift knob is located on the right side of the transaxle. Look for a round stop collar fastened to a shaft sticking out the side. When the knob is pushed all the way in, it is in low gear. Pull it out half way and the transaxle is in neutral. Pull it all the way out for high gear.

WARNING

When the transmission is set to the Neutral position, the tug is free to roll and the brakes will be ineffective. Use this position only for the purpose of slowly moving on a non-functioning tug. Wheel chocks may be needed for stopping. Otherwise, be sure the transmission is firmly set to the full in position (low speed) or the full out position (high speed).

8. Routinely inspect the spring on the hand winch for proper tension. Over time this spring may relax and not keep the dog firmly in the sprocket which could allow the winch to unspool and let the aircraft roll off the front of the cradle and cause damage to the aircraft or injury to people or objects nearby. Maintain a firm grip on the winch handle at all times and never release the handle when the ratchet lever is in unlocked position with a load on the winch. Otherwise, the handle will spin violently which could cause personal injury.
9. Use extreme caution while operating under adverse weather conditions. With snow or ice on the ramp traction can be reduced significantly which could result in loss of control of tug and towed aircraft. Evaluate weather conditions to determine if the aircraft can be moved safely. If in doubt do not attempt to move aircraft.

2.3 BATTERY SAFETY GUIDELINES

1. Always wear eye protection and rubber gloves when working with batteries.
2. Never wear jewelry, watches or rings while working around batteries.
3. When working on tug, always remove all power leads from batteries. The battery pack is capable of extremely high currents and could cause serious damage or injury if short-circuited.
4. If battery acid is accidentally spilled on the skin, immediately flush the area with large amounts of water. **Electrolyte splashed in the eyes is extremely dangerous!** If this should happen, force the eye open and flood it with cool, clean water for approximately fifteen minutes. A doctor should be called immediately when the accident occurs.
5. If you have any doubts or questions, contact Tronair.

2.4 GROUND POWER UNIT SAFETY GUIDELINES

1. Read 6.4 “Safety Precautions” in the battery care section of this manual.
2. Never guess when it comes to high current electrical equipment. Think about what you are doing before you do it.
3. Read and understand the cautionary statements in above section.
4. Always plug the black plug into the black socket. Reverse voltage can damage aircraft electrical systems.
5. Never over boost the electrical system by using a higher voltage than the rated voltage for the aircraft.
6. Pressing the Emergency Stop Button will disconnect the negative side of the GPU circuit. The Emergency Stop Button must be in the pulled up position for the GPU to function.

2.5 SAFETY GUIDELINES

1. **DO NOT USE THE PARKING BRAKE HAND BUTTON TO STOP THE TUG WHILE MOVING.** The Parking Brake Hand Button allows faster setting of the parking brake for stopping and holding on inclines.
2. Tug motion is normally stopped by returning the Joystick to the Neutral upright position. Moving the Joystick through Neutral and into the opposite direction will result in the same braking effort as moving it to Neutral.

WARNING

Available stopping torque is reduced when the transmission is set for high gear. Stopping distances may be longer when the transmission is set for high gear.

3. Accelerate slowly. Always operate the tug as smoothly as possible to prevent damage to the nose wheel strut of the towed aircraft.
4. Do not leave tug unattended when children are present.

WARNING

Do not allow anyone to sit or ride on the diamond plate or front fenders of the tug while in motion.

5. The tug is equipped with a safety brake, which prevents the vehicle from moving when the systems are off. However the tug can be moved or towed **by putting the transmission in neutral.**

WARNING

When the transmission is set to the Neutral position, the tug is free to roll and the brakes will be ineffective. Use this position only for the purpose of slowly moving on a non-functioning tug. Wheel chocks may be needed for stopping. Otherwise, be sure the transmission is firmly set to the full in position (low speed) or the full out position (high speed).

2.5 SAFETY GUIDELINES *(continued)*

6. Operators are expected to know and observe all normal safety procedures for working around aircraft. The operator's knowledge of these general aviation safety procedures is a basic assumption for this manual. The omission of general aircraft safety procedures from the Operation & Service Manual is no excuse for the operator's failure to apply them.
7. In the event the Ground Power Unit (GPU) is used, the operator is expected to have a working knowledge of electrical characteristics of the specific aircraft being assisted. Damage to the aircraft's electrical system can occur from over voltage, lack of proper isolation or incorrect polarity. Such mishaps are entirely preventable if the operator knows the aircraft characteristics and proceeds with care.
8. For moving aircraft up or down inclines/slopes, a qualified operator should be in the aircraft cockpit to utilize the aircraft's brakes for safety/backup.
9. The tug, like any piece of machinery, should be operated by responsible personnel who are alert, attentive and aware of the potential for serious injury or death. Operators should not be under the influence of intoxicants, drugs or any substance that would alter or impair their actions or ability to make responsible and prudent judgments. No person should be allowed to operate the tug without reading and understanding this operator manual.
10. Proper attire should be worn while operating tug. Loose fitting clothing should be avoided. Appropriate outdoor work shoes should be worn at all times.
11. Eye protection and rubber gloves should be worn when adding water or working with the batteries. Remember that the current capability of the batteries is extremely high.
12. Important! All switches need to be turned off before plugging in the tug for charging.
13. The diamond plate over the batteries should always be removed when charging the batteries. During the charging cycle, explosive hydrogen gas is expelled. Open flame or sparks must be avoided. Do not smoke near the batteries while charging
14. Read Section 6 and review and understand safety procedures for working around batteries.
15. When moving in reverse direction, look both ways and clear the area of other traffic and obstacles.
16. Contact Tronair before making substitutions of any parts.

3.0 TRAINING

3.1 TRAINING REQUIREMENTS

The employer of the operator is responsible for providing a training program sufficient for the safe operation of the tug.

3.2 TRAINING PROGRAM

The employer provided operator training program should cover safety procedures concerning use of the tug in and around the intended aircraft at the intended aircraft servicing location.

3.3 OPERATOR TRAINING

The operator training should provide the required training for safe operation of the tug.

NOTE: Maintenance and Trouble Shooting are to be performed by a skilled and trained technician.

4.0 SPECIFICATIONS

4.1 DIMENSIONS

Weight:	2,450 lbs (1,111.3 kg) **eJP-3** 3,000 lbs (1,360.5 kg) **eJP-3L**
Length:	134 3/16 in (340.8 cm) **eJP-3** 170 9/16 in (433.2 cm) **eJP-3L**
Height:	49 7/16 in (125.7 cm)
Width:	40 in (101-6 cm)
Ground Clearance:	3 5/16 in (8.4 cm)
Deck Height:	18 in (45.7 cm)
Cradle Depth:	18 in (45.7 cm)
Cradle Width:	19 in (48.3 cm)
Cradle Lift Height:	6 in (15.2 cm)
Cradle Capacity:	3,000 lbs (1,179.3 kg)
Steering Axle Tire Size:	(2) 4.80 x 8” (16 inch O.D.)
Drive Tire Size:	(2) 16 x 6-8

4.2 BATTERIES

Traction Motor Voltage:	48 volts D.C.
Battery Type:	8 (eJP 30) and 16 (eJP-3L) 6 volt, deep cycle
Battery Capacity:	235 Ah (eJP-3), 470 Ah, (eJP-3L)
Charge Time:	8 hours, average, from full discharge
Built-In Automatic Charger:	Set up for 115 (120) Volts AC /60 HZ. Can be changed to 230 Volts AC Single Phase 50/60 HZ. See Appendix V

4.3 GROUND POWER UNIT

GPU Low Voltage:	12 volt nominal
GPU Medium Voltage:	24 volt nominal
GPU High Voltage:	30 volt nominal
GPU Cable Length:	14’, Cessna and Piper style adapters included
Max Amp Draw:	500 amps

4.4 CAPACITY

High Gear Ratio	25:1
Low Gear Ratio	40:1
Empty Speed	10 mph (16 kph)
Full Load Speed	3 mph (4.8 kph)
Motor Horsepower	6 hp continuous duty
Normal Operation Range	8 hours, average, on full charge
Maximum Aircraft Weight	30,000 lbs (13,608 kg) in low gear
Gradability at 28,000 lbs	3.0%

4.5 STANDARD EQUIPMENT

Two-Speed Axle (High Gear and Low Gear)
Regenerative Braking through Motor Control
Built-In Battery Charger
Battery Disconnect Switch
Battery State of Charge Indicator
Battery Water Filler
Ground Power Unit (GPU)
GPU Cables and Plugs
Two-Speed Winch with Nylon Strap
Nylon Strut Strap
Nose Wheel Safety Ratchet Strap
Trailer Hitch Receiver
Fire Extinguisher
Hour Meter
LED Headlights
Powder Coated Frame
Covered Storage Compartments
Person Present (Deadman) Switch
Automatic Parking Brake

4.6 OPTIONAL EQUIPMENT AVAILABLE

Custom Colors and Graphics

4.7 ADD ON KITS

K-4050	Slide In Pintle Hitch	K-4054	PC-12 Adapter (eJP-3 Only)
K-4051	Standard Tire Chains	K-4055	Falcon 50/900/2000 Adapter (Required)
K-4057	Stand Off Arm For Aircraft With Wheel Pants	K-4056	Lear 40/45 Adapter (Required)
K-4094	Jumper Cables (For GPU)	K-4177	Sabreliner Adapter
K-4101	On-Board Air Compressor	K-4222	Falcon 10/20/100/200 AdapteR
K-4052	Westwind Adapter	K-4999	Stop/Turn Signal/Tail Lights

5.0 TECHNICAL DATA

5.1 FRAME AND COMPONENTS

Heavy gauge steel, laser-cut, formed and welded into a structural unit.

5.2 DRIVE MOTOR

A six horsepower, 48 volt, direct current, continuous duty-cycle motor, designed specifically for tug, is coupled directly to the transmission by bevel gearing.

5.3 MOTOR SPEED CONTROL

A solid-state controller, utilizing the latest MOSFET technology, controls the drive motor. Current limit, controlled acceleration and braking current are digitally programmed into each unit before shipment. A digital display on the console displays hours of use and charge level of the batteries.

5.4 POWER TRANSMISSION

Power transmission is by means of a two-speed transaxle, with all gear drive components operating in an oil bath. There are no chains, couplings, belts or U-joints in the drive train.

5.5 BATTERIES

The eJP-3 has eight 6 volt batteries connected in series for 48 volts and 235 Ah (20 hr rate). The eJP-3L has sixteen 6 volt batteries connected in series and parallel for 48 volts and 470 Ah (20 hr rate).

5.6 GROUND POWER UNIT

30 volts are provided to assist starting aircraft engines. Fourteen feet of cable and two types of GPU plugs are provided, including Cessna-style and Piper-style ends.

5.7 BATTERY CHARGER

eJP-3 A built-in automatic 25 AMP 48 Volt DC charger is shipped wired for 115 (120) Volts AC, 13 AMP, 60 HZ. It can operate off a standard 120 Volt AC, 20 amp circuit. The charger can be configured for 230 Volts AC Single Phase 50/60 HZ by changing the fuse positions. Instructions for changing the fuse positions can be found in the Quick Charge Manual (Appendix V).
eJP-3L A built-in automatic 40 AMP 48 Volt DC charger is shipped wired for 115 (120) Volts AC, 20 AMP, 60 HZ. It must operate from a 125 Volt AC, 30 amp circuit. It can be configured for 230 Volts AC Single Phase 50/60 HZ by changing the fuse positions. Instructions for changing the fuse positions can be found in the Quick Charge Manual (Appendix V).

5.8 BRAKING

Regenerative braking is provided by the solid state motor controller. Braking occurs as the Joystick is moved toward the Neutral upright position. Braking strength ramps up based on the programmed deceleration curve.

5.9 PARKING BRAKE

An electrically released disk brake is mounted on the drive motor. The parking brake sets automatically when the Person Present (deadman) switch on the Joystick is released **and** regen braking has brought the tug to a stop. A Parking Brake Hand Button is to the left of the steering wheel. This button is to be used to eliminate the time laps between the release of the Joystick and the automatic setting of the parking brake when stopping on inclines.

5.10 WINCH

A heavy duty, two-speed hand winch is standard. A nylon strap is included so that aircraft will not be damaged or scratched.

5.11 LIFT CRADLE

A direct current motor and hydraulic pump operate two lift cylinders that raise and lower the nose wheel lift cradle. Control is by “Raise” and “Lower” push buttons located on the control panel. The lift cradle is designed to accommodate both dual and single nose wheels.

5.12 STEERING AXLE

Dual 4.80 x 8” (16 inch O.D.) industrial tires are used for steering. The steering axle assembly rides on tapered roller bearings, as do the wheels. The steering axle moves in a 120º arc to provide a very tight turning radius.

5.13 STEERING

A 16” industrial steering wheel provides comfortable steering without power assist. An industrial oil bath gear reducer provides primary gear reduction. Secondary reduction is provided by roller chain. The steering wheel is tilted rearward 10º from horizontal to provide the most comfortable and efficient driving position.

5.0 Technical data continued on following page.

5.0 TECHNICAL DATA *(continued)*

5.14 LIGHTING

Forward and rear LED headlights are included. Headlights are turned on with toggle switch. Strobe comes on when tug is started.

5.15 DRIVE TIRES

Drive tires are 16 x 6-8 solid rubber traction tires.

5.16 OPERATORS PLATFORM

The operator's platform is designed to accommodate the operator and one passenger. The platform is free from pedals and brake levers that encumber the operator.

6.0 OPERATING INSTRUCTIONS

1. Stand on Operator Platform and pull the E-stop up.
2. Turn the "Off-On-Start" switch to the "Start" position and then release.
3. When operating the tug, stand firmly on the operator's platform, with legs spread slightly apart and body braced against the backrest. Keep one hand firmly on the steering wheel and the other on the Joystick. Do not move tug any faster than is necessary.
4. Make sure the cradle is raised off the ground. Grab the Joystick and squeeze the Person Present (deadman) switch. Slowly move the Joystick in the desired direction of travel. If you activate the throttle before squeezing deadman switch, your tug will not move. This is a safety feature built into the controller. Release the throttle back to neutral and start over in the direction you want to travel.
5. This vehicle is NOT designed to coast. Accelerating, braking, and maintaining a constant speed are all very dependent on Joystick position. This results in a vehicle that is very easy to drive and extremely easy to control on inclines. Squeeze and hold the deadman switch on the Joystick. Slowly move the Joystick in the Forward or Reverse direction to accelerate; slowly move the Joystick back to center to brake. Hold the Joystick steady for a steady speed.
6. Moving the Joystick back to center, moving the Joystick into the opposite direction, or releasing the deadman lever will all brake at the same rate.
7. The Parking Brake Hand Button can be used for more precise stopping on inclines. Hold the tug to a stop using the Joystick; press and hold the Parking Brake Hand Button before releasing the Joystick. This will eliminate the time laps between releasing the deadman and the automatic setting of the parking brake.

WARNING

Available stopping torque is reduced when the transmission is set for high gear. Stopping distances may be longer when the transmission is set for high gear.

WARNING

Do not make sharp turns while moving rapidly. Always look behind you before backing up.

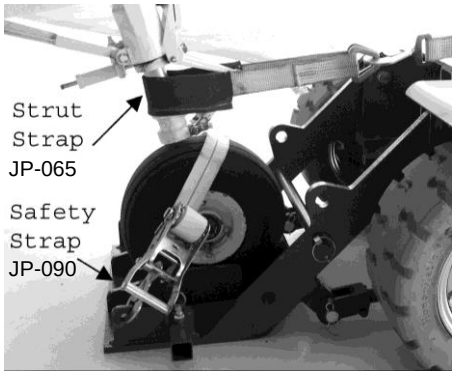
6.1 LOADING AIRCRAFT

1. **Check with the owner/operator of the aircraft to determine what precautions need to be taken to properly tow the aircraft.** Determine if any steering linkages or other components need to be disconnected or bypassed in order to allow the nose wheel to turn within its prescribed turning limits.
2. The lift cradle is equipped with three sets of holes in the side support arms to accept a 1" diameter 20" long bar. The top two sets of holes are to be used for aircraft without nose wheel pants. Based on the diameter of the nose wheel put the bar through the set of holes that will best handle that particular aircraft. The top hole for example would be used for large diameter (18") single nose wheel Cessna Citations or Lear Jets. Put the bar through the lowest set of holes only for single engine aircraft that have nose wheel pants. The nose wheel pant will slide over the top of the bar.

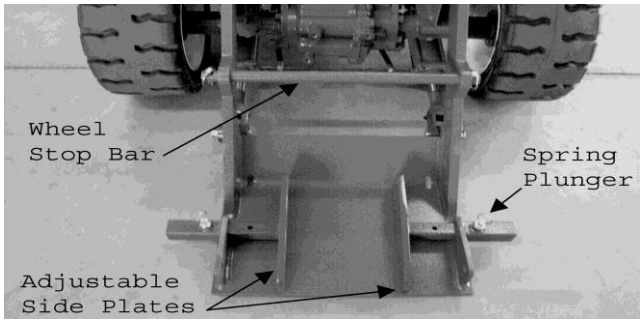
Note: With whatever set of holes you use, lift the cradle only high enough off the ground to clear obstacles while moving the aircraft. If you raise the cradle too high a sudden stop or other circumstance could cause the nose wheel of the aircraft to roll over the top of the bar and onto the tug causing damage to the aircraft and possible injury to the operator.

To avoid this situation use the safety strap as described in #3. Notice that the moveable side plates are tapered as they go forward. This is to keep the side plates from touching the bottom of the side of the wheel pant when the cradle is raised. Pay attention as you raise the cradle and make sure you do not raise it too high and allow the side plates to contact the bottom of the wheel pant.

6.1 LOADING AIRCRAFT *(continued)*



3. Position the tug in front of the aircraft nose wheel and lower the lift cradle to the ground. Winch the nose wheel onto the lift cradle, utilizing the strut strap or appropriate attachment. **Make sure there is a little slack in the winch strap before lifting the cradle as it will move up and away from the tug as it is raised. This will increase the tension in the strap and could damage the aircraft nose wheel assembly as the cradle is being raised. Once the cradle is raised to the desired height then retighten the winch strap so it has adequate tension in it to keep the aircraft secure in the cradle.** Some aircraft have sensors or other components attached to the nose wheel strut and may be damaged by using the nylon strut strap. In such cases do not move the aircraft unless you have an appropriate towing adapter. Check for proper ratchet operation on each use of the winch. Do not use if ratchet will not lock properly, seek immediate repairs.



4. Secure the aircraft nose wheel with the safety strap. The safety strap is a strap with a ratchet mechanism and spring clip hooks at each end. On either side of the forward end of the cradle are brackets that have a hole in each of them. These holes on either side are used for the safety strap. After the aircraft has been winched onto the cradle hook one end of the safety strap to one side of the cradle and position the strap up and over the top of the nose wheel (or nose wheel pant) and in front of the oleo strut. Hook the other end into the hole on the other side of the cradle and use the ratchet to snug up the strap. Be very careful not to position the strap where it might damage some component of the nose wheel assembly. Do not over tighten as it only needs to be snug enough to prevent the nose wheel from possibly lifting upward out of the cradle. On some aircraft with nose wheel pants it may make sense to run the safety strap through a scissors on the aft side of the strut.
5. If the aircraft has a single nosewheel versus a dual nosewheel then the moveable side plates will be needed in order to keep the nose wheel from twisting or rotating while the aircraft is being moved. Once the nose wheel is in position on the cradle, lift up on the ring of the index plunger on top of the square tube on the cradle and slide the moveable side plate in the proper direction. If you release the ring on the plunger when you start to reposition the side plate it will drop into the next available hole of the inner square tube.
6. Raise the lift cradle high enough to clear obstacles on the ground.
7. If moving aircraft over 15,000 lbs make sure the transaxle is in LOW gear. The knob for this is located on the right side of the transaxle as you are standing on the cradle looking aft towards the steering wheel. There is a sticker on the front center of the transaxle that shows to push the shaft all the way in (to your left) to place it in low gear.
8. Move the aircraft by slowly advancing the accelerator lever in the direction of travel.
9. For moving aircraft up or down inclines/slopes, a qualified operator should be in the aircraft cockpit to utilize the aircraft's brakes for safety/backup.

6.2 UNLOADING AIRCRAFT

1. To unload aircraft, lower lift cradle to a position 1/2" above the ground. Remove strut strap and safety strap.
2. Chock the aircrafts main wheels and then back tug away from the aircraft, allowing the nose wheel of the aircraft to roll off lift cradle onto the ground.

7.0 GROUND POWER UNIT

7.1 DESCRIPTION

1. The ground power unit (GPU) is an integral part of tug. The traction batteries serve as the source of power to start the aircraft.
2. The black terminal is the negative, terminal. Always connect the black plug into the black terminal. This provides the ground connection to the aircraft.
3. The first red terminal is the 12 volt terminal. With the batteries in a fully charged condition, the terminal voltage will be closer to 14 volts. With the batteries in a partially charged condition, the voltage will be typically closer to 12 volts. To assist a 12 volt aircraft, plug the black lead into the black terminal and the red plug into the 12 volt terminal.
4. The second red terminal, labeled 24 volt, is used to start aircraft with 24 volt systems. Plug the black plug into the black terminal and the red plug into the 24/ volt terminal. When the batteries are in a fully charged condition, the voltage will be near 26 volts. As the batteries are used, the voltage will decrease to nearly 24 volts.
5. The third red terminal, labeled 30 volt, may be used to start 28 volt aircraft, especially in cold weather, or when conditions require additional voltage. Check with the aircraft owner/operator to make sure the increased voltage is within the aircraft's electrical system tolerances. When the batteries are in a fully charged condition, the voltage will be near 31 volts. This increased voltage will make starting easier.

CAUTION

Do not use the 30 volt terminal unless the aircraft electrical system is isolated from the starting circuit. The over voltage could damage the aircraft's electrical system.

6. The GPU positive voltage is connected directly to the traction batteries and does not have a fuse in the circuit. Pressing the E-stop will disconnect the negative side of the GPU circuit. Be extremely careful when handling the GPU cables. Extremely high currents are possible.

7.2 CONNECTION TO AIRCRAFT

1. Adapters are included with tug. Position tug so the power socket on the aircraft is in a location that will allow the engine to be started safely. Be sure the "Master" switch in the aircraft is off prior to starting the engines. Boost voltage could damage the aircraft's electrical system.

WARNING

Consult the owner/operator of the aircraft to confirm proper procedures for a GPU start.

2. Determine the voltage of the aircraft that is to be boosted. Attach the appropriate adapter to the end of the long boost cables. Connect the black plug (negative) into the black socket in the front of the GPU panel. **Always connect the GPU cables to the tug first before making connection to the aircraft.**
3. Connect the red plug into the appropriate red socket in the front of the GPU panel. Be sure that the voltage selected is correct for the Aircraft that is being boosted. **Again, make sure the connection is made to the tug prior to connecting to the aircraft.**

CAUTION

Do not allow aircraft to draw full power for more than one minute in ten minutes. Excessive use of the GPU could cause severe heating and damage the batteries and/or GPU cables.

WARNING

Do not use the GPU system to run aircraft heating and cooling systems. The GPU system is not designed to handle these continuous loads and can cause damage to the batteries and GPU cables. Under these circumstances the batteries could produce explosive gases which, if ignited, may cause serious injury to nearby personnel.

4. Once the aircraft engine has started, disconnect the GPU cable at the aircraft then from tug. Carefully wind the GPU cables and stow them in one of the storage compartments on tug.

7.3 DETERMINING PROPER VOLTAGE

1. Check the aircraft ratings to determine the proper voltage, if unknown. DO NOT GUESS. Over-voltage can damage aircraft electrical systems.
2. Do not unplug the GPU cables while the aircraft is being started. High currents can cause severe arcing.

8.0 BATTERY CARE

This section provides general instructions for good battery care. Please refer to Appendix in this section for additional information on battery care.

8.1 WATER

1. Add approved water only to a fully charged battery. You can use local tap water as long as it is not high in mineral deposits or other hard deposits.
2. Keep electrolyte water level above separator protectors.
3. Keep battery cells filled to proper level. Low water can cause permanent damage to batteries.
4. Check water level once a week. Replace water lost to evaporation. Never add water to a discharged battery.
5. Never add sulfuric acid to a battery.
6. Do not transfer acid from one cell to another.
7. Never allow the batteries to stand in an uncharged state. Plate damage will occur.

8.2 CHARGING

1. **Keep battery compartment open during charging to ensure proper ventilation.**
2. The batteries should be recharged when the state of charge indicator has declined to 30-40%.
   For the Honeywell state of charge indicators, charge when the yellow LED lights are down to 3. This will be in the 30-40% range. The last yellow LED will begin to flash when the charge drops below 25%.
   For the Curtis state of charge indicators, charge when the LEDs in the yellow range are showing. This will be in the 30-40% range. There are 3 LEDs in the yellow range. At 30% charge, there will be a flashing red LED. At 20% charge, there will be a double flashing red LED.
   Do not skim charge or constantly top up the batteries, as this will shorten the life considerably.
   If the vehicle is not being used, batteries should be stored at full charge and topped up monthly.
3. Keep flame and metal away from the battery tops to prevent battery gasses from exploding.
4. Cool before charging or operating, if battery is above 115º F.
5. The Emergency Stop Switch **MUST** be in the “off” position during charging.

8.3 PRECAUTIONS

1. Keep battery tops clean and dry.
2. Keep vent caps tightly in place.
3. Do not use battery with specific gravity below 1.155.
4. Be sure battery compartment cover is removed and they are well vented while charging batteries.
5. Do not overcharge batteries. Allow several hours use between charges.

8.4 BATTERY MAINTENANCE

See Appendix I for additional information on battery maintenance.

9.0 TROUBLESHOOTING

9.1 GENERAL TROUBLESHOOTING

9.1.1 If The Tug Will Not Run

- Is the E-stop button depressed? Pull up to release.
- Check the wire connections on the joystick and make sure no wires have come loose.
- Check switch positions. Are E-stop and start switches on?
- Are you squeezing the deadman switch on the Joystick. The deadman switch must be squeezed before moving the Joystick and held continually for the vehicle to move.
- Check that all battery connections are tight and show no signs of corrosion.
- Check that all batteries are fully charged and that none has defective cells.
- Check wiring for loose connections.
- Check for faulty forward-reverse switches. They are on the bottom of the joystick.
- Check for worn motor brushes.
- Check direction switches on the Joystick and see if they are engaging and sending voltage to controller.
- Make sure wire harness plugs are seated correctly in controller.

9.1.2 If Tug Runs But Lacks Sufficient Power

- Check batteries – specific gravity
- Check to see that brakes are not dragging.
- Check all battery and switch connections to see that they are clean and tight.
- Check for loose wiring.

9.2 BATTERY CHARGER TROUBLE SHOOTING

The battery charger is configured to best match the CROWN batteries that are shipped with the tug. In this configuration, the charger charges the batteries until the charging voltage reaches 56 Volts DC. At that time, a counter starts to begin a 3 hour gassing cycle before the charge is shown as complete. This means that any time the charger is plugged in, even if the batteries are fully charged, the charger will run for a minimum of three hours. If necessary, for location operational purposes, the length of the charging cycle (gassing period) can shortened. Contact Tronair or contact Quick Charge direct from the information located in the Quick Charge Manual (Appendix V).

Pressing the Equalize button during the charge cycle will run a second 3 hour gassing cycle when the first charge is complete.

There is a panel meter in the charger for purposes of trouble shooting. The meter has a toggle to switch from voltage to amperage. When the charger is on, the voltage will be the charging voltage and the amperage will be the charging amperage. When the charger is off (not plugged into an AC source) the voltage will be battery voltage and the amperage will read at or near 0.

Remove the rear panel from the driver's console to access the charger panel meter.

9.3 CRADLE UP OR DOWN DOESN'T WORK

If the cradle goes one direction but not the other, or goes really slow in the other direction it could be a faulty coil on one of the cartridge valves or missing wiring if wiring has been disconnected for some reason. If one coil doesn't work then fluid can flow one direction because the powered side cartridge valve will work and the return fluid will push open the other valve. But the reverse will not work as the non-working cartridge valve can't open therefore preventing fluid from getting to the cylinders.

10.0 MAINTENANCE

WARNING

All work on the tug should be performed by competent repair personnel. Before performing maintenance, review all safety procedures.

10.1 GENERAL MAINTENANCE

1. After the tug has been in operation for (4) months the steering chain should be tightened to take up the slack from initial chain stretch. If this is not done there is a chance that the steering chain could jump off the sprocket, which would cause the steering system to fail. Access the chain through the knee level panel at the driver's platform. Under the steering sub-frame there are three bolt heads facing down that screw into the steering ratio multiplier. Loosen these three bolts and pull the whole assembly back to tighten the chain. Retighten the three bolts while still applying tension to the steering assembly.
2. Check the electrical connections for loosening; tighten if necessary.
3. Check battery water level weekly
4. Paint the terminals of the batteries with acid-proof coating.
5. Check all bolts and hydraulic fittings for looseness. Tighten if necessary.
6. If battery acid should spill into the battery box or on metal parts, flush with water and baking soda. Sprinkle baking soda in bottom of battery box to prevent corrosion.

WARNING

Battery acid is corrosive. Wear gloves and eye protection when servicing batteries.

7. Keep tug in a clean condition. Check for any unusual conditions, such as bent metal or broken parts.
8. Electric vehicles, such as tug, should never be steam cleaned.
9. Tire Replacement. Replace worn tires with equal or greater capacity tires only. Do not change tire dimensions when replacing tires.

10.2 LUBRICATION

LUBRICATION CHART

Lube Point	Interval	Lube Spec	Remarks
Hydraulic Pump	Weekly	AW 46	Check level
Transaxle	Semi-annual	**80/90 Wt. Gear lube Oil**	Check level
Lift Cradle Pivots	Monthly	SAE 50	
Hydraulic Cylinders	Monthly	SAE 50	Lube both ends
Steering Roller Chain	Annually	Chain lube spray	
Steering Axle Hubs	Annually	Lithium Bearing Grease	Including top support hub
Steering Shaft Flange Bearing	Annually	Lithium Bearing Grease	Zirk fitting

CAUTION

To avoid potential injury or equipment damage, use proper support and block front tires when either end of tug is raised. Use blocks/jack stands capable of supporting 3,000 lbs.

1. Lubricate the pivot points on the lift cradle with SAE 50 oil on a monthly basis.
2. Lubricate both ends on the two hydraulic cylinders with SAE 50 oil on a monthly basis.
3. Lubricate the roller chain on the steering axle with chain lube spray on an annual basis. This can be accessed by raising the steering axle with a jack under the platform or through the knee level panel at the drivers platform.
4. Repack the steering shaft roller bearings with wheel bearing grease on an annual basis.
5. Repack the steering axle wheel bearings with wheel bearing grease on an annual basis. Clean bearings and remove all old grease using solvent. Do not mix greases having different bases.
6. Check the oil in the steering gearbox annually. Add SAE 90W, if necessary.
7. Check the oil level in the hydraulic reservoir every day during preoperational check. Add hydraulic oil, if necessary. Use an AW 46 hydraulic oil. Make sure the cradle cylinders are fully retracted prior to adding fluid. Fluid level should be at least one and half inches down from the top.
8. Check the transaxle fluid level every month. Remove the level screw which faces forward and is near the center line of the axle. If oil is not to this level, add SAE 90W at the filler plug on top of the transaxle. The transaxle holds seven (7) pints.
9. The motor bearings and the drive wheel bearings are sealed and require no lubrication.

10.0 Maintenance continued on following page.

10.0 MAINTENANCE *(continued)*

10.3 NYLON STRAPS

1. **Preshift Inspection Of Straps:** Winch, strut and safety straps should be inspected during the daily preshift inspection process.

WARNING

These straps are the primary means of securing the aircraft to the tug. Failure of these components could result in death or serious injury and/or significant damage to the aircraft.

2. **Worn/Damaged Straps:** Discontinue use of any strap that shows signs of wear or damage such as torn or frayed edges, damaged “D” rings or hooks, loose or broken stitching, signs of chemical damage or holes in webbing of strap. See attached sheet for examples of unserviceable straps.
3. **Periodic Strap Inspection:** Strut and winch straps are degraded in tension capacity by normal wear, age and exposure to the elements. Operators should inspect straps daily during normal preshift inspection.
4. **Routine Strap Replacement:** Strut and winch straps should be associated with a specific tug and tracked for age. Straps should be routinely replaced annually or after 150 hours of use, whichever occurs first. Replacement is mandatory if inspection shows any wear or damage that would lower maximum capacity of the straps or fittings.
5. **Non-Routine Strap Replacement:** Enclosure (1) is provided as a guideline for inspecting straps. **Straps provide the primary securing device for your aircraft and as such should be of primary importance in the maintenance cycle.**

10.4 COMPONENT WEAR

1. The parking brake on the rear of the motor disk will wear very slowly. If the dynamic motor braking is utilized, the parking brake will last for many years.
2. Tires should be replaced when the tread depth is less than ¼ in.
3. **Motor Brushes**: Motor brushes will wear very slowly; however, they should be checked at least once a year.

10.5 REPAIRS

2. Repairs needed on your tug should be performed by competent repair personnel.
3. The batteries in your tug must be replaced with like batteries. The charger has been designed to operate with this size battery. Do not substitute a higher or lower Amp/hour rated battery. All batteries should be replaced at the same time.
4. **Do not attempt to repair the electronic controller.** Contact Tronair for proper repair procedures.
5. Contact Tronair before making substitutions of any parts.

11.0 PRE-SHIFT CHECKLIST

Perform this check every day prior to the first shift. Place X if ok.
Do NOT operate any tug until all discrepancies have been corrected

	Week Of: _____							
	Date							
Function	**Inspected By**							
Check Fluid Levels								
Hydraulic Reservoir								
Battery Water Level								
Condition Check								
Hydraulic Hoses								
Lift Cradle Hydraulic Lines								
Nylon Winch Strap								
Nylon Attachment Straps								
Tires								
Lights								
Operational Check								
Dynamic Motor Braking								
Steering								
Lift Cradle								
GPU Plugs								
Leak Check								
Hydraulic Pump Bay								
All Hydraulic Lines								
Battery Cases								
Monthly Torque Specs								
Drive Wheel Lug Nuts – 90 ft lbs								
Rear Wheel Lug Nuts – 90 ft lbs								

Make copies of this page for continued use.

12.0 PROVISION OF SPARES

12.1 SOURCE OF SPARE PARTS

Spare parts may be obtained from the manufacturer:

TRONAIR, Inc.
1 Swanton Cargo Pkwy East
Swanton, Ohio 43558 USA

Telephone: (419) 866-6301 or 800-426-6301
Fax: (419) 867-0634
E-mail: sales@tronair.com
Website: www.tronair.com

12.2 RECOMMENDED SPARE PARTS LISTS

Reference the following page(s) for Replacement Parts and Kits available.

13.0 IN SERVICE SUPPORT

Contact Tronair, Inc. for technical services and information. See Section 1.3 – Manufacturer.

14.0 GUARANTEES/LIMITATION OF LIABILITY

Tronair Platinum Warranty
Tronair products are warranted to be free of manufacturing or material defects for a period of two years after shipment to the original customer. This is solely limited to the repair or replacement of defective components. This warranty does not cover the following items:

a) Parts required for normal maintenance
b) Parts covered by a component manufacturers warranty
c) Replacement parts have a 90-day warranty from date of shipment

If you have a problem that may require service, contact Tronair immediately. Do not attempt to repair or disassemble a product without first contacting Tronair, any action may affect warranty coverage. When you contact Tronair be prepared to provide the following information:

a) Product Model Number
b) Product Serial Number
c) Description of the problem

If warranty coverage is approved, either replacement parts will be sent or the product will have to be returned to Tronair for repairs. If the product is to be returned, a Return Material Authorization (RMA) number will be issued for reference purposes on any shipping documents. Failure to obtain a RMA in advance of returning an item will result in a service fee. A decision on the extent of warranty coverage on returned products is reserved pending inspection at Tronair. Any shipments to Tronair must be shipped freight prepaid. Freight costs on shipments to customers will be paid by Tronair on any warranty claims only. Any unauthorized modification of the Tronair products or use of the Tronair products in violation of cautions and warnings in any manual (including updates) or safety bulletins published or delivered by Tronair will immediately void any warranty, express or implied.

The obligations of Tronair expressly stated herein are in lieu of all other warranties or conditions expressed or implied. **Any unauthorized modification of the Tronair products or use of the Tronair products in violations of cautions and warnings in any manual (including updates) or safety bulletins published or delivered by Tronair will immediately *void any warranty, express or implied* and Tronair *disclaims any and all liability for injury (WITHOUT LIMITATION and including DEATH), loss or damage arising from or relating to such misuse*.**

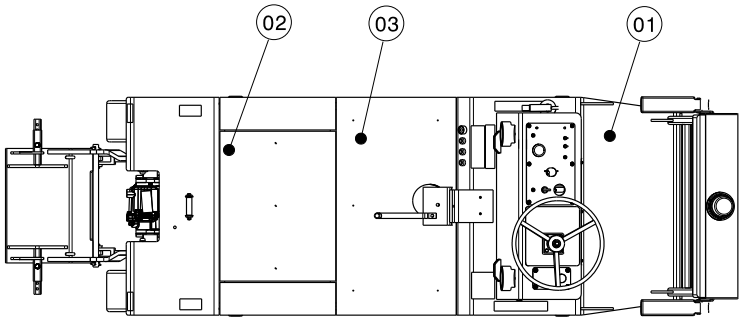
15.0 APPENDICES

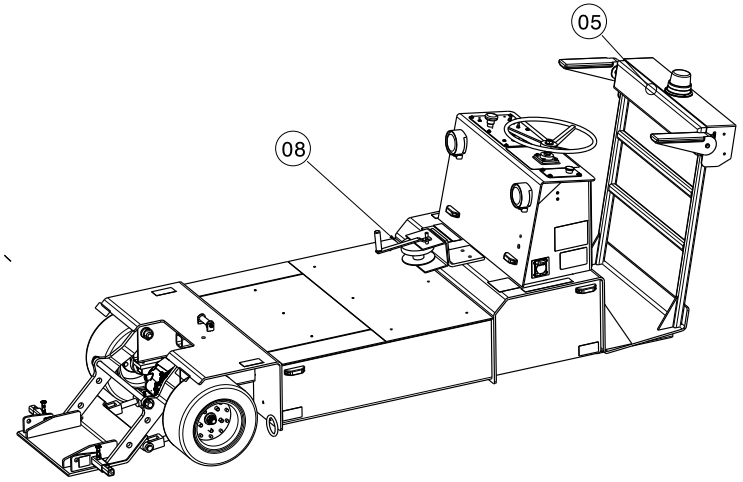
APPENDIX I	INS-1857, Hydraulic Schematic
APPENDIX II	INS-2276, Electrical Schematic
APPENDIX III	INS-2277 (eJP-3) and INS-2278 (eJP-3L), Wiring Diagrams
APPENDIX IV	Deep Cycle Battery Handling, Maintenance and Test Procedures
APPENDIX V	Battery Charger Operating Instructions & Warranty
APPENDIX VI	Honeywell Controller Operating Instructions / Curtis Controller Operating Instructions
APPENDIX VII	Declaration of Conformity

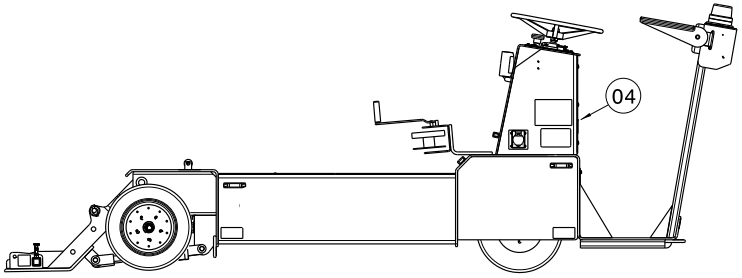
This page left blank intentionally.

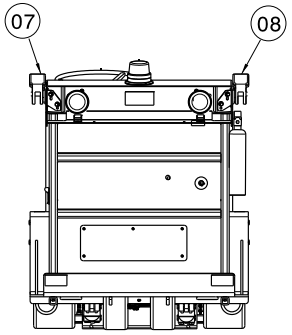
Parts List Illustration - eJP-3

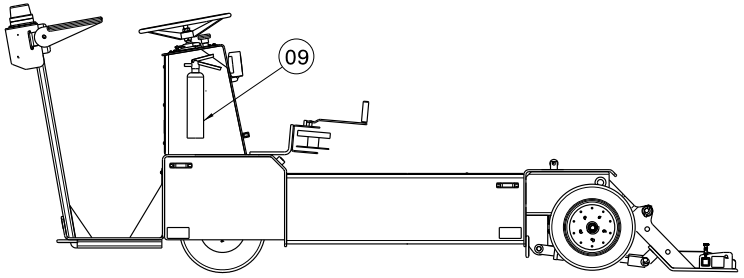
When ordering replacement parts/kits, please specify model, serial number and color of your unit.











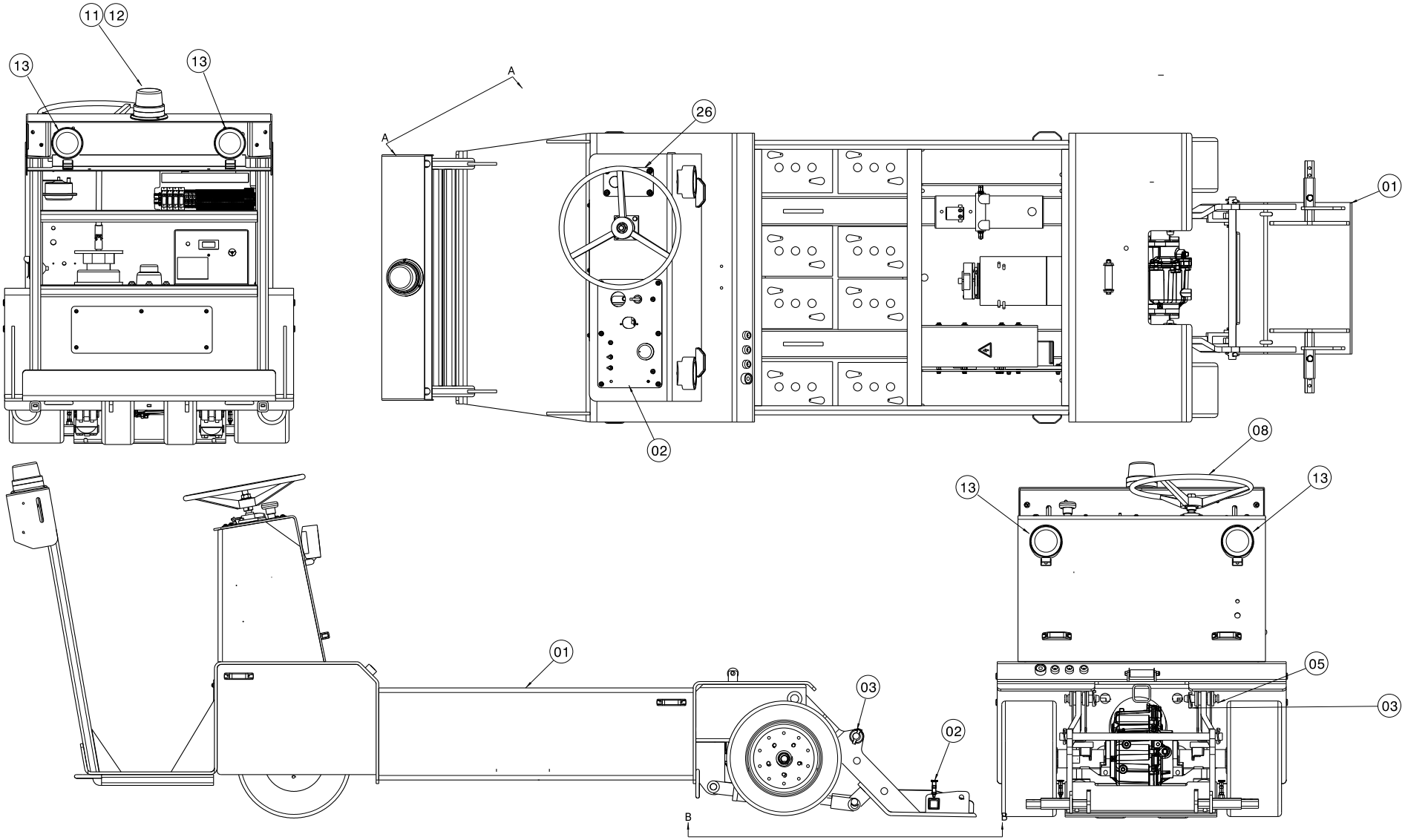
Parts List - eJP-3

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

Item	Part Number	Description	Qty
1	H-2948	Mat, Platform	1
2	Z-6329	Cover, Motor Bay (Coated)	1
3	Z-6328	Assembly, Battery Cover (Coated)	1
4	S-2331-01	Cover, Console	1
5	JP-001	Backrest , Padded	1
7	JP-228	Armrest, LH & RH (pair)	1
9	H-3075	Extinguisher, Fire	1
10	JP-064	Winch, Manual	1
NS	JP-069	Strap, Winch Nylon	1
NS	JP-159	Winch, Replacement Spring	1
NS	JP-160	Winch, Repair Kit	1
NS	H-3076	Bracket, Extinguisher	1
NS	V-2733	Label, eJP-3	2

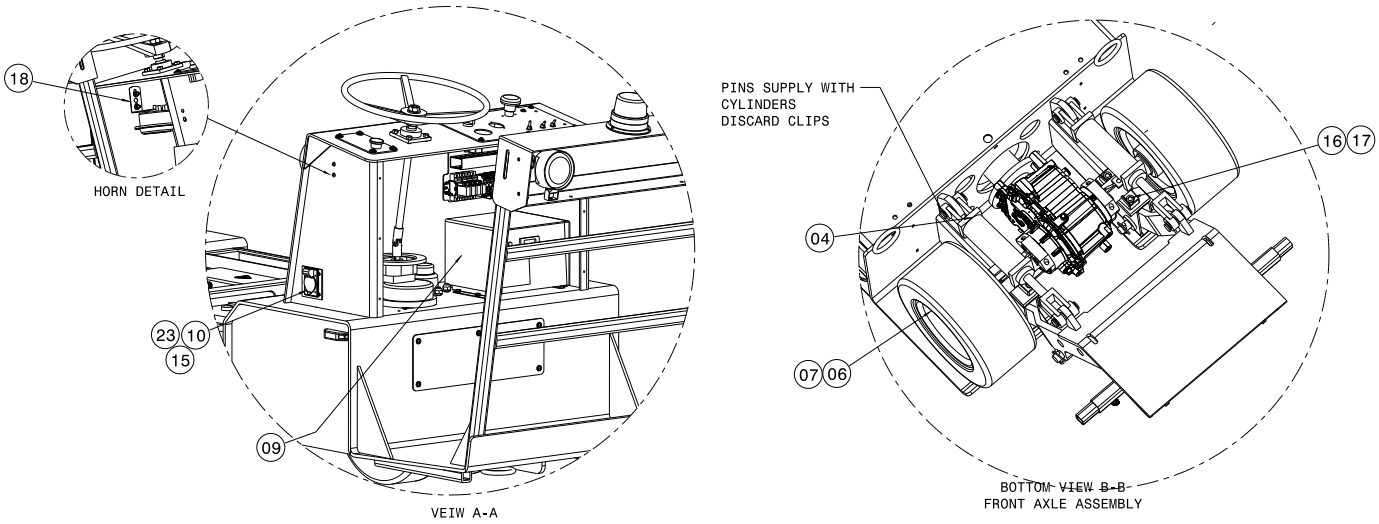
Parts List Illustration - eJP-3

When ordering replacement parts/kits, please specify model, serial number and color of your unit.



Parts List Illustration - eJP-3

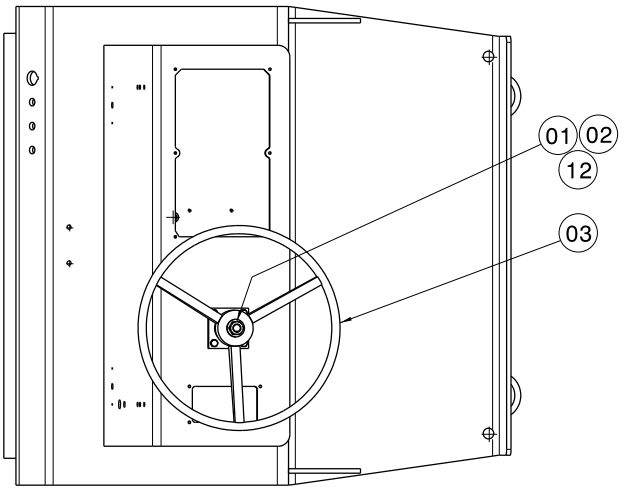
When ordering replacement parts/kits, please specify model, serial number and color of your unit.

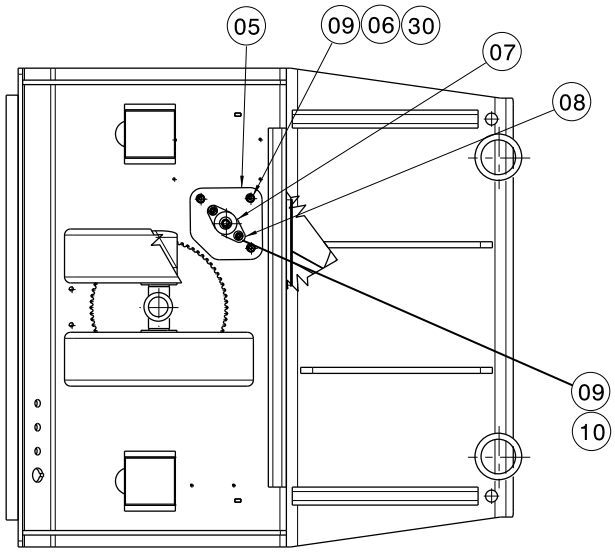


Item	Part Number	Description	Qty
1	Z-6266	Weldment, Lift Cradle	1
2	JP-115	Indexing Plunger	2
3	JP-114	Linch Pin	4
4	HC-2746	Cylinder, Hydraulic	2
5	JP-104	1” x 3” Link Pin	2
6	JP-061	Solid Rubber Drive Tires	2
7	JP-126	Front Wheel Hub Nuts	10
8		Assembly, Steering	REF
9	EC-2621	Battery Charger	1
10	EC-1318	Recessed, Male Plug, Panel Mount	1
11	JP-118	Strobe	1
12	JP-166	Cover, Strobe Half	1
13	EC-2456	Light, Work Spot LED	4
15	J-5367-01	Plate, Cover Outlet	1
16	G-1100-109520	Bolt, Hex Head, ½ - 20 x 2 Long	4
17	G-1251-1090R	Lockwasher, ½	4
18	EC-2011	Horn	1
23	G-1152-102110	Screw, SOC Flat Head 82º Cap	4
NS	EC-1765	Connector, Female Plug Body	1

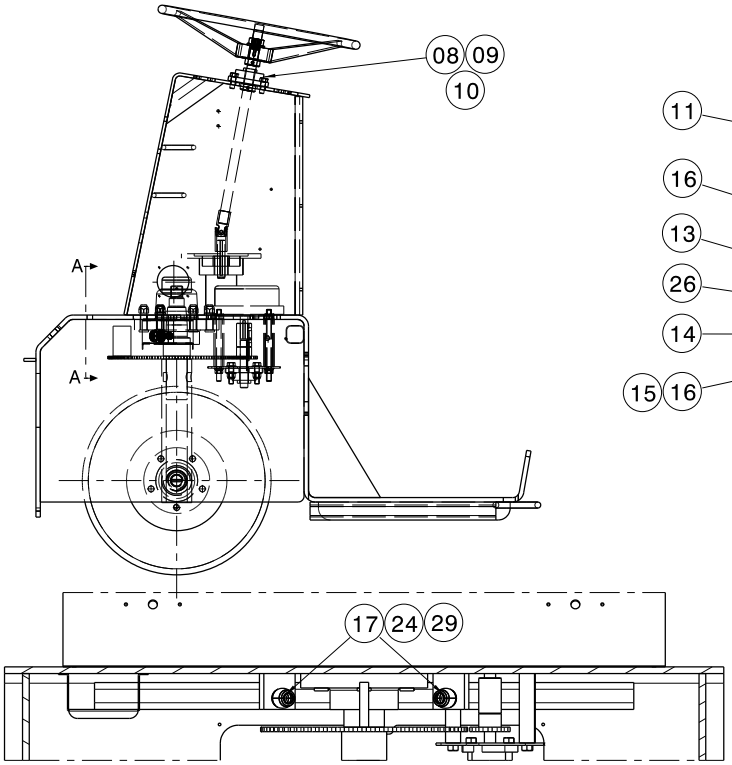
Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

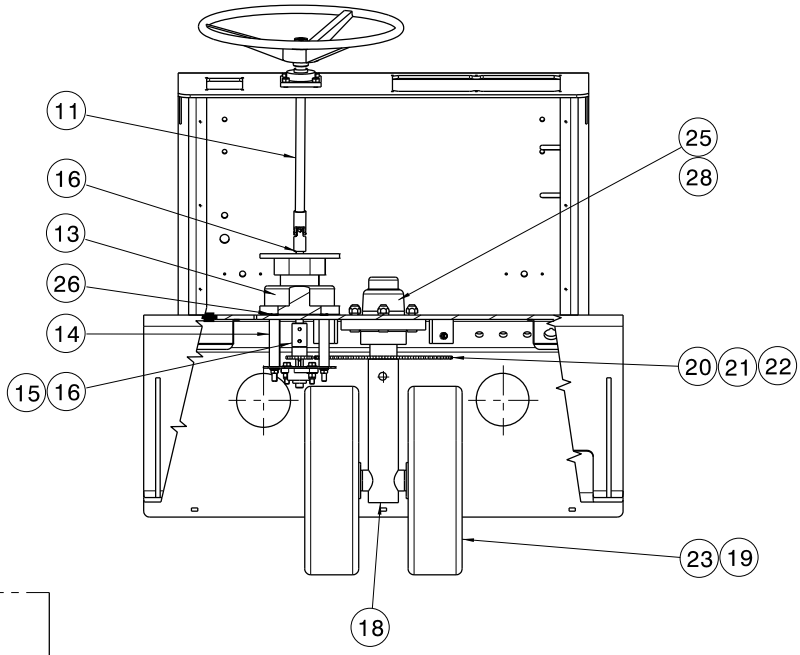




BOTTOM VIEW



Section view A-A
Scale: 3:16



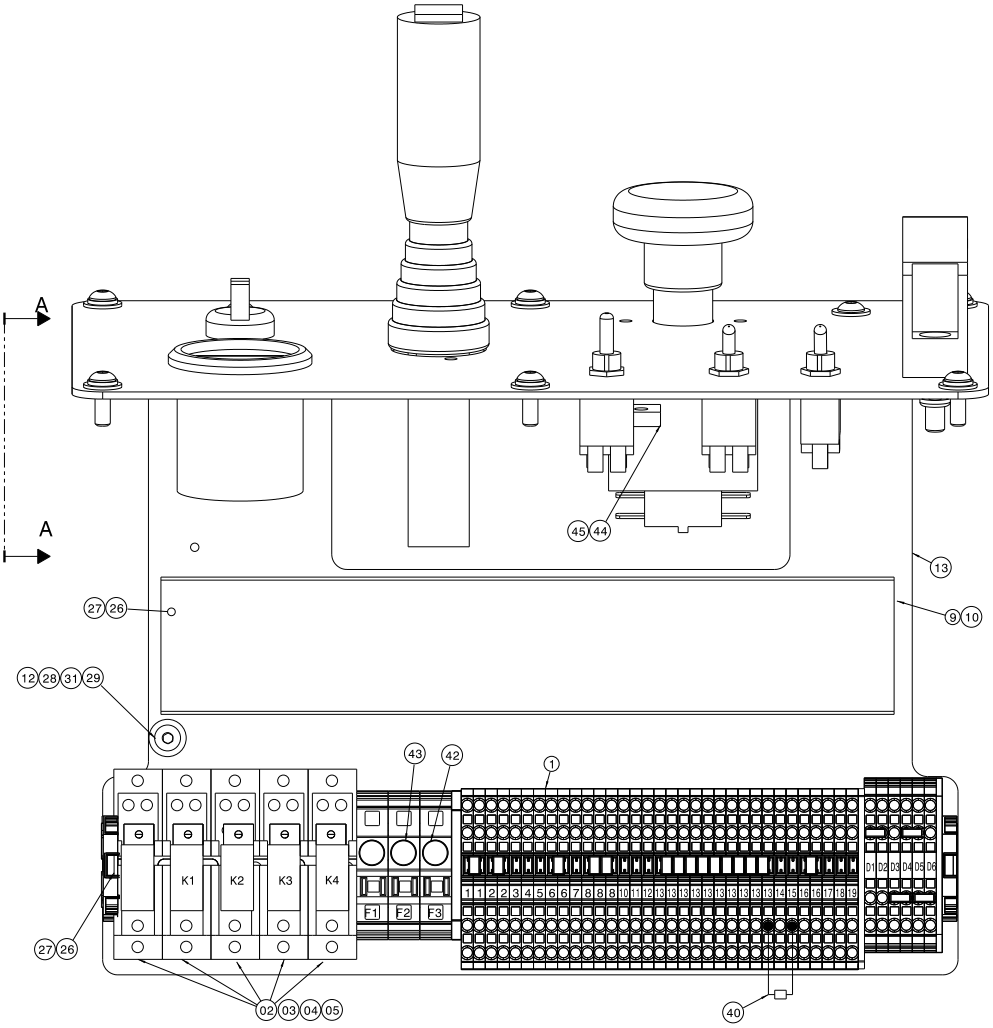
Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

Item	Part Number	Description	Qty
1	JP-027	Nut, Stainless (¾" – 16)	1
2	G-1250-1110N	Flatwasher, Narrow ¾	1
3	JP-024	Steering Wheel	1
5	S-2111-01	Plate, Bottom	1
6	R016-07*006.00	Rod, STL Plate THD ⅜ - 16	3
7	JP-042	Bearing, Flanged ⅝" Bore	1
8	G-1100-1070N	Bolt, Hex Head, ⅜ – 16 x 1 ½ Long	6
9	G-1503-1070N	Lockwasher, ⅜ SS	9
10	G-1200-1070	Nut, Hex ⅜– 16	6
11	Z-6268-01	Weldment, Steering Shaft	1
12	J209-01-00.75	Key, 3/16 Sq. x ¾ Long	1
13	JP-006-01	Multiplier, Ratio	1
14	TR-1968-01	Spacer, Mounting	3
15	Z-6269-01	Weldment, Sprocket	1
16	J209-01*001.50	Key, 3/16 Sq. x 1.5 Long	2
17	H-3803	Spring, Compression	2
18	Z-7019-01	Weldment, Steer Axle	1
19	JP-021	Hub W/Bearings 3500# with Lug Nuts	2
20	JP-020	Chain #40	41 in.
21	JP-113	Link, Half #40 Chain	1
22	JP-110	Link, Master #40 Chain	1
23	JP-060	Wheel, Solid	2
24	G-1154-106212	Screw, 5/16 – 18 Socket Button Head Cap	2
25	H-3200	Hub, With Bearings and Seal	1
26	G-1253-03	Lockwasher, External Tooth	3
28	G-1202-1095	ESN, ½ - 20	6
29	G-1202-1060	ESN, 5/16 – 18	2
30	G-1200-1070	Nut, ⅜ - 16 Hex	3

Parts List

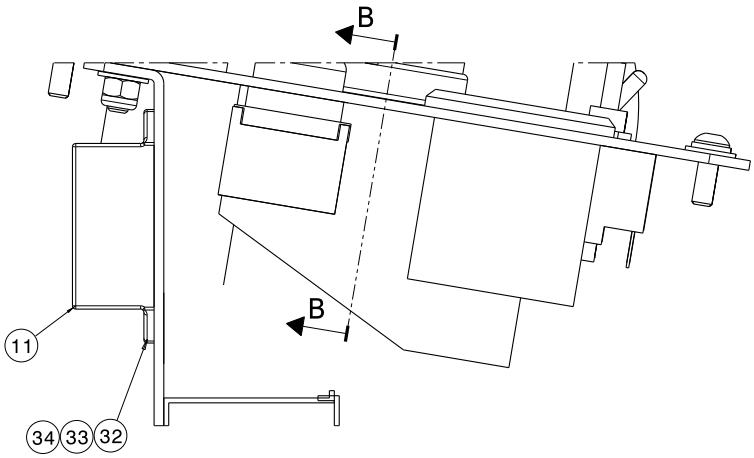
When ordering replacement parts/kits, please specify model, serial number and color of your unit.



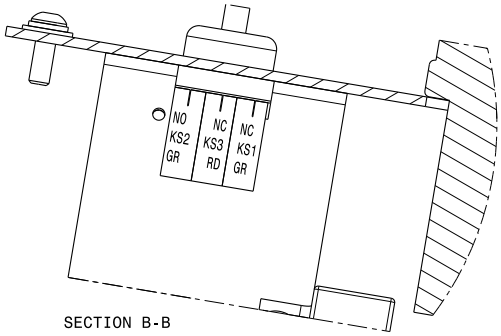
Item	Part Number	Description	Qty
1	EC-2827	Assembly, Din Rail	1
2	EC-2259	Socket, Relay	5
3	EC-2258	Relay	5
4	EC-2260	Relay, Clip	5
5	EC-2060	Diode	5
9	EC-1710-10-12.0	Duct, Wiring	1
10	EC-1711-03-12.0	Covering, Wiring Duct	1
12	EC-2012	Relay, High Capacity	1
13	S-2752-01	Plate, Din Rail	REF
26	G-1476-103004	Screw, 10 - 24 Socket Button Head Cap	8
27	G-1202-1030	ESN, 10 – 24	8
28	G-1476-105006	Screw, ¼ - 20 Socket Button Head Cap	1
29	G-1503-1050N	Flatwasher, ¼ Narrow SS	1
31	G-1202-1050	ESN, ¼ - 20	3
40	4000-34	Resistor, 3K3 OHM 5W 1%	1
44	G-1114-080016	Bolt, Metric M8 Hex Head	2
45	G-1514-M80R	Washer, Split Metric	2
NS	EC-2113-10.00	Replacement Fuse, (10 AMP), use in F1, F3	
NS	EC-2113-5.00	Replacement Fuse, (5 AMP), use in F2	

Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.



SECTION A-A

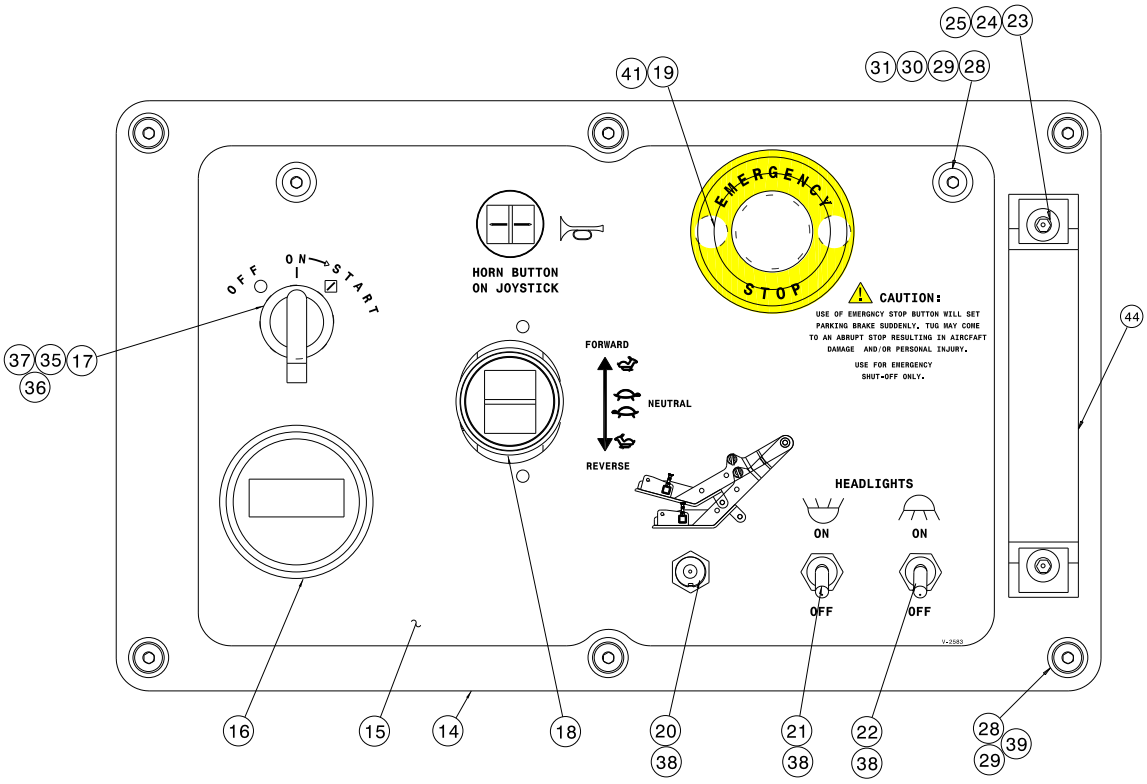


SECTION B-B

Item	Part Number	Description	Qty
11	EC-2824	Flasher, Solid State 9-32 Volts (for Turn Signal Option)	1
32	G-1157-101504	Screw, Pan HD CRS REC, #6 – 32	2
33	G-1250-1010N	Flatwasher, #6	4
34	G-1202-1010	ESN, #6 – 32	2

Parts List

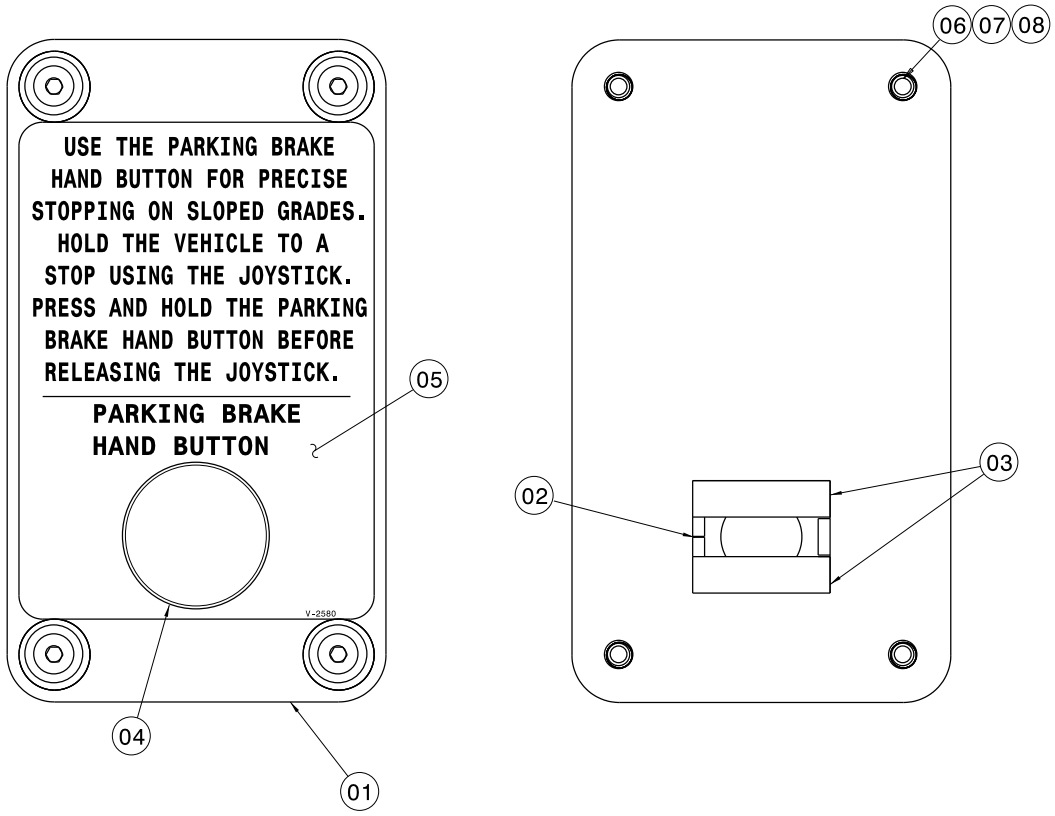
When ordering replacement parts/kits, please specify model, serial number and color of your unit.



Item	Part Number	Description	Qty
14	S-2751-01	Panel, Accelerator	1
15	V-2583	Label, Control Panel	1
16	EC-2096	Meter, Hour	1
17	EC-2740	Switch, 3 Position Spring R/L	1
18	EC-2334	Joystick	1
19	EC-2831	Switch, E-Stop	1
20	EC-2745	Switch, Toggle 3 Position (DPDT)	1
21	EC-2747	Switch, Toggle 2 Position (DPST)	1
22	EC-2746	Switch, Toggle 2 Position (SPST)	1
23	G-1476-106012	Screw, Hex Socket Button Head Cap	2
24	G-1202-1065	ESN, 5/16 – 24	2
25	G-1503-1060N	Flatwasher, 5/16	2
28	G-1476-105006	Screw, ¼ - 20 Socket Button Head Cap	8
29	G-1503-1050N	Flatwasher, ¼ Narrow SS	9
30	G-1502-1050R	Lockwasher, ¼ SS	2
31	G-1202-1050	ESN, ¼ - 20	3
35	14142	Flange, Latch	1
36	14143	N.O. Contact Block, Green	1
37	14144	N.C. Contact Block, Red	3
38	EC-2744	Seal, Togglw Switch	3
39	G-1658-13	Washer, w/Neoprene ¼ Diameter	6
41	EC-2838	Knob, E-Stop Machine	1
44	JP-103	Handle, Grab	1

Parts List

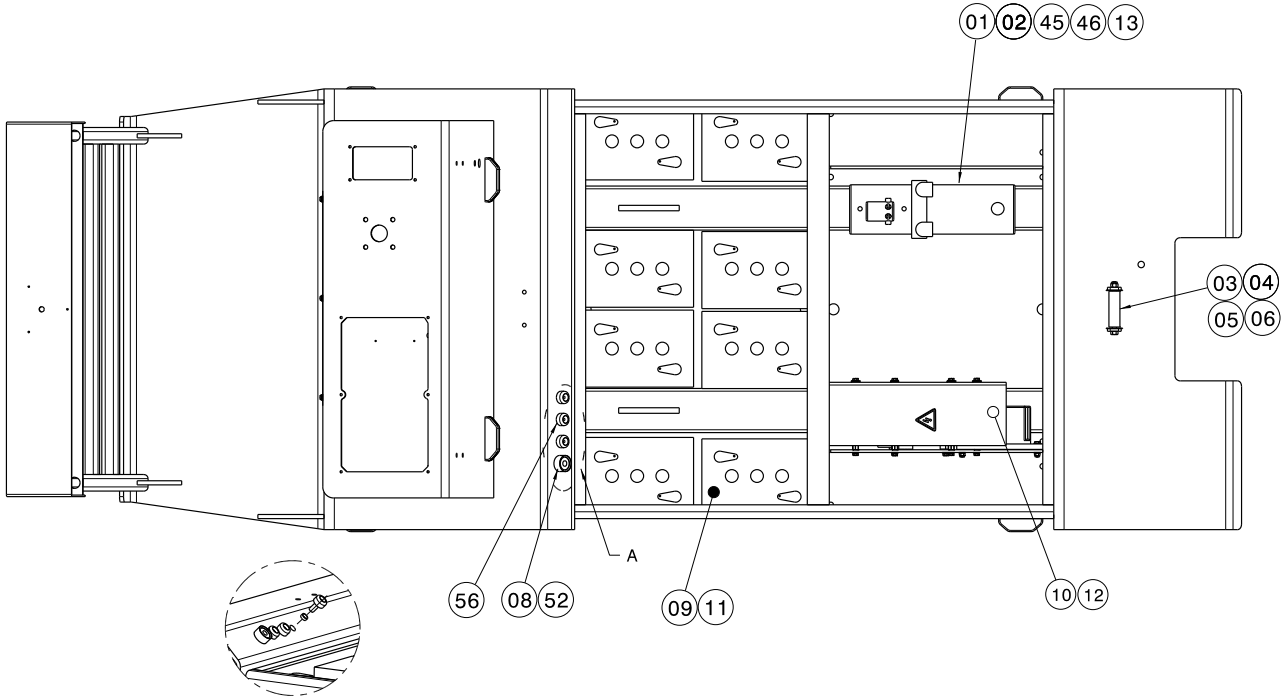
When ordering replacement parts/kits, please specify model, serial number and color of your unit.



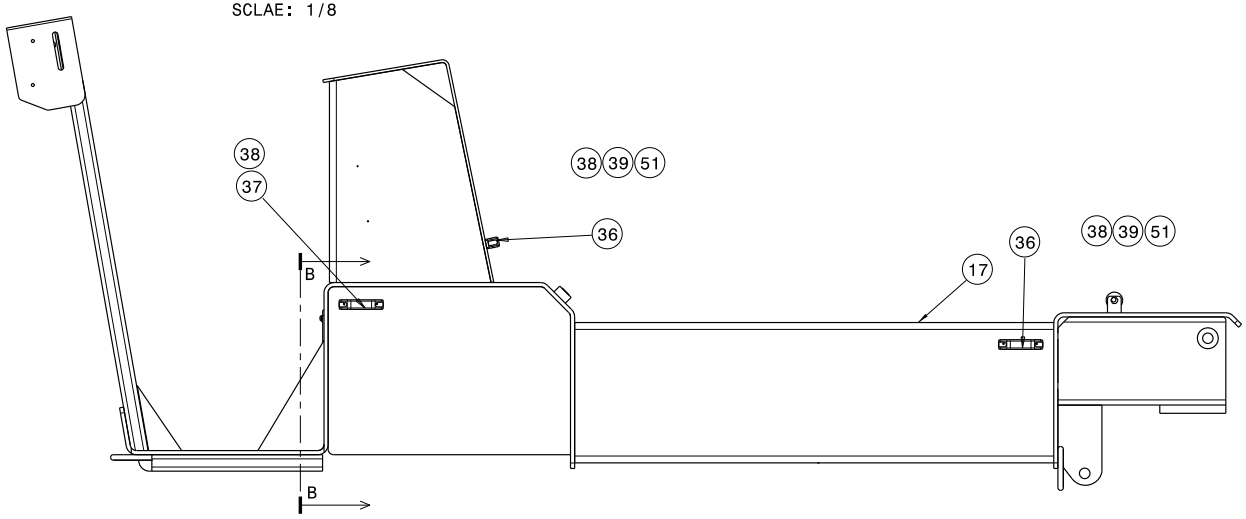
Item	Part Number	Description	Qty
1	S-2747-01	Panel, Switch	1
2	14142	Flange, Latch	1
3	14144	Block, Contact Red	2
4	EC-2817	Switch, Push Button	1
5	V-2580	Label, Panel Brake	1
6	G-1503-1050N	Flatwasher, ¼ Narrow SS	4
7	G-1658-13	Washer, w/Neoprene ¼ Diameter	4
8	G-1476-105010	Screw, ¼ - 20 Socket Button Head Cap	4

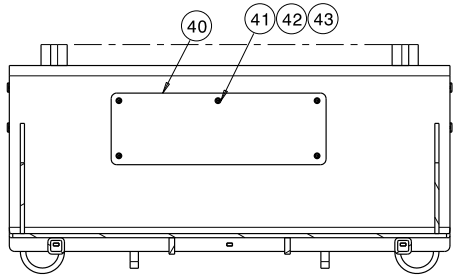
Parts List - eJP-3

When ordering replacement parts/kits, please specify model, serial number and color of your unit.



DETAIL A
SCLAE: 1/8





SECTION B-B

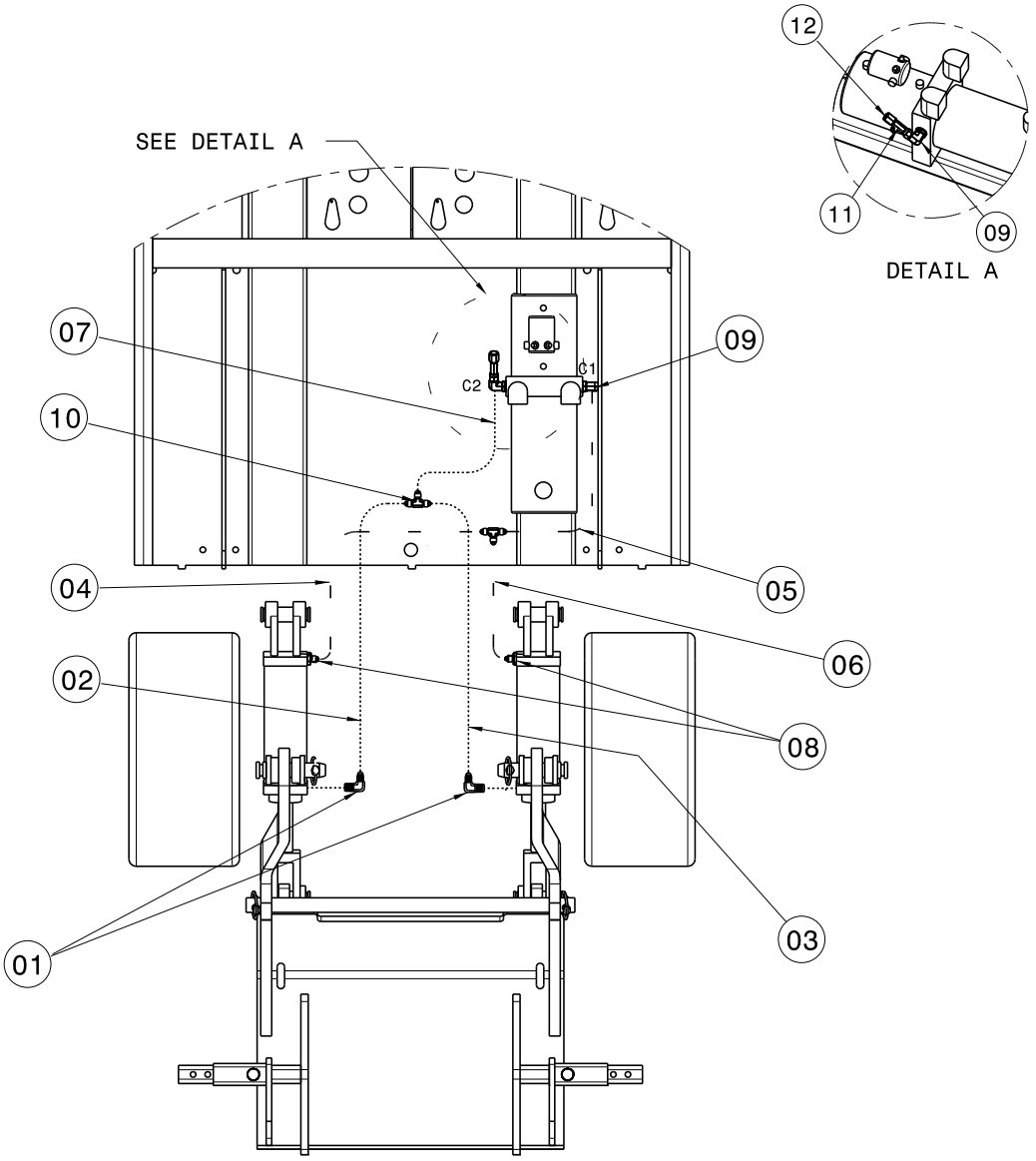
Parts List – eJP-3

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

Item	Part Number	Description	Qty
1	JP-003	Pump, Hydraulic	1
2	G-1100-107006	Bolt, Hex Head ⅜ - 16 x ¾ Long	2
3	TR950-01*003.25	Roller	1
4	G-1202-1070	ESN, ⅜ - 16	1
5	G-1100-107044	Bolt, Hex Head ⅜ - 16 x 4 ½ Long	1
6	G-1254-15	Washer, Fender ⅜	2
7	JP-033	Socket, Welding	3
8	EC-2003	Socket, Female	1
9	JP-058	Battery, 6V	8
10	Z-8592	Assembly, Controller	1
11	EC-2110	Battery, Terminal Insulator Black	20
12	EC-2837	TSX500 Harness, 11 ft.	1
13	Z-8597	Assembly, Suppression Diode eJP-3 Pump Motor	1
15	G-1503-1050W	Flatwasher, ¼	5
16	EC-2835	Kit, Power Cable	1
17	Z-6260	Frame	REF
36	EC-2707	Assembly, Light Side Marker (Amber)	4
37	EC-2708	Assembly, Light Side Marker (Red)	2
38	G-1476-103110	Screw, 10 – 32 1.0 Socket Button Head Cap	8
39	G-1250-1030N	Flatwasher, #10	8
40	S-2744-01	Panel Access	REF
41	G-1476-105006	Screw, ¼ - 20 Socket Button Head Cap	5
42	G-1502-1050R	Lockwasher, ¼ Regular SS	5
43	G-1503-1050N	Flatwasher, ¼	5
45	G-1251-1070R	Lockwasher, ⅜ Regular	2
46	G-1250-1070N	Flatwasher, ⅜Narrow	2
51	G-1202-1035	ESN, #10 – 32	8
52	TR1048*0.125	TBG, Silicone Rubber	1
56	TR-2030	Ring, Plastic Insulator	3
NS	EC-1799-01-SS	Seal, Oil Tight Hole	2
NS	H-2990	Trim, Vinyl	62”

Hydraulics Assembly

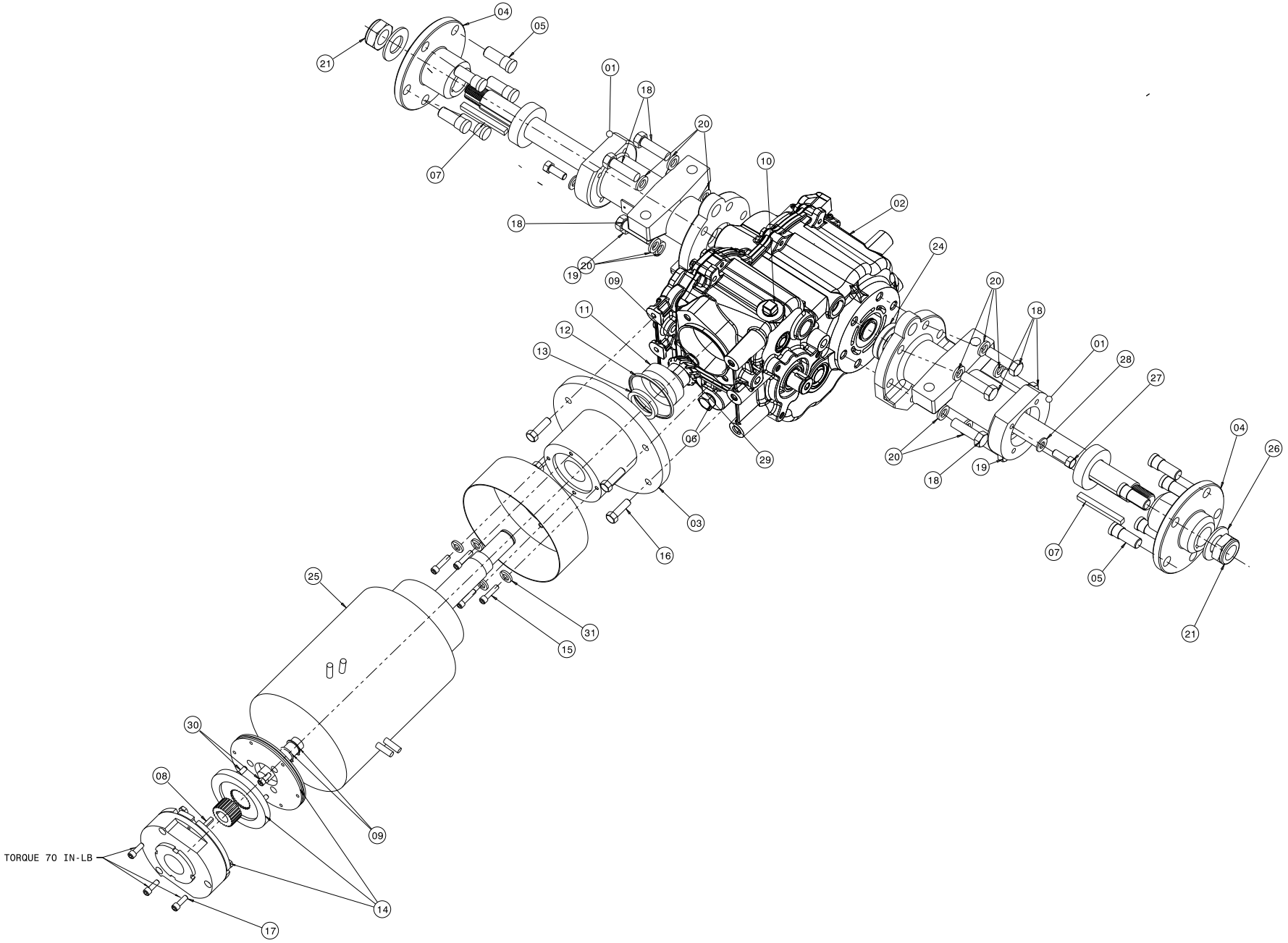
When ordering replacement parts/kits, please specify model, serial number and color of your unit.



Item	Part Number	Description	Qty
1	N-2001-06-S-B	Elbow, Straight Thread	2
2	TF-1037-28*30.0	Assembly, Hose	1
3	TF-1037-28*20.0	Assembly, Hose	1
4	TF-1037-27*16.0	Assembly, Hose	1
5	TF-1037-28*15.0	Assembly, Hose	1
6	TF-1037-27*14.0	Assembly, Hose	1
7	TF-1037-28*13.0	Assembly, Hose	1
8	N-2007-06-S-B	Connector, Straight Thread	2
9	N-2001-05-S-B	Elbow, ¼ Tube x 09 Straight Thread	2
10	N-2012-03-S	Tee, Union	2
11	N-2016-03-S	Tee, Run Swivel	1
12	N-2008-S	Cap. ¼	1

This page left blank intentionally.

Axle Assembly



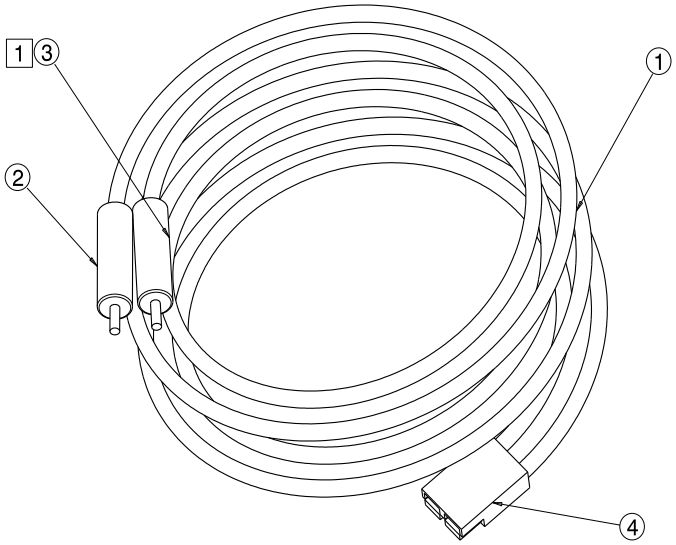
Parts List – Axle Assembly

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

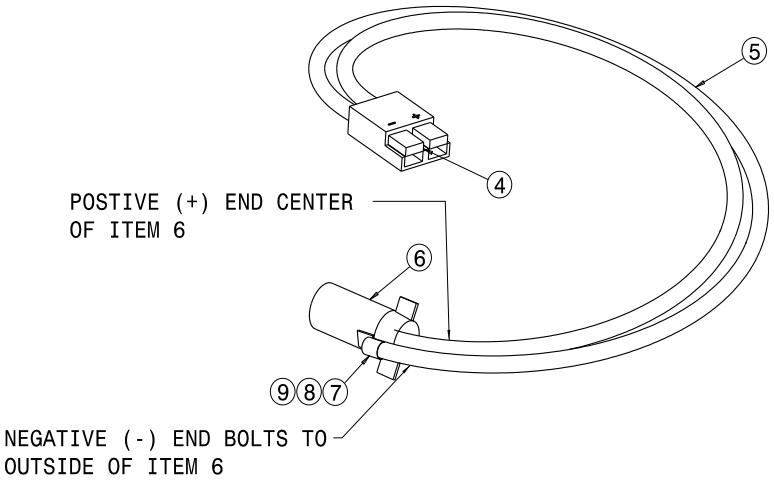
Item	Part Number	Description	Qty
1	Z-6312	Peerless Axle Housing (includes axle bearings)	2
2	JP-054	Peerless 2 Speed Transaxle	1
3	JP-008	Motor Adaptor	1
6	N-2053-07-S-B	Transmission Drain Plug	*Ref*
8	J209-01*00.75	Shaft Key, 3/16 x ¾ ” LG	1
9	G-1392-75-S	Ring, External Retaining	3
10	N-2206-06-S	Transmission Filler Plug ¾	1
11	JP-080	Fafner Bearing, Double Sealed	1
12	HC-2000-149	O-Ring, Series 2	1
13	JP-082	Shaft Seal, Drive Shaft	1
14	JP-004	Electric Brake (includes brake, pad, hardware)	1
15	G-1151-105210	Screw, Hex Socket HD Cap	4
16	G-1100-107012	Bolt, 3/8 – 16 HD GR 5	4
17	G-1114-060020	Bolt, Metric Class 8.8	*Ref*
18	G-1100-109022	Bolt, ½ - 13 x 2 ¼ Hex HD GR 5	8
19	G-1100-109016	Bolt, ½ - 13 x 1 7/5 Hex HD GR 5	4
20	G-1251-1090R	Lockwasher, ½ Regular	12
24	JP-117	Peerless Axle Housing Alignment Ring	2
	H-2989	Shaft Seal (for Item 24)	2
25	EC-2094	GE Motor	1
27	G-1420-107010	Bolt, Hex HD GR 8	4
28	G-1513-1070N	Flatwasher, 3/8 Thru Hard	4
29	JP-056	Drive Pinion (Bevel Gear)	1
30	G-1491-106082	Screw, M6-1.0 x 14 mm HD Cap	3
31	G-1251-1050HC	Lockwasher, Helical Spring	4
NS	JP-026	½“ Collar	1
NS	L-1016	.875 Gal 80/90 Wt. Oil	1
	K-4162	**Kit, Wheel Hub;** *consists of*	
4	JP-057	Wheel Hub	1
5	JP-074	Wheel Hub Stud Disc	5
7	J213-01*003.00	Shaft Key, 5/16 x 3” LG	1
21	G-1203-1120	Jamnut, 1 – 14 Elastic	1
26	G-1503-1130N	Flatwasher	1
	K-4163	**Kit, Axle Assembly;** *consists of:*	
	G-1420-10701	Bolt, ⅜ - 16 Hex Head Grade 8	2
	G-1513-1070N	Flatwasher, ⅜ Thru Hard	2
	JP-055	Axle and Bearing only	1
	K-4257	**Kit, Axle and Housing;** *consists of:*	
1	Z-6312	Peerless Axle Housing	1
7	J213-01*003.00	Shaft Key, 5/16 x 3” LG	1
18	G-1100-109022	Bolt, ½ - 13 x 2 ¼ Hex HD GR 5	2
19	G-1100-109016	Bolt, ½ - 13 x 1 7/5 Hex HD GR 5	4
20	G-1251-1090R	Lockwasher, ½ Regular	8
21	G-1203-1120	Jamnut, 1 – 14 Elastic	1
24	JP-117	Peerless Axle Housing Alignment Ring	1
26	G-1503-1130N	Flatwasher	1
27	G-1420-107010	Bolt, Hex HD GR 8	4
28	G-1513-1070N	Flatwasher, 3/8 Thru Hard	4
NS	G-1100-109520	Bolt, ½ - 20 x 2 Hex HD GR 5	2

Parts List – Cables

When ordering Replacement Parts/Kits, please specify Model & Serial Number of your product.

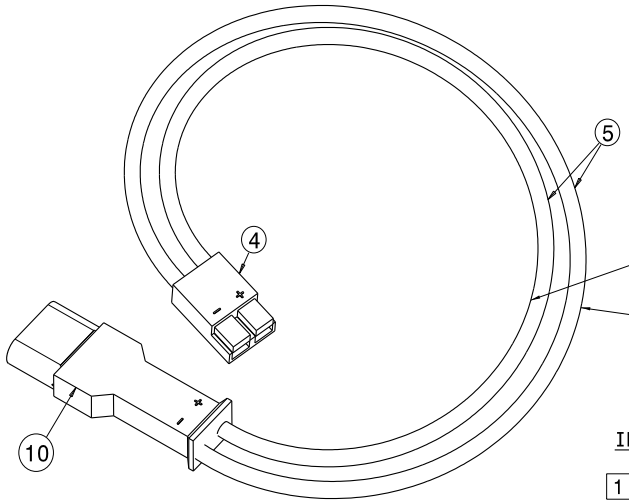


Z-6585 CABLE ASSEMBLY



Z-6303 ASSEMBLY, CABLE PIPER

Z-6304 ASSEMBLY, CABLE CESSNA



INSTRUCTIONS

1 CABLE WITH ITEM 3 (RED PLUG) MUST BE CONNECTED TO POSTIVE TERMINAL OF ITEM 4 (CONNECTOR)

Parts List – Cables

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

Item	Part Number	Description	Qty
1	EC-1185-04*144	Cable, Welding 1/0	2
2	EC-2004	Plug, Male Negative (Black)	1
3	JP-031	Plug, Male Positive (Red)	1
4	JP-105	Gray HPU Connector	3
5	EC-1185-04*24.0	Cable, Welding 1/0	4
6	JP-037	Piper APU Plug	1
7	EC-1057-01	Heat Shrink	1
8	EC-1034-07	Terminal, Ring	1
9	G-1100-105004	Bolt, Hex Head Grade 5	1
10	JP-038	Cessna APU Plug	1
For complete cable replacement order:			
	Z-6585	**Cable Assembly;** *consists of:*	
1	EC-1185-04*144	Cable, Welding 1/0	2
2	EC-2004	Plug, Male Negative (Black)	1
3	JP-031	Plug, Male Positive (Red)	1
4	JP-105	Gray HPU Connector	1
	Z-6303	**Piper Cable Assembly;** *consists of:*	
4	JP-105	Gray HPU Connector	1
5	EC-1185-04*24.0	Cable, Welding 1/0	2
6	JP-037	Piper APU Plug	1
7	EC-1057-01	Heat Shrink	1
8	EC-1034-07	Terminal, Ring	1
9	G-1100-105004	Bolt, Hex Head Grade 5	1
	Z-6304	**Piper Cable Assembly;** *consists of:*	
4	JP-105	Gray HPU Connector	1
5	EC-1185-04*24.0	Cable, Welding 1/0	2
10	JP-038	Cessna APU Plug	1

Parts List
REPLACEMENT STRAPS

Part Number	Description	Qty
JP-069	Winch Strap	1
JP-090	Safety Strap	1
JP-065	2” Strut Strap (31”)	1

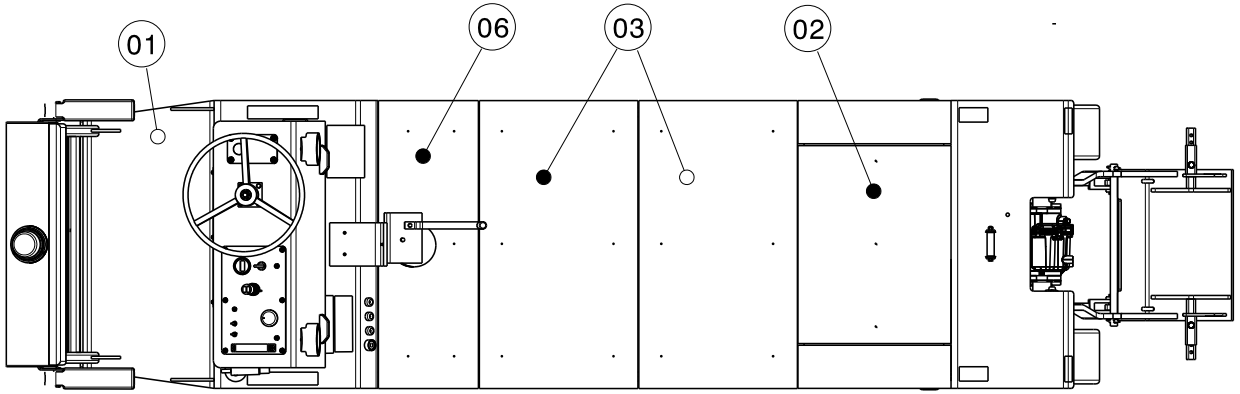
Parts List
REPLACEMENT LABELS

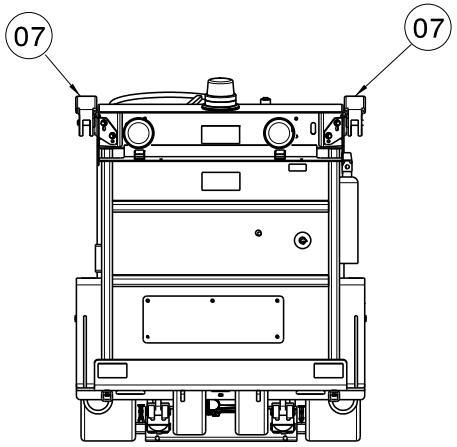
Part Number	Description	Qty
V-2141	Transmission Shaft	1
V-2137	Ground Power Unit	1
V-2590	Operation & Loading Instructions	1
V-1001	Made IN USA	1
V-2733	eJP-3	2
V-2734	eJP3L	2
V-2118	Serial Number CE	1
V-2187	Battery Instructions	1
V-2195	Ground Power Unit	1
V-2194	Sit Down	2
V-2188	Winch	1
V-2197	Use AW46 Oil	1
V-2191	Caution Hands/Feet	1
V-1814	Warning Keep 5 Ft Clear	2
V-2452	Label, Charging Power Level	1
V-2455	Label, Charger Inlet, 13 AMP eJP-3	1
V-2456	Label, Charger Inlet, 20 AMP eJP-3L	1
V-2580	Label, Brake Panel	1
V-2583	Label, Control Panel	1
V-2579	Label, Signal Panel (Turn Signal Option Only)	1

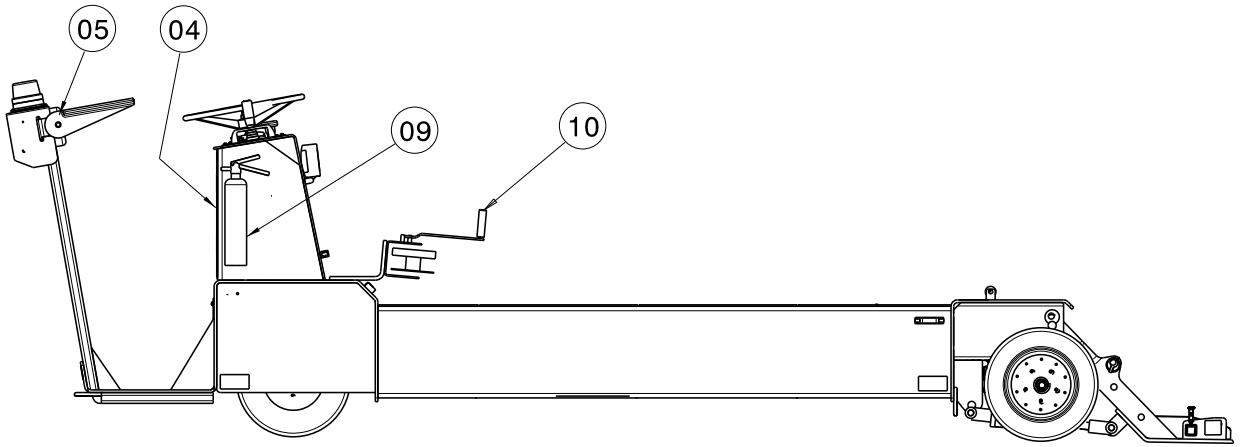
This page left blank intentionally

Parts List Illustration - eJP-3L

Reference Parts List on following page







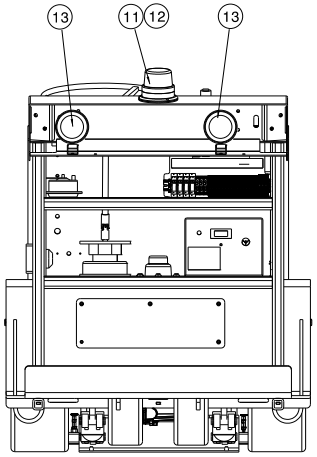
Parts List - eJP-3L

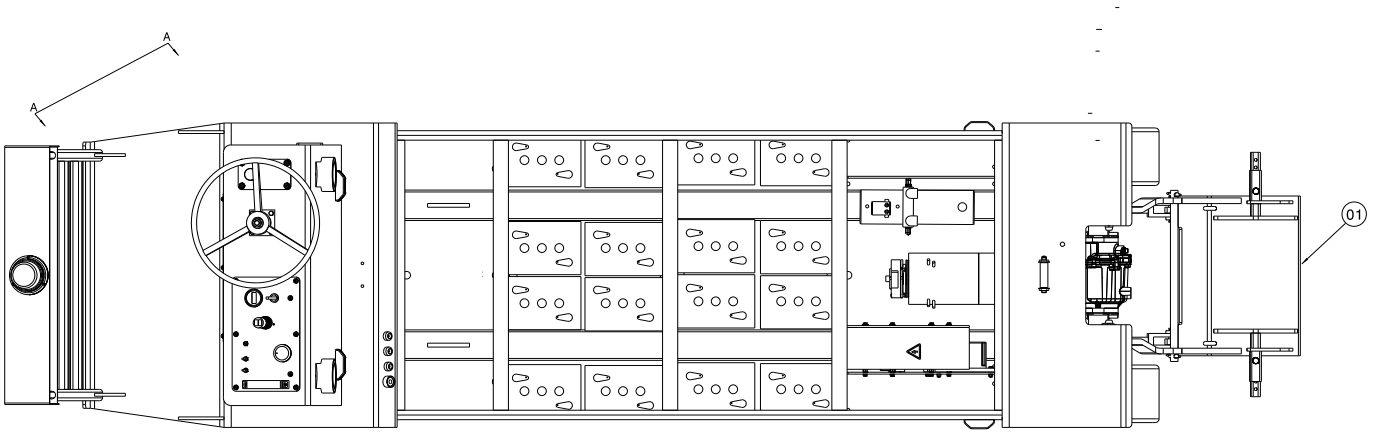
When ordering replacement parts/kits, please specify model, serial number and color of your unit.

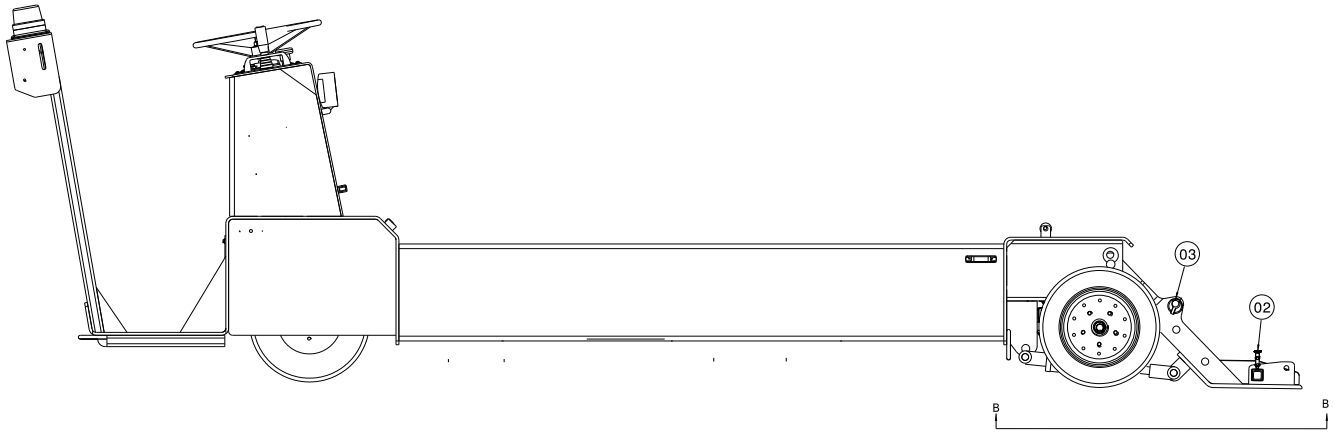
Item	Part Number	Description	Qty
1	H-2948	Mat, Platform	1
2	Z-6329	Cover, Motor Bay (Coated)	1
3	Z-6328	Assembly, Battery Cover (Coated)	1
4	S-2331-01	Cover, Console	1
5	JP-001	Backrest , Padded	1
6	Z-6327	Assembly, Storage Cover (Coated)	1
7	JP-228	Armrest, LH & RH (pair)	1
9	H-3075	Extinguisher, Fire	1
10	JP-064	Winch, Manual	1
NS	JP-069	Strap, Winch Nylon	1
NS	JP-159	Winch, Replacement Spring	1
NS	JP-160	Winch, Repair Kit	1
NS	H-3076	Bracket, Extinguisher	1
NS	V-2733	Label, eJP-3	2
NS	H-3076	Bracket, Extinguisher	1

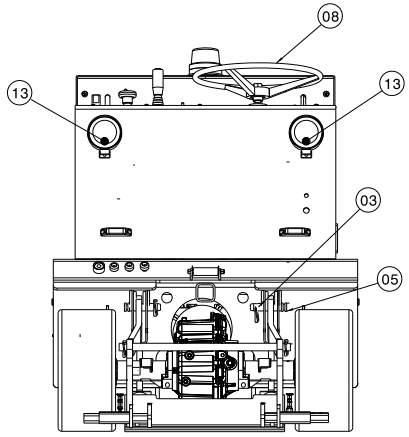
Parts List - eJP-3L

When ordering replacement parts/kits, please specify model, serial number and color of your unit.



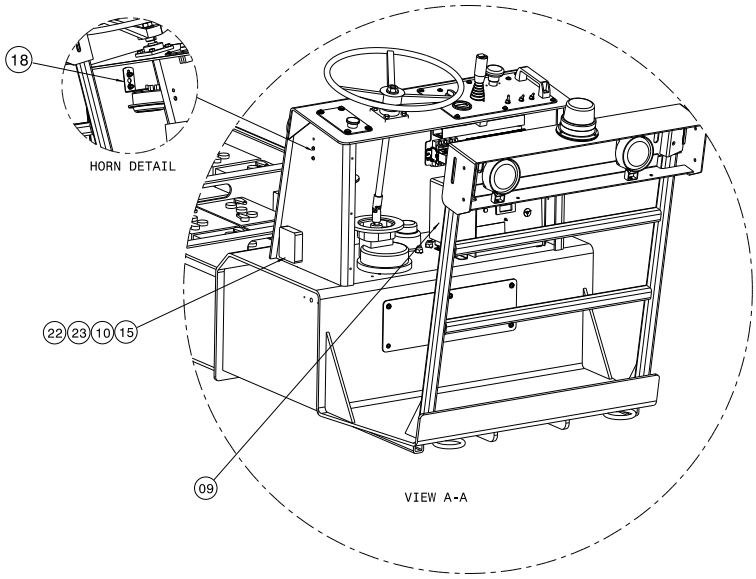


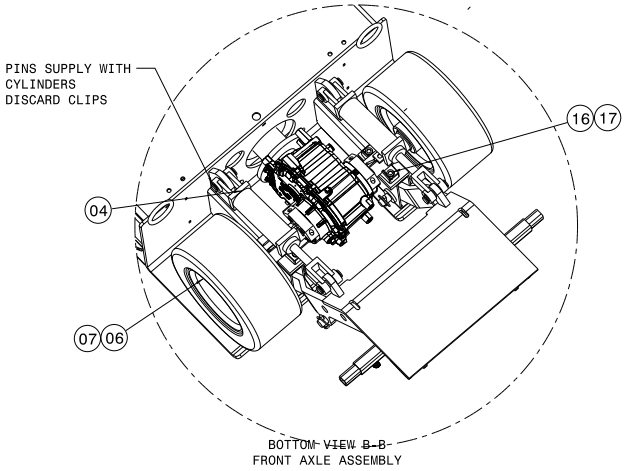




Parts List - eJP-3L

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

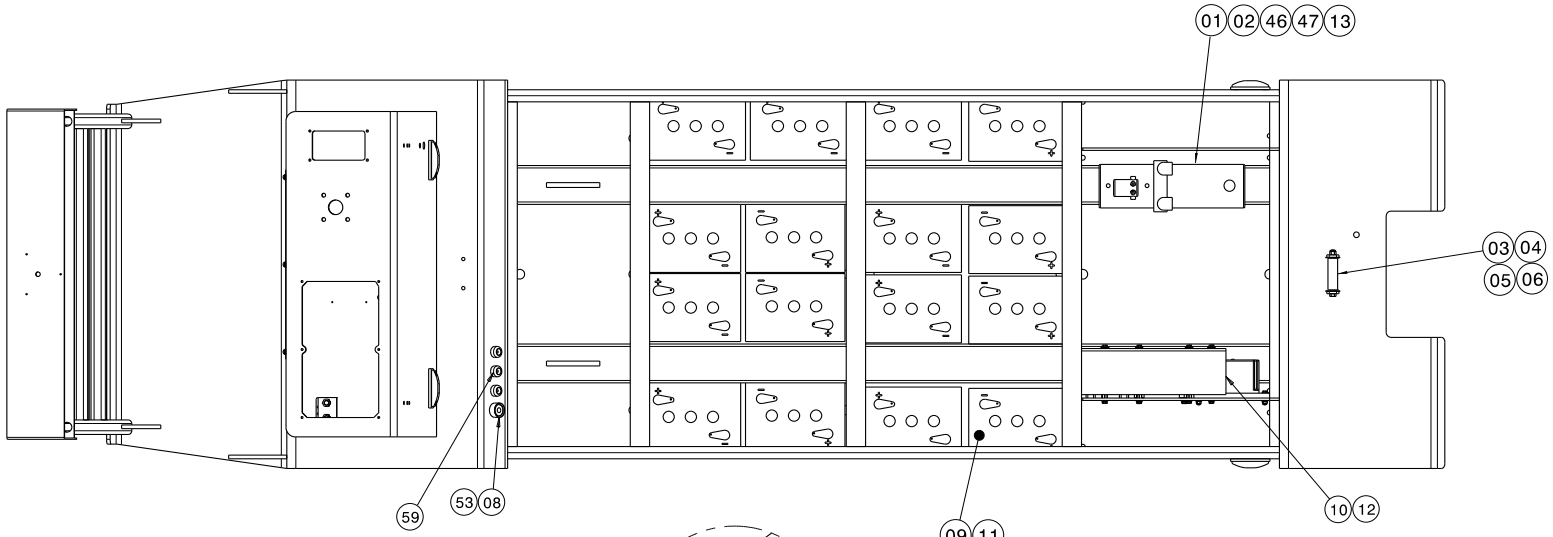


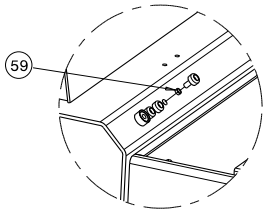


Item	Part Number	Description	Qty
1	Z-6266	Weldment, Lift Cradle	1
2	JP-115	Indexing Plunger	2
3	JP-114	Linch Pin	4
4	HC-2746	Cylinder, Hydraulic	2
5	JP-104	1” x 3” Link Pin	2
6	JP-061	Solid Rubber Drive Tires	2
7	JP-126	Front Wheel Hub Nuts	10
8	Z-6288	Assembly, Steering	REF
9	EC-2622	Battery Charger	1
10	EC-2632	Recessed, Male Panel Mount	1
11	JP-118	Strobe	1
12	JP-166	Cover, Strobe Half	1
13	EC-2456	Light, Work Spot LED	4
15	EC-2632	Flange, Inlet Socket Rating 30 A	1
16	G-1100-109520	Bolt, Hex Head, ½ - 20 x 2 Long	4
17	G-1251-1090R	Lockwasher, ½	4
18	EC-2011	Horn	1
22	G-1202-1020	Stopnut, Elastic #8	4
23	G-1497-102006	Screw, RD HD PH SS, 8-32 x ¾	4
NS	EC-2736	Connector, Female Plug Body	1

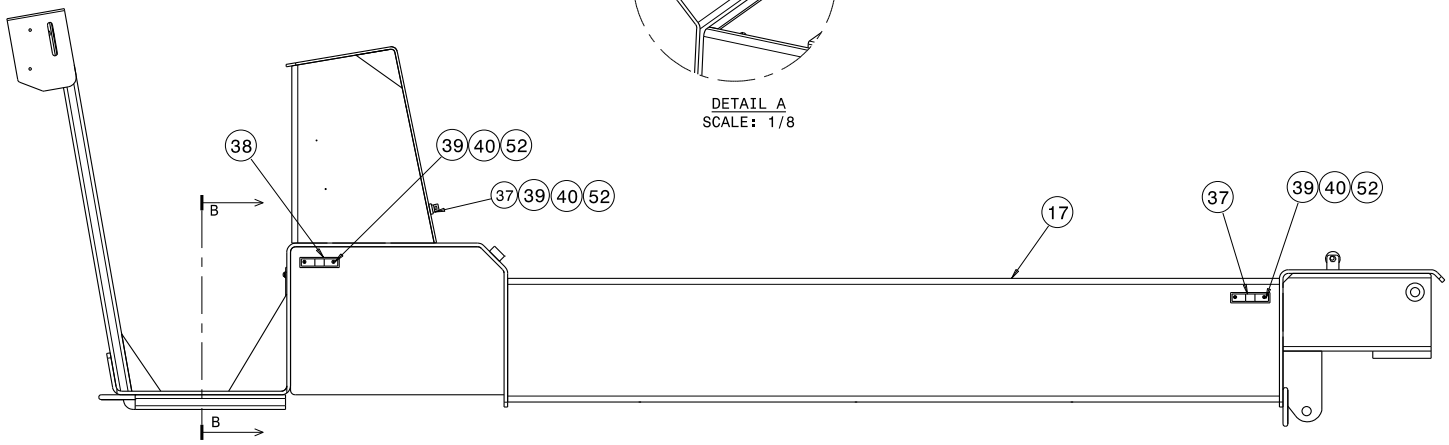
Parts List - eJP-3L

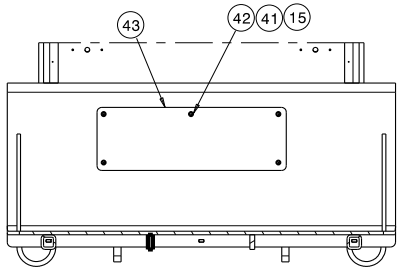
When ordering replacement parts/kits, please specify model, serial number and color of your unit.





DETAIL A
SCALE: 1/8





Section view B-B[3]
Scale: 1:8

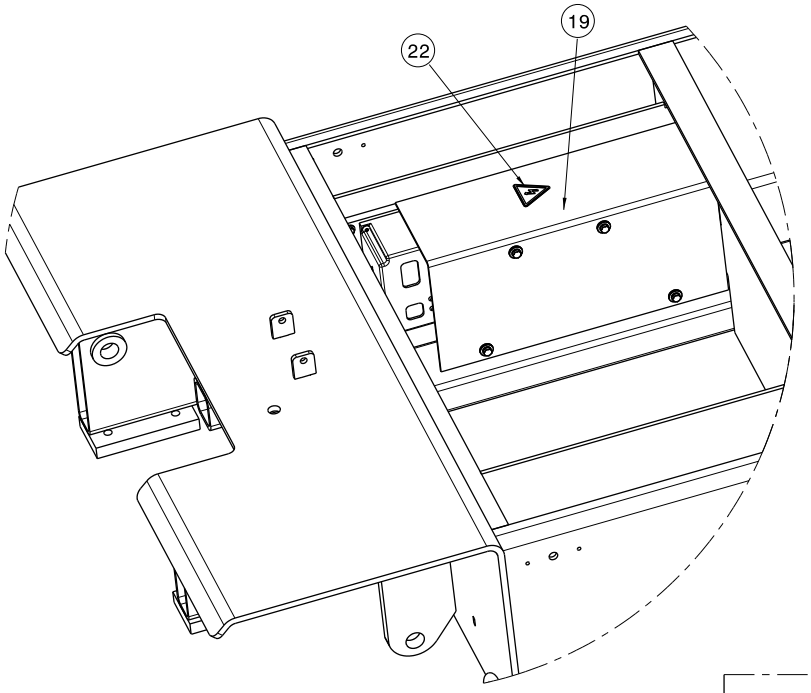
Parts List - eJP-3L

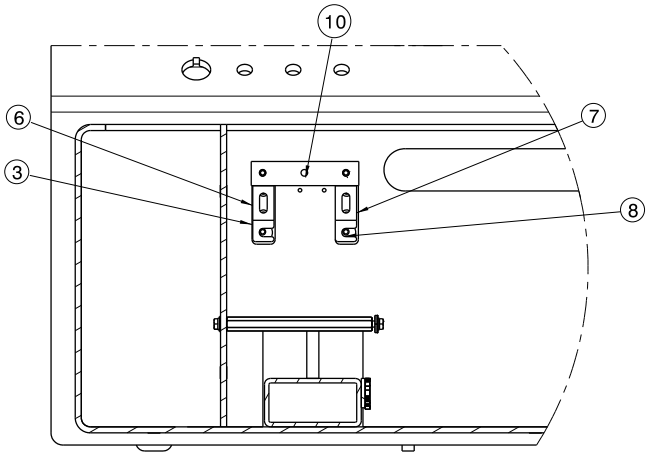
When ordering replacement parts/kits, please specify model, serial number and color of your unit.

Item	Part Number	Description	Qty
1	JP-003	Pump, Hydraulic	1
2	G-1100-107006	Bolt, Hex Head ⅜ - 16 x ¾ Long	2
3	TR950-01*003.25	Roller	1
4	G-1202-1070	ESN, ⅜ - 16	1
5	G-1100-107044	Bolt, Hex Head ⅜ - 16 x 4 ½ Long	1
6	G-1254-15	Washer, Fender ⅜	2
7	JP-033	Socket, Welding	3
8	EC-2003	Socket, Female	1
9	JP-058	Battery, 6V	16
10	Z-8585	Assembly, Controller	1
11	EC-2110	Battery, Terminal Insulator Black	36
12	EC-2837	TSX500 Harness, 11 ft Long	1
13	Z-8597	Assembly, Suppression Diode eJP-3 Pump Motor	1
15	G-1503-1050N	Flatwasher, ¼	5
16	EC-2836	Kit, Power Cable	1
17	Z-6296	Frame	REF
37	EC-2707	Assembly, Light Side Marker (Amber)	4
38	EC-2708	Assembly, Light Side Marker (Red)	2
39	G-1476-103110	Screw, 10 – 32 1.0 Socket Button Head Cap	12
40	G-1250-1030N	Flatwasher, #10	12
41	G-1476-105006	Screw, ¼ - 20 Socket Button Head Cap	5
42	G-1502-1050R	Lockwasher, ¼ Regular	5
43	S-2744-01	Panel Access	REF
46	G-1251-1070R	Lockwasher, ⅜ Regular	2
47	G-1250-1070N	Flatwasher, ⅜Narrow	2
52	G-1202-1035	ESN, #10 – 32	8
53	TR1048*0.125	TBG, Silicone Rubber	1
58	G-1502-1050R	Lockwasher, ¼ SS	4
59	TR-2030	Ring, Plastic Insulator	3
NS	H-2990	Trim, Vinyl	62”

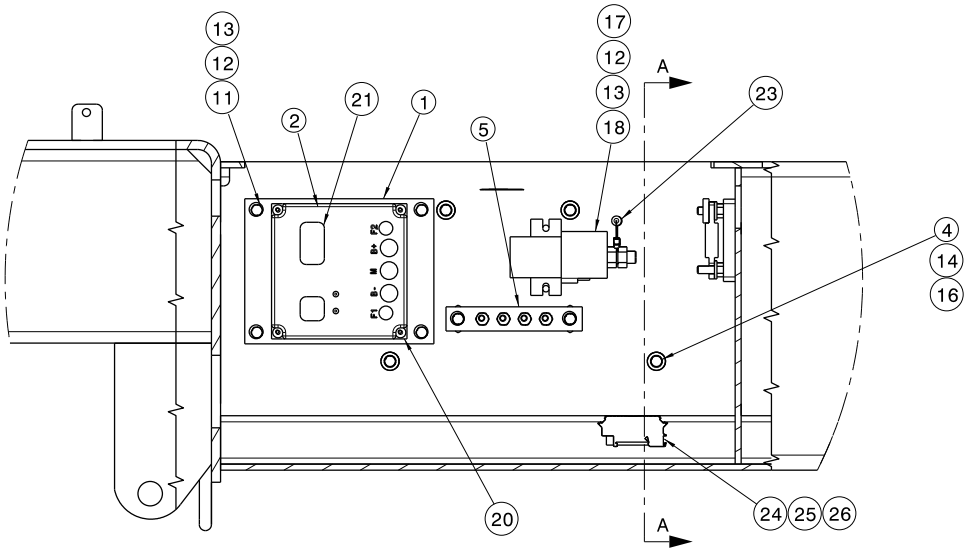
Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.





Section view A-A
Scale: 1:4



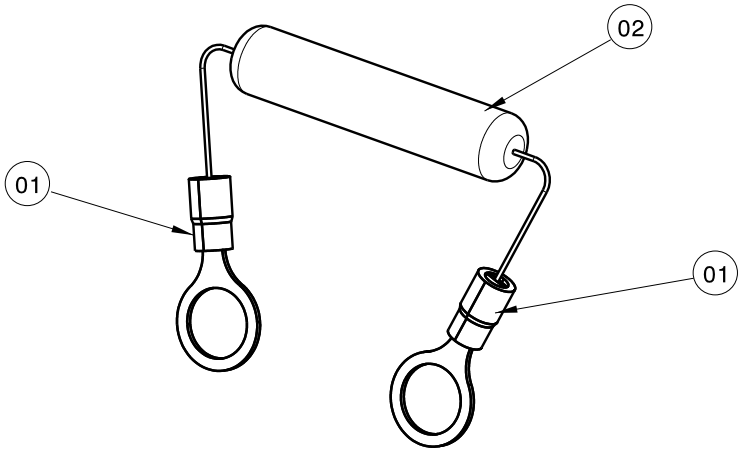
Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

Item	Part Number	Description	Qty
1	J-5815	Plate, Heat Shrink	1
2	EC-2090	Controller	1
3	EC-1618	Fuse Block, ANL Limiters	2
4	H-3808	Standoff, Female Thread 5 Long	4
5	Z-7949	Assembly, Negative Buss Bar	1
6	EC-1619-18	Fuse, Low Voltage Limiter 400 A	1
7	EC-1619-04	Fuse, Low Voltage Limiter 60 A	1
8	G-1152-103712	Screw, Socket Flat Head 10-32	4
10	J-5189	Bar, Buss	1
11	G-1100-105012	Bolt, Hex Head Grade 5, ¼ - 20 x 1.25 Long	4
12	G-1503-1050N	Flatwasher, ¼ SS	10
13	G-1202-1050	ESN, ¼ - 20	6
14	G-1658-13	Washer, Neoprene, ¼	4
15	G-1502-1050R	Lockwasher, ¼ Regular	8
16	G-1100-15006	Bolt, Hex Head Grade 5, ¼ - 20 x ¾ Long	8
17	G-1476-105010	Screw, Socket Button head Cap, ¼ - 20	2
18	EC-2825	Contactor, 48 VDC SPST NO	1
19	S-2753	Cover, Controller	1
20	G-1154-105206	Screw, Socket Button head Cap, ¼ - 20	4
21	EC-2837	TSX500 Harness, 11 ft	1
22	V-1050	Label, ISO Electrical Shock	1
23	Z-9545	Assembly, Resistor 250 OHM	1
24	EC-2408	Terminal, Block Diode 4 Cond	1
25	EC-2411	Plate, End Diode Block	1
26	H-2973	Tape, Polyurethane Foam Seal	2“

Parts List

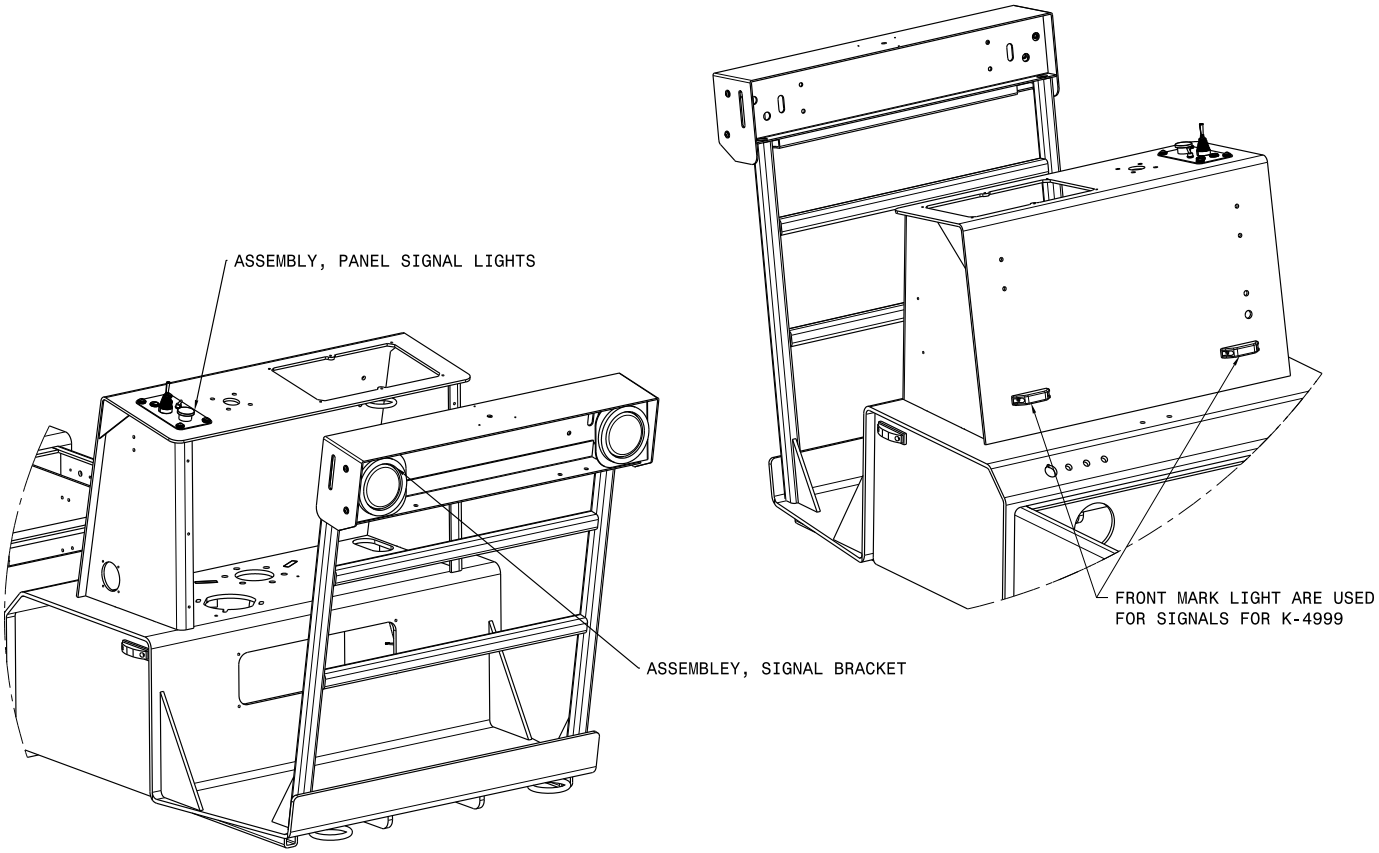
When ordering replacement parts/kits, please specify model, serial number and color of your unit.

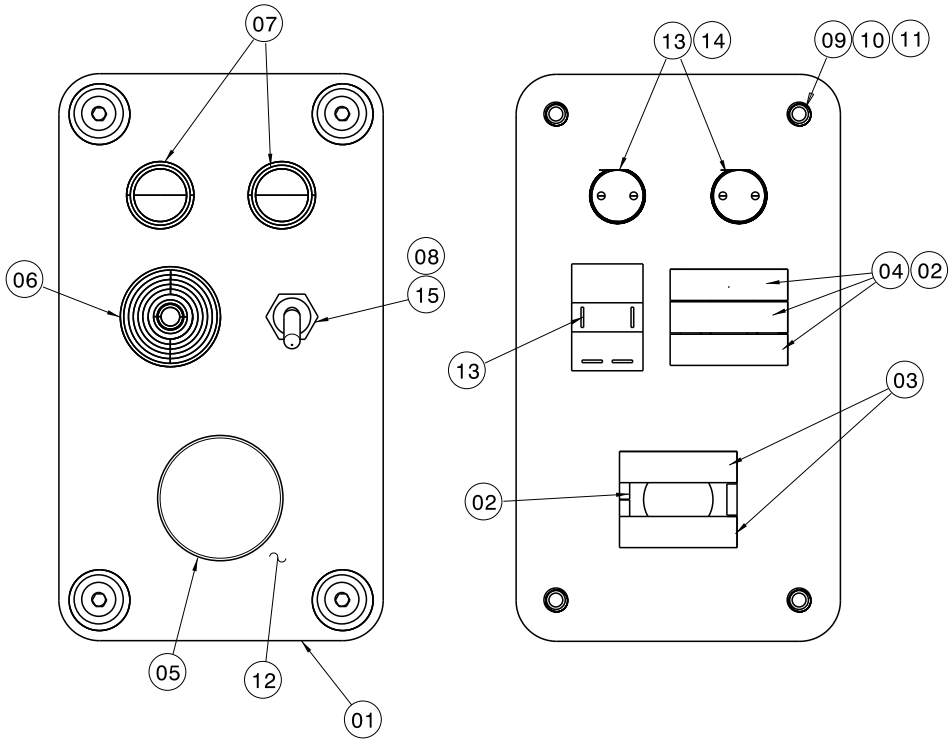


Item	Part Number	Description	Qty
1	EC-1180-13	Terminal, Ring Tongue	2
2	EC-2880	Resistor, 250 OHM 10 W	1

Parts List – Turn Signal Kit Option

When ordering replacement parts/kits, please specify model, serial number and color of your unit.





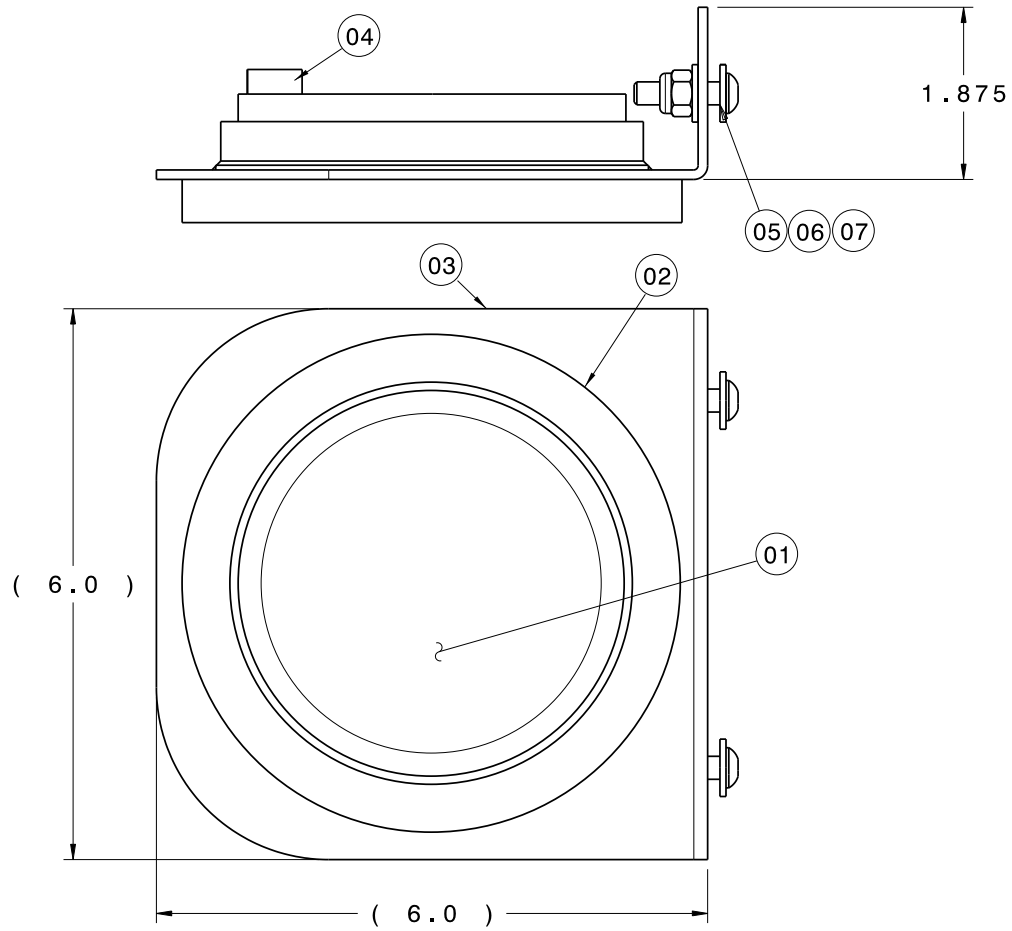
Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

Item	Part Number	Description	Qty
1	S-2733-01	Panel, Switch	1
2	14142	Flange, Latch	2
3	14144	Block, Contact Red	2
4	14143	Block, Contact Green	3
5	EC-2817	Switch, Push Button	1
6	EC-2449	Switch, Toggle	1
7	EC-2826	Indicator, Green LED	2
8	EC-2747	Switch, Toggle 2 Position (DPST)	1
9	G-1503-1050N	Flatwasher, ¼ Narrow	4
10	G-1658-13	Washer, Neoprene, ¼	4
11	G-1476-105010	Screw, Socket Button head Cap, ¼ - 20	4
12	V-2579	Label, Panel Switch	1
13	EC-1326-01	Disconnect, Female	8
14	EC-1327-01	Tab, Male	4
15	EC-2744	Rubber, Switch Boots	1

Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.



Item	Part Number	Description	Qty
1	EC-2819	Light, LED Red	1
2	H-3804	Bracket, Gasket	1
3	H-3805	Bracket, LED Holder	1
4	EC-2820	Harness, LED Light	1
5	G-1476-105010	Screw, Socket Button head Cap, ¼ - 20	2
6	G-1503-1050N	Flatwasher, ¼ Narrow	4
7	G-1202-1050	ESN, ¼ - 20	2

TRONAIR®

APPENDIX I

Hydraulic Schematic
INS-1857

TRONAIR®

APPENDIX II

Electrical Schematic
INS-2276

APPENDIX III

Wiring Diagrams
INS-2277, INS-2278

TRONAIR®

APPENDIX IV

Deep Cycle Battery
Handling, Maintenance and Test Procedures

Safety. First.

Deep Cycle Battery Handling, Maintenance & Test Procedures

Crown Deep Cycle Batteries

The chemistry and plate design of deep cycle batteries are totally different than that of automotive starting batteries. The grid metal used in the deep cycle battery plate is specifically formulated to increase the adhesion of high-density active paste material. This provides the best available running time, cycle life and charge acceptance.

Crown Battery's heavy-duty plate design also protects against the stress of challenging Electric Vehicle (EV), motive power and RE (RE) applications – which includes vibration, heat and overcharge.

Crown deep cycle batteries employ a low-maintenance design. They do require periodic maintenance and effective charging service to ensure dependable service life. The purpose of this service guide is to help you understand the characteristics, operation and care of the batteries in your equipment so that all of their advantages may be fully realized.

The Power Behind Performance

CROWN®
DEEP CYCLE
BATTERIES

Inspection & Handling

1. Do not allow batteries in your equipment to tip or operate at a severe angle in any direction. This would allow the battery electrolyte to push through the battery vent assembly.
2. Charge the batteries in your equipment in a well-ventilated area.
3. Upon receipt of your equipment, examine the batteries for signs of wetness or impact (which may indicate damage in shipment or that the batteries were tipped beyond a 45° angle during transit).
4. If there is evidence of damage – notify Crown Battery or the OEM supplier to make a damage report.
5. Charge the batteries before placing the batteries in service. Simply connect the battery charger to your machine's charging port and allow it to run until it automatically shuts off.

Operating Guidelines

Deep cycle batteries supply all the power used in EV, motive power or RE system applications. One full cycle represents a full battery recharge followed by a complete battery discharge (as specified by the OEM). Battery life is usually measured in cycles – but in practical terms, your batteries should work well for three years from the beginning date of service.

However, battery maintenance and charging procedures will either prolong or shorten battery life, depending upon how well recommended practices are followed.

Other Factors That Affect Battery Life and Performance:

- Batteries are rated in ampere-hours (Ah) and are designed to perform a specific workload within an established period of time. Increasing either and/or both of these will over-discharge the batteries and result in shortened life.
- Limit discharging the batteries beyond 1.75 volts per cell – or 1.125 specific gravity per cell. 1.75 volts per cell corresponds to end-point voltages of 5.25 volts for 6-volt batteries, 7 volts for 8-volt batteries and 10.5 volts for 2-volt batteries.
- Batteries should always be recharged immediately following a complete discharge period. Never allow batteries to remain in a fully discharged condition, otherwise permanent damage will result.
- If daily or routine equipment operation results in only partial discharges (40% or less) and specific gravities are 1.225 or higher, recharging may be deferred to the next day, providing the workload is not expected to increase. Generally, user experience will determine the frequency of charging service under these circumstances.
- Under normal circumstance the temperature of the battery electrolyte must not exceed 110° F (43° C). If the battery is continuously operated at or above this point the service life of the battery will be severely diminished. Under normal conditions, battery electrolyte condition should range from 60° to 100° F (15° to 38° C). After charging, the battery should be allowed to cool-down or rest from 6 to 8 hours before the next discharge cycle begins.
- If a battery is ever hot to the touch, allow it to cool to ambient temperature before charging or discharging.
- Keep battery connectors and cabling in good condition. When disconnecting the battery connector from the equipment, pull on the connector – not the cable. Damage to the connectors and/or cables will result in poor battery performance.

Renewable Energy Charging Systems

To maximize performance and life batteries should be recharged fully after each discharge period. To verify full recharging, regularly monitor individual battery voltage and specific gravity. As a general rule, the total input amperes from your RE charging source should be between 10% and 20% of the total ampere-hours (20 Hour Rating) of the battery system capacity. Many RE charge controllers have adjustable equalization settings that ensure batteries are regularly restored to full capacity. Batteries used in RE systems should be equalized every thirty days at a minimum – with more frequent equalization occurring for battery systems routinely discharged below 50% of their rated capacity. Please refer to the following chart for additional charge control setting information:

	System Voltage				
Voltage Setting	6 V	12 V	24 V	36 V	48 V
Daily Charge (Absorption)	7.5	15	30	45	59.5
Equalize	7.8	15.6	31.2	46.8	62.4
Float	6.8	13.5	27	40.5	54

Contact Crown Battery's technical support department for additional charging application information.

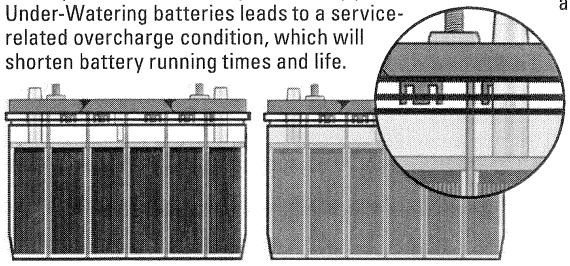
Watering Service

Deep cycle batteries begin service consuming relatively low amounts of water. In electric vehicle, motive power or RE service, the real need to add water to batteries may vary from weekly service to monthly service depending upon the operating environment and other external factors. As batteries age they will use more water, and in warmer climates batteries will require more frequent service. Equipment owners and users must be vigilant in performing regular watering service to ensure premium performance and life.

There are two conditions when watering can be harmful to your batteries:

☑ Over-Watering ☑ Under-Watering

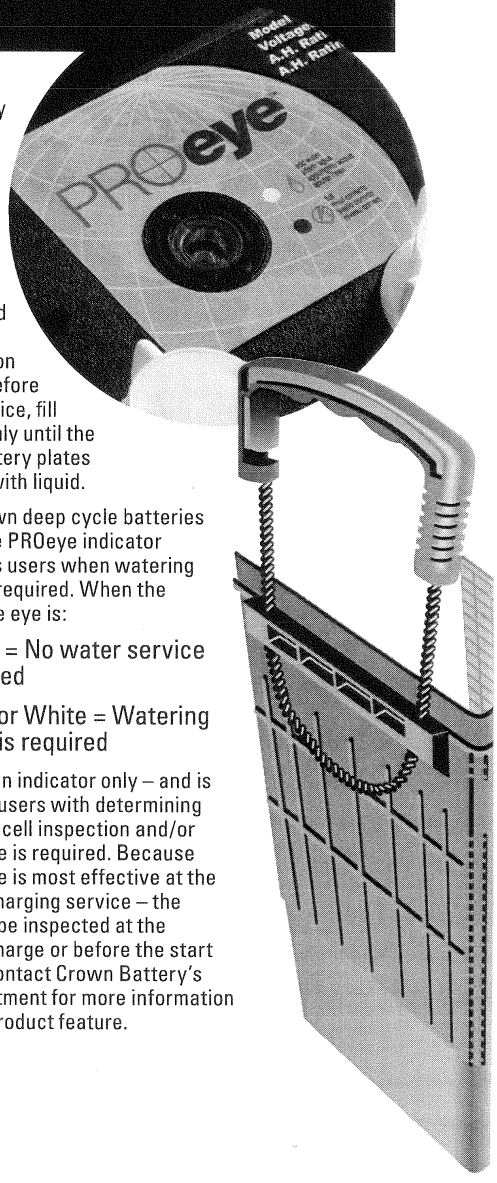
Over-Watering dilutes the sulfuric acid levels inside the battery – which results in poor battery performance. Under-Watering batteries leads to a service-related overcharge condition, which will shorten battery running times and life.



You can prevent watering-service related problems by using the illustration shown above as a reference point. Maintain battery liquid levels above the top of the battery plates – but no higher than the battery cover vent well. Never fill batteries to the brim of the cell or to a point where they overflow.

Several other rules apply when watering:

- USE ONLY DISTILLED or DE-MINERALIZED WATER.
- Never add battery acid, commercial additives or other foreign material to the batteries.
- Watering service should occur only after charging service is completed. Watering before charging service will result in overflow of the battery's electrolyte – causing a dangerous chemical spill condition and loss of battery capacity.
- Never charge batteries if the battery plates are found to be uncovered/ un-submerged in electrolyte. If this condition is detected before charging service, fill the battery only until the top of the battery plates are covered with liquid.



Many Crown deep cycle batteries feature the PROeye indicator that shows users when watering service is required. When the color of the eye is:

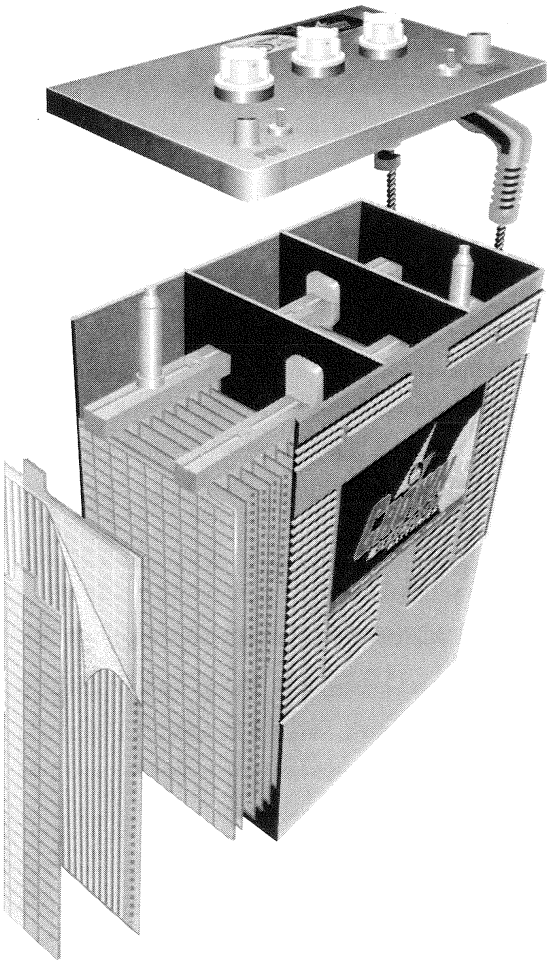
☑ Green = No water service is required

☑ Clear or White = Watering service is required

The PROeye is an indicator only – and is designed to aid users with determining when individual cell inspection and/or watering service is required. Because watering service is most effective at the completion of charging service – the PROeye should be inspected at the completion of charge or before the start of duty cycle. Contact Crown Battery's technical department for more information regarding this product feature.

SAFETY PRECAUTIONS:

1. ***CAUTION:*** *All lead-acid batteries generate highly flammable hydrogen gas. If ignited, the gas may explode violently. When working near batteries, always wear safety glasses, do not smoke or use open flame near the batteries, remove watches and jewelry, and avoid causing sparks with tools.*
2. *Battery electrolyte is corrosive and can cause blindness or severe burns. If exposed to battery electrolyte, immediately flush with water and seek medical attention.*
3. *The batteries in your equipment are electrically live at all times. Keep the top of the batteries clean and dry to prevent ground shorts and corrosion.*
4. *Do not tip a battery beyond a 45° angle in any direction. This would allow battery electrolyte to push through the battery vent assembly.*



Preventative Maintenance

- Battery covers and terminals should be kept clean, dry and free of corrosion. Battery vent caps must be secured to the batteries during use and charging period. Remove vent caps only to inspect electrolyte levels or specific gravities.
- When batteries or terminals require cleaning, use only biodegradable cleaner-neutralizer solutions that can be safely applied and disposed of through a common sanitary sewer. Other chemical-based solutions are often dangerous, ineffective and cannot be disposed of in an environmentally safe manner.
- If electrolyte is spilled onto batteries or the battery compartment area, neutralize it with a cloth moistened with a solution of baking soda and water mixed in the proportion of one pound of baking soda to one gallon of water. When the electrolyte is neutralized, wipe the affected area with a water-moistened cloth to remove all traces of soda.
- Inspect cable-to-terminal connections to ensure connections are tight and free of corrosion. Battery cables must be intact with no exposed wires.
- Preventative maintenance practices should include periodic inspection of battery specific gravity and open circuit voltage. An imbalance of specific gravity and open circuit voltage is usually a sign of improper charging, service infrequency, or a bad cell condition.

The Power Behind Performance

CROWN®
DEEP CYCLE BATTERIES

Charging Guidelines

EV or Motive Power Service

Original equipment systems usually include an automatic charging system for battery charging. To maximize battery life and performance, batteries should be charged as outlined in the operating instructions included with the charging equipment. In the event of a charging-related battery performance problem, consult the OEM or Crown Battery service department to seek technical support. Extra care spent in proper charging will ensure battery performance.

Battery charging equipment varies in terms of output and overall charging performance. For new or replacement chargers used in EV or motive power service, Crown Battery recommends electronically controlled automatic chargers that are programmed to deliver a high constant current rate of 12 to 18 amperes per 100 ampere-hours (20 Hour Rating) of battery capacity. The constant voltage phase begins after the gassing point is achieved (2.42 volts per cell). This stage of charge will last approximately 5 hours for a fully discharged battery. During the constant voltage phase the charger voltage is limited to the gassing level (2.42 volts per cell), and the input current is allowed to gradually diminish. When the input current falls to the finish rate setting of 3 to 4 amperes per 100 ampere-hours (20 Hour Rating) of battery capacity, the charge phase will change from constant voltage to constant current at 3 to 4 amperes per 100 ampere-hours (20 Hour Rating) of battery capacity – with a maximum charging voltage of 2.65 volts per cell. The charge will be terminated approximately 3.5 hours from the gassing point by an approved charge termination method such as DV/DT. Please note that fixed ferro-resonant chargers using this profile must have finish voltages set at 2.58 volts per cell or higher.

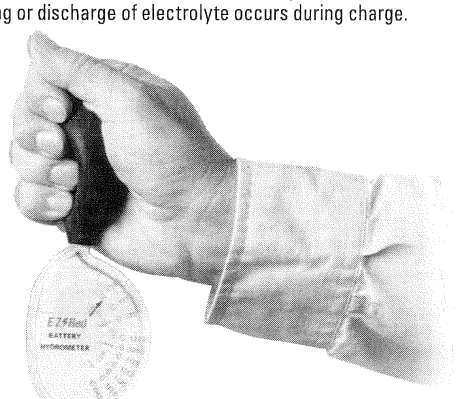
Batteries should always be recharged immediately following a complete discharge period. A weekly equalization charge – with the finish rate charge time extended 3 hours for a total of 6 hours from the gassing point – will ensure reliable discharge time and battery life. The charge factor of the standard recharge cycle should be equal to or greater than 1.08 (108%), while the charge factor of the equalization cycle should be equal to or greater than 1.15 (115%). To ensure optimum battery performance, total recharge time should in all cases be limited to 10 hours.

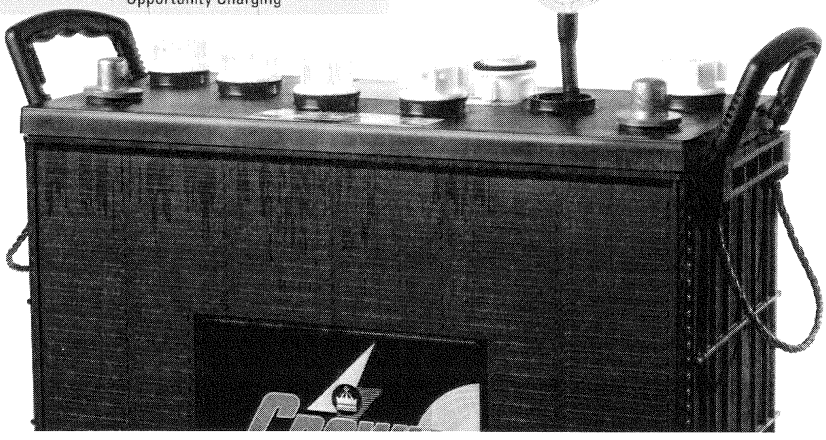
Power off the charger before connection to the battery to avoid sparking. To avoid battery explosion, never charge a frozen battery – warming the battery to room temperature before charging service begins. Charging service should be terminated if batteries become excessively hot or if violent gassing or discharge of electrolyte occurs during charge.

Troubleshooting

When properly maintained and charged, Crown deep cycle batteries will provide many years of trouble-free service. However, failure to follow the operating and maintenance guidelines listed above may result in poor performance or premature failure. The following addresses some of the typical errors in operation and maintenance:

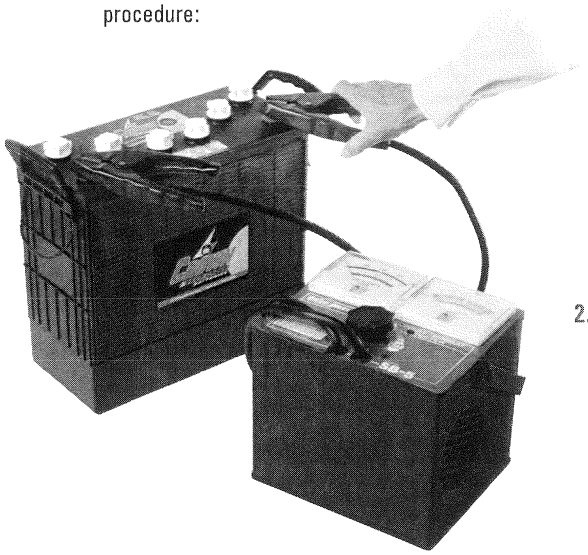
Condition	Check For
Poor Battery Performance	• Undercharged Battery • Sulfated Battery • Cold Operating Environment *(Less than 32°F / 0°C Temperature Reduces Useable Battery Capacity)* • Defective Connectors or Cables • Low Electrolyte • Old Batteries • Defective Charge-Level Gauge
Unequal/Low Specific Gravities	• Over-filling • Undercharging
Excessive Water Service	• Overcharging • Container Leak • Old Batteries
Odor During Charging	• Low Electrolyte • Overcharging
High Temperature	• Overcharging • Battery Overworked • Opportunity Charging



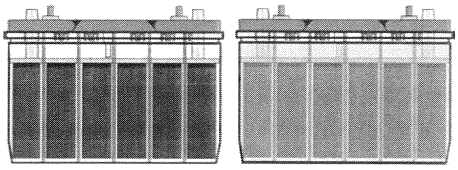


Troubleshooting

A common procedure for troubleshooting battery performance involves a three-point procedure:



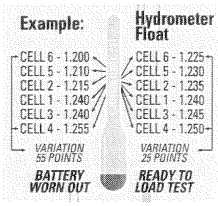
1. Visual Inspection: Check battery age or length of service if available. Inspect battery for damage - when physical damage to the battery container or terminals is present, replace the battery. If none, check the battery's cell electrolyte levels. Fluid levels should be above the top of plates in all cells, and no higher than the top of the fluid level indicator:



If the battery is sufficiently filled with electrolyte – proceed to step 2. If the top of the battery's plates are not covered with liquid, add water, replace vent caps and place the battery on charge. Be sure no open flame or spark is near while the battery's vent caps are removed from the battery.

2. Specific Gravity Inspection: Hydrometer reading of all cells should be at least 1.235 and show less than 50 points difference between high and low.

More than 50 points difference: replace the battery. Less than 50 points, but some cells read less than 1.235: recharge the battery. Replace the vent caps during recharge. Charge the battery using a properly matched automatic charger until all cells measure a specific gravity of 1.275 to 1.280. If charging won't bring up specific gravity, replace the battery.



State of Charge Level	Specific Gravity
100%	1.280 or Greater
75%	1.235 - 1.240
50%	1.190 - 1.195
25%	1.150 - 1.175
Discharged	1.125 or Less

3. Open Circuit Voltage and Electrical Load Test: Battery open circuit voltage is an effective indication of battery state of charge. Determine the approximate state of charge from the following chart.

Electrical load testing is an effective troubleshooting technique for identifying batteries with internal defects – but it is not an approved method for measuring deep cycle battery capacity. For this reason Crown Battery recognizes load test results as useful only for identifying batteries having bad cell conditions.

Batteries with less than 75% state of charge should be charged before an electrical load test is applied to the battery. When load testing batteries, remove all battery cables, disconnecting the negative cables first. Make sure the battery terminals are free of corrosion and dirt.

For batteries having stainless threaded stud terminals, attach a lead charging post to the threaded stud terminal before testing. Using a carbon pile load tester, apply a 50 to 75 ampere load for 15 seconds; remove the load. Refer to the chart at the left to determine the minimum passing voltage.

State of Charge Level	12 Volt Battery Open Circuit Voltage	6 Volt Battery Open Circuit Voltage
100%	12.6 or Greater	6.3 or Greater
75% - 100%	12.4 - 12.6	6.2 - 6.3
50% - 75%	12.2 - 12.4	6.1 - 6.2
25% - 50%	12.0 - 12.2	6.0 - 6.1
0 - 25%	11.7 - 12.0	5.95 - 6.0
0%	11.7 or Less	5.95 or Less

Chart Assumes a Fully Charged Gravity of 1.280.

	Battery Voltage Under 15 Second Load		
State of Charge	12 Volt	6 Volt	Specific Gravity
100%	12.66	6.33	1.280
75%	12.00	6.00	1.235

If the test voltage is above the minimum, return the battery to service. If test voltage is below the minimum, replace the battery.

The Power Behind Performance

CROWN® BATTERY
SINCE 1926

Crown Battery Manufacturing Co.
Made in the USA
1445 Majestic Drive • P.O. Box 990
Fremont, OH 43420-0990
419·334·7181 • Fax 419·334·7124
www.crownbattery.com
sales@crownbattery.com

Printed in U.S.A.

Form No. _____

Battery Care...Maintenance

Battery Inventory Management

Batteries should be stored in a cool, dry area in an upright position. Store batteries on a solid surface that can safely accommodate their weight. Batteries can be safely stacked two or three layers high by using a secure stacking surface (wafer-board, plywood, etc.) placed between each layer. When stacking batteries in layers, take care to secure battery terminals against short-circuit and to block-and-brace batteries to prevent any movement of the battery group.

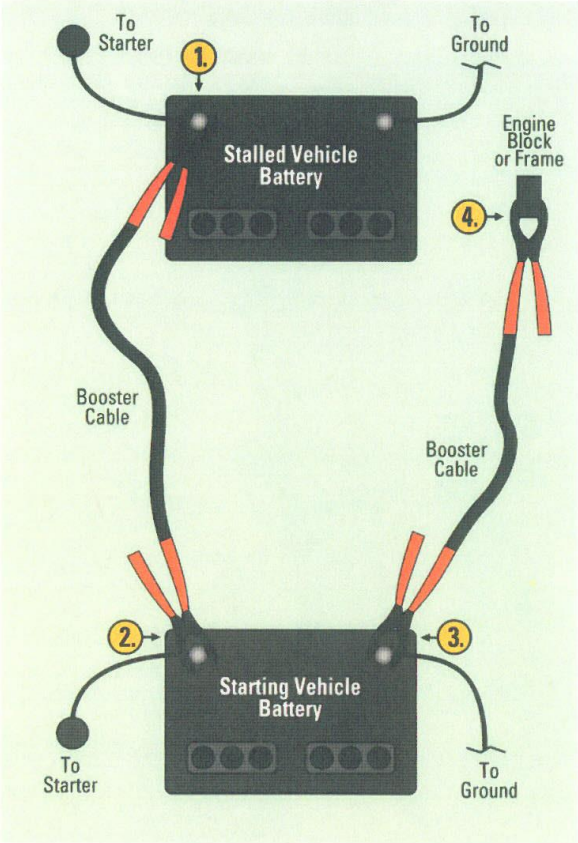
Use or sell oldest battery inventory first *(First In, First Out)*. Batteries require periodic stock rotation and service charging to ensure peak performance. Batteries marked with Shipping Date Codes older than 6 months from the current date should be service charged before sale or use. Shipping Date Codes follow a universal code standard. For example, L5 = Battery shipped in December 2005:

Month		***Year***	
A – January	G – July	1 – 2001	6 – 2006
B – February	H – August	2 – 2002	7 – 2007
C – March	I – September	3 – 2003	8 – 2008
D – April	J – October	4 – 2004	9 – 2009
E – May	K – November	5 – 2005	0 – 2010
F – June	L – December		

Recommended Charging Practices

- Before charging service, refer to the charger manufacturer's instructions for correct charger-to-battery connection and equipment operation.
- Power off the charger before connection to the battery to avoid sparking.
- For batteries fitted with threaded stud terminals or GM-type side terminals, use only lead charging posts that ensure a flush lead-to-lead terminal surface contact. Verify that charging posts are securely tightened to the terminal, which will enable safe and effective charging service.
- To avoid battery explosion, never charge a frozen battery. Frozen batteries should be warmed to room temperature before charging service begins.
- Check battery cell electrolyte levels to ensure that liquid levels are above the top of the plates in all cells. If plates are not covered, add only enough water to cover plates, replace vent caps and place on charge. Be sure no open flame or spark is near while the battery's vent caps are exposed. After charging, fill with water and replace vent caps on the battery.
- Charging service should be terminated if batteries become excessively hot or if violent gassing or discharge of electrolyte occurs during charge.
- Avoid "quick" or "fast" charging batteries in all cases. Limit charger input current to 25% of the battery's reserve capacity minutes rating. Lower current input charges the battery more uniformly and creates less heat, which reduces the possibility of overcharge. Remember, overcharging ruins batteries.
- Monitor battery state-of-charge throughout the charging period, continuing the charge until a three-hour period shows no additional voltage or tapering of charge current. Refer to page 1 for full-charge voltage and specific gravity points.

Recommended Jump-Starting Practices



Refer to the vehicle owner's manual for manufacturer's recommended procedure.

Make it a point to wear personal protective equipment whenever jump-starting batteries – shield your eyes and face at all times, wear heavy-duty protective gloves before touching batteries or jumper cables.

Make certain that battery vent caps are tight and level. Place a heavy cloth over both batteries' vent caps. Keep a safe distance between vehicles involved in jump-starting, making sure vehicles don't come into contact while jump-starting occurs.

1. Connect one end of the booster cable to the positive terminal of the discharged battery.
2. Connect the other end of the positive booster cable to the positive terminal of the assisting battery.
3. Connect one end of the negative booster cable to the negative terminal of the assisting battery.
4. Complete the jump-start connection by securing the other end of the negative booster cable to the engine block of the vehicle having the discharged battery – as far away from the discharged battery as possible. Be aware of safety risks while completing this connection, such as moving fan blades, belts and fuel lines.

Printed in the U.S.A.

Form No. 20-TRD-B1105

TRONAIR®

APPENDIX V

Battery Charger
Operating Instructions & Warranty

Quick Charge™ CORPORATION

OPERATING INSTRUCTIONS

OBWXU4825TA, OBWXU4840TA Battery Chargers

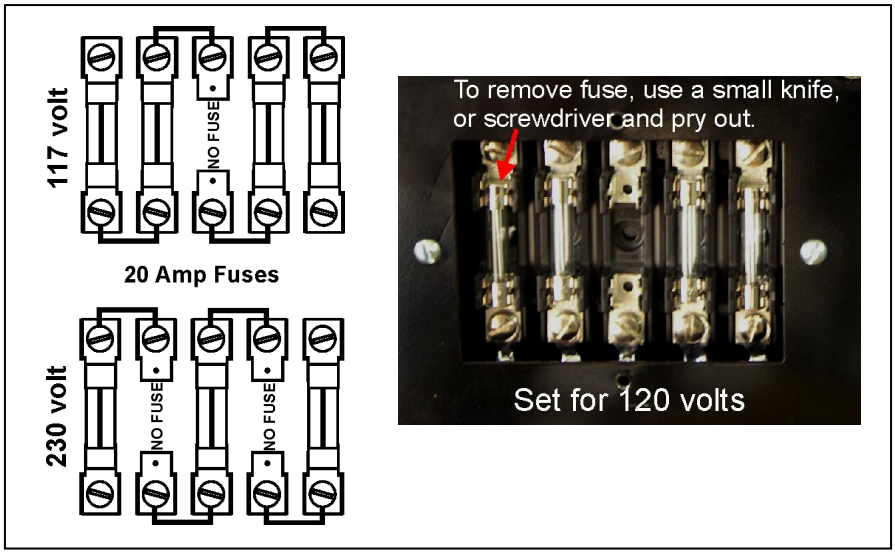
For Industrial Use: Designed for gel, wet cell, AGM, and Lithium Ion Batteries (Lithium ion applications *must be factory programmed*)

Quick Charge Corp.
800 658-2841
e-mail quickcharge@icnet.net
www.quickcharge.com
Made in the U.S.A

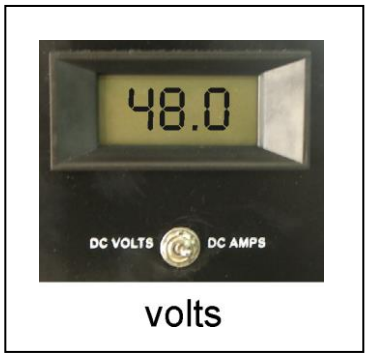
012713

QUICK START INSTRUCTIONS:
The charger is programmable to charge different battery types and is preset at the factory to match the batteries installed. If batteries are replaced with a different style or brand, the program may need to be changed. See section on reprogramming.

The charger will work from a 120 or 230 volt 50-60HZ supply. Before using, remove the fuse access cover and make sure the fuses are set to the correct voltage.



If the charger is connected to the battery pack, and meter is switched to volts, battery voltage should be displayed. 48 is the nominal voltage of the pack, the number maybe much lower than this if the pack is very dead.

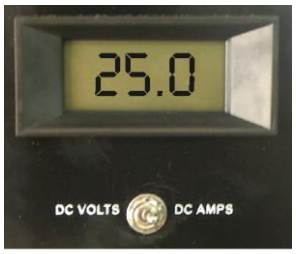


Plug the charger into AC power. The charge status LED should flash red for about 5 seconds, then switch to solid red.

Steady or flickering 100% complete

By switching the meter to amps, the charge current is displayed. In this case, 25. 40 for a 40 amp charger. Will be less on partially discharged batteries.

NOTE: It does not matter what position the meter switch is in. It is for viewing and not operating.



amps

As the batteries become charged, the amps will decrease and the voltage will increase. When the batteries reach 80%, the LED will turn yellow. At full charge, the LED will turn green, and if set to maintain the batteries, it will flicker. If set to shut off, it will be steady.

To discontinue charging, unplug the AC power cord.

Read the entire instructions before using.

EQUALIZATION:

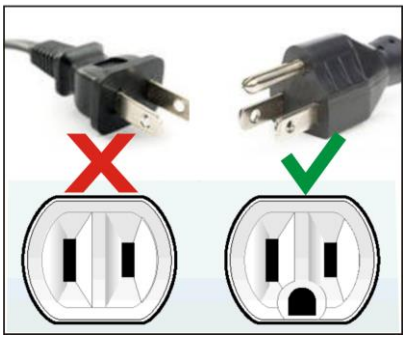
When using multiple batteries in a series string, cells become uneven during charge and discharge cycles. At least once a month perform two charge cycles back to back, this will give a chance for cells that are lagging behind to catch up, and is important to overall battery performance. NOTE: This only needs to be done when using the wet cell or AGM settings with a standard, or extended gassing/absorption cycle. (Switch #1 ON).

SAFETY INFORMATION AC WIRING:

Before making AC connections, refer to the requirements on the charger ID label. If your charger is not equipped with an AC plug, *for example, a 230 volt charger*, have a qualified electrician install one.

To reduce the risk of fire, use this charger only on branch circuits that are protected by a circuit breaker or fuse, and that are adequate to carry the power drawn by the charger. All wiring should be in accordance with the National Electric Code, ANSI/NFPA 70, and all local codes and ordinances.

This battery charger must be grounded to reduce the risk of electric shock. 117 volt chargers are equipped with a grounding type plug, 230 volt chargers are shipped without a plug. Have a qualified electrician install a properly grounded 3 wire plug.



DO NOT USE THIS CHARGER ON A TWO POLE UNGROUNDED OUTLET OR ATTEMPT TO BREAK OFF THE GROUND PRONG FOR USE ON A RECEPTACLE OR EXTENSION CORD NOT HAVING A GROUND.

If an extension cord must be used, make sure it is in good condition. Use a three conductor cord no smaller than the size being used on the charger, and keep it as short as possible. The use of an improper extension cord could result in a risk of a fire or electric shock. Locate all cords so that they will not be stepped on, tripped over, or otherwise subjected to damage or stress.

OTHER SAFETY INFORMATION:

Do not use charger if it shows signs of physical stress, or if DC output leads or connector feel hot when used.

Do not disconnect the DC output clamps, or connector from the batteries when the charger is on. The resulting arcing could cause the batteries to explode.

Do not expose charger to rain.

The charger will become hot during use, provide adequate air flow around it. Do not place charger on cloth or vinyl seats, blankets, or around any other obstructive materials. Do not place charger against walls, allow 12” of space on all sides.

BATTERY SAFETY & CARE INFORMATION:

Always wear protective eye shields and clothing when working with batteries. Batteries contain acids which can cause bodily harm. Do not put wrenches or other metal objects across the battery terminal or battery top. Arcing or explosion of the battery can result. Do not wear jewelry when working around batteries. Arcing can cause severe burns.

The tops of the batteries and battery hold downs must be kept clean and dry at all times to prevent excessive self discharge and flow of current between the battery post and frame.

With wet cell batteries, maintain the proper electrolyte level by adding water when necessary. Never allow the electrolyte level to fall below the top of the battery plates. Electrolyte levels fall during discharge and rise during charging. Therefore, to prevent the overflow of electrolyte when charging, add water only after the batteries have been fully charged, or just enough to cover the plates if discharged. Old batteries require more frequent additions of water than do new batteries.

Do not over discharge batteries. Excessive discharge can cause polarity reversal of individual cells resulting in complete battery failure. Re-charge batteries as soon as possible after a deep discharge, but not if they are warm, allow a cooling down period.

Provide adequate ventilation when charging batteries. Chargers can ignite flammable materials and vapors. Do not use near fuels, grain, dust, solvents, or other flammables.

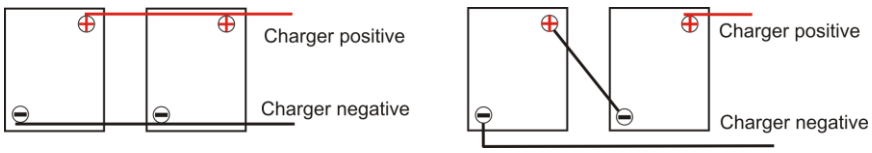
Do not charge batteries in excessively hot temperatures; wait till the cool of the evening.

PRE CHARGE INFORMATION:

Before connecting the charger to the batteries, make sure the battery pack is of the same voltage rating of the charger. If you are unsure, count the number of cells on the battery pack and multiply by two. This figure should be the same as the DC voltage rating of the charger. (*see ratings label on charger*)

Make sure the AC cord, DC output leads, terminals, connectors, or clamps are all in good working condition. Do not use the charger if there are any signs of stress or damage, or if wires are cut or have damaged insulation. Using this charger with any of these symptoms could result in a fire, property damage, or personal injury. Have a qualified service person make the necessary repairs. Repairs should not be made by people who are not qualified.

Illustration of series and parallel battery connections.



Parallel

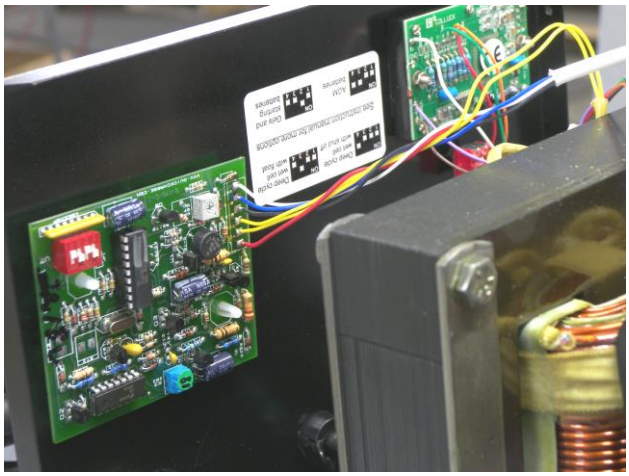
When batteries are connected in Parallel the battery amp hour capacity is additive and the voltage remains the same. *Example:* two 180 amp hour 12 volt batteries would equal 12 volts and 360 amp hour

Series

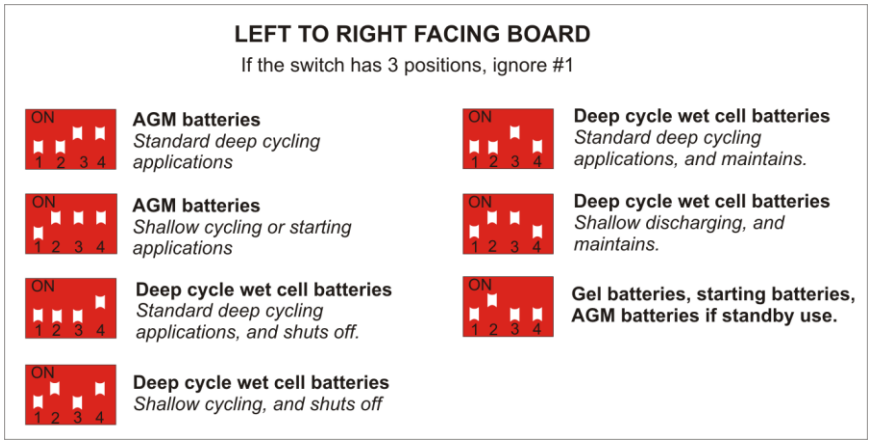
When batteries are connected in Series the voltage is additive and the battery amp hour capacity remains the same. *Example:* two 180 amp hour 12 volt batteries would equal 24 volts and 180 amp hour

REPROGRAMMING:

Remove sheet metal screws holding cover on.



Select the switch configuration that most closely matches your application. Whether choosing maintenance mode, or shut off is a personal preference, however the maintenance mode assures batteries will remain charged and won't self discharge. IMPORTANT: Use switch numbers as a guide, as some boards may be upside down, and reversed.



NOTE: The #1 position is designated for batteries requiring long finish rates. If your performance is poor, it could be the batteries are being undercharged. Verify with specific gravity readings on wet cells. US Battery, and Full River are two brands that benefit from longer charge cycles.

TROUBLESHOOTING:

Symptom	Cause	Corrective Action
No voltage reading on meter when connected to battery, and the LED flashes red/green.	Connected reverse to battery, or not connected to battery. Break in DC cord, or connector. Battery too dead to charge.	Correct polarity, or connect to battery. On chargers having a white and black wire, white is positive. Have a qualified person make repair. Replace.
When switched on, the red LED does not light, and no amps read on meter	The panel mount fuse is blown. There is no AC power present at the plug.	Replace with one having the same rating. Check that there is power at the source. If using an extension cord, check that it is not damaged.
When I put a volt meter across the output of the charger there is no power coming out when I switch it on.	The charger must be connected to a battery to turn on.	
The batteries don't receive a full charge. On wet cells, the specific gravity will not rise to a full reading after the charge has completed.	The charger is too small for the battery. The charge profile is not set correctly. The cycle needs more time. The battery is defective.	Check that the charger's output is about 10% of the amp hour rating of the battery. Recheck the dip switch setting. If in doubt, contact us. If you have a 4 position switch, switch #1 position ON. Replace.
The battery voltage reads well below the rating of the battery, and when powered up the LED is red with a yellow flash, and the amps are less than 5.	The battery is very low, and the charger is in a slow charge phase until the voltage rises to a safe level before full turn on.	Leave connected, it may take hours, but if the voltage rises even a little bit, it should recover, and turn the charger full on. (*Do not allow your batteries to deep discharge, it is the number one cause of premature battery failure*.)
When switched on, the LED flashes red/yellow, and there is no amp output on the meter	Charger and battery voltage mismatch	Connect the charger to a battery(s) with the same voltage rating.
The charger blows it's fuse, or branch circuit fuse/circuit breaker as soon as it's switched on.	Charger is shorted	Contact factory.

Symptom	Cause	Corrective Action
The charger blows the branch circuit fuse/circuit breaker a short while after being switched on.	The branch circuit is too small.	Relocate charger to a branch circuit with a heavier rating, or remove other loads on the circuit.
Batteries use water, get hot, or smell.	One or more dead cells. Dip switch not set correctly.	Replace batteries. If charging in a series string, it is best to replace all the batteries rather than mix new with old. If shallow discharging, check that the dip switch is not set to standard, or extended cycle.
Voltage rises quickly on battery(s) and the amps fall fast even though they are dead.	The batteries are sulfated.	Sometimes batteries can be recovered. Leave the charger on for some hours, if the voltage falls and the current begins to rise, it may be able to be recovered.

QUICK CHARGE OBWXU Battery Chargers
"LIMITED WARRANTY"

Quick Charge Corporation warrants the OBWXU line of chargers for three (3) years from the date of purchase. After the warranty period, chargers returned to the factory for repair will be charged a minimum rate of $25.00. Charger will be returned, freight and repair charges, C.O.D. unless other arrangements have been made. This warranty covers all defects in manufacture and performance, provided the unit is operated in compliance with manufacture's operating instructions.
For repairs to be made at the Quick Charge factory, a charger and/or component(s) should be sent, freight prepaid to Quick Charge at:

Quick Charge Corp.
1032 S.W. 22nd St.
Oklahoma City, OK. 73109

Quick Charge, will at it's option, repair or replace the charger or component in question. The repaired item will then be returned, freight prepaid by Quick Charge. This warranty is void if the charger or component have been altered, changed, or repaired by anyone not authorized by Quick Charge, or if the charger or component, have been subjected to misuse, negligence, or harsh environmental conditions. (Except those chargers designed for such conditions)

If returning the charger to the factory is not practical, replacement parts may be shipped to the customer for field repair at no charge. On parts such as circuit boards, the customer will be required to return the board suspected to be defective to Quick Charge, freight prepaid. If such defective parts are not returned, the customer will be invoiced for the repair parts. Field repairs are made at the user's own risk. "Authorization" by Quick Charge to repair refers to maintaining the warranty only. Quick Charge assumes no responsibility or liability for field servicing, and shall not be responsible for incurred travel or labor charges.

Quick Charge corporation shall not in any event be liable for the cost of any special, indirect or consequential damages to anyone, product or thing. This warranty is in lieu of all other warranties expressed or implied. Quick Charge neither assumes nor authorizes any representative or other person to assume for us any liability in connection with the sale of this product.

APPENDIX VI

Honeywell
Battery and Time Controller Operating Instructions

Honeywell

Sensing and Control

Honeywell Hobbs

Operating instructions

Battery and time controller Type 855

Please note!
Read this operating instructions carefully. In the event of questions, please contact your dealer or Honeywell Hobbs directly. Pay attention to the battery manufacturer's information and ensure that the installation and operating conditions described below are observed, since otherwise you may lose your warranty rights.
Note in particular the information on the valid protection conditions in the section „Electrical connection" or the protection regulations applicable in your country.

Type	Function
855	battery- and time controller
855.1	battery- and time controller with integrated service counter
855.5	battery controller
855.6	battery controller without relay contact

Functions
The Honeywell Hobbs battery- and time controller of type series 855 monitors the residual capacity at discharge of „traction-batteries" and according to the type of the controller it also registers operating hours. An additional relay contact protects the battery against exhaustive discharge. Optionally the controller can be delivered with integrated service counter.
The controller is adjustable to the different battery types by the exhaustive discharge voltage via potentiometer on the rear of the unit. In order to activate a new adjustment the unit has to be reset! The factory set standard discharge voltage is **1,73 V/cell**. When choosing another adjustment we recommend to verify the correct discharge voltage. The residual capacity of the battery is monitored via a multi LED bar display (1 red LED, 7 yellow LEDs) (2). If the residual capacity falls under the limiting value „pre-warning" (approx. **25 %**), the yellow LED starts flashing. When reaching the discharge voltage, the red LED (1) lights and the relay contact (pins 3+4) opens. In order to complete e.g. a lifting operation, the relay contact can be closed one more time for approx. **30s** by switching the key-operated switch off and on. There are 2 possibilities to reset the controller:

- battery is separated from the vehicle: reset voltage is **2,09V/cell** (reset voltage has to be exceeded for approx. 4 sec.)
- battery remains in the vehicle while charging: reset voltage is **2,35V/cell**

The operating hours are indicated by a LC display. Type 855.1: The current status of the service down counter is indicated for a period of 5 sec. every time the unit is turned on (or the key switch is turned on resp.). After termination of the service time (service counter = 0), the service counting status is indicated in the LC display (flashes). The service counter is resetable via the reset button on the rear of the controller.

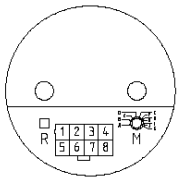
Exhaustive discharge voltage in V/cell (adjustable via potentiometer on the rear of the controller)

A	B	C	D	E	F	G	H	I	J	K
1,57	1,63	1,68	1,73	1,78	1,82	1,84	1,86	1,89	1,91	1,93

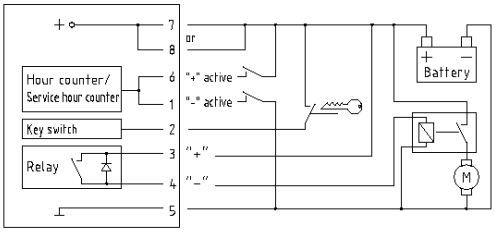
Delivery
The Honeywell Hobbs battery- and time controller is delivered with mounting staff and plug connector

Mounting
The controller is applicable for flush mounting in a boarding dash (or similar application).
Cutout Ø 52 mm (optionally with adapter for cutout Ø 60mm order code:.... /735).

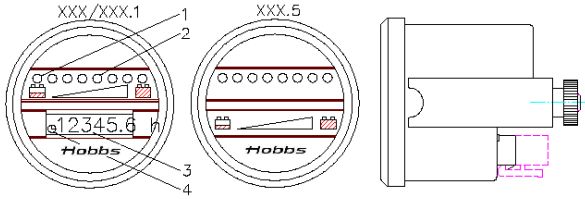
rear view:



1: hour counter input -
2: key-operated switch +
3: relay +
4: relay -
5: battery -
6: hour counter input +
7: battery +
8: battery +
M: adjustable potentiometer
R: reset button (option)



Electrical connection
The instrument must be installed by an authorised specialist. The relevant conditions must be observed, in particular the operating voltage of the controller must agree with the rated voltage of the battery (see rating plate).
Check the correct polarity of the relay contacts !



Function and operation

1 = red LED „Charge battery"
2 = yellow multi LED bar display for residual capacity of battery
3 = LC display for hour counter
4 = operation indication for hour counter

Technical data:

Operating voltage (V) tolerance ±25%:	12	24	36	48
Current consumption max. (mA):	50	35	35	25
EMC:	emission EN 55011 immunity EN 50082-2 (in case of excess-voltages that are above the approved EMC/EMI protection, we recommend a shielding from custom's side)			
Vibration:	EN 60068-2-34 (1g eff., 10-500Hz, 2,5h)			
Shock:	EN 60068-2-27 (30g, 18ms, 3 shocks), Continuous shocks EN 60068-2-29 (25g, 6ms, 1000 shocks)			
Relay contact:	opens when reaching discharge voltage, voltage free, breaking capacity 12VDC/5A, 24VDC/5A, 36VDC/3A, 48VDC/2A			
Signal inputs:	Minimum pulse duration 0,5 sec.			
Display:	multi LED bar display (8 LEDs), LC-Display 6 digits (4,5mm)			
Counting range:	hour counter up to 99999,9h service counter (option) up to 9999h			
Time divergence:	max. 0,02%			
Ambience:	-30°C to +70°C, max. 95% humidity			
Protection class:	IP65 frontal			

Honeywell Hobbs, 1034 East Ash Street, Springfield, IL 62703 USA, Phone +1-217-753-7797, Fax +1-217-753-7789 www.hobbscorporation.com Edition: 42/02 Rev.1.9

Instruction Sheet P/N 89208 Rev.

APPENDIX VII

Declaration of Conformity

DECLARATION of CONFORMITY

The design, development and manufacture is in accordance with European Community guidelines

Towbarless Tug
eJP-3
eJP-3L

Relevant provisions complied with by the machinery:
2006/42/EC
EN 1915-1
EN 12312-7

Relevant standards complied with by the machinery:
EN ISO 12100-1

Identification of person empowered to sign on behalf of the Manufacturer:

Patrick Finch

Quality Assurance Representative

Tronair, Inc.
1 Air Cargo Pkwy East
Swanton, OH 43558

Phone: (419) 866-6301 | 800-426-6301
Web: www.tronair.com
Email: sales@tronair.com