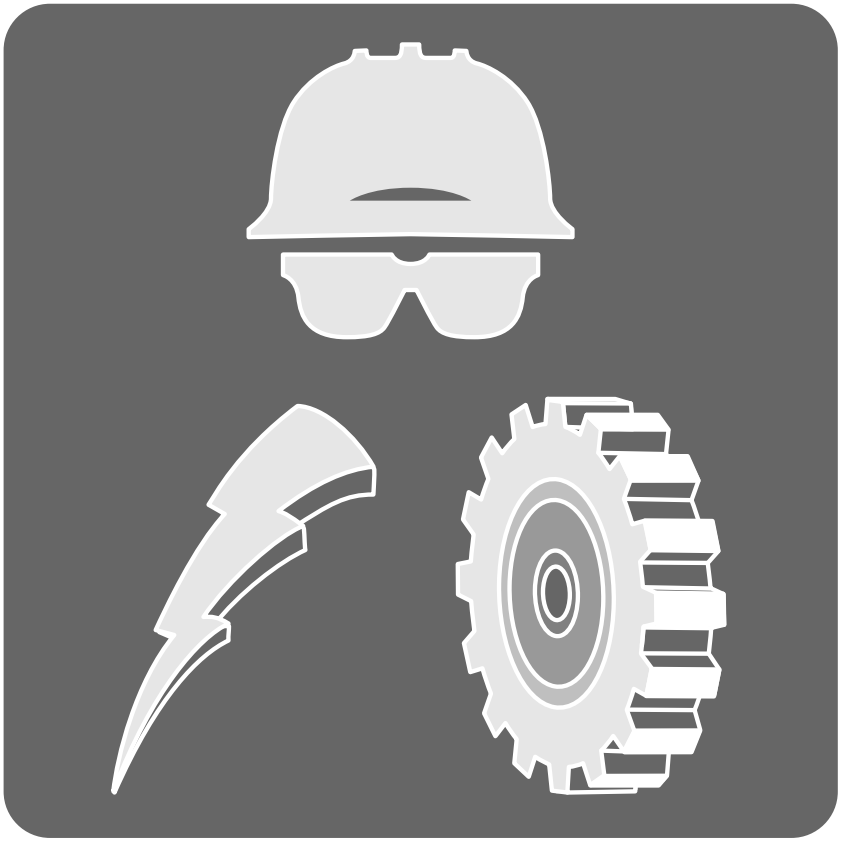
KOMATSU

P&H

Access Ladders — Gen2

Section 03–07



LDG2-S-V-LA-EN.0001

Table of Contents

This Page Intentionally Left Blank

Preface

This Manual is provided as a guide to personnel involved with the operation, maintenance and repair of Komatsu Mining Corp. equipment. We recommend that such personnel review and become familiar with the general procedures and information contained within this manual. In addition, we recommend that this manual be kept readily available for reference when repairs or maintenance are necessary.

Read and become familiar with this Manual and any other general safety practices before attempting any procedures.

Due to the complexities of mining equipment and the environment in which it operates, situations may arise which are not directly discussed in detail in this Manual. When such a situation arises, past experience, availability of equipment and common sense play a large part in what steps are to be taken. In addition, a Komatsu Mining Corp. service center representative is available to answer your questions and assist you upon request.

Komatsu Mining Corp. reserves the right to continually improve its products and associated documentation. Therefore, physical alterations to Komatsu equipment may not be identified in this Manual. Revisions may be frequently made to this Manual in an effort to ensure that information contained within is current as alterations occur to the equipment. If you find an error or have other feedback regarding this Manual, please contact Product Training and Publications at *Pro.Train.Pub@mining.komatsu*.

Copyright

This Page Intentionally Left Blank

Safety

This publication contains special instructions that pertain to safety, operation, maintenance, and repair of the machine. Listed below are the signal words and symbols that precede these instructions and their meanings:

DANGER

The danger label indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

The warning label indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

The caution label, used with the safety alert symbol indicates a hazardous situation which, if not avoided, could result in minor or moderate injury (includes the safety alert symbol).

CAUTION

The caution label (without safety alert symbol) is used to address practices not related to personal injury – only equipment damage.

NOTICE

The notice label indicates areas of importance to the reader that are not related to personal injury or machine damage.

Safety, Warnings, and Cautions

⚠ WARNING

CRUSH HAZARD

- **Crush hazards exist if attempting to transport personnel on the machine. There are no provisions on the machine to accommodate the transportation of any persons other than the operator alone, unless a training seat in the cab is optionally provided. Ladders and catwalks attached to the machine are designed for servicing of the machine while the machine is stopped only. They are NOT designed for transporting riders at any time. Do not transport personnel or allow riders on the machine. A crush hazard is present while riding on any location of the machine other than the cab Operator's seat or training seat (if so equipped), which could result in serious injury or death.**
- **Crush hazards exist if the park brake is not set before operating the ladder. Before raising or lowering the ladder, set the machine park brake. Uncontrolled machine movement could cause a hazardous condition when trying to enter or exit the ladder, which could result in serious injury or death.**
- **Crush hazards exist from leaving the cab without setting the park brakes, which could result in unplanned and uncontrolled movement of the machine. The operator should never leave the cab with the park brake released. Set the park brake before leaving the cab. Leaving the cab without setting the park brake could cause a crush hazard from unexpected machine movement, resulting in property damage, serious injury or death.**
- **Crush hazard exists when placing the ladder in the "DOWN" position. Always lockout the ladder activation valve (or bleed the air system to 0 psi) prior to performing any service operations to the ladder. Failure to do so could cause a crush hazard resulting in serious injury or death.**

STRUCK BY AND CRUSH HAZARDS

- **Struck by or Crush hazards exist if personnel are in the travel area of the ladder when it is being lowered or raised. The ladder lowers and raises rapidly when engaged. Before lowering or raising the ladder, make sure all personnel are clear of the area. Being struck by the ladder or thrown off the machine could result in serious injury or death.**
- **Struck by or Crush hazards exist if personnel are in the travel area of the ladder when it is being lowered by using the back-up bleed down valve. When lowering the ladder, be certain all personnel are a safe distance from the ladder. Lowering the ladder without power by activating the "Back-up Bleed Down Valve" causes the ladder to RAPIDLY lower NON-STOP until reaching ground level. Releasing the "Back-up bleed Down Valve" knob or cable will NOT stop the ladders' rapid decent to ground level. Being struck or crushed by the ladder could result in serious injury or death.**
- **Struck by or Crush hazards exist if the ladder is not de-energized prior to performing maintenance work on it. Place the ladder in the "DOWN" position and use Battery Isolation Switch to de-energize the ladder prior to performing any service operations to the ladder. Failure to de-energize the ladder prior to working on it could cause personnel to be struck by or crushed by the ladder, resulting in serious injury or death.**
- **Struck by or crush hazard exists if personnel are in the travel area of the ladder when it is being lowered by using the back-up bleed down valve. When lowering the ladder, be certain all personnel are a safe distance from the ladder. Lowering the ladder without power by activating the "Back-up Bleed Down Valve" causes the ladder to RAPIDLY lower NON-STOP until reaching ground level. Releasing the "Back-up bleed Down Valve" knob or cable will NOT stop the ladders' rapid decent to ground level. Being struck or crushed by the ladder could result in serious injury or death.**

FALL HAZARD

- **Fall hazard exists due to uncontrolled ladder movement if it is not placed in the full down position before entering or exiting the ladder. Place the ladder in the full DOWN position before entering or exiting the ladder. Serious injury is possible if the ladder is not in the full DOWN and LOCKED position before entering or exiting the machine.**

FALL AND CRUSH HAZARDS

- **Fall hazard or Crush hazards exist if personnel rides the ladder up or down. Never ride the ladder up or down when it is being activated. Being struck by or crushed by the ladder could result in serious injury or death.**
- **Fall hazard or crush hazards exists when operating the ladder or using it to enter or exit the machine. To avoid personal injury and component damage it is essential that all personnel using the ladder be familiar with its operation and all indicators and alarms. Falls and crush hazards are possible if personnel are not familiar with the ladder operation before using it, which could result in serious injury.**

⚠ CAUTION

FALL AND SLIPPING HAZARDS

- **Fall hazards and slipping hazards exist when mounting and dismounting the machine. Ensure the ground conditions are such that slipping or falling does not occur when stepping on or off the ladder. Always ensure firm ground before releasing the ladder when dismounting the machine. Failure to ensure firm ground before mounting or dismounting a machine can cause fall and slipping hazards resulting in injury.**

This Page Intentionally Left Blank

Scope of This Publication, 03-07

POWERED ACCESS LADDER contains information about the operation and maintenance for the access ladder. It is essential that all personnel, that are to use the ladder, receive the following instructions and training before operating the access ladder. Various models are available as explained in the following text.

This Page Intentionally Left Blank

Mounting and Dismounting the Machine

These guidelines should be followed when mounting and dismounting the machine:

⚠ WARNING

Crush hazards exist if attempting to transport personnel on the machine. There are no provisions on the machine to accommodate the transportation of any persons other than the operator alone, unless a training seat in the cab is optionally provided. Ladders and catwalks attached to the machine are designed for servicing of the machine while the machine is stopped only. They are NOT designed for transporting riders at any time. Do not transport personnel or allow riders on the machine. A crush hazard is present while riding on any location of the machine other than the cab Operator's seat or training seat (if so equipped), which could result in serious injury or death.

1. Always use "three-point support" with the machine, and face the ladder while you enter or leave it. "Three point support" means that three out of four arms and legs are in contact with the machine at all times during mount and dismount.

⚠ CAUTION

Fall hazards and slipping hazards exist when mounting and dismounting the machine. Ensure the ground conditions are such that slipping or falling does not occur when stepping on or off the ladder. Always ensure firm ground before releasing the ladder when dismounting the machine. Failure to ensure firm ground before mounting or dismounting a machine can cause fall and slipping hazards resulting in injury.

2. Clean shoes and wipe hands before attempting to climb on the machine.
3. Look for icy/slick conditions that could make use of a ladder or stairway treacherous.
4. Use handholds, ladders, or steps (as provided) when mounting and dismounting.
5. NEVER attempt to mount or dismount a moving machine.
6. NEVER jump off the machine.
7. NEVER try to climb on or off the machine when carrying tools or supplies. Use a hand line to pull equipment up onto the platform.
8. Observe proper shutdown procedures before dismounting.
9. Follow all local work rules for mounting and dismounting the machine.

Ladder Mounted on Hydraulic Reservoir

A ladder is mounted on the hydraulic reservoir. When using this ladder, refer to instructions in "Mounting and Dismounting the Machine" as previously explained in this document.

This Page Intentionally Left Blank

Powered Access Ladders

"Power Step Model RL1001 & RL1002"

Some P&H wheel loaders are optionally equipped with a powered access "Power Step Model RL1001" ladder mounted on the left rear of the rear frame.

Safe operation of the ladder depends on adherence to the safety warnings and cautions, and all safety rules required in the users area of operation. Periodic inspection and service must also be performed to the ladder to ensure safe and trouble-free operation.

⚠ WARNING

Struck by or Crush hazards exist if personnel are in the travel area of the ladder when it is being lowered or raised. The ladder lowers and raises rapidly when engaged. Before lowering or raising the ladder, make sure all personnel are clear of the area. Being struck by the ladder or thrown off the machine could result in serious injury or death.

⚠ WARNING

Struck by or Crush hazards exist if personnel are in the travel area of the ladder when it is being lowered by using the back-up bleed down valve. When lowering the ladder, be certain all personnel are a safe distance from the ladder. Lowering the ladder without power by activating the "Back-up Bleed Down Valve" causes the ladder to RAPIDLY lower NON-STOP until reaching ground level. Releasing the "Back-up bleed Down Valve" knob or cable will NOT stop the ladders' rapid decent to ground level. Being struck or crushed by the ladder could result in serious injury or death.

⚠ WARNING

Fall hazard or Crush hazards exist if personnel rides the ladder up or down. Never ride the ladder up or down when it is being activated. Being struck by or crushed by the ladder could result in serious injury or death.

CAUTION

Component damage can result from attempting to ride the ladder up or down during operation. Do not ride the ladder up or down. Riding the ladder will void the manufacturer’s warranty and could result in component damage.

⚠ WARNING

Struck by or Crush hazards exist if the ladder is not de-energized prior to performing maintenance work on it. Place the ladder in the "DOWN" position and use Battery Isolation Switch to de-energize the ladder prior to performing any service operations to the ladder. Failure to de-energize the ladder prior to working on it could cause personnel to be struck by or crushed by the ladder, resulting in serious injury or death.

⚠ WARNING

Crush hazards exist if the park brake is not set before operating the ladder. Before raising or lowering the ladder, set the machine park brake. Uncontrolled machine movement could cause a hazardous condition when trying to enter or exit the ladder, which could result in serious injury or death.

WARNING

Fall hazard exists due to uncontrolled ladder movement if it is not placed in the full down position before entering or exiting the ladder. Place the ladder in the full DOWN position before entering or exiting the ladder. Serious injury is possible if the ladder is not in the full DOWN and LOCKED position before entering or exiting the machine.

WARNING

Fall hazard or crush hazards exists when operating the ladder or using it to enter or exit the machine. To avoid personal injury and component damage it is essential that all personnel using the ladder be familiar with its operation and all indicators and alarms. Falls and crush hazards are possible if personnel are not familiar with the ladder operation before using it, which could result in serious injury.

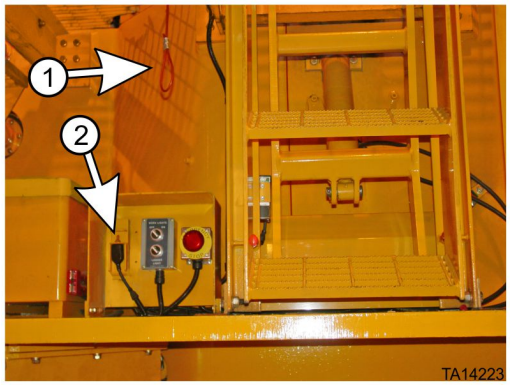
Normal Operation of the Power Step Ladder

Two switches are provided to raise and lower the ladder. One switch operates the ladder at ground level, the other operates the ladder from an elevated level. A ground-level switch is mounted to the left of the ladder. The elevated-level switch is mounted at the ladder dismount area. Both locations have access to the mechanical safety latch that must be disengaged before raising or lowering the ladder. Access to a "Back-up Bleed Down Valve" used to lower the ladder without power is provided at both ground and elevated levels.

Ground Level Ladder Operation of the Power Step Ladder

To raise the ladder from ground location: Move the electrical toggle switch to the UP position and hold it until the ladder reaches the UP position. Refer to illustration “Ground level ladder controls”. The ladder will rise and lock in the UP position. DO NOT attempt to operate the machine unless you are certain the ladder is LOCKED in the UP position.

Figure 1: Ground level ladder controls

	1. Mechanical Safety Latch Cable 2. Ground Level Toggle Switch

WARNING

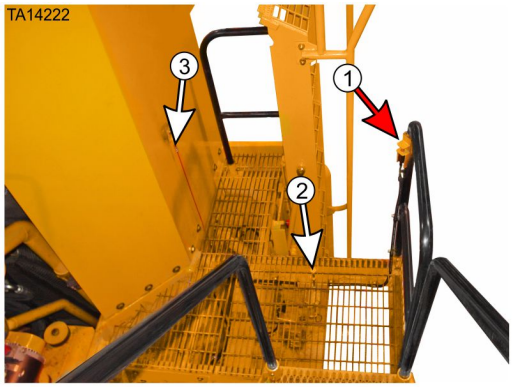
Struck by or Crush hazards exist if personnel are in the travel area of the ladder when it is being lowered or raised. The ladder lowers and raises rapidly when engaged. Before lowering or raising the ladder, make sure all personnel are clear of the area. Being struck by the ladder or thrown off the machine could result in serious injury or death.

To lower the ladder from the ground location: Pull the hanging cable (Refer to illustration Ground level ladder controls to disengage the mechanical safety latch, then move the electrical switch to the DOWN position and hold it until the ladder reaches the DOWN position. The mechanical latch cable can be released once the ladder clears the mechanical latch. The ladder will lower and lock in the DOWN position.

Elevated Level Ladder Operation of the Power Step Ladder

To raise the ladder from elevated location: Move the electrical toggle switch to the UP position and hold it until the ladder reaches the UP position. Refer to illustration Elevated level ladder controls. The ladder will rise and lock in the UP position. **DO NOT attempt to operate the machine unless you are certain the ladder is in the UP position.**

Figure 2: Elevated level ladder controls



1. Elevated Level Toggle Switch (Typical Location)
2. Mechanical Safety Latch Lever
3. Back-Up Bleed Down Valve Cable

To lower the ladder from the elevated location: Step on the "Mechanical Latch Activation Lever" to disengage the mechanical safety latch, then move the electrical switch to the DOWN position and hold it until the ladder reaches the DOWN position. Refer to illustration Elevated level ladder controls. The Mechanical Latch Activation Lever can be released once the ladder clears the mechanical latch. The ladder will lower and lock in the DOWN position.

Operating the Power Step Ladder without Electrical Power

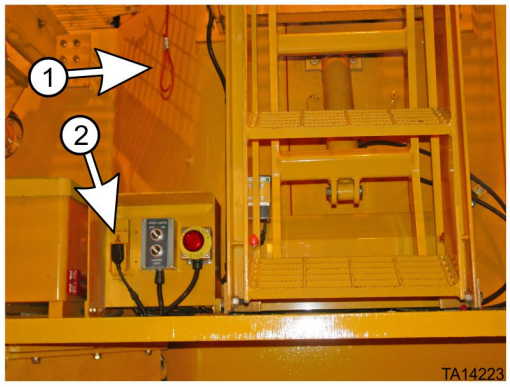
If loss of electrical power to the ladder occurs, a "Back-up bleed Down Valve" is provided to allow hydraulic fluid release within the system, allowing the ladder to be lowered. The ability to actuate the "Back-up bleed Down Valve" is provided at the ground location (by direct access to the valve) and elevated location (by use of a cable attached to the valve).

⚠ WARNING

Struck by or Crush hazards exist if personnel are in the travel area of the ladder when it is being lowered by using the back-up bleed down valve. When lowering the ladder, be certain all personnel are a safe distance from the ladder. Lowering the ladder without power by activating the "Back-up Bleed Down Valve" causes the ladder to RAPIDLY lower NON-STOP until reaching ground level. Releasing the "Back-up bleed Down Valve" knob or cable will NOT stop the ladders' rapid decent to ground level. Being struck or crushed by the ladder could result in serious injury or death.

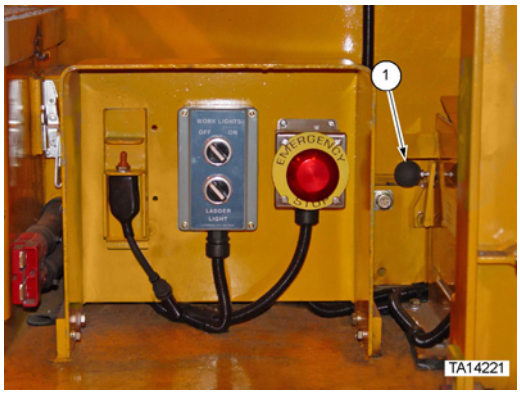
To lower the ladder from the ground location without electrical power: Pull the hanging Mechanical Safety Latch Cable to disengage the mechanical safety latch, then pull out the Back-up bleed Down Valve knob. The mechanical latch cable can be released once the ladder clears the mechanical latch. The ladder will lower and lock in the down position. Refer to illustrations “Mechanical safety latch cable (ground location) and Back-up bleed down valve (ground location access)” for details.

Figure 3: Mechanical safety latch cable (ground location)



1. Mechanical Safety Latch Cable
2. Ground Level Toggle Switch

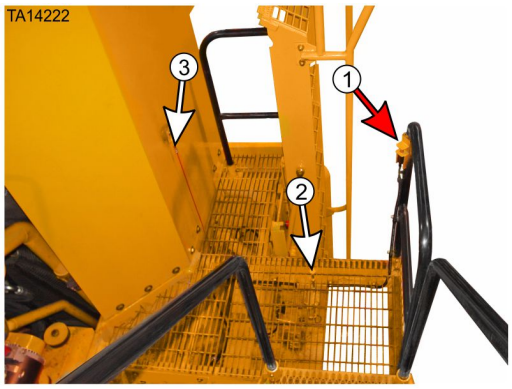
Figure 4: Back-up bleed down valve (ground location access)



1. Back-Up Bleed Down Valve

To lower the ladder from the elevated location without electrical power: Step on the Mechanical Safety Latch Lever to disengage the mechanical safety latch, then pull the Back-up Bleed Down Valve cable (refer to Back-up bleed down valve cable (elevated location access). The Mechanical Latch Activation Lever can be released once the ladder clears the mechanical latch. The ladder will lower and lock in the DOWN position.

Figure 5: Back-up bleed down valve cable (elevated location access)



1. Elevated Level Toggle Switch
2. Mechanical Safety Latch Lever
3. Back-Up Bleed Down Valve Cable

NOTICE

Before operating the ladder in normal mode, once power is restored, the "Back-up bleed Down Valve" must be reset by pushing it in until it reaches its' original position.

⚠ WARNING

Crush hazards exist from leaving the cab without setting the park brakes, which could result in unplanned and uncontrolled movement of the machine. The operator should never leave the cab with the park brake released. Set the park brake before leaving the cab. Leaving the cab without setting the park brake could cause a crush hazard from unexpected machine movement, resulting in property damage, serious injury or death.

Service, Inspection and Lubrication of the Power Step Ladder

Please refer to the vendor materials in Section 03 of the Service Manual.

Daily Inspections of the Power Step Ladder

1. Check for oil leaks.
2. Check for loose or damaged fasteners and parts. Pay particular attention to the bolts that secure the ladder to the machine.
3. Listen for adverse noise conditions during operation.
4. Check for changes in appearance, such as improper alignment, that will affect operation and stability of the ladder.
5. Check safety labels. Replace any that have become illegible, damaged, or removed.
6. Check for cleanliness of stair steps. They should be free of debris and anything that would make the steps slippery, such as oil and grease.

Weekly Inspections of the Power Step Ladder

1. Check condition of switch, hydraulic hoses and fittings.
2. Check electrical wiring and connections.

   Please refer to the vendor literature at the end of this section for more information.

Cleaning the Power Step Ladder

1. Clean ladder as required to ensure safe entry and exit of the machine.

NOTICE

When washing the machine DO NOT aim high-pressure water at or near the ladder's control box or bearings.

Please refer to the vendor literature at the end of this section for more information.

Troubleshooting the Power Step Ladder

Should the motor fail to operate, follow all safety procedures required to check the motor ground strap connected to the loader frame. Paint or corrosion can cause a poor connection that can prevent motor operation.

Hedweld Model "C"

Some machines are optionally equipped with a "Hedweld" model, powered access ladder mounted on the left rear of the rear frame.

Safe operation of the ladder depends on adherence to all safety warnings and cautions, and all safety rules required in the users area of operation. Periodic inspection and service must also be performed to the ladder to ensure safe and trouble-free operation.

⚠ WARNING

Struck by or Crush hazards exist if personnel are in the travel area of the ladder when it is being lowered or raised. The ladder lowers and raises rapidly when engaged. Before lowering or raising the ladder, make sure all personnel are clear of the area. Being struck by the ladder or thrown off the machine could result in serious injury or death.

Struck by or crush hazard exists if personnel are in the travel area of the ladder when it is being lowered by using the back-up bleed down valve. When lowering the ladder, be certain all personnel are a safe distance from the ladder. Lowering the ladder without power by activating the "Back-up Bleed Down Valve" causes the ladder to RAPIDLY lower NON-STOP until reaching ground level. Releasing the "Back-up bleed Down Valve" knob or cable will NOT stop the ladders' rapid decent to ground level. Being struck or crushed by the ladder could result in serious injury or death.

⚠ WARNING

Fall hazard or Crush hazards exist if personnel rides the ladder up or down. Never ride the ladder up or down when it is being activated. Being struck by or crushed by the ladder could result in serious injury or death.

CAUTION

Component damage can result from attempting to ride the ladder up or down during operation. Do not ride the ladder up or down. Riding the ladder will void the manufacturer's warranty and could result in component damage.

⚠ WARNING

Struck by or Crush hazards exist if the ladder is not de-energized prior to performing maintenance work on it. Place the ladder in the "DOWN" position and use Battery Isolation Switch to de-energize the ladder prior to performing any service operations to the ladder. Failure to de-energize the ladder prior to working on it could cause personnel to be struck by or crushed by the ladder, resulting in serious injury or death.

⚠ WARNING

Crush hazards exist if the park brake is not set before operating the ladder. Before raising or lowering the ladder, set the machine park brake. Uncontrolled machine movement could cause a hazardous condition when trying to enter or exit the ladder, which could result in serious injury or death.

⚠ WARNING

Fall hazard exists due to uncontrolled ladder movement if it is not placed in the full down position before entering or exiting the ladder. Place the ladder in the full DOWN position before entering or exiting the ladder. Serious injury is possible if the ladder is not in the full DOWN and LOCKED position before entering or exiting the machine.

⚠ WARNING

Fall hazard or crush hazards exists when operating the ladder or using it to enter or exit the machine. To avoid personal injury and component damage it is essential that all personnel using the ladder be familiar with its operation and all indicators and alarms. Falls and crush hazards are possible if personnel are not familiar with the ladder operation before using it, which could result in serious injury.

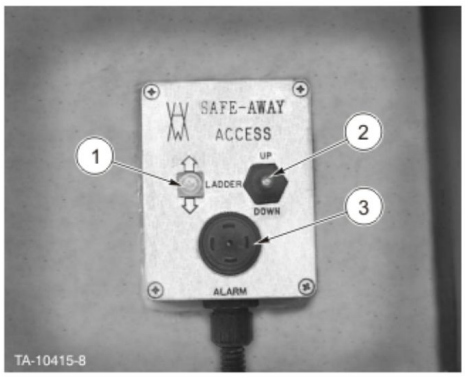
Normal Operation of the Hedweld Model C

Two box-mounted three-position momentary toggle switches are provided to raise and lower the ladder. One switch operates the ladder at ground level, the other operates the ladder from an elevated level. A lower, ground-level switch is mounted to the left of the ladder. The upper switch box is provided to allow operation after climbing and dismounting the ladder. (Refer to illustration Upper ladder switch).

Typical Operation at Ground or Elevated Levels of the Hedweld Model C

To raise the ladder: Push either switch to the UP position and release it. The ladder will rise to the UP position. The switches have a green LED that flashes while the ladder is in the UP cycle. Once the ladder is in the up position the green LED will remain illuminated without flashing. **DO NOT attempt to operate the machine unless you are certain the ladder is in the UP position.**

Figure 6: Upper ladder switch

	1. LED 2. Toggle Switch 3. Audible Alarm

To lower the ladder: Push either switch to the DOWN position and release it. The ladder will lower in the DOWN position. The switches have a red LED that flashes while the ladder is in the DOWN cycle. Once the ladder is in the down the red LED will remain illuminated without flashing.

NOTICE

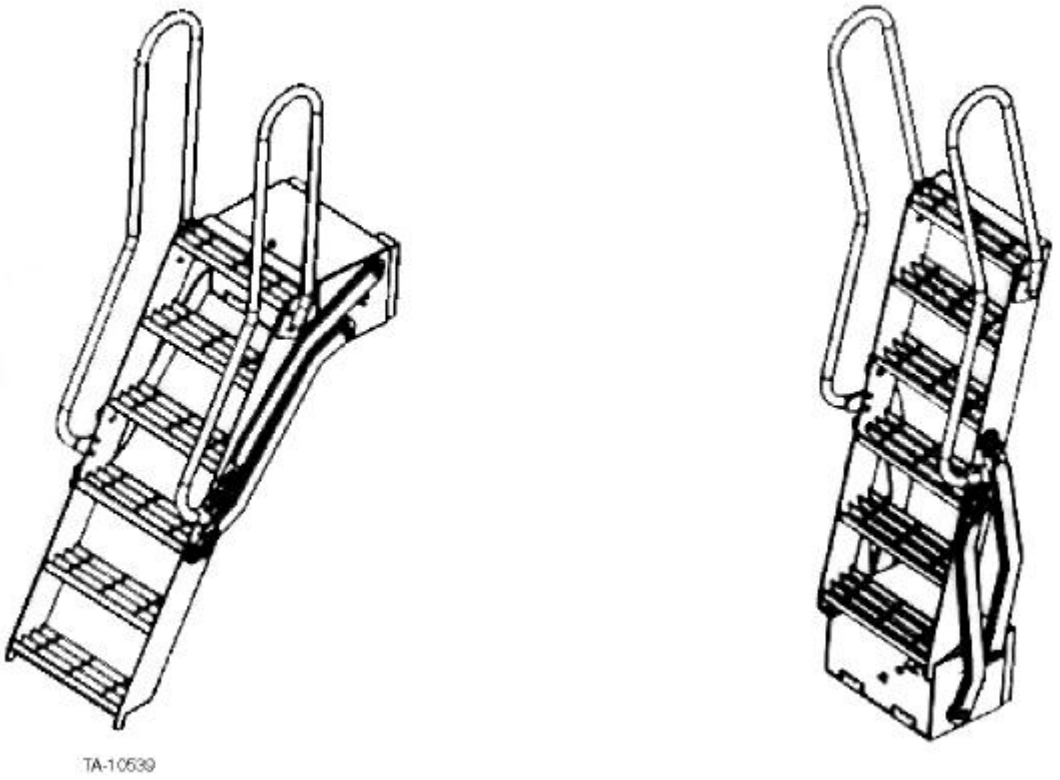
If the park brake is released with the ladder in the DOWN position, an alarm is posted on the touch screen. Tractive power is inhibited until the operator raises the ladder to the full UP and LOCKED position. The park brake must be set again and re-released before the park brakes will release.

⚠ WARNING

Crush hazards exist from leaving the cab without setting the park brakes, which could result in unplanned and uncontrolled movement of the machine. The operator should never leave the cab with the park brake released. Set the park brake before leaving the cab. Leaving the cab without setting the park brake could cause a crush hazard from unexpected machine movement, resulting in property damage, serious injury or death.

Alarms: Prior to ladder operation, the green or red LED (as applicable to the ladder's position) should be illuminated and NOT flashing. A flashing red, green, or orange LED, prior to ladder operation, is an indication of a problem and the ladder should not be operated until it is repaired. Problems occurring during ladder operation result in an audible alarm accompanied by rapidly flashing, dim, or constantly on LEDs during the ladder's up/down cycles. Troubleshooting information for problems indicated by the various alarm codes is provided in the manufacturer's information, located in Section 03 of the Service Manual.

Figure 7: Powered access ladder



Extended	Retracted

Operating the Hedweld Model C Ladder without Electrical Power

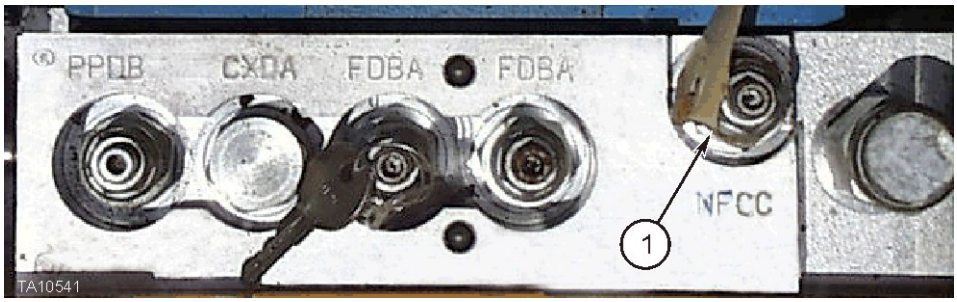
Should an emergency situation or mechanical problem occur, which results in loss of electrical power to the ladder, the ladder can still be lowered.

Loss of power to the ladder is sensed by the ladder's control system. When the up/down switches on either box are moved to the DOWN position, the emergency down circuit is actuated. A charged 24 VDC capacitor powers the ladder to the down position. The capacitor has power to lower the ladder only one time, it is recharged by reapplying power to the ladder.

Manual Release of the Hedweld Model C

The ladder can be manually raised or lowered by loosening the Allen-head screw on the ladder's control panel. Access the control panel is gained by raising the metal plate at the top of the ladder (Refer to illustration Ladder manual release).

Figure 8: Ladder manual release



Manual release

(Located on ladder control panel at top of ladder)

Service of the Hedweld Model C

The following service intervals and procedures are recommendations based on normal usage and conditions. To best prepare a time schedule for your application, monitor and record on a daily and seasonal observation basis for modifications to these recommendations which may be required.

NOTICE

Disconnect power from the ladder prior to performing any service operations to the ladder, welding on the machine, or removal of any plugs on the ladder's PC board or harness system. Refer to illustration "Ladder lockout switch and fluid".

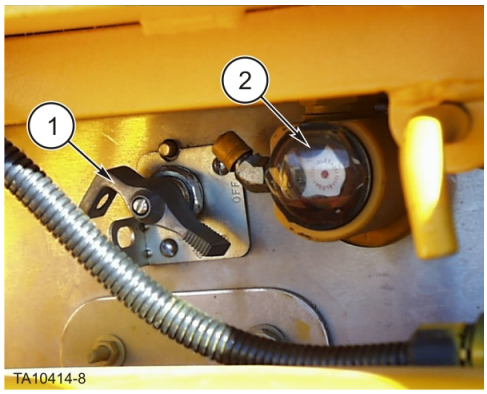
Daily Inspections of the Hedweld Model C

1. Check for oil leaks.
2. Check for loose or damaged fasteners and parts. Pay particular attention to the bolts that secure the ladder to the machine.
3. Listen for adverse noise conditions during operation.
4. Check for changes in appearance, such as improper alignment, that will affect operation and stability of the ladder.
5. Check safety labels. Replace any that have become illegible, damaged, or removed. Refer to the ladder manufacturer's information (located in the section of the Service Manual entitled "VENDOR SUPPORT DOCUMENTATION" to order replacement labels. Replacement labels are not available through Komatsu
6. Check hydraulic fluid level. The hydraulic fluid level is checked by viewing the sight glass on the ladder's control box, located at the top of the ladder (Refer to illustration "Ladder lockout switch and fluid). Correct oil level is approximately 20 mm below the filler opening. **DO NOT overfill reservoir. Replenish with IPSO 46-68 viscosity hydraulic oil.**

NOTICE

Should ladder operation become inhibited in extremes of heat and cold, it may be necessary to consult your lubricant supplier or a lubrication engineer for a recommendation on hydraulic oil that suits the extreme conditions.

Figure 9: Ladder lockout switch and fluid level sight glass



1) Lockout Switch, **2)** Fluid Level Sight Glass

(located on control box at top of ladder)

7. The bearings are sealed and pre-greased. They do not need periodic lubrication but should be checked for smooth operation and to ensure they are correctly locked onto the shaft. DO NOT subject the bearings to any high-pressure washing. Water penetration will destroy the bearings. If the bearings are washed with high-pressure water, the bearings will require grease immediately after washing.

Weekly Inspections of the Hedweld Model C

1. Check condition of hydraulic hoses and fittings.
2. Check electrical wiring and switches.

Annual Service of the Hedweld Model C

1. Change hydraulic fluid.

NOTICE

After changing the hydraulic oil, the hydraulic function of the ladder should be operated through its full range. This is to expel any air that is present, which would otherwise destroy the seals in the hydraulic system.

Cleaning the Hedweld Model C

1. Clean ladder as required to ensure safe entry and exit of the machine.

NOTICE

When washing the machine DO NOT aim high-pressure water at or near the ladder's control box or bearings.

Please refer to the vendor literature for more information.

Komatsu Model

The ladder is powered by an air cylinder which receives pressure from the Compressed Air System, when a manual valve is operated.

Safe operation of the ladder depends on adherence to the safety warnings and cautions listed herein, and all safety rules required in the user's area of operation. Periodic inspection and service must also be performed to the ladder to ensure safe and trouble-free operation.

⚠ WARNING

Struck by or Crush hazards exist if personnel are in the travel area of the ladder when it is being lowered or raised. The ladder lowers and raises rapidly when engaged. Before lowering or raising the ladder, make sure all personnel are clear of the area. Being struck by the ladder or thrown off the machine could result in serious injury or death.

⚠ WARNING

Fall hazard or Crush hazards exist if personnel rides the ladder up or down. Never ride the ladder up or down when it is being activated. Being struck by or crushed by the ladder could result in serious injury or death.

CAUTION

Component damage can result from attempting to ride the ladder up or down during operation. Do not ride the ladder up or down. Riding the ladder will void the manufacturer's warranty and could result in component damage.

⚠ WARNING

Struck by or Crush hazards exist if the ladder is not de-energized prior to performing maintenance work on it. Place the ladder in the "DOWN" position and use Battery Isolation Switch to de-energize the ladder prior to performing any service operations to the ladder. Failure to de-energize the ladder prior to working on it could cause personnel to be struck by or crushed by the ladder, resulting in serious injury or death.

⚠ WARNING

Crush hazards exist if the park brake is not set before operating the ladder. Before raising or lowering the ladder, set the machine park brake. Uncontrolled machine movement could cause a hazardous condition when trying to enter or exit the ladder, which could result in serious injury or death.

⚠ WARNING

Fall hazard exists due to uncontrolled ladder movement if it is not placed in the full down position before entering or exiting the ladder. Place the ladder in the full DOWN position before entering or exiting the ladder. Serious injury is possible if the ladder is not in the full DOWN and LOCKED position before entering or exiting the machine.

WARNING

Fall hazard or crush hazards exists when operating the ladder or using it to enter or exit the machine. To avoid personal injury and component damage it is essential that all personnel using the ladder be familiar with its operation and all indicators and alarms. Falls and crush hazards are possible if personnel are not familiar with the ladder operation before using it, which could result in serious injury.

The valve for raising and lowering the ladder is located just behind the cab. The valve is a lever-operated toggle valve which is pulled up to retract the ladder and pushed down to lower the ladder. The ladder is moved by an air operated cylinder mounted under the ladder.

Typical Operation of the Komatsu Model

The ladder is powered by an air cylinder which receives pressure from the compressed air system.

Safe operation of the ladder depends on adherence to all safety warnings and cautions, and all safety rules required in the users area of operation. Periodic inspection and service must also be performed to the ladder to ensure safe and trouble-free operation.

Normal Operation at Elevated Level of the Komatsu Model

The valve for raising and lowering the ladder is located, on the frame of the Low Voltage Control Cabinet (LVCC). The valve is a lever-operated toggle valve which is pulled up to retract the ladder and pushed down to lower the ladder.

Refer to illustration “Powered rear access ladder switch”. DO NOT attempt to operate the machine unless you are certain the ladder is in the UP position. Refer to Parts Manual for air schematic.

Figure 10: Powered rear access ladder switch

TA-9239

Service Requirements of the Komatsu Model

The following service intervals and procedures are recommendations based on normal usage and conditions. To best prepare a time schedule for your application, monitor and record on a daily and seasonal observation basis for modifications to these recommendations which may be required.

WARNING

Crush hazard exists when placing the ladder in the "DOWN" position. Always lockout the ladder activation valve (or bleed the air system to 0 psi) prior to performing any service operations to the ladder. Failure to do so could cause a crush hazard resulting in serious injury or death.

Daily Inspections of the Komatsu Model

1. Check for air leaks.
2. Check for loose or damaged fasteners and parts. Pay particular attention to the bolts that secure the ladder to the machine.
3. Listen for adverse noise conditions during operation.
4. Check for changes in appearance, such as improper alignment, that will affect operation and stability of the ladder.
5. Check safety labels. Replace any that have become illegible, damaged, or removed.
6. Check for cleanliness of stair steps. They should be free of debris and anything that would make the steps slippery, such as oil and grease.

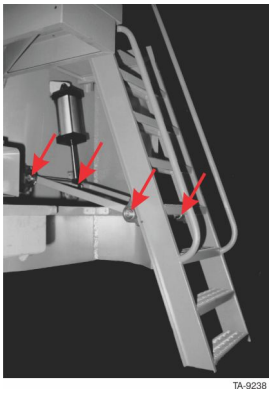
Weekly Inspections of the Komatsu Model

1. Check condition of switch, air hoses and fittings.
2. Check electrical wiring and connections to and from limit switch.

NOTICE

The pillow block bearings on the Powered Rear Access Ladder require manual lubrication every 500 hours of operation. Refer to illustration “Powered rear access ladder lube points”.

Figure 11: Powered rear access ladder lube points



Arrow indicate lube points (left rear of machine)

Cleaning the Komatsu Model

Clean ladder as required to ensure safe entry and exit of the machine.

NOTICE

When washing the machine DO NOT aim high-pressure water at or near the ladder's bearings.

This Page Intentionally Left Blank

Vendor Literature for Access Ladder

VL 07 – HEDWELD LeTourneau L1350 Safe-Away Access Ladder Model “C”

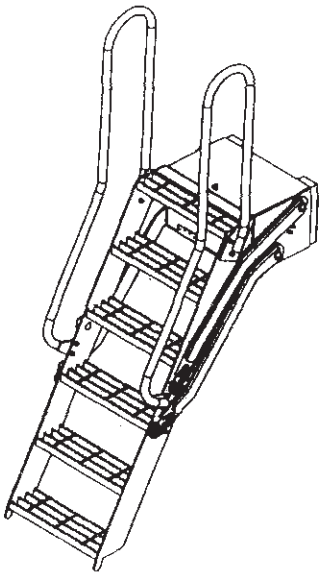
VL 89 – POWER STEP Operator and Maintenance Access Systems

VL 106 – SAFE-AWAY Vehicle Access System Series 2005 Power Pack

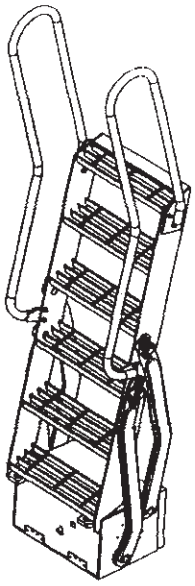
This Page Intentionally Left Blank

HEDWELD

ENGINEERING PTY LTD



Extended



Retracted

LeTOURNEAU L1350
SAFE-AWAY ® ACCESS SYSTEM
MODEL 'C'

Service and Operating Manual

IMPORTANT CUSTOMER INFORMATION

This manual has been prepared to assist the owner in the setup, operation & maintenance of the Safe-Away® Access System .

Hedweld Engineering is continually testing and evaluating its product which may result in design changes and improvements from time to time. The right to make any changes in design, or improvements, without imposing any obligation to install them on products previously manufactured, is specifically reserved, and, for this reason, the information in this manual must not be regarded as binding.

When requested, Hedweld Engineering will carry out on-site training & familiarisation of the equipment covered in this manual as soon as practicable after delivery. However, it is the sole responsibility of the customer to ensure that personnel required to use this equipment be adequately informed about its appropriate use. Specifically:

i ***The equipment is not designed as a ride-on device, and personnel must ensure that the ladder is in the fully down position before boarding.***

ii ***Running, or jumping on the ladder may cause severe structural damage, as well as hydraulic component failure.***

Damage to an access system by the above causes or by other practices contrary to any instruction contained within this manual may invalidate the warranty conditions of the access system.

Your co-operation is appreciated.

Hedweld Engineering Pty Ltd,
Technical Publications Department

CONTENTS

Contents Continued .....

◆◆◆◆◆

INTRODUCTION

The **Safe-Away® Vehicle Access System** illustrated on Page 2 of this manual, was manufactured at Hedweld Engineering Pty Ltd in its workshop at Mt. Thorley, near Singleton New South Wales, Australia, in the heart of the Hunter Valley mining area.

This retractable ladder has been designed to ensure many years of safe and effortless access to your vehicle while being low in maintenance cost. Because the ladder retracts high away from the ground, and within the boundaries of the vehicle, there is less likelihood of it becoming damaged or distorted.

It has been fully tested with all necessary adjustments having been made prior to shipment. The quality of manufacture of the unit is guaranteed and the system will comply with all relevant quality and manufacturing standards.

The **Safe-Away® Access System** is easily installed and in the remote possibility that the unit is damaged, it can be simply removed for repair at any suitably equipped workshop, or alternatively replaced with a service exchange unit available from Hedweld.

Standard features available with the **Safe-Away® Access System** include:

1. **Sequencing of up and down operation** of the ladder on an adjustable time lapse basis.

2. **Flashing LED lights to signal travel of the ladder** followed by a static light to indicate the status in either the up or down position. This is complimented by an intermittent warning alarm which operates during motion of the ladder. Provision has been made for an optional external courtesy lamp to operate during this mode.

3. **Emergency evacuation from the vehicle.** When the power is cut off, or not available, the ladder can still be lowered to the access position.

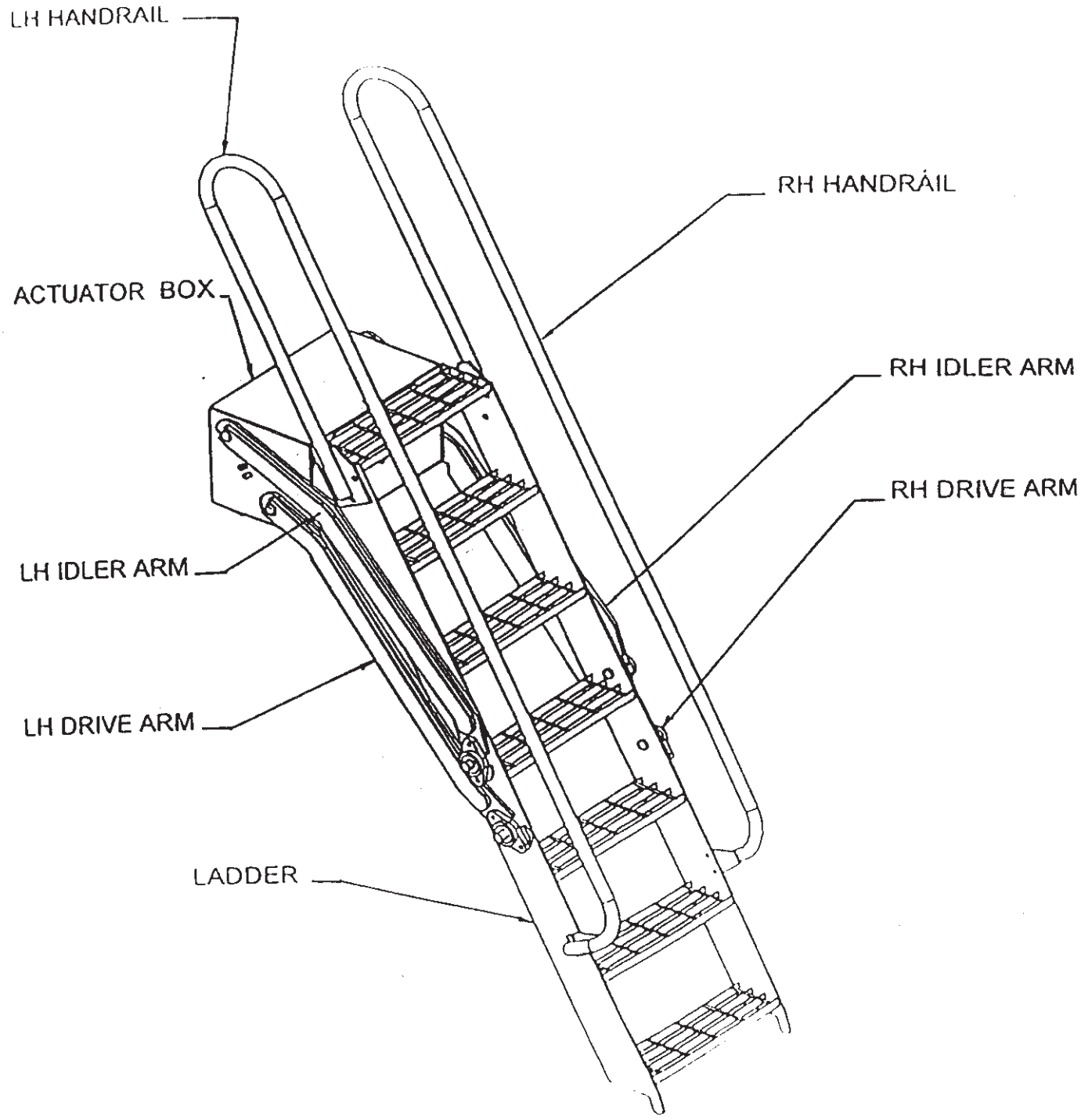
4. **Ladder lock out.** The lowering of the ladder can be made inoperative until the park brake is set.

5. **Systems lock out.** While the ladder is in the down position, operations such as propel, or swing, are prevented to save accidental damage.

6. **Auto Ladder raise.** The release of the park brake will automatically retract the ladder to the up position

HEDWELD ENGINEERING PTY LTD

General Layout of Safe-Away® Vehicle Access System



7. **Trouble shooting aided by LED (Light Emitting Diode) display.** Each input and output can be monitored by changes in the electronic control card LED display.

8. **Additional remote control stations** can be added if required.

9. An **independent electric over hydraulic power pack and directional control valve** provides full and positive hydraulic control of the ladder operation. As an alternative, the ladder can be powered from the vehicle's own hydraulic supply.

   The hydraulic system contains a number of special features, including:

   a. Pressure reducing and relief valve, to protect the hydraulic components.
   b. Pressure compensated flow control valves which control the ladder speed in both directions.
   c. Check valve to prevent loss of accumulator pressure.
   d. Manual bypass valve to allow for manual operation of the ladder.
   e. System pressure is maintained by an accumulator, to propel the ladder down in the case of system pressure failure.
   f. A pressure switch has been fitted, to maintain accumulator pressure.
   g. Factory set pressure relief valve between A & B port to prevent accidental intensification of the actuator.

As optional extras, the **Safe-Away® Access System** offers the following:

10. **Engine Idle and Shut Down** function. This feature incorporates:

    i idle down on ***"ignition off"***, or
    ii idle down on ***"ladder down"***, or
    iii idle down on ***"ignition off"*** **and** idle down on ***"ladder down"***

11. **Maintenance Override.** This feature allows normal starting and stopping of the vehicles' engine during maintenance by overriding the **Engine Idle Shut Down** function described above. Complete operation of the ladder is available.

12. **Indicator Brightness Control** for cabin LED's. For operator comfort, the UP and DOWN indicators can be controlled for night driving.

13. **Access-Courtesy light. (Optional only).** Pressing the up or down directional switch activates the courtesy light. The light will stay on for a preset period.

14. **Emergency stop.** This safety feature has been incorporated specifically for graders, to overcome ladder/cabin door interference. The feature can be used to interrupt any sequential operation to prevent injury, or damage to equipment, as well as act as an interlock to isolate an activity in the event of an unplanned occurrence.

Accompanying this manual is the warranty conditions set out by Hedweld Engineering for the equipment. The warranty covers conditions for both supplier/manufacturer (Hedweld) and customer/owner/operator. Read these conditions carefully before placing the unit into operation.

Should you have a problem with your **Safe-Away® Access System**, do not hesitate to contact the Technical Dept at Hedweld Engineering, who will assist you in any way possible. We are confident that most problems can be solved over the phone. Also, pay particular attention to the safety and maintenance sections of this manual, as the better you look after the **Safe-Away®** system the longer it will look after you.

---oooOOOooo---

SAFETY

GENERAL SAFETY

The following safety procedures should be considered as the minimum requirements for the operation, use and maintenance of the **Safe-Away® Vehicle Access System**.

Note: Information in this manual shall not be construed to waive, or modify, any obligation imposed pursuant to any regulation under the Occupational Health & Safety Act, or under any other existing Health and Safety Legislation.

1. Never run or jump on the ladder.

2. Hold onto the handrail when using the ladder.

3. Always face the ladder when ascending or descending.

4. Never attempt to ride on the ladder while it is in the process of being raised or lowered, or while the vehicle is in motion.

5. Always visually check the ladder before use to ensure that the unit has not been accidentally damaged.

6. Report defects immediately.

7. Ensure that the ladder is in the fully down position before boarding.

8. Keep hands and fingers away from pinch points during the raising and lowering of the ladder.

9. Always check that there are no personnel on the ladder, or in a position where their safety is placed at risk, when lowering or raising the ladder.

10. The ladder should be kept clean and free of moisture, grease and oil.

11. When boarding the vehicle, always operate the toggle control switch to raise the ladder. The automatic raising of the ladder when the park brake is released, is designed as an ***emergency safety function only***, and should not be activated under normal operation.

SAFETY DURING MAINTENANCE

The following safety procedures should be considered as the ***minimum requirements*** for personnel during maintenance of the **Safe-Away® Vehicle Access System.**

All personnel who maintain, repair, or operate electrical and hydraulic equipment should be familiar with the hazards and the precautionary measures which must be observed. Only qualified and authorised personnel should install, maintain, adjust, or operate pressurised systems, especially the safety devices involved.

Follow recognised isolation and tag-out procedures before commencing maintenance on this machine. Failure to properly isolate the primary energy sources, i.e. electricity and hydraulics, may lead to personal injury. The following points are listed in the interest of personal safety when working with the access system.

1. Always isolate the power from the system (and lockout or apply a danger tag, as applicable) before carrying out any electrical or mechanical work on the system. Failure to properly isolate the power supply can lead to serious injury.

2. Always isolate the power from the system (and lockout or apply a danger tag, as applicable) before carrying out any maintenance work on the vehicle.
   Note: If the park brake function is being utilised by the machine, ensure the park brake has been set before restoring power to the ladder control system as inadvertent raising of the ladder will occur. See information on "Park Brake" Page 19.

3. Do not attempt to repair, loosen or open any part of the hydraulic system unless both the electrical and hydraulic supply have been isolated and the hydraulic lines have been depressurised. Maintenance personnel should themselves, ensure the system is depressurised either by checking a gauge connected to the immediate line or equipment, by opening a test valve, or by noting that a disconnection in a line already exists. ***Do not bleed a pressurised line by loosening a fitting.***

4. Check the electrical harness, wires and hydraulic lines for damage or wear on a regular basis. If replacing hydraulic lines ensure they are of the same quality and length.

5. Prevent dirt or debris from entering the system when carrying out repairs, or replacing parts.

6. Do not use the electrical harness or hydraulic lines as a step.

7. Most hydraulic systems have been fitted with a safety pressure relief valve. Do not activate the system unless the relief valve is in place.

8. Do not check for leaks with your hand as a severe injury could result. If a high pressure injection injury is suspected, seek medical treatment immediately.

9. Eye protection should be worn when carrying out maintenance on this equipment.

UNPLANNED LADDER MOVEMENTS - (Park Brake Function Utilised).

A number of unplanned movements to the ladder could occur during maintenance of the vehicle, if the park brake is inadvertently released. These movements are standard functions of the ladder when the vehicle is operating during normal production periods, however, in a maintenance environment, these unplanned movements, described below, could cause injury if any personnel are working on or near the ladder.

A **Automatic raising of the ladder.**

Inadvertent raising of the ladder will occur if the park brake is released and:

i power has not been isolated to the ladder control system ..... or,
ii the power is restored to the ladder control system after previously being isolated.

To prevent this unplanned movement from happening ensure:

a. that power has been isolated from the ladder control system before releasing the park brake;
b. the park brake has been reset before restoring power to the ladder control system.

See further information on "Park Brake" Page 19.

B **Automatic recharging of the accumulator. (Ladder in the UP position).**

An accumulator is installed as part of the hydraulic system to ensure positive holding of the ladder in the ***fully up*** position. However, pressure drops can occur, mainly due to external leaks in hoses, and the system will respond by activating the power pack and recharging the accumulator. During this period of low pressure, the ladder may creep a short distance from its upper limit and the control board will sense this movement and relocate the ladder at the same time the accumulator is being charged. Movement is sudden and forceful. This recharging occurs normally when the vehicle is in operation. When the vehicle is stopped and park brake is applied, no recharging will occur.

However, if during any period of maintenance there is a need for the ladder to be held in the UP position with power on, and it creeps off the limit, the ladder will automatically be relocated if the park break is inadvertently released.

This unplanned ladder movement can be eliminated by ensuring that power has been isolated from the ladder control system before commencing maintenance on other parts of the vehicle.

---oooOOOooo---

INSTALLATION

OVERVIEW

The **Safe-Away® Vehicle Access System** is supplied with the ladder, drive and idler arms, and actuator box pre assembled, requiring only the physical attachment of the ladder to the required vehicle. The hand rails are fitted after the ladder is secured to the vehicle.

An electrical harness is supplied complete with wiring and plugs ready for installation and connection to the access system as well as to a lower remote control switch, cabin control switch, and other optional accessories.

When required, a hydraulic power pack, installed in a stainless steel cabinet and complete with plumbing and electrical harness, is also included, ready for installation. The main electrical harness provides for power pack control wiring and connections. Battery lead kits are supplied for vehicles where a standard location of the power pack has been established. However, battery leads are not supplied for some vehicles due to non-standard lengths to suit the multiple possible mounting locations. Hydraulic hoses are supplied for plumbing to the actuator box, and to some destinations, the power pack is pre-filled with oil to the correct level before delivery. Check before installation, to ensure that no leakage has occurred during transit.

Illustrated on drawing number 70-0108 at the end of this manual, are the components enclosed in the **Safe-Away®** actuator box. The front door folds down from the top on the double hinged base and is fastened in the closed position with a spring loaded locking pin, located in the centre of the door. An electrical harness complete with sealed plug is attached to the actuator box to provide a fast and efficient means of connection to matching plugs on the main wiring harness.

When requested, Hedweld Engineering will carry out complete on-site fitting of the **Safe-Away® Access System** as soon as practicable after delivery. Installation costs are an addition to the access unit. When electing to self-install the access system, advice should be sought from Hedweld Engineering's Technical Dept for the correct method and sequence of installation.

Incorrect installation of this system may invalidate warranty conditions.

ELECTRICAL INSTALLATION

After fitment of the ladder assembly, handrails, and hydraulic power pack, the following procedure to complete the electrical installation needs to be carried out:

Note 1: Ensure that the machine battery isolating switch has been opened before performing this operation. Follow standard danger and out-of-service tags procedures where applicable.

Note 2: When securing electrical harnesses to equipment, reference should be made to applicable Statutory Regulations in that State (e.g. NSW Mines Dept MDG15) to ensure the correct installation requirements are complied with.

Note 3: Before securing components to the vehicle, check the layout of harnesses to ensure adequate length for connection to selected location.

Note 4: Refer to drawing 700151D at the end of this manual to aid in the identification of the following components.

1. Install **Ladder Harness** (Conduit No. A/S3) from the **Actuator Box** to the **PC Board Enclosure** as follows:

   a. Feed the end of the harness, labelled Ladder Conduit A/S3-1, through the hole provided in the bottom of the stainless steel control cabinet and secure to the **PC Board Enclosure** with the aid of the 16 way plug also labelled A/S3-1.
   b. Secure the harness plate to the bottom of the control cabinet with the two 6mm studs supplied.
   c. Join the other end of the Ladder Harness, number A/S3-2 to the actuator box harness, labelled A/S3-3.

2. Install the **Lower Remote Control Box.**

   a. Mount the lower remote control box in the position required on the vehicle. Ensure the location matches the length of supplied harness to be connected. For added protection the remote control box can be installed in the mild steel enclosure supplied with the ladder assembly.
   b. Plug the lower remote control box harness A/S3-5 into the actuator box harness A/S3-4 as provided.

3. Install the **Cabin Control Harness** A/S-2 from the **PC Board Enclosure** to the **Vehicle Cabin** as follows:

   a. Feed the cabin control harness 16 way plug A/S2-1 through the second hole provided in the bottom of the stainless steel control cabinet and secure to the PC Board Enclosure with the aid of the 16 way plug.
   b. Secure the harness plate to the bottom of the control cabinet with the two 6mm studs supplied.
   c. Layout the harness to the cabin location and attach to the machine with approved securing devices.
   d. Select suitable position for the entry of the harness to the cabin and drill a 50mm (minimum) hole.
   e. Drill two additional holes to suit the harness bulkhead plate.

   f. Feed the cabin control harness plug A/S2-2 through the hole in the cabin in preparation for plugging to the top control harness, not yet installed.
   g. Secure the harness bulkhead plate to the bottom of the cabin.

4. Install the **Top Control Harness** in the **Cabin** as follows:

   a. Select a suitable position in the cabin to locate the control plate of the harness (e.g. dash board) and drill a hole to accommodate access of plug A/S2-3.
   b. Secure the control plate to the chosen location in preparation for plugging A/S2-3 to the matching plug from the cabin control harness installed at Procedure 3 above.

5. Install the **Park Brake Harness** from the **Park Break Pressure Switch** to the **Cabin** as follows:

   a. Select suitable position for the entry of the harness to the cabin and drill a 27mm (minimum) hole.
   b. Drill two additional holes to suit the harness bulkhead plate.
   c. Feed the single end of the harness through the hole in the cabin and plug A/S2-4 of the park brake harness to the matching plug A/S2-2 on the cabin harness.
   d. Secure the harness bulkhead plate to the bottom of the cabin.
   e. Install park brake pressure switch supplied, into the machine. (Consult Original Equipment Manufacturer for installation details).
   f. Layout the harness to the pressure switch location and attach to the machine with approved securing devices.
   g. Plug the harness to the pressure switch.

6. Install the **Upper Remote Control Box and Harness.** (Optional Deck Control)

   a. Mount the upper remote control box in the position required on the vehicle. Ensure the location matches the length of supplied harness to be connected. For added protection the remote control box can be installed in the mild steel enclosure supplied with the ladder assembly.
   b. Layout the harness to the park brake harness connection and attach to the machine with approved securing devices.
   c. Plug the upper remote control box harness A/S2-6 into the Park Brake harness A/S2-5.

7. Install **Main Supply to Power Pack Control Cabinet** - Recommended method of installation.

   a. Select a suitable length of 35mm^2 flexible cable and contain in "harnesflex", or similar approved conduit.
   b. Feed one end of the cable through the hole provided in the bottom of the power pack box and fit a matching compression gland over the conduit to ensure an adequate seal from dust and moisture.
   c. Crimp cable end with suitable termination lug and connect to the 90amp rated isolator in the power pack box.
   d. Install and connect a second 90amp circuit breaker (supplied with order) into the machines power supply. The circuit breaker must be located as close as possible to the source of supply. (5 metres of cable supplied).

e. Crimp power supply end of the 35mm^2 cable with a suitable termination lug and connect to the 90amp circuit breaker.

f. Connect and attach the length of cable with approved securing devices.

8. **Access-Courtesy Light & Harness**

Due to the multiple possible mounting locations, there is no standard installation procedure for a courtesy light.

However, provision is made in all Safe-Away electrical harnesses for connection of a courtesy light, and where this feature is requested, information on the location and distance from the control cabinet is required, to determine the make-up of the harness.

--oooOOOooo---

MAINTENANCE

SAFETY PRECAUTIONS

Safe and efficient operation of the **Safe-Away® Vehicle Access System** can only be achieved if the equipment is correctly operated and maintained. Many accidents occur because of failure to follow fundamental rules and precautions.

All personnel who maintain or repair this equipment should be familiar with the hazards and the precautionary measures which must be observed. Before carrying out any maintenance, read the safety procedures previously listed in this manual. Only qualified and authorized personnel should install, maintain or adjust the equipment and, where applicable, recognised **Danger and Out-of-Service** tag rules and regulations should be followed ..... ***If in doubt, ASK.***

Warning: Power should be disconnected from the access system:

- during all types of maintenance, except where needed for testing purposes;
- when any welding is being carried out on the machinery;
- before any plugs on the PC board, or harness system, are disconnected.

UNPLANNED LADDER MOVEMENTS - (Park Brake Function Utilised).

A number of unplanned movements to the ladder could occur during maintenance of the vehicle, if the park brake is inadvertently released. These movements are standard functions of the ladder when the vehicle is operating during normal production periods, however, in a maintenance environment, these unplanned movements, described below, could cause injury if any personnel are working on or near the ladder.

A. Automatic raising of the ladder.

Inadvertent raising of the ladder will occur if the park brake is released and:

i power has not been isolated to the ladder control system ..... or,
ii the power is restored to the ladder control system after previously being isolated.

To prevent this unplanned movement from happening:

a. ensure that power has been isolated from the ladder control system before releasing the park brake;
b. ensure the park brake has been reset before restoring power to the ladder control system.

B. **Automatic recharging of the accumulator. (Ladder in the UP position).**

An accumulator is installed as part of the hydraulic system to ensure positive holding of the ladder in the ***fully up*** position and to propel the ladder down in case of an emergency if the system pressure fails. However, pressure drops can occur, mainly due to external leaks in hoses, and the system will respond by activating the power pack and recharging the accumulator.

During this period of low pressure, the ladder may creep a short distance from its upper limit and the control board will sense this movement and relocate the ladder at the same time the accumulator is being charged. Movement is sudden and forceful. This recharging occurs normally when the vehicle is in operation. When the vehicle is stopped and park brake is applied, no recharging will occur.

However, if during any period of maintenance there is a need for the ladder to be held in the UP position with power on, and it creeps off the limit, the ladder will automatically be relocated if the park break is inadvertantly released.

This unplanned ladder movement can be eliminated by ensuring that power has been isolated from the ladder control system before commencing maintenance on other parts of the vehicle.

See further information on "Park Brake" Page 19.

MAINTENANCE SCHEDULE

The maintenance schedule should be tailored to suit each specific location and each type of equipment the **Safe-Away®** is applied to. Monitor the frequency of required service of each application for the first 30 days. After this period compile the data and establish the service schedule.

LADDER MAINTENANCE

Under normal operating conditions, the ladder will require only a minimum amount of maintenance. Correct care of your equipment will result in longer life, better performance, and more economical operation.

Preventive maintenance is the easiest and least expensive type of maintenance. Preventive maintenance begins with an awareness of the conditions of the **Safe-Away® Ladder** and its operating system. Maintenance planning should include looking for:

- Oil leaks.
- Loose or damaged parts.
- Worn or damaged hoses.
- Adverse noise conditions.
- Any change in equipment appearance, especially that which will effect the stability of the ladder.

The following checks are recommended to be carried out to the ladder system at a frequency determined by the established maintenance schedule. The steps are numbered for convenience and are not in any special sequence:

Mechanical

1. Visually inspect the condition of the arms and ladder assembly. If damaged in any way, the assembly should be removed for repair.
2. Check the tightness of all nuts and bolts. Especially the securing bolts which hold the ladder onto the machine.
3. The bearing assemblies supplied are pre-greased. They should be periodically checked for smooth operation and to ensure they are correctly locked onto the shaft.

   Note: **DO NOT** direct high pressure water at the bearings when cleaning the ladder assembly, as this may damage the seal and shorten the operational life of the bearing. See information "Cleaning ", on the following page.

Electrical

4. Check the range of functions of the ladder system, including remote switches and park brake interlock.
5. Check the condition of all wiring harness and cables for physical damage or ingress of moisture. Moisture can cause short circuits. Uncontrolled ladder movements have resulted.
6. Ensure the control box is properly sealed and free of moisture.

   Notes:

   i Attention should be payed to the machine's battery condition as this relatively easy process may reduce damage to the systems electronic components. The electronic control card will not operate when battery voltage falls below 19.2 volts.

   ii Warranty of the **Safe-Away® Access System** components may be void when damage is caused by faulty battery cells, poor connections, faulty regulators, shorted rectifiers or missing phases in alternators.

Hydraulic

7. Visually inspect all hydraulic lines and fittings. Investigate the cause of any oil pools. Replace or tighten as necessary.
8. Check and ensure optimum hydraulic oil level is maintained in the reservoir. When replenishing, ***do not*** fill beyond the recommended level. ISO 46 to 68 viscosity hydraulic oil is recommended for this system.

Changing Hydraulic Oil

Hydraulic oil becomes contaminated in time and malfunctions may begin to appear in the hydraulic system. Therefore, it is recommended that the oil be changed at least once a year.

Note: After changing the oil, the hydraulic function of the ladder should be operated through its full range. This is to expel any air that is present, which would otherwise destroy the seals in the hydraulic system.

Cleaning

With regular use of the ladder, cleaning should be carried out at frequent intervals to extend the life of the equipment and to lessen the risk of personal injury during use. These intervals will also vary with the severity of the environment and conditions under which work is conducted.

It is recommended that cleaning should only be carried out with mains pressure water equipment and environment friendly degreasers. However, if it is necessary to use high pressure water equipment, ***do not*** aim the high pressure spray near, or at, the ladder control cabinet, actuator box, or harnesses. The ingress of moisture via a damaged harness may result in an uncontrolled ladder movement.

---oooOOOooo---

OPERATION

Normal operation of the **Safe Away® Access System** is accomplished by operating either the control box in the operator's cabin, or the lower remote control box accessible from ground level. An optional upper remote control can be fitted on request, usually located on the machine landing.

When in the vehicle's cabin, always operate the toggle control switch to raise the ladder. The automatic raising of the ladder when the park brake is released, is considered an ***emergency safety function*** only and should not be activated under normal operation.

RAISING

A stationary vehicle with engine at rest, will normally have the ladder in the down position. The indicating LED (Light Emitting Diode), located in the cover of the cabin control box should be illuminated RED.

To raise the ladder, push the toggle switch located on the cover of the control box to the UP position and release the switch. The GREEN LED will pulse on and off for several seconds as the ladder raises. When the ladder has reached the UP position, the GREEN LED will stop pulsing and then remain illuminated. The vehicle can now be operated.

LOWERING

To lower the ladder, the vehicle park brake must be applied.

Push the toggle switch located on the cover of the control box to the DOWN position and release the switch.

The RED LED will pulse on and off as the ladder lowers. When the ladder has reached the ***DOWN*** position, the RED LED will continue to pulse until the preset time period has elapsed, and then remain illuminated.

---oooOOOooo---

SYSTEM FUNCTIONS AND OPTIONS

The operation of the ladder is controlled by an electronic microprocessor and printed circuit (PC) board located in the stainless steel power pack cabinet. The printed circuit board is mounted in a clear lid, plastic enclosure supplied with plug on terminals, with provision for customising system operation, including external accessories of the ladder.

The following functions and options of the system are available. Refer to Pages 19 to 29 for further descriptions:

1. **Sequencing up and down operation of the ladder.** This is achieved with an adjustable timed circuit in the PC board. This circuit controls the (electric / hydraulic or pneumatic / hydraulic) power pack. This circuit also energises the electro-hydraulic directional control valve which determines the up and down direction of the ladder.

2. **Ladder travel indication.** Flashing LED's (Light Emitting Diodes) signal the travel of the ladder in the up or down mode. The flashing LED's stop flashing and remain illuminated when the ladder cycle (up or down) has been completed. A provision on the PC board has been provided for an external lamp or warning device.

3. **Emergency power supply.** The PC board has a built in auxiliary power supply circuit which allows the ladder to be sent down (one time only) in the event of an emergency where a failure of main power to the power pack occurs, or a power pack failure develops. See "Emergency Down" Page 29.

4. **Ladder Lock Out.** The down function of the ladder is disabled if the park brake has not been applied. See "Park Brake" Page 19.

5. **Systems Lock Out.** Functions such as propel or swing can be deactivated by the PC board utilities to protect the ladder from being damaged if the ladder is not in the up position before operating the equipment. See "Limit Switch" Page 25.

6. **Auto Ladder Raise.** The ladder can be made to raise automatically by release of the park brake. See "Park Brake" Page 19.

7. **Trouble shooting aided by LED display.** The electronic control board displays an LED for each input and output in the system, and the LED will change its condition to suit a corresponding change in the physical device it represents. Observing the LED's can determine the state of the input/output devices. See "LED Troubleshooting" Page 27.

8. **Additional remote control stations or warning lights.** These items can be added to the standard two (2) station system. (Optional).

9. **24 VDC electric driven hydraulic power pack.** The power pack ensures the **Safe-Away®** ladder system is completely independent from the vehicle's hydraulic supply. Battery lead kits are supplied for vehicles where a standard location of the power pack has been established. However, battery leads are not supplied for some vehicles due to non-standard lengths to suit the multiple possible mounting locations.

10. **Full and positive hydraulic control of the ladder operation.** This is accomplished by a unique hydraulic manifold which provides six (6) functions to the hydraulic operation of the ladder system. See "Hydraulic Control Functions" Page 28.

11. **Engine idle and shutdown.** This feature incorporates:

    i idle down on ***"ignition off"***, or
    ii idle down on ***"ladder down".***
    iii idle down on ***"ignition off"*** **and** idle down on ***"ladder down"***

    When incorporated, the vehicle's engine will be shut down after a preset time period when the ignition key has been switched off, or, when the ladder has reached its lowered position. The preset time period options are five (5) minutes and eight (8) minutes. See further description Page 26.

12. **Maintenance Override.** This feature allows normal starting and stopping of the vehicles' engine during maintenance by overriding the **Engine Idle Shut Down** function described above. Complete operation of the ladder is available. See further description Page 27.

13. **Brightness Control** for indicating LED's. For operator comfort, the UP and DOWN indicators can be controlled for night driving. See further description Page 27.

14. **Access-Courtesy light. (Optional only).** Pressing the up or down directional switch activates the courtesy light. The light will stay on for a preset period.

15. **Emergency stop.** This safety feature has been incorporated specifically for graders, to overcome ladder/cabin door interference. The feature can be used to interrupt any sequencial operation to prevent injury, or damage to equipment, as well as act as an interlock to isolate an activity in the event of an unplanned occurrence.

---oooOOOooo---

DESCRIPTION OF SYSTEM FUNCTIONS

PARK BRAKE

The park brake function is to prevent damage to the system by automatically raising the ladder if the vehicle is attempted to be driven. Releasing the park brake will cause precisely the same action as having pressed the UP switch. The ladder will travel up until timed out, or the upper limit is reached - motion is immediate. With the park brake released, the down switches are disabled.

Note: This function is designed for emergency use only. To ensure damage is not caused by malfunction, always use the toggle switch and ensure the ladder has been raised before releasing the brake.

The electronic printed circuit board, shown on drawing 70-0149A at the end of this manual, must be set to suit this park brake function. The board is set before leaving the factory and is accomplished by positioning the DIN, or selection switch, also shown on the drawing, as follows:

- Switch "0" must be set in the OFF position. This allows automatic raising of the ladder when the park brake is wired.

If a customer elects not to employ the park brake facility, the DIN switch must be positioned as follows:

- Switch "0" must be set to the ON position. This function disables automatic raise of the ladder on park brake release. However, the system still allows the recharging function to operate normally. (See "Automatic Recharge of Accumulator" on the following page).

All **Safe-Away®** ladder harnesses are provided with wiring for the park brake facility to be connected. (See harness diagram 7001551D). If this is not utilised, then an alternative method of auto-raise should be adopted.

Failure to do so may void the warranty of this equipment if damage results.

ACCESS (Courtesy) LIGHT - Optional

Pressing either the UP or DOWN directional switch will result in the courtesy light being turned on, and it will remain on for a preset period (approx. 2 minutes max.). The courtesy light is wired through a supplied interface relay, due to the current limitations from the electronic control board.

AUTOMATIC RECHARGE OF ACCUMULATOR

An accumulator is installed as part of the hydraulic system to ensure positive holding of the ladder in the fully UP position, and to propel the ladder DOWN in case of an emergency if the system pressure fails. The accumulator will automatically be recharged under the following conditions:

1. When the limit switch is reached on each UP cycle of the ladder, the power pack will continue to run for a further 4 seconds to "top-up" the accumulator and ensure the ladder has docked securely. This 4 second time period is factory set (Pot. 3) and takes over from the normal UP cycle time set by Pot. 1. (See Page 33 for explanation of potentiometer settings). Although the 4 second time can be adjusted, no more than 5 seconds is recommended.

2. While the ladder is UP and at rest, pressure drops can occur, mainly due to external leaks in hoses. When the pressure drops below a pre-determined level, the system will respond by activating the power pack and recharging the accumulator. This is accomplished by a low pressure switch which will close its contacts if the pressure falls below the low pressure setting of 17 Bar - 250 PSI. The power pack and UP solenoid will then be energised for the preset time period of 4 seconds, set by Pot 3.

Safety Note: Recharging after a pressure drop is designed to occur when the vehicle is in operation. When the vehicle is stopped and the park brake is applied, no recharging will occur. However, if during any period of maintenance to the parent vehicle there is a need for the ladder to be held in the UP position with power on, and a pressure drop results, it is possible for the ladder to creep off the upper limit. If this occurs the ladder will automatically be relocated if the park break is inadvertently released. Movement is sudden and forceful.

This unplanned ladder movement can be eliminated by ensuring that power has been isolated from the ladder control system before commencing maintenance on other parts of the vehicle.

INDICATIONS AND ALARMS

The system relies on preset time periods for which the ladder will be driven up or down. When a direction switch is pressed, the alarm will sound for the preset time unless a reverse direction of motion is actioned. For example, if during upward movement of the ladder, the DOWN cycle is selected, the control board will automatically change to a DOWN cycle and immediately reverse the direction of the ladder. The flashing green UP LED will be turned off and the flashing red LED will be turned on until the DOWN cycle has been completed, when a constant red will be indicated. The total audible alarm time will amount to the UP time prior to interruption, plus the ***total*** DOWN preset time.

The following indications and alarm warnings are displayed by the LED's (Light Emitting Diodes) on the cabin toggle switch control, as well as on the main electronic printed circuit board enclosure in the stainless steel power pack control cabinet. Audible alarms are fitted in the actuator box and the cabin control box. These audible alarms are programmed to sound only when selected problems occur.

1. Flashing GREEN indicates that the ladder is moving UP.

2. Constant GREEN indicates that the ladder is fully UP.

3. Flashing RED indicates that the ladder is moving DOWN.

4. Constant RED indicates that the ladder is fully DOWN.

5. Constant ORANGE indicates that the power supply to the electronic card is low. A continuous audible alarm will also be heard for 10 seconds. (See explanation "Low Battery Voltage" below).

6. Flashing ORANGE indicates one of four conditions:
   - i indicates that the ladder has failed to reach the full UP position. The preset time period has expired without the ladder reaching its upper limit. A continuous audible alarm will sound. (See explanation "Ladder Fails To Reach Up Position" below).
   - ii indicates that the ladder, originally raised to the UP position, has been physically forced from its upper limit switch during operation of the vehicle. (See explanation "Ladder Disengages From Upper Limit" on Page 22).
   - iii indicates a faulty, or sticking toggle switch when power is restored to the electronic control system. (See explanation "Power Up - CPU Test" Page 26).
   - iv indicates the emergency stop (when utilised) has been activated. (See explanation "Emergency Stop" Page 29).

7. Flashing ORANGE / RED indicates that there is low oil pressure to the ladder. (See explanation "Leakage / Watchdog Timer" Page 23).

8. Flashing RED / GREEN / ORANGE indicates that the microprocessor in the electronic control box has failed the self test on initial power up of the system. (See explanation "Power Up - CPU Test" Page 26).

9. Rapid flashing RED indicates DOWN toggle switch stuck.

10. Rapid flashing GREEN indicates UP toggle switch stuck.

Low Battery Voltage (Constant Orange LED - Audible Alarm 10 sec.) :
When the vehicle battery supply has reached approximately 19 volts, a constant ORANGE will be displayed by the LED and the audible alarm will sound for 10 seconds. The ladder should not be operated under these circumstances until full power has been restored as ladder system damage may result.

Ladder Fails To Reach UP Position (Flashing Orange LED - Audible Alarm 5 sec) :
When this state occurs, move the toggle switch to the UP position. The electronic board will interpret this as a second UP motion request of the ladder and cancel the current alarm status. It will then revert to a normal UP cycle with flashing green LED and pulsing audible alarm. If ladder once again fails to reach its UP position, then the alarm status will change to the following:

i Five (5) orange flashes with a continual audible alarm for 5 seconds.
ii After the five (5) seconds has elapsed, the audible alarm cancels and the LED changes to constant green.
iii Every two (2) minutes thereafter, the audible alarm will sound for 1/10 of a second and the LED will flash orange five (5) times. The alarm status has now been placed in a reminder mode. See following information.

The alarm state described above indicates that the ladder has not reached its UP position due to any one of a number of reasons. Problems previously experienced have been:

a. Faulty upper limit switch.
b. Ladder unable to dock adequately due to some restriction, such as mechanical obstruction, mud on docking platform.
c. Physical damage to ladder.
d. Time setting to raise ladder too low.
e. Viscosity of oil too low due to unusually cold atmospheric conditions.

Note: Depending on the circumstances causing the problem, the ladder, even in this alarm state, may still be raised adequately for the vehicle to be placed into service without the risk of damage to the access system. This enables maintenance, or repairs, to be carried out at a more convenient time. However, when this alarm state occurs, ***it is the sole responsibility of the operator to investigate the condition of the ladder before placing the vehicle into service.*** The alarm status described in (iii), above, is a reminder to the operator that the problem still exists and requires attention as soon as practicable.

Once the problem has been rectified, the alarm status can be reset by switching off, and then restoring, the power to the PC board. If the alarm status still exists, so does the problem, and the system should be reinvestigated.

Ladder Disengages From Upper Limit Switch (Flashing Orange LED - Audible Alarm) :

With the ladder in the UP position and the vehicle mobile, the LED will indicate continuous green. If the ladder is forced from its limit and remains off the limit for more than two (2) seconds, the control card will endeavour to relocate the ladder within a four (4) second period. No alarm will be displayed. This relocating time is factory set but can be adjusted by Pot. 3, see Page 33. No more than five (5) seconds is recommended.

If the ladder does not re-engage with the upper limit within the preset time, the alarm status will change to the following:

i Five (5) orange flashes with a continual audible alarm for 5 seconds.
ii After the five (5) seconds has elapsed, the audible alarm cancels and the LED changes to constant green.
iii Every two (2) minutes thereafter, the audible alarm will sound for 1/10 of a second and the LED will flash orange five (5) times. The alarm status has now been placed in a reminder mode. See following information.

Under the conditions described above, the alarm state indicates that the ladder has not re-engaged with the upper limit switch. To protect the power pack unit from unnecessary operation and inevitable burn-out of the electric motor, the system control has been programmed to make only one attempt to relocate the ladder.

Note: Depending on the reason for the ladder not re-engaging, e.g. faulty upper limit switch, physical damage to ladder, etc., the ladder, even in this alarm state, may still be raised adequately for the vehicle to be continually operated in production without the risk of damage to the access system. This enables maintenance, or repairs, to be carried out at a more convenient time. However, when this alarm state occurs, ***it is the sole responsibility of the operator to investigate the condition of the ladder before continuing with the vehicle in its present operation***. The alarm status described in (iii) on the previous page, is a reminder to the operator that the problem still exists and requires attention as soon as practicable.

An undamaged ladder will still operate normally in the DOWN mode. However, when in the fully DOWN position, the alarm status will reappear. Once the problem has been rectified, the alarm status can be reset by switching off, and then restoring, the power to the PC board. If the alarm status still exists, so does the problem, and the system should be reinvestigated.

Leakage / "Watchdog" Timer (Flashing Orange / Red LED) :

This indicates a hydraulic leak, or blown hose supplying the actuator assembly and is expected to occur only during the UP cycle. The oil pressure has remained low and the power pack has been energised for the "watchdog" setting of 30 seconds. When the "watchdog" setting has expired, an ORANGE / RED sequence will indicate on both LED's. The system electronic functions will still allow the ladder to operate under these conditions, but will continue to indicate this alarm until the low pressure symptom has been rectified. Total time of power pack operation under these conditions will be 30 seconds, plus the time already expired during the UP cycle before activation of the low pressure switch.

After this time period has elapsed, the power pack will shut down and an audible alarm will sound for 5 seconds as well as a continual flashing ORANGE / RED of both LED indicators. If no further function of the ladder system is selected the indicator will continue to flash, and the audible alarm will sound for 1/10 of a second every two (2) minutes until the low pressure is rectified.

When this problem occurs the ladder, in most circumstances, will have reached its UP limit, but can still be lowered in the normal manner. When the DOWN toggle is selected, the control system will activate the ladder and indicate flashing RED for the normal DOWN cycle. However, when the ladder reaches the DOWN position, and the DOWN cycle has timed out, the alarm status will return. (Audible alarm for 5 seconds as well as a continual flashing ORANGE / RED LED indicator).

The audible alarm will sound for 1/10 of a second every two (2) minutes, and the flashing ORANGE / RED indicator will continue until the low pressure is rectified.

Ignition Warning (Optional):

Although an optional feature, all **Safe-Away®** ladder harnesses are equipped with wiring to provide an ignition warning system. (See electrical schematic and harness diagram 70-0149A and 7001551D). When connected, and the vehicle's ignition is switched on, an audible alarm - no visual indication - will sound for a time period determined by the position of the DIP Selector switch "0" described on Page 34. The position of this switch is, in turn, determined by the choice of park brake connection explained on Page 19.

The time period is as follows:

i **DIN Selector switch "0" in position OFF (Park brake used) -**

If the ladder is in the UP position, the alarm will sound for one (1) to two (2) seconds. If the ladder is DOWN, the alarm will sound for five (5) seconds.

ii **DIN Selector switch "0" in position ON (Park brake not used) -**

The alarm will sound for ten (10) seconds for both UP or DOWN positions of the ladder.

The purpose of the alarm is to attract the attention of the operator so that the position of the ladder can be determined before starting the vehicle. This ignition warning facility is **NOT** an automatic raise function, and all operators should be aware of such.

Note: The wiring included in the ladder harness for connection to the vehicle's ignition system, must only be wired to an interface relay (not supplied) with normally closed contacts when the ignition is OFF. ***It must not be connected to a positive potential of the vehicle's electrical supply system, otherwise damage to the ladder's electronic control system could result.***

Alarm Status On Restoration Of Power To Control Board :

The alarm status at the time of restoration of power will be determined by whether the ignition facility is connected, and by what position the ignition is in at the time, namely OFF or ON. There will be no visual LED indication. The audible alarm status is as follows:

1. **Ignition Facility Wired**

Ignition OFF - no audible alarm.
Ignition ON -

i ***DIN Selector switch "0" in position OFF (Park brake used) -***

If the ladder is in the UP position, the alarm will sound for one (1) to two (2) seconds. If the ladder is DOWN, the alarm will sound for five (5) seconds.

ii ***DIN Selector switch "0" in position ON (Park brake not used) -***

The alarm will sound for ten (10) seconds for both UP or DOWN positions of the ladder.

2. **Ignition Facility Not Wired**

Same as Ignition ON, above.

See also "Power Up - CPU Test" on Page 26.

LIMIT SWITCH

The main function of the limit switch is to monitor travel of the ladder to the UP position. Optionally, it can be utilised to inhibit the vehicle's propel, or swing, if the ladder is in the DOWN position. The standard **Safe-Away®** ladder system does not incorporate a DOWN limit. The use of a limit switch to cover the DOWN cycle is considered unnecessary due to the electronic safety features already incorporated into the control board.

Two contacts are incorporated into the limit switch. The electrical circuit diagram 70-0157-4, shown at the end of this manual, illustrates the position of both contacts when the ladder is in the **DOWN** position.

When the ladder is raised and reaches the UP position, both contacts will change and the following will apply:

1. (i) When the UP limit is reached, the normally closed contacts open. The control system then knows that the ladder has reached the end of its travel. The LED will change from FLASHING GREEN to CONSTANT GREEN.

(ii) When the UP limit is reached the normally open contacts close. If utilised, this function will allow the vehicle's propel, or swing, to be activated.

2. If the ladder fails to reach the UP limit switch the LED will commence a FLASHING ORANGE alarm after the system has timed out. This indicates to the operator that the switch needs to be pressed again to complete the ladders travel. If the ladder once again fails to reach the limit, check for:

i ladder mechanism malfunction;
ii objects obstructing the pathway of the ladder travel;
iii excessive weight being applied to the ladder.

If i, ii and iii, are satisfactory, check the preset time for the ladder UP travel. The travel time may have been retarded from the original potentiometer setting on the electronic printed circuit board. (See Pot.1 Page 33).

3. The system cannot be told to move beyond the limit switch. If the limit has been reached, the up switch is disabled.

POWER UP - CPU TEST

Each time that power is restored to the Central Processing Unit (CPU), the system runs a CPU and Ram test to ensure all solid state components are operating to their desired function. If this self-test fails it indicates with a RED / GREEN / ORANGE alarm. The printed circuit board and attached components will need to be returned to Hedweld Engineering for diagnosis and repair/replacement.

During the self test, (approximately two (2) seconds), the system also checks the status of each individual input and output to determine the location of the ladder and ensure all programmed parameters correspond with that position. To ensure the ladder does not operate during power up if a directional toggle switch is faulty, or is inadvertently held in either the UP or DOWN position, the system will indicate a visual alarm with a flashing ORANGE LED until the problem is rectified.

ENGINE IDLE AND SHUTDOWN - Optional

This feature incorporates:

i idle down on ***"ignition off"***, or
ii idle down on ***"ladder down"***, or
iii idle down on ***"ignition off"*** **and** idle down on ***"ladder down"***

When incorporated, the vehicle's engine will be shut down after a preset time period when the ignition key has been switched off, or, when the ladder has reached its lowered position. The preset time period options are five (5) minutes and eight (8) minutes.

When choosing the ***"ladder down"*** option, the engine shut down cycle will activate each time the ladder reaches its DOWN position . If the UP toggle is selected before the shutdown period expires, the ladder will raise and the control system will cancel the shutdown. Once the shutdown cycle has commenced, the control system overrides the ignition switch position.

Note: After shutdown, the **Safe-Away® Access System** will revert to the normal DOWN mode. If the ignition has been left in the ON position during the shutdown, it may be necessary to reset the ignition switch to OFF before attempting to restart the engine.

The ***"ladder down"*** option, is programmed into each standard **Safe-Away®** control system and each time the ladder reaches its DOWN position, the shutdown cycle will commence. However, if not connected as an option, (factory set) the shutdown cycle will be ignored by the control system when it times out.

When choosing the ***"ignition off"*** option, the engine shut down cycle will activate each time the ignition key is turned to the OFF position, regardless of the ladder location. The shutdown cycle will not effect lowering of the ladder. If the ignition is reset to ON before the shutdown period expires, the control system will cancel the shutdown.

Both of these features can be incorporated into the one option if desired.

MAINTENANCE OVERRIDE - Optional

This feature allows normal starting and stopping of the vehicles' engine during maintenance by overriding the **Engine Idle Shut Down** function described above. Complete operation of the ladder is available during maintenance override.

Safety Warning:

As advised earlier in this manual, inadvertent raising of the ladder will occur if, during maintenance, the park brake was released and:

i power was not isolated to the ladder control system ; or

ii the power was restored to the ladder control system after isolation.

The maintenance override option will not prevent these unplanned movements from occurring. See "Maintenance - Unplanned Ladder Movements" Page 12.

INDICATOR BRIGHTNESS CONTROL - Optional

In the majority of vehicles, the most suitable location for mounting the ladder cabin toggle control switch and UP and DOWN indicators, is on the vehicle dash board. To some drivers the glare from the illuminated UP LED can become an annoyance when operating at night. If this becomes a problem, both the UP and DOWN indicators can be controlled to aid operator comfort.

Available options are:

i UP and DOWN LED half bright.

ii UP and DOWN LED full bright (normal setting).

iii UP LED off after 10 seconds.

These options are normally factory set, but can be adjusted during service. Contact Hedweld Engineering for information if other options are desired.

LED TROUBLESHOOTING

The electronic control board displays an LED for each input and output in the system, and the LED will change its status to match a corresponding change in the condition of the physical device it represents. Observing the LED's can determine the state of the input/output devices.

When an input contact is closed, the corresponding LED is bright. When the contact opens, the LED will change to a dull appearance. This allows an immediate appraisal of each input. For example, the UP limit switch contact is closed when the ladder is DOWN - the LED will be bright. When the ladder is UP the contact will open - the input LED will change to a dull condition. These conditions will only apply to the LED's on Connectors 1 & 2 shown on the schematic diagram 70-0149A at the end of this manual.

All output devices will be shown bright when active (operating) and off when inactive. For example, when the power pack is operating the LED will be bright. When the power pack is off, the output LED will also be off.

The most noticeable output LED is commonly termed the "twinkler". This output is a rapid flashing LED which monitors the incoming power supply to the Central Processor Unit (CPU). If this LED is not "twinkling", the incoming supply has been interrupted. This LED is shown as No. 8 on Connector 3 of drawing 70-0149A.

Page 42 lists all inputs and outputs incorporated into the **Safe-Away® Access System** printed circuit board. Refer also to Hedweld drawing 70-0149A at the end of this manual, which shows a diagram of the PC board layout, connectors and location of the input and output numbers on the board.

HYDRAULIC CONTROL FUNCTIONS

The hydraulic manifold provides seven (7) functions to the hydraulic operation of the ladder system:

i Pressure Reducing/Relief valve (Maximum setting 2000 PSI - 138 bar) provides protection of the **Safe-Away®** hydraulic system and safety setting in the raise and lower function of the ladder.

ii Check Valve / Accumulator which provides auxiliary oil to operate the emergency down function and constant pressure in the up position.

iii Pressure Compensated Flow Controls in the up and down circuits provide a constant up and down travel speed of the ladder regardless of the pressure required to move the ladder.

iv C-Top directional valve with manual override suited to the customers choice of hydraulic supply options.

v Manual By-Pass valve to allow the ladder to be lowered or raised manually.

vi Pressure Switch to replenish the accumulator oil (minimum 250 PSI 17 bar) which maintains a constant pressure to the actuator in the up position.

vii Factory set pressure relief valve between A & B port, prevents accidental intensification of the actuator if a person attempts to ride the ladder whilst it is in the process of being raised.

When installing the power pack with the ladder system, the power pack will be supplied with all hydraulic plumbing, including the hoses to the actuator box. These hoses will need to be fitted at the time of installation .

Note: To some destinations, the power pack may have been shipped without reservoir oil. Ensure the quantity of oil is checked before placing the unit into service.

When utilising the vehicle's hydraulic system to power the ladder, the required hydraulic connections to the actuator will be one (1) ***pressure*** hose from an adequate oil supply 1/2 GPM (1.9 LPM) maximum, to the pressure port of the actuator manifold and one (1) ***return*** hose from the actuator manifold tank port to the hydraulic source tank port. The actual location of these hook up points will depend on the advise of the original equipment manufacturer, or the supplier of the hydraulic power unit.

EMERGENCY DOWN

This function will allow the ladder to be lowered in the event of total system power failure. A capacitor, mounted under the control box lid, provides ***emergency down*** power for the ladder.

In this emergency, the ladder can be lowered by pressing the DOWN toggle switch which will result in a shift of the DOWN solenoid, and the card status being operated until the stored energy in the capacitor is exhausted. Hydraulic fluid will then rotate the actuator to a point where gravity will lower the ladder to the DOWN position.

This is a once only operation. However, the capacitor will recharge immediately power is restored in readiness for the next emergency. (See further explanation "Capacitor", on Page 32).

EMERGENCY STOP

This safety feature has been incorporated specifically for graders, to overcome ladder/cabin door interference. The feature can be used to interrupt any sequencial operation to prevent injury, or damage to equipment, as well as act as an interlock to isolate an activity in the event of an unplanned occurrence.

---oooOOOooo---

OPERATOR ALARM SUMMARY (VISUAL LED INDICATIONS & AUDIBLE WARNINGS)

The following visual **LED** (Light Emitting Diode) indications and audible alarm warnings are a function of the control system:

- **Flashing GREEN** indicates that the ladder is moving UP. (Audible alarm optional).
- **Constant GREEN** indicates that the ladder is fully UP.
- **Flashing RED** indicates that the ladder is moving DOWN. (Audible alarm optional).
- **Constant RED** indicates that the ladder is fully DOWN.
- **Constant ORANGE - Audible Alarm (10 sec.)** indicates that the power supply (vehicle's battery) to the electronic card is low. Use ladder only in an emergency, or damage to components may occur. Battery should recover after a short engine run. If this does not happen report problem to maintenance personnel immediately.

Do not attempt to operate the machine unless you are certain the ladder is in the UP position.

- **Flashing ORANGE** - Four problems can occur::
  - i Directional toggle switch is faulty, or is inadvertently held in either the UP or DOWN position, when power is being restored to the electronic control system. The ladder cannot be operated until the problem is rectified. **No audible alarm will sound.**
  - ii The ladder has failed to reach the full UP position and the preset time period has expired without the ladder reaching its upper limit. Try the UP switch again but if alarm still persists, report the problem immediately to maintenance personnel. **Audible alarm will sound for five (5) seconds.** (See Page 21 for full explanation).
  - iii The ladder has reached the full UP position, and then dropped off the UP limit due to system error. Try the UP switch again but if alarm still persists, report the problem immediately to maintenance personnel. **Audible alarm will sound for five (5) seconds.** (See Page 22 for full explanation).
  - iv The emergency stop (when utilised) has been activated. Investigate reason for emergency stop activation. Report to maintenance personnel if in doubt. (See explanation "Emergency Stop" Page 29).

  Note: Problems occurring in ii) and iii) above may mean a critical failure, therefore:

Do not attempt to operate the machine unless you are certain the ladder is in the UP position.

- **Flashing ORANGE / RED** indicates that there is low oil pressure to the ladder. This may be a critical failure. Check for low oil in the power pack reservoir, faulty pressure switch, or hydraulic leaks in the system. Report any problems immediately to maintenance personnel. **Audible alarm will sound for five (5) seconds.** (See Page 23, "Leakage/Watchdog Timer", for full explanation).

Do not attempt to operate the machine unless you are certain the ladder is in the UP position.

- **Flashing RED/GREEN/ORANGE** indicates that the microprocessor in the electronic control box has failed the self test on restoration of power to the system. This test is not performed at any other time. The ladder cannot be operated as the controller is faulty and cannot be relied upon to perform any functions. Report the problem immediately to maintenance personnel. **No audible alarm will sound.** (See Page 26, "Power UP - CPU Test", for full explanation).

Do not attempt to operate the machine unless you are certain the ladder is in the UP position.

NOTE: As a generalisation, any indication with **ORANGE** requires attention.

For a full explanation of all indications and alarms, see information titled "Indications and Alarms" commencing on Page 20.

---oooOOOooo---

MICRO PROCESSOR FOR SAFE-AWAY® LADDER SYSTEM

The micro processor control board is a solid state unit which is equipped with a programmable EPROM chip. The chip can be programmed to suit many different applications for the control system. An 85% reserve capacity remains for future customer developments and requirements.

Note: The power should be disconnected from the controller during maintenance or while any welding is being conducted on the machinery or before any plugs on the PC board or harness system is disconnected.

CAPACITOR

A capacitor is mounted under the control box lid, which is separate from the control board. The function of the capacitor is to provide ***emergency power*** allowing the ladder to be lowered in the event of total system power failure.

In this emergency, the ladder can be lowered by pressing the DOWN toggle switch which will result in a shift of the DOWN solenoid, and the card status being operated until the stored energy in the capacitor is exhausted. Hydraulic fluid will then rotate the actuator to a point where gravity will lower the ladder to the DOWN position. This is a once only operation. However, the capacitor will recharge immediately power is restored in readiness for the next emergency.

SPECIFICATIONS

Voltage: + 24VDC

Current: Maximum total load: 10 Amps
Maximum Amps per solenoid drive: 3 Amps (fused with 4 amp soldered fuses)
RD non condensing , not exceeding 75 %
Max temp 55°C (122°F)

Output: 4 Fuse protected outputs with built in diodes across all solenoid drives

Inputs: 16 Voltage free inputs. (Can be either N/C or N/O inputs depending on program)

Main Power: Polarity protected on main power and ground inputs

Fusible Resistor: 0.5 watt Nickel film. Set to fuse to protect board when transient voltages occur. (See information "Fusible Resistor" Page 36).

Led Displays: 6 error or alarm codes in the form of constant, or flashing, LED displays

Voltage Protection: 14V<21V= 24V LOW
19.2V <30V = 24V OK
>30V = 24V HIGH
Low power is indicated by a constant orange LED display. (See "Indications and Alarms", Page 20).

POTENTIOMETER SETTINGS:

The role of the potentiometers is to control the length of time certain functions of the ladder are active. On standard ladders, the potentiometers are calibrated before delivery to time periods based upon previous operating experiences. However, the 'pot' settings can be altered at any time after installation and commissioning to suit customer's requirements. Clockwise adjustment increases the time value, anticlockwise decreases the time value. All adjustments are binary coded.

Note: If, at any time, the potentiometers are inadvertently altered, this will increase or decrease the values to the processor which will alter the time periods. In extreme cases, damage to the access system could result. Consult the technical department at Hedweld Engineering if there are doubts about potentiometer settings.

Failure to do so may void the warranty of this equipment if damage results.

Meanings of Pot Inputs:

Pot 1	up timer	This sets the time after which the UP motion will time out. (Max 63.5 seconds). The setting must be adjusted to a period greater than the physical time it takes the ladder to engage with the upper limit switch, otherwise, the controls will switch to an alarm mode.
Pot 2	down timer	This sets the time after which the DOWN motion will time out. (Max 63.5 seconds.
Pot 3	recharge timer	This controls the length of time for which the power pack will run under the conditions that the system is fully up (limit reached), and/or the pressure low . (Max 25.5 seconds.)
Pot 4	response timer	Sets the response time for the ladder to move after operation of the toggle switch. (Max 12.7 seconds).
Pot 5	light timer	Sets the courtesy light timer. (Max 127.5 seconds).
Pot 6	not used	
Pot 7	not used	
Pot 8	"Watchdog" timer	Sets the length of time for which, if the power pack has been running and the pressure has been low, the system will interrupt its operation and switch to an alarm status. (Max 127.5 seconds).

DIP SWITCH SETTINGS

It was the intent of the design of this system to keep the behaviour of the dip switch settings independent and additive. Each combination of switches being set to ON or OFF, adds a new behaviour to the system. There are ten (10) switches. An explanation of each are as follows:

Dip Switch 1: Setting the switch to ON gives an audible pre-movement alarm immediately a toggle switch is activated. The ladder will not move until this time period has elapsed. The time is governed by the response time set by Pot 4. (See previous page).

Dip Switch 2: Setting the switch to ON allows the toggle switch to be released after selecting the desired direction of travel. The control system will complete the ladder movement without the need to continually hold the switch.

Dip Switch 3: Setting the switch to ON will result in immediate movement of the ladder, in any direction, when selected by the toggle switch. This feature is reserved, and recommended only, for ride-on access systems.

The Safe-Away® Access System is not a ride-on device.

Dip Switch 4: Setting the switch to ON will activate the audible alarm during movement of the ladder in either direction. This time period for the alarm will be governed by the time taken for the ladder to reach the limit switch for the UP cycle, and the setting of Pot 2 for the DOWN cycle.

Dip Switch 5: Setting the switch to ON indicates to the control system that an UP limit switch is functional. If the limit switch fails to operate, or the ladder fails to reach the UP limit switch, the control system will change to an alarm mode. See "Limit Switch" explanation Page 25.

Dip Switch 6: Setting the switch to ON indicates to the control system that a DOWN limit switch is functional. If the limit switch fails to operate, or the ladder fails to reach the DOWN limit switch, the control system will change to an alarm mode.

Note: The use of a limit switch to cover the DOWN cycle is considered unnecessary due to the electronic safety features already incorporated into the control card.

Dip switch 7: This switch is for special control system functions only and must be set in the OFF position for the **Safe-Away® Access System**.

Dip switch 8: This switch is for special control system functions, for factory use only, and must be set in the OFF position for the **Safe-Away® Access System**.

Dip Switch 9: This switch is for special control system functions, for factory use only, and must be set in the OFF position for the **Safe-Away® Access System.**

Dip Switch 0: Setting the switch to the OFF position incorporates all safety features of the control system's park brake function. In this setting, automatic raising of the ladder will occur when the vehicle's park brake is released to protect the ladder from damage. When the park brake is on, the ladder can be operated in either direction. When the park brake is released with the ladder down, the ladder will automatically raise but cannot be re-lowered. See "Park Brake" information Page 19.

Note 1: Recharging of the hydraulic system will not occur when the park brake is applied. (See "Automatic Recharge of Accumulator" on Page 20).

Setting the switch to ON ***disables*** all safety features of the control system's park brake function. Although allowing the recharging function to operate normally, the system in this condition will:

i. not allow automatic raise of the ladder on park brake release;
ii. not prevent inadvertent lowering of the ladder during vehicle motion;
iii. increase the risk of "operator error".

Note 2: All **Safe-Away®** ladder harnesses are provided with wiring for the park brake facility to be connected. (See electrical schematic and harness diagrams 70-0149A and 7001551D). If this is not utilised, then an alternative method of auto-raise should be adopted. ***Failure to do so may void the warranty of this equipment if damage results.***

DIP SWITCH SETTINGS FOR STANDARD SAFE-AWAY® LADDER :

Switch	Position
1	off
2	on
3	off
4	on
5	on
6	off
7	off
8	off
9	off
10	off

Note: If there is any cause to deviate from these standard switch settings, ensure the information listed under "DIP Switch Settings" commencing on Page 34, is completely read and understood before making changes.

Failure to do so may void the warranty of this equipment if damage results.

FUSES AND PROTECTION DEVICES

Fuses and protection devices are fitted to the printed circuit board (PCB) to safeguard against damage and subsequent costly repairs, or replacement.

- The incoming supply is via a 10 ampere, 20mm x 5mm dia. glass fuse. This is to protect against major overloads or short circuits, either of which could cause a fire in the wiring harness.

- Each output driver is protected by a "wired in" 5 ampere fuse. These protect the FET's from over current and over voltage. If these fuses fail, the board should be exchanged - ***after determining the cause of the failure.***

- A fusible resistor (10 ohm 0.5 watt, nickel film), protects the electronics from high in-rush current caused by transient voltages, or spikes, and from excessive current, AC or DC.

Investigations into the failure of previously damaged PCB's have revealed that causes have been attributed to unsafe maintenance practices and faulty vehicle supply. Some noted problems are as follows:

Fusible resistor fails:

Excessive voltage due to incorrect alternator regulation. Causes are -

i very flat battery (high internal resistance);
ii poorly maintained battery terminals;
iii battery cells too dry;
iv defective alternator regulator.

Low battery voltage (below 16 volts for some considerable time) -

i shorted cells;
ii batteries not on charge;

Excessive AC on battery, or supply, due to -

i faulty alternator rectifier, or winding;
ii Electronic "voltage converter" not supplying a steady output;
iii arcing of connections to the PCB supply.

10 Amp supply fuse fails:

Attempting to drive too many outputs at full (3 ampere) load simultaneously.

5 Amp fuses fail due to:

i excessive current when extra components are added;
ii attempted jumping of power pack solenoid;
iii incorrect connection of "free wheeling" diode to solenoid coils.

High in-rush current caused by transient voltages, or spikes, can be generated by jump starting a vehicle, or when carrying out welding operations on a vehicle. Ensure power is isolated from the ladder system before carrying out these operations.

The fuses and protection devices discussed previously are designed to guard against destructive currents and voltages. However, they will not eliminate bad practices and vehicle downtime. This can only be achieved through accepted maintenance and troubleshooting techniques.

---oooOOooo---

TROUBLESHOOTING THE SAFE-AWAY® VEHICLE ACCESS SYSTEM

Service and fault finding procedures present hazards which can result in severe personal injury, or even death. All personnel who carry out these procedures should be familiar with the hazards and the precautionary measures which must be observed. Only personnel qualified to perform services on pressurised systems should carry out these procedures and then only in a safe and proper manner. Carefully read the safety instructions previously listed in this manual before commencing work.

As well as using the following charts, becoming familiar with the status of the printed circuit board LED's during operation will also aid in troubleshooting and reduce downtime of the vehicle. Refer to "LED Troubleshooting" Page 27.

SYMPTOM	POSSIBLE CAUSE
Ladder fails to raise or lower	Check the oil level in the reservoir. Replenish if necessary.
	Air may need to be bled from the system.
	Check isolating switch on stainless steel control cabinet. Ensure switch is in the ON position.
	Check existing equipment battery disconnect switch . Ensure switch is in the ON position.
	Check for low power condition of existing equipment battery source. Board will not operate under 19.2 volts supply (24 volt system).
	Check for loose or corroded battery leads.
	Check all electrical plugs and toggle switches for tightness of connections.
	Check for broken or leaking hydraulic pressure hose from power source to the actuator box.
	Check 90 Amp circuit breaker. Reset if necessary.
	Check manual release. Must be fully closed and locknut tightened.
	Check "twinkler" LED on PC board in control cabinet. If "twinkler" LED is not active and other parts of the access system are proven serviceable, damage to the PC board has occurred.

SYMPTOM	POSSIBLE CAUSE
Power pack continues to run when ladder is fully up.	Check the oil level in the reservoir. Replenish if necessary.
	UP cycle time too long. Adjust setting Pot. 1 anticlockwise. **Note:** Continuous running of the power pack will burn out the drive motor.
	Check wiring connections for loose or corroded condition at the pressure switch on the actuator manifold.
	Check pressure switch for possible malfunction. Normally closed below 25 psi (17 bar). Normally open above 250 psi.
	Check control solenoid on power pack for malfunction. Contacts may be welded together.
Power pack continues to run when ladder is fully down.	DOWN cycle time too long. Adjust setting Pot. 2 anticlockwise. **Note:** Continuous running of the power pack will burn out the DC power pack drive motor.
	Check control solenoid on power pack for malfunction. Contacts may be welded together.
Ladder fails to lower with emergency down function.	Clean excess debris off stairway mechanism. (May be binding pivot points)
	Check ladder for damage. Look for bent or misalignment of stairway section .
	Check for pinched or blockage of hydraulic hose.
	Check accumulator pre-charge 500PSI (35 bar).
	Check for loose or broken accumulator hose.
	Check accumulator check valve cartridge (Item 6, Drg. 70-0109B) for malfunction.
	Check printed circuit board capacitor for malfunction.
	Faulty toggle switch. Try alternative switch.

SYMPTOM	POSSIBLE CAUSE
Ladder fails to raise fully.	Check the oil level in the reservoir. Replenish if necessary.
	Air may need to be bled from the system.
	Check bearings for damage or excessive wear.
	Check time duration on the UP cycle. Increase UP time Pot 1 if necessary.
	Check for leaking or broken hydraulic pressure hose from power pack to actuator manifold P port.
	Check pressure at gauge port on the actuator manifold. Set PPDB valve pressure setting on actuator manifold to minimum 700 PSI (48 bar). If power pack fails to deliver required pressure check pump pressure at P port of pump. Pump relief setting should be 2000 PSI.
	Check ladder for damage. Look for bent or misalignment of the stairway section or arms.
	Check for excess debris on stairway. (Excess weight).
	Check for build up of debris on mounting platform. Excess may prevent docking of ladder.
	Sticky manual release.
Ladder "Down-Travel" speed is too fast.	Check oil level in reservoir. Replenish if necessary.
	Air may need to be bled from the system.
	Excessive weight on stairway.
	Check for loose or broken hydraulic hose.
	Set travel speed with Flow Control Valve (FR10-33E) on actuator manifold. Item 5 Drg. 70-0109B. (Left valve - DOWN speed. Right valve - UP speed)

SYMPTOM	PROBABLE CAUSE
Ladder "Up-Travel" speed is too slow.	Low oil level in the reservoir.
	Air may need to be bled from the system.
	Check for excess debris on ladder.
	Check PPDB pressure setting. Item 7, Drawing 70-0109B. Adjust if necessary.
	Set travel speed with Flow Control Valve (FR10-33E) on actuator manifold. Item 5 Drg. 70-0109B. (Left valve - DOWN speed. Right valve - UP speed)
	Sticking control valve spool.
	Oil viscosity, or ambient temperature, too low.
	Check relief valve setting Item 4, Drg 70-0109B.
	Check hydraulic hoses for blockage, tight bends, pinching or crushing.
	Check for leaking hydraulic hose and fiitings..

INPUT OUTPUT LISTING

CONNECTOR 1 - INPUTS

Pin No.	Description
1 & 3	LED - DOWN
2 & 3	LED - UP
4 & 6	Remote Toggle - DOWN
5 & 6	Remote Toggle - UP
7, 8, 9 & 10	Common
11 (L7)	Open to ground - UP LED remains ON.
11 (L7)	Closed to ground - UP LED times OFF (After 10 sec.)
12 (L6) & 13 (L5)	Open to ground - 5 min. shutdown
12 (L6) Closed 13 (L5) Open	20 sec. shutdown (test box only)
12 (L6) Closed 13 (L5) Closed	20 sec. shutdown (test box only)
12 (L6) Open 13 (L5) Closed	8 minute shutdown
14 (L4)	Open to ground - emergency stop inactivated.
14 (L4)	Closed to ground - emergency stop activated.
15 (L3)	Open to ground - nil ladder shutdown
15 (L3)	Closed to ground - ladder down engine shutdown.
15 (L3) & 16 (L2)	Open to ground - maintenance override
15 (L3) & 16 (L2)	Closed to ground - ladder down & ignition off engine shutdown.
16 (L2)	Open to ground - nil ignition shutdown
16 (L2)	Closed to ground - Ignition off engine shutdown
17 (L1)	Open to ground - Ignition OFF
17 (L1)	Closed to ground - Ignition ON
17 (L1) & 18 (Gr)	Both open to ground - Ignition OFF
17 (L1) & 18 (Gr)	Both closed to ground - Ignition ON

CONNECTOR 2 - INPUTS

Pin No.	Description
1 & 3	Remote UP
1 & 2	Remote DOWN
4	Common
4 & 5	Local UP
4 & 6	Local DOWN
7	Common
8 & 9	Park Brake
10 & 11	UP Limit
12 & 13	DOWN Limit (Not used)
14 & 15	Pressure Switch
16	Not used
17 & 18	Electrolytic Capacitor (10k uf)
19 & 20	24v Supply

CONNECTOR 3 - OUTPUTS

1 & 2	CPU LED Indicator (Twinkler)
3 & 4	Fuel Shutdown
5 & 6	Latch pin - Factory use only
7 & 8	Access Light
9 & 10	Audible Alarm
11 & 12	Power Pack
13 & 14	DOWN Solenoid
15 & 16	UP Solenoid

Limited Warranty

The manufacturing division of Hedweld Engineering Pty Ltd warrants that it will make any repairs and needed adjustments on new components and to correct defects in materials or workmanship Hedweld Engineering Pty Ltd makes no warranty on component parts not manufactured or fabaricated by Hedweld Engineering Pty Ltd but herby assigns to you the purchaser, all of its rights under the original manufacturer's warranty covering such component parts and agrees to assist you in makeing such contacts with the manufacturer of such component parts as may be necessary to protect your rights under the Warranty covering them.

This Warranty is given expressly in lieu of all other warranties expressed or implied and of all other obligations or liabilities for manufacturing defects on the part of Hedweld Engineering Pty Ltd. No person on behalf of Hedweld Engineering Pty Ltd is given any authority to make any other warranty or make any other representations on behalf of the manufacturer or to assume any responsibility on its behalf other than as set forth in this Warranty.

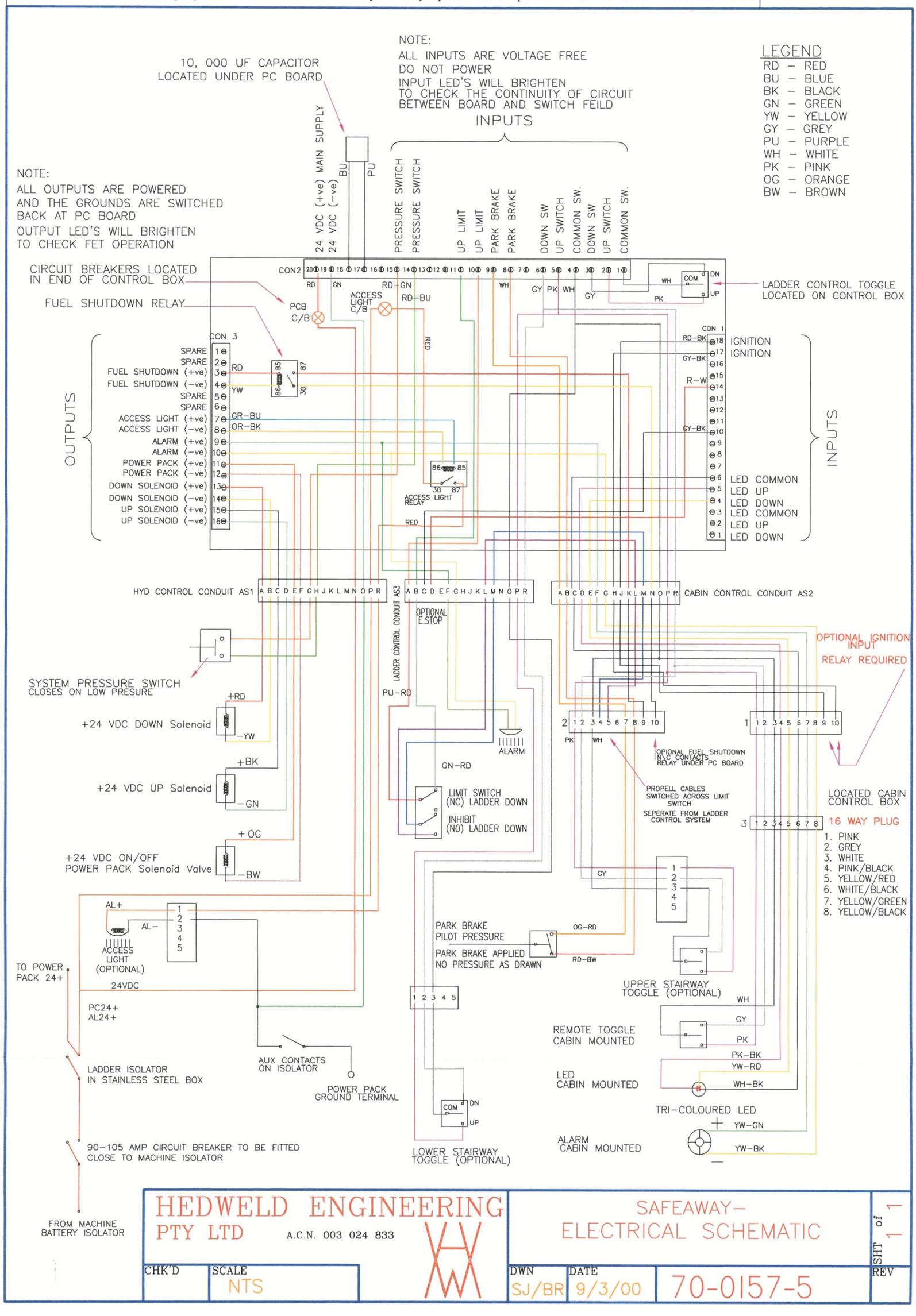
This Warranty shall not apply to any Component which shall have been repaired or altered outside of Hedweld Engineering Pty Ltd, if in its judgement such repairs or alterations effect the stability or reliability of equipment sold nor does said warranty apply to any component which has been operated at a speed exceeding factory rated speed or loaded beyond the factory rated capacity or which has been subjected to any misuse, neglect, accident or lack of normal maintenance.

The warranty period begins on the date the component is first delivered to the first retail purchaser. This Warranty is twelve (12) months.

Warranty repairs will be made at no charge. A resonable time is reserved to make such repairs after the component is delivered, cost pre-paid to the manufacturing plant.

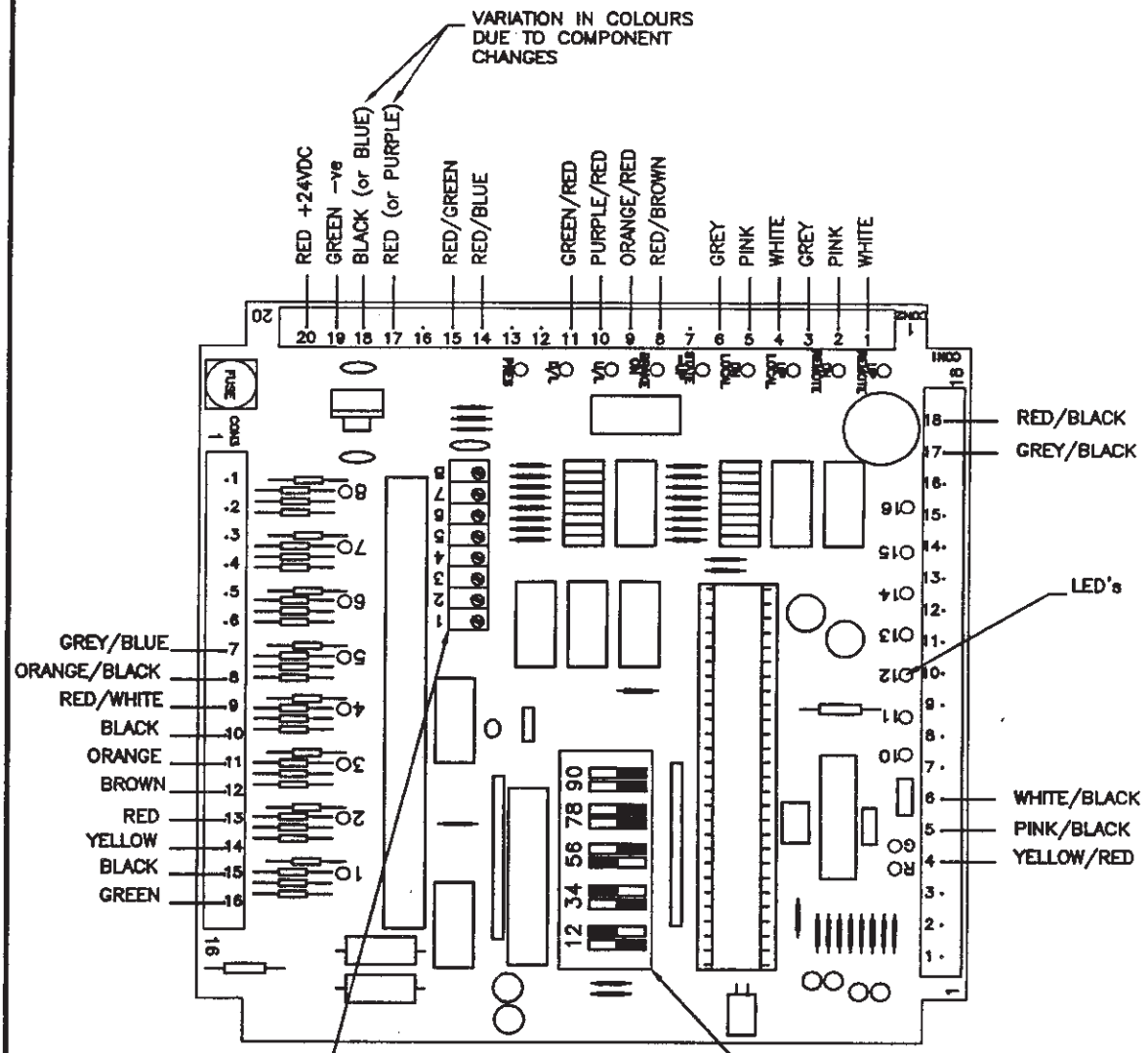
Any implied warranty applicable to a component is limited in duration to the duration of this written Warranty. Hedweld Enginerring shall not be liable for consequential commercial damages resulting from breach of this written Warranty or any implied warranty.

Hedweld Engineering Pty Ltd is continually testing and evaluating its product which may result in design changes and improvements from time to time. The right to make any changes in design or improvements without imposing any obligation to install them on products previously manufactured is specifically reserved.



HEDWELD ENGINEERING PTY LTD A.C.N. 003 024 833		SAFEAWAY– ELECTRICAL SCHEMATIC		SHT 1 of 1
CHK'D	SCALE NTS	DWN SJ/BR	DATE 9/3/00	70-0157-5 REV

VL7



POT SETTINGS FOR SAFEAWAY SYSTEMS

8	WATCHDOG TIMER
7	UNUSED
6	UNUSED
5	LIGHT ON TIMER
4	TOGGLE DELAY/PRE-ALARM TIME
3	ACCUMULATOR CHARGE
2	DOWN
1	UP

DIP SWITCH SETTINGS FOR STANDARD SAFEAWAY SYSTEMS

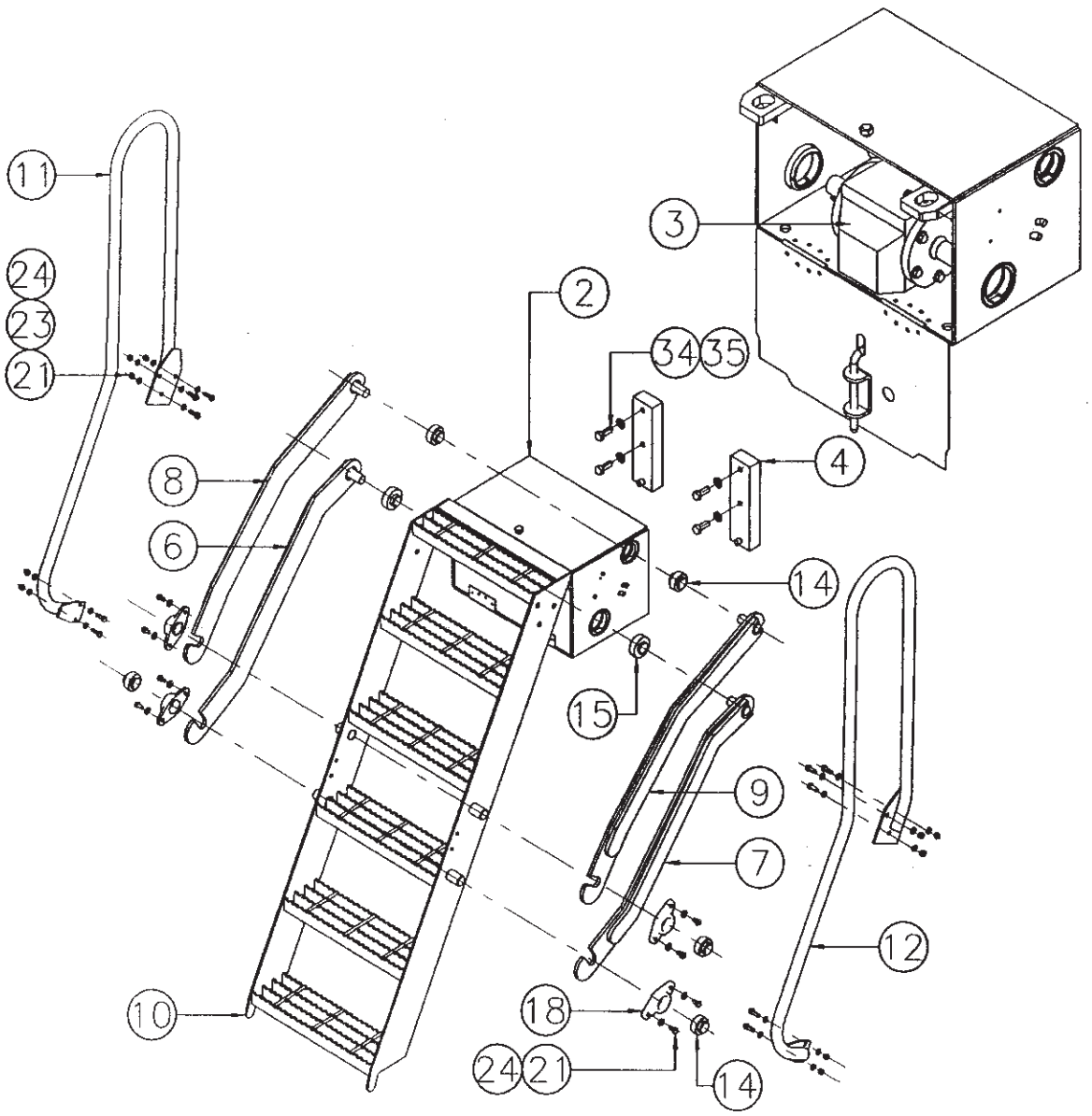
0	OFF
9	OFF
8	OFF
7	OFF
6	OFF
5	ON
4	ON
3	OFF
2	ON
1	OFF

FOR ORDERING PURPOSES PC BOARD SUPPLIED COMPLETE WITH ENCLOSURE (PART NO: 18.140)

HEDWELD ENGINEERING PTY LTD A.C.N. 008 084 852

CONNECTION AND SETTINGS SAFEAWAY PC BOARD ACCESS

CHK'D	SCALE	DWN	DATE		REV
	N.T.S.	B.A.M	24/4/96	70-0149A	A



REV	DESCRIPTION	DWN	DATE

HEDWELD ENGINEERING PTY LTD
A.C.N. 003 024 833

0 10 20 30 40 50 100
GRAPHIC SCALE (mm)
METRIC

SCALE	CHK'D	DWN	DATE	DRAWING NO
1:10		DPW	7/2/01	AC151-00-03

SAFEAWAY
MODEL – C
EXPLODED VIEW

VL7

ASSEMBLY: MODEL 'C' 6FT SAFE-AWAY ACCESS LADDER 37.169

244mm STEP

ITEM NO.	DRG NO.	PART NO.	DESCRIPTION	QTY	CHECK LIST
			SAFE-AWAY LADDER ASSEMBLY GROUP		
A1		**37.169**	*** 6FT x 244 SAFEAWAY LADDER ASSEMBLY COMPLETE ***	**1**	☐
A2	AC073-1	37.008	LADDER BOX	1	☐
A3		25.039	ACTUATOR (ONLY)	1	☐
A4	AC005-1	37.021	MOUNTING PAD	2	☐
A5	AC 1007	**37.153**	**SAFEAWAY 6FT ARM SET**	**1**	☐
A6	AC 1007	37.004	L/H DRIVE ARM	1	
A7	AC 1007	37.005	R/H DRIVE ARM	1	
A8	AC 1007	37.006	L/H IDLER ARM	1	
A9	AC 1007	37.007	R/H IDLER ARM	1	
A10	AC 1007	37.312	LADDER 244mm Step	1	☐
A11	*A4 1002*	*37.068*	*L/H HANDRAIL BENT TYPE F 6FT (See Below For Straight Option)*	*1*	☐
A12	*A4 1002*	*37.069*	*R/H HANDRAIL BENT TYPE F 6FT (See Below For Straight Option)*	*1*	☐
A13		**16.999**	**BEARING KIT SUB TOTAL**	**1**	☐
A14		16.002	UB 205 BEARING	6	
A15		16.005	UB 206 BEARING	2	
A16		16.012	52 MST PRESSED BEARING FLANGES	4	
A17		16.009	62 MST PRESSED BEARING FLANGES	4	
A18		16.010	FL 205 CAST BEARING HOUSING	4	
A19		37.022	DRIVE ARM STOP BLOCK	2	☐
A20		9.503	1/4" x 1/4" GRUB SCREW	4	☐
A21		9.603	1-1/4" x 3/8" ZINC BOLTS	22	☐
A22		9.017	1" x 3/8" ZINC BOLTS	8	☐
A23		9.742	3/8" NYLOC NUTS	14	☐
A24		9.702	3/8" H.T. WASHERS	40	☐
A25		9.602	1" x 5/16" ZINC BOLTS	4	☐
A26		9.741	5/16" NYLOC NUTS	4	☐
A27		9.701	5/16" H.T. WASHERS	8	☐
A28		1.802	5/16" MAKE A KEY (150MM)	1	☐
A29		9.601	1" x 1/4" ZINC BOLTS	2	☐
A30		9.097	1/2" x 1/4" BLACK BOLTS	2	☐
A31		9.700	1/4" FLAT WASHERS	6	☐
A32		9.740	1/4" NYLOC NUTS	2	☐
A33		9.807	3/4" x 3/8" SOCKET HD ALLEN BOLTS	4	☐
A34		9.800	1" x 8-32 HCS ALLEN BOLTS	2	☐
A35		9.048	1-1/4" x 5/8" BOLTS	4	☐
A36		9.705	5/8" H.T. WASHERS	4	☐
A37		18.174	LADDER BOX HARNESS MODEL C	1	☐
A38		37.065	SAFEAWAY REMOTE BOXES	2	☐
A39		37.010	SAFE-AWAY LABEL	1	☐
A40		37.011	SAFE-AWAY MANUAL RELEASE LABEL	1	☐
A41		37.062	CAUTION-STAND CLEAR LABEL	1	☐

A45		37.063	DANGER - FAILURE TO READ AND FOLLOW	1	☐
A46		37.061	DANGER - ELECTROCUTION HAZARD	1	☐
A47		37.064	NOTICE - SAFE-AWAY STANDARDS LABEL	1	☐
A48		37.051	L/H ADJUSTING COUPLING	1	☐
A49		37.053	R/H COUPLING	1	☐

SAFE-AWAY S/S CONTROL CABINET GROUP

B1		**37.083**	*** NEW TYPE POWER PACK ASSEMBLY ***	**1**	☐
B2	AC001-10	37.066	ALUMINIUM P.C. BOARD MOUNTING PLATE	1	☐
B3		37.090	S.S. P/PACK CABINET	1	☐
B4		18.028	BATTERY ISOLATOR	1	☐
B5		25.006	POWER PACK (NO TANK)	1	☐
B6		25.500	MANIFOLD, VALVING & DCV	1	☐
B7		20.802	P/PACK HYD TANK	1	☐
B8		25.108	PRESURE SWITCH	1	☐
B9		37.080	HOSING & FITTINGS (CABINET)	1	☐
B10		18.140	P.C. CONTROL BOARD IN ENCLOSURE	1	☐
B11		25.032	ACCUMULATOR	1	☐
B12		18.300	90 AMP CIRCUIT BREAKER	1	☐
B13		18.305	20 AMP CIRCUIT BREAKER	1	☐
B14		18.166	SAFEAWAY S/S CABINET HARNESS	1	☐

EXTERNAL GROUP

C1			"COMPLETE" WIRING HARNESS WITH P.C. BOARD TO SUIT AS PER ORDER NO. _____	1	☐
C2		*25.108*	*HYD PARK BRAKE PRESSURE SWITCH (See Below For Air Option)*	*1*	☐
C3		*25.079*	*HYD PARK BRAKE PRESSURE SWITCH MANIFOLD*	*1*	☐
C3		*20.081*	*HYD PARK BRAKE PRESSURE SWITCH 1/4" BSP TO 7/16" SIC NIPPLE*	*1*	☐
C3		*16.941*	*HYDRAULIC PARK BRAKE PRESSURE SWITCH ORING*	*1*	☐
C3		*20.092*	*HYDRAULIC PARK BRAKE PRESSURE SWITCH 9/16" UNO PLUG*	*1*	☐
C4		37.208	INFILL MOUNTING FRAME BOX (CAT 992) (OPTIONAL)	☐	☐
C5		37.065	UP/DOWN SAFEAWAY REMOTE MOUNTING BOX	☐	☐
C6			HYDRAULIC HOSE KIT TO SUIT AS PER ORDER NO. _____	☐	☐

OPTIONAL

D1		*37.069*	*R/H HANDRAIL STRAIGHT*	☐	☐
D2		*37.068*	*L/H HANDRAIL STRAIGHT*	☐	☐
D3		*25.242*	*AIR PARK BRAKE PRESSURE SWITCH*	☐	☐
D4		*20.028*	*AIR PARK BRAKE PRESSURE SWITCH 1/4 BSPT TEE F,F,F*	☐	☐
D5		*20.032*	*AIR PARK BRAKE PRESSURE SWITCH 1/4" BSPT NIPPLE*	☐	☐

J/N: _____

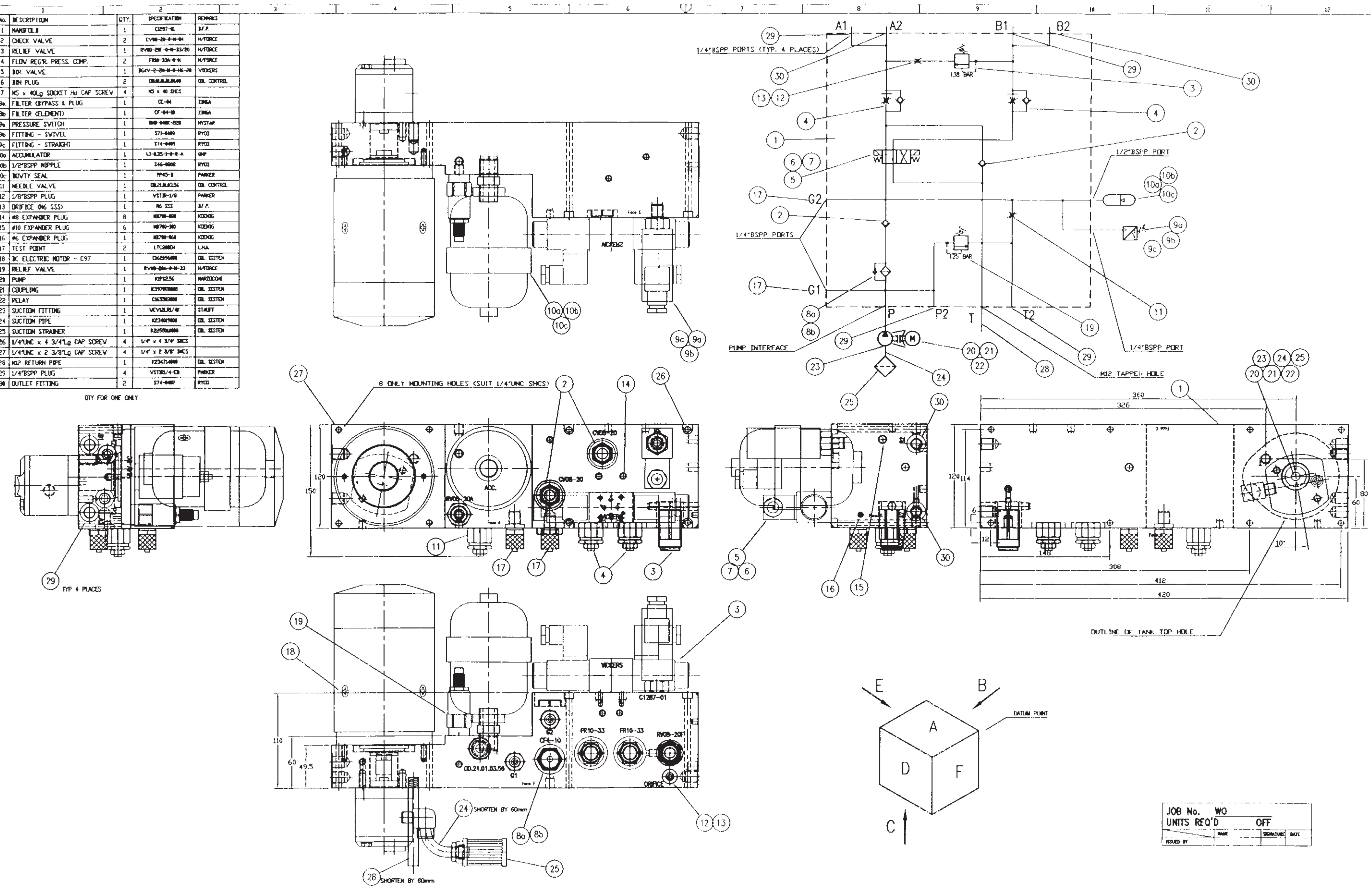
O/N: _____

Signed By: _____

* *INDICATES COMPLETE UNIT OR ASSEMBLY CONTAINING ALL THE PARTS LISTED IN THE GROUP DIRECTLY BELOW*

No.	DESCRIPTION	QTY.	SPECIFICATION	REMARKS
1	MANIFOLD	1	C1287-01	D.F.P.
2	CHECK VALVE	2	CV08-20-0-N-04	H/FORCE
3	RELIEF VALVE	1	RV08-20F-0-N-23/20	H/FORCE
4	FLOW REG'R. PRESS. COMP.	2	FR10-33A-0-N	H/FORCE
5	DIR. VALVE	1	DG4V-2-2N-M-U-H6-20	VICKERS
6	DIN PLUG	2	00.00.00.00.00	OIL CONTROL
7	M5 x 40Lg SOCKET Hd CAP SCREW	4	M5 x 40 SHCS	
8a	FILTER (BYPASS & PLUG	1	CE-04	ZINGA
8b	FILTER (ELEMENT)	1	CF-04-10	ZINGA
9a	PRESSURE SWITCH	1	1000-040K-02B	HYSTAP
9b	FITTING - SWIVEL	1	S71-0409	RYCO
9c	FITTING - STRAIGHT	1	S74-0409	RYCO
10a	ACCUMULATOR	1	L1-0.25-1-0-0-A	GHP
10b	1/2"BSPP NIPPLE	1	S46-0808	RYCO
10c	DOWTY SEAL	1	PP45-8	PARKER
11	NEEDLE VALVE	1	00.21.01.03.56	OIL CONTROL
12	1/8"BSPP PLUG	1	VSTIR-1/8	PARKER
13	ORIFICE (M6 SSS)	1	M6 SSS	D.F.P.
14	#8 EXPANDER PLUG	8	MB700-080	KOENIG
15	#10 EXPANDER PLUG	6	MB700-100	KOENIG
16	#6 EXPANDER PLUG	1	MB700-060	KOENIG
17	TEST POINT	2	LTC20004	LHA
18	DC ELECTRIC MOTOR - C97	1	CK6200640	OIL SISTEM
19	RELIEF VALVE	1	RV08-20A-0-N-33	H/FORCE
20	PUMP	1	KP12.56	MARZOCCHI
21	COUPLING	1	K35700000	OIL SISTEM
22	RELAY	1	CK5503000	OIL SISTEM
23	SUCTION FITTING	1	WEV12LR1/4X	STAUFF
24	SUCTION PIPE	1	K234019000	OIL SISTEM
25	SUCTION STRAINER	1	K22550A000	OIL SISTEM
26	1/4"UNC x 4 3/4"Lg CAP SCREW	4	1/4" x 4 3/4" SHCS	
27	1/4"UNC x 2 3/8"Lg CAP SCREW	4	1/4" x 2 3/8" SHCS	
28	M12 RETURN PIPE	1	K23471400	OIL SISTEM
29	1/4"BSPP PLUG	4	VSTIR1/4-ED	PARKER
30	OUTLET FITTING	2	S74-0407	RYCO

QTY FOR ONE ONLY



JOB No. WO

UNITS REQ'D OFF

REFER DWG. C1287-01 FOR MANIFOLD DETAILS

TOLERANCES
FAB & WELDING
0 - 1000mm ±1
1000 - 3000mm ±2
ABOVE 3000mm ±3
DRILLING & MACHINING ±0.3
UNLESS NOTED OTHERWISE

METRIC - DO NOT SCALE
DRAFTING STANDARD
AS 1100

WHEDWELD ENGINEERING PTY LTD

CLIENT
SYSTEM
MACHINE
DWG.

C1287-02

A1

Safe-Away® Vehicle Access System

OPERATIONAL DOs AND DON'Ts

DOs :

- Do hold onto the handrail when using the ladder.
- Do face the ladder when ascending or descending.
- Do check the ladder before use to ensure that the unit has not been accidentally damaged.
- Do report defects immediately.
- Do ensure that the ladder is in the fully down position before boarding.
- Do keep hands and fingers away from pinch points during the raising and lowering of the ladder.
- Do check that there are no personnel on the ladder, or in a position where their safety is placed at risk, when lowering or raising the ladder.
- Do keep the ladder clean and free of moisture, grease and oil.
- Do become familiar with the indications and alarms as contained in this manual.
- Do become familiar with the operation of the ladder system.
- Do become familiar with the system functions applicable to your vehicle's ladder system.
- Do ensure the park brake has been set before attempting to lower the ladder.
- Do use the toggle switch, instead of the park brake, to raise the ladder.
- Do contact the manufacturer if problems persist.

DON'Ts :

- Don't run or jump on the ladder.
- Don't ride on the ladder while it is in the process of being raised or lowered.
- Don't restore power to the ladder control system unless you know the park brake has been set.
- Don't ride on the ladder while the vehicle is in motion.
- Don't use the electrical harness or hydraulic lines as a step.
- Don't use the park brake to intentionally raise the ladder - use the toggle switch.
- Don't board the ladder until it is in the fully down position.
- Don't operate the vehicle unless you are certain the ladder is in the UP position.
- Don't use the ladder, unless in an emergency, when the vehicle's battery supply is low.
- Don't alter any settings on the printed circuit board without authorisation.

---oooOOOooo---

LeTOURNEAU SAFE-AWAY® MODEL 'C'
VEHICLE ACCESS SYSTEM

HEDWELD ENGINEERING PTY LTD
4 Russell Road, Mt. Thorley,
Via Singleton. NSW. 2330.
Australia.

Telephone +61 02 6574 6563 Fax +61 02 6574 6750.

Website: www.hedweld.com.au
Email: enquiries@hedweld.com.au

 PRINTED APRIL 2001

POWER STEP

Operator & Maintenance Access Systems

POWER STEP MANUALS

CONTENTS:
INSTALLATION MANUAL
INSPECTION & OPERATING INSTRUCTIONS
PARTS MANUAL
APPLICATION: LeTourneau l1850
Model No. RL1001

READ CAREFULLY BEFORE INSTALLATION AND OPERATION OF THE POWER STEP

POWER STEP INC.
P.O. Box 3005
Duluth, MN 55803
Phone: (218) 525-3758
Fax: (218) 525-1168

POWER STEP INSTALLATION – LeTourneau L1850
Model No. RL1001

INSTALLATION NEEDS

1. Boom truck or fork truck - 1000 lb. capacity.

2. Welding truck.

3. Two personnel - welder and mechanic.

4. 3 1/2 quarts of Dexron II or equivalent hydraulic oil. For cold weather environments, a broad range synthetic oil is recommended.

MOUNTING & ASSEMBLY

1. Remove the existing ladder assembly including power unit and related components. Review Figures 1 through 5 to see where power step components will be mounted. Refer to Figure 2 for assembly item numbers referred to below.

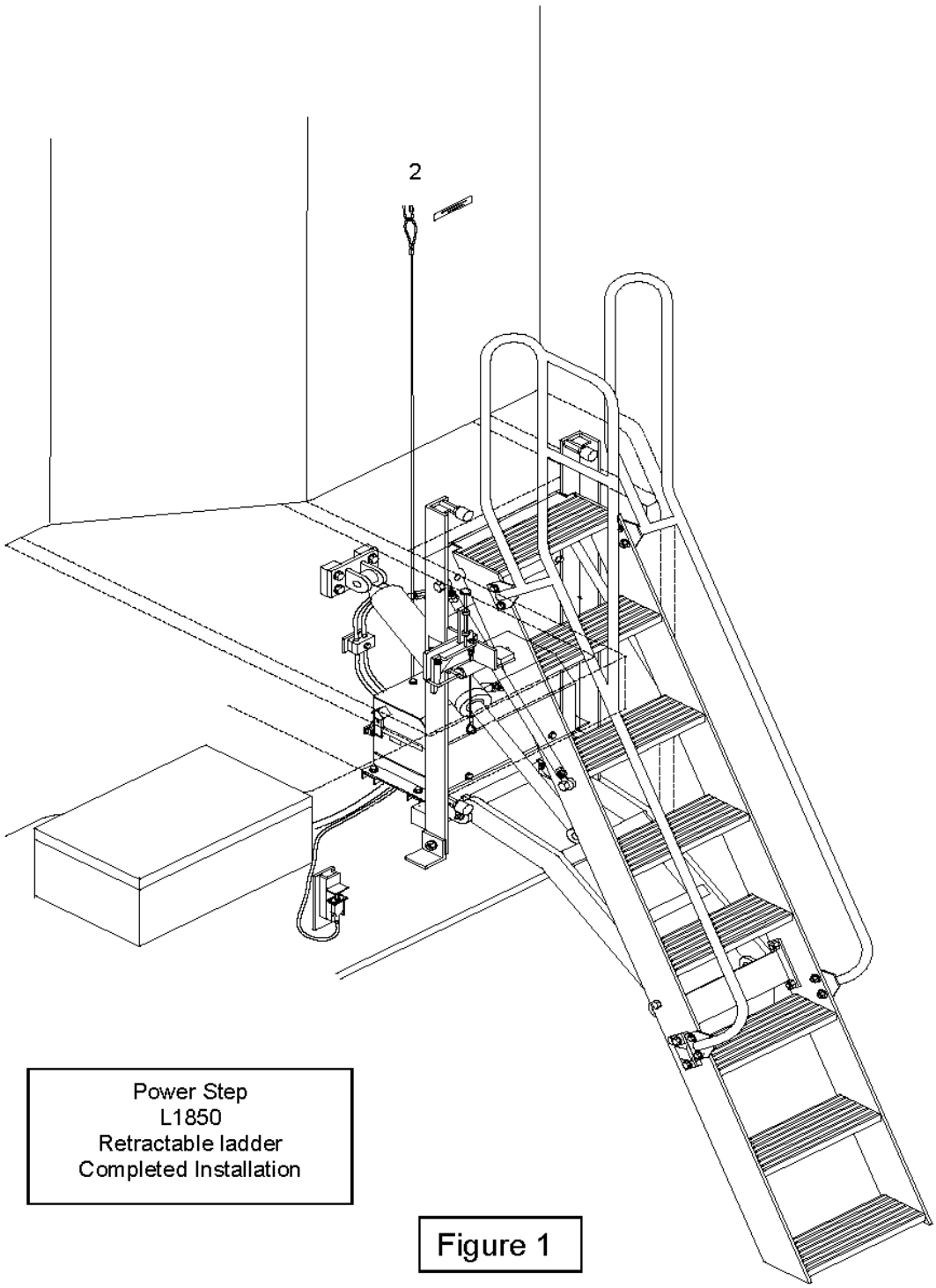
2. Lift ladder assembly (1) into place on existing mounting pins. Strap ladder against mounting bracket stops tightly to make assembly easier to handle (as shown in figure 3). Install 5/8 –11 x 1 ½ bolts (2) in mounting bracket.

3. Level assembly with machine and check for plumb with side of machine. Install lower mounting angles at bottom of mounting bracket legs using 5/8 –11 x 2 bolts, washers, and locknuts. Make angles flush with floor. Tack, then weld angles to floor. Tighten all mounting bolts.

4. Attach cylinder (10), to cylinder mounting block (11), using cylinder pin and cotter pin. Attach rod end of cylinder to ladder lift frame using pin and cotter pin. Extend cylinder rod approximately 3/4" from the fully closed position. There should be about ¼" clearace between the cylinder cap and lift frame (Figure 5). Place rear cylinder mount blocks up against back wall. Grind spot clean for welding. With cylinder properly aligned, tack blocks, check cylinder clearance, then weld to frame wall.

4. Carefully lower ladder to the full down position. Remove lifting sling.

5. Install right and left railings (3 and 4) using ½-13 x 1 ½ bolts, flat washers and nuts.



Power Step
L1850
Retractable ladder
Completed Installation

Figure 1

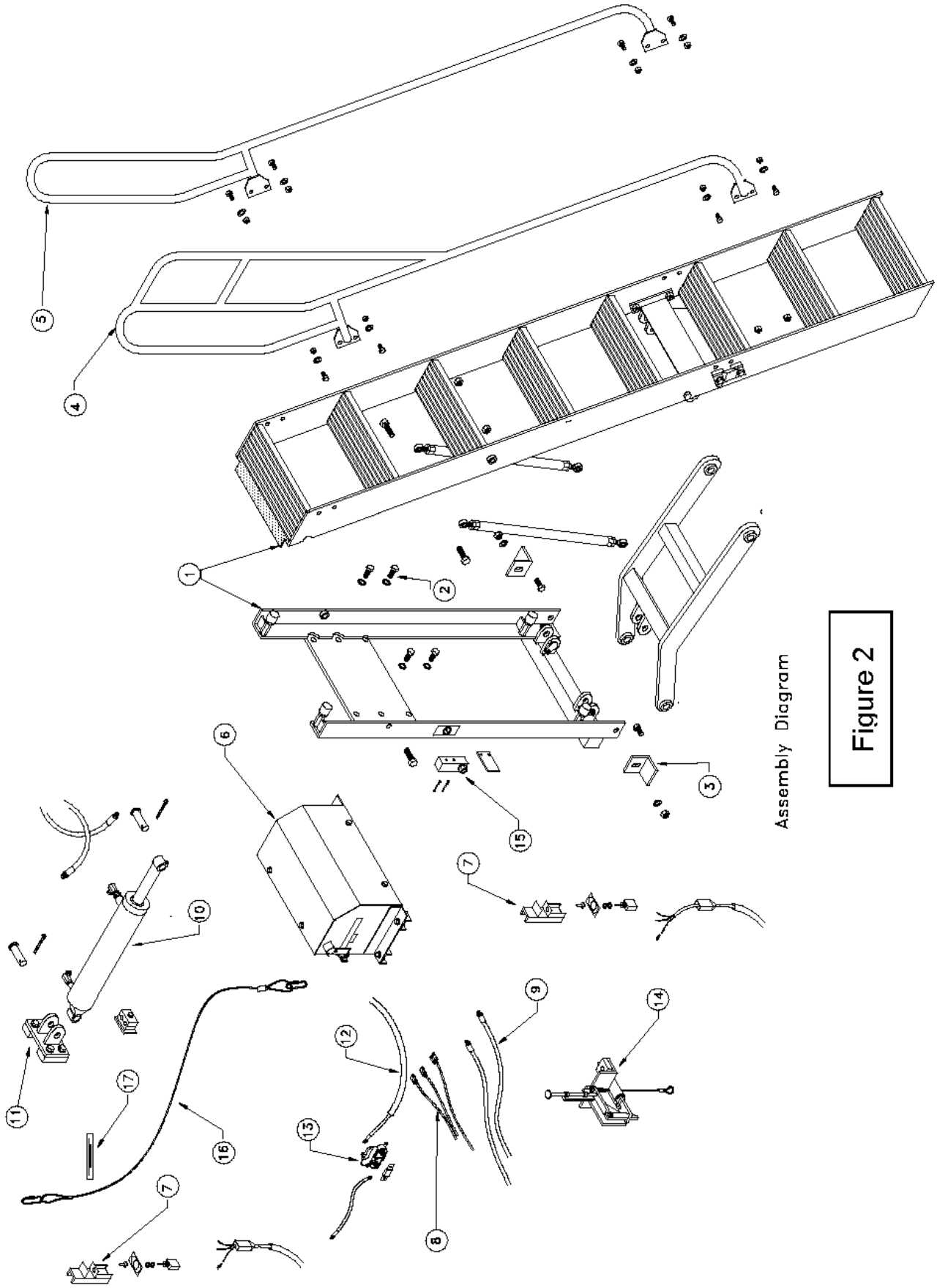


Figure 2

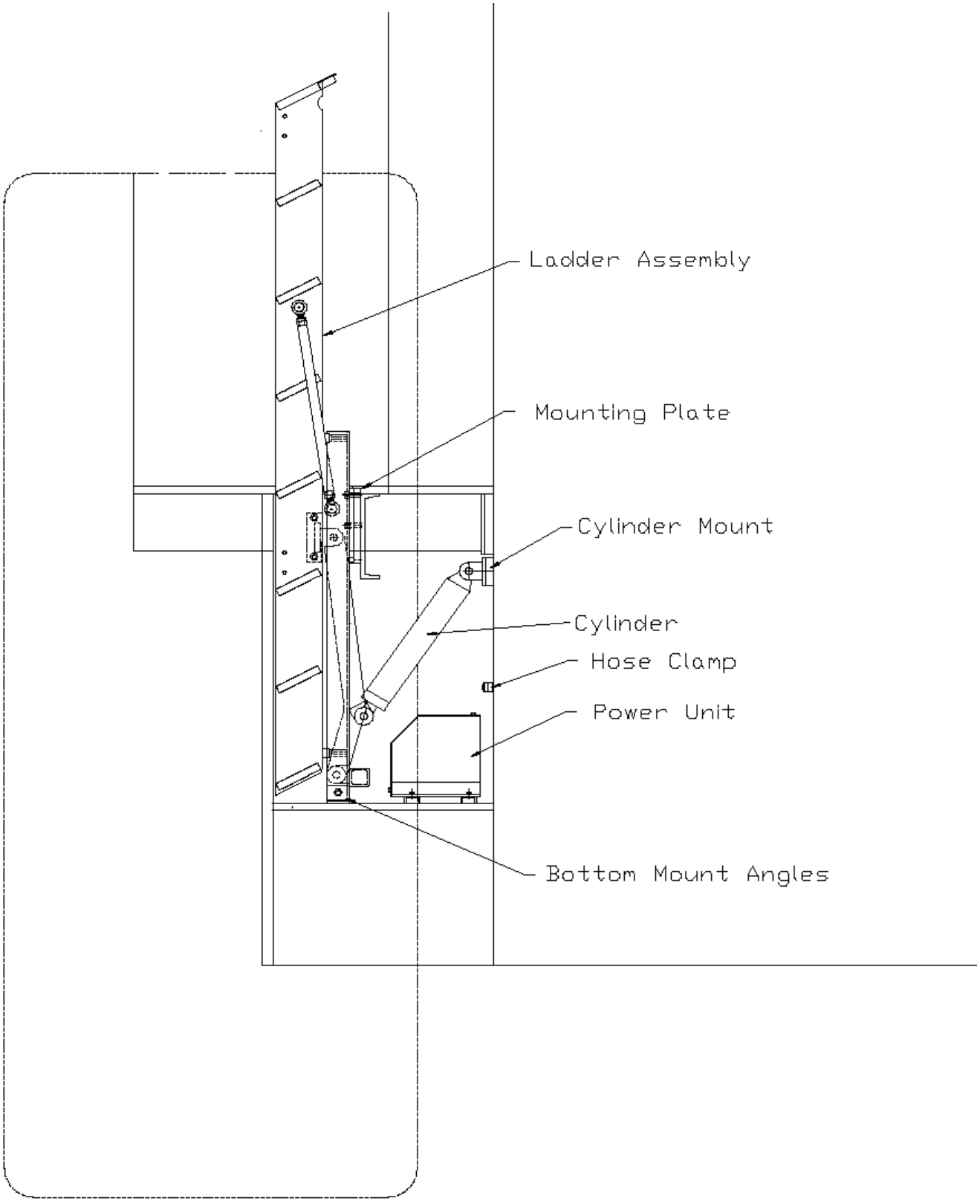


Figure 3

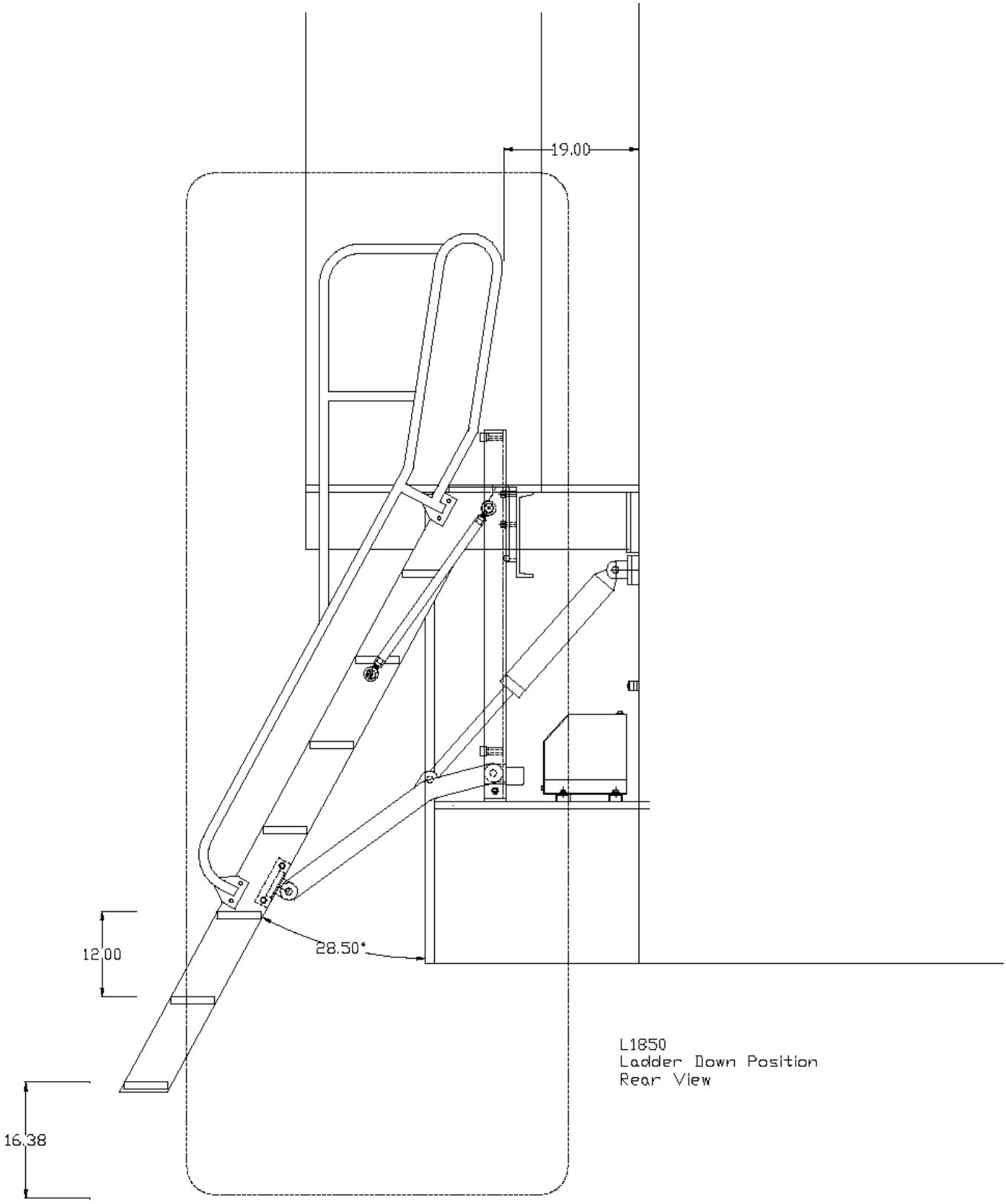


Figure 4

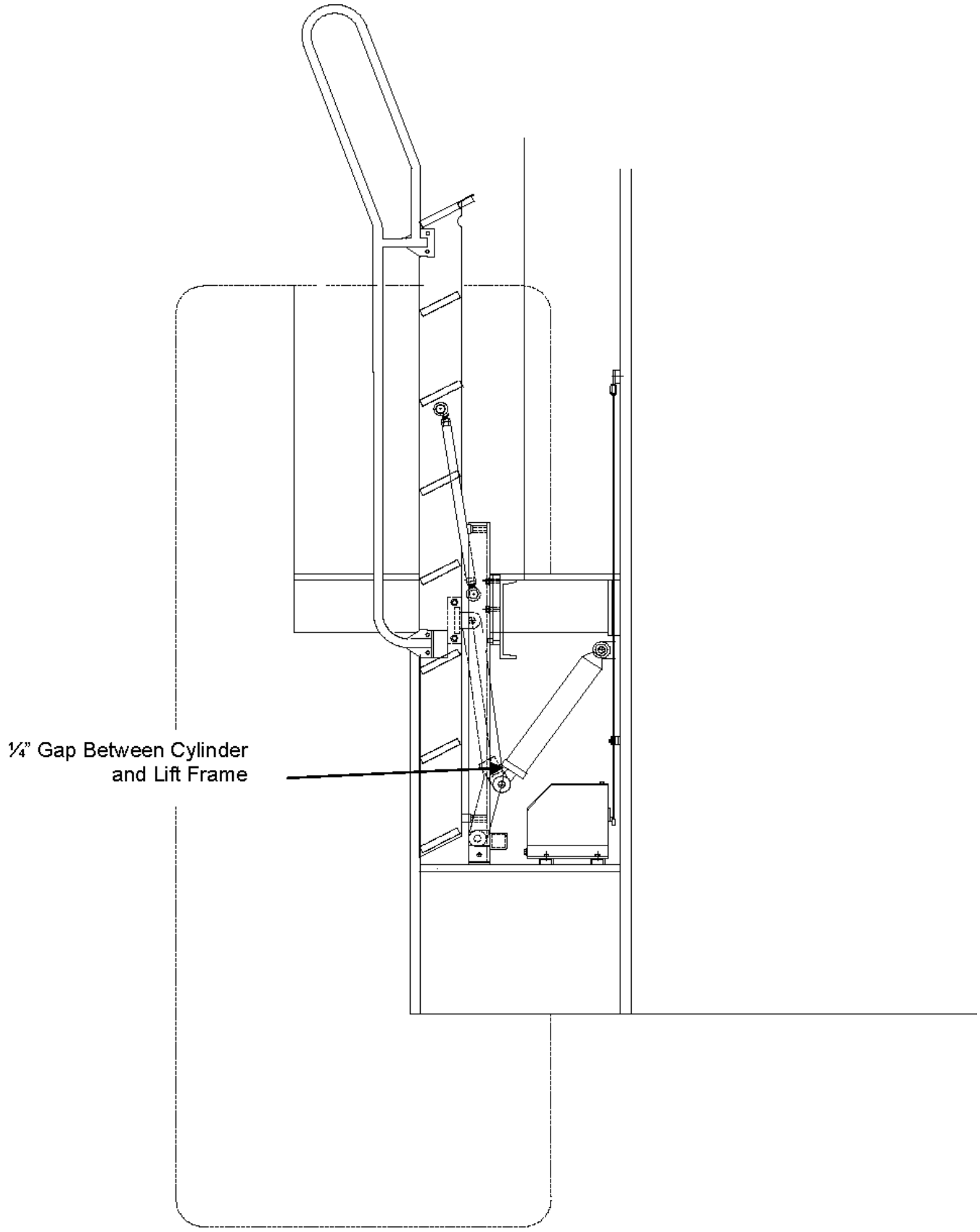


Figure 5

6. Set power unit into position behind ladder assembly, centered, with approximately 2" clearance between box and back wall. Weld mounting clips to floor.

7. Mount switch brackets (7). Mount one on upper rail upright (figure 10). Mount the other on the lower bumper plate near the batter box. Mount in protected locations where they will not be inadvertently actuated.

8. Open motor enclosure. Route the three wire harness connectors (8) under the enclosure and connect to control box connectors in the power unit (figure 6). Route the two 16/3 (3 wire connector) control wires to the two switch bracket locations. Tighten and clamp wires, then cut to length at switch brackets. Install switches as shown in Figure 7. Tie control wire to rail upright. Install clamps where necessary.

9. Route hydraulic hoses (9) between the power unit and cylinder. Connect hoses. For proper operation, the rod end of the cylinder hose is connected to the nearest fitting on the power unit (Figure 6).

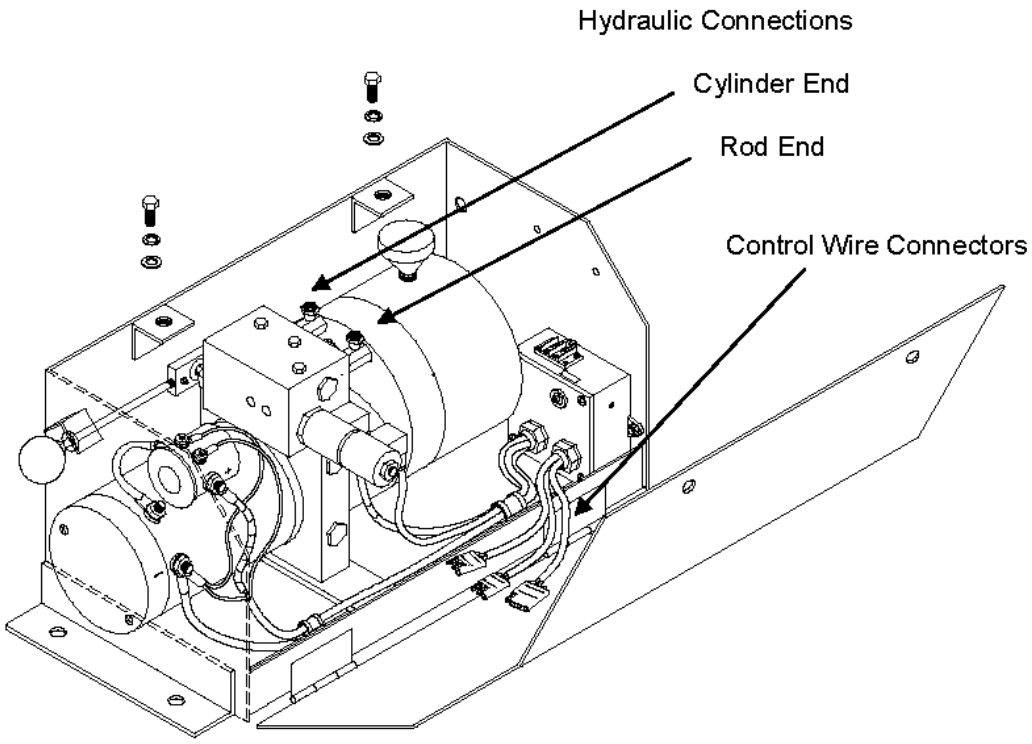


Figure 6

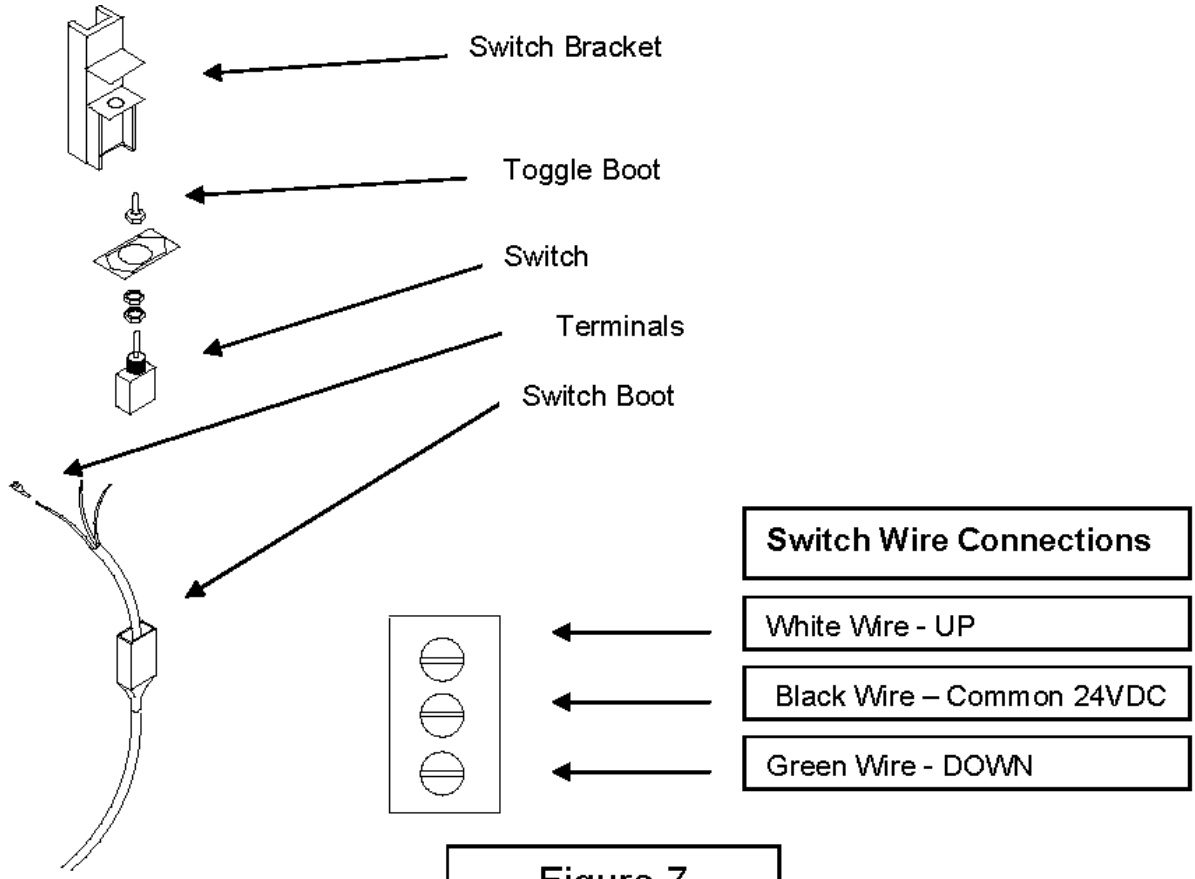


Figure 7

10. Attach end of battery cable (12) to power unit as shown in Figure 8.

11. Route the positive +24VDC battery cable from the power unit to the battery. Install the flexible conduit under the battery box opening. Install the fuse holder (13) inside the battery box (figure 9). Use the short cable to connect the fuse to the battery. Fill power unit with hydraulic fluid.

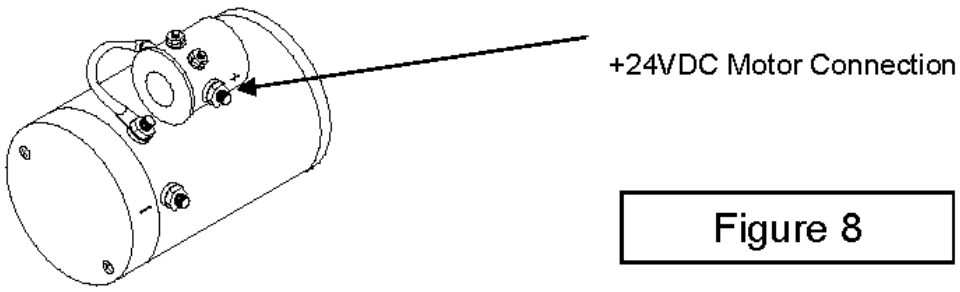


Figure 8

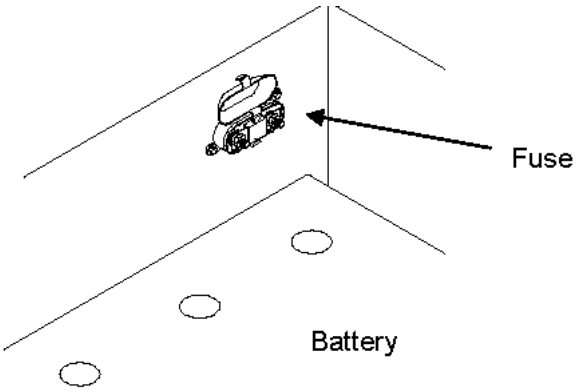


Figure 9

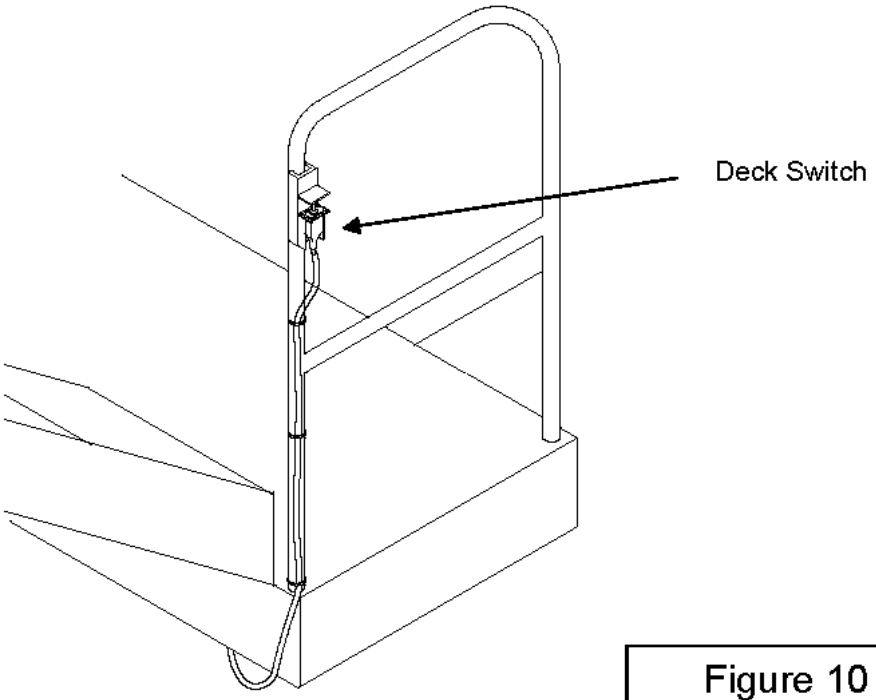


Figure 10

RUNNING AND ADJUSTMENT

1. Using one of the control switches, run step into the "up" position. Cycle several times to remove any possible air from the system. Adjust side turnbuckles if necessary for alignment and smooth operation.

2. Run ladder to the upper stop. Position the latch release assembly (14) under side channel so latch plate slides past and depresses pin during operation. Tack latch release assembly blocks in place on channel. Notch floor bars to allow release pedal to extend through floor. Test latch release by operating ladder, then weld blocks.

3. With ladder fully latched, mount limit switch and limit switch bracket (13) on the rear of the ladder bracket upright angle. Route the 16/2 (4 wire connector) wire to limit switch. Connect white to common and black to NC as shown in wiring diagram. The limit switch should be within ¼" (6 mm) of the step when in the "UP" position for proper sensing. Refer to wiring diagram. When in the up position, the outer green wire terminal in the control box will provide a ground signal to the machine (figure 11).

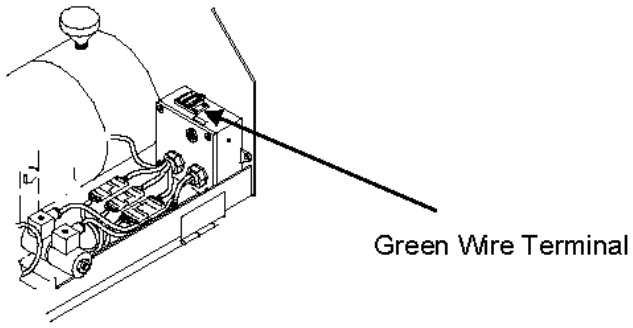


Figure 11

4. Connect valve release cable (16) to release lever on back of power unit. Run cable vertically along wall so it is accessible at the upper deck level. With cable semi loose in position, weld link to upper wall. Put label on wall near upper cable. Test cable for proper operation, then reset valve knob.

POWER STEP - MAINTENANCE INSTRUCTIONS - L1850

LUBRICATION:

Following installation, lubricate all components prior to use. Recommended lubrication frequency thereafter:

Lift Arm Pins- Grease Biweekly
Cylinder Pins-Grease Biweekly
Lock Pin-Grease or oil as necessary

INSPECTION AND MAINTENANCE:

OBSERVE AND CHECK THE FOLLOWING PRIOR TO USE AND DURING MAINTENANCE -

1. Ladder pivot and cylinder pins securely in place and not worn.
2. Hydraulic system for leakage.
3. Handrails in working order.
4. Step latch functional.
5. Mounting bolts in place and tight.
6. Stair treads in place and tight.
7. Check for other physical damage to components.

Check hydraulic fluid level if any leakage has occurred. Fill with Dexron II or equivalent ATF hydraulic oil.

CAUTION:

When maintaining hydraulic system, always check to see that restricted orifice fittings at the cylinder are in place before operation. If replacement is needed, refer to parts list for proper size and part number. Maintenance of the hydraulic system should be performed **ONLY** with the platform in the lowered position. Hydraulic system pressure relief valve within power unit is factory preset at 2000 psi. The 4-way valve package pressure relief is set at 600 psi. This is the system operating pressure.

WARNING - DANGER:

Forcibly raising the power step ladder by means other than under its own hydraulic power (crane, winch, etc.) will create excessive pressure in the cylinder and possibly cause pressure to be stored in the cylinder in the latched position, or caused air to enter the hydraulic system, through the cylinder. This practice will defeat the inherent safety features of the hydraulic system and create a dangerous situation for personnel. This practice should be avoided, if at all possible, to maintain safe operation of, or potential damage to the ladder. In those instances where this cannot be avoided, please follow the guidelines listed below to put the power step back into service. If the ladder has been raised by alternate means, and is in the latched position, THE LADDER SHOULD BE PROPERLY CHAINED AND TAGGED AND **MUST NOT BE USED BY PERSONNEL** UNTIL IT HAS BEEN LOWERERED BY ALTERNATE MEANS AND ALL AIR HAS BEEN PURGED FROM THE HYDRAULIC SYSTEM. The following procedure should be followed in resetting the system:

1) Securely attach hoist or crane to raised ladder.
2) Pull valve release knob on power unit.
3) Lower ladder gently to fully down position.
4) Reset knob on power unit to the closed position.
5) Test system.

Power Step, Inc.
L1850 Powered Retractable Ladder

Inspection & Operating Instructions

INSPECTION:

OBSERVE AND CHECK THE FOLLOWING PRIOR TO USE AND DURING MAINTENANCE -

1. Ladder pivot and cylinder pins securely in place and not worn.
2. Hydraulic system for leakage.
3. Handrails in working order.
4. Step latch functional.
5. Mounting bolts in place and tight.
6. Stair treads in place and tight.
7. Check for other physical damage to components.

OPERATING PROCEDURES:

To Lower Ladder -

1. Release latch by actuating lever with hand or foot.
2. Move switch to the "down" position. Hold until ladder has fully descended to the stop position.
3. If the ladder has settled onto the latch, raise to upper stop before releasing latch.

To Raise Ladder -

Move switch to the "up" position. Hold until ladder contacts the upper stop. The ladder will latch automatically. Leave pressure on stop.

Loss of Battery Power -
Back-up Bleed-down Valve Use

If electrical power has been lost to the ladder, it can lowered by using the manual bleed-down valve located on the end of the power unit enclosure.

1. To lower, release latch, then pull valve release knob.
2. From the top deck level, release latch, then pull release cord by wall.
3. If step has settled on latch, manually pull step towards you, then release latch. Step will bleed down under gravity.
4. Power must be restored and valve must be reset to the closed position (push in knob) prior to raising the ladder.

PRECAUTIONS:

1. Communicate with machine operator prior to boarding a running machine.
2. When operating, make sure area of ladder motion is clear of personnel and obstructions.

3. Keep ladder and deck clear of debris and other tripping hazards.
4. Keep clear of moving parts during operation.
5. Always run ladder to the full “down” position before use.
6. Never attempt to operate while someone is on or in the way of the ladder.
7. Use handrails at all times.
8. Secure ladder in latched position prior to moving machine.
9. Always face ladder when going up or down.

POWER STEP

PARTS MANUAL
LeTourneau L1850
Model No. TS7401

POWER STEP INC.
P.O. Box 3005
Duluth, MN 55803
Phone: (218) 525-3758
Fax: (218) 525-1168

2/3/06

POWER STEP

PARTS LIST

Powered Ladder - L1850

Model No. RL1001

FIGURE 1

Master Parts List

ITEM NO.	DESCRIPTION	QUANTITY
1	Ladder	1
2	Ladder Bracket	1
3	Lift Frame	1
4	Power Unit Module	1
5	Mounting Block	4
6	Lift Plate	1
7	Left Rail, with fill rail	1
7	Left Rail, without fill rail	1
8	Right Rail	1
9	Lower Mount Angle	2
10	Bolt, 5/8 - 11 x 2 , Grd. 8	2
11	Nut, Lock, 5/8, Grd. 8	2
12	Washer, Flat 5/8	2
13	Stop Bumper	4
14	Nut, Jam 5/8	4
15	Bolt, 5/8 - 11 x 1 1/2, Grd. 8	12
16	Washer, Lock 5/8	8
17	Turnbuckle Tube	2
18	Rod End, 3/4 -16 RH	1
19	Nut, Jam 3/4 - 16 RH	1
20	Nut, Jam 3/4 -16 LH	1
21	Rod End, 3/4 - 16 LH	1
22	Bolt, 3/4 - 16 x 2 1/2 Grd. 8	4
23	Nut, Lock 3/4-16 Grd. 8	4
24	Bearing, Journal 1"	4
25	Pin, Pivot	4
26	Snap Ring 1"	4
27	Grease Zerk, 1/8 NPT Straight	3
28	Bolt, 3/8 - 24 x 1 1/4 Grd. 8	4
29	Washer, 3/8 Flat	8
30	Nut, Lock 3/8 - 24 Grd. 8	4
31	Bolt, 1/2 -13 x 1 1/2, Grd. 8	8
32	Washer, 1/2" Flat	8
33	Nut, Lock, 1/2 -13, Grd. 8	8
34	Bolt, 1/2 -13 x 1, Grd. 8	4
35	Washer, 1/2 Lock	4
36	Latch Plate	1
37	Bolt, 3/8 - 16 x 1, Grd. 8	6

38	Washer, 3/8 Lock	4
39	Grease Zerk, 1/8 NPT 90 Deg.	2
40	Cylinder	1
41	Pin, Cylinder	2
42	Pin, Cotter 3/16 x 2	2
43	Zerk, Grease, 1/4-28	2
44	Union Adapter 90 deg. 1/4, .078" Orifice	1
45	Reducer, 3/8 x 1/4	1
46	Union Adapter 90 deg. 1/4, .094" Orifice	1
47	Rear Cylinder Mount	1
48	Mounting Block	2
49	Hose, 65"	2
50	Valve Lever Assy.	1
51	Bolt, 1/4-20 x 1, Grd. 8	2
52	Nut, Nylock, 1/4 - 20	3
53	Latch Bracket	1
54	Nut, 3/8 Nylock	1
55	Spring	1
56	Bearing, 3/8	1
57	Washer, 5/16 Flat	1
58	Nut, 5/16 Nylock	1
59	Latch Pull	1
60	Latch Pin	1
61	Latch Push Rod	1
62	Pin, Cotter 1/8 x 1	1
63	Latch Lever	1
64	Mounting Block	2
65	Link	2
66	Pull Cable	1
67	Label - Pull Cable	1
68	Switch, Limit, Proximity	1
69	Bracket, Limit Switch	1
70	Wire, Lower Switch	1
71	Wire, Upper Switch	1
72	Wire, Limit Switch	1
73	Switch	2
74	Decal, Switch	2
75	Boot, Toggle	2
76	Switch Bracket	2
77	Connector, Fork	6
78	Wire Loom,	1
79	Boot, Switch	2
80	Decal, Caution	1
81	Fuse Holder	1
82	Fuse, 250 A	1
83	Cable, Battery 8'	1
84	Cable, Battery 30"	1

85	Conduit, 1/2", 7'	1
86	Cable Lug	1
87	Wire, Machine Control, 16/2, 25'	1
88	Hose Clamp, Double	1
89	Wire Tie - 6 inch	10
90	Wire Tie - 12 inch	5

FIGURE 2

Power Unit Module

Complete Assembly Part No. 80108

ITEM NO.	DESCRIPTION	QUANTITY
1	Power Unit Assy.	1
2	Enclosure	1
3	Control Box Assy.	1
4	Valve Package	1
5	Adapter, Female Swivel 1/4, 90 Deg.	2
6	Bolt, 3/8-16 x 1, Grd. 8	2
7	Washer, 3/8 Lock	4
8	Washer, 3/8 Flat	2
9	Bolt, 3/8-16 x 3/4, Grd. 8	2
10	Bolt, 1/4-20 x 3/4, Grd. 8	2
11	Nut, Nylock, 1/4 - 20	4
12	Washer, 1/4 Flat	2
13	Cable, Ground	1
14	Clamp, Wire, 3/4	1
15	Clamp, Wire, 3/8	1
16	Nut, Nylock 3/8 - 16, Low Profile	2
17	Knob, 1/4	1
18	Rod, Valve Release	1
19	Slide, Valve Release	1
20	Grommet	1
21	Pin, Cotter	1
22	Label	1
23	Label	1

FIGURE 3

Power Unit Components

Complete Assembly Part No. 80012

ITEM NO.	DESCRIPTION	QUANTITY
1	Solenoid Assy.	1
2	Motor 24V	1
3	Cavity Plug	1
4	Check Valve	1
5	O-Ring	1
6	Coupling	1
7	Pump O-Ring Kit	1

8	Inlet Plumbing Kit	1
9	Filter	1
10	Pump Assy.	1
11	Pump Housing Bolt	2
12	Reservoir	1
13	Reservoir Screw	4
14	Breather	1
15	Relief Valve Assy.	1
16	Plug	1

FIGURE 4

Control Box Components

Complete Assembly Part No. 75021

ITEM NO.	DESCRIPTION	QUANTITY
1	Box, Cover & Screws	1
2	Alarm	1
3	Relay	1
4	Breaker, 10A	1
5	Strain Relief	2
6	Terminal Strip	1
7	Screw	2
8	Nut	3
9	Screw	1
10	Connector	2

FIGURE 5

Valve Package Components

Complete Assembly Part No. 65006

ITEM NO.	DESCRIPTION	QUANTITY
1	Valve Body	1
2	4-Way Cartridge Valve	1
3	Relief Valve (600 PSI)	1
4	Release Valve	1
5	O-Ring	2
6	Bolt, 1/4 - 20 x 3	3
7	Washer, Lock 1/4"	3

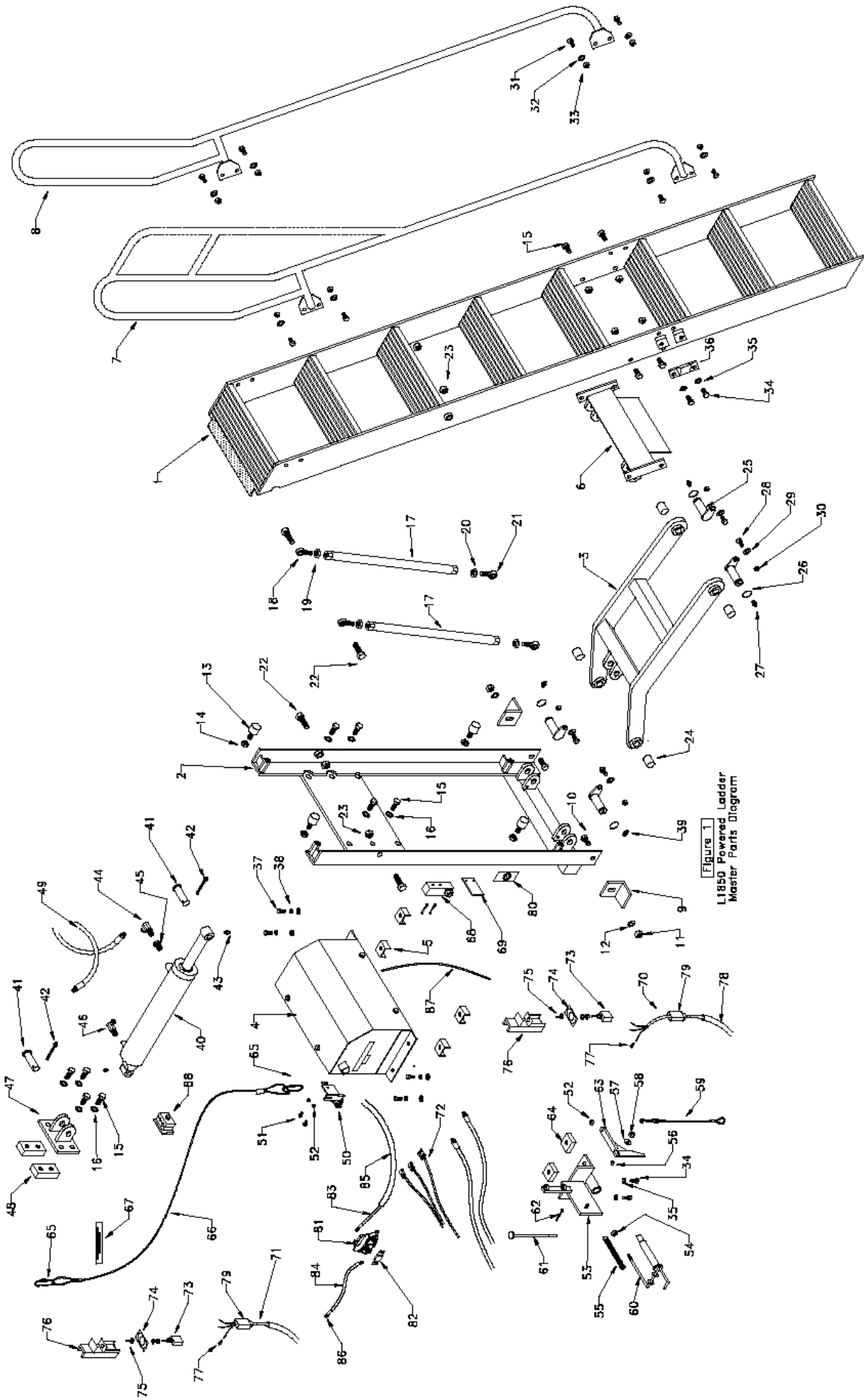


Figure 1
L1850 Powered Ladder
Master Parts Diagram

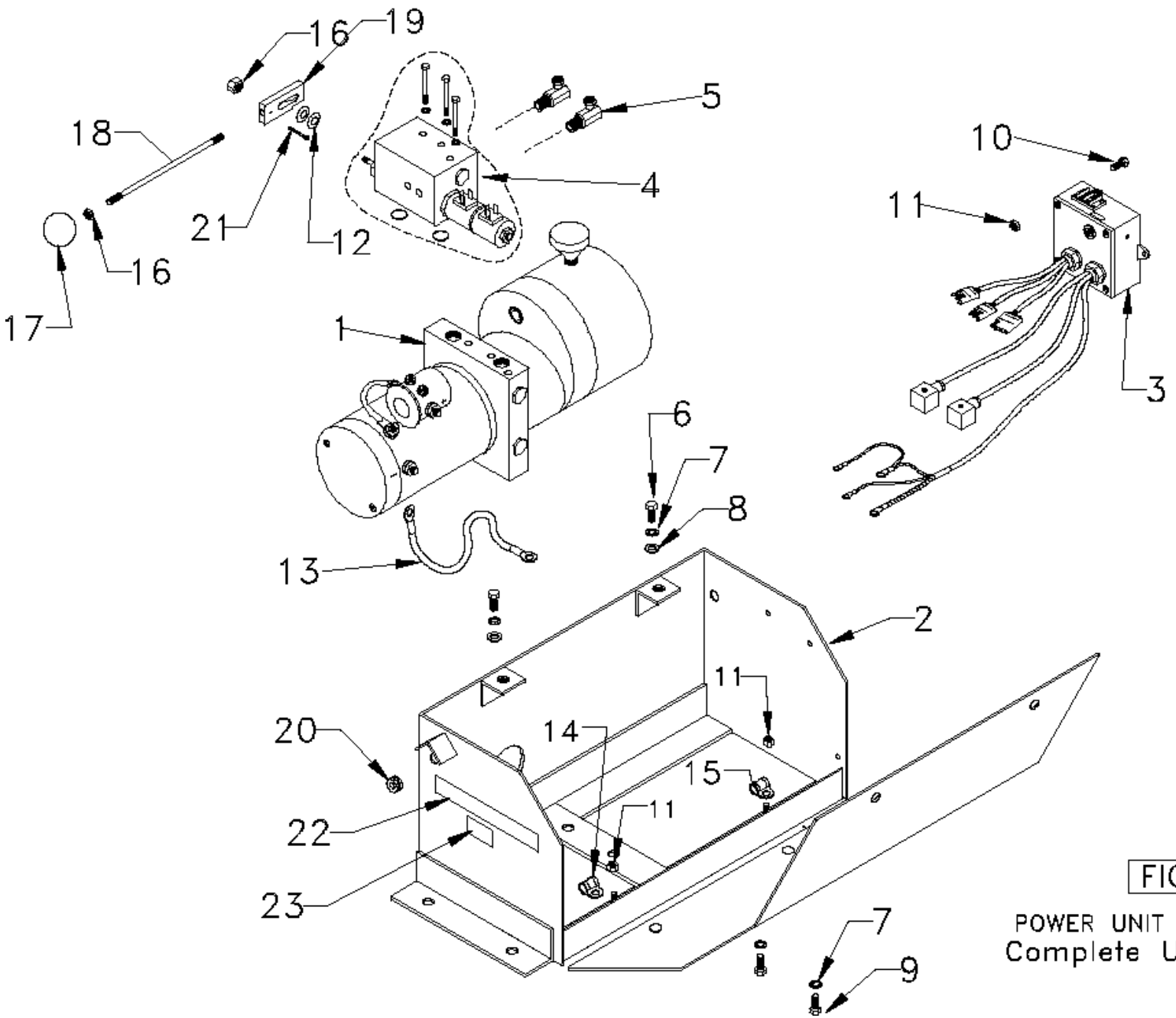


FIGURE 2

POWER UNIT MODULE COMPONENTS
Complete Unit Part No. 80108

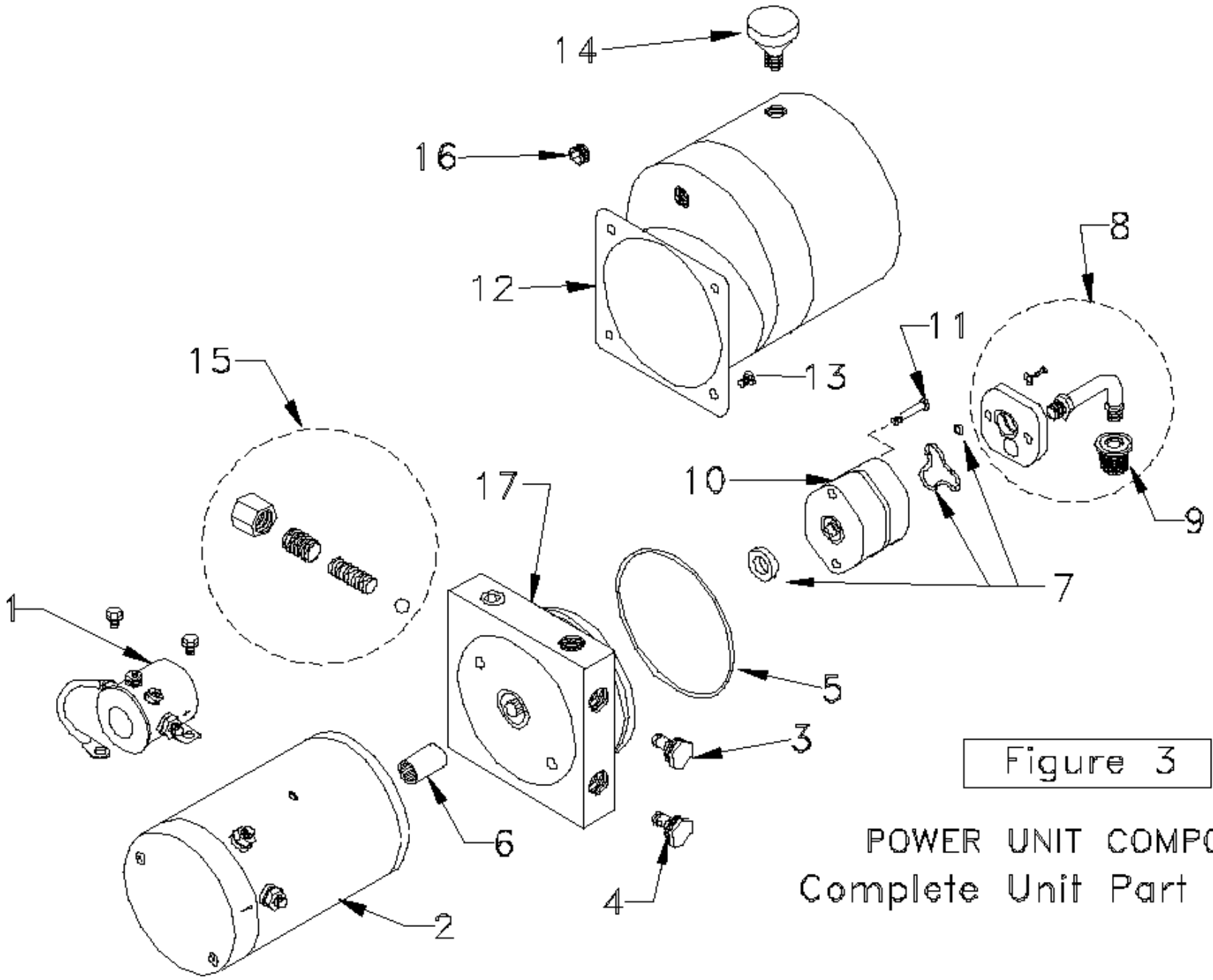


Figure 3

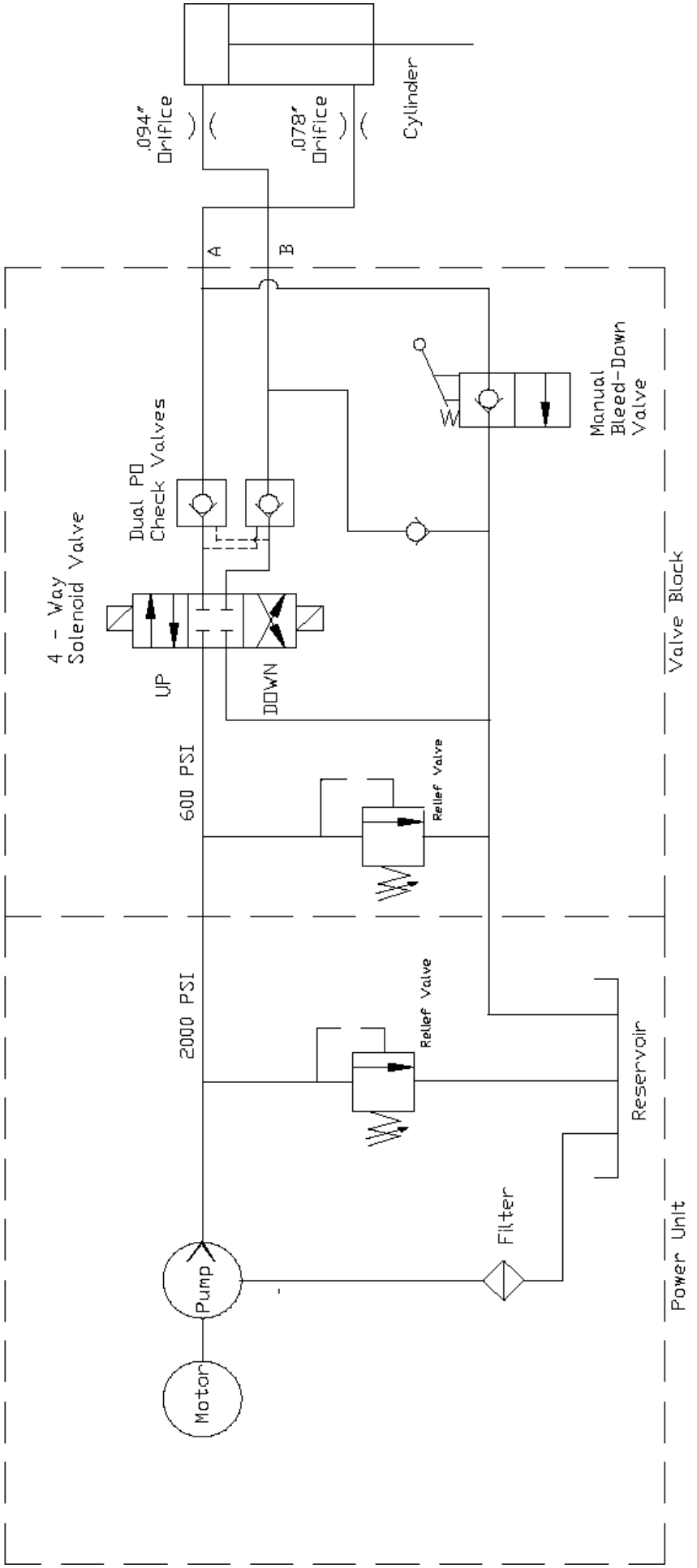
POWER UNIT COMPONENTS
Complete Unit Part No. 80012

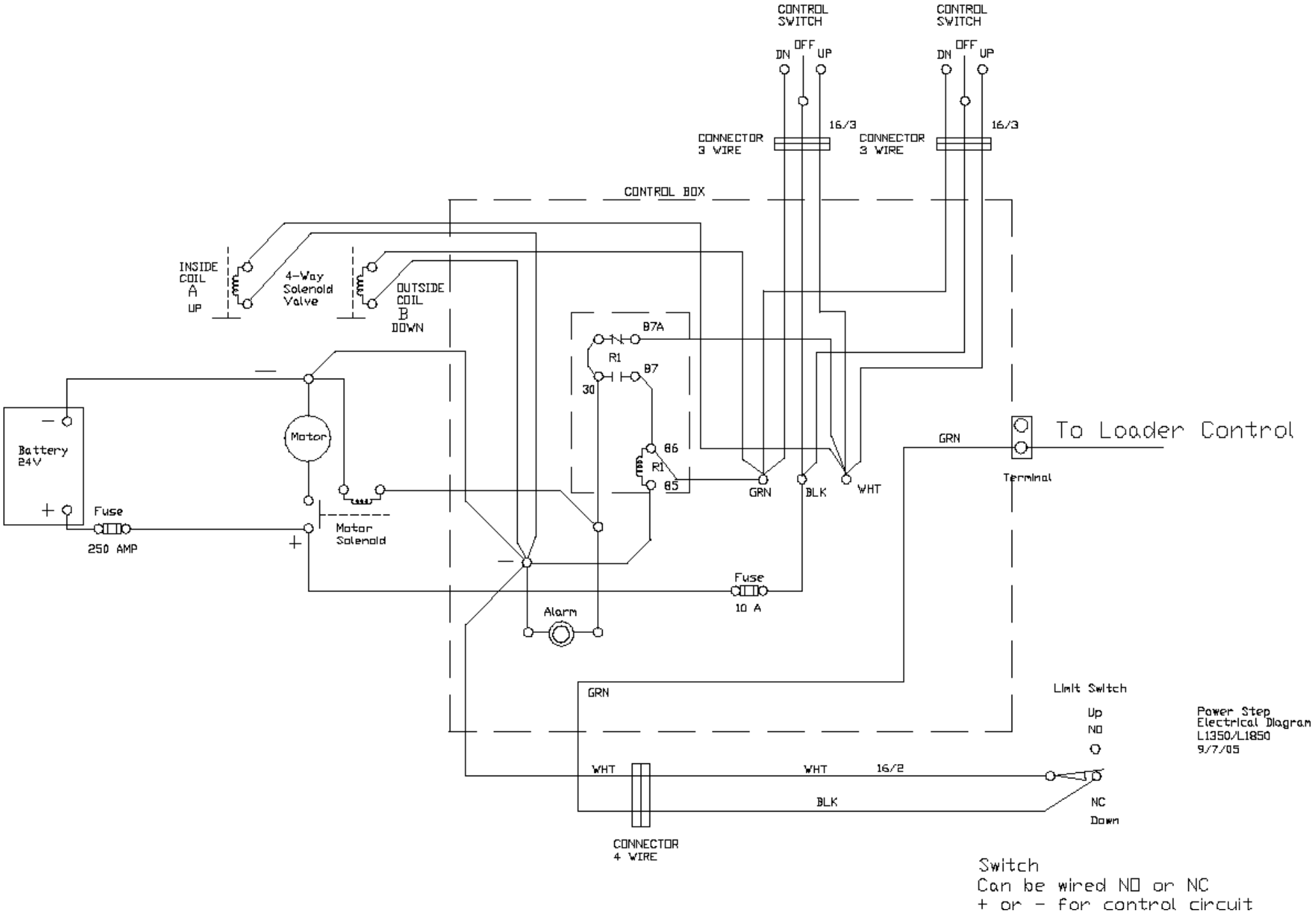
Figure 4

CONTROL BOX COMPONENTS
Complete Unit Part No. 75021

Figure 5

VALVE PACKAGE COMPONENTS
Complete Unit Part No. 65006


Power Step
L1850 Retractable Ladder
Hydraulic Diagram
9/7/05
Cylinder
.094" Orifice
.078" Orifice
A
B
Manual Bleed-Down Valve
Dual PO Check Valves
4 - Way Solenoid Valve
UP
DOWN
Valve Block
600 PSI
Relief Valve
2000 PSI
Relief Valve
Reservoir
Filter
Pump
Motor
Power Unit


CONTROL SWITCH
DN OFF UP
CONTROL SWITCH
DN OFF UP
CONNECTOR 3 WIRE
16/3
CONNECTOR 3 WIRE
16/3
CONTROL BOX
INSIDE COIL A UP
4-Way Solenoid Valve
OUTSIDE COIL B DOWN
B7A
R1
B7
30
86
R1
85
GRN
BLK
WHT
To Loader Control
GRN
Terminal
Battery 24V
Motor
Fuse
250 AMP
Motor Solenoid
Fuse
10 A
Alarm
GRN
Limit Switch
Up
NO
WHT
WHT
16/2
BLK
NC
Down
CONNECTOR 4 WIRE
Power Step
Electrical Diagram
L1350/L1850
9/7/05
Switch
Can be wired NO or NC
+ or - for control circuit

SAFE-AWAY® PTY LTD ABN 32 115 966 437

"A SAFER WAY TO ACCESS EQUIPMENT"

SAFE-AWAY® VEHICLE ACCESS SYSTEM

SERIES 2005 POWER PACK

Service and Operating Manual

CONTENTS

PAGE

Continued……

Contents Continued……

Page

♦♦♦♦♦

IMPORTANT CUSTOMER INFORMATION

This manual has been prepared to assist personnel in the operation of the **Safe-Away® Series 2005 Access System.**

When requested, Hedweld Engineering will carry out on-site training and familiarisation of the equipment covered in this manual, as soon as practicable after delivery. However, it is the sole responsibility of the customer to ensure that personnel required to operate this equipment are adequately informed about its appropriate use. Specifically:

i. ***The equipment is not designed as a ride-on device, and personnel must ensure that the ladder is in the fully down position before boarding.***

ii. ***Running, or jumping on the ladder may cause severe structural damage, as well as hydraulic component failure.***

Damage to an access system by the above causes or by other practices contrary to any instruction contained within this manual may invalidate the warranty conditions of the access system.

In addition, Hedweld Engineering Pty Ltd will not accept responsibility for any misadventure resulting from unauthorised modifications to the supplied equipment that affect the control functions, or compromise the equipment's safety.

Your co-operation is appreciated.

Hedweld Engineering Pty Ltd,
Technical Publications Department

1/27 Kyle Street, Rutherford, NSW, 2320, Australia.
Telephone: +61 02 4936 9000 Fax: 02 4936 9099

Website: www.safe-away.com.au
Email: enquiries@safe-away.com.au

POWER PACK

INTRODUCTION & OVERVIEW

The **Safe-Away® Access System,** ***Series 2005,*** was manufactured by Safe-Away Pty Limited in its workshop at Rutherford, near Maitland, NSW, Australia, in the heart of the Hunter Valley mining area.

The retractable ladder or stairway system has been designed to improve safety for operator and maintenance staff when accessing large earth moving equipment employed in the mining industry. The ladder / stair also offers a facility low in operational and maintenance cost and because the unit retracts within the boundaries of the vehicle, there is less likelihood of it becoming damaged or distorted.

The **Safe-Away® Access System** is easily installed, and in the remote possibility that the unit is damaged, it can be simply removed for repair at any suitably equipped workshop. Alternatively, it can be replaced with a service exchange unit available from Safe-Away Pty Ltd.

Operation of the ladder system is controlled by an electronic printed circuit card, incorporating a microprocessor, located in the cabin push button control enclosure, and is supplied with plug-on terminals to allow for customising the operations of the stairway. Standard features available with the **Safe-Away® Access System** include:

1. **Sequencing of up and down operation** of the ladder / stair on a time lapse basis.

2. **Ladder NOT RAISED indicating.** Indication is shown on cabin control push button unit by way of an illuminated red indicator when ever the ladder is not in the fully raised position.

3. **Error indication.** A red illuminated **ERROR** indicator and audible beeper are mounted on incab push button unit**.** Alarm for Under Voltage, Over Voltage, Ladder not raised to correct position, Motor overrun. Error indication is resetable.

4. **Programming and Error Information.** Reprogramming and Error information downloading to Notebook through serial port in incab controller.

5. **Ladder lock-out.** The lowering of the ladder can be made inoperative until the park brake is set.

6. **Auto ladder raise.** The release of the park brake will automatically retract the ladder to the up position.

7. **Trouble shooting and Memory.** Trouble shooting of the electronic controls can be performed utilizing a Notebook. Also memory down load facility is available for Fault finding and program updates. Serial port using Windows XP HyperTerminal.

8. **An independent electric over hydraulic power pack and directional control valve** provides full and positive hydraulic control of the ladder / stairway operation. As an alternative, the ladder/stairway can be powered from the vehicle's own hydraulic supply.

As optional extras, the **Safe-Away® Access System** offers the following:

9. **Additional remote control stations** can be added if required (Option).

10. **Access-Courtesy light.** Pressing the up or down directional switch activates the courtesy light. The light will stay on for a preset period (Option).

11. **Emergency evacuation from the vehicle.** When the power is cut off, or not available, the ladder can still be lowered to the access position (Option).

12. **Systems lock-out.** While the stairway is in the down position, functions such as propel, or swing, maybe prevented from operating to save accidental damage (Option).

The **Safe-Away® Access System** has been fully tested with all necessary adjustments made prior to shipment. The quality of manufacture of the unit is guaranteed and the system will comply with all relevant Australian standards.

Accompanying this manual is the warranty conditions set out by Safe-Away for the equipment. The warranty covers conditions for both supplier/manufacturer, and customer/owner/operator. Read these conditions carefully before placing the unit into operation.

Should you have any problems with your access system, do not hesitate to contact the Technical Dept at Safe-Away who will assist you in any way possible. We are confident that most problems can be solved over the phone. Also, pay particular attention to the safety and maintenance sections of this manual, as the better you look after your **Safe-Away® Access System,** the better it will look after you.

♦♦♦♦♦

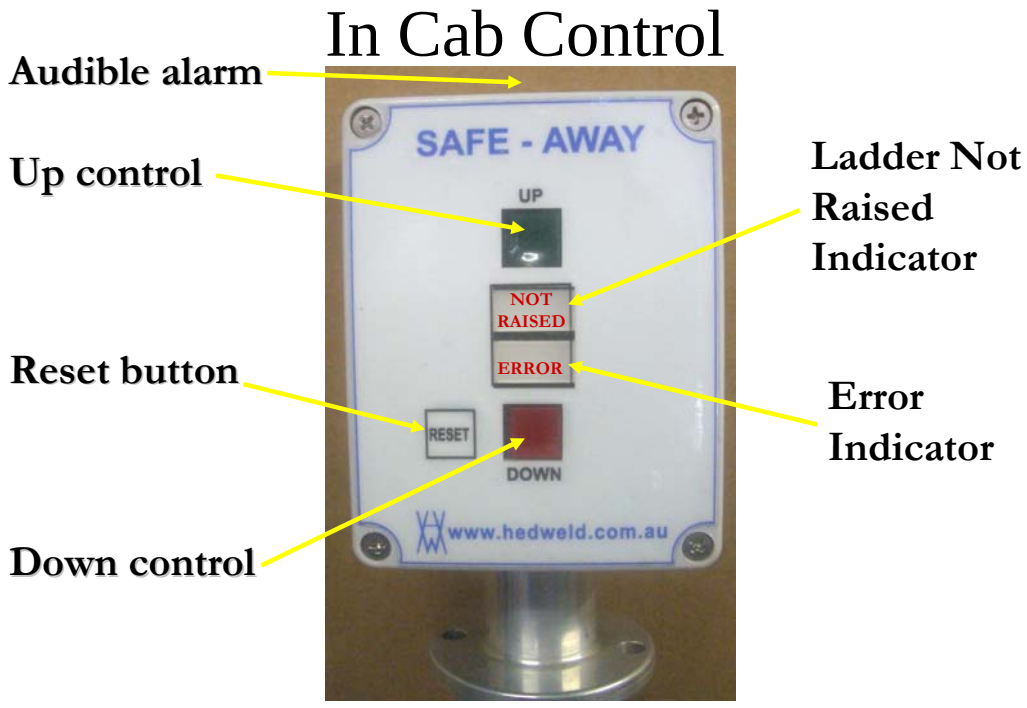


Figure 1. Ladder Incab Control Station
Part No. EF04084 (Mounted inside the vehicles cab)

SAFETY

GENERAL SAFETY

The following safety procedures should be considered as the minimum requirement for the operation and safe use of the **Safe-Away® Access System.**

Note: Information in this manual shall not be construed to waive, or modify, any obligation imposed pursuant to any regulation under the Occupational Health & Safety Act, or under any other existing Health and Safety Legislation.

1. Never run or jump on the ladder / stairway.
2. Do not overload the ladder/stairway. Use the ladder/stair one person at a time.
3. Hold onto the handrail when using the ladder/stairway.
4. Never attempt to ride on the ladder/stairway while it is in the process of being raised or lowered, or while the machine is in motion.
5. Always visually check the stairway before use to ensure that the unit has not been accidentally damaged.
6. Ensure that the ladder/stairway is in the fully down position before boarding.
7. Keep hands and fingers away from pinch points during the raising and lowering of the ladder/stairway.
8. Always check that there are no personnel on the ladder/stair when raising, or in the immediate vicinity when lowering.
9. The ladder should be kept clean and free of moisture, grease and oil.
10. When in the machine's cabin, always operate the remote control switch to raise the ladder/stairway. The automatic raising of the access system when the parking brake is released, is designed as an emergency safety function only, and should not be activated under normal operation.
11. Report defects immediately.

SAFETY DURING MAINTENANCE

The following safety procedures should be considered as the minimum requirement for personnel during maintenance of the **Safe-Away® Access System.**
All personnel who maintain, repair, or operate electrical and hydraulic equipment should be familiar with the hazards and the precautionary measures which must be observed. Only qualified and authorised personnel should install, maintain, adjust or operate pressurised systems especially the safety devices involved.

Follow recognised isolation and tag-out procedures before commencing maintenance on this machine. *Failure to properly isolate the primary energy sources, ie. Electricity and hydraulics, may lead to personal injury.*

The following points are listed in the interest of personal safety when working with the **Safe-Away® Access System:**

1. Unless otherwise required for testing or adjusting purposes, always isolate the power from the system (and lockout or apply a danger tag as applicable) before carrying out any electrical or mechanical work on the system. Failure to properly isolate the power supply can lead to serious injury.
2. Do not attempt to repair, loosen or open any part of the hydraulic system unless both the electrical and hydraulic supply, have been isolated and the hydraulic lines have been depressurised. Personnel should themselves, ensure the system is depressurised either by checking a gauge connected to the immediate line or equipment, by opening a test valve, or by noting that a disconnection in a line already exists. ***Do not bleed a pressurised line by loosening a fitting.***
3. Check the electrical harness, wiring and hydraulic lines for damage or wear on a regular basis. If replacing hydraulic lines ensure they are of the same quality and length as the original.
4. Prevent dirt/debris from entering the system when carrying out repairs, or replacing parts.
5. Do not use the electrical harness or hydraulic lines as a step.
6. Most hydraulic systems are fitted with a safety pressure relief valve. Do not activate the system unless the relief valve is in place.
7. Do not check for leaks with your hand as a severe injury could result. If a high-pressure injection injury is suspected, seek medical treatment immediately.
8. It is recommended that eye protection be worn when carrying out maintenance on this equipment.

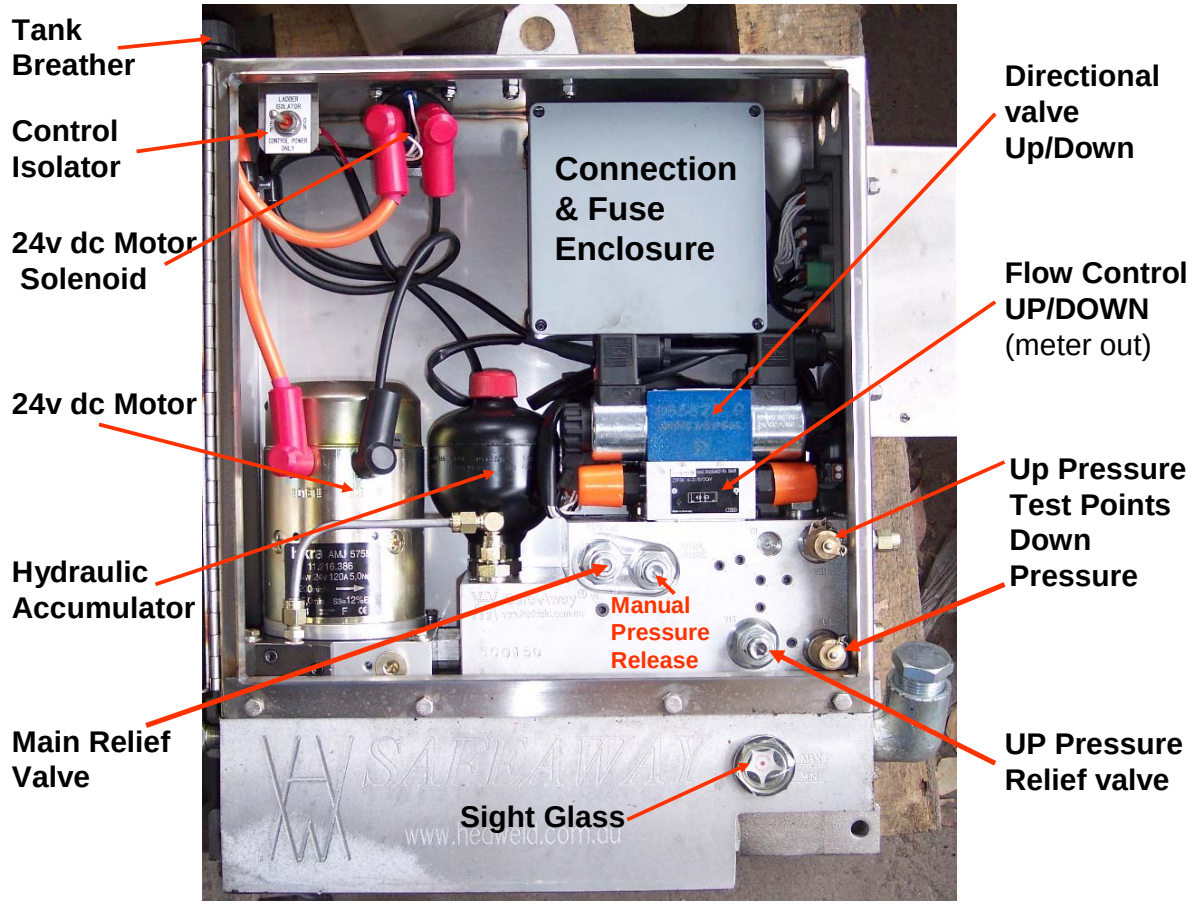


Figure 2. Safe-Away® Access System, *SERIES 2005*, Power Pack (Part No. SA05051)

LADDER OPERATION

Normal operation of the **Safe-Away® Access System** is accomplished by operating either the Push Button switch on the control box in the operator's cabin or on the remote toggle switch located at ground level, and in some cases at the top of the access stairs.

Caution: When in the vehicle's cabin, always operate the push button control switch to raise the ladder. The automatic operation of the ladder when the park brake is released is designed as an ***emergency safety function only***, and should not be activated for normal use.

BATTERY ISOLATOR SWITCH & POWER PACK CONTROL ISOLATOR SWITCH MUST BE IN ON POSITION BEFORE SYSTEM CAN OPERATE.

The Part Numbers referred to below refer to Hydraulic Schematic AC0268-13-01 and Exploded View Drawings iAC051-20-01 and iAC051-19-01

RAISING

The ladder of a stationary vehicle would normally be in the down position. The indicator light, [***NOT RAISED***] located in the cover of the cabin control box, should be illuminated whenever the ladder in not in the **FULLY UP** position.

To raise the ladder, push the illuminated green [LADDER] **UP** push button on the cabin control box. The hydraulic power pack will energise and raise ladder. The motor (p/n CP03012) will start enabling the hydraulic pump to supply pressurized oil to the system. The C-Top (p/n CP05150) will move to UP position. The operating hydraulic pressure supplied to the system is controlled by relief valve (p/n CP05310), nominal system pressure is 170 bar, however the actual working pressure maybe higher or lower, depending on ladder type and size. The oil will flow through the C-Top (p/n CP05150) and flow control valve (p/n CP03519)[metering out] and past a Cavity Plug (p/n CP03525) , to the UP side of the cylinder. At the same time oil will charge the accumulator (p/n CP07501) and pressure switch (p/n CP06106) at system pressure, the stairway will move in the UP direction. When the ladder/stairway has reached the **FULLY UP** position & strikes the limit switch, the ***NOT RAISED*** indicator light will extinguish, the power pack will continue to run for a further 4 seconds to charge the accumulator (p/n CP07501).
The stairway will be maintained in the UP position by the pressure from the accumulator (p/n CP07501), should the pressure in the accumulator fall below 60 bar the pressure switch (p/n CP06106) will start the motor/hydraulic pump and recharge the system. This can only occur 3 times per hour, not more frequently than once every 8 minutes. On the second occasion the limit alarm will be energised, resetting automatically when the power pack stops, on the third occasion the limit alarm will energise and must be manually reset by depressing the clear button.

LOWERING

Note: To lower the ladder, the vehicle's park brake **must** be applied.

Push the illuminated red [LADDER] **DOWN** push button located on the cover of the cabin control box. The C-Top (p/n CP05150) will change to DOWN position and the motor (p/n CP03012) will activate to commence the down operation, however the power pack will cut off a pre-determined time and the ladder/stair will continue to lower under its own mass, controlled by the hydraulic flow control valve (p/n CP03519)[metering out]. The hydraulic pressure for the DOWN operation is reduced by pressure reducing valve (p/n CP05137) to 50 bar.

The indicator light, ***NOT RAISED*** located in the cover of the cabin control box, will illuminate when the ladder leaves the **FULLY UP** position, and then remain illuminated.

REMOTE OPERATION

Remote switch units maybe installed as required at the top of the ladder as well as ground level. The remote unit consists of a polycarbonate enclosure with a return to centre toggle switch.
These remote switch units may be used to raise and lower the **Safe-Away® Access System, *Series 2005*.**

RAISING

To raise the ladder, push the toggle switch to the ***UP*** position and release the switch.
(Operation will be the same as the ladder RAISING operation described on previous page).

LOWERING

Note: To lower the ladder, the vehicle's park brake must be applied.

Push the toggle switch located on the cover to the ***DOWN*** position, and release the switch.
(Operation will be the same as the ladder LOWERING operation described on previous page)

The indicator light, ***NOT RAISED*** located in the cover of the cabin control box will illuminate when the ladder leaves the **FULLY UP** position, and then remain illuminated.

EMERGENCY DOWN – HYDRAULIC DUMP BALL VALVE (OPTIONAL ONLY)

This function will allow the ladder to be lowered in the event of total system power failure. A ball valve mounted near the top of the Access System can be operated to redirect the fluid pressure from the UP side of the system cylinder (actuator) to the down side and allow the system to lower. To reset after use move handle on ball valve to original position and with power restored to Power Pack, press the RAISE button.

Note: This is a once only operation. Recharging of hydraulic system & accumulator will occur when normal operation of ladder is re-instated.

EMERGENCY DOWN – ELECTRIC SWITCH (OPTIONAL ONLY)

This function will allow the ladder to be lowered in the event of total system power failure. A red latch covered switch is mounted near the top of the Access System. To activate this switch, lift the red latch and operate the self centering toggle switch. This will enable power from a capacitor to energise the solenoid on the C-Top (p/n CP05150) forcing the C-Top to the Down Position and allow the system to lower. To reset after use close the red latch, with power restored to Power Pack, press the RAISE button.

Note: This is a once only operation. Recharging of hydraulic system & accumulator will occur when normal operation of ladder is re-instated.

◆◆◆◆◆

DESCRIPTION OF SYSTEM FUNCTIONS

PARK BRAKE

The park brake function is to prevent damage to the ladder/stairway by automatically raising the ladder if the vehicle is attempted to be driven. Releasing the park brake will cause precisely the same action as having pressed the UP switch. The ladder will travel up until timed out or the upper limit is reached - motion is immediate. With the park brake released, the DOWN operation is disabled.
For equipment with SLEW capability it is recommended that this interlock be wired into the Slew lock not the Park Brake.
Use of the Park Brake function to raise the ladder will be recorded in the microprocessor memory and down loaded as an error when servicing is carried out.

Note: This function is designed for emergency use only. To ensure damage is not caused by malfunction, always use the push button and ensure the ladder has been raised before releasing the brake.

Caution: All **Safe-Away® Access System** harnesses are provided with wiring for the park brake facility to be connected. If this is not utilised, then an alternative method of ***auto-raise*** should be adopted. ***Failure to do so may void the warranty of this equipment if damage results.***

ACCESS (BOARDING) LIGHT – (Optional)

Pressing either the UP or DOWN direction switch will result in the courtesy light being turned on, and it will remain on for a preset period (approx. 2-mins max.). Due to the current limitations from the electronic control card, the courtesy light is wired through a supplied interface relay.

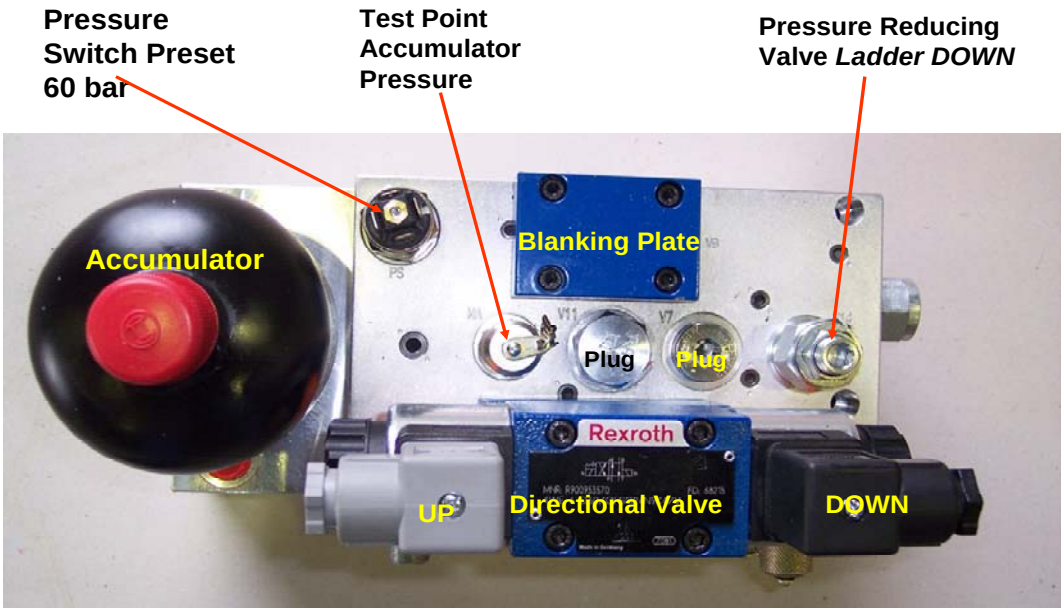


Figure 3, Safe-Away Power Pack Manifold *Top View*

AUTOMATIC RECHARGE OF ACCUMULATOR

An accumulator is installed as part of the hydraulic system to ensure positive holding of the stairway in the fully UP position, and to propel the stairway DOWN in case of an emergency if the system pressure fails. The accumulator will automatically be recharged under the following conditions:

1. When the limit switch is reached on each UP cycle of the ladder, the power pack will continue to run for a further 4-seconds to "top-up" the accumulator and ensure the stairway has docked securely. This 4-second time period is factory set.
2. While the stairway is UP and at rest, pressure drops can occur, mainly due to external leaks in hoses. When the pressure drops below a pre-determined level, the system will respond by activating the power pack and recharging the accumulator. This is accomplished by a low- pressure switch, which will close its contacts if the pressure falls below the low-pressure setting of 60-bar (870-psi). The power pack will then be energised for the preset time period equal to the timing of the ladder up cycle, this operation can only occur for a maximum of three time per hour, and not more frequently than once every eight minutes. On the second occasion the limit alarm will be energised, resetting automatically when the power pack stops, on the third occasion the limit alarm will energise and must be manually rest by depressing the clear button.

Safety Note: Recharging after a pressure drop is designed to occur when the vehicle is in operation. When the vehicle is stopped and the park brake is applied, no recharging will occur. However, if during any period of maintenance to the parent vehicle there is a need for the ladder to be held in the UP position with power on, and a pressure drop results, it is possible for the ladder to creep off the upper limit. If this occurs the stairway will automatically be relocated if the park brake is inadvertently released - ***movement is sudden and forceful.***

This unplanned ladder movement can be eliminated by ensuring that power has been isolated from the stairway control system before commencing maintenance on other parts of the vehicle.

INDICATIONS AND ALARMS

The system relies on preset time periods for which the ladder will be driven up or down.

AUDIBLE AND VISUAL INDICATIONS

THESE ALARMS ARE BOTH AUDIBLE AND VISUAL

The ERROR indicator reflects the state of the Audible alarm for the following conditions.

- When a direction switch is pressed, the alarms will sound whenever the ladder is in motion – up or down- ONE SHORT BEEP EACH SECOND.

- Ladder operation caused by Park Brake release (or similar device) – RAPID BEEPING. Ladder should always be raised by operating LADDER UP controls before releasing Park Brake

- UNDER VOLTAGE. (Under 21 volts) One LONG BEEP FOLLOWED BY ONE SHORT BEEP, repeated every 2 seconds. This alarm clears itself when the voltage returns to above 21 volts, may also be cleared by pressing and holding RESET button.

- OVER VOLTAGE. (Over 31 volts) ONE LONG BEEP FOLLOWED BY TWO SHORT BEEPS, repeated every 2 seconds. This alarm will continue until cleared by pressing and holding RESET button.

- LIMIT ALARM. (Ladder not raised properly) THREE LONG BEEPS, repeated every 2 seconds. Check ladder is fully raised before clearing alarm. Can be cleared by pressing and holding RESET button. Possible causes:-
  - Faulty upper limit switch.
  - Stairway unable to dock adequately due to some restriction, such as mechanical obstruction; mud on docking platform.
  - Physical damage to stairway.
  - Time setting to raise stairway too low.
  - Viscosity of oil too low due to unusually cold atmospheric conditions.
  - Pressure switch reactivated system following drop in accumulator pressure.

- SAFETY SWITCH ALARM (For other safety devices fitted to Access System, door switches etc) Two long beeps every 2 seconds. This alarm may only be cleared by pressing and holding RESET button. Access system may not operate until this alarm has been cleared.

Note: Depending on the circumstances causing the problem, the ladder, even in this alarm state, may still be raised adequately for the vehicle to be placed into service without the risk of damage to the access system. This enables maintenance or repairs to be carried out at a more convenient time. However, when this alarm state occurs, ***it is the sole responsibility of the operator to investigate the condition of the ladder before placing the vehicle into service.***

Ladder Disengages From Upper Limit Switch

With the stairway in the UP position and the vehicle mobile, the LADDER NOT RAISED indicator is not illuminated. If the stairway is forced from its limit and remains off the limit for more than 2-seconds, the control card will endeavour to relocate the ladder within a 4-second period, the power pack will be energised for the preset time period equal to the timing of the ladder up cycle, this operation can only occur a maximum of three time per hour.
The LADDER NOT RAISED alarm will be displayed. This relocating time is factory set.
If the ladder does not re-engage with the upper limit within the preset time, the LIMIT ALARM will activate.

Under the conditions described above, the alarm state indicates that the ladder has not re-engaged with the upper limit switch. To protect the power pack unit from unnecessary operation and inevitable burn-out of the electric motor, the system control has been programmed to make only three attempts per hour to relocate the ladder.

Note: Depending on the reason for the ladder not re-engaging, eg. Faulty upper limit switch, physical damage to the ladder etc., the ladder, even in this alarm state, may still be raised adequately for the vehicle to be continually operated in production without the risk of damage to the access system. This enables maintenance or repairs to be carried out at a more convenient time. However, when this alarm state occurs, ***it is the sole responsibility of the operator to investigate the condition of the ladder before continuing with the vehicle in its present operation***. The alarm status described above, is a reminder to the operator that the problem still exists and requires attention as soon as practicable.

LIMIT SWITCH

The main function of the limit switch is to monitor travel of the ladder to the UP position. Optionally, it can be utilised to inhibit the vehicle's propel or swing, if the ladder is in the DOWN position. The standard **Safe-Away® Access System** does not incorporate a DOWN limit. The use of a limit switch to cover the DOWN cycle is considered unnecessary due to the safety features already incorporated into the electronic control card.

The electrical schematic diagram AC267-01-01 shown at the end of this manual illustrates the position of the contacts when the ladder is in the **LADDER NOT RAISED** position. When the ladder is raised and reaches the RAISED position, the contacts will change and the following will apply:

1. When the RAISED limit is reached the normally open contacts close. If utilised, this function will allow the vehicle's propel or swing, to be activated.

2. If the ladder fails to reach the RAISED limit switch the LIMIT ALARM will indicate after the system has timed out. This indicates to the operator that the switch needs to be pressed again to complete the ladder 's travel. If the ladder once again fails to reach the limit, check for:
   i. ladder mechanism malfunction;
   ii. objects obstructing the pathway of the ladder travel;
   iii. excessive weight being applied to the ladder.

3. The system cannot be told to move beyond the limit switch. If the limit has been reached, the RAISE switch is disabled.

HYDRAULIC CONTROL FUNCTIONS

The hydraulic manifold provides nine functions to the hydraulic operation of the ladder system: (references to items below are to Hydraulic Schematic AC0268-13-01)

1 Pressure Relief valve (p/n CP05310) (Nominal setting 170-bar; 2465-psi) provides protection of the **Safe-Away® Access System, *Series 2005,*** hydraulic system and safety setting in the raise and lower function of the ladder.
2 Accumulator (p/n CP07501) which provides constant pressure in the up position.
3 Pressure Compensated Flow Controls (p/n CP03519) for the up and down circuits provide a constant up and down travel speed of the ladder regardless of the pressure required to move the stairway.
4 C-Top directional valve with manual override (p/n CP05150) suited to the customer's choice of hydraulic supply options.
5 Manual By-Pass/Manual Pressure Release valve (p/n CP05134) to remove hydraulic pressure from system & allow the ladder to be lowered manually (on some systems).
6 Pressure Switch (p/n CP06106) to replenish the accumulator oil (minimum 60-bar; 870-psi) which maintains a constant pressure to the cylinder in the up position.
7 Down Pressure Reducing Valve preset at 50 bar-725 psi (p/n CP05137)

When installing the power pack with the ladder system, the power pack will be supplied with all hydraulic plumbing, including the hoses to the cylinder.

Note: To some destinations, the power pack may have been shipped without reservoir oil. Ensure the quantity of oil is checked before placing the unit into service.

Utilising Parent Vehicle's Hydraulic Supply

When electing to power the ladder direct from the parent vehicle's hydraulic system, the required hydraulic connections to the actuator will be one ***pressure*** hose from an adequate oil supply 1.9-lpm (0.5-gpm) maximum, to the pressure port of the manifold block and one ***return*** hose from the manifold tank port to the hydraulic source tank port. The actual location of these hook-up points will depend on the advice of the original equipment manufacturer or the supplier of the hydraulic power unit.
In circumstances where the hydraulic pressure is utilised from the steering system of the vehicle, it is critical that no pressure drops occur to compromise the safety of the vehicle and its driver. To safeguard against a complete steering system failure if a hydraulic hose on the ladder fails or if a severe oil leak occurs, the **Safe-Away® Access System** is fitted with a "burst hose valve" or velocity valve. This is fitted at the connection point of the ladder hydraulic line to the vehicle's steering system accumulator. The valve will automatically close when a predetermined flow of hydraulic oil is reached.

MAINTENANCE MANUAL LOWERING OF LADDER / STAIRWAY

If the Ladder / Stairway is in the UP POSITION, in an emergency or for maintenance purposes, it is possible to bypass the normal operating system and lower the ladder / stairway, provided access to the Power Pack cabinet is available, as follows:-

- Turn off the control isolator switch in the power pack cabinet
- Move the C-top spool to the DOWN position, by pushing the spool button on the end of the C-Top, the stairway will start to descend
- To release the stored pressure in the accumulator, slowly open the manual pressure release valve (p/n CP05134), on the front of the hydraulic manifold.
- Once LOWERING is complete, turn control isolator on and close manual pressure release valve and secure

MANUAL LOWERING OF STAIRWAY (OPTIONAL)

An optional manual lowering switch is available to lower ladder in case of emergency or power failure. This consists of a Red Latch covered Toggle Switch, usually located adjacent to the ladder. When operated will lower the ladder to the boarding position. To raise the ladder simply ensure that there is power supplied to the system, return the Red Latch to the original position and restart the Power Pack by pressing the raise button.

MANUAL HYDRAULIC LOWERING OF STAIRWAY (OPTIONAL)

An optional manual lowering valve is also available to lower ladder in case of emergency or power failure. This consists of a ball valve, usually located adjacent to the ladder, when operated will lower the ladder to the boarding position. To raise the ladder simply return the valve operator to the original position and restart the Power Pack by pressing the raise button.

◆◆◆◆◆

SPECIFICATIONS

Voltage:	+ 24VDC
Current:	Maximum total load: 10-amps RD non condensing , not exceeding 75 % Max temp 55°C (122°F)
Output:	4 Fuse protected outputs.
Inputs:	16 Voltage free inputs. (Can be either N/C or N/O inputs depending on program)
Main Power:	Polarity protected on main power and ground inputs
Voltage Protection:	14V<21V= 24V LOW 21V <30V = 24V OK >31V = 24V HIGH

♦♦♦♦♦

CLEANING – POWER PACK

With regular use of the ladder, cleaning of the Control Cabinet / Power Pack should be carried out at frequent intervals to extend the life of the equipment and to lessen the risk of personal injury during use. These intervals will vary with the severity of the environment and conditions under which work is conducted.

It is recommended that cleaning of the Control Cabinet / Power Pack should only be carried out with a brush and compressed air. If oil has leaked within the stainless steel control cabinet, wipe up the excess oil, determine the cause of the oil leak and rectify, then clean up any remaining oil. Do not use high-pressure water equipment to clean inside the stainless steel control cabinet, ***do not*** aim the high-pressure spray near, or at, the ladder control cabinet, actuator box, bearings, or electrical harnesses when cleaning the Ladder / Stairway. The ingress of moisture via a damaged harness may result in an uncontrolled ladder movement or damage to the electrical system.

♦♦♦♦♦

PREVENTIVE MAINTENANCE PROCEDURES

SAFETY PRECAUTIONS

Safe and efficient operation of the **Safe-Away® Access System** can only be achieved if the equipment is correctly operated and maintained. Many accidents occur because of failure to follow fundamental rules and precautions.

All personnel who maintain or repair this equipment should be familiar with the hazards and the precautionary measures which must be observed. Before carrying out any maintenance, read the safety procedures previously listed in this manual. Only qualified and authorised personnel should install, maintain or adjust the equipment and where applicable, recognised **Danger and Out-of-Service** tag rules and regulations should be followed ... ***If in doubt, ASK someone of authority.***

Caution: Power should be disconnected from the access system:

- during all types of maintenance, except where needed for testing purposes;
- when any welding is being carried out on the ladder or parent machinery;
- before any plugs on the printed circuit card, or harness system is disconnected.

UNPLANNED LADDER MOVEMENTS - Park Brake Function Utilised

A number of unplanned movements to the stairway could occur during maintenance of the vehicle, if the park brake is inadvertently released. These movements are standard functions of the stairway when the vehicle is operating during normal production periods. However, in a maintenance environment, these unplanned movements, described below, could cause injury if any personnel are working on or near the stairway.

Note: These circumstances would not apply to a ladder with its hydraulic system powered from the vehicle's own supply, ***unless the system is pressurised.***

A. Automatic raising of the ladder:

Inadvertent raising of the ladder will occur if the park brake is released and:

i. power has not been isolated to the ladder control system...or,
ii. power is restored to the ladder control system after previously being isolated.

To prevent this unplanned movement from happening, ensure:

a. power has been isolated from the ladder control system before releasing the park brake;
b. the park brake has been reset before restoring power to the ladder control system.

B. Automatic recharging of the accumulator. (ladder in the UP position).

An accumulator is installed as part of the hydraulic system to ensure positive holding of the ladder in the ***fully up*** position, and to propel the ladder down in case of an emergency if the system pressure fails (option). However, pressure drops can occur, mainly due to external leaks in hose fittings, and the system will respond by activating the power pack and recharging the accumulator.

During this period of low pressure, the ladder may creep a short distance from its upper limit and the control card will sense this movement and relocate the ladder at the same time the accumulator is being charged - movement is sudden and forceful. This recharging occurs normally when the vehicle is in operation. When the vehicle is stopped with the park brake applied, no recharging will occur.

However, if during any period of maintenance there is a need for the ladder to be held in the UP position with power on, and it creeps off the limit, the ladder will automatically be relocated if the park break is inadvertently released.

This unplanned ladder movement can be eliminated by ensuring that power has been isolated from the ladder control system before commencing maintenance on other parts of the vehicle.

♦♦♦♦♦

ACCESS SYSTEM MAINTENANCE

Electrical Maintenance

1. Check the range of functions of the ladder system, including remote switches and park brake interlock if utilised. Ensure the ladder ***NOT RAISED*** indicator correctly indicates during each cycle as well as the sounding of the audible alarm.
2. Check the condition of all wiring and wiring harnesses inside and outside of the stainless steel control cabinet for physical damage or ingress of moisture. Moisture can cause short circuits, and uncontrolled ladder movements have previously resulted.
3. Ensure the control cabinet is properly sealed and free of moisture.
4. Check vehicle electrical supply. With engine running, alternator supply voltage to the access system controls should not exceed 30-volts. With engine stopped, battery supply voltage must not fall below 21 volts.

Caution:

i. If either of the conditions in (4) above occurs, damage to the systems electronic components may result. The electronic control card will not operate when battery voltage falls below 21 volts. For efficient operation of the ladder, the batteries should be sufficiently charged to supply an output of between 24 and 28 volts.

ii. On new installations, warranty of the **Safe-Away® Access System** components may be void when damage is caused by faulty battery cells, poor connections, faulty regulators, shorted rectifiers or missing phases in alternators.

5. Check all electrical connections to the ladder system for security. Check:
   - circuit breakers;
   - toggle switches;
   - starter solenoid and power pack.
   - power pack isolator.
6. Check the park brake function by releasing the park brake with the stairway down. The ladder should rise.

Caution: Ensure the safety of personnel is not compromised during this procedure.

7. Check the propel or swing function. The machine should not respond with the ladder down.

Hydraulic Maintenance

1. Visually inspect all hydraulic lines and fittings. Investigate the cause of any oil stains. Replace or tighten as necessary. Ensure replacement hoses are of the same length and size as the originals. (See note below).
2. Ensure optimum hydraulic oil is maintained in the reservoir.

Note 1: The hydraulic oil level must be in the centre of the sight glass ***WHEN THE LADDER CYLINDER IS IN THE FULLY RETRACTED POSITION.***

Caution: It is most important when carrying out repairs, or replacing parts of the hydraulic system, especially hoses, to prevent dirt or debris from entering the lines and to bleed air from the system before operating the ladder**.** Any foreign contaminants can destroy sensitive components.

Changing Hydraulic Oil

Hydraulic oil becomes contaminated over time, and malfunctions may begin to appear in the hydraulic system. Therefore, it is recommended that the oil be changed at least once a year.

Note: After changing the oil, the hydraulic functions of the ladder should be operated through its full range. This is to expel any air that is present, which would otherwise destroy the seals in the hydraulic system.

ACCUMULATORS

INTRODUCTION AND DESCRIPTION

A hydro-pneumatic accumulator is shown at P/n CP07501, on Power Pack Cabinet Layout drawing AC268-13-01 at the end of this manual. An accumulator is essentially a fluid pressure storage chamber in which the potential energy of an incompressible fluid under pressure can be stored against a compressible force of a gas to do useful work.

This stored fluid is readily available to perform a given task when called upon by the requirements of the system in which it is used.

The accumulator contains a flexible rubber bladder in the enclosed shell pre-charged with a gas, usually nitrogen, to a pressure determined by the hydraulic system's working pressure and loads. When the hydraulic system pump forces fluid into the fluid chamber, the gas inside the bladder compresses until the gas pressure becomes equal to the system pressure. The stored potential energy of the fluid held under pressure then serves as a quick secondary source of energy.

There are considerable advantages in using bladder accumulators in a hydraulic system. These are:

1. **Auxiliary Power Source** - Additional circuits can be powered.
2. **Energy Conservation -** Reduces the need for a large pumping capacity.
3. **Leakage Compensation -** Reduces the need for frequent pump operation.
4. **Thermal Expansion Compensation -** Prevents damage to overall components and piping.
5. **Emergency Power Source -** Makes the hydraulic system fail-safe.
6. **Fluid Make-Up Device -** Balances the change in fluid volume.
7. **Hydraulic Shock Absorber -** Reduces costly system maintenance and operator fatigue.
8. **Holding Device -** Saves power, reduces pump wear, and prevents overheating.
9. **Transfer Barrier -** Serves as a low cost, high performance booster.
10. **Fluid Dispenser -** Inexpensive lubricating system.

FUSES AND PROTECTION DEVICES

Fuses and protection devices are fitted to the printed circuit card to safeguard against damage and subsequent costly repairs, or replacement.
All fuses are blade type automotive of either 20, 10 or 5 amp rating, are mounted in the connection board enclosure at the top right hand corner of the stainless steel Hydraulic Power Pack cabinet. Also in this enclosure is the Emergency Down capacitor along with a remote operating switch, Power Pack and Boarding Light relays and the Over Voltage relay which protects the system from over voltage of 42 volts for 6 seconds. List of fuses etc below.
This connection board also has operational LED as listed later in this manual.

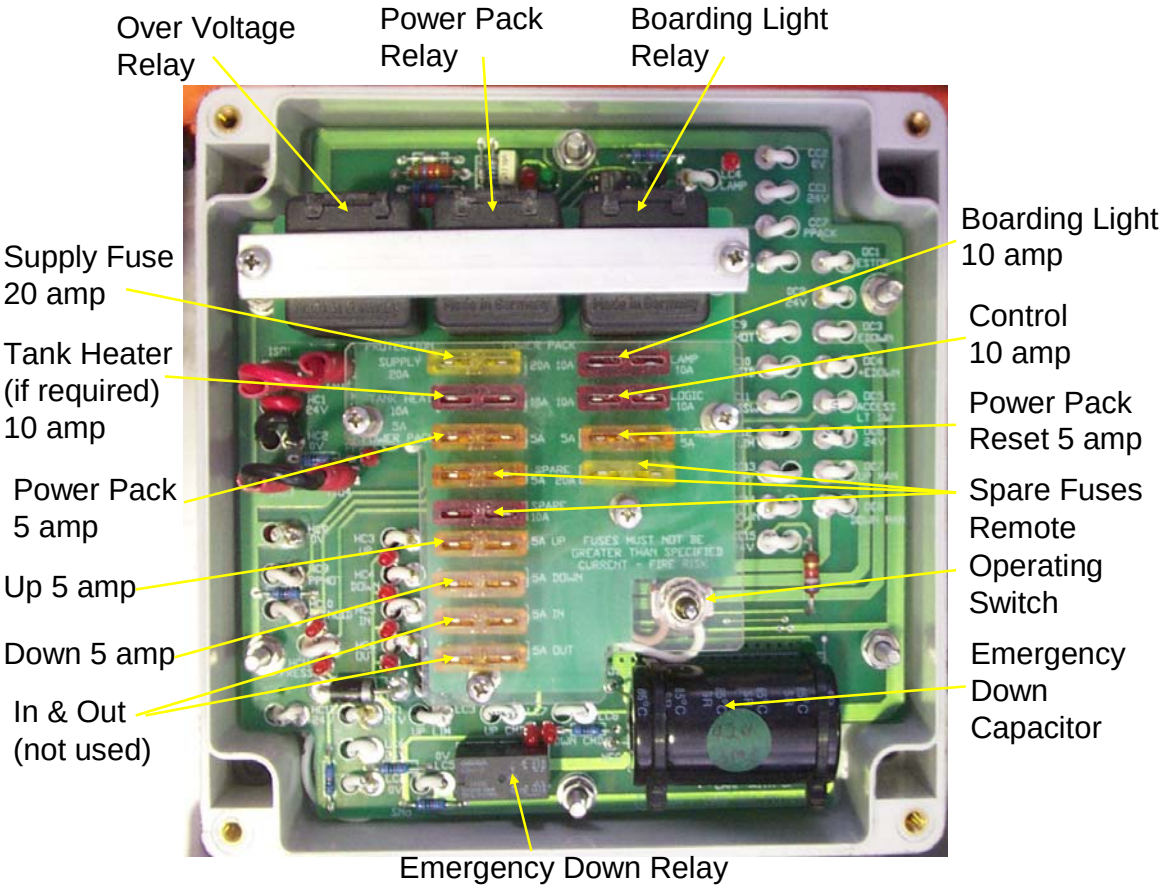


Figure 4. Connection Board in Power Pack Cabinet (Bottom Board) Part No. EF04081

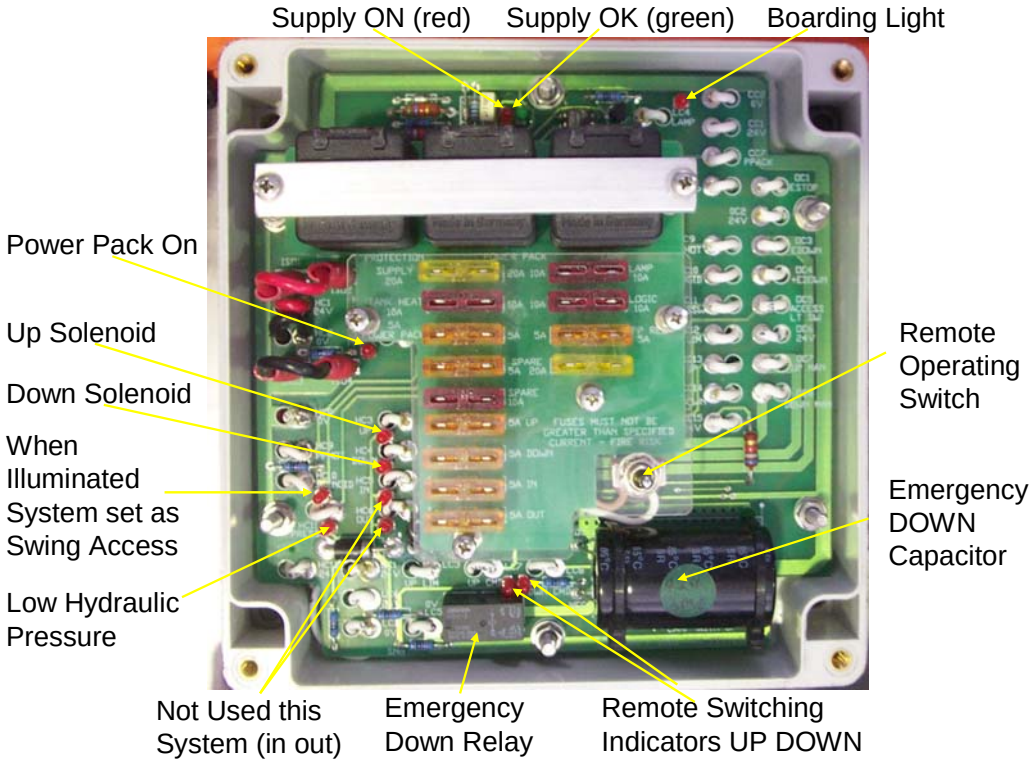


Figure 5. Connection Enclosure mounted in Hydraulic Power Pack (Bottom Board) Part No. EF04081

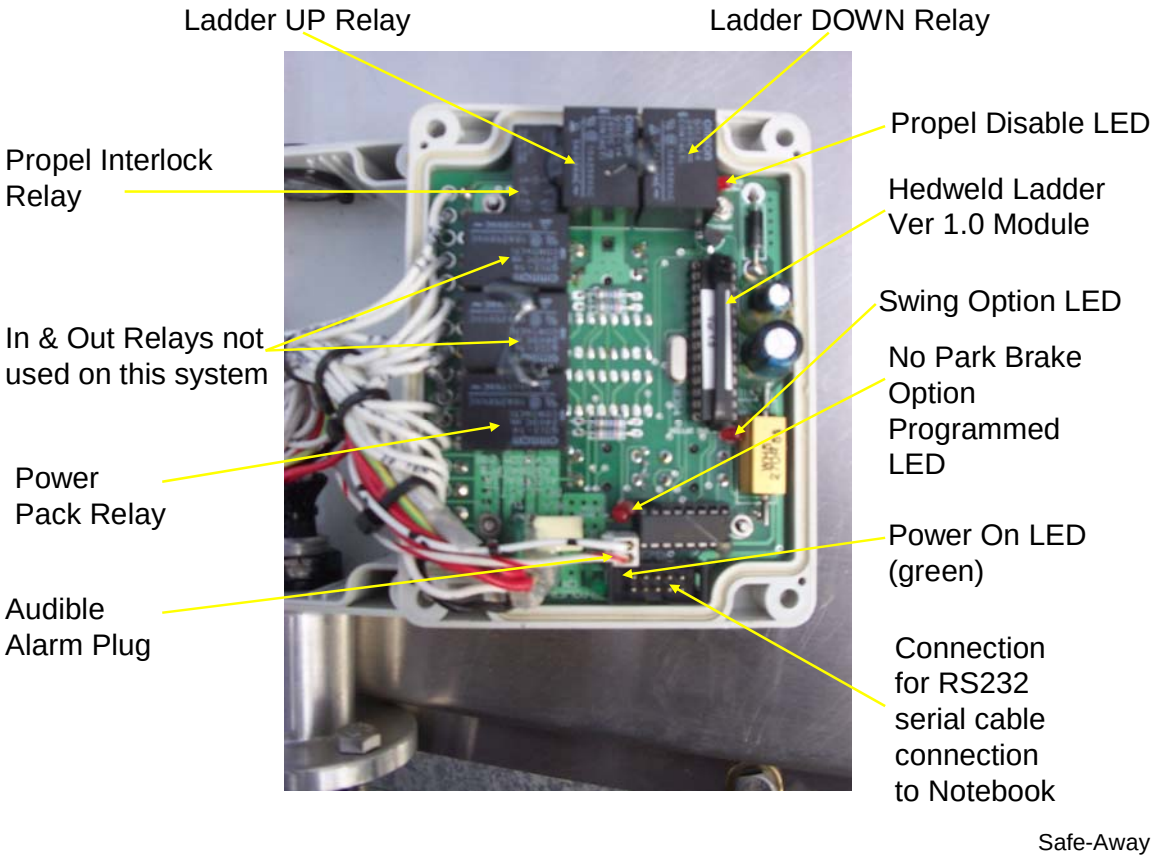


Figure 6. Incab Controller (rear view) Part No. EF04084

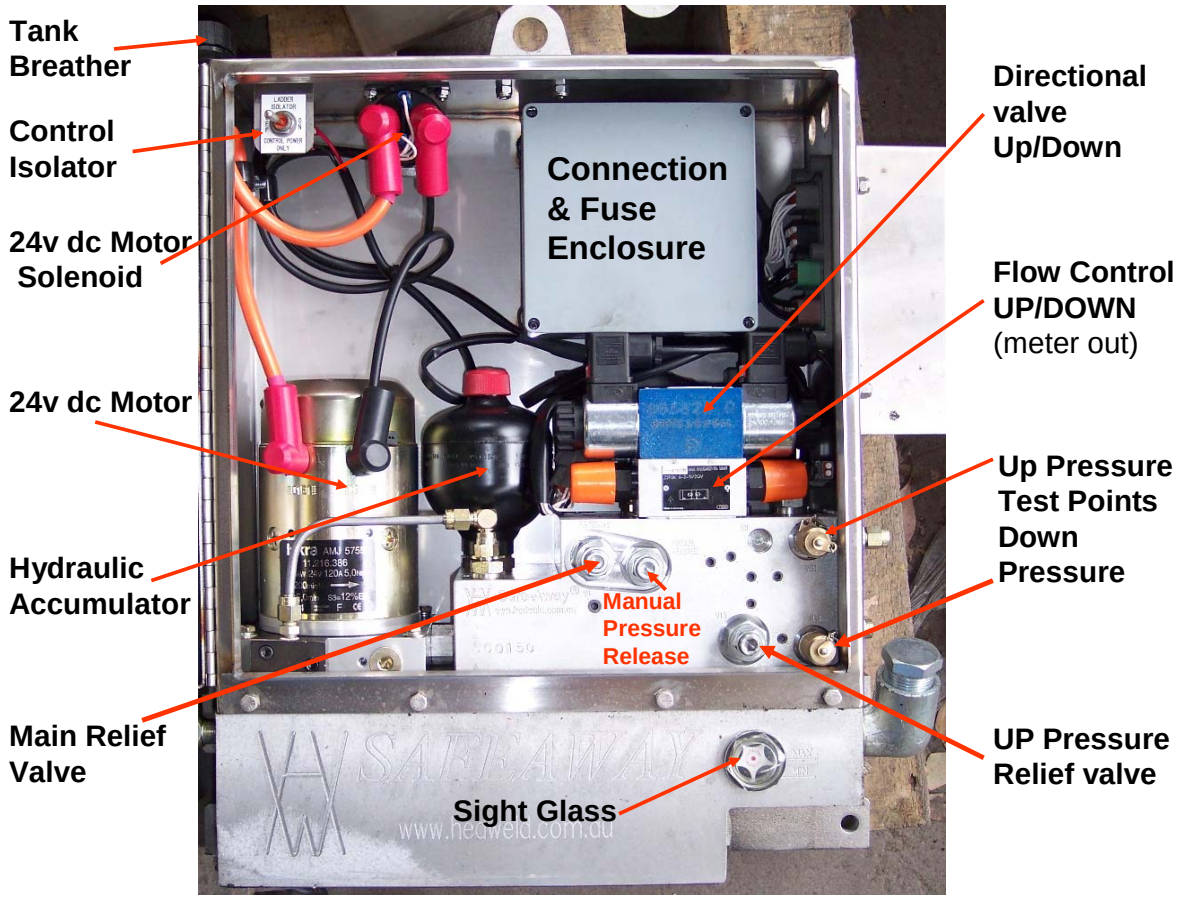


Figure 7. **Safe-Away® Access System, *Series 2005*, Power Pack, Part No. SA05051**

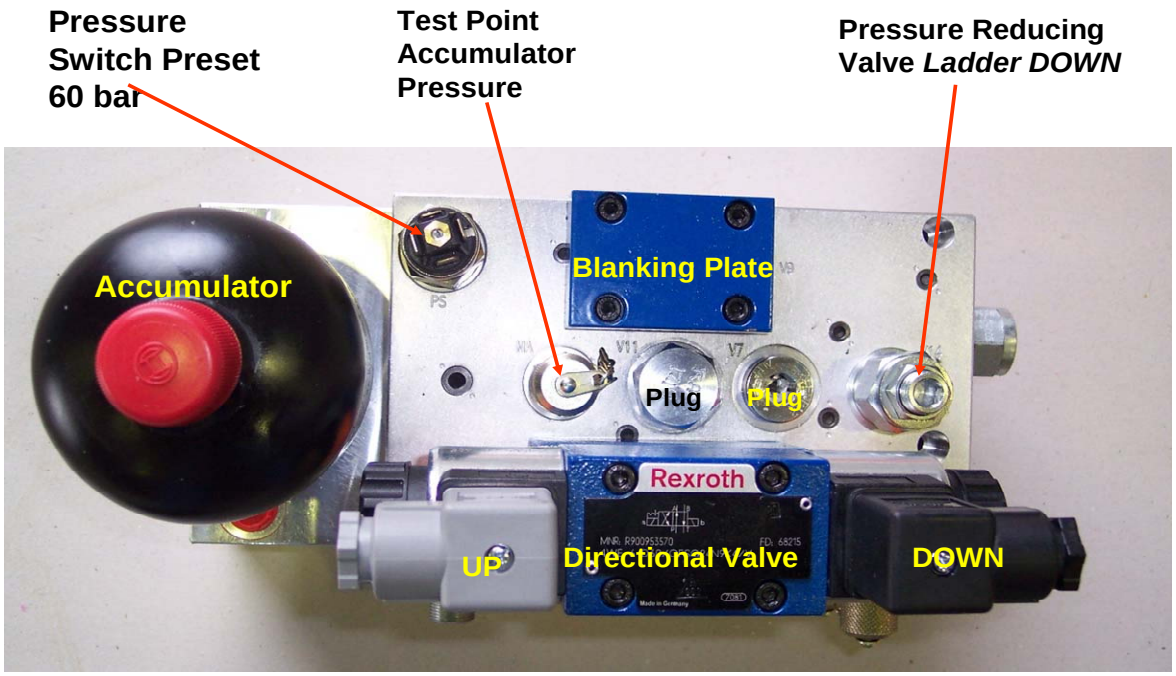


Figure 8. **Safe-Away® Access System, *Series 2005***, Manifold Top View

TROUBLESHOOTING
Safe-Away® Access System, *Series 2005.*

Hazards associated with servicing and fault finding procedures of pressurised systems can result in severe personal injury, and in extreme cases even death. It is recommended, therefore, that only qualified personnel familiar with these hazards and the precautionary measures that must be observed, should carry out these procedures, and then only in a safe and proper manner.

Carefully read the safety instructions previously listed in this manual before commencing work.

SYMPTOM	POSSIBLE CAUSE	REMEDY
Ladder fails to raise or lower.	Low oil level.	Replenish reservoir with cylinder fully retracted.
	Air in hydraulic system.	Bleed air from system.
	No power to system controls.	Ensure isolating switch on stainless steel control cabinet is on.
		Ensure vehicle battery disconnect switch is on.
	Low power condition of vehicle battery source.	Recharge/replace vehicle battery. Card will not operate under 21 volts dc supply.
	Loose or corroded battery leads.	Tighten/clean leads and terminals.
	Loose electrical plugs and toggle switch connections.	Tighten all plugs and toggle switch connections.
	Burst or leaking hydraulic pressure hose from power source to actuator assembly.	Repair/replace hose or fittings.
	Tripped 105-amp circuit breaker.	Reset circuit breaker. If continually tripping, investigate cause.

SYMPTOM	POSSIBLE CAUSE	REMEDY
Ladder fails to raise or lower. (Continued from previous page)	Manual release partially opened.	Ensure valve fully closed and secure.
Power pack continues to run when access system is fully up.	Low oil level.	Replenish reservoir with cylinder fully retracted.
	UP cycle time too long.	Reprogram UP control.
	Loose or corroded pressure switch connections on the actuator manifold.	Tighten/clean leads and terminals.
	Pressure switch malfunction.	Replace pressure switch.
	Power pack solenoid malfunction. Contacts may be welded together.	Replace solenoid.
Power pack runs when access system is fully down.	DOWN cycle time too long.	Reprogram DOWN control.
	Power pack solenoid malfunction. Contacts may be welded together.	Replace solenoid.
Ladder travel speed too slow.	Low oil level.	Replenish reservoir with cylinder fully retracted..
	Air in hydraulic system.	Bleed air from system.
	Excess weight on access system.	Remove load from ladder.
	UP Pressure relief setting too low.	Adjust p/n CP03524 drawing number iAC051-19-01 & AC268-13-01
	Flow control valve set too low.	Adjust flow control valve P/n CP03519 drawing AC268-13-01.
	Sticking control valve spool. Valve partially open.	Remove and repair.
	Oil viscosity, or ambient temperature, too low.	Replace with suitable oil to suit climatic conditions.

SYMPTOM	POSSIBLE CAUSE	REMEDY
Access system travel speed is too fast.	Travel speed valve set too high.	Adjust flow control valve P/n CP03519 drawing AC268-13-01
Ladder fails to raise fully.	Low oil level.	Replenish reservoir with cylinder fully retracted.
	Air in hydraulic system.	Bleed air from system.
	UP cycle time too short.	Reprogram UP control.
	Leaking hydraulic pressure hose or fitting from power source to the actuator assembly.	Repair/replace hose or fittings.
	Pressure relief setting too low.	Adjust p/n CP03524 drawing number iAC051-19-01 & AC268-13-01
	Bent or misaligned stairway.	Remove for repair.
	Excess weight on stairway.	Remove load
	Sticking manual release valve. Spool partially open.	Remove and repair.
Access system fails to lower with emergency down function.	Excess debris on stairway mechanism. May be binding pivot points.	Remove debris and clean mechanism.
	Ladder assembly damaged.	Remove & repair bent or misaligned stairway section.
	Pinched or blocked hydraulic hose.	Repair/replace hose.
	Insufficient accumulator pre-charge.	Recharge accumulator with nitrogen to 55-bar (800-psi)
	Check valve malfunction on accumulator manifold.	Repair/replace check valve.
	Faulty switch.	Try alternative switch
	PC card capacitor malfunction.	Replace capacitor.

INPUT OUTPUT LISTING
PC CARD

REMOTE INCAB INPUT OUTPUT LISTING

12 WAY FEMALE PLUG DT04-12PA (GREY)		
Pin No.	Cable No.	Description
1	1	24 V DC +
2	2	Neg
3	3	Up Sol
4	4	Down Sol
5	5	In Sol
6	6	Out Sol
7	7	Power Pack Sol
8	8	E Stop Door
9	9	Motor Run
10	10	Swing ID
11	11	Pressure Switch
12	12	UP Limit

3 WAY FEMALE PLUG DT04-03PA		
Pin No.	Cable No.	Description
1	15	24 V DC +
2	13	UP Input
3	14	DOWN Input

6 WAY FEMALE PLUG DT04-6P		
Pin No.	Cable No.	Description
1	13	Up Input
2	14	Down Input
3	15	Spare
4	16	Spare
5	17	Spare
6	Grey	Spare

8 WAY FEMALE PLUG DT04-08PA		
Pin No.	Cable No.	Description
1	16	Park Brake
2	Red	24 V DC +
3	17	Propel Output
4		Spare
5	Red	24V DC +
6	Black	NEG
7	Red	24 V DC +
8	8	E Stop Door

INPUT OUTPUT LISTING
POWER PACK CABINET

CABINET CONNECTION INPUT OUTPUT LISTING

12 WAY MALE PLUG (A) GREY		
Pin No.	Cable No.	Description
1	1	24 V DC +
2	2	Neg
3	3	Up Sol
4	4	Down Sol
5	5	In Sol
6	6	Out Sol
7	7	Power Pack Sol
8	8	E Stop Door
9	9	Motor Run
10	10	Swing ID
11	11	Pressure Switch
12	12	UP Limit

12 WAY MALE PLUG (B) BLACK		
Pin No.	Cable No.	Description
1	13	24 V DC +
2	14	Neg
3	15	Spare
4		Spare
5		Spare
6		Spare
7		Spare
8		Spare
9		Spare
10		Spare
11		Spare
12		Spare

12 WAY MALE PLUG (C) GREEN		
Pin No.	Cable No.	Description
1	1	24V DC +
2	2	Neg
3	3	Limit Input
4	4	Access Light
5	5	Neg
6	6	24V DC +
7	7	Up Input
8	8	Down Input
9		Spare
10		Spare
11		Spare
12		Spare

12 WAY MALE PLUG (D) BROWN		
Pin No.	Cable No.	Description
1	1	E Stop
2	2	24V DC +
3	3	Emergency Down
4	4	24V DC +
5	5	Acc/Light Manual
6	6	24V DC +
7	7	Up Manual
8	8	Down Manual
9		Spare
10		Spare
11		Spare
12		Spare

Limited Warranty

The manufacturing division of Safe-Away Pty Limited warrants that it will make any repairs and needed adjustments on new components and to correct defects in materials or workmanship. Safe-Away Pty Limited makes no warranty on component parts not manufactured or fabricated by Safe-Away Pty Limited but herby assigns to you the purchaser, all of its rights under the original manufacturer's warranty covering such component parts and agrees to assist you in making such contacts with the manufacturer of such component parts as may be necessary to protect your rights under the Warranty covering them.

This Warranty is given expressly in lieu of all other warranties expressed or implied and of all other obligations or liabilities for manufacturing defects on the part of Safe-Away Pty Limited. No person on behalf of Safe-Away Pty Limited is given any authority to make any other warranty or make any other representations on behalf of the manufacturer or to assume any responsibility on its behalf other than as set forth in this Warranty.

This Warranty shall not apply to any Component which shall have been repaired or altered outside of Safe-Away Pty Limited, if in its judgement such repairs or alterations effect the stability or reliability of equipment sold nor does said warranty apply to any component which has been operated at a speed exceeding factory rated speed or loaded beyond the factory rated capacity or which has been subjected to any misuse, neglect, accident or lack of normal maintenance.

The warranty period begins on the date the component is first delivered to the first retail purchaser. This Warranty is six (6) months.

This Warranty is to ensure that the defective parts in equipment supplied by Safe-Away Pty Limited are replaced with new parts by Safe-Away Pty Limited or any other person nominated in writing by Safe-Away Pty Limited. All replacement parts are supplied Ex Works EXW (Incoterms 1990).

Any implied warranty applicable to a component is limited in duration to the duration of this written Warranty. Safe-Away shall not be liable for consequential commercial damages resulting from breach of this written Warranty or any implied warranty.

Safe-Away Pty Limited is continually testing and evaluating its product that may result in design changes and improvements from time to time. The right to make any changes in design or improvements without imposing any obligation to install them on products previously manufactured is specifically reserved.

◆◆◆◆◆

CABIN CONTROLLER

1 24VDC+
2 NEG
3 UP SOL
4 DW SOL
5 IN SOL
6 OUT SOL
7 MOTOR SOL
8 E/STOP, DOOR
9 MOTOR RUN
10 SWING ID
11 PRESSURE SWITCH
12 UP LIMIT

PLUG (A) GREY

1 24VDC+
2 NEG
3 UP SOL
4 DW SOL
5 IN SOL
6 OUT SOL
7 MOTOR SOL
8 E/STOP, DOOR
9 MOTOR RUN
10 SWING ID
11 PRESSURE SWITCH
12 UP LIMIT

BOTTOM CONTROLLER mounted in the HYD compartment

1. UP INPUT
2 DW INPUT
3
4
5
6

PLUG (B) BLACK

1 UP INPUT
2 DW INPUT
3 SPARE
4 SPARE
5 SPARE
6 SPARE
7
8
9
10
11
12

15 13 14 — 1 2 3 — 24VDC+ UP INPUT DW INPUT — UPPER REMOTE

16 RED 17 RED BLK RED 8 — 1 2 3 4 5 6 7 8

PARK BRAKE — 24VDC+ — PROPEL OUTPUT — PARK BRAKE

24VDC+ NEG — E/DOWN DOUBLE POLE SWITCH — P/BRAKE RELAY COIL — DOWN RELAY COIL

24VDC+ E/STOP DOOR — E/STOP DOOR

1 2 3 4 5 6 7 8 — 11 12 — PRESSURE SWITCH

3 NEG — UP SOL
4 NEG — DW SOL
13 NEG — HEATER

CONTROL ISOLATOR — 24VDC+ NEG

7 8 9 — MOTOR SOL — MOTOR

POS — NEG

105AMP C/B — 24VDC SUPPLY

PLUG (C) GREEN

1 2 3 4 5 6 7 8 9 10 11 12

24VDC+ NEG — LIMIT INPUT — ACCESS LIGHT — NEG — 24VDC+ UP INPUT — DW INPUT

UP LIMIT — ACCESS LIGHT — LOWER REMOTE

PLUG (D) BROWN

1 2 3 4 5 6 7 8 9 10 11 12

1 2 — E/STOP DOOR
1 2 — 24VDC+ EMERGENCY DOWN
1 2 3 4 — 24VDC+ ACC/LIGHT MANUAL
24VDC+ UP MANUAL — DW MANUAL

OPTIONS

E/STOP DOOR — EMERG DOWN — ACCESS LIGHT — MANUAL REMOTE

REV	DESCRIPTION	DWN	DATE

HEDWELD ENGINEERING PTY LTD
A.C.N. 003 024 833

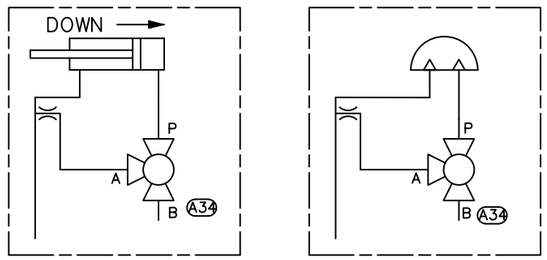
0 10 20 30 40 50 100
GRAPHIC SCALE (mm)

METRIC

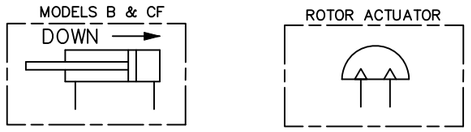
SCALE	NTS	SAFEAWAY	SHEET 1 OF 1
CHK'D		2005 POWER PACK	
DWN	BB	ELECTRICAL SCHEMATIC	REV
DATE	21/02/05	DRAWING NO. AC267-01-01	

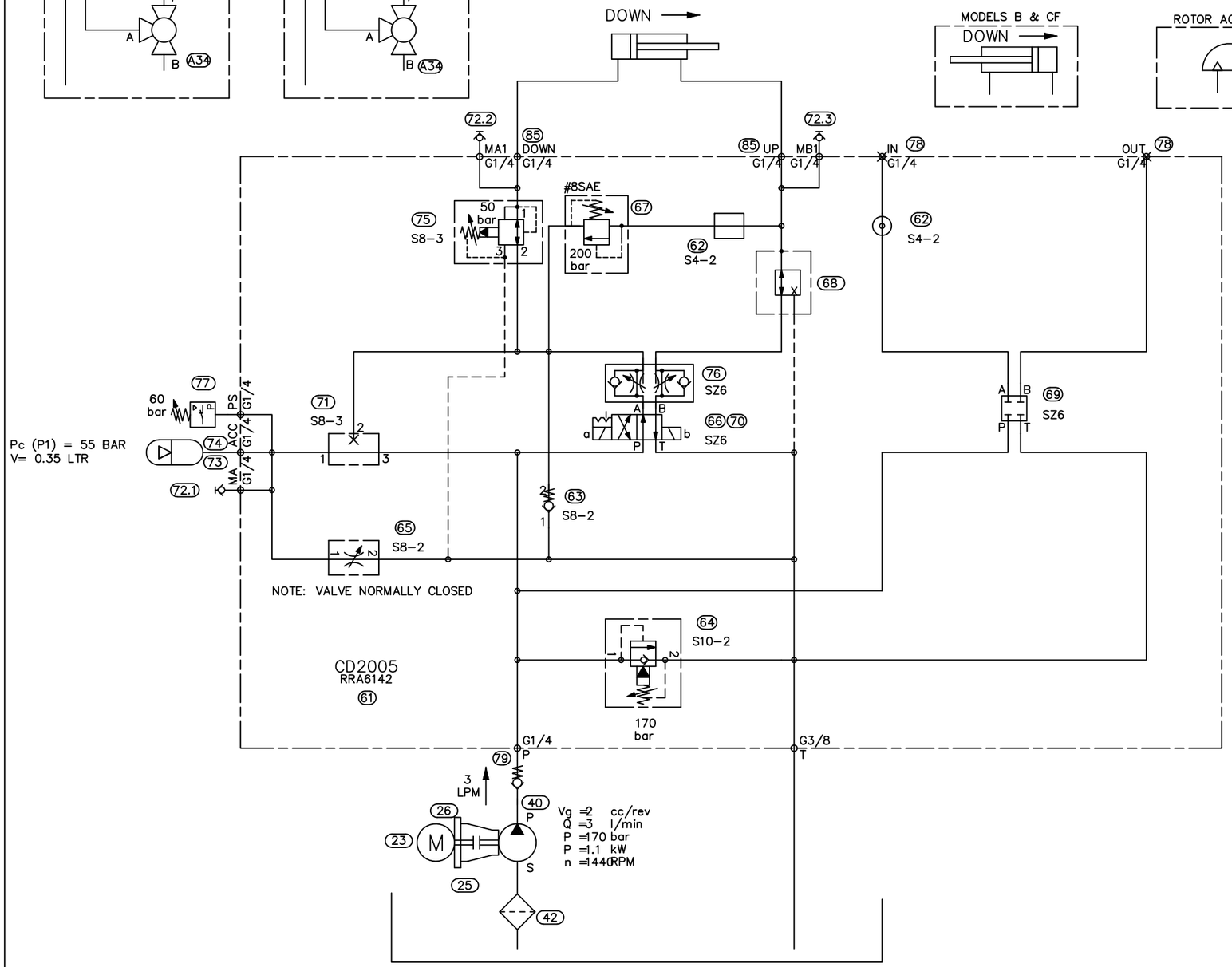
NOTE: ALL MANURFACTURING DRAWINGS REFER iMES001-01
FOR GENERAL NOTES

MANUAL (EMERGENCY) DOWN OPTION.



DO NOT SCALE – PRESSURE IN BAR – FLOW IN LITRES/MINUTE





CONTROL VOLTAGE = 24V DC
NOTE: ITEM 5 NORMALLY CLOSED

NOTE: MANIFOLD MATERIAL – ALUMINIUM T6061

Parts List			
ITEM	QTY	DESCRIPTION	PART No.
A34	1	EMERGENCY DOWN VALVE 3/2 BALL VALVE	CP05026
23	1	ISKRA MOTOR	CP03012
25	1	COUPLING	CP07003
26	1	MOTOR MOUNT	CP03020
40	1	PUMP ASSEMBLY	CP07004
42	1	SUCTION FILTER	CP07031
61	1	MANIFOLD	CP03518
62	2	7/16" UNO PLUG	CP03521
63	1	CARTRIDGE-CHECK FLOW 1-2	CP05133
64	1	CARTRIDGE-RELIEF ANTI CAV.CHECK	CP05310
65	1	CARTRIDGE-FLOW CONTROL NEEDLE VALVE	CP05134
66	1	VALVE - SOLENOID,C TOP	CP05150
67	1	CARTRIDGE-RELIEF-DIFF.AERA-DIR.OP.	CP03524
68	1	CAVITY PLUG	CP03525
69	1	BLANKING PL (C/W 4 M5X20 SCREWS)	CP03522
70	1	SCREW KIT (4 OF M5X90)	CP03520
71	1	PLUG-CAVITY	CP07033
72	3	COUPLING-MINIMESS	CP07034
73	1	ACCUMULATOR-DIAPHRAGM-0.35 LITRE	CP07501
74	1	ADAPTOR-ACCUMULATOR TO MANIFOLD	HF20021
75	1	CARTRIDGE-PRESSURE REDUCING	CP05137
76	1	VALVE-FLOW CONTROL	CP03519
77	1	PRESSURE SWITCH	CP06106
78	2	PLUG - 1/4" BSPP	HF06002
79	1	1/4" BSPP X 7/16" JIC NIPPLE	HF01008
85	2	1/4" BSPP X 7/16" 90.JIC NIPPLE	HF04009
86	2	7/16"JIC NUT CAP	HF07101

REV	DESCRIPTION	APPR No.	DWN	DATE
D	PRESSURE ADDED TO ITEM 67	TBA	DK	27/11/07
C	ITEM D17 CHANGED TO BALL VALVE	TBA	DK	22/10/07
B	PARTS LIST UPDATED	TBA	DK	9/8/07
A	DRAWING MODIFIED 06/06/07		BM	6/6/07

HEDWELD ENGINEERING PTY LTD
A.C.N. 003 024 833

0 10 20 30 40 50 100
GRAPHIC SCALE (mm)
METRIC

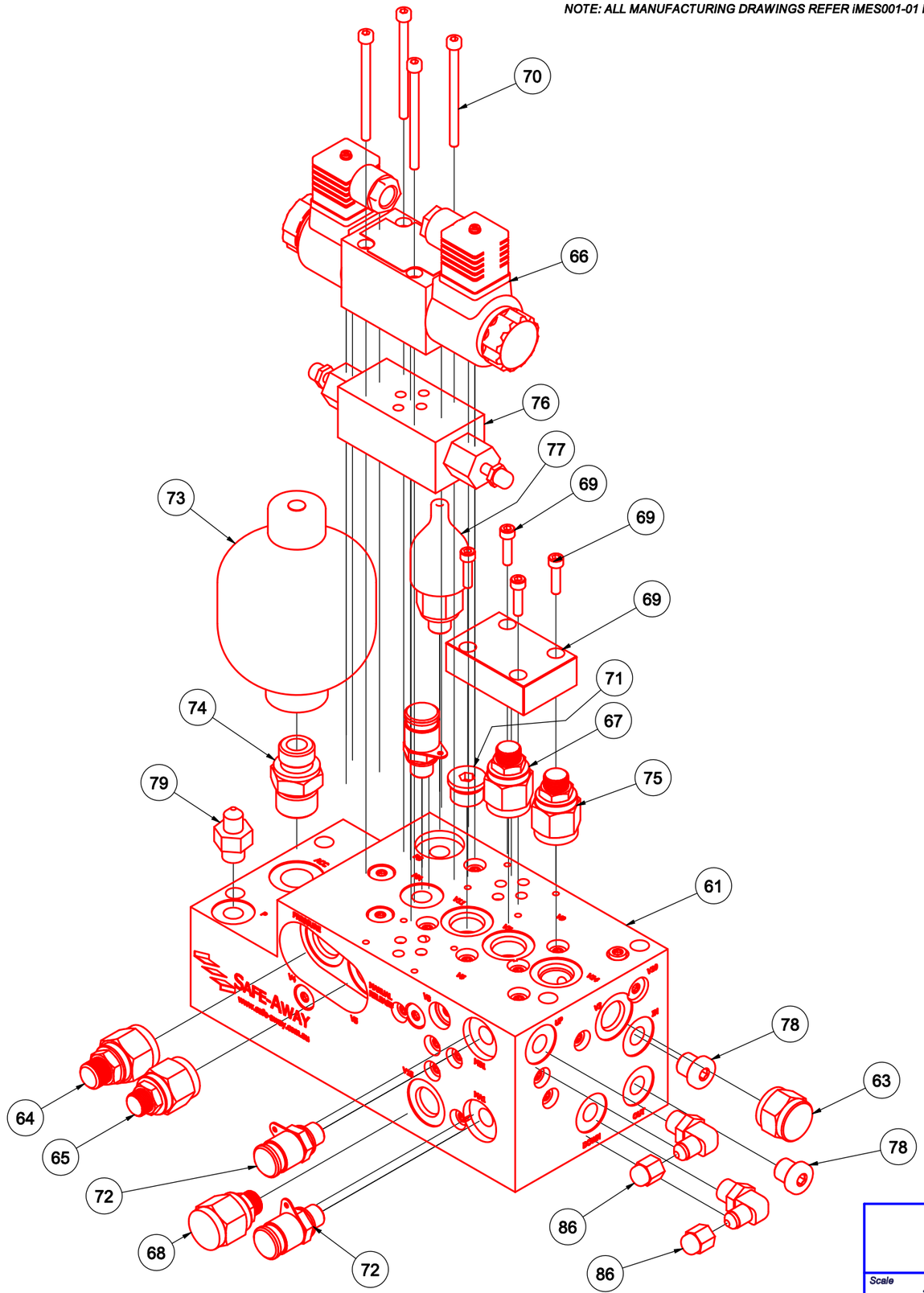
SCALE 1:10
CHK'D
DWN BM
DATE 06/06/07

SAFEAWAY
SINGLE ACTING MODIFIED
HYDRAULIC CIRCUIT

DRAWING NO. AC0268-13-01

SHEET 1 OF 1
REV D

NOTE: ALL MANUFACTURING DRAWINGS REFER iMES001-01 FOR GENERAL NOTES



Parts List			
ITEM	QTY	DESCRIPTION	PART No.
61	1	HEDWELD MANIFOLD	CP03518
62	12	7/16" UNO PLUG	CP03521
63	1	CARTRIDGE-CHECK FLOW 1-2	CP05133
64	1	CARTRIDGE-RELIEF ANTI CAV.CHECK	CP05310
65	1	CARTRIDGE-FLOW CONTROL NEEDLE VALVE	CP05134
66	1	VALVE - SOLENOID,C TOP	CP05150
67	1	CARTRIDGE-RELIEF-DIFF.AERA-DIR.OP.	CP03524
68	1	CAVITY PLUG	CP03525
69	1	BLANKING PL (C/W 4 M5X20 SCREWS)	CP03522
70	4	SCREW KIT (4 OF M5X90)	CP03520
71	1	PLUG-CAVITY	CP07033
72	3	COUPLING-MINIMESS	CP07034
73	1	ACCUMULATOR-DIAPHRAGM-0.35 LITRE	CP07501
74	1	ADAPTOR-ACCUMULATOR TO MANIFOLD	HF20021
75	1	CARTRIDGE-PRESSURE REDUCING	CP05137
76	1	VALVE-FLOW CONTROL	CP03519
77	1	PRESSURE SWITCH	CP06106
78	2	PLUG - 1/4" BSPP	HF06002
79	1	1/4" BSPP X 7/16" JIC NIPPLE	HF01008
85	2	1/4" BSPP X 7/16" 90.JIC NIPPLE	HF04009
86	2	7/16"JIC NUT CAP	HF07101

NOTE: POWERPACK EXPOLDED VIEW IS ON DRAWING iAC051-20-01

Customer: HEDWELD ENGINEERING PTY. LTD. A.C.N. 003 024 833

Certification No. | Certification Supplier

MECENSOL Pty Ltd
Mechanical Engineering Solutions
A.C.N. 113 648 141

Date: 25/02/2005 METRIC

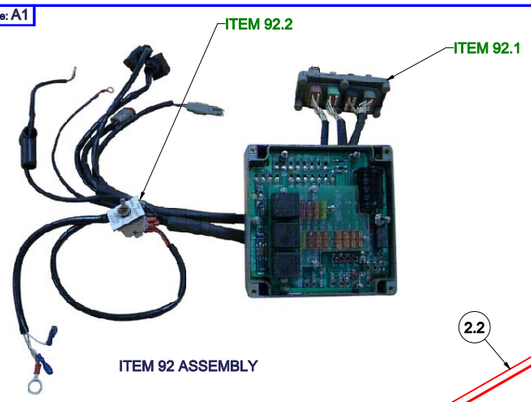
SAFEAWAY
SINGLE ACTING MANIFOLD
EXPLODED VIEW

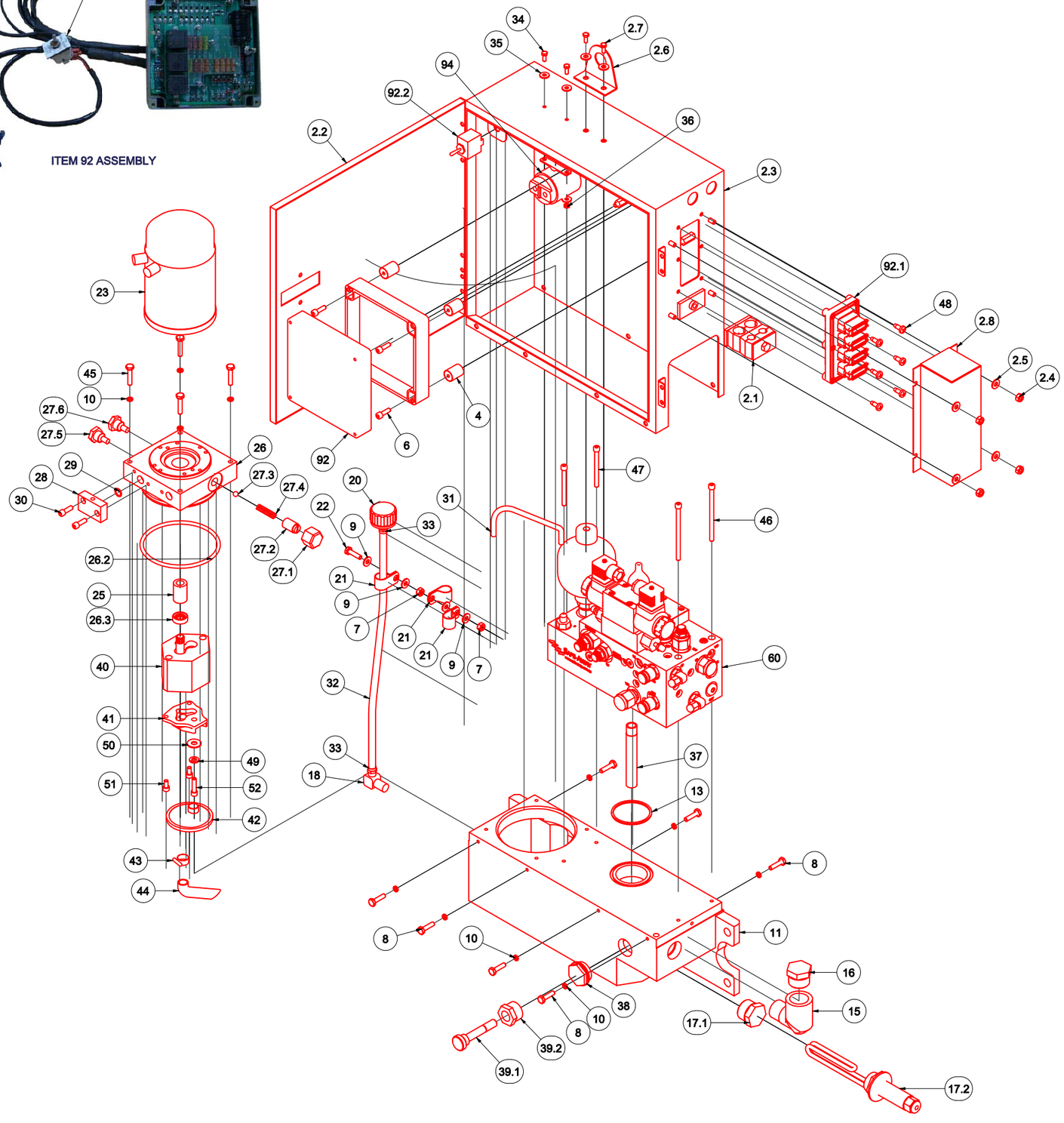
Scale	Drawn	Drawing Number	Revision	Sheet
1:2	DK	iAC051-19-01	A	1 2

P:\INV\Models\Access\iAC051\iAC051-19.dw

Sheet Size: A1

NOTE: ALL MANUFACTURING DRAWINGS REFER iMES001-01 FOR GENERAL NOTES





Parts List				
ITEM	QTY	DESCRIPTION	DRAWING NUMBER	PART NUMBER
2	1	STAINLESS STEEL CABINET COVER	iAC051-05-01	HW60025
2.1	1	14MM TWIN DOUBLE STAUF		BH02106
2.2	1	CABINET DOOR	iAC051-05	
2.3	1	STAINLESS STEEL COVER		
2.4	6	1/4" NYLOCK NUTS		NB03501
2.5	8	1/4" FLAT WASHER		NB02002
2.6	1	LIFTING LUG		
2.7	2	1/4" UNC X 1/2" S/S BOLTS		NB20000
2.8	1	ELECTRICAL COVER PLATE	iAC051-05-01	HW60023
4	4	RUBBER MOUNTS		BE10000
5	4	M6 X 21MM STUD		NB50000
6	4	M6 SOCKET HEAD CAP SCREW		NB15510
7	2	1/4" UNC NYLOC NUT S/S		NB03501
8	7	1/4" UNC X 1/2" LG S/S BOLT		NB20000
9	4	1/4" FLAT WASHER		NB02002
10	11	1/4" SPRING WASHER		NB02002
11	1	HYDRAULIC TANK	iAC051-01-01	HW60021
13	1	O RING 60IDX3 SECT		PS03054
15	1	OIL FILLER ELBOW 1" MALE/FEMALE (VERT CAB ONLY)		FV04003
16	1	OIL FILLER PLUG 1"BSPT		FV06006
17.1	1	1" BSPP PLUG		HF06006
17.2	1	OIL HEATER		EF08001
18	1	BREATHER ELBOW 3/8 CR33MS		HF04010
20	1	BREATHER 3/4"		CP07014
21	3	14MM "P" CLAMP		BH02004
22	1	1/4" UNC X 1.25" SETSCREW		NB10021
23	1	ISKRA MOTOR		CP03012
25	1	COUPLING SPLINE		CP07003
26	1	MOTOR MOUNT		CP03020
26.2	1	O-RING		PS03056
26.3	1	SHAFT SEAL		BE03023
27	1	RELIEF VALVE KIT		CP05309
27.1	1	VALVE CAP		
27.2	1	ADJUSTING SCREW		
27.3	1	BALL - CHECK		
27.4	1	SPRING-BLACK		
27.5	1	VALVE PLUG		
27.6	1	CHECK VALVE		
28	1	ADAPTER PLATE		HW90039
29	1	O RING 19IDX1.5 SECT		PS03055
30	2	1/4" UNC X 3/4" SHCS		NB15026
31	1	HYD PIPE KIT		HF30000
32	1	BREATHER HOSE 3/8"		HT02101
33	2	FEMALE SWIVEL TAIL 3/8"		HF08600
34	2	3/16" X 1/2" SCREW		NB17000
35	4	3/16" S/S WASHER		NB02020
36	2	3/16" UNC S/S NUT - NYLOC		NB03546
37	1	RETURN PIPE / DROP TUBE	iAC051-13-01	HW90040
38	1	SIGHT GLASS		HF20017
39.1	1	DIP STICK	iAC051-18-01	HW60012
39.2	1	REDUCER 1" - 3/8" BSP		FV08009
40	1	PUMP ASSEMBLY - KP16		CP07004
41	1	SUCTION COVER FOR KV16 PUMP		CP07027
42	1	SUCTION FILTER		CP07031
43	1	HOSE CLAMP-SIZE 00		HT05002
44	1	RUBBER SUCTION PIPE		CP07029
49	1	5/16" SPRING WASHER		NB02502
50	1	5/16" FLAT WASHER		NB02003
51	2	M6 X 12 SHCS		NB15509
52	1	5/16" UNC X 1" SHCS		NB15019
45	4	1/4" UNC X 1 1/4" BOLT		NB01010
46	2	1/4" UNC X 4" SHCS		NB15011
47	2	1/4" UNC X 2.75" SHCS		NB15025
48	6	S/S SCREW 12GX16mm SELF TAPPING		NB03929
60	1	MANIFOLD ASSEMBLY	iAC051-19-01	CP03518
92	1	RELAY FUSE BOARD AND WIRING ASSEMBLY		EF04081
92-1	1	DEUTSCH PLUG SET		
92.2	1	ISOLATOR SWITCH		EF06030
94	1	SOLENOID ISKRA KM136		EF06005
95	1	IDENTITY HARNESS		EF04083

Customer: HEDWELD ENGINEERING PTY. LTD. A.C.N. 003 024 853

Certification No. | Certification Supplier

MECENSOL Pty Ltd
Mechanical Engineering Solutions
A.C.N. 113 646 141

Date: 15/11/2004
METRIC

SAFEAWAY POWER PACK
SINGLE ACTING
EXPOLDED VIEW

Scale	Drawn	Drawing Number	Revision	Sheet
	DK	iAC051-20-01	A	1 / 1

P:\IW\Models\Access\iAC051\iAC051-20.idw

Safe-Away® Series 2005
Vehicle Access System

OPERATIONAL DOs AND DON'Ts

DOs :

- Do hold onto the handrail when using the ladder.
- Do check the ladder / stair before use to ensure that the unit has not been accidentally damaged.
- Do report defects immediately.
- Do ensure that the ladder / stair is in the fully down position before boarding.
- Do keep hands and fingers away from pinch points during the raising and lowering of the ladder.
- Do check that there are no personnel on the ladder / stair, or in a position where their safety is placed at risk, when lowering or raising the ladder.
- Do keep the ladder / stair clean and free of moisture, grease and oil.
- Do become familiar with the indications and alarms as contained in this manual.
- Do become familiar with the operation of the ladder stair system.
- Do become familiar with the system functions applicable to your vehicle's ladder system.
- Do ensure the park brake has been set before attempting to lower the ladder.
- Do use the up/down button / switch, instead of the park brake, to raise the ladder.

DON'Ts :

- Don't run or jump on the ladder / stair.
- Don't ride on the ladder / stair while it is in the process of being raised or lowered.
- Don’t overload the ladder / stair - use the access system one person at a time.
- Don't restore power to the ladder control system unless you know the park brake has been set.
- Don't ride on the ladder /stair while the vehicle is in motion.
- Don't use the electrical harness or hydraulic lines as a step.
- Don't use the park brake to intentionally raise the ladder / stair - use the up/down button / switch.
- Don't board the ladder / stair until it is in the fully down position.
- Don't operate the vehicle unless you are certain the ladder / stair is in the UP position.
- Don't use the ladder / stair - unless in an emergency - when the vehicle's battery supply is low.

♦♦♦♦♦

SAFE-AWAY® VEHICLE ACCESS SYSTEM

SERIES 2005 POWER PACK

SAFE-AWAY PTY LIMITED
1/27 Kyle Street,
Rutherford. NSW. 2320.
Australia.

Telephone +61 02 4936 9000 **Fax +61 02 4936 9099.**

Website: www.safe-away.com.au
e-mail: enquiries@safe-away.com.au

 PRINTED October 2007

Index

C

P

This Page Intentionally Left Blank

Komatsu Mining Corp.
https:\\mining.komatsu