

SNO-WAY®

SNOW & ICE CONTROL EQUIPMENT

INSTALLATION & OWNER'S MANUAL

22 SERIES 2 SNOW PLOWS WITH ESS® PLOW LIGHT SYSTEM

FOR GRAVITY HYDRAULICS
WITH SERIAL NUMBER AFTER 222G100000

FOR DOWN PRESSURE® HYDRAULICS
WITH SERIAL NUMBER AFTER 222D100000

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INTRODUCTION

This manual was written for the assembly, installation and maintenance of your new Sno-Way plow. Most importantly, this manual provides an operating plan for safe use. Refer to the Table of Contents for an outline of this manual.


Please keep this manual with your machine at all times as reference material and so it can be passed on to the next owner if the machine is sold.


We require that you read and understand the contents of this manual COMPLETELY, especially the chapter on SAFETY, before attempting any procedure contained in this manual.



The Society of Automotive Engineers has adopted this SAFETY ALERT SYMBOL to pinpoint characteristics that, if NOT carefully followed, can create a safety hazard. When you see this symbol in this manual or on the machine itself, BE ALERT!, your personal safety and the safety of others, is involved.

• Defined in the next column, are the SAFETY ALERT messages and how they will appear in this manual.

	WARNING
INDICATES A HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, COULD RESULT IN DEATH OR SERIOUS INJURY.	

	CAUTION
INDICATES A HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, COULD RESULT IN MINOR OR MODERATE INJURY.	

NOTICE
IS USED TO ADDRESS PRACTICES NOT RELATED TO PHYSICAL INJURY. FAILURE TO FOLLOW COULD LEAD TO PROPERTY DAMAGE.

NOTE: Additional information concerning the equipment or the procedure that may or may not be contained elsewhere in this manual.

BE AWARE! It is illegal to remove, deface or otherwise alter the safety decals mounted on this equipment.

Record the Power Pack Model Number, Power Pack Serial Number, Controller Serial Numbers, Blade Model Number, Blade Serial Number and the Pump Serial Number in the space provided below as a handy record for quick reference. The Power Pack Serial Number is located on the A-Frame (driver's side near the front), the Blade Serial Number is located on one of the middle ribs of the blade. This plate contains information that your Dealer needs to answer questions or to order replacement parts, if needed, for your unit.

NAME PLATE DATA	
POWER PACK MODEL NUMBER	_____
POWER PACK SERIAL NUMBER <small>(Located on A-Frame)</small>	_____
CONTROLLER SERIAL NUMBERS:	
TRANSMITTER S.N.	_____
RECEIVER S.N.	_____
BLADE MODEL NUMBER	_____
BLADE SERIAL NUMBER <small>(Located on Blade Frame)</small>	_____
PUMP SERIAL NUMBER	_____
(FILL IN)	

DEALER	
NAME	_____
ADDRESS	_____
CITY	_____ STATE _____ ZIP _____
PHONE ()-	_____
(FILL IN)	

ORIGINAL PURCHASER	
NAME	_____
ADDRESS	_____
CITY	_____ STATE _____ ZIP _____
PHONE ()-	_____
(FILL IN)	

We reserve the right to make changes or improve the design or construction of any part(s) without incurring the obligation to install such parts or make any changes on any unit previously delivered.

Graphics and illustrations may be used which may show equipment and/or options not included in every installation without incurring the obligation to install such parts or make changes on units previously delivered.

Sno-Way Service Parts Manuals are available on-line or at your authorized Sno-Way dealer. Request part number 97102305 & 97101915 for the 22 Series 2 Snow Plow. Factory contact information is available at www.snoway.com.

SAFETY

BEFORE ATTEMPTING ANY PROCEDURE IN THIS BOOK, READ AND UNDERSTAND ALL THE SAFETY INFORMATION CONTAINED IN THIS SECTION. IN ADDITION, ENSURE ALL INDIVIDUALS WORKING WITH YOU ARE ALSO FAMILIAR WITH THESE SAFETY PRECAUTIONS.

For your safety Warning and Information Decals have been placed on this product to remind the operator to take safety precautions. It is important that these decals are in place and are legible before operation begins. New decals can be obtained from Sno-Way or your local dealer.

REMEMBER The careful operator is the best operator. Most accidents are caused by human error. Certain precautions must be observed to prevent the possibility of injury to operator or bystanders and/or damage to equipment.

NEVER operate plow when under the influence of alcohol, drugs or other medications that could hamper your judgement and reactions. An accident may result in serious injury or death to other persons or yourself.

ALWAYS operate vehicle in a well-ventilated area. The carbon monoxide in exhaust gas is highly toxic and can cause serious injury or death.

NEVER allow hands, hair or clothing to get near any moving parts such as fan blades, belts and pulleys. Never wear neckties or loose clothing when working on the vehicle.

NEVER wear wrist watches, rings or other jewelry when working on the vehicle or individual equipment. These things can catch on moving parts or cause an electrical short circuit that could result in personal injury.

ALWAYS wear safety goggles when working on the vehicle to protect your eyes from battery acid, gasoline, and dust or dirt from flying off of moving engine parts.

ALWAYS be aware of and avoid contact with hot surfaces such as engine, radiator, and hoses.

ALWAYS wear safety glasses with side shields when striking metal against metal! In addition, it is recommended that a softer (non-chipable) metal material be used to cushion the blow. Failure to heed could result in injury to the eye(s) or other parts of the body.

NEVER allow children or unauthorized person to operate this unit.

NEVER exceed 45 m.p.h. when snow plow is attached to vehicle. Braking distances may be increased and handling characteristics may be impaired at speeds above 45 m.p.h.

ALWAYS lock the vehicle when unattended to prevent unauthorized operation of the plow.

ALWAYS check the job site for terrain hazards, obstructions and people.

NEVER exceed 10 m.p.h. when plowing. Excessive speed may cause serious injury and damage of equipment and property if an unseen obstacle is encountered while plowing.

ALWAYS position blade so it does not block path of headlamps beam. Do not change blade positions while traveling. An incorrect plow position blocking headlamp beam may result in an accident.

ALWAYS check surrounding area for hazardous obstacles before operating this unit.

ALWAYS inspect the unit periodically for defects. Parts that are broken, missing or plainly worn must be replaced immediately. The unit, or any part of it should not be altered without prior written approval of the manufacturer.

ALWAYS insert the cylinder lock when plow is not in use. If the cylinder lock is not installed, the plow blade could inadvertently drop and cause injury.

ALWAYS shut off the vehicle engine, place the transmission in Neutral or Park, turn the ignition switch to the "OFF" position, firmly apply the parking brake of the vehicle and turn "OFF" the plow controller before attaching or detaching the blade from the vehicle or when making adjustments to the blade.

ALWAYS inspect lift system bolts and pins whenever attaching or detaching the plow, and before traveling. Worn or damaged components could result in the plow dropping to the pavement while driving, causing an accident.

ALWAYS keep hands and feet clear of blade and A-Frame when attaching or detaching plow.

NEVER place fingers in A-frame or mount lug holes to check alignment when attaching snow plow. Sudden motion of the plow could severely injure a finger.

NEVER stand between the vehicle and blade or directly in front of blade when it is being raised, lowered or angled. Clearance between vehicle and blade decreases as blade is operated and injury or death can result from blade striking a body or dropping on hands or feet.

NEVER work on the vehicle without having a fully serviced fire extinguisher available. A 5 lb or larger CO² or dry chemical unit specified for gasoline, chemical or electrical fires, is recommended.

NEVER smoke while working on the vehicle. Gasoline and battery acid vapors are extremely flammable and explosive.

NEVER use your hands to search for hydraulic fluid leaks; escaping fluid under pressure can be invisible and can penetrate the skin and cause injury! If any fluid is injected into the skin, see a doctor at once! Injected fluid MUST be surgically removed by a doctor familiar with this type of injury or gangrene may result.

REMEMBER it is the owner's responsibility for communicating information on the safe use and proper maintenance of this machine.

INSTALLATION INSTRUCTIONS

General

Install the subframe on the vehicle using the instructions supplied with the subframe package. The pin height should be 8" - 10" off the ground. (See Figure 1-1).

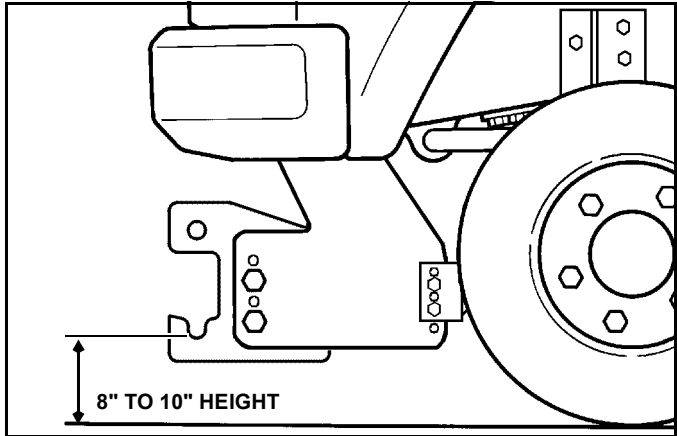


Figure 1-1

Electrical Installation

Install harnesses on the vehicle using the instructions supplied with the control package.

Mechanical Installation

IMPORTANT: Graphics and illustrations may be used which may show equipment and/or options not included in every installation.

Assemble Blade, Swing Frame, and Trip Springs

NOTE: The 22 series 2 blade uses blade stops. Make sure the proper stops are installed.

1. Open the power pack carton and remove the blade parts bag (part number 96107547). The blade stops are in the blade parts bag.

2. Place stops between the lugs on the swing frame. Secure with 3/8" x 1-3/4" bolts and locknuts. (See Figure 1-2). The bolts and nuts are in the blade parts bag.

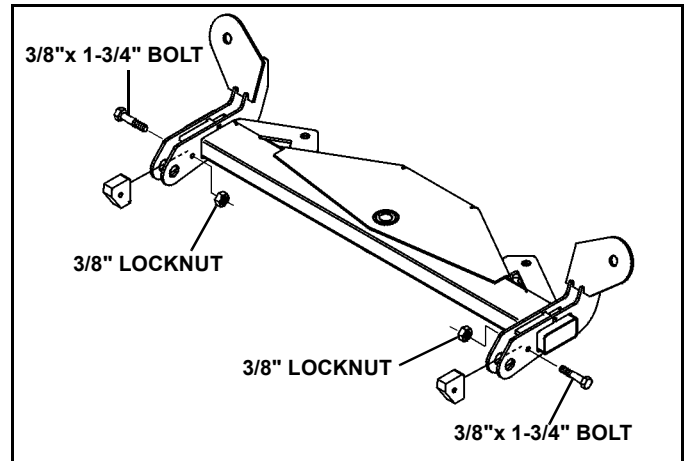


Figure 1-2

3. Lay blade face down on floor.

4. Place swing frame on blade, positioning the two inside ribs between the swing frame lugs. Insert a 3/4" x 1-5/8" clevis pin from blade parts bag to fasten each side. (See Figure 1-3).

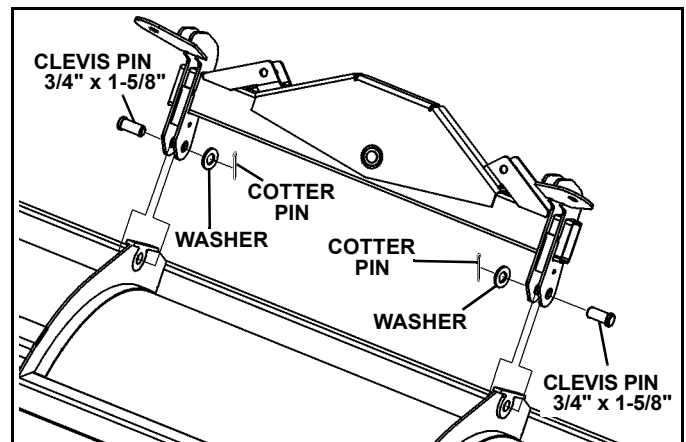


Figure 1-3

5. Insert washer on end of each clevis pin and secure with cotter pin.

NOTE: Make sure cotter pin is properly bent as in Figure 1-4 or pin may work loose.

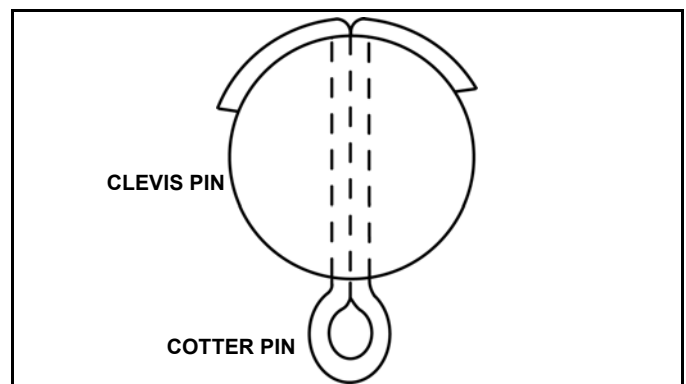


Figure 1-4

6. Remove the springs from the power pack carton. Hook springs onto blade with open end of loop facing up. (See Figure 1-5).

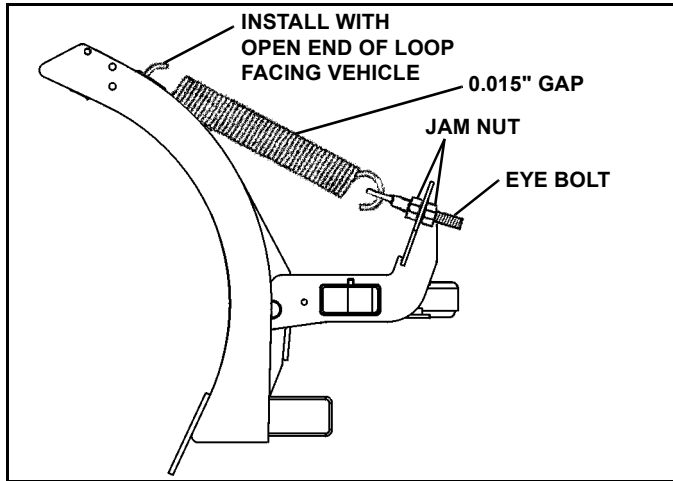


Figure 1-5

7. Hook other end of spring onto eyebolt. Insert one eyebolt on each side of the blade into the hole on the swing frame spring bracket. Use a nut on either side of bracket to secure. (See Figure 1-5).

8. Tighten springs until a .015" feeler gauge can pass between two or more coils. (A 3x5 postcard is approximately .015" thick.)



CAUTION

Do not over tighten trip springs. If more than .015" (1/64") gap appears between coils damage could occur during plowing.

Spring must be installed with open end of top loop facing vehicle. Bottom loop position will vary.

FAILURE TO FOLLOW COULD RESULT IN MINOR OR MODERATE INJURY.

Final Installation



WARNING

Install caps on both wing cylinder hydraulic lines before operating hydraulic system in step 3. Failure to cap both lines may allow high pressure hydraulic fluid to be unintentionally discharged.

FAILURE TO FOLLOW CAN RESULT IN DEATH OR SERIOUS INJURY.

1. Remove power unit from carton. Remove pump cover and install receiver using instructions included with controls package. Fill reservoir on pump with supplied hydraulic fluid.

2. Set lower hitch pins into slot on truck subframe. Plug in power and control harness and rotate light/lift bar into position. Lock in place by rotating cam handles.

3. Set A-frame level using plow control. Once A-frame is level, turn off controller and disconnect power. See "Mounting Snow Plow To Vehicle" on page 8 for more information.

4. Remove 3/4" locknut, washer and 3/4" bolt. Slide swing frame into A-frame. Replace 3/4" bolt, washer and locknut. Tighten hardware. See Figure 1-6 and Figure 1-7.

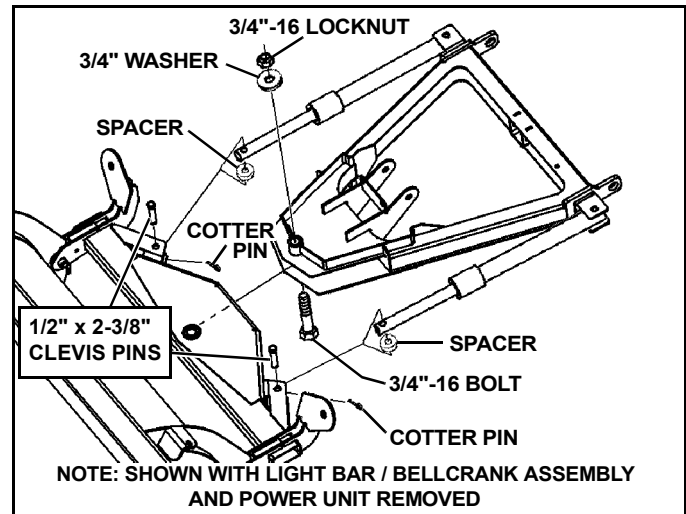


Figure 1-6

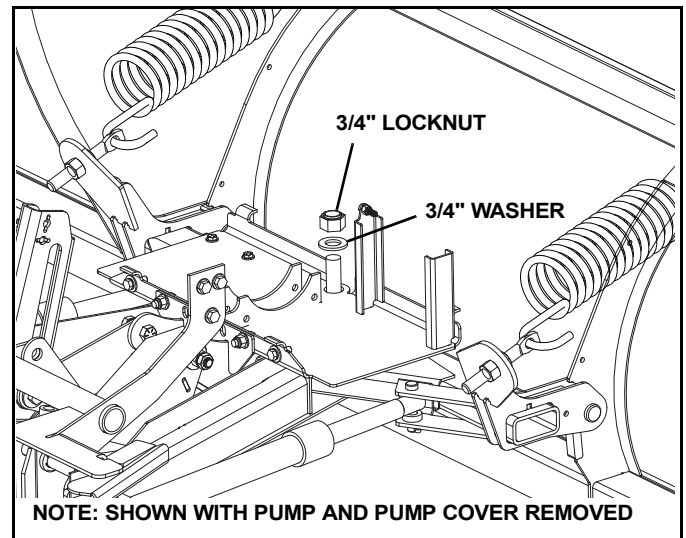


Figure 1-7

5. Remove cotter pins, clevis pins and spacers from rod end of cylinders. Reconnect the power and control. Extend cylinders using plow control to align holes in cylinder rod and swing frame. Replace spacers, clevis pins and cotter pins, making sure that spacer is on bottom of rod. (See Figure 1-6).

6. Cycle all plow functions and refill reservoir. Repeat until all air is removed from hydraulic system.

IMPORTANT: Review the "Break In Period" section on page 10 of the Maintenance section to determine if the 3/4" bolt installed in step 11 is tightened appropriately.

7. Install side marker into pre-drilled holes on blade frame using hardware included in package.

8. Remove left and right light support from power pack carton. Attach passenger's side light bar support to lift/light bar with (3) 3/8" x 1" screws, (6) washers and (3) locknuts from the light bar parts bag part number 96106089. On the driver's side use (3) 3/8 x 1" screw, (6) washers, and (3) locknuts from the parts bag. Do not tighten at this time. (See Figure 1-8)

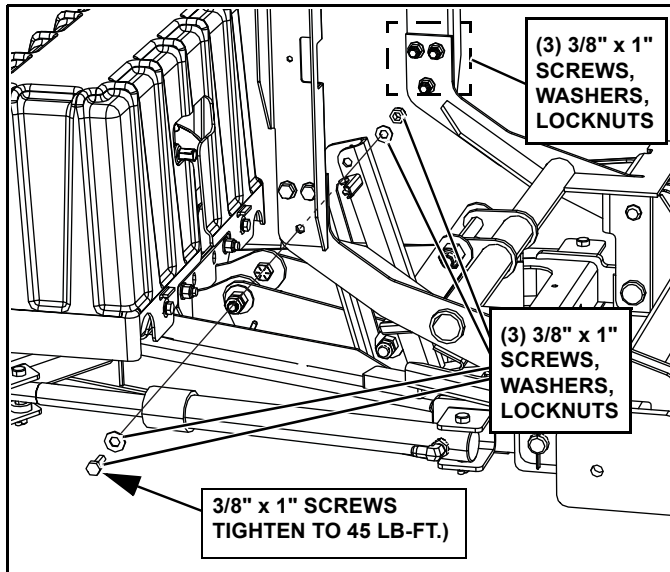


Figure 1-8

9. Secure light bar to supports with (6) 3/8" x 1" screws and locknuts. Align light bar supports to vertical position and tighten all light bar hardware. Tighten screws to 45 lb-ft. (See Figure 1-8 and Figure 1-9.)

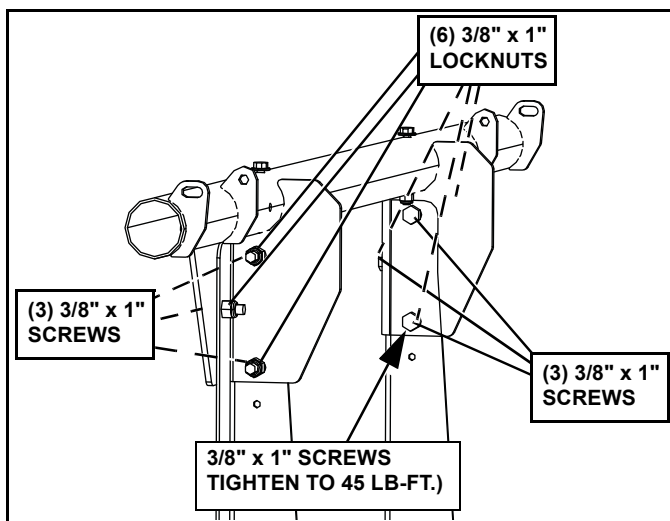


Figure 1-9

10. Place Drivers Side headlamp on top of Light Bar with the headlamp tabs inside of the Light Bar tabs. Insert (2) 5/16" x 1-1/2" screws, and (4) 5/16" washers. Screws must be inserted from the outside of the plow to the center. Place (2) 5/16" serrated tooth washers between the headlamp and Light Bar tabs. Secure with (2) 5/16" locknuts. Do not tighten. (See Figure 1-10)

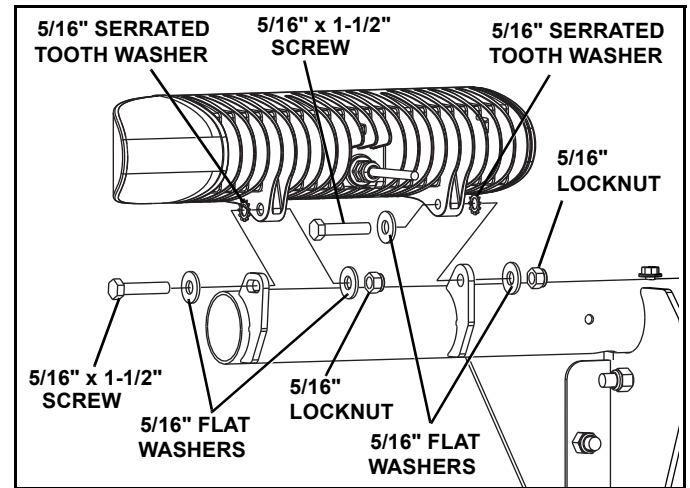


Figure 1-10

11. Repeat step 10 with Passengers Side headlamp making sure screws are inserted from the outside of the plow to the center.

12. Apply dielectric grease to all light harness connectors.

13. Run passenger and drivers' side light harnesses across Upper Light Bar tube, down the Light Bar Support, and through hole in Light Bar Support. Secure with (3) fir tree mounts inserted into holes in Light Bar Tube and Light Bar Supports. (See Figure 1-11 and Figure 1-12)

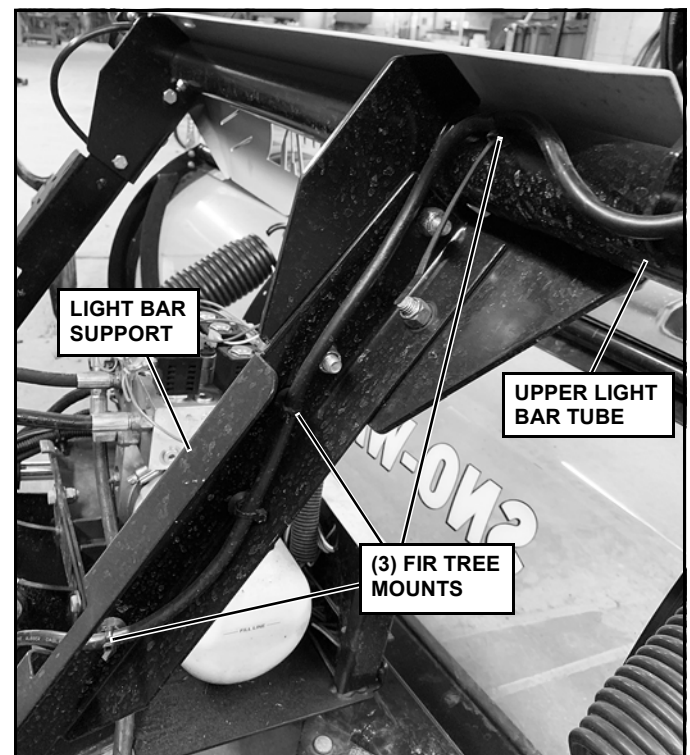


Figure 1-11

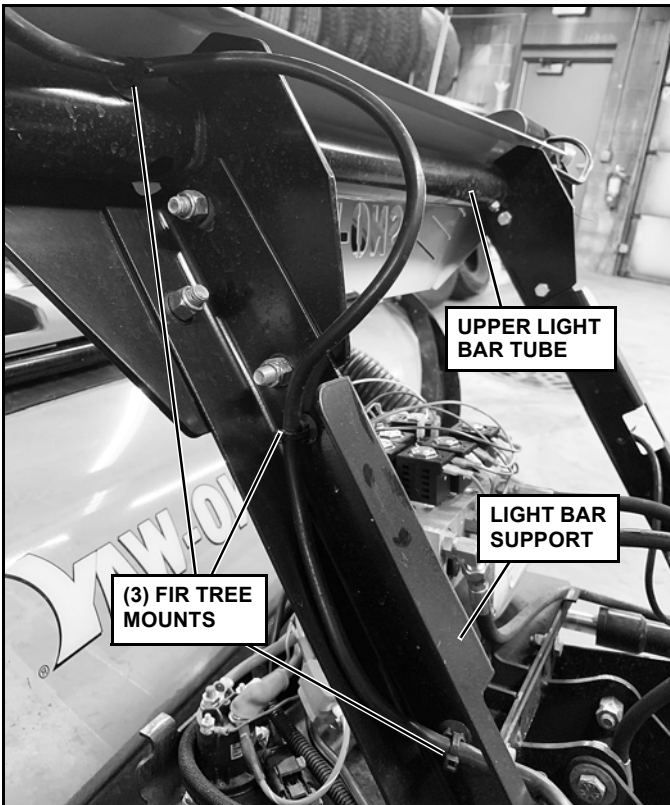


Figure 1-12

14. Remove the Extension harnesses from the parts bag. Plug the longer of the two harnesses into the passenger side light harness. Secure the harness to the Lower Light Lift Bar with two fir tree mounts. The plugs should be between the two fir tree mounts. Run the harness along the back of the A-Frame, and alongside the power and ESS harnesses up to the pump platform. (See Figure 1-13 and Figure 1-14)

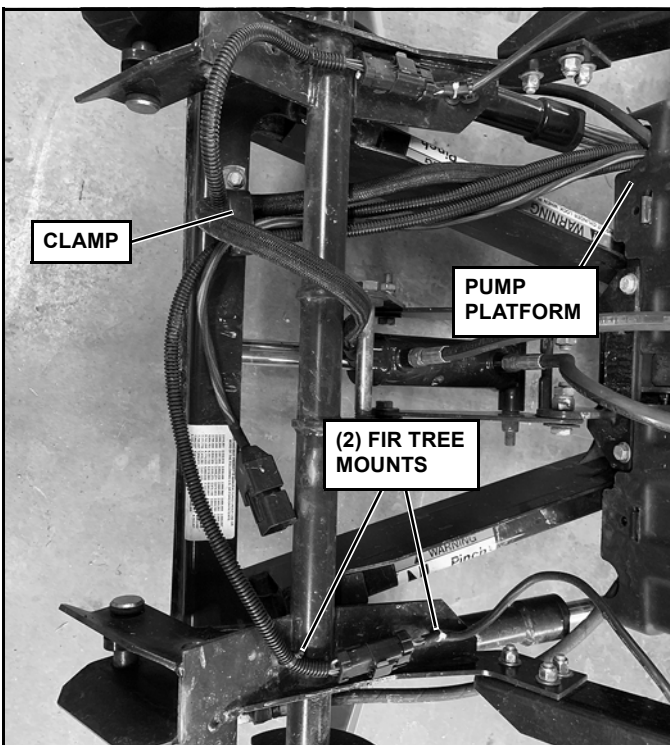


Figure 1-13

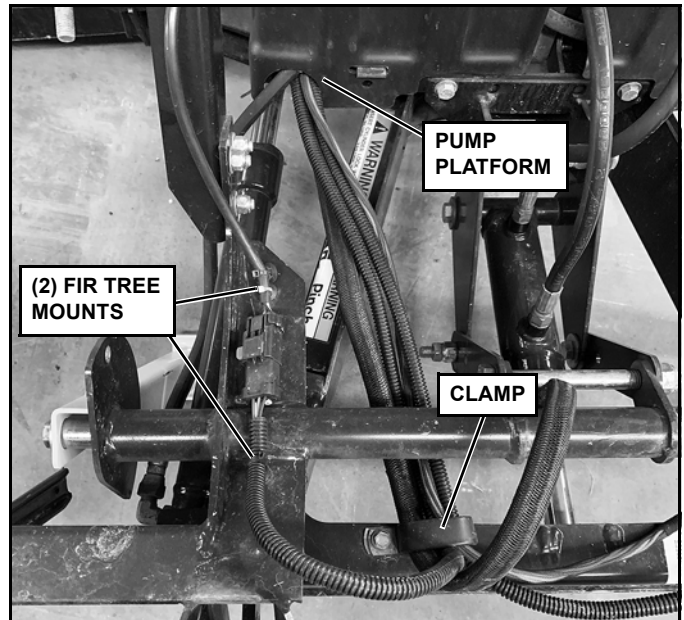


Figure 1-14

15. Plug the shorter harness into the drivers side light harness. Secure the harness to the Lower Light Lift Bar with two fir tree mounts. The plugs should be between the two fir tree mounts. Run the harness alongside the power and ESS harnesses up to the pump platform. (See Figure 1-13 and Figure 1-14)

16. Remove the cable clamp from the parts bag. Insert the Power, ESS, and extension harnesses into the clamp. Secure clamp to the back of the A-Frame using 1/4" x 1.00" Screw, 1/4" Washer, and 1/4" Locknut. (See Figure 1-13 and Figure 1-14)

17. Run both harnesses into the pump cover along the power and control harnesses. Plug the harnesses into the Pro Control II plus Receiver module (See Figure 1-15). See control manual for more information.



Figure 1-15

18. Check operation of all lamp functions (Low beam headlamp, high beam headlamp, marker lights and directional signals).

19. Aim plow lights with plow in the fully raised position. Lock the lamps in the adjusted position by tightening two 5/16" x 1-1/2" screws. (See Figure 1-10)

NOTE: In order to conform to Federal Motor Vehicle Safety Standards follow the Headlamp Aiming Procedure in the maintenance section.

20. Install pump cover by tilting pump cover forward, sliding pump cover over front two tabs, rotate cover back, and pull rear of cover over rear tabs. Replace screws and washers at rear of pump cover.

Mounting Snow Plow To Vehicle

1. Drive truck into plow. Align light/lift bar frame outside of subframe lugs. Pins should fit inside slots cut into subframe lugs. (See Figure 1-16).

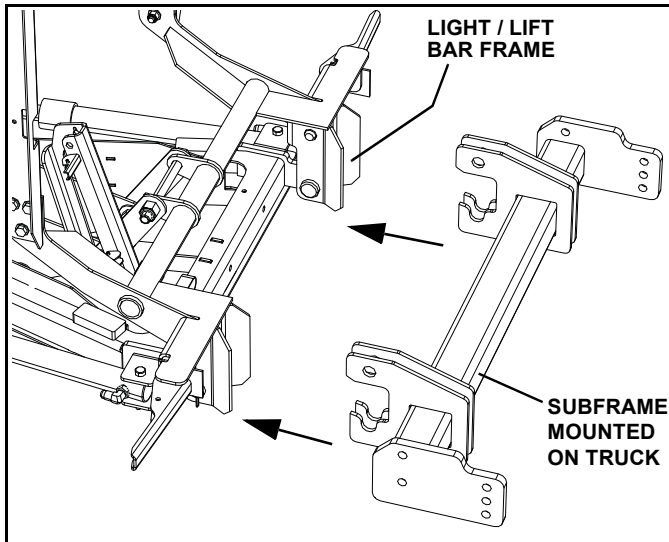


Figure 1-16

*NOTE: If pins are too high or low to fit into slots on subframe, adjust the height by plugging in the plow and hand held controller. **For Down Pressure Plows** - To lower the pins, turn on down pressure and press down. To raise the pins, press up. **For Gravity Plows** - To lower the pins, place plow in float and push up on light bar. To raise the pins, press up.*



WARNING

When using the hand held controller to raise or lower the plow A-frame for mounting the plow to the vehicle, be especially careful of the movement of the light bar. This movement will occur when raising or lowering the A-frame or jack stand.

FAILURE TO FOLLOW CAN RESULT IN DEATH OR SERIOUS INJURY.



WARNING

Pressing the blade angle functions will result in the A-frame swinging if it is not secured to the truck. Do not press the angle function during plow installation.

FAILURE TO FOLLOW CAN RESULT IN DEATH OR SERIOUS INJURY.

2. Plug in power harness and ESS harnesses.



WARNING

The power cable in front of the truck is wired directly to the battery. The power cable is always energized, even if the truck is turned off. Always replace the protective cap after disconnecting the plow power cable. Allowing an unprotected plug to contact metal parts of the truck may cause electrical component damage. Never use a metal object to clean the plug contacts.

FAILURE TO FOLLOW CAN RESULT IN DEATH OR SERIOUS INJURY.

3. Rotate light/lift bar into position by turning on down pressure and pressing the lower button. (See Figure 1-17).

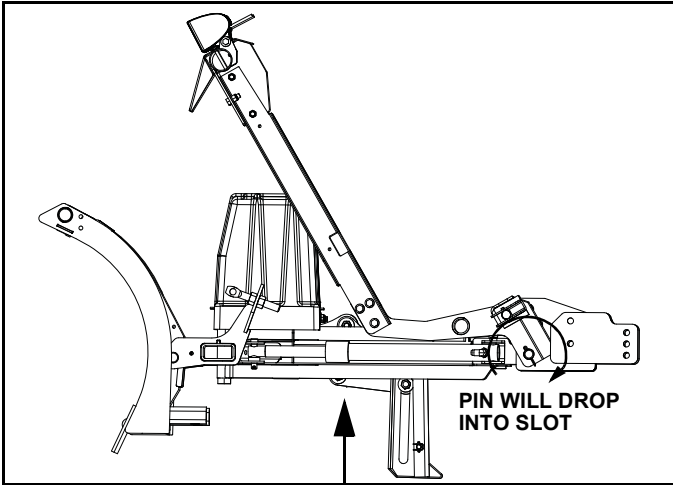



Figure 1-17

NOTE: If your plow is not equipped with down pressure hydraulics you will have to manually rotate the light lift bar into position by placing plow in float mode and pushing on the light bar.

4. Rotate pin handles forward to lock upper hitch pins in place. (See Figure 1-18). Put plow in float position by turning down pressure off.


WARNING

Make sure that upper hitch pins are engaged before moving truck. Hitch pins not fully engaged could result in the plow separating from the truck.

FAILURE TO FOLLOW CAN RESULT IN DEATH OR SERIOUS INJURY.

NOTE: Upper hitch pins are fully engaged when pin handle is tight against pin bracket and you cannot see the upper hitch pin between the pin bracket and pin handle. If upper hitch pins are not fully engaged:
 A. Raise plow an inch off the ground, then lower. Or,
 B. Turn Down Pressure ON and then OFF.
 Upper hitch pins will snap into place.

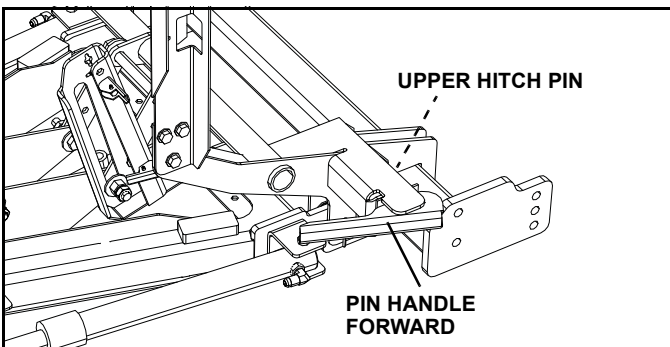


Figure 1-18

5. Disengage both jack stand pins by pulling on handles. Raise the jack stand and engage the bottom pin by pushing on the handle. Make sure pin is engaged in hole by rotating jack stand back and forth. (See Figure 1-19).

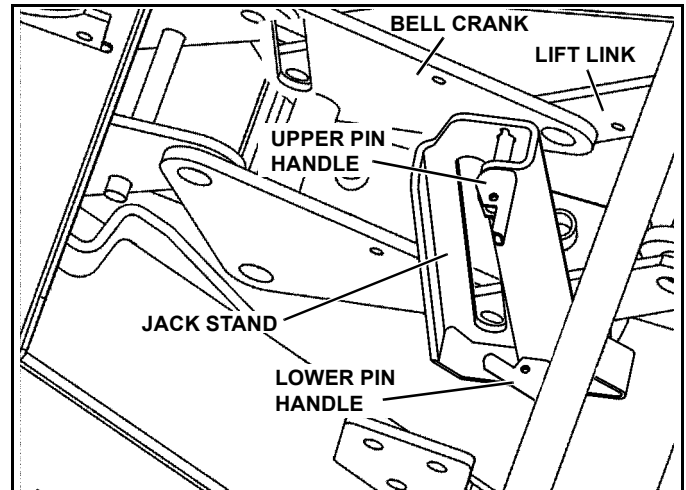



Figure 1-19



WARNING

Before use, test plow lights. DO NOT operate if any plow lights are not functioning properly.

FAILURE TO FOLLOW CAN RESULT IN DEATH OR SERIOUS INJURY.

6. Raise, lower, and angle plow to make sure no hoses or wires pinch in the plow mechanism.

Installing The Cylinder Lock Clamp


WARNING

Insert cylinder lock clamp when plow is not engaged in plowing operations. Failure to do so can allow plow to drop to unsafe position.

FAILURE TO FOLLOW CAN RESULT IN DEATH OR SERIOUS INJURY.

1. Raise the plow to the full UP position.
2. Turn the ignition OFF and apply the parking brake.
3. Turn OFF the hand-held controller.
4. Remove the pin from the cylinder lock clamp.

5. Position the cylinder lock clamp around the exposed (chrome) portion of the lift cylinder with the open side of the cylinder lock up. Install the pin. (See Figure 1-20).

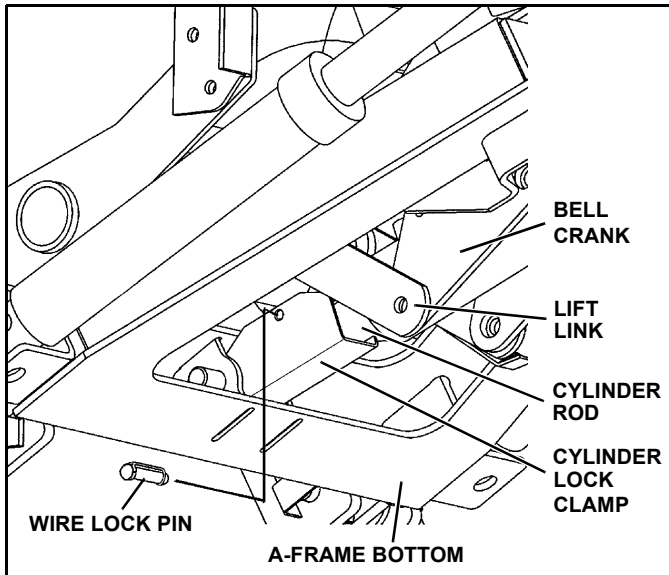


Figure 1-20

6. Lower the plow so that cylinder lock clamp is tight against cylinder.



WARNING

Failure to lower plow onto clamp could block headlights resulting in an accident.

FAILURE TO FOLLOW CAN RESULT IN DEATH OR SERIOUS INJURY.

Removing Snow Plow From Vehicle

Choose a location for the plow storage, which will allow the plow to be removed from the vehicle and not be moved after removal. Also, choose a location that will not allow the plow stand to sink into the ground. A dry, protected area is recommended.

1. Lower plow to the ground, put vehicle in park, turn off the engine and set the parking brake.

2. Disengage lower jack stand pin by pulling on handle. Lower the jack stand and engage the top pin by pushing on the handle. Make sure pin is engaged in hole by rotating jack stand back and forth. (See Figure 1-21)

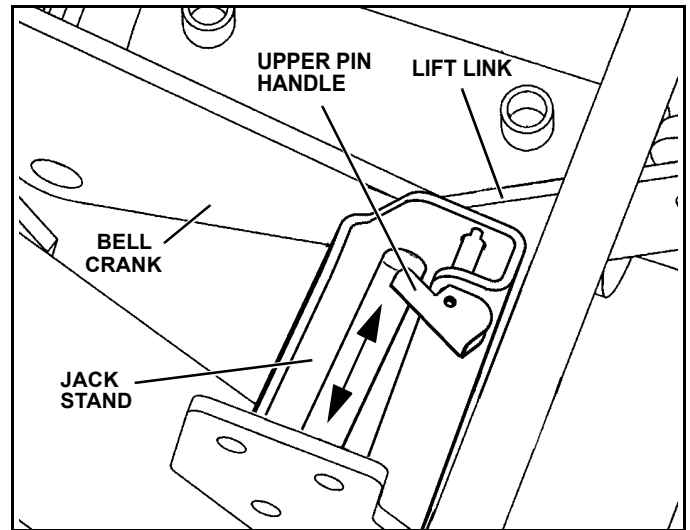


Figure 1-21

3. Turn Down Pressure ON and then OFF.

4. Push pin handles toward truck to unlock main pins. (See Figure 1-22)

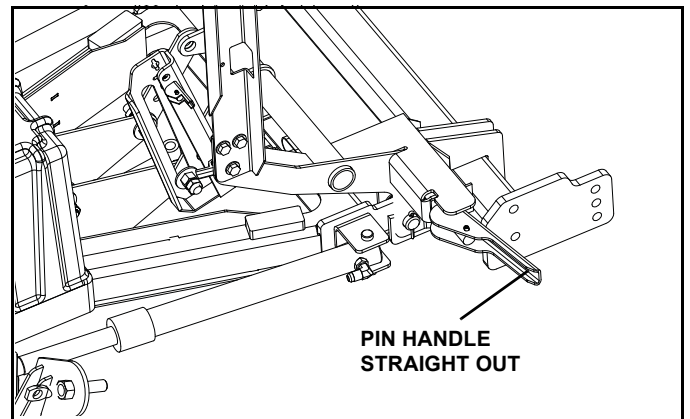


Figure 1-22

5. Rotate jack stand down and raise A-frame by pressing the up button. (See Figure 1-23)

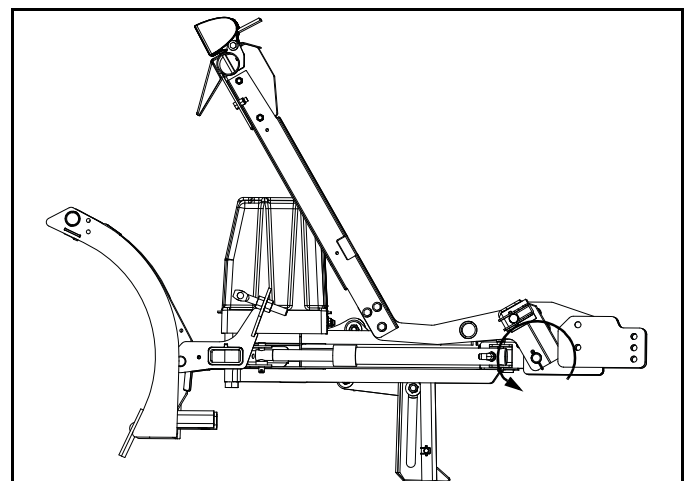


Figure 1-23

6. Disconnect power and ESS harnesses, replace protective caps, and back truck away from plow.

MAINTENANCE

General



WARNING

Before servicing plow, lower plow to the ground or onto cylinder lock clamp and disconnect main power harness.

FAILURE TO FOLLOW CAN RESULT IN DEATH OR SERIOUS INJURY.

- Before operating, perform a through visual inspection of the equipment. Look for fluid leaks, cracked, bent or broken components, loose nuts, bolts or attachments and proper fluid levels.

- A clean system is essential to long pump life and proper performance.

- When adding oil to the reservoir, wipe area around the filler port clean before removing the breather cap. Use clean oil and a clean funnel (DO NOT use a cloth or rag to strain the oil).

IMPORTANT: Sno-Way supplies type 5606 Sno-Way Hydraulic Oil with the unit from the factory. If additional oil is added it must be compatible with Sno-Way oil. If another type of oil has been used in the system the same type of oil must be used for topping off the system. Improper hydraulic fluid can cause operating problems in cold weather.

- Do **NOT** use synthetic oil.
- Oil must contain an anti-foam additive.
- Ensure all electrical connections are clean and tight.
- To prevent rust from forming, clean and repaint exposed metal surfaces.
- **NEVER** operate the equipment with the protective covers or guards removed.

Break In Period

The plow will go through a break in period during which the A-frame and swing frame will settle in. After 15-20 hours of operation check for free play of the A-frame and swing frame pivot.

1. Raise the plow and insert a jack stand under the A-frame.
2. Push down on end of blade as far as it will go on the right or left side. Measure and record the distance from the ground to the bottom edge of the wear strip.

3. Pull upwards on the same end of the plow as far as it will go. Measure and record the distance from the ground to the bottom edge of the wear strip.

4. Subtract the two measurements. If the number is greater than 1-1/2" then the free play needs to be adjusted.

To Remove Excessive Free Play

1. Tighten the pivot bolt nut (typically 1/6 to 1/3 turn, one or two flats).

Periodic Inspection

After every 20 hours of operation perform the following inspections:

1. Inspect plow assembly including sub frame for any damage or excessive wear. Replace parts as necessary.
2. Inspect all fasteners (Plow & Truck Mount) to insure they are properly tightened. Re-tighten loose fasteners to the proper torque. Loose fasteners on the Bellcrank, Pump Platform to A-Frame, Power Unit to the Pump Platform, and Truck Mount must have the locknuts replaced and tightened while using Sno-Way thread locker 96115529. (Refer to torque specification chart in this manual).
3. Apply a small amount of light oil to: Quick-tatch pin and handle assemblies, pivot pins between the blade and swing frame, and pivot pins at lift and swing cylinders. Also lubricate jackstand pins. (See Figure 2-1)

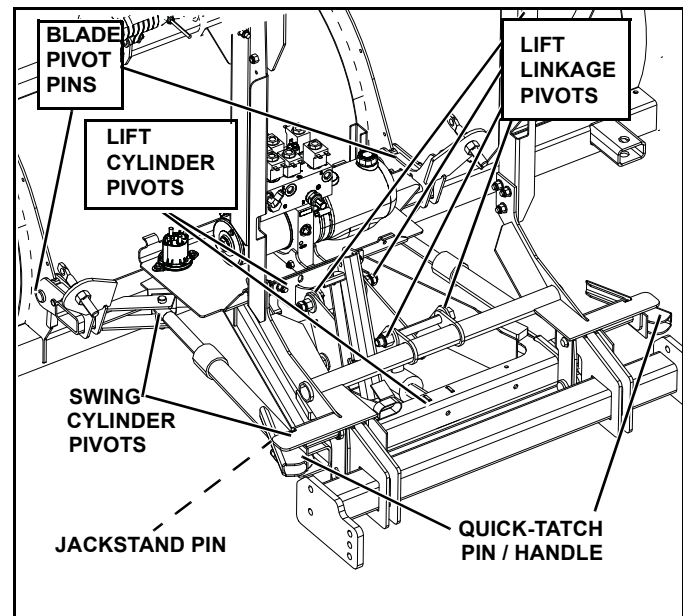


Figure 2-1

Plow Storage

When storing the plow for long periods of time use the following guidelines.

1. If the plow will not be stored on pavement, place a board under the jack stand to prevent it from sinking into the ground.
2. To prevent corrosion, coat the exposed portion of the cylinders with light grease.
3. Grease all pivot points.
4. Fill hydraulic reservoir to the fill line to minimize trapped air.
5. Place dielectric grease on the terminals of all electrical plugs, including those under pump cover. Make sure protective caps are in place or connectors are plugged together.
6. Check and replace any worn or damaged components, such as cutting edges, deflectors, and bushings.
7. For additional protection, use a 99101213 plow parka cover.

Polycarbonate Blade Care

- **DO NOT use abrasive or highly alkaline cleaners on polycarbonate blade.**
- **Never scrape polycarbonate blade with squeegees, razor blades or other sharp instruments.**
- **Benzene, gasoline, acetone or carbon tetrachloride should never be used on polycarbonate blade.**
- **DO NOT clean polycarbonate blade in hot sun or at elevated temperatures.**

Polycarbonate Blade Cleaning Instructions

Wash with a mild soap or detergent and luke-warm water using a clean cloth or soft sponge. Dry thoroughly with a chamois or moist cellulose sponge to prevent water spots.

Special Fasteners Torques and Requirements

IMPORTANT: Incorrectly securing fasteners may result in incorrect operation, excessive wear, and early failure of plow components. It may also void your warranty.

- **ALWAYS check to make sure you are using the correct torque specification for the fastener you are using.**
- **DO NOT use any lubricants on the threads of any fastener.**

Standard Fasteners

The Torque Specifications Chart on page 34 of this manual should be used as the guide for fastener torque requirements for most standard fasteners used on the plow.

Standard fasteners with special torque requirements will be noted in assembly or service instructions pertaining to the specific piece of equipment.

Hydraulic Fittings

Hydraulic fittings with locknuts should be assembled with at least three full turns of the fitting in the port and then the locknut should be tightened to 27 lb-ft.

Hydraulic fittings with 37 degree flare end swivels should be torqued to 18-20 lb-ft.

Fluid Requirements

IMPORTANT: Sno-Way supplies type 5606 Sno-Way Hydraulic Oil with the unit from the factory. If additional oil is added it must be compatible with Sno-Way oil.

It is recommended that the fluid in the hydraulic system be changed once a season.

NOTE: Type 5606 oil is rated to -60 deg. F, when Type 5606 is not available Exxon UNIVIS J13 or equivalent may be used.

Do NOT use synthetic oil.
Oil must contain an anti-foam additive.

NOTICE

- **Using the proper oil increases the life expectancy of the most critical part of your plow; the hydraulic power unit.**
- **Failure to use the proper oil can cause extensive damage to the power unit, seals and hydraulic cylinders.**
- **Improper oil can cause operating problems and poor performance in cold weather.**

FAILURE TO FOLLOW COULD LEAD TO PROPERTY DAMAGE.

Changing Oil and Cleaning Filter Screen

NOTE: Change oil and clean filter screen at the beginning of every season. This will help ensure maximum life and maximum performance from the pump assembly.



WARNING

- Allow the system to cool down before draining oil or handling system components. Burns can result from contact with hot oil.
- Never disconnect any hydraulic line or fitting with the plow in the raised position. Always lower the plow and relieve pressure before removing any lines or caps.

FAILURE TO FOLLOW CAN RESULT IN DEATH OR SERIOUS INJURY

1. Move plow to a clean, dry area with a solid surface. Lower the plow to the ground, put vehicle in park, turn off the engine, and set the park brake. Turn off the plow controller.

2. To prevent inadvertent short circuit or electrical shock, disconnect the power harness and communication harness at the vehicle bumper.



WARNING

Ensure engine is OFF and set parking brake before working on plow. Vehicle movement, equipment failure or inadvertent operation of the control switches during maintenance could result in serious injury

FAILURE TO FOLLOW CAN RESULT IN DEATH OR SERIOUS INJURY.

3. Remove the two screws at the lower back of the pump cover. Pull the back of the pump cover off the rear tabs and rotate the cover slightly forward. Push the cover off the front tabs and remove. (See Figure 2-2)

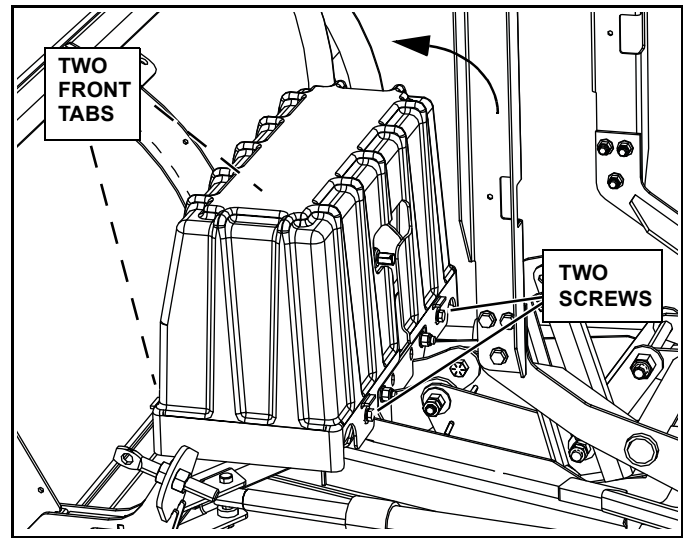


Figure 2-2

4. Remove the filler/breather cap from the reservoir. (See Figure 2-3)

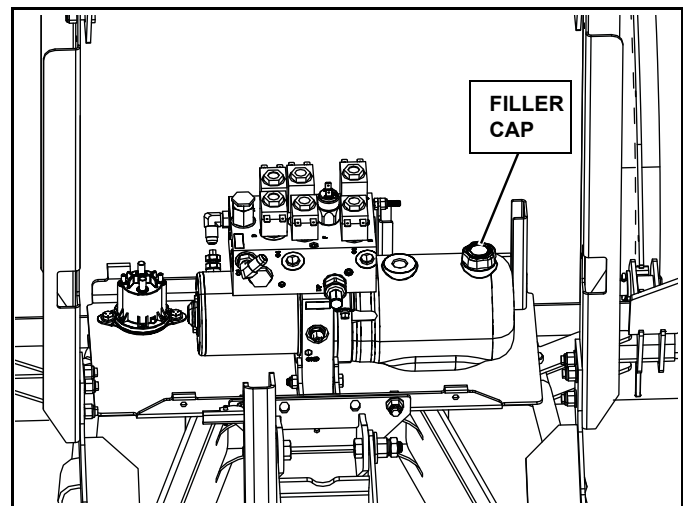


Figure 2-3

5. Using a suction gun or similar tool, remove the oil from the reservoir.

NOTE: Be careful to avoid contacting and damaging the filter screen while removing oil.

6. Remove the lift cylinder hoses from the valve block. Remove the swing cylinder hoses from the fitting in the valve block. Mark hoses before removal to be certain they are reinstalled in the correct location.

7. Place the hoses in a container to catch oil expelled from cylinders. Cycle the lift cylinder by disconnecting hitch pins and pushing and pulling on light bar. Cycle swing cylinders by disconnecting from swing frame and pushing and pulling on cylinder rod.

8. Reconnect swing cylinders and install hitch pins.

9. Loosen the band clamp, which holds the reservoir to the pump assembly. Pull and twist the reservoir until it separates from the pump assembly. Be careful not to damage the filter screen. (See Figure 2-4)

10. Note the position of the reservoir oil pick-up tube and be sure the tube is in the same position when the filter is removed and installed. (See Figure 2-4)

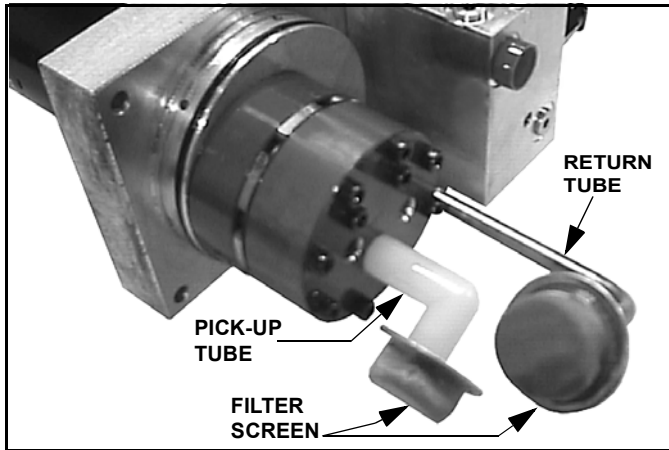


Figure 2-4

11. Pull the filter screens off the return and suction tubes (hold it by the metal cover, not the screen) and clean. Blow-dry with low-pressure air from the inside. (See Figure 2-4).

12. Carefully re-install the filter screens. Use care when handling the screens to avoid damage.

13. Visually check that the pickup tube and filter are in the proper orientation (See Figure 2-4). If not, rotate the pickup tube until the tube and filter are in the proper orientation.

14. Clean the inside and outside of the reservoir.

15. Inspect the O-ring seal for damage. Replace if needed. Before installing, lubricate with fresh oil, and reinstall reservoir carefully to avoid damaging the O-Ring.

16. Tighten band clamp that holds the reservoir to power unit.

17. Reconnect hydraulic fittings and hoses in their correct position and torque to 20-25 lb-ft. If unit utilizes O-Ring and jam nut type connectors tighten jam nut to 15-20 lb-ft.

18. Fill the hydraulic reservoir with type 5606 hydraulic fluid until the fluid registers full on the oil level mark on reservoir.

NOTE: Vehicle must be parked on level ground and plow must be in lowered position in order to properly check the reservoir level.

19. Refer to controls manual and cycle plow to remove air from hydraulic system. Refill reservoir as needed.

20. Operate system and check for leaks. Repair and replace components as necessary. Install pump cover.

Cutting Edge

IMPORTANT: Cutting edge MUST be replaced when it is worn to the bottom edge of the plow frame.

1. Raise the plow to full up position.
2. Place a jack stand under both ends of the blade bottom rail.
3. With the Down Pressure Hydraulic System OFF, lower plow until firmly resting on jack stands.
4. The blade skin must be retained prior to removing cutting edge. This can be done using a pair of 6" C-clamps located at the center of the curved portion of the blade.
5. With an assistant, remove hardware and worn wearstrip from plow.
6. Insert two carriage bolts, one on each end of the blade, through the cutting edge and blade. Loosely install two locknuts.
7. Insert the remaining carriage bolts and loosely install locknuts on each bolt.
8. Beginning on either side, tighten all nuts securely.

NOTICE

• Do Not use Teflon tape or pipe dope on hydraulic fittings. These can dislodge and jam valves in the hydraulic system.

FAILURE TO FOLLOW COULD LEAD TO PROPERTY DAMAGE.



WARNING

The bottom of the cutting edge can be very sharp. Whenever handling a cutting edge, work with an assistant and wear suitable protective gloves to avoid serious injury.

FAILURE TO FOLLOW CAN RESULT IN DEATH OR SERIOUS INJURY.

Plow Shoe Adjustment

1. Raise plow to full up position.
2. Support blade with a jack.
3. Turn vehicle ignition switch and plow control OFF and apply emergency brake.
4. Adjust shoe assemblies by removing shoe mounting lynch pin and adding or subtracting washers on the top or bottom of the shoe-mounting bracket. (See Figure 2-5).

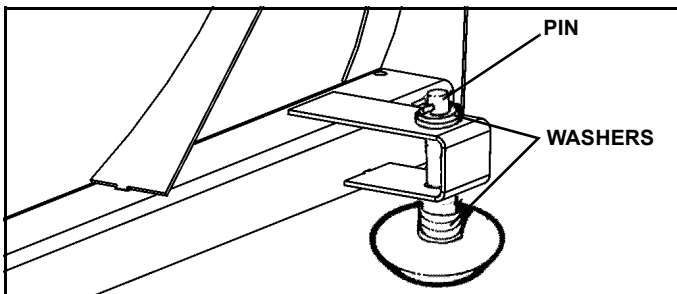


Figure 2-5

5. After the plow shoe position is properly adjusted place washer on the shoe stem - above the plow shoe mounting bracket and below the retaining lynch pin - to remove all up and down movement of the plow shoe in the bracket. Failure to do so will result in excessive wear of the holes in mounting bracket or bending of the plow shoe stem.

IMPORTANT: Snap lynch pin ring over so that it contacts the pin. If ring does not contact lynch pin, rotate the pin and reverse the direction of the ring. If the ring does not contact the pin it is not locked and could fall out.

Trip Spring Adjustment

See "Mechanical Installation" on page 4.

Blade Stop Replacement

Replace the blades stop at least every 3 years by following in reverse order: the steps under "Assemble Blade, Swing Frame, and Trip Springs" on page 4 in the Mechanical Installation section.

Emergency Plow Raise

If your snowplow becomes inoperable for any reason, follow the instructions below to raise the plow for transport to your nearest Sno-Way Dealer.

1. Move truck to level hard ground.
2. Place a jack under the swing frame as close to the A-frame as possible.
3. Raise jack until the A-frame is at approximately 30 degrees with the ground.
4. Make sure the plow and jack are stable. Place a jack stand or wood blocking under the A-frame to prevent the plow from suddenly dropping.



WARNING

Failure to place a jack stand under the plow could result in the plow rapidly falling.

FAILURE TO FOLLOW CAN RESULT IN DEATH OR SERIOUS INJURY.

5. Install cylinder lock clamp. (See "Installing The Cylinder Lock Clamp" on page 9.)
6. Remove Jack and Jack stand.
7. Drive to your nearest Sno-Way dealer for service.

Headlight Aiming Procedure

Requirements:

An unobstructed wall that is preferably painted white with minimum dimensions 10 feet (3 m) wide by 5 feet (1.5 m) high. The vehicle that is having the lamps installed will need to be parked such that the distance from the front of the snow plow lamps to the wall is 25 feet (7.6 m). The ground of the wall and driveway in which the vehicle is parked must be flat and even.

Preparation for Headlamp Aim:

The vehicle must be positioned 25 feet (7.6 m) away from the aiming wall. The center of the vehicle must be aligned with the center of the wall. This can be facilitated by using black tape to mark the wall. The wall will require a vertical line that represents the center line of the vehicle and the wall (Line 1), and a horizontal line that represents the center line height of the snow plow lamps (Line 2), (reference item 9 below). The wall will also require two vertical lines bisecting the horizontal line that provides the distance between the snow plow headlamps (Lines 3 left and 4 right). Locate the high beam light on each snow plow lamp and project the location onto the front lens with the aid of a small 1/2" piece of black tape. Then, using a tape measure, accurately measure the distance between the black tape left and right light centers. Once the distance has been determined, divide the distance by two. This is the distance between Line #1 to Line #3 and Line #1 to Line #4. (See Figure 2-6) Finally, the wall will require a horizontal line that represents the nominal vertical aim position down (Line 5), (reference item 10 below). (See Figure 2-6)

1. Remove ice or mud from under fenders.
2. Set tire inflation pressures to the values specified on the tire sidewall or information label.
3. Check truck springs for sag or broken suspension system.
4. See that there is no load on the vehicle other than the driver, the snow plow frame, and the snow plow. The snow plow should be in the raised position.
5. Check functioning of any automatic vehicle leveling systems and specific manufacturer's instructions pertaining to vehicle preparation for headlamp aiming.
6. Clean the snow plow lamp lens.
7. Check for LED burnout and proper beam switching.
8. Stabilize suspension by rocking vehicle sideways.
9. Measure the vertical height of the center of the snow plow lamp from ground. This dimension will be required for comparison to Table #1 below.
10. Reference Table #1 and determine the nominal vertical aim down below the horizontal center line of the snow plow headlamps. Using black tap, draw this horizontal line (Line 5). (See Figure 2-6)

Table 1: Vertical Beam Aim Guidelines (Line 5)

Headlamp (Centerline) Mounting Height	Nominal Vertical Aim Down
22 to 36 in (56 to 90 cm)	0 Vertical
36 to 48 in (90 to 120 cm)	2 in (5 cm) Down
48 to 54 in (120 to 140 cm)	4 in (6.4 cm) Down

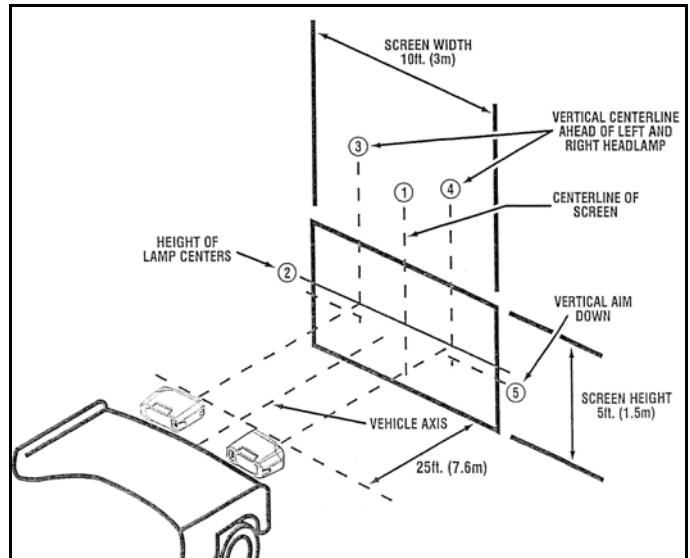


Figure 2-6 Alignment of Headlamp Aiming Screen

Visual Headlamp Aiming Procedure:

1. Activate the snow plow lamp HIGH beams so that they illuminate toward the wall. (See Figure 2-7)
2. Focus the left snow plow lamp hot spot beam directly at the cross hair target that is developed by Line 5 and Line 3.
3. There are two bolts that provide vertical aiming of the headlamp. Adjust the lamps accordingly and tighten the bolts.

4. Repeat the same procedure for the right snow plow lamp. Use the hot spot beam cross hair target that is developed by Line 5 and Line 4.

5. Confirm that each lamp has maintained the correct aiming location. Secure the mounting bolts.

Verify Completion:

This completes the headlamp aiming process. Confirm that the headlamps are switched back to the low beam position before operating vehicle.

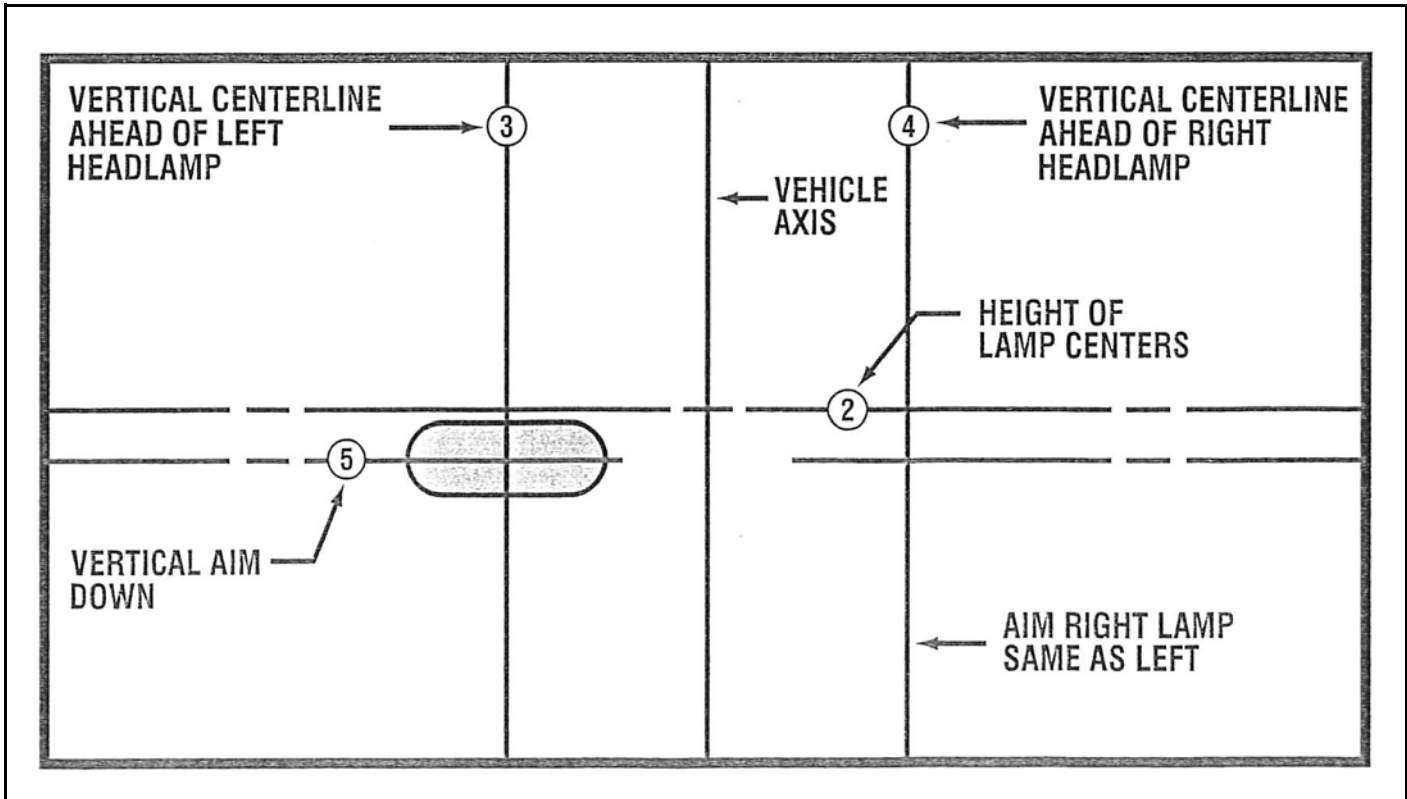


Figure 2-7 High-Intensity Zone (Shaded Area of a Properly Aimed Upper Beam on the Aiming Screen 25 ft (7.6 m) in Front of Vehicle)

PLOWING OPERATION

Operating Class

The 22 Series 2 Sno-Way plow is specifically designed for applications on light duty trucks and SUVs.

NOTE: The loaded vehicle, including any ballast weight and optional equipment, must not exceed the Gross Vehicle Weight (GVW) or front or rear Gross Axle Weight (GAW) ratings specified on the Safety Compliance Certification Label located on the driver's side door opening. For additional information, refer to your dealer and the Sno-Way Application Guide for proper vehicle applications.

Before the Season Begins

1. Inspect plow vehicle's electrical system for proper operation.
2. Inspect plow assembly including sub frame for any damage or excessive wear. Replace parts as necessary.
3. Inspect all fasteners to insure they are properly tightened. Re-tighten loose fasteners to the proper torque (Refer to torque specification chart in this manual).
4. Apply a small amount of light oil to: Quick-tatch pin and handle assemblies, pivot pins between the blade and swing frame, and pivot pins at lift and swing cylinders. Also lubricate jackstand pins. (See Figure 2-1).
5. Clean and repaint any exposed metal parts with corrosion resistant enamel.
6. Check free play between the a-frame and swing frame pivot. Adjust if necessary. (See "Break In Period" on page 11).
7. Check the oil level and repair any oil leaks. (See "MAINTENANCE" on page 11).
8. Inspect electrical connectors. Make sure the contacts are clean, and apply a small amount of dielectric grease.
9. If ballast is required, position and secure ballast behind rear wheels, for optimum performance.

Transporting Vehicle With Plow Attached

1. Always install the cylinder lock clamp when the plow is raised and the operator is not engaged in plowing operations. See "Installing The Cylinder Lock Clamp" on page 9.

NOTICE

• Remove the plow when driving extended distances at temperatures above 40 deg. F, the plow blocks enough airflow to cause it to overheat at temperatures above 40 deg. F.

FAILURE TO FOLLOW COULD LEAD TO PROPERTY DAMAGE.

2. Position the blade out of the beam path of the headlights before driving.



WARNING

The plow blade may partially block the plow lights when fully raised. Always lower plow onto lift cylinder lock clamp when transporting plow at night. Blocked plow lights could result in an accident.

FAILURE TO FOLLOW CAN RESULT IN DEATH OR SERIOUS INJURY.

3. Do not exceed 45 M.P.H. when driving with the snowplow attached. Braking distance is increased and handling impaired at speeds above 45 M.P.H.
4. Reduce speed when crossing railroad tracks or when road conditions deteriorate.
5. Never change blade angle or height while driving.
6. Inspect plow and attaching hardware for damage before transporting or plowing.

Plowing Like A Pro



WARNING

Wear your seat belt! Contact with a hidden obstruction can cause serious personal injury from bodily contact within the vehicle cab or whiplash from sudden stops.

FAILURE TO FOLLOW CAN RESULT IN DEATH OR SERIOUS INJURY.



WARNING

• Never exceed 10 m.p.h. when plowing! Serious personal injury can result, as well as damage to equipment and property, if an unseen obstruction is encountered while plowing.

• Never plow with your head protruding from the vehicle side window. Serious head or neck injuries can result from sudden stops or coming into contact with tree branches, signs or other stationary objects.

FAILURE TO FOLLOW CAN RESULT IN DEATH OR SERIOUS INJURY.

NOTE: The air bag is factory set to deploy at a certain acceleration level. The air bag will deploy with the plow attached if an obstruction is hit with enough force to reach this level. Always plow within the recommended plowing speeds and know the area you are plowing to avoid any obstructions.

NOTE: For better clean up of hard packed snow; raise the plow shoes so that the cutting edge of the blade comes into direct contact with pavement. Use the lowest possible gear to place maximum power behind the cutting edge.

For instructions on using the plow controller to manipulate the plow see the manual included with your plow control package.

1. Become familiar with the area to be plowed and mark potential hazards before the snow falls. Many immovable objects cannot be seen when covered with snow. Developing a plan early can save valuable time and equipment damage. Allow sufficient room to pile snow, out of the traffic area, with enough space for when the next storm comes.

2. Plow with the storm. The "Pros" are out early removing only several inches at a time. Allowing snow to accumulate to unmanageable levels can cause removal problems and wear and tear on equipment. The plow is not a "Ram" or a "Bulldozer". If used properly, it will give many years of safe and reliable service.

3. Research municipal ordinances for restrictions on the disposal of snow. Many municipalities do not allow snow to be placed in or moved across roads or highways.

4. Research state department of transportation rules on maximum width restrictions for snow plows. Certain blades may require permits.

Using The Down Pressure (DP) Hydraulic Systems

The DP system was designed for removing hard packed snow from hard surfaces that has been driven on prior to plowing.

The system should be turned OFF when plowing surfaces such as gravel, dirt, sand, etc., to prevent cutting into the surface.

Activating the system applies down pressure to the down pressure side of the lift cylinder. This down pressure will force the cutting edge through hard packed snow. If down pressure decreases as a result of a low spot, more down pressure will be applied to the lift cylinder. When a high spot is encountered the down pressure will be relieved to allow the plow to follow the contour without lifting the front of the truck.

Clearing Driveways

1. Head into driveway with the blade angled to move snow away from buildings. Continue to widen the drive path by rolling snow away from buildings on successive passes.

2. If there is a garage at the end of the driveway, plow to within several vehicle lengths of the garage and push the snow off the driveway.

3. Raise the blade and drive through the snow up to the garage. Drop the blade and "Back Drag" the snow 1-1/2 vehicle lengths back. Repeat as necessary.

4. Back the vehicle to garage door and plow forward toward street, removing the remaining snow.

Clearing Parking Lots

NOTICE

Excessive stacking of snow causes undue stress to the snowplow and vehicle. Repeated loading of this nature may result in the failure of plow components designed to protect the snowplow and vehicle from major damage.

FAILURE TO FOLLOW COULD LEAD TO PROPERTY DAMAGE.

1. "Back Drag" areas in front of buildings and near walls then work away from buildings towards the outer edges of the lot.

2. Plow a single path down the center in the longest direction.

3. Angle plow toward the outside and make successive passes until the area is cleared and the snow is "Stacked" around the outer edges. If snow is too deep to clear in the above manner, clear main traffic lanes and stack snow at intermediate positions.

TROUBLESHOOTING

Introduction

Whenever service is necessary, your local dealer knows your plow best and is interested in your complete satisfaction. Return your snowplow to your local dealer for maintenance service or any other assistance you may require. If you are unable to do so, this troubleshooting guide should help you determine the problem. However, before attempting the servicing of your plow, you should possess good mechanical abilities and a total understanding of the mechanism.

1. You have read this guide carefully and are certain that all of the suggestions pertaining to your problem have been attempted.

2. You have the following available:

- A. Date snowplow was originally installed
- B. Power Pack Serial Number

This information should be recorded on page 2 of this Owners Manual.

Troubleshooting Guide - Quick Reference

1. Check vehicle electrical system for proper operation.
2. Check all wiring to be sure that battery terminals are clean and connections to battery, fuse, solenoid, and all connectors on plow harness are clean and tight.
3. Check for external leakage at cylinders, hoses, and power unit.
4. Check the voltage at the coils which operate solenoid valves. For proper operation, Pro Control system solenoid coils require a minimum of 10 volts DC.
5. Check oil level in hydraulic system reservoir.

WARNING

First read all warning instruction, the safety messages, and directions before attempting any adjustments or repairs to your unit!

FAILURE TO FOLLOW CAN RESULT IN DEATH OR SERIOUS INJURY.

PLEASE: Before calling parts and service personnel be certain that:

TROUBLESHOOTING GUIDE

PROBLEM	PROBABLE CAUSE	CORRECTIVE ACTION
Motor will not run/ motor runs slow	Fuse Blown	Check the circuit breaker / 250A fuse at your battery as well as the 10A fuse on the pump harness. If either fuse has blown check over all electrical wiring to determine why the fuse blew and replace fuse
	Motor solenoid failed	Replace Motor solenoid.
	Motor seized	Remove and replace motor, torque motor bolts between 50 to 60 inch pounds.
	Motor brushes worn	Replace motor.
	Seal between motor and pump damaged allowing oil to enter motor housing	Remove the motor. Drain oil from the reservoir. Loosen the clamp and remove the reservoir. Remove the 4 Allen screws and remove the pump from the base block. Remove pump seal and replace. If the motor can be salvaged, clean out motor and reassemble. If the motor can not be salvaged replace motor.
Motor continues to run and will not shut off	Wires shorted out	Check all wires starting at solenoid working your way back to the vehicle.
	Solenoid shorted internally	Replace solenoid.

TROUBLESHOOTING GUIDE

PROBLEM	PROBABLE CAUSE	CORRECTIVE ACTION
Blade will not lift (motor runs)	Hydraulic fluid level low	Fill hydraulic fluid up to the fill line on the reservoir using Sno-Way hydraulic fluid.
	Improper main system pressure relief valve setting	Using a 3000 psi gauge plumbed into the gauge port (GP), run plow over relief. Adjust main pressure relief screw to the proper main system pressure for the series of plow. This can be found in the back of your owners manual or online at SNOWAY.com.
	Breather cap plugged	Remove and replace breather cap.
	Coil on valve (F)	Check if there is magnetism on coil (F). If there is not swap coil with the coil (A). If the problem moves to the angle function the coil is bad and needs to be replaced.
	Lower valve (F) stuck	Check valve to make sure there is magnetism on the "F" coil. Remove the "F" valve and swap it with the "E" valve. If the blade lifts your valve was stuck closed. Remove and replace the valve.
	Raise cylinder binding	Check all linkages in the bell crank area. Replace and damaged components.
	Pick up tube filter plugged	Remove hydraulic fluid from the tank. Remove the tank and observe the pick up tube screen. Clean or replace if necessary.
	Worn/failed pump	Using a 3000 psi gauge plumbed into the gauge port (GP), run plow over relief. Adjust main pressure relief screw. If the pressure will not raise and the angle functions work remove hydraulic fluid and tank. Replace pump.
	Pick up tube is not submerged in fluid	Remove hydraulic fluid and tank. Turn pick up tube so it is angled down to the bottom of the tank.
	Down pressure valve (E) stuck open	Check valve to make sure there in not magnetism on the "E" coil. Remove the "E" valve and swap it with the "F" valve. If the blade lifts, your valve was stuck open. Replace the valve.
Raise Valve (C) not functioning	Check "C" coil for magnetism. Remove the "C" valve and inspect. Make sure the lower part of the valve moves free and there is no debris causing the valve to stick. If stuck and cant be freed up replace valve.	
Blade lifts slowly	Hydraulic fluid level low	Fill hydraulic fluid up to the fill line on the reservoir using Sno-Way hydraulic fluid.
	Breather cap plugged	Remove and replace breather cap.
	Improper main system pressure relief valve setting	Using a 3000 psi gauge plumbed into the gauge port (GP), run plow over relief. Adjust main pressure relief screw to the proper main system pressure for the series of plow. This can be found in the back of your owners manual or online at SNOWAY.com.
	Pick up tube filter plugged	Remove hydraulic fluid from the tank. Remove the tank and observe the pick up tube screen. Clean or replace if necessary.
	Improper oil viscosity for outside air temperature/ Ice in hydraulic tank	Change oil with Sno-Way hydraulic fluid.
	Weak system pump	Using a 3000 psi gauge plumbed into the gauge port (GP), run plow over relief. Adjust main pressure relief screw. If the pressure will not raise and the angle functions work remove hydraulic fluid and tank. Replace pump.
	(continued)	

TROUBLESHOOTING GUIDE

PROBLEM	PROBABLE CAUSE	CORRECTIVE ACTION
Blade lifts slowly (continuation)	Low vehicle battery voltage	Check voltage at both the battery and at the solenoid during function. The battery may show 12V when the plow is not under load. If the voltage drops below 9V when operating the plow, trouble shoot power system on your vehicle.
Plow lifts but does not hold - New plow first action	Dirt in check valve	Cycle raise and lower system to flush debris.
	Dirt in lower valve (B)	Cycle raise and lower system to unstick valve.
Plow lifts but does not hold - second action	Dirt or Debris in check valve	Cycle raise and lower system to unstick valve if this does not work replace valve.
	Lower valve (B) stuck	Check valve to make sure there is not magnetism on the "B" coil. Remove the "B" valve and swap it with the "F" valve. If the blade lifts your valve was stuck open. Replace the valve.
	Seals, O-ring(s) on lower valve (B) damaged	Remove the lower valve (B) and inspect the O-rings to see if they are damaged. If damaged replace the O-ring if there is one available. If not replace the valve.
	Piston seals leaking (Internal) on raise cylinder	Raise the plow up in the air and support the blade with a hydraulic floor jack. Remove the hose off of the rod side of the lift cylinder. Slowly lower the floor jack and watch to see what direction the fluid flows from the lift cylinder. If the fluid sucks into the lift cylinder the seals are good. If the fluid flows out of the lift cylinder, fluid is leaking past the seals and the cylinder needs to be replaced.
Unit will not lower (Gravity) (Down pressure off)	Plugged breather cap	Remove and replace breather cap.
	Low or no voltage available at lower coil (B)	Check wiring harness to make sure the connection had not been severed. If a ground is present when operated the blue with the white trace wire the coil may be weak. Swap coil with another coil on the valve block. If the problem moves to a different function replace coil.
	Lower valve (B) sticking or stuck	Swap out the (B) valve with the (E) valve. If the plow lowers the valve is sticking and should be cleaned or replaced.
	Lower coil (B) inoperative	Check to see if the blue with the white trace wire has a ground signal. If it does and the coil is not magnetized, the coil needs to be replaced.
	Raise cylinder damaged allowing movement in one direction only	Visually inspect bell crank assembly and lift cylinder. If it is damaged remove and replace.

TROUBLESHOOTING GUIDE

PROBLEM	PROBABLE CAUSE	CORRECTIVE ACTION
Unit will not apply Down Pressure (Down Pressure switch ON)	Lower valve (B) sticking or stuck	Remove the lower valve (B) and swap it out with the (E) valve. If down pressure engages, the (B) valve is sticking and will need to be cleaned or replaced.
	Inoperative down pressure, pressure switch	Remove the yellow and the brown wires from the pressure switch. Using a continuity tester check for continuity across the two prongs of the pressure switch. If the switch does not have continuity the switch has failed and need to be replaced.
	Down Pressure relief valve setting too low	The motor will be starting and stopping rapidly or running constantly. The down pressure relief valve can be adjusted. It is recommended that you take the plow to your local Sno-Way dealer to determine if the adjustment is set to the proper pressure setting. To adjust remove the top cap of the down pressure relief valve. Using an Allen wrench turn the set screw inside the valve clockwise 1/4 turn until the motor cycling stops for a minimum of 45 sec. If this can not be achieved the relief valve is damaged and needs to be replaced.
	Valve (E) sticking or stuck closed	Check to make sure there is magnetism on coil (E). If there is remove (E) valve and swap it with valve (F). If down pressure now works the valve is sticking and needs to be cleaned or replaced.
	Valve (F) sticking or stuck open	Check to make sure there is not magnetism on coil (F). If there is remove (F) valve and swap it with valve (E). If the motor stops running and the down pressure now works the valve is sticking and needs to be cleaned or replaced.
	Broken wire/ open circuit in down pressure electrical circuit	Check wiring harness to make sure the connection had not been severed or shorted on to a different ground causing the pressure switch or float / raise (F) valve to stay open.
Blade will not angle (motor runs)	Hydraulic fluid level low	Fill hydraulic fluid up to the fill line on the reservoir using Sno-Way hydraulic fluid.
	Low or no voltage available at angle coil (A or D) BAD GROUND	Check wiring harness to make sure the connection had not been severed. If a ground a present when operated from the red (A) or green (D) wire one of the coils may be weak. Swap the coil with another coil on the valve block. If the problem moves to a different function replace coil.
	Angle coil (A or D) inoperative	Check to see if the red (A) or green (D) wire has a ground signal. If it does and the coil is not magnetized the coil needs to be replaced.
	Angle cylinder binding or bent	Visually inspect cylinder. If it is damaged replace cylinder.
	Pick-up tube not submerged in fluid	Add fluid to the fill line. See maintenance section of owners manual.
	Pilot operated check valve sticking or stuck closed	Remove pilot check valve and inspect both cartridges and piston. If the valve has external springs make sure they both are not damaged and installed properly. Clean valves and re install.
	Angle valve (A or D) not operating	Swap the (A or D) valve out with the (C) raise valve and see if the angle function works. If the problem moves to the raise function replace valve.

TROUBLESHOOTING GUIDE

PROBLEM	PROBABLE CAUSE	CORRECTIVE ACTION
Unit angles very slowly	Hydraulic fluid level low	Fill hydraulic fluid up to the fill line on the reservoir using Sno-Way hydraulic fluid.
	Pivot bolt too tight clamping a-frame to swing frame	Loosen pivot bolt slightly to free up swing frame movement.
	Improper oil viscosity for outside air temperature/ Ice in hydraulic tank	This will effect all functions. Replace hydraulic fluid with Sno-Way hydraulic fluid.
	Damaged cylinder	Visually inspect cylinder. If it is damaged replace cylinder.
	Cylinder packing improperly torqued or dry	Turn the Gland nut counter clockwise about 1/4 turn. If this does not fix the issue replace cylinder.
	Crossover relief valve pressure setting too low	All other problems should be addressed before moving to the cross over relief valve. If the cross over relief valve is not set properly you will also notice the plow not holding angle when plowing. If this is the case replace cross over relief valve.
Unit angles in one direction	Angle coil (A or D) inoperative	Check to see if the red (A) or green (D) wire has a ground signal. If it does and the coil is not magnetized the coil needs to be replaced.
	Low or no voltage available at angle coil (A or D)	Check wiring harness to make sure the connection had not been severed. If a ground is present when operated from the red (A) or green (D) wire one of the coils may be weak. Swap the coil with another coil on the valve block. If the problem moves to a different function replace coil.
	Angle valve (A or D) not operating	Swap the (A or D) valve out with the (C) raise valve and see if the angle function works. If the problem moves to the raise function replace valve.
	Angle cylinder binding or bent	Visually inspect cylinder. If it is damaged replace cylinder.
	Crossover relief valve sticking or stuck	Remove cross over relief valve and inspect. Clean if possible or replace crossover relief valve.
Unit does not hold angle Note: This problem is usually noted when pushing snow.	Cross over relief valve pressure setting too low, sticking or stuck	Replace crossover relief valve.
	Pilot check valve has debris or damaged piston	Remove pilot check valve and inspect both cartridges and piston. If the valve has external springs make sure they both are not damaged and installed properly. Clean valves and re install.

TROUBLESHOOTING GUIDE

PROBLEM	PROBABLE CAUSE	CORRECTIVE ACTION
Fluid leaking at power unit	Hydraulic fittings not torqued properly (too tight, too loose)	Inspect fitting tighten if too loose. If too tight inspect hose fitting for cracks. Check O-rings on fittings on valve block to see if they are damaged. Replace hoses or O-ring if they are available.
	O-rings between valve block and base are worn/missing or not seating properly	If the oil is leaking from between the top valve block and the base, remove the screws that hold the top valve block to the base. Check the O-rings. If they are damaged replace and seat properly.
	O-rings between base and the reservoir worn or not seating properly	Drain the oil out of the reservoir. Remove the tank. Inspect the O-ring on the base block. If it is damaged or not seated properly re-seat or replace the O-ring.
	Reservoir over-full	Oil will leak out of the breather cap if this is the problem. Remove hydraulic fluid down to the fill line on the reservoir.
	Pump shaft seal leaking	This can be determined if there is oil leaking from the motor housing. Remove the motor. Drain the oil out of the reservoir and remove. Remove the pump from the base. Remove the pump seal. Install new seal. Reinstall all components removed.
	Valve block cap screw loose	Tighten cap screw.
	Reservoir fasteners loose	Tighten reservoir fastener or replace if damaged.

THEORY OF OPERATION

Hydraulic Power Unit

The hydraulic power unit consists of:

- 12V DC Motor
- Hydraulic pump rated at 1.12 GPM @ 1500 PSI
- 1.35 quart capacity reservoir
- fine mesh intake and return filters
- Filter screens on all outlet ports

The fluid supply line for the pump is submerged in the hydraulic fluid reservoir and is equipped with a fine mesh intake filter screen.

The 12V DC motor is protected electrically by a 250 amp fuse located between the battery and the motor solenoid.

The hydraulic pump is protected by a 1750 PSI system relief valve.

If this unit is equipped with a down pressure option, this will allow the operator to selectively switch the system to provide additional hydraulic force to the cutting edge of the plow.

IMPORTANT: For proper operation, ProControl 2 Plus system solenoid coils require a minimum of 10 volts DC. Lower voltage will cause erratic operation, or failure to operate.

Hydraulic Controls

The hydraulic controls consist of:

- System pressure relief valve, set to 1750 PSI.
- One crossover relief valve, set to 2000 PSI.
- Two three-way two position hydraulic valves for angle left or right functions.
- Two single acting hydraulic cylinders for angle left and right functions.
- One three-way two position, one two-way two position valve, and one check valve for raise and lower function for gravity plows.
- One three-way two position, three two-way two position valves and two check valves for raise, lower and down pressure functions for down pressure plows.
- One down pressure relief valve for down pressure plows.

Electro-Hydraulic Operation

All hydraulic functions are controlled by the 12V DC electrical system which energize coils on the hydraulic valve and the power unit motor start solenoid.

ProControl 2 plus systems directly apply +12V DC power to all valve coils as soon as power is connected to the plow.

Pro Control 2 plus systems employ ground switching to energize the hydraulic valve coils. The individual coils are energized as required when the control circuit board or receiver module completes the coil circuit path to ground by means of a signal from the wired or wireless hand-held controller in the vehicle.

Raise Mode Of Operation

Actuating the 'Raise' switch on the hand-held controller sends a signal to the control circuit board on the plow, which then actuates the motor start solenoid and the coil for the 'C' valve.

Actuating the start solenoid sends current to the power unit motor to cause the power unit to pump hydraulic fluid. Hydraulic fluid under pressure is directed through the 'C' valve to the lift cylinder causing it to extend and raise the plow. On down pressure plows, the 'F' valve is also actuated to allow fluid in the rod end of the double acting raise cylinder to return to the reservoir.

When the 'Raise' switch on the hand-held controller is released, the start solenoid circuit is broken, the motor stops, the circuit to the coil for the 'C' valve and (if a down pressure plow) the 'F' valve is broken and these valves go to their normally closed positions.

Lower Mode Of Operation - Gravity Down and Float

Actuating the 'Lower' switch on the hand-held controller sends a signal to the control circuit board on the plow. This actuates the coil for the 'B' valve and (if a down pressure plow) the 'F' valve, allowing hydraulic fluid to flow from the lift cylinder to the reservoir.

Once the 'Lower' switch has been actuated, the system will stay in this mode until the 'Raise' function is actuated or control is shut off, allowing hydraulic fluid to flow between the reservoir and the lift cylinder. This allows the lift cylinder to extend and retract as necessary to follow ground contours while plowing.

Down Pressure (DP) System

This system operates only when both the 'DP' switch and the 'Lower' switch on the hand-held controller are actuated.

Actuating the 'DP' switch actuates the pressure switch, the 'B' valve coil, the 'E' valve coil and, through the pressure switch, the start solenoid as required. When the 'E' is actuated and the hydraulic pump operates, hydraulic fluid is directed to the rod end of the lift cylinder, retracting the cylinder and forcing the plow down.

The pressure switch in this system senses the pressure of the fluid in the lift cylinder and closes when the pressure becomes low, allowing the motor and the pump to pump fluid into the rod end of the cylinder. When the pressure reaches the proper level the switch opens, shutting off the motor and the pump.

The system is protected by a relief valve, which relieves excess pressure if the plow is forced up, such as by a bump or obstacle in the roadway. Once any obstacle is cleared, the plow can return to a lower position, which will also lower the pressure. If the pressure becomes too low, the pressure switch will activate the motor and pump as mentioned above to return pressure to normal levels.

The down pressure system is overridden any time the plow control is placed in the 'Raise' mode, but will resume when placed back in the 'Lower' position.

Also, note that the 'E' valve is deactivated anytime an angle function is activated, but returns to its previous condition as soon as the angle function is completed.

Angle Left or Right Mode of Operation

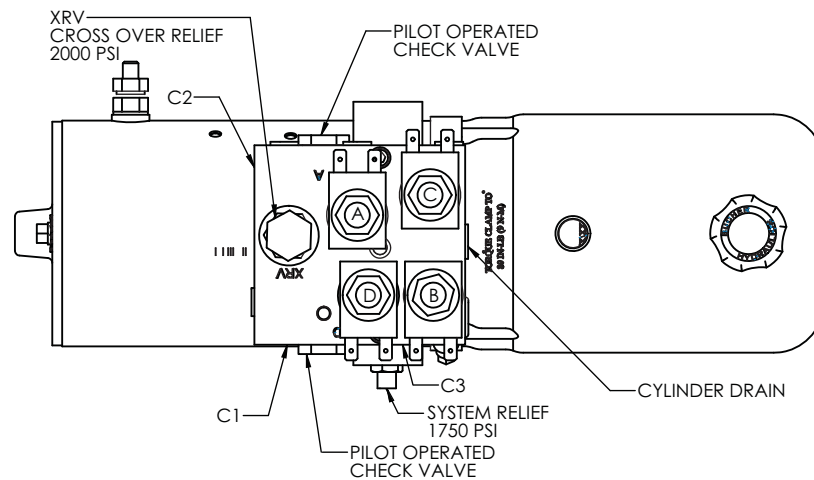
Actuating the 'Angle Right' switch on the hand-held controller sends a signal to the control circuit board on the plow. This actuates the start solenoid and the coil for the 'A' valve, allowing hydraulic fluid under pressure to flow through the 'A' valve to the swing cylinder. At the same time, the hydraulic fluid passing through the 'A' valve unseats a check valve in the circuit for the 'D' valve, allowing hydraulic fluid to flow from the opposite swing cylinder through the 'D' valve and back to the reservoir.

Actuating the 'Angle Left' switch on the hand-held controller sends a signal to the control circuit board on the plow. This actuates the start solenoid and the coil for the 'D' valve, allowing hydraulic fluid under pressure to flow to the swing cylinder. This fluid also unseats a check valve in the circuit for the 'A' valve, allowing fluid to flow from the opposite swing cylinder through the 'A' valve and back to the reservoir.

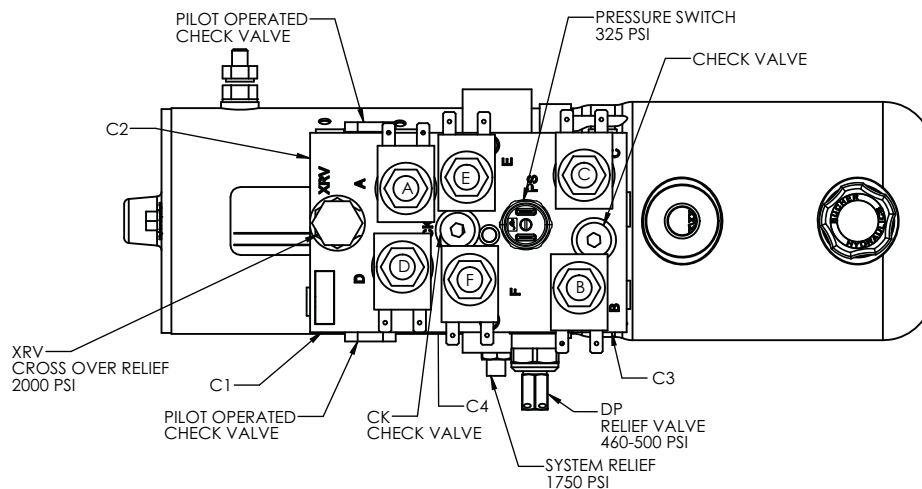
The angle circuits are protected by a crossover relief valve set to relieve pressure on the circuit a 2000 PSI. If the blade of the plow contacts an obstacle during plowing operations, the crossover relief valves will allow fluid to flow out of the swing cylinder on the side encountering the obstacle, allowing the cylinder to retract and allowing the blade to adjust its angle to relieve the force from the outside.

Fuse

A fuse is located near the battery in the primary 12V DC positive power circuit and is in place to protect the electrical system against direct shorts. A high amp draw condition will cause the element in the fuse to interrupt current flow to the plow. The fuse will need to be replaced after interruption.

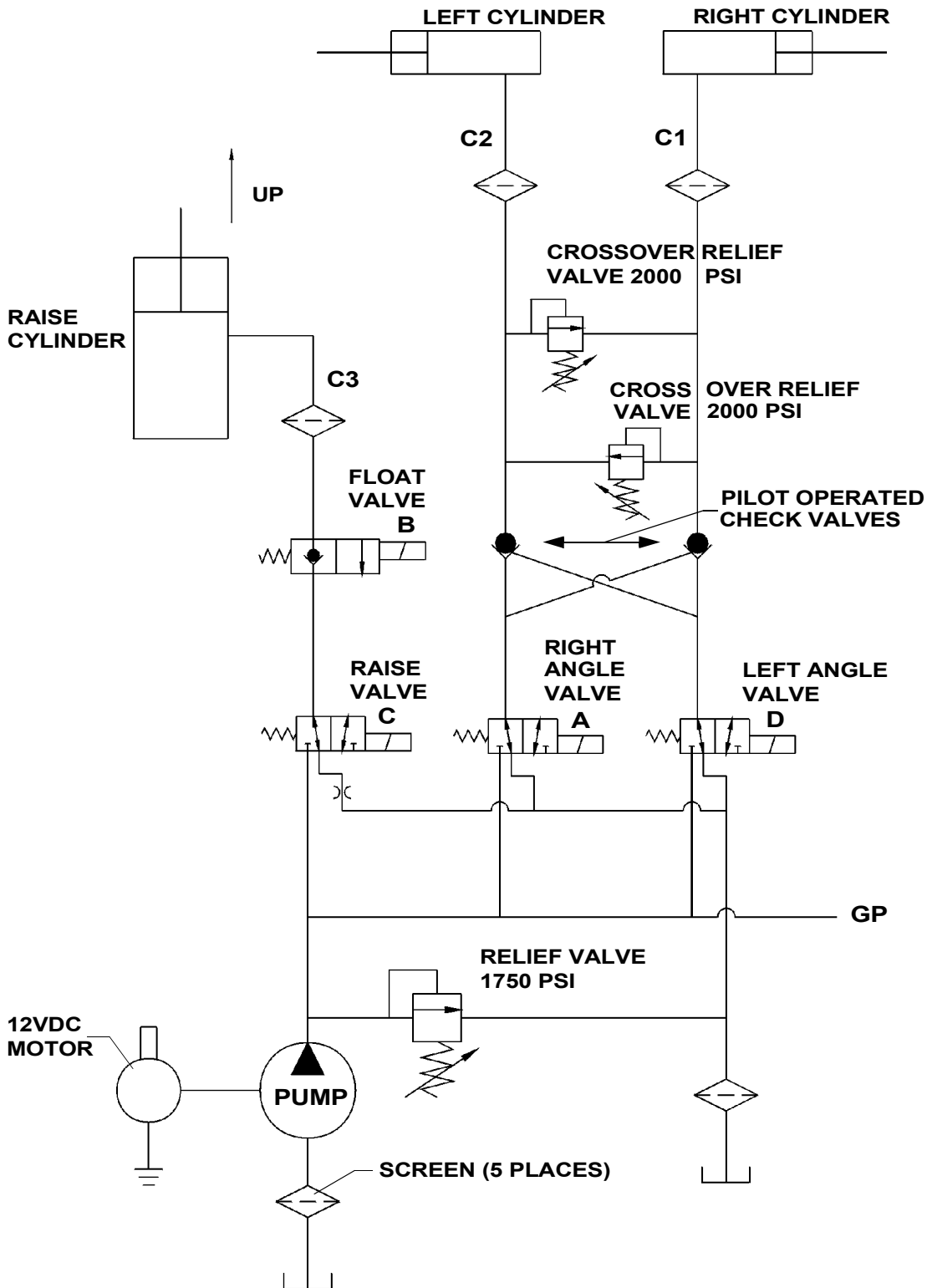


22G Power Unit Components

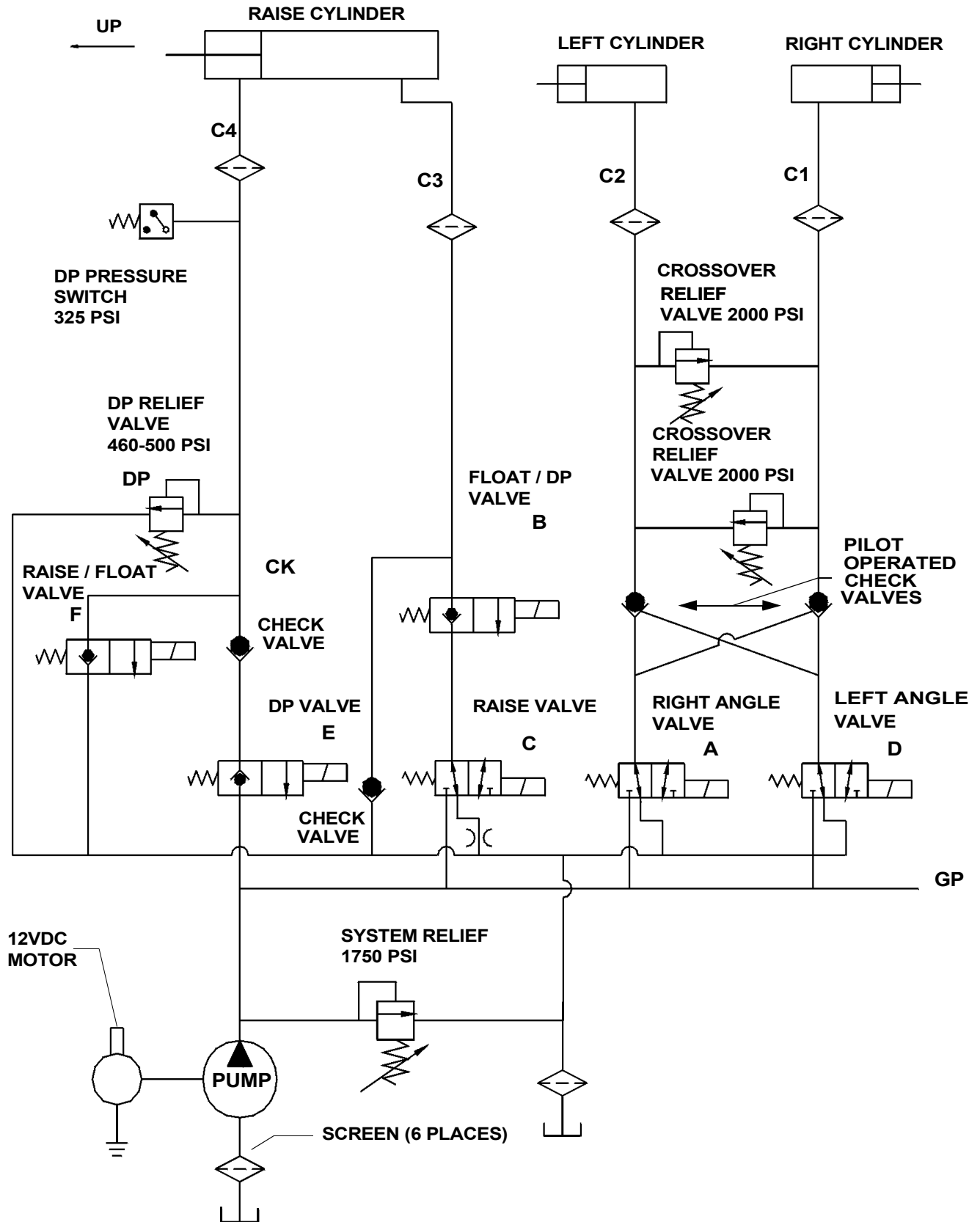


22D Power Unit Components

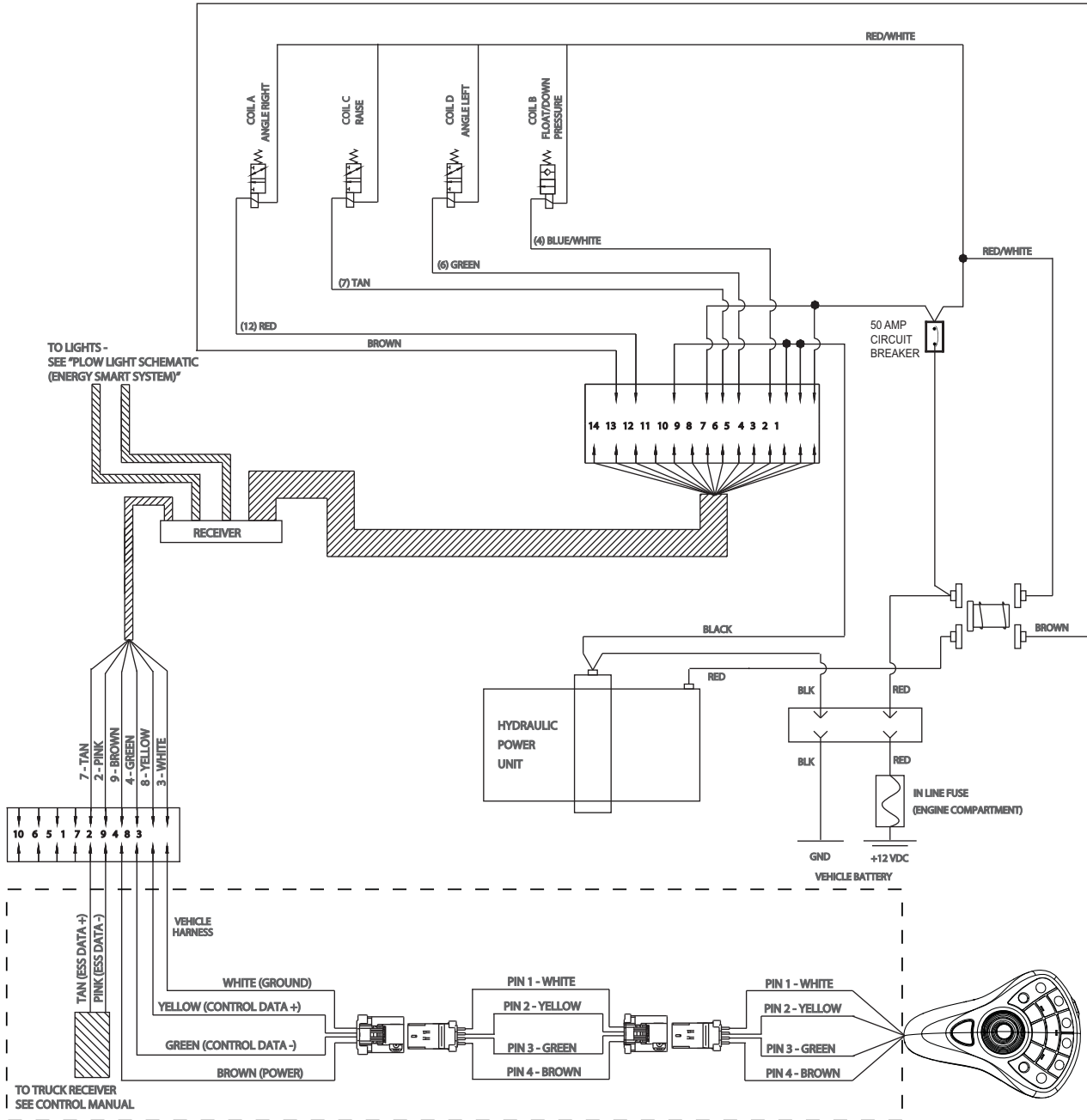
HYDRAULIC SCHEMATIC (Gravity Down System)



HYDRAULIC SCHEMATIC (Down Pressure System)

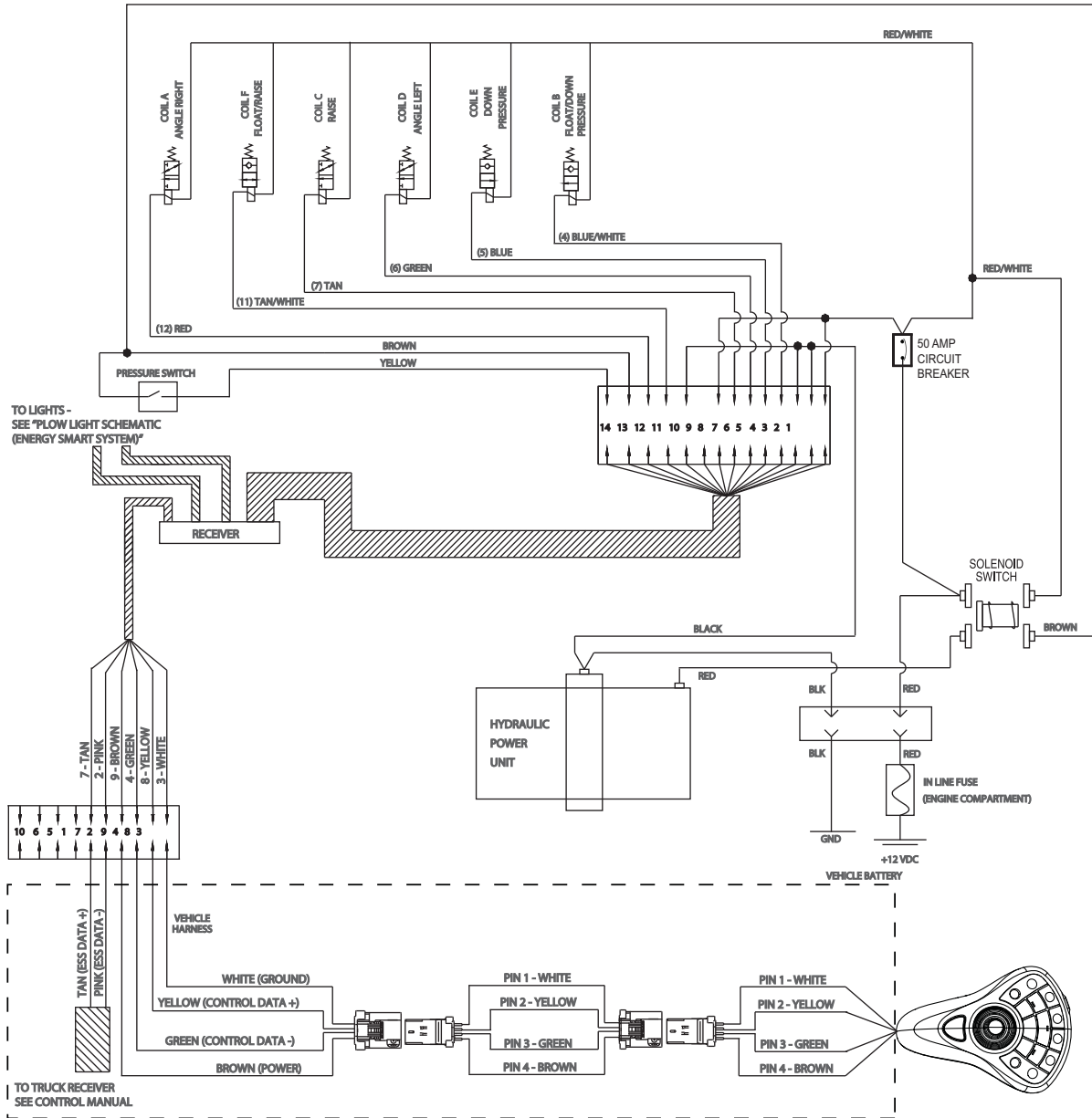


WIRING SCHEMATIC (Gravity Down System) (22G)



PLOW FUNCTION	MOTOR SOLENOID	A	B	C	D
WIRE COLOR	BROWN	RED	BLUE/WHITE	TAN	GREEN
RAISE	X			X	
DOWN (FLOAT)			X		
ANGLE LEFT	X				X
ANGLE RIGHT	X	X			

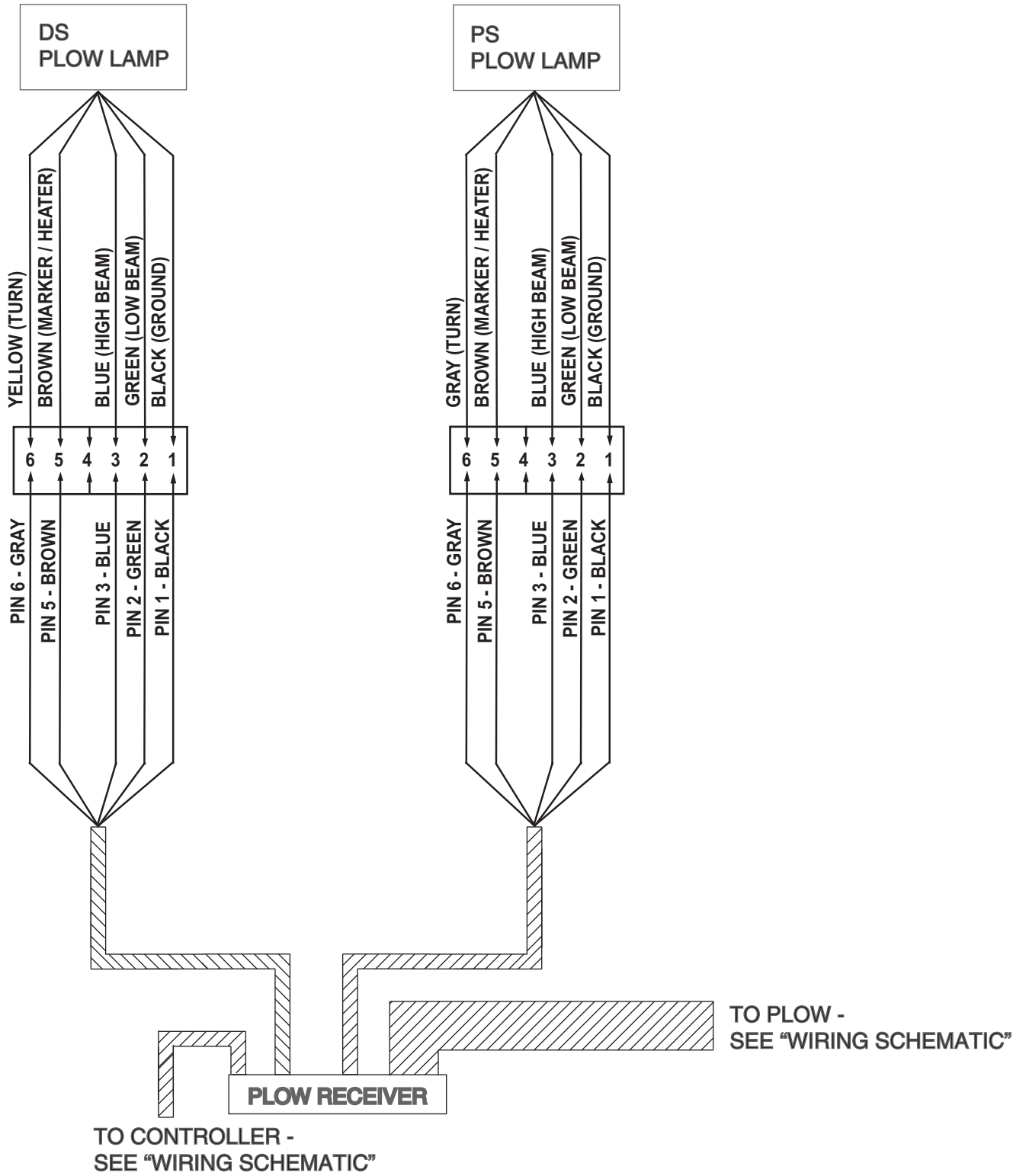
WIRING SCHEMATIC (Down Pressure System) (22D)



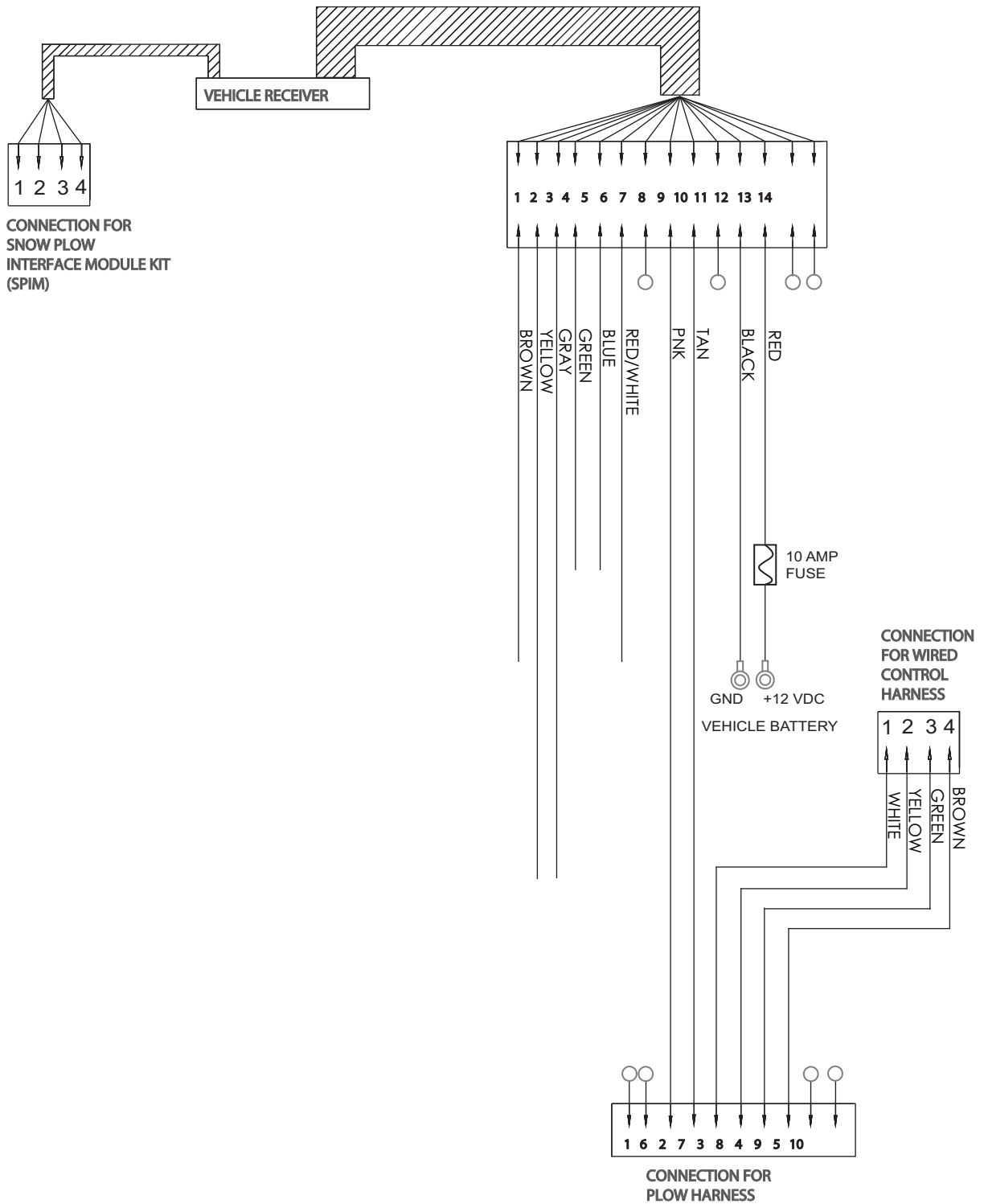
PLOW FUNCTION	MOTOR SOLENOID	A	B	C	D	E	F	PRESSURE SWITCH
WIRE COLOR	BROWN	RED	BLUE/WHITE	TAN	GREEN	BLUE	TAN/WHITE	YELLOW AND BROWN
RAISE	X			X			X	
DOWN (FLOAT)			X				X	
DOWN PRESSURE™						X		X
ANGLE LEFT	X				X			
ANGLE RIGHT	X	X						

NOTE: COIL E MUST BE DEACTIVATED FOR ANGLE FUNCTIONS












PLOW LIGHT SCHEMATIC (Energy Smart System)



ENERGY SMART SYSTEM (ESS) WIRING SCHEMATIC



TORQUE SPECIFICATIONS

SAE Grade and Head Markings	1 or 2 No Marks 	5  5.1  5.2 	8  8.2 
	2 No Marks 	5  	8  

SIZE	Grade 1		Grade 2		Grade 5, 5.1 or 5.2		Grade 8 or 8.2	
	Lubricated ^a	Dry ^b	Lubricated ^a	Dry ^b	Lubricated ^a	Dry ^b	Lubricated ^a	Dry ^b
	lb-ft	lb-ft	lb-ft	lb-ft	lb-ft	lb-ft	lb-ft	lb-ft
8-32			14*	19*	22*	30*	31*	42*
10-24			21*	27*	32*	43*	45*	60*
1/4	2.8	3.5	4.5	5.5	7	9	10	12.5
5/16	5.5	7	9	11	15	18	21	26
3/8	10	13	16	20	26	33	36	46
7/16	16	20	26	32	41	52	58	75
1/2	25	31	39	50	63	80	90	115
9/16	36	45	56	70	90	115	130	160
5/8	50	62	78	100	125	160	160	225
3/4	87	110	140	175	225	280	310	400
7/8	140	175	140	175	360	450	500	650
1	210	270	210	270	540	675	750	975
METRIC COARSE THREAD Grade 8.8			Grade 8.8		Grade 10.9		Grade 12.9	
			Dry	Lubed	Dry	Lubed	Dry	Lubed
M6-1			8	6	11	8	13.5	10
M8-1.25			19	14	27	20	32.5	24
M10-1.5			37.5	28	53	39	64	47
M12-1.75			65	48	91.5	67.5	111.5	82
M14-2			103.5	76.5	145.5	108	176.5	131
M16-2			158.5	117.5	223.5	165.5	271	200

DO NOT use these values if a different torque value or tightening procedure is given for a specific application.

Fasteners should be replaced with the same or higher grade. If higher grade fasteners are used, these should only be tightened to the strength of the original.

^a "Lubricated" means coated with a lubricant such as engine oil, or fasteners with phosphate and oil coatings.

^b "Dry" means plain or zinc plated without any lubrication

* Values with asterisk are in lb-in.

NOTES

NOTES

SNO-WAY[®] INTERNATIONAL, INC.



Hartford, WI 53027 USA
Website: www.snoway.com
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DEALER PRE DELIVERY CHECKLIST

The following inspections **MUST** be accomplished prior to delivering the snowplow to the customer. Place an X in the box after accomplishing each item on the checklist.

CHECK THAT

- Parts have not been damaged in shipment. Repair or replace items that are loose, dented or missing.
- All covers, guards and decals are in place and attached securely.
- All pivot pins and cotters are installed and secure.
- Trip springs are adjusted.
- Shoe assemblies are installed and adjusted.
- Snow plow headlamps are adjusted properly.
- Snow plow headlamps are functional.
 - High Beam Low Beam Park Lamps
 - Left Turn Right Turn Headlamp Beam Aimed Correctly
- Cylinder lock clamp is installed.

Start the vehicle engine and place an X in the box after accomplishing each item on the checklist.

CHECK THAT

- ALL** blade functions work properly.
- Cylinders, hoses and fittings **DO NOT** leak.
- Listen for abnormal noises or vibrations; Repair or replace as necessary.
- The Power Unit is properly filled.

DELIVERY CHECKLIST

The following checklist is to be accomplished with the customer present, Place an X in the box after accomplishing each item on the checklist.

- After giving the Customer his Owner's Manual, instruct him to read it **PRIOR** to operating the Snow Plow. If he has any questions or does not understand part(s) of the Manual, ask him to contact the Dealer for answers or explanations **BEFORE** operating the unit.
- Record the Serial Numbers, Date of Purchase, Purchaser's Name and Address, and the Dealers Name, Address and Phone Number in the space provided on Page 1 of the Owner's Manual.
- Explain mounting and removal procedures.
- Demonstrate power plow controller operation.
- Demonstrate cylinder lock clamp installation.
- Demonstrate Down Pressure hydraulic system function and operation. (If unit is so equipped)
- Register product on Sno-Way Registration Website, www.warranty.snoway.com.
Warranty claims can NOT be submitted without registered product.**

SNO-WAY® INTERNATIONAL, INC.



Hartford, WI 53027 USA
Website: www.snoway.com
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