



Rainger Linear Owner's Manual

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TABLE OF CONTENTS

EC Declaration of Conformity	7
Electrical Safety Statement	8
About This Manual	8
Ancillary Equipment Warranty	8
Safety	9
Recognize Safety Information	9
Safety Messages	9
Information Messages	9
Use of Personal Protective Equipment.....	10
Conductive Materials and Equipment.....	10
Fall Protection.....	10
Minimum Working Clearance	11
Qualified Person	11
Irrigation Equipment near Airports and Crop Dusting Aircraft.....	11
Overhead Power Lines	12
Minimal Lockout / Tagout Procedure	13
Sequence of Lockout	13
Restoring Equipment to Service	13
Operate Safely.....	14
Safety Decals	18
Overview	21
Rainger Linear.....	21
Standard Cart.....	21
Center Feed System	21
End Feed System	22
Swing Around Cart.....	23
Furrow Guidance	23
Below Ground Guidance.....	24
Spans	25
Drive Towers.....	25
Hitch	25
Overhang.....	25
End Gun	25
Water Application	26
Side Load Safety Box.....	26
Span Cable.....	26
Intermediate Tower Boxes	26
Last Tower Box	26
Central Pulse Tower Box	27
Safety Circuit	28
Alignment	28
Guidance.....	29
Above Ground Guidance (Option)	29
Furrow Guidance (Option)	29
Below Ground Guidance (Option).....	29
Control Panel.....	30
Electric Cord Drag (Options)	30
Field Stops	31
Above Ground Cable End of Field Stop (Option).....	31
Cart Mounted End of Field Stop/End of Hose Stop (Option)	31
Auto Reverse/Auto Stop (Option).....	31
Drive Unit Mounted End of Field Stop/Auto Reverse (Option).....	32
Auto Reverse/Auto Stop Box (Option).....	32

TABLE OF CONTENTS

Operation	33
Machine Operation.....	33
Overwatering Timer.....	33
Water Shut Off Valve (Closed Delivery Hose Drag Only).....	34
Starting and Stopping the Machine.....	35
Starting the Machine.....	35
Emergency Stopping.....	35
Stopping Under Normal Conditions.....	35
Establishing Wheel Tracks.....	37
Wheel Tracks.....	37
Direction of Travel.....	37
Establishing Perpendicular Wheel Tracks.....	37
Establishing Parallel Wheel Tracks.....	38
Methods Of Operation.....	39
Method I.....	39
Method II.....	40
Method III.....	40
Method IV.....	41
Method V.....	41
Wheel Rotation Speeds.....	42
Percentage Timer Settings.....	42
Linear Water Application Data.....	42
Electric Cord Handling.....	43
Electric Cord Operation.....	43
Start Up.....	45
Cart Path.....	47
Poly Hose.....	47
Moving Poly Hose.....	47
Cart Weight.....	47
Hose Bumpers.....	47
Pump.....	47
Hose Inlets and Couplers.....	48
Side Inlet.....	49
Hose and Cord Layout.....	49
Hose and Cord Positioning.....	50
Center Inlet.....	53
Hose and Cord Layout.....	53
Exhaust Primer.....	59
Compressed Air Primer.....	59
12 VDC Electric Primer.....	60
50/60 Hz AC Voltage Electric Primer.....	61
Start Up - Engine Generator Pump Applications.....	62
Start Up - Electric Cord / Motor Pump Applications.....	64
Electric Cord Handling.....	65
Electric Cord Operation.....	65
Electric Cord Positioning.....	67
Swing Around.....	69
Anchoring the Cart.....	69
Pivot Procedure.....	70

TABLE OF CONTENTS

Maintenance	73
Safety	73
Disconnect All Power	73
Wheel Gearbox	74
Center Drive Gearmotors	75
Helical Gearmotor.....	75
Worm Gearmotor.....	75
Swing Around Cart Lubrication	76
Tire and Wheel	76
Wheel Lug Nut Torque	76
Tire Pressures	76
Centrifugal Pump Lubrication	77
Furrow	78
Furrow End of Field Shutdown	78
Cart Path	79
Barricade	79
Wheel Tracks	79
Engine/Generator	79
Poly Hose Repair.....	80
Rigid Mender Installation	80
Flex Joint Hose Replacement	80
Bonding Ground Wire	81
Above Ground Guidance Cable Adjustment.....	81
Side Inlet Elbow Adjustment.....	83
Electric Primer Maintenance	83
Modified Alignment Adjustment	88
Span Flushing Procedure	89
Winterization.....	92
Off Season Storage of Hose.....	92
Off Season Storage of Electric Cord.....	92
Recommended Maintenance	93
Hardware Identification.....	96
Ancillary Equipment.....	96
Torque Chart	96
Critical Torque Applications	96
Troubleshooting	97
In-Line Shut Down.....	97
Tower Ahead Shut Down	98
Tower Behind Shut Down	99
Operation.....	100
Electric Primer	104

TABLE OF CONTENTS

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EC DECLARATION OF CONFORMITY



We: **Valmont Industries, Inc.**
28800 Ida Street
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Serial Number:

Purchase Order:

declare under our sole responsibility that the product,

Crop Irrigation System

to which this documentation relates, is in conformity with the following documents:

Machinery Directive 2006/42/EC
Low Voltage Directive 2014/35/EU
Electromagnetic Compatibility Directive 2014/30/EU

The above-referenced equipment is in conformity with all safety-related clauses (Not all clauses reflecting commercial preference are met) of the following documents:

EN 60204-1:2006 Safety of Machinery – Electrical Equipment of Machines
EN 12100:2010 Safety of Machinery
EN 909:1998+A1 Irrigation Machines

Statement regarding **Pressure Equipment Directive 97/23/EC:**

The Crop Irrigation System is excluded from the scope of the Pressure Equipment Directive, by the language of Article 1, Sections 3.2, 3.6 & 3.10. This equipment is classified less than Category 1.

Statement regarding **RoHS Directive 2011/65/EC:**

The Crop Irrigation System is excluded from the scope of the RoHS Directive, by the language of Article 2, Section 4(e), being a "Large Scale Fixed Installation."

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ELECTRICAL SAFETY STATEMENT

Installation of the Valley Electric Irrigation Machine - European Union Only

Valmont Industries Inc. does not install a differential (ground fault) circuit breaker in the control panel of the Valley electric irrigation machine because the standards of protection vary according to country of destination. The distributor must provide and install a differential (ground fault) circuit breaker that meets the standards of the country where the Valley irrigation machine is installed.

In the European Union, differential circuit breaker protection is fixed at a maximum of 24 volts.

Good grounding of the Valley irrigation machine is required.

- If resistance to ground is lower than 80 ohms, a differential (ground fault) circuit breaker of 300 mA will meet requirements.
- If resistance to ground is between 80 and 800 ohms, a differential (ground fault) circuit breaker of 30 mA will meet requirements.

The power supply installation and inspection of equipment protection components or systems are the responsibility of the installer. Valmont Industries, Inc. is not responsible for the failure of equipment protection components or systems not of their manufacture.

Valley pivot irrigation machines receiving power from a generator must have a cable connected from the irrigation machine structure to a ground rod and another cable from the irrigation machine structure to the ground terminal on generator in order for the differential (ground fault) circuit breaker to work.

The linear irrigation machines equipped with a generator are not equipped with a ground rod but must have a cable connected from the linear irrigation machine structure to the ground terminal of the generator in order for the differential (ground fault) circuit breaker to work.

- The resistance between the irrigation machine and the generator must be substantially below 80 ohms.

About This Manual

Information contained in this manual applies to Valley Rainger Linear hose drag, ditch feed and swing around Irrigation Machines.

All information in this manual is based on information available at the time of printing. Valmont Industries Inc. reserves the right to make changes at any time without notice and without incurring any obligation. Specifications are applicable to equipment sold within the United States and may vary outside of the United States.

Ancillary Equipment Warranty

The owner is responsible for warranty registration of all ancillary equipment such as engines, pumps and generators with its respective manufacturer.

Recognize Safety Information

This irrigation equipment can be powered by high voltage, which can be extremely dangerous if used improperly. For maximum safety and optimum performance of the machine, all owner/operators and maintenance personnel must read and understand the owner/operator manual(s), all safety messages in this manual and safety signs/decals on the machine before operating this equipment.

Anyone assembling, operating, servicing or maintaining this machine must read and understand all operation, maintenance, troubleshooting, testing, installation, assembly instructions and all safety messages in this manual before operating the machine or beginning any maintenance, troubleshooting, testing, installation or assembly of components.

These instructions alert you to certain things you should do carefully; if you don't, you could hurt yourself or others, hurt the next person who operates the equipment, or damage the equipment.

Safety Messages

Safety messages in this manual are preceded by the hazard symbol and one of three words: DANGER, WARNING or CAUTION. These messages alert you to potential hazards that could hurt you or others and or cause property damage.



This HAZARD SYMBOL is used to alert you to information about unsafe actions or situations, and may be followed by the word DANGER, WARNING or CAUTION.

DANGER

The HAZARD SYMBOL used with the word DANGER describes immediate hazards that can result in severe personal injury or death.

WARNING

The HAZARD SYMBOL used with the word WARNING describes unsafe actions or situations that can result in severe injury, death and/or major equipment or property damage.

CAUTION

The HAZARD SYMBOL used with the word CAUTION describes unsafe actions or situations that can result in injury, and/or minor equipment or property damage.

Information Messages

Important information messages in this manual are preceded by the word NOTE.

NOTE

The word NOTE is used to alert you to information that describes procedures or tips to help you install, operate or maintain your equipment properly.

SAFETY

Use of Personal Protective Equipment

- People working in areas where there are potential electrical hazards must use, personal protective equipment that is appropriate for the specific parts of the body to be protected and for the work to be performed. Refer to U.S. Occupational Safety & Health Administration (OSHA) Regulations (Standards - 29 CFR) Safeguards for personnel protection. - 1910.335, or applicable national, state or local regulations, for additional information.
- Personal protective equipment must be maintained in a safe, reliable condition and periodically inspected or tested.
- Protective shields, protective barriers, or insulating materials must be used to protect each person from shock, burns, or other electrically-related injuries while that person is working near exposed energized parts which might be accidentally contacted or where dangerous electric heating or arcing might occur. When normally enclosed live parts are exposed for maintenance or repair, they must be guarded to protect unqualified persons from contact with the live parts.
- Safety signs and tags. Safety signs, safety symbols, or accident prevention tags must be used where necessary to warn people about electrical hazards which may endanger them.

Conductive Materials and Equipment

Materials and equipment that can conduct electricity must be handled in a way that will prevent them from contacting energized power lines, exposed conductors or circuit parts.

- When handling long conductive objects (such as but not limited to truss rods, pipes, angles and ladders) in areas with energized power lines, exposed conductors or circuit parts, work practices (such as the use of insulation, guarding, and material handling techniques) must be used to minimize the hazard.
- Portable ladders must have non-conductive side rails.
- Do not wear conductive articles of jewelry and clothing (such as but not limited to watch bands, bracelets, rings, key chains, necklaces, metalized aprons, cloth with conductive thread, or metal headgear) that could come in contact with energized power lines, exposed conductors or circuit parts.

Fall Protection

Identify potential fall hazards and determine if fall protection equipment is appropriate for the task, before beginning the work. Pay attention to hazards associated with routine and non-routine tasks. Inspect fall protection equipment (harnesses, lanyards) and devices (guardrails, tie-off points) before each use. Use fall protection equipment if required for the job. Be sure the fall protection equipment is right for the task, fits properly, and is in good condition. Refer to U.S. Occupational Safety & Health Administration (OSHA) Regulations Standards - 29 CFR 1926.500, 1926.501 and 1926.502, or applicable national, state or local regulations for more information.

- When using scaffolds, make sure there is proper access, full planking, stable footing, and guard railing.
- When using a boom lift, keep feet firmly on the platform of a boom lift, use fall protection equipment tied-off at all times to the guardrail or tie-off point.
- When using a ladder, make sure the ladder is non-conductive and the correct size for the task. Read the ladder user instructions and be sure the ladder is in good condition. Make sure ladder is set on stable footing and at the correct angle.

Minimum Working Clearance

To reduce the risk of injury, all persons require adequate working clearance around the electrical panel or other electrical equipment. The table below identifies the minimum working clearance needed. Refer to U.S. Occupational Safety & Health Administration (OSHA) Regulations (Standards - 29 CFR) Safeguards for personnel protection. -1910.303(g)(1)(i), or any other applicable national, state or local regulations, for additional information.

MINIMUM WORKING CLEARANCE 0-600 VOLTS				
WIDTH OF WORKING CLEARANCE AREA	HEIGHT OF WORKING CLEARANCE AREA	★MINIMUM WORKING CLEARANCE IN FRONT OF ELECTRICAL PANEL/EQUIPMENT		
		EXPOSED LIVE PARTS ON ONE SIDE OF WORK SPACE AND NO LIVE GROUNDED PARTS ON THE OTHER SIDE.	EXPOSED LIVE PARTS ON ONE SIDE OF WORK SPACE AND LIVE GROUNDED PARTS ON THE OTHER SIDE.	EXPOSED LIVE PARTS ON ONE SIDE OF WORK SPACE AND EXPOSED LIVE PARTS ON THE OTHER SIDE.
30 in (760 mm) MINIMUM OR WIDTH OF ENCLOSURE, WHICH EVER IS GREATER	78 in (1980 mm) MINIMUM OR HEIGHT OF ENCLOSURE, WHICH EVER IS GREATER	36 in (915 mm) MINIMUM	42 in (1065 mm) MINIMUM	48 in (1220 mm) MINIMUM

★Concrete, brick or tile walls shall be considered as grounded.

Qualified Person

A Qualified Person is one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated his/her ability to solve or resolve problems related to the subject matter, the work, or the project.

Only qualified persons may work on electric circuit parts or equipment that have not been de-energized.

Refer to U.S. Occupational Safety & Health Administration (OSHA) Regulations Standards - 29 CFR 1926.32(m) and 1910.333, or applicable national, state or local regulations for additional information.

Irrigation Equipment near Airports and Crop Dusting Aircraft

- If any part of the irrigation machine comes within 3200 ft (975 m) of an airport runway, especially the approach (ends) of the runway, additional warning markers may be required. In the United States, CFR Title 14, Chapter I, Subchapter E, Part 77 – Safe, Efficient Use, and Preservation of the Navigable Airspace describes when marking is needed.

This document is available at: www.ecfr.gov

- Marking requirements vary depending on the location of the irrigation equipment relative to the runway, the type of airport (Civil, Military, or Heliport) and other factors. Contact the local airport authority for guidance and specific recommendations. In the United States, guidelines for marking structures near airports are published by the Federal Aviation Administration in Advisory Circular AC 70/7460-1L – Obstruction Marking and Lighting.

Available here: www.faa.gov/regulations_policies/advisory_circulars

- For irrigation machines near private or unregulated airfields, including farm-based airstrips, Valley strongly recommends complying with the same standards and requirements as Civil airports as shown in Part 77.
- Regulations vary by country, contact your local aviation authority for guidance.

Overhang cables, including overhang back cables are a particular danger. In locations where low-flying aircraft are likely, such as within 1,500 ft (457 m) of an end of an airport runway, or where crop dusting aircraft are common, Valley recommends adding obstruction markers to overhang cables to improve their visibility.

For large overhangs (36 ft / 10.97 m Heavy Duty and longer), five 12 in (300 mm) or 20 in (500 mm), aviation orange marker balls are sufficient. One near the rabbit ears, two in the middle of the back cables and two in the middle of the highest overhang cables. Refer to Section 3.5 in AC70/7460-1 for additional details. Aviation marker balls are available online and from a variety of aviation and airport safety equipment providers.

SAFETY

Overhead Power Lines

Assembling, towing or transporting irrigation machine components such as but not limited to the pivot point, linear cart, span/drive unit assemblies, overhangs and/or corner assemblies underneath or near power lines is extremely dangerous because of the risk of electrocution.

Operating equipment that elevates irrigation machine components, such as but not limited to an aerial lift or crane, near power lines is extremely dangerous because of the risk of electrocution. Only qualified personnel should operate this type of equipment. Before operating the equipment, qualified personnel must read the equipment manufacturers' operating and safety instructions.

Refer to U.S. Occupational Safety & Health Administration (OSHA) Regulations (Standards - 29 CFR) Cranes and derricks. - 1926.550, or any other applicable national, state or local regulations for additional information.

- Always presume that any overhead power line is an energized line unless and until the person(s) owning the line and/or the electrical utility authorities indicate that it is not an energized line and it has been visibly grounded.
- Before operating any equipment near any power line make sure the line has been de-energized and visibly grounded at the point of work.
- Electrocution can occur without touching an electrical power line. Electricity, depending on the magnitude, can jump or become induced into equipment or conductive materials that come in close proximity to, but do not touch a power line. High wind, lightning, wet ground and other environmental conditions will increase the possibility of electrocution and require additional consideration.
- Transmitter towers can induce the equipment or materials being handled with an electrical charge. Before working or operating equipment near transmitter towers, make sure the transmitter is de-energized.
- Select the location where the span/drive unit will be assembled to ensure that neither the irrigation machine, or the equipment used during the assembly process, will violate the minimum clearance guidelines.
- Never operate equipment or allow the load, ropes or tag lines within 10 ft (3.05 m) of any power line rated 50 kV or lower whether it is energized or not. For lines rated over 50 kV, the minimum clearance shall be 10 ft (3.05 m) plus 0.4 in (1.1 cm) for each kV over 50 kVs.
- Never assemble, tow, transport or allow irrigation machine components underneath or within 10 ft (3.05 m) of any power line rated 50 kV or lower whether it is energized or not. For lines rated over 50 kV, the minimum clearance shall be 10 ft (3.05 m) plus 0.4 in (1.1 cm) for each kV over 50 kVs. Overhang support angles, cables and spinner drive components regularly extend 10 ft to 12 ft (3.1 m to 3.7 m) above the irrigation pipeline (span).
- Use barricades to identify areas where interference with overhead power lines could occur. Keep the assembly, towing or transporting of irrigation machine components and the operation of equipment including load, ropes or tag lines away from any power line, in the distances described above, whether the line is energized or not.
- Always designate a person to observe clearance between the power line and all equipment being operated or moved in order to give timely warning for all operations to STOP if the minimum clearance is violated.

Minimal Lockout / Tagout Procedure

The following procedure establishes the minimum requirements for the lockout of energy isolating devices whenever maintenance or servicing is done on machines or equipment. It is used to ensure that the machine or equipment is stopped, isolated from all potentially hazardous energy sources and locked out before personnel perform any servicing or maintenance where the unexpectedly energized or start-up of the machine or equipment or release of stored energy could cause injury. All personnel, upon observing a machine or piece of equipment which is locked out to perform servicing or maintenance shall not attempt to start, energize, or use that machine or equipment.

When the energy isolating devices are not lockable, tagout should be used and affected personnel must wear full personal protection.

Refer to U.S. Occupational Safety & Health Administration (OSHA) Regulations (Standards - 29 CFR) Typical minimal lockout procedures - 1910.147 App A, or applicable national, state or local regulations, for additional information.

Sequence of Lockout

1. Notify all affected personnel that servicing or maintenance is required on a machine or equipment and that the machine or equipment must be shut down and locked out to perform the servicing or maintenance.
2. The authorized personnel shall identify the type and magnitude of the energy that the machine or equipment utilizes, shall understand the hazards of the energy, and shall know the methods to control the energy.
3. If the machine or equipment is operating, shut it down by the normal stopping procedure (depress the stop button, open switch, close valve, etc.).
4. De-activate the energy isolating device(s) so that the machine or equipment is isolated from the energy source(s).
5. Lock out the energy isolating device(s) with assigned individual lock(s).
6. Stored or residual energy (such as that in capacitors, springs, elevated machine members, rotating fly-wheels, hydraulic systems, and air, gas, steam, or water pressure, etc.) must be dissipated or restrained by methods such as grounding, repositioning, blocking, bleeding down, etc.
7. Ensure that the equipment is disconnected from the energy source(s) by first checking that no personnel are exposed, then verify the isolation of the equipment by operating the push button or other normal operating control(s) or by testing to make certain the equipment will not operate.

CAUTION

- RETURN OPERATING CONTROL(S) TO NEUTRAL OR “OFF” POSITION AFTER VERIFYING THE ISOLATION OF THE EQUIPMENT.

8. The machine or equipment is now locked out.

DANGER

- WHEN PERSONNEL WILL BE EXPOSED TO CIRCUIT ELEMENTS AND ELECTRICAL PARTS, A QUALIFIED PERSON MUST USE TEST EQUIPMENT TO VERIFY THAT THE CIRCUIT ELEMENTS AND EQUIPMENT PARTS OF THE EQUIPMENT ARE DE-ENERGIZED.

Restoring Equipment to Service

When the servicing or maintenance is completed and the machine or equipment is ready to return to normal operating condition, the following steps shall be taken:

1. Check the machine or equipment and the immediate area around the machine to ensure that non-essential items are removed and that the machine or equipment components are operationally intact.
2. Check the work area to ensure that all personnel are safely positioned or removed from the area.
3. Verify that the controls are in neutral.
4. Remove the lockout devices and re-energize the machine or equipment.
5. Notify affected personnel that the servicing or maintenance is completed and the machine or equipment is ready to be used.

SAFETY

Operate Safely

Valley Irrigation machines are designed with safety in mind. However, if this machine is operated incorrectly, it may pose a safety threat to the operator. A good safety program is much like a chain, it is only as strong as its weakest link. The manufacturer, dealer, and operator must maintain and improve all safety programs. Following is a list of safety operating tips which you and all other persons servicing or operating the machine must read and understand.

CAUTION

- **DO NOT OPERATE THIS MACHINE WITHOUT FIRST READING THE OWNER'S MANUALS FOR THE MACHINE.**
- **READ ALL SAFETY MESSAGES IN THIS MANUAL AND SAFETY SIGNS ON THE MACHINE.**
- **DO NOT LET ANYONE OPERATE THIS MACHINE WITHOUT PROPER INSTRUCTIONS.**
- **UNAUTHORIZED MODIFICATIONS MAY IMPAIR THE FUNCTION AND/OR SAFETY OF THE MACHINE.**
- **IF YOU DO NOT UNDERSTAND ANY PART OF THIS MANUAL, CONTACT YOUR VALLEY DEALER.**

EMPLOYEE INSTRUCTION ON SAFETY

It is very important to instruct your employees on the safe use of this equipment at the time of their initial assignment to operate it. DO NOT let anyone operate this equipment without proper instructions.

Safety training should be presented annually and the service manager should ensure employees fully understand the safety messages and what to do in case of emergencies.

EMERGENCY STOPPING

The machine can be stopped at any time at any tower by turning the disconnect switch, located underneath the tower box, to the OFF position. See Figure 14-1.

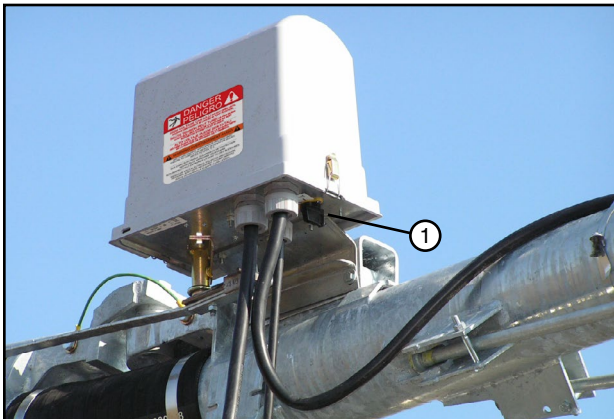


Figure 14-1 1. Disconnect Switch

WARNING

PROPER GROUNDING

DO NOT attempt to start the machine until the electrical service is properly installed and grounded by a qualified electrician as per the electrical standards.

If the power supplied to the machine is not grounded properly, severe injury or death can result should an electrical malfunction occur.

It is your responsibility to ensure that your power supplier and/or electrical contractor has grounded the irrigation machine as required by the National Electrical Code and by applicable local electrical codes. If a machine is properly grounded and fuse sizing is correct, there is extremely low probability of an individual being injured by electrical shock.

NOTE

- **All 480 VAC, 60 Hz. (380 VAC, 50 Hz.) power supply services MUST be a 4 conductor service. Three 480 VAC (380 VAC) power lines and one ground conductor which is as large as the power carrying conductors for that service.**

Operate Safely

DANGER

DISCONNECT POWER WHEN SERVICING

ALWAYS disconnect electrical power before servicing or performing maintenance to the machine.

If you are going to perform maintenance on the machine, YOU MUST shut off and lock the main power disconnect as shown below. See Figure 15-1.

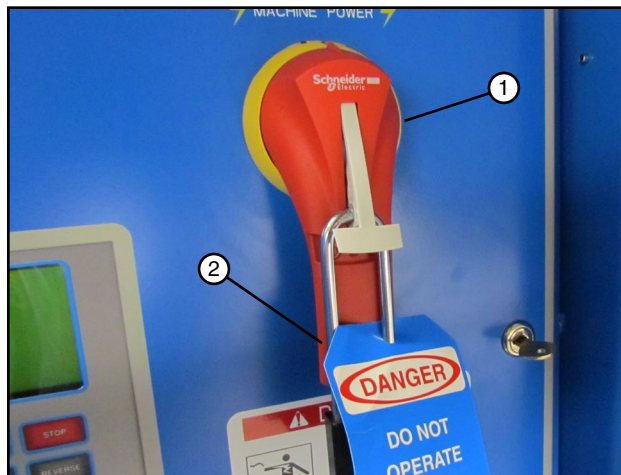


Figure 15-1 1. Main Power Disconnect
2. Lock

The blue (OSHA safety color code) tag shown below should also be filled out and attached to the disconnect after locking. See Figure 15-2.

The tag should reveal the name of a person to contact before restoring power to the machine.



Figure 15-2

CAUTION

QUALIFIED SERVICE PERSONNEL

If you do not understand electricity or other parts of the machine, have qualified service personnel perform any hazardous repairs or maintenance.

CAUTION

GUARD ALL POWER TAKE-OFF DRIVES

This includes all belt and power line drives.

Replace any guards and shields removed for maintenance.

WARNING

MARK AND GUARD ALL POWER LINES

Do NOT deep rip or chisel near the buried power service wires.

Do NOT deep rip in a circle at the drive unit. The deep chisel track will cause severe stresses on the structure.

If you do deep rip your field, run the machine with the percent timer at 100% for the first revolution.

WARNING

SUSPECTED SHORT CIRCUITS

DO NOT touch the machine if you suspect a short-circuit situation. Call a qualified electrician or an authorized Valley dealer immediately.

Circumstances which may cause you to suspect hazardous voltage situations may include:

- Physical damage to the machine or span cable
- Recent electrical storms (lightning)
- Unusual operating characteristics of the machine

If you suspect a short circuit due to feeling a rippling tingle when touching the machine, DO NOT touch the machine again. Call a qualified electrician or an authorized Valley dealer immediately.

WARNING

LIGHTNING AND THE MACHINE

Stay away from the machine during an electrical storm. An irrigation machine makes a good path to earth. It is also probably the tallest object in the field, which makes it a good lightning receptor!

SAFETY

Operate Safely

CAUTION

DO NOT OVERSIZE FUSES

Fuses are sized for the protection of a specific machine.

Be certain you have the proper fuse sizes in place before initial start-up and when replacing fuses.

CAUTION

PLUG - IN CONNECTORS

Disconnect power before connecting or disconnecting any plug-in connectors.

CAUTION

DO NOT OPERATE AT FREEZING TEMPERATURES

Spraying water has a cooling effect and water will freeze even though the air temperature is slightly above freezing.

Shut the machine down at 40 degrees Fahrenheit (4.5 degrees Celsius). Do not operate machine when temperature is below 40°F (4.5°C).

- **DAMAGE TO EQUIPMENT RESULTING FROM FREEZE-UP IS NOT COVERED UNDER WARRANTY.**
- **IT IS IMPORTANT TO MAKE SURE ALL PIPE DRAINS FUNCTION PROPERLY TO PREVENT PIPELINE FREEZE-UP DURING COLD WEATHER.**

CAUTION

AVOID HIGH PRESSURE WATER STREAMS

Avoid body contact with high pressure water streams.

WARNING

AVOID CHEMICALS

Avoid exposure to sprinkler spray while chemicals are being injected into the water. Read EPA Label Improvement Program (PR Notice 87-1) and all instructions for chemical applications.

If you plan on chemigating, make certain you have complied with state or local regulations in regard to safety equipment, certification, operation and calibration of the injector pump. Make certain you have first aid and fresh water available in case of an accident. You must also be familiar with the correct cleanup procedures in case of a spill.

- **USE OF PROTECTIVE CLOTHING IS RECOMMENDED WHEN HANDLING CHEMICALS. SAFETY GLASSES, GLOVES, AND PROTECTIVE OUTERWEAR SHOULD BE WORN WHEN HANDLING CHEMICALS.**
- **CONTAMINATION OF THE WATER SUPPLY MAY OCCUR IF EFFECTIVE SAFETY DEVICES ARE NOT INSTALLED/USED IN CONNECTION WITH INJECTION EQUIPMENT FOR CHEMIGATION.**

DANGER

DRIVE SHAFTS START WITHOUT WARNING

An electric motor on each tower of the center pivot powers two or more drive shafts connected to wheel gear drives. These drive shafts start and stop without warning.

- **DO NOT TOUCH ROTATING DRIVE SHAFT OR SHIELD, CLOTHING OR LIMBS MAY BECOME ENTANGLED, RESULTING IN SEVERE INJURY.**
- **DO NOT SERVICE THE MACHINE UNTIL THE MAIN DISCONNECT IS LOCKED IN THE OFF POSITION.**
- **ALWAYS REPLACE DRIVE SHAFT SHIELDS AFTER SERVICING.**
- **DRIVE SHAFT SHIELDS MUST ALWAYS BE IN PLACE WHEN OPERATING THE MACHINE.**

CAUTION

CHECK WHEEL TRACKS BEFORE STARTING

Make sure all objects, livestock or persons are clear of the machine before starting. Drive trains are powerful and can climb over vehicles, equipment, etc.

Operate Safely

CAUTION

KEEP CHILDREN AWAY

Irrigation Machines are NOT playground equipment. Prevent children from playing or climbing around on the machine. This can be extremely dangerous, especially if the machine is operating.

CAUTION

CHECK MACHINE DIRECTION

DO NOT operate the machine if it moves in the direction opposite to that which was chosen.

Forward should be clockwise and reverse counter-clockwise.

CAUTION

KEEP WATER OFF ROADWAYS

It is against the law in most states to allow water to spray on state and county roadways. This is a serious hazard to passing motorists.

If end guns are used, make sure you read and understand the correct procedures for setting the on and off positions to avoid watering the roadways.

If an end gun is watering a roadway, immediately discontinue use and adjust the shutoff setting or call your Valley dealer to repair the end gun shut off mechanism.

CAUTION

AUTO REVERSE OPERATION SAFETY

If the machine reverses direction at a roadway or a physical object such as a building, tree line, power pole, etc., then you MUST provide a backup device to stop the machine if the reversing mechanism were to fail. See Figure 17-1.

Contact your Valley dealer for more information concerning physical barricades for machines under these circumstances.

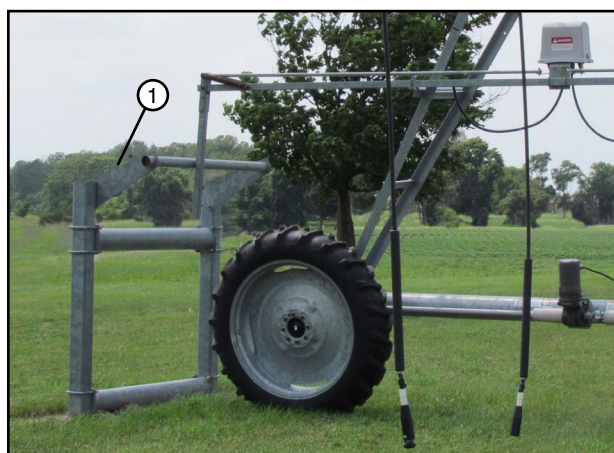


Figure 17-1 1. Physical Barricade

CAUTION

PROPER USE OF THE SAFETY OVERRIDE

Caution MUST be taken by the operator when using the safety override function as it will bypass or disable all of the machine's automatic safety shutdown circuits.

NEVER depress and hold the START/STOP SAFETY OVERRIDE switch in the START position for more than 3 to 5 seconds.

If the machine is not in full view by the operator, do not use the Safety Override function.

The operator MUST inspect the entire machine between each safety override start attempt.

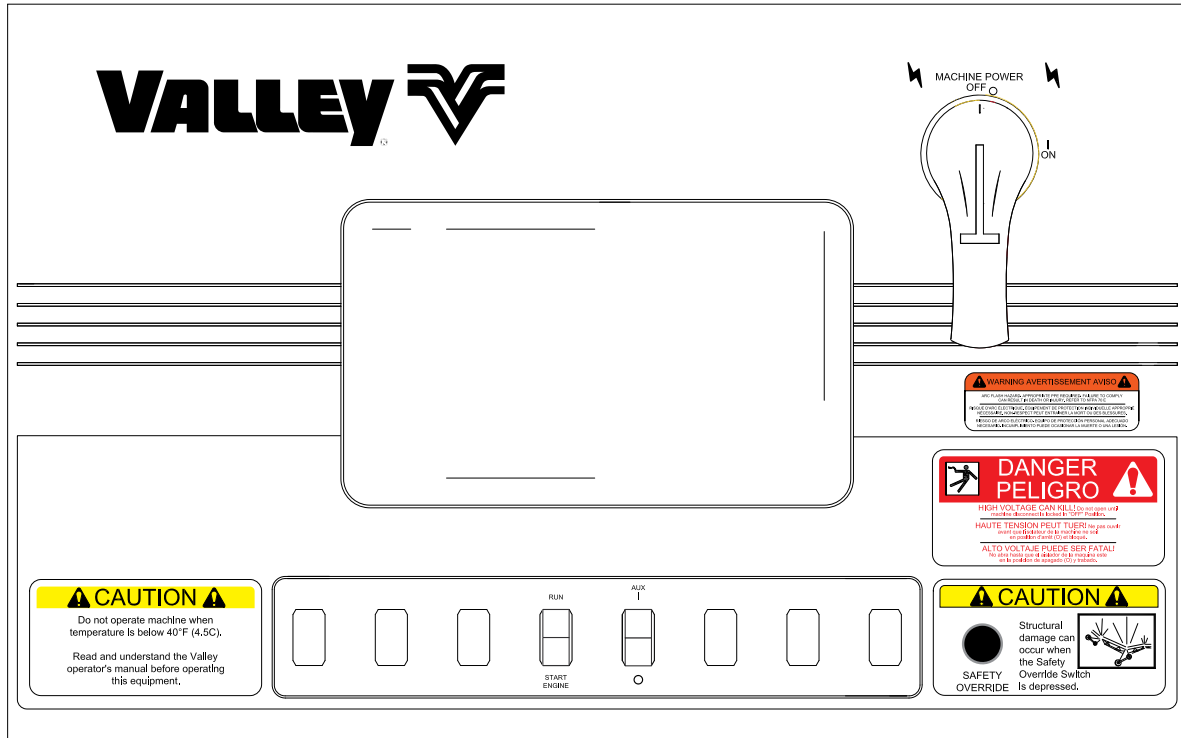
Repeated safety override start attempts can cause severe structural damage.

Call your Valley dealer if the machine fails to start.

SAFETY

Safety Decals

These Danger, Warning, and Caution decals appear in various locations on a Valley irrigation machine. You MUST familiarize yourself and other operator's with these safety decals. For replacement of any decal, contact your local Valley dealer.



CAUTION

Do not operate machine when temperature is below 40°F (4.5C).

Read and understand the Valley operator's manual before operating this equipment.

WARNING AVERTISSEMENT AVISO

ARC FLASH HAZARD. APPROPRIATE PPE REQUIRED. FAILURE TO COMPLY CAN RESULT IN DEATH OR INJURY. REFER TO NFPA 70 E

RISQUE D'ARC ÉLECTRIQUE. ÉQUIPEMENT DE PROTECTION INDIVIDUELLE APPROPRIÉ NÉCESSAIRE. NON-RESPECT PEUT ENTRAÎNER LA MORT OU DES BLESSURES.

RIESGO DE ARCO ELÉCTRICO. EQUIPO DE PROTECCIÓN PERSONAL ADECUADO NECESARIO. INCUMPLIMIENTO PUEDE OCASIONAR LA MUERTE O UNA LESIÓN.

DANGER PELIGRO

HIGH VOLTAGE CAN KILL! Do not open until machine disconnect is locked in "OFF" Position.

HAUTE TENSION PEUT TUER! Ne pas ouvrir avant que l'isolateur de la machine ne soit en position d'arrêt (O) et bloqué.

ALTO VOLTAJE PUEDE SER FATAL! No abra hasta que el aislador de la maquina este en la posición de apagado (O) y trabado.

CAUTION

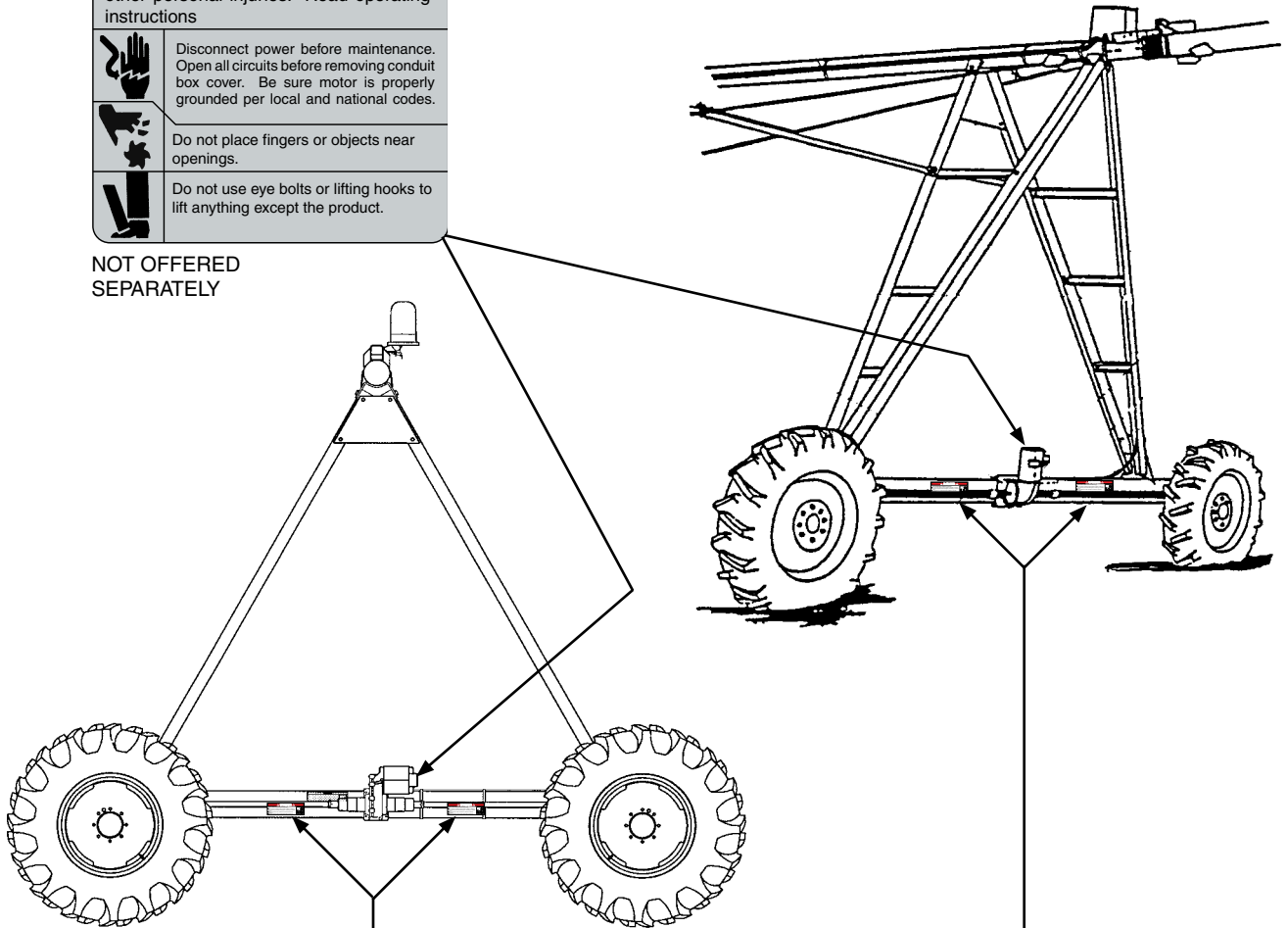
SAFETY OVERRIDE



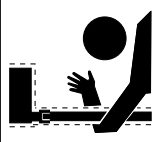
Structural damage can occur when the Safety Override Switch is depressed.

Safety Decals

 WARNING	
Improper installation of this motor may result in fire, explosion, electrical shock or other personal injuries. Read operating instructions	
	Disconnect power before maintenance. Open all circuits before removing conduit box cover. Be sure motor is properly grounded per local and national codes.
	Do not place fingers or objects near openings.
	Do not use eye bolts or lifting hooks to lift anything except the product.

NOT OFFERED
SEPARATELY



 DANGER 	
Drive Shaft Starts Without Warning!	
<ul style="list-style-type: none">Do not touch rotating drive shaft or shield. Clothing or limbs may become entangled, resulting in severe injury.Do not service until machine is locked in the off position.Always replace drive shaft shield after servicing.	

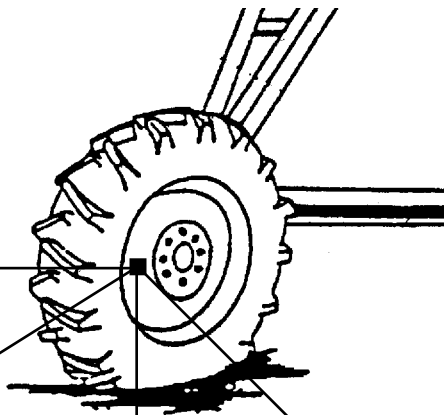
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SAFETY

Safety Decals



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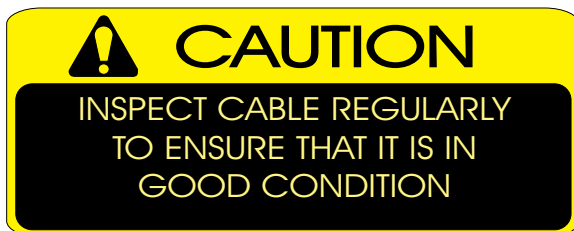
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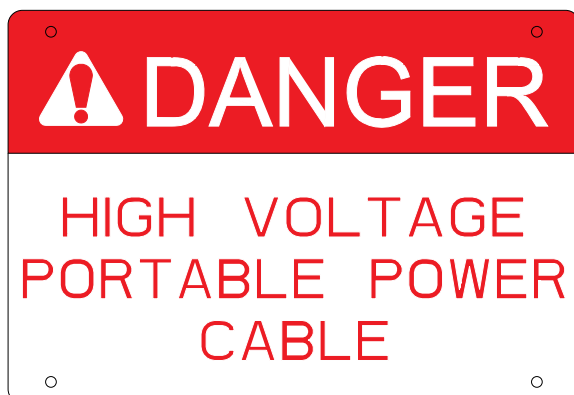
Part No. 0992750

Location: Remote public power installations



Part No. 0992748

Location: Remote public power package



Part No. 1732291 - POWER CABLE SIGN

Location: Remote public power installations



Part No. 0992749

Location: remote public power installations

OVERVIEW

Rainger Linear

There are two different types of Rainger Linear four wheel cart: Standard or Swing Around. The Standard Rainger Linear can be a Center Feed or End Feed system. The Swing Around Rainger Linear has a swivel on the cart and can only be an End Feed system. A closed delivery hose drag or open delivery ditch feed may be used with either type of cart. The closed delivery hose drag cart may have a side or center inlet. Each Standard Rainger Linear and Swing Around Rainger Linear machine has a free standing span located approximately in the center of the system. The placement of the tower boxes varies depending on the type of machine and guidance system.

Standard Cart - Center Feed System Closed Delivery Hose Drag / Open Delivery Ditch Feed

Typically the four wheel cart is located next to the water supply pipeline or ditch and can be attached to any span. The free-standing span is located in the middle of the machine. Directly over the cart, there is a center feed tower box. The central pulse tower box is located on the end of free standing span that is furthest away from the cart. The center feed system has two end towers with each end tower having an end tower box. All other tower boxes are linear intermediate tower boxes. See Figure 21-1.

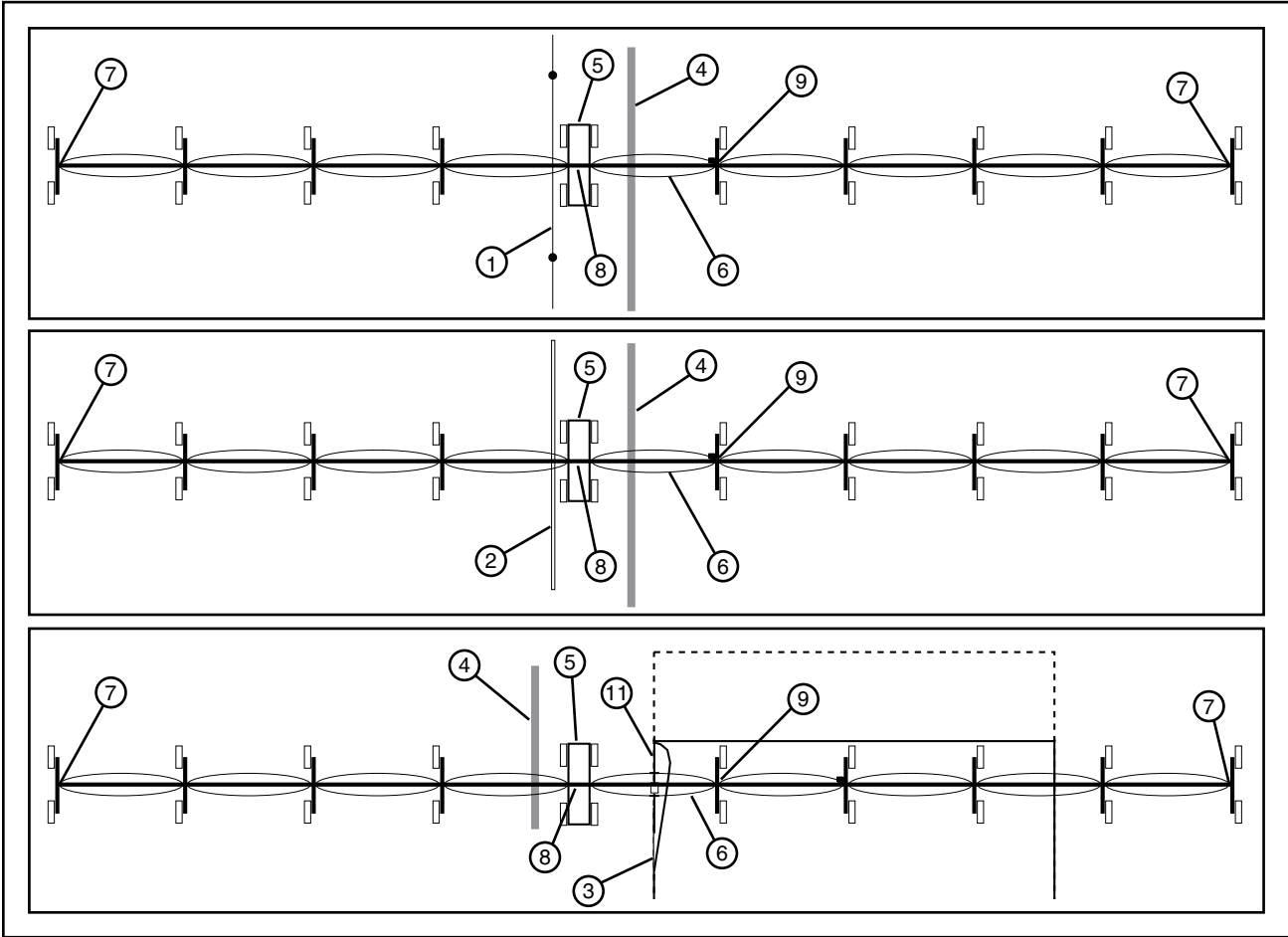


Figure 21-1 1. Above Ground Guidance 5. 4-Wheel Cart 9. Central Pulse Tower Box
 2. Furrow Guidance 6. Free Standing Span 10. Guidance System
 3. Below Ground Guidance 7. End Tower Box 11. Antenna
 4. Water Supply 8. Central Feed Tower Box

Center Drive Motor RPM			
Motor Type	Cart Motor RPM	Intermediate Drive Unit Motor RPM	Last Regular Drive Unit Motor RPM
Standard Speed	43	43	34
High Speed	68	68	56

OVERVIEW

Standard Cart - End Feed System

Closed Delivery Hose Drag / Open Delivery Ditch Feed

If the water supply pipeline or ditch is located at the edge of the field, the four wheel cart will be the end tower next to the water supply pipeline or ditch. The hose drag linear cart may have a side inlet or center inlet.

The central pulse tower box is always on the opposite end of the system from the four wheel cart. Its location varies depending on the total number of spans or the type of guidance system.

- When there are 5 spans or less the central pulse tower box is located on the first tower from the end.
- When there are 6 spans or more the central pulse tower box is located on the second tower from the end.
- With a Below Ground Guidance System the central pulse tower box is located on the end of free standing span that is furthest away from the cart.

Linear intermediate tower boxes are installed on both ends of the free-standing span.

There is no tower box on the span directly over the control panel or cart and only one end tower box located on the other end of the system. All other tower boxes are intermediate tower boxes. See Figure 22-1.

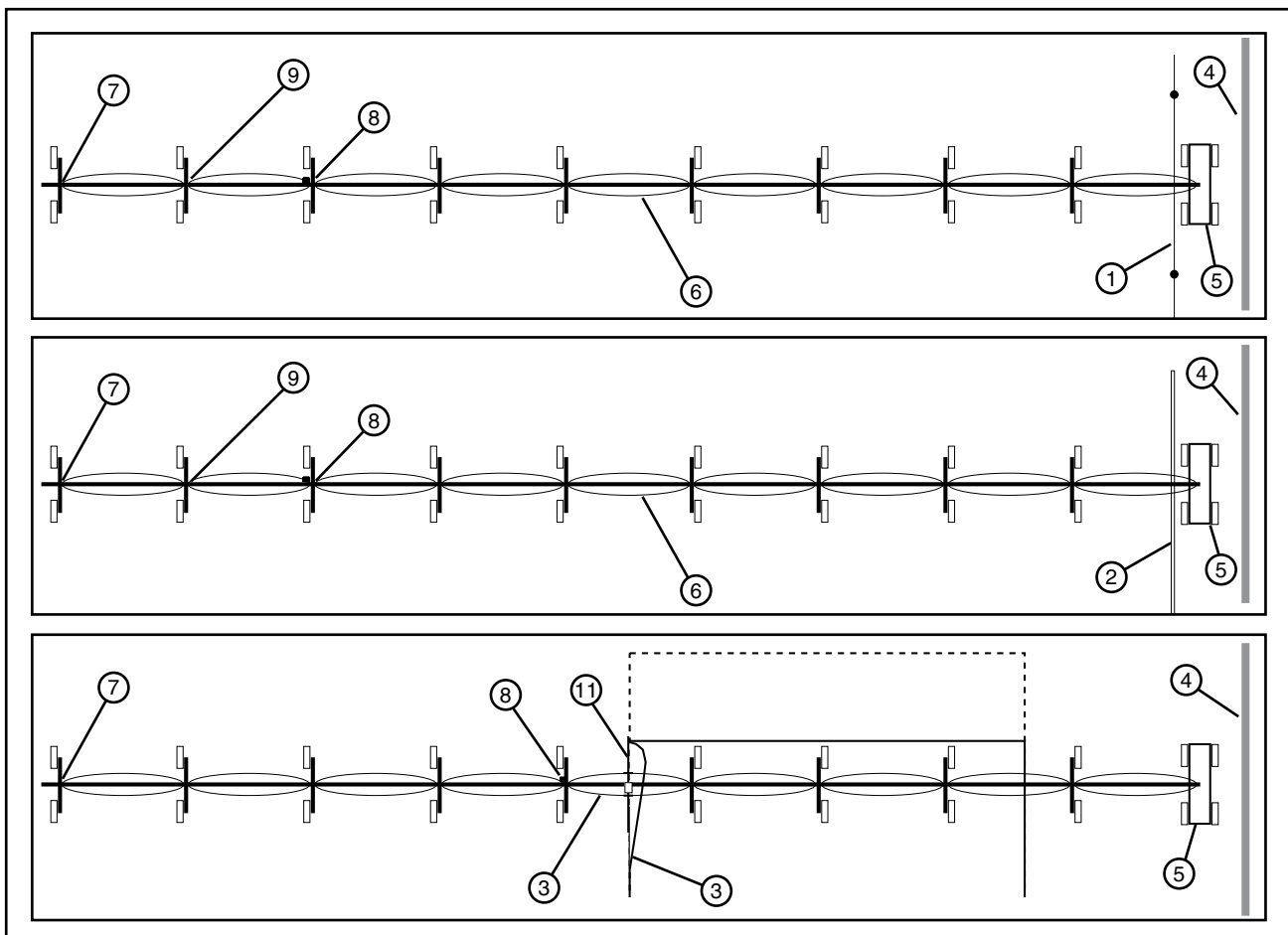


Figure 22-1 1. Above Ground Guidance 5. 4-Wheel Cart 9. Central Pulse Tower Box - 5 or less
 2. Furrow Guidance 6. Free Standing Span 10. Guidance System
 3. Below Ground Guidance 7. End Tower Box 11. Antenna
 4. Water Supply 8. Central Pulse Tower Box 6 or more

Center Drive Motor RPM			
Motor Type	Cart Motor RPM	Intermediate Drive Unit Motor RPM	Last Regular Drive Unit Motor RPM
Standard Speed	43	43	34
High Speed	68	68	56

Swing Around Cart - Furrow Guidance

Closed Delivery Hose Drag / Open Delivery Ditch Feed

The water supply pipeline or ditch is typically located near the center of the field, the four wheel cart will be next to the water supply pipeline or ditch. The hose drag linear cart may have a side inlet or center inlet.

The central pulse tower box is always on the opposite end of the system from the four wheel cart. Its location varies depending on the total number of spans.

- When there are 5 spans or less, the central pulse tower box is located on the first tower from the end.
- When there are 6 spans or more, the central pulse tower box is located on the second tower from the end.

Linear intermediate tower boxes are installed on both ends of the free-standing span.

There is a collector ring on the span directly over the cart and only one end tower box located on the other end of the system. All other tower boxes are intermediate tower boxes. See Figure 23-1.

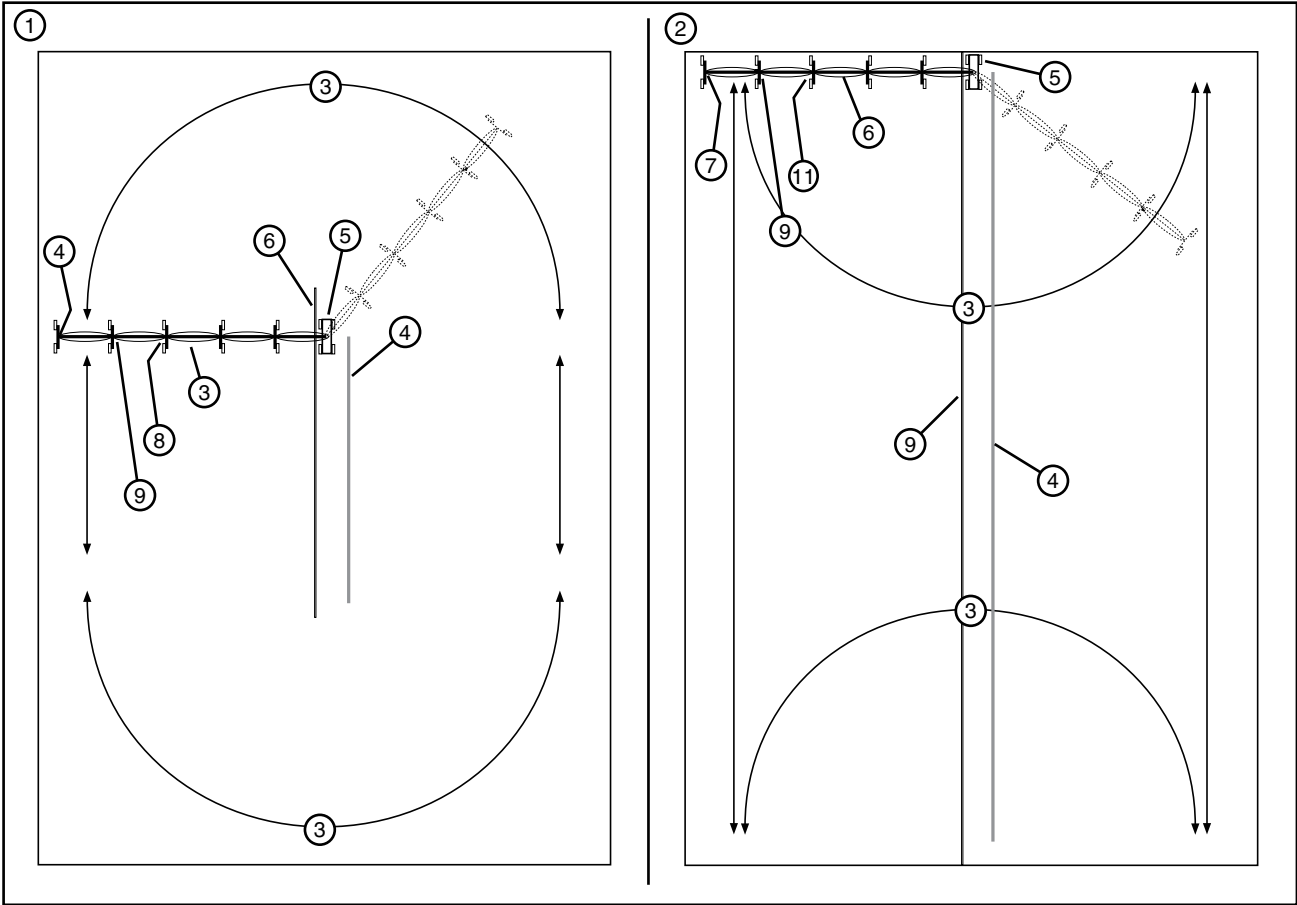


Figure 23-1 1. Pivot Out - Furrow Guidance 6. Free Standing Span 11. Antenna
 2. Pivot In - Furrow Guidance 7. End Tower Box
 3. Swings Dry Only 8. Central Pulse Tower Box 6 or more spans
 4. Water Supply 9. Central Pulse Tower Box 6 or less spans
 5. 4-Wheel Cart 10. Furrow Guidance

Center Drive Motor RPM			
Motor Type	Cart Motor RPM	Intermediate Drive Unit Motor RPM	Last Regular Drive Unit Motor RPM
Standard Speed	43	43	34
High Speed	68	68	56

OVERVIEW

Swing Around Cart - Below Ground Guidance Closed Delivery Hose Drag / Open Delivery Ditch Feed

The water supply pipeline or ditch is typically located near the center of the field, the four wheel cart will be next to the water supply pipeline or ditch. The hose drag linear cart may have a side inlet or center inlet.

The central pulse tower box is always on the opposite end of the system from the four wheel cart. It is located on the end of free standing span that is furthest away from the cart.

A linear intermediate tower box is installed on the other end of the free-standing span.

There is a collector ring on the span directly over the cart and only one end tower box located on the other end of the system. All other tower boxes are intermediate tower boxes. See Figure 24-1.

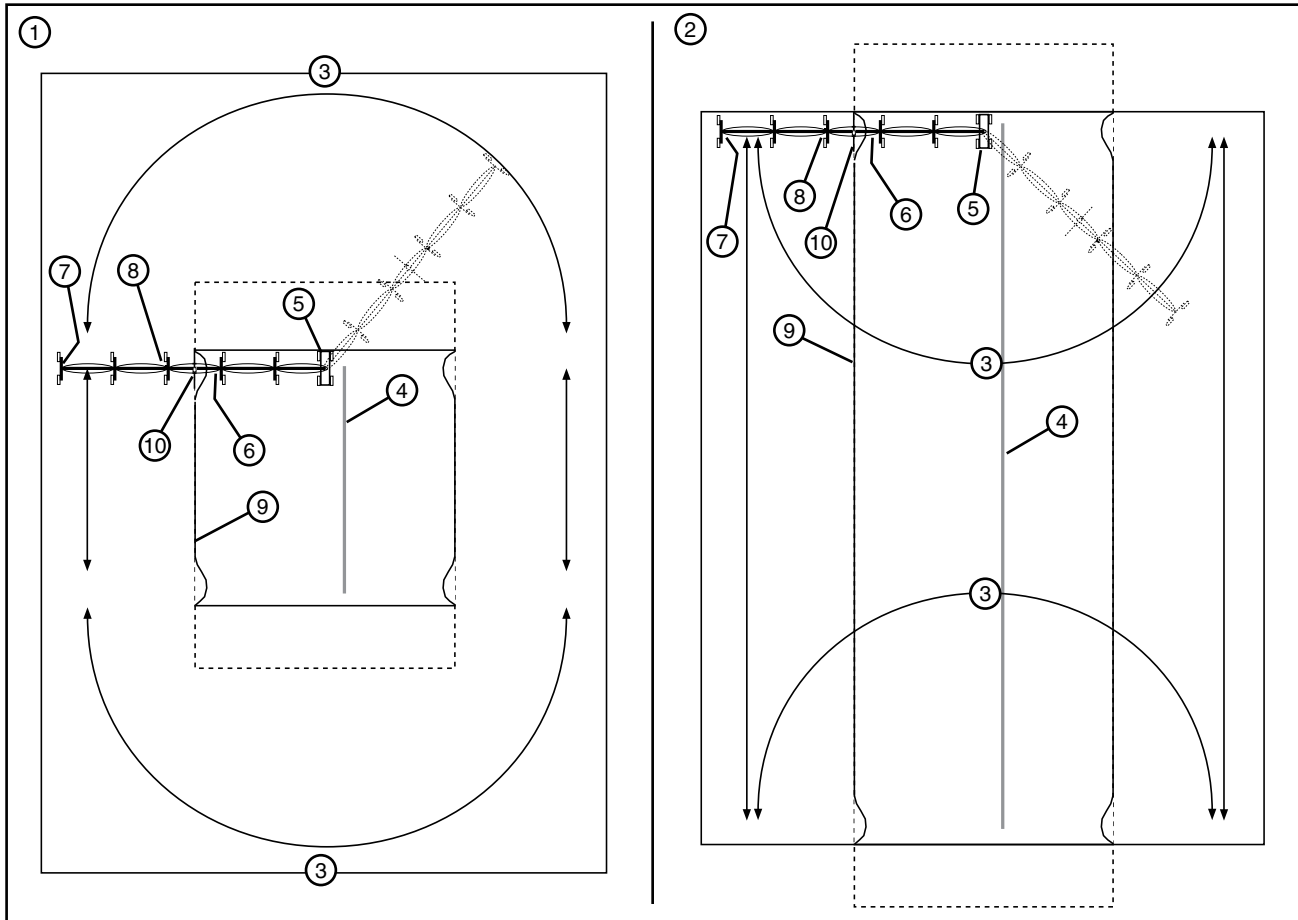


Figure 24-1 1. Pivot Out - Below Ground Guidance 2. Pivot In - Below Ground Guidance 3. Swings Dry Only 4. Water Supply 5. 4-Wheel Cart 6. Free Standing Span 7. End Tower Box 8. Central Pulse Tower Box 9. Below Ground Guidance 10. Antenna

Center Drive Motor RPM			
Motor Type	Cart Motor RPM	Intermediate Drive Unit Motor RPM	Last Regular Drive Unit Motor RPM
Standard Speed	43	43	34
High Speed	68	68	56

OVERVIEW

Spans

Water is transported across the field through a pipeline. The pipeline is made up of a series of spans which are connected together. Each span consists of truss assemblies and truss rods to support the span a tower box that acts as a junction box for the span cable and motor lead, and a drive tower which moves the pipeline across the field. See Figure 25-1.

Drive Towers

Power to the electric motor on the center drive gearbox is supplied by the tower box. The center drive gearbox drives the wheel gearboxes. See Figure 25-2.

Hitch

The spans are attached to each other with a ball hitch and cup assembly which gives lateral, rotational, and vertical flexibility between the spans. See Figure 25-3.

The span pipeline is connected together with a flexible hose and held in place with band clamps. See Figure 25-3.

Overhang

Typically an overhang is attached to the end of the last span pipe and used for irrigation beyond the span/drive unit. Support ears and cables provide support for the overhang. See Figure 25-4.

End Gun

Typically a booster pump is installed and an end gun is attached at the end of the overhang and used to increase the area irrigated beyond the end of the machine. See Figure 25-5.

The end gun is set to cover a specified area. This area is determined by the forward and backward angles, which are referred to as the end gun arc settings. See Figure 25-6.

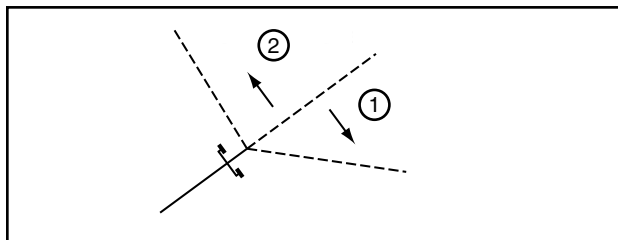


Figure 25-6 1. Forward Angle
2. Backward Angle

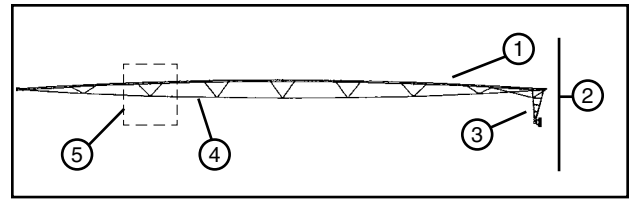


Figure 25-1 1. Pipeline 4. Truss rod
2. Span 5. Truss assembly
3. Drive tower

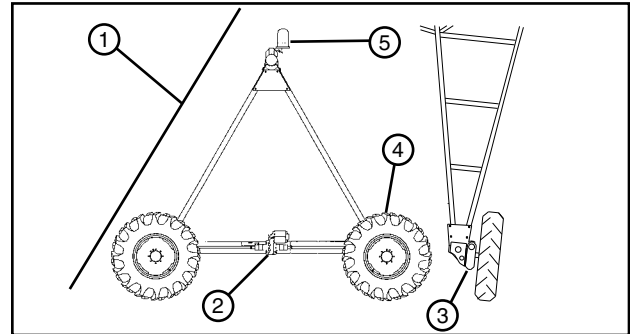


Figure 25-2 1. Drive Tower 4. Tire And Wheel Assy
2. Center Drive Gearbox 5. Tower Box
3. Wheel Gearbox

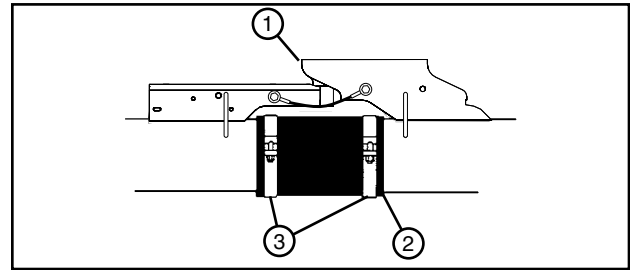


Figure 25-3 1. Ball Hitch And Cup Assembly
2. Flexible Hose
3. Band Clamp

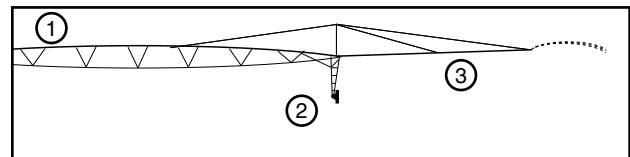


Figure 25-4 1. Span 3. Overhang
2. Drive Unit

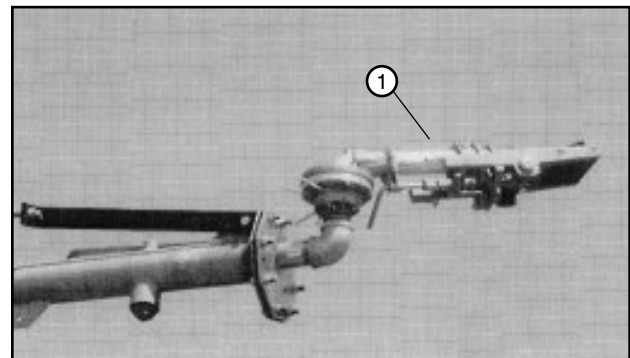


Figure 25-5 1. End Gun

OVERVIEW

Water Application

A sprinkler chart provides the operator with information about water application depths and pass times at different percent timer settings.

Water is applied to the field through the sprinklers. Sprinklers can be mounted on top of the pipeline or on drop tubes that hang below the pipeline. See Figure 26-1.

Side Load Safety Box

The side load safety box will shut down the machine if the span gets out of alignment with the linear cart.

The side load safety box location varies depending on the type of Rainger Linear cart.

- If Rainger linear center or end feed cart, the side load safety box is located on the first span pipe. See Figure 26-2.
- If Rainger linear swing around cart, the side load safety box is located on the Rainger Linear cart. See Figure 26-3.

See Maintenance section for adjustment procedure.

Span Cable

A cable with color coded wires enters and leaves each tower box. The cable runs the entire length of the machine and is referred to as span cable. See Figure 26-4.

The span cable can carry multiple voltages including high voltage depending on control panel and the country of use.

Intermediate Tower Boxes

The intermediate tower control boxes provide power to the center drive gear motors depending on the tower box position in relationship to the next tower in the system. See Figure 26-4.

Last Tower Box

The last tower control box provides power to the center drive gear motor depending on the percent timer setting at the control panel. It also completes the safety circuit. See Figure 26-4.

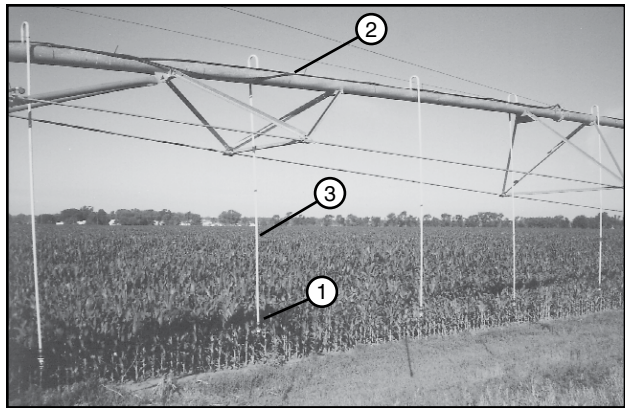


Figure 26-1 1. Sprinkler 2. Pipeline 3. Drop Tube

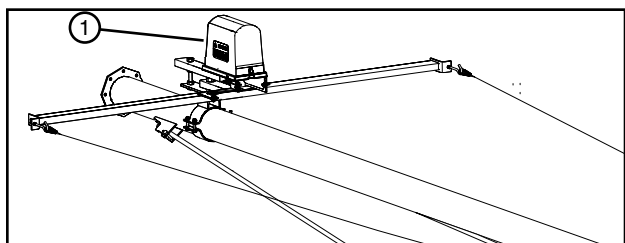


Figure 26-2 Standard Rainger Cart
1. Span Mounted Side Load Safety Box



Figure 26-3 Swing Around Rainger Cart.
1. Cart Mounted Side Load Safety Box

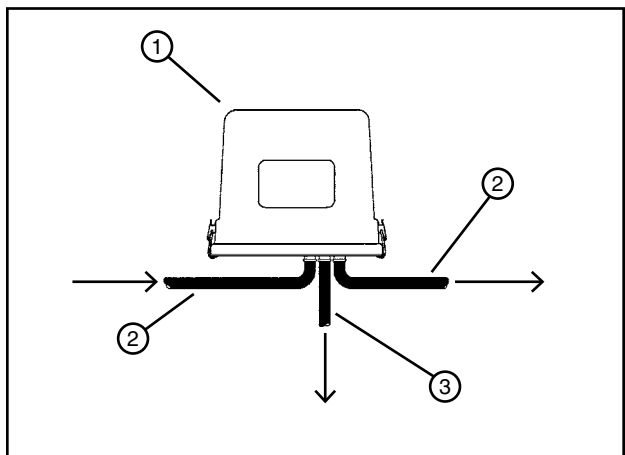


Figure 26-4 1. Tower Box 2. Span Cable 3. Cable to Drive Motor

OVERVIEW

Central Pulse Tower Box

The central pulse tower box provides power to the center drive gear motor depending on its position in relationship to the last tower and the machine's angle to the guidance system.

The basic components include safety microswitch, run microswitch, motor contactor, terminal block, disconnect, overwatering timer, and pulse timer. See Figure 27-1.

The overwatering timer is a safety device used to shut the system off if one of the end towers fail to move during the overwatering timer cycle. See Figure 27-2.

The overwatering timer cycle is adjustable from 0 to 60 minutes.

Each time the central pulse tower moves, the overwatering timer is reset and another timer cycle begins.

The pulse timer is part of the linear steering system. See Figure 27-3.

During operation, the linear machine moves at a 90° angle to the guidance system. If this angle changes, the linear irrigation machine must steer itself back to the correct operating position.

When the linear machine steers, the pulse timer restricts the run time of the leading end tower to a percentage of the run time of the tower where the pulse timer is located. This allows the trailing end tower to catch up, while minimizing radical steering and possible structural damage.

The pulse timer dial is factory set to 20 percent and sealed in position.

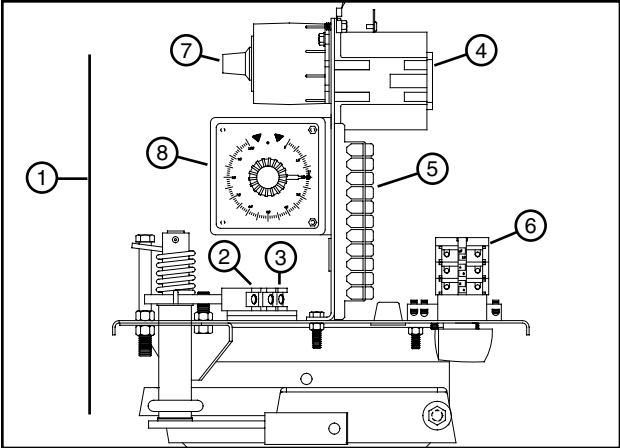


Figure 27-1 1. Central Pulse Tower Box 5. Terminal Block
 2. Safety Microswitch 6. Disconnect
 3. Run Microswitch 7. Overwatering Timer
 4. Motor Contactor 8. Pulse timer

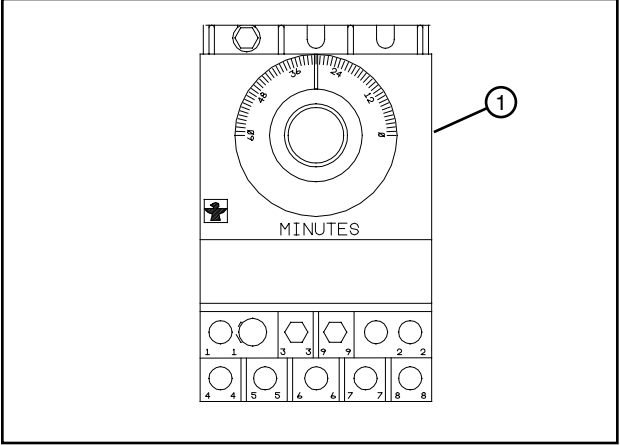


Figure 27-2 1. Overwatering Timer

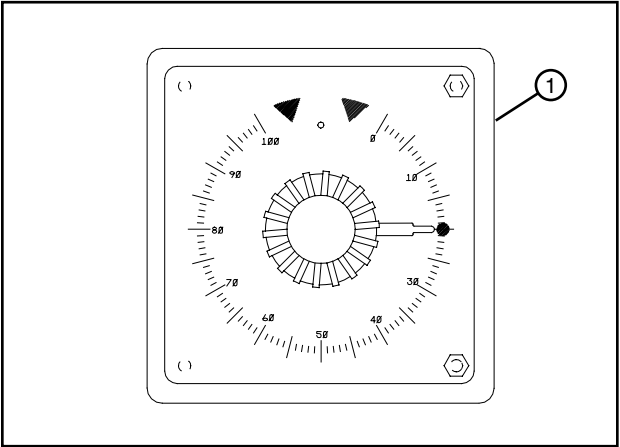


Figure 27-3 1. Pulse Timer

OVERVIEW

Safety Circuit

The safety circuit is a 120 volt AC control circuit that starts in the control panel and runs the entire length of the machine. See Figure 28-1.

Each drive tower box contains a safety microswitch. The safety microswitches must be closed to complete the safety circuit.

When the machine is in alignment, the safety microswitches are closed. If the machine ever becomes too far out of alignment, a safety microswitch opens, breaking the safety circuit. This stops the machine to prevent structural damage.

Alignment

There are 2 types of span alignment for linear machines, modified or floating alignment. The type of alignment used depends on the number of spans.

- Linear machines with five spans or less can use modified or floating alignment. See Figures 28-2 and 28-3.
- Linear machines with six spans or more must use floating alignment.

The end tower is the controlling tower. As the end tower moves, all of the other towers move to maintain straight alignment.

When the end towers move, they create an angular deflection with the next tower, this closes the run microswitches and causes the next tower to move.

This cycle repeats itself throughout the length of the entire machine.

The result of these cycles is that any tower can be moving at any time, depending on its relationship with the next outer span.

See Maintenance section for adjustment procedure.

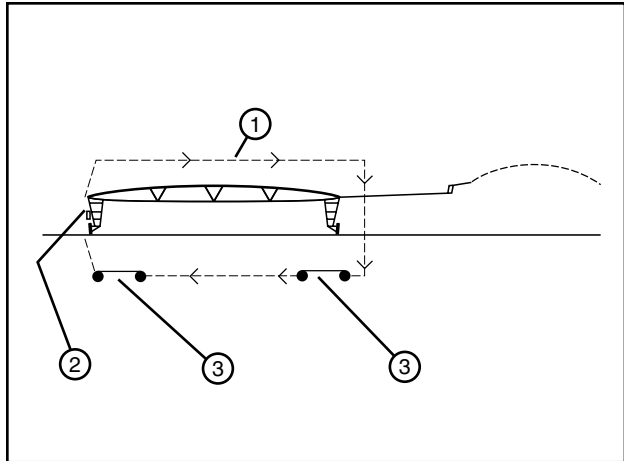


Figure 28-1 1. Safety circuit 2. Control panel 3. Safety Microswitch



Figure 28-2 Modified alignment



Figure 28-3 Floating alignment

Guidance

There are 3 types of guidance for Rainger Linear machines, above ground cable, furrow or below ground guidance. Either type of guidance can be used.

Above Ground Guidance (Option)

The above ground cable guidance system consists of an above ground cable supported by posts running parallel with the ditch or the water supply pipeline. Two guidance boxes, attached to the linear cart straddle the cable. See Figure 29-1.

As the machine travels through the field, the control arms straddle the cable. If the machine moves off course, movement of the leading control arms will call for a steer in the appropriate direction.

Furrow Guidance (Option)

The furrow guidance system consists of two furrow guidance boxes, arms, and skids mounted on the linear cart. See Figure 29-2.

The skids follow a "V" shaped furrow, 4 in to 6 in (101.6 mm - 152.4 mm) deep, running the length of the field. See Maintenance section for detailed instructions on furrow maintenance and construction.

When the linear cart moves away from the furrow, the guidance arm will actuate a steer switch bringing the linear cart back into the correct position. If the steer switch should fail, a back-up safety switch would shut the machine down.

Below Ground Guidance (Option)

The below ground guidance system consists of a buried single loop wire running through the center of the field, a guidance box, five antennas mounted on the machine and an oscillator to energize the buried wire. The buried wire emits a signal when the oscillator is ON. Make sure the oscillator is turned ON before using the machine.

The reference antenna sits directly above the buried wire monitoring its signal. As the forward or reverse steering antenna moves to the left or right of the buried wire it will become in phase or out of phase with the reference antenna and cause the system to steer back onto the wire. See Figure 29-3.

The phase loss antennas are located on each side of the buried wire. As long as the wire stays between these two antennas the machine will continue to run. If either phase loss antenna crosses over the wire, the safety circuit will open and the machine will shut down. See Figure 29-3.

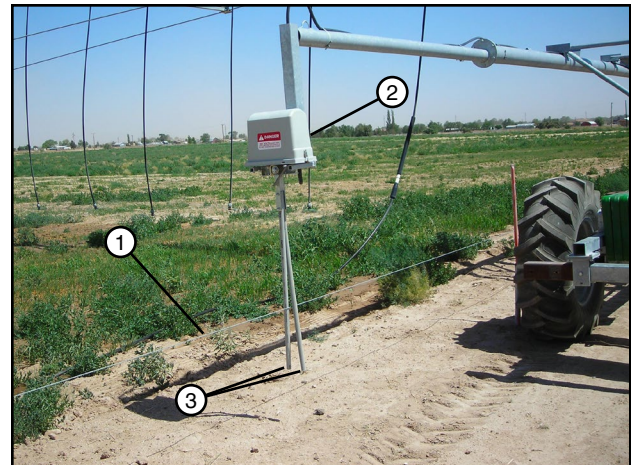


Figure 29-1 1. Cable 2. Guidance Box 3. Control Arm

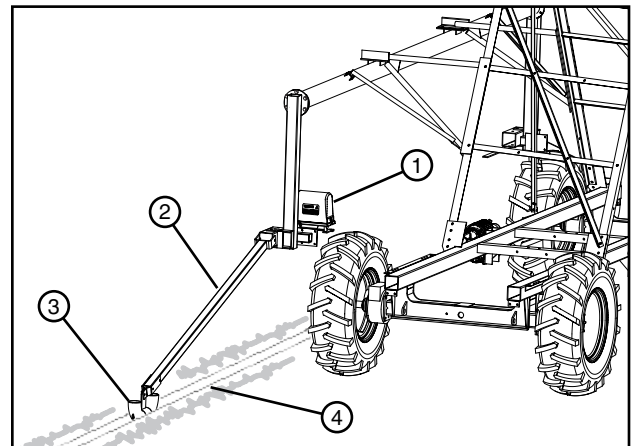


Figure 29-2 1. Guidance Box 2. Guidance Arm 3. Skid 4. Furrow

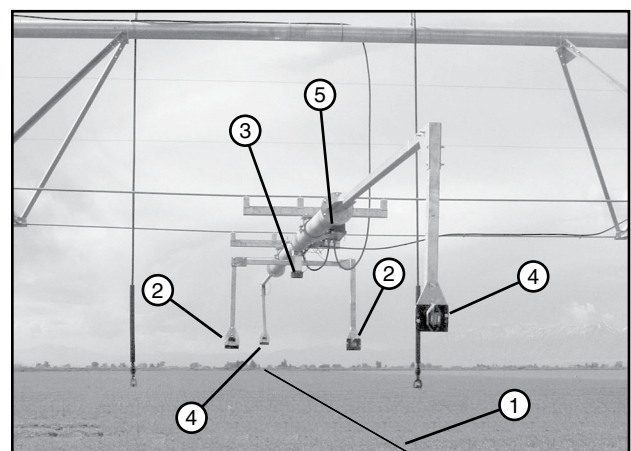


Figure 29-3 1. Buried wire location 2. Phase Loss antenna 3. Reference antenna 4. Steering antenna 5. Guidance box

OVERVIEW

Control Panel

The control panel allows the operator to control the machine. The control panel is located at the linear cart. See Figure 30-1.

Basic functions controlled by the panel include:

1. Starting/Stopping
2. Selecting forward or reverse running direction
3. Selecting machine speed (which controls the amount of water being applied).

When the machine is started, the AC power is sent through the span cable to the tower boxes. The control circuit distributes the power to the drive motors through the motor contactors and the machine moves depending on the control panel settings.

Refer to the control panel owner's manual for detailed information about the control panel operation.

Electric Cord Drag (Options)

Closed Delivery

The electric cord mounting with safety switch can be mounted horizontally or vertically on the cart. See Figure 30-2.

The electric cord is spring loaded. If the electric cord is pulled beyond the limits of the safety switch setting, the safety switch opens to shut down the machine.

Open Delivery

The electric cord mounting with safety switch is mounted vertically on the cart between the cart disconnect panel, pump panel and junction box. See Figure 30-3.

The electric cord is spring loaded. If the electric cord is pulled beyond the limits of the safety switch setting, the safety switch opens to shut down the machine.

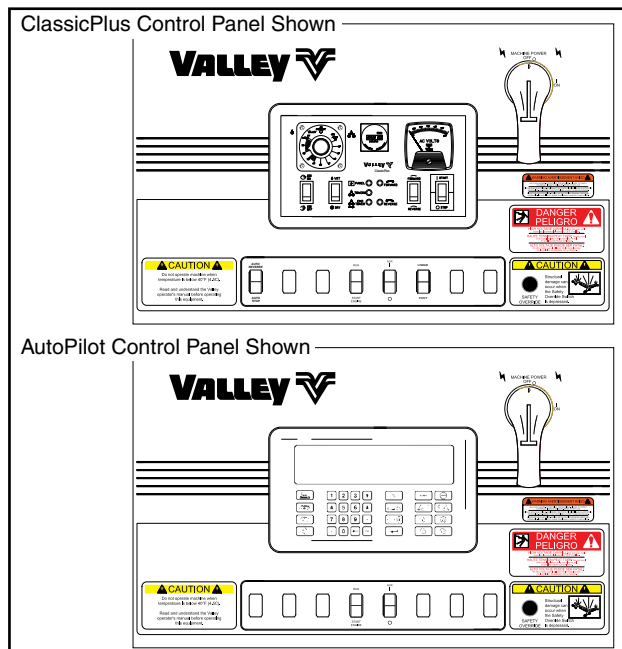


Figure 30-1

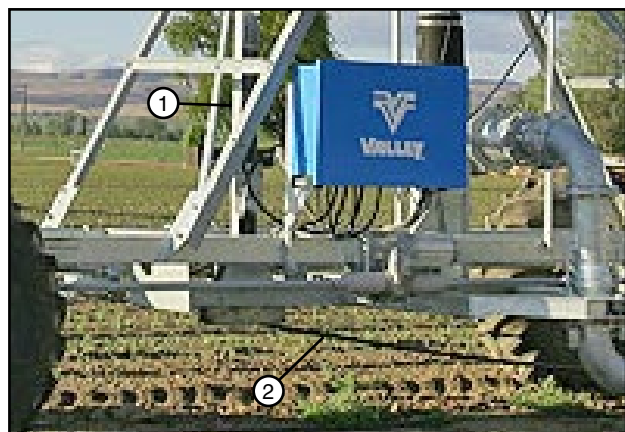


Figure 30-2 Closed Delivery
1. Electric Cord Mounting (Vertical Mounting Shown)
2. Electric Cord

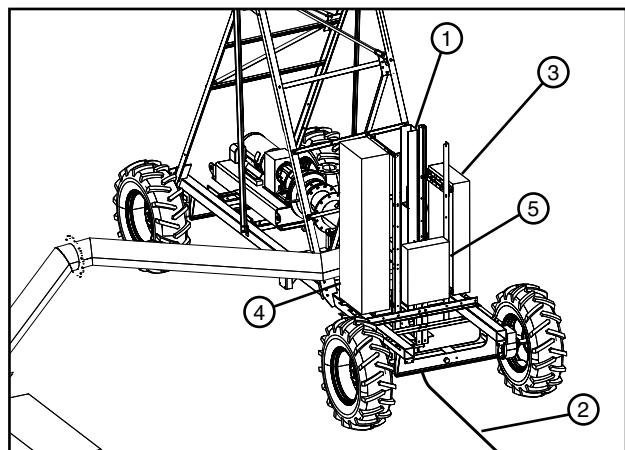


Figure 30-3 Open Delivery
1. Electric Cord Mounting
2. Electric Cord
3. Cart Disconnect Panel
4. Pump Panel
5. Junction Box

Field Stops

Above Ground Cable End of Field Stop (Option)

The Above Ground Cable Guidance End of Field Stops are positioned on the above ground cable at each end of the field. See Figure 31-1.

When the leading control arms reach the triangular end of field stop plate they begin to separate and eventually trip the safety switch which shuts down the machine.

Cart Mounted End of Field Stop/ End of Hose Stop (Option)

The End-Of-Field Stop/End Of Hose Stop has a single stage switch to stop the cart at the end of the field or end of hose.

When used as an end of field stop, an end of field stop post is placed as desired at each end of the field. When the swivel arm deflects against the stop post, the machine will stop. See Figure 31-2.

When used as an end of hose or cord stop, an end of hose stop post is placed at required intervals along the cart path. When the swivel arm deflects against the stop post, the machine will stop. The stop post must be removed before the machine can be restarted. See Figure 31-2.

Auto Reverse/Auto Stop (Option)

The Auto Reverse/Auto Stop has a two stage switch. The first stage is used for auto reverse. The second stage is used for auto stop. An end of field stop post is placed as desired at each end of the field and/or an end of hose post is placed at required intervals along the cart path. See Figure 31-2.

When the swivel arm deflects against the stop post, the first stage of the switch is closed and if the Auto Reverse option is enabled and ON the machine will auto reverse.

If the Auto Reverse is NOT ON, the machine continues to move and the swivel arm deflects against the stop post. When the second stage of the switch closes, the machine will stop.

When using this option as an end of hose stop, the stop post must be removed before the machine can be restarted.

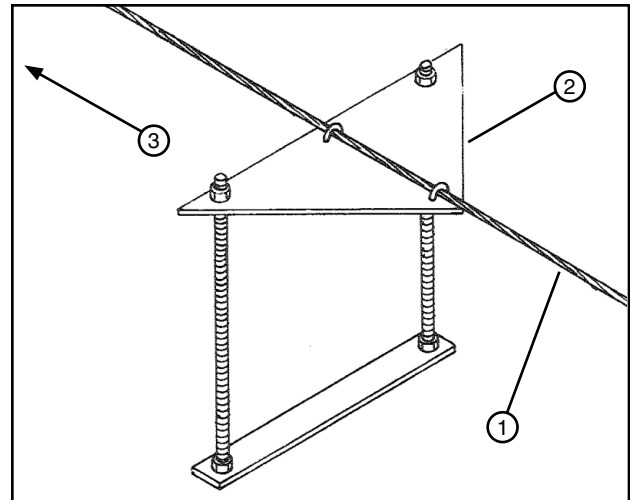


Figure 31-1 1. Above Ground Cable
2. End of Field Stop Plate
3. End of Field

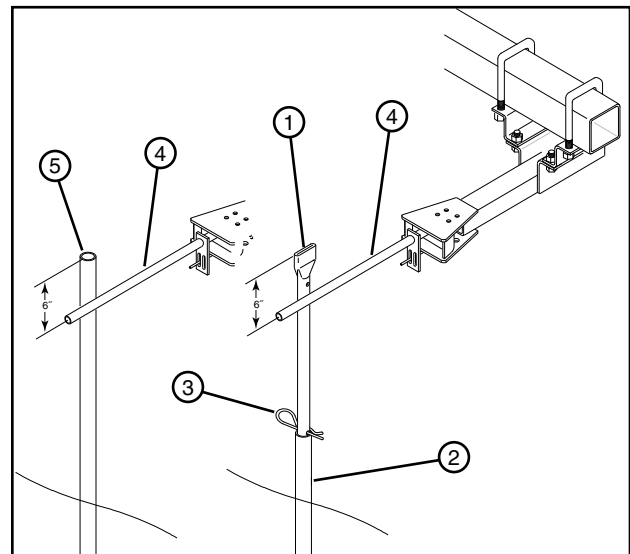


Figure 31-2 1. End Of Hose Stop Post Upper
2. End Of Hose Stop Post Lower
3. 5/32 in Hair Pin
4. Swivel Arm
5. End Of Field Stop Post

OVERVIEW

Field Stops

Drive Unit Mounted End of Field Stop/Auto Reverse (Option)

The drive unit mounted end of field stop is used with both the end of field stop and end of field auto reverse option. See Figure 32-1.

This mechanism will stop the system when the actuator arm contacts the barricade.

If the auto reverse option is installed, the operator can choose to either have the system stop or automatically reverse its direction of travel and continue to run.

CAUTION

- NEVER USE THE SAFETY OVERRIDE BUTTON TO WALK THE MACHINE OFF OF THE BARRICADE. STRUCTURAL DAMAGE MAY RESULT.
- SOIL MAY BUILD UP IN THE WHEEL TRACK RESULTING IN A RAMP EFFECT ALLOWING THE ACTUATOR ARM TO GO OVER THE BARRICADES. REGULARLY MAINTAIN THE WHEEL TRACK TO INSURE THE ACTUATOR ARM ALWAYS CONTACTS THE BARRICADE.

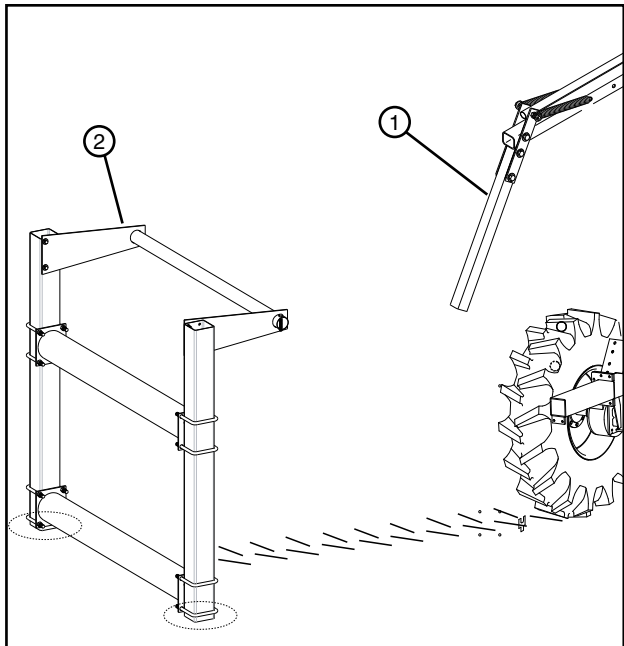


Figure 32-1 1. Actuator arm
2. Barricade

Auto Reverse/Auto Stop Box (Option)

The Auto Reverse/Auto Stop box provides the machine the ability to Auto Reverse and Auto Stop.

The Auto Reverse/Auto Stop Box is mounted on the drive unit mounted end of field stop and is only used with the Auto Reverse/Auto Stop option.

OPERATION

Machine Operation

The Rainger Linear was designed to be used on relatively level fields should not be used on any severe rolling or sloping terrain. The cart path must be maintained flat and free of any ruts or tracks which would force side loads into the cart frame. Should ruts develop in the cart path, the owner/operator should grade the surface smooth and maintain cart path flat and free of ruts or tracks during irrigation season.

For proper operation of the Rainger Linear machine, the Control Panel Owner's Manual and Rainger Linear Owner's Manual must be used together.

The Control Panel Owner's Manual includes safety guidelines and explains the basic operation of the control panel itself, including how to start/stop the machine, change running direction and change water application amounts.

The Rainger Linear Owner's Manual includes safety guidelines and explains the operation of the Rainger Linear machine including how to establish wheel tracks, methods of operation, closed delivery operation, open delivery operation, swing around operation, electric cord drag operation with hose and cord positioning.

All owner's, operators and maintenance personnel MUST read and understand the Control Panel Owner's Manual and the Rainger Linear Owner's Manual.

Overwatering Timer

The overwatering timer located in the central pulse tower box is a safety device used to shut the machine off should one or both of the end towers fail to move. The overwatering timer is set by the operator. See Figure 33-1.

⚠ DANGER

- THE TOWER BOXES CONTAIN HIGH VOLTAGE! 480 VOLTS CAN KILL.
- ALWAYS DISCONNECT ELECTRICAL POWER BEFORE SETTING THE OVERWATERING TIMER.
- ALWAYS REPLACE ANY COVER THAT WAS REMOVED TO MAKE OVERWATERING TIMER ADJUSTMENT.

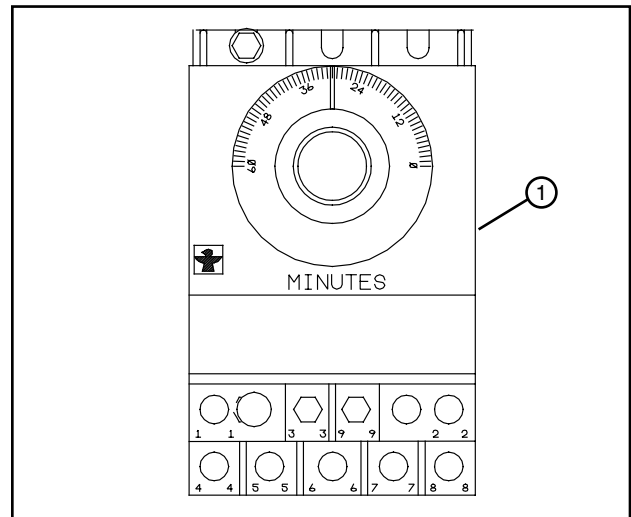


Figure 33-1 1. Overwatering timer

Refer to the chart for suggested overwatering timer settings based on the control panel percent timer setting. The times shown in the chart are actual minutes that the overwatering timer will allow the central pulse tower box drive unit to stand still before it shuts the machine off. See Figure 33-2.

NOTE

- An overwatering timer setting of less than the Suggested Overwatering Timer Setting may be used when chemigating.

Each time the central pulse tower box drive unit moves the overwatering timer is reset and another time out cycle begins.

OVERWATERING TIMER SETTINGS	
The overwatering timer should be set in relationship to the percent timer setting.	
Percent Timer Setting	Suggested Overwatering Timer Setting
90%	20 Minutes
80%	20 Minutes
60%	20 Minutes
40%	20 Minutes
30%	28 Minutes
10%	36 Minutes

Figure 33-2

OPERATION

Water Shut Off Valve (Closed Delivery Hose Drag Only)

The Water Shut Off Valve is typically used to prevent overwatering by automatically shutting off the flow of water if the machine shuts down due to a break in the safety circuit. The Water Shut Off Valve is a hydraulically operated sleeve type control valve with a function selector and an electric solenoid. See Figure 34-1.

The function selector has three positions; Open, Close and Auto.

- When the function selector handle is pointed to the Open position the water shut off valve will open completely.
- When water pressure exists on the up stream side of the water shut of valve and the function selector handle is pointed to the Close position the sleeve chamber is pressurized, closing the water shut off valve completely.
- When the function selector handle is pointed to the Auto position then the electric solenoid is used to automatically open or close the water shut off valve if wired to do so. The electric solenoid must be energized to open the water shut off valve and de-energized to close the water shut off valve. The water shut off valve is either in the completely opened or the completely closed (shut off) when operated electrically. Pointing the function selector handle to open or close will override the auto control.
- To hold the water shut off valve partly open, use the function selector to open the water shut off valve part way and then point the function selector handle midway between open and close.

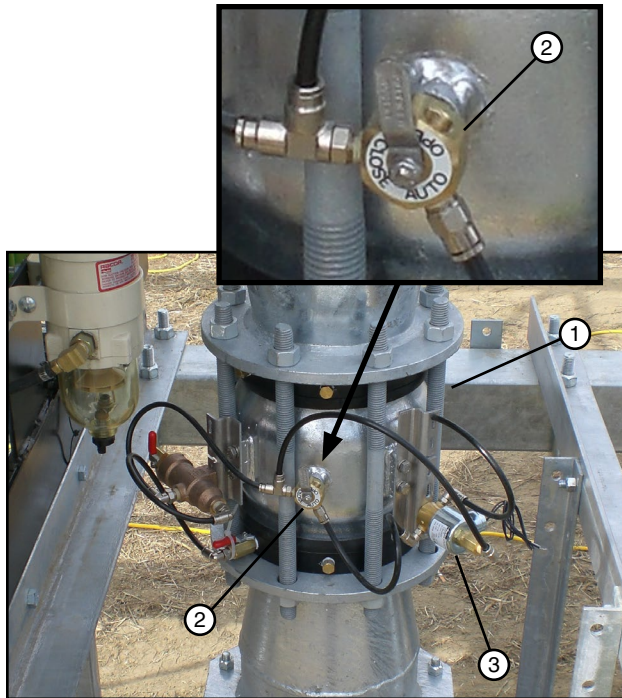


Figure 34-1 1. Water Shut Off Valve
2. Function Selector
3. Electric Solenoid

Starting and Stopping the Machine

Starting the Machine

Refer to the control panel owner's manual for information about starting the machine.

Emergency Stopping

To stop the machine in an emergency situation, shut off any one of the following:

- Main Service Disconnect Switch from public power to the control panel. See Figure 35-1.
- Control Panel Main Disconnect Switch. See Figure 35-1.
- Any Tower Box Disconnect Switch. See Figure 35-1.

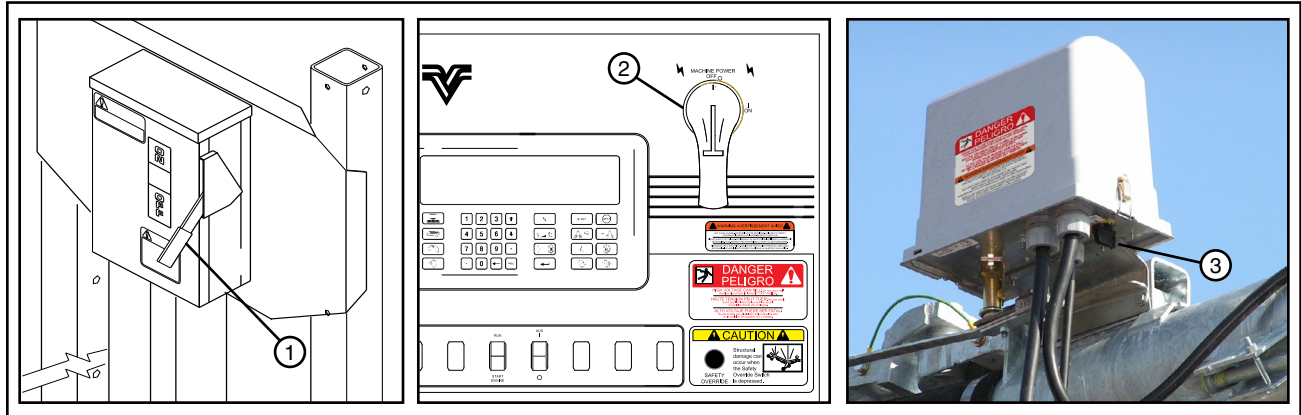


Figure 35-1 1. Main Service Disconnect Switch
2. Control Panel Main Disconnect Switch
3. Tower Box Disconnect Switch

Stopping Under Normal Conditions

1. Press the STOP key. See Figure 35-2.
2. Turn the main disconnect switch to the OFF position. See Figure 35-2.
3. Turn the pumping unit OFF (if not automatic).
4. If an engine generator set is utilized, place the Engine Run/Start switch to the Start position for the next start-up sequence.

WARNING

- **DO NOT SHUT THE MACHINE OFF BY SLOWLY IDLING DOWN THE ENGINE GENERATOR SET. THIS PRACTICE CAUSES LOW VOLTAGE AND WILL DAMAGE MACHINE COMPONENTS.**
- **ALWAYS STOP THE IRRIGATION MACHINE PRIOR TO SHUTTING DOWN THE ENGINE-GENERATOR SET.**

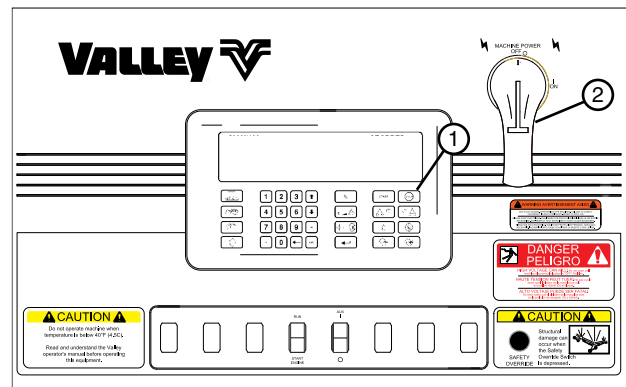


Figure 35-2 AutoPilot Control Panel Shown
1. Stop Key
2. Main Disconnect Switch OFF

OPERATION

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Establishing Wheel Tracks

Wheel Tracks

It is important to establish proper wheel tracks for a linear machine. The methods described in this section will help minimize deep wheel tracks and allow the system to steer as required.

- Wheel tracks affect the linear machine's ability to steer.
- Ensure correct tire pressure to help reduce the possibility of deep wheel tracks.
- Wheel track depth:
 - » Regular drive units must not exceed 4 in (100 mm). See Figure 37-1.
 - » Single span swing around drive unit must not exceed 2 in (50 mm). See Figure 37-1.
 - » Do not allow wheel tracks at the cart. See Figure 37-1.
- Wheel track depth can be controlled by using track fillers, tillers, discs, or flotation tires.

Direction of Travel

The linear system should typically travel perpendicular to crop rows that are up to 4 in (100 mm) deep. However, if the crop row exceeds 4 in (100 mm) in depth, the direction of travel should be parallel to the crop rows.

The linear system should not cross furrows or rows at a shallow angle.

Establishing Perpendicular Wheel Tracks

Use the following method to establish perpendicular wheel tracks.

1. Plant the crop perpendicular to the linear system. See Figure 37-2.
2. Make the first pass across the field depending on your tillage method.
 - If using a conservation tillage method, the first pass across the field should be DRY and at a 100% percentage timer setting.
 - If using conventional tillage methods, the first pass across the field should be WET and at a 100% percentage timer setting.
3. The second pass should be at the 80 - 100% percentage timer setting while applying water.
4. Subsequent passes can be at any desired setting. However, for wheel tracks, making frequent light applications of water is better than making fewer heavy applications of water.

Water is not applied the same way as with a side roll, traveling gun, or surface irrigation due to the ease in making applications. Typically application depths would not exceed 1.0 inches (25 mm).

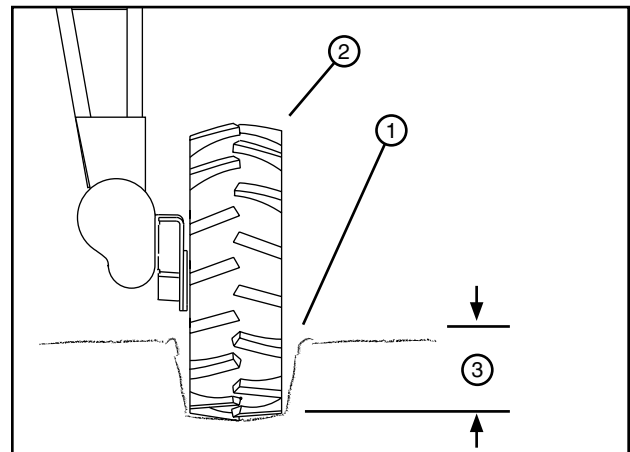


Figure 37-1 1. Wheel track 2. Linear drive unit 3. Maximum Depth

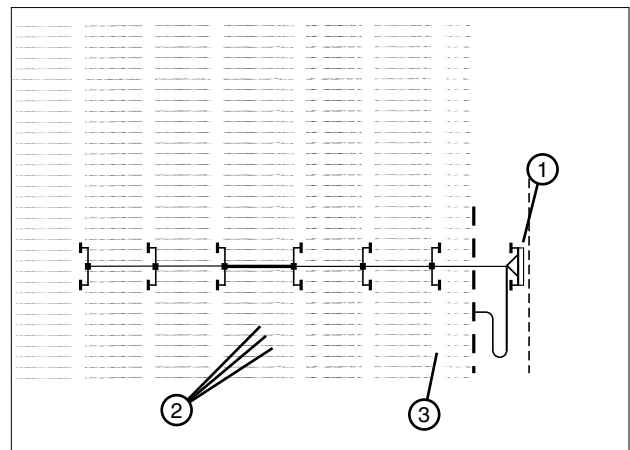


Figure 37-2 Perpendicular Travel
1. Linear System
2. Crop Rows
3. Wheel Track

OPERATION

Establishing Parallel Wheel Tracks

Use one of the following methods to establish parallel wheel tracks:

NOTE

- ROWS MUST BE PLANTED PARALLEL WITH THE WHEEL TRACKS AND THE WHEELS MUST NOT CROSS A ROW.

METHOD 1

1. Make the first pass across the field depending on your tillage method.
 - If using a conservation tillage method, the first pass across the field should be DRY and at a 100% percentage timer setting.
 - If using conventional tillage methods, the first pass across the field should be WET and at a 100% percentage timer setting.
2. Plant the crop parallel to the wheel tracks allowing a minimum of 10 in (254 mm) of clearance space between each wheel track and the first crop row on either side of the wheel track. See Figures 38-1 and 38-2.

METHOD 2

1. Plant the crop parallel to where the irrigation machine will run. See Figure 38-1.
2. Make the first pass across the field depending on your tillage method.
 - If using a conservation tillage method, the first pass across the field should be DRY and at a 100% percentage timer setting.
 - If using conventional tillage methods, the first pass across the field should be WET and at a 100% percentage timer setting.
3. Remove or flatten the rows at the wheel tracks with a minimum of 10 in (254 mm) of clearance space on each side of the wheel track. See Figure 38-2.

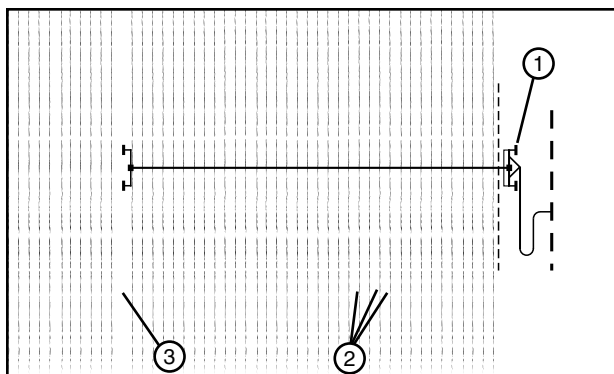


Figure 38-1 Parallel Travel
1. Linear System
2. Crop Rows
3. Wheel Track

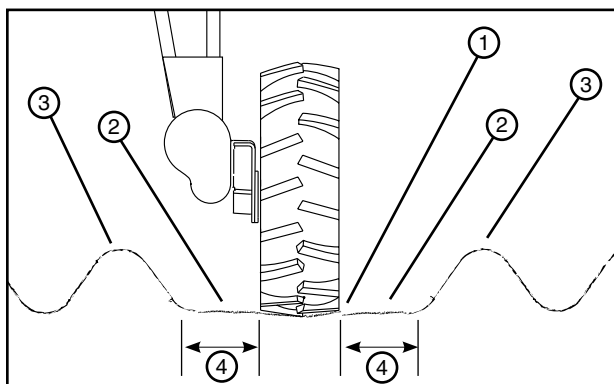


Figure 38-2 1. Wheel Track 3. First Crop Row
2. Clearance Space 4. 10 in Min.

OPERATION

Methods Of Operation

The five methods of machine operation that follow are examples of how the machine may be operated. These are not the only methods of operation. Your method of operation may be different.

Contact your authorized Valley dealer for assistance with designing your own method of operation based on management style, soil types, crop water requirements, and system capacity.

Method I

Can be used on most soil types.

The system operator must be present at the completion of each step to change irrigation mode, percentage timer setting, and/or direction.

1. The percentage timer is set at the desired application rate and the system is started at one end of the field and run wet (irrigating) to the middle of the field. See Figure 39-1.
2. The system is stopped, the percentage timer is set to 100% and the system is run dry to the other end of the field. See Figure 39-1.

NOTE

•To reduce the possibility of creating deep ruts, make sure the first part of the field that was irrigated has dried sufficiently before running the system back to the original end of the field.

3. The system direction is reversed, the percentage timer is set to the desired application rate and the system is run wet (irrigating) to the middle of the field. See Figure 39-2.
4. The system is stopped, the percentage timer is set to 100% and the system is run dry to the original end of the field. See Figure 39-2.

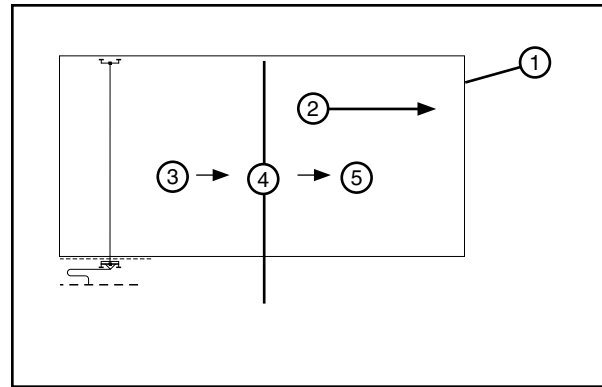


Figure 39-1 1. Field 2. Direction of Travel 3. Wet 4. STOP 5. Dry

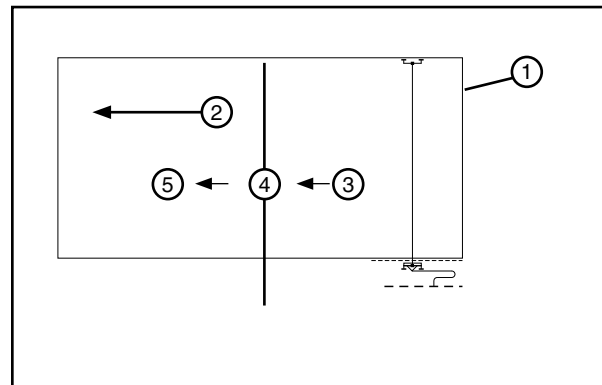


Figure 39-2 1. Field 2. Direction of Travel 3. Wet 4. STOP 5. Dry

OPERATION

Methods of Operation

Method II

Can be used on most soil types.

The system operator does not need to be present at the completion of each step and maintenance can be performed during the system stop.

1. The percentage timer is set at the desired application rate and the system is started at one end of the field and run wet (irrigating) to the other end of the field. See Figure 40-1.
2. The system is stopped until the field has dried sufficiently before running the system back to the original end of the field. See Figure 40-1.

NOTE

•To reduce the possibility of creating deep ruts, make sure the field has dried sufficiently before running the system back to the original end of the field.

3. Reverse the system direction, set the percentage timer, and run the system wet or dry back to the original end of the field. See Figure 40-2.

Method III

Can be used for frequent shallow applications on relatively sandy soils.

The system operator may need to be present at the end of the first step if the auto reverse option is not used.

1. The percentage timer is set at the desired application rate and the system is started at one end of the field and run wet (irrigating) to the other end of the field. See Figure 40-3.
2. Reverse the system direction, set the percentage timer, and run the system wet back to the original end of the field. See Figure 40-4.

NOTE

•To reduce the possibility of creating deep ruts, the water application should be shallow and the soil type should be sandy.

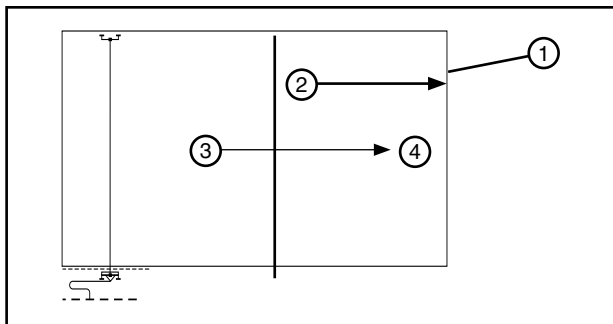


Figure 40-1 1. Field
2. Direction of Travel
3. Wet
4. STOP

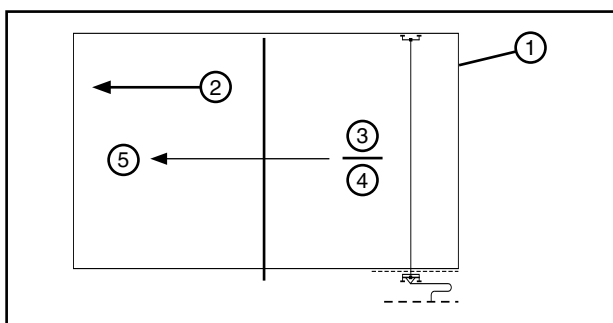


Figure 40-2 1. Field
2. Direction of Travel
3. Wet
4. Dry
5. STOP

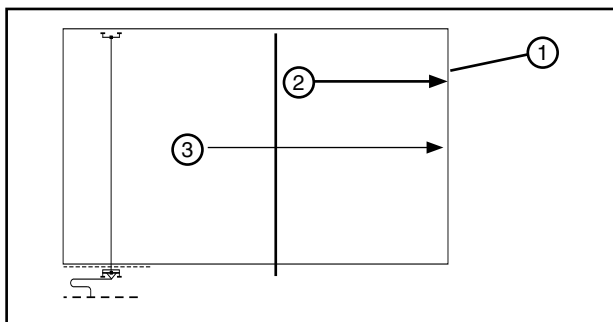


Figure 40-3 1. Field
2. Direction of Travel
3. Wet

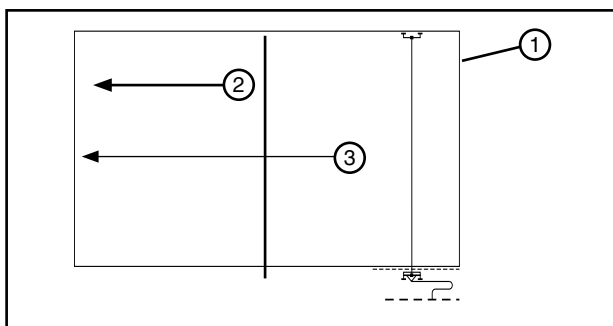


Figure 40-4 1. Field
2. Direction of Travel
3. Wet

Methods of Operation

Method IV

Can be used in situations where the water source cannot be independently controlled by the system operator.

Requires the system operator to be present at the completion of each step to change the percentage timer setting and/or the direction.

1. The percentage timer is set at the desired application rate, the system is started at one end of the field, and run wet (irrigating) to the middle of the field. See Figure 41-1.
2. At the middle of the field the percentage timer is set to 100% and the system continues to run wet to the other end of the field. See Figure 41-1.
3. The system direction is reversed, the percentage timer is set to the desired application rate and the system is run wet (irrigating) to the middle of the field. See Figure 41-2.
4. At the middle of the field, the percentage timer is set to 100% and the system continues to run wet to the original end of the field. See Figure 41-2.

Method V

Can be used where it is desired to harvest one portion of a field while irrigating another part of the field.

The system operator may need to be present at the end of the first step if the auto reverse option is not used.

1. The percentage timer is set at the desired application rate and the system is started at one end of the field and run wet (irrigating) to the middle of the field and stopped. See Figure 41-3.
2. At the middle of the field the system direction is reversed. Set the percentage timer and run the system either wet or dry back to the original end of the field. See Figure 41-4.

NOTE

- To reduce the possibility of creating deep ruts, the water application should be shallow.

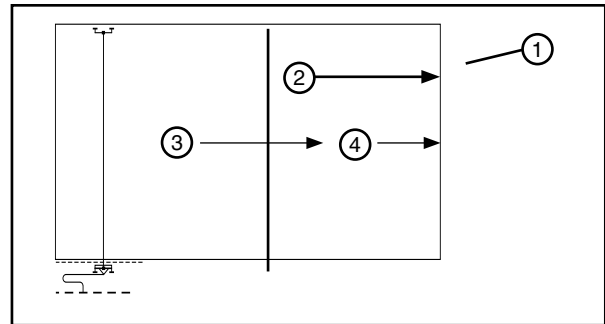


Figure 41-1 1. Field 2. Direction of Travel 3. Wet Deep 4. Wet Shallow

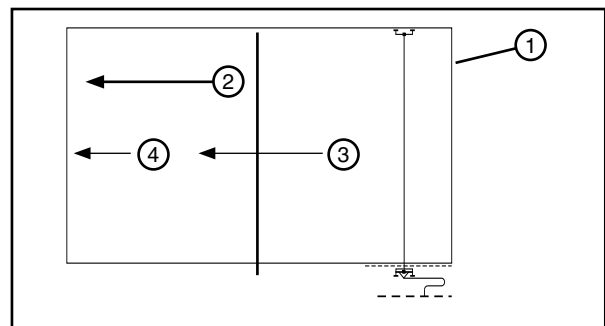


Figure 41-2 1. Field 2. Direction of Travel 3. Wet Deep 4. Wet Shallow

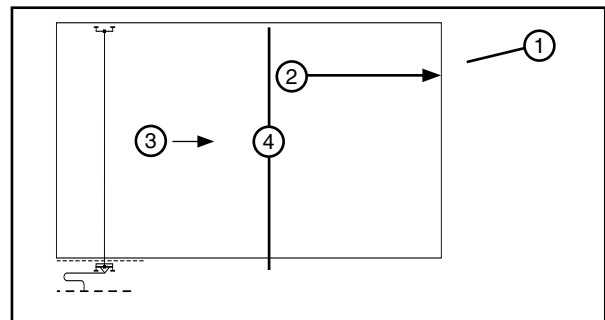


Figure 41-3 1. Field 2. Direction of Travel 3. Wet 4. STOP

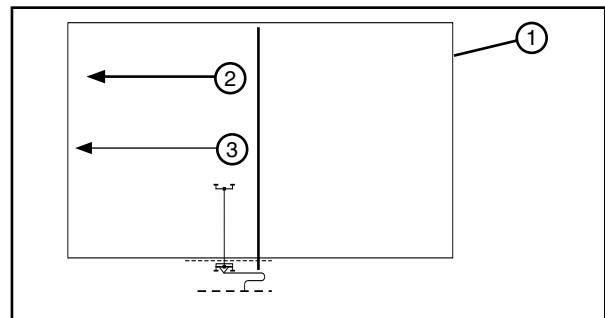


Figure 41-4 1. Field 2. Direction of Travel 3. Wet or Dry

OPERATION

Linear Water Application Data

Wheel Rotation Speeds *

Center Drive Output RPM	High Float 14.9 x 24	Maxi-Float 16.9 x 24
29	6.54 ft/min	6.98 ft/min
30	6.77 ft/min	7.22 ft/min
35	7.90 ft/min	8.42 ft/min
37	8.35 ft/min	8.90 ft/min
56	12.63 ft/min	13.48 ft/min
58	13.08 ft/min	13.96 ft/min
68	15.34 ft/min	16.36 ft/min
69	15.56 ft/min	16.60 ft/min

*Machine speed is controlled by the speed of the end drive units.

EXAMPLE

$$\begin{aligned} \text{Application/Rate} &= \frac{\text{GPM} \times 2310}{\text{Acres} \times 43560} = \frac{1100 \times 2310}{120 \times 43560} = \frac{2,541,000}{5,227,200} = 0.48 \text{ ft} \\ \text{(In /Day/Capac.)} & & & & & & & \text{Day} \\ \text{Application/Rate} &= \frac{\text{GPM} \times 2310}{\text{Acres} \times 43560} = \frac{(\quad) \times 2310}{(\quad) \times 43560} = \frac{(\quad)}{(\quad)} = \frac{(\quad)}{\text{Day}} \end{aligned}$$

EXAMPLE

$$\begin{aligned} \text{Hours/Pass} &= \frac{\text{Length of Run}}{60 \times \text{Chart Speed}} = \frac{3234 \text{ ft}}{60 \times 5.90} = 9.1 \text{ hours} \\ \text{@ 100\%} & & & & & \text{Pass} \\ \text{Hours/Pass} &= \frac{\text{Length of Run}}{60 \times \text{Chart Speed}} = \frac{(\quad)}{60 \times (\quad)} = \frac{(\quad)}{\text{Pass}} \\ \text{@ 100\%} & & & & & \text{Pass} \end{aligned}$$

Add maintenance, refueling, and other "down time" to the calculated results.

EXAMPLE

$$\begin{aligned} \text{Inches/Pass} &= \frac{\text{Hrs./Pass} \times \text{App. Rate (In Day)}}{24} = \frac{9.1 \times 0.48}{24} = 0.18 \text{ ft} \\ \text{@ 100\%} & & & & & \text{Pass} \\ \text{Inches/Pass} &= \frac{\text{Hrs./Pass} \times \text{App. Rate (In Day)}}{24} = \frac{(\quad)}{24} = \frac{(\quad)}{\text{Pass}} \\ \text{@ 100\%} & & & & & \text{Pass} \end{aligned}$$

Percentage Timer Settings

100%	Hrs./Pass @ 100%		Hours/Pass	100%	Inches/Pass @ 100%		In/Pass
90%	_____	÷ 0.90 =	_____	90%	_____	÷ 0.90 =	_____
80%	_____	÷ 0.80 =	_____	80%	_____	÷ 0.80 =	_____
70%	_____	÷ 0.70 =	_____	70%	_____	÷ 0.70 =	_____
60%	_____	÷ 0.60 =	_____	60%	_____	÷ 0.60 =	_____
50%	_____	÷ 0.50 =	_____	50%	_____	÷ 0.50 =	_____
40%	_____	÷ 0.40 =	_____	40%	_____	÷ 0.40 =	_____
30%	_____	÷ 0.30 =	_____	30%	_____	÷ 0.30 =	_____
25%	_____	÷ 0.25 =	_____	25%	_____	÷ 0.25 =	_____
20%	_____	÷ 0.20 =	_____	20%	_____	÷ 0.20 =	_____
15%	_____	÷ 0.15 =	_____	15%	_____	÷ 0.15 =	_____
10%	_____	÷ 0.10 =	_____	10%	_____	÷ 0.10 =	_____
5%	_____	÷ 0.05 =	_____	5%	_____	÷ 0.05 =	_____

Electric Cord Handling

DANGER

- NEVER HANDLE THE ELECTRIC CORD WHEN THE POWER IS ON.
- THE DISCONNECT SWITCH MUST BE IN THE “OFF” POSITION WHEN INSERTING OR REMOVING THE PLUG FROM THE RECEPTACLE.
- NEVER ALLOW THE ELECTRIC CORD TO KINK.
- NEVER ALLOW THE HOSE TO DRAG OVER THE ELECTRIC CORD ALWAYS LAY THE ELECTRIC CORD OVER THE HOSE.
- REGULARLY INSPECT THE ELECTRIC CORD FOR NICKS OR CUTS. REPLACE A DAMAGED ELECTRIC CORD IMMEDIATELY. DO NOT ATTEMPT TO SPLICE A DAMAGED ELECTRIC CORD.

WARNING

- DO NOT DRIVE ANY VEHICLE OVER THE CORD AT ANY TIME UNLESS THE CORD IS PROTECTED FROM PHYSICAL DAMAGE.
- REMOVE ALL SHARP OBJECTS FROM THE TRAVEL LANE THAT MAY CAUSE DAMAGE TO THE ELECTRIC CORD.
- ALWAYS INSURE THAT THE ELECTRIC CORD MECHANICAL SAFETY CABLE IS ROUTED THROUGH CABLE HOOK ON POWER PEDESTAL EACH TIME THE ELECTRIC CORD IS PLUGGED INTO THE RECEPTACLE.
- INSURE THAT THE MECHANICAL SAFETY CABLE IS FUNCTIONAL EACH TIME THE ELECTRIC CORD IS PLUGGED INTO POWER PEDESTAL. THE PLUG MUST ALWAYS BE FREE SO THAT THE MECHANICAL SAFETY CABLE CAN PULL THE PLUG FROM RECEPTACLE IF NECESSARY.
- ALWAYS ATTACH THE CAP TO PLUG WHEN MOVING THE ELECTRIC CORD AND PLUG FROM ONE POWER PEDESTAL TO ANOTHER, OR WHEN STORING THE CORD.
- THE PLUG CAP COLLAR IS FOR ATTACHMENT OF THE PLUG CAP ONLY! DO NOT ATTACH THE PLUG CAP COLLAR TO THE RECEPTACLE. THE PLUG MUST ALWAYS BE FREE SO THAT THE MECHANICAL SAFETY CABLE CAN PULL THE PLUG FROM RECEPTACLE IF NECESSARY.

Electric Cord Operation

1. Ensure that the danger signs are in place and visible at each end of the travel lane. See Figure 43-1.
2. Check the electric cord for nicks, cuts, or abrasions. DO NOT use the electric cord or start the system if any of these defects are found. Contact your local Valley dealer.

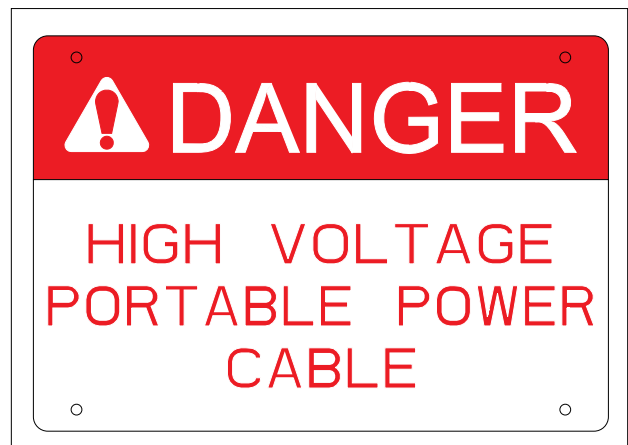


Figure 43-1 Danger Sign

OPERATION

Closed Delivery Electric Cord Operation

- Turn the power pedestal disconnect switch to the OFF position. See Figure 44-1.

⚠ DANGER

•THE DISCONNECT SWITCH MUST BE IN THE "OFF" POSITION WHEN INSERTING OR REMOVING THE PLUG FROM THE RECEPTACLE.

- Remove plug cap from electric cord plug, and insert the electric cord plug into the power pedestal receptacle. See Figure 44-1.

⚠ WARNING

•ALWAYS ATTACH THE PLUG CAP TO THE PLUG WHEN MOVING THE ELECTRIC CORD FROM ONE POWER PEDESTAL TO ANOTHER OR WHEN STORING THE ELECTRIC CORD.

- Place the cord anchor cable through the mechanical cable anchor ring on the power pedestal.

For proper operation of the cord anchor cable disconnect, there must be slack in the electric cord between the cord grip and plug when the cord anchor cable is pulled taut. See Figure 44-2.

⚠ WARNING

•DO NOT ATTACH ELECTRIC CORD PLUG TO POWER PEDESTAL RECEPTACLE WITH PLUG CAP COLLAR.

- Turn the power pedestal disconnect switch to the ON position to energize the cart disconnect panel.

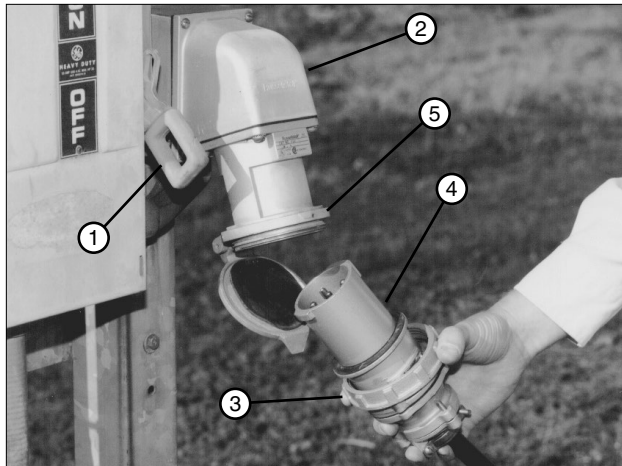


Figure 44-1 1. Disconnect Switch 2. Power Pedestal 3. Plug Cap Collar 4. Plug 5. Receptacle

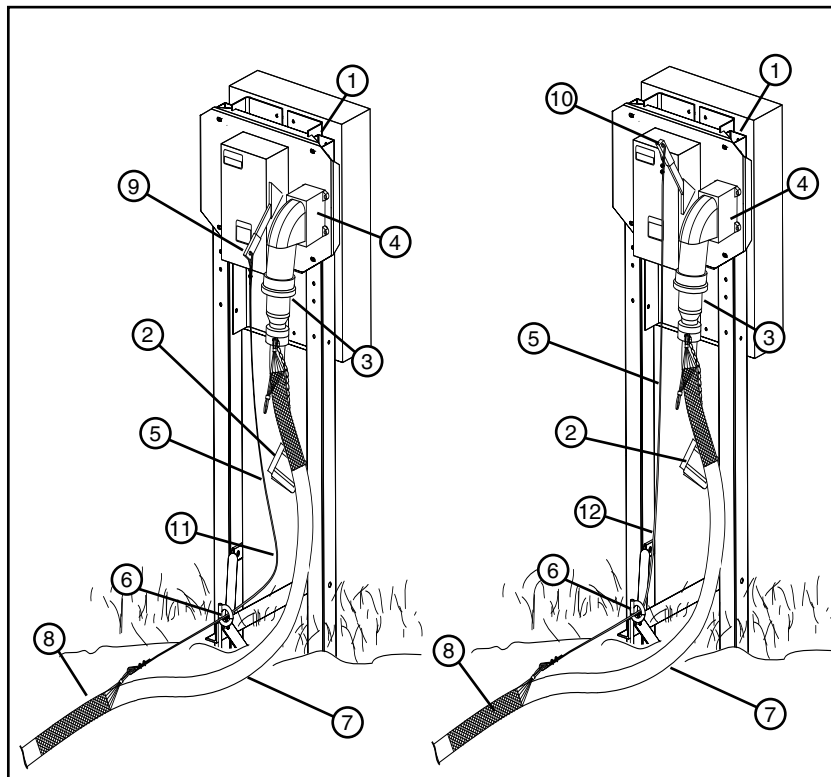


Figure 44-2 1. Power Pedestal 2. Plug Cap 3. Electric Cord Plug 4. Power Pedestal Receptacle 5. Cord Anchor Cable 6. Cable Anchor Ring 7. Electric Cord 8. Cord Grip 9. Disconnect Switch - OFF 10. Disconnect Switch - ON 11. Cable is Slack 12. Cable is Taut

Start Up

1. Inspect the wheel tracks to insure no vehicles or other equipment will be contacted upon start-up or operation.
2. If the machine is equipped with below ground guidance, turn the oscillator ON.
3. Connect or start power source.
 - If equipped with an Electric Cord, refer to Electric Cord Handling and Operation beginning on page 43, then return to this instruction and continue with step 9.
 - If equipped with an Engine/Generator, continue with step 4.
4. Check the engine fuel, coolant, and oil levels.
5. If equipped with a centrifugal pump, check the centrifugal pump oil reservoir level.
6. At the engine control panel, move the Remote Shutdown toggle switch to the Bypassed position. See Figure 45-1.
7. Push the Reset button on the water pressure gauge.
8. Push and hold the red Safety button in while turning the Engine Start switch to START. When the engine starts, turn the Engine Start switch to the ON position and the safety button will hold itself in.
9. Turn the control panel disconnect to the ON position.
10. If equipped with an Engine/Generator, check the voltmeter reading and verify that the generator is producing the correct Nominal Supply Voltage for this machine. See Figure 45-2.
11. Determine how the machine will be run.
 - If running the machine wet, with water, refer to Side Inlet Hose and Cord Positioning beginning on page 49 or Center Inlet Hose and Cord Positioning beginning on page 53, then return to this instruction and continue with step 12.
 - If running the machine dry, without water continue with step 14 or if applicable, refer to Side Inlet Hose and Cord Positioning beginning on page 49 or Center Inlet Hose and Cord Positioning beginning on page 53, then return to this instruction and continue with step 14.



Figure 45-1 1. Safety Button 3. Engine Start Switch
2. Toggle Switch 4. Water Pressure Gauge Reset

Nominal Supply Voltage	Maximum Allowed Voltage	Minimum Allowed Voltage
480 VAC @ 60Hz	505 VAC	440 VAC
415 VAC @ 50Hz	420 VAC	375 VAC
400 VAC @ 50Hz	420 VAC	365 VAC
380 VAC @ 50Hz	420 VAC	355 VAC
230 VAC @ 60Hz	253 VAC	220 VAC
120 VAC @ 60Hz	132 VAC	105 VAC
110 VAC @ 50Hz	121 VAC	95 VAC

Figure 45-2

⚠ CAUTION

- **DO NOT OPERATE THE MACHINE IF THE VOLT METER READS BELOW THE MINIMUM ALLOWED VOLTAGE OR ABOVE THE MAXIMUM ALLOWED VOLTAGE. SEE FIGURE 45-2.**
- **OPERATING THE MACHINE OUTSIDE THESE LIMITS COULD CAUSE DAMAGE TO THE DRIVE MOTORS AND OTHER ELECTRICAL COMPONENTS.**
- **CORRECT THE LOW VOLTAGE PROBLEM BEFORE RESUMING OPERATION.**

OPERATION

Closed Delivery Start Up

12. Slowly fill the system with water.
13. If equipped with an Engine/Pump to boost pressure after the hose, follow steps 4 through 8 to start the engine/pump.
14. Refer to the appropriate Control Panel Owner's Manual for control panel operating procedures.
15. If equipped with an Engine/Generator and or Pump, hold the safety button in and move the remote shutdown toggle switch to the enabled position when the system is running.

With the remote shutdown toggle switch in the engaged position the engine will stop running if the system shuts down. See Figure 46-1.

16. If equipped with an Engine/Generator, check the voltmeter reading again while the generator is under load to verify that the generator is producing the correct Nominal Supply Voltage for this machine. See Figure 46-2.

CAUTION

- **DO NOT OPERATE THE MACHINE IF THE VOLT METER READS BELOW THE MINIMUM ALLOWED VOLTAGE OR ABOVE THE MAXIMUM ALLOWED VOLTAGE. SEE FIGURE 46-2.**
- **OPERATING THE MACHINE OUTSIDE THESE LIMITS COULD CAUSE DAMAGE TO THE DRIVE MOTORS AND OTHER ELECTRICAL COMPONENTS.**
- **CORRECT THE LOW VOLTAGE PROBLEM BEFORE RESUMING OPERATION.**



Figure 46-1 1. Safety Button 3. Engine Start Switch
2. Toggle Switch 4. Water Pressure Gauge Reset

Nominal Supply Voltage	Maximum Allowed Voltage	Minimum Allowed Voltage
480 VAC @ 60Hz	505 VAC	440 VAC
415 VAC @ 50Hz	420 VAC	375 VAC
400 VAC @ 50Hz	420 VAC	365 VAC
380 VAC @ 50Hz	420 VAC	355 VAC
230 VAC @ 60Hz	253 VAC	220 VAC
120 VAC @ 60Hz	132 VAC	105 VAC
110 VAC @ 50Hz	121 VAC	95 VAC

Figure 46-2

Closed Delivery Cart Path

The cart path must be maintained in a smooth, hard condition to allow the poly hose to slide freely over the surface.

Poly Hose

The standard poly hose wall thickness varies depending on which inlet the hose is used on and the size of hose.

Inlet	Size	Wall Thickness
Side Inlet	4.75 in	SDR 17
	6 in	SDR 11
Center Inlet	8 in	SDR 17

A heavier wall SDR 11 – 6 in poly hose is used with the side inlet because of the tighter bending radius of the hose and the stresses of auto reversing.

Moving Poly Hose

Use a 5 ft (1.5 m) nylon sling as shown when moving poly hose. See Figure 47-1.

Cart Weight

Weight may be added to the cart as required for increasing the hose pulling capability. The cart tires may be filled with a weight additive and other weights added to the cart frame as needed. See Figure 47-2.

Hose Bumpers

The installation of hose bumpers on the cart can reduce the hose handling labor, but may require heavier wall SDR 13.5 or SDR 11 poly hose due to the tighter bending radius of the hose. See Figure 47-3.

Pump

To boost water pressure after the hose, the Rainger Linear hose drag cart can be equipped with an engine driven pump.

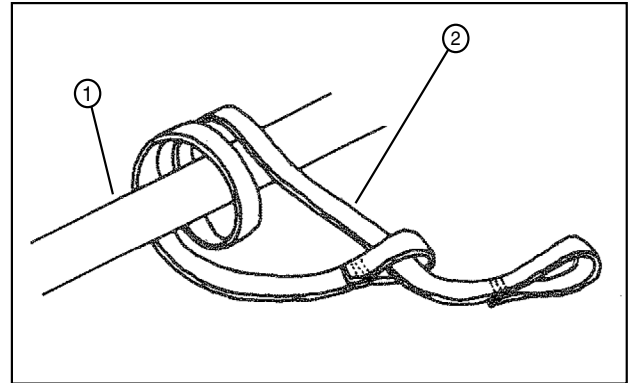


Figure 47-1 1. Poly Hose
2. Sling

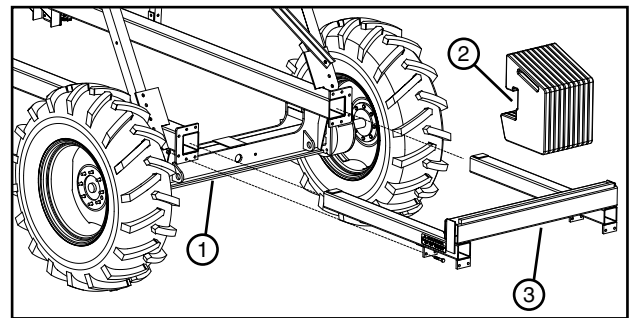


Figure 47-2 1. Linear cart
2. Tractor weights (Obtain Locally)
3. Weight rack assembly



Figure 47-3 1. Hose Bumper

OPERATION

Hose Inlets and Couplers

There are two different hose inlets, the Side Inlet and the Center Inlet.

- Side Inlet hose layout and basic method of operation begins on the next page.
- Center Inlet hose layout and basic method of operation begins on page 53.
- Hose coupler design varies depending on the type and size of the hose. See Figures 48-1 and 48-2.
- Side inlet hose couplers are secured to the inlet with pull straps. See Figure 48-1.
- Center inlet hose couplers are secured to the inlet with a circle lock ring. See Figure 48-2.
- The center inlet uses soft hose on the inlet end of the hose. See Figure 48-2.
- Soft hose requires the use of chains to pull the poly hose. See Figure 48-2.
- There are two types of center inlet. Single inlet for 8 inch hose or double inlet for all other sizes of hose. See Figure 48-2.

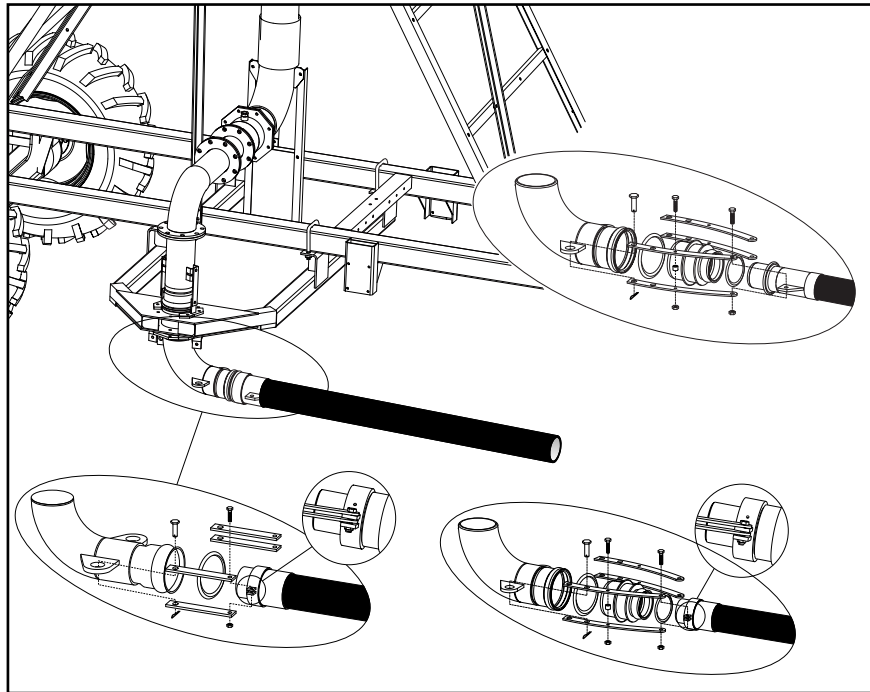


Figure 48-1 Side Inlet Hose Couplers

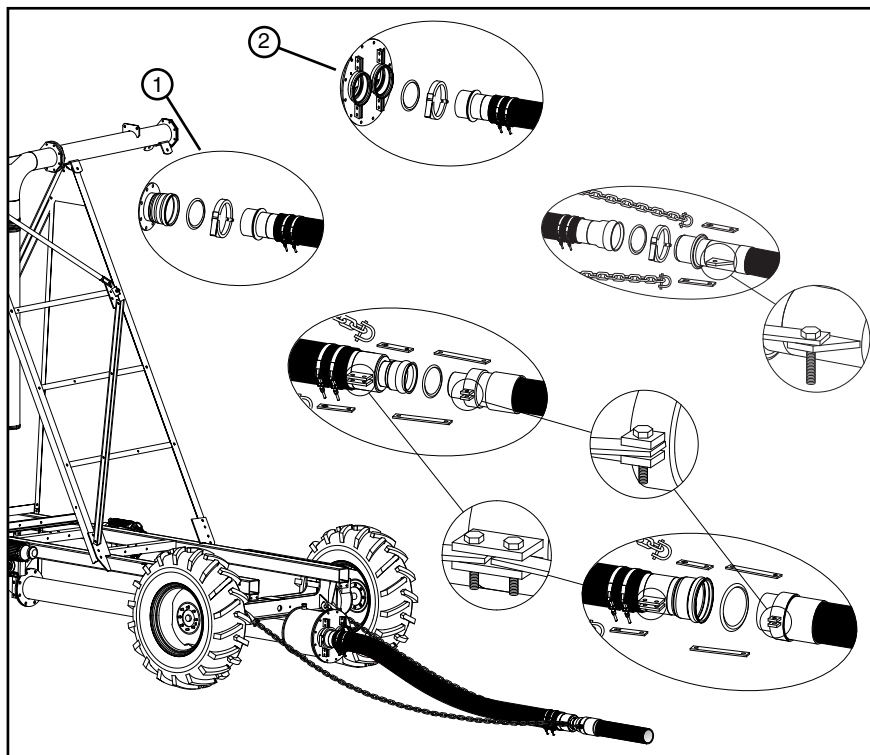


Figure 48-2 Center Inlet Hose Couplers, Soft hose and Chains

1. Single Inlet
2. Double Inlet

Side Inlet

Hose and Cord Layout

When using the side inlet, position the hose as shown. See Figure 49-1.

- The hose layout distance from the water pipeline varies depending on hose diameter.
- The cart path must be maintained in a smooth, hard condition, to allow the poly hose to slide freely over the surface.
- The side inlet hose drag is designed to reverse at the ends of the field without disconnecting the poly hose from the cart.
- The side inlet swivel elbow should be adjusted outward to an angle of at least 10° in order for the machine to reverse consistently.
- The side inlet configuration can greatly reduce hose handling labor compared to the center inlet configuration, but should not be expected to auto-reverse completely unattended.
- Due to the tight bending radius in the poly hose, and the stresses of auto-reversing, it is recommended to use heavier (SDR 15.5 or SDR 13.5) wall poly hose for side inlet hose drags.
- Hose bumpers may be installed to push the poly hose out of the way of the cart tires.
- At the ends of the field, where reversing direction takes place, maintain a smooth, hard area on the inlet side of the cart, so that the poly hose can slide freely over the surface when reversing.

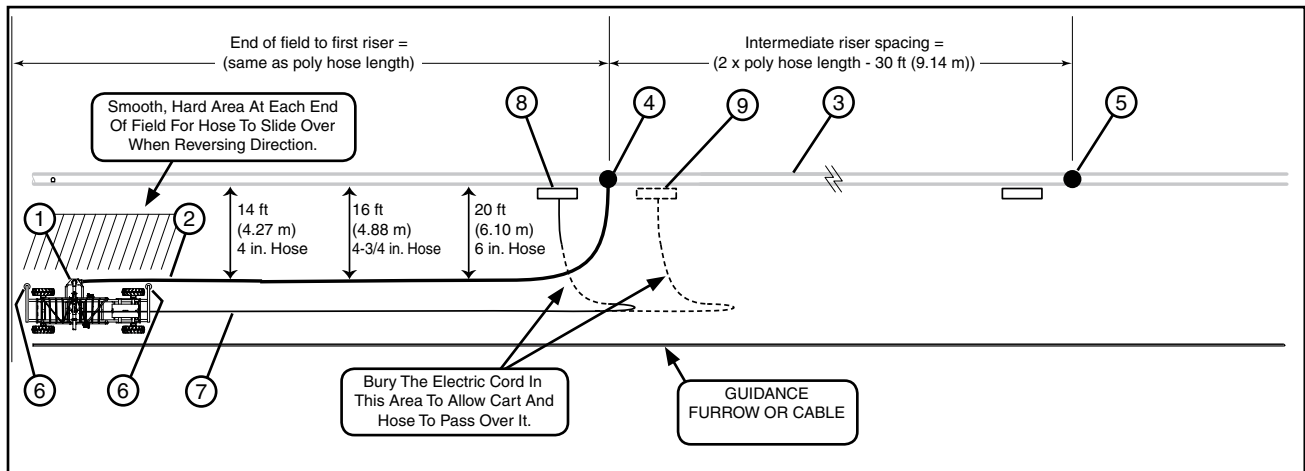


Figure 49-1 Side Inlet Hose Layout

- | | |
|-----------------------|---|
| 1. Side Inlet | 6. Hose Bumper (optional) |
| 2. Hose | 7. Electric Cord (optional) |
| 3. Water Pipeline | 8. Power Pedestal |
| 4. First Riser | 9. Alternate Power Pedestal Location and Electric Cord Position |
| 5. Intermediate Riser | |

OPERATION

Side Inlet

Hose and Cord Positioning

The following instructions describe a basic method of positioning which includes how to position the hose and optional electric cord for the side inlet depending on direction of machine movement, position of machine in relationship to the pipeline and power pedestals as the machine moves across the field.

1. Connect the first hose to the pipeline shut off valve and linear cart side inlet, then latch in place. See Figure 50-1.
2. Set the end of field/hose stop post for the length of the hose being used.
3. If using the optional electric cord drag:
 - (a) Make sure the power pedestal disconnect is in the OFF position.
 - (b) Position the electric cord far enough away from the hose, so that the hose will not drag over it. To prevent interference between the electric cord, cart tires and hose, bury the electric cord in the area where interference will occur or when applicable, position the electric cord over the top of hose. See Figure 50-1.
 - (c) Connect the electric cord to the power pedestal.
 - (d) When ready, switch the power pedestal disconnect switch into the ON position.
4. At the machine/control panel:
 - (a) Set the direction of travel.
 - (b) Set the percentage timer to the desired application rate or speed.
 - (c) If applicable set the Auto Reverse/Auto Stop control as desired.
5. When ready, start the machine. If applicable, start pipeline pump and open the water shut off valve for the hose. The machine should start and run in the desired direction and auto reverse or stop at the end of field/hose stop post which was set for the length of the hose.
 - (a) As the cart moves, the side inlet begins to pivot. See Figure 50-2.
 - (b) As the side inlet pivots the hose is pushed out away from the cart and guided by either the side walls of the cart tires or the optional hose bumpers. See Figure 50-3.
 - (c) After the side inlet has pivoted completely the hose is being pulled by the side inlet and guided by either the side walls of the cart tires or the optional hose bumpers. See Figure 50-4.

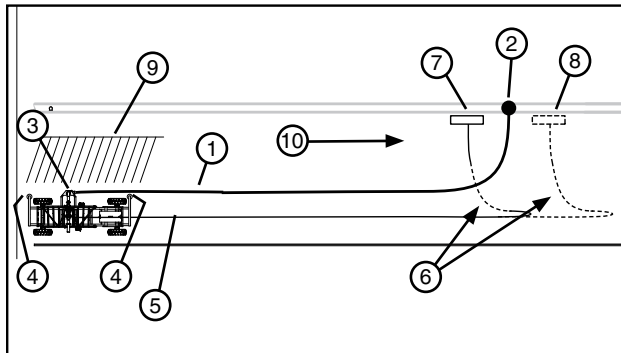


Figure 50-1 1. First Hose 2. Shut Off Valve 3. Side Inlet 4. Hose Bumper 5. Electric Cord 6. Buried Electric Cord 7. Power Pedestal 8. Alternate Power Pedestal Location 9. Smooth Hard Surface 10. Direction of Travel

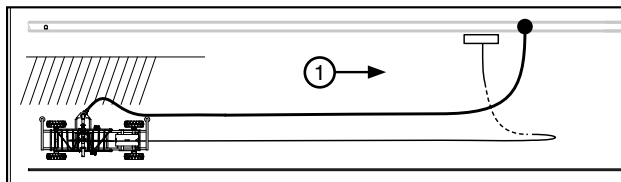


Figure 50-2 1. Direction of Travel

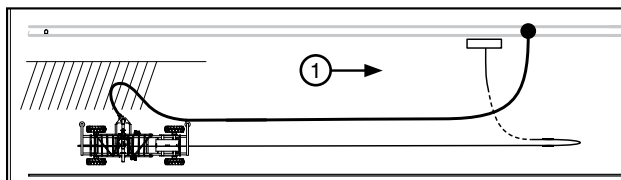


Figure 50-3 1. Direction of Travel

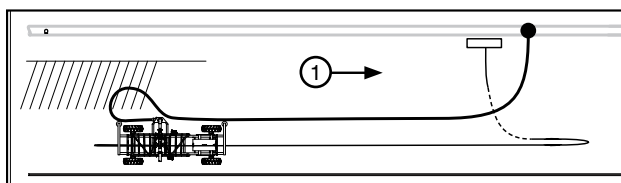


Figure 50-4 1. Direction of Travel

Side Inlet

Hose and Cord Positioning (continued)

6. As the machine approaches the end of field/hose stop post, Stop the machine and close the water shut off valve for the hose.
7. Disconnect the first hose from the pipeline shut off valve so that water from the hose drains away from the cart path.
 - If more than one hose is being used, disconnect first hose from side inlet. Connect second hose to next pipeline shut off valve, position second hose, connect and secure to side inlet. See Figure 51-1.
 - If only one hose is being used, reposition the hose and connect to the next pipeline shutoff valve.

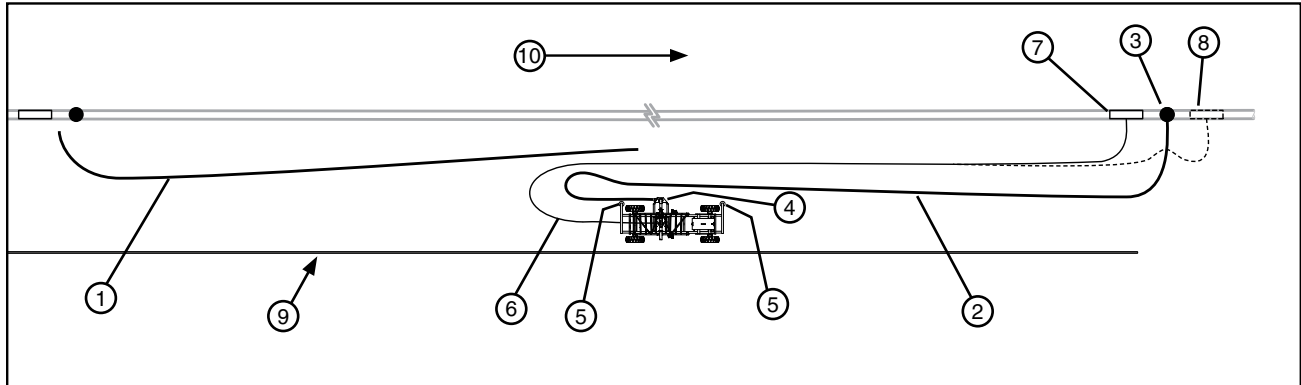


Figure 51-1

1. First Hose	5. Hose Bumper (optional)	9. Guidance Furrow or Cable
2. Second Hose	6. Electric Cord (optional)	10. Direction of Travel
3. Shut Off Valve	7. Power Pedestal	
4. Side Inlet	8. Alternate Power Pedestal Location	

8. Reposition the end of field/hose stop for the length of the hose being used.
9. If using the optional electric cord drag:
 - (a) Make sure the power pedestal disconnect is in the OFF position.
 - (b) Disconnect the electric cord from the power pedestal.
 - (c) Position the electric cord far enough away from the hose, so that the hose will not drag over it. To prevent interference between the electric cord, cart tires and hose, bury the electric cord in the area where interference will occur or when applicable, position the electric cord over the top of hose. See Figure 51-1.
 - (d) Make sure the second power pedestal disconnect is in the OFF position.
 - (e) Connect the electric cord to the second power pedestal.
 - (f) When ready, switch the second power pedestal disconnect switch into the ON position.
10. At the machine/control panel:
 - (a) Select the original direction of travel.
 - (b) Set the percentage timer to the desired application rate or speed.
 - (c) If applicable set the Auto Reverse/Auto Stop control as desired.
11. When ready, start the machine. If applicable, start pipeline pump and open the water shut off valve for the hose. The machine should start and run in the desired direction and auto reverse or stop at the end of field/hose stop post which was set for the length of the hose.
12. Repeat the steps 6-11 as needed to cross the field.

OPERATION

Side Inlet

Hose and Cord Positioning

13. As the machine approaches the edge of the field do one of the following:

- **If Auto Reverse is on**, monitor and assist the auto reverse process as needed, shutting pipeline valve for the hose off and on as required.
 - (a) Reposition the end of field/hose stop for the length of hose being used.
 - (b) The machine should start and run in the desired direction and stop at the end of field/hose stop post which was set for the length of the hose.
- **If Auto Stop is on**, monitor and assist the auto stop process as needed, shutting pipeline valve for the hose off as required.
 - (a) If this is a standard linear machine continue with step 14 of this instruction to run machine back across the field in the opposite direction.
 - (b) If this is a swing around linear machine and the operator intends to swing the machine around to the other field, proceed to the Swing Around section, follow the Swing Around procedure and swing the machine around to the other field. After swinging machine around, return to this instruction and continue with step 14 to run machine back across the field in the opposite direction.

14. Reposition the end of field/hose stop for the length of hose being used.

15. If using the optional electric cord drag:

- (a) Make sure the power pedestal disconnect, that the electric cord is connected to, is in the OFF position.
- (b) Position the electric cord far enough away from the hose, so that the hose will not drag over it. To prevent interference between the electric cord, cart tires and hose, bury the electric cord in the area where interference will occur or when applicable, position the electric cord over the top of hose. See Figure 52-1.
- (c) When ready, switch the power pedestal disconnect switch into the ON position.

16. At the machine/control panel:

- (a) Select the desired direction of travel.
- (b) Set the percentage timer to the desired application rate.
- (c) If applicable set the Auto Reverse/Auto Stop control as desired.

17. When ready, start the machine. If applicable, start pipeline pump and open the water shut off valve for the hose. The machine should start and run in the desired direction and auto reverse or stop at the end of field/hose stop post which was set for the length of the hose.

18. Repeat the steps 6-11 as needed to cross the field in the opposite direction.

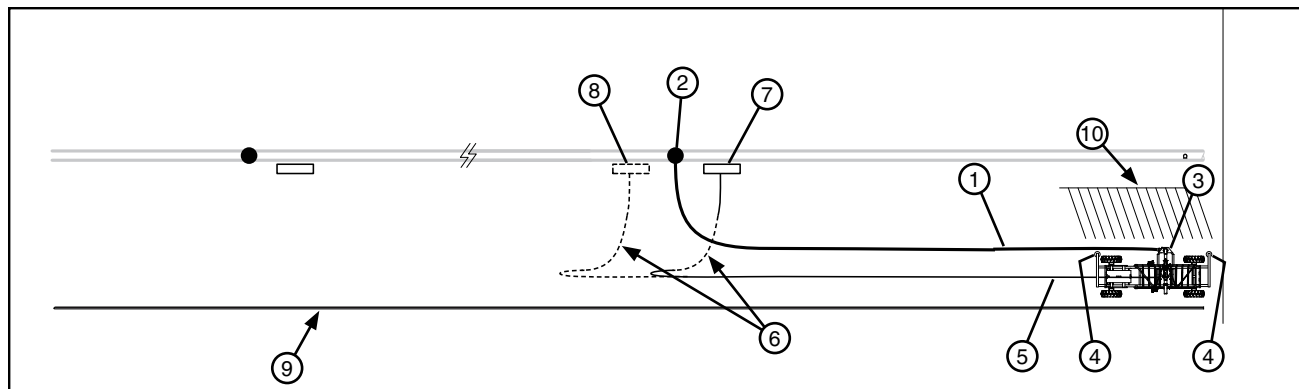


Figure 52-1 1. Hose
2. Shut Off Valve
3. Side Inlet
4. Hose Bumper (optional)
5. Electric Cord (optional)
6. Buried Electric Cord
7. Power Pedestal
8. Alternate Power Pedestal Location
9. Guidance Furrow or Cable
10. Smooth Hard Area

Center Inlet

Hose and Cord Layout

- When using the center inlet, position the hose as shown. See Figure 53-1.
- The cart path must be maintained in a smooth, hard condition, to allow the poly hose to slide freely over the surface.
- The hose must be disconnected from the cart, repositioned and then connected to the other end of cart when reversing direction.
- If using the optional electric cord drag with the center inlet, position the electric cord far enough away from the hose, so that the hose will not drag over it. When applicable, prevent interference between the electric cord and hose by positioning the electric cord over the top of hose or burying the electric cord at point of anticipated interference. See Figure 53-1.

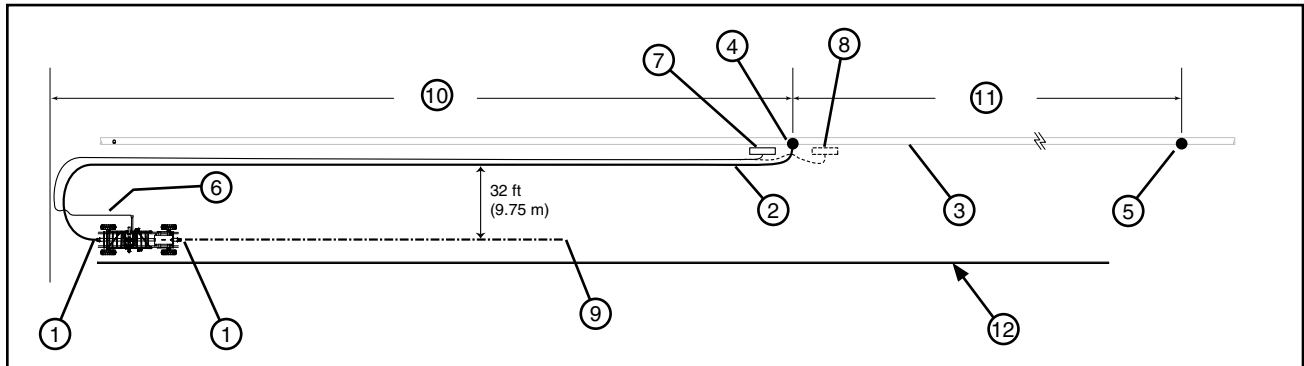


Figure 53-1

1. Center Inlet	5. Intermediate Riser	9. Centerline of Cart
2. 8 in Hose	6. Electric Cord (optional)	10. End of field to first riser = (poly hose length - 50 ft (15.24 m))
3. Water Pipeline	7. Power Pedestal	11. Intermediate riser spacing = (2 x poly hose length - 80 ft (24.38 m))
4. First Riser	8. Alternate Power Pedestal Location	12. Guidance Furrow or Cable and Electric Cord Position

OPERATION

Center Inlet

Hose and Cord Positioning

The following instructions describe a basic method of positioning which includes how to position the hose and optional electric cord for the single or double hose center inlet depending on direction of machine movement, position of machine in relationship to the pipeline and power pedestals as the machine moves across the field.

1. Allow the linear cart to move past the end of the hose approximately 50 ft (15.24 m). Stop the system.
2. Connect the riser end of hose to the pipeline shut off valve.
3. Connect the inlet end of hose to the center inlet with circle lock ring. Attach chains from the soft hose/poly hose connection to the anchor bracket on each side of cart. See Figure 54-1.
 - Temporarily installing a post approximately 6 ft (1.82 m) behind the linear cart and on the pipeline side of the hose will aid in connecting the hose to the center inlet. See Figure 54-2.
4. Set the end of field/hose stop post for the length of the hose being used.
5. If using the optional electric cord drag:
 - (a) Make sure the power pedestal disconnect is in the OFF position.
 - (b) Position the electric cord far enough away from the hose, so that the hose will not drag over it. To prevent interference between the electric cord, cart tires and hose, position the electric cord over the top of hose or when applicable, bury the electric cord in the area where interference will occur. See Figure 54-2.
 - (c) Connect the electric cord to the power pedestal.
 - (d) When ready, switch the power pedestal disconnect switch into the ON position.

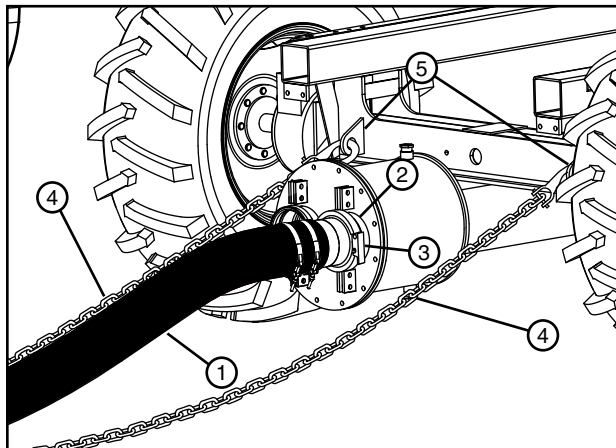


Figure 54-1 1. Soft Hose 2. Center Inlet 3. Circle Lock Ring 4. Chain 5. Anchor Bracket * Double Inlet Shown



CAUTION

• TO PREVENT THE OPTIONAL ELECTRIC CORD FROM SNAGGING ON THE TEMPORARY POST, REMOVE THE TEMPORARY POST IMMEDIATELY AFTER CONNECTING THE HOSE.

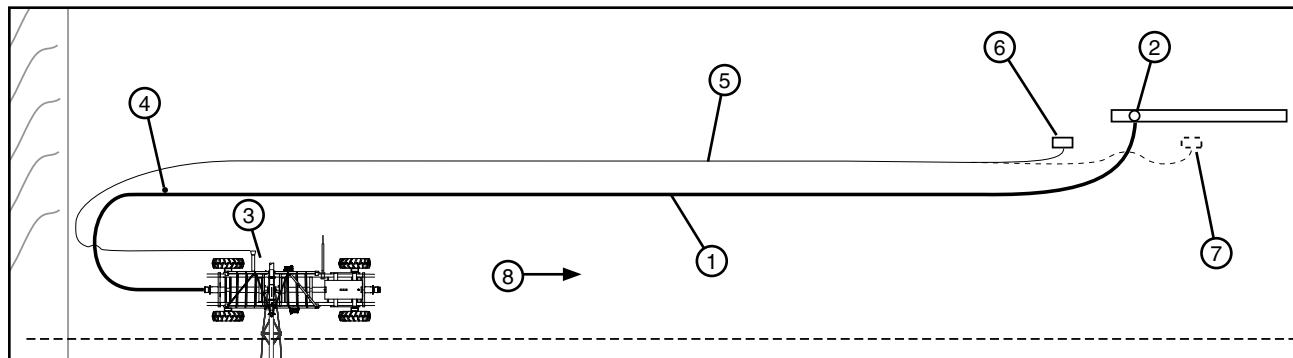


Figure 54-2 1. First Hose 2. Shut Off Valve 3. Center Inlet 4. Temporary Post (optional) 5. Electric Cord 6. Power Pedestal 7. Alternate Power Pedestal Location and Electric Cord Position 8. Direction of Travel

Center Inlet Hose and Cord Positioning

6. At the machine/control panel:
 - (a) Set the direction of travel.
 - (b) Set the percentage timer to the desired application rate or speed.
7. When ready, start the machine. If applicable, start pipeline pump and open the water shut off valve for the hose. The machine should start and run in the desired direction and stop at the end of field/hose stop post which was set for the length of the hose.
8. If applicable, prepare the second hose by connecting the riser end to the pipeline shut off valve. Position second hose approximately 15 ft (4.57 m) from the center of the linear cart toward the pipeline. See Figure 55-1.
9. Allow the linear cart to move past the end of the second hose approximately 50 ft (15.24 m). Stop the machine. See Figure 55-1.

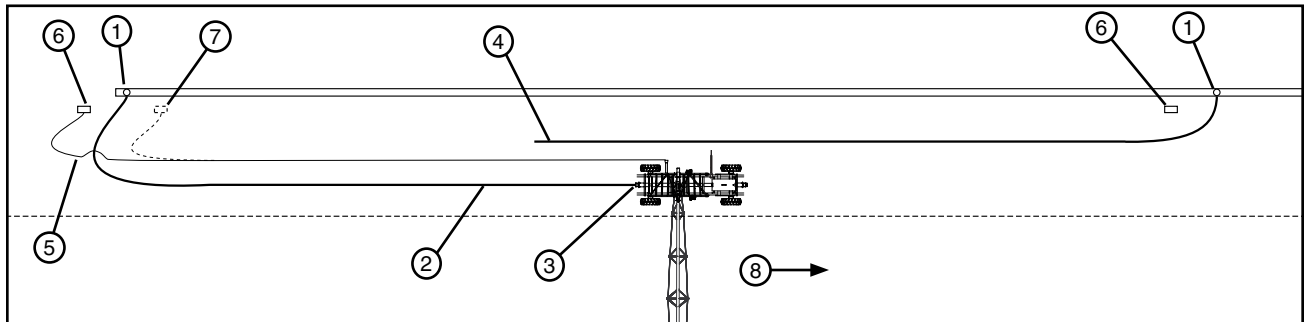


Figure 55-1 1. Shut Off Valve 4. Second hose 7. Alternate Power Pedestal Location and Electric Cord Position
2. First Hose 5. Electric Cord 8. Direction of Travel
3. Center Inlet 6. Power Pedestal

Depending on the type of center inlet do one of the following:

- If this is a single inlet:
 - (a) Close the water shut off valve for the first hose.
 - (b) Select the opposite direction of travel, start the system, and run until tension on the first hose is relaxed. Stop the system.
 - (c) Disconnect the first hose from the pipeline shut off valve so that water from the hose drains away from the cart path.
 - (d) Disconnect chains for first hose from cart and disconnect first hose from center inlet.
 - (e) Connect the inlet end of second hose to the single hose center inlet with circle lock ring. Attach chains from the soft hose/poly hose connection to the anchor bracket on each side of cart.
- If this is a double inlet:
 - (a) Connect the inlet end of second hose to the center inlet with circle lock ring. Attach chains from the soft hose/poly hose connection to the anchor bracket on each side of cart. See Figure 55-2.
 - (b) Open the water shut off valve for the second hose and close the water shut off valve for the first hose.
 - (c) Disconnect the first hose from the pipeline shut off valve so that water from the hose drains away from the cart path.
 - (d) Select the opposite direction of travel, start the system, and run until tension on the first hose is relaxed. Stop the system.
 - (e) Disconnect chains for first hose from cart and disconnect first hose from center inlet.

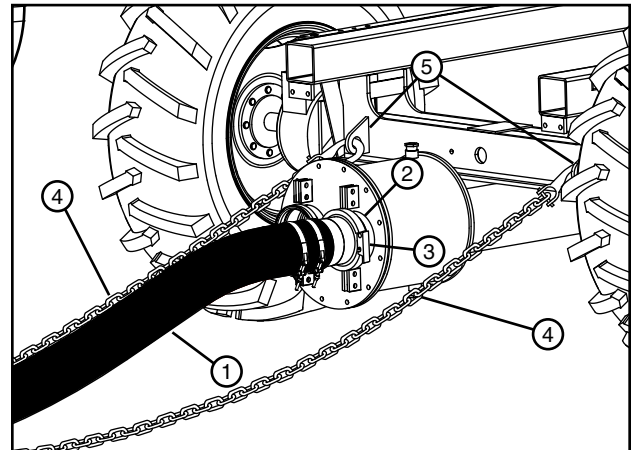


Figure 55-2 1. Second Hose 4. Chain
2. Center Inlet 5. Anchor Bracket
3. Circle Lock Ring * Double Inlet Shown

OPERATION

Center Inlet

Hose and Cord Positioning

10. Reposition the end of field/hose stop for the length of the hose being used.
11. If using the optional electric cord drag:
 - (a) Make sure the power pedestal disconnect is in the OFF position.
 - (b) Disconnect the electric cord from the power pedestal.
 - (c) Position the electric cord far enough away from the hose, so that the hose will not drag over it. To prevent interference between the electric cord, cart tires and hose, position the electric cord over the top of hose or when applicable, bury the electric cord in the area where interference will occur. See Figure 56-1.
 - (d) Make sure the second power pedestal disconnect is in the OFF position.
 - (e) Connect the electric cord to the second power pedestal.
 - (f) When ready, switch the second power pedestal disconnect switch into the ON position.
12. At the machine/control panel:
 - (a) Select the original direction of travel.
 - (b) Set the percentage timer to the desired application rate or speed.
13. When ready, start the machine. If applicable, start pipeline pump and open the water shut off valve for the hose. The machine should start and run in the desired direction and auto reverse or stop at the end of field/hose stop post which was set for the length of the hose.
14. Repeat the steps 8-14 as needed to cross the field in the same direction.
15. As the machine approaches the end of field/hose stop post, stop the machine and close the water shut off valve for the hose. If applicable, close the cart riser pipe valve.
16. Select the opposite direction of travel, start the system, and run until tension on the second hose is relaxed. Stop the machine.
17. Disconnect the hose from the pipeline shut off valve so that water from the hose drains away from the cart path. Disconnect soft hose chains from cart and disconnect hose from center inlet.
18. Select the original direction of travel, start and run the system so that the hose drops out of the linear cart. Stop the machine. See Figure 56-1.

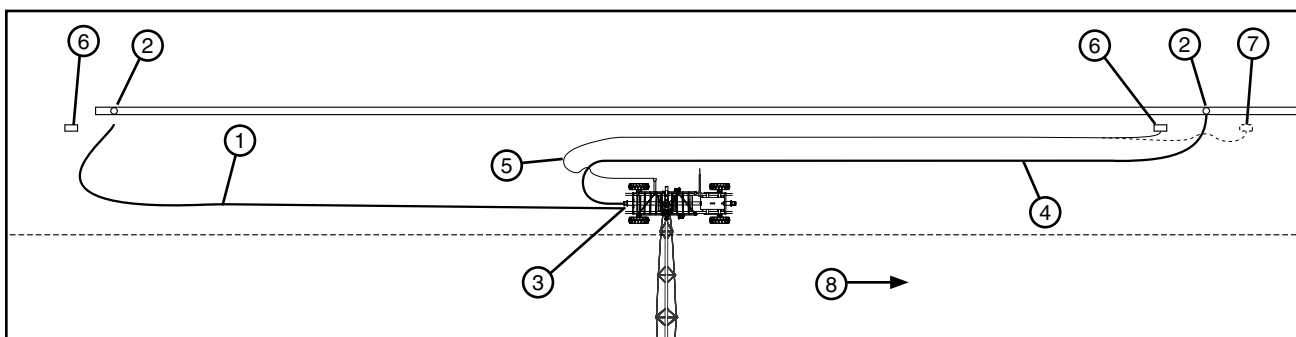


Figure 56-1 1. First Hose 5. Electric Cord
2. Shut Off Valve 6. Power Pedestal
3. Center Inlet 7. Alternate Power Pedestal Location and Electric Cord Position
4. Second hose 8. Direction of Travel

- If this is a standard fixed span linear machine continue with step 19 of this instruction to run machine back across the field in the opposite direction.
- If this is a swing around linear machine and the operator intends to swing the machine around to the other field, proceed to the Swing Around section, follow the pivot procedure and swing the machine around to the other field. After swinging machine around, return to this instruction and continue with step 20 to run machine back across the field in the opposite direction.

Center Inlet

Hose and Cord Positioning

19. Reposition the hose and connect the riser end of hose to the pipeline shut off valve.
20. Connect the inlet end of hose to the center inlet with circle lock ring.
21. Attach chains from the soft hose/poly hose connection to the anchor bracket on each side of cart. See Figure 57-1.
22. Reposition the end of field/hose stop for the length of hose being used.
23. If using the optional electric cord drag:
 - (a) Make sure the power pedestal disconnect, that the electric cord is connected to, is in the OFF position.
 - (b) Position the electric cord far enough away from the hose, so that the hose will not drag over it. To prevent interference between the electric cord, cart tires and hose, position the electric cord over the top of hose or when applicable, bury the electric cord in the area where interference will occur. See Figure 57-2.
 - (c) When ready, switch the power pedestal disconnect switch into the ON position.
24. At the machine/control panel:
 - (a) Select the desired direction of travel.
 - (b) Set the percentage timer to the desired application rate.
25. When ready, start the machine. If applicable, start pipeline pump and open the water shut off valve for the hose. The machine should start and run in the desired direction and stop at the end of field/hose stop post which was set for the length of the hose.
26. Repeat the steps 6-16 as needed to cross the field in the opposite direction.

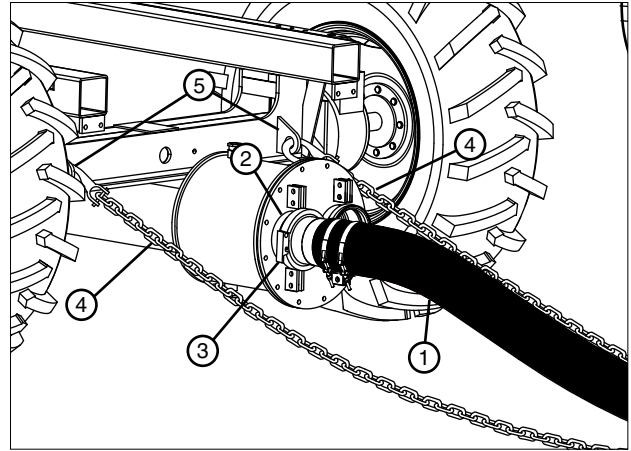


Figure 57-1 1. Soft Hose 2. Center Inlet 3. Circle Lock Ring 4. Chain 5. Anchor Bracket * Double Inlet Shown

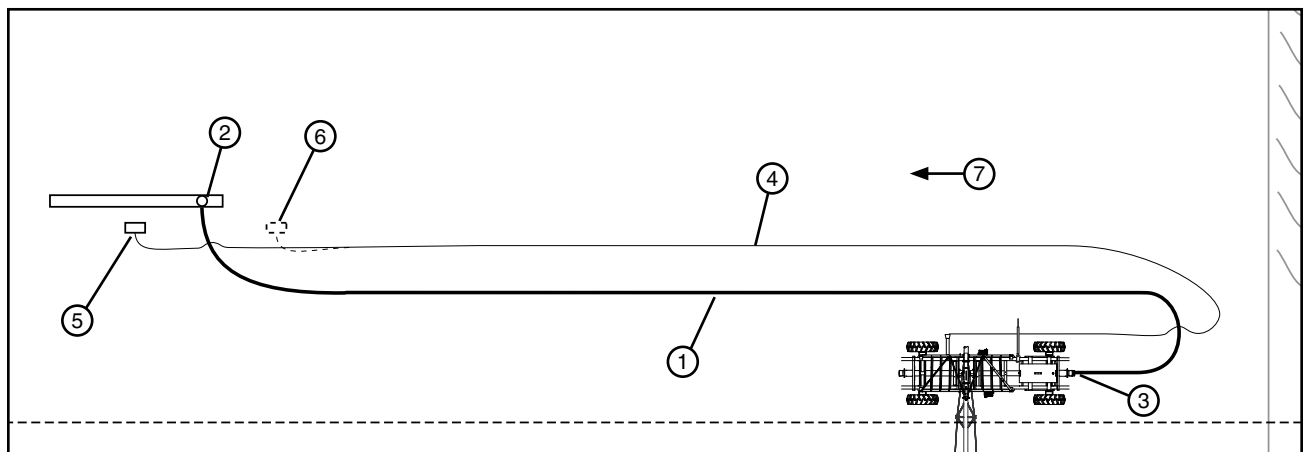


Figure 57-2 1. Hose 2. Shut Off Valve 3. Center Inlet 4. Electric Cord 5. Power Pedestal 6. Alternate Power Pedestal Location and Electric Cord Position 7. Direction of Travel

OPERATION

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Open Delivery

Exhaust Primer

International Only: The exhaust primer is used for priming of pump installations with suction inlets in an Engine Generator Pump Application. See Figure 59-1.

1. Close the riser pipe valve.
2. Start the engine and insert the primer slide into the primer assembly, diverting exhaust to the exhaust primer. As the exhaust passes through the exhaust primer it creates a vacuum in the hose running to the inlet pipe. The vacuum pressure is displayed on the engine control panel vacuum gauge.
3. Adjust the engine RPM to achieve the maximum vacuum reading possible on the engine control panel vacuum gauge.

The vacuum will pull air out of the inlet pipe and pull water into the cavity. The inlet and pump cavity will be full of water and primed when water begins to spray out of the exhaust primer.

4. Remove the primer slide from the primer assembly.
5. Slowly open the riser pipe valve to fill the system with water.
6. After riser pipe valve is completely open and the system is full of water, bring the engine up to its operating RPM.

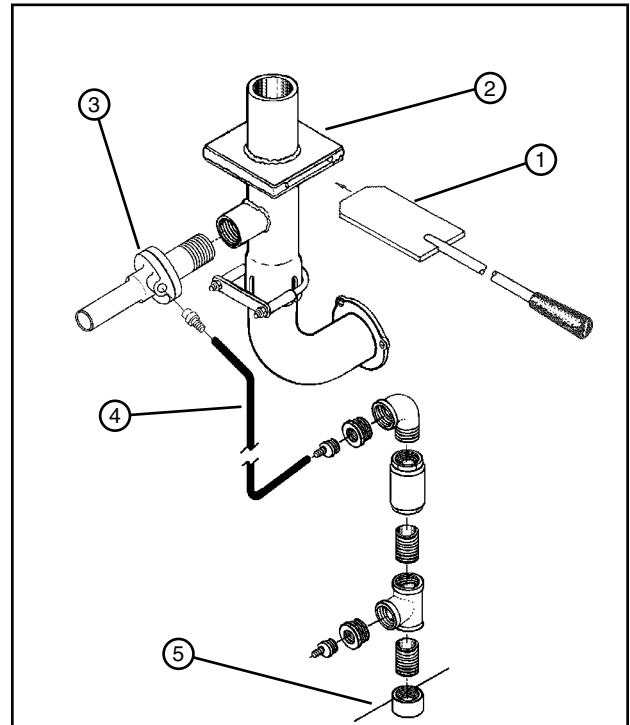


Figure 59-1 1. Primer Slide 2. Primer Assembly 3. Exhaust Primer 4. Hose 5. Inlet Pipe

Compressed Air Primer

The vacuum pump compressed air primer is used for priming of pump installations with suction inlets in an Engine Generator Pump Application. See Figure 59-2.

1. Close the riser pipe valve.
2. Connect compressed air line to the vacuum pump and open the vacuum pump valve.
3. Apply 45 to 50 psi of continuous compressed air pressure to the vacuum pump.
4. Start the engine. As the air passes through the vacuum pump it creates a vacuum. The vacuum pump will pull air out of the inlet pipe and pull water into the cavity. The vacuum pressure is displayed on the engine control panel vacuum gauge. The inlet and pump cavity will be full of water and primed when water begins to spray out of the vacuum primer.
5. Slowly open the riser pipe valve.
6. After riser pipe valve is completely open, close the vacuum pump valve, bring the engine up to its operating RPM and disconnect the compressed air line.

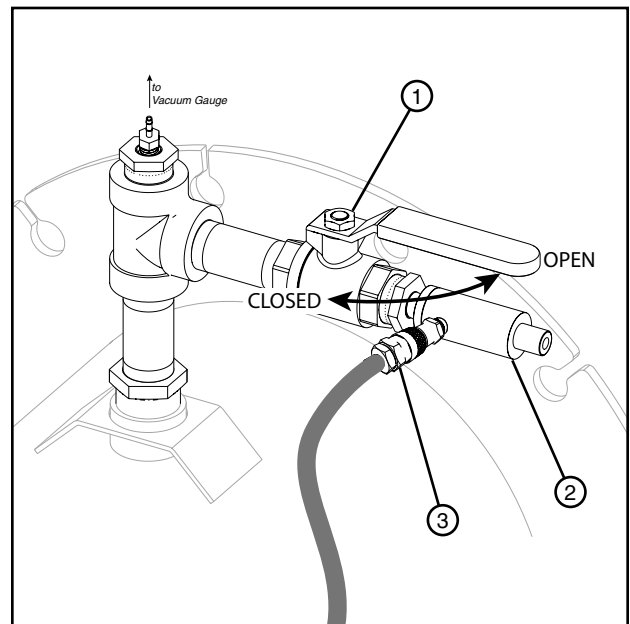


Figure 59-2 1. Vacuum Pump Valve 2. Vacuum Pump 3. Compressed Air Line

OPERATION

Open Delivery 12 VDC Electric Primer

The 12 VDC Electric primer is used for priming of pump installations with suction inlets in an Engine Generator Pump Application. See Figure 60-1.

1. Fill the automatic bearing oiler with lightweight oil, SAE 10W. See Figure 60-1.
2. Close the riser pipe valve.
3. Open the ball valve on the electric primer. See Figure 60-1.
4. Engine Generator Start Up: Refer to the Start Up - Engine Generator Pump Applications instructions for Open Delivery in the Operation section of this manual.
5. Close the single throw switch to start the electric primer. See Figure 60-1.
6. When water squirts from the ball valve, open the single throw switch to stop the electric primer.
7. Slowly fill the system with water. Alternate between slowly opening the riser valve and increasing the engine RPM so that the pump does not lose prime.
8. Close the ball valve on the electric primer.

If water enters and fills the water trap on the electric primer. The water trap valve will close, the relief valve will open, and no priming will occur.

To re-establish prime:

1. Open the single throw switch to stop the electric primer.
2. Depress the manual plunger on top of the water trap to allow water to draw-down. See Figure 60-2.
3. If necessary, open the drain cock valve for full drainage. See Figure 60-2.
4. When fully drained repeat steps 2-8.

Refer to Troubleshooting section for additional solutions to problems that may occur with the electric primer.

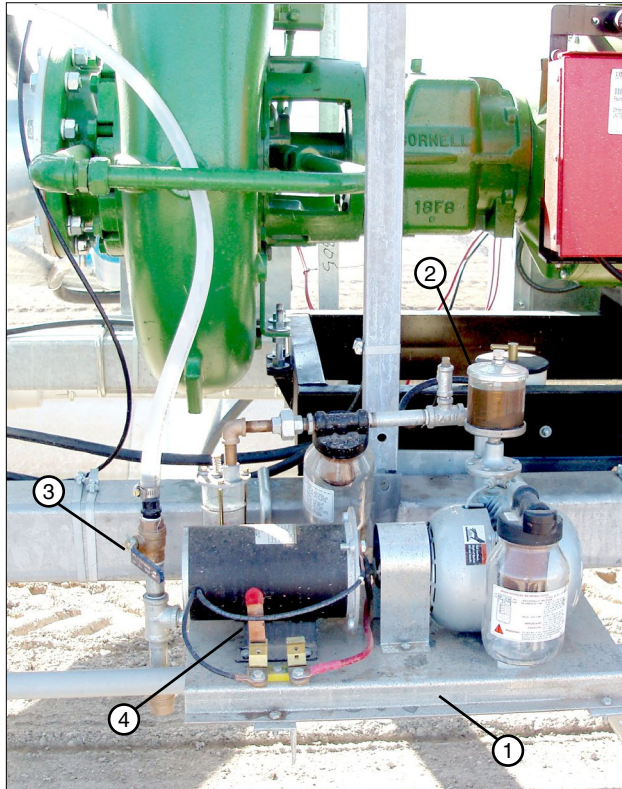


Figure 60-1 1. Electric Primer
2. Automatic Bearing Oiler
3. Ball Valve
4. Single Throw Switch

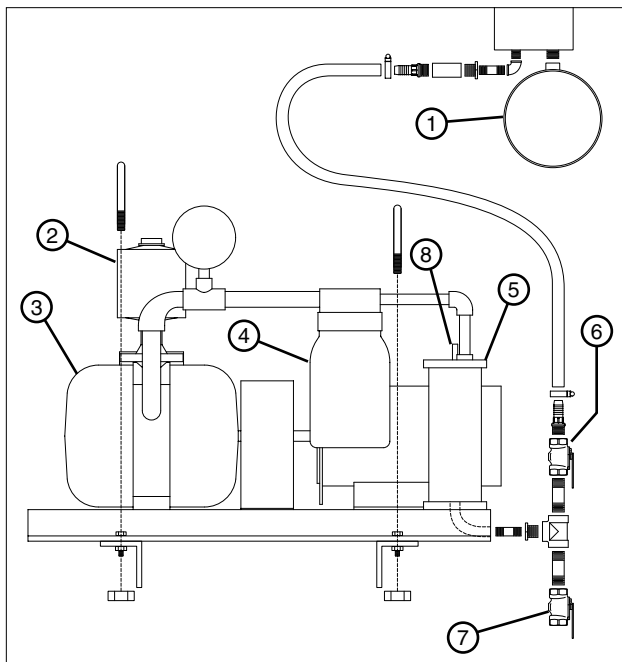


Figure 60-2 1. Suction Inlet Pipe 5. Water Trap
2. Oiler 6. Ball Valve
3. Vacuum Pump 7. Drain Cock Valve
4. Oil Trap 8. Manual Plunger

Open Delivery

50/60 Hz AC Voltage Electric Primer

The 50/60 Hz AC Voltage Electric primer is used for priming of pump installations with suction inlets in an Electric Cord / Motor Pump Application. See Figure 61-1.

1. Fill the automatic bearing oiler with lightweight oil, SAE 10W. See Figure 61-1.
2. Close the riser pipe valve.
3. Open the ball valve on the electric primer. See Figure 61-1.
4. Cord Drag Start Up: Refer to the Start Up - Electric Cord / Motor Pump Applications instructions for Open Delivery in the Operation section of this manual.
5. Start the electric primer. At the control panel switch the auxiliary control for the electric primer to ON.
6. When water squirts from the ball valve, stop the electric primer. At the control panel switch the auxiliary control for the electric primer to OFF.
7. Slowly fill the system with water. Slowly open the riser valve so that the pump does not loose prime.
8. Close the ball valve on the electric primer.

If water enters and fills the water trap on the electric primer. The water trap valve will close, the relief valve will open, and no priming will occur.

To re-establish prime:

1. Stop the electric primer. At the control panel switch the auxiliary control for the electric primer to OFF.
2. Depress the manual plunger on top of the water trap to allow water to draw-down. See Figure 61-2.
3. If necessary, open the drain cock valve for full drainage. See Figure 61-2.
4. When fully drained repeat steps 2-8.

Refer to Troubleshooting section for additional solutions to problems that may occur with the electric primer.

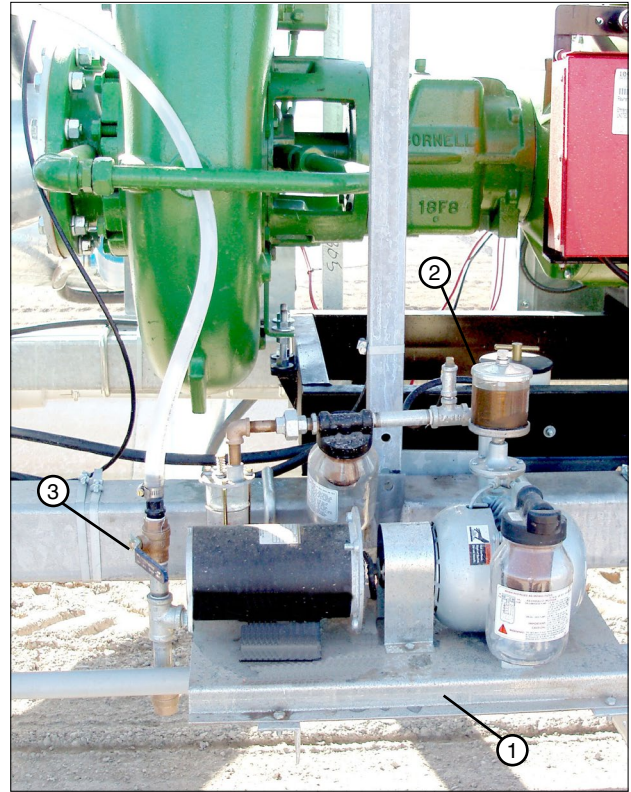


Figure 61-1 1. Electric Primer
2. Automatic Bearing Oiler
3. Ball Valve

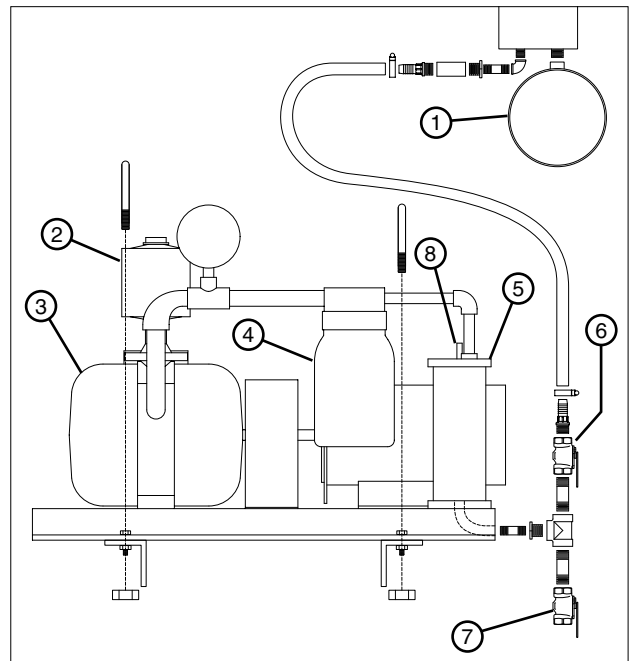


Figure 61-2 1. Suction Inlet Pipe 5. Water Trap
2. Oiler 6. Ball Valve
3. Vacuum Pump 7. Drain Cock Valve
4. Oil Trap 8. Manual Plunger

OPERATION

Open Delivery

Start Up - Engine Generator Pump Applications

1. Inspect the wheel tracks to insure no vehicles or other equipment will be contacted upon start-up or operation.
2. Turn on the oscillator, if the system has below ground guidance.
3. Check the engine fuel, coolant, and oil levels. Fill as needed.
4. Check the centrifugal pump oil reservoir level. Fill as needed.
5. At the engine control panel, move the Remote Shutdown toggle switch to the Bypassed position. See Figure 62-2.
6. Push the Reset button on the water pressure gauge.
7. Push and hold the red Safety button in while turning the Engine Start switch to START. When the engine starts, turn the Engine Start switch to the ON position and the safety button will hold itself in.
8. Turn the control panel disconnect to the ON position.
9. Check the voltmeter reading and verify that the generator is producing the correct Nominal Supply Voltage for this machine. See Figure 62-3.



Figure 62-1 1. Safety Button 3. Engine Start Switch
2. Toggle Switch 4. Water Pressure Gauge Reset

CAUTION

- **DO NOT OPERATE THE MACHINE IF THE VOLT METER READS BELOW THE MINIMUM ALLOWED VOLTAGE OR ABOVE THE MAXIMUM ALLOWED VOLTAGE. SEE FIGURE 62-2.**
- **OPERATING THE MACHINE OUTSIDE THESE LIMITS COULD CAUSE DAMAGE TO THE DRIVE MOTORS AND OTHER ELECTRICAL COMPONENTS.**
- **CORRECT THE LOW VOLTAGE PROBLEM BEFORE RESUMING OPERATION.**

Nominal Supply Voltage	Maximum Allowed Voltage	Minimum Allowed Voltage
480 VAC @ 60Hz	505 VAC	440 VAC
415 VAC @ 50Hz	420 VAC	375 VAC
400 VAC @ 50Hz	420 VAC	365 VAC
380 VAC @ 50Hz	420 VAC	355 VAC
230 VAC @ 60Hz	253 VAC	220 VAC
120 VAC @ 60Hz	132 VAC	105 VAC
110 VAC @ 50Hz	121 VAC	95 VAC

Figure 62-2

10. Determine if the machine will be run wet or dry.
 - If running the machine wet, with water,
 - (a) Lower suction inlet into ditch until the inlet lift cables go slack. See Figure 62-1.
 - (b) Prime the centrifugal pump. See Exhaust Primer on page 59, Compressed Air Primer on page 59 or 12 VDC Electric Primer on page 60. After the pump is primed return to this instruction.
 - (c) Continue with step 11.
 - If running the machine dry, without water, raise the suction inlet completely out of the ditch, then continue with step 12.

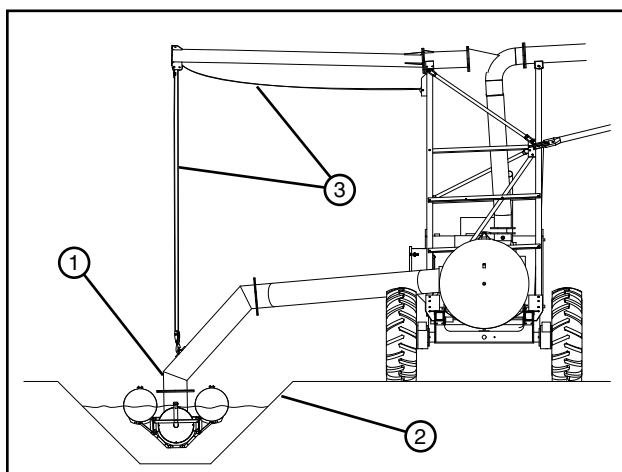


Figure 62-3 1. Suction Inlet 3. Lift Cable
2. Ditch

Start Up - Engine Generator Pump Applications (continued)

11. Slowly fill the system with water. Alternate between slowly opening the riser valve and increasing the engine RPM so that the pump does not lose prime.
12. Refer to the appropriate Control Panel Owner's Manual for control panel operating procedures.
13. When the system is running and while holding the safety button in, move the remote shutdown toggle switch to the enabled position. See Figure 63-1.
With the remote shutdown toggle switch in this position the engine will stop running if the system shuts down.
14. Check the voltmeter reading again while the generator is under load to verify that the generator is producing the correct Nominal Supply Voltage for this machine. See Figure 63-2.



Figure 63-1 1. Safety Button 3. Engine Start Switch
2. Toggle Switch 4. Water Pressure Gauge Reset

CAUTION

- **DO NOT OPERATE THE MACHINE IF THE VOLT METER READS BELOW THE MINIMUM ALLOWED VOLTAGE OR ABOVE THE MAXIMUM ALLOWED VOLTAGE. SEE FIGURE 63-2.**
- **OPERATING THE MACHINE OUTSIDE THESE LIMITS COULD CAUSE DAMAGE TO THE DRIVE MOTORS AND OTHER ELECTRICAL COMPONENTS.**
- **CORRECT THE LOW VOLTAGE PROBLEM BEFORE RESUMING OPERATION.**

Nominal Supply Voltage	Maximum Allowed Voltage	Minimum Allowed Voltage
480 VAC @ 60Hz	505 VAC	440 VAC
415 VAC @ 50Hz	420 VAC	375 VAC
400 VAC @ 50Hz	420 VAC	365 VAC
380 VAC @ 50Hz	420 VAC	355 VAC
230 VAC @ 60Hz	253 VAC	220 VAC
120 VAC @ 60Hz	132 VAC	105 VAC
110 VAC @ 50Hz	121 VAC	95 VAC

Figure 63-2

OPERATION

Open Delivery

Start Up - Electric Cord / Motor Pump Applications

1. Inspect the wheel tracks to insure no vehicles or other equipment will be contacted upon start-up or operation.
2. If the machine has below ground guidance, turn the oscillator ON.
3. Connect electric cord to power source. Refer to Open Delivery Electric Cord Handling and Operation beginning on page 65, then return to this instruction and continue with step 4.
4. Check the centrifugal pump oil reservoir level.
5. Move the cart disconnect panel switch to the ON position.
6. Move the pump panel disconnect switch to the ON position.
7. Turn the control panel disconnect switch to the ON position.
8. Check the voltmeter reading and verify that the Nominal Supply Voltage is correct for this machine. See Figure 64-1.
9. Determine if the machine will be run wet or dry.

- If running the machine wet, with water:
 - (a) Lower suction inlet into ditch until the inlet lift cables go slack. See Figure 64-2.
 - (b) Prime the centrifugal pump. See 50/60 Hz AC Voltage Electric Primer on page 61. After the pump is primed return to this instruction and continue with step (c).
 - (c) Start the pump using the control panel. Refer to the appropriate Control Panel Owner's Manual for control panel operating procedures.
 - (d) Slowly fill the system with water. Slowly open the riser valve so that the pump does not loose prime.
 - (e) Refer to the appropriate Control Panel Owner's Manual for control panel operating procedures.
 - (f) Also refer to Open Delivery Electric Cord Handling and Operation beginning on page 67 as needed.
- If running the machine dry, without water:
 - (a) Make sure the suction inlet is raised out of the ditch/water,
 - (b) Refer to the appropriate Control Panel Owner's Manual for control panel operating procedures.
 - (c) Also refer to Open Delivery Electric Cord Handling and Operation beginning on page 67 as needed.

CAUTION

- **DO NOT OPERATE THE MACHINE IF THE VOLT METER READS BELOW THE MINIMUM ALLOWED VOLTAGE OR ABOVE THE MAXIMUM ALLOWED VOLTAGE. SEE FIGURE 64-2.**
- **OPERATING THE MACHINE OUTSIDE THESE LIMITS COULD CAUSE DAMAGE TO THE DRIVE MOTORS AND OTHER ELECTRICAL COMPONENTS.**
- **CORRECT THE LOW VOLTAGE PROBLEM BEFORE RESUMING OPERATION.**

Nominal Supply Voltage	Maximum Allowed Voltage	Minimum Allowed Voltage
480 VAC @ 60Hz	505 VAC	440 VAC
415 VAC @ 50Hz	420 VAC	375 VAC
400 VAC @ 50Hz	420 VAC	365 VAC
380 VAC @ 50Hz	420 VAC	355 VAC

Figure 64-1

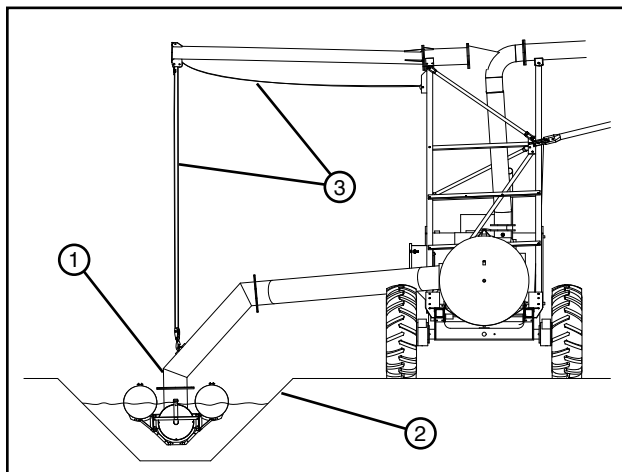


Figure 64-2 1. Suction Inlet 2. Ditch 3. Lift Cable

Electric Cord Handling

DANGER

- NEVER HANDLE THE ELECTRIC CORD WHEN THE POWER IS ON.
- THE DISCONNECT SWITCH MUST BE IN THE “OFF” POSITION WHEN INSERTING OR REMOVING THE PLUG FROM THE RECEPTACLE.
- NEVER ALLOW THE ELECTRIC CORD TO KINK.
- NEVER ALLOW THE HOSE TO DRAG OVER THE ELECTRIC CORD ALWAYS LAY THE ELECTRIC CORD OVER THE HOSE.
- REGULARLY INSPECT THE ELECTRIC CORD FOR NICKS OR CUTS. REPLACE A DAMAGED ELECTRIC CORD IMMEDIATELY. DO NOT ATTEMPT TO SPLICE A DAMAGED ELECTRIC CORD.

WARNING

- DO NOT DRIVE ANY VEHICLE OVER THE CORD AT ANY TIME UNLESS THE CORD IS PROTECTED FROM PHYSICAL DAMAGE.
- REMOVE ALL SHARP OBJECTS FROM THE TRAVEL LANE THAT MAY CAUSE DAMAGE TO THE ELECTRIC CORD.
- ALWAYS INSURE THAT THE ELECTRIC CORD MECHANICAL SAFETY CABLE IS ROUTED THROUGH CABLE HOOK ON POWER PEDESTAL EACH TIME THE ELECTRIC CORD IS PLUGGED INTO THE RECEPTACLE.
- INSURE THAT THE MECHANICAL SAFETY CABLE IS FUNCTIONAL EACH TIME THE ELECTRIC CORD IS PLUGGED INTO POWER PEDESTAL. THE PLUG MUST ALWAYS BE FREE SO THAT THE MECHANICAL SAFETY CABLE CAN PULL THE PLUG FROM RECEPTACLE IF NECESSARY.
- ALWAYS ATTACH THE CAP TO PLUG WHEN MOVING THE ELECTRIC CORD AND PLUG FROM ONE POWER PEDESTAL TO ANOTHER, OR WHEN STORING THE CORD.
- THE PLUG CAP COLLAR IS FOR ATTACHMENT OF THE PLUG CAP ONLY! DO NOT ATTACH THE PLUG CAP COLLAR TO THE RECEPTACLE. THE PLUG MUST ALWAYS BE FREE SO THAT THE MECHANICAL SAFETY CABLE CAN PULL THE PLUG FROM RECEPTACLE IF NECESSARY.

Electric Cord Operation

1. Ensure that the danger signs are in place and visible at each end of the travel lane. See Figure 65-1.
2. Check the electric cord for nicks, cuts, or abrasions. DO NOT use the electric cord or start the system if any of these defects are found. Contact your local Valley dealer.

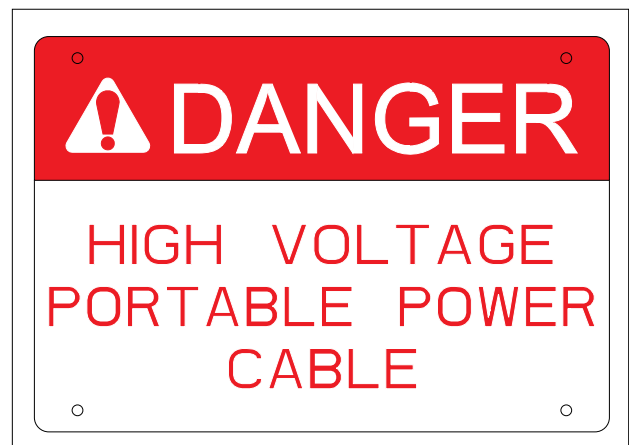


Figure 65-1 Danger Sign

OPERATION

Closed Delivery Electric Cord Operation

- Turn the power pedestal disconnect switch to the OFF position. See Figure 66-1.

⚠ DANGER

•THE DISCONNECT SWITCH MUST BE IN THE “OFF” POSITION WHEN INSERTING OR REMOVING THE PLUG FROM THE RECEPTACLE.

- Remove plug cap from electric cord plug, and insert the electric cord plug into the power pedestal receptacle. See Figure 66-1.

⚠ WARNING

•ALWAYS ATTACH THE PLUG CAP TO THE PLUG WHEN MOVING THE ELECTRIC CORD FROM ONE POWER PEDESTAL TO ANOTHER OR WHEN STORING THE ELECTRIC CORD.

- Place the cord anchor cable through the mechanical cable anchor ring on the power pedestal.

For proper operation of the cord anchor cable disconnect, there must be slack in the electric cord between the cord grip and plug when the cord anchor cable is pulled taut. See Figure 66-2.

⚠ WARNING

•DO NOT ATTACH ELECTRIC CORD PLUG TO POWER PEDESTAL RECEPTACLE WITH PLUG CAP COLLAR.

- Turn the power pedestal disconnect switch to the ON position to energize the cart disconnect panel.

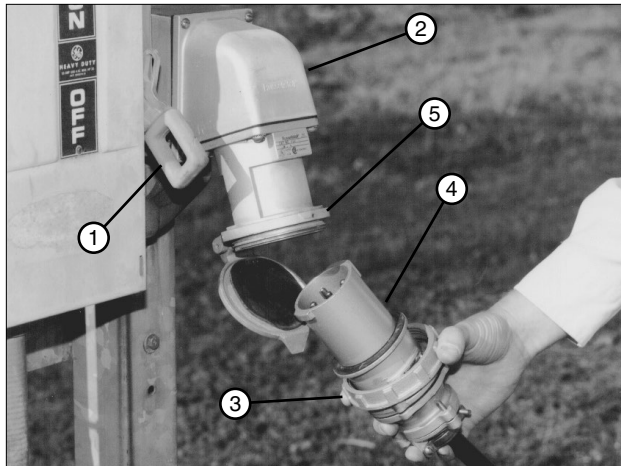


Figure 66-1
1. Disconnect Switch
2. Power Pedestal
3. Plug Cap Collar
4. Plug
5. Receptacle

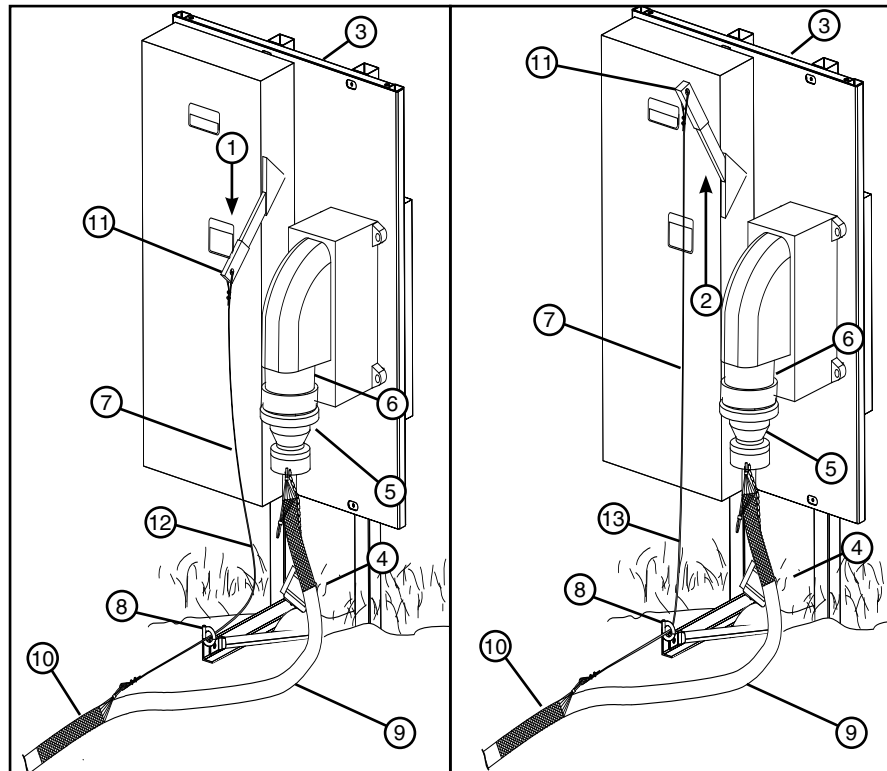


Figure 66-2
1. Off Position
2. On Position
3. Power Pedestal
4. Plug Cap
5. Electric Cord Plug
6. Power Pedestal Receptacle
7. Cord Anchor Cable
8. Cable Anchor Ring
9. Electric Cord
10. Cord Grip
11. Disconnect Switch
12. Cable is Slack
13. Cable is Taut

Open Delivery

Electric Cord Positioning

The following instructions describe a basic method of positioning the electric cord for open delivery depending on direction of machine movement and position of power pedestals as the machine moves across the field.

1. Connect electric cord:
 - (a) Make sure the power pedestal disconnect is in the OFF position.
 - (b) Position the electric cord between the cart wheel tracks. To prevent interference between the electric cord and cart tires, bury the electric cord in the area where interference will occur or when applicable. See Figure 67-1.
 - (c) Connect the electric cord to the power pedestal.
 - (d) When ready, switch the power pedestal disconnect switch into the ON position.

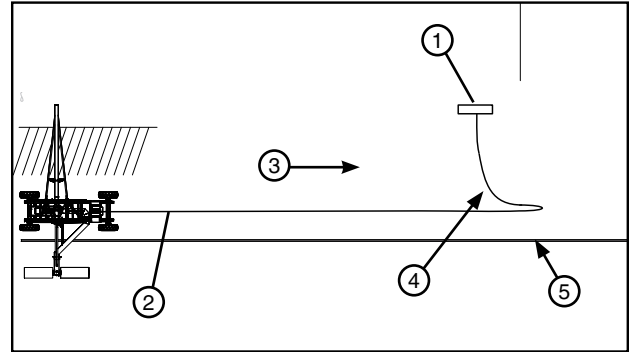


Figure 67-1 1. Power Pedestal 2. Electric Cord 3. Direction of Travel 4. Buried Cord 5. Furrow or Cable Guidance

2. Follow the instructions for Open Delivery Cord Drag Start Up.

Then, at the machine/control panel:

- (a) Set the direction of travel.
 - (b) Set the percentage timer to the desired application rate or speed.
 - (c) If applicable set the Auto Reverse/Auto Stop control as desired.
3. When ready, start the machine. The machine should start and run in the desired direction and auto reverse or stop at the end of field stop post which was set for the length of the electric cord.
 4. As the machine approaches the end of field stop post, Stop the machine and close the water shut off valve on the riser if applicable.
 5. Move the electric cord:
 - (a) Make sure the power pedestal disconnect is in the OFF position.
 - (b) Disconnect the electric cord from the power pedestal.
 - (c) Position the electric cord far enough away from the hose, so that the hose will not drag over it. To prevent interference between the electric cord, cart tires and hose, bury the electric cord in the area where interference will occur or when applicable, position the electric cord over the top of hose. See Figure 67-1.
 - (d) Make sure the second power pedestal disconnect is in the OFF position.
 - (e) Connect the electric cord to the second power pedestal.
 - (f) When ready, switch the second power pedestal disconnect switch into the ON position.
 6. At the machine/control panel:
 - (a) Select the original direction of travel.
 - (b) Set the percentage timer to the desired application rate or speed.
 - (c) If applicable set the Auto Reverse/Auto Stop control as desired.

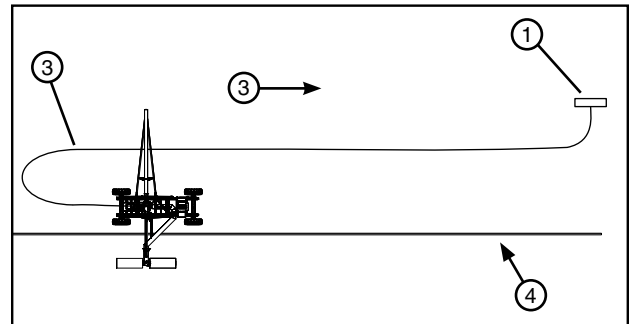


Figure 67-2 1. Power Pedestal 2. Electric Cord 3. Buried Cable 4. Furrow or Cable Guidance

OPERATION

Open Delivery

Electric Cord Positioning (continued)

7. When ready, start the machine. If applicable, open the water shut off valve on the riser. The machine should start and run in the desired direction and auto reverse or stop at the end of field stop post which was set for the length of the electric cord.
8. Repeat the steps 6-11 as needed to cross the field.
9. As the machine approaches the edge of the field do one of the following:
 - If Auto Reverse is on, monitor and assist the auto reverse process as needed, closing and opening the riser valve as required.
 - (a) Reposition the end of field stop for the length of electric cord.
 - (b) The machine should start and run in the desired direction and stop at the end of field stop post which was set for the length of the electric cord.
 - If Auto Stop is on, monitor and assist the auto stop process as needed, closing the riser valve as required.
 - (a) If this is a standard linear machine continue with step 14 of this instruction to run machine back across the field in the opposite direction.
 - (b) If this is a swing around linear machine and the operator intends to swing the machine around to the other field, proceed to the Swing Around section, follow the Swing Around procedure and swing the machine around to the other field. After swinging machine around, return to this instruction and continue with step 14 to run machine back across the field in the opposite direction.
10. Reposition the end of field stop for the length of electric cord.
11. Move electric cord:
 - (a) Make sure the power pedestal disconnect, that the electric cord is connected to, is in the OFF position.
 - (b) Position the electric cord far enough away from the hose, so that the hose will not drag over it. To prevent interference between the electric cord, cart tires and hose, bury the electric cord in the area where interference will occur or when applicable, position the electric cord over the top of hose. See Figure 68-1.
 - (c) When ready, switch the power pedestal disconnect switch into the ON position.
12. At the machine/control panel:
 - (a) Select the desired direction of travel.
 - (b) Set the percentage timer to the desired application rate.
 - (c) If applicable set the Auto Reverse/Auto Stop control as desired.
13. When ready, start the machine. If applicable, open the riser water shut off valve. The machine should start and run in the desired direction and auto reverse or stop at the end of field/hose stop post which was set for the length of the hose.
14. Repeat the steps 6-11 as needed to cross the field in the opposite direction.

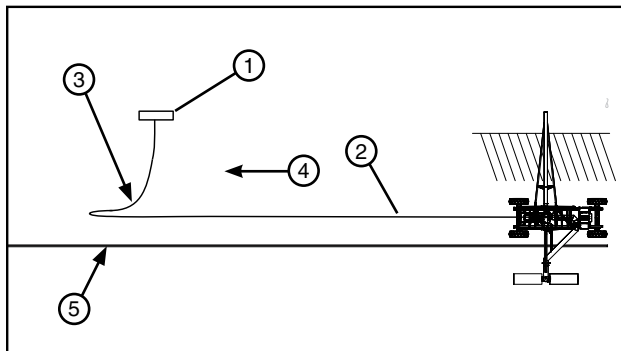


Figure 68-1 1. Power Pedestal
2. Electric Cord
3. Buried Cord
4. Direction of Travel
5. Furrow or Cable Guidance

OPERATION

Swing Around

The following is a guide to pivoting the Swing Around Linear span.

Prior to pivoting the span, the operator must insure the cart is correctly positioned over the pivoting point. If the machine has stopped before reaching the pivot position, run the cart manually to the pivot position. See Figure 69-1.

⚠ CAUTION

- **THE AREA AROUND THE CART WHERE THE MACHINE IS TO SWING AROUND SHOULD BE FLAT AND IN THE SAME PLANE AS FIRST SPAN.**
- **PRIOR TO SWINGING AROUND, MAKE SURE THE STABILIZERS ARE VERTICAL UNDER THE CART AND ARE ON SOLID GROUND OR ON ANOTHER HARD SURFACE SUCH AS PLANKS, BOARDS OR CONCRETE.**
- **FOR MACHINES GREATER THAN 1000 FEET OR 6 SPANS IN LENGTH, ANCHOR CHAINS MUST BE USED TO TIE CART DOWN. EITHER EARTH ANCHORS OR CONCRETE ANCHORS MAY BE USED (SEE FIGURE ABOVE).**
- **SOME MACHINE CONFIGURATIONS, SUCH AS LARGE FOOT PIVOT TIRES, AND SOME FIELD CONDITIONS MAY REQUIRE ANCHORING THE CART ON MACHINES SHORTER THAN THE RECOMMENDATION ABOVE.**

- If the swing around Rainger linear is greater than 1000 feet or 6 spans in length, anchoring the cart before pivoting the span is **REQUIRED**. Continue with Anchoring the Cart on this page.
- If the swing around Rainger linear is 1000 feet or less, or 6 spans in length or less, anchoring the cart before pivoting the span is recommended. Continue with either Anchoring the Cart on this page or Pivot Procedure on the next page.

Anchoring the Cart

1. Make sure the machine is in the pivot position between the short binder chains on the cart path. See Figure 69-1.
2. Attach one long binder chain to the mounting plate on each side of machine structure with a clevis, clevis pin and cotter pin. See Figure 69-1.
3. Attach each long binder chain from machine to a short binder chain with a load binder. See Figure 69-1.
4. Latch each load binder closed so that the long binder chains are tight. See Figure 69-1.
5. Continue with Pivot Procedure on the next page.

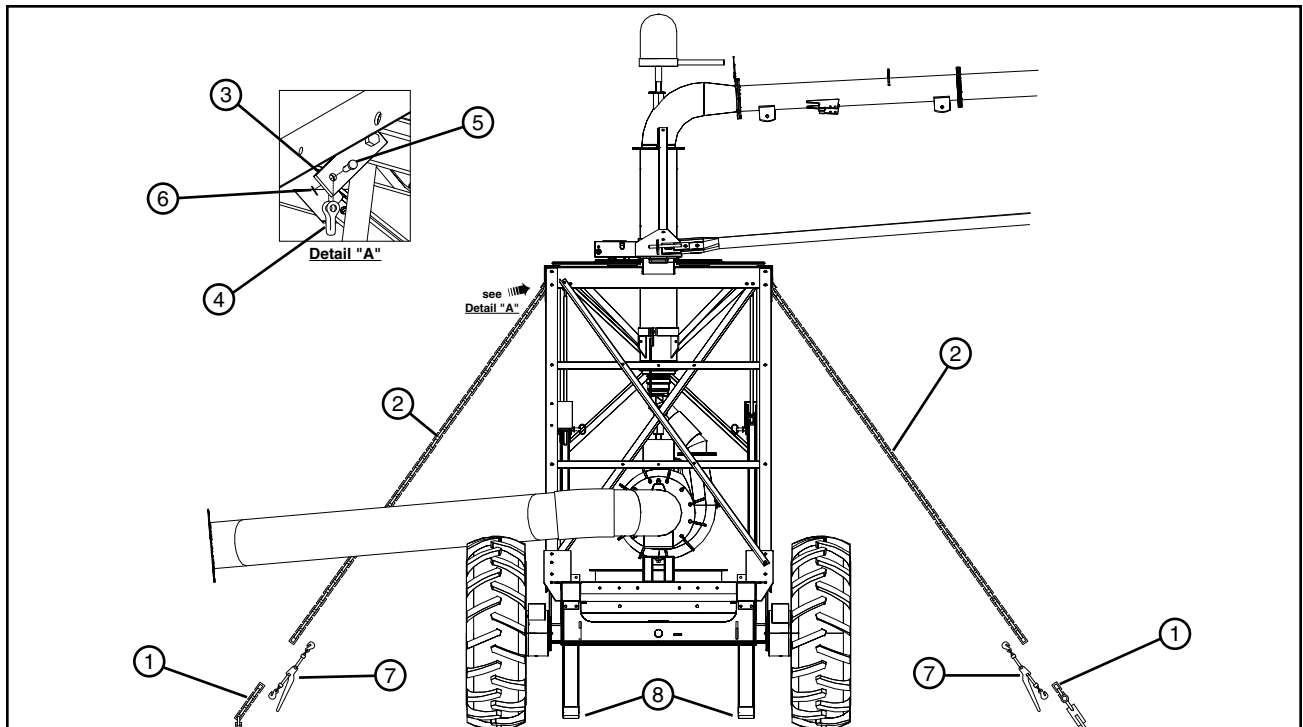



Figure 69-1


- | | | | |
|-----------------------|-------------------|---------------|----------------|
| 1. Short Binder Chain | 3. Mounting Plate | 5. Clevis Pin | 7. Load Binder |
| 2. Long Binder Chain | 4. Clevis | 6. Cotter Pin | 8. Stabilizers |

OPERATION

Swing Around Pivot Procedure

To pivot the span, correctly position the machine and follow the guidelines on the previous page. Then do the following:

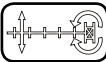
1. Press  to Stop the machine. See Figure 70-1.

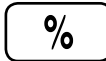
2. Press  to turn the Water OFF. See Figure 70-1.

NOTE

•The Rainger Linear Swing Around should always be ran dry (without water) when pivoting or swinging the span around. See Figure 70-2.

3. Set the control panel to pivot mode. See Figure 70-1.

Press  and **2**.

4. Press  to set the percent timer to the desired percentage. See Figure 70-1.

5. There are typically 2 pivot zones. See Figure 70-2.

6. Press the correct number key to select the pivot zone that the machine will be operating within. See Figure 70-3.

Select a Zone 1=A, 2=B, 3=C 4=D. See Figure 70-3.

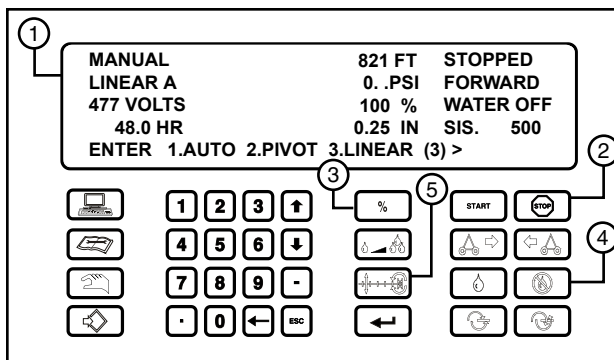


Figure 70-1 1. Control Panel Display 4. Percent Timer Key
2. Stop Key 5. Pivot/Linear Key
3. Water OFF Key

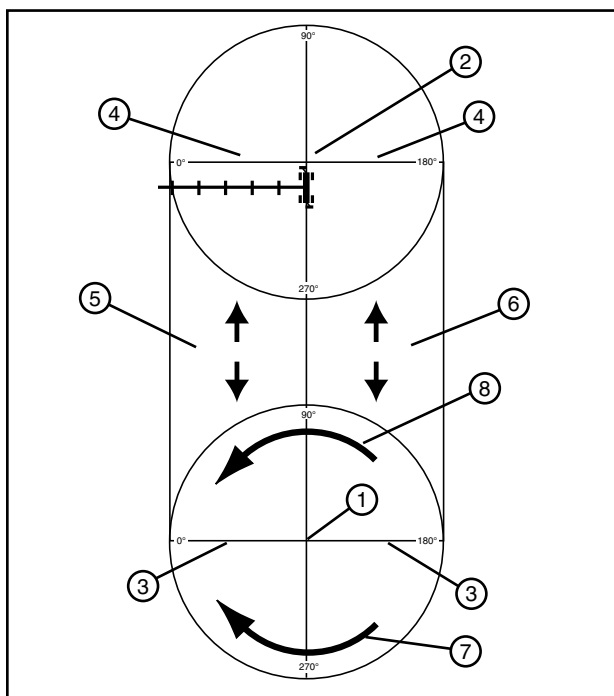


Figure 70-2 1. Pivot Zone A 5. Linear Zone A
2. Pivot Zone B 6. Linear Zone B
3. Linear Start 7. Forward
4. Linear End 8. Reverse

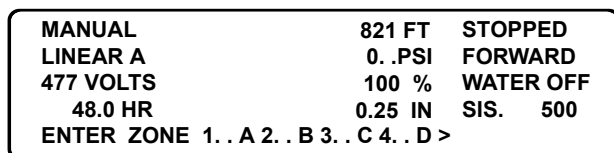


Figure 70-3

OPERATION

Swing Around

Pivot Procedure (continued)

7. Remove the torque and clevis pins securing the pivot swivel lever in the closed position. See Figure 71-1.
8. Pull the pivot swivel lever to open the pivot swivel latch. Some force may be required to open the latch. See Figure 71-1.
9. With the pivot swivel lever in the open position, store the torque and clevis pins in lever mount. See Figure 71-1.
10. Repeat steps 7-9 for the other lever.

NOTE

- If a latch **DOES NOT** open, use the override button to jog the span in one direction then the other direction to release the latch.
- The Override button only functions in the pivot mode when at least one of the latch proximity sensors are **NOT** activated.

WARNING

- **TO REDUCE THE POSSIBILITY OF STRUCTURAL DAMAGE, BOTH OF THE PIVOT SWIVEL LEVERS AND LATCHES MUST BE IN THE OPEN POSITION BEFORE ATTEMPTING TO PIVOT THE SPAN.**

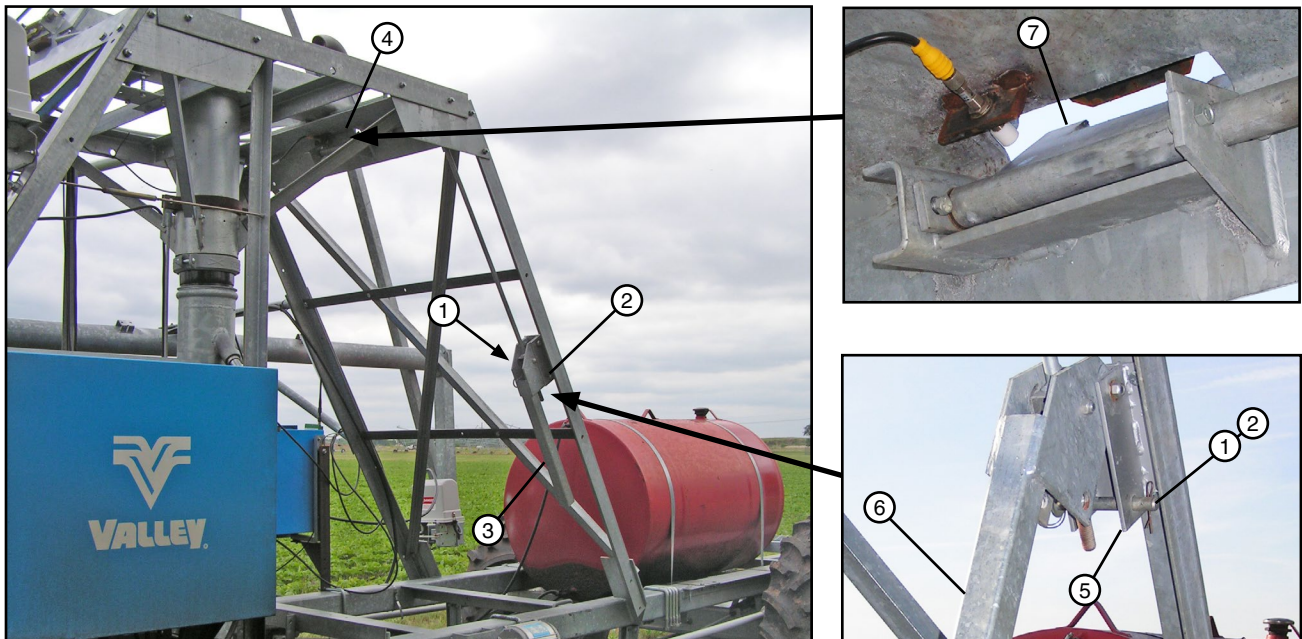
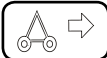



Figure 71-1 1. Torque Pin
2. Clevis Pin
3. Pivot Swivel Lever (CLOSED POSITION)
4. Pivot Swivel Latch (CLOSED POSITION)


5. Lever Mount
6. Pivot Swivel Lever (OPEN POSITION)
7. Pivot Swivel Latch (OPEN POSITION)

11. Select the direction of movement for the span to pivot. See Figure 71-2.

• Press  for reverse.

OR

• Press  for forward.

12. Press  to start the machine in the pivot mode. See Figure 71-2.

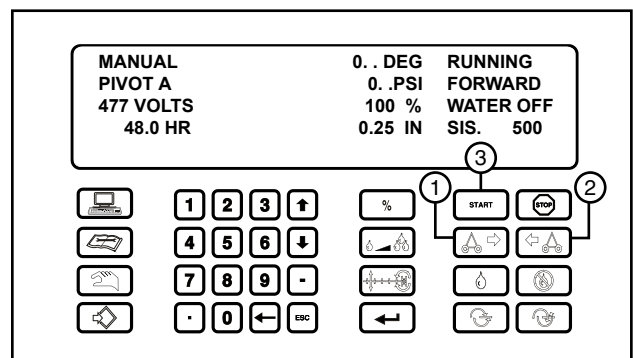


Figure 71-2 1. Reverse Key 2. Forward Key 3. Start Key

OPERATION

Swing Around Pivot Procedure (continued)

13. After the span has pivoted a few degrees and the latch hoops have moved behind the pivot swivel latches, push the pivot swivel levers into the closed position. See Figures 72-1 and 72-2.

Secure each lever in the closed position with the original torque and clevis pins. See Figure 72-2.

14. Monitor the machine as the span pivots.

Each pivot swivel latch rides against a latch hoop to keep the latch open.

When the span has pivoted 180° and each latch has reached the end of a latch hoop, the latches will automatically close, latching the span in position, activating the latch proximity sensors which will automatically stop the machine.

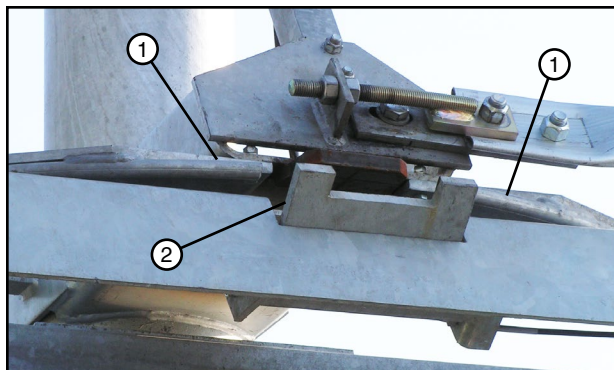


Figure 72-1 1. Latch Hoop
2. Pivot Swivel Latch

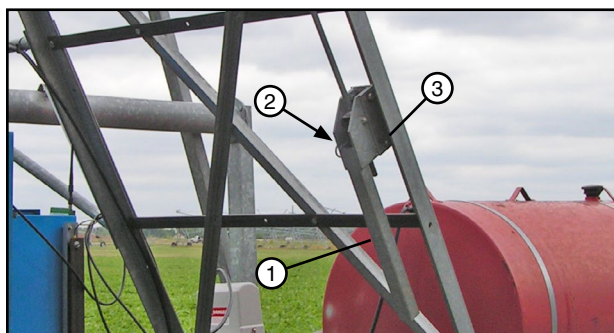



Figure 72-2 1. Pivot Swivel Lever (CLOSED POSITION)
2. Torque Pin
3. Clevis Pin

NOTE

- If both latches **DO NOT** automatically close and latch completely, use the override button to jog the span in one direction then the other direction to close the remaining open latch.
- The **Override** button only functions in the pivot mode when at least one of the latch proximity sensors are **NOT** activated.
- Both of the latches **MUST** close and both latch proximity sensors **MUST** activate before the machine can be switched from the pivot mode to the linear mode.

15. After the latches are closed press . See Figure 72-3.

16. Press  and **3** to return the machine to the linear mode. See Figure 72-4.

Pivot procedure is complete.

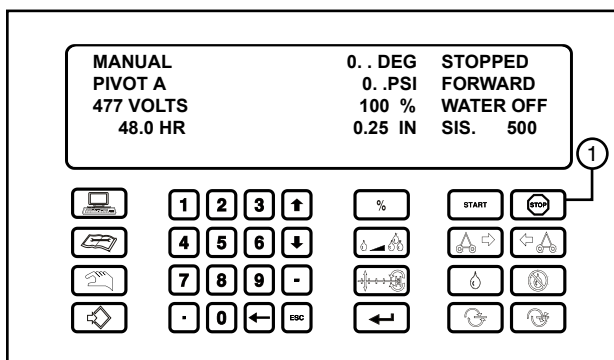


Figure 72-3 1. Stop Key

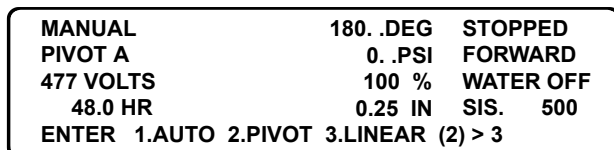


Figure 72-4

DANGER

- THE CONTROL PANEL CONTAINS HIGH VOLTAGE! 480 VOLTS CAN KILL.
- ALWAYS DISCONNECT ELECTRICAL POWER BEFORE SERVICING OR PERFORMING MAINTENANCE TO THE MACHINE.
- TESTING AND TROUBLESHOOTING SHOULD BE PERFORMED ONLY BY AN AUTHORIZED VALLEY DEALER.
- ALWAYS REPLACE ANY GUARDS OR SHIELDS THAT ARE REMOVED FOR PERFORMING MAINTENANCE.

Disconnect All Power

Before performing service or maintenance on any part of the machine, follow the MINIMAL LOCKOUT/TAGOUT PROCEDURE located in the SAFETY section of this manual and do the following:

1. SHUT OFF and LOCK the public power service disconnect to the irrigation machine. See Figure 73-1.

FILL OUT the blue (OSHA safety color code) tag and attach to the disconnect after locking. See Figure 73-1.

2. SHUT OFF and lock the control panel main power disconnect. See Figure 73-2.

FILL OUT the blue (OSHA safety color code) tag and attach to the disconnect after locking. See Figure 73-2.

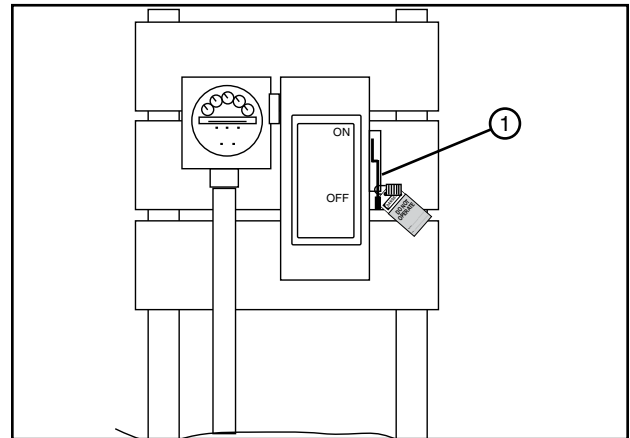


Figure 73-1 1. Public Power Service Disconnect

DANGER

- BE AWARE OF HIGH WATER PRESSURE. TURN OFF THE PUMP AND ALLOW THE MACHINE TO DRAIN COMPLETELY BEFORE REPAIRING OR PERFORMING MAINTENANCE TO THE MACHINE.

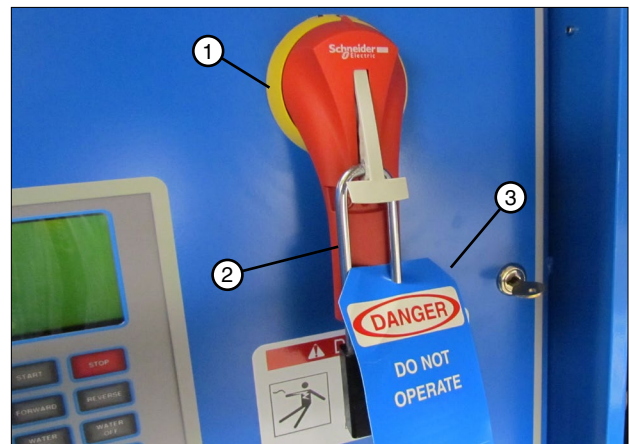


Figure 73-2 1. Main Disconnect
2. Lock
3. Blue Tag

MAINTENANCE

Wheel Gearbox

NOTE

- After the first operating season, change the oil in all of the wheel gearboxes.
- After the first oil change, change the wheel gearbox oil every third year or 3000 operating hours, whichever occurs first.
- At the end of each operating season, drain the wheel gearboxes of any condensation or contaminated oil that may have accumulated in the gearbox and refill to its normal level.

3. Remove the drain plug from the bottom of the wheel gearbox and drain the oil into a container. See Figure 74-1.
4. Install the drain plug after draining oil.
5. Clean all of the dirt away from the expansion chamber cap and remove the expansion chamber cap. Do not allow dirt to fall into the gearbox when removing the cap. See Figure 74-2.
 - Make sure the vent holes on each side of the expansion chamber cap are open and unobstructed.

NOTE

- Use only Valley Gear Lube. Other brands of lubricants may contain corrosive extreme pressure additives, which may damage bronze worm gears.
- The oil in worm gear cases may reach temperatures up to 200° F (94° C) without alarm.

6. Fill the wheel gearbox with Valley Gear Lube. The capacity is approximately 3.9 quarts (3.7 liters).
 - Fill gearbox to the top of worm gear shaft or remove the check plug and fill until the oil begins to flow out of the check plug hole. See Figure 74-3.
7. Install the expansion chamber cap after refilling the gearbox. Secure with original hardware and torque to 8 lb-ft (10.8 N·m).

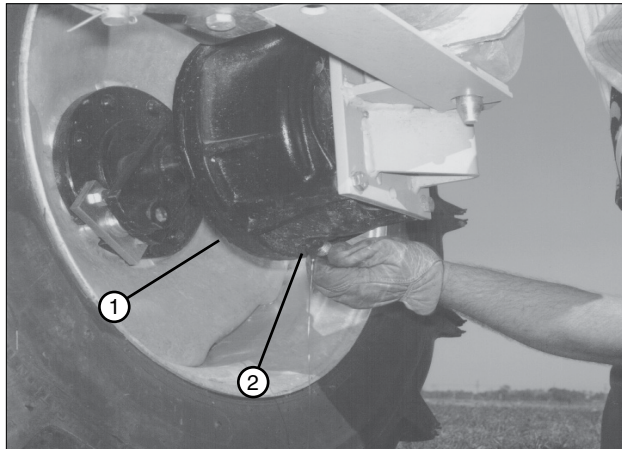


Figure 74-1 1. Wheel Gearbox
2. Drain Plug

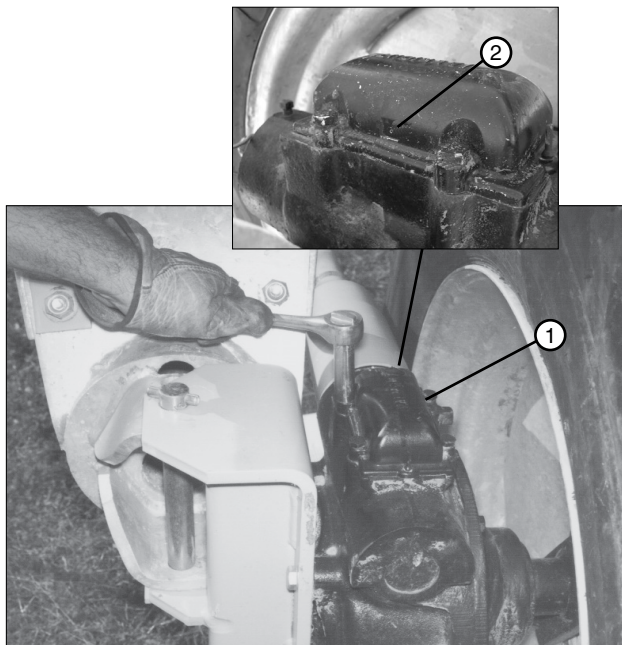


Figure 74-2 1. Expansion Chamber Cap
2. Vent Hole

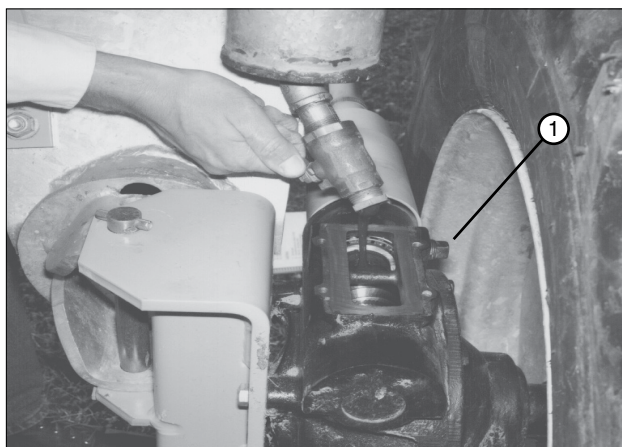


Figure 74-3 1. Check Plug

MAINTENANCE

Center Drive Gearmotors

Helical Gearmotor

After EACH season of operation, change the oil in all of the helical gearmotor gearboxes.

1. Remove the drain plug and the fill plug. Drain the oil and install the drain plug. See Figure 75-1.

NOTE

•Use only Valley Gear Lube. Other brands of lubricants may contain corrosive extreme pressure additives, which may damage bronze worm gears.

2. Fill the gearbox 1-7/8 in (48 mm) from the bottom of fill plug hole with Valley Gear Lube. The capacity of the gearbox is approximately 44 oz (1.3 liter). See Figure 75-1.

NOTE

•OIL LEVEL SHOULD BE 1-7/8 IN (48 MM) BELOW FILL PLUG WHEN FULL.

⚠ WARNING

•INPUT SEAL FAILURE CAN OCCUR IF OIL CAPACITY IS EXCEEDED.

Worm Gearmotor

After EACH season of operation, change the oil in all of the worm gearmotor gearboxes.

1. Remove the drain plug and the fill plug. Drain the oil and install the drain plug. See Figure 75-2.

NOTE

•Use only Valley Gear Lube. Other brands of lubricants may contain corrosive extreme pressure additives, which may damage bronze worm gears.

2. Fill the gearbox to within 1/2 in (12.7 mm) of the bottom of the fill plug hole with Valley Gear Lube. The capacity of the gearbox is approximately 1 quart (0.9 liter). See Figure 75-2.

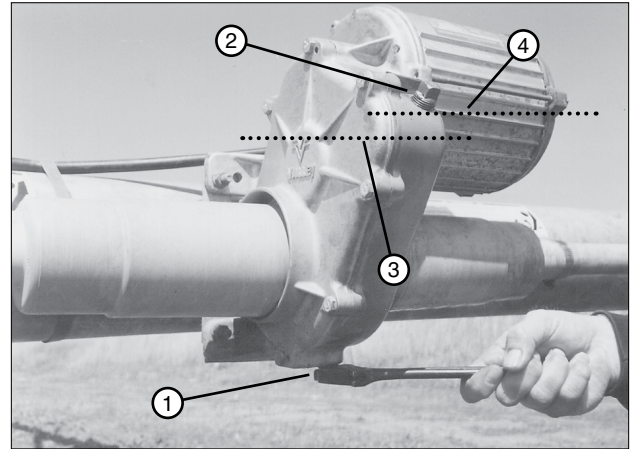


Figure 75-1 1. Drain Plug
2. Fill Plug
3. Oil Level
4. Bottom of Fill Plug Hole

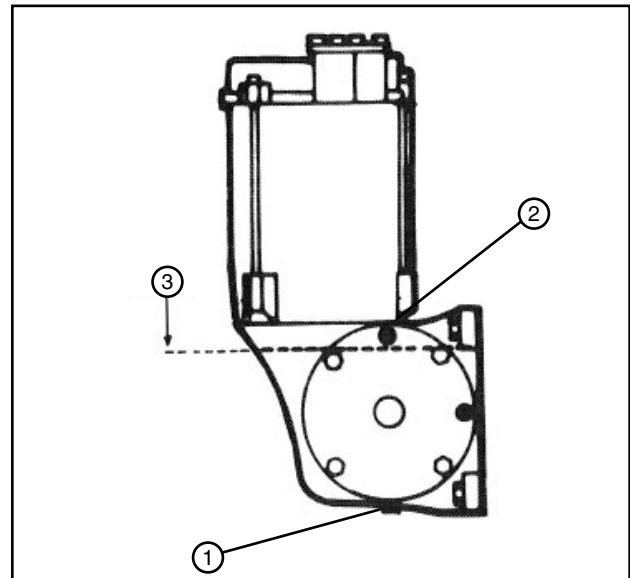


Figure 75-2 1. Drain Plug
2. Fill Plug
3. Oil Level

MAINTENANCE

Swing Around Cart Lubrication

There are 10 grease fittings that must be lubricated with a good grade of lithium based grease after every 5 passes. See Figure 76-1.

- There are 8 grease fittings on the bearing tube assembly.
- There are 2 grease fittings on the swivel yoke.

Tire and Wheel

Wheel Lug Nut Torque

Wheel lug nuts should be torqued to 125 lb-ft (169.47 N·m). See Figure 76-2.

Check the wheel lug nut torque annually, pre-season; at spring start-up.

Tire Pressures

Proper tire pressure is important! Operating with low tire pressure will damage the tires and the drive train.

Check tire pressure several times a year:

- Pre-season: At spring start-up.
- During-season: Check tire pressure monthly.
- Post-season: When performing fall winterization.

For the correct tire pressure refer to the decal on the rim or the tire pressure chart. See Figure 76-3.

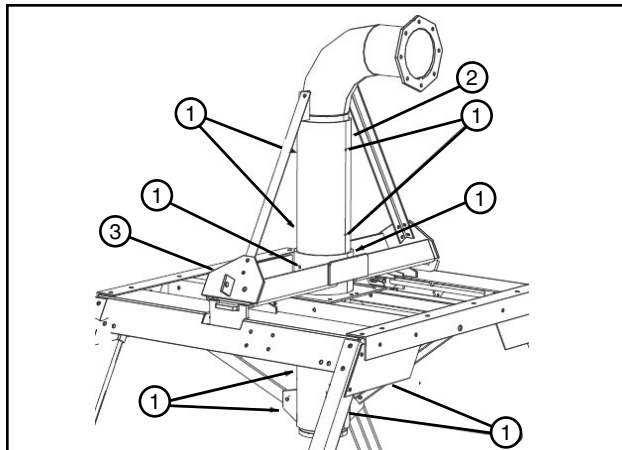


Figure 76-1 1. Grease Fitting 2. Bearing Tube 3. Swivel Yoke

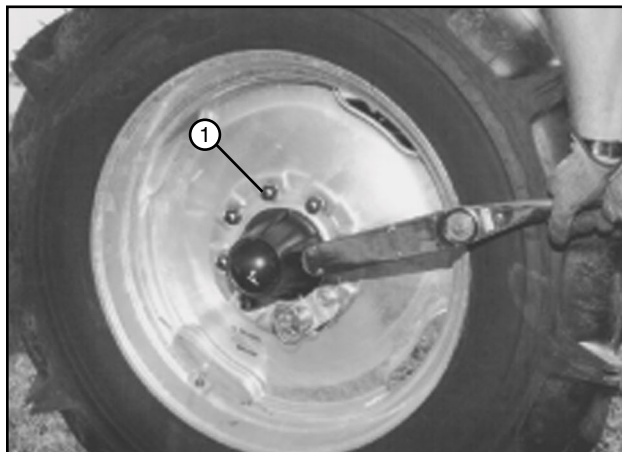


Figure 76-2 1. Wheel lug nut

⚠ WARNING

- TIRES ARE SHIPPED AT A PRESSURE OF 30 TO 35 PSI (206 TO 241 KPA).
- BE SURE THE TIRES HAVE BEEN DEFLATED TO THE CORRECT PRESSURE (SHOWN ON DECAL) BEFORE THE TIRE IS USED.

NOTE

- When replacing tires be sure the ply rating of the new tire is equal to or greater than the ply rating of the old tire.

TIRE PRESSURE CHART

Hose Drag Cart		
Tire Size	Pounds per Square Inch	Kilo pascal
(Inches)	(PSI)	(kPa)
14.9 X 24 Float Tire	18	124
14.9 X 24 Turf Tire	18	124
Span Drive Units		
Tire Size	Pounds per Square Inch	Kilo pascal
(Inches)	(PSI)	(kPa)
11.2 X 38 Tire	23	152
14.9 X 24 Float Tire	18	124
14.9 X 24 Turf Tire	18	124
16.9 X 24 Float Tire	16-18*	110-124
16.9 X 24 Turf Tire	16-18*	110-124

Figure 76-3 * Tire pressure may be reduced to 16 psi (110 kPa) for increased flotation.

Centrifugal Pump Lubrication

The following are general centrifugal pump lubrication recommendations and may not apply to the centrifugal pump included with this irrigation machine. Always refer to the centrifugal pump Owner's Manual or centrifugal pump manufacturer for the proper lubricant, lubrication frequency and lubrication procedures.

Grease Lubricated Frames

Use Lithium based grease equivalent to one of the following manufacturer's products:

G.E. Long Life Grease No. D682C5

Mobil Mobilux No. EP2

Shell Alvania EP2

Texaco Multifak No. 2

When adding grease be sure that grease fittings and end of grease gun are clean. See Figure 77-1.

Use a hand operated grease gun only.

Refer to the table in Figure 77-2 for general lubrication frequency.

Run-Dry Reservoirs

Use an oil or fluid equivalent to one of the following manufacturer's products:

- Chevron Turbine Oil GST 32
- Transmission Fluid
- Hydraulic Fluid
- Royal Purple Barrier Fluid FDA 22
- Synthetic White Oil 22

Fill and maintain the reservoir fluid level up to the middle of the top sight glass. See Figure 77-1.

When filling the reservoir with fluid, be sure the air has been purged out of the upper circulation hose to reduce the possibility of vapor lock.

Change the reservoir oil every 1000 hours or once a year.

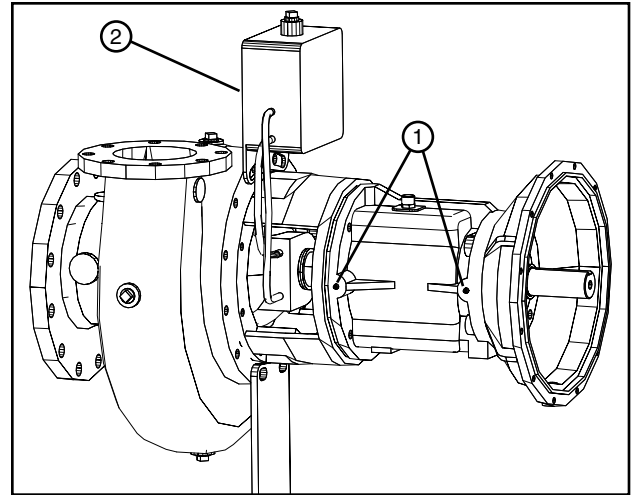


Figure 77-1 1. Grease Fitting
2. Run-Dry Reservoir

	Frame Size		
	2-5-11 EM309	6-7-8-16 60B4 though 68B4	10-12 18-18D
Total Running Time	<2000 hours	1,500 hours	1,000 hours
8-Hour Day Service	36 weeks	27 weeks	18 weeks
24-Hour Day Service	12 weeks	9 weeks	6 weeks
	3 pumps	6 pumps	12 pumps

Figure 77-2 Lubrication Chart

MAINTENANCE

Furrow

The furrow must be maintained perfectly straight and unobstructed. The skid must slide in the furrow at a minimum depth of 3 in (75 mm) and a maximum of 6 in (150 mm). See Figure 78-1.

The furrow guidance arm pivot points must be aligned with the furrow and the furrow guidance arm neutral position must be adjusted so that it is straight in line with the furrow guidance arm pivot point.

WARNING

- **NEVER TRY TO REPOSITION THE SYSTEM WHEN THERE ARE ESTABLISHED WHEEL TRACKS.**

A three foot wide path on each side of the furrow must be kept clear of any obstructions that could prevent the system guidance hardware from functioning properly.

This path should have no parallel or perpendicular ridges or furrows through it.

Furrow End of Field Shutdown

An optional method of providing an additional end of field shutdown is to place an angle in the furrow where you want the system to stop.

The furrow must be angled away from the drive unit enough that when the leading skid has traveled forward 10 ft (3.05 m) it has angled over 2 ft (0.61 m). See Figure 78-2.

CAUTION

- **DO NOT ALLOW THE STRAIGHT PORTION OF THE FURROW TO GO BEYOND WHERE THE ANGLED END OF THE FIELD STOP FURROW IS PLACED.**

NOTE

- **If either skid gets out of the furrow it will cause the system to shut down after the furrow guidance arm moves approximately 18 in (457 mm) out of alignment with the furrow guidance arm pivot point.**

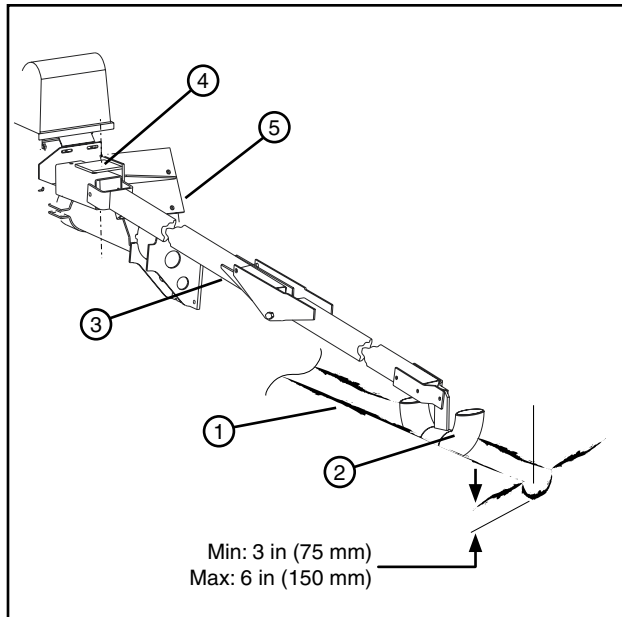


Figure 78-1 1. Furrow 2. Skid 3. Furrow Guidance Arm 4. Guidance Arm Pivot Point 5. Drive Unit Side

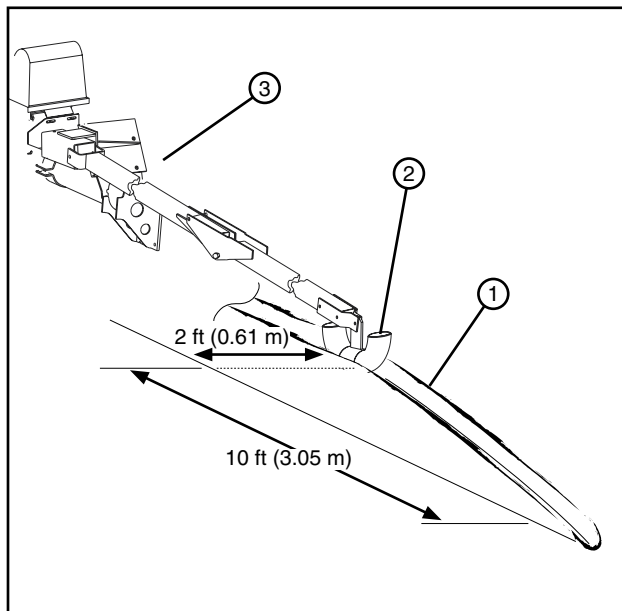


Figure 78-2 1. Furrow 2. Skid 3. Drive Unit Side

Cart Path

The cart path must be kept clean and free of debris that may damage tires, hoses, or the linear machine.

- To reduce the possibility of structural damage to the irrigation machine, the cart path should always be graded flat and level so that the cart will not tip to either side as it travels down the cart path. The cart path should not have a crown or be graded at an angle. Structural damage to the irrigation machine may result.
- When changing hoses, always disconnect and drain the hose at the pipe line valve before disconnecting the hose from the cart to prevent water puddles from forming on the cart path.
- Do not allow wheel tracks to form on the cart path. The presence of wheel tracks in the cart path may cause inconsistent steering and unplanned machine stoppage. If left in a state of disrepair, wheel tracks can cause structural damage to the irrigation machine.

Barricade

Maintain the barricade structure and area.

Inspect the barricade structure for failure and tighten any loose hardware completely.

Ensure that the actuator arm contacts the tripping structure. Under certain conditions, soil may build up in the wheel track resulting in a ramp effect. This may allow the actuator arm to go over the top of the structure which trips the actuator arm. See Figure 79-1.

Should this happen, the machine will not stop but continue to move and can result in damage to the machine. Remove any build up of soil in the barricade area.

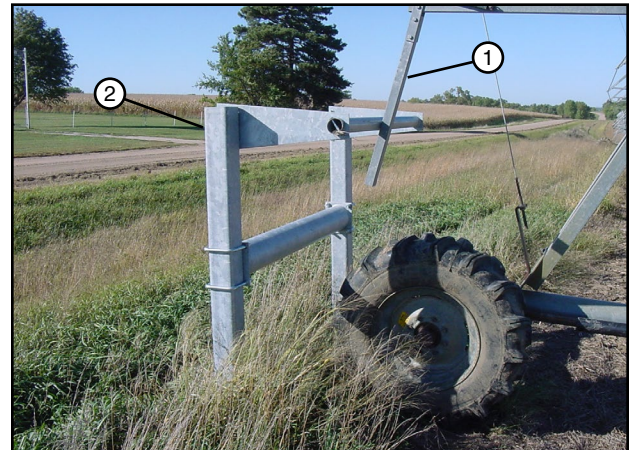


Figure 79-1 1. Actuator arm
2. Barricade

Wheel Tracks

It is important to maintain wheel tracks. See Figure 79-2.

- Wheel tracks affect the linear machine's ability to steer.
- Ensure correct tire pressure to help reduce the possibility of deep wheel tracks.
- Wheel track depth:
 - » Regular drive units must not exceed 4 in (100 mm).
 - » Single span swing around drive unit must not exceed 2 in (50 mm).
 - » Do not allow wheel tracks at the cart.
- Wheel track depth can be controlled by using track fillers, tillers, discs, or flotation tires.

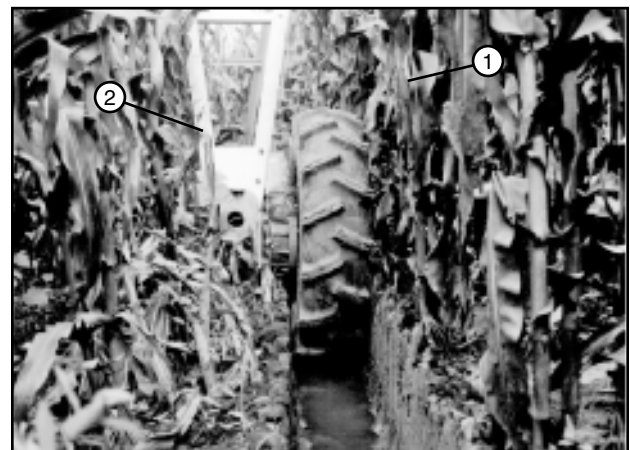


Figure 79-2 1. Wheel Track
2. Drive Unit

Engine/Generator

Refer to the Owner's Manual supplied with engine/generator for specific details on maintenance, operation, and winterizing of the engine/generator.

CAUTION

- A PARTIALLY FILLED FUEL TANK WILL PERMIT CONDENSATION WHICH WILL CONTAMINATE THE FUEL AND ACT TO DAMAGE THE INJECTION PUMP AND INJECTORS.

MAINTENANCE

Poly Hose Repair

Hoses should be repaired as soon as possible after damage is discovered to prevent further deterioration.

NOTE

•Pin holes in the hose should be marked with a quick burst of bright colored spray paint while there is pressure in the line to assist in locating the hole later for repair.

Large tears or cuts, that interrupt operation, can be temporarily repaired by using a rigid mender. A rigid mender is a straight steel nipple that fits inside the two hose ends to be joined. Clamps secure the hoses to the nipple. Although rigid mendings satisfactorily join the sections, they do introduce a rigid section in the hose which encumbers free travel of the hose on the cart path.

Permanent hose repairs require special equipment. Contact your Valley Dealer for permanent repair of hose or training and use of the special equipment.

Rigid Mender Installation

1. Place the rigid mender between the two sections of hose. See Figure 80-1.
2. Insert the mender halfway into the first hose section. See Figure 80-1.
3. Slide the other hose section into the mender. See Figure 80-1.
4. Secure both hoses onto rigid mender with band clamps. See Figure 80-1.

Flex Joint Hose Replacement

No extra support is needed when changing the flex joint hose. See Figure 80-2.

1. Loosen the band clamps and slide out of way.
2. Remove the old flex joint hose.
3. Insert the new flex joint hose.
4. Position the band clamps and tighten completely.

NOTE

•Position the band clamps so that they do not interfere with the alignment mechanism.

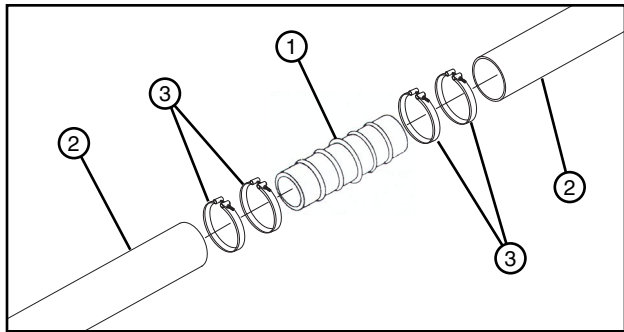


Figure 80-1 1. Rigid Mender
2. Hose
3. Clamp

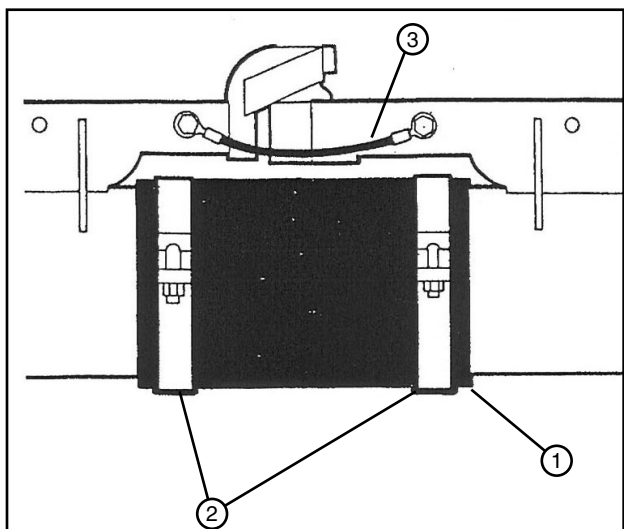


Figure 80-2 1. Flex joint hose
2. Band clamp
3. Bonding ground wire

Bonding Ground Wire

Bonding ground wire **MUST** be installed for proper ground between individual spans. See Figure 81-1.

Above Ground Guidance Cable Adjustment

1. Attach a 40 ft to 50 ft pigtail loop or smooth cable grip to the guidance cable. Attach a 2 ton cable puller to the pigtail loop/cable grip and end post. Use the cable puller to apply approximately 2000 lb of tension to the guidance cable. See Figure 81-1.
2. Take a static measurement of the guidance cable distance from the ground at the halfway point between support stakes. See Figure 81-1.
3. Hook a 0 to 50 lb fish scale on guidance cable at the halfway point between support stakes. See Figure 81-1.

OR

Hang 33 lb of weight in a 5 gallon bucket on the guidance cable at the halfway point between support stakes.

4. Pull the fish scale toward the ground, hold it at 33 lb of tension and measure the deflected height of cable from the ground at the halfway point between support stakes. See Figure 81-1.

OR

Let 33 lb of weight in a 5 gallon bucket hanging on guidance cable, deflect the cable, measure the deflected height of cable from the ground at the halfway point between support stakes.

5. Subtract the deflected measurement from the static measurement. See Figure 81-1.

Static Measurement _____

Deflected Measurement - _____

Guidance Cable Deflection

The guidance cable deflection should be no more than 4 in maximum. If the deflection is more than 4 in apply more tension to guidance cable with cable puller and repeat steps 3 through 5. See Figure 81-1.

6. After setting guidance cable tension, remove slack from guidance cable and attach to the end post with one 3/16 in cable thimble and three 3/16 in cable clamps. Remove cable puller and pigtail. See Figure 81-1.

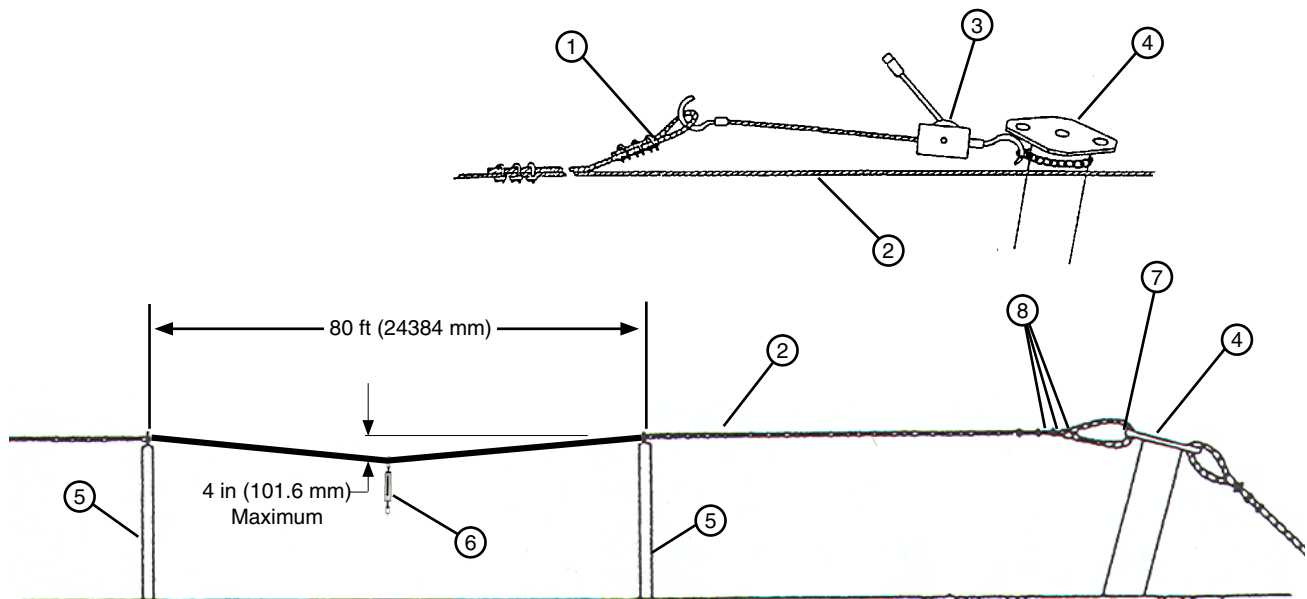


Figure 81-1 1. Pigtail Loop or Smooth Cable Grip 5. Support Stake
 2. Guidance Cable 6. Fish Scale
 3. Cable Puller 7. 3/16 in Cable Thimble
 4. End Post 8. 3/16 in Cable Clamp

MAINTENANCE

Span Safety Box Cable Tension Adjustment

1. Check safety cable tension.

Use a truss spreader part number 9360055 to check the cable tension. The truss spreader is 115 in (292 cm) long and weighs 23.4 lb (10.6 kg).

2. Position the truss spreader across the safety cables at approximately 58 in (147 cm) from the alignment mounting bracket. See Figure 82-1.
3. Hold and support the truss spreader across the safety cables and measure the distance from the truss spreader to the span pipe. This is the ORIGINAL measurement. See Figure 82-1.

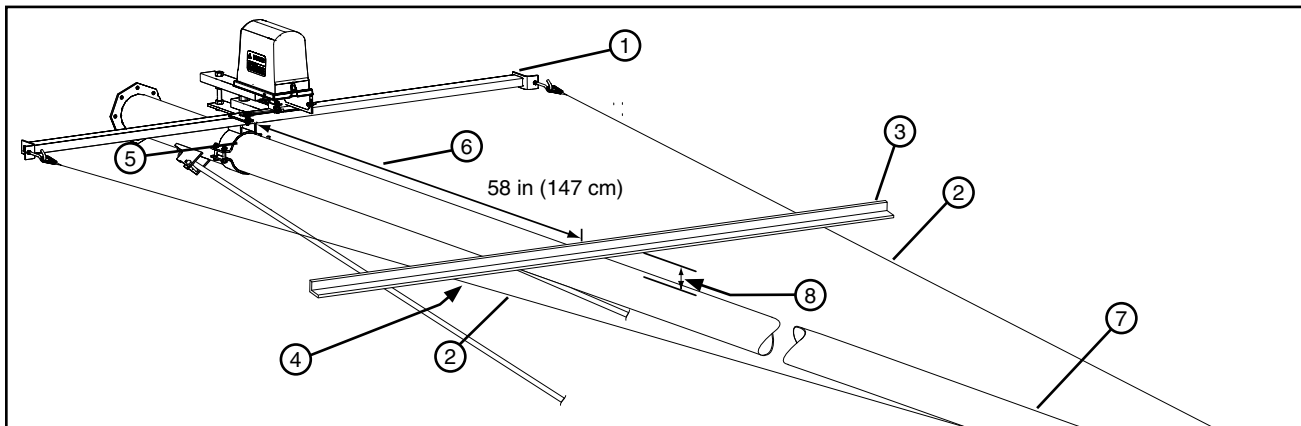


Figure 82-1 1. T-bar
2. Safety Cable
3. Truss Spreader
4. Support Truss Spreader so Span Cables Do Not Deflect
5. Alignment Mounting Bracket
6. 58 in (147 cm)
7. Span Pipe
8. Original Measurement

4. Lower the spreader angle onto the safety cables and allow the safety cables to support the full weight of spreader angle.
5. Measure the distance from the spreader angle to the span pipe. This is the DEFLECTED measurement.

The full weight of the spreader angle should deflect the safety cables downward approximately 1-3/4 in to 2 in (41 mm to 51 mm) when the DEFLECTED measurement is compared to the ORIGINAL measurement. Adjustment of deflection is made at the fixed end cable mount hook bolts. See Figure 82-2.

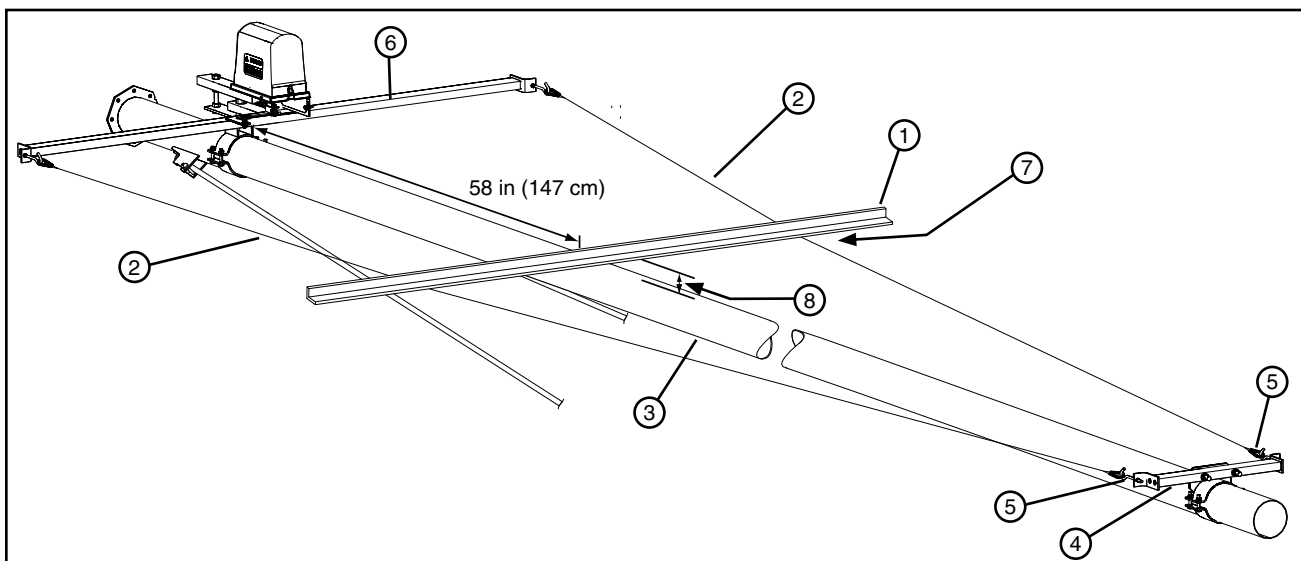


Figure 82-2 1. Spreader Angle
2. Safety Cable
3. Span Pipe
4. Fixed End Cable Mount
5. Hook Bolt
6. T-bar
7. Refer to Step 5
8. Deflected Measurement

Span Safety Box Cable Adjustment

1. Adjust the fixed end cable mount hook bolts until both the proper deflection of safety cable is achieved and the T-bar is perpendicular (90 degrees) to the span pipe. See Figure 83-1.
2. After adjustment, tighten all hook bolt hardware completely.

Side Inlet Elbow Adjustment

To insure that the swivel inlet elbow works correctly when the machine is reversed the inlet elbow angle must be angled away from the cart at approximately 10 degrees. See Figure 83-2.

To adjust the side inlet elbow angle do the following:

1. Loosen jam nuts on 1/2 in x 3 in cap screw at each stop bracket.
2. Set the side inlet elbow in one direction so that it angles away from the cart at approximately 10 degrees.
3. Adjust 1/2 in x 3 in cap screw until the head contacts the stop tab on inlet elbow, then tighten the jam nuts.
4. Repeat steps 2 and 3 for the other direction.

Electric Primer Maintenance

- The Vacuum Pump requires occasional flushing. Remove the pressure gauge and run 1/4 cup of flushing solvent (GAST AH225 or equivalent) through the pump. See Figure 83-3.
- If the pump fails to produce a vacuum when it is first turned on, a brief warm-up may free the blades and restore the normal function.
- LUBRICATION: The automatic bearing oiler should be refilled as needed with a high detergent automotive engine oil with a viscosity equivalent to SAE 10W or less. See Figure 83-3.
- AIR FILTER: Clean the air filter regularly. Remove air filter from its holder and wash thoroughly in solvent and let dry completely, then re-install air filter in its holder. Replace air filter every year. See Figure 83-3.
- CONNECTIONS: Be sure all connections between primer pump and centrifugal pump are tight.

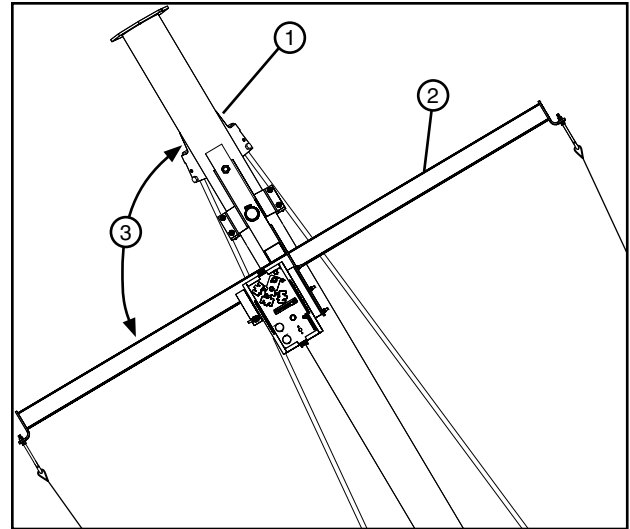


Figure 83-1 1. Span Pipe 2. T-bar 3. 90 Degrees

* T-bar must be perpendicular to span pipe after adjusting safety cables.

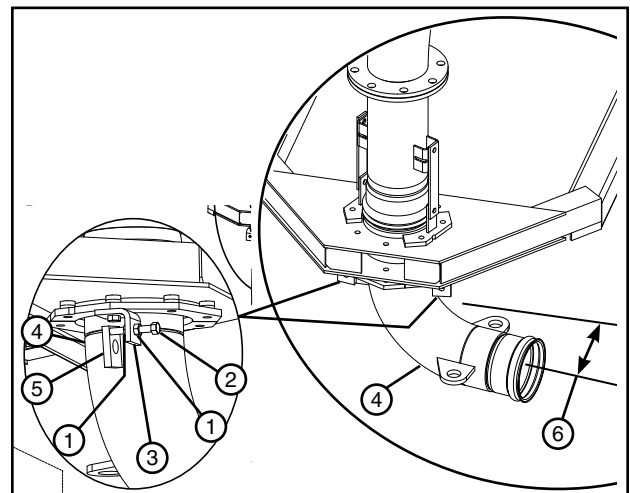


Figure 83-2 1. Jam Nut 2. 1/2 x 3 Cap Screw 3. Stop Bracket 4. Side Inlet Elbow 5. Stop Tab 6. 10 Degrees

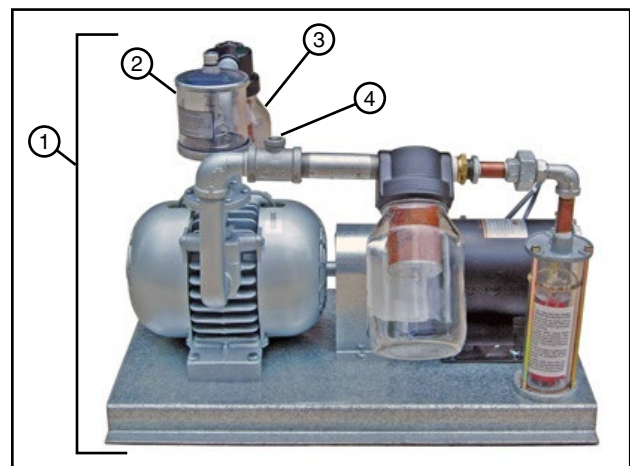


Figure 83-3 1. Electric primer pump 2. Bearing Oiler 3. Air Filter 4. Shown without vacuum gauge

MAINTENANCE

Machine Alignment

The machine is initially aligned when it is installed. However, for various reasons it may become necessary to adjust the alignment.

⚠ WARNING

•DO NOT ALIGN THE MACHINE WHEN THERE ARE ESTABLISHED WHEEL TRACKS. WHEEL TRACKS MUST BE REMOVED BEFORE ALIGNING THE MACHINE TO REDUCE THE POSSIBILITY OF STRUCTURAL DAMAGE.

Alignment should be checked annually and adjusted before there are wheel tracks.

Alignment is an important factor in the operation of the machine. A misaligned machine develops very high stresses which could cause structural damage and reduce expected motor and gearbox life.

A leading bow creates extreme tension or linear pulling force over the entire machine. See Figure 84-1.

A trailing bow creates extreme compressing or linear pushing force on the entire machine. When the spans are compressed, they lose their inherent strength. See Figure 84-1.

⚠ WARNING

•A TRAILING BOW IN EITHER DIRECTION IS NEVER ACCEPTABLE AND MAY RESULT IN SEVERE STRUCTURAL DAMAGE.

NOTE

•If the irrigation machine is operated in forward and reverse, a leading bow in one direction becomes a trailing bow in the other direction. Therefore, such a machine should be aligned to operate in as straight a line as possible.

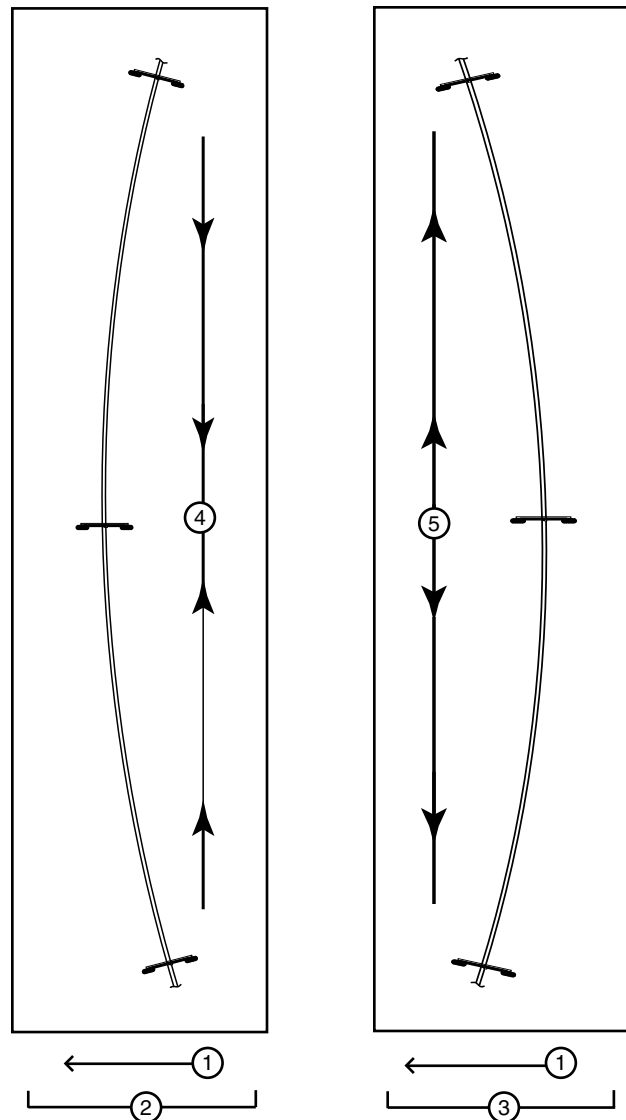


Figure 84-1 1. Direction of Travel
2. Leading Bow
3. Trailing Bow

4. Direction of Pulling
5. Direction of Pushing

MAINTENANCE

Machine Alignment

Tower Alignment - Three Tower Method

The three tower alignment method is used to identify towers that start or stop in a position that is either leading or trailing in relationship to the other two towers.

This procedure works best with two people:

- One person at tower 1 sighting the tower alignment.
 - One person at tower 2 adjusting the alignment.
1. At the control panel, set the percent timer at 50% and start the machine in either the forward or the reverse direction.
 2. Begin the alignment procedure from an end tower. Identify the first three towers as 1, 2, and 3. Use towers 1 and 3 to align tower 2. See Figure 85-1.
 3. Sight an imaginary center line between the center of the tower drive motor 1 to the center of the tower drive motor 3. See Figure 85-1.
 4. Observe the movement of the tower drive motor 2. It should start and stop equal distances from the imaginary center line. See Figure 85-1.
If it does not, the alignment linkage at tower box 2 needs to be adjusted.
 5. If adjustments are necessary, stop the machine and make adjustments using the Floating or Modified Alignment Adjustment procedures, located in the Adjustments Section of this manual.

CAUTION

•ADJUSTMENTS TO THE CENTER TOWERS CAN CAUSE THE SYSTEM TO GO INTO A STEER. AFTER ADJUSTING THE ALIGNMENT WAIT FOR THE SYSTEM TO CYCLE TWICE BEFORE MOVING ON TO THE NEXT TOWER.

6. After tower 2 is aligned, move in to the next tower and repeat steps 3, 4, and 5 of this procedure.
Continue this process to the other end of the machine.

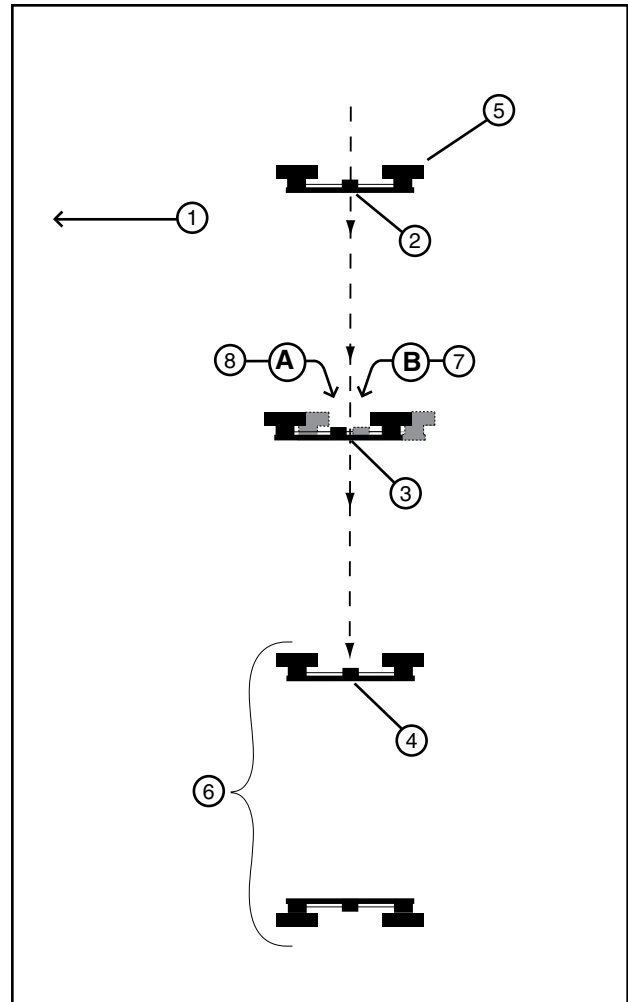


Figure 85-1 1. Direction of Travel 5. End Tower
2. Tower 1 6. Free Standing Span
3. Tower 2 7. Start
4. Tower 3 8. Stop

MAINTENANCE

Machine Alignment Floating Alignment Adjustment

When a machine is equipped with floating alignment the tower box is located on the yoke and tower box support with a mechanical linkage between the tower box switch pivot arm and the yoke control rod. See Figures 86-1 and 86-2.

NOTE

•All adjustments shown are made from the tower box side of drive unit.

1. Adjust nuts #1 and #2 as needed. Refer to Figures 86-2 and 86-3.

CAUTION

•NEVER ADJUST NUTS #1 AND #2 MORE THAN 1/4 TURN AT ONE TIME.

•ALWAYS RE-TIGHTEN THE JAM NUTS AND ALLOW THE TOWER TO CYCLE TWICE (START AND STOP) TO DETERMINE IF THE TOWER IS STILL LEADING OR TRAILING.

2. Adjust nuts #1 and #2 until the tower is in alignment.
3. Continue the Three Tower Method of alignment down the entire length of the machine making adjustments as necessary to individual towers.



Figure 86-1

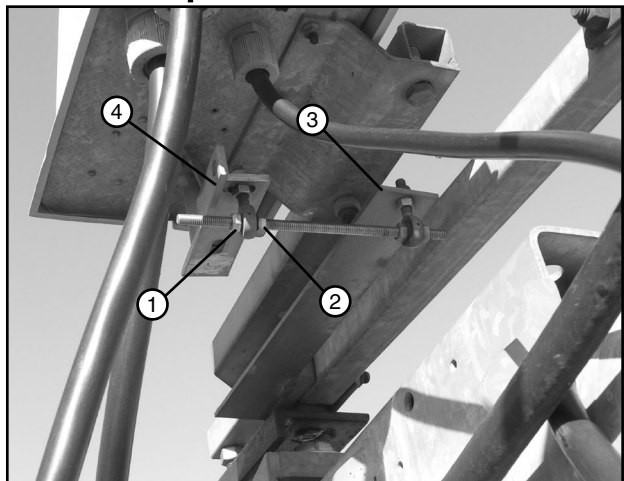


Figure 86-2 1. Nut 2. Nut 3. Yoke Control Rod 4. Switch Pivot Arm

ADJUSTMENT CHART

Direction of travel	Condition	Adjust Nuts
Forward	Leading Bow	**Counter-clockwise
	Trailing Bow	*Clockwise
Reverse	Leading Bow	*Clockwise
	Trailing Bow	**Counter-clockwise

Figure 86-3 * Clockwise - Adjust the nut further onto the threaded rod.

** Counter-clockwise - Back the nut off the threaded rod as if removing it.

Machine Alignment

Floating Alignment Cable Tension Adjustment

1. The alignment tube must be able to move up and down freely while adjusting cable tension.

If necessary loosen the cap screw until the alignment tube moves up and down freely. See Figure 87-1.

2. Measure the distance from the end of the alignment tube down to the pipe. This is the pre-weight measurement. See Figure 87-2.
3. Place a 13 lb (5.9 kg) weight on the alignment tube. Center the weight over the cable attachment assembly. See Figure 87-3.

A standard 7/8 in (22.2 mm) square driveshaft 60 in (1524 mm) long weighs approximately 13 lb (5.9 kg).

4. Measure the distance from the end of the alignment tube to the span. This is the weighted measurement. See Figure 87-3.

Subtract the weighted measurement from the pre-weight measurement. The remaining dimension is the amount of cable deflection. The cable deflection should be 1-1/4 in (32 mm).

5. Adjust the hook bolts evenly to obtain the proper cable deflection. See Figure 87-3.

To insure equal tension in the cables, make sure the alignment tubes attached to the cables are aligned with the span.

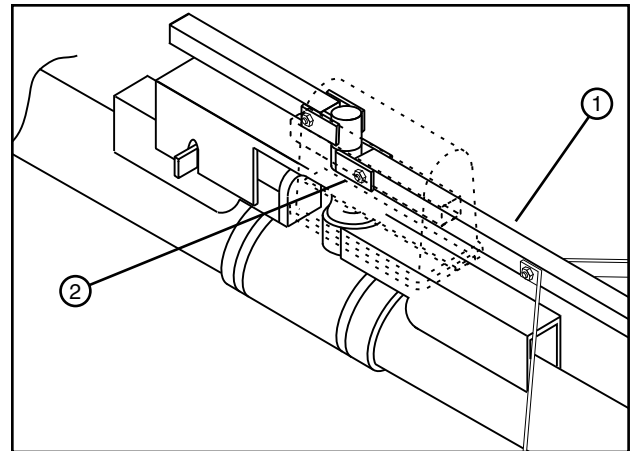


Figure 87-1 1. Alignment Tube
2. Cap Screw

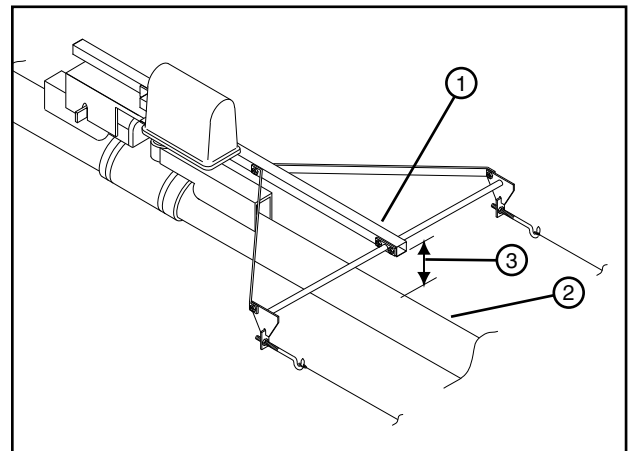


Figure 87-2 1. Alignment Tube
2. Span
3. Pre-weight Measurement

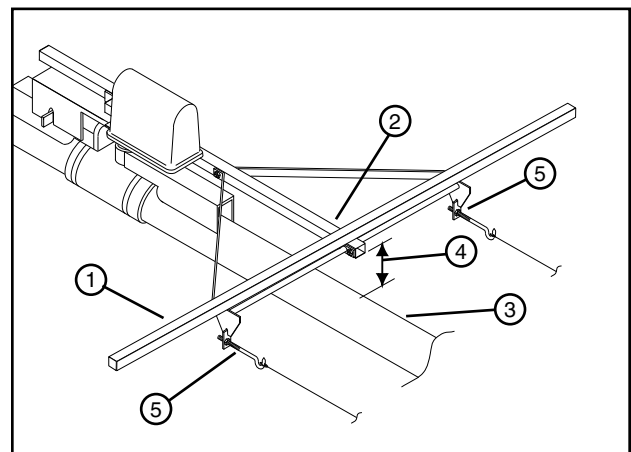


Figure 87-3 1. Weight 4. Weighted Measurement
2. Alignment Tube 5. Hook Bolt
3. Span

MAINTENANCE

Machine Alignment

Modified Alignment Adjustment

When a machine is equipped with modified alignment the tower box is located on the side of the tower with a mechanical linkage between the tower box and the control bar.

NOTE

•All adjustments shown are made from the tower box side of drive unit.

1. From the tower box side of drive unit, loosen the jam nut at each end of the connection rod. See Figures 88-1 and 88-2.
2. To adjust the distance between the control bar and the switch pivot arm, rotate the connection rod clockwise or counter-clockwise no more than 1/8 of a turn at one time. See Figures 88-1 and 88-2, and the adjustment chart below.

ADJUSTMENT CHART

Direction of travel	Condition	Adjust Nuts
Forward	Leading Bow	**Counter-clockwise
	Trailing Bow	*Clockwise
Reverse	Leading Bow	*Clockwise
	Trailing Bow	**Counter-clockwise

* Clockwise - From the tower box side of the drive tower, rotate the connection rod clockwise to increase the distance between the control bar and the switch pivot arm.

** Counter-clockwise - From the tower box side of the drive tower, rotate the connection rod counter-clockwise to decrease the distance between the control bar and the switch pivot arm.

CAUTION

- NEVER ADJUST THE CONNECTION ROD MORE THAN 1/8 OF A TURN AT ONE TIME.
- ALWAYS RE-TIGHTEN THE JAM NUTS AND ALLOW THE TOWER TO CYCLE TWICE (START AND STOP) TO DETERMINE IF THE TOWER IS STILL LEADING OR TRAILING.

3. Adjust the connection rod until the tower is in alignment.
 - Sensitivity can be adjusted by repositioning the connection rod. See Figure 88-3.
4. Continue the Three Tower Method of alignment down the entire length of the machine, make adjustments as necessary to individual towers.



Figure 88-1 1. Tower Box Side of Drive Unit

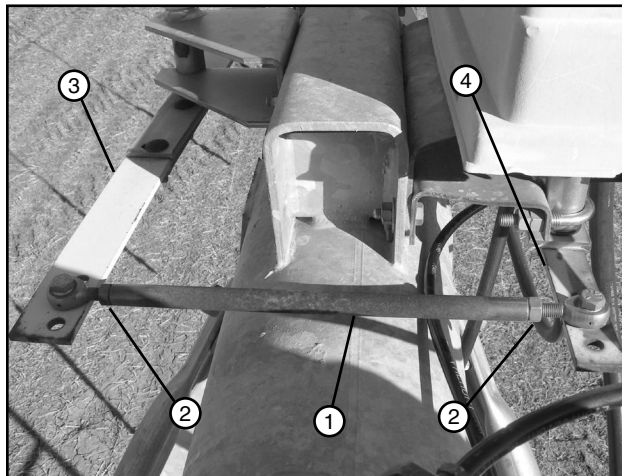


Figure 88-2 1. Connection rod 2. Jam nut 3. Control bar 4. Switch pivot arm

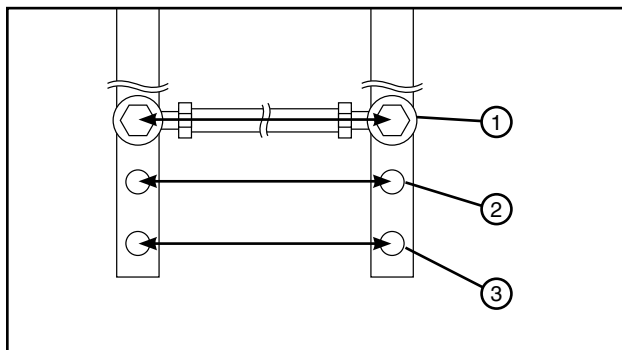


Figure 88-3 Connection Rod Sensitivity
1. Position 1 - Most Sensitive
2. Position 2 - Less Sensitive
3. Position 3 - Least Sensitive

MAINTENANCE

Span Flushing Procedure

The purpose of flushing the machine is to remove sand and debris from the pipeline. Excessive accumulation of sand in the machine also adds weight and can cause structural damage to the machine.

The Flushing Process Should Be Performed:

- After system installation.
- After pump repair.
- After structural repair.
- Seasonally - prior to operating the system and after the operating season is over.
- As often as necessary according to debris or sand content in the water. Excessive sprinkler problems (clogging) could be an indication of high debris or sand content.

NOTE

- Excessive sprinkler problems (clogging) could be an indication of high debris or sand content.

DANGER

- DO NOT START THE FLUSHING PROCEDURE WHILE THE SYSTEM IS UNDER WATER PRESSURE. REMOVING SAND TRAP PLUGS WHILE THE SYSTEM IS UNDER PRESSURE MAY CAUSE PERSONAL INJURY OR DEATH.

1. Turn the pump is off and make sure machine is completely drained.

DANGER

- BE AWARE OF HIGH WATER PRESSURE. TURN OFF THE PUMP AND ALLOW THE MACHINE TO DRAIN COMPLETELY BEFORE REPAIRING OR PERFORMING MAINTENANCE TO THE MACHINE.

2. Turn the control panel main disconnect switch off. Only water is required for this procedure - the machine does not need to run.

Follow the MINIMAL LOCKOUT/TAGOUT PROCEDURE located in the SAFETY section of this manual and do the following:

- (a) SHUT OFF and LOCK the public power service disconnect to the irrigation machine. FILL OUT the blue (OSHA safety color code) tag and attach to the disconnect after locking. See Figure 89-1.
- (b) SHUT OFF and LOCK the control panel main power disconnect. FILL OUT the blue (OSHA safety color code) tag and attach to the disconnect after locking. See Figure 89-2.

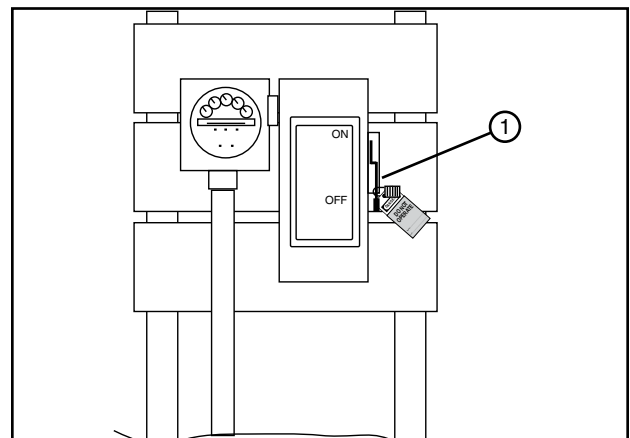


Figure 89-1 1. Public Power Service Disconnect

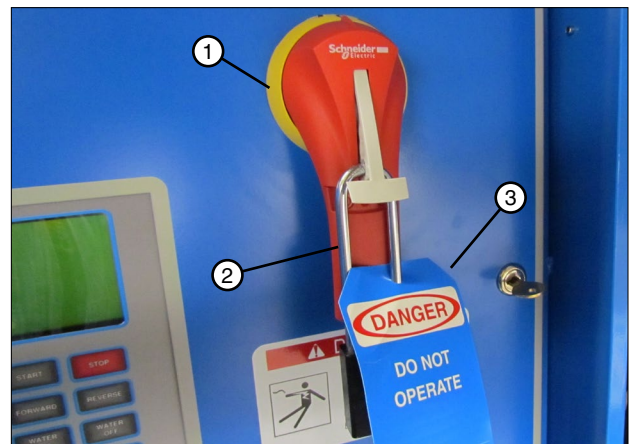


Figure 89-2 1. Main Disconnect
2. Lock
3. Blue OSHA Tag

MAINTENANCE

Span Flushing Procedure

3. Remove the pipe drains at each drive unit tower. Clean sand and foreign particles from these drains. Turn the rubber drain seal over when reinstalling. See Figure 90-1.

NOTE

•The rubber drain seals should be turned over when being reinstalled. This practice helps to increase the seal life.

4. Remove and clean the sand trap at the last regular drive unit. See Figure 90-2.
5. Remove plugs from the overhang drains. Clean sand and foreign particles from these drains. Turn the rubber drain seal over when reinstalling. See Figure 90-3.
6. Start the pump and allow the machine to flush thoroughly.
7. Turn off the water supply and re-install the pipe drains, sand trap and overhang plugs.

NOTE

•After flushing for winterization, ensure the water has been allowed to drain completely before replacing the pipe drains and plugs to prevent freezing and splitting of the pipeline.

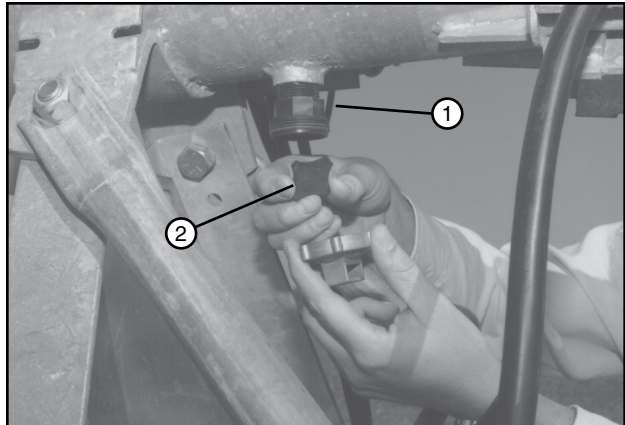


Figure 90-1 1. Pipe Drain
2. Rubber Seal

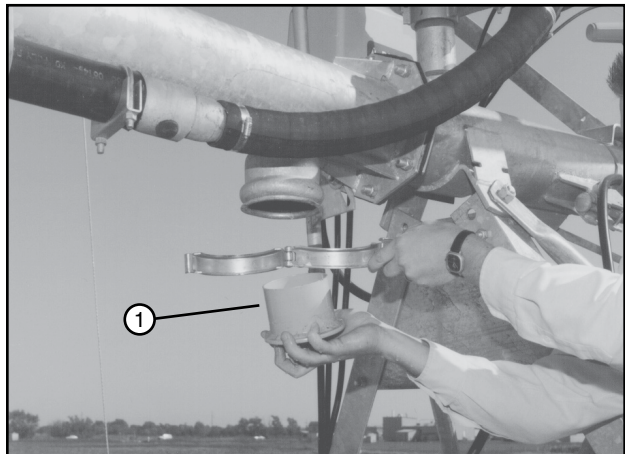


Figure 90-2 1. Sand Trap

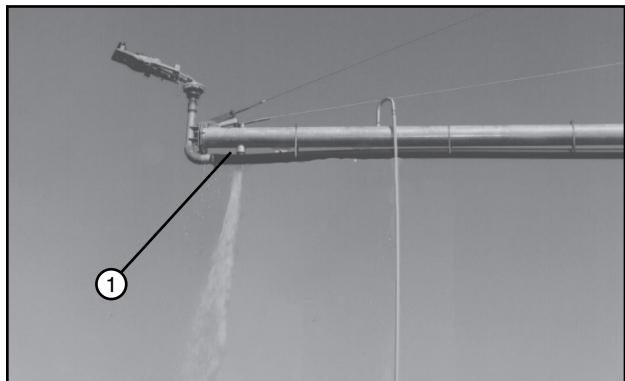


Figure 90-3 1. Overhang Drain

MAINTENANCE

Span Flushing Procedure

8. If the machine is equipped with an end gun:
 - Make sure the booster pump hose drain is not plugged with sand or debris and the hose is completely drained. See Figure 91-1.
 - Clean the end gun shut off solenoid valve cross filter or optional dirty water filter. See Figures 91-2 and 91-3.
 - Clean the water shut off valve external filter. See Figure 91-4.

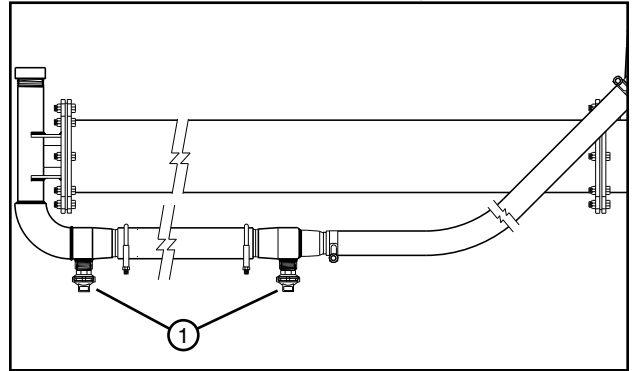


Figure 91-1 1. Booster Pump Hose Drain

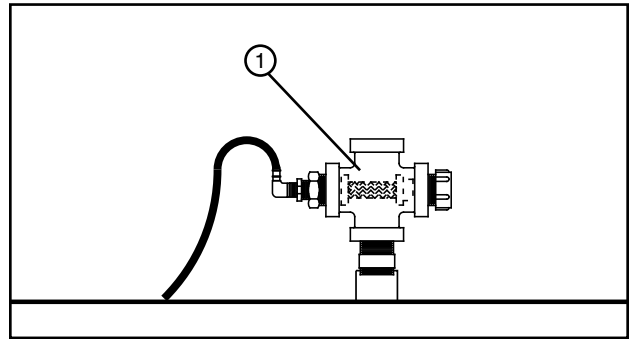


Figure 91-2 1. Cross Filter

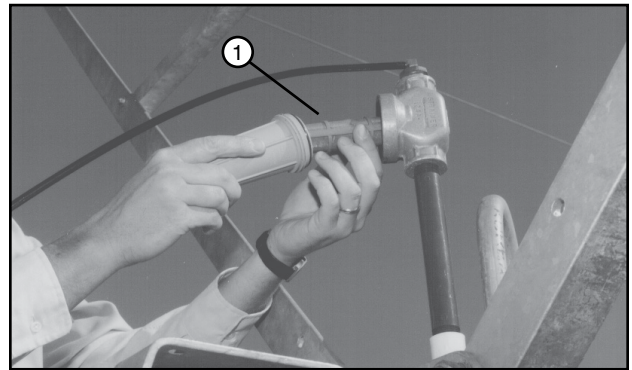


Figure 91-3 1. Optional Dirty Water Filter



Figure 91-4 1. Water Shut Off Valve
2. External Filter

MAINTENANCE

Winterization

In regions where the temperature during the winter months will drop below 40°F (4°C) and/or the growing season is 6 months or less, the irrigation machine must be winterized.

- Flush and drain the irrigation machine and all plumbing components as specified in the flushing procedure section. After flushing for winterization, ensure the water has been allowed to drain completely from all drains and plumbing components before replacing drains and plugs to prevent freezing and splitting of the pipeline.
- All underground pipe **MUST** be drained below the frost line. When drainage is complete, re-install all plugs to prevent rodent infestation.
- Perform all post-season maintenance as specified in the recommended maintenance section.
- Winterize auxiliary equipment such as pumps, power units, mainline pipes and hoses according to the auxiliary equipment manufacturers recommendations.

Parking the Machine

The metal in the irrigation machine will expand and contract with variances in temperature. When the machine is being operated, this poses no threat. However, if the machine is parked in the wheel tracks which were created during the year, shrinking due to the contraction of the metal could cause structural damage.

The possibility of structural damage due to metal contraction increases as the machine length increases. Machines which are 1500 ft (457 m) or longer are susceptible to these stresses, especially where extreme temperature variances occur (90°F (32°C) down to -0°F (-17°C)) and when wheel tracks are present.

To reduce the possibility of structural damage due to expansion and contraction of the metal, the operator should consider one of the following methods when parking the machine in the off season:

1. Park the machine in an area where the wheel tracks have been eliminated.
2. Place wooden 2 in x 12 in planks over the wheel tracks. Park the machine with the tires on the center of the planks.
3. Towable Drive Units – Place every third drive unit's wheels in the tow position.
4. Remove all wheel tracks and run the machine dry (without water) for approximately 100 yards (92 m) to 200 yards (183 m) monthly. Only run the pivot if the temperature is above 40°F (4°C).
5. If an irrigation machine has more than 8 spans of 10 in (254 mm) pipe, the spans must be disconnected. Each span should be supported off the end of the previous span with chains to allow for contraction during cold weather.

Contact your Valley dealer for other winter storage/parking information and tips.

Off Season Storage of Hose

Never leave the hose laying in the field during the winter. The hose can be easily covered by snow, mud, or dust and can quickly become damaged by farm equipment. Driving over the top of the hose can cause damage. Since some hoses contain PVC or rubber, extended exposure to sunlight can lead to cracking or checking problems.

After the final irrigation pass of the season, purge the hose of any remaining water.

Store the hose in a protected area where it will be sheltered from the weather and safe from livestock and rodents. Store the hose away from gas or diesel fuels, contaminants, transformers, and welding areas that can produce ozone.

Off Season Storage of Electric Cord

Never leave the electric cord laying in the field during the winter. The electric cord can be easily covered by snow, mud, or dust and can quickly become damaged by farm equipment. Driving over the electric cord can cause damage.

After the final irrigation pass of the season, shut off power and disconnect electric cord plug from power receptacle. Install cap on plug and carefully coil and hang electric cord on machine.

MAINTENANCE

Recommended Maintenance

Part Replacement

If replacement parts are needed, use only genuine VALLEY REAL PARTS.

Regular Maintenance

Time, humidity, vibration, temperature, sand, and machine operation all contribute to wear on your VALLEY irrigation machine. To keep the machine operating properly with a minimum amount of down time, establish a regular preventative maintenance program using the recommended maintenance charts in this section.

Linear Machine						
	Pre season	1st Pass	4th Pass	Mid season	Post season	Remarks
Check all nuts and bolts. Tighten as required.	X			X		
Check anchor bolts and chains.	X			X		
Check equipment grounding conductors. Tighten or clean as required.	X			X		
Check condition of all power supply conduit and wires.	X			X		Replace or repair any broken conduit or wire with cracked insulation.
If applicable, check collector ring base drain for proper drainage.	X			X		
Visually check pivot contacts for evidence of arcing.	X				X	Burned or pitted contact points indicate low voltage. If using a generator, check belts for proper tension.
Drain riser assembly.					X	
Check placement of screens on generator, pump panel, and electric motors (used to prevent rodent damage).	X				X	
Check tire pressure.	X			X	X	See the TIRE PRESSURES in the MAINTENANCE SECTION.
Check condition of electrical conductor.	X				X	Replace if frayed, worn or weather checked.
Lubricate 10 grease fittings on swing around cart bearing tube and swivel yoke.	X			X	X	Lubricate after every 5 passes.

Span						
	Pre season	1st Pass	4th Pass	Mid season	Post season	Remarks
Check all nuts and bolts. Tighten as required.	X			X		
Check flanges for leaks and tighten as required.	X			X		
Check pipe drains for proper drainage. Clean as required.	X			X		
Check structural components for tightness.	X			X		
Check span cable for damage.	X			X		Replace or repair cable if chaffed or weather checked.
Check span cable for proper banding.	X			X		Replace bands and adjust span cable as required.

MAINTENANCE

Recommended Maintenance

Sprinkler						
	Pre season	1st Pass	4th Pass	Mid season	Post season	Remarks
Check the water pressure to make sure it matches the sprinkler package pressure.	X		X	X		
Check sprinklers and nozzles for tightness.	X			X		
Check spray nozzles for pumping air or the pump is hard to prime.	X			X		Check for vacuum leaks at the suction inlet.
Check sprinkler for free movement.	X			X		
Check sprinkler nozzles for wear.	X		X	X		
Check pressure gauge or pressure transducer for proper operation.	X			X		
Check for plugged or partially plugged nozzles.	X	X	X	X		Clean as required.
Flush entire machine.	X				X	See the FLUSHING PROCEDURE in the MAINTENANCE SECTION.
Check end gun bearing and brake setting.	X				X	

Alignment						
	Pre season	1st Pass	4th Pass	Mid season	Post season	Remarks
Check all nuts and bolts.	X			X		Tighten as required.
Check connection of grounding bond jumpers.	X			X		
Check all safety switches for proper operation.						As required.
Check surge suppressor connection.	X					
Visually check alignment of machine.	X			X	X	DO NOT adjust if wheel tracks have been established.
Check the cable tension - floating alignment.	X					
Check the alignment tube for vertical motion.	X					
Check the alignment tube for horizontal motion on the stainless steel shaft	X					
Check the cross bar tube for motion on the stainless steel shaft.	X					
Check the ball joints for freedom of movement.	X					
Check for cap over modified alignment control rod cotter key and washer.	X					Replace cap if missing.

MAINTENANCE

Recommended Maintenance



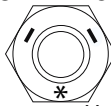
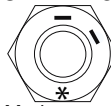
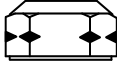
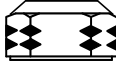

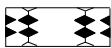
Overhang, End Gun and Booster Pump						
	Pre season	1st Pass	4th Pass	Mid season	Post season	Remarks
Check overhang cables for broken cable strands.	X			X		
Check the end gun drain.	X			X	X	Clean as required.
Check the sand trap.				X	X	Clean as required.
Check the end gun arc settings.	X			X		Refer to sprinkler chart.
Check the end gun bearing and brake.	X			X		
Check the end gun nozzle for wear.	X					
Drain the booster pump and booster pump hose.					X	See WINTERIZATION in MAINTENANCE SECTION.

Drive Unit						
	Pre season	1st Pass	4th Pass	Mid season	Post season	Remarks
Check the water and flex joint hose for leaks.	X			X		Tighten clamps or replace as required.
Check the motor lead cable for damage.	X			X		Replace if outer insulating sheath is cracked.
Check for proper ground connection on motor and motor lead.	X			X		
Check the motor drain hole for proper drainage.	X			X		
Check the center drive gearbox lubricant and drain moisture.	X				X	See the CENTER DRIVE GEARBOX in the MAINTENANCE SECTION.
Change the center drive gear box lubricant.	X					Change after the first season and then change every third season thereafter.
Check the center drive gearbox seals and gaskets.	X					
Check the wheel gearbox lubricant level and drain moisture.	X				X	See the WHEEL GEARBOXES in the MAINTENANCE SECTION.
Change the wheel gearbox lubricant.	X					Change after the first season and then change every third season thereafter.
Check the drive shaft U-joints.	X					
Check the U-joint and drive shaft covers for damage.	X					Replace as required.
Check the wheel lug nut torque.	X				X	Tighten to 125 ft lb (169 N-m) torque.
Check the tire pressure.	X			X	X	See the TIRE PRESSURES in the MAINTENANCE SECTION.
Clean the wheel gearbox vent hole in expansion chamber.	X		X	X	X	Vent hole must be kept open to extend the wheel gearbox seal life.
Check the ARAS/EOFS arms for proper operation.	X			X		

MAINTENANCE

Recommended Maintenance

Ancillary Equipment						
	Pre season	1st Pass	4th Pass	Mid season	Post season	Remarks
Perform all maintenance as required or recommended by the ancillary equipment manufacturer.	X	X	X	X	X	Refer to the ancillary equipment owner's manual or manufacturer for required or recommended maintenance and service intervals.

Hardware Identification - SAE Grade - Inch Size					
CAP SCREW		NUT		LOCKNUT	
GRADE 5	GRADE 8	GRADE 5	GRADE 8	GRADE B	GRADE C
					
		* Vendor's Mark		Use With Grade 5 Screw	Use With Grade 8 Screw
					

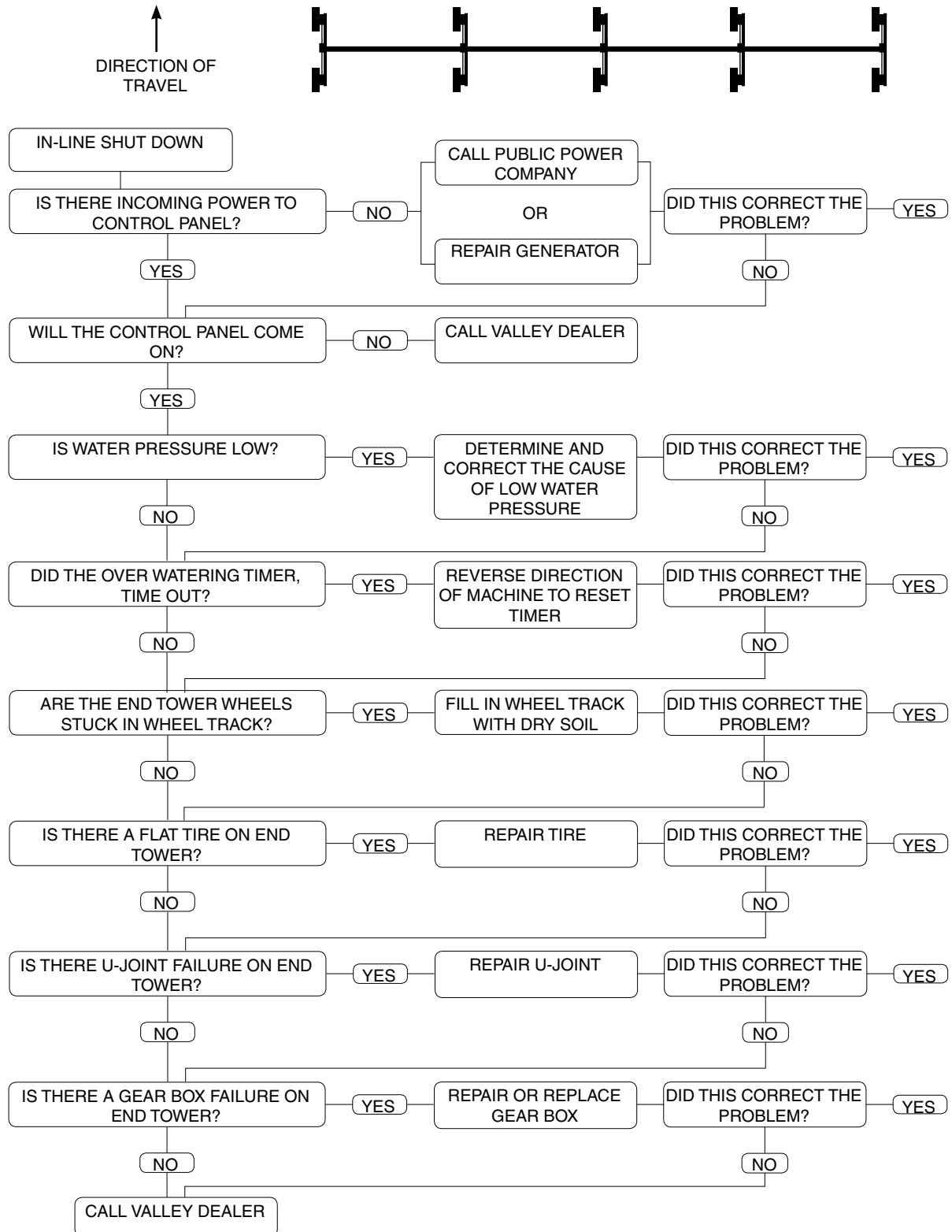
Torque Chart - Hex Head Cap Screws								
SIZE INCH	GRADE 5				GRADE 8			
	ACCEPTABLE RANGE		ACCEPTABLE RANGE		ACCEPTABLE RANGE		ACCEPTABLE RANGE	
	lb-ft	lb-ft	N·m	N·m	lb-ft	lb-ft	N·m	N·m
1/4	9	8-9	12	11-12	12	11-13	16	15-17
5/16	18	16-19	24	22-25	25	22-27	34	30-36
3/8	31	28-33	42	38-44	43	39-47	58	53-64
7/16	49	44-53	66	60-71	69	63-75	94	85-101
1/2	75	68-81	102	92-109	106	96-115	144	130-156
9/16	108	98-117	146	133-158	152	139-166	206	188-225
5/8	149	135-162	202	183-219	210	191-229	285	259-310
3/4	264	240-297	358	325-402	372	338-406	504	458-550
7/8	426	387-464	577	525-629	601	546-655	815	740-888
1	637	579-695	863	785-942	900	818-982	1220	1109-1331

Critical Torque Applications				
	GRADE 5		GRADE 8	
	lb-ft	N·m	lb-ft	N·m
SPANS & DRIVE UNITS				
Hitch ball bolts	750	1016.8	1050	1423.6
Wheel lug nuts	125	169.4		

TROUBLESHOOTING

In-Line Shut Down

In-line shut downs typically occur because of a failure in one or more of the following areas: power source, machine controls, or end tower. Use the flow chart below to determine if the in-line shut down was due to a mechanical failure. Refer to the operation pages of this section or the control panel Owners Manual for other TROUBLESHOOTING information.



TROUBLESHOOTING

Tower Ahead Shut Down

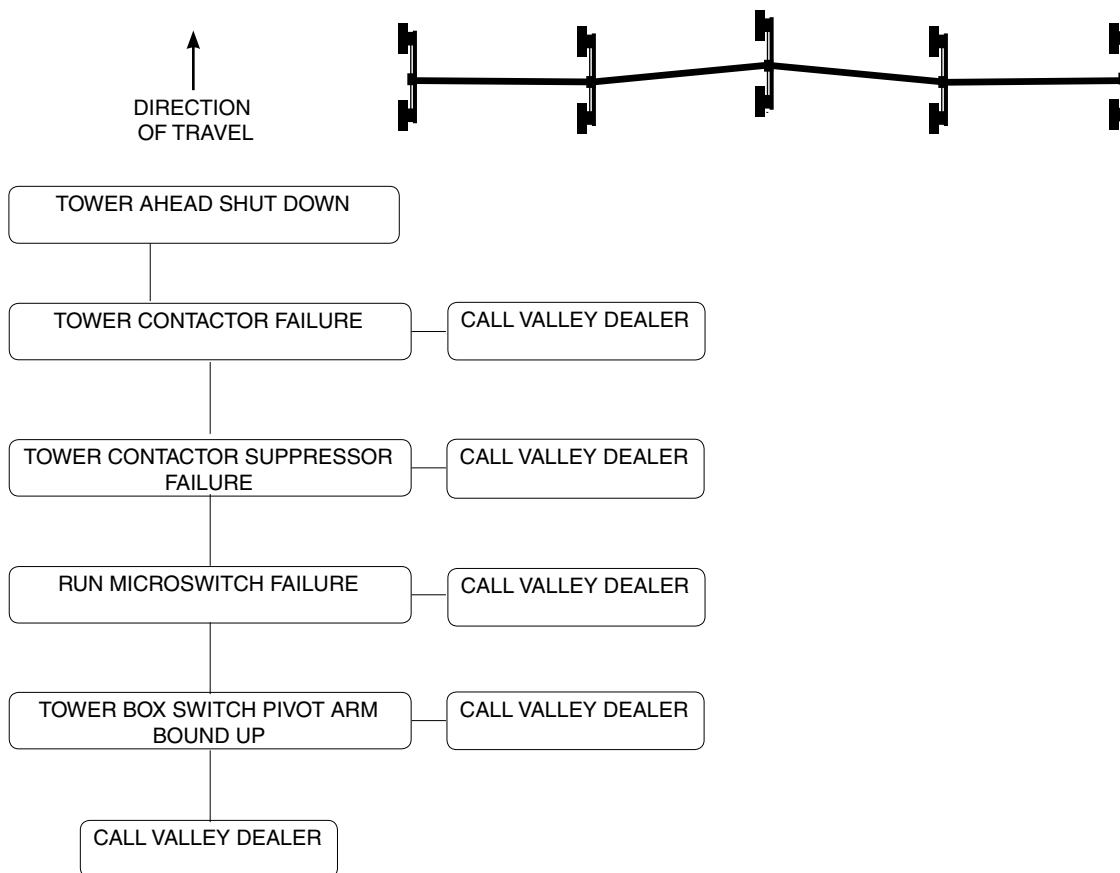
In a tower ahead shut down, the tower which is out of line and the farthest ahead fails to shut off and breaks the safety circuit.



WARNING

- TO REDUCE THE POSSIBILITY OF STRUCTURAL DAMAGE, NEVER REVERSE THE DIRECTION OF TRAVEL AFTER A TOWER AHEAD SHUT DOWN. AFTER MACHINE IS REPAIRED, ALWAYS OPERATE IN THE SAME DIRECTION OF TRAVEL AS BEFORE THE SHUT DOWN. WHEN THE MACHINE COMES BACK INTO ALIGNMENT THE DIRECTION CAN BE CHANGED.

Tower ahead shut downs typically occur because of a component failure in the tower box. Some causes of tower ahead shut downs are shown below. Call your Valley Dealer to diagnose and repair a tower ahead shut down. Refer to the operation pages of this section or the control panel Owners Manual for other TROUBLESHOOTING information.



TROUBLESHOOTING

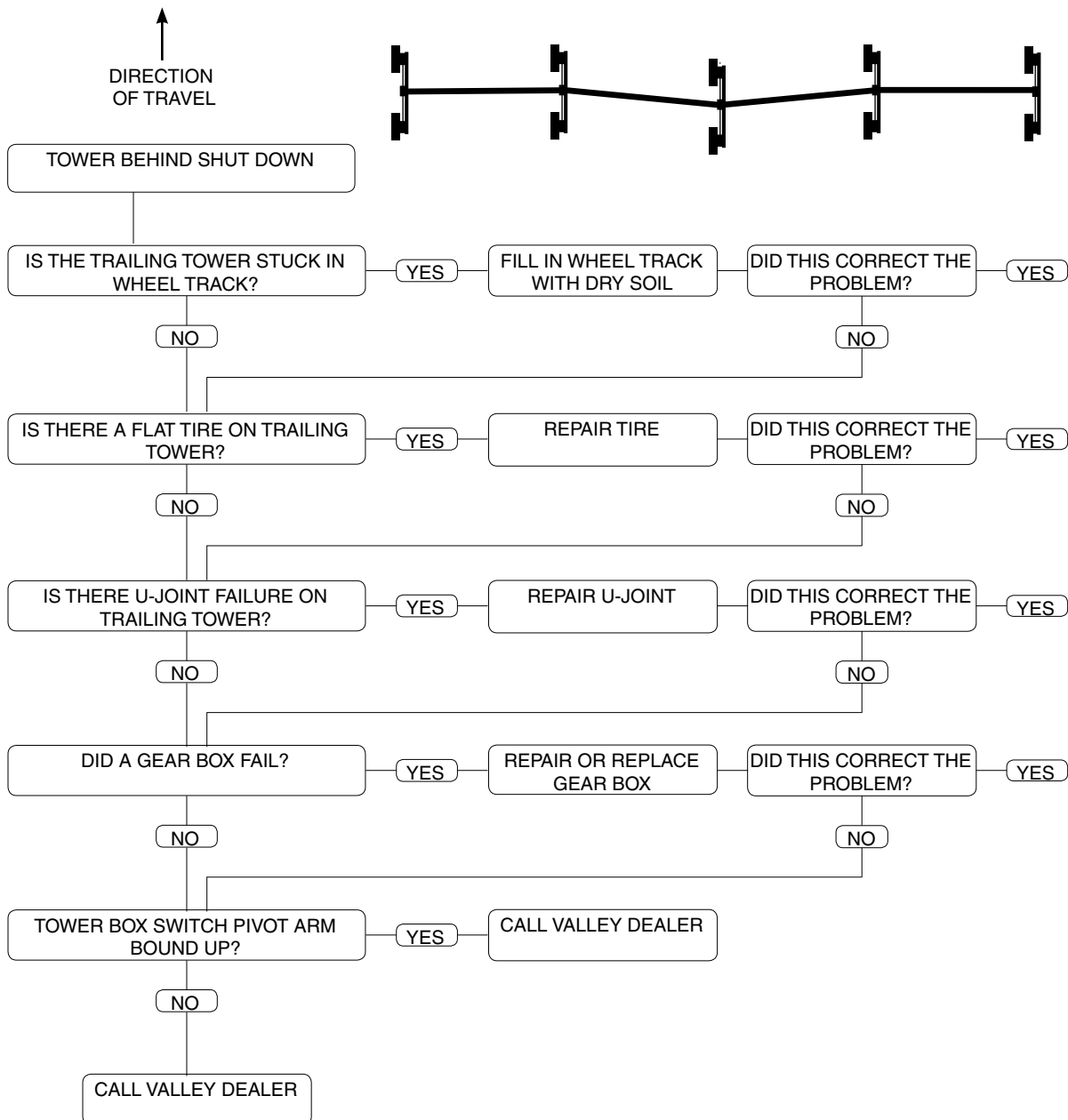
Tower Behind Shut Down

In a tower behind shut down, the tower which is out of line and the farthest behind, fails to run and breaks the safety circuit.

WARNING

•TO REDUCE THE POSSIBILITY OF STRUCTURAL DAMAGE, NEVER OPERATE THE MACHINE IN THE SAME DIRECTION OF TRAVEL AS THE MACHINE WAS OPERATING WHEN THE SHUT DOWN OCCURRED. AFTER MACHINE IS REPAIRED, ALWAYS OPERATE IN THE OPPOSITE DIRECTION OF TRAVEL AS THE MACHINE WAS OPERATING BEFORE THE SHUT DOWN. WHEN THE MACHINE COMES BACK INTO ALIGNMENT THE DIRECTION CAN BE CHANGED.

Tower behind shut downs typically occur because of a failure in one or more of the following areas; tower box, drive train or machine alignment. Use the flow chart below to determine if the cause of shut down is mechanical. Refer to the operation pages of this section or the control panel Owners Manual for other TROUBLESHOOTING information.



TROUBLESHOOTING

Operation

PROBLEM	POSSIBLE CAUSE	SOLUTION
System will not hold the safety.	Drive unit out of alignment, breaking the Span Safety Box switch.	Move drive unit back into alignment and determine cause.
	Flat or low tire causing misalignment of drive units.	Repair or replace.
	Gearbox motor failure.	Contact your local Valley dealer.
	Electrical component failure.	Contact your local Valley dealer.
	Center drive gearbox failure.	Repair or replace.
	Wheel gearbox failure.	Repair or replace.
	Drive shaft/U-joint failure.	Repair or replace.
	Guidance control box microswitch failure.	Contact your local Valley dealer.
	Pulse tower box microswitch failure.	Contact your local Valley dealer.
	Span safety box microswitch failure.	Contact your local Valley dealer.
	Machine not positioned correctly with guidance system.	Align the machine, then attempt to restart in the opposite direction of travel to align the machine with guidance system.
	Oscillator power supply failure.	Contact your local Valley dealer.
System holds safety, but the end tower will not move in the run mode.	Low pressure switch defective.	Contact your local Valley dealer.
	Bad relay on relay board.	Contact your local Valley dealer.
Machine shut down in-line.	Engine/generator stopped.	Check fuel supply.
		Check fuel filter.
		Check water separator.
		Check oil level.
	If no problems are discovered, turn the control panel disconnect to the off position and attempt to restart the engine/generator.	
	Incoming power failure.	Call the power company.
	Plug pulled out of receptacle.	Make sure the cord is long enough.
Make sure the end of cord stop is set correctly.		
	Loss of water pressure.	Check pump for proper operation.
Low voltage or intermittent low voltage.	Engine RPM too slow.	Adjust the engine/generator as needed. Refer to the engine/generator owner/operator's manual.
	Intermittent excessive load.	Attempt restart of machine. If the machine restarts, monitor the voltage and continue operation.

TROUBLESHOOTING

Operation

PROBLEM	POSSIBLE CAUSE	SOLUTION
Machine will not run after pressing the start button.	Auto stop switch is depressed.	Attempt restart of machine in the opposite direction of travel.
	End of field stop switch is depressed.	Attempt restart of machine in the opposite direction of travel.
	End of hose stop switch is depressed.	Remove hose stop post and attempt restart of machine in the same direction of travel.
	Safety microswitch stuck in the open position.	Contact your local Valley dealer.
Engine will not rev up to the rated engine RPM.	Clogged fuel filters.	Replace.
	Air entering engine fuel supply line.	Contact your local Valley dealer.
	Injector nozzles plugged.	Clean injector nozzles.
	Injector pump malfunction.	Repair or replace.
	Clogged air intake filter.	Replace.
Radical steering in both directions.	Pulse timer failure.	Contact your local Valley dealer.
Excessive steering in both directions.	Intermittent failure of wiring between the control panel and the steering boxes.	Contact your local Valley dealer.
Immediate steer, out of position when the machine is calling for a minor steer, into position with guidance system.	Incorrect wiring at the control panel or steering box.	Contact your local Valley dealer.
Steering properly in one direction of travel, but the machine wanders in the other direction of travel.	Failure of steering relay.	Contact your local Valley dealer.
	Above ground cable or furrow guidance box out of adjustment.	Adjust above ground cable or furrow guidance box.
	Furrow guidance furrow not straight.	Repair furrow.
	Above ground cable guidance cable tension too slack.	Adjust above ground cable tension.
	Wheel track on cart path causing cart to lean.	Repair wheel track.
	Steering arms do not return to the neutral position.	Check the steering arms and linkage for binding.
	Cam or micro switch out of adjustment.	Contact your local Valley dealer.

TROUBLESHOOTING

Operation

PROBLEM	POSSIBLE CAUSE	SOLUTION
Pump fails to prime	Leak on the inlet side of pump, inlet sucking air.	Check inlet tube seals.
		Check optional flow meter fittings and seals.
		Make sure water level in ditch is correct.
		Make sure inlet is submerged to the correct depth.
Optional water shut off valve fails to operate.	External water filter plugged.	Clean or replace external water filter.
	Tube line plugged.	Check tube lines for blockage.
	Solenoid valve plugged.	Clean solenoid valve passages.
	Solenoid valve failure.	Contact your local Valley dealer.
	Electrical problem.	Contact your local Valley dealer.
Side inlet elbow does not rotate properly during auto reverse.	Side inlet elbow stop(s) are out of adjustment.	Adjust side inlet elbow stops.
Longitudinal scratches or cuts on the hose.	Sharp project in runway.	Keep the lanes clean.
		Check the equipment for sharp edges or protrusions.
Vertical breaks in the hose.	Improper bend at loop, causing the hose to kink.	Maintain recommended bend diameter.
	Insufficient water pressure.	Increase the pressure at the pump to a minimum of 70 psi (483 kPa).
Water blisters forming behind the coupling.	Improperly applied coupling.	Take care to apply correctly according to the manufacturer's instructions.
	Tube cut while coupling is being installed.	Take care to apply correctly according to the manufacturer's instructions.
Hose cover checking cracking at the edges.	Stored incorrectly near electrical equipment.	Store 150 ft (46 m) from electrical motors.
	Stored for extended period of time in direct sunlight.	Store hose in cool, dry protected areas.

TROUBLESHOOTING

Operation

PROBLEM	POSSIBLE CAUSE	SOLUTION
Hose is snaking (a certain amount is acceptable).	Hose under excessive pressure.	Do not exceed recommended 150 psi (1034 kPa) water pressure.
	Improper hose layout.	Lay hose out in straight line at the edge of the runway with the recommended bend diameter. Pull hose taut, removing all slack before pressurizing.
Hose cover blisters.	Kinking - insufficient bend radius.	Increase the bend radius when laying the hose out.
	Poor cover adhesion.	Cut out the affected area and apply a cover repair.
	Hose has a pin hole leak.	Remove the blistered area and splice the hose. Install a pin hole plug.
Cover gouges, cuts, scrapes, abrasions.	Foreign obstruction in the runway.	Keep runway clear.
	Sharp object on the machine.	Check the machine for a sharp object and remove.
	Running over the hose with the cart or other equipment.	Protect the hose and do not run over hose or walk on it.
Hose cover repair being peeled or stripped off.	Foreign objects in runway.	Keep runway clear. Repair cover with cover repair kit.
	Improperly applied cover repairs.	Reapply cover repair following the manufacturer's instructions carefully.
Hose pulls in two.	Hose cut by debris in the runway.	Make sure runways are clear of debris and are level and grassy.
	Hose caked heavily with mud or clay.	Clean hose after each pull.
	Hose stretched to maximum length when water pressure is turned off.	Leave some slack in the hose to allow for 2-3% elongation [13-20 ft (3.96 m - 6.07 m) in a 660 ft (201 m) length].
	Hose used as a tow rope.	Never use the hose as a tow rope to pull equipment.
	Hose stop post is not installed.	Install the hose stop post.
Couplings pull off.	Coupling improperly installed.	Cut hose and reapply coupling.
	Excessive mud on hose.	Clean mud off of hose and reapply coupling.

TROUBLESHOOTING

Operation

Electric Primer				
PROBLEMS				POSSIBLE CAUSE
LOW VACUUM PRESSURE	HIGH VACUUM PRESSURE	PUMP OVERHEATING	MOTOR OVERLOAD	
X	At Pump	X	X	Air Filter Dirty
X	At Pump	X	X	Vacuum Line Collapsed
	X	X	X	Relief Valve Set Too High
X				Relief Valve Set Too Low
X	At Pump	X	X	Plugged Vacuum/ Pressure Line
X				Vanes Sticking
	X	X	X	Running At Too High RPM
X				Vanes Worn (Replace)
X				Shaft Seal (Replace)
X		X	X	Dust or Offset Powder in Pump
X		X		Motor Not Wired Correctly