

**LINEAR  
FOUR-WHEEL HOSE DRAG**

**OWNERS MANUAL**

**0992992\_F**

## WARNING

As with any electrical machinery, if the power supplied to the Linear Irrigation System is not grounded properly, or if the equipment is tampered with, severe injury or death can result should an electrical malfunction occur. It is your responsibility to insure that your power supplier and/or electrical contractor has grounded the irrigation system as required by the National Electrical Code and by applicable local electrical codes.

Before attempting to adjust or trouble-shoot the electrical components of the Valley Linear system, the following safety procedures should be observed.

1. Do not attempt to check any of the components until all power is disconnected. All components can be checked with power off.
2. The integrity of the equipment grounding conductors for the entire irrigation system should be seasonally checked by a qualified electrician.
3. Do not depend on another person to disconnect the power -- do it yourself.
4. When starting the machine, do not take for granted that system is going to run in the proper direction.
5. Do not oversize fuses -- they were sized for the protection of your machine.

When work is performed on system electrical components, a padlock should be used to lock the main disconnect of the machine. This should be used while conducting all checks other than those on the pivot box. Make certain disconnect is open before using the OHM meter. Remember that there may be 480 volts in all boxes.

Normally, if a system is properly grounded, and fuse sizing is correct, there is very little probability of an individual being injured by electrical shock. However, if an electrical "short-circuit" exists on a system, it could be extremely hazardous.

If you have any reason to suspect that the system may have hazardous voltage on the hardware, such as physical damage to the electrical cable, recent electrical storms (lightning), or unusual operational characteristics, it is recommended that you contact a qualified electrician to check the system. If you must operate or touch the system under the above conditions, do not grasp the hardware as you would a ladder rung. Instead, quickly and lightly brush the back of your hand past a pivot or tower leg. Physical contact in this manner, with a hot system, will be felt as a "rippling tingle" or "jolt", but should not cause serious injury. However, if you do experience such a sensation, contact a qualified electrician or Valley serviceman immediately.

Specifications, descriptions and illustrative material contained herein were as accurate as known at the time this publication was approved for printing. Valmont Industries, Inc. reserves the right to change specification or design without incurring obligation. Specifications are applicable to systems sold in the United States and may vary outside the U.S.

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# Linear Safety

The VALLEY LINEAR SYSTEM is powered by 480 volts and can be extremely dangerous if used improperly. For your maximum safety and optimum performance of the VALLEY LINEAR SYSTEM, it is essential that you, your maintenance personnel, or any other operator of the system read and understand this manual before operating this product.

**SAFETY FIRST. GOOD ELECTRICAL AND OPERATIONAL PRACTICES  
SAVE TIME, MONEY AND LIFE.**

## OPERATE SAFELY.

### OPERATE SAFELY.

**DO NOT** operate system without first reading Operator's Manual.

**DO NOT** attempt to start system until system and electrical service is properly installed and grounded.

**DO NOT** oversize fuses -- they were sized for the protection of your machine. Refer to the Linear Panel Fuse Chart of this manual prior to initial start up to be certain that you have the proper size fuses.

**MAKE SURE** no equipment is parked over or near a wheel track.

**MAKE SURE** that all persons are clear before turning the machine on.

**AVOID** exposure to system spray while chemicals are being injected into the water.

**WARNING** Repeated start attempts can cause serious structural damage. Inspect entire system after each start attempt failure. Do not depress the start and safety override buttons simultaneously for more than three seconds. Repeated override attempts can cause serious structural damage.

**DO NOT** operate if system moves in the direction opposite to direction selected. Contact dealer. Forward - right, reverse - left.

**DO NOT** attempt to service any part of the system while the system is operating.

**ALWAYS** disconnect electric power before servicing the machine. Shut off and lock the main disconnect yourself. Don't trust someone else to do it for you.

**ALWAYS** have qualified personnel perform any hazardous repair or maintenance.



# Linear Introduction

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## DESCRIPTION OF THE VALLEY LINEAR

The Linear cart is used on both Center Feed and End Feed Systems.

Each system will have a free-standing span located in the approximate center of the system. If the ditch or pipeline is located at the edge of the field, the 4 wheel cart will be the end tower adjacent to the ditch. If the ditch or pipeline is located at a position other than the edge of the field, the cart will be a part of the free-standing span that is adjacent to the ditch or pipeline.

The placement of tower boxes varies with the type of system. The two types are:

1. **Center Feed** - This has an end tower box on each of the two end towers. The 4 wheel cart will be part of the free-standing span. Directly over the cart, there is a center feed tower box. At the far end of the free-standing span away from the cart is the central pulse tower box.
2. **End Feed** - The central pulse tower box stays on the far end of the system. It is located at the second tower from the end. Linear intermediate tower boxes are installed on both ends of the free-standing span. The significant difference with an end feed system is that there is no tower box on the span directly over the control panel or cart, and only one end tower box located on the far end of the system.

The Linear is guided by either an above ground cable or buried wire, or Furrow Guidance.

1. **Cable Guidance** - The cable guidance system consists of an above ground cable supported by posts running parallel with the ditch or pipeline. Two guidance support arms are attached at angles to the cart. As the system travels through the field, two pairs of vertical steering arms, (one on each end), straddle the cable. If no pressure is applied to the leading arms, the system is on course. If it varies slightly off course, movement of one arm will call for a steer in the appropriate direction. If, for some reason, no corrective steer occurs, the control arm will move far enough to break the safety circuit and shut the entire system down. The trailing control arms are part of the safety system in that if the cart wanders or twists to the degree that the rear of the cart moves away from the guidance cable far enough, it will break the safety circuit. Steering is not affected by the

trailing set of control arms. In addition, should the cable break, the vertical steering arms will sense this, consequently shutting down the system.

2. **Below Ground Guidance** - The below ground guidance system consists of a buried single loop wire running through the center of the field. A slight curve of this wire at each end of the field is necessary to counter the effects of the return wire electrical field.

Located in the middle of the free-standing span attached to a tube suspended from the truss rods are five antennas. Two safety and one reference antenna are located in the middle of the tube, and on each end there is a steering antenna; one forward, one reverse.

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.

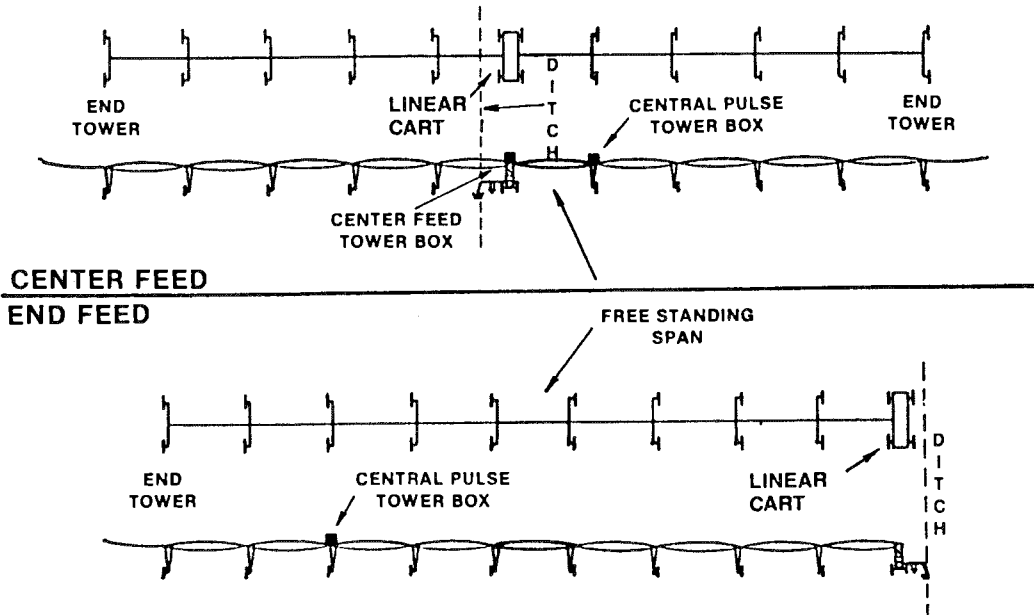
The two safety antennas are located on each side of the buried wire. As long as the wire stays in between these two antennas the system will continue to run. Should one or the other safety antenna cross over the wire, the safety circuit will be open and the system will shut down.

3. **Furrow Guidance** - The furrow guidance system utilizes a "V" shaped furrow, 4" to 6" deep, running the length of the field. Resting in and following this furrow are front and rear guide wheels, each attached to the end of a long square tube assembly that mounts to a pivot point on the drive unit leg attachment plate. On the drive unit end of the tube is an actuator arm which is positioned between the vertical control arms extending from beneath the steering box. Should the drive unit wander away from the furrow, the actuator arm would move the vertical control arms which would depress a steer switch bringing the system back into correct position. If the steer switch should fail, a back-up safety switch would shut the system down. If the actuator arm breaks or slips from between the vertical control arms, the control arms move to a position that will trip a safety switch and shut down the system.

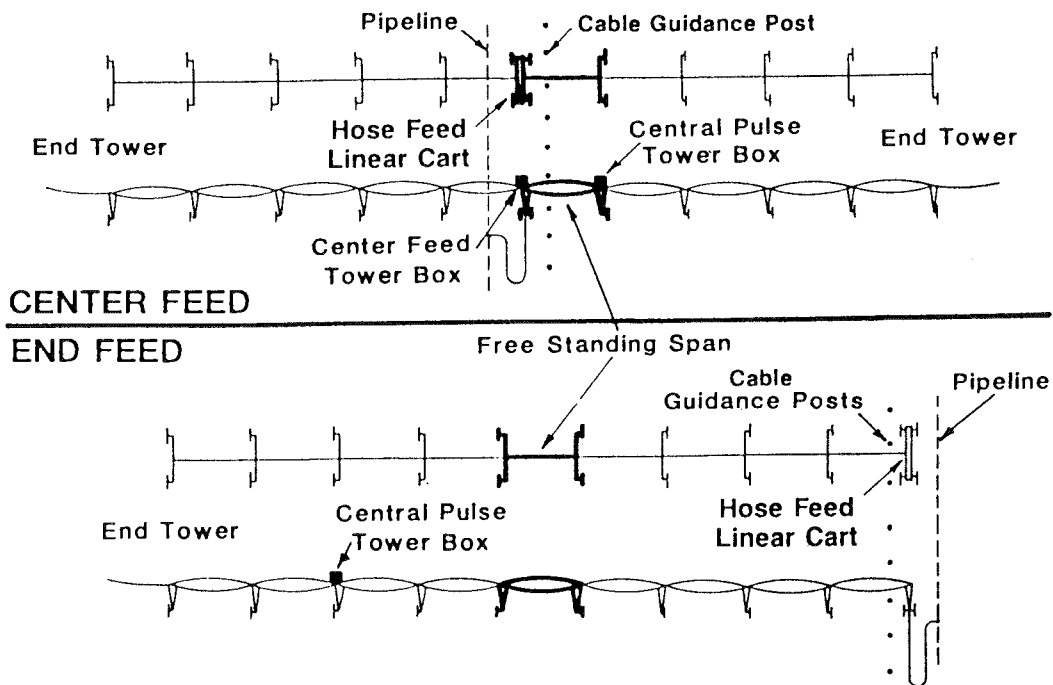


# Linear Tower Box Locations

## LINEAR SYSTEM



## HOSE FEED LINEAR SYSTEM





# Linear Wheel Track Establishment & Maintenance

It is very important to establish proper wheel tracks for a linear system. Wheel tracks have a significant effect on the systems ability to steer.

Wheel track depths must not be allowed to exceed 6 inches. Track fillers, tillers, discs or floatation tires are some ways to control this depth. Special care should be taken with the swing around linear at its pivoting points. Its wheel track depth must not exceed 4 inches.

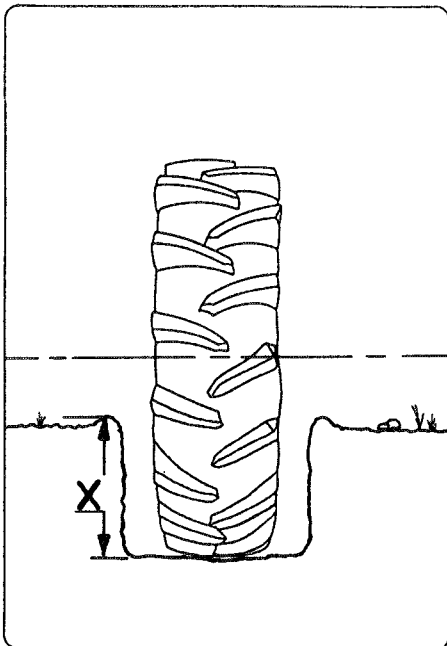
## DIRECTION OF TRAVEL

Your field tillage practice has a direct effect on the linear system and the maintenance of the wheel tracks. Prior to planting or seed bed preparation the following must be considered.

The linear system should typically operate or run perpendicular to the crop rows. However, if the crop irrigated requires a seed bed which exceeds 4" in depth the run or direction of travel should parallel the crop rows.

If the crop does require the system to operate parallel to the crop rows one of the following methods should be implemented:

- A. Operate the system dry the entire length of the field prior to planting. This will establish the systems wheel tracks.
- B. Using the wheel tracks as a guide plant the crop or crops parallel to the tracks allowing 10" of clearance space between each wheel track and the first crop row on either side of the tracks.



- II
- A. Plant the entire crop parallel to the systems "run."
- B. Operate the system dry across the freshly planted field.
- C. Remove or flatten the rows at and 10" on either side of the wheel tracks.

The methods above will help prevent deep wheel tracks, avoid hopping of drive units between the crop rows and allow the system to "steer" as required.

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

## PROCEDURE FOR ESTABLISHING WHEEL TRACKS

1. The first pass across the field should be dry and at a 100% percentage timer setting.
2. The second pass should be at the 80-100% percentage timer setting while applying water.
3. Subsequent passes at any desired setting. It is best, however, to make more frequent, lighter applications than fewer heavier applications.

If the system is operating in tracks that have become too deep, the tracks must be filled in and the system run dry at the 100% percentage timer setting. The return pass is made while watering at the 80-90% setting. If any portion of the old track still remains, repeat this procedure until the system is operating on a flat, level track.

X = Less than 6" for standard linear operation.

X = Less than 4" at the end of field run for swing around linear systems.





# Linear Water Application Data

## WHEEL ROTATION SPEEDS

Center Drive Output RPM	Standard Tires 11.2 x 24	High Float 14.9 x 24	Maxi-Float 16.9 x 24
*29	5.90 ft./min.	6.54 ft./min.	6.98 ft./min.
30	6.10 ft./min.	6.77 ft./min.	7.22 ft./min.
*35	7.12 ft./min.	7.90 ft./min.	8.42 ft./min.
37	7.53 ft./min.	8.35 ft./min.	8.90 ft./min.
56	11.39 ft./min.	12.63 ft./min.	13.48 ft./min.
*58	11.80 ft./min.	13.08 ft./min.	13.96 ft./min.
68	13.83 ft./min.	15.34 ft./min.	16.36 ft./min.
*69	14.03 ft./min.	15.56 ft./min.	16.60 ft./min.

\*ValleyBaldor

### EXAMPLE

$$\text{Applic./Rate (In./Day/Capac.)} = \frac{\text{GPM} \times 2310}{\text{Acres} \times 43560} = \left( \frac{1100 \times 2310}{120 \times 43560} = \frac{2541000}{5227200} = .48''/\text{Day} \right)$$

$$\left( \frac{\quad}{\quad} \right) \times 2310 = \left( \frac{\quad}{\quad} \right) = \left( \quad \right)$$

$$\left( \frac{\quad}{\quad} \right) \times 43560 = \left( \frac{\quad}{\quad} \right)$$

### EXAMPLE

$$\text{Hours/Pass @ 100\%} = \frac{\text{Length of Run}}{60 \times \text{Chart Spd.}} = \left( \frac{3234'}{60 \times 5.90} = 9.1 \text{ Hours*} \right)$$

\*NOTE: Add maintenance, refueling, and other "down time" to **calculated** results.

$$\left( \frac{\quad}{\quad} \right) = \left( \quad \right)$$

$$60 \times \left( \quad \right)$$

### EXAMPLE

$$\text{In./Pass @ 100\%} = \frac{\text{Hrs./Pass} \times \text{App. Rate (In./Day)}}{24} = \left( \frac{8.8 \times .48}{24} = .17 \right)$$

$$\left( \frac{\quad}{\quad} \right) \times \left( \quad \right) = \left( \quad \right)$$

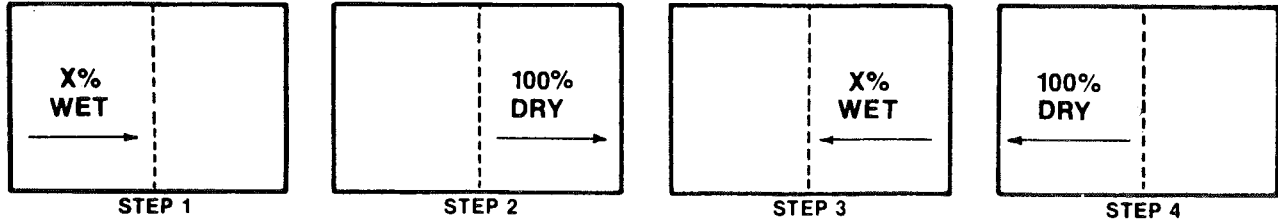
$$24$$

## PERCENTAGE TIMER SETTINGS

	Hrs./Pass @ 100%	Hr./Pass	In./Pass @ 100%	In./Pass	100%
100%	_____ ÷ .9 = _____	_____	_____ ÷ .9 = _____	_____	100%
90%	_____ ÷ .8 = _____	_____	_____ ÷ .8 = _____	_____	90%
80%	_____ ÷ .7 = _____	_____	_____ ÷ .7 = _____	_____	80%
70%	_____ ÷ .6 = _____	_____	_____ ÷ .6 = _____	_____	70%
60%	_____ ÷ .5 = _____	_____	_____ ÷ .5 = _____	_____	60%
50%	_____ ÷ .4 = _____	_____	_____ ÷ .4 = _____	_____	50%
40%	_____ ÷ .3 = _____	_____	_____ ÷ .3 = _____	_____	40%
30%	_____ ÷ .25 = _____	_____	_____ ÷ .25 = _____	_____	30%
25%	_____ ÷ .2 = _____	_____	_____ ÷ .2 = _____	_____	25%
20%	_____ ÷ .15 = _____	_____	_____ ÷ .15 = _____	_____	20%
15%	_____ ÷ .1 = _____	_____	_____ ÷ .1 = _____	_____	15%
10%	_____ ÷ .05 = _____	_____	_____ ÷ .05 = _____	_____	10%
5%	_____ ÷ .05 = _____	_____	_____ ÷ .05 = _____	_____	5%

The following information presents some of the many possible operation methods. None of them should be considered as a "RECOMMENDED" method for your system operation. We suggest that you discuss this matter with your Valley Dealer who can assist you in determining soil types, crop water requirements and system capacity.

## Method I

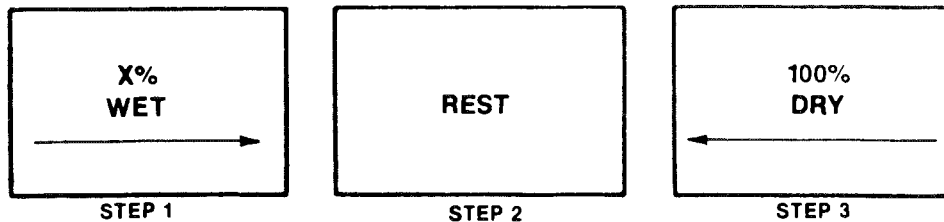


**Method I** is a good method for many fields and soils. The system is started at one end of the field and run to a point somewhere in the middle of the field, "wet", or irrigating as it moves. At the middle point, the system is stopped; the speed control is set at 100%, and the system is moved "dry" to the other end of the field. At this end, the system is reversed and speed is reset to desired application depth, and the system is returned to the middle point. At the middle point, the system is stopped. By the time the system reaches this point, the first part of the field that was irrigated has probably dried sufficiently to let the system speed be reset to 100% and allow the

system to be run "dry" to the original end of the field without danger of deep rutting caused by running across recently irrigated wet ground.

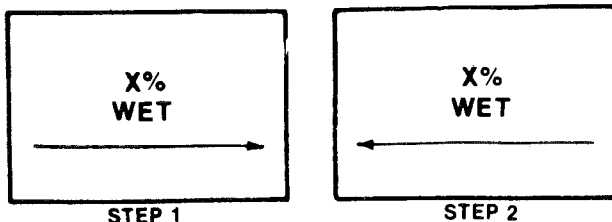
Note the importance of the system operator being required to be present at the completion of each step in the process in order to change mode (wet or dry), direction (forward or reverse), and set speed (change percentage timer). If the operator was only 30 minutes late each time the system reached the end of a step of the cycle (even if it was 3 a.m.), two hours of time would be used without accomplishing any irrigation.

## Method II



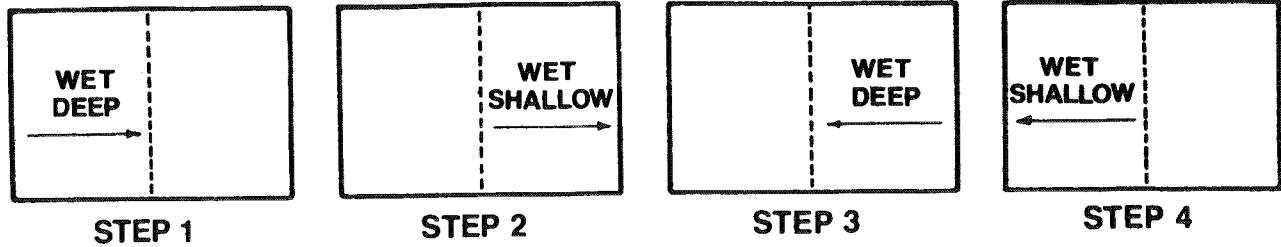
**Method II** is a good method where minimal operator attention is available and/or irrigation is largely supplemental in nature. The system is started at one end of the field and run "wet" to the opposite end. To avoid deep ruts from running the system back over the newly irrigated field, the system is allowed to "rest" for a period of time sufficient to let the field dry out a bit. Because there is no immediate need for system reversal at the completion of step 1, no critical attendance by the system operator is required. Also, maintenance can be performed on the system during the "rest" period, step 2. At the end of the step 2 period, the system is returned quickly and "dry" to the starting point.

## Method III



**Method III** is probably limited to frequent shallow applications on relatively sandy soils. The system run "wet" back and forth across the field, and reversed over freshly irrigated ground - a practice that is probably allowable only where applications have been shallow and where soil type (sandy) do not readily "rut" when wet.

### Method IV



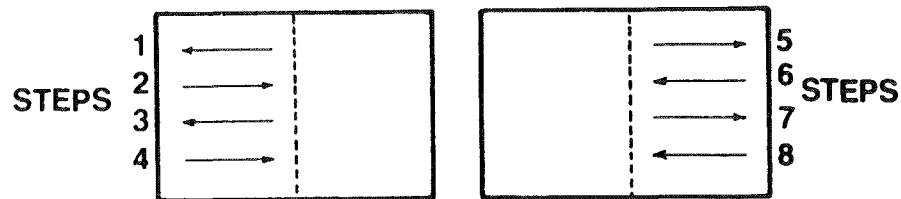
**Method IV** is similar to Method I, except it is probably more suitable in situations where the water source cannot be independently controlled by the system operator and/or it is not desired or possible to turn the water "off" while the system is being repositioned in the cycle. The machine is started at one end and run "wet" with a fairly deep application to a middle point. At the middle point the speed is increased so that a shallower amount is applied to the second part of the field. Upon reaching the end of the field, the system is reversed and slowed down to apply the deep application. If the previous shallow application and soil type are compatible, wheel track rutting may be minimized even though the system is

crossing freshly irrigated ground. This situation will obviously be worst right at the end of the field; as the machine progresses through step 3 it will be irrigating progressively dryer soil. When the system reaches the middle point, the speed is increased to apply the shallow depth while the machine is moving to the original point.

For example, if the system has a capacity for applying 0.4" depth at 100% speed, and it is desired to apply a total of 2", the application would be:

$$\begin{aligned}
 &\text{Steps 1 and 3} = 1.6'' \text{ (25\% setting)} \\
 &\text{Steps 2 and 4} = 0.4'' \text{ (100\% setting)} \\
 \hline
 &\text{Total} = 2.0''
 \end{aligned}$$

### Method V



**Method V** can be used where it is desired to harvest one portion of a field while irrigating the other. This has proven popular on forage crops such as alfalfa. A variety of options are available in the groups of steps 1, 2, 3, 4 and 5, 6, 7, 8, with the system running wet, alternating wet and dry, or whatever mode is desired while field work is underway on the other portion of the field. In essence, each part of the field should be examined in the proper method of operation just as if it were a separate field - and then the two (or more) portions must be added together to determine the total irrigation requirement for the field.

### Other Methods

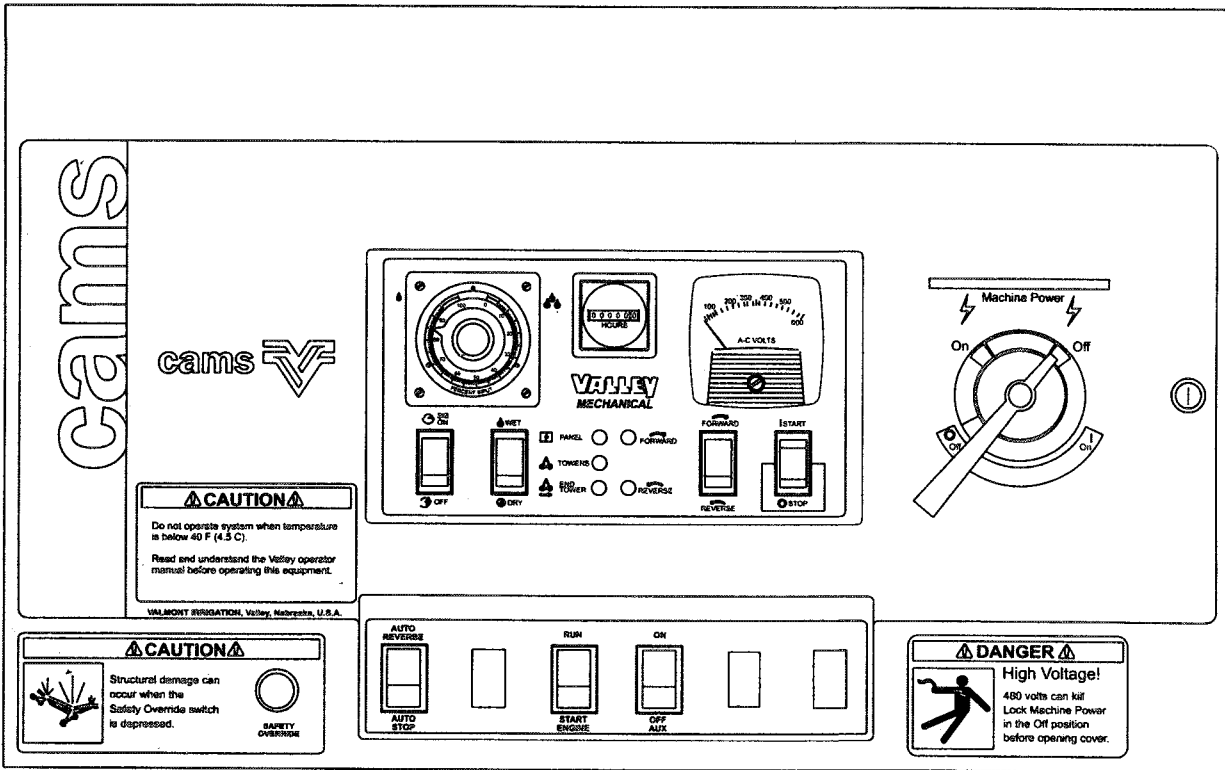
Because the Linear is a very versatile system, and because specific field requirements vary widely, an almost endless combination of system management methods are possible.



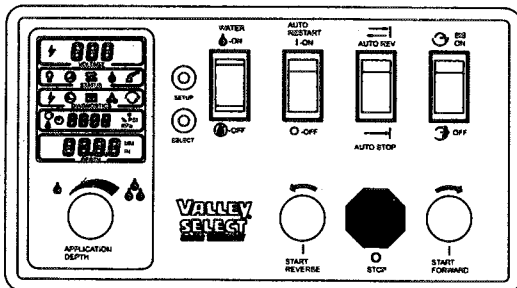
# Valley Control Panels

## CONTROL MODULE OPTIONS

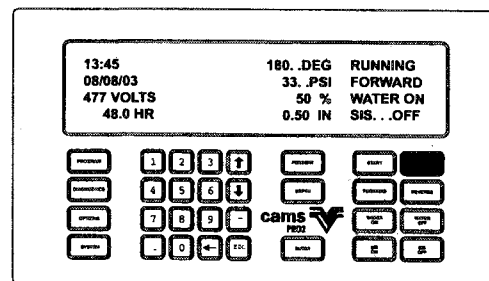
Valmont Irrigation offers three different control panels for your Valley Linear – the Valley Mechanical, Valley Select and Valley Cams Pro 2. The design of the control panel utilizes a modular concept for quick and easy upgrade capability from one module to the next. The three different control module options are illustrated below:



**VALLEY cams CONTROL PANEL w/MECHANICAL MODULE**



**VALLEY SELECT**



**VALLEY cams Pro 2**

C2012298



# Owner/Operator Manuals

One of the following three owner/operators manuals will be included with this manual as a guide for operating the control panel and the Linear. You will have received

either a Valley Mechanical, Valley Select or Valley Cams Pro 2 Control Panel Owner/Operators Manual, depending on your initial purchase decision.

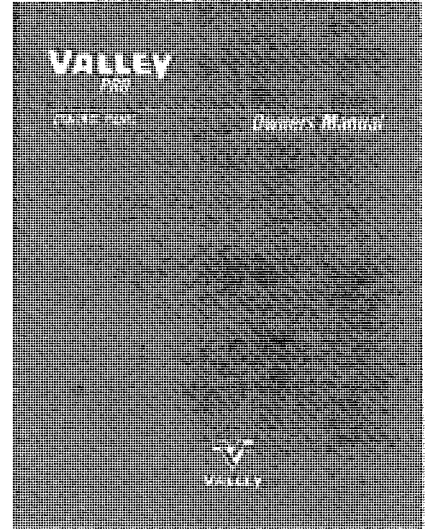
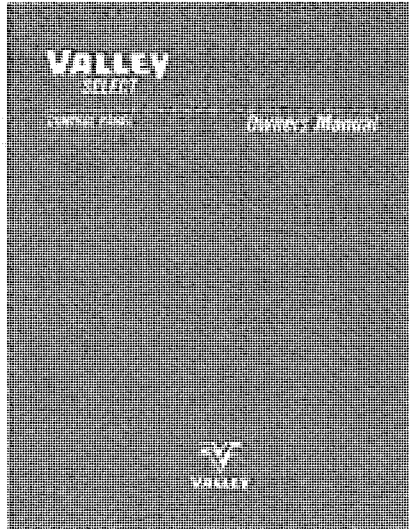
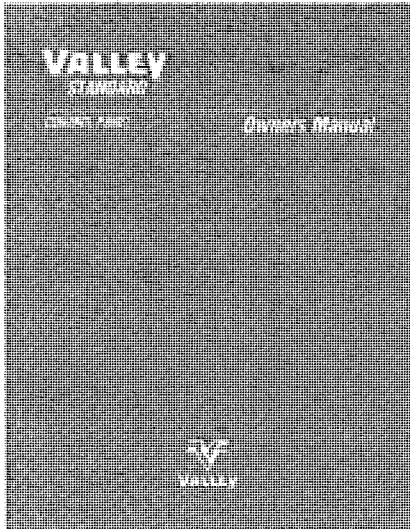
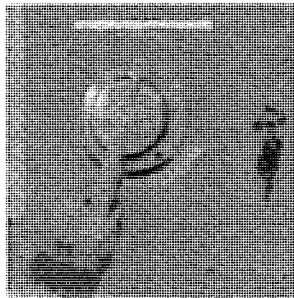


Figure 15

**IMPORTANT:** The control panel owner/operators manual will cover the operation of the panel itself, including how to start/stop the linear, change running direction, change water application amounts, etc. You **MUST** familiarize yourself not only with the manual you are reading, but also with the appropriate control panel owner/operators manual.

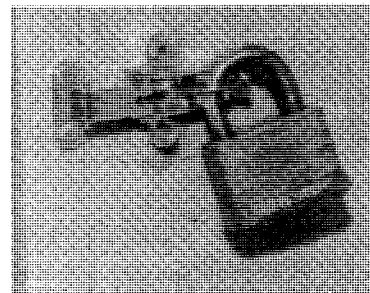
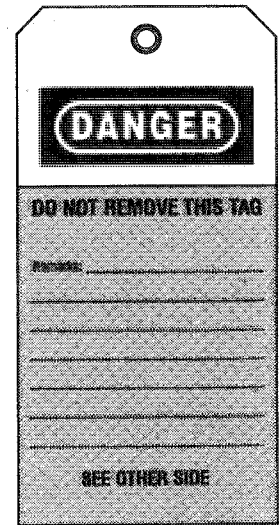
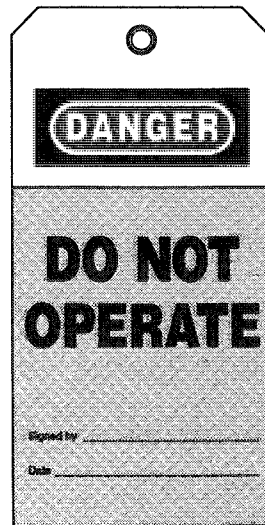
### CAUTION

**DISCONNECT POWER WHEN SERVICING**  
ALWAYS disconnect electrical power before servicing or performing maintenance to the machine. If you are going to perform maintenance to the machine, YOU MUST shut off and lock the main power disconnect as shown below. Always stop the machine by pressing stop button on control panel. Never stop an operating machine by turning off the control panel or service disconnect.



Don't trust someone else to turn the power off for you. **DO IT YOURSELF** and take the keys with you!

The blue (OSHA safety color code) tag shown to the right should also be filled out and attached to the disconnect after locking. The tag should reveal the name of a person to contact before restoring power to the machine.

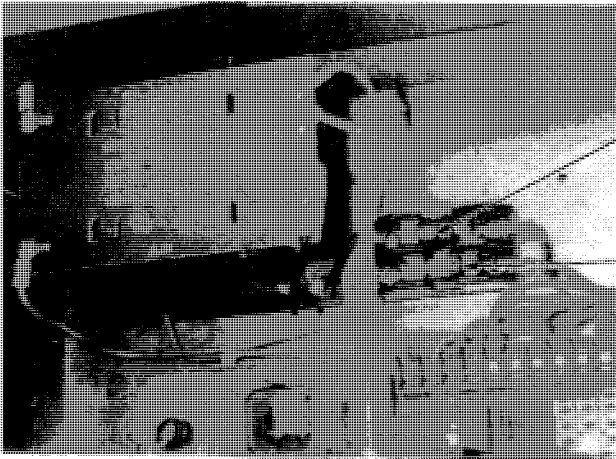


You must also lock the outside of the control panel and attach the "Do Not Operate" tag to the latch.



# Linear Panel Fuses

DO NOT OVERSIZE FUSES — THEY WERE SIZED FOR THE PROTECTION OF YOUR MACHINE.



5 Amp Fuse  
P/N 314243

3 Amp Fuse  
P/N 314755

## HIGH VOLTAGE DANGER

480 VOLTS

DO NOT OPEN  
UNTIL MACHINE DISCONNECT IS  
IN "OFF" POSITION AND LOCKED

### RECOMMENDED FUSE SIZES FOR MAIN LINEAR PANEL

No. of Spans	STANDARD SPEED						HIGH SPEED					
	Center Feed			End Feed			Center Feed			End Feed		
	No Booster	1 Booster	2 Boosters	No Booster	1 Booster	2 Boosters	No Booster	1 Booster	2 Boosters	No Booster	1 Booster	2 Boosters
1	12	12	15	12	12	17.5	12	15	17.5	12	15	20
2	12	12	17.5	12	15	17.5	12	15	20	12	17.5	20
3	12	15	17.5	12	15	20	15	17.5	25	15	20	25
4	12	15	20	12	17.5	20	15	20	25	17.5	20	25
5	12	17.5	25	15	17.5	25	17.5	25	25	20	25	30
6	15	20	25	15	20	25	20	25	30	20	25	30
7	15	20	25	17.5	20	25	25	25	30	25	30	30
8	17.5	25	25	17.5	25	30	25	30	45	25	30	45
9	20	25	30	20	25	30	25	30		30	30	
10	20	25	30	25	25	30	30	45		30	45	
11	25	30	30	25	30	30	30			30		
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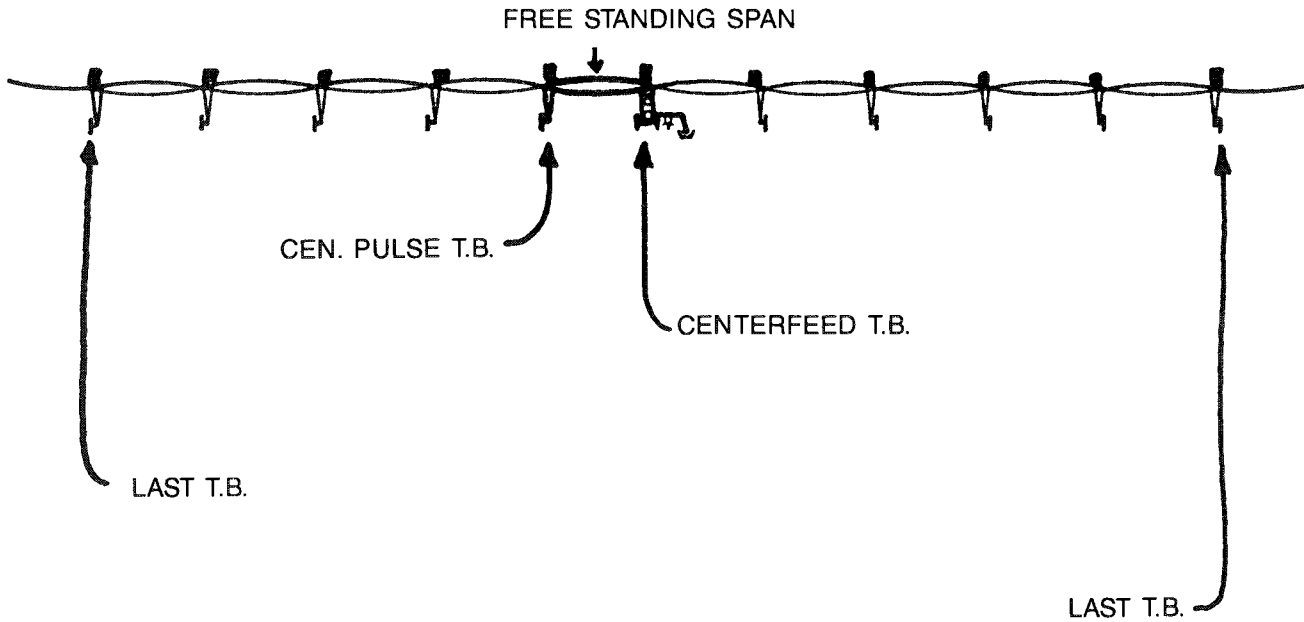
480 Volts  
See Chart

ALL SYSTEMS BELOW  
HEAVY LINE REQUIRE  
SPECIAL 45 AMP  
MODIFICATION



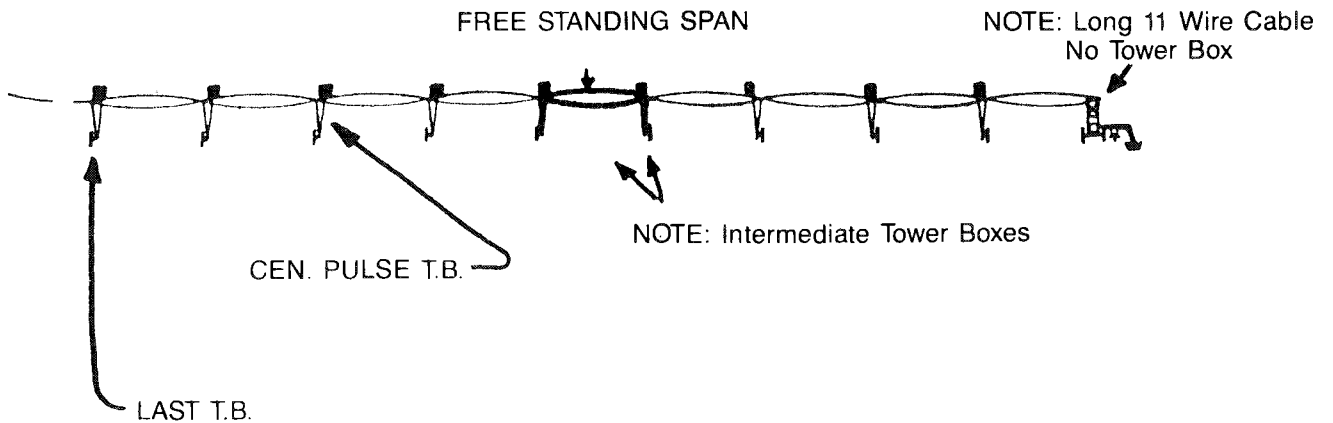
# Linear Tower Box Locations

## CENTERFEED TOWER BOX LOCATIONS

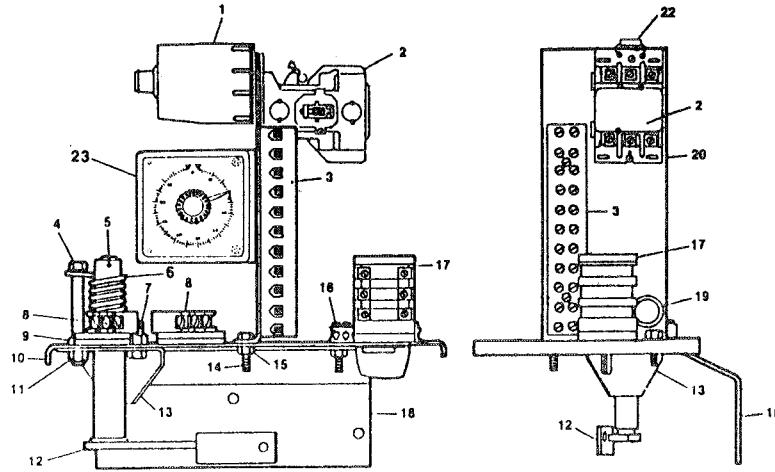


All boxes not pointed out are intermediate tower boxes.

## END FEED TOWER BOX LOCATIONS



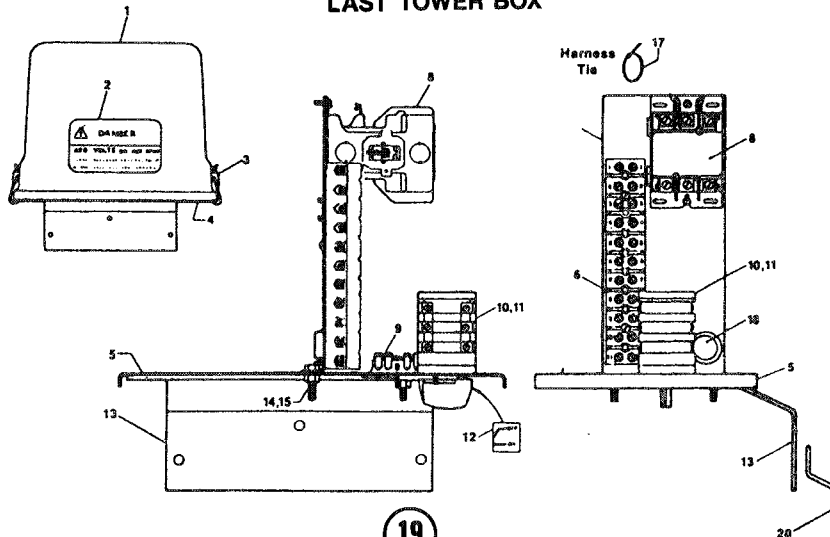
## CENTRAL PULSE TOWER BOX



24

ITEM	DESCRIPTION	PART #	ITEM	DESCRIPTION	PART #
1	Delay Timer	314708	12	Switch Pivot Arm	1701262
2	Contactur	314667	13	Sensor Bearing Assy.	1702051
3	Terminal Block	315485	14	1/4" x 1" C.S.	161058
4	3/8" x 3 1/2" C.S.	181150	15	1/4" Locknut	133008
5	1/8" x 1" Roll Pin	111024	16	Ground Lug	315120
6	Spring	181046	17	Disconnect	315748
7	3/8" x 1" C.S.	181045	18	Mounting Plate	1702054
8	Micro Switch	314905	19	Snap Bushing	992070
9	3/8" Nut	131018	20	Vertical Plate	1702053
10	Bottom Plate	1702055	21	Harness Tie	314225
11	3/8" Locknut	133006	22	Suppressor	315663
			23	Percent Timer	315398
			24	Central Pulse Box Comp.	1811432

## LAST TOWER BOX



19

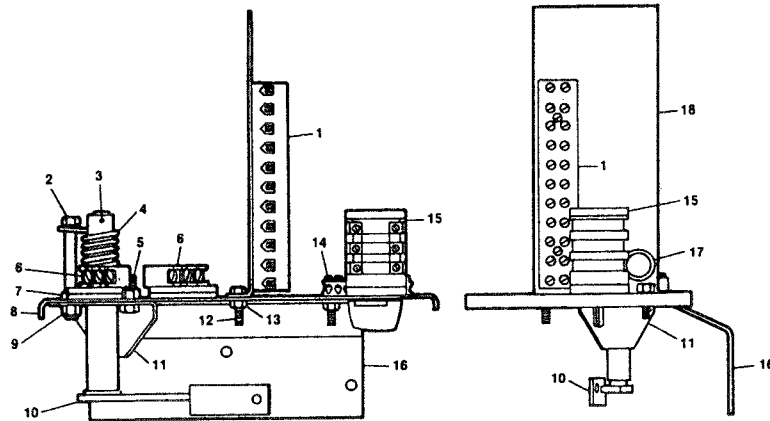
ITEM	DESCRIPTION	PART #	ITEM	DESCRIPTION	PART #
1	Electric Tower Box Cover	1702056	11	Disconnect Sleeve (Cover)	1702190
2	Decal (Danger)	981261	12	Disconnect Decal	992090
3	Tower Box Cover Latch	992073	13	Mounting Plate	1702054
4	Gasket (On Bottom Plate)	992071	14	1/4" x 1" Cap Screw	161058
5	Bottom Plate	1702216	15	1/4" Lock Nut	133008
6	Terminal Strip	315121	16	Vertical Plate	N/A
8	Contactur	314667	17	Harness Tie (4 Req'd.)	314225
9	Grounding Lug	315120	18	Snap Bushing	992070
10	Disconnect	315748	19	Last Tower Box Assem.	1811363
			20	Mounting Bracket - Last Tower	1700484





# Linear Tower Box Components

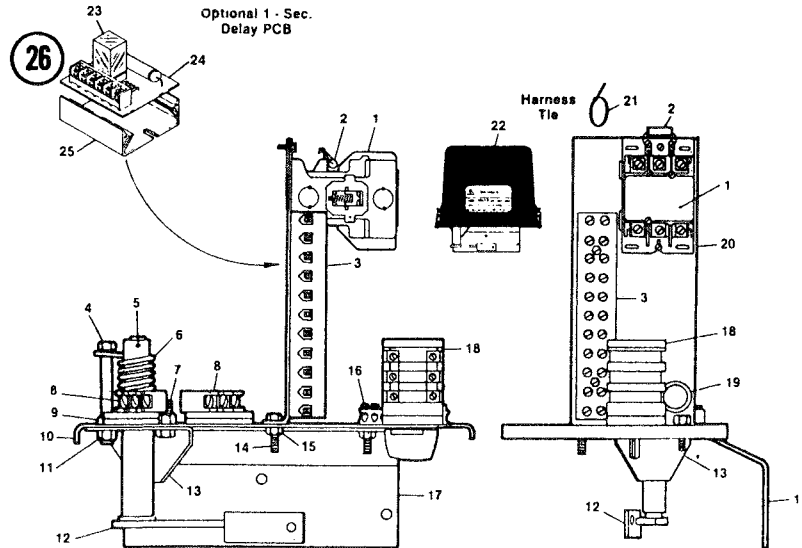
## CENTERFEED TOWER BOX



20

ITEM	DESCRIPTION	PART #	ITEM	DESCRIPTION	PART #
1	Terminal Block	315485	11	Sensor Bearing	1702051
2	3/8" x 3 1/2" C.S.	161150	12	1/4" x 1" C.S.	161056
3	1/8" x 1" Roll Pin	111024	13	1/4" Locknut	133006
4	Spring	181046	14	Ground Lug	315120
5	3/8" x 1" C.S.	161045	15	Disconnect	315746
6	Microswitch	314905	16	Mounting Plate	1702054
7	3/8" Nut	131018	17	Snap Bushing	992070
8	Bottom Plate	1702055	18	Vertical Plate	1702053
9	3/8" Locknut	133006	19	Harness Tie	314225
10	Switch Pivot Arm	1701262	20	Center Feed Box Comp.	1811433

## INTERMEDIATE TOWER BOX



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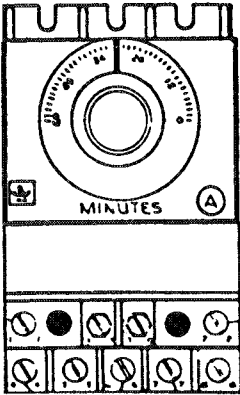
ITEM	DESCRIPTION	PART #	ITEM	DESCRIPTION	PART #
1	Contactor	314667	15	1/4" Locknut	133006
2	Suppressor	315663	16	Ground Lug	315120
3	Terminal Block	315485	17	Mounting Plate	1702054
4	3/8" x 3 1/2" C.S.	161150	18	Disconnect	315745
5	1/8" x 1" Roll Pin	111024	19	Snap Bushing	992070
6	Spring	181046	20	Vertical Plate	1702053
7	3/8" x 1" C.S.	161045	21	Harness Tie	314225
8	Microswitch	314905	22	Tower Box Cover	1702056
9	3/8" Nut	131018	23	Relay	314813
10	Bottom Plate	1702055	24	1-Second Delay Board	315624
11	3/8" Locknut	133006	25	Snaptrack	314833
12	Switch Pivot Arm	1701262	26	1-Second Delay Pkg.	KA00415
13	Sensor Bearing	1702051	27	Complete Intermediate Tower w/o 1-Sec. Delay	1811222
14	1/4" x 1" C.S.	161056			



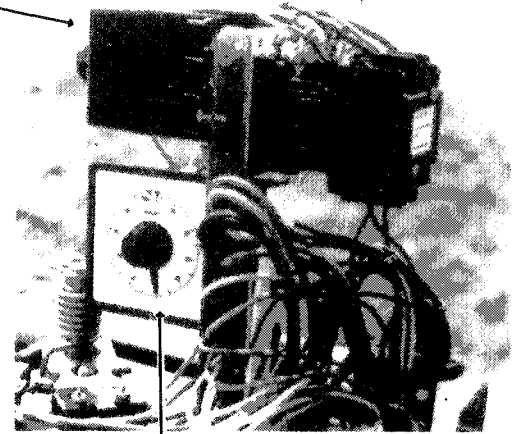
# Linear Central Pulse Tower Box Operation

Set the Overwatering Timer using the chart below.

CENTRAL PULSE TOWER BOX



RECOMMENDED OVER WATERING TIMER SETTINGS VS: PERCENTAGE TIMER SETTINGS	
Over Watering	Panel % Timer
20 Min.	90
20 Min.	80
20 Min.	60
20 Min.	40
28 Min.	30
36 Min.	10



The Pulse Percentage Timer will always be set at 20%.

## OVERWATERING TIMER

The overwatering timer is a safety device used to shut the system off should one or both of the end towers fail to move due to mechanical/electrical failure or wheel slippage. The chart illustrated above outlines suggested timer settings based on the systems control panel percent timer setting. These times are actual minutes the timer will allow the central pulse box to "stand still" before it shuts the system "off."

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

## PULSE TIMER

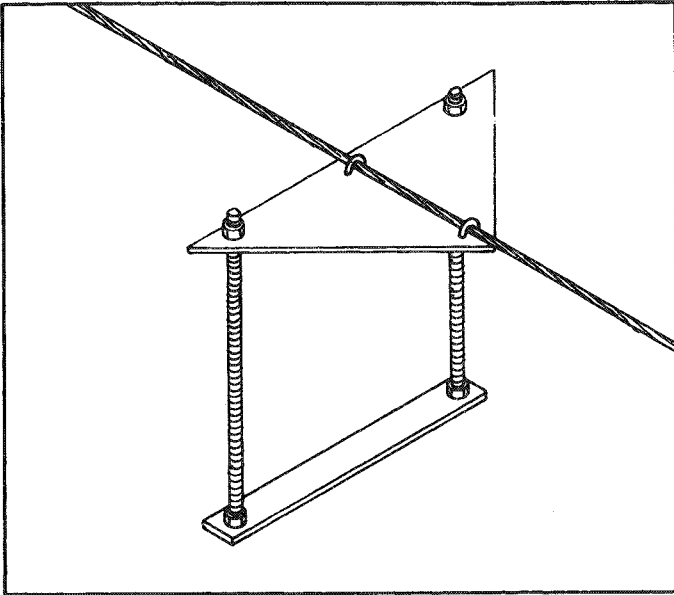
During normal operation a linear system travels at right angles to the guidance cable or wire. If, for some reason, this angle changes the system must "steer" itself back to the right angle operating position.

A linear steers by stopping one of the systems end towers allowing the opposite end or side of the system to catch up bringing the system back to the position of right angles to the guidance cable or wire. When a "steer" is in process it is necessary to pulse or slow down the end of the system which is leading or ahead. The pulse timer performs this function. When a "steer" occurs the leading end tower will only run 20% of the time the opposite or trailing end tower runs. This pulse design has been integrated into the Valley linear to eliminate sharp or dramatic steers at the same time reducing drive unit and pipeline stress caused by wheel tracks, tillage practices, etc.



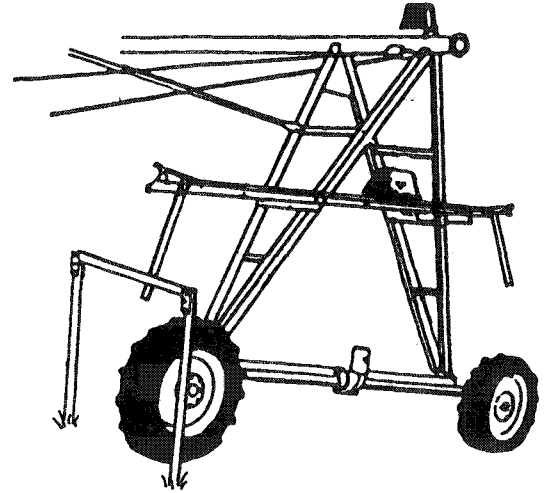
# Linear End of Field Stop and Auto Reverse

## ABOVE GROUND CABLE GUIDANCE SYSTEMS



Two End-of-Field stops (as above) are included with each cable guidance system. They are to be positioned at both ends of the field. When the leading control arms reach the triangular plate they begin to separate and eventually trip the safety switch which shuts the system down.

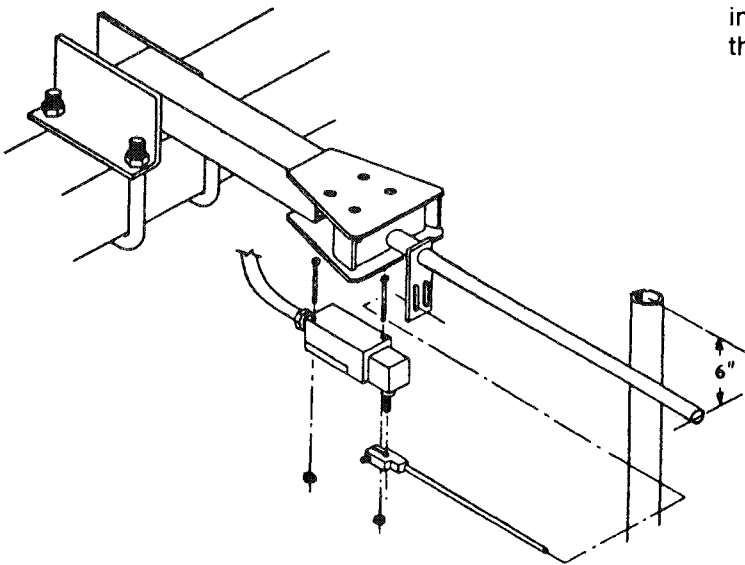
## DRIVE UNIT MOUNTED



This assembly is used for both end of field stop and end of field auto reverse options. (End of field stop is standard equipment on the swing around linear.)

This option will stop the system when the actuator arm contacts the barricade. If the Auto Reverse/Auto Stop option is installed you may choose to either stop the system when it reaches the barricade or have the system automatically reverse its direction of travel and continue to run. **NOTE:** Care must be taken when this option is used. You must insure the actuator arm contacts the barricade. Under certain conditions soil may build up in the wheel track resulting in a ramp effect allowing the actuator arm to go over the barricades.

## BELOW GROUND GUIDANCE

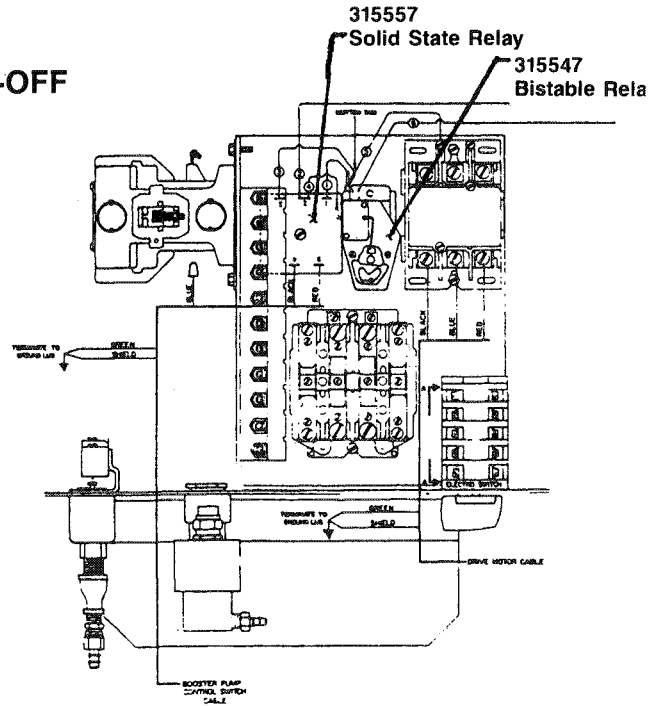
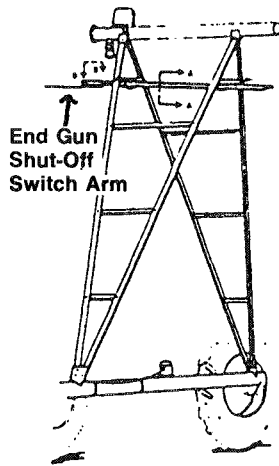


This switch assembly and two posts are included with each below ground guidance system. The switch assembly is mounted on the ditch feed or hose drag cart. When the switch arm deflects by contacting the stop post, the system will shut down.



# Linear End Gun Shut-Off Auto Linear

## END GUN SHUT-OFF



This option is used to control the linear end gun (if so equipped). The end gun switch arm contacts a post(s) placed in the field turning the end gun "off" or "on" as desired. When this option is purchased the end gun shut-off box replaces the standard last tower box.



# Linear Micro Switch Replacement and Adjustment Procedure

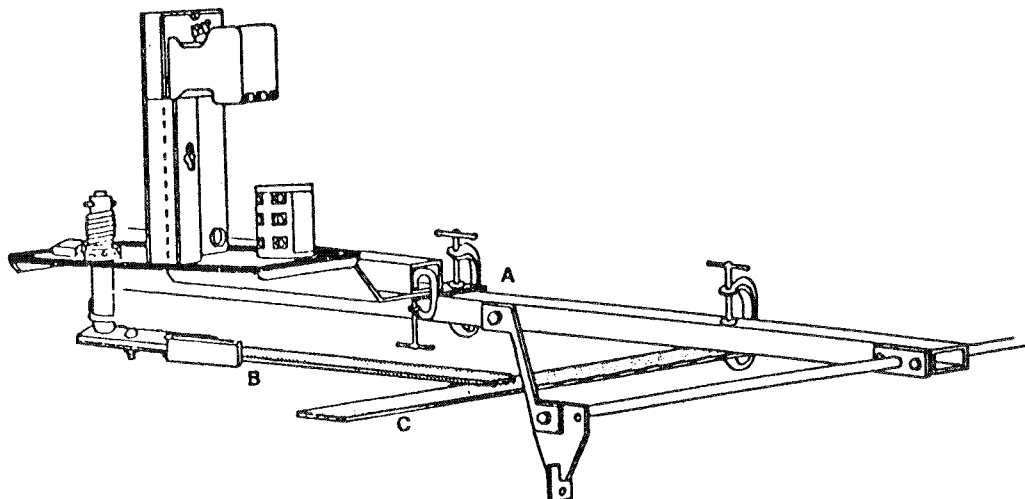
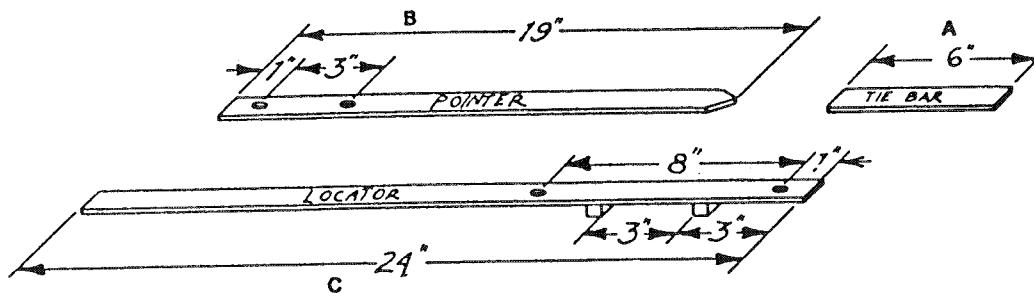
**REPLACEMENT:** When a micro switch (Run Switch or Safety Switch) is found to be faulty, note the wire positions and disconnect the wires and remove the switch. Install the new switch, reconnect the wires and proceed with the switch adjustment as follows:

## ADJUSTMENT PROCEDURE:

1. Remove ball joint rod end from switch arm assembly.
2. Install Pointer Bar using 5/16" carriage bolts.
3. Mount locator bar on bottom of right hand T-Bar assembly with small C-clamp.
- 3a. Install short piece of bar stock material, with C-clamps or vice grips, between the lower box yoke and the right hand T-Bar as shown. This will temporarily prevent any movement of the "floating alignment" mechanism during initial adjustment.
4. Connect a VOM to the "N.C." and "C" Terminal of Safety Switch.
5. Slowly pull pointer bar until meter shows continuity . . . continue pulling until meter shows "open." Make mark on locator bar.
6. Slowly release pointer bar. Meter will again show continuity. Continue to release until meter again indicates "open." Mark this location.
7. Measure distance between lines. To determine "X" measurement, refer to the tower box table and use

appropriate tower box number. Adjust Safety Switch allen screw to achieve required dimension. Refer to the tower box table and use the "X" dimension that corresponds to your tower box. Repeat steps 5 & 6 as often as necessary.

8. When Safety Switch is adjusted, measure and locate centerline of safety band.
9. Connect VOM to Common & N.O. of Run Switch. Pull slowly on Pointer Bar until VOM shows continuity. Mark this point on locator bar.
10. Move VOM Probe from N.O. to N.C. Contact on the Run Switch. VOM should show continuity. Pull Pointer Bar until VOM shows "OPEN," then slowly release pointer until VOM shows continuity. Mark this point. Measure and locate centerline of Run Switch "travel band." The centerline of both switches must coincide. If they do coincide, no further adjustment is necessary. If not, adjust the run switch allen screw as needed to bring the centerlines together.
11. The two switches are now electrically centered with each other, and after removing the pointer and locator bars and reinstalling the control bar, pre-adjust tower box in accordance with instructions provided in the Alignment Procedure and Tower Box Adjustment sections of this manual.

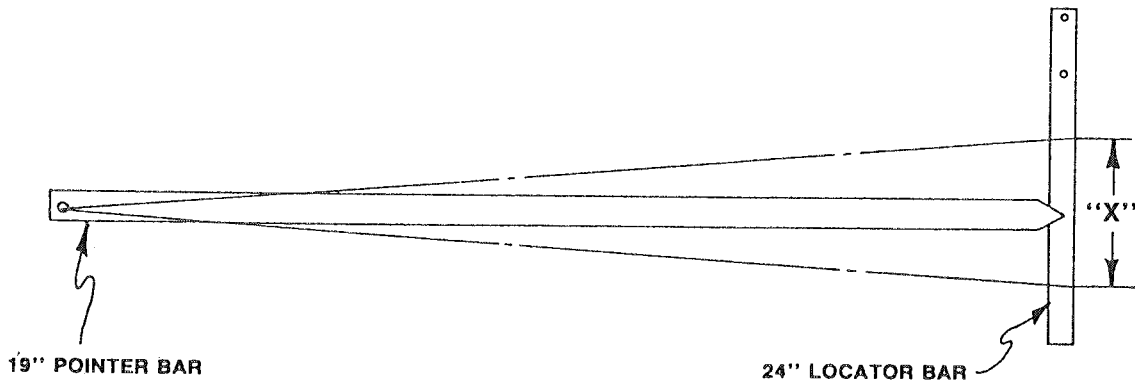




# Linear Micro Switch Replacement and Adjustment Procedure

## TOWER BOX

Part Number	Description	Safety Band (Measurement "X")		
		Degrees	Decimal	Inches.
1811433	Centerfeed	2°	.663"	43/64"
1811105	Central Pulse	4°	1.32"	1 21/64"
1811106	Intermediate (Rainger)	4°	1.32"	1 21/64"
1811219	Intermediate	4°	1.32"	1 21/64"
1811222	Intermediate (Rainger)	4°	1.32"	1 21/64"
1811265	First	4°	1.32"	1 21/64"
1811432	Central Pulse	4°	1.32"	1 21/64"
1810372	Intermediate (Welded frame)	6°	2"	2"
1810624	First (Welded frame)	6°	2"	2"
1811696	Double Run (LCPA)	10°	3.326"	3 5/16"
1811697	Overwatering (LCPA)	10°	3.326"	3 5/16"
1811698	Intermediate (LCPA)	10°	3.326"	3 5/16"

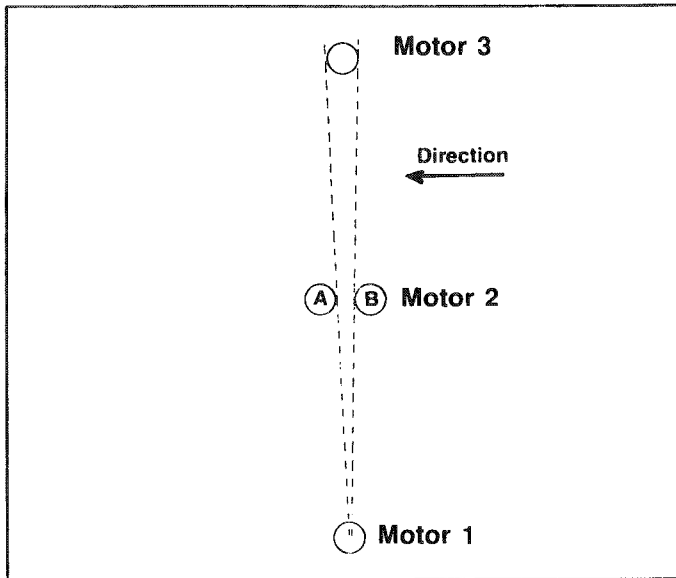




# Linear Alignment Procedure

Set the percentage timer at 50% with the system running in either direction. Begin the alignment procedure at the center of the system at the free-standing span.

One person sights an imaginary line from the center of motor 1 to the edges of motor 3. (See figure below).



Motor 2 should stop at position A and start at position B. Any deviation from these positions will require that the alignment linkage between the tower box and alignment hardware be adjusted.

A second person located at drive unit 2 can adjust that tower as directed by the person at drive unit 1.

If the start/stop position of motor 2 is erratic and hard to adjust, or the distance between the start and stop position is greater than that shown in the illustration, check the alignment mechanism for binding or loose nuts.

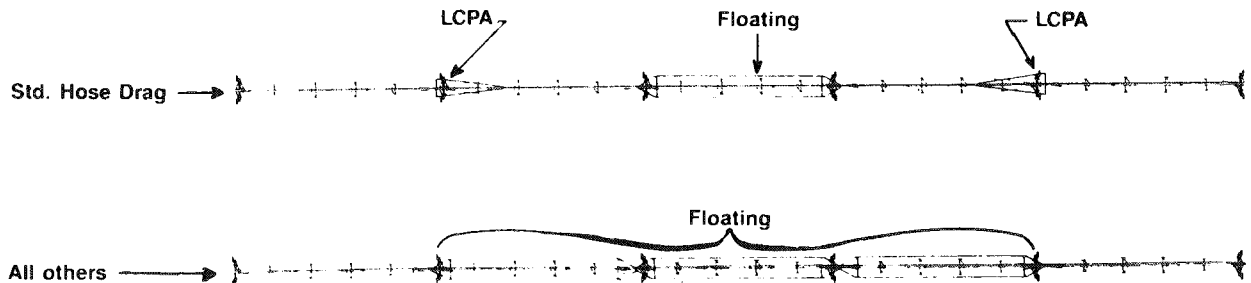
Once drive unit 2 is adjusted, the two people adjusting the alignment should move out to the next two drive units and adjust them. Continue this to the end of the system, then return to the free-standing span and adjust the other half of the system.

Adjustments made to the center towers can cause the system to go into a steer. Therefore, the person adjusting the alignment should wait for the system to stabilize itself before continuing to the next drive unit. When drive units at the outer ends of the system are adjusted, the alignment is not affected as drastically.

Accurate alignment is necessary for proper system guidance to occur. The alignment must be the same whether the system is traveling in forward or reverse.

For adjustment procedures refer to linear alignment adjustment pages.

Note: Standard, Hose Drag systems have floating alignment on the free-standing span and LCPA on the rest of the system. All other linear systems consist entirely of floating alignment.

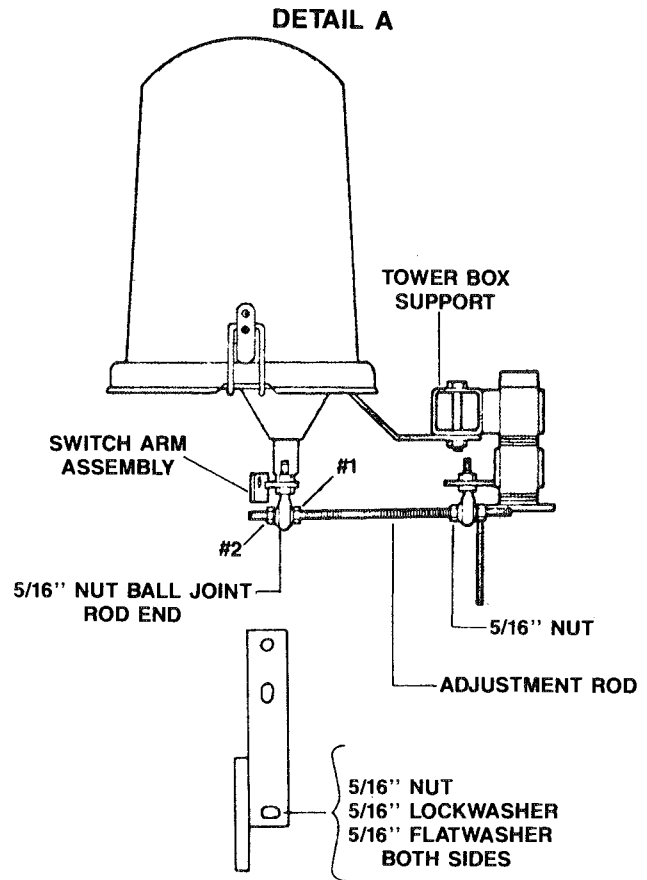




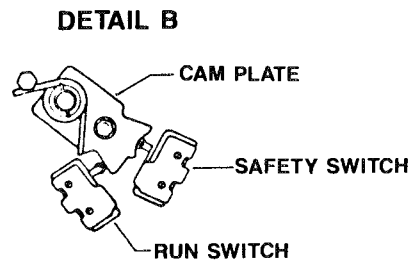
# Linear Alignment Tower Control Box Adjustment

(SYSTEM MUST BE IN STRAIGHT LINE)

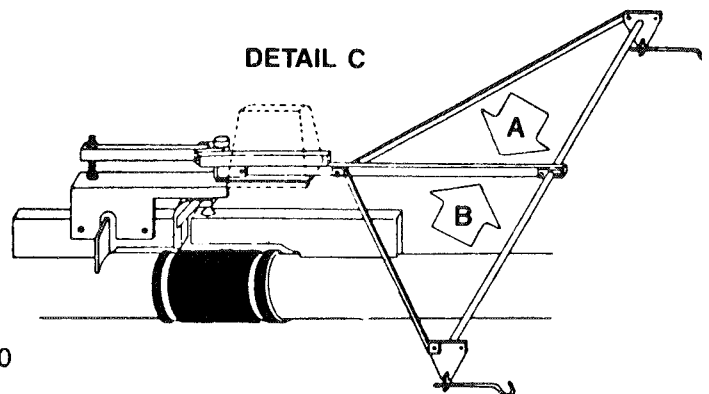
1. After the tower box has been attached to the Tower Box Support (Det. A), but prior to attaching the adjustment rod, MANUALLY DEPRESS THE RUN SWITCH AND ROTATE THE SWITCH ARM ASSEMBLY IN BOTH DIRECTIONS TO ASCERTAIN THAT THE SAFETY SWITCH WILL ACTUATE BEFORE THE CAM PLATE MAKES CONTACT WITH THE BOLT IN THE CENTER OF THE CAM PLATE (Det. B), If you cannot hear the safety switch "click" in and out in both directions, do not proceed with that tower run switch adjustment until a fully qualified service technician has properly adjusted the safety switch.



2. Attach the adjustment rod as shown in Det. A, but leave nuts #1 & #2 completely loose. Rotate the switch pivot arm assembly (under the control box) until the roller of the Safety Switch rests in the "V" of the cam plate, and tighten bolt #1.
3. Adjust nut # until the run switch is depressed, and then back the nut off until it releases. Tighten nut #2.



4. Readjust nut #1 & #2 as needed, to accomplish the following:
  - a. Pull tee assembly at "A". Run Switch should actuate, but not release when pressure is removed.
  - b. Push tee assembly at "B" (with same pressure as at "A"). Run Switch should release, but not actuate when pressure is removed.

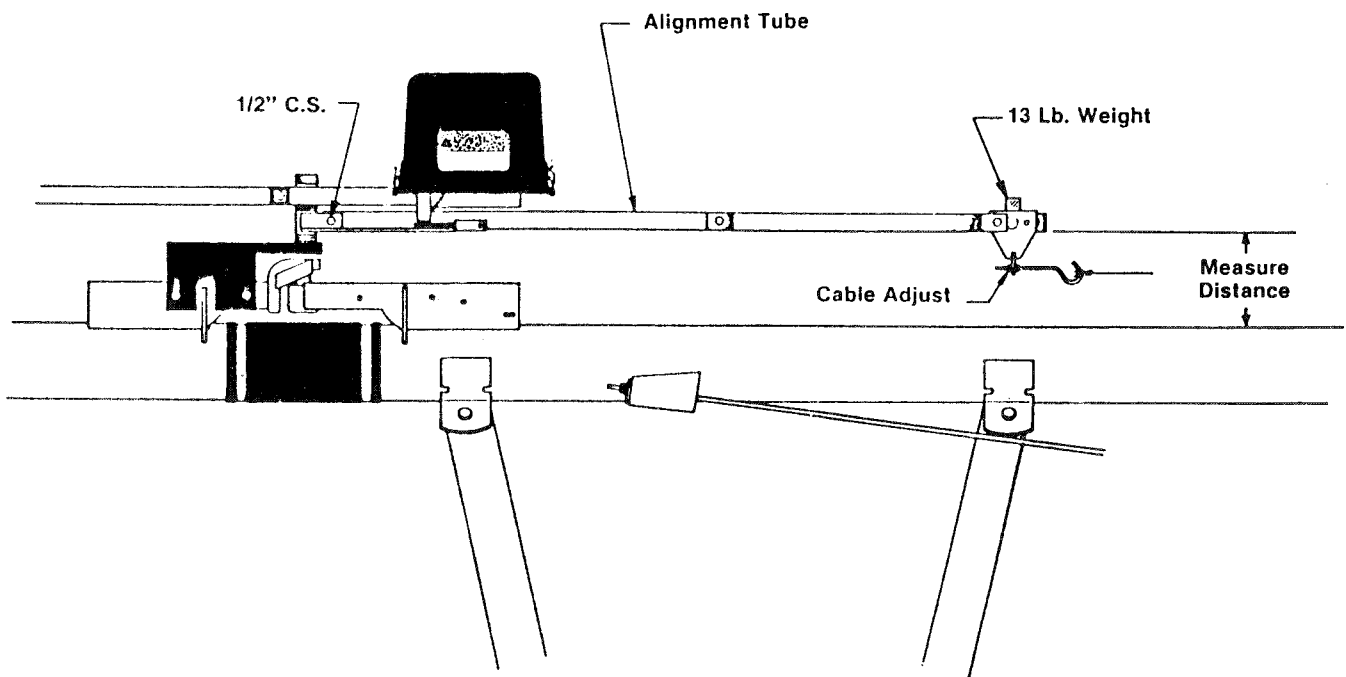






## Linear Field Adjustment of Floating Alignment Cable Tension

1. The alignment tube must be able to move up and down freely while adjusting cable tension. If this is not possible, loosen the  $\frac{1}{2}$ " C.S. to the point where no binding of the alignment tube takes place.
2. Measure the distance from the alignment tube down to the span.
3. Place a 13 lb. (plus or minus one ounce) weight so that the center of gravity is located on the alignment tube between the two bolts joining the cable attachment assembly. (If a 13 lb. weight is not readily available, a standard  $\frac{7}{8}$ " square driveshaft 60" long meets the required weight tolerance. Place the driveshaft's center of gravity between the two bolts of the alignment tube and parallel above the cable attachment assembly.)
4. After proper placement of the weight, measure the distance from the alignment tube to the span. The amount of deflection due to the 13 lb. weight should be  $\frac{1}{4}$ " ( $\pm \frac{1}{16}$ ").
5. Adjust "J"-bolts evenly to obtain proper deflection. To insure equal tension in the cables, usually align both of the alignment tubes with the span.





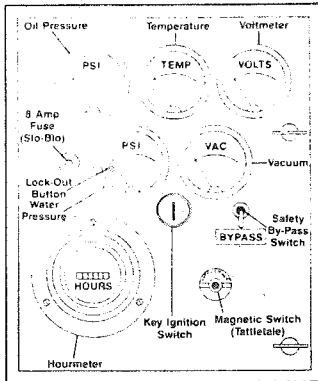


# Linear Start Up Procedures

1. Inspect wheel tracks to insure no vehicle or other equipment will be contacted upon start-up or operation.
2. Turn on the oscillator if the system has below ground guidance.
3. If equipped with an engine generator power source check engine fuel, coolant and oil levels.
4. Switch the power source disconnect to the "ON" position or start the diesel engine. Refer to your engine owner's manual for your particular engine.

8. Prime Pump if so equipped. (See page on Pump Priming.) Fill system with water.
9. Once the system is filled, turn the control panel disconnect to "ON" position. Check the voltmeter reading. This should be 480-505 VAC. Adjust engine throttle as needed to provide the required voltage.
10. Refer to the appropriate Control Panel Owner's Manual for start-up and operating procedures.
11. **SWING AROUND ONLY** - Place the Raise/Lower-Normal Switch in the "NORMAL" position and the Linear-Pivot Mode Switch in the "LINEAR" position.
12. When system is running, move toggle switch of Murphy Panel to "ON" or "RUN". In this position, the engine will stop running if the system shuts down.

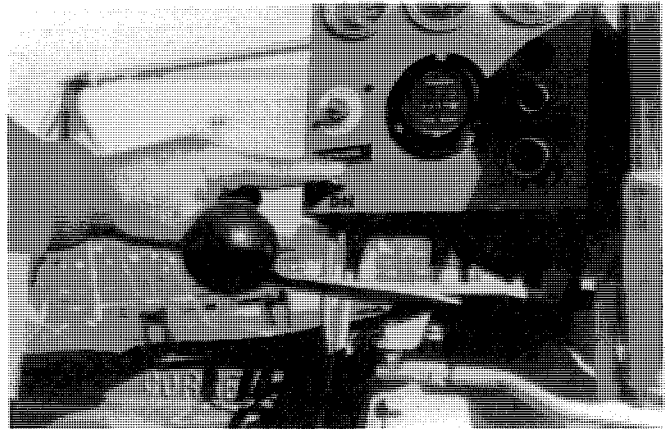
ENGINE CONTROL PANEL



## MURPHY PANEL

### ON MURPHY PANEL (DITCH FEED ONLY)

5. Move safety toggle switch to "Bypassed" position.
6. Push "Reset" button on water pressure gauge.
7. Push and hold the red "Tattletale" button in while pushing "Engine Start" button. As soon as the engine starts, release Engine Start and the Tattletale button will hold itself in.



**NOTE:** You must physically hold the tattletale button in when switching the toggle to "Run."

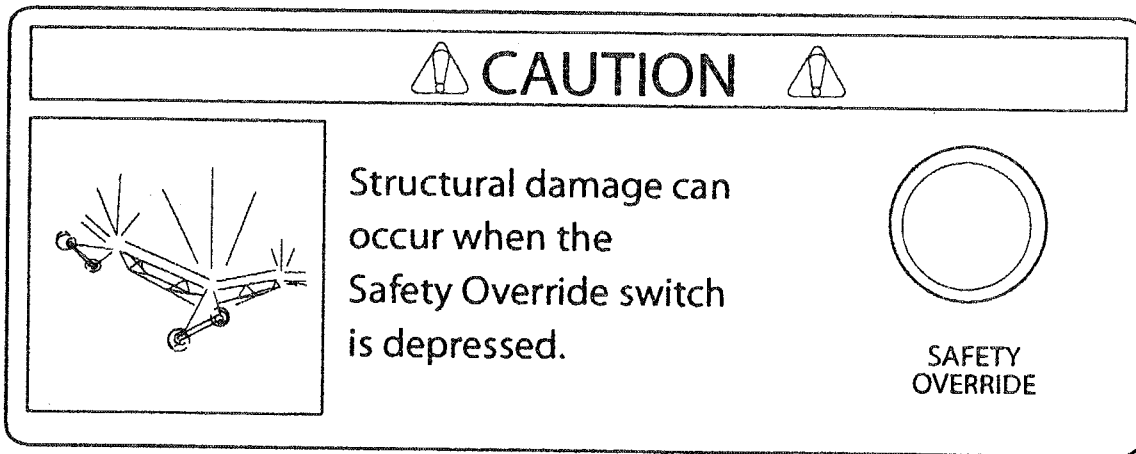


# Linear Safety Override

The Linear is equipped with a safety override push button switch. Should the system misalign for some reason, and it is necessary to override the safety circuit momentarily to realign the system, this switch may be used.

**CAUTION MUST BE TAKEN** when this button is depressed as it will by-pass or disable all of the system's safety circuits. Never depress this button for more than 3 to 5 seconds and you are able to see the entire system.

**NEVER** depress the override button longer than 3 to 5 seconds and you must inspect the entire system between each start attempt. Repeated override start attempts can cause severe structural damage. Call your local Valley dealer should the system fail to start.



Location: Control Panel

CVII98 a



# Linear Exhaust Primer Operation

Close the riser pipe mounted hand operated valve. Start the engine and push in on the primer handle.

This causes the plate on the end of the primer handle to enter the exhaust pipe, diverting the air flow from the exhaust through a venturi, which is attached to the bottom side of the exhaust pipe, immediately adjacent to the muffler. As the exhaust air passes the venturi, it creates a negative pressure in the hose line which is attached to the venturi. This negative pressure is known as "vacuum" and can be read on the vacuum gauge on the Murphy control.

You should now adjust the RPM of the engine until you can achieve a maximum vacuum reading on the gauge.

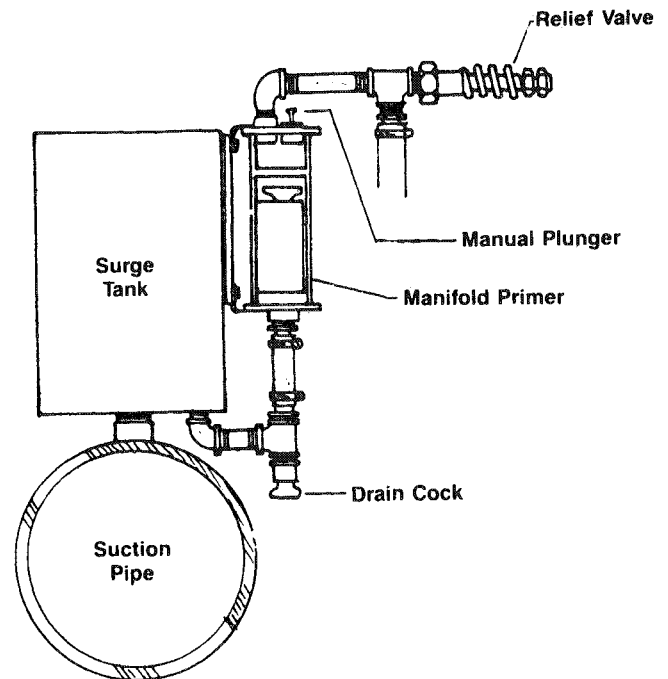
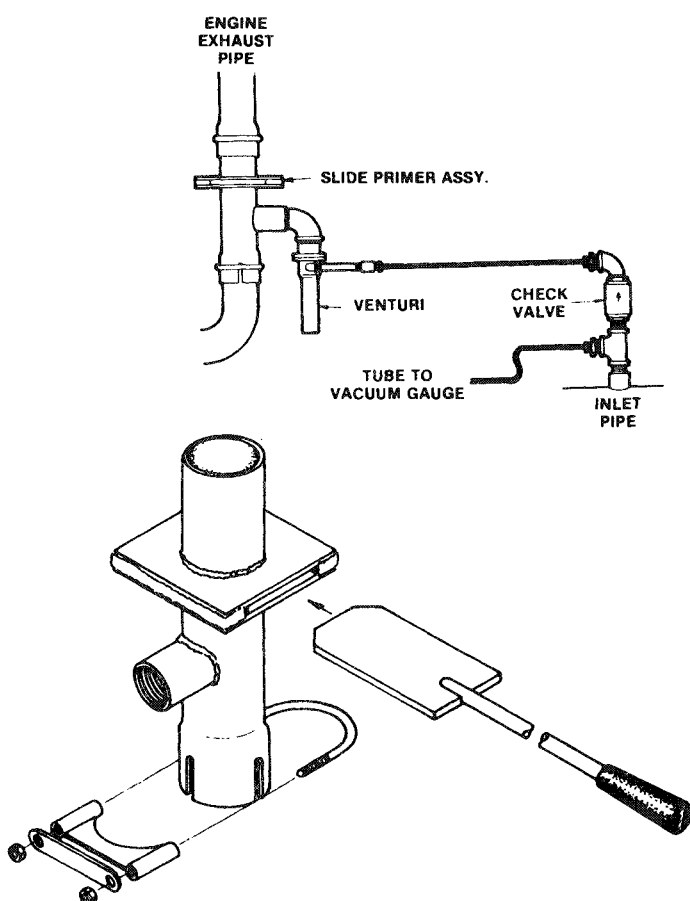
The vacuum will pull air out of the inlet and pull water into the cavity. When water begins to spray out of the venturi the inlet and pump cavity will be full of water and primed. You may now remove the primer slide from the exhaust pipe and slowly open the hand valve, filling the system. Once the system pipeline is full and the hand valve completely open, bring the engine up to its operating R.P.M.

## ELECTRIC PRIMER OPERATION

1. Grease the seal on the engine driven pump before each use.
2. Open the 3/4" Ball Valve on the centrifugal pump.
3. Start engine, turn main disconnect switch on and adjust engine RPM until voltmeter reads 500 volts.
4. Turn on the electric primer using the switch located on the under side of the main control panel.
5. When water squirts from the ball valve, turn the pump switch to "off."
6. Slowly open riser valve.
7. Close the ball valve.

If water enters the chamber on the manifold primer it will close off, the relief valve will open and no priming will occur. To re-establish prime:

1. Turn off primer motor.
2. Depress the manual plunger to allow draw-down.
3. If necessary, open the drain cock for full drainage.
4. When fully drained repeat 1-7.





# ***Linear Electric Cord Option***

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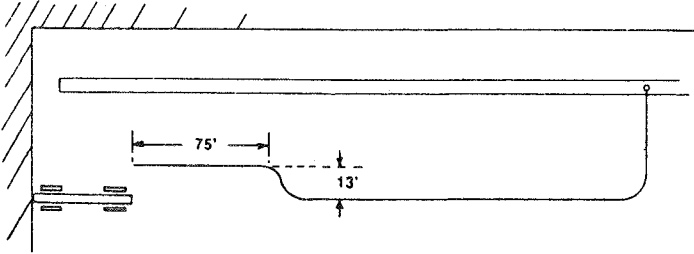
## **Additional Start-Up Guide Specifically For The Electric Cord Drag Option**

1. Ensure that the danger signs are in place and visible at each end of the travel lane.
2. Check the electric cord for nicks, cuts or abrasions. (Do not start the system if any of these defects are found. Call your Valley service dept.)
3. Remove the plug cap and insert the plug into a receptacle.
4. Place the safety cable through the mechanical safety cable hook at the power pedestal.
5. Turn the disconnect switch on at the power pedestal and G.F.I. panel.
6. Prime the system:
  - a) Close the riser valve.
  - b) Turn on the electric primer.
  - c) When water appears in the clear manifold primer turn the primer off.
7. Move the pump panel disconnect switch to the "on" position.
8. Set the selector switch on the pump panel to the manual position. The pump should start.
9. Slowly open the riser butterfly valve and fill the system.
10. Select a percentage timer setting.



# Polyethylene Hose Operating Procedure

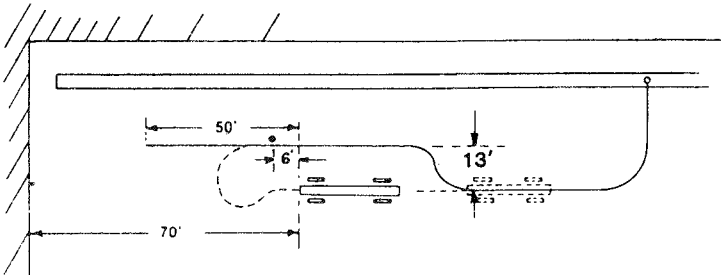
1. Linear Cart Travel starts at the edge of the field. Lay about 75' of hose 13' from the center of the cart, toward the pipeline.



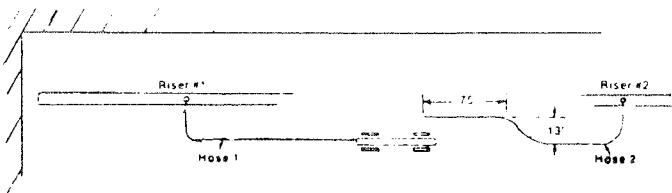
2. Allow the system to run dry for approximately 70'. Stop the system and connect the hose to the cart. (Refer to System Start-Up Procedures.)

NOTE: 1) Do not pull the polyethylene hose in this manner if there is no water pressure in the hose.

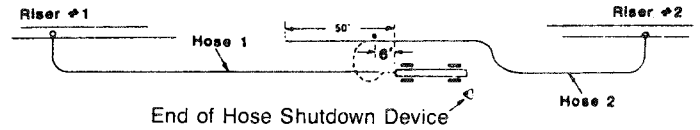
2) Installing an additional guidance post or stake 6' behind the cart as shown, will aid in connecting the hose to the cart.



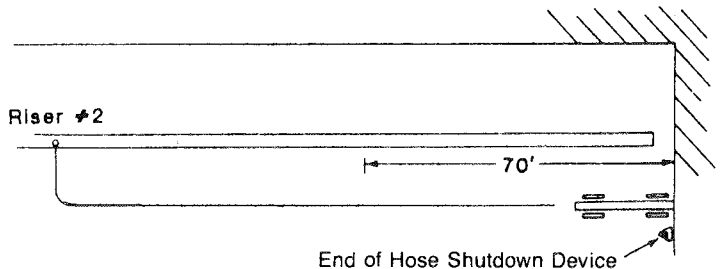
3. Prior to reaching Hose #2, reposition about 75' of Hose #2 13' toward the pipeline. This will allow the system to pass without coming in contact with Hose #2.



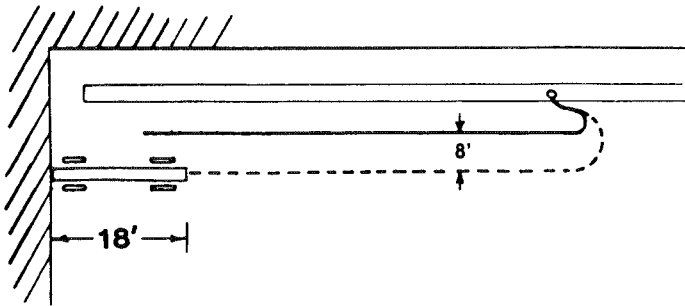
4. Allow the system to move past Hose #2 about 50'. Set the percentage timer at 0%. Connect Hose #2. Open valve at second riser, shut valve at first riser. Select opposite direction of travel, set percentage timer at 100% and back the system up enough to remove tension and allow some slack in Hose #1. Reset percentage timer to 0%. Unhook latch at hose coupler and rotate coupler 180°. Select original direction of travel and reset percentage timer. As system moves ahead, Hose #1 will drop out. Move end of field shutdown device to proper guidance stake.



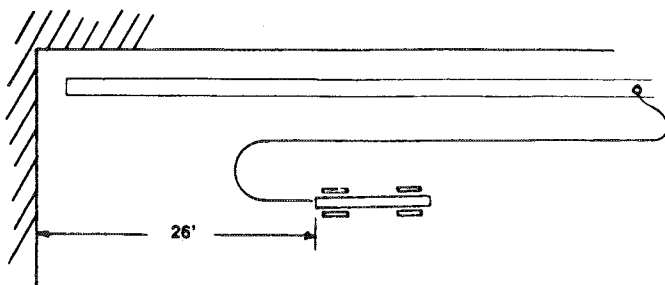
5. In order to maintain uniformity in water distribution across the field, during the last 70' of operation the system should be operated at half the selected speed. Upon reaching the edge of field but **before** reaching the end of field shutdown device, set percentage timer at 0% and put the hand/auto switch in the hand position. Shut valve at second riser. Select opposite direction of travel, set percentage timer at 100% and back the system up enough to allow some slack in the hose. Reset percentage timer to 0%. Unhook latch at hose coupler and rotate coupler 180°. Select original direction of travel and reset percentage timer at 100%. As system moves ahead, the hose will drop out. When this happens, set percentage timer at 0%.



1. Closed Delivery Linear Cart starts at the edge of the field. Lay entire length of hose about 8' from the center of the cart, toward the pipeline.



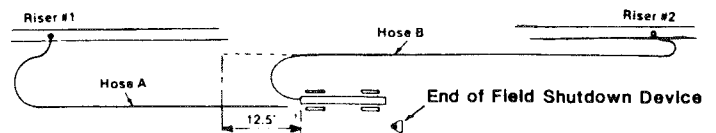
2. Allow the system to run dry for approximately 26'. Stop the system and connect the hose to the cart. (Refer to System Start-Up Procedures.)



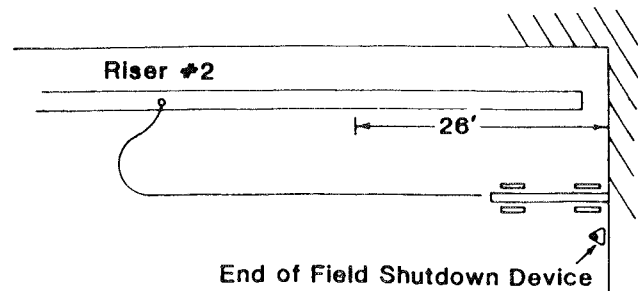
3. Prior to reaching Hose B, lay the entire length of Hose B 8' over as in Step 1.



4. Allow the system to move about 13' beyond the end of Hose B. Set the percentage timer at 0%. (This will stop system movement without shutting the system down.) Connect Hose B. Open valve at second riser, shut valve at first riser. Select opposite direction of travel, set percentage timer at 100% and back the system up enough to allow some slack in Hose A. Reset percentage timer to 0%. Unhook latch at hose coupler and rotate coupler 180°. Select original direction of travel and reset percentage timer. As system moves ahead, Hose A will drop out. Move end of field shutdown device to proper guidance post in preparation for return run.



5. In order to maintain uniformity in water distribution across the field, during the last 26' of operation the system should be operated at half the selected speed. Upon reaching the edge of the field but **before** reaching the end of field shutdown device, set percentage timer at 0% and put the hand/auto switch in the hand position. Shut valve at the second riser. Select opposite direction of travel, set percentage timer at 100% and back the system up enough to allow some slack in the hose. Reset percentage timer to 0%. Unhook latch at hose coupler and rotate coupler 180°. Select original direction of travel and reset percentage timer at 100%. As system moves ahead, the hose will drop out. When this happens, set the percentage timer at 0%.

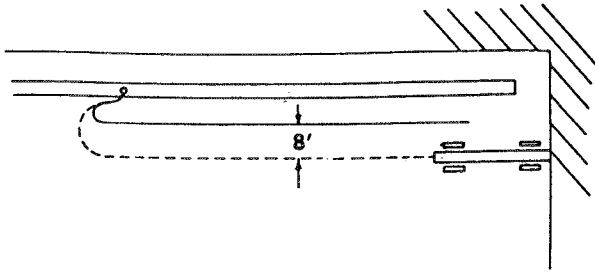




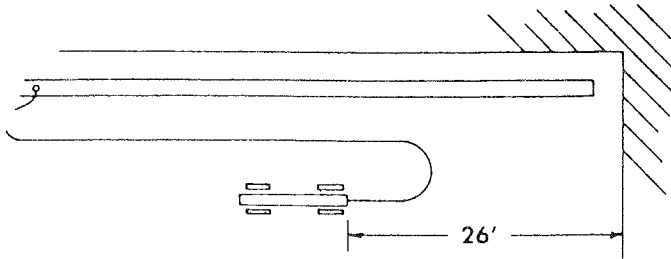


# Traveler Hose Operating Procedure

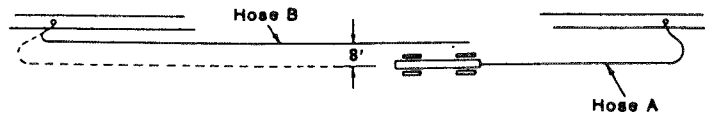
6. Lay the entire length of hose over about 8'.



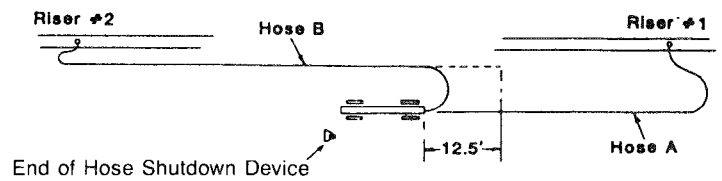
7. Select opposite direction of travel and set percentage timer at 100%. Let the system run dry for about 26'. Set percentage timer at 0%. Put hand/auto switch in the auto position. Connect hose to cart. Set percentage timer and open valve at pipeline riser.



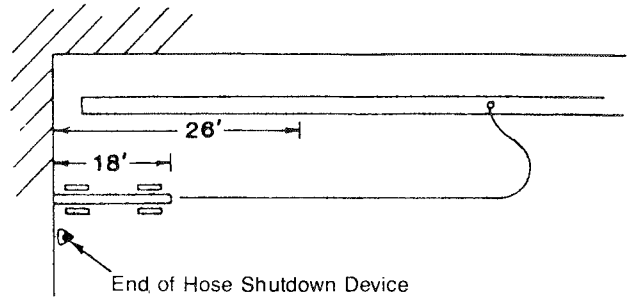
8. Repeat Step 3.



9. Repeat Step 4.



10. Repeat Step 5.



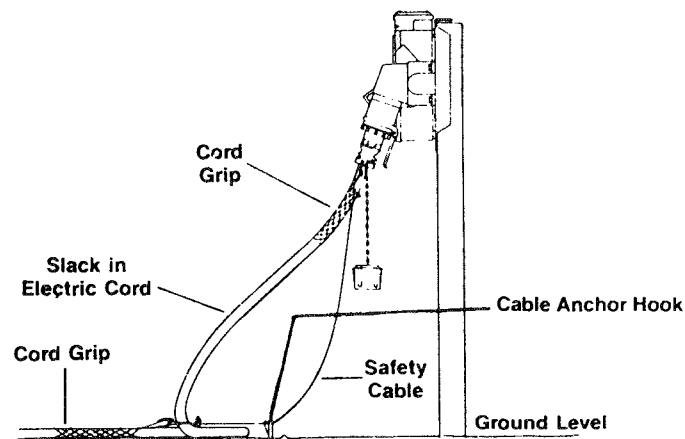


# Proper Cord Handling Procedures For Electric Cord Linears

1. Remove all sharp objects from the travel lane that may cause damage to the electric cord.
2. Never handle the electric cord when power is on.
3. The disconnect switch must be in the "off" position when inserting or removing the plug from the receptacle.
4. Never allow the hose to drag over the electric cord. Always lay the electric cord over the hose.
5. Never allow the electric cord to kink.
6. Regularly inspect the electric cord for nicks or cuts. Replace a damaged electric cord immediately. **DO NOT** attempt to splice a damaged cord.
7. Do not drive any vehicle over the cord at any time unless the cord is protected from physical damage.
8. Place the safety cable through the mechanical safety cable hook of the power pedestal each time the plug is inserted into a receptacle.
9. Insure that the mechanical safety cable is functional each time the cord is plugged in.
10. Attach the cup cap to the plug when moving the cord and plug assembly from one power pedestal to another, or when storing the cord.
11. The screw collar on the plug is for attachment of the cup cap only. **DO NOT** attach this collar to the receptacle. The plug must always be capable of being pulled out!
12. The electric cord should be stored off the ground and protected from rodent damage when not being used for long periods of time.

## SPECIAL NOTE

1. Periodically check to see that the "Danger" signs located at the ends of the travel lane are in place and legible.
2. "Danger" and "Warning" decals are on this equipment to help insure your safety. Be aware of the potential hazards.

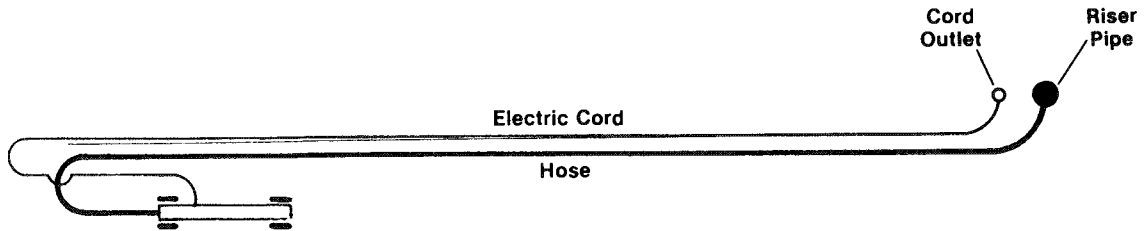


The figure above shows the proper installation of the mechanical safety cable disconnect. Be sure the safety cable is routed through the cable anchor hook before power is turned on. For proper operation, there must be slack in the power cord between the two cord grips when the cable is pulled tight.



# Linear Hose and Cord Layout

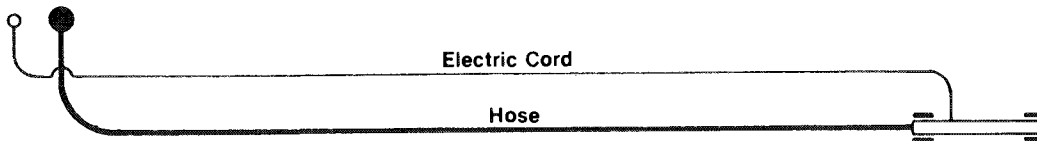
## POSITION 1 — Start of Run



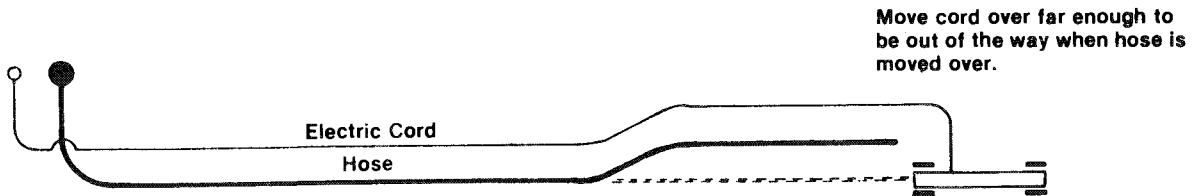
Cord connected to cart on riser side of cart.

NOTE: Electric cord positioned behind hose & is laying OVER hose.

## POSITION 2 — End of Run



## POSITION 3 — End of Run -- Reposition Hose & Cord



Move cord over far enough to be out of the way when hose is moved over.

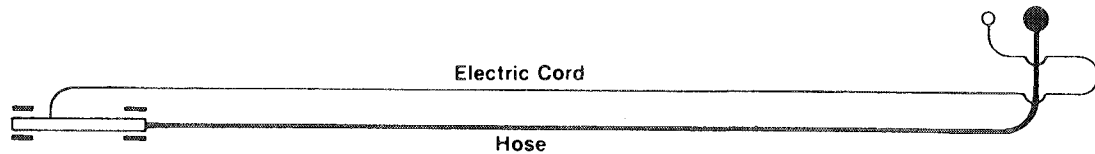
Reposition hose & cord before reversing directions.

## POSITION 4 — Reverse Direction -- Hose & Cord Hook-Up at Start of Run



Connect hose so cord is over the top of hose.

## POSITION 5 — End of Run



## POSITION 6 — End of Run -- Reposition Hose & Cord

Move cord over far enough to be out of the way when moving hose.



Reposition hose & cord before reversing directions.



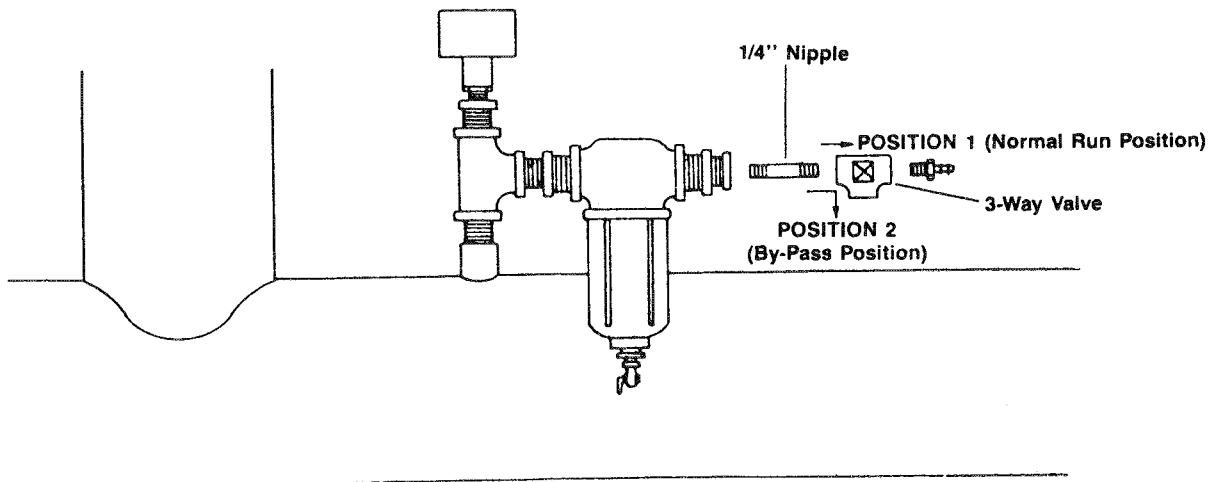
# Linear Butterfly Option

## Cord Drag Option

A manual override valve is supplied with 6000 Hose Drag systems ordered with the butterfly. The purpose of this valve is to override the hydraulic safety circuit going to the system butterfly valve. The electric cord can then be disconnected and moved to the next riser without having the safety circuit close the butterfly valve on the riser pipe causing an unwanted pump shutdown.

Before shutting off and disconnecting the electric cord, the operator should turn the 3-way valve to the by-pass position which keeps water from going to the butterfly valve cylinder and by-passes it to the atmosphere. After the cord has been reconnected and the system is restarted, the operator should turn the 3-way valve back so water is directed to the butterfly valve cylinder and closed to the atmosphere.

By having water directed to the atmosphere when overriding the safety circuit, the operator will always know the position of the valve so he will not leave it in the by-passed position after reconnecting the cord.





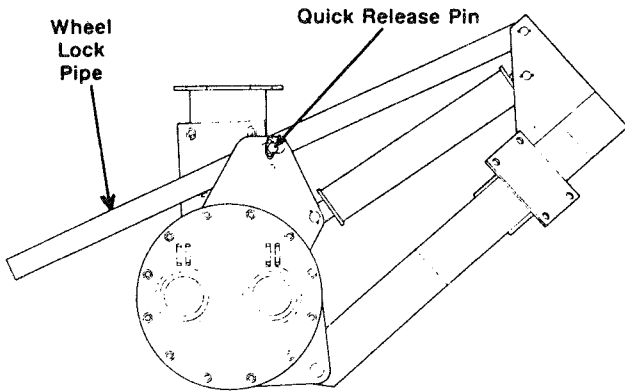
# Pivoting The Swing Around Linear

The following is a guide to pivoting the swing around linear. Prior to pivoting the system you must insure the position of the 4 wheel cart over the pivoting point. If the system has stopped at a point other than desired adjust the end-of-hose stop post to the position required and relocate the cart to the desired position.

It is imperative that routine maintenance of the pivot area be performed. The pivot area must be kept clean of weeds or other debris.

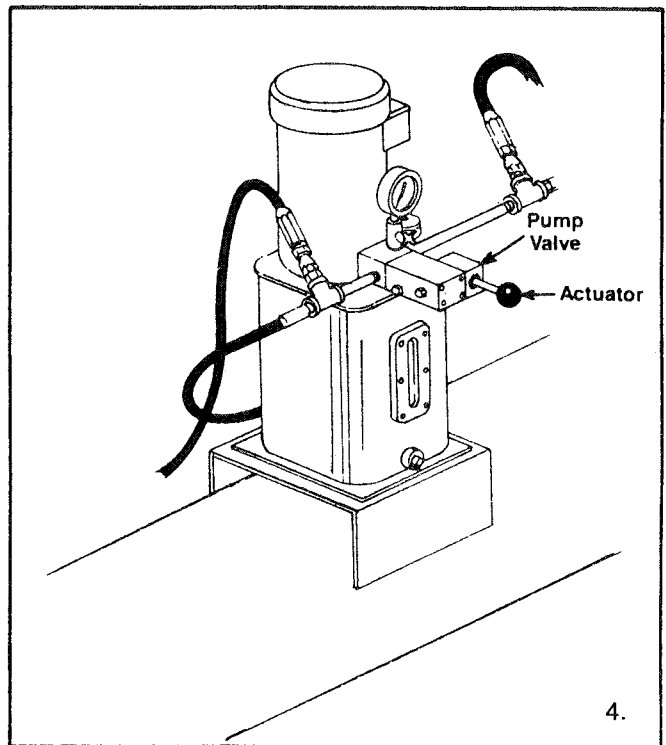
## PIVOTING PROCEDURES

1. Place the RUN/STOP switch in the "RUN" position and the LINEAR/PIVOT switch in the "PIVOT" position.

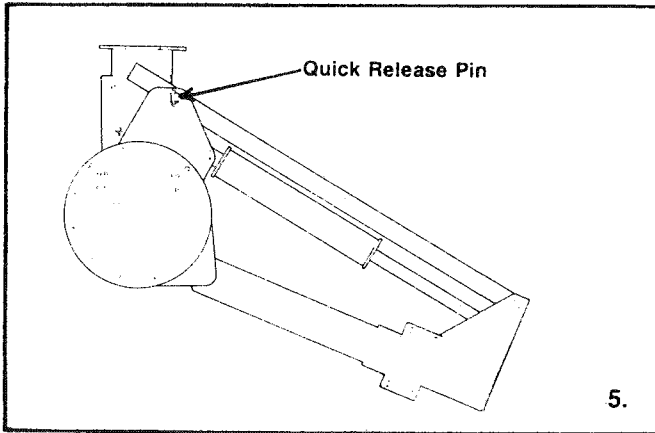


2. Remove the quick release pin from the wheel lock pipe.
3. Place the RAISE/LOWER-NORMAL switch in the RAISE/LOWER position.

4. If the optional pump was not purchased, the hoses from hydraulic cylinders should now be attached to the hydraulic system of a tractor and the pivot wheels lowered. (Use caution around high pressure hydraulic lines.)



If the optional electric pump is being used, actuate the pump valve to extend the pivot wheels.



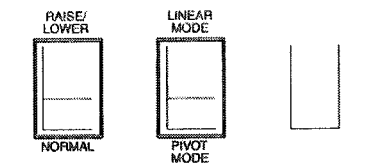
5. Reinsert the quick release pin through the hole at the end of the wheel lock pipe.
6. Return the pump valve to the neutral position and put the RAISE/LOWER-NORMAL toggle switch in the NORMAL position.
7. Attach the three anchor chains, removing all slack with the load binders provided.

8. Turn Percentage Timer to 100%.
9. Depress the Directional start button desired.
10. When the system has pivoted and has stopped, place the RAISE/LOWER-NORMAL switch in the "RAISE/LOWER" position.
11. Remove the anchor chains.
12. Remove the quick release pins and retract the pivot wheels, locking them back into the "UP" position. (See step 4)
13. Place the RAISE/LOWER-NORMAL switch in the "NORMAL" position and the LINEAR-PIVOT mode switch in the "LINEAR" position.

The system is now ready to resume normal linear operation.

Note: The recommended hydraulic oil for use in the Swing Around Linear hydraulic system is: Mobile - DTE 25, or Amoco - B - 30277. Three gallons of oil are required. This oil can be ordered from your Valley dealer in 5 gallon containers under part number 992578.

## Switches Used When Pivoting



The position of these switches is critical to the linear pivoting process, particular attention must be given to correct positioning.

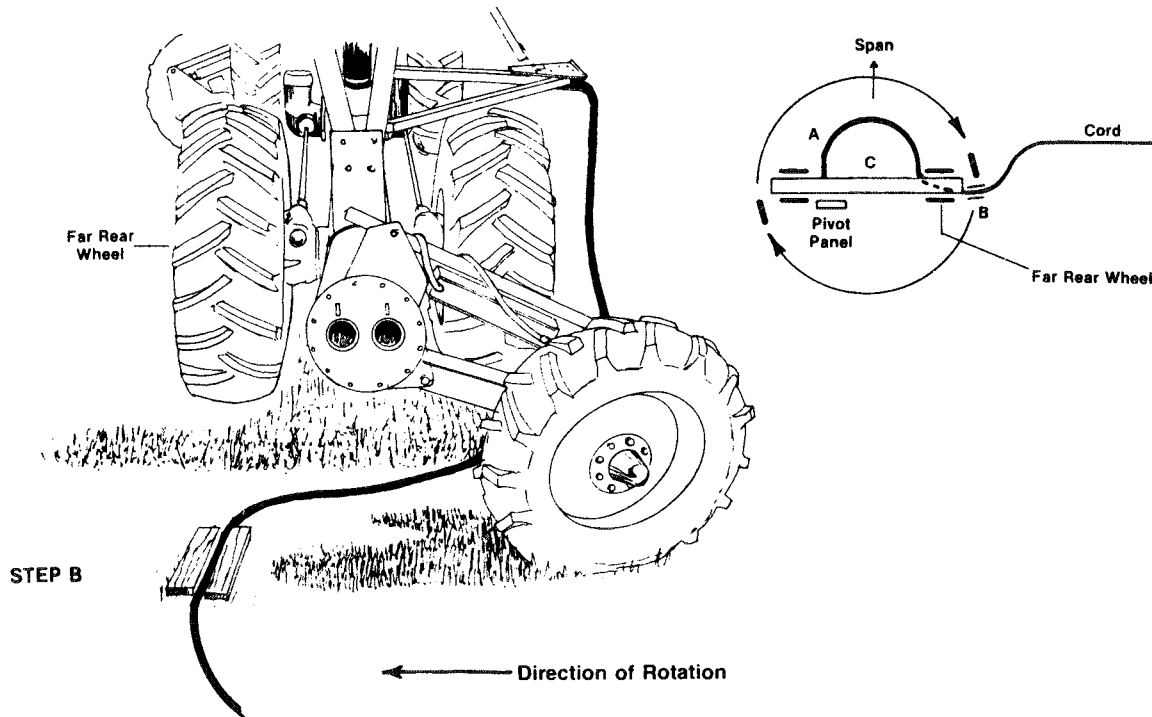
**WARNING:** Do not put the mode switch in the "Pivot" mode without first lowering the pivot wheels. Severe structural damage could result.

**WARNING:** Do not put the toggle switch in the "Linear" mode without first raising the pivoting wheels. Severe structural damage could result.



# ***Electric Cord Swing Around Linear***

## **PREFERRED PIVOTING CONDITION Clockwise Into Electric Cord**



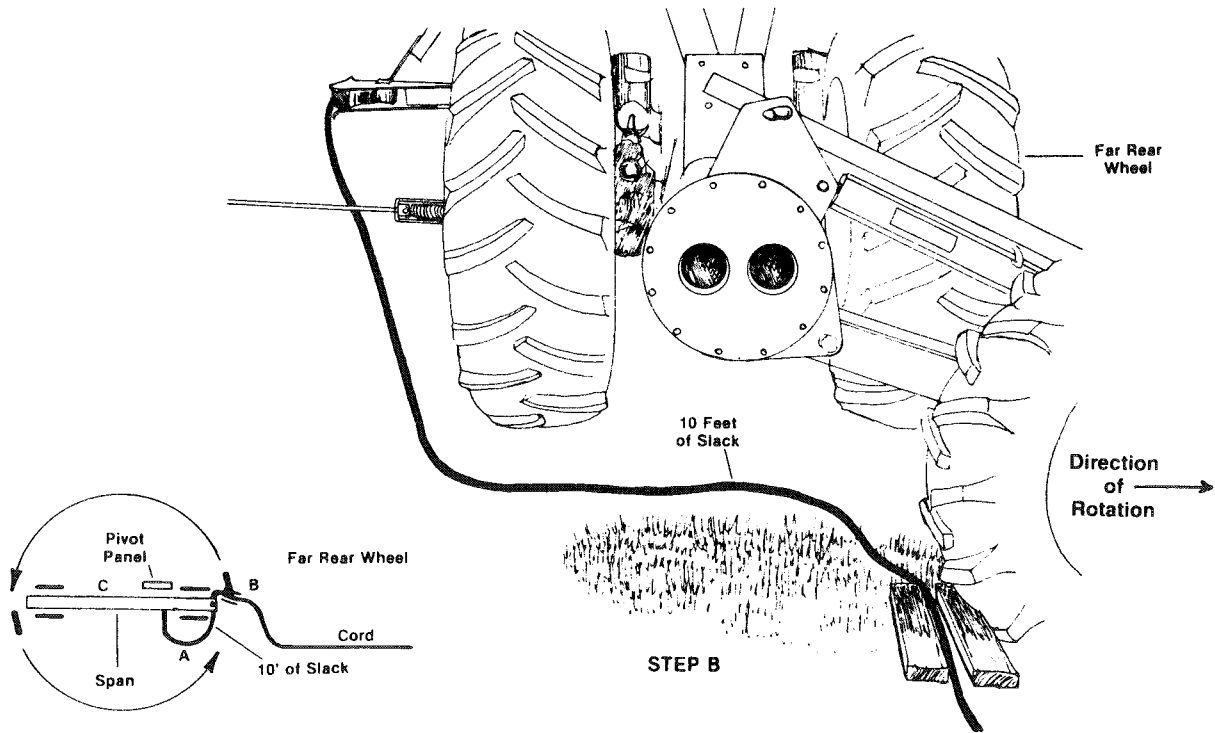
- A) Place electric cord behind shutdown actuator.
- B) Route electric cord behind far rear wheel as shown. This should be done before the pivot wheels are lowered. Provide protection for electric cord where pivot wheels pass over (at cart & drive units).
- C) Connect load binders up as close to the cart swivel as possible so the cord will not catch on them.





# Electric Cord Swing Around Linear

## ALTERNATE PIVOTING CONDITION Counterclockwise Into Electric Cord

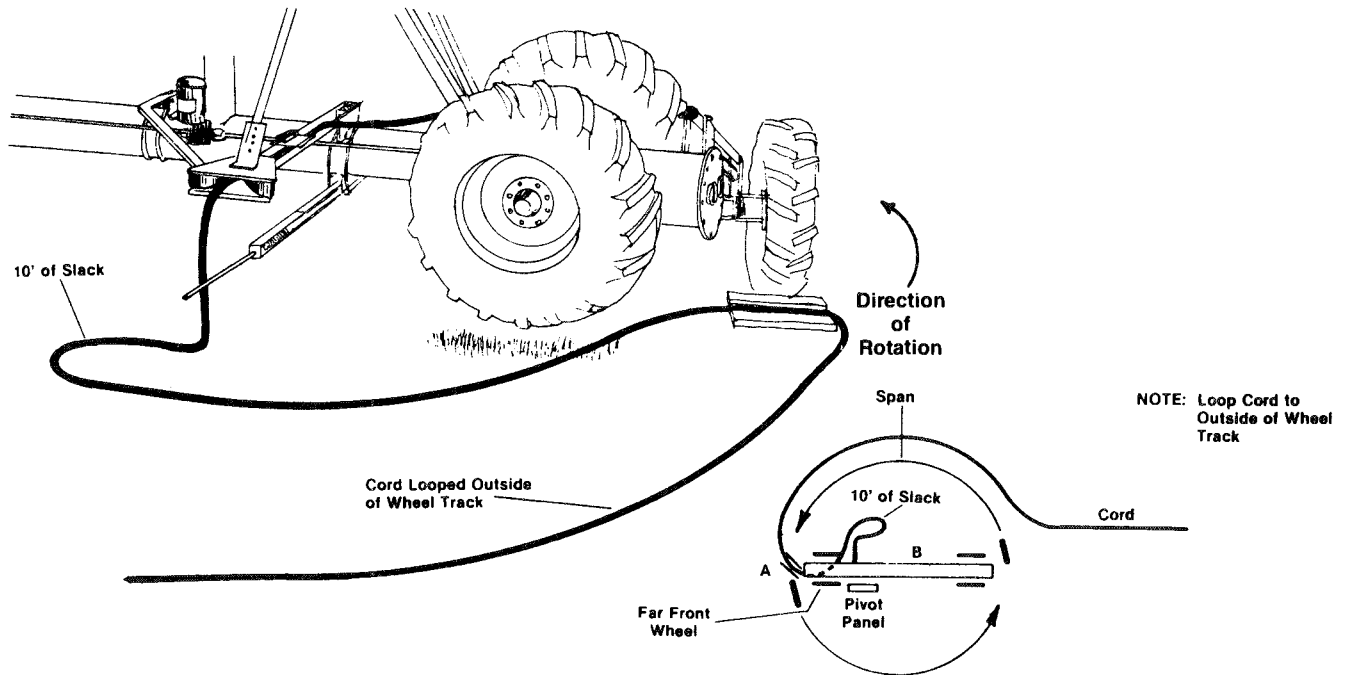


- A) Place electric cord behind hose shutdown actuator.
- B) Route electric cord behind far rear wheel as shown. This can be done after the pivot wheels are lowered. Provide protection for electric cord where pivot wheels pass over cord (at cart & drive units).
- C) Connect load binders up as close to the cart swivel as possible so the cord will not catch on them.



# Electric Cord Swing Around Linear

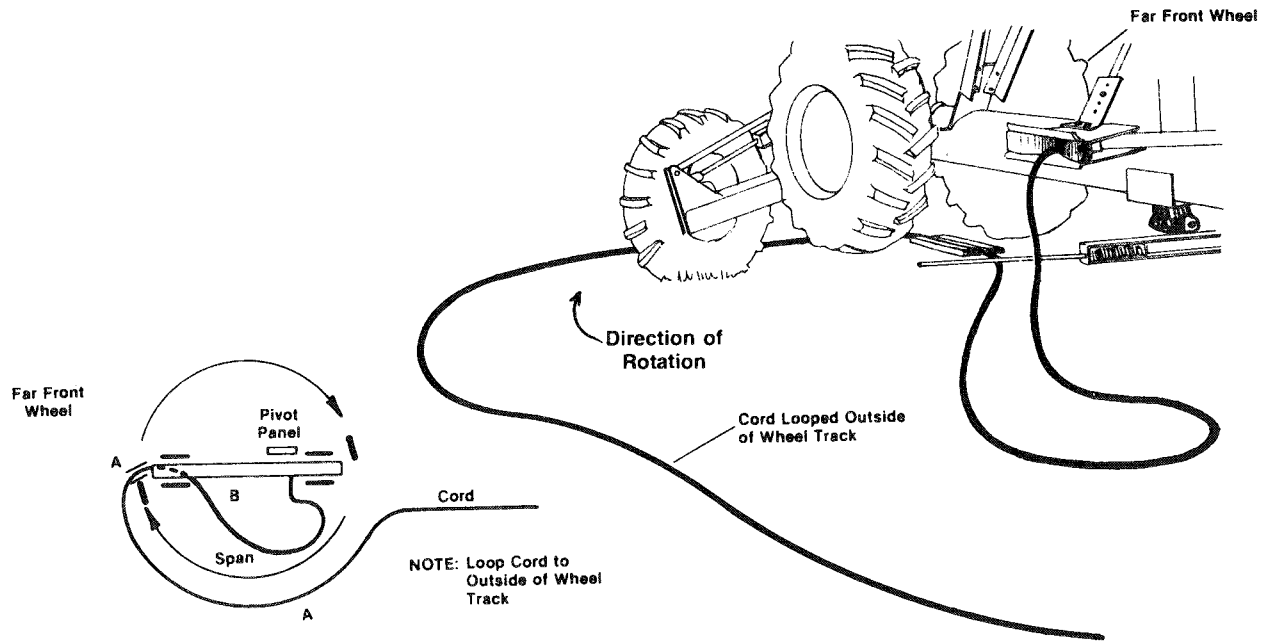
## ALTERNATE PIVOTING CONDITION Counterclockwise Away From Electric Cord



- A) Pull up 35' of electric cord and position as shown. Be sure to provide ten feet of slack inside pivot wheels. Also provide protection for cord where wheels pass over it (at cart & at drive units).
- B) Connect load binders up as close to the cart swivel as possible so electric cord will not catch on them.

# Electric Cord Swing Around Linear

## ALTERNATE PIVOTING CONDITION Clockwise Away From Electric Cord



- A) Pull up 35' of electric cord and position as shown. Provide protection for cord where wheels pass over it (at cart & drive units).
- B) Connect load binders up as close to the cart swivel as possible so electric cord will not catch on them.



# ***Maintenance Safety***

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## **ALWAYS PRACTICE SAFE MAINTENANCE**

**DO NOT** Attempt to service any component until all electric power is disconnected. Always turn the control panel disconnect to "off." Lock it in that position.

**DO NOT depend on another person to disconnect the power -- DO IT YOURSELF!**

**NEVER** perform any maintenance or trouble shooting until power is off, the outer door shut, and the "Do Not Operate" sign placed in the panel latch.

**REPLACE** any guards and shields removed for servicing.

**DO NOT** attempt to adjust end gun as it operates.

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



# Maintenance Check List

Time, humidity, vibration, temperature, sand and system operation all contribute to wear on your VALLEY irrigation system. To keep the system operating properly with a minimum amount of down time, we urge you to establish a regular preventative maintenance program. If replacement parts are needed, use only VALLEY REALPARTS.

**DO NOT** attempt to service any component until all electrical power is disconnected and the panel locked.

**DO NOT** attempt to adjust the end gun while it is operating.

**DO NOT** depend on another person to disconnect the power — **DO IT YOURSELF!**

**DO REPLACE** any guards and shields removed for servicing.

## LINEAR CART ✓

	1st PASS	4th PASS	Pre- season	REMARKS
Check all nuts and U-bolts	X	X	X	
Check wire connections & plumbing fittings	X	X	X	
Check equipment grounding cables			X	
Grease axle swivel pin & U-joints	X		X	
Engine maintenance				See Engine Operators Manual

## SPAN ✓

Check and insure all head keepers are installed			X	
Check flanges for leaks, tighten as necessary			X	
Check pipe drains for open flow and invert seal when applicable (see winterization)			X	These must be checked at end of season shutdown
Check structural components for tightness			X	
Check power cable for breaks and proper banding			X	
Check overhang cables for broken strands		X	X	

## SPRINKLER ✓

Check match up of pivot pressure to sprinkler package pressure		X	X	Notify your Valley dealer of any change
Check sprinklers & nozzles for tightness			X	
Check sprinkler for free movement		X	X	
Check sprinkler nozzles for wear			X	Increasing engine RPM or pipeline pressure loss indicates wear
Check pressure gauge for proper operation and calibration			X	
Check for plugged or partially plugged nozzles	X	X	X	
Flush entire system			X	See Flushing Procedure
Check end gun bearing and brake setting			X	
Drain booster pump hose				This should be done at end of season



# Maintenance Check List (Continued)

## DRIVE UNIT ✓

	1st PASS	4th PASS	Pre- season	REMARKS
Check flex joint boot for leaks Tighten as required			X	
Check conditions of motor lead cable			X	
Check for proper ground connection on motor and motor lead			X	
Check motor lead connections and connector position			X	
Check motor drain hole for open flow			X	
*Drain & replace gearmotor lubrication				*See note
*Check/change gearbox lubricant				*See note
Check gearmotor seals and gaskets			X	
Check drive shaft U-joints and U-joint covers			X	
Check gearbox seals & gaskets			X	
Check and tighten wheel lug bolts			X	
Check tire pressure			X	See tire pressures
Clean gearbox ventilation hole in expansion chamber		X	X	Ventilation holes must be kept open to extend the gearbox seal life

## SPECIAL ALIGNMENT ✓

Check cable tension - floating alignment			X	
Check "T" bar for vertical motion			X	
Check "T" bar for horizontal motion on stainless steel shaft			X	
Check cross bar tube for motion on stainless steel shaft			X	
Check ball joints for free turning			X	
Check for cap over cotter key and washer			X	

\*NOTE: Recommended change totally the first year and every third year thereafter. When not changed condensation should be checked and gearbox oil level replenished.



## **Linear Standard Recommended Engine Preservation**

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NOTE: Check the Owner's Manual supplied with engine for specific details on maintenance and operation and winterizing.

1. Clean the outside of the engine, cooling air passages and cooling fins with diesel fuel, benzine or cold detergent.
  2. Drain the engine oil in hot condition and fill in corrosion inhibitor oil. (The MIL specification for this oil is MIL-L-21260.)
  3. Pour the oil out of the air cleaner bowl, clean bowl and fill in corrosion inhibitor oil.
  4. Drain fuel from tank, **mix well** with 10% corrosion inhibitor oil and fill back into tank. (With very large tanks, it is permissible to mix the corrosion inhibitor oil directly in the tank.)  
**CAUTION:** A partially filled fuel tank will permit condensation which will contaminate the fuel and act to damage the injection pump and injectors.
  5. Drain or draw off the oil from injection pump and governor and refill with corrosion inhibitor oil.
  6. Run engine for about ten minutes so that pipes, filter, pump, and nozzles are filled with the preservation mixture and the new motor oil is distributed to all parts of the engine.
  7. After this run-in time, stop engine, remove the rocker arm chamber covers and spray the rocker arm chambers with a mixture of diesel fuel and 10% corrosion inhibitor oil. Reinstall the covers.
  8. Turn engine over several times **without firing** in order to spray the mixture into the combustion chambers.
  9. Remove all V-belts and spray the grooves of the pulleys with corrosion inhibitor oil. Remove the oil before re-using the engine.
  10. Tightly close openings of cooling air blower, air cleaner intake and exhaust pipes.
  11. Drain Racor filter or water separator.
- Before putting the engine back into full operation, all corrosion inhibitor oil must be replaced by fresh motor oil.

### **Standard Start-Up Procedure for Engines Returning To Irrigation Pump Service After Prolonged Storage**

#### OWNER CHECK LIST

1. **Inspect:** Cooling blower, radiator, cooling fins, fuel lines, linkages, manifolds, diesel fuel in storage tank, safety shut-down, wiring, and electrical items (including battery).
2. **Clean:** All pulleys (remove any rust).
3. **Reinstall or replace:** V-belts, depending on condition (check V-belt tension).
4. **Replace:** All fuel filters and lube oil filters, engine lube oil, injection pump lube oil, governor lube oil, oil in oil bath air filter (or filter elements if dry type air filter is used).



# Pump Lubrication

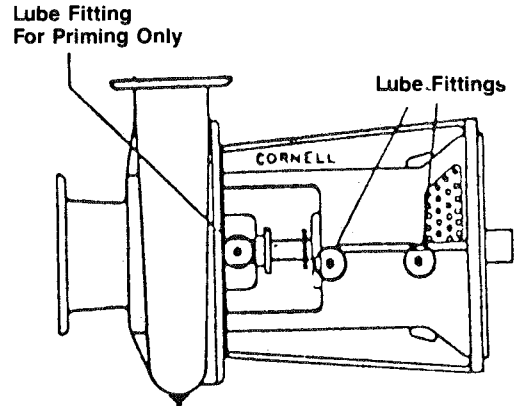
Lithium based grease should be used for pump lubrication and it should be equivalent to one of the following manufacturers products.

- Shell - Alvania EP2
- Mobil - Mobilux No. EP2
- Texaco - Multifax No. 2
- G.E. - Long Life Grease No. D6A2C5

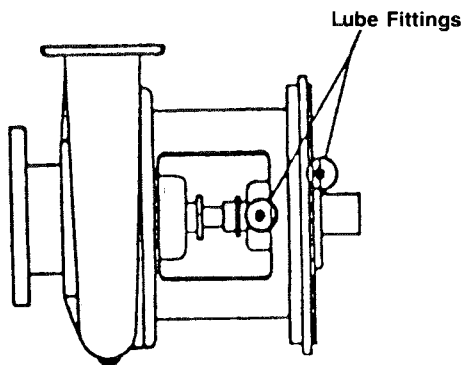
Recommended greasing intervals are as follows:

Cornell pumps - Grease with one pump of grease per bearing every week.

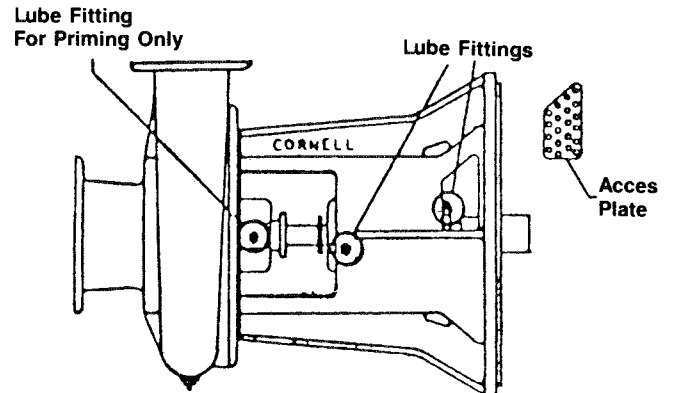
Paco pumps - Regrease at one to three month intervals.



**Cornell 6RB-64B4-3**



**Paco 6012**



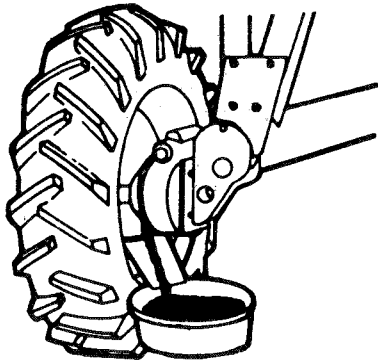
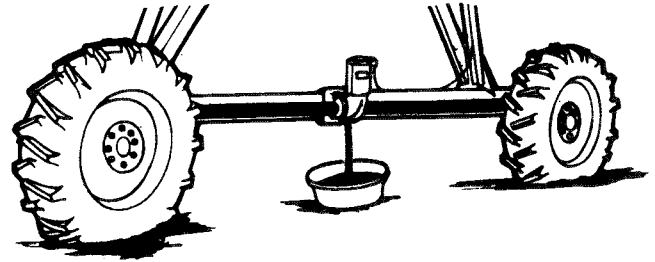
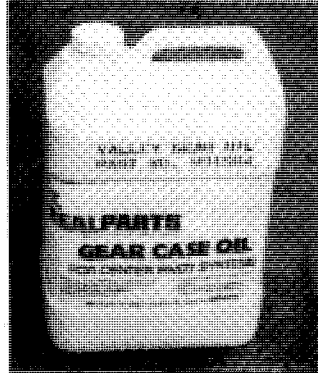
**Cornell 6RB-65B4-1**





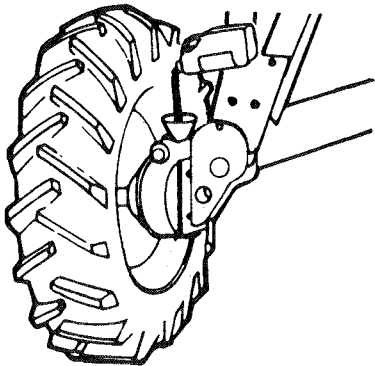
# Gearbox Lubrication

**IMPORTANT:** The composition of various brands of lubricants contain additives which are corrosive to bronze worm gears. Therefore, we recommend only the use of VALLEY Gear Lube, which is a compounded worm lubricant containing non-corrosive extreme pressure additives. The oil bath in worm gear cases may reach a temperature of 200°F. (90°C.) without alarm.



## VALLEY GEARBOXES (After First Season)

After first season of operation, drain and replace oil from gearboxes. Refill the gearboxes thru expansion chamber until level of oil is even with the bottom of the expansion chamber ( $\pm$  5 qt. capacity).

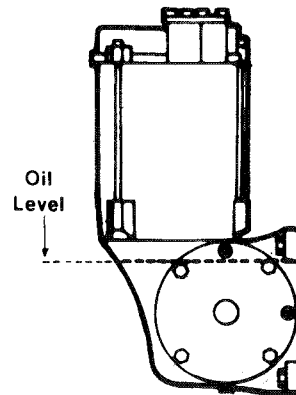


## VALLEY GEARBOXES

After every season drain any water that may have accumulated from the gearboxes. Do not drain gearbox empty. Replace plug. Refill gearbox thru expansion chamber until level of oil is even with the bottom of the expansion chamber. Drain and refill every third season thereafter.

## ELECTRICAL MOTOR GEARMOTORS

After the first season of operation, drain oil from gear motors and refill. After every season drain any water that may have accumulated from the gearboxes. Do not drain gearbox empty. Replace plug. Refill gearbox thru expansion chamber until level of oil is even with the bottom of the expansion chamber. Drain and refill every third season thereafter.



Refill the gear case to approximately  $\frac{1}{2}$ " from the fill plug with Valley Gear Lube. ( $\pm$  1 qt. capacity).

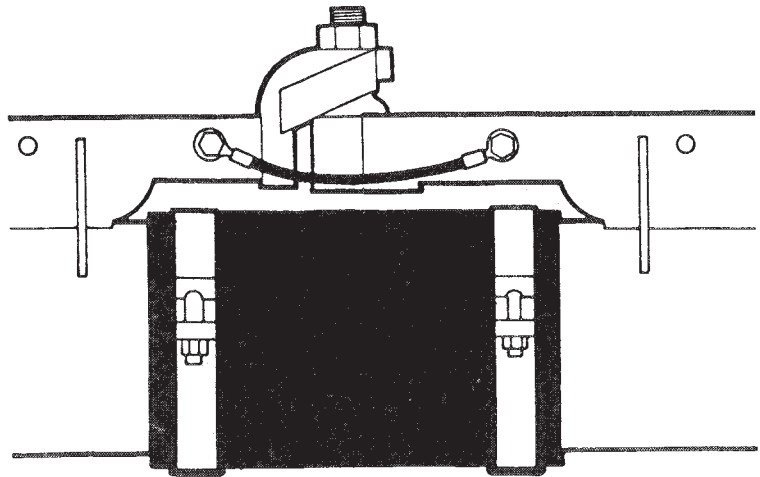


# Flex Hoses

Flex hoses on Valley systems are constructed of fiber reinforced neoprene which resists cracking and checking, heat and water.

If a boot must be replaced, loosen the two clamps to remove the old boot and insert the new one. No extra support is needed while making the changes.

		HOSE P/N	CLAMP P/N
8"	Pipeline	1710029	991147
6 5/8"	Pipeline	1800318	991087
6"	Pipeline	991187	991186
10"	Pipeline	1702326	(1) 992386 & (1) 992441



## TIRE PRESSURE

Proper tire pressure is important! Operating with low tire pressure will damage the tires and 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 correct tire pressure refer to the decal on the rim or tire pressure chart.

Hose Drag Cart		
Tire Size	Pounds per Square Inch	Kilopascal
(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	Kilopascal
(Inches)	(PSI)	(kPa)
11.2 X 38 Tire	22	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

## ⚠ 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.

\*Tire pressure may be reduced to 16 psi (110 kPa) for increased flotation.

## 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.

**⚠ WARNING**

ADJUST TO 18 PSI BEFORE USE

THIS TIRE AND RIM FOR CENTER PIVOT USE ONLY

INFLATE TO 18 PSI (1.2 BAR)

**VALLEY**

#0991532

Part No. 0991532

**⚠ WARNING**

ADJUST TO 22 PSI BEFORE USE

THIS TIRE AND RIM FOR CENTER PIVOT USE ONLY

INFLATE TO 22 PSI (1.5 BAR)

**VALLEY**

#0991593

Part No. 0991593

**⚠ WARNING**

ADJUST TO 34 PSI BEFORE USE

THIS TIRE AND RIM FOR CENTER PIVOT USE ONLY

INFLATE TO 34 PSI (2.3 BAR)

**VALLEY**

#0996109

Part No. 0996109

**⚠ WARNING**

ADJUST TO 30 PSI BEFORE USE

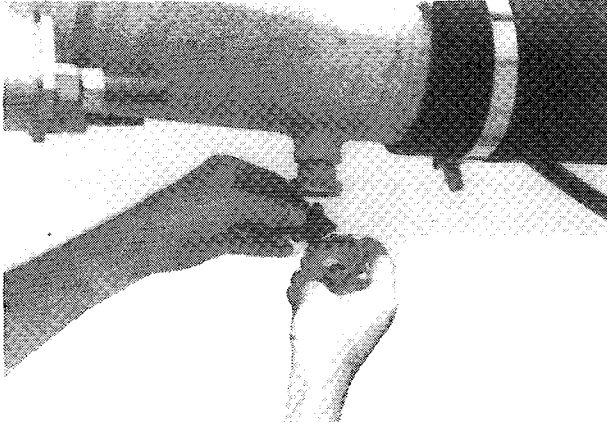
THIS TIRE AND RIM FOR CENTER PIVOT USE ONLY

INFLATE TO 30 PSI (2.1 BAR)

**VALLEY**

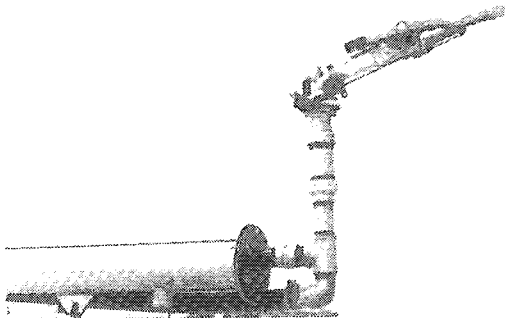
#0991366

Part No. 0991366

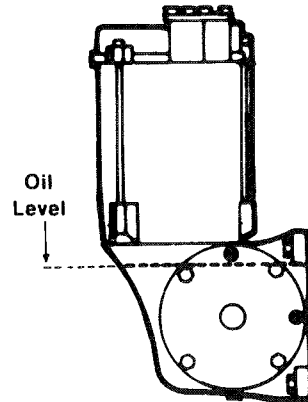


1. Remove bottom pipe drain caps. Clean sand and foreign particles from these drains, then flush.

NOTE: Drain seals should be turned over when being re-installed. This will greatly increase the seal life.



2. Remove overhang drain nozzles, flush and reinstall.
3. Check nut tightness on all wheels.
4. Visually check motor junction box to make sure drain hole in bottom is open. Check gaskets installed between the stator, junction box and cap. Replace if cracked or mis-shaped.



5. Oil in the electric gear motors should be changed at the end of each season. Refill the gear case approximately  $\frac{1}{2}$ " of the fill plug for proper bearing lubrication. (1 qt. capacity)
6. Remove the drain plug on the bottom of the booster pump volute case and the bearing frame and drain any water accumulation. **\*WARNING: Volute case must be drained prior to onset of freezing temperatures.**
7. Protect moving parts and bearing surfaces against rust and corrosion by greasing all fittings with Waterproof Grease.

Follow manufacturer's WINTERIZATION recommendations on all auxiliary equipment such as pumps, power units, mainline pipes and hoses. Generally, this includes lubrication, clearing drains, covering openings to prevent rodent infestation and overall protection from the elements. A thorough flushing of the system with all drains removed should clean out any build-up of sand or other foreign matter. Replace all drains and don't forget to insure that the mainline is pumped clear.

Additional winterizing facts which are common to your area may be suggested by your serviceman. If you have any questions or comments concerning winterizing procedures contact your VALLEY dealer. Areas of extreme cold weather (below 0°F) should remove all wheel tracks prior to end of season shut down.



# ***Flushing Procedure***

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After thoroughly checking the system and correcting any problems, the system must be flushed. The purpose for flushing the system is to remove sand and debris from the pipeline. Sand is extremely abrasive and can cause undue wear to the sprinkler heads.

**IMPORTANT:** Excessive accumulation of sand in the system also adds weight and can cause system damage.

The Flushing Process Should Be Performed:

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



**DANGER! DO NOT START 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.**

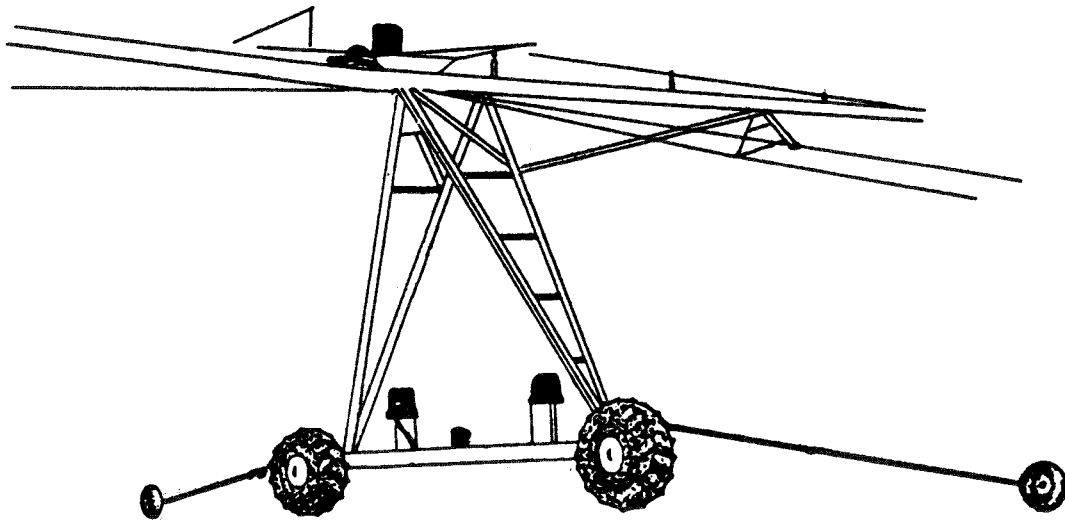
Flushing Procedure:

1. Be sure the main disconnect switch is off. Electrical power is not needed for this procedure.
2. Remove sand trap, drain caps and end caps from end of overhang.
3. Start engine/pump.
4. Allow system to flush out thoroughly.
5. Turn off pump and re-install drains, sand trap and end caps on overhang.
6. After flushing for winterization, insure that all drains have allowed water out of the pipeline to prevent freezing and splitting of the pipeline.



# Furrow Guidance Maintenance

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The furrow must be maintained perfectly straight and unobstructed. The guide wheel must roll in the furrow at a minimum depth of three inches and a maximum of six inches.

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.

The furrow guidance arms must be initially adjusted to maintain a distance of twelve inches from the guide arm pivot point to the furrow. \*NEVER try to reposition the system when there are established wheel tracks.

## 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 guide wheel has traveled forward ten feet it has angled over two feet. Do not allow the straight portion of the furrow to go beyond where the angled end of the field stop furrow is placed.

\*The furrow guidance safety system is based on a twelve inch offset of the guidance wheel. If either wheel gets out of the furrow it will cause the system to shut down.



# ***Linear Travel Lane and Off Season Hose Storage***

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## **TRAVEL LANE**

The travel lane should be smooth, hard-packed dirt or planted in a hardy, short vegetation. It should be free of ruts and any objects that could damage the hose such as stones, scrap iron or barbed wire. The lane should not have loose dirt that could build up inside the hose loop as this can cause an excessive amount of drag.

## **OFF SEASON STORAGE OF TRAVELER HOSE**

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

When you complete 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 well away from gas or diesel fuels, contaminants, transformers and welding areas that can produce ozone.



# Traveler Hose Repair

## Hose Repair

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

Small "pin-holes" should be marked with a quick burst of spray paint while there is pressure in the line, since it will be virtually impossible to locate the hole later when you are ready to repair it.

Large tears or cuts, that interrupt operation can be temporarily repaired by using a "hard-mender" that essentially is a short length of pipe securely banded. This method can keep you in operation during critical irrigation periods. Your dealer can provide permanent repairs at your mutual convenience later. You should inspect the travel lane to see what caused the damage. When the permanent repair or splice is properly completed, it is usually stronger than the original hose.

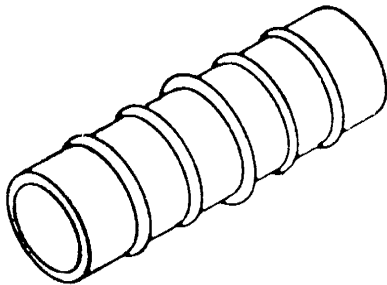
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## Rigid Menders

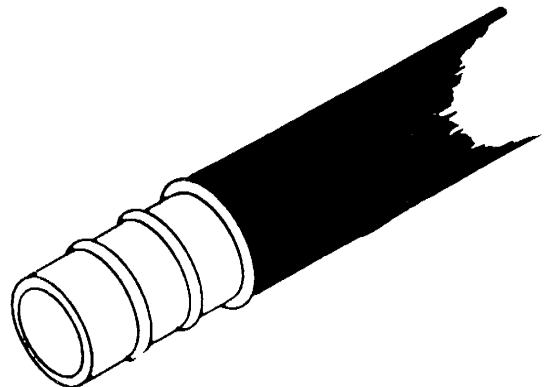
Several rigid menders, available through dealers, provide a simple method of temporarily joining two separate sections of hose. These consist of a straight steel nipple that fits inside the two hose ends to be joined and fasteners or clamps that secure the hoses to the nipple.

Although menders satisfactorily join the sections, they do introduce a rigid section in the hose which encumbers free travel on the runway.

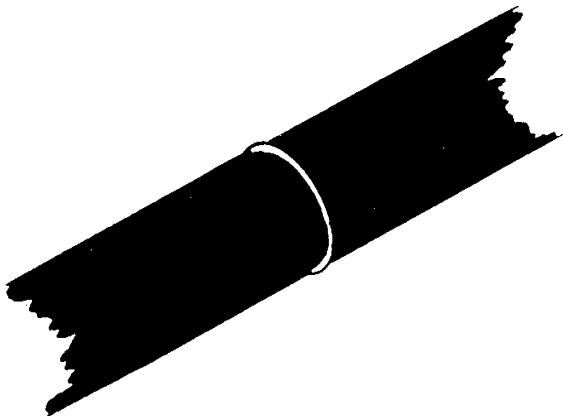
A common installation procedure is shown below.



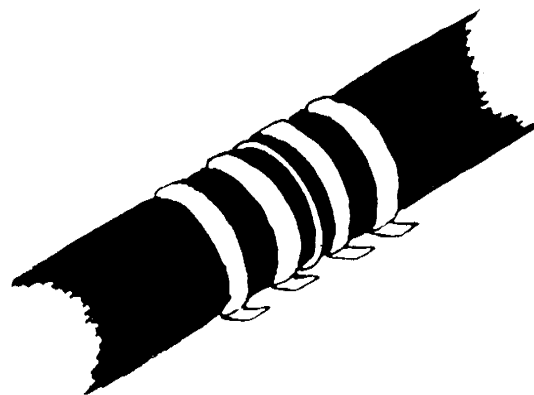
1. Place rigid mender between two sections of hose.



2. Insert mender halfway into first hose section.



3. Slide other hose section into mender.



4. Band both sections securely.



# ***Polyethylene Hose, Hard Hose Installation and Maintenance***

## **HEAT FUSION TOOLS AND EQUIPMENT**

Electrically heated tools, operated on 110-120 volts A.C. are recommended for heating polyethylene pipe and fittings to make fusion joints. These tools are thermostatically controlled and have temperature indicating thermometers. The normal source of electrical power is a portable A.C. generator. A welding machine having a 110-120 volt A.C. outlet may be used. Direct current (D.C.) **should not** be used as damage to the heating tool may result. Electrically heated tools are preferred, however, gas-fired heating tools may be used to make heat fusion joints. These tools generally are not as efficient as electrically heated tools, and proper control of the fusion temperatures is most critical.

For **butt fusion** you will need these tools:

1. A heating tool with butt fusion heater faces.
2. A butt fusion joining jig to round and hold the pipe in alignment.
3. A butt fusion machine tool (facing tool) to square the ends of the pipe.

There are several types of butt fusion equipment available from various manufacturers. These include manual, electric and hydraulic butt fusion machines. Regardless of the type of equipment used, the fusion procedures given in this manual should be adhered to or modified only to such extent to perform the required joining using that particular equipment.

## **CARE OF TOOLS AND EQUIPMENT:**

Clean, smooth heating faces are essential for sound fusion joints. Heater faces should be cleaned before and after every fusion. Remove any material that accumulates on the heater faces with a soft wooden stick, such as a tongue depressor, then wipe the faces with a heavy textured cotton cloth. Never use a metal instrument, such as a pocket knife or wire brush, to scrape material from the heater faces; the heater faces are coated with a release agent, and metal will damage this coating. Maintain a supply of wooden sticks and wiping cloths and use them freely. Clean tools and clean materials are essential for sound fusion joints.

Return worn or damaged heater faces to manufacturer for reconditioning and recoating. Repair or replace damaged power cords immediately. Check the accuracy of heating tool thermometers periodically and replace if found defective. A good check is to switch thermometers between two or more heaters and noting the stabilization temperatures. Surface temperature may also be checked with a pyrometer or a temperature sensitive crayon, such as Temp-L-

Stik. Replacements for defective thermometers are available from the manufacturer of the heating tools or most air conditioning supply houses.

It may sometimes be necessary to adjust the operating temperature of a heating iron. Make the adjustment as follows:

1. Plug in the heating iron and allow the temperature to stabilize.
2. To raise the temperature, turn the adjusting screw located in the hole adjacent to the thermometer **counter-clockwise** in ¼ turn increments allowing temperature to stabilize.
3. To lower temperature, turn the adjusting screw **clockwise** in ¼ turn increments allowing temperature to stabilize.

NOTE: ¼ turn approximates 25° change.

Avoid lifting or suspending electrical heating tools by their power cords. Use the handles for this purpose.

Partitioned tool boxes are available and are recommended for storage of installation tools. Insulated heating boxes for carrying hot heating tools are also recommended

## **CUTTING POLYETHYLENE PIPE:**

Polyethylene pipe may be cut with an ordinary carpenter's saw or special pipe cutter. The pipe should be cut squarely and all burrs removed with a sharp knife or a fine-toothed file. To insure a square cut with a saw, clamp a cold ring of the proper size around the pipe and use it as a saw guide. A miter box, if available, may also be used to insure square cut ends.

## **CLEANING POLYETHYLENE PIPE AND FITTINGS:**

Use a clean cloth to remove dust, dirt, grit, moisture or other contaminants from the pipe ends and/or fittings to be joined. No special cleaning agents should be used as some agents might possibly contaminate fusion joints. For extremely dirty pipe or fittings, use a wet cloth and then dry the pipe or fittings.



## SAFETY RECOMMENDATIONS

Be cautious of sharp cutting blades on chamfering and facing tools. Avoid painful burns by hot fusion tools by placing them in an insulated carrying box when not in use. Use caution in removing the fusion tool from pipe and fittings after completion of the fusion heating cycle so that other workers are not stuck by the hot tool.

## Recommended Heat Fusion Joining Techniques and Procedures

### BUTT FUSION TECHNIQUE:

This technique consists of simultaneously heating the ends of two matching pipes and/or butt fittings by holding them in contact with a heating plate until the ends are molten, then, upon removal of the heating plate, joining the two molten ends together and allowing the resulting joint to cool. It is essential to butt fusion joining that the pipe and/or fitting ends be properly mated by using a butt fusion joining jig capable of rounding, holding the ends in alignment. A facing tool is used to square and trim the ends smooth to provide full surface contact with the heating plate.

### BUTT FUSION JOINING PROCEDURE:

1. Clean any dirt and debris from the pipe ends.
2. Clamp the pipe ends into the butt fusion joining jig leaving approximately one inch or less exposed for facing.
3. Place the facing tool between the pipe ends and bring the pipe ends into contact with the cutter blades.
4. Rotate the facing tool while applying sufficient steady pressure to force the pipe onto the cutter blades.
5. Face the pipe ends until long, continuous curls of plastic shavings from both pipe ends are evident. Continue facing while slowly relaxing the pressure and allow the facing tool to cut out cleanly.
6. Remove the facing tool and clean away all plastic shavings and debris from the joining jig.
7. Bring the pipe ends together and carefully check alignment and fit. There should be no misalignment greater than 10% of pipe wall thickness. There should be no gap that would allow daylight to be seen between pipe ends. Repeat the facing operation and/or adjust alignment as necessary to achieve these criteria.
8. Check the pipe and heater for cleanliness.

9. Check the heater for proper temperature ( $500 \pm 10^\circ\text{F}$ ).
10. Place the heater between the pipe ends. Bring the pipe ends into contact with the heater and apply firm, steady pressure to force the pipe ends against the heater. Do not let the heater slip downward during the heating time cycle. Observe the melt bead as it develops. Maintain steady pressure until a small bead of molten material is **first** visible around the entire circumference of both pipe ends.

Then, **relax the pressure**, but maintain full contact of both pipe ends with the heater. Maintain **only** enough pressure as necessary to keep the pipe in contact with the heater. Do not continue to force out more molten material. Heat for approximately 20 seconds after the "bead" is visible all the way around both sections of hose.

11. At the end of the heating time cycle, snap back the traveling carriage of the joining jig and remove the heater. The heater will stick to one side, so snap it off that side quickly. When removing the heater, do not allow it to bump the pipe ends.

**NOTE: Do not attempt fusion unless an adequate melt is apparent.**

12. Bring the molten pipe ends together quickly, but do not slam them together as this may cause excessive displacement of the molten material. Apply sufficient pressure to cause the fusion bead to approximately double in size but not overlay itself. Roll the bead over until it just touches the pipe surface. (See illustration below).

Cross section of butt fusion bead showing proper bead roll out  
(Bead size exaggerated for clarity)



Visual observation of the melt roll out as it occurs is a key indication that proper mixing of the molten surfaces has been attained.

13. Maintain pressure and hold the joint steady for approximately 30 seconds until the melt bead becomes firm. Allow an additional three minutes cooling before removing the pipe from the joining jig.

Do not test or stress pipe until the joint is cool to the touch. This may vary from five to thirty minutes depending on pipe size. If the joint is to be destructively tested, allow at least thirty minutes cooling before performing the test.

14. Check for well rounded uniform melt beads with no sharp edges. There should be no gaps or voids in the cut-out specimen.





# Linear Troubleshooting

During the life of the system, minor problems may arise that can be solved by the system operator. The following trouble-shooting guide is designed to assist the operator in finding the possible cause of a problem and the solution.

Problems may arise that can be corrected only by a qualified service person. If this should happen, try to describe the problem fully when talking to the service person. This may give him enough information to repair the system with greater expediency.

**DANGER! 480 VOLTS -- TURN THE MAIN DISCONNECT SWITCH OFF BEFORE REPAIRING THE SYSTEM.**

**DANGER! HIGH WATER PRESSURE. TURN OFF THE PUMP AND ALLOW THE SYSTEM TO DRAIN COMPLETELY BEFORE REPAIRING THE SYSTEM.**

## PROBLEM

1. System Shut Down

## POSSIBLE CAUSE

A. Engine Stopped

## SOLUTION

1. Check Fuel Supply
2. Check Racor Filter or water separator
3. Check Oil Level
4. Look for obvious loose wires, fuel lines, system misalignment, steering arm extension

If no obvious problems are evident, turn off control panel disconnect. Attempt to restart engine.

2. Engine will not restart

A. Engine Problem

B. Murphy 518 APH

1. See Engine Operator Manual

1. See "Service Tips 518 APH" in this manual

3. Engine will restart

A. Generator Problem

1. Turn disconnect switch to "On"

2. Observe "Shutdown" indicators



# Linear Troubleshooting

4. Linear Power Source Light on

A. No Voltage on Voltmeter

1. Check for missing belts or
2. EXCESSIVELY loose belts

B. Low Voltage

1. Check for belt slippage
2. Adjust engine speed

If the above checks do not rectify fault, contact qualified service person to correct problem.

C. Normal Voltage

1. Attempt restart of Linear System.
2. If system restarts, monitor and continue operation.
3. If system does not continue operation, contact qualified service person to determine and repair problem.

5. Linear System Forward or Reverse light on, Run light fails to illuminate

A. Safety Circuit Incomplete

1. Visually check tower alignment.
2. Visually check position of system steering arms in relation to cable.

B. System misaligned

1. Check mechanical drive unit components.
2. Check electrical drive components (visually)

6. Priming

A. Leaks

1. Check O-Ring Seal
2. Vacuum line, hose leaks
3. Flow meter fittings
4. Inlet sucking air

7. System will not run after holding start button for 3 seconds

A. End of Field or Hose switch depressed (if option is installed)

1. Attempt restart by holding override button in long enough to move end tower(s)  $\pm$  6 inches
2. Remove device
3. Attempt restart



# Linear Hose Drag Troubleshooting

## ADDITIONAL INFORMATION SPECIFIC TO THE HOSE DRAG LINEAR

### PROBLEM

1. Hose pulls in two

### POSSIBLE CAUSE

A. Cut in two

B. Hose caked heavily with mud or clay

C. Hose stretched to maximum length when water pressure is turned off

D. Hose used as "tow rope"

### SOLUTION

1. Make sure runways are clear of debris and are level and grassy.

1. Clean hose after each pull

1. Leave some slack in hose to allow for 2% to 3% elongation (13 ft. to 20 ft. in a 660 ft. length.)

1. Never use the hose as a tow rope to pull equipment

2. Couplings pulling off

A. Coupling improperly applied

B. Excessive mud on hose

1. Cut hose and reapply coupling

1. Clean hose of excessive mud buildup

3. Longitudinal scratches or cuts on hose

A. Sharp object in runway

1. Keep lanes clean. Check equipment for sharp edge or protrusions

4. Vertical breaks in hose

A. Improper bend at loop, causing hose to kink

B. Insufficient water pressure

1. Maintain recommended bend diameter

1. Increase pressure at pump to minimum 70 psi

5. Water blisters forming behind coupling

A. Improperly applied couplings

B. Tube cut while hose is being coupled

1. Take care to apply correctly according to coupling manufacturer's instructions

1. Take care to apply coupling correctly according to coupling manufacturer's instructions

6. Traveler Hose cover checking (crazing) at edges

A. Stored incorrectly near electrical equipment

B. Stored for long periods in direct sunlight

1. Store 150 ft. from electrical motors

1. Store in cool, dry protected areas

7. Snaking (a certain amount is acceptable)

A. Hose under excess pressure

B. Improper lay out

1. Don't exceed recommended 150 lb. water pressure

1. Lay hose out in straight line at edge of runway with recommended bend diameter. Pull hose taut, removing all slack before pressurizing.

8. Cover blisters

A. Kinking - insufficient bend radius

B. Poor cover adhesion

1. Increase loop diameter

1. Cut out affected area and apply a cover repair

C. Pin hole leak

1. Remove blistered area and splice hose or apply a pin hole plug using Goodyear plug gun kit.

9. Cover gouges, cuts, scrapes, abrasions

A. Foreign obstruction in the runway

B. Running over Traveler hose with cart or other equipment

1. Keep runway clean

1. Do not run over hose or walk on it

10. Peeling or stripping cover repairs

A. Foreign objects in runway

B. Improperly applied cover repairs

1. Keep runway clean. Repair cover with cover repair kit

1. Reapply cover repair following instructions carefully



# *Linear Swing Around*

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## ADDITIONAL INFORMATION SPECIFIC TO THE SWING AROUND LINEAR

### PROBLEM:

1. Low or no hydraulic oil pressure.

### POSSIBLE CAUSE & REMEDY:

- A. Low oil reservoir.
- B. Defective oil pump.
- C. Motor failure on hydraulic pump.
- D. Blown 8 amp fuse on the hydraulic circuit in the panel.
- E. Blown 3-phase 480 volt power supply fuse.
- F. Pressure relief setting adjusted too low. (1200 lb. recommended)
- G. Break in oil line(s).

2. System will not hold safety.

- A. Tower or towers out of alignment breaking safety alignment switch.
  1. Flat tire causing tower misalignment.
  2. Burned out tower motor.
  3. Defective contactor.
  4. Gearbox (either center drive or wheel failure).
  5. Drive shaft or U-joint failure.
  6. Run micro switch either sticking or failed.
- B. Guidance control box safety failure.
- C. Guidance safety box failure.
- D. Power oscillator failure.
- E. Break in the buried wire circuit.
- F. Power oscillator power supply failure.
- G. Pivot point safety switch opened safety.

3. System will not follow guidance wire, but will hold safety.

- A. Guidance control box malfunction.
- B. Steering antenna failure.
- C. Blown steering fuse in guidance control box.
- D. Failure of steering relays, call a qualified Valley serviceman.

4. System holds safety, but end towers will not move in the run mode.

- A. Low pressure switch defective.
- B. Bad Percentage Timer.



# **Troubleshooting Swing Around Linear**

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## **PROBLEM:**

6. Optional water shut-off valve fails to operate.

## **POSSIBLE CAUSE & REMEDY:**

- A. Check water filter to insure it is not plugged.
- B. Verify solenoid #1 and #2 are operating properly.
- C. Check butterfly valve at the water inlet to be sure it is not blocked or jammed in place.
- D. Check for plugged ¼" tubing from the solenoid valve to the butterfly valve.
- E. Improper adjustment of the amount of valve closure desired.

7. Diesel engine will not rev up to rated engine R.P.M.

- A. Clogged fuel filters
- B. Air entering engine fuel supply line.
- C. Injector nozzles plugged.
- D. Injector pump malfunction.
- E. Clogged air intake filter.

8. Generator will not develop full 500 volts A.C.

- A. Improperly set throttle stop on the engine. Generator not rotating at 1800 R.P.M.
- B. Defective diode bridge board.
- C. Blown 3-phase fuse in control panel.
- D. Defective generator winding.

9. Diesel engine overheating.

- A. Engine overloaded.
- B. Cylinder cooling fins dirty.
- C. Worn pulley sheave on the engine blower.

10. High engine oil consumption.

- A. Improper weight and grade oil.



# Service Tips 518-APH

"The Best Service Tip is to learn -- How It Works" - Do this, and the following will make sense.

## A. ENGINE START-UP

Red pushbutton on 518-APH must be held in the depressed position while starting engine until running oil pressure is established to open SWITCHGAGE contacts.

1. 518-APH pushbutton would remain in the depressed position during normal running. If pushbutton fails to remain in the depressed position:

- a. Visually check wiring for loose connections, frayed wiring, etc. on all terminals and safety switch loop circuit.
- b. Check 14 amp fuse connected to "B" terminal.
- c. Check for good ground on "G" terminal.

d. Disconnect safety switch loop circuit from Sw. 1 and Sw. 2 terminals. Place temporary jumper between Sw. 1 and Sw. 2 and restart engine. If pushbutton stays in with engine running, (518-APH Switch is **not at fault**). This indicates either an **open circuit, unwanted ground, or too high resistance** in safety switch loop circuit wiring between Sw. 1 and Sw. 2.

e. **Continuity** Checks (Power removed from (b) terminal)

### 1. Open in Loop Circuit

With Ohmmeter or continuity light, check for good continuity through safety switch loop circuit. If good continuity is indicated, proceed to Step (2).

### 2. Unwanted Ground in Loop Circuit

With SWITCHGAGE contact adjusted away from pointer, check continuity between one end of loop circuit and ground. "**Good Continuity**" indicates an unwanted ground in loop circuit such as terminal rotated against mounting panel. Remove ground, restore loop circuit connections to Sw. 1 and Sw. 2 and restart engine.

### 3. Too High Resistance in Safety Switch Wiring

With Ohmmeter check resistance between one end of loop circuit to the other. Resistance should not exceed 25 Ohms. If resistance too high, check for good connections in loop circuit. Otherwise select larger size wire for loop circuit.

## B. ENGINE SAFETY SHUTDOWN

a. Engine fails to shutdown when contacts close on one-wire to ground SWITCHGAGES such as 20P Oil Pressure SWITCHGAGE.

1. With engine running, Jumper Sw. 1 to (G) terminal. If switch trips and engine shuts down, trouble is failure of SWITCHGAGE contacts to make contact or lack of good case ground on SWITCHGAGE.

### a. Lack of Case Ground on SWITCHGAGE

Tighten mounting studs on SWITCHGAGE and insure panel is grounded.

### b. Failure of contacts on SWITCHGAGE to Make Contact

Adjust contacts back and forth to give a wiping and cleaning action on contacts. If this fails to correct problem, replace SWITCHGAGE.