CHAIN DISK

Model 236

Installation and Operation Manual

PNEG-602

Date: 05-29-13

BY THE GSI GROUP

PNEG-602

Contents

Table of Contents

Applications

Typical Chain Disk System applications are shown as follows: *(See Figure 1A.)*

In poultry applications, switches may be placed in more than one hopper to assure that no hopper empties before the control unit hopper requires feed. If this is done, all switches must be wired in parallel so that any one switch can start the system. If only one hopper level control is used, it must be located at the end of the delivery system.

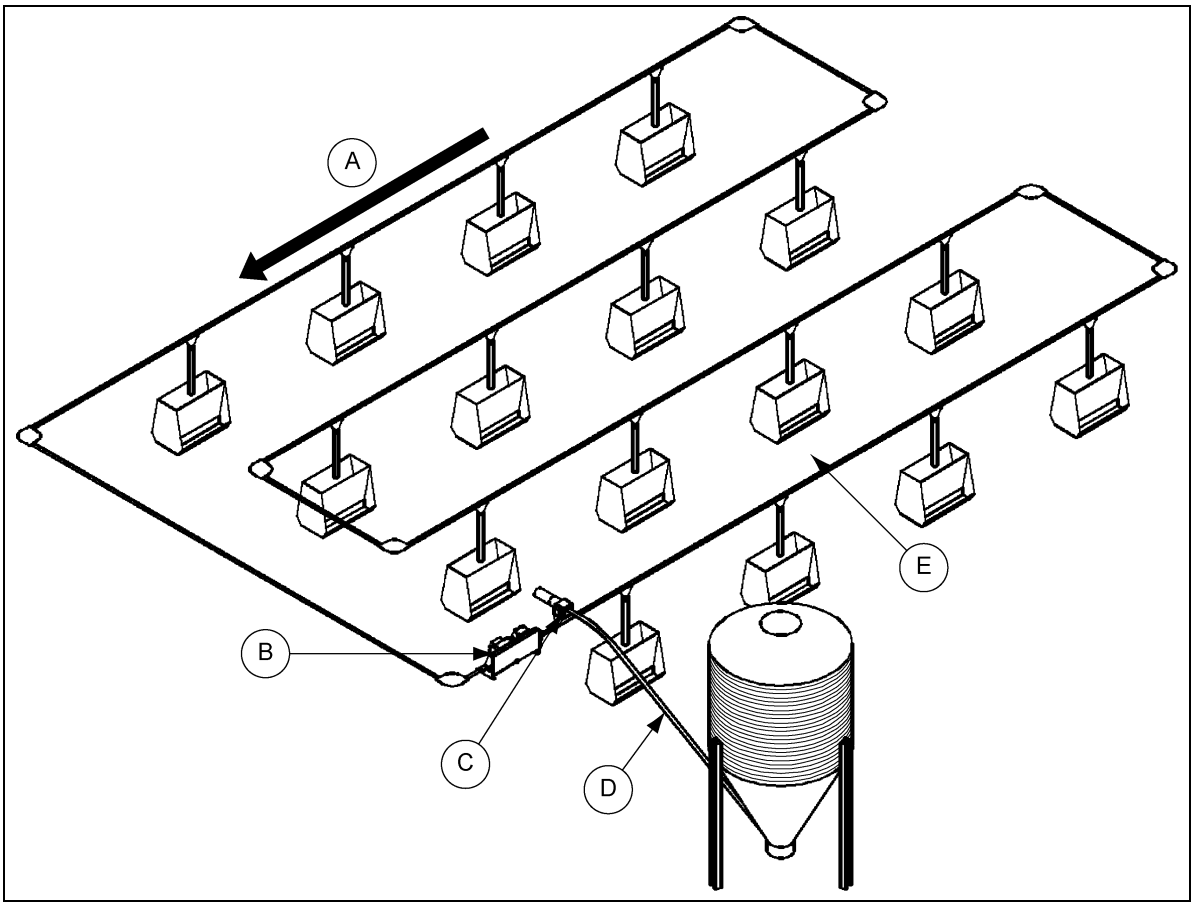


Figure 1A *Typical Application*

Ref #	Description
A	Direction of Travel for Chain and Disk
B	Chain Disk Drive Unit
C	Flex-Flo Control Unit
D	Flex-Flo Fill System
E	Chain Disk System

In most swine applications, the feed control is installed in the last hopper at the end of the delivery system. If a tube mounted proximity switch is used, it should be installed just beyond the last feeder.

Using the Manual

Read the entire manual prior to any work being done. This installation/owner manual is to be used as a guideline for the installation of the Chain Disk Feed System Model 236. All instructions should be construed as recommendations only, as the actual installation may vary according to local conditions. Wiring diagrams can be found later in this manual. Instructions presented in this manual should only be carried out by a trained technician. It is essential that the technician has a sound understanding of technical matters and drawings in both mechanical and electrical areas.

Background

The Chain Disk Feed System consists of a drive unit which pulls a chain with nylon disks attached to it through tubing, thus conveying feed from a storage bin to animals inside a building. The disks have approximately the same diameter as the inside of the tube, therefore being a highly efficient conveying system with total clean-out of the tube. This system can be adapted to complex configurations because of its ability to go through tight corners and at any angle including vertical. The delivery of feed can be controlled manually or automatically with the use of a control unit, sensors and drop kits.

Safety Guidelines

This manual contains information that is important for you, the owner/operator, to know and understand. This information relates to protecting ***personal safety*** and ***preventing equipment problems.*** It is the responsibility of the owner/operator to inform anyone operating or working in the area of this equipment of these safety guidelines. To help you recognize this information, we use the symbols that are defined below. Please read the manual and pay attention to these sections. Failure to read this manual and its safety instructions is a misuse of the equipment and may lead to serious injury or death.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

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

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

CAUTION, used with the safety alert symbol, indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE is used to address practices not related to personal injury.

General Safety Statement

Our foremost concern is your safety and the safety of others associated with grain handling equipment. This manual is to help you understand safe operating procedures and some problems that may be encountered by the operator and other personnel.

As owner and/or operator, you are responsible to know what requirements, hazards, and precautions exist and inform all personnel associated with the equipment or in the area. Safety precautions may be required from the personnel. Avoid any alterations to the equipment, which may produce a very dangerous situation, where SERIOUS INJURY or DEATH may occur.

You should consider the location of the bin site relative to power line locations or electrical transmission equipment. Contact your local power company to review your installation plan or for information concerning required equipment clearance. Clearance of portable equipment that may be taken to the bin site should also be reviewed and considered. Any electrical control equipment in contact with the bin should be properly grounded and installed in accordance with National Electric Code provisions and other local or national codes.

This product is intended for the use of grain storage only. Any other use is a misuse of the product.

This product has sharp edges, which may cause serious injury. To avoid injury, handle sharp edges with caution and always use proper protective clothing and equipment.

Sidewall bundles or sheets must be stored in a safe manner. The safest method of storing sidewall bundles is laying horizontally with the arch of the sheet upward, like a dome. Sidewall sheets stored on edge must be secured so that they cannot fall over and cause injury. Use care when handling and moving sidewall bundles.

Personnel operating or working around equipment should read this manual. This manual must be delivered with equipment to its owner. Failure to read this manual and its safety instructions is a misuse of the equipment.

Safety Instructions

Our foremost concern is your safety and the safety of others associated with this equipment. We want to keep you as a customer. This manual is to help you understand safe operating procedures and some problems that may be encountered by the operator and other personnel.

As owner and/or operator, it is your responsibility to know what requirements, hazards, and precautions exist, and to inform all personnel associated with the equipment or in the area. Safety precautions may be required from the personnel. Avoid any alterations to the equipment. Such alterations may produce a very dangerous situation where SERIOUS INJURY or DEATH may occur.

This equipment shall be installed in accordance with the current installation codes and applicable regulations, which should be carefully followed in all cases. Authorities having jurisdiction should be consulted before installations are made.

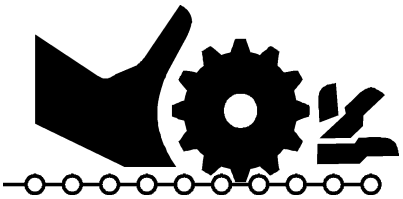
Keep Hands Clear of Chain Disk

Moving Chain Disk can cut and crush.

Keep hands clear.

Disconnect and lock out power before servicing.

Do not operate with guards removed.

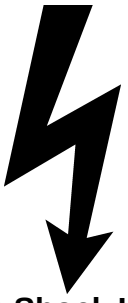


Moving Parts

Install and Operate Electrical Equipment Properly

Electrical controls should be installed by a qualified electrician and must meet the standards set by the National Electrical Code and all local and state codes.

Disconnect and lock out all power sources before installing wires/cables or servicing equipment.



Electric Shock Hazard

Practice Safe Maintenance

Understand service procedures before doing work. Keep area clean and dry.

Never lubricate, service, or adjust machine while it is in operation. Keep hands, feet, and clothing away from rotating parts.

Keep all parts in good condition and properly installed. Fix damage immediately. Replace worn or broken parts. Remove any built-up grease, oil, and debris.

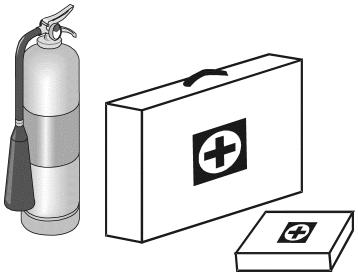
Maintain Equipment and Work Area

Prepare for Emergencies

Be prepared if fire starts.

Keep a first aid kit and fire extinguisher handy.

Keep emergency numbers for doctors, ambulance service, hospital, and fire department near your telephone.



Keep Emergency Equipment Quickly Accessible

Wear Protective Clothing

Wear close-fitting clothing and safety equipment appropriate to the job.

Remove all jewelry.

Tie long hair up and back.

Wear safety glasses at all times to protect eyes from debris.

Wear gloves to protect your hands from sharp edges on plastic or steel parts.

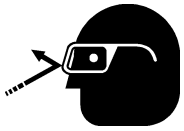
Wear steel-toed boots to help protect your feet from falling debris. Tuck in any loose or dangling shoestrings.

A respirator may be needed to prevent breathing potentially toxic fumes and dust.

Wear a hard hat to help protect your head.

Wear appropriate fall protection equipment when working at elevations greater than six feet (6').

Eye Protection



Gloves

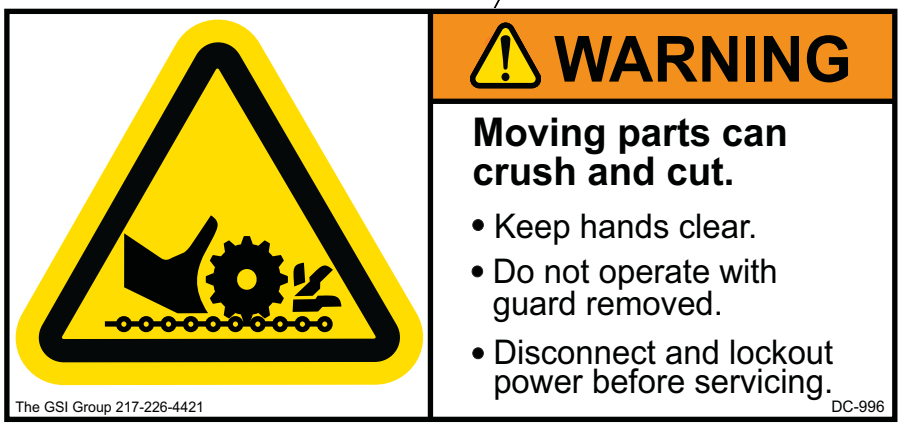
Steel-Toed Boots

Respirator

Hard Hat

Fall Protection

DC-491 is located on the front cover of the drive unit.

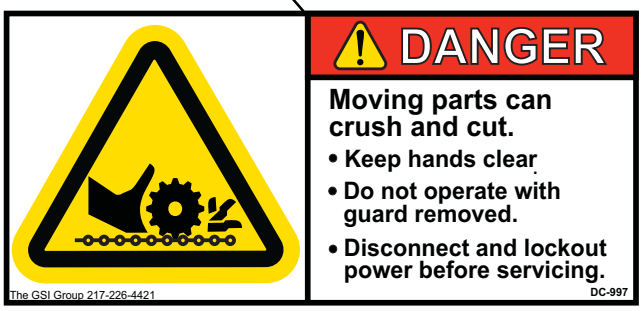


DC-996 is located on the front cover of the drive unit.

DC-490 is located on the electrical box of the drive unit.

DC-889 is located on the electrical box of the drive unit.

DC-997 is located inside the drive unit.



Capacity	The rated capacity is up to 50 lbs./min. (23 kg/min.) Capacity is based on a feed density of 40 lbs./ft.^{3} (641 kg/m^3). Refer to chart on *Page 24* depending on tubing material and run time.
Overall system length	The maximum effective length can be up to 2000' (610 m). Refer to chart on *Page 24*. Subtract 25' (7.6 m) per corner or effective length = (Total ft. of chain) + 25' (# of corners).
Types of feed	The Model 236 Chain Disk is specifically designed to convey normal types of swine and poultry feeds. When conveying any other type of material contact the manufacturer as the warranty may be invalidated.
Tubing	There are two (2) options: 1. Clear and white PVC tubing having dimensions of 2.00" (51 mm) I.D. and 2.36" (60 mm) O.D. coming in 10' (3 m) lengths. Clear and white PVC couplers are used to join sections of tubing together. 2. Welded steel tube having dimensions of 2-3/8" O.D. x 2.277" I.D. Steel compression couplers are used to join sections together. Available in lengths or 10' or 20'.
Corners	Each corner has a 9.4" (239 mm) diameter cast steel self-cleaning wheel with non-greasable ball bearings encased in a clear polycarbonate housing with a removable cover.
Chain	The flexible chain is heat treated with a 3000 lbs. (13.3 kN) breaking strength. Nylon disks having 1.7" (43 mm) O.D. are molded on every other chain link. The chain is connected together using a special open link connector. The disks are symmetrical, making the chain non-directional.
Drive unit	The drive unit, having dimensions of 51.6" (1.3 m) length, 17.6" (0.4 m) height and 20.3" (0.5 m) width, is an enclosed stainless steel housing with a spring loaded aluminum idler tensioning wheel and drive sprocket inside. The drive sprocket is directly coupled to the output shaft of an aluminum housed speed reducer, which in turn is driven by an electric motor.
Electric motor	There are three (3) special built 1.5 HP motors to choose from: 208V-230V, 1 PH, 60 Hz; 230V, 1 PH, 50 Hz; 208V-230V/460V, 3 PH, 50/60 Hz.
Control unit	A 230V, 1 PH unit is available. With an additional 3 PH contactor, it can be used to control a 3 PH drive unit. The APCD-500 control unit has a built in 24 hours time clock, maximum run timer and drop feed control. The APCD-600 has a built in maximum run timer and is used for continuous feeding. The APCD-500-S is used in conjunction with the APCD-500, when configuring feed systems with multiple Chain Disk drive units. A single APCD-500 can control up to seven (7) APCD-500-S control units.

Part #	Description
	Model 300 Flex-Flo fill system or comparable equivalent having a maximum of 50 lbs./min. (23 kg/min.) rated capacity.
APCD-620	Chain Disk fill hopper which connects to Flex-Flo control unit.
APCD-109	Manual kwik-attach drop kit (single).
APCD-110	Manual kwik-attach drop kit (box of 10).
APCD-119	Pneumatic kwik-attach drop kit assembly.
APCD-710	Drop kit for Chain Disk with pull cord (single).
APCD-710-10	Drop kit for Chain Disk with pull cord (box of 10).
AP-1260	ACCU-DROP feeders fitting tube with 2.36" (60 mm) outside diameter.
AP-2259	Farrowing drop feeder - Model 236 (8.5 lbs. capacity).
AP-2263	Farrowing drop feeder - Model 236 (12 lbs. capacity).
APCD-294	Tube mounted proximity switch.
FLX- 4256	Proximity switch, 20V DC to 240V AC, N.O. (used with APCD-294).
AP-2385	ECONO-DROP feeder fitting tube with 2.36" O.D. PVC tube.
AP-3800	ULTRA-DROP feeders for gestation with 2.36" O.D. PVC tube or welded steel tube.
AP-3800A	ULTRA-DROP feeders for farrowing with 2.36" O.D. PVC tube or welded steel tube.

Refer to *Page 20* for tubing option.

Laying Out the Tubing

Laying out the tubing is one of the most important steps in the installation of the Chain Disk System. Place the tubes in approximately the position where they will be installed (either on the ground or on top of the penning for the time being). If white PVC or welded steel tubing is used it would be helpful to place sections of clear PVC tubing at various places throughout the system for easy viewing of the feed, especially before and after the fill hopper and where the proximity switch is located. **Things to consider: the system must be closed looped, sections of tubing can go in any direction and the change in direction of the tubing must be 90°.** For now overlap the tubes where there is to be a corner and leave the cutting of the tubes to fit various components until these components are installed which will be later on. Establish where the outlet drops are to be. **Make sure that the ends of these tubes do not meet where there is to be a drop kit or drop feeder.** If they do, one end of the tube must be cut off enough so the coupler will miss the drop kit.

Assembly of Tubing

Once the tubing has been properly layed out the tubes need to be connected together in long sections. Assemble long sections of white or clear PVC tubing using glued couplers. Assemble long sections of welded steel tubing using steel compression couplers.

NOTE: *Maximum length of each section should not exceed the length of fish tape which will be used later on to install chain.*

NOTE: *For extremely long systems of PVC tubing, we recommend gluing only one side of the coupler leaving an 1/8" (3 mm) gap between ends of tubing to allow for tubing expansion.*

Chain Disk Systems use specially formulated PVC tubing. For strong tube connections, apply the PVC solvent cement as the instructions below suggest:

1. Square tube ends and remove all burrs and dirt.
2. Check to make sure all connections are smooth.
3. When the temperature is below 40°F or above 85°F, consult PVC solvent cement container.
4. Apply a coat of cement to both parts being connected.
5. Assemble parts quickly. CEMENT MUST BE FLUID - if not fluid, re-coat both parts.
6. While still fluid, rotate tubes 1/4 turn back and forth to spread out cement properly.
7. Hold parts together for 30 seconds - wipe off excess cement with cloth. Completed joints should not be disturbed until they have cured enough to withstand handling. Keep container closed when not in use.

Cutting Outlet Holes

With the sections of tubing still layed out and the placement of the drop kits already established, the next step is to mark on the top of the tube where each drop kit is to be. The reason for marking the tube in advance is to make sure the holes stay aligned even if the tubes rotate as the holes are being cut. Once the tubes are marked, cut the holes for the outlet drops as shown in *Figure 6A and Figure 6B*. Use a saber saw or hack saw to cut extended outlet holes. Use a hole saw or uni-bit (step drill) to cut outlet holes. Be sure to remove any burrs after cutting so the drop kit can perform properly.

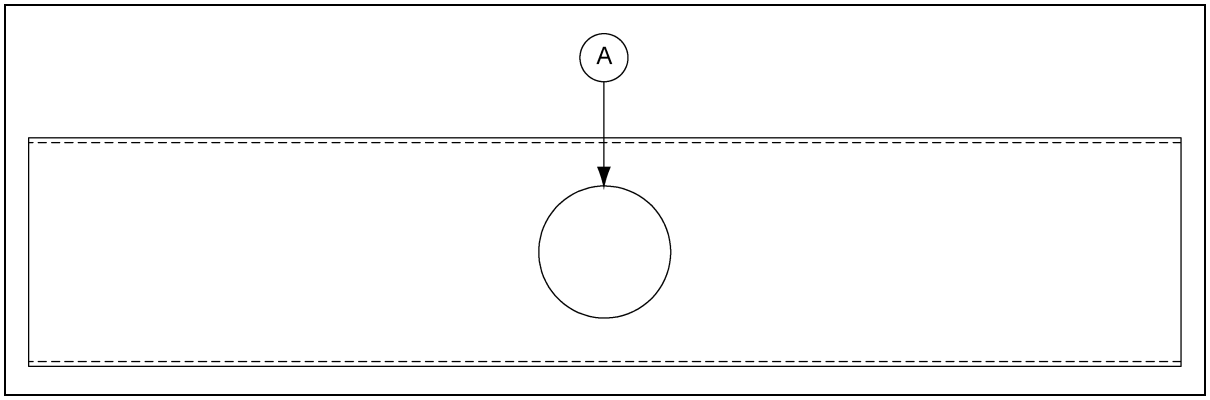


Figure 6A *Outlet Hole for Partial Drop-Out in Welded Steel and PVC Tubing (Used with Drop Kits and Drop Feeders)*

Ref #	Description
A	Ø 1-3/8" (35 mm)

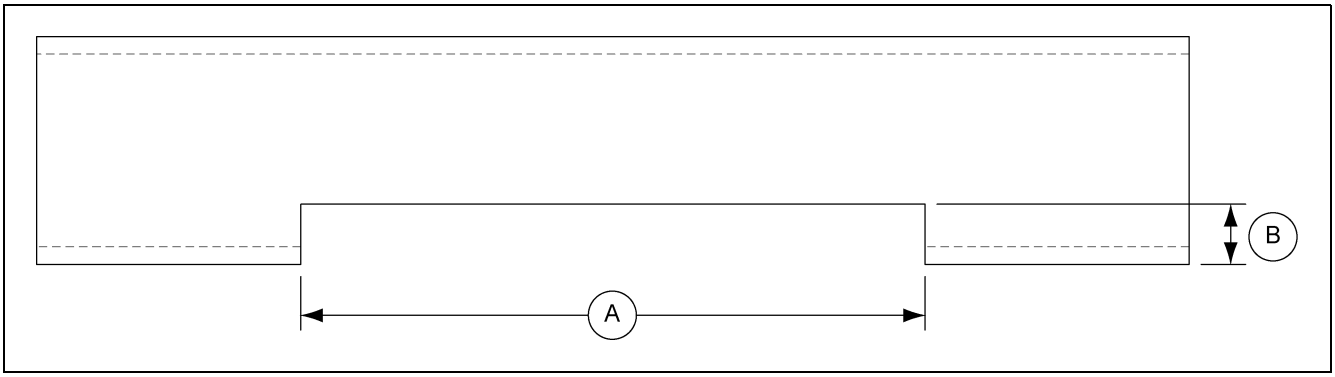


Figure 6B *Extended Outlet Hole with Total Drop-Out (Only used with Kwik-Attach Drop Kit)*

Ref #	Description
A	6-1/2" (165 mm)
B	5/8" (16 mm)

Suspension Tube

IMPORTANT: *Suspend the sections of PVC tubing every 4' and welded steel tubing every 8' from the ceiling. To minimize drag and wear keep the sections of tubing as straight as possible. Failure to do this will void the warranty.*

Drop Kit Installation

Kwik-Attach

1. Snap the slide around the tube over the outlet hole. *(See Figure 6C.)*
2. Fasten the housing to the tube using two (2) hose clamps. Make sure the outlet hole is in the middle of the housing.
3. Slide can be rotated from side to side to open and close the drop kit.

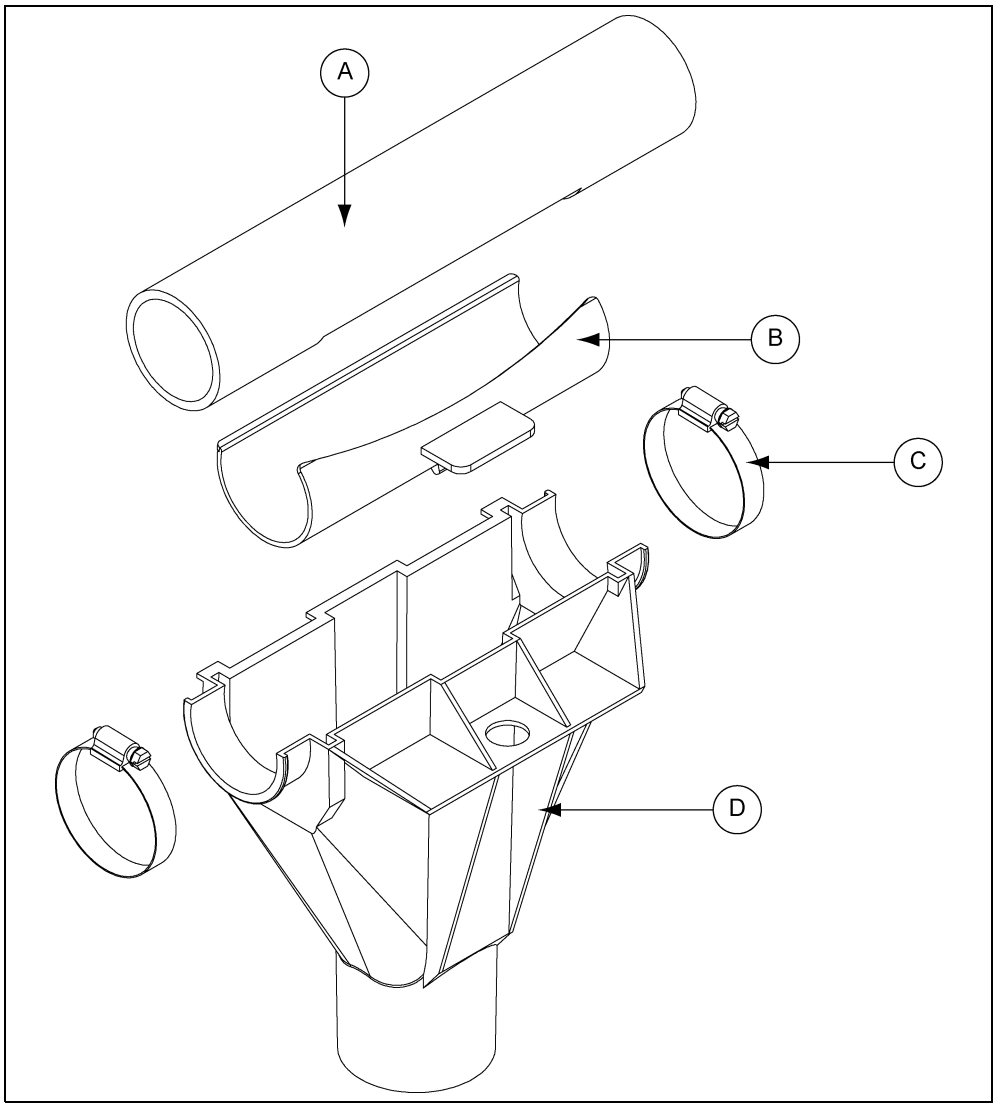


Figure 6C *Kwik-Attach Drop Kit Installation for PVC and Welded Steel Tubing (APCD-109)*

Ref #	Description
A	PVC or Welded Steel Tubing
B	Slide
C	Hose Clamp (2)
D	Housing

Drop Kit Installation (Continued)

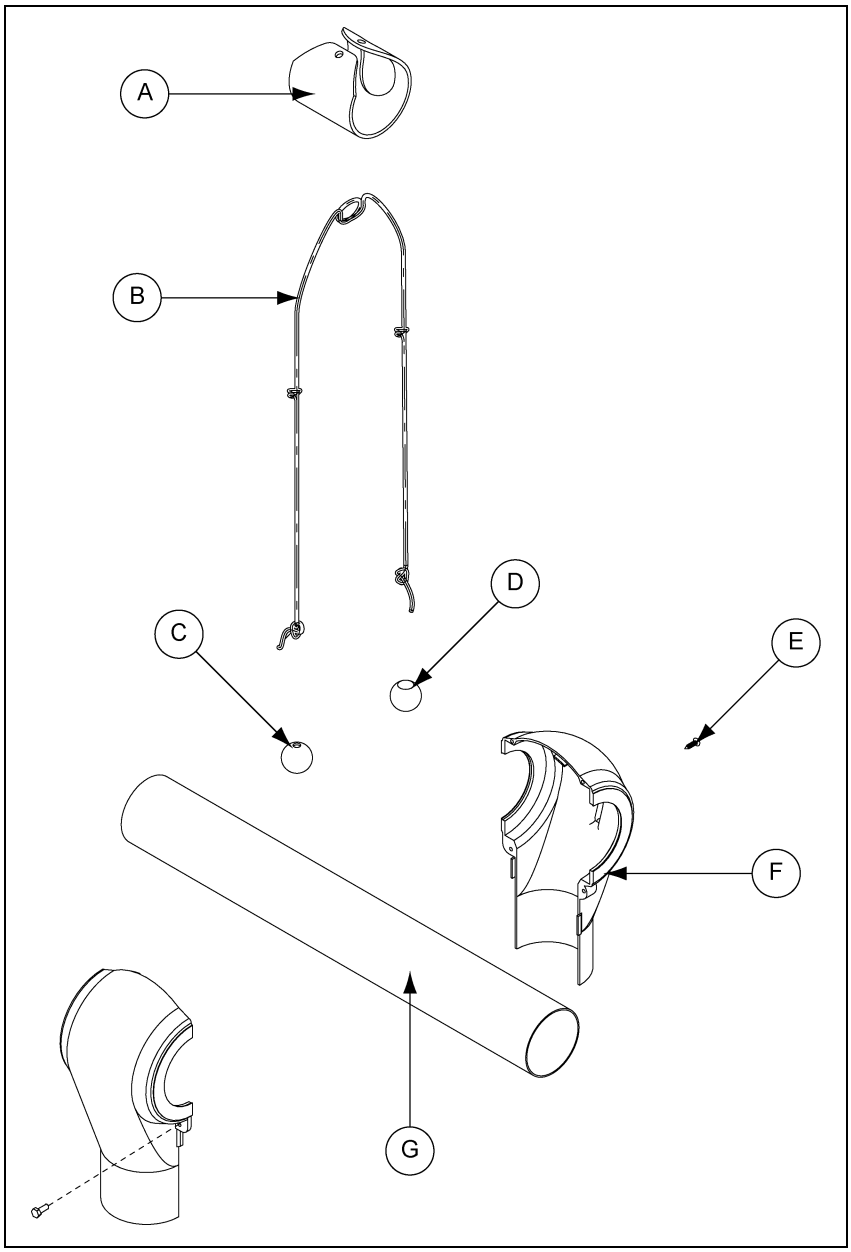


Figure 6D *Pull Cord Style Drop Kit Installation for PVC and Welded Steel Tubing (APCD-710)*

Ref #	Description
A	Slide
B	White Cord
C	Indicator Ball (Red)
D	Indicator Ball (Green)
E	Screw and Nut (Four (4) Each)
F	Drop Half (2)
G	PVC or Welded Steel Tubing

Drop Feeder Installation

Refer to the Drop Feeder Installation and Operational Manual to install the drop feeders.

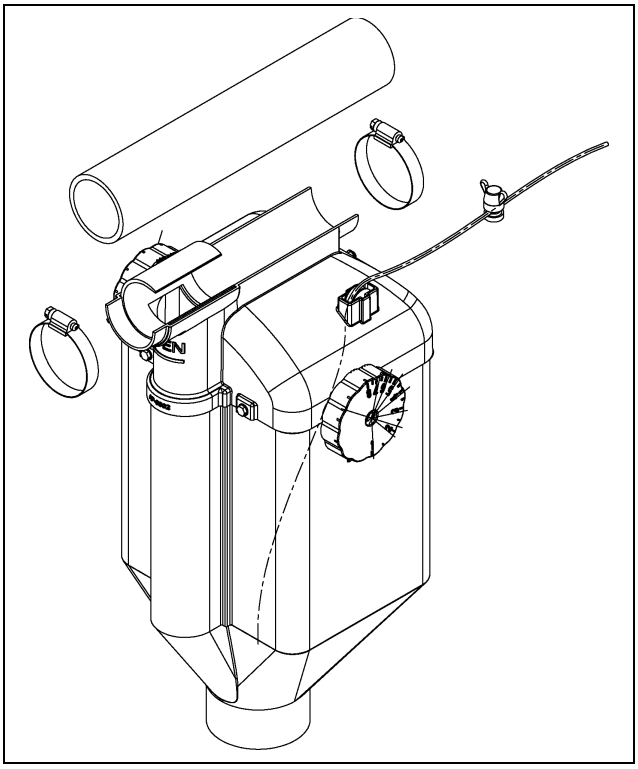


Figure 6E *Ultra-Drop Feeder on Welded Steel and PVC Tubing (AP-3800)*

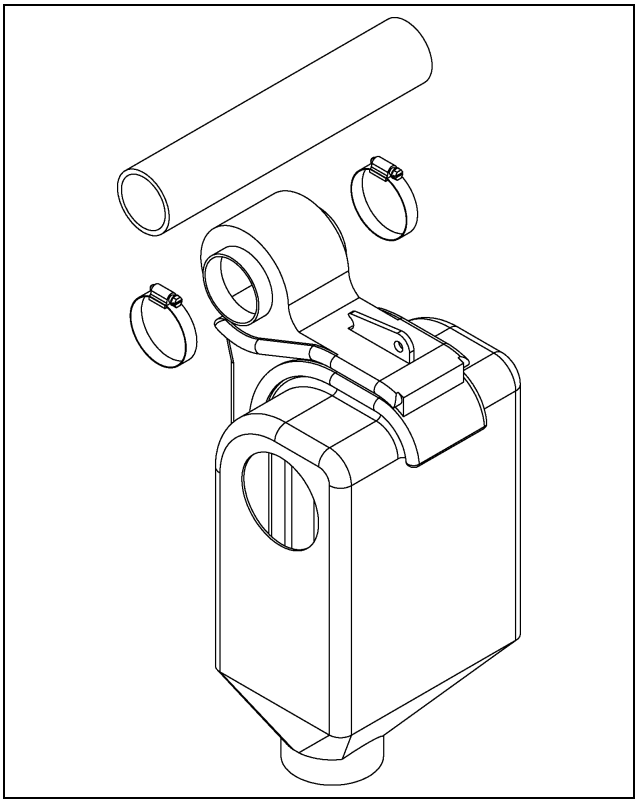


Figure 6F *Econo-Drop Feeder on PVC and Welded Steel Tubing (AP-2385)*

Location

The Chain Disk Model 236 drive unit is designed in such a way that if feed enters the drive unit, it is able to carry it back out again. Because of this, the drive unit can be placed anywhere in the system given consideration to accessibility and potential traffic around it. The drive unit can also be bolted to the floor (bolts not provided) or suspended, keeping in mind that the position of it in relationship to the rest of the system will affect the number of corners needed.

However the best position to locate the drive unit is between the last feeder and the fill hopper. This ensures that only a minimum amount of feed flows through the drive unit.

Structural Integrity of Support

The entire drive unit weighs approximately 170 lbs. If the drive unit is suspended, the structural member(s) from which it is suspended must be able to support it. ***Extreme caution should be used to avoid structural damage and bodily injury.*** To evaluate structural integrity of the support consult a qualified structural engineer.

Suspension of the Drive Unit

Although the drive unit can be bolted to the floor, the most common installation is to suspend the drive unit. *(See Figure 7A on Page 21.)* The suspension unit is included with the drive unit.

1. Screw lag screw eye bolts into structural members approximately 48" (1.2 m) apart from one another to provide a stable suspension.
2. Measure and cut chain into four (4) equal length sections leaving each plenty long for adjustment later.
3. Hook chain over lag screw eye bolts in ceiling.
4. Suspend drive unit by hooking other end of the chain over leveling eye bolts on the suspension unit.
5. Level drive unit by re-hooking chain or by screwing leveling eye bolts in or out.

Tubing Connections

6. Cut the PVC or welded steel tubing so that it butts up to the stainless steel tubing on both the inlet and outlet side of the drive unit.

For the PVC Tubing

7. Install the PVC couplers to the drive unit and secure with saddle clamps.

For the Welded Steel Tubing

8. Install the steel compression couplers to the drive unit and tighten securely.

Suspension of the Drive Unit (Continued)

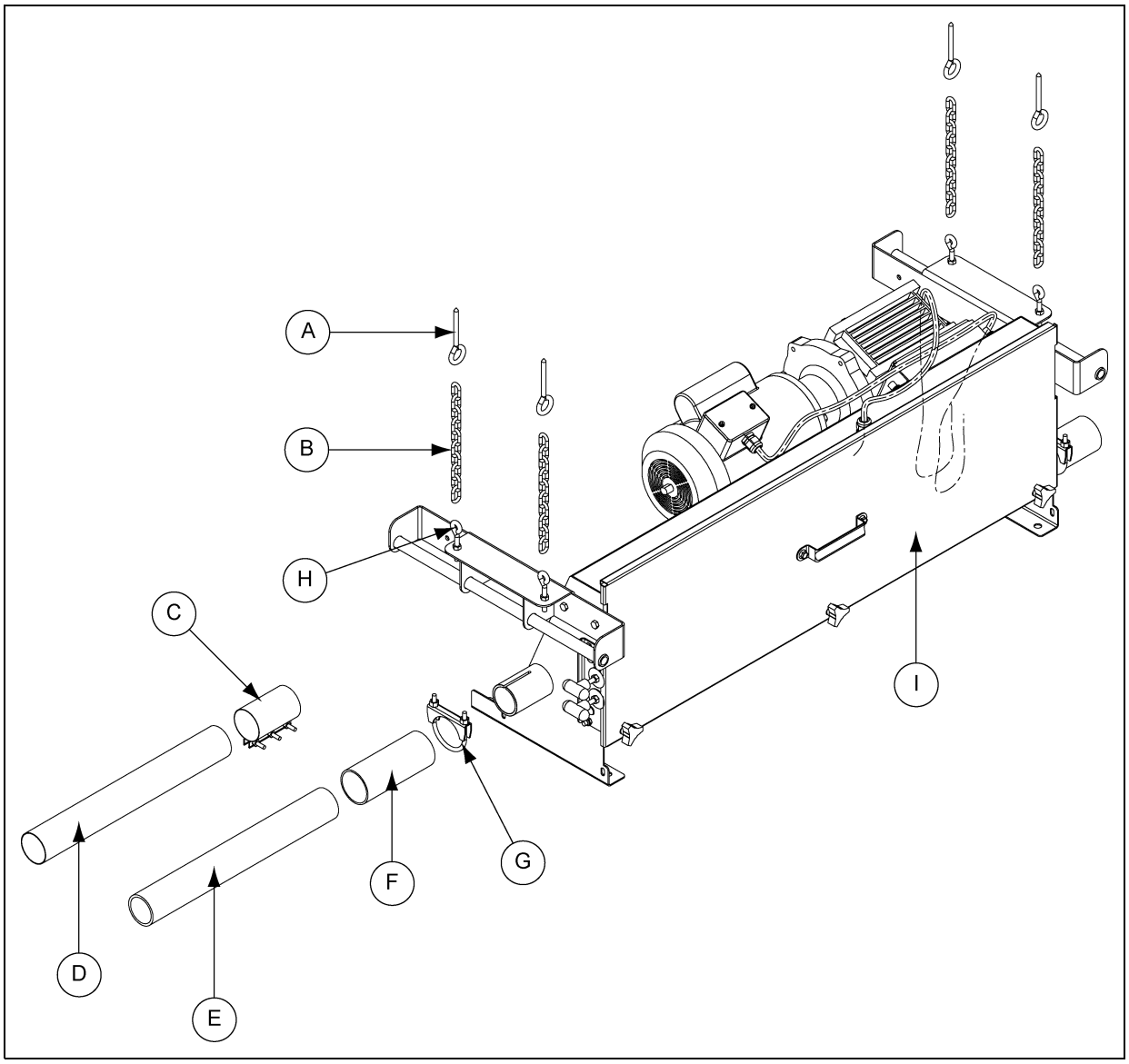


Figure 7A *Drive Unit Installation and Suspension*

Ref #	Description
A	Lag Screw Eye Bolt (4)
B	Chain (4)
C	Steel Compression Coupler
D	Welded Steel Tube
E	PVC Tube
F	PVC Coupler
G	Saddle Clamp
H	Leveling Eye Bolts (4)
I	Drive Unit

Measuring and Cutting Tube

Ends for Corners

1. Remove the top from the corner and hold the rest of it in place to mark the tubes for cutting. *(See Figure 8A.)*
2. Cut the tubes so they extend into the corner up to the shoulder provided in the molding.

Initial Assembly of Corners

1. Bolt the bottom of the corner to the tubes using the add on clamps (these parts need to be snapped off of the top), 5/16" x 1-1/4" bolts, 5/16" nuts.
2. Replace the 1/2" neoprene backed flat washer and 1/2" lock nut on the pivot shaft to retain the idler wheel from being pulled off during chain and disk installation. The top of the corner can remain off until after the chain and disks are installed. Corner must be suspended using the two (2) wire suspension angles provided to avoid tubing wear. Use one wire suspension angle on each side of the corner. *(See Figure 8A below and Figure 8B on Page 23.)* Place wire suspension angles over the add on clamps so that corners will be supported before tops are installed.

IMPORTANT: *Two (2) corner wire suspension angles must be used to support each corner. Failure to properly suspend corners will void warranty.*

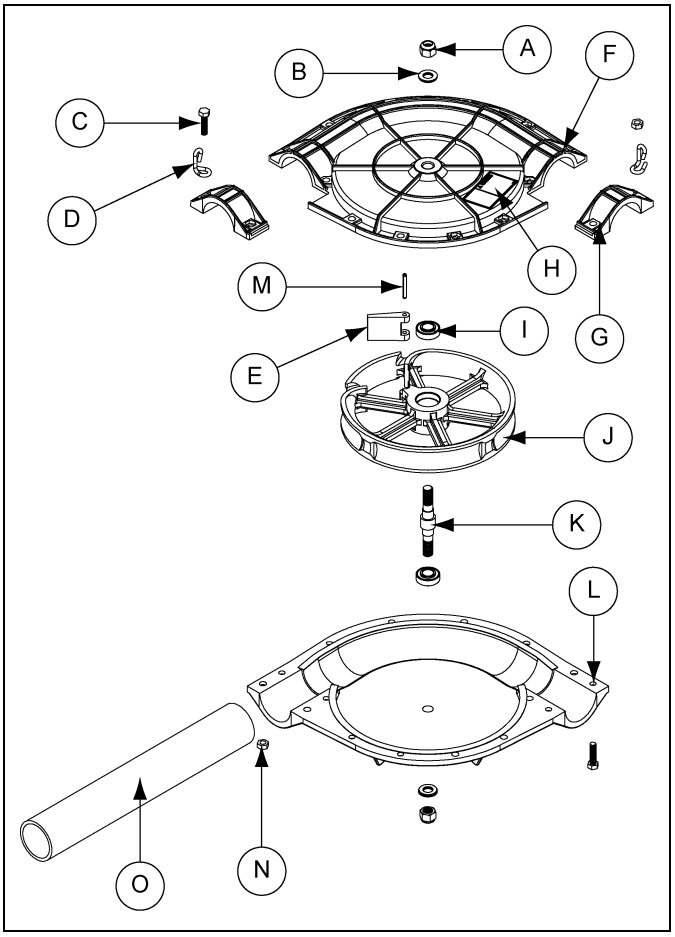


Figure 8A *Horizontal Corner Installation and Suspension*

Ref #	Description
A	1/2" Lock Nut (2)
B	1/2" Neoprene Backed Flat Washer (2)
C	5/16"-18 x 1-1/4" Hex Bolt (16)
D	Wire Suspension Angle (2)
E	Wiper
F	Corner Top
G	Add on Clamp
H	Decal
I	Bearing (2)
J	Idler Wheel
K	Shaft
L	Corner Bottom
M	Spring Pin 3/16" x 1-1/2"
N	5/16"-18 Hex Nut (16)
O	PVC or Welded Steel Tubing

Measuring and Cutting Tube (Continued)

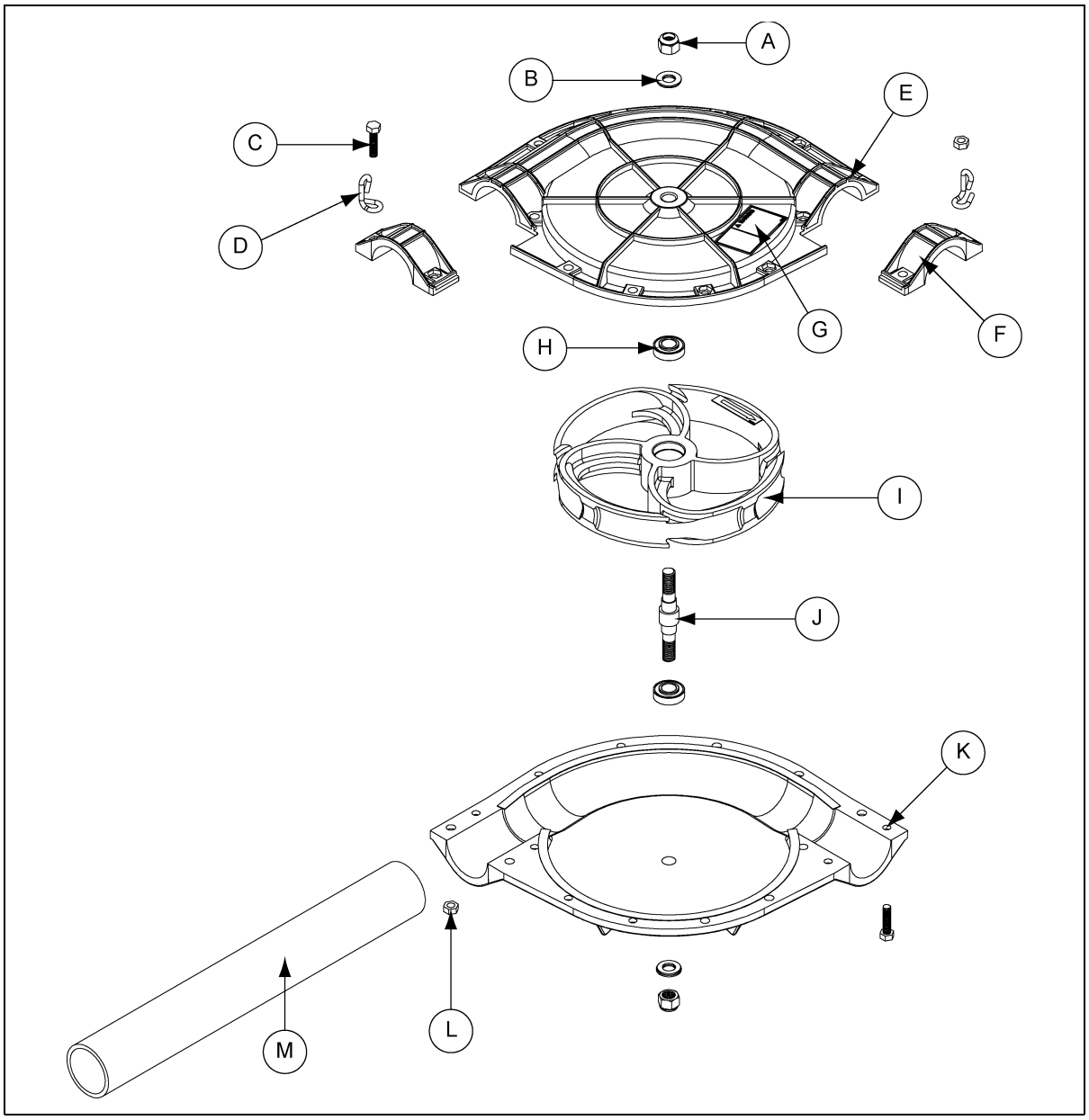


Figure 8B *Vertical and Inclined Corner Installation and Suspension*

Ref #	Description
A	1/2" Lock Nut (2)
B	1/2" Neoprene Backed Flat Washer (2)
C	5/16"-18 x 1-1/4" Hex Bolt (16)
D	Wire Suspension Angle (2)
E	Corner Top
F	Add on Clamp
G	Decal

Ref #	Description
H	Bearing (2)
I	Idler Wheel
J	Shaft
K	Corner Bottom
L	5/16"-18 Hex Nut (16)
M	PVC or Welded Steel Tubing

Installation

Figure 9A on Page 25 shows a typical Chain Disk installation including a Flex-Flo System. A Flex-Flo System must be used to transport feed from the bulk feed tank to the Chain Disk System inside the building. In colder climates the Chain Disk System can lock up when used outside due to freezing whereas the auger in the Flex-Flo System can break loose frozen feed due to its outside rotational motion and winding up tendency.

IMPORTANT: *The correct gearbox must be used on the Model 300 Flex-Flo System to prevent overfilling of the Chain Disk System.*

Table below shows the maximum fill system rate for different effective lengths of a Chain Disk System and the corresponding Flex-Flo gearbox RPM to deliver that rate. The effective length is determined by adding the length of chain plus 25' (0.7 m) per corner. Refer to Model 300 Flex-Flo Installation and Operation Manual for proper installation of the Flex-Flo System. The Flex-Flo System can run parallel or perpendicular to the Chain Disk System.

Chain Disk System Design Criteria

Chain Disk Tube	Recommended Applications	Chain Disk System must not exceed any of these four (4) design criteria.				Flex-Flo Fill System	Effective Length	Effective Capacity *** (lbs./min.)
		Maximum Corners	Maximum Chain	Maximum Effective Length *	Maximum Daily Run Time **			
2.36" O.D. PVC Tube	Farrowing/Lactation Nursery	24 Corners	1150'	1750 Effective Feet	100 Minutes per Day	Model 300 at 250 RPM (35 pounds per minutes)	Up to 1000	35
							1000-1250	30
							1250-1500	25
							1500-1750	20
2.375" O.D. Welded Steel Tube	Breeding and Gestation with Electronic Sow Feeding (ESF) Finishing	24 Corners	1900'	2000 Effective Feet	240 Minutes per Day	Model 300 at 250 RPM (35 pounds per minutes)	up to 1500	35
							1500-1750	30
							1750-2000	25
						Model 300 at 358 RPM (50 pounds per minutes)	Up to 1000	50
							1000-1250	45
							1250-1500	40
							1500-1750	35
							1750-2000	30

*** Effective length** of a Chain Disk System = Total feet of Chain Disk chain + (number of Chain Disk corners x 25).
Example: Seven hundred feet of Chain Disk tubing + (Sixteen Chain Disk corners x twenty five) = 1100 Effective ft.

**** Daily run time** of a Chain Disk System = Maximum daily feed requirement divided by “Effective Capacity”.
Example: Eight hundred gestating sows x five pounds per sow per day (4000 lbs.)/20 pounds per minute “Effective Capacity” = 200 minutes.

***** Effective capacity** of a Chain Disk System is the estimated actual fill rate of the system when adjusted for the cycling of the Flex-Flo fill system by the Chain Disk controller’s current sensor to prevent system overload.

Typical Fill System Installation

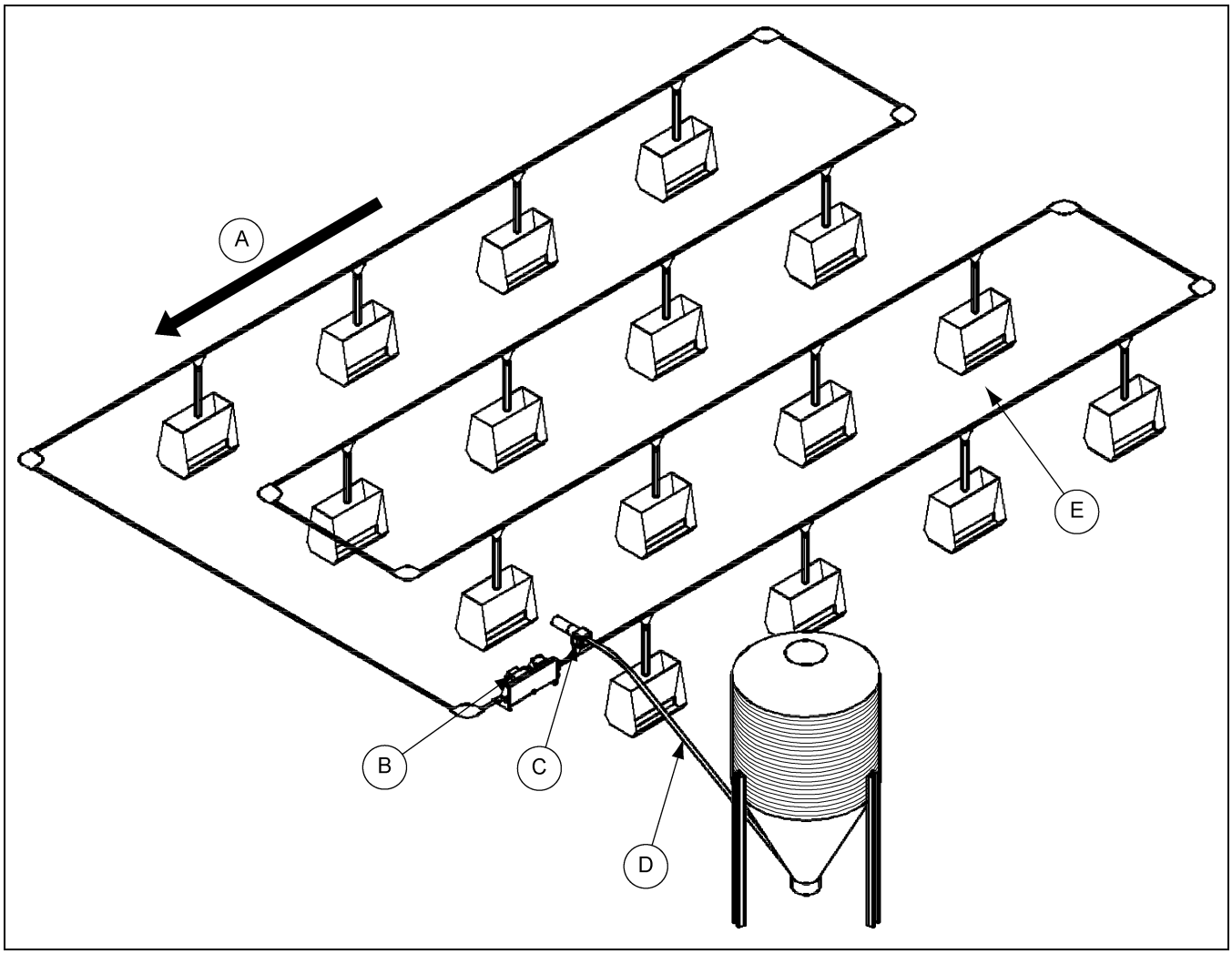


Figure 9A *Typical Fill System Installation*

Ref #	Description
A	Direction of Travel for Chain and Disk
B	Chain Disk Drive Unit
C	Flex-Flo Control Unit
D	Flex-Flo Fill System
E	Chain Disk System

Fill Hopper Installation

1. Attach fill hopper to the Flex-Flo control unit using #10 x 1" self-drilling screws provided with Flex-Flo control. *(See Figure 9B.)*
2. Adjust the suspension height of the control unit until fill hopper is in line with tubing.
3. Refer to *Page 20* for tubing connections.

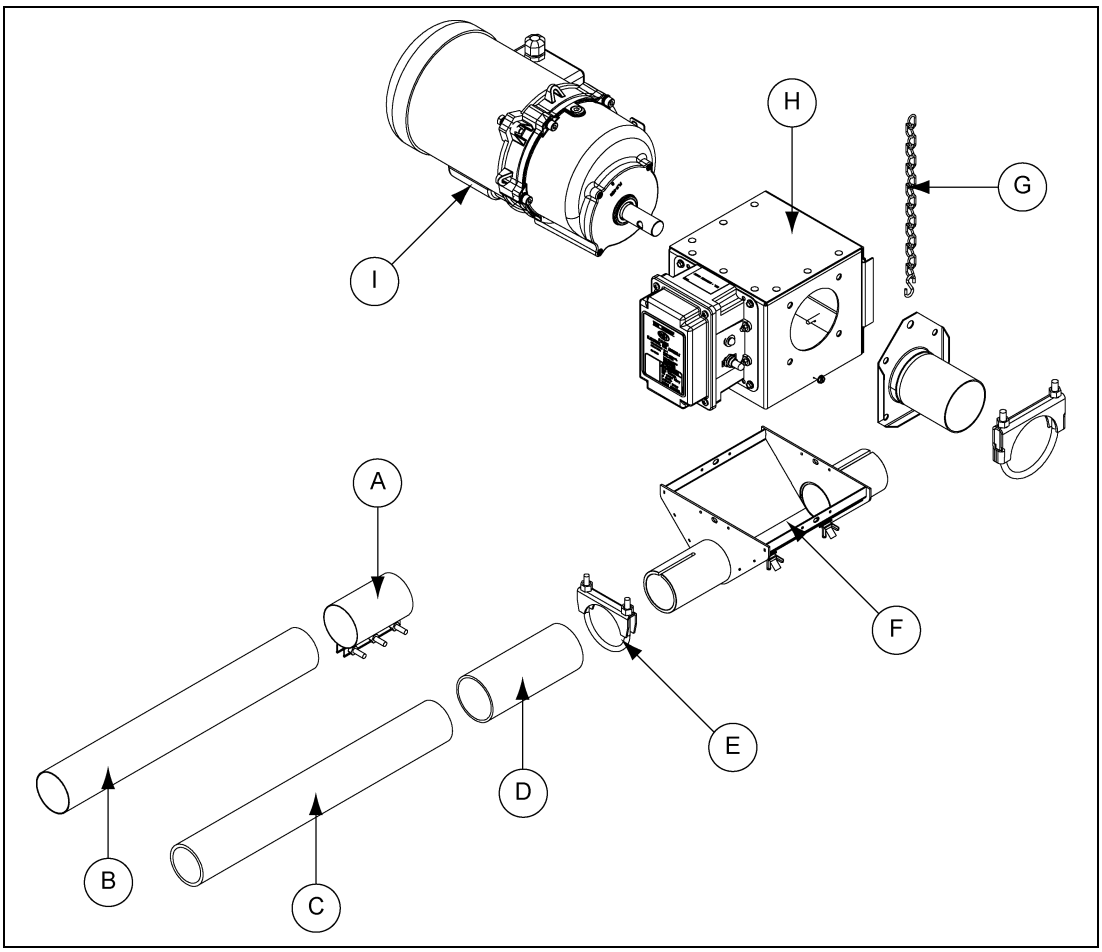


Figure 9B *Fill Hopper Installation*

Ref #	Description
A	Steel Compression Coupler
B	Welded Steel Tube
C	PVC Tube
D	PVC Coupler
E	Saddle Clamp
F	Chain Disk Fill Hopper
G	Suspension Chain
H	Flex-Flo Control Unit
I	Flex-Flo Power Unit

Wiring Instructions

WARNING

1. Disconnect all electrical power before inspecting or servicing equipment unless maintenance instructions specifically state otherwise.

2. Keep hands and tools away from exposed Chain Disks.

3. Do not operate equipment without covers and guards properly positioned. Failure to do so may cause personal injury or damage to the equipment.

Safety Regulations

1. All wiring should be done by a qualified electrician in accordance with local and national electrical codes.
2. Ground all electrical equipment for safety.
3. Use proper size wire according to the national electrical codes to wire all systems. *(See Figure 10A.)*

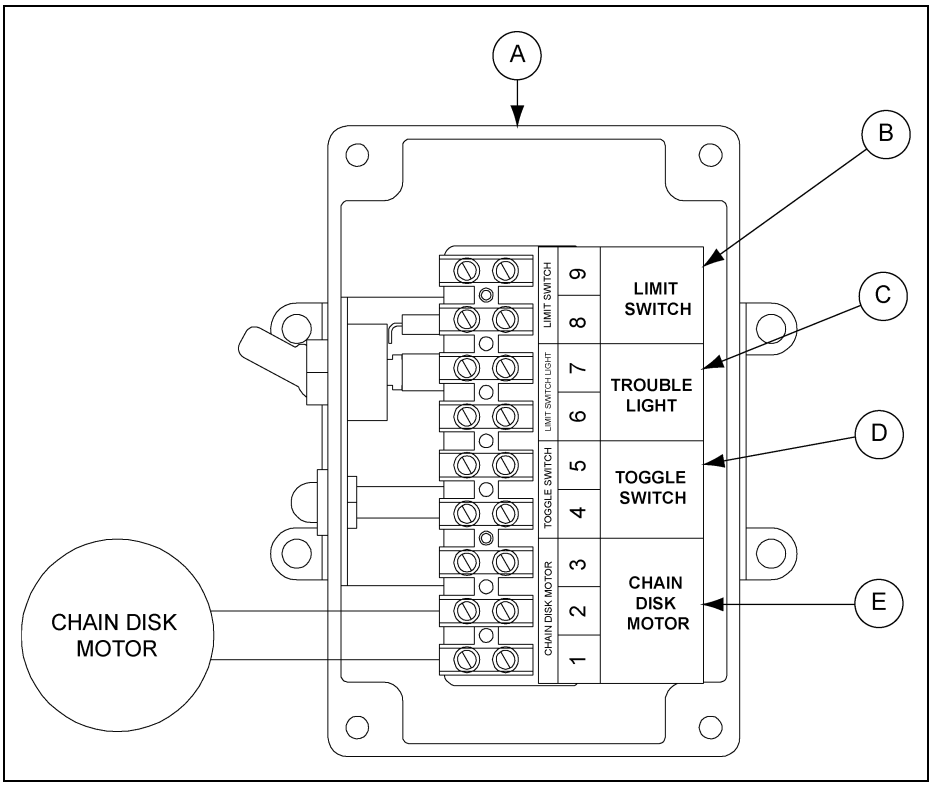


Figure 10A *Chain Disk Junction Box*

Ref #	Description
A	Chain Disk Drive Unit Electrical Junction Box
B	To Safety Switch Terminals
C	To Trouble Light Terminals
D	To Toggle Switch Terminals
E	To Contactor Terminals

Single Auger Single Loop System Illustration

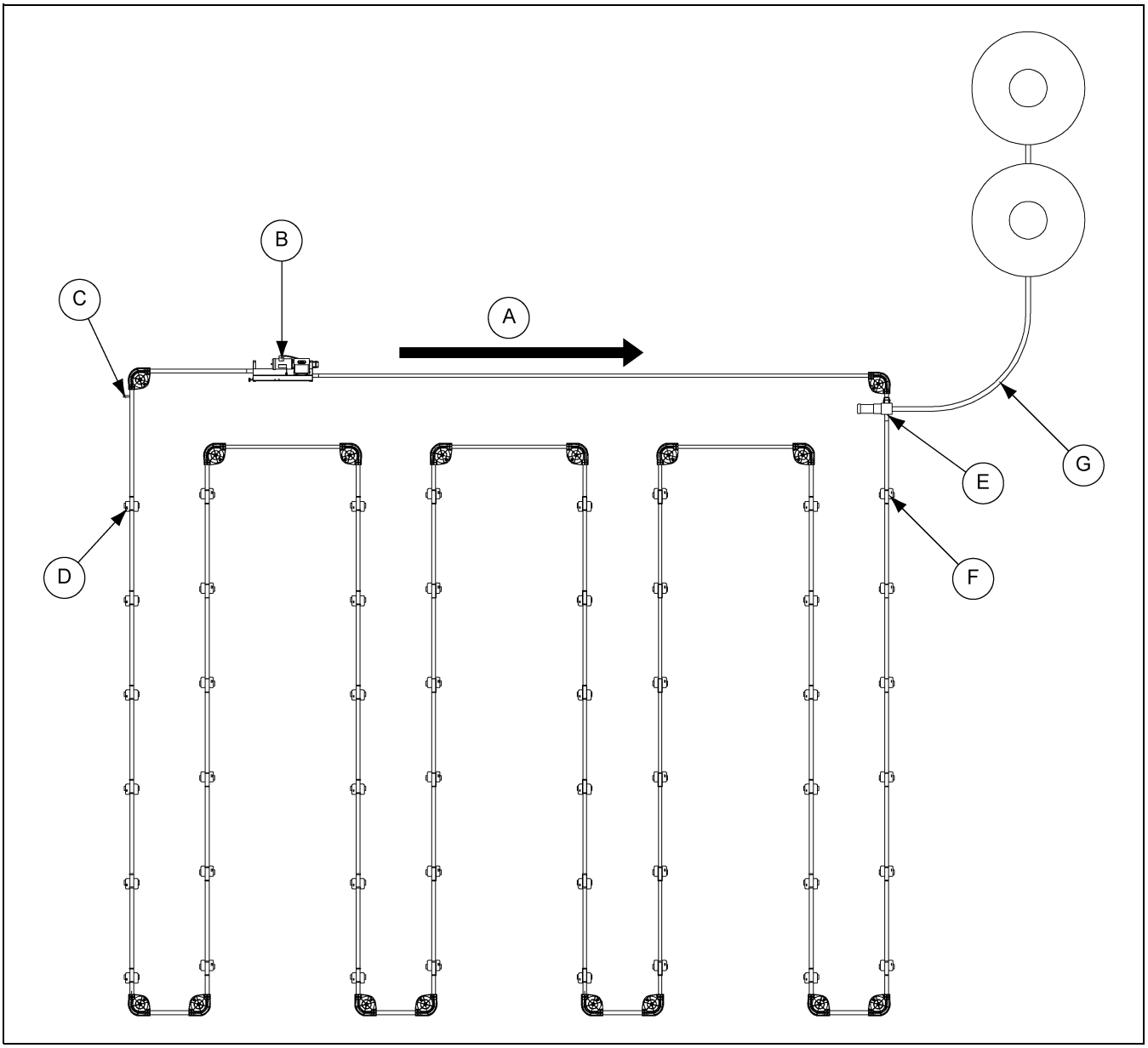


Figure 10B

Ref #	Description
A	Direction of Chain Travel
B	Chain Disk Drive Unit
C	Tube Mounted Proximity Switch
D	Last Feeder to be Filled
E	Flex-Flo Power Unit and Fill Hopper
F	First Feeder to be Filled
G	Model 300 Flex-Flo Auger

Single Auger Two (2) Loops System Illustration

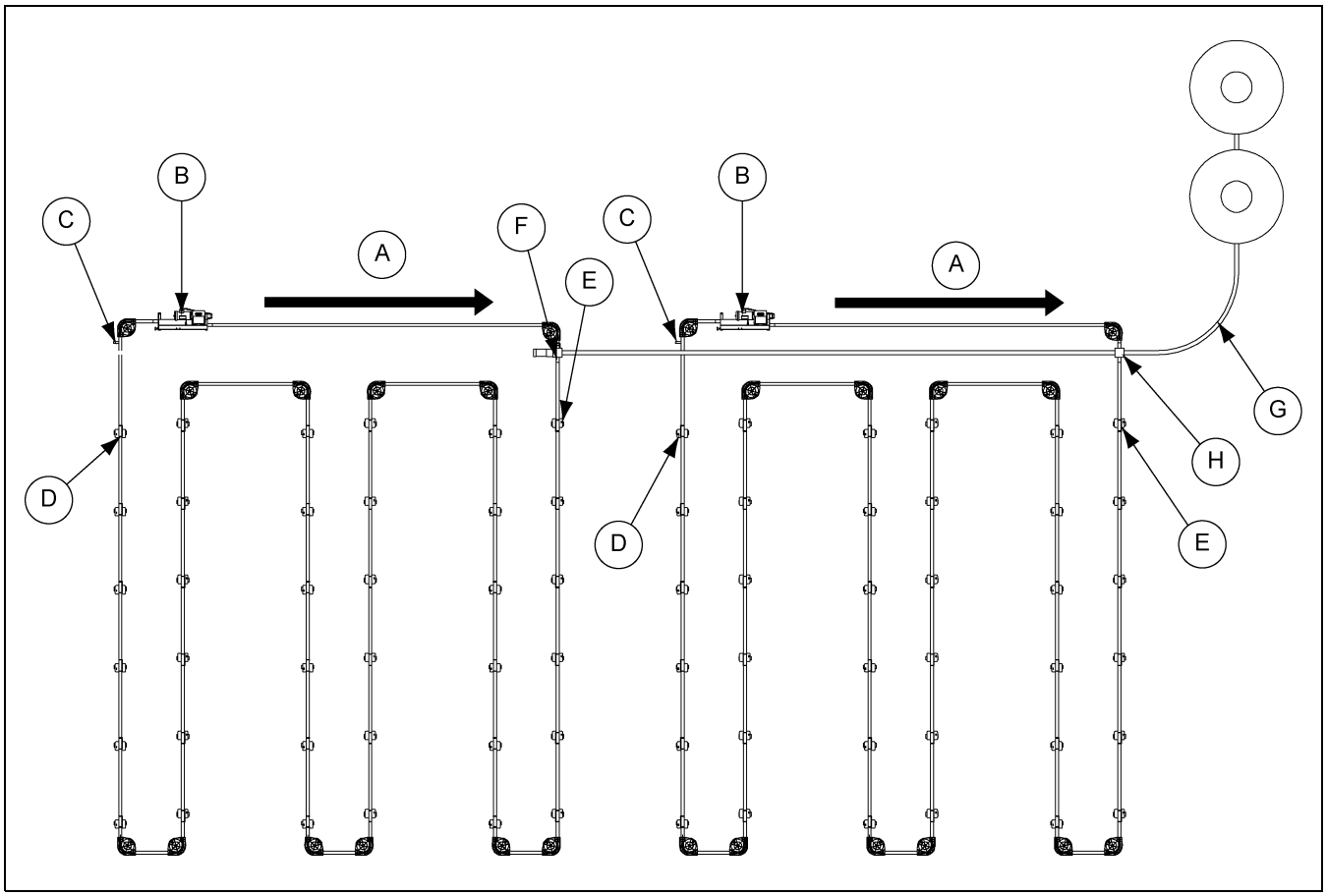


Figure 10C

Ref #	Description
A	Direction of Chain Travel
B	Chain Disk Drive Unit
C	Tube Mounted Proximity Switch
D	Last Feeder to be Filled
E	First Feeder to be Filled
F	Flex-Flo Power Unit and Fill Hopper
G	Model 300 Flex-Flo Auger
H	Model 300 Pass through Control and Fill Hopper

Current Sensor

The Chain Disk System can over fill if the fill system's capacity is greater than the capacity of the Chain Disk System or if longer systems are allowed to re-circulate. Overfilling will overload the Chain Disk motor causing the thermal reset switch on the motor to kick out and/or premature motor failure. To prevent this from occurring a current sensor has been installed on the circuit board of the Chain Disk control unit. This current sensor monitors the amp draw of the Chain Disk motor and controls a relay which has the fill system (Example: Flex-Flo) wired to it. While the Chain Disk System is filling, the amp draw of the motor will increase steadily. If the amperage reaches the maximum point of a specified range, the current sensor will automatically turn OFF the fill system temporarily. As the Chain Disk System continues to empty itself, the amp draw of the motor will decrease steadily. If the amperage reaches the minimum point of a specific range, the current sensor will automatically turn the fill system back ON. This ON/OFF cycling of the Flex-Flo will occur every few minutes until the Chain Disk feed system is full, at which time both the Chain Disk and Flex-Flo will shut OFF. *(See Figure 11B on Page 31.)*

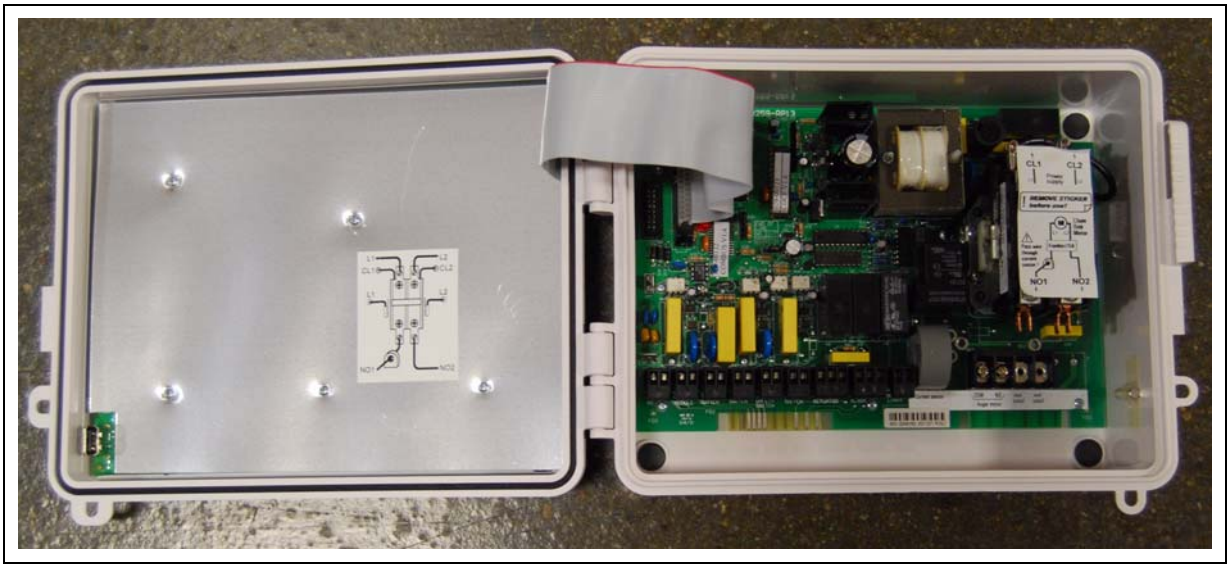


Figure 11A *PC Board*

Chain Disk Control Current Sensor Settings

Chain Disk Motor	Voltage	Recommended # of Loops through Current Sensor	Recommended Window Size	Suggested Maximum Current Sensor Setting for New Blue Gearbox*	Suggested Maximum Current Sensor Setting for Old Grey Gearbox**
Single Phase, 60 Hz	208-230	1	1.0	6.0	9.0
Single Phase, 50 Hz	190-230	1	1.0	6.0	9.0
Three Phase, 60 Hz	208-230	2	1.5	8.0	9.0
	460	3	1.0	6.0	7.0
Three Phase, 50 Hz	190	2	1.5	9.0	10.0
	230	2	1.5	8.0	10.0
	380	3	1.0	7.0	9.0

Critical amp setting should be 2 amps over maximum current sensor setting.

* New blue gearbox can only be used with 1.5 HP motor.

** Old grey gearbox can only be used with 2 HP motor.

Current Sensor (Continued)

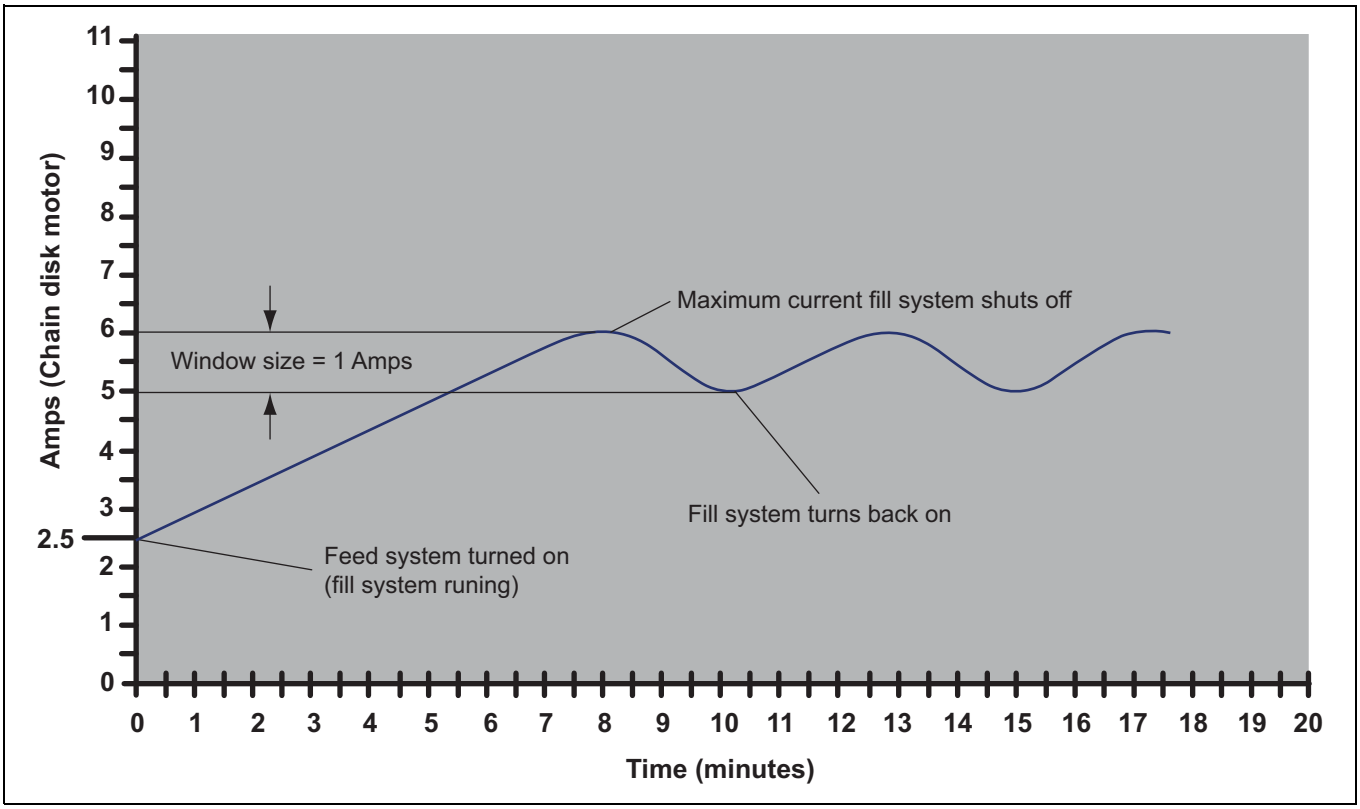


Figure 11B *Graphical Illustration of Current Sensor Operation for Typical Feed System*

Limit Switch

The limit switch *(See Figure 11C and Figure 11D on Page 32)*, which is located in the Chain Disk drive unit, is used as a safety switch. The limit switch can be activated in either direction by a bracket which is connected to the idler wheel. It will shut the system down if the chain is too long or too short, if the chain or spring breaks or if something gets caught in the system. To re-activate the system, pull the blue reset button on the limit switch, reset the appropriate control unit by acknowledging the alarm on the APCD-500 control unit or push the reset button on the APCD-500-S control unit.

Limit Switch (Continued)

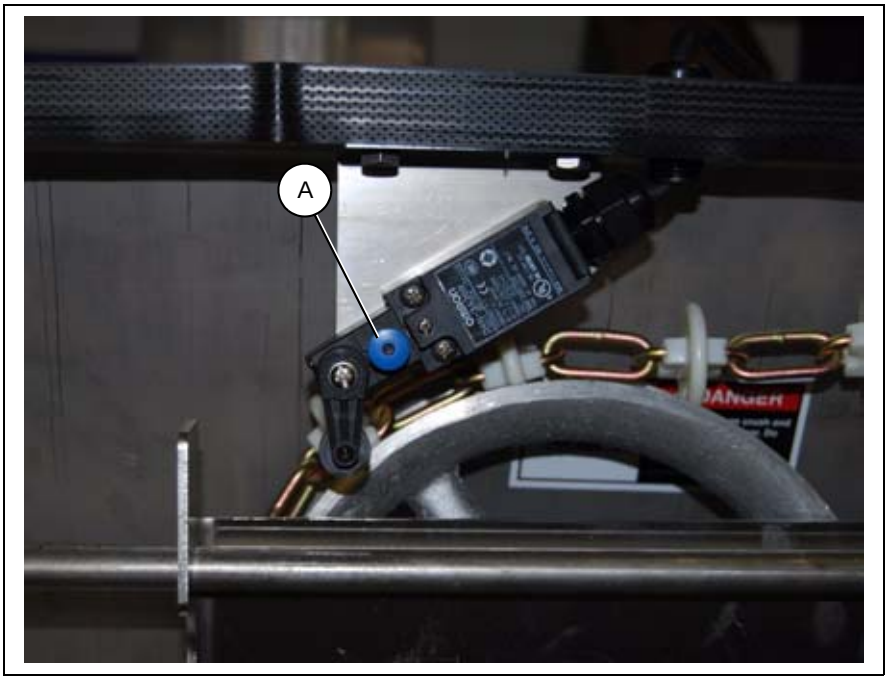


Figure 11C *Limit Switch in Normal Operating State*

Ref #	Description
A	Blue Reset Button

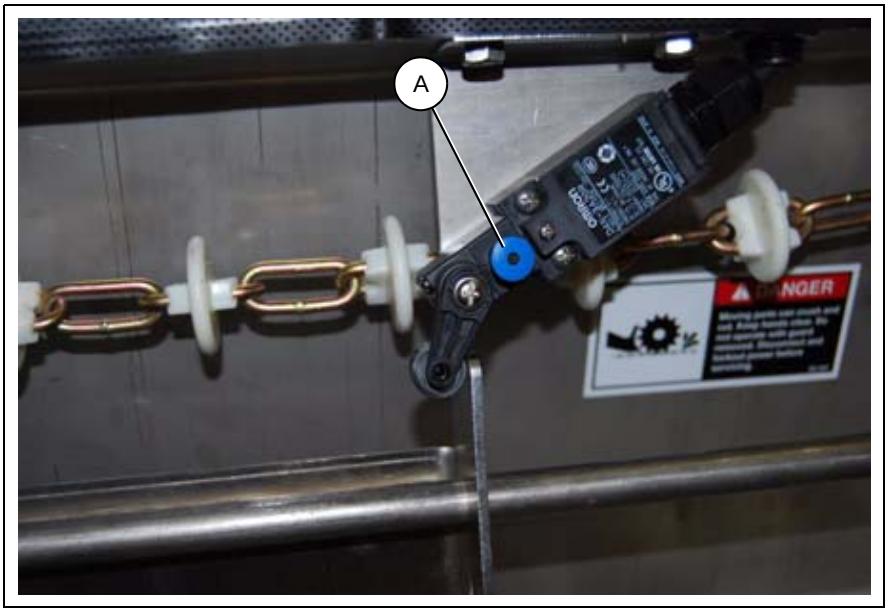


Figure 11D *Limit Switch in Activated Shut Down State*

Ref #	Description
A	Blue Reset Button

Limit Switch (Continued)

Disconnect power and fix the problem before pulling the reset button or acknowledge the alarm on the APCD-500 control.

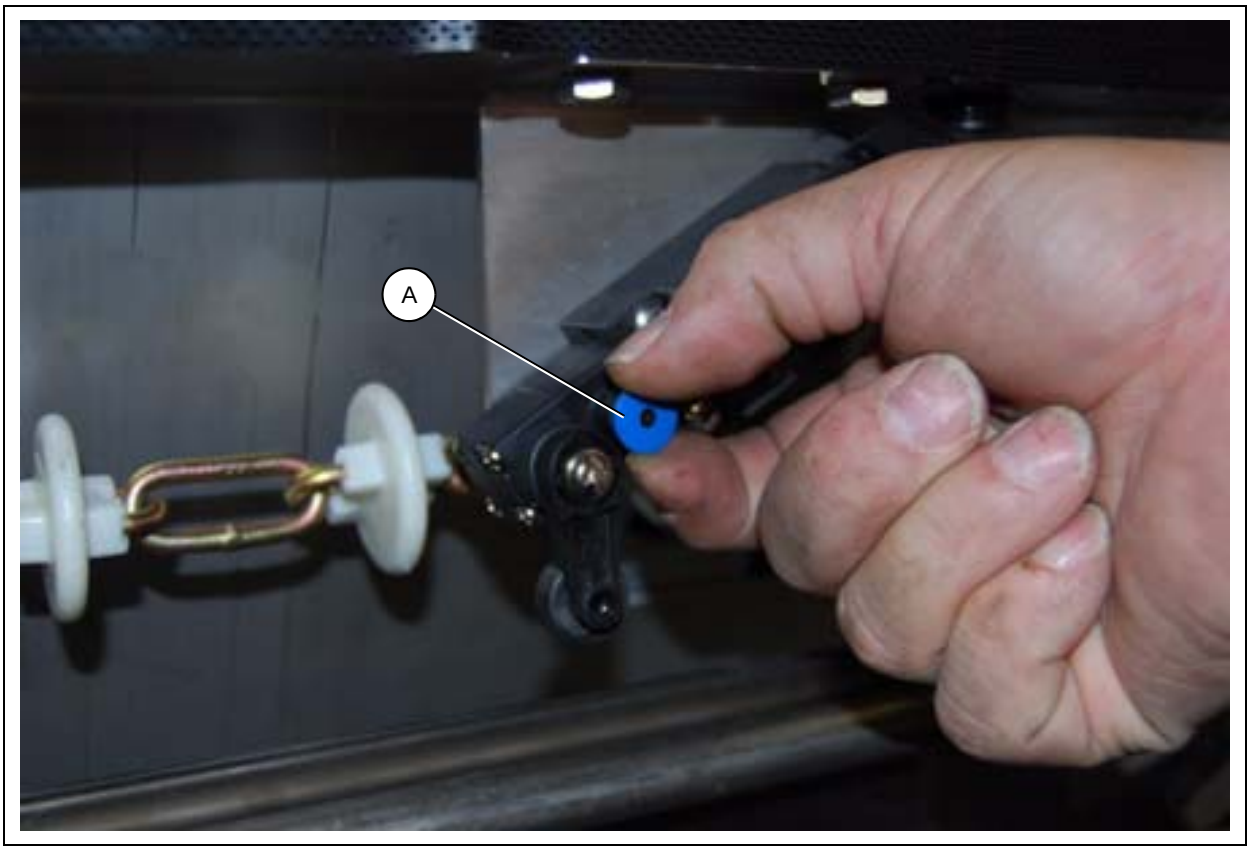


Figure 11E *Pulling the Reset Button*

Ref #	Description
A	Blue Reset Button

NOTE: *For operation, control settings and adjustment, see APCD-500, APCD-500-S and APCD-600.*

If a Flex-Flo System is used, turn the toggle switch to the OFF position.

Testing Limit Switch

With the motor turned on activate the limit switch in one direction. If the motor does not stop, refer to troubleshooting on *Page 62*. To re-start, refer to *Page 31*.

Check Drive Sprocket Rotation

Check to make sure the drive sprocket is turning counterclockwise as viewed from inside the drive unit. If not, rewire the wire connections to the motor according to the wiring connection diagram on the motor. *(See Figure 13A.)*

Figure 13A *Chain and Disks with Connector Link*

Pulling Chain through Tubing

NOTE: *Fish tape required. (Length must be equal to or longer than the longest section of tubing.)*

NOTE: *You may want to mark or paint the linked sections, so they can easily be identified through a clear tube.*

CAUTION

Inspect chain when installing to remove any kinks and knots from the chain. If kinks or knots get into system they can damage or break the disks. *(See Figure 13B.)*

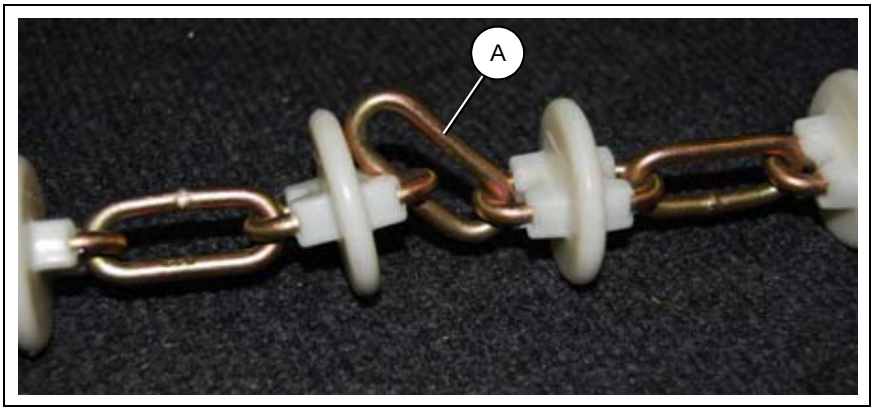


Figure 13B

Ref #	Description
A	Kinks

Pulling Chain through Tubing (Continued)

1. Start installing chain at one end of the drive unit so after all the chain is installed the final connection can be made inside the drive unit. *(See Figure 13C.)*

Figure 13C

2. At the other end of the first section of tubing start pushing the fish tape through the tube until it comes out into the drive unit. *(See Figure 13D.)*

Figure 13D

3. Connect one end of a section of chain and disks to the fish tape.
4. Pull the section of chain and disks through the tubing until there is only about 5' (1.5 m) left in the drive unit. If the section of tubing is longer than the chain and disks, use more than one section of chain and disks and connect them together using a connector link. *(See Figure 13A on Page 35.)*

Pulling Chain through Tubing (Continued)

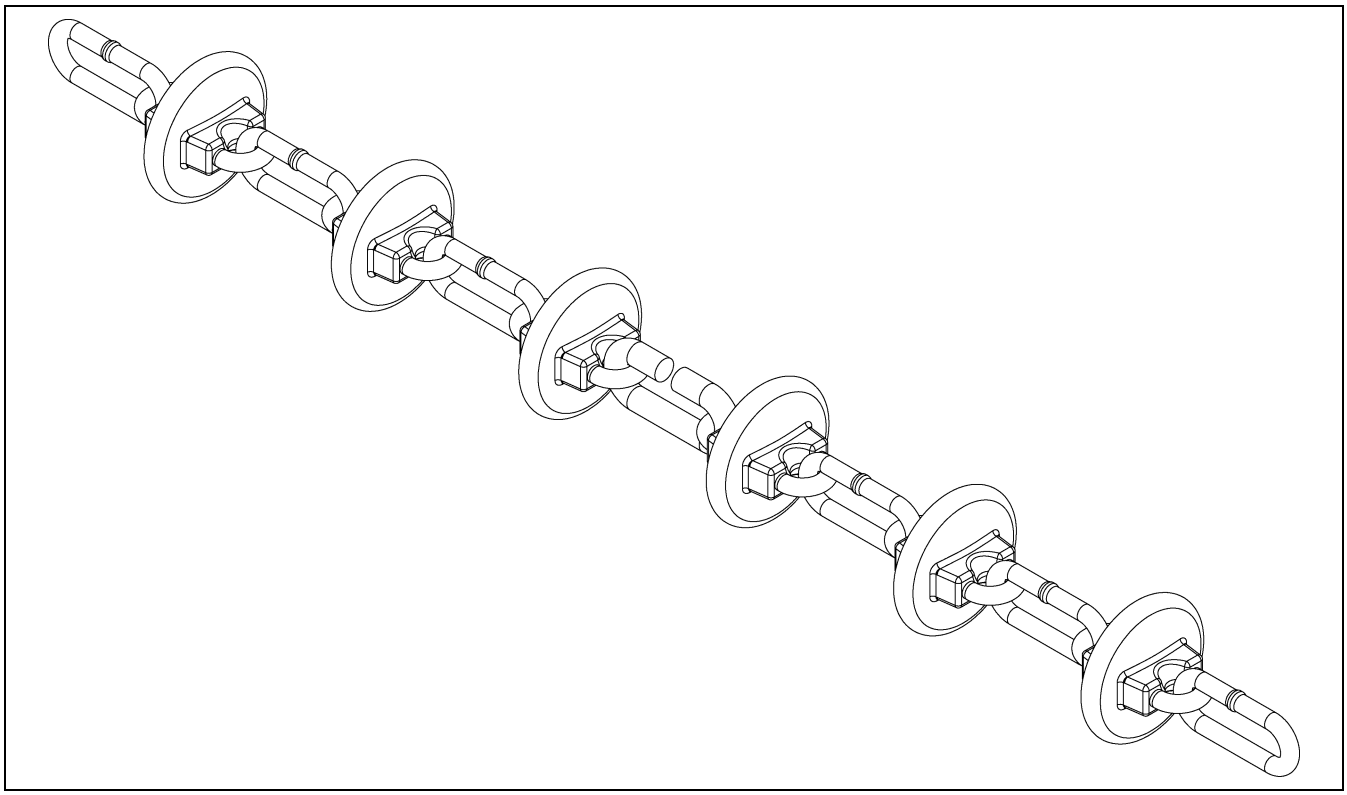


Figure 13E *Coupling - Right*

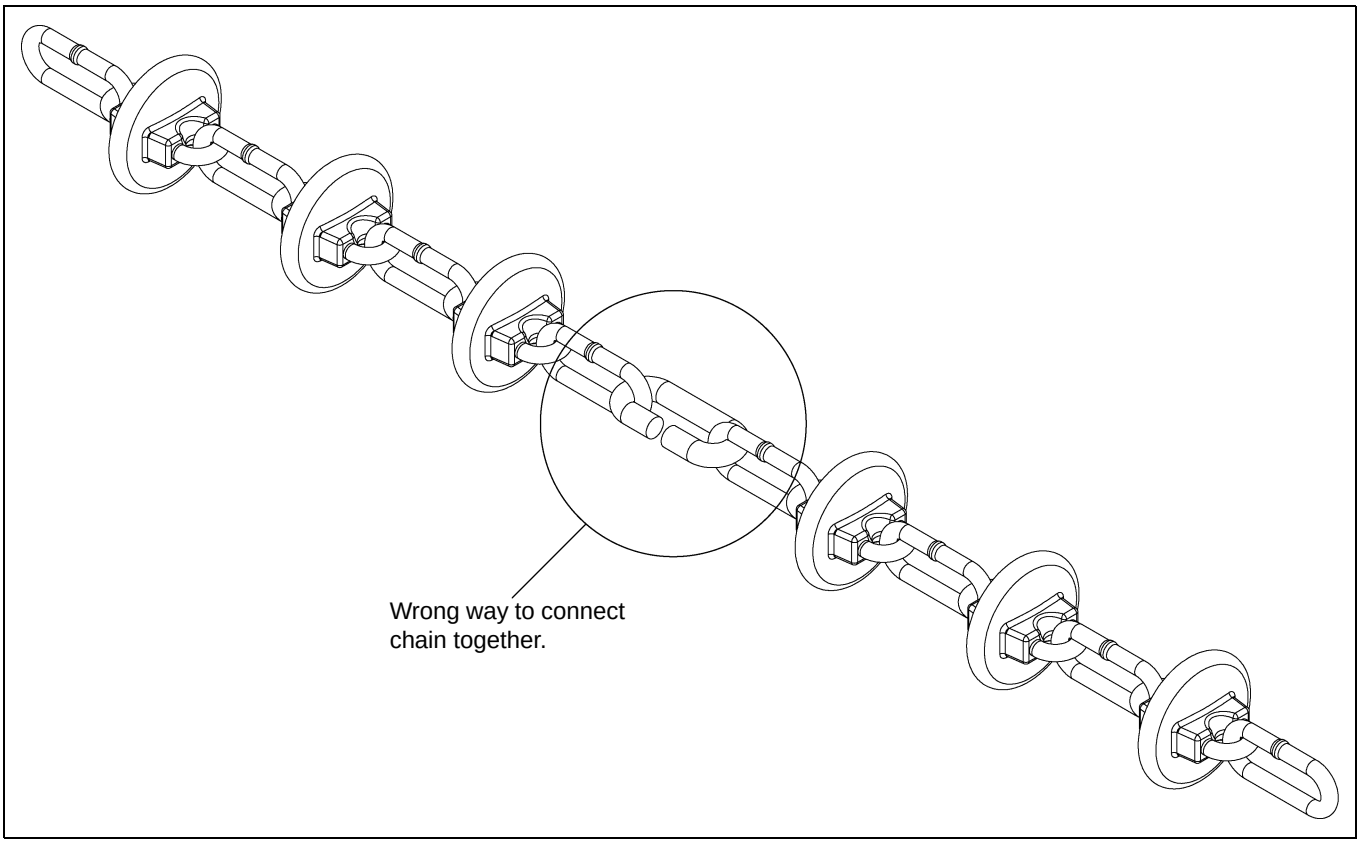


Figure 13F *Coupling - Wrong*

Pulling Chain through Tubing (Continued)

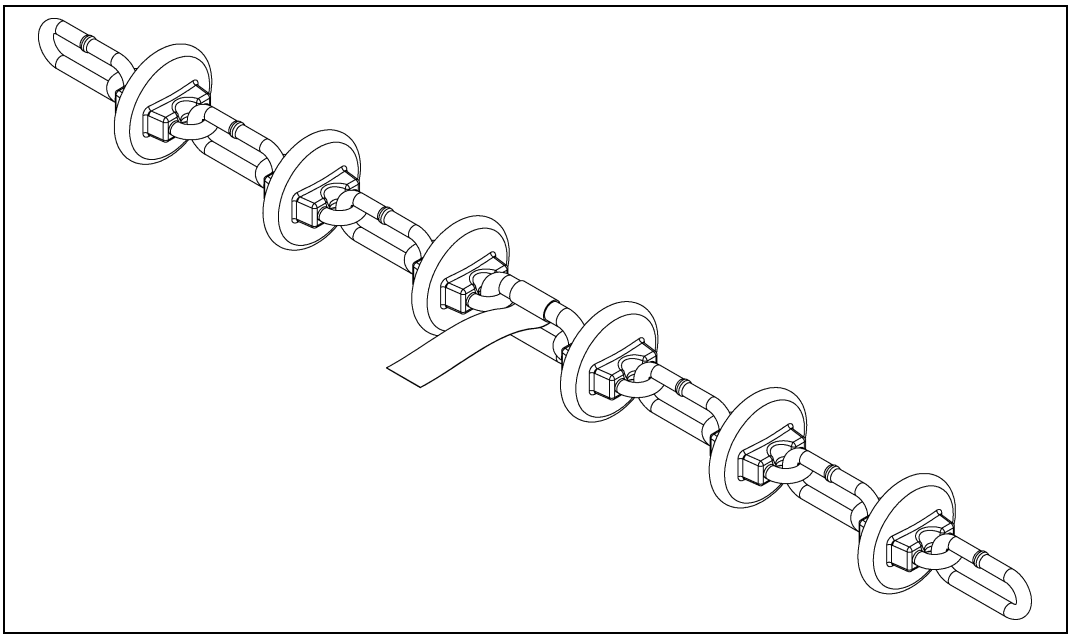


Figure 13G *Coupling - Tape Correct*

5. Go to the other end of the next section of tubing and start pushing the fish tape through the tube until it comes out this end of the tubing.
6. Connect one end of a new section of chain and disks to the fish tape. *(See Figure 13G.)*
7. Pull the section of chain and disks through the tubing until there is only about 1' (1.5 m) left hanging out the tube.
8. Connect the two (2) sections of chain and disk together using a connector link. *(See Figure 13A on Page 35.)*
9. Pull on the chain and disks until the slack is out of the section.
10. Connect the sections of tubing together.
11. Connections of chain and disk can be made at the corners as well.
12. Repeat *Step 4 on Page 36* through *Step 10 above* until all the chain and disks are pulled through the tubing.

Final Assembly of Corners

CAUTION

Before the final connection of the chain and disks is made in the drive unit the top on each corner must be replaced. Otherwise, the tension in the chain will warp the corner housings and make it difficult to replace the tops.

1. Remove the 1/2" lock nut and 1/2" neoprene backed flat washer which were placed on the pivot shaft previously. *(See Figure 8A on Page 22 and Figure 8B on Page 23.)*
2. Connect the top to the corner using 5/16" x 1-1/4" bolts and 5/16" nuts. Torque hex nuts to 5 ft. lbs. (DO NOT OVERTIGHTEN.)
3. Replace the 1/2" neoprene backed flat washer and 1/2" lock nut on the pivot shaft. Torque lock nut to 10 ft. lbs. (DO NOT OVERTIGHTEN.)

Installing Chain into Drive Unit

1. Unhook both springs inside the drive unit. *(See Figure 13H-Figure 13J below and Page 40.)*
2. Slide the idler wheel until it is as close to the drive sprocket as possible.
3. Wrap one end of the chain and disks around the idler wheel and the other around the drive sprocket as shown in *Figure 13H-Figure 13J below and Page 40*. The fan end of the motor has a shaft extension with flat sides which can be turned with a 1/2" wrench to thread the chain and disks around the drive sprocket. Remove the plastic protector cap to expose the motor shaft extension.
4. Cut the two (2) ends of the chain and disks so that the connection can be made in a convenient location.
5. Connect the ends using a connector link. *(See Figure 13H-Figure 13J below and Page 40.)*
6. Re-hook both springs using the “T” handle knobs.
7. Put the drive unit cover ON.

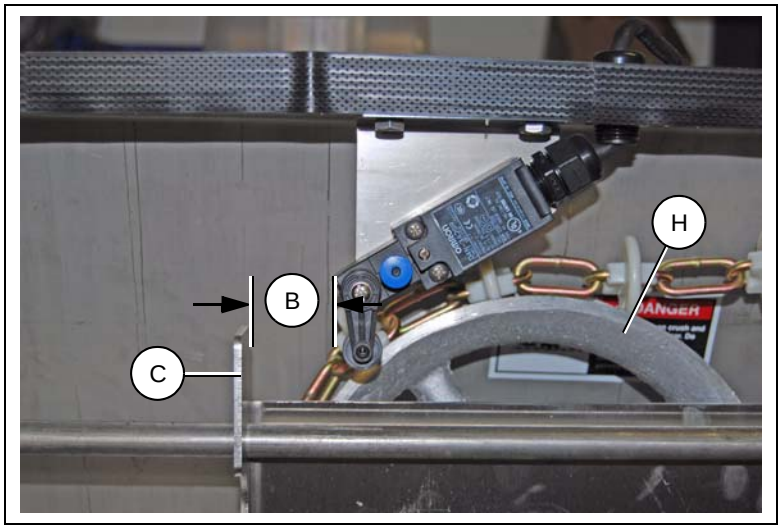


Figure 13H

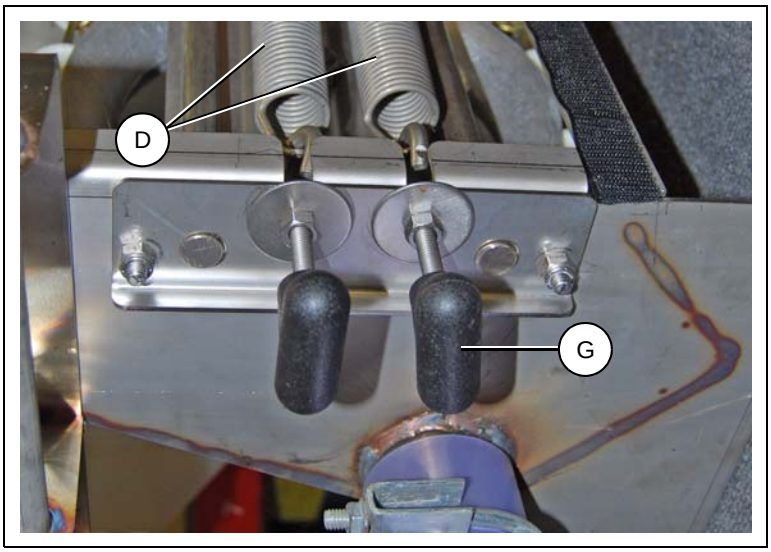


Figure 13I

Installing Chain into Drive Unit (Continued)

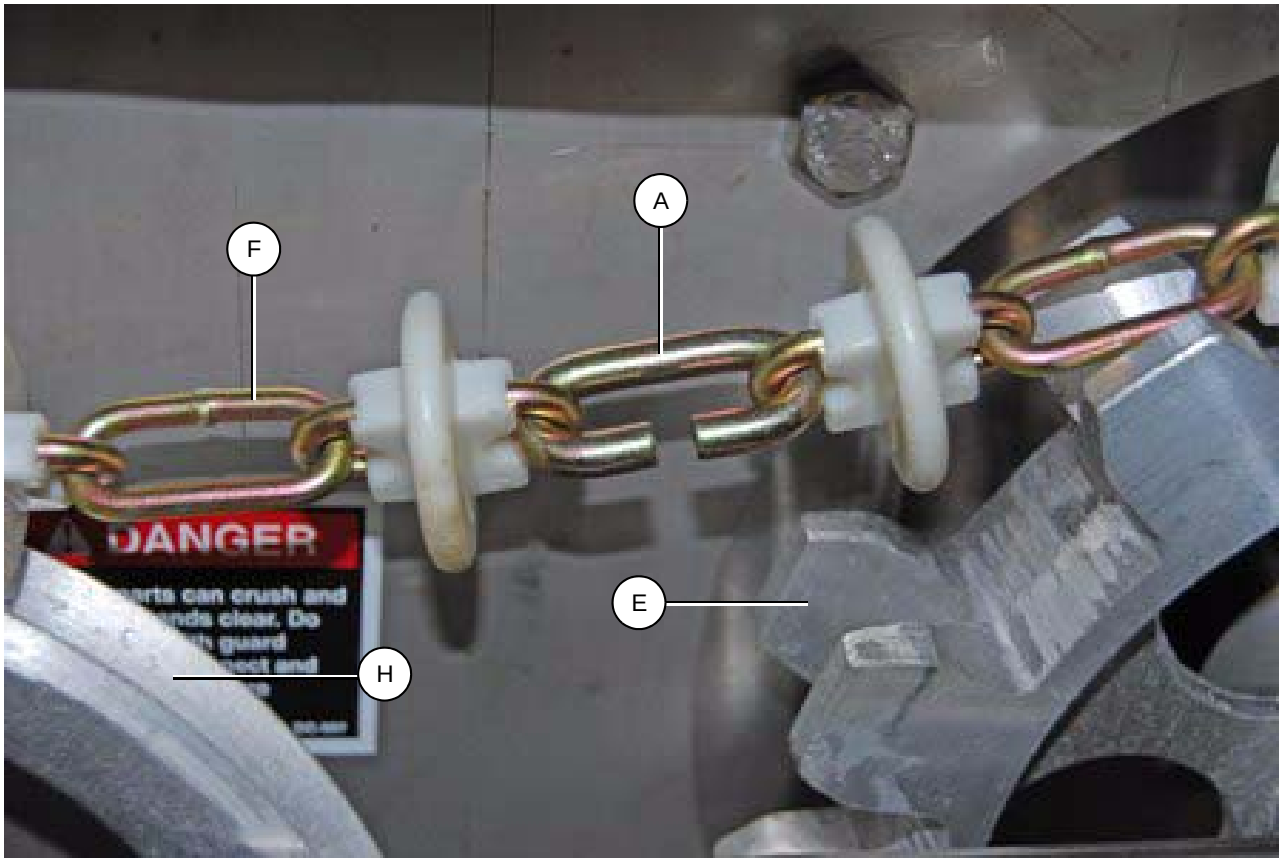


Figure 13J

Ref #	Description
A	Connector Link
B	2"
C	Left Limit Switch Tab
D	Spring (2)
E	Drive Sprocket
F	Chain and Disks
G	“T” Handle Knobs (2)
H	Idler Wheel

Chain Take-Up

1. Run the Chain Disk System for 10-15 seconds.
2. Disconnect all electrical power.
3. Remove drive unit cover.
4. Check to see that the limit switch is not contacting the limit switch tab. In the process of breaking in the chain and disks, the chain will lengthen causing the limit switch tab to move to the left eventually hitting the limit switch and shutting down the system. If the limit switch tab has moved to the left or has already hit the limit switch, links of chain need to be taken out of the system.

   Refer to installing chain *Steps 1 to 7 on Pages 36 and 38*.

   NOTE: *Always remove twice as much chain as the idler wheel needs to move. As an example, if the idler wheel should move 4" to the right, remove 8" of chain.*
5. Connect all electrical power.
6. Repeat *Steps 1-4 above* until the limit switch stays approximately 2" from the left limit switch tab as shown in *Figure 13H-Figure 13J on Pages 39 and 40*. Increase the time that the system runs each time these steps are repeated until the system has run for at least 10 minutes.

Mounting Proximity Switch

1. Mount proximity switch to a CLEAR section of tubing located after the last drop tube and before the drive unit. *(See Figure 13K.)*
2. Attach the proximity switch mounting bracket to the clear tubing using the hose clamps provided. Adjust the bracket so the proximity switch is mounted at a 45° angle. *(See Figure 13K.)*

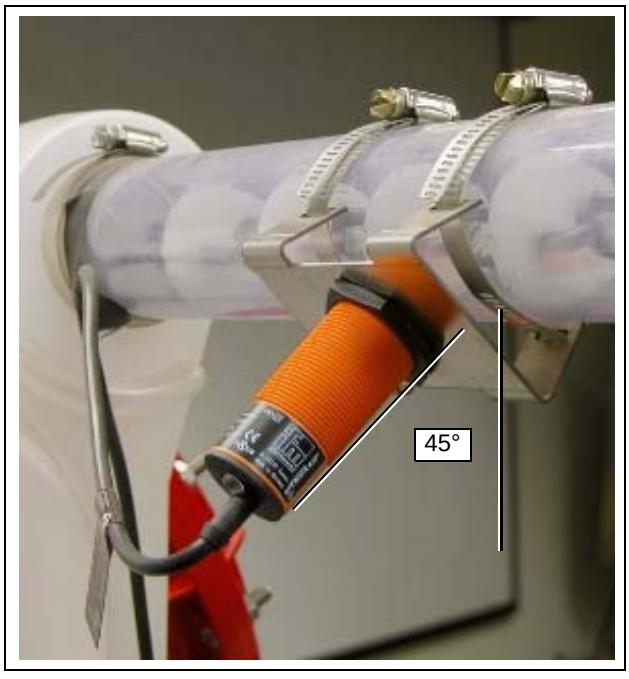


Figure 13K

3. The proximity switch must touch the clear tube. Adjust the top plastic nut until the top of the switch is touching the tube. Adjust the bottom plastic nut to secure into place. *(See Figure 13L on Page 42.)*

Mounting Proximity Switch (Continued)

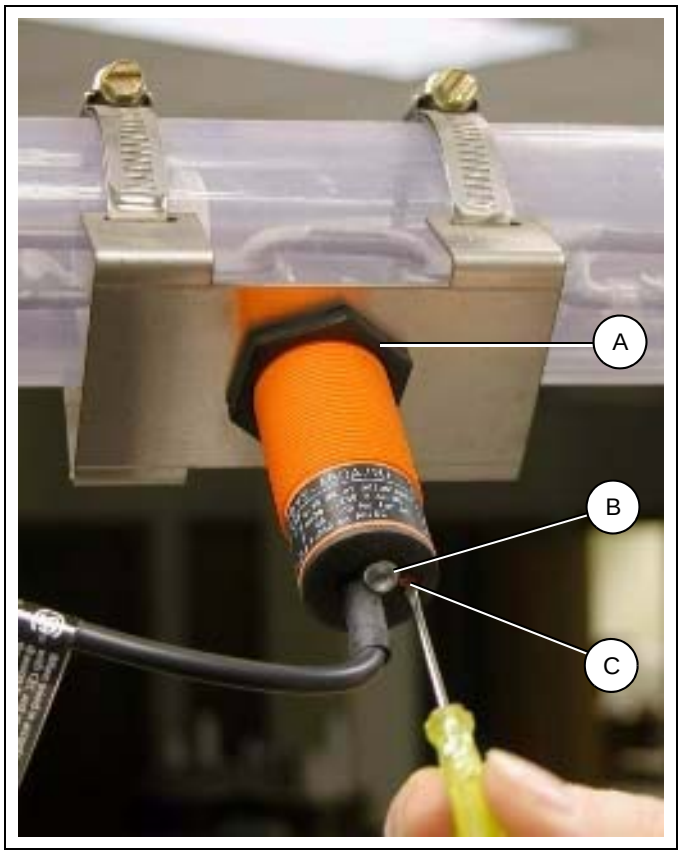


Figure 13L

Ref #	Description
A	Bottom Plastic Nut
B	Indicator Light
C	Sensitivity Adjustment Screw

Adjusting Sensitivity

1. Turn OFF the flex auger so no feed is being added to the line.
2. Turn Chain Disk on in Manual Mode and clear all feed from inside of line. You may want to adjust the feed sensor bypass time to allow the line to run longer during setup.
3. If the light is ON when the tube is empty, the switch is to sensitive. You must reduce the sensing distance by turning the sensitivity adjustment screw counterclockwise. To increase the sensing distance adjust the screw clockwise. *(See Figure 13L.)*
4. To set the correct sensitivity, place your index finger on the tubing so it is 1/4" from the sensing end of the proximity switch. Then turn the sensitivity adjustment screw until the indicator light turns ON. The light may be ON solid or may just blink when a disk passes by. Either setup is fine.

   NOTE: *Make sure that you have your fist closed with only your index finger open. Also, do not touch the tube with the other hand or leave anything laying over the tube to interfere with the sensitivity. (See Figure 13M and Figure 13N on Page 43.)*

Adjusting Sensitivity (Continued)

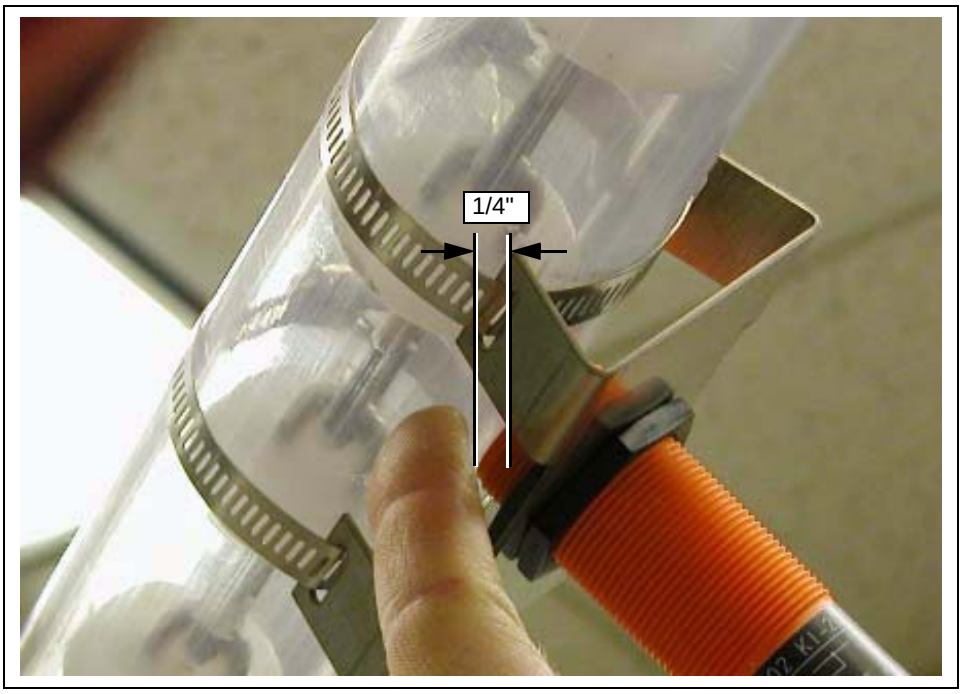


Figure 13M

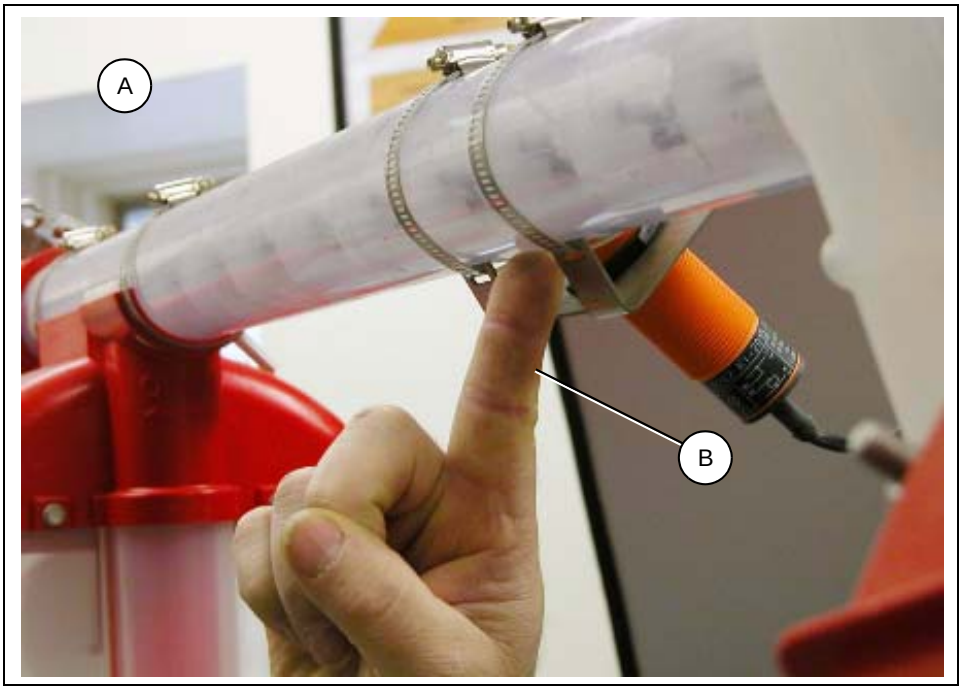


Figure 13N

Ref #	Description
A	Clear Area Around Tube
B	Index Finger with Closed Fist

5. Reset the feed sensor bypass time if it was changed for setup.

WARNING

Always disconnect power before removing any covers from equipment.

Chain and Disk Tension

Check the tension in the chain and disk monthly. If the limit switch tab is close to the limit switch, see “chain take-up”, *Steps 2-6 on Page 41* on how to remove a section of chain.

Remember to always remove twice as much chain as the distance the idler wheel needs to move to the right.

Gearbox Maintenance Free

1. This gearbox is a high efficiency gearbox that runs extremely cool. The cooler temperature prevents seals from degrading.
2. The gearbox is sealed for life. No need to check or add fluid.

Bushing Replacement in Idler Wheel

Check nylon bushings (APCD-007) in main drive idler wheel annually. If bushings show excessive wear contact manufacturer for replacements. Refer to parts list on *Page 47* for a drawing of this bushing.

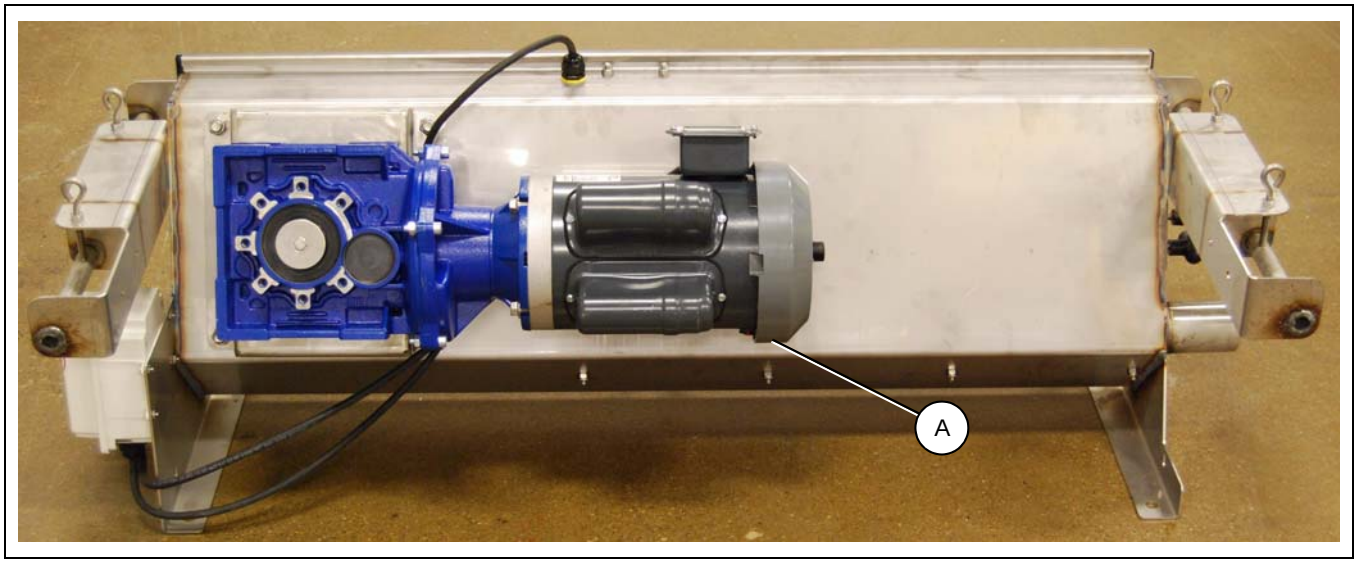


Figure 14A *Back of Control Unit*

Ref #	Description
A	Motor Overload Reset Button

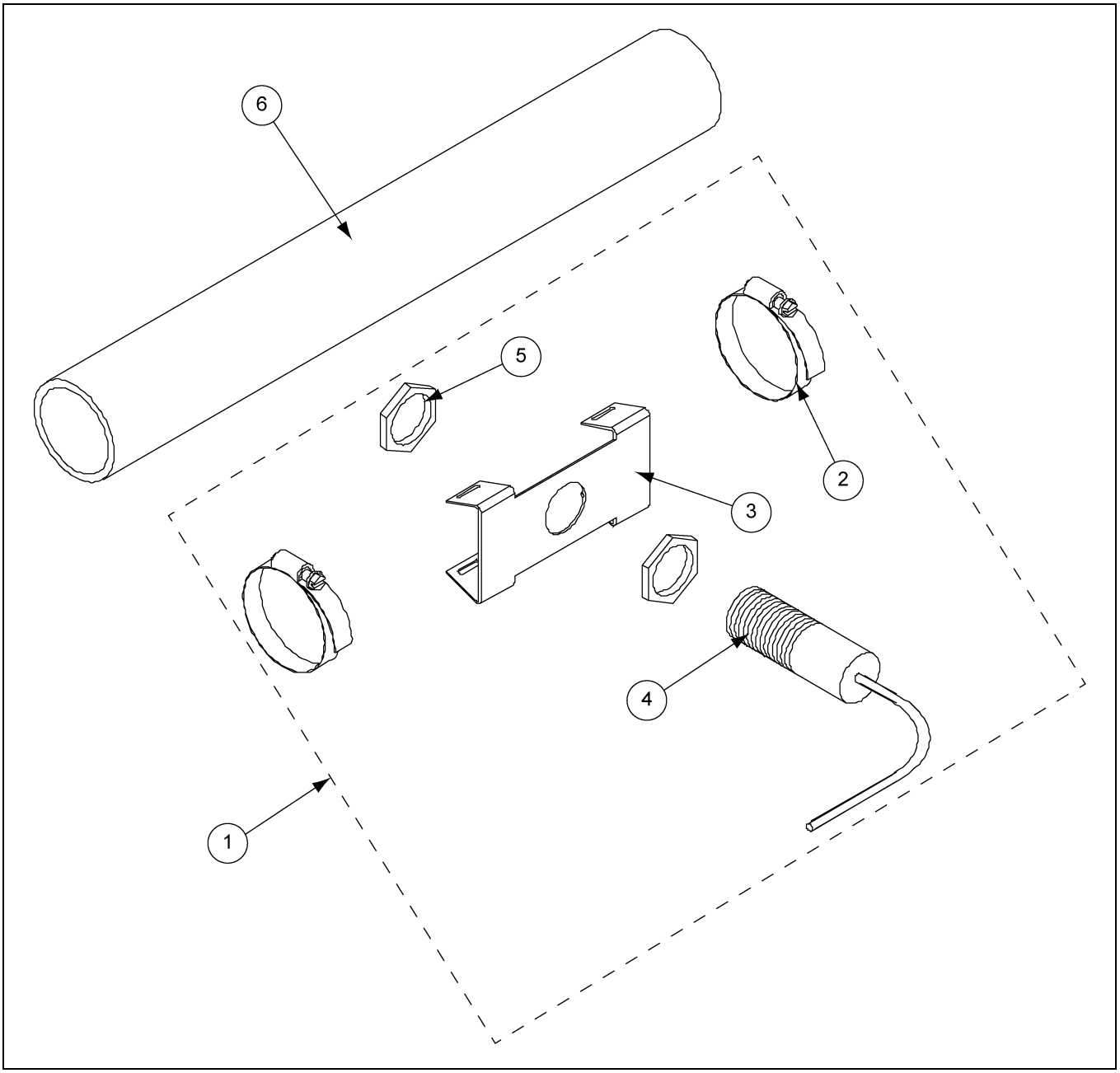
Limit Switch Inspection

Check the operation of the limit switch in drive unit monthly.

1. Disconnect power and remove drive unit cover.
2. Activate the limit switch in one direction.
3. Replace cover and turn ON power.
4. Turn the Chain Disk control to the manual start position. If the Chain Disk safety switch and alarm indicator light do not come ON; disconnect power, inspect wiring and limit switch and replace if necessary. If the alarm indicator light comes ON then the switch is working properly.
5. Turn the Chain Disk control to the manual stop.
6. The Chain Disk is now ready for normal operation.

NOTES

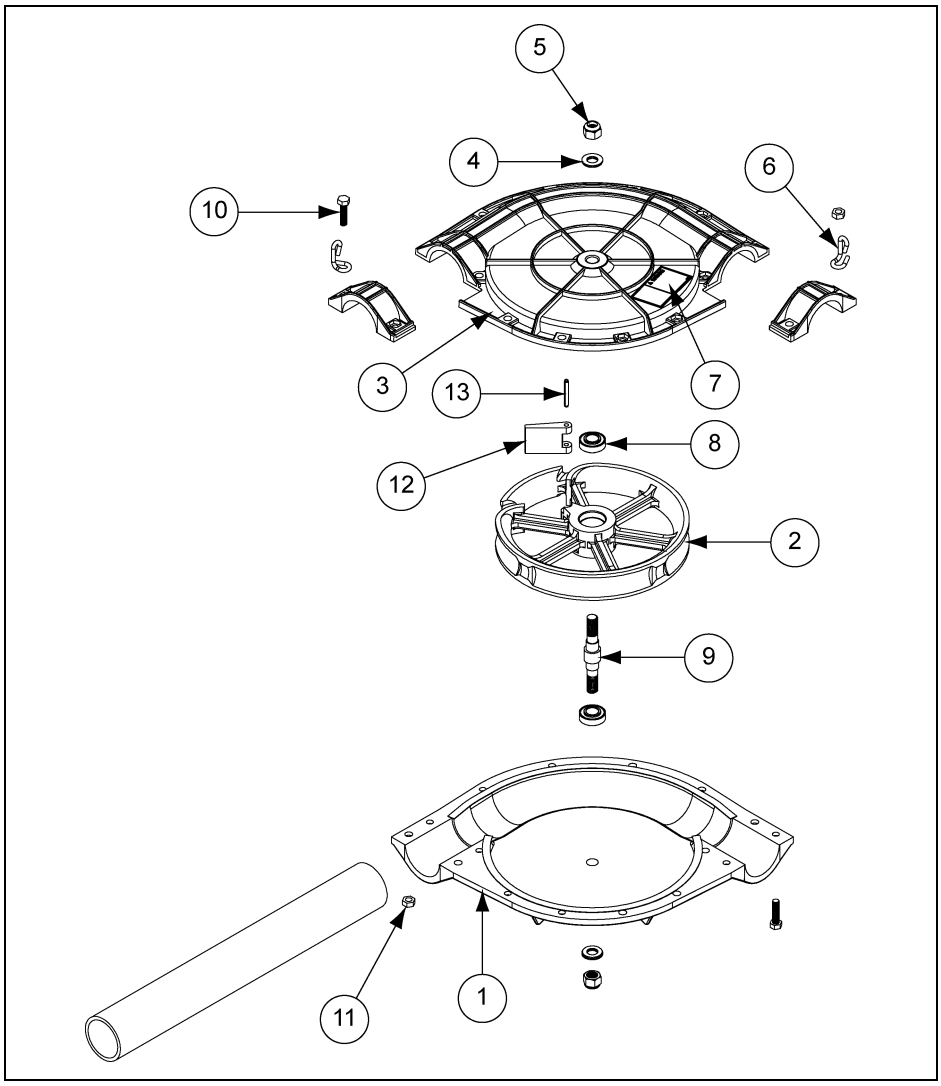
Proximity Feed Sensor for Clear PVC Tube



Proximity Feed Sensor for Clear PVC Tube Parts List

Ref #	Part #	Description	Qty
1	APCD-294	Proximity Feed Sensor for Tube 220V	
2	AP-0583	Clamp, Hose, Stainless Steel 1-13/16" to 2-3/4"	2
3	APCD-136	Proximity Switch Mounting Bracket	1
4	FLX-4256	Proximity Switch N.O. 20-250 VAC	1
5	FLDX-1172N	Proximity Switch Mounting Nut	2
6	APCD-104	Tube, Model 236 Clear PVC, 10' Sections	

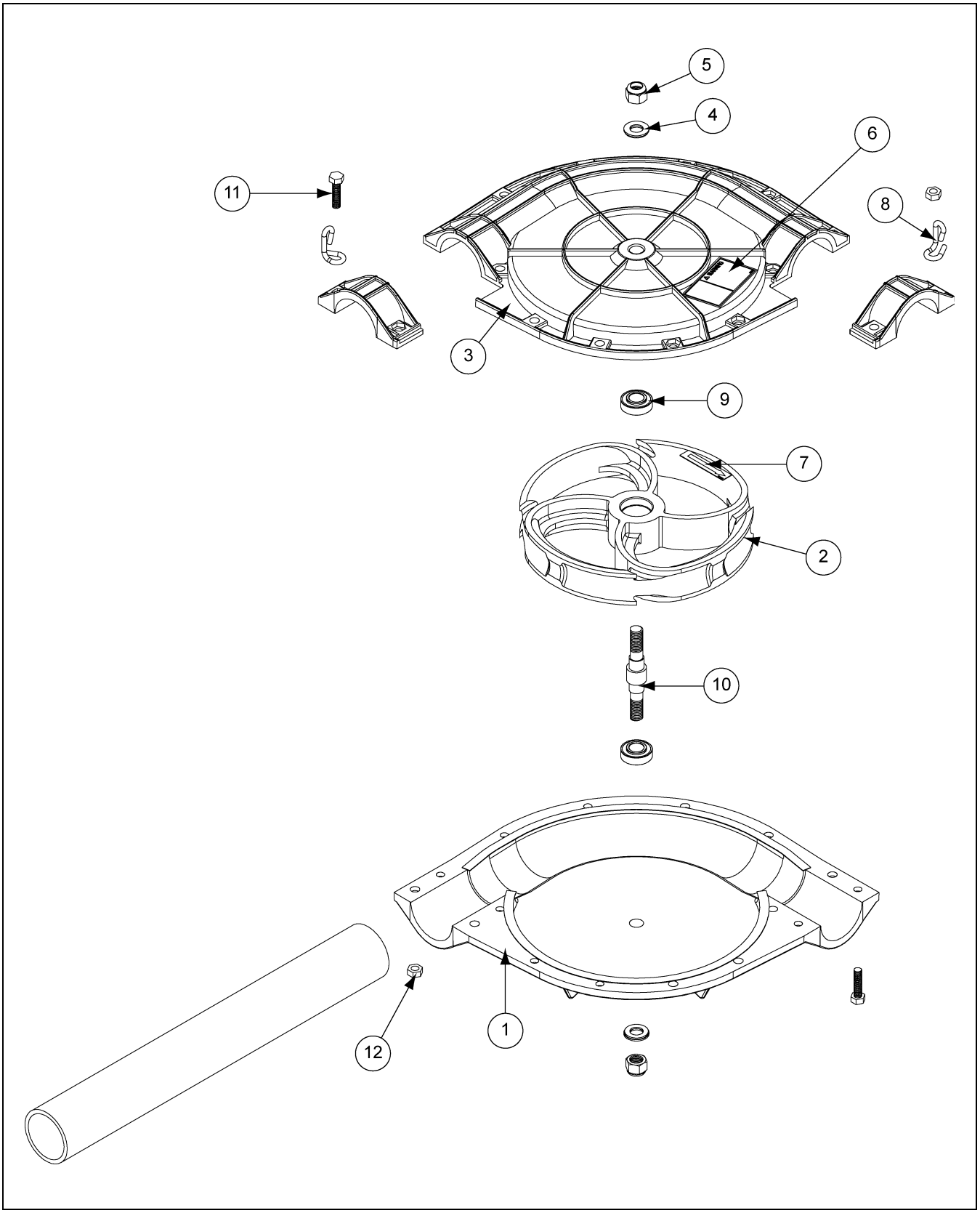
Horizontal Corner Installation and Suspension (APCD-708)



Horizontal Corner Installation and Suspension (APCD-708) Parts List

Ref #	Part #	Description	Qty
1	APCD-001P	90° Chain Disk Corner Bottom Half - Clear	1
2	APCD-713	Self-Cleaning Corner Wheel Assembly	1
3	APCD-000P	90° Chain Disk Corner Top, Half - Clear	1
4	S-9379	Washer, 1/2" Neoprene Backed SS	2
5	S-7417	Nylock Nut 1/2" 13 SS	2
6	APCD-313	Wire Suspension Angle	2
7	DC-1244	Decal, Warning Chain Disk Corner	1
8	APCD-330	Bearing, Corner Idler Wheel	2
9	APCD-327	Shaft, Corner Idler Wheel	1
10	S-7683	Bolt, HHCS 5/16"-18 x 1-1/4" SS	16
11	S-8452	Flange Nut 5/16"-18 SS Waxed	16
12	APCD-430B	Flipper for Self-Cleaning Corner Wheel	1
13	S-7184	Spring Pin 3/16" x 1-1/2" Long Roll Spring Pin Zinc	1

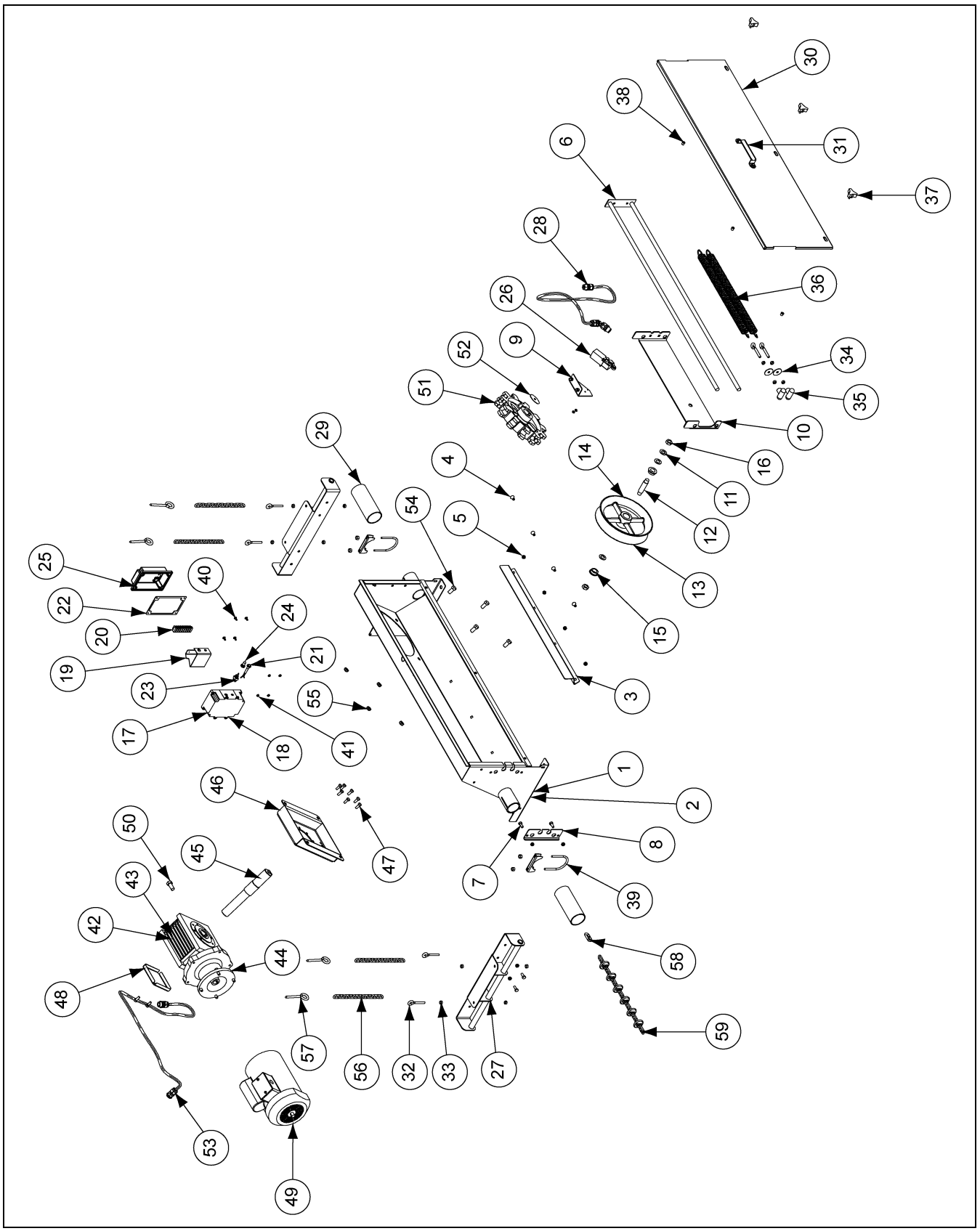
Vertical and Inclined Corner Installation and Suspension (APCD-703)



Vertical and Inclined Corner Installation and Suspension (APCD-703) Parts List

Ref #	Part #	Description	Qty
1	APCD-001P	90° Chain Disk Corner Bottom Half - Clear	1
2	APCD-702C	Vertical Corner Wheel Assembly with Steel Cast Wheel	1
3	APCD-000P	90° Chain Disk Corner Top, Half - Clear	1
4	S-9379	Washer, 1/2" Neoprene Backed SS	2
5	S-7417	Nylock Nut 1/2"-13 SS	2
6	DC-1244	Decal, Warning Chain Disk Corner	1
7	DC-5132	Decal, Red Arrow (Direction)	2
8	APCD-313	Wire Suspension Angle	2
9	APCD-330	Bearing, Corner Idler Wheel	2
10	APCD-327	Shaft, Corner Idler Wheel	1
11	S-7683	Bolt, HHCS 5/16"-18 x 1-1/4" SS	16
12	S-8452	Flange Nut 5/16"-18 SS Waxed	16

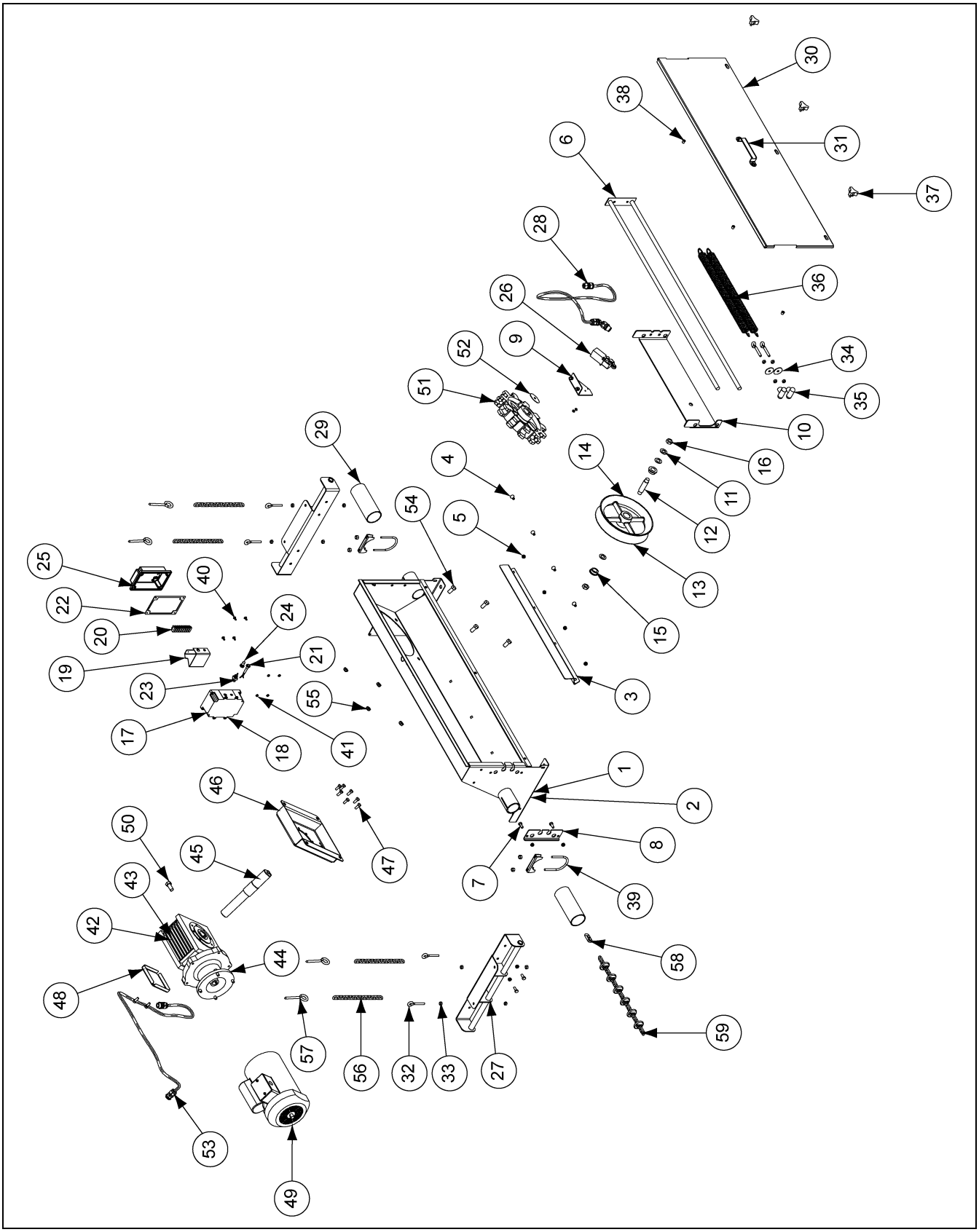
Chain Disk Drive Unit (APCD-610-150, APCD-610-160 and APCD-610-350)



Chain Disk Drive Unit (APCD-610-150, APCD-610-160 and APCD-610-350) Parts List

Ref #	Part #	Description	Qty
1	APCD-609	Trough Assembly, Chain Disk Drive Unit	1
2	APCD-412	Trough Assembly	1
3	APCD-398	Chain Disk Inlet Trough	1
4	S-8451	Carriage Bolt 5/16"-18 x 3/4" SS	4
5	S-7356	Esna Nut 5/16"-18 SS	14
6	APCD-346	Idler Rod Assembly	1
7	S-7821	Bolt, HHCS 5/16"-18 x 3/4" SS	10
8	APCD-369	L.H. End Panel Stiffener	1
9	APCD-349	Limit Switch Bracket	1
10	APCD-414	Idler Slide Bracket	1
11	S-7999	Flat Washer 5/8" x 1-3/16" O.D. SS	3
12	APCD-154	Shaft, Drive Unit Idler Wheel	1
13	APCD-012	Wheel Assembly Idler with Bushings	1
14	APCD-010	Wheel Main Drive Idler Machined	1
15	APCD-007	Bushing, Main Driver Idler	2
16	S-7998	Jam Nut 5/8"-11 SS	2
17	APCD-249	Electrical Box Assembly	1
18	APCD-181	Electrical Box - Drilled	1
19	APCD-138	Terminal Block Mounting Bracket	1
20	S-8042	Terminal Block 9 Connector	1
21	S-7604	Light 250V Sealed Red Pilot	1
22	FLX-4561S	4" x 6" Electrical Box Gasket	1
23	20-5060	Switch, Toggle SPST 15A with ON/OFF	1
24	70-0129	Boot Switch Weatherproof	1
25	FLX-4560	Electrical Box Lid 4" x 6"	1
26	APCD-715	Limit Switch with Metric watertight Fitting	1
27	APCD-382	Suspension Angle Assembly	2
28	APCD-604	Cord Limit Switch Long Drive	1
29	APCD-105	Coupler, Model 236 Clear PVC	2
30	APCD-350	Door Chain Disk Long Drive	1
31	PR-331	Peak Cap Handle	1
32	S-8191	Eye Bolt 5/16"-18 x 2-1/4" SS	6

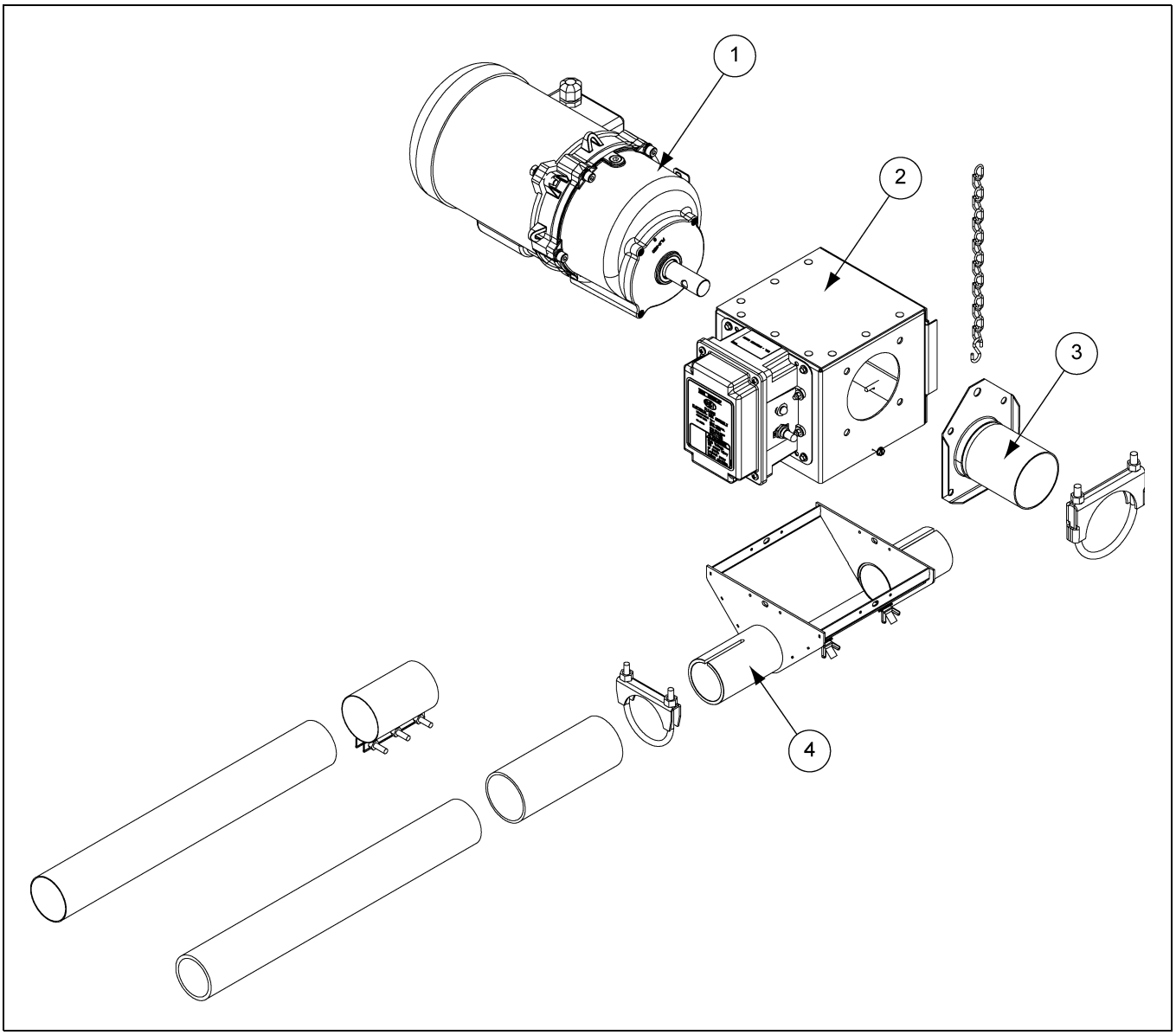
Chain Disk Drive Unit (APCD-610-150, APCD-610-160 and APCD-610-350) (Continued)



Chain Disk Drive Unit (APCD-610-150, APCD-610-160 and APCD-610-350) Parts List (Continued)

Ref #	Part #	Description	Qty
33	S-7008	Nut 5/16"-18 SS	12
34	S-8724	Fender Washer 5/16" x 1-1/2" x 1/16"	2
35	S-8184	Knob Bar 2-1/4" Diameter 5/16" Thread	2
36	APCD-336	Extension Spring	2
37	S-8006	Knob, 1/4"-20 x 1/2" SS Stud	3
38	S-8979	Nutsert 1/4"-20 Yellow Dichromate	3
39	S-8004	Clamp, U-Bolt 5/16"-18 x 2-1/2" (with Saddle)	2
40	S-6732	Screw, MS #10-24 x 1/2" THS SS	4
41	S-7931	Hex Nut #10-24 SS	6
42	APCD-608-150	Gearmotor Chain Disk 1 PH 50 Hz	1
42	APCD-608-160	Gearmotor Chain Disk 1 PH 60 Hz	1
42	APCD-608-350	Gearmotor Chain Disk 3 PH 50/60 Hz	1
43	APCD-601S	Gearbox Assembly for Service, Motovario	1
44	APCD-601	Gearbox, BA72C	1
45	APCD-233M72	Shaft, Motovario BA72C Gearbox	1
46	APCD-234M72W	Bracket Assembly, Gearbox Mount for Motovario, BA72C	1
47	S-10111	Bolt, HHCS M8 - 1-1/4" x 20" SS	9
48	APCD-628	Mounting Plate for Manufacturing Label	1
49	APCD-617-150	Motor, 1.5 HP, 1450 RPM, 1 PH, 50 Hz, 56C, TEFC	1
49	APCD-617-160	Motor, 1.5 HP, 1750 RPM, 1 PH, 60 Hz, 56C, TEFC	1
49	APCD-617-350	Motor, 1.5 HP, 1450/1750 RPM, 3 PH, 50/60 Hz, 56C, TEFC	1
50	S-8033	Flange Bolt 3/8"-16 x 1" SS	4
51	APCD-014	Main Drive Sprocket - Machined	1
52	S-7991	Fender Washer 11/32" I.D. x 2" O.D. SS	1
53	APCD-351	Cord Assembly for 1 PH, 50/60 Hz	1
53	APCD-351-3PH	Cord Assembly for 3 PH, 50/60 Hz	1
54	S-7413	Bolt, HHCS 1/2"-13 x 1" SS	4
55	S-7417	Nylock Nut 1/2"-13 SS	4
56	HT-1414	3/16" Proof Chain - 10'	4
57	APCD-055	Eye Bolt 5/16" x 4" SS Lag	4
58	S-7977	Connecting Link	1
59	APCD-605-150	Chain and Disk Assembly Bag of 150'	1
59	APCD-605-100	Chain and Disk Assembly Bag of 100'	1
59	APCD-605-50	Chain and Disk Assembly Bag of 50'	1
59	APCD-605-20	Chain and Disk Assembly Bag of 20'	1

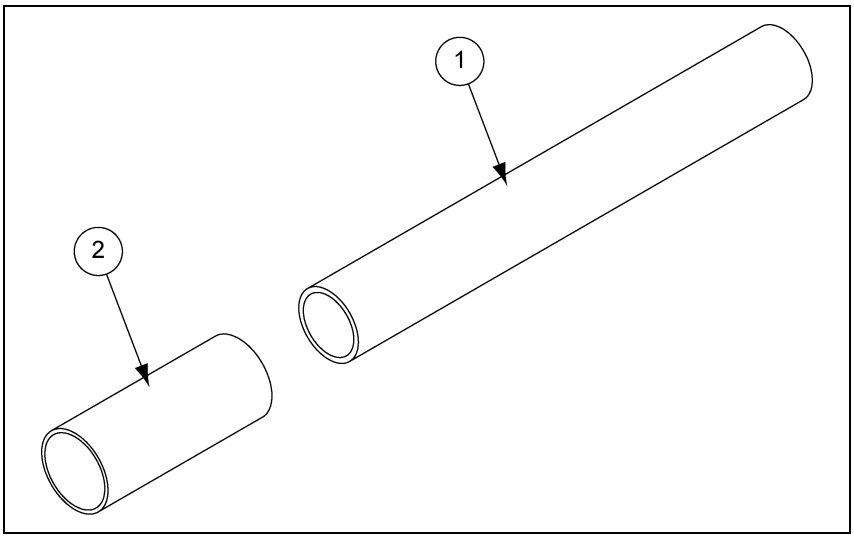
Fill Hopper Assembly



Fill Hopper Assembly Parts List

Ref #	Part #	Description
		DDPU Use Correct HP Rating for Flex-Flo
1	FLX-4403	Gearbox FF, 6.5:1, 250 RPM at 60 Hz, 219 RPM at 50 Hz, without Pinion
2	FLX-4496	Model 220-300-350 Control Unit, 220V
3	FLX-2696	Model 300 Direct Drive Driver and Tube Anchor Package
4	APCD-620	Fill Hopper Assembly

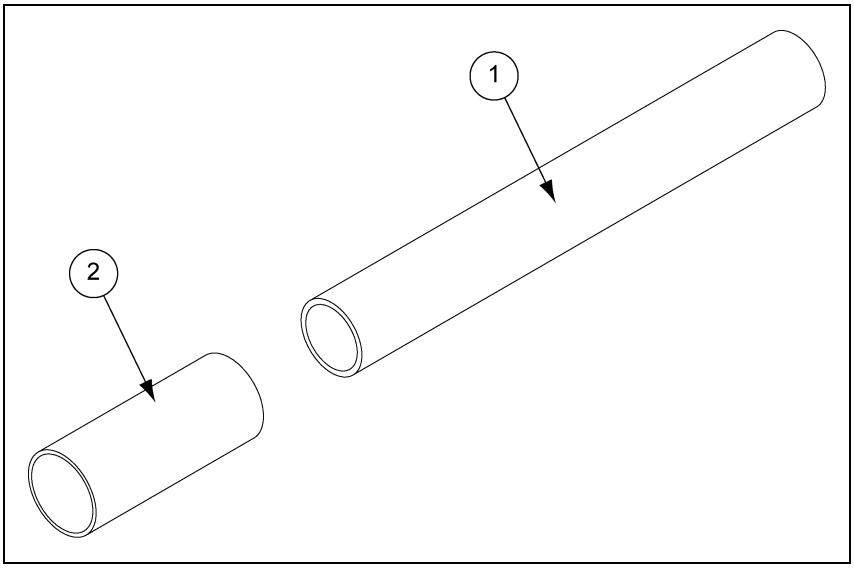
PVC - Clear



PVC - Clear Parts List

Ref #	Part #	Description
1	APCD-104	Tube, Model 236 Clear PVC, 10' Sections
2	APCD-105	Coupler, Model 236 Clear PVC

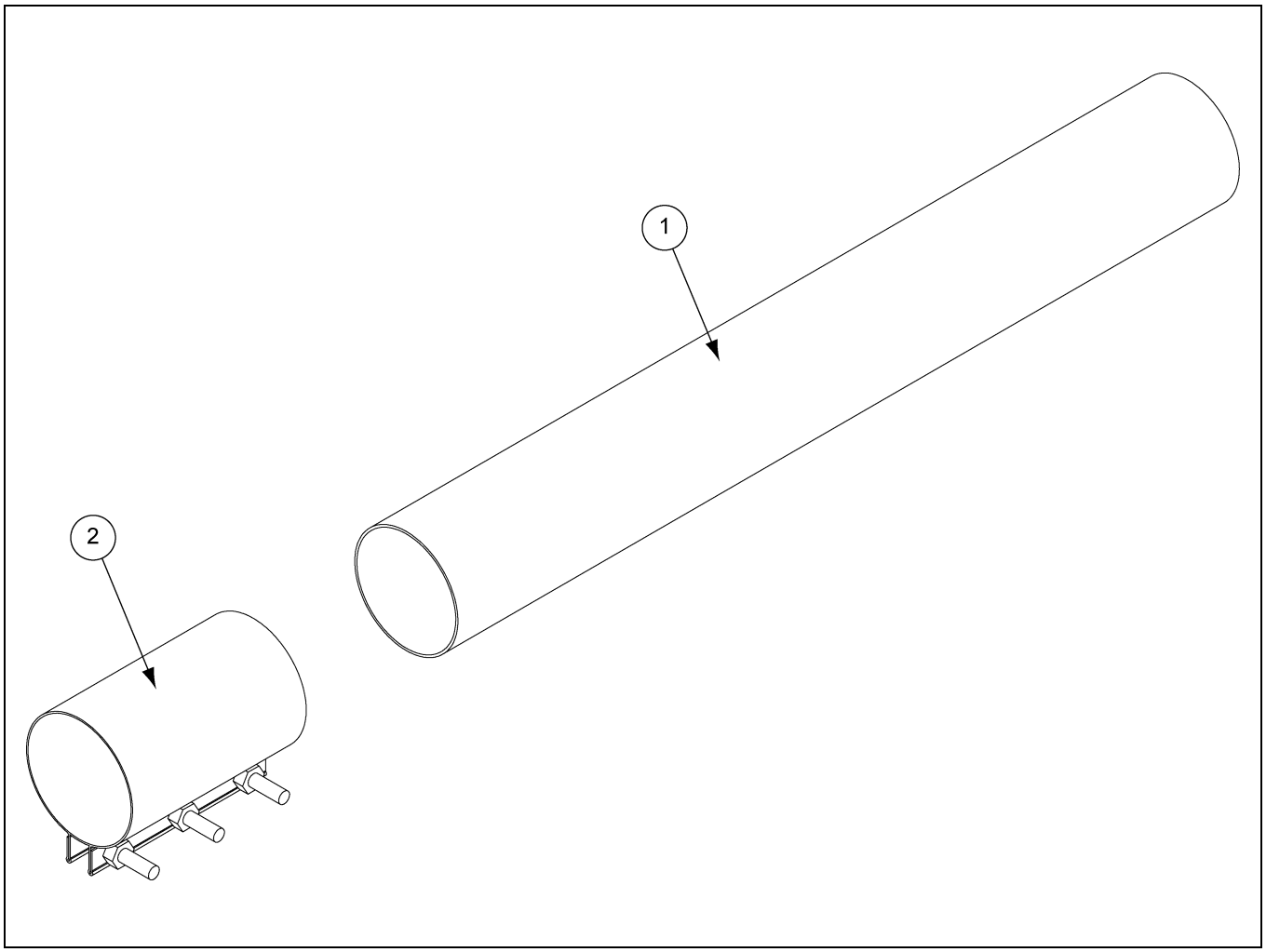
PVC - White



PVC - White Parts List

Ref #	Part #	Description
1	APCD-112	Model 236 White PVC Tube, 10' Sections
2	APCD-113	Model 236 White PVC Coupler

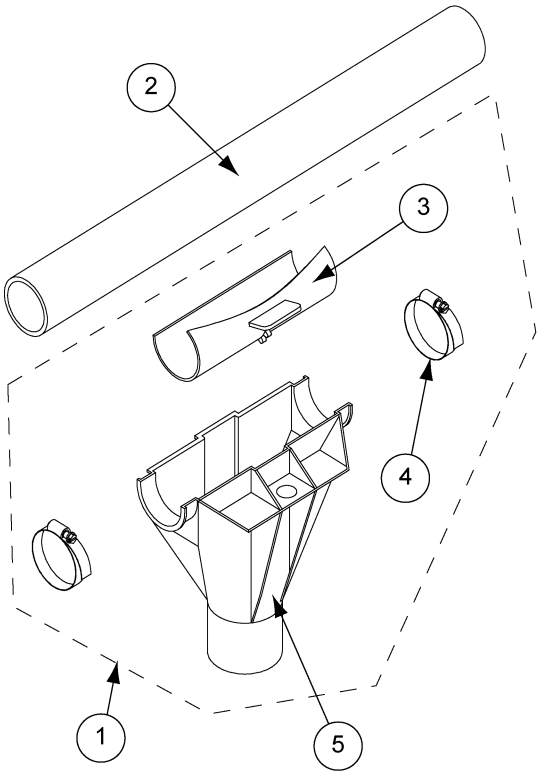
Welded Steel Tubing



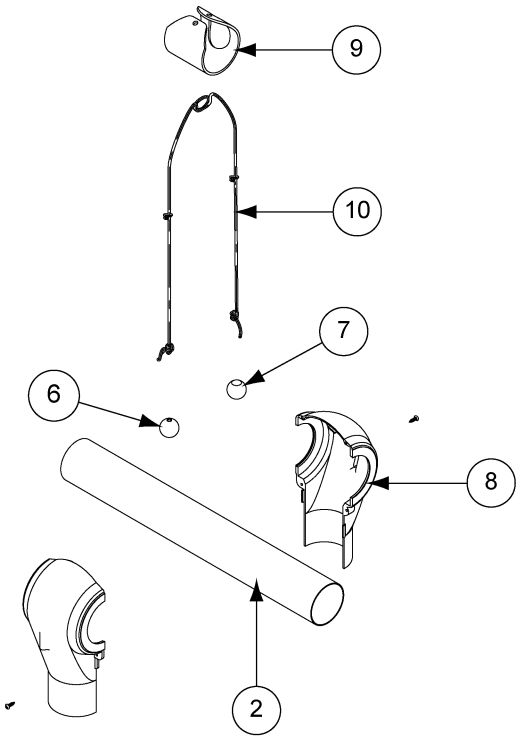
Welded Steel Tubing Parts List

Ref #	Part #	Description
1	APCD-217	Tube, Electric Weld, Round, 2-3/8" O.D., 18 Ga, 10' Long, G90 Galv.
1	APCD-217-20	Tube, Electric Weld, Round, 2-3/8" O.D., 18 Ga, 20' Long, G90 Galv.
2	APCD-408	Coupler, 2-3/8" Pipe Sleeve with Hardware

Drop Kits



Kwik-Attach drop kit for welded steel or PVC tubing (APCD-109)

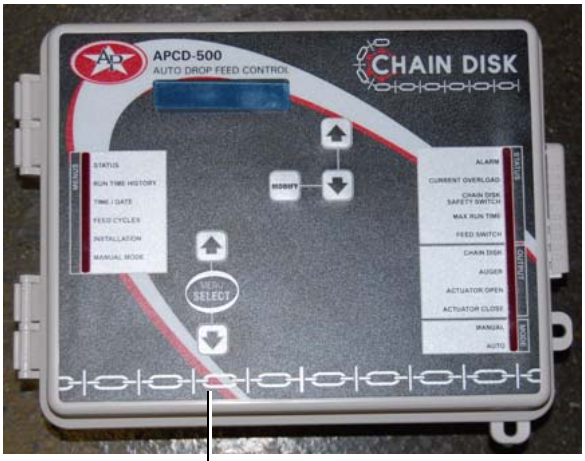


Drop kit with pull cord for welded steel or PVC tubing (APCD-710)

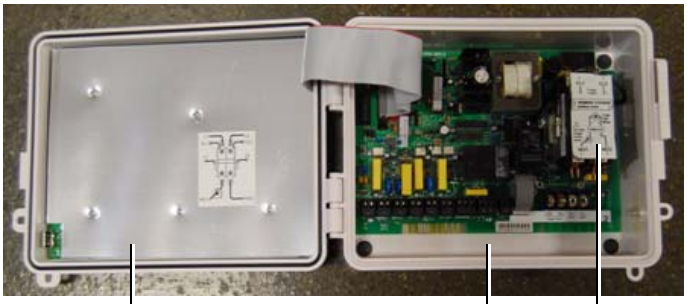
Drop Kits Parts List

Ref #	Part #	Description	Qty
1	APCD-109	Drop Kit, Kwik-Attach (Single)	
1	APCD-110	Drop Kit, Kwik-Attach (Box of 10)	
1	APCD-710	Pull Cord Style Drop Kit (Single)	
1	APCD-710-10	Pull Cord Style Drop Kit (Box of 10)	
2	APCD-104	Tube, Model 236 Clear PVC, 10' Sections	
2	APCD-112	Model 236 White PVC Tube, 10' Sections	
2	APCD-217	Tube, Electric Weld, Round, 2-3/8" O.D., 18 Ga, 10' Long, G90 Galv.	
2	APCD-217-20	Tube, Electric Weld, Round, 2-3/8" O.D., 18 Ga, 20' Long, G90 Galv.	
3	APCD-058	Slide, Kwik-Attach Drop Kit	1
4	AP-0583	Clamp, Hose, Stainless Steel 1-13/16" to 2-3/4"	2
5	APCD-059	Housing, Kwik-Attach Drop Kit	1
6	FLX-2441	Indicator Ball (Green)	1
7	FLX-2442	Indicator Ball (Red)	1
8	FLX-237D	Drop Half for APCD-710	1
9	FLX-2437	Shut Off Slide	1
10	CW-2008-1M	Cord, 1/8" #4 White Solid Braided	1

Chain Disk Control Unit



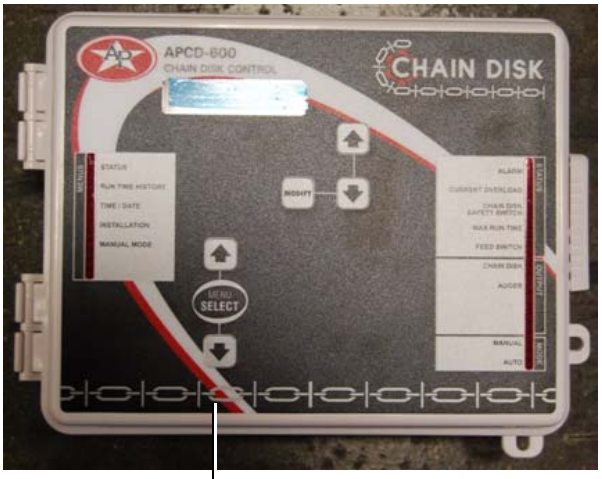
1



4 2 3

5

8 6 7



9

12 10 11

Chain Disk Control Unit Parts List

Ref #	Part #	Description
1	APCD-500	Chain Disk Auto Drop Feed Master Control
2	APCD-500B	Bottom Board for APCD-500
3	APCD-393	Relay for APCD-500
4	APCD-500T	Top Board for APCD-500
5	APCD-500-S	Chain Disk Slave Control
6	APCD-500B-S	Bottom Board for APCD-500-S
7	APCD-393	Relay for APCD-500-S
8	APCD-500T-S	Top Board for APCD-500-S
9	APCD-600	Chain Disk Continuous Feed Control
10	APCD-600B	Bottom Board for APCD-600
11	APCD-393	Relay for APCD-600
12	APCD-600T	Top Board for APCD-600

Problem	Possible Cause	Corrective Action
Chain Disk motor will not run.	Chain Disk motor will not run.	Check circuits, fuses and ON-OFF switches on equipment.
	Limit switch activated in drive unit.	Refer to limit switch *on Page 31*.
	Motor thermal overload switch activated.	Refer to motor overload reset button in *Figure 14A on Page 44*. Check current sensor setting.
Motor overloads after running briefly.	Low voltage (motor runs slow and overheats).	Check line voltage at motor; use adequate wire size in circuits.
	Foreign object caught in chain.	Check system for any foreign objects and remove them.
	Chain Disk System to full with feed.	Check Flex-Flo fill system rate; check feed sensing switch; check current sensor setting.
	Wet feed being conveyed or allowed to stand in system.	Clean the system; avoid conveying wet feed or empty line after each feeding.
	Defective motor.	Replace motor.
Limit switch activated.	Chain in system not tight enough.	Take out a section of chain referring to *Page 41*; pull reset button.
	Chain has broken somewhere in system.	Find where chain has broken and fix using special connector link; reset limit switch and then pull control unit reset button.
	Foreign object in system.	Check system for any foreign objects and remove them; reset limit switch and then push the control unit reset button.
	Chain Disk System to full with feed.	Check Flex-Flo fill system rate; check feed sensing switch; reset limit switch and then push control unit reset button.
Chain Disk motor does not shut OFF when full.	Proximity switch sensitivity improperly adjusted. (Not sensitive enough.)	Refer to *Page 41* for proper proximity switch adjustment.
Chain Disk motor always shut OFF immediately after prox by-pass time.	Proximity switch sensitivity improperly adjusted. (Too sensitive.)	Refer to *Page 41* for proper proximity switch adjustment.

GSI Group, LLC Limited Warranty

The GSI Group, LLC ("GSI") warrants products which it manufactures to be free of defects in materials and workmanship under normal usage and conditions for a period of 12 months after sale to the original end-user or if a foreign sale, 14 months from arrival at port of discharge, whichever is earlier. The end-user's sole remedy (and GSI's only obligation) is to repair or replace, at GSI's option and expense, products that in GSI's judgment, contain a material defect in materials or workmanship. Expenses incurred by or on behalf of the end-user without prior written authorization from the GSI Warranty Group shall be the sole responsibility of the end-user.

Warranty Extensions:

The Limited Warranty period is extended for the following products:

	Product	Warranty Period
AP Fans and Flooring	Performer Series Direct Drive Fan Motor	3 Years
	All Fiberglass Housings	Lifetime
	All Fiberglass Propellers	Lifetime
Cumberland Feeding/Watering Systems	Feeder System Pan Assemblies	5 Years **
	Feed Tubes (1-3/4" and 2.00")	10 Years *
	Centerless Augers	10 Years *
	Watering Nipples	10 Years *
Grain Systems	Grain Bin Structural Design	5 Years
Grain Systems Farm Fans Zimmerman	Portable and Tower Dryers	2 Years
	Portable and Tower Dryer Frames and Internal Infrastructure †	5 Years

* Warranty prorated from list price:
0 to 3 years - no cost to end-user
3 to 5 years - end-user pays 25%
5 to 7 years - end-user pays 50%
7 to 10 years - end-user pays 75%

** Warranty prorated from list price:
0 to 3 years - no cost to end-user
3 to 5 years - end-user pays 50%

† Motors, burner components and moving parts not included. Portable dryer screens included. Tower dryer screens not included.

GSI further warrants that the portable and tower dryer frame and basket, excluding all auger and auger drive components, shall be free from defects in materials for a period of time beginning on the twelfth (12^{th}) month from the date of purchase and continuing until the sixtieth (60^{th}) month from the date of purchase (extended warranty period). During the extended warranty period, GSI will replace the frame or basket components that prove to be defective under normal conditions of use without charge, excluding the labor, transportation, and/or shipping costs incurred in the performance of this extended warranty.

Conditions and Limitations:

THERE ARE NO WARRANTIES THAT EXTEND BEYOND THE LIMITED WARRANTY DESCRIPTION SET FORTH ABOVE. SPECIFICALLY, GSI MAKES NO FURTHER WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE IN CONNECTION WITH: (I) PRODUCT MANUFACTURED OR SOLD BY GSI OR (II) ANY ADVICE, INSTRUCTION, RECOMMENDATION OR SUGGESTION PROVIDED BY AN AGENT, REPRESENTATIVE OR EMPLOYEE OF GSI REGARDING OR RELATED TO THE CONFIGURATION, INSTALLATION, LAYOUT, SUITABILITY FOR A PARTICULAR PURPOSE, OR DESIGN OF SUCH PRODUCTS.

GSI shall not be liable for any direct, indirect, incidental or consequential damages, including, without limitation, loss of anticipated profits or benefits. The sole and exclusive remedy is set forth in the Limited Warranty, which shall not exceed the amount paid for the product purchased. This warranty is not transferable and applies only to the original end-user. GSI shall have no obligation or responsibility for any representations or warranties made by or on behalf of any dealer, agent or distributor.

GSI assumes no responsibility for claims resulting from construction defects or unauthorized modifications to products which it manufactured. Modifications to products not specifically delineated in the manual accompanying the equipment at initial sale will void the Limited Warranty.

This Limited Warranty shall not extend to products or parts which have been damaged by negligent use, misuse, alteration, accident or which have been improperly/inadequately maintained. This Limited Warranty extends solely to products manufactured by GSI.

Prior to installation, the end-user has the responsibility to comply with federal, state and local codes which apply to the location and installation of products manufactured or sold by GSI.

9101239_1_CR_rev7.DOC (revised July 2009)

This equipment shall be installed in accordance with the current installation codes and applicable regulations, which should be carefully followed in all cases. Authorities having jurisdiction should be consulted before installations are made.

1004 E. Illinois St.
Assumption, IL 62510-0020
Phone: 1-217-226-4421
Fax: 1-217-226-4420
www.gsiag.com

CN-305798