



FASTIRTM

Owner's Instruction and Parts Manual
for Sukup Fastir and Fastir Plus Units



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10/21/2020	Added table showing max amps & circuit breaker sizes; added reference to it -----	9 & 31
06/29/2020	Updated description of Part # A7540 -----	8 & 56
	Updated Figs. 9, 10, 14 & 57 to show stabilizer arm bracket -----	12, 13, 19 & 57
	Updated Table 25 to add stabilizer arm bracket & qty's. of items 15-17 -----	57
03/13/2020	Updated drawing SWSM0054, Figure 43-----	33
11/14/2019	Updated guidance for operating machine for more than four weeks-----	32
	Updated Principles of Grain Drying & Managing Stored Grain sections -----	35-48
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	Added Ref # 26 bushing on drawing and parts list -----	67

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**Steve Sukup, the late Eugene Sukup, Charles Sukup
Sukup Manufacturing Co., Sheffield, IA, USA**

Thank you for turning to Sukup Manufacturing Co. for your grain drying needs. In 1962, a young, innovative farmer named Eugene Sukup bought his first grain bin to dry and store shelled corn. However, he soon encountered problems with the process, such as crusting and hot spots. In response, Eugene developed and patented an idea for an automatic stirring machine—the idea from which Sukup Manufacturing Co. was born.

Sukup stirring machines have come a long way since they revolutionized in-bin drying, but they remain the simplest, most dependable stirring machines on the market. The Fastir stirring machine's adaptable design and variety of extras make it ideal for in-bin drying.

Fastir stirring machines eliminate overdried grain, increase airflow, and preserve grain quality.

Overdried grain resulting from typical heating processes has been a frequent problem when drying grain in bins, resulting in lower quality grain, wasted fuel and wasted time.

Sukup's goal has been to eliminate this problem by bringing the advantages of stirring to both low- and high-temperature in-bin drying systems. As the machine mixes and loosens bottom layers of grain that are easily overdried, grain may be heated to higher temperatures to achieve faster drying rates without any of the typical effects of overdrying.

The Fastir provides a low-cost solution for in-bin drying of grain. If additional stirring capacity is desired after installation, more down augers may be economically added to machines. In short, our stirring machine is an excellent tool for adding greater flexibility to any bin drying or storage system, whether at high or low temperature.

We hope that you return to Sukup for all of your grain storage, drying and handling needs. Along with the simply dependable Fastir, Sukup is the leader in unloading equipment, fans and heaters. Sukup grain bins and stand-alone dryers have also taken the market by storm. From heaters to grain bins and everything in between, our family-owned company is dedicated to providing customers with the best quality products and the best value for their money.

This manual contains instructions for the installation, operation, and service of **Sukup Fastir** and **Fastir Plus** units. Fastir Plus has the same features as the Fastir, plus a stationary outside carriage. Carefully read and follow all instructions.

This document also contains an illustrated parts assembly manual (page 53), which is broken down into groups for each section of the unit and details all serviceable parts. Parts shown in exploded views of assemblies are numbered and are identified in **Ref #** column of parts list following each illustration. Total number of parts required per unit or assembly is shown opposite each part number.

When ordering parts, always give part number (in **Part #** column) and part description shown alongside reference number. Do **not** order parts by reference numbers. If part number cannot be found in manual, give clear description of part and its location and function. Also, specify your machine type and size.



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GRAIN HANDLING & MATERIAL HANDLING LIMITED WARRANTY

SUKUP MANUFACTURING CO. (Sukup) warrants to original retail purchaser that within time limits set forth, new equipment shall be free from defects in material and workmanship. A part will not be considered defective if it substantially fulfills performance specifications, such as cosmetic (appearance) issues that will not affect life of product. Should any part prove defective within the warranty period, the part will be replaced without charge F.O.B. Sukup Manufacturing Co., Sheffield, Iowa USA or Distribution Centers - Arcola, Illinois; Aurora, Nebraska; Defiance, Ohio; Jonesboro, Arkansas; Cameron, Missouri; Watertown, South Dakota. To obtain warranty, a copy of original invoice is required, see reverse side.

THE FOREGOING LIMITED WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES OF MERCHANTABILITY, FITNESS FOR PARTICULAR PURPOSE AND OF ANY OTHER TYPE, WHETHER EXPRESS OR IMPLIED. Sukup neither assumes nor authorizes anyone to assume for it any other obligation or liability in connection with said part, and will not be liable for incidental or consequential damages. **THE REMEDIES STATED HEREIN SHALL BE THE EXCLUSIVE REMEDIES AVAILABLE UNDER THIS LIMITED WARRANTY.**

Sukup reserves the right to change specifications, add improvements or discontinue manufacture of any of its equipment without notice or obligation to purchasers of its equipment. This warranty gives you specific legal rights. You may also have other rights which vary according to state or province.

WARRANTY EXCLUSIONS - Labor, transportation, or any cost related to a service call is not provided by Sukup. This Limited Warranty does not apply to damage resulting from misuse, neglect, normal wear, accident or improper installation or maintenance. **ITEMS NOT MANUFACTURED BY SUKUP (e.g. tires, belts, motors) ARE COVERED UNDER WARRANTIES OF THEIR RESPECTIVE MANUFACTURERS AND ARE EXCLUDED FROM COVERAGE UNDER THE SUKUP WARRANTY.** Since the stirring down augers are so critical to the successful operation of the stirring machine, Sukup Manufacturing Co. will not warranty any machines unless they are equipped with Sukup down augers. **SUKUP MANUFACTURING CO. MAKES NO WARRANTY, EXPRESS OR IMPLIED, WITH RESPECT TO DOWN AUGERS LONGER THAN 20', INCLUDING, WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY AND WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.**

Upon taking delivery of product, purchaser (dealer and/or end user) assumes responsibility for proper storage of all materials. Proper storage includes dry, temperature and humidity controlled facilities, which eliminate the potential of moisture, including condensation, from causing white rust and/or corrosion of any sort. Warranty does not extend to defects, damage or cosmetic (appearance) issues caused by improper storage, handling or erection.

BASIC WARRANTY - All Sukup manufactured products are warranted for one year from date of purchase. Part(s) must be returned to Sukup within 30 days in event of failure.

EXTENDED STIRRING MACHINE WARRANTY - Sukup warrants stirring machines for two years from date of purchase.

EXTENDED STIRRING AUGER WARRANTY - Sukup warrants stirring down augers for two years from date of purchase. Must return top 18" of down auger to obtain credit.

EXTENDED FAN WARRANTY - Sukup warrants fans for two years from date of purchase.

EXTENDED HEATER CIRCUIT BOARD WARRANTY - Sukup warrants heater circuit boards for three years from date of purchase.

EXTENDED MATERIAL HANDLING WARRANTY - Sukup warrants Material Handling, excluding structural support systems, for two years from date of purchase.

REPLACEMENT PARTS WARRANTY PERIOD - Sukup warrants replacement parts (e.g. belts, sensors, rotating contacts, gearmotors, switches) purchased from Sukup for one (1) full drying season following purchase.

ELECTRIC MOTOR WARRANTY - The manufacturers of electric motors warranty their motors through authorized service centers for a 2 year period from motor date code. Contact motor manufacturer for nearest location. If motor warranty is refused by a service center based upon date of manufacture, use the following procedure: Have motor repair shop fill out warranty report form as if they were providing warranty service. State on report reason for refusal. Send report, motor nameplate, and proof of purchase date (invoice from Sukup and invoice for your customer) to Sukup. If electric motor warranty is not satisfactorily handled by motor service center, contact Sukup for assistance. Sukup will attempt to obtain warranty from motor manufacturer, any credit obtained will be passed on. Warranty may also be obtained by returning motor to Sukup Manufacturing Co. or Distribution Centers with prior authorization. **NOTE:** Sukup will not be responsible for unauthorized motor replacement or repair. Labor for removal of motor from fan not included.

WARRANTY CERTIFICATION - Warranty registration card should be mailed within one month of product delivery to certify warranty coverage.

UNAPPROVED PARTS OR MODIFICATION - All obligations of Sukup under this warranty are terminated if unapproved parts such as stirring augers longer than 20' are used, or if equipment is modified or altered in any way not approved by Sukup.

12/7/18

I. General Safety Practices



Read manual before installing or using product. Failure to follow instructions and safety precautions in manual can result in death or serious injury. Keep manual in a safe location for future reference.



On safety decals, this symbol and the signal words Danger, Warning, Caution and Notice draw your attention to important instructions regarding safety. They indicate potential hazards and levels of intensity.



DANGER

RED - **DANGER** indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.



WARNING

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



CAUTION

YELLOW - **CAUTION** indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

NOTICE

BLUE - **NOTICE** alerts you to practices unrelated to personal injury, such as messages related to property damage.

IMPORTANT: To prevent death or serious injury to you or your family, it is essential that safety decals are clearly visible, in good condition, and applied to the appropriate equipment.

FOLLOW MACHINE SAFETY DECAL MESSAGES

Carefully read this manual and all safety decals on your equipment. Safety decals must be kept in good condition.

Replace missing or damaged safety decals free of charge by contacting Sukup Manufacturing Co. by mail at PO Box 677, Sheffield, Iowa 50475; by phone at 641-892-4222; or by e-mail at info@sukup.com.



It is the responsibility of the owner/operator to know what specific requirements, precautions, and work hazards exist. It is also the responsibility of the owner/operator to inform anyone operating or working in the area of this equipment of hazards and safety precautions that need to be taken to avoid personal injury or death. Always keep children away from bins and vehicles with flowing grain.

Make no unauthorized modifications to machine. Modifications may endanger function and/or safety of unit. Keep unit in good working condition. Keep shields in place. Replace worn or missing shields free of charge by contacting Sukup Manufacturing Co.

GRAIN BIN SAFETY

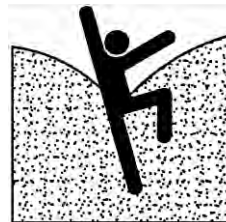
Owners/operators are responsible for developing site-specific confined space entry procedures. OSHA's confined space entry procedures (29CFR 1910.146) can be found at www.osha.gov.

If you must enter bin for repair or maintenance:

- Use a safety harness, safety line and respirator
- Station another person outside of bin
- Avoid the center of the bin
- Wear appropriate personal protective equipment
- Keep clear of all augers and moving parts



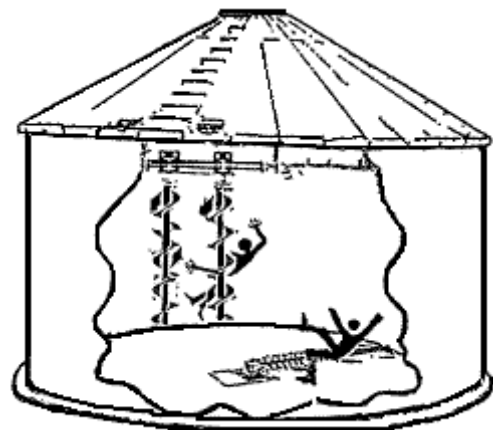
DANGER! Never enter bin unless all power is locked off and another person is present. Rotating augers can dismember or kill! Flowing grain may trap and suffocate. If you enter a bin of flowing grain you can be completely submerged in grain in about 8 seconds.



Failure to heed these warnings could result in death or serious injury.

NEVER clean out bin with augers running!

When bin is nearly empty, sweep (floor) augers will travel at an increasing speed; just turning around can give augers enough time to trap you. Keep away from sweep and sump augers to avoid entanglement.



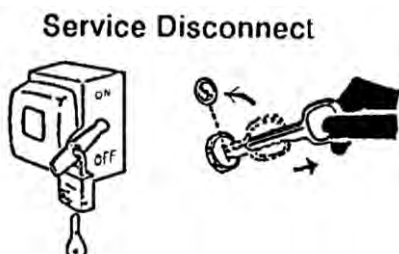
Failure to heed this warning could result in death or serious injury.

I. General Safety Practices (continued)

To avoid electrocution, all equipment must be properly wired and grounded according to electrical codes. Have unit wired by qualified electrician.



Have an electrician install a main power disconnect switch capable of being locked only in OFF position. Mark disconnect clearly as to equipment it operates.



Always lock out main power disconnect switch whenever equipment is not in use.

WARNING: When servicing equipment, never enter bin unless all power is locked out and another person is present. Always LOCK OUT all power and always check with voltage meter before servicing. To avoid personal injury, frequently inspect all mechanical and electrical components. Repair and/or replace worn parts. Be sure all electrical wires are in good condition.

Failure to do so could result in death or serious injury.

Owners/operators are responsible for developing site-specific Lockout/Tagout procedures based on equipment at their work site. See OSHA's typical minimal lockout procedures (29CFR 1910.147 App A) at www.osha.gov.

WARNING: KEEP CLEAR OF ALL MOVING PARTS.

Keep people (ESPECIALLY YOUTH) away from equipment, particularly during operation.



Keep away from all moving parts. Keep all shields in place. **SHUT OFF AND LOCK OUT** all power before servicing.

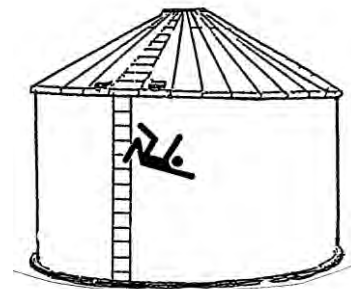
Failure to follow precautions above could result in death or serious injury.

CAUTION: Metal edges are sharp. To avoid injury, wear protective clothing and handle equipment and parts with care.

Failure to do so may result in minor or moderate injury.

WARNING! If a ladder is to be placed against crosstube for installation or maintenance, securely wire outside drive end of crosstube to track to avoid movement of unit. (Be sure to remove wire when work is completed.) Failure to do so could result in death or serious injury.

WARNING! Metal is slippery when wet. To avoid falls, never carry items while climbing on bin. Maintain secure hand and foothold if climbing on bin. Failure to do so could result in death or serious injury.



PERSONAL PROTECTIVE EQUIPMENT



Refer to OSHA 1910.132 (Personal Prot. Equip.)

Owners/Operators are responsible for developing site-specific personal protective equipment standards. OSHA's personal protective equipment standards (29CFR 1910.132) can be found at www.osha.gov.

EMERGENCIES – KNOW WHAT TO DO

Have emergency numbers and written directions to work site readily available in case of emergency. An area for emergency phone numbers to be recorded is provided below and at end of this manual.

Ambulance • Fire • Police: 9-1-1

Bin rescue team: _____

Emergency medical squad: _____

Address of work site: _____

Directions to work site: _____

II. Placement of Fastir Safety Decals

Yearly and prior to equipment use, ensure that all decals and shields are in legible condition and in place according to these drawings. Replace missing or damaged safety decals or shields free of charge by contacting Sukup Manufacturing Co. by mail at Box 677, Sheffield, Iowa 50475; by phone at 641-892-4222; or by e-mail at info@sukup.com.

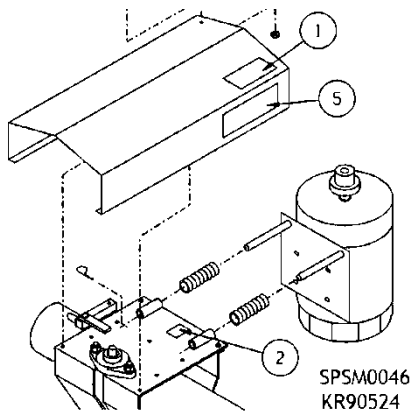


Figure 1 - Placement of Safety Decals on Carriages
Decals #1, #2, and #5 are factory-mounted. If their replacement is necessary, follow steps below.

- 1 Before replacing Decals #1, #2, and #5:
 - 1.1 Disconnect electricity.
 - 1.2 Wire end of crosstube to track.
 - 1.3 Ensure hairpin clips are through holes in motor mount.
- 2 Ensure areas of placement for decals are free from grease, oil and dirt.
- 3 Mount decals without standing under machine.



Decal #1-L0284



Decal #2-L0271



Decal #5-L0260

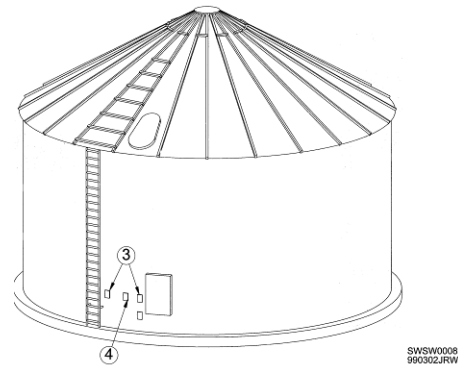


Figure 2 - Placement of Safety Decals on Outside of Bin
Decals #3 and #4 must be mounted on-site:

- 1 Ensure areas of placement for decals are free from grease, oil, and dirt.
- 2 During machine installation, mount decal #3 on bin sheet near door handle and at all other entry points or by ladder going up to roof so everyone entering bin will see it. See above.
 - 2.1 *Note:* If suggested areas of placement for decals are not clearly visible, place safety decals in a more suitable area. Never cover up any existing safety decals.
- 3 Mount decal #4 on bin sheet near door handle. See above.



Decal #3-L0258A



Decal #4-L0281

MATERIALS REQUIRED

Before beginning to install this product, ensure that all required components are present by checking the Shipping List section below. Also, compare carton contents against labels on cartons and ensure crosstube supplied is correct size for bin.

Shipping List

Table 1 - Major Parts List

Description	Fastir			Fastir Plus		
	Qty - Single	Qty - Double	Qty - Triple	Qty - Triple	Qty - Quad	Qty - Quint
Fastir Crosstube	1	1	1	1	1	1
Hanger Pipe	1	1	1	1	1	1
Top Hanger	1	1	1	1	1	1
Outside Cord Hanger	1	1	1	1	1	1
Tie Bar(s)	-	2	4	2	4	6
Track	1	1	1	1	1	1
Down Auger	1	2	3	3	4	5
Hardware Ctn #1	1	1	1	1	1	1
Hardware Ctn #2	1	1	1	1	1	1
Hardware Ctn #3	-	-	-	1	1	1
Stationary Auger Kit	-	-	-	1	1	1
Stabilizer Arm Kit (Standard with units ordered after 2007)	1	1	1	1	1	1

Table 2 - Fastir/Fastir Plus Basic Hardware Carton Part Numbers

Hardware Carton #	Part #									
	Single		Double		Triple		Quad		Quint (Fastir Plus)	
	4-1/2"	5-1/2"	4-1/2"	5-1/2"	4-1/2"	5-1/2"	4-1/2"	5-1/2"	4-1/2"	5-1/2"
1	A8490	-	A8491	A84912	A8492	A84922	A8493	A84933	-	A84935
2	Varies by bin diameter and motor phase and voltage									
3*	* For Fastir Plus units only				A3424	A34242	A3424	A34242	A3424	A34242

Table 3 - Fastir/Fastir Plus Basic Hardware Carton #1 Contents

Description	Part #		Qty					
	4-1/2" Crosstube	5-1/2" Crosstube	Single	Double	Triple	Quad	Quint	
Safety Decal Pkg.	A3399	A3399	1	1	1	1	1	1
Motor Mount	A5209	A5209	1	2	3	4	5	
Cast Junction Elec. Box	A5612	A5612	1	1	1	1	1	
Flinger	A5616	A5616	1	2	3	4	5	
Cord Support Strap	A6121	A6121	1	1	1	1*	1*	
Parts Sack Single	A6806	A6806	1	-	-	-	-	
Parts Sack Double	A6807	A6807	-	1	-	-	-	
Parts Sack Triple	A6808	A6808	-	-	1	1	1	
Pivoting Hanger, 30"	A7504	A7504	1	1	1	1	1	
Hanger	A7509	A7509	2	2	2	2	2	
Rev. Carriage Plate	A80342	A8060	4	4	4	4	4	
Primary Carriage	A8500	-	1	-	-	-	-	
Primary Carriage	A8501	A6130	-	1	1	1	1	
Satellite Carriage	A8502	A6135	-	1	2	3	4	
Shield	A8508	A6120	1	2	3	4	5	
Flange Bearing "1"	J0003	J0003	2	4	6	8	10	
Belt	J0179	J0195	1	2	3	4	5	
Pulley, 9", Sng, A Groove	J0355	J0355	1	2	3	4	5	
Prevent Voiding Warranty	L0249	L0249	1	1	1	1	1	
Imp. Grain Level Warning	L0304	L0304	1	1	1	1	1	
Sukup Logo	L03171	L03171	-	1	1	1	1	
Manual	L1413	L1413	-	1	1	1	1	
Wire Ties, Bundle	L9999	L9999	1	2	3	4	5	

*Includes 2 with Fastir Plus

Table 4 - Fastir/Fastir Plus Hardware Carton #2 Contents

Description	Part #	Qty				
		Single	Double	Triple	Quad	Quint
Gearmotor, Hvy Duty (*Gearmotor, Extra Hvy Duty - A5299)	A5319	1	1	1	1	1
Rotating Contact	Varies	1	1	1	1	1
Pillow Block Bearing 1" (*Pillow Blk Bearing 1-1/4" - A5651)	A5649	1	1	1	1	1
Junction Switch Box	A8140	1	1	1	1	1
Tilt Switch	Varies		1	2	3	4
Bolt Sack, Track	Varies	1	1	1	1	1
Tie Bar 18" hole- to-hole (*Tie Bar 27" hole-to-hole - A59021)	A5897	-	-	2	2	2

*Used on 40' Diameter & Larger Machines

Table 5 - Fastir Plus Only Hardware Carton #3 Contents

Description	Part #		Qty
	4-1/2" Crosstube	5-1/2" Crosstube	
Safety Decal Package	A3399	A3399	1
Parts Sack Stationary Auger Kit	A3426	A3426	1
Motor Mount	A5209	A5209	1
Outside Stationary Carriage	A5250	A6140	1
Shield	A8508	A6120	1
Stationary Carriage Plate	A5245	A6115	2
Flinger	A5616	A5616	1
Bolt Sack, Supplemental	A6854	A6854	1
Bearing, 1" Flange	J0003	J0003	2
Belt	J0179	J0195	1
Pulley, 9" Single A Groove	J0355	J0355	1
Prevent Voiding Warranty Sticker	L0249	L0249	1
Warning, Keep Away Moving Parts	L0284	L0284	1
Important, Grain Level Sticker	L0304	L0304	1
Sukup Logo	L03171	L03171	1
Manual	L1413	L1413	1
Wire Ties, Bundle	L9999	L9999	1

Tools Required

- Wrenches: 5/16", 7/16", 1/2", 9/16", 3/4", 10 mm wrench or adjustable (Crescent) wrench
- Hex (Allen) Wrenches: 1/4", 5/32"
- Regular-head Screwdriver
- Phillips-head Screwdriver
- Wire Stripper
- Punch
- Hammer

MAX AMPS & CIRCUIT BREAKERS

Table below shows maximum amps and circuit breaker size depending on number of down augers and motor hp, phase and voltage.

			NUMBER OF DOWN AUGERS									
			ONE		TWO		THREE		FOUR		FIVE	
HP	PHASE	VOLTS	MAX AMPS	BREAKER SIZE*	MAX AMPS	BREAKER SIZE*	MAX AMPS	BREAKER SIZE*	MAX AMPS	BREAKER SIZE*	MAX AMPS	BREAKER SIZE*
1.5	1	230	9	15	18	35	27	60	35	70	44	80
2	1	230	10	20	19	35	28	60	38	80	47	80
1.5	3	230	6	15	10	20	15	30	20	40	25	45
1.5	3	460	3	15	6	15	8	15	10	20	13	25

*Breaker sizes are recommendations only. Check motor nameplate amperage, National Electric Code and local codes to size breakers properly.

ASSEMBLY & INSTALLATION

I. Installing Track

For part numbers and descriptions of parts referenced in this section, see parts assembly manual, page 53.

Track is most easily installed while first ring of bin is being assembled on the ground. Track of correct size must be installed as a unit in bin. Track brackets and curvature vary according to bin diameter.

The process for installing track on some Sukup bin sheets differs slightly from that used with bin sheets produced by other companies. Section A describes the process used with Sukup track-punched bin sheets. Section B describes the process used with Sukup bin sheets not punched for track and for non-Sukup bin sheets.

With bin sheets produced by other companies, the existing holes in top bin sheets may be used for mounting track in many cases (Section B). However, in some cases, no holes will match and all holes must be drilled in bin sheet to mount track. Section C describes this process.

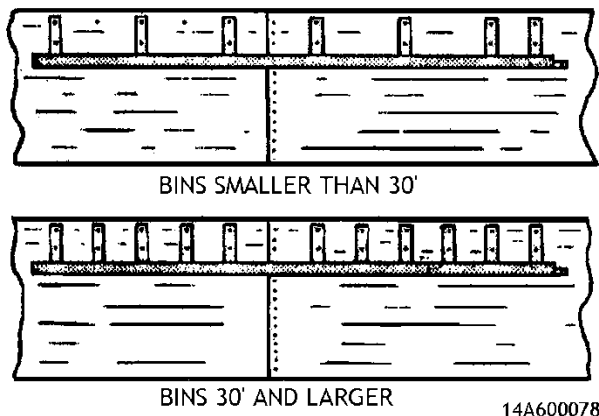


Figure 3 - Head-On View of Track Bracket Placement

A. Installing Track on Sukup Bin Sheets Punched for Track

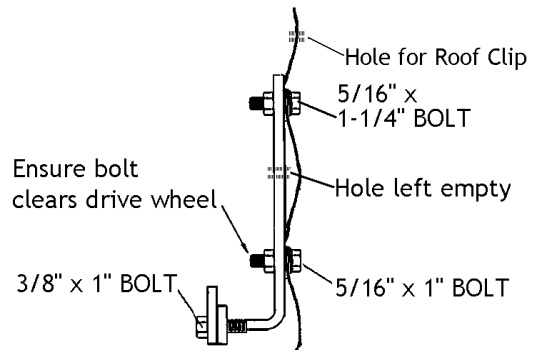
A1 For Sukup bins smaller than 30', insert 5/16" x 1-1/4" bolts in top hole of every other pair of bolt holes for track around top of bin (approximately 18" spacing). For Sukup bins 30' and larger, place bolts in top hole of every pair of bolt holes (approximately 9" spacing) except those at bin wall seam. **Figure 3, Figure 4.**

A2 Mount 1 length of track with bolts through top holes on track brackets. **Figure 3, Figure 4.**

A2.1 Note: On bins 30' and larger with a double-bracketed track, a gap has been left to prevent interference between seam bolts and track brackets. Install first section of track with seam in place of missing bracket. **Figure 3.**

A3 Insert 5/16" x 1" bolts through bottom holes on track brackets.

A4 Place 5/16" nuts onto bolts through track bracket. Do **not** tighten at this time. **Figure 4.**



Sukup Track-Punched Bin Sheet

Figure 4 - Side View of Track Mounted on Sukup Bin Sheet Punched for Track

A5 Mount remaining track sections using steps A2-A4, joining track sections together with 3/8" x 1" bolt and 3/8" lockwasher and nut. Tighten using 9/16" wrench. **Figure 5.**

A5.1 Note: Ensure these bolts are pointing to outside (toward bin sidewall) to avoid obstructing machine movement.

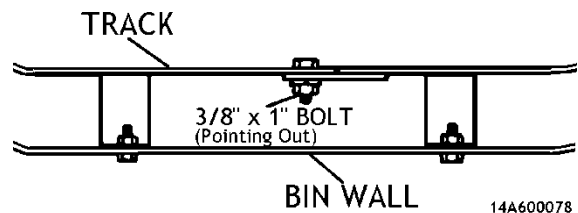


Figure 5 - Top View of Track Splice

A6 Tighten 5/16" nuts on bolts through track bracket using 1/2" wrench.

A7 Ensure entire length of track and bin wall is free of any obstructions that could hinder movement of machine through bin.

B. Installing Track on Sukup Bin Sheets Not Punched for Track and on Bin Sheets from Other Companies

B1 For bins smaller than 30', insert 5/16" x 1-1/4" bolts in single ring of bolt holes around top of bin (approximately 18" spacing). For bins 30' and larger, place bolts in every bolt hole (approximately 9" spacing) except those at bin wall seam. **Figure 3.**

B2 Tighten 5/16" spacer nuts onto these bolts. **Figure 6.**

B3 Mount first segment of track over bolts and screw on a second 5/16" nut. **Figure 3, Figure 6.**

- B3.1 *Note:* On bins 30' and larger with a double-bracketed track, a gap has been left to prevent interference between vertical seam on sidewall sheets and track brackets. Install first section of track with bin wall seam in place of missing bracket. **Figure 3.**

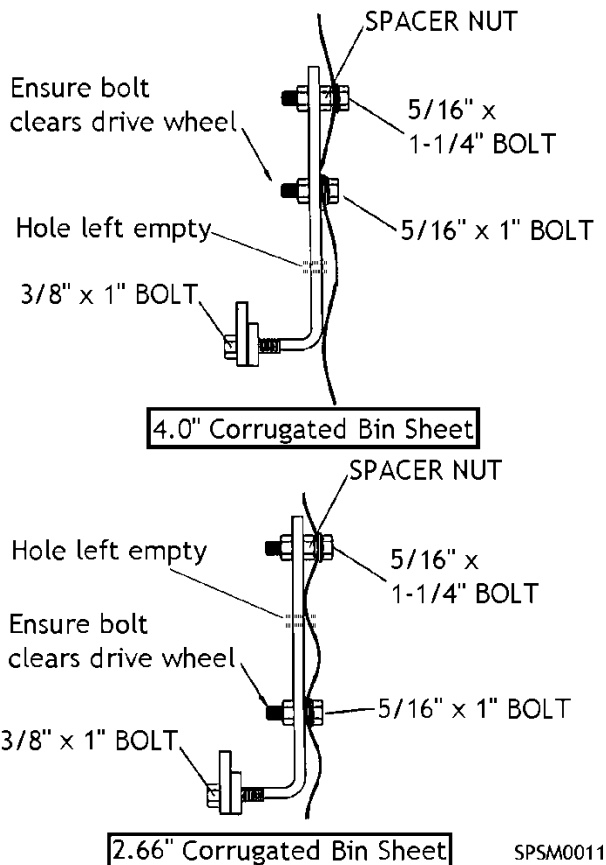


Figure 6 - Side View of Track Mounted on Sukup Bin Sheets Not Punched for Track and Sheets from Other Companies

- B4 Mount remaining track sections using steps B2-B3, joining track sections together with 3/8" x 1" bolt and 3/8" lockwasher and nut. Tighten using 9/16" wrench. **Figure 5.**
- B4.1 *Note:* Ensure these bolts are pointing to outside (toward bin sidewall) to avoid obstructing machine movement.
- B5 After all track sections are in place, drill second, lower bolt holes through bin sheets using track brackets as pattern. **Figure 6.**
- B5.1 *Note:* Drill through **middle** bracket holes only when dealing with 4.0" cor. sidewall sheet.
- B5.2 *Note:* Drill through **bottom** bracket holes only when dealing with 2.66" cor. sidewall sheet.
- B6 Insert 5/16" bolt **no longer than 1"** into newly drilled holes. If needed, insert a longer bolt pointed to outside to avoid obstructing machine

movement and screw on 5/16" nuts. Tighten using 1/2" wrench.

- B6.1 *Note:* Leave unused track bracket holes empty. **Figure 6.**

- B7 Tighten 5/16" nuts on top bolts through track brackets using 1/2" wrench.
- B8 Ensure entire length of track and bin wall is free of any obstructions that could hinder movement of machine through bin.

C. Installing Track When Holes for Track Brackets Must Be Drilled

- C1 Place first segment of track in bin.
- C2 Drill holes in top bin sheet to match holes on each bracket:
- C2.1 When drilling 4.0" Cor. sidewall sheets, use top and bottom track bracket holes as guide as shown in **Figure 4.**
- C2.2 When drilling 2.66" Cor. sidewall sheet, use bracket holes as guide to drill through corrugation hills on sheet.
- C3 Insert 5/16" x 1-1/4" bolt through top bolt holes. **Figure 6.**
- C4 Mount first segment of track over bolts and screw on 5/16" nuts. **Figure 6.**
- C5 Insert 5/16" x 1" bolts in lower holes of track bracket and add 5/16" nuts. Tighten using 1/2" wrench. **Figure 6.**
- C5.1 *Note:* Leave unused track bracket holes empty. **Figure 6.**
- C6 Mount remaining track sections using steps C2-C5, joining track sections together with 3/8" x 1" bolts and 3/8" lockwashers and nuts. Tighten using 9/16" wrench. **Figure 5.**
- C6.1 *Note:* **Ensure these bolts are pointing to outside (toward bin sidewall) to avoid obstructing machine movement.**
- C6.2 *Note:* Because of the large variation in diameter from bin to bin, it may be necessary to use a splice to join the last section of track. These splice sections are available at no charge by contacting Sukup Manufacturing Co. by mail at Box 677, Sheffield, Iowa 50475; by phone at 641-892-4222; or by e-mail at info@sukup.com.
- C6.3 If splice is required, bolt splice sections in place and tighten.
- C7 Ensure entire length of track and bin wall is free of any obstructions that could hinder movement of machine through bin.

II. Assembling & Installing Carriages

For part numbers and descriptions of parts referenced in this section, see parts assembly manual, page 53.

- 1 Carry crosstube and hardware into bin.
- 2 Place outside crosstube end with drive wheel next to bin sidewall and inside end with shaft in center of bin.

For Fastir Plus units, begin here and continue following instructions:

- 3 Bolt stationary carriage plate onto drive wheel end of crosstube with hub pointing outward using 3/8" x 1-3/4" bolts and 3/8" washers and nuts. **Figure 7, Figure 13.**

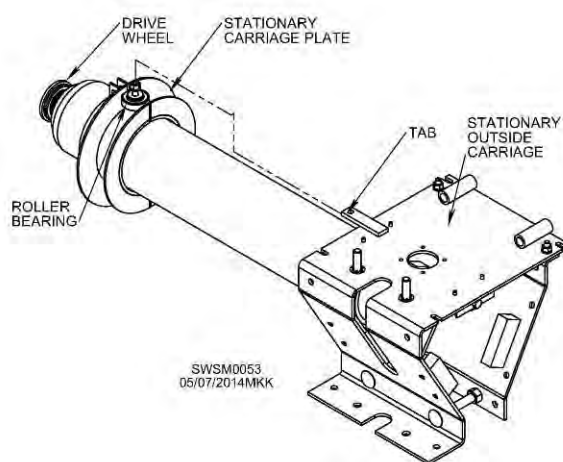


Figure 7 - Placement of Stationary Outside Carriage on Fastir Plus Unit

- 4 Slide stationary outside carriage onto crosstube beside plate with reversing mechanism tab pointing toward drive wheel. **Figure 7, Figure 13.**

For multiple-carriage regular Fastir units, begin here and continue following instructions:

- 5 Slide satellite carriage(s) onto crosstube from inside, shaft end with reversing mechanism tab pointing toward drive wheel, as shown in **Figure 7.**

For single-carriage Fastir units, begin here:

- 6 Slide primary carriage about 1 foot onto crosstube from inside, shaft end. Knurled bearing should be on top and slot for down auger on front of crosstube as shown in **Figure 7, Figure 8.**
- 7 Ensure 1/16" gaps (approximately the thickness of a credit card) exist between crosstube and bearing blocks. **Figure 8.**

Note: If necessary, adjustments may be made using 3/4" wrench on bottom carriage bolts. **Do not overtighten carriages.**

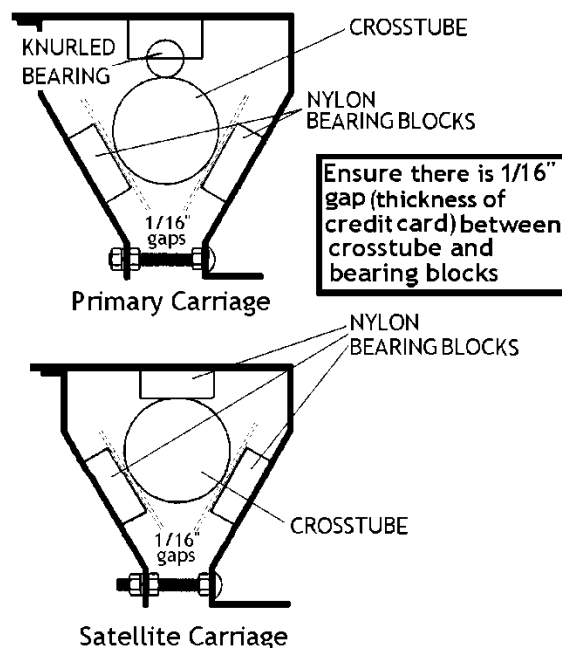


Figure 8 - Side View of Primary and Satellite Carriages

- 8 See applicable table and drawing on Pages 15-18 to determine correct spacing between carriages, comparing hole-to-hole lengths.
- 9 Bolt tie bar to lower inside of back plates on carriages as shown in **Figure 9.** Use 5/16" x 1" bolts pointing inward, one stabilizer arm bracket (A4545), and 5/16" lock washers and nuts. Tighten using 1/2" wrench.

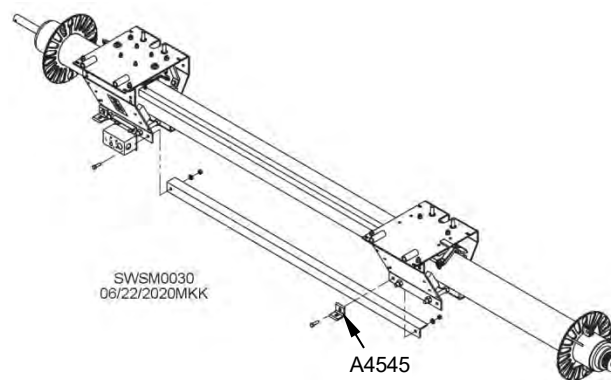


Figure 9 - Backside View of Fastir Tie Bar Installation

INSTALLING ADDITIONAL TIE BAR

9A On all Fastir sizes, install additional tie bar on back inside of carriage near top as shown in **Figure 10**.

9B Install additional tie bar(s) between other moving carriages in same manner. See **Figure 10**.

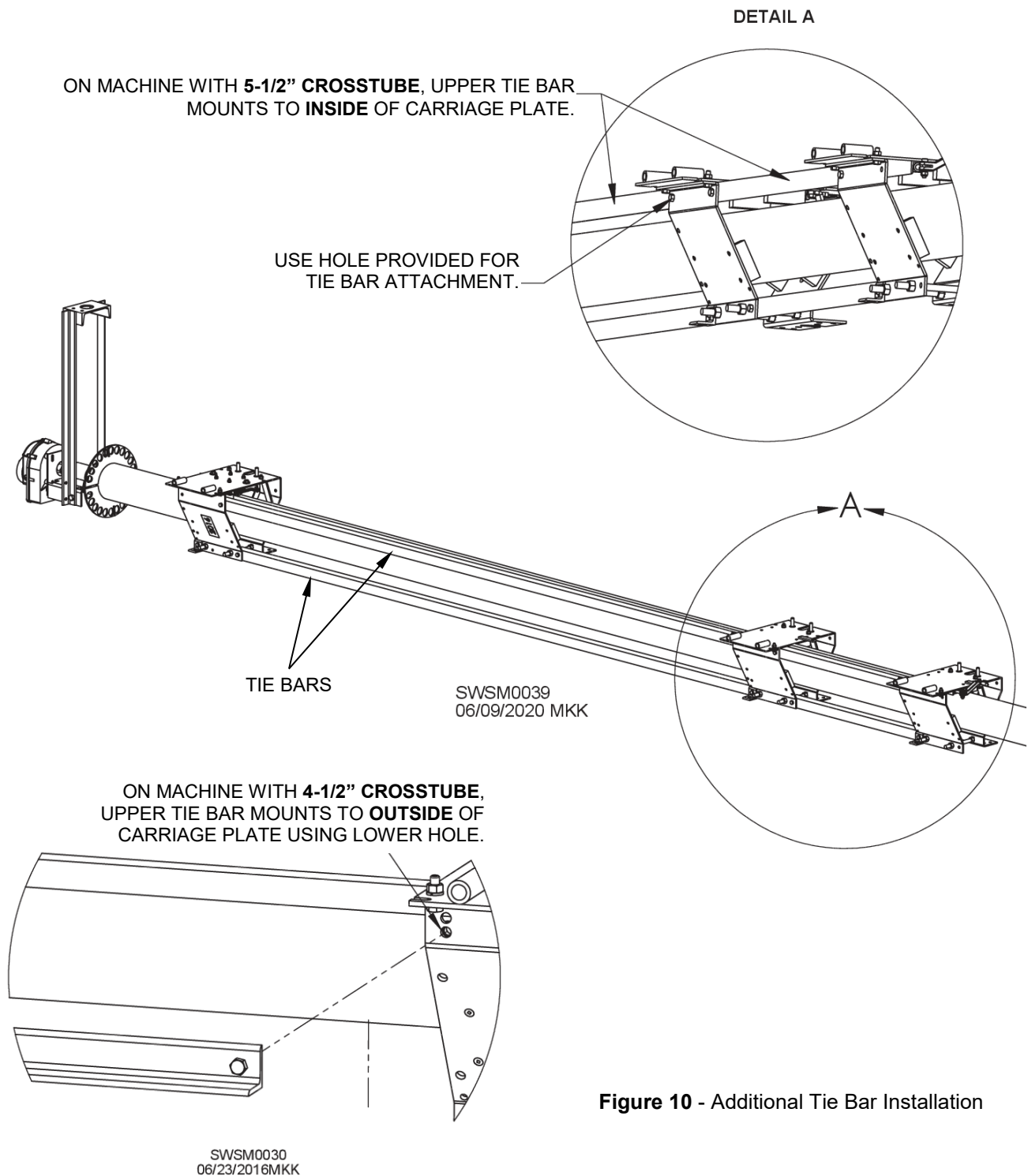
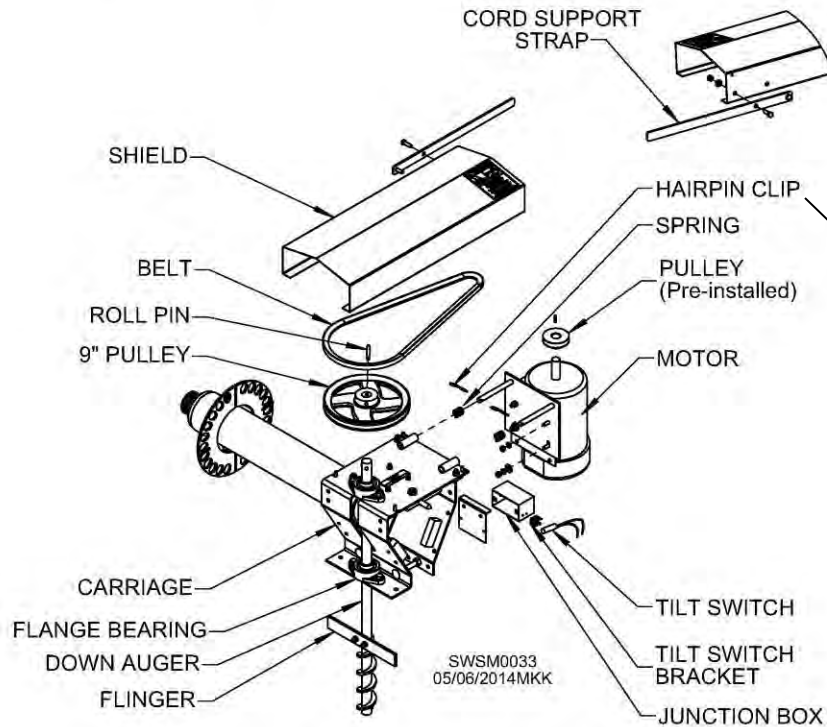
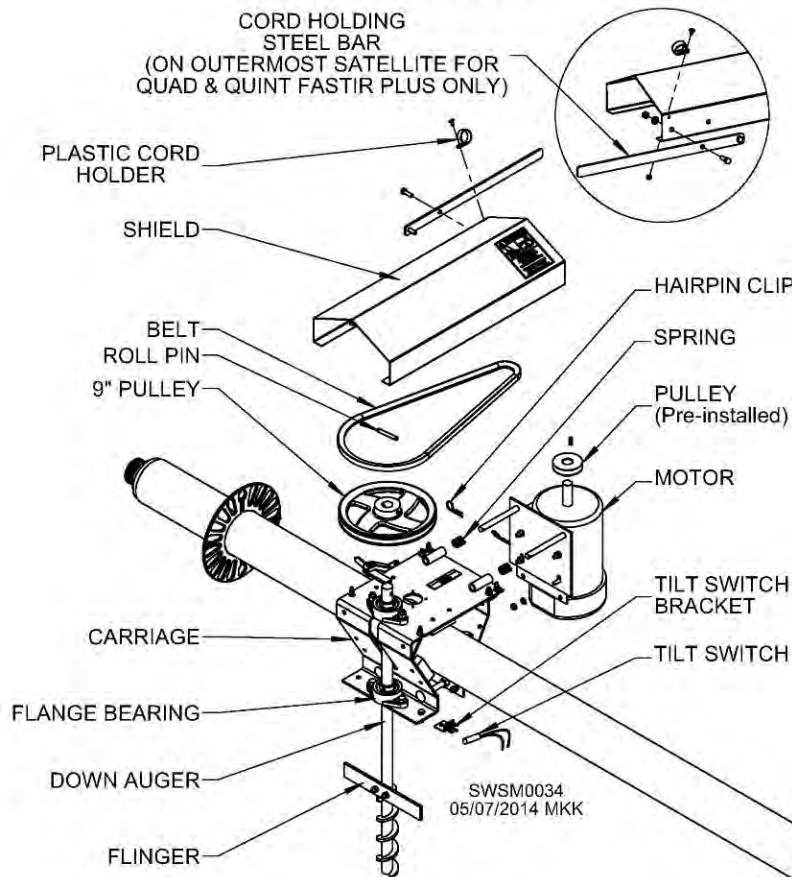


Figure 10 - Additional Tie Bar Installation

PRIMARY CARRIAGE



SATELLITE CARRIAGE



! WARNING:

To prevent death or serious injury be sure that hairpin clips are inserted in motor mount so motor will not fall unexpectedly.

Figure 11 - Primary and Satellite Carriage Assemblies, Exploded Views

Fastir Assembly

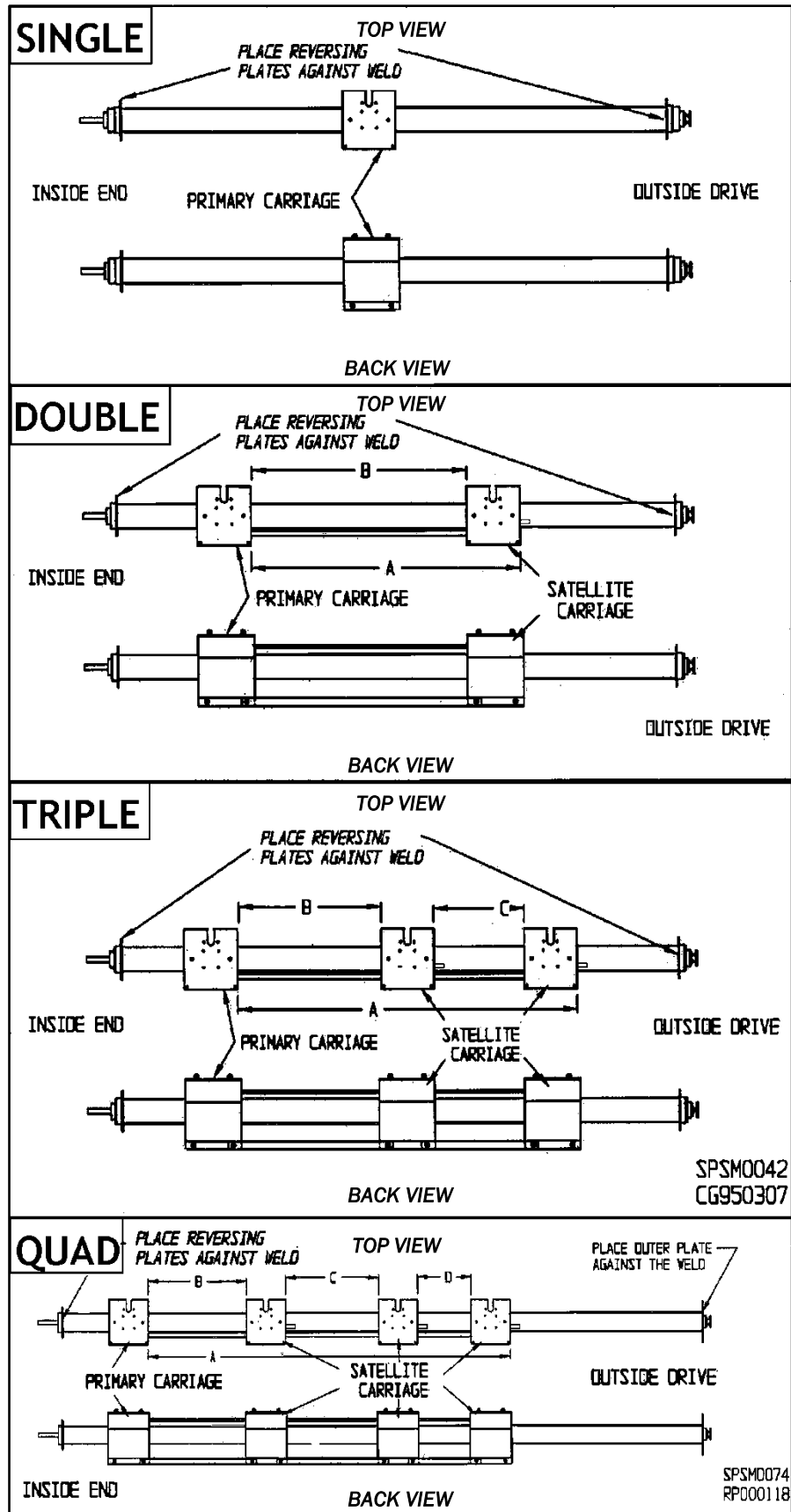


Figure 12 - Tie Bar and Carriage Placement for Fastir Units

Fastir

Table 6 - Hole-to-Hole Lengths (Measured from Hole Centers) for Tie Bars and Reversing Rods

Double Auger					Triple Auger					
Bin Diameter	Reversing Rod Hole-to-Hole*		Tie Bar Hole-to-Hole**		Reversing Rod Hole-to-Hole*		Tie Bar Hole-to-Hole**			
	(A)		(B)		(A)		(B)		(C)	
	Part #	Length (")	Part #	Length (")	Part #	Length (")	Part #	Length (")	Part #	Length (")
18'-18'7"	A8514	46	A59051	37	A85231	59.5	A5901	24	A5897	18
21'-21'8"	A8523	55.5	A59071	46	A85152	68.5	A5904	33	A5897	18
24'-24'9"	A85143	61.5	A59081	52	A85261	77	A59061	41	A5897	18
27'-27'10"	A8526	70.5	A59110	61	A8522	88	A59081	52	A5897	18
30'-31'	A8527	83.5	A81151	74	A8518	96.5	A59110	61	A5897	18
33'-34'	A85282	90.5	A59124	81	A8529	102	A59116	66	A5897	18
36'-37'1"	A8529	102	A59141	93	A85302	112.75	A59121	77	A5897	18
42'-42'8"	A8532	118.5	A5916	109	A8533	137.5	A59141	93	A59021	27
48'	-	-	-	-	A85333	153.75	A5916	109	A59021	27
49'3"	-	-	-	-	A85333	153.75	A5916	109	A59021	27
Quadruple Auger										
Bin Diameter	Reversing Rod Hole-to-Hole*		Tie Bar Hole-to-Hole**							
	(A)		(B)		(C)		(D)			
	Part #	Length (")	Part #	Length (")	Part #	Length (")	Part #	Length (")	Part #	Length (")
27'-27'10"	A8529	102	A59032	29	A59032	29	A5897			18
30'-31'	A8532	118.5	A59051	37	A59051	37	A5897			18
33'-34'	A85321	127	A59061	41	A59061	41	A5897			18
36'-37'1"	A85324	136	A59071	46	A59071	46	A5897			18
42'-42'8"	A8537	165	A5910	56	A5910	56	A59021			27
48'	A85381X	196.5	A5912	71	A5912	71	A59021			27

*Hole-to-hole measurement is with adjustable spade bolt; cut length of reversing rod 1-1/2" shorter than hole-to-hole measurement.

**Cut length of tie bar 1-1/2" longer than hole-to-hole measurement.

Fastir Plus Assembly

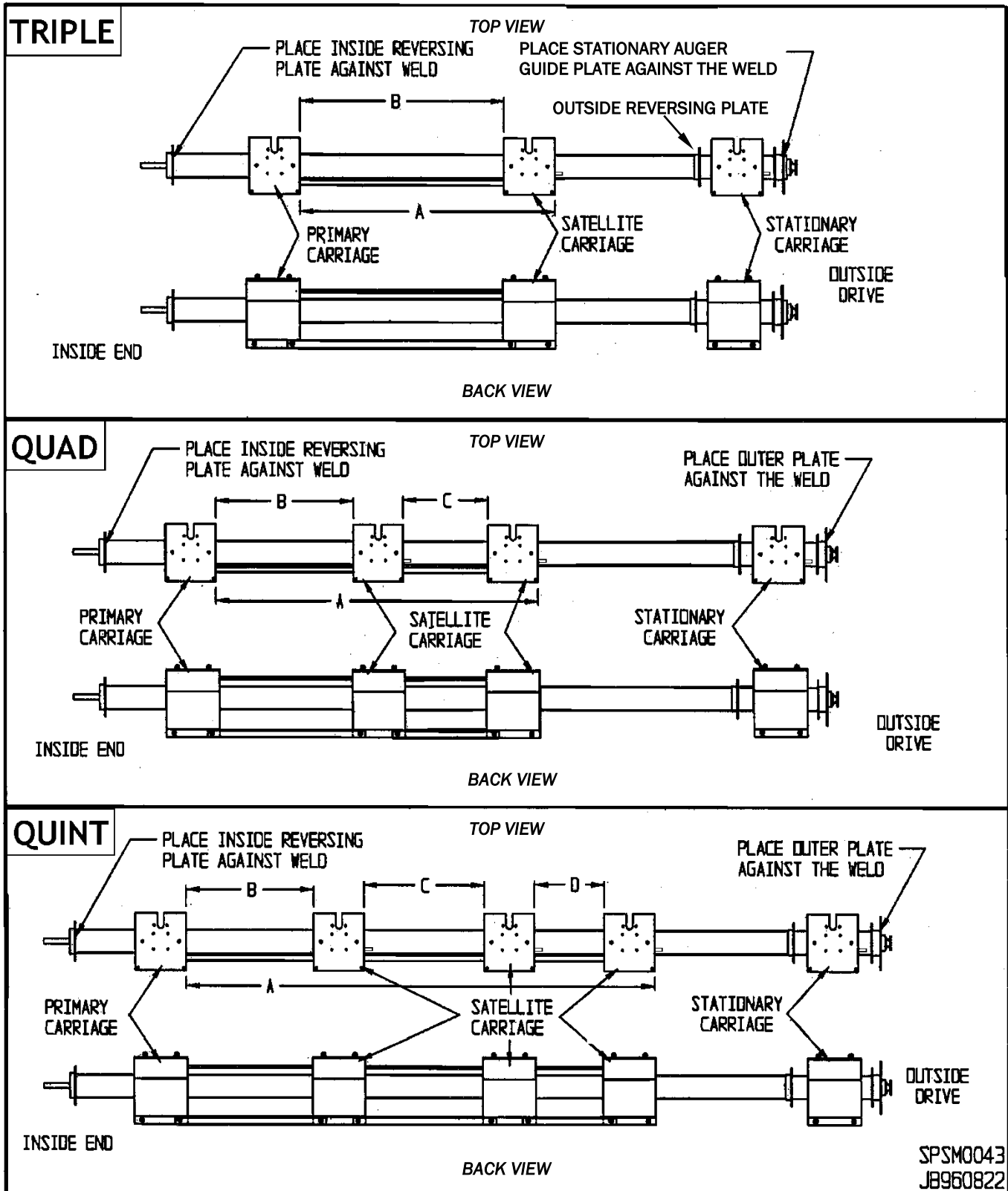


Figure 13 - Tie Bar and Carriage Placement for Fastir Plus Units

Fastir Plus

Table 7 - Hole-to-Hole Lengths (Measured from Hole Centers) for Tie Bars and Reversing Rods

Triple Auger (1 Stationary)					Quadruple Auger (1 Stationary)					
Bin Diameter	Reversing Rod Hole-to-Hole*		Tie Bar Hole-to-Hole**		Reversing Rod Hole-to-Hole*		Tie Bar Hole-to-Hole**			
	(A)		(B)		(A)		(B)		(C)	
	Part #	Length (")	Part #	Length (")	Part #	Length (")	Part #	Length (")	Part #	Length (")
18'-18'7"	A85140	36.5	A59021	27	-	-	-	-	-	-
21'-21'8"	A8514	46	A59051	37	-	-	-	-	-	-
24'-24'9"	A8523	55.5	A59071	46	A85153	68.75	A5904	33	A5897	18
27'-27'10"	A8515	66	A5910	56	A85261	77	A59061	41	A5897	18
30'-31'	A85260	75.5	A59116	66	A8522	88	A59081	52	A5897	18
33'-34'	A85383	80.5	A5912	71	A8519	97	A59110	61	A5897	18
36'-37'1"	A85282	90.5	A59124	81	A85300	106.75	A5912	71	A5897	18
42'	-	-	-	-	A85322	130.75	A59131	86	A59021	27
Quintuple Auger (1 Stationary)										
	Reversing Rod Hole-to-Hole*			Tie Bar Hole-to-Hole**						
	(A)			(B)		(C)		(D)		
	Part #	Length (")		Part #	Length (")	Part #	Length (")	Part #	Length (")	
42'-42'-8"	A85361	157		A59081	52	A59081	52	A59021	27	
48'	A8539	185		A59116	66	A59116	66	A59021	27	
49'3"	A85382	185		A59116	66	A59116	66	A59021	27	

*Hole-to-hole measurement is with adjustable spade bolt; cut length of reversing rod 1-1/2" shorter than hole-to-hole measurement.

**Cut length of tie bar 1-1/2" longer than hole-to-hole measurement.

III. Installing Stabilizer Arm Kit

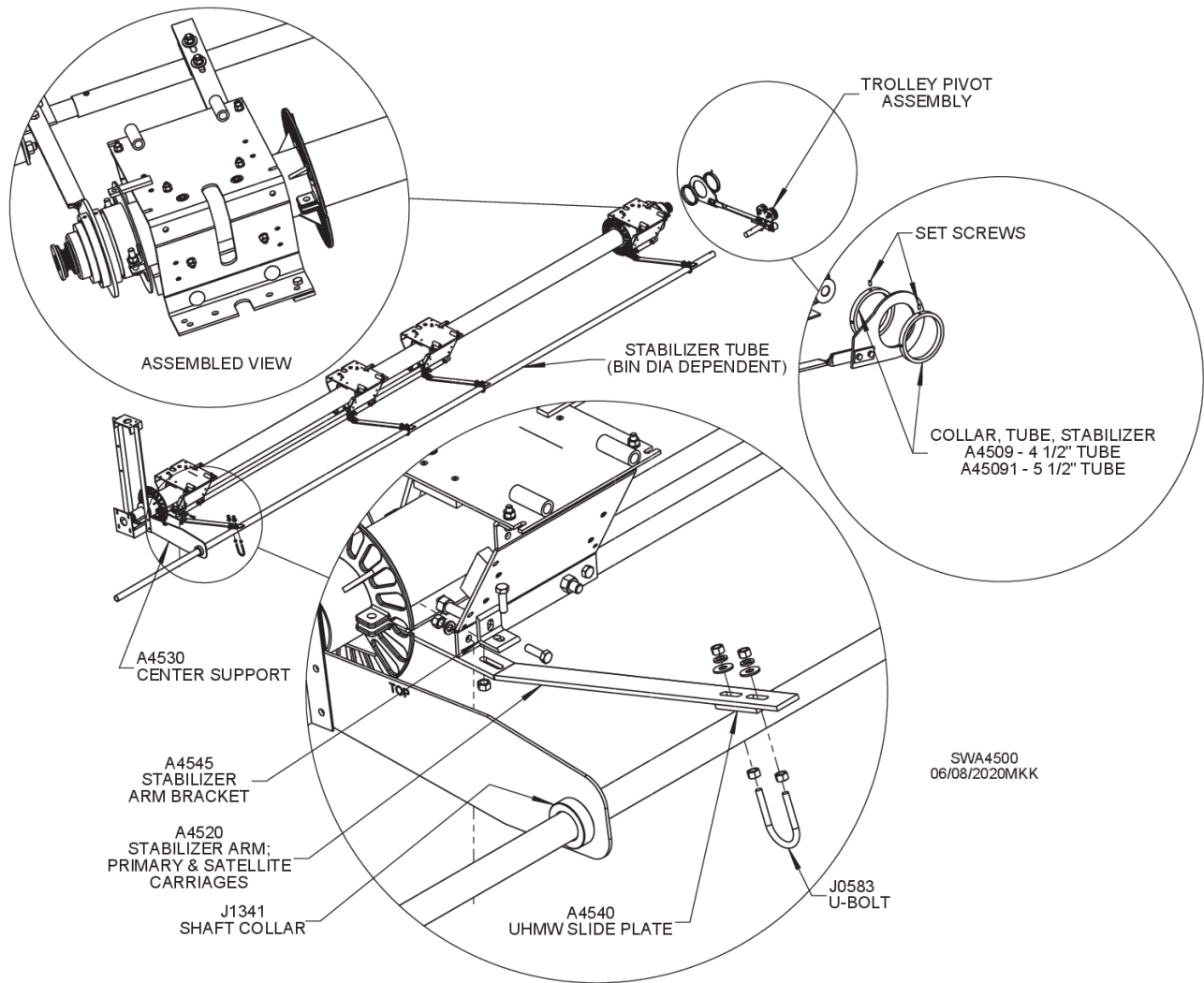


Figure 14 - Stabilizer Arm Assembly on Quad Unit

- 10 Installation of stabilizer arm requires that brackets be attached to all carriages (primary, satellite and, if present, stationary outside carriages). All three types of carriages use the same brackets, which are supplied by Sukup Manufacturing Co.
- 11 Bolt center support to center hanger using two (2) 3/8" holes in center hanger. Ensure bottom of center support is flush with bottom of center hanger assembly. Word "TOP" is etched on center support (A4530) to aid in positioning.
- 12 Attach stabilizer arm bracket (A4545) to primary and satellite carriages as shown above.
- 13 Adjust U-bolts on stabilizer tube so they are loose enough to allow primary and satellite carriages to slide freely.
- 14 Assemble trolley as shown on next page.

Stabilizer Kit Trolley Pivot Assembly

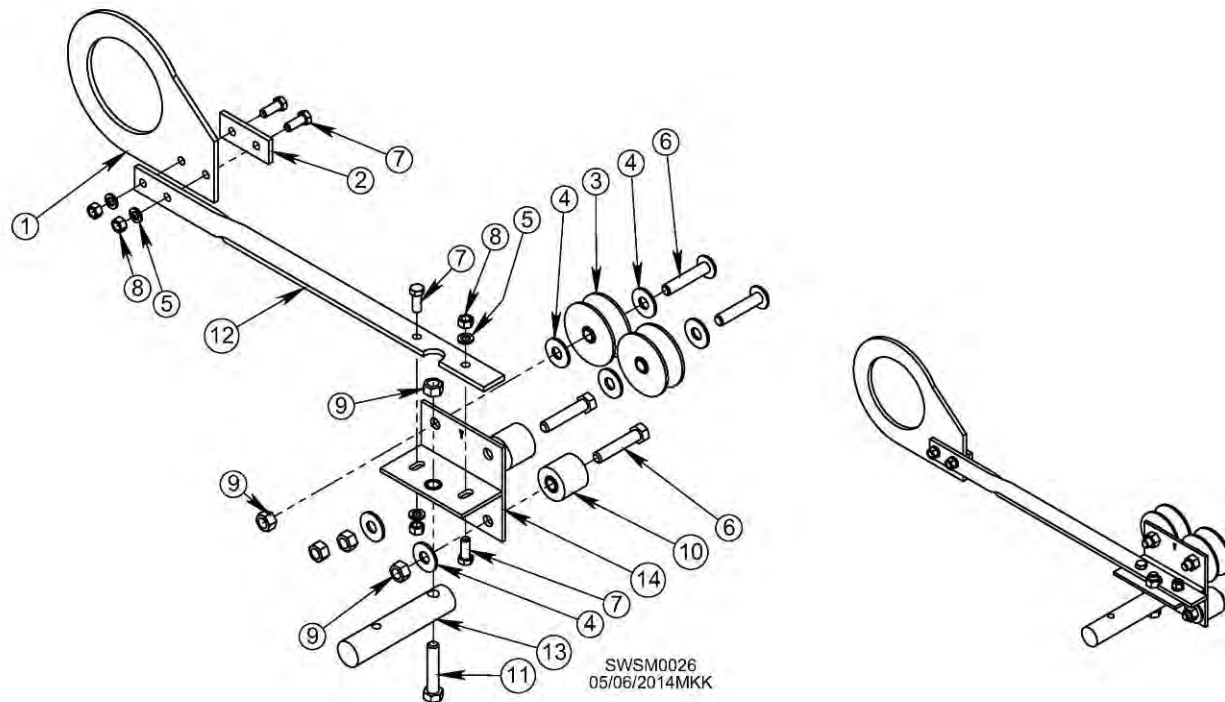


Figure 15 - Assembly of Stabilizer Kit Pivot Assembly, Exploded View

Table 8 - Stabilizer Kit Trolley Pivot Assembly Parts List

Ref #	Description	Qty	Part #
1	Bracket, Plate, Trolley – 4 ½", UHMW	1	A4517
	Bracket, Plate, Trolley – 5 ½", UHMW	1	A45171
2	Trolley Bracket Cover	1	A4518
3	Wheel, Trolley, w/ Bushings	2	A6048
3A	Bushing, 1/2" x 3/4" x 3/4"		J0073
3B	Bushing, 1/2" x 3/4" x 1/2"		J0072
4	Flatwasher, 1/2"	6	J1125
5	Lockwasher, 3/8", PLT	4	J1205
6	Screw, 1/2"-13, 2.5", GR5, BHCS	5	J07463
7	Screw, 3/8"-16, 1.25", PLT	4	J0616
8	Nut, Hex, 3/8"-16, PLT	4	J1020
9	Nut, Hex, Lock, 1/2" - 13	5	J1042
10	Roller, Trolley, w/ Bushings	2	A6049
10A	Bushing, 1/2" x 3/4" x 1"		J0074
10B	Bushing, 1/2" x 3/4" x 1/2"		J0072
11	Screw, 1/2"-13, 2.5", GR5, BHCS	3	J07463
12	Bracket, Bar, Pivot Trolley	1	A45161
13	Shaft, Connect, Pivot Trolley	1	A45131-01
14	Bracket, Weldment, Pivot Trolley	1	A45122

- 15 If your trolley comes pre-assembled, skip to Step 20.
- 16 Add a 1/2" flatwasher to each 1/2" x 2-1/2" bolt and slide a top trolley pulley onto each, adding second 1/2" flatwasher on outside of pulleys. **Figure 15.**
- 17 Insert 1/2" x 2-1/2" bolt through roller assembly. **Figure 15.**
- 18 Add 1/2" locknut to each bolt. **Figure 15.**
- 19 Insert 1/2" x 2-1/2" bolt through hole on connecting shaft and slide up through center extended hole on weldment bracket. Add 1/2" locknut. **Figure 15.**
- 20 Insert 3/8" x 1-1/4" bolts through 2 holes trolley bracket cover, bracket plate, and bracket bar, adding 3/8" lockwashers and nuts. **Figure 15.**
- 21 Bolt bracket bar to weldment bracket using 2 3/8" x 1-1/4" bolts pointing down through assembly. Add 3/8" lockwasher and nut. **Figure 15.**
 - 21.1 Note: Bracket plate fits over crosstube.
- 22 Tighten all hardware. Ensure roller turns freely.

IV. Installing Tilt Switches

For part numbers and descriptions of parts referenced in this section, see parts assembly manual, page 53.

- 23 Bolt junction box with attached tilt switch onto bottom of motor side of primary carriage using 5/16" x 1" bolts (pointing out through carriage) and 5/16" lockwashers and nuts provided on junction box. Tighten using 1/2" wrench. **Figure 16.**

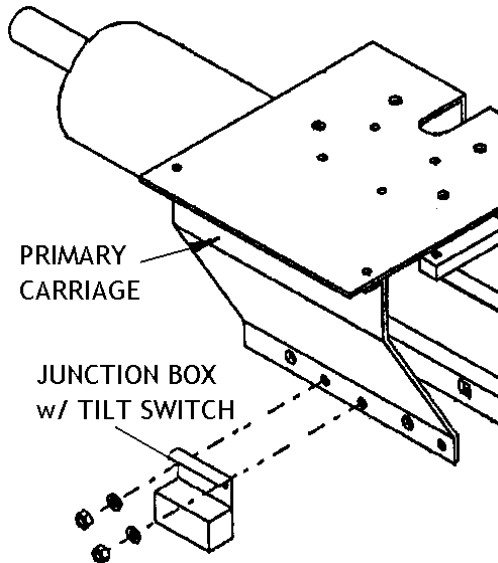


Figure 16-Tilt Switch Placement on Primary Carriage

- 24 On satellite and stationary outside carriages (if present), bolt tilt switches to bottom auger side of carriages near down auger slots (facing in). Use 5/16" x 1" bolt pointing down through plate and 5/16" lockwasher and nut. **Figure 17.**

SATELLITE OR STATIONARY CARRIAGE

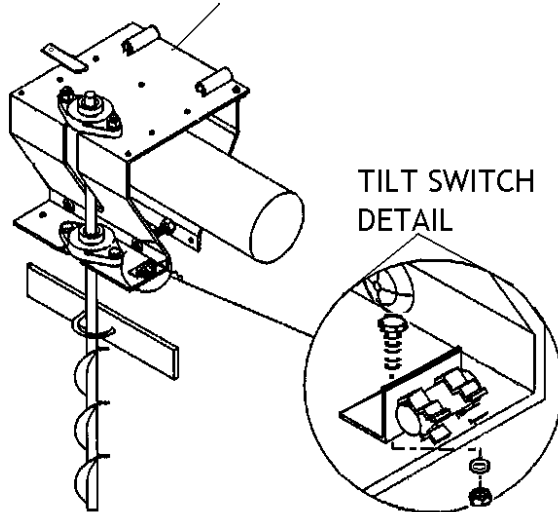


Figure 17-Tilt Switch Placement on Satellite and Stationary Carriages

- 25 Align tilt switch with carriage edge and tighten using 1/2" wrench.

V. Installing Motors

For part numbers and descriptions of parts referenced in this section, see parts assembly manual, page 53.

- 26 Slide springs from hardware sack onto each rod on motor mount(s). **Figure 18.**

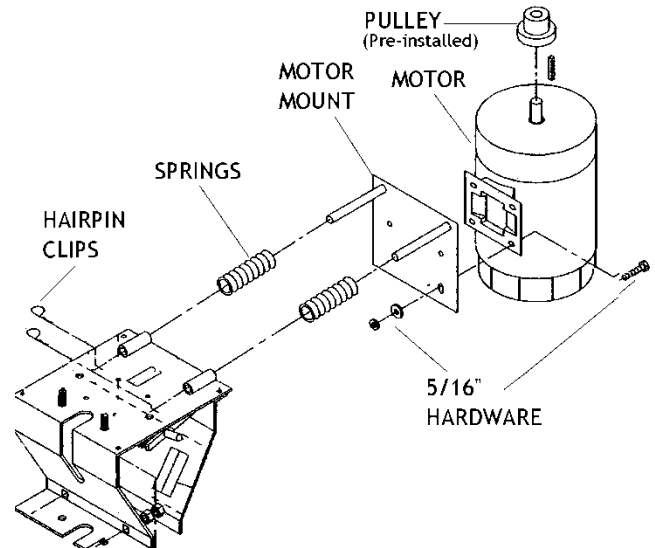


Figure 18-Motor Installation

- 27 Bolt appropriate motor for each carriage onto motor mount with motor pulley facing up. Use 5/16" x 1" bolts and 5/16" flatwashers, lockwashers, and nuts and tighten with 1/2" wrench. **Figure 18.**
- 28 Slide motor mount rods through tubes welded onto carriages from outside of carriage. **Figure 18.**
- 29 Attach motor mount to carriage by inserting hairpin clips from hardware sack into holes on ends of motor mount rods. **Figure 18.**

! DANGER! Failure to secure motor mount with hairpin clips could result in motor falling off machine if belt is not attached, causing death or serious injury.

- 29.1 *Note:* Sequences of motors (beginning with primary carriage and moving outward) are as follows (see page 69 for motor component numbers):

- **Single-Auger Machine:** S
- **Double-Auger Machine:** A-O
- **Triple-Auger Machine, Single Phase:** A-O-O
- **Triple-Auger Machine, Three Phase:** A-B-O
- **Quadruple-Auger Machine:** A-O-B-O
- **Quintuple-Auger Machine:** A-B-O-B-O

VI. Installing Reversing Plates

For part numbers and descriptions of parts referenced in this section, see parts assembly manual, page 53.

- 30 On both ends of crosstube, position reversing plates vertically against weldment on each side of crosstube. **Figure 19.**

30.1 On **Fastir Plus**, position reversing plates on inside of stationary carriage.

See assembled view. Figure 14.

- 31 Bolt reversing plates together using 3/8" x 1-3/4" bolts and 3/8" lockwashers and nuts. Tighten using 9/16" wrench. **Figure 19.**

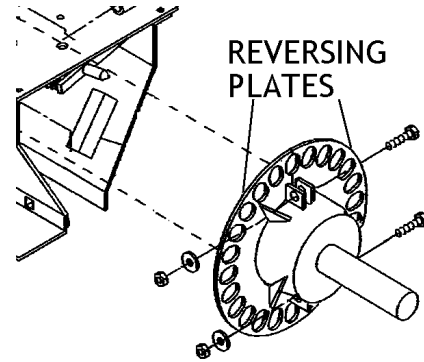


Figure 19 - Reversing Plate Installation

VII. Installing Center Hanger & Related Parts

For part numbers and descriptions of parts referenced in this section, see parts assembly manual, page 53.

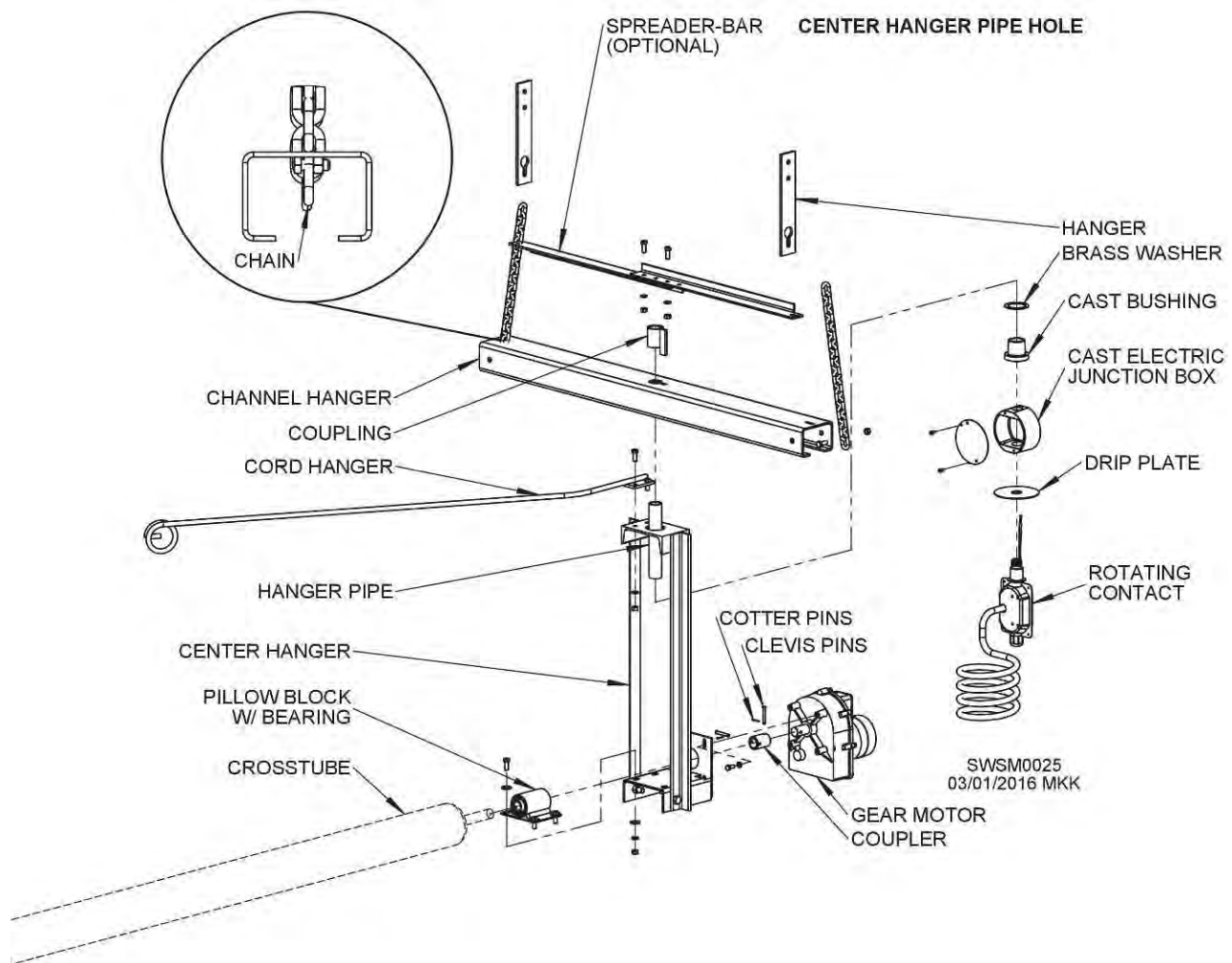


Figure 20 - Center Hanger Assembly

**Note:* Center hanger will not hang straight up and down due to new pivoting hanger. This is normal and will not affect performance.

- 32 Slide pillow block with bearing onto crosstube shaft. Do not tighten set screws at this time.
- 33 Bolt center hanger onto pillow block with 3/8" x 1" bolts and 3/8" flatwashers, lockwashers, and

nuts. Do not tighten until gear motor alignment is correct (step 39). **Figure 20.**

- 34 Remove 5/16" x 3/4" bolts and 5/16" lockwashers provided on gearmotor. Save hardware.

- 35 Remove cotter and clevis pins from holes on 1" tube coupler attached to gearmotor shaft. Save pins. **Figure 20.**
- 36 Slide 1" tube coupler onto crosstube shaft and insert 1/4" x 1-3/4" clevis pin and 1/16" x 3/4" cotter pin from step 35 into holes to connect crosstube shaft and gearmotor. **Figure 20.**
- 37 Insert 5/16" x 3/4" bolts and 5/16" lockwashers from step 34 through holes in center hanger and screw into holes on gearmotor. Check vertical alignment. Tighten using 1/2" wrench. **Figure 20.**
- 38 Adjust gearmotor placement so no binding exists on pins and center hanger and so pillow block and center hanger do not touch tube. **DO NOT ATTEMPT TO ADJUST** gearmotor shaft by tapping on shaft with a hammer.
- 39 Tighten 4 set screws in pillow block bearing (2 on each end) using 1/8" hex (Allen) wrench. Tighten bolts (step 33) using 9/16" wrench. Tighten set screws on pillowblock. **Figure 20.**
- 40 Screw hanger pipe tightly into 1" threaded hole on cast electric junction box.
 - 40.1 **Note: Ensure threads are fully engaged, as they will hold weight of Fastir.** **Figure 20.**
- 41 Slide cast bushing and brass washer onto hanger pipe so they rest on junction box. **Figure 20.**
- 42 Slide end of hanger pipe up through bottom of hole in center hanger so junction box is inside center hanger. **Figure 20, Figure 21.**

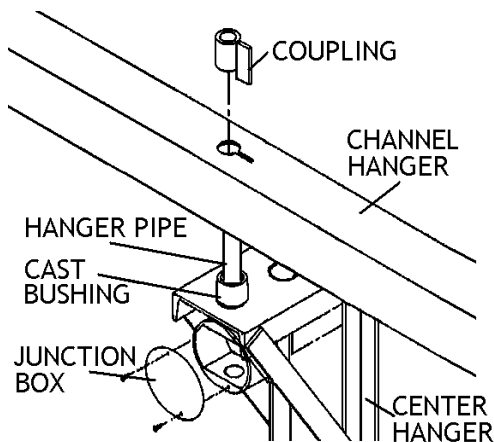


Figure 21 - Placement of Cast Electric Junction Box on Center Hanger

- 42.1 **Note: Do not thread rotating contact into cast electric junction box until machine is raised in bin** (see page 31 for rotating contact instructions). Failure to heed this note can result in rotating contact binding and breaking.
- 43 Slide channel hanger over hanger pipe. **Figure 20, Figure 21.**
- 44 Screw coupling onto hanger pipe ensuring tab on coupling fits in slot on channel hanger. **Figure 20, Figure 21.**

- 45 Thread a liquid-tight elbow (not provided) into top of coupling. Ensure threads are seated properly and tighten well. **Figure 20.**
- 46 Bolt chains onto each end of channel hanger using 3/8" x 1" bolt and 3/8" nut. Tighten using 9/16" wrench. **Figure 20, Figure 22.**
 - 46.1 **Note:** Center hanger will hang slightly tilted. This is normal.

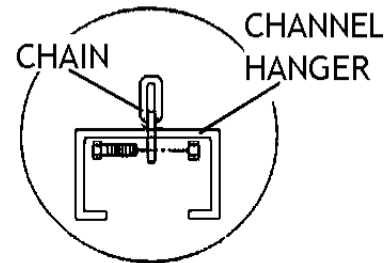


Figure 22 - Chain Placement in Channel Hanger

- 47 Bolt cord hanger to top of center hanger with 5/16" x 1" bolts. Tighten using 1/2" wrench. **Figure 23.**

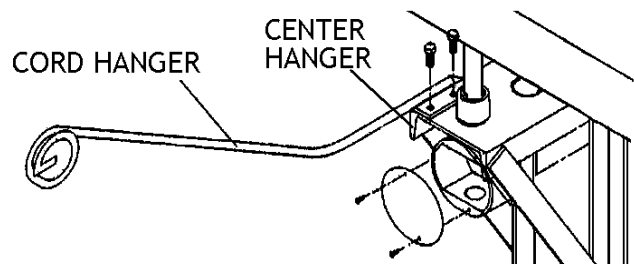


Figure 23 - Cord Hanger Placement on Machine

- 47.1 **Fastir Plus Only:** Bolt cord hanger to bottom plate of stationary outside carriage using existing 1/2" carriage tightening bolts (double nut). **Figure 24.**
- 47.2 **Note:** Position cord hanger behind direction of travel of crosstube to keep cords away from augers.

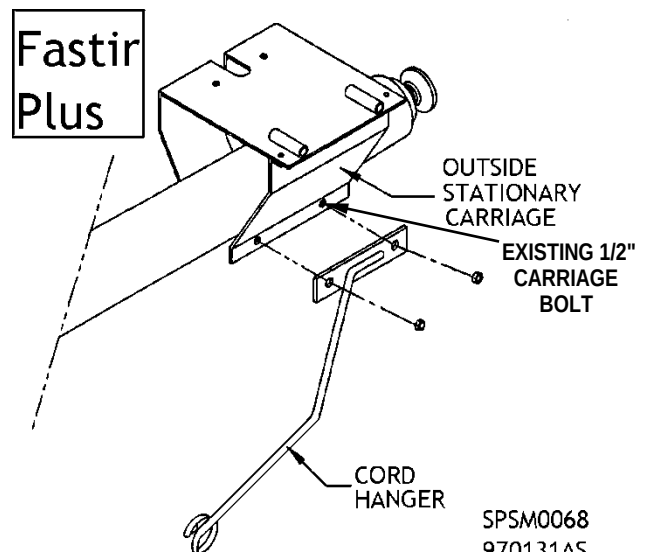


Figure 24 - Cord Hanger Placement on Fastir Plus Unit

VIII. Installing & Adjusting Reversing Mechanism

For part numbers and descriptions of parts referenced in this section, see parts assembly manual, page 53.

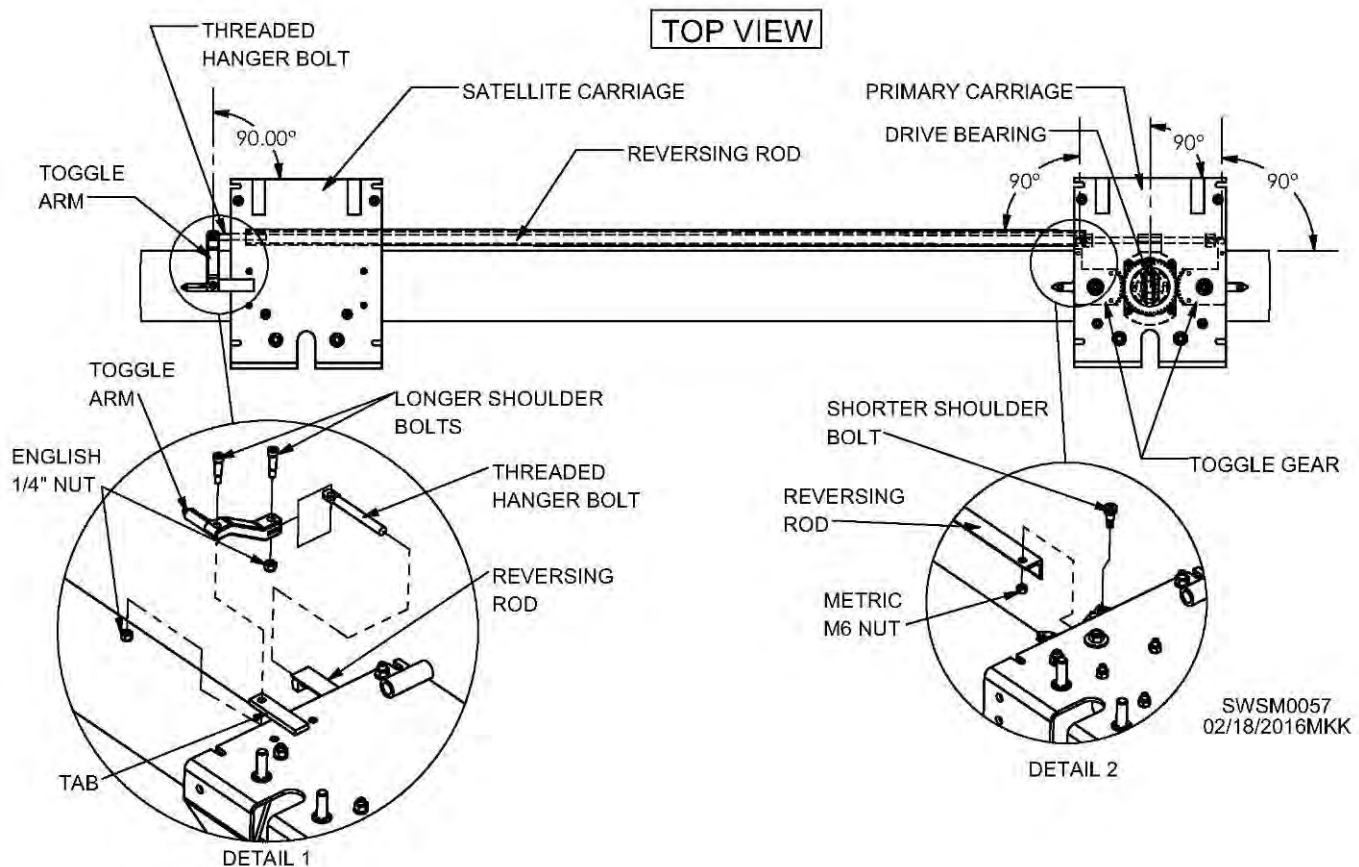


Figure 25 - Reversing Mechanism Installation and Adjustment

48 Ensure reversing mechanism (located on inside top of primary carriage) is timed properly by tripping reversing mechanism out of locking position and moving toggle gears to a “centered” position. **Figure 25.**

48.1 *Note:* In centered position, all components should be parallel with edge of carriage and each other. When timed properly, reversing rod toggle gear (gear closest to bin wall), drive bearing, and primary toggle gear should all be perfectly parallel to edge of carriage. **Figures 42, 43.**

See page 33 for reversing mechanism troubleshooting instructions.

49 On satellite carriage closest to bin wall, bolt toggle arm from parts sack to **top** of tab extending beyond carriage shell using a 5/16” shoulder bolt and 1/4” locking nut. Ensure toggle arm is parallel with edge of satellite carriage **while drive bearing is centered.** **Figure 25, Detail 1.**

50 Feed end of reversing rod with threaded bolt hole through inside of satellite carriages and let sit inside the carriage closest to bin wall. **Figure 25, Detail 1.**

50.1 *Note:* Hole-to-hole length of reversing rod should be checked by consulting appropriate tables on pages 15-18.

51 Bolt opposite end of reversing rod (without threaded bolt hole) to bottom of reversing rod toggle gear on primary carriage using 8 mm shoulder bolt and 6 mm locking nut. **Figure 25, Detail 2.**

51.1 *Note:* A standard 5/32” hex (Allen) wrench will fit this metric shoulder bolt.

52 Screw threaded hanger bolt from parts sack into threaded hole on reversing rod end closest to bin wall until bolt holes on threaded hanger bolt and toggle arm align. **Figure 26.**

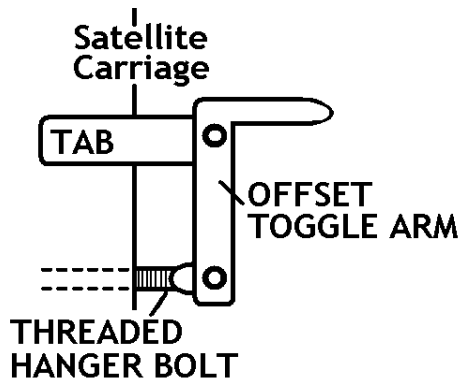


Figure 26 - Satellite-Carriage End of Reversing Mechanism

- 53 Bolt threaded hanger bolt (now screwed into reversing rod) to toggle arm using a 5/16" shoulder bolt and 1/4" locking nut. Ensure reversing mechanism is still in centered position; toggle arm should still be parallel to edge of carriage. **Figure 26.**
- 54 Tighten all 3 shoulder bolts using a 5/32" hex (Allen) wrench and a 7/16" wrench.
- 55 Ensure reversing mechanism can move freely by shifting it from one locked position to the other.

IX. Wiring Gearmotor on Center Hanger

For part numbers and descriptions of parts referenced in this section, see parts assembly manual, page 53.

- 56 Run black 18 ga. 3-wire cord from primary carriage junction box underneath crosstube and tie bar and tie-strap cord to cord support strap.
- 57 Run cord along cord hanger and down side of center hanger, securing cord using provided black zip ties.
- 58 Remove curved cover with Sukup logo on front of gearmotor junction box using 5/16" wrench. Save 1/4" screws.
- 59 Insert 3/8" electrical connector from hardware sack into hole on side of gearmotor junction box. **Figure 27.**
- 60 Tighten metal fastening ring inside of box.
- 61 Thread 3-wire cord through electrical connector, providing a drip loop in cord by motor. Secure 3-wire cord by lightly tightening connector screws using screwdriver.
 - 61.1 *Note:* At this point, there will be 4 wires from gearmotor and 3 wires from 3-wire cord inside gearmotor junction box.
- 62 Connect loose, short white wire with female spade (located in plastic sack on junction box wire) to terminal of capacitor that is included inside gearmotor junction box. **Figure 27.**

- 62.1 *Note:* Sack with white wire should come attached to carriage junction box and also includes yellow wire nuts.
- 62.2 *Note:* In steps 62-66, ensure wires and wire nuts are connected tightly so they do not vibrate out of place during use of machine.

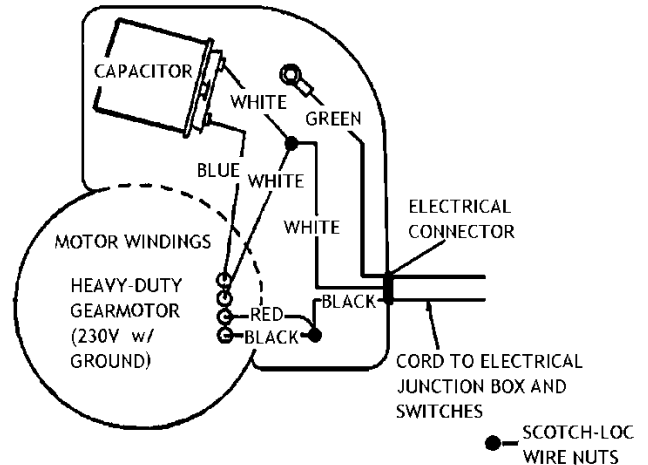


Figure 27 - Gearmotor Junction Box Wiring Diagram

- 63 Connect blue wire with female spade from gearmotor to terminal on opposite side of capacitor. **Figure 27.**
- 64 Strip back 1/2" of rubber insulation on white, red, and black wires from gearmotor using wire stripper.
- 65 Using yellow wire nut from attached part sack, connect:
 - White wire from 3-wire cord
 - White wire from gearmotor
 - White wire from step 62. **Figure 27.**
- 66 Using yellow wire nut from attached part sack, connect:
 - Black wire from 3-wire cord
 - Black wire from gearmotor
 - Red wire from gearmotor. **Figure 27.**
- 67 Secure green ground wire from 3-wire cord under the ground screw inside junction box.
 - 67.1 *Note:* All wires should now be connected somewhere.
- 68 Place capacitor and all wires back into gearmotor junction box.
- 69 Replace cover from step 58 on gearmotor using reserved 1/4" screws and 5/16" wrench.
 - 69.1 *Note:* Ensure wires are not pinched between gearmotor junction box and box cover before tightening cover down.

X. Wiring Motors

For part numbers and descriptions of parts referenced in this section, see parts assembly manual, page 53.

Note: 460V motors are factory-wired without plug-ins due to their high voltage and will not need to be connected.

Note: Single phase, 3-auger units and 4- and 5-auger units must use dual lead rotating contact.

- 70 Position rotating contact about where it threads into cast electric junction box, but **do not thread rotating contact into place until machine is raised in bin** (see pages 28 and 31 for further rotating contact installation instructions).

NOTICE: Failure to heed instruction in Step 70 can result in component damage and failure.

- 71 Run cord(s) from rotating contact up center hanger and out to end of cord hanger alongside 3-wire cord from primary carriage junction box, leaving drip loop near rotating contact. **Figure 28.**

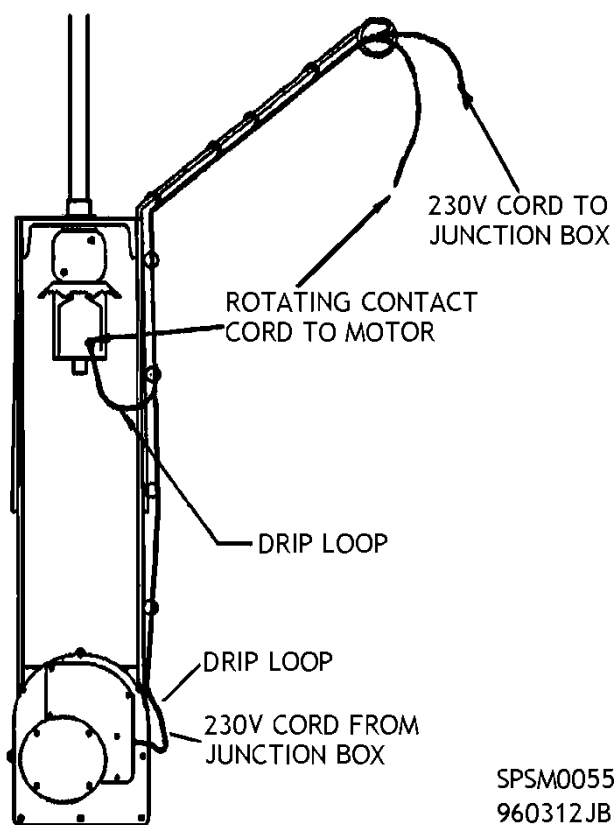


Figure 28 - Cord Placement on Center Hanger

- 72 Connect rotating contact cord plug to plug on appropriate cord coming from "A" or "S" motor on primary carriage. See **Figure 30** on page 27 for cord connection diagrams.

- 73 On 3-auger, single phase and 4- and 5-auger units: Connect second rotating contact cord plug to plug on cord from appropriate satellite carriage motor. **Figure 30**, page 27.
- 74 Secure rotating contact cord(s) to cord hanger and center hanger using provided black zip ties as in step 57.
- 75 Connect plugs on short cord on "A" or "S" motor to short cord on primary junction box. **Figure 30**, page 27.
- 76 On multiple-carriage units: Connect motors using plugs on appropriate cords. **Figure 30**, page 27.

XI. Wiring Tilt Switches on Motors

For part numbers and descriptions of parts referenced in this section, see parts assembly manual, page 53.

- 77 On multiple-carriage units: Connect:

- 2 black wires with male spades on satellite carriage tilt switches to
- Black and white wires with female spades at one end of provided black tilt-switch cord. **Figure 29.**

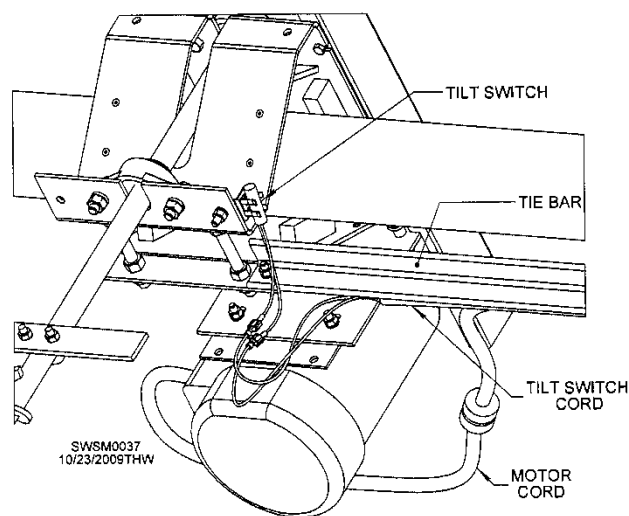
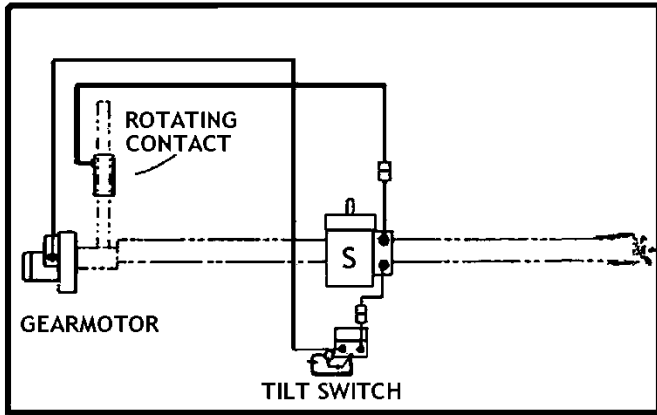


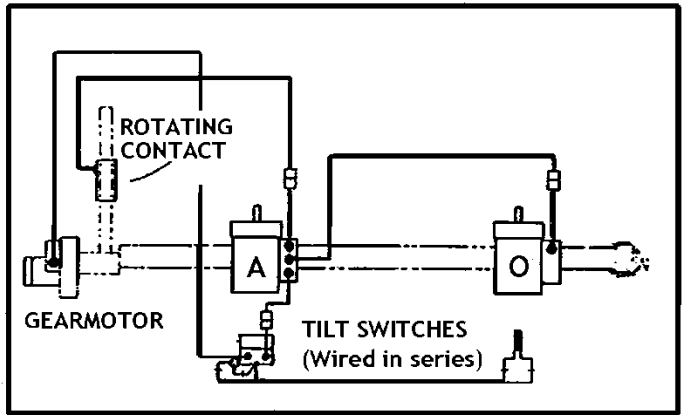
Figure 29 - Bottom, Angle View of Satellite Carriage Tilt Switch Wiring

- 78 Run black motor cord(s) from step 76 and black tilt-switch cord through plastic cord holders (see **Figure 11** on page 14 for plastic cord holder and cord support strap placement).
- 79 Run cords together across tie bar to primary carriage, securing out of way of moving parts using provided black zip ties. **Figure 29.**
- 79.1 *Note:* Leave enough slack in cords that carriages can travel entire length of crosstube.

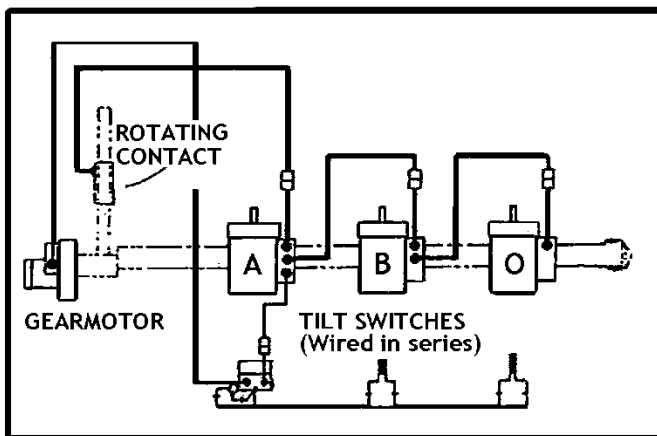
Fastir and Fastir Plus Cord Connections



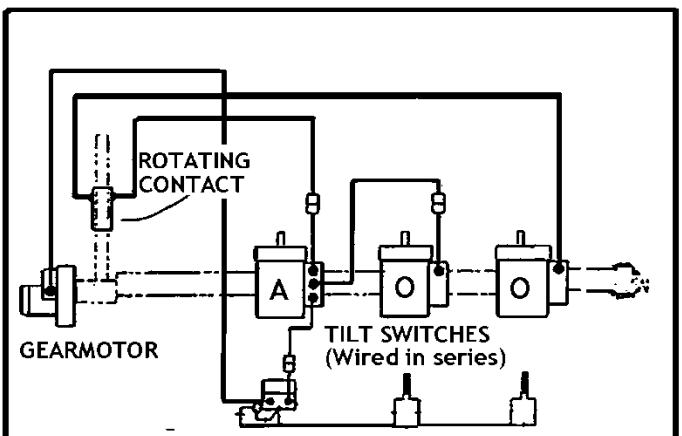
SINGLE AUGER MACHINE



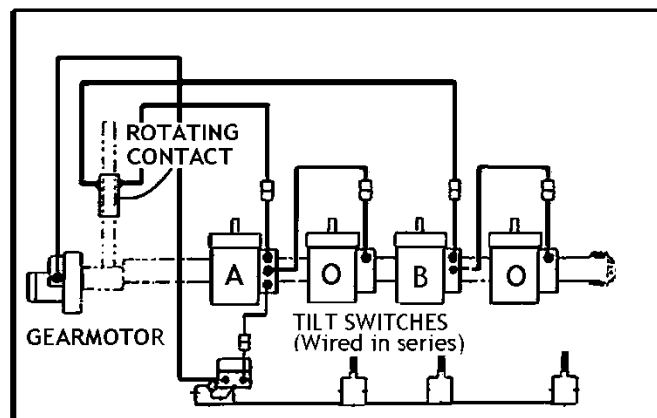
DOUBLE AUGER MACHINE



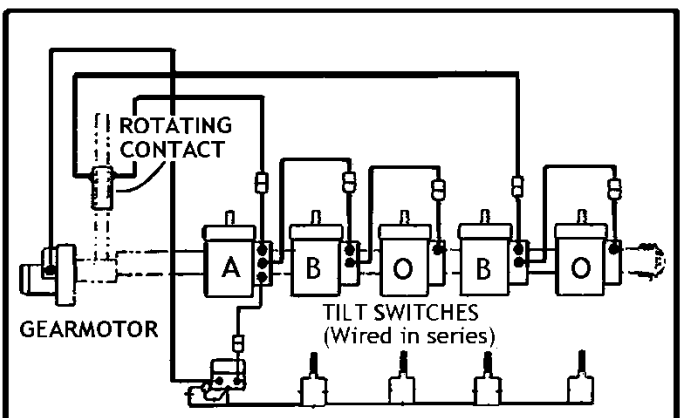
TRIPLE AUGER MACHINE, THREE PHASE



TRIPLE AUGER MACHINE, SINGLE PHASE



QUADRUPLE AUGER MACHINE



QUINTUPLE AUGER MACHINE

Figure 30 - Motor and Tilt Switch Cord Connection Diagrams

Note: Above diagrams are for machines with 230V motors. 460V units are wired directly and have no plugs.

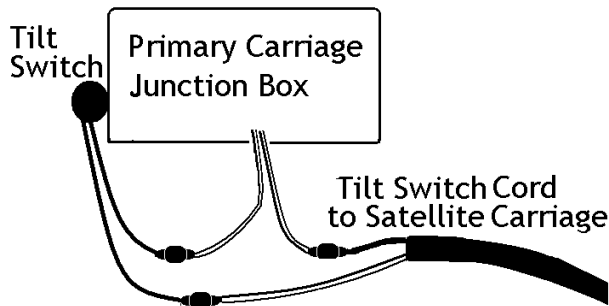


Figure 31 - Primary Carriage Junct Box and Tilt Switch Wiring

80 Connect:

- Black wire with male spade from black tilt-switch cord to
- 1 white wire with female spade from primary carriage junction box. **Figure 31.**

81 Connect:

- White wire with female spade from same end of black tilt-switch cord to
- 1 black wire with male spade from primary carriage tilt switch. **Figure 31.**

82 Connect:

- Female spade on remaining white wire from primary carriage junction box to
- Remaining black wire with male spade from primary carriage tilt switch. **Figure 31.**

XII. Installing Machine

For part numbers and descriptions of parts referenced in this section, see parts assembly manual, page 53.

83 Raise machine to top of bin so that outside drive wheel end rests on track.



WARNING: Keep people away when raising machine with jacks or when working on machine after it is raised. Falling items may cause death or serious injury. Fasten cable to equipment and ensure jacks are securely anchored. Winch should be securely locked before releasing handle. Never permit anyone on or under the equipment being moved or raised.

Cable must be securely fastened to the equipment and to the winch drum. Always ensure cable is pulling straight off the winch and is not in contact with the frame or drum sides. Always prevent cable from rubbing against fixed objects.

Always inspect cable and hook before each use to ensure they are not damaged. Replace cable if it is frayed or kinked. If cable or hook breaks, cable can act like a whip and inflict serious injury to anyone in its path. Never stand alongside cable or guide it by hand. Operate jacks with a firm grip, never with wet or oily hands.

Never leave equipment unattended when hanging by the winch or allow unauthorized persons to operate the winch.

84 Securely wire end of crosstube that rests on track to track in order to avoid movement during machine installation.

85 Bolt hangers to peak ring support band. **Figure 32.**

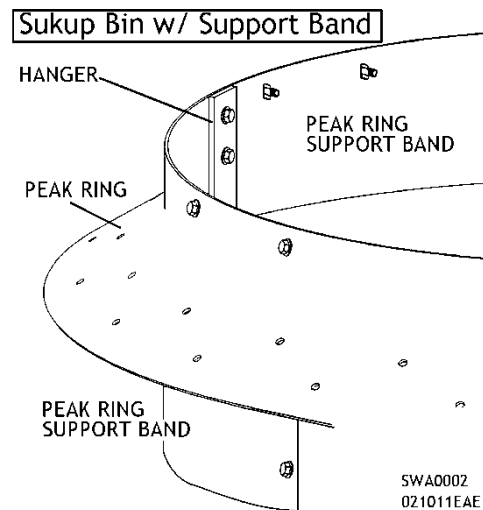


Figure 32 - Preparing Machine for Hanging

85.1 *Note:* In Sukup bins ordered with Fastir units and in all Sukup bins 40' and larger, a support band is located inside the peak ring. In non-Sukup bins, hangers bolt only to peak ring.

86 Bolt chains in hangers using keyhole slots, adjusting chains so crosstube is level. **Figure 33.**

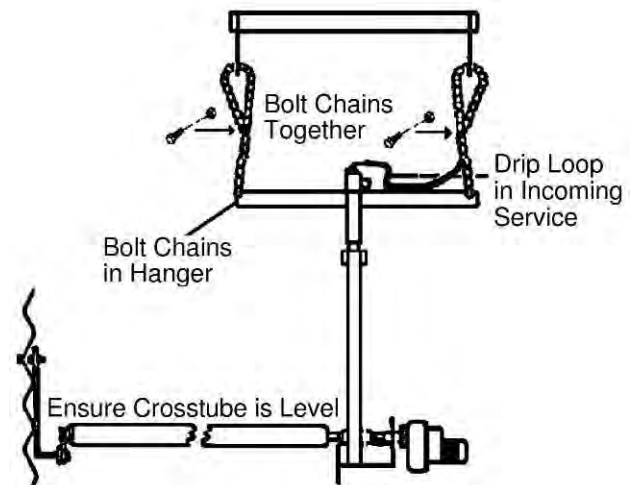


Figure 33 - Leveling Crosstube During Installation

87 Bolt chains together. **Figure 33.**

XIII. Installing Rotating Contact

For part numbers and descriptions of parts referenced in this section, see parts assembly manual, page 53.

- 88 After machine is raised in bin, place drip plate over threaded end of rotating contact so plate opens downward. **Figure 34.**

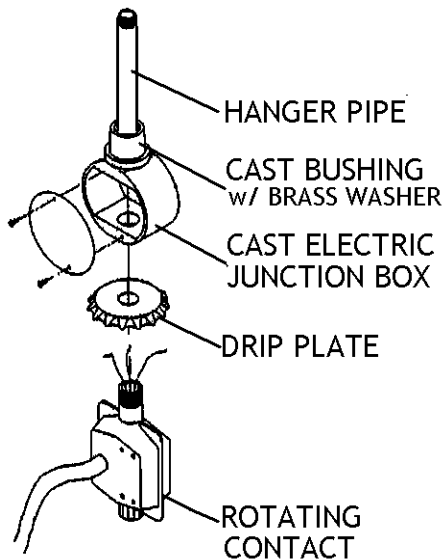


Figure 34 - Rotating Contact Installation

- 89 Tightly thread rotating contact into bottom of cast electric junction box on center hanger. **Figure 34.**

XIV. Installing Optional Spreader-Bar Kit

For part numbers and descriptions of parts referenced in this section, see parts assembly manual, page 53.

On narrow hatch openings, it may be necessary to spread hanger chains to provide clearance for grain spreader fin. The following instructions detail installation of Sukup Manufacturing Co.'s optional spreader bar kit (**Part# A5635**).

- 90 Determine clearance needed and place one bolt in proper hole on spreading bar.

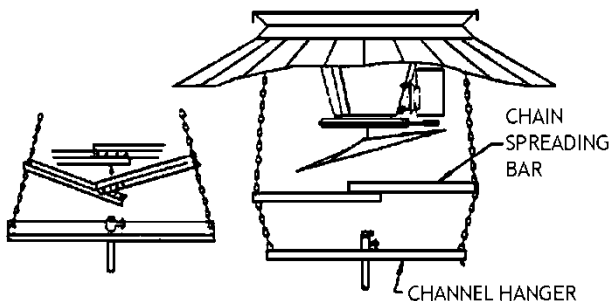


Figure 35 - Placement and Installation of Spreader Bar

- 91 Place slotted ends of spreading bar on chain as shown and force chains apart by pushing bar straight. **Figure 35.**

91.1 *Note:* Ensure spreading bar is far enough below grain spreading fins to avoid fins hitting bar while in position of maximum incline.

- 92 Place second bolt in matching holes on spreading bar and tighten both bolts.
- 93 Ensure crosstube remains level after spreading chains; re-level if needed.

XV. Preparing Down Augers

For part numbers and descriptions of parts referenced in this section, see parts assembly manual, page 53.

Down augers must be 3" to 5" above floor or any unloading equipment that would serve as an obstruction at bin bottom.

DISCLAIMER: Use of down augers longer than 20' will void warranty on stirring machine. Damage to other components as a result of using down augers over 20' will not be the responsibility of Sukup Manufacturing Co.

Sukup Manufacturing Co. makes no warranty, express or implied, with respect to down augers longer than 20', including, without limitation, any warranty of merchantability and warranty of fitness for a particular purpose. The following calculations will help determine down auger cut length.

Down Auger Cut Length

Depending upon your bin setup, you may need 2 different lengths of down augers for proper clearance and operation. Use the following formulas to calculate required down auger length(s).

Note: Final cut length tolerance is **+ or -1.0"**.

CALCULATING DOWN AUGER LENGTH

$$DA = L + (\text{plus}) H - (\text{minus}) \text{Clearance}$$

L: Measure from the top of the track rail to floor of bin.

H: For bins up to 40': **7.5"**
For bins 40' and up: **8.0"**

Clearance: The clearance is the distance from bin floor to bottom of auger taking into account any obstructions such as a sweep. Recommended clearance to any obstruction or floor is 3 to 5 inches.

Note: The far outside auger or stationary auger MAY need to be shorter to clear the sweep drive wheel. **Figure 36.**

Following are dimensions of typical Sukup products to aid in calculating down auger length.

REFERENCE DIMENSIONS OF SUKUP PRODUCTS

Product and Relational Dimensions Needed for Accurate Calculation	Height (Inches)
6" and 8" Sukup powered sweeps	10.0
10" Sukup powered sweeps	11.5
Sukup powered sweep drive wheel	17
Height from cement floor to top of metal floor with standard 13.25" floor supports	13.5
Top of bin sheet to top of rail on pre-punched, non-commercial Sukup bins (Use if track is to be installed on existing horizontal bin sheet bolts.)	7.5

(Examples of calculations shown on next page)

DOWN AUGER LENGTH EXAMPLES

EX1: An **existing** 30' bin will have a FASTIR Triple installed. "L" is measured at 200". There is no sweep and a 4" clearance between the floor and the auger will be used.

$$DA = 200 + 7.5 - 4$$

$$DA = 203.5"$$

EX2: A **new** Sukup 6-ring, 42' farm bin (265" eve height) will have a FASTIR Plus Triple installed during bin assembly. An 8" Sukup powered sweep will be installed on a floor with 13.25" floor supports.

$$L = (265" \text{ eave height}) - (13.5" \text{ for floor}) - (7.5" \text{ for top of sheet to rail})$$

$$L = 265 - 13.5 - 7.5$$

$$L = 244"$$

$$DA = (244" \text{ for L}) + (8.0" \text{ for H}) - (10" \text{ for sweep}) - (4" \text{ for clearance})$$

$$DA = 244 + 8.0 - 10 - 4$$

$$DA = 238"$$

Because a Sukup powered sweep will be installed, the stationary carriage will need a shorter auger.

$$OA = (244" \text{ for L}) + (8.0" \text{ for H}) - (17" \text{ for sweep wheel}) - (4" \text{ for clearance})$$

$$OA = 244 + 8 - 17 - 4$$

$$OA = 231"$$

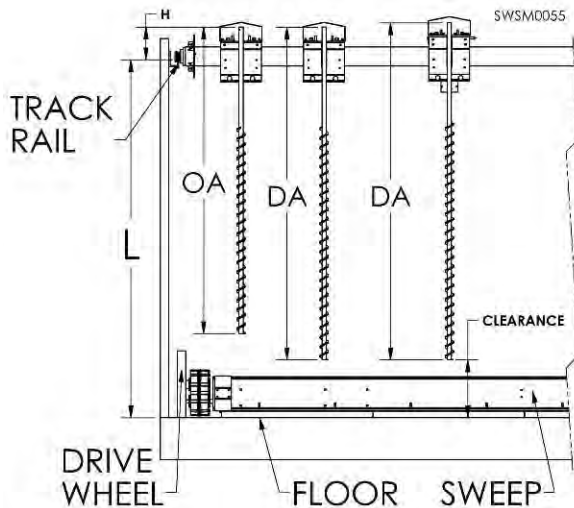


Figure 36 - Down Auger Preparation

94 Mark appropriate position on auger for cut.

95 Weld or braze flighting slightly above point of cut to prevent unraveling.

96 Cut down augers to length.

96.1 *Note:* Down augers should always be cut from bottom.

96.2 *Note:* In some cases, down augers may be cut after installation on machine.

97 Bolt flinger to auger just above auger flighting using 5/16" x 1-3/4" U-Bolt and 5/16" nuts and tighten using 1/2" wrench. **Figure 37.**

98 Slide the following items over top of each auger shaft in the order below:

- Flange bearing (hub up)
- Locking collar for bearing (groove down)
- Flange bearing (hub up)
- Locking collar for bearing (groove down)
- 9" pulley (hub up). **Figure 37.**

98.1 *Note:* If parts will not slide smoothly over shaft, use emery cloth or file to clean shaft.

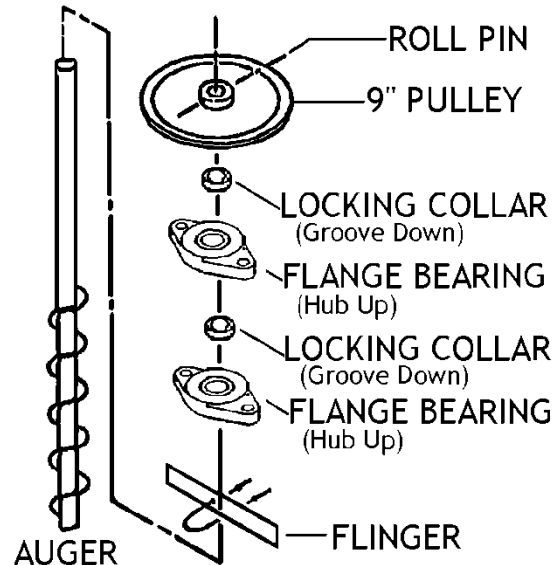


Figure 37 - Down Auger Assembly

99 Attach 9" pulley to top of auger shaft by inserting 5/16" rollpin in hole provided on shaft. **Figure 37.**

100 Slide top locking collar and top flange bearing up against pulley.

101 Position a punch in unused hole on locking collar and **lightly tap** with hammer in direction of shaft rotation to lock flange bearing in place.

101.1 **Note:** Do not overtighten collar – bearing race will crack.

102 Tighten set screw on top locking collar using hex (Allen) wrench.

XVI. Installing Down Augers

For part numbers and descriptions of parts referenced in this section, see parts assembly manual, page 53.

103 Slide auger up through slot in carriage so top bearing rests on two pre-installed 7/16" x 1-1/2" bolts, which point up through top of carriage plate and are secured with push nuts. **Figure 38.**

104 Add 7/16" lockwashers and nuts to pre-installed bolts to bolt top bearing to carriage. Tighten using 11/16" wrench. **Figure 38.**

- 105 Slide bottom bearing down and bolt to carriage with 7/16" x 1-1/4" bolts and 7/16" lockwashers and nuts. Tighten using 11/16" & 5/8" wrenches. **Figure 38.**

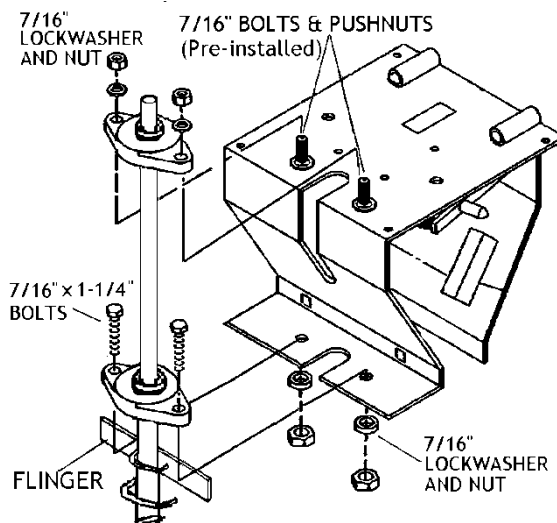


Figure 38 - Installing Down Auger on Carriage

- 106 Position a punch in unused hole on locking collar and **lightly tap** with hammer in direction of shaft rotation (CW when viewed from above).
106.1 Note: Do not overtighten collar - bearing race will crack.
 107 Tighten set screw on bottom locking collar using hex (Allen) wrench.
 108 Ensure there is clearance of approximately 1/4" between down auger and crosstube.
 109 Ensure there is still clearance of approximately 1/16" (thickness of credit card) between crosstube and bearing blocks. **Figure 39.**

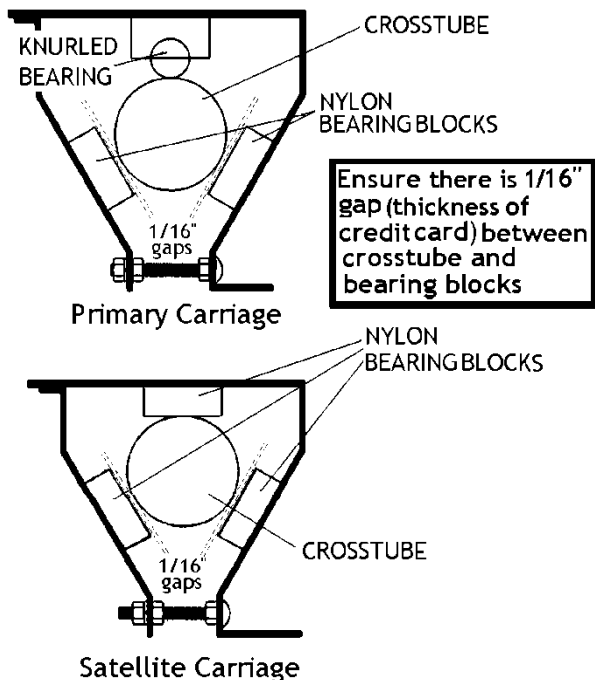


Figure 39 - Side View of Primary and Satellite Carriages

- 110 Mount belts to 9" pulley on down auger and pulley on motor, aligning if necessary.

110.1 *Note:* Pulley should touch bearing lock collar.

- 111 Mount center carriage shields to carriages. Holes in shield must be aligned with slots in corners of top carriage plate.
 112 Bolt center carriage shield to carriage using 1/4" x 1" bolts and tighten using 7/16" wrench.
 113 For **Fastir** unit, bolt on cord support strap and tie-strap cord onto bar of primary carriage. For **Fastir Plus** unit, tie-strap cord to bars of primary and outside satellite carriages.
 114 Bolt plastic cord holders (with black cords through them) onto carriage shields using screws provided with cord holders and tie-strap cord to cord support strap.

Fastir carriages should now appear as in Figure 11 on page 14.

XVII. Final Steps

For part numbers and descriptions of parts referenced in this section, see parts assembly manual, page 53.

- 115 Have electrician provide liquid-tight elbow and drip loop and bring electrical service into cast electric junction box attached to center hanger, wiring to leads of rotating contact. **Figure 40.**

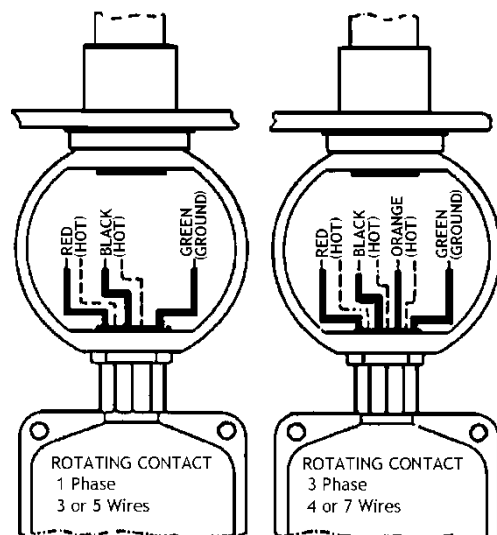


Figure 40 - Rotating Contact Wiring Diagram

Note: See max amps & breaker table on Page 9.

- 116 Have electrician provide an electrical disconnect/on-off switch at top of bin to ensure machine cannot be turned on accidentally during service and for more convenient operation.
 117 Ensure crosstube is unwired before operation (See step 84).
 118 Ensure entire length of track and bin sidewall are free from obstructions that could hinder movement of crosstube or outside carriage and auger around bin.

--- INSTALLATION COMPLETE ---

FASTIR OPERATION GUIDELINES

Sukup Fastir machines benefit in-bin drying by:

- **Eliminating overdried grain layers.** Stirring mixes grain throughout bin.
- **Drying faster.** Stirring allows the use of higher drying temperatures.
- **Increasing drying capacity.** Stirring loosens grain and allows increased airflow through it.

As the machine mixes and loosens bottom layers of grain that are easily overdried, grain may be heated to higher temperatures to achieve faster drying rates without any of the typical effects of overdrying.

I. Operation Procedures

- 1 Start machine when grain is about 30", or one ring, deep.
 - 1.1 **Note: Do NOT wait to start machine when grain bin is nearly or completely full.**
 - 1.2 **Note: When drying grain, center roof opening should be open to release additional moisture from bin.**
- 2 **Never turn off machine while drying grain or when continued filling will take place.** In natural air drying or low temperature drying, do not shut machine off until grain is dry.
- 3 In situations where a multiple-auger machine is used and drying of one bin of grain will take longer than four weeks, operate stirring machine intermittently to reduce grain damage.
 - 3.1 **Note:** The amount of time machine should be operated depends on many factors, such as ambient air temperature and humidity, size of bin, grain type and cleanliness, amount of heat added. Contact your dealer for more information.
- 4 **Do not overfill bin.** Filling must be stopped when distance between top of grain mound and crosstube reaches 18" to prevent belt and motor failure. **Filling above this point voids equipment warranty.**
- 5 Use probe to determine moisture content of crop. When grain first tests dry on the top, grain throughout entire bin may **not** necessarily be dry. Remember, the Sukup stirring machine was designed to move dry grain off the bottom and bring it to the top.
- 6 **After grain has dried, shut off heater. Cool grain and continue stirring.** Ensure grain is thoroughly cooled before shutting off fan. Continue stirring for an additional 48 hours.
 - 6.1 **Note:** Sukup Manufacturing Co. also recommends periodically running stirring machine during winter months if grain is not frozen.

II. Restarting Fastir Machine

Note: Shutting off machine allows grain to "set up" around augers during inactivity. If machine has been idle for more than two days, take care when restarting it by using the following steps:

- 1 Support carriages and prevent distortion of crosstube by setting boards on top of grain as shown in **Figure 41**.

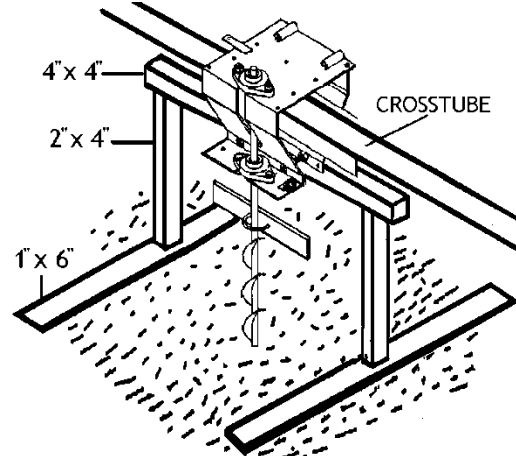


Figure 41 - Carriage Support Setup During Machine Restart

- 2 Before power is applied, loosen down augers by turning clockwise.
- 3 For 230V Units Only: Unplug all motors and start each individually beginning with motor nearest to center of bin.
- 4 Remove boards below carriages before restarting.

III. Fastir Maintenance

Check the following items at the beginning of each drying season:

- Belts aligned and in good condition
- Shields securely in place
- Electrical connections tight and insulated
- Gearmotor and shear pins in good condition
- Down augers not bent, worn out, or otherwise in need of replacement
- Locking collars tight on bearings
- Electrical cords secured out of way of all moving parts
- All bolts and nuts tight
- Hairpin clips inserted through holes on ends of motor mount rods.
- All safety decals in place and in good condition. See **page 7**.

FASTIR TROUBLESHOOTING GUIDE

WARNING: When servicing equipment, never enter bin unless all power is locked out and another person is present. Always LOCK OUT all power and always check with voltage meter before servicing. Failure to do so could result in death or serious injury.

I. Checking Gearmotor

- 1 Set Ohmmeter on RX100 scale to check gearmotor windings for continuity.
 - 1.1 *Note:* Reading between lines should be about 80 ohms from red to blue and 60 ohms from black to white. There should be no reading (infinity) from any of the leads to ground.

II. Bench-Testing Gearmotor

Note: A short pigtail with plug is required to bench-test gearmotor. Cord and plug must be 230V.

Connect wires as follows and as shown below:

- 1 Connect black and red wires from gearmotor windings to black wire of test pigtail.

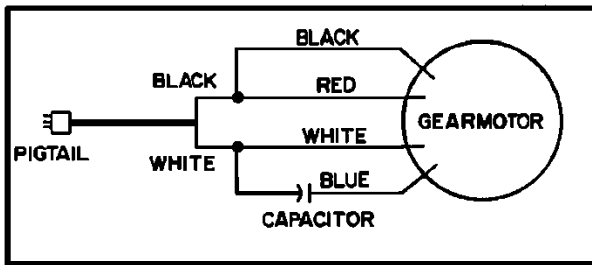


Figure 42 - Gearmotor Bench-Test Wiring Diagram

- 2 Connect blue wire from gearmotor windings to one terminal of capacitor.
- 3 Connect other side of capacitor and white wire from gearmotor to white wire of test pigtail.
- 4 Plug test pigtail into 230V source. If gearmotor does not run, see above section.
- 5 To reverse direction, disconnect pigtail from power source and interchange red and blue wires from gearmotor windings.

III. Checking Capacitor

- 1 Set Ohmmeter on RX100 scale.
- 2 Place leads on terminals of capacitor. This initial connection will slightly charge capacitor.

Note: A constant reading of zero (0) or infinity indicates a bad capacitor.
- 3 Interchange meter leads; Ohmmeter should go to approximately half-scale, and then slowly drop back to infinity.
- 4 Interchange leads again. The same should occur.

IV. Checking Reversing Mechanism

Note: See page 24 for instructions for assembling and adjusting reversing mechanism.

- 1 Align toggle gear arms (A & C) and drive bearing (B) so they are parallel with side of carriage plate. **Figures 42, 43.**

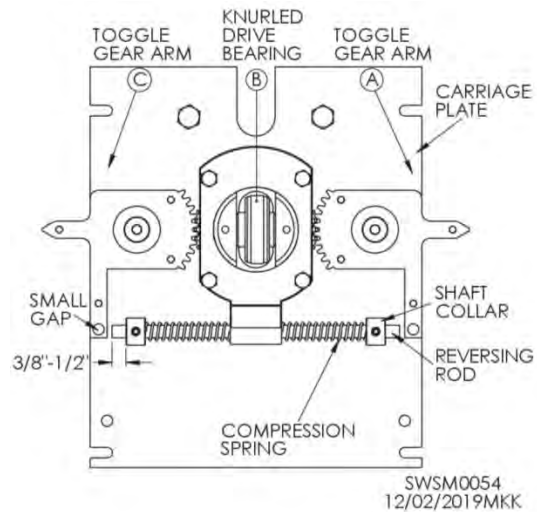


Figure 43 - Aligned Reversing Mechanism

- 2 If arms (A & C) and bearing (B) are not in line:
 - 2.1 Loosen two large carriage bolts on carriage housing.
 - 2.2 Remove housing.
 - 2.3 Remove drive bearing and directional gear assembly.
 - 2.4 Reinstall directional gear between toggle gears so that drive bearing (B), and both toggle gear arms (A & C) are parallel to carriage plate.
 - 2.4.1 *Note:* Ensure thrust bearing in directional gear is in place.
 - 2.4.2 *Note:* Torque toggle gear bolt to 30 ft-lbs.
 - 2.5 Put carriage housing back on and retighten bolts.
- 3 Compression spring should have same measurement on both sides of carriage housing to shaft collar. Ensure distance between shaft collar and end of reversing rod is same on both ends. Distance between reversing rod and arm on toggle gears should also be checked for distance. **Figure 43.**
- 4 Reversing mechanism assembly is aligned **correctly** when angle of knurled center bearing is opposite angle of the two toggle gear arms. **Figure 44.**

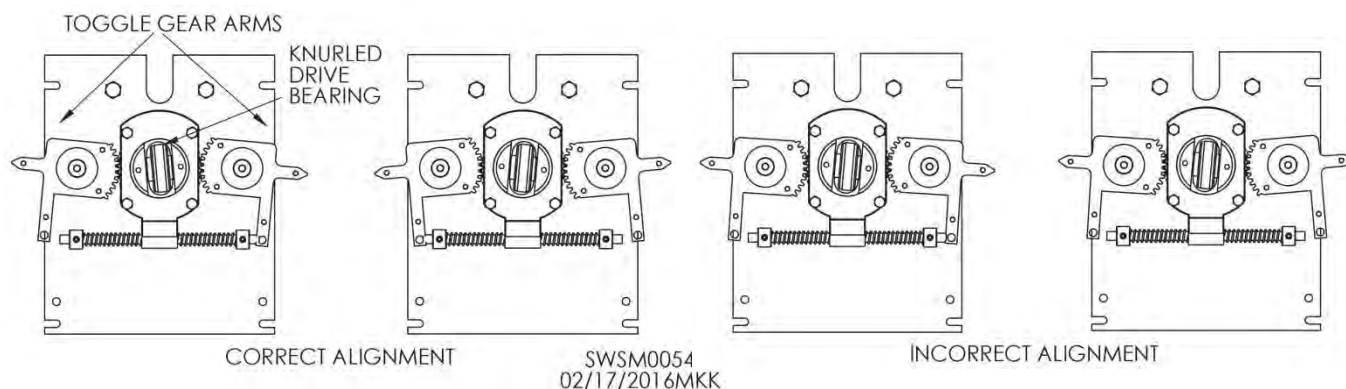


Figure 44 - Alignment of Reversing Mechanism Assembly

Table 9 - Common Fastir Problems and Solutions

Problem	Reason	Solution
Gearmotor not turning while augers are vertical.	No electricity	Check plug-in for proper voltage using voltmeter.
	Automatic thermal overload shut off. 230V to 115V gearmotor or 115V to 230V gearmotor.	Check plug-in for proper voltage Check for binding or obstruction on track or tube.
	Weak thermal overload in field of gearmotor.	Replace field in gearmotor.
	Gears may be out of gearmotor.	Feel if gearmotor is running. If so, gears must be replaced.
	Capacitor bad.	Replace capacitor.
	Tilt switch(es) on augers shutting off gearmotor on center hanger.	Hold down bypass button on junction box. If gearmotor turns, tilt switch is improperly adjusted or faulty. Also check wiring connection.
1-1/2 HP motor not turning.	Thermal overload shut off.	Press reset button. Motor may be running on 115V and must be on 230V (except on 460V units).
1-1/2 HP motor running slow, lacking power.	Wired for 115V or one fuse blown.	Use voltmeter to determine voltage (must be 230V).
Crosstube not turning.	Shearpin sheared on gearmotor.	Replace shearpin.
Crosstube not moving forward on track.	Shearpin sheared on gearmotor.	Replace shearpin.
Machine vibration.	Bent down auger.	Straighten or install new down auger.
Belts breaking.	Belt not properly aligned.	Adjust motor pulley.
	Damaged pulley.	Check pulley and auger shaft for damage and replace if necessary.
Down auger trailing excessively.	Flighting worn off of down auger.	Replace auger.
Machine hitting top of bin.	Track installed too high.	Lower track.
Down auger getting ahead.	Crosstube not traveling around bin. Hard spot or concentrations of fines in center of bin.	Check gearmotor and gears to insure proper function. Replace any damaged part.
Cannot get drying air hot enough.	LP gas vaporizes too slowly.	Provide vaporizer on burner.
Carriage not traveling in or out of crosstube.	Reversing mechanism bearing did not switch completely.	Adjust springs on reversing rod making each side equal. Check detent & spring. Check toggle gear bolt for overtorque. Torque should be approx. 30 ft-lbs.

PRINCIPLES OF GRAIN DRYING

Note: Information that follows includes general guidelines. Seek more specific information from your local extension office or contact Midwest Plan Service, 4306D Ellings Hall, Iowa State University, Ames, Iowa 50011. Email: mwps@iastate.edu

V. Basic Principles

- Air removes water from grain.
- The more airflow through grain, the faster drying occurs.
- The warmer the airflow through grain, the more water can be removed and the faster drying occurs.
- For every 20°F (11°C) increase in drying temperature, relative humidity (RH) is cut by about half.
- The warmer the air, the drier the grain.

The table below illustrates these principles:

Table 10 - Effect of Heating on Grain

Outside Air	Air Temp Heated to	Relative Humidity	Dries Grain to	Drying Ratio
70°F (21°C), 60% RH	No heating	60%	13%	1.0
	90°F (32°C)	31%	8%	2.6
	110°F (43°C)	17%	5%	4.3

As Table 10 shows, simply increasing air temperatures by 20°F (11°C) - from 70°F (21°C) to 90°F (32°C) - cuts relative humidity by half and generates a drying speed 2.6 times faster than original rate. Raising drying temperature by 40°F (22°C) - from 70°F (21°C) to 110°F (43°C) - results in a drying speed that is 4.3 times faster than were no heat added. However, drying grain to 8% or 5% moisture content is very costly and also results in excessive grain damage as bottom layers of grain are over-dried. By incorporating a stirring machine to mix dry grain at bottom of bin with wet, upper grain, desirable average moisture may be obtained. University tests have found that a properly stirred bin will have less than 1% variation in moisture content from top to bottom.

Dry air carries moisture away from grain. Higher airflow rates increase drying rates. Fan speed, motor size and resistance of grain to air determine airflow. Deeper grain depths and higher airflow rates cause higher static pressure against fan. Higher static pressure decreases fan output. Short, wide bins allow grain to dry better than tall, thin bins since there is less grain restriction (static pressure). Tall, thin bins may require 30 times more horsepower than short, wide bins to maintain same airflow. See **Figure 45**.

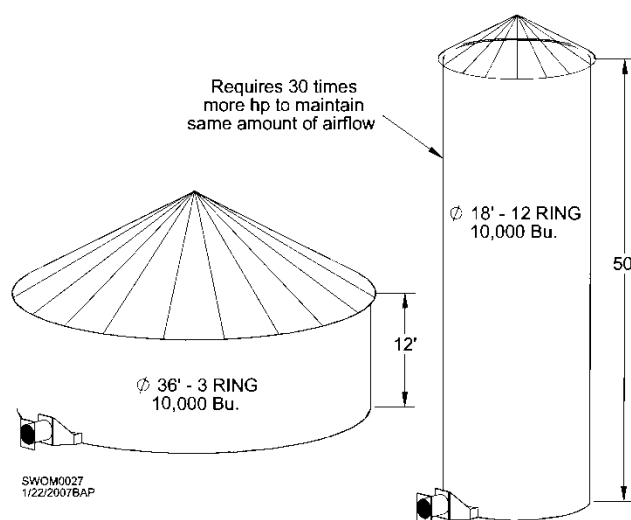


Figure 45 - Requirements for Drying in Different-Sized Bins

As air enters grain it picks up moisture, which cools the air slightly. As air moves through a deep grain mass, the air temperature is gradually lowered and its relative humidity is increased until the air approaches equilibrium with grain. If air reaches equilibrium with grain, it passes through remaining grain without any additional drying. If high relative humidity air enters dry grain mass, moisture is removed from air and enters grain. This slightly dried air will begin to pick up moisture when it reaches wetter grain.

Overdrying

Overdrying grain costs money in two ways: (1) An excessive amount of energy is used to dry the grain. (2) Grain is worth less because of shrinkage.

Table 11 shows extra costs associated with marketing overdried corn. Stirring machines are an excellent way to eliminate overdrying and are essential when a heater is used with a drying bin.

Table 11 - Costs of Marketing Overdried Corn Based on \$1.00=€1.30, \$.06 kW/hr (€0.046 kW/hr) and \$1.00/gal LP (€0.266/L LP)

Moisture Content (%)	Extra Drying Costs		Extra Shrinkage		Total Overdrying	
	Dollars (\$)	Euros (€)	Dollars (\$)	Euros (€)	Dollars (\$)	Euros (€)
14	0.035	0.031	0.044	0.040	0.079	0.071
13	0.061	0.055	0.072	0.065	0.133	0.120
12	0.087	0.078	0.099	0.089	0.186	0.167
11	0.117	0.105	0.126	0.113	0.243	0.218

Grain Cooling

Grain dried with a heater must be cooled. Run fans without heat until air coming out of bin is same temperature as that going in, usually a couple of days. Insufficient cooling of grain will result in moisture condensation and grain spoilage during storage.

Fans

Axial fans are the most common types of fan used for aeration. They require a relatively low initial investment and operate well at static pressures below 3 to 4 inches (76 to 100 mm or 750 pa) water gauge. However, axial fans are noisy, and should be directed away from residences if possible.

Centrifugal fans deliver a fairly consistent airflow over a wide range of static pressures, but require a higher initial investment than axial fans. Centrifugal fans are much quieter and more efficient. When aeration is required for tall bins or small grains that create high static pressures, 3,500-rpm centrifugal fans are recommended.

Use Aeration & Drying Assistant in Sukup Office to ensure optimal fan is selected for the application. If using brochures, select a fan according to the manufacturer's rating tables to deliver required air volume at expected static pressure.

Airflow Requirements

Use Table 12 to help determine airflow needed in specified aeration applications. Requirements are presented in standard and metric units.

Table 12 - Airflow Requirements

Aeration Application		CFM/Bu	m³/hr/MT
Normal Storage		1/20 to 1/5 (usually 1/10)	4 to 15 (usually 8)
Cooling Hot Grain from Dryer *		1/2	38
Cooling in Bin		1/2 to 1 (usually 1/2)	38 to 76
Wet Holding Tank		1/4 to 1/2	19 to 38
Roof Dryer		12 to 22	911 to 1670
In-Bin Drying:	Natural Air	1 to 3	76 to 228
	Low Temp (2°F to 5°F temp rise)	1 to 3	76 to 228
	High Temp (120°F max for corn)	1-1/2 to 5	114 to 380

* If basing airflow on dryer capacity, CFM = 12 x bu/hr capacity of dryer.

Heater Selection

Major factors in heater selection are temperature rise required, type of fuel, heater placement and heater controls. Temperature rise is the difference between ambient (surrounding air) temperature and plenum temperature. Use one of the following formulas to determine heater required:

LP & Natural Gas

$$\text{BTU/Hr.} = \text{Temp. Rise (}^{\circ}\text{F)} \times \text{CFM} \times 1.08$$

$$\text{kW} = \text{Temp. Rise (}^{\circ}\text{C)} \times \text{Cubic meters/hr.} \times .000333$$

$$\text{Temp. Rise (}^{\circ}\text{F)} = \frac{\text{BTU/hr.} \times .93}{\text{CFM}}$$

$$\text{Temp. Rise (}^{\circ}\text{C)} = \frac{\text{kW} \times 3000}{\text{Cubic meters/hr.}}$$

Electric

$$\text{Temp. Rise (}^{\circ}\text{F)} = \frac{\text{kW} \times 3000}{\text{CFM}}$$

$$\text{Temp. Rise (}^{\circ}\text{C)} = \frac{\text{kW} \times 3000}{\text{Cubic meters/hr.}}$$

Very little temperature rise is desired when drying **rice** or **soybeans**, whereas **corn** is often dried with higher temperatures. **Important:** To maintain quality and avoid risk of fire when drying **corn**, in-bin-drying temperature should not exceed 120°F (49°C) for stir drying and 160°F (71°C) for in-bin continuous-flow drying. See Table 13 for maximum air (plenum) temperatures for in-bin drying. Also see Table 15.

Table 13 - Maximum Air (Plenum) Temperatures for Drying Selected Grains*

Grain	Maximum Air (Plenum) Temperatures			
	In-Bin Drying		Seed	
Barley	110°F	43°C	110°F	43°C
Corn	120°F	49°C	110°F	43°C
Flaxseed	120°F	49°C	110°F	43°C
Mustard	110°F	43°C	110°F	43°C
Oats	120°F	49°C	110°F	43°C
Pinto Beans	90°F	32°C	90°F	32°C
Rye	120°F	49°C	110°F	43°C
Soybeans	110°F	43°C	110°F	43°C
Wheat	120°F	49°C	110°F	43°C

*From North Dakota State University (NDSU) extension service, AE 701 (Revised), November 1994.

Note: These are **general guidelines only**. Drying temperatures may need to be lower for your specific situation. Please contact your local extension office for further information.

Heater Controls

Heater efficiency and cost of operation can be improved through proper selection of controls. For continuous flow drying, use high-low or modulating valve control. When two or more fans are used on a bin, use a high-low or thermostat control, which can be controlled through a dual burner control. The following section describes types of heater controls:

Thermostat – A thermostat cycles heater on and off to maintain plenum temperature. It is the least expensive control, but also least efficient. When burner is shut off, fan is blowing outside air into plenum, cooling it off. On-and-off action provides an average plenum temperature based on setting by user, but there is more short-term temperature variability.

High-Low Burner - The high-low control cycles burner from a high setting to a 20°F to 30°F (10°C to 15°C) lower setting to maintain a more uniform plenum temperature. This eliminates extremes in plenum temperatures from a standard thermostat and provides economy of operation. *Note:* Use High-Low Control with a dual burner control when more than one fan and heater is used on bin.

Modulating Valve - The modulating valve provides the most precise temperature control by continuously regulating burner flame to maintain a constant temperature. Modulating valve relies on a capillary tube filled with gas that expands and contracts with changes in plenum temperature. This gas moves a diaphragm controlling LP gas or natural gas pressure to burner.

Humidistat - The humidistat is used with a low-temperature burner and is located in plenum of bin. It cycles burner on and off based on relative humidity to control humidity of drying air.

Fan, Heater and Controller Locations

Proper fan and heater placement is critical so that airflow and heat are evenly distributed under bin floor. By placing a heater downstream between fan and transition, air moves through fan and is heated. Because air expands as it is heated, additional drying capacity is obtained.

Controls must be located between the primary and one of the secondary fan and heater units. When utilizing two or three fan and heater combinations on same bin, a dual or triple burner control must be used. When two or more fans are placed on a bin, use a high-low or thermostat control, which can be controlled through a dual or triple burner control (modulating valve-controlled heaters may **not** be used in any dual or triple applications). Additionally, plenum temperature should be monitored on outboard sides of any dual or triple fan and heater combinations. Sukup Manufacturing Co. suggests that plenum temperature always be monitored all the way around a bin. Checking bin sidewall with a bare hand in plenum area allows easy detection of hot or cold spots.

Illustration below shows appropriate locations for single, dual and triple fan and heater units and their controls.

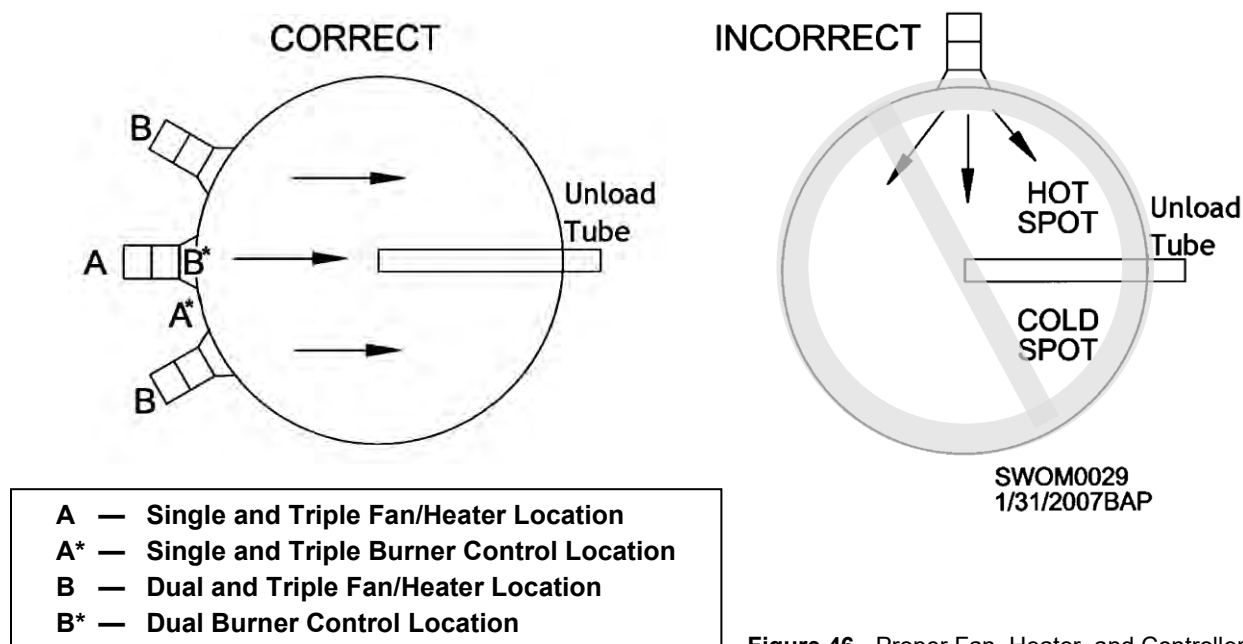


Figure 46 - Proper Fan, Heater, and Controller

Placement on Bins

Note: When triple fans and heaters are used, “A” becomes primary unit. On dual fan and heater units, either unit may be primary.

Air-straightener vanes must be included in axial fan or heater to provide proper burner operation and even heat distribution in bin plenum. Centrifugal fans may be equipped with either upstream or downstream heaters. Either location may be used with low-temperature heaters. For high-temperature operation, downstream heaters are preferred to provide greater drying capacity. Sukup downstream heaters are equipped with adjustable air-deflecting devices so that heat distribution in plenum can be altered if necessary.

Type of Fuel

Use of propane or natural gas is based on availability. Burners for both fuels can be sized to provide required heat. When using propane as a fuel, either liquid or vapor may be used. Generally, a heater must include a vaporizer for liquid propane when ambient temperature is below 32°F (0°C), and 1 million Btu/hr (292 kW) is required. See Sukup heater manual for sizes of propane tanks required when using vapor propane.

If natural gas is preferred, contact gas company to determine whether adequate line pressure is available for operation. Some companies may be unable to provide a sufficient natural gas supply. For high-temperature heaters, 15 psi (100 Kpa) supply pressure while operating is required to reach maximum Btu/hr (kW/hr) capacity from heater. If natural gas company cannot supply this, a heater with larger piping (e.g. 1-1/4” or 31.75 mm) should be used. Electric heaters provide 1°F to 4°F (1°C to 2°C) of temperature rise. LP and natural gas burners usually have lower operating costs than electrical heaters.

VI. Drying Guidelines to Prevent Spoilage along Bin Wall

A large amount of moisture is removed from grain during drying. About 1 gallon of water (3.785 liters) can be removed from one bushel (.029 metric ton) of corn at 25% moisture.

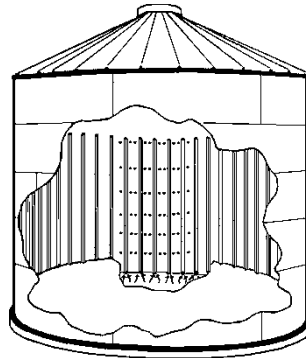
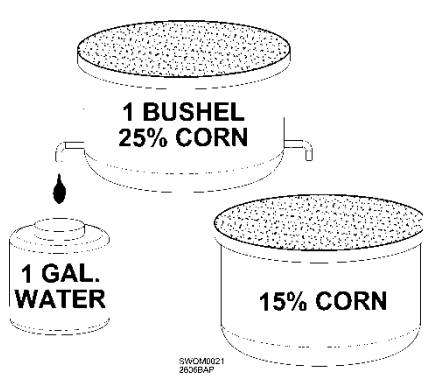


Figure 47 - Sukup Airway System in Bin

With so much moisture present, drying hot grain in bins can cause sidewall condensation. Some of this water condenses on bin wall and causes spoiled grain, especially when high drying temperatures - 100°F (38°C) to 120°F (49°C) - are used while outside temperatures are low. For example, when outside temperatures drop below freezing, ice up to 1/2" thick can form on bin sidewalls. When sun shines

on south side of bin, ice located there melts, but remains on shaded portions of wall. If bin is filled at this time, ice on shaded sides is covered up and remains in bin if grain is believed to be dry and operation of fan and heater is discontinued. When temperature rises, ice will melt and soak into grain, resulting in caking and spoilage of grain. Hard spots in the bin, sour-smelling grain when bin's top hatch is opened, and leakage around middle bin sheets all may indicate this type of problem.

Follow guidelines below to prevent grain spoilage caused by moisture condensation that results from drying. This problem is most severe when drying at higher temperatures in colder climates.

- **-Use bin floors** with perforated flashing to ensure maximum airflow along bin wall.
- **-Fans** should provide a minimum of 1.75 CFM/bu (117 m³/hr./MT) aeration rate when bin is full. Listed below are minimum fan recommendations based on 16' (5M) grain depth and 1.75 CFM/bu (117 m³/hr./MT) aeration rate.

Table 14 - Minimum Fan Recommendations Based on 16' (5 m) Grain Depth & 1.75 CFM/bu (117 m³/hr/MT)

Bin Dia.	Type of Cent. Fan	Fan Qty	Type of Axial Fan	Fan Qty
24'	10 hp	1	28" 10-15 hp	1
27'	15 hp	1	"	1
30'	20 hp	1	"	2
33'	10 hp	2	"	2
36'	10 hp	2	"	2
42'	15 hp	2	"	2
48'	20 hp	2	"	3

- **Install Sukup Airway tubes**, which pipe air from bin plenum to areas along bin wall where it is needed most, working like a defrosting system on a vehicle's windshield. Sukup Airways consist of a system of 10' or 12' triangular, perforated tubes attached every 9" along inside of bin sidewall. Required number of tubes is four times diameter of bin. The main purpose of Airway tubes is to remove moisture condensation and reduce spoilage costs. Tubes work by directing a metered amount of warm air along bin sidewalls. Ensure tubes are not plugged with fines or bees wings and that flashing is punched so tubes extend through flashing to allow maximum airflow. **Figure 47** shows Airway tubes in bin.
- **Completely empty bin before filling with final batch of grain.**
- **Dry grain at no more than 100°F (38°C) on final batch.** In cooling process (after grain is dried) run fan with heater for one (1) day at 50°F (10°C) to cool grain (air should not steam eyeglasses when checked), then run fans with no heat for two (2) days before shutting down system.
- **Run fans and stirring machines with no heat for 24 hours each month** while grain is in storage and only on days in which humidity is 50% or less.

VII. Drying Precautions



WARNING: Read and follow all safety information below. Failure to do so could cause bin fire resulting in death or serious injury.

To Prevent an In-Bin Fire:

- Maximum plenum temperature for in-bin drying without stirring should be no more than 10°F (5°C) above ambient (outside) air. This will help prevent a fire as well as maintain grain quality. See Table 13.

Table 15 - Maximum Plenum Temperatures for Corn Drying

Drying Method	Maximum Plenum Temperature for Corn Drying	
	°F	°C
In-bin Drying without Stirring Machine	10 above outside air temp.	5 above outside air temp.
In-bin Drying with Stirring Machine	120	50
In-bin Continuous Flow Drying	160	70

Note: Temperatures are only recommendations. Drying temperatures for other grains vary due to ambient temperature, moisture content and rate of drying. See Table 13, which shows maximum plenum temperatures for drying other grains and seeds. Consult local extension office for information regarding your specific situation.

- **DO NOT** combine drying equipment from various companies. Sukup heaters are intended to be used with Sukup fans only. Sukup heaters have a variety of automatic controls to shut them down in case of ignition failure, high temperature limits or airflow failure. Combining equipment from various companies may result in a lack of safety controls needed to cut power. Inspect these items regularly for proper operation.
- Keep area beneath perforated floor clean of all fines and foreign material as they may cause a bin fire. For even heat distribution, floor supports should not block transition.
- Grain should be screened before going into bin to remove fines and debris. Use of a grain spreader will help distribute fines.
- Thoroughly ventilating bins with dryer fan before igniting heater will reduce risk of a fire or explosion from leaking fuel.
- Faulty electrical wiring can also cause fire. Be certain components are wired by a qualified electrician.

If Fire is Suspected:

Follow these basic fire-safety procedures to ensure safety for you, your family and employees:

- Always account for all co-workers, neighboring farmers and first responders.
- Shut off gas at heater and supply tank. Shut off fan. Call fire department.
- Keep fire away from fuel supply tanks and keep them cool by spraying water on them if needed.
- Seal fan inlet and any other openings to smother fire.
- Remove fan and heater from transition. Sandbag transition opening. If possible, flood bottom of bin (plenum) with water to a depth of 4" (100 mm) above perforated floor. This will protect steel floor supports and may extinguish fire, depending upon its location.
- If fire is located higher in bin, a long pipe with small holes may be inserted through bin wall or manhole and into grain to direct water at source of fire. This may help keep fire in a centralized location, but it's nearly impossible to extinguish a fire in a grain bin by simply pouring water on it. These fires can only be extinguished by completely emptying bin.
- Take note of bin surroundings to avoid heat transfer onto neighboring structures.
- **ALL GRAIN MUST BE REMOVED FROM BIN TO REACH POINT OF FIRE.** Do not cut holes in bin to remove grain. Do not enter a bin that is on fire. Grain may bury you.
- Grain may smolder for days. Do not restart fan in hope that fire has gone out unless all grain has been removed from bin.

MANAGING STORED GRAIN

I. Basic Principles

Grain will deteriorate faster as temperature and moisture content increase. Using corn as an example, **Table 16** illustrates just how quickly grain can spoil even with proper aeration.

Table 16 - Allowable Storage Times for Aerated, Shelled Corn

Grain Temp		Corn Moisture						
		18%	20%	22%	24%	26%	28%	30%
		Days Before Spoilage						
°F	°C							
30	-1	648	321	190	127	94	74	61
35	2	432	214	126	85	62	49	40
40	4	288	142	84	56	41	32	27
45	7	192	95	56	37	27	21	18
50	10	128	63	37	25	18	14	12
55	13	85	42	25	16	12	9	8
60	16	56	28	17	11	8	7	5
65	18	42	21	13	8	6	5	4
70	21	31	16	9	6	5	4	3
75	24	23	12	7	5	4	3	2
80	27	17	9	5	4	3	2	2

Corn is a perishable commodity with a limited shelf life that depends on its moisture content and temperature. "Shelf life" refers to length of time that aerated, good quality shelled corn can be stored before losing 1/2% of dry matter. With this amount of dry matter decomposition, it is assumed that the corn loses some quality, but maintains its market grade. **For each 10°F (5°C) increase in temperature, storage time is cut in about half when held at a given moisture content.**

Grain moisture content changes with relative humidity of surrounding air. **Table 17** shows moisture content of corn at various temperatures and relative humidity. Contact your local extension office for information on other grains.

Table 17 - Corn Equilibrium Moisture Content

Grain Temp		Relative Humidity								
		10%	20%	30%	40%	50%	60%	70%	80%	90%
		Corn Equilibrium Moisture Content (%)								
°F	°C									
20	-7	9.4	11.1	12.4	13.6	14.8	16.1	17.6	19.4	22.2
25	-4	8.8	10.5	11.9	13.1	14.3	15.6	17.1	19.0	21.8
30	-1	8.3	10.1	11.4	12.7	13.9	15.2	16.7	18.6	21.1
35	2	7.9	9.6	11.0	12.3	13.5	14.8	16.3	18.2	20.8
40	4	7.4	9.2	10.6	11.9	13.1	14.5	16.0	17.9	20.5
45	7	7.1	8.8	10.2	11.5	12.8	14.1	15.7	17.6	20.5
50	10	6.7	8.5	9.9	11.2	12.5	13.8	15.4	17.3	20.2
55	13	6.3	8.2	9.6	10.9	12.2	13.5	15.1	17.0	20.0
60	16	6.0	7.9	9.3	10.6	11.9	13.3	14.8	16.8	19.7
65	18	5.7	7.6	9.0	10.3	11.6	13.0	14.6	16.5	19.5
70	21	5.4	7.3	8.7	10.0	11.4	12.7	14.3	16.3	19.3
75	24	5.1	7.0	8.5	9.8	11.1	12.5	14.1	16.1	19.1
80	27	4.9	6.7	8.2	9.6	10.9	12.3	13.9	15.9	18.9
85	29	4.6	6.5	8.0	9.3	10.7	12.1	13.7	15.7	18.7
90	32	4.4	6.3	7.7	9.1	10.4	11.9	13.5	15.5	18.5
95	35	4.1	6.0	7.5	8.9	10.2	11.7	13.3	15.3	18.4
100	38	3.9	5.8	7.3	8.7	10.0	11.5	13.1	15.1	18.2

Under certain conditions (see Table 17), no matter how long fan is operated, grain may not reach desired moisture content that will allow it to be stored without spoilage. Keep in mind that air temperature and relative humidity are not constant. Use daily averages for determining final moisture content.

Table 18 shows recommended aeration when storing grain for short periods in a wet holding tank at various moisture contents. These rates will only hold grain for lengths of time shown in **Table 16**. If no aeration is provided, grain may deteriorate much faster if small “hot spots” develop, producing heat and moisture that accelerate deterioration. Aeration is intended to prevent hot spots by keeping all grain at same temperature.

Table 18 - Wet Holding Tank Airflow Requirements

Moisture Content (%)				Airflow	
Corn	Soybeans	Wheat	Rice	CFM/Bu	m³/hr/MT
14	10-11	12-13	10	1/10-1/8	8-10
15-17	12-13	14-15	11-12	1/7-1/5	11-15
18-20	14-Max	16-17	13-14	1/4-1/2	19-38

II. Grain Storage

More grain is damaged by improper storage than for any other reason. The most common problems are:

- Inadequate observation of grain during storage - not checking grain frequently.
- Improper grain management - not using aeration to control grain temperature.
- Pockets of fines (broken kernels, weed seeds and debris) restricting airflow and providing food for insects and mold.
- Grain deteriorating because it was held too long without adequate aeration prior to drying.
- Improper cooling of grain after drying. Grain must be dry and cool before storing.
- Poor initial grain quality or insufficient drying to safe moisture content.
- Improper or lack of insect control.

Moisture Content of Grain Storage

The length of time grain can be stored without aeration and the moisture content at which it is stored determine whether there will be significant deterioration. Short-term storage generally refers to storage over winter. Long-term storage spans more seasons. Grain with damaged kernels or with significant amounts of foreign material needs to be stored at moisture levels 1 to 2 percentage points lower than clean grain. Contact local elevator or bin dealer for recommended moisture contents and storage times.

Table 19 shows recommended maximum moisture contents for safe grain storage. Values are for good-quality, clean grain and aerated storage. Reduce moisture content 1% for poor quality grain, such as grain damaged by blight, drought, etc.

Table 19 - Maximum Moisture Content for Safe Storage

Grain	Moisture Content (%)
Shelled Corn & Sorghum	
To be sold as #2 grain or equivalent by Spring	15
To be stored up to 1 year	14
To be stored more than 1 year	13
Small Grains (oats, barley, etc.)	13
Soybeans	
To be sold by spring	14
To be stored up to 1 year	12
Sunflowers	
To be stored up to 6 months	10
To be stored up to 1 year	8
Wheat	13
Rice	12-1/2

Grain should be dried to moisture content required for storage period intended. If problems with bin and/or grain arise, see page 46 for recommended actions. Each of these problems can be minimized with good management. **Aeration must be used to control grain temperature and prevent grain loss.** See Aeration section.

For best results in storing dried grain, an accurate moisture test is needed to determine that grain is dry. Also, an aeration system is necessary for controlling grain temperature. Drying fan can be used for cooling if grain is stored in bin in which it is dried. If grain is to be placed into a different bin, it should be equipped with an aeration system to control grain temperature during storage. It is imperative that grain be cooled during storage to control insects and reduce moisture migration. Moisture content of grain for safe storage depends upon the grain and length of time stored.

Short-Term Storage of Wet Grains

Wet corn is defined as having a moisture content of 16% or higher. Temperatures will not remain constant because wet corn releases heat. Resulting higher temperatures can rapidly lead to corn deterioration due to hot spots. Aeration systems are crucial to prevent this temperature rise. Even with aeration, however, allowable storage time for wet corn is limited, as shown in **Table 16**.

Storage Preparation

Insects are either already in bins before filling takes place or will enter later. Steps below will aid in prevention of insect problems in grain. For more information on insect control, contact local extension office.

- Clean bin thoroughly prior to filling.
- Repair cracks and/or crevices where moisture and insects may enter.
- Avoid filling bin with new crop before removing all of old crop.
- Clean and check aeration system. Foreign material may collect in ducts, creating an insect breeding environment and obstructing airflow.

Grain Condition for Storage

Grain stores best if it is cool, dry and clean. Mold growth depends on temperature and grain moisture content. Grain that contains considerable foreign material or broken kernels will be more susceptible to mold and insects. Such grain should be cleaned to reduce this hazard or be dried to a moisture content level that is 1% to 2% lower than clean grain.

Checking Grain

All stored grain needs to be checked on a regular basis. Check at least bi-weekly during critical fall and spring months when outside air temperatures change rapidly. Check grain at least once a month during winter, but more often if there are problems. Search for small changes that are indicators of potential problems, such as crusting or condensation on bin roof. It may also be necessary to check moisture content of grain with a moisture meter. Check and record temperatures at several points in bin. Any increase in temperature indicates a problem unless outdoor temperatures are warmer than the grain. Testing weight of grain is another way to monitor its quality.

Filling and Coring Bin

Best storage results are obtained when grain is level in bin. Lowering center core of stored grain improves airflow and makes checking grain easier. Leveling can be done with a grain spreader or by withdrawing grain from center after filling.

In most bins, normal grain discharge flow creates a center core that flows directly down to center sump. This creates an inverted cone in surface grain that gradually increases in diameter. As unload continues, grain funnels down center core to center sump.

A bin filled to its peak will not have uniform airflow. Peaked grain is hard to manage and is particularly risky when grain is stored above its safe moisture content. Part of the peak in all bins should be removed by coring. It is important to core bins filled with moist grain, especially if bin does not have a grain spreader that levels the surface and spreads fines and trash. Coring will remove the majority of fines and foreign material because most fines tend to accumulate in center of bin. This is important since fines are more susceptible to spoilage and will restrict airflow. This practice improves airflow through grain, which reduces chance of spoilage and helps aeration fans work more efficiently.

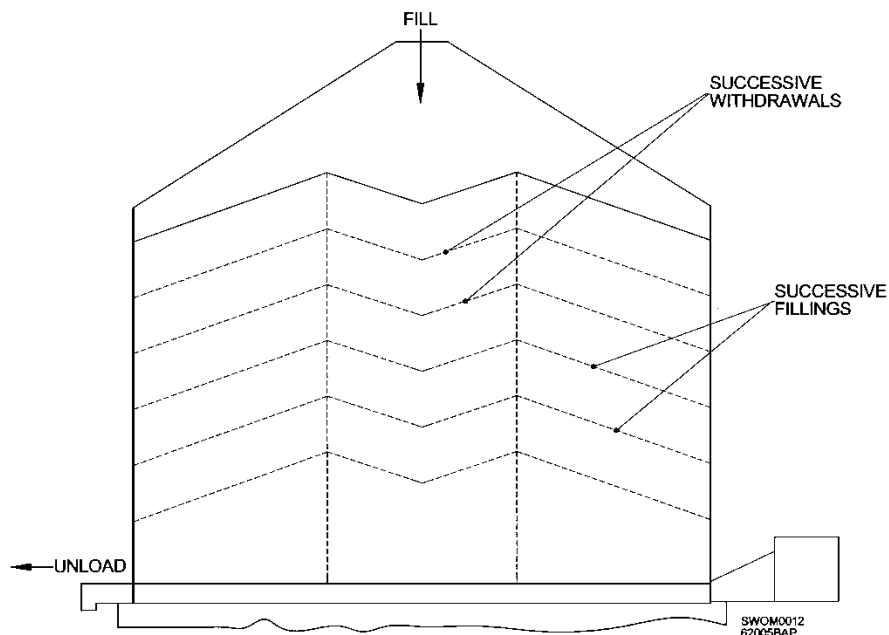


Figure 48 - Bin Coring Diagram

Coring is done by unloading grain periodically while bin is being filled. Pull down peak after several feet of new grain is added. See **Figure 48**. **Note: Do not fill and core bin simultaneously.** Coring periodically during initial filling will remove a major portion of fines and foreign material. Coring after bin is filled will remove some fines, but not as much as coring periodically when filling.

When coring a bin after filling is complete, remove about half the peak height for improved aeration. After coring, top of grain should be visually inspected to ensure an inverted cone has been created as shown in **Figure 48**. If no cone is created, bridging of grain has occurred and a very unsafe condition has been created. Do **not** enter bin until bridging situation has been safely corrected.

Moisture Migration

Crops are normally placed in storage at temperatures much warmer than winter temperatures. Since grains are good insulators, grain in center of bin will be at same temperature as at harvest, even after outside temperatures have dropped well below freezing. This temperature differential causes moisture migration.

Air near bin wall cools and sinks to bottom of bin, pushing air up in center. When grain near surface cools warmer air, moisture in the air condenses. Cool air cannot hold as much moisture as warm air. As this circulation continues, moisture begins to accumulate near top center of bin (as shown in **Figure 49**) and crusting may occur, indicating moisture accumulation and mold growth. An aeration system cools grain uniformly, limiting moisture migration. In spring and summer months when outside air warms up, moisture migration may occur in opposite way and moisture will accumulate at bottom of bin.

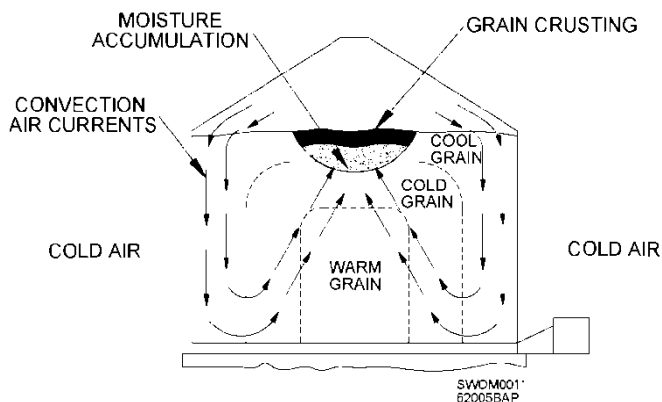


Figure 49 - In-Bin Moisture Migration

Accessories and Practices for proper grain storage:

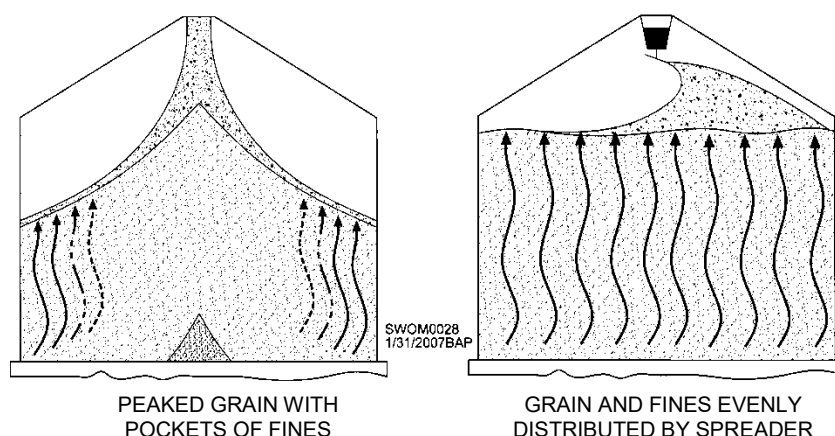
Properly Installed Transitions will prevent pressure loss and air loss. Outlet area of transition must be adequate for airflow produced by fan. Transition's shape should provide a smooth airflow without any abrupt direction changes. Transition must be properly sealed at both ends to prevent air loss. If any bin stiffeners need to be cut to install transition, suitable alternative support must be provided to prevent bin wall collapse.

Cleaning grain before storing improves storage. Fines, foreign material and broken kernels can create grain storage problems. Kernels break during harvesting and handling. Select a grain cleaner that collects and conveys screenings away. The most common locations are at receiving, after dryer just before delivery to storage, and at load-out. Cleaning is easier at low flow rates. Coring bin also will remove a major portion of fines and foreign material.

Roof vents ensure proper airflow and prevent snow and rain from entering bin. Roof vents also increase efficiency of aeration system and should always be used in drying. Without adequate open area to let air and moisture out of bin, aeration or drying system will not work sufficiently. There should be a 1ft² (.093 M²) opening for every 1500 CFM (2550 m³/hr.) that fan will produce. Have at least 1" (25.4 mm) eave opening. Keep center cap and manhole open during cooling and drying, but closed during storage. Also, roof vents need to be cleaned of dust and debris after each season to prevent roof damage.

Grain Spreaders are available for bins up to 60' diameter and provide a more level grain surface in bin. Peaked grain produces uneven airflow in bin. Also, fines and foreign material in grain tend to gather in center of bin. These fines contribute to airflow resistance. Properly adjusted and operated grain spreaders will leave top surface of grain closer to level, with fines and foreign material more evenly distributed throughout grain mass. Level surface and more evenly distributed fines result in uniform airflow throughout the bin. See Figure 50.

Figure 50 - Effect of Spreaders on Peaked Grain



III. Aeration

The objective of aeration is to maintain uniform temperature in the grain to prevent hot spots that accelerate spoilage. Ideally a fully perforated floor would be used. However, aeration ducts may be used for structures storing only cool, dry grain.

Since most problems develop in center of bin and grain will cool naturally near wall, aeration system must at least provide good airflow in center of structure. If ducts placed directly on floor of structure are to be held in place by grain, be sure grain is loaded directly on top of duct to prevent movement and damage to ducts. Duct must be strong enough to support grain regardless of its shape or material used. Ensure airflow rate for aeration (storage) is 1/20 to 1/5 CFM/bu, usually 1/10 CFM/bu (4 to 15 m³/hr./MT, usually 8).

Cooling Grain for Winter Storage

Grain should be kept near average outdoor temperature during fall. Increasing airflow rate reduces time needed for cooling or warming, but also increases power requirement. **Begin aeration to reduce grain temperature when average outdoor temperature is about 10°F to 15°F (6°C to 8°C) lower than grain temperature.** The average outdoor temperature is the average daily high/low. You can estimate when a cooling or warming cycle has passed through the grain by measuring the temperature. **Repeat this cycle** as often as necessary, checking temperature at several locations, **until grain has cooled to 35°F to 45°F (2°C to 7°C).**

For pressure systems, check temperature at top of grain. For suction, check temperature coming out of fan. **Be sure to continue each aeration cycle until cooling front has moved completely through grain.** This minimizes the chance for a moisture front within the grain mass to cause spoilage. **Table 20** shows length of time required to change grain temperature. To be sure cooling front has passed through grain, check grain and air temperature.

Table 20 - Approximate Grain Cooling or Warming Times

Airflow Rate		Fan Hours by Season		
CFM/Bu	m³/hr/MT	Fall	Winter	Spring
1/20	4	300	400	240
1/10	8	150	200	120
1/5	15	75	100	60
1/4	19	60	80	48
1/3	25	45	61	36
1/2	38	30	40	24
3/4	57	20	27	16
1	76	15	20	12
1-1/4	95	12	16	10
1-1/2	114	10	13	8

DO NOT FREEZE GRAIN due to problems it can create, particularly during warming and in larger bins. Condensation during aeration can be a problem in grain cooled below freezing. It will be difficult to warm grain in spring without condensation immediately freezing into ice. Frozen chunks block aeration warming cycles and grain unloading. **NOTICE: Condensation also re-wets grain and can cause sudden bin failure and collapse due to expansion of kernels.** If grain does freeze, begin thawing it once the average outdoor temperature is 10° to 15° F (6° to 8°C) above grain temperature. Follow steps outlined in segment below. **NOTICE: Failure to follow instructions for thawing frozen grain may result in sudden bin collapse and failure.**

Managing Grain in Spring and Summer

Start fan when average outdoor temperature is 10° to 15° F (6° to 8° C) above grain temperature. Once warm-up cycle is started, do not turn fan off. Stopping the warming front before a cycle is completed encourages condensation of moisture and spoilage. As outside temperatures continue to rise, repeat this cycle as often as needed until average grain temperature is 50° to 60° F (10° to 16° C). **Maintain grain temp. within 10° - 15° F (5° to 8° C) of the average monthly temp.** Do not warm grain to summer temperatures above 60 F (16 C) in the southern U.S. or 50 F (10 C) in the northern U.S. due to insect infestation and other storage issues.

IV. Addressing Grain Storage Problems

Stirring machines provide an ideal solution to many common grain storage problems. The table below details some of the problems of grain management that can arise and the action you should take.

Table 21 - Common Grain Storage Problems and Recommended Action

Observation	Probable Cause	Recommended Action
- Musty or spoiled grain odor. - Hard layer or core grain below. - Surface grain wet or slimy. - Grain is sticking or frozen together. - Hard surface crust, caked, and blocking airflow.	Heating moisture accumulation or moisture migration occurring.	Run fan without heater and turn on stirring machine.

V. Bin System Upkeep

Grain bin and equipment maintenance before and during harvest season will help ensure that good quality grain will be stored and preserved. Bin will provide many years of extended service if properly maintained. Use following guidelines as a checklist of maintenance inspections that should be performed on a regular basis.



WARNING: Damage from lack of bin maintenance may cause sudden structural failure and collapse, which may result in death or serious injury. Frequently monitor and inspect bin and foundation for any deflections, cracks or deviations that may occur. Follow operation and maintenance instructions described in this manual.

Roof, Stairs, & Vents

- **Clean debris from bin roof, peak ring, roof vents, and stairs at end of each harvest season.** Dust and debris can cause damage to roof as well as make steps and rungs slippery and unsafe to walk on. Not cleaning debris above roof vents can cause white and brown rust to develop on galvanized metal.
- If an excessive amount of heavy snow accumulates or builds up unevenly on one side of roof, it must be removed immediately.
- **Important:** Inspect bin roof and sidewall for leaks, loose or sheared bolts, and rust or other corrosion. Caulk any cracks, replace and tighten all missing bolts and nuts, and remove rust or corrosion with wire brush and paint over tainted area. If problem is severe, contact Sukup Manufacturing customer service and your dealer.
- Ensure proper function of attachments to all bin openings such as manhole and center caps. Ensure all latches and hold-down clips are used as intended. Also, ensure cap has weather-tight seal and is in correct position if overhead conveyor is mounted. Spouts require roof cap to be permanently fixed.
- Tighten any loose bolts used to attach roof steps to roof ribs and, if necessary, install handrails to increase worker safety. Also, ensure roof ring expanders and splices are in their correct position and properly tightened. Because of workers being at extensive heights, it is important that all roof components be rigid.
- Whenever on the roof, inspect all panels, supporting ribs, stairs, steps, vents, and especially all connections to ensure accidents do not occur. Roof vents should be checked for blockage caused by dirt, dust, debris, frost, ice, bird nests, etc. Clean any debris to allow free airflow and prevent damage to the roof.

Ladders, Catwalks, & Supports

- Ensure access ladders and platforms are intact and securely fastened to bin, and that safety cages are securely attached.
- Catwalks are often supported by steel structures bolted to bin sidewall. Check all connections between the catwalks and the supports often. Bent braces, loose bolts and sidewall damage can be extremely dangerous.
- While climbing ladder, check for any worn-out or loose rungs, loose or missing bolts, and dangerous jagged edges protruding from the ladder or safety cage. Determine cause and fix or replace. Contact Sukup Manufacturing Co. if sheared bolts are discovered, as they may be an indication of a more serious problem.

Sidewall Sheets, Stiffeners, & Doors

- **Inspect bin exterior regularly.** Check for missing bolts, buckled or torn sheets, sidewall bulges, and any unusual changes in bin's appearance. Pay particular attention to bolted joints, noting any waviness along edges, elongated bolt holes, or cracks, all of which are signs of over-stress. If a serious structural problem is detected, contact Sukup Manufacturing Co. customer service and an independent consulting engineer.
- Shim all stiffener base plates if void appears between base plate and concrete. Also, ensure each stiffener base is correctly anchored to foundation. If base plate is not bearing uniformly on concrete foundation, it may cause stiffener buckling somewhere above the base.
- Visually inspect stiffeners and splices to ensure there are no gaps. Improperly connected stiffeners will cause sidewall and stiffener buckling. Ensure base is level on concrete, all bolts and nuts are tight, and stiffeners are supported through an aeration tunnel.
- Ensure door is correctly installed and caulked. Check corrugation around door to ensure a watertight seal. Before filling bin, lock inner doors tight against frame to ensure no structural damage occurs

Foundations

- Inspect bins and foundations for structural problems. Uneven foundation settlement can cause gaps at bottom of bin, resulting in spilled grain, entry points for water, insects and rodents, and exits for forced air, reducing efficiency and increasing costs.
- **Inspect concrete routinely for exposed rebar, unusual cracking, or spalling of concrete.**
- Ensure all anchor bolts are tightened and undamaged. Cracks that develop around anchor bolts result in the bin being susceptible to wind damage.
- Ensure base of bin is uniformly resting on the foundation and sealant is intact. If gaps occur, caulk between bottom of bin and the foundation.

Electrical

- Inspect wiring of fans and other electrical components for corrosion and cracked, frayed, or broken insulation. Exposed wiring should be run through waterproof, dust-tight conduit. Avoid kinks in conduit and ensure all connections are secure.
- Check control boxes for rodent damage. If found, clean and repair or replace broken wiring, relays and other components, and close opening(s) that allowed rodent entry.

Bin Site Maintenance

- Remove any spilled grain from bin site. Mow around bins to reduce likelihood of insect or rodent infestation and ensure water drains away from bin foundations. Items or debris left near bin site may interfere with safe, unobstructed movement around the bin.
- Treat outside of bin at foundation and around door, ducts and fans with insecticide if an insect problem arises.
- Thoroughly clean all bins by removing all old grain. Do not place new grain on top of old. This will help prevent mold and insect infestation of new grain. Remove all traces of old grain from combines, truck beds, grain carts, augers and any other equipment used for harvesting.
- Remove all rust and apply rust-inhibiting primer or paint to affected areas. Removing corrosion in its early stages is better than having rust streaks running down the bin.
- If you find buckled sheets, sidewall bulges or any unusual changes in bin's appearance, please contact Sukup Manufacturing Co. customer service if bin is still under warranty, or an independent consulting engineer to determine problem and find a solution.

Replacement Parts

To replace any deteriorated parts such as bin sheets and flooring, contact your local dealer/distributor. **Do not substitute materials for replacement parts.** Your bin is assembled with certain materials of specific thickness. Do not replace parts without consulting your dealer.

Prior to equipment use, please check that all decals are in place according to this manual and are legible. Safety decals are available for replacement at no charge for Sukup equipment. See Safety Section of this manual. Please specify decal number when requesting replacements.

The grain management information contained in this manual includes general guidelines that come from the sources listed below. Your specific situation may require additional procedures or attention. Seek advice for your specific operation from your local extension office or consulting engineer, or contact Midwest Plan Service, 4306D Ellings, Iowa State University, Ames, Iowa 50011. Email: mwps@iastate.edu

References:

- MWPS-22 Grain Drying, Handling, and Storage Handbook
- ASAE Standard S412.3 Feb '03, St. Joseph, Mich.
- AED-20 Managing Dry Grain in Storage
- Extension Offices at Iowa State University, North Dakota State University, Purdue University, University of Kentucky, University of Missouri

APPENDIX A - WIRING DIAGRAMS

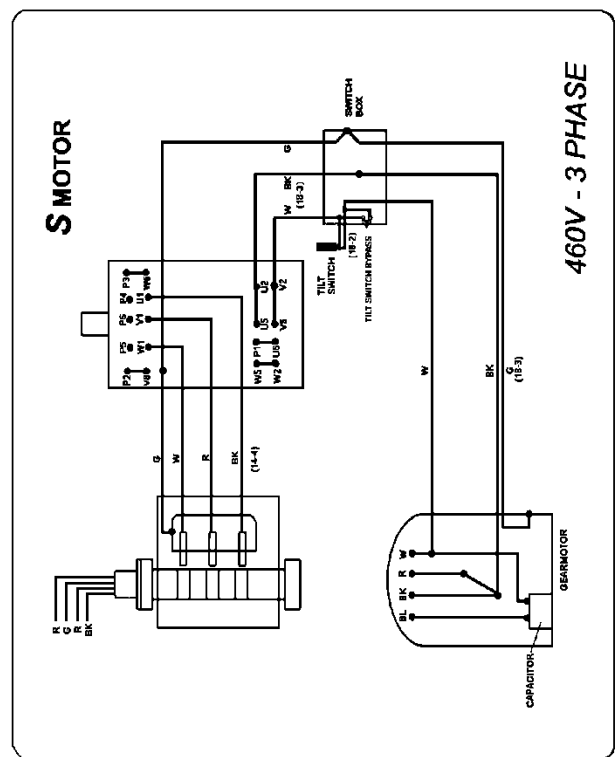
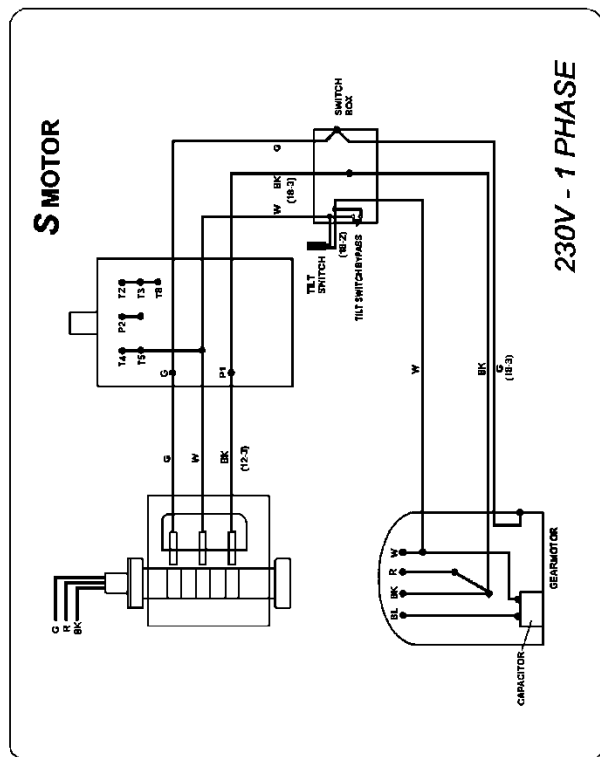
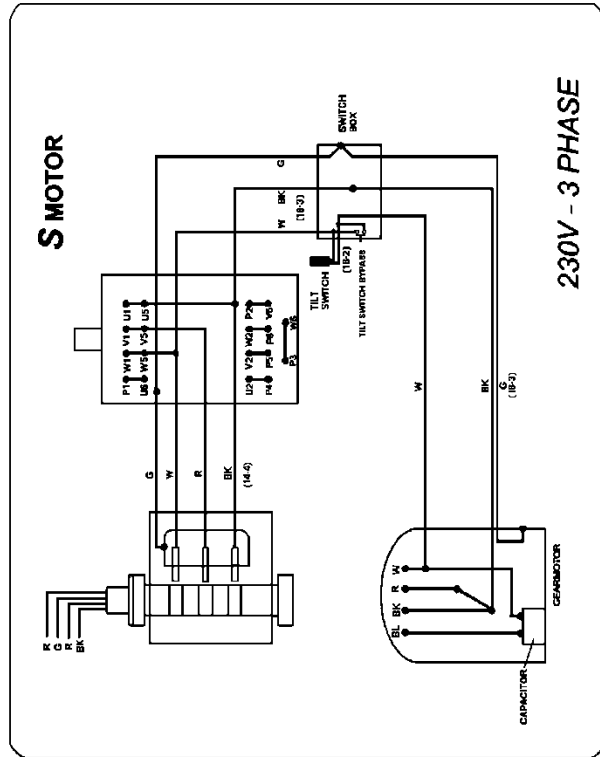
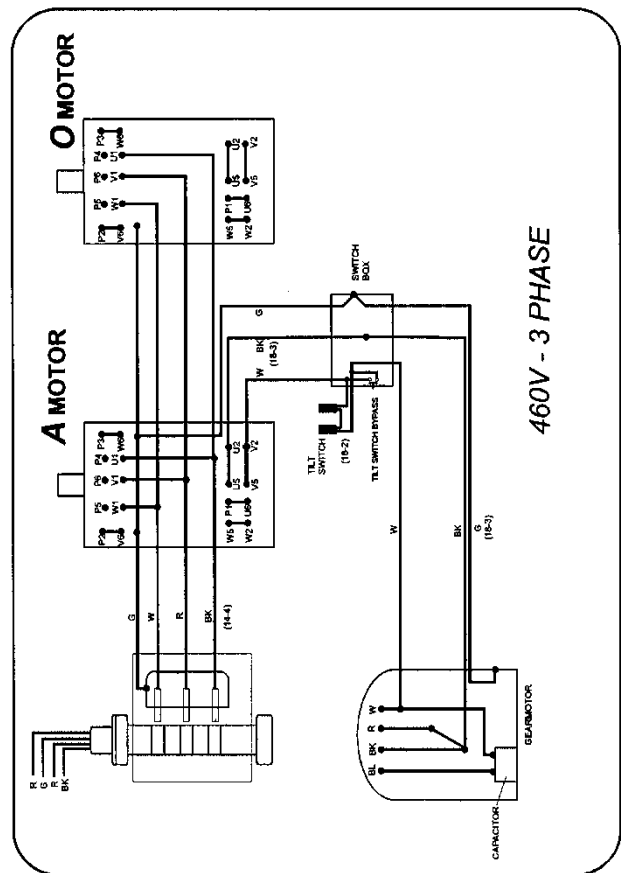
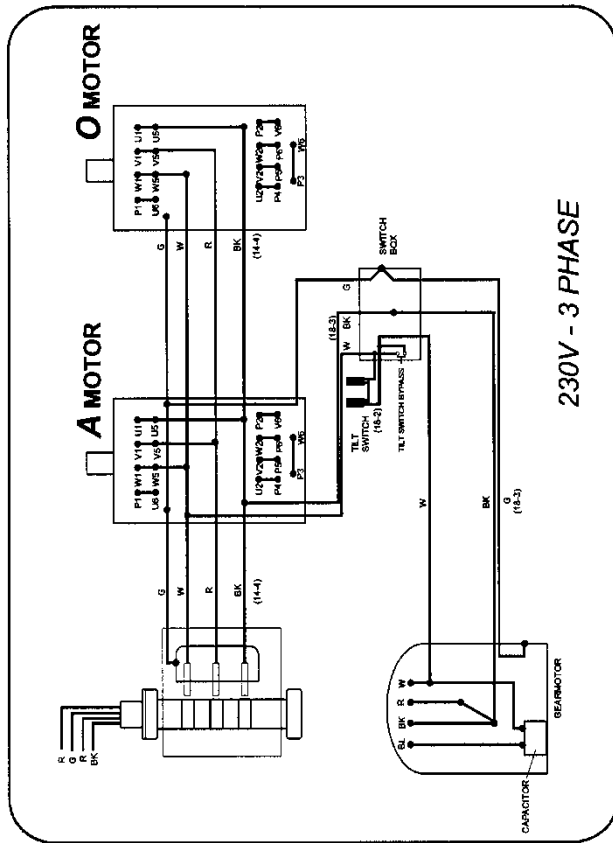
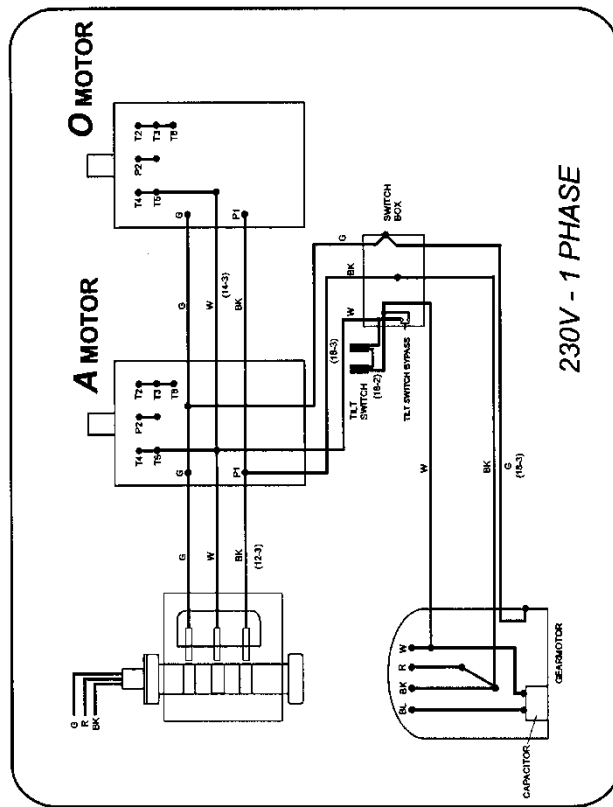


Figure 51 - Single-Auger Fastir Wiring Diagram

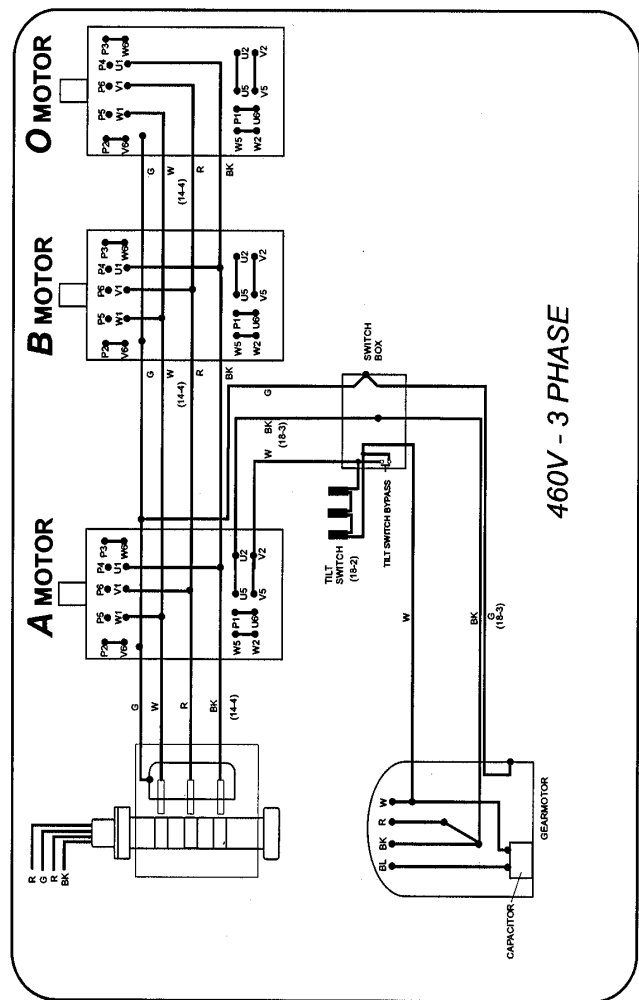
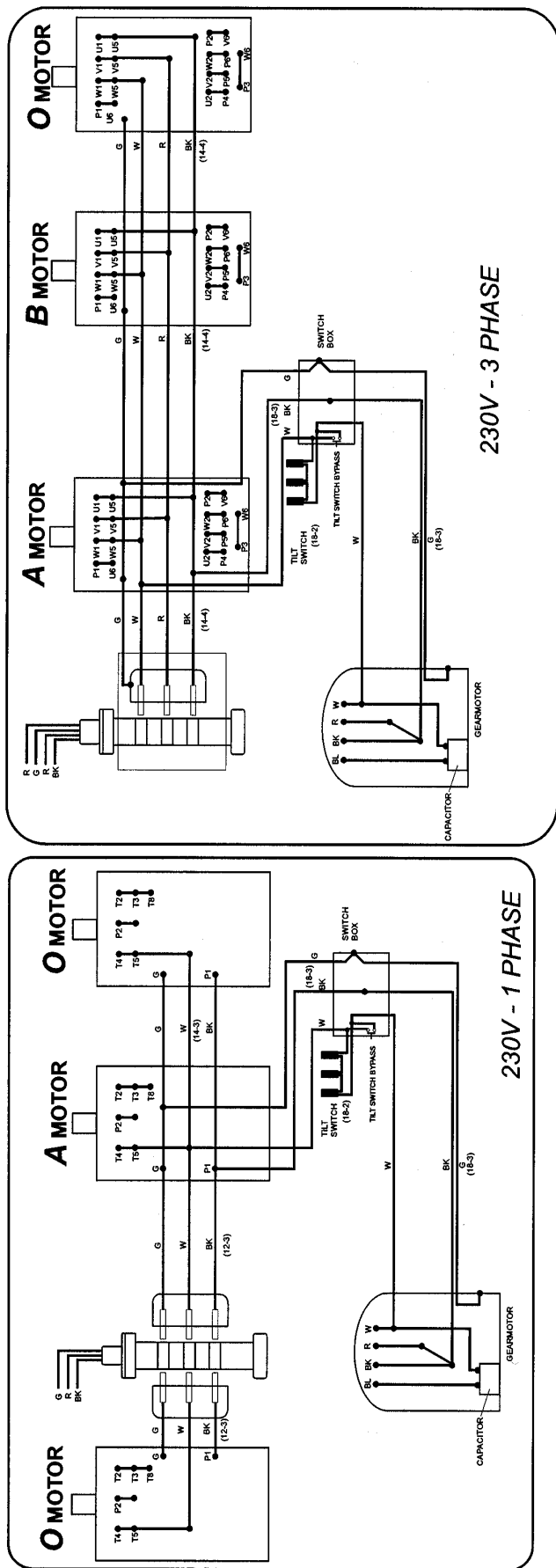


DOUBLE AUGER MACHINE 1 1/2 HP MOTOR W/230 V GEARMOTOR

WIRE COLOR CODE: W - WHITE
BK - BLACK
G - GREEN-GROUND
R - RED
BL - BLUE

- - WIRE CONNECTION
- (18 -3 INDICATES CORD SIZE
- THESE DIAGRAMS USE LESSON MOTORS

Figure 52 - Double-Auger Fastir Wiring Diagram



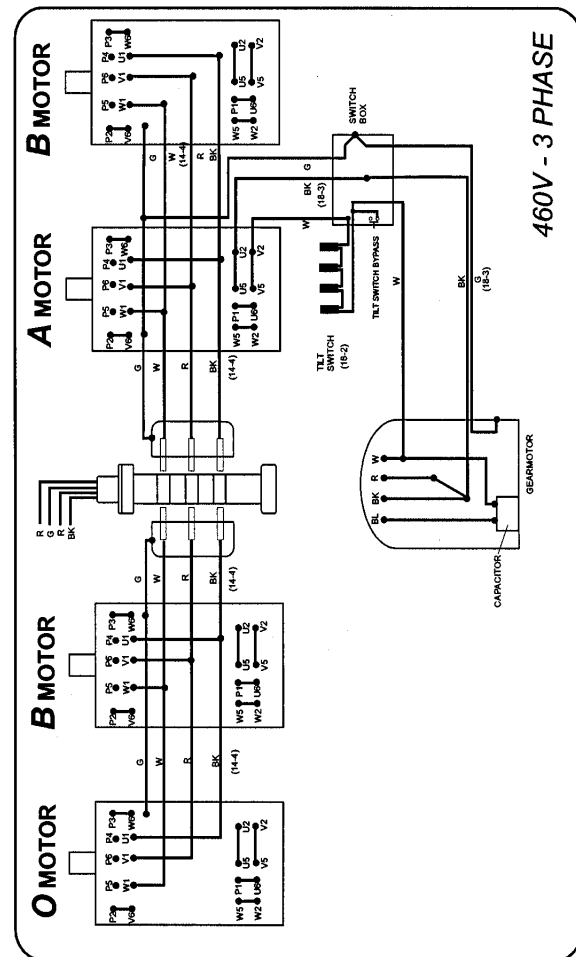
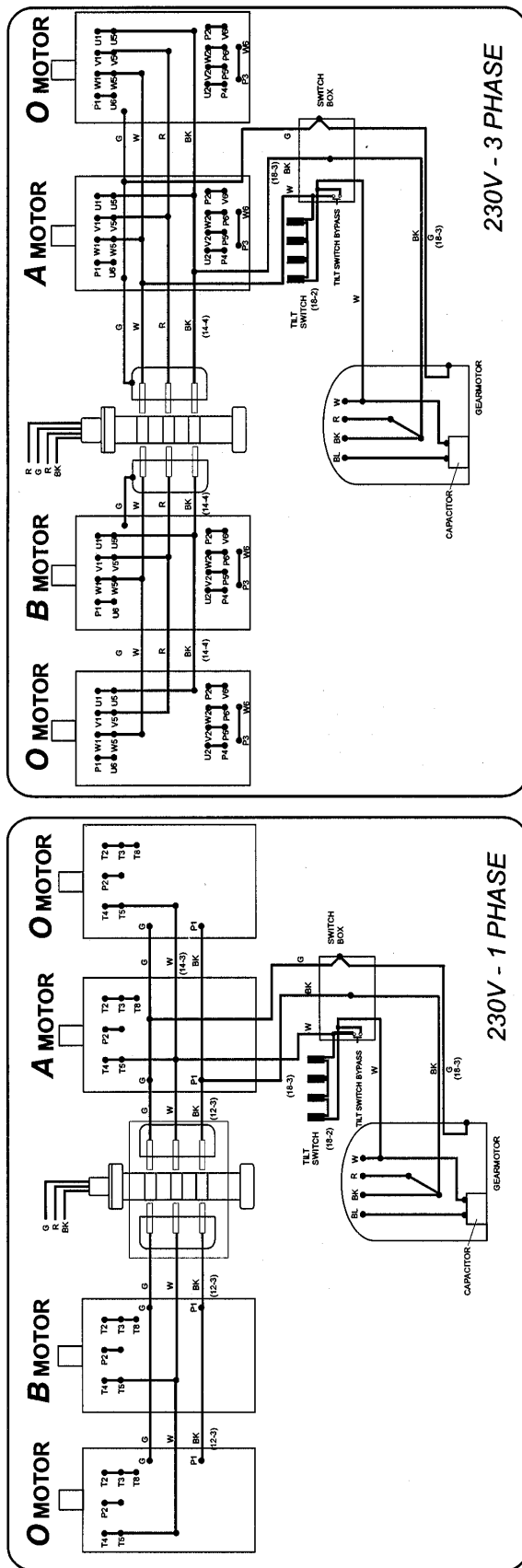
TRIPLE AUGER MACHINE 1 1/2 HP MOTOR W/230 V GEARMOTOR

WIRE COLOR CODE: W - WHITE
BK - BLACK
G - GREEN-GROUND
R - RED
BL - BLUE

● - WIRE CONNECTION

(18 - 3 INDICATES CORD SIZE
THESE DIAGRAMS USE LESSON MOTORS

Figure 53 - Triple-Auger Fastir Wiring Diagram



QUAD - FOUR AUGER MACHINE **1 1/2 HP MOTOR** **W/230 V GEARMOTOR**

- WIRE COLOR CODE: W - WHITE
BK - BLACK
G - GREEN-GROUND
R - RED
BL - BLUE
- - WIRE CONNECTION
- (18-3 INDICATES CORD SIZE
- THESE DIAGRAMS USE LESSON MOTORS

Figure 54 - Quadruple-Auger Fastir Wiring Diagram



FASTIR PARTS ASSEMBLY MANUAL



Parts shown in exploded views of assemblies are reference numbered and correspond to numbers in **Ref #** column of parts list following each illustration. Total number of parts required per unit or assembly is shown opposite each part number.

When ordering parts, always give part number (in **Part #** column) and part description shown alongside reference number. Do **not** order parts by reference numbers. If part number cannot be found in manual, give clear description of part and its location and function. Also, specify machine type and size.

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(This page intentionally left blank to more easily reference drawings with parts lists.)

I. Track

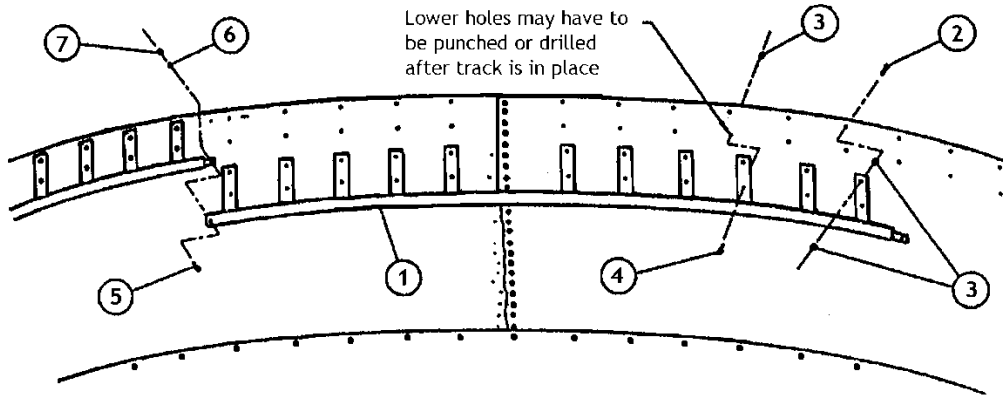


Figure 55 - Track Assembly

Table 22 - Track Parts List

Ref #	Description	Length (Inches)	Qty	Part #	Part #
				Bundle	Ea. Piece
1	15'-18' Sgl Brkt.	(109 7/8)	1	A5700	A5719
	18' Sgl Brkt.	(114-3/4)	1	A5701	A5728
	Bolt Sack Track 18'	-	1	A6810	-
	21' Sgl Brkt.	(110)	1	A5702	A5720
	*21'8"-22' Sgl Brkt.	(114-3/4)	1	A5703	A5728
	Bolt Sack Track 21'	-	1	A6811	-
	23'6"-24' Sgl Brkt.	(110-3/8)	1	A5704	A5721
	24'8" Sgl Brkt.	(114-3/4)	1	A5705	A5728
	Bolt Sack Track 24'	-	1	A6812	-
	26'6"-27' Sgl Brkt.	(110-3/4)	1	A5706	A5722
	*27'10"-28' Sgl Brkt	(114-3/4)	1	A5707	A5728
	Bolt Sack Track 27'	-	1	A6813	-
	29'4"-30' Dbl. Brkt.	(110-7/8)	1	A5708	A5723
	31' Dbl. Brkt.	(114-3/4)	1	A5709	A5729
	Bolt Sack Track 31'	-	1	A6814	-
	33' Dbl. Brkt.	(111)	1	A5710	A5724
	34' Dbl. Brkt.	(114-3/4)	1	A5711	A5729
	36' Dbl. Brkt.	(111-3/16)	1	A5712	A5725
	37'1" Dbl. Brkt.	(114-3/4)	1	A5713	A5729
	Bolt Sack Track 36'	-	1	A6815	-
	40'2"-42' Dbl. Brkt.	(111-3/8)	1	A5714	A5726
	Bolt Sack Track 42'	-	1	A6816	-
	48' Dbl. Brkt.	(111-3/8)	1	A5715	A5727
	Bolt Sack Track 48'	-	1	A6817	-
*Must include short track section (A5718)					
Ref #	Description	Sgl Brkt* Qty	Dbl Brkt** Qty	Part # (Bundle)	
2	Bolt, 5/16 -18x 1-1/4 GR8	7	11	B5952	
3	Nut, 5/16	21	33	J1002	
4	Bolt, 5/16 - 18 x 1	7	11	J0527	
5	For track splice:				
	Bolt, 3/8 - 16 x 1	-	1	J0606	
6	Lockwasher, 3/8	-	1	J1205	
7	Nut 3/8 - 16	-	1	J1020	

Table 23 - Short Track Section Parts List

Description	Qty	Part #
Short track section, 18-1/2"	1	A5718
Bolt, 5/16"- 18 x 1-1/4" bin bolt GR8	2	B5952
Nut, 5/16"- 18	4	J1002
Bolt, 5/16" - 18 x 1"	2	J0527
Bolt, 3/8"- 16 x 1" GR5	1	J0606
Lockwasher, 3/8"	1	J1205
Nut, 3/8"- 16	1	J1020

The short track section is needed on some bins to complete track ring. Listed with short section is hardware needed to hang one piece.

II. Center Hanger Assembly

CENTER HANGER ASSEMBLY

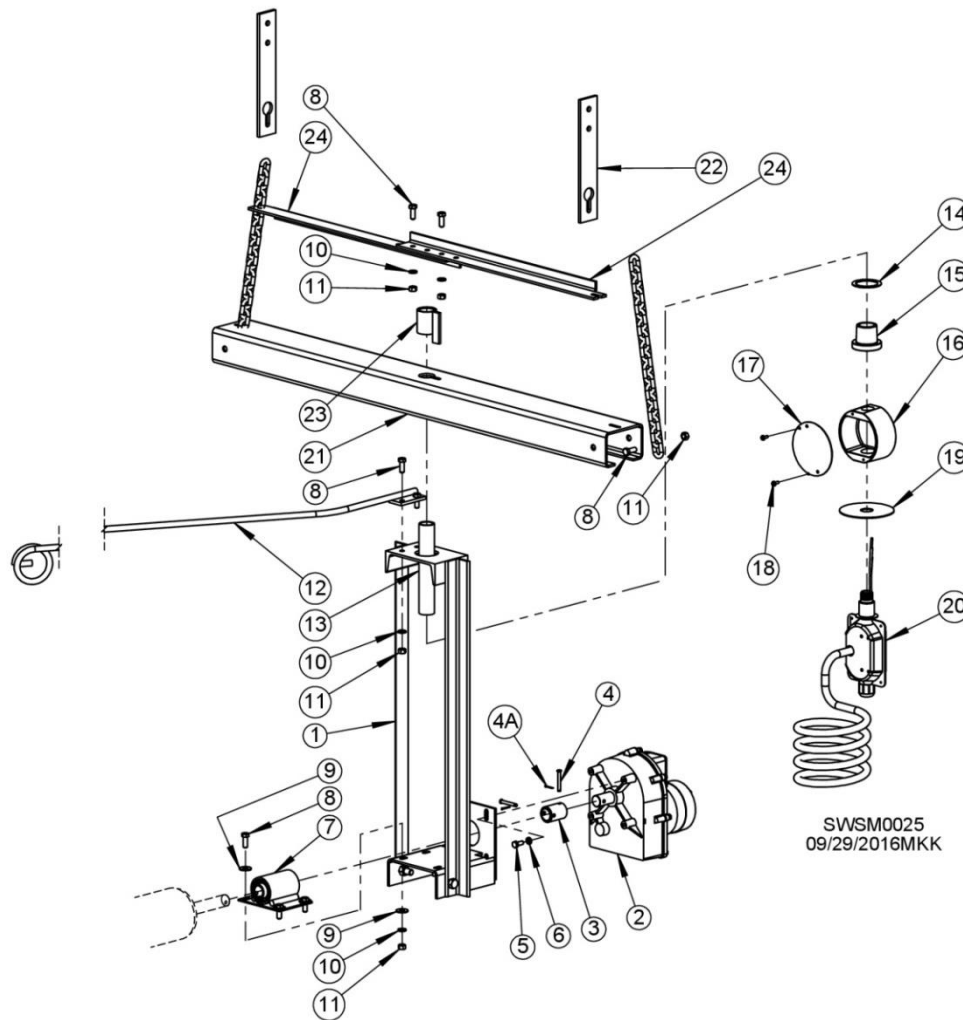


Figure 56 - Center Hanger Assembly, Exploded View

Table 24 - Center Hanger Assembly Parts List

Ref. #	Description	Qty	Part #
1	Pivoting Hanger, 30"	1	A7504
2	H.D. Gearmotor 230V	1	A5319
3	Tube Coupler, 1" ID	1	A5318
4	Clevis Pin, 1/4" x 1-3/4" PLTD	2	J1538
4A	Cotter Pin, 1/16"x 3/4" PLTD	2	J1419
5	Bolt, 5/16"- 18 x 3/4" GR5	4	J0520
6	Lockwasher, 5/16"	4	J1200
7	Pillow Block w/ 1" brgs	1	A5649
	* Pillow Block w/ 1-1/4"		A5651
	Center Brg for Pillow Block 1"		J0030
	* Center Brg for Pillow Block 1-1/4"		J0039
	Snap Ring for Pillow Block 1"	2	J3597
	* Snap Ring for Pillow Block 1-1/4"	2	J35982
8	Bolt, 3/8" -16 x 1" GR5	8	J0606
9	Flatwasher, 3/8"	4	J1117
10	Lockwasher, 3/8"	8	J1205
11	Nut, 3/8"- 16	8	J1020
12	Cord Hanger	1	A5609
	Cord Hanger, extra long		A5598

* 40' and larger bins

Ref. #	Description	Qty	Part #
13	Hanger Pipe 8" x 1" 18'-24'2"	1	A5603
	Hanger Pipe 24" x 1" 27'-27'10"		A5604
	Hanger Pipe 32" x 1" 29'-31'		A5605
	Hanger Pipe 48" x 1" 33'-37'		A5607
	Hanger Pipe 72" x 1" 39'-42'		A5606
	Hanger Pipe 96" x 1" 48'-49'3"		A5608
14	Brass Washer	1	A5601
15	Cast Bushing	1	A5602
16	Cast Electric Junction Box	1	A5612
17	Junction Box Cover	1	A5658
18	Screw, 10-32, 1/2", SHW HD Self Tap.	3	J0478
19	Drip Plate	1	A5611
20	Rotating Contact (see separate breakdown for size)	1	
21	Channel Hanger	1	A4827
22	Hanger, 11" large stirring machine	2	A7509
23	Coupling w/ tab	1	A56101
24	Chain Spreader Bar Kit - optional (kit includes hardware & instructions)	1	A5635
25	Chain, 4-1/2' (Bins up to 22')	2	A4823
	Chain, 5-1/2' (Bins 22'1" to 34')	2	A4824
	Chain, 6-1/2' (Bins 34'5" on up)	2	A4825

III. Wrap-Around Carriages

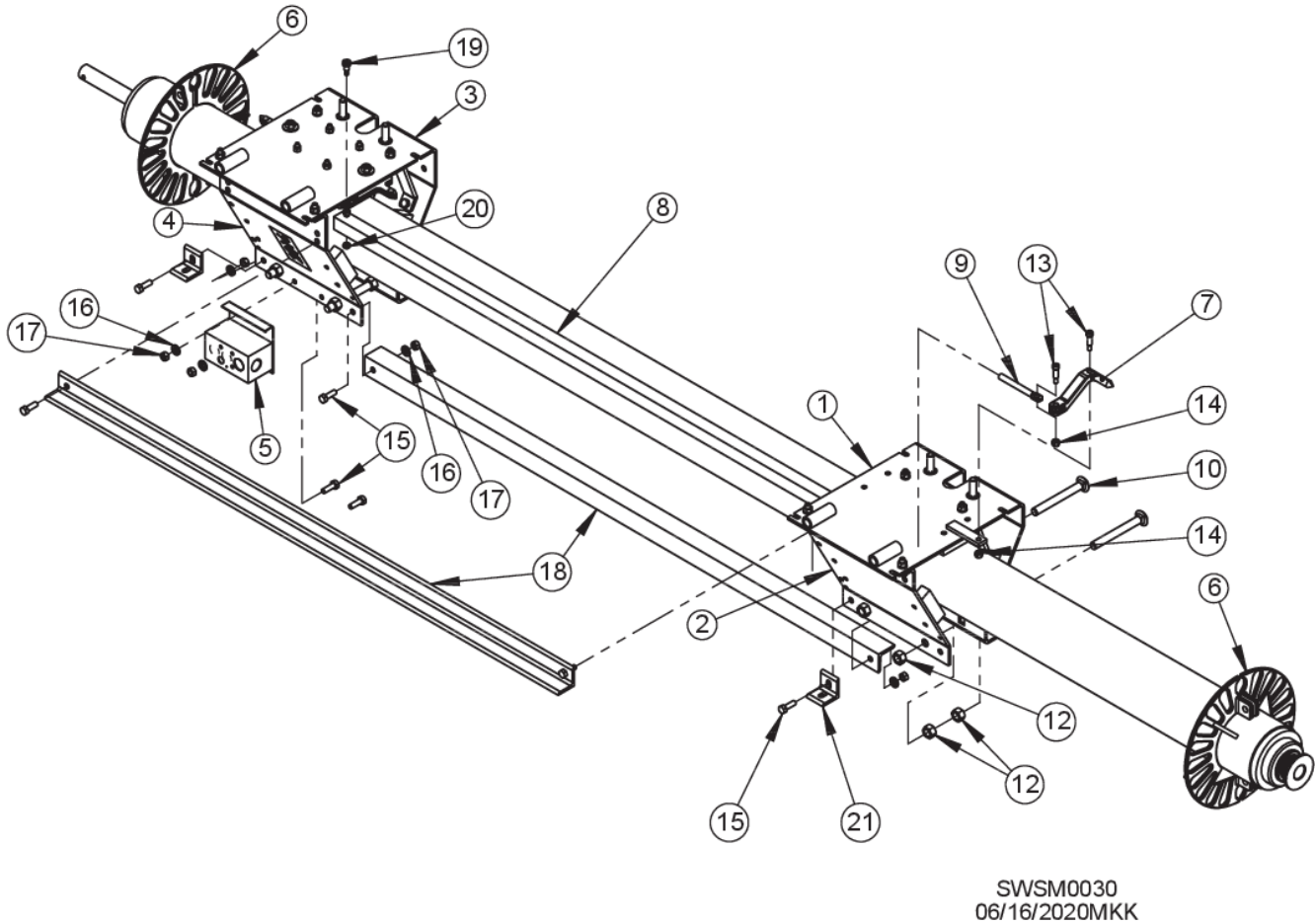


Figure 57 - Wrap-Around Carriage, Exploded View

Table 25 - Wrap-Around Carriage Parts List

Ref #	Description	Qty	Part #	Part #
			4-1/2" Crosstubes	5-1/2" Crosstubes
1	Satellite Carriage, assembled	1	A8502	A6135
2	Satellite Body	1	A5696	A6105
3	Satellite Wing	1	A5697	A6111
4	Primary Carriage, assembled	1	A8501	A6130
5	Primary Body	1	A5693	A6100
6	Primary Wing	1	A5694	A6110
5	Junction Box	1	A8139	A8139
6	Complete Reversing Plate Assy w/ hardware	2	A8034	A8049
7	Reversing Carriage Plate, (1/2 plate)	4	A80342	A8060
8	Toggle Arm	1	A8505	A8505
9	Reversing Rod	1	Specify machine size	Specify machine size
9	Bolt, Hanger	1	A8550	A8550
10	Bolt, Carriage,	4	J07592	J07611
11	Lockwasher, 1/2" (Not shown)	4	J1215	J1215
12	Nut, Hex, 1/2"	12	J1040	J1040
13	Shoulder Bolt, 5/16", 3/4", 1/4-20 thread	2	J0521	J0521
14	Locknut, 1/4-20, PLT, Nylon	2	J0992	J0992
15	Bolt, 5/16" x 1"	7	J0527	J0527
16	Lockwasher, 5/16"	7	J1205	J1205
17	Nut, Hex 5/16"	7	J1002	J1002
18	Tie Bar	2	Specify machine size	Specify machine size
19	Shoulder Bolt, 8 mm, 10, 6 mm thread	1	J0538	J0538
20	Locknut, 6 mm, Nylock	1	J0998	J0998
21	Stabilizer Arm Bracket	2	A4545	A4545

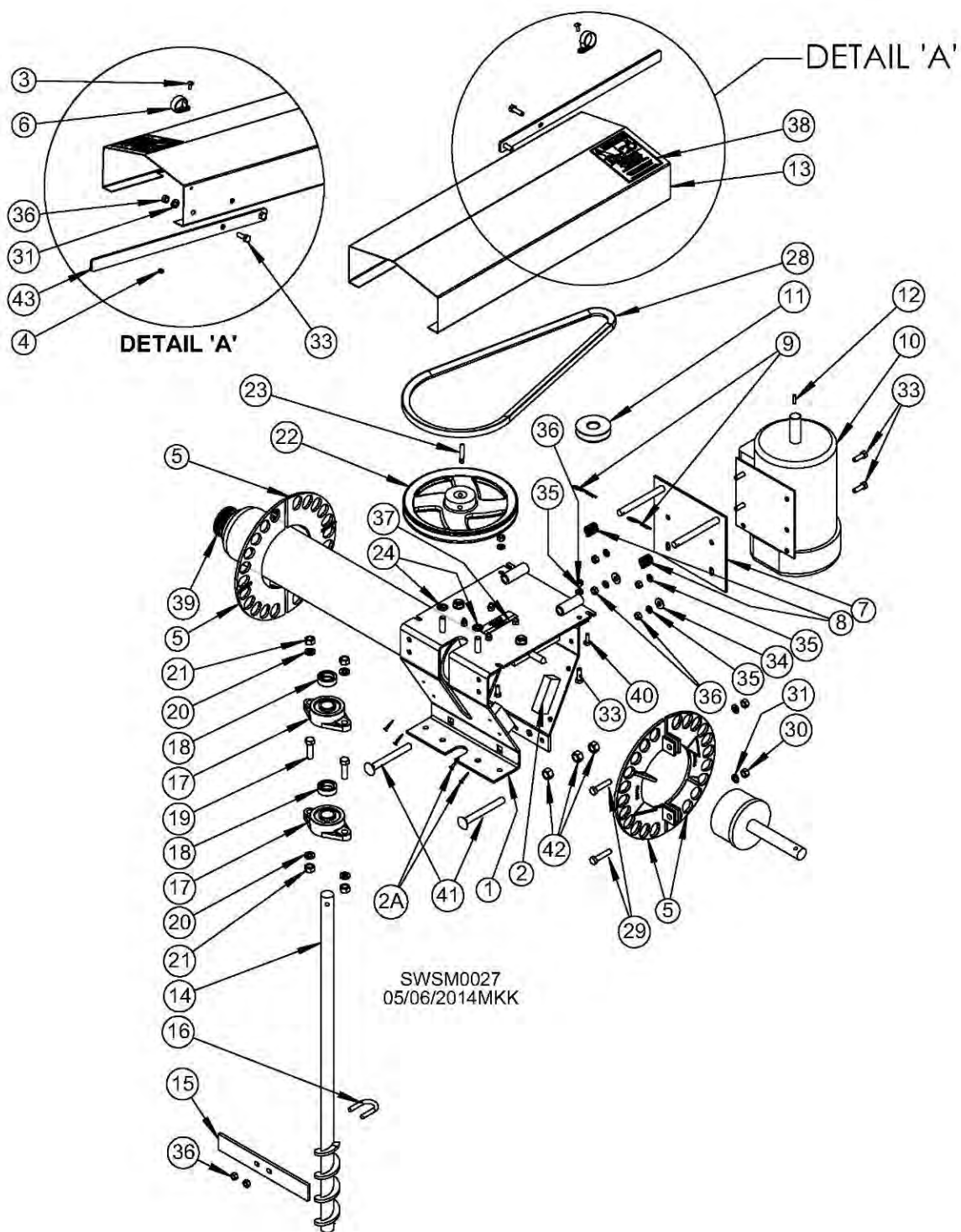


Figure 58 - Primary Wrap-Around Carriage, Exploded View

Primary Wrap-Around Carriage

Table 26 - Primary Wrap-Around Carriage Parts List

Ref #	Description	Qty	Part #	Part #
			4-1/2" Crosstubes	5-1/2" Crosstubes
1	Primary Carriage	1	A8501	A6130
2	Bearing Block	4	A8507	A8507
2A	Screw, 1-1/8"	8	J0463	J0463
3	Machine Screw #10-24 x 1/2"	1	J0514	J0514
4	Nut, Hex, #10-24 Plated	1	J0985	J0985
5	Reversing Carriage Plate	4	A80342	A8060
6	Cord Holder	1	A5637	A5637
7	Motor Mount	1	A5209	A5209
8	Spring Comp., 1-1/2" CL x 1/2" ID	2	J2365	J2365
9	Hairpin Clip	2	J5410	J5410
10	Motor "S" 1-1/2hp 1ph 230V Motor "A" 1-1/2hp 1ph 230V Motor "S" 1-1/2hp 3ph 230V Motor "A" 1-1/2hp 3ph 230V Motor "S" 1-1/2hp 3ph 460V Motor "A" 1-1/2hp 3ph 460V (Motor includes pulley and key) ("A" Motors wired w/ 9'6" replacement leads) See page 68 for correct cord lengths & #s		A7721 A7721 A7732 A7732 A7735 A7735	A7721 A7721 A7732 A7732 A7735 A7735
	Receptacles (Not Shown) Plug, Male, 3-Prong - 1ph Plug, Female, 3-Prong, Arm - 1ph Plug, Male, 4-Prong, Arm - 3ph Plug, Female, 4-Prong, Arm - 3ph		J3715 J3720 J3725 J3730	J3715 J3720 J3725 J3730
11	Pulley, 2-3/4" x 7/8" "A"	1	J0295	J0295
12	Key Stock, 3/16" sq. x 3/4"	1	A7522	A7522
13	Center Carriage Shield	1	A8508	A6120
14	Down Auger - 15'6" Standard, other sizes optional	1	A4210	A4210
15	Flinger	1	A5616	A5616
16	U-Bolt, 5/16"- 18 x 1-3/4"	1	J0810	J0810
17	Flange Bearing, 1" FHFT 205-16	2	J0003	J0003
18	Locking Collar	2	J0067	J0067
19	Bolt, 7/16" -14 x 1-1/2"	4	J0710	J0710
20	Lockwasher, 7/16"	4	J1210	J1210
21	Nut, 7/16"- 14	4	J1035	J1035
22	Pulley, 9" "A" Groove w/pin hole	1	J0355	J0355
23	Rollpin 5/16" x 2-1/4"	1	J1510	J1510
24	Push Nut, 7/16", Stud	2	J1036	J1036
28	Belt	1	J0179	J0195
29	Bolt, 3/8" -16 x 1-3/4", PLT GR5, Tap	4	J0640	J0640
30	Nut, 3/8"-16	4	J1020	J1020
31	Lockwasher, 3/8" Split	4	J1205	J1205
33	Bolt, 5/16" - 18 x 1"	6	J0527	J0527
34	Flatwasher, 5/16"	8	J1111	J1111
35	Lockwasher, 5/16"	6	J1200	J1200
36	Nut, 5/16"- 18	8	J1002	J1002
37	Decal, Replace Shield	1	L0271	L0271
38	Decal, Warning	1	L0284	L0284
39	Outer Slug w/ drive wheel	1	A8085	A8089
40	Bolt, 1/4" - 20 x 3/4"	2	J0505	J0505
41	Bolt, Carriage	2	J07592	J07611
42	Nut, 1/2"- 13, Hex Head	6	J1040	J1040
43	Cord Support Strap	1	A6121	A6121

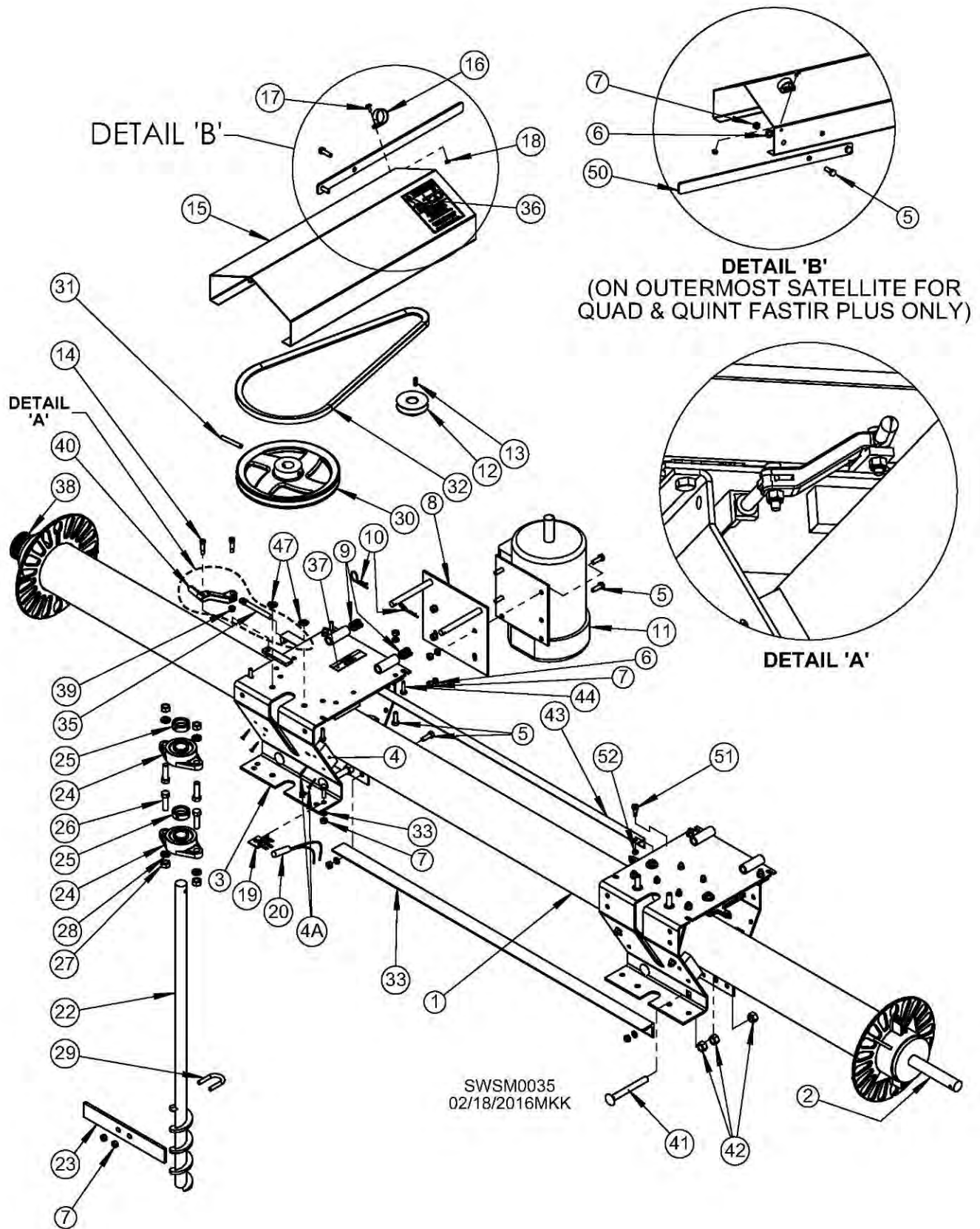


Figure 59 - Satellite Wrap-Around Carriage, Exploded View

Satellite Wrap-Around Carriage

Table 27 - Satellite Wrap-Around Carriage Parts List

Ref #	Description	Qty	Part #	Part #
			4-1/2" Crosstube	5-1/2" Crosstube
1	Crosstube, Fastir, 18'-18'7"	1	A8126	-
	Crosstube, Fastir, 21'-21'8"	1	A8128	-
	Crosstube, Fastir, 24'-24'9"	1	A8130	-
	Crosstube, Fastir, 27'-27'10"	1	A8132	-
	Crosstube, Fastir, 30'-31'	1	A8134	-
	Crosstube, Fastir, 33'-34'	1	A8136	-
	Crosstube, Fastir, 36'-37'1"	1	A8138	-
	Crosstube, Fastir, 42'-42'8"	1	A81381	A81372
	Crosstube, Fastir, 48'	1	A81382	A81371
2	Inner Slug, 1" shaft	1	A4822	-
	*Inner Slug, 1-1/4" shaft	1	A4807	A4817
3	Satellite Carriage (With bearing block)	1	A8502	-
3A	Satellite Carriage (With bearing)	1	A8504	A6135
4	Bearing Block	6	A8507	A8507
4A	Screws, 1-1/8"	12	J0463	J0463
5	Bolt, 5/16"- 18 x 1"	7	J0527	J0527
6	Lockwasher, 5/16", Split	7	J1200	J1200
7	Nut, 5/16"	9	J1002	J1002
8	Motor Mount	1	A5209	A5209
9	Spring Comp., 1-1/2" CL x 1/2" ID	2	J2365	J2365
10	Hairpin Clip	3	J5410	J5410
11	Motor "O" 1-1/2HP 1ph 230V (See page 69). Motor "B" 1-1/2HP 1ph 230V " " " Motor "O" 1-1/2HP 3ph 230V " " " Motor "B" 1-1/2HP 3ph 230V " " " Motor "O" 1-1/2HP 3ph 460V " " " Motor "B" 1-1/2HP 3ph 460V " " "			
12	Pulley, 2-3/4" x 7/8" "A"	1	J0295	J0295
	*Pulley, 3" x 7/8" single "A" Groove	1	J0319	J0319
13	Key, 3/16" x 3/16" x 3/4"	1	A7522	A7522
14	Shoulder Bolt, 5/16", 3/4", 1/4-20 thread	2	J0521	J0521
15	Outer Carriage Shield	1	A8508	A6120
16	Plastic Cord Holder	1	A5637	A5637
17	Machine Screw #10-24	1	J0514	J0514
18	Nut, #10-24	1	J0985	J0985
19	Tilt Switch Bracket		A5449	A5449
20	Tilt Switch 7MPL-46		A5445	A5445
21	Tilt Switch, Bracket, & Cord (Not shown)	Varies by unit, See page 69.		
22	Down Auger 15'6" Standard (Other sizes optional)	1	A4210	A4210
23	Flinger	1	A5616	A5616
24	Flange Bearing 1" FHFT 205-16	2	J0003	J0003
25	Locking collar	2	J0067	J0067
26	Bolt, 7/16"- 14 x 1-1/2" GR5	4	J0710	J0710
27	Nut, 7/16"- 14	4	J1035	J1035
28	Lockwasher, 7/16"	4	J1210	J1210
29	U-Bolt, 5/16"- 18 x 1-3/4"	1	J0810	J0810
30	Pulley 9" "A" Groove w/ Pin Hole	1	J0355	J0355
31	Rollpin, 5/16" x 2-1/4"	1	J1510	J1510
32	Belt	1	J0179	J0195
33	Tie Bar (Specify size needed)	Varies, see pages 16 & 18.		
35	Bolt, Spade	1	A8550	A8550
36	Decal, Warning	1	L0284	L0284
37	Decal, Replace Shield	1	L0271	L0271
38	Outer Slug w/ drive wheel	1	A8085	A8089
39	Locknut, 1/4-20, PLT, Nylon	2	J0992	J0992
40	Toggle Arm	1	A8505	A8505
41	Bolt, Carriage	4	J07592	J07611
42	Nut, Hex, 1/2"	12	J1040	J1040
43	Reversing Rod	1	Varies, see pages 16 & 18	
44	Bolt, 1/4" x 1"	4	J0508	J0508
46	Lockwasher, 1/2"	3	J1215	J1215
47	Push Nut, 7/16", Stud	2	J1036	J1036
48	Bearing Block (Not shown)	2	A8507	A8507
48A	Bearing Ball Transfer (Not Shown)	1	J0144	J0144
49	Screws, #8 Stainless Steel (Not Shown)	4	J0463	J0463
50	Cord Support Strap	1	A6121	A6121
51	Shoulder Bolt, 8 mm, 10, 6 mm thread	1	J0538	J0538
52	Locknut, 6 mm, Nylock	1	J0998	J0998

* For required receptacle, see page 59.

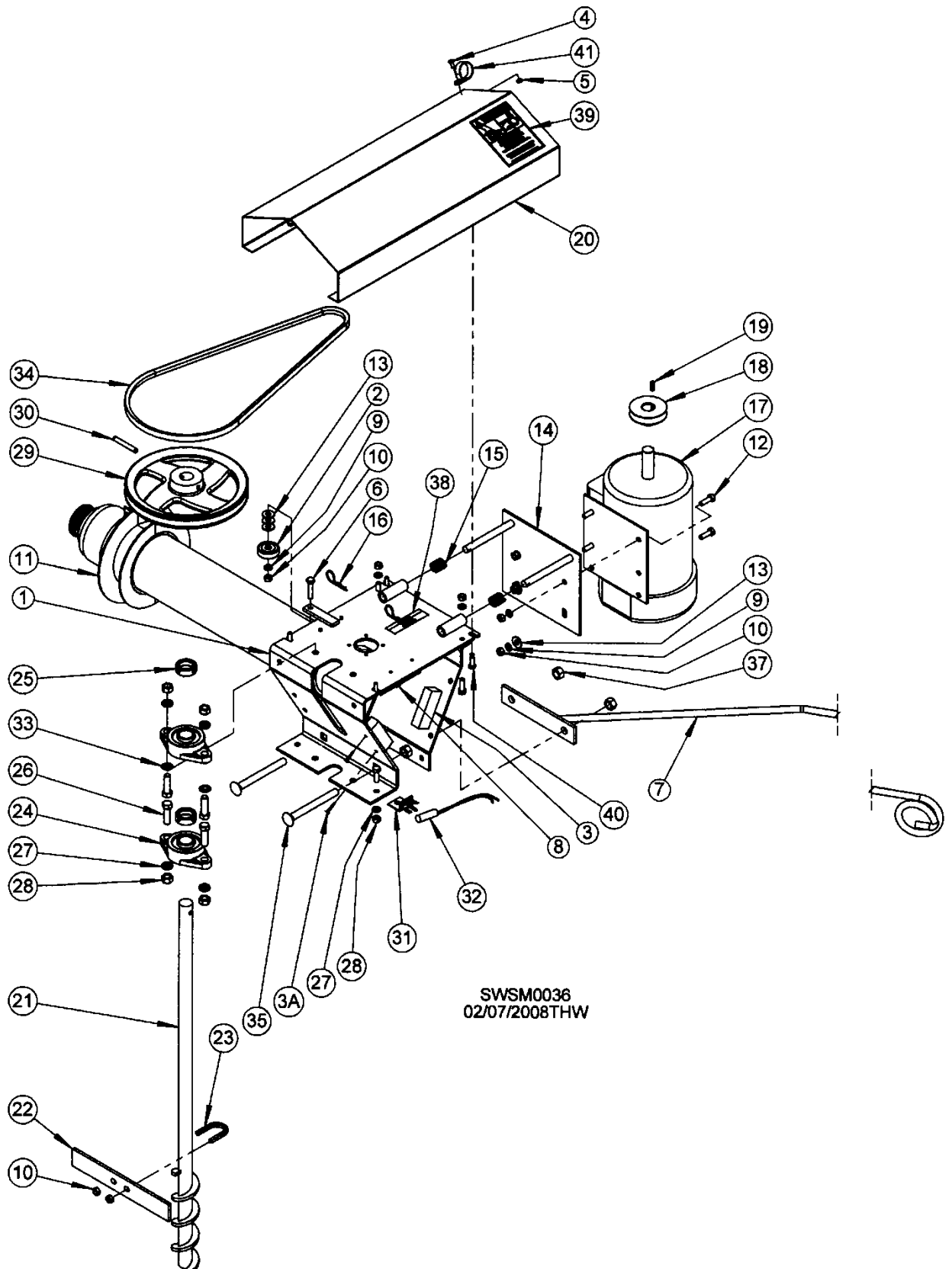


Figure 60 - Stationary Outside Carriage, Exploded View

Stationary Outside Carriage

Table 28 - Stationary Outside Carriage Parts List

Ref #	Description	Qty	Part # 4-1/2" Crosstube	Part # 5-1/2" Crosstube
1	Outside Carriage	1	A5250	A6140
2	Roller Bearing	1	J0045	J0045
3	Bearing Block	4	A8507	A8507
3A	Screws, 1-1/8"	8	J0463	J0463
4	Machine screw, #10-24 plated	1	J0514	J0514
5	Nut, #10-24 plated	1	J0985	J0985
6	Bolt, 5/16" x 1-1/4"	1	J0550	J0550
7	Cord Hanger	1	A52121	A52121
8	Bearing, 1" OD, .3125 ID RF - 16 - PP INA	2	J00425	J00425
9	Lockwasher, 5/16"	8	J1200	J1200
10	Nut, 5/16"- 18	11	J1002	J1002
11	Stationary carriage PLT	1	A5245	A6115
12	Screw, 5/16"- 18 x 1"	7	J0527	J0527
13	Flatwasher, 5/16"	6	J1111	J1111
14	Motor Mount	1	A5209	A5209
15	Spring, Compr. 1-1/2" CLx1/2ID	2	J2365	J2365
16	Hairpin Clip	2	J5410	J5410
17	Motor "O" 1-1/2hp, 230V 1ph (Includes Pulley & Key)	1	A7725	A7725
	Motor "O" 1-1/2hp, 230V 3ph (Includes Pulley & Key)	1	A7729	A7729
18	Pulley, 2-3/4" x 7/8 "A"	1	J0295	J0295
19	Key, 3/16" sq. x 3/4"	1	A7522	A7522
20	End Carriage Shield	1	A8508	A6120
21	Down Auger 15'6" (std, other sizes opt.)	1	A4210	A4210
22	Flinger	1	A5616	A5616
23	U-Bolt, 5/16"- 18 x 1-3/4"	1	J0810	J0810
24	Flange Bearing 1" FHFT 205-16	2	J0003	J0003
25	Locking Collar	2	J0067	J0067
26	Bolt, 7/16"- 14 x 1-1/2"	4	J0710	J0710
27	Lockwasher, 7/16"	4	J1210	J1210
28	Nut, 7/16"- 14	4	J1035	J1035
29	Pulley, 9" "A" Groove w/pin hole	1	J0355	J0355
30	Rollpin 5/16" x 2-1/4"	1	J1510	J1510
31	Tilt Switch Brkt. w/clip (New)	1	A5449	A5449
32	Tilt Switch 7MP 1-46	1	A5445	A5445
	Tilt Switch, Brkt, & Cord (Not shown)	1	Varies by unit, See page 69.	
33	Push Nut, 7/16", Stud	2	J1036	J1036
34	Belt	1	J0179	J0195
35	Bolt, Carriage	2	J07601	J07611
37	Nut, 1/2"- 13 Hex Head	6	J1040	J1040
38	Decal, Warning	1	L0284	L0284
39	Decal, Replace Shield	1	L0271	L0271
40	Bolt, 1/4"-20 x 3/4"	2	J0505	J0505
41	Plastic Cord Holder	1	A5637	A5637

VII. Electrical Junction Box Assembly

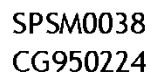


Figure 61 - Electrical Junction Box Assembly, Exploded View

Table 29 - Electrical Junction Box Assembly Parts List

Ref #	Description	Qty	Part #
	Junction switch box, w/15'4" CD & MT PLT		A8140
	Junction switch box, w/17'10" CD & MT PLT		A8141
	Junction switch box, w/20'4" CD & MT PLT		A8142
	Junction switch box, w/22'4" CD & MT PLT		A8143
1	Electric Box	1	A8139
2	Screw #6-32 x 1/4"	2	J0455
3	Push Button (normally open)	1	J4485
4	Bolt, 5/16"- 18 x 1"	2	J0527
5	Nut, 5/16"- 18	2	J1002
6	Lockwasher, 5/16"	2	J1200
7	Tilt Switch w/connector	1-5	A5445
8	Mounting plate Electric Box	1	A8081
9	Switch cover, push button	1	J4500
10	Power Cord (18-3) 16" w/Plug	1	A5350
11	*Gearmotor Cord only 18-3	1	K6551
13	Heyco Bushing, 7-K-2	2	J5040
14	Plug 2474 3-prong male	1	J3715
15	Female Spade, 4 x 293		J3826
16	Male Spade, 4 x 292		J3822

* When ordering this part, machine size, number of down auger, and/or cord lengths must be specified to match proper parts.

VIII. Reversing Mechanism Assembly

REVERSING MECHANISM ASSEMBLY

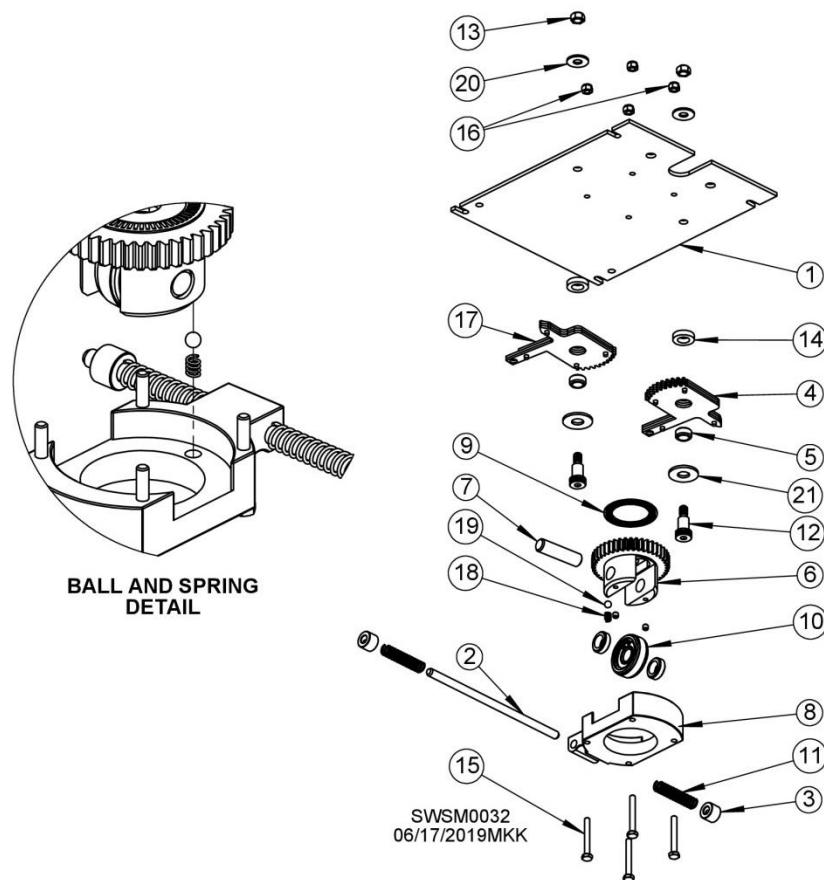


Figure 62 - Reversing Mechanism Assembly, Exploded View

Table 30 - Reversing Mechanism Assembly Parts List

Ref #	Description	Qty	Part #
1	Plate Reversing Carriage	1	A5693
2	Reversing Rod 8-1/4" long (Prior to 2010/06)	1	A8059
	Reversing Rod 8-5/8" long (2010/06 and later)	1	A80593
3	Shaft Collar 3/8"	2	J1319
4	Toggle Gear	1	A80453
5	Bushing, 1/2" x 3/4" x 5/8"	2	J00823
6	Directional Gear	1	A8043
	Set Screws 1/4" x 1/4"	2	J1074
7	Pin, 2-3/8" long	1	A8044
8	Housing	1	A8042
9	Thrust Bearing	1	J0058
10	* Knurled Drive Bearing (Replacement for J0057)	1	A80691
	(Complete with Bushings)		
	Knurled Bearing	1	A8069
	Bushing, .339	2	A8074
	Snap Ring, 1.5652 TRC	1	J3696
11	Compression Spring LC063GH11 (Prior to 2010/06)	2	J2348
	Compression Spring LC063GH13M (2010/06 and later)	2	J23489
12	Bolt, 1/2" - 13 x 1-1/2" - GR5	2	J07229
13	Nut, 1/2" - 13, Center Lock Jam	2	J1025
14	Machine Bushing, 1/2" - 18 Ga.	2	A85075
15	Bolt, 1/4"-20 x 2" GR5	4	J05134
16	Lock Nut, 1/4"-20	4	J0992
17	Reversing Gear	1	A80452
18	Spring, Comp, 5/16" OD x .54" long	1	J2363
19	Ball, Steel, 5/16"	1	J3308
20	Flatwasher, 3/8, PLT	2	J1117
21	Flatwasher, 1/2, PLT	2	J1125

IX. Rotating Contact

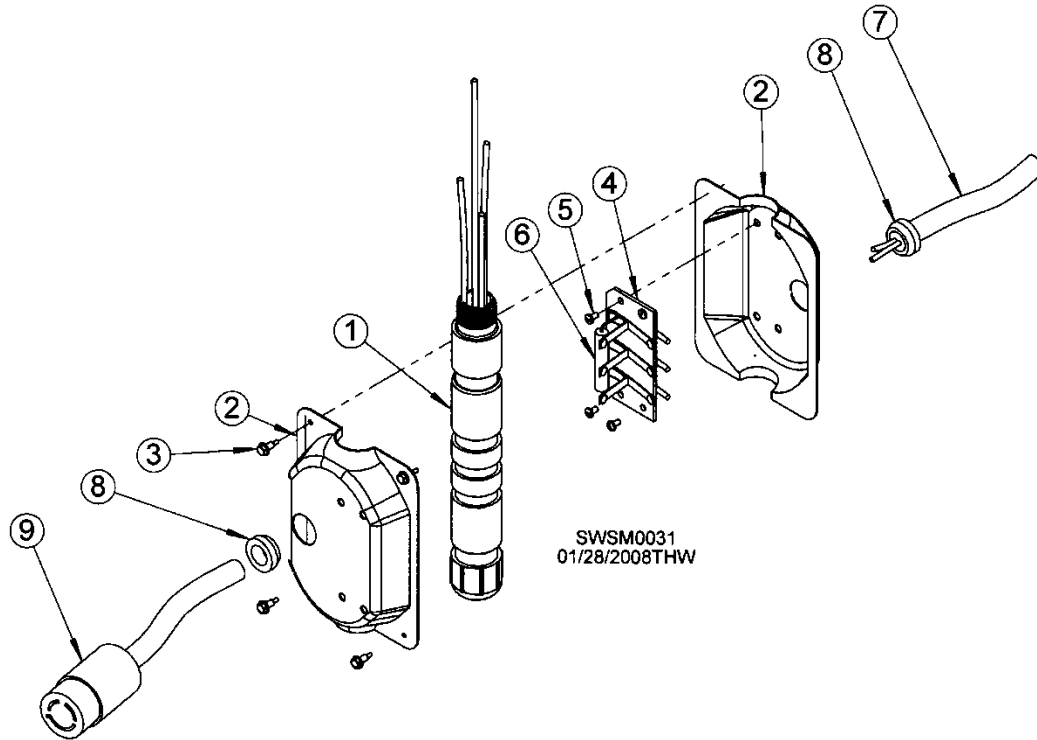


Figure 63 - Rotating Contact Assembly, Exploded View

Table 31 - Rotating Contact Parts List

Ref #	Description	Qty	Part #	The following are complete rotating contacts with cords. Listed are standard replacement cord lengths. If different length is required, specify desired length when ordering. See Table 33 .					
1	Rot. Cont. Center, 3-wire 1ph	1	A5558	Part #	Volts	# of Leads	Phase	Spool Wire	Cord Length
	Rot. Cont. Center, 4-wire 3ph		A5559	A5504	230	Single	1	3	17'10"
	Rot. Cont. Center, 5-wire 1ph		A5585	A5532	230	Single	3	4	17'10"
	Rot. Cont. Center, 7-wire 3ph		A5560	A5539	460	Single	3	4	19'2"
2	Rotating Contact, Can, Single		A5549	A5475	230	Dual	1	5	12'10", 10'10"
	Can, Lead Side Only		A5594	A5476	230	Dual	1	5	15'10", 10'10"
	Can, Side Only, Single		A5595	A5477	230	Dual	1	5	17'10", 10'10"
	Rotating Contact, Can, Dual	1	A5550	A5478	230	Dual	1	5	24'10", 10'10"
	Can, Lead Side Only		A5594	A5480	230	Dual	3	7	12'10", 10'10"
	Can, Side Only, Dual		A5596	A5481	230	Dual	3	7	15'10", 10'10"
3	Screw, #8-18 x 1/2" PLT, S Drill	4	J0460	A5482	230	Dual	3	7	17'10", 10'10"
4	Cont. Bd 1ph w/htr 3 term	1*+	A5563	A5483	230	Dual	3	7	24'10", 10'10"
	Cont. Bd 1ph w/o htr 3 terminals		A5578	The following are rotating contacts without cord:					
	Cont. Bd 3ph w/htr 3 terminals		A5561	A5551	230	Single	1	3	N/A
	Cont. Bd 3ph w/o htr 3 terminals		A5580	A5553	230	Single	3	4	N/A
5	Cont. Bd 460 3ph w/htr, 3 terminal	4*	A5582	A5554	460	Single	3	4	N/A
6	#6032 x 1/4" pan head mach screw		J0455	A5555	230	Dual	1	5	N/A
	Contact board heater, 230V	1	J5530	A5556	460	Dual	3	7	N/A
	Contact board heater, 460V, 40k		J5532	A5557	230	Dual	3	7	N/A
7	Cord 12-3, (specify lgth req.)	1*	K6331	Note: Can should be sealed with tub and tile caulk. Spool should spin freely after assembly. If spool binds, find and correct problem before installing on stirring machine.					
8	Cord 14-4, (specify lgth req.)		K6401						
	8P-2 Heyco bushing	1*	J5000						
9	3-prong female plug 3494	1*	J3720						
	4-prong female plug 2456, 460V wired direct		J3730						

*Number required for single lead rotating contact. Qty required for dual lead rotating contact is double.

+Single lead contacts require 1 board w/ heater. Dual lead contacts require 1 board w/ heater, 1 without.

X. Gearmotor

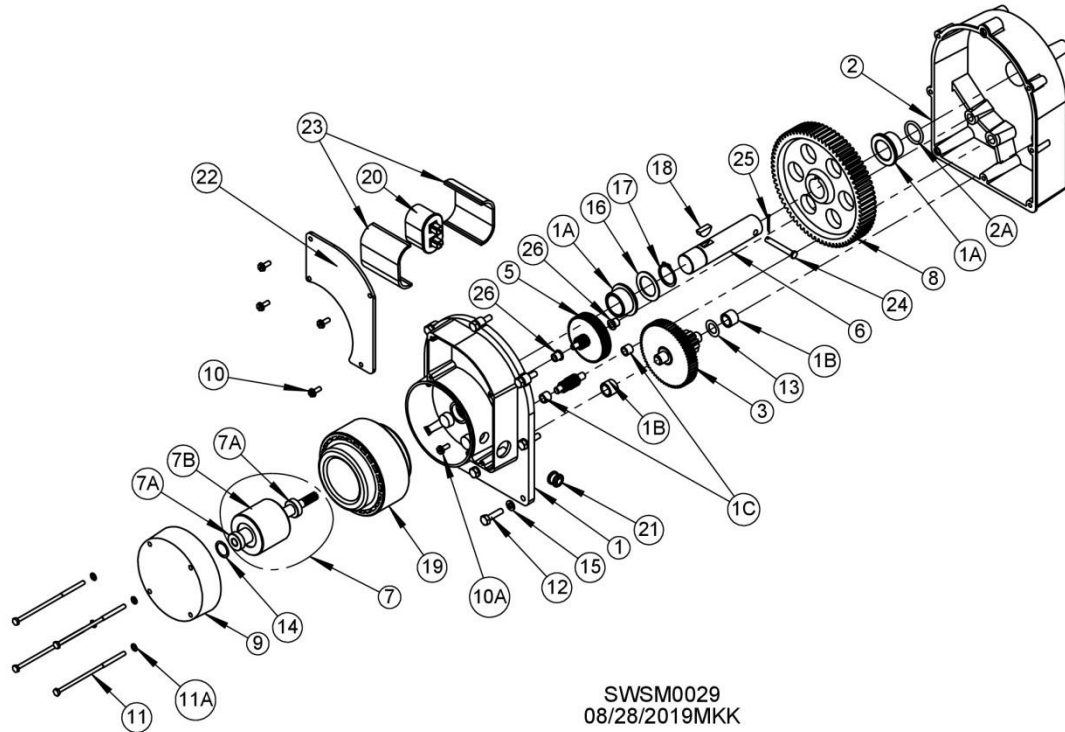


Figure 64 - Gearmotor, Exploded View

Table 32 - Gearmotor Parts List

Ref #	Description	Qty	Part #
1	Gearmotor, HD, 230V, Reg, w/ Capacitor	1	A5319
1A	Case, Top, w/ Junction Box & Bushings	1	A5301-01
1B	Bushing, #1 Shaft	2	J3500
1C	Bushing, #2 Shaft	2	J3505
	Bushing, #3 Shaft	2	J3510
2	Case, Bottom, Casting Machined	1	A5302-01
2A	O Ring, 214, .984ID x .139C/S	1	J3540
3	Gear, #2, (Steel, 65 Teeth w/Pinion)	1	A5292
4	Gear, #3, (Steel, 61 Teeth)	1	A5293
5	Gear, #4, (Fiber, 72 Teeth)	1	A5306
6	Shaft, Output, HD Gearmotor, 1" x 4.75" L	1	A5308
7	Armature & Shaft, 230V. w/ bearings	1	A5310L
7A	Bearing, .375" ID, .875" OD	2	J0015
7B	Rotor w/ shaft 115 & 220V	1	J3666
8	Gear, #1, (Large Metal, 72 Teeth)	1	A5321
9	Cover, Field, End Bell	1	A5325
10	Screw, #10-32, 1/2"	5	J0478
10A	Screw, #10-32, 1/2" (Painted green for 'ground')	1	J0478
11	Screw, #10-32, 4.50, PLT, HHMS	4	J0500
11A	Washer, Lock, #10, Int Tooth, PLT	4	J1191
12	Screw, 1/4" -20, 1", PLT, GR5, HHCS	8	J0508
13	Flatwasher, .875" OD, .505, .010	1	J1150
14	Wafer Spring Washer, WO-855, .010	1	J1160
15	Lockwasher, 1/4", Split	8	J1195
16	Bushing, Machine, 1"- 18 Ga.	1	J1266
17	Snap Ring, 1.00, 5100-100, Truarc	1	J3585
18	Key, Half-moon, HD, .25" x .75" (806)	1	J3600
19	Stator, Grmt., 230V, HD (93)	1	J3626
20	*Capacitor, 5MFD, 370V	1	J4930
21	Grommet, Rubber, #2335, 1/4" x 5/8"	1	J4971
22	Casting, Gearmotor, Elec. Box Cover	1	K5436
23	Foam, 2 1/2" x 3 1/2"	2	A5327
24	Pin, Clevis, 1/4" x 1 3/4", PLTD	1	J1538
25	Pin, Cotter, 1/16 x 3/4, PLT	1	J1419
26	Bushing, #4 Shaft	2	J3515

* Capacitor comes installed in gearmotor at factory.

XI. Cord Lengths

Table 33 - Cord Lengths for Fastir and Fastir Plus Unit

Bin Dia	A Motor Cord	B Motor Cord	S Motor Cord	O Motor Cord	Tilt Switch Quantity	Tilt Switch Cord Length	Rotating Contact	Dual Lead Rotating Contact	Gearmotor Cord
Single									
18'	-	-	1	-	-	-	12' 10"	-	17' 10"
21'	-	-	1	-	-	-	12' 10"	-	17' 10"
24'	-	-	1	-	-	-	14' 6"	-	20' 4"
27'	-	-	1	-	-	-	17' 10"	-	20' 4"
30'	-	-	1	-	-	-	17' 10"	-	22' 4"
31'	-	-	1	-	-	-	17' 10"	-	22' 4"
Double									
18'	5'	-	-	1	1	4'	10' 10"	-	15' 4"
21'	6'	-	-	1	1	5'	10' 10"	-	15' 4"
24'	6'	-	-	1	1	5'	10' 10"	-	15' 4"
27'	7'	-	-	1	1	6'	10' 10"	-	15' 4"
30'	8'	-	-	1	1	7'	10' 10"	-	15' 4"
31'	8'	-	-	1	1	7'	10' 10"	-	15' 4"
33'	8'	-	-	1	1	7'	12' 10"	-	17' 10"
36'	9' 6"	-	-	1	1	8'	12' 10"	-	17' 10"
Triple - Fastir Note: On Triple, 1 phase units, use dual rotating contact with "A", dual "O" motors. For sizes not listed, check nearest size. For example, on 37' 1", use lengths for 36'.									
18'	4'	3' - 3PH	-	1 - 3PH 2 - 1PH	2	3'	10' 10"	12' 10" 1PH	15' 4"
21'	5'	3' - 3PH	-	1 - 3PH 2 - 1PH	1	3'	10' 10"	15' 10" 1PH	15' 4"
24'	6'	3' - 3PH	-	1 - 3PH 2 - 1PH	1	3'	10' 10"	15' 10" 1PH	15' 4"
27'	6'	3' - 3PH	-	1 - 3PH 2 - 1PH	1	3'	10' 10"	17' 10" 1PH	15' 4"
30'	7'	3' - 3PH	-	1 - 3PH 2 - 1PH	1	3'	10' 10"	20' 10" 1PH	15' 4"
31'	7'	3' - 3PH	-	1 - 3PH 2 - 1PH	1	3'	10' 10"	20' 10" 1PH	15' 4"
33'	8'	3' - 3PH	-	1 - 3PH 2 - 1PH	1	3'	12' 10"	22' 10" 1PH	15' 4"
36'	8'	3' - 3PH	-	1 - 3PH 2 - 1PH	1	3'	12' 10"	22' 10" 1PH	15' 4"
42'	9' 6"	4' - 3PH	-	1 - 3PH 2 - 1PH	1	8'	16'	28' 4" 1PH	20' 4"
48'	11'	4' - 3PH	-	1 - 3PH 2 - 1PH	1	3'	17' 10"	29' 6" 1PH	20' 4"
Triple - Fastir Plus									
18'	5'	7' - 3PH	-	1 - 3PH 2 - 1PH	1	9' 6"	10' 10"	12' 10" 1PH	15' 4"
21'	6'	7' - 3PH	-	1 - 3PH 2 - 1PH	1	9' 6"	10' 10"	15' 10" 1PH	15' 4"
24'	7'	8' - 3PH	-	1 - 3PH 2 - 1PH	1	11'	10' 10"	15' 10" 1PH	15' 4"
27'	8'	9' 6" - 3PH	-	1 - 3PH 2 - 1PH	1	11'	10' 10"	17' 10" 1PH	17' 10"
30'	8'	9' 6" - 3PH	-	1 - 3PH 2 - 1PH	1	11'	12' 10"	20' 10" 1PH	17' 10"
31'	8'	9' 6" - 3PH	-	1 - 3PH 2 - 1PH	1	11'	12' 10"	20' 10" 1PH	17' 10"
33'	9' 6"	11' - 3PH	-	1 - 3PH 2 - 1PH	1	7'	12' 10"	22' 10" 1PH	17' 10"
36'	9' 6"	11' - 3PH	-	1 - 3PH 2 - 1PH	1	7'	12' 10"	22' 10" 1PH	17' 10"
Quad - Fastir Plus									
27' *	5'	9' 6"	-	2	1 1 1	11' 3' 4'	10' 10"	20' 10"	15' 4"
30' *	6'	9' 6"	-	2	1 1 1	3' 5' 11'	10' 10"	20' 10"	15' 4"
31' *	6'	9' 6"	-	2	1 1 1	3' 5' 11'	10' 10"	20' 10"	15' 4"
33' *	7'	11'	-	2	1 1 1	3' 6' 11'	12' 10"	24' 10"	17' 10"
36' *	7'	11'	-	2	1 1 1	3' 7' 12'	12' 10"	24' 10"	17' 10"
42' *	9' 6"	11'	-	2	1 1 1	4' 8' 12'	12' 10"	28' 4"	17' 10"
Quint - Fastir Plus									
42' *	7'	9' 6" 7'	-	2	1 1 1 1	5' 4' 6' 11'	12' 10"	28' 4"	15' 4"
48' *	8'	7' 8'	-	2	1 2 1	4' 7' 11'	12' 10"	28' 4"	17' 10"

XII. Electrical Components

Table 34 - Electrical Components for Fastir and Fastir Plus Units

Bin Diameter	1 PH, 230V					3 PH, 230V					3 PH, 460V					Fastir Plus		Fastir	
	S Motor	O Motor	A Motor	B Motor	Rotating Contact	S Motor	O Motor	A Motor	B Motor	Rotating Contact	S Motor	O Motor	A Motor	B Motor	Rotating Contact	Tilt Switch	Tilt Switch		
Single																			
18'-187"	A7720	-	-	-	A5502	A7730	-	-	-	A5530	A7734	-	-	-	A5537	-	-		
21'-218"	A7720	-	-	-	A5502	A7730	-	-	-	A5530	A7734	-	-	-	A5537	-	-		
24'-248"	A7720	-	-	-	A5503	A7730	-	-	-	A5531	A7734	-	-	-	A5538	-	-		
27'-2710"	A7720	-	-	-	A5504	A7730	-	-	-	A5532	A7734	-	-	-	A5539	-	-		
30'-31"	A7720	-	-	-	A5504	A7730	-	-	-	A5532	A7734	-	-	-	A5539	-	-		
Double																			
18'-187"	-	A7725	A77215	-	A5501	-	A7729	A77325	-	A5529	-	A7733	A7735	-	A5536	A8431	-		
21'-218"	-	A7725	A77216	-	A5501	-	A7729	A77326	-	A5529	-	A7733	A7735	-	A5536	A8432	-		
24'-248"	-	A7725	A77216	-	A5501	-	A7729	A77326	-	A5529	-	A7733	A7735	-	A5536	A8432	-		
27'-2710"	-	A7725	A77217	-	A5501	-	A7729	A77327	-	A5529	-	A7733	A7735	-	A5536	A8433	-		
30'-31"	-	A7725	A77218	-	A5501	-	A7729	A77328	-	A5529	-	A7733	A7735	-	A5536	A8434	-		
33'-34"	-	A7725	A77218	-	A5502	-	A7729	A77328	-	A5530	-	A7733	A7735	-	A5537	A8434	-		
36'-371"	-	A7725	A7721	-	A5502	-	A7729	A7732	-	A5530	-	A7733	A7735	-	A5537	A8435	-		
Triple-Fastir & Fastir Plus Note: * Denotes component is required for Fastir Plus instead of alternative.																			
18'-187"	-	A7725 x2	A77214	-	A5475	-	A7729	A77324	A77313	A5529	-	A7733	A7735	A7736	A5536	A8430 x2	A8430		
21'-218"	-	A7725 x2	A77215*	-	A5476	-	A7729	A77325	A77313	A5529	-	A7733	A7735	A7736	A5536	A8430	A8436		
24'-248"	-	A7725 x2	A77216*	-	A5476	-	A7729	A77326	A77313	A5529	-	A7733	A7735	A7736	A5536	A8430	A8436		
27'-2710"	-	A7725 x2	A77217*	-	A5477	-	A7729	A77327	A77313	A5529	-	A7733	A7735	A7736	A5536	A8430	A8431		
30'-31"	-	A7725 x2	A77218*	-	A5519	-	A7729	A77328	A77313	A5529	-	A7733	A7735	A7736	A5536	A8430	A8433		
33'-34"	-	A7725 x2	A77218	-	A5507	-	A7729	A77328	A77313	A5530	-	A7733	A7735	A7736	A5537	A8430	A8434		
36'-371"	-	A7725 x2	A77218	-	A5507	-	A7729	A77328	A77313	A5530	-	A7733	A7735	A7736	A5537	A8430	A8439		
42'	-	A7725 x2	A7721	-	A5511	-	A7729	A77329	A77314	A5531	-	A7733	A7735	A7736	A5538	A8430	-		
48'	-	A7725 x2	A77219	-	A5512	-	A7729	A77329	A77314	A55321	-	A7733	A7735	A7736	A55381	A8430	-		
Quad-Fastir Plus																			
27'-2710"	-	A7725 x2	A77215	A7728	A5519	-	A7729 x2	A77325	A7731	A5481	-	A7733 x2	A7735	A7736	A55481	-	A8430		
30'-31"	-	A7725 x2	A77216	A7728	A5519	-	A7729 x2	A77326	A7731	A5481	-	A7733 x2	A7735	A7736	A5547	-	A8430		
33'-34"	-	A7725 x2	A77217	A77289	A55071	-	A7729 x2	A77327	A77319	A55901	-	A7733 x2	A7735	A7736	A55484	-	A8430		
36'-371"	-	A7725 x2	A77217	A77289	A55071	-	A7729 x2	A77328	A77319	A55901	-	A7733 x2	A7735	A7736	A55484	-	A8430		
42'-428"	-	A7725 x2	A7721	A77289	A5484	-	A7729 x2	A7732	A77319	A5485	-	A7733 x2	A7735	A7736	A55486	-	A8438		
Quint-Fastir Plus																			
42'-428"	-	A7725 x2	A77217	A77287	A5484	-	A7729 x2	A77326	A77317	A5485	-	A7733 x2	A7735	A7736 x2	A55486	-	A8431		
48'	-	A7725 x2	A77218	A77288	A5484	-	A7729 x2	A77327	A77318	A5485	-	A7733 x2	A7735	A7736 x2	A55486	-	A8437		

CONTACT INFORMATION

Owner's manuals are available from Sukup and additional copies can be requested at the address, phone number, or e-mail address shown below. Please indicate manual number L1413 when requesting the Fastir Owner's Instruction and Parts Manual.

Sukup Dealer Information

Dealer Name:	_____
Address:	_____
Cell Phone:	_____
Office Phone:	_____
Fax:	_____

In Case of Emergency

Have emergency numbers and written directions to your location near phone and arrange and practice a safety plan.

Ambulance • Fire • Police: 9-1-1
Bin rescue team: _____
Local EMS team: _____
911 address of work site: _____
Directions to work site: _____



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