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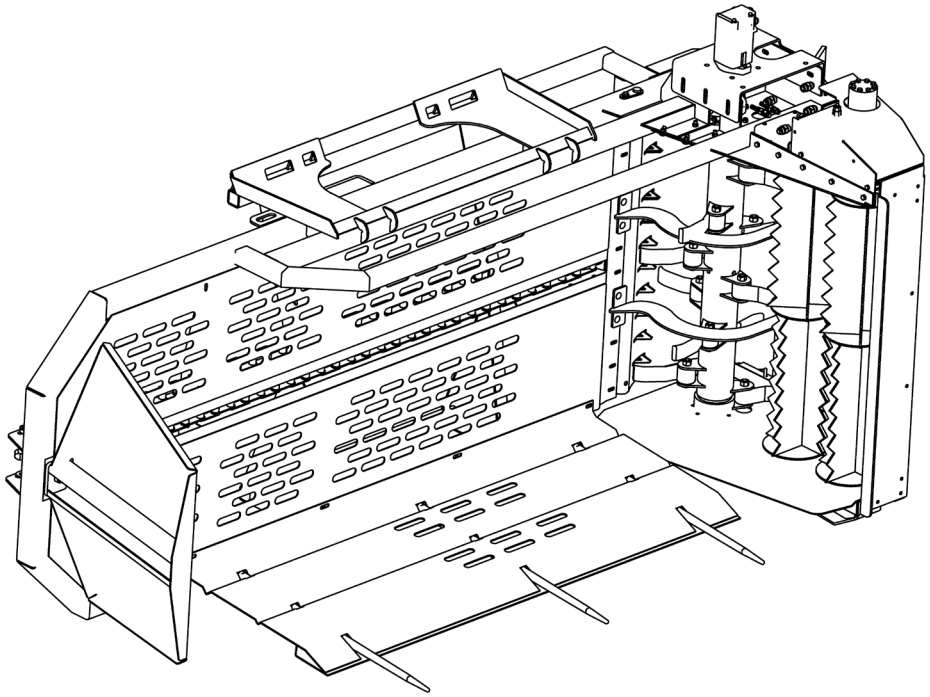
Operator's Manual

Keep this manual with the machine at all times.

BALE BOSS 1 SQUARE BALE PROCESSOR

Bale Processor

Boss I - 20 Series



Rev. 1-4 PRINTED IN CANADA 40252

Operator's Manual

Thank you for choosing the Tubeline Boss 1 - 20 Series Bale Processor.

Our hope is that it will give you many years of productive service.

Please read and understand this manual and the machine before operation.

This manual covers both 3720 and 3820 models.

3720 SERIES

3820 SERIES

Warranty and Limitation of Liability

All equipment is sold subject to mutual agreement that it is warranted by the company to be free from defects of materials and workmanship. But the company shall not be liable for special, indirect or consequential, damages of any kind under this contract or otherwise. The company's liability shall be limited exclusively to replacing or repairing without charge, at its factory or elsewhere, at its discretion.

Any material, or workmanship defects which become apparent within one year from the date on which the equipment was purchased, and the company shall have no liability for damages of any kind. The buyer by the acceptance of the equipment will assume all liability for any damages, which may result from the use or misuse by his employees or others.

Warranty coverage is null and void unless Warranty Registration form has been completely filled in and is on file at Tubeline Manufacturing Ltd.

Serial Plate Location

The implement serial number is located underneath the flail drum motor*, see below.* This number helps us to track changes and improvements and must be mentioned when ordering parts or requesting service. For your convenience, a space has been provided inside the front cover of this manual to record the serial number, model number, purchase date, and dealer name.

Model No: _____

Serial No: _____

Date Purchased: _____

Dealer Name: _____

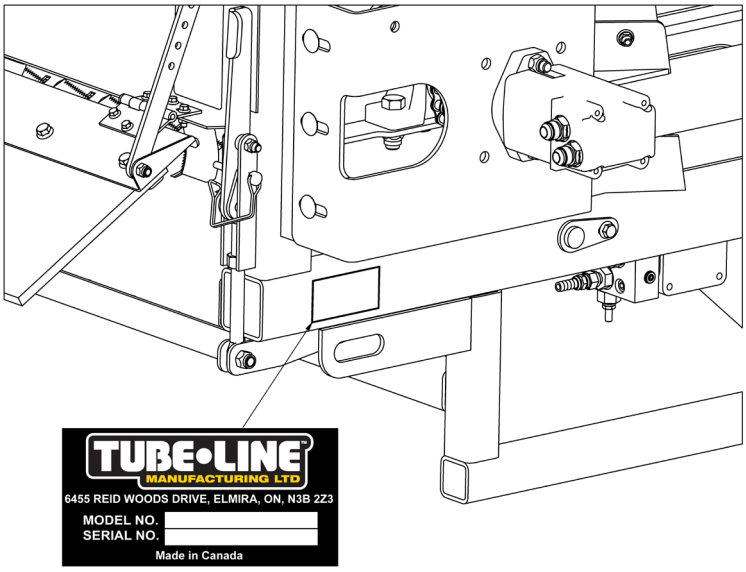


Table of Contents

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Section 1 - Introduction

The **Boss I 20 Series** is carefully designed and manufactured to give you many years of dependable service. You or any other person, who will be assembling, operating, maintaining or working with this product, are required to read and completely understand the information and instructions contained in this manual. If anyone does not fully understand every part of this manual, please obtain further assistance by contacting the dealer from which this product was purchased or by contacting Tube·Line at the telephone number or address listed on the previous page of this manual. Keep this manual available for reference whenever this product is being handled or used. Provide this manual to any new owners and/or operators.

Bale Sizes

Tubeline Boss 20 series machines can load and shred all types of forage in large square bales.

Model 3720 specifications:

Maximum bale weight is 1500lbs (680 kg).

Maximum length of bales is 72” (183 cm) X 36” (91 cm) X 36” (91 cm).

Model 3820 specifications:

Maximum bale weight is 1500lbs (680 kg).

Maximum length of bales is 84” (213 cm) X 36” (91 cm) X 36” (91 cm).

Uses

The Tubeline Boss I 20 Series has many uses, including :

- Laying windrows in open fields.
- Filling feed bunks - fence line, circular, etc.
- Spreading forage for livestock bedding.
- Spreading mulch over perennial plants such as strawberries and mushrooms.

General Information

The purpose of this manual is to assist you in safely assembling, mounting, operating and maintaining your Boss I. Read this manual carefully to obtain valuable information and instructions that will help you achieve safe and dependable service. The illustrations and data used in this manual were current at the time of printing, but due to possible engineering and/or production changes, this product may vary slightly in detail. Tube·Line reserves the right to redesign and/or change components as necessary without notification.

Throughout this manual, references may be made to :

Power Unit	The engine-driven machine to which this product must be attached, ie; loader tractor, skidsteer, telehandler, etc.
Right, Left, Front, Rear	Directions which are determined in relation to the operator of the equipment when seated in the normal operating position.
IMPORTANT	Precautions that must be followed to prevent damage to equipment.
NOTICE	Precautions that must be followed to prevent substandard performance.

Section 2 - Safety

NOTICE: This safety alert symbol is found throughout this manual to call attention to instructions involving yourself and others working around the machine.

Failure to follow these instructions can result in injury or death.

This symbol means:

- **Attention!**
- **Become Alert!**
- **Your Safety is involved!**

Safety Signal Words / Safety Messages

CAUTION: Indicates a potentially hazardous situation that may result in injury.

WARNING: Indicates a potentially hazardous situation that could result is serious injury or death.

DANGER: Indicates a hazardous situation that needs to be avoided. Operator needs to be aware of these dangers. High probability of serious injury or death.

NOTICE: Indicates an informative non-safety related message.

Safety Guidelines

Take the necessary precautions to avoid injury or death. These include:

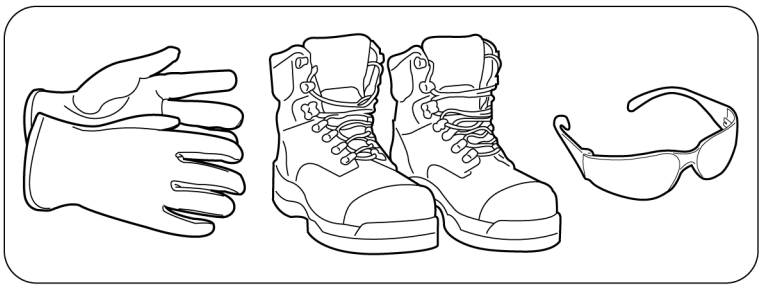
- Reading and understanding this manual before operating.
- Have training and train new operators.
- Review the safety instructions with all users annually.
- Know where safety decals are and what they convey.
- **DO NOT** paint over, remove or deface any safety signs or warning decals on your equipment.
- Replace damaged and/or missing safety decals.
- **DO NOT** operate without fully installed shields.
- Reinstall any removed shields **BEFORE** operating.
- Inspect machine before operating.
- **DO NOT** operate this machine while under the influence of drugs or alcohol.
- **DO NOT** let children ride or operate this machine.

Personal Protective Equipment

WARNING: Wear work boots, gloves, and safety glasses when maintaining or repairing machine.

WARNING: Wear work boots and ear protection when operating machine.

DANGER: Secure loose clothing, hair, accessories, etc before operating or maintaining the TL50SLV.



Maintenance Safety

Know and follow good work practices when assembling, mounting, maintaining, repairing, removing and storing this product:

- Work on a level surface in a clean, dry and well lit area.
- Use properly grounded electrical outlets and tools.
- Use the right tool for the job at hand.
- Make sure that your tools are in good condition to perform the necessary function.

WHEN YOUR POWER UNIT IS USED DURING ANY TYPE OF ASSEMBLY, OPERATION, MAINTENANCE OR OTHER WORK ON OR NEAR THIS PRODUCT:

Before leaving the operator's station or before beginning any type of work on this product, lower this product to the ground, apply your power unit's parking brake, stop the engine, remove the starter key, wait for all moving parts to stop and then relieve all pressure in the hydraulic lines.

NOTICE: Refer to your power unit's operator's manual for instructions on how to relieve hydraulic pressure in lines.

Know your loader's safe lifting and operating capacity and the weight of this product. See the specifications in this manual for the weight of this product and refer to your power unit's and loader's operator's manuals for safe operating limits. Lift capacity may be reduced if using a quick-attach.

Never allow anyone, except the operator, to be around the power unit or this product when either is in motion. Do not start up unless others are clear of the work area. Do not allow riders on this product or the power unit. Do not stand or climb on this product when raised. Do not place any part of your body under any part of this product unless this product is securely resting on adequate blocking or on the ground.

Do not use blocking made of concrete blocks, logs, buckets, barrels or any other material that could suddenly collapse or shift positions. Do not use wood or steel blocking that shows any signs of material decay. Never operate controls from the ground. Operate the controls only from the operator's

station. Never leave the equipment unattended with the engine running or with this product raised on the loader.

Transport Safety

- Be aware of the added weight and width of this product.
- Reduce travel speeds accordingly, especially when traveling over rough ground.
- Keep this product close to the ground and under control when transporting.
- When transporting, be sure processor does not block view of vehicle lights or road.

Hydraulic Safety

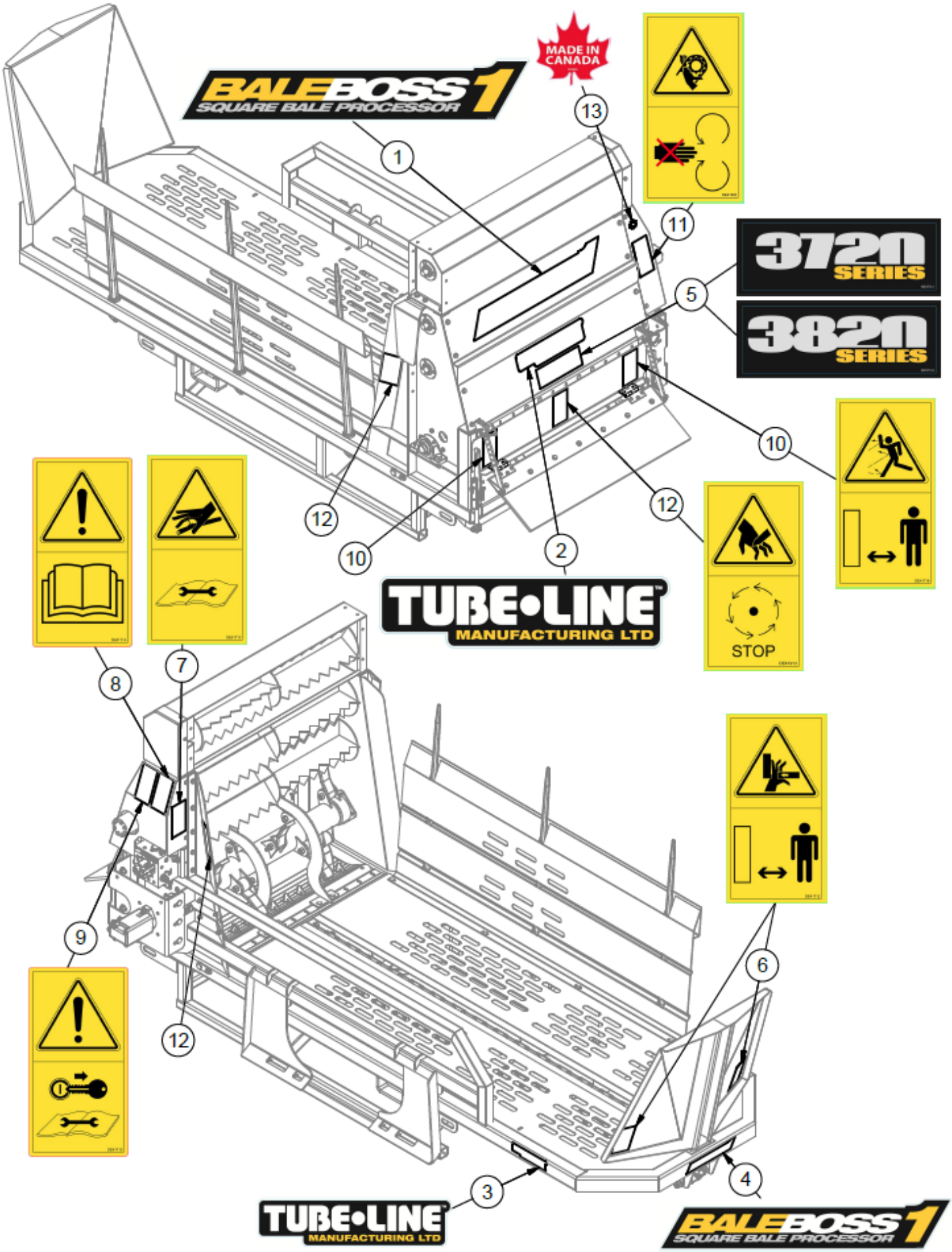
WHEN DEALING WITH HYDRAULICS DURING ANY TYPE OF ASSEMBLY, OPERATION, MAINTENANCE OR OTHER WORK ON OR NEAR THIS PRODUCT:

Hydraulic fluid under pressure can penetrate the skin and cause serious injury or death. Hydraulic leaks under pressure may not be visible. Wear safety glasses, protective clothing and use a sound piece of cardboard or wood when searching for hydraulic leaks. DO NOT USE YOUR HANDS! If any fluid penetrates the skin, SEEK IMMEDIATE MEDICAL ATTENTION!

Before connecting or disconnecting hydraulic hoses, read your tractor or power unit's operator's manual for detailed instructions on connecting and disconnecting hydraulic attachments. Make certain that all parts meet the specifications for this product when installing or replacing hydraulic hoses or fittings. After connecting hydraulic lines: Slowly and carefully raise the loader and cycle the rollback / dump cylinders to check hose clearances and to check for any interference. Operate the hydraulics on this product to check hose clearances and to check for any interference. Make certain that the hoses cannot interfere with or actuate the quick-attach mechanism. Make certain that hoses will not be pinched, or get tangled, in any equipment. Do not lock the auxiliary hydraulics of your power unit in the "ON" position.

Refer to your power unit's operator's manual and this manual for procedures and intervals, then inspect and maintain the entire hydraulic system to insure that the fluid remains cleans, that all devices function properly and that there are no fluid leaks.

Section 3 - Safety Sign Locations



ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	DE23960	Boss 1 Decal 32.5 x 5.5
2	1	DE28146	Tubeline Decal 4” x 16”
3	1	DE28705	Tubeline Decal 2.0” x 8.3 “
4	1	DE28724	Bale Processor BossI - 2.0 x 12 Decal
5	1	DE37511	Boss I-3820 Model Decal
	1	DE37512	Boss I-3720 Model Decal
6	2	DE41712	ISO Decal - Hand Pinch Point
7	1	DE41713	ISO Decal - High Pressure Fluid
8	1	DE41714	ISO Decal - Read Operator’s Manual
9	1	DE41715	ISO Decal - Remove Key Before Repair
10	2	DE41718	ISO Decal - Thrown Object Vertical
11	1	DE41902V	ISO Decal - Chain Entanglement Vertical
12	3	DE41913	ISO Decal - Cutting Hazard
13	1	DECANADA	Decal Made In Canada

Placement or Replacement of Safety Signs

Clean the area of application with non-flammable solvent, then, wash the same area with soap and water. Allow the surface to fully dry. Remove the backing from the safety sign, exposing the adhesive surface. Apply the safety sign to the position shown in the diagram above and smooth out any bubbles.

Instructions

- Keep all safety signs clean and legible.
- Replace all missing, illegible or damaged safety signs.
- Replacement parts for parts with safety signs attached must also have safety signs attached.
- Safety signs are available free of charge from your dealer or from Tube-Line.

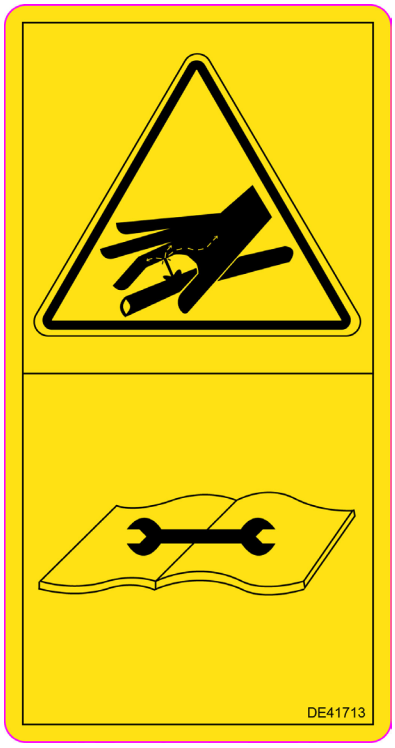
Safety Decals

DE41712 - Hand Pinch Hazard

Keep clear of machine while operating.
Do not attempt to free material by hand.
May result in serious injury and/or death.

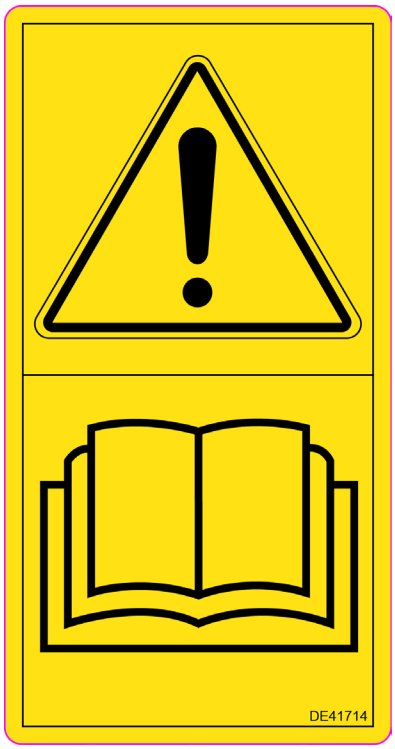
DE41713 - Hydrulic Fluid Puncture Hazard

Do not attempt to find hydraulic leaks with hand. Consult operators manual (*pg.7-1*)



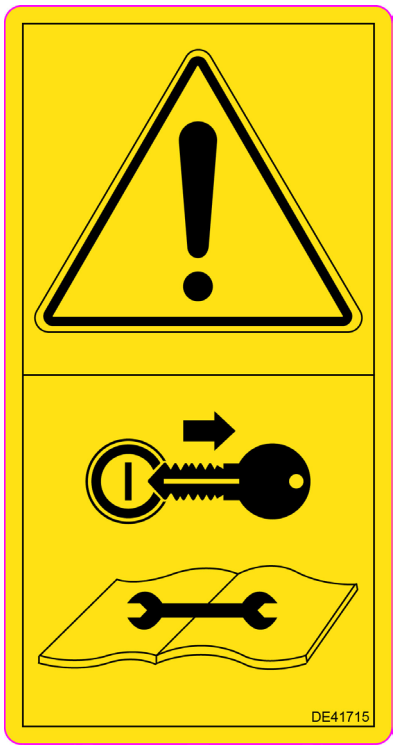
DE41714 - Read Operator's Manual Before Operating.

Fully understand how to use machine before operating.



DE41715 - Remove Key Before Servicing.

Read operator's manual for proper repair or maintenaince techniques.

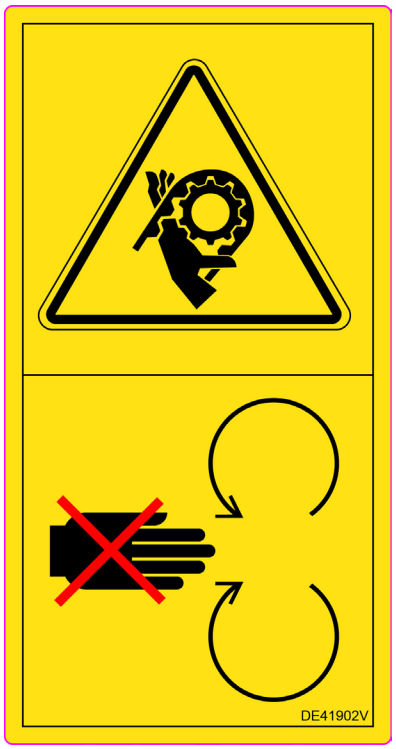


DE41718 - Thrown Object Hazard.

Keep clear of machine while operating. Serious injury may occur.

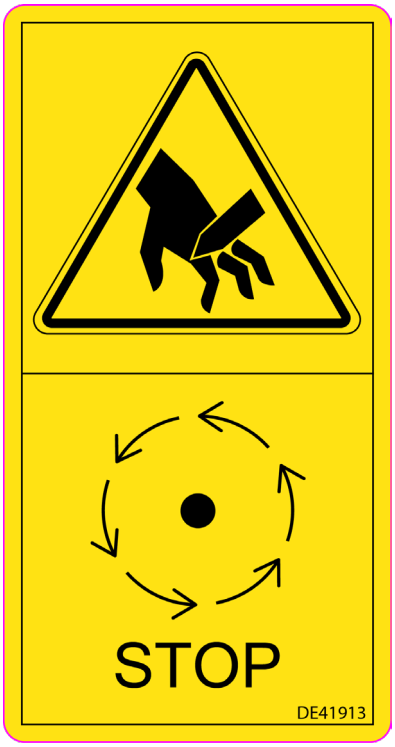
DE41902V - Chain Entanglement Hazard.

Keep hands clear of rotating parts while machine running. Do not operate without shielding in place. Do not wear loose clothing while operating.



DE41912 - Cutting Hazard.

Sharp knives can cause dismemberment. Wait for moving parts to stop before attempting to repair.



Section 4 - Power Unit Specifications

IMPORTANT

Exceeding any of the recommended power unit specifications CAN result in damage to your power unit and/or this product and WILL void all Tubeline warranties.

Minimum	Maximum
20 GPM at 2500 PSI	40 GPM at 3000 PSI

Section 5 - Functions & Adjustments

Control Switch Functions

NOTICE: The Boss I 20 series machine can be operated without electrical controls.However this removes the ability to stop the ram and top beater independantly from the flail drum.

With the handheld electrical control positioned as shown in Fig.1, the three toggle switch functions are:

- **(A)** Neutral position, the switch has no control over the hydraulic functions.
- **(B)** Left position, the switch will stop hydraulic flow to the bale ram.
- **(C)** Right position, the switch will stop hydraulic flow to both the bale ram and the top beaters.

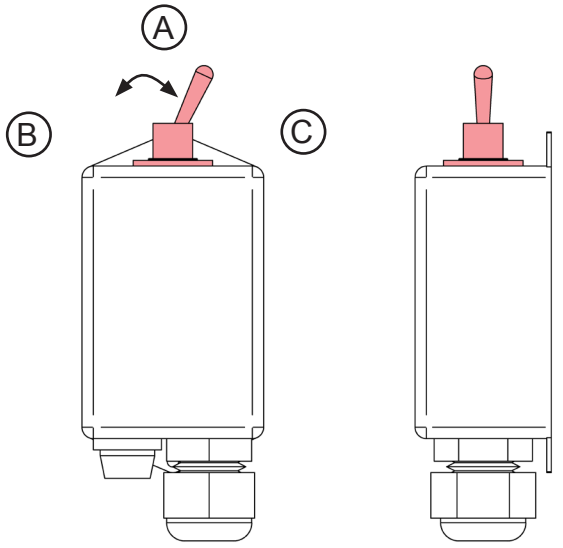


Fig.1

Control Manifold Functions - CTI

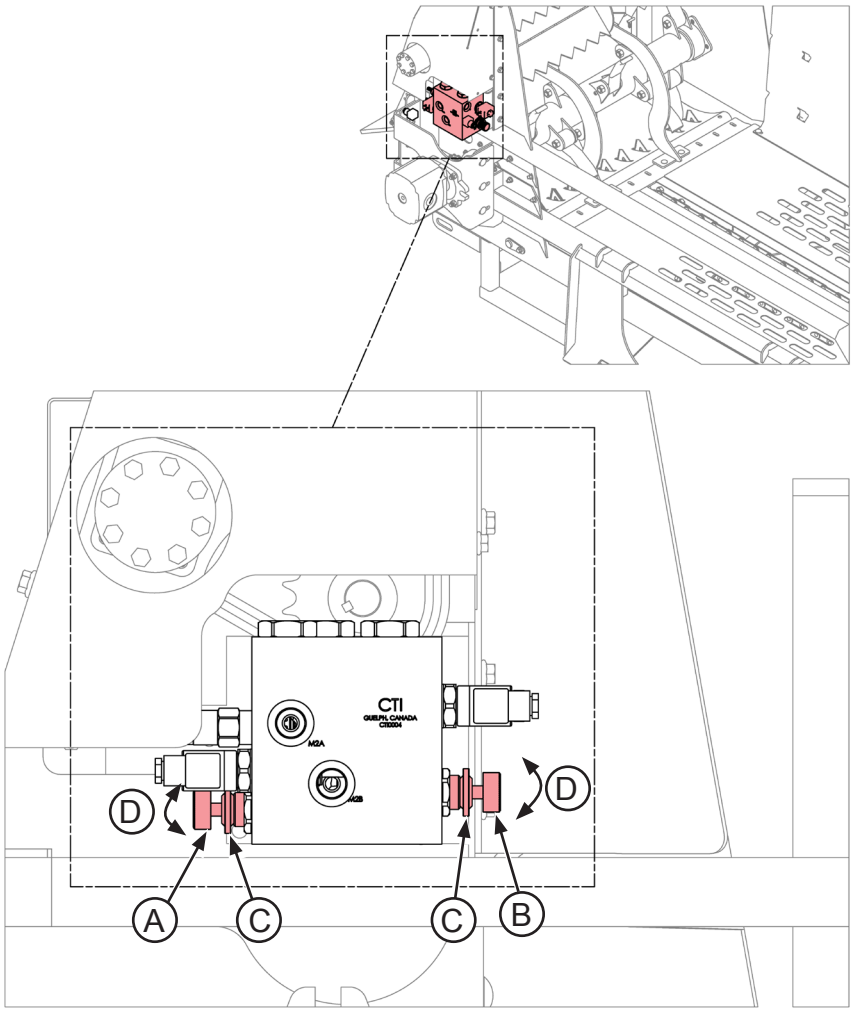
A Boss I 20 series machine equipped with a CTI manifold valve has 2 adjustable hydraulic functions.

1. Bale Feed Rate

The hand dial located on the left side **(A)** of the manifold valve controls the speed that the bale ram pushes a bale into the flail drum.

2. Secondary Bale Feed Rate

The hand dial located on the right side **(B)** of the manifold valve controls the rotation speed of the top beaters.



Adjusting CTI Manifold Dials

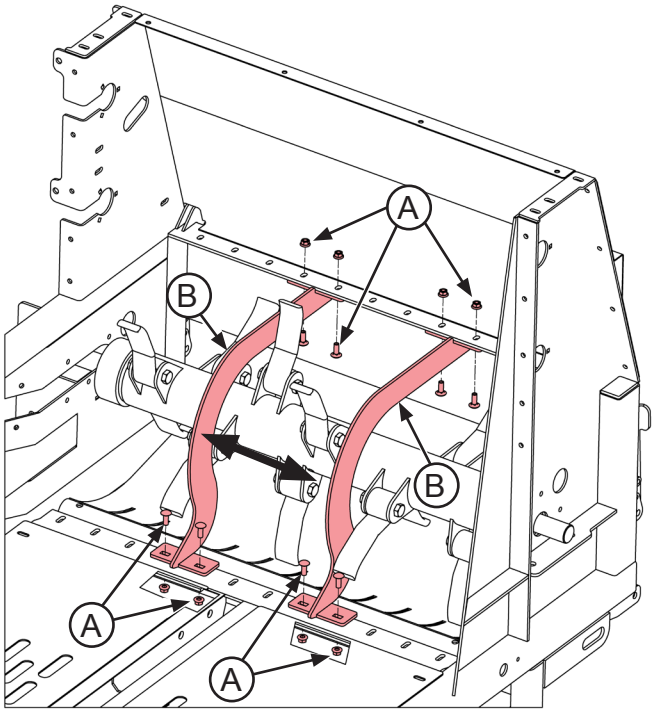
CAUTION: Damage to dial knobs may result if attempting to adjust while hydraulics are under pressure.

Loosen lock knob **(C)** until the adjuster knob **(D)** can rotate. Turn adjuster knob left to increase speed of function. Turn adjuster knob to right to decrease speed of function.

Flail Drum Guards Adjustment

Flail drum guards are a great way to restrict the amount of material that is feed through the flail drum. However longer materials may be restricted too much and become entangled in the guards. Follow these instructions to remove or change the spacing of the flail drum guards.

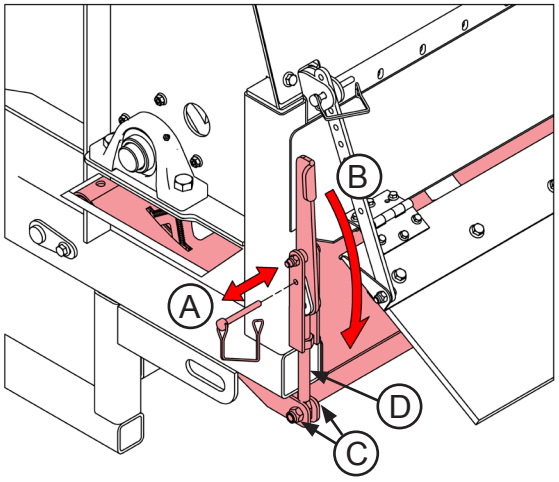
1. Remove nuts and bolts **(A)** from top and bottom of gaurds.
2. Slide, or remove, guards **(B**) to desired locations.
3. Refasten nuts and bolts of top and bottom of guards.

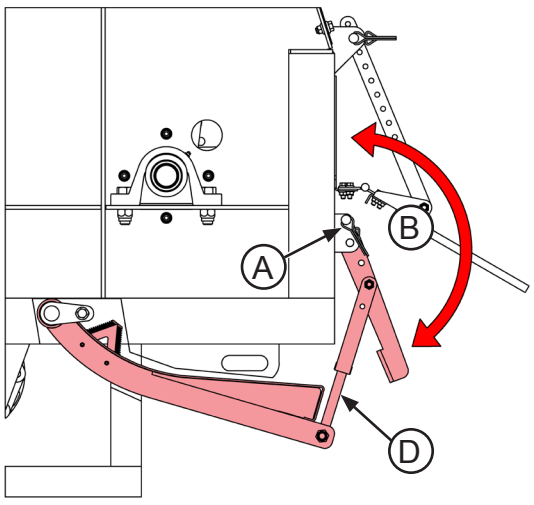


Flail Floor Adjustment

The floor beneath the flail drum can be lowered to allow longer strand material to be fed out of the machine.

1. Pull lock pins **(A)** from upper pivot likages (both sides).
2. Pull pivot linkage handles **(B)** down to lower floor (both sides).
3. Refasten lock pins through frame lugs to avoid losing them.
4. Further adjustment can be made by unfastening nuts and bolts **(C)** of lower pivot point which allows the eyebolts **(D)** to turn.
5. Turn the eyebolts to adjust the amount the flail floor lowers.
6. Refasten the nut and bolt through the eyebolt and flail floor (both sides).





Removing Cutting Knives

Removing the knives offers less resistance and faster processing when shorter material is being fed through the Boss I.

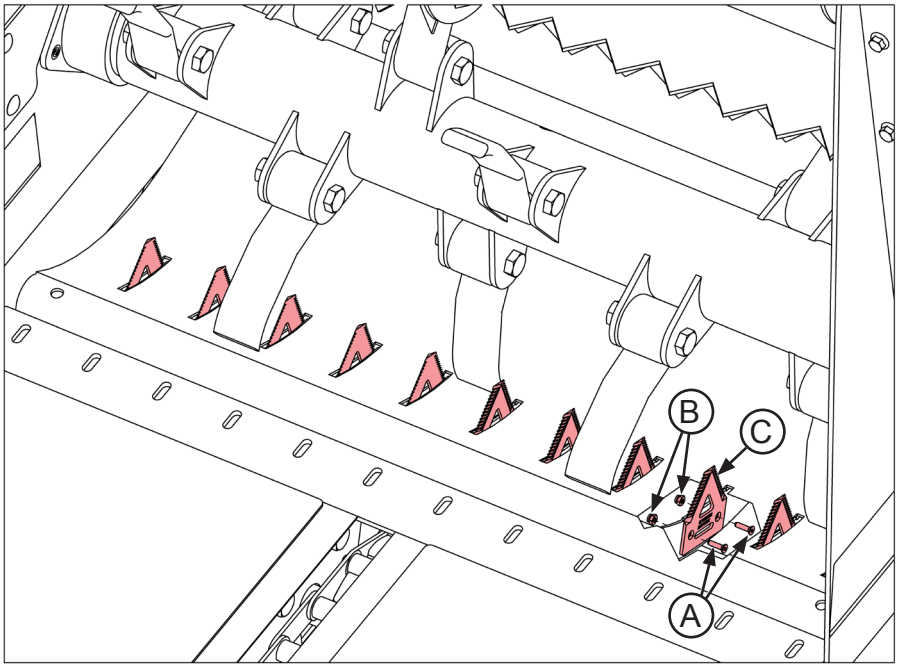
DANGER: Only remove knives when machine is disconnected from power unit. Wear work gloves to avoid cutting hands on serrated edges.

To remove knives follow these instructions:

WARNING: You may want to clamp the knife blade(s) to the frame to avoid accidental injury when fasteners are removed.

1. Remove countersunk bolts **(A)** and lock nuts **(B)**.
2. Remove knife blade **(C)** and wrap sharp edges with a rag or other thick material.
3. Repeat the process to remove as many knives as desired.

Knives and hardware should be stored in a labelled container for future use.



Section 6 - Processor Operation

DANGER

Failure to obey the following procedure will result in death or serious injury. Avoid contacting overhead wires.

WARNING

Failure to obey the following procedures could result in death or serious injury.

Never lift this product: above the operator's eye level OR to a height where visibility is obstructed, whichever is lower.

Use caution when raising loaded processor. Objects could fall from processor toward bystanders or operator.

Remove all foreign objects and twine from bales before processing.

Processor Installation Instructions

Refer to the operator's manuals of your power unit, your loader and your quick-attach for special or detailed mounting instructions. This product should fit onto the quick-attach or loader arms of your power unit the same as the original products that were designed by your loader / quick-attach manufacturer. If this product does not fit properly, contact Tube·Line before operating. Never place your finger into the mounting plate or 3-point hitch or loader holes. A slight movement of the power unit or this product could cause serious injury.

Make certain that all safety signs are in place and legible. Refer to the safety sign page in this manual for the placement of safety signs for this product. Inspect driveline shield for free rotation. Replace all damaged or excessively worn parts and hardware only with genuine Tube·Line parts or with properly rated fasteners, hydraulic hoses or fittings. Make certain that all locking pins, latches and connection devices are properly installed and secured. Make certain that all shields are in place and secure.

- Never use processor on a power unit that is not equipped with a cab or ROPS, and operator restraints (seat belts or equivalent devices).
- Place this product on a firm, level surface that is large enough to safely accommodate this product, your power unit and all workers involved in the mounting process. Be sure all connection points are properly secured.
- Refer to the operator's manual(s) for your power unit, loader and quick-attach and follow the mounting instructions contained therein.
- Carefully raise the loader arms and cycle the tilt cylinders to check clearances and to verify that all mounting procedures have been successfully completed.
- Drive slowly through gates and doors.
- Know your loader's safe operating weight limit and the weight of your loader attachment.

NOTICE

Refer to your power unit's operator's manual for safe operating limit and use of counterweights.

Processor Hydraulic Connection

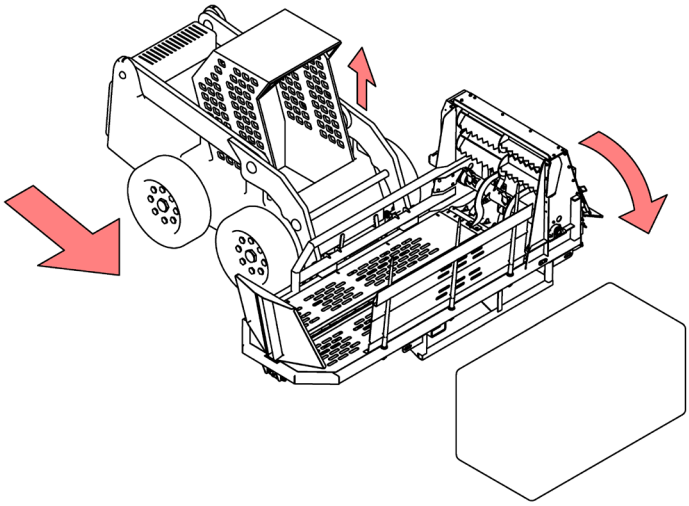
SAFETY FIRST!! READ AND UNDERSTAND THE SAFETY INSTRUCTIONS *(Section 2)* **BEFORE BEGINNING ANY HYDRAULIC CONNECTION.**

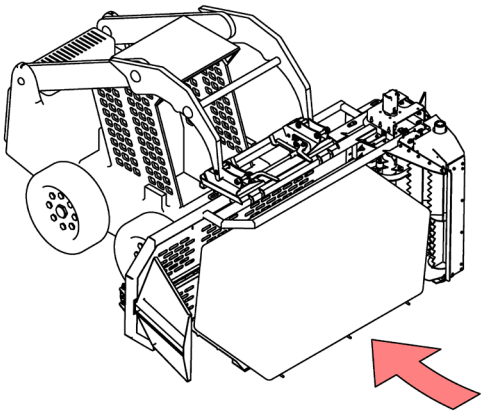
Disconnect the hydraulic hose quick couplers from one another and attach the quick couplers to your power unit as per the instructions in your power unit's operator's manual.

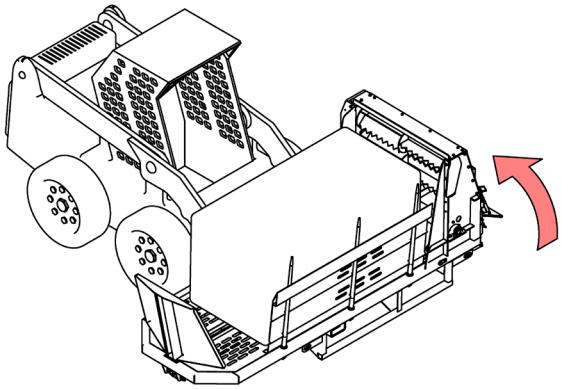
Carefully raise the loader arm and cycle the tilt cylinders to check hose clearances and to check any interference.

Loading Bales

- Load one bale at a time. If bales are frozen, put frozen side down to the table for better operation.
- Center the bale on the forks before loading on to the table. Slide forks lightly on the ground when loading bales. Store bales on level ground and on a clean surface free from rocks and other foreign objects.
- Adjust discharge deflector to spread forage at desired width.
- Operating power unit at maximum RPM. allows the processor to do a better job of chopping forage.
- Twine build-up should be kept to a minimum to reduce fire hazard and keep the machine in balance.
- Always lower the processor to the ground; set the parking brake; stop the engine; remove ignition key and wait for all moving parts to stop before leaving the operator's seat.







Section 7 - Processor Maintenance

Regular maintenance is the key to long equipment life and safe operation. It is very important that these maintenance functions be performed as described below.

SAFETY FIRST!! READ AND UNDERSTAND THE SAFETY INSTRUCTIONS *(Section 2)*
BEFORE BEGINNING ANY PROCESSOR MANTENANCE OPERATION

IMPORTANT

The flail tube on this machine is a fully balanced assembly. If for any reason the flails must be removed, they must be returned to the same position they were taken from. If this is not done a balance problem will result in causing machine vibration. Number flails and inserts and their positions before you do any work.

Before First Use

Inspect the attachment for shipping damage. If damage does exist, do not operate until the damaged parts have been replaced or repaired.

Before Each Use

Check for loose or badly worn parts.

Conveyor chain should be adjusted to allow chain slack 1” (2.54 cm) to 1½” (3.8 cm).

Make sure that all hydraulic fittings are tightened and that there are no leaks in any fittings or hoses.

Inspect rotor and all rotating parts for twine or wire build-up.

Check for cylinder wear and broken flails and flail bracket wear. Replace with new “Boss” flails to keep machine in balance.

Make sure that all safety signs are in place, are clean and are legible. Refer to Safety Sign Section, *page 3-1*.

After Every 10 Hours of Operation

Grease all roller bearings *(refer to diagram on page 9-1).*

Inspect and tighten Allen screws on bearing.

Repairs

When making repairs, use only genuine Tubeline parts or, for fasteners, hydraulic hoses or hydraulic fittings, use only properly rated parts.

Order safety decals for replacement parts that have a safety decal on the original part.

Section 8 - Processor Service

SAFETY FIRST!! READ AND UNDERSTAND THE SAFETY INSTRUCTIONS *(Section 2)* **BEFORE BEGINNING ANY PROCESSOR SERVICE.**

WARNING

Hydraulic fluid under pressure can penetrate skin, resulting in serious injury or death. Always relieve hydraulic pressure before disconnecting lines.

Shut off engine, set parking brake and relieve hydraulic pressure before connecting or disconnecting hydraulic lines. Refer to your power unit's manual for instruction on how to relieve hydraulic pressure in lines.

Before applying pressure to the system, be sure that all connections are tight and be sure there are no damaged hoses, lines or fittings.

Wear safety glasses and use metal or wood when searching for leaks. Do not use your hands.

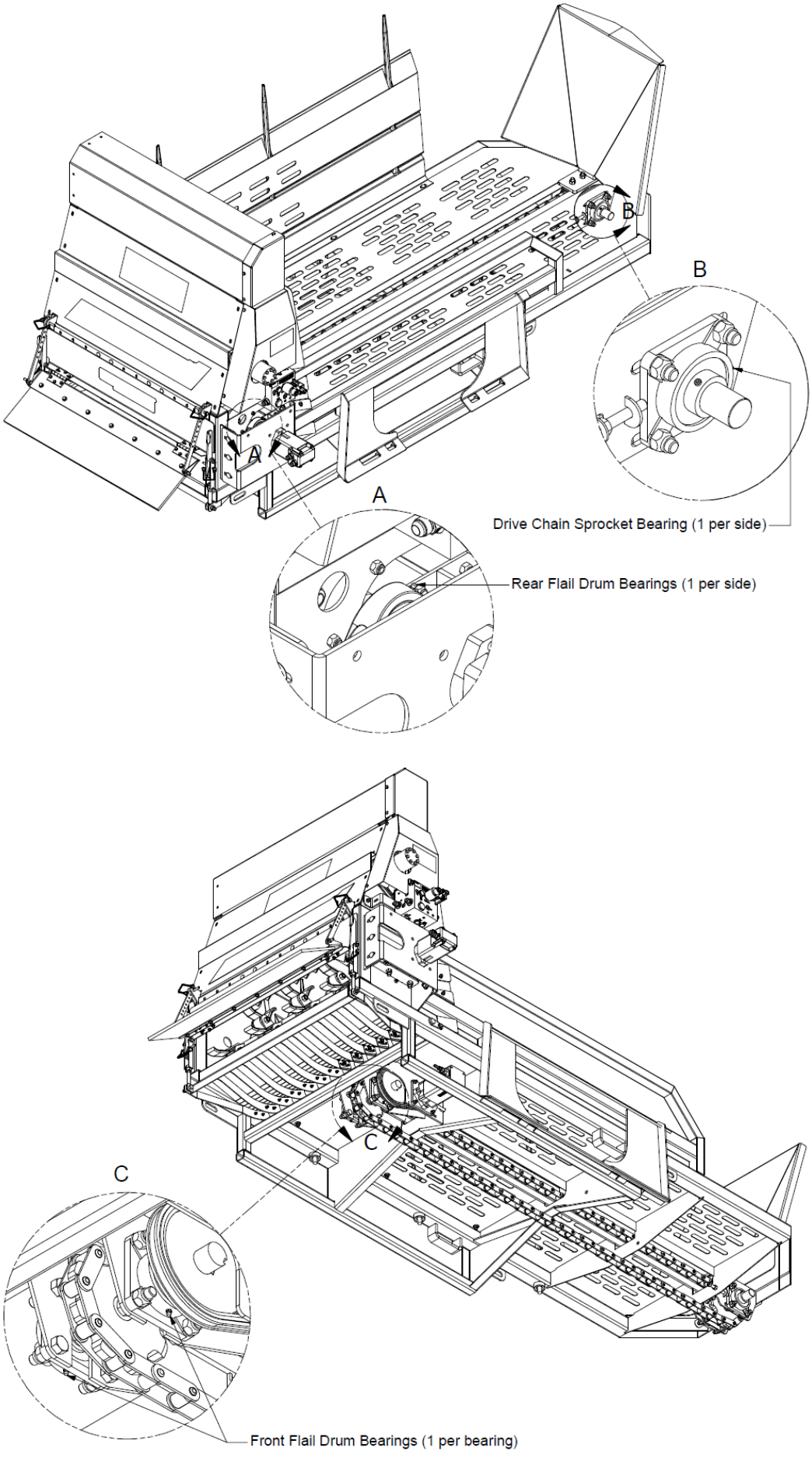
WARNING

Before servicing the loader, remove the attachment and make certain the lift arms are lowered to their lowest position or that the arms are supported by the mechanical lock up devices (if the machine is so equipped).

Steam-clean the power unit before any installation is made to the hydraulic system.

Remove any attachment from the power unit and position on a level surface.

Section 9 - Grease Points



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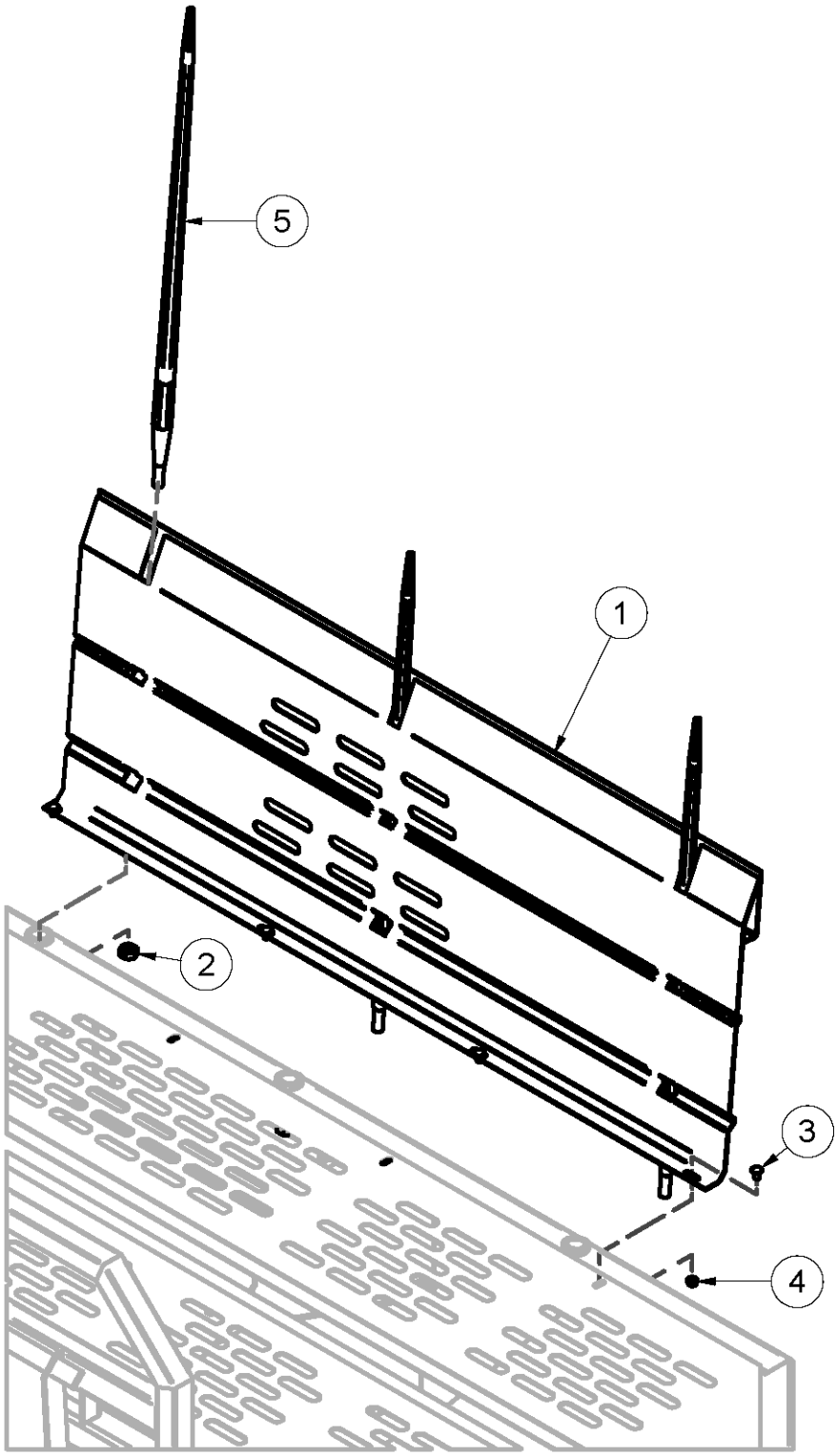
Section 10 - Part Breakdowns & Lists

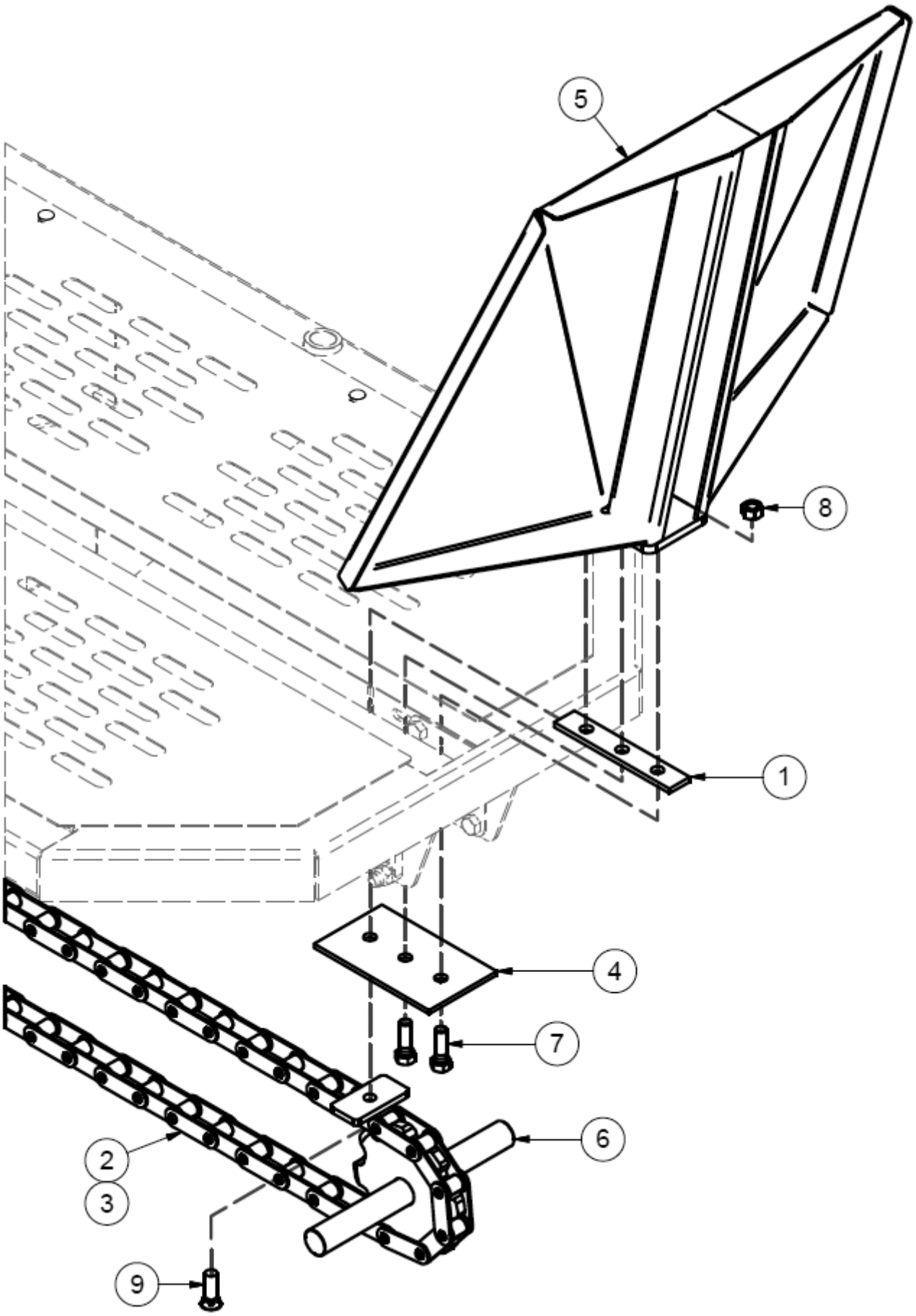
Loading Plate



Loading Plate

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	25783	Loading Plate
2	3	39510	Conus 1 Nut
3	4	CB 3/8-16 X0.75 Z5	Carriage Bolt - 3/8-16 x 3/4” Grade 5 Zinc
4	4	HNC3/8	Serrated Hex Nut
5	3	LA-MFE43	43” Tine

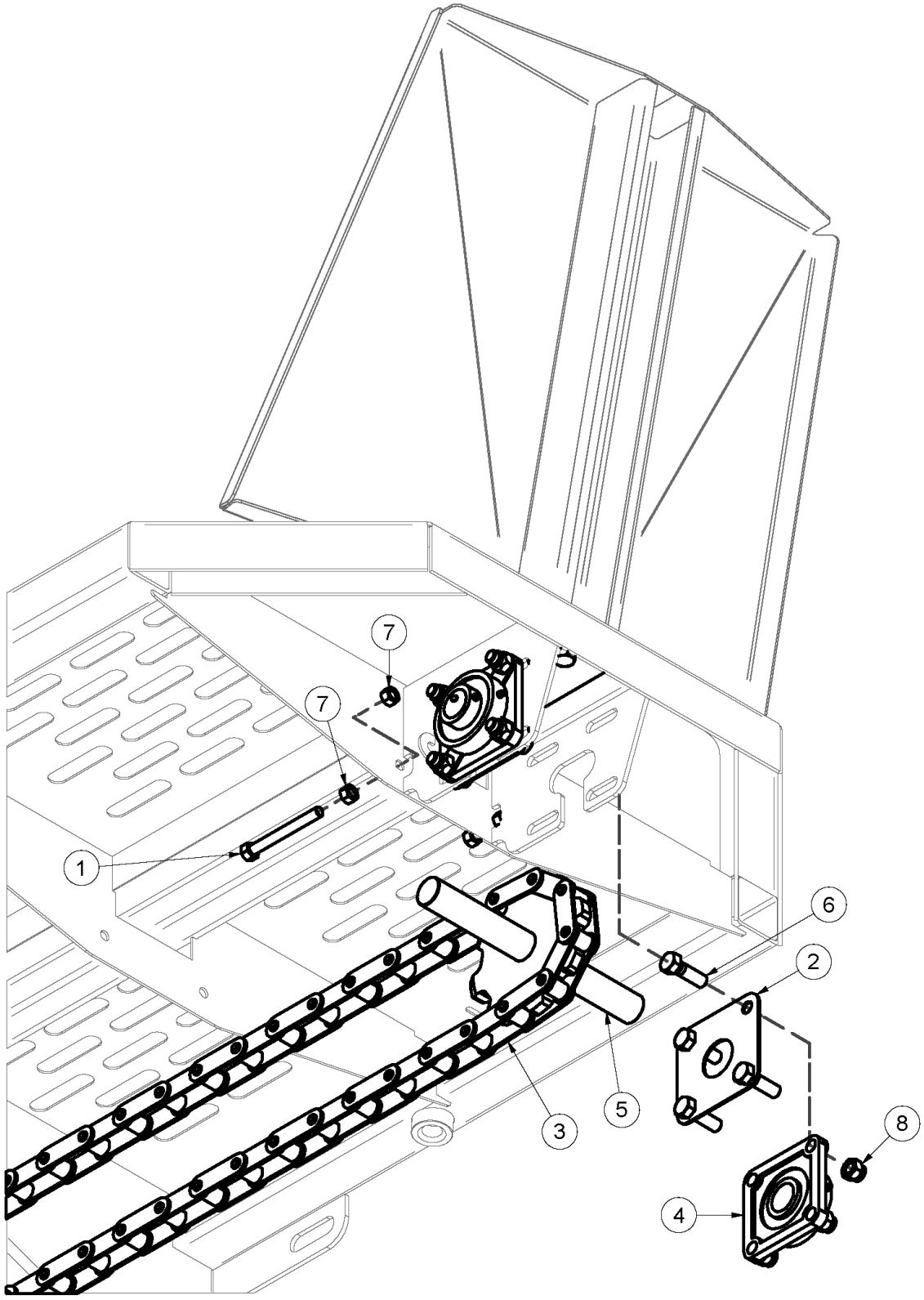
Ram



Ram

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	36350	Ram Guide
2	1	39992	3720 Bed Chain (81X Chain)
3	1	39993	3820 Bed Chain (81X Chain)
4	1	B1 123	Bottom Ram Slider Plate
5	1	B1 150	Ram
6	1	BS200138A	Idler
7	2	HB 5/8-11X2 Z5	HB .625 x 2 Hex Bolt
8	3	HN 5/8	HN .625 Hex Nut
9	1	PB 5/8-11X2	PB .625 x 2 Plow Bolt

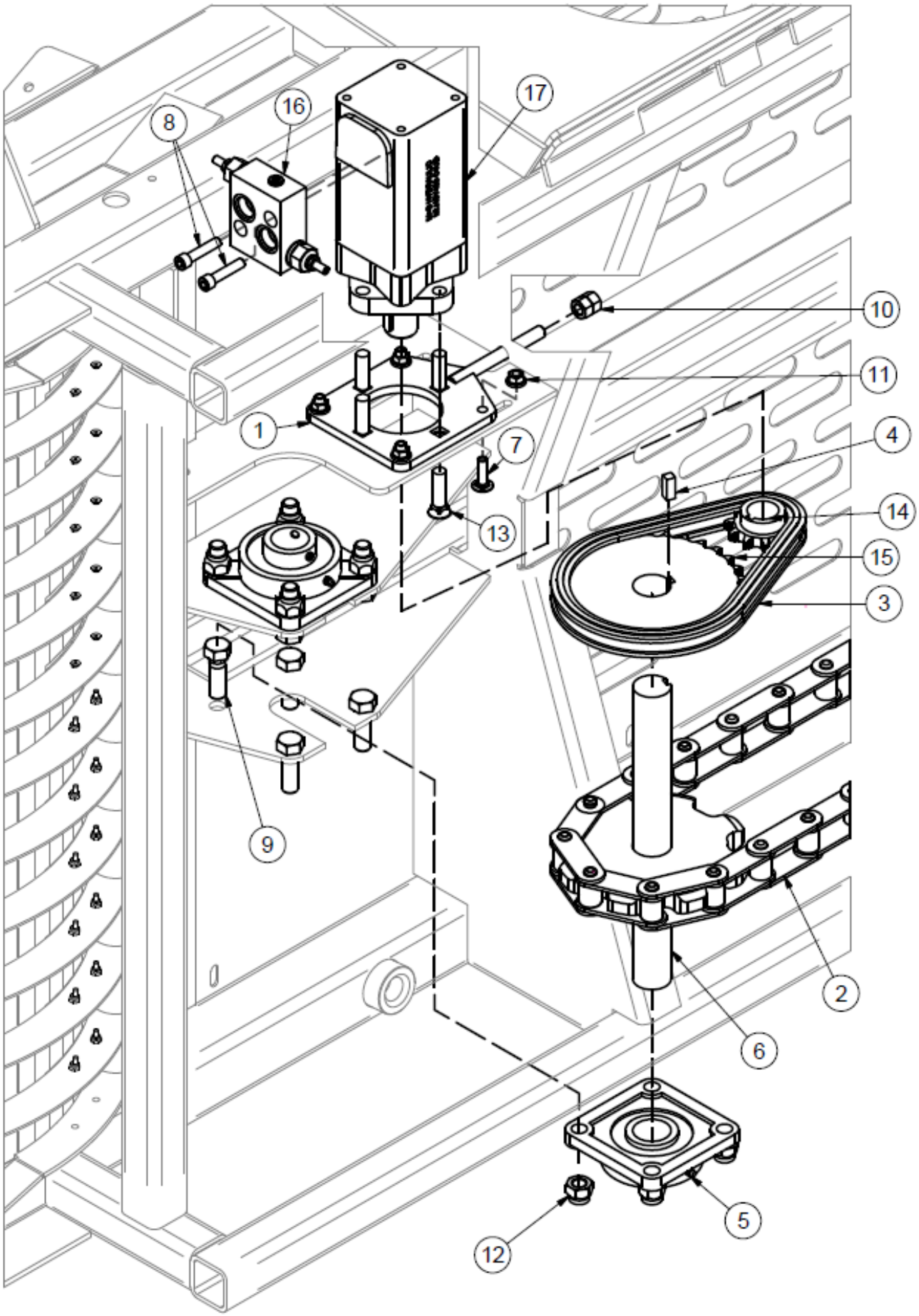
Rear Idler



Rear Idler

ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	36308	Bearing Adjustment
2	2	36353	Bearing Plate
3	1	39992	3720 Bed Chain - (81X Chain)
	1	39993	3820 Bed Chain - (81X Chain)
4	2	BEA UCF208-24-1.5	1 1/2” 4 Bolt Flange Bearing
5	1	BS200138A	Idler
6	8	HB 5/8-11X2 Z5	Hex Bolt 5/8-11x2 Grade 5 Zinc Plated Hex Cap Screw
7	4	HN 1/2	Hex Nut 1/2”-13 Grade 5 Zinc Plated Finished
8	8	LN 5/8 N	LN 5/8-11 Zinc Plated Nylon Insert Lock Nut

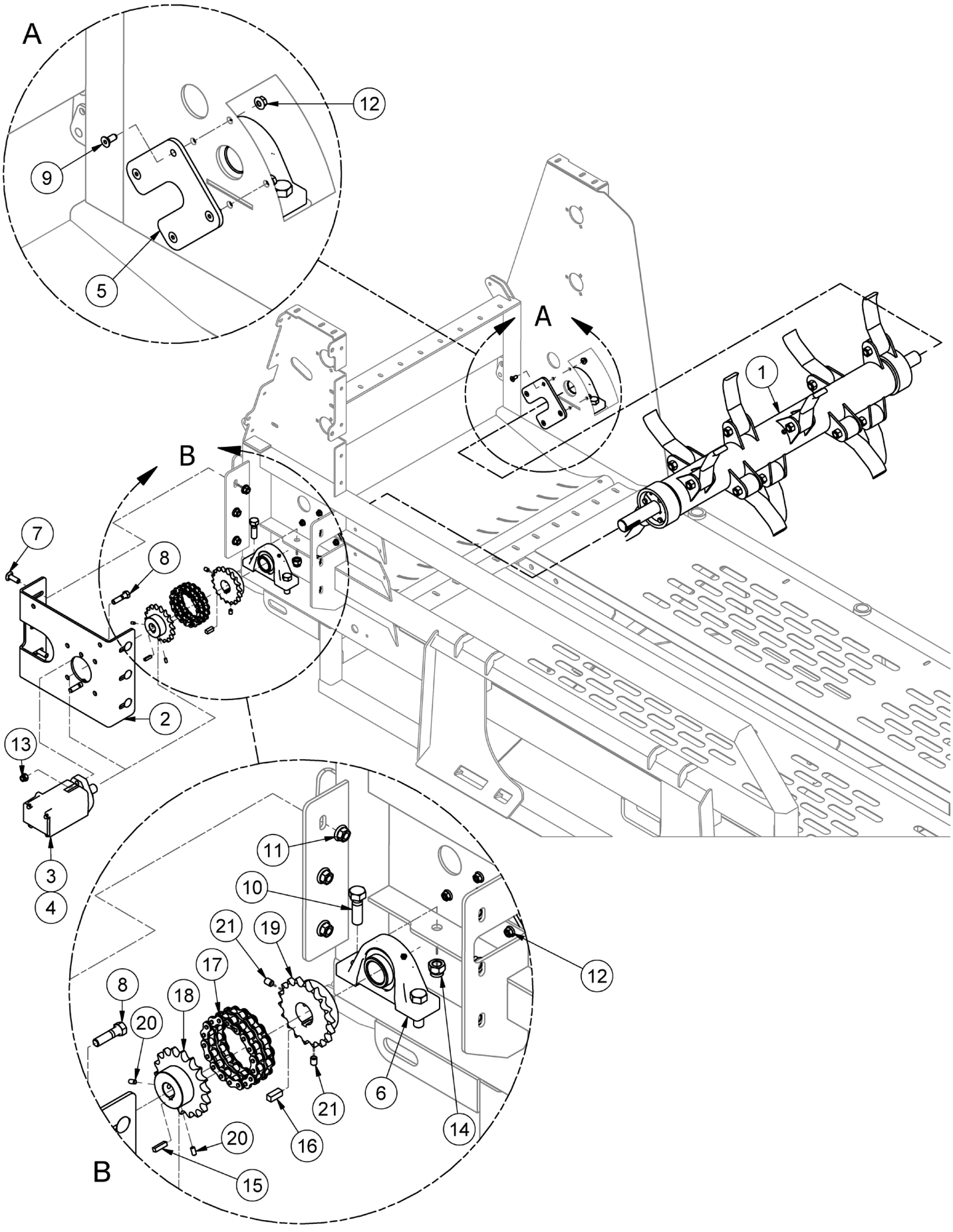
Front Chain Drive



Front Chain Drive

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	36695	Ram Motor Plate
2	1	39993	Ram Chain
3	1	39997	Chain - #60 x 39 Links (+ Connector Link)
4	1	39999	Keystock - .375 X .375 X 1.25
5	2	BEA UCF208-24-1.5	Flange Bearing
6	1	BS200141A	Bed Chain Sprocket Weldment
7	4	CB 3/8-16 X1.25 Z5	Carriage Bolt - 3/8-16 x 1 1/4” Grade 5 Zinc
8	8	HB 3/8-16X1.75 SHCS	Hex Bolt - 3/8-16 x 1 3/4 Socket Head Cap Screw
9	2	HB 5/8-11X2 Z5	Hex Bolt 5/8-11x2 Grade 5 Zinc Plated Hex Cap Screw
10	4	HN 1/2	Hex Nut 1/2”-13 Grade 5 Zinc Plated Finished
11	8	HNC3/8	Serrated Hex Nut
12	4	LN 5/8 N	LN 5/8-11 Zinc Plated Nylon Insert Lock Nut
13	4	PB 1/2-13X2	Plow Bolts - 1/2-13 x 2 Flat Head Gr.5
14	1	SPR60B111.25	Sprocket - 11 Tooth, 1.25” Bore w/ .313” Keyway
15	1	SPR60B30F-IH	Sprocket - 30 Tooth, 1.5” Bore w/ .375” Keyway
16	1	VAL KPDS100-A-3	Relief Valve
17	1	VAL MLHSY400	Hydraulic Motor

Flail Drum Assembly

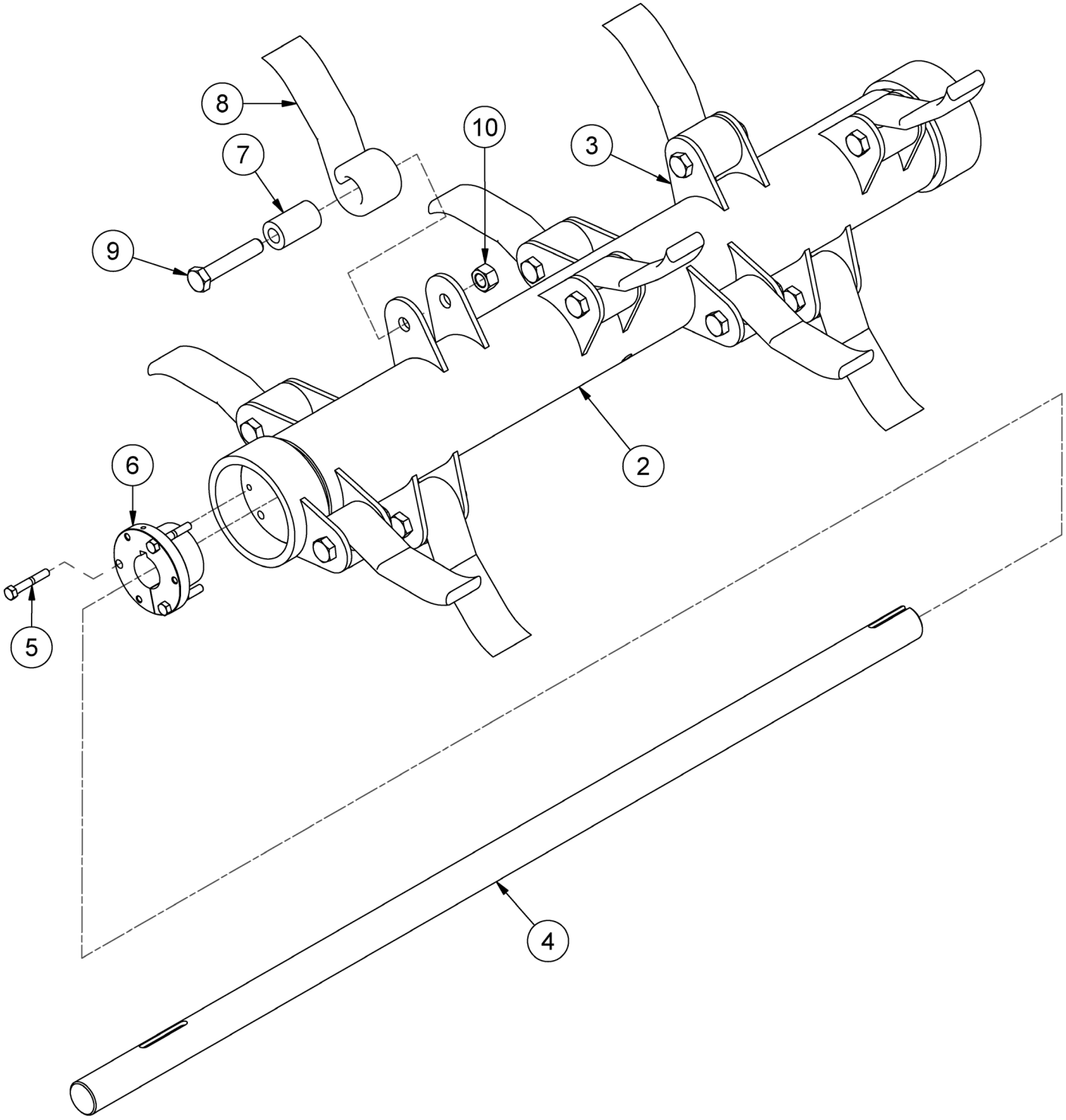


Flail Drum Assembly

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
1	1	39678	Flail Drum	Brkdwn Pg.10-14
2	1	36395	Motor Mount	
3	1	VAL 1002	Hydraulic Motor	
4	1	SK 61258	Seal Kit for Eaton Hydraulic Motor 104-1002-006	
5	2	36376	Flail Spacer	
6	2	BEA P208-108DI	1.5” Pillow Block Bearing	
7	6	CB 1/2-13 X1.5 Z5	Carriage Bolt - 1/2-13 x 1 1/2” Grade 5 Zinc	
8	2	HB 1/2-13X2 Z5	Hex Bolt 1/2-13x2 Grade 5 Zinc Plated Hex Cap Screw	
9	8	HB 5/16-18X0.75 FHSCS	Hex Bolt - 5/16”-18 x 3/4” Flat Socket Cap Screw	
10	4	HB 5/8-11X2 Z5	Hex Bolt 5/8-11x2 Grade 5 Zinc Plated Hex Cap Screw	
11	6	HNC1/2	Serrated Hex Nut	
12	8	HNC5/16	Serrated Hex Nut	
13	2	LN 1/2 N	LN 1/2-13 Zinc Plated Nylon Insert Lock Nut	
14	4	LN 5/8 N	LN 5/8-11 Zinc Plated Nylon Insert Lock Nut	
15	1	KS40254	Keystock .250 X 1.000	
16	1	KS39999	Keystock .375 X 1.000	
17	1	SPR6018CC	#60 Chain Coupler (c/w Connector Link)	
18	1	SPR60B18	18 Tooth, 1” Bore Chain Coupler Sprocket	
19	1	SPR60B18-1.5	18 Tooth, 1.5” Bore Chain Coupler Sprocket	
20	2	SS 14X12	Allan Head Set Screw, 1/4-20 x 1/2	
21	2	SS 38X12	Allan Head Set Screw, 3/8-16 x 1/2	

Flail Drum (Taper Lock Hub) Breakdown

*Taper lock drum will replace welded style flail drum.

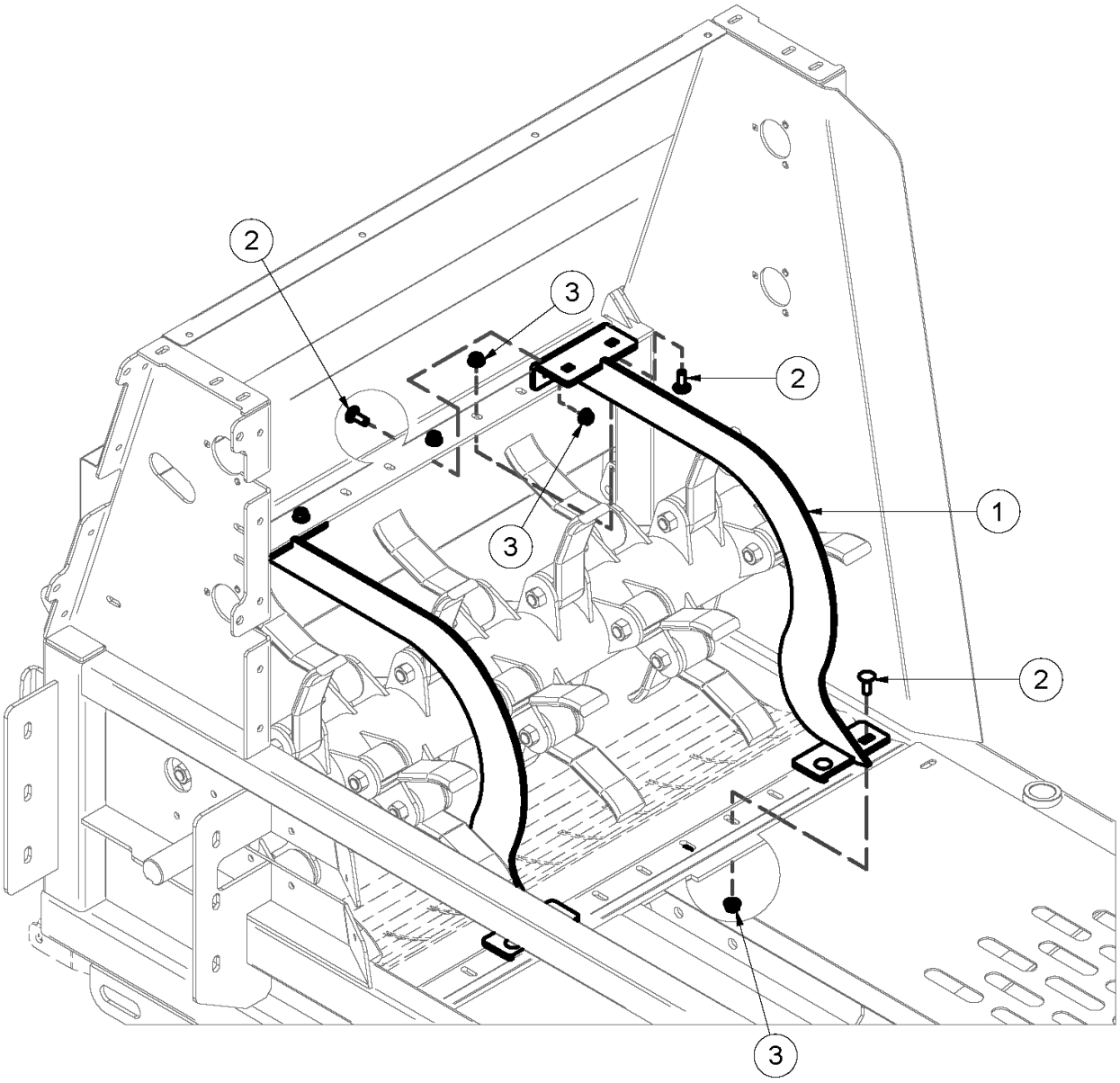


Flail Drum (Taper Lock Hub) Breakdown

*Taper lock drum will replace welded style flail drum.

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
1	1	39678	Boss I 20 Series Complete Taper Lock Drum Assembly	Inc. All Items
2	1	39677	Flail Drum	Inc. Items 3-6
3	24	30070	Flail Mount Lug	
4	1	39921	1.5” Flail Drum Shaft	
5	6	HB 5/16-18X2 Z5	Hex Bolt 5/16-18x2 Grade 5 Zinc Plated Hex Cap Screw	
6	2	BS BUSK-1.5	SK Taper Lock Bush 1 1/2	
7	12	BS200059	Flail Bushing	
8	12	BS200060A-1	Hammers, Heavy - 7/16 Material	
9	12	HB 5/8-18 X3.25 YZ8	Hex Bolt 5/8-18x3 1/4 Grade 8 Zinc Hex Cap Screw	
10	12	HN 5/8-18	Hex Nut - 5/8”-18 Grade 5 Zinc Plated Finished N.F.	

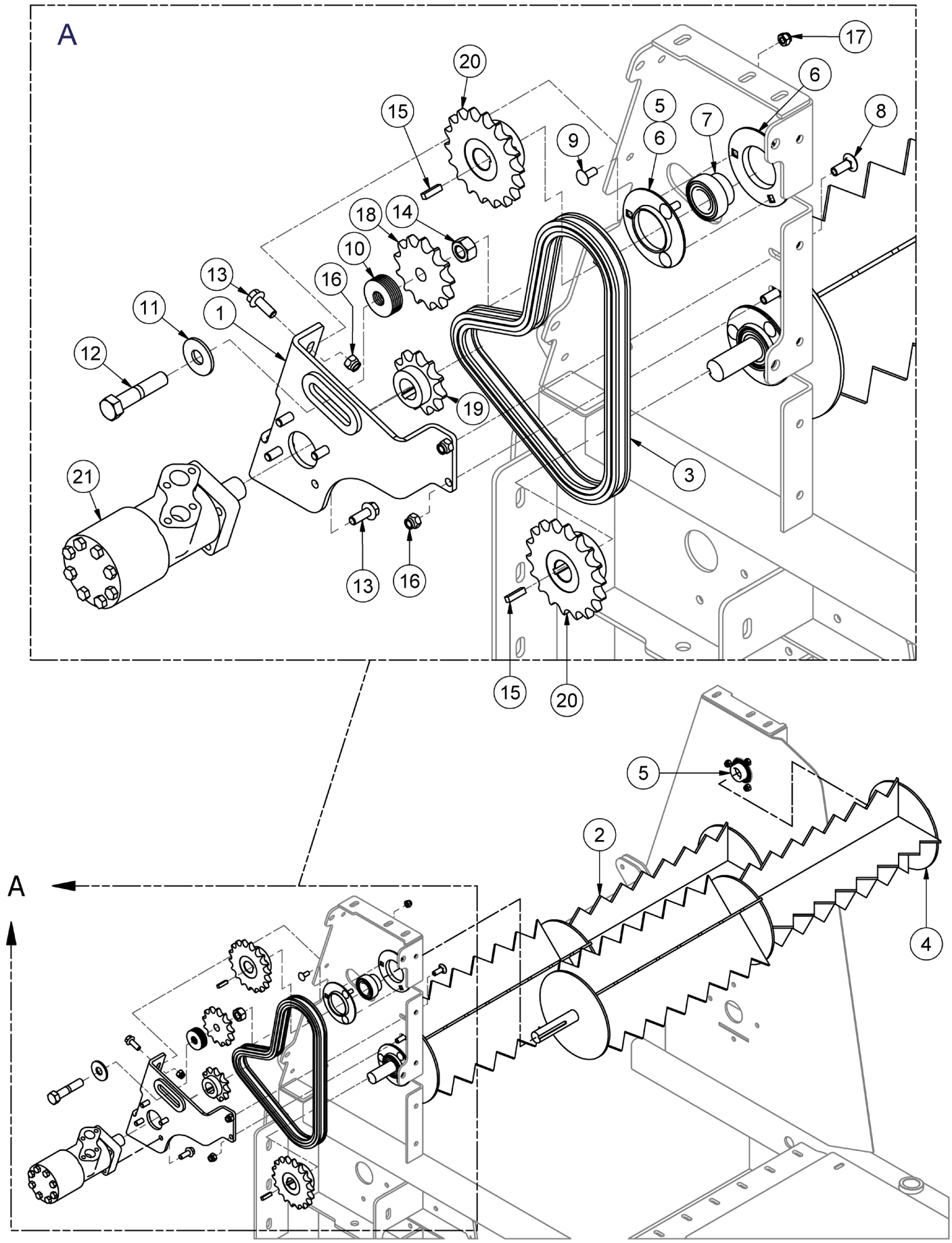
Flail Drum Guards



Flail Drum Guards

ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	36306	Flail Rib
2	12	CB 3/8-16 X1 Z5	Carriage Bolt - 3/8-16 x 1” Grade 5 Zinc
3	12	HNC3/8	Serrated Hex Nut

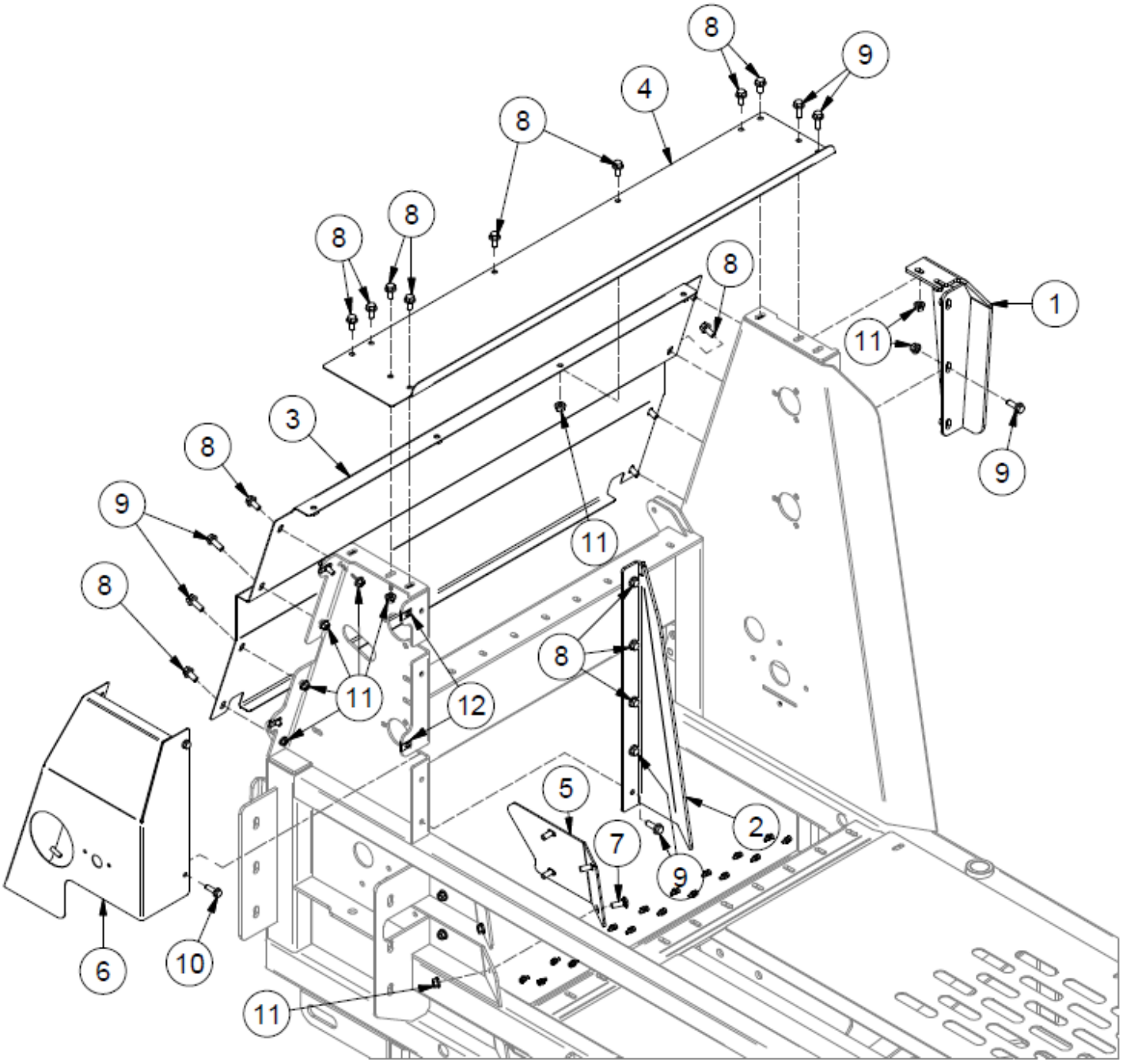
Top Beaters



Top Beaters

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	36312	Hyd. Motor Mount
2	1	36972	Top Beater
3	1	40256	Chain - #60, 49 Links (+ Connector Link)
4	1	B1 084	Top Beater
5	4	BEA 42852	BEA SA205-16+BEA PF205
6	2	BEA PF205	PF205 Bearing Flange
7	1	BEA SA205-16	1” Bearing Insert
8	2	CB 3/8-16 X1 Z5	Carriage Bolt - 3/8-16 x 1” Grade 5 Zinc
9	6	CB 5/16-18 X0.75 Z5	Carriage Bolt - 5/16-18 x 3/4” Grade 5 Zinc
10	6	FW 5/8	Flatwasher - 5/8” Zinc Plated USS
11	1	FW 5/8 HD	Flatwasher - Hardened
12	1	HB 5/8-11X3 Z5	Hex Bolt 5/8-11x3 Grade 5 Zinc Plated Hex Cap Screw
13	6	HBC3/8X1	Hex Bolt Cerrated 3/8-16 x 1 Zinc Flange Bolt
14	4	HN 5/8	Hex Nut 5/8”-11 Grade 5 Zinc Plated Finished
15	2	KS40254	Keystock - .25 x .25 x 1.5
16	12	LN 3/8 N	LN 3/8-16 Zinc Plated Nylon Insert Lock Nut
17	6	LN 5/16 N	LN 5/16-18 Zinc Plated Nylon Insert Lock Nut
18	1	SPR60A13-.625	Idler Sprocket - #60, 13 Tooth, 5/8 Bore
19	1	SPR60B11-1.0	Sprocket - #60, 11 Tooth
20	3	SPR60B18	Sprocket - #60, 18 Tooth
21	1	VAL 1008	Hydraulic Motor

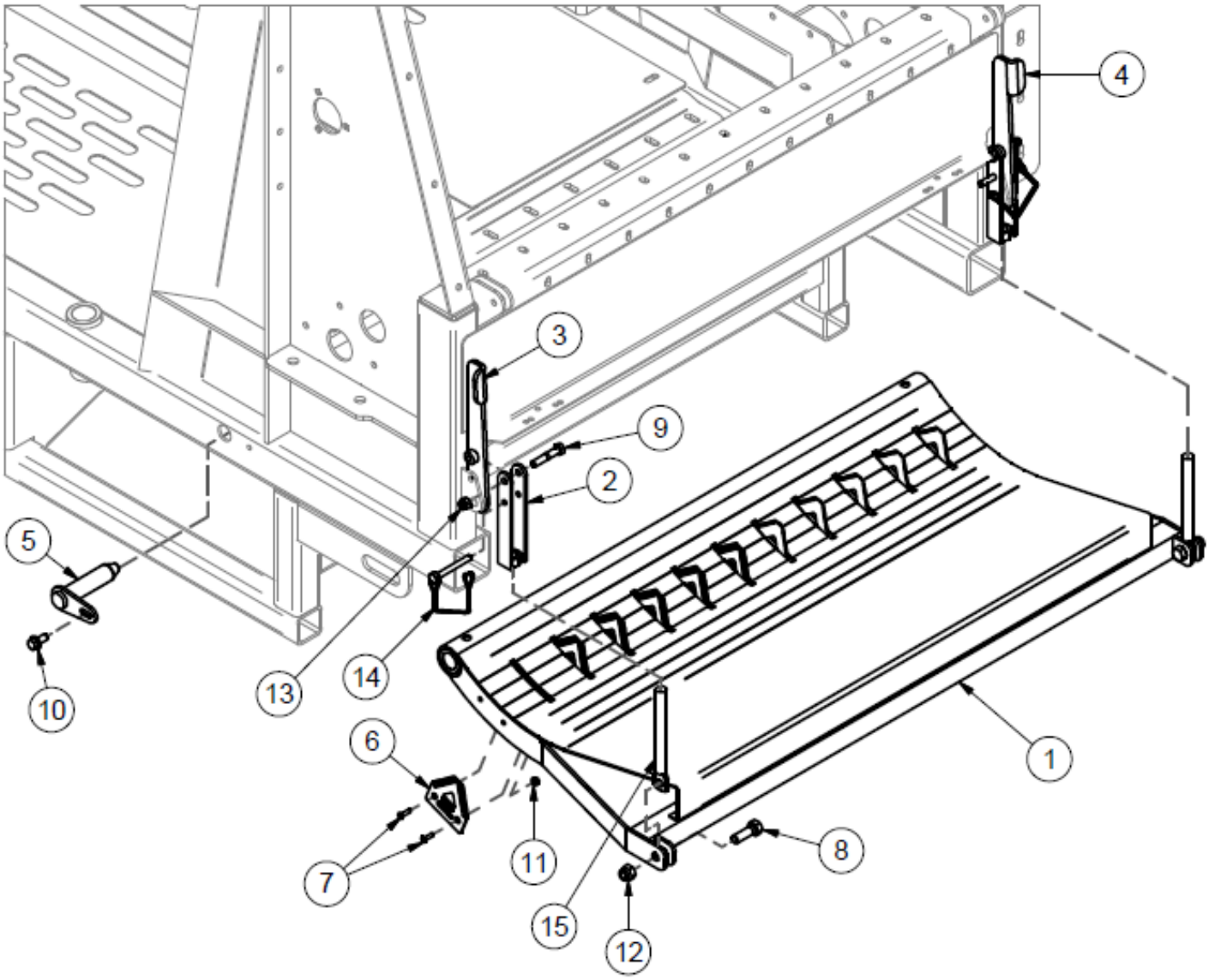
Front Shields



Front Shields

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	36311	Skid Shoe
2	1	36375	Bolt-On Flail Sideplate
3	1	36379	Left Beater Shield
4	1	36380	Top Beater Shield
5	1	36384	Lower Rear Housing Cover
6	1	36920	Side Shield
7	4	CB 3/8-16 X1 Z5	Carriage Bolt - 3/8-16 x 1” Grade 5 Zinc
8	17	HBC3/8X0.75	Hex Bolt Cerrated 3/8-16 x 3/4 Zinc Flange Bolt
9	9	HBC3/8X1	Hex Bolt Cerrated 3/8-16 x 1 Zinc Flange Bolt
10	4	HBC5/16X1	Hex Bolt Cerrated 5/16-18 x 1 Zinc Flange Bolt
11	26	HNC3/8	Serrated Hex Nut
12	4	HNP 5/16	Panel Nut - 5/16” U-Type Spring

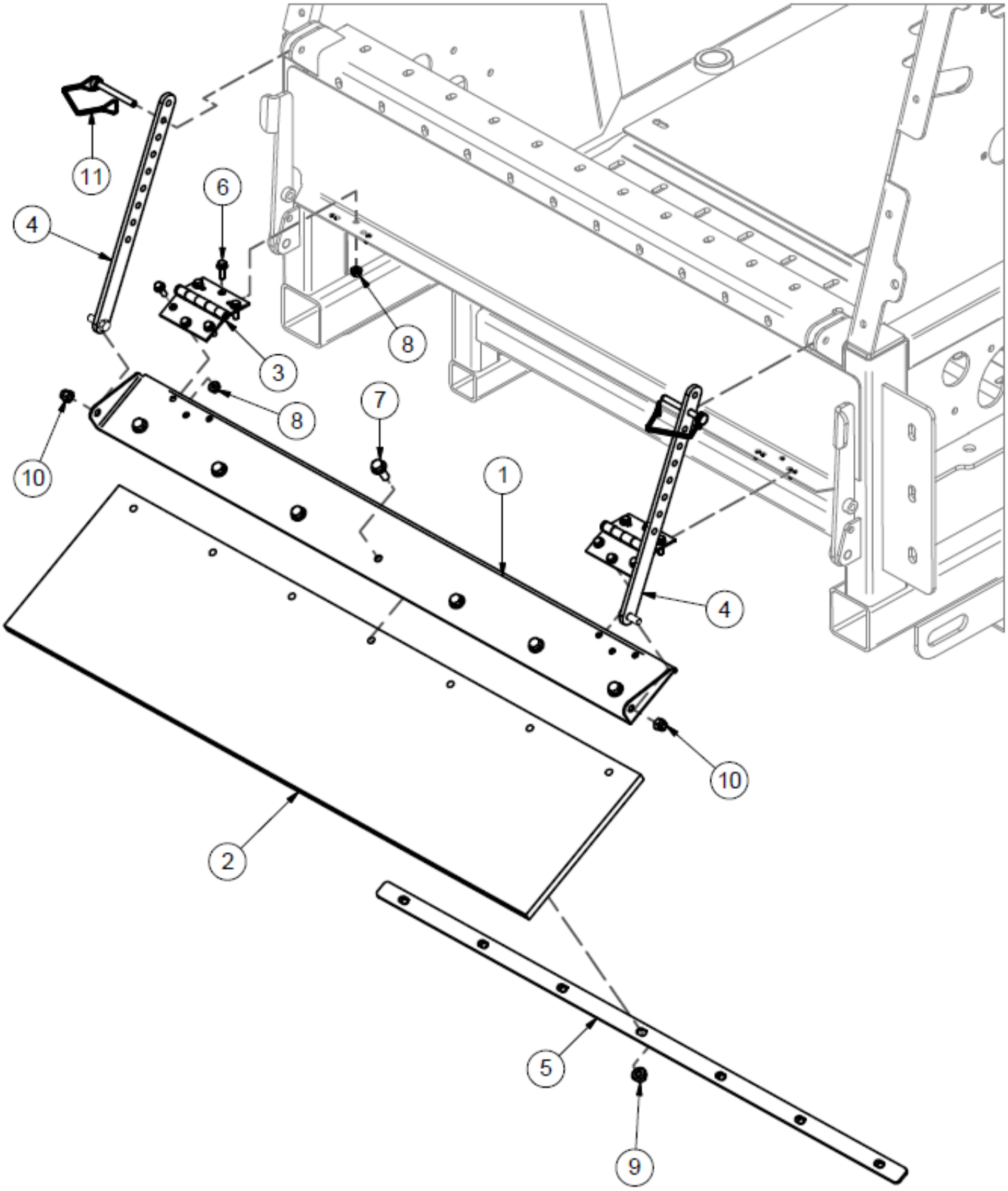
Discharge Chute



Discharge Chute

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	36304	Folding Flail
2	2	36305	Link
3	1	36307	Clamp Handle
4	1	36307M	Clamp Handle
5	2	36930	Retaining Pin
6	11	37508	Knife
7	22	HB #10-24X0.75 FHSCS	Hex Bolt - 3/16”-24 x 3/4” Flat Socket Cap Screw
8	2	HB 1/2-13X1.5 Z5	Hex Bolt 1/2-13x1 1/2 Grade 5 Zinc Plated Hex Cap Screw
9	2	HB 3/8-16X2 Z5	Hex Bolt 3/8-16x2 Grade 5 Zinc Plated Hex Cap Screw
10	2	HBC3/8X0.75	Hex Bolt Cerrated 3/8-16 x 3/4 Zinc Flange Bolt
11	22	LN #10 N	LN 3/16-24 Zinc Plated Nylon Insert Lock Nut
12	4	LN 1/2 N	LN 1/2-13 Zinc Plated Nylon Insert Lock Nut
13	7	LN 3/8 N	LN 3/8-16 Zinc Plated Nylon Insert Lock Nut
14	2	LP B1997	Lock Pin
15	2	PP-00051	Flat Eye Bolt 5/8 x 7.0

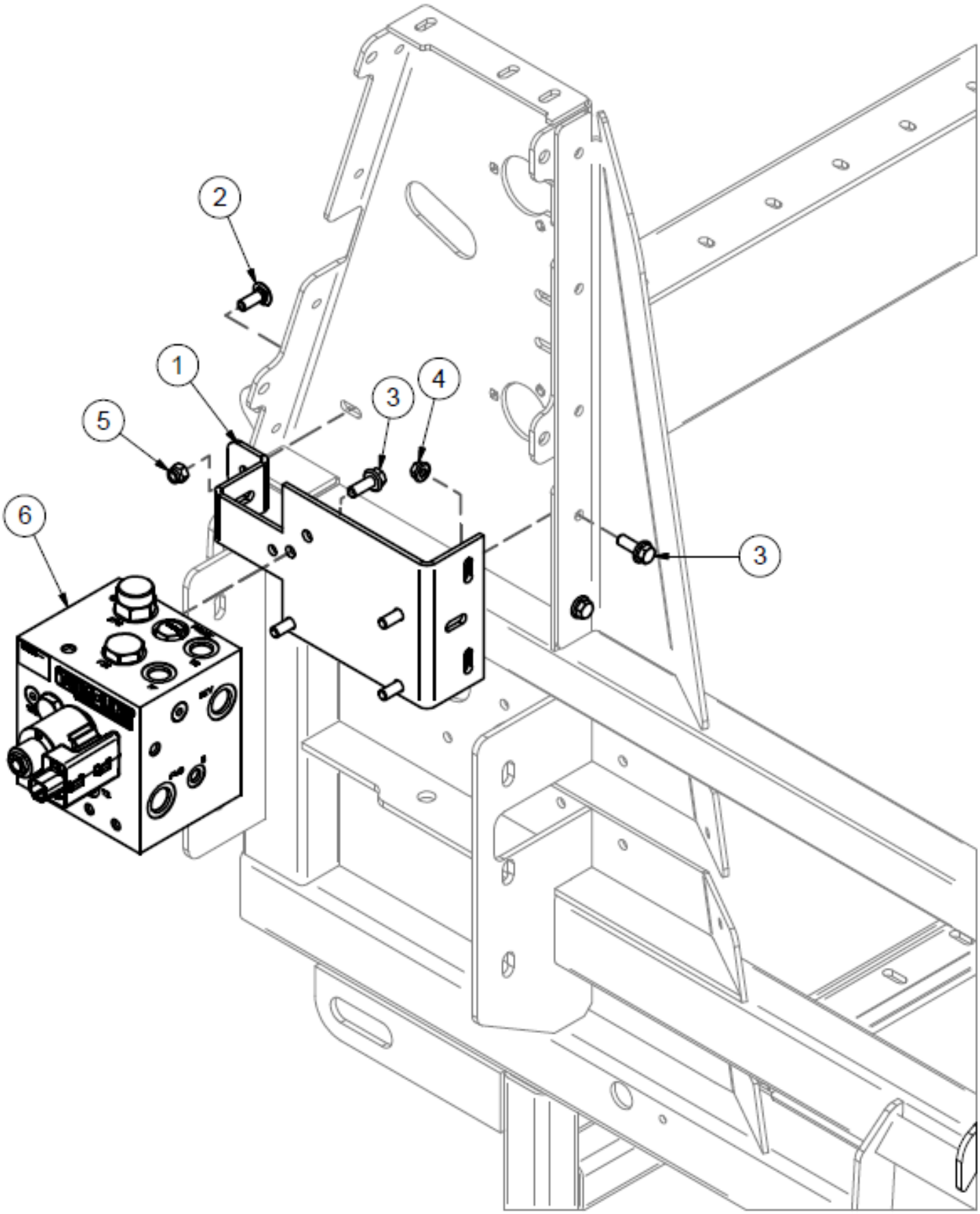
Discharge Flap



Discharge Flap

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	36318	Deflector
2	1	36932	Rubber Deflector
3	2	HIN 3.5X3.5	Hinge
4	2	36938	Shield Adjuster
5	1	37843	Rubber Deflector Bolt Plate
6	12	HBC1/4X0.75	Hex Bolt Cerrated 1/4-20 x 3/4 Zinc Flange Bolt
7	7	HBC3/8X1	Hex Bolt Cerrated 3/8-16 x 1 Zinc Flange Bolt
8	12	HNC1/4	Serrated Hex Nut
9	7	HNC3/8	Serrated Hex Nut
10	2	LN 3/8 N	LN 3/8-16 Zinc Plated Nylon Insert Lock Nut
11	2	LP B1997	Lock Pin

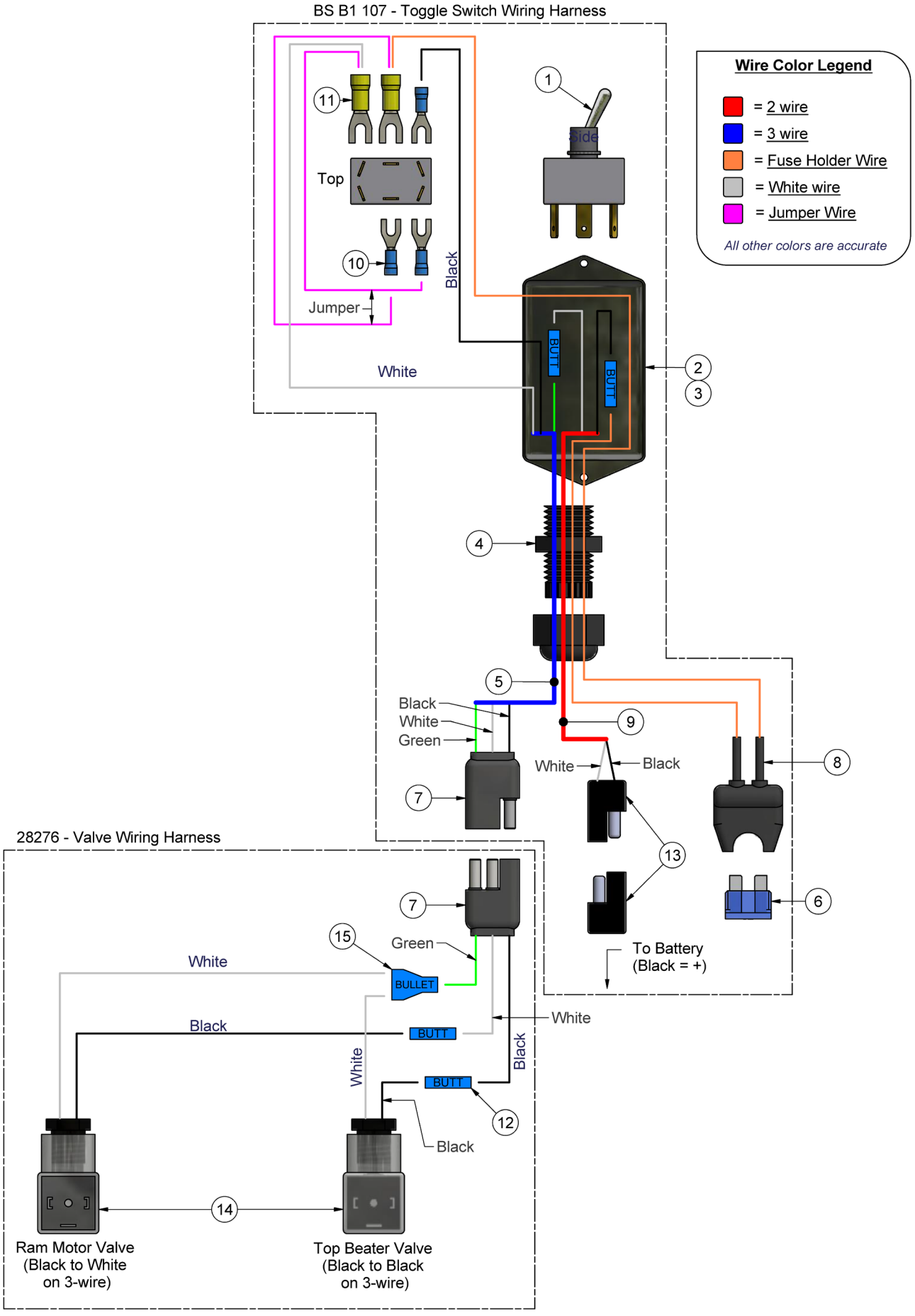
Manifold Block



Manifold Block

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	36392	Valve Mount
2	1	CB 3/8-16 X1 Z5	Carriage Bolt - 3/8-16 x 1” Grade 5 Zinc
3	6	HBC3/8X1	Hex Bolt Cerrated 3/8-16 x 1 Zinc Flange Bolt
4	2	HNC5/16	Serrated Hex Nut
5	1	LN 3/8 N	LN 3/8-16 Zinc Plated Nylon Insert Lock Nut
6	1	Manifold Block may vary. See Hydraulic Schematics on *page 9-30 to 9-33* for further clarification.	

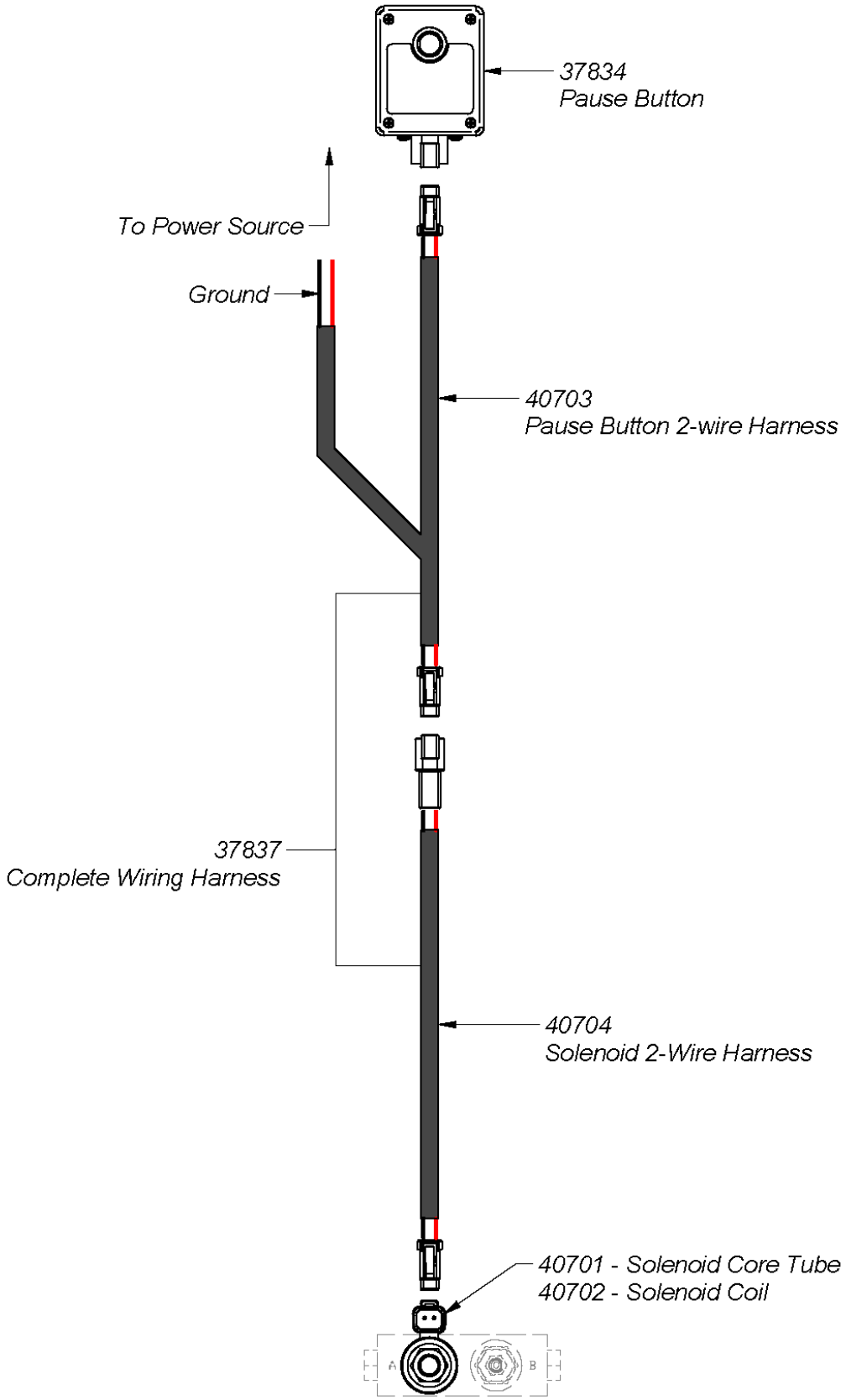
Electrical Schematic- CTI



Electrical Schematic - CTI

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
	1	BS B1 107	Boss I Toggle Switch Wiring Harness	Inc Items 1-13
1	1	26203	Toggle Switch for Boss I (Double Pole)	
2	1	BS C-0203-N	Textured Case Cover	
3	1	BS TF-2315TX	Top Foot Enclosure with Textured Finish	
4	1	TL180-150	1/2 NPT 6-12mm Gland Connector	
5	1	TL270101-250	10.5 3 Wire 16 Ga. Cab Tire	
6	1	TL550-100-079	15 Amp Glass Fuse	
7	2	TL82-1033	Flat 3 Wire Connector	Inc Male & Female
8	1	TL82-2164	Fuse Holder	
9	1	TL82-5503	Wire - 2 Wire Cable	
10	3	TL83-2387	Female Quick Disconnect, 16-14	
11	2	TL83-2587	Female Insulated Spade (Yellow)	
12	4	EL23662	Electrical Connector PVC Butt Connector BL	
13	1	TL82-1034	2 Pole Flat Connector	Inc Male & Female
	1	28276	Boss I Valve Wiring Harness	Inc Items 7,14,15
14	2	28534	Tandem Valve DIN Connector	
15	1	TL83-2400	Female Bullet Connector, 16-14	

Electrical Schematic- FPS



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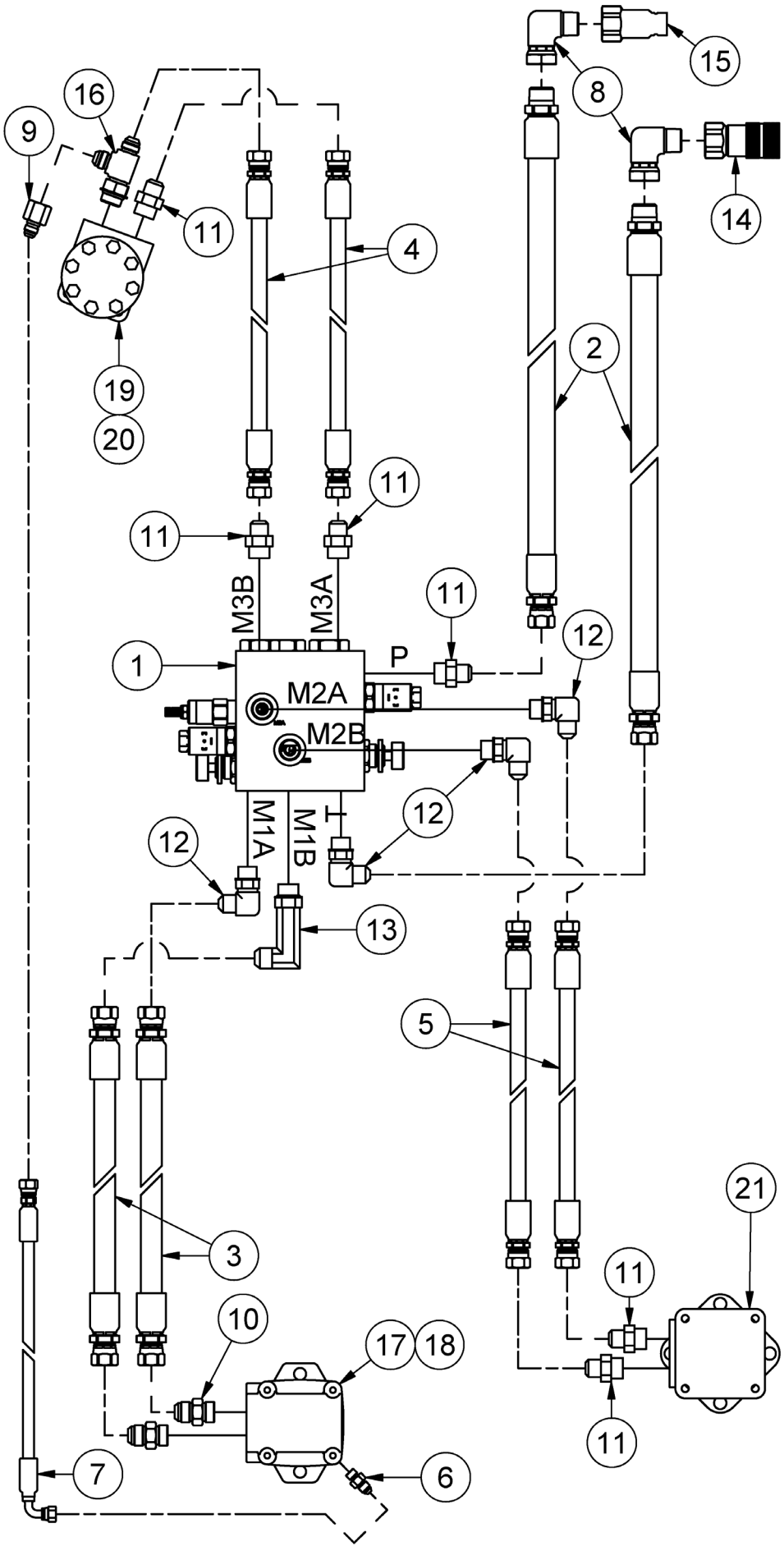
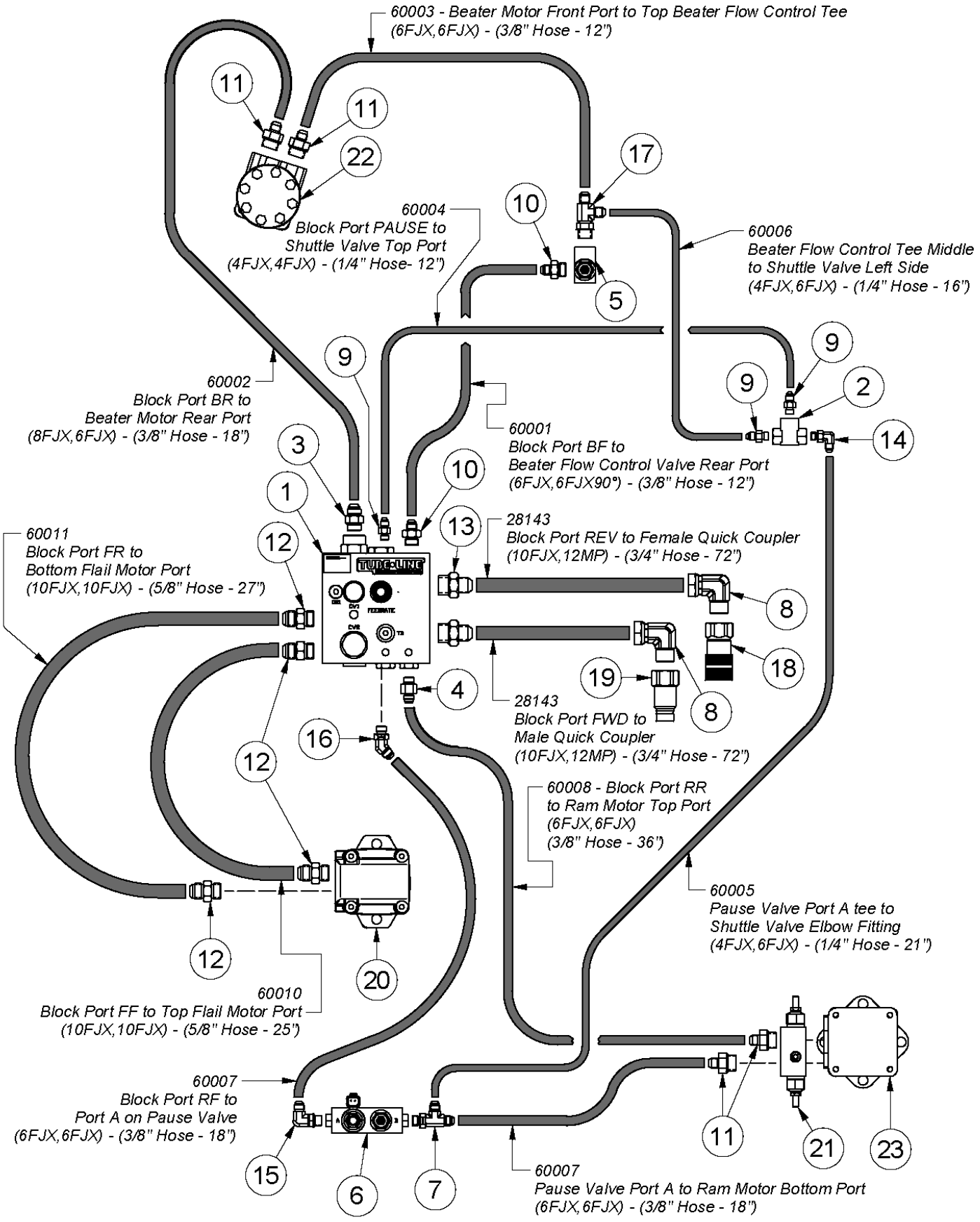
Hydraulic Layout - CTI



Hydraulic Layout - CTI

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	28036	Manifold Block
2	2	28143	Hose - HH72 - 12AT1(12MP,10FJXH)HCL 72”
3	2	39834	Hose - HH26 - 10AT1(10FJXH,10FJXH) HCL 26”
4	2	39835	Hose - HH18 - 6AT1(8FJXH,8FJXH) HCL 18”
5	2	39837	Hose - HH42 - 6AT1(8FJXH,8FJXH) HCL 42”
6	1	43702	Check Valve 1/4 O-ring to Jic
7	1	44811	Hose - HH29 - 4AT1(4FJX90S,6FJX) HCL 29”
8	2	HF 1501-12-12	Hydraulic Elbow Fitting
9	1	HF 2406-8-6	1/2 FJIC - 3/8 MJIC Reducer
10	2	HF 6400-10-10	Hydraulic Fitting
11	6	HF 6400-8-10	Hydraulic Adaptor Fitting
12	4	HF 6801-8-10	Hydraulic Elbow Fitting
13	1	HF 6801L-10-10	Hydraulic Elbow Fitting (Long)
14	1	HF QCFF-1	Female Quick Coupler
15	1	HF QCFF-2	Male Quick Coupler
16	1	HF6804-8-10-8	Hyd. Fitting 1/2-MJIC-5/8-MORB-1/2-MJIC
17	1	VAL 1002	Flail Motor
18	1	SK 61258	Seal Kit for Eaton Hydraulic Motor
19	1	VAL 1008	Top Beater Motor
20	1	SKMLHPQUDE	Seal Kit for 200 & 400 Series Motors
21	1	VAL MLHSY400	Bed Chain Drive Motor

Hydraulic Layout - FPS



Hydraulic Layout - FPS

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	40613	Manifold Block
2	1	40614	Shuttle Valve
3	1	40615	1/2” Check Valve Fitting
4	1	40616	3/8” Check Valve Fitting
5	1	40617	Manual Flow Control (c/w dial)
6	1	40618	Complete Electric Pause - Manual Flow Control FPS
	1	40700	Valve Body (c/w plugs & dial)
	1	40701	Solenoid Core Tube
	1	40702	Solenoid Coil
	1	42431	Adjustable Flow Control Cartridge
7	1	45071	Hydraulic Tee Fitting
8	2	HF 1501-12-12	Hydraulic Elbow Fitting
9	3	HF 6400-4-4	Hydraulic Fitting
10	2	HF 6400-6-8	Hydraulic Fitting
11	4	HF 6400-6-10	Hydraulic Fitting
12	4	HF 6400-10-10	Hydraulic Fitting
13	2	HF 6400-10-12	Hydraulic Fitting
14	1	HF 6801-4-4	Hydraulic Elbow Fitting
15	1	HF 6801-6-6	Hydraulic Elbow Fitting
16	1	HF 6802-6-6	Hydraulic 45° Elbow Fitting
17	1	HF 6804-6-8-6	Hydraulic Tee Fitting
18	1	HF QCFF-1	3/4” Female Quick Coupler
19	1	HF QCFF-2	3/4” Male Quick Coupler
20	1	VAL 1002	Hydraulic Motor - (Flail Drum)
21	1	VAL KPDS100-A-3	Relief Valve
22	1	VAL MLHPQ400C4C	Hydraulic Motor - (Top Beater)
23	1	VAL MLHSY400	Hydraulic Motor - (Chain Drive)

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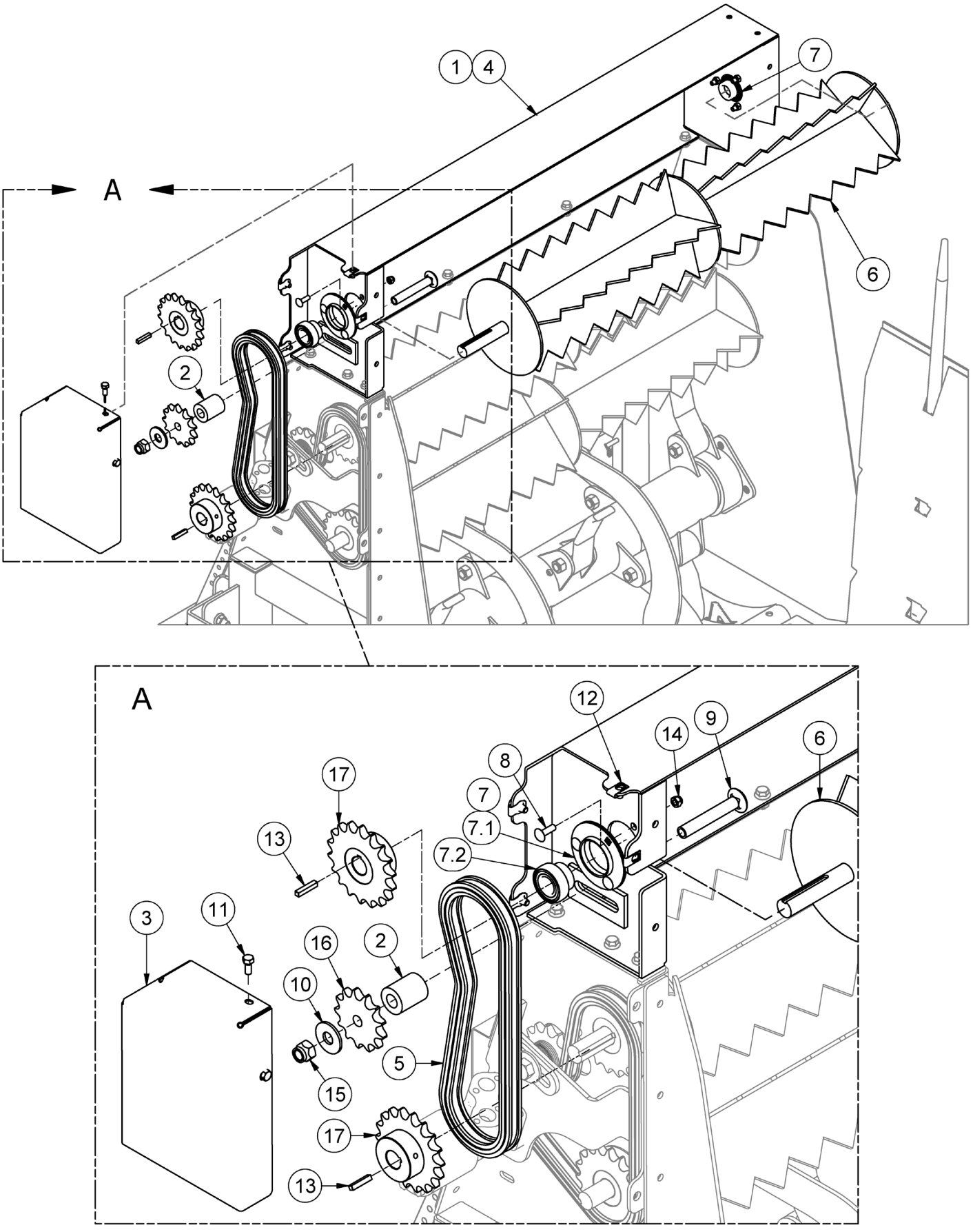
Section 11 - Options

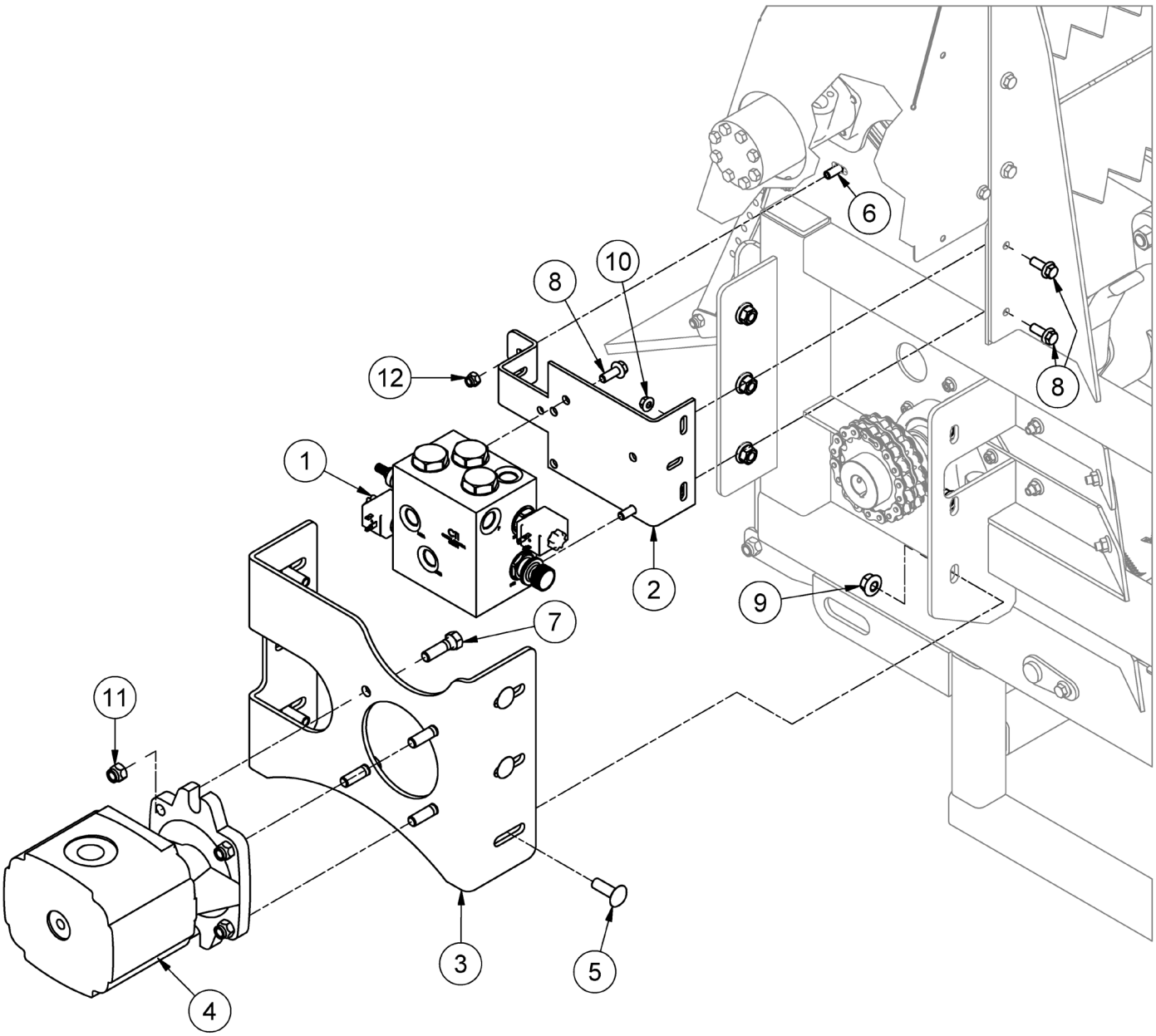
Third Beater Kit



Third Beater Kit

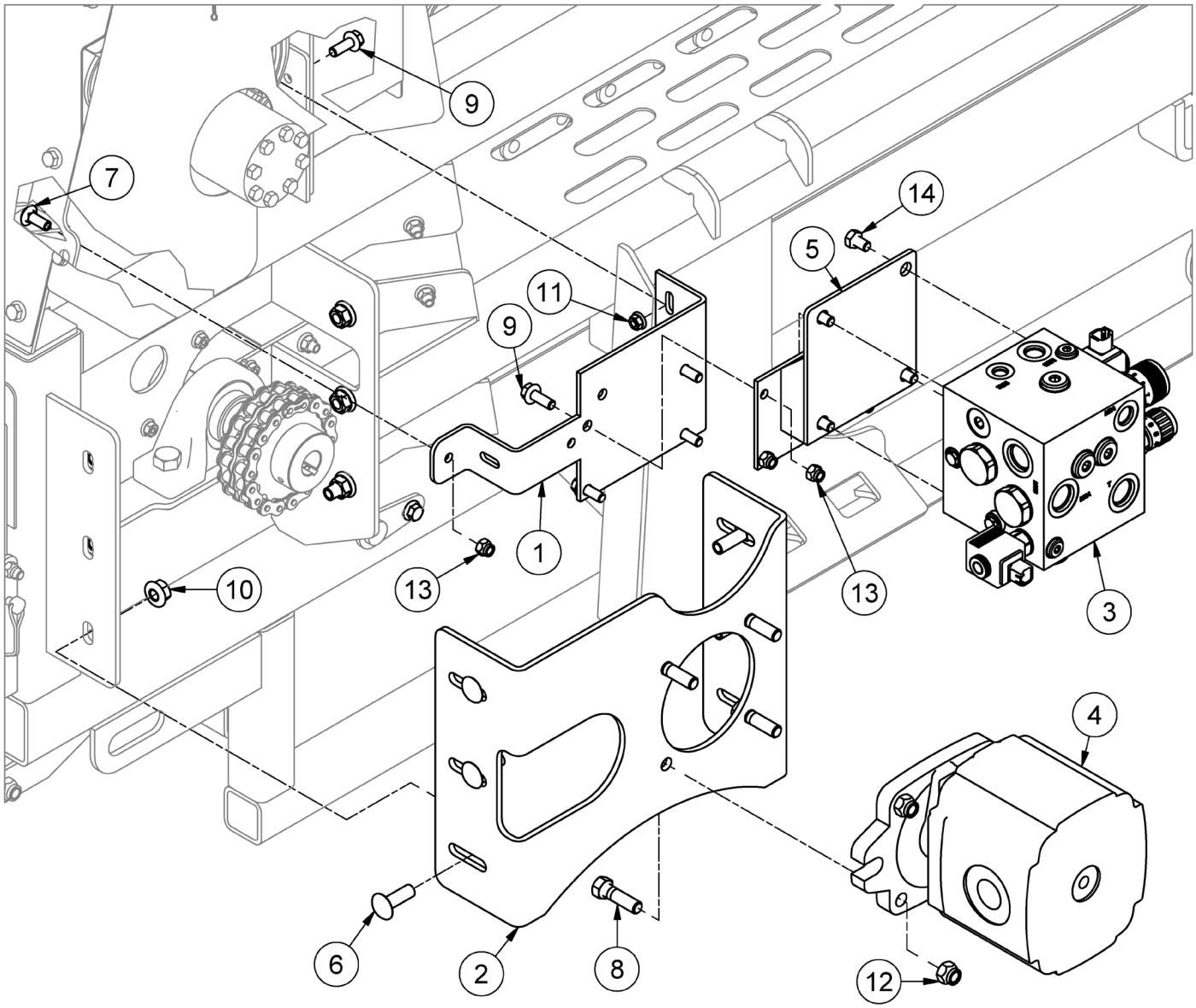
ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
1	1	36916	3rd Beater Kit	Incl. All Items
2	1	36915	Idler Sprocket Spacer	
3	1	36921	3rd Beater Chain Guard	
4	1	36934	3rd Beater Frame	
5	1	40255	Chain - #60, 49 Links	
6	1	B1 084	Top Beater	
7	2	BEA 42852	BEA SA205-16 + BEA PF205	
7.1	2	BEA PF205	Flange (3 Hole) - PF205 NTL	Qty for 1
7.2	1	BEA SA205-16	Bearing, Insert 1” - SB205-16 NTL	Qty for 1
8	6	CB 5/16-18 X1 Z5	Carriage Bolt - 5/16-18 x 1” Grade 5 Zinc	
9	1	CB 5/8-11 X4 Z5	Carriage Bolt - 5/8-11 x 4” Grade 5 Zinc	
10	1	FW 5/8	Flatwasher - 5/8” Zinc Plated USS	
11	4	HB 5/16-18X0.75 Z5	Hex Bolt 5/16-18x3/4 Grade 5 Zinc Plated Hex Cap Screw	
12	4	HNP 5/16	Panel Nut - .375 U-Type Spring	
13	2	KS40258	Keystock - .25 x .25 x 1	
14	6	LN 5/16 N	LN 5/16-18 Zinc Plated Nylon Insert Lock Nut	
15	1	LN 5/8 N	LN 5/8-11 Zinc Plated Nylon Insert Lock Nut	
16	1	SPR60A13-.625	Sprocket - #60, 13 Tooth, .625 Bearing	
17	2	SPR60B18	Sprocket - #60, 18 Tooth, 1” Bore	

High Flow Kit - CTI



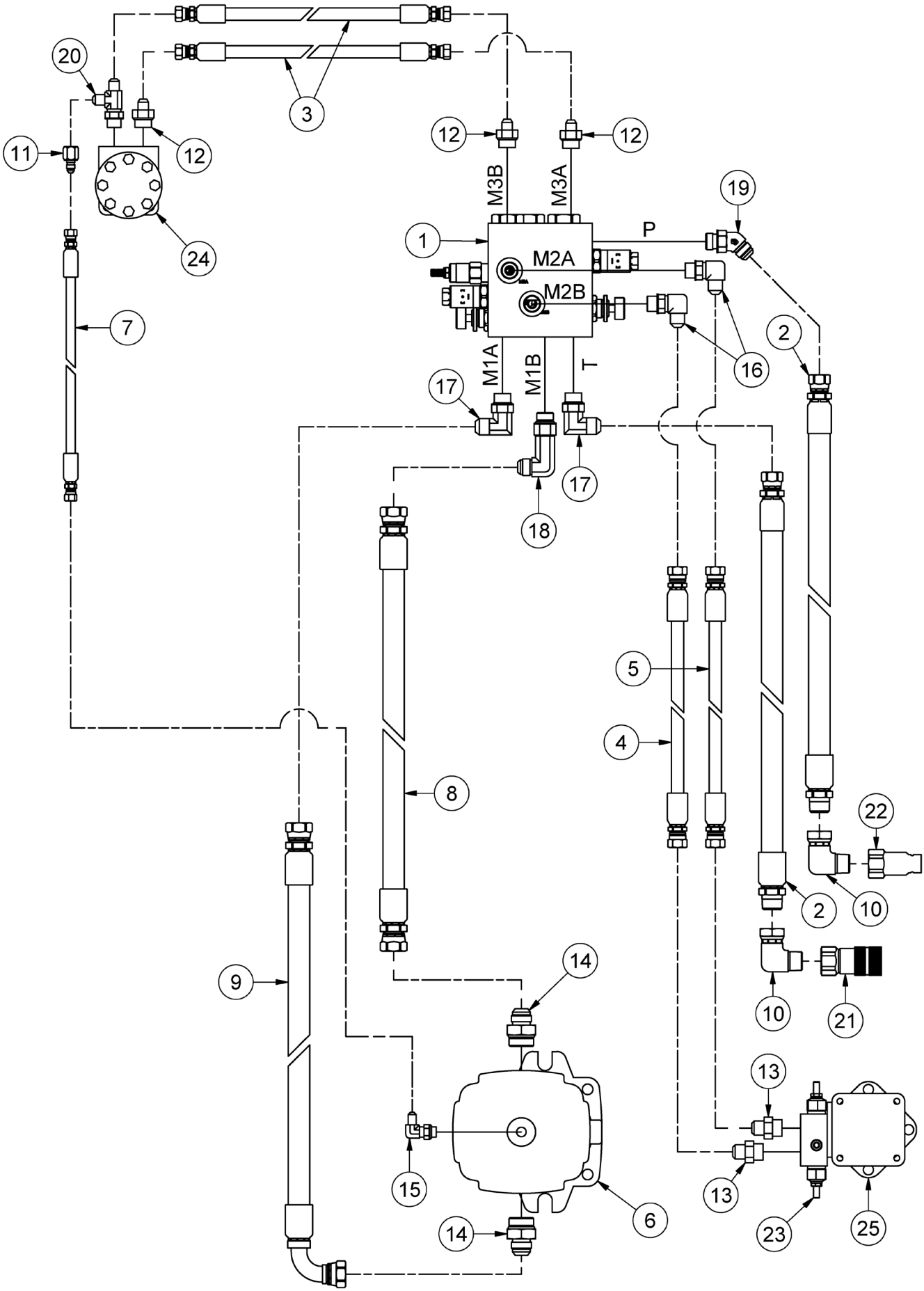
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	28036	Manifold Block
2	1	36392	Valve Mount
3	1	36399	Hydraulic Motor Mount
4	1	42272	High Flow Hydraulic Motor
5	6	CB 1/2-13 X1.5 Z5	Carriage Bolt - 1/2-13 x 1 1/2” Grade 5 Zinc
6	1	CB 3/8-16 X1 Z5	Carriage Bolt - 3/8-16 x 1” Grade 5 Zinc
7	4	HB 1/2-13X1.75 Z5	Hex Bolt 1/2-13x1 3/4 Grade 5 Zinc Plated Hex Cap Screw
8	2	HBC3/8X1	Hex Bolt Cerrated 3/8-16 x 1 Zinc Flange Bolt
9	6	HNC1/2	Serrated Hex Nut
10	2	HNC5/16	Serrated Hex Nut
11	4	LN 1/2 N	LN 1/2-13 Zinc Plated Nylon Insert Lock Nut
12	1	LN 3/8 N	LN 3/8-16 Zinc Plated Nylon Insert Lock Nut

High Flow Kit - Canimex



ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	36392	Valve Mount
2	1	36399	Hydraulic Motor Mount
3	1	42179	Boss I Canimex Manifold
4	1	42272	High Flow Hydraulic Motor
5	1	43066	Canimex Manifold Bracket
6	6	CB 1/2-13 X1.5 Z5	Carriage Bolt - 1/2-13 x 1 1/2" Grade 5 Zinc
7	1	CB 3/8-16 X1 Z5	Carriage Bolt - 3/8-16 x 1" Grade 5 Zinc
8	4	HB 1/2-13X1.75 Z5	Hex Bolt 1/2-13x1 3/4 Grade 5 Zinc Plated Hex Cap Screw
9	6	HBC3/8X1	Hex Bolt Cerrated 3/8-16 x 1 Zinc Flange Bolt
10	6	HNC1/2	Serrated Hex Nut
11	2	HNC3/8	Serrated Hex Nut
12	6	LN 1/2 N	LN 1/2-13 Zinc Plated Nylon Insert Lock Nut
13	5	LN 3/8 N	LN 3/8-16 Zinc Plated Nylon Insert Lock Nut
14	4	M10X16X1.5	Metric Bolt

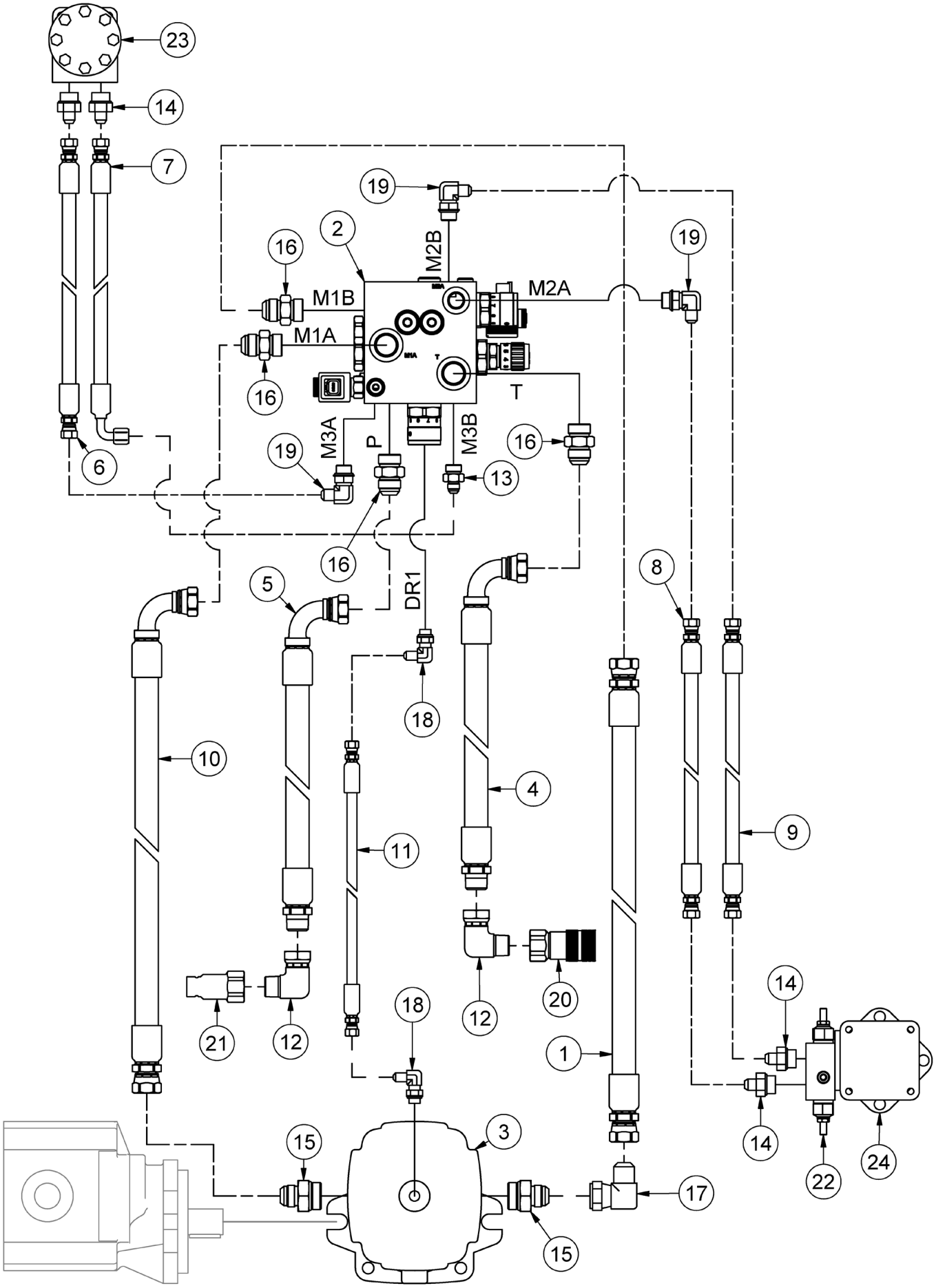
High Flow Layout - CTI



High Flow Layout - CTI

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	28036	Manifold Block
2	2	28143	Hose - HH72 - 12AT1(12MP,10FJXH)HCL 72”
3	2	39835	Hose - HH18 - 6AT1(8FJXH,8FJXH) HCL 18”
4	1	39836	Hose - HH40 - 6AT1(8FJXH,8FJXH) HCL 40”
5	1	39837	Hose - HH42 - 6AT1(8FJXH,8FJXH) HCL 42”
6	1	42272	High Flow Hydraulic Motor
7	1	43226	Hose - HH31 - 4AT1(4FJX,4FJX) HCL 31”
8	1	45395	Hose - HH26 - 12AT1(10FJXH,12FJXH) HCL 26”
9	1	45396	Hose - HH26 - 12AT1(10FJXH,12FJX90L) HCL 26”
10	2	HF 1501-12-12	Hydraulic Fitting 90 Degree Male to Female
11	1	HF 2406-06-04	Hyd. Adapter
12	3	HF 6400-6-10	Hydraulic Fitting - Male JIC - Male ORB
13	2	HF 6400-8-10	Hyd Fitting - Male JIC - Male ORB
14	2	HF 6400-12-16	Hydraulic Adapter JIC to O-Ring
15	1	HF 6801-4-6	Hydraulic Fitting - Male JIC - Male Orb 90 Degree
16	2	HF 6801-8-10	Hyd. Fitting -1/2” JIC - 5/8” 90 Degree Elbow
17	2	HF 6801-10-10	Forged Fitting - 5/8” JIC X 5/8” SAE 90 Degree Elbow
18	1	HF 6801-10-10-LL	Forged Fitting - 5/8” JIC X 5/8” SAE 90 Degree Elbow
19	1	HF 6802-10-10	Forged Fitting - 5/8” JIC X 5/8” SAE 45 Degree Elbow
20	1	HF 6804-6-8-6	Hydraulic Fitting - Male JIC - Male ORB Tee
21	1	HF QCFF-1	Quickcoupler 3/4” Flat Face Pipe - Female
22	1	HF QCFF-2	Quickcoupler 3/4” Flat Face Pipe - Male
23	1	VAL KPDS100/A/3	Relief Valve
24	1	VAL MLHPQ400C4C	M+S Hydraulic Motor
25	1	VAL MLHSY400	Complete Motor - MLHSY400C4UD

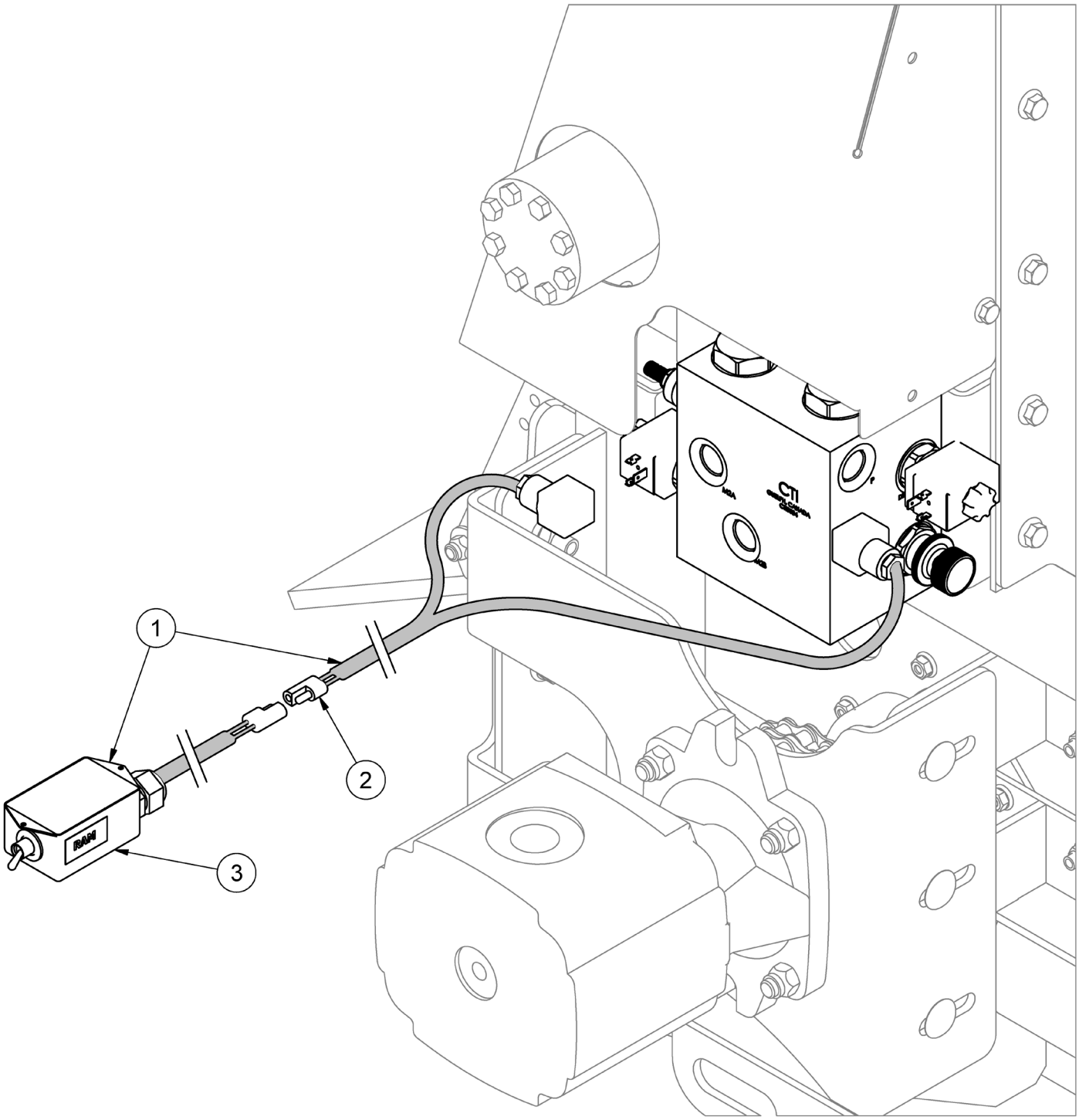
High Flow Layout - Canimex



High Flow Layout - Canimex

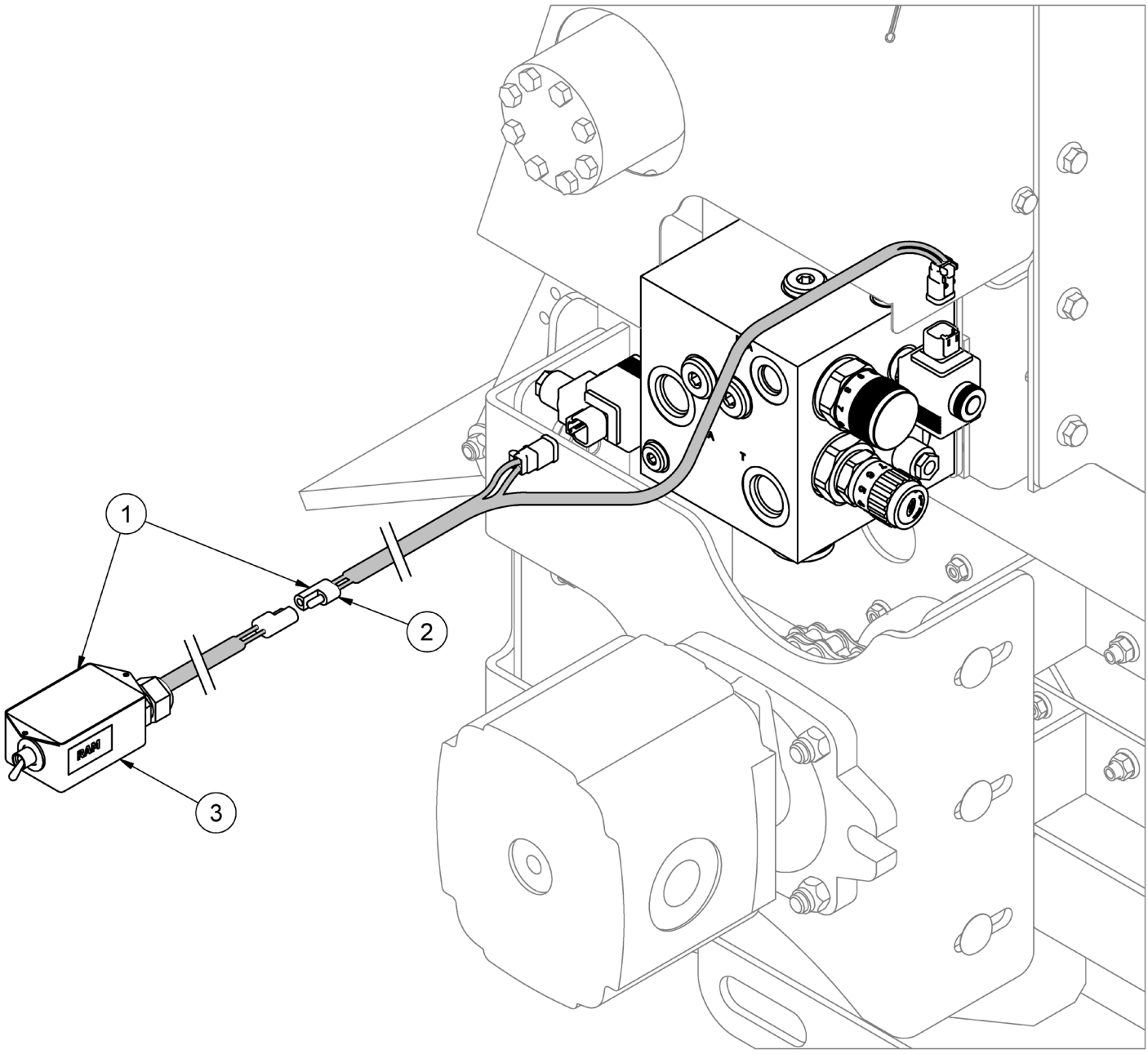
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	23896	Hose - HH24 - 12AT1(12FJ,12FJ) HCL 24”
2	1	42179	Boss I Canimex Manifold Block
3	1	42272	High Flow Hydraulic Motor
4	1	43107	Hose - HH72 - 12AT1(12MP,12FJXH90S)HCL 72”
5	1	43108	Hose - HH76 - 12AT1(12MP,12FJXH90S)HCL 76”
6	1	43221	Hose - HH15 - 6AT1(6FJX,6FJX) HCL 15”
7	1	43222	Hose - HH15 - 6AT1(6FJX,6FJX90L) HCL 15”
8	1	43223	Hose - HH53 - 6AT1(6FJX,6FJX) HCL 53”
9	1	43224	Hose - HH57 - 6AT1(6FJX,6FJX) HCL 57”
10	1	43225	Hose - HH24 - 12AT1(12FJX,12FJX90S) HCL 24”
11	1	43226	Hose - HH31 - 4AT1(4FJX,4FJX) HCL 31”
12	2	HF 1501-12-12	Hydraulic Fitting 90 Degree Male to Female
13	1	HF 6400-6-8	Hyd Fitting -Male JIC - Male ORB
14	4	HF 6400-6-10	Hydraulic Fitting - Male JIC - Male ORB
15	2	HF 6400-12-16	Hydraulic Adapter JIC to O-Ring
16	4	HF 6400-16-16	Hydraulic Fitting - O-Ring to JIC Adapter, Male JIC to 3/4” BSPP
17	1	HF 6500-12-12	Hyd. Fitting
18	2	HF 6801-4-6	Hydraulic Fitting - Male JIC - Male Orb 90 Degree
19	3	HF 6801-6-8 NWO	Adapter
20	1	HF QCFF-1	Quickcoupler 3/4” Flat Face Pipe - Female
21	1	HF QCFF-2	Quickcoupler 3/4” Flat Face Pipe - Male
22	1	VAL KPDS100/A/3	Relief Valve
23	1	VAL MLHPQ400C4C	M+S Hydraulic Motor
24	1	VAL MLHSY400	Complete Motor - MLHSY400C4UD

High Flow Electrical Harness - CTI



ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
1	1	45960	Boss I CTI Electrical Harness - Complete	Incl. Items 2,3
2	1	28276	Boss I CTI Valve Wiring Harness	
3	1	BS B1 107	Boss I Toggle Switch Wiring Harness	

High Flow Electrical Harness - Canimex

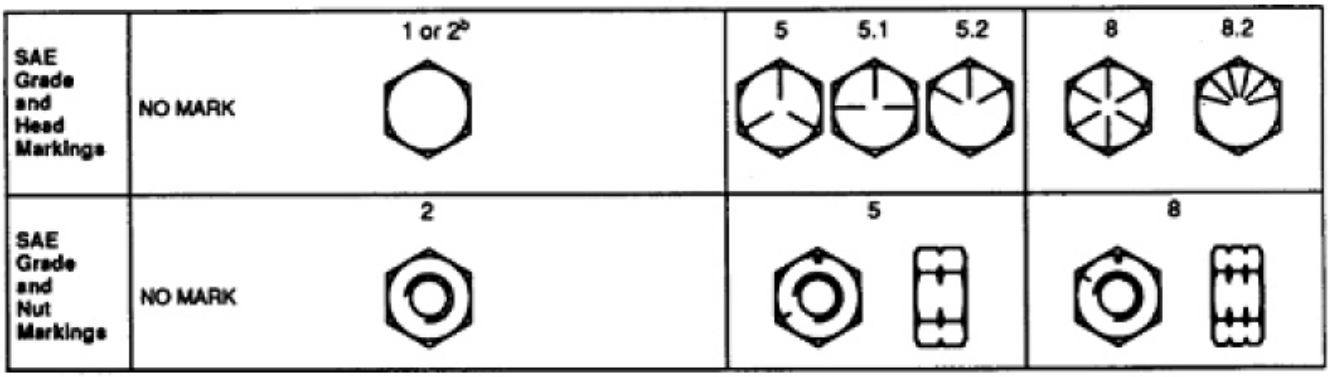


ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
1	1	45958	Boss I HF Canimex Harness - Complete	Incl. Items 2,3
2	1	45959	Boss I HF Canimex Harness	
3	1	BS B1 107	Boss I Toggle Switch Wiring Harness	

Section 12 - Torque Value Charts

Imperial Torque Values

UNIFIED INCH BOLT AND CAP SCREW TORQUE VALUES



Size	Grade 1				Grade 2[b]				Grade 5, 5.1, or 5.2				Grade 8 or 8.2			
	Lubricated[a]		Dry[a]		Lubricated[a]		Dry[a]		Lubricated[a]		Dry[a]		Lubricated[a]		Dry[a]	
	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft
1/4	3.7	2.8	4.7	3.5	6	4.5	7.5	5.5	9.5	7	12	9	13.5	10	17	12.5
5/16	7.7	5.5	10	7	12	9	15	11	20	15	25	18	28	21	35	26
3/8	14	10	17	13	22	16	27	20	35	26	44	33	50	36	63	46
7/16	22	16	28	20	35	26	44	32	55	41	70	52	80	58	100	75
1/2	33	25	42	31	53	39	67	50	85	63	110	80	120	90	150	115
9/16	48	36	60	45	75	56	95	70	125	90	155	115	175	130	225	160
5/8	67	50	85	62	105	78	135	100	170	125	215	160	240	175	300	225
3/4	120	87	150	110	190	140	240	175	300	225	375	280	425	310	550	400
7/8	190	140	240	175	190	140	240	175	490	360	625	450	700	500	875	650
1	290	210	360	270	290	210	360	270	725	540	925	675	1050	750	1300	975
1-1/8	400	300	510	375	400	300	510	375	900	675	1150	850	1450	1075	1850	1350
1-1/4	570	425	725	530	570	425	725	530	1300	950	1650	1200	2050	1500	2600	1950
1-3/8	750	550	950	700	750	550	950	700	1700	1250	2150	1550	2700	2000	3400	2550
1-1/2	1000	725	1250	925	990	725	1250	930	2250	1650	2850	2100	3600	2650	4550	3350

DO NOT use these values if a different torque value or tightening procedure is given for a specific application. Torque values listed are for general use only. Check tightness of fasteners periodically.

Shear bolts are designed to fail under predetermined loads. Always replace shear bolts with identical grade.

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

Make sure fasteners threads are clean and that you properly start thread engagement. This will prevent them from failing when tightening.

Tighten plastic insert or crimped steel-type lock nuts to approximately 50 percent of the dry torque shown in the chart, applied to the nut, not to the bolt head. Tighten toothed or serrated-type lock nuts to the full torque value.

[a] "Lubricated" means coated with a lubricant such as engine oil, or fasteners with phosphate and oil coatings. "Dry" means plain or zinc plated without any lubrication.

[b] Grade 2 applies for hex cap screws (not hex bolts) up to 152 mm (6-in.) long. Grade 1 applies for hex cap screws over 152 mm (6-in.) long, and for all other types of bolts and screws of any length.

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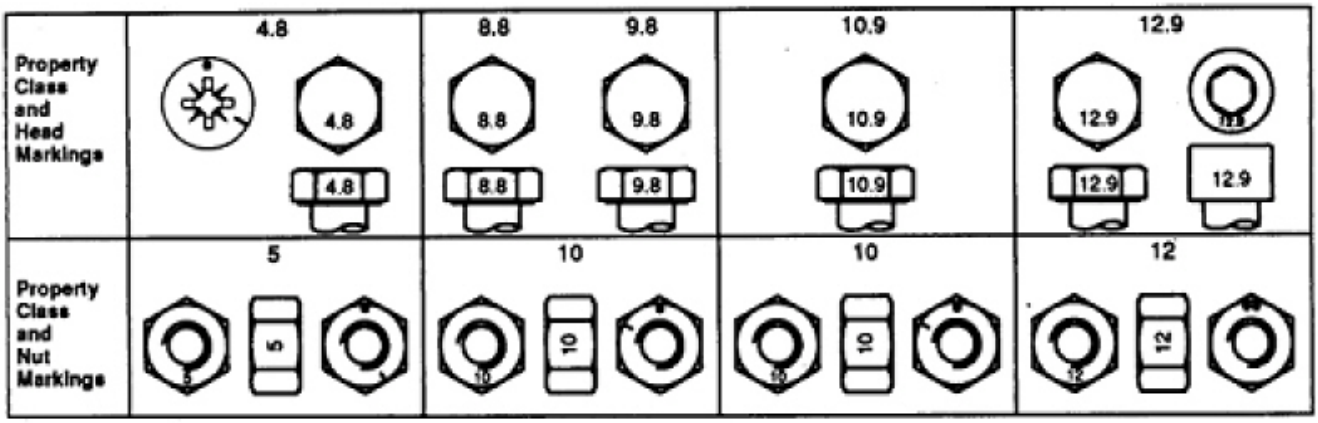
METRIC BOLT AND CAP SCREW TORQUE VALUES



Size	Class 4.8				Class 8.8 or 9.8				Class 10.9				Class 12.9			
	Lubricated[a]		Dry[a]		Lubricated[a]		Dry[a]		Lubricated[a]		Dry[a]		Lubricated[a]		Dry[a]	
	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft
M6	4.8	3.5	6	4.5	9	6.5	11	8.5	13	9.5	17	12	15	11.5	19	14.5
M8	12	8.5	15	11	22	16	28	20	32	24	40	30	37	28	47	35
M10	23	17	29	21	43	32	55	40	63	47	80	60	75	55	95	70
M12	40	29	50	37	75	55	95	70	110	80	140	105	130	95	165	120
M14	63	47	80	60	120	88	150	110	175	130	225	165	205	150	260	190
M16	100	73	125	92	190	140	240	175	275	200	350	255	320	240	400	300
M18	135	100	175	125	260	195	330	250	375	275	475	350	440	325	560	410
M20	190	140	240	180	375	275	475	350	530	400	675	500	625	460	800	580
M22	260	190	330	250	510	375	650	475	725	540	925	675	850	625	1075	800
M24	330	250	425	310	650	475	825	600	925	675	1150	850	1075	800	1350	1000
M27	490	360	625	450	950	700	1200	875	1350	1000	1700	1250	1600	1150	2000	1500
M30	675	490	850	625	1300	950	1650	1200	1850	1350	2300	1700	2150	1600	2700	2000
M33	900	675	1150	850	1750	1300	2200	1650	2500	1850	3150	2350	2900	2150	3700	2750
M36	1150	850	1450	1075	2250	1650	2850	2100	3200	2350	4050	3000	3750	2750	4750	3500

DO NOT use these values if a different torque value or tightening procedure is given for a specific application. Torque values listed are for general use only. Check tightness of fasteners periodically.

Shear bolts are designed to fail under predetermined loads. Always replace shear bolts with identical property class.

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

Make sure fasteners threads are clean and that you properly start thread engagement. This will prevent them from failing when tightening.

Tighten plastic insert or crimped steel-type lock nuts to approximately 50 percent of the dry torque shown in the chart, applied to the nut, not to the bolt head. Tighten toothed or serrated-type lock nuts to the full torque value.

[a] *"Lubricated" means coated with a lubricant such as engine oil, or fasteners with phosphate and oil coatings. "Dry" means plain or zinc plated without any lubrication.*

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