

**QUBICA  AMF**

**XLi  EDGE**

# PINSPOTTER

*With the*

*Optical Durabin*

*and the*

**EDGE**  
**PERFORMANCE LIFT**



# SERVICE & PARTS MANUAL

These Original Instructions for the XLi EDGE Pinspotter  
were written in English.

QubicaAMF Bowling Products, Inc.  
Performance Equipment Division  
8100 AMF Drive

Mechanicsville, Virginia 23111

1-866-460-7263 (Domestic) 804.730.4000 (International)

Fax 804.559.8650

**XLi *EDGE* Pinspotter Service & Parts Manual - P/N 400-088-120 Rev. A**

**XLi *EDGE* Pinspotter Manual Set - P/N 610-088-500 Rev. A**





**EU DECLARATION OF CONFORMITY IN ACCORDANCE WITH COUNCIL DIRECTIVES**

We hereby declare that the machinery described below complies with the essential machine health and safety requirements of Council Directives 2006/42/EC and the electromagnetic compatibility requirements of Council Directives 2004/108/EC on the approximation of the laws of the Member States.

<i>Conforming Machinery:</i>	XLi EDGE Pinspotter with SmartGuard Safety System
<i>Type/Function:</i>	Bowling Pinspotter
<i>Model Number:</i>	<b>612-088-105CE11</b> (Lane Pair) <b>612-088-106CE11/612-088-107CE11</b> (Single)
<i>Serial Number(s):</i>	
<i>Manufacturer:</i>	<b>QubicaAMF Worldwide, LLC</b> 8100 AMF Drive Mechanicsville, Virginia 23111 USA
<i>Authorized Representative:</i>	Ronald Wood SVP International Sales and Service QubicaAMF BV Hongkongstraat 63 3047 BR Rotterdam The Netherlands
<i>Conforms with Harmonized Standards:</i>	IEC60204-1:2010, EN61000-6-4:2007, EN55011, EN61000-4-2: 2005, EN61000-4-3:2006, EN61000-4-4:2004, EN61000-4-5:2005, EN61000-4-6:2007, EN61000-4-11:2004, EN61000-4-2:1995+A1:1999+A2:2001
<i>Date of Issue:</i>	
<i>Place of Issue:</i>	8100 AMF Drive Mechanicsville, Virginia USA
<i>Signed:</i>	
<i>Signatory:</i>	Ronald Wood SVP International Sales and Service QubicaAMF BV Hongkongstraat 63 3047 BR Rotterdam The Netherlands





# ***XLi EDGE* Automatic Pinspotter Service & Parts Manual**

**Part Number 400-088-120, Rev. A**

## **Summary of Changes**

<b>Change No.</b>	<b>ECR No.</b>
Rev. A	12-0053

## **List of Effective Pages**

<b>Page</b>	<b>Change No.</b>	<b>Effective Date</b>
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## **1.0 Introduction**

### **1.1 How To Use This Manual**

This manual set is provided for use by trained and authorized bowling center mechanics in conjunction with the adjustment and maintenance of QubicaAMF XLi EDGE pinspotters, including the EDGE Performance Lift, the XLi EDGE Pin Distributor, the Positive Ball Lift (PBL) and Light Ball Sensor (LBS), the XLi Chassis, and associated equipment. This pinspotter manual does not cover the installation of the pinspotter or associated equipment.

Several manuals are included in this manual set. These manuals may provide instructions for the installation of the associated equipment related to repair or replacement. Refer to the attachments at the back of the manual for information specific to this equipment.

**Refer to Section 2, Safety, before proceeding with machine maintenance.**

### **1.2 Manual Layout**

The QubicaAMF XLi EDGE Pinspotter Service and Parts Manual is divided into individual sections by the section tabs. Each section contains its own Table of Contents to help the user find a topic within that section. Several sections include subsection tabs for quick reference. The complete Table of Contents for all sections is provided at the beginning of this manual, a Parts Section Table of Contents is located at the beginning of Section 5.0, and a replacement part number index can be found at the end of Section 5.0.

#### **Section Tab**

#### **Subsection Tab**

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## ***XLi EDGE QubicaAMF Pinspotter***

- Attachment A - XLi EDGE Pinspotter Controller System Wiring Diagram
- Attachment B - XLi EDGE Pinspotter Pin Distributor Manual
- Attachment C - Positive Ball Lift (PBL) Manual
- Attachment D - XLi Control Chassis Manual
- Attachment E - XLi EDGE Pinspotter Motor & Gearbox Manual
- Attachment F - EDGE Performance Lift Manual
- Attachment G - AccuCam 3000 Camera Manual
- Attachment H - XLi Manager's Control Unit (MCU) Manual
- Attachment I – Radaray XLi Foul Detector Manual

### **1.3 Maintenance DVD**

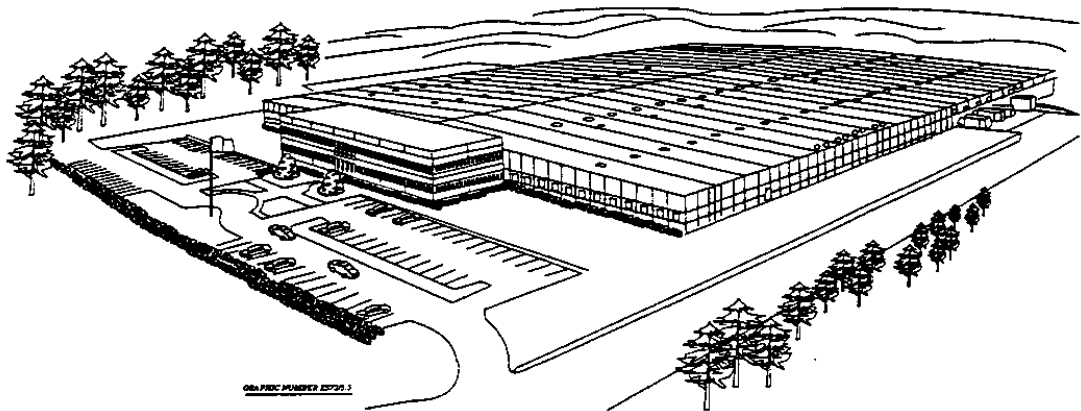
Attached to the inside of the front cover of this manual set is a DVD that contains animations of various maintenance and adjustment procedures. These animations are provided as a supplement to the written procedures contained in this manual. Reading the instructions is important to performing the activity safely and correctly, but a visual rendition minimizes translation errors, adds clarity, and makes the activity easier to understand.

The DVD contains animations in the PAL and NTSC video standards. NTSC is the standard used in North America and much of South America. The PAL standard is used in most other countries. Both standards are included to make the animations available to as many customers as possible.

### **1.4 QubicaAMF Bowling Products, Inc.**

- Qubica AMF (formerly AMF) was founded in New York in 1900 as the American Machine and Foundry Co., Inc. AMF's first product was automated machinery for the tobacco industry.
- In 1936, the pinspotter was invented by Fred Schmidt in his garage in Pear River, New York. AMF hired him in 1938 allowing him to perfect his invention. The war delayed production, but in 1946 the pinspotter made its first public debut at the World's Fair. In 1951, the pinspotter went into production and revolutionized tenpin bowling.
- In 1946, AMF introduces "pindilator", the first automatic pinspotting machine, at the ABC Tournament in Buffalo, New York, and the first automated pinspotter to be installed and used by bowlers in an ABC Championship in Fort Worth, Texas.
- In 1986, AMF Bowling was acquired from AMF Incorporated by a group of Richmond, Virginia, investors.

- IN 1988, AMF relocated their Corporate Headquarters, engineering offices, R&D lab, and manufacturing facilities to their current location, a new 375,000 square foot, 70 acre facility in Mechanicsville, Virginia.
- In 2004, AMF Bowling Worldwide, Inc. was acquired by the investment group of Code, Hennessy, & Simmons, LLC.
- In 2005, AMF Bowling Products and Qubica, an Italian manufacturer of a variety of bowling products, merged to form QubicaAMF Bowling Products.



**QubicaAMF Bowling, Inc Corporate Headquarters Richmond, Virginia**

The company has manufacturing facilities in Lowville, New York, which manufactures bowling pins and lanes

QubicaAMF is also a world leader in the manufacture and sale of bowling products, with a global market presence in more than 50 countries.

## **1.5 QubicaAMF's Commitment to Quality**

When you make a commitment to QubicaAMF, QubicaAMF makes a commitment to you. A commitment to see that you get the very best. The best equipment, the best engineering, the best technology, and the best customer service and technical support in the industry. By having all of these disciplines under one roof, QubicaAMF is uniquely positioned to provide the finest in products and services to the bowling industry.

QubicaAMF's commitment to their customers doesn't stop after the sale. QubicaAMF strives to provide their customers with pinspotters that, with proper maintenance, will provide you with years of trouble-free operation. In the event that help is needed, QubicaAMF is ready to serve you. For customer service or technical support from within the United States call **1-866-460-7263**, or from outside of the U.S. call **1-804-569-1000**.



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*XLi EDGE QubicaAMF Pinspotter*

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## 2.1 GENERAL SAFETY GUIDELINES AND SYMBOLS

QubicaAMF feels strongly about its commitment to safety. Proper service and repair are important to the safety of the mechanic as well as the safe, reliable operation of the pinspotters.

Please read, understand, and follow all of the recommended safety procedures presented in this manual.

The service procedures recommended and described in this technical manual are effective methods of performing service and repair. Some of these procedures require the use of tools specially designed for this purpose.

- Properly trained personnel should be present whenever maintenance is being performed on a pinspotter.
- No unauthorized personnel should be allowed in the pit area.
- Keep in mind that the XLi EDGE QubicaAMF pinspotter performs a series of mechanical motions and electrical actions during each cycle, and that **SEVERE BODILY INJURY OR DEATH** could result should personnel enter the machine when power is on. When working in a pinspotter, it is recommended that power also be turned off on adjacent machines.
- Remember that safety must remain your first priority at all times.
- The sound pressure level (LpA) in the area of the control chassis (operator's station) during bowling activities is in excess of 80 dBA. Hearing protection is recommended.
- Safety goggles, ear protection, and steel-toed shoes are recommended whenever any work is being performed on a pinspotter.
- Wearing loose clothing or jewelry is **NOT RECOMMENDED** when operating or maintaining the machinery.
- Do not attempt to clear pin jams with a pin hook without first turning off power to the pinspotter.

It is important to note that this manual contains various symbols and wording that provide information that must be carefully followed in order to reduce the risk of personal injury during service or repair, or that warn of the possibility that improper service or repair may damage the pinspotter or render it unsafe.

Additionally, the XLi EDGE QubicaAMF pinspotter has a number of built-in features and components as well as various warning labels that are designed to minimize and warn against the risks associated with this equipment. Heed all warnings and do not defeat the safety features that come with your pinspotters. Never place the machine into service with any of the guards removed. Some of the warning labels you may observe on the pinspotter are shown on the following pages.



***XLi EDGE QubicaAMF Pinspotter***

	This symbol means STOP, DO NOT PROCEED, and is a warning that hazards could exist. It is often followed by other symbols.		This symbol means that the mechanic should read, understand, and follow the technical manual before servicing the machine.
	This symbol indicates a LOCKOUT/TAGOUT point for performing maintenance.		This symbol reminds the user to remove main power from the machine prior to performing maintenance.
	This symbol warns the mechanic to unplug the motor before servicing.		This symbol indicates STOP! NO ACCESS FOR UNAUTHORIZED PERSONS. Service should be performed by authorized, trained personnel only.
	This symbol indicates that eye protection is required.		This symbol indicates that hearing protection is required.
	This symbol is a warning against breaking a photo eye beam, which will cause the machine to cycle.		This symbol indicates that the machine may start or cycle automatically without warning.
	This symbol states that a crushing hazard exists.		This symbol is a warning against operating the equipment with the guards removed.
	This symbol denotes that an entanglement hazard associated with gears exists.		This symbol denotes that an entanglement hazard associated with belts and pulleys exists.
	This symbol warns that a falling hazard exists.		This symbol warns that a tripping hazard exists.

The above symbols may be found displayed as follows:

<b>WARNING AVERTISSEMENT</b> <b>ADVERTENCIA WARNUNG</b>				
<b>STOP.</b> READ and UNDERSTAND TECHNICAL MANUAL Before Servicing Machine.	<b>DETÉNGASE.</b> LEA Y COMPRENDA el MANUAL TÉCNICO antes de iniciar las tareas de servicio.		<b>HALT!</b> Vor Arbeiten an der Maschine das TECHNISCHE HANDBUCH LESEN und VERSTEHEN.	<b>ARRÊTER.</b> LIRE et lIRE à BIEN COMPRENDRE le MANUEL TECHNIQUE avant de travailler sur la machine.
<b>LOCKOUT/TAGOUT.</b> UNPLUG Main Power and UNPLUG Motor Before Servicing Machine. See Lockout/Tagout Procedure.	<b>DESENERGIZAR/ETIQUETAR "EN SERVICIO"</b> desconecte la alimentación de la red y ETIQUETAR el motor antes de realizar las tareas de servicio. Consulte su procedimiento de bloqueo y etiquetado.		<b>SPIERRINGE/SERVICE-KENNZEICHNUNG</b> Vor Arbeiten an der Maschine Sperrenstecker und Motorstecker trennen. Bitte auch Sperrschlüssel verwenden.	<b>VERROUILLER/SIGNALISER, DÉBRANCHEZ l'alimentation principale et le moteur avant de travailler sur la machine.</b> Consultez la procédure de verrouillage de sécurité.
<b>DO NOT BREAK PHOTO BEAM.</b> Machine will cycle. STARTS AUTOMATICALLY. CRUSH HAZARD. Pin Deck Area.	<b>NO ROMPA EL HAZ FOTOGRÁFICO</b> o la máquina ARRANCA AUTOMÁTICAMENTE. PELIGRO DE APLASTAMIENTO. Área de la pata.		<b>LICHTSTRAL NICHT UNTERBRECHEN.</b> die Maschine wird automatisch STARTET. QUETSCHGEFAHR. Pindeck/Bereich.	<b>NE PAS INTERROMPRE LE FAISCEAU DE LA CELLULE.</b> la machine se mettra en marche DÉMARRAGE AUTOMATIQUE. DANGER D'ÉCRASEMENT. Zone des quilles.
<b>DO NOT OPERATE WITHOUT GUARDS.</b> BELT ENTANGLEMENT. GEAR ENTANGLEMENT.	<b>NO HAGA FUNCIONAR LA MÁQUINA SIN GUARDAS debidamente instalados.</b> ATARQUE DE LAS CORRIAS. ATARQUE DE LAS MACHINAS.		<b>NIETRIEBNAHME OHNE abgedeckte augenschutzschützer VERBOTTEN.</b> GÜRTELVERWICKLUNG. GETRIEBEVERWICKLUNG.	<b>NE PAS METTRE EN MARCHÉ SI LES PROTECTIONS NE SONT PAS correctement installées.</b> ENTRAÎNEMENT PAR LES COURROIES. ENTRAÎNEMENT PAR LES ENGRENAGES.
<b>FALL / TRIP HAZARD.</b> Do not use Palletized Platform Guards as a Catcher to access other Palletizers in Operation.	<b>PELIGRO DE CAÍDA/VELOCIDAD.</b> No use las guardas de la plataforma montada como trampas para acceder a otros Palletizadores en Operación.		<b>FALL- bzw. KIPPEFAHRGefahr.</b> Nicht als Laufsteg zum Zugang zu anderen Palletisern in Betrieb benutzen.	<b>RISQUE D'ACCROCHAGE/CHUTE.</b> Ne pas utiliser les protections de la plateforme avant pour accéder aux autres Palletisiers en fonctionnement.
<b>EYE PROTECTION REQUIRED.</b> HEARING PROTECTION REQUIRED.	<b>SE NECESITA PROTECCIÓN OCULAR.</b> SE NECESITA PROTECCIÓN AUDITIVA.		<b>AUGENSCHUTZ ERFORDERLICH.</b> OHRENSCHUTZ ERFORDERLICH.	<b>PROTECTION OCULAIRE REQUISE.</b> PROTECTION AUDITIVE REQUISE.
<b>NO ACCESS FOR UNAUTHORIZED PERSONS.</b> Service by Authorized Trained Personnel Only.	<b>NO SE PERMITE LA ENTRADA A PERSONAL NO AUTORIZADO.</b> Sólo personal autorizado puede realizar tareas de servicio.		<b>KEIN ZUGANG FÜR UNBEFUGTE.</b> Service nur durch betugtes Fachpersonal!	<b>ACCÈS INTERDIT AUX PERSONNES NON AUTORISÉES.</b> Les entrées ne seront pas effectués que par un personnel autorisé formé et entraîné.

Spanish German French

<b>WARNING</b> <b>ADVERTENCIA</b> <b>WARNUNG</b> <b>AVERTISSEMENT</b>		<b>Serious Injury May Occur!</b> Machine will start automatically or by breaking the photo beam.	<b>¡Pueden ocurrir serias lesiones!</b> La máquina arrancará automáticamente o, rompiendo el haz fotográfico.	<b>Hohe Verletzungsgefahr!</b> Maschine startet automatisch, bzw. wenn der Lichtstrahl unterbrochen wird.	<b>Risques de blessures graves!</b> La machine peut se mettre en marche automatiquement ou si le faisceau de la cellule est interrompu.
		<ul style="list-style-type: none"> <li>• Lock-out/Tag-out</li> <li>• Disconnect motor plugs before entering machine.</li> </ul>	<ul style="list-style-type: none"> <li>• Desenergizar/etiquetar "En servicio"</li> <li>• Desconecte las orejetas del motor antes de entrar en la máquina.</li> </ul>	<ul style="list-style-type: none"> <li>• Sperrung/Service-Kennzeichnung</li> <li>• Vor Zugang zur Maschine Motorstecker trennen.</li> </ul>	<ul style="list-style-type: none"> <li>• Verrouiller/signaler.</li> <li>• Débrancher les prises des moteurs avant de pénétrer dans la machine.</li> </ul>

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<b>WARNING</b> <b>ADVERTENCIA</b> <b>WARNUNG</b> <b>AVERTISSEMENT</b>		<b>Serious injury may occur.</b> Crush hazard. Do not operate with guard removed.	<b>¡Pueden ocurrir serias lesiones!</b> Peligro de aplastamiento. No opere sin la defensa colocada en su lugar.	<b>Hohe Verletzungsgefahr!</b> Quetschgefahr. Nicht ohne Schutzvorrichtung in betriebsnehmen.	<b>Risques de blessures graves!</b> Danger d'écrasement. Ne pas utiliser avec la protection retirée.
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<b>CAUTION</b> <b>ATENCIÓN</b> <b>VORSICHT</b> <b>ATTENTION</b>		<b>Do NOT step or stand on this surface.</b>	<b>NO pise ni se ponga de pie sobre esta superficie.</b>	<b>Fläche NICHT betreten!</b>	<b>Ne PAS monter ou se tenir sur cette surface.</b>
--	--	--	--	-------------------------------	---

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<b>DANGER</b> <b>PELIGRO</b> <b>GEFAHR</b> <b>DANGER</b>		<b>Pindeck Crush Area!</b> <ul style="list-style-type: none"> <li>• Lock-out</li> <li>• Tag-out</li> <li>• Unplug Power</li> <li>• Unplug Motor</li> </ul>	<b>¡Plataforma, área de aplastamiento!</b> <ul style="list-style-type: none"> <li>• Desenergizar</li> <li>• Etiquetar "En servicio"</li> <li>• Desconectar la alimentación</li> <li>• Desconectar el motor</li> </ul>	<b>Pinstandfläche, Quetschbereich!</b> <ul style="list-style-type: none"> <li>• Sperrung</li> <li>• Service-Kennzeichnung</li> <li>• Stromstecker trennen</li> <li>• Motorstecker trennen</li> </ul>	<b>Zone des quilles, danger d'écrasement!</b> <ul style="list-style-type: none"> <li>• Verrouiller.</li> <li>• Signaler.</li> <li>• Débrancher l'alimentation.</li> <li>• Débrancher le moteur.</li> </ul>
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It is also important to understand that the use of these symbols is not all-inclusive because it is impossible to warn of all the possible hazardous consequences that might result from failure to follow these instructions.



## 2.2 SAFETY PROCEDURES AND PRECAUTIONS

1. **PLACE THE SWEEP IN THE 1<sup>ST</sup> GUARD POSITION AND DISCONNECT THE POWER PLUG** before working on any pinspotter equipment and before entering any portion of a pinspotter. **FOR ENTRY INTO A PINSPOTTER, THE ADJACENT (PAIRED) PINSPOTTER MUST BE ISOLATED IN THE SAME MANNER AS THE PINSPOTTER BEING ACCESSED.** Follow your center's established lock-out and tag-out procedures.

A lock-out device should be placed over the power connector to prevent power from being applied to the machine during maintenance or repair. Refer to Figure 2-1 for machine power connector locations.

For pinspotter installations equipped with the XLi EDGE SmartGuard™ Safety System, refer to the *XLi EDGE SmartGuard™ Safety System Manual, 400-088-092*, for specific information relating to electrical isolation requirements when entering the machine.

2. Be sure all safety guards are securely in place before operating a pinspotter.
3. Wait a minimum of 60 seconds after disconnecting the power plug before opening the chassis or contacting any electrically charged pinspotter components.
4. **NEVER** alter pinspotter safety mechanisms or wiring.

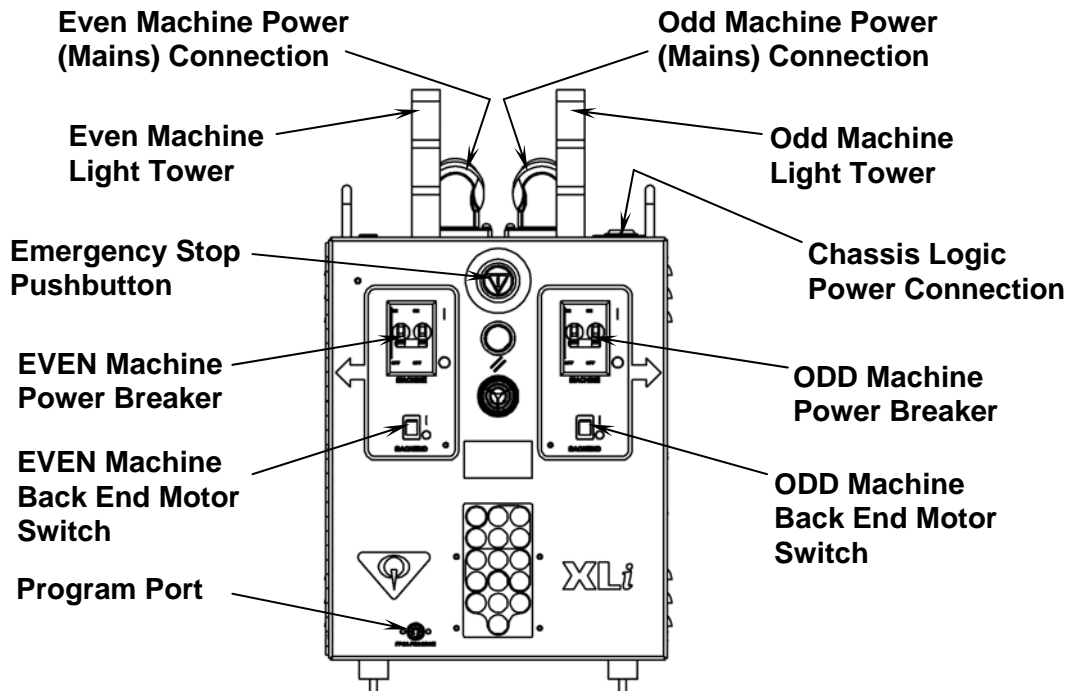


Figure 2-1

## 2.3 SAFETY GUARDS

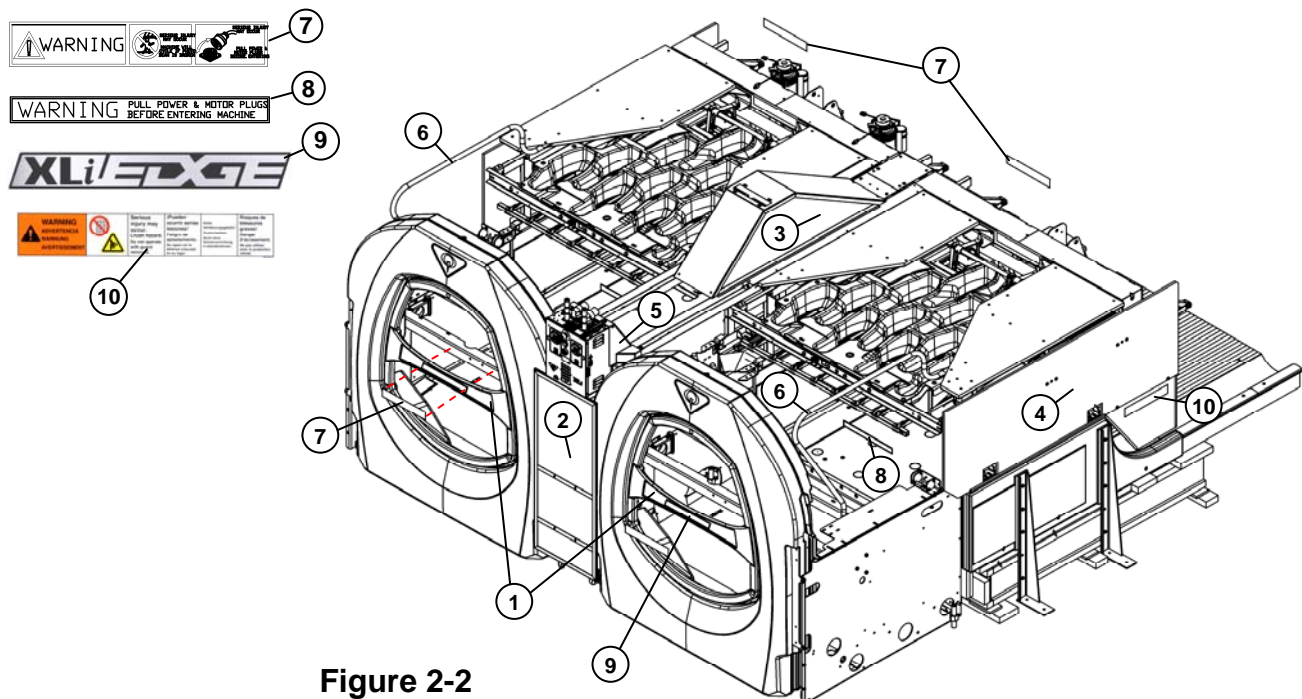
For pinspotters equipped with the SmartGuard™ Safety System, refer to the XLi EDGE SmartGuard Safety System Manual, 400-088-092, for additional information concerning the function and operation of the safety system as well as for additional safety requirements and lock-out / tag-out instructions.

All safety guards must be in place before operating the machine. When maintenance is required, the following steps must be followed.

1. Place the Sweep in the First Guard position.
2. Turn off the logic and machine power breakers on the Control Chassis.
3. Disconnect the power plugs from the top of the Control Chassis.
4. Lock out and tag out power to the pinspotter in accordance with your facility's established procedures.
5. Remove guards only as required to perform the maintenance.
6. Once maintenance is complete, replace all guards.

There are six different types of safety guards and several labels on a standard pair of QubicaAMF Pinspotters (refer to Figure 2-2):

- |   |  |
|---|--|
| 1. Center Screen Guards                 | 6. Hand Rails                          |
| 2. Ball Lift Screen Guard               | 7. Warning Label (Distributor Support) |
| 3. PBL Top Guard                        | 8. Warning Decal (Yoke)                |
| 4. End Guard Panel                      | 9. EDGE Logo Decal                     |
| 5. Chassis Cover Guard (behind Chassis) | 10. End Guard Danger Label             |



**Figure 2-2**



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*XLi EDGE QubicaAMF Pinspotter*

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**Basic Pinspotter Operation****CONTENTS**

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### 3.1 PINSPOTTER MECHANICAL OPERATION

#### 3.1.1 FOUR BASIC PINSPOTTER FUNCTIONS

The XLi EDGE Pinspotter has four basic functions:

1. Stops balls
2. Returns balls
3. Sets pins
4. Resets pins

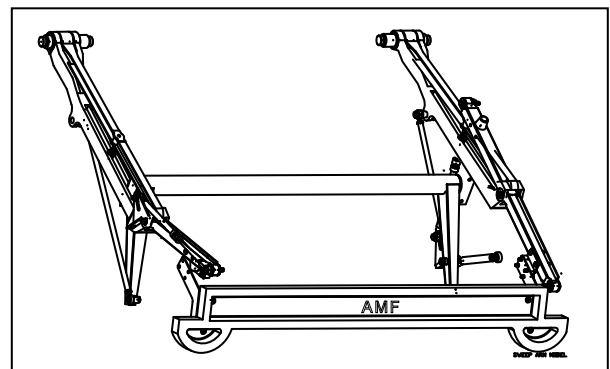
#### 3.1.2 EIGHT BASIC PINSPOTTER COMPONENTS

##### 1. Cushion

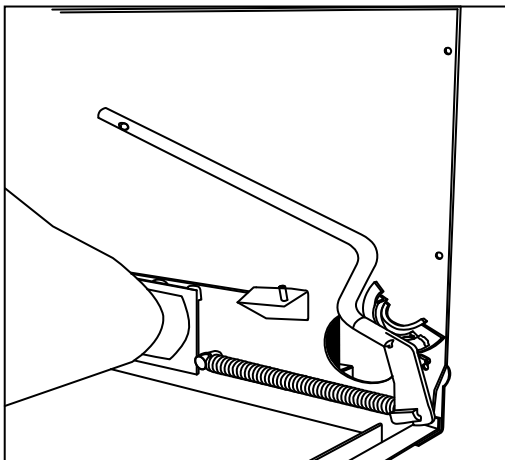
The cushion stops the ball and deflects it into the pit area.

##### 2. Sweep

The sweep removes fallen pins from the pin deck and adjacent gutters. It also is a guard preventing balls from striking the table while spotting or respotting pins (Figure 3-1).



**Figure 3-1, Sweep**



**Figure 3-2, Pin Conveyor**

##### 3. Pin Conveyor

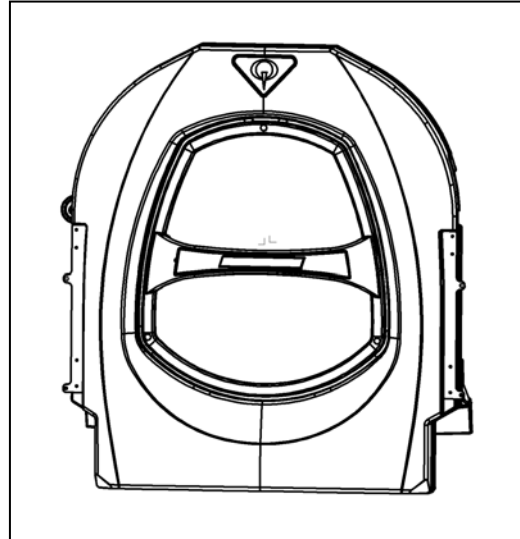
The pin conveyor (Figure 3-2) is a belt that carries fallen pins to the pin elevator, where they are carried up to the distributor. The underlying bounce board provides support for the pins and guides the ball to the opening to the ball lift.



## *XLi EDGE QubicaAMF Pinspotter*

### 4. Pin Elevator

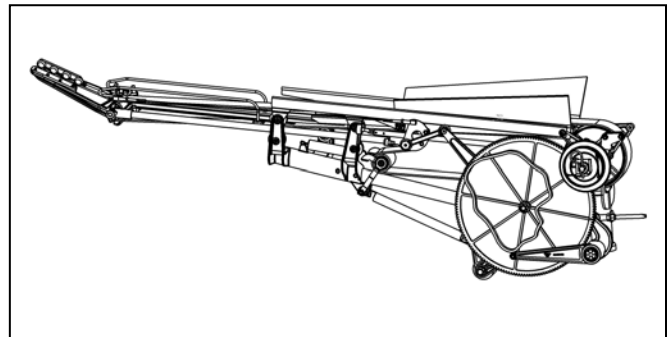
The pin elevator (Edge Performance Lift) carries the pins from the pit area to the distributor. (Figure 3-3)



**Figure 3-3, EDGE Performance Lift**

### 5. Distributor

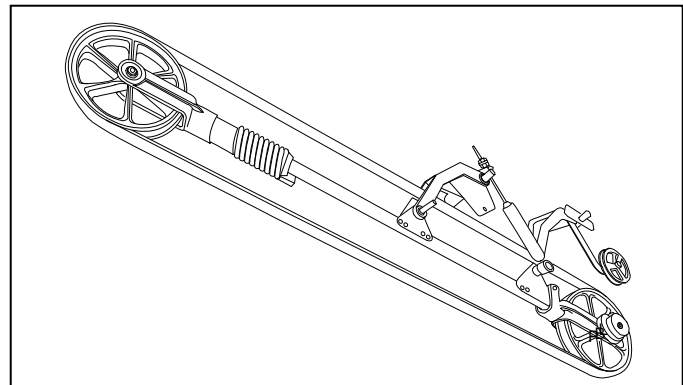
The distributor (Figure 3-4) delivers the pins from the pin elevator to the bin. The distributor runs continuously and is driven by the back end motor.



**Figure 3-4, Distributor**

### 6. Ball Lift

The ball lift (Figure 3-5) lifts the ball high enough to permit gravity to return the ball to the bowler. The ball lift is mounted between the odd and even pinspotters on a pair of lanes.



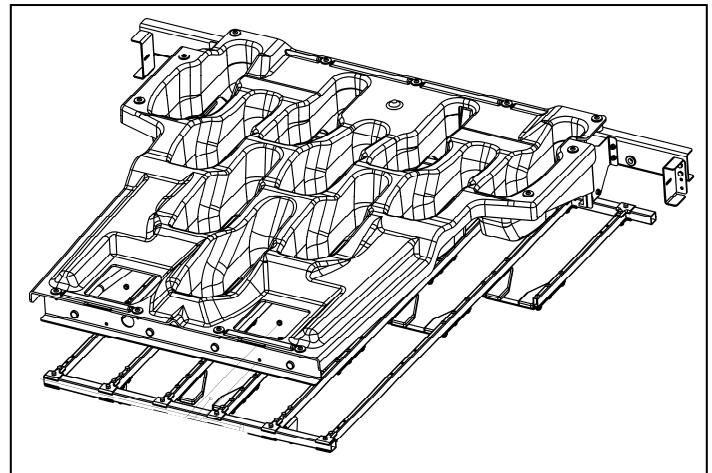
**Figure 3-5, Ball Lift**

*Pinspotter Mechanical Operation*

**7. Bin and Shuttle Assemblies**

The bin (Figure 3-6) stores pins received from the distributor until ready for spotting. Two sets of pins can be stored in the bin assembly until required.

The shuttle sits just below the bin and keeps the pins in place until actuated, at which point it drops the bottom layer of pins into the spotting cups.

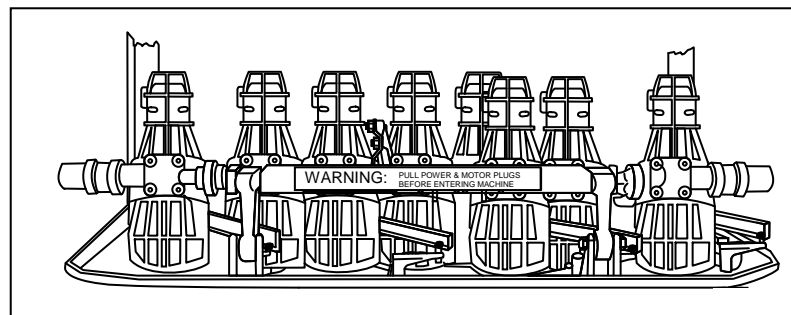


**Figure 3-6, Bin & Shuttle Assembly**

**8. Table**

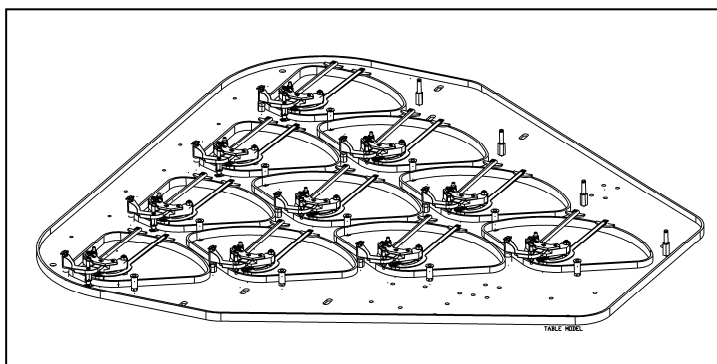
The table performs its spotting and respotting functions by employing two major subassemblies:

The **yoke assembly** supports the ten spotting cups (Figure 3-7).

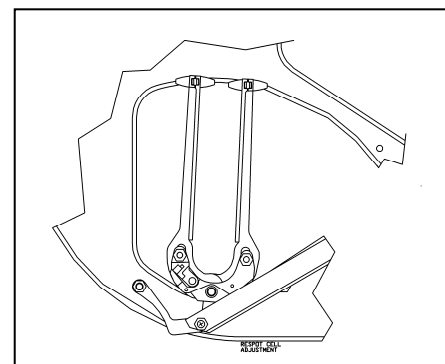


**Figure 3-7, Yoke and Spotting Cups**

The **table assembly** houses the ten respot cell assemblies (Figures 3-8a & 3-8b).



**Figure 3-8a, Table**



**Figure 3-8b, Respot Cell**



---

## *XLi EDGE QubicaAMF Pinspotter*

### **3.1.3 FIVE BASIC PINSPOTTER CYCLES**

The XLi EDGE Pinspotter employs five basic cycles:

1. First Ball Cycle
2. Second Ball Cycle
3. Strike Cycle
4. First Ball Foul Cycle
5. Second Ball Foul Cycle

#### **1. FIRST BALL CYCLE**

- The machine is ready for the first ball with first ball light on.
- After the bowler rolls the ball, the ball trigger detects the ball passing, signals the chassis, and starts the machine cycle.
- The sweep runs to its down or 1<sup>st</sup> guard position. It remains here until called upon to sweep the pins into the pit.
- A time delay begins, and at its conclusion the camera detects the pins that remain standing, relays this information to the chassis, and then the table starts its first descent.
- Standing pins are mechanically gripped and raised to a height sufficient for the sweep to pass under them and clear the lane of fallen pins.
- The sweep begins its run-through, pushes fallen pins into the pit, and returns to the guard position where it stops.
- The table respots the pins that weren't knocked down by the action of the first ball, and the table and sweep return to the home position.
- The second ball light comes on.

#### **2. SECOND BALL CYCLE**

- When the second ball is rolled, the ball trigger senses the ball and starts the machine cycle.
- The sweep drops to the 1<sup>st</sup> guard position. It remains here until called upon to sweep the pins into the pit.
- A time delay begins, and at its conclusion the camera detects the pins that remain standing and relays this information to the chassis.

*Pinspotter Mechanical Operation*

- The sweep then performs its sweeping operation and returns to the guard position.
- At this time, the table receives its spotting signal and the spotting cups swing downward to set up a complete set of pins.
- The table and sweep return to the home position.
- The second ball light goes off, and first ball light stays on.

**3. STRIKE CYCLE**

- In the strike cycle, the machine components are in the same condition as for the first ball.
- The ball is rolled and the ball trigger senses the ball and starts the machine cycle.
- The sweep drops to the 1<sup>st</sup> guard position and the time delay starts as in the first ball cycle.
- At the end of the time delay, the camera attempts to detect any pins that remain standing. Since there are none, it feeds this information to the chassis which interprets this as a strike.
- The first ball light goes off and the strike light comes on.
- The sweep clears all of the fallen pins from the lane.
- The mask flashes the strike lights, the table begins a spotting operation, descends, and the cups swing down and deposit a full set of pins.
- The table and sweep return to the home position, and the first ball light comes on.

**4. FIRST BALL FOUL CYCLE**

- When the ball is rolled and the bowler commits a foul, the foul detector unit operates and prepares the machine for a foul cycle.
- The foul detector unit energizes the foul light on the mask and rings a bell or buzzer.
- The ball passes the ball trigger which senses the ball and starts the machine cycle.
- The sweep drops to the 1<sup>st</sup> guard position and then completes its sweeping operation of the pin deck.

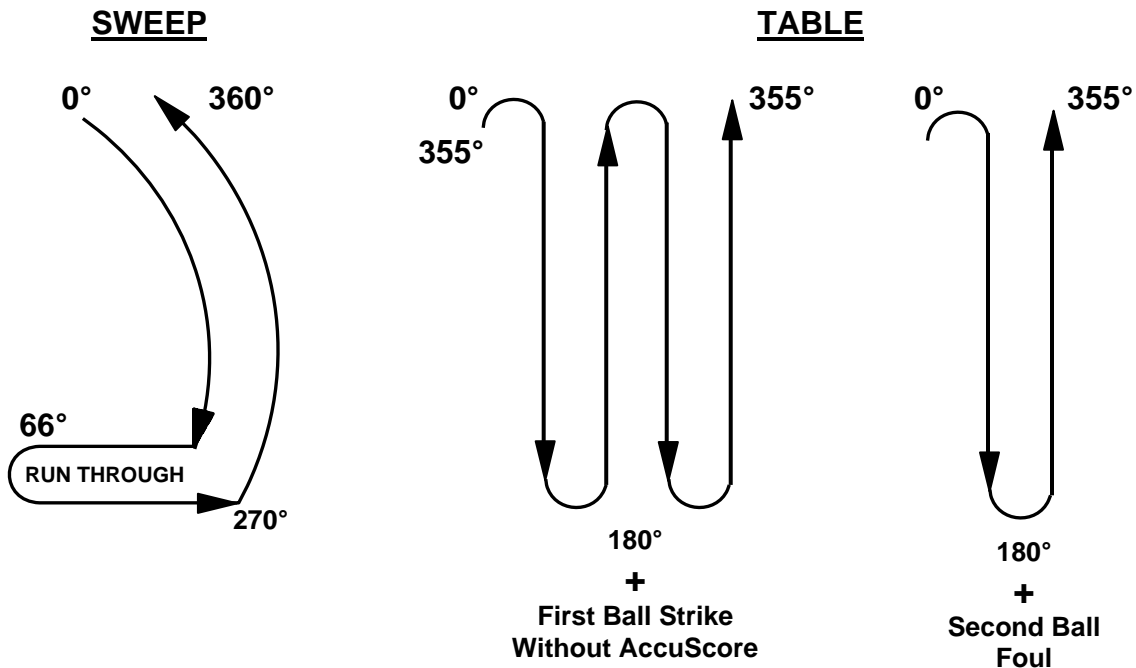


## *XLi EDGE QubicaAMF Pinspotter*

- The table, when full of pins, begins its spotting operation. The table cups swing down and deposit a full set of pins.
- The table and sweep return to the home position. A score of zero pins has been registered.
- The machine is ready for a second ball with the second ball light on.

### **5. SECOND BALL FOUL CYCLE**

- Should the bowler commit a foul when delivering the second ball, The foul detector unit operates the foul light and bell or buzzer.
- The sweeps standing and fallen pins without a scoring time delay and returns to the 1<sup>st</sup> guard position.
- A score of zero pins is registered for the second ball.
- The table receives its spotting signal and the spotting cups swing downward to set up a complete set of pins.
- The table and sweep return to the home position, and the first ball light comes on.



**Figure 3-9**

## 3.2 PINSPOTTER ELECTRICAL OPERATION

Power to the pinspotter is supplied via the chassis. The chassis has three power supplies: one for each pinspotter's electrical components (the cables with the large blue connectors), and a logic power supply that provides control power for the various machine functions.

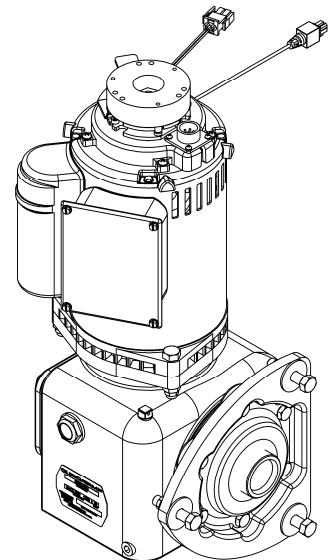
**Before turning on control power to the pinspotter chassis, ensure that the red E-stop buttons on the chassis and at the front of the pinspotters are not depressed. These buttons have a lock-in feature that requires that they be pulled out to its normal position. If an E-stop button is in the depressed position when chassis logic power is energized, the pinspotters will not turn on and the E-STOP ERROR message will not be displayed. If an E-Stop button is pressed after logic power is turned on, the chassis will sense this and display the E-STOP ERROR message.**

### 3.2.1. MOTORS

The machine employs three capacitor-start induction motors. All three motors are fractional horsepower units. These motors are designed to operate in a voltage range of 208VAC to 240VAC and are available in 50 Hz or 60 Hz, to match the electrical power in your area. All motors have gear reducer units attached.

Two of the three motors (Figure 3-10) are mounted on the front end and operate the table and sweep. These motors operate intermittently as required and are equipped with a brake and an encoder assembly that is used to provide position indication for the table and sweep. **The Table and Sweep motors are interchangeable.**

The third motor is mounted on the back end and supplies power to drive the pin elevator, the pin conveyer, the ball lift (PBL), and the distributor. This motor runs continuously.



**DRAWING 3-10**



### **3.2.2 ENCODERS & SWITCHES**

The positions of the Table and Sweep are controlled by the Chassis using optical encoders located within the top casting on each motor. The encoders consist of a perforated disk and a light source and sensor assembly. When the motor is energized, the disk, which is attached to the motor shaft, spins. As it spins, the light beam is alternately interrupted and sensed. Each time the light beam is sensed a count is registered. Each count represents a movement of a fraction of a degree of the Table or Sweep drive shafts. From this count the position of the shaft, in degrees, is calculated by the Chassis, and is used to stop the motors at the desired locations.

The Table and Sweep drive shafts each have an encoder and disk assembly mounted on them. These are similar to the ones on the motors except that there is only a single perforation in each of the disks. These perforations are aligned with the light beam when the Table and Sweep are at the Home position and provide an absolute indication of when these shafts are correctly positioned for the start of a cycle. The Chassis can utilize this information to correct any drift, or accumulation errors, in the counts by resetting the counts to zero when the shafts are at the home position. This self-correcting feature helps to ensure accurate and consistent operation.

#### **The Off Spot Switch**

The off spot switch is an electro-mechanical switch that actuates when the table contacts a pin that is standing but has moved off its spot beyond the normal respot range of the table. Its purpose is to prevent damaging the machine if an off-spot condition occurs.

#### **The Optical Bin Switch (BSO)**

The optical bin switch is a light-sensing switch that actuates when the #9 pin (the last pin delivered by the distributor) is deposited in the bin. Its purpose is to allow the machine to spot pins only when the bin is full. The optical design eliminates the need for springs and moving parts that could interfere with the proper positioning of the pin in the bin pocket.

### **3.2.3 PROTECTION DEVICES**

In addition to the circuit breakers on the power supply panels and chassis, as well as fuses contained in the chassis (see Chassis Manual), the back end motor and the table and sweep motors are protected by thermal overload devices called “Klixon” switches that can be identified by a red reset button located on each motor. They shut off the motor when it exceeds a predetermined temperature caused by an overload or an electrical fault, and must be manually reset after an appropriate cool down period.



### **3.2.4 MACHINE PIT TIME DELAY**

When the pinspotter is turned off at the Manager's Control Unit (MCU), Advantage Front Desk, or BOSS Front Desk, all functions and motors, **except the pinspotter back end motor**, become inoperative. A time delay allows the back end motor to continue to operate for approximately 60 seconds to enable all of the pins in the pit to be delivered to the bin and for the bowler's ball to be returned to the ball rack. (The machine pit time delay is built into the chassis).

### **3.2.5 FRAME COUNTERS**

A frame count is provided for the manager's convenience so that the number of frames bowled can be determined. This count is kept in the Chassis (total) and Manager's Control Unit (MCU). This unit is located at the manger's control desk.

### **3.2.6 BOWLER'S PIT SIGNAL SYSTEM**

A signal system is provided on the chassis for the center's convenience so that the bowler has a method of notifying the maintenance man that a machine needs attention. This system is both audible and visual through the chassis light tower and beeper.

The bowler's push button, also known as the mechanic call button, is located on the ball rack. When the mechanic call button is pressed, the red and green lights on the chassis light tower flash alternately and an intermittent audible beep is emitted. The lights and sound remain on until cleared by the mechanic.

### **3.2.7 TENTH FRAME BUTTON**

The tenth frame button, located on the end of the ball rack, is provided as a means of cycling the machine when required. Whenever pins are left standing after a game has been completed, the tenth frame button can be operated to signal the machine to set up for the next bowler.



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**NOTE: Please refer to the Options and Profile Ball Return Manuals (P/N 612-860-032 & 612-860-010) for more Information on functions of the mechanic call and tenth frame buttons.**

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## *XLi EDGE QubicaAMF Pinspotter*

### **3.2.8 BALL DETECTOR**

The detector assembly contains four optical emitters/sensors, two for each lane. Dual detectors provide better ball speed information to the chassis which helps determine the time delay to be applied before lowering the sweep – the slower the ball speed, the longer the delay. The detectors are factory aligned so that they are parallel and should not need adjustment. The entire assembly is adjustable to provide correct alignment with the reflector assembly. Slotted mounting holes are provided in the base of the assembly for fine-tuning the alignment. See Figure 3-14.

#### **3.2.8.1 Ball Detector Location**

The ball detector and reflector assemblies must be properly aligned in order to function correctly. The design of the detector greatly reduces the possibility of crosstalk. Crosstalk refers to the light from one detector head shining directly into another detector head because of the location or alignment of the reflectors.

##### **Detector Assembly**

The detector assembly should be mounted on a rigid framework behind the downsweep and outside the path of the sweep, if possible (preferred). A small section of the optional plastic bumper rails may need to be removed to allow this installation. If installation inside the sweep path is necessary, this option must be selected on the chassis menu or else the sweep can cause the machine to shut down when it passes through the ball detector beam.

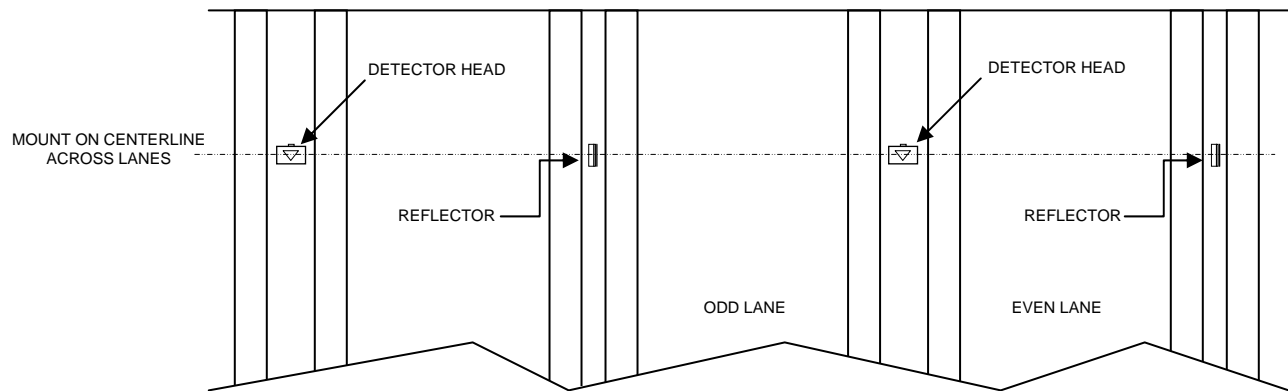
##### **Reflectors**

The reflectors should be mounted on the smaller capping on the opposite side of the lane centered at exactly the same distance from the 7-10 line as the detector head (see Figures 3-13 and 3-14). A reflector assembly consists of a mounting bracket upon which two rectangular reflectors are mounted, one for each adjacent lane. A tool is provided that contains a window for verifying detector alignment. Each end lane utilizes a reflector assembly containing only a single reflector.

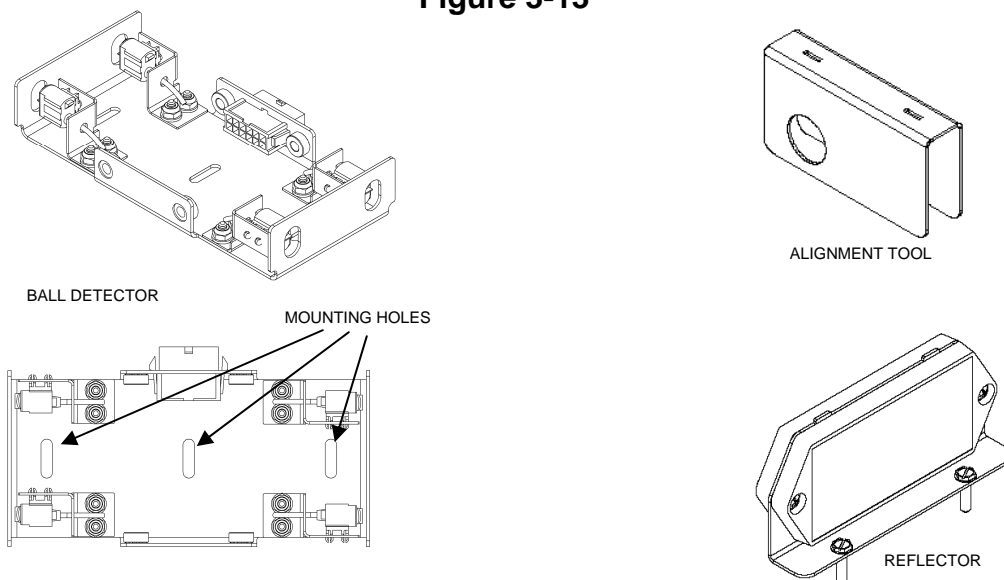
##### **LEDs**

Inside each detector there are four light emitting diodes, one for each detector head, that indicate when detector alignment is correct. If the LEDs are on constantly, the detector is in alignment. If the LEDs are blinking, a signal is being sensed, but alignment is not quite correct. If the LED is out, no signal is being sensed.

*Pinspotter Mechanical Operation*



**Figure 3-13**



**Figure 3-14**

**3.2.8.2 Ball Detector Operation**

The ball detector is designed to detect and signal the passage of a bowling ball. The detector head contains four optics systems, two monitoring the odd lane and two monitoring the even lane. The light from one detector can only be sensed by that detector's corresponding sensor, thereby eliminating crosstalk.

The Chassis measures the time period between the interruption of the first beam to the interruption of the second beam, which are aligned two inches apart, and uses this data to calculate ball speed. A variable time delay, which is inversely proportional to ball speed, is electronically inserted to provide a waiting period between the time a ball is detected and the time the Chassis cycles the machine. This allows the ball to clear the pin deck before the machine cycles.



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### *XLi EDGE QubicaAMF Pinspotter*

For example, the minimum time delay is 0.1 second, and the maximum time delay is 3 seconds. Depending on the speed of the ball, a slowly rolled ball may result in a time delay of as much as 3 seconds depending on the maximum time delay setting, while a rapidly rolled ball may result in a delay of as little as 0.1 second. The time delay varies in 0.1 second increments.

To initiate a sweep cycle, both detectors must sense the passage of the ball from front to back. If the beam is interrupted from back to front, no sweep cycle will occur. Also, if either beam is broken while the Sweep drive motor is running, for safety reasons the pinspotter will shut down and will need to be reset at the Chassis.

When the “Behind Sweep” option is selected on the Chassis, the Chassis will ignore ball detector signals when the sweep is near the first guard and second guard positions.

#### **3.2.8.3 Ball Detector System Test**



**MAKE CERTAIN THAT ALL PERSONNEL, TOOLS, AND EQUIPMENT ARE CLEAR OF THE MACHINE BEFORE RESTORING POWER!**

**Note: This test does not apply to installations containing the SmartGuard™ Safety System.**

1. Turn the chassis power ON.
2. Verify that the optical path of the ball detector is not blocked.
3. Rapidly pass a screwdriver handle or other small tool across the face of the detector from front to back causing a short duration of interruption. This should initiate a machine cycle very quickly.
4. After the cycle has been completed, again break the optical paths, this time with your hand so that the blockage lasts approximately 1 second. This should cause the machine to cycle approximately 3 seconds after the blockage is removed. If the machine cycle operation delay appears too fast or too slow for any machine, the maximum time delay setting can be adjusted to provide a time delay of up to 3 seconds.
5. Finally, pass your hand across the optical paths fairly quickly, and after the Sweep begins to move, pass your hand across the optical paths again. The Pinspotter should shut down and a red tower light for that lane should turn on at the Chassis. **Clear it by pressing the TRBL CLEAR button on the handheld device or on the Chassis.**

### *Pinspotter Mechanical Operation*

If the ball detector is installed inside the path of the sweep, the chassis will not accept a detection signal if the sweep is near the 1<sup>st</sup> or 2<sup>nd</sup> guard position. If the sweep breaks the detector beam, the detector senses it as if it was a ball and sends a detection signal to the chassis. Since the chassis receives this signal within the programmed range, it ignores the signal and does not cycle the machine nor does it cause a pinspotter shutdown as described in Step 5.

6. Repeat Steps 2 through 5 for the other lane.

#### **3.2.8.4 Ball Detector Maintenance & Cleaning Recommendations**

The system is designed to operate properly with a significant amount of dust and dirt accumulation on the optics. Periodic cleaning of the reflector surfaces and detector heads will help ensure proper operation.



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**NOTE: It is recommended that the units be covered during any lane maintenance that generates large amounts of dust and dirt.**

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1. Use a clean, soft cloth to gently wipe the face of the reflectors on the reflector units as well as the detector heads.
2. If gentle wiping does not remove the dirt, it may be due to grease or oil accumulation. A mild soap (such as dishwashing liquid soap) and water solution may be used. First wash and then gently wipe dry.



**DO NOT USE ABRASIVE CLEANERS OR STRONG SOLVENTS AS THEY MAY PERMANENTLY DAMAGE THE SURFACES.**

#### **3.2.9 Pit Light Operation**

The QubicaAMF XLi EDGE Pinspotter is equipped with a 220-volt 50/60-hertz dual pit light (see Figure 3-15 for pit light rating and certification labels) that can be used to provide normal (daylight) illumination or ultraviolet (black light) illumination when special glow effects are desired. The black light feature is especially effective when used with QubicaAMF Glow Track Lanes as well as Xtreme™ Product Line components. There are two different versions of the pit light: the Standard Dual Pit Light, 088-000-400, and the CE Dual Pit Light, 088-00-401, which contains required EMI filters. Additionally, each of these lights is available with and without an infrared LED panel which is needed when the black light is in operation on lanes that do not have Q-Vision, T-Vision, or M-Vision scoring cameras.



# XLi EDGE QubicaAMF Pinspotter

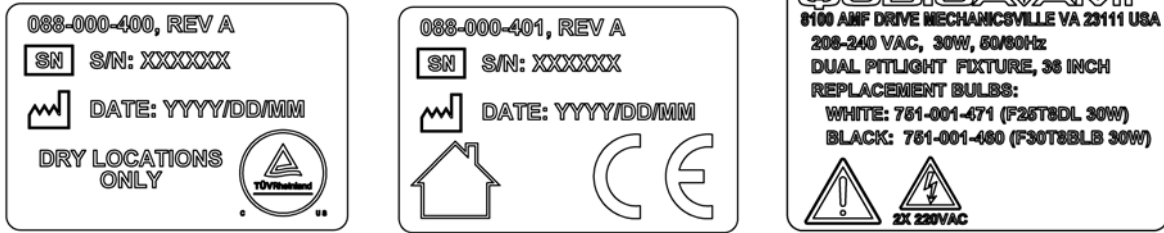


Figure 3-15

The pit light for each pinspotter can be switched to select normal or black light independently of any other pinspotter. This can be done from the Chassis, the MCU, or from the handheld unit using the Settings Menu. Refer to the XLi Control Chassis Manual, 400-088-009 and the Manager’s Control Unit Manual, 400-088-008, for specifics on Pit Light operation. The Pit Light Wiring Diagram is shown in Figures 3-16a & b below, and Pit Light replacement parts are shown in Section 5 of this manual.

Pit Lights containing banks of infrared LEDs allow the scoring camera to “see” the pins when the black light feature is being used, and are automatically switched on during black light operation. Verify LED operation by positioning a mirror so that you can see directly into the LEDs when the black light is on. You should see a faint reddish glow from within the LEDs.

If the pit light fails to operate, check that it is plugged into the pinspotter’s wiring harness, that the lamps are secured properly in their sockets (the black light should be in the bottom position), and that the lamps are good. Pit lights also have fuse protection. These fuses are accessed from the top of the chassis and should be checked if both lamps and the infrared LEDs fail to illuminate.

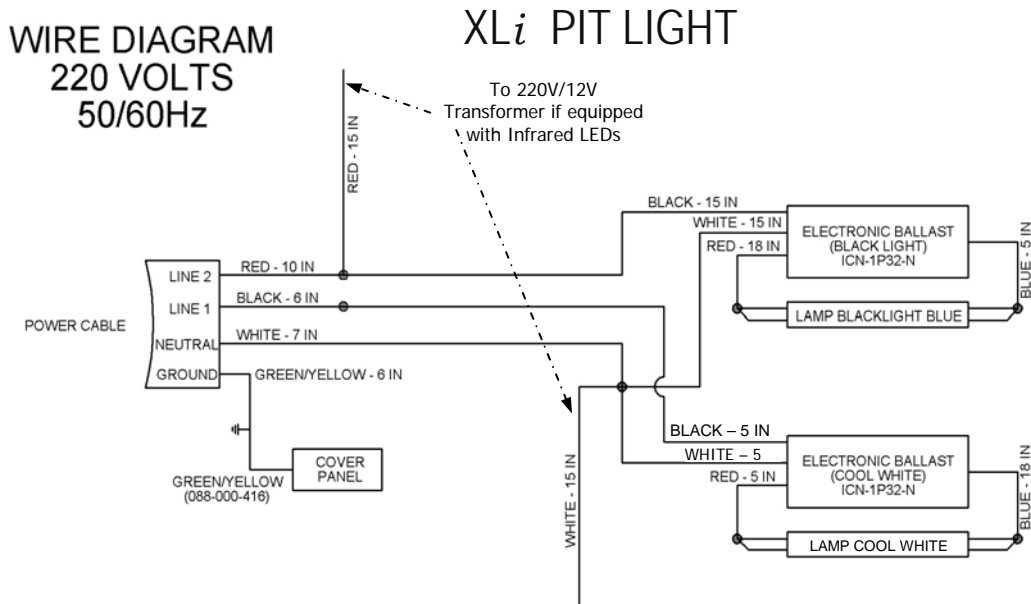
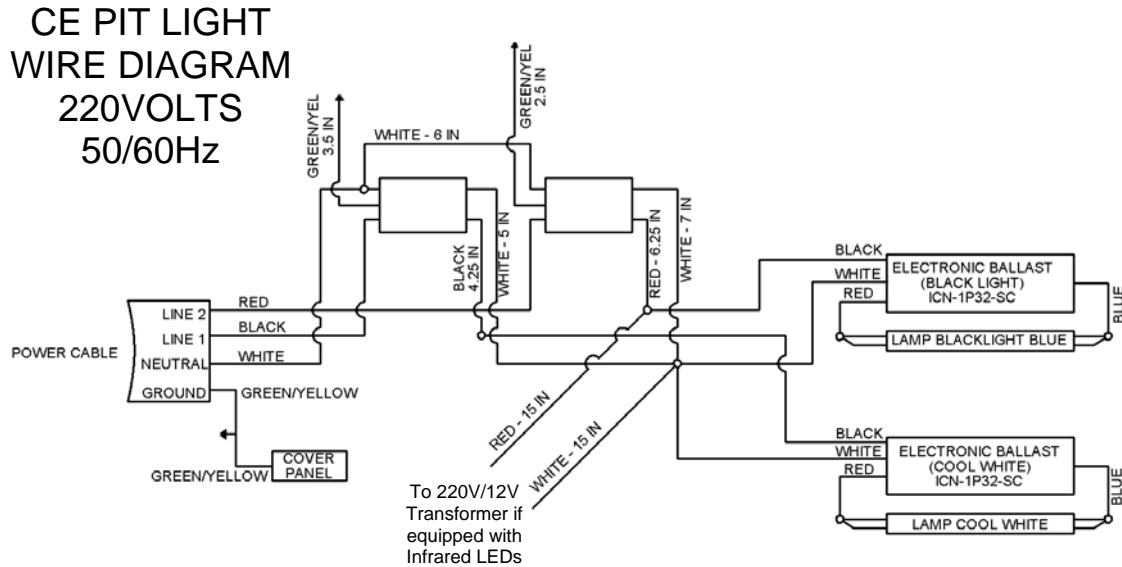
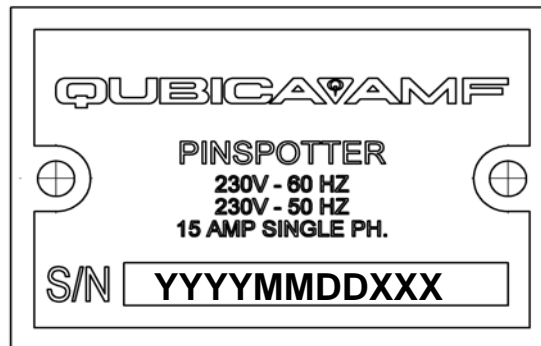


Figure 3-16a



**Figure 3-16b**

**3.3 ELECTRICAL DRAWINGS AND PINSPOTTER RATINGS**



**Figure 3-17**

Shown above are the pinspotter's voltage, frequency, and current ratings. Also, each machine is serialized with a date-of-manufacture- based serial number.

For information pertaining to the QubicaAMF XLi EDGE Pinspotter's electrical connections, refer to Attachment A, *QubicaAMF XLi EDGE Pinspotter Wiring Diagram*, 088-200-678.



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## *XLi EDGE QubicaAMF Pinspotter*

### **3.4 PIN DISTRIBUTOR**

For information pertaining to the XLi EDGE Pin Distributor, refer to Attachment B, *XLi EDGE Pin Distributor Manual*, P/N 400-088-121.

### **3.5 POSITIVE BALL LIFT (PBL)**

For information pertaining to the Positive Ball Lift, refer to Attachment C, *QubicaAMF Pinspotter Positive Ball Lift Manual*, 400-088-011.

### **3.6 CHASSIS**

For information pertaining to the operation of the pinspotter chassis, refer to Attachment D, *XLi QubicaAMF Pinspotter Chassis Manual*, P/N 400-088-009.

### **3.7 MOTORS & GEARBOXES**

For information pertaining to the front end and back end gear-motor assemblies, refer to Attachment E, *XLi QubicaAMF Pinspotter Motor and Gearbox Manual*, P/N 400-088-0017.

### **3.8 EDGE PERFORMANCE LIFT**

For information pertaining to the EDGE Performance Lift, refer to Attachment F, *EDGE Performance Lift Pinspotter Manual Supplement*, P/N 400-088-091.

### **3.9 SCORING CAMERA**

For information pertaining to the scoring camera, refer to Attachment F, *AccuCam 3000 Camera Manual*, P/N 400-286-002.

### **3.10 MANAGER'S CONTROL UNIT**

For information pertaining to the Manager's Control Unit (MCU), refer to Attachment G, *Manager's Control Unit (MCU) Manual*, P/N 400-088-008.

### **3.11 RADARAY XLi**

For information pertaining to the Radaray XLi Foul Detector, refer to Attachment H, *Radaray XLi Manual*, P/N 400-088-006.



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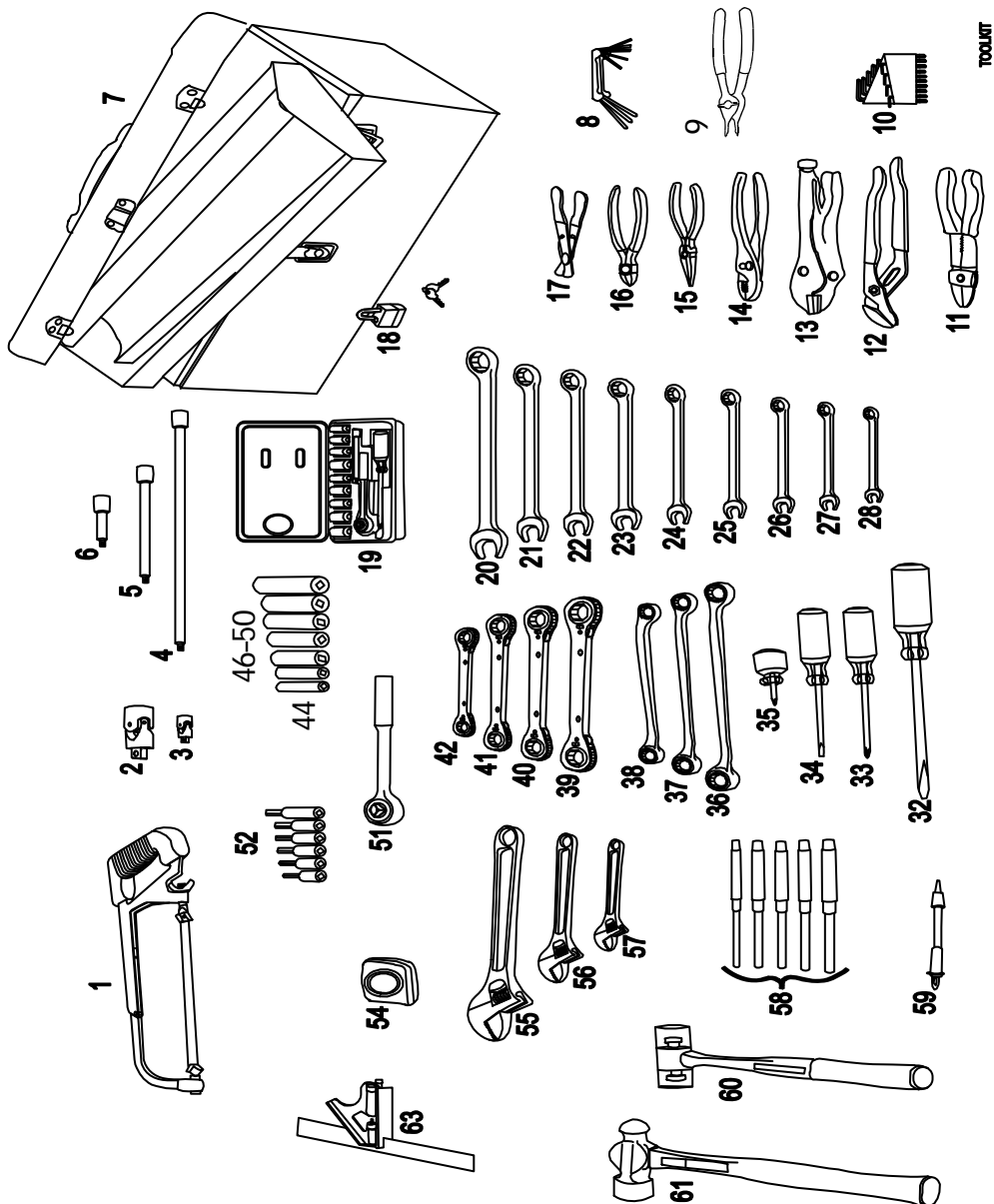


**4.1 SERVICE TOOLS**

**4.1.1 SERVICE TOOL KITS**

There are a couple of tool kits available for servicing the XLi EDGE Pinspotter: The Deluxe Tool Kit, P/N 784-528-013, and an XLi Steel Table Tool Kit, P/N 784-528-014. Figure 4.1-1a shows most of the tools that are included in the Deluxe Tool Kit, Figure 4.1-1b shows the tools that are included in the Steel Table Special Tool Kit, and Figure 4.1-1c shows the new motor crank. The complete lists of parts in the kits are also included.

**4.1.1a Deluxe Tool Kit**



**Figure 4.1-1a, Deluxe Tool Kit - P/N 784-528-013**



## ***XLi EDGE Pinspotter***

**Table 4.1-1a, Deluxe Tool Kit Parts List**

<b>ITEM</b>	<b>PART#</b>	<b>DESCRIPTION</b>	<b>ITEM</b>	<b>PART#</b>	<b>DESCRIPTION</b>
1	788-504-004	12" Hacksaw	34	789-006-008	4" Flat Blade Screwdriver
2	789-512-029	Universal 3/8" Drive	35	789-001-001	2" #2 Phillips Screwdriver
3	789-512-028	Universal 1/4" Drive	36	793-507-030	11/16 X 3/4" Offset Box Wrench
4	782-501-001	12" Extension 3/8" Drive	37	793-507-029	9/16" X 5/8" Offset Box Wrench
5	789-502-004	6" Extension 3/8" Drive	38	793-507-028	7/16" X 1/2" Offset Box Wrench
6	789-502-003	3" Extension 3/8" Drive	39	793-510-044	3/4" X 7/8" Ratching Box Wrench
7	792-005-005	Tool Box	40	793-510-043	5/8" X 11/16" Ratching Box
8	793-503-017	Hex Key Set	41	793-510-042	1/2" X 9/16" Ratching Box
9	793-002-007	Snap Ring Pliers	42	793-510-041	3/8" X 7/16" Ratching Box
10	793-503-051	Hex Key Set (14 Pieces)	43	792-517-037	9" Torpedo Level (not shown)
11	792-512-019	Crimping Tool	44	789-509-030	1/2" Deep Socket, 3/8" Dr
12	786-501-001	10" Channelock® Pliers	45		deleted
13	793-514-048	10" Vise Grip® Pliers	46	789-509-022	3/4" Deep Socket, 3/8" Dr
14	786-503-003	6" Slip Joint Pliers	47	789-509-021	11/16" Deep Socket, 3/8" Dr
15	786-502-002	6" Needle Nose Pliers	48	789-509-020	5/8" Deep Socket, 3/8" Dr
16	786-504-004	6" Diagonal Cutters	49	789-509-019	9/16" Deep Socket, 3/8" Dr
17	792-029-031	Wire Strippers	50	789-509-018	7/16" Deep Socket, 3/8" Dr
18	714-501-001	Padlock	51	789-505-008	3/8" Drive Ratchet
19	789-511-027	1/4" Drive Socket Set (13 Pieces)	52	780-503-014	3/8" Drive Hex Bit Set (6 Pieces)
20	793-506-050	3/4" Combination Wrench	53		deleted
21	793-506-027	11/16" Combination Wrench	54	792-026-028	1/2" X 8' Steel Tape Measure
22	793-506-026	5/8" Combination Wrench	55	793-501-003	10" Adjustable Wrench
23	793-506-025	9/16" Combination Wrench	56	793-501-002	8" Adjustable Wrench
24	793-506-024	1/2" Combination Wrench	57	793-501-001	6" Adjustable Wrench
25	793-506-023	7/16" Combination Wrench	58	787-001-006	Punch Set (6 Pieces)
26	793-506-022	3/8" Combination Wrench	59	791-004-004	Testlight - 80V - 600V
27	793-506-021	5/16" Combination Wrench	60	783-502-002	Mallet - 16 oz. Plastic
28	793-505-020	15/16" Combination Wrench	61	783-501-001	Hammer - 16 oz. Ball Peen
		deleted	62		deleted
		deleted	63	792-020-044	12" Combination Square
31	088-000-210	Mini-Fit Pin Crimp Tool (not shown)			
32	789-006-009	8" Flat Blade Screwdriver			
33	789-001-002	4" # 2 Phillips Screwdriver			

### 4.1.1b XLi Steel Table Tool Kit

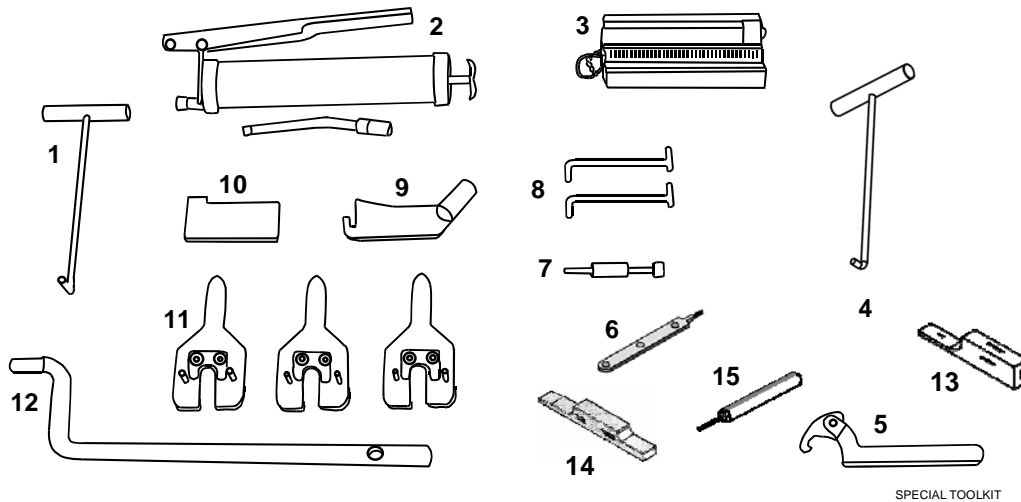


Figure 4.1-1b, XLi Steel Table Tool Kit - P/N 784-528-014

Table 4.1-1b, XLi Steel Table Tool Kit Parts List

ITEM	QTY	PART#	DESCRIPTION
1	1	792-505-005	Spring Puller
2	1	785-005-005	Grease Gun w/Extension
3	1	030-003-542	Clipper Belt Lacer
4	1	792-505-036	Spring Puller (short end)
5	1	793-511-045	Adjustable Spanner Wrench
6	1	088-000-207	Mini-Fit Pin Extractor
7	1	030-004-031	Pin Extracting Tool
8	2	792-501-001	Pit Conveyor Belt Removal Pins
9	1	792-502-002	Pit Conveyor Belt Tool Flag
10	1	070-006-519	Respot Gauge
11	3	090-005-525	Steel Table Locating Tool
12	1	784-003-000	Pit Conveyor Belt Installation Tool Handle
13	2	088-001-216	Multigage – Frame, Sweep, Distributor
14	1	088-001-217	Yoke Toe Gage
15	1	088-000-204	Pin Pusher (extracting tool)

### 4.1.1c Motor Crank

The XLi EDGE Pinspotter’s table and sweep drive motors can be operated manually to position the table or sweep for maintenance or adjustment. The drive motors contain a brake that must be manually released before hand cranking the motor, and will automatically re-engage when the brake lever, located at the top of each motor, is released. A new motor crank tool (P/N 088-000-033) is also provided. The design of the tool prevents insertion of the tool with drive power connected. **Use only the motor crank tool provided with the pinspotter for manual operation of the table and sweep drive motors.**

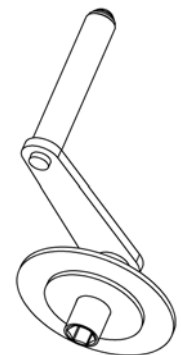


Figure 4.1-1c

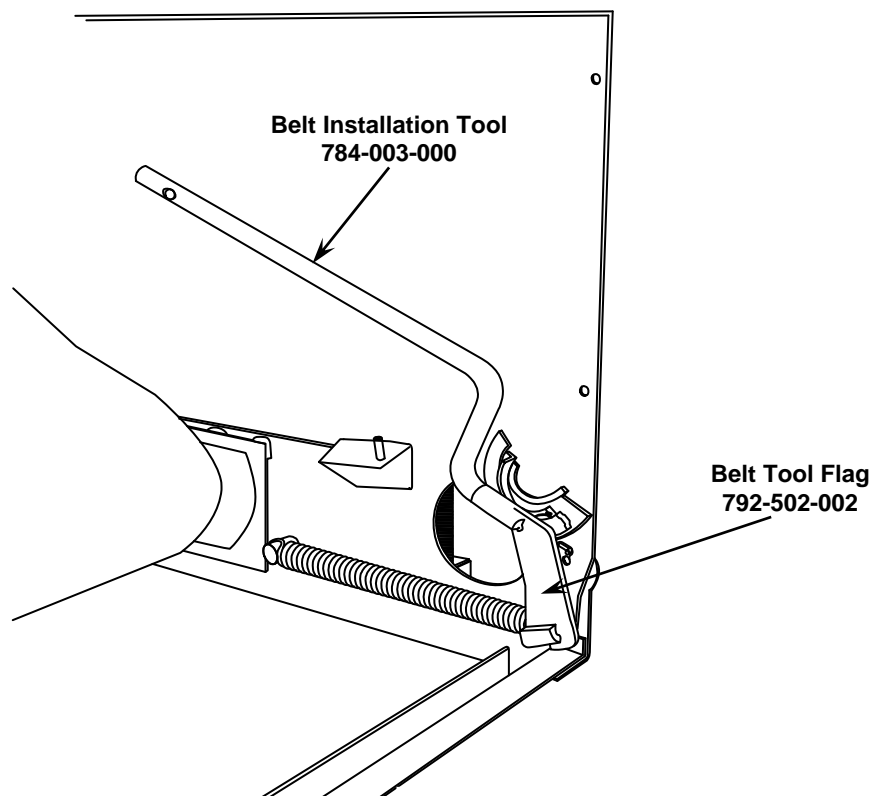


## *XLi EDGE Pinspotter*

### 4.1.2 PIT CONVEYOR BELT INSTALLATION TOOL

The Pit Conveyor Belt installation tool is used to remove spring tension from the belt roller for replacement of the belt, belt roller, bounce board, and other related parts. With the pinspotter shutdown, insert the tool between the tail plank and the belt near one end of the roller, and using the tool as a lever, apply pressure towards the rear of the machine until you can insert a belt removing pin (P/N 792-501-001) into the hole provided in the side plate. Repeat this procedure for the other end of the roller. The front roller can now be removed.

Because of the danger involved should the belt removing pins be accidentally knocked out while working in the pit, the belt installation tool can be used in conjunction with the flag (P/N 792-502-002) to remove spring tension from the front roller bearing supports. Attach the flag to the bearing support as shown in Figure 4.1-2, apply rearward pressure, remove the belt removing pin, and carefully let off pressure until the bearing support is resting against the tail plank. Repeat for the other side. **Perform this procedure with caution as the bearing supports are under considerable spring tension.**



**Figure 4.1-2, Pit Conveyor Belt Installation Tool in Use**

**4.1.3 CLIPPER BELT LACER (DISTRIBUTOR BELT)**

The clipper belt lacer is provided to help the mechanic manufacture replacement distributor belts. The optimum belt length can vary slightly from distributor to distributor. If possible, match the existing belt length. The belt lacing will add approximately 1/4 inch to the overall, installed belt length. Laced belts are also available from QubicaAMF. To make a belt, refer to the *XLi EDGE Pinspotter Pin Distributor Manual*, 400-088-121.



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### 4.1.4 CRIMPING TOOL (typical)

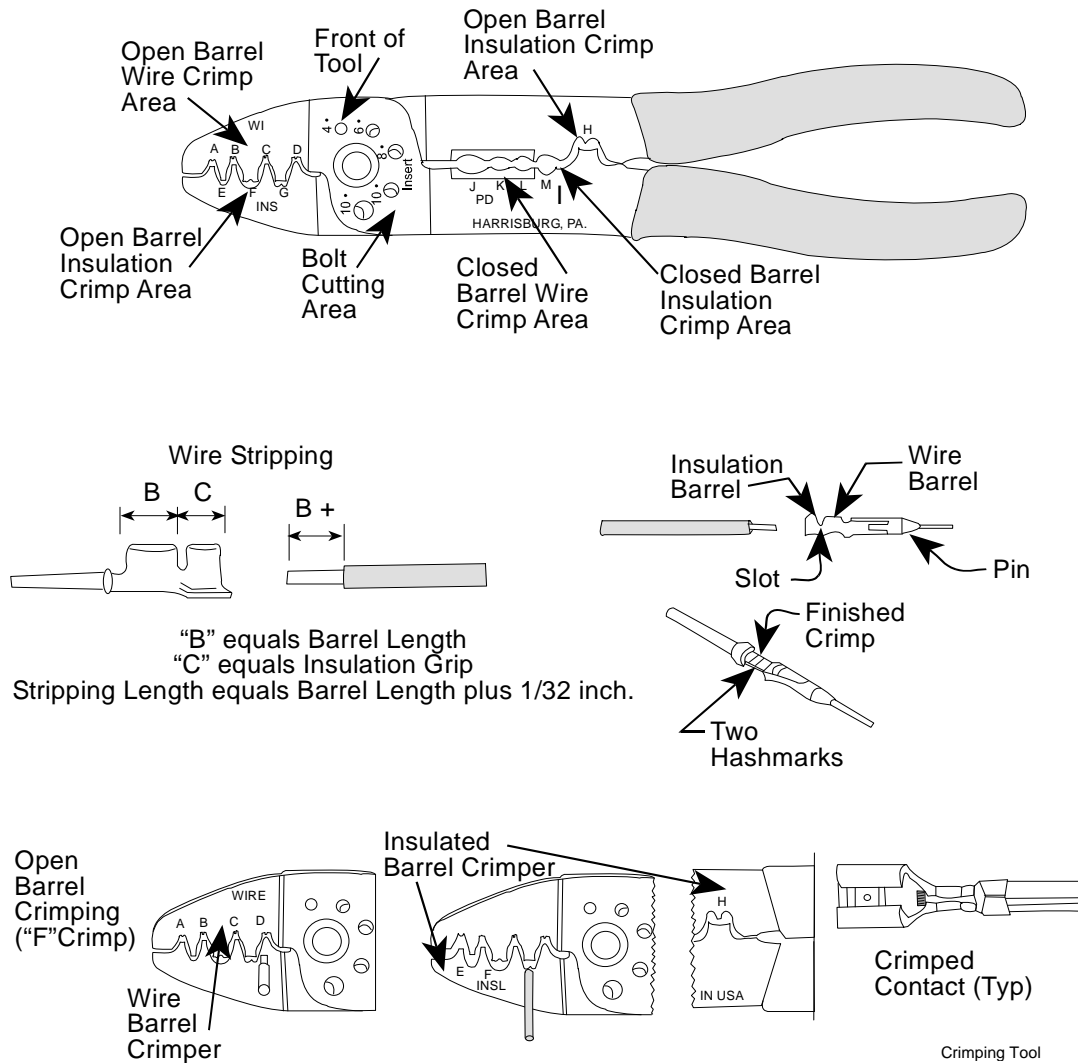


Figure 4.1-3

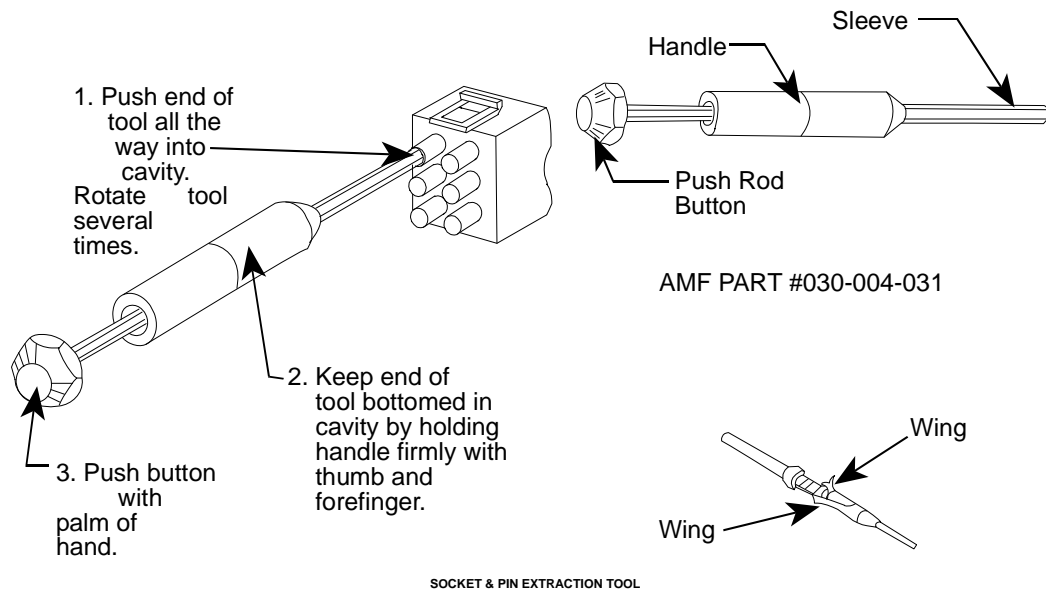
**Wire Barrel** - Position the contact in the appropriate crimp area (A, B, C, or D) with the wire barrel opening facing the letter. Squeeze the tool handles just enough for the jaws to hold the contact in place. Insert a properly stripped wire into the wire barrel. Hold the wire in place and squeeze the tool handles to finish the crimp.

**Insulation Barrel** - Position the contact and wire in the appropriate insulation crimp area (E, F, G, or H) with the insulation barrel opening facing the letter. Hold the contact and wire in place and squeeze the tool handles to finish the crimp.



**4.1.5 SOCKET AND PIN EXTRACTION TOOL**

The socket and pin extraction tool is designed to allow removal of pins and sockets from various connectors for repair or replacement. This tool is included in the Steel Table Tool Kit and is available from QubicaAMF by ordering P/N 030-004-031. Use the tool as shown in Figure 4.1-4 below.



**Figure 4.1-4, Pin Extracting Tool**

**NOTE:** When a pin or socket is removed from an "M" type plug, it will be necessary to flare out the two wings (Figure 4.1-4) which have been flattened by the extraction tool. This action is necessary so that the terminal seats properly and will not back out of the plug when reinstalled. Care should also be exercised to prevent damage to the ring at the rear of the terminal. This area must remain circular to promote correct alignment within the plug.





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## **4.2 MACHINE ADJUSTMENTS**

There are two types of adjustments that can be made to a pinspotter: 1) electronic setpoint adjustments, and 2) mechanical adjustments. Setpoint adjustments are made from the MCU, the Chassis, or the handheld unit. Refer to the MCU manual, P/N 400-088-008, for details on MCU operation and the Chassis manual, P/N 400-088-009, for Chassis and handheld unit operation.

**It is important to understand how the Chassis implements setpoint changes.** The Table and Sweep drive motors have encoders that constantly feed Table and Sweep position information to the Chassis. Whenever there is a difference between the actual stopping point of the Table or Sweep and the associated setpoint, the Chassis will attempt to automatically correct the stopping point. So, for example, if the Table overshoots the home position by three degrees, it could take a couple of table cycles to make the correction. The same is true whenever a setpoint is changed. If the Sweep's 1<sup>st</sup> Guard setpoint is changed from 66° to 70°, it could take a couple of Sweep cycles for the setpoint change to be fully realized. **It is important for the mechanic to understand that the correction might not be immediate and to not adjust the setpoint further until the machine has cycled enough times for the change to be fully implemented.**

If the Table or Sweep consistently overshoots its stopping point, if an out of range warning message appears on the Chassis display, or if the Table backs up when stopping at the home position, a brake failure may have occurred.

### **4.2.1 MACHINE HEIGHT AND POSITION ADJUSTMENTS**

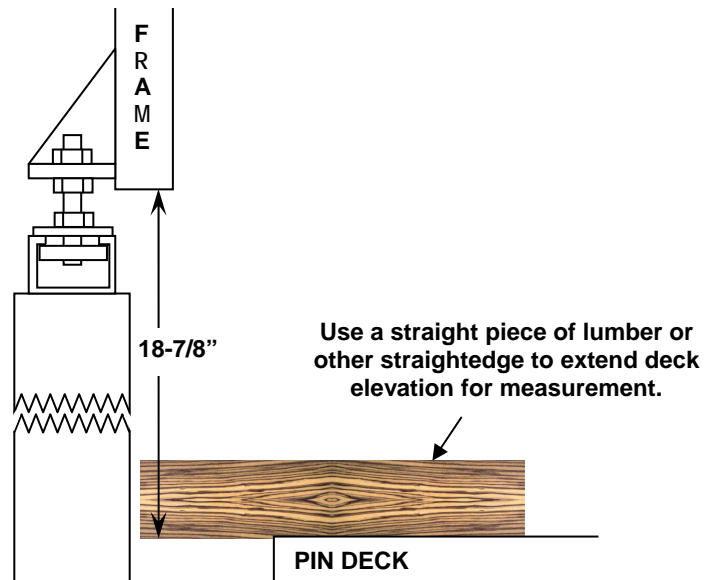
**Refer to the *Critical Measurements* sheets at the end of this section for a listing of the most important pinspotter installation parameters. Performing recommended maintenance and maintaining these critical settings will help you achieve optimal pinspotter operation.**

Before making any table adjustments you must check the machine height and position relative to the pin deck.

1. Verify that the vertical distance from the pin deck to the underside of the frame is  $18\text{-}7/8 \pm 1/8$  inches at all four corners. This measurement should be as nearly the same as possible at each corner, i.e. not 18-3/4 inches at one corner and 19 inches at another, although both numbers are within limits. A level or straight edge can be used to help make this measurement (see Figure 4.2-1). Making adjustments may also require adjustment of the back end's large leveling jack screws.
2. From a line running through the center of the 7 and 10 spots (known as the 7-10 line), it should measure 13-5/8 inches to the front of the front vertical member of the front end frame (see **A** in Figure 4.2-2). Adjust by loosening the unistrut jam nuts and sliding the entire unit forward or backward, as necessary, and then tighten the jam nuts.

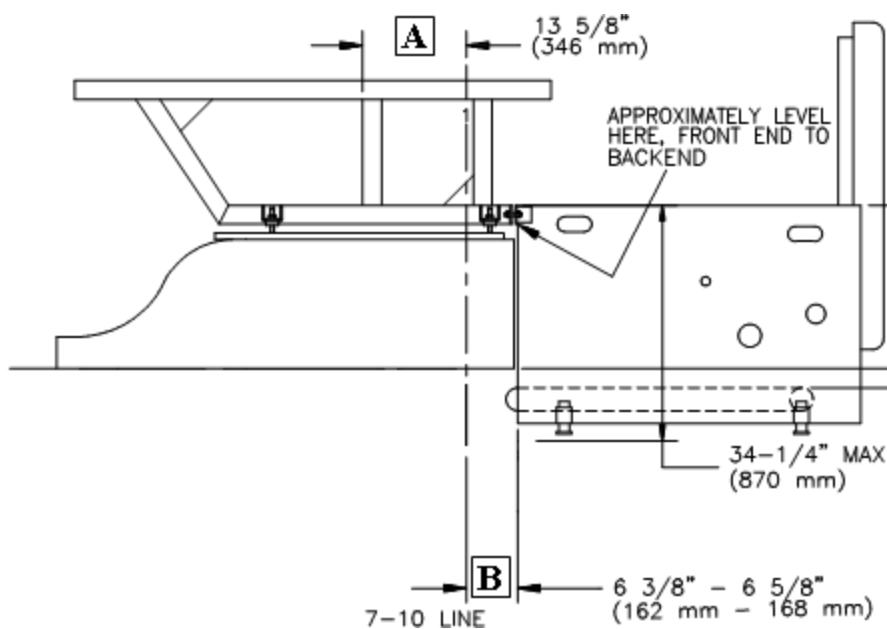


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**Figure 4.2-1**

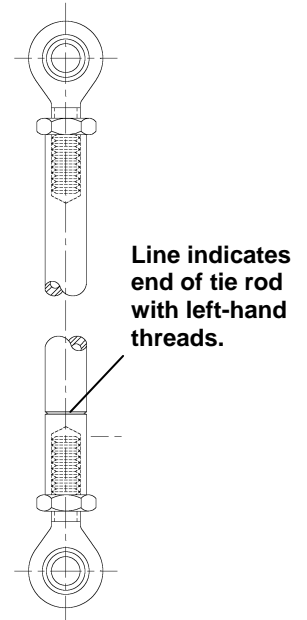
3. From the 7-10 line it should measure  $6\text{-}1/2 \pm 1/8$  inches to the front edge of the kickback plates (see **B** in Figure 4.2-2). This distance can be adjusted by adding or removing washers from the junction of the front-end and back-end units.



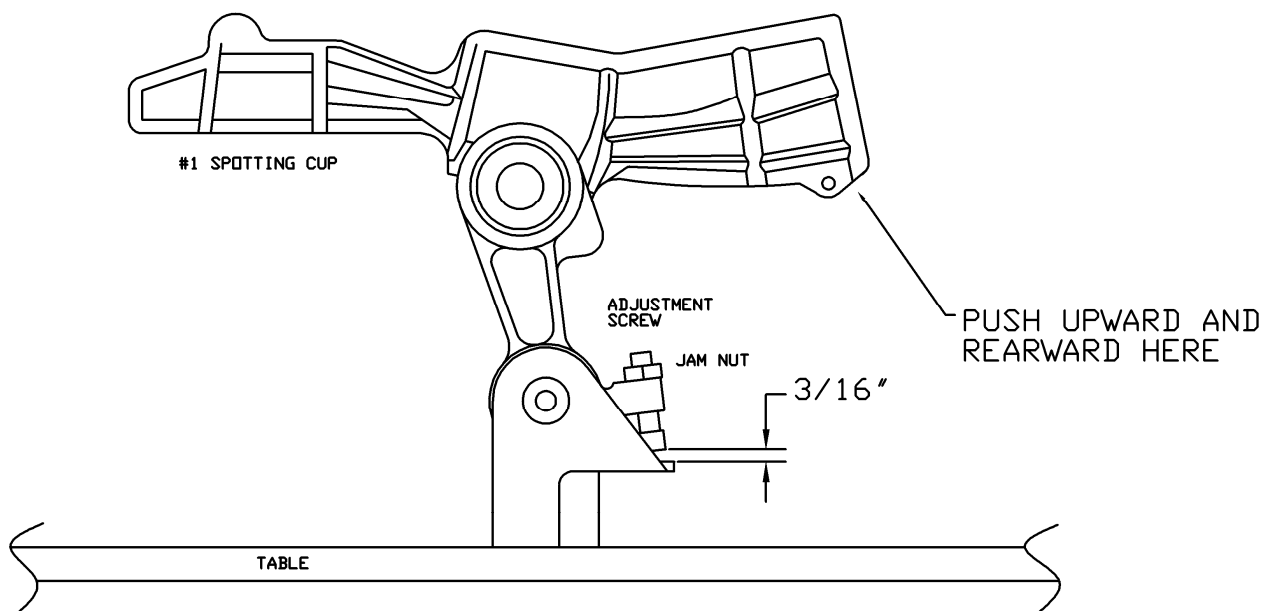
**Figure 4.2-2**

**4.2.2 TABLE ADJUSTMENTS****4.2.2.1 Tie Rod Adjustment**

Throughout this section, references to adjusting the various tie rods are made. A tie rod (Figure 4.2-3) is a device that consists of two threaded sections and a center section into which the threaded sections fit. On most tie rods, one threaded section has standard right-hand threads, and the other threaded section has left-hand threads. Turning the center section increases or decreases the tie rod's overall length. **The end with the left-hand threads can be identified by a line scribed around the circumference of the center section near the end.** It is helpful to know which end is left threaded because there is a jam nut on each of the threaded sections, and the left-threaded nut must be turned opposite the normal direction to loosen. A few tie rods have right-hand threads on both ends to prevent the tie rod from going out of adjustment during operation, and at least one end must be disconnected for it to be adjusted. Loosen the jam nuts before making any tie rod adjustments, and tighten them after adjustments have been made.

**Tie Rod****Figure 4.2-3**

The following Table adjustments are presented in the order in which they should be performed for optimal results.

**4.2.2.2 Table Leg Screw Adjustment****Figure 4.2-4**



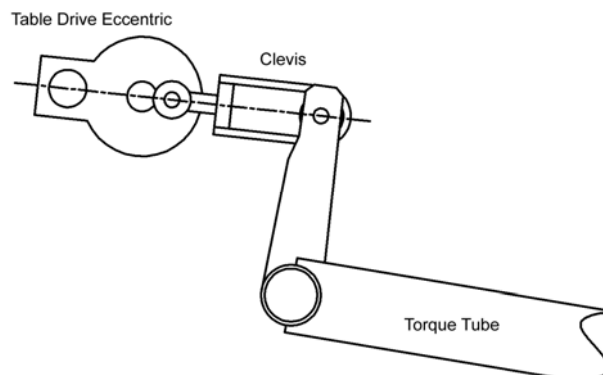
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## ***XLi EDGE Pinspotter***

1. Run the Table to its low point on a respot cycle.
2. Unplug both the Table and Sweep Motors.
3. Loosen the Jam Nuts on both Table Leg adjustment screws (Figure 4.2-4).
4. Grasp the #1 Spotting Cup and push rearward and upward until it stops.
5. While holding the #1 Cup in this position, obtain a 3/16" gap under the square head of the Table Leg adjustment screw on the 7-pin side (nearest the Yoke Link).
6. Release the #1 Spotting Cup and allow the cups to return to a resting state. The square head of the 7-pin side adjustment screw should rest on the leg bracket. If it does not, back off the 10-pin side adjustment screw until it does.
7. Without losing the adjustment, tighten the 7-pin side jam nut.
8. Turn the 10-pin side adjustment screw until the head of the screw touches the Table Leg Bracket. Continue turning the screw until it is finger tight. Do not use a wrench.
9. Tighten the jam nut for the adjustment screw on the 10-pin side.
10. Push the #1 cup upward and rearward again to double-check the 3/16" gap.

### **4.2.2.3 Table Level and Height Adjustments**

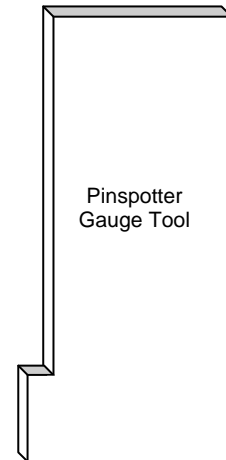
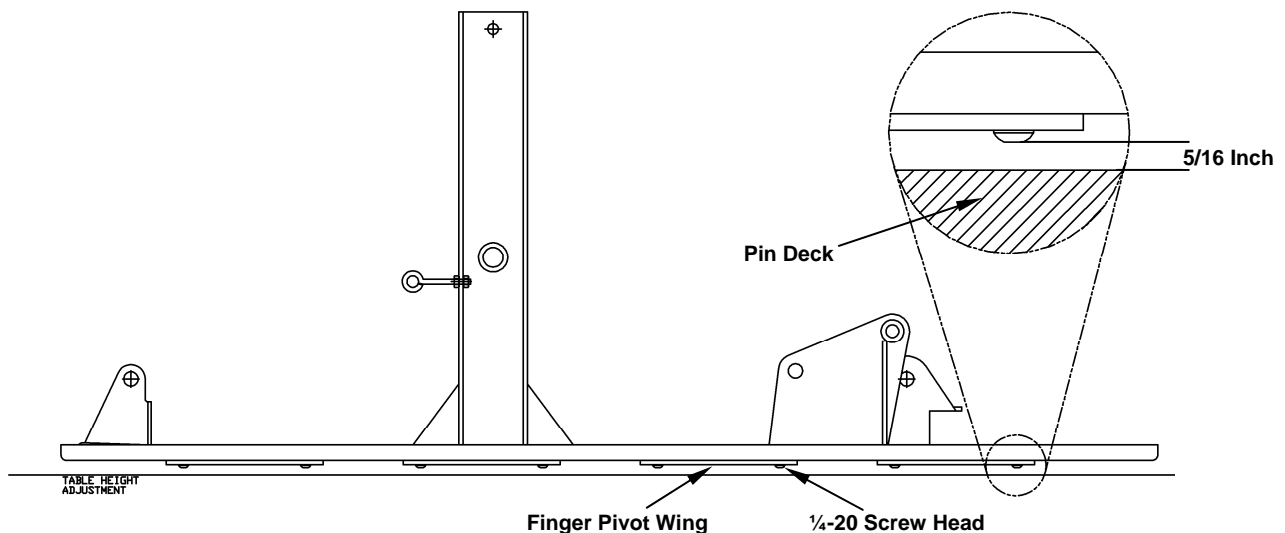
1. Run the Table to near Bottom Dead Center.
2. Unplug the Table Motor.
3. Use the Hand crank to align the Table Drive Shaft, Eccentric Stud, and Clevis Bolt to get the Table exactly at Bottom Dead Center (see Figure 4.2-5).



**Figure 4.2-5**



4. Adjust the Table clevis so that the Pinspotter Gauge Tool (Figure 4.3-6), laying flat on the pin deck, just fits between the pin deck and Button Head Screw in the center of each wing bracket at the 1, 8 and 10 pin openings resulting in a 5/16-inch gap between the screw head and the pin deck (see Figure 4.2-7).
  - a. To adjust the Table height, support the table by placing a solid object on the pin deck and lowering the table onto it until there is no tension on the clevis.
  - b. Remove the clevis bolt, bearing, and spacers.
  - c. To raise the height of the table, screw the clevis onto the threaded stud further. This shortens the clevis assembly's overall length. To lower the height of the table, lengthen (unscrew) the clevis assembly. Each half turn of the clevis will result in approximately a 1/8-inch change in table height.
  - d. Reinstall the bearing, spacers, and clevis bolt.
  - e. Manually raise the table and remove the support.
  - f. Lower the table and recheck the table height with the gauge tool.

**Figure 4.2-6****Figure 4.2-7**

5. To obtain the same clearance between the three button head screws and the pin deck proceed as follows:
  - a. Loosen the jam nuts on the Table Leveling Rods.

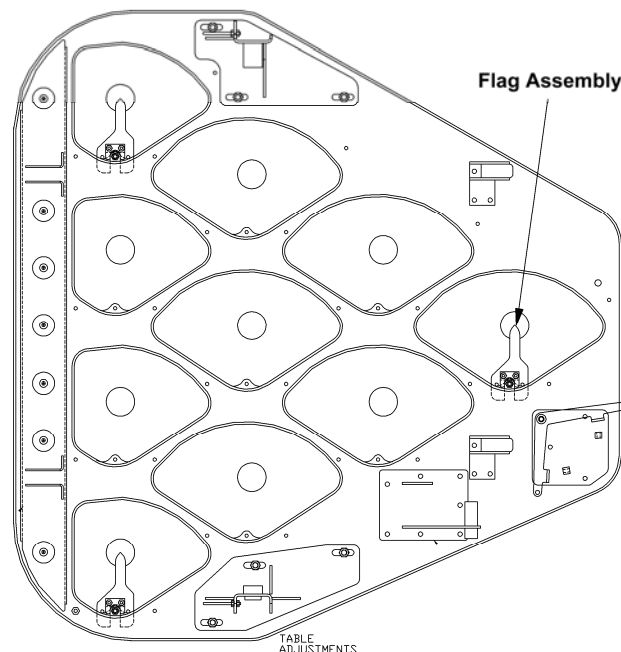


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- b. Adjust the Leveling Rods to obtain an equal amount of clearance at all 3 locations (1, 8 and 10).
  - c. Repeat steps 4a. through 4f. as necessary to obtain a 5/16-inch gap (thickness of Tool) between the pin deck and the head of the Button Head Screws at the 1, 8 and 10 pin positions.
  - d. If it is not possible to obtain 5/16" all the way around the table, it may be necessary to shim under one of the Table Uprights with C-washers.
  - e. Once the Table is level and 5/16" above the pin deck, hold the Leveling Rods secure and tighten the jam nuts.
6. Plug in the Table Motor.
  7. Run the Table to the Home position.

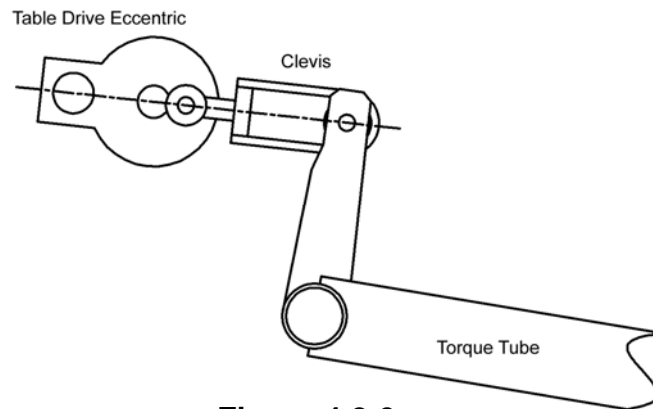
### **4.2.2.4 Positioning (flagging) the Table**

1. With the Table and Sweep at zero (home) and both motor plugs disconnected, install 3 flags on the Wing Brackets at the 1, 7, and 10-pin positions of the Table as shown in Figure 4.2-8.



**Figure 4.2-8**

2. Remove the Spot Rod from the Spot Lever.
3. Remove the two Tension Springs from the 7-10 Yoke Shaft to the Table Uprights.
4. Crank the Table to Bottom Dead Center (its lowest point). Table Drive Shaft, Eccentric stud, and Clevis bolt through Torque Tube all in line as seen in Figure 4.2-9).

**Figure 4.2-9**

5. Loosen the 6 nuts on the carriage bolts that hold the Table to the Table Uprights. The Table Uprights should be perpendicular to the pin deck.
6. Move the Table so that the points of the Flags are exactly over the center spots of the 1, 7, and 10-pin spots.
7. Tighten all six carriage bolt nuts.
8. Plug the Table Motor back in.
9. Run the Table to the home position.
10. Reconnect the Table Spot Rod.

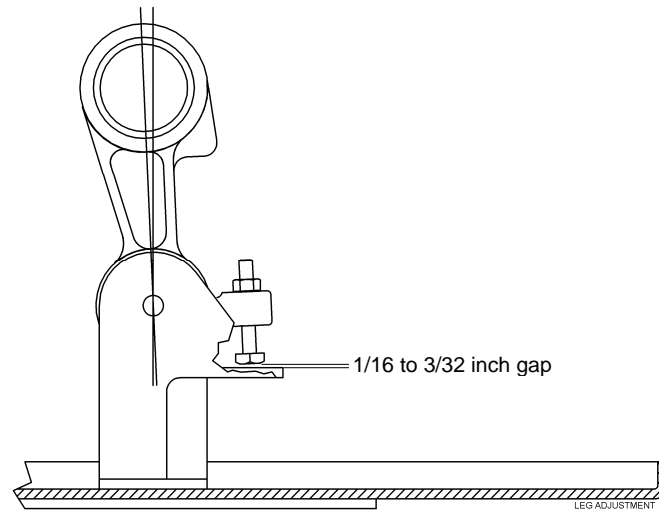
#### **4.2.2.5 Spot Rod Adjustment**

1. With the Bin full of pins, hold down on the Cam Lever to manually actuate the Spot Linkage.
2. Run the Table down to just before the point where the pins touch the pin deck.
3. Unplug the Table and Sweep Motors.
4. Use the hand crank to lower the Table to the point where the bottom of the pins (if not all, then most) first touch the pin deck.



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5. Loosen the jam nuts on the Spot Rod.
6. Adjust the Spot Rod so that the head of the Table Leg Screw just begins to lift off of the Table Leg Bracket. There should be a 1/16 to 3/32-inch gap (see Figure 4.2-10).

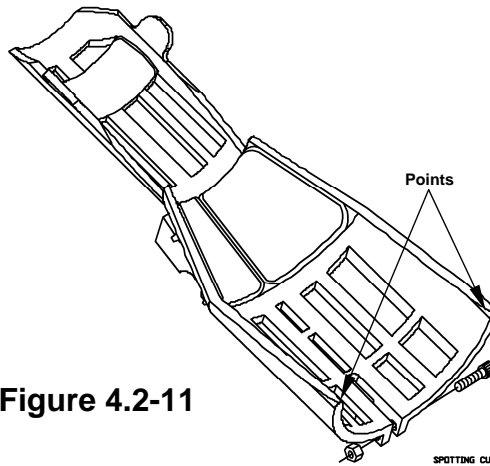


**Figure 4.2-10**

7. Gently push up and down on the front of the Table to be sure this adjustment is true.
8. Once it is within adjustment, tighten the Spot Rod jam nuts.
9. Continue with the next adjustment.

### **4.2.2.6 Individual Pin Height Adjustment**

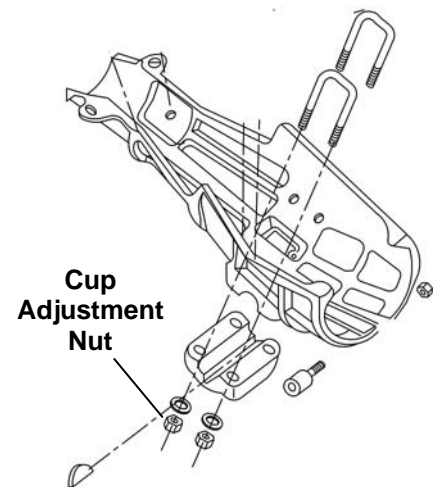
1. Lower the Table to where most of the pins just touch the pin deck.
2. Look under the Table and notice which pins are touching the pin deck and which are not. Make a note of which pins are sitting too low and which are sitting too high. All 10 pins must touch the pin deck simultaneously to obtain a proper spotting action.
3. Plug in the Table Motor and run the Table to the low point in a Respot cycle.
4. Unplug the Table Motor.
5. Using a hammer, open the cup width at the points of the Spotting Cups where pins were too high (see Figure 4.3-11). Conversely, close the cup width on Spotting Cups where pins were too low. **Caution: too much force could break the Spotting Cup.**

**Figure 4.2-11**

6. Plug the Table Motor back in.
7. Repeat the above steps until all 10 pins touch the pin deck simultaneously.

#### **4.2.2.7 Individual Spotting Cup ON-SPOT Adjustments**

1. With all 10 pins touching the pin deck, adjust the Table height so that the pins cannot be pulled out of the front of the spotting cups and are held snugly in place (a slight amount of movement of some of the pins is okay). Ideally, all 10 pins will be touching the pin deck and will be snug in the Spotting Cups.
2. Adjust all 10 Spotting Cups to place the pins exactly on spot ( $\pm 1/16$ " ). To adjust the spotting cups in order to place pins on spot, proceed as follows:
  - a. When pins are being set too far forward, loosen the two top cup nuts and tighten the bottom two nuts (see Figure 4.2-12).
  - b. When pins are being set too far back, loosen the bottom two nuts and tighten the top two nuts.
  - c. When pins are being set too far left or right, loosen all four cup nuts and slide the cup on the shaft accordingly. Tighten the nuts.

**Figure 4.2-12**

3. Clear the pin deck and set several racks to be sure pins are on spot.



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## ***XLi EDGE Pinspotter***

### **4.2.2.8 Spotting Cup Toe-in**

1. Run the Table down so that the pins are just touching the pin deck but are still snug in the Spotting Cups.
2. Look under the Table and note the gap between the heels (back) of all the pins and the pin deck. This gap should be roughly 1/8”.
3. If the gap is too large (greater than 3/16”), the Table must be moved rearward and Sections 4.2.2.5 through 4.2.2.7 must be repeated.
4. If the gap is too small (less than 1/16”) or there is no gap at all, the Table must be moved forward and sections 4.2.2.5 through 4.2.2.7 must be repeated.

### **4.2.2.9 Final Spot Checks**

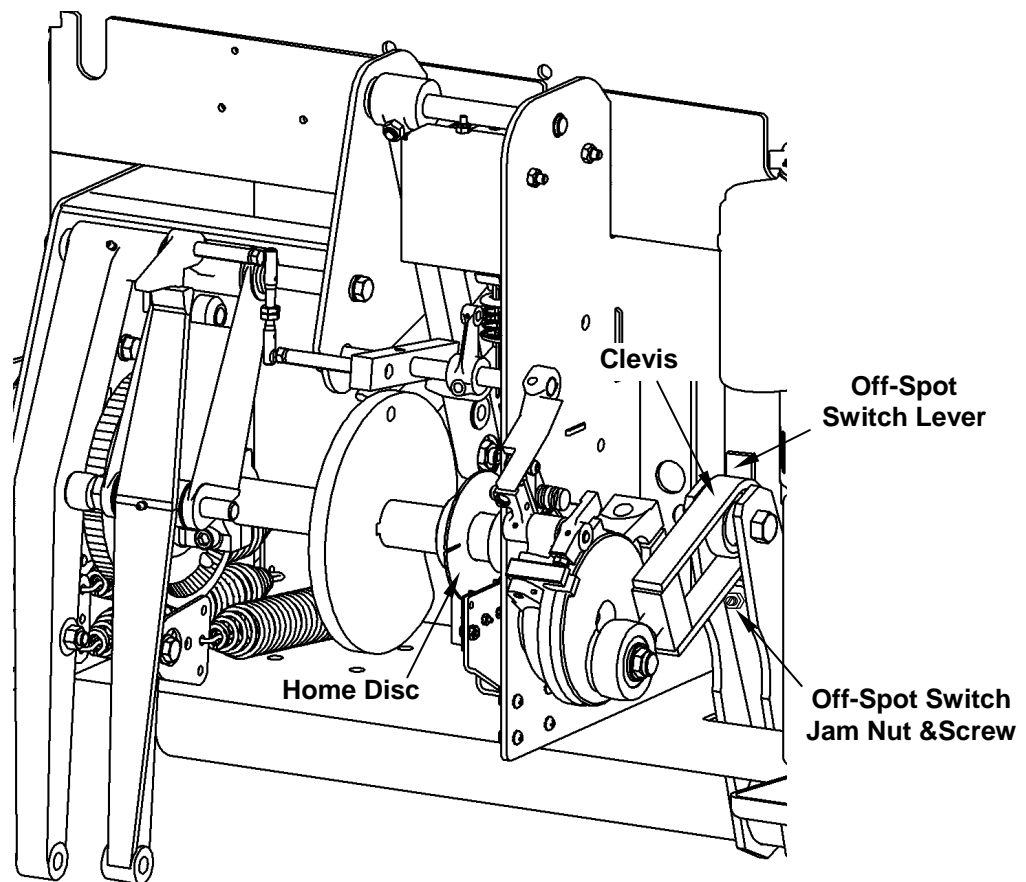
1. Run through a dozen or more Spot cycles.
2. Check that Table motion is smooth with fluid cup rotation and no bounce. Loose Torsion Springs on the Yoke Assembly can cause jerky cup rotation. If the Table has a bounce on its way down to the pin deck, or if the pins seem to hit the pin deck somewhat hard, be sure the Torsion Springs are adjusted so that the spring retaining clips are even with the top of the cup’s u-bolt nuts. If the Table still has a bounce, try wiping some lane oil on the Spotting Cup Liners and see if the problem goes away. The last thing to check would be the 3/16” gap under the head of the Table Leg Screw. Readjust if necessary.
3. Be sure that pins do not wobble or fall over when spotting. If pins wobble or fall over:
  - a. check that there are no broken or chipped bottom rings on the pins, and that there is no debris on the pin deck.
  - b. Next, check the Table height adjustment (5/16”) and toe adjustment.
  - c. If the height and toe measurements are correct, check the Spot Rod adjustment.
  - d. If the Spot Rod adjustment is correct, remove one of the smaller counterbalance springs from the Torque Tube. If pins spot well now, the Table will have to run for some time without this spring, until the pivot points wear in some and loosen up.
4. Be sure that the Table does not “deck” at Bottom Dead Center while spotting pins. This is easy to observe as the pins will touch the pin deck, and immediately after you will feel or hear the Table hit the pin deck. If this happens, readjust the Clevis. Keep in mind this may require you to make other adjustments as well.

5. Check the Respot Cells to be sure they open and close smoothly. If they don't, adjust the Respot Rod accordingly.
6. Once pins spot well, go back and check all jam nuts to be sure they are tight.

#### **4.2.2.10 Table Off-Spot Switch Operation and Adjustment**

When the table contacts an off-spot pin during a respot cycle, the table stops its downward movement, but clevis movement continues causing it to contact the off-spot lever actuating the off-spot switch. This action places the machine in a 2<sup>nd</sup> ball cycle, causes the table to return to the home position, and holds the sweep at the 1<sup>st</sup> guard position. As necessary, adjust the off-spot switch as follows:

1. With the table at the home position, loosen the off-spot adjusting screw jam nut located on the table arm just below the clevis (see Figure 4.2-13).



**Figure 4.2-13**



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## ***XLi EDGE Pinspotter***

2. Using gauge 088-001-217, insert the thicker end of the gauge between the off-spot switch lever and the clevis at the point where the two meet. Adjust the screw counterclockwise to the point of switch actuation.
3. Remove the gauge. When the thinner end of the gauge is inserted (but not the taper at the end), the switch should not actuate.
4. Hold the screw in position and tighten the jam nut.
5. To check above adjustment:
  - a. Cycle the machine through the 1st ball cycle with a pin placed out of range.
  - b. The sweep should drop to the 66° (1<sup>st</sup> guard) position.
  - c. The table should contact the pin and return to the zero (home) position.
  - d. The 2nd ball light should turn on.

### **▲ CAUTION**

**Some of the table adjustments require that the table be operated under power. When this is the case, the respot cells should be actuated manually to open the fingers and prevent damage.**

6. Remove any fallen pins, open the respot cell fingers, and press the sweep reverse button to bring the sweep to the home position and continue play.

### **4.2.2.11 Table and Respot Cell Operation**

Much of the table's operation is controlled by an encoder, pivot arms, control rods, a solenoid, latches, and levers. The table operating logic is as follows:

When the ball detector initiates a machine cycle, the state (energized or deenergized) of the solenoid determines whether the action results in setting a new set of pins, or in the respotting of the existing pin arrangement.

If the spotting solenoid is energized, the shuttle cam causes a set of pins to be deposited in the cups. The Spot Lever is captured at its top end causing the Spot Rod to pivot the cups as the Table descends. At the same time, a lever actuates to cause the eccentric latch to disengage, allowing the Table to descend fully to set the pins.

When a 2<sup>nd</sup> ball cycle is initiated, the solenoid remains deenergized, and the eccentric remains latched causing the Table to only partially descend. At the same time, the Spot Lever's pivot point changes to the center of the lever because it is not restrained at the top. This shortens its movement preventing the cups from pivoting. This also allows the Respot



Rod to cause the Respot Cell fingers to close to pick up the pins that remain standing. The Sweep cycles to remove the fallen pins (dead wood), and a shifter link pivots causing the fingers to open on the Table's second visit to the respot position. The Table and Sweep then return to the home position.

#### 4.2.2.12 Table Home Position Adjustment

The Table drive shaft has a disc with a slot in it that provides feedback to the chassis via a sensor when the table drive shaft reaches the home position. This position should be just before the Table reaches the highest point in its cycle (top dead center), at approximately the 355° point of drive shaft rotation. To adjust the Table's home position:

1. Disengage the brake (see Figure 4.2-14), and manually crank the table to just before top dead center. There should be a gap of approximately ½ inch between the table drive eccentric's white nylon roller and the rear edge of the cam link as viewed from above.
2. Loosen the setscrew in the collar that secures the home disc to the shaft, and rotate the disc until the light on the sensor comes on indicating that the slot in the disc is aligned with the sensor's optics. Tighten the setscrew.
3. Run the Table through several cycles, and verify it is stopping at the desired position.

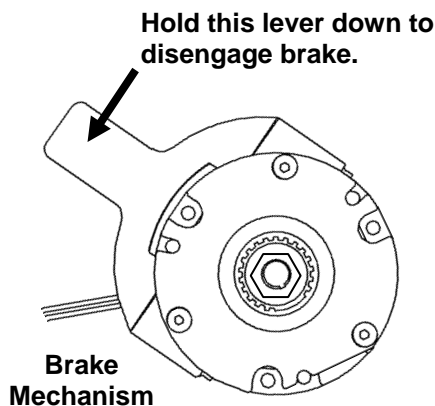


Figure 4.2-14

Because of the Table's inertia, it may stop slightly past the home position. This is normal. If the Table runs considerably past the home position and stops consistently at the same point, increase the gap between the nylon roller and cam link, and then reset the home disc at this new position. **Excessive coasting past the home position could indicate a motor brake problem. You can observe the operation of the brake by watching the motor shaft and hexagonal hub in the center of the brake. The shaft should stop abruptly when the motor turns off.**

#### 4.2.2.13 Table Drive Eccentric Operation

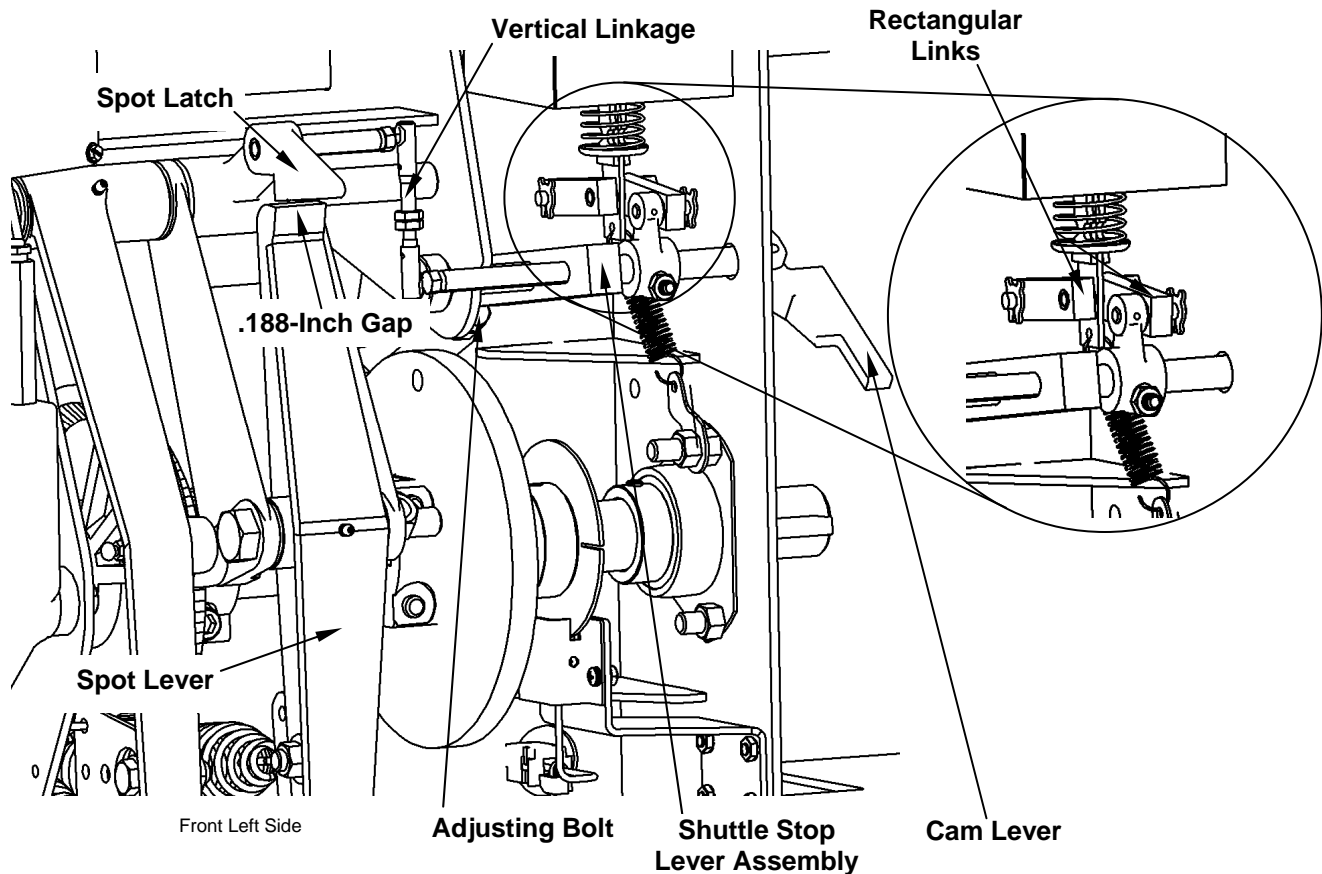
The table drive eccentric controls the low points of table travel during the spot and respot cycles. During a respot cycle, the eccentric's latch is engaged locking the eccentric's input and output sides together, which only allows the table to lower to the respot height. When the spotting solenoid is energized at the start of a spotting cycle, the eccentric's latch is disengaged allowing the two sides of the eccentric to operate independently. This permits the table to descend further for spotting a set of pins.



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### **4.2.2.14 Spotting Linkage Adjustments**

1. With the table at the home position, the distance between the end of the shuttle stop lever assembly and the adjusting bolt (see Figure 4.2-15) should be .015 inches. Adjust the bolt to provide this spacing and then tighten the jam nut.



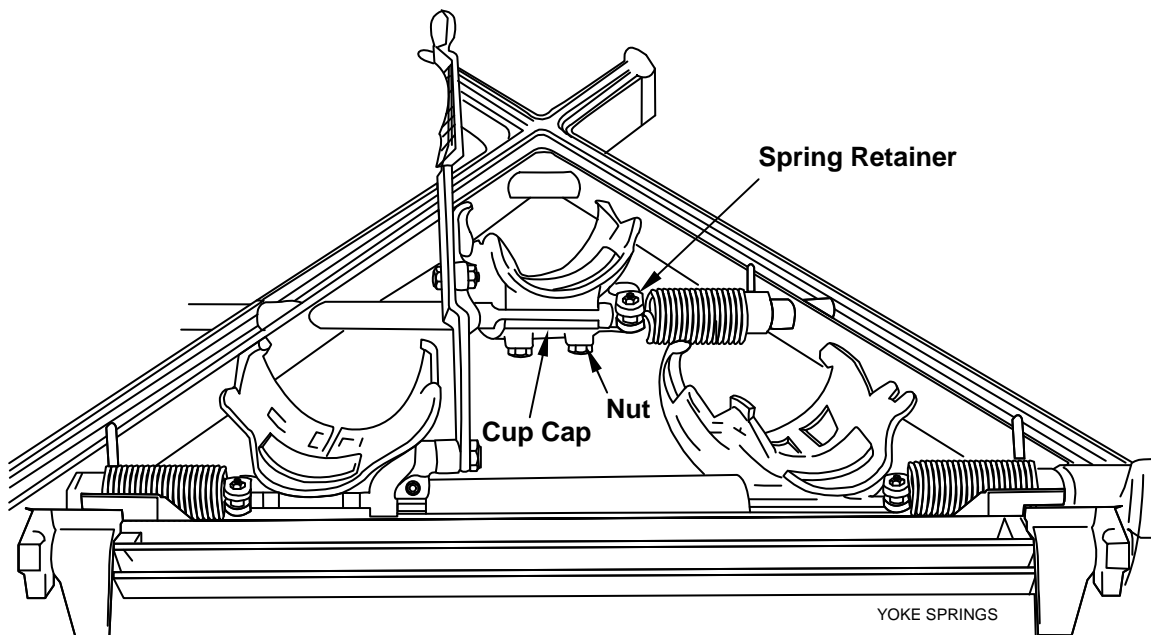
**Figure 4.2-15**

2. When the spotting solenoid is actuated, the cam lever should be locked in the down position. This locked condition is established when solenoid engagement causes the two rectangular links (see Figure 4.2-15) to align horizontally. Test for locking by manually engaging the solenoid and then pulling up on the cam lever. The lever must remain in the down position. This rigidity is necessary to disengage the eccentric's latching mechanism during a spotting cycle. If the lever moves, some part of the linkage is worn or broken and must be replaced.
3. With the table at the home position, insert the thicker end of gauge (088-001-217) between the top of the spot lever and the bottom edge of the spot latch. Adjust the vertical linkage to obtain a .188-inch clearance and then tighten the jam nuts against each other.

### 4.2.2.15 Yoke Spring Adjustment

The yoke springs, located on the #3 and #4 yoke shafts, are used to stabilize cup movement during a spotting operation. They also serve to hold the spotting cups horizontal during a respot cycle.

1. With the table in the home position, loosen the spring retainer's locking nut slightly and tap the spring retainer on the yoke shaft so that the spring end is in line with the top of the nuts on the spotting cup cap (see Figure 4.2-16). This is the initial (approximate) setting.



**Figure 4.2-16**

2. Cycle the machine through several spotting operations and observe cup movement. Insufficient spring tension will cause unstable cup movement causing the pins to wobble or fall when spotted. Too much spring tension will cause the cups to slam back after the pins have been spotted. Adjust accordingly.

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**Note:** If the springs need to be replaced, the yoke must be removed from the machine. See Section 4.2.2.17 for yoke assembly removal instructions.

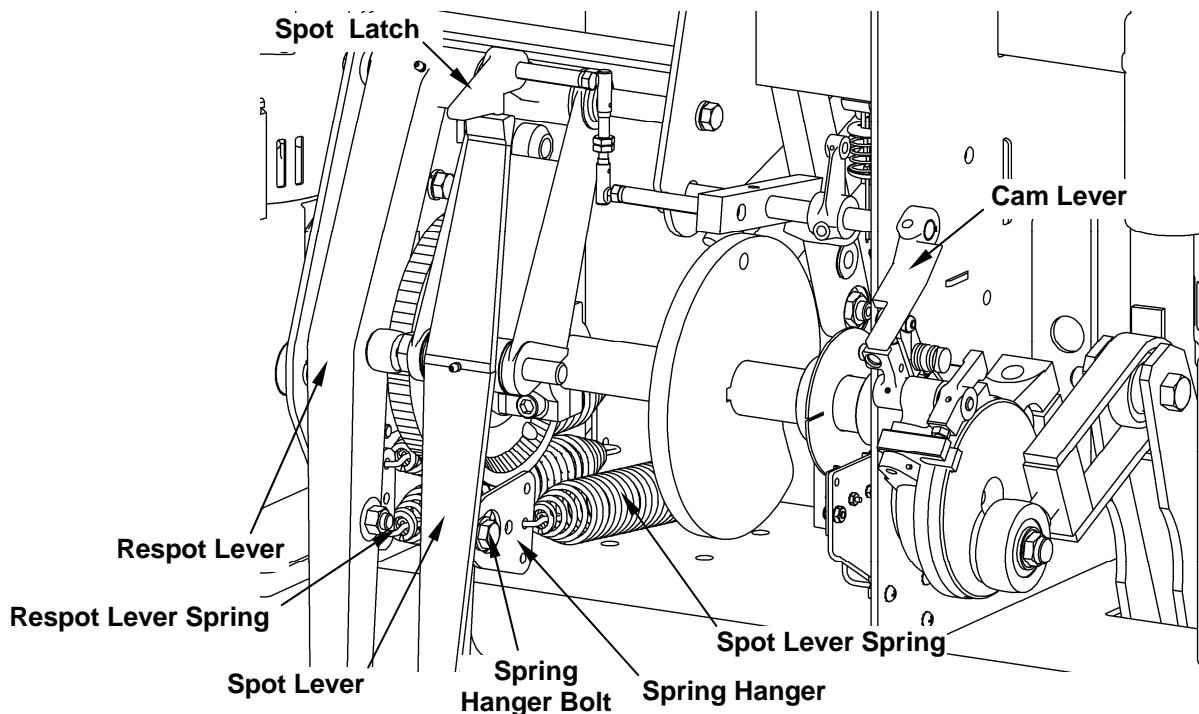
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## ***XLi EDGE Pinspotter***

### **4.2.2.16 Spot and Respot Lever Spring Removal or Replacement**

1. Hold the cam lever down on the table drive eccentric while holding the spot latch up (see Figure 4.2-17) and have a second person manually crank the table down.
  - a. To remove the spot lever spring, stop the table when the lower end of the spot lever is in toward the table as far as it will go (minimum spring tension).
  - b. To remove the two respot lever springs, stop the table when the lower end of the respot lever is in toward the table as far as it will go.
2. Loosen the nut on the spring hanger bolt (see Figure 4.2-17) so that it is being held by just one or two threads.



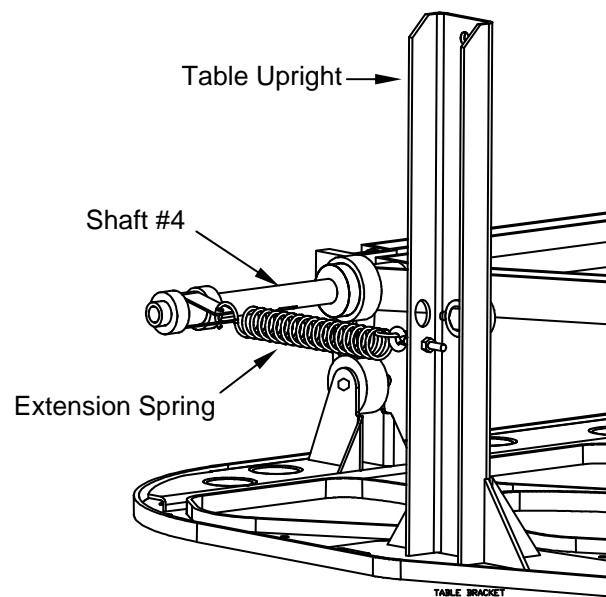
**Figure 4.2-17**

3. Insert the spring puller (792-505-005) in the center hole in the spring hanger. Free the hanger from the bolt by pulling on the hanger and passing the larger part of the slotted opening in the spring hanger over the bolt head.
4. Complete the removal of the hanger bolt and nut. Inspect the hanger and bolt, and replace if needed.
5. To replace spring(s), reverse the actions in steps 2 through 4 above.
6. Return the table to the home position.

**4.2.2.17 Yoke Assembly (X-Frame) Removal**

**Note:** If the yoke is broken, it can be repaired with Yoke Repair Kit #610-704-011. It is not necessary to remove the yoke from the table in order to make the repair.

1. With the table at the home position, disconnect the spot and respot rods from the lower end of the spot and respot levers.
2. Hold the cam lever down on the table drive eccentric and manually crank the table to the 180 degree position, which is the lowest position of the table.
3. Remove the pins from the spotting cups.
4. Disconnect the extension springs (one on each side) which attach yoke shaft #4 to the table uprights. (See Figure 4.2-18.)



**Figure 4.2-18**

5. Remove the bolts that attach the front and rear X-frame legs to the front and rear table brackets. The yoke can now be removed.
6. To reinstall the yoke assembly, reverse the actions of steps 1, 2, 4, & 5.



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### 4.2.2.18 Respot Cell Operation & Adjustments

When the table lowers to pick up pins as in a first ball cycle, the respot cell fingers close on the standing pins, lock, and then the table raises the pins high enough for the sweep to clear the lane of fallen pins. The table then respots the pins.

#### 4.2.2.18.1 Finger Adjustment

1. Move the respot cell linkage to close the cell fingers.
2. Using a 1/8-inch hex wrench and the widest part of the respot cell gauge (070-006-519), adjust each of the respot cells for a 2-inch opening between fingers approximately mid way along the fingers (see Figure 4.2-19). This adjustment can be made with the respot cell either in or out of the table.

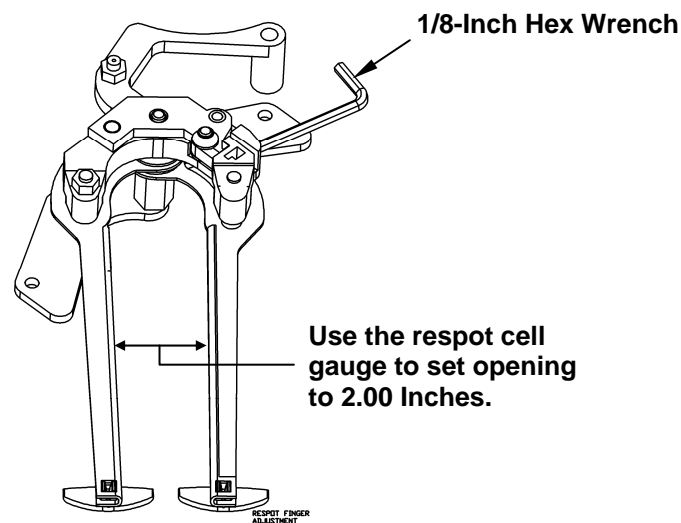
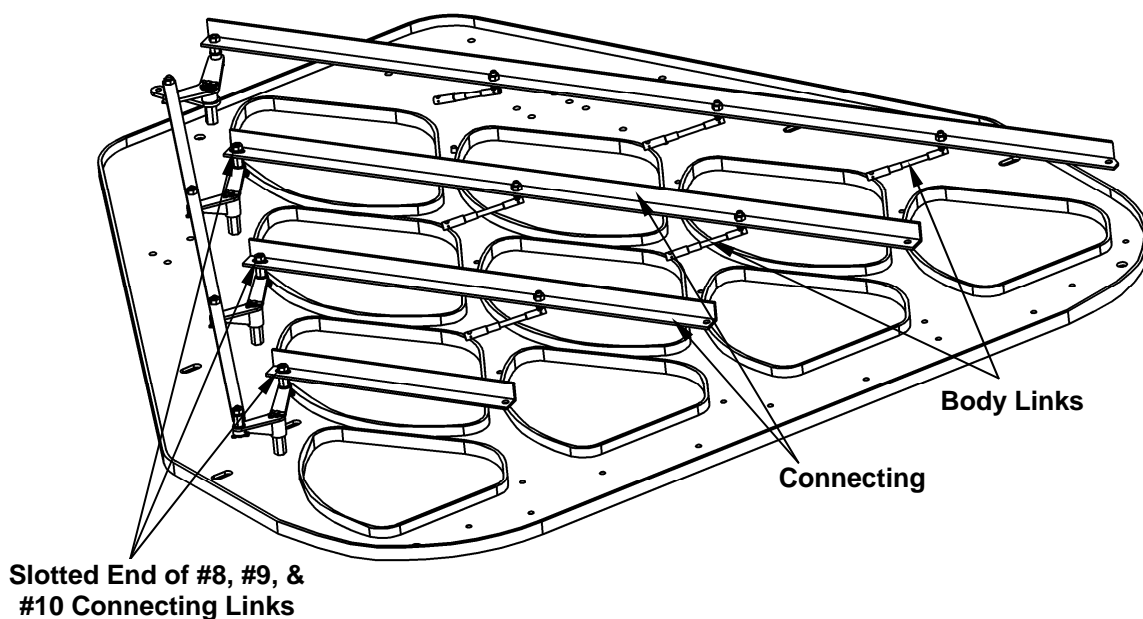


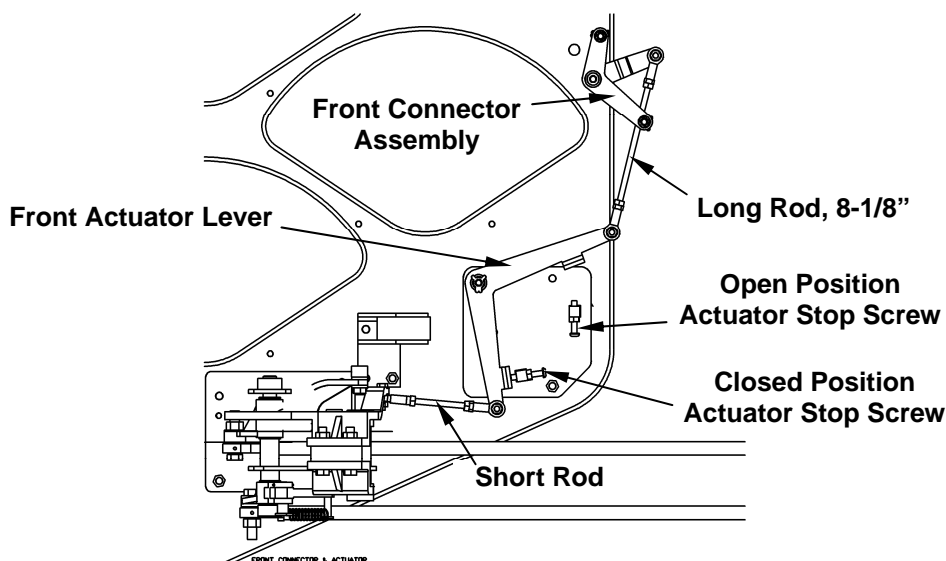
Figure 4.2-19

#### 4.2.2.18.2 Respot Cell Adjustment

1. Manually crank the table to the spotting position.
2. Disconnect the 6 body links that connect the respot cells to the #7, #8 & #9 connecting links (see Figure 4.2-20).
3. Loosen the bolts that connect cells #8, #9 & #10 to the slotted ends of the connecting links. **Do not loosen the bolt at the #7 cell connecting link.**

**Figure 4.2-20**

4. Loosen the two actuator stop screws (see Figure 4.2-21).
5. Set the length of the long rod on the front actuator assembly to 8-1/8 inches (206 mm) from center to center between the openings at each end.

**Figure 4.2-21**

6. Open cell #7 fully.



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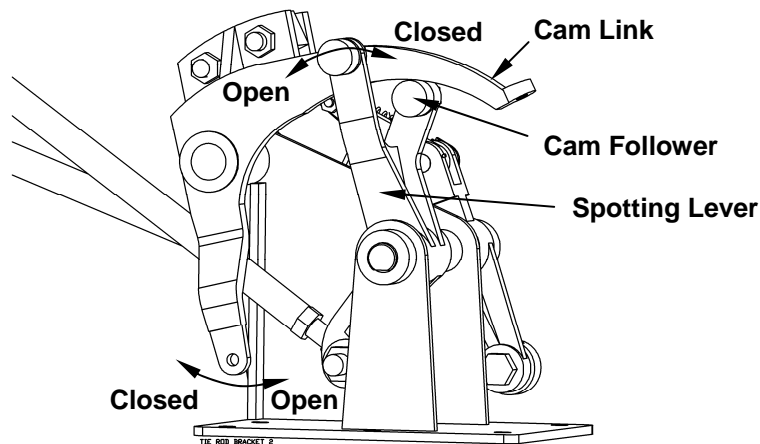
7. While keeping cell #7 fully open, adjust the slot in the #8 cell connecting link so that the #8 cell is fully open. Keeping the #8 cell fully open, tighten the bolt in the #8 connecting link slot.
8. Repeat Step 7 for the #9 and #10 cells.
9. With the rear cells (#7, #8, #9, & #10) fully open, turn the open position actuator stop screw until it is against the actuator lever. Turn the screw an additional 1/2 turn. Tighten the jam nut on the stop screw.
10. With all cells fully open, adjust and connect the respot cell body links for the remaining 6 cells so that when connected, the cells are fully open. Set the length of the body links so that the excess movement (play) in cells 1 through 6 matches the excess movement in cells 7 through 10.

---

**NOTE: When all of the respot cells have been adjusted, and with the front actuator lever in the open position against the stop, there should be approximately 1/4-inch of play in each cell's fingers.**

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11. Loosen the jam nuts on the short rod (see Figure 4.2-21).
12. Move the spotting lever to the spotting position, which is done by placing the spotting lever in a "fingers open" position (see Figure 4.2-22).

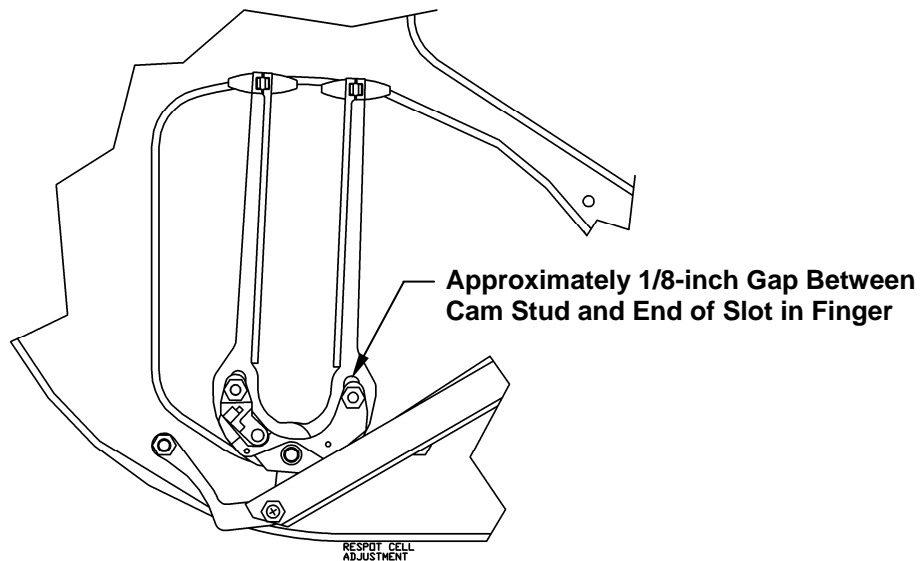


**Figure 4.2-22**

13. Open the respot cells fully (actuator lever against the open position stop screw).



14. With the spotting lever in the fingers open position, adjust the length of the short rod (Figure 4.2-21) so that the cam link (Figure 4.2-22) just makes contact with the cam follower. **THE CAM FOLLOWER MUST STILL BE ABLE TO TURN FREELY.** Tighten the jam nuts on the short rod.
15. Recheck the adjustment of the long rod, and adjust as necessary to ensure that all cells are fully open and have the correct amount of play in the respot cell fingers.
16. Crank the table to the home position.
17. With the pin deck clear, crank the table down to the respot position.
18. Rotate the front actuator lever to close the cells completely. Adjust the closed position actuator stop screw until it is against the actuator lever. Turn the screw an additional 2 turns. There should be approximately 1/8 inch between the cam studs and the end of the slot on each finger (see Figure 4.2-23). Turning the stop screw in increases the gap. Tighten the jam nut on the closed position stop screw.

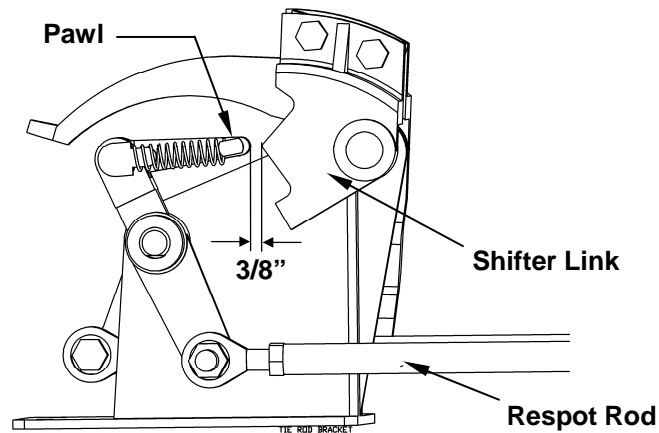
**Figure 4.2-23**

19. Crank the table to the Home position.
20. Close the respot cells slightly so that the center highest point of the shifter link is directly opposite the pawl (see Figure 4.2-24). Adjust the length of the respot rod so that the pawl clears the center highest point by 3/8 inch.



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**Figure 4.2-24**

21. Run the table through a respot cycle. The cell fingers should open and close at the lowest point of the stroke. If the fingers appear to open and close too early, shorten the respot rod to increase the clearance between the pawl and shifter link. If the fingers appear to open and close too late, lengthen the respot rod accordingly.

---

**Note:** When the fingers are adjusted properly, all of the pins should be held at the same point (near the top ring) on the neck. This will cause all of the pins to contact the pin deck at the same time minimizing respotting problems. If one or more pins are not being picked up in this manner, readjust those cells in accordance with Section 4.2.2.18.1.

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### **4.2.2.19 Table Motor and Gearbox Removal**

For table drive motor and gearbox removal, refer to the *XLi Pinspotter Motor & Gearbox Manual*, P/N 400-088-017.

## 4.2.3 SWEEP OPERATION & ADJUSTMENTS

### 4.2.3.1 Sweep Operation

The sweep should operate smoothly in all locations and should not rub the machine or the pin deck. The position of the Sweep is controlled by the Chassis using the Sweep drive motor encoder for position indication and the home disc and encoder for an absolute reference of the home position.

### 4.2.3.2 Sweep Adjustments

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**Note:** Sweep adjustments should be made on both sides of the machine.

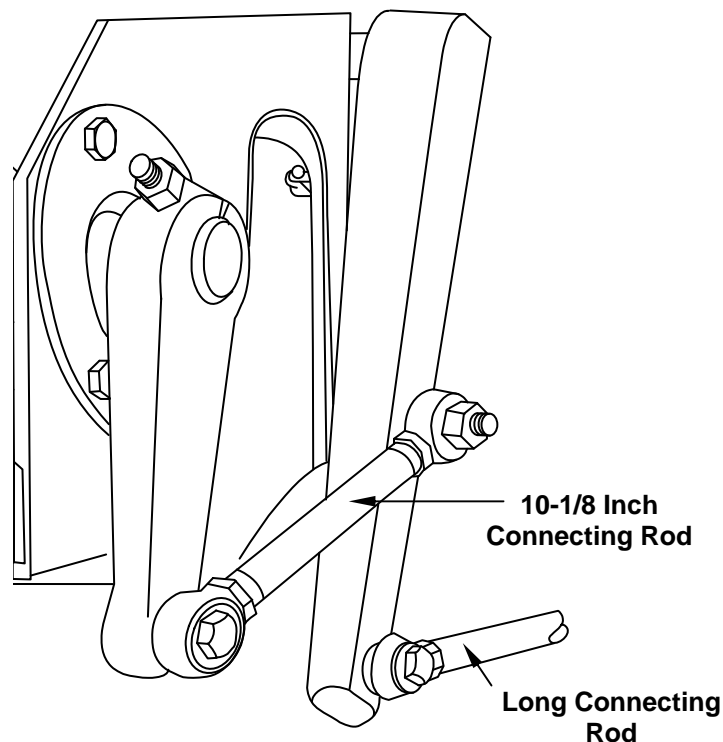
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1. With the sweep at the Home position:
  - a. Adjust the short connecting rod (see Figure 4.2-25) to obtain a starting length of 10-1/8 inches center to center between the rod end openings. Tighten the jam nuts.

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**Note:** Sweep travel is determined by the length of the short connecting rod. If this rod is too long, the sweep will collapse into the pit. If too short, the sweep will hit the frame of the machine at the home position.

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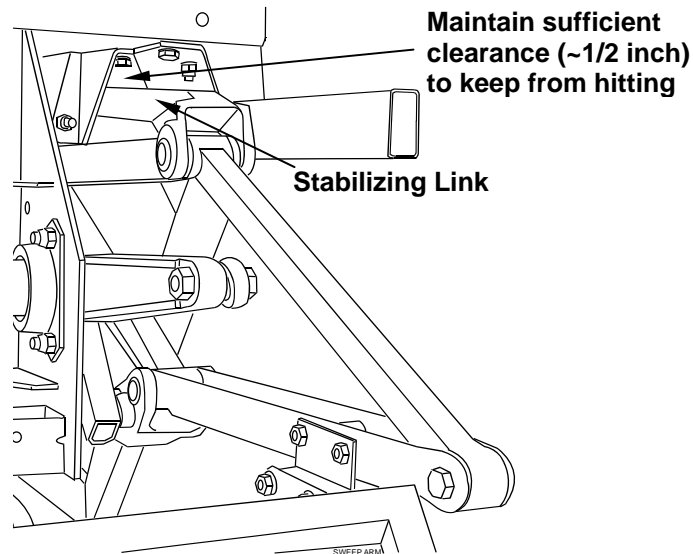


**Figure 4.2-25**



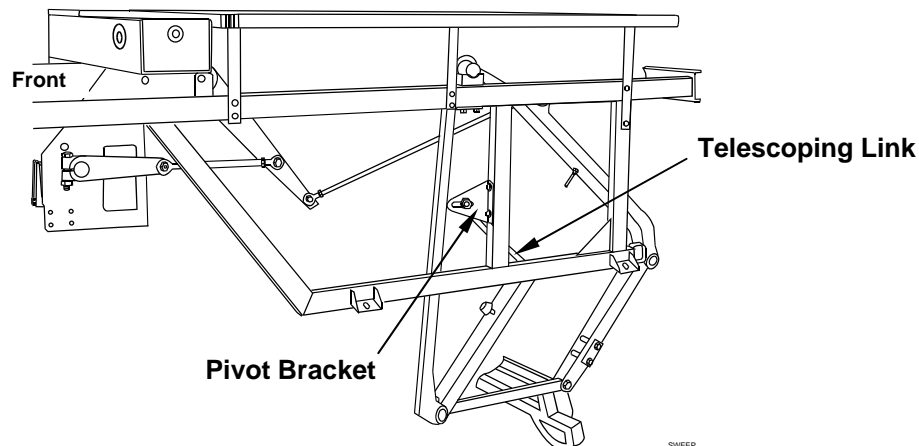
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2. Adjust the long connecting rod (see above) to obtain approximately 1/2-inch of clearance between the stabilizing link and the frame (see Figure 4.2-26) when the sweep is in the home position. The clearance must be sufficient to keep the sweep from contacting the frame during sweep operation.



**Figure 4.2-26**

3. Manually crank the sweep to its lowest point at the 1<sup>st</sup> guard position. The sweep bar should clear the pin deck by approximately 1-1/8 inch. This can be checked and set using the pinspotter multigage (088-001-216).
  - a. To increase the clearance between the sweep bar and the pin deck, loosen the nut where the telescoping link connects to the slotted pivot bracket on the vertical frame member (see Figure 4.2-27), and move the end of the telescoping link toward the front of the pinspotter. Retighten the nut.



**Figure 4.2-27**

- b. To decrease clearance between the sweep bar and the pin deck, move the end of the telescoping link toward the rear of the pinspotter.
  - c. Repeat this adjustment on the other side of the machine to maintain both ends of the sweep at the same height above the lane.
4. Manually crank the sweep to the #5 pin position (4-5-6 line). The sweep bar should clear the pin deck by 3/16". Use the pinspotter multigage (088-001-216) to check this.
  - a. To lower the sweep, loosen the pivot bracket's mounting screws on the vertical frame member and move the bracket up. To raise the sweep, move pivot bracket down.
  - b. Retighten the bracket's mounting screws.
  - c. As necessary, repeat this adjustment on the other side of the pinspotter.
5. Set a pin on each side of the pin deck as far back as possible.
6. Continue cranking the sweep to its extreme back position. The sweep should just touch the pins so that under power, the sweep should knock the pins into the pit. If the sweep does not go back far enough, increase the length of the 10-1/8-inch long connecting rod. Do not lengthen it more than is necessary. Under power, the sweep may collapse into the pit area.
7. Manually crank sweep to the home position. Recheck the stabilizing link for the correct clearance. The long connecting rod may have to be readjusted in order to have sufficient clearance.
8. Operate the machine under power and note sweep operation. If necessary, repeat the sweep adjustments.

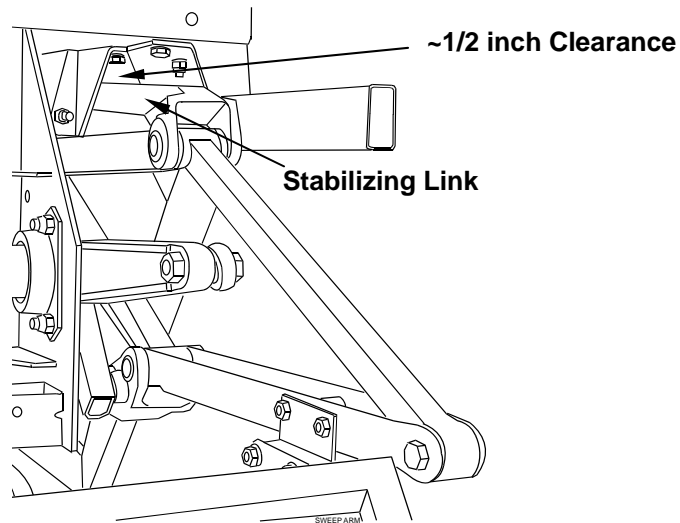
### **4.2.3.3 Sweep Home Position Adjustment**

The Sweep drive shaft has a disc with a slot in it that provides feedback to the chassis via a sensor when the drive shaft reaches the Home position. The Sweep's Home position should be at the highest point in its cycle. The Sweep's Stabilizing Link should be approximately 1/2 inch from the pinspotter's frame (see Figure 4.2-28). To adjust the Sweep's Home position:

1. Disengage the brake (see Figure 4.2-29) and manually crank the Sweep to the highest point of its travel.
2. Loosen the setscrew in the collar that secures the home disc to the drive shaft, and rotate the disc until a light on the sensor comes on indicating that the slot in the disc is aligned with the sensor's optics. Tighten the setscrew.



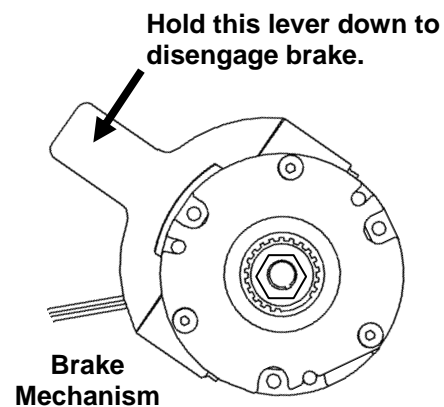
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**Figure 4.2-28**

3. Run the Sweep through several cycles, and verify it is stopping at the desired position.

A slight amount of overtravel is normal. If the Sweep runs considerably past the Home position and consistently stops at the same point, reset the home disc with the Sweep at a slightly lower position. **Excessive coasting of the Sweep past the Home position could indicate a motor brake problem.** You can observe the operation of the brake by watching the motor shaft and hexagonal hub in the center of the brake. The shaft should stop abruptly when the motor turns off.



**Figure 4.2-29**

### **4.2.3.4 1<sup>st</sup> and 2<sup>nd</sup> Guard Positions**

When the ball detector senses the passage of a ball, the Chassis directs the Sweep to descend to the 1<sup>st</sup> Guard position so that no further play can take place while the pins complete their action and are scored. Following removal of the deadwood, the Sweep stops at the 2<sup>nd</sup> Guard position while pins are spotted or respotted. At both the 1<sup>st</sup> and 2<sup>nd</sup> Guard positions, the Sweep should be positioned slightly above the surface of the lane. These positions are indicated on the Chassis display in degrees of drive shaft rotation (000 to 360). The 1<sup>st</sup> Guard position should be approximately 66° and the 2<sup>nd</sup> Guard position should be approximately 270°.

Because of slight variations between lanes and pinspotter adjustments, it may be necessary to fine tune the position of the Sweep at the 1<sup>st</sup> and 2<sup>nd</sup> Guard positions. This is done by changing the setpoints in the *Guard Set Menu* on the Chassis. Refer to the *XLi Chassis Manual* for specifics on changing Chassis setpoints. **Following a setpoint change, cycle the pinspotter several times until it is stopping consistently in the same place before making further adjustment.**

#### **4.2.3.5 Sweep Motor and Gearbox Removal**

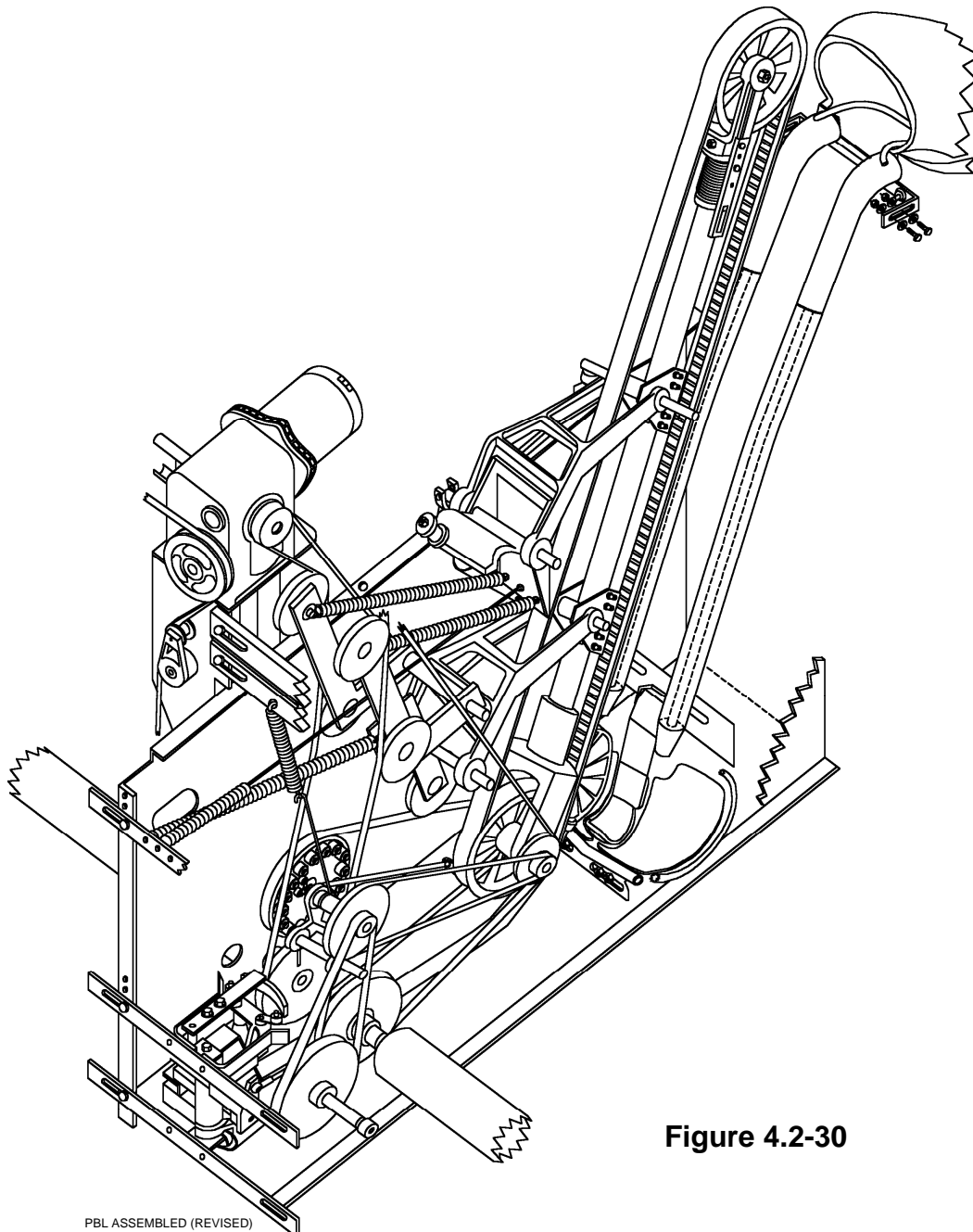
For sweep drive motor and gearbox removal, refer to the *XLi Motor & Gearbox Manual*, P/N 400-088-017.



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### 4.2.4 POSITIVE BALL LIFT

The purpose of the Positive Ball Lift (PBL) is to raise the ball high enough to permit a gravity return to the bowler. The ball lift consists of a number of separate assemblies that work together to achieve the desired result. For complete information about the Positive Ball Lift refer to the *Positive Ball Lift Pinspotter Manual Supplement*, 400-088-011.



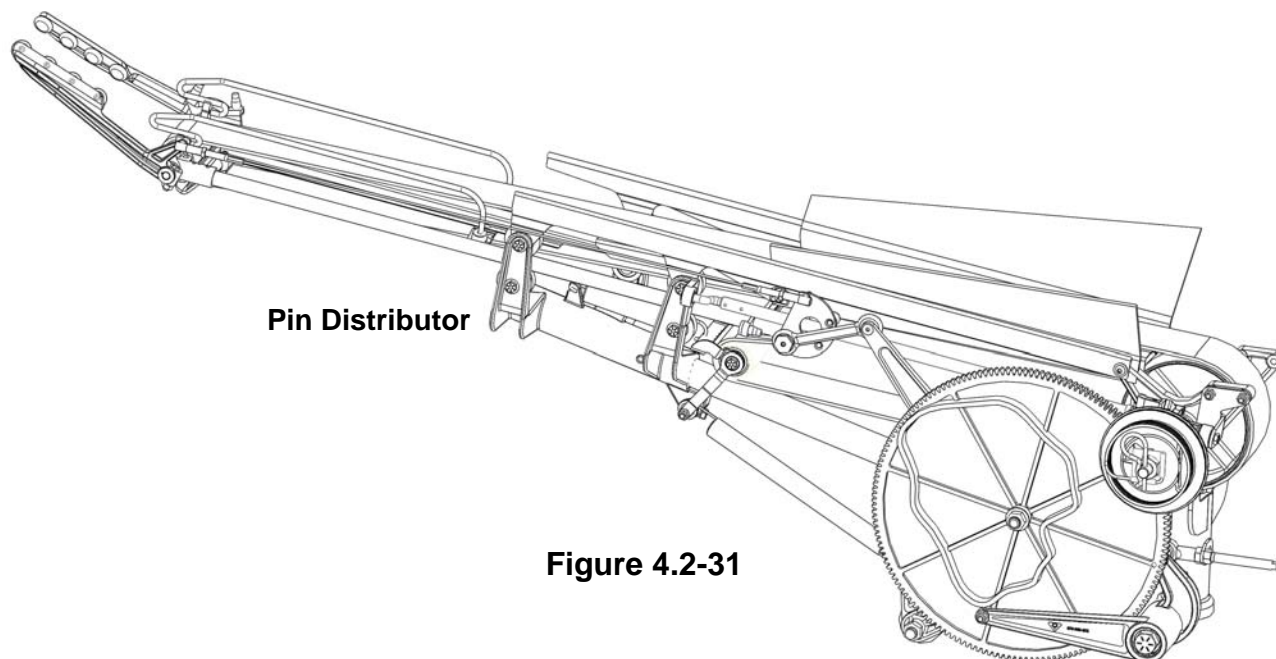
**Figure 4.2-30**

PBL ASSEMBLED (REVISED)



**4.2.5 DISTRIBUTOR**

The Distributor transfers pins from the Pin Elevator to the Bin. Through a number of cleverly designed components, it extends and retracts while sweeping from side to side stopping and depositing pins in each of the ten bin positions. For complete information concerning the Distributor, refer to the *XLi EDGE Pinspotter Pin Distributor Manual*, 400-088-121.

**Figure 4.2-31**



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### 4.2.6 BIN AND SHUTTLE OPERATION & ADJUSTMENT

#### 4.2.6.1 Bin and Shuttle Operation

The Bin assembly can store two complete sets of pins. The Shuttle, located below the Bin, holds the pins in the Bin until a new setup is required. When the Shuttle Cam Follower, which is attached to the Shuttle, travels into the low point of the Shuttle Cam, located on the Table Drive Shaft, the Shuttle momentarily moves forward allowing a set of pins to drop through from the Bin to the Spotting Cups.

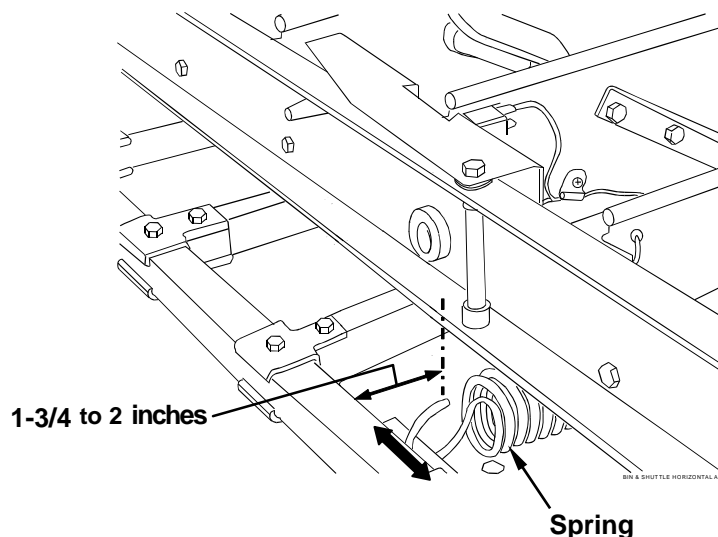
#### 4.2.6.2 Bin and Shuttle Adjustments

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**Note:** Adjustments must be made with no pins in the bins.

---

1. With Durabin 2, there should be approximately 1-3/4 to 2 inches between the back edge of the Bin's back channel and the leading edge of the Shuttle assembly measured at the center of the Bin (see Figure 4.2-32). To adjust,
  - a. Place a punch or screwdriver through the hole near the shuttle end of the shuttle connecting rod's tube, and then loosen the jam nut on the end fitting. Do not rotate the connecting rod's tube, as this will loosen the connecting rod's components causing the shuttle to malfunction during operation.
  - b. Disconnect the end of the shuttle connecting rod from the shuttle and adjust the length of the rod accordingly.
  - c. Reconnect the rod and tighten the jam nut.

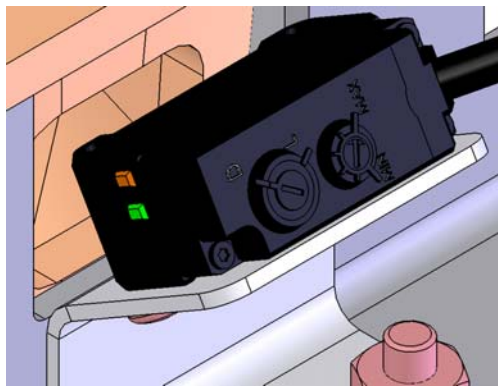


**Figure 4.2-32**

### 4.2.6.3 Bin Switch Operation

The optical bin switch (BSO) is located behind the #9 pin location on the bin. The #9 bin position is the last one filled when preparing the bin for the next setup of pins. When the 10th pin is delivered to the #9 bin position, it is detected by optical sensor which actuates the bin switch (see Figure 4.2-33a), and sends a signal to the chassis indicating that 10 pins are ready for a spotting cycle.

Test the switch with a pin several times. If the switch does not actuate, verify that the lens is clean, the opening in the bin pocket is clear of debris, the mounting screws are tight, and that the connector is securely connected.



**Figure 4.2-33a**



**Figure 4.2-33b**

### 4.2.6.4 Optical Bin Switch Adjustment

The bin switch is set and tested before the pinspotter is shipped, but should adjustment be necessary, such as when installing a replacement bin switch, perform the following.

1. Place a bowling pin in the 9-Pin bin pocket, standing up vertically on the Spotting Cup. (See Figure 4.2-33b)
2. Using a small flat-blade screwdriver, set the larger dial on the back of the Optical Sensor, Labeled D-L, to "D". Adjust the smaller (intensity) dial to MAX (fully clockwise). While watching the Orange and Green LEDs on the side of the Sensor (refer to Figure 4.2-33a), turn the intensity dial counterclockwise slowly through the following sequence:
  - A. Green LED is on, (Orange LED is off)
  - B. Green LED goes out (both LEDs are off)
  - C. Orange LED turns on
  - D. Green LED turns on (both LEDs are on)

Stop at the point where the Green LED turns back on and both LEDs are on (Step D). The proper intensity is now set.

3. Test the pinspotter for proper operation. If the Bin Switch signal works opposite of what it should, switch the D-L setting on the Sensor.



## *XLi EDGE Pinspotter*

### 4.2.7 CUSHION OPERATION & ADJUSTMENTS

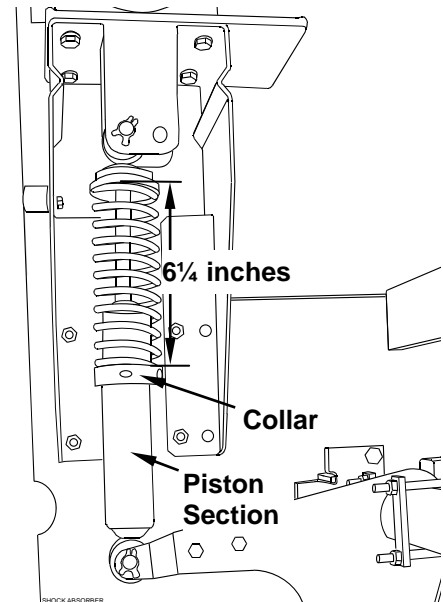
#### 4.2.7.1 Cushion Shock Absorber Adjustment

**Note:** This adjustment can be made either with the shock absorber mounted in the machine or held in a vise.

#### **CAUTION**

If the shock absorber is held in a vise, clamp the shock on its end only. **DO NOT PLACE THE PISTON SECTION IN A VISE.**

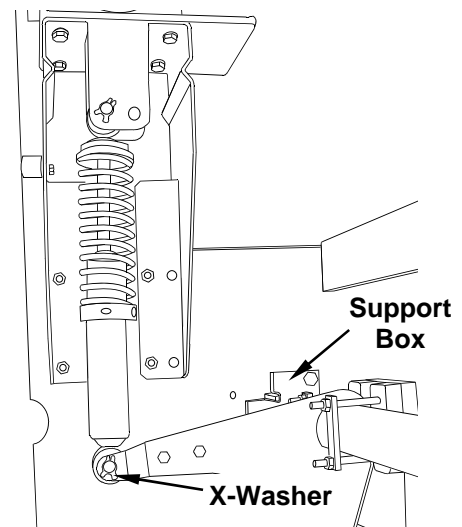
1. Loosen the collar's lock screw.
2. Insert a 1/2-inch open-end wrench between the coils of the spring at the point where the piston rod exits the piston housing so that the open end of the wrench straddles the piston rod.
3. Hold the wrench against the piston housing while turning the spring. When the length of the spring is 6¼ inches, slide the collar against the spring, tighten the collar's lock screw, and remove the wrench.



**Figure 4.2-34**

#### 4.2.7.2 Cushion Removal

1. Unlatch the pin curtain.
2. Remove one X-washer from the shock absorber mounting pin and remove the pin to release the shock absorber from the cushion assembly.
3. Remove the three screws that mount the support box to the kickback plate (See Figure 4.2-35) **on the shock absorber end of the cushion only!**
4. Slide the free end of the cushion forward until the other end comes free from its mount block. Remove the cushion assembly from the machine.
5. To replace, reverse the above procedure.



**Figure 4.2-35**

### 4.2.7.3 Replacing Urethane Rivets

1. Remove any remaining sections of the broken rivet.
2. Lubricate the raised portion of the new rivet's stem with liquid soap.
3. Push the rivet through the cushion assembly until about 1 inch protrudes through the back of the wooden plank.
4. Insert the end of the urethane rivet protruding through the wooden plank into the hole near the end of the belt installation tool (784-003-000).
5. Use the tool as a crank to pull on the rivet until the raised portion of the stem is pulled through the back of the wooden plank. Trim the ends of the rivets along the bottom row as necessary to prevent them from interfering with the passage of fallen pins.

## 4.2.8 PIN CONVEYOR BELT ADJUSTMENTS

### 4.2.8.1 Belt Removal Procedure

**▲ CAUTION**

Turn OFF the machine being worked on as well as the machines on each side of the machine being worked on while replacing the belt.

1. Disconnect the pin conveyor drive belt from the drive pulley on the rear roller, and remove the pulley from the roller.
2. Remove the paddle from the rudder arm.
3. Release the front roller from its bearing supports as follows:
  - a. Insert the belt installation tool between the front roller and the tail plank.
  - b. Apply pressure toward the rear of the machine. When the bearing support bracket clears the hole in the kickback plate, insert a retaining pin (792-501-001) into the hole.
  - c. Repeat steps 3a and 3b for the other side of the machine.
4. Remove the front roller by rolling it over the bounce plate and out the ball exit opening into the adjacent machine.

**▲ CAUTION**

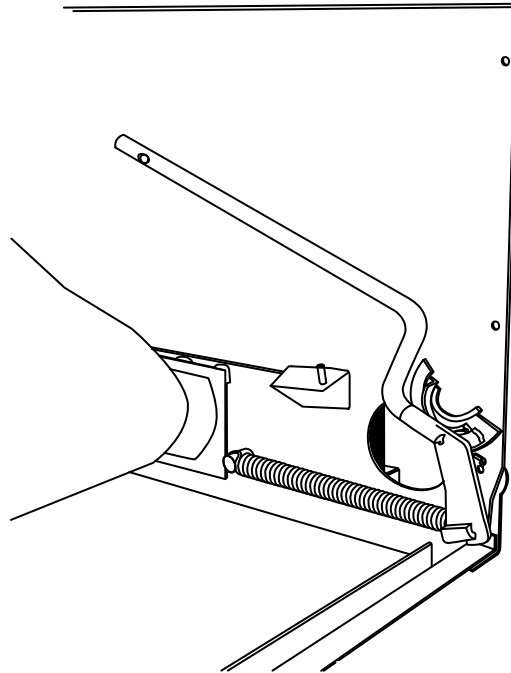
Spring tension on the roller bearing support brackets should be removed while working in the pit. Personnel can be injured if a retaining pin is accidentally knocked out.



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## ***XLi EDGE Pinspotter***

5. Make the machine safe for entry as follows:
  - a. Place the belt installation tool flag (792-502-002) onto the bearing support assembly (see Figure 4.2-36).



**Figure 4.2-36**

- b. Apply pressure toward the rear of the machine and remove the retaining pin from the hole in the kickback plate.
    - c. Slowly release the tension on the bearing support assembly until it rests on the tail plank. **DO THIS PROCEDURE WITH CAUTION.**
    - d. Repeat steps 5a through 5c for the other side of the machine.
6. Unhook the rear roller support from its bracket and tip the rear roller from its bearing support.
7. Remove the rear roller passing it into the adjacent machine through the access hole in the kickback plate on the side opposite the ball exit side of the machine.
8. Remove the four 5/16-inch nuts and washers that secure the vibration dampeners to the studs on the pit support brackets at each corner of the bounce board assembly.
9. Lift the belt and bounce board assembly onto the pin deck and slide out onto the lane.

**4.2.8.2 Belt Replacement Procedure****▲ CAUTION**

Turn OFF the machine being worked on as well as the machines on each side of the machine being worked on while replacing the belt.

1. Note the direction of the arrow on the belt. This may be located either on the inside or the outside of the belt.
  - a. Place the bounce board assembly inside the belt with the V-shaped cutout toward the ball exit. The arrow on the belt must point in the direction the belt turns during operation.
  - b. Wrap the belt around the bounce plate assembly and place it in the pit slightly forward on the pit support brackets. Do not fasten the bounce plate down at this time.
2. Install the rear roller by passing it from the adjacent machine on the side opposite the ball exit side of the machine, through the opening in the rear of the kickback plates and through the belt. The axle of the roller should protrude through the hole in the kickback plate and into the space occupied by the PBL.
3. Place the rear roller bearings in the bearing supports and hook the handle of the rear roller support bracket under the retaining tab on the kickback plate.
4. Install the drive pulley and conveyor drive belt.
5. Place the bounce plate in position inserting the studs on the pit support brackets through the mounting holes in the vibration dampers.
6. Place the free end of the grounding strap over the stud at the right rear vibration dampener and install the washers and 5/16-inch lock nuts onto the studs at each corner of the bounce plate assembly. Tighten securely. Make sure that the pin conveyor belt is free and not pinched between the bounce board and brackets.
7. Install the front roller by passing it through the ball exit opening of the adjacent machine and into the belt on top of the bounce board, but do not position in the bearing supports yet.
8. Before the front roller can be replaced, spring tension must be applied to the bearing support assemblies.

**▲ CAUTION**

Keep your fingers clear of any moveable parts while applying spring tension. A severe pinching hazard exists.



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## *XLi EDGE Pinspotter*

- a. Place the flag on the belt installation tool, and hook the tool on the bearing support assembly as shown in Figure 4.2-36.
  - b. Apply pressure toward the rear of the machine until the bearing support bracket clears the hole in the kickback plate, and insert the retaining pin into the hole. The belt installation tool can be rotated in the flag while applying pressure in order to provide additional clearance.
  - c. Repeat steps 8a and 8b for the other side of the machine.
  - d. Install the front roller in the bearing supports.
  - e. Grasp the end of the roller assembly on the top only and roll it into the support assembly. Repeat for the other end of the roller. Make sure that the roller bearings are fully seated in the bearing supports.
  - f. Apply pressure at one end of the front roller with the belt installation tool and remove the retaining pin. Carefully ease off on the roller. Repeat for the other end of the roller.
9. Reinstall the paddle on the rudder arm.

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**NOTE: Some break-in may be required for certain styles of pin conveyor belts.**

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**4.2.9 PIN ELEVATOR ADJUSTMENTS**

For information relating to adjusting and maintaining the Pin Elevator, refer to the *EDGE Performance Lift Pinspotter Manual Supplement, p/n 400-088-091*.



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## ***XLi EDGE Pinspotter***

### **ELECTRICAL DRAWINGS**

Refer to Attachment A, the *XLi EDGE Control System Wiring Diagram*, 088-200-678.

### **DISTRIBUTOR ADJUSTMENT AND MAINTENANCE**

Refer to Attachment B, the *XLi EDGE Pinspotter Pin Distributor Manual*, 400-088-121.

### **POSITIVE BALL LIFT ADJUSTMENT AND MAINTENANCE**

Refer to Attachment C, the *Positive Ball Lift Pinspotter Manual*, 400-088-011.

### **CHASSIS**

Refer to Attachment D, the *XLi Pinspotter Control Chassis Manual*, 400-088-009.

### **MOTORS AND GEARBOXES**

Refer to Attachment E, the *XLi Pinspotter Motor & Gearbox Manual*, 400-088-017.

### **PIN ELEVATOR**

Refer to Attachment F, the *EDGE Performance Lift Pinspotter Manual Supplement*, 400-088-091.

### **SCORING CAMERA**

Refer to Attachment G, the *AccuCam 3000 Camera Manual*, 400-286-002.

### **MANAGER'S CONTROL UNIT (MCU)**

Refer to Attachment H, the *Manager's Control Unit (MCU) Operations and Service Manual*, 400-088-008.

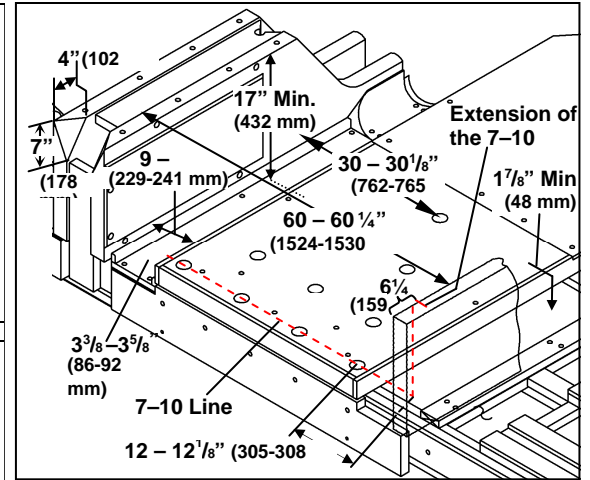
### **RADARAY XLi**

Refer to Attachment I, the *Radaray XLi Manual*, 400-088-006.

# Critical Measurements

## KICKBACKS / PINDECK

Distance from back edge of kickback to 7 – 10 Line .....	6 1/4" (159 mm) New / 6 1/4"–6 1/2" (159–165) Retrofit
Distance from wood part of kickback to center of the #7 and #10 Spots* ..	12 1/16" ± 1/16" (12" – 12 1/8": 305–308 mm)
Distance from wood part of kickback to center of the #1 Spot* .....	30 1/16" ± 1/16" (30" – 30 1/8": 762–765 mm)
Distance between kickbacks (wood to wood) across Lane* .....	60 1/8" ± 1/8" (60" – 60 1/4": 1524–1530 mm)
Distance from top of kickback to Pin Deck surface* .....	≥ 17" (432 mm)
Dimension of cuts on back of Double Kickback Assembly .....	4" deep x 7" high (102 x 178 mm)



## FLAT GUTTERS

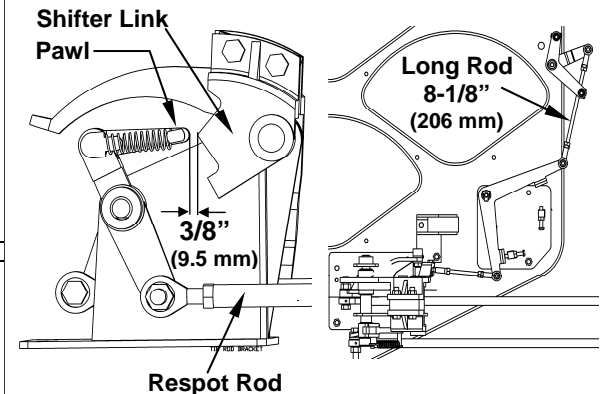
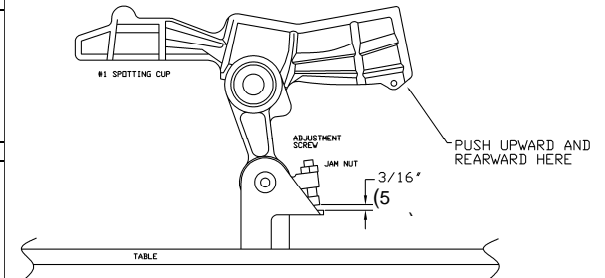
Width of Flat Gutters (includes molding)* .....	9 1/4" ± 1/4" (9" – 9 1/2": 229–241 mm)
Depth of gutter opposite the #1 Spot* .....	≥ 1 7/8" (48 mm)
Depth of gutter at point opposite the #7 and #10 Spots* .....	3 1/2" ± 1/8" (3 3/8" – 3 5/8": 86–92 mm)

## FRONT END

Distance from underside of frame to Pin Deck surface .....	18 7/8" ± 1/8" (18 3/4" – 19": 476–483 mm)
Height difference between corners of frame .....	1/32" (1 mm)

## TABLE

Play in respot cell fingers .....	1/4" – 3/8" (6–9.5 mm) + equal finger to finger
Length of long rod at front of table .....	8 1/8" (206 mm)
Table position (Flags) max deviation from center of #1, #7, & #10 Spots ...	± 1/8" (3 mm)
Gap under table leg screw (cups horizontal) .....	3/16" (5 mm)
Gap under table leg screw (cups vertical – spot rod adjustment) .....	1/16" – 3/32" (1.5 – 2.5 mm)
Gap between Pawl and point of Shifter Link .....	3/8" (9.5 mm)
Table height – Distance between pin deck and screw head .....	5/16" (8 mm)
Yoke spring position .....	Even with top of U-bolt nut

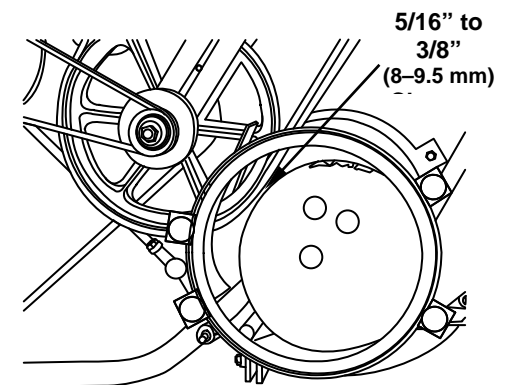
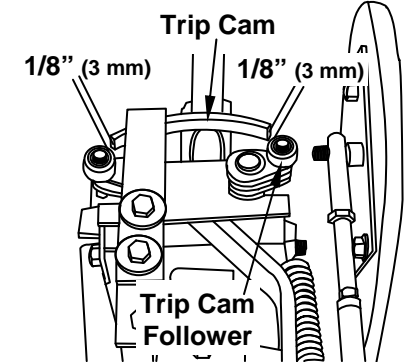
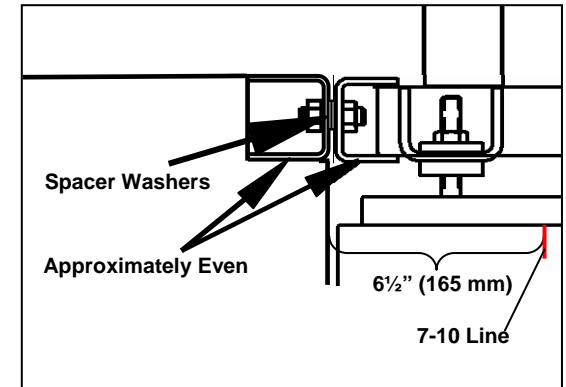


## BACK END

Distance from front edge of side plate flange to 7–10 Line .....	6 1/2" (165 mm) New / 6 1/2"–6 3/4" (165–171 mm) Retrofit
Back End height vs. Front End height at connection points .....	Approximately Even

# Critical Measurements

<b><u>PBL</u></b>	
Lift arm height above door weldment .....	$1/8''$ to $3/16''$ (3–5 mm) above weldment
PBL height (clearance between ball on lift arm and lift belt) .....	$5/16''$ – $3/8''$ (8–9.5 mm)
<b><u>LBS</u></b>	
Distance LBS should travel after rudder hits bumper .....	$1/16''$ – $1/8''$ (1.5–3 mm)
Gap between Trip Cam and followers (L&R) with rudder centered .....	$1/8''$ (3 mm)
<b><u>DISTRIBUTOR</u></b>	
Distance between trip arms.....	3" (76 mm) Max
Clearance between belt guard and screw head on bin.....	$1/8''$ – $1/4''$ (3–6 mm)
<b><u>SWEEP</u></b>	
Length of each long rod.....	10 threads showing (total of both ends); 12 on 7-
Distance above pin deck at 1 <sup>st</sup> Guard .....	$1\frac{1}{8}'' \pm 1/8''$ (1"– $1\frac{1}{4}''$ : 25–32 mm)
Distance above pin deck at the center of the #4, #5, & #6 Spots.....	$3/16'' \pm 1/16''$ ( $1/8''$ – $1/4''$ : 3–6 mm)
Maximum rearward travel (manually cranked) .....	Front of bar at back of 7 -10 row
<b><u>BALL DETECTOR</u></b>	
<b><u>–WHEN MOUNTED OUTSIDE THE PATH OF THE SWEEP–</u></b>	
Distance from center of detector/reflector to the 7–10 Line.....	$59\frac{3}{4}'' \pm 1/2''$ ( $59\frac{1}{4}''$ – $60\frac{1}{4}''$ : 1505–1530 mm)
Height of detector mounting platform above Pin Deck .....	Capping height + $5/16''$ (8 mm)
<b><u>–WHEN MOUNTED INSIDE THE PATH OF THE SWEEP–</u></b>	
Distance from center of detector/reflector to the 7–10 Line.....	$51\frac{1}{2}'' \pm 1''$ ( $50\frac{1}{2}''$ – $52\frac{1}{2}''$ : 1283–1334 mm)
Thickness of board used to mount detector to nose of kickback.....	$1/4''$ – $3/8''$ (6–9.5 mm)



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## 4.3. LUBRICATION INSTRUCTIONS

### 4.3.1 LUBRICATION

Lubrication is one of the most important items in the proper operation and maintenance of the XLi EDGE Pinspotter. Care must be taken to insure that lubricants are applied correctly. Avoid excessive lubrication to minimize the possibility of transmitting lubricants to the bowler. Before lubricating exposed parts or surfaces, it is important that the old lubricant first be removed. It is also very important to clean the pinspotter as you lubricate.

Table 4.3-1 provides a quick look at the items requiring lubrication as well as the lubrication frequency and Figure number (drawing) that should be referenced for more information. The Figures that follow the Lubrication Schedule show the specific points of lubrication, the correct amount of lubricant to use, and the frequency of lubrication for each part of the machine that requires periodic lubrication.

**Lubrication of the Distributor, Positive Ball Lift (PBL), and Front & Back End Gearboxes is covered in their respective manuals.**

### 4.3.2 LUBRICANT SYMBOLS

**1** **OILING:** Items indicated by a number within a square require oiling. Use SAE #10 oil as the lubricant.

**1** **GREASING:** Items indicated by a number within a circle require greasing. Use a multipurpose grease (such as Bearing Guard #2) as the lubricant.

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**NOTES:** Refer to the *XLi Pinspotter Motor & Gearbox Manual*, for proper lubrication instructions for these items. Use only QubicaAMF Gear Lube in the gearboxes!

**There are 52 uniball rod ends on each pair of XLi Pinspotters. Although they are considered greaseless and maintenance free, an occasional drop of oil on a rod end may be desired to prevent squeaking.**

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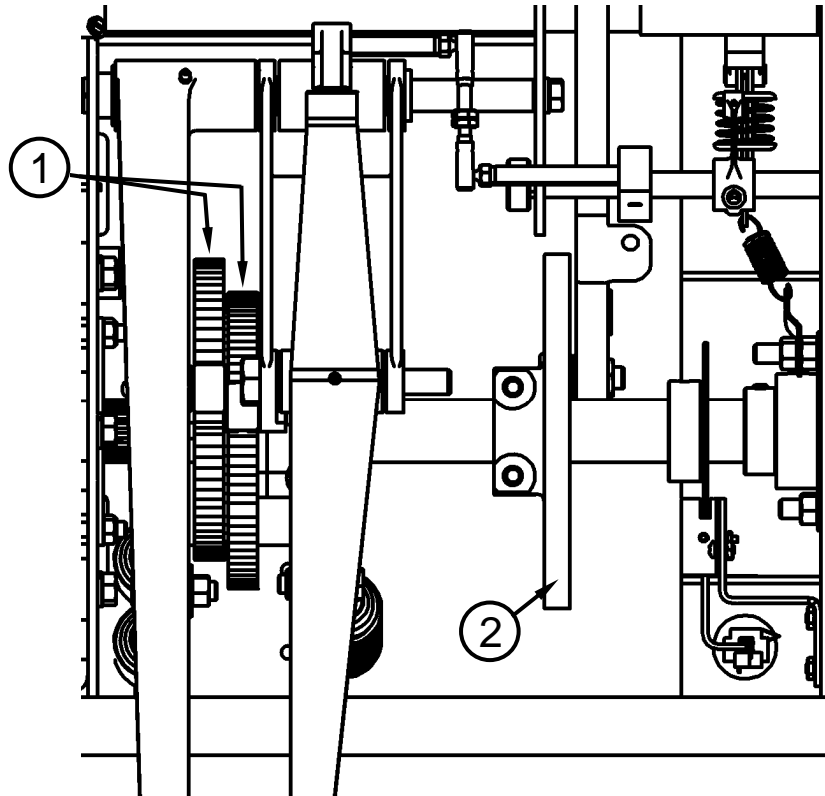


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**Table 4.3-1, Lubrication Schedule**

	<b>Table/Table Drive</b>	<b>Oil/Grease</b>	<b>Figure</b>	
<b>EVERY 25,000 FRAMES</b>	Spotting hook pivot bushings	Oil	4.3-3b	
	Upper spotting link assembly bushings	Oil	4.3-3b	
	Solenoid linkages	Oil	4.3-3b	
	Ball joint assemblies	Oil	4.3-3b	
	Cam lever shaft	Oil	4.3-3c	
	Roller arm assembly	Oil	4.3-3c	
	Crank housing	Oil	4.3-3c	
	Latch pivot	Oil	4.3-3c	
	Off-spot lever pivot	Oil	4.3-3c	
	Spring hanger pivot bolts	Oil	4.3-3c	
	Spring hook bushings	Oil	4.3-3d	
	Respot cell lever	Oil	4.3-5	
	Respot cell pivot points	Oil	4.3-5	
	Carburetor links	Oil	4.3-5	
	Pivot washers	Oil	4.3-5	
	Finger lever bushings	Oil	4.3-7a	
	Finger link	Oil	4.3-7a	
	Spot lever	Oil	4.3-7b	
	Front actuator assembly bushings	Oil	4.3-8	
	Front connecting link assembly bushings	Oil	4.3-8	
	Table spot and respot cams	Grease	4.3-3a	
	Shuttle cam	Grease	4.3-3a	
	Spot and respot cam follower bearing	Grease	4.3-3b	
	Spot and respot levers	Grease	4.3-3b	
	Shuttle cam follower	Grease	4.3-3c	
		<b>Sweep/Sweep Drive</b>	<b>Oil/Grease</b>	<b>Figure</b>
	Linkage knuckles	Oil	4.3-4a	
	Linkage joints	Oil	4.3-4a	
	Sweep motor tie rod assembly	Oil	4.3.4b	
	<b>Yoke Assembly</b>	<b>Oil/Grease</b>	<b>Figure</b>	
	Rear leg bushings	Oil	4.3-6	
	Linkage rod pivot points	Oil	4.3-6	
	Front leg lower bushings	Oil	4.3-6	
<b>EVERY 100,000 FRAMES</b>		<b>Table/Table Drive</b>	<b>Oil/Grease</b>	
		Table drive eccentric assembly	Grease	4.3-3c
		Cam ball	Grease	4.3-3c
		Inside of clevis	Grease	4.3.3c
		Table support weldment sleeve bearings	Grease	4.3-3d
		Respot cell finger slots	Grease	4.3-5
		Shifter link and cam link needle bearings	Grease	4.3-7a & b
		Cam Link	Grease	4.3-7a
		Shifter Link	Grease	4.3-7a
		Actuator arm inside surface	Grease	4.3-7b
		<b>Sweep/Sweep Drive</b>	<b>Oil/Grease</b>	<b>Figure</b>
		Inside guide tube	Grease	4.3-4a
		<b>Miscellaneous</b>	<b>Oil/Grease</b>	<b>Figure</b>
		Shuttle pivot shaft sleeve bearings	Grease	4.3-9
		Shock absorber pivot pins	Oil	4.3-10
		Back End side plate front roller bearing bracket	Grease	4.3-11
	Back End side plate rear roller support bushing	Oil	4.3-11	



**4.3.3 TABLE DRIVE ASSEMBLY****Figure 4.3-3a****CAUTION**

Watch out for sharp edges on the Shuttle Cam and the Table Spot and Respot Cams.

Every 25,000 frames:

- ① 1. Apply a light coating of grease on the table spot and respot cams.
- ② 2. Apply a light coating of grease on the shuttle cam.



## *XLi EDGE Pinspotter*

### 4.3.3 TABLE DRIVE ASSEMBLY - continued

Every 25,000 frames:

1. Spotting hook pivot bushings: 1 drop of oil (2 places).
2. Upper spotting link assembly bushings: 1 drop of oil (2 places).
3. Solenoid linkages: 1 drop of oil (6 places).
4. Ball joint assemblies: 1 drop of oil (2 places).

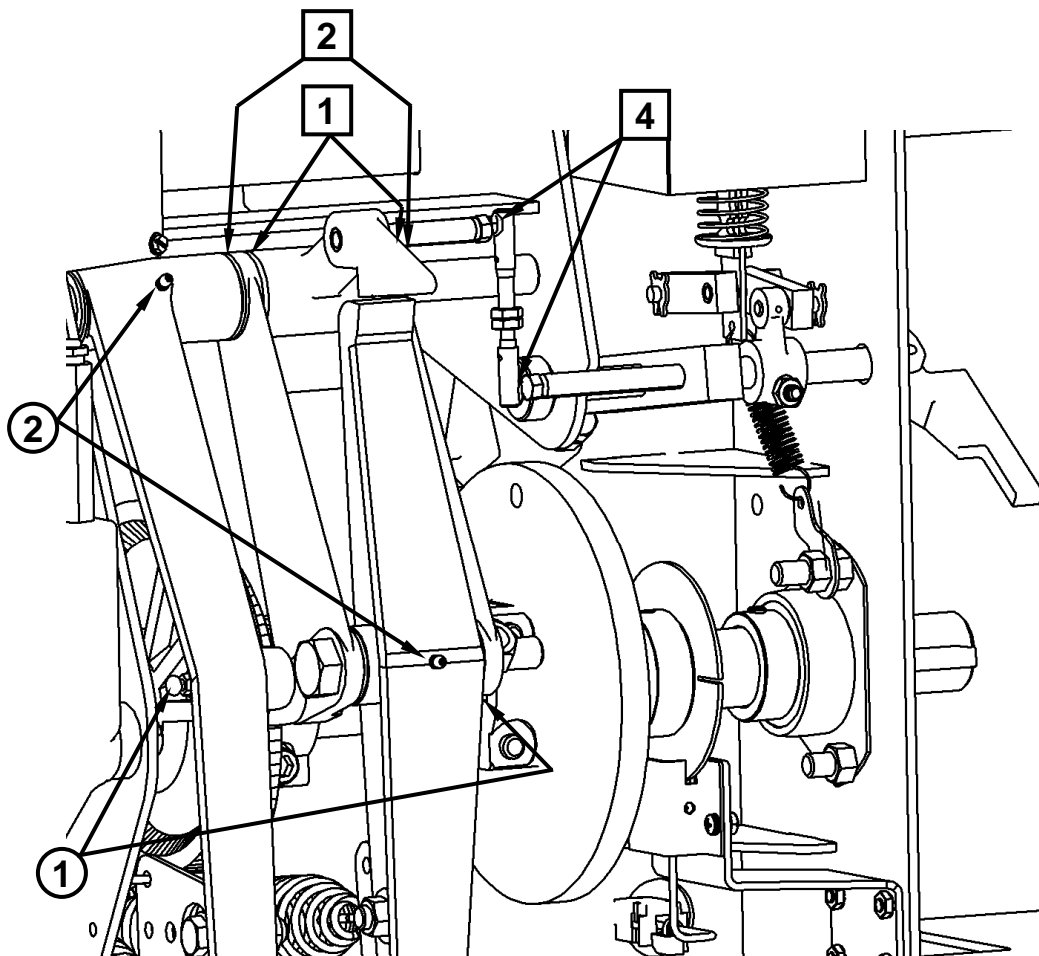


Figure 4.3-3b

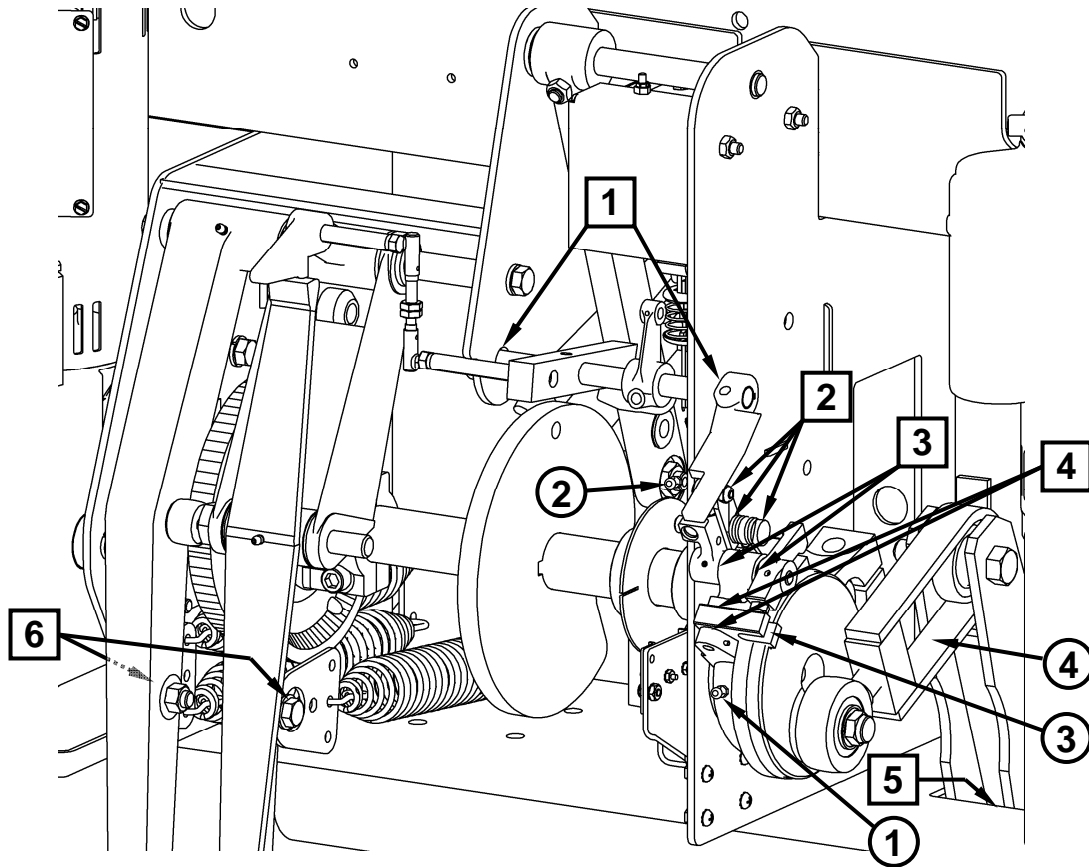
Every 25,000 frames:

1. Grease the spot and respot cam follower bearing.
2. Grease the spot and respot levers.

**4.3.3 TABLE DRIVE ASSEMBLY - continued**

Every 25,000 frames:

- 1** 1. Cam lever shaft: 1 drop of oil (4 places).
- 2** 2. Roller arm assembly: 1 drop of oil (3 places).
- 3** 3. Crank housing: 1 drop of oil (2 places).
- 4** 4. Latch pivot: 1 drop of oil (2 places).
- 5** 5. Off-spot lever pivot: 1 drop of oil (2 places).
- 6** 6. Spring hanger pivot bolts: 1 drop of oil (2 places).



**Figure 4.3-3c**

- 1** 7. Grease the table drive eccentric assembly **every 100,000 frames**.
- 2** 8. Apply grease to the shuttle cam follower **every 25,000 frames**.
- 3** 9. Apply a light coating of grease to the cam ball **every 100,000 frames**.
- 4** 10. Apply a light coating of grease to the inside of the clevis **every 100,000 frames**.

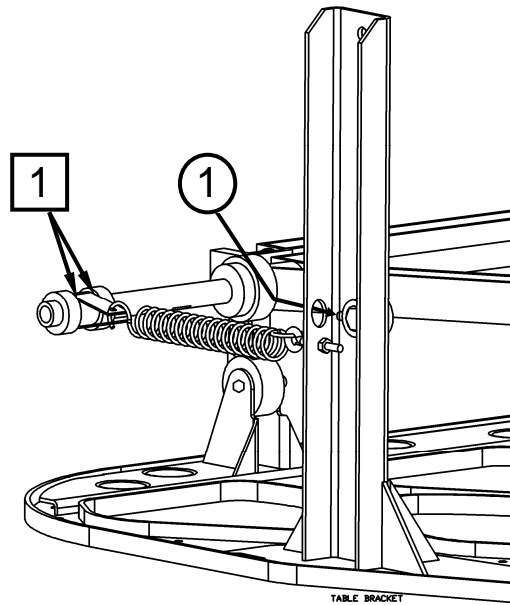


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*XLi EDGE Pinspotter*

**4.3.3 TABLE DRIVE ASSEMBLY - continued**

- ① 1. Grease the table support weldment sleeve bearings (2 places) **every 100,000 frames.**



**Figure 4.3-3d**

- 2 1 Spring hook bushings: 1 drop of oil (4 places) **every 25,000 frames.**

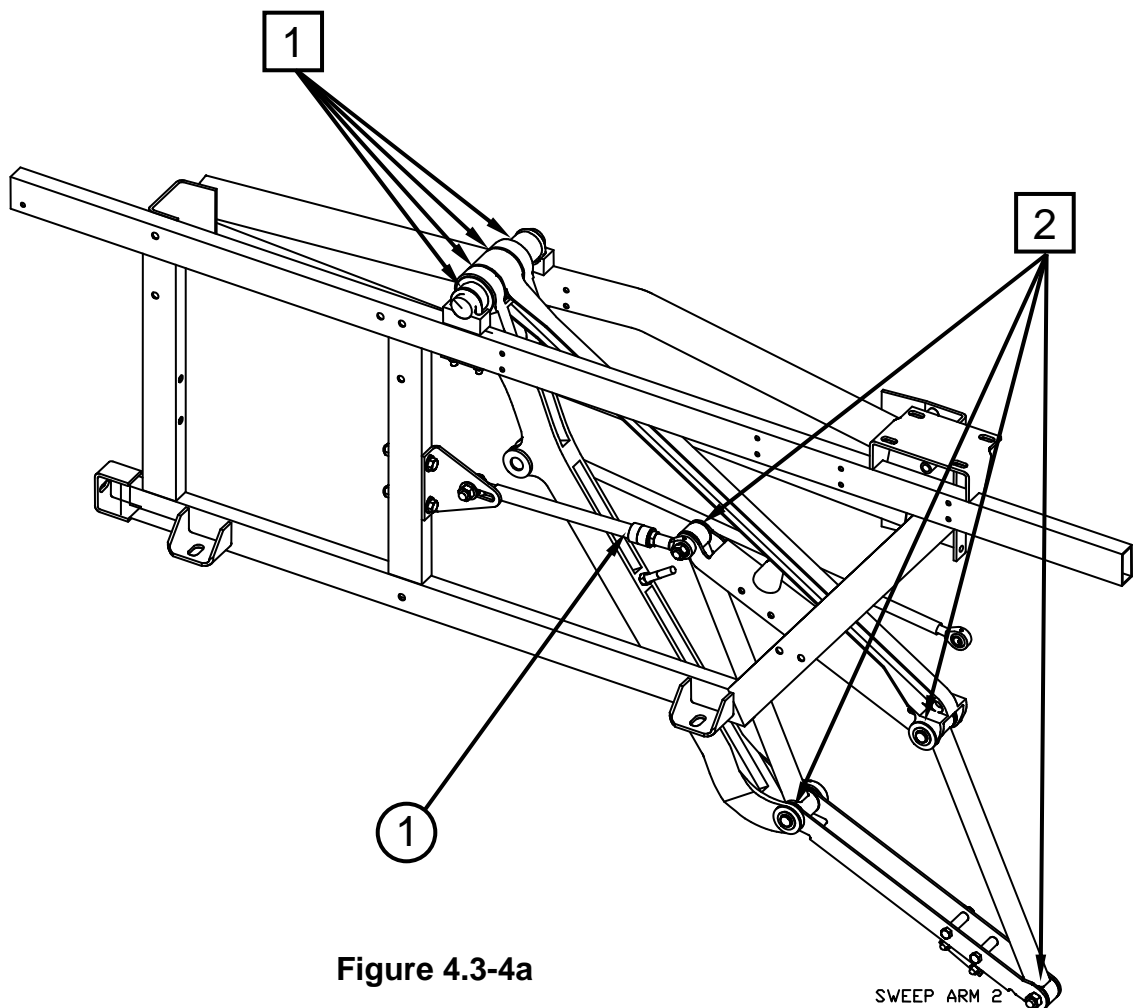
**4.3.4 SWEEP DRIVE AND LINKAGES**



**NOTE:** Only one side of the sweep linkage is shown. Totals reflect both sides.

Every 25,000 frames:

- 1** 1. Linkage knuckles: 4 drops of oil on each knuckle (8 places).
- 2** 2. Linkage joints: 2 drops of oil on each joint (8 places).



**Figure 4.3-4a**

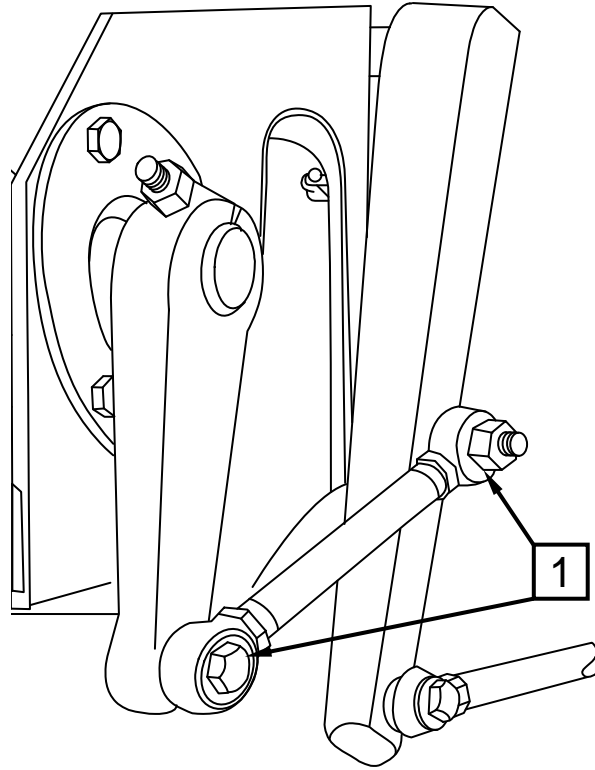
- 1** 3. Inside guide tube: clean and grease **every 100,000 frames**.



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*XLi EDGE Pinspotter*

**4.3.4 SWEEP DRIVE AND LINKAGES - continued**



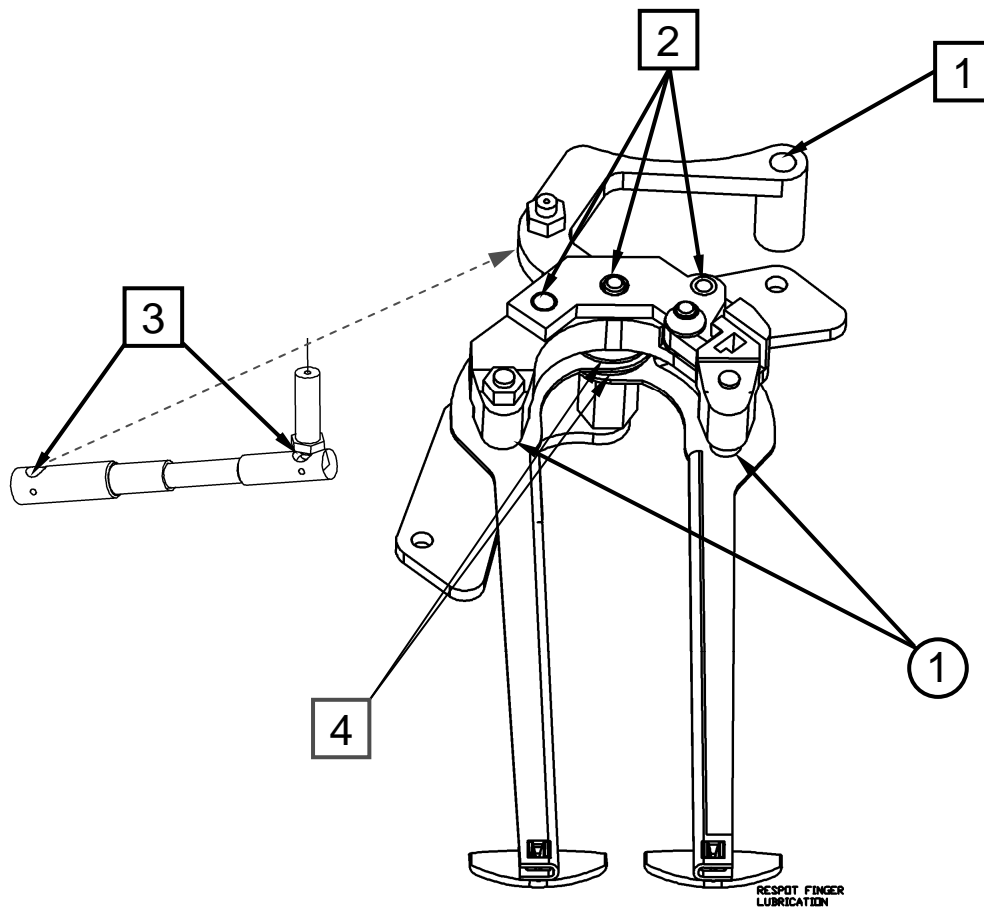
**Figure 4.3-4b**

- 1** 1. Sweep motor tie rod assembly: 2 drops of oil (2 places) **every 25,000 frames.**

**4.3.5 RESPOT CELLS**

Every 25,000 frames:

- 1** 1. Respot cell lever: 1 drop of oil on each lever (10 per machine).
- 2** 2. Pivot points: 1 drop of oil on each pivot point (10 cells per machine).
- 3** 3. Carburetor links: 1 drop of oil at each end (6 links per machine).
- 4** 4. Pivot washers: 1 drop of oil on each washer (2 places per cell).



**Figure 4.3-5**

- 1** 5. Respot cell finger slots: apply a light film of grease along the perimeter of each slot (20 places) **every 100,000 frames**.



## *XLi EDGE Pinspotter*

### 4.3.6 YOKE ASSEMBLY

Every 25,000 frames:

1. Rear leg bushings: 2 drops of oil on each side (8 places).
2. Linkage rod pivot points: 1 drop of oil (4 places).
3. Front leg lower bushings: 2 drops of oil each side (4 places).

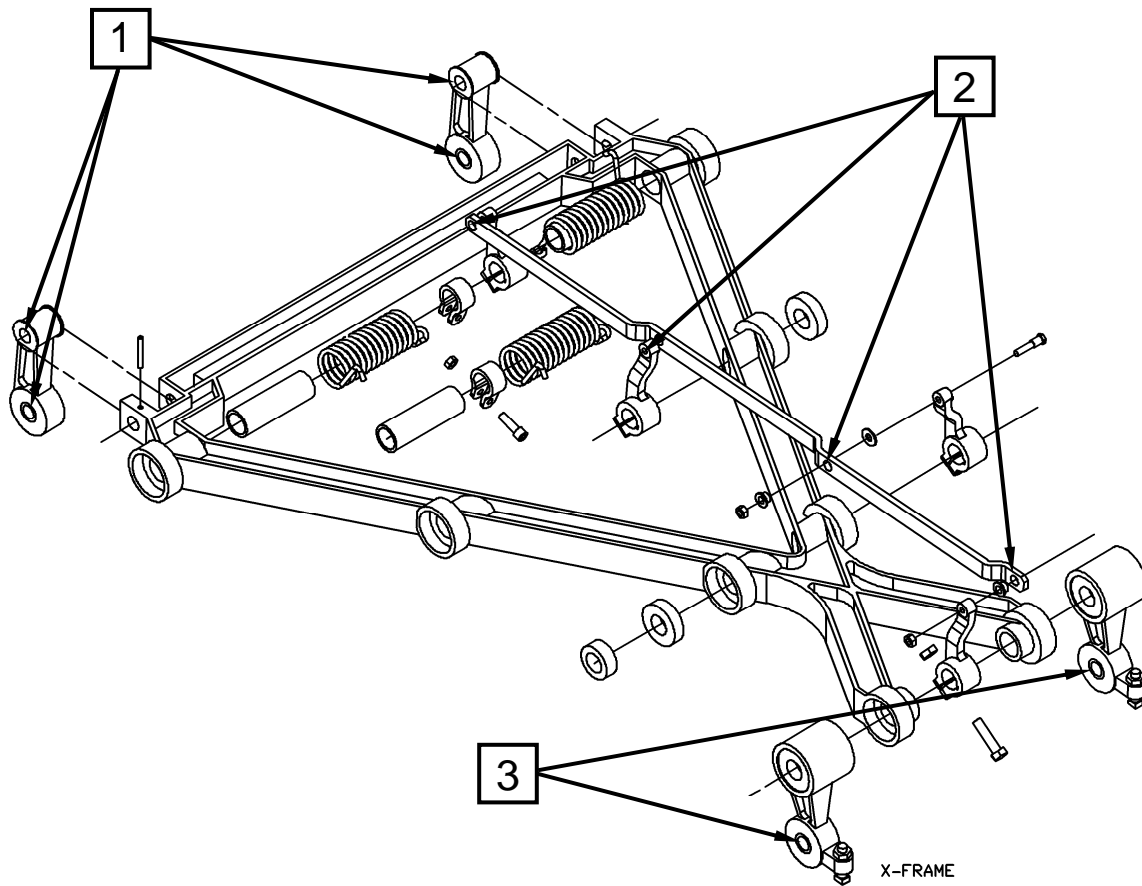


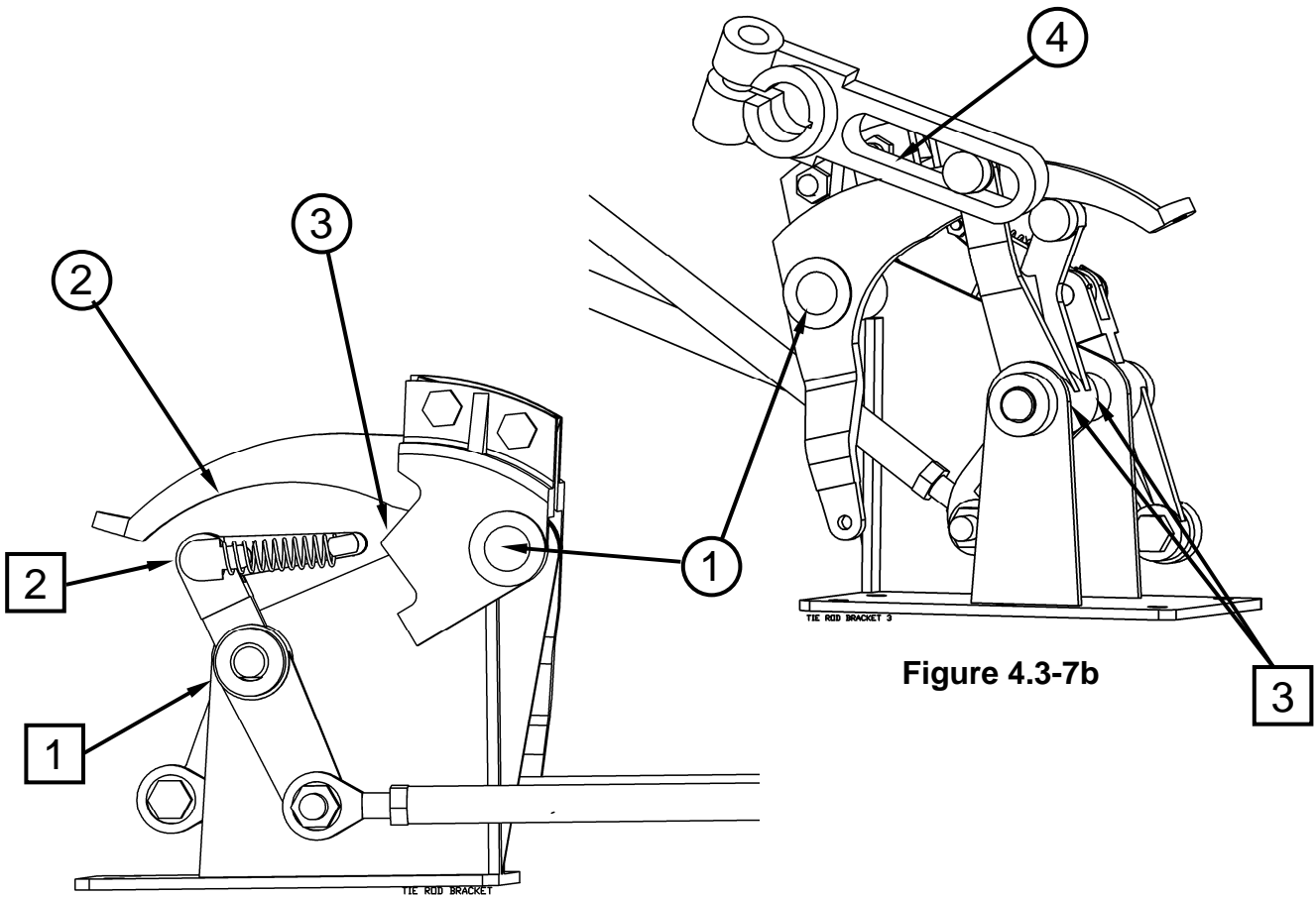
Figure 4.3-6



**4.3.7 TABLE SHIFTER MECHANISM**

Every 25,000 frames:

- 1** 1. Finger lever bushings: 1 drop of oil (2 places).
- 2** 2. Finger link: 1 drop of oil (2 places).
- 3** 3. Spot lever: 1 drop of oil (2 places).



**Figure 4.3-7a**

**Figure 4.3-7b**

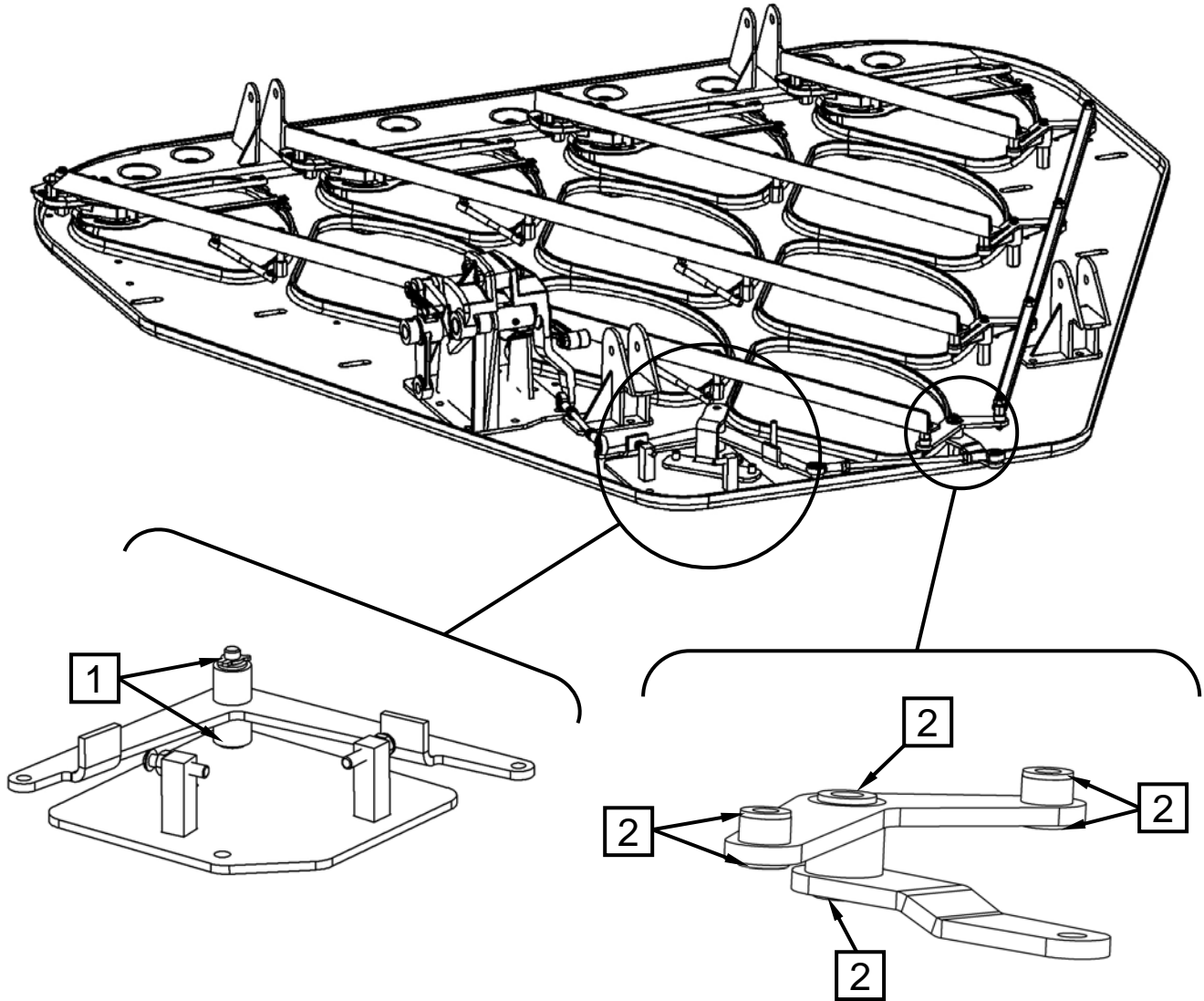
Every 100,000 frames:

- 1** 4. Shifter Link and cam link: repack needle bearings (2 places).
- 2** 5. Cam Link: apply a light coat of grease to the underside (1 place).
- 3** 6. Shifter Link: apply a light coat of grease (1 place).
- 4** 7. Actuator Arm: apply a light coat of grease to the inside surface (1 place).



## *XLi EDGE Pinspotter*

### 4.3.8 TABLE ACTUATOR AND CONNECTOR ASSEMBLIES



**Figure 4.3-8**

**Every 25,000 frames:**

- 1** 1. Front actuator assembly bushings: 1 drop of oil (2 places).
- 2** 2. Front connecting link assembly bushings: 1 drop of oil (6 places).

**4.3.9 BIN & SHUTTLE ASSEMBLY**

- ① 1. Shuttle pivot shaft sleeve bearings: grease (2 places) every 100,000 frames.

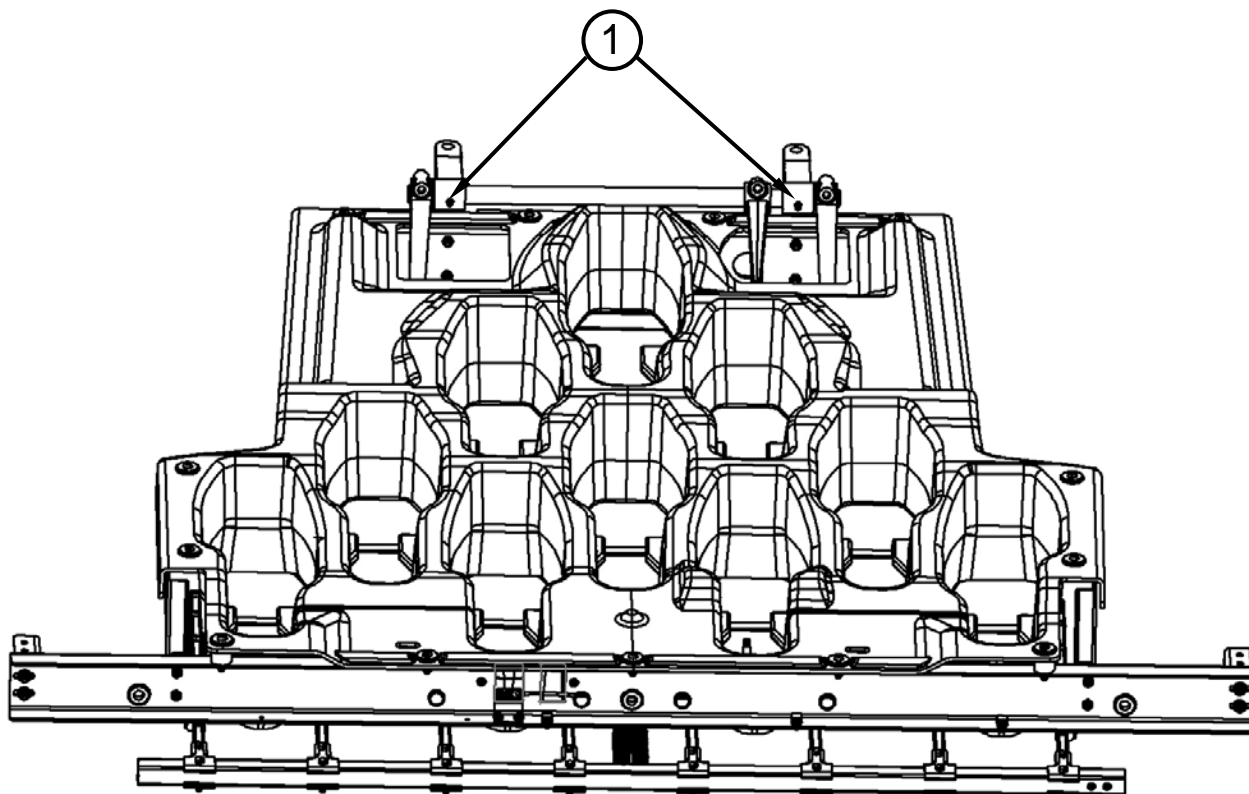


Figure 4.3-9

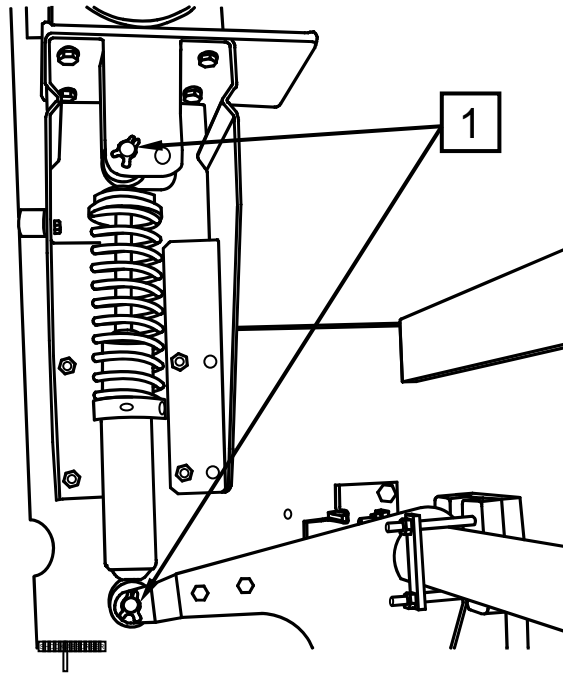


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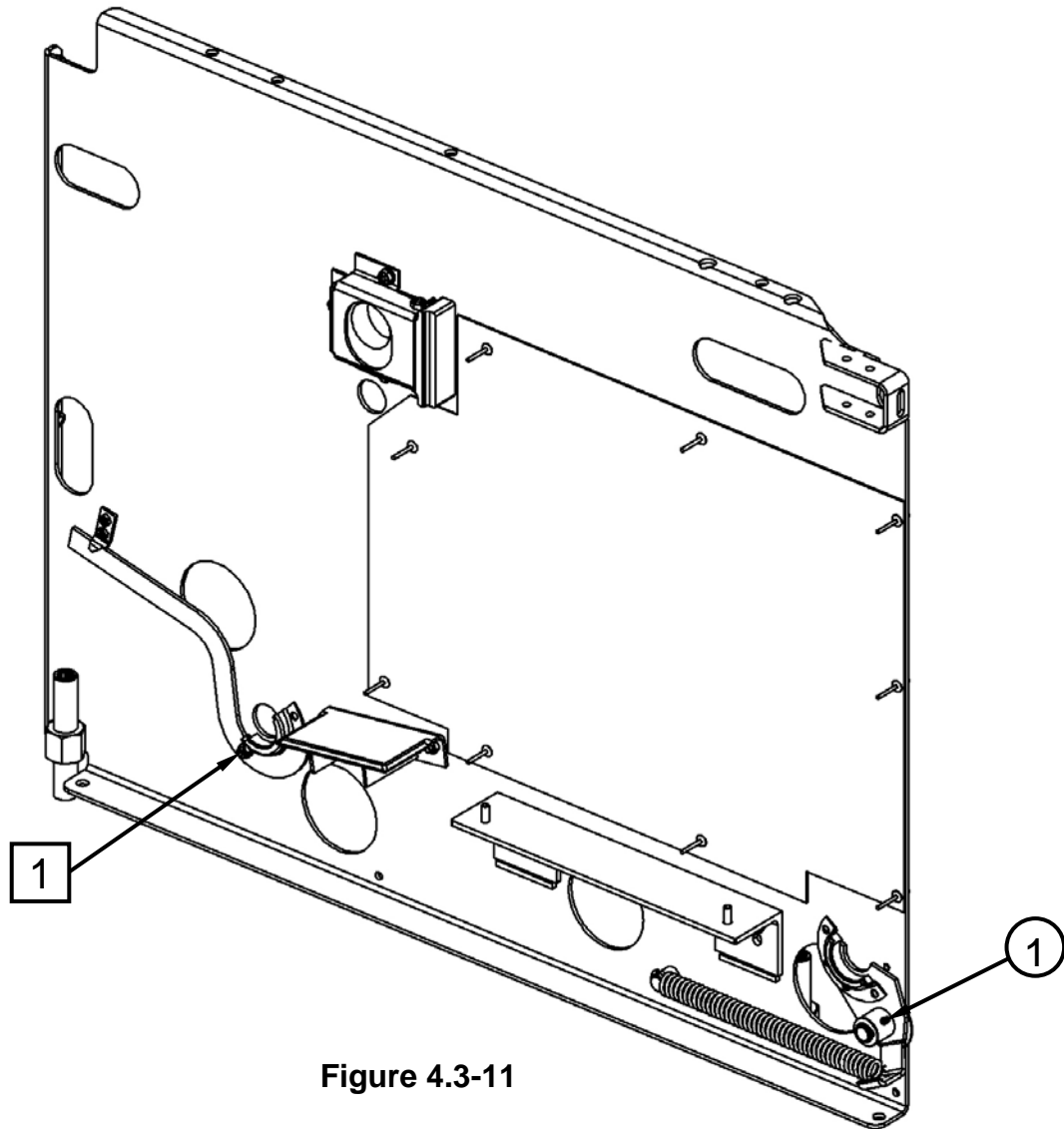
*XLi EDGE Pinspotter*

**4.3.10 SHOCK ABSORBER**

1. Pivot pins: apply 2 drops of oil every (2 places) **every 100,000 frames.**



**Figure 4.3-10**

**4.3.11 BACK END SIDE PLATE ASSEMBLY****Figure 4.3-11**

Every 100,000 frames:

- ① 1. Front roller bearing bracket assembly R.H. and L.H.: grease (2 places).
- ① 2. Rear roller support weldment bushing (1 place): 1 drop of oil.



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# **SECTION 4.4**

## **Preventive Maintenance**

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**4.4 SCHEDULING PREVENTIVE MAINTENANCE**

**4.4.1 QubicaAMF WEEKLY PREVENTIVE MAINTENANCE CHART**

Preventive maintenance is performed by the proprietor’s maintenance technician using in accordance with the schedule shown on the following pages. Each machine is given this check according to the frequency indicated. Table 4.4-1 provides a quick and easy method of dividing the weekly maintenance items. For example, the maintenance technician of a 16-lane house would do four pinspotters a day for four days each week. The items that are performed according to frame count should be penciled in on the weekly chart as they become due.

**Table 4.4-1**

<b>TYPICAL PINSPOTTER INSPECTION SCHEDULE</b>														
<b>Number of Pinspotters</b>														
<b>DAY</b>	<b>6</b>	<b>8</b>	<b>10</b>	<b>12</b>	<b>14</b>	<b>16</b>	<b>18</b>	<b>20</b>	<b>22</b>	<b>24</b>	<b>26</b>	<b>28</b>	<b>30</b>	<b>32</b>
<b>MON.</b>	2	2	2	4	4	4	4	4	5	5	6	6	6	8
<b>TUES.</b>	2	2	2	4	4	4	4	4	5	5	5	6	6	6
<b>WED.</b>	2	2	2	4	4	4	4	4	4	5	5	6	6	6
<b>THURS.</b>		2	2		2	4	4	4	4	5	5	5	6	6
<b>FRI.</b>			2				2	4	4	4	5	5	6	6

If your bowling center has more lanes than shown in the table, you can determine your schedule by adding the totals from two columns. For example, if your center has 36 lanes, add the numbers from the **30** column to the numbers from the **6** column for each day of the week. In this case, your schedule would be: **8, 8, 8, 6, 6 = 36**. If the number of lanes in your center is an exact multiple of one of the numbers shown in the table, simply multiply the number of lanes for that day by the multiple. For example, if your center has 48 lanes, multiply the numbers in the **24** column by **2**, which result in **10, 10, 10, 10, 8 = 48**. Alternately, you could have added the numbers in the **28** and **20** columns to get **10, 10, 10, 9, 9 = 48**, which is also acceptable.

Table 4.4-2 shows the scheduling frequency for servicing pinspotters based on frame count. The following pages specify the maintenance frequency of various pinspotter components, and Section 4.5 contains the specific procedures for servicing activities that require more detailed instructions.

**Table 4.4-2**

<b>Service Frequency</b>	<b>25k</b>	<b>50k</b>	<b>75k</b>	<b>100k</b>	<b>125k</b>	<b>150k</b>	<b>175k</b>	<b>200k</b>	<b>225k</b>	<b>250k</b>	<b>275k</b>	<b>300k</b>	<b>325k</b>	<b>350k</b>	<b>375k</b>	<b>400k</b>
25K Item	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
100K Item				<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>
200K Item								<input checked="" type="checkbox"/>								<input checked="" type="checkbox"/>
400K Item																<input checked="" type="checkbox"/>



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*QubicaAMF XLi EDGE Pinspotter*

**4.4.2 PREVENTIVE MAINTENANCE SCHEDULE**

**QUBICAAMF**  
**XLi EDGE**  
**PINSPOTTER**

**Daily**

Check the call sheets for the previous day, transfer calls to stop summary		
Investigate / correct machines that have developed a malfunction pattern.		
Clean Positive Ball Lift (PBL) Belt with a dry rag		
Clean Distributor Belt with a dry rag		
Assign and record completed PM on the PM charts		

**Weekly**

Inspect the Carrier Rails for correct installation direction (pointed end down)		
Inspect Kickout Springs (2 per machine) – missing, bent, or loose		
Remove, launder, and install Ball Wipes and Dust Collector Cloths		
Inspect Distributor, observe for proper operation, correct as needed		
Clean Durabin and Shuttle with a vinyl type dressing		
Clean O-Pan and Distributor Funnels with a vinyl type dressing		

**QUBICA AMF**  
**XLi EDGE**  
**PINSPOTTER**

**Every 25,000 Frames**

Clean the PBL Assembly & Uprail Assembly – check for loose hardware		
Clean the Ball Door Exit, Lift Arm, and LBS Paddle, – check for loose hardware		
Clean the EDGE Performance Lift Inner & Outer Shells, Plows, Flight Cups, Tabs, & Carrier Rails with diluted AP3 Cleaner, then apply a vinyl type dressing		
Clean the Pit Conveyor Belt		
Service the Table Assembly (see subsection 4.5.1)		
Service the Sweep Assembly (see subsection 4.5.2)		
Service the Cushion Assembly (see subsection 4.5.3)		
Service the Distributor Clutch Assembly (refer to the <i>XLi EDGE Distributor Manual</i> )		
Service the Shuttle Assembly (see subsection 4.5.5)		
Complete 25,000 Frame Scheduled Lubrication (refer to Section 4.3)		



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*QubicaAMF XLi EDGE Pinspotter*

**QUBICAAMF**  
**XLi EDGE**  
**PINSPOTTER**

**Every 100,000 Frames**

Clean the Machine Framework with a water-based cleaner.		
Check all Machine Belts for wear and cracking, replace as needed.		
Check and tighten Front End Unistrut Jackscrew Jam Nuts.		
Check for missing Back End Jackscrew Locks.		
Check alignment of Spot/Respot Cam to Spot/Respot Levers (see subsection 4.5.6)		
Check centering of Sweep and Table Home Sensor Disc (see subsection 4.5.7)		
Check the Sweep Home Stopping Position (see subsection 4.5.8)		
Check the Table Home Stopping Position (see subsection 4.5.9)		
Check LBS operation (refer to the <i>Positive Ball Lift (PBL) Manual</i> )		

**100,000 frame schedule continued on next page**

**QUBICA  AMF**  
**XLi *EDGE***  
**PINSPOTTER**

**Every 100,000 Frames**

Clean the Distributor Assembly (refer to the <i>XLi EDGE Distributor Manual</i> )		
Service the Distributor Drive Shaft Assembly (refer to the <i>XLi EDGE Distributor Manual</i> )		
Service the Cushion Shock Assembly (see subsection 4.5.13)		
Service the Down Sweep and Transition Track (see subsection 4.5.14)		
Service the Front End Motor (Sweep & Table) Brakes & Encoders (refer to the <i>XLi EDGE Motor &amp; Gearbox Manual</i> )		
Service the Sweep Motor & Gearbox (Sweep & Table) Brakes & Encoders (refer to the <i>XLi EDGE Motor &amp; Gearbox Manual</i> )		
Service the Table Motor & Gearbox (Sweep & Table) Brakes & Encoders (refer to the <i>XLi EDGE Motor &amp; Gearbox Manual</i> )		
Service the Backend Motor & Gearbox (Sweep & Table) Brakes & Encoders (refer to the <i>XLi EDGE Motor &amp; Gearbox Manual</i> )		
Complete 100,000 Frame scheduled Lubrication (refer to Section 4.3)		



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*QubicaAMF XLi EDGE Pinspotter*

**QUBICAAMF**  
**XLi EDGE**  
**PINSPOTTER**

**Every 200,000 Frames**

Service the EDGE Performance Lift and Track/Chain Assembly (refer to the <i>EDGE Performance Lift Pinspotter Manual Supplement</i> )		
Service the Pit Conveyor Rollers and Pit Assembly (see subsection 4.5.20)		

**Every 400,000 Frames**

Service the Positive Ball Lift (PBL) Assembly (refer to the <i>Positive Ball Lift (PBL) Manual</i> )		
Service the Light Ball Sensor (LBS) Assembly (refer to the <i>Positive Ball Lift (PBL) Manual</i> )		
Service the Distributor Assembly (refer to the <i>XLi EDGE Distributor Manual</i> )		
Service the Table Drive (see subsection 4.5.24)		
Service the Shuttle Rod Assembly (see subsection 4.5.25)		
Service the Shifter and Cam Link Needle Bearings (see subsection 4.5.26)		

### **4.4.3 PINSPOTTER PROTECTION DURING LANE REFINISHING (Wood Lanes Only)**

During the resurfacing or refinishing of wood lanes, dust particles and aerosols from the refinishing agents can settle on operating parts of the pinspotter and cause serious problems when operations are resumed. To prevent problems, the following precautionary measures must be observed:

#### **4.4.3.1 Refinishing Wood Lanes**

The purpose of this protection is to prevent aerosols from epoxies, urethanes, and varnishes from depositing on exposed electrical contacts. When cured, these substances act as electrical insulators making the unit inoperative.

1. Seal all motor ventilating openings using masking tape or plastic wrap.
2. Cover and seal the chassis.

#### **4.4.3.2 Resurfacing Wood Lanes**

1. Cover all open gearing, delicate assemblies, and operating surfaces with rags, newspaper, or plastic. This prevents dust particles from clinging to the mechanisms, which can cause mechanical binds.
2. Cover any exposed part that has an oily or greasy surface.
3. After resurfacing is complete, all protection except on motors and chassis can be removed.
4. Wipe down the entire pinspotter with a damp cloth.
5. After the refinishing process is completed **AND THE BUILDING IS FREE OF ALL VAPORS FROM THE REFINISHING AGENTS**, motor and chassis protection may be removed.

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**NOTE:** The sweep assembly may be removed, if necessary, in order to permit the resurfacing machinery to reach the back of the pin deck area.

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## *QubicaAMF XLi EDGE Pinspotter*

### **4.4.4 LANE AND PINSPOTTER CLEANING**

#### **4.4.4.1 Lane Cleaning**



**Turn off the power to the pinspotters and remove the power plug before cleaning the lanes.**

1. For daily lane cleaning, TURN OFF POWER TO THE PINSPOTTER either at the mask, the chassis, or at the Manager's Control Unit.
2. Knock the pins into the pit with a mop or broom.
3. After all the lanes have been cleaned, turn on the pinspotters and press the cycle buttons or tenth frame switches to make the pinspotter ready for the first ball.

#### **4.4.4.2 Pinspotter Cleaning**



**Turn off the power to the pinspotters and remove the power plug before cleaning the pinspotter.**

The pinspotter must be kept clean to provide satisfactory service to the bowler. It is important to maintain the cleaning schedule provided in this section.

##### **Each Week**

- A. Wipe the following assemblies with a cloth dampened with a pin cleaner such as "Topshot".
  - Inside the bin and spotting cups
  - Pit carpet
  - Orienter pan and distributor funnels
- B. Follow up by wiping down the items listed above with a vinyl dressing such as Armor All®
- C. Vacuum between the kickback plates of adjacent machines as well as under the light ball sensor and rudder arm assembly.
- D. Vacuum under the carpet.

The EDGE Performance lift should be completely wiped down with diluted AP3 cleaner and dressed with a vinyl dressing every 25,000 frames.



**4.4.5 PIN CHANGING PROCEDURE**

1. Cycle the pinspotter to spot a full set of pins on the pin deck and to store a full set in the bin pockets.
2. Push the *Sweep Run* button to sweep all of the pins into the pit.
3. **Turn power to the pinspotter OFF.**
4. Remove the old pins from the pit area, and replace with a new set.
5. Turn the pinspotter on and press the cycle button. This will place the second old set of pins on the lane and start loading the bin with new pins.
6. When the new set of pins has been loaded into the bin, repeat steps 2, 3, and 4.
7. Press the cycle button to complete the pin changing procedure.



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*QubicaAMF XLi EDGE Pinspotter*

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# SECTION 4.5

## Maintenance Procedures

### CONTENTS

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## **4.5 MAINTENANCE PROCEDURES**

This section provides specific preventive maintenance instructions for servicing pinspotters on a frequency based on frame count. This has been determined to be a more reliable and efficient method because it is based on actual machine use. Generally, the longer the service interval, the more significant the maintenance activity. Repeat each maintenance item at every multiple of the indicated frame count. For example, a maintenance activity performed at 25,000 frames would be repeated at 50,000, 75,000, 100,000, 125,000, etc. A 100,000 frame maintenance activity is repeated at 200,000, 300,000, etc. Maintenance may need to be done more frequently based on a pinspotter's age, mechanical condition, and repair history.

This section, as well as the corresponding sections in the accompanying manuals, provides details relating to the required pinspotter maintenance. For example, simply stating "Service the Distributor Clutch Assembly" in the Preventive Maintenance Schedule (Section 4.4) doesn't provide the technician with enough information to perform the task as intended by the manufacturer. The additional information, which in this example is located in the accompanying *XLi EDGE Distributor Manual*, gives specific details that should result in more consistent pinspotter performance from machine to machine, from technician to technician, and from center to center.

While each maintenance activity is written as a standalone instruction, other maintenance items that are due to be performed can be grouped together and performed at the same time in order to minimize repeating activities and to take advantage of such things as tagging out the pinspotter, gathering tools, cleanup, etc.

### **25,000 Frame Maintenance**

#### **4.5.1 Service the Table Assembly**

1. Run Table to the pin deck (spotting the pins). Shut off the pinspotter.
2. Remove power from the pinspotter. Follow appropriate Lock out/Tag out procedures
3. Remove the bowling pins from the spotting cups
4. Clean the Spotting Cups with a water-based cleaner.
5. Clean the Table, Respot Cells, Linkages, Shifter Mechanism, Yoke, Spot and Respot Rods, and Leg Supports with a cloth sprayed with WD-40.
6. Check for broken, worn, or loose parts or hardware. Tighten or replace as necessary.
7. Apply required lubrication following the lubrication schedule.
8. Restore power to the pinspotter, and return the Table to the Home position.
9. Cycle the pinspotter. Check pin spotting and respotting for operational issues. Make adjustments as necessary following the applicable procedures in this Service Manual.

#### **4.5.2 Service the Sweep Assembly**



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## ***QubicaAMF XLi EDGE Pinspotter***

1. Remove power from the pinspotter. Follow appropriate Lock out/Tag out procedures. The Sweep will have to be cranked to the various positions to allow access to all areas.
2. Wipe the Sweep bar, links, and arms with a cloth sprayed with WD-40.
3. Check for broken, bent, worn, or loose parts or hardware. Tighten, repair, or replace as necessary.
4. Visually inspect the corners of the Sweep Mounts for cracks. Replace if cracks are found.
5. Apply required lubrication following the lubrication schedule.
6. Restore power to the pinspotter, and return the Sweep to the Home position.
7. Cycle the pinspotter. Check the Sweep for operational issues. Make adjustments as necessary following the applicable procedures in this Service Manual.

### **4.5.3 Service the Cushion Assembly**

1. Remove power from the pinspotter. Follow the appropriate Lock out/Tag out procedures.
2. Check for loose hardware at the Cushion Tube Weldment to Cushion Plank, Box Support to Kickback Plate, and Hanger Ear to Cushion Tube Weldment.
3. Check pad placement (should straddle Cushion Tube Weldment Upright - ball door side).
4. Check for broken, bent, worn, or loose parts or hardware. Tighten, repair, or replace as necessary.

### **4.5.4 Service the Distributor Clutch Assembly**

**Refer to the *XLi EDGE Distributor Manual* for information relating to this maintenance activity.**

### **4.5.5 Service the Shuttle Assembly**

1. Lower the table to respot height.
2. Remove power from the pinspotter. Follow the appropriate Lock out/Tag out procedures.
3. Remove the Shuttle Tension Spring.
4. Remove the Shuttle out of one of the slides on one side by loosening the two bolts and nuts holding the slide bracket to the rear frame of the Durabin, and then pop the Shuttle out of the slide. Lower the Shuttle. This provides easier access to the hardware on the Shuttle.
5. Check the Pin Holders (cookies) for wear. Replace as needed.

6. Check for bent or broken bin straps. Replace as needed.
7. Check for bent tubes. Straighten or replace as needed.
8. Check for cracked or broken Shuttle Arm Brackets. Replace as needed.
9. Check for loose or missing hardware. Tighten or replace as needed.
10. Place the Shuttle in the slides, holding the Slide Bracket tight to the Shuttle, and tighten the bolts and nuts holding the Slide Bracket to the rear frame of the Durabin.
11. Install the Shuttle Tension Spring.
12. Restore power to the pinspotter. Cycle the pinspotter and observe for correct Shuttle operation. Adjust the Shuttle Rod as needed. If pins are not shuttling, decrease the Shuttle Rod length. If pins are double shuttling, increase the Shuttle Rod length.

### **100,000 Frame Maintenance**

#### **4.5.6 Check the Alignment of the Spot and Respot Cams and Levers**

1. Remove power from the pinspotter. Follow the appropriate Lock out/Tag out procedures.
2. Visually observe if the Spot Lever and Respot Lever Cam Followers are in alignment with the Spot and Respot Cam surfaces. If not, visually observe if the Shuttle Lever Cam Follower is in alignment with the Shuttle Cam surface. If not, the Table Drive Shaft may have moved.
3. To correct, loosen the Locking Collar by loosening the setscrew holding it to the shaft, and using a punch and hammer at the hole, rotate the collar counterclockwise.
4. Carefully move the Table Drive Shaft until the Spot and Respot Lever Cam Followers are in alignment with the Spot and Respot Cam surfaces. A block and hammer can be used to tap the shaft into position.
5. Tighten the Bearing Locking Collar by rotating the collar clockwise using a punch and hammer at the hole. Tighten the Locking Collar setscrew.
6. Check the alignment of Table Drive Clevis, centered between the forks of the Torque Tube. Adjust if necessary.
7. Restore power and cycle the pinspotter. Observe for correct pinspotter operation.

#### **4.5.7 Check Centering of the Sweep and Table Home Sensor Discs**



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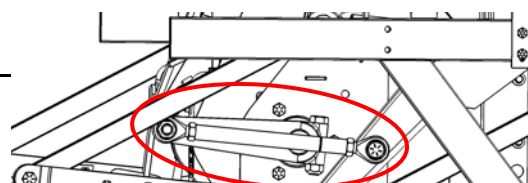
## ***QubicaAMF XLi EDGE Pinspotter***

1. Remove power from the pinspotter by turning off the Main Power Breakers on the Control Chassis. On SmartGuard™-equipped pinspotters, open the Safety System Disconnect Switch.
2. Visually observe the clearance between the Sweep and Table Home Sensor Discs and their guards. The discs should not contact the guards or the lenses of the sensors.
3. If adjustment is required, first check the alignment of Spot and Respot Cams to the Spot and Respot Levers. If that alignment is incorrect, do that adjustment first in accordance with Section 4.5.6.
4. If the alignment of Spot and Respot Cams to Spot and Respot Levers is correct and the Home Disc is in contact with the guard or the lens of the sensor, center the disc as follows:
  - a) Crank the Sweep or Table Motor until the Home Sensor LED is on. On SmartGuard™-equipped pinspotters, it is necessary to connect a 9-volt DC power source to the Home Disc connector in order to get the LED to turn on with the Safety System Disconnect open.
  - b) Loosen the setscrew holding the Home Sensor Disc to the drive shaft.
  - c) Move the Home Sensor Disc on the shaft until it is centered in the slot of the Home Sensor Guard, and the Home Sensor LED is on.
  - d) Tighten the setscrew holding the Home Sensor Disc to the shaft.
5. Crank the Sweep or Table Motor until the Home Sensor Disc makes one complete revolution, check that the disc doesn't contact the sensor or its guard. If it does, the disc may have to be readjusted or replaced if badly bent.
6. Restore power and cycle the pinspotter. Observe for correct pinspotter operation.

### **4.5.8 Check the Sweep Home Stopping Position**

1. Cycle the pinspotter one complete cycle.
2. Remove power from the pinspotter by turning off the Main Power Breakers on the Control Chassis. On SmartGuard™-equipped pinspotters, open the Safety System Disconnect Switch.
3. Check that the Sweep Home Sensor LED is on. If not, crank the sweep motor until the Sweep Home Sensor LED comes on. On SmartGuard™-equipped pinspotters, it is necessary to connect a 9-volt DC power source to the Home Disc connector in order to get the LED to turn on with the Safety System Disconnect open.

4. Visually observe the location of the Sweep Motor Tie Rod Assembly in relation to the





Sweep Crank Arm and Sweep Drive Shaft. The Sweep Motor Tie Rod Assembly should bisect the Sweep Crank Arm and Sweep Drive Shaft (see Figure at right). If not, crank the Sweep Motor until the Sweep Motor Tie Rod Assembly bisects the Sweep Crank Arm and Sweep Drive Shaft.

5. Loosen the setscrew holding the Home Sensor Disc to the Sweep Drive Shaft.
6. Rotate the Home Sensor Disc on the Sweep Drive Shaft until the Home Sensor LED comes on, keeping the disc centered in the slot of the Home Sensor Guard.
7. Tighten the setscrew holding the Home Sensor Disc to the Sweep Drive Shaft.
8. The Chassis Guard Settings will have to be adjusted if the Home stopping position was changed.
9. Restore power and cycle the pinspotter. Observe for correct pinspotter operation.

#### **4.5.9 Check Table Home Stopping Position**

1. Cycle the pinspotter one complete spotting cycle.
2. Remove power from the pinspotter by turning off the Main Power Breakers on the Control Chassis. On SmartGuard-equipped pinspotters, open the Safety System Disconnect Switch.
3. Check that the Table Home Sensor LED is on. If not, crank the Table Motor until the Table Home Sensor LED comes on. On SmartGuard™-equipped pinspotters, it is necessary to connect a 9-volt DC power source to the Home Disc connector in order to get the LED to turn on with the Safety System Disconnect open.
4. There should be a gap of approximately ½ inch between the Table Drive Eccentric's white nylon roller and the rear edge of the Cam Link as viewed from above. If not, crank the Table Motor until you obtain the ½ inch between the Table Drive Eccentric's white nylon roller and the rear edge of the Cam Link.
5. Loosen the setscrew holding the Home Sensor Disc to the Table Drive Shaft.
6. Rotate the Home Sensor Disc on the Table Drive Shaft until the Home Sensor LED comes on, keeping the disc centered in the slot of the Home Sensor Guard.
7. Tighten the setscrew holding the Home Sensor Disc to the Table Drive Shaft.
8. Restore power and cycle the pinspotter. Observe for correct pinspotter operation.

#### **4.5.10 Check Light Ball Sensor Operation**

**Refer to the *Positive Ball Lift Manual* for information relating to this maintenance activity.**



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## ***QubicaAMF XLi EDGE Pinspotter***

### **4.5.11 Clean the Distributor Assembly with a Water-Based Cleaner**

Refer to the *XLi EDGE Distributor Manual* for information relating to this maintenance activity.

### **4.5.12 Service the Distributor Drive Shaft Assembly**

Refer to the *XLi EDGE Distributor Manual* for information relating to this maintenance activity.

### **4.5.13 Service the Cushion Shock Assembly**

1. Run the sweep to the 1<sup>st</sup> Guard position.
2. Remove power from the pinspotter. Follow the appropriate Lock out/Tag out procedures.
3. Remove the Cushion Shock Assembly from the Cushion Assembly by opening the "X" washer with a pair of pliers and pushing the pin out of the hanger ear, shock grommet, and the Cushion Tube Weldment. (To ease the removal of the pin, loosen the nuts and bolts attaching the hanger ear to the Cushion Tube Weldment).
4. Remove the Cushion Shock Assembly from the Motor Mount Weldment by opening the "X" washer with a pair of pliers, and pushing the pin out of the Motor Mount Weldment and Cushion Shock Assembly grommet.
5. Check the grommets and bushings for damage or excessive wear. Replace as needed.
6. Lubricate the bushing and grommet using brake fluid only.
7. Remove the compression spring from the shock assembly by loosening the bolt holding the collar. Slide the collar, spring, and spring seating washer off the shock.
8. Clamp the shock end only (not the piston housing) in a vise. Press the piston rod into the housing, checking for binds and/or little-to-no resistance. Replace as needed.
9. Check the piston housing for dents or leaking fluid. Replace as needed.
10. Install the compression spring, collar, and spring seating washer.
11. Insert a 1/2-inch open-end wrench between the coils of the spring at the point where the piston rod exits the piston housing so that the wrench jaws straddle the piston rod.
12. Hold the wrench against the piston housing while turning the spring. When the length of the spring is 6¼ inches, slide the collar against the spring, tighten the collar's lock screw, and remove the wrench.
13. Install the cushion shock assembly on the Motor Mount Weldment by inserting the retaining pin through the holes in the Motor Mount Weldment and the Cushion Shock Assembly. There should be one large washer on each side of the Cushion Shock Assembly located between the Cushion Shock and the Motor Mount Weldment

***Maintenance Procedures***

14. Attach the Cushion Shock Assembly to the Cushion Tube Weldment by inserting the pin through the holes in the Cushion Tube Weldment, the Cushion Shock Assembly, and the hanger ear capturing a large washer on each side of the Cushion Shock. To ease retaining pin installation, loosen the nuts and bolts attaching the hanger ear to the Cushion Tube Weldment. Tighten the hanger ear nuts and bolts after the shock is in place.
15. Restore power to the pinspotter.
16. Run the Sweep to the Home position.
17. Cycle the pinspotter and observe for correct operation.

**4.5.14 Service the Downsweep and Transition Track**

1. Run both Sweeps of the pair of pinspotters to the 1<sup>st</sup> Guard position.
2. Remove power from both pinspotters. Follow the appropriate Lock out/Tag out procedures.
3. Remove the PBL Upper Guard Weldments, if present, by lifting it off the rear brackets and the Center Bracket Assembly. Set it aside.
4. Remove the Ball Wiper Cloth by removing the Wiper Cloth Rings from Wiper Supports. Set it aside.
5. Remove the Dust Trap by unsnapping the retaining straps around the Wiper Supports. Set it aside.
6. Clean the Downsweep Weldment and Transition Track with a cloth dampened with a water-based cleaner.
7. Check the Downsweep Weldment and Transition Track for broken parts. Replace or repair as needed.
8. Check that the Downsweep is centered between the pinspotter frames. Correct as needed.
9. Check for loose, worn, or missing hardware on the Downsweep Weldment, Transition Track, and the Track Support Brackets. Tighten or replace as needed.
10. Install the Ball Wiper Cloth and Dust Trap.
11. Install the PBL Guard Weldment.
12. Restore power to the pinspotters and run both Sweeps to the Home position.

**4.5.15 Service the Front End Motor (Table & Sweep) Brakes and Encoders**

Refer to the *XLi Motor & Gearbox Manual, 400-088-017*, for information relating to this maintenance activity.



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## ***QubicaAMF XLi EDGE Pinspotter***

### **4.5.16 Service the Sweep Motor & Gearbox**

Refer to the *XLi Motor & Gearbox Manual, 400-088-017*, for information relating to this maintenance activity.

### **4.5.17 Service the Table Motor & Gearbox**

Refer to the *XLi Motor & Gearbox Manual, 400-088-017*, for information relating to this maintenance activity.

### **4.5.18 Service the Back End Motor & Gearbox**

Refer to the *XLi Motor & Gearbox Manual, 400-088-017*, for information relating to this maintenance activity.

**200,000 Frame Maintenance****4.5.19 Service the EDGE Performance Lift**

Refer to the *EDGE Performance Lift Pinspotter Manual Supplement* for information relating to this maintenance activity.

**4.5.20 Service the Pit Conveyor Rollers and Pit Assembly**

1. Sweep the pins from the pin deck and allow the bin to fill.
2. Run the Sweep to 1<sup>st</sup> Guard position on the pinspotter being worked on as well as on the adjacent pinspotters.
3. Remove power from all 3 pinspotters. Follow the appropriate Lock out/Tag out procedures.
4. Remove the EDGE Performance Lift.
5. Remove the Paddle from the Rudder Arm.
6. Remove the Cushion Assembly and set aside.
7. Disconnect the Pit Conveyor Drive Belt from the Pit Conveyor Pulley on the rear roller, and remove the pulley from the roller.
8. Release the front roller from its bearing supports by inserting the Carpet Installing Tool or a pry bar between the front roller and the Tail Plank. Apply pressure toward the rear of the pinspotter. When the Bearing Support Bracket clears the hole in the Kickback Plate, insert a Carpet Pin (792-501-001) or a 7/16-20 x 3/4" bolt into the hole.
9. Remove the front roller by rolling it over the Bounce Board and out the Ball Exit Opening into the adjacent pinspotter.
10. Remove the rear roller by unhooking the Rear Roller Support from its bracket. Tip the rear roller from its bearing support; then, pass it into the adjacent pinspotter through the access hole in the Kickback Plate on the side opposite the ball exit side.
11. If the Pit Conveyor Belt does not need to be replaced, mark the direction of rotation on the belt.
12. Remove the Bounce Board Assembly and Conveyor Belt by removing the 4 nuts and washers that secure the Vibration Dampeners to the studs on the Pit Support Brackets. Fold the Pit Conveyor Belt onto the Bounce Board Assembly and lift the Bounce Board off the studs and out of the back of the pinspotter.
13. Sweep or vacuum the area beneath the area previously covered by the Bounce Board Assembly.
14. Check for loose, worn, or missing hardware. Tighten or replace as needed.



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## ***QubicaAMF XLi EDGE Pinspotter***

15. Release the spring tension on the Front Bearing Supports using the carpet tool and flag, remove the Carpet Pins or 1/4-20 bolts and allow the Front Bearing Supports to rotate forward. Use a spring puller to remove the spring from the stud on the side plate.
16. Remove the snap rings with snap ring pliers and slide the Bearing Supports off the Pivot Studs. Clean the studs and Bearings Supports.
17. Check the studs for wear. Replace as needed.
18. Check the Bearing Support Bushings. Replace as needed.
19. Check the condition of the rubber support and the metal "ears" that hold the rubber in place. Replace as needed.
20. Lubricate the Pivot Studs and Bearing Support Bushings with grease.
21. Install the Bearing Supports and retain with the snap rings.
22. Attach the springs to the stud on the side plate using a spring puller. With the carpet tool and flag, rotate the Front Bearing Supports until a Carpet Pin (792-501-001) or a 7/16-20 x 3/4" bolt can be inserted into the hole in the side plate to hold the Front Bearing Support under tension.
23. Check the Rubber Supports, Support Retainer, and the Support Weldment that hold the rear roller in place for excessive wear. Replace as needed.
24. Check the Pit Support Brackets for worn or broken studs or cracking. Replace as needed.
25. Check the condition of the Kickback fiber panels and rivets. Replace as needed.
26. Remove the Pit Conveyor Belt from the Bounce Board.
27. Check the Bounce Boards for cracks and excessively worn or damaged areas. Replace as needed.
28. Check the support channels and angle support for cracks or broken areas. Replace as needed.
29. Check the Vibration Dampeners for deformity or cracks and rips in the rubber. Replace as needed.
30. Check that the Bonding Strap is in good condition. Replace as needed.
31. Remove any belt fabric from the bearing area on the front and rear rollers.
32. Check the condition of the bearings on the front and rear rollers. Replace as needed.
33. Check for excessive play in the Front Roller Assembly halves, or if the front roller was knocking during operation, replace or rebuild the front roller.
34. Install the Pit Conveyor Belt onto the Bounce Board Assembly. The arrow on the Pit Conveyor Belt must point in the direction of belt rotation.

***Maintenance Procedures***

35. Wrap the Pit Conveyor Belt around the Bounce Plate Assembly and place it in the Pit on the Pit Support Brackets. Place the free end of the Bonding Strap over the stud of the Pit Support Bracket and install the washers and 5/16-inch lock nuts onto the studs at each corner of the Bounce Plate Assembly. Tighten securely. Make sure that the Pit Conveyor Belt is free and not pinched between the Bounce Board and the brackets.
36. Install the rear roller by passing it from the adjacent pinspotter on the side opposite the ball exit side of the pinspotter, through the opening in the rear of the Kickback Plates, and through the Pit Conveyor Belt. Place the rear roller bearings in the Bearing Supports and hook the handle of the Rear Roller Support Weldment under the retaining tab on the Kickback Plate.
37. Install the Pit Conveyor Drive Pulley and belt.
38. Install the front roller into the pinspotter by passing it through the Ball Exit Opening of the adjacent pinspotter and into the Pit Conveyor Belt on top of the Bounce Board.
39. Install the front roller in the Bearing Supports by grasping the end of the roller assembly on the top only and roll it into the support assembly. Repeat for the other end of the roller. Make sure that the roller bearings are fully seated in the Bearing Supports. Remove the Carpet Pins (792-501-001) or a 7/16-20 x 3/4" bolts holding the Bearing Support Brackets by inserting the Carpet Installing Tool or a pry bar between the front roller and the Tail Plank and applying pressure toward the rear of the pinspotter to allow removal of the pins or bolts.
40. Install the Paddle on the Rudder Arm.
41. Install the Cushion Assembly.
42. Install the EDGE Performance Lift.
43. Return power to the pinspotters.
44. Run the Sweep to the Home position.
45. Depending on the type of Pit Conveyor Belt installed (if new), a break-in period may be required.

**400,000 Frame Maintenance****4.5.21 Service the Positive Ball Lift Assembly**

Refer to the *Positive Ball Lift (PBL) Manual* for information relating to this maintenance activity.

**4.5.22 Service the Light Ball Sensor (LBS) Assembly**

Refer to the *Positive Ball Lift Manual* for information relating to this maintenance activity.



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## ***QubicaAMF XLi EDGE Pinspotter***

### **4.5.23 Service the Distributor Assembly**

Refer to the *XLi EDGE Distributor Manual* for information relating to this maintenance activity.

### **4.5.24 Service the Table Drive**

1. Run the Sweep to the 1<sup>st</sup> Guard position.
2. Run the Table to the pin spotting height.
3. Remove power from the pinspotter. Follow the appropriate Lock out/Tag out procedures.
4. Manually crank the Table up a couple of inches, slide a 2x4 under it in the center, then crank the Table down so that it rests on the 2x4. The Table must be supported to allow the bolt to be removed from the Clevis.
5. Remove the nut and bolt securing the Clevis to the Table Torque Tube. Set the bearing and spacers aside. Try to keep the Clevis from turning on the rod end to prevent having to adjust the Table height during reassembly.
6. Loosen the nut and bolt clamping the Table Drive Assembly to the Table Drive Shaft.
7. Remove the Table Drive Assembly from the Table Drive Shaft. Be careful of the key.
8. Remove the Clevis Rod End from the Table Eccentric Drive.
9. Check the Clevis for wear. Replace as needed.
10. Check the Clevis Rod End Bearings for excessive play or binding. Replace as needed.
11. Remove the Latch Arm Assembly, Link Actuator Assembly, and Latch Assembly by removing their corresponding roll pins and shafts from the Table Drive Housing.
12. Check the bushings in the Table Drive Housing and the Latch Assembly Sleeve for excessive play. Replace as needed.
13. Check all of the actuating mechanism for loose or worn parts. Replace as needed.
14. Remove the locking nut from the bolt that is securing the Table Drive Eccentric to the Table Drive Housing.
15. Remove the Table Drive Eccentric from the housing.
16. Clean all the grease from the roller bearings.
17. Check that the roller bearings rotate freely. If not replace.
18. Apply a liberal amount of new grease to the roller bearings and inside the housing.



***Maintenance Procedures***

19. Attach the Table Drive Eccentric to the Table Drive Housing with the bolt. Tighten the bolt completely and then back off 1/3 turn.
20. Install the locknut on the bolt, tightening the nut with a socket while holding the bolt with a wrench.
21. Reassemble all components of the Table Drive Assembly including the Clevis and Rod End.
22. Install the Table Drive Assembly onto the Table Drive Shaft, centering the Clevis between the Torque Tube arm forks where the Clevis sits, and tighten the nut and bolt that secures the Table Drive Assembly to the Table Drive Shaft.
23. Check the bearing that supports the Torque Tube for excessive play or wear. Replace as needed.
24. Install the bolt and nut that secures the Clevis to the Torque Tube, capturing the bearing and spacers and tighten the bolt and nut.
25. Crank the Table up slightly and remove the 2x4.
26. Return power to the pinspotter.
27. Run the Table through one complete cycle.
28. Run the Sweep and Table to the Home position.
29. Cycle the pinspotter and observe for correct operation.
30. If pins spot incorrectly, fall over, or if the Table is contacting the pin deck, then Table adjustments are needed.

**4.5.25 Service the Shuttle Rod Assembly**

1. Run the Sweep to the 1<sup>st</sup> Guard position.
2. Remove power from the pinspotter. Follow the appropriate Lock out/Tag out procedures.
3. Remove pins from the Durabin Assembly.
4. Remove the spring from the rear of the Shuttle Assembly. Set it aside.
5. Remove the nuts and bolts that secure the Shuttle Rod Assembly to the Shuttle Operating Rod Lever and the Front End Lever Assembly of the Shuttle Actuator, and remove the Shuttle Rod Assembly from the pinspotter.
6. Insert a pin punch in the hole in the larger diameter tube off the Shuttle Rod Assembly. The pin punch must pass thru the hole of the inner rod and out the other side of the large tube. The inner rod can be turned to align the holes with a locking-type pliers or another pin punch in the hole in the smaller diameter tube of the Shuttle Rod Assembly.



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7. With the pin punch inserted, place the large diameter tube in a vise, clamping on the large tube.
8. Using locking-type pliers clamped to the smaller diameter tube, rotate the smaller diameter tube in a counterclockwise direction and unscrew the small tube until it separates from the inner rod.
9. Remove the washers and spring from the Shuttle Rod Assembly.
10. Check the washers and spring for excessive wear. Replace as needed.
11. Remove the pin punch from the large tube.
12. Adjust the large tube in the vise so that the large nut (where the rod end attaches) can be loosened and removed.
13. Remove the large nut and then remove the inner rod from the large tube.
14. Clean all parts with a cloth dampened with a water-based cleaner.
15. Check for excessive wear on the inner rod. Replace as needed.
16. Check the rod ends for excessive wear. Replace as needed.
17. Apply a liberal amount of grease inside the large tube where the inner rod goes.
18. Assemble the Shuttle Rod Assembly by reversing the steps above inserting the inner rod through the large diameter tube, the through washer, the spring, and the stepped washer. Apply Loctite<sup>®</sup> 242 or 243 to the threads of the inner rod, and thread it into the smaller diameter tube. Torque to 30-35 ft-lbs (40-47 Nm). Complete the assembly by installing the large nut and rod ends.
19. Install and tighten the nut and bolt to secure the Shuttle Rod Assembly to the Shuttle Operating Rod Lever.
20. Install and tighten the nut and bolt securing the Shuttle Rod Assembly to the Front End Lever Assembly of the Shuttle Actuator.
21. Attach the Shuttle Spring to the rear of the Shuttle.
22. Check for the correct Shuttle Rod adjustment (1 $\frac{3}{4}$ "-2" between rear Shuttle Tube and Durabin frame). Adjust if needed.
23. Return power to the pinspotter.
24. Run the Sweep to the Home position.
25. Cycle the pinspotter and observe for correct Shuttle operation.

**4.5.26 Service the Shifter and Cam Link Needle Bearings**

1. Run the Table to the pin spotting height.
2. Remove power from the pinspotter. Follow the appropriate Lock out/Tag out procedures.
3. Loosen the jam nuts on both rod ends of the Short Rod Assembly that connects the Cam Link to the Actuator Lever Weldment.
4. Turn the rod of the Short Rod Assembly to remove the pressure of the Cam Link against the Cam Follower.
5. Remove the nut and bolt that secures the Short Rod Assembly to the Actuator Lever Weldment.
6. Remove the two nuts and bolts that secure the Cam Link to the Shifter Link Assembly.
7. Remove the Cam Link and Shifter Link Assembly from the shaft.
8. Wipe away excess grease from shaft, Cam Link, and Shifter Link Assembly.
9. Inspect the shaft for excessive wear. Replace as needed. To remove the shaft, loosen the set screw and push the shaft from the Tie Rod Bracket.
10. If the shaft has been removed, install it in the Tie Rod Bracket, but do not tighten the set screw at this time.
11. Inspect the needle bearings in the Cam Link and Shifter Link Assembly for wear. Replace as needed.
12. Apply a liberal amount of grease to the needle bearings.
13. Install the needle bearings, Cam Link, and Shifter Link Assembly on the shaft.
14. Install the spacer and the two nuts and bolts to secure the Cam Link and Shifter Link Assembly. Tighten securely.
15. Tighten the set screw to secure the shaft to the Tie Rod Assembly.
16. Install and tighten the nut and bolt that secures the Short Rod Assembly to the Actuator Lever Weldment.
17. Turn the rod of the Short Rod Assembly so that the Cam Link applies pressure against the Cam Follower. Finger tight only.
18. Tighten the jam nuts on both rod ends of the Short Rod Assembly.
19. Return power to the pinspotter.
20. Run the Table to the Home position.
21. Cycle the pinspotter and observe for correct operation.



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## **4.6 TROUBLESHOOTING**

### **4.6.1 TROUBLESHOOTING TOOLS**

#### **4.6.1.1 CONTINUITY TESTER**

**CAUTION**

Using the continuity tester on live circuits can damage the tester.

#### **1. Open Circuits**

- A. To check the continuity of any wire, disconnect one end of the wire.
- B. Connect one side of the tester to one end of the suspect wire, and the other side of the tester to the end of the disconnected wire.
- C. If the wire is good, the tester should read zero and/or beep. If the wire is open, the tester will not react.

#### **2. Shorts**

- A. To check for a short between two wires, disconnect both ends of the suspect wires.
- B. Connect the tester to one end of each wire. If tester lights, the wires are shorted. If tester does not light, the wires are not shorted.

#### **3. Grounds**

- A. To check for a ground, disconnect both ends of the suspect wire.
- B. Connect one side of the tester to the machine's frame (bare metal) or to a conduit and the other side of the tester to one end of the wire being tested.
- C. If the wire is grounded, the tester should light. If the wire is not grounded, the tester will not light.

#### **4.6.1.2 VOLTAGE TESTER**

**CAUTION**

For use on alternating or direct current (AC or DC) between 80 and 600 volts. All power to the component to be tested should be turned on. Caution should be used when testing live circuits.

- A. To check for voltage, connect the tester across the hot leads (line) on the device to be tested. The neon bulb will glow if voltage is present. When checking across 220 volts, the neon bulb will be twice as bright as when checking 110 volts. **The tester cannot be used**



## QubicaAMF XLi EDGE Pinspotter

### 4.6.2 TABLE TROUBLESHOOTING

#### 4.6.2.1 PROBLEM: Respot cells will not pick up or place pins.

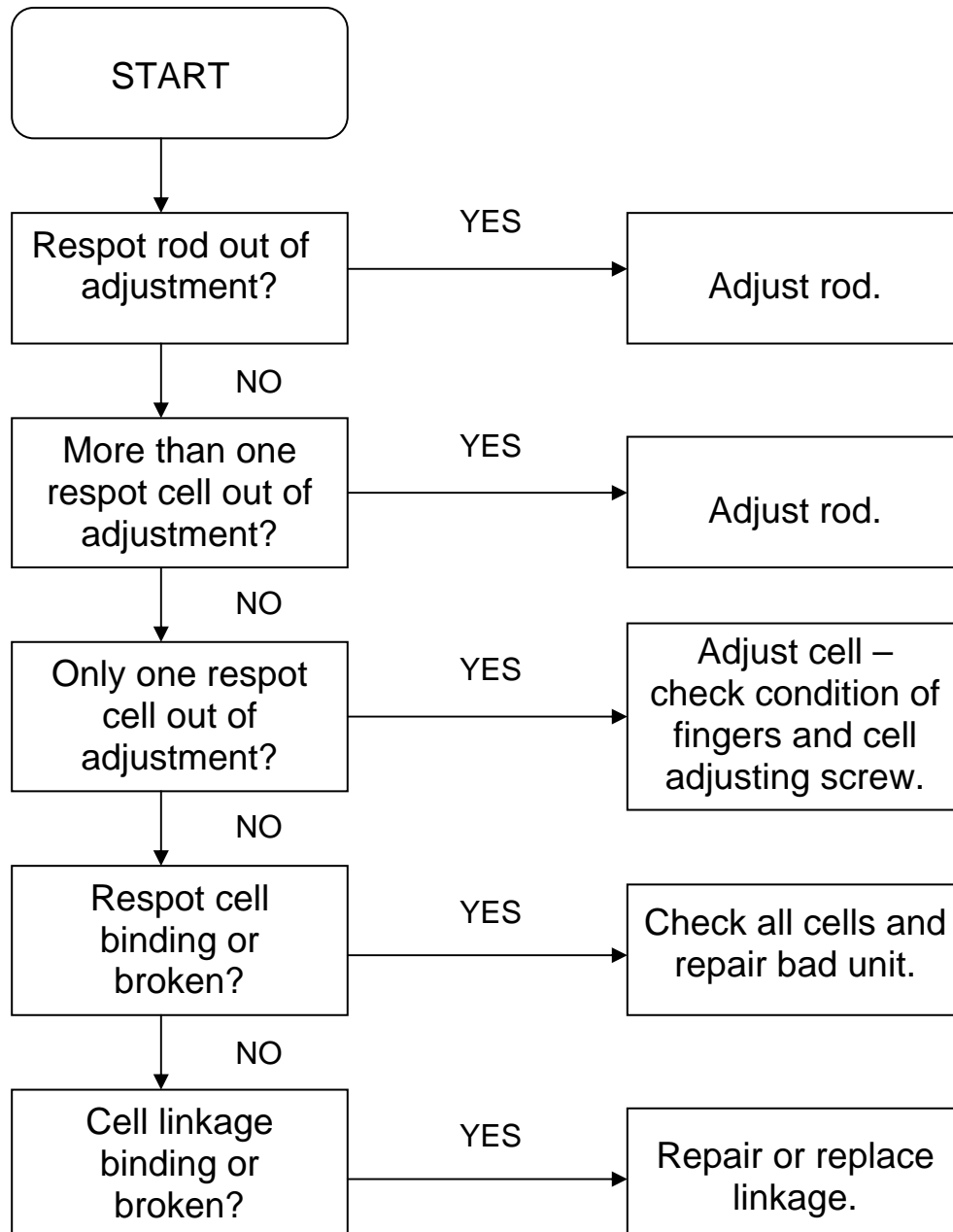
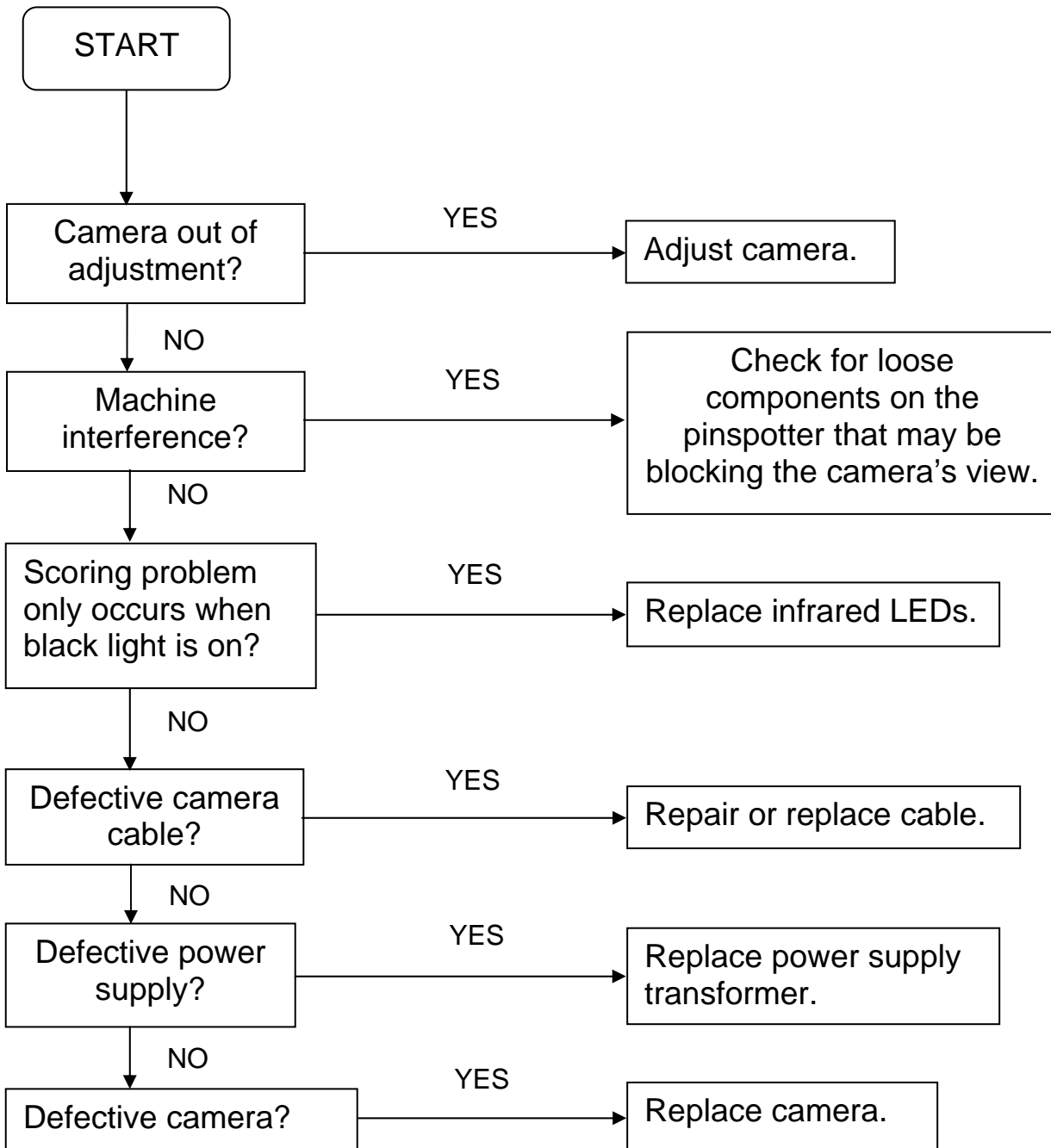


Figure 4.6-1



**4.6.2.2 PROBLEM: Scoring or Pindication Problems (miscounts, no strike cycle, etc.)**



**Figure 4.6-2**



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## QubicaAMF XLi EDGE Pinspotter

### 4.6.2.3 PROBLEM: Table runs continuously.

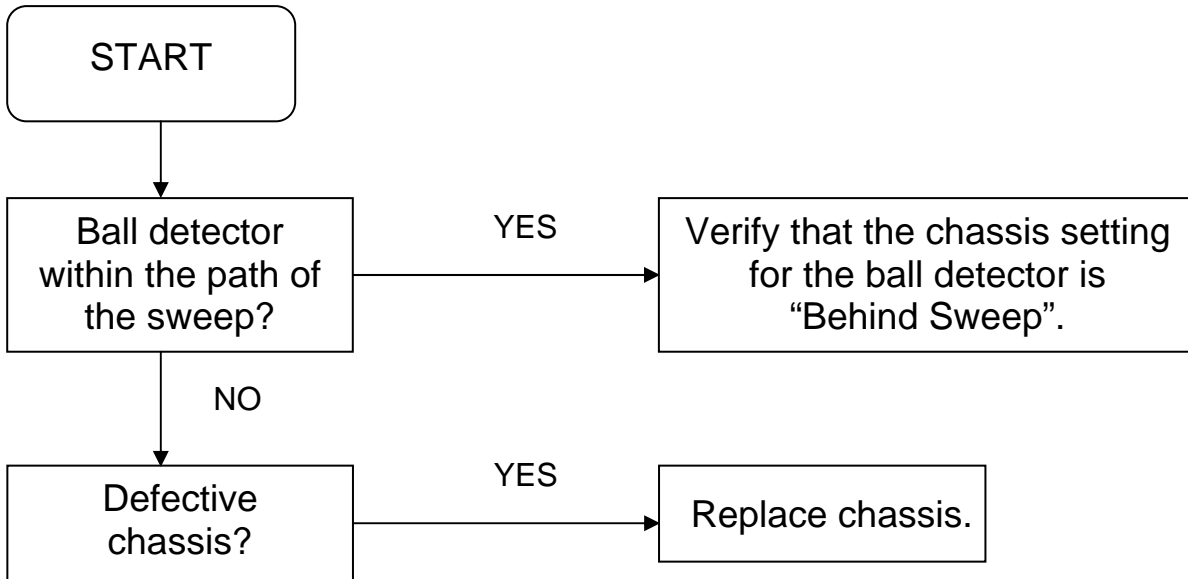
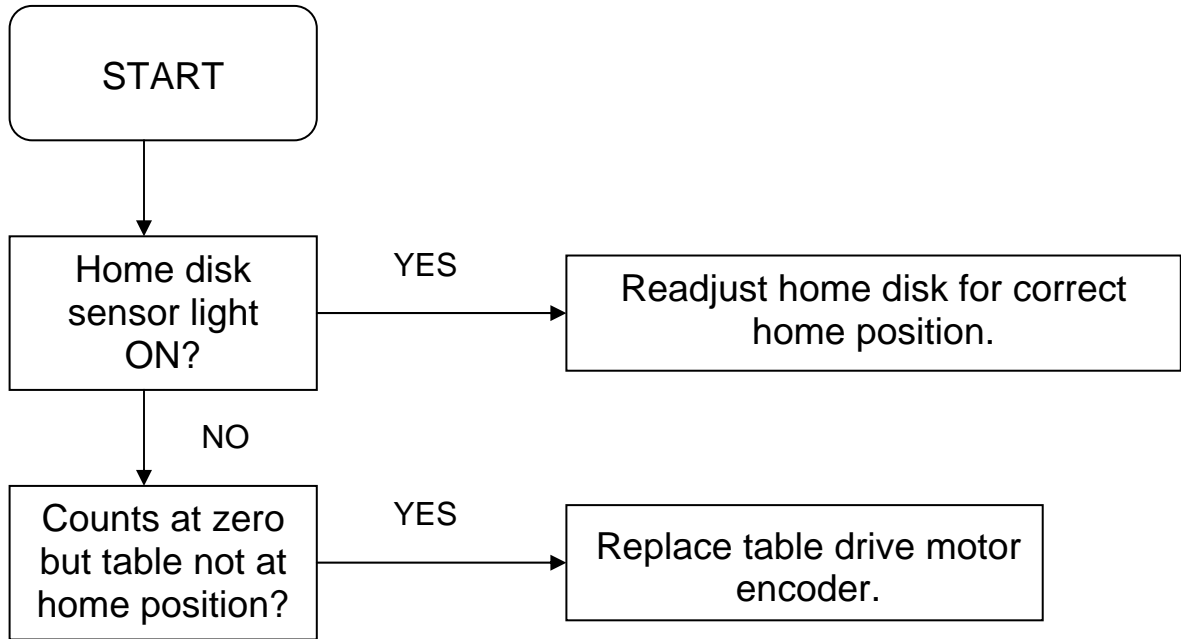


Figure 4.6-3

**4.6.2.4 PROBLEM: Table stops before zero position.**



**Figure 4.6-4**



---

## QubicaAMF XLi EDGE Pinspotter

4.6.2.5 **PROBLEM:** 1<sup>st</sup> ball - sweep goes down and after a time delay the sweep runs and cleans off all the pins and comes back to the guard position. The table does not come down.

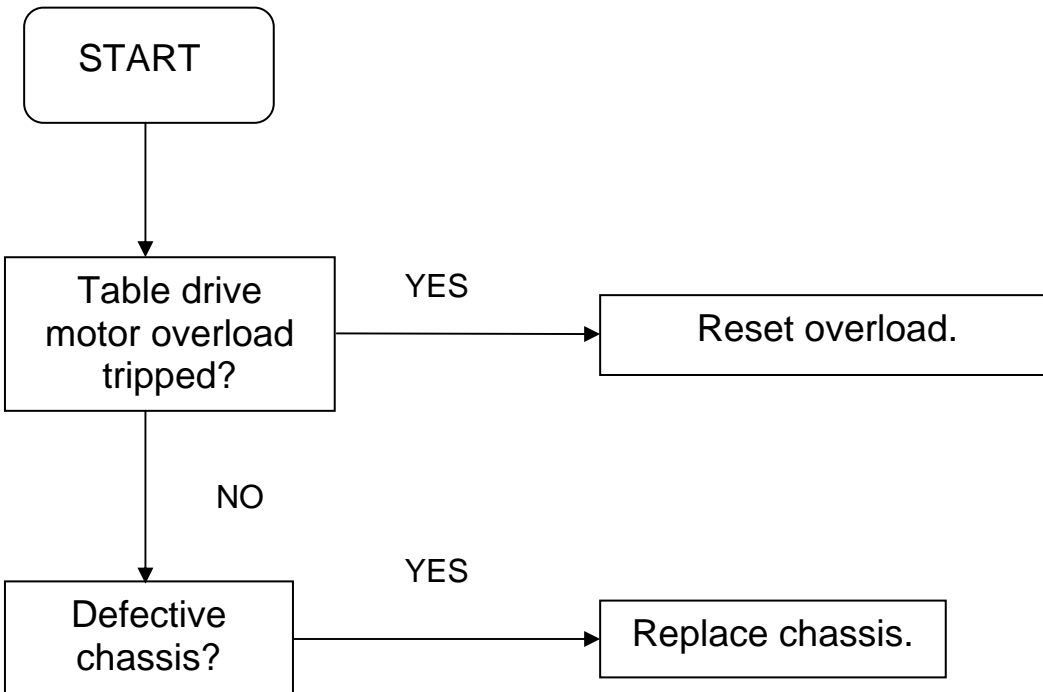
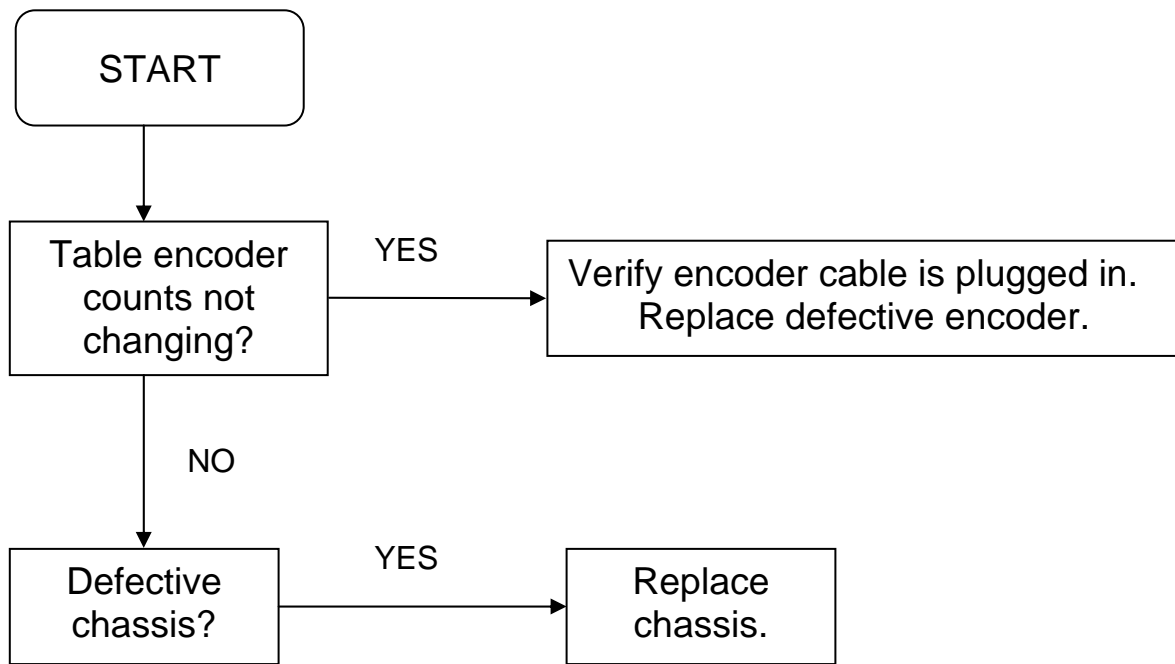


Figure 4.6-5

**4.6.2.6 PROBLEM: 1<sup>st</sup> ball - sweep moves down to the guard position, and the table continues to run.**



**Figure 4.6-6**

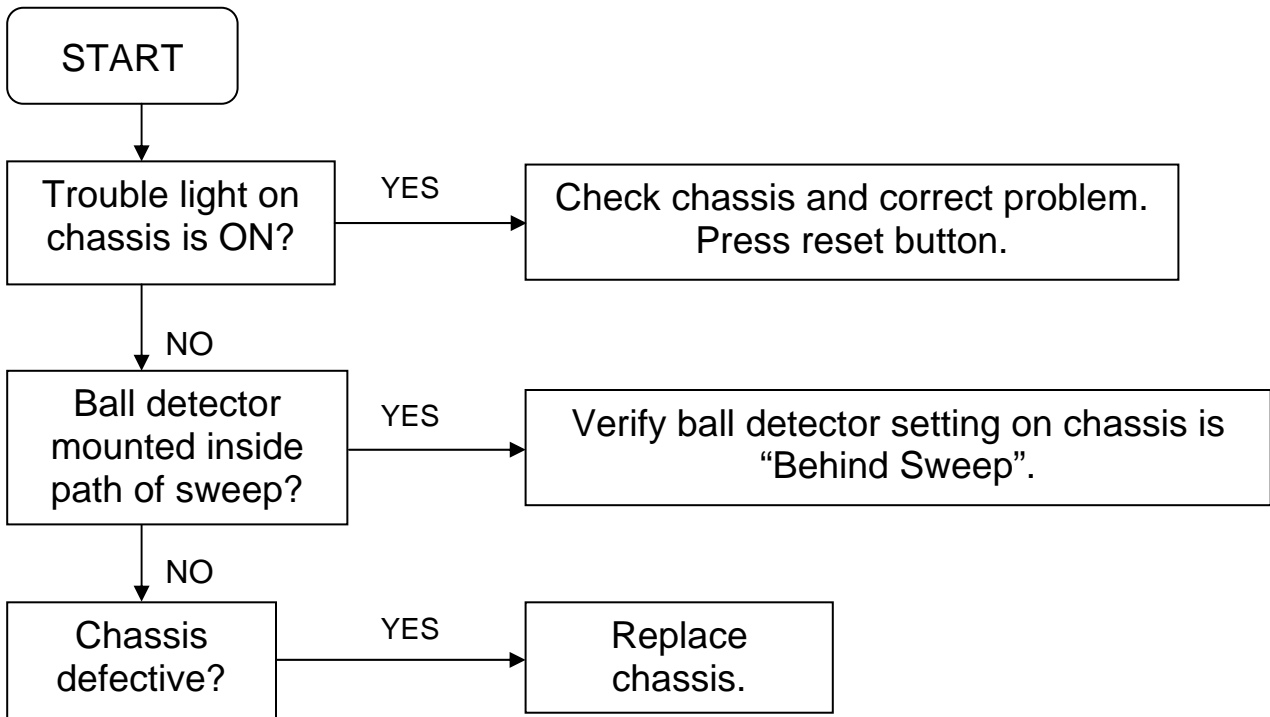


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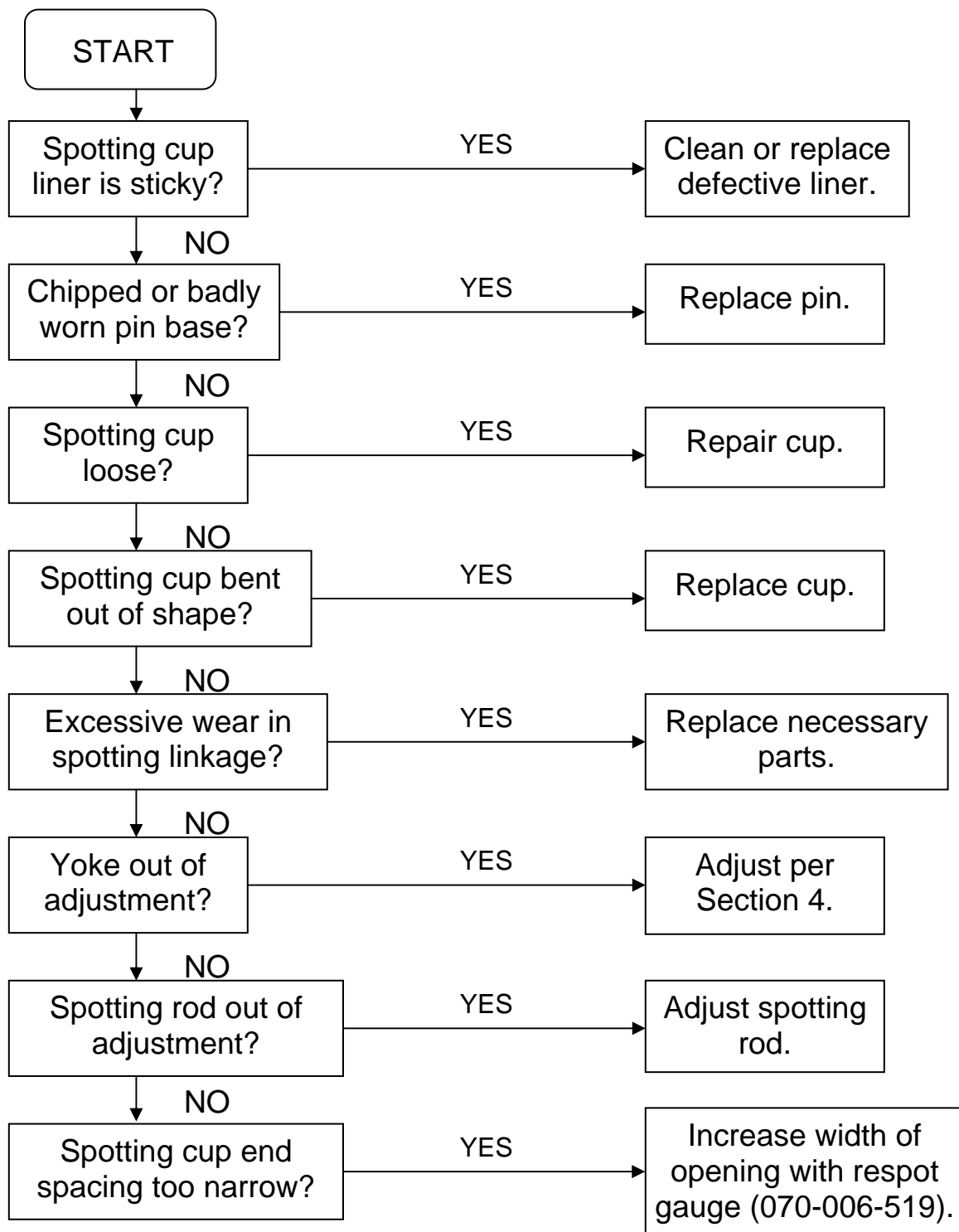
## QubicaAMF XLi EDGE Pinspotter

**4.6.2.7 PROBLEM: 1st ball - sweep starts toward pit, table starts up with pins in fingers, both stop, neither will run.**



**Figure 4.6-7**

**4.6.2.8 PROBLEM: Pin fell over during spotting.**



**Figure 4.6-8**



## QubicaAMF XLi EDGE Pinspotter

### 4.6.2.9 PROBLEM: 2<sup>nd</sup> Ball or Strike – Table runs but does not shuttle pins or go all the way down to the spotting position.

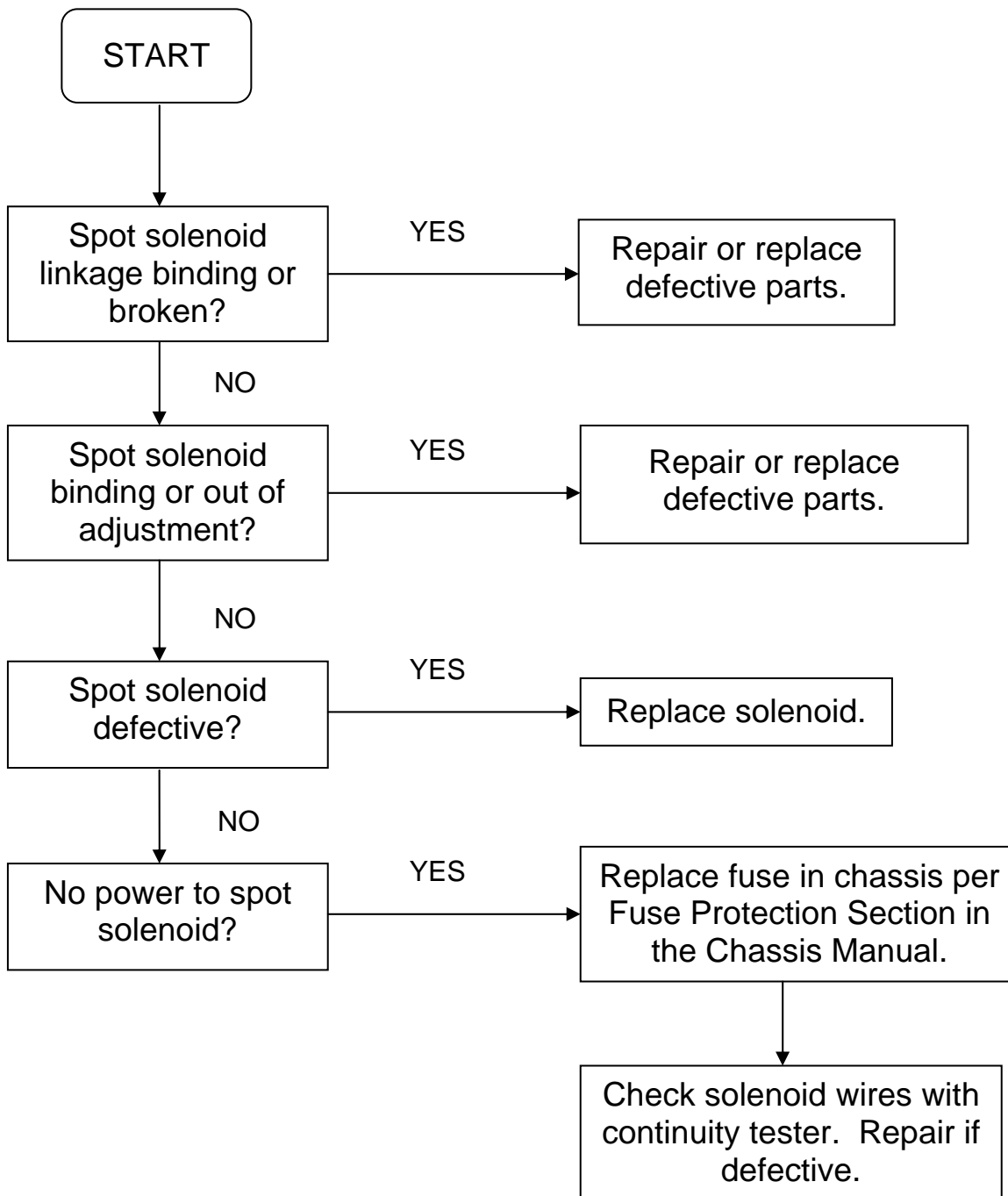
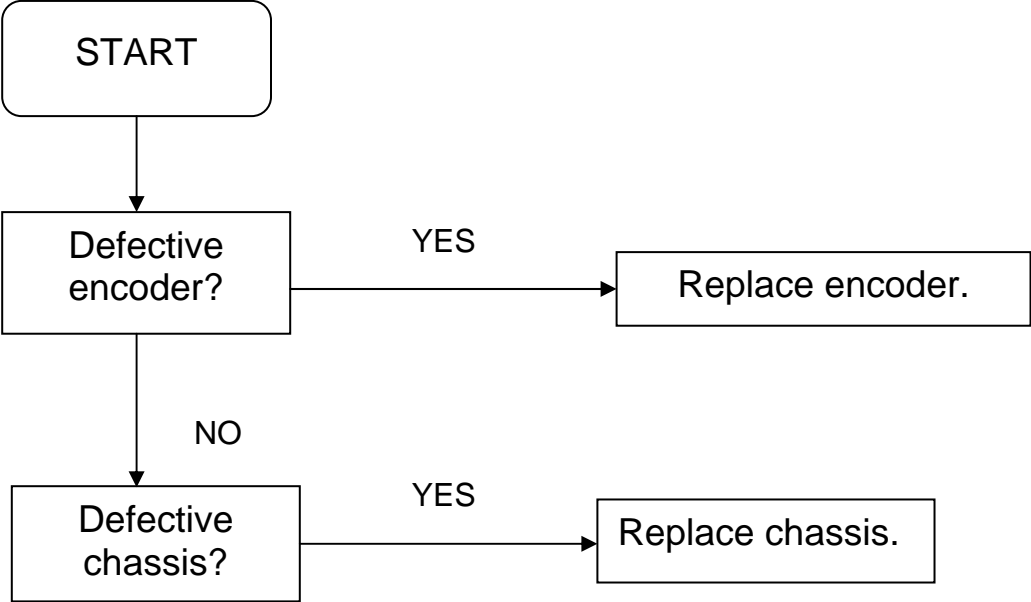


Figure 4.6.9



**4.6.3 SWEEP TROUBLESHOOTING**

**4.6.3.1 PROBLEM:** Sweep runs up, down, and starts through to clean off the deck a second time as the table spots pins. Table and sweep stop because of interlock.

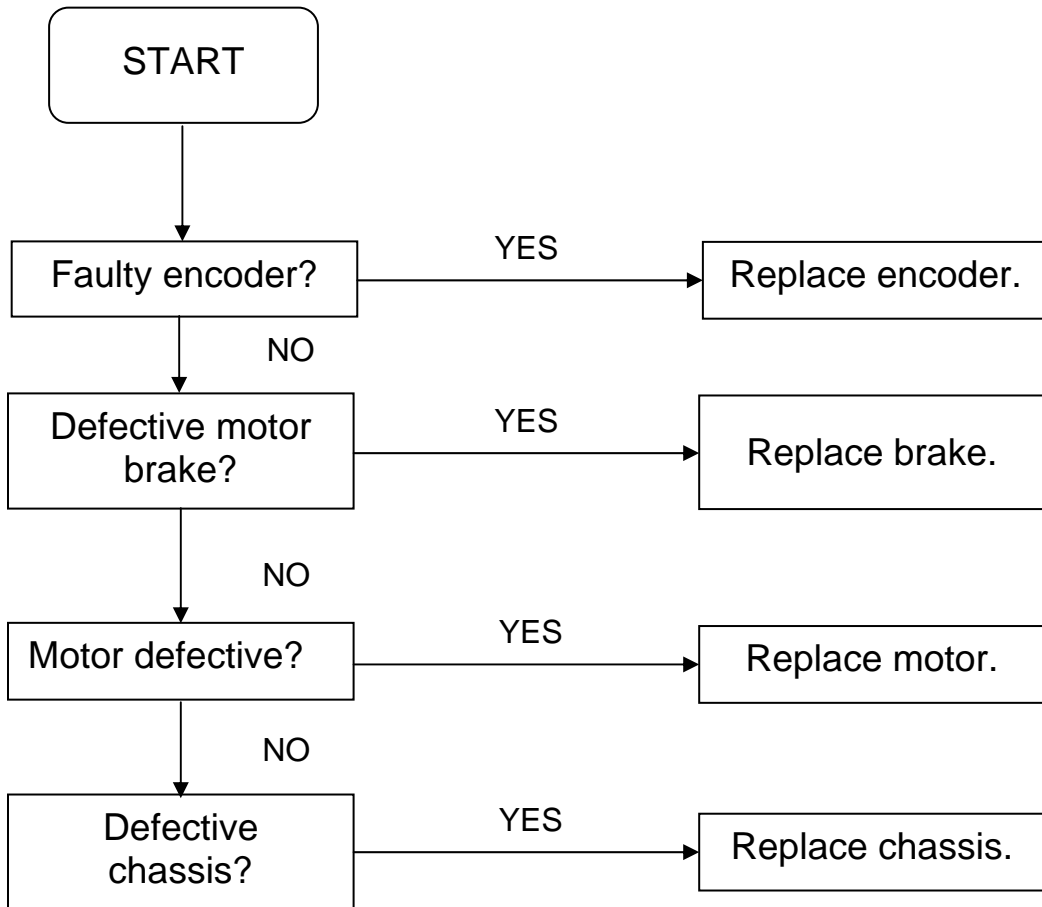


**Figure 4.6-10**



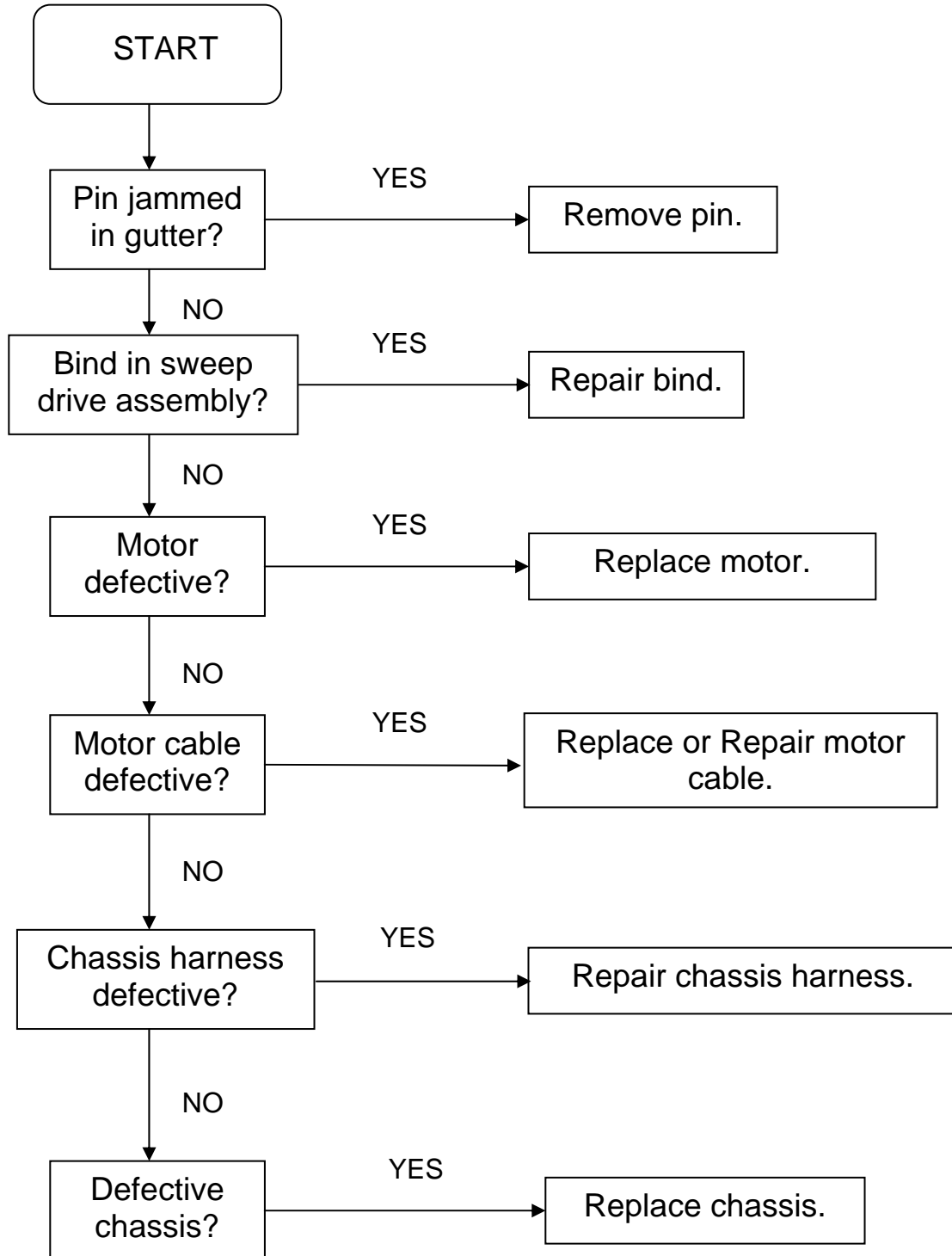
**QubicaAMF XLi EDGE Pinspotter**

**4.6.3.2 PROBLEM: Sweep overruns all stopping positions. Motor coasts.**



**Figure 4.6-11**

**4.6.3.3 PROBLEM: Sweep motor trips overload.**



**Figure 4.6-12**



## QubicaAMF XLi EDGE Pinspotter

### 4.6.3.4 PROBLEM: Sweep hits gutter at 66° guard position.

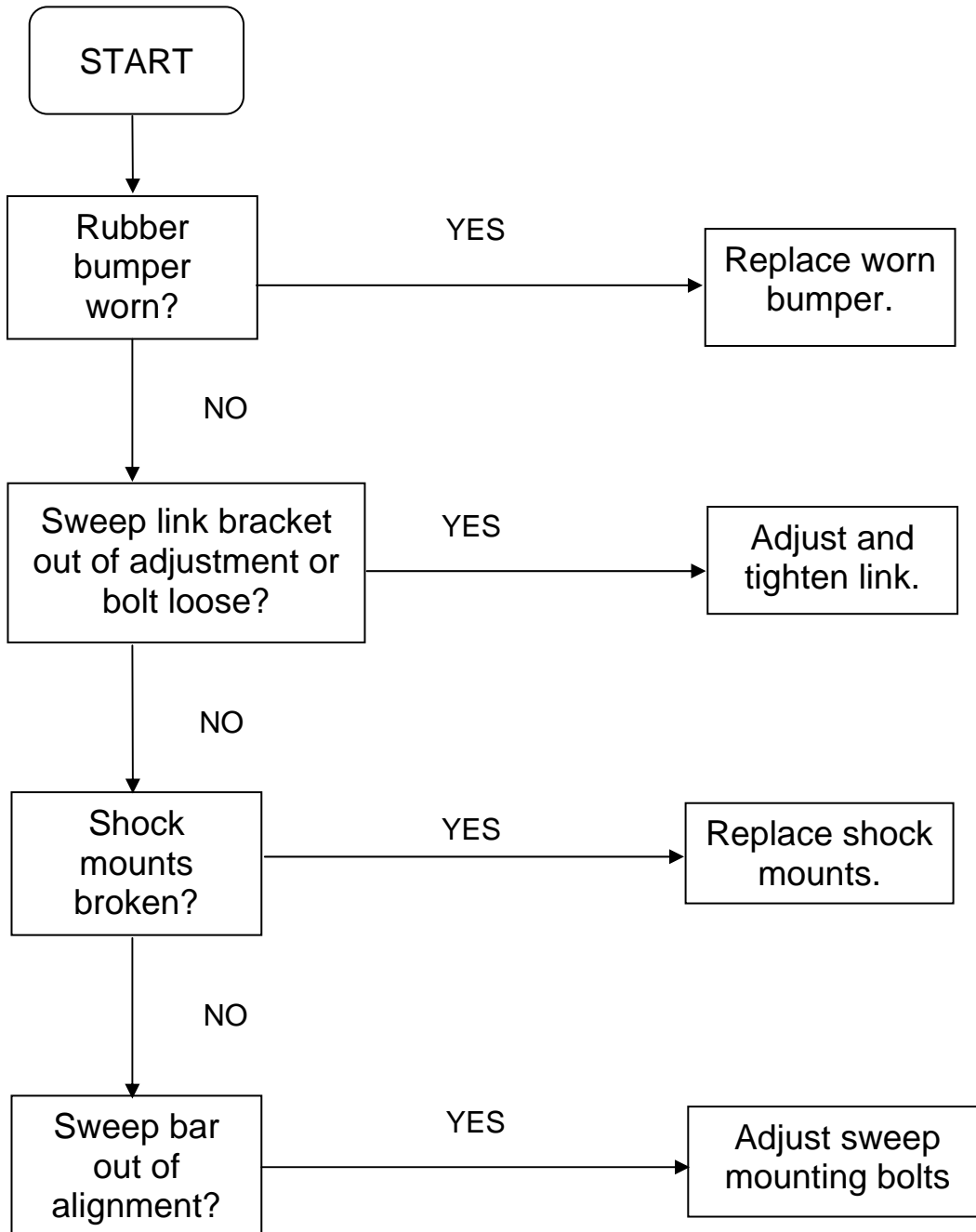
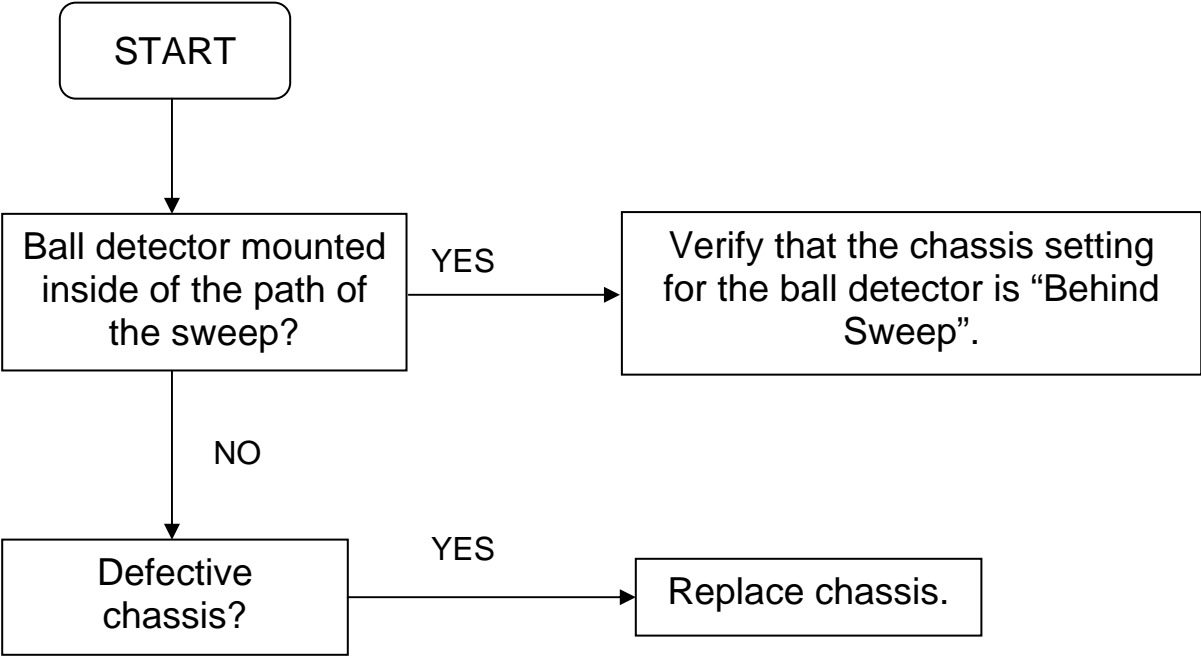


Figure 4.6-13

**4.6.3.5 PROBLEM: Sweep runs continuously.**



**Figure 4.6-14**



## QubicaAMF XLi EDGE Pinspotter

### 4.6.3.6 PROBLEM: Sweep arm hits frame of machine at zero. position.

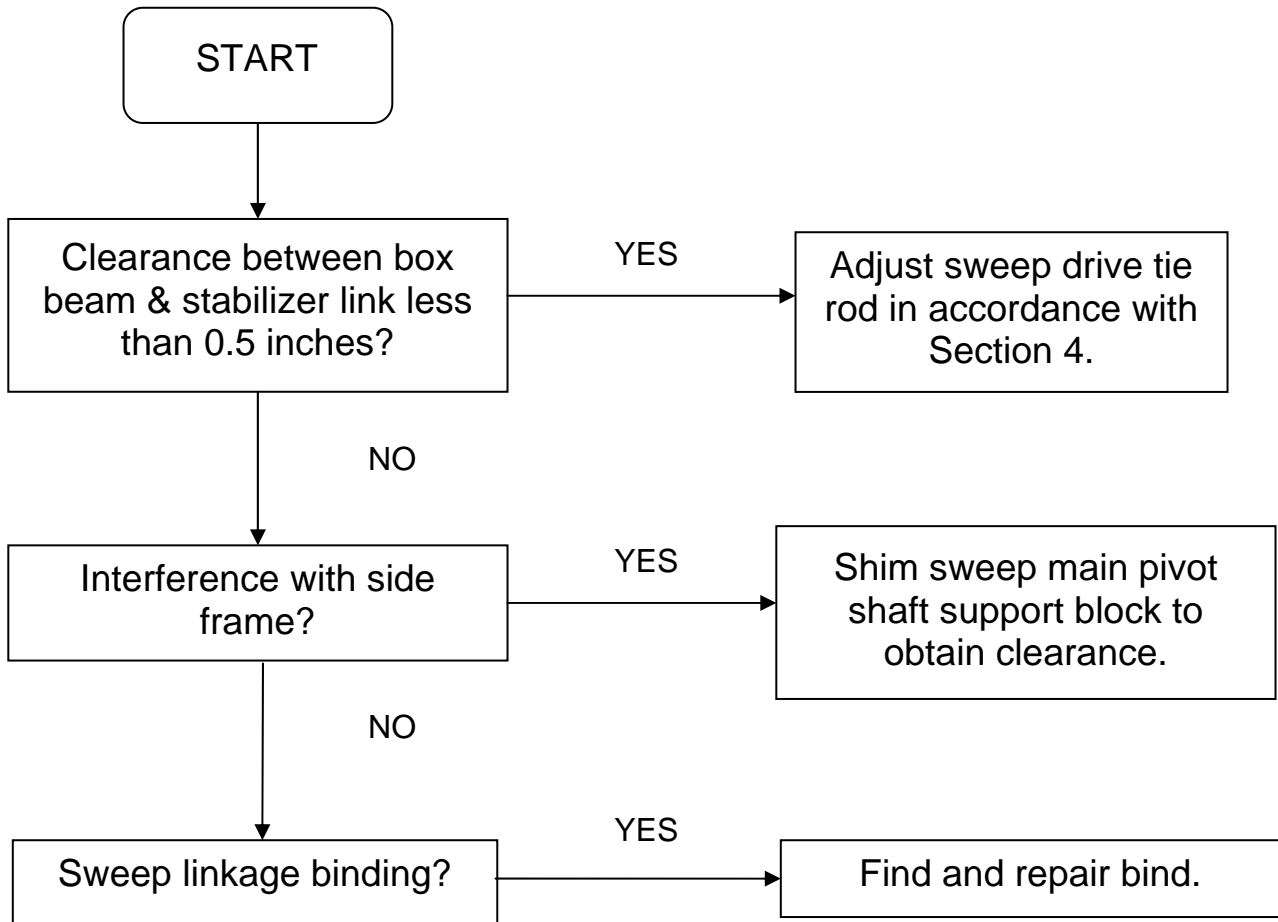
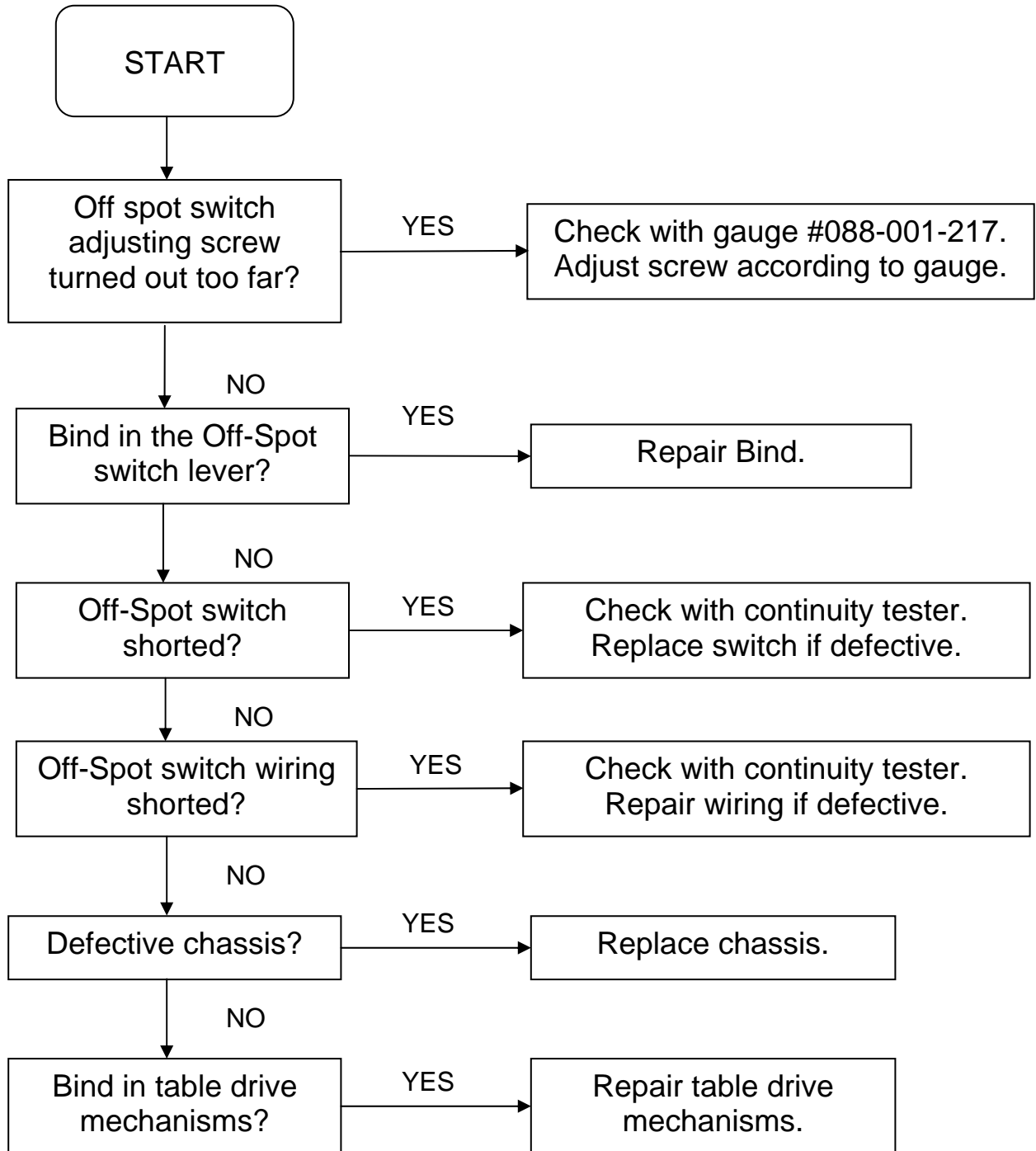


Figure 4.6-15

**4.6.3.7 PROBLEM: 1<sup>st</sup> ball – table comes down and picks up standing pins, but does not respot them. Sweep remains at guard position.**



**Figure 4.6-16**



## QubicaAMF XLi EDGE Pinspotter

**4.6.3.8 PROBLEM: 1<sup>st</sup> ball - table comes down on top of an off spot pin, thus not picking up the pins. Then the sweep cleans off all of the pins both standing and down. Table comes down, spots pins, then goes up, sweep goes up, and the strike light goes on.**

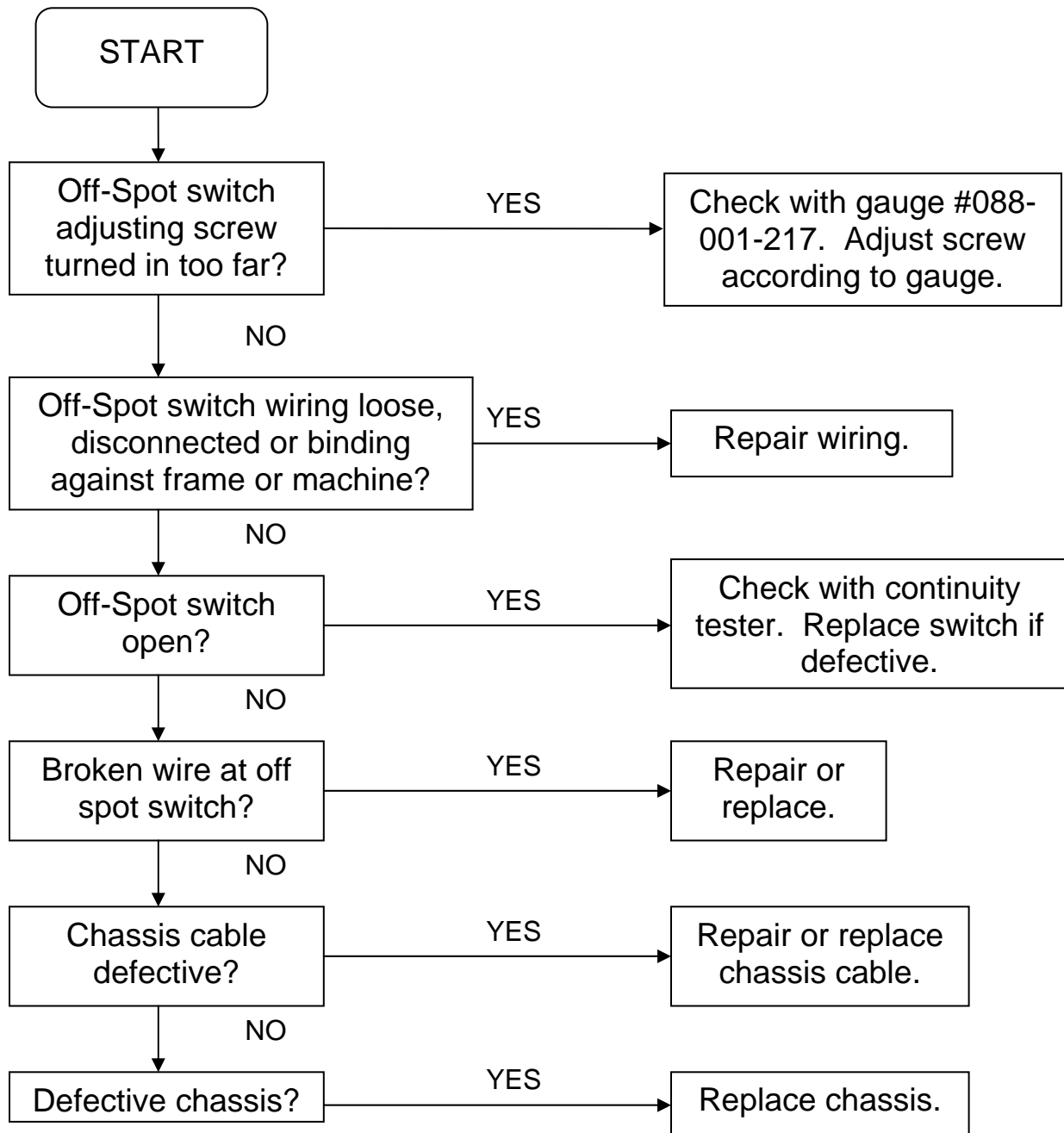
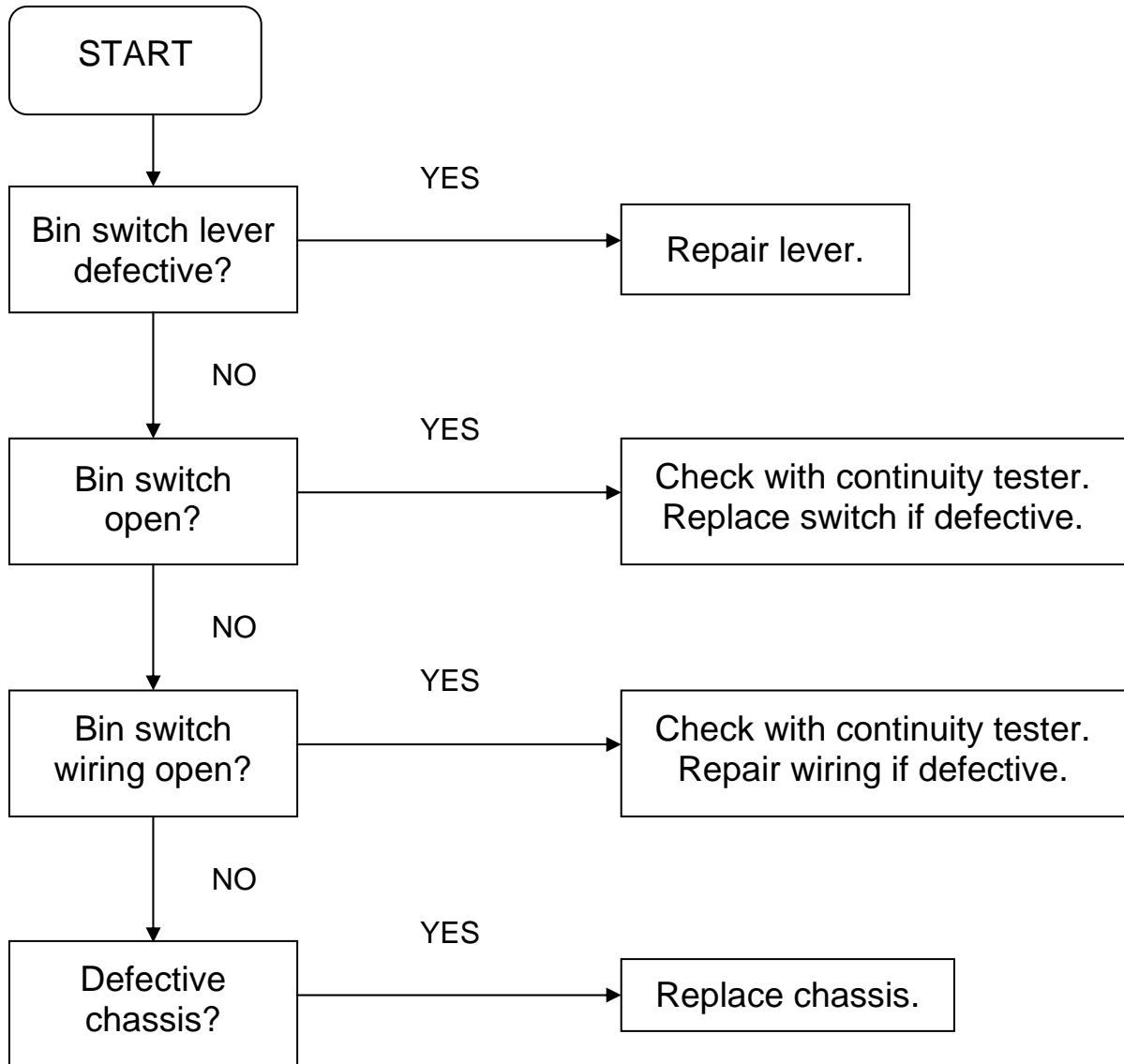


Figure 4.6-17



**4.6.3.9 PROBLEM: 2<sup>nd</sup> ball or strike – table does not run, bins loaded with pins but will not drop the pins into the spotting cups.**



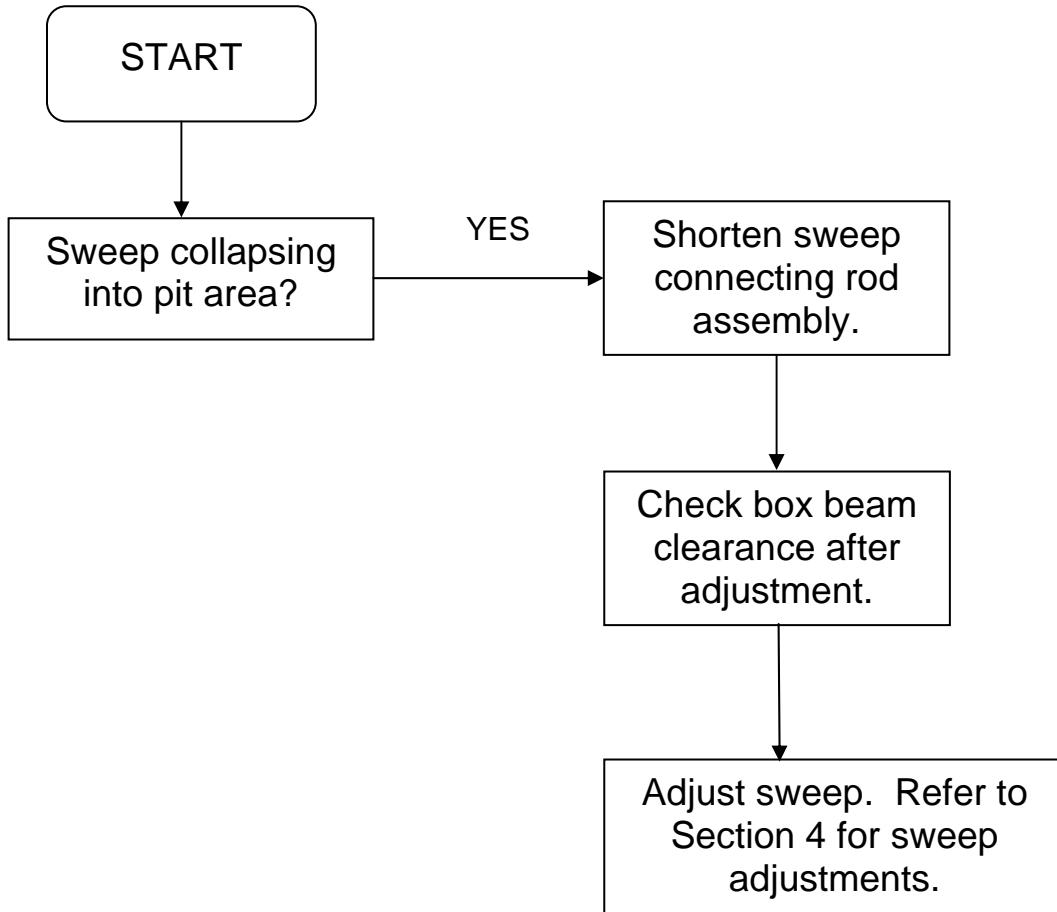
**Figure 4.6-18**



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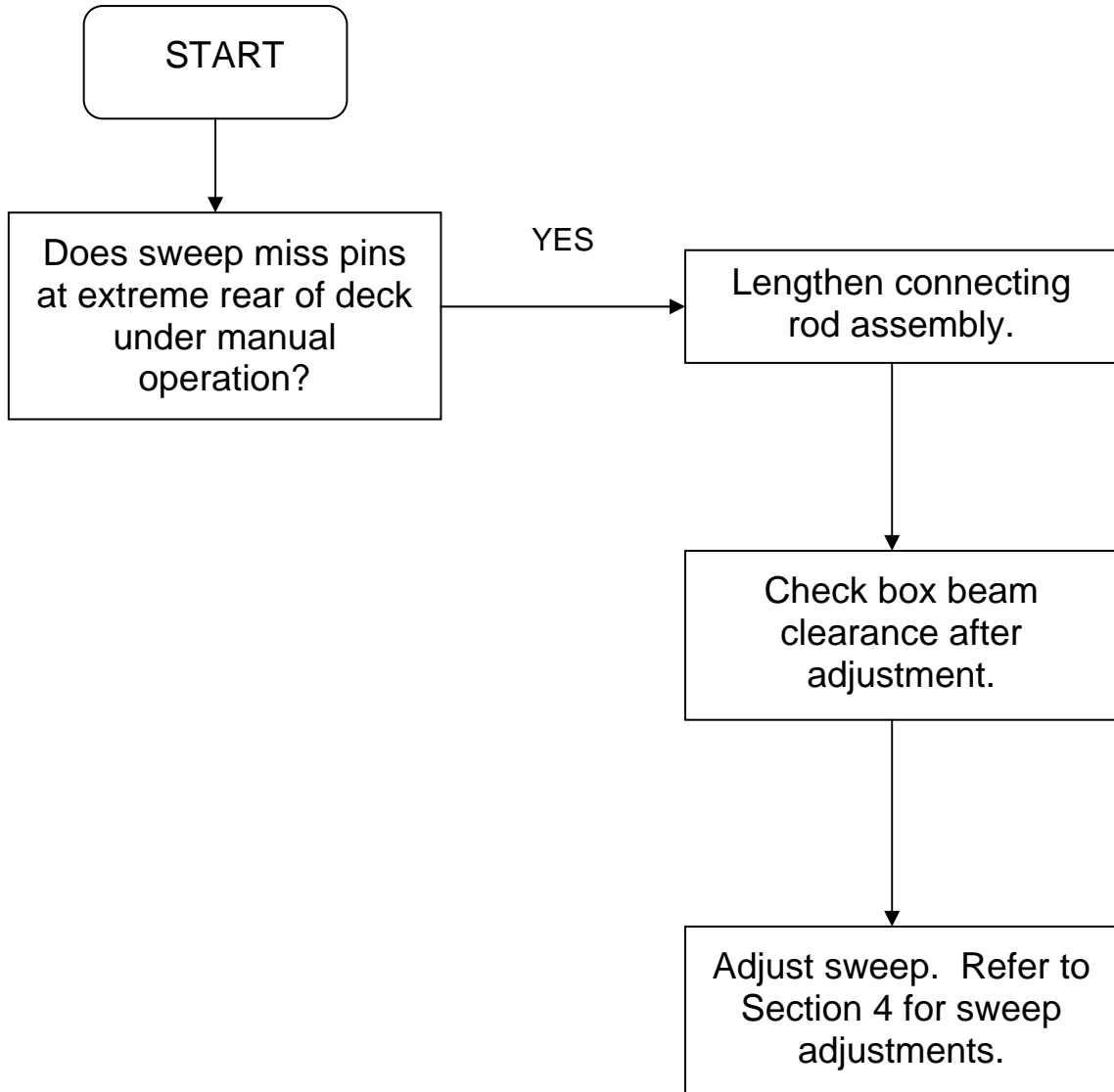
**QubicaAMF XLi EDGE Pinspotter**

**4.6.3.10 PROBLEM: Sweep runs too far into pit area.**



**Figure 4.6-19**

**4.6.3.11 PROBLEM: Sweep does not knock all pins into pit.**



**Figure 4.6-20**



## QubicaAMF XLi EDGE Pinspotter

### 4.6.4 CUSHION AND PIT TROUBLESHOOTING

#### 4.6.4.1 PROBLEM: Ball idles at cushion.

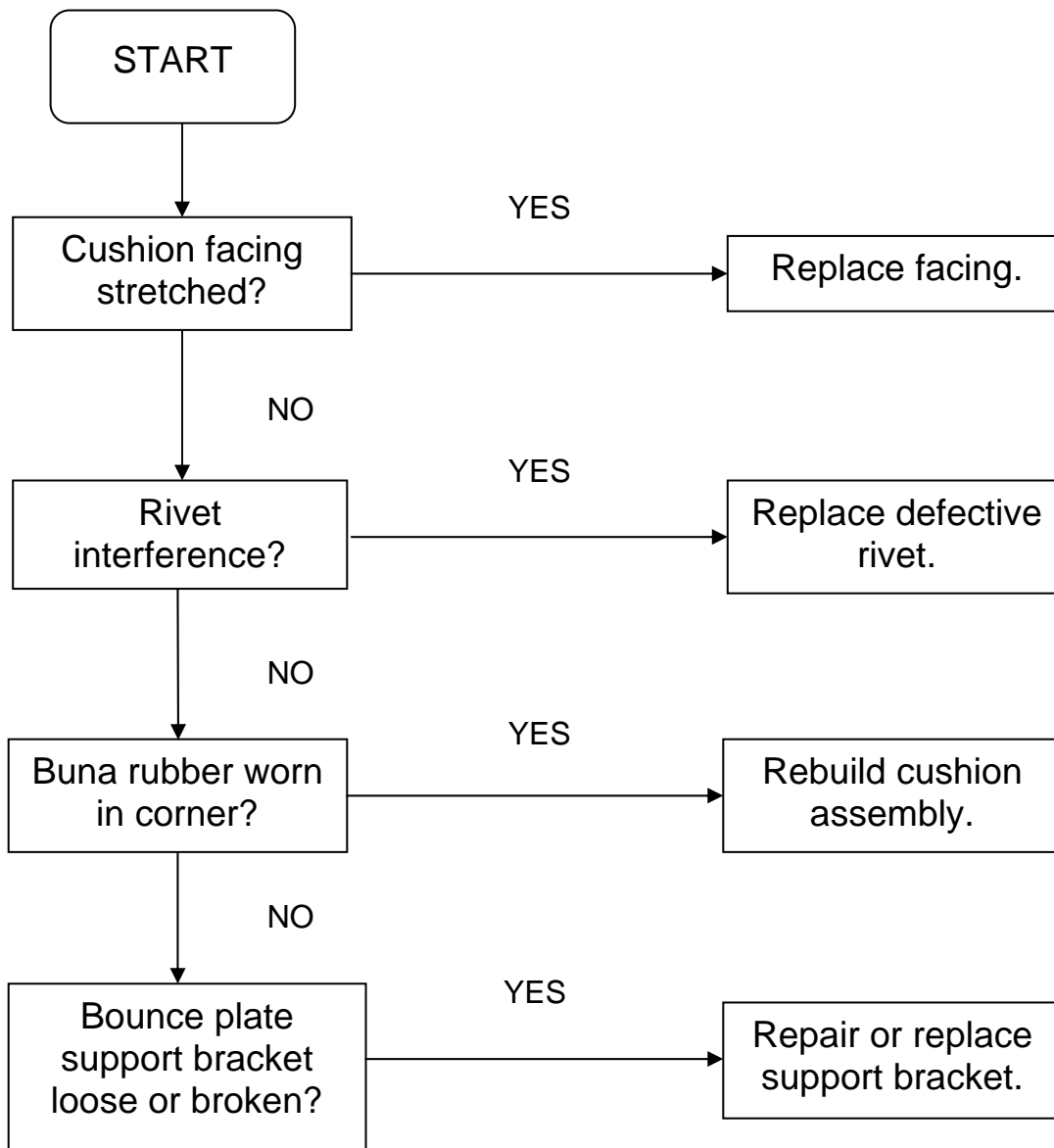
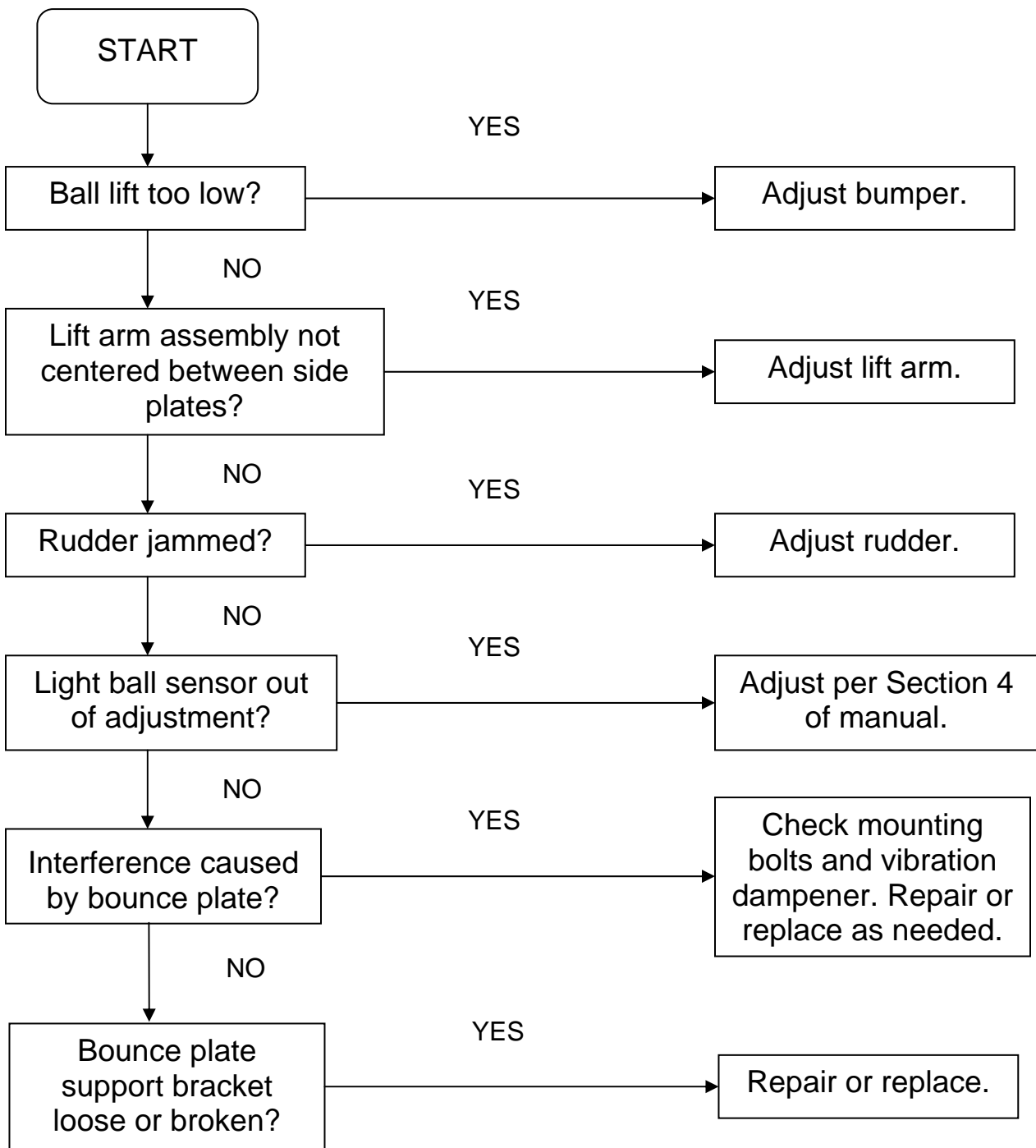


Figure 4.6-21

**4.6.4.2 PROBLEM: Ball idles at exit – will not enter lift.**



**Figure 4.6-22**



## QubicaAMF XLi EDGE Pinspotter

### 4.6.4.3 PROBLEM: Ball failed to cycle machine.

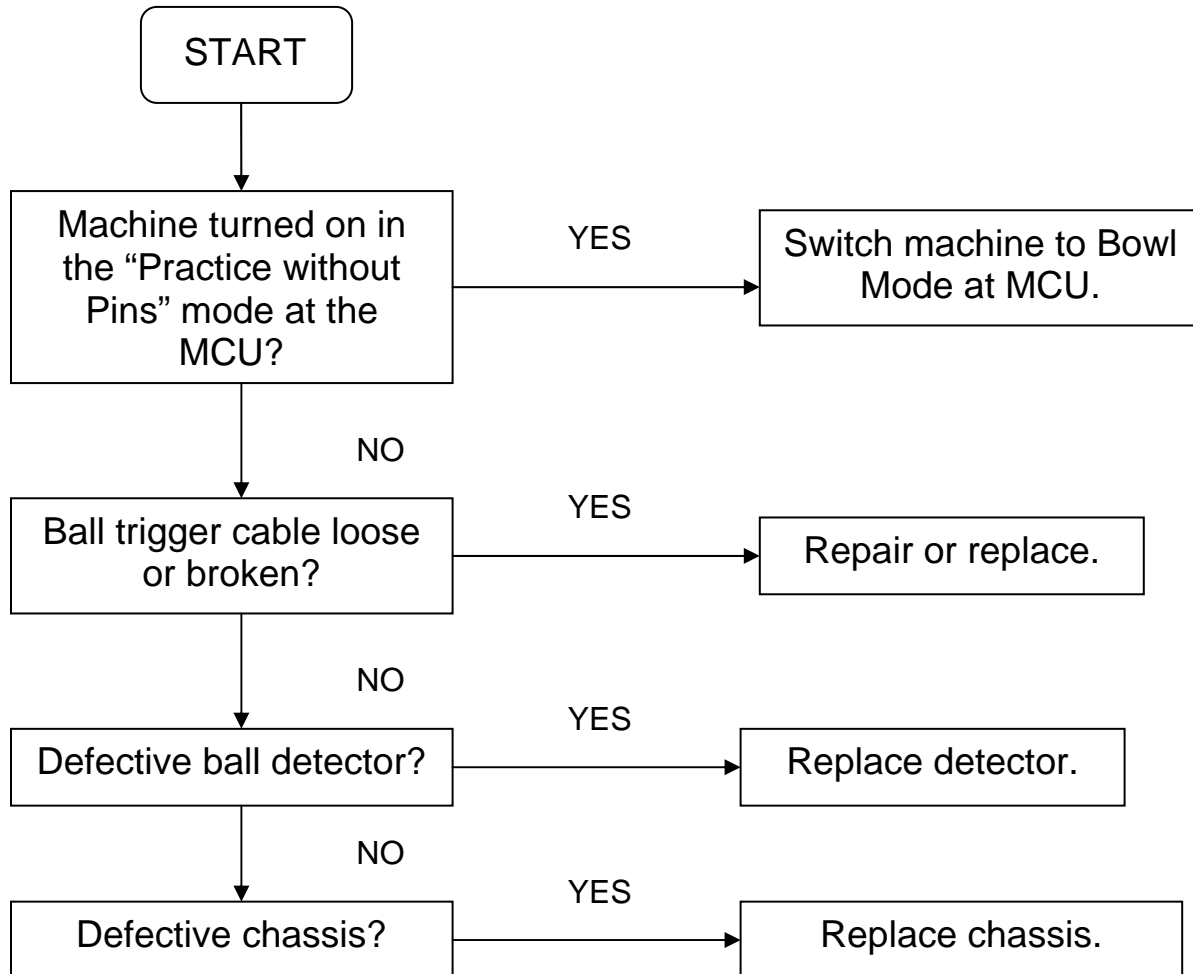
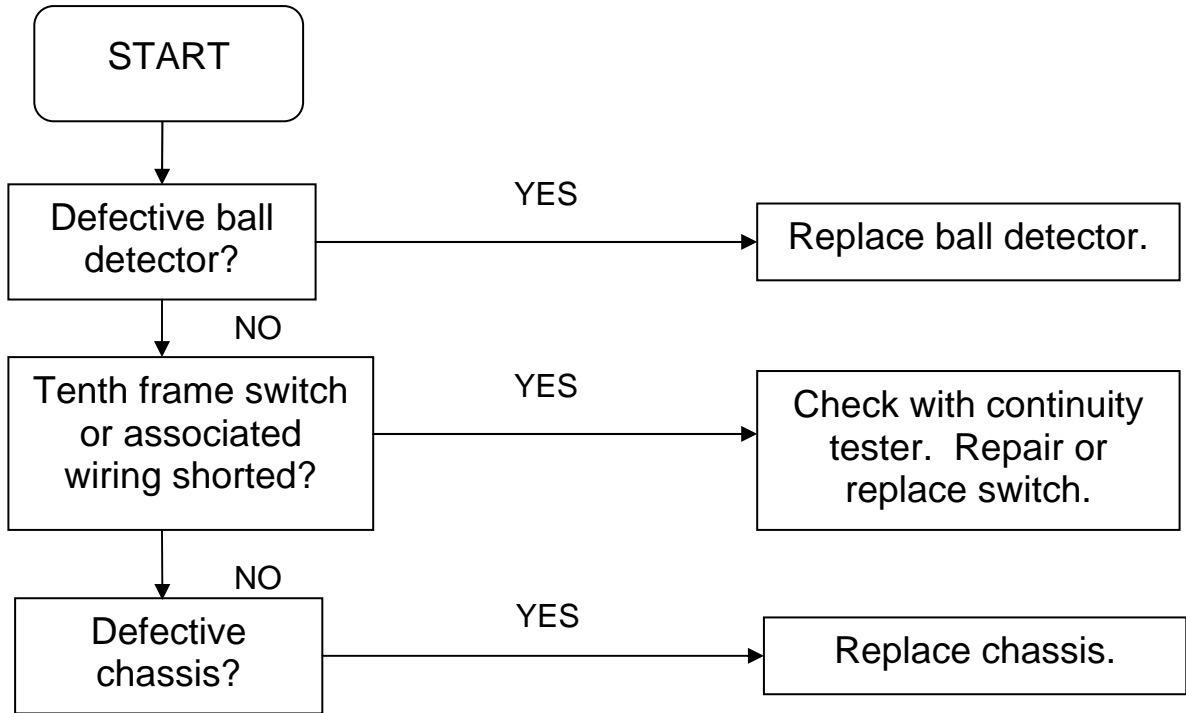


Figure 4.6-23

**4.6.4.4 PROBLEM: Machine continues to cycle or cycles randomly.**



**Figure 4.6-24**



## QubicaAMF XLi EDGE Pinspotter

### 4.6.4.5 PROBLEM: Back end motor trips on overload.

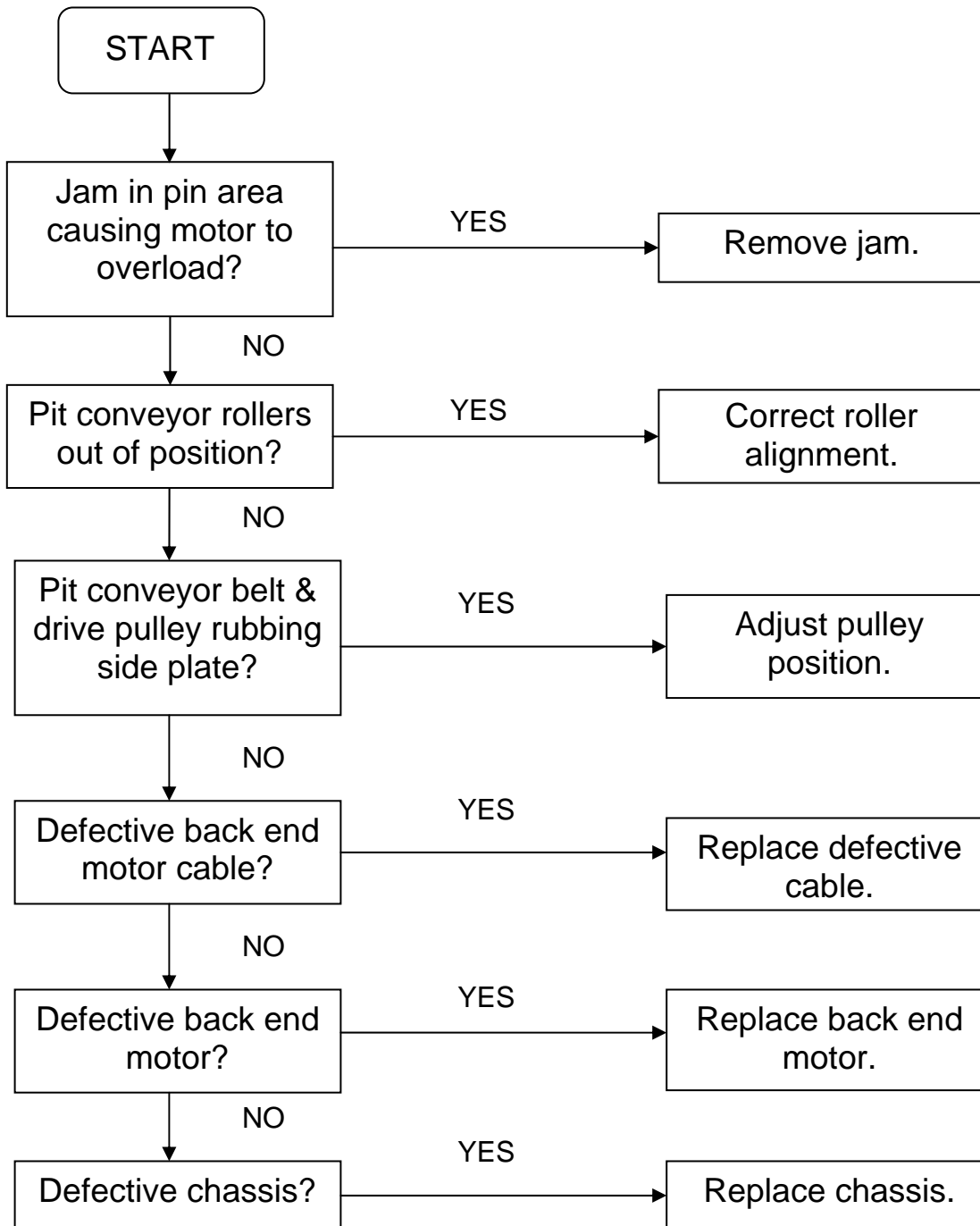
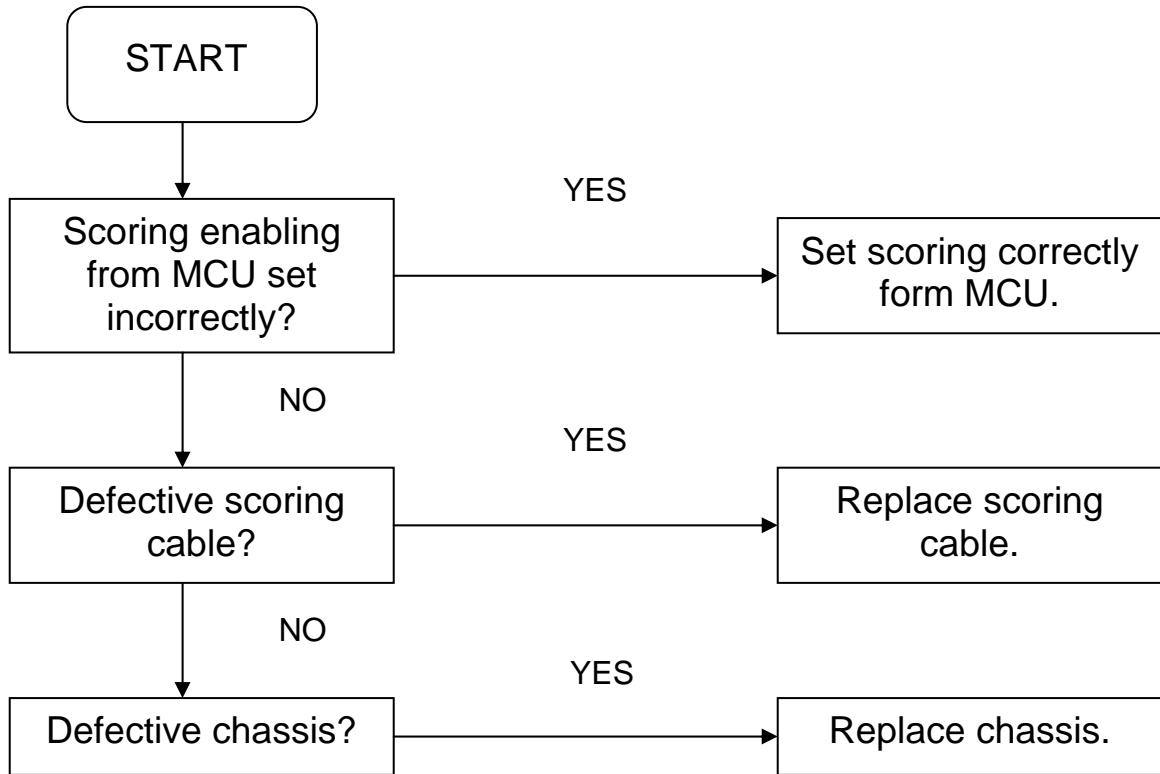


Figure 4.6-25



**4.6.5 CHASSIS TROUBLESHOOTING**

**4.6.5.1 PROBLEM: Table time delay too long or too short.**



**Figure 4.6-26**



## QubicaAMF XLi EDGE Pinspotter

### 4.6.5.2 PROBLEM: Sweep time delay too long or too short.

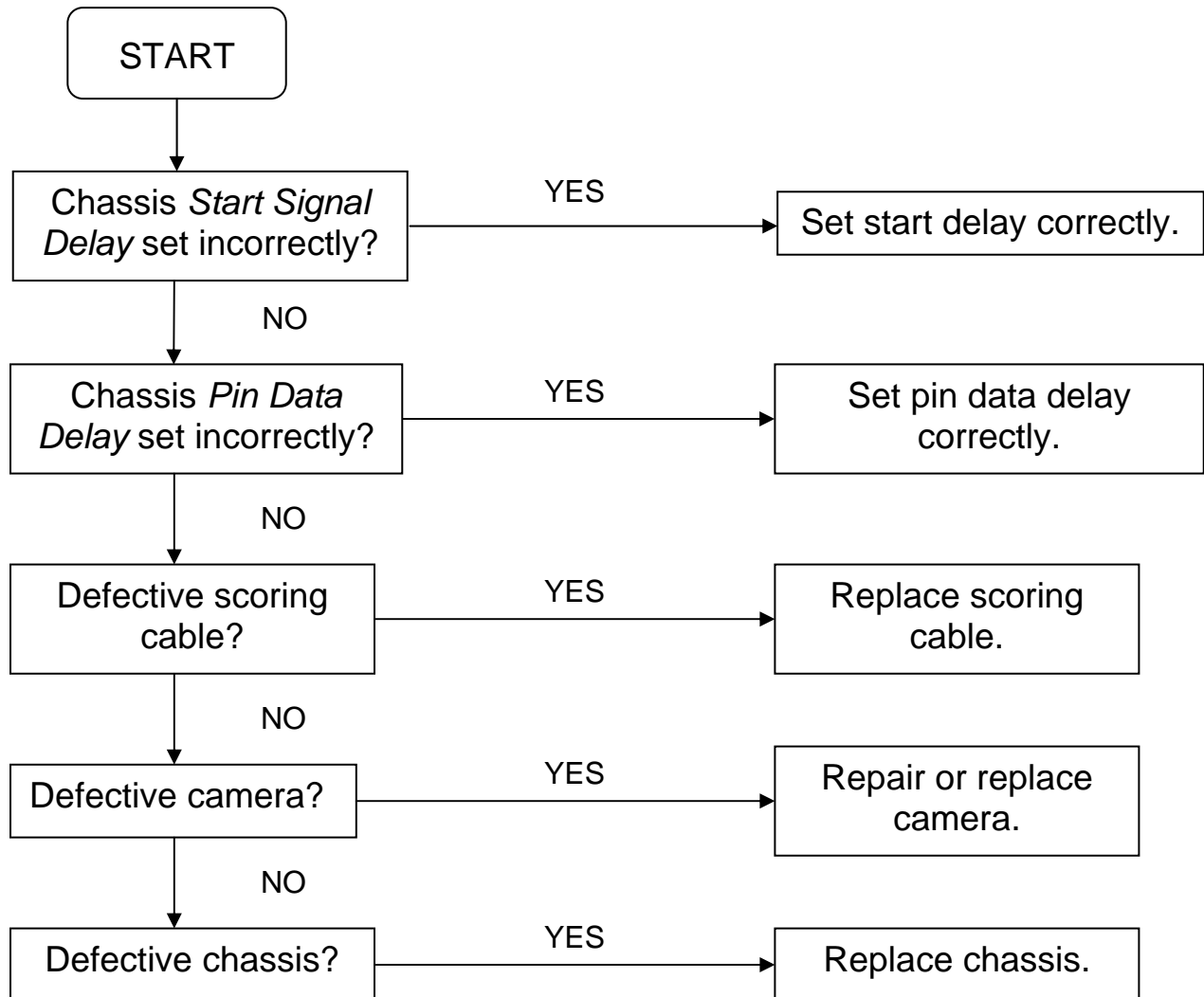
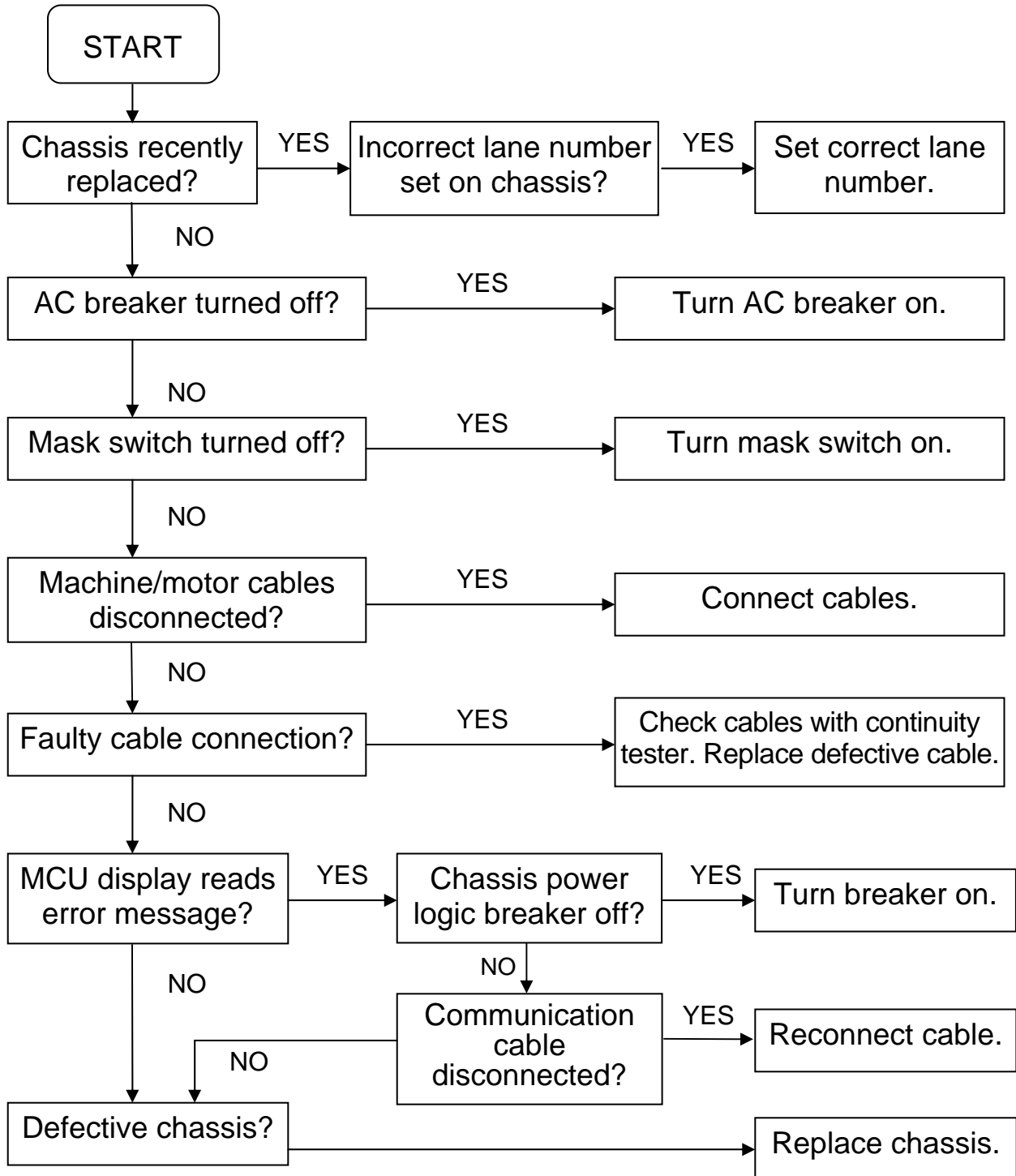


Figure 4.6-27

**4.6.5.3 PROBLEM: Cannot turn machine on from the MCU.**



**Figure 4.6-28**



## QubicaAMF XLi EDGE Pinspotter

**4.6.5.4 PROBLEM: Scoring chassis scores correctly on first ball, but does not score on second ball. Second ball signal is not getting to chassis.**

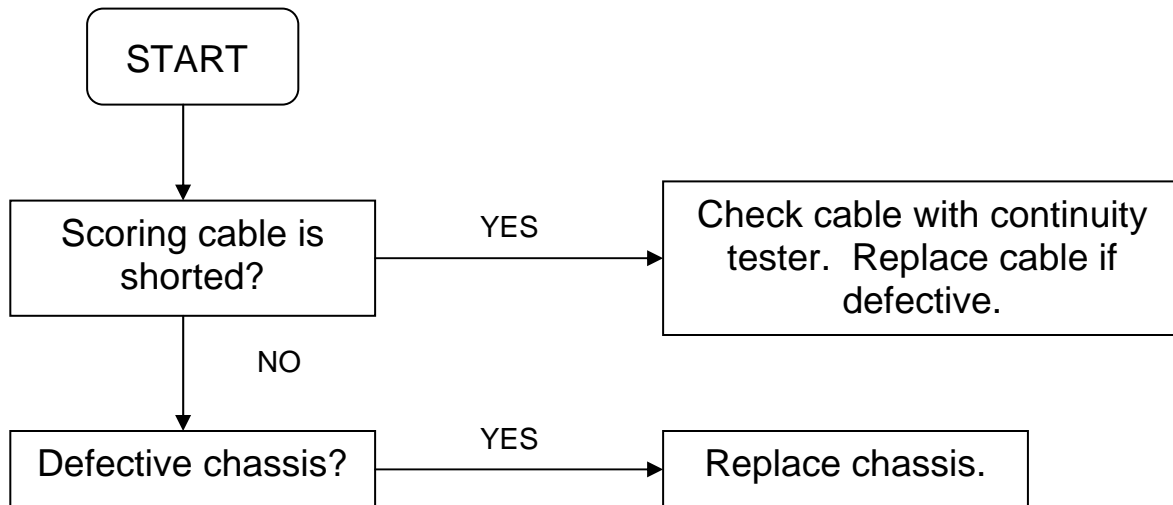
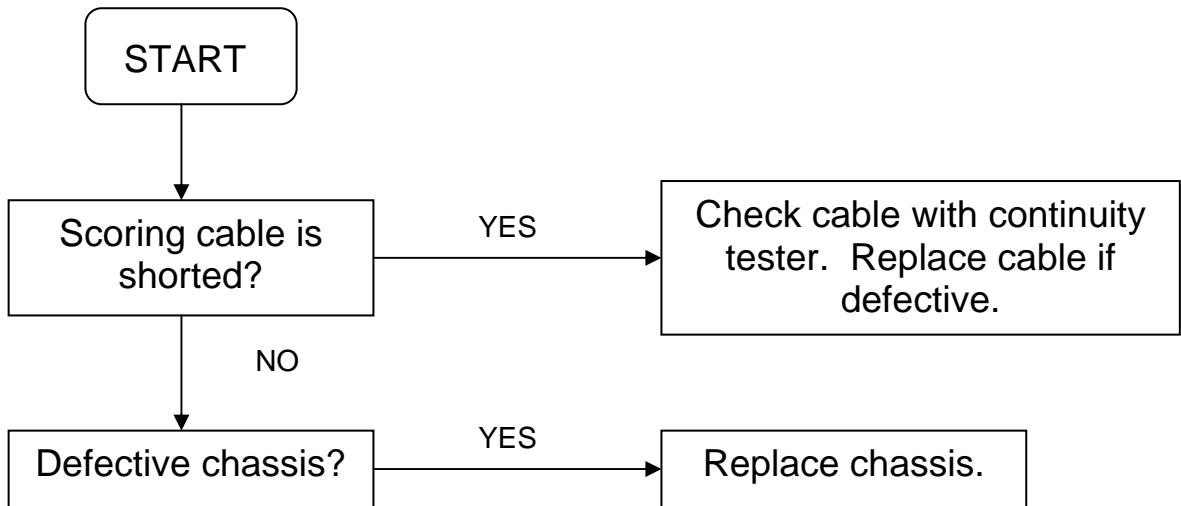


Figure 4.6-29

**4.6.5.5**     **PROBLEM:** Scoring chassis is not scoring the first ball, but scores correctly on the second ball. Receiving second ball signal continuously.



**Figure 4.6-30**



## QubicaAMF XLi EDGE Pinspotter

### 4.6.6 MOTOR TROUBLESHOOTING

#### 4.6.6.1 PROBLEM: Table motor runs continuously.

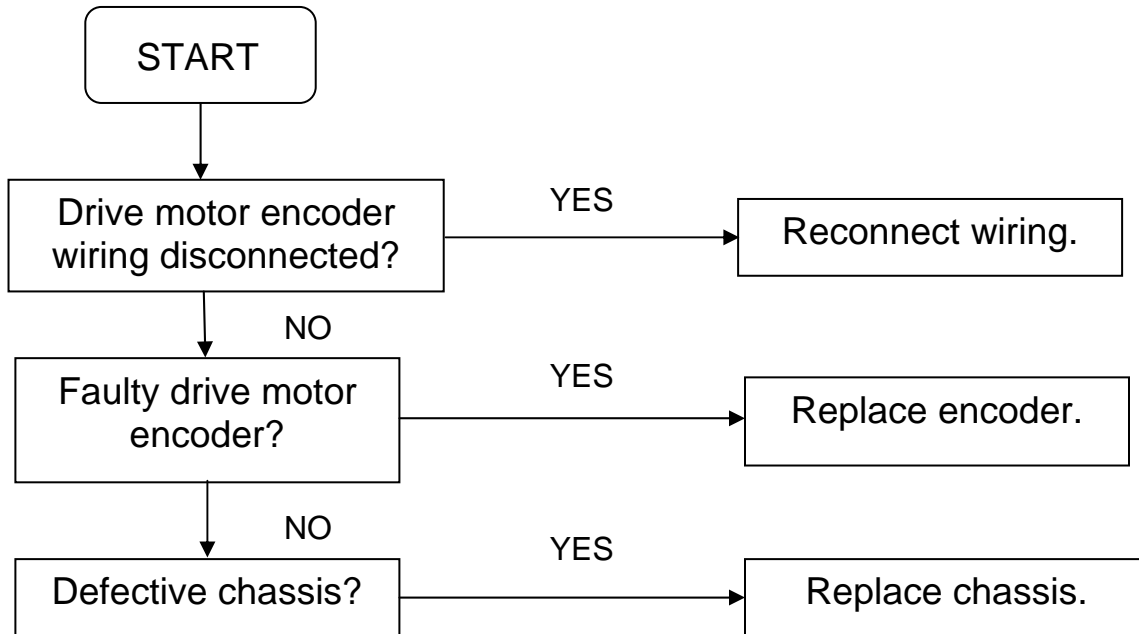
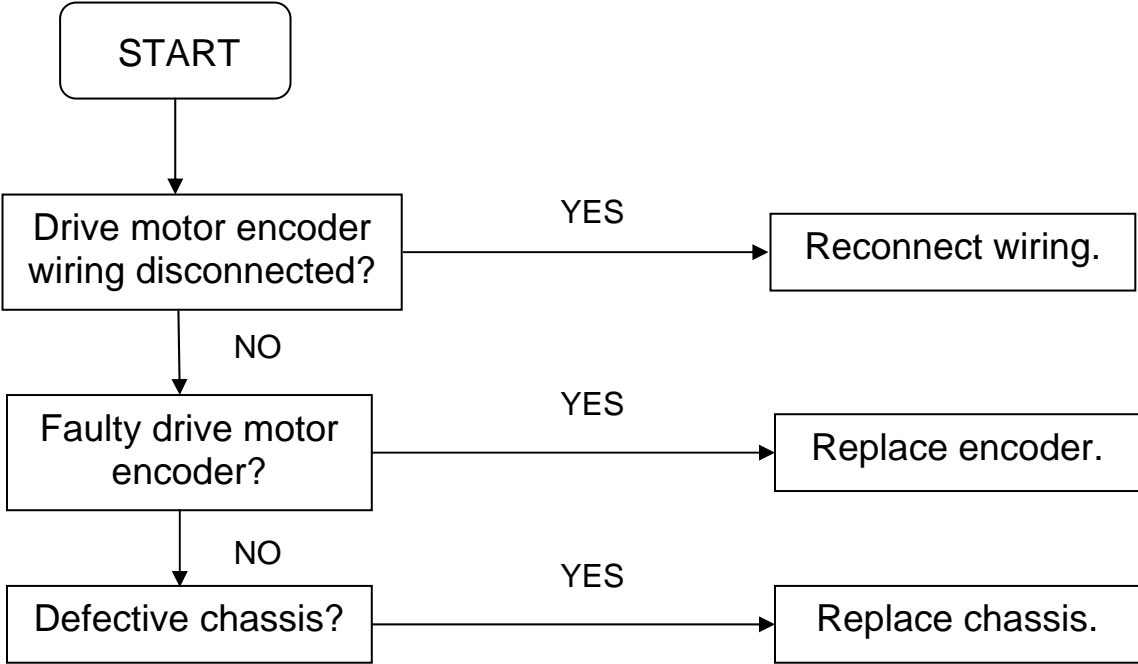


Figure 4.6-31

**4.6.6.2 PROBLEM: Sweep motor runs continuously.**



**Figure 4.6-32**



## QubicaAMF XLi EDGE Pinspotter

### 4.6.6.3 PROBLEM: Front end motor will not run.

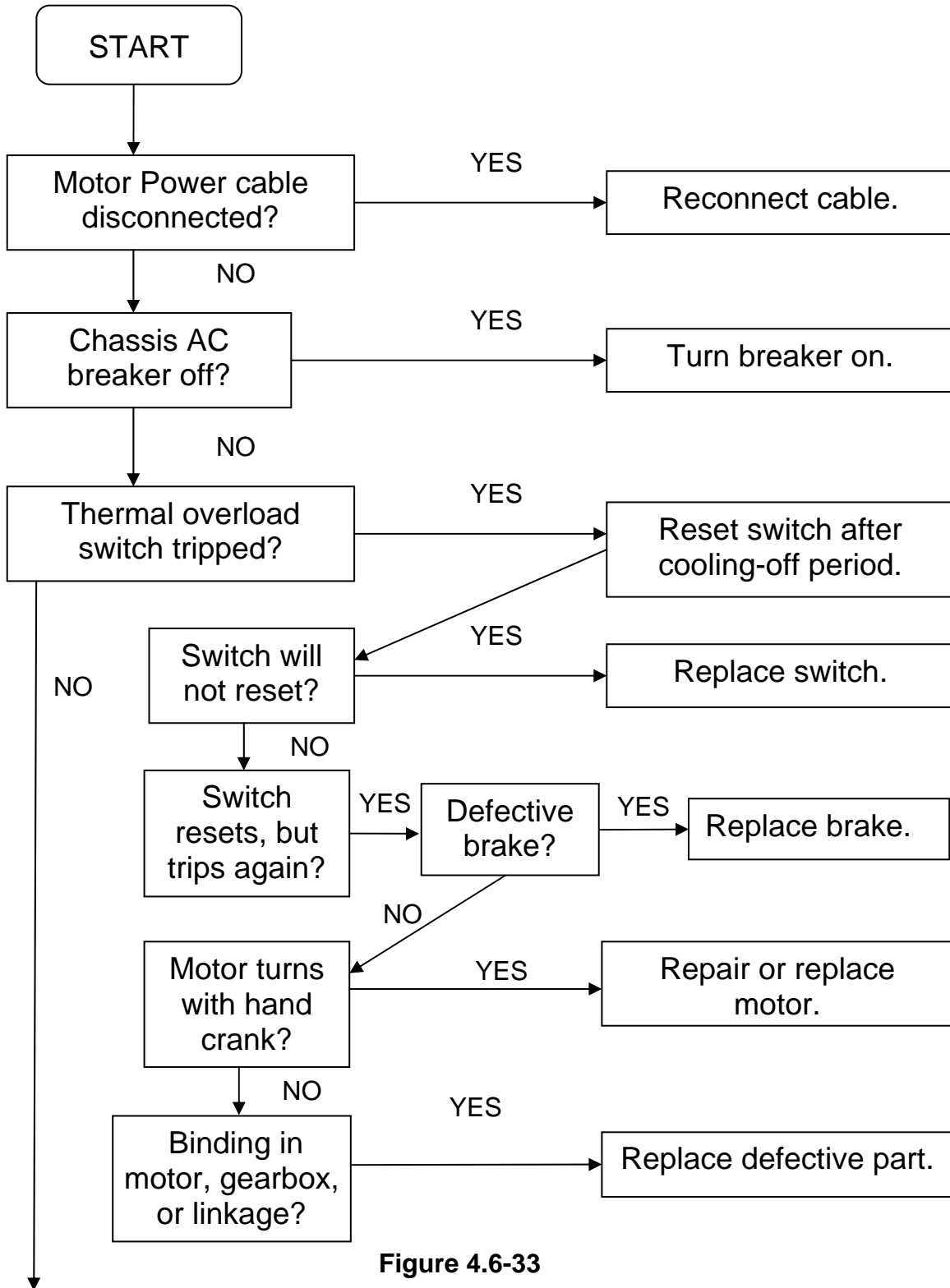
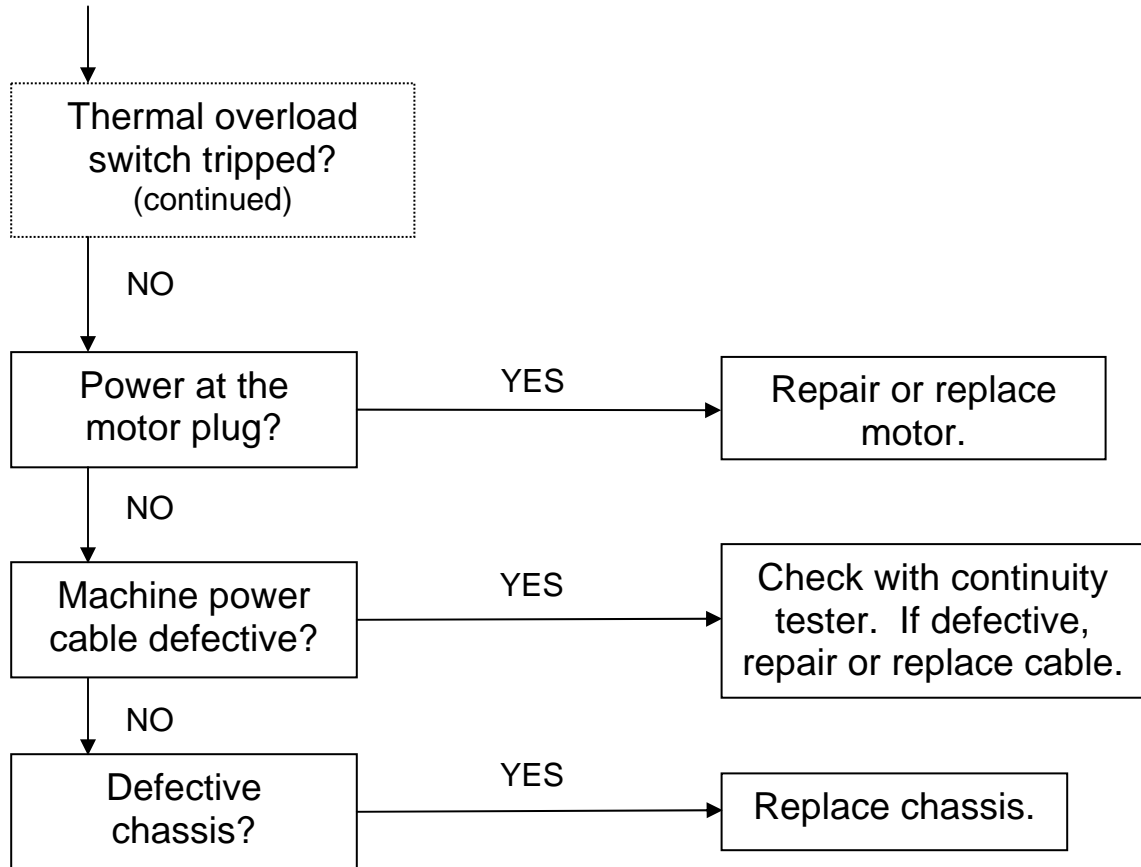


Figure 4.6-33



**4.6.6.3 PROBLEM: Front end motor will not run. (Continued from previous page.)**



**Figure 4.6-34**



## QubicaAMF XLi EDGE Pinspotter

### 4.6.7 PIT LIGHT TROUBLESHOOTING

#### 4.6.7.1 PROBLEM: Pit Light will not turn on.

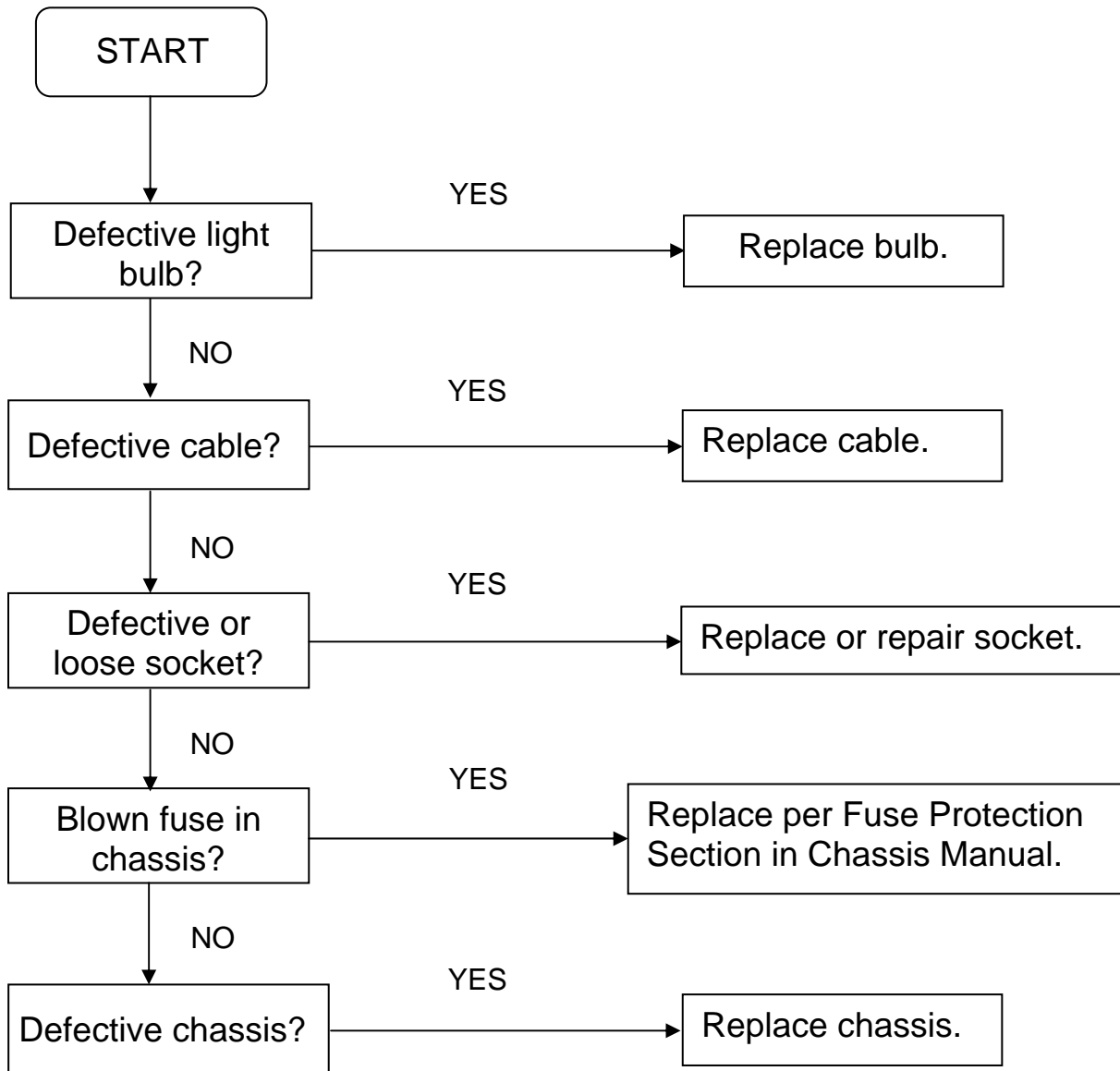


Figure 4.6-35

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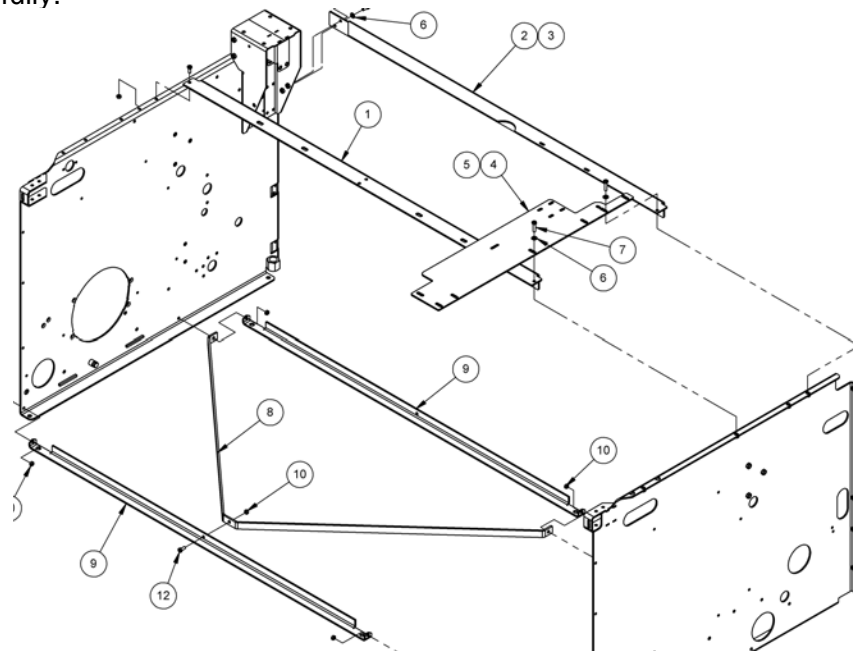
# Section 5.0

## Drawings and Part Numbers

The drawings and parts lists in this section contain information that can be used for identifying and ordering replacement parts for your XLi EDGE Pinspotters. Becoming familiar with the numbering format used in this section will help you select the correct parts for your machine.

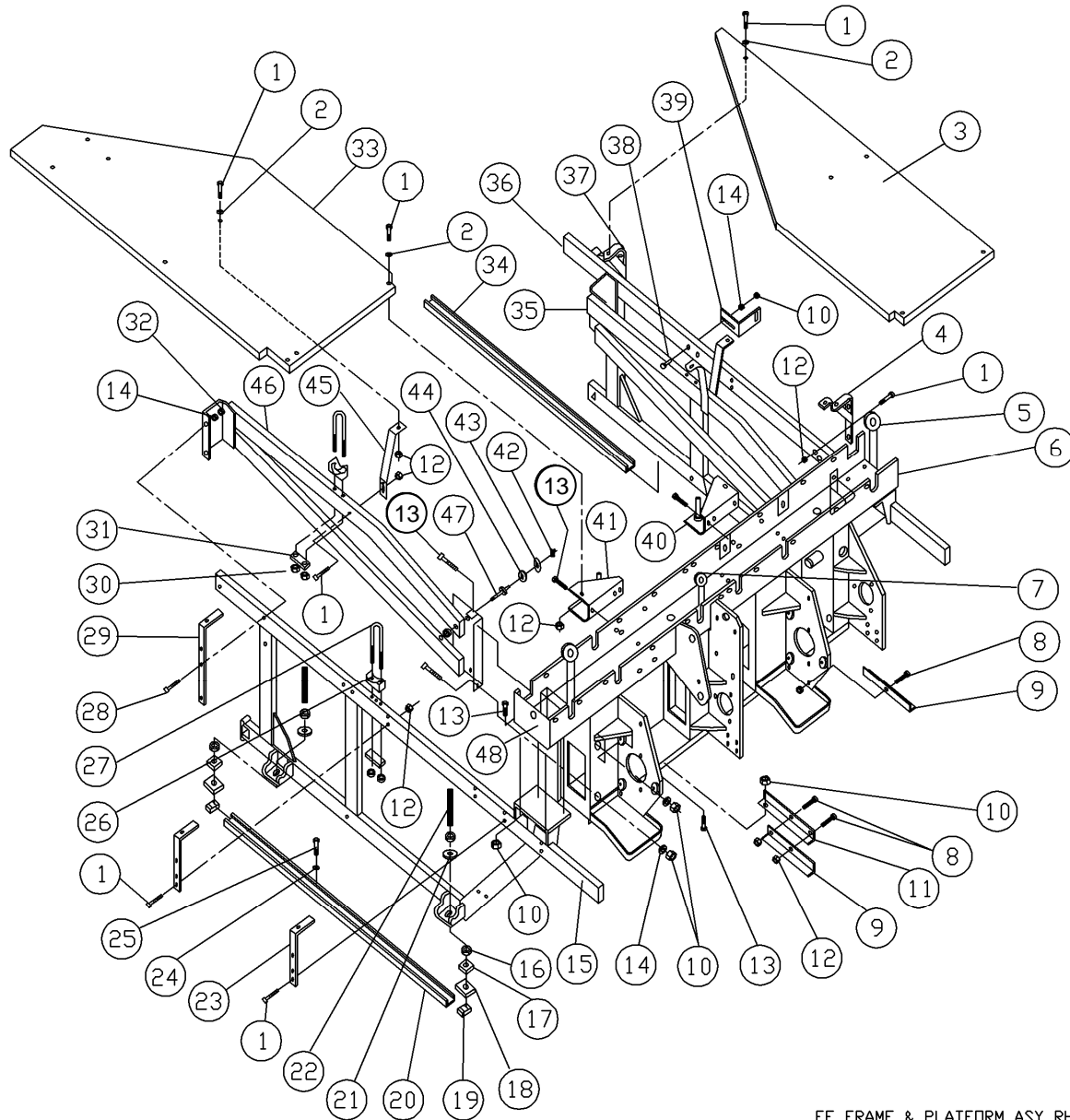
Because the older Left Hand (LH) / Right Hand (RH) convention for identifying machines and parts caused confusion, machines are now designated either EVEN or ODD based on whether they are normally installed on an even or odd numbered lane. For identifying similar parts within a machine (often mirror-image parts designed for a specific location), the designations 7-PIN SIDE and 10-PIN SIDE are now used, as these locations are easily identified and are independent of the point of reference, (i.e. from behind the machine or in front of the machine).

Often a single drawing is used to represent both the even and odd pinspotters (as shown below) because most of the parts that are being called out are common to both pinspotters. Occasionally two or more item numbers are shown associated with a single part (see items 2 & 3 and 4 & 5). When ganged item numbers refer to the same part in the drawing, the item number with the line pointing to the part is the one that is actually depicted (item 2 here). In the parts list, Item 2 also carries an EVEN MACHINE designation while item 3 carries an ODD MACHINE designation. In this case, the illustrated part is the part on the EVEN pinspotter. The part called out as item 3 is not shown and may be a mirror image of item 2 or may have other physical differences, but provides the same function on the ODD pinspotter and carries a different part number. Both part numbers are included in the parts list. Be sure to read the descriptions carefully.



Some ganged item numbers, for example,  $\textcircled{8}$   $\textcircled{8A}$ , represent a main component  $\textcircled{8}$  and an assembly  $\textcircled{8A}$  that contains the main component. Assemblies contain two or more parts (refer to the assembly's item description to see which parts are included in the assembly), and may be the more efficient or convenient means of replacing the main component. The part numbers for both the main component and the assembly are listed separately.

# FRONT END FRAME & PLATFORM ASSEMBLY – ODD MACHINE



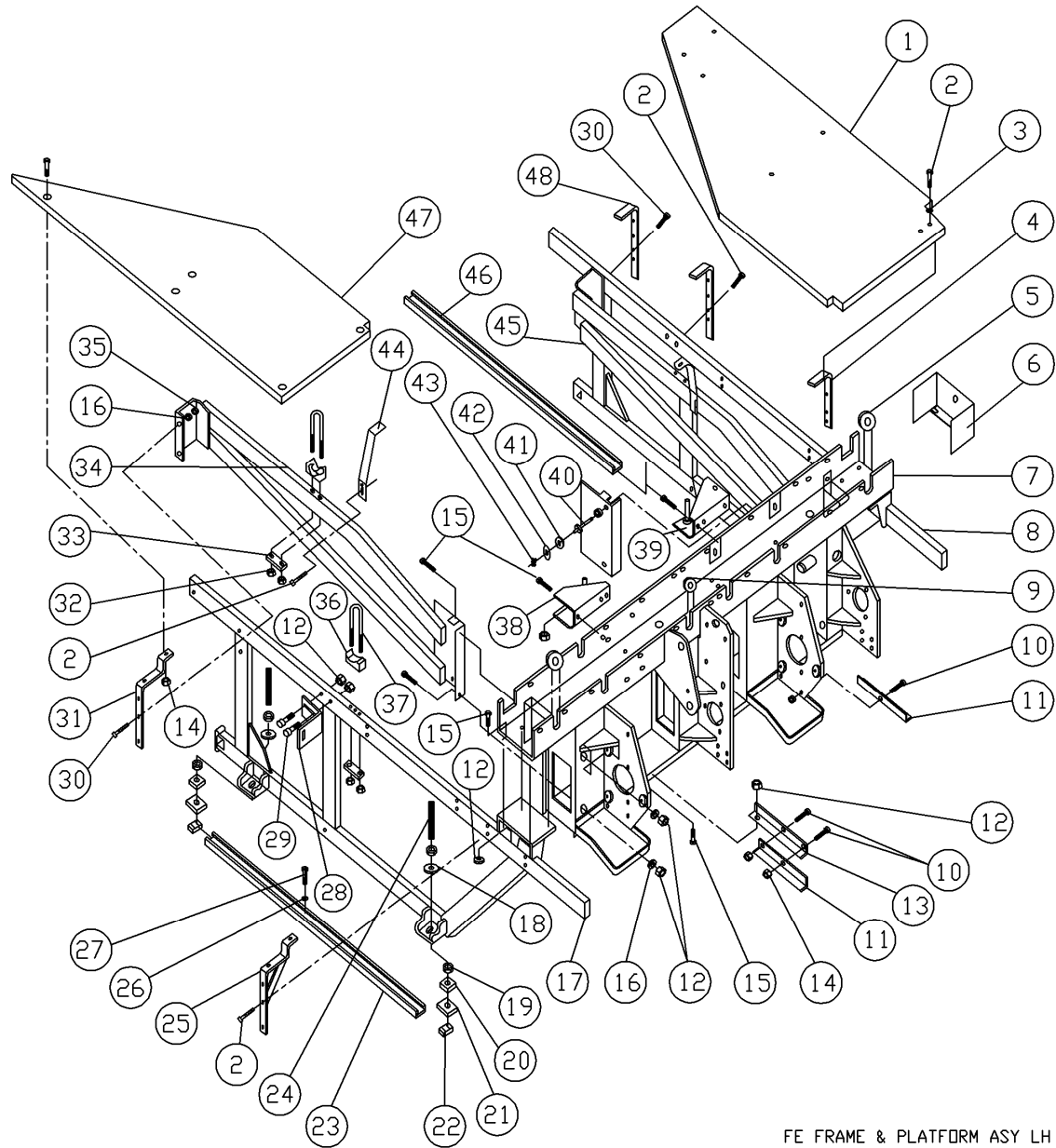
FE FRAME & PLATFORM ASY RH



## FRONT END FRAME & PLATFORM ASSEMBLY – ODD MACHINE

ITEM	QTY	PART #	DESCRIPTION	ITEM	QTY	PART #	DESCRIPTION
1	20	809-849-285	SCREW, HEX, 1/4 -20 X 1-3/4	27	4	804-557-731	U-BOLT, SWEEP MOUNTING
2	5	948-753-102	WASHER, FLAT, 5/8 X 9/32 X 1/16	28	4	809-865-325	SCREW, HEX, 3/8 -16 X 2
3	1	070-006-425	PLATFORM, 10-PIN SIDE	29	1	070-006-405	ANGLE WELDMENT
4	1	070-001-819	PLATFORM SUPPORT WELDMENT	30	8	844-057-002	NUT, HEX LOCK, 5/16 -18
5	2	250-001-046	GROMMET, LARGE	31	4	070-008-126	CLAMP BAR
6	1	088-500-200	CROSS BEAM WELDMENT, WIDE DUCT	32	1	840-065-002	NUT, FLEX LOCK, THIN, 3/8 - 16
7	8	711-520-017	GROMMET, SMALL	33	1	070-006-426	PLATFORM, 7-PIN SIDE.
8	4	809-849-125	SCREW, HEX, 1/4 -20 X 3/4	34	1	070-007-844	UNISTRUT, SHORT
9	2	070-001-698	PIT LIGHT BRACKET	35	1	090-005-647	INNER SIDE BRACE 10-PIN SIDE.
10	24	839-665-002	NUT, HEX LOCK 3/8 -16	36	1	090-004-002	SIDE FRAME, 10-PIN SIDE.
11	1	070-001-596	ANGLE BRACKET	37	1	070-006-414	PLATFORM SUPPORT BRACKET
12	14	844-049-002	NUT, STOVER LOCK, 1/4 -20	38	4	809-865-285	SCREW, HEX, 3/8 -16 X 1-3/4
13	16	809-865-165	SCREW, HEX, 3/8 -16 X 1	39	2	070-004-654	TRACK SUPPORT BRACKET
14	25	948-767-132	WASHER, FLAT, 13/16 X 13/32 X 1/16	40	1	070-006-411	BRACKET WELDMENT (BIN ASSEMBLY, 10-PIN SIDE)
15	1	090-004-006	SIDE FRAME, 7-PIN SIDE	41	1	070-006-413	BRACKET WELDMENT (BIN ASSEMBLY, 7-PIN SIDE)
16	8	835-573-002	NUT, HEX JAM, 1/2 -13	42	1	963-400-002	X-WASHER
17	4	070-007-509	ELEVATING NUT	43	1	945-867-242	WASHER, 13/32 X 1-1/2
18	4	000-021-786	FRAME ADJUSTMENT PLATE	44	4	090-003-795	COUNTERBALANCE SPRING ROLLER
19	4	853-500-001	UNISTRUT NUT	45	3	070-006-490	PLATFORM SUPPORT BRACKET
20	1	070-007-843	UNISTRUT, LONG	46	1	090-005-646	INNER SIDE BRACE, 7-PIN SIDE
21	4	000-021-787	WASHER, 9/16 X 1-5/8 X 1/4, BLACK	47	4	090-002-028	PIN SPRING ROLLER
22	4	070-007-510	ELEVATING SETSCREW	48	1	090-005-034	END PLATE
23	2	070-001-817	PLATFORM ANGLE WELDMENT				
24	8	948-761-112	WASHER, FLAT, 11/16 X 11/32 X 1/16				
25	8	810-556-320	SCREW, HEX LAG, 5/16 X 2				
26	4	000-021-528	SADDLE				

# FRONT END FRAME & PLATFORM ASSEMBLY – EVEN MACHINE



FE FRAME & PLATFORM ASY LH



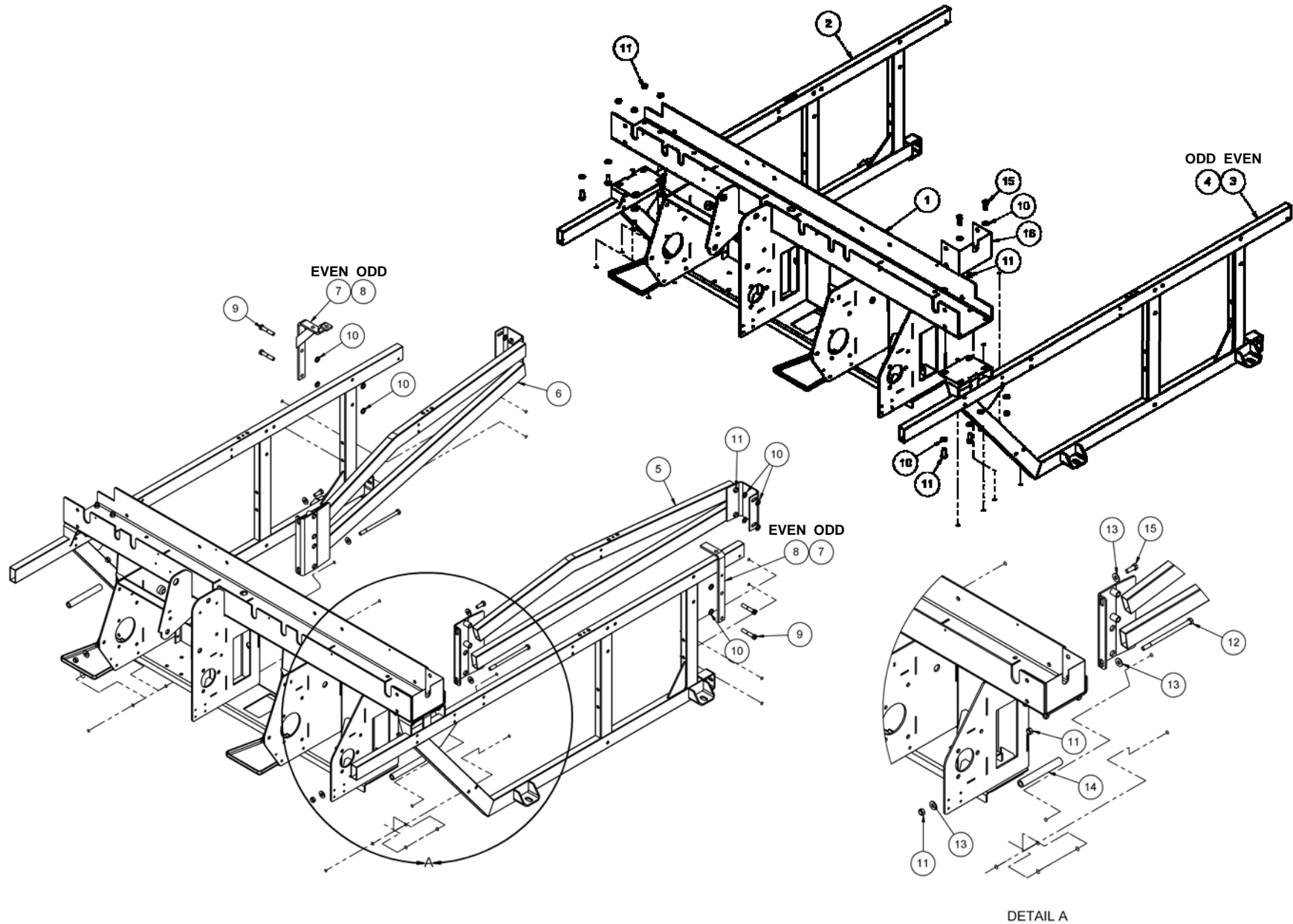


## FRONT END FRAME & PLATFORM ASSEMBLY – EVEN MACHINE

ITEM	QTY	PART #	DESCRIPTION
1	1	070-006-426	PLATFORM, 10-PIN SIDE
2	20	809-849-285	SCREW, HEX, 1/4 -20 X 1-3/4
3	10	948-753-102	WASHER, FLAT, 5/8 X 9/32 X 1/16
4	2	070-001-817	PLATFORM ANGLE WELDMENT
5	2	250-001-046	GROMMET, LARGE
6	1	090-005-034	END PLATE
7	1	088-500-200	CROSSBEAM WELDMENT, WIDE DUCT
8	1	090-004-003	SIDE FRAME, 10-PIN SIDE
9	8	711-520-017	GROMMET, SMALL
10	4	809-849-125	SCREW, HEX, 1/4 -20 X 3/4
11	2	070-001-698	PIT LIGHT BRACKET
12	24	839-665-002	NUT, STOVER LOCK, 3/8 -16
13	1	070-001-596	ANGLE BRACKET
14	14	844-049-002	NUT, STOVER LOCK, 1/4 - 20
15	16	809-865-165	SCREW, HEX, 3/8 - 16 X 1
16	25	948-767-132	WASHER, FLAT, 13/16 X 13/32 X 1/16
17	1	090-004-006	SIDE FRAME, 7-PIN SIDE
18	4	000-021-787	WASHER, 9/16 X 1-5/8 X 1/4
19	8	835-573-002	NUT, HEX JAM, 1/2 - 13
20	4	070-007-509	ELEVATING NUT
21	4	000-021-786	FRAME ADJUSTMENT PLATE
22	4	853-500-001	UNISTRUT NUT
23	1	070-007-844	UNISTRUT, SHORT
24	4	070-007-510	ELEVATING SETSCREW
25	1	070-001-819	PLATFORM SUPPORT WELDMENT
26	8	948-761-112	WASHER, FLAT, 11/16 X 11/32 X 1/16

ITEM	QTY	PART #	DESCRIPTION
27	8	810-556-320	SCREW, HEX LAG, 5/16 X 2
28	2	070-004-654	TRACK SUPPORT BRACKET
29	4	809-865-285	SCREW, HEX, 3/8 - 16 X 1-3/4
30	4	809-865-325	SCREW, HEX, 3/8 - 16 X 2
31	1	070-006-414	PLATFORM SUPPORT BRACKET
32	8	844-057-002	NUT, STOVER LOCK, 5/16 - 18
33	4	070-008-126	CLAMP BAR
34	1	090-005-646	INNER SIDE BRACE, 7-PIN SIDE
35	4	840-065-002	NUT, FLEX LOCK, THIN, 3/8 - 16
36	4	000-021-528	SADDLE
37	4	804-557-731	U-BOLT, SWEEP MOUNTING
38	1	070-006-413	BRACKET WELDMENT, BIN ASSEMBLY, 7-PIN SIDE
39	1	070-006-411	BRACKET WELDMENT, BIN ASSEMBLY, 10-PIN SIDE
40	4	090-002-028	PIN SPRING ROLLER
41	4	090-003-795	COUNTERBALANCE SPRING ROLLER
42	4	945-867-242	WASHER, 13/32 X 1-1/2
43	4	963-400-002	X-WASHER
44	3	070-006-490	PLATFORM SUPPORT BRACKET
45	1	090-005-647	INNER SIDE BRACE, 10-PIN SIDE
46	1	070-007-843	UNISTRUT, LONG
47	1	070-006-425	PLATFORM, 7-PIN SIDE
48	1	070-006-405	ANGLE WELDMENT

# FRONT END FRAME ASSEMBLY – EVEN & ODD MACHINES





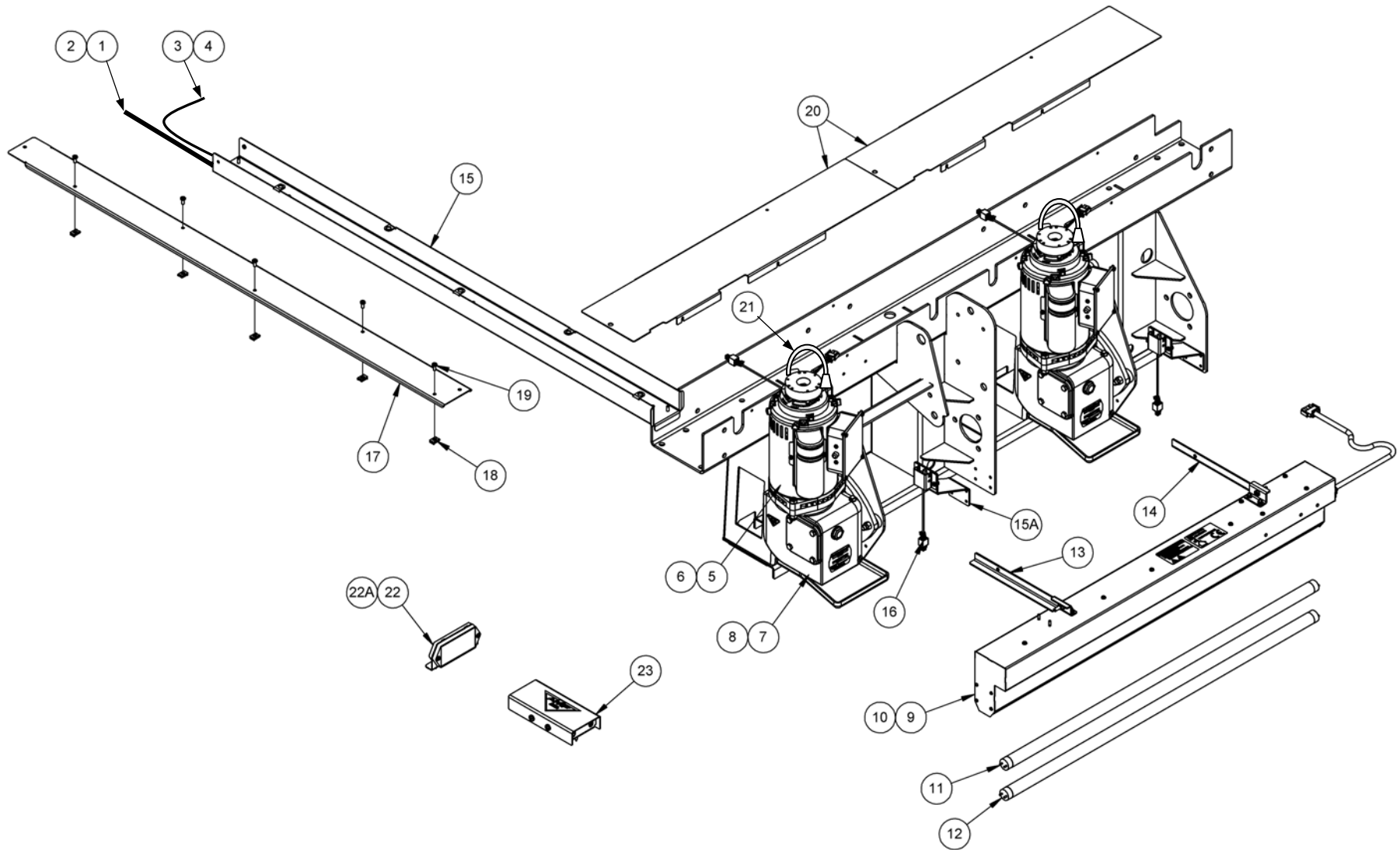
## FRONT END FRAME ASSEMBLY – EVEN & ODD MACHINES

ITEM	QTY	PART #	DESCRIPTION
1	1	088-500-200	CROSSBEAM WELDMENT, WIDE DUCT
2	1	090-004-006	SIDE FRAME, 7-PIN SIDE, ODD & EVEN
3	1	090-004-003	SIDE FRAME, 10-PIN SIDE, EVEN MACHINE
4	1	090-004-002	SIDE FRAME, 10-PIN SIDE, ODD MACHINE
5	1	090-005-647	FRAME BRACE WELDMENT, 10-PIN SIDE
6	1	090-005-646	FRAME BRACE WELDMENT, 7-PIN SIDE
7	1	070-006-414	REAR PLATFORM SUPPORT, 7-PIN SIDE EVEN MACHINE, 10-PIN SIDE ODD MACHINE
8	1	070-006-405	PLATFORM SUPPORT BRACKET, COMMON
9	4	809-865-325	SCREW, HEX, 3/8-16 X 2
10	22	948-767-132	FLAT WASHER, .41 X .73 X .06
11	16	844-065-002	NUT, STOVER LOCK, 3/8-16
12	2	809-865-104	SCREW, HEX, 3/8-16 X 6½
13	6	947-356-617	FLAT WASHER, 5/16 USS
14	2	088-500-222	CROSSBEAM SPACER
15	10	809-865-165	SCREW, HEX, 3/8-16 X 1
16	1	090-005-034	CROSSBEAM END PLATE

ITEM	QTY	PART #	DESCRIPTION
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# FRONT END ELECTRICAL INSTALLATION

**NOTE:** Even machine shown. Odd machine has cable duct on the opposite end of the crossbeam.

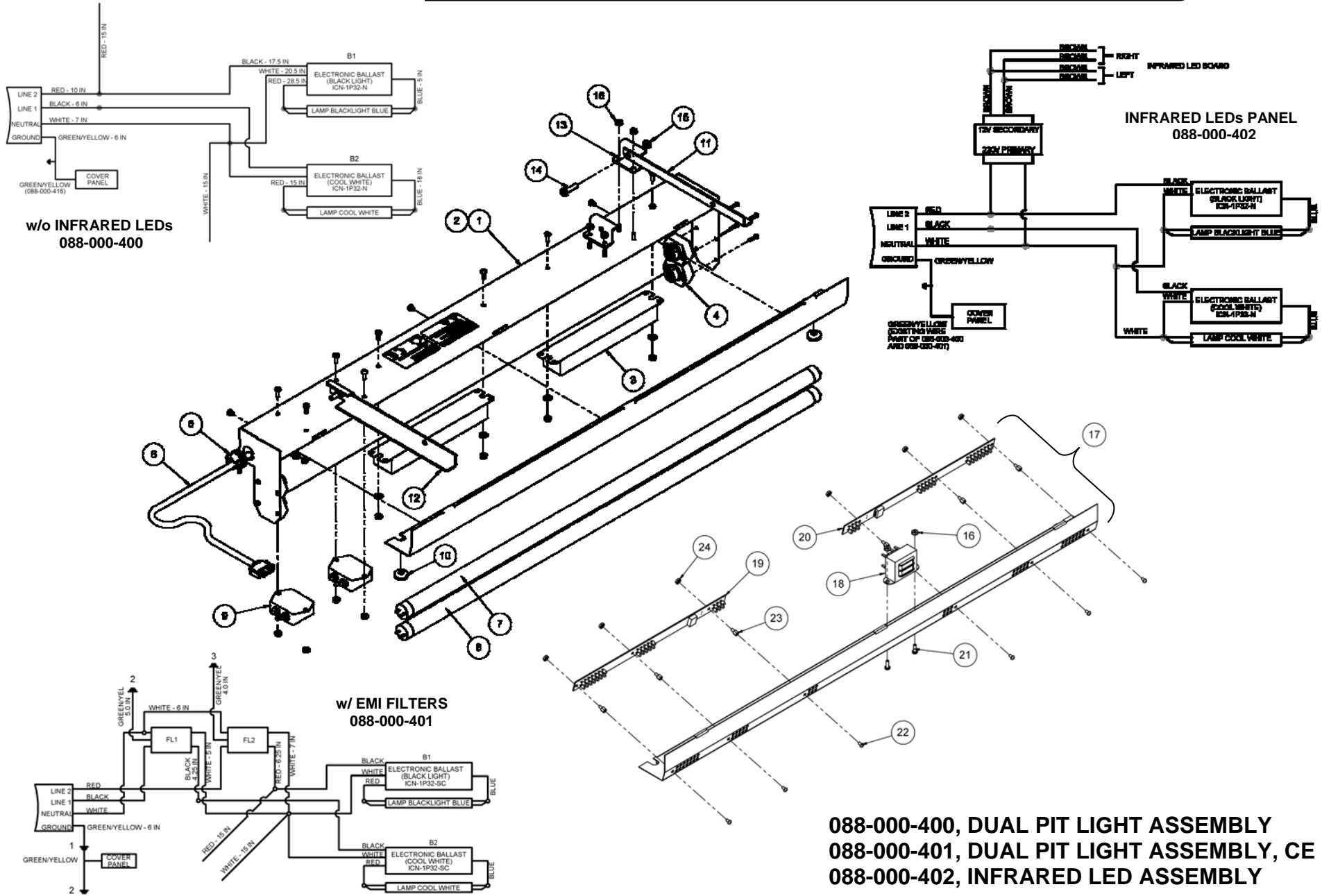




## FRONT END ELECTRICAL INSTALLATION

ITEM	QTY	PART #	DESCRIPTION	ITEM	QTY	PART #	DESCRIPTION
1	1	088-500-238	EVEN MACHINE POWER CABLE				
2	1	088-500-239	ODD MACHINE POWER CABLE				
3	1	088-000-242	EVEN MACHINE LOGIC CABLE				
4	1	088-000-243	ODD MACHINE LOGIC CABLE				
5	2	088-000-145	FRONT END XLi MOTOR ASSEMBLY, 50 HZ				
6	2	088-000-146	FRONT END XLi MOTOR ASSEMBLY, 60 HZ				
7	2	088-004-509	FRONT END GEARBOX, 50HZ				
8	2	088-004-504	FRONT END GEARBOX, 60HZ				
9	1	088-000-401	DUAL PIT LIGHT ASSEMBLY, CE				
10	1	088-000-400	DUAL PIT LIGHT ASSEMBLY				
11	1	751-001-471	LAMP, DAY LIGHT, 36"				
12	1	751-001-460	LAMP, BLACK LIGHT, 36"				
13	1	070-001-907	PIT LIGHT SUPPORT BRACKET, 7-PIN SIDE				
14	1	070-001-908	PIT LIGHT SUPPORT BRACKET, 10-PIN SIDE				
15	2	088-000-022	ENCODER				
15A	2	088-000-107	HOME ASSEMBLY				
16	1	088-200-477	CABLE DUCT ASSEMBLY, WIDE				
17	1	088-500-226	CABLE DUCT COVER, WIDE				
18	5	724-511-074	U-NUT, 10 - 32				
19	5	818-240-082	SCREW, PAN HEAD, 10 - 32 X 1/2, SEMS				
20	2	088-500-225	CROSSBEAM COVER				
21	2	090-005-876	MOTOR CABLE				
22	2	088-000-189	REFLECTOR, XLi BALL DETECTOR				
22A	1	088-001-292	REFLECTOR KIT (incl. 2 reflectors and bracket)				
23	1	088-000-080	BALL DETECTOR ASSEMBLY				

# DUAL PIT LIGHT ASSEMBLY



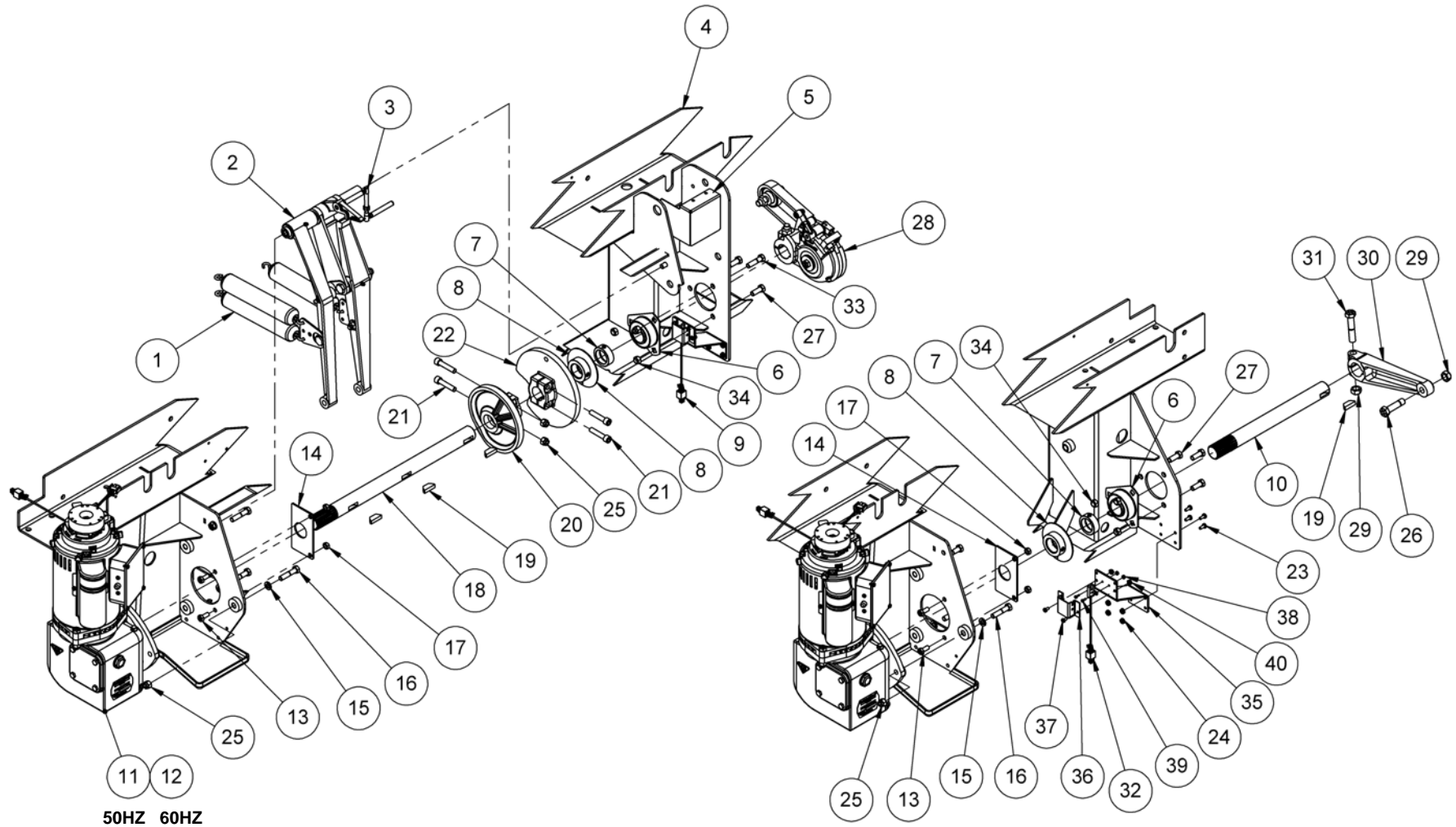


## DUAL PIT LIGHT ASSEMBLY

ITEM	QTY	PART #	DESCRIPTION
1	1	088-000-400	DUAL PIT LIGHT ASSEMBLY, DOMESTIC
2	1	088-000-401	DUAL PIT LIGHHT ASSEMBLY, CE
3	2	740-501-017	BALLAST, INSTANT START
4	2	751-002-159	FLUORESCENT BULB SOCKET
5	1	744-107-053	CABLE CLAMP
6	1	088-000-025	POWER CABLE
7	1	751-001-471	DAYLIGHT BULB, 36"
8	1	751-001-460	BLACKLIGHT BULB, 36"
9	2	770-029-255	EMI FILTER, (088-000-401 UNITS ONLY)
10	2	711-520-017	GROMMET
11	1	070-001-907	PITLIGHT ANGLE BRACKET, 10-PIN SIDE
12	1	070-001-908	PITLIGHT ANGLE BRACKET, 7-PIN SIDE
13	3	090-008-043	DUAL PITLIGHT MOUNTING BRACKET
14	2	809-849-165	SCREW, HEX, ¼-20 X 1
15	2	844-049-002	NUT, STOVER LOCK, ¼-20
16	16	843-133-002	NUT, KEPS, 8-32
17	1	088-000-402	INFRARED LED ASSEMBLY
18	1	088-000-009	TRANSFORMER, 220V/12V
19	1	088-000-411	INFRARED LED BOARD, LONG WIRE
20	1	088-000-412	INFRARED LED BOARD, SHORT WIRE
21	2	818-233-082	SCREW, PAN HEAD, 8-32 X ½
22	6	818-227-042	SCREW, ROUND HEAD, 6-32 X ¼
23	6	722-506-075	STANDOFF, ¼ HEX, 6-32 X ¼, M-F
24	6	843-127-002	NUT, KEPS, 6-32

ITEM	QTY	PART #	DESCRIPTION
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# FRONT END DRIVE





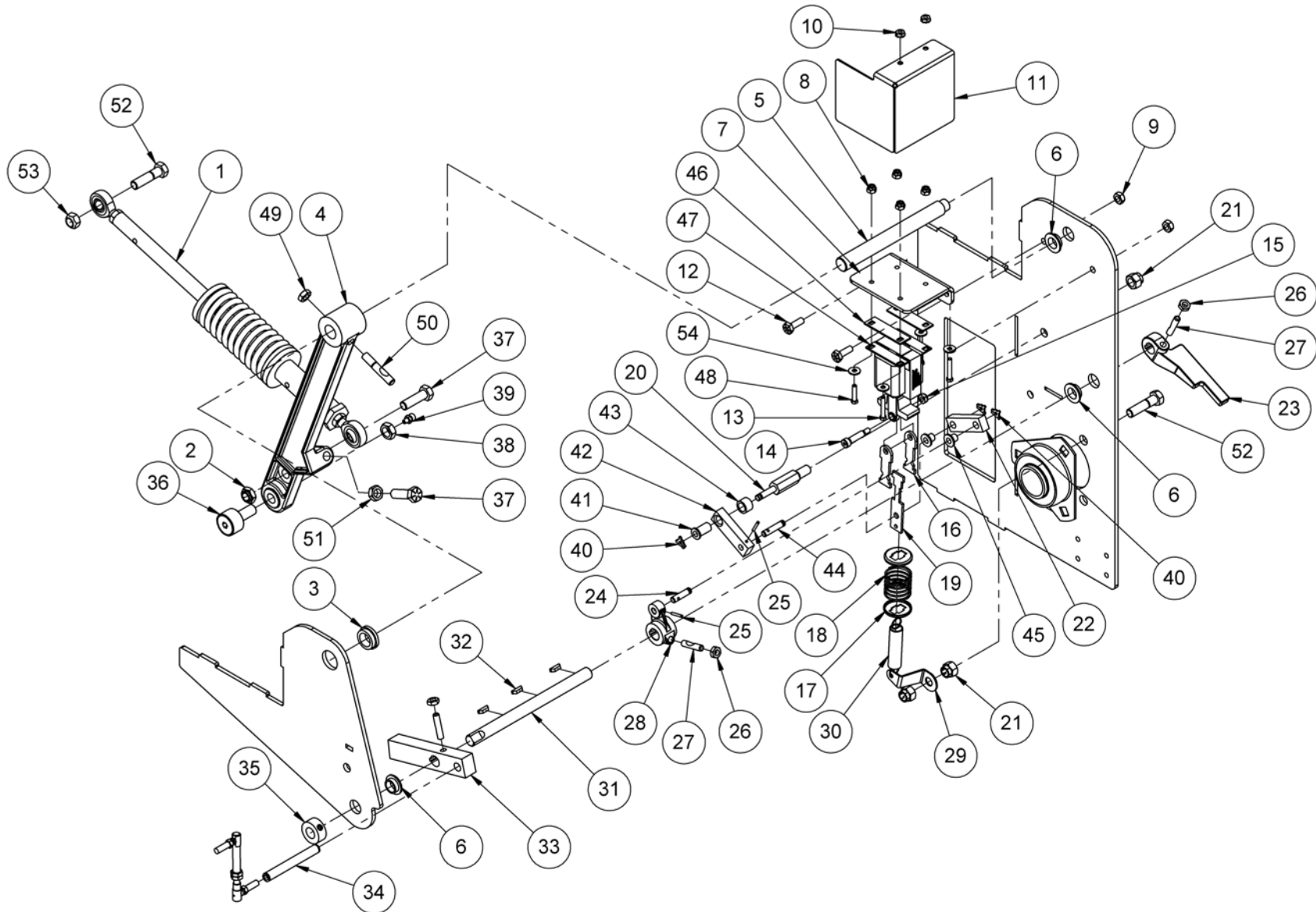


## FRONT END DRIVE

ITEM	QTY	PART #	DESCRIPTION
1	3	070-001-707	EXTENSION SPRING
2	1	070-006-492	RESPOT ARM LINK ASSEMBLY
3	1	070-006-493	BALL JOINT ASSEMBLY
4	1	088-500-200	CROSSBEAM WELDMENT, WIDE DUCT
5	1	090-005-029	SOLENOID COVER
6	2	701-420-034	BEARING, 1-1/4 BORE, 3-BOLT FLANGE
7	2	902-900-110	BEARING COLLAR, 1-1/4, LOCKING
8	2	088-000-038	HOME DISC ASSEMBLY
9	2	088-000-107	HOME ASSEMBLY, includes 32 & 35 -40
10	1	070-001-699	SWEEP DRIVE SHAFT
11	2	088-000-172	FRONT END DRIVE UNIT, 50 HZ
12	2	088-000-173	FRONT END DRIVE UNIT, 60 HZ
13	4	809-857-125	SCREW, HEX, 5/16 - 18 X 3/4
14	2	070-006-765	SHAFT PLATE
15	6	951-164-002	WASHER, SPLIT LOCK, 3/8
16	6	809-865-285	SCREW, HEX HEAD, 3/8 -16 X 1-3/4
17	4	844-057-002	NUT, STOVER LOCK, 5/16 - 18
18	1	090-005-565	TABLE DRIVE SHAFT
19	4	907-000-900	KEY
20	1	070-001-910	SPOT & RESPOT CAM
21	4	810-265-280	SCREW, SOCKET HEAD, 3/8 - 16 X 1 1/4
22	1	070-006-427	SHUTTLE CAM
23	8	818-240-082	SCREW, ROUND HEAD, 10-32 X 1/2
24	8	843-140-002	NUT, HEX LOCK, 10 - 32
25	9	839-665-002	NUT, FLEX LOCK, 3/8 - 16

ITEM	QTY	PART #	DESCRIPTION
26	1	070-003-243	SCREW, HEX, 1/2-13 X 2
27	5	809-865-165	SCREW, HEX, 3/8 - 16 X 1
28	1	090-005-550	TABLE DRIVE ASSEMBLY
29	2	844-073-002	NUT, STOVER LOCK, 1/2 - 13
30	1	000-023-139	CRANK ARM
31	1	809-873-405	SCREW, HEX, 1/2 - 13 X 2-1/2
32	2	088-000-022	ENCODER, HOME SENSOR ASSEMBLY
33	1	809-865-245	SCREW, HEX, 3/8-16 X 1-1/2
34	5	844-065-002	NUT, STOVER LOCK, 3/8-16
35	2	088-000-039	HOME SENSOR BRACKET
36	2	088-000-040	SENSOR COVER
37	4	818-233-062	SCREW, ROUND HEAD, 8-32 X 3/8, SEMS
38	4	843-121-002	NUT, 4-40, KEPS
39	4	817-921-060	SCREW, PAN HEAD, 4-40 X 3/8, SEMS
40	4	843-133-002	NUT, 8-32, KEPS

# SOLENOID & SHUTTLE OPERATING ASSEMBLY



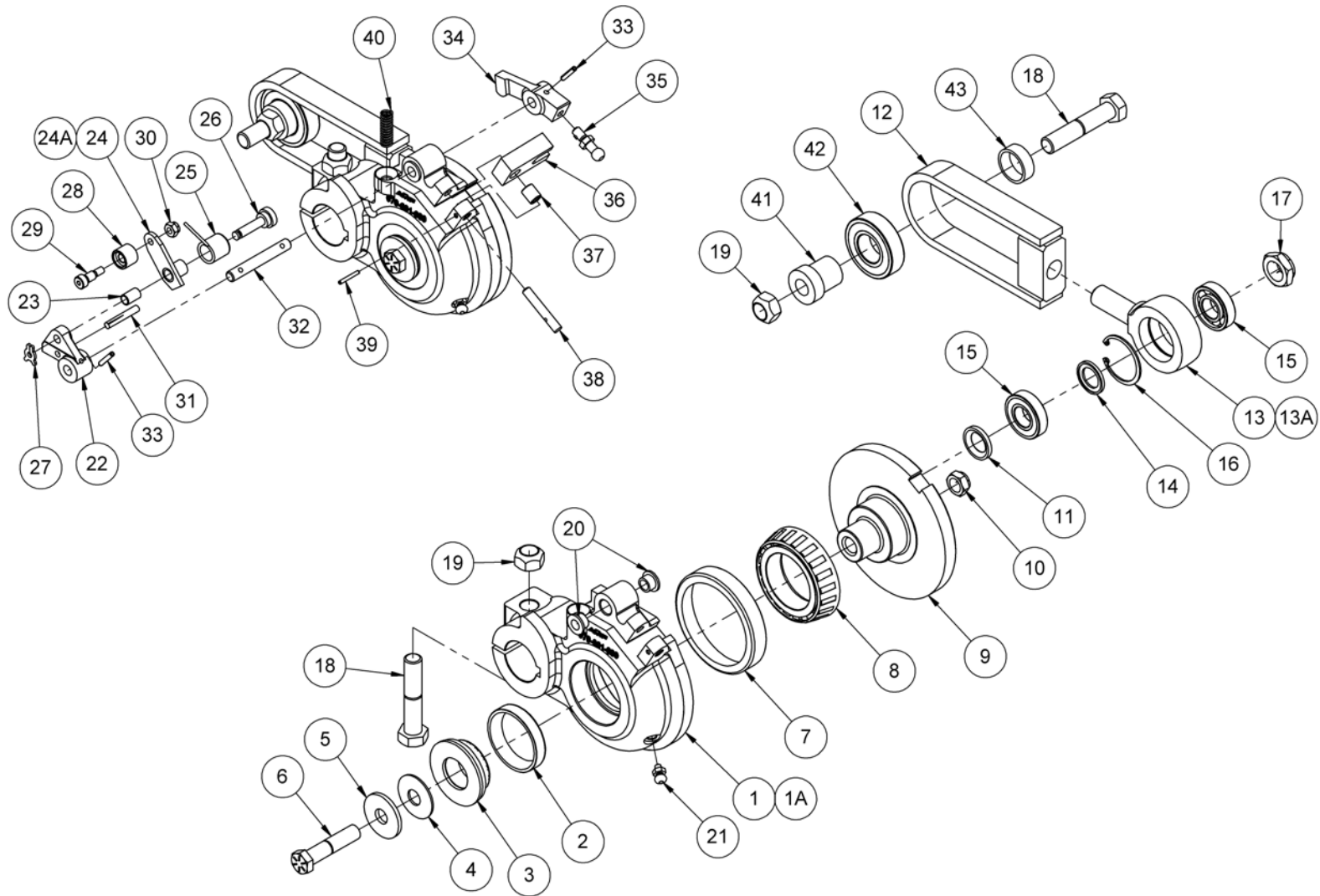


## SOLENOID & SHUTTLE OPERATING ASSEMBLY

ITEM	QTY	PART #	DESCRIPTION
1	1	088-001-631	SHUTTLE CONNECTING ROD w/Lge Spring
2	1	840-065-002	NUT, FLEX LOCK, 3/8 - 16
3	1	900-210-251	FLANGED BEARING
4	1	070-006-295	SHUTTLE OPERATING ROD LEVER
5	1	090-004-017	RESPOT LEVER SHAFT
6	3	900-208-041	FLANGED BEARING, .503 X .753 X 5/16
7	1	090-005-018	SOLENOID BRACKET
8	4	839-533-002	NUT, NYLON LOCK, 8 - 32
9	2	844-049-002	NUT, STOVER LOCK, 1/4 - 20
10	2	843-133-002	NUT, HEX LOCK, 8 - 32
11	1	090-005-029	SOLENOID GUARD
12	2	809-849-125	SCREW, HEX, 1/4 - 20 X 3/4
13	2	813-933-162	SCREW, HEX, 8 - 32 X 1
14	1	880-139-200	SHOULDER BOLT, 1/4 X 7/8, BLACK
15	1	840-039-002	NUT, FLEX LOC, 10-24, THIN
16	2	070-006-724	LINK, SHUTTLE SPRING
17	2	070-006-277	SPRING WASHER
18	1	070-006-276	SHUTTLE DRIVE SPRING
19	1	070-006-282	LINK, SPOTTING SOLENOID
20	1	090-005-028	SOLENOID PIVOT STUD
21	1	839-665-002	NUT, FLEX LOCK, 3/8 - 16
22	1	070-008-132	LINK ASSEMBLY
23	1	070-006-278	CAM LINK
24	1	070-001-777	LINK PIN
25	2	913-415-100	SPRING PIN, 3/32 X 5/8
26	3	835-549-002	NUT, HEX JAM, 1/4 - 20
27	3	070-006-116	CLAMP STUD, 1/4 X 1-1/8

ITEM	QTY	PART #	DESCRIPTION
28	1	070-006-292	LINK
29	1	088-001-293	SPRING CLIP
30	1	070-006-283	SHUTTLE DRIVE LINK SPRING
31	1	090-005-017	SOLENOID PIVOT SHAFT
32	3	907-000-200	KEY
33	1	070-006-456	STOP LEVER
34	1	913-464-480	SPRING PIN, 3/8 X 3
35	1	901-100-110	SET COLLAR
36	1	070-006-728	CAM FOLLOWER
37	1	809-865-205	SCREW, HEX, 3/8 - 16 X 1-1/4
38	1	835-570-002	NUT, HEX JAM, 7/16 - 20
39	1	710-501-012	GREASE FITTING
40	3	963-200-002	X - WASHER
41	1	900-204-121	FLANGED BEARING, .25 X .378 X 3/4
42	1	070-008-134	LINK ASSEMBLY
43	1	070-008-133	LINK ASSEMBLY SPACER
44	1	070-006-287	PIN, LONG
45	2	070-002-653	FLANGED BEARING, .252 X .315 X .33
46	2	090-003-459	DAMPER BASE
47	1	090-005-723	SOLENOID, 50/60 HZ, 230V
48	2	814-333-122	SCREW, HEX, 8 - 32 X 3/4
49	1	835-557-002	NUT, HEX, 5/16 - 18, JAM
50	1	070-006-284	CLAMP STUD 5/16 X 1-3/4
51	1	835-565-002	NUT, HEX, 3/8-16, JAM
52	2	809-865-245	SCREW, HEX, 3/8 - 16 X 1 1/2
53	1	844-065-002	NUT, STOVER LOCK, 3/8 - 16
54	4	948-637-072	WASHER, FLAT, 3/16 X 7/16 X 3/64

# TABLE DRIVE ASSEMBLY



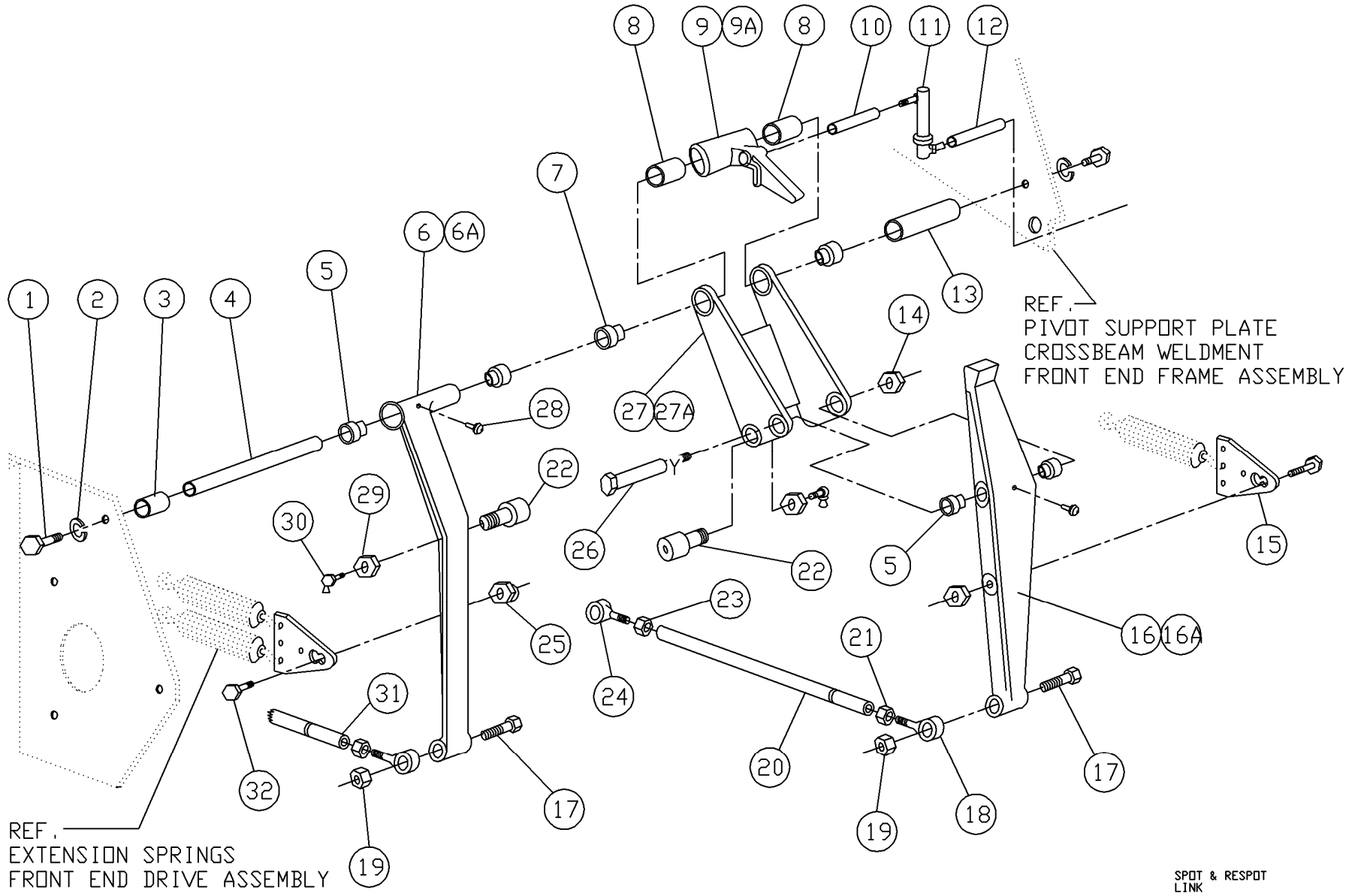


## TABLE DRIVE ASSEMBLY

ITEM	QTY	PART #	DESCRIPTION
1	1	070-001-889	TABLE DRIVE CRANK HOUSING
1A	1	070-002-778	CRANK HOUSING & CUP ASSEMBLY (Includes items 1, 2, 7, 20, & 21)
2	1	070-002-780	ROLLER BEARING CUP
3	1	070-002-824	CONE & SEAL BEARING ASSEMBLY
4	1	070-006-729	SPRING DISC
5	1	949-071-227	WASHER, FLAT, .47 X 1.38 X .12
6	1	809-870-325	SCREW, HEX, 7/16 - 20 X 2
7	1	070-002-777	ROLLER BEARING CUP
8	1	070-002-776	CONE-STYLE ROLLER BEARING
9	1	090-005-549	TABLE DRIVE ECCENTRIC
10	1	840-070-002	NUT, FLEX LOCK, 7/16 - 20
11	1	070-001-849	WASHER, 5/8 X 1 X 1/8
12	1	070-007-755	YOKE WELDMENT
13	1	000-021-879	ROD END
13A	1	000-021-880	ROD END ASSY (includes 13, 14, 15, & 16)
14	1	000-021-878	SPACER
15	2	000-021-881	BALL BEARING, .625 X 1.375 X .34
16	1	919-000-600	RETAINING RING
17	1	840-182-002	NUT, 5/8-18, FLEX LOCK
18	2	809-873-405	SCREW, HEX, 1/2 - 13 X 2-1/2
19	2	844-073-002	NUT, STOVER LOCK, 1/2 - 13
20	2	900-205-053	FLANGED BEARING .315 X .44 X 5/16
21	1	710-501-004	GREASE FITTING

ITEM	QTY	PART #	DESCRIPTION
22	1	070-008-322	LINK ACTUATOR ASSEMBLY
23	1	070-002-652	BUSHING .252 X .315 X .5
24	1	070-001-861	LINK & HUB ASSEMBLY
24A	1	070-007-250	LINK ASSEMBLY (includes items 23 & 24)
25	1	070-001-931	SPRING
26	1	070-001-932	PIN
27	1	963-300-002	X-WASHER
28	1	070-001-857	NYLON ROLLER
29	1	880-139-120	SHOULDER SCREW, 10 - 24 X 1/4 X 3/8
30	1	839-539-002	NUT, FLEX LOCK, 10 - 24
31	1	912-137-200	GROOVE PIN, 1/16 X 1-1/4
32	1	070-008-325	PIN, ACTUATOR ASSEMBLY
33	2	913-423-120	SPRING PIN, .125 X 3/4
34	1	070-008-321	LATCH ARM ASSY (1/8" SPRING PIN HOLE)
35	1	070-001-893	CAM BALL ASSEMBLY
36	1	070-001-918	LATCH ASSEMBLY
37	1	900-104-071	SLEEVE BEARING, .253 X 7/16 X .44
38	1	070-001-894	PIVOT PIN
39	1	913-415-120	SPRING PIN, .094 X 3/4
40	1	070-001-917	COMPRESSION SPRING
41	1	070-007-310	FLANGED BEARING, .502 X .871 X 1.20
42	1	190-001-490	BALL BEARING, .88 X 1.88 X .50
43	1	070-007-311	SLEEVE, TABLE DRIVE ASSEMBLY

# SPOT & RESPOT LINKAGES

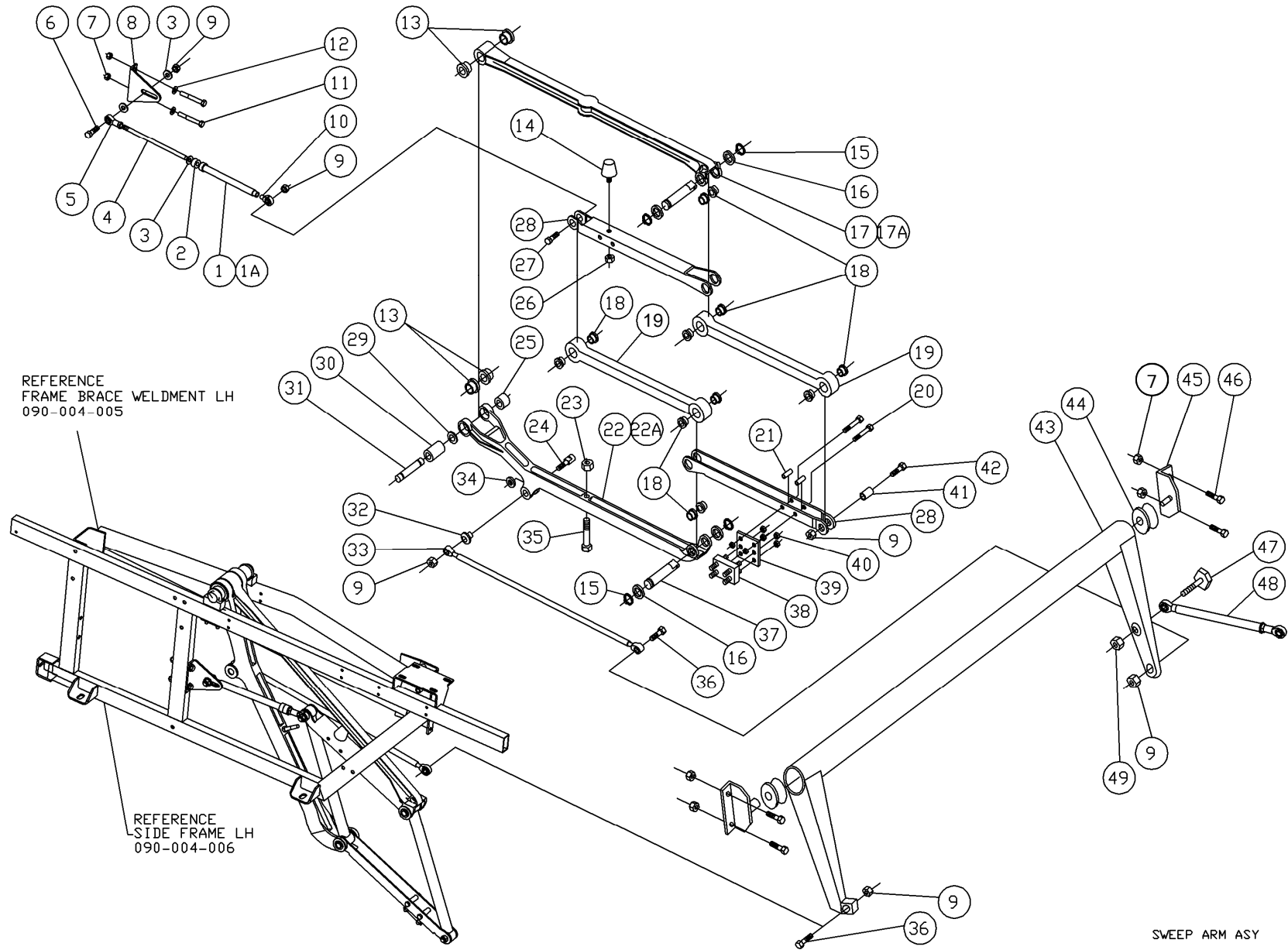




## SPOT & RESPOT LINKAGES

ITEM	QTY	PART #	DESCRIPTION	ITEM	QTY	PART #	DESCRIPTION
1	2	809-865-125	SCREW, HEX, 3/8 - 16 X 3/4	24	2	090-005-265	END FITTING, 7/16-20, R.H. THREADS
2	2	951-164-002	WASHER, SPLIT LOCK, 3/8	25	2	839-665-002	NUT, FLEX LOCK, 3/8 - 16
3	1	090-005-534	SPACER	26	1	070-001-585	SPOT LINK PIN
4	1	090-005-025	PIVOT SHAFT, 5/8 X 8-5/8	27	1	070-001-565	UPPER SPOTTING LINK
5	4	070-001-919	FLANGED BEARING, .627 X .814 X .870	27A	1	070-001-605	UPPER SPOTTING LINK ASSY. (incl. 7 & 27)
6	1	070-006-459	RESPOT ARM LINK	28	2	710-501-009	GREASE FITTING
6A	1	070-006-492	RESPOT ARM LINK ASSY. (incl. 5, 6, & 28)	29	2	844-070-002	NUT, STOVER LOCK, 7/16 - 20
7	2	070-002-691	FLANGED BEARING, .627 X .752 X 1/2	30	2	710-501-012	GREASE FITTING
8	2	900-110-141	SLEEVE BEARING, .628 X .878 X 7/8	31	1	Not for sale	RESPOT TIE ROD (ROD ONLY) see pg 27.
9	1	070-001-996	SPOTTING ARM LATCH	32	2	070-001-587	SPRING HANGER PIN
9A	1	090-005-552	SPOTTING ARM LATCH ASSY. (incl. 8 & 9)				
10	1	913-464-400	SPRING PIN				
11	1	070-006-493	BALL JOINT ASSEMBLY				
12	1	913-464-480	SPRING PIN, 3/8				
13	1	090-005-564	SPACER, LONG				
14	1	844-073-002	NUT, STOVER LOCK, 1/2 - 13				
15	2	090-005-576	SPRING HANGER				
16	1	070-006-479	RESPOT ARM LINK				
16A	1	070-006-481	SPOTTING ARM LINK ASSY. (incl. 5, 16, & 28)				
17	2	809-869-365	SCREW, HEX, 7/16 - 14 X 2 1/4				
18	2	090-005-264	END FITTING, 7/16-20, L.H. THREADS				
19	2	844-069-002	NUT, STOVER LOCK, 7/16 - 14				
20	1	Not for sale	SPOT TIE ROD (ROD ONLY) see pg 27.				
21	2	835-670-002	NUT, JAM, 7/16-20, L.H. THREADS				
22	2	070-006-728	CAM FOLLOWER BEARING ASSEMBLY				
23	2	835-570-002	NUT, JAM, 7/16-20, R.H. THREADS				

# SWEEP ARM ASSEMBLY





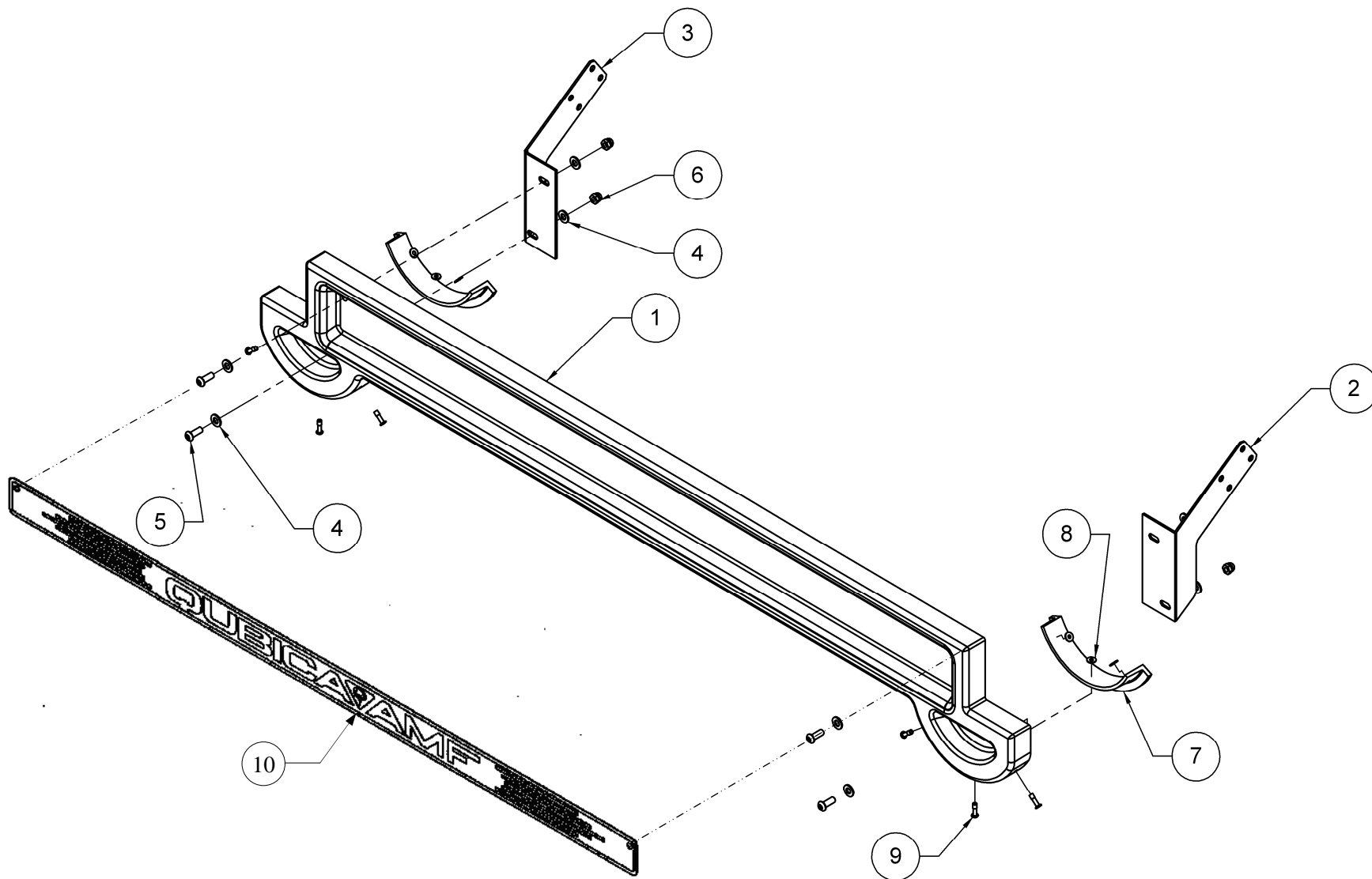


## SWEEP ARM ASSEMBLY

ITEM	QTY	PART #	DESCRIPTION
1	1	070-007-278	TUBE WELDMENT
1A	1	090-006-145	SWEEP LINK SLIDE ASSY (incl. 1, 2, 3, 4, 5, & 10)
2	1	070-007-283	BUMPER
3	3	949-100-002	WASHER, 59/64 X 15/32
4	1	070-007-276	ROD
5	1	090-005-257	ROD END
6	1	809-869-245	BOLT, 7/16-14 X 1½
7	6	844-065-002	NUT, STOVER LOCK, 3/8 - 16
8	1	090-006-128	SWEEP LINK BRACKET
9	5	838-369-002	NUT, CENTER PUNCH LOCK, 7/16 - 14
10	1	090-006-138	ROD END, 7/16 - 20 X .5
11	2	809-865-445	SCREW, HEX, 3/8 - 16 X 2.75
12	2	948-767-132	WASHER, 13/32 X 13/16 X 1/16
13	4	000-023-104	FLANGED BEARING, 1.25 X 1.5 X .953
14	1	090-006-137	BUMPER
15	4	919-005-600	RETAINING RING
16	4	070-006-121	WASHER
17	1	088-000-093	SWEEP LINK
17A	1	090-006-139	STABLIZER LINK ASSY (incl. 13, 17 & 18)
18	12	000-023-114	FLANGED BEARING, .628 X .81 X .06
19	2	090-006-133	MIDDLE LINK, STEEL
20	2	809-857-365	SCREW, HEX, 5/16 - 18 X 2¼
21	2	090-006-125	LOWER STEEL SWEEP SPACER
22	1	070-003-157	DRIVE LINK CASTING
22A	1	090-006-140	DRIVE LINK ASSY (incl. 13, 18, 22, 23 & 35)
23	1	839-665-002	NUT, FLEX LOCK, 3/8 - 16

ITEM	QTY	PART #	DESCRIPTION
24	1	090-006-134	DRIVE LINK PIN
25	1	070-003-233	MAIN PIVOT SPACER, SHORT
26	1	839-057-002	NUT, HEX LOCK NYLON, 5/16 - 18
27	1	809-869-405	BOLT, HEX, 7/16 - 14 X 2-1/2
28	1	090-006-132	STEEL SWEEP LINK, UPPER & LOWER
29	1	070-011-819	SHIM, TABLE & SWEEP
30	1	070-003-232	MAIN PIVOT SPACER, LONG
31	1	070-003-106	MAIN PIVOT SHAFT
32	1	090-006-135	DRIVE LINK BUSHING/SPACER
33	1	090-005-254	DRIVE LINK CONNECTING ROD
34	1	070-003-117	DRIVE LINK SPACER
35	1	070-003-221	SCREW, SWEEP LINK ASSEMBLY
36	2	809-869-365	SCREW, HEX, 7/16 - 14 X 2-1/4
37	2	090-006-126	PIN, STEEL SWEEP LINKAGE
38	1	090-006-136	SHOCK MOUNT
39	1	090-006-131	SWEEP SHOCK MOUNT PLATE
40	2	844-057-002	NUT, STOVER LOCK, 5/16 - 18
41	2	090-006-127	STEEL SWEEP LINK SLEEVE
42	1	809-869-325	BOLT, HEX, 7/16 - 14 X 2
43	1	090-004-010	SWEEP ROCKER ARM
44	2	090-005-015	TORQUE TUBE BEARING
45	2	090-004-007	TORQUE TUBE HANGER
46	4	809-865-205	SCREW, HEX, 3/8 - 16 X 1-1/4
47	1	070-003-245	SCREW, HEX, ½ - 13 X 3
48	1	088-001-353	TIE ROD ASSEMBLY, SWEEP MOTOR
49	1	844-073-002	NUT, STOVER LOCK, ½ - 13

# SWEEP BAR & MOUNTING ASSEMBLY



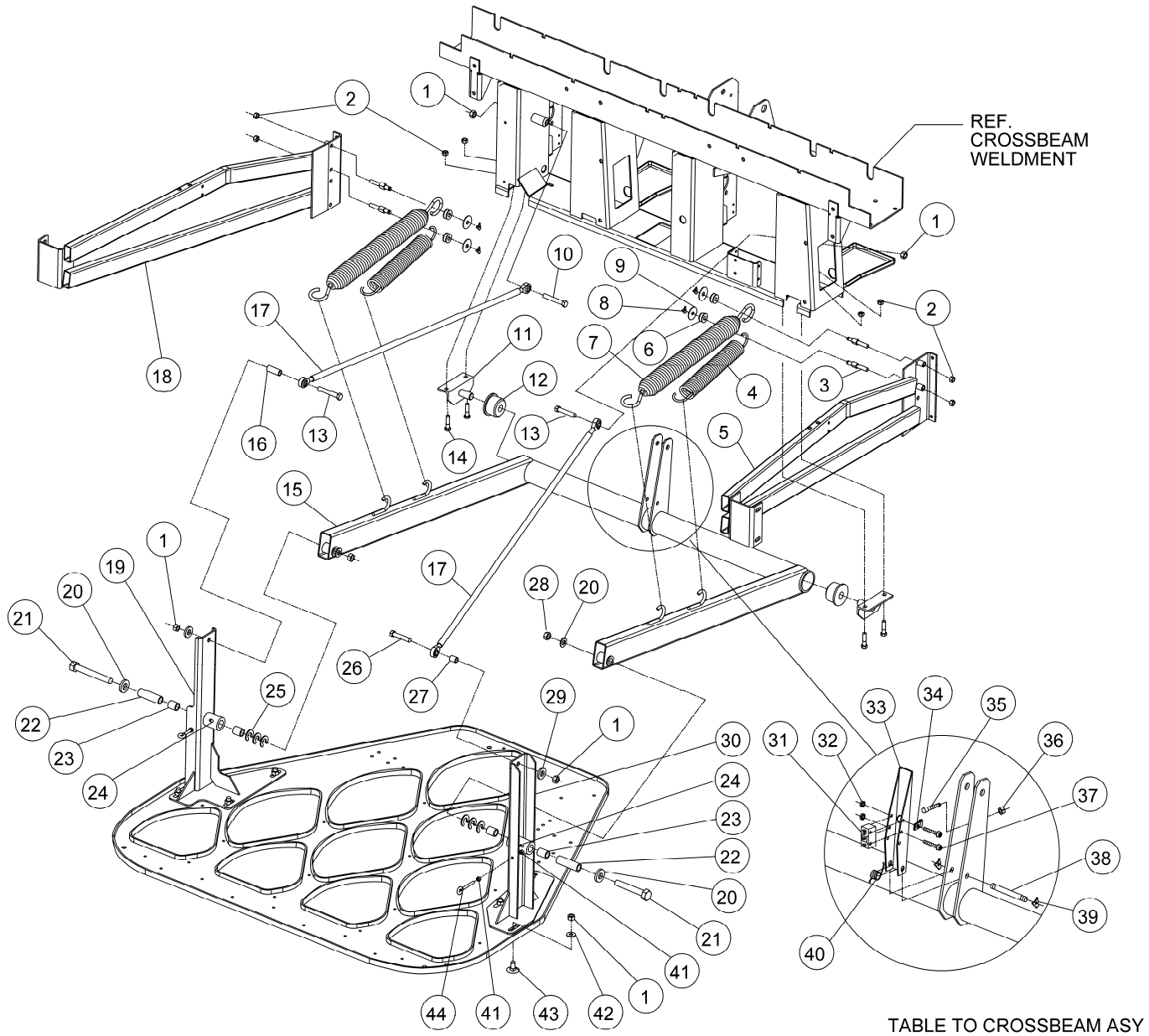


## SWEEP BAR & MOUNTING ASSEMBLY

ITEM	QTY	PART #	DESCRIPTION
1	1	300-000-165	SWEEP BAR
2	1	090-006-130	SWEEP MOUNTING BRACKET, 10-PIN SIDE
3	1	090-006-129	SWEEP MOUNTING BRACKET, 7-PIN SIDE
4	8	948-722-111	WASHER, FLAT, 11/16 X 11/32 X 1/16
5	4	808-557-140	SCREW, BUTTON HEAD, 5/16 - 18 X 7/8
6	4	830-057-002	NUT, ACORN, 5/16 - 18
7	2	300-000-175	SWEEP BAR CAP
8	6	948-637-072	WASHER, 3/16, POP RIVET BACKUP
9	6	938-637-100	RIVET, 3/16, ALUMINUM
10	1	088-001-089	SWEEP DECAL

ITEM	QTY	PART #	DESCRIPTION
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# TABLE & CROSSBEAM ASSEMBLY





## TABLE & CROSSBEAM ASSEMBLY

ITEM	QTY	PART #	DESCRIPTION
1	10	838-369-002	NUT, CENTER PUNCH LOCK, 7/16 - 14
2	8	839-665-002	NUT, STOVER LOCK, 3/8 - 16
3	4	090-002-028	SPRING ROLLER PIN
4	2	090-005-662	COUNTERBALANCE SPRING, SMALL
5	1	090-005-646	SIDE BRACE, L.H.
6	4	090-003-795	COUNTERBALANCE SPRING ROLLER
7	2	000-022-782	COUNTERBALANCE SPRING
8	4	963-400-002	X-WASHER, 3/16
9	4	945-867-242	WASHER, FLAT, .406 X 1-1/2 X .05
10	1	809-869-365	SCREW, HEX, 7/16 - 14 X 2.25
11	2	090-004-007	TUBE HANGER BRACKET
12	2	090-005-015	TORQUE TUBE BEARING
13	1	809-869-520	SCREW, HEX, 7/16 - 14 X 3.25
14	4	809-865-245	SCREW, HEX, 3/8 - 16 X 1-1/2
15	1	090-005-645	TORQUE TUBE WELDMENT
16	1	090-005-597	LEVELING SPACER
17	2	090-005-253	TIE ROD ASSEMBLY
18	1	090-005-647	SIDE BRACE, R.H.
19	1	090-005-514	TABLE SUPPORT WELDMENT, 10-PIN SIDE
20	4	948-983-212	WASHER, 21/32 X 1-5/16
21	2	070-006-048	BOLT, SPECIAL
22	2	090-005-654	SLEEVE, UPRIGHT
23	4	900-114-101	SLEEVE BEARING .877 X 1.128 X 5/8
24	2	710-501-004	GREASE FITTING
25	6	070-007-752	SPACER
26	1	809-869-325	SCREW, HEX, 7/16 - 14 X 2

ITEM	QTY	PART #	DESCRIPTION
27	1	070-007-303	LEVELING ROD SPACER
28	2	844-081-002	NUT, STOVER LOCK, 5/8 - 11
29	2	949-100-002	WASHER, 59/64 X 15/32 X 1/16
30	1	090-005-509	TABLE SUPPORT WELDMENT, 7-PIN SIDE
31	1	000-026-042	MICROSWITCH
32	2	843-127-002	NUT, HEX LOCK, 6-32
33	1	070-001-852	OFF-SPOT LEVER
34	1	744-203-013	CABLE CLAMP
35	1	070-001-854	ADJUSTMENT SCREW
36	1	835-549-002	NUT, HEX JAM, 1/4-20
37	2	818-227-202	SCREW, ROUND HEAD, 6-32 X 1-1/4
38	1	070-001-591	PIN
39	2	963-400-002	X-WASHER
40	1	070-001-853	SPRING
41	4	835-549-002	NUT, HEX JAM, 1/4 - 20
42	6	947-271-967	WASHER, FLAT, 7/16
43	6	801-369-161	CARRIAGE BOLT, 7/16 - 14 X 1
44	2	879-849-487	EYEBOLT, 1/4 - 20 X 3

# TABLE & BRACKET ASSEMBLY

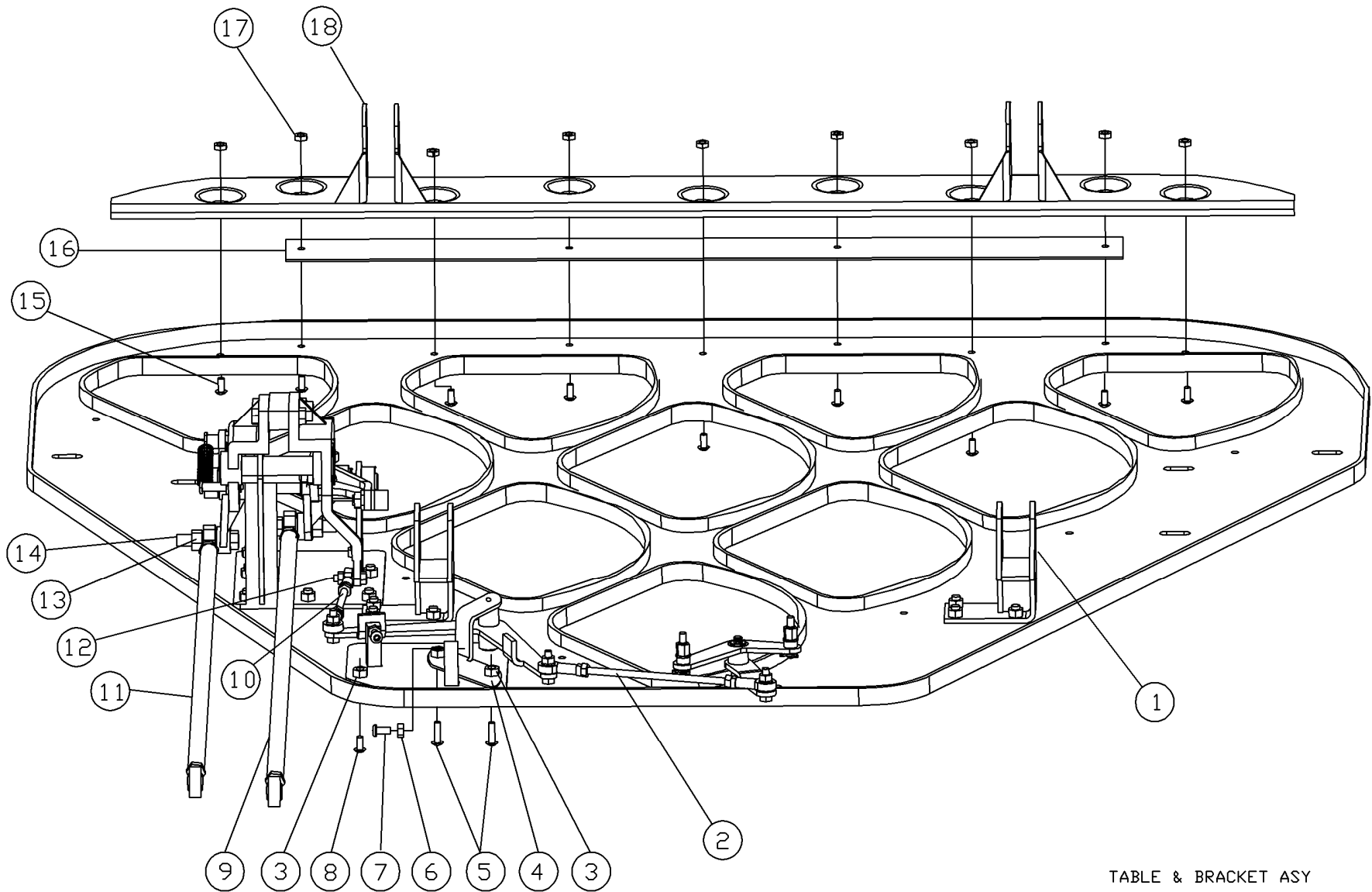


TABLE & BRACKET ASY

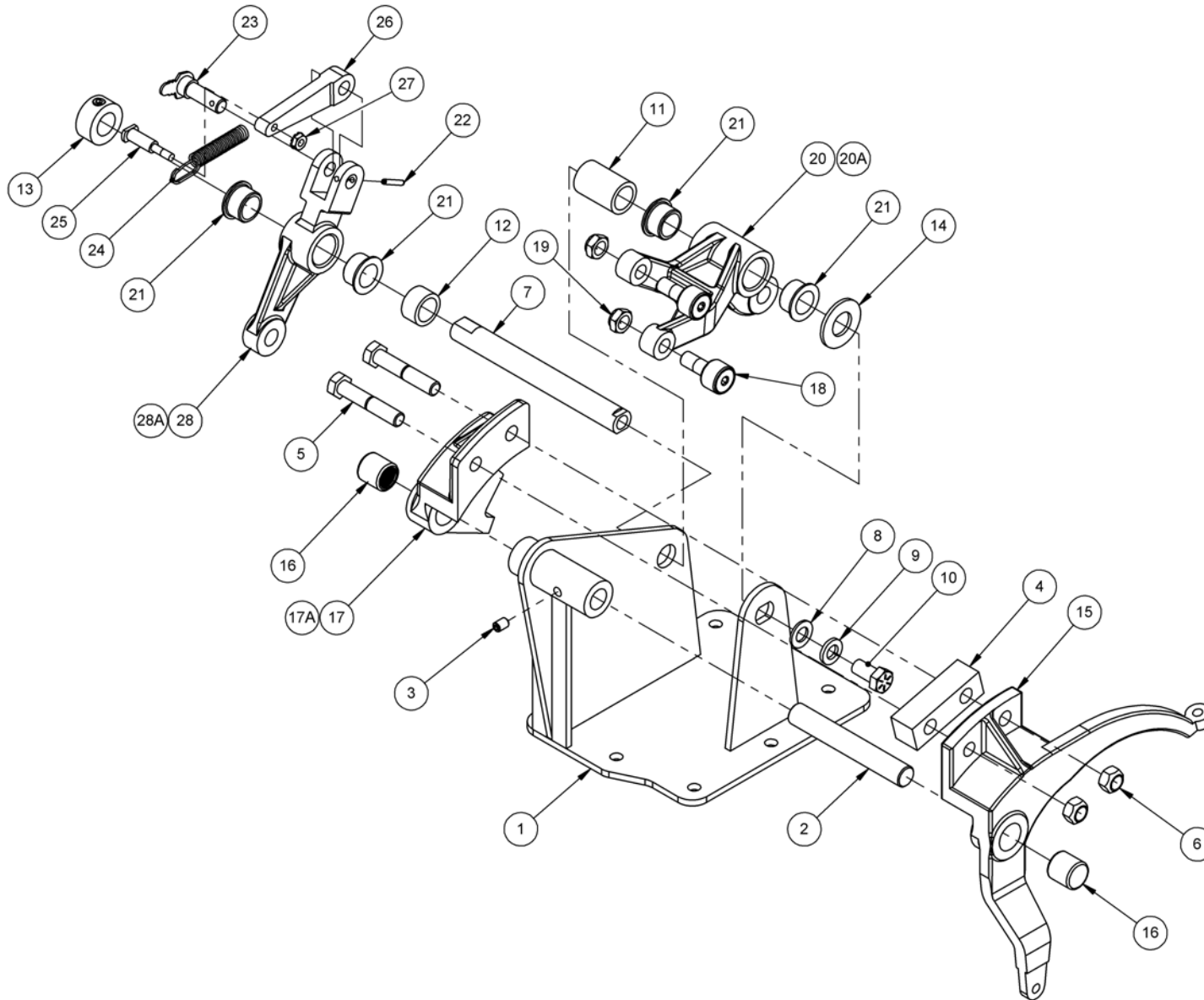


## TABLE & BRACKET ASSEMBLY

ITEM	QTY	PART #	DESCRIPTION
1	2	090-005-505	FRONT TABLE BRACKET
2	1	090-005-613	ROD ASSEMBLY, LONG
3	19	844-057-002	NUT, STOVER LOCK, 5/16 - 18
4	1	090-005-637	PIVOT SUPPORT BRACKET
5	2	808-557-140	SCREW, BUTTON HEAD CAP, 5/16 - 18 X 7/8
6	2	835-549-002	NUT, HEX JAM, 1/4 - 20
7	1	808-549-200	SCREW, BUTTON HEAD CAP, 1/4 - 20 X 1 1/4
8	17	808-557-120	SCREW, BUTTON HEAD CAP, 5/16 - 18 X 3/4
9	1	088-005-501	SPOT TIE ROD ASSEMBLY
10	1	090-005-615	ROD ASSEMBLY, SHORT
11	1	088-005-500	RESPOT TIE ROD ASSEMBLY
12	4	809-849-165	SCREW, HEX, 1/4 - 20 X 1
13	2	844-069-002	NUT, STOVER LOCK, 7/16 - 14
14	2	809-869-285	SCREW, HEX, 7/16 - 14 X 1-1/2
15	9	808-549-120	SCREW, BUTTON HEAD CAP, 1/4 - 20 X 3/4
16	1	090-005-656	REAR BRACKET SHIM
17	13	844-049-002	NUT, STOVER LOCK, 1/4 - 20
18	1	090-005-536	REAR MOUNTING BRACKET

ITEM	QTY	PART #	DESCRIPTION
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# TIE ROD BRACKET ASSEMBLY





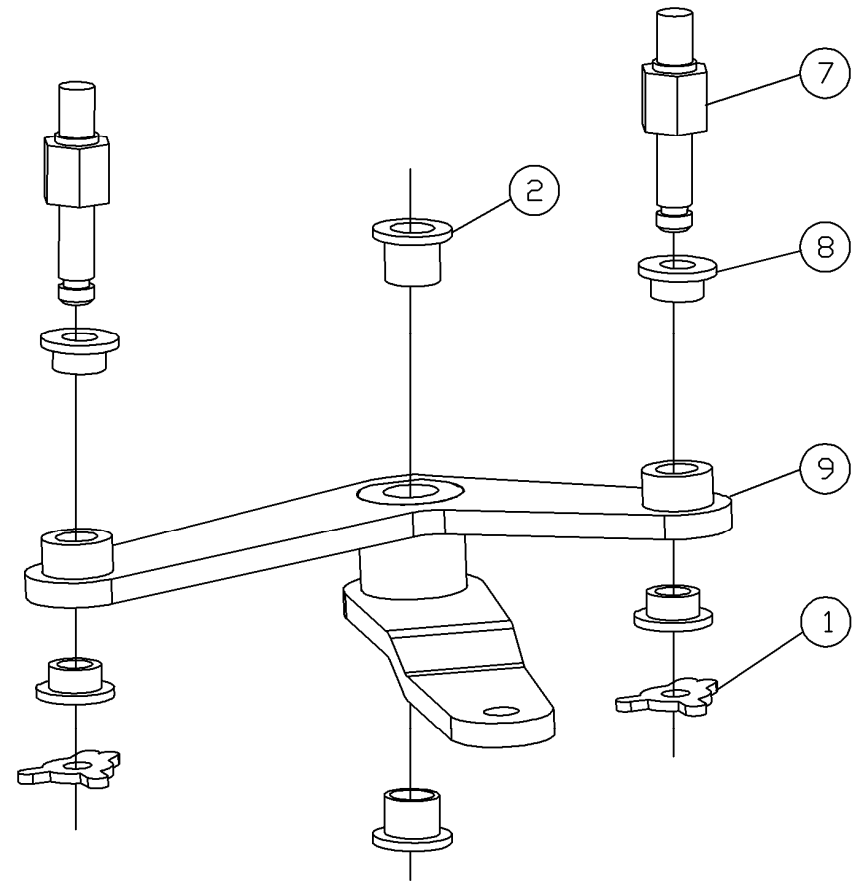
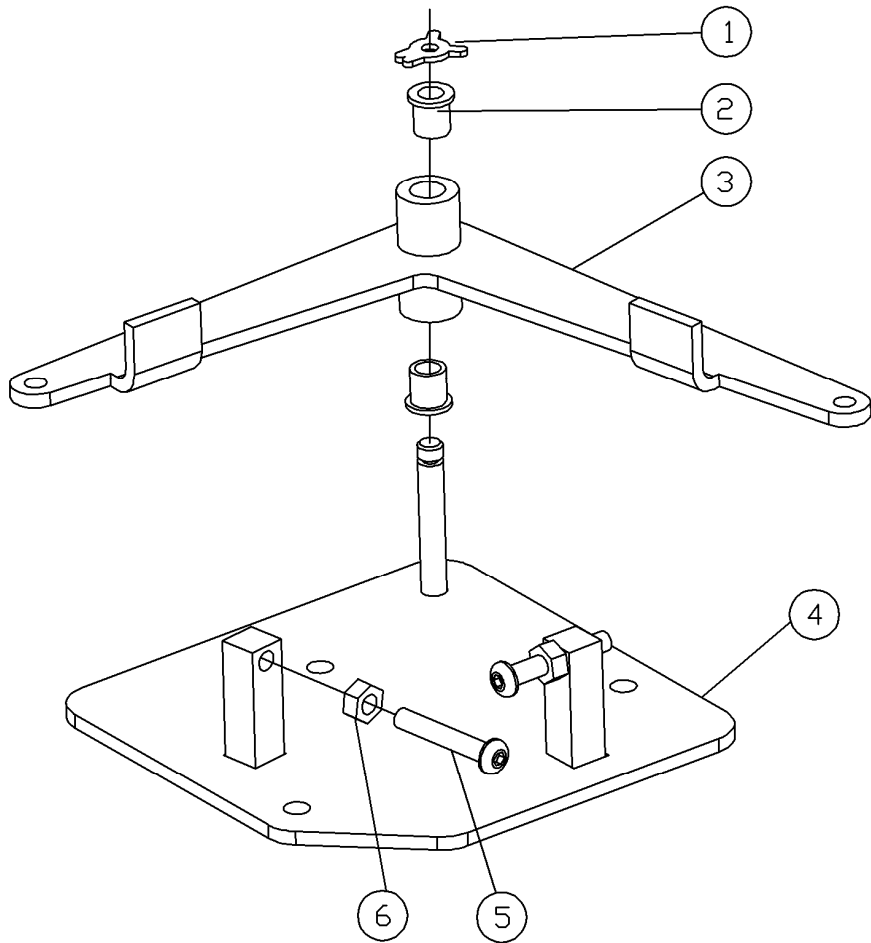


## TIE ROD BRACKET ASSEMBLY

ITEM	QTY	PART #	DESCRIPTION
1	1	088-005-503	TIE ROD BRACKET
2	1	090-005-521	SHAFT, SHORT SIDE
3	1	807-249-060	SETSCREW, 1/4 - 20 X 3/8
4	1	090-005-520	SPACER
5	2	809-865-325	SCREW, HEX, 3/8 - 16 X 2
6	2	844-065-002	NUT, STOVER LOCK, 3/8 - 16
7	1	090-005-655	SHAFT
8	1	948-767-132	WASHER, FLAT, 13/32 X 13/16 X 1/16
9	1	951-164-002	WASHER, SPLIT LOCK, 3/8
10	1	809-865-125	SCREW, HEX, 3/8 - 16 X 3/4
11	1	090-005-532	SPACER
12	1	090-005-533	SPACER
13	1	000-021-423	COLLAR w/SET SCREW, 5/16-18 X 1/4
14	1	948-680-120	WASHER, FLAT, .656 X 1.312 x .057
15	1	070-002-725	CAM LINK
16	2	070-002-781	NEEDLE BEARING
17	1	070-002-724	SHIFTER LINK
17A	1	070-002-727	SHIFTER LINK & BEARING ASY (incl. 16 & 17)
18	2	070-002-816	CAM FOLLOWER
19	2	840-066-002	NUT, FLEX LOCK, THIN, 3/8 - 24
20	1	070-002-599	SPOT LEVER
20A	1	070-002-578	SPOT LEVER ASSEMBLY (incl. 20 & 21)
21	4	070-002-745	FLANGED BEARING, .6265 X .814 X 1/2
22	1	913-423-120	SPRING PIN
23	1	090-005-631	PIVOT WELDMENT
24	1	070-001-807	RESPOT LEVER SPRING

ITEM	QTY	PART #	DESCRIPTION
25	1	090-005-629	PIN
26	1	070-002-590	FINGER LINK
27	1	843-140-002	NUT, 10 - 32, KEPS
28	1	070-002-589	FINGER LEVER
28A	1	070-002-579	FINGER LEVER ASSY (includes 21 & 28)

# FRONT ACTUATOR & CONNECTOR ASSEMBLIES



FRONT ACTUATOR & CONNECTOR ASY

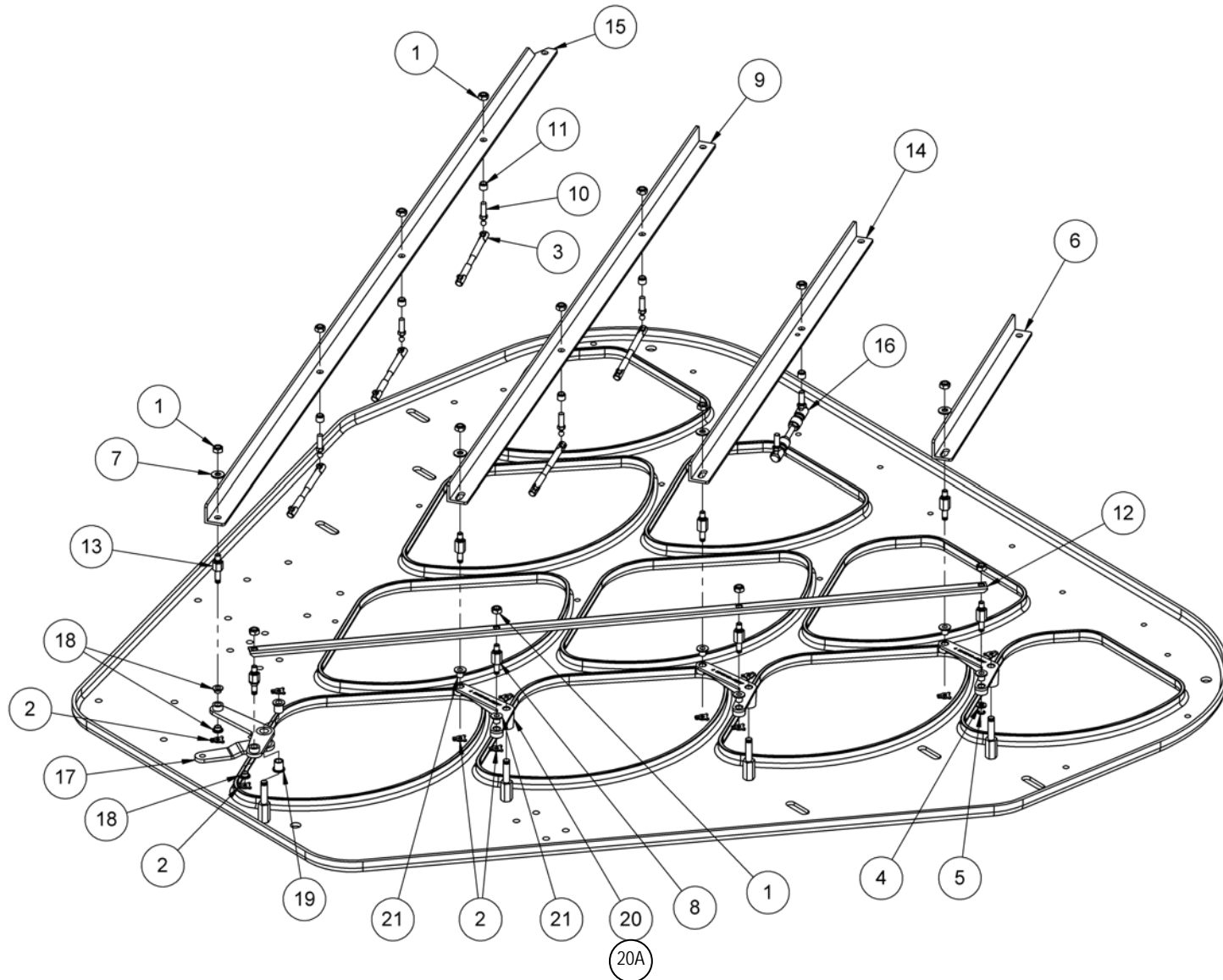


## FRONT ACTUATOR & CONNECTOR ASSEMBLIES

ITEM	QTY	PART #	DESCRIPTION
1	3	963-400-002	X-WASHER
2	4	900-205-081	FLANGED BEARING, .315 X .44 X .5
3	1	090-005-600	ACTUATOR LEVER WELDMENT
4	1	090-005-603	ACTUATOR BASE WELDMENT
5	2	808-549-200	SCREW, BUTTON HEAD CAP, 1/4 - 20 X 1-1/4
6	2	835-549-002	NUT, HEX JAM, 1/4 - 20
7	2	090-005-612	FRONT CONNECTING LINK PIN, 7 PIN
8	4	070-002-630	FLANGED BEARING, .252 X .315 X .218
9	1	090-005-607	FRONT CONNECTING LINK

ITEM	QTY	PART #	DESCRIPTION
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# TABLE & RESPOT LINKS



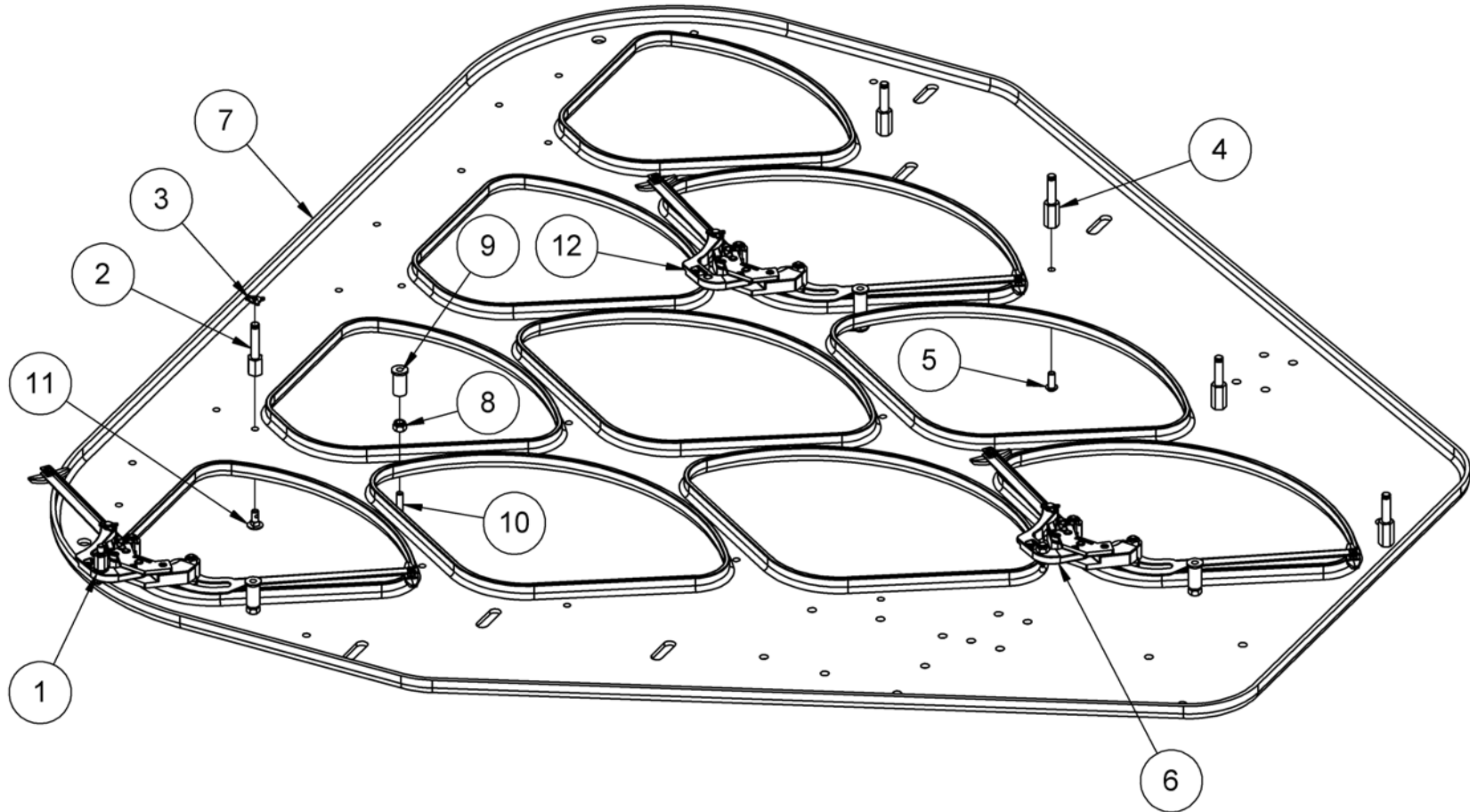


## TABLE & RESPOT LINKS

ITEM	QTY	PART #	DESCRIPTION
1	14	844-049-002	NUT, STOVER LOCK, 1/4 - 20
2	12	963-400-002	X-WASHER
3	6	090-002-020	LINK BODY
4	1	785-502-207	FLAT WASHER
5	1	919-001-450	E-CLIP
6	1	090-005-558	10-PIN LINK
7	3	948-753-102	WASHER, FLAT, 9/32 X 5/8 X 1/16
8	6	090-005-571	PIN, 8-, 9-, & 10-PIN LINKS
9	1	090-005-556	8-PIN LINK
10	5	730-027-019	STUD, BALL HEAD
11	6	070-002-815	SPACER BUSHING
12	1	070-002-671	RESPOT LINK
13	2	090-005-612	PIN, 7-PIN LINK
14	1	090-005-557	9-PIN LINK
15	1	090-005-555	7-PIN LINK
16	1	088-005-532	6-PIN LINK ASSEMBLY
17	1	090-005-607	FRONT LINK CONNECTOR WELDMENT
18	4	070-002-630	FLANGED BEARING, .25 X .32 X .22
19	2	900-205-081	FLANGED BEARIING, .31 X .44 X .50
20	3	070-002-677	LEVER CASTING
20A	3	070-007-623	RESPOT LEVER ASSY (Includes items 20 & 21)
21	6	070-002-653	FLANGED BEARING, .252 X .315 X .38

ITEM	QTY	PART #	DESCRIPTION
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# TABLE & RESPOT CELLS



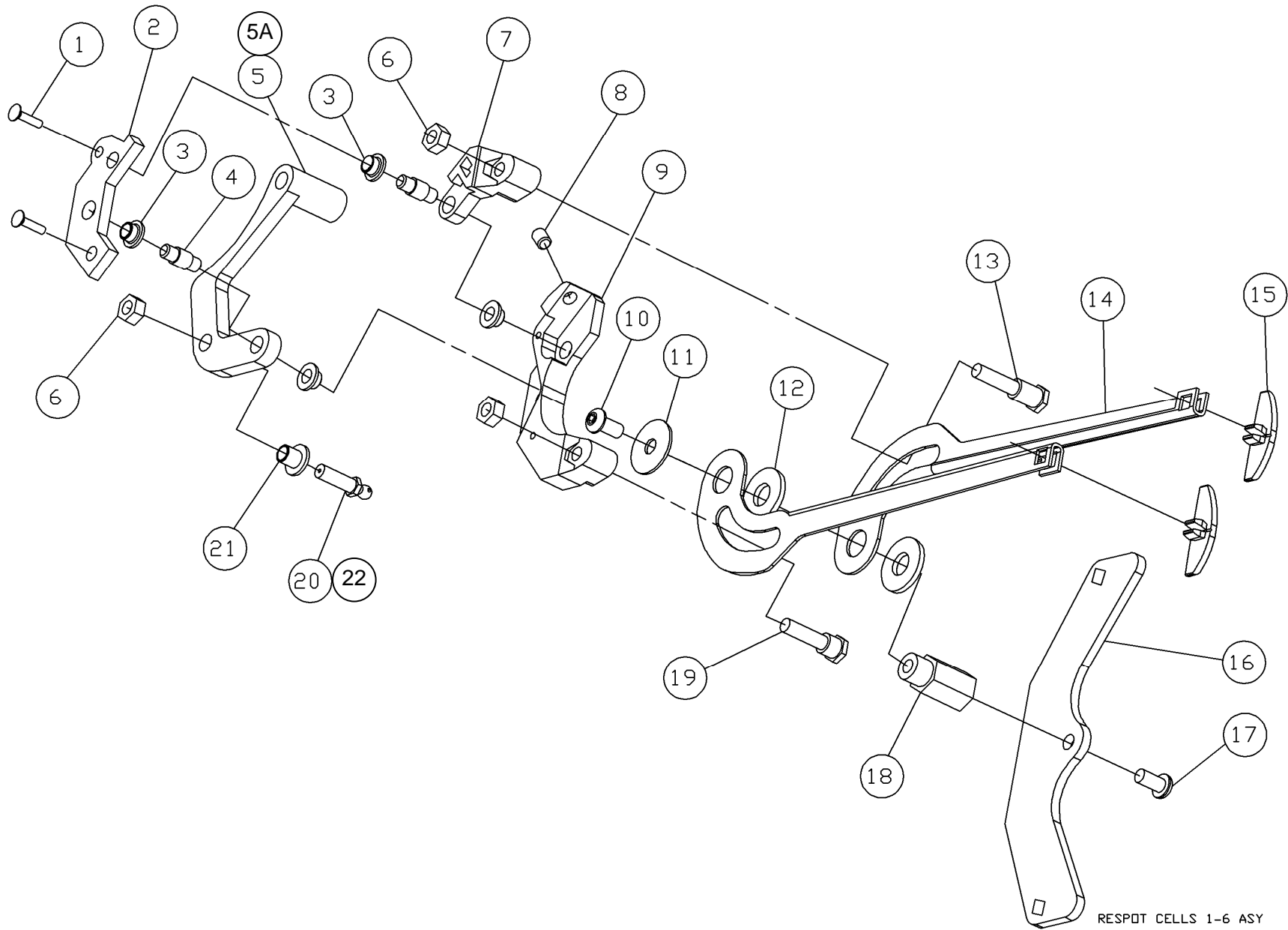


# TABLE & RESPOT CELLS

ITEM	QTY	PART #	DESCRIPTION
1	4	090-005-540	RESPOT CELL ASSY (pins 7 through 10)
2	10	090-005-504	RESPOT PIVOT
3	10	963-400-002	X-WASHER
4	4	090-005-503	LINK CONNECTOR PIVOT
5	4	809-149-100	SCREW, BUTTON HEAD CAP, 1/4 - 20 X 5/8
6	5	090-005-544	RESPOT CELL ASSY (pins 1 through 5)
7	1	088-005-502	TABLE
8	10	838-549-002	NUT, NYLON LOCK, 1/4 - 20
9	10	855-349-010	WELL NUT, 1/4 - 20 x 1
10	10	801-149-247	CARRIAGE BOLT, 1/4 - 20 X 1-1/2
11	10	801-149-100	CARRIAGE BOLT, 1/4 - 20 X 5/8
12	1	088-005-513	RESPOT CELL ASSY, (pin 6)

ITEM	QTY	PART #	DESCRIPTION
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# RESPOT CELL ASSEMBLY, CELLS 1 THROUGH 6





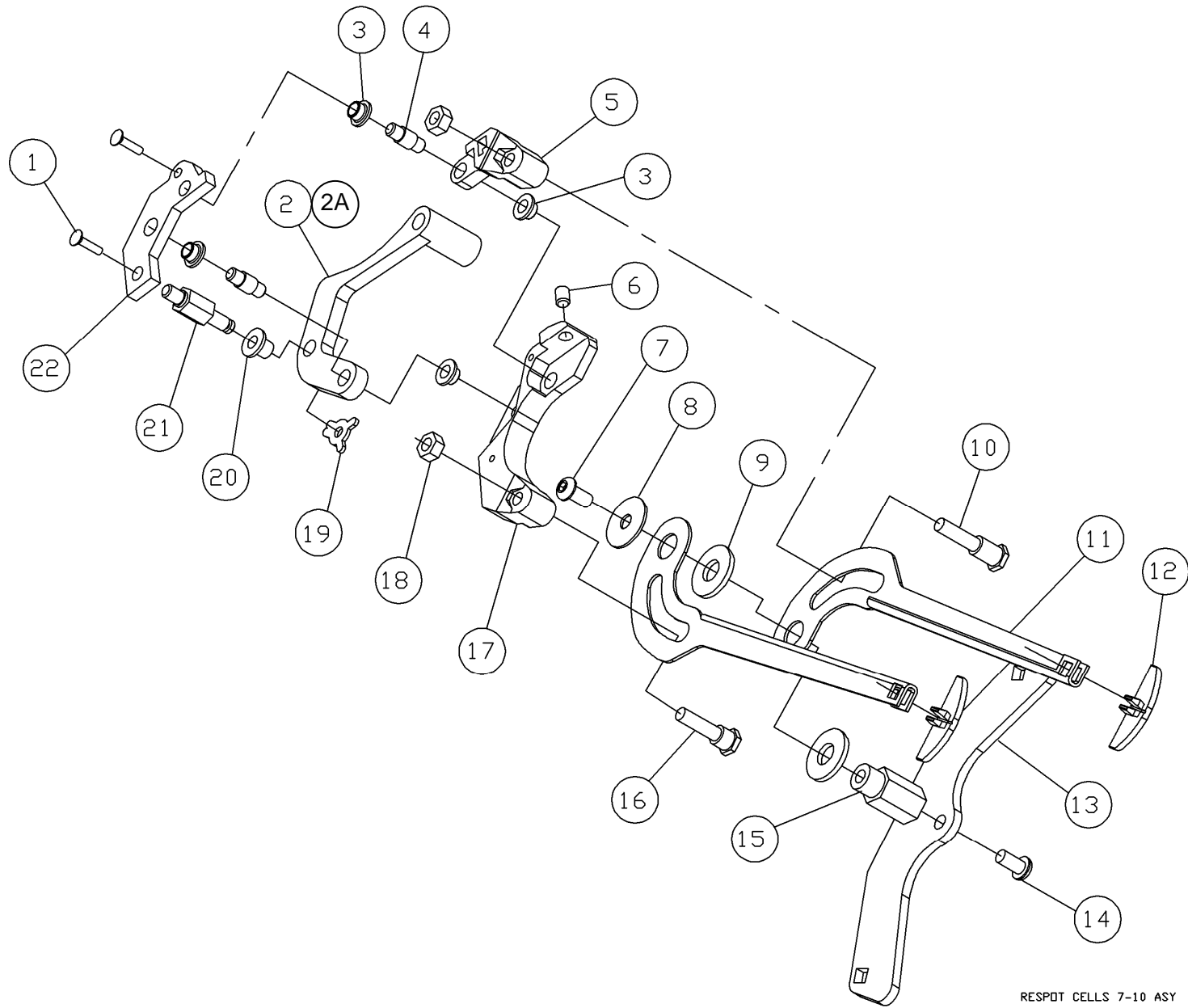


## RESPOT CELL ASSEMBLY, CELLS 1 THROUGH 6

ITEM	QTY	PART #	DESCRIPTION
1	2	070-002-750	SCREW, FLAT HEAD
2	1	070-002-695	YOKE PLATE
3	4	070-002-630	FLANGED BEARING, .252 X .315 X .218
4	2	070-002-645	LEVER ASSEMBLY SHAFT
5	1	070-002-651	RESPOT LEVER
5A	1	070-007-618	RESPOT LEVER ASSY (Includes Items 4, 5, & 21)
6	2	844-049-002	NUT, STOVER LOCK, 1/4 - 20
7	1	090-004-113	RESPOT YOKE ARM
8	1	807-650-050	SETSCREW, 1/4 - 28 X 5/16
9	1	090-004-118	RESPOT YOKE
10	1	808-549-080	SCREW, BUTTON HEAD CAP, 1/4 - 20 X 1/2
11	1	070-007-192	WASHER
12	2	948-975-172	WASHER, FLAT, 1/2
13	1	090-005-640	STUD, LONG
14	2	090-004-119	RESPOT FINGER
15	2	090-005-617	FINGER INSERT
16	1	090-005-632	FINGER PIVOT WING
17	1	809-149-100	SCREW, BUTTON HD w/PATCH, 1/4 - 20 X 5/8
18	1	090-005-522	RESPOT FINGER BUSHING
19	1	070-007-195	STUD, SHORT
20	1	730-027-019	STUD, BALL HEAD
21	1	070-002-653	FLANGED BEARING, .252 X .315 X .38
22	1	088-005-524	STUD, BALL HEAD, 6-PIN LINK ONLY

ITEM	QTY	PART #	DESCRIPTION
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# RESPOT CELL ASSEMBLY, CELLS 7 THROUGH 10



RESPOT CELLS 7-10 ASY

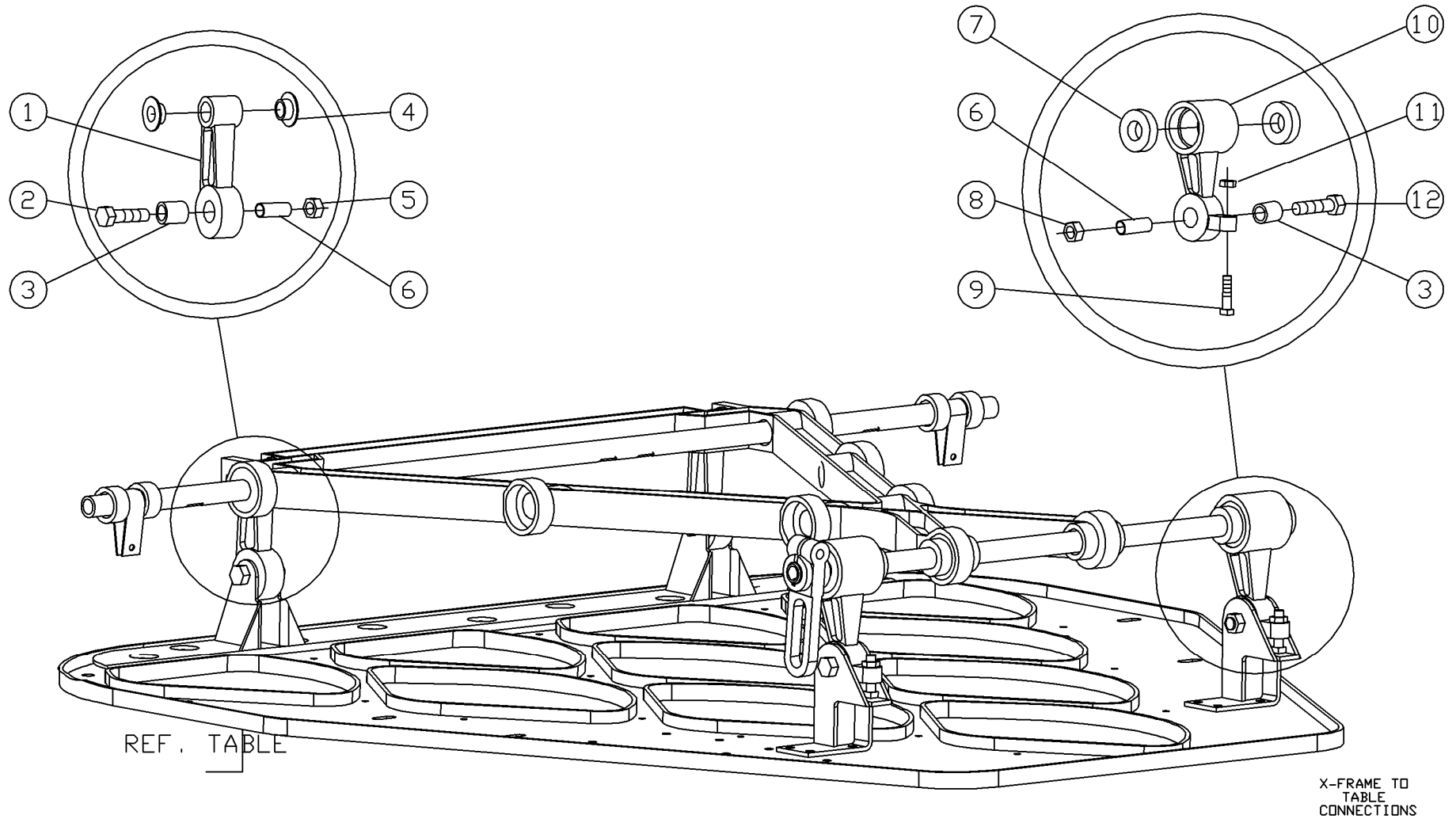


## RESPOT CELL ASSEMBLY, CELLS 7 THROUGH 10

ITEM	QTY	PART #	DESCRIPTION
1	2	070-002-750	SCREW, FLAT HEAD, 6-32 x 5/8
2	1	070-002-651	RESPOT LEVER
2A	1	070-002-620	RESPOT LEVER ASSY (Includes Items 2, 4, & 20)
3	4	070-002-630	FLANGED BEARING, .252 X .315 X .218
4	2	070-002-645	LEVER ASSEMBLY SHAFT
5	1	090-004-113	RESPOT YOKE ARM
6	1	807-650-050	SETSCREW, 1/4 - 28 X 5/16
7	1	808-549-080	SCREW, BUTTON HEAD CAP, 1/4 - 20 X 1/2
8	1	070-007-192	WASHER
9	2	948-975-172	WASHER, FLAT, 1/2
10	1	090-005-640	STUD, LONG
11	2	090-004-119	RESPOT FINGER
12	2	090-005-617	FINGER INSERT
13	1	090-005-632	FINGER PIVOT WING
14	1	809-149-100	SCREW, BUTTON HD w/PATCH, 1/4 - 20 X 5/8
15	1	090-005-522	RESPOT FINGER BUSHING
16	1	070-007-195	STUD, SHORT
17	1	090-004-118	RESPOT YOKE
18	2	844-049-002	NUT, STOVER LOCK, 1/4 - 20
19	1	963-200-002	X-WASHER
20	1	070-002-653	FLANGED BEARING, .252 X .315 X .38
21	1	090-005-571	PIN, 8-9-10 LINKS
22	1	070-002-695	YOKE PLATE

ITEM	QTY	PART #	DESCRIPTION
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# X-FRAME TO TABLE CONNECTIONS



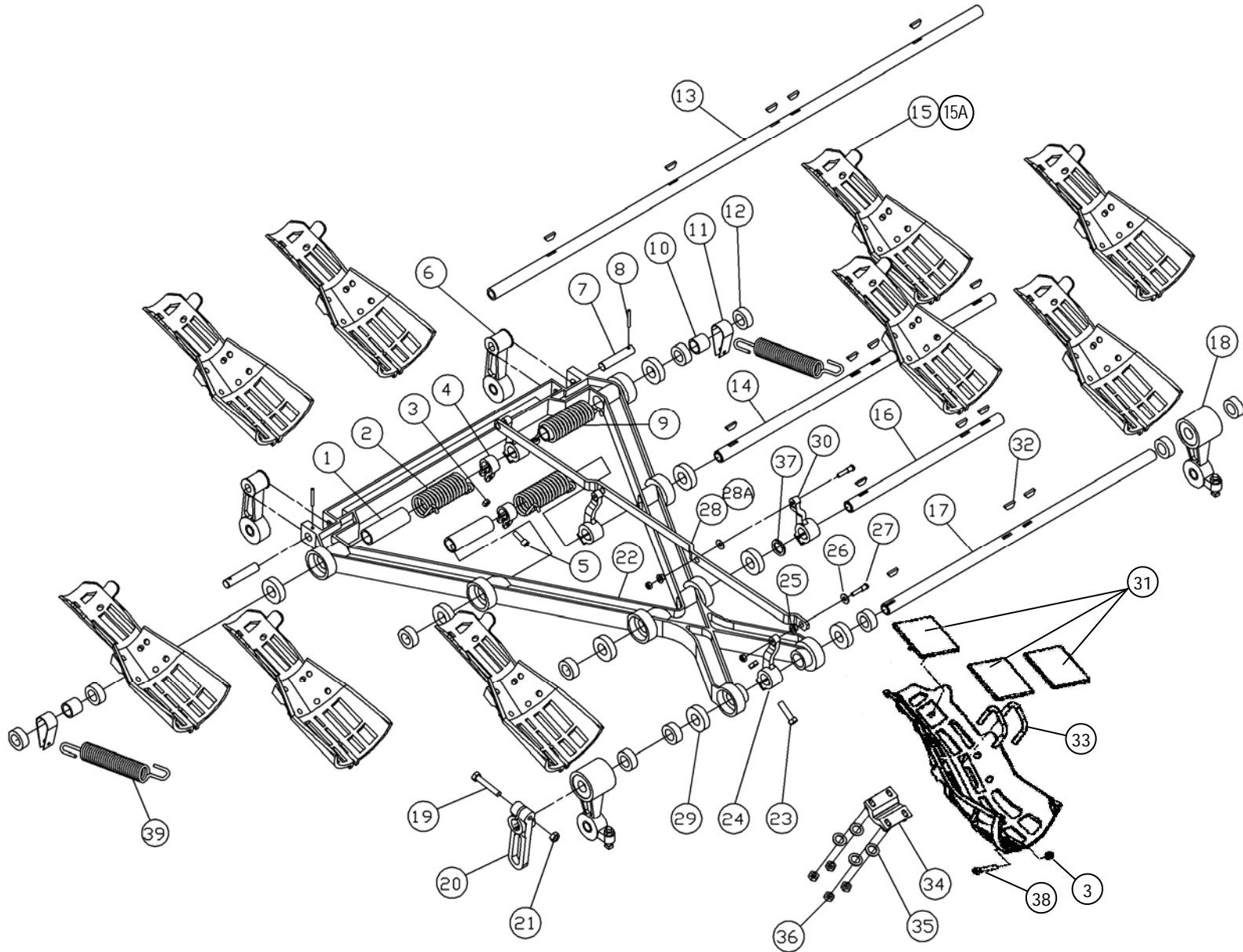


## X-FRAME TO TABLE CONNECTIONS

ITEM	QTY	PART #	DESCRIPTION
1	2	090-005-547	REAR LEG
2	2	809-865-325	SCREW, HEX, 3/8 - 16 X 2
3	4	090-005-593	AXLE TUBE (SLEEVE)
4	4	000-023-114	FLANGED BEARING, .628 X .815 X .06
5	2	844-065-002	NUT, STOVER LOCK, 3/8 - 16
6	4	900-110-161	BUSHING
7	4	190-001-490	BALL BEARING, .875 X 1.875 X .5
8	2	844-069-002	NUT, STOVER LOCK, 7/16 - 14
9	1	806-265-240	SETSCREW, 3/8 - 16 X 1.5
10	2	090-005-546	FRONT LEG
11	2	835-565-002	NUT, HEX JAM, 3/8 - 16
12	2	809-869-365	SCREW, HEX, 3/8 - 16 X 2¼

ITEM	QTY	PART #	DESCRIPTION
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# YOKE & SPOTTING CUP ASSEMBLY



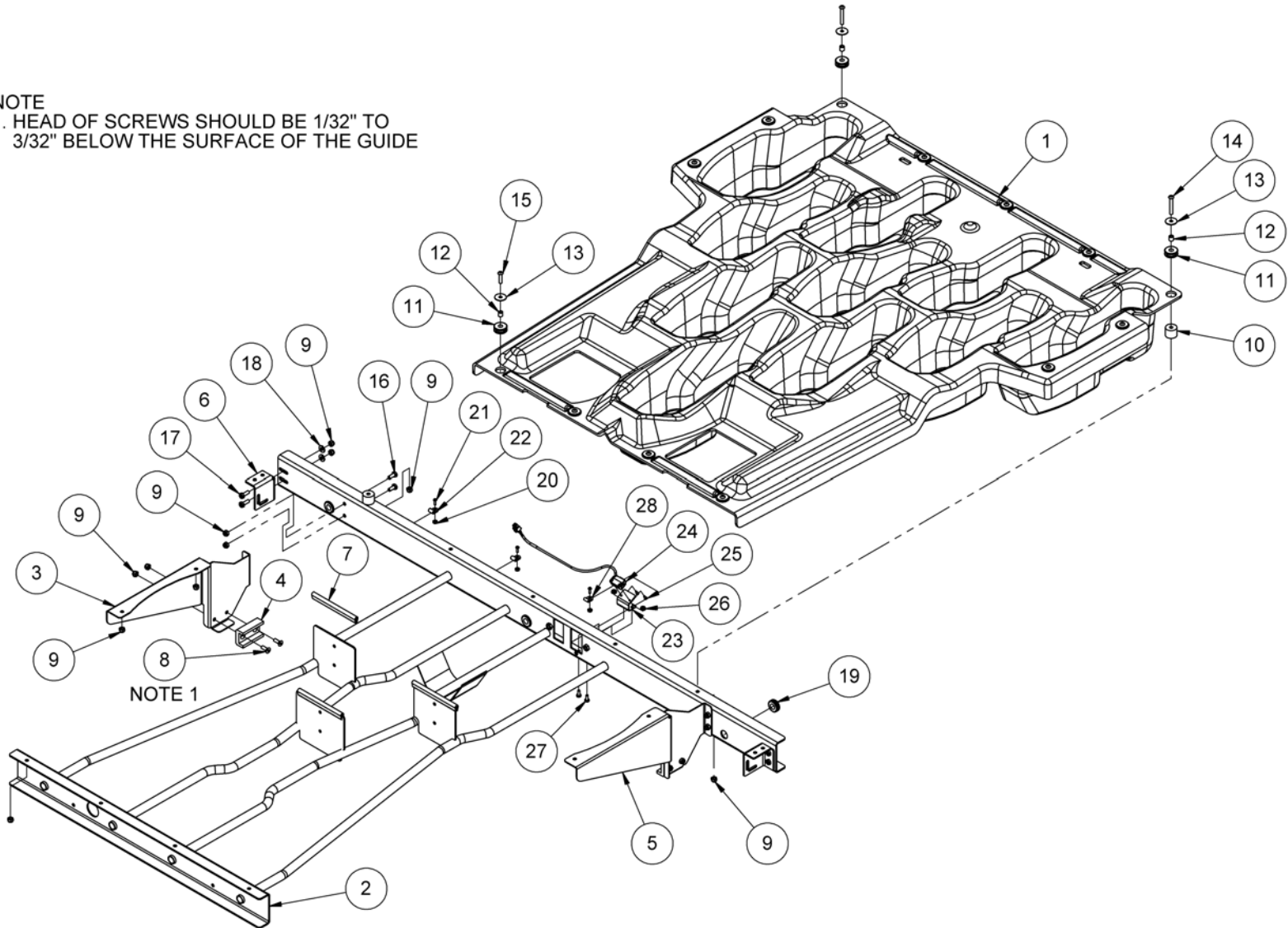


## YOKE & SPOTTING CUP ASSEMBLY

ITEM	QTY	PART #	DESCRIPTION	ITEM	QTY	PART #	DESCRIPTION
1	3	070-002-719	SPRING SLEEVE	27	4	070-002-723	PIN
2	2	070-002-688	SPRING, R.H. WOUND, 7-PIN SIDE	28	1	070-002-611	LINK
3	17	844-049-002	NUT, STOVER LOCK, 1/4 - 20	28A	1	070-002-612	LINK ASSEMBLY (includes: 25 & 28)
4	3	090-004-033	CLAMP	29	8	190-001-490	BALL BEARING, .875 X 1.875 X .5
5	3	809-849-165	SCREW, HEX, 1/4 - 20 X 1	30	2	070-002-603	OUTER LEVER
6	2	090-005-548	REAR LEG ASSEMBLY	31	30	070-002-784	SPOTTING CUP LINER
7	2	070-002-609	PIN	32	15	907-000-600	KEY
8	2	913-437-240	SPRING PIN, 3/16 X 1-1/2	33	20	070-002-787	U-BOLT
9	1	070-002-689	SPRING, L.H. WOUND, 10-PIN SIDE	34	10	070-002-788	CAP
10	2	900-114-161	BEARING, 7/8 X 1-1/8 X 1	35	40	948-761-112	WASHER, FLAT, 11/32 X 1-1/16 X 1/16
11	2	090-005-577	SPRING HOOK	36	40	844-057-002	NUT, STOVER LOCK, 5/16 - 18
12	12	000-025-549	LOCK COLLAR WITH SETSCREW	37	1	070-002-620	SPACER
13	1	090-005-578	SHAFT #4	38	10	810-249-240	SCREW, SOCKET HEAD, 1/4 - 20 X1-1/2
14	1	070-002-617	SHAFT #3	39	2	000-026-032	SPRING
15	10	070-002-809	SPOTTING CUP				
15A	10	070-002-808	SPOTTING CUP ASSY (includes 3, 15, 31, 33 & 38)				
16	1	070-002-616	SHAFT #2				
17	1	090-005-553	SHAFT #1				
18	2	090-005-545	FRONT LEG ASSEMBLY				
19	1	809-865-365	SCREW, HEX, 3/8 - 16 X 1-1/2				
20	1	090-005-554	ARM ACTUATOR				
21	5	839-665-002	NUT, FLEX LOCK, 3/8 - 16				
22	1	070-002-683	YOKE				
23	4	809-865-245	SCREW, HEX, 3/8 - 16 X 1-1/2				
24	2	070-002-602	INNER LEVER				
25	4	900-205-053	FLANGED BEARING, .315 x .44 x 5/16				
26	4	701-310-036	THRUST BEARING				

# DURABIN II ASSEMBLY

NOTE  
1. HEAD OF SCREWS SHOULD BE 1/32" TO  
3/32" BELOW THE SURFACE OF THE GUIDE



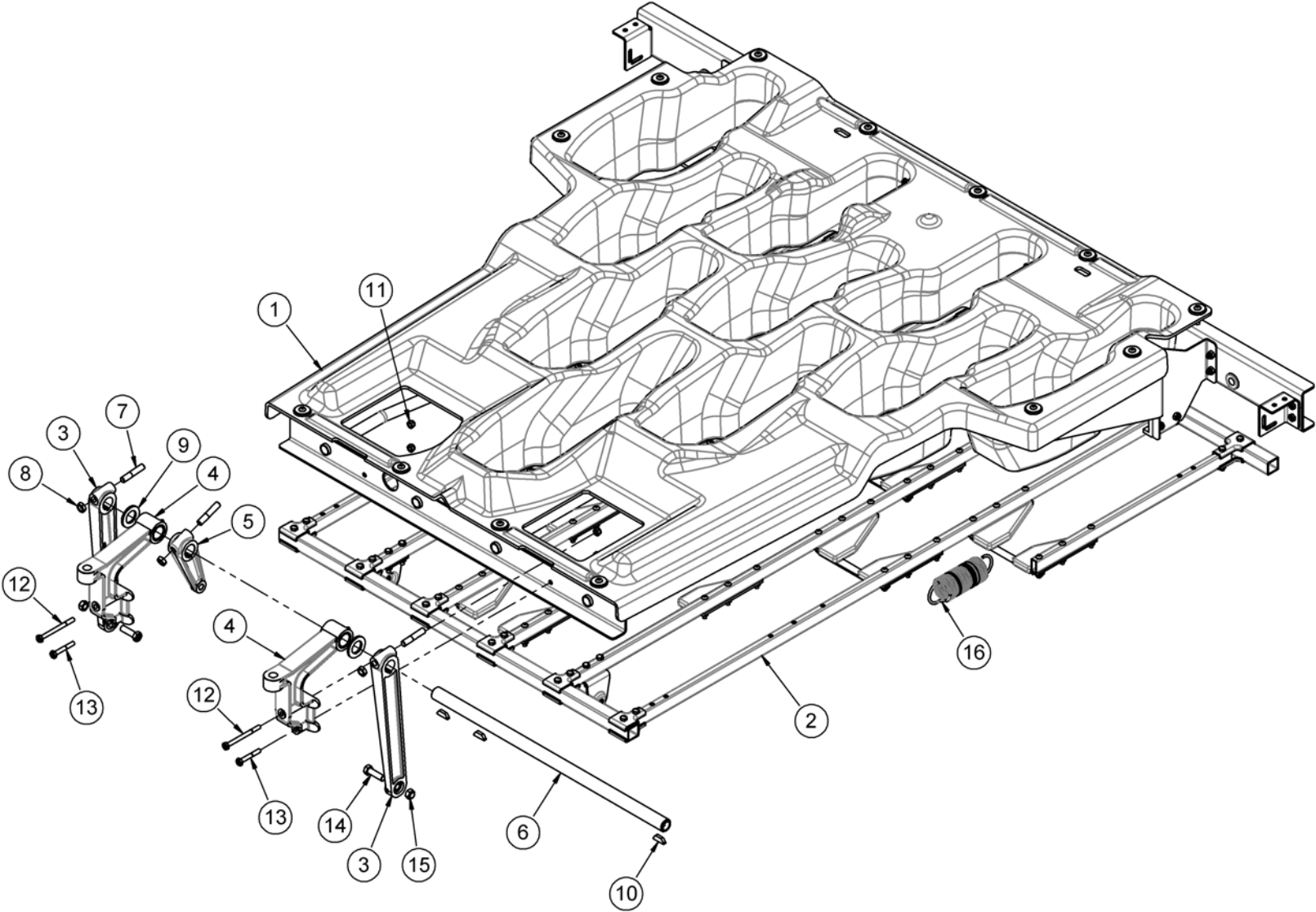




## DURABIN II ASSEMBLY

ITEM	QTY	PART #	DESCRIPTION	ITEM	QTY	PART #	DESCRIPTION
1	1	088-000-259	DURABIN II w/OPTICAL BIN SWITCH	27	2	818-240-082	SCREW, PAN HEAD, 10-32 X 1/2, SEMS
2	1	088-001-601	DURABIN II FRAME WELDMENT	28	1	744-107-013	CLAMP, NYLON, 1/8
3	1	088-001-607	DURABIN II SHUTTLE SUPPORT, 7-SIDE				
4	2	088-001-603	SHUTTLE REAR SUPPORT GUIDE				
5	1	088-001-610	DURABIN II SHUTTLE SUPPORT, 10-SIDE				
6	2	088-001-634	REAR SAFETY SUPPORT BRACKET				
7	3	088-001-264	BIN FRAME EDGE TRIM				
8	4	808-849-120	SCREW, SOCKET FLAT HEAD, 1/4-20X3/4				
9	25	839-549-002	NUT, HEX, 1/4-20				
10	2	088-001-605	HAT REPLACEMENT SPACER				
11	13	711-512-040	GROMMET, 3/8X7/8X1/4				
12	13	088-001-604	SPACER, .25X.375X.375, STEEL				
13	13	070-007-192	WASHER, 1/4X1.00X.05				
14	2	808-549-285	SCREW, BUTTON HEAD, 1/4-20X1-3/4				
15	11	808-549-160	SCREW, BUTTON HEAD, 1/4-20X1				
16	4	809-849-100	SCREW, HEX, 1/4-20X5/8				
17	4	809-849-125	SCREW, HEX, 1/4-20X3/4				
18	4	948-753-102	WASHER, A-N FLAT, 1/4				
19	3	711-516-020	GROMMET, 1-1/16X1/2X3/8				
20	4	843-127-002	NUT, KEPS, 6-32				
21	2	818-227-082	SCREW, PHILIPS PAN HEAD, 6-32X1/2				
22	2	744-107-016	CLAMP, NYLON, 3/16				
23	1	088-000-226	OPTICAL SWITCH BRACKET				
24	1	088-000-245	OPTICAL SENSOR ASSEMBLY				
25	2	863-030-080	SCREW, PAN HEAD, M3 .5 X 8 MM				
26	2	843-140-002	NUT, 10-32, KEPS				

# DURABIN II SHUTTLE ACTUATOR

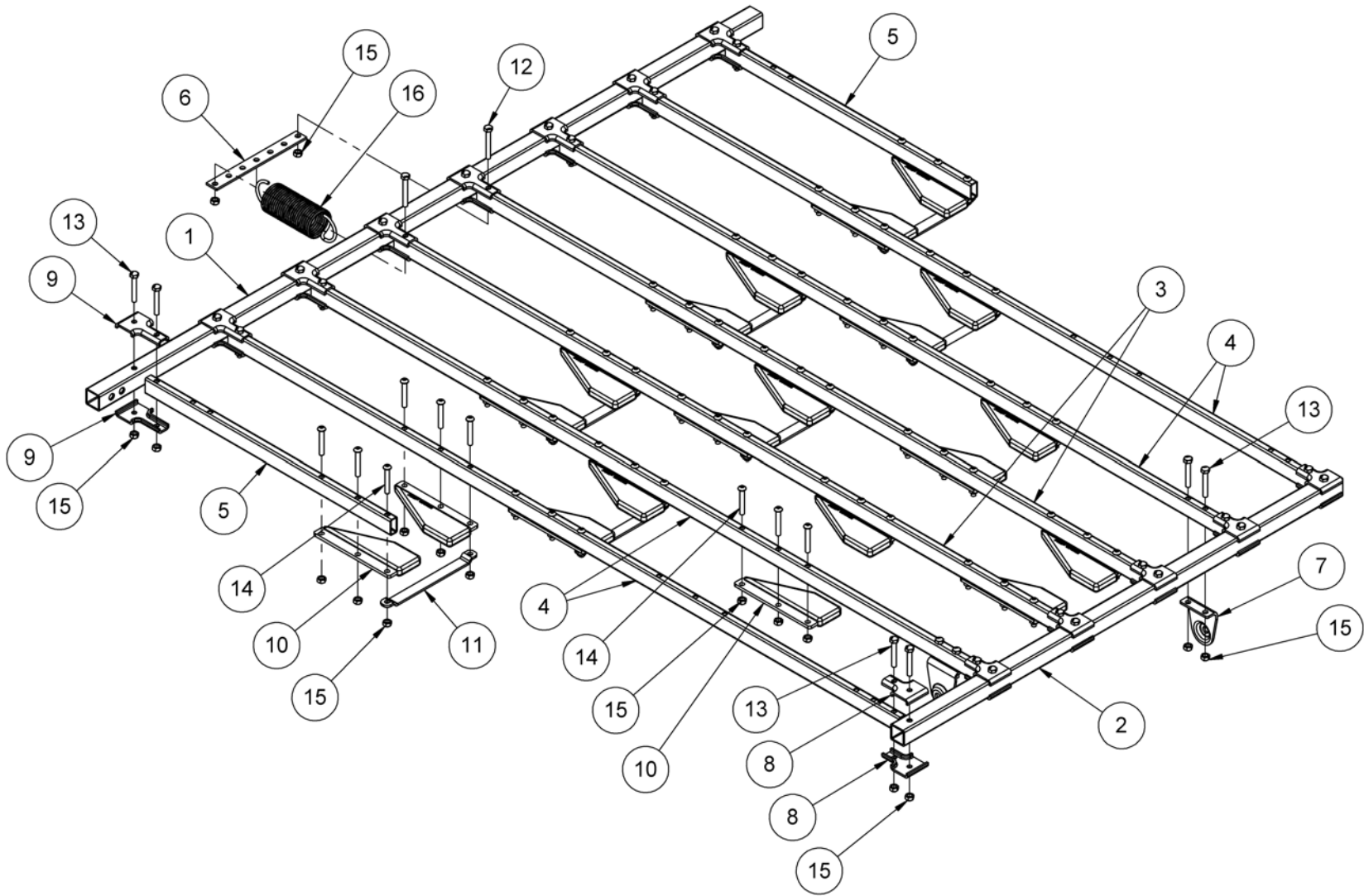




## DURABIN II SHUTTLE ACTUATOR

ITEM	QTY	PART #	DESCRIPTION	ITEM	QTY	PART #	DESCRIPTION
1	1	088-000-228	DURABIN II (BSO) ASSEMBLY ON FRAME				
2	1	088-500-162	DURABIN II SHUTTLE ASSEMBLY				
3	2	070-006-429	SHUTTLE OPERATING ARM; RH & LH				
4	2	070-006-358	BRACKET ASSEMBLY				
5	1	070-006-408	LEVER; FRONT END ASSEMBLY				
6	1	070-006-402	SHAFT, BIN ASSEMBLY				
7	3	070-006-403	STUD CLAMP				
8	3	831-565-002	NUT, HEX, 3/8 -16				
9	2	701-329-050	OILITE BEARING, 1.500 X .8905 X.125				
10	3	907-000-600	KEY, HY PRO # 706				
11	4	839-549-002	NUT, 1/4 - 20 HEX				
12	2	809-849-485	SCREW, HEX, 1/4 - 20 X 3, HD, BLACK				
13	2	809-849-285	SCREW, HEX, 1/4 - 20 X 1-3/4				
14	2	809-865-205	SCREW, HEX, 3/8 - 16 X 1-1/4				
15	2	844-065-002	NUT, 3/8 - 16, STOVER				
16	1	070-006-447	SHUTTLE SPRING				

# SHUTTLE ASSEMBLY – DURABIN II



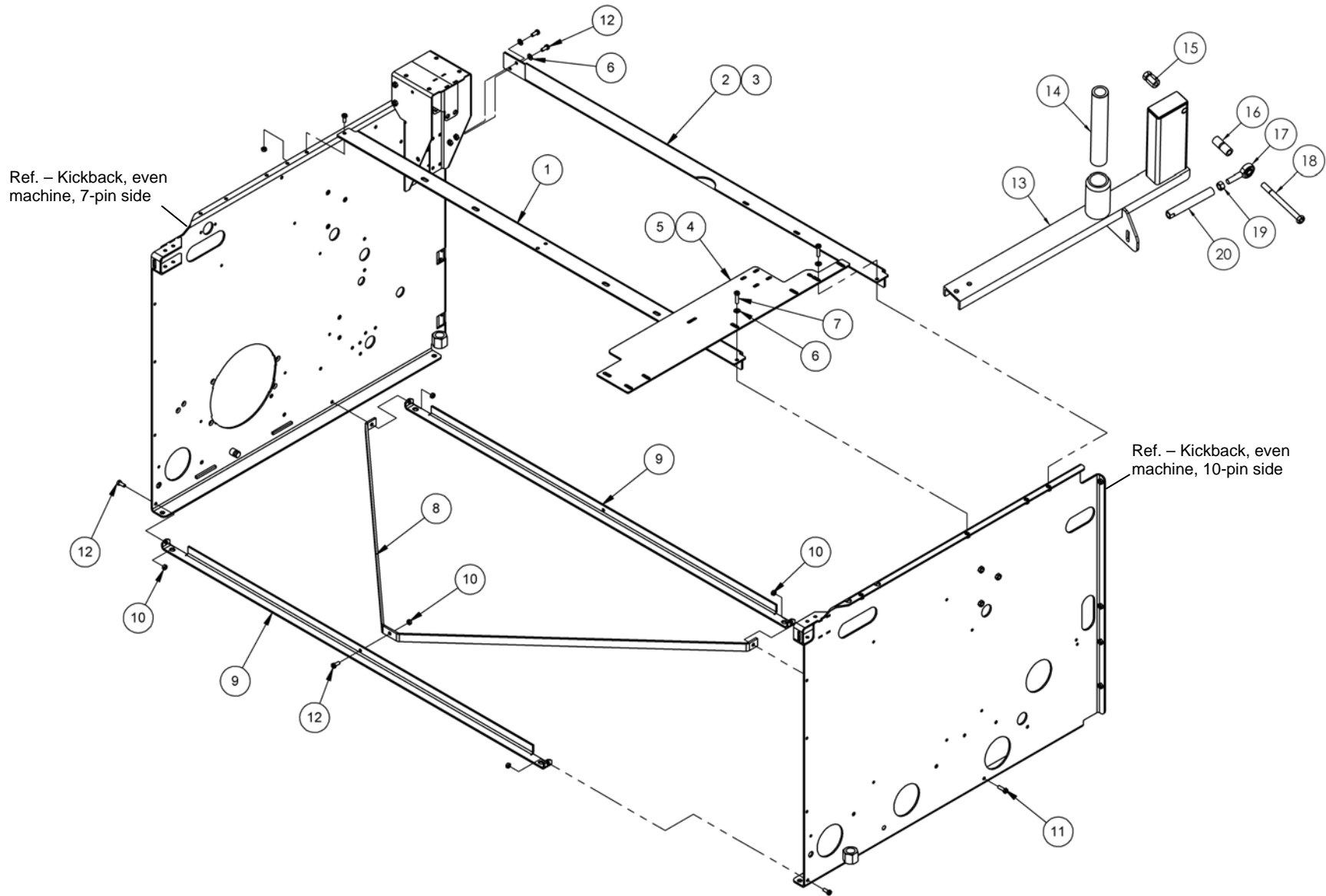


## SHUTTLE ASSEMBLY – DURABIN

ITEM	QTY	PART #	DESCRIPTION
1	1	088-500-153	CROSS TUBE, LONG
2	1	088-500-158	CROSS TUBE, SHORT
3	2	088-500-157	CENTER TUBE
4	4	088-500-155	SIDE TUBE, LONG
5	2	088-500-154	SIDE TUBE, SHORT
6	1	088-500-166	SPRING STRAP
7	2	088-500-159	SHUTTLE ARM BRACKET
8	12	088-500-161	FRONT SHUTTLE CLAMP
9	16	088-500-163	REAR SHUTTLE CLAMP
10	20	088-001-211	XL/PIN HOLDER
11	7	070-006-268	STRAP
12	2	861-206-045	SCREW, HEX, M6 - 1 X 45
13	30	709-013-069	SCREW, HEX, M6 - 1 X 40
14	60	709-013-068	SCREW, BUTTON HEAD, M6 - 1 X 40
15	92	872-000-602	NUT, HEX, M6 - 1, STOVER LOCK
16	1	070-006-447	SHUTTLE SPRING

ITEM	QTY	PART #	DESCRIPTION
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# BACK END ASSEMBLY



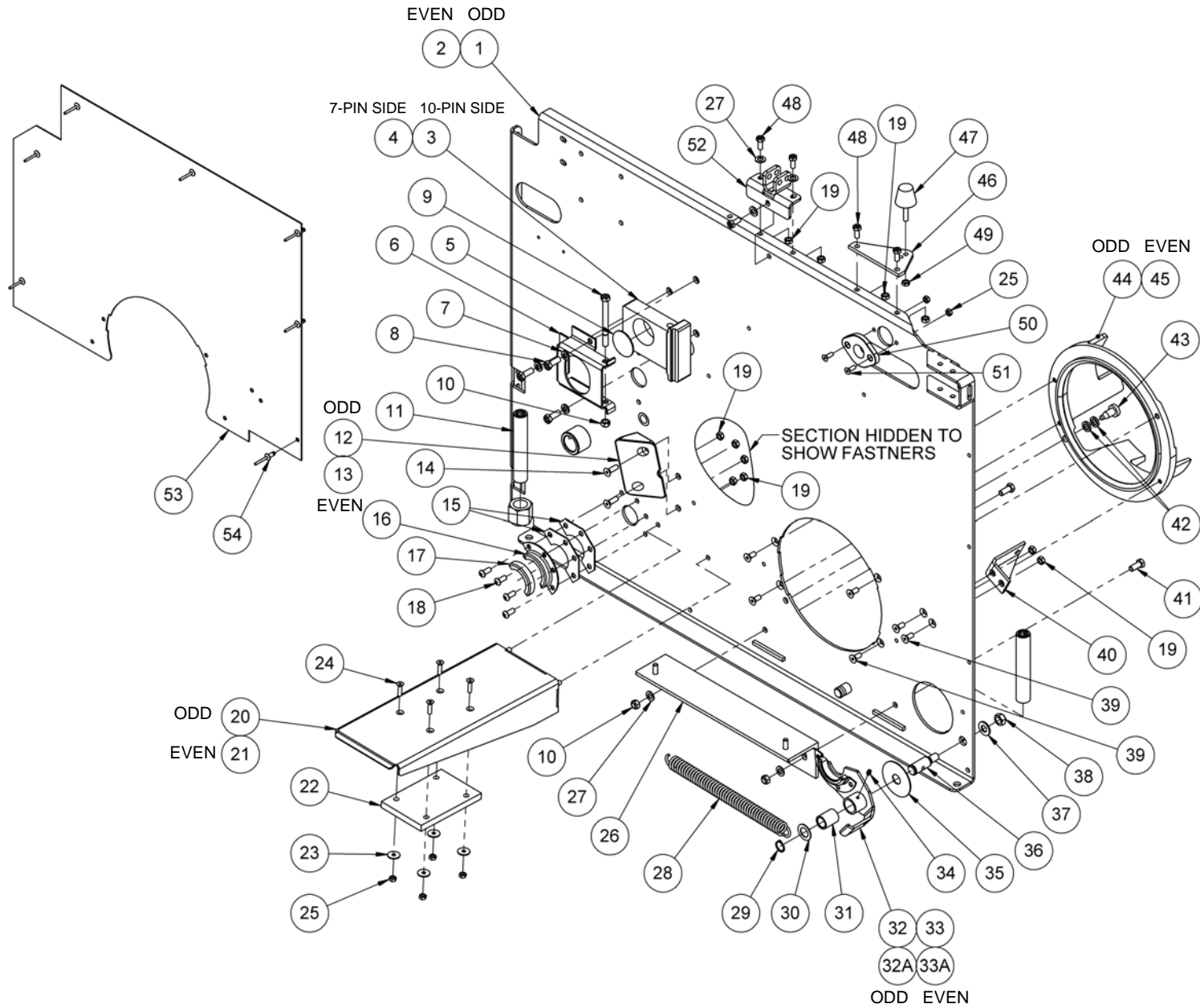


## BACK END ASSEMBLY

ITEM	QTY	PART #	DESCRIPTION
1	1	070-007-359	DISTRIBUTOR SUPPORT BRACKET
2	1	088-001-520	DISTRIBUTOR SUPPORT, EVEN MACHINE
3	1	088-001-521	DISTRIBUTOR SUPPORT, ODD MACHINE
4	1	088-200-059	TREAD PLATE, EVEN MACHINE
5	1	088-200-060	TREAD PLATE, ODD MACHINE
6	4	948-761-112	FLAT WASHER, 5/16 SAE
7	3	809-857-205	SCREW, HEX, 5/16 -18 X 1-1/4
8	1	070-001-185	BRACE
9	2	070-001-184	STRAP WELDMENT
10	6	844-057-002	NUT, STOVER LOCK, 5/16 -18
11	2	809-857-165	SCREW, HEX, 5/16 -18 X 1
12	6	809-857-125	SCREW, HEX, 5/16 -18 X 3/4
13	1	088-002-522	DISTRIBUTOR SUPPORT WELDMENT
14	1	070-006-045	DISTRIBUTOR SUPPORT POST
15	1	070-006-044	SPRING POST NUT, 3/8-16
16	1	070-006-043	SPACER
17	1	809-865-725	SCREW, HEX, 3/8-16 X 4-1/2
18	1	090-005-256	ROD END, MALE, 3/8
19	1	831-566-002	NUT, HEX, 3/8-24
20	1	070-006-047	SAFETY LINK TUBING

ITEM	QTY	PART #	DESCRIPTION
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# KICKBACK PLATE ASSEMBLY- BALL EXIT SIDE







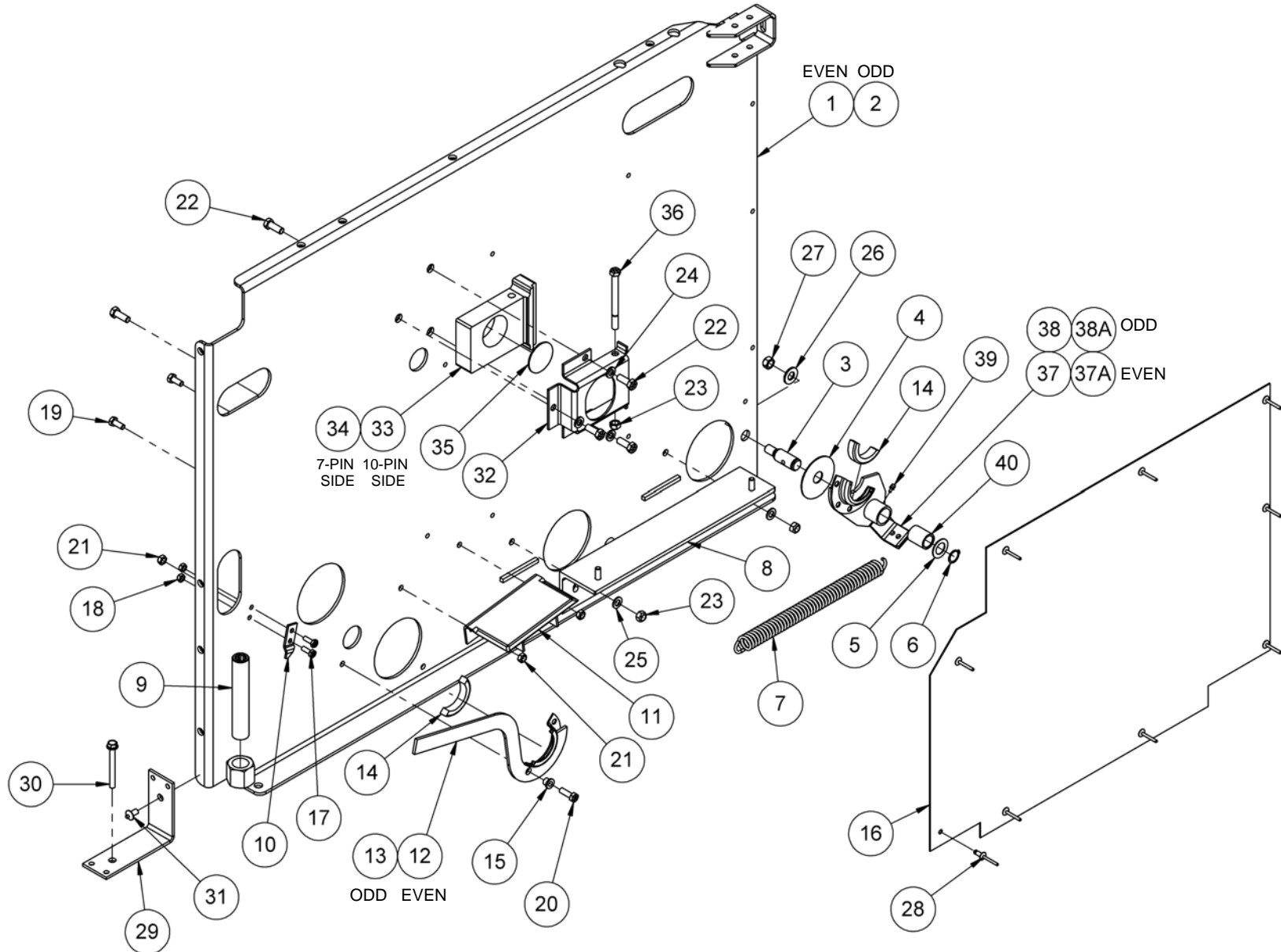
## KICKBACK PLATE ASSEMBLY- BALL EXIT SIDE

ITEM	QTY	PART #	DESCRIPTION
1	1	088-001-593	KICKPLATE. 10-PIN SIDE.. ODD MACHINE
2	1	088-001-592	KICKPLATE. 7-PIN SIDE.. EVEN MACHINE
3	1	000-022-794	BLOCK SUPPORT. 10-PIN SIDE
4	1	000-022-795	BLOCK SUPPORT. 7-PIN SIDE
5	1	000-022-300	SHIELD
6	1	000-022-788	BOX SUPPORT
7	3	951-164-002	WASHER. SPLIT LOCK. 3/8
8	5	809-865-165	SCREW. HEX. 3/8 - 16 X 1
9	1	809-865-645	SCREW. HEX. 3/8 - 16 X 4
10	3	844-065-002	NUT. STOVER LOCK. 3/8 - 16
11	2	000-024-890	SETSCREW
12	1	088-001-567	ANTI-IDLING CORNER. ODD
13	1	088-001-568	ANTI-IDLING CORNER. EVEN
14	2	808-867-160	SCREW. FLAT HEAD. 5/16-18 X 1
15	2	090-004-136	SPACER
16	1	000-022-926	RETAINER SUPPORT
17	2	000-022-924	BEARING SUPPORT
18	4	808-557-120	SCREW. BUTTON HEAD. 5/16 - 18 X 3/4
19	8	844-057-002	NUT. FLEX LOCK. 5/16 - 24
20	1	088-001-571	ANTI-IDLING CHANNEL WELDMENT. ODD
21	1	088-001-572	ANTI-IDLING CHANNEL WELDMENT. EVEN
22	1	088-001-583	ANTI-IDLING NOISE PAD
23	4	000-026-865	FLAT WASHEER. 3/8 X 7/8 X 1/16
24	4	808-849-160	SCREW. FLAT HEAD. ¼-20 X 1
25	6	844-049-002	NUT. STOVER LOCK. 1/4 - 20
26	1	090-004-131	PIT SUPPORT BRACKET
27	2	948-767-132	WASHER. 13/32 X 13/16 X 1/16
28	1	000-021-204	SPRING
29	1	919-005-800	RETAINING RING
30	1	000-027-642	FRONT ROLLER SUPPORT WASHER
31	1	900-112-203	SLEEVE BEARING. .753 X 1-1/4

ITEM	Q	PART #	DESCRIPTION
32	1	000-029-602	BRACKET WELDMENT. 10-PIN SIDE. ODD MACHINE
32A	1	000-029-672	BEARING BRACKET ASSEMBLY. 10-PIN SIDE ODD MACHINE (Includes 17, 31, 32, & 34)
33	1	000-022-248	BRACKET WELDMENT 7-PIN SIDE. EVEN MACHINE
33A	1	000-022-249	BEARING BRACKET ASSEMBLY. 10-PIN SIDE EVEN MACHINE (Includes 17, 31, 33, & 34)
34	1	710-501-009	GREASE FITTING
35	1	000-027-641	THRUST BEARING
36	1	000-029-015	PIVOT STUD
37	1	948-975-172	WASHER. FLAT. 1 X 1/2 X 1/16
38	1	844-074-002	NUT. STOVER LOCK. 1/2 - 20
39	6	808-857-120	SCREW. FLAT HEAD. 5/16 - 18 X 3/4
40	1	000-024-668	TRACK SUPPORT BRACKET
41	2	809-865-145	SCREW. HEX. 3/8-16 X 7/8
42*	1*	070-011-050	WASHER. SPECIAL
43	1	000-028-362	BUMPER. URETHANE
44	1	070-011-642	URETHANE DOOR RING. ODD MACHINE. 10-PIN SIDE
45	1	070-011-641	URETHANE DOOR RING. EVEN MACHINE. 7-PIN SIDE
46	1	070-004-642	BALL LIFT STOP BRACKET
47	1	000-024-641	STOP BUMPER
48	5	809-857-125	SCREW. HEX. 5/16 - 18 X 3/4
49	1	835-558-002	NUT. HEX JAM. 5/16 - 24
50	1	088-500-190	CURTAIN ROD BUSHING. CS
51	2	088-849-120	SCREW. BUTTON HEAD. 1/4 - 20 X ¾
52	1	088-001-034	SINGLE SADDLE BRACKET WELDMENT
53	1	000-029-640	KICKBACK PANEL
54	7	938-648-010	RIVET. .25 X .48. AL
n/a	1	008-100-413	ADHESIVE (apply between items 3&5 or 4&5 as applicable)

\* 0, 1, or 2 washers depending on the distance between the two machines' kickback plates.

# KICKBACK PLATE ASSEMBLY- SIDE OPPOSITE BALL EXIT



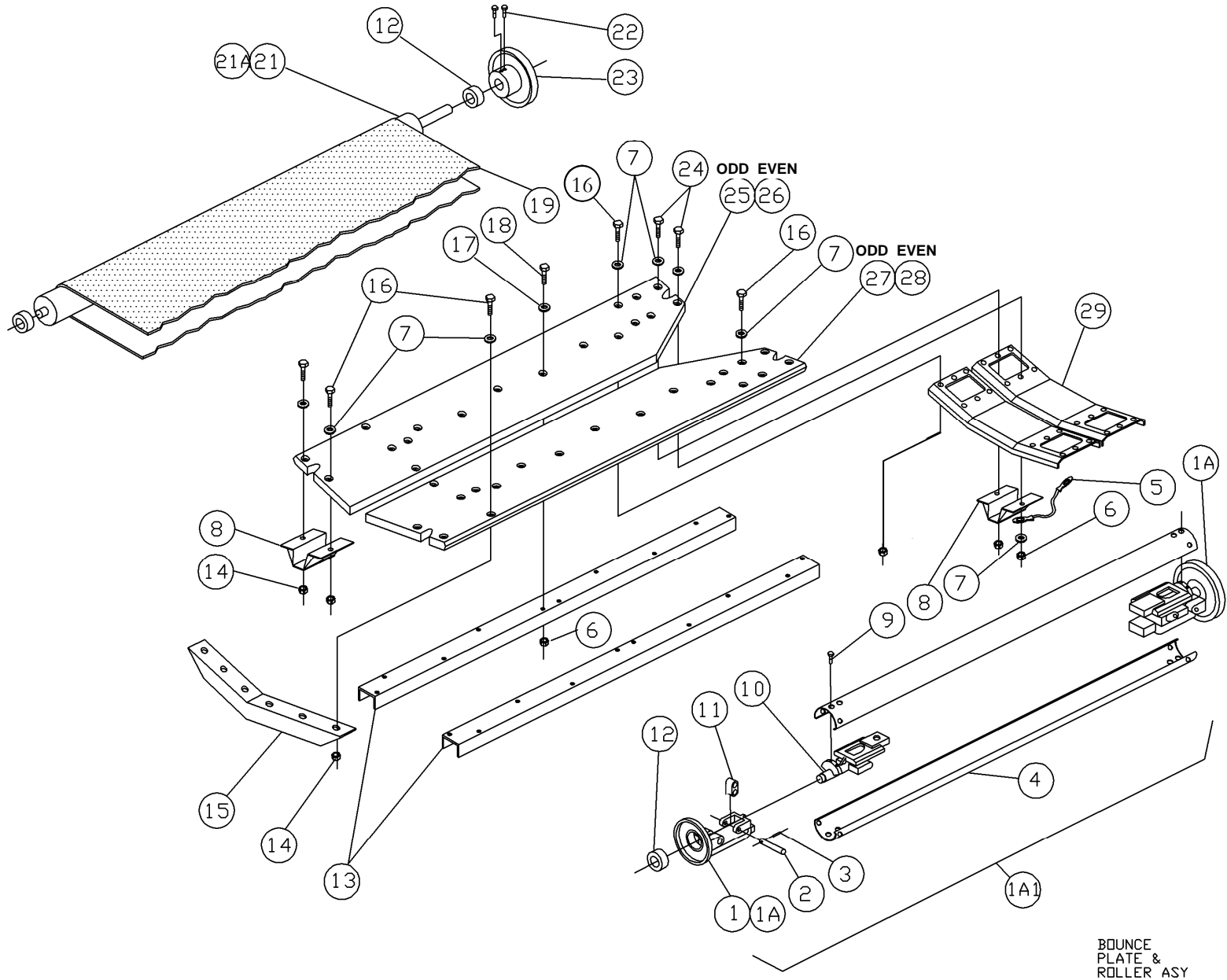


## KICKBACK PLATE ASSEMBLY– SIDE OPPOSITE BALL EXIT

ITEM	QTY	PART #	DESCRIPTION
1	1	088-001-594	KICKBACK WELDMENT 10-PIN SIDE, EVEN MACHINE
2	1	088-001-595	KICKBACK WELDMENT 7-PIN SIDE, ODD MACHINE
3	1	000-029-015	PIVOT STUD
4	1	000-027-641	THRUST BEARING
5	1	000-027-642	FLAT WASHER, .75 X 1 1/4 X .0478
6	1	919-005-800	RETAINING RING
7	1	000-021-204	SPRING
8	1	090-004-131	PIT SUPPORT BRACKET
9	2	000-024-890	SETSCREW (JACK SCREW)
10	1	000-023-468	BRACKET
11	1	000-022-878	ANGLE
12	1	000-023-465	SUPPORT WELDMENT, EVEN MACHINE
13	1	000-023-464	SUPPORT WELDMENT, ODD MACHINE
14	2	000-022-924	BEARING SUPPORT
15	1	000-023-467	FLANGED BEARING, .314 X .434 X .310
16	1	070-002-027	KICKBACK PANEL
17	2	809-849-125	SCREW, HEX, 1/4 - 20 X 3/4
18	2	844-049-002	NUT, STOVER LOCK, 1/4 - 20
19	2	809-857-125	SCREW, HEX, 5/16 - 18 X 3/4
20	1	809-857-165	SCREW HEX, 5/16 - 18 X 1
21	3	844-057-002	NUT, STOVER LOCK, 5/16 - 18
22	5	809-865-165	SCREW, HEX, 3/8 - 16 X 1
23	3	844-065-002	NUT, STOVER LOCK, 3/8 - 16
24	3	951-164-002	WASHER, SPLIT LOCK, 3/8
25	2	948-767-132	WASHER
26	1	948-975-172	WASHER, FLAT, .53 x 1.06 x .10
27	1	844-074-002	NUT, STOVER LOCK, 1/2 - 20
28	9	938-648-010	RIVET, .25 X .48, AL
29	1	000-026-464	KICKBACK BRACKET
30	1	709-013-059	SCREWBOLT, HEX, 8 mm X 75 mm
31	1	937-738-003	RIVET, STEEL
32	1	000-022-788	BOX SUPPORT

ITEM	QTY	PART #	DESCRIPTION
33	1	000-022-794	BLOCK SUPPORT, 10-PIN SIDE
34	1	000-022-795	BLOCK SUPPORT, 7-PIN SIDE
35	1	000-022-300	SHIELD
36	1	809-865-645	SCREW, HEX, 3/8 - 16 X 4
37	1	000-021-044	BRACKET WELDMENT, 10-PIN SIDE, EVEN MACHINE
37A	1	000-027-646	BEARING ASSEMBLY., 10-PIN SIDE, EVEN MACHINE (includes: 14, 37, 39 & 40)
38	1	000-021-043	BRACKET WELDMENT, 7-PIN SIDE, ODD MACHINE
38A	1	000-027-645	BEARING ASSEMBLY., 7-PIN SIDE, ODD MACHINE (includes: 14, 38, 39 & 40)
39	1	710-501-009	GREASE FITTING
40	1	900-112-203	SLEEVE BEARING, .753 X 1-1/4
n/a	1	008-100-413	ADHESIVE apply between items (33&35 or 34&35as applicable)

# BOUNCE PLATE & ROLLER ASSEMBLY



BOUNCE  
PLATE &  
ROLLER ASY

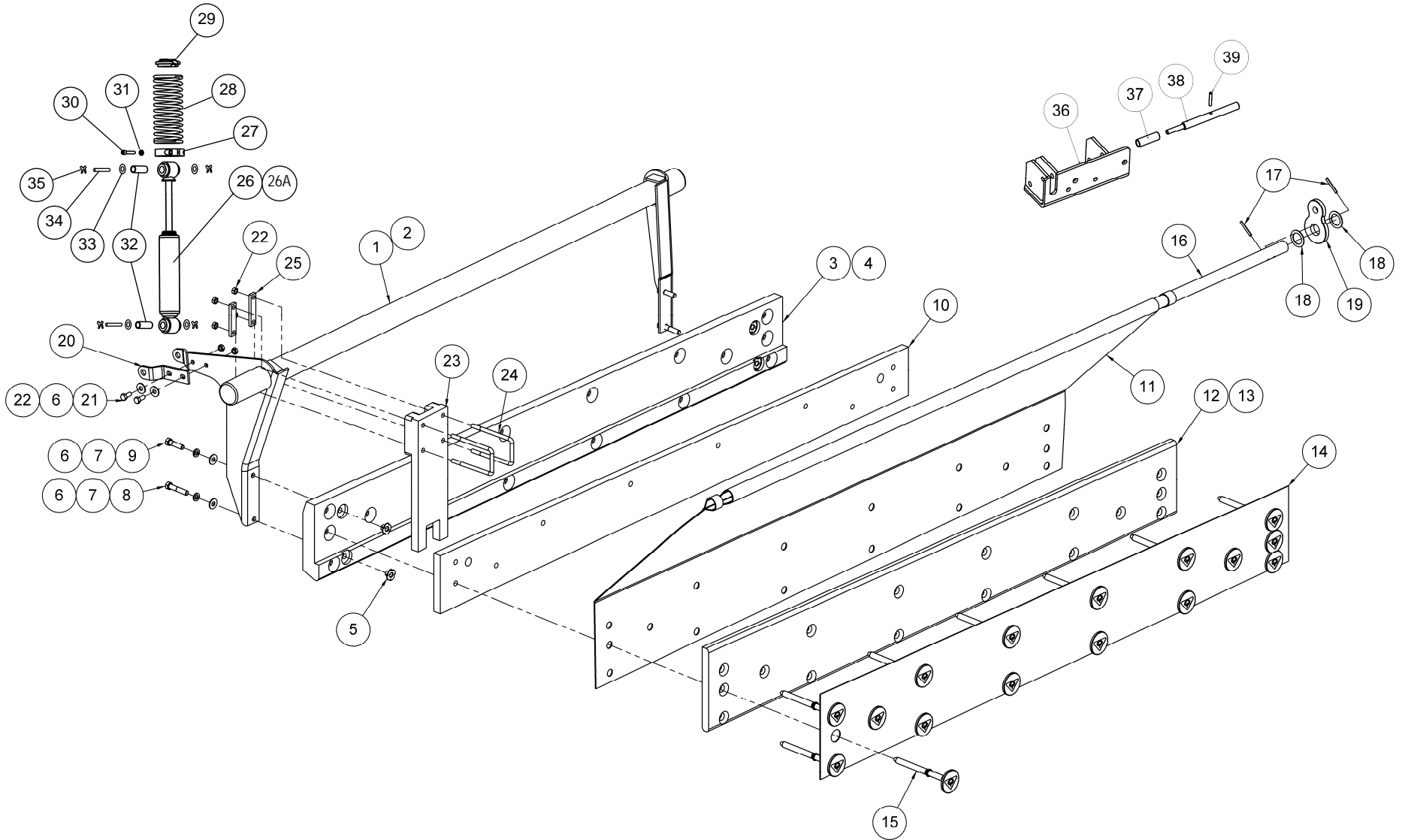


## BOUNCE PLATE & ROLLER ASSEMBLY

ITEM	QTY	PART #	DESCRIPTION
1	2	000-024-579	ROLLER HINGE
1A	2	000-024-592	HINGE ASSY (includes 1, 2, 3, 10, 11 & 12)
1A1	1	000-024-576	FRONT ROLLER ASSY (includes 1A, 4 & 9)
2	4	000-024-582	PIN
3	8	913-411-100	SPRING PIN, .078 X 5/8
4	2	000-024-578	ROLLER BODY
5	1	000-025-622	BONDING STRAP
6	18	844-057-002	NUT, STOVER LOCK, 5/16 - 18
7	23	948-753-102	WASHER, FLAT, .281 X .625 X .06
8	4	000-021-224	VIBRATION DAMPENER
9	16	000-025-662	SCREW, NYLON LOCKING
10	2	000-024-580	SHAFT HINGE
11	2	000-024-760	LINK
12	4	000-024-590	BEARING
13	2	090-005-274	SUPPORT CHANNEL
14	22	844-049-002	NUT, STOVER LOCK, 1/4 - 20
15	1	000-029-626	ANGLE SUPPORT
16	18	809-849-165	SCREW, HEX, 1/4 - 20 X 1
17	18	948-761-112	WASHER, FLAT, .343 X .625 X .06
18	18	809-857-165	SCREW, HEX, 5/16 - 18 X 1
19	1	088-500-505	CARPET BELT, BLACK
20			Not used
21	1	070-002-033	REAR ROLLER
21A	1	070-002-034	REAR ROLLER ASSY (includes 12 & 21)
22	2	806-265-160	SETSCREW, SQUARE HEAD, 3/8 - 16 X 1
23	1	090-004-203	82-90 CARPET DRIVE SHEAVE

ITEM	QTY	PART #	DESCRIPTION
24	4	809-849-205	SCREW, HEX, 1/4 - 20 X 1-1/4
25	1	090-005-272	BOUNCE BOARD, REAR, ODD. MACHINE
26	1	090-005-273	BOUNCE BOARD, REAR, EVEN MACHINE
27	1	090-005-270	BOUNCE BOARD, FRONT, ODD MACHINE
28	1	090-005-271	BOUNCE BOARD, FRONT, EVEN MACHINE
29	2	000-021-914	BOUNCE BOARD CHANNEL

# CUSHION, CURTAIN, & SHOCK ABSORBER ASSEMBLY



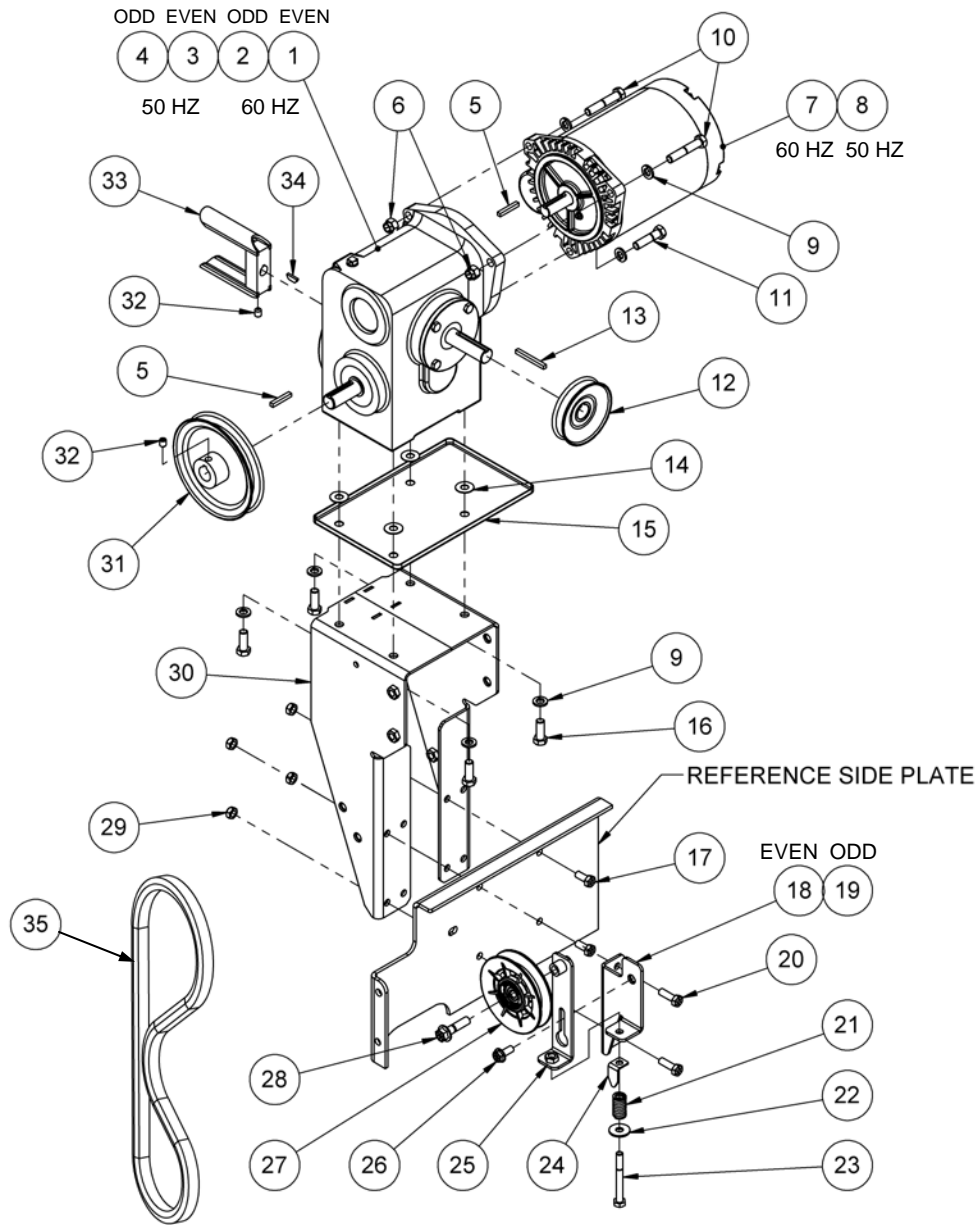


## CUSHION, CURTAIN, & SHOCK ABSORBER ASSEMBLY

ITEM	QTY	PART #	DESCRIPTION
1	1	070-002-252	TUBE WELDMENT, EVEN MACHINE
2	1	070-002-050	TUBE WELDMENT, ODD MACHINE
3	1	000-024-795	PLANK, EVEN MACHINE
4	1	000-024-796	PLANK, ODD MACHINE
5	4	7045-003716-	TEE NUT, 3/8 - 16
6	4	947-356-617	WASHER, 5/16, FLAT
7	4	951-164-002	WASHER, SPLIT LOCK, 3/8
8	2	809-865-329	SCREW, HEX, 3/8 - 16 X 2
9	2	809-865-249	SCREW, HEX, 3/8 - 16 X 1-1/2
10	1	000-022-770	SPONGE RUBBER CUSHION PAD
11	1	000-026-450	CURTAIN ASSEMBLY
12	1	000-024-808	RUBBER CUSHION, EVEN MACHINE
13	1	000-024-807	RUBBER CUSHION, ODD MACHINE
14	1	090-005-230	CUSHION COVER
15	16	000-028-529	RIVET, URETHANE, CUSHION ASSEMBLY
16	1	070-011-288	CURTAIN ROD
17	2	913-437-240	SPRING PIN, .187 X 1-1/2
18	2	945-091-242	WASHER, 1-1/2 X 1 X .046
19	1	070-005-610	CURTAIN LINK
20	1	000-024-534	HANGER EAR
21	2	809-857-125	SCREW, HEX, 5/16 - 18 X 3/4
22	7	844-057-002	NUT, STOVER LOCK, 5/16 - 18
23	1	070-001-432	PAD
24	2	070-001-422	U-BOLT
25	2	070-001-421	STRAP

ITEM	QTY	PART #	DESCRIPTION
26	1	000-022-823	SHOCK ABSORBER w/UPPER COLLAR
26A	1	000-022-824	SHOCK ASSY (Includes items 26 through 32)
27	1	000-022-286	CUSHION STRUT COLLAR
28	1	000-022-288	SPRING
29	1	000-022-287	SPRING SEATING WASHER
30	1	810-250-200	SCREW, SOCKET HEAD CAP, 1/4 - 28 X 1-1/4
31	1	951-148-002	WASHER, SPLIT LOCK, 1/4
32	2	000-022-822	SLEEVE
33	4	948-975-172	WASHER, FLAT, 1-1/16 X 17/32 X 3/32
34	2	000-022-821	PIN
35	4	963-600-002	X-WASHER
36	1	070-007-360	SUPPORT BRACKET WELDMENT
37	1	070-001-389	CURTAIN LATCH SPRING
38	1	070-001-396	CURTAIN LATCH PIN
39	1	913-431-160	SPRING PIN, .156 X 1

# BACK END DRIVE MOTOR & BRACKET ASSEMBLY





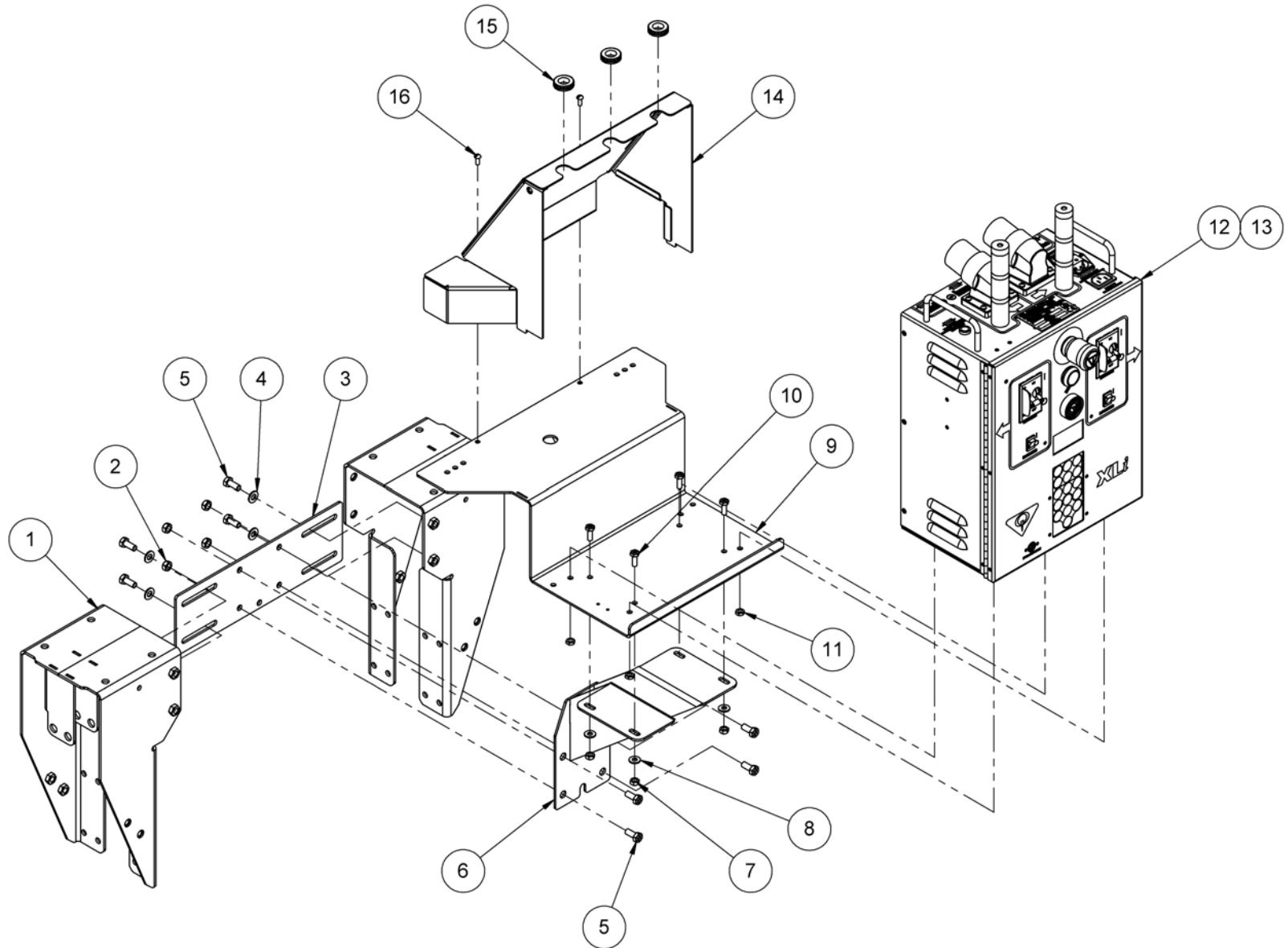


## BACK END DRIVE MOTOR & BRACKET ASSEMBLY

ITEM	QTY	PART #	DESCRIPTION
1	1	088-004-502-02	BE GEARBOX, EVEN MACHINE, 60 Hz
2	1	088-004-501-02	BE GEARBOX, ODD MACHINE, 60 Hz
3	1	088-004-507-02	BE GEARBOX, EVEN MACHINE, 50 Hz
4	1	088-004-506-02	BE GEARBOX, ODD MACHINE, 50 Hz
5	1	907-201-000	KEY, SQUARE, 3/16 X 1-1/4
6	2	839-665-002	NUT, FLEX LOCK, 3/8 - 16
7	1	090-003-766	MOTOR, 60 Hz
8	1	090-007-310	MOTOR, 50 Hz
9	8	951-164-002	WASHER, SPLIT LOCK, 3/8
10	2	809-865-325	SCREW, HEX, 3/8 - 16 X 2
11	1	809-865-245	SCREW, HEX, 3/8 - 16 X 1-1/2
12	1	000-022-172	DRIVE SHEAVE
13	1	907-202-600	KEY, SQUARE, 3/16 X 1-7/8
14	4	000-023-758	GASKET WASHER, 7/8 X 3/8 X 1/32
15	1	090-004-517	BACK END MOTOR DRIP PAN
16	4	809-865-165	SCREW, HEX, 3/8 - 16 X 1
17	2	809-857-125	SCREW, HEX, 5/16 - 18 X 3/4
18	1	088-001-539	IDLER MOUNT, EVEN MACHINE
19	1	088-001-534	IDLER MOUNT, ODD MACHINE
20	2	809-857-165	SCREW, HEX, 5/16-18 X 1
21	1	088-001-823	IDLER TENSION SPRING
22	1	7050-034100-006	FLAT WASHER, .36 X .98 X .08
23	1	809-857-445	SCREW, HEX, 5/16-18 X 2-3/4
24	1	088-001-824	IDLER SPRING INDICATOR
25	1	088-001-535	IDLER BAR WELDMENT
26	1	801-757-121	SCREW, HEX, WASHER HEAD, 5/16-18 X 3/4

ITEM	QTY	PART #	DESCRIPTION
27	1	088-001-825	IDLER PULLEY, 4-INCH
28	1	801-765-241	SCREW, HEX WASHER HEAD, 3/8-16 X 1-1/2
29	4	844-057-002	NUT, STOVER LOCK, 5/16 - 18
30	1	088-001-800	BACK END MOTOR MOUNT
31	1	088-001-822	ELEVATOR DRIVE SHEAVE, 5-INCH
32	2	807-358-060	SETSCREW, 5/16 - 24 X 3/8
33	1	090-001-130	DISTRIBUTOR DRIVE HOUSING
34	1	907-000-300	KEY, .13 X .63
35	1	088-001-528	PIN ELEVATOR DRIVE HEX V-BELT
36	1	090-004-520	PIT CONVEYOR DRIVE BELT (NOT SHOWN)

# CHASSIS & MOUNTING BRACKET ASSEMBLY



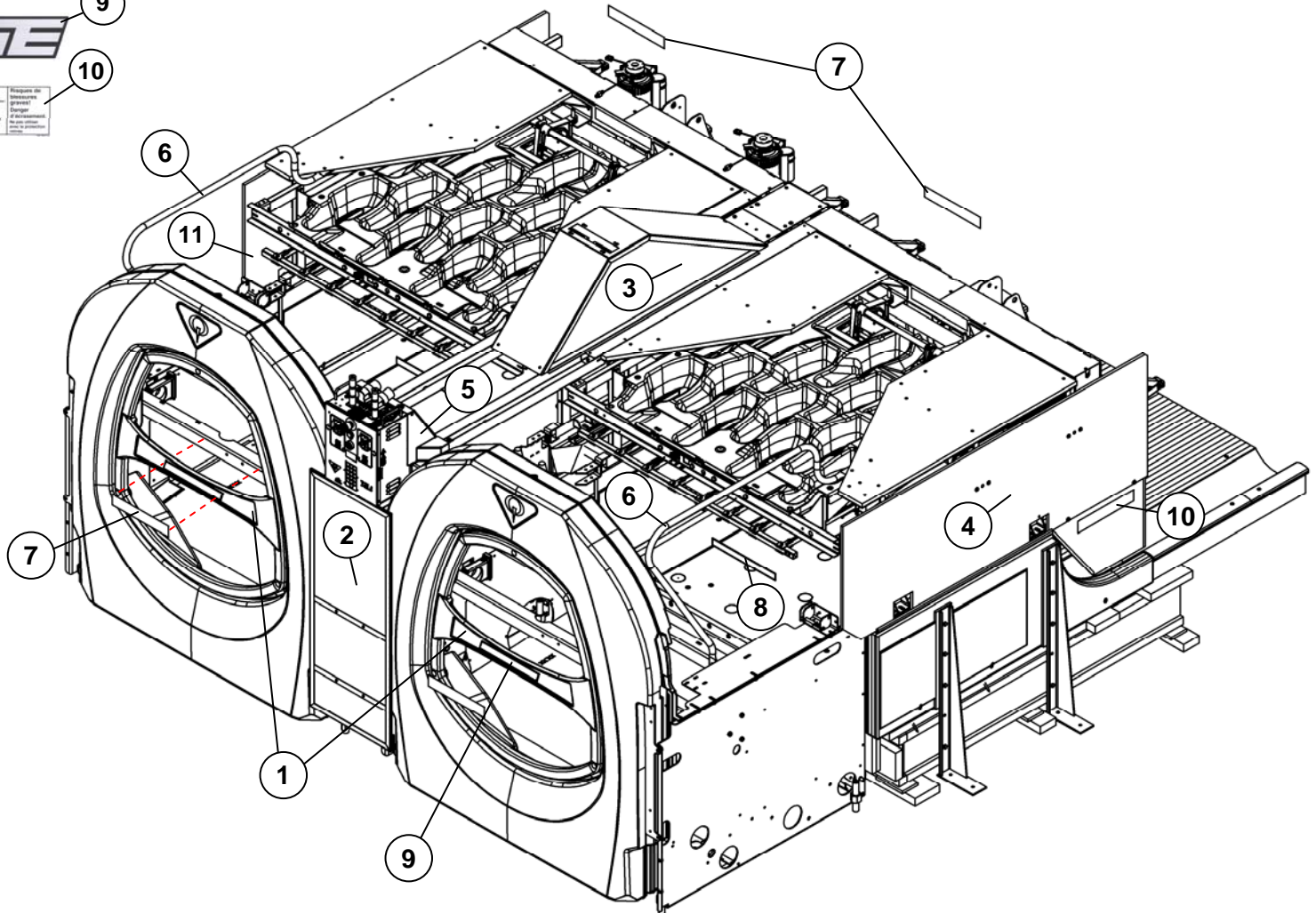
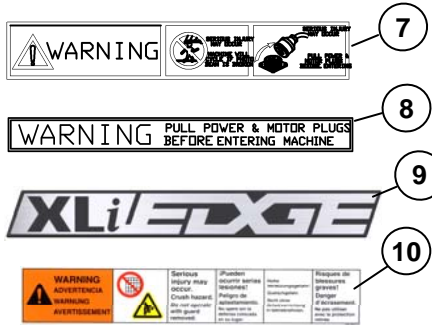


## \*CHASSIS & MOUNTING BRACKET ASSEMBLY

ITEM	QTY	PART #	DESCRIPTION	ITEM	QTY	PART #	DESCRIPTION
1	2	088-001-800	BACK END MOTOR MOUNT WELDMENT				
2	4	844-057-002	NUT, STOVER LOCK, 5/16 - 18				
3	1	088-001-804	TIE PLATE				
4	4	948-761-112	WASHER, FLAT, 11/32 X 11/16 X 1/16				
5	8	809-857-125	SCREW, HEX, 5/16 - 18 X 3/4				
6	1	088-001-806	CHASSIS SUPPORT, DOMESTIC*				
7	4	844-049-002	NUT, STOVER LOCK, 1/4 - 20				
8	4	948-753-102	WASHER, FLAT, 9/32 X 5/8 X 1/16				
9	1	088-200-486	CHASSIS MOUNTING WLDMT, DOMESTIC*				
10	4	809-849-125	SCREW, HEX, 1/4 - 20 X 3/4				
11	4	835-549-002	NUT, HEX JAM, 1/4 - 20				
12	1	088-000-001-03	XLi CHASSIS w/BRAKE FUSE				
13	1	088-400-001-01	XLi CHASSIS w/BRAKE FUSE for SMARTGUARD-EQUIPPED PINSPOTTERS				
14	1	088-200-481	CHASSIS COVER, WIDE DUCT*				
15	3	711-520-012	GROMMET, 5/8 X 7/8 X 1/16				
16	2	812-840-082	SCREW, ROUND HEAD, 10 - 32 X 1/2				

\* FOR SMARTGUARD CHASSIS MOUNTING COMPONENTS, REFER TO THE *SMARTGUARD SAFETY SYSTEM MANUAL, 400-088-092*.

# GUARDS & SAFETY LABELS





## GUARDS & SAFETY LABELS

ITEM	QTY*	PART #	DESCRIPTION
1	2	088-001-558	EDGE LIFT SCREEN GUARD ASSEMBLY
2	1	088-001-115	BALL LIFT GUARD, REAR
3	1	070-011-401	BALL LIFT GUARD WELDMENT
4	1	090-006-243	ODD END GUARD ASSEMBLY
5	1	088-200-568	CHASSIS COVER, WIDE DUCT
6	2	090-005-118	HANDRAIL
7	4	090-004-028	WARNING LABEL
8	2	090-005-642	WARNING DECAL (ON YOKE)
9	2	088-001-826	EDGE LOGO DECAL
10	3	088-001-154	END GUARD SAFETY LABEL
11	2	088-001-160	E-STOP BUTTON & SWITCH ASSEMBLY
12	2	070-010-238	FRONT GUARD ASSEMBLY BRACKET
11	1	090-006-230	EVEN END GUARD ASSEMBLY

\* per pair

ITEM	QTY	PART #	DESCRIPTION
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