

**QUBICA~~A~~AMF**

**90XL*i***

**AUTOMATIC PINSPOTTER**



# **SERVICE & PARTS MANUAL**

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**90XL*i* Pinspotter Service & Parts Manual - P/N 400-088-010 Rev. E  
90XL*i* Pinspotter Manual Set - P/N 610-088-008**





# **90XL*i* Automatic Pinspotter**

## **Service & Parts Manual**

**Part Number 400-088-010**

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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 90XL*i* pinspotters, 90XL*i* Chassis, 90XL*i*-style front end gearmotors, and the AccuCam 3000 Camera. This pinspotter manual does not cover the installation of the pinspotter or associated equipment.

Several other manuals are included in this manual set. These manuals provide instructions for the installation of the associated equipment. 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 90XL*i* Pinspotter Operation, 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 of 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 parts index can be found at the end of Section 5.0.

#### **Section Tab**

#### **Subsection Tab**

Section 1 - Introduction

- 1.1 How To Use This Manual
- 1.2 Manual Layout
- 1.3 QubicaAMF Bowling Products, Inc.
- 1.4 QubicaAMF Bowling's Commitment to Quality

Section 2 - Safety

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Parts Index



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## ***90XLi QubicaAMF Pinspotter***

Attachment A - 90XLi Pinspotter Controller System Wiring Diagram

Attachment B - Pin Distributor Manual

Attachment C - Positive Ball Lift (PBL) Manual

Attachment D - 90XLi Chassis Manual

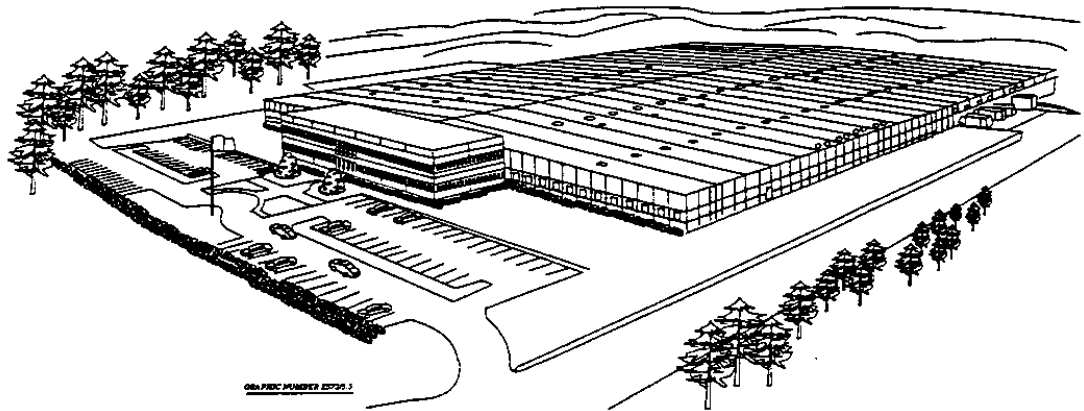
Attachment E - 90XLi Pinspotter Motor & Gearbox Manual

Attachment F - AccuCam 3000 Camera Manual

Attachment G - 90XLi Manager's Control Unit (MCU) Manual

### **1.3 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 of more than 50 countries.

## **1.4 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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***90XLi 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 90XLi 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.
- 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.

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.

The



risk of significant personal injury.

The



symbol indicates that damage to the machine or personal injury may occur.



## 90XLi QubicaAMF Pinspotter







The symbol represents the possibility that improper service or repair may damage the pinspotter.

Additionally, the 90XLi 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 below.

	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.



## Safety

	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>					
STOP. READ and UNDERSTAND TECHNICAL MANUAL Before Servicing Machine.	DETENGASE. LEA y COMPRENDA el MANUAL TÉCNICO antes de iniciar las tareas de servicio.			HALT! Vor Arbeiten an der Maschine das TECHNISCHE HANDBUCH LESEN und VERSTEHEN.	ARRÊTER. Lire et voir à bien COMPRENDRE les instructions du MANUEL TECHNIQUE avant de travailler sur la machine.
LOCKOUT/TAGOUT. UNPLUG Main Power and UNPLUG Motor Before Servicing Machine. See Lockout Safety Procedures.	ETIQUETAR "EN SERVICIO" Desconectar la alimentación de la red y DESCONECTAR el motor antes de realizar las tareas de servicio. Consulte las procedimientos de seguridad para desenergizar.			SPERREN/BEZEICHNEN Vor Arbeiten an der Maschine Stromkasten und Motorstecker TRENNEN. Bitte auch Sperrvorrichtung benutzen.	SERVOUEIL/REPRÉSENTER DÉBRANCHER l'alimentation principale et le moteur avant de travailler sur la machine. Consulter la procédure de verrouillage de sécurité.
DO NOT BREAK PHOTO BEAM. Machine will cycle. STARTS AUTOMATICALLY. CRUSH HAZARD. Pin Deck Area.	NO ROMPA EL HAZ FOTOGRAFICO y la maquina REINICIA. APARCA AUTOMATICAMENTE. PELIGRO DE APLASTAMIENTO. Área de la púa.			LICHTSTRAHL NICHT UNTERBRECHEN. Bei sonst der Maschine angeschlossen STARTET AUTOMATISCH. QUETSCHGEFAHR. Pinenbereich.	NE PAS INTERROMPRE LE FASCEAU DE LA CELLULE. La machine se mettra en marche automatiquement. DANGER D'ÉCRASEMENT. Zone des piques.
DO NOT OPERATE WITHOUT GUARDS Properly installed. BELT ENTANGLEMENT GEAR ENTANGLEMENT. FALL TRIP HAZARD. Do not use Front-End Platform Guards as a Caissette to access other Pinpoints in Operation.	NO HAGA FUNCIONAR LA MÁQUINA SIN GUARDAS adecuadamente instalados. ATAQUE DE LAS CORREAS. ATAQUE DE LAS MARCHAS. PELIGRO DE CAÍDAS/VELOCIDAD. No use las guardas de la plataforma frontal para acceder a otros puntos de trabajo en operación.			INBETRIEBNAHME OHNE richtig/offiziell angebrachte SCHUTZGÜTER VERBOTEN. GURTVERWICKLUNG. GETRIEBVERWICKLUNG. FALL- BZW. KIPPGEFAHR Frontplattform Schutzgitter nicht als Landung zum Zugang zu anderen Punkten in Betrieb benutzen.	NE PAS METTRE EN MARCHÉ SI LES PROTECTIONS NE SONT pas correctement installées. EMMÊLEMENT AUX COURROIES. EMMÊLEMENT AUX ENGRENAGES. RISQUE D'ACCROCHAGE/ CHUTE Ne pas utiliser les protections de la plate-forme avant pour accéder aux autres points de fonctionnement.
EYE PROTECTION REQUIRED. HEARING PROTECTION REQUIRED.	SE NECESITA PROTECCIÓN OCULAR. SE NECESITA PROTECCIÓN AUDITIVA.			AUGENSCHUTZ ERFORDERLICH. OHRENSCHUTZ ERFORDERLICH.	PROTECTION OCULAIRE REQUISE. PROTECTION AUDITIVE REQUISE.
NO ACCESS FOR UNAUTHORIZED PERSONS. Service by Authorized Trained Personnel Only.	NO SE PERMITE LA ENTRADA A PERSONAL NO AUTORIZADO. Solo personal autorizado puede realizar tareas de servicio.			KEIN ZUGANG FÜR UNBEFUGTE. Service nur durch befugtes Fachpersonal!	ACCÈS INTERDIT AUX PERSONNES NON AUTORISÉES. Les entrées ne doivent être effectuées que par un personnel dûment formé et autorisé.






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. • Lock-out/Tag-out • Disconnect motor plugs before entering machine.	<b>¡Pueden ocurrir serias lesiones!</b> La máquina arrancará automáticamente o, rompiendo el haz fotográfico. • Desenergizar/etiquetar "En servicio" • Desconecte las orejetas del motor antes de entrar en la máquina.	<b>Hohe Verletzungsgefahr!</b> Maschine startet automatisch, bzw. wenn der Lichtstrahl unterbrochen wird. • Sperrung/Service- Kennzeichnung • Vor Zugang zur Maschine Motorstecker trennen.	<b>Risques de blessures graves!</b> La machine peut se mettre en marche automatiquement ou si le faisceau de la cellule est interrompu. • Verrouiller/signaler. • Débrancher les prises des moteurs avant de pénétrer dans la machine.
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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.
--	---	---	---	---	---

AMF 93001115

 <b>CAUTION</b> <b>ATENCIÓN</b> <b>VORSICHT</b> <b>ATTENTION</b>		<b>Do NOT</b> step or stand on this surface.	<b>NO pise ni se</b> ponga de pie sobre esta superficie.	<b>Fläche</b> <b>NICHT</b> betreten!	<b>Ne PAS</b> monter ou se tenir sur cette surface.
--	---	---	---	--	---

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## 90XLi QubicaAMF Pinspotter



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. **DISCONNECT THE POWER PLUG** before working on any pinspotter equipment and before entering an operating portion of a pinspotter (Figure 2-1). 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.**

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.

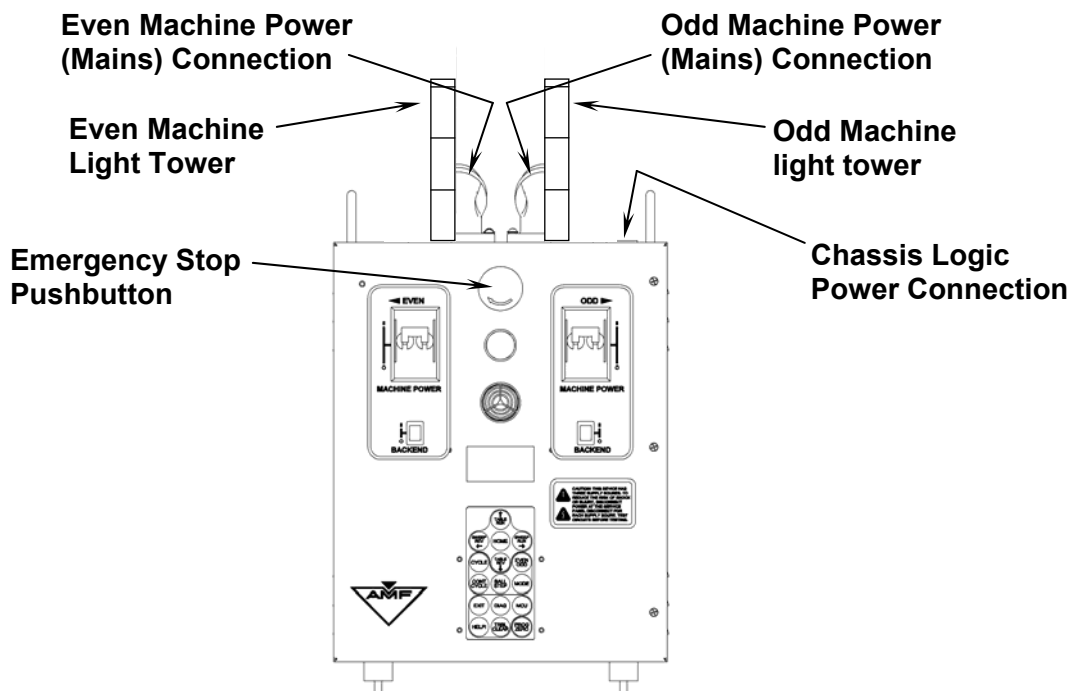


Figure 2-1

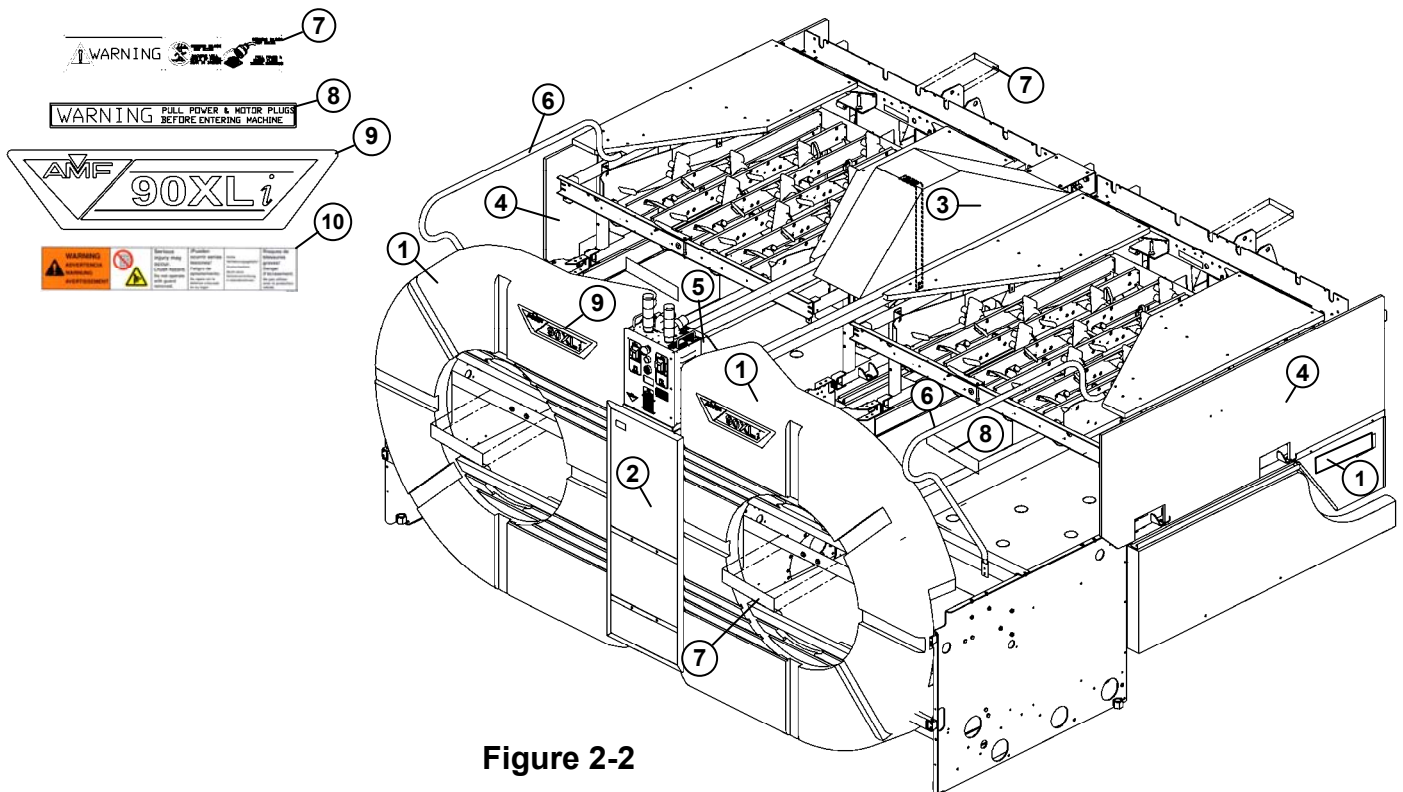
## 2.3 SAFETY GUARDS

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. Pin Wheel Guards                     | 6. Hand Rails              |
| 2. Ball Lift Screen Guard               | 7. Warning Label           |
| 3. PBL Top Guard                        | 8. Warning Decal (yoke)    |
| 4. End Guard Panel                      | 9. Wheel Guard Decal       |
| 5. Chassis Cover Guard (behind chassis) | 10. End Guard Danger Label |



**Figure 2-2**



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## ***90XLi QubicaAMF Pinspotter***

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## **3.1 PINSPOTTER MECHANICAL OPERATION**

### **3.1.1 FOUR BASIC PINSPOTTER FUNCTIONS**

The 90XLi Pinspotter has four basic functions:

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

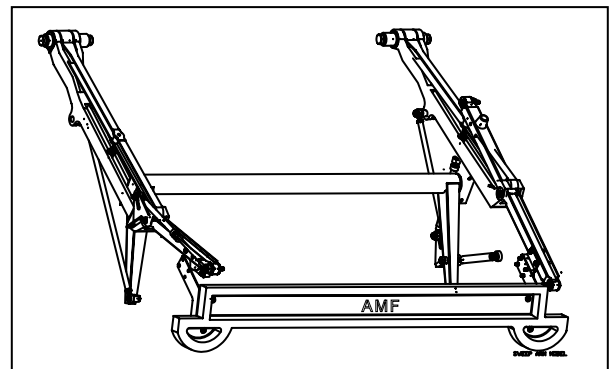
### **3.1.2 EIGHT BASIC PINSPOTTER COMPONENTS**

#### **1. Cushion**

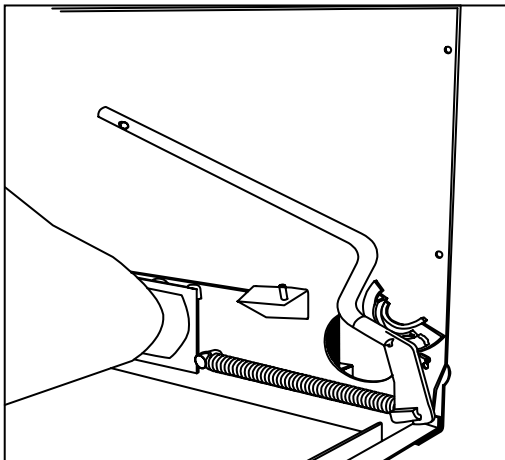
The cushion stops the ball and deflects it into the pit area.

#### **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**



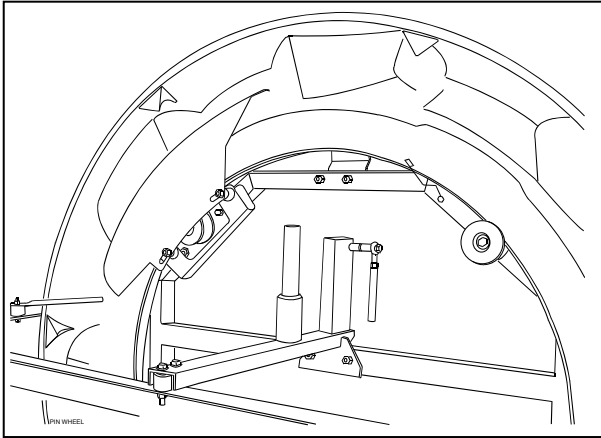
**Figure 3-2, Carpet**

#### **3. Carpet**

The carpet (Figure 3-2) is a belt that carries fallen pins to the pin elevator wheel, 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 return.



## 90XLi QubicaAMF Pinspotter



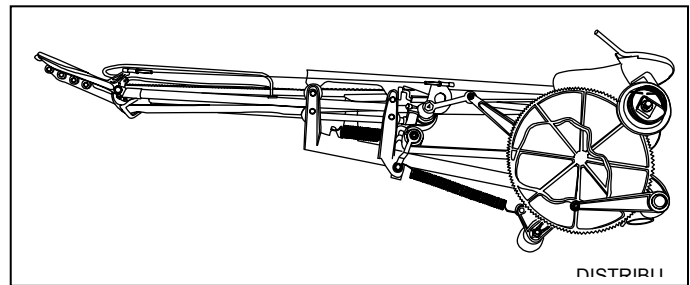
**Figure 3-3, Pin Elevator Wheel**

### 4. Pin Elevator Wheel

The pin elevator wheel carries the pins from the pit area and delivers them to the distributor. (Figure 3-3)

### 5. Distributor

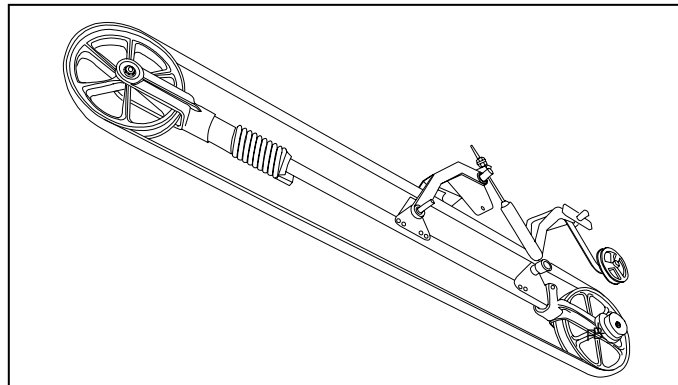
The distributor (Figure 3-4) delivers the pins from the pin elevator to the bin. The distributor runs continuously and is driven by the back-end motor.



**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 in the middle of a pair of pinspotters.



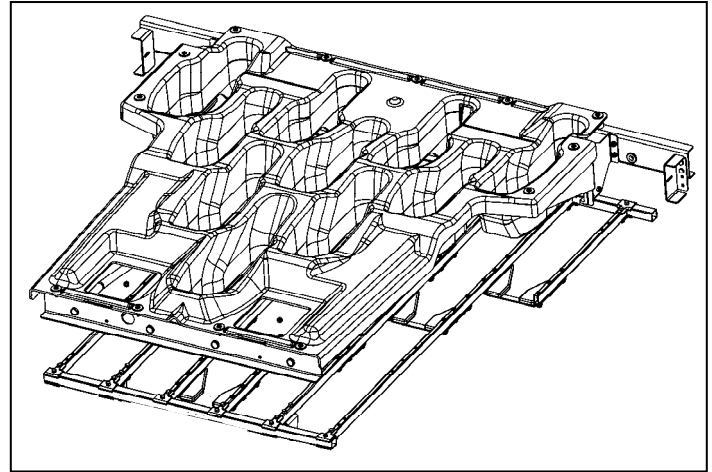
**Figure 3-5, Ball Lift**



***Pinspotter Mechanical Operation*****7. Bin and Shuttle Assemblies**

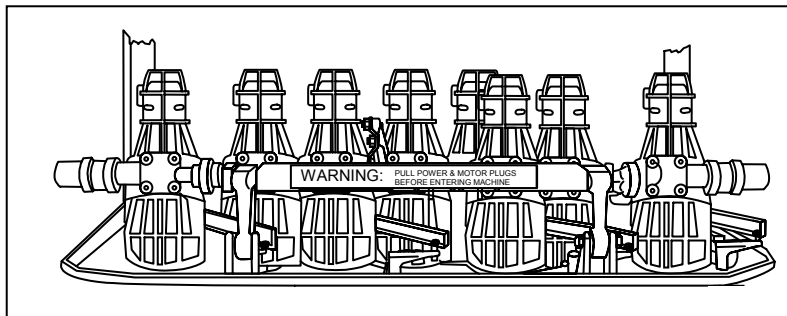
The bin (Figure 3-6) stores pins received from the distributor until ready for spotting. Two sets of pins can be stored in the bin assembly until required.

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.

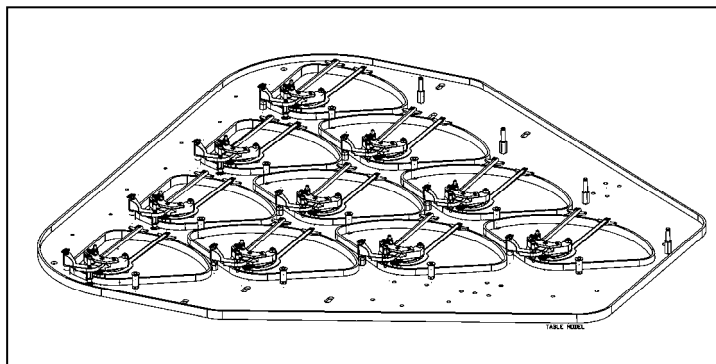
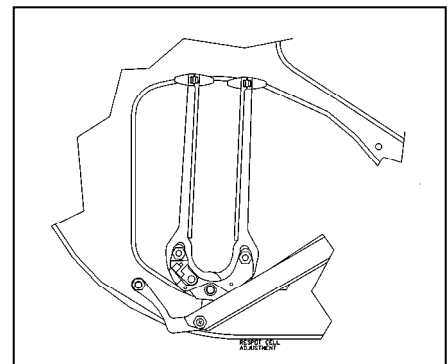
**Figure 3-6, Bin & Shuttle Assembly****8. Table**

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**



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## ***90XLi QubicaAMF Pinspotter***

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

The 90XLi 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 photoeye 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, 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 photoeye 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 photoeye 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 photoeye 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.



## 90XLi 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 machine performs a second ball operation without a scoring time delay.
- The foul detector unit operates the foul light and bell or buzzer.
- A score of zero pins is registered for the second ball.

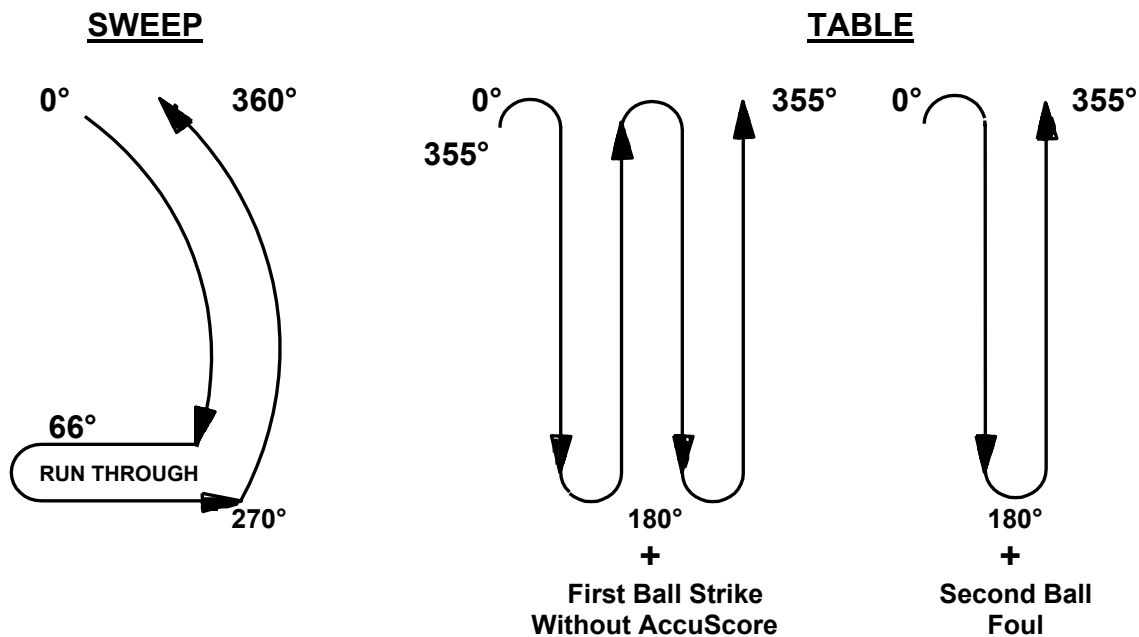


Figure 3-9

## **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.

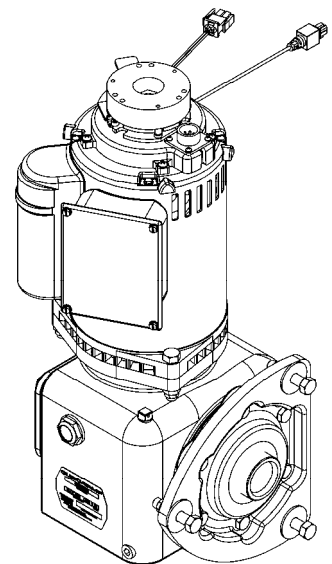
**Before turning on control power to the pinspotter chassis, ensure that the red E-stop buttons on the chassis and at the front of the pinspotters are not depressed. These buttons have a lock-in feature that requires that they be rotated so that the button pops out to its normal position. If an E-stop 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 wheel, the carpet, the ball lift, 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 Bin Switch (BS)**

The bin switch is an electromechanical 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.

### **3.2.3 PROTECTION DEVICES**

In addition to the circuit breakers on the power supply panels and chassis, as well as the fuses contained in the chassis (see Chassis Manual), the back end motor and the table and sweep motors are protected by thermal overload devices. These devices, identified by a red reset button, are located on each motor and are sometimes referred to as a "Klixon". 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.

*Pinspotter Mechanical Operation***3.2.4 MACHINE PIT TIME DELAY**

When the pinspotter is turned off at the Manager's Control Unit (MCU), Advantage Front Desk, and 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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### **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.

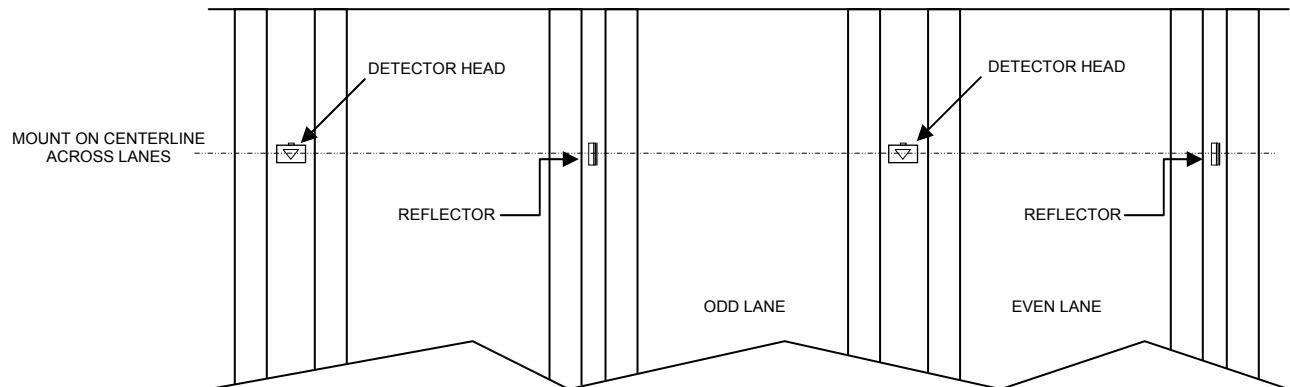
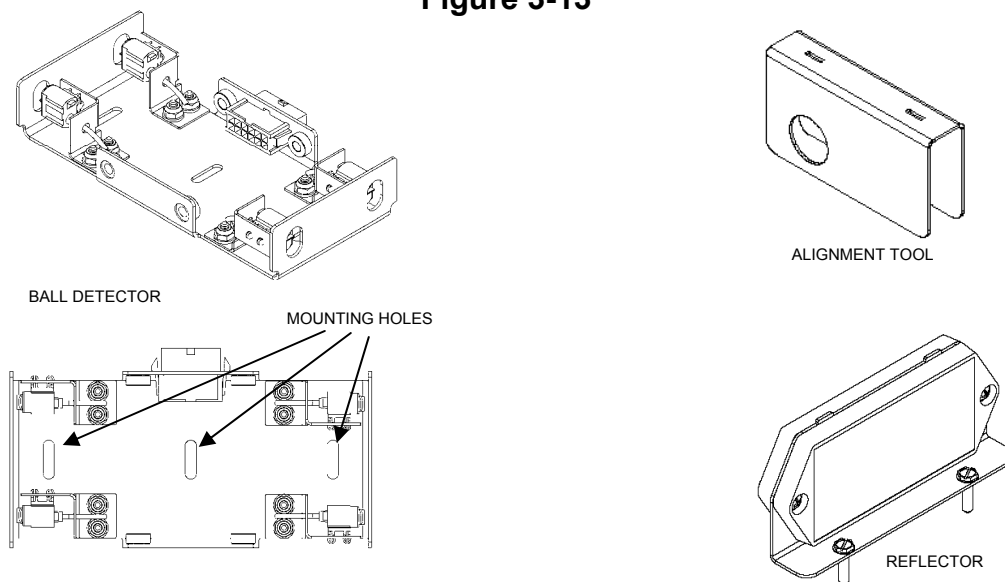
##### **Reflectors**

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 unit interfaces with the Chassis and provides ball speed information as well.

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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## 90XLi 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



#### WARNING

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

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***

- a. 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 ball 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 90XLi Pinspotter is equipped with a 220-volt 50/60-hertz dual pit light 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.

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



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to the 90XLi 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 Figure 3-15 below, and Pit Light replacement parts are shown in Section 5 of this manual.

The Pit Light assembly contains two banks of infrared LEDs that allow the camera to “see” the pins when the black light feature is being used, and are automatically switched on during black light operation. You can 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 lights fail 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. The 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.

### 90XLi PIT LIGHT WIRE DIAGRAM 220 VOLTS 50/60 HZ

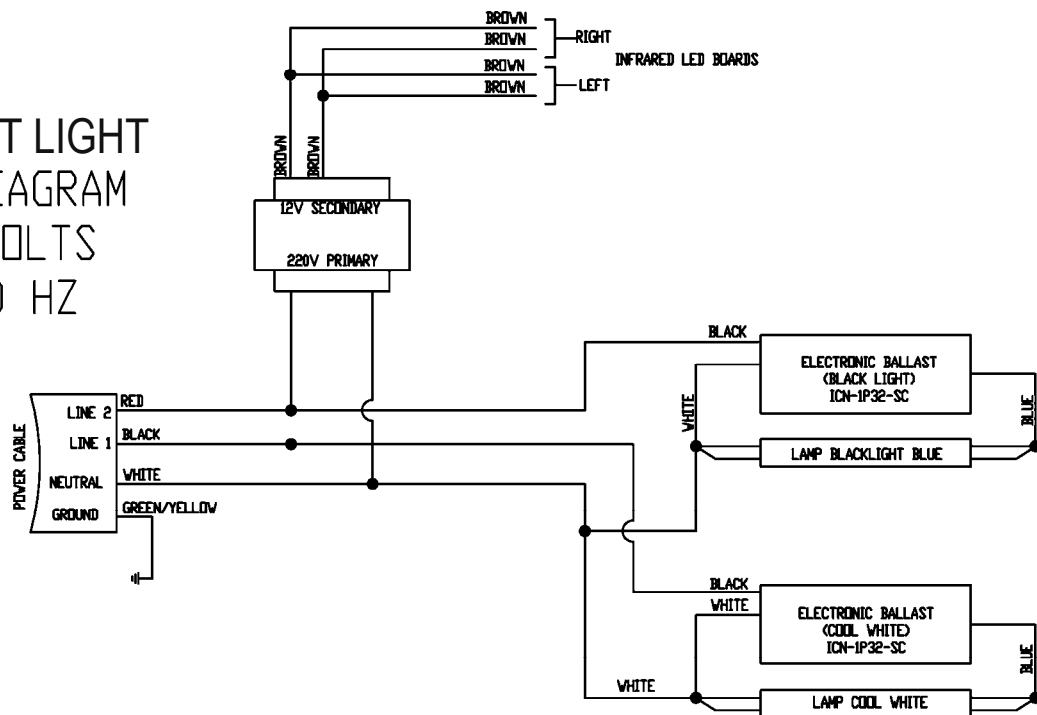


Figure 3-15

### **3.3 ELECTRICAL DRAWINGS**

For information pertaining to the QubicaAMF 90XLi Pinspotter's electrical connections, refer to Attachment A, *QubicaAMF 90XLi Pinspotter Wiring Diagram*, 088-000-136.

### **3.4 PIN DISTRIBUTOR**

For information pertaining to the QubicaAMF 90XLi Pin Distributor, refer to Attachment B, *QubicaAMF PinDistributor Manual Supplement*, P/N 400-088-012.

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

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

### **3.6 CHASSIS**

For information pertaining to the operation of the pinspotter chassis, refer to Attachment D, *90XLi 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, *90XLi QubicaAMF Pinspotter Motor and Gearbox Manual*, P/N 400-088-0013.

### **3.8 SCORING CAMERA**

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

### **3.9 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.

### **3.10 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 90XL*i* pinspotter: The Deluxe Tool Kit, P/N 784-528-013, and a new XL*i* 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

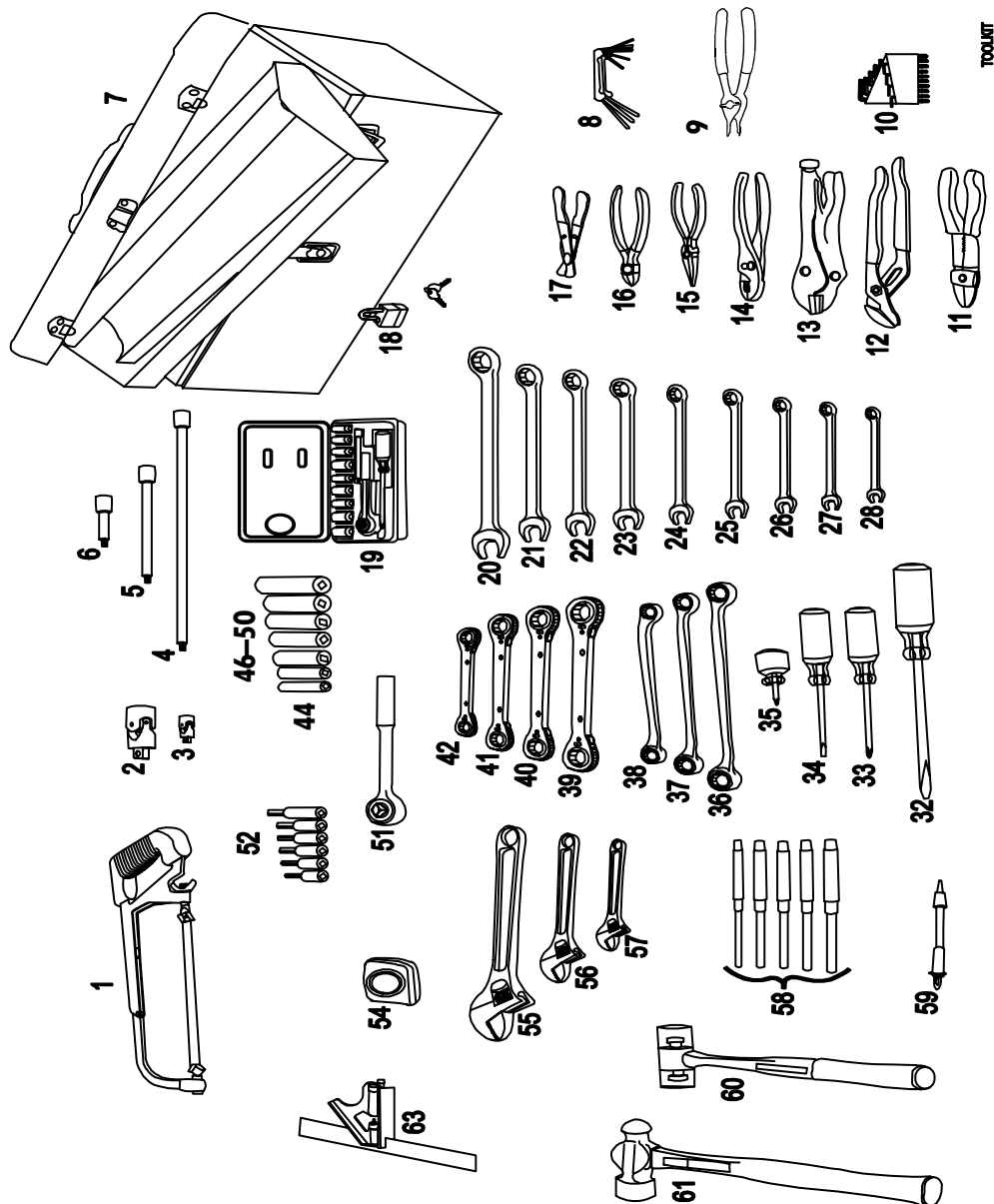


Figure 4.1-1a, Deluxe Tool Kit - P/N 784-528-013



## 90XLi QubicaAMF Pinspotter

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

ITEM	PART#	DESCRIPTION	ITEM	PART#	DESCRIPTION
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 Rachet
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 90XLi Steel Table Tool Kit

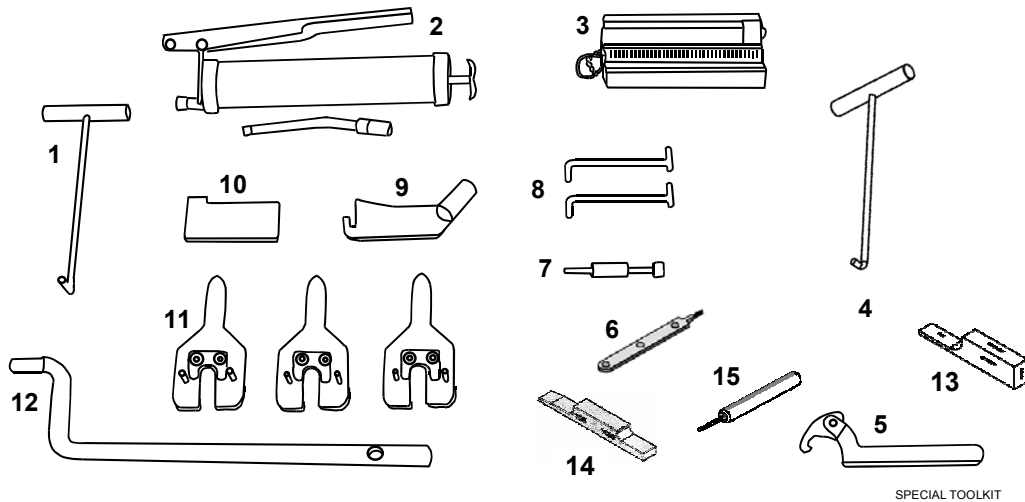


Figure 4.1-1b, XLi Steel Table Tool Kit - P/N 784-528-014

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	Carpet Removal Pins
9	1	792-502-002	Carpet Tool Flag
10	1	070-006-519	Respot Gauge
11	3	090-005-525	Steel Table Locating Tool
12	1	784-003-000	Carpet 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 90XLi 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.**

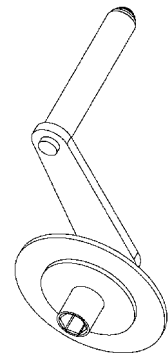


Figure 4.1-1c



## 90XLi QubicaAMF Pinspotter

### 4.1.2 CARPET INSTALLING TOOL

The carpet installing tool is used to remove spring tension from the carpet roller for replacement of the carpet, carpet roller, bounce board, and other related parts. With the pinspotter shutdown, insert the tool between the tail plank and the carpet 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 carpet 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 carpet removing pins be accidentally knocked out while working in the pit, the carpet installing 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 carpet 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.**

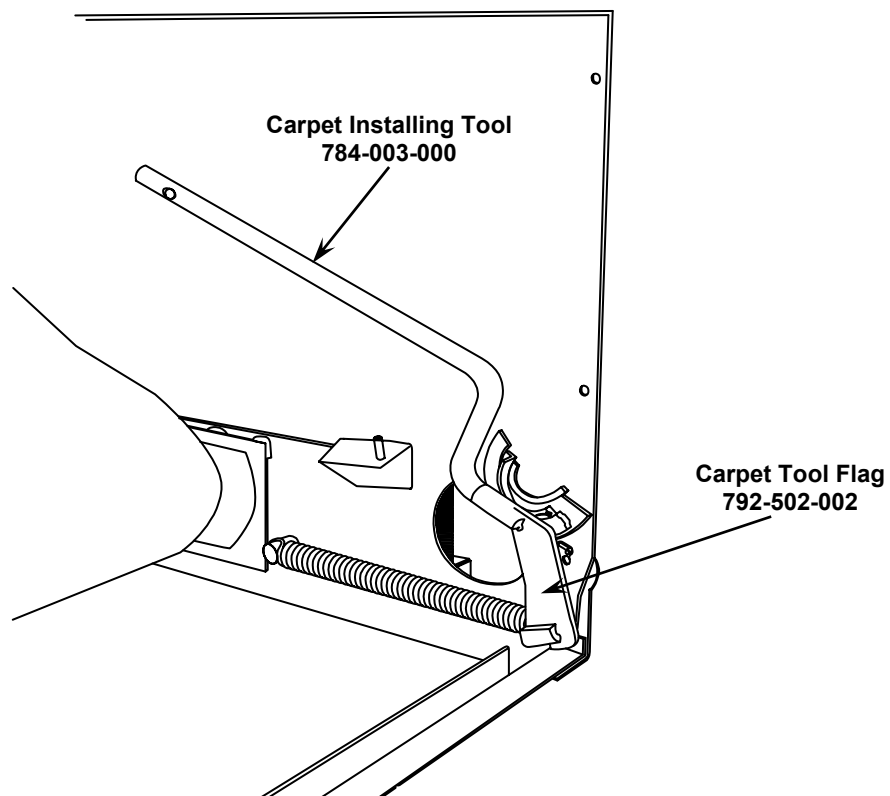


Figure 4.1-2, Carpet Installing Tool in Use

**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 90XLi QubicaAMF Pinspotter Distributor Manual Supplement, 400-088-012.



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### 4.1.4 CRIMPING TOOL (typical)

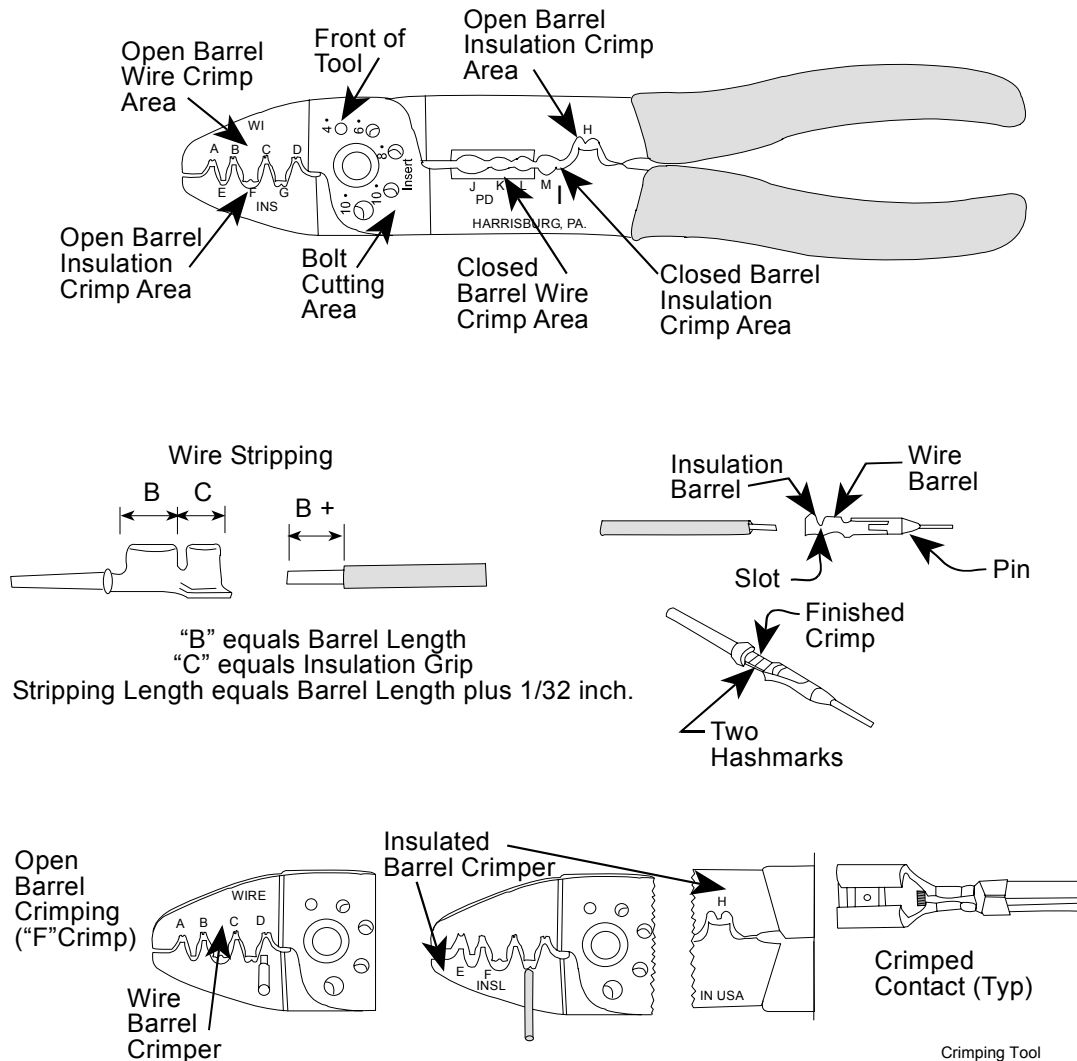


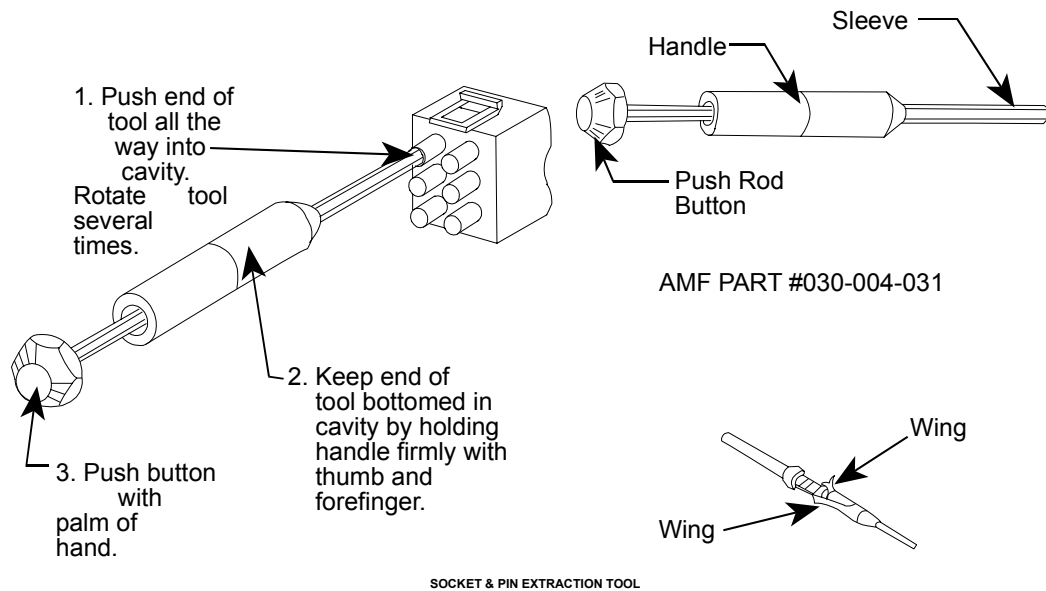
Figure 4.1-3

**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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***90XLi QubicaAMF Pinspotter***

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## **SECTION 4.2**

### **Machine Adjustments**

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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 90XLi Critical Measurements sheet, p/n 400-088-014, for a complete 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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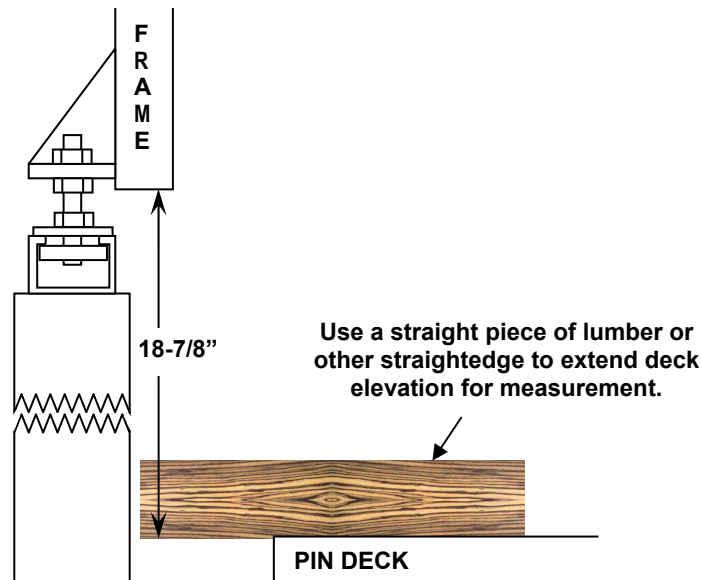


Figure 4.2-1

3. From the 7-10 line it should measure  $6-1/2 \pm 1/8$  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.

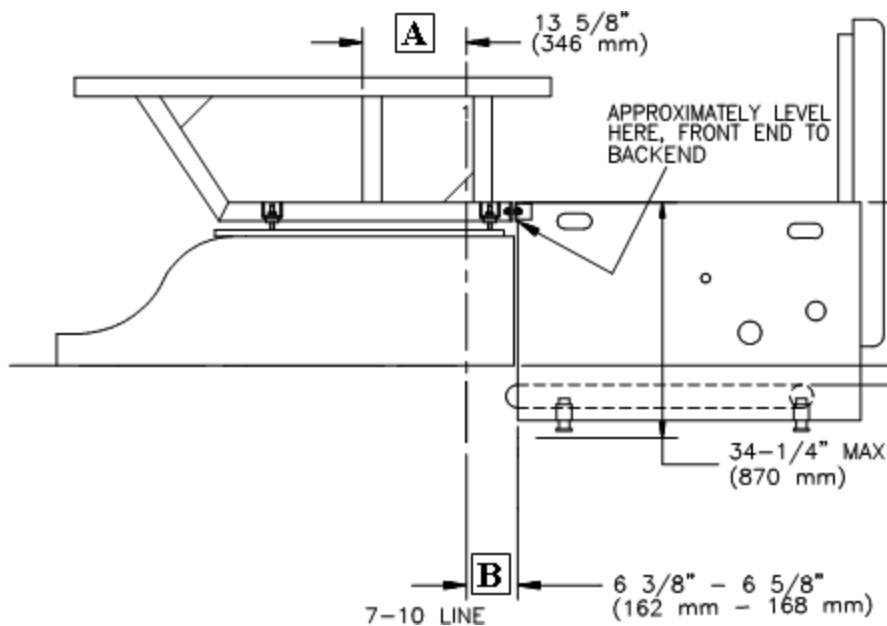
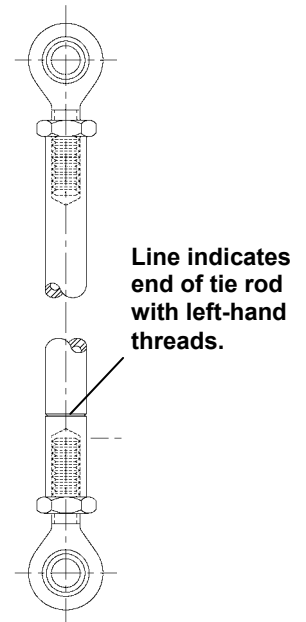


Figure 4.2-2

## 4.2.2 TABLE ADJUSTMENTS

### 4.2.2.1 Tie Rod Adjustment

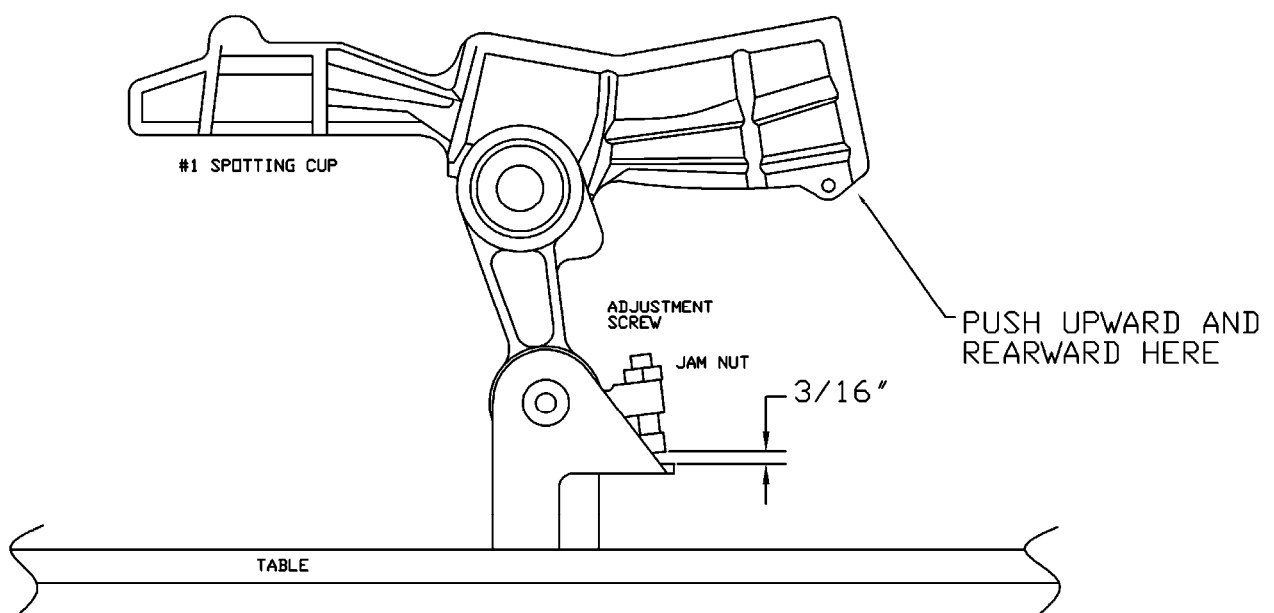
Throughout this section, references to adjusting the various tie rods are made. A tie rod is a device that consists of two threaded sections and a center section into which the threaded sections fit. On most tie rods, one threaded section has standard right-hand threads, and the other threaded section 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**

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 4.2-3**



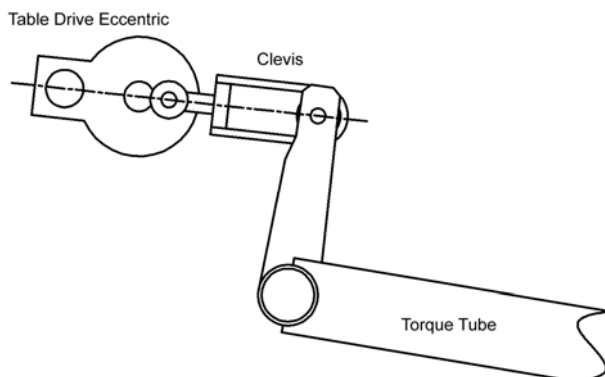
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1. Run the Table to its low point on a respot cycle.
2. Unplug both the Table and Sweep Motors.
3. Loosen the Jam Nuts on both Table Leg adjustment screws (Figure 4.2-3).
4. Grasp the #1 Spotting Cup and push rearward and upward until it stops.
5. While holding the #1 Cup in this position, obtain a  $\frac{3}{16}$ " 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  $\frac{3}{16}$ " gap.

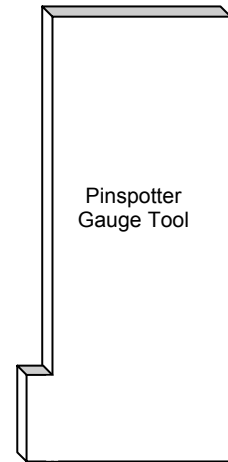
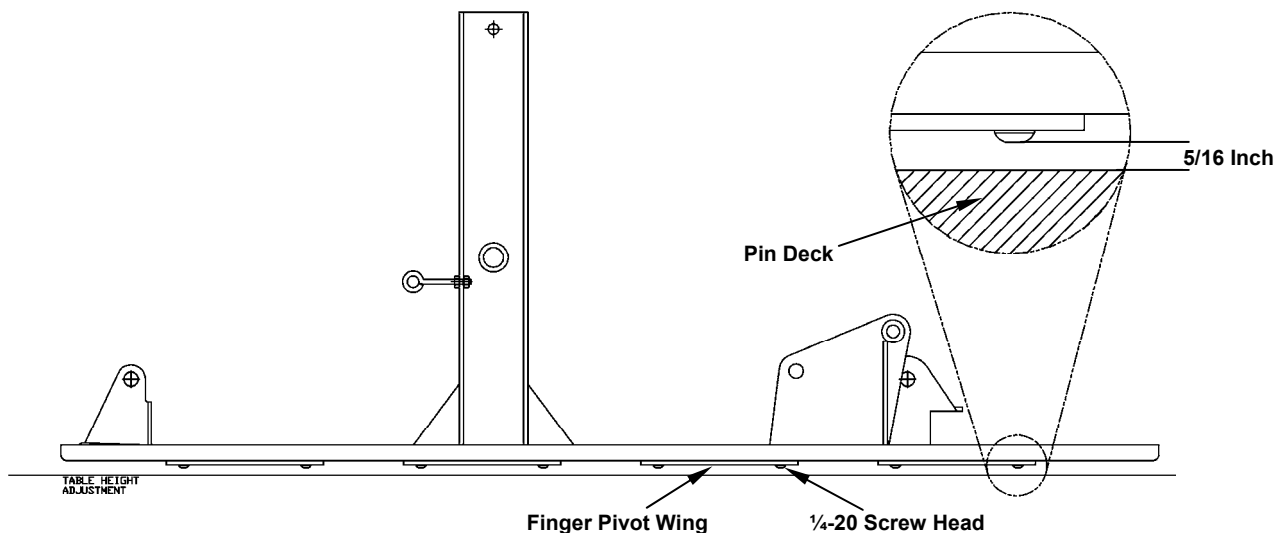
### **4.2.2.3 Table Level and Height Adjustments**

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 4.2-4).



**Figure 4.2-4**

4. Adjust the Table clevis so that the Pinspotter Gauge Tool (Figure 4.3-5), 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 4.2-6).
  - 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 4.2-5****Figure 4.2-6**

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.

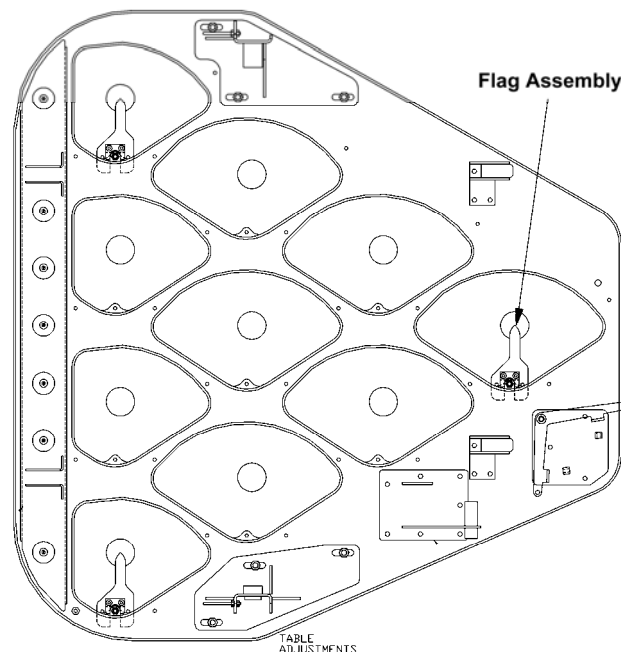


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- b. Adjust the Leveling Rods to obtain an equal amount of clearance at all 3 locations (1, 8 and 10).
  - c. Repeat steps 4a. through 4f. as necessary to obtain a 5/16-inch gap (thickness of Tool) between the pin deck and the head of the Button Head 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

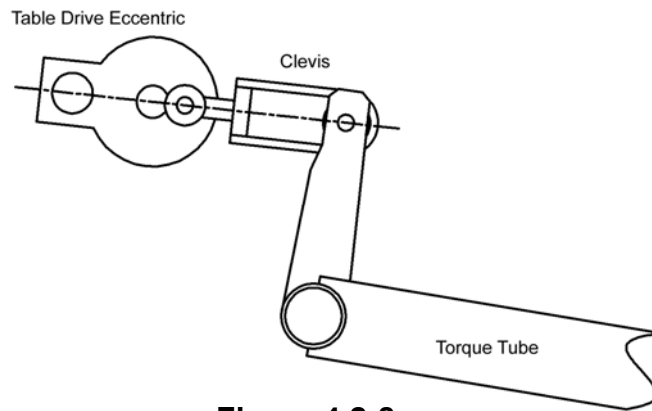
1. With the Table and Sweep at zero (home) and both motor plugs disconnected, install 3 flags on the Wing Brackets at the 1, 7, and 10-pin positions of the Table as shown in Figure 4.2-7.



**Figure 4.2-7**



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 4.2-8).



**Figure 4.2-8**

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**

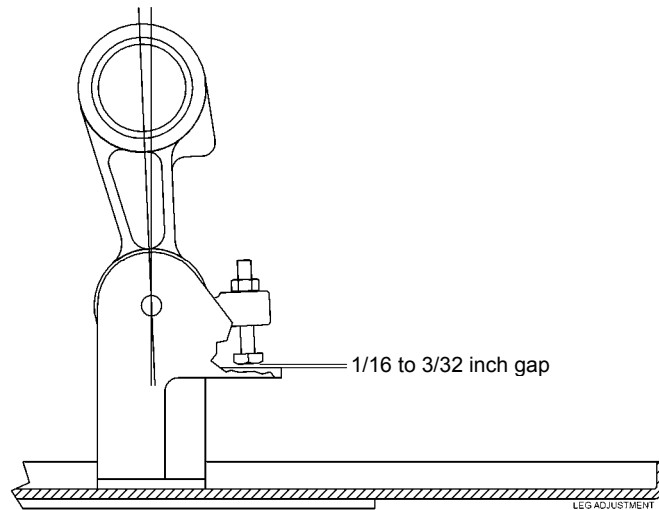
1. With the Bin full of pins, hold down on the Cam Lever to manually actuate the Spot Linkage.
2. Run the Table down to just before the point where the pins touch the pin deck.
3. Unplug the Table and Sweep Motors.
4. Use the hand crank to lower the Table to the point where the bottom of the pins (if 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 4.2-9).

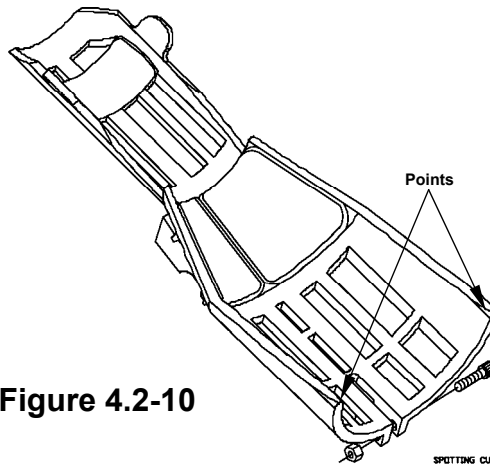


**Figure 4.2-9**

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

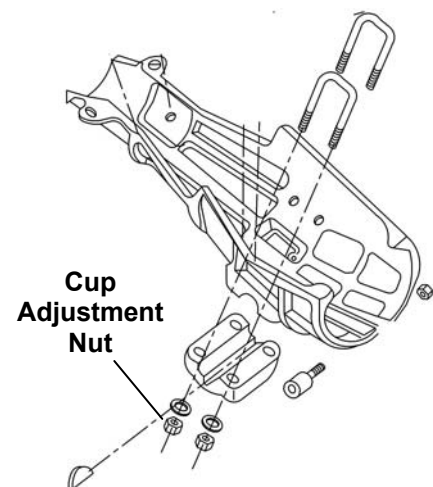
1. Lower the Table to where most of the pins just touch the pin deck.
2. Look under the Table and notice which pins are touching the pin deck and which are not. Make a note of which pins are sitting too low and which are sitting too high. All 10 pins must touch the pin deck simultaneously to obtain a 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 4.3-10). Conversely, close the cup width on Spotting Cups where pins were too low. **Caution: too much force could break the Spotting Cup.**

**Figure 4.2-10**

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 4.2-11).
  - 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 4.2-11**

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



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### **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**

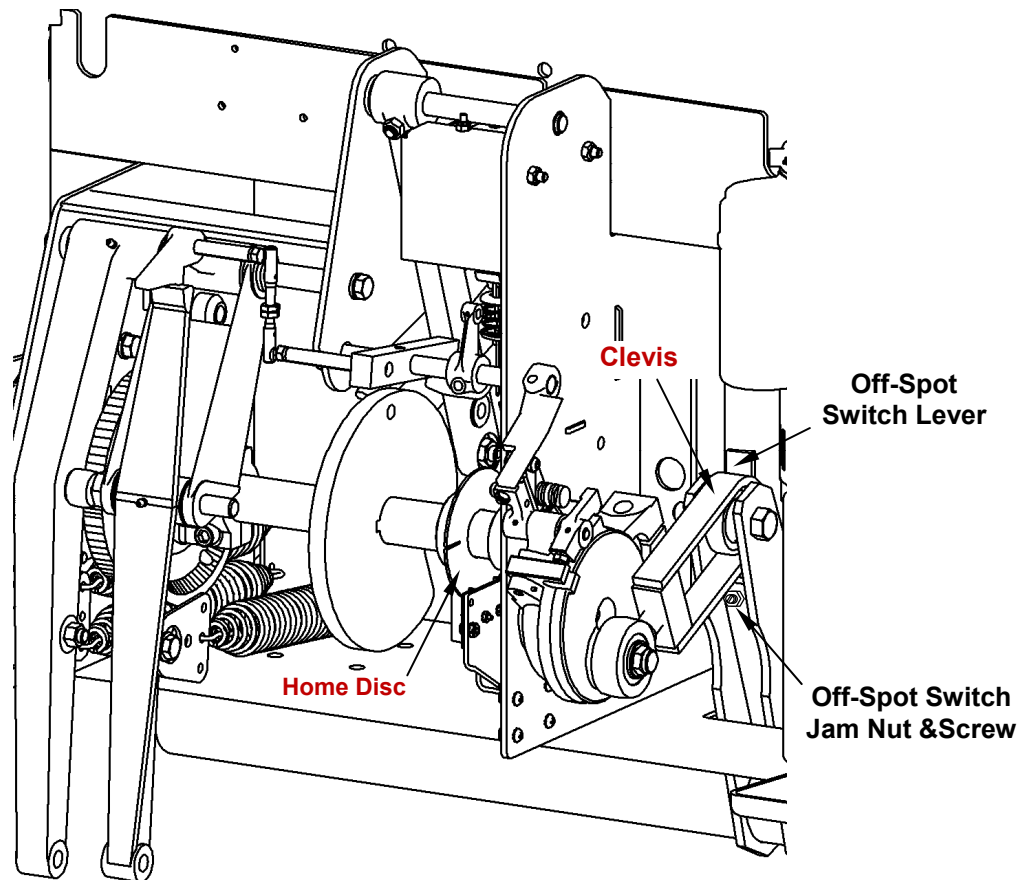
1. Run through a dozen or more Spot cycles.
2. Check that Table motion is smooth with fluid cup rotation and no bounce. Loose Torsion Springs on the Yoke Assembly can cause jerky cup rotation. If the Table has a bounce on its way down to the pin deck, or if the pins seem to hit the pin deck somewhat 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 4.2-12).



**Figure 4.2-12**



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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.

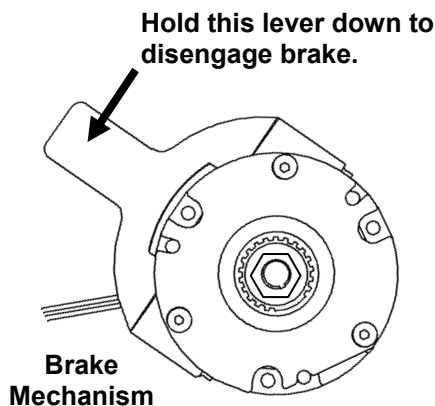
When a 2<sup>nd</sup> ball cycle is initiated, the solenoid remains deenergized, and the eccentric remains latched causing the Table to only partially descend. At the same time, the Spot Lever's pivot point changes to the center of the lever because it is not restrained at the top. This shortens its 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 4.2-13), 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 4.2-13**

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**

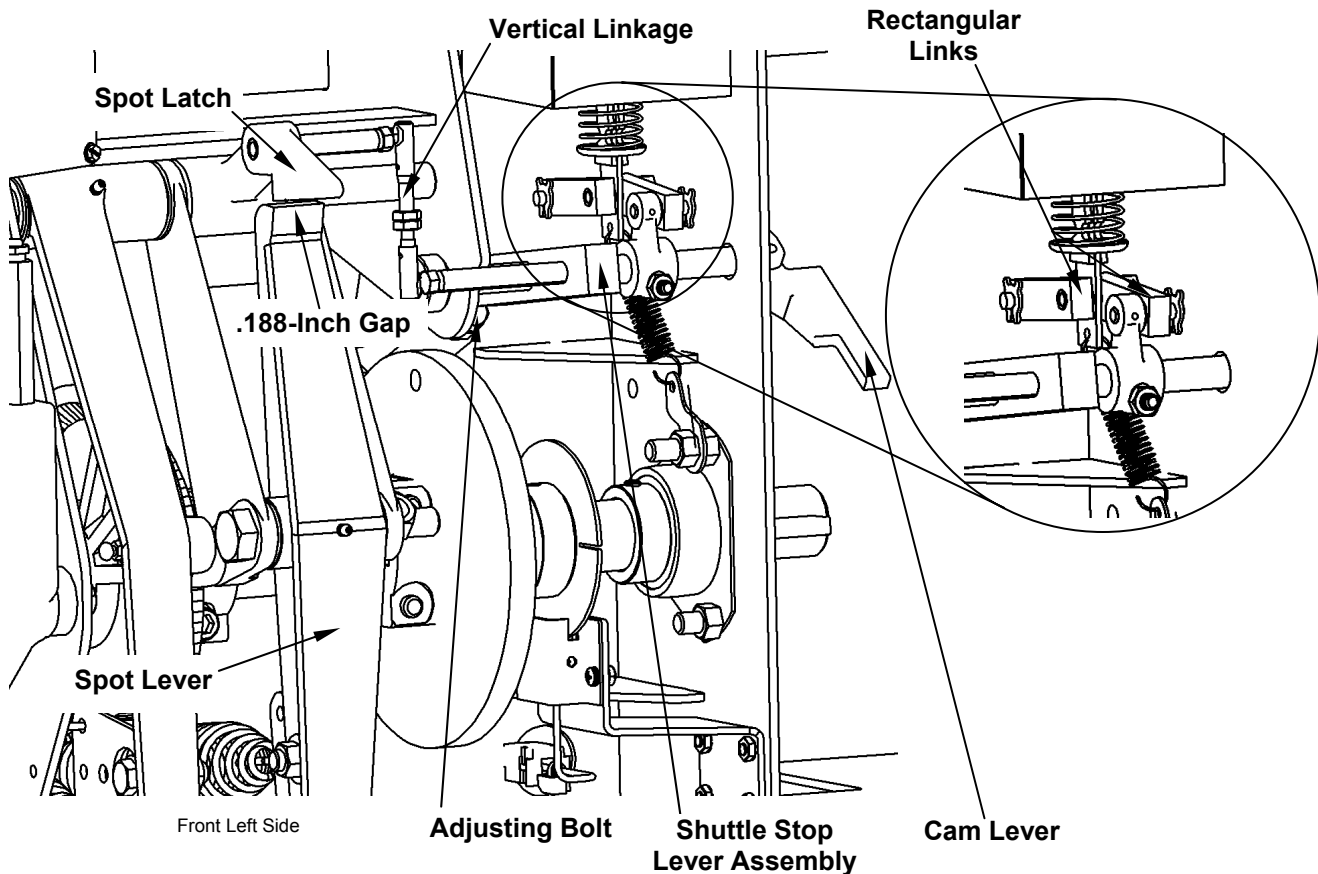
The table drive eccentric controls the low points of table travel during the spot and respot cycles. During a respot cycle, the eccentric's latch is engaged locking the eccentric's input and output sides together, which only allows the table to lower to the respot height. When the spotting solenoid is 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.



## 90XLi QubicaAMF Pinspotter

### 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 4.2-14) should be .015 inches. Adjust the bolt to provide this spacing and then tighten the jam nut.



**Figure 4.2-14**

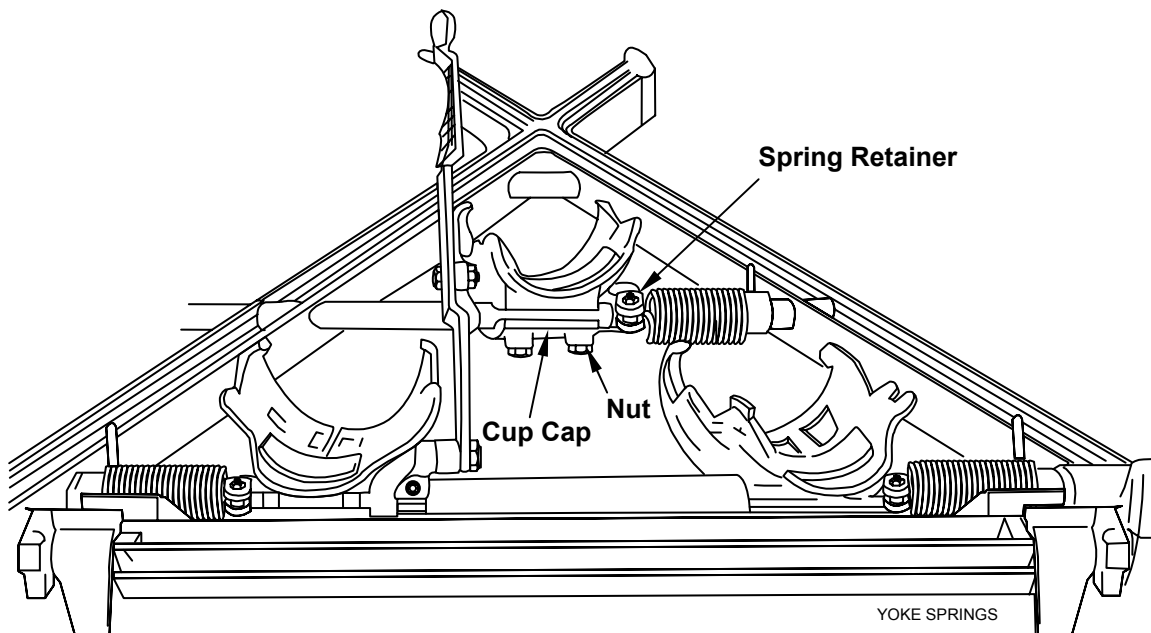
2. When the spotting solenoid is actuated, the cam lever should be locked in the down position. This locked condition is established when solenoid engagement causes the two rectangular links (see Figure 4.2-14) to align horizontally. Test for locking by manually engaging the solenoid and then pulling 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 4.2-15). This is the initial (approximate) setting.



**Figure 4.2-15**

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.

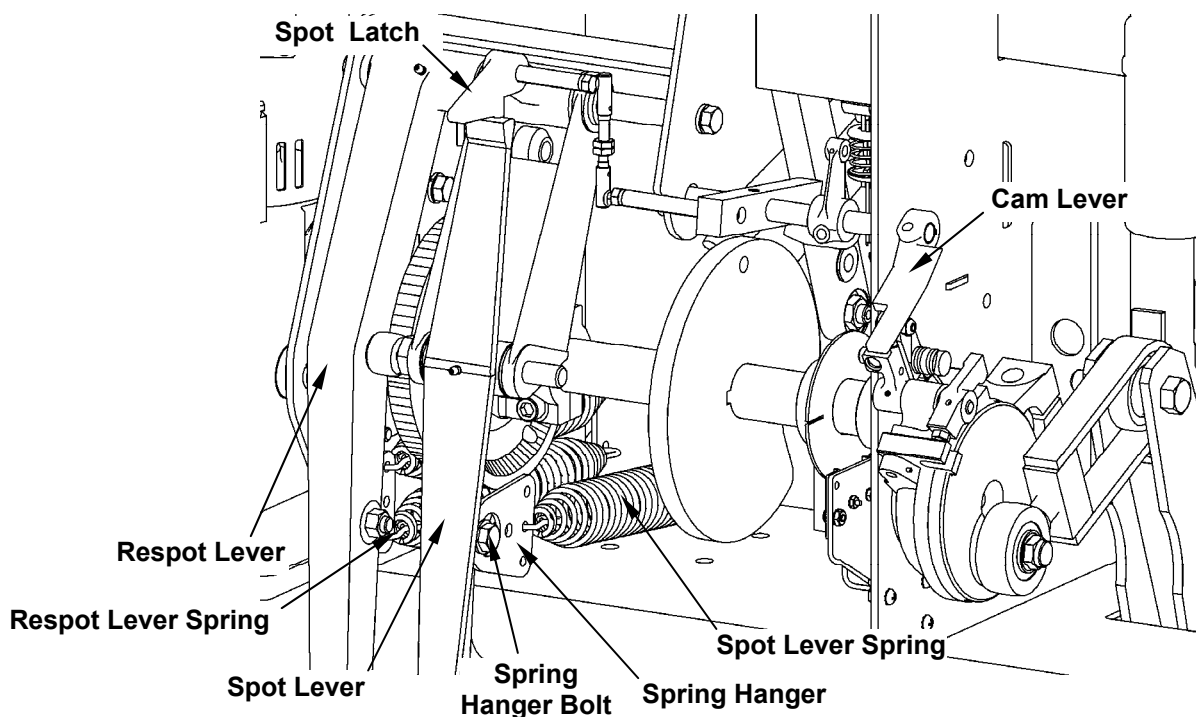
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## 90XLi QubicaAMF Pinspotter

### 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 4.2-16) 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 4.2-16) so that it is being held by just one or two threads.



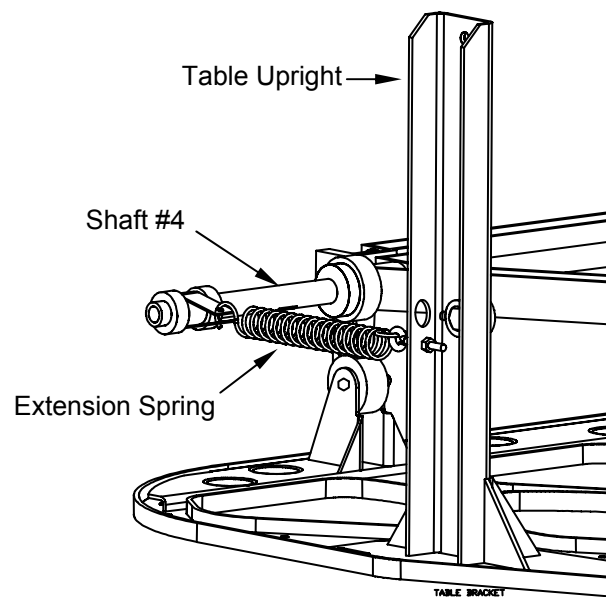
**Figure 4.2-16**

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 4.2-17.)



**Figure 4.2-17**

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 4.2-18). This adjustment can be made with the respot cell either in or out of the table.

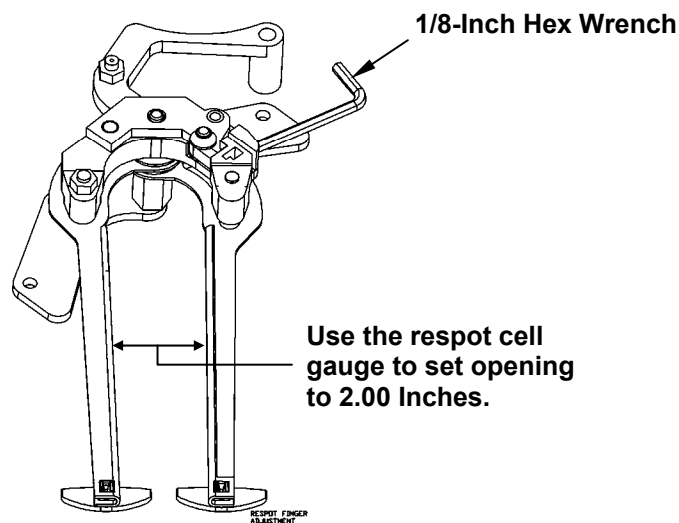
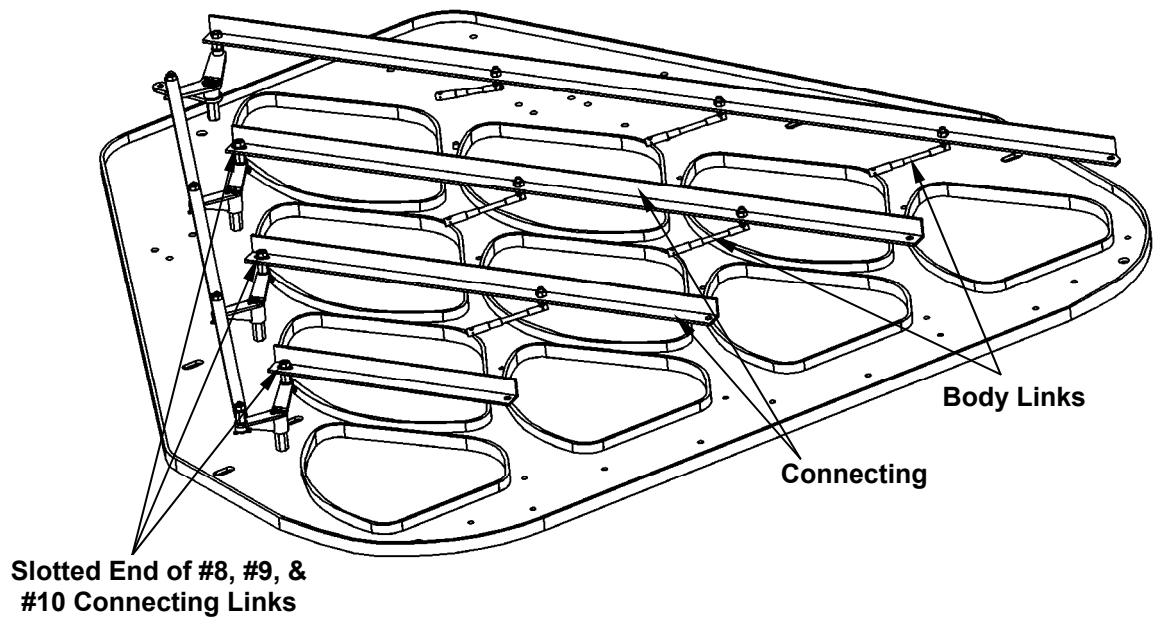


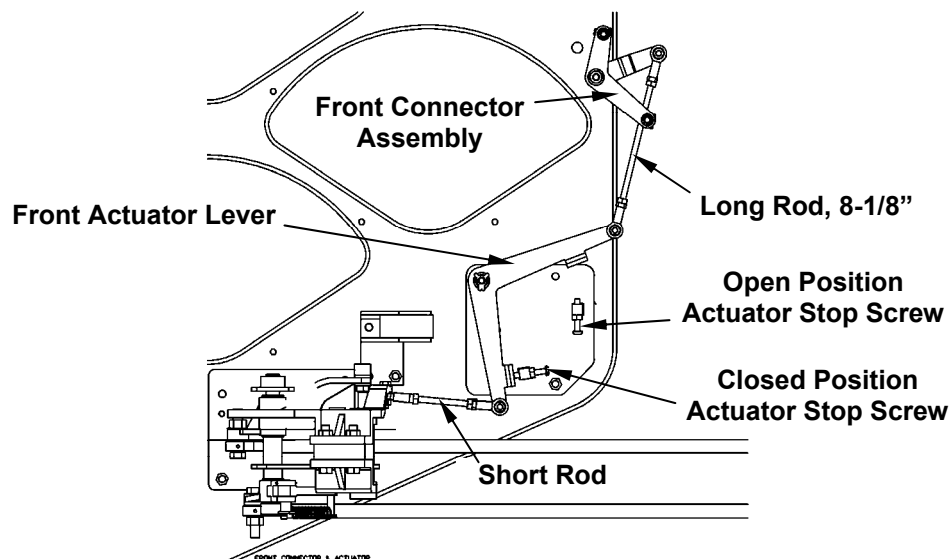
Figure 4.2-18

#### 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 4.2-19).
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 4.2-19**

4. Loosen the two actuator stop screws (see Figure 4.2-20).
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 4.2-20**

6. Open cell #7 fully.



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## 90XLi QubicaAMF Pinspotter

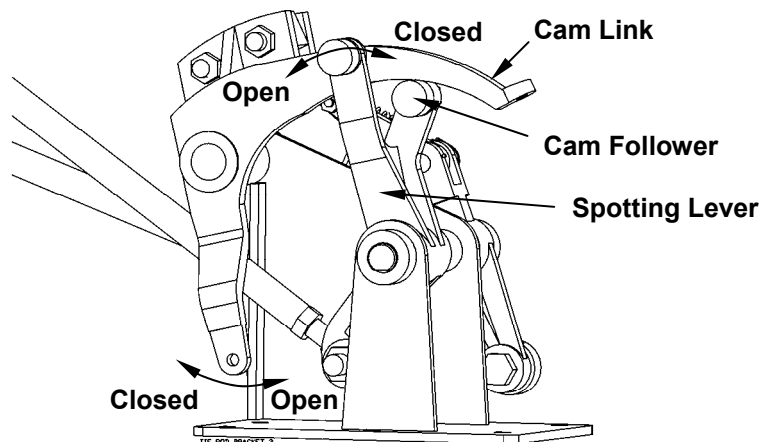
7. While keeping cell #7 fully open, adjust the slot in the #8 cell connecting link so that the #8 cell is fully open. Keeping the #8 cell fully open, tighten the bolt in the #8 connecting link slot.
8. Repeat Step 7 for the #9 and #10 cells.
9. With the rear cells (#7, #8, #9, & #10) fully open, turn 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 4.2-20).
12. Move the spotting lever to the spotting position, which is done by placing the spotting lever in a "fingers open" position (see Figure 4.2-21).

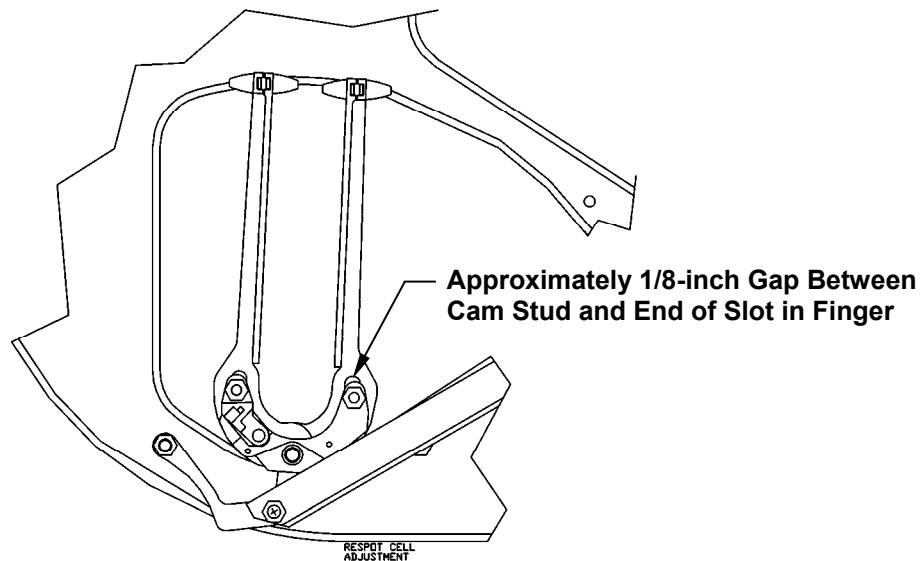


**Figure 4.2-21**

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

***Machine Adjustments***

14. With the spotting lever in the fingers open position, adjust the length of the short rod (Figure 4.2-20) so that the cam link (Figure 4.2-21) 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 4.2-22). Turning the stop screw in increases the gap. Tighten the jam nut on the closed position stop screw.

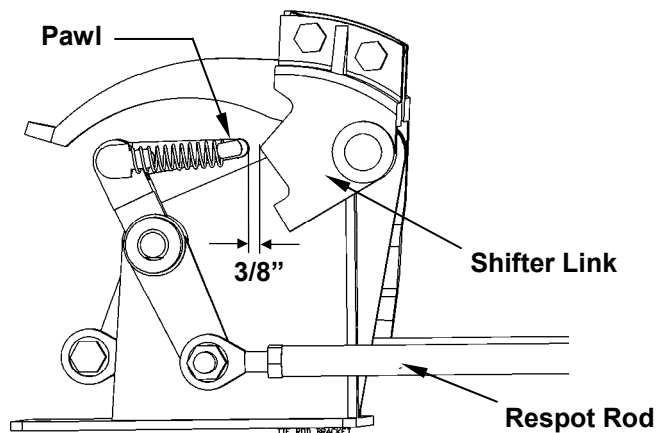
**Figure 4.2-22**

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 4.2-23). 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 4.2-23**

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 *90XLi Pinspotter Motor and Gearbox Manual*, P/N 400-088-013.



### 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.

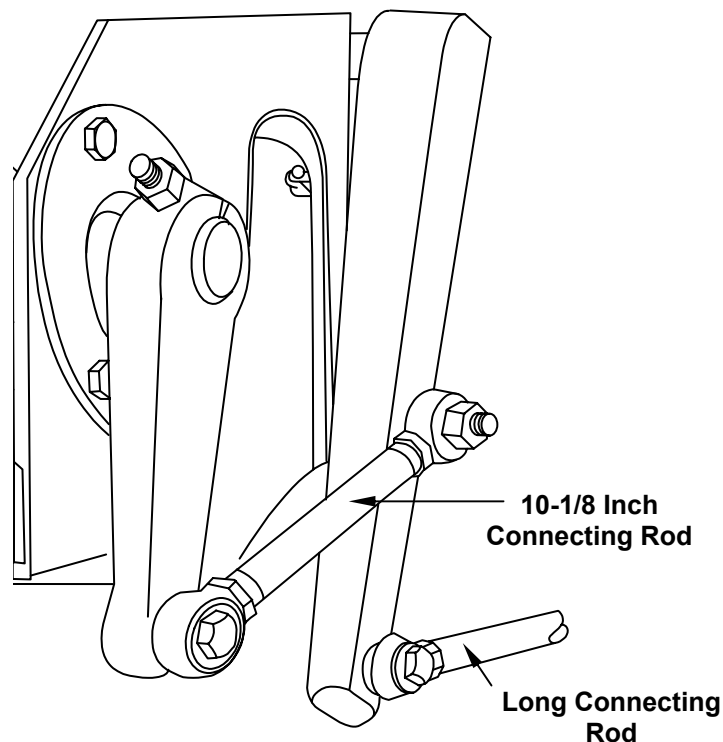
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1. With the sweep at the Home position:
  - a. Adjust the short connecting rod (see Figure 4.2-24) to obtain a starting length of 10-1/8 inches center to center between the rod end openings. Tighten the jam nuts.

---

**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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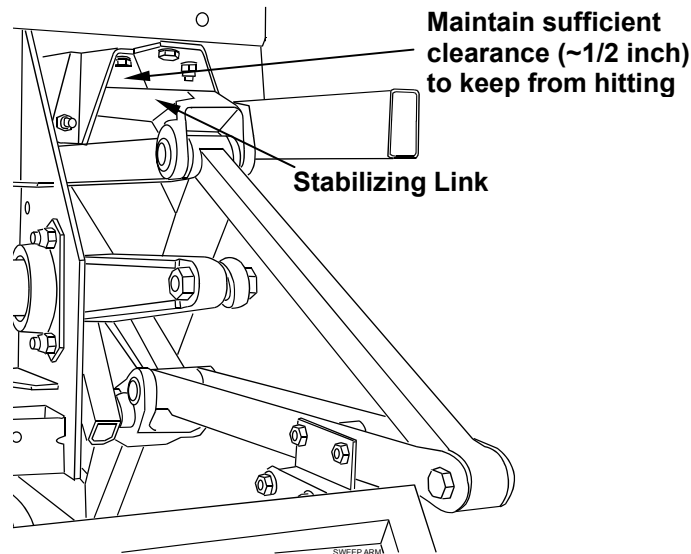


**Figure 4.2-24**



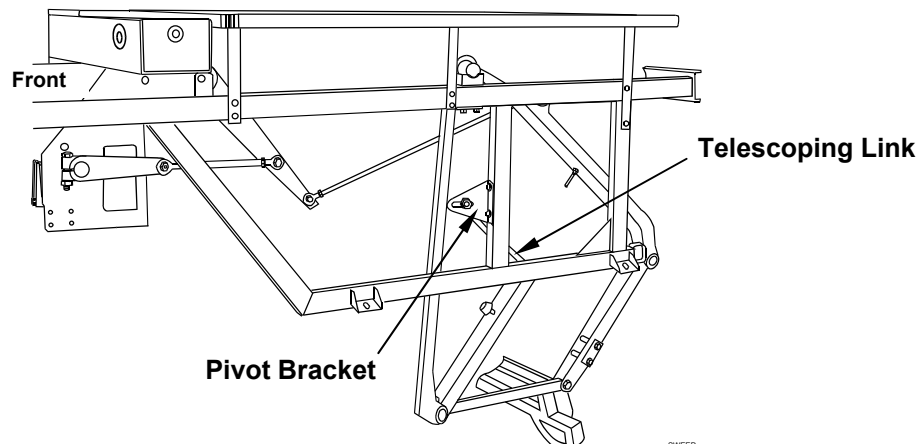
## 90XLi QubicaAMF Pinspotter

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 4.2-25) 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 4.2-25**

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 4.2-26), and move the end of the telescoping link toward the front of the pinspotter. Retighten the nut.



**Figure 4.2-26**

***Machine Adjustments***

- 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 4.2-27). To adjust the Sweep's Home position:

1. Disengage the brake (see Figure 4.2-28) 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.



## 90XLi QubicaAMF Pinspotter

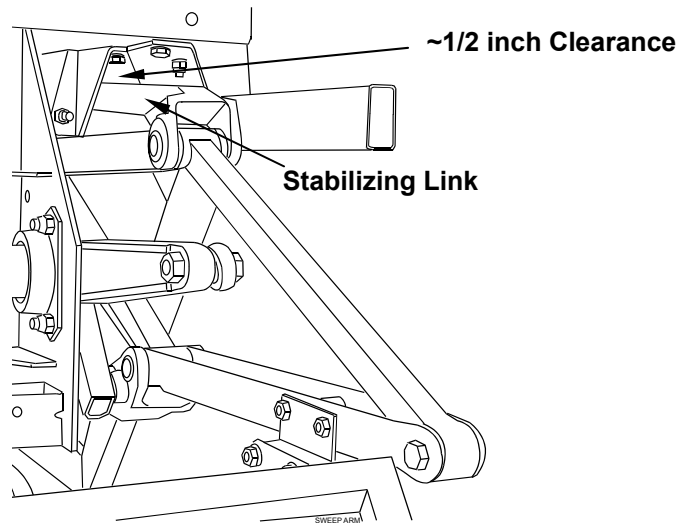


Figure 4.2-27

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.

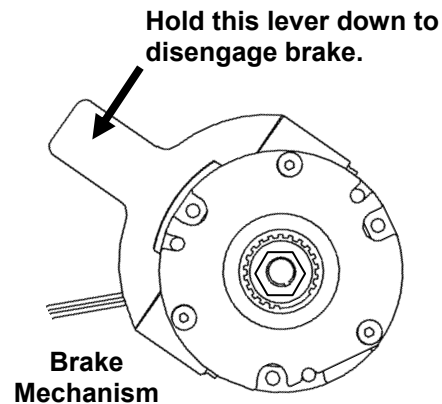


Figure 4.2-28

### 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°.

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*Machine Adjustments*

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 90XLi 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 motor and gearbox removal, refer to the *90XLi Motor and Gearbox Repair and Maintenance Manual*, 400-088-0013.



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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.

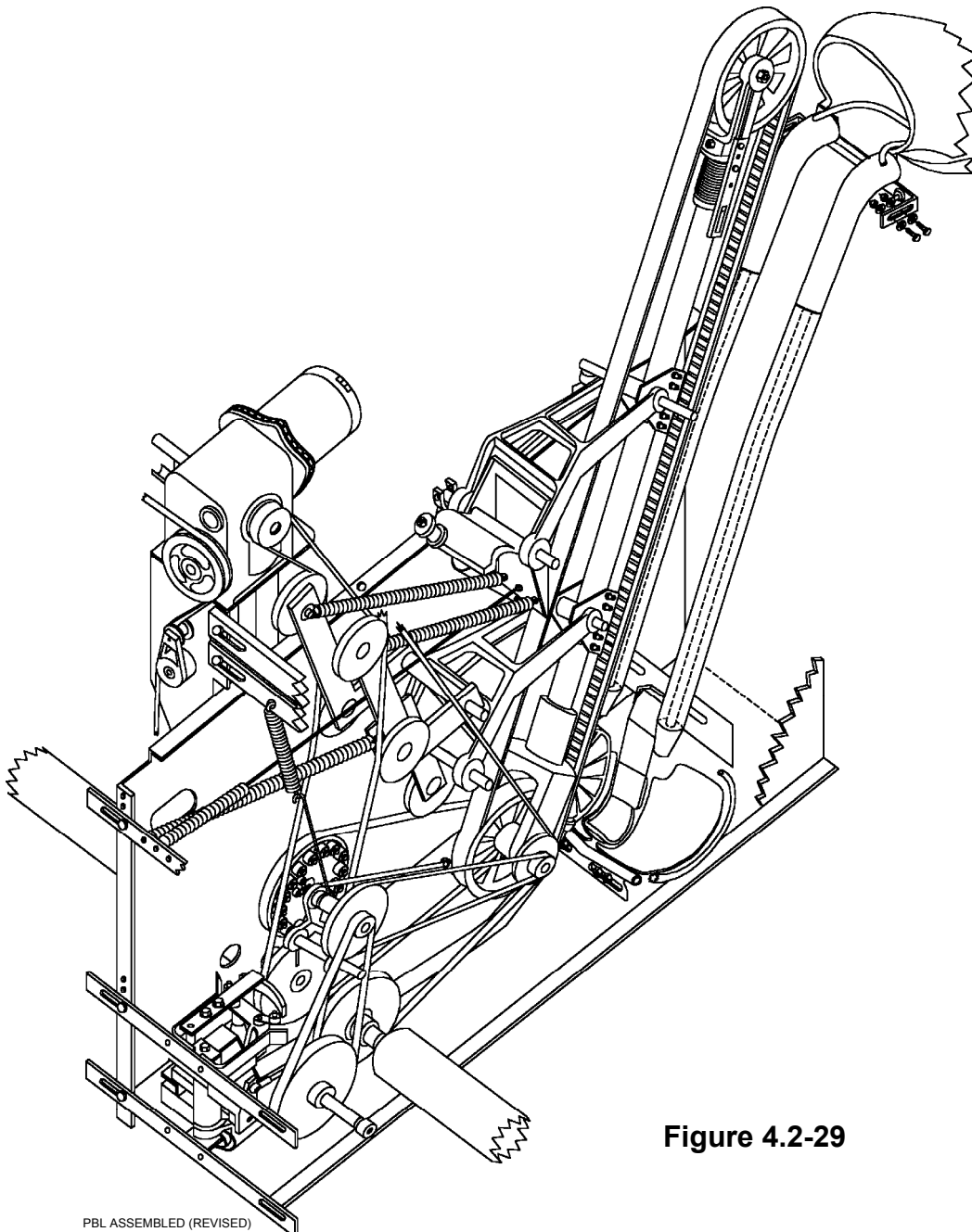
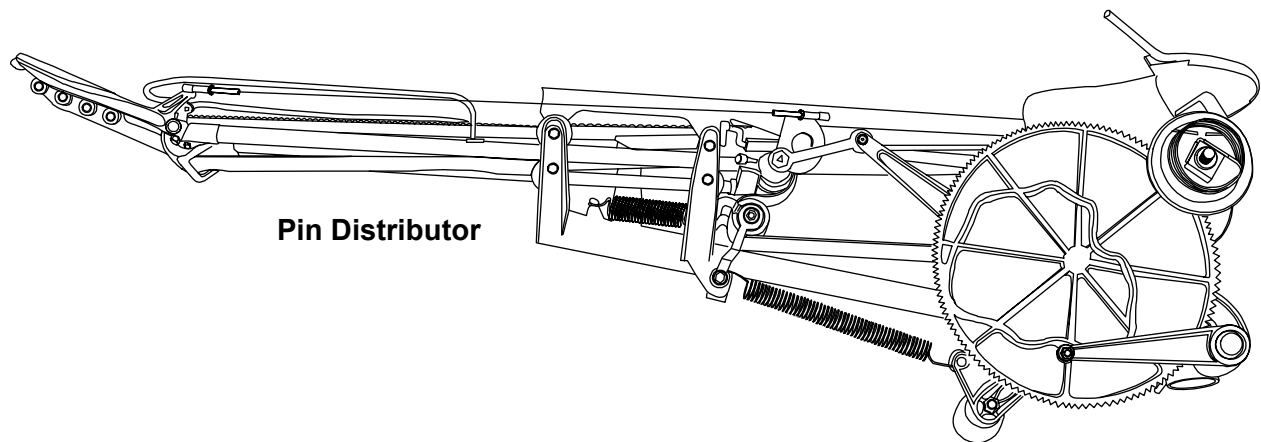


Figure 4.2-29

### 4.2.5 DISTRIBUTOR

The Distributor transfers pins from the Pin Wheel 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 *QubicaAMF Pinspotter Pin Distributor Manual*, 400-088-012.



**Figure 4.2-30**

DISTRIBUTOR 1



## 90XLi QubicaAMF Pinspotter

### 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.

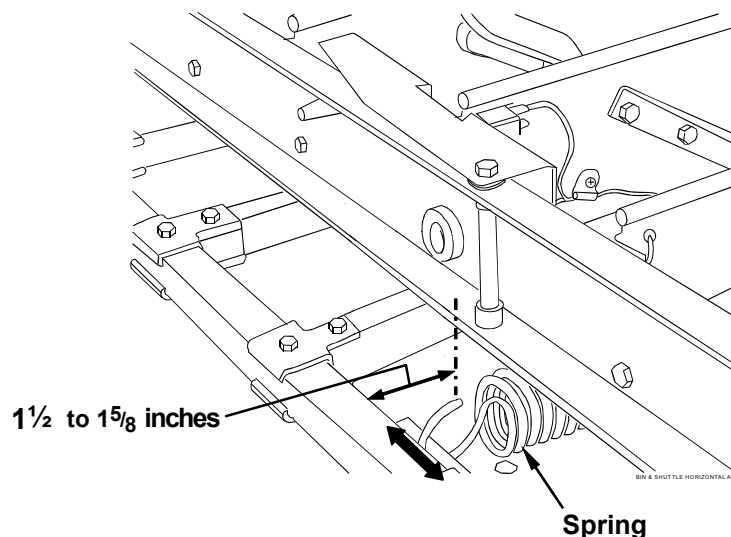
#### 4.2.6.2 Bin and Shuttle Adjustments

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

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1. With Durabin 2, there should be approximately 1-1/2 to 1-5/8 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 4.2-31). 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.



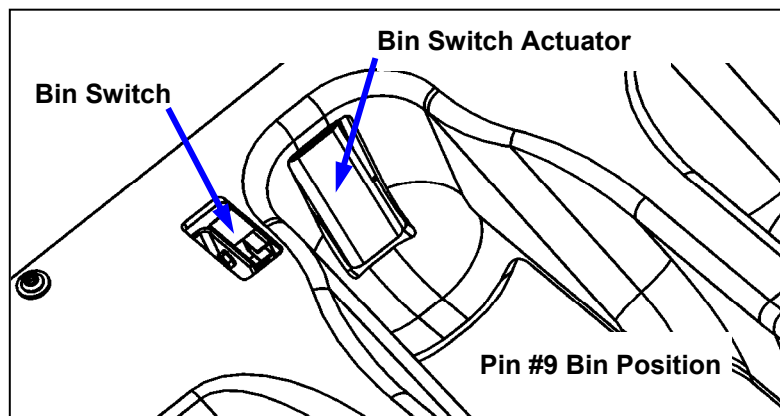
**Figure 4.2-31**



### 4.2.6.3 Bin Switch Operation

The bin switch (BS) is located in the bin framework between the #8 and #9 pin locations. 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 actuates the bin switch (see Figure 4.2-32), which sends a signal to the chassis indicating that 10 pins are ready for a spotting cycle.

To test the switch, operate the lever several times. If the switch does not actuate, verify that the switch mounting screws are tight and that the wires are securely connected to the switch terminals.



**Figure 4.2-32**



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### 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.

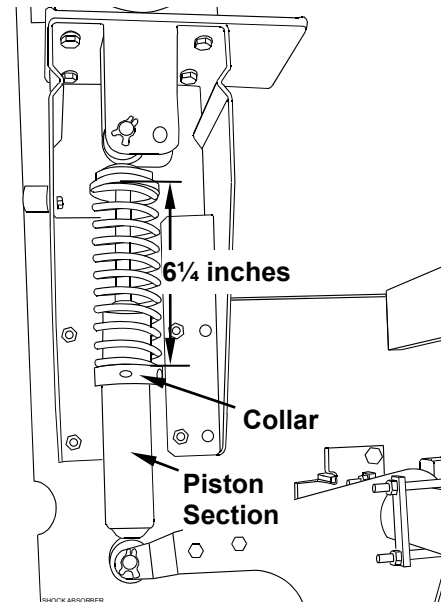


Figure 4.2-33

#### 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 4.2-34) **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.

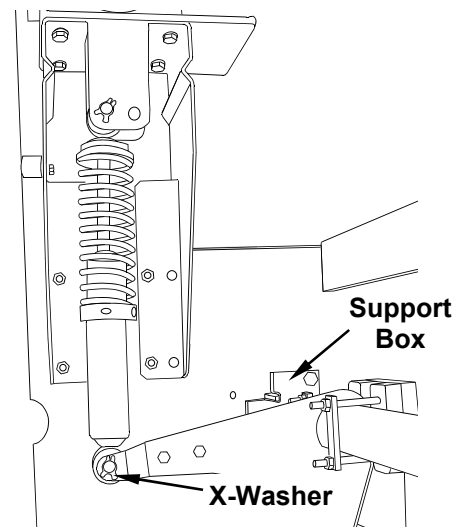


Figure 4.2-34

### 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 carpet installing 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 CARPET ADJUSTMENTS

### 4.2.8.1 Carpet 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 carpet.

1. Disconnect the carpet drive belt from the carpet 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 carpet installing 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 carpet 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**

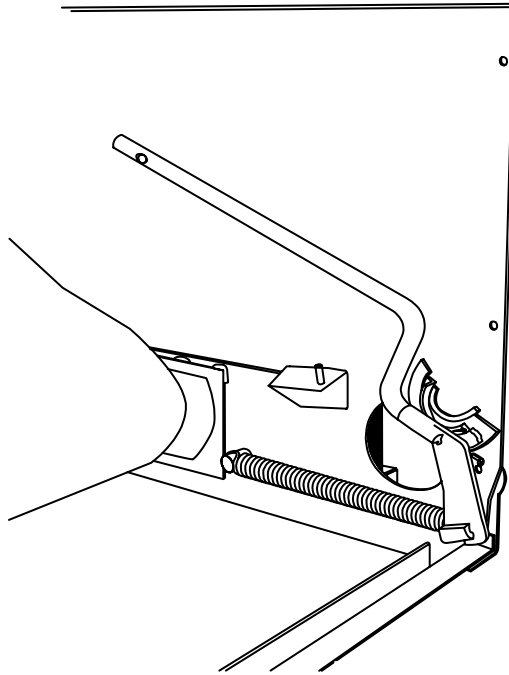
Spring tension on the roller bearing support brackets should be removed while working in the pit. Personnel can be injured if a carpet pin is accidentally knocked out.



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## 90XLi QubicaAMF Pinspotter

5. Make the machine safe for entry as follows:
  - a. Place the carpet tool flag (792-502-002) onto the bearing support assembly (see Figure 4.2-35).



**Figure 4.2-35**

- b. Apply pressure toward the rear of the machine and remove the carpet 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 carpet and bounce board assembly onto the pin deck and slide out onto the lane.

**4.2.8.2 Carpet 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 carpet.

1. Note the direction of the arrow on the carpet. This may be located either on the inside or the outside of the carpet.
  - a. Place the bounce board assembly inside the carpet with the V-shaped cutout toward the ball exit. The arrow on the carpet must point in the direction the carpet turns during operation.
  - b. Wrap the carpet 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 carpet. 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 carpet drive pulley and 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 carpet 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 carpet 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.



---

### ***90XLi QubicaAMF Pinspotter***

- a. Place the flag on the carpet installing tool, and hook the tool on the bearing support assembly as shown in Figure 4.2-35.
- b. Apply pressure toward the rear of the machine until the bearing support bracket clears the hole in the kickback plate, and insert the carpet pin into the hole. The carpet installing 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 carpet installing tool and remove the carpet 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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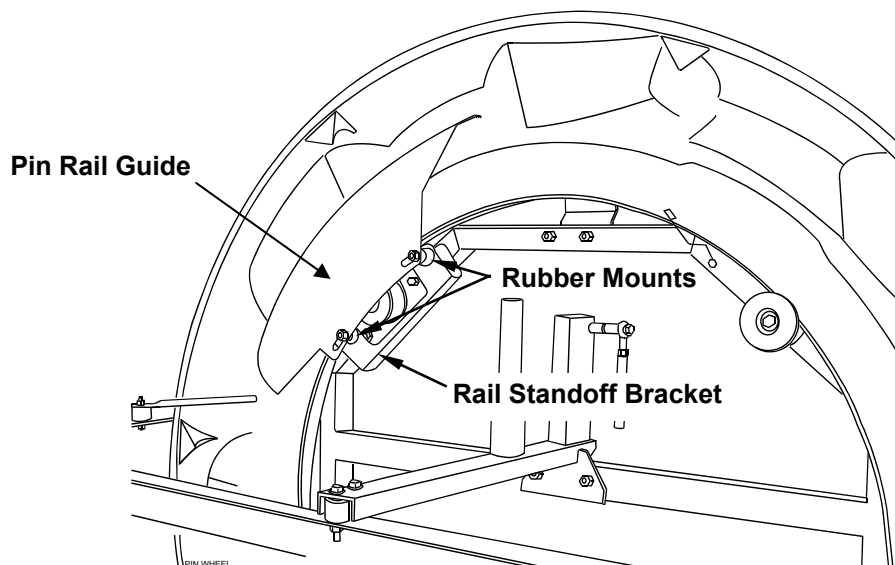
**NOTE: Some break-in may be required for certain styles of carpet belts.**

---

## **4.2.9 PIN WHEEL ADJUSTMENTS**

### **4.2.9.1 Pin Guide Rail Adjustments**

1. Remove the pin guide rail and adjust the rubber mounts so that they are in the center of their mounting slots on the rail standoff bracket. Tighten the nuts securely.
2. Position the pin guide rail on the studs of the rubber mounts so that the guide rail is as far as possible from the orientor pan. (The studs will be against one end of the guide rail's slots as shown in Figure 4.2-36.)



**Figure 4.2-36**

3. Run the machine and observe the guide rail as pins pass over it and observe the pins as they fall from the pin wheel onto the orientor pan. The pins should not cause the guide rail to deflect significantly and should fall onto the center of the orientor pan.
  - a. If the guide rail deflects significantly as a pin passes over it, this indicates that the guide rail is too high. Repeat the procedure from step 1 lowering the rubber mounts instead of centering them. Be aware that lowering the rubber mounts too much can result in pins being deposited head first causing pin jams and dropped pins.
  - b. If the pins are not deposited in the center of the orientor pan, adjust the pin guide rail closer to the orientor pan until the pins fall onto the center of the pan.

---

**NOTE:** Either adjustment affects the other. Whenever an adjustment is made, check to see if readjustment of the other setting is needed.

---



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## 90XLi QubicaAMF Pinspotter

4. Run the machine and observe the pins orienting to the distributor as they approach the orientor pan both butt first and head first. Pins should drop onto the center of the pan, and roll free of the pin wheel. The pins should not shift or bind as they pass over the guide rail and should release cleanly at the drop-off point.

### 4.2.9.2 Pin Seating Rod Adjustment

1. Loosen the lock nut and position the pin seating rod (Figure 4.2-37) so that it clears the pin bracket by approximately 1/4 inch. Tighten the lock nut.

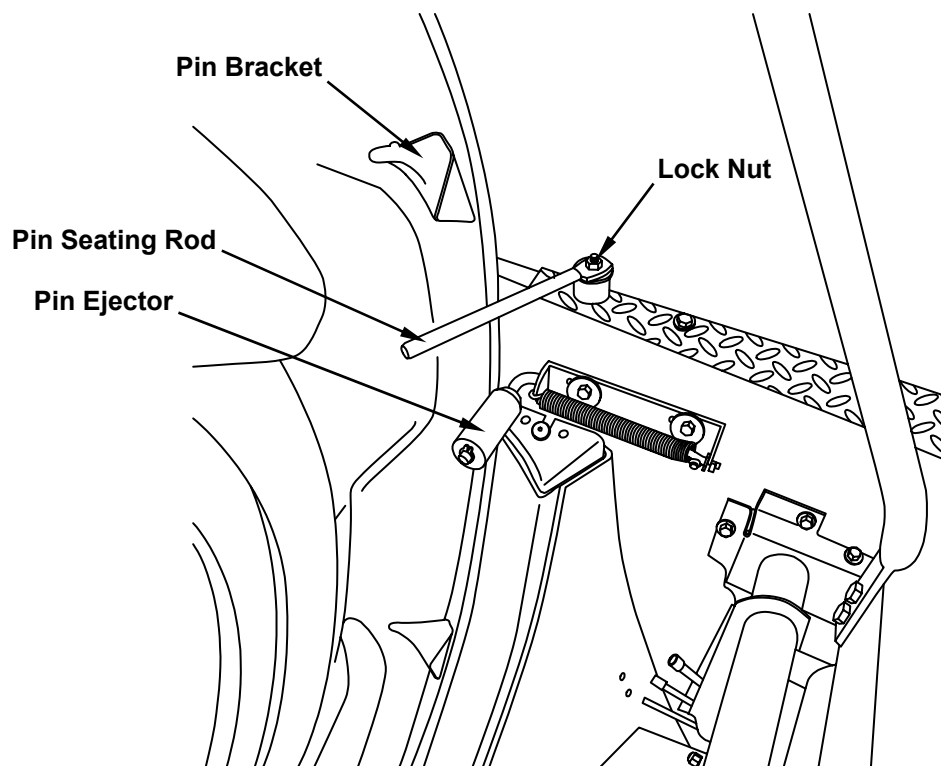


Figure 4.2-37

### 4.2.9.3 Pin Ejector Adjustment

1. Loosen the pin ejector mounting bolts using a 1/2-inch wrench.
2. Position the pin ejector assembly in the machine so that the beveled edge of the roller assembly is approximately 1/4 inch from the pin wheel. Tighten the bolts.
3. Observe pins as they pass by the pin ejector. A properly seated pin should not touch the pin ejector.

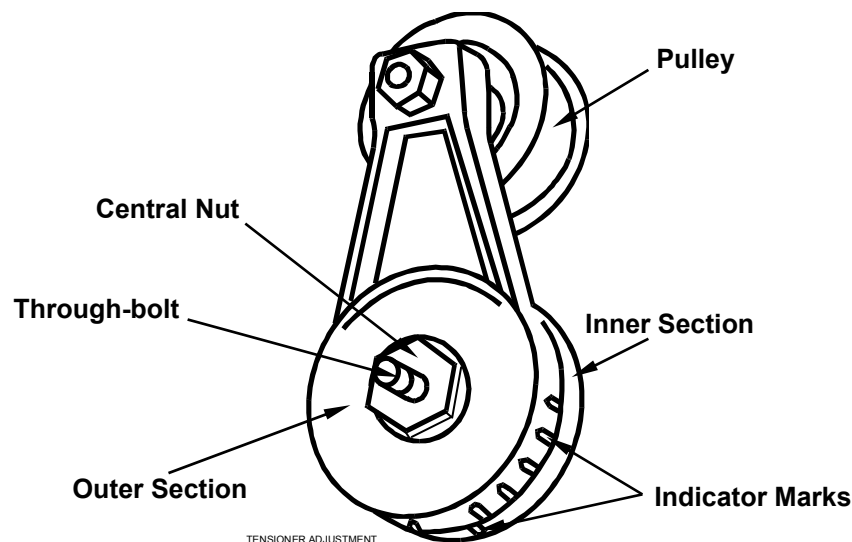


#### **4.2.9.4 Pin Wheel Drive Belt Tensioner Adjustment**

The pin wheel belt tensioner assembly (Figure 4.2-38) consists of an inner section and an outer section. The inner section has one indicator mark cast into its perimeter. The outer section contains a pulley as well as ten indicator marks (in two groups of five to accommodate left hand and right hand installations) on the casting. Adjustment requires the use of 9/16-inch and 15/16-inch wrenches.

1. Loosen the tensioner's through-bolt just enough to allow free movement of tensioner assembly.
2. Using a 15/16-inch wrench, turn the large central nut on the outside of the tensioner assembly so that the pulley rotates just beyond the 12:00 o'clock position and contacts the pin wheel drive belt. Continue rotating the central nut to apply tension to the belt until the mark on the inner perimeter of the tensioner aligns with the middle (third) mark on the outer section. Hold this setting and tighten the through-bolt.

This setting should provide the correct tension, but slightly more or less tension may be applied, as needed, to provide smooth operation.



**Figure 4.2-38**



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## ***90XLi QubicaAMF Pinspotter***

### **ELECTRICAL DRAWINGS**

Refer to Attachment A, the *QubicaAMF 90XLi Control System Wiring Diagram*, 088-000-136.

### **DISTRIBUTOR ADJUSTMENT AND MAINTENANCE**

Refer to Attachment B, the *QubicaAMF Pinspotter Pin Distributor Manual*, 400-088-012.

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

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

### **CHASSIS**

Refer to Attachment D, the *90XLi Pinspotter Control Chassis Manual*, 400-088-009.

### **MOTORS AND GEARBOXES**

Refer to Attachment E, the *90XLi QubicaAMF Pinspotter Motor and Gearbox Manual*, 400-088-013.

### **SCORING CAMERA**

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

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

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

### **RADARAY XLi**

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

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<b>4.3.11</b>	<b>Back End Side Plate Assembly .....</b>	<b>4.3-12</b>



## **4.3. LUBRICATION INSTRUCTIONS**

### **4.3.1 LUBRICATION**

Lubrication is one of the most important items in the proper operation and maintenance of the 90X*Li* 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.

This section of the manual shows the points of lubrication, the correct lubricants to use, and the frequency of lubrication for each part of the machine.

**Lubrication of the Distributor and the Positive Ball Lift (PBL) is covered in their respective manual supplements.**

### **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 multi-purpose grease (such as Bearing Guard #2) as the lubricant.

---

**NOTES:** Refer to Attachment E, the *90X*Li* Pinspotter Motor and Gearbox Manual*, of this manual for proper lubrication instructions for these items. Use only QubicaAMF Gear Lube in the gearbox!

There are 52 uniball rod ends on each pair of 90X*Li* 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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### 4.3.3 TABLE DRIVE ASSEMBLY

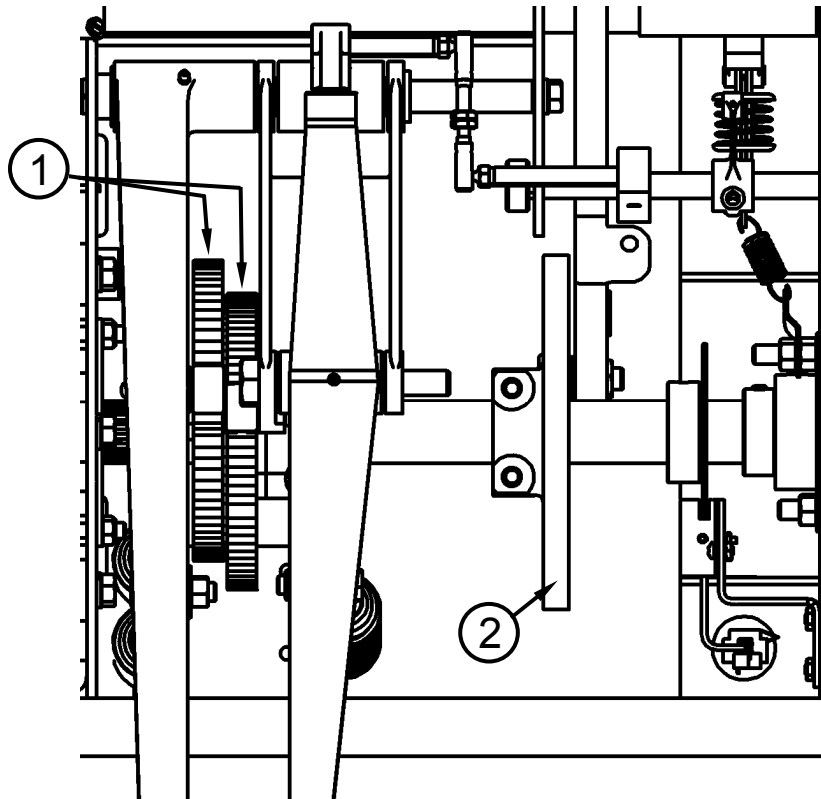


Figure 4.3-1

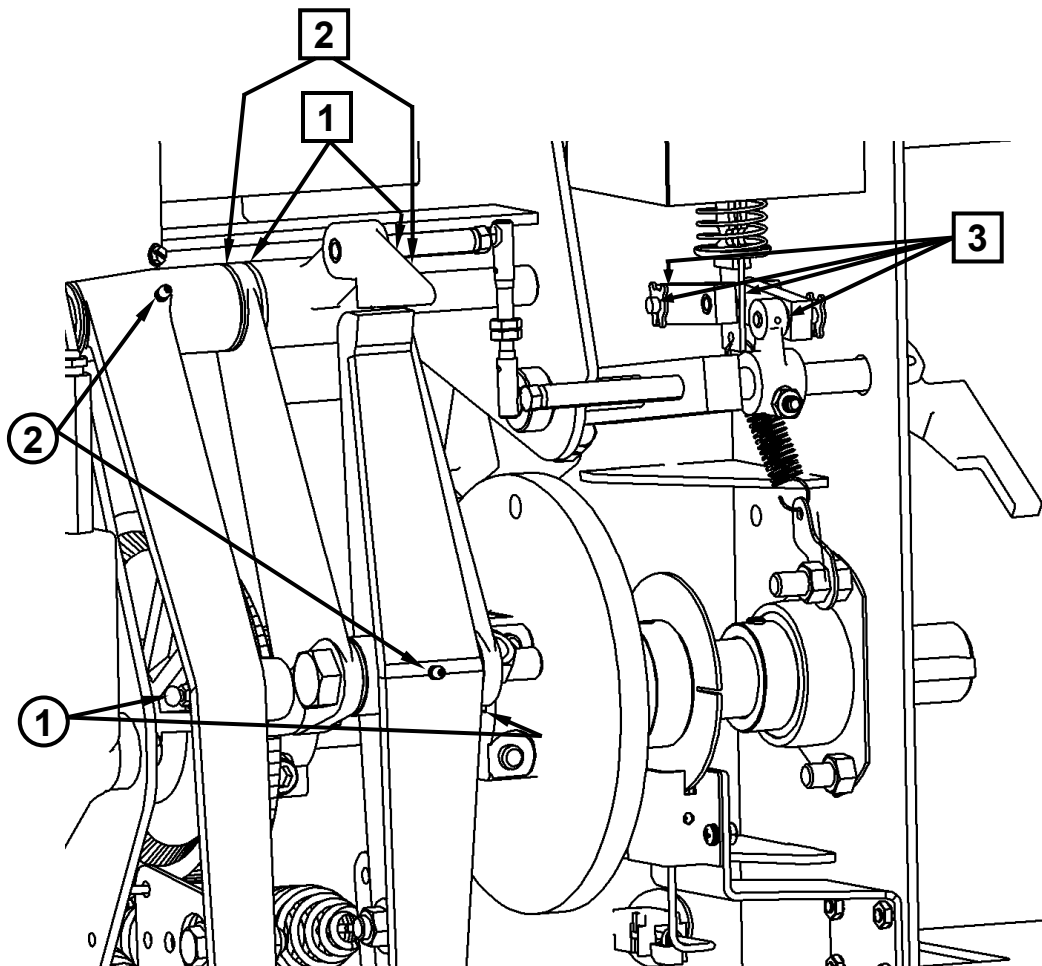
**CAUTION**

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

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

**4.3.3 TABLE DRIVE ASSEMBLY - continued**

- 1** 1. Spotting hook pivot bushings (2 places): 1 drop of oil every 2 months.
- 2** 2. Upper spotting link assembly bushings (2 places): 1 drop of oil every 2 months.
- 3** 3. Solenoid linkages (6 places): 1 drop of oil every 2 months.

**Figure 4.3-2**

- 1** 4. Grease the spot and respot cam follower bearing once a month.
- 2** 5. Grease the spot and respot levers every 3 months.



## 90XLi QubicaAMF Pinspotter

### 4.3.3 TABLE DRIVE ASSEMBLY - continued

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

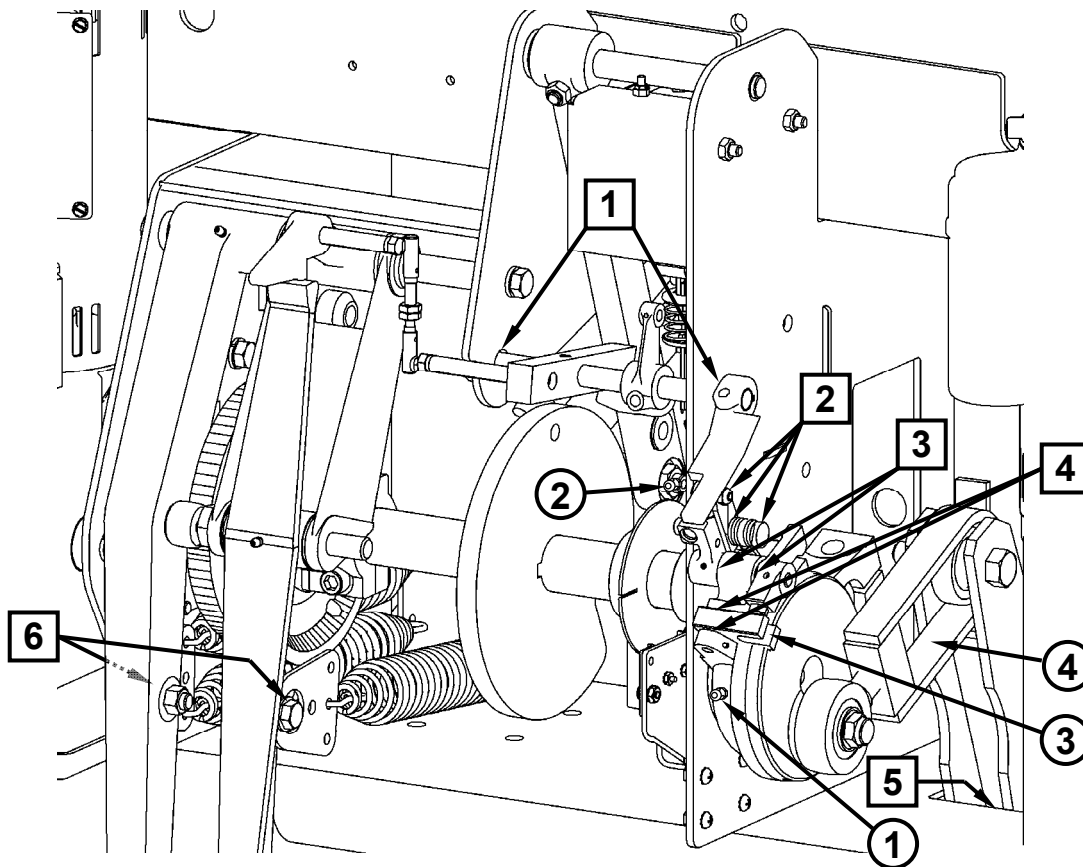


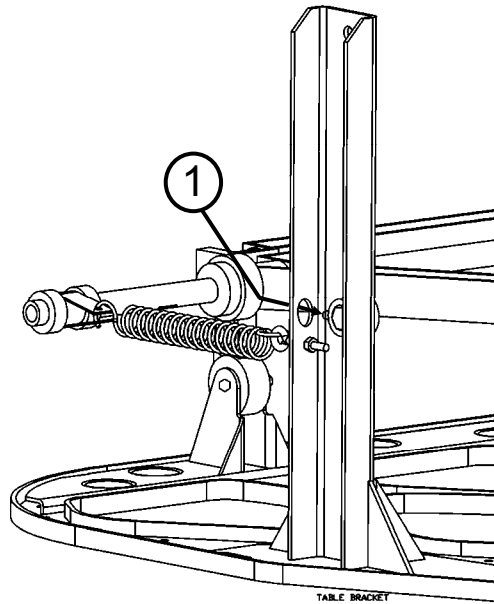
Figure 4.3-3

- |   |   |
|---|---|
| 1 | 7. Apply grease to the table drive eccentric assembly once per year.            |
| 2 | 8. Apply grease to the shuttle cam follower once a month.                       |
| 3 | 9. Apply a light coating of grease to the cam ball every 6 months.              |
| 4 | 10. Apply a light coating of grease to the inside of the clevis every 6 months. |



**4.3.3 TABLE DRIVE ASSEMBLY - continued**

- ① 1. Grease the table support weldment sleeve bearings (2 places) every 3 months.

**Figure 4.3-4**



## 90XLi QubicaAMF Pinspotter

### 4.3.4 SWEEP DRIVE AND LINKAGES



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

1

1. Linkage knuckles (2 places): 4 drops of oil at each knuckle every 3 months.

2

2. Linkage joints (8 places): 2 drops of oil on each joint once a month.

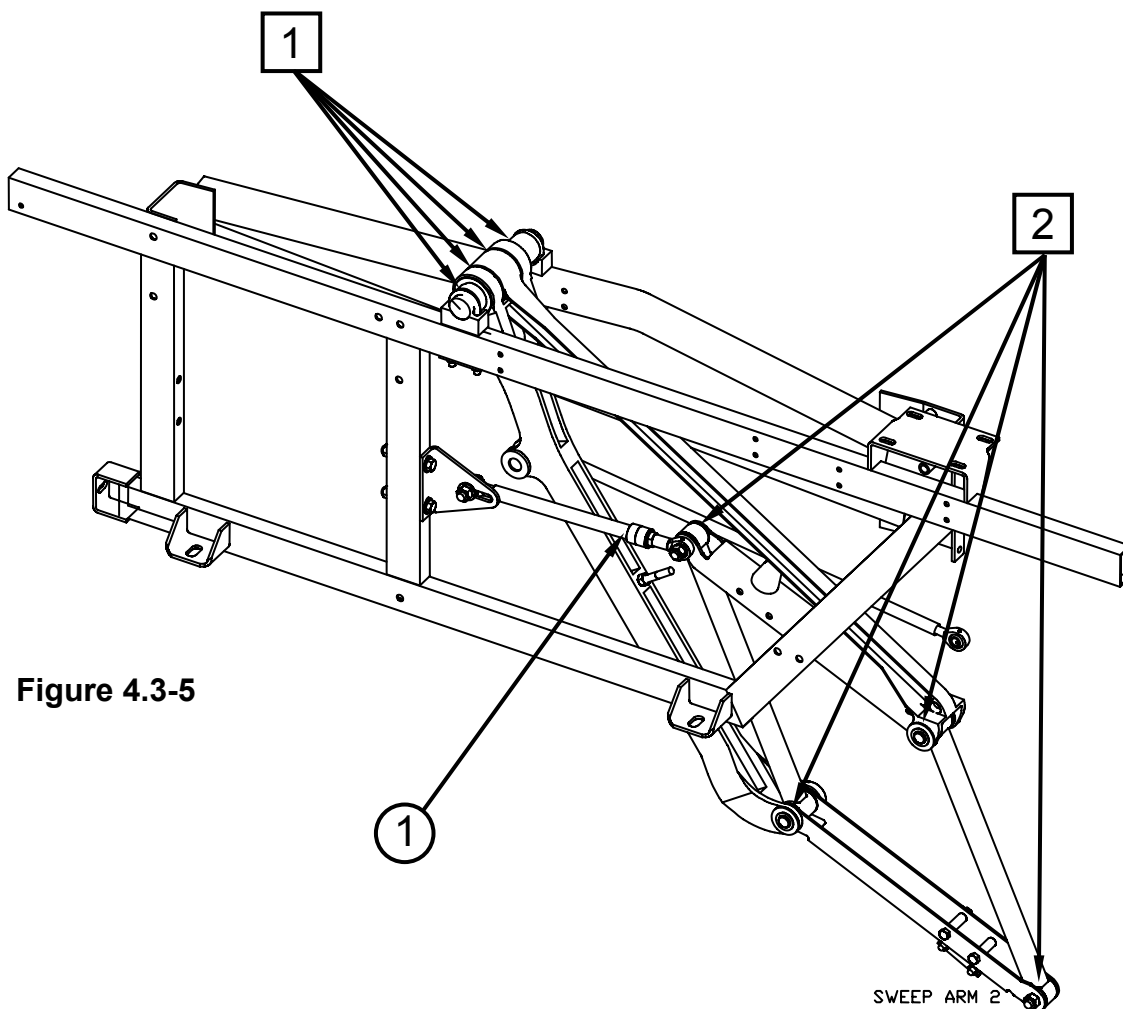


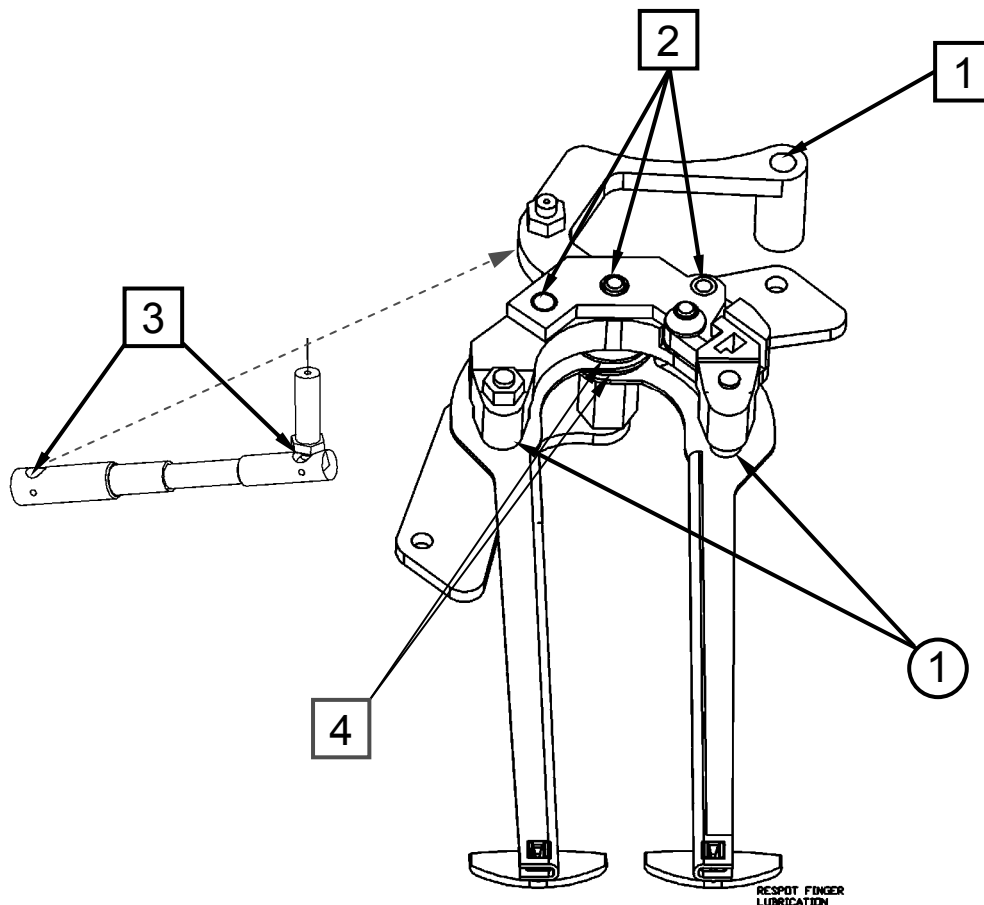
Figure 4.3-5

1

3. Inside guide tube: clean and grease every 3 months.

**4.3.5 RESPOT CELLS**

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

**Figure 4.3-6**

- 1** 5. Respot cell finger slots (20 places): apply a light film of grease along the perimeter of each slot once a month.



## 90XLi QubicaAMF Pinspotter

### 4.3.6 YOKE ASSEMBLY

- 1

 1. Rear leg bushings (8 places) 2 drops of oil on each side every 3 months.
- 2

 2. Linkage rod pivot points (4 places): 1 drop of oil every 3 months.
- 3

 3. Front leg lower bushings (4 places): 2 drops of oil each side every 3 months.

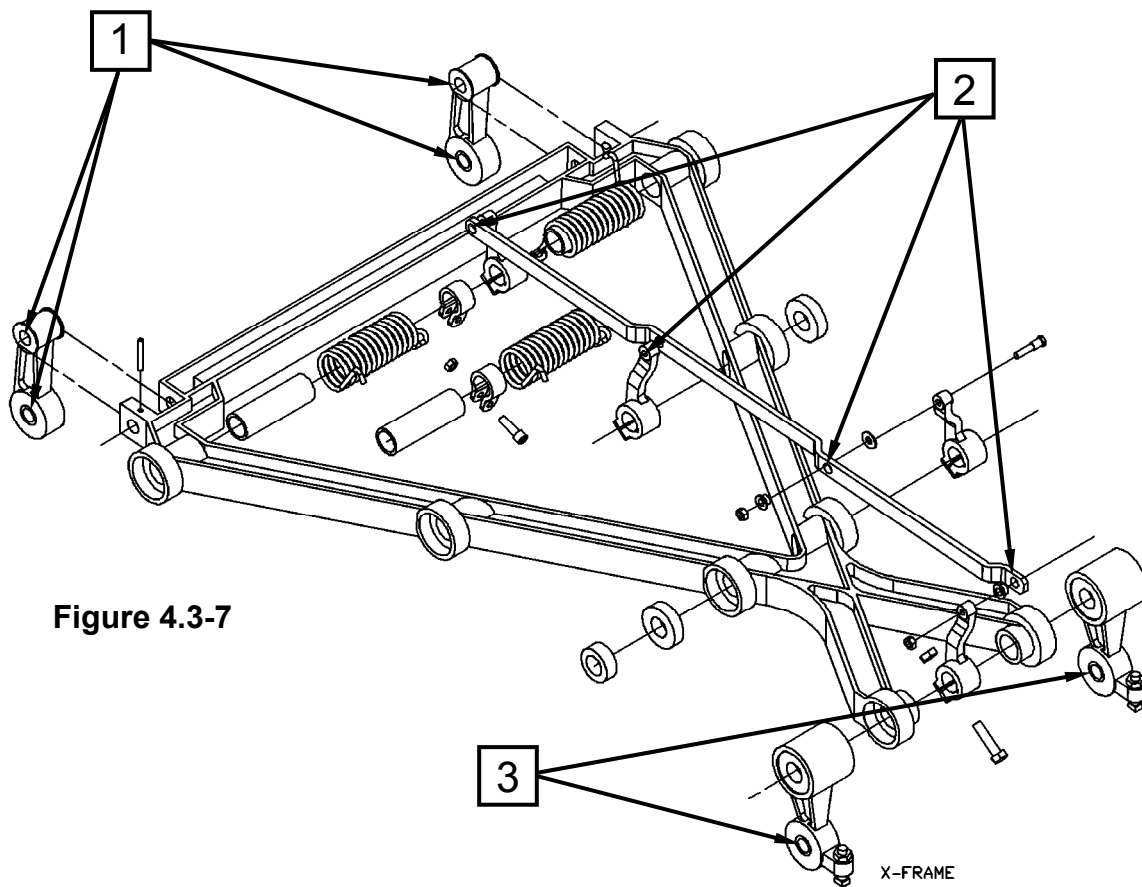
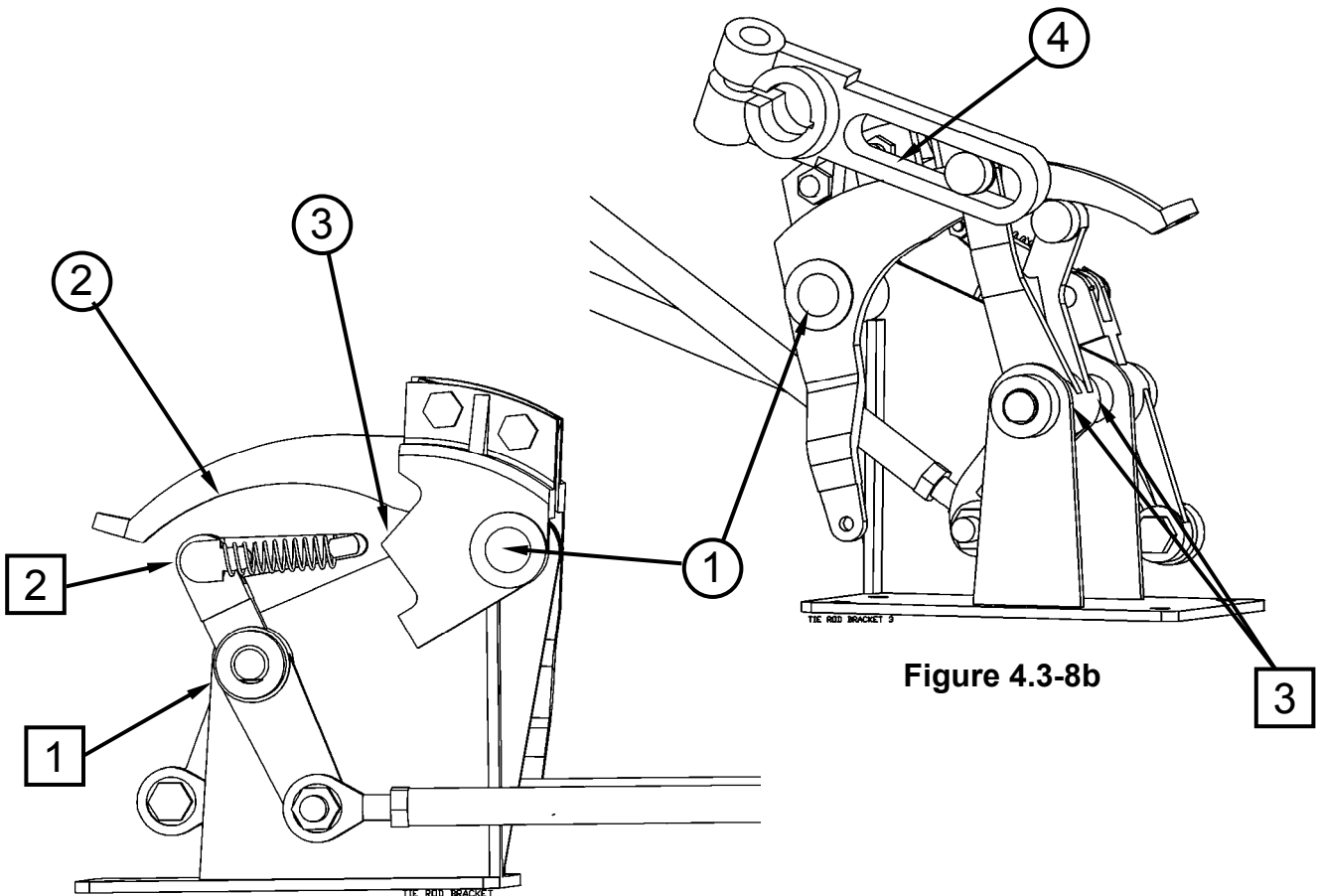


Figure 4.3-7

**4.3.7 TABLE SHIFTER MECHANISM**

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

**Figure 4.3-8a****Figure 4.3-8b**

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



## 90XLi QubicaAMF Pinspotter

### 4.3.8 BIN & SHUTTLE ASSEMBLY

- ① 1. Shuttle pivot shaft sleeve bearings (2 places): grease every 6 months.

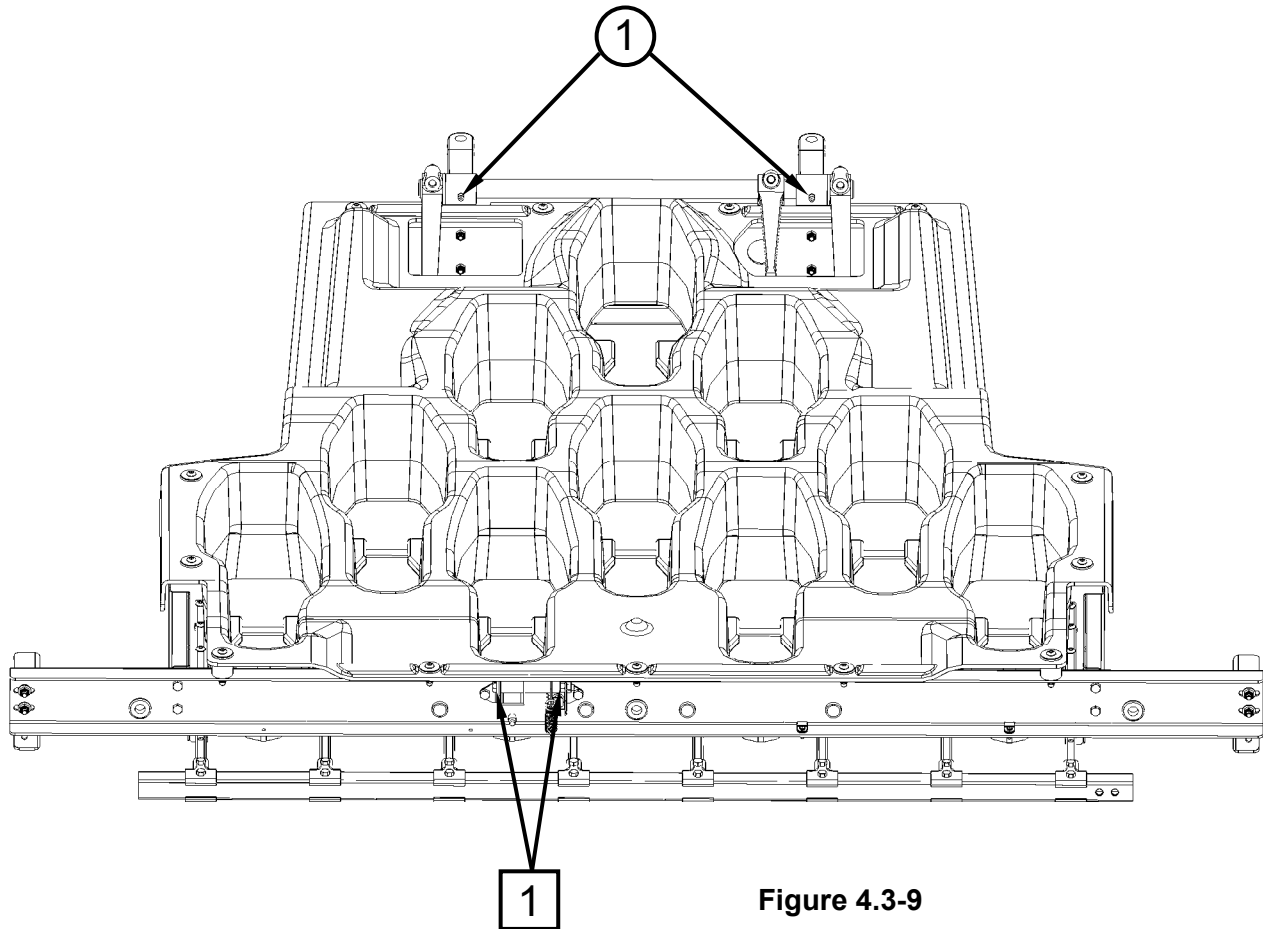
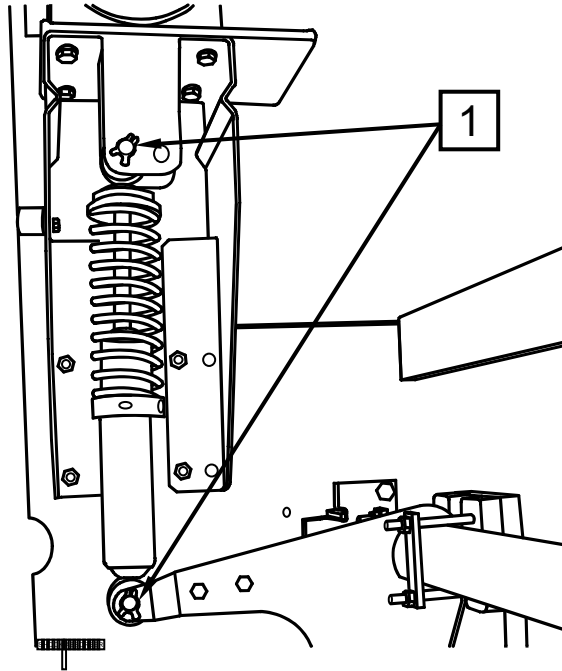


Figure 4.3-9

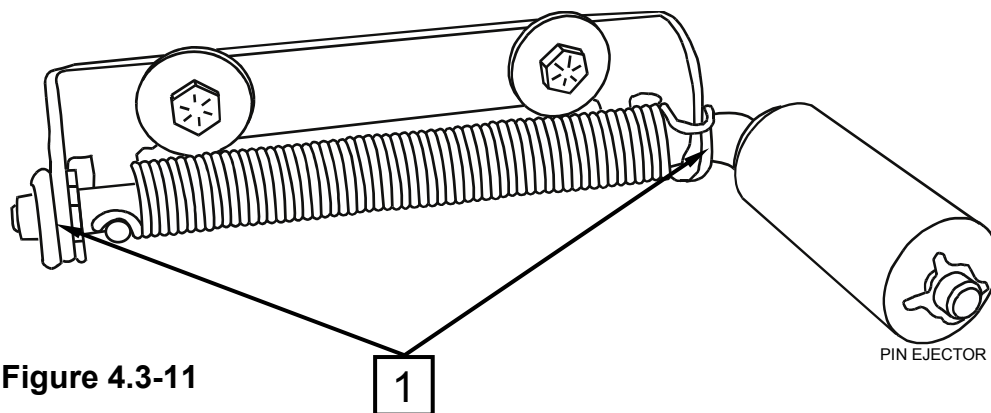
- 1 1. Bin switch bracket pivot points (2 places): apply 2 drops of oil every 3 months.

**4.3.9 SHOCK ABSORBER****1**

1. Pivot pins (2 places): apply 2 drops of oil every 3 months.

**Figure 4.3-10****4.3.10 PIN EJECTOR****1**

1. Apply 2 drops of oil at the bushings (2 places) every 3 months.

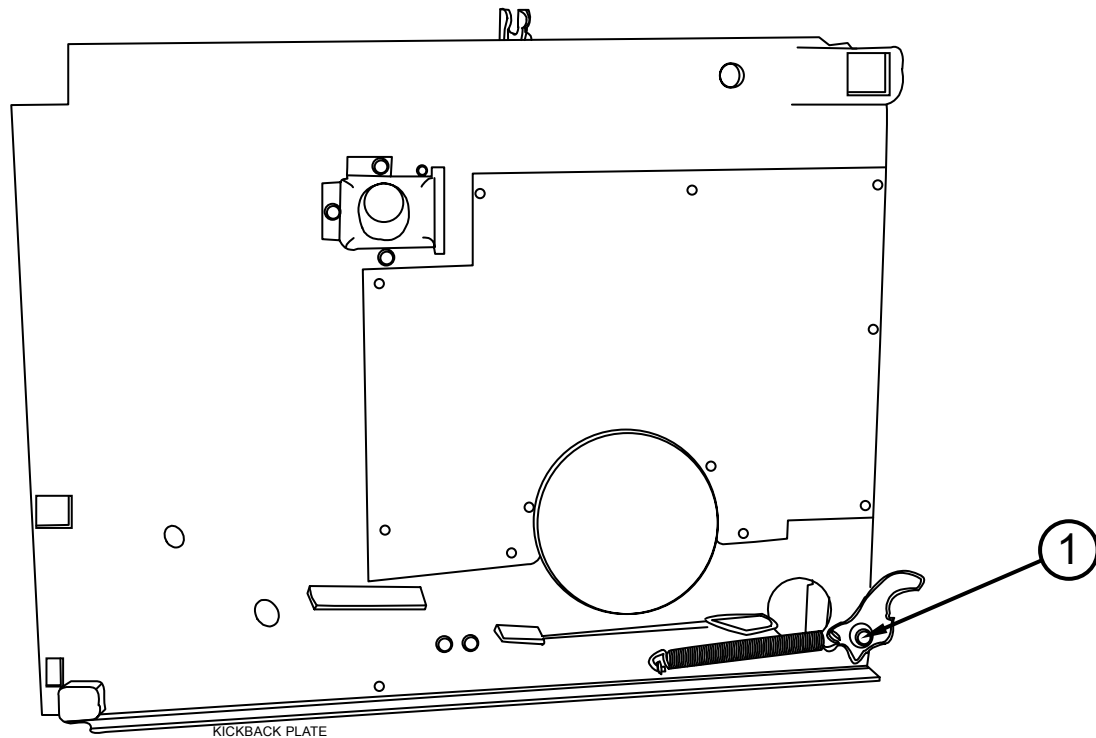
**Figure 4.3-11**



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## 90XLi QubicaAMF Pinspotter

### 4.3.11 BACK END SIDE PLATE ASSEMBLY



**Figure 4.3-12**

- ① 1. Front roller bearing bracket assembly R.H. and L.H. (2 places): grease every 6 months.



## **SECTION 4.4**

### **Preventive Maintenance**

#### **CONTENTS**

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### 4.4 PREVENTIVE MAINTENANCE

#### 4.4.1 QubicaAMF WEEKLY PREVENTIVE MAINTENANCE CHART

Preventive maintenance is performed by the proprietor's maintenance man using the form shown on Page 4.4-3. Each machine is given this check once each week. Table 4.4-1 provides a quick and easy method of dividing the workload throughout the week. For example, the maintenance man of a 16-lane house would do four pinspotters a day for four days each week.

**Table 4.4-1**

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



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## ***QubicaAMF 90XLi Pinspotter***

### **4.4.2 MAINTENANCE CHECK OF PINSPOTTER ASSEMBLIES**

The *QubicaAMF Pinspotter Preventive Maintenance Checklists* shown on pages 4.4-3 through 4.4-9 should be used as a reference when performing pinspotter maintenance. The front of the form lists the major pinspotter assemblies and provides spaces for checking off the completion of specific maintenance items, which are listed on the back of the form. The legend at the top of the front page provides a simplified method of recording the type of action completed or required. If parts are replaced, the part numbers should be entered in the *Parts Replaced* column. This information will facilitate ordering replacement parts and restocking.

The checklist can also be used to help in scheduling maintenance by using the items that have been marked with a **C**, **L**, **A**, or **X** during the weekly check to create a list of tasks that may require special parts or machine downtime.

The maintenance checks in this manual are meant to be used as a guide in support of, or in the absence of, more stringent maintenance requirements that may be put in place by either QubicaAMF or your bowling center manager.





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## ***QubicaAMF 90XLi Pinspotter***

### **1. Pin Elevator**

- A. Plastic Rollers
- B. Wear Strip
- C. Pulley
- D. Pockets & Cleats
- E. Drive Belt
- F. Belt Tensioner

### **2. Distributor**

- A. Pinion Gear, Bushing, & Sleeve
- B. Pin Delivery Position
- C. Shafts & Bearings
- D. Cable Assembly
- E. Drive Shaft & Universal
- F. Distributor Belt
- G. Clutch Assembly

### **3. Bin & Shuttle**

- A. Bin Switch
- B. Broken or Loose Parts
- C. Smooth Operation

### **4. Cushion**

- A. Ball Impact Pad
- B. Screws and Fasteners
- C. Urethane Rivets
- D. Shock Absorber
- E. Hanger Weldment & Support Blocks
- F. Curtain & Facing

### **5. Carpet & Pit Area**

- A. Front Roller
- B. Rear Roller & Drive Belt
- C. Bearings, & Supports
- D. Plows and Bounce Plate
- E. Condition of Carpet Belt

### **6. Ball Exit & Ball Lift**

- A. Ball Exit Weldment
- B. Drive Belts
- C. Track Rail Covers & Thimbles

### **D. Light Ball Sensor**

- E. Ratchet Assembly
- F. Lift Belt
- G. Pulley Assemblies & Bearings
- H. Clutches & Shafts
- I. Wiper Cloth

### **7. Sweep**

- A. Cams & Cam Followers
- B. Sweep Drive Linkage
- C. Stopping Positions
- D. Condition & Operation

### **8. Table**

- A. Cams & Cam Followers
- B. Drive, Supports, & Linkages
- C. Respot Cells & Mechanisms
- D. Pin Cups
- E. Spotting Pattern

### **9. Motors & Gearboxes**

- A. Seals, Plugs, & Covers
- B. Oil Level
- C. Observe Operation
- D. Excessive Noise

### **10. Pit Light**

- A. Fluorescent Bulb (Day Light)
- B. Black Light
- C. Infrared LEDs

### **11. Pindication & Scoring**

- A. 1<sup>st</sup> & 2<sup>nd</sup> Ball
- B. Strike & Foul
- C. Ball Detector & Reflector
- D. Camera
- E. Scoring

### **12. MCU Functions**

- A. Communication
- B. Proper Spec Codes



## **DAILY PREVENTIVE MAINTENANCE**

Month of \_\_\_\_\_

Day Of the Month		
Check the call sheets for the previous day, transfer calls to stop summary		
Cycle / check machines, foul lights, related equipment		
Investigate / correct machines that have developed a malfunction pattern.		
Clean Ball Lift & Distributor Belts.		
Clean Pin Elevator,		
Clean Pin Guide, Orientor Pan		
Keep work area, workbench, service aisle clean and orderly		
Assign and record completed PM on the PM charts		



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***QubicaAMF 90XLi Pinspotter***

**QUBICAAMF**



**WEEKLY PREVENTIVE MAINTENANCE**

**Month of \_\_\_\_\_ Year of \_\_\_\_\_**

Clean shuttle and bin		
Clean, check ball door exit, lift arm, paddle, LBS operation		
Clean ball lift assembly, lift rods		
Clean pit carpet belt		
Clean pin curtain, cushion, drip pans		
Tighten plows, check for cracks, replace as needed		
Change ball wipes		
Clean bowling pins		
Inspect distributor, observe for proper operation, correct as needed		





## **MONTHLY PREVENTIVE MAINTENANCE**

Month of \_\_\_\_\_ Year of \_\_\_\_\_

Check, clean, correct, adjust, spotting cups, respot cells, table assembly in general		
Check, clean, correct, adjust, sweep assembly		
Check, clean, correct, ball tracks, downsweeps		
Check, correct, adjust carpet belt tracking, front and rear rollers		
Check, correct, adjust bounce board, dampers, supports, ground strap		
Check, correct, adjust cushion assembly, shock		
Blow out sweep and table brakes		
Check all machine belts, replace as needed		
Clean distributor assembly		



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***QubicaAMF 90XLi Pinspotter***

**QUBICAAMF**



**QUARTERLY PREVENTIVE MAINTENANCE**

Year of \_\_\_\_\_

Clean the machine framework, drip pans		
Complete Quarterly lubrication items		
Tighten front and rear jackscrews		
Tighten pit cushion and hanger box bolts		
Remove the distributor clutch assembly. Clean the pinion and sleeve, friction disks metal and plastic. Use fine emery cloth to smooth friction disk. Lubricate pinion and sleeve and reassemble		
Check: pin holder brackets, shuttle straps, shuttle operator rod. Repair as needed. Tighten shuttle bolts		



## **ANNUAL PREVENTIVE MAINTENANCE**

Year of \_\_\_\_\_

Check the following for worn or broken parts, repair or replace as needed:  Table and sweep arms, shaft bushings, keyways and pillow blocks		
Complete Annual lube chart items		
Check / correct gearbox oil leaks, change oil		
Rebuild table drive		
Rebuild carpet roller and pit assembly		
Rebuild distributor assembly		
Rebuild ball lift assembly, light ball sensor		
Clean underground return tracks, tighten dropsweep track		



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## *QubicaAMF 90XLi Pinspotter*

### **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.

---

**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.

---

#### **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 given below:

##### **1. Every Two Weeks**

- A. Dust the entire machine.

##### **2. Twice Each Week**

- A. Wipe the following assemblies with a cloth dampened with a pin cleaner such as "Topshot".
  - Inside the pin elevator wheel
  - Inside the bin and spotting cups
  - Pit carpet
  - Pin curtain face
  - Distributor belt and orientor pan
  - Pulleys and V-belt drives
- B. Check the gearbox drip pans and clean as required.



---

## ***QubicaAMF 90XLi Pinspotter***

- 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 pin elevator wheel and carpet.
- E. Clean the PBL belt.

### **3. Once Each Week**

- A. Remove, launder, and replace the ball wiper cloth.

### **4. Once Each Month**

- A. Remove, launder, and replace the dust trap cloth.

## **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.

**Troubleshooting****CONTENTS**

Distributor and Positive Ball Lift Troubleshooting matrices are located in their respective manuals.

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## **4.5 TROUBLESHOOTING**

### **4.5.1 TROUBLESHOOTING TOOLS**

#### **4.5.1.1 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.

#### **4.5.1.2 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 on circuits below 80 volts.**



## QubicaAMF 90XLi Pinspotter

### 4.5.2 TABLE TROUBLESHOOTING

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

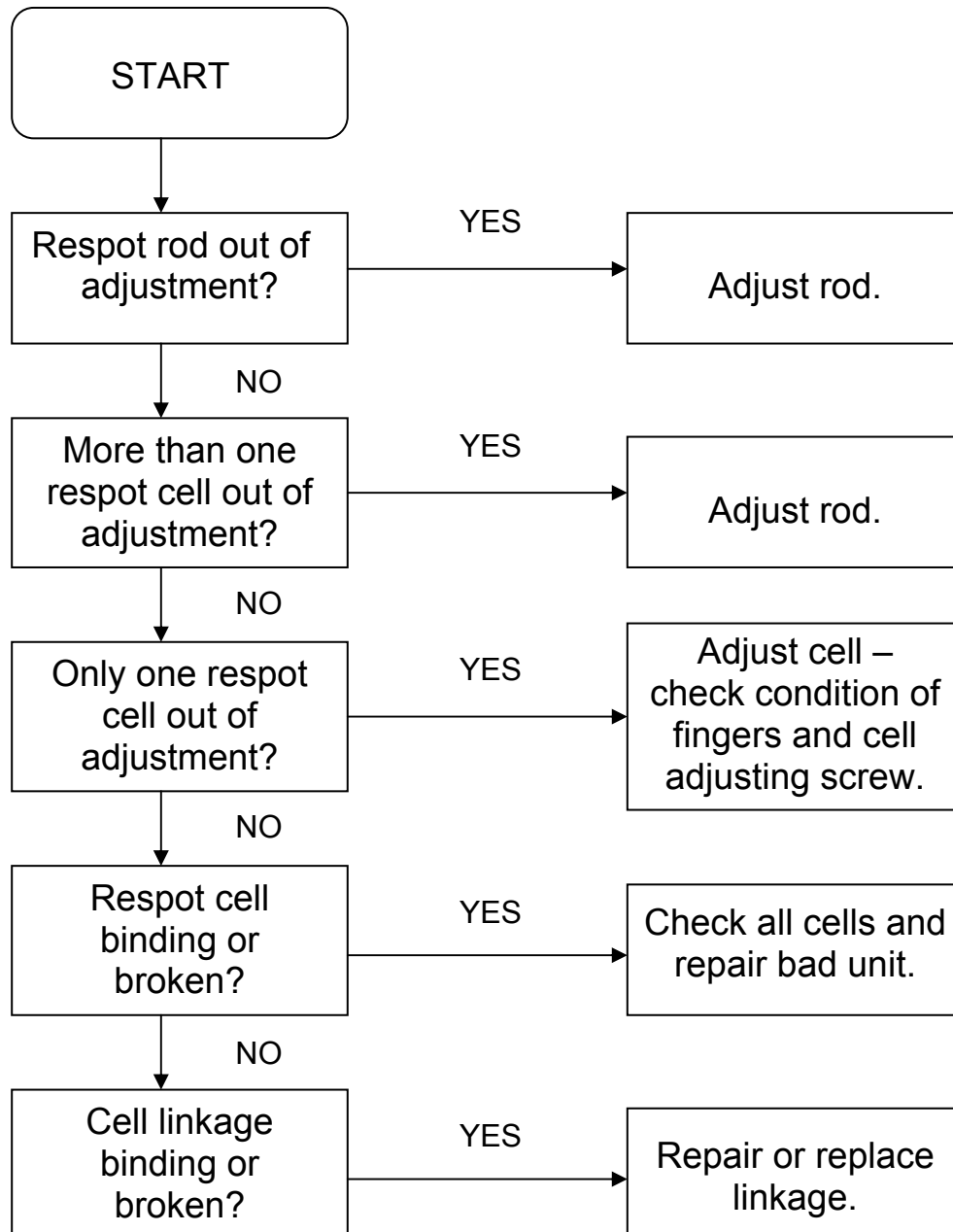


Figure 4.5-1

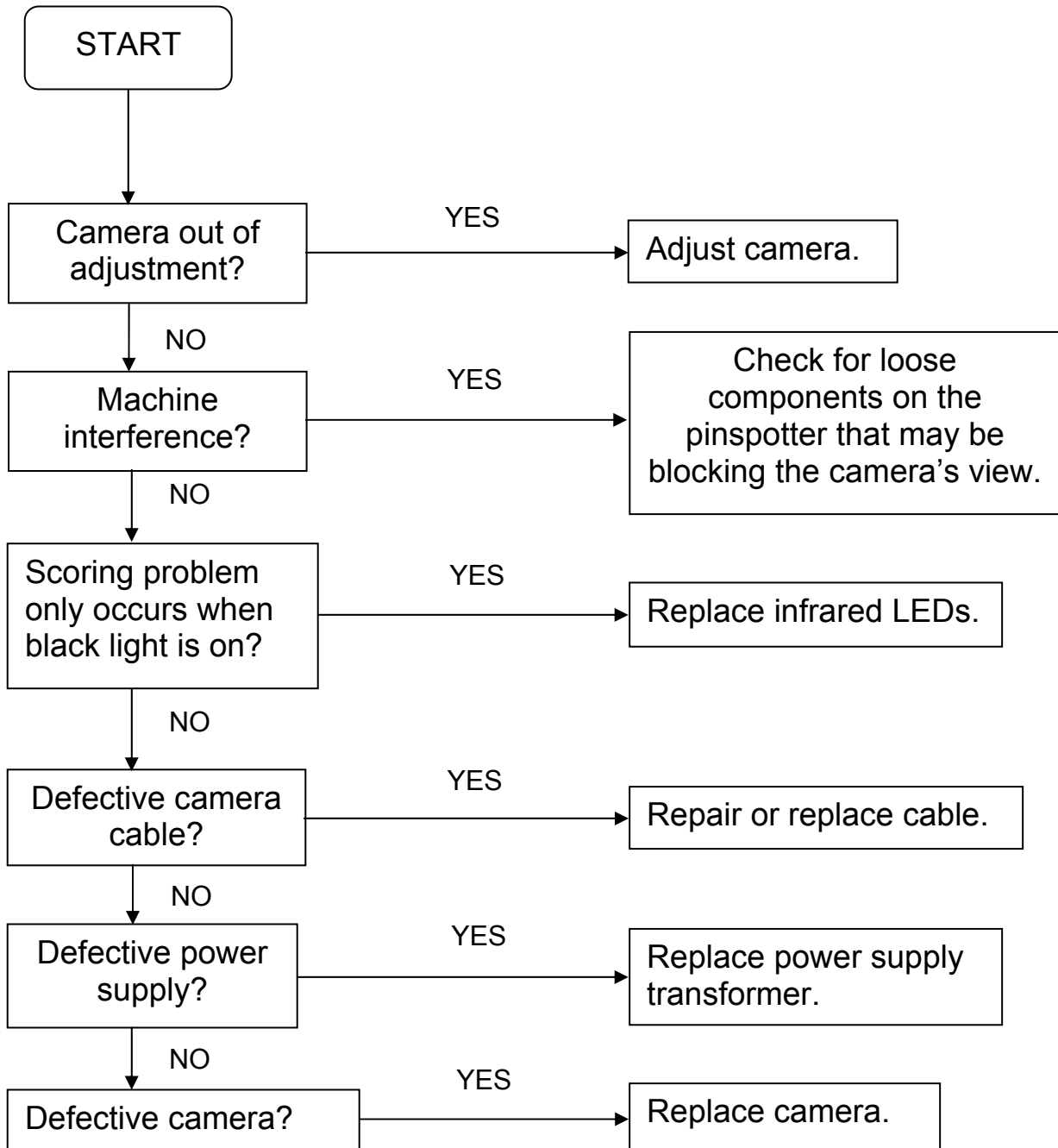
**4.5.2.2 PROBLEM: Scoring or Pindication Problems (miscounts, no strike cycle, etc.)**

Figure 4.5-2



## QubicaAMF 90XLi Pinspotter

### 4.5.2.3 PROBLEM: Table runs continuously.

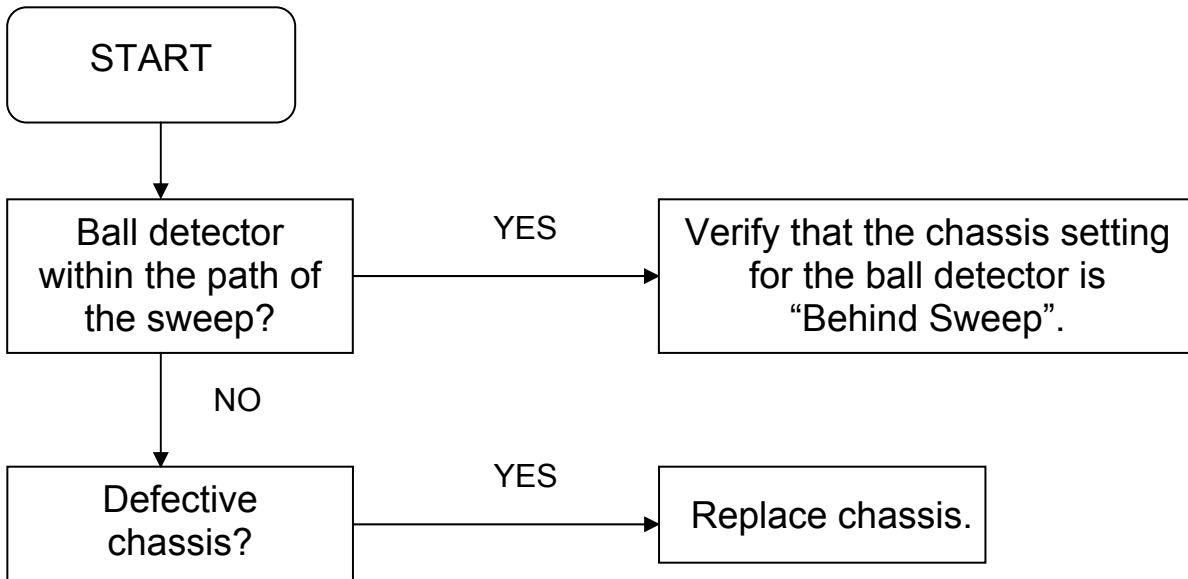
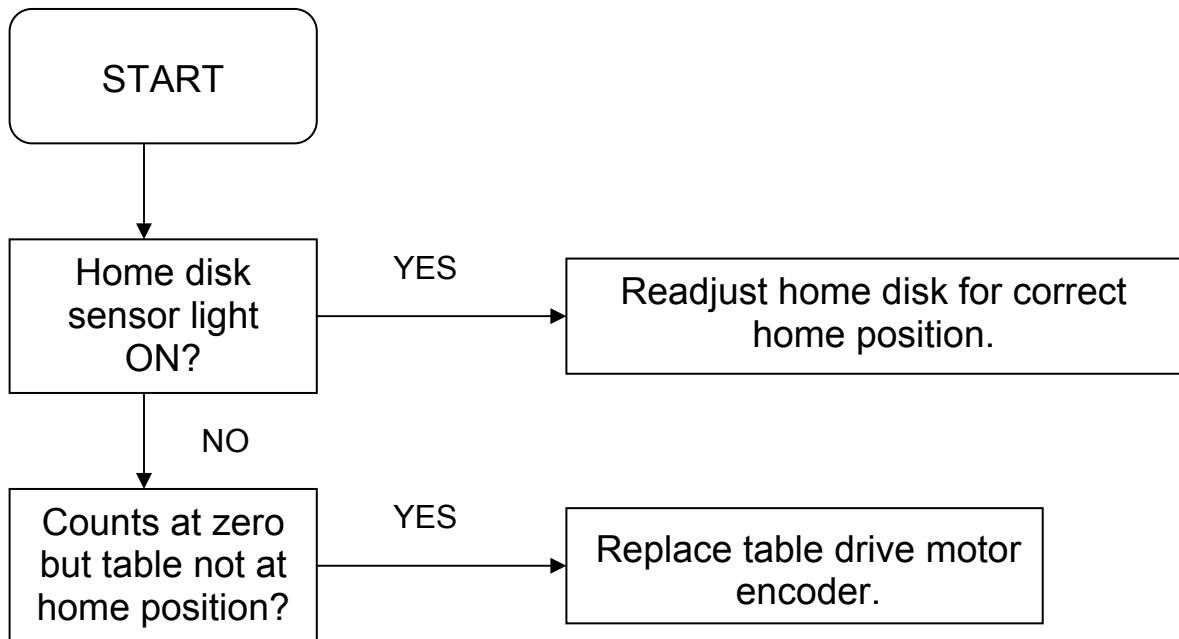


Figure 4.5-3

**4.5.2.4 PROBLEM: Table stops before zero position.****Figure 4.5-4**



## QubicaAMF 90XLi Pinspotter

**4.5.2.5 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.

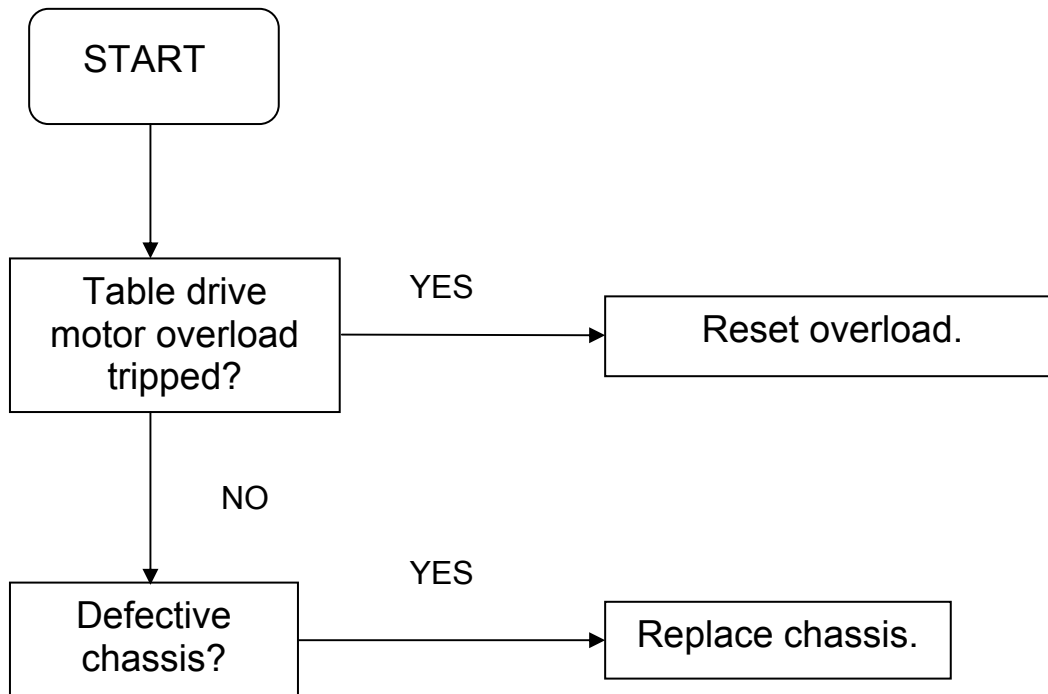
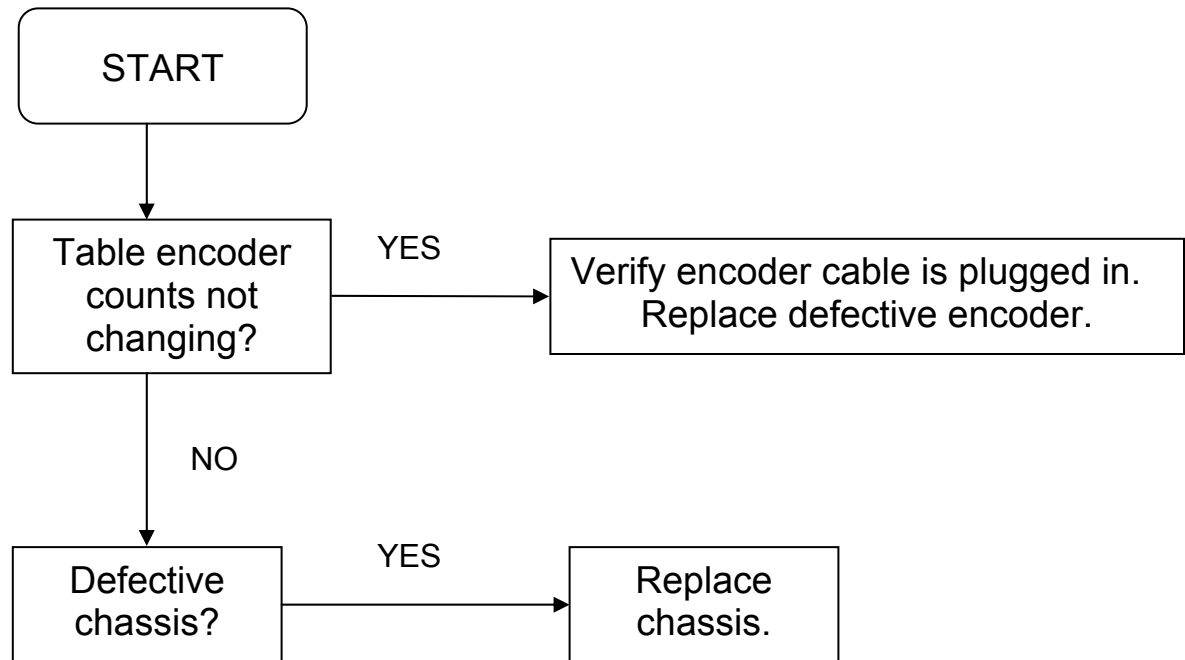


Figure 4.5-5

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



**Figure 4.5-6**



---

## QubicaAMF 90XLi Pinspotter

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

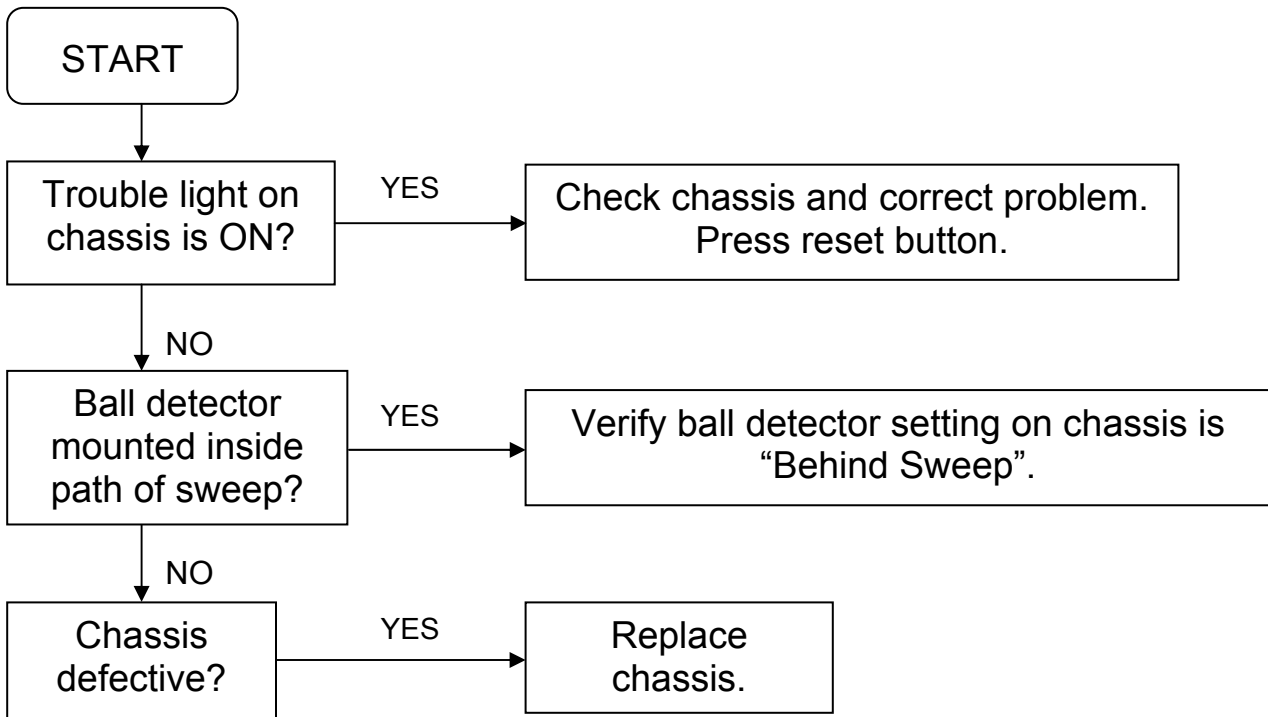
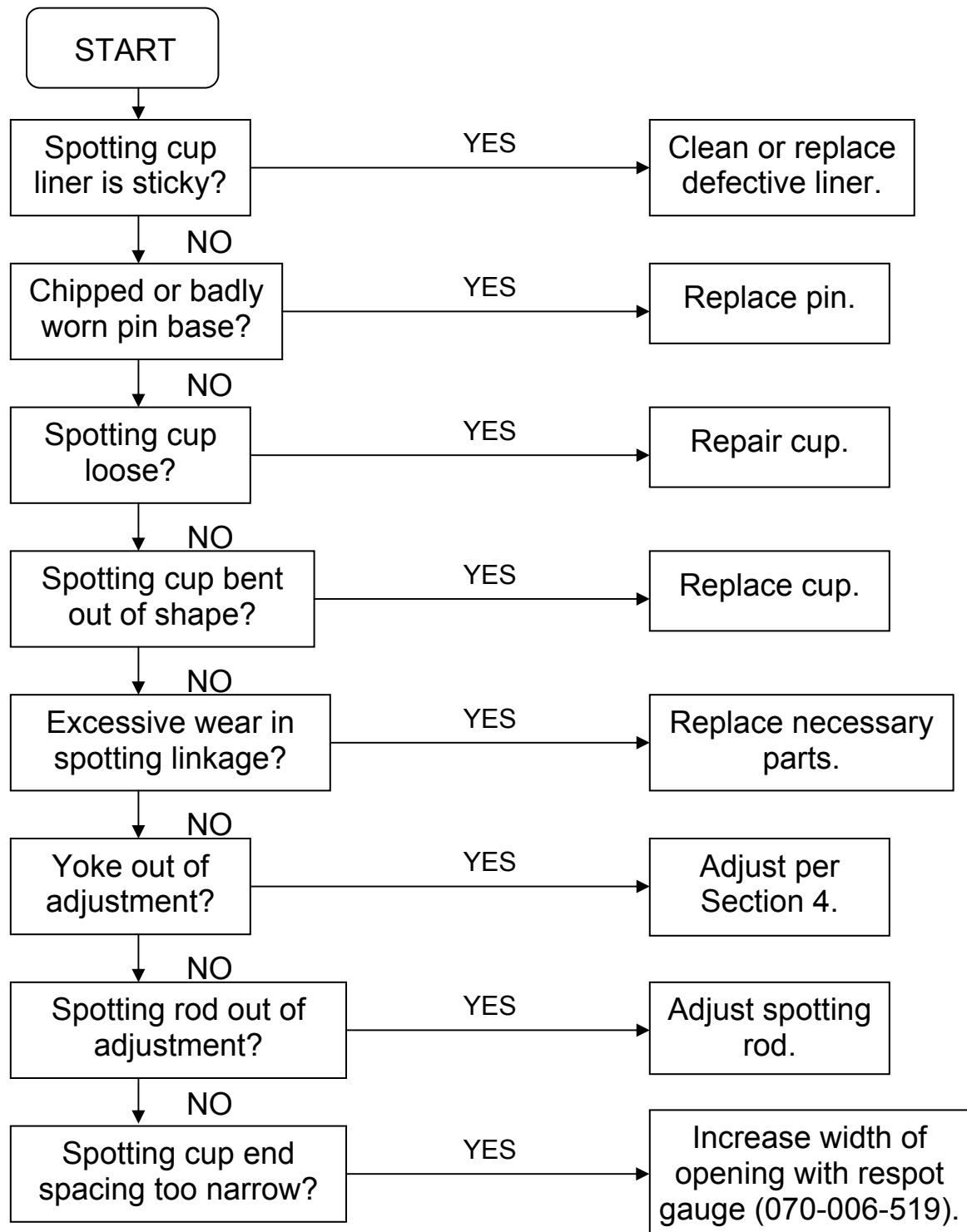


Figure 4.5-7



**4.5.2.8 PROBLEM: Pin fell over during spotting.****Figure 4.5-8**



## QubicaAMF 90XLi Pinspotter

### 4.5.2.9 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.

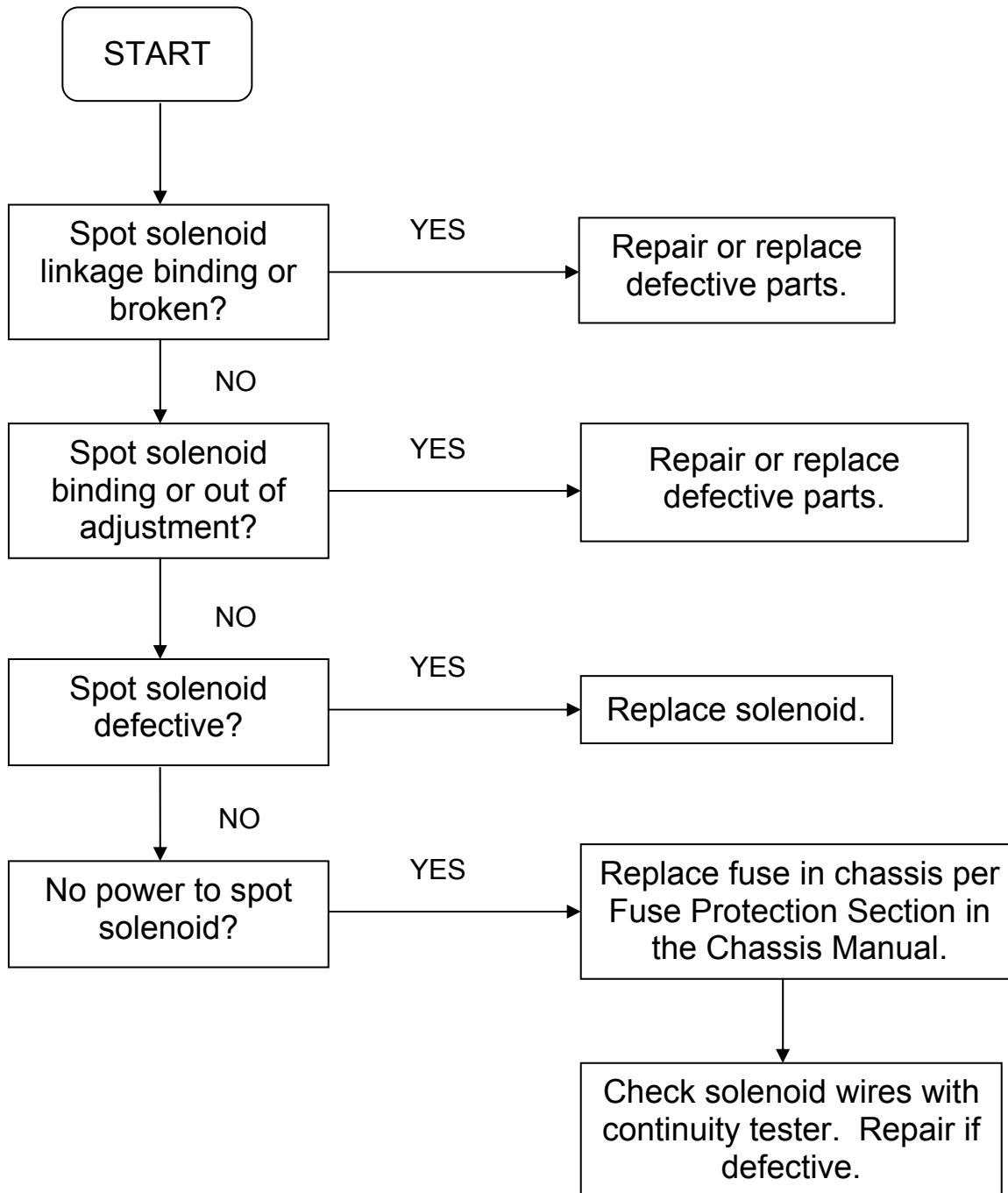


Figure 4.5.9

### 4.5.3 SWEEP TROUBLESHOOTING

**4.5.3.1 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.

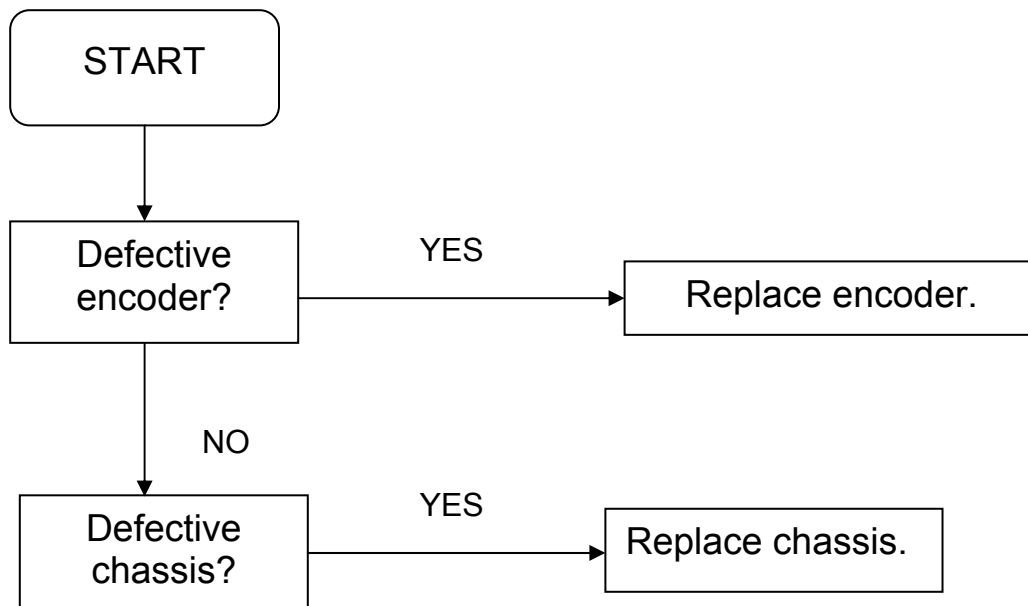


Figure 4.5-10



## QubicaAMF 90XLi Pinspotter

### 4.5.3.2 PROBLEM: Sweep overruns all stopping positions. Motor coasts.

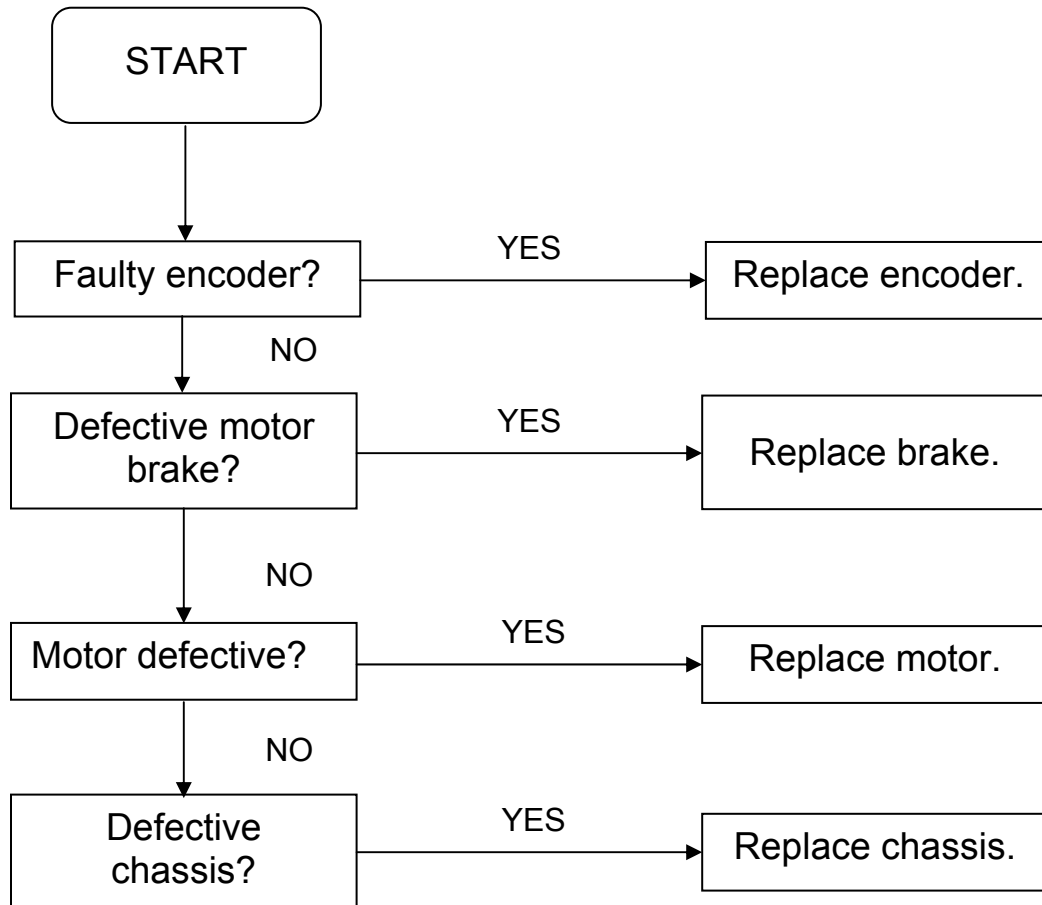
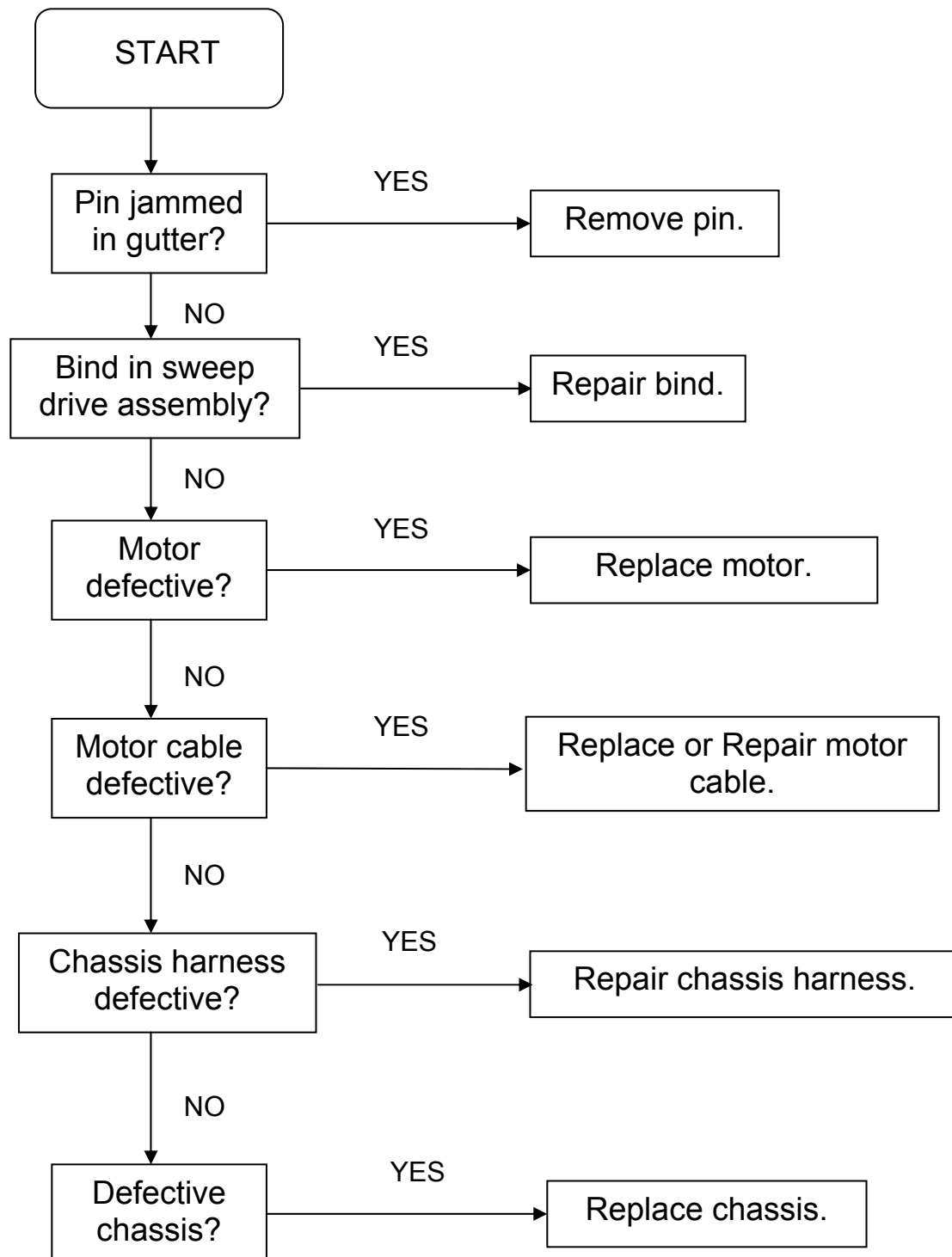


Figure 4.5-11

**4.5.3.3 PROBLEM: Sweep motor trips overload.****Figure 4.5-12**



## QubicaAMF 90XLi Pinspotter

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

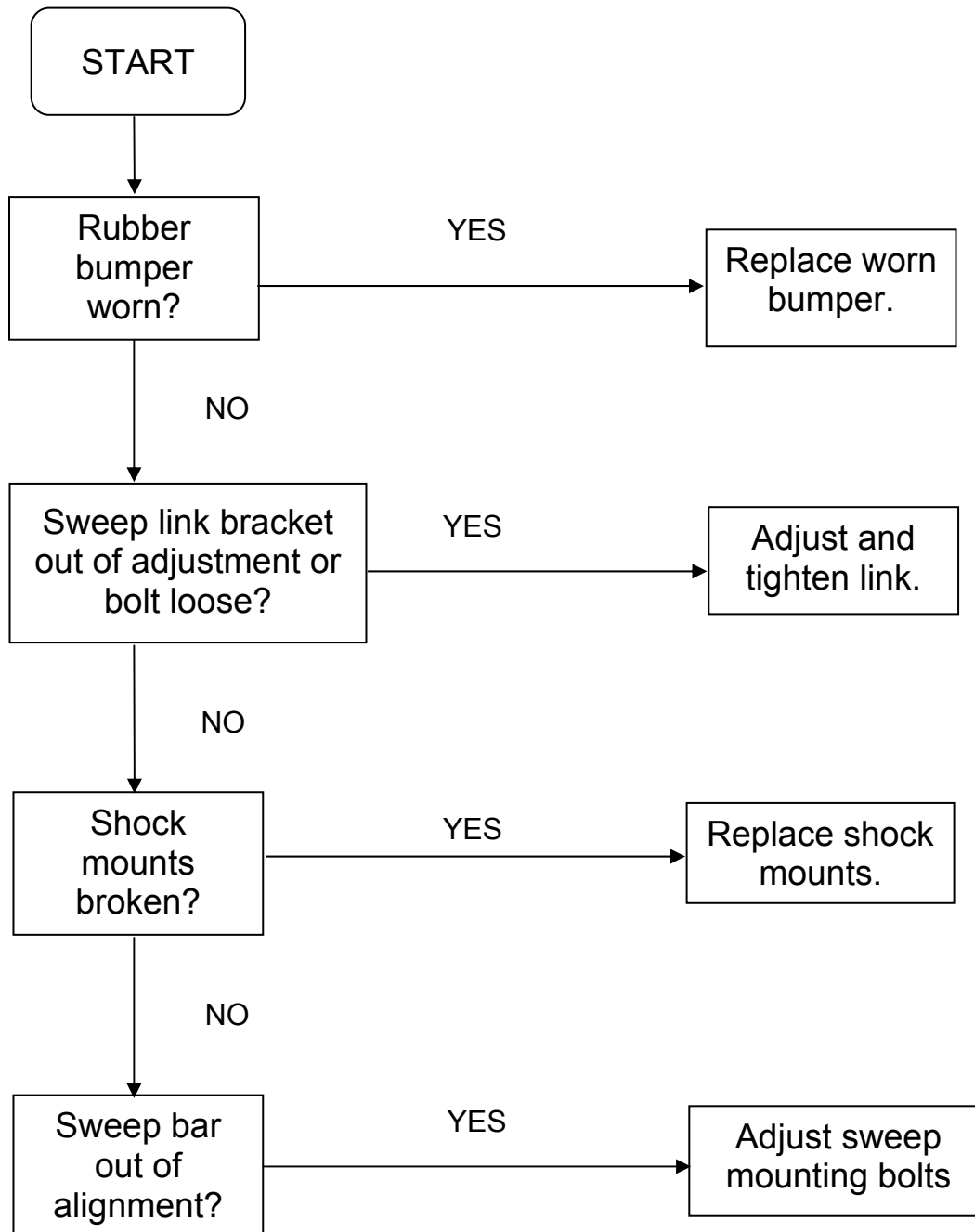
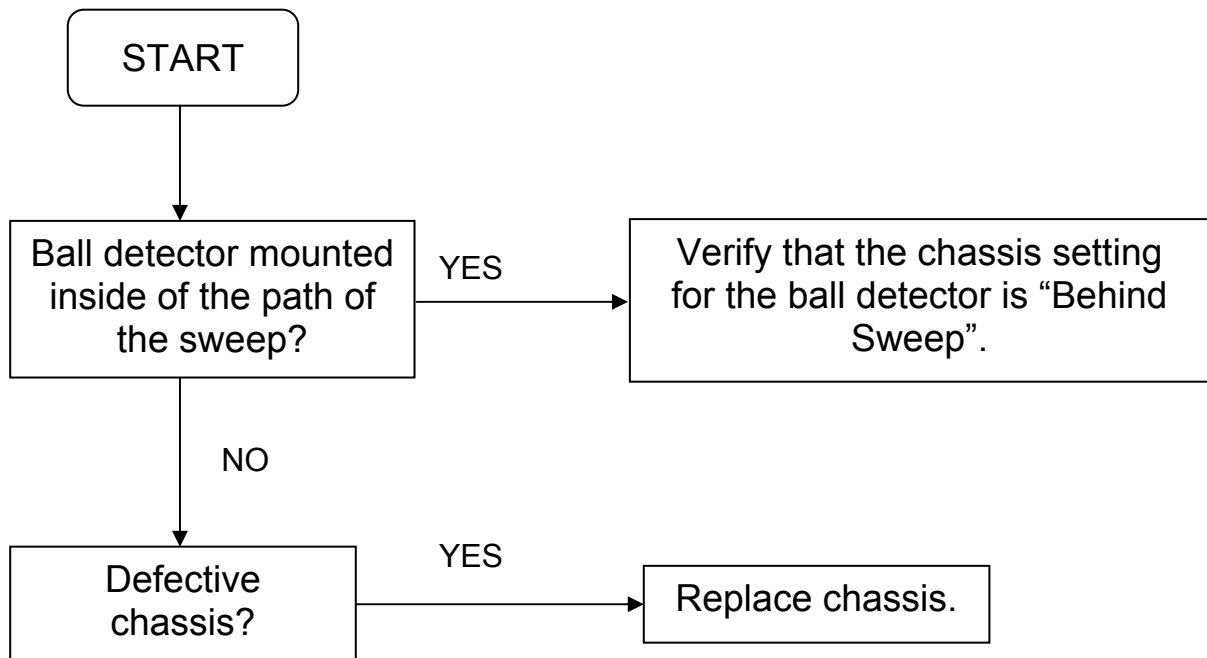


Figure 4.5-13

**4.5.3.5 PROBLEM: Sweep runs continuously.****Figure 4.5-14**



## QubicaAMF 90XLi Pinspotter

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

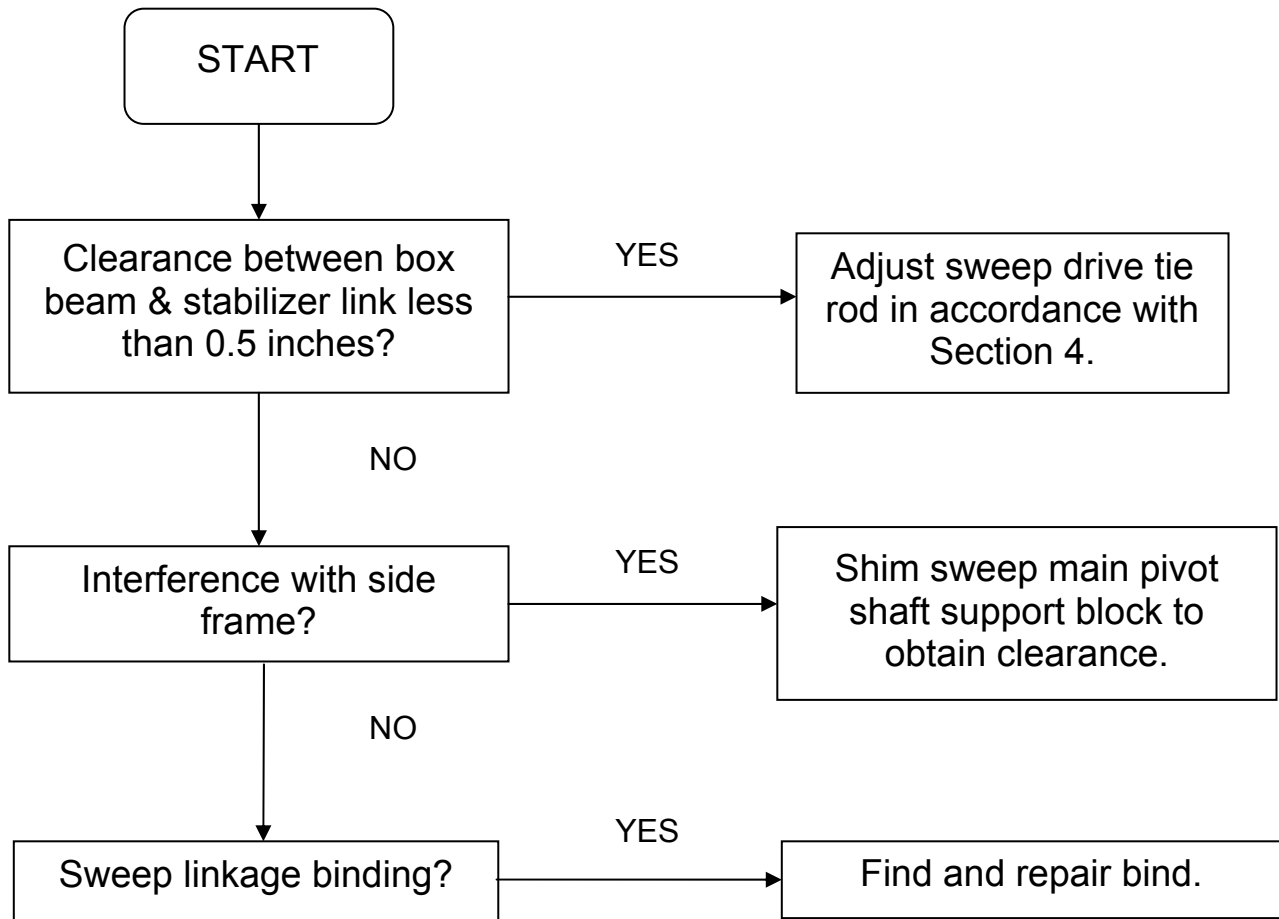


Figure 4.5-15



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

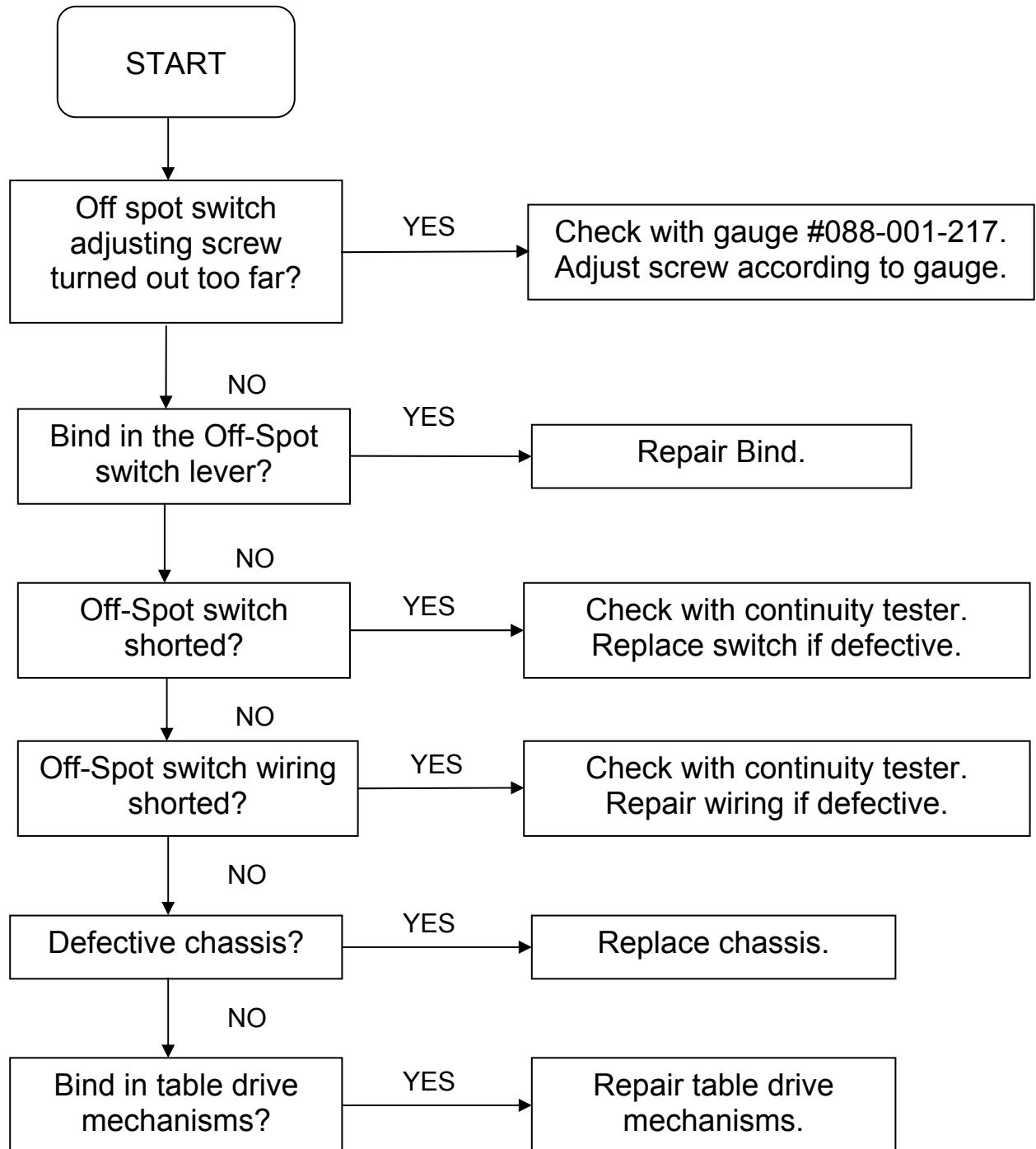


Figure 4.5-16



## QubicaAMF 90XLi Pinspotter

**4.5.3.8 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.

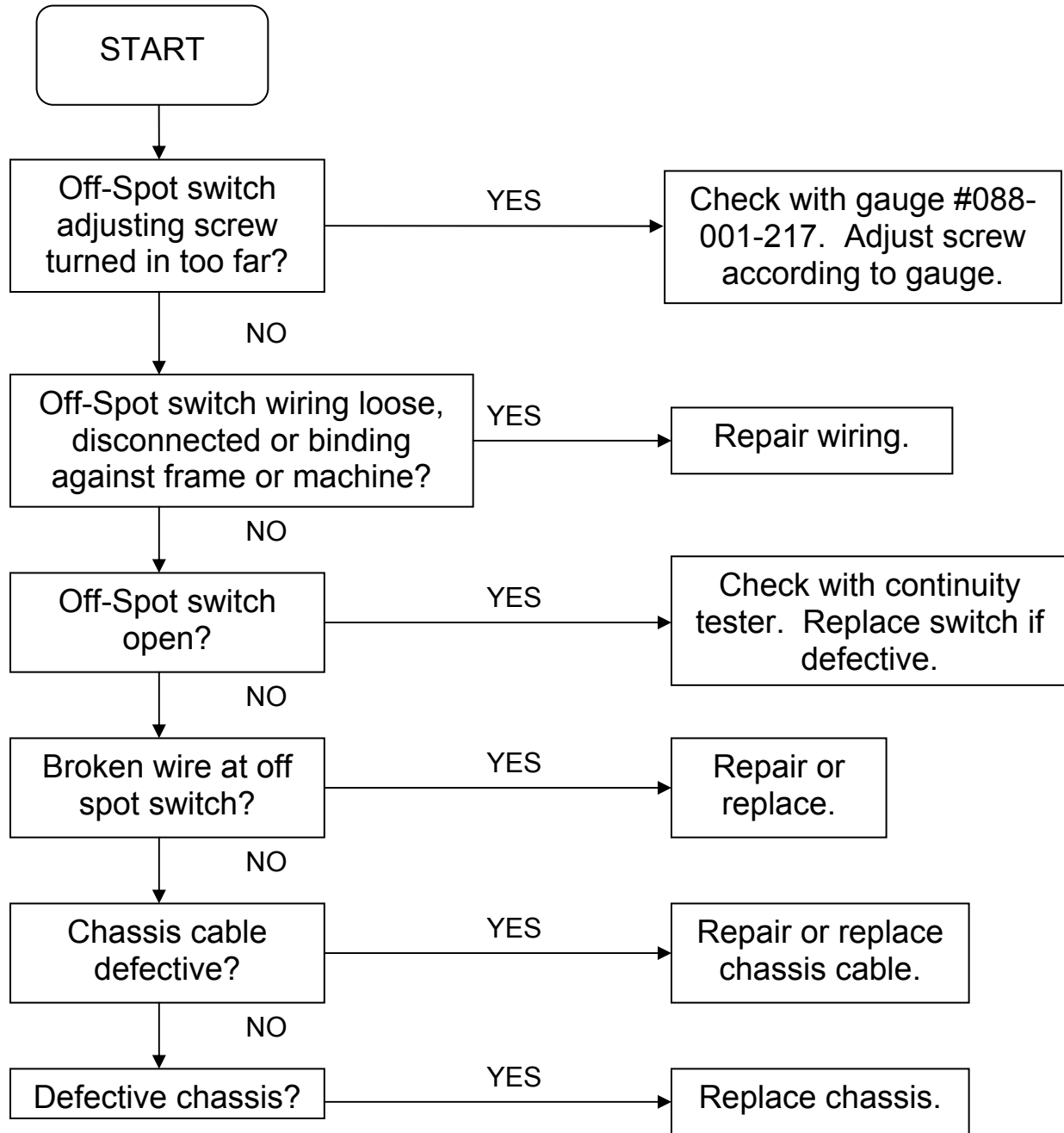


Figure 4.5-17

**4.5.3.9 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.**

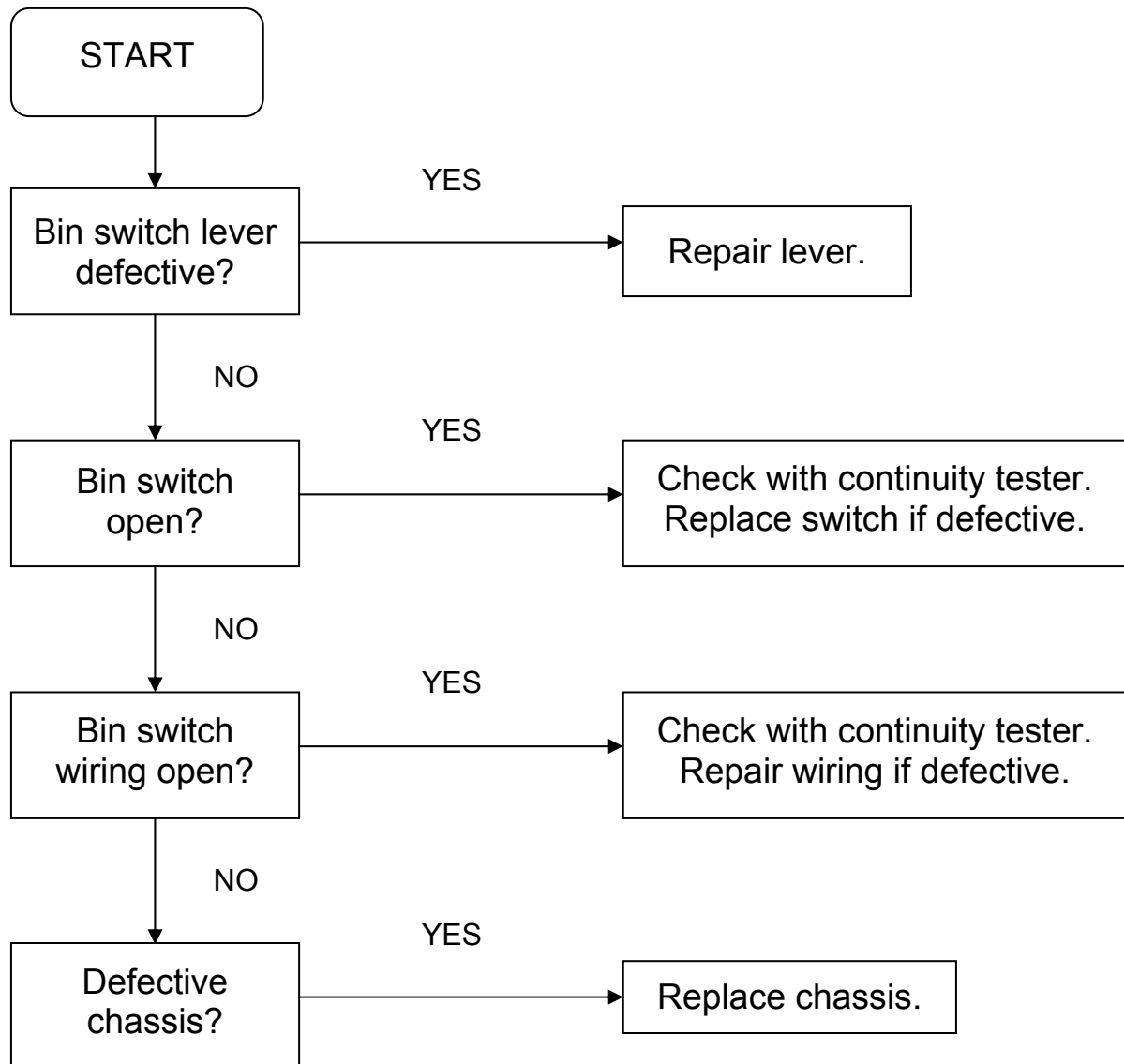


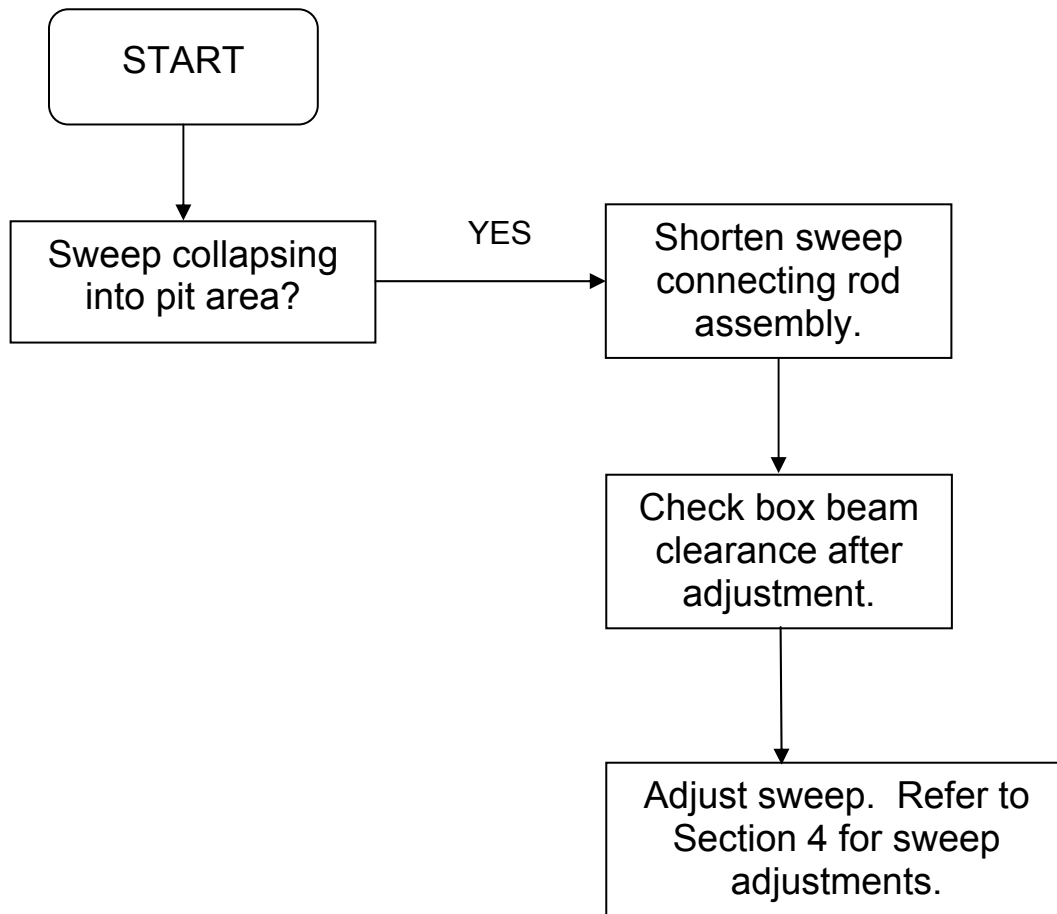
Figure 4.5-18



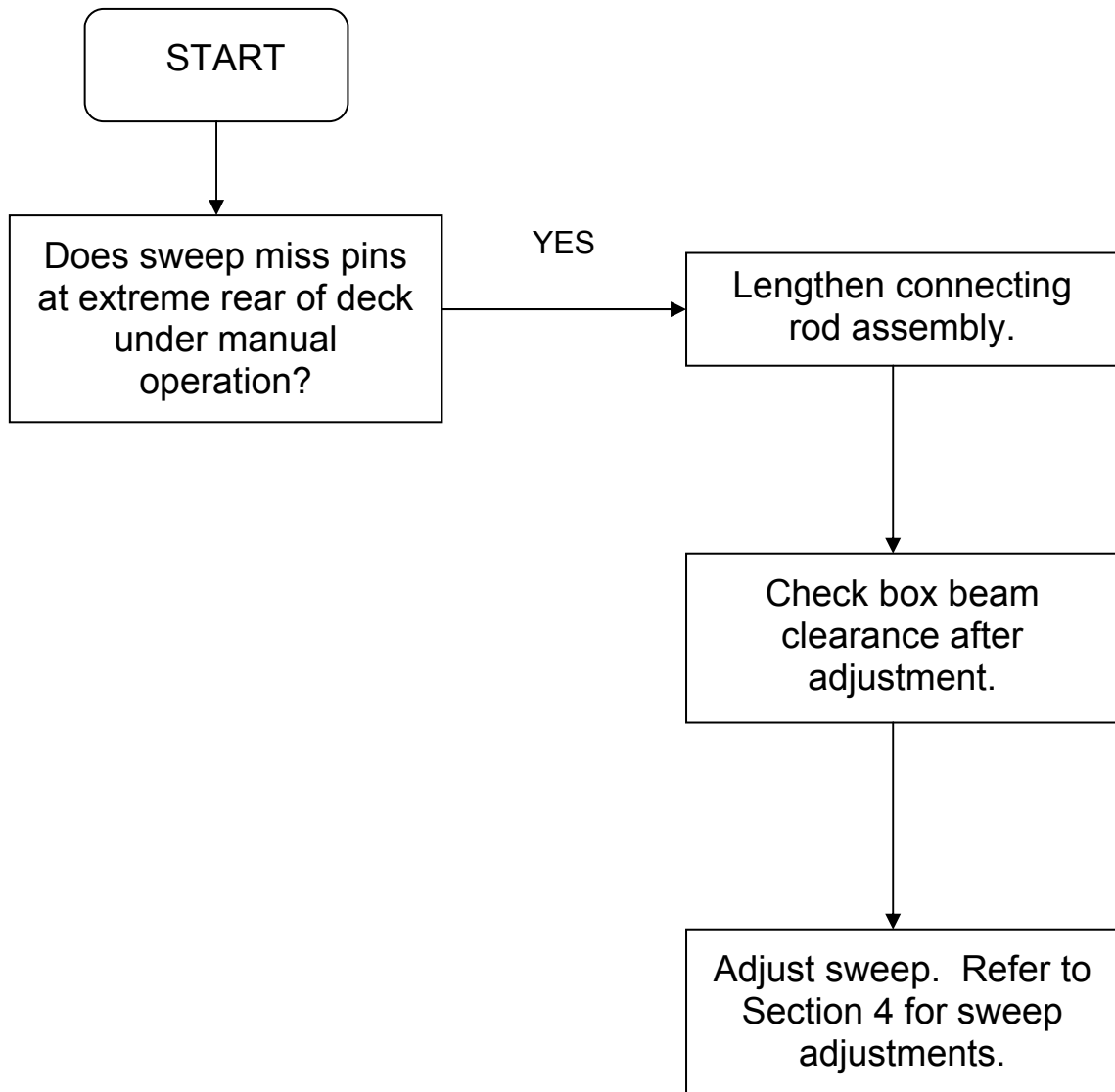
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## **QubicaAMF 90XLi Pinspotter**

### **4.5.3.10 PROBLEM: Sweep runs too far into pit area.**



**Figure 4.5-19**

**4.5.3.11 PROBLEM: Sweep does not knock all pins into pit.****Figure 4.5-20**



## QubicaAMF 90XLi Pinspotter

### 4.5.4 CUSHION AND PIT TROUBLESHOOTING

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

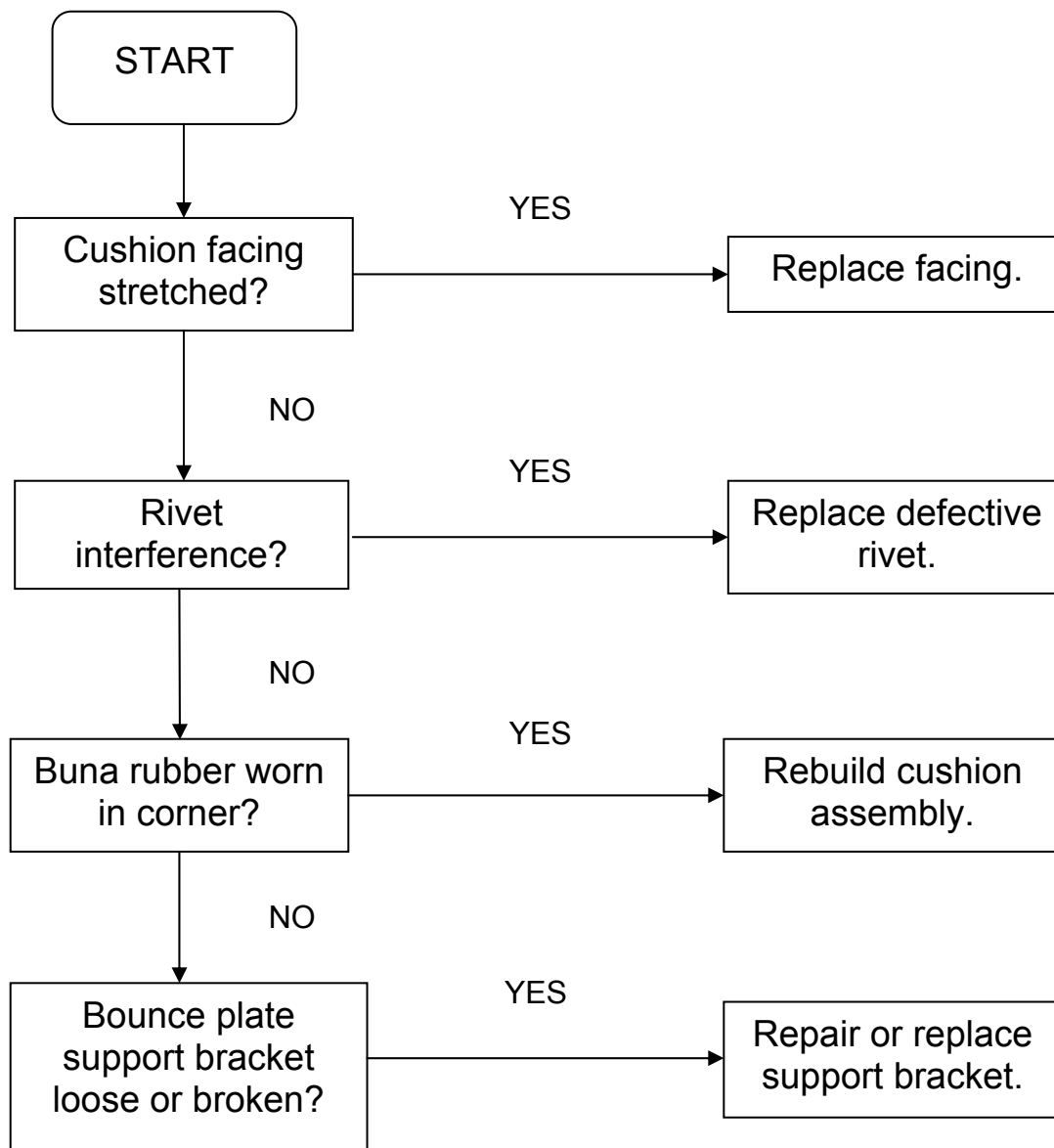


Figure 4.5-21

### 4.5.4.2 PROBLEM: Ball idles at exit – will not enter lift.

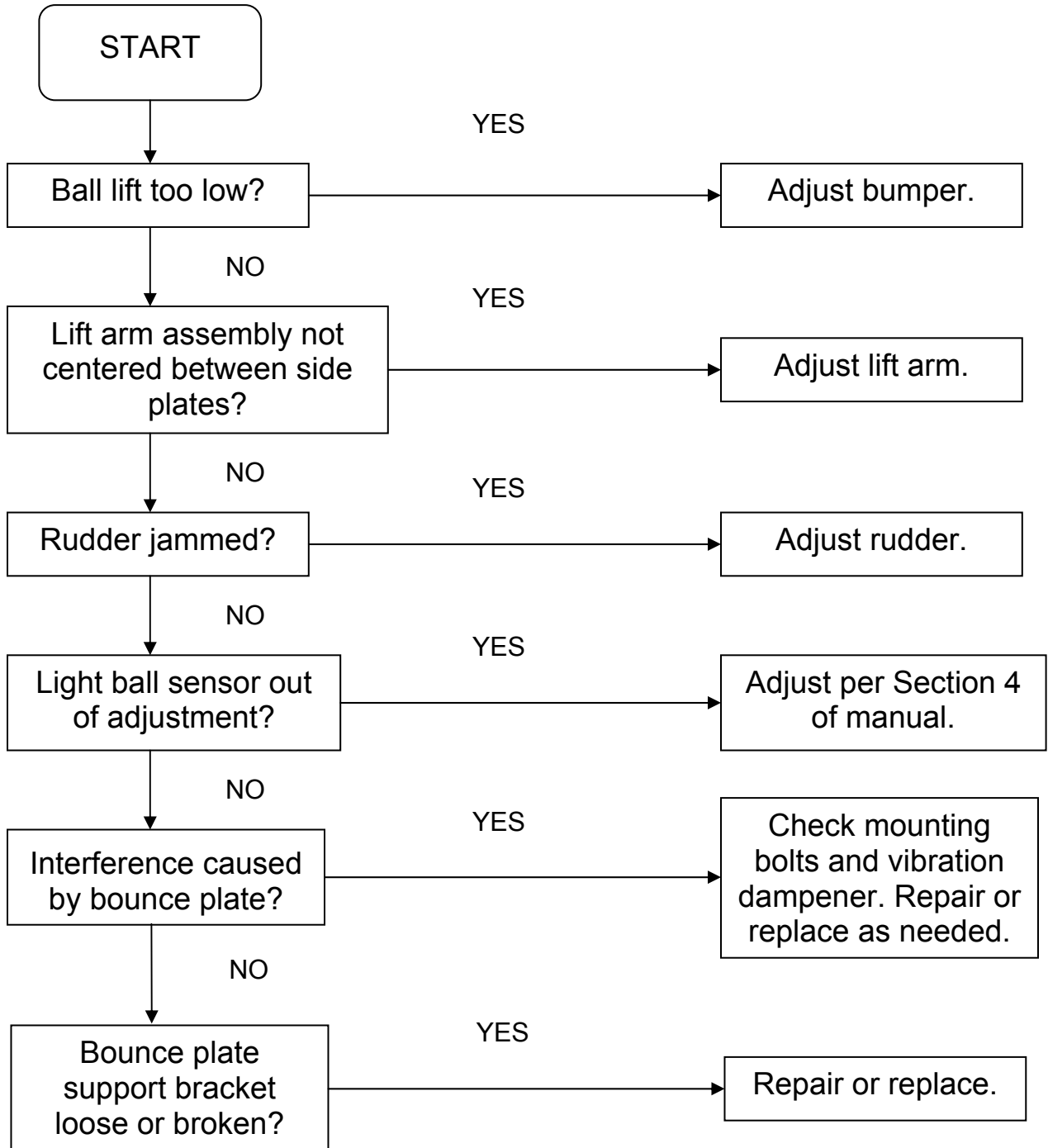


Figure 4.5-22



## QubicaAMF 90XLi Pinspotter

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

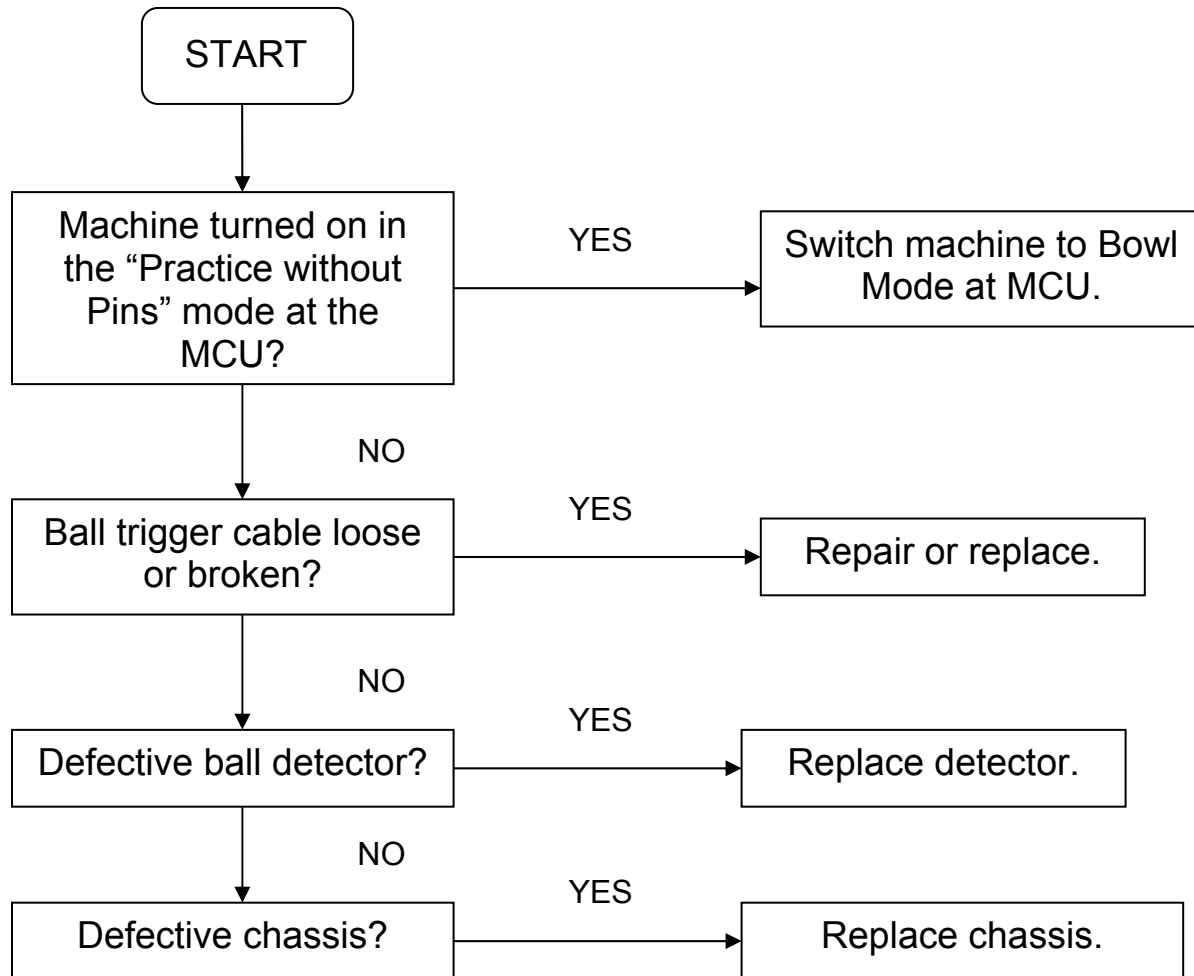


Figure 4.5-23



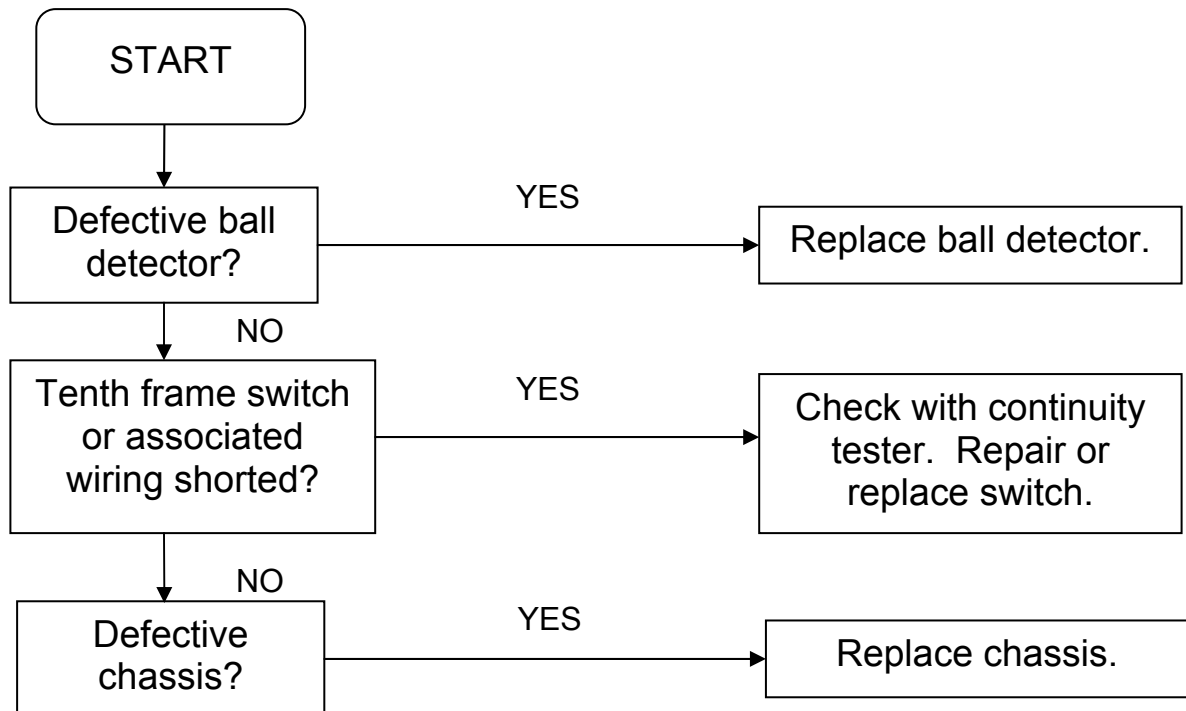
**4.5.4.4 PROBLEM: Machine continues to cycle or cycles randomly.**

Figure 4.5-24



## QubicaAMF 90XLi Pinspotter

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

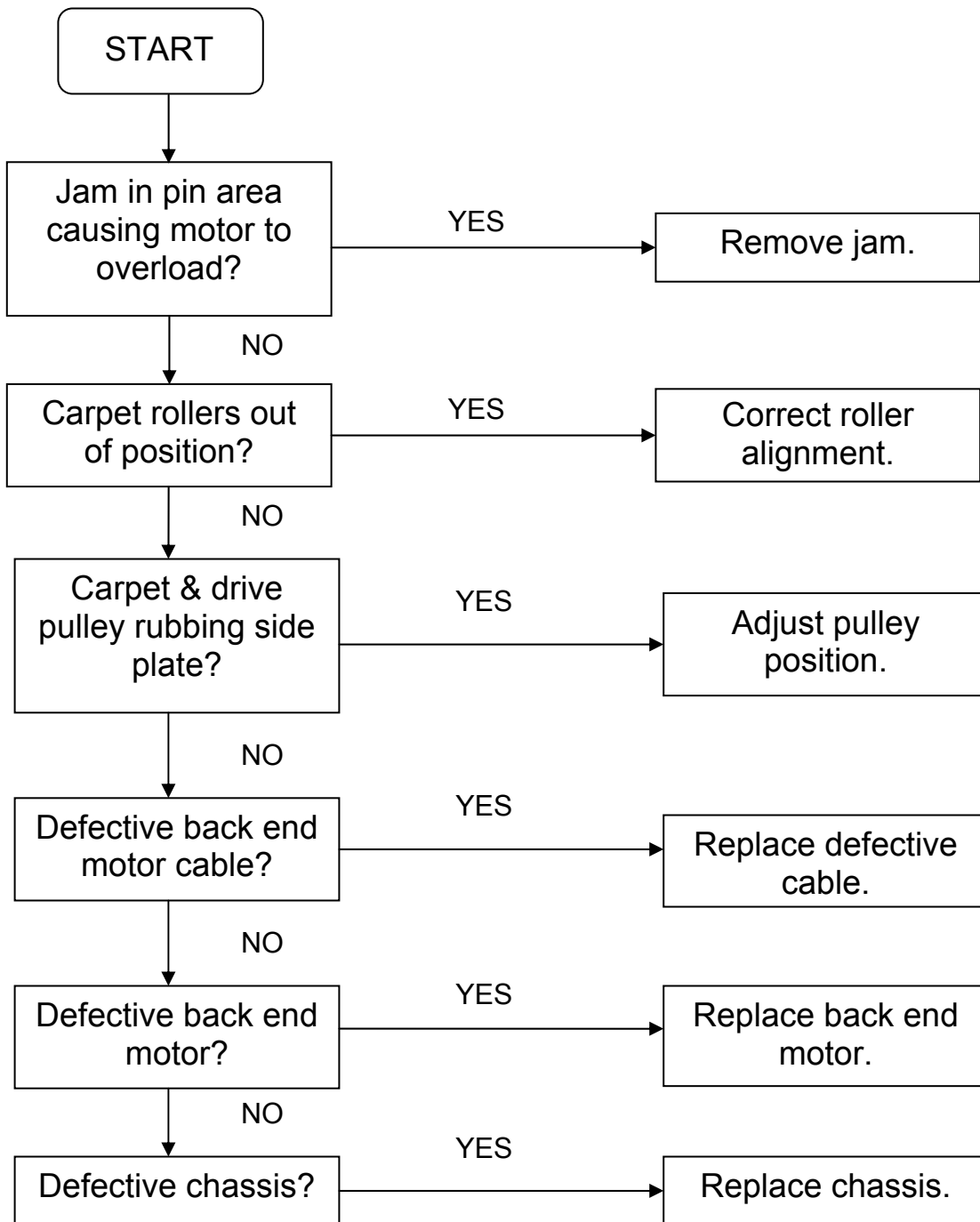


Figure 4.5-25

## 4.5.5 CHASSIS TROUBLESHOOTING

### 4.5.5.1 PROBLEM: Table time delay too long or too short.

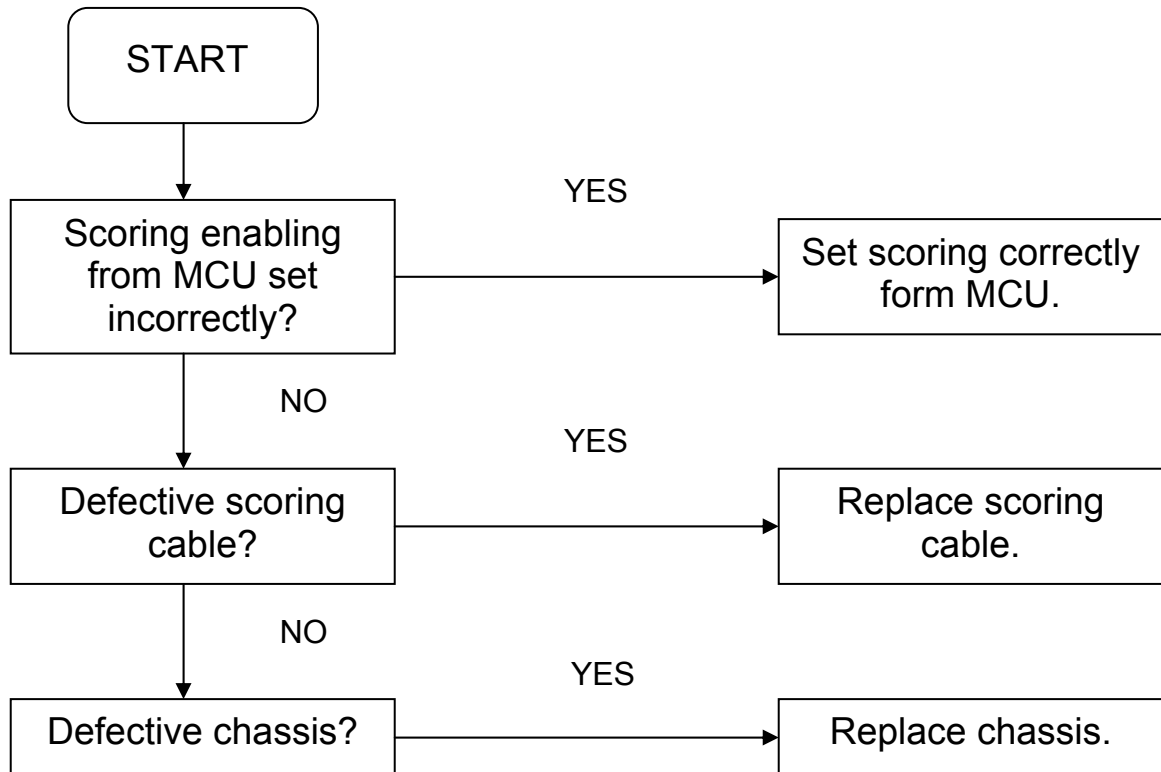


Figure 4.5-26



## QubicaAMF 90XLi Pinspotter

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

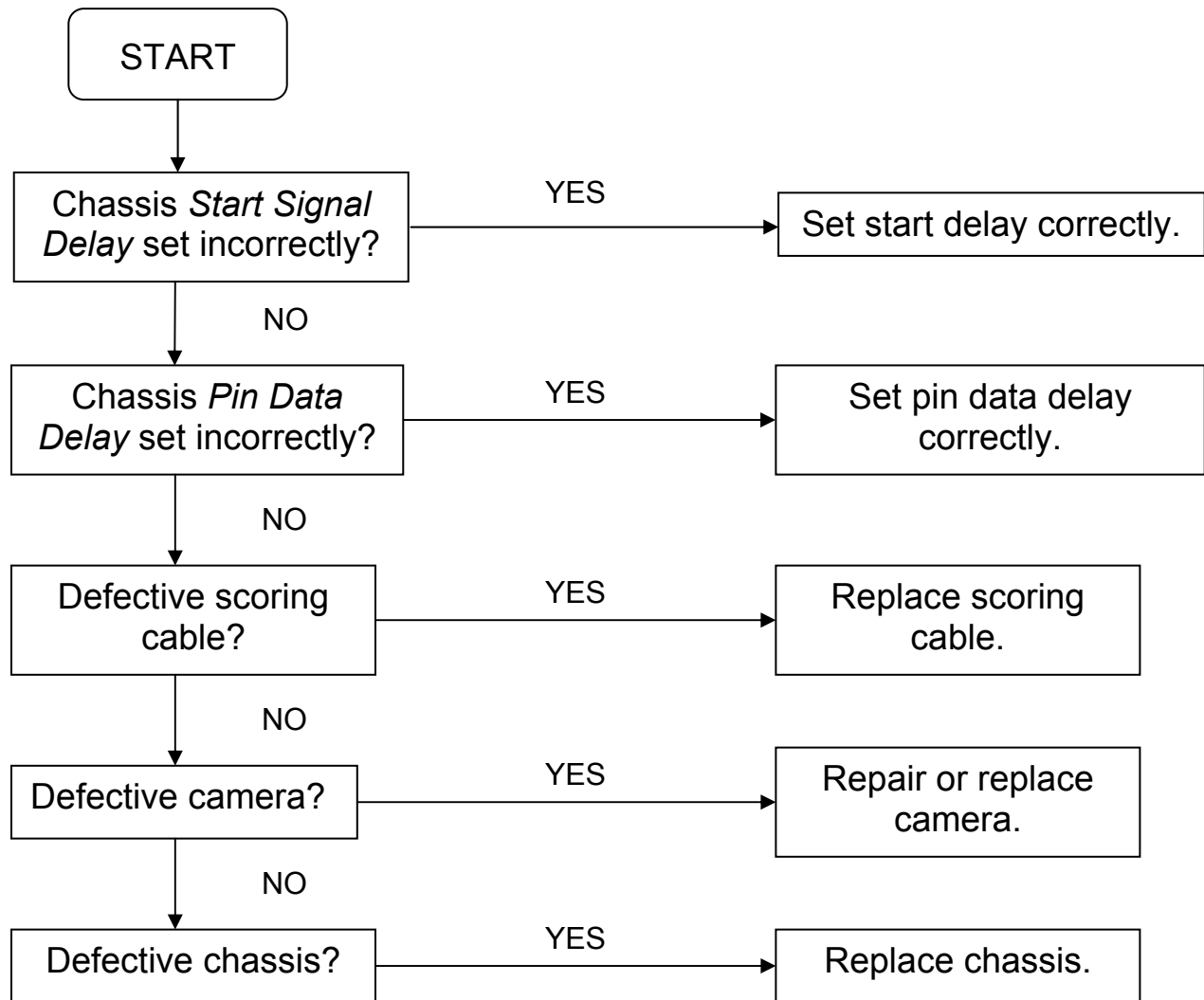
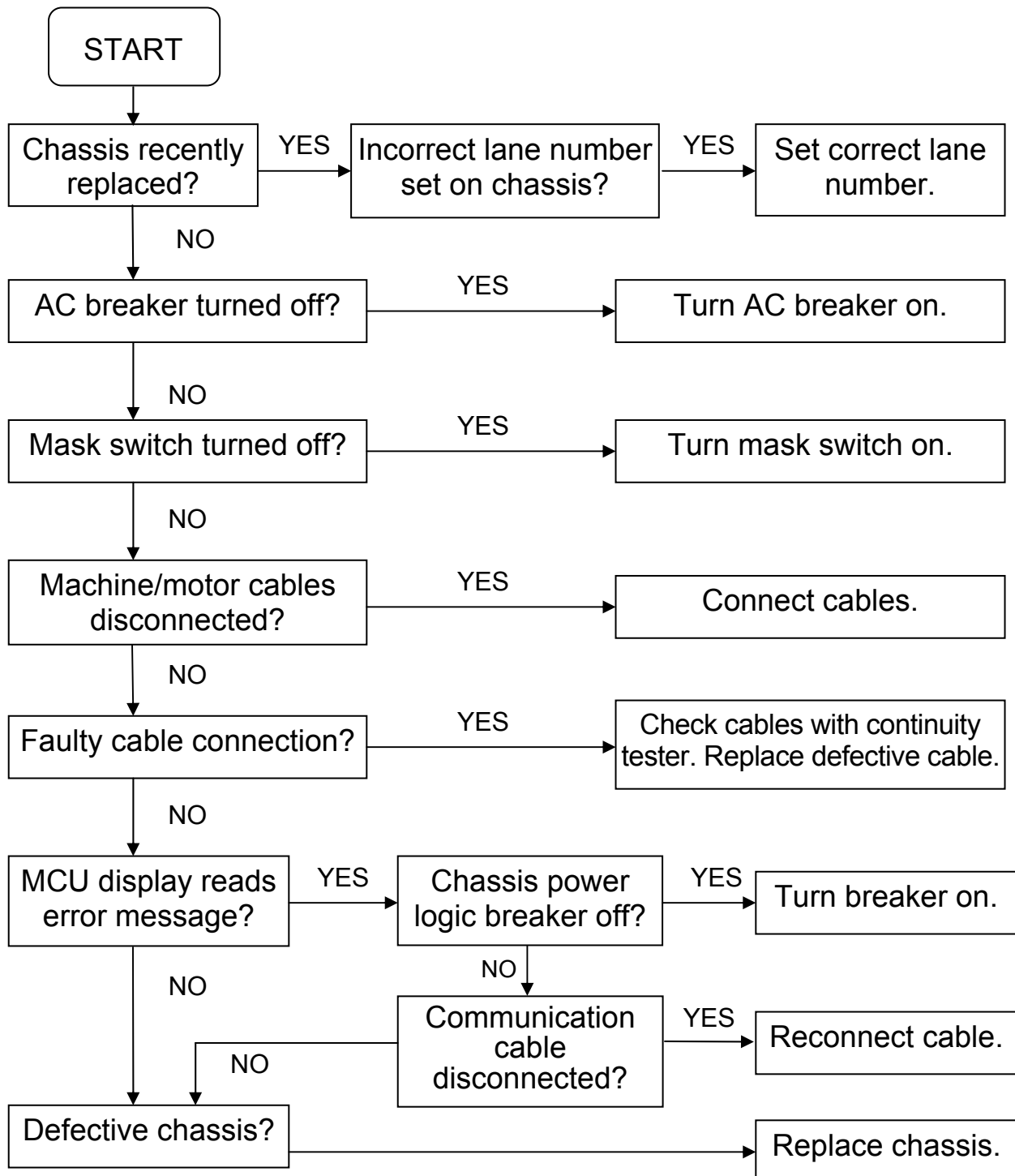


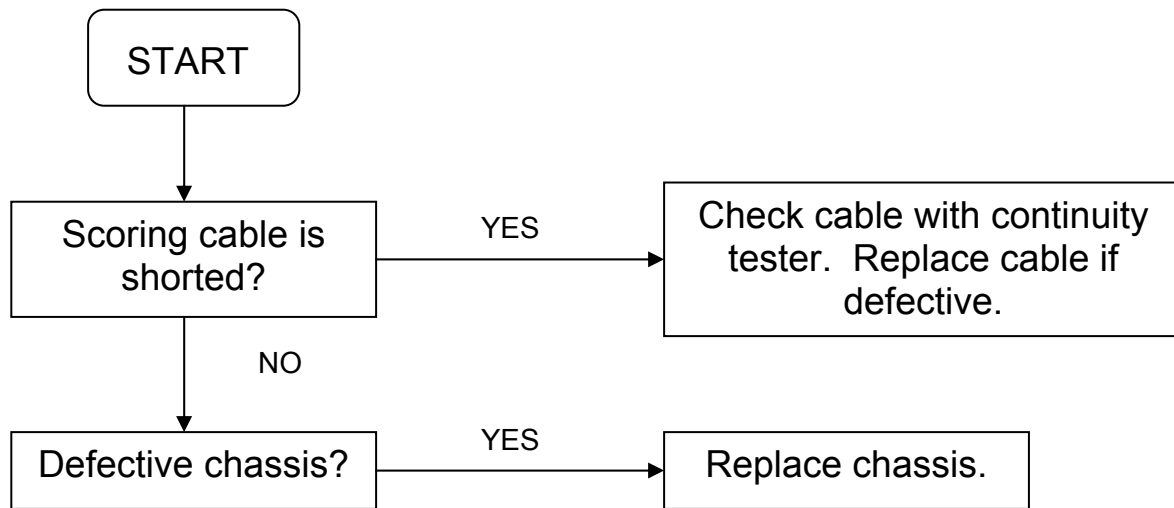
Figure 4.5-27

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

**Figure 4.5-28**



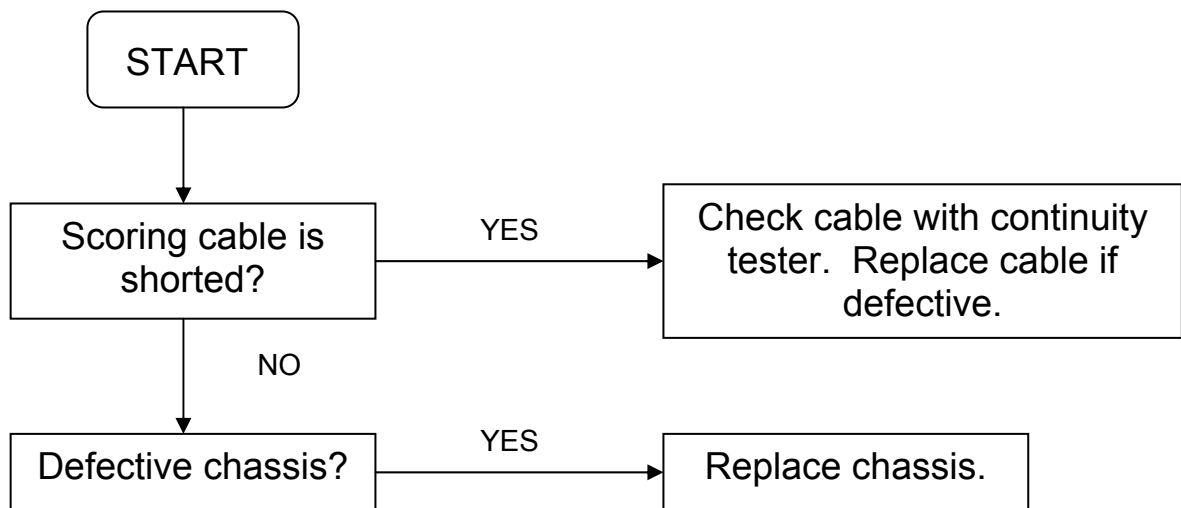
## QubicaAMF 90XLi Pinspotter

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



**Figure 4.5-29**

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



**Figure 4.5-30**



## QubicaAMF 90XLi Pinspotter

### 4.5.6 MOTOR TROUBLESHOOTING

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

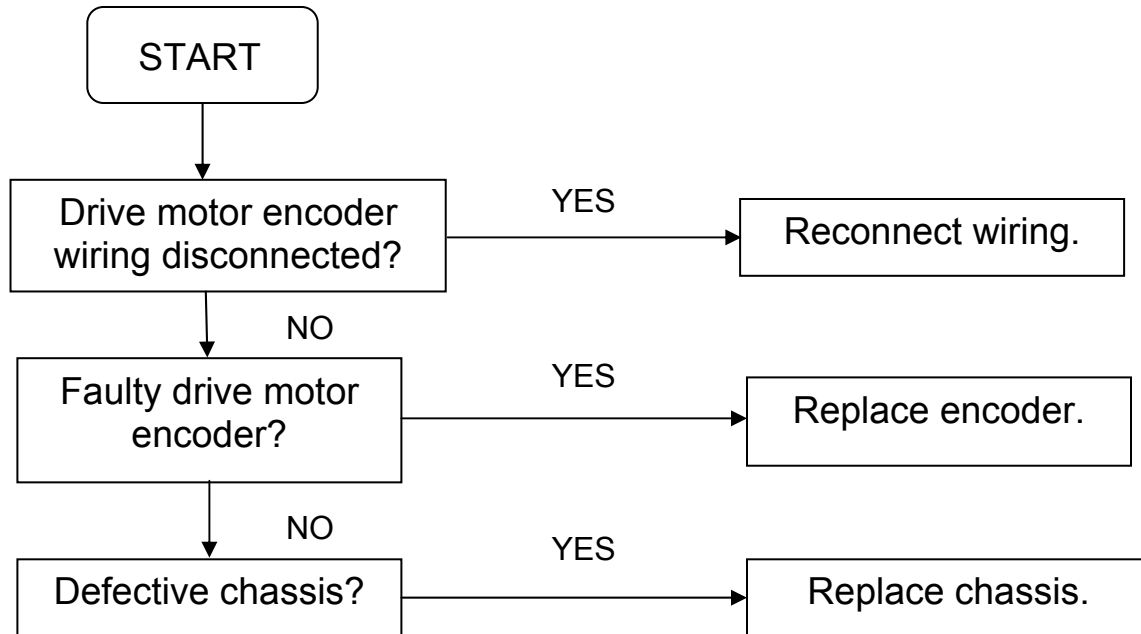
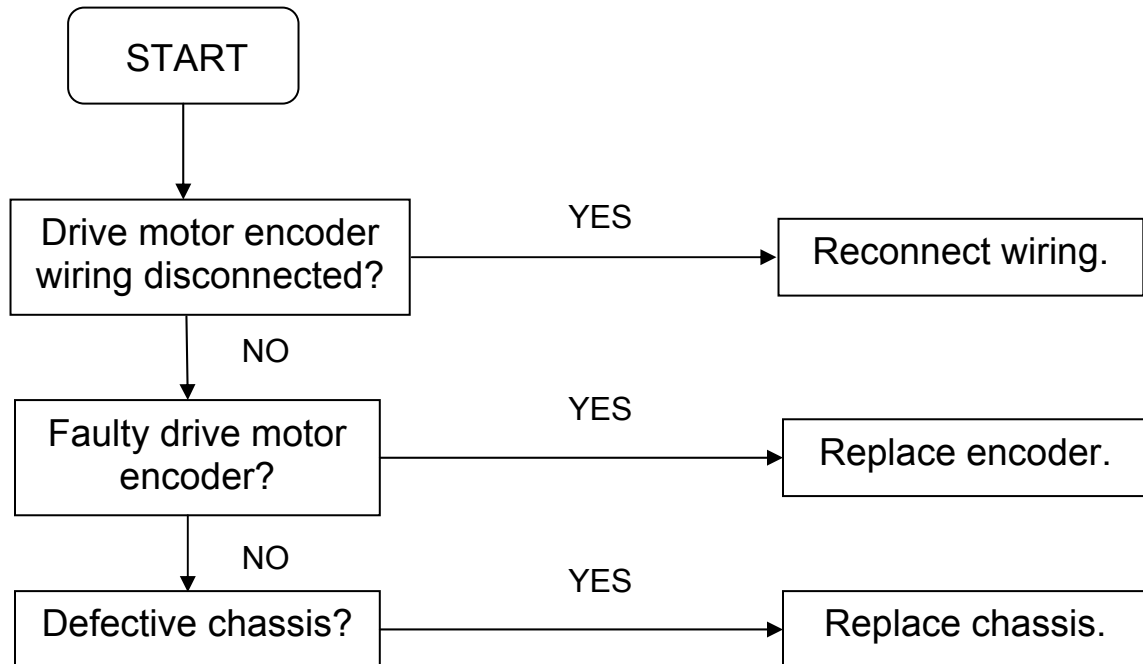


Figure 4.5-31



**4.5.6.2 PROBLEM: Sweep motor runs continuously.****Figure 4.5-32**



## QubicaAMF 90XLi Pinspotter

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

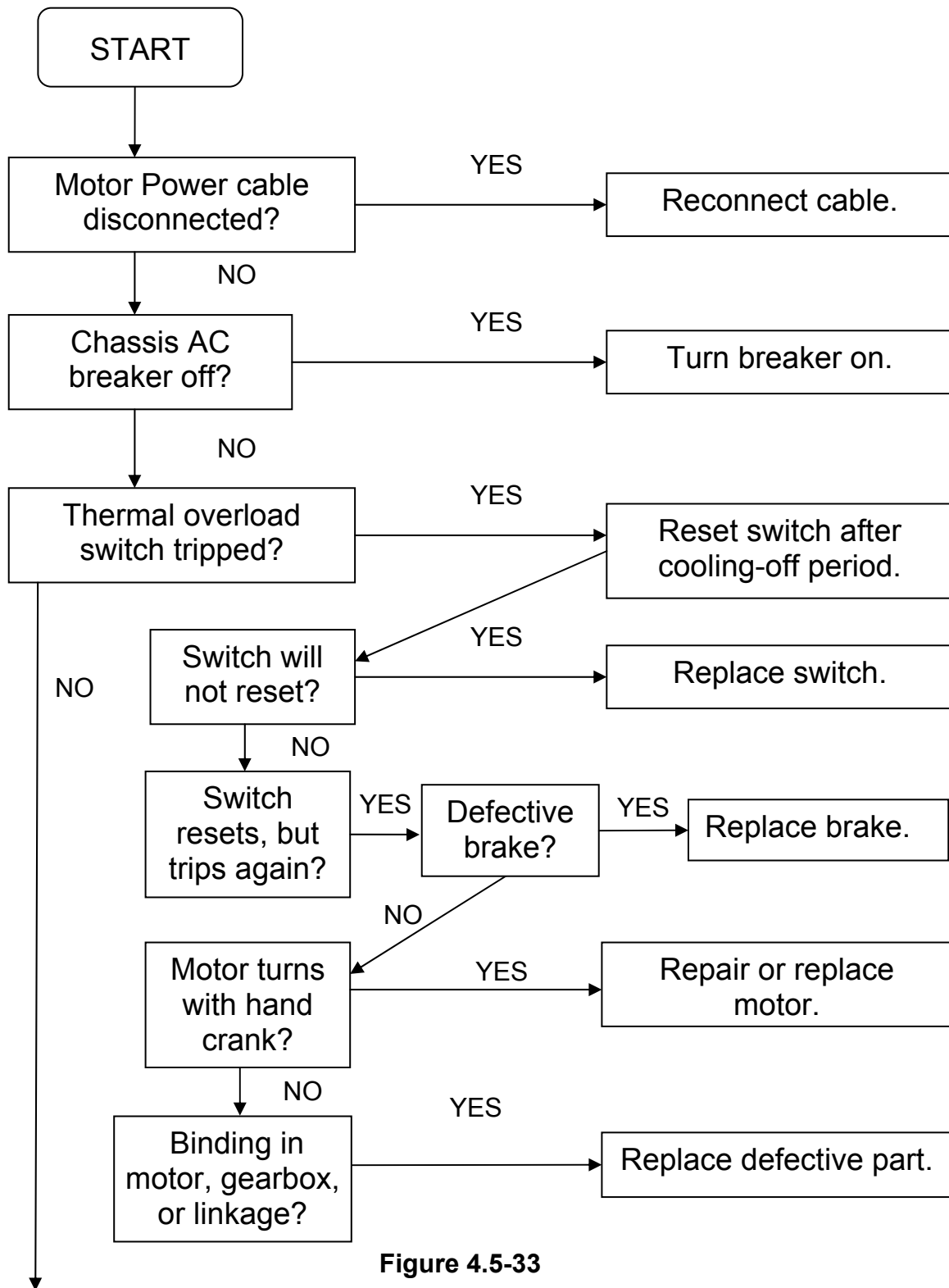
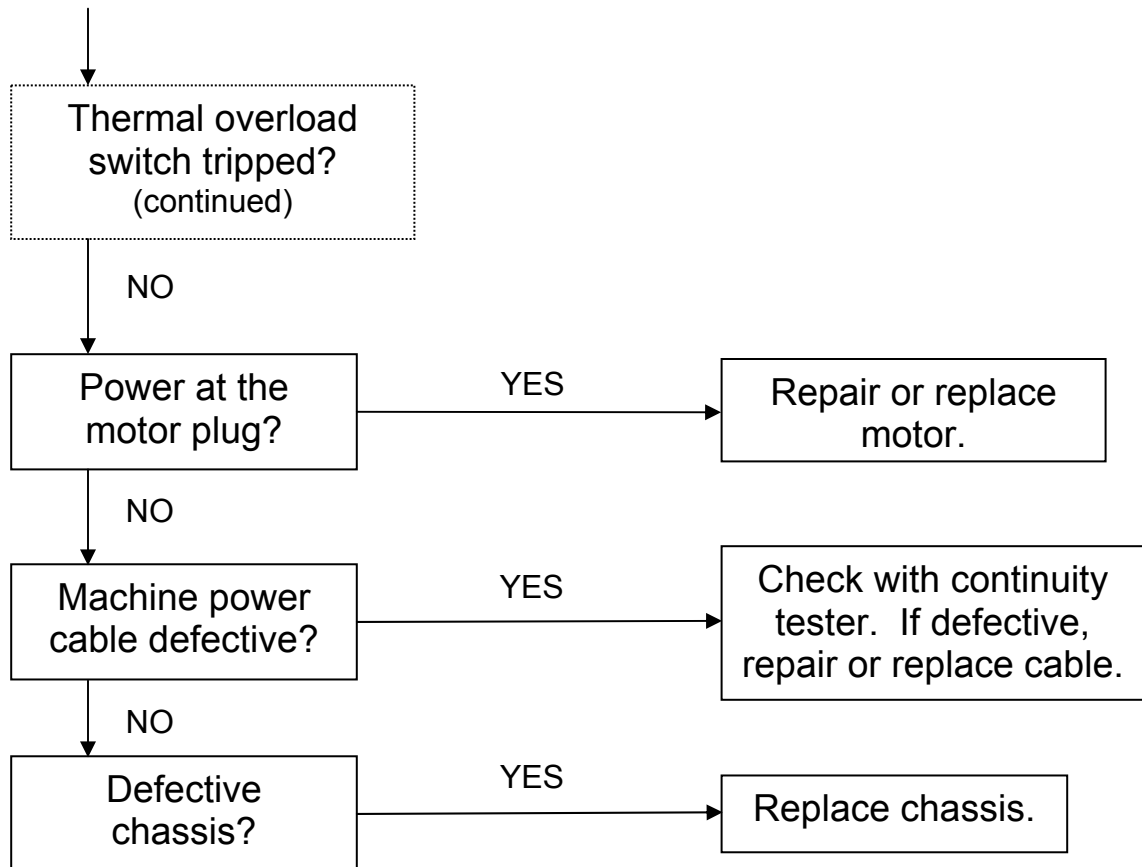


Figure 4.5-33

**4.5.6.3 PROBLEM: Front end motor will not run. (Continued from previous page.)****Figure 4.5-34**



## QubicaAMF 90XLi Pinspotter

### 4.5.7 PIT LIGHT TROUBLESHOOTING

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

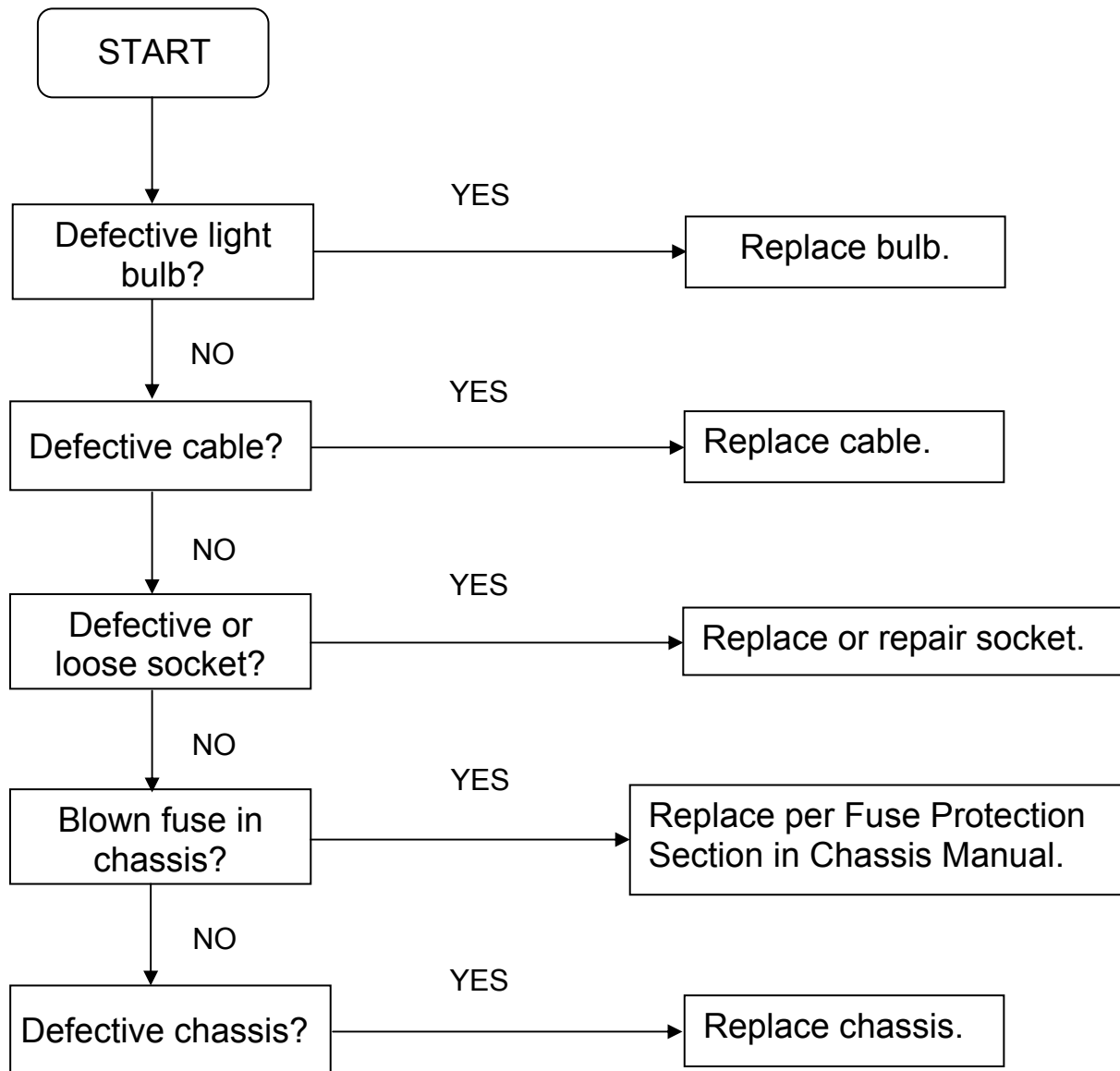


Figure 4.5-35

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# Section 5.0

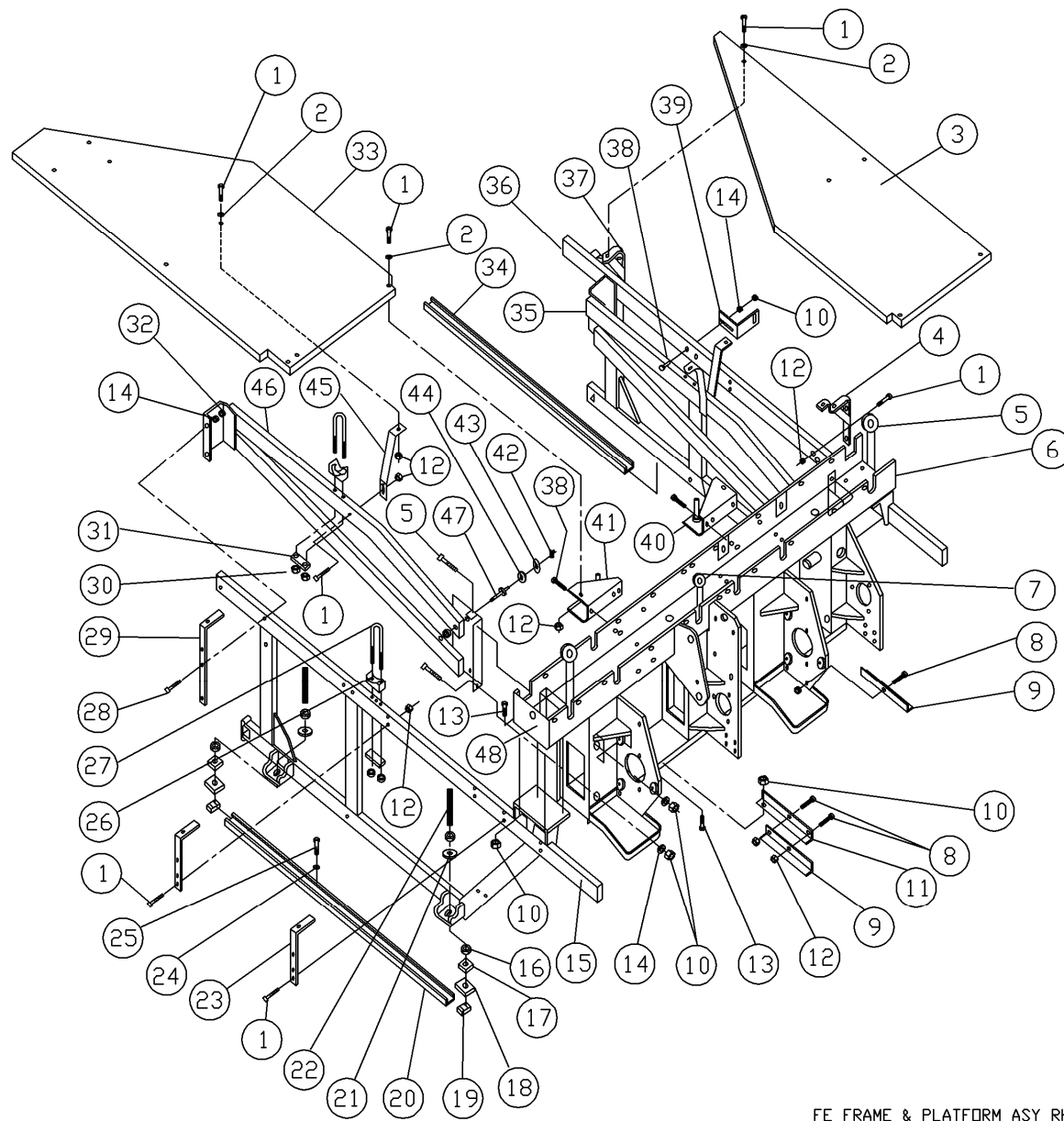
## Drawings and Part Numbers

The drawings and parts lists in this section contain the following attributes:

- The use of the letters L.H. or R.H. in the description refers to a part that is specific to the left hand or right hand side of a machine. Left hand and right hand components may look similar, but are not interchangeable within the same machine. The phrases L.H. MACHINE and R.H. MACHINE in the description refer to parts that are specific to either a left hand or right hand machine. It is possible for a part to carry both designations. For example, a part's description may include the phrase: R.H./L.H. MACHINE. This would indicate a part that is used on the right hand side of a left hand machine. **It is important to note that when referring to a left hand or right hand machine, the point of reference is from the back of the machine. (Lane 1 is a right hand machine, Lane 2 is a left hand machine, etc.) When referring to L.H. or R.H. parts, the point of reference is from the front of the machine.**
- Because the older LH/RH convention can be confusing, some parts are now designated either EVEN or ODD based on whether they go into an even or odd numbered pinspotter (i.e. Lane 1 is an odd machine, etc.). For similar components within a machine, the designation 7-PIN SIDE or 10-PIN SIDE is now commonly used as these positions are easily identified and are independent of the point of reference.
- 110V & 220V indicate components that are to be used in machines connected to electrical circuits that correspond to the indicated voltage only. 220V components can also be used on 240-volt circuits.
- Two or more item numbers may be shown associated with a single part. When adjacent item numbers refer to the same part, the item number closest to the line pointing to the part is the one that is actually depicted. For example, items 20 and 21 refer to the same part. Item 20 also carries a R.H. designation while item 21 carries a L.H. designation. A pointer (line) connects item 20 and the illustration. The illustrated part is the R.H. part. The L.H. part is not shown and may be a mirror image of item 20 or may have other physical differences. Both part numbers are included in the parts list.
- Components with a number followed by the letter 'A', such as (8A), indicate an assembly. Assemblies contain two or more parts (see the assembly's part description for the parts that are included in the assembly) and may be the more efficient means of replacing the main component. The number assigned to an assembly (in this example the number 8) indicates the major component of the assembly.

Occasionally there are two different assemblies with the same major component. In this case, the first assembly will be as described in the previous paragraph, and the second assembly will have a number after the letter 'A', as in (8A1).

# FRONT END FRAME & PLATFORM ASSEMBLY – ODD MACHINE



FE FRAME & PLATFORM ASY RH

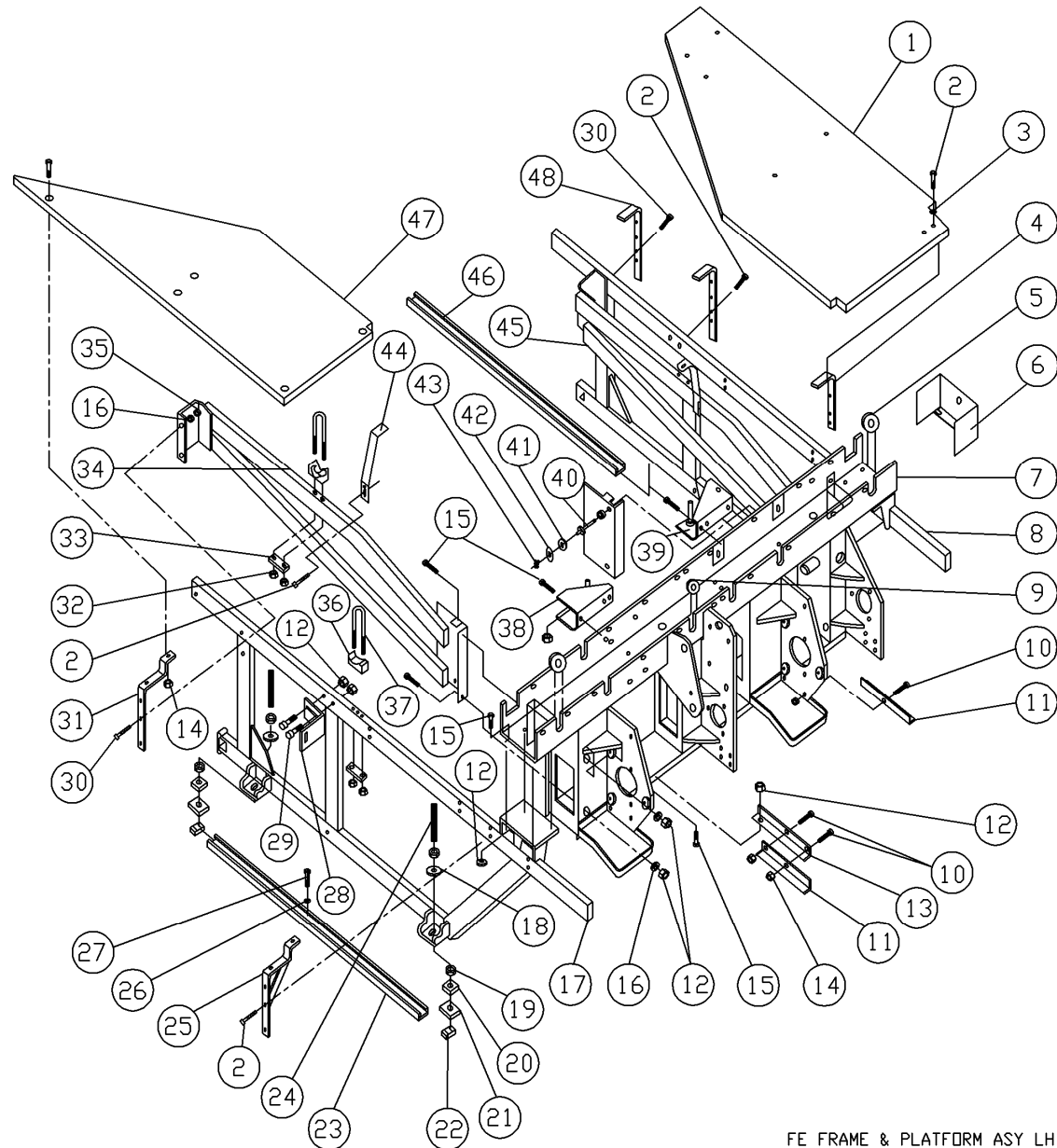




## FRONT END FRAME & PLATFORM ASSEMBLY – ODD MACHINE

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, R.H.	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	088-200-566	CROSS BEAM WELDMENT	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, L.H.
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 R.H.
10	24	839-665-002	NUT, HEX LOCK 3/8 -16	36	1	090-004-002	SIDE FRAME, R.H.
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	18	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, R.H.)
15	1	090-004-006	SIDE FRAME, L.H.	41	1	070-006-413	BRACKET WELDMENT (BIN ASSEMBLY, L.H.)
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 L.H.
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



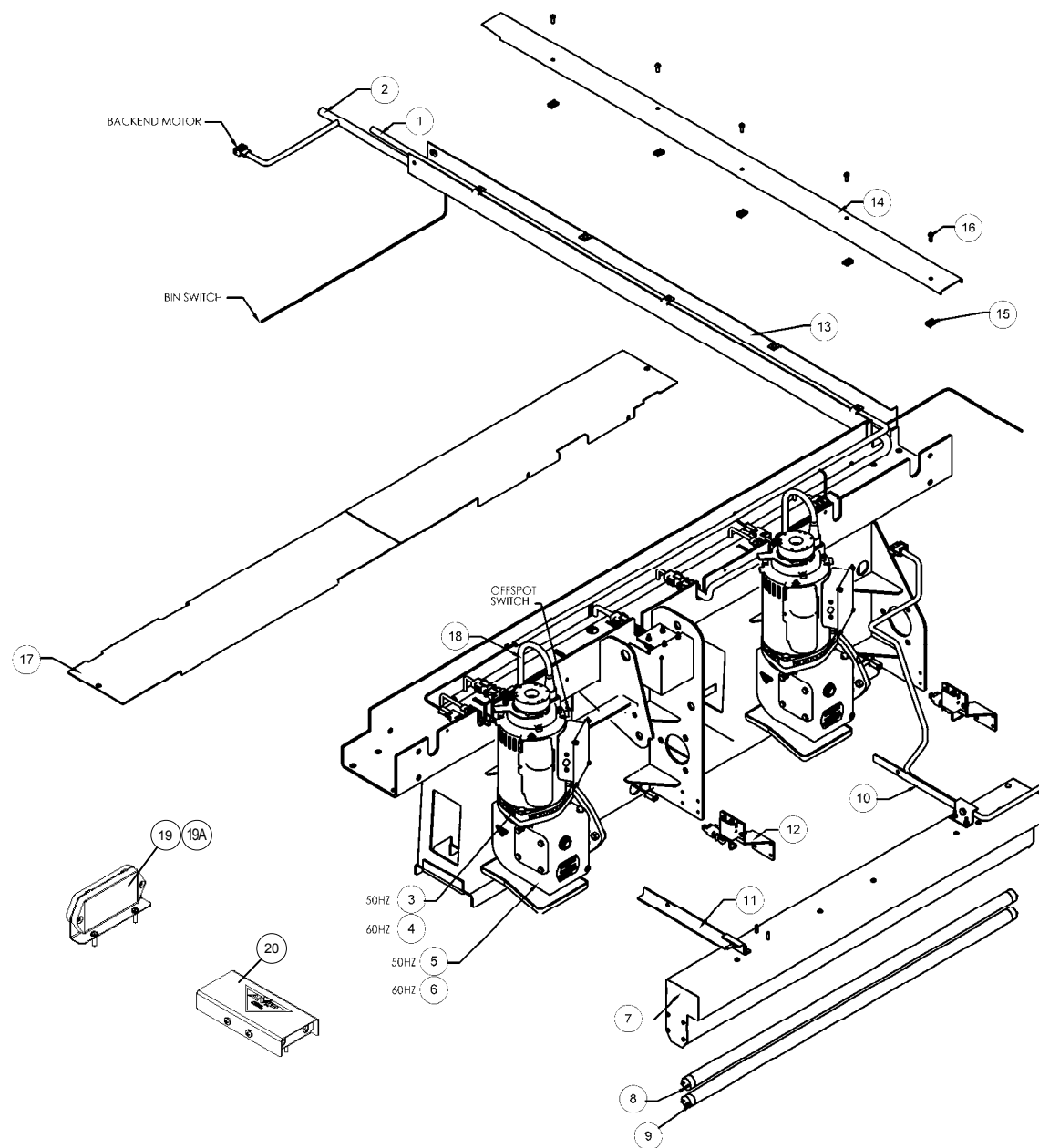
FE FRAME & PLATFORM ASY LH



## FRONT END FRAME & PLATFORM ASSEMBLY – EVEN MACHINE

ITEM	QTY	PART #	DESCRIPTION	ITEM	QTY	PART #	DESCRIPTION
1	1	070-006-426	PLATFORM, R.H.	27	8	810-556-320	SCREW, HEX LAG, 5/16 X 2
2	20	809-849-285	SCREW, HEX, 1/4 -20 X 1-3/4	28	2	070-004-654	TRACK SUPPORT BRACKET
3	10	948-753-102	WASHER, FLAT, 5/8 X 9/32 X 1/16	29	4	809-865-285	SCREW, HEX, 3/8 - 16 X 1-3/4
4	2	070-001-817	PLATFORM ANGLE WELDMENT	30	6	809-865-325	SCREW, HEX, 3/8 - 16 X 2
5	2	250-001-046	GROMMET, LARGE	31	1	070-006-414	PLATFORM SUPPORT BRACKET
6	1	090-005-034	END PLATE	32	8	844-057-002	NUT, STOVER LOCK, 5/16 - 18
7	1	088-200-566	CROSSBEAM WELDMENT	33	4	070-008-126	CLAMP BAR
8	1	090-004-003	SIDE FRAME, R.H.	34	1	090-005-646	INNER SIDE BRACE, L.H.
9	8	711-520-017	GROMMET, SMALL	35	4	840-065-002	NUT, FLEX LOCK, THIN, 3/8 - 16
10	4	809-849-125	SCREW, HEX, 1/4 -20 X 3/4	36	4	000-021-528	SADDLE
11	2	070-001-698	PIT LIGHT BRACKET	37	4	804-557-731	U-BOLT, SWEEP MOUNTING
12	24	839-665-002	NUT, STOVER LOCK, 3/8 -16	38	1	070-006-413	BRACKET WELDMENT, BIN ASSEMBLY, L.H.
13	1	070-001-596	ANGLE BRACKET	39	1	070-006-411	BRACKET WELDMENT, BIN ASSEMBLY, R.H.
14	14	844-049-002	NUT, STOVER LOCK, 1/4 - 20	40	4	090-002-028	PIN SPRING ROLLER
15	18	809-865-165	SCREW, HEX, 3/8 - 16 X 1	41	4	090-003-795	COUNTERBALANCE SPRING ROLLER
16	25	948-767-132	WASHER, FLAT, 13/16 X 13/32 X 1/16	42	4	945-867-242	WASHER, 13/32 X 1-1/2
17	1	090-004-006	SIDE FRAME, L.H.	43	4	963-400-002	X-WASHER
18	4	000-021-787	WASHER, 9/16 X 1-5/8 X 1/4	44	3	070-006-490	PLATFORM SUPPORT BRACKET
19	8	835-573-002	NUT, HEX JAM, 1/2 - 13	45	1	090-005-647	INNER SIDE BRACE, R.H.
20	4	070-007-509	ELEVATING NUT	46	1	070-007-843	UNISTRUT, LONG
21	4	000-021-786	FRAME ADJUSTMENT PLATE	47	1	070-006-425	PLATFORM, L.H.
22	4	853-500-001	UNISTRUT NUT	48	1	070-006-405	ANGLE WELDMENT
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				

# FRONT END ELECTRICAL INSTALLATION - ODD MACHINE

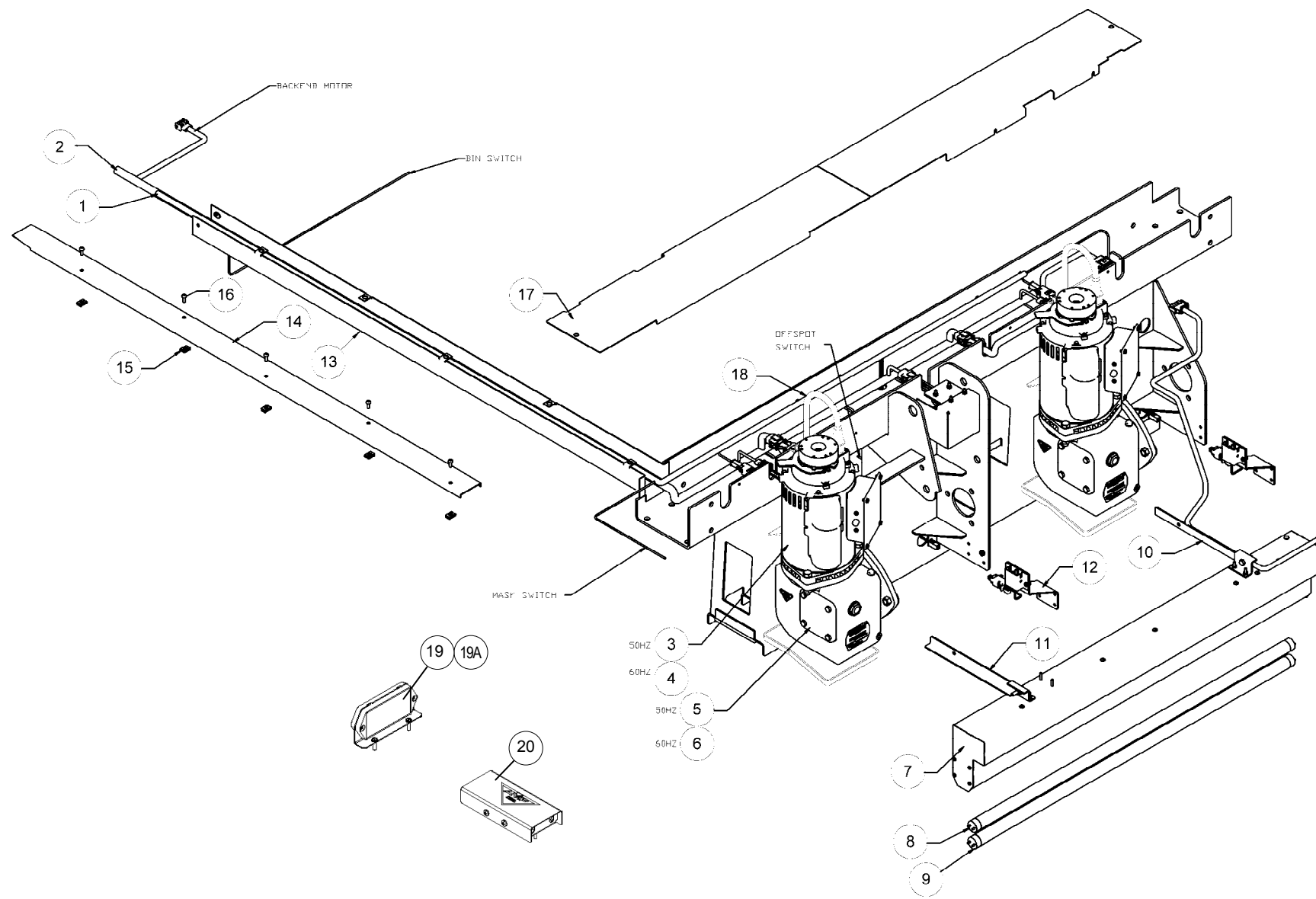




## FRONT END ELECTRICAL INSTALLATION - ODD MACHINE

ITEM	QTY	PART #	DESCRIPTION	ITEM	QTY	PART #	DESCRIPTION
1	1	088-000-007	ODD LOGIC CABLE				
2	1	088-000-008	ODD POWER CABLE				
3	2	088-000-145	FRONT END MOTOR ASSEMBLY, 50 HZ				
4	2	088-000-146	FRONT END MOTOR ASSEMBLY, 60 HZ				
5	2	088-004-509	FRONT END GEARBOX, 50HZ				
6	2	088-004-504	FRONT END GEARBOX, 60HZ				
7	1	088-000-024	DUAL PIT LIGHT ASSEMBLY, DUAL INPUT				
8	1	751-001-466	LAMP, DAY LIGHT T8 36", 30W				
9	1	751-001-460	LAMP, BLACK LIGHT T8 36", 30W				
10	1	070-001-907	PIT LIGHT SUPPORT BRACKET, R.H.				
11	1	070-001-908	PIT LIGHT SUPPORT BRACKET, L.H.				
12	2	088-000-107	HOME ASSEMBLY				
13	1	088-200-477	CABLE DUCT ASSEMBLY				
14	1	088-200-478	CABLE DUCT COVER				
15	5	724-511-074	U-NUT, 10 - 32				
16	5	812-840-082	SCREW, ROUND HEAD, 10 - 32 X ½				
17	2	090-005-053	CROSSBEAM COVER				
18	2	090-005-876	MOTOR CABLE				
19	2	088-000-189	REFLECTOR, XL/ BALL DETECTOR				
19A	1	088-001-292	REFLECTOR KIT (incl. 2 reflectors and bracket)				
20	1	088-000-080	BALL DETECTOR ASSEMBLY				

# FRONT END ELECTRICAL INSTALLATION - EVEN MACHINE

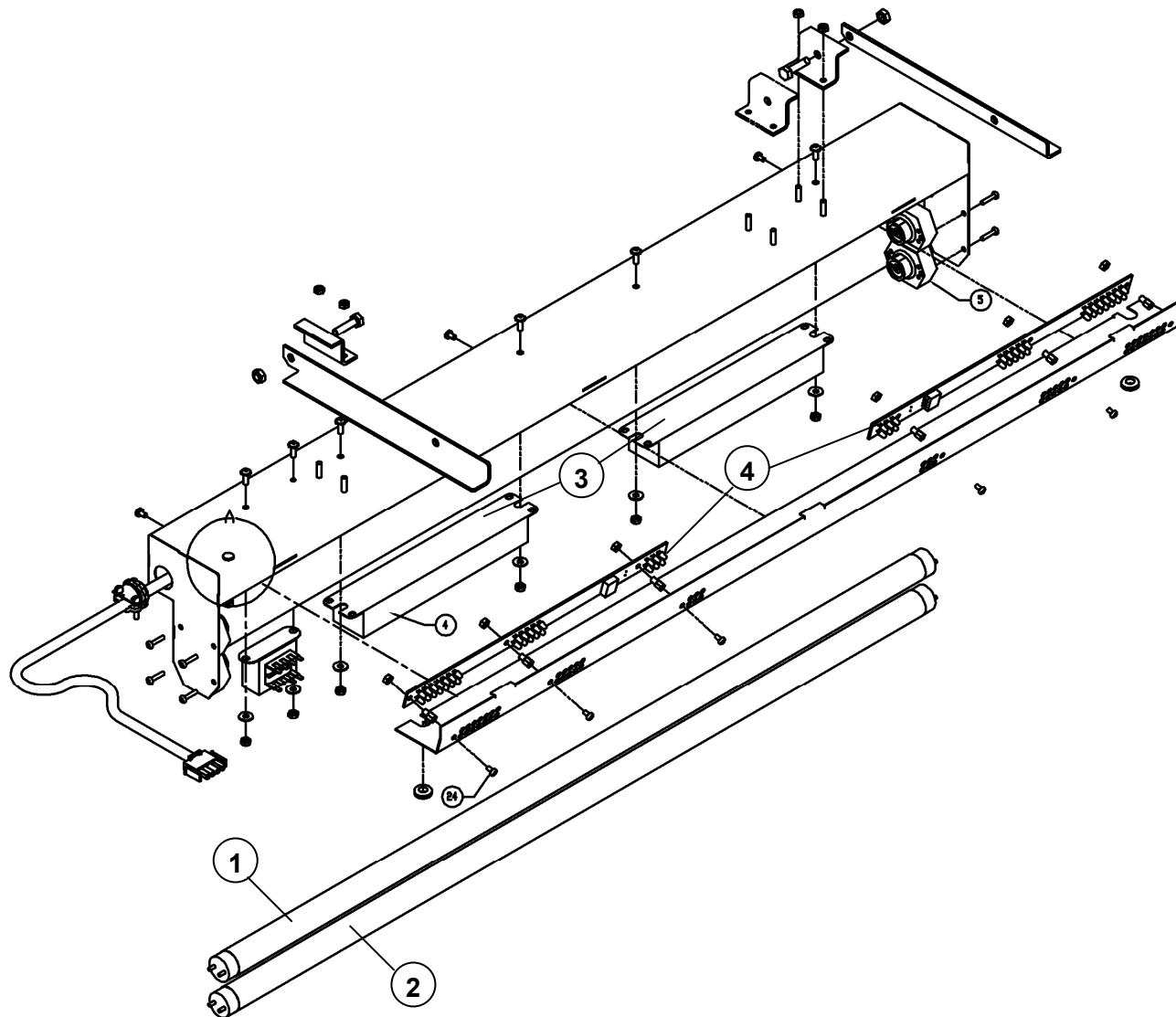




## FRONT END ELECTRICAL INSTALLATION - EVEN MACHINE

ITEM	QTY	PART #	DESCRIPTION	ITEM	QTY	PART #	DESCRIPTION
1	1	088-000-005	EVEN LOGIC CABLE				
2	1	088-000-006	EVEN POWER CABLE				
3	2	088-000-145	FRONT END MOTOR ASSEMBLY, 50 HZ				
4	2	088-000-146	FRONT END MOTOR ASSEMBLY, 60 HZ				
5	2	088-004-509	FRONT END GEARBOX, 50HZ				
6	2	088-004-504	FRONT END GEARBOX, 60HZ				
7	1	088-000-024	DUAL PIT LIGHT ASSEMBLY, DUAL INPUT				
8	1	751-001-466	LAMP, DAY LIGHT T8 36", 30W				
9	1	751-001-460	LAMP, BLACK LIGHT T8 36", 30W				
10	1	070-001-907	PIT LIGHT SUPPORT BRACKET, R.H.				
11	1	070-001-908	PIT LIGHT SUPPORT BRACKET, L.H.				
12	2	088-000-107	HOME ASSEMBLY				
13	1	088-200-477	CABLE DUCT ASSEMBLY				
14	1	088-200-478	CABLE DUCT COVER				
15	5	724-511-074	U-NUT, 10 - 32				
16	5	812-840-082	SCREW, ROUND HEAD, 10 - 32 X ½				
17	2	090-005-053	CROSSBEAM COVER				
18	2	090-005-876	MOTOR CABLE				
19	2	088-000-189	REFLECTOR, XL/ BALL DETECTOR				
19A	1	088-001-292	REFLECTOR KIT (incl. 2 reflectors and bracket)				
20	1	088-000-080	BALL DETECTOR ASSEMBLY				

## DUAL PIT LIGHT ASSEMBLY



088-000-024, DUAL PIT LIGHT ASSEMBLY



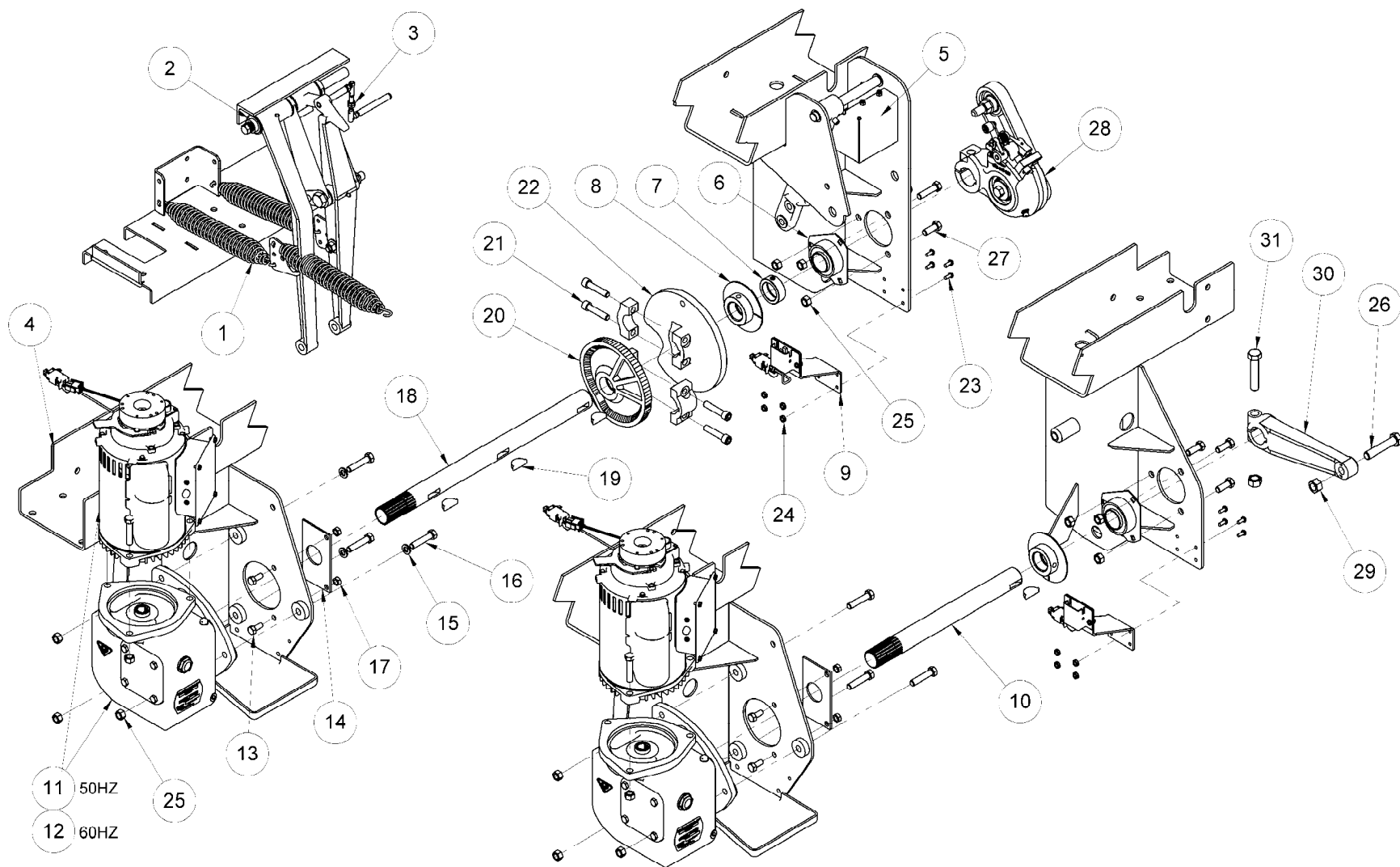


## DUAL PIT LIGHT ASSEMBLY

ITEM	QTY	PART #	DESCRIPTION
1	1	751-001-466	LAMP, DAY LIGHT T8 36", 30W
2	1	751-001-460	LAMP, BLACK LIGHT T8 36", 30W
3	2	740-501-017	BALLAST, 110-277V, 50/60 HZ
4	2	090-008-020	INFRARED LAMP ASSEMBLY

ITEM	QTY	PART #	DESCRIPTION

# FRONT END DRIVE

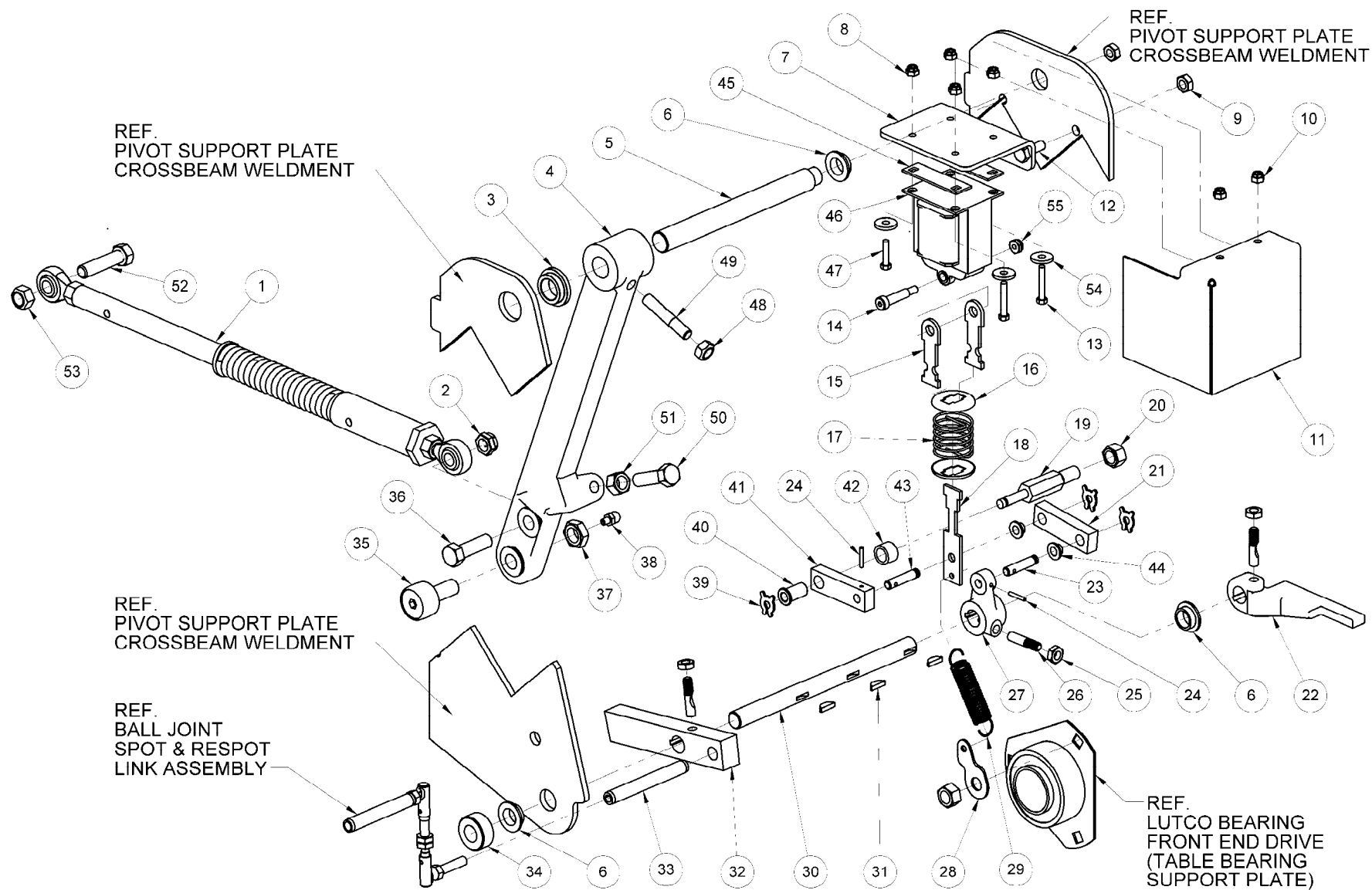




## FRONT END DRIVE

ITEM	QTY	PART #	DESCRIPTION	ITEM	QTY	PART #	DESCRIPTION
1	3	070-001-707	EXTENSION SPRING	27	5	809-865-165	SCREW, HEX, 3/8 - 16 X 1
2	1	070-006-492	RESPOT ARM LINK ASSEMBLY	28	1	090-005-550	TABLE DRIVE ASSEMBLY
3	1	070-006-493	BALL JOINT ASSEMBLY	29	3	844-073-002	NUT, STOVER LOCK, 1/2 - 13
4	1	088-200-566	CROSSBEAM WELDMENT	30	1	000-023-139	CRANK ARM
5	1	090-005-029	SOLENOID GUARD	31	2	809-873-405	SCREW, HEX, 1/2 - 13 X 2-1/2
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				
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	7	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	12	839-665-002	NUT, FLEX LOCK, 3/8 - 16				
26	1	070-003-243	CRANK ARM SCREW				

# SOLENOID & SHUTTLE OPERATING ASSEMBLY

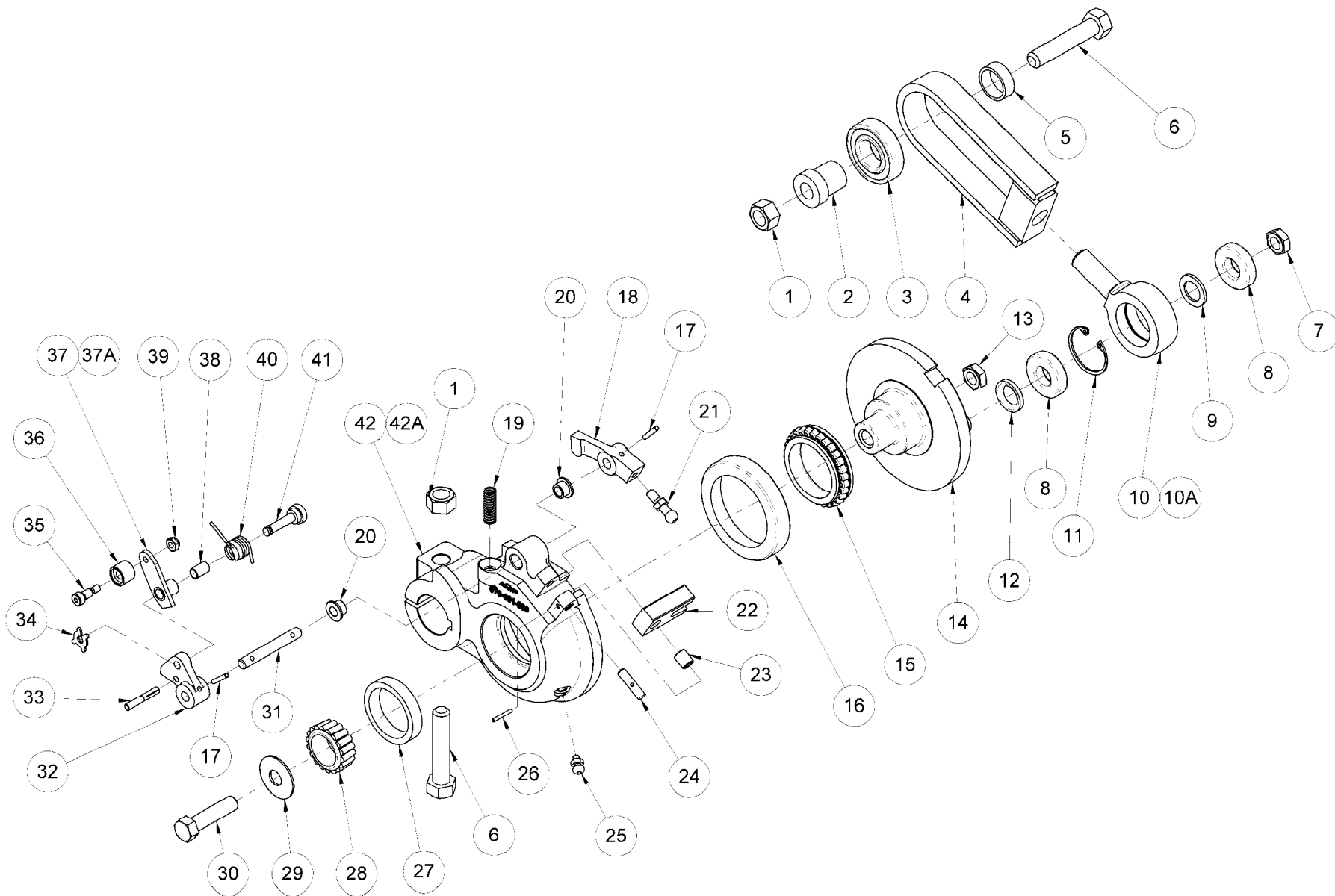




## SOLENOID & SHUTTLE OPERATING ASSEMBLY

ITEM	QTY	PART #	DESCRIPTION	ITEM	QTY	PART #	DESCRIPTION
1	1	090-005-263	SHUTTLE CONNECTING ROD	29	1	070-006-283	SHUTTLE DRIVE LINK SPRING
2	1	840-065-002	NUT, FLEX LOCK, 3/8 - 16	30	1	090-005-017	SOLENOID PIVOT SHAFT
3	1	900-210-251	FLANGED BEARING	31	3	907-000-200	KEY
4	1	070-006-295	SHUTTLE OPERATING ROD LEVER	32	1	070-006-456	STOP LEVER
5	1	090-004-017	RESPOT LEVER SHAFT	33	1	913-464-480	SPRING PIN, 3/8 X 3
6	3	900-208-041	FLANGED BEARING, .503 X .753 X 5/16	34	1	901-100-110	SET COLLAR
7	1	090-005-018	SOLENOID BRACKET	35	1	070-006-728	CAM FOLLOWER
8	4	839-533-002	NUT, NYLON LOCK, 8 - 32	36	1	809-865-205	SCREW, HEX, 3/8 - 16 X 1-1/4
9	2	844-049-002	NUT, STOVER LOCK, 1/4 - 20	37	1	835-570-002	NUT, HEX JAM, 7/16 - 20
10	2	843-133-002	NUT, HEX LOCK, 8 - 32	38	1	710-501-012	GREASE FITTING
11	1	090-005-029	SOLENOID GUARD	39	3	963-200-002	X - WASHER
12	2	809-849-125	SCREW, HEX, 1/4 - 20 X 3/4	40	1	900-204-121	FLANGED BEARING, .25 X .378 X 3/4
13	2	813-933-162	SCREW, HEX, 8 - 32 X 1	41	1	070-008-134	LINK ASSEMBLY
14	1	880-139-200	SHOULDER BOLT, 1/4 X 7/8, BLACK	42	1	070-008-133	LINK ASSEMBLY SPACER
15	2	070-006-724	LINK, SHUTTLE SPRING	43	1	070-006-287	PIN, LONG
16	2	070-006-277	SPRING WASHER	44	2	070-002-653	FLANGED BEARING, .252 X .315 X .33
17	1	070-006-276	SHUTTLE DRIVE SPRING	45	2	090-003-459	DAMPER BASE
18	1	070-006-282	LINK, SPOTTING SOLENOID	46	1	090-005-723	SOLENOID, 50/60 HZ, 230V
19	1	090-005-028	SOLENOID PIVOT STUD	47	2	814-333-122	SCREW, HEX, 8 - 32 X 3/4
20	1	839-665-002	NUT, FLEX LOCK, 3/8 - 16	48	1	844-057-002	NUT, HEX, 5/16 - 18
21	1	070-008-132	LINK ASSEMBLY	49	1	070-006-284	CLAMP STUD 5/16 X 1-3/4
22	1	070-006-278	CAM LINK	50	1	809-865-205	SCREW, HEX, 3/8 - 16 X 1
23	1	070-001-777	LINK PIN	51	1	835-566-002	NUT, HEX JAM, 3/8 - 16
24	2	913-415-100	SPRING PIN, 3/32 X 5/8	52	1	809-865-245	SCREW, HEX, 3/8 - 16 X 1 1/2
25	3	835-549-002	NUT, HEX JAM, 1/4 - 20	53	1	844-065-002	NUT, STOVER LOCK, 3/8 - 16
26	3	070-006-116	CLAMP STUD, 1/4 X 1-1/8	54	4	948-637-072	WASHER, FLAT, 3/16 X 7/16 X 3/64
27	1	070-006-292	LINK	55	1	840-039-002	NUT, FLEX LOC, 10-24, THIN
28	1	070-006-280	SPRING CLIP				

# TABLE DRIVE ASSEMBLY

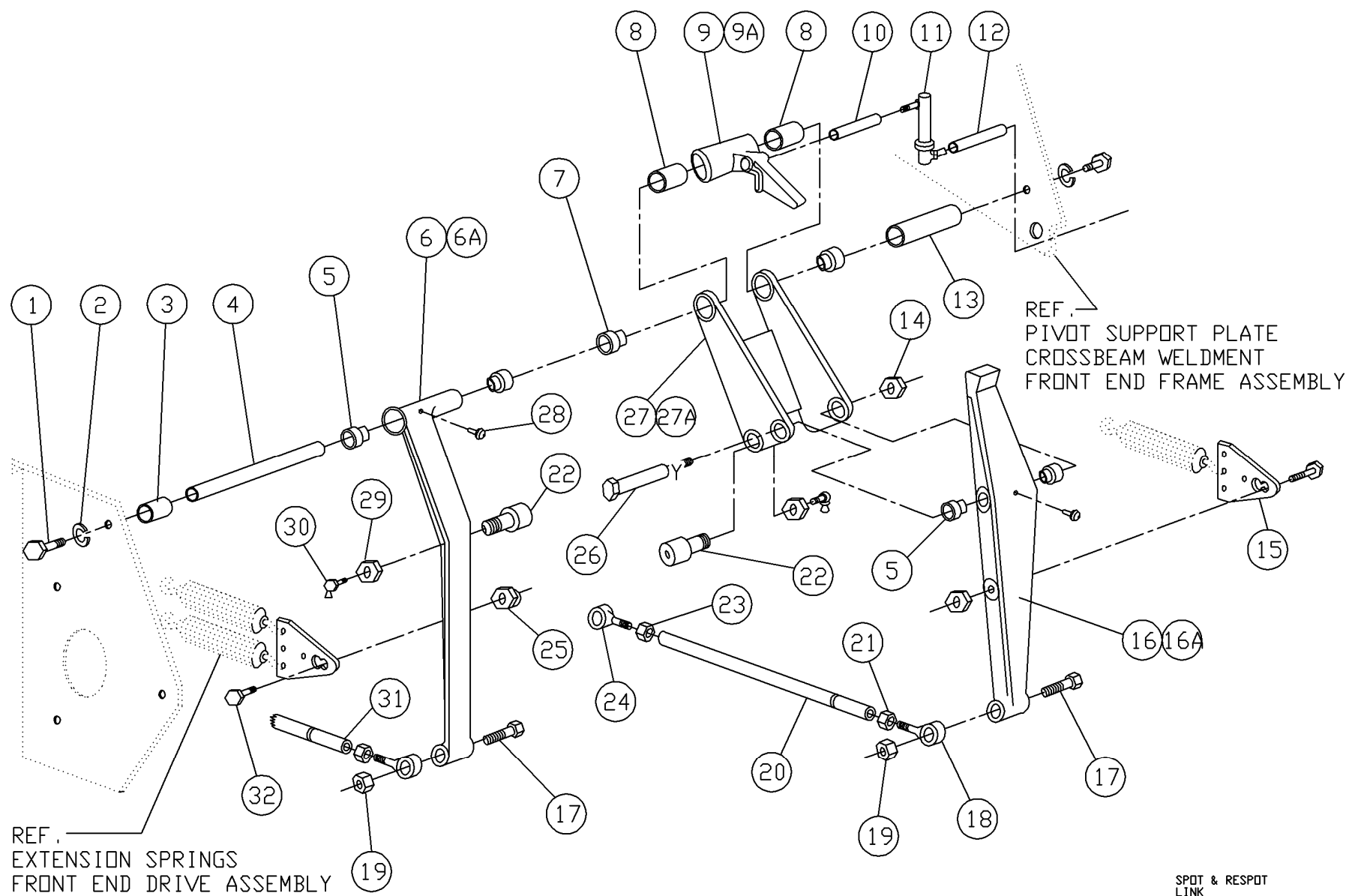




## TABLE DRIVE ASSEMBLY

ITEM	QTY	PART #	DESCRIPTION	ITEM	QTY	PART #	DESCRIPTION
1	2	844-073-002	NUT, STOVER LOCK, 1/2 - 13	25	1	710-501-004	GREASE FITTING
2	1	070-007-310	FLANGED BEARING, .502 X .871 X 1.20	26	1	913-415-120	SPRING PIN, .094 X 3/4
3	1	190-001-490	BALL BEARING	27	1	070-002-780	ROLLER BEARING CUP
4	1	070-007-755	YOKE WELDMENT	28	1	070-002-824	CONE & SEAL BEARING ASSEMBLY
5	1	070-007-311	SLEEVE, TABLE DRIVE ASSEMBLY	29	1	070-006-729	SPRING DISC
6	2	809-873-405	SCREW, HEX, 1/2 - 13 X 2-1/2	30	1	809-870-325	SCREW, HEX, 7/16 - 20 X 2
7	1	840-182-002	NUT, FLEX LOCK	31	1	070-008-325	PIN ACTUATOR ASSEMBLY
8	2	000-021-881	BALL BEARING, .625 X 1.375	32	1	070-008-322	LINK ACTUATOR ASSEMBLY
9	1	000-021-878	SPACER	33	1	912-137-200	GROOVE PIN, 1/16 X 1-1/4
10	1	000-021-879	ROD END	34	1	963-300-002	X-WASHER
10A	1	000-021-880	ROD END ASSY (includes 8, 9, 10 & 11)	35	1	880-139-120	SHOULDER SCREW, 10 - 24 X 1/4 X 3/8
11	1	919-000-600	RETAINING RING	36	1	070-001-857	NYLON ROLLER
12	1	070-001-849	WASHER, 1 X 5/8 X 1/8	37	1	070-001-861	LINK & HUB ASSEMBLY
13	1	840-070-002	NUT, FLEX LOCK, 7/16 - 20	37A	1	070-007-250	LINK ASSEMBLY (includes items 37 & 38)
14	1	090-005-549	TABLE DRIVE ECCENTRIC	38	1	070-002-652	BUSHING .252 X .315 X .5
15	1	070-002-776	CONE-STYLE ROLLER BEARING	39	1	839-539-002	NUT, FLEX LOCK, 10 - 24
16	1	070-002-777	BEARING CUP	40	1	070-001-931	SPRING
17	2	913-423-120	SPRING PIN, .125 X 3/4	41	1	070-001-932	PIN
18	1	070-008-321	LATCH ARM ASSY (1/8" SPRING PIN HOLE)	42	1	070-001-889	TABLE DRIVE CRANK HOUSING
19	1	070-001-917	COMPRESSION SPRING	42A	1	070-002-778	CRANK HOUSING & CUP ASSEMBLY (includes items 16, 20, 25, 27, & 42)
20	2	900-205-053	FLANGED BEARING .315 X .44 X 5/16				
21	1	070-001-893	CAM BALL ASSEMBLY				
22	1	070-001-918	LATCH ASSEMBLY				
23	1	900-104-071	SLEEVE BEARING, .253 X 7/16				
24	1	070-001-894	PIVOT PIN				

## SPOT & RESPOT LINKAGES



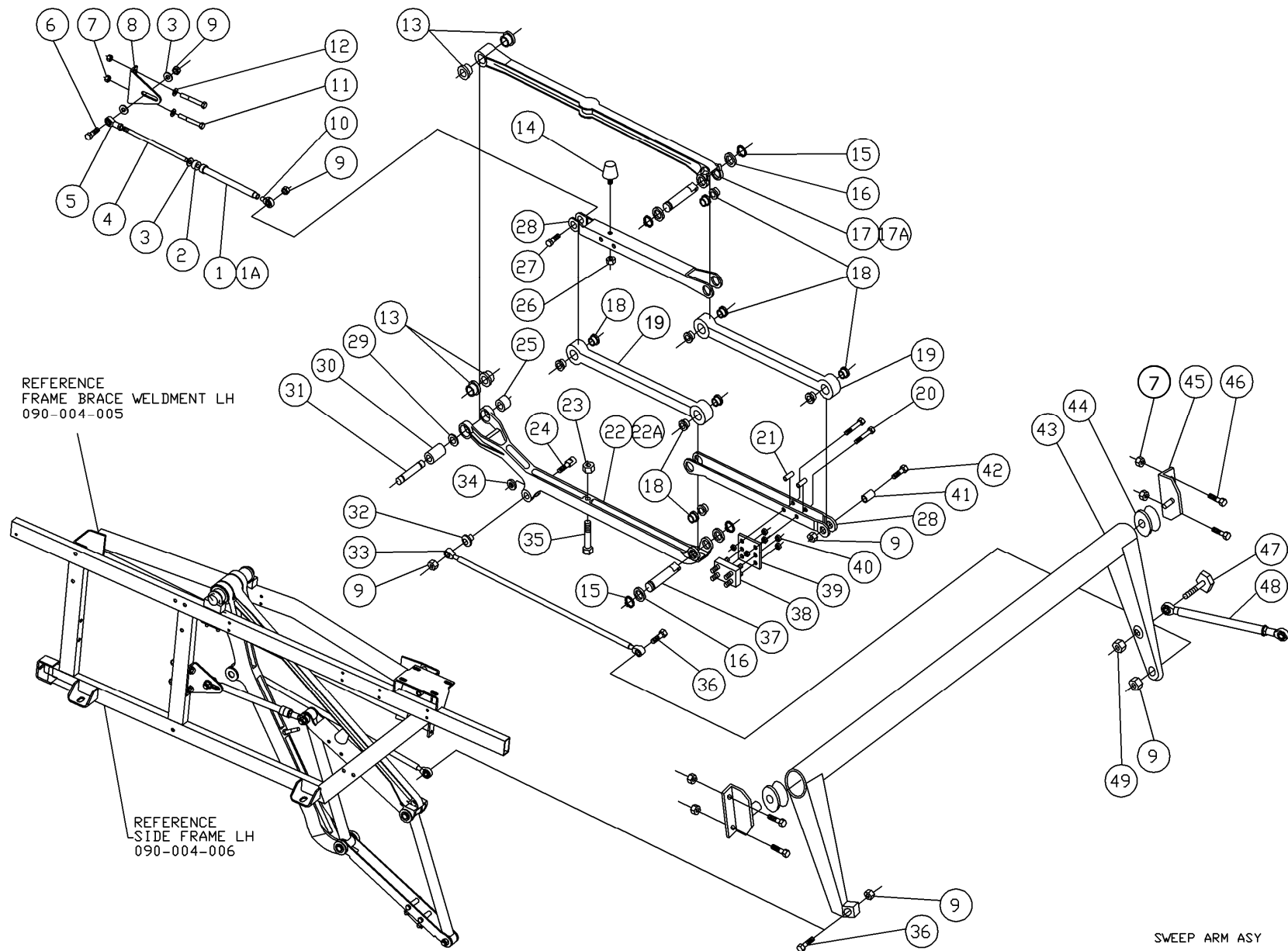




## SPOT & RESPOT LINKAGES

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



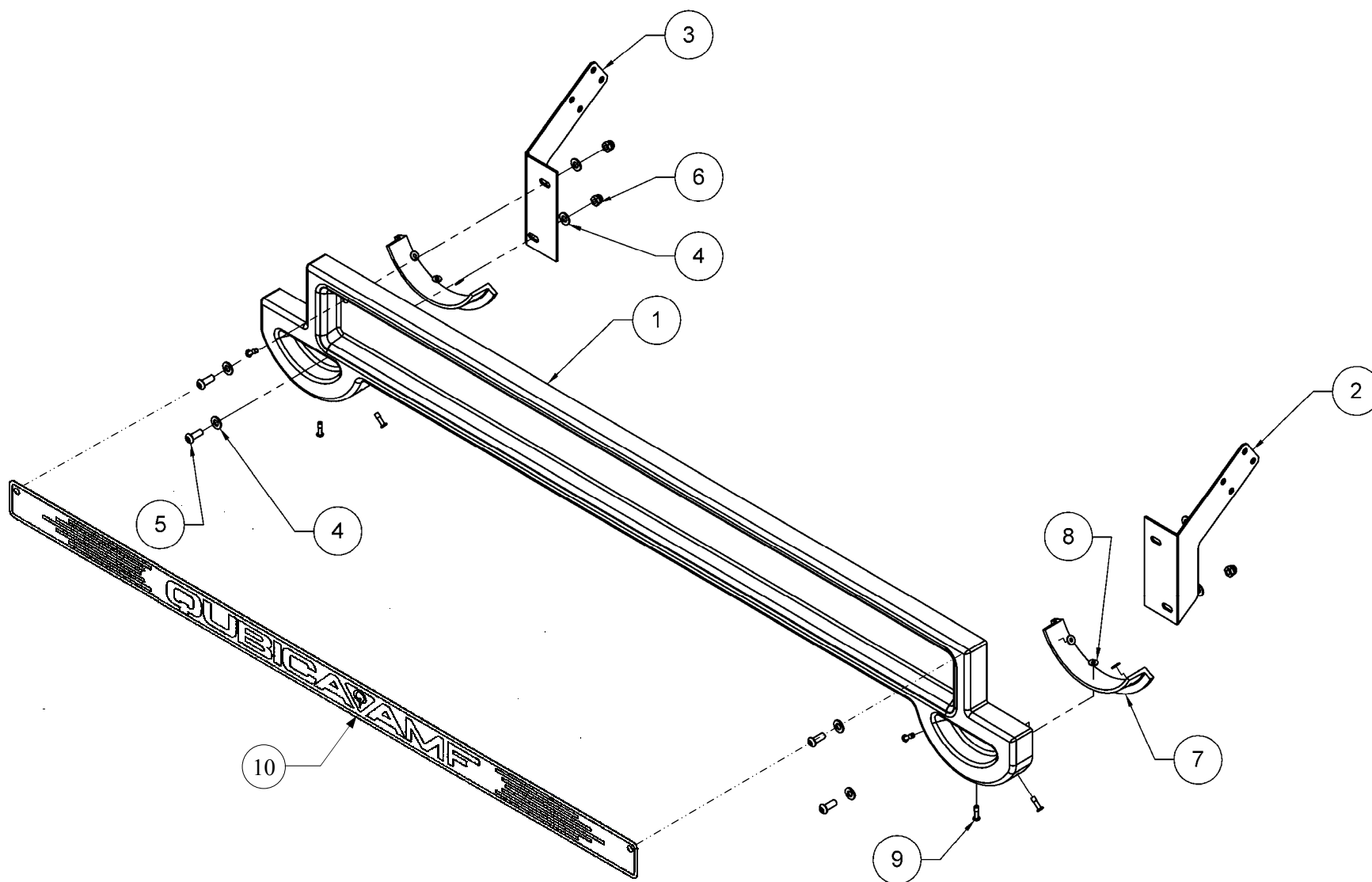
SWEEP ARM ASY



## SWEEP ARM ASSEMBLY

ITEM	QTY	PART #	DESCRIPTION	ITEM	QTY	PART #	DESCRIPTION
1	1	070-007-278	TUBE WELDMENT	24	1	090-006-134	DRIVE LINK PIN
1A	1	090-006-145	SWEEP LINK SLIDE ASSY (incl. 1, 2, 3, 4, 5, & 10)	25	1	070-003-233	MAIN PIVOT SPACER, SHORT
2	1	070-007-283	BUMPER	26	1	839-057-002	NUT, HEX LOCK NYLON, 5/16 - 18
3	3	949-100-002	WASHER, 59/64 X 15/32	27	1	809-869-405	BOLT, HEX, 7/16 - 14 X 2-1/2
4	1	070-007-276	ROD	28	1	090-006-132	STEEL SWEEP LINK, UPPER & LOWER
5	1	090-005-257	ROD END	29	1	070-011-819	SHIM, TABLE & SWEEP
6	1	809-869-245	BOLT, 7/16-14 X 1½	30	1	070-003-232	MAIN PIVOT SPACER, LONG
7	6	844-065-002	NUT, STOVER LOCK, 3/8 - 16	31	1	070-003-106	MAIN PIVOT SHAFT
8	1	090-006-128	SWEEP LINK BRACKET	32	1	090-006-135	DRIVE LINK BUSHING/SPACER
9	5	838-369-002	NUT, CENTER PUNCH LOCK, 7/16 - 14	33	1	090-005-254	DRIVE LINK CONNECTING ROD
10	1	090-006-138	ROD END, 7/16 - 20 X .5	34	1	070-003-117	DRIVE LINK SPACER
11	2	809-865-445	SCREW, HEX, 3/8 - 16 X 2.75	35	1	070-003-221	SCREW, SWEEP LINK ASSEMBLY
12	2	948-767-132	WASHER, 13/32 X 13/16 X 1/16	36	2	809-869-365	SCREW, HEX, 7/16 - 14 X 2-1/4
13	4	000-023-104	FLANGED BEARING, 1.25 X 1.5 X .953	37	2	090-006-126	PIN, STEEL SWEEP LINKAGE
14	1	090-006-137	BUMPER	38	1	090-006-136	SHOCK MOUNT
15	4	919-005-600	RETAINING RING	39	1	090-006-131	SWEEP SHOCK MOUNT PLATE
16	4	070-006-121	WASHER	40	2	844-057-002	NUT, STOVER LOCK, 5/16 - 18
17	1	088-000-093	SWEEP LINK	41	2	090-006-127	STEEL SWEEP LINK SLEEVE
17A	1	090-006-139	STABLIZER LINK ASSY (incl. 13, 17 & 18)	42	1	809-869-325	BOLT, HEX, 7/16 - 14 X 2
18	12	000-023-114	FLANGED BEARING, .628 X .81 X .06	43	1	090-004-010	SWEEP ROCKER ARM
19	2	090-006-133	MIDDLE LINK, STEEL	44	2	090-005-015	TORQUE TUBE BEARING
20	2	809-857-365	SCREW, HEX, 5/16 - 18 X 2¼	45	2	090-004-007	TORQUE TUBE HANGER
21	2	090-006-125	LOWER STEEL SWEEP SPACER	46	4	809-865-205	SCREW, HEX, 3/8 - 16 X 1-1/4
22	1	070-003-157	DRIVE LINK CASTING	47	1	070-003-245	SCREW, HEX, ½ - 13 X 3
22A	1	090-006-140	DRIVE LINK ASSY (incl. 13, 18, 22, 23 & 35)	48	1	088-001-353	TIE ROD ASSEMBLY, SWEEP MOTOR
23	1	839-665-002	NUT, FLEX LOCK, 3/8 - 16	49	1	844-073-002	NUT, STOVER LOCK, ½ - 13

## SWEEP BAR & MOUNTING ASSEMBLY

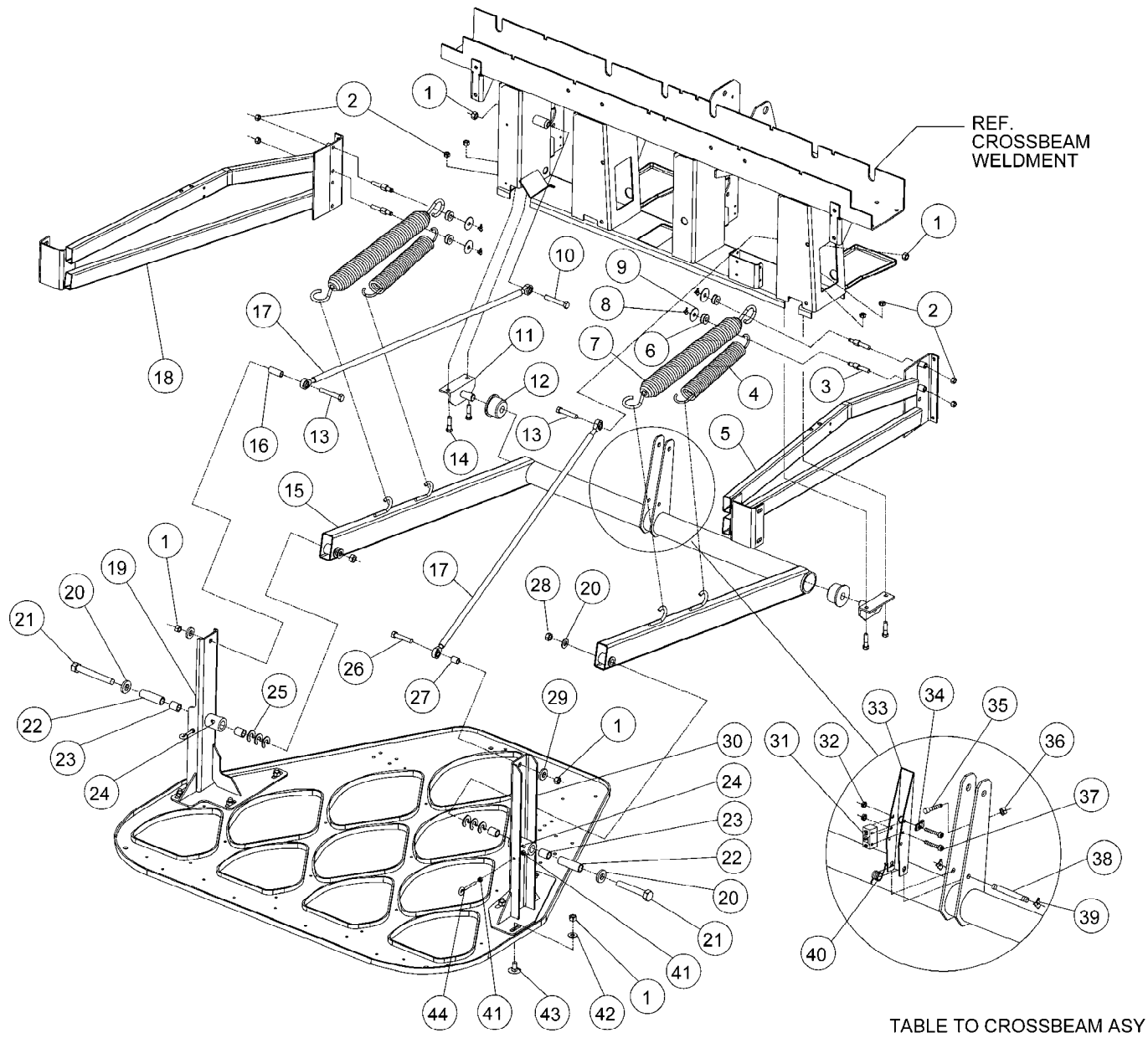




## SWEEP BAR & MOUNTING ASSEMBLY

ITEM	QTY	PART #	DESCRIPTION	ITEM	QTY	PART #	DESCRIPTION
1	1	300-000-165	SWEEP BAR				
2	1	090-006-130	SWEEP MOUNTING BRACKET, R.H.				
3	1	090-006-129	SWEEP MOUNTING BRACKET, L.H.				
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	90XLi SWEEP DECAL				

# TABLE & CROSSBEAM ASSEMBLY





## TABLE & CROSSBEAM ASSEMBLY

ITEM	QTY	PART #	DESCRIPTION	ITEM	QTY	PART #	DESCRIPTION
1	10	838-369-002	NUT, CENTER PUNCH LOCK, 7/16 - 14	27	1	070-007-303	LEVELING ROD SPACER
2	8	839-665-002	NUT, STOVER LOCK, 3/8 - 16	28	2	844-081-002	NUT, STOVER LOCK, 5/8 - 11
3	4	090-002-028	SPRING ROLLER PIN	29	2	949-100-002	WASHER, 59/64 X 15/32 X 1/16
4	2	090-005-662	COUNTERBALANCE SPRING, SMALL	30	1	090-005-509	TABLE SUPPORT WELDMENT, 7-PIN SIDE
5	1	090-005-646	SIDE BRACE, L.H.	31	1	000-026-042	MICROSWITCH
6	4	090-003-795	COUNTERBALANCE SPRING ROLLER	32	2	843-127-002	NUT, HEX LOCK, 6-32
7	2	000-022-782	COUNTERBALANCE SPRING	33	1	070-001-852	OFF-SPOT LEVER
8	4	963-400-002	X-WASHER, 3/16	34	1	744-203-013	CABLE CLAMP
9	4	945-867-242	WASHER, FLAT, .406 X 1-1/2 X .05	35	1	070-001-854	ADJUSTMENT SCREW
10	1	809-869-365	SCREW, HEX, 7/16 - 14 X 2.25	36	1	835-549-002	NUT, HEX JAM, 1/4-20
11	2	090-004-007	TUBE HANGER BRACKET	37	2	818-227-202	SCREW, ROUND HEAD, 6-32 X 1-1/4
12	2	090-005-015	TORQUE TUBE BEARING	38	1	070-001-591	PIN
13	1	809-869-520	SCREW, HEX, 7/16 - 14 X 3.25	39	2	963-400-002	X-WASHER
14	4	809-865-245	SCREW, HEX, 3/8 - 16 X 1-1/2	40	1	070-001-853	SPRING
15	1	090-005-645	TORQUE TUBE WELDMENT	41	4	835-549-002	NUT, HEX JAM, 1/4 - 20
16	1	090-005-597	LEVELING SPACER	42	6	947-271-967	WASHER, FLAT, 7/16
17	2	090-005-253	TIE ROD ASSEMBLY	43	6	801-369-161	CARRIAGE BOLT, 7/16 - 14 X 1
18	1	090-005-647	SIDE BRACE, R.H.	44	2	879-849-487	EYEBOLT, 1/4 - 20 X 3
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				

# TABLE & BRACKET ASSEMBLY

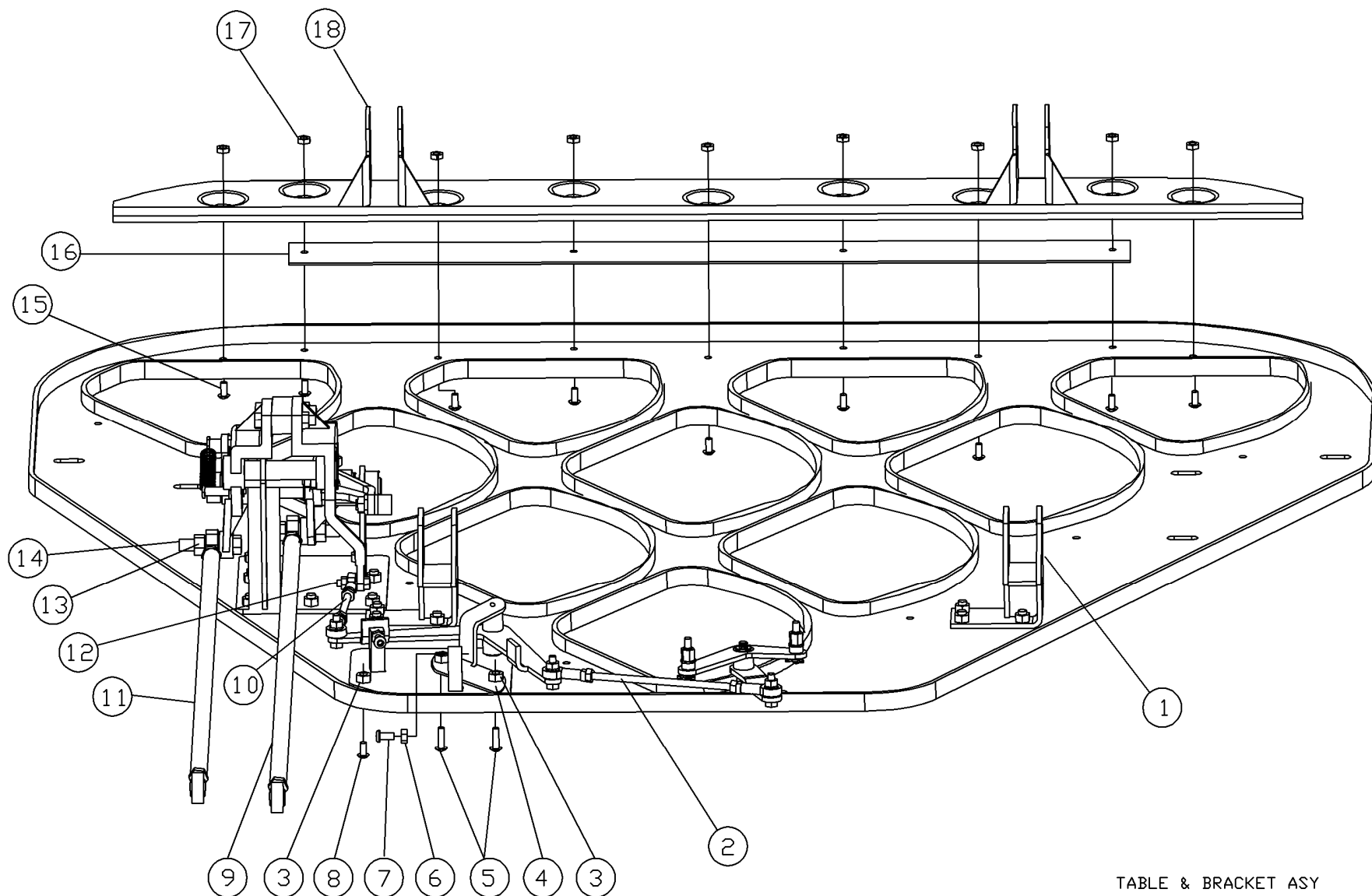


TABLE & BRACKET ASY

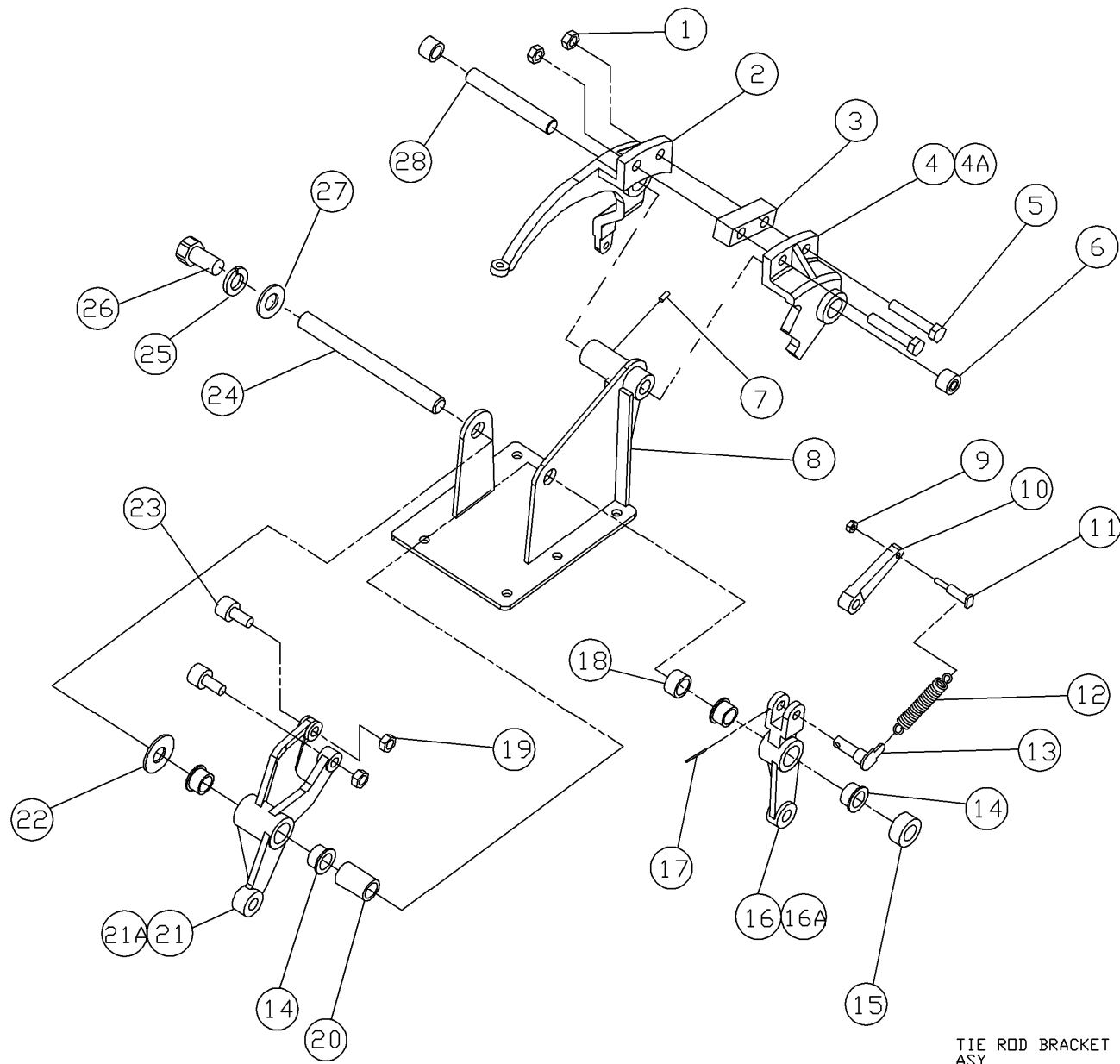




## TABLE & BRACKET ASSEMBLY

ITEM	QTY	PART #	DESCRIPTION	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				

# TIE ROD BRACKET ASSEMBLY



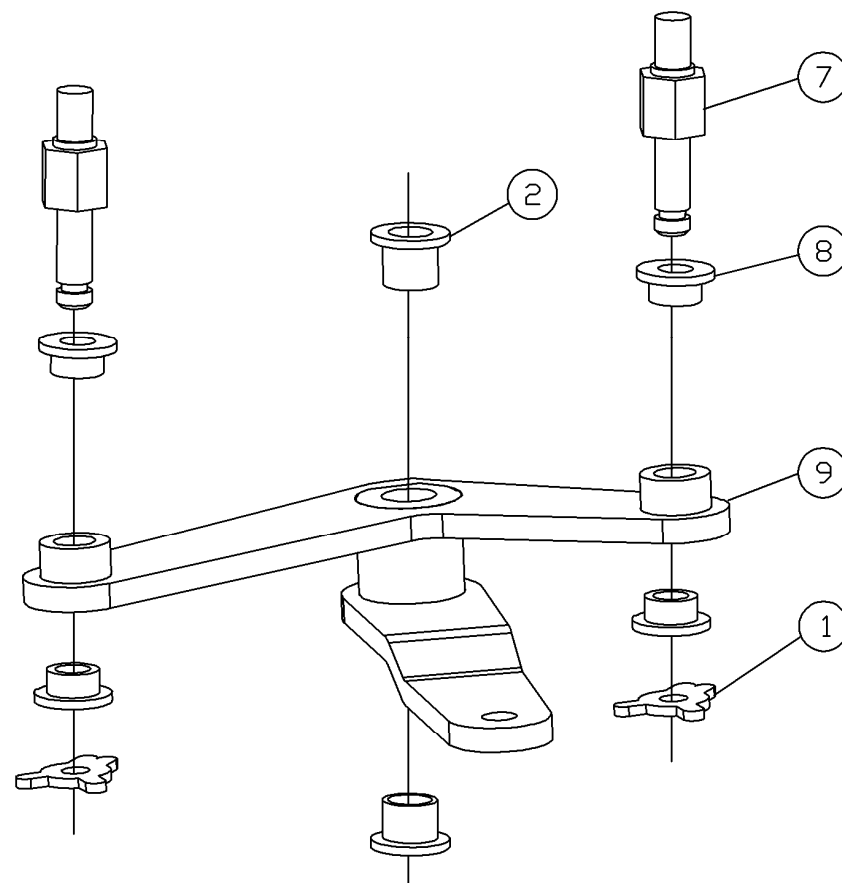
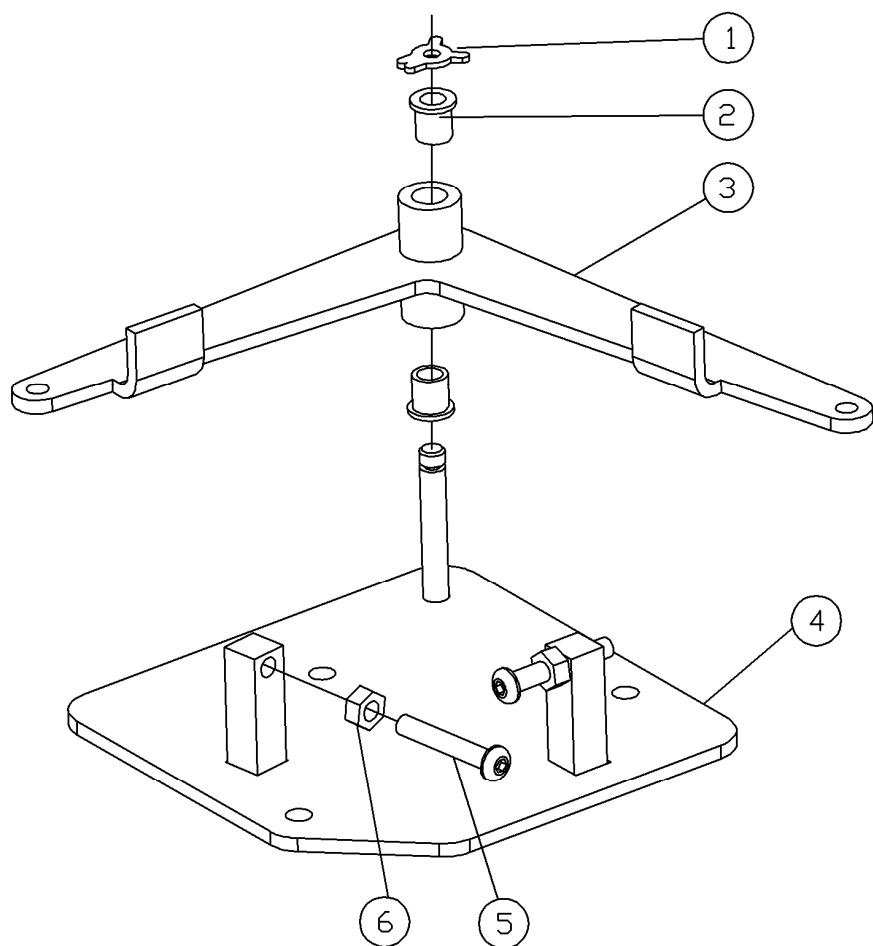
TIE ROD BRACKET  
ASY



## TIE ROD BRACKET ASSEMBLY

ITEM	QTY	PART #	DESCRIPTION	ITEM	QTY	PART #	DESCRIPTION
1	2	844-065-002	NUT, STOVER LOCK, 3/8 - 16	24	1	090-005-655	SHAFT
2	1	070-002-725	CAM LINK	25	1	951-164-002	WASHER, SPLIT LOCK, 3/8
3	1	090-005-520	SPACER	26	1	809-865-125	SCREW, HEX, 3/8 - 16 X 3/4
4	1	070-002-724	SHIFTER LINK	27	1	948-767-132	WASHER, FLAT, 13/32 X 13/16 X 1/16
4A	1	070-002-727	SHIFTER LINK & BEARING ASSY (incl. 4 & 6)	28	1	090-005-521	SHAFT, SHORT SIDE
5	2	809-865-325	SCREW, HEX, 3/8 - 16 X 2				
6	2	070-002-781	NEEDLE BEARING				
7	1	807-249-060	SETSCREW, 1/4 - 20 X 3/8				
8	1	088-005-503	TIE ROD BRACKET				
9	1	843-140-002	NUT, HEX LOCK, 10 - 32				
10	1	070-002-590	FINGER LINK				
11	1	090-005-629	PIN				
12	1	070-001-807	RESPOT LEVER SPRING				
13	1	090-005-631	PIVOT WELDMENT				
14	4	070-002-745	FLANGED BEARING, .6265 X .814 X 1/2				
15	1	000-021-423	SHAFT COLLAR				
16	1	070-002-589	FINGER LEVER				
16A	1	070-002-579	FINGER LEVER ASSY (includes 14 & 16)				
17	1	913-423-120	SPRING PIN				
18	1	090-005-533	SPACER				
19	2	840-066-002	NUT, FLEX LOCK, THIN, 3/8 - 24				
20	1	090-005-532	SPACER				
21	1	070-002-599	SPOT LEVER				
21A	1	070-002-578	SPOT LEVER ASSEMBLY (incl. 14 & 21)				
22	1	948-983-212	WASHER, FLAT, 21/32 X 1-5/16				
23	2	070-002-816	CAM FOLLOWER				

## FRONT ACTUATOR & CONNECTOR ASSEMBLIES



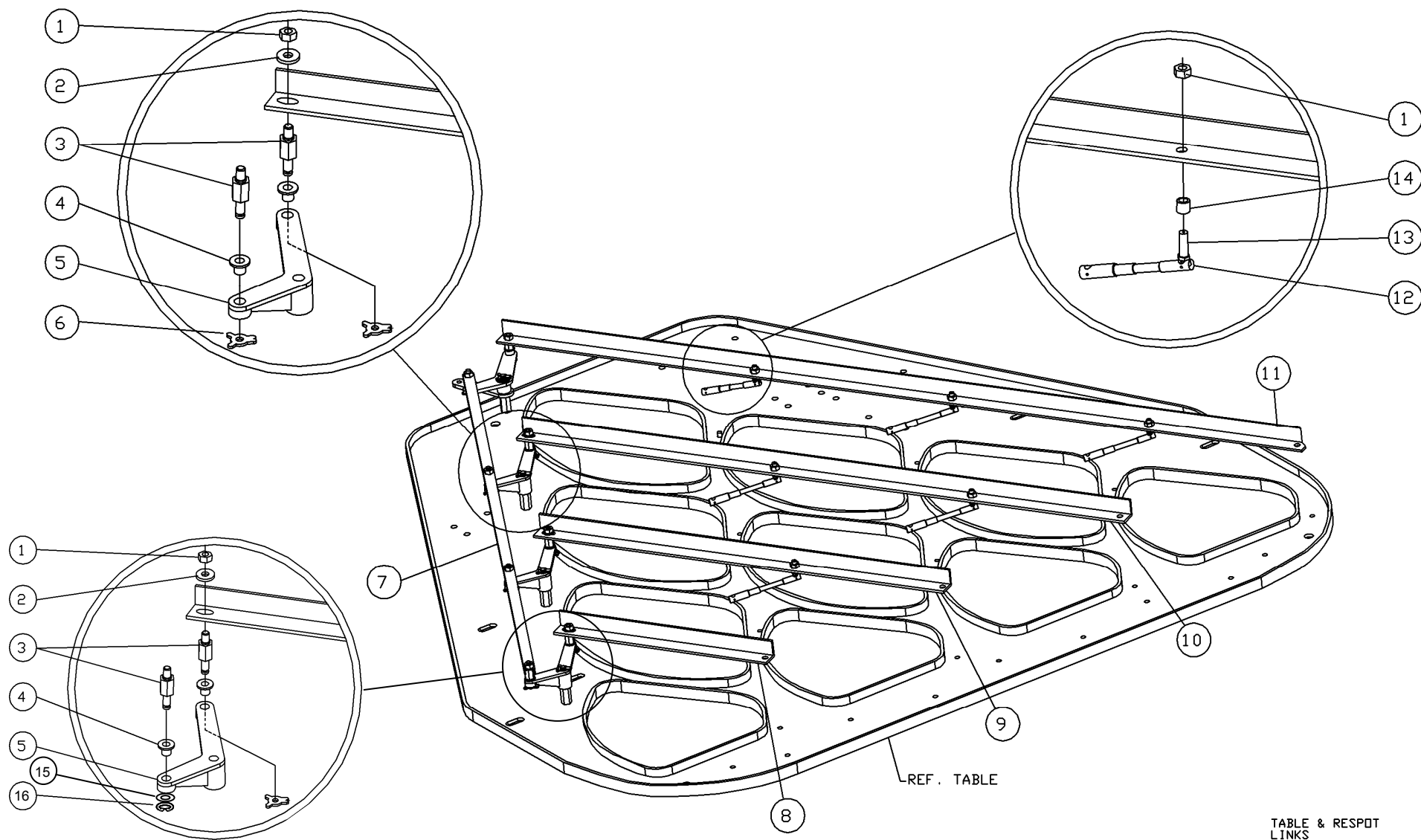
FRONT ACTUATOR & CONNECTOR ASY



## FRONT ACTUATOR & CONNECTOR ASSEMBLIES

ITEM	QTY	PART #	DESCRIPTION	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				

## TABLE & RESPOT LINKS



10-Pin Lever Only

TABLE & RESPOT  
LINKS



## TABLE & RESPOT LINKS

ITEM	QTY	PART #	DESCRIPTION	ITEM	QTY	PART #	DESCRIPTION
1	14	844-049-002	NUT, STOVER LOCK, 1/4 - 20				
2	3	948-753-102	WASHER, FLAT, 9/32 X 5/8 X 1/16				
3	6	090-005-571	PIN, 8, 9, & 10 LINKS				
4	6	070-002-653	FLANGED BEARING, .252 X .315 X .38				
5	3	070-002-677	LEVER CASTING				
6	12	963-400-002	X-WASHER				
7	1	070-002-671	RESPOT LINK				
8	1	090-005-558	10-PIN LINK				
9	1	090-005-557	9-PIN LINK				
10	1	090-005-556	8-PIN LINK				
11	1	090-005-555	7-PIN LINK				
12	6	090-002-020	LINK BODY				
13	6	730-027-019	STUD, BALL HEAD				
14	6	070-002-815	SPACER BUSHING				
15	1	785-502-207	FLAT WASHER				
16	1	919-001-450	E-CLIP				

## TABLE & RESPOT CELLS

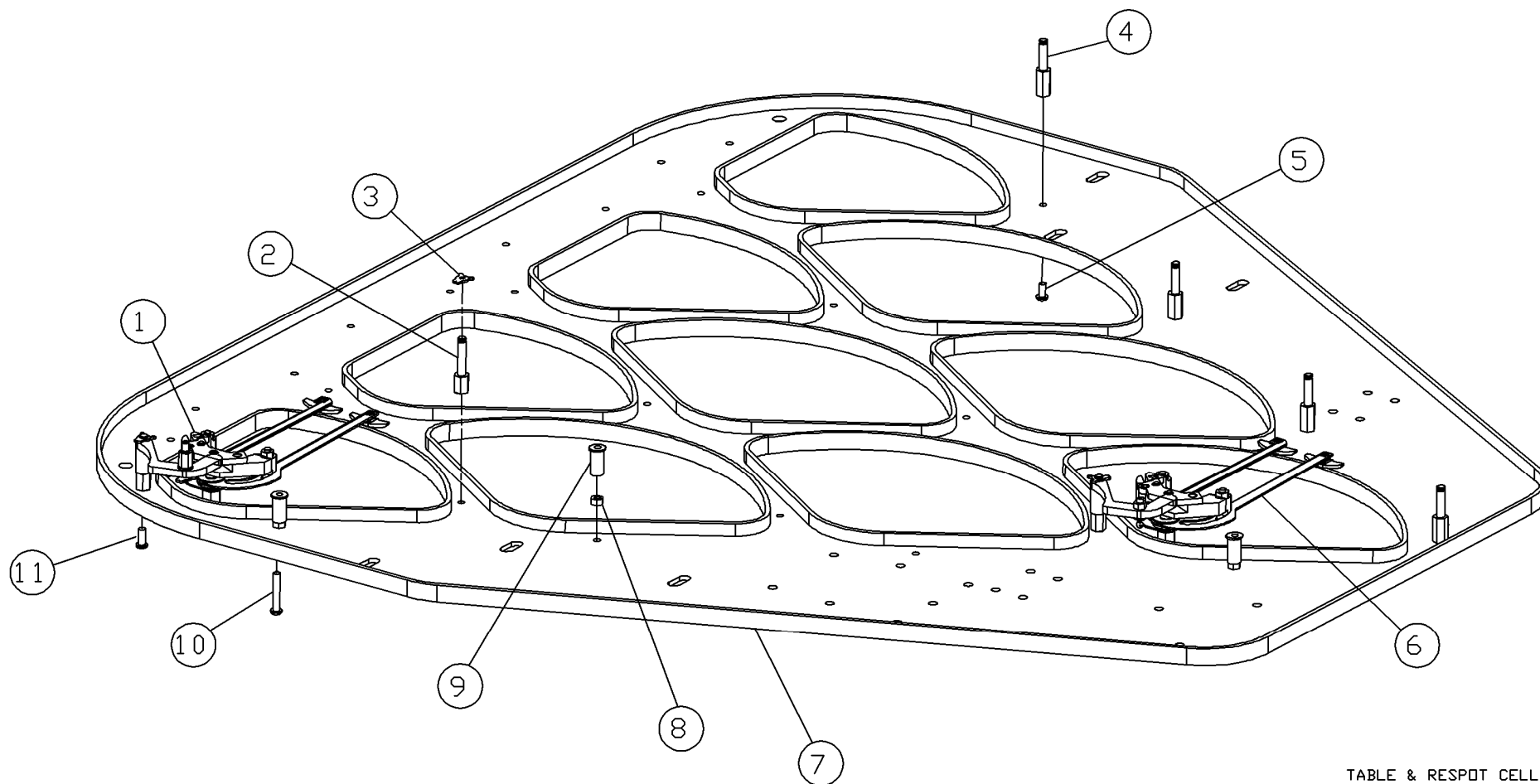


TABLE & RESPOT CELLS

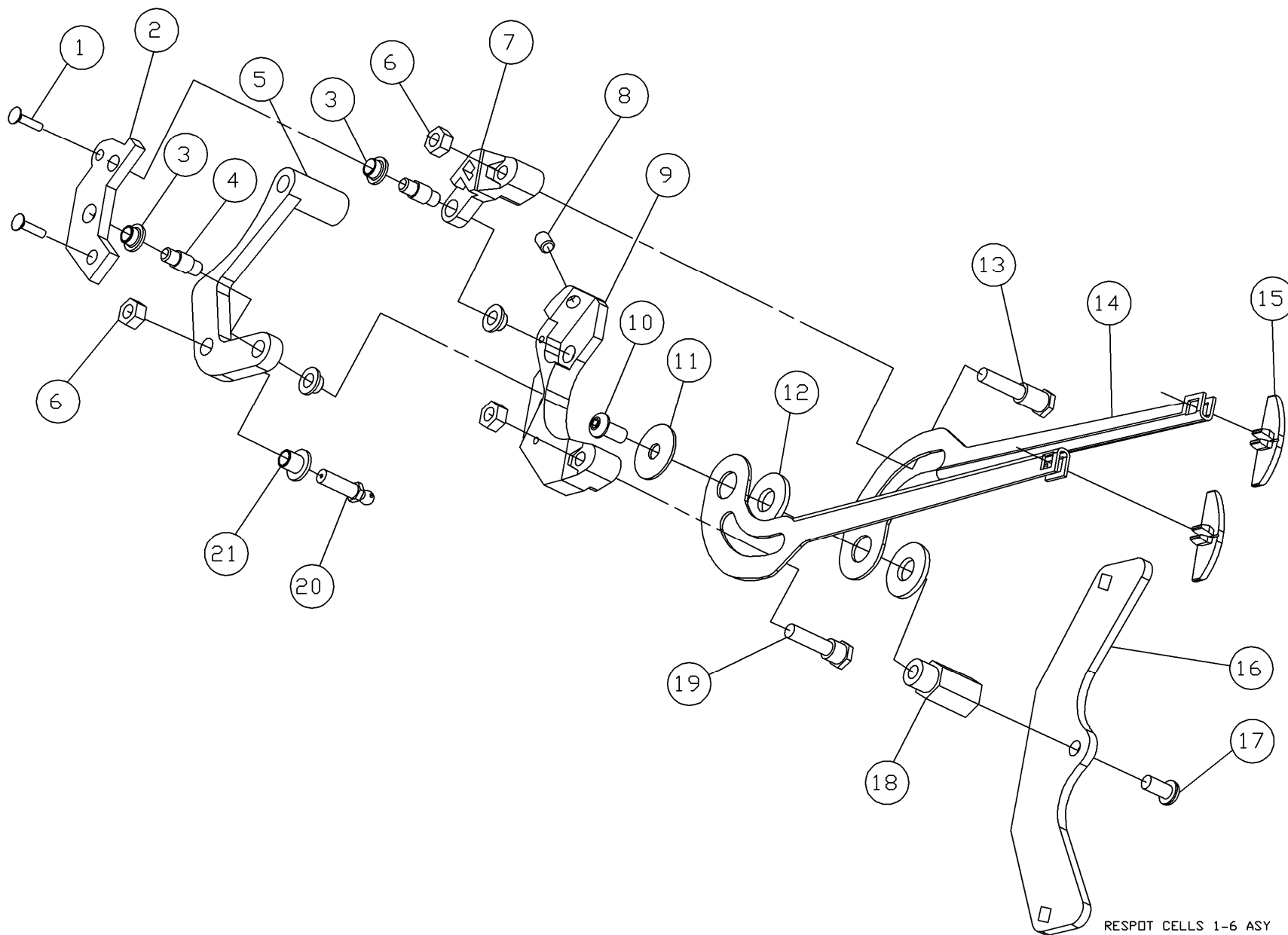




## TABLE & RESPOT CELLS

ITEM	QTY	PART #	DESCRIPTION	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	6	090-005-544	RESPOT CELL ASSY (pins 1 through 6)				
7	1	088-005-502	TABLE				
8	10	844-049-002	NUT, STOVER 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				

## RESPOT CELL ASSEMBLY, CELLS 1 THROUGH 6



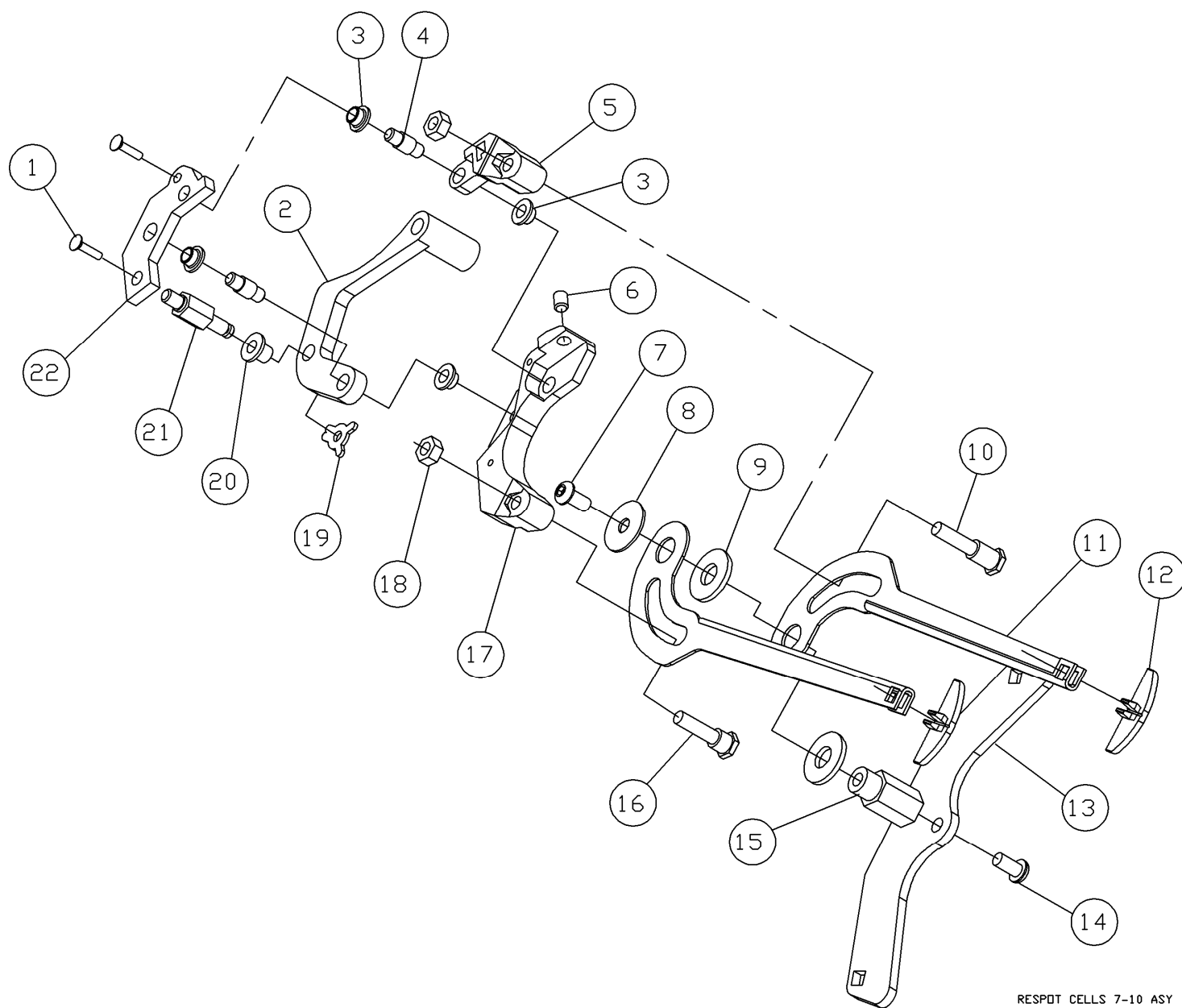
RESPOT CELLS 1-6 ASY



## RESPOT CELL ASSEMBLY, CELLS 1 THROUGH 6

ITEM	QTY	PART #	DESCRIPTION	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				
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				

## RESPOT CELL ASSEMBLY, CELLS 7 THROUGH 10



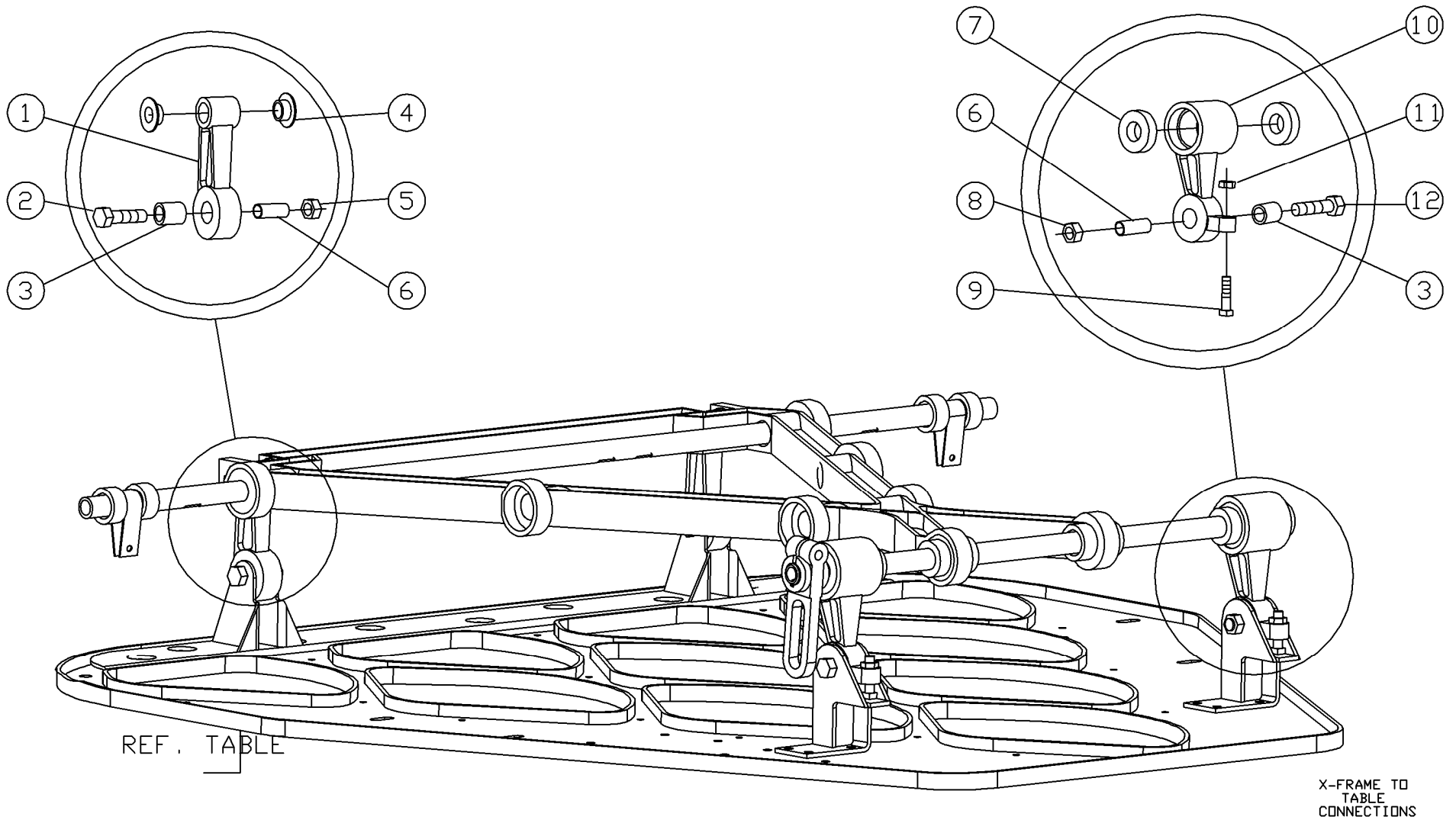
RESPOT CELLS 7-10 ASY



## RESPOT CELL ASSEMBLY, CELLS 7 THROUGH 10

ITEM	QTY	PART #	DESCRIPTION	ITEM	QTY	PART #	DESCRIPTION
1	2	070-002-750	SCREW, FLAT HEAD				
2	1	070-002-651	RESPOT LEVER				
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				

## X-FRAME TO TABLE CONNECTIONS

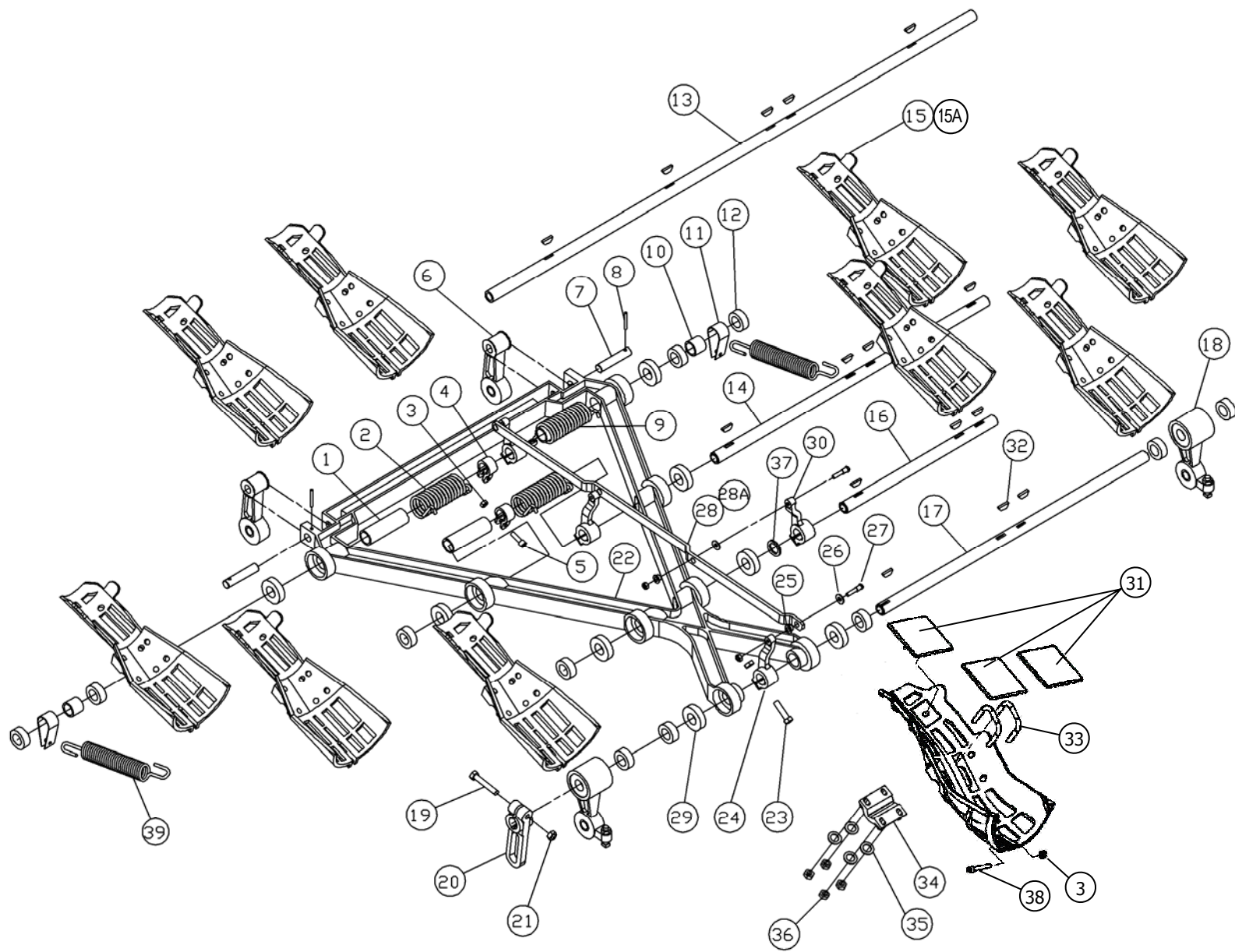




## X-FRAME TO TABLE CONNECTIONS

ITEM	QTY	PART #	DESCRIPTION	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				

## YOKE & SPOTTING CUP ASSEMBLY



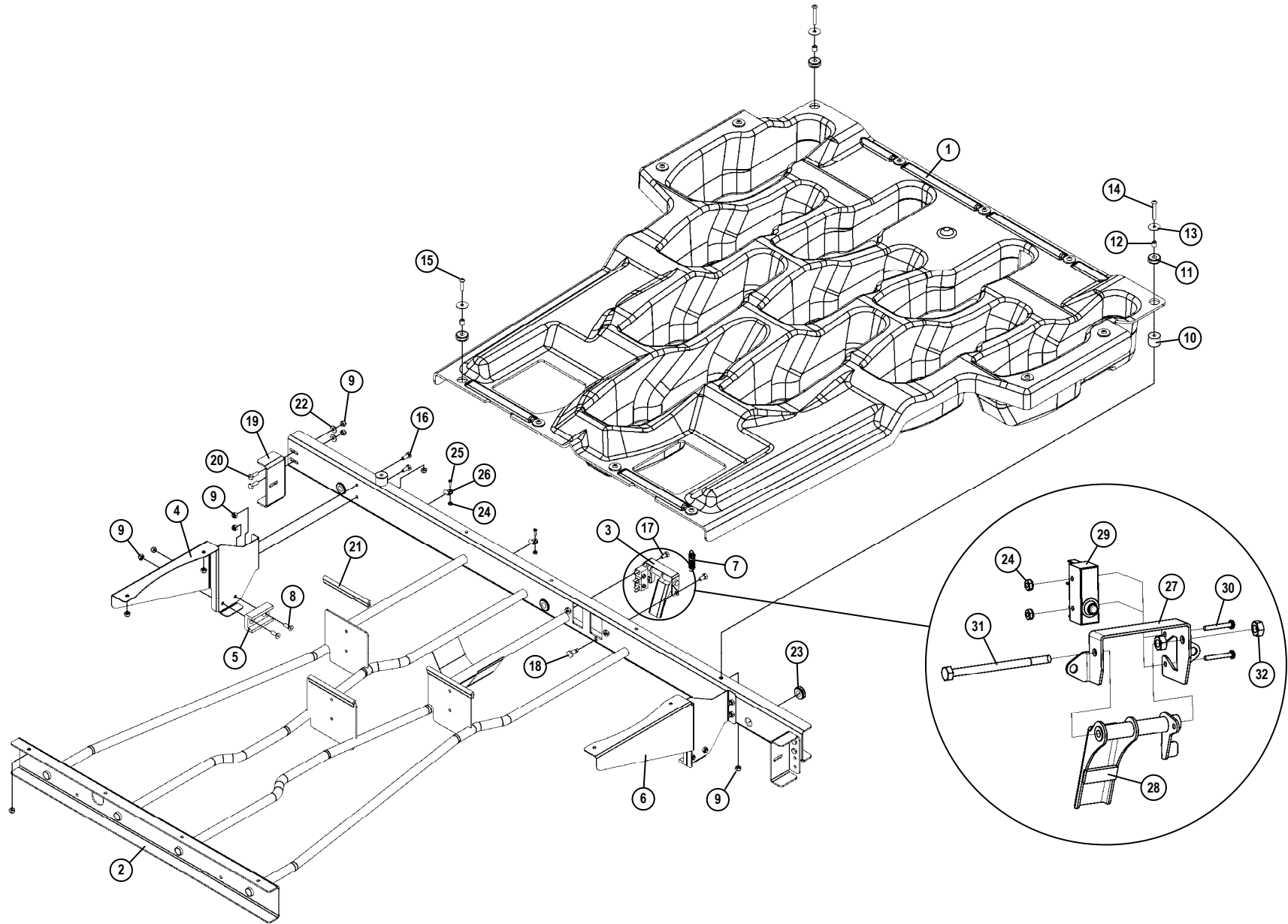




## YOKE & SPOTTING CUP ASSEMBLY

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, L.H. 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, R.H. 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 X 1-1/2
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

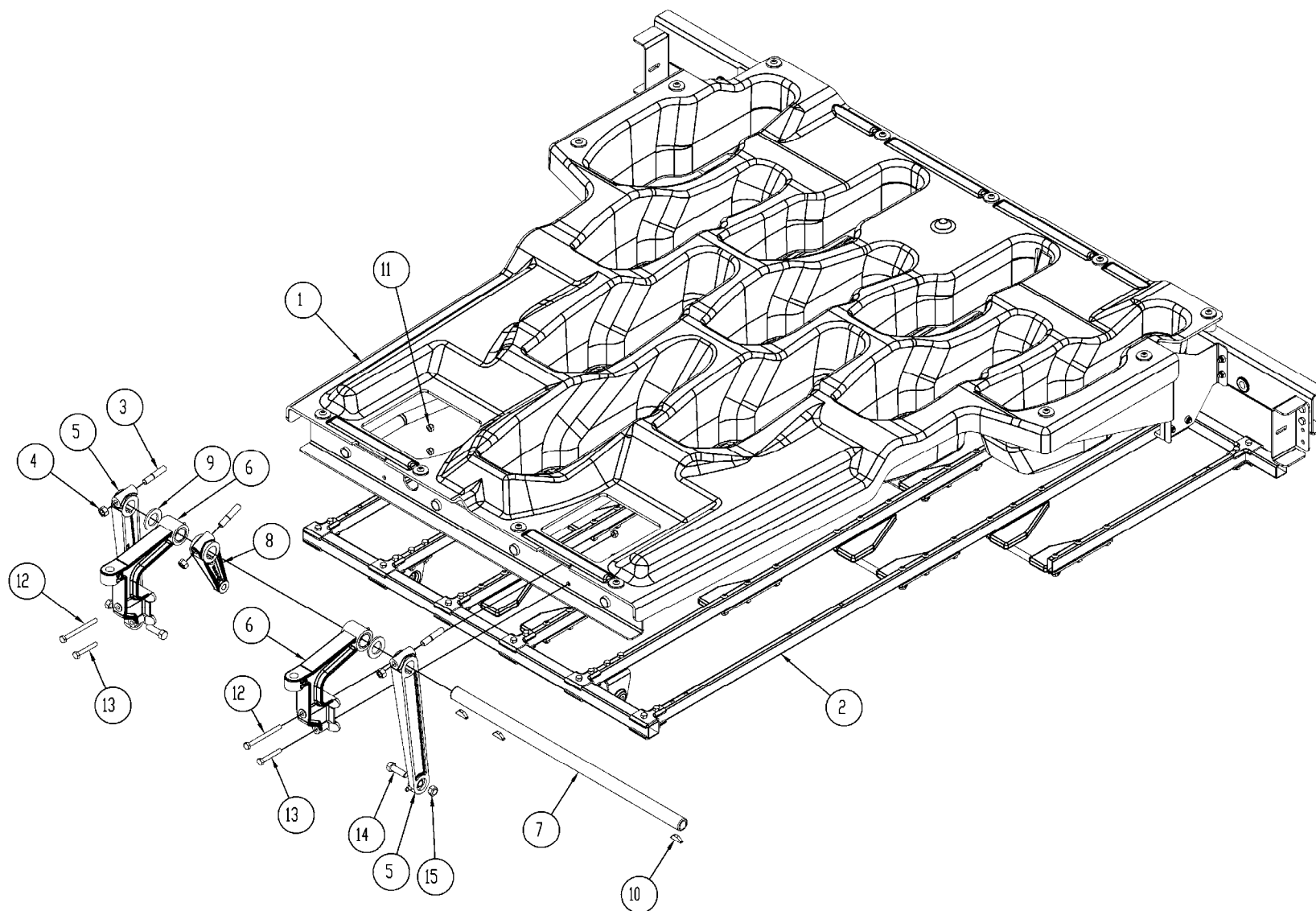




## DURABIN II ASSEMBLY

ITEM	QTY	PART #	DESCRIPTION	ITEM	QTY	PART #	DESCRIPTION
1	1	088-001-600	DURABIN II	28	1	088-001-608	DURABIN II SWITCH ACTUATOR
2	1	088-001-601	DURABIN II FRAME WELDMENT	29	1	000-026-043	SWITCH
3	1	088-001-602	DURABIN II BIN SWITCH ASSEMBLY	30	2	818-227-162	SCREW, PHILIPS PAN HD, 6-32X1, SEMS
4	1	088-001-607	DURABIN II SHUTTLE SUPPORT, 7-SIDE	31	1	809-849-605	SCREW, HEX, 1/4-20X3-3/4
5	2	088-001-603	SHUTTLE REAR SUPPORT GUIDE	32	2	834-549-002	NUT, HEX, 1/4-20
6	1	088-001-610	DURABIN II SHUTTLE SUPPORT, 10-SIDE				
7	1	088-001-200	DURABIN SWITCH SPRING				
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	2	809-849-085	SCREW, HEX, 1/4-20X1/2, GRADE 8				
18	1	070-006-142	BUMPER				
19	2	070-006-371	SUPPORT BRACKET				
20	4	809-849-125	SCREW, HEX, 1/4-20X3/4				
21	3	088-001-264	BIN FRAME EDGE TRIM				
22	4	948-753-102	WASHER, A-N FLAT, 1/4				
23	3	711-516-020	GROMMET, 1-1/16X1/2X3/8				
24	4	843-127-002	NUT, KEPS, 6-32				
25	2	818-227-082	SCREW, PHILIPS PAN HEAD, 6-32X1/2				
26	2	744-107-013	CLAMP, NYLON, 3/16				
27	1	088-001-606	DURABIN II SWITCH BRACKET				

## DURABIN II SHUTTLE ACTUATOR

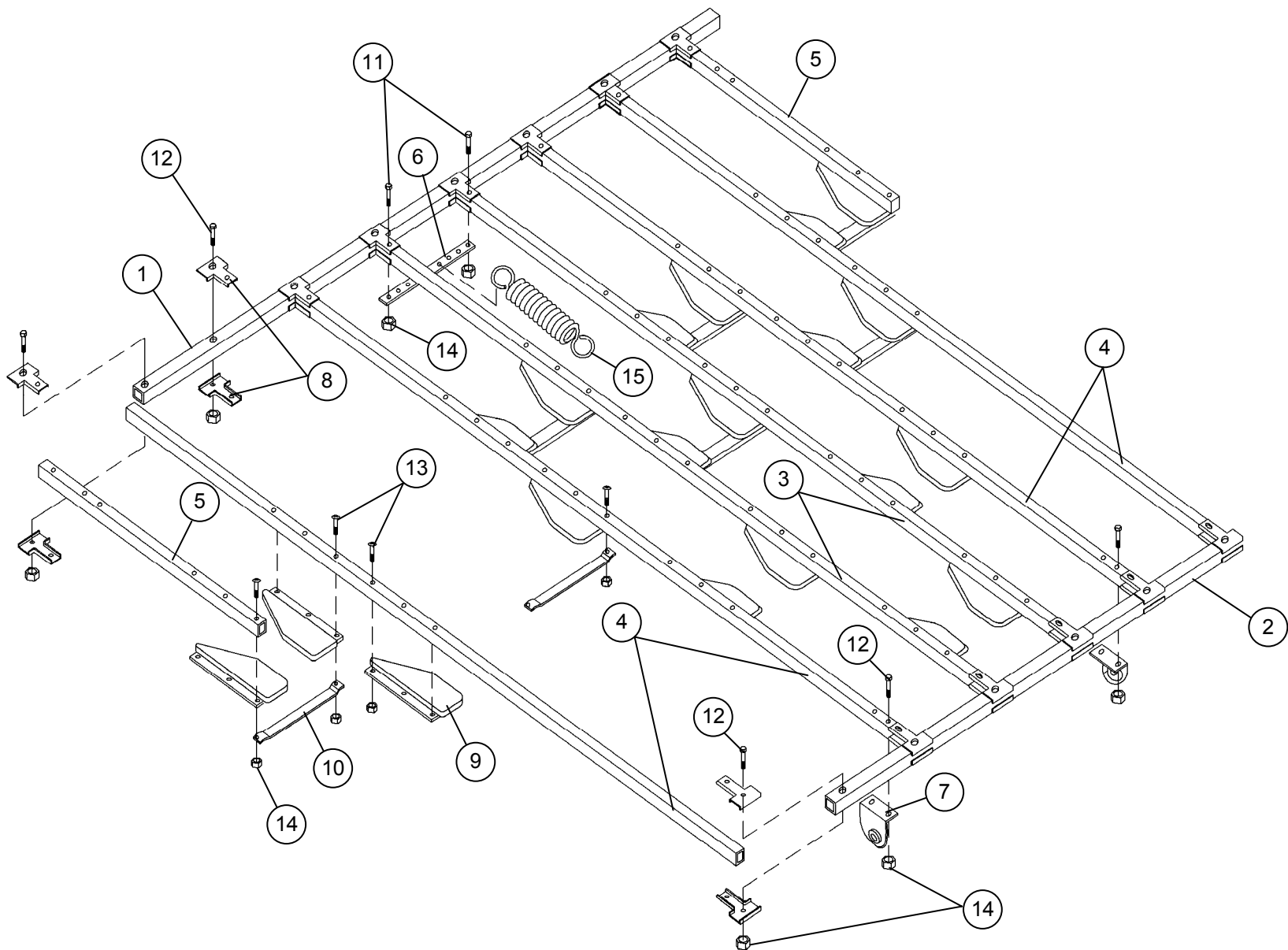




## DURABIN II SHUTTLE ACTUATOR

ITEM	QTY	PART #	DESCRIPTION	ITEM	QTY	PART #	DESCRIPTION
1	1	088-001-620	DURABIN II ASSEMBLY ON FRAME				
2	1	088-500-162	DURABIN II SHUTTLE ASSEMBLY				
3	3	070-006-403	STUD CLAMP				
4	3	831-565-002	NUT, HEX, 3/8 -16				
5	2	070-006-429	SHUTTLE OPERATING ARM; RH & LH				
6	2	070-006-358	BRACKET ASSEMBLY				
7	1	070-006-402	SHAFT, BIN ASSEMBLY				
8	1	070-006-408	LEVER; FRONT END ASSEMBLY				
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, GRADE 8				
15	2	844-065-002	NUT, 3/8 - 16, STOVER				

## SHUTTLE ASSEMBLY – DURABIN II

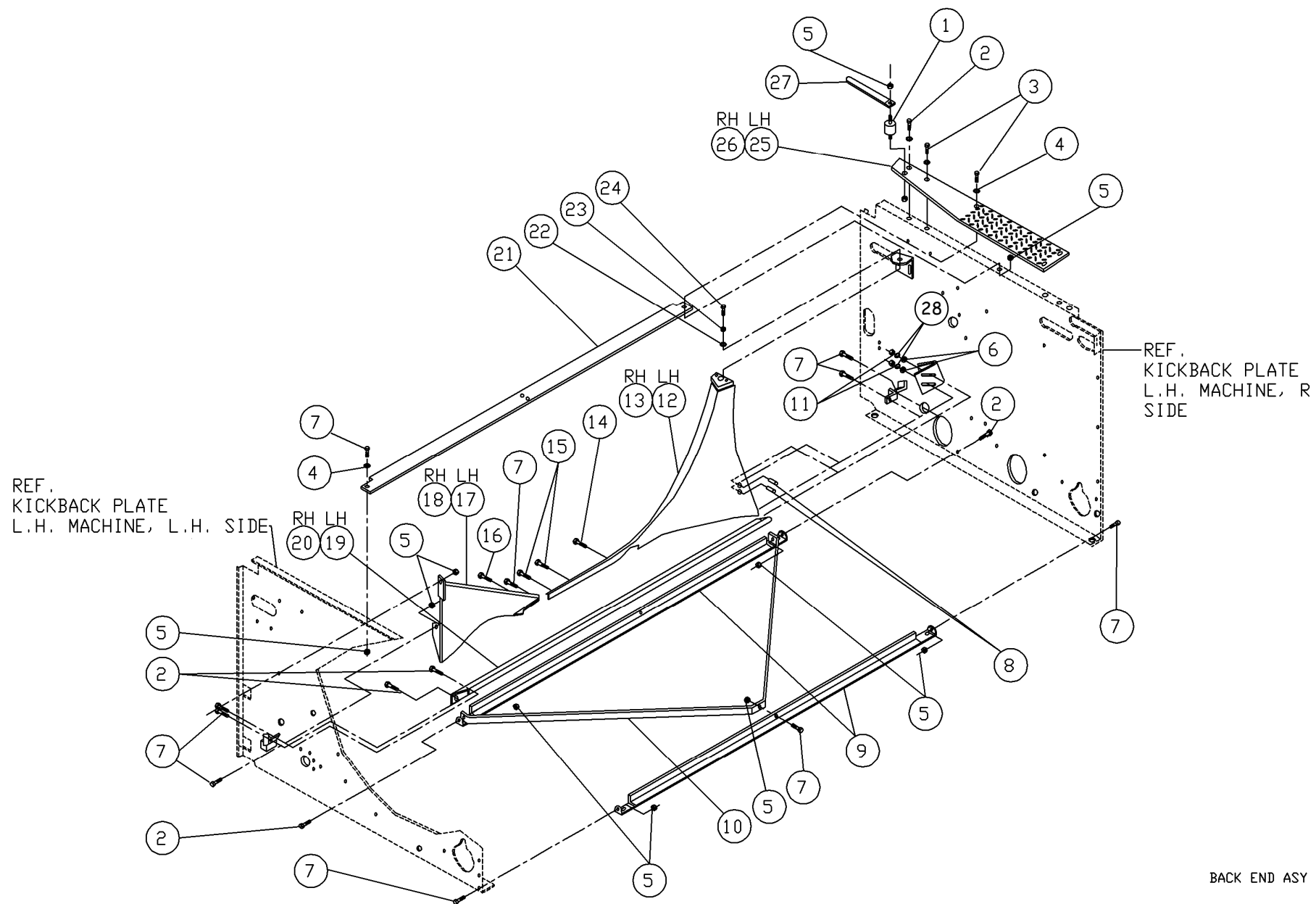




## SHUTTLE ASSEMBLY – DURABIN II

ITEM	QTY	PART #	DESCRIPTION	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	BIN SPRING STRAP				
7	2	088-500-159	SHUTTLE ARM BRACKET				
8	28	088-500-161	END CLAMP				
9	20	088-001-211	XL/ PIN HOLDER				
10	7	070-006-268	STRAP				
11	2	861-206-045	SCREW, HEX, M6 X 1.0 X 45				
12	30	709-013-069	SCREW, HEX, M6 X 1.0 X 40				
13	60	709-013-068	SCREW, BUTTON HEAD, M6 X 1.0 X 40				
14	92	872-000-602	NUT, HEX, M6 X 1.0, STOVER LOCK				
15	1	070-006-447	SPRING, SHUTTLE ASSEMBLY				

# BACK END ASSEMBLY



BACK END ASY



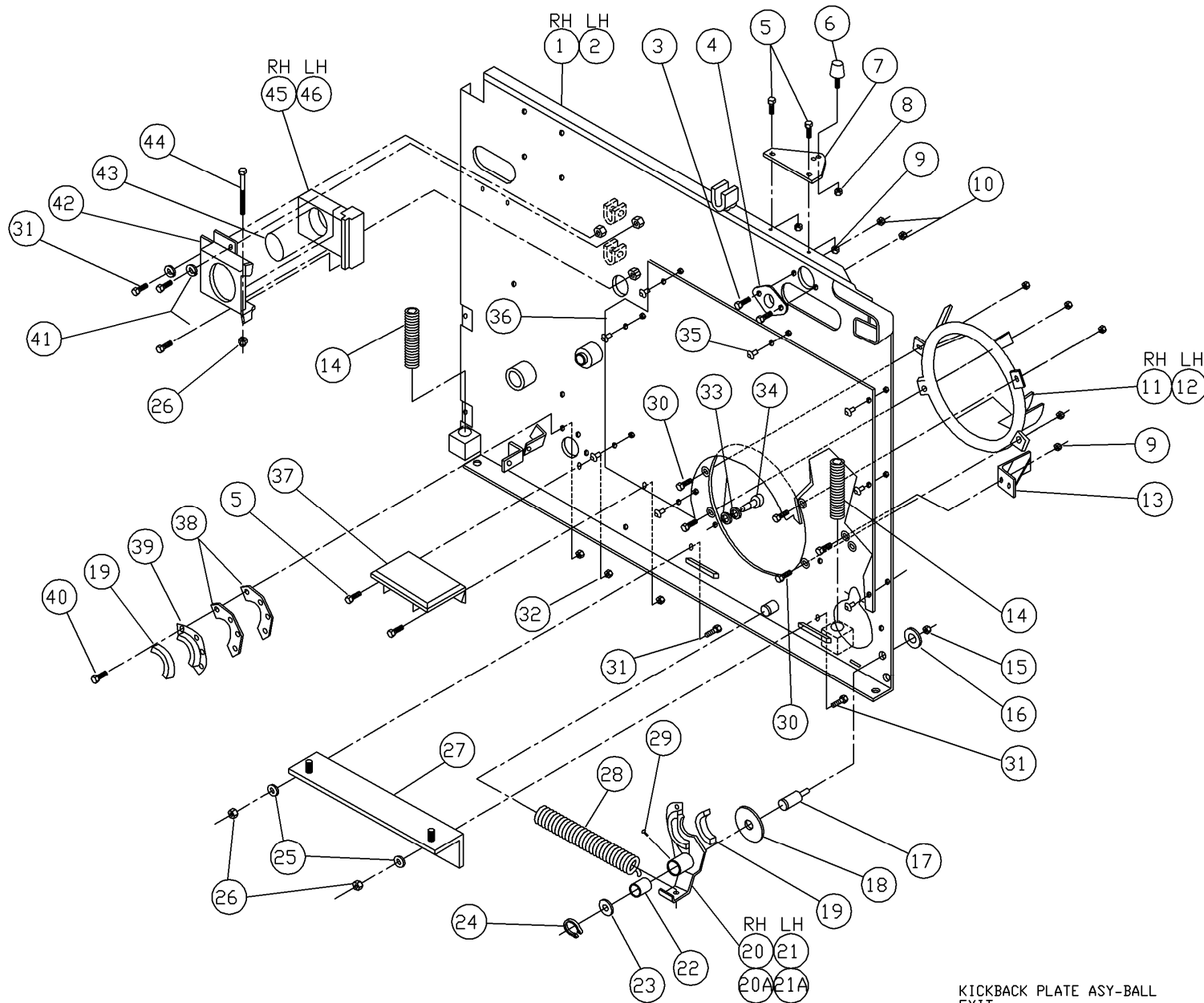


## BACK END ASSEMBLY

ITEM	QTY	PART #	DESCRIPTION
1	1	000-029-068	RUBBER MOUNTING
2	6	809-857-165	SCREW, HEX, 5/16 - 18 X 1
3	3	809-857-205	SCREW, HEX, 5/16 - 18 X 1-1/4
4	6	948-761-112	WASHER, FLAT, 11/16 X 11/32 X 1/16
5	12	844-057-002	NUT, STOVER LOCK, 5/16 - 18
6	2	948-753-102	WASHER, FLAT, 5/8 X 9/32 X 1/16
7	6	809-857-125	SCREW, HEX, 5/16 - 18 X 3/4
8	2	808-849-160	SCREW, FLAT HEAD, 1/4 - 20 X 1
9	2	070-001-184	STRAP WELDMENT
10	1	070-001-185	BRACE
11	2	844-049-002	NUT, STOVER LOCK, 1/4 - 20
12	1	000-027-380	PLOW ASSY, R.H. SIDE, L.H. MACHINE
13	1	000-027-381	PLOW ASSY, L.H. SIDE, R.H. MACHINE
14	1	808-858-240	SCREW, FLAT HEAD, 5/16 - 24 X 1 1/2
15	2	808-858-120	SCREW, FLAT HEAD, 5/16 - 24 X 3/4
16	1	809-858-125	SCREW, HEX, 5/16 - 24 X 3/4
17	1	070-002-168	PLOW ASSY, L.H. SIDE, L.H. MACHINE
18	1	070-001-404	PLOW ASSY, R.H. SIDE, R.H. MACHINE
19	1	030-006-964	APRON ASSEMBLY, L.H. MACHINE
20	1	030-006-963	APRON ASSEMBLY, R.H. MACHINE
21	1	070-007-359	SUPPORT BRACKET
22	1	948-767-132	WASHER, FLAT, 13/32 X 13/16 X 1/16
23	1	951-164-002	WASHER, SPLIT LOCK, 3/8
24	1	808-566-160	SCREW, BUTTON HEAD, 3/8 - 24 X 1
25	1	088-200-060	TREAD WELDMENT, R.H. SIDE, L.H. MACHINE
26	1	088-200-059	TREAD WELDMENT, L.H. SIDE, R.H. MACHINE
27	1	070-001-195	PIN SEATING ROD

ITEM	QTY	PART #	DESCRIPTION
28	2	951-148-002	WASHER, SPLIT LOCK, 1/4

# KICKBACK PLATE ASSEMBLY- BALL EXIT SIDE



KICKBACK PLATE ASY-BALL  
EXIT

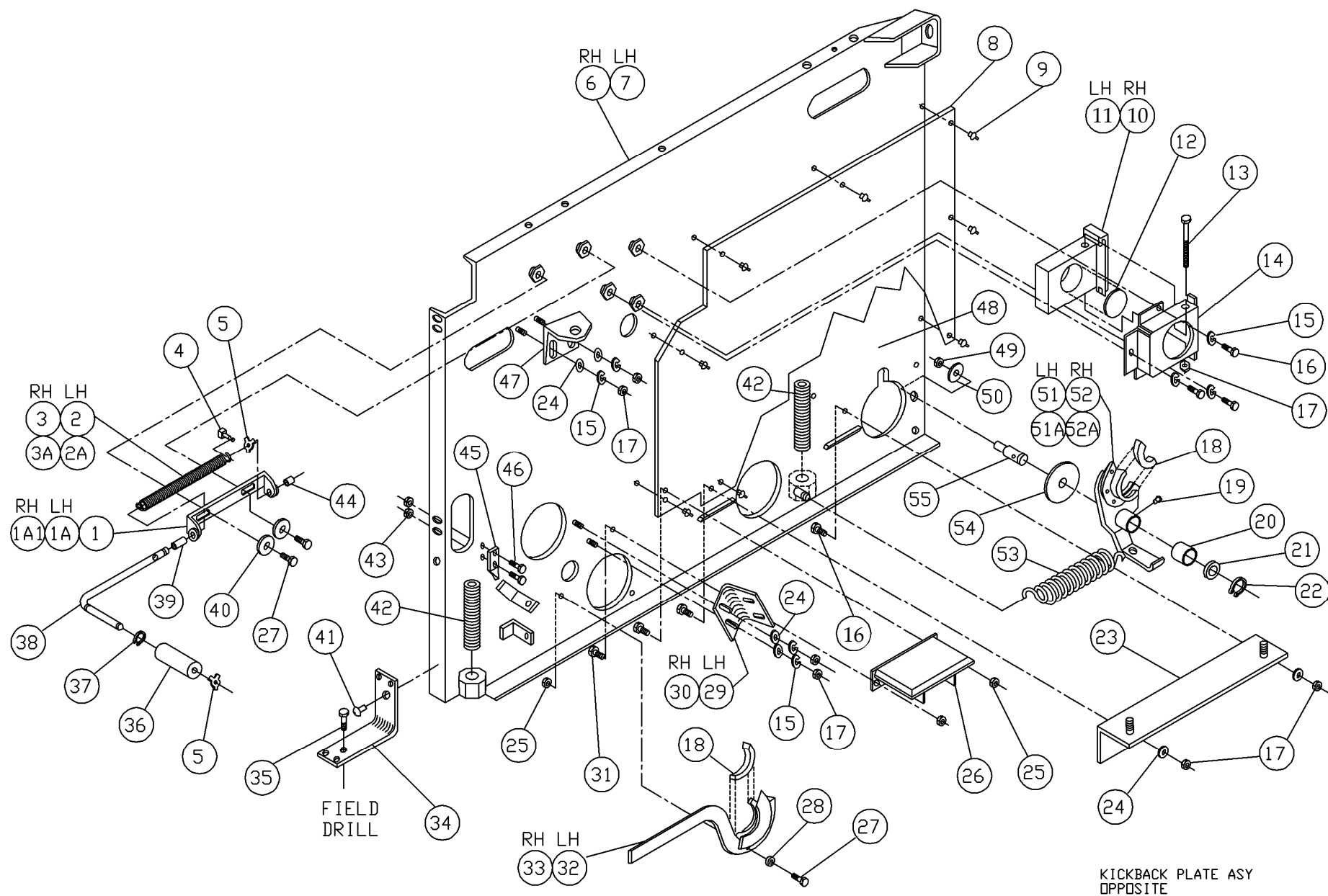


## KICKBACK PLATE ASSEMBLY– BALL EXIT SIDE

ITEM	QTY	PART #	DESCRIPTION	ITEM	QTY	PART #	DESCRIPTION
1	1	090-004-126	KICKPLATE, R.H. SIDE, R.H. MACHINE	23	1	000-027-642	FRONT ROLLER SUPPORT WASHER
2	1	090-004-129	KICKPLATE, L.H. SIDE, L.H. MACHINE	24	1	919-005-800	RETAINING RING
3	2	808-549-160	SCREW, BUTTON HEAD, 1/4 - 20 X 1	25	2	948-767-132	WASHER, 13/32 X 13/16 X 1/16
4	1	070-011-286	CURTAIN ROD BUSHING	26	3	839-665-002	NUT, FLEX LOCK, 3/8 - 16
5	2	809-857-125	SCREW, HEX, 5/16 - 18 X 3/4	27	1	090-004-131	PIT SUPPORT BRACKET
6	1	000-024-641	STOP BUMPER	28	1	000-021-204	SPRING
7	1	070-004-642	BALL LIFT STOP BRACKET	29	1	710-501-009	GREASE FITTING
8	1	835-558-002	NUT, HEX JAM, 5/16 - 24	30	6	808-857-120	SCREW, FLAT HEAD, 5/16 - 18 X 3/4
9	8	844-057-002	NUT, STOVER LOCK, 5/16 - 18	31	5	809-865-165	SCREW, HEX, 3/8 - 16 X 1
10	2	844-049-002	NUT, STOVER LOCK, 1/4 - 20	32	8	844-057-002	NUT, FLEX LOCK, 5/16 - 24
11	1	070-011-006	DOOR WELDMENT, R.H. MACHINE	33	1-2*	070-011-050	WASHER, SPECIAL
12	1	070-011-005	DOOR WELDMENT, L.H. MACHINE	34	1	000-028-362	BUMPER, URETHANE
13	1	000-024-668	TRACK SUPPORT BRACKET	35	9	937-000-000	DRIVE RIVET (field replacement)
14	2	000-024-890	SETSCREW	36	1	000-029-640	KICKBACK PANEL
15	1	844-074-002	NUT, STOVER LOCK, 1/2 - 20	37	1	000-022-878	ANGLE
16	1	948-975-172	WASHER, FLAT, 1-1/4 X 1/2 X 1/16	38	2	090-004-136	SPACER
17	1	000-029-015	PIVOT STUD	39	1	000-022-926	RETAINER SUPPORT
18	1	000-027-641	THRUST BEARING	40	4	808-557-120	SCREW, BUTTON HEAD, 5/16 - 18 X 3/4
19	2	000-022-924	SUPPORT BEARING	41	3	951-164-002	WASHER, SPLIT LOCK, 3/8
20	1	000-029-602	BRACKET WELDMENT, R.H. SIDE, R.H. MACHINE	42	1	000-022-788	BOX SUPPORT
20A	1	000-029-672	BEARING BRACKET ASSEMBLY, R.H. SIDE, R.H. MACHINE (Includes 19, 20, 22, & 29)	43	1	000-022-300	SHIELD
21	1	000-022-248	BRACKET WELDMENT L.H. SIDE, L.H. MACHINE	44	1	809-865-645	SCREW, HEX, 3/8 - 16 X 4
21A	1	000-022-249	BEARING BRACKET ASSEMBLY, L.H. SIDE, L.H. MACHINE (Includes 19, 21, 22, & 29)	45	1	000-022-794	BLOCK SUPPORT, R.H. SIDE
22	1	900-112-203	SLEEVE BEARING, .753 X 1-1/4	46	1	000-022-795	BLOCK SUPPORT, L.H. SIDE
				n/a	1	008-100-413	LOCTITE ADHESIVE #404 (apply between items 43 & 45 or 43 & 46, as applicable)

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

# KICKBACK PLATE ASSEMBLY- SIDE OPPOSITE BALL EXIT



KICKBACK PLATE ASY  
OPPOSITE

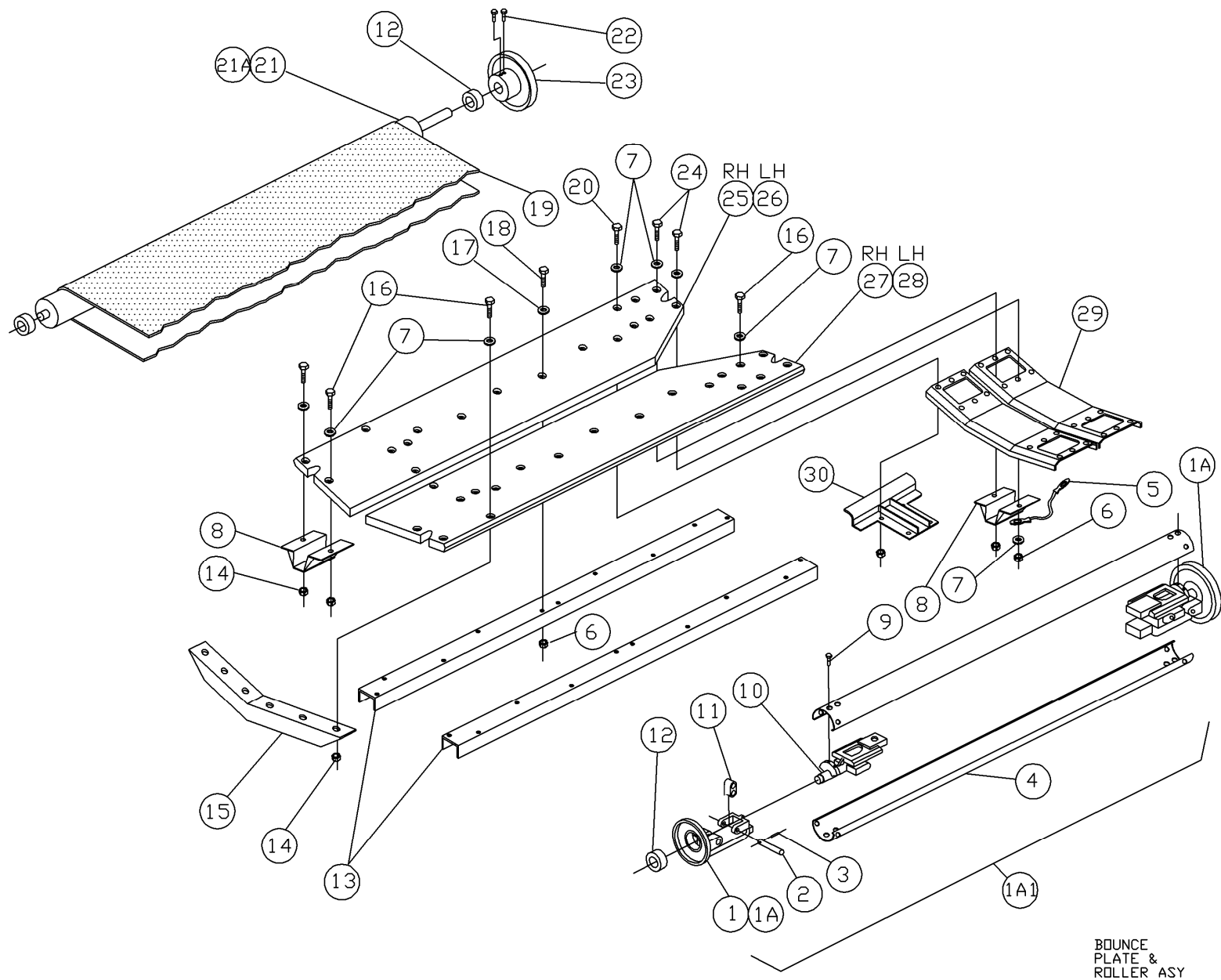


## KICKBACK PLATE ASSEMBLY– SIDE OPPOSITE BALL EXIT

ITEM	QTY	PART #	DESCRIPTION
1	1	000-024-509	PIN EJECTOR BRACKET
1A	1	000-024-510	BRACKET ASSEMBLY, L.H. MACHINE (includes 1, 39 & 44)
1A1	1	000-024-511	BRACKET ASSEMBLY, R.H. MACHINE (includes 1, 39 & 44)
2	1	000-024-512	PIN EJECTOR SPRING, L.H. MACHINE
2A	1	000-024-507	PIN EJECTOR ASSEMBLY, L.H. MACHINE (includes 1, 2, 4, 5, 36, 37, 38, 39, & 44)
3	1	000-024-513	PIN EJECTOR SPRING, R.H. MACHINE
3A	1	000-024-508	PIN EJECTOR ASSEMBLY, R.H. MACHINE (includes 1, 3, 4, 5, 36, 37, 38, 39, & 44)
4	1	000-029-317	STOP PIN
5	1	963-600-002	X-WASHER, ¼
6	1	090-004-128	KICKBACK WELDMENT R.H. SIDE, L.H. MACHINE
7	1	090-004-127	KICKBACK WELDMENT L.H. SIDE, R.H. MACHINE
8	1	070-002-027	KICKBACK PANEL
9	9	937-000-000	DRIVE RIVET (field replacement)
10	1	000-022-794	BLOCK SUPPORT, R.H. SIDE
11	1	000-022-795	BLOCK SUPPORT, L.H. SIDE
12	1	000-022-300	SHIELD
13	1	809-865-645	SCREW, HEX, 3/8 - 16 X 4
14	1	000-022-788	BOX SUPPORT
15	7	951-164-002	WASHER, SPLIT LOCK, 3/8
16	5	809-865-165	SCREW, HEX, 3/8 - 16 X 1
17	7	839-665-002	NUT, FLEX LOCK, 3/8 - 16
18	2	000-022-924	SUPPORT BEARING
19	1	710-501-009	GREASE FITTING
20	1	900-112-203	SLEEVE BEARING, .753 X 1-1/4
21	1	000-027-642	WASHER
22	1	919-005-800	RETAINING RING
23	1	090-004-131	PIT SUPPORT BRACKET
24	6	948-767-132	WASHER
25	3	844-057-002	NUT, STOVER LOCK, 5/16 - 18
26	1	000-022-878	ANGLE

ITEM	QTY	PART #	DESCRIPTION
27	3	809-857-165	SCREW HEX, 5/16 - 18 X 1
28	1	000-023-467	FLANGED BEARING, .314 X .434 X .310
29	1	000-023-432	CLIP, BOTTOM, L.H. MACHINE
30	1	000-023-431	CLIP, BOTTOM, R.H. MACHINE
31	2	809-857-125	SCREW, HEX, 5/16 - 18 X ¾
32	1	000-023-465	SUPPORT WELDMENT, L.H. MACHINE
33	1	000-023-464	SUPPORT WELDMENT, R.H. MACHINE
34	1	000-026-464	KICKBACK BRACKET
35	1	709-013-059	SCREWBOLT, HEX, 8 mm X 75 mm
36	1	000-025-803	ROLLER, PIN EJECTOR ASSEMBLY
37	1	919-005-400	RETAINING RING
38	1	000-025-804	SHAFT, PIN EJECTOR ASSEMBLY
39	1	000-024-515	SLEEVE BEARING, .44 X .56 X ¾
40	1	000-028-334	WASHER
41	1	937-738-003	RIVET, STEEL
42	2	000-024-890	SETSCREW
43	2	844-049-002	NUT, STOVER LOCK, ¼ - 20
44	1	000-024-516	SLEEVE BEARING, .44 X .56 X 3/8
45	1	000-023-468	BRACKET
46	2	809-849-125	SCREW, HEX, ¼ - 20 X ¾
47	1	000-023-821	SIDE CLIP WELDMENT
48	1	070-002-027	KICKBACK PANEL
49	1	844-074-002	NUT, STOVER LOCK, 1/2 - 20
50	1	941-070-200	WASHER, FLAT, 1.25 X .5 X .083
51	1	000-021-043	BRACKET WELDMENT, L.H. SIDE, R.H. MACHINE
51A	1	000-027-645	BEARING ASSY., L.H. SIDE, R.H. MACHINE (includes: 18, 19, 20 & 51)
52	1	000-021-044	BRACKET WELDMENT, R.H. SIDE, L.H. MACHINE
52A	1	000-027-646	BEARING ASSY., R.H. SIDE, L.H. MACHINE (includes: 18, 19, 20 & 52)
53	1	000-021-204	SPRING
54	1	000-027-641	THRUST BEARING
55	1	000-029-015	PIVOT STUD

# BOUNCE PLATE & ROLLER ASSEMBLY



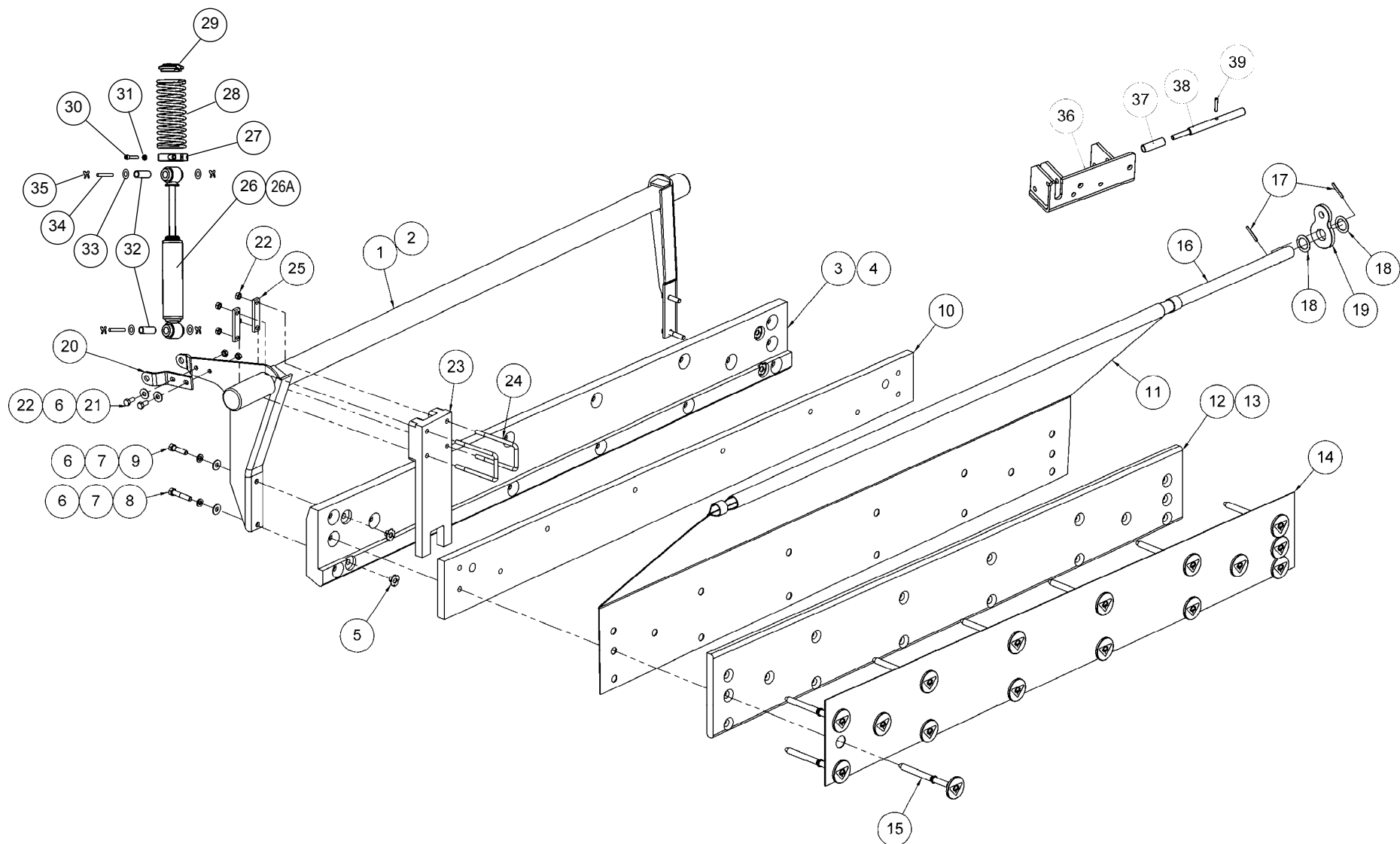
BOUNCE  
PLATE &  
ROLLER ASY



## BOUNCE PLATE & ROLLER ASSEMBLY

ITEM	QTY	PART #	DESCRIPTION	ITEM	QTY	PART #	DESCRIPTION
1	2	000-024-579	ROLLER HINGE	24	4	809-849-205	SCREW, HEX, 1/4 - 20 X 1-1/4
1A	2	000-024-592	HINGE ASSY (includes 1, 2, 3, 10, 11 & 12)	25	1	090-005-272	BOUNCE BOARD, REAR, R.H. MACHINE
1A1	1	000-024-576	FRONT ROLLER ASSY (includes 1A, 4 & 9)	26	1	090-005-273	BOUNCE BOARD, REAR, L.H. MACHINE
2	4	000-024-582	PIN	27	1	090-005-270	BOUNCE BOARD, FRONT, R.H. MACHINE
3	8	913-411-100	SPRING PIN, .078 X 5/8	28	1	090-005-271	BOUNCE BOARD, FRONT, L.H. MACHINE
4	2	000-024-578	ROLLER BODY	29	2	000-021-914	BOUNCE BOARD CHANNEL
5	1	000-025-622	BONDING STRAP	30	1	070-007-769	BRACKET WELDMENT
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	14	809-849-165	SCREW, HEX, 1/4 - 20 X 1				
17	18	948-761-112	WASHER, FLAT, .343 X .625 X .06				
18	18	809-857-205	SCREW, HEX, 5/16 - 18 X 1-1/4				
19	1	088-500-505	CARPET BELT, BLACK				
20	4	809-849-325	SCREW, HEX, 1/4 - 20 X 2				
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				

# CUSHION, CURTAIN, & SHOCK ABSORBER ASSEMBLY



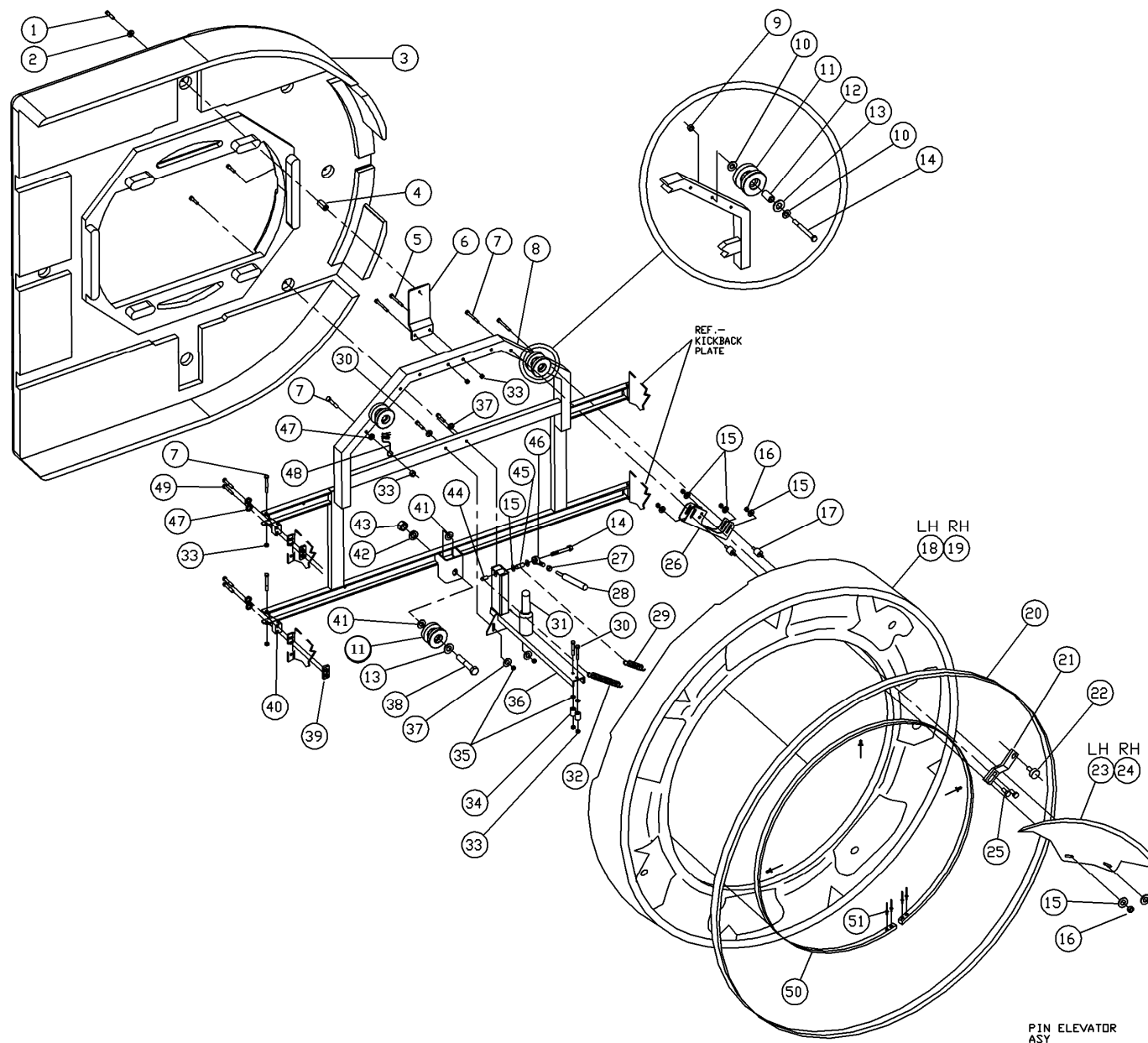




## CUSHION, CURTAIN, & SHOCK ABSORBER ASSEMBLY

ITEM	QTY	PART #	DESCRIPTION	ITEM	QTY	PART #	DESCRIPTION
1	1	070-002-252	TUBE WELDMENT, EVEN MACHINE	26	1	000-022-823	SHOCK ABSORBER w/UPPER COLLAR
2	1	070-002-050	TUBE WELDMENT, ODD MACHINE	26A	1	000-022-824	SHOCK ASSY (Includes items 26 through 32)
3	1	000-024-795	PLANK, EVEN MACHINE	27	1	000-022-286	CUSHION STRUT COLLAR
4	1	000-024-796	PLANK, ODD MACHINE	28	1	000-022-288	SPRING
5	4	7045-003716-043	TEE NUT, 3/8 - 16	29	1	000-022-287	SPRING SEATING WASHER
6	4	947-356-617	WASHER, 5/16, FLAT	30	1	810-250-200	SCREW, SOCKET HEAD CAP, 1/4 - 28 X 1-1/4
7	4	951-164-002	WASHER, SPLIT LOCK, 3/8	31	1	951-148-002	WASHER, SPLIT LOCK, 1/4
8	2	809-865-329	SCREW, HEX, 3/8 - 16 X 2	32	2	000-022-822	SLEEVE
9	2	809-865-249	SCREW, HEX, 3/8 - 16 X 1-1/2	33	4	948-975-172	WASHER, FLAT, 1-1/16 X 17/32 X 3/32
10	1	000-022-770	SPONGE RUBBER CUSHION PAD	34	2	000-022-821	PIN
11	1	000-026-450	CURTAIN ASSEMBLY	35	4	963-600-002	X-WASHER
12	1	000-024-808	RUBBER CUSHION, EVEN MACHINE	36	1	070-007-360	SUPPORT BRACKET WELDMENT
13	1	000-024-807	RUBBER CUSHION, ODD MACHINE	37	1	070-001-389	CURTAIN LATCH SPRING
14	1	090-005-230	CUSHION COVER	38	1	070-001-396	CURTAIN LATCH PIN
15	16	000-028-529	RIVET, URETHANE, CUSHION ASSEMBLY	39	1	913-431-160	SPRING PIN, .156 X 1
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				

# PIN ELEVATOR & HOOP ASSEMBLY

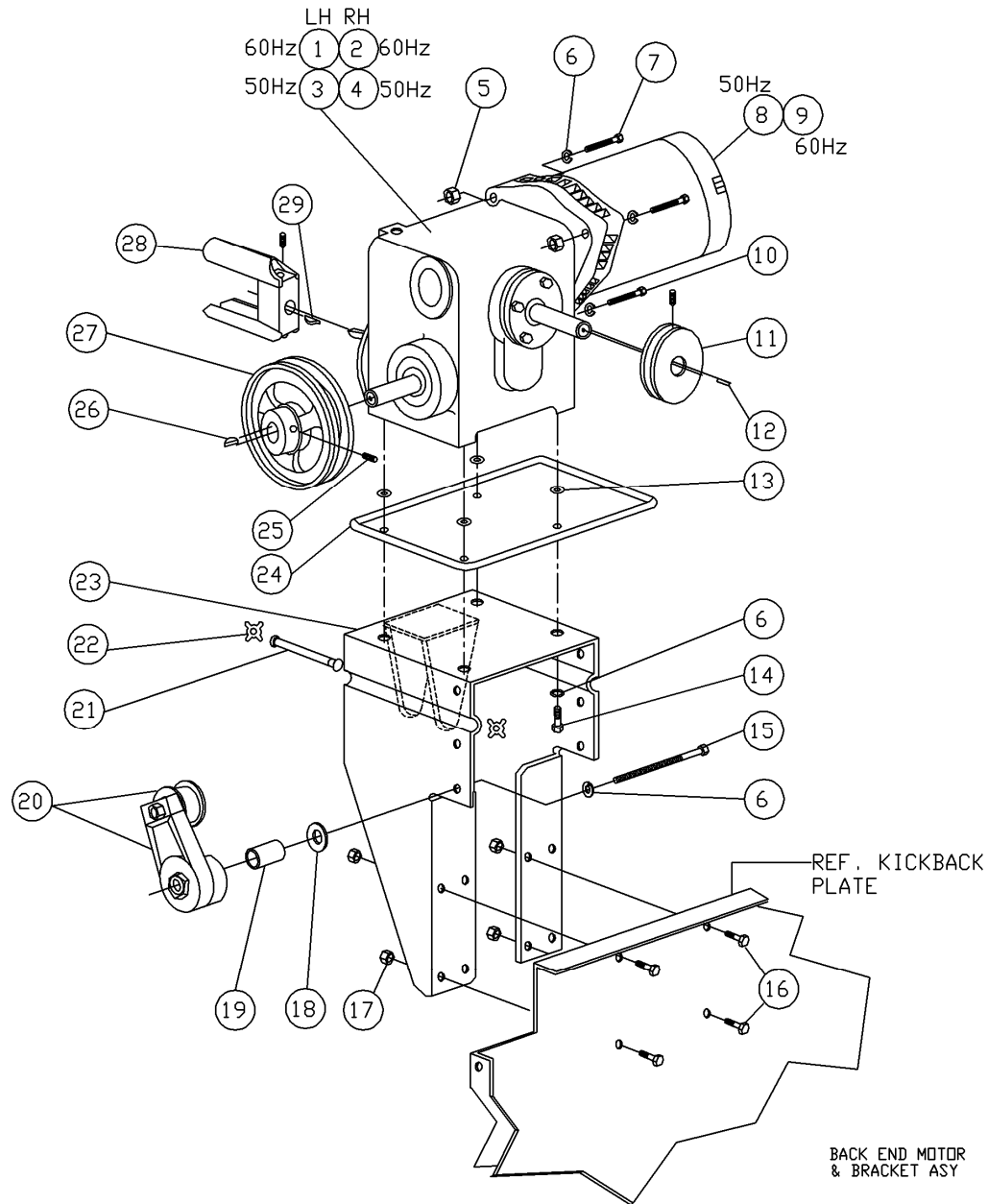




## PIN ELEVATOR & HOOP ASSEMBLY

ITEM	QTY	PART #	DESCRIPTION	ITEM	QTY	PART #	DESCRIPTION
1	4	809-857-280	SCREW, HEX, 5/16 - 18 X 1-3/4	27	1	831-566-002	NUT, HEX, 3/8 - 24
2	4	090-004-055	WASHER	28	1	070-006-047	SAFETY LINK TUBE
3	1	090-007-145	WHEEL GUARD, REVERSIBLE	29	1	070-006-030	SAFETY LINK SPRING
4	4	090-007-241	SPACER	30	6	809-857-365	SCREW, HEX, 5/16 - 18 X 2-1/4
5	2	809-857-445	SCREW, HEX, 5/16 - 18 X 2-3/4	31	1	070-006-045	DISTRIBUTOR SUPPORT POST
6	1	090-003-111	UPPER GUARD SUPPORT	32	1	000-026-032	DISTRIBUTOR LATERAL DRIVE SPRING
7	7	809-857-405	SCREW, HEX, 5/16 - 18 X 2-1/2	33	12	844-057-002	NUT, STOVER LOCK, 5/16 - 18
8	1	090-003-102	HOOP WELDMENT	34	2	070-008-449	SPACER
9	2	844-065-002	NUT, STOVER LOCK, 3/8 - 16	35	10	948-761-112	WASHER, FLAT, 11/16 X 11/32 X 1/16
10	4	947-367-141	WASHER, 7/8 X 13/32 X 1/8	36	1	090-003-112	DISTRIBUTOR MOUNT
11	3	090-007-327	PIN ELEVATOR ROLLER	37	4	947-356-617	WASHER, FLAT, 11/32 X 5/16
12	2	090-003-116	SPACER	38	1	880-781-240	SHOULDER BOLT, SOCKET HEAD, 3/4 X 1-1/2
13	3	950-001-008	WASHER, NYLON, .750 X 1.25 X .08	39	4	090-005-123	NUT PLATE
14	2	809-865-725	SCREW, HEX, 3/8 - 16 X 4-1/2	40	4	090-005-106	HINGE/SPACER
15	6	948-767-132	WASHER, 13/16 X 13/32 X 1/16	41	1	948-809-210	WASHER, FLAT, 1-5/16 X 5/8 X .09
16	4	834-557-002	NUT, HEX, 5/16 - 18	42	1	951-181-002	WASHER, SPLIT LOCK, 5/8
17	2	000-029-068	RUBBER MOUNTING	43	1	840-381-002	NUT, FLEX LOCK, 5/8-11
18	1	090-004-117	PIN WHEEL WELDMENT, L.H. MACHINE	44	1	070-006-044	SPRING POST NUT, 3/8 - 16
19	1	090-004-116	PIN WHEEL WELDMENT, R.H. MACHINE	45	1	070-006-043	SPACER
20	1	090-002-065	PIN WHEEL BELT	46	1	090-005-256	ROD END
21	1	070-001-415	RAIL STOP BRACKET	47	13	951-156-002	WASHER, SPLIT LOCK, 5/16
22	1	000-021-992	BUMPER	48	1	090-005-144	STATIC BRUSH
23	1	070-006-099	RAIL, L.H. MACHINE	49	8	809-857-325	SCREW, HEX, 5/16-18 X 2
24	1	070-006-098	RAIL, R.H. MACHINE	50	1	090-005-108	PIN WHEEL STRIP
25	2	824-757-102	SCREW, WASHER HEAD, 5/16 - 18 X 5/8	51	7	938-523-050	POP RIVET, 1/8 X .251 X .31
26	1	090-005-120	RAIL STANDOFF BRACKET				

# BACK END DRIVE MOTOR & BRACKET ASSEMBLY

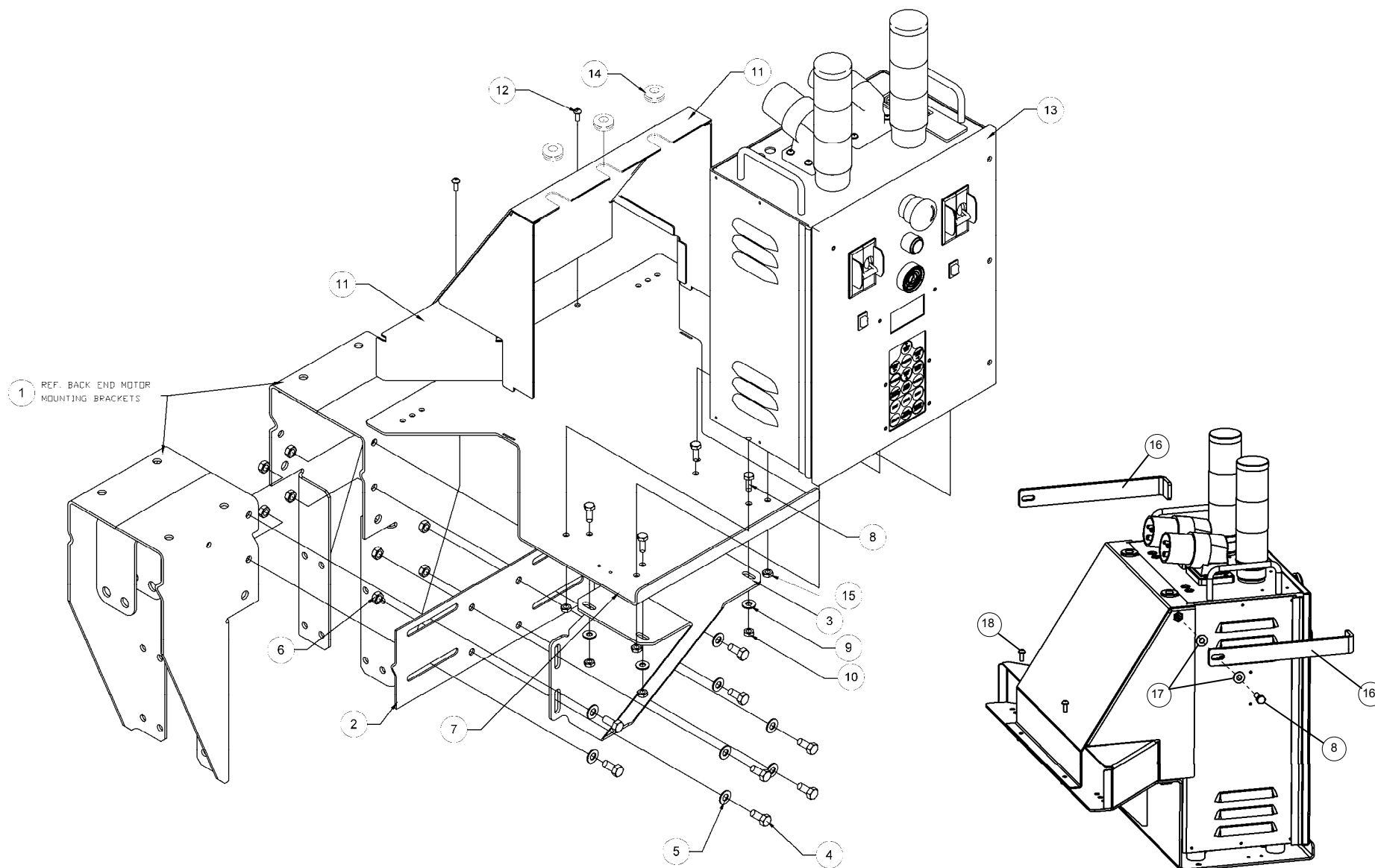




## BACK END DRIVE MOTOR & BRACKET ASSEMBLY

ITEM	QTY	PART #	DESCRIPTION	ITEM	QTY	PART #	DESCRIPTION
1	1	088-004-502	GEARBOX, EVEN MACHINE, 60 Hz	27	1	000-023-673	PIN ELEVATOR DRIVE SHEAVE
2	1	088-004-501	GEARBOX, ODD MACHINE, 60 Hz	28	1	090-001-130	DISTRIBUTOR DRIVE HOUSING
3	1	088-004-507	GEARBOX, EVEN MACHINE, 50 Hz	29	1	907-000-300	KEY
4	1	088-004-506	GEARBOX, ODD MACHINE, 50 Hz				
5	2	839-665-002	NUT, FLEX LOCK, 3/8 - 16				
6	8	951-164-002	WASHER, SPLIT LOCK, 3/8				
7	2	809-865-325	SCREW, HEX, 3/8 - 16 X 2				
8	1	090-007-310	MOTOR, 50 Hz				
9	1	090-003-766	MOTOR, 60 Hz				
10	1	809-865-245	SCREW, HEX, 3/8 - 16 X 1-1/2				
11	1	000-022-172	DRIVE SHEAVE				
12	1	907-202-600	KEY, SQUARE, 3/16 X 1-7/8				
13	4	000-023-758	GASKET WASHER, 7/8 X 3/8 X 1/32				
14	4	809-865-165	SCREW, HEX, 3/8 - 16 X 1				
15	1	070-003-221	SCREW, HEX, 3/8 - 16 X 3-1/2				
16	4	809-857-125	SCREW, HEX, 5/16 - 18 X 3/4				
17	4	844-057-002	NUT, STOVER LOCK, 5/16 - 18				
18	1	000-021-792	WASHER, FLAT, 7/8 X 13/32 X 1/8				
19	1	090-004-519	SPACER				
20	1	090-003-508	TENSIONER ASSEMBLY				
21	1	000-022-821	PIN				
22	2	963-600-002	X-WASHER				
23	1	090-003-509	MOTOR MOUNT WELDMENT				
24	1	090-004-517	BACK END MOTOR DRIP PAN				
25	3	807-358-060	SETSCREW, 5/16 - 24 X 3/8				
26	1	907-201-000	KEY, SQUARE, 3/16 X 1-1/4				

# CHASSIS & MOUNTING BRACKET ASSEMBLY

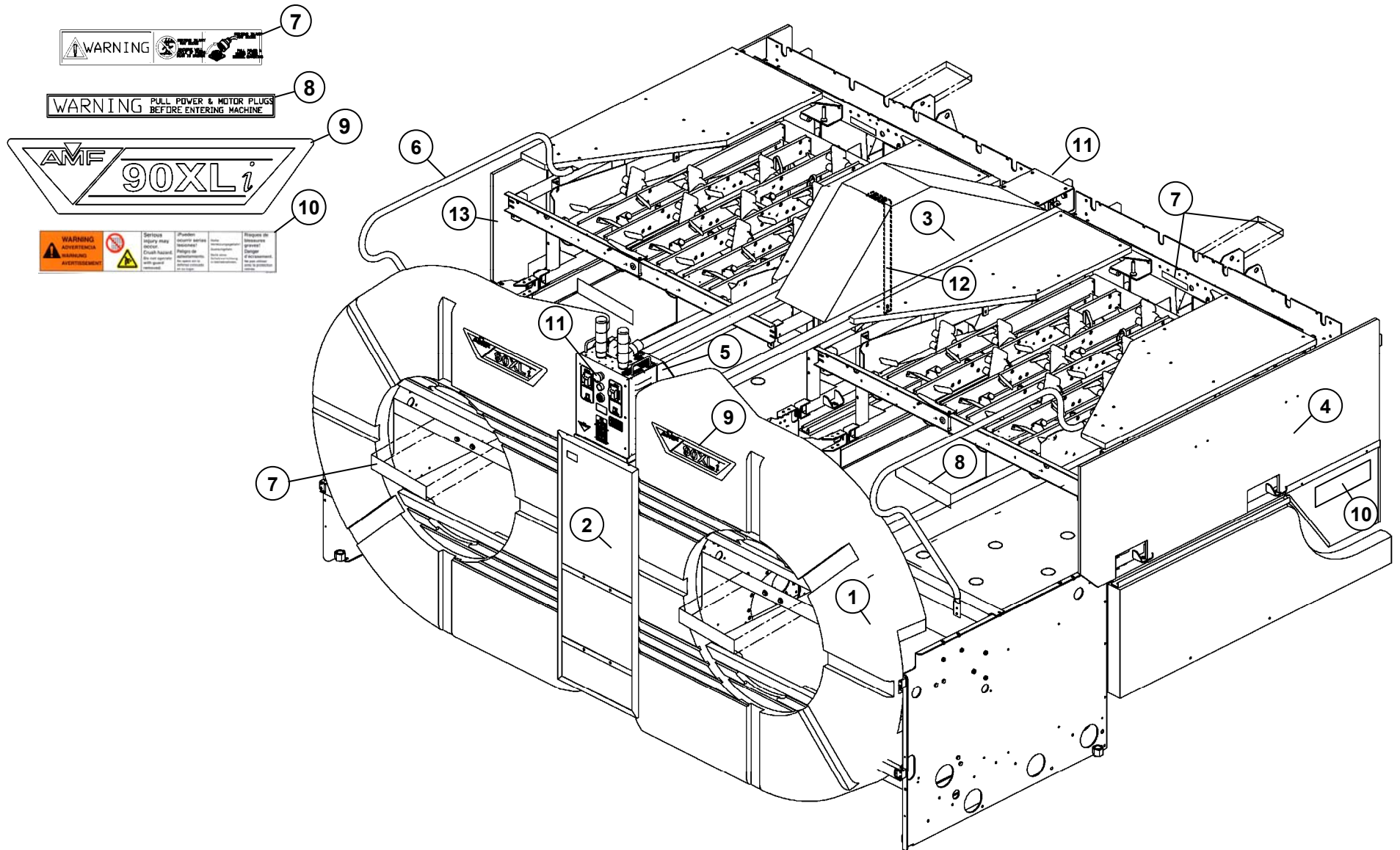




## CHASSIS & MOUNTING BRACKET ASSEMBLY

ITEM	QTY	PART #	DESCRIPTION	ITEM	QTY	PART #	DESCRIPTION
1	2	090-003-509	MOTOR MOUNT WELDMENT				
2	1	090-004-513	TIE PLATE				
3	1	088-000-068	CHASSIS SUPPORT BRACKET				
4	8	809-857-125	SCREW, HEX, 5/16 - 18 X 3/4				
5	8	948-761-112	WASHER, FLAT, 11/32 X 11/16 X 1/16				
6	8	844-057-002	NUT, STOVER LOCK, 5/16 - 18				
7	1	088-200-486	CONTROLLER MOUNTING WELDMENT				
8	8	809-849-125	SCREW, HEX, 1/4 - 20 X 3/4				
9	4	948-753-102	WASHER, FLAT, 9/32 X 5/8 X 1/16				
10	4	844-049-002	NUT, STOVER LOCK, 1/4 - 20				
11	1	088-200-568	CHASSIS COVER ASSEMBLY, WIDE				
12	2	812-840-082	SCREW, ROUND HEAD, 10 - 32 X 1/2				
13	1	088-000-001	90XLi PINSPOTTER CONTROLLER (220V 50/60HZ)				
14	3	711-520-012	GROMMET, 5/8 X 7/8 X 1/16				
15	6	835-549-002	NUT, HEX JAM, 1/4 - 20				
16	2	088-200-180	CHASSIS REAR COVER STRAP				
17	4	948-753-101	WASHER, FLAT, 1/4, BLACK				
18	2	818-240-082	SCREW, ROUND HEAD, 10-32 X 1/2, SEMS				

## GUARDS & SAFETY LABELS







## GUARDS & SAFETY LABELS

ITEM	QTY	PART #	DESCRIPTION	ITEM	QTY	PART #	DESCRIPTION
1	2	090-007-145	PINSPOTTER WHEEL GUARD				
2	1	088-001-115	BALL LIFT GUARD, REAR				
3	1	070-011-401	BALL LIFT GUARD WELDMENT				
4	1	090-006-243	LEFT HAND END GUARD ASSEMBLY				
5	1	088-000-004	CHASSIS COVER				
6	2	090-005-118	HANDRAIL				
7	6	090-004-028	WARNING LABEL				
8	2	090-005-642	WARNING DECAL (ON YOKE)				
9	2	088-000-035	90XLi WHEEL GUARD DECAL				
10	3	088-001-154	DANGER DECAL				
11	2	088-001-160	E-STOP BUTTON & SWITCH ASSEMBLY				
12	2	070-010-238	FRONT GUARD ASSEMBLY BRACKET				
13	1	090-006-230	RIGHT HAND END GUARD ASSEMBLY				

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