



Operating and Service Manual

Ballworx
Advanced Polishing System

November 2000 /14-900075-000

Brunswick® 
CUSTOMER SERVICE
A tradition in excellence.

Statement of Intent

This manual is provided to be used by qualified bowling center personnel. Customer accepts responsibility for safety training of all personnel who operate, service, or maintain this product.

Ballworx Advanced Polishing System Operating and Service Manual

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Reorder Part No. 14-900075-000

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525 West Laketon Avenue
P.O. Box 329
Muskegon, MI 49443-0329
U.S.A.

231.725.3300



WARRANTY REGISTRATION CARD

IMPORTANT: In order to validate your Brunswick Ballworx warranty, this portion must be filled out completely, cut out of this manual, and returned within 10 days after installation to: Brunswick Bowling at the address listed on back of this card.

Contact Person: _____

Name of Bowling Center: _____

Phone Number: _____ Fax Number: _____

Street Address: _____

City: _____ State: _____ Zip Code: _____

Distributor: _____

Ballworx Serial Number: _____ Date of Installation: _____

Installer's Signature: _____

Place
Stamp
Here

Brunswick Bowling & Billiards Corporation
Attention: Ballworx Warranty Department
P.O. Box 329
Muskegon, MI 49443-9928

Warranty and Service Policy

Warranty

If any defects in materials appear during the 12 months after installation, the defective part will be repaired or replaced at Brunswick's option, without charge to the Customer for parts. **The Purchaser must assume all other costs in making the repair or replacement.**

NORMAL MAINTENANCE PROCEDURES AND ADJUSTMENTS ARE THE RESPONSIBILITY OF THE CUSTOMER AND ARE NOT COVERED UNDER THE TERMS OF THIS WARRANTY.

Brunswick reserves the right to change the design of any product, but assumes no responsibility to incorporate such design changes on products already sold.

This warranty applies only to new products and extends only to the original purchaser. This warranty shall not apply to any machine repaired or altered in any way outside of our factory-authorized service station and/or distributor, or where parts, other than Brunswick-approved parts, have been installed in the machine, or where the machine has been subject to misuse, negligence, accident, or abuse. Brunswick reserves the right to inspect and make the final decision on any claim under this warranty that it deems questionable.

Under no circumstances shall the seller or manufacturer be liable for loss of profits or other direct or indirect costs, expenses, losses, or damages arising out of defects in, or failure of the equipment, or of the parts.

During the warranty period, parts that are faulty due to material or workmanship will be repaired or replaced free of charge only if the defective part is properly identified and returned for credit. A Brunswick Product Trouble Report must be completed, including a description of the problem, and the completed form must accompany the returned part. A returned goods number must be obtained from Brunswick prior to returning any items. Identify the returned part by attaching a tag containing the part name and part number.

The above warranty is exclusive: THERE ARE NO IMPLIED WARRANTIES, INCLUDING MERCHANTABILITY AND FITNESS FOR USE, beyond those expressly made herein.

Any warranty claim must be preceded by a phone call to a Technical Support Engineer who will assist the customer with troubleshooting procedures prior to the filing of any warranty claim. For Ballworx, call 231-725-4637 or 231-725-4972 or FAX 231-725-4677.

Motor Warranty

The electric motors are guaranteed by the motor manufacturers for a period of one year from the date of delivery to purchaser. If the motors develop any defect in material or workmanship during the one-year warranty period, they will be repaired or replaced free of charge, at Brunswick's option. **The Purchaser must assume all other costs in making the repair or replacement.**

Obtaining Warranty Service For Parts

In order to obtain warranty service for defective parts, the Purchaser must purchase from Brunswick, a part to replace the defective part and then return the defective part with a Product Trouble Report and the replacement part invoice to Brunswick's service center at 525 W. Laketon Avenue, Muskegon, MI 49443, freight prepaid. Upon determination that the returned part is defective, Brunswick will credit Purchaser's account for the purchase price of the replacement part purchased by Purchaser.

Service Parts

Refer to the bowling section of the BRUNSWICK PARTS CATALOG for parts identification. Service parts may be ordered through your Brunswick representative. When ordering service parts, specify part numbers and description to simplify handling. **USE ONLY GENUINE BRUNSWICK SERVICE PARTS**

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Section 1: General Information

Introduction

The Brunswick Ballworx Advanced Polishing System is an automatic bowling ball polishing machine, which offers 1 to 4 polishing levels with time & money determined by the Proprietor programming Ballworx.

The polishing levels are determined by the amount of money deposited in the coin and/or bill acceptor slots and are explained on the customer display adjacent to the coin and/or bill acceptor slots.

Ballworx consists, in part of a high-speed cotton buffing wheel that polishes the bowling ball, a ball roller mechanism that constantly rotates the bowling ball, and an oscillator mechanism that constantly changes the position of the bowling ball against the buffing wheel. A polishing compound block is used that intermittently applies polishing compound material to the buffing wheel. The buffing wheel, ball roller, oscillator, and compound block are driven by a double-ended, one-horse power electric motor.

The ball door is mounted on the front panel and is opened by the customer at the beginning of each operation to accept a bowling ball. The ball door is then closed by the customer and remains closed during the entire operation of the machine. The ball door is then reopened by the customer at the completion of operation to allow the customer to remove his/her polished bowling ball.

A blower, driven by the one-horse power motor, forces air upward through the polishing compartment, through an air filter on the bottom side of the top panel, and through vents in the top panel. The forced air, removes polishing material and dust from the polishing compartment and insures that the bowling balls will be free from polishing material and dust at the completion of the machine's operation.

A Liquid Crystal Display (LCD) on the Customer Display indicates the information needed for customer use, including (Pricing, Time, Money Deposited, and Time Remaining). A start button initiates machine operation once money has been deposited.

Installation and Set-Up

Machine Placement

1. Position Ballworx in its permanent location.
2. Level Ballworx (refer to "*Mounting Feet Adjustment*" section on page 18).
3. Insert power plug into the grounded receptacle. (The power cord provided with Ballworx is an approved three-prong plug.)

NOTE: *The grounded receptacle provided for Ballworx must be on a dedicated 208/230 VOLT 20 AMP breaker.*

4. Ballworx is now is ready for test operation.

Programming

Ballworx has been programmed at the factory with pricing and time values. If these settings are not acceptable, they can be changed. (Refer to the "*Programming*" section beginning on page 39)

Operation

The operation of Brunswick Ballworx Advanced Polishing System is as follows:

The customer decides which polishing level is desired, and then deposits the appropriate amount of money as explained on the customer display. When the proper amount has been deposited, the ball door is opened, the bowling ball is inserted, and the ball door is closed. Then the customer depresses the “START” button on the customer display.

When the “START” button is depressed, Ballworx, through its control PCB, selects the proper polishing level, and starts the one-horse power motor.

During the polishing operation, the bowling ball is held against the cotton buffing wheel and rests on a slow turning, urethane ball roller to prevent the bowling ball from spinning at the same speed as the buffing wheel. The difference in speed between the bowling ball and the buffing wheel produces a friction buffing effect.

A compound advance mechanism moves the polishing compound material momentarily against the buffing wheel once during each minute of operation. The controlled application of the compound material to the buffing wheel insures that the proper amount of compound material is used during the polishing operation.

A constantly rotating oscillator arm changes the position of the bowling ball during the polishing operation to apply a uniform polish to the whole bowling ball.

At the completion of the polishing operation, the one-horse power motor stops. The customer then opens the ball door, removes his/her bowling ball, and then closes the ball door.

Ballworx is now ready for the next customer to use.

The theory of operation, adjustments, troubleshooting, maintenance, and house-ball operation will be explained in subsequent sections of this manual. This manual should be read carefully and all procedures followed to obtain optimum performance of the Brunswick Ballworx Advanced Polishing System.

Section 2: Component Description

Frame and Motor

The Ballworx frame is constructed of reinforced sheet metal and consists of two side frames, a lower frame and back panel. Two parallel brackets extend across the front and rear of the lower frame. Four screw-type adjustable mounting feet are threaded into the brackets at the four corners of the machine and are used to level and stabilize the position of Ballworx.

The buffing wheel and bowling ball compartments are located between the side frames with baffles between them for separation. The upper polishing compartment is relatively airtight when the top cover is in position, except for a large opening in the center baffle. During polishing operation a portion of the bowling ball protrudes into the buffing compartment through the circular opening. The bowling ball compartment is located in front of the buffing compartment and houses the bowling ball during polishing operation.

Buffing Wheel Mechanism

Attached to the inside of both the right and left-hand side frames is the buffing wheel assembly, which includes a dual supported shaft. This shaft protrudes through a bearing housing and the right-hand side frame, it also attaches to a pillow block bearing and bracket mounted on the left-hand side frame. Refer to *Figure 1*.

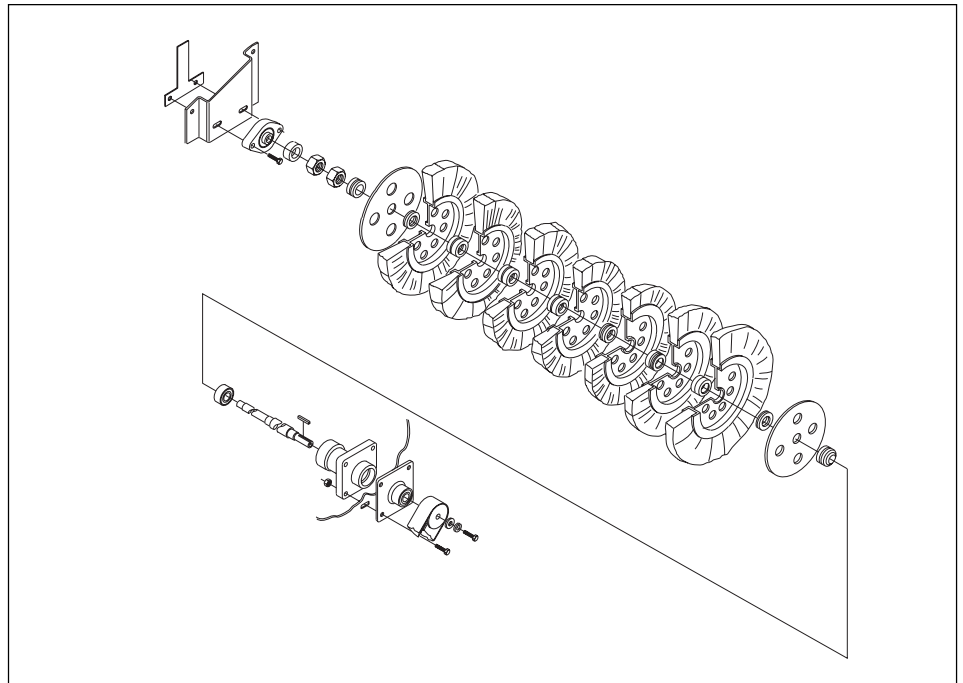


Figure 1. Buffing Wheel

The buffing shaft rotates counter clockwise at high speed (3000 rpm) and is driven by a Linkable 'V'-belt from the large pulley on the one horse power motor, to the small pulley on the buffing shaft. Both pulleys are keyed to their respective shafts.

The buffing wheel assembly is mounted on the buffing shaft and consists of seven individual sections of cotton buffing material attached to seven separate metal hubs. Metal spacers that are positioned on the buffing shaft separate the seven sections of the buffing wheel. The entire buffing wheel assembly is secured to the buffing shaft by a pair of jam nuts. These nuts have left-hand threads.

The buffing wheel mechanism mounting holes are slotted to allow adjustment of the buffing wheel assembly as the cotton buffing material wears. A slide plate and adjusting screw are mounted on the outside of the right-hand side frame and are attached to the buffing wheel mechanism. (Refer to *"Buffing Wheel Adjustment"* section on page 20)

A linkable belt drives the buffing wheel from the motor pulley. This belt is made up of small links, which are removable to increase or decrease belt tension. (Refer to *"Belt Tension Adjustment"* section on page 26)

Ventilation System

Brunswick Ballworx employs a forced air ventilation system through the ball compartment and buffing compartment to insure that all dirt and dust is removed from the bowling ball during polishing operation. Refer to *Figure 2*.

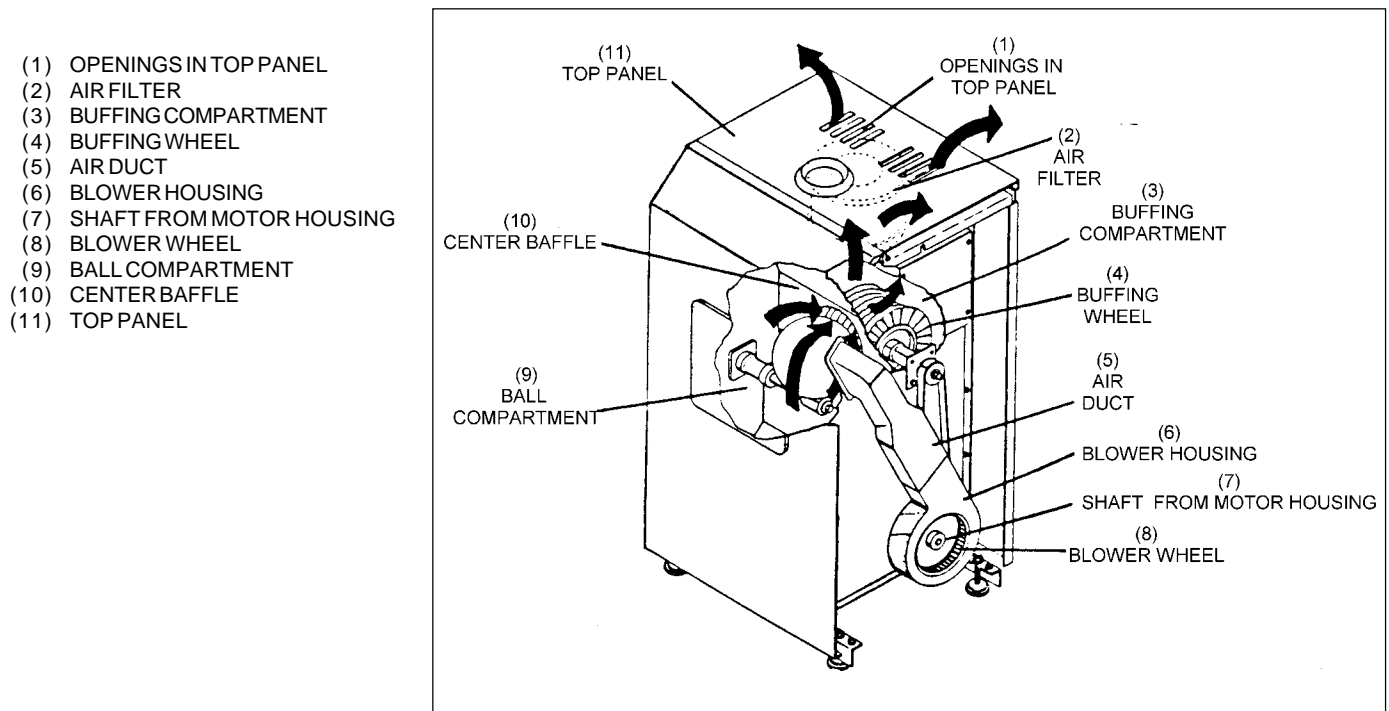


Figure 2. Overview of Ventilation System

A blower wheel is attached to the right-hand end of the shaft from the one horse power motor. A sheet metal housing covers the blower wheel and directs the air upward, through an air duct, and into the bowling ball compartment.

During the polishing operation, the bowling ball protrudes through the circular opening in the center baffle as previously described. Since the bowling ball compartment is basically airtight, the air that is forced into the bowling ball compartment escapes into the buffing wheel compartment. Air passes between them at high velocity, thus removing all dirt and dust from the bowling ball. The only escape route for the dust-laden air is through an air filter attached to the bottom of the top cover. The dust-laden air is forced through the air filter and deposits the impurities in the air filter, then passes through openings in the top cover.

The blower wheel starts to turn when the ball door is closed and the "Start" button is depressed at the start of the polishing operation, and stops turning when the ball door is opened and/or at the completion of the polishing operation.

Ball Roller Mechanism

Mounted to the inside surface of the left-hand side frame is a bearing housing, which houses a bearing at each end. The housing supports the ball roller shaft that extends from the bowling ball compartment through the left-hand side frame. Refer to *Figure 3*.

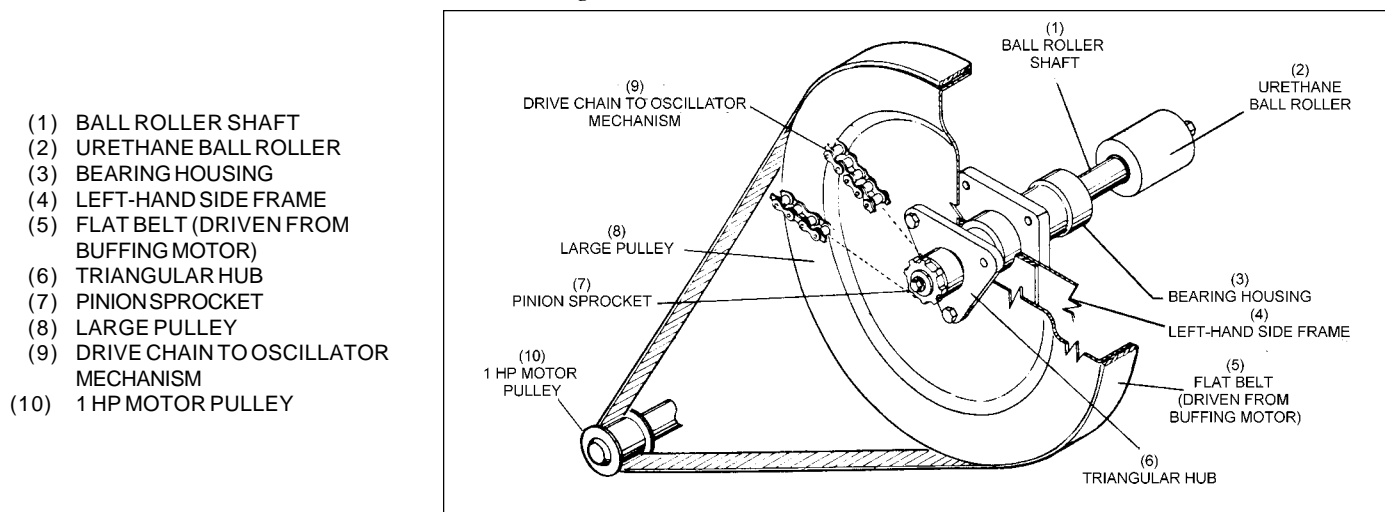


Figure 3. Ball Roller Mechanism

The inside end of the ball roller shaft carries the urethane ball roller, on which the bowling ball rides during the polishing operation. The function of the ball roller is to rotate at a slower speed than the buffing wheel and consequently prevent the bowling ball from spinning at the same rate of speed as the buffing wheel. The urethane ball roller also supports the weight of the bowling ball while being polished.

When the ball door closes, the weight of the bowling ball is transferred from the door cradle to the ball roller. The bowling ball, in its polishing position, rests on the ball roller and a steel roller at the bottom of the opening in the center baffle. At this time the bowling ball also contacts the buffing wheel and steel ball door roller. Two steel rollers, one attached to each side frame, restrict the lateral movement of the bowling ball during the polishing operation.

The ball roller consists of a urethane cylinder that is bonded to a metal sleeve. The ball roller assembly is keyed to the ball roller shaft and is secured by a bolt to the end of the shaft.

The exterior end of the ball roller shaft carries a triangular hub that is keyed to the shaft. A large circular pulley is bolted to the inside surface of the hub and carries a flat belt that is driven by a small pulley attached to the one horse power motor. The reduction ratio of the pulley diameter causes the ball roller shaft to be driven at a slow speed.

A small pinion sprocket is keyed to the exterior end of the ball roller shaft and is secured by a bolt and set screw to the end of the shaft. The pinion sprocket drives the oscillator mechanism.

Oscillator Mechanism

A bearing housing is mounted to the inside surface of the left-hand side frame to provide support for the oscillator pinion shaft. The oscillator pinion shaft extends through the left-hand side frame, directly under the buffing wheel compartment. Refer to *Figure 4*.

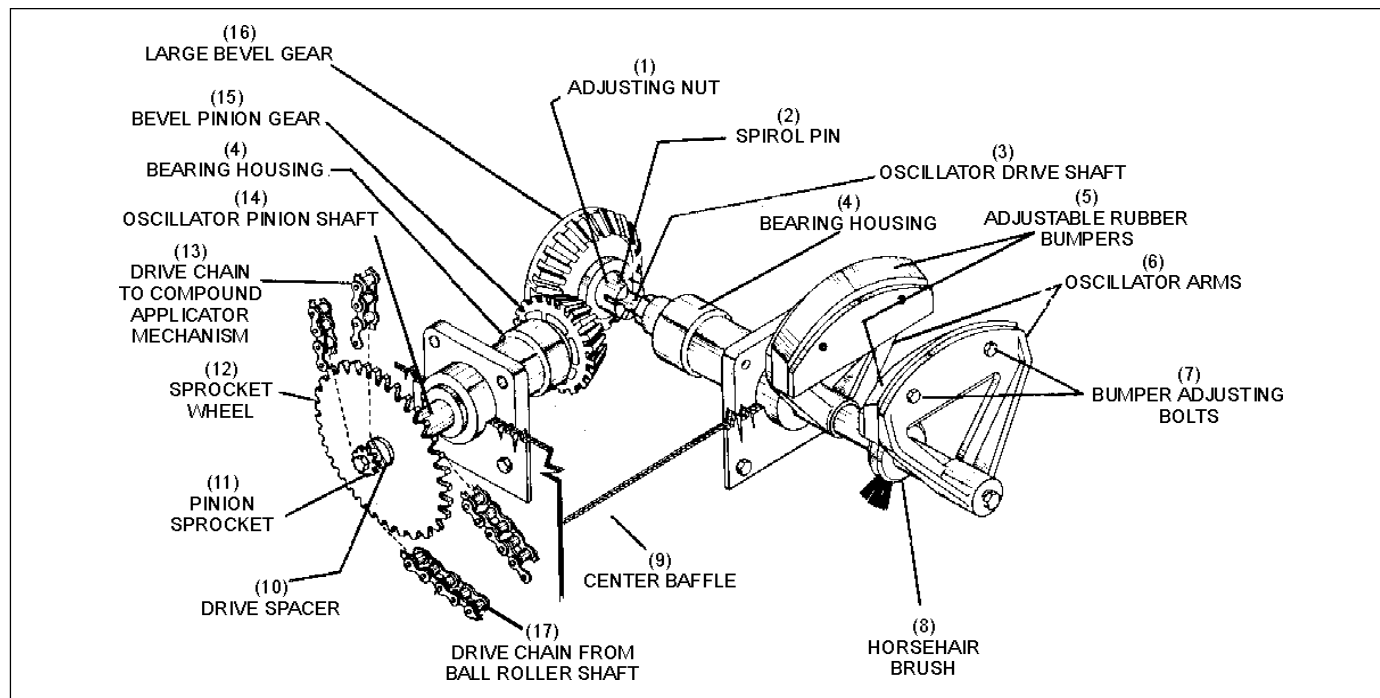


Figure 4. Ball Mechanism Overview

- | | | |
|---|---|----------------------------|
| (1) ADJUSTING NUT | (2) SPIRAL PIN | (3) OSCILLATOR DRIVE SHAFT |
| (4) BEARING HOUSING | (5) ADJUSTABLE RUBBER BUMPERS | (6) OSCILLATOR ARMS |
| (7) BUMPER ADJUSTING BOLTS | (8) HORSEHAIR BRUSH | (9) CENTER BAFFLE |
| (10) DRIVE SPACER | (11) PINION SPROCKET | (12) SPROCKET WHEEL |
| (13) DRIVE CHAIN TO COMPOUND APPLICATOR MECHANISM | (14) OSCILLATOR PINION SHAFT | (15) BEVEL PINION GEAR |
| (16) LARGE BEVEL GEAR | (17) DRIVE CHAIN FROM BALL ROLLER SHAFT | |

A large sprocket wheel and a smaller pinion sprocket gear are attached to the left end of the oscillator pinion shaft. The large sprocket gear has a radial key slot across its exterior face that aligns with an identical radial slot in the end of the shaft. A drive spacer, having a radial key surface on each of its faces, engages the key slots of the sprocket wheel and shaft, thus locking them together. The drive spacer, pinion sprocket wheel are secured to the oscillator drive shaft with a bolt and lock washer.

The oscillator pinion shaft is powered through the large sprocket wheel by a drive chain that is driven by the pinion sprocket on the ball roller shaft. As the drive chain rotates the large sprocket wheel, the force is transmitted to the shaft and sprocket gear through the radial keys on the drive spacer, thus rotating the pinion sprocket and oscillator pinion shaft.

A small nylon bevel pinion gear is keyed to the right-hand end of the oscillator pinion shaft and meshes with a large nylon bevel gear that is mounted to the end of the oscillator pinion shaft. The oscillator drive shaft extends forward into the bowling ball compartment and is supported by a bearing housing that is mounted to the rear surface of the center baffle

The large nylon bevel gear is attached to the oscillator shaft assembly. An adjusting nut having six horizontal projections, is threaded onto the rear end of the oscillator shaft assembly. The large nylon bevel gear, with six mating holes on its forward face, is positioned on the shaft against the adjusting nut, with the projections of the nut engaging the holes in the large nylon bevel gear. A pair of jam nuts and a flat washer on the end of the oscillator drive shaft secures the large nylon bevel gear against the adjusting nut. The adjusting nut can be threaded forward or backward to obtain proper alignment between both nylon bevel gears. A spiral pin inserted through the oscillator drive shaft engages two slots in the adjusting nut to lock the adjusting nut when the nylon bevel gears are aligned. Refer to *Figure 5*.

- (1) BEVEL PINION GEAR
- (2) JAM NUTS
- (3) ADJUSTING NUTS
- (4) SPIRAL PIN
- (5) OSCILLATOR SHAFT
- (6) PINION GEAR
- (7) BEARING HOUSING
- (8) CENTER BAFFLE

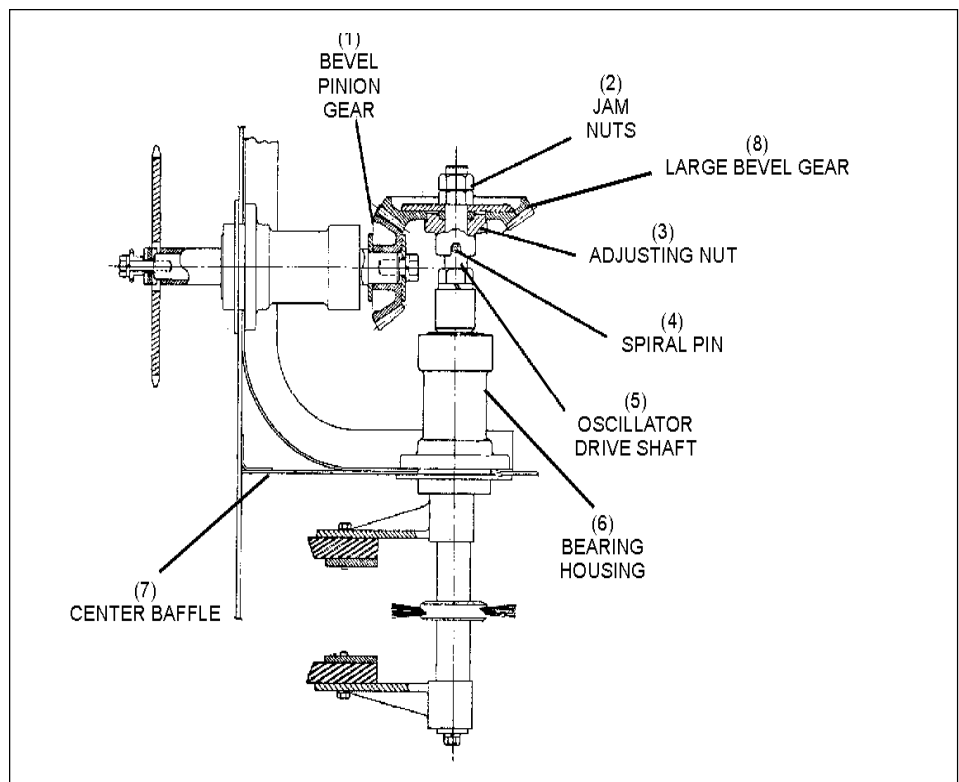


Figure 5. Oscillator Shaft

When the oscillator pinion shaft is rotated, as previously described, the motion is transferred from the small nylon pinion bevel gear to the large nylon bevel gear, which, through the projections on the adjusting nut, rotates the oscillator drive shaft assembly.

The reduction ratio between the small and the large nylon bevel gears causes the oscillator drive shaft assembly to rotate slower than the oscillator pinion shaft.

Two oscillator arms are keyed to the forward end of the oscillator drive shaft, separated by two spacers and a horsehair brush. The oscillator arms straddle the ball roller. A urethane oscillator bumper pad is clamped to each oscillator arm and, as the oscillator shaft rotates, the bumper pads will contact the bowling ball once per revolution. When the oscillator bumper pads contact the bowling ball, the bowling ball will be momentarily lifted and rotated, thereby constantly changing the position of the bowling ball against the buffing wheel. Since the oscillator mechanism is powered indirectly by the one horsepower motor, the oscillator mechanism rotates only when the ball door is closed during a polishing operation.

The horsehair brush is mounted on the oscillator shaft assembly, directly under the urethane ball roller. As the oscillator assembly rotates, the brush contacts the urethane ball roller and keeps it clean to prevent marking of the bowling balls being polished.

Cradle and Ball Door Mechanism

The cradle and ball door mechanism located in the center of the front panel is where the customer will place the bowling ball. The customer opens the ball door to access the cradle assembly, and places the bowling ball onto the cradle in the center of the ball door. The cradle assembly has four (4) idler rollers that the bowling ball rests on until the ball door is closed. The cradle assembly also has one (1) spring loaded steel guide roller to hold the bowling ball against the buffing wheel.

Compound Advance Mechanism

Mounted to the exterior surface of the left-hand side frame, above the oscillator drive shaft, is another bearing housing that contains a reducer shaft. The outside end of the reducer shaft carries a large sprocket gear that has a radial key slot across its exterior face. This radial key slot aligns with an identical slot in the end of the shaft. A drive spacer having a radial key surface on each of its faces engages the key slot of the sprocket gear and shaft, thus locking them together. Mounted on the extreme end of the reducer shaft is a small pinion sprocket, which also has radial key slot across its hub. This slot engages the opposite key surface of the drive spacer to lock the small pinion sprocket to the large sprocket gear and shaft. The drive spacer and small pinion sprocket gear are mounted on a bolt that is screwed into the end of the shaft. The bolt holds the keyed slots in engagement with the drive spacer. A roller chain drives the large sprocket gear from the small pinion sprocket gear on the oscillator pinion shaft.

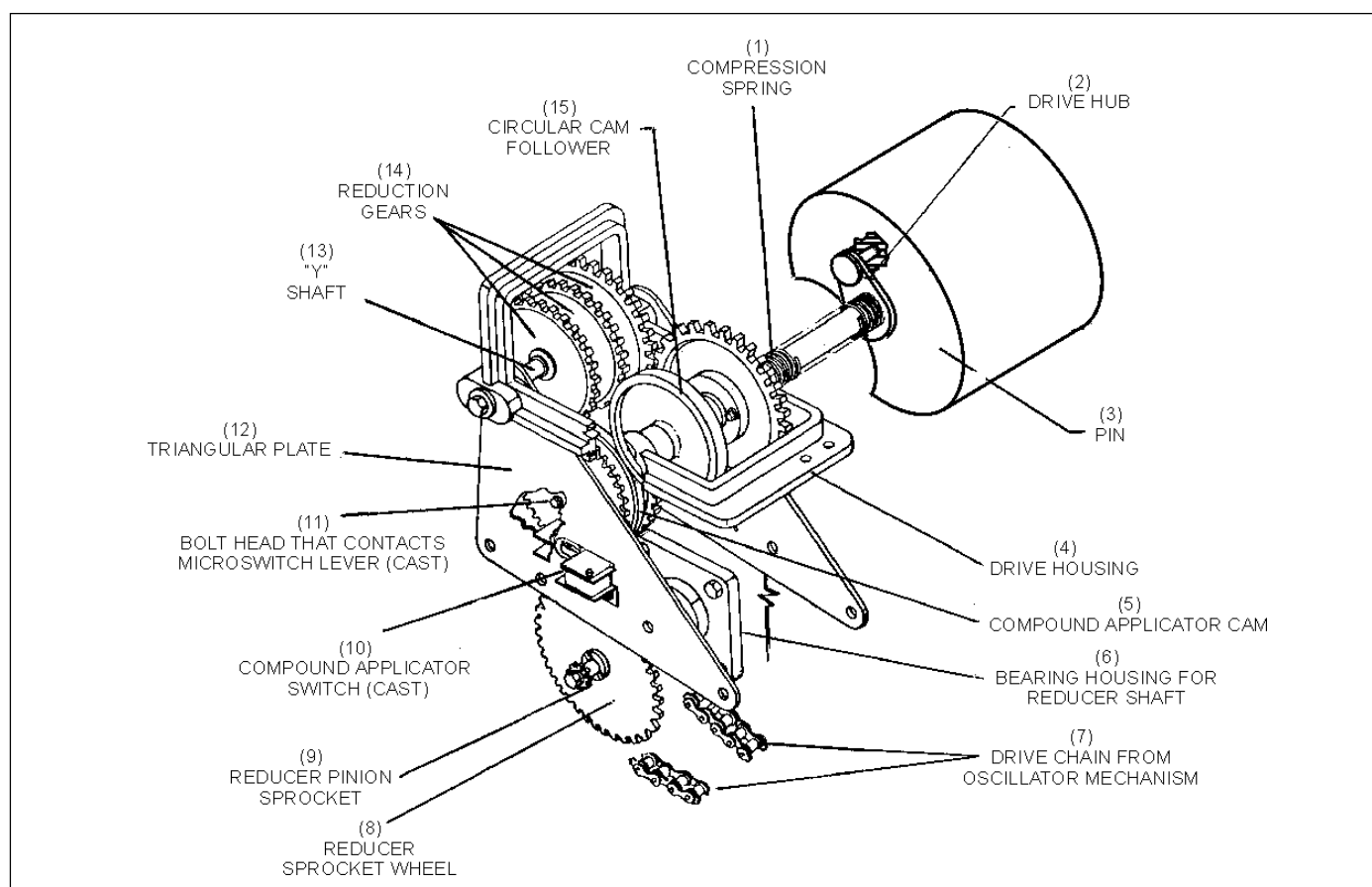


Figure 6. Compound Advance Mechanism

- | | | |
|---|---|---------------------------------------|
| (1) COMPRESSION SPRING | (2) DRIVE HUB | (3) PIN |
| (4) DRIVE HOUSING | (5) COMPOUND APPLICATOR CAM | (6) BEARING HOUSING FOR REDUCER SHAFT |
| (7) DRIVE CHAIN FROM OSCILLATOR MECHANISM | (8) REDUCER SPROCKET WHEEL | (9) REDUCER PINION SPROCKET |
| (10) COMPOUND APPLICATOR SWITCH (CAST) | (11) BOLT HEAD THAT CONTACTS MICROSWITCH LEVER (CAST) | (12) TRIANGULAR PLATE |
| (13) "Y" SHAFT | (14) REDUCTION GEARS | (15) CIRCULAR CAM FOLLOWER |

Mounted to the exterior surface of the left-hand side frame, directly above the reducer sprocket, are two parallel triangular plates. The two plates are held apart by two cylindrical spacers and mounting bolts that attach the triangular plates to the side frame. These two bolts and spacers serve as stationary pivot shafts for the sprockets, cams and gears that are mounted between the triangular plates. These two shafts will be referred to as “X” and “Y”. Mounted on shaft “X”, immediately under the outside plate, is a sprocket wheel which has two rivets that protrude inward and engage two holes in the circular compound applicator cam that is freely mounted on the “X” shaft. (Figure 7). Freely mounted on the “X” shaft are two additional gears, each having one large diameter gear and a small diameter pinion gear. Mounted on the “Y” shaft are three more combination gears, each having one large diameter gear and a one small pinion gear. As the buffing motor turns, the large sprocket wheel is rotated by the reducer pinion sprocket, which also rotates the compound applicator cam. The meshing of the five additional gears on the “X” and “Y” shafts form a reduction gear train which causes the last gear on the “Y” shaft to turn at the lowest speed.

A split plate drive housing is freely mounted on the “Y” shaft and straddles the three gears mounted on the “Y” shaft. The drive housing carries the compound shaft that extends through a circular hole in the left-hand side-frame and into the buffing compartment. The inside end of the compound shaft carries the buffing compound which is keyed to the compound drive shaft by means of a drive hub and a pin that projects into the compound material. A compression spring between the left-hand frame and the drive hub keeps the projection in the hole of the compound material. When the compound drive shaft turns, the motion is transmitted to the compound material through the drive hub, which turns the compound material. A washer and thumbscrew secure the compound material to the inside end of the compound shaft.

A gear hub is attached to the compound shaft between the arms of the drive housing. The hub carries a circular spur gear that is driven by the reduction gear train from the reducer sprocket. A circular cam follower is also mounted on the compound drive shaft, separated from the circular gear and hub by a spacer. A tension spring is attached to the forward end of the drive housing to urge the circular cam follower against the compound applicator cam. The compound applicator cam has a low dwell for approximately 90 degrees of its circumference. As the circular cam follower engages the low dwell in the compound applicator cam, the tension spring pulls downward on the drive housing, thus pivoting the compound material against the buffing wheel. Then, as the circular cam follower engages the high level of the compound applicator cam, the drive housing is pushed upward to move the compound material away from the buffing wheel. The compound applicator cam rotates at approximately one revolution per minute. The buffing compound material is applied against the buffing wheel one time per minute during the polishing cycle.

A "Sold Out" microswitch that has an actuating lever and roller is mounted on the inside surface of the drive housing. The circumference of the gear hub has a low dwell for 45 degrees of its circumference. The gear hub and compound material rotate on the drive shaft and consequently, when the shaft has made one revolution. The compound is no longer usable. The actuator lever on the "Sold Out" switch will find the low dwell in the gear hub and close the switch to indicate electrically that the compound material is depleted refer to *Figure 7*. When the switch closes, the customer display will register "Sold Out" and lock out both the coin mechanism and dollar bill acceptor. The compound material must then be replaced. Refer to the *"Replacement of Buffing Compound"* sections

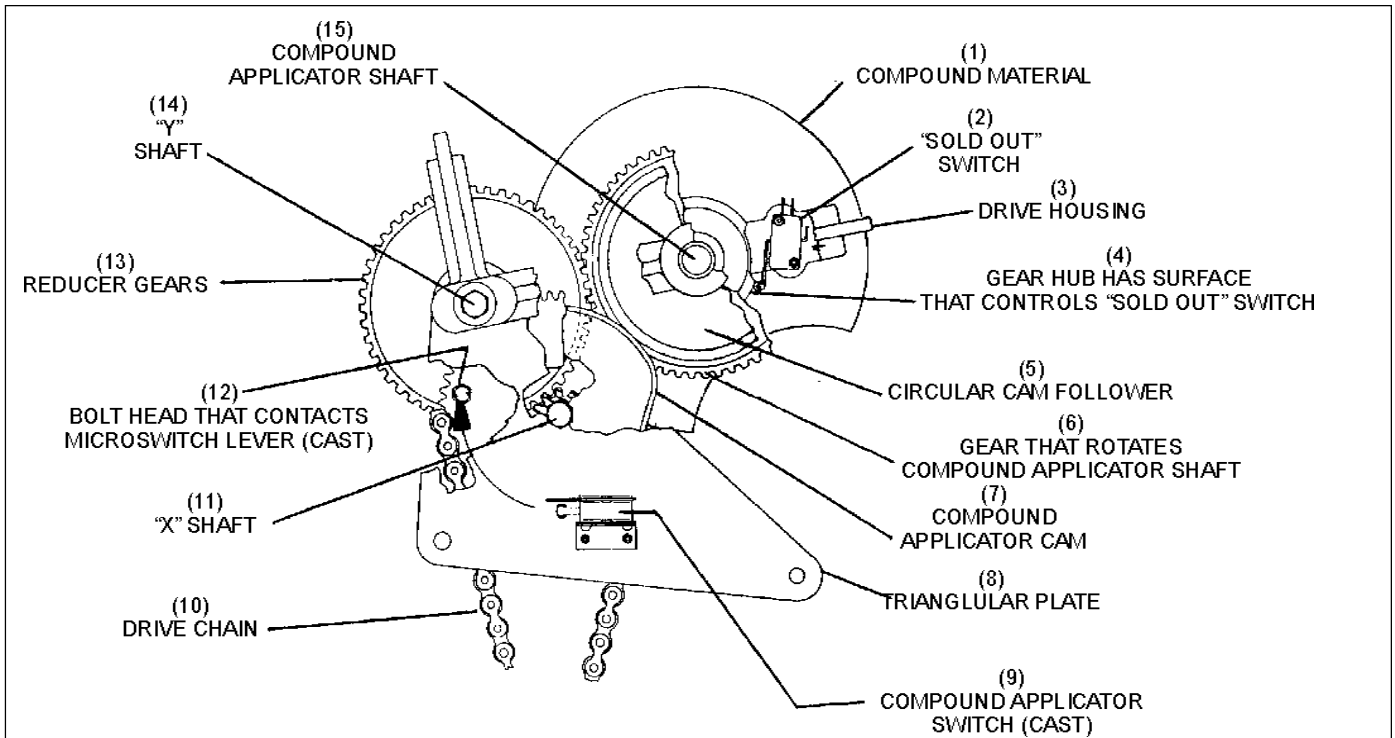


Figure 7. "Sold Out" Switch

- | | | |
|--|---------------------------|---|
| (1) COMPOUND MATERIAL | (2) "SOLD OUT" SWITCH | (3) DRIVE HOUSING |
| (4) GEAR HUB HAS SURFACE THAT CONTROLS "SOLD OUT" SWITCH | (5) CIRCULAR CAM FOLLOWER | (6) GEAR THAT ROTATES COMPOUND APPLICATOR SHAFT |
| (7) COMPOUND APPLICATOR COMPOUND | (8) TRIANGULAR PLATE | (9) COMPOUND APPLICATOR SWITCH |
| (10) DRIVE CHAIN | (11) "X" SHAFT | (12) BOLT HEAD THAT CONTACTS MICROSWITCH LEVER (CAST) |
| (13) REDUCER GEARS | (14) "Y" SHAFT | (15) COMPOUND APPLICATOR SHAFT |

A "One Minute Pulse" microswitch that is attached to an "L" shaped bracket is mounted on the outside of the triangular plate. The actuator lever for the switch protrudes through an elongated opening in the triangular plate and contacts the outside surface of the sprocket gear. The sprocket gear carries a button head screw that contacts the switch once per revolution. Since the sprocket gear rotates one revolution per minute, the switch is depressed once each minute. The switch indicates electrically each minute of elapsed time during a polishing cycle.

Electrical System and Control Box

Overview

The Brunswick Ballworx operates on 208/230 Volts AC, 50/60 HZ single-phase power. A transformer is used to supply 115 Volts AC and 16 Volts AC to the control systems. The PC Board rectifies the power and supplies 12 volts DC to the Bill Acceptor as well as the optional Programmable Coin Validator.

Motor

An integral, automatic resetting, thermal overload device protects the motor.

Control Box Circuit Breaker

The control circuitry is protected by a 2 amp re-settable circuit breaker mounted on the left-hand side of the electrical box.

Control Box Buffing Motor Relay

The buffing motor relay, when energized, closes two sets of contacts, (R3 & R1) and (L3 & L1) on the buffing motor relay. (Reference wiring schematic on page 36) When contacts (R3 & R1) and (L3 & L1) on this relay are closed, the one horsepower motor is powered and the motor starts. At the end of the polishing operation, (R3 & R1) and (L3 & L1) on the relay open and a third set of contacts, (R4 & R1) and (L4 & L1), also on this relay, close, putting a reverse current across the reverse motor windings, thus acting as a motor brake.

Control Box Buffing Motor Relay Houseball Toggle Switch

The house ball toggle switch is a single pole, two-position switch. In its normal coin operated position, Ballworx will operate when coins are deposited for the programmed cycles. It is always left in this position for customer operation. For house ball cleaning the switch is put to the “Houseball” position, which registers on the customer display, and gives the programmed cycle when the start button is depressed.

Printed Circuit Board (PCB)

The Printed Circuit Board (PCB) controls the operations of Ballworx. The (PCB) is the information center and translates all the signals from and to the external components. The (PCB) is where the owner/operator programs the pricing and time levels for the customer usage.

No attempt should be made to repair a Printed Circuit Board in the field. This will void the warranty on the (PCB). Replacement Printed Circuit Boards are available from Brunswick. (Follow the return policy in the "Warranty" section in the front of book)

Start Button (Customer Display)

The start button is a momentary contact push button switch that makes contact when it is manually depressed. When pressure is removed, the push button switch returns to its open position.

LCD Screen (Customer Display)

The Customer Display is a Liquid Crystal Display (LCD); it is a two-segment 12-character display. The information programmed from the (PCB) will register on this display, making it adaptable for any pricing and/or time structure. This screen gives all the information the customer will need to determine the polishing level.

External Microswitch

Door Closed Switch

The Door Closed Switch is a single pole, double throw microswitch that is mounted on the exterior right-hand side frame and is controlled by the ball door mechanism. When the ball door is open, the switch is deactuated and its normally open (N/O) contacts are open. When the ball door is closed, the switch is actuated and its (N/O) contacts are closed. No connection is made to the normally closed (N/C) terminal of the switch. This switch is connected to the (PCB) in series with the buffing motor relay and will permit the motor to operate only when the ball door is closed.

1 Minute Pulse Switch

The 1 Minute Pulse Switch is a single pole, double throw microswitch that is mounted to the triangle plate of the compound advance mechanism, and is controlled by the button head screw on the timing sprocket. When the button head screw is not in contact with the switch, the switch is deactuated and its normally open (N/O) contacts are open. When the button head screw is in contact with the switch, the switch is actuated and its (N/O) contacts are closed. No connection is made to the normally closed (N/C) terminal of the switch. This switch is connected to the (PCB) and counts down the time remaining for a polishing level.

Sold Out Switch

The Sold Out Switch is a single pole, double throw microswitch that is mounted to the compound shaft on the compound advance mechanism, and is controlled by a cam on the compound shaft. When the high of the cam contacts the switch, the switch is actuated and its normally closed (N/C) contacts are closed. When the low dwell of the cam allows the switch roller arm to move away from the switch, the switch is deactuated and its (N/C) contacts are open. No connection is made to the normally open (N/O) terminal of the switch. This switch is connected to the (PCB) and shuts down the operation of the machine until compound material is replaced.

Scrolling Message Display

The Scrolling Message Display is mounted to the back frame of Ballworx. It is a programmable message display, which accepts programming from a remote controller or integrated computer cable. This sign is capable of displaying multiple messages including but not limited to (advertising, special events, bowler's scores). Refer to the promotion handbook for more information.

Bill Acceptor

Bill Acceptor (US Machines Only):

The Internal Bill Acceptor with Stacker is mounted on the left-hand side of the front panel. This bill acceptor is capable of accepting (\$1, \$5, \$10, \$20, \$50, & \$100) dollar bills but is factory switched to accept \$1 bills only. The dip switches on the top of the bill acceptor control which bills it will accept. The stacker box on the back of the bill acceptor will hold a maximum of 400 bills. It also has a separate lock for access to the bills. The bill acceptor is mounted by 2 wing nuts accessible through the left service panel. A phone jack style cable, connects the bill acceptor to the (PCB). Ballworx will not give change.

Coin Mechanism

Programmable Coin Mechanism

The Programmable Coin Mechanism can accept any type of coin in the world including tokens in multiple denominations. The coin mechanism is mounted to the right-hand side of the front panel and has a keyed lock for easy access to clear coin jams. The coin mechanism is connected to the (PCB) by a ribbon cable that transfers all the information needed to operate.

Section 3: Adjustments

IMPORTANT!: When servicing Brunswick Ballworx, the power cord must be disconnected from the power source to prevent injury to personnel.

Adjustment No. 1 Mounting Feet

This adjustment is made to insure that Ballworx is level and supported on all four (4)-mounting feet to avoid unnecessary vibration and for proper ball polishing performance. Refer to *Figure 8*.

- (1) ADJUSTING NUTS
- (2) MOUNTING FEET

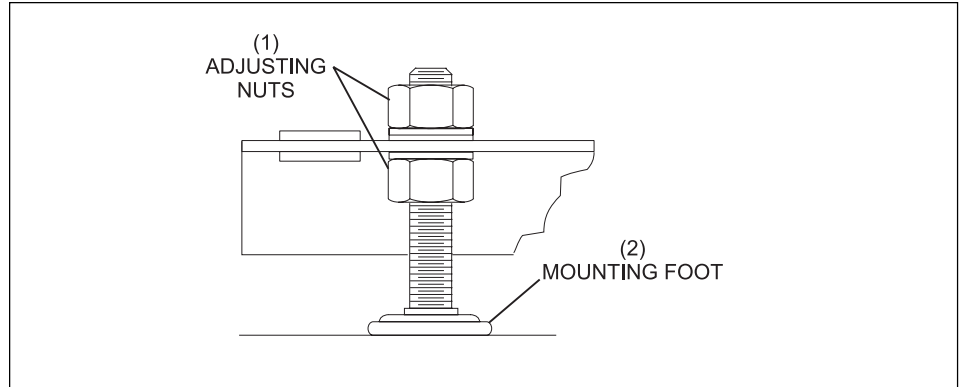


Figure 8. Mounting Feet

1. With Ballworx positioned in its operational location, remove both side-doors.
2. Place a carpenter's level across the flat surface of the top panel.
3. Loosen the two (2) nuts on each mounting foot.
4. Adjust each mounting foot until Ballworx is level from side to side and front to rear.
5. Check each mounting foot to be certain that all four (4) mounting feet support the weight of Ballworx.
6. Securely tighten both nuts on each mounting foot.
7. Replace both side-doors.

Adjustment No. 2 Steel Guide Rollers

This adjustment is made to ensure that the guide rollers are positioned properly to restrict the motion of the bowling ball during the polishing operation, and that the bowling ball is centered to the buffing wheel.

NOTE: The Steel Guide Roller Adjusting Template, used in this adjustment, is supplied with Ballworx. The template is attached to the left side of the back panel with two (2) wing nuts. Refer to Figure 9.

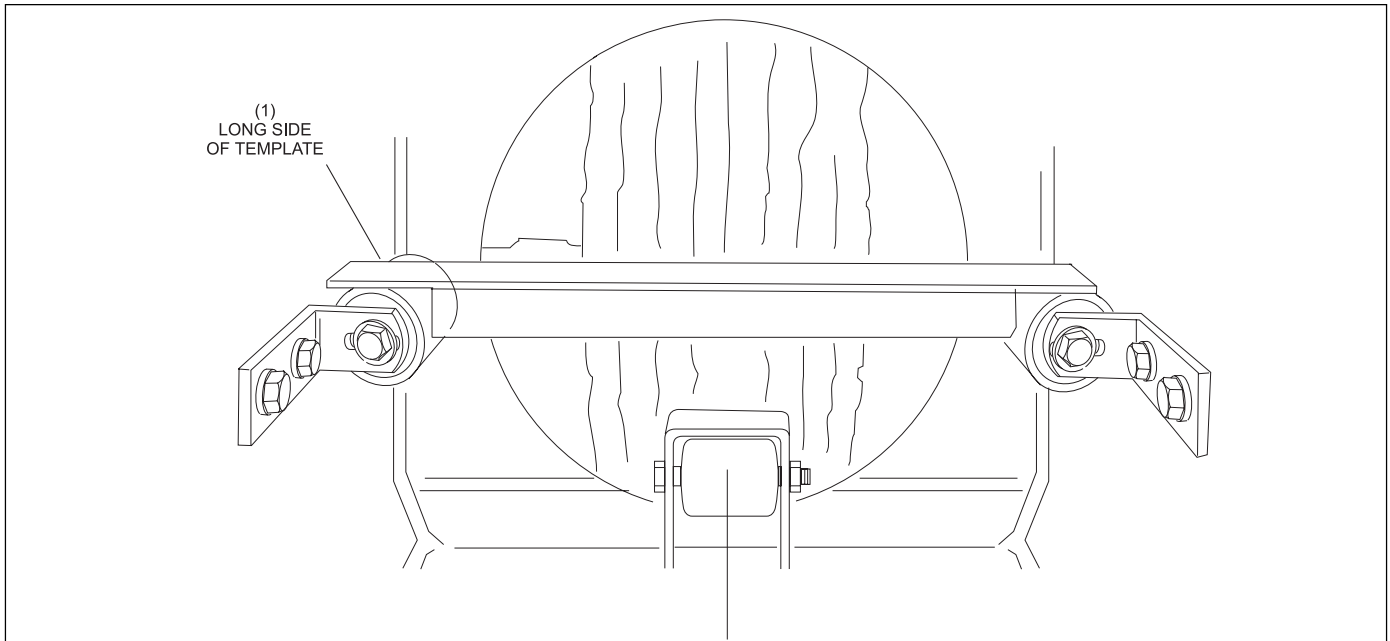


Figure 9. Roller Adjusting Template

(1) LONG SIDE OF TEMPLATE

1. Disconnect power from Ballworx.
2. Remove side doors.
3. Remove top assembly.
4. Access steel guide roller template form Ballworx. This is the “L”-shaped right-angle template. There is a long and short side to this template. See illustration below
5. Open ball door
6. Place template onto the steel guide rollers, mounted to the sides of the ball compartment, with the long side to the left-hand side roller.
7. Adjust guide rollers so that both guide rollers are flush with template and the template is held firmly against the right-hand side frame.
8. Replace top assembly, side doors, and return power to Ballworx.

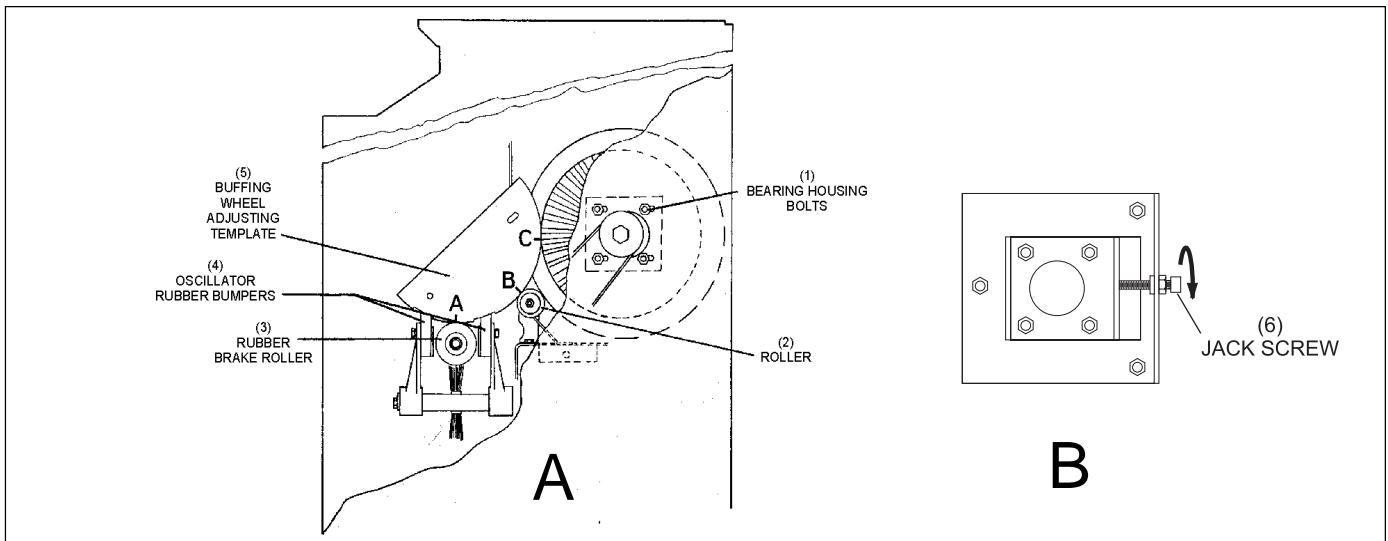
Adjustment No. 3 Buffing Wheel

This adjustment is required to maintain adequate pressure and contact area between the bowling ball and the buffing wheel as the buffing wheel becomes worn through normal use or when installing a new buffing wheel. To maintain proper polishing performance, it is recommended that the buffing wheel adjustment be checked whenever the compound is replaced.

NOTE: *The buffing wheel adjusting template used in this sequence, is supplied with the ball conditioner. The template is attached to the left side rear panel with two (2) wing nuts.*

1. Disconnect power from Ballworx.
2. Remove side doors.
3. Remove top assembly.
4. Open ball door and cradle assembly to its fully open position.
5. Remove the linkable drive belt from the upper pulley.
6. Using a ½ inch wrench, loosen the four (4) bolts that secure the buffer shaft bearing housing to the right-hand side frame and the two (2) bolts that secure the pillow block bearing to the pillow block bracket.

7. Position the template inside the ball compartment with point “A” on the center of the rubber brake roller and point “B” against the metal roller beneath the buffing wheel (*Figure 10A*). On the outside of the right-hand side frame is an easy adjust bracket with jackscrew and locknut. Loosen the locknut and rotate the jackscrew moving the entire buffing wheel assembly forward or rearward until the narrowest portion of the buffing wheel just touches the edge of the template at point “C”. Tighten the locknut on the jackscrew. Rotating the jackscrew 1 complete revolution moves the buffing wheel assembly 1/32 of an inch. It is recommended to move the buffing wheel assembly forward 1/32 of an inch or, one complete turn clockwise, each time a new buffing wheel compound block is installed. Refer to *Figure 10B*.



Figures 10A & 10B. Buffing Wheel Adjustment

- | | | |
|-------------------------------|--------------------------------------|-------------------------|
| (1) BEARING HOUSING BOLTS | (2) ROLLER | (3) RUBBER BRAKE ROLLER |
| (4) OSCILLATOR RUBBER BUMPERS | (5) BUFFING WHEEL ADJUSTING TEMPLATE | (6) JACK SCREW |

8. Tighten the four (4) bolts for the bearing housing first and the shaft will self align with the frame of the machine, then tighten the two (2) bolts for the pillow block bearing.
9. Replace drive belt, top assembly, side doors, and return power to Ballworx.

NOTE: Always test, a bowling ball in Ballworx after making any adjustment. After a 2-minute cycle a bowling ball should come out of Ballworx slightly warm.

Adjustment No. 4 OscillatorBumper Pads

This adjustment is made to ensure that the oscillator bumper pads are positioned at the proper height effectively lifting the bowling ball away from the buffer, off the ball roller, and rotating the bowling ball during the polishing cycle.

NOTE: *The Oscillator Bumper Pad Adjusting Template, used in this adjustment, is supplied with Ballworx. The template is attached to the left side rear panel with two (2) wing nuts.*

1. Disconnect power from Ballworx.
2. Remove side doors.
3. Remove top assembly.
4. Open ball door and cradle assembly to its fully open position.
5. Manually rotate the large pulley on the ball roller shaft until the oscillator arms are in the maximum upward position.

NOTE: *The oscillator shaft always rotates in the clockwise direction during operation so therefore there is a leading edge and a trailing edge to the oscillator bumper arms.*

6. Manually rotate the large pulley on the ball roller shaft until the oscillator bumper's leading edge is aligned with the center of the ball roller and buffing wheel. The leading edge is designated by the first screw head that will pass by the buffing wheel when rotated in the clockwise direction. Refer to *Figure 11*.

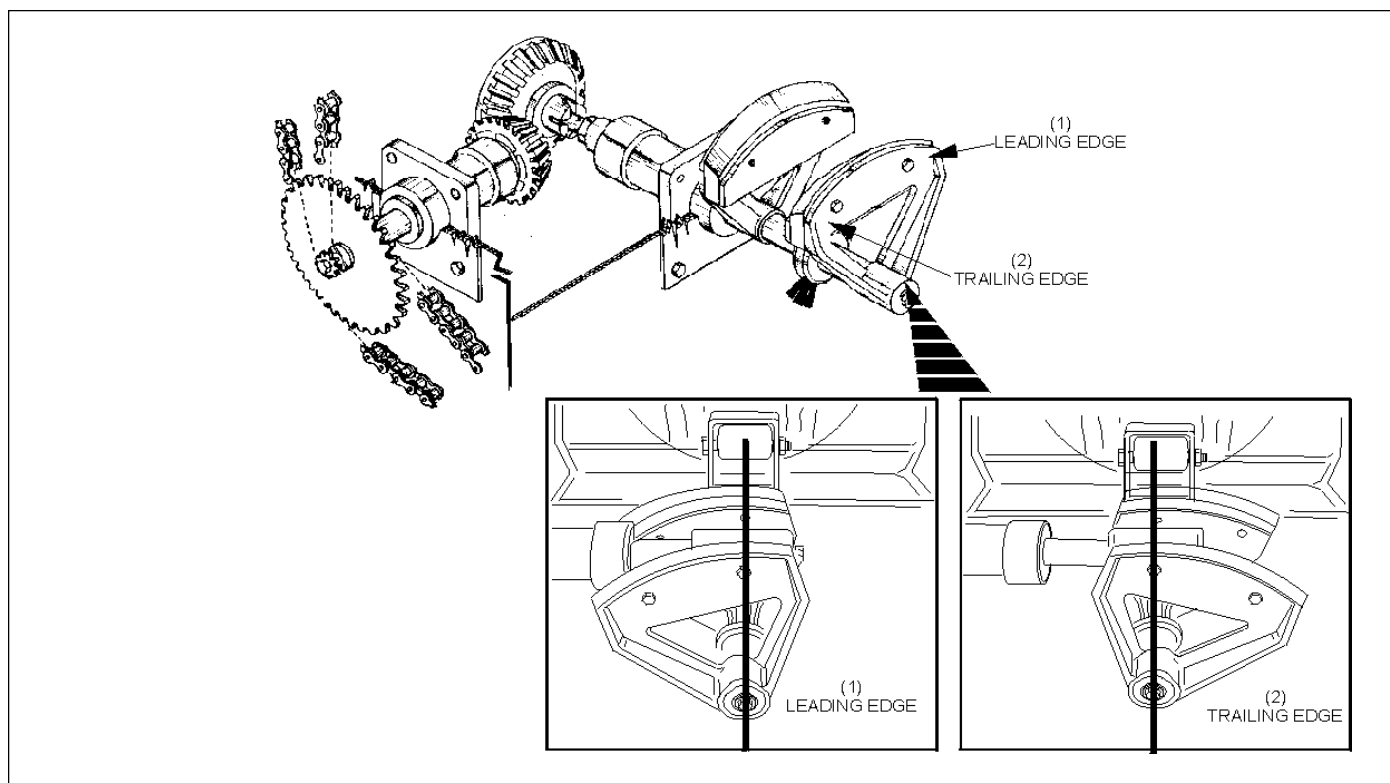


Figure 11. Oscillator Bumper Pad Adjustment

(1) LEADING EDGE

(2) TRAILING EDGE

7. Position the template inside the ball compartment with point "A" on the center of the ball roller and point "B" against the steel guide roller beneath the buffing wheel. Refer to *Figure 12*.

- (1) BEARING HOUSING BOLTS
- (2) ROLLER
- (3) RUBBER BRAKE ROLLER
- (4) OSCILLATOR RUBBER BUMPERS
- (5) BUFFING WHEEL ADJUSTING TEMPLATE

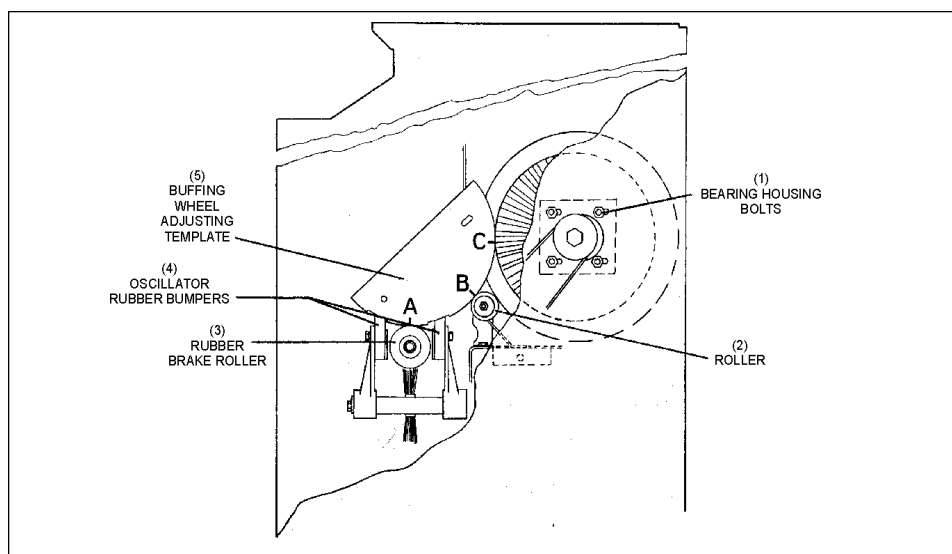


Figure 12. Template Position

NOTE: The template has two (2) cutouts in it. These cutouts are not the same. The cutout for the oscillating bumper pad closest to the buffing wheel is deeper than the cutout for the oscillator bumper pad closer to the ball door. This allows for the lifting of the bowling ball away from the buffing wheel.

8. Using a 5/16" wrench, loosen the two bolts that secure each oscillator bumper pad to the oscillator arms.
9. Adjust the oscillating bumper pad closest to the ball door assembly, with template in place raise or lower the oscillator bumper pad on the leading edge until it just touches the cutout in the template without raising the template off the ball roller at point "A". Snug the bolt on leading edge of oscillator bumper pad just so that it holds the bumper pad in place.
10. Rotate the large pulley on the ball roller shaft so that the trailing edge is centered to the ball roller shaft and the buffing wheel. Raise or lower the ending edge of the oscillator bumper pad so that it just touches the cutout of the template without raising the template off the ball roller at point "A". Tighten ending edge bolt. Tighten both leading and trailing edge bolts securely.

NOTE: The oscillating bumper pads holes are elongated to allow for movement up and down. Do not over tighten the oscillator bumper pad bolts. This will cause the bumper pads to squeeze between the oscillator arm and clamping plate changing the height adjustment.

11. Rotate the oscillator arm back to the leading edge to adjust the oscillator bumper pad closet to the buffing wheel. Raise or lower this oscillator bumper pad so that it just touches the cutout in the template. Snug the bolt on leading edge of oscillator bumper pad, just tight enough to hold bumper in place.
12. Rotate the oscillator arm to the trailing edge and adjust the trailing edge of the oscillator bumper pad so that it just touches the cut out in the template. Tighten leading edge bolt. Refer to *Figure 13*.

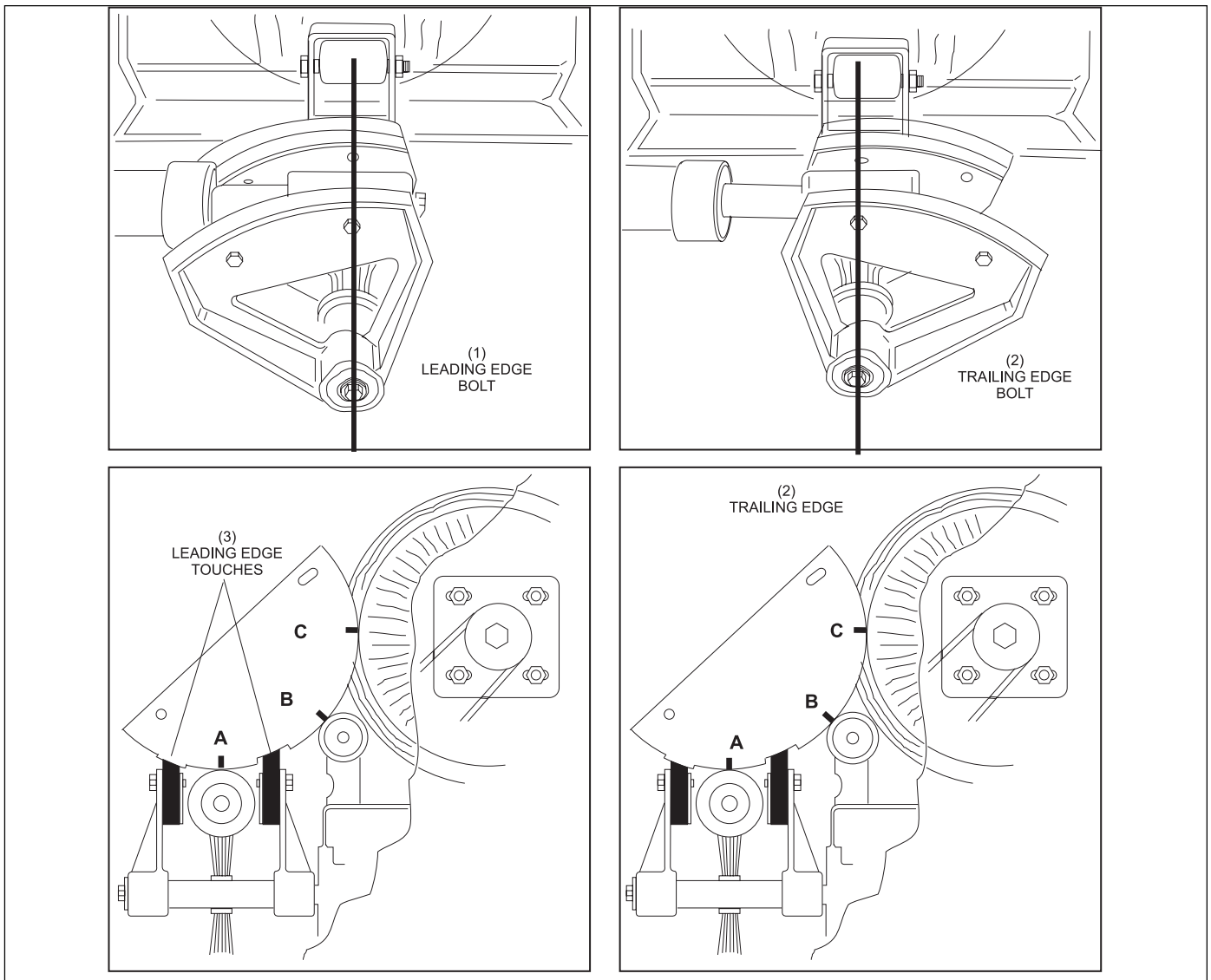


Figure 13. Adjust Oscillator Bumper

(1) LEADING EDGE BOLT

(2) ENDING EDGE BOLT

(3) LEADING EDGE TOUCHES

Adjustment No. 5 Belt Tracking and Tension

These adjustments are made to allow the proper tensioning and tracking of the motor belts on both sides of Ballworx and to increase the life of the belts. As the belts get older and stretch, belt tension will decrease. An adjustable drive belt is used for the buffing wheel drive system.

1. To increase or decrease the belt tension on the flat belt on the left side of the machine, adjust the motor mount plate up or down with the jam nuts on the adjusting rod at the lower back of the machine. Refer to *Figure 14*.

- (1) MOTOR BASE 9 PIVOT UP TO DECREASE, DOWN TO INCREASE)
- (2) UPPER LOCKNUT
- (3) LOWER LOCKNUT
- (4) ADJUSTING SCREW
- (5) HINGED PIVOT

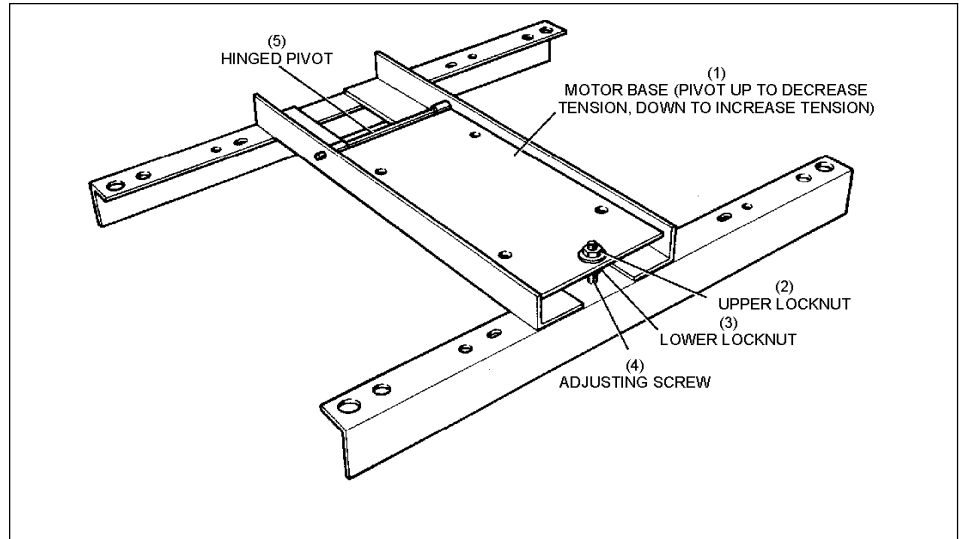


Figure 14. Adjust Belt Tension.

2. Once the proper belt tension is achieved on the small flat belt for the ball roller shaft assembly, adjust the linkable belt for the buffing wheel by removing or adding a link to increase or decrease tension. Refer to *Figure 15*.

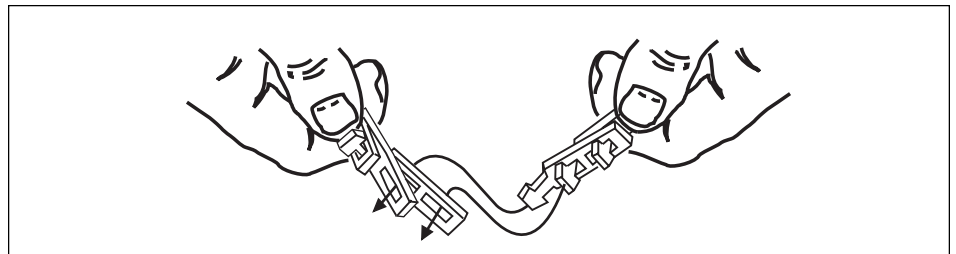


Figure 15. Adjust belt Length

3. Tracking is properly accomplished by moving the two (2) drive pulleys on the motor shafts, in towards or out away from the motor. Position these drive pulleys so the belts run centered on their perspective driven pulleys. Refer to *Figure 16*.

(1) IN OR OUT
(2) DRIVE PULLEY

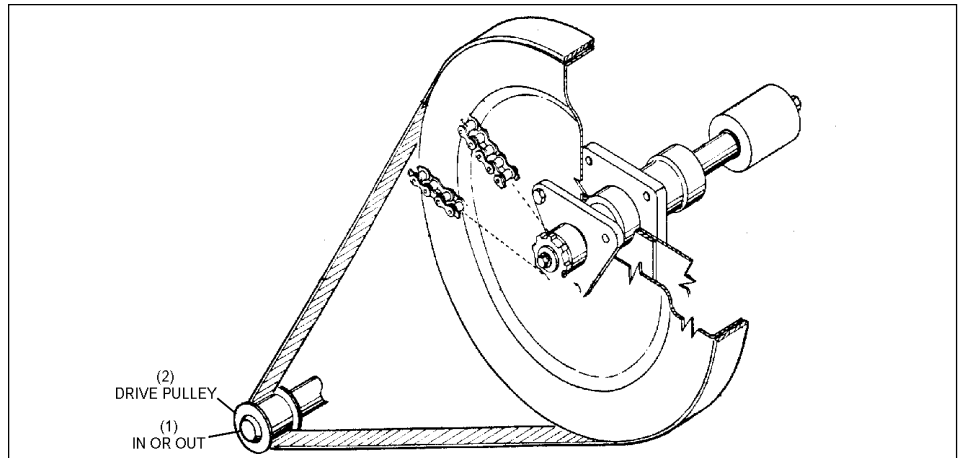


Figure 16. Adjust Tracking

Adjustment No. 6 Cradle and Ball Door Assembly

This adjustment is made to ensure the proper seal is obtained between the ball door and the front panel.

1. Disconnect power from Ballworx
2. Open ball door and cradle to its fully open position.
3. Remove the ball door by unscrewing the four (4) button head Allen screws.
4. Close cradle assembly. The outside edge of the door track should be flush with the front panel.
5. To adjust the cradle, use a 7/16 inch wrench to loosen the four (4) bolts that hold the ball track to the cradle assembly and tilt the ball track so it is flush with the front panel. Tighten bolts.
6. Install ball door to the cradle assembly; close the ball door and cradle assembly, check to see if the seal is flush to the front panel all the way around the ball door. Refer to *Figure 17*.

NOTE: The holes in the ball track are slightly oversized to allow fine-tuning of the seal adjustment.

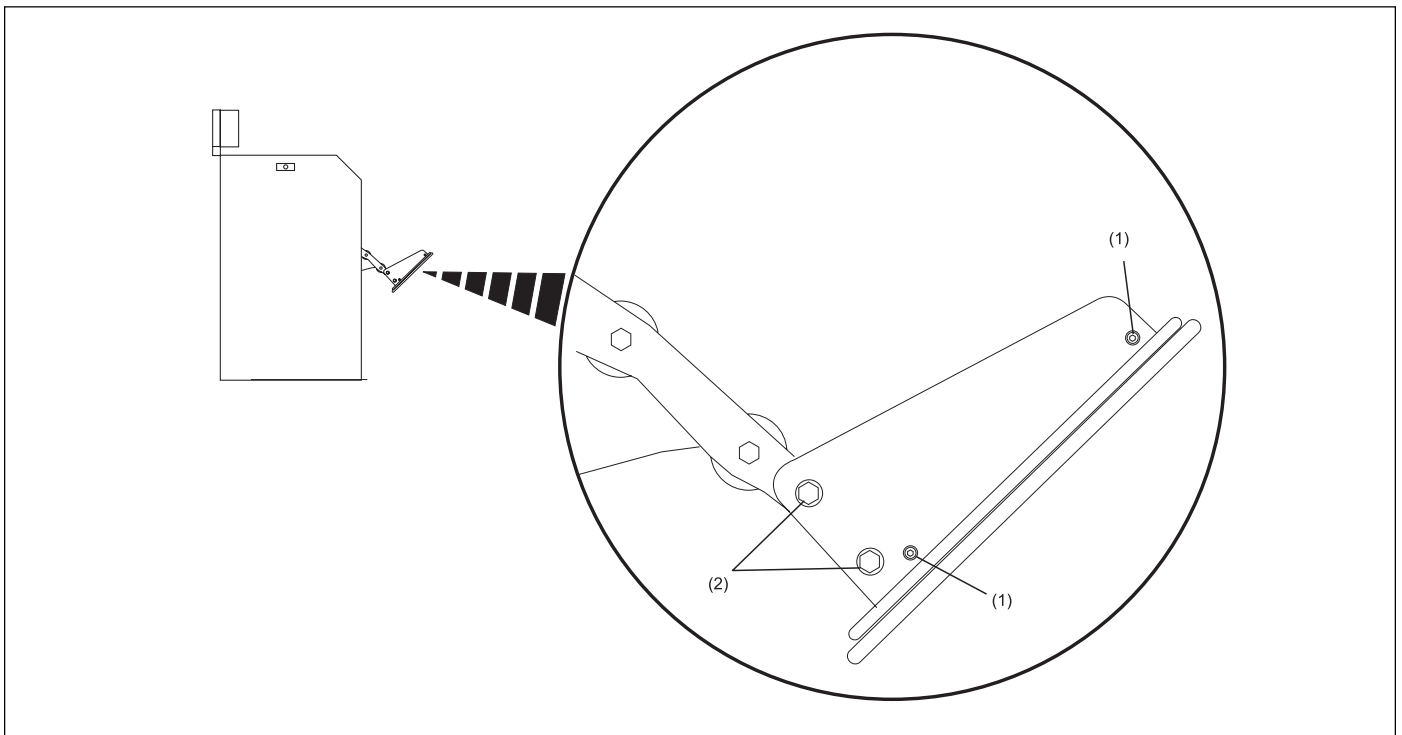


Figure 17. Adjust Ball Door

(1) BUTTON HEAD ALLEN SCREW - 4 PLCS. (2) 7/16" BOLTS - 4 PLCS.

Adjustment No. 7 Bevel Gears

This adjustment is made to ensure that the bevel gears on the oscillator, and oscillator drive shafts are positioned to properly mesh. The bevel gears are accessible from the rear of Ballworx. Refer to *Figure 18*.

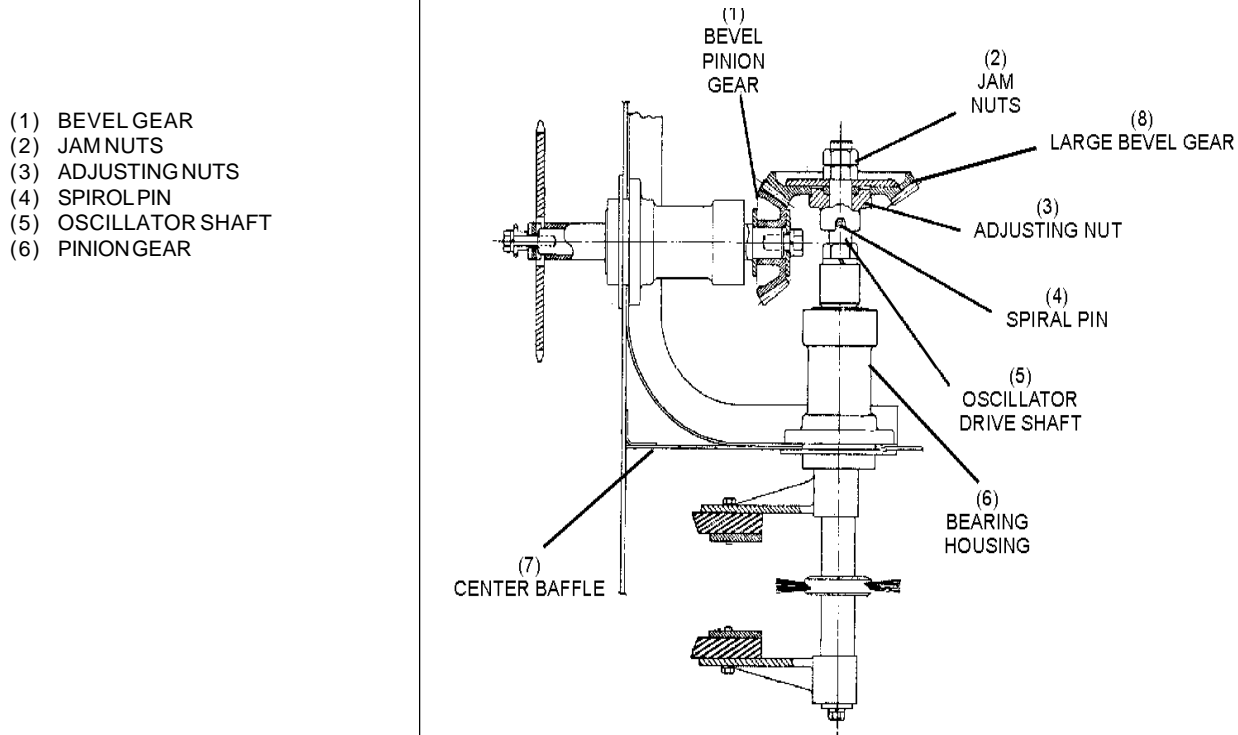


Figure 18. Bevel Gear Adjustment

1. Disconnect power from Ballworx and remove the motor screen.
2. Remove the two (2) jam nuts that secure the bevel gear to the oscillator shaft.
3. Remove the spirol pin that locks the adjusting nut to the oscillator shaft.
4. Thread the adjusting nut forward or rearward to obtain minimum backlash between the bevel gears when they are properly meshed. Be sure the projections on the adjusting nut engage the holes in the bevel gear.

NOTE: *If the adjusting nut is too far forward severe strain will be placed on the gear teeth and shaft. If the adjusting nut is too far rearward, the gears will be noisy with excessive backlash and wear.*

5. Once adjustment is made, position slots in adjusting nut to install spirol pin.
6. Install bevel gear jam nuts and motor screen
7. Restore power and test run Ballworx.

Section 4: General Maintenance

Recommended maintenance procedures for Brunswick Ballworx are contained in these instructions. These maintenance procedures must be followed to obtain optimum performance of Ballworx.

Replacement of Buffing Compound

1. Remove side doors.
2. Put Ballworx into “Houseball” mode.
3. Depress start button and run Ballworx, observing the drive housing, when the drive housing reaches the low dwell of the cam, open the ball door to stop the motor.
4. Disconnect power from Ballworx, and remove the top assembly.
5. Open the ball door to its fully open position.
6. Remove the thumbscrew and washers that secure the compound block to the compound shaft. Refer to *Figure 19*.

- (1) THUMBSCREW
- (2) WASHERS
- (3) COMPOUND WHEEL
- (4) COMPOUND DRIVE WELDMENT

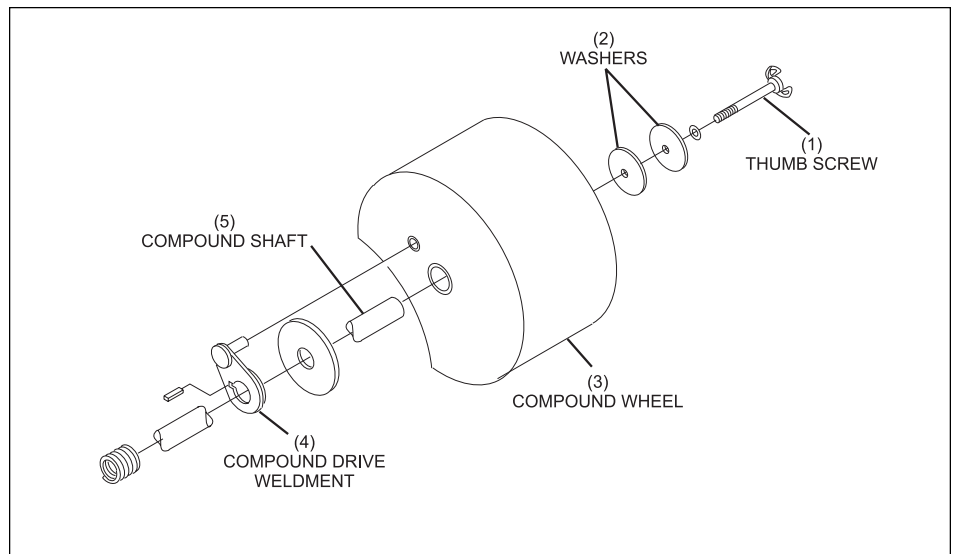


Figure 19. Remove Thumb Screws and Washers

7. Carefully slide the compound block from the compound shaft. Retain the hardware for future use.

8. Using a 7/16 inch wrench, loosen the two (2) bolts on the clamping plate to the spur gear, so that the compound shaft will rotate freely. Refer to *Figure 20*.

(1) 7/16" CLAMPING BOLTS

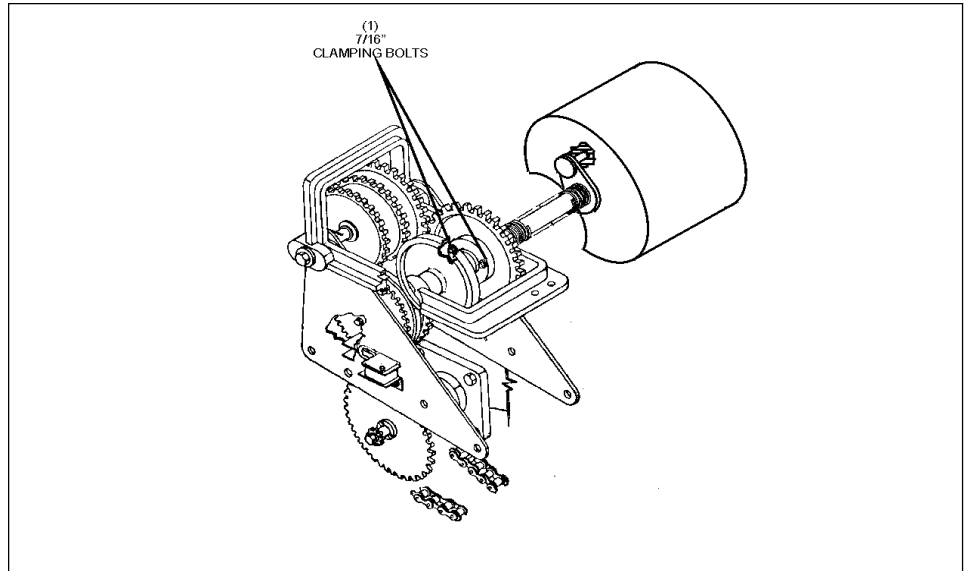


Figure 20. Loosen Bolts Holding Clamping Plate

9. Engage the compound drive weldment that engages the compound block to the compound shaft. Rotate the shaft towards the rear of Ballworx so that it is ready to receive the new compound block.
10. Install the new compound block. Insure that the new compound block does not touch the buffing wheel either in front or in the back. Install the wing nut with 2 washers and tighten.
11. Allow the spring tension to pivot the compound block against the buffing wheel. The forward leading edge portion of the compound block should barely touch the buffing wheel when the circular cam follower is in the low dwell of the applicator cam.
12. Once the proper distance of the compound block to the buffing wheel is achieved, using a 7/16 inch wrench, tighten the two (2) clamping bolts.

NOTE: *The compound block must move away from the buffing wheel when the circular cam follower encounters the high level of the compound applicator cam. Once the new compound block is installed and adjusted, no more adjusting is necessary until a new compound block is installed.*

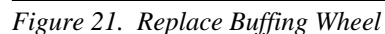
13. Install the top assembly. Restore power to Ballworx
14. Turn the "Houseball" toggle switch to the "Houseball" position and polish three houseballs.
15. Return "Houseball" toggle switch to the "Customer" position. Ballworx is now ready for use.

Replacement of Buffing Wheel

Recommended maintenance procedures for the Brunswick Ballworx are contained in these instructions. These maintenance procedures must be followed to obtain optimum performance of Ballworx.

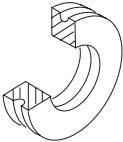
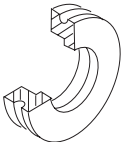
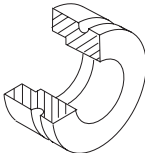
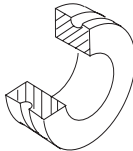
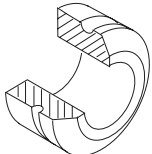
1. Disconnect power from Ballworx.
2. Open the ball door to its fully open position.
3. Remove both side doors and top assembly from Ballworx.
4. Remove the thumbscrew and washers that secure the compound block to the compound shaft.
5. Carefully slide the compound block from the compound shaft. Retain hardware for later use.
6. Loosen the setscrew in the bearing lock collar on the left side of the buffing wheel shaft. This locking collar has an eccentric groove that fits over the bearing. The bearing also has an eccentric groove that aligns with the locking collar.
7. To release the positive lock, hold the buffing wheel, insert a punch into punch hole and knock locking collar towards the back of Ballworx. Slide locking collar away from bearing.

- NOTE:** The two (2) jam nuts have left-handed threads.



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9. Using a ½ inch wrench, loosen and remove the two (2) bolts and T-bracket that secure the pillow block bearing to the pillow block bracket mounted on the left-hand side frame. Slide the pillow block bearing towards the buffing wheel.
10. Using a ½ inch wrench, loosen and remove the two (2) bolts that attach the pillow block bracket to the left-hand side frame. These two (2) bolts are on the lower outside of the triangle plates of the compound advance mechanism. Remove the pillow block bracket.
11. Remove the pillow block bearing, locking collar, and jam nuts.
12. Remove the buffing wheel sections from the buffing wheel shaft. Discard the seven sections of the used buffing wheel. Retain the spacers and plates. Note the sequence of spacers on the shaft. They will be installed in the same sequence.
13. Each of the seven sections of the new buffing wheel assembly is stamped with a letter “A” through “G”. Lay them on a flat surface in alphabetical order. Refer to *Figure 21*.
14. The spacers are not stamped with a letter. They can, however, be identified using the chart below. Arrange spacers and plates in proper sequence with buffing wheel sections. Refer to *Figure 21*.

				
“L”	“P”	“N”	“K”	“M”
Width .263	Width .281	Width .630	Width .468	Width .700
Plain	Counter-Bore	Counter-Bore	Plain	Chamfer

15. In the proper sequence, slide the buffing wheel sections, plates, and spacers onto the buffing wheel shaft. Assemble loosely and arrange the pre-marked buffing wheel sections to form a solid “V” shaped line. Refer to *Figure 22*.

(1) SOLID V-SHAPED LINE

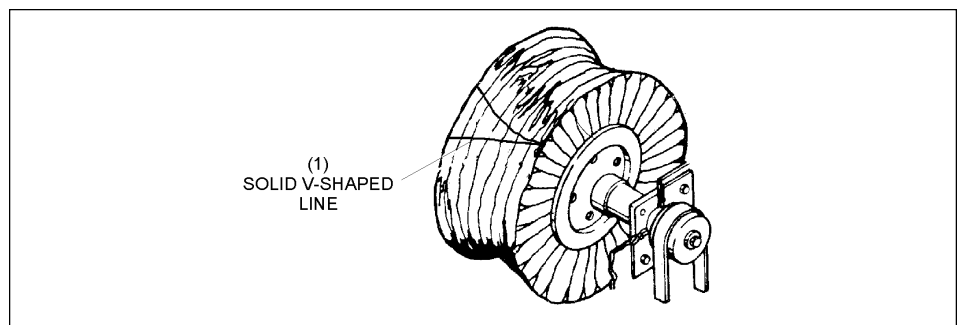


Figure 22. V-Shaped line

NOTE: The center hole flanges of the buffing wheel sections A, B, and C face to the right and fit into the counter-bore of the spacers. The center hole flanges of sections D, E, F, and G face, to the left.

16. Replace the two (2) jam nuts (left-handed thread) that secure the buffing wheel sections to the buffing wheel shaft. Do not fully tighten at this time.
17. Slide the locking collar and pillow block bearing on to the buffing wheel shaft as far as they will go.
18. Install the pillow block support bracket to the left-hand side of the frame.
19. Install the T-bracket and bolts that attach the pillow block bearing to its support bracket. **Do not fully tighten bolts at this time.**
20. Using a ½ inch wrench, loosen the four (4) bolts on the buffing wheel bearing housing, move the easy-adjust slide bracket back to zero (0). Tighten the four (4)-mounting bolts.
21. Tighten the two (2) bolts for the pillow block bearing.
22. Tighten the two (2) jam nuts (left-handed thread) that secures the buffing wheel sections to the buffing wheel shaft. Remember the drive pulley is slotted to receive a 1 1/8" wrench to hold the buffing wheel shaft.
23. Replace the compound block according to the procedure detailed in "Replacement of Buffing Compound" in the General Maintenance section of this manual.
24. Perform the buffing wheel adjustment outlined in the "Adjustment" section of this manual.
25. Replace top assembly, restore power to Ballworx, and run a test ball.
26. Perform any adjustments as needed. Put Ballworx into customer mode, and replace side doors.

Section 5: Preventive Maintenance

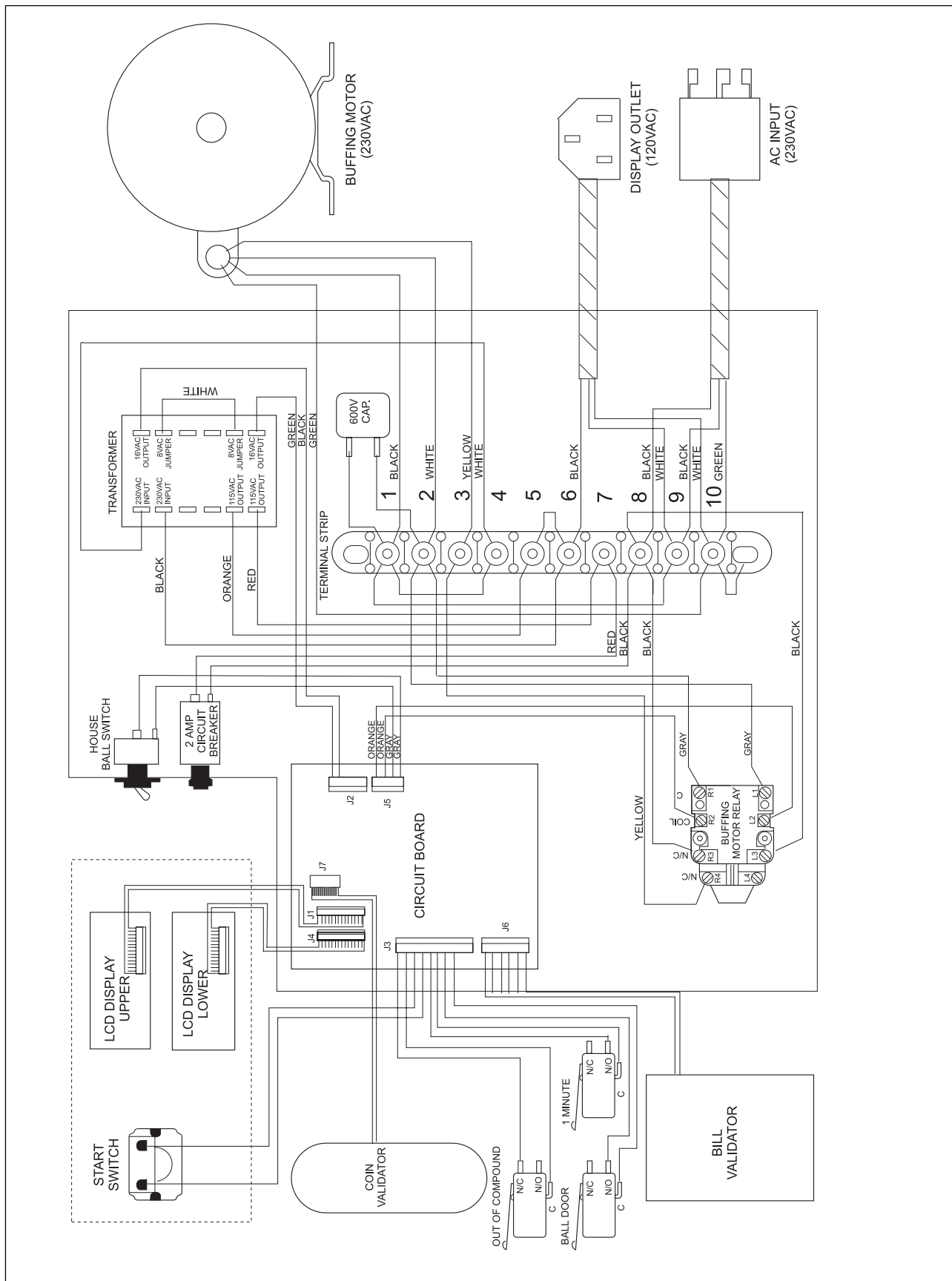
Bi-Monthly

1. Thoroughly vacuum Ballworx including the ball compartment, buffing compartment and all mechanisms.
2. Remove the air filter from the top assembly. Blow or vacuum all dirt from the filter. Install a new filter when accumulated dirt will not allow free passage of air through the filter.

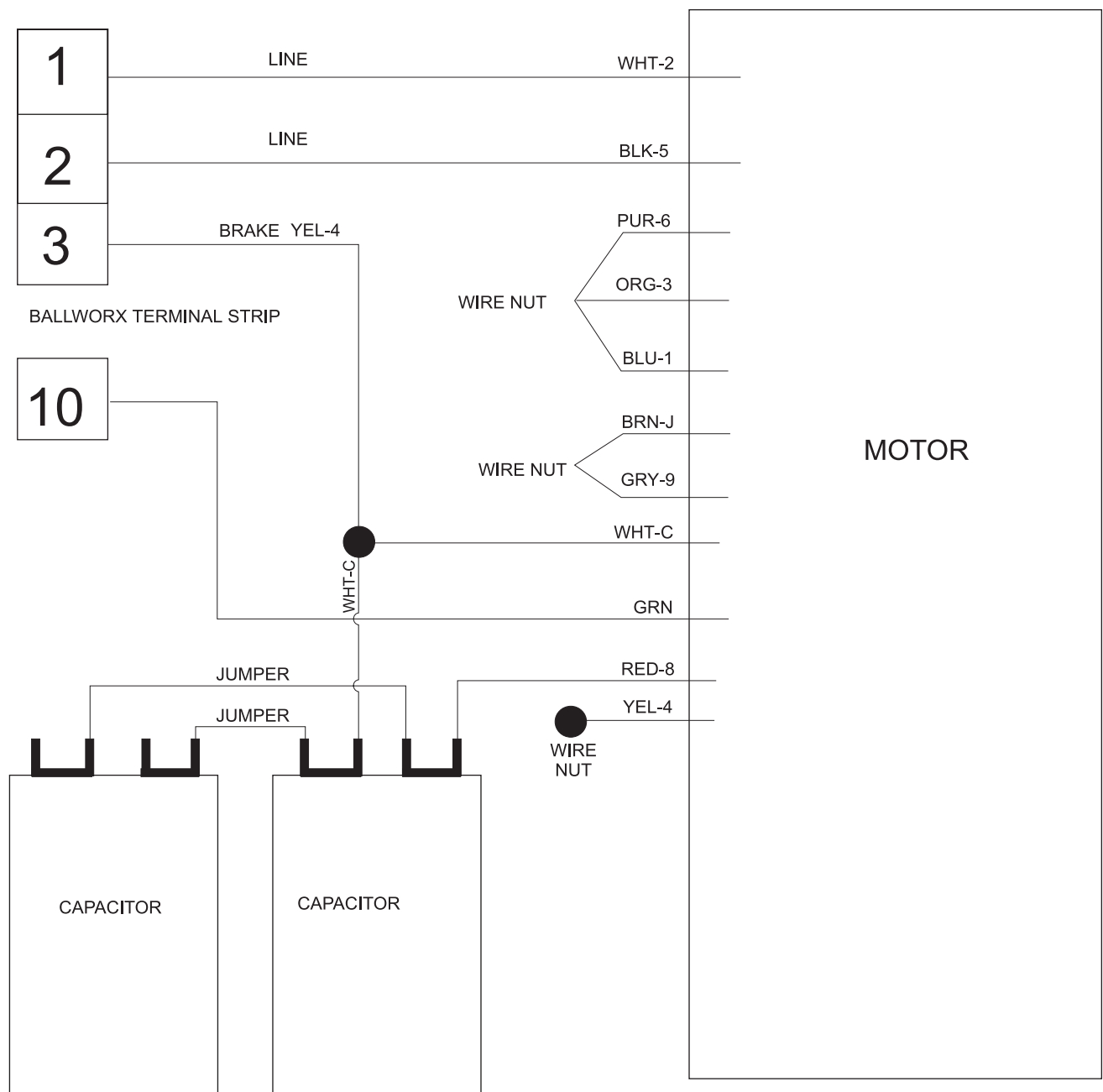
Monthly

1. Wipe all chains and sprockets with a dry rag. Apply a **LIGHT** coat of general-purpose grease to all chains and sprockets.
2. Apply a **LIGHT** coat of general-purpose grease to the bevel gears for the oscillator and oscillator drive mechanisms.
3. Apply a **LIGHT** coat of general-purpose grease to the contact surfaces of the ball door hinge arms and the ball door stop pin.

Section 6: Electrical



Ballworx Control Box Wiring (230V)



Ballworx Motor Wiring Diagram for Ballworx Motors (208V - 230V)

Section 7: Programming

Control Box

Controls:

POWER Indicator:

Illuminates when Power is applied to the Control Box

DISPLAY TEST Button:

Illuminates all segments of the Numeric Displays

RESET Button:

Restarts the Controller

DISPLAY CONTRAST:

Adjusts the contrast of the Customer Display LCD's

FUNCTION Buttons:

Enables viewing of Controller Programming

PROGRAMMING Buttons:

Enables editing of Controller Programming

Operation:

To Display Data:

Depress the appropriate function button on the controller to display the current value of Programming

Function Buttons:

(Low Gloss, High Gloss, Super Gloss, "Like New", House, Coin Value, and Totals)

To Program Data:

Depress the appropriate programming button on the controller to edit the current value of Programming

PROGRAMMING Buttons:

(Clear, Increment Coin, and Increment Time)

Programming

Setting Gloss Level Values:

Depress and Hold the appropriate “Gloss Level” Button. Depress “Increment Coin” to edit the number of “coins” required for that specific “Gloss Level”. Depress “Increment Time” to edit the number of “minutes” required for that specific “Gloss Level”.

Setting Coin Values:

Depress and Hold the “Coin Value” Button. Depressing either “Increment Coin” or “Increment Time” buttons will edit the “Coin Value”. Set this value for a specific coin, (e.g. Quarters U.S. “00 25”)

Setting House Ball Run Time:

Depress and Hold the “House” Button. Depress “Increment Time” to edit the number of “minutes” required for “House Ball”.

Utilizing Clear Button:

Depress and Hold any of the “Function” Buttons except “Totals”. Depress and Hold “Clear” Button. Depress either “Increment Coin” or “Increment Time” Buttons to bring settings back to (“01”).

Metering Functions:

To display the number of “coins” deposited Depress “Totals” Button.
To Display the number of “run time” minutes Depress and Hold “Totals” Button, Depress “Clear” Button.

Programmable Coin Mechanism

The programmable coin mechanism is what its name implies. This mechanism can accept tokens and most types of coins in the world in multiple denominations. This coin mechanism has “on-board” programming technology, and all programming takes place within the coin mechanism.

Controls

- (1) POWER AND PROGRAMMING LED INDICATOR
- (2) PROGRAMMING BUTTON

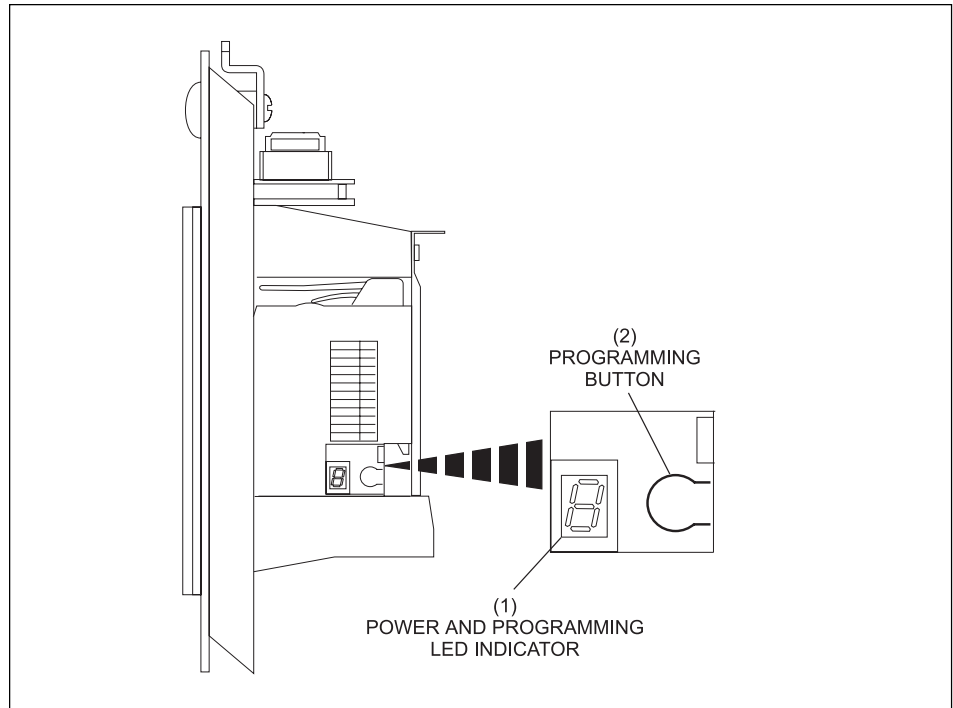


Figure 23. Coin Mechanism

Power and Programming LED Indicator:

Illuminates when Power is applied and has three colors (Green, Amber, and Red)

Display LCD:

Segments illuminate when programming

Programming Button:

Starts the Controller

Enable Coin

1. Press Programming Button: one (1) time. LED will flash (Green).
2. Insert Coin. Done when LED changes to solid (Green). Refer to *Figure 23*.

Disable Coin

1. Press Programming Button: two (2) time. LED will flash (Red).
2. Insert Coin. Done when LED changes to solid (Green). Refer to *Figure 23*.

Program Multiple Coins

1. Press Programming Button: three (3) times. LED will flash (Amber).
2. Press Programming Button: to Index to Category # 5.
3. Insert 10 Coins of the same value
4. Press Programming Button: one (1) time. LED changes to solid (Amber).
5. Press Programming Button: to Index to multiplier needed for that specific coin value refer to "*Programming Theory*" on page 44.
6. To escape press Programming Button, and hold for 2 seconds. Refer to *Figure 23*.

Programming Theory:

Coin Value/Denomination is programmed through both the Coin Mechanism, and the Control Box PC Board. These values must coincide with each other, matching the values on the Coin Mechanism and the Control Box PC Board. A maximum of five (5) coins can be programmed through the Ball-Conditioner. The Coin Mechanism has been pre-programmed with the internal memory for Ballworx Tokens

Determine the coins to be used in the Ball-Conditioner. The value of the highest denomination coin cannot exceed ten (10) times the lowest denomination of coin. The “Coin Value” on the Control Box PC Board will always be set for the lowest Value/Denomination of coin being used in the Ball-Conditioner.

Examples:

1. **(U. S. A.)**

Two (2) coins will be used \$0.25/Quarter & \$1.00/Dollar
\$1.00/Dollar coin being four (4) times the \$0.25/Quarter
Coin Mechanism multiplier of one (1) for \$0.25/Quarter
Coin Mechanism multiplier of four (4) for \$1.00/Dollar
Control Box PC Board “Coin Value” set for “00 25”

2. **(Canada)**

Three (3) coins will be used \$0.25/Quarter, \$1.00/Dollar, & \$2.00/Dollar
\$2.00/Dollar coin being eight (8) times the \$0.25/Quarter
\$1.00/Dollar coin being four (4) times the \$0.25/Quarter
Coin Mechanism multiplier of one (1) for \$0.25/Quarter
Coin Mechanism multiplier of four (4) for \$1.00/Dollar
Coin Mechanism multiplier of eight (8) for \$2.00/Dollar
Control Box PC Board “Coin Value” set for “00 25”

3. **(Japan)**

Three (3) coins will be used 50/Yen, 100/Yen, & 500/Yen
500/Yen coin being ten (10) times the 50/Yen
100/Yen coin being five (5) times the 50/Yen
Coin Mechanism multiplier of one (1) for 50/Yen
Coin Mechanism multiplier of five (5) for 100/Yen
Coin Mechanism multiplier of ten (10) for 500/Yen
Control Box PC Board “Coin Value” set for “00 50”

Scrolling Message Display

It is a programmable message display, which accepts programming from a remote controller or use your PC with the optional software. This sign is capable of displaying multiple messages including but not limited to (advertising, special events, bowler’s scores). Refer to the Promotional Handbook and the “Beta-Brite” Manual for instructions on programming.

Section 8: Troubleshooting

Ball Conditioner Inoperable - Power to PC Board

CAUSE A: Improper power to ball conditioner.

REMEDY A: Check main supply voltage line and 20AMP circuit breaker.

CAUSE B: Ball conditioner "Sold-Out".

REMEDY B: Check compound replace if required. Check the "Sold Out" switch for continuity. Repair or replace as required.

CAUSE C: Insufficient money deposited and/or registered.

REMEDY C: Check "Coin Mechanism" switch for operation and continuity. Repair or replace as required. Check "Bill Acceptor" operation. clean or replace unit as required.

CAUSE D: Defective "Ball Door" switch.

REMEDY D: Check "Ball Door" switch for continuity. Repair or replace as required.

CAUSE E: Defective "Start" switch.

REMEDY E: Check "Start" switch for continuity. Repair or replace as required

CAUSE F: Loose or broken communication wire.

REMEDY F: Check to be sure all wires are secure and check for continuity. Repair or replace as required

CAUSE G: Thermal overload on buffing motor in open position.

REMEDY G: Allow motor to cool. Overload device will reset automatically. If overload remains open, check motor overload. Repair or replace as required.

CAUSE H: Dirty or burned contacts on buffing motor relay.

REMEDY H: Clean contacts with burnishing tool. Replace as required.

CAUSE I: Defective coil on buffing motor relay.

REMEDY I: Inspect Coil on relay for proper operation and continuity. Repair or replace as required.

CAUSE J: Defective PC board.

REMEDY J: Replace PC board.

Ball Conditioner Inoperable - No Power to PC Board

CAUSE A: Open circuit breaker, or fuse in power supply panel.

REMEDY A: Inspect the circuit breaker or fuse. Reset or replace as required.

CAUSE B: Faulty power plug or open circuit

REMEDY B: Be sure power plug engages power receptacle. Inspect circuitry for loose or broken wires. Repair or replace as required.

CAUSE C: Open circuit breaker in ball conditioner control box.

REMEDY C: Inspect the 2 AMP breaker in the ball conditioner control box. Reset or replace as required.

CAUSE D: Defective transformer in ball conditioner control box.

REMEDY D: Verify transformer voltages. Replace as required.

CAUSE E: Loose or broken communications wire.

REMEDY E: Check that all wires are secure and check for continuity. Repair or replace as required.

CAUSE F: Improper power to ball conditioner.

REMEDY F: Check main supply voltage line and 20AMP circuit breaker.

Buffing Cycle Will Not Start When Ball Door is Closed

CAUSE A: Defective "Ball Door" switch.

REMEDY A: Check "Ball Door" switch for continuity. Repair or replace as required.

CAUSE B: Thermal overload on buffing motor in open position.

REMEDY B: Allow motor to cool. Overload device will reset automatically. If overload remains open, check motor overload. Repair or replace as required.

CAUSE C: Dirty or burned contacts on buffing motor relay.

REMEDY C: Clean contacts with burnishing tool. Replace as required.

CAUSE D: Defective coil on buffing motor relay.

REMEDY D: Inspect coil on relay for proper operation and continuity. Repair or replace as required.

CAUSE E: Defective PC board.

REMEDY E: Replace PC board.

Ball Conditioner is Operable When "Start" button is Depressed and No Money is Deposited.

CAUSE A: "House Ball" toggle switch in "house" position.

REMEDY A: Flip toggle switch to "Customer" operation position.

CAUSE B: Defective "House Ball" toggle switch.

REMEDY B: Check "House Ball" toggle switch for continuity. Repair or replace as required.

CAUSE C: Defective "Coin" switch.

REMEDY C: Check "Coin" switch for continuity. Repair or replace as required

CAUSE D: Defective PC board.

REMEDY D: Replace PC board.

Ball Conditioner Continues to Run

CAUSE A: Dirty or burnt contacts on Buffing Motor Relay.

REMEDY A: Clean contacts with burnishing tool or replace relay as required.

CAUSE B: Defective "1 Minute" Switch

REMEDY B: Check "1 Minute" switch for continuity. Repair or replace as required.

CAUSE C: Defective PC board.

REMEDY C: Replace PC board.

Ball Conditioner Vibrates Excessively During Polishing Operation

CAUSE A: Buffing wheel sections are loose on buffing shaft.

REMEDY A: Tighten nuts on end of buffing shaft.

CAUSE B: Bearing housing for buffing wheel not secured to side frame.

REMEDY B: Adjust buffing wheel and tighten mounting bolts that secure housing to side frame.

CAUSE C: Oscillator bumpers adjusted to high.

REMEDY C: Check Oscillator Bumper Adjustment.

CAUSE D: Steel guide rollers misadjusted

REMEDY D: Check *"Guide Roller Adjustment"* section.

CAUSE E: Mounting feet misadjusted.

REMEDY E: Check *"Mounting Feet Adjustment"* section.

Ball Conditioner Will Not Polish Bowling Ball Properly

CAUSE A: Buffing wheel sections are loose on buffing shaft.

REMEDY A: Tighten nuts on end of buffing shaft.

CAUSE B: Bearing housing for buffing wheel not secured to side frame.

REMEDY B: Adjust buffing wheel and tighten mounting bolts that secure housing to side frame.

CAUSE C: Buffing wheel misadjusted.

REMEDY C: Check *"Buffing Wheel Adjustment"* section.

CAUSE D: Oscillator bumpers adjusted to high.

REMEDY D: Check Oscillator Bumper Adjustment.

CAUSE E: Steel guide rollers misadjusted

REMEDY E: Check *"Guide Roller Adjustment"* section.

CAUSE F: Buffing Wheel oversaturated with compound.

REMEDY F: Run bowling balls through ball conditioner without compound.

CAUSE G: Air filter dirty.

REMEDY G: Clean or replace air filter as required.

CAUSE H: Ball roller, steel guide rollers, oscillator pads, and ball conditioner dirty.

REMEDY H: Vacuum and clean all areas of ball conditioner.

Ball Door Moves Excessively During Operation

CAUSE A: Buffing Wheel Misadjusted.

REMEDY A: Check *"Buffing Wheel Adjustment"* section.

CAUSE B: Cradle and Ball door misadjusted.

REMEDY B: Check *"Cradle and Ball Door Adjustment"* Section.

CAUSE C: Oscillator bumpers misadjusted.

REMEDY C: Check *"Oscillator Bumper"* Adjustment.

CAUSE D: Steel guide rollers misadjusted

REMEDY D: Check *"Guide Roller Adjustment"* section.

Customer Display Inoperable or Displays Wrong Information

CAUSE A: Improper power to ball conditioner.

REMEDY W: Check main supply voltage line and 20AMP circuit breaker.

CAUSE B: Loose, broken, and/or reversed communications cables.

REMEDY B: Check that all cables are secure check for continuity, and/or correct connections. Repair or replace as required.

CAUSE C: Open circuit breaker in ball conditioner control box.

REMEDY C: Inspect the 2 AMP breaker in the ball conditioner control box. Reset or replace as required.

CAUSE D: Defective transformer in the ball conditioner control box.

REMEDY D: Verify transformer voltages. Replaces as required.

CAUSE E: Improper programming on the control box PC board.

REMEDY E: Check "*Programming*" section.

CAUSE F: Defective control box PC board.

REMEDY F: Replace PC board.

CAUSE G: Defective LCD PC board.

REMEDY G: Replace PC board.

Programmable Coin Mechanism Will Not Accept and/or Register (Coins)

CAUSE A: Coin mechanism jammed with quarters and/or foreign objects.

REMEDY A: Clear jam.

CAUSE B: House ball toggle switch is in "*House Ball*" position.

REMEDY B: Flip toggle switch to "*Customer Operation*" position.

CAUSE C: Defective "House Ball" toggle switch.

REMEDY C: Check "House Ball" toggle switch for continuity. Repair or replace as required.

CAUSE D: Loose, broken, and/or reversed communications cables.

REMEDY D: Check that all cables are secure and check for continuity, and/or correct connections. Repair or replace as required.

CAUSE E: Coin mechanism lost programming.

REMEDY E: Check coin mechanism programming section.

CAUSE F: Defective coin mechanism.

REMEDY F: Replace coin mechanism.

CAUSE G: Defective coin mechanism communications PC board.

REMEDY G: replace PC board.

CAUSE H: Defective Control PC board.

REMEDY H: Replace PC board.

Internal "Stacking" Bill Acceptor Will Not Accept and/or Register (Bills)

CAUSE A: Bill Acceptor mechanism jammed with bills and/or foreign objects.

REMEDY A: Clear jam.

CAUSE B: House ball toggle switch is in *"House Ball"* position.

REMEDY B: Flip toggle switch to *"Customer Operation"* position.

CAUSE C: Defective "House Ball" toggle switch.

REMEDY C: Check "House Ball" toggle switch for continuity. Repair or replace as required.

CAUSE D: Loose, broken, and/or reversed communications cables.

REMEDY D: Check that all cables are secure. Check for continuity, and/or correct connections. Repair or replace as required.

CAUSE E: DIP switches set incorrectly at bill acceptor.

REMEDY E: Set DIP switches correctly.

CAUSE F: Defective bill acceptor.

REMEDY F: Replace as required.

CAUSE G: Defective Control PC board.

REMEDY G: Replace PC board.