Models 64 and 65
Assembly Machines
Service and Maintenance
Manual
# SECTION 1

## GENERAL INFORMATION

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1.1 INTRODUCTION

This manual is designed to support the “Limited Lube” versions of both Metric and Imperial (inch) carousel type assembly machines (Models 65 & 64 respectively). Much of the information, particularly regarding the chassis and index, may also be used in reference to “Fully Lubed” machines. However, this manual will not indicate where this is the case. For specific information regarding “Fully Lubed” machines, contact AGR Bodine customer service. This manual provides the following information:

- Machine Moving and set up procedure
- Description of the basic design features of the machine and AGR Bodine standard units
- Basic machine and standard assembly information
- Maintenance and repair procedures
- Maintenance intervals
- Spare and replacement part information

Note: This document does not contain information provided in separate manuals by manufacturers of major system components.

Regarding Metric versus Imperial, where information differs between the two, it will be either explicitly stated or the Imperial information will be in brackets [ ] following the Metric information.

Note: Although each machine is basically built as either Metric or Imperial, either style machine uses some components and/or fasteners of the other style. In other words, Metric machines use some Imperial parts while Imperial machines use some metric parts. Generally, this manual will not indicate where this occurs.

The Manual is divided into three sections:

Section 1  General Information
Section 2  Maintenance Instruction
Section 3  AGR Bodine Engineering Drawings

A complete set of Customer engineering drawings is provided with each AGR Bodine machine following installation. These drawings can be used for identifying the AGR Bodine standard assemblies and/or subassemblies used on each station of your machine by drawing number. Additionally, the drawing numbers for many AGR Bodine standard assemblies and/or subassemblies are provided in their related sections in this manual.

If information regarding any AGR Bodine standard assembly or subassembly beyond that which is provided in this manual is required, it may possibly be obtained from AGR Bodine Engineering drawings. Section 3 provides a complete listing of AGR Bodine Engineering drawings that are available for reference. Copies of these drawings may be obtained through AGR Bodine Customer Service or Technical Support.

AGR Bodine strongly suggests that any operators and service technicians assigned to this machine review this manual prior to beginning any repairs or equipment maintenance. Additionally, AGR Bodine will accept no responsibility for production losses or personal injury resulting from modifications to one of its machines by unauthorized or untrained personnel.

Note - Inconvenience only if disregarded, no damage or personal injury.

Caution - Equipment damage can occur, but not personal injury.
1.2 OPERATING ENVIRONMENT

To ensure optimum performance of the AGR Bodine Equipment, the following criteria must be met:

- Floor must be able to support 1700 Kg/sq. meter [350 Lb/ sq. ft.].
- Individual rest points on the floor must be able to support 8.44 Kg/sq. cm [120 Lb/sq. in.]
- Floor must be flat and level within 25mm [1 inch] over the length of the machine.
- Indoor facility protected from outdoor elements
- Temperature range between 64°F (18°C) and 100°F (38°C)
- Relative humidity of between 20% and 60% with no condensation.

1.3 NOISE AND VIBRATION EMISSION AND MEASURING METHOD

Lines comply with applicable norms for noise and vibration: 85dBa.

1.4 SAFETY

Read This Information Carefully!

- Operation of the AGR Bodine Model 64 machine involves heavy machinery with high voltage electrical energy, high-speed moving parts, pressurized air and fluid lines, and other potentially hazardous elements.

SAFETY AWARENESS IS AN ESSENTIAL PART OF YOUR JOB.

- You can help PREVENT accidents that may cause SERIOUS INJURY to you and others or DAMAGE to the equipment by observing all the standard SHOP SAFETY RULES in force at your workplace and taking the following additional SAFETY PRECAUTIONS:

General Rules

- Use care when loading, lifting or transporting parts or other items. When lifting, keep your back straight, bend at the knees, and lift with the legs. **Do not** attempt to lift objects that are too heavy or awkward to handle.
- **Do not** engage in horseplay, running, scuffling, showing off or throwing things.
- **Do not** smoke in restricted areas.
- **Do not** tamper with electrical equipment. Contact authorized personnel if repairs or adjustments to electrical equipment are required. Keep electrical enclosures closed. **Do not** use for storage.
- **Do not** direct compressed air or fluids under pressure at yourself or others. **Do not** use compressed air to dry hands or clothing.
- Use courtesy, cooperation, and common sense when moving materials or when walking through the plant. Use sound judgment and the "rules of the road."
- Be aware of the operation of heavy machinery and equipment around you.

Clothing and Equipment

- Wear goggles or safety glasses (with side shields) in the shop area at all times.
- Protective clothing such as gloves, aprons, coveralls, face shields, earplugs, etc., must be worn if the conditions and circumstances of your job require it.
Safety (cont.)

- Appropriate footwear of "substantial construction" must be worn in the shop area. Leisure or athletic-type footwear, as well as open-toe, open-heel, or sandal-type shoes are restricted. Shoes with slip-proof soles and safety toes are recommended.
- Do not wear loose clothing, long sleeves, scarves, neckties or jewelry while operating machinery.
- Restrain long hair with a net or cap.

Note:
Obtain the necessary protective clothing or equipment from your supervisor.

Work Area

- Practice good housekeeping in your work area. Place all refuse in the appropriate containers and clean up all spills as soon as possible.
- Keep your work area free of hazardous obstructions.
- Return all tools and support equipment to their proper storage location after use.
- Report any unsafe conditions in your work area to your supervisor.
- Before beginning work in any area, know the location of the nearest first-aid station.
- Learn the location and use of all emergency equipment in your department.
- Familiarize yourself with emergency escape routes and exits.
- Use established aisles when going to and from your work area. Keep aisles clear of obstructions.

Safety Devices

Mechanical Safety Devices
- Physical guarding surrounding the machine

Electrical Safety Devices
- Line Power Disconnect
- Emergency Stop Pendants
- Safety Light Curtains

Pneumatic Safety Devices
- Lockable Manual Air Shutoff
- Electrical Air Shutoff

Machinery Precautions

Caution:
KEEP THE DOORS TO THE ELECTRICAL CABINET CLOSED!
Only authorized personnel may open them.

- Keep your work area clean by cleaning up oil spills and removing all rags and scrap that could cause accidents.
- Never stack items carelessly so that they might fall and cause injury or damage.
Machinery Precautions (cont.)

- Ensure that a fire extinguisher and other appropriate fire protection gear are readily available.
- Do not smoke or permit any open flames around the machine at any time.

**REMEMBER... IF YOU SUFFER AN INJURY, SEEK FIRST AID IMMEDIATELY!**

- Know and respect the machinery. Approach moving machine parts with caution. Wear safety glasses to deflect flying fragments, leather gloves for handling parts with fragments, and proper safety shoes.
- Be familiar with the machine before using it in normal production.
- Inspect the machine before turning on power to ensure that all safety devices are in place.
- Never operate the machine faster than speeds recommended by the manufacturer.
- Do not operate the machine in the run mode unless the safety light curtain is activated. If the safety light curtain is not activated or has been removed for any reason, it must be replaced before restarting the machine in the run mode.
- Never disable safety systems in order to cycle machine in run mode.
- Never reach inside any enclosures or guards while the machine is being cycled into the run mode.
- While performing troubleshooting procedures for this machine, it may be necessary for maintenance personnel to remove the guards. Use extreme care to ensure that personnel keep clear of the machine, thereby reducing the potential for serious injury.
- Never manually activate limit switches, relays or valves unless following maintenance instructions.
- Report air system leaks to your supervisor immediately.
- Always assume that power is **ON** unless proven otherwise.
- Do not lean on the machine or against the control panels.
- Do not operate the machine if there are obstructions in the way of moving machine parts.
- Never place your hands on or near any moving machine parts.
- Do not place instruments, tools, etc., on the machine where they could be knocked into the path of a moving part.
- Never clean any part or remove tools while the machine is running.
- Always be attentive to machine malfunctions. Fault indications, improper or marginal instrument readings, excessive vibration or unusual noises can indicate problems requiring immediate attention.
- Learn the location of the EMERGENCY STOP push-button on the Operator Control Panel, and the Emergency Stop Buttons mounted on the machine guarding.

**Note:**

These Emergency Stop Buttons are installed for **EMERGENCIES ONLY!**
They are **NOT** to be used for routine stops of the machine.

- Before starting cleaning, lubricating, or any other maintenance work, **ALWAYS** shut off the main power. Be sure that the air pressure is at zero (0) psi, lock all the lockable disconnects, and place a WARNING or DANGER notice on the controls.
- Do not attempt to make unauthorized machine adjustments. If you feel an adjustment is necessary, contact the jobsetter. Only qualified personnel should make repairs or adjustments to the machine.
- Do not work on pneumatic devices without bleeding the system pressure to zero (0) psi.
- Limit system pressures to within specifications to prevent damage to the system.
1.5 MAINTENANCE AND SERVICE CONTACT(S)

If you do not understand the instructions in this manual, or you need assistance with the installation or operation of the machine, please contact the Customer Service Department of Arthur G. Russell Co., Inc.

Arthur G. Russell Co., Inc.
750 Clark Avenue
Bristol, CT 06010
USA

Phone: (860) 583-4109
Fax: (860) 583-0686

www.arthurgrussel.com
1.6 LINE MOVING AND SHIPPING

Transportation Instructions

- AGR Bodine Model 64/65 to be moved separately from the feeders.
- The skids are designed to use rollers, dollies, and lift trucks.
- A large forklift is recommended for unloading the machine from the truck.
- The recommended method for lifting the machine is shown in views A and B.

Caution:

- The Model 64/65 machine is top-heavy. Lifting from the base or legs may tip the machine.
- Do not lift the machine by the camshaft.
- Do not lift the machine higher than necessary.
- If jacks are used for lifting, care must be taken not to twist the machine.

THIS APPROACH IS NOT RECOMMENDED

- Never lift or carry vibratory feeders by the bowl. Damage to the equipment is likely.
- Leveling pads must be placed under the legs when the machine is lowered. Make sure hands and feet are clear.
- Before lifting the skid, remove the panel box support bracket.

Note:

If damage has occurred to the machine in transit, the buyer is responsible for reporting the damage to the trucking company and to AGR Bodine upon discovery. Due to the considerable size and weight of the machine, the moving and lifting procedure requires careful planning to avoid possible damage or injury.

Warning: Only qualified personnel should move the machine.
Alternate Methods

Using lift trucks or overhead cranes and two 16mm cables, lift by A (the upper pivot shaft idler end) and B (the upper pivot shaft drive end) Use a spreader to protect the upper electrical cabinet. A pivot shaft collar (C) should be used to eliminate possible cable slippage (1.50 I.D.- 2PC.)

Note:
It is important for the lifting cable to be as close to the Sampson as possible to prevent the pivot shaft from bending.

On 7 and 8 bay machines the idler end lift point will be the pivot shaft next to the 5th or 6th bay Sampson. Using a large lift truck with a capacity equal to or greater than the machine weight, position the forks as follows:
- Under the upper or lower solid tooling plates (D) to lift either one or both ends
- Under the base (E)
- Through wire cables on the upper pivot shaft (F)
- Under the Sampson legs (G)
Combinations of lift trucks and cranes may be used.

<table>
<thead>
<tr>
<th>Bay</th>
<th>Height</th>
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<tr>
<td>1</td>
<td>2.39m</td>
<td>3.5m (137”)</td>
<td>2000-2500 kg</td>
</tr>
<tr>
<td>each Additional bay</td>
<td>2.39m</td>
<td>.61m (24”)</td>
<td>750-1250 kg</td>
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(Weights are approximated only and may vary depending upon station equipment and design)

1.7 EQUIPMENT INSTALLATION (ACTIVATION)

Note:
The first startup of the assembly machine and the personnel training must be performed exclusively by the manufacturer’s authorized service personnel. An arbitrary startup is not allowed. In the event of non-compliance, any warranty claims shall expire.
1.8 UNPACKING AND HANDLING

The machine will be skidded and crated. All auxiliary devices such as vibratory feeders, etc., will be boxed/skidded separately.
Place the rectangular counterbored rest pads (SYN-6-1) under each leveling screw (SYN-5) when the machine is placed on the floor. These will be found wired together and fastened to the machine.

Cleaning
Use any good clean industrial solvent to remove the rust preventive on all machine surfaces. Special care must be taken to clean the belt, the pallets and fixtures, and the pallet guide tracks. Also, the cam tracks on all large cams must be carefully degreased. Re-grease the cam tracks with a light coat after cleaning. After degreasing, spray or wipe a light coat of oil on all machined surfaces to prevent rust stains.

Leveling

Note: This leveling procedure is extremely important to the overall operation of this machine.

STEP 1
- Locate the machine on the floor with a leveling pad (SYN-6-1) under each Sampson leveling screw (SYN-5) and a steel plate under each of the base plate leveling studs. (refer to fig’s #L-1 and L-3)
- First level procedure (fig. # L-1). Level the main base under the drive end of the machine. Using a precision level resting on (2) \(\frac{1}{2}\)" [12mm] diameter dowel pins. Raise or lower the end of the machine where the electrical cabinet is mounted.
- Second level procedure (fig. # L-2). Remove the shroud that covers the drive drum. Set the level as shown on the top of the drive drum for the side to side leveling of the machine.
Leveling (cont'd)

Fig.# L-4

STEP 2

- When the main base is level and stable, the individual Sampson bases must be leveled and brought into the same plane as the main base. Begin at the drive end of the machine (refer to fig.# L-4).

- Place one 1/2" [12mm] dowel pin on the surface of the main base near the second Sampson and the second 1/2" [12mm] dowel on the ground surface of the third Sampson. Rest the level (or a precision-ground parallel bar if the level is not at least 24" [609.6mm] long) on the dowels. Turn the Sampson leveling screws (SYN-5) until the surface of the Sampson base is in the same plane as the main base on both sides of the machine within 0.002" [0.05mm]. Lock the leveling screws in place.

- Proceed down the machine, maintaining 0.002" [0.05mm] accuracy, until all Sampson bases have been leveled.

- Re-check all Simpsons and the main base to ensure accuracy and make adjustments as necessary.

With the machine level, it may now be lagged to the floor if desired. (If the machine is resting on an unstable floor, it is recommended that it be lagged).
Unpacking and Handling (cont.)

**Clutch re-assembly**

Machines are shipped with a shipping spacer under the “Mayr” clutch (refer to fig’s. #1&2). This helps protect the lower seal in the indexer. After the machine is leveled and lagged the shipping spacer may be removed and the clutch re-assembled.

1. Remove the shipping spacer
2. Carefully lower the clutch assembly into position and tighten appropriate bolts. The clutch assembly is “keyed” to the mating surface and is very heavy. If the clutch is dropped it may get skewed and gall the mating key thereby effecting alignment.
3. Lock the “Ringfeder” collar in place. Take any 3 or 4 locking screws equally spaced and snug them down to establish a perpendicular position of the shrink disc collars relative to the shaft. This will properly seat the collars on the taper of the inner ring and avoid cocking of the collars.
4. Using a torque wrench, tighten all locking screws gradually and all the way around in either clockwise or counterclockwise sequence (not in diametrically opposite sequence). Several passes are required until all screws are torqued to 9ft/lbs [12.2Nm].
5. Check and make sure that no screw will turn anymore by applying the specified tightening torque. Only then is the installation complete.
6. The gap between the shrink collars should be as equal as possible all around.
Band Tension

Machines are shipped with the steel drive band slack. AFTER the machine is leveled and lagged the idle drum must be adjusted and locked against its preset stops. This will reset the factory set tension.

STEP 1
- Loosen the bearing mount bolts in the upper and lower flange bearings as shown below.

STEP 2
- Loosen the jam nuts and turn the adjusting screws to slide the upper and lower flange bearings outward until they rest against the stop plates. It is not necessary to apply pressure, but a snug fit must exist between the flange bearings and the stop plates. A 0.001" [0.025mm] feeler gauge should be used to check this fit. ( refer to the arrows below for the feeler gauge fit location ) Even with the stop plates in place it is possible to over extend the adjustment by crushing the stop plates and their locating pins. So be very careful and use a feeler gauge.

STEP 3
- Tighten the upper and lower flange bearing screws and lock the adjusting screws.
Unpacking and Handling (cont.)

**Vibratory Feeders**

- Hoppers are carefully crated and shipped separately from the machine/feeder. Uncrate carefully to avoid damage to delicate tooling. NEVER LIFT A VIBRATORY FEEDER BY THE BOWL.
- Hoppers will usually be numbered in cold water paint to determine proper location on the machine.
- Hoppers that are mounted on their own base plates and vibratory rails that are spring-cushion mounted will have shipping straps fastened to them to prevent damage in shipment. These should not be removed until the units have been at least roughly positioned on the machine, but must be removed before the feeders can be placed in operation.

**Electrical Connections**

Wire size used to connect the machine is dependent upon the Disconnect and the distance between the machine and power source. Connect a size 6-ground wire to the AC ground bus on the panel. The AC ground bus is a row of green and yellow grounding terminal blocks on the control panel. The nameplate on the panel door will indicate the exact voltage characteristics for which the machine is wired. Follow local/country electrical code requirements, as AGR Bodine assumes no responsibility for improper installation or violation of local codes.

Note:

The machine must have a good earth ground to operate properly. The absence of a good earth ground may cause the machine to operate erratically.

**Pneumatic Connections**

The air supply line must be at least as large as the connection to the machine. The size of air supply line is also dependent on the length of the run to the machine from the main supply.

**1.9 SUMMARY**

Every effort has been made by AGR Bodine to clearly provide information necessary to operate this machine in a safe and efficient manner. Please review each section carefully, making notes as necessary in the spaces provided, and keep it close to the machine for quick reference. If a problem occurs that is not directly addressed on the preceding pages, please call the AGR Bodine plant at 203.712.1900, Monday through Friday, 8:00 a.m. to 4:30 p.m. eastern standard time.

**1.10 DISPOSAL OF EQUIPMENT AT END OF SERVICE**

At the end of service, all AGR Bodine assembly and test systems can be shipped directly to AGR Bodine’s Lebanon, MO., facility (at the owner’s expense) for proper disposal.
## SECTION 2
### MAINTENANCE INSTRUCTIONS

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2.1 WIPER ASSEMBLY

2.1.1 FUNCTION
This assembly consists of a steel channel that secures a felt wiper. There are four sub assemblies per machine: (1) upper and lower on the infeed side to the drive wheel and (1) upper and lower on the exit side from the drive wheel. The wiper has two functions. The two wipers, located before the belt infeed side to the drive wheel, are kept dry, and are to wipe off the pallets as they index through the felt track. The two wipers, located just after the belt exit from the drive wheel, are saturated with oil to lubricate the guiding surfaces of the pallets. Figure #1 shows a front view and side view of a pair of wiper assemblies with the lubrication fittings. There is a central lubrication system that pulses, on a specific and consistent interval, a metered squirt of oil onto the wipers. The brass fitting mounted directly to the wiper channel is an injector that is spring-loaded shut and forced open with pressure from the oiler’s pulse.
2.1.2 LOCATION
There are 4 sub-assemblies per machine: (1) upper and lower on the infeed side to the drive wheel and (1) upper and lower on the exit side from the drive wheel. Figure #2 is a partial front elevation of the drive end of the machine, which shows one upper and one lower wiper assembly in position. The other two wiper assemblies are located on the other side of the machine.

For a complete listing of available engineering drawings refer to section 3.
2.1.3 WIPER REPLACEMENT
Jog machine to be approximately mid index. Refer to Figure #3 and notice that there is a pallet partially in and a pallet partially out of the wiper’s rail. This is an important condition for wiper alignment upon re-assembly.
1. Remove the two mounting screws that hold each sub-assembly to the back wall of the machine (Figure #3).
2. Roll assembly out (refer to Figure #4). Remove the end cap and slide the old felt out.
3. Wipe out the groove area and check the lubrication port (if used) for clogs.
4. Insert the new felt (saturate felt before inserting if you are on the lubricated side of the machine) and replace the end cap. Make sure the end cap is oriented the correct way when reassembling. There is an offset groove that is critical to the function of the machine, Notice the offset on the end view in Figure #1.
5. Relocate the wiper assembly by angling it in using the pallets as a locating position.

![Figure #3](image3.png)

![Figure #4](image4.png)

2.1.4 INJECTOR REPLACEMENT
Refer to Figure #5
1. If replacing the upper injector, replace the tube compression fitting also. The lower injector may be removed without disturbing the tubing connection if there is a “t” fitting that is in line.
2. The lube layout may vary due to other options that may be on your equipment-double check part number that is engraved on the injector. Refer to spare parts list below for more information.
3. Disconnect tube and remove the injector.
4. Spread pipe dope on the new injector threads prior to installing. Be very careful not to introduce any pipe dope into the injector’s orifice.

![Figure #5](image5.png)
2.1.5 MAINTENANCE
- Monthly: Check wiper for wear and lubrication as required.
- Bi-monthly: Replace the wiper. This interval is an approximation and may need to vary depending upon your specific conditions and environment. It is suggested that you replace all 4 wipers at the same time.

2.1.6 RECOMMENDED SPARE PARTS

<table>
<thead>
<tr>
<th>PART</th>
<th>PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>WIPER, FELT</td>
<td>64-14-8</td>
</tr>
<tr>
<td>*INJECTOR, UPPER</td>
<td>ZSA-10 18302-10</td>
</tr>
<tr>
<td>INJECTOR, LOWER</td>
<td>ZST-10 18303-10</td>
</tr>
</tbody>
</table>

*If ordering the noted injector, ask for a Tube Compression Fitting to be shipped with it.

2.1.7 TROUBLE SHOOTING
1. Pallets show scoring or heavy debris deposits
   - Check the wipers for wear or imbedded material in felt.
   - Check the lubrication ports for clog and the tubing for crimps
2. Lubricated wipers are dry:
   - Check oil reservoir
   - Check for crimped hose or clogged oil port.
   - Check that the lubricator is pulsing properly. Refer to the lube system manual for specifications and conditions.
   - Check for faulty injector, if the condition exists in only 1 of 2 wiper assemblies.
3. High or fast wear of the wipers:
   - Check pallets for hardened dirt and debris that may not be wiping off.
   - Check alignment of wiper assembly as it relates to the pallets
   - Check belt and pallet conditions.
4. Too much lubrication. Oil dripping all over pallets.
   - Check for faulty injector, if the condition exists in only 1 of 2 wiper assemblies.
   - Refer to the lube system manual for specifications and conditions.
2.2 MOTOR, BRAKE AND INDEXER

2.2.1 FUNCTION
The Motor, Reducer, and Indexer assembly provides the precision index motion for the machine along with providing the drive for the camshafts. The basic components are a drive motor, a speed reducer, and an indexer (Intermittor).

2.2.2 DESCRIPTION
In the traditional design (refer to Figure #1a), the speed reducer which is directly connected to the indexer, is belt driven by the drive motor. If the motor is a fixed speed, the belt sheaves can be changed to change the machine speed. The indexer and drive motor are each mounted independently to the machine base.

The Integrated design (refer to Figure #1b), incorporates a gear motor (combines the motor and reducer into a single unit) that is mounted directly to the indexer thereby eliminating the traditional belt drive. Machine speed is changed by using a variable speed drive motor. Only the indexer is mounted directly to the machine base.

In either design, the speed reducer will accommodate a range of machine speeds based on the drive motor rpm. In the traditional design the reduction amount is either 30:1, 40:1 or 60:1. In the integrated design, the reduction amount will vary based on the required range of machine speeds and the desired motor speed.

Drive motor size is from 3 to 5 HP and is selected based on the overall loading requirements. The drive motor is equipped with a brake that enables the machine to be stopped quickly.

Also, a hand wheel is provided for manually cycling the machine.

![Figure #1a](image)

**MOTOR, REDUCER AND INDEXER ENGINEERING DRAWINGS - REF. (TRADITIONAL DESIGN)**

<table>
<thead>
<tr>
<th>ASSEMBLY OR SUBASSEMBLY</th>
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<td>MOTOR, REDUCER AND INDEXER (TRADITIONAL DESIGN)</td>
<td>65-12-00-101</td>
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*For a complete listing of available engineering drawings refer to section 3*
Figure #1b

MOTOR, REDUCER AND INDEXER ENGINEERING DRAWINGS - REF. (INTEGRATED DESIGN)

<table>
<thead>
<tr>
<th>ASSEMBLY OR SUBASSEMBLY</th>
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<tr>
<td>MOTOR, REDUCER AND INDEXER (INTEGRATED DESIGN)</td>
<td>65-12-00-103</td>
</tr>
<tr>
<td></td>
<td>64-12-00-103</td>
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</tbody>
</table>

For a complete listing of available engineering drawings refer to section 3.
2.2.3 MOTOR/BRAKE REPLACEMENT

Before beginning any work, electrically lockout machine and remove appropriate shrouding.

Traditional Design
The motor, motor base and brake are removed as a set. The motor and brake are a single item. It is suggested that you replace the belt at this time also.

1. Electrically disconnect the motor and brake.
2. Refer to Figure #2. Remove the belt by loosening motor mount bolts “A” and sliding motor towards the indexer using adjustment bolt “B” (Belt tensioning bolt).
3. Remove sheave and set aside for later installation on the new motor.
4. Remove bolts “C” and carefully lift the motor up and out (Use the lifting ring located as shown).

5. Position and attach the new motor/brake onto the motor base then install the sheave from the old motor.
6. Reconnect electrically then verify correct motor rotation. The motor rotation as viewed from the shaft end of the motor should be opposite the machine rotation. Therefore, if the machine rotation is clockwise, the motor rotation should be counter clockwise and vice versa. Use the jog button to "bump" the motor for observing the rotation. If the motor rotation is correct move onto the next step. If the motor rotation is incorrect, rewire to correct it and re-verify.

7. Install the new belt then tension. Make sure that the sheaves are inline and parallel to minimize belt wear. Refer to Figure’s #3 & #4. Figure #3 shows a quick way to check tension using a steel scale and a piece of bar stock. With about 9N [2 lbs.] of pressure on the scale, it should read about 6.35mm [¼”].

Integrated Design
The motor and brake is a single item and is removed as a set.

Refer to the manufacturers’ documentation for gear motor removal and installation procedure.

Important!
Before running the machine, verify that the rotation is correct. Once the motor is electrically connected, use the jog button to "bump" the motor. Observe the drive wheel on the machine. If the rotation is correct no further action is needed. If the rotation is incorrect, rewire to correct it and re-verify.
2.2.4 INDEXER REPLACEMENT

Before beginning any work, electrically lockout machine and remove appropriate shrouding.

Traditional Design
It is suggested that the torque limiter and timing chain be replaced with the indexer. It is strongly suggested that you allow AGR Bodine to replace the indexer due to the complexity and importance of a precision installation.

1. Refer to Figure #2. Remove the belt by loosening motor mount bolts "A" and sliding motor towards the indexer using adjustment bolt “B.”
2. Remove the Encoder that is mounted to the top of the indexer.
3. Remove the Torque Limiter that is mounted to the dial plate on the top of the indexer (refer to Torque Limiter, section 2-3, for removal information).
4. Remove the silent timing drive chain (refer to Camshaft Drive, section 2-10, for removal information).
5. Remove the 4 bolts holding the indexer in place. Remove the indexer (there are no specific lifting points with which to grab the indexer, We suggest that you slide the unit to the edge of the main plate and onto a forklift or use lift straps.)
6. Position the new indexer and secure. The indexer must be in zero position before reassembling the rest of the components. Using the hand wheel, rotate the indexer (in the running direction) until the indexer dial plate (which the clutch mounts to) is through the “dwell” phase and just begins to move (the “index” phase). This is zero position.
7. Once “zero” position has been established you may now assemble and tune the timing drive chain (refer again to Camshaft Drive, section 2-10, for assembly and tuning detail).
8. Remount the Encoder and refer to the Encoder section 2-6 for assembly and tuning detail.
9. Remount the belt and sheave to the indexer and tension. Refer to Figure’s #3 & #4. Figure #3 shows a quick way to check tension using a steel scale and a piece of bar stock. With about 9N [2 lbs.] of pressure on the scale, it should read about 6.35mm [¼”].

Integrated Design
It is suggested that the torque limiter and timing chain be replaced with the indexer. It is strongly suggested that you allow AGR Bodine to replace the indexer due to the complexity and importance of a precision installation.

1. Electrically disconnect the motor.
2. Remove the Encoder that is mounted to the top of the indexer.
3. Remove the Torque Limiter that is mounted to the dial plate on the top of the indexer (refer to Torque Limiter, section 2-3, for removal information).
4. Remove the silent timing drive chain (refer to Camshaft Drive, section 2-10, for removal information).
5. Remove the 4 bolts holding the indexer in place. Remove the indexer.(There are no specific lifting points with which to grab the indexer, We suggest that you slide the unit to the edge of the main plate and onto a forklift or use lift straps.) Note: The motor will need to be detached from the indexer. This may be done, per the manufacturers’ instructions, either before or after the indexer is removed from the machine.
6. Position the new indexer and secure. The indexer must be in zero position before reassembling the rest of the components. Using the hand wheel, rotate the indexer (in the running direction) until the indexer dial plate (which the clutch mounts to) is through the “dwell” phase and just begins to move (the “index” phase). This is zero position.
7. Once “zero” position has been established you may now assemble and tune the timing drive chain (refer again to Camshaft Drive, section 2-10, for assembly and tuning detail).
8. Remount the Encoder and refer to the Encoder section 2-6 for assembly and tuning detail.
9. Before running the machine, verify that the rotation is correct. Once the motor is electrically connected, use the jog button to “bump” the motor. Observe the drive wheel on the machine. If the rotation is correct no further action is needed. If the rotation is incorrect, rewire to correct it and re-verify.
2.2.5 BRAKE REPLACEMENT (Traditional Design only)

Before beginning any work, electrically lockout machine and remove appropriate shrouding.

1. Disconnect the brake module electrically.
2. Loosen the setscrews that secure the hub to the motor’s shaft (access through the vent holes).
3. Remove the mounting stud bolts that secure the unit to the motor housing.
4. Re-assemble in reverse order.
   - Make sure that the key is on the shaft properly.
   - Make sure that the unit slips on the shaft freely.
   - Shaft set screw torque: 17.6 Nm [156 in-lbs]
   - Mounting stud bolt torque: 54.2 Nm [480 in-lbs]
5. After assembly check the armature for any shipping spacers. They may be removed through the air vent slots.

2.2.6 SYNCHRONIZING INDEXER AND CAM SHAFTS

1. Jog the machine until it is in its work cycle, when the index locking pin is fully engaged in a drive wheel bushing. Scribe or mark a line on a pallet guide correlating to the edge of a pallet.
2. Place a scale against the pallet guide and slowly jog the machine until the pallet moves exactly half way through its index cycle. This is equal to 4” [101.6mm] on an 8” [203.2mm] index machine and 2” [50.8mm] on a 4” [101.6mm] index machine. The camshaft position dial (Figure #5) should read 60 ± 2° if a 120° indexer is used or 45 ± 2° if a 90° indexer is used.
   - If the dial reading is acceptable, synchronize the encoder to camshaft position. (Refer to Section 2.6.5 Encoder spec. sheet)
   - If it is unacceptable, the camshafts must be synchronized with the indexer. Refer to Figure #6 and the spec. sheet for the Cam Shaft Drive assembly Section 2.10. The drive adapter is located on the lower camshaft, mounted to the sprocket and facing inward towards the machine. Loosen the jam nuts and with the proper adjusting screw, rotate sprocket until the camshaft dial position indicator reads correctly (45° or 60°).

Figure #5

![Figure #5](image)

Figure #6

![Figure #6](image)
2.2.7 SYNCHRONIZING INDEXER AND DRIVE WHEEL

Normally, the index-locking pin should silently engage the drive wheel bushings. If "banging" is encountered it is necessary to adjust the timing coupling ring (mounted to the indexer) in order to synchronize the drive wheel with the indexing unit.

1. Jog the machine 1 cycle at a time, carefully observing if the pallets and fixtures jump slightly forward or backward when the locking pin engages the drive wheel bushings.
2. If the pallets and fixtures jump forward, the drive wheel lags the indexer. To correct this problem on a machine with clockwise index rotation. See Figure #7.
   - Loosen the three socket head screws, which fasten the timing coupling ring to the index timing plate, and slightly re-tighten them.
   - Loosen the jam nut that secures the right hand adjusting screw and slightly back off the screw from the dowel. Make very small adjustments at a time.
   - Loosen the left hand jam nut and advance the left hand adjusting screw until it locks the dowel firmly between the 2 adjusting screws. Re-tighten both jam nuts.
   - Firmly tighten the three socket head screws.
   - Jog machine one cycle at a time and repeat observations.
   - If the pallets and fixtures jump backward when the locking pin engages the drive wheel bushings, the drive wheel leads the indexer. To correct, repeat the procedure above, but make adjustments in the opposite direction.
3. Make adjustments as necessary until the locking pin silently engages the drive wheel bushings.
4. For a machine with counter-clockwise index rotation, repeat the above procedure, but make adjustments in the opposite direction.

2.2.8 MAINTENANCE

Monthly: Check belt tension
Yearly: Change oil (or every 2400 hrs. depending on usage/environment etc.)
2.2.9 RECOMMENDED SPARE PARTS
The motor, indexer, and related components should provide years of service. Although spares are not recommended, it should be kept in mind that the indexer is a long lead item with a minimum (8) week lead time.

2.2.10 TROUBLE SHOOTING:
1. Sluggish motion during cycle:
   - Check belt tension.
   - Check oil level in indexer.
2. Erratic motion during cycle:
   - Cam follower broken inside indexer (replace indexer).
3. Replacing belt often and/or high wear on sheaves
   - Check sheave alignment
4. No index with motor rotation
   - Belt loose or broken.

2.2.11 TROUBLE SHOOTING BRAKE # IMCB x 210-90V:
1. Armature rubbing – periodic noise to constant rubbing.
   *The brake armature may be cocked, resulting in varying air gap and rubbing on adjacent friction surface when disengaged.*
   - Disconnect power to motor
   - Adjust the armature position by inserting a screwdriver through the vent slots and pry the armature away 1.59 to 2.29mm [0.06“-0.09”] from the surface on which it is rubbing.
   - Energize the coil.
   - Insert two screwdrivers, 180 degrees apart, through the vent slots and push the armature toward the friction surface until it is fully engaged.
   - Remove the screwdrivers and de-energize the coil.
   - The “dyna-gap” self-adjusting feature will automatically set and maintain the proper air gap 0.76 to 1.27mm [0.03“-0.05”].
2. No engagement when brake coil is energized.
   *The armature air gap is too large*
   - Disconnect power to motor
   - Energize the coil.
   - Insert two screwdrivers, 180 degrees apart, through the vent slots and push the armature toward the friction surface until it is fully engaged.
   - If armature still does not engage properly, refer to the manufacturer for possibly resetting the armature air gap.
3. Rapid wear or short life
   - High temperatures due to fast cycling or enclosure will result in a high wear rate. Ensure the unit is being ventilated as efficiently as possible.
   - Exposure to harsh environments due to abrasive dust and grit may shorten the life of the unit. In these types of environments, an effort should be made to shield the brake module from abrasive materials.
4. Increased stopping time
   *Improper voltage, Normal wear, Oil or grease contamination on friction surfaces.*
   - Connect a D-C voltmeter with the proper range across the brake magnet field terminals. With the power to the coil and the potentiometer turned to the highest setting, the voltage should read within 10% of the unit’s rating. As the potentiometer knob is adjusted counterclockwise (lower), the voltage should drop.
   - If the electrical checks are ok then look at mechanical components for damage, wear, or improper installation.
   - Friction surfaces may be wiped with a cloth that has been dampened with a degreaser. Do not drench or soak the friction material.
   - If all the above does not fix the problem then replace the brake module.
2.3 TORQUE LIMITER

2.3.1 FUNCTION
The TORQUE LIMITER assembly, sometimes referred to as the CLUTCH or SAFETY CLUTCH, is an Overload detecting device to protect the machine and the intermittor from damage upon any jam conditions that may occur. An array of steel balls is contained in a cage, which rides in precision pockets between the hardened driving and driven plates of the clutch. If the driven load exceeds the torque setting, the steel balls ride out of the pockets disengaging the drive, and de-energizing the clutch safety proximity switch causing the machine to stop. The driven plate is preloaded by a stack of disc springs, and is coupled to the output bushing. Under normal running conditions, the proximity switch is “on” and under a fault condition; the switch is “off”

TORQUE LIMITER ENGINEERING DRAWINGS - REF.

<table>
<thead>
<tr>
<th>ASSEMBLY OR SUBASSEMBLY</th>
<th>AGR Bodine DRAWING NUMBER</th>
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<td>METRIC</td>
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<td>WITH MAYR TORQUE LIMITER</td>
<td>65-12-00-202</td>
</tr>
<tr>
<td>WITH AUTOGARD TORQUE LIMITER</td>
<td>65-12-00-201</td>
</tr>
</tbody>
</table>

For a complete listing of available engineering drawings refer to section 3

Rev. 09/07/2011
2.3.2 LOCATION
The Torque Limiter assembly is mounted to the top of the Coupling Timing Ring, which is mounted to the Indexer and is clamped around the bottom of the Drive Drum assembly's shaft as shown in bold line in Figure #2.

2.3.3 REMOVING THE TORQUE LIMITER FROM THE DRIVE UNIT
1. Jog the machine until the locking pin is fully engaged in a drive wheel bushing (refer to Section 2.5 Index Locking Pin spec. sheet for location and more information.) Also make sure that the coupling timing ring adjusting screws are accessible. (Figure #3)
2.3.4 REMOVING THE TORQUE LIMITER FROM THE DRIVE UNIT (continued)

2. Remove the proximity switch bracket and loosen the hex screws in the shrink disc so that it slides freely up the drive shaft. (Figure #4)

3. Completely loosen the 6 socket head screws in the drive plate (shortened Allen Hex wrench needed). Lightly spray the shaft with WD-40 as needed and slide the clutch assembly up the drive shaft. Support the clutch assembly in place to prevent from sliding back down the shaft. If the clutch does not remove freely, use the (2) 3/8-24 screws [as jack screws] (not supplied) to jack the clutch from below. Refer to Figure #5.

4. Remove the coupling timing ring: (refer to Figure #6)
   - Loosen the jam nut and back off 1 of the adjusting screws from the dowel pin. If you loosen both you will have to re-phase the indexer with the machine.
   - Loosen and remove the three socket head screws, which fasten the coupling ring to the indexer.
   - Lift the coupling timing ring from the indexer and remove.

5. Slide the clutch assembly down the drive shaft and remove.
2.3.5 INSTALLING CLUTCH INTO DRIVE UNIT

If a new clutch is being installed, it is necessary to fit the clutch hub to the drive shaft. The hub should have a free but snug fit ("push fit") with the drive shaft. If, after thoroughly cleaning the mating area of the drive shaft, the fit is not acceptable, use a 50.8mm [2.000"] reamer to remove any high spots from the inside of the hub. When new clutches are shipped from the factory, the clutch key is pre-fitted to the hub keyway with the proper slide fit.

Note:
AGR Bodine presets the torque setting on the clutch. If the torque appears to be insufficient for proper operation of the machine, consult AGR Bodine Customer Service.

1. Tap the clutch key into the key pocket of the drive shaft, so that it sits squarely against the bottom of the pocket.
2. Slide the fitted clutch assembly up the drive shaft and support the clutch assembly in place.
3. Install the coupling timing ring:
   • Make sure that the mating surfaces between the coupling timing ring and the indexer timing plate are clean. Use an India stone (or equivalent) to remove surface imperfections.
   • Install the coupling timing ring with the socket head screws and flat washers, but do not tighten completely.
   • Turn the adjusting screw that was backed off in Step 4 of "Removing Torque Limiter from Drive Unit" until it is firmly against the dowel and lock the jam nut.
   • Firmly tighten the socket head screws.
4. Carefully lower the clutch assembly into position and tighten appropriate bolts. The clutch assembly is "keyed" to the mating surface and is very heavy. If the clutch is dropped it may get skewed and gall the mating key thereby effecting alignment.
   • Fasten with the (6) socket head screws.
   • Lock the "Ringfeder" collar in place. The "Ringfeder" collar is the clamp that secures the top of the clutch to the drive shaft.
   • Take any (3) or (4) locking screws equally spaced and snug them down to establish a perpendicular position of the shrink disc collars relative to the shaft. This will properly seat the collars on the taper of the inner ring and avoid cocking of the collars.
   • Using a torque wrench, tighten all locking screws gradually and all the way around in either clockwise or counterclockwise sequence (not in diametrically opposite sequence). Several passes are required until all screws are torqued to 12.2 Nm [9ft/lbs].
   • Check and make sure that no screw will turn anymore by applying the specified tightening torque. Only then is the installation complete.
   • The gap between the shrink collars should be as equal as possible all around.
5. Re-install the proximity switch bracket and position it so that a slight upward movement of the clutch will de-energize the switch. Observing the LED on the clutch proximity switch can do this. LED "on" is a running condition LED "Off" is a fault condition.
6. Jog the machine and observe the engagement of the Index Locking Pin with the drive wheel bushings. Make adjustments as necessary.
2.3.6 CLEARING MACHINE JAM AND resetting CLUTCH
If a machine jam has occurred and the clutch safety overload switch has been tripped, the jam must be cleared and the clutch reset to its normal operating position.

1. Locate the source of the jam:
   - Inspect for small parts that may have become lodged between the pallet guides and pallet wiper blocks.
   - Inspect each fixture for small parts that may have become jammed in the channel of the pallet guides. Normally, the pallets should have slight play within the guides, both vertically and in and out. If a jam is found, remove the appropriate pallet guides and clear the jam. It is important that the guides be clean before replacing.

2. Reset the clutch to its normal operating position as follows:
   - Shut off machine (the main disconnect) to disengage brake relay.
   - Record the encoder degree position that the machine is at.
   - Back up machine using the hand wheel until the pop of the clutch re-engaging is heard. At this point the clutch proximity sensor LED should be on.
   - Advance the machine using the hand wheel to the recorded degree position.

3. Visually inspect all tooling for damage.
4. Slowly jog the machine through a full cycle to ensure that all jams have been cleared.
5. Check the setting of the camshaft encoder (see in Section 2.6.5 Synchronizing Encoder with Camshaft Indexer Position). In normal operation, if a jam should occur causing the clutch to disengage, the machine should stop with 30° or so of cam shaft rotation.

2.3.7 MAINTENANCE
Monthly:
   - Check proximity sensor for location.
   - Check all bolts for loosening.
   - Clean off oil and grease that may have dripped on clutch.

2.3.8 RECOMMENDED SPARE PARTS
Under normal operating conditions the clutch should give years of service. A spare is not recommended. Usually the clutch is stocked by AGR Bodine. If a clutch is required, use the charted information when placing an order through Customer Service. The parts are the same for metric or imperial machines. If your clutch is an older style American Autoguard #203ACT4-ABL clutch with a mechanical roller type switch, this will be replaced with the Mayr clutch with the 12mm proximity switch and 64-12-101 imperial or M64-12-101 metric switch bracket. There will be mounting and programming required when installing the new 12mm switch and bracket. Please consult AGR Bodine Customer Service for correct installation.

<table>
<thead>
<tr>
<th>PART</th>
<th>PART NUMBER</th>
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<tbody>
<tr>
<td>MAYR TORQUE LIMITER EAS-NC4/451.725.0-SO</td>
<td>TUA02-001</td>
</tr>
</tbody>
</table>
2.3.9 TROUBLE SHOOTING

1. Losing “phase”
   - Verify that there are no jams of any kind.
   - Check that the adjusting screws have not loosened (refer to Figure #6).
   - Check that the “Ringfeder” collar has not loosened and slipped (refer to Figure #7.) The Ringfeder collar is “keyed” to the shaft. The key may be loose or missing.

2. Clutch kicks out too easily:
   - Verify that there are no jams of any kind.
   - The springs in the clutch may be worn or broken. Replace the clutch.
   - Check the proximity switch for location or looseness.

3. False “overload” condition:
   - Check proximity switch (it may need adjustment or replacement).
2.4 DRIVE WHEEL

2.4.1 FUNCTION
This drive wheel assembly transfers the index motion from the indexer to the steel band.

DRIVE WHEEL ENGINEERING DRAWINGS - REF.

<table>
<thead>
<tr>
<th>ASSEMBLY OR SUBASSEMBLY</th>
<th>AGR Bodine DRAWING NUMBER</th>
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<td>8” INDEX DRIVE WHEEL</td>
<td>65-12-00-302</td>
</tr>
<tr>
<td>4” INDEX DRIVE WHEEL</td>
<td>65-12-00-303</td>
</tr>
</tbody>
</table>

For a complete listing of available engineering drawings refer to section 3

Rev. 09/07/2011
2.4.2 LOCATION
This assembly is located on the drive end of the machine, above the clutch (torque limiter) as shown in Figure #2.

2.4.3 CHECKING DRIVE WHEEL HEIGHT
The distance from the machined surface on the top of the drive wheel housing to the top of the perimeter of the drive wheel is set at the factory and stamped on the drive wheel housing. (Refer to Figure #3) As a troubleshooting step, this distance can be measured with a depth micrometer and compared to the number stamped on the housing. If there is a discrepancy greater than ±0.05mm [±0.002"], it is strongly recommended that AGR Bodine Customer Service be contacted before attempting to adjust the drive wheel height.
2.4.4 SHAFT & BEARING REPLACEMENT & POSITIONING THE DRIVE WHEEL

General assembly information is noted below (Figure #4); however it is highly recommended that AGR Bodine service engineers do all major component changes and adjustments.

![Diagram of drive wheel assembly](image)

**Figure #4**

1. Remove the appropriate shrouding.
2. Remove tooling belt (steel band). (Refer to Section 2.8 TOOLING BELT spec. sheet.)
3. Remove torque limiter (clutch) (refer to torque limiter spec. sheet) – Section 2.3
4. Remove the bearing nut and replace with a new one.
5. Loosen upper collar (only if replacing the shaft). Turn the lower collar to press off the drive wheel from the shaft. (The lower collar also acts as a jack collar to break the press fit shaft from the wheel hub.) Also note that the three “collars” in this assembly are locked to the shaft with setscrews and a brass plug.
6. Insert two support bars 530 x 20 x 50mm [21” x 2” x 3/4”] across the casting, under the wheel as shown in Figure #4. This will leave the wheel in position and take the weight off the shaft and bearings.
7. Remove the shaft by pulling out from the bottom while turning the collars. It may be easier to remove the lower bearing with the shaft.
8. Assemble new shaft to the wheel (*Do not install new bearings at this time*)
   - With a rubber mallet, tap on the bottom of the shaft up and tighten the upper collar. This must be done a few times to insure a solid seat.
9. Reassemble the rest of the components with the new bearings. The bearing retainers should be bolted solid against the casting. The bearing nut and collars should be loose to facilitate the final height adjustments.
   - If replacing just the bearings, it is best to replace the top bearing first before disassembling the lower bearing assembly.
10. Remove the support bars.
2.4.5 POSITIONING THE DRIVE WHEEL

1. The drive dowels in the center of the periphery of the wheel must be centered exactly between the upper and lower pallet guides. (Figure #5)

- One method of setting wheel height, using readily available tools, is to clamp a straight edge or parallel to the top surface of the wheel so that it will extend back to the dowel pins locating the first set of pallet guides. Use a depth micrometer to measure to the centerline of the drive dowel.
- Measure to the upper or lower dowel in the pallet guide supports. Adjust the wheel height until the centerline of the drive dowel is on the centerline between the upper and lower pallet guide dowels.
- Referring to Figure #4, use the collar under the top bearing and the lower collar to adjust the height of the wheel. Loosen the top lock nut on the shaft before adjusting wheel height. Note that excessive pressure applied to either collar will tend to cramp the bearings. The final height reading for center line position of the drive dowel should be taken with both collars firmly against their bearings and the top lock nut on the drive shaft locked firmly against the inner race of the top bearing. When the height of the wheel is established, the torque limiter (safety clutch) assembly can be installed.

2.4.6 MAINTENANCE

- Monthly: clean side surface of wheel where tooling belt rides. Check for odd wear patterns on wheel.
- Yearly: Check the drive dowel height and drive wheel height (ref Figure #3).

2.4.7 RECOMMENDED SPARE PARTS

None.

2.4.8 TROUBLE SHOOTING

1. If it is determined that the drive wheel assembly is the problem, General items to look for:
   - Make sure the 3 collar clamps have not loosened
   - Check the drive wheel height and drive dowel height.
   - Check for loose or faulty bearings.
   - Check for debris embedded in wheel where tooling belt rides.
   - Check the drive dowel quality-worn, broken, or damaged.
2.5 INDEX LOCKING PIN

2.5.1 FUNCTION
Also referred to as the “Shot Pin,” the Lock Pin locks the tooling belt in a precise and repeatable position during the “dwell” cycle. This mechanism is cam driven from the lower camshaft. The arm is spring-loaded in the working stroke and cam actuated in the retract stroke to allow minimum damage under a failure condition. There is a proximity sensor, located near the pin, to insure the pin is in the proper location during the index and dwell cycle.

INDEX LOCKING PIN ENGINEERING DRAWINGS - REF.

<table>
<thead>
<tr>
<th>ASSEMBLY OR SUBASSEMBLY</th>
<th>AGR Bodine DRAWING NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>INDEX LOCKING PIN</td>
<td>65-12-00-406</td>
</tr>
</tbody>
</table>

For a complete listing of available engineering drawings refer to section 3

2.5.2 LOCATION
Mounted to the frame under the drive wheel.
2.5.3 SETTING THE LOCK PIN AND PROXIMITY SWITCH

1. Jog machine to 50° so that the lock pin is fully retracted. Loosen the jam nuts that are locking the clevises in the link (refer to Figure’s #2 & #4) Adjust the lock pin height so that the top of the pin is 10.67mm [0.420"] below the bottom of the drive wheel then lock the nuts.

2. Set proximity switch distance from target collar as shown in Figure #3. A 0.38mm [0.015"] shim should slip between the collar and face of the proximity switch.

3. Jog the machine to about 200° (Lock pin is fully up). Rotate the proximity target collar slowly so that the bottom edge of the target is above the switch and the switch just turns off. Rotate collar back ½ turn to turn the switch on and lock the jam nut.

4. Jog machine 105° (for a 90° Index machine) or 135° (for a 120° index machine). Proximity switch should be on. Repeat set up procedure as necessary.
2.5.4 REPLACING LOCK PIN

1. Remove shrouding.

2. The machine will be in the dwell position. This puts the lock pin extended into the drive wheel and the extension springs will be in the "weakest" position for ease of handling.

3. Remove the lower clevis pin held in position with a cotter pin. Refer to Figure #4.

4. The lock pin linkage may now be angled back and pulled down.

5. The lock pin is attached to the linkage with the upper clevis and clevis pin. Now is a good time to replace both clevises and clevis pins.

6. Replace lock pin and re-assemble the linkage if you have replaced the clevises refer to the procedure detailing setting the lock pin and re-adjusting the proximity switch. Lubricate the lock pin with light oil prior to inserting it into the liner; also note that the long flat on the pin must align with the lubrication port in the casting.

7. Jog machine to check for proper function.
2.5.5 REPLACE BUSHING LINER
1. Cycle the machine to be approximately mid-index. (45° for a 90° index and 60° for a 120° index)
2. Remove the lock pin linkage (refer to “replacing lock pin” information).
3. The bushing liner is pressed into the casting. You will need to purchase from AGR Bodine or make a bearing puller (refer to Figure #5).
4. Jack out the bearing from below as shown in Figure #5.
5. Tap in a new liner. Note that the liner is flush at the top of the casting and the groove in the liner aligns with the lubrication port.
6. After inserting new liner the bore should be honed to 19.07mm [.7507"] diameter.

2.5.6 REPLACE CAM FOLLOWER, LEVER ARM BUSHINGS & PIVOT SHAFT
1. Both the cam follower and the lever arm bushings are pressed in and require that the lever arm be removed from machine in order to replace these items. (Refer to Figure #1 for component location.)
2. Cycle machine to the “dwell” position.
3. Remove shrouding.
4. Relieve spring tension and disconnect from lever arm (refer to Figure #6). The extension springs have a threaded insert in each end that allows for relieving tension by turning the springs. Figure #6 shows spring tension relieved. When reassembling the spring arrangement turn the spring until it bottoms out on the shoulder of the rod-end. (Refer to Figure #7)
2.5.7 REPLACE CAM
A normal duty cam has a split hub, which may be removed directly from the shaft (Figure #8.)
The heavy duty cam with taper lock hub, (Figure #9), is not split and requires the removal of the cam shaft drive assembly's sprocket prior to removing the cam. Refer to Section 2.10 for Sprocket removal.

<table>
<thead>
<tr>
<th>NORMAL DUTY CAM</th>
<th>INDEX</th>
<th>DIRECTION</th>
<th>HEAVY DUTY CAM</th>
<th>INDEX</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>M64-12-20, 64-12-20</td>
<td>120°</td>
<td>CW</td>
<td>64-12-95</td>
<td>120°</td>
<td>CW</td>
</tr>
<tr>
<td>M64-12-50, 64-12-50</td>
<td>120°</td>
<td>CCW</td>
<td>64-12-95</td>
<td>120°</td>
<td>CCW</td>
</tr>
<tr>
<td>M64-12-88, 64-12-88</td>
<td>90°</td>
<td>CCW</td>
<td>64-12-106</td>
<td>90°</td>
<td>CW</td>
</tr>
<tr>
<td>M64-12-89, 64-12-89</td>
<td>90°</td>
<td>CW</td>
<td>64-12-106</td>
<td>90°</td>
<td>CCW</td>
</tr>
</tbody>
</table>

2.5.8 INJECTOR REPLACEMENT
1. The locking pin and lever are automatically lubricated through the machine's central lubrication system.
2. If replacing either injector, replace the tube compression fitting also.
3. The lube layout may vary due to other options that may be on your equipment-double the check part number that is engraved on the injector.
4. Disconnect tube and remove the injector.
5. Spread pipe dope on the new injector threads prior to installing. (Be very careful not to introduce any pipe dope into the injector's orifice.)

2.5.9 MAINTENANCE
Monthly: Check the lubrication and condition of the lock pin, pivot shaft and cam follower.
Yearly:
- Check the diameter of the lock pin for excessive wear.
- Adjust lock pin height (accounting for cam wear).
2.5.10 RECOMMENDED SPARE PARTS (Same part for Metric and Imperial)

<table>
<thead>
<tr>
<th>PART</th>
<th>PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUSHING, LINER</td>
<td>*64-12-15</td>
</tr>
<tr>
<td>PIN, SHOT</td>
<td>*64-12-16</td>
</tr>
<tr>
<td>SHAFT, PIVOT</td>
<td>*64-12-19</td>
</tr>
<tr>
<td>McGill CAM FOLLOWER</td>
<td>CCF-1¼-SB</td>
</tr>
<tr>
<td>CLEVIS (2) REQUIRED</td>
<td>*42-6387-3</td>
</tr>
<tr>
<td>CLEVIS PIN (2) REQUIRED</td>
<td>*48-45657-16</td>
</tr>
<tr>
<td><strong>INJECTOR</strong></td>
<td>*ZSA-06 18302-06</td>
</tr>
</tbody>
</table>

* Since these parts are stocked at AGR Bodine and the instance of wear is negligible over years of service, it is not critical that you keep a stock of these items available.

** Request compression fitting when ordering this part

Additional tools required

<table>
<thead>
<tr>
<th>PART</th>
<th>PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>LINER PULLER ASSEMBLY</td>
<td>CONTACT AGR BODINE CUSTOMER SERVICE</td>
</tr>
</tbody>
</table>

2.5.11 TROUBLE SHOOTING

1. Sensor not signaling lock pin in location:
   - Check the link actuation. If it does actuate the sensor, it may need to be adjusted or replaced.
   - Check the clevis and clevis pin for wear.
   - If the link does not actuate:
     - Check for debris in the area that may be wedged or blocking the mechanism (Remember that the mechanism is actuated with spring retraction, The cam retracts the link)
     - Check for lubrication in the lock pin area and the lever arm pivot area

2. Sensor signal not clearing for index (lock pin not retracting)
   - Sensor may need to be re-adjusted.
   - Cam may be worn: re-adjust sensor collar to compensate (If this is determined the cause-watch the mechanism carefully. There should not be this extreme cam wear without other influencing factors.)
   - Cam follower may be worn or damaged.
   - Check the clevis and clevis pin for wear.

3. Squeaky or noisy pivot shaft or shot pin.
   - Look for scoring on the shaft and lock pin, this would indicate lack of lubrication.
   - Check the oil reservoir, if not empty check for clogged or crimped oil lines.
   - Check for excessive dirt and debris on pivot shaft and shot pin.
   - Check for faulty injector (if problem exists with just one of the 2 wiper assemblies.)
   - Check that the lubricator is pulsing properly (Refer to the lube system manual for specifications and conditions.)

4. Too much lubrication (oil dripping)
   - Check for faulty injector (if problem exists with just one of the 2 wiper assemblies.)
   - Refer to the lube system manual for specifications and conditions.
2.6 ENCODER

2.6.1 FUNCTION
This Encoder is a device that monitors the camshaft’s orientation.

2.6.2 LOCATION
The Encoder is mounted to the top of the indexer. A gear belt transfers rotation from the indexer output shaft to the Encoder shaft. (Refer to Figure #1, shrouding shown removed for clarity)

ENCODER ENGINEERING DRAWINGS - REF.

<table>
<thead>
<tr>
<th>ASSEMBLY OR SUBASSEMBLY</th>
<th>AGR Bodine DRAWING NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>METRIC</td>
</tr>
<tr>
<td>ENCODER</td>
<td>65-12-00-501</td>
</tr>
</tbody>
</table>

For a complete listing of available engineering drawings refer to section 3
2.6.3 ENCODER REPLACEMENT

1. Remove shrouding as needed
2. Refer to Figure #2. Remove the cover.
3. Remove the gear belt (loosen the three belt tensioning screws).
4. Electrically disconnect the encoder.
5. Remove the gear pulley (attached to the adapter sleeve with two set screws)
6. Remove the adapter sleeve (attached to the encoder shaft with two set screws).
7. Install new encoder and re-assemble. Be sure to align adapter sleeve and gear pulley with the mating gear pulley mounted to the indexer.
8. The Encoder should be set with the machine at the mid-index position. Place a scale against the pallet guide and slowly jog the machine until the pallet moves exactly half way through its index cycle. This is equal to 101.6mm [4"] on a 203.2mm [8"] index machine and 50.8mm [2"] on a 101.6mm [4"] index machine. The camshaft position dial should read 60 ± 2° if a 120° indexer is used or 45 ± 2° if a 90° indexer is used.

![Figure #2](image1)

![Figure #3](image2)

2.6.4 GEARBELT REPLACEMENT & TENSION ADJUSTMENT

1. Remove old gear belt (refer to Section 2.6.3 encoder replacement instruction #’s 1, 2&3)
2. Loosen the setscrews that hold the gear pulley onto the adapter sleeve (gear pulley should be free to rotate.)
3. Install the new belt and tension (refer to Figure #3.) Place a piece of bar stock, approx. 12” [304.8mm] long, across the two gear pulleys. With a scale, half way between the two gear pulleys, measure the belt sag as shown (with approx. 9N [2 lbs.] of pressure). It should be about 9.525mm [3/8"]. Make sure that while you are tensioning the belt that you keep the faces of the gear pulleys in line and parallel.
4. Refer to the Section 2.6.5 synchronizing encoder with indexer/camshaft information.
5. Grab the gear pulley with your hand and rotate back and forth with-in the tension of the gear belt (do not over torque the gear pulley). Look at the electronic read-out (mounted to the back of the main electrical enclosure). It should not vary by more than 2 degrees, if it does, then loosen the gear pulley setscrews and re-tension the belt.

2.6.5 SYNCHRONIZING ENCODER WITH INDEXER (Intermittor)

*First Check to make sure that the camshaft is synchronized with the indexer.*

*Second check the gear belt to the encoder is tensioned properly*

1. Loosen the 2 setscrews that lock the gear pulley to the encoder’s adapter sleeve.
2. While watching the electronic read-out screen (mounted to the back of the main electrical enclosure), rotate the adapter sleeve and compare the screen display with the camshaft position dial (mounted to the upper camshaft). They should match with-in 2 degrees.
3. Tighten the gear pulley setscrews.
2.6.6 MAINTENANCE
(Maintenance interval is dependent upon many factors such as environment etc.)

Monthly:
- Check belt tension and gear pulley wear.
- Compare encoder readout with camshaft angle.

2.6.7 RECOMMENDED SPARE PARTS

<table>
<thead>
<tr>
<th>PART</th>
<th>PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEAR BELT</td>
<td>300-L-050</td>
</tr>
</tbody>
</table>

2.6.8 TROUBLE SHOOTING

1. High wear of gear belt or gear pulleys.
   - Gear pulleys must be aligned. Evidence of misalignment would be black gear belt dust on the floor under the belt or uneven wear on the gear pulleys.

2. Erratic or boggy motion
   - Check belt tension
   - Check belt and pulleys for debris
   - Check belt for missing teeth

3. Encoder losing sync.
   - Check belt tension (belt may be jumping teeth)
   - Check belt and pulleys for debris
   - Check belt for missing teeth
2.7 IDLER WHEEL

2.7.1 FUNCTION
This assembly supports the tooling belt.

IDLER WHEEL ENGINEERING DRAWINGS - REF.

<table>
<thead>
<tr>
<th>ASSEMBLY OR SUBASSEMBLY</th>
<th>AGR Bodine DRAWING NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDLER WHEEL</td>
<td>METRIC: 65-13-0-1</td>
</tr>
<tr>
<td></td>
<td>IMPERIAL: 64-13-0-1</td>
</tr>
</tbody>
</table>

For a complete listing of available engineering drawings refer to section 3
2.7.2 LOCATION
This assembly is located at the opposite end of the machine from the drive wheel (in bold lines in Figure #2).

Figure #2
2.7.3 COMPONENT REPLACEMENT

(It is highly recommended that AGR Bodine service engineers perform this repair due to the precision and complexity requirements)

**Shaft and Bearing replacement:** (refer to Figure #3)

(If replacing just the bearings, you may skip the shaft removal information and remove and replace one bearing at a time starting with the lower one.)

1. Remove the appropriate shrouding.
2. Remove tooling belt. (Refer to Section 2.8 TOOLING BELT spec.)
3. Loosen idler wheel clamp (only if replacing the shaft). Turn the jack collar to press off the idler wheel from the shaft.
4. Insert 2 support bars 530 x 20 x 50mm [21"x3/4'x2"] across the casting, under the idler wheel as shown in Figure #3. This will leave the wheel in position and take the weight off the bearings.
5. Remove the bearing nut and discard. Always replace the nut with a new one every time. Save the flat washer.
6. Remove the shaft by pulling out from the bottom while turning the collars and clamps. It may be easier to remove the lower bearing with the shaft. Notice that the top bearing has a metal shim bolted to each side that locates it central with the lower bearing. Save these shims and mark them so they can be put back in the exact position from which they came. Also order a new set with the bearing in case the existing shims may be no longer valid. It is very critical that the bearings are in line with each other.

![Figure #3](image-url)
SHAFT AND BEARING REPLACEMENT (continued)

7. Insert a new shaft and replace the existing jack collar as shown in Figure #4 (Notice there are no bearings at this time and the support bars are still there.) The jack collar should be away from the bottom of the idler wheel.

8. Tap the bottom of the shaft up into the idler wheel with a mallet to seat the taper hub of the wheel to the shaft.

9. Thread on the idle wheel clamp and tighten to the wheel. The clamp collars have a set screw and a brass plug that locks the collar against the shaft.

10. Re-assemble as indicated in Figure #3, keeping the upper bearing and collars loose. Remove the support bars.

11. Level the idler wheel side to side, as shown in Figure #5. This is done by grinding the shims accordingly to achieve a snug fit of the upper bearing. Idler wheel leveling, front to back, will be done with the tensioning bolts.

12. Level the idler wheel, front to back. Then bolt the upper bearing into position. At this point the shaft is still loose in the bearings for height adjustment.

13. Adjust for height (Figure #6) using the bearing nut noted in Figure #3.

14. Clamp the upper bearing in place, and then tighten the set screws with the brass plug against the shaft.

15. Clamp the lower bearing to the shaft.

16. Re-assemble belt to the machine (refer to Section 2.8 belt tensioning spec.).
2.7.4 MAINTENANCE
1. Monthly:
   • Clean wheel (behind tooling belt)
   • Check the side of the wheel where the tooling belt rides, for wear and damage.

2.7.5 RECOMMENDED SPARE PARTS

<table>
<thead>
<tr>
<th>PART</th>
<th>PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>NONE</td>
<td></td>
</tr>
</tbody>
</table>

2.7.6 TROUBLE SHOOTING
1. Damage to grooves around the perimeter of the wheel:
   • Check wheel height.
   • Check that the collars have not loosened.
   • Check pallets for loose bolts and dowel pins that may be out of position.
2. Inconsistent wear pattern on idle wheel
   • Check level of wheel (front to back and side to side).
   • Check wheel for imbedded debris
2.8 TOOLING BELT

2.8.1 FUNCTION
This belt is a pre-stressed steel band that carries the work pallets from station to station. The band is pierced and burnished with a standard hole pattern that is on a 101.6mm [4.00"] center. It may be single tooled on a 101.6mm [4.00"] index and single or double tooled on an 203.2mm [8.00"] index.

2.8.2 LOCATION
Shown in bold lines in Figure #1 above.

TOOLING BELT ENGINEERING DRAWINGS - REF.

<table>
<thead>
<tr>
<th>ASSEMBLY OR SUBASSEMBLY</th>
<th>AGR Bodine DRAWING NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOOLING BELT</td>
<td>METRIC: 65-14-0-10</td>
</tr>
<tr>
<td></td>
<td>IMPERIAL: 64-14-0-10</td>
</tr>
</tbody>
</table>

For a complete listing of available engineering drawings refer to section 3.
2.8.3 OLD BAND REMOVAL

1. Remove appropriate shrouding (The band will be pulled out from idler end of machine)
2. If the band is not broken, carefully jog machine so that the master pallet is aligned in front of the notches in the notched support bar (refer to Figure #2) and make sure that the shot pin is engaged. Under most conditions the notched support bars are located in the same place regardless of direction of the machine index. The master pallet will have "MASTER" stamped along the side edges.
3. Remove all fixtures from the pallets.
4. Remove all oilers/wipers and locators (refer to fig #2).
5. Remove track guards (used on single tooled 203.2mm [8"] index machines only) by pulling them over the rubber bumpers which fasten them in place. Refer to Figure #4
6. Remove band tension (idler wheel mount) as shown in Figure #3.
   - Loosen the bearing mount bolts in the upper and lower flange bearings.
   - Thread the (2) adjusting screws into the casting.
7. Unbolt and remove the master pallet. The master pallet connects the ends of the band together.
8. Un-wrap the band from the drive wheel.
9. From the idler end of the machine, the band may now be pulled out. You may need helpers to support the band as it is being removed.
2.8.4 NEW BAND ASSEMBLY

1. Lay the new band flat on a piece of paper or cardboard on the floor.
   - Clean both sides.
   - The punched holes in the band have a slight radius on one side of the band and a slight raised burr on
     the opposite side. Place the “burr” side down on the floor.

2. Remove all the pallets from the old band and discard screws.
   - Check the pallets for wear, burrs etc. Repair or replace as necessary.
   - Clean pallets thoroughly.

3. The master pallet (pallet #1) is shown in Figure #5 and is assembled to the band after the band is located on
   the machine. All other pallets are slid under the band as it lays on the floor and attached as shown in Figures
   #5 & #6. Note that the position of the 2nd pallet (which is mounted first) depends on the index pitch of the
   machine. All subsequent pallets will be mounted on a 101.6mm [4"] or a 203.2mm [8"] pitch.

4. You must assemble the pallets with new hardware: the button head cap screw and the special nylon washer
   (Figure #6). Tighten screws until the nylon washer will not move. Over tightening may cause premature band
   breakage.

5. Insert the rubber bumpers if your machine is a single tooled 203.2mm [8"] index (Figure #4). Replace all that
   are damaged in any way. Do not install the track guards yet.
2.8.5 NEW BAND INSTALLATION

1. Check to ensure that the Index locking pin is fully engaged in the drive wheel bushing. The drive wheel must be locked in position.

2. Make sure the pallet guide channels are clean (inspect for burrs and damage and replace as needed). Lubricate them with light machine oil. Also, check the felt wipers and replace as necessary (refer to Section 2.1 wiper spec.).

3. 10-12 people are needed to install the belt assembly.
   - Using a team of at least 10 to 12 people, pick up the drive band assembly and turn it so that its edge is perpendicular to the floor. Be careful when handling to avoid buckling the belt. While feeding the assembly, hold it in the same horizontal plane as the pallet guides.
   - Starting on the right hand side of the machine (as viewed from the idler end), feed one end of the belt into the pallet guide channel from the idler end of the machine. Continue feeding while making sure each pallet is fully engaged in the pallet guides until the end reaches the notches in the pallet guide support bars. Refer to Figure #2.
   - Slide the master pallet into the channel from the drive end of the machine and over the end of the band.
   - Now feed the other end of the band through the guides on the left-hand side of the machine and around the drive wheel into the pallet guide channel on the right hand side until the two ends meet.

4. Overlap the band ends.
   - On a clockwise indexing machine, slide the end of the band that was fed from the drive end between the master pallet and the end of the band that was fed from the idler end. Line up the first set of dowel holes in each end and engage the master pallet dowels. (refer to Figure #7)
   - On a counter-clockwise indexing machine, slide the end of the band, which was fed from the drive end behind the end of the band that was fed from the idler end. Line up the first set of dowel holes in each end and engage the Master pallet dowels. (refer to Figure #8)

5. Fasten the master pallet to the band through the notches in the pallet guide support bars (Figure #2). Use the same method as in fastening the previous pallets, making sure not to over tighten the button head screws.

6. Mount the work holding fixtures to the pallets making sure that the mating surfaces are clean.
   - (Do not mount fixtures around the drive and idler wheels where there is no support of the pallets or band.)
7. Snap the track guards into position. (Figure #4)
8. Tension the band.
9. Install the drive and idler-end fixtures.
2.8.6 BAND TENSION

1. Loosen the bearing mount bolts in the upper and lower flange bearings as shown in fig. #9.

2. Loosen the jam nuts and turn the adjusting screws to slide the upper and lower flange bearings outward until they contact the stop plates. The stop plate location is factory pre-set based on the original steel drive band and should result in proper band tension with the new band. It is not necessary to apply pressure, but a very close fit must exist between the flange bearings and the stop plates. A 0.025mm [0.001"] feeler gauge should be used to check this fit (refer to the arrows below for the feeler gauge fit location). Even with the stop plates in place it is possible to over extend the adjustment by crushing the stop plate locating pins. Care should be taken to ensure that this does not happen.

3. Check that the drum is square (90°) to the casting.

4. Tighten the upper and lower flange bearing screws and lock the adjusting screws.

5. Jog the machine through several cycles to verify smooth indexing.
   - If there is a “popping” sound at the drive drum, it is likely that the index drive pins are not engaging properly with the steel band. This may be a result of a misadjustment of the flange bearings relative to the stop plates and should be checked at this point. If the stops are properly adjusted and the popping persists, further adjustment may be needed. However, at this point, it is highly recommended that AGR Bodine customer service be contacted before further action is taken. Adjustments beyond those described up to this point can result in a general loss of fixture positioning relative to the work stations. If further adjustments must be made, fixture positioning would need to be verified prior to restart of the machine. Due to the criticality of fixture position, further adjustments are not described in this manual and should be discussed with and/or performed by qualified AGR Bodine personnel.
   - Once the proper band tension has been achieved, run the machine for an hour to break-in the belt.
2.8.7 MAINTENANCE

Weekly:
- Check pallets for scoring where they ride in the track grooves.
- Check for loose pallets and fixtures.

Monthly:
- Check for cracked steel band. With a flashlight from the back of the machine, you can look through and view the back of the steel band. You should be able to see any cracks in the band.
- Check band tension (listen for "popping" or banging).

2.8.8 RECOMMENDED SPARE PARTS

<table>
<thead>
<tr>
<th>PART</th>
<th>PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUTTON HD CAP SCREW</td>
<td>M6 x 12mm [¼-20 X ½&quot;] w/ NYLOCK INSERT</td>
</tr>
<tr>
<td>NYLON WASHER</td>
<td>64-14-88</td>
</tr>
<tr>
<td>RUBBER BUMPER</td>
<td>4837</td>
</tr>
</tbody>
</table>

2.8.9 TROUBLE SHOOTING

1. “Popping” sound at drive wheel:
   - Banging may be the lock pin, refer to Section 2.5 lock pin spec.
   - Refer to band tensioning information.
   - Check for debris on band and pallets.
   - Check the drive pins on the drive wheel that locate the steel band (pins may be out too far or not enough).

2. Steel Belt breaking:
   If the following fault conditions do not provide a resolution it is recommended that you contact AGR Bodine for a service visit.
   - Check level of machine.
   - Check for any debris in fixture guides.
   - Check for loose pallets.
   - Check for squareness of idler wheel (refer to Section 2.7 idler wheel spec.).
   - Check fixture locators for any interference. The fixture locators are the pallet guide rails, upper & lower, located just before and after the drive and idler wheels, (total quantity of 8 per machine).
   - Check wiper assembly for any interference.
   - Check preload of bearings in drive wheel housing (refer to Section 2.4 drive wheel spec.).
   - Check the drive pins on the drive wheel that locate the steel band (pins may be out too far or not enough).
   - Check drive wheel and idler wheel height (refer to Section 2.4 and 2.7 wheel spec.).
3. Band cracks:
   - Figure #10 shows cracks around the index drive pinholes. This indicates band tension too tight, drive pins in drive wheel protruding out too far, or debris behind the steel band on the drive and/or idler wheels.
   - Figure #11 shows cracks around the index drive pinholes. This type of opposing pattern generally indicates not enough band tension, or the index drive pins in the drive wheel are protruding out too far.
   - Figure #12 shows cracks around the pallet mount holes and tears in band. This indicates the fixtures or pallets are hitting an obstruction.
2.9 LONG CAM SHAFT DRIVE ASSEMBLY

2.9.1 FUNCTION
The long camshaft drive assembly drives the upper camshaft from the lower camshaft. This locks the relationship between the upper and lower camshafts together. (Note that there is an option to include a drive set-up on the idler end. This is used in addition to the standard drive assemblies to assist the camshaft rotation when high load conditions exist.) There is also a “heavy duty” option that has a tapered bushing sprocket on the lower camshaft.

2.9.2 LOCATION
Mounted between the upper and lower camshaft on the drive end of the machine (refer to Figure #1).

LONG CAM SHAFT DRIVE ENGINEERING DRAWINGS - REF.

<table>
<thead>
<tr>
<th>ASSEMBLY OR SUBASSEMBLY</th>
<th>AGR Bodine DRAWING NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>METRIC</td>
</tr>
<tr>
<td>CLOCKWISE ROTATION</td>
<td>65-15-0-10</td>
</tr>
<tr>
<td>COUNTERCLOCKWISE ROTATION</td>
<td>65-15-0-11</td>
</tr>
<tr>
<td>CLOCKWISE ROTATION (DRIVE ASSIST MOUNTED ON IDLER END)</td>
<td>65-15-0-20</td>
</tr>
<tr>
<td>COUNTERCLOCKWISE ROTATION (DRIVE ASSIST MOUNTED ON IDLER END)</td>
<td>65-15-0-21</td>
</tr>
</tbody>
</table>

For a complete listing of available engineering drawings refer to section 3
2.9.3 REPLACING AND TENSIONING CHAIN

1. Remove shrouding.
2. Jog the machine until the upper and lower camshaft keyways are at twelve o'clock (zero degrees), and the connecting link is in an area that is easy to access. The machine may have to be jogged a few cycles to achieve this orientation.
3. Tap a camshaft key into the upper and lower camshaft keyway at the idler end of the machine and install the camshaft clamp plates over the camshafts and a corresponding pivot shaft (refer to Figure #2). Make sure they are securely keyed in place. This procedure assures that you maintain the relationship of the upper and lower camshafts. (Refer to spare parts list for clamp plate and camshaft key ordering information).

The clamp plates also prevent upper shaft “roll-over.” The weight of the tooling may cause the upper camshaft to rotate when the chain is removed. This is a safety hazard.
REPLACING AND TENSIONING CHAIN (continued)

4. Before attempting to remove the silent timing drive chain, remove tension from the chain by loosening the jam nut on the chain tensioning unit and turning the hex nut counter-clockwise (refer to Figure #3).
   - With the upper and lower camshafts locked securely in place, locate the connecting link and remove the connecting pin to break the chain and remove. (refer to Figure #4)
5. Install new chain.
   - Loosen the hex bolts on the drive adapter and back off the adjusting set screws from the dowel pin. (refer to Figure #3) The drive adapter is located on the upper camshaft, mounted to the sprocket.
   - Install the silent timing chain and insert the connecting link (refer to Figure #4). Note the position and orientation of the pin relative to the connecting rocker. They are designed to roll on each other.
   - If there is chain assembly on the idler end of the machine replace that chain at the same time.
   - Tension the chain by hand turning the hex nut (Figure #3) until the chain can be slightly deflected with the pressure of a thumb. Do not over-tighten, as stretching will result. Lock the jam nut against the hex nut.
   - At this point the dowel in the drive adapter (Figure #3) should be approximately at the center of its adjustment range. If this is not the case, remove tension from the chain and shift it one sprocket tooth in the appropriate direction (each tooth will shift orientation by 12.7mm [½”]).
   - With the chain properly tensioned, tighten the hex bolts in the drive adapter and lock the adjusting screws firmly against the dowel.
   - Remove camshaft keys and camshaft clamp plates (previously mounted at the idler end of the machine.)
   - Cycle machine a few times to insure timing accuracy and readjust as necessary.
   - REPLACE SAFETY SHROUDING.

2.9.4 MAINTENANCE
( Maintenance interval is dependent upon many factors such as chain load, environment etc.)
   - Periodically check chain tension and sprocket wear.
   - Chain should be lubricated often (WD-40 or equivalent.)

2.9.5 RECOMMENDED SPARE PARTS

<table>
<thead>
<tr>
<th>PART</th>
<th>PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHAIN</td>
<td>CHS02-0001</td>
</tr>
<tr>
<td>CHAIN CONNECTING LINK SET</td>
<td>CHS02-0004</td>
</tr>
<tr>
<td>IDLER SPROCKET*</td>
<td>64-15-46</td>
</tr>
<tr>
<td>BEARING</td>
<td>BBP01-0006 (2)</td>
</tr>
</tbody>
</table>

*It is highly recommended that you order the idler sprocket pre-assembled with the (2) bearings (BBP01-0006), retaining ring (RNG01-0028), shaft (64-15-47) and spacer (64-15-48).

Additional components required for chain installation

<table>
<thead>
<tr>
<th>PART</th>
<th>PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAMSHAFT KEY</td>
<td>64-20-16 (2 required)</td>
</tr>
<tr>
<td>CAMSHAFT CLAMP PLATE</td>
<td>64-11-54 (2 required)</td>
</tr>
</tbody>
</table>
2.9.6 TROUBLE SHOOTING

1. High wear of chain or sprockets – See Figure #5.
   - Sprockets (including the tensioner sprocket) should be aligned. Evidence of misalignment would be metal dust on the floor under the chain or uneven wear on the sprockets.

2. Grinding noise or clatter.
   - Chain may need to be flushed and re-lubricated.
   - Chain may be misaligned.
   - Tensioner sprocket may need replacing.

3. Erratic or boggy motion.
   - Check chain tension.
   - Check chain and sprockets for debris – clean and re-lubricate (chain or sprockets may be damaged if there is a buildup of metal chips and debris).

![Figure #5](image-url)
2.10 CAMSHAFT DRIVE ASSEMBLY

2.10.1 FUNCTION
The camshaft drive assembly transfers motion from the indexer to the lower camshaft.

2.10.2 LOCATION
Mounted between the indexer and the lower cam shaft on the drive end of the machine (refer to Figure #2).

CAM SHAFT DRIVE ASSEMBLY ENGINEERING DRAWINGS - REF.

<table>
<thead>
<tr>
<th>ASSEMBLY OR SUBASSEMBLY</th>
<th>AGR Bodine DRAWING NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>METRIC</td>
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<tr>
<td>STANDARD DRIVE</td>
<td>65-15-0-30</td>
</tr>
<tr>
<td>HEAVY DUTY DRIVE</td>
<td>65-15-0-31</td>
</tr>
</tbody>
</table>

*For a complete listing of available engineering drawings refer to section 3*

2.10.3 REPLACING AND TENSIONING CHAIN
1. Remove safety shrouding.
2. Jog the machine until the lower camshaft keyway is at twelve o'clock (zero degrees) and the connecting link is within the area noted (refer to Figure #3). Link location is done for ease of accessibility only.
   • The machine may have to be jogged a few cycles to achieve this orientation.
   • At the idler end of the machine, tap a camshaft key into the lower camshaft keyway and install the camshaft clamp plate over the camshaft and a corresponding pivot shaft (refer to fig, #4). Make sure it is securely keyed in place. This procedure assures that you maintain the relationship of the camshaft to the indexer. (Refer to spare parts list for clamp plate and camshaft key ordering information).

   The clamp plates also prevent upper shaft “roll-over.” The weight of the tooling may cause the upper camshaft to rotate when the chain is removed. This is a safety hazard.
3. Before attempting to remove the timing drive chain, remove tension from the chain by loosening the jam nut on the chain tensioning unit and turning the tie nut counter-clockwise (refer to Figure #3).
   - With the lower camshaft locked securely in place, locate the connecting link and remove the connecting pin to break the chain and remove (refer to Figure #5).
REPLACING AND TENSIONING CHAIN (continued)

4. Install new chain
   - Hand turn the indexer to “zero” (this is necessary only if the chain broke during production.)
   - Loosen the hex bolts on the drive adapter and back off the adjusting set screws from the dowel pin. (refer to Figure #6) The drive adapter is located on the lower camshaft, mounted to the sprocket and facing inward towards the machine.
   - Install the timing chain and insert the connecting link (refer to Figure #5). Note the position and orientation of the pin relative to the connecting rocker. They are designed to roll on each other.
   - Tension the chain by hand turning the lower tensioning unit tie nut (Figure #3) until the chain can be slightly deflected with the pressure of a thumb. Do not over-tighten, as stretching will result. Lock the tie nut in place.
   - At this point the dowel in the drive adapter (Figure #6) should be approximately at the center of its adjustment range. If this is not the case, remove tension from the chain and shift it one sprocket tooth in the appropriate direction (each tooth will shift orientation by 12.7mm [1/2"]).
   - With the chain properly tensioned, tighten the hex bolts in the drive adapter and lock the adjusting screws firmly against the dowel.
   - Remove camshaft key and camshaft clamp plate (previously mounted at the idler end of the machine.)
   - Cycle machine a few times to insure timing accuracy and readjust as necessary.
   - REPLACE SAFETY SHROUDING.

2.10.4 CHECK INDEX TIMING
The initial index timing starts at camshaft zero. Since the extended input shaft of the indexer is connected by a timing chain drive to the lower camshaft, the chain coupling must be made to place the keyway on the lower camshaft at 12 o’clock just as the index starts. After proper tension is applied to the chain, the drive adapter (refer to Figure #6) should be adjusted on the lower camshaft to provide exact relationship of start of index and keyway position. Machines with an 203.2mm [8"] index require 120° to complete the index. Machines with a 101.6mm [4"] index can be equipped with either 120° index or 90° index as specified. The standard 120° index lock pin cam will automatically pull and drop the lock pin at the proper time if camshaft zero has been properly established. If a 90° indexer is selected, you must use a 90°-lock pin cam.

To further ensure that the machine timing is correct:
1. Jog the machine until it is in its work cycle (when the index-locking pin is fully engaged in a drive wheel bushing), and scribe or mark a line on a pallet guide correlating to the edge of a pallet.
2. Place a scale against the pallet guide and slowly jog the machine until the pallet moves exactly half way through its index cycle. This is equal to 101.6mm [4"] on an 203.2mm [8"] index machine and 50.8mm [2"] on a 101.6mm [4"] index machine.
3. At this point the camshaft position dial should read 60 ± 2° if the machine is equipped with a 120° indexer or 45 ± 2° if it is equipped with a 90° indexer. (Refer to the indexer tag.) If the dial reading is not acceptable, it is necessary to make corrections at the drive adapter and adjusting set screws.

2.10.5 MAINTENANCE
Maintenance interval is dependent upon many factors such as chain load, environment etc.
   - Periodically check chain tension and sprocket wear.
   - Chain should be lubricated often (WD-40 or equivalent okay to use.)
2.10.6 RECOMMENDED SPARE PARTS

<table>
<thead>
<tr>
<th>PART</th>
<th>PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHAIN</td>
<td>CHS02-0002 (used on assembly #64-15-0-30 &amp; 65-15-0-30 only)</td>
</tr>
<tr>
<td>CHAIN</td>
<td>CHS02-0003 (used on assembly #64-15-0-31 &amp; 65-15-0-31 only)</td>
</tr>
<tr>
<td>CHAIN CONNECTING LINK SET</td>
<td>CHS02-0004</td>
</tr>
<tr>
<td>IDLER SPROCKET*</td>
<td>64-15-46</td>
</tr>
<tr>
<td>BEARING</td>
<td>BBP01-0006 (2)</td>
</tr>
</tbody>
</table>

*It is highly recommended that you order the idler sprocket pre-assembled with the (2) bearings (BBP01-0006), retaining ring (RNG01-0028), shaft (64-15-47) and spacer (64-15-48).

Additional components required for chain installation

<table>
<thead>
<tr>
<th>PART</th>
<th>PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAMSHAFT KEY</td>
<td>64-20-16</td>
</tr>
<tr>
<td>CAMSHAFT CLAMP PLATE</td>
<td>64-11-54</td>
</tr>
</tbody>
</table>

2.10.7 TROUBLE SHOOTING

1. High wear of chain or sprockets
   - Sprockets (including the Tensioner sprocket) should be aligned and parallel. Evidence of mis-alignment would be metal dust on the floor under the chain or uneven wear on the sprockets.

2. Grinding noise or clatter
   - Chain may need to be flushed and re-lubricated.
   - Chain may be misaligned.
   - Tensioner sprocket may need replacing (or the bearings inside).

3. Erratic or boggy motion
   - Check chain tension
   - Check chain and sprockets for debris – clean and re-lubricate (chain or sprockets may be damaged if there is a buildup of metal chips and debris)
2.11 RISE AND FALL MECHANISM

2.11.1 FUNCTION
This assembly consists of two extruded aluminum bars that run the length of the machine (one on each side) that are raised during index and lowered during the dwell period. It is a universal-mounting surface used to locate light load sub-assemblies such as the inspection mechanisms, hold-downs and other similar tooling. This assembly is cam driven from the lower camshaft. The standard stroke is 50.8mm [2.00"] but may change according to your requirements.

RISE AND FALL MECHANISM ASSEMBLY ENGINEERING DRAWINGS - REF.

<table>
<thead>
<tr>
<th>ASSEMBLY OR SUBASSEMBLY</th>
<th>AGR Bodine DRAWING NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>FULL ASSEMBLY</td>
<td>65-16-0-8</td>
</tr>
<tr>
<td>STABILIZER ASSEMBLY</td>
<td>65-16-0-6</td>
</tr>
<tr>
<td></td>
<td>64-16-0-5</td>
</tr>
<tr>
<td></td>
<td>64-16-0-6</td>
</tr>
</tbody>
</table>

For a complete listing of available engineering drawings refer to section 3
2.11.2 LOCATION
The cam and mounting bracket assemblies are located in various positions depending upon how many bays the machine has. There is a minimum of 2 assemblies per machine, the first is mounted just inside the first SAMPSON at the drive end and the second is mounted at the idler end either just inside or just outside the SAMPSON. Generally, there is a cam driven mechanism at 2 bay intervals. If there are an odd number of bays there would be an intermediate sub-assembly used called a stabilizer. The stabilizer is a stiffening mechanism used to help maintain the accuracy of the rise & fall bar that is not driven by a cam. Figure #2 shows a top view of two five bay machines and the various locations of the cam mechanisms and the stabilizer mechanism.

![Diagram](image-url)

Figure #2
2.11.3 RISE & FALL BAR ASSEMBLY REBUILD

General notes:

- Read through entire procedure to familiarize yourself with the scope of the project before starting.
- Due to the complexity of replacing an item it is highly recommended that you do rebuild it completely every time (with the possible exception of the cam.)
- When doing the procedures described below, do one complete mechanism at a time to minimize the re-tuning time.

2.11.4 CAM AND CAM FOLLOWER REPLACEMENT

1. Jog the machine until the rise and fall mechanism is at the bottom of its stroke (approximately 240°).
2. Before removing the cam, remove the screws securing the bars to the mechanism (Refer to Figure #3). This removes the weight from the cam and block. If you are not replacing the cam you may just slide it out of the way (space permitting). Depending upon the specific situation, the cam may have a cam track on the normally blank side, if there is a dual-purpose cam used; make sure you replace the cam in the same orientation as the old cam.

Figure #3
CAM AND CAM FOLLOWER REPLACEMENT (continued)

3. Mark the shafts so that reassembly is easier (refer to Figure #4).
4. Remove the cam follower block (refer to Figure #4) by removing the 8 screws that clamp the block halves to the shafts and sliding the block halves up until they clear the cam shaft.
5. The cam follower has to be pressed out of the block.

![Figure #4](image)

6. Re-assemble (refer to Figure #5 follower side view) cam follower by pressing in a new follower. Be sure to replace the elastic jam nut with a new one.
7. Locate the cam follower block on the rods. Locate using a .68” [17.27mm] thick spacer block (ref Figure #4).
8. Wipe off cam and re-lubricate the cam track with Dow Corning Molykote G-n paste.
9. Slide the cam into position, engaging the cam follower; lift the cam follower assembly as you slide the cam into position. (Refer to Figure #6 for final dimensions)
10. Reassemble the rise & fall bars to the block as referenced in Figure #4.

![Figure #5](image)

![Figure #6](image)
2.11.5 REPLACE BALL BUSHINGS, SEALS AND SHAFTS

General notes:
- The stabilizer assemblies are constructed the same as the rise & fall assemblies except there are no cams. The rebuild procedure is the same as noted below.
- It is recommended that you replace the shafts and seals whenever you replace the ball bushings.

1. Jog the machine to an index position (around 30 degrees) so that the rise & fall bar is in the full up position.
2. Place bar stock, 15.88x558.8mm [5/8" thick x 22" long] as shown in Figure #7 near the location where you are working to support the rise & fall bars. This is very important, the rise & fall bars will sag if they are not supported and critical height location will be lost upon re-assembly. If the 15.88mm [5/8"] stock will not slide under the bars then use 12.7mm [½"] thick stock and shim the ends up for a snug fit.
3. Loosen and slide the cam out of the way.
4. Loosen the eight (8) screws that clamp the shafts to the “support rise & fall bar” and lift the shaft up until you can access the eight (8) screws clamping the shafts to the “block cam follower” (refer to Figure #7).
5. The “support” and “support, lower” blocks may now be removed. Note that the “support, lower” block is doweled into position and should slide off dowels with a light tap of a rubber mallet.

6. The seals and ball bushings are press fit. Press out the old seals and bushings, clean and inspect the blocks for nicks that may affect the insertion of new components and insert new seals and bushings. Refer to Figure #8 for seal orientation. Note that there is a shoulder to which you press the lower seal first in the “support, lower” block. In the upper “support” the seal and bushing set should be pressed in to the dimension noted (approximately). It is suggested that you use a press tool with an outside diameter of 31.5mm [1.240"] and a wall thickness of 1.59mm [1/16"] to minimize possible damage to seals or ball bushings.
REPLACE BALL BUSHINGS, SEALS, AND SHAFTS (continued)

7. Re-assemble components. Take extreme care when inserting shafts through the seal and ball bushings. Quality check shafts for nicks and grooves that may affect performance. Clean and lightly oil shafts prior to assembling. Clamp shafts to dimension noted in Figure #7.
8. Make sure that all screws are tightened then remove the bar stock.
9. After all assemblies have been rebuilt and re-assembled to machine. Jog the machine and check all stations that mount to the rise & fall bars for height accuracy

2.11.6 MAINTENANCE
• Monthly wipe and lubricate the shafts and cam grooves per Lubrication Chart in Section 2.22.

2.11.7 RECOMMENDED SPARE PARTS

<table>
<thead>
<tr>
<th>PART DESCRIPTION</th>
<th>AGR Bodine PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>METRIC MACHINES</td>
</tr>
<tr>
<td>BALL BUSHING</td>
<td>BBO02-0001</td>
</tr>
<tr>
<td>BALL BUSHING SEAL</td>
<td>OGP02-0001</td>
</tr>
<tr>
<td>SHAFT</td>
<td>64-16-6</td>
</tr>
<tr>
<td>CAM FOLLOWER</td>
<td>*CCF01-0008</td>
</tr>
<tr>
<td>CAM</td>
<td>Refer to station &quot;00&quot; for part no.</td>
</tr>
</tbody>
</table>

Refer to the appropriate Engineering drawings or to the Station assembly drawing(s) for identifying replacement parts or call AGR Bodine Customer Service for help in identifying replacement parts.
*For machines built before 2006 refer to section 2-24-1

2.11.8 TROUBLE SHOOTING
1. Erratic motion during cycle:
   • Check the cam follower condition.
   • Check the cam groove area for wear or debris.
2. Rise & Fall bar does not move:
   • Cam follower broken.
   • Check areas around the rise & fall bar and mechanism for debris.
3. All stations mounted to rise & fall bars experiencing consistent faults:
   • The rise & fall bar’s connection to the shafts may have loosened and need to be re-adjusted and tightened.
2.12 LIGHT DUTY PRESS

2.12.1 FUNCTION
The LIGHT DUTY PRESS is a cam driven arm coupled to a precision slide that provides a vertical motion for the machine.

A closed cam path provides positive stroke in both directions. Cams are modified to allow customized motion requirements. The cams are machined from a fixed keyway that guarantees a permanent, non-adjustable timing.

The connecting link transfers the “up/down” motion from the arm to the precision slide and provides turnbuckle adjustment (item “A” in Figure #1) for a refined vertical location. The connecting link is a customized sub-assembly that is designed around the customer’s requirements. It may be a solid link, compliant link, or a “lock-out” link depending upon specific function.

**DESIGN FEATURES**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Metric</th>
<th>Imperial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. vertical stroke</td>
<td>88.90mm [3.50&quot;]</td>
<td></td>
</tr>
<tr>
<td>Max. load pressure</td>
<td>25kg [55 lbs.]</td>
<td></td>
</tr>
</tbody>
</table>

2.12.2 LOCATION
The press may be mounted above the machine’s centerline as shown in Figure #1 or inverted and mounted below the machine’s centerline; it may also be mounted to the back of the machine, above and below the centerline on either side of the machine.

LIGHT DUTY PRESS ENGINEERING DRAWINGS - REF.

<table>
<thead>
<tr>
<th>ASSEMBLY OR SUBASSEMBLY</th>
<th>AGR Bodine DRAWING NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>METRIC</td>
</tr>
<tr>
<td>STANDARD LIGHT DUTY PRESS</td>
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</tr>
<tr>
<td>ELEVATED LIGHT DUTY PRESS</td>
<td>65-20-0-21</td>
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<tr>
<td>SOLID LINK</td>
<td>65-20-00-201</td>
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<tr>
<td>AIR CYLINDER LINK-STANDARD</td>
<td>65-20-00-203</td>
</tr>
<tr>
<td>AIR CYLINDER LINK-ELEVATED</td>
<td>65-20-00-204</td>
</tr>
<tr>
<td>COMPLIANT LINK</td>
<td>65-51-00-201</td>
</tr>
<tr>
<td>SLIDE SUBASSEMBLY-STDARND</td>
<td>65-20-00-301</td>
</tr>
<tr>
<td>SLIDE SUBASSEMBLY-ELEVATED</td>
<td>65-20-00-302</td>
</tr>
</tbody>
</table>

For a complete listing of available engineering drawings refer to section 3
2.12.3 LINK CONFIGURATIONS

Standard solid link (Figure #2):
- Provides adjustable precision vertical location.
- In some cases the specific tooling mechanism mounted to the slide should allow for vertical compensation.

Standard compliant link (Figure #3):
- Provides adjustable precision vertical location.
- Has built-in compliance. Tooling may be mounted solid to the precision slide.

Standard "lock-out" link (Figure #4):
- Provides adjustable precision vertical location.
- May be used as a compliant link (air spring) or solid link. Tooling to be mounted to the slide to match linkage features.
- "Lock-out" feature allows the station to be bypassed without the tooling doing any work. A condition to protect tooling, product, and or fixtures.

The "links" shown above are 3 basic standard assembly configurations. They can be customized or redesigned to your specific needs. Refer to the station that this light duty press is assigned to for specific detail information.
2.12.4 SETTING THE VERTICAL STROKE
1. Jog the machine until the station to be adjusted is at the extreme lowest point of its vertical stroke.
2. Loosen the R.H. jam nut, (refer to Figure #2) which secures the rod end to the bottom of the hex link and
loosen the L.H. jam nut, which secures the clevis to the top of the hex link.
3. Turn the vertical link until the desired tooling height is reached and tighten the jam nuts.
   • If a compliance link is used, refer to the specific station for the amount of compliance required.
   • If an air cylinder is used in place of the vertical link, loosen the jam nut which secures the cylinder shaft to
     the rod end and turn the shaft to adjust the vertical stroke as required. Make sure that the cylinder is not
     in its "lock out" position when making this adjustment.
4. Always jog machine a few indexes to check the adjustments.

2.12.5 MAINTENANCE PROCEDURES
1. REMOVAL AND INSTALLATION OF CAMS
   See section 2.23.1
2. REPLACING CAM FOLLOWERS
   See section 2.23.2
3. REPLACING LINERS
   See section 2.23.3

2.12.6 MAINTENANCE
WEEKLY: Wipe and lubricate the shafts and cam grooves. [Refer to section 2.22 for Lubrication Chart]
Check precision slide and tooling for excess play.
MONTHLY: Check cam followers and shaft liners for too much play.
Check critical heights and stops.
Check for proper link compliance.

2.12.7 RECOMMENDED SPARE PARTS

<table>
<thead>
<tr>
<th>PART DESCRIPTION</th>
<th>AGR Bodine PART NUMBER</th>
<th>METRIC MACHINES</th>
<th>IMPERIAL MACHINES</th>
</tr>
</thead>
<tbody>
<tr>
<td>HUB LINER</td>
<td>92-50-2</td>
<td>92-50-2</td>
<td></td>
</tr>
<tr>
<td>CAM FOLLLOWER</td>
<td>*CCF01-0008</td>
<td>CCF01-0008</td>
<td></td>
</tr>
<tr>
<td>ROD END (SOLID LINK)</td>
<td>RDE01-M006</td>
<td>RDE01-0006</td>
<td></td>
</tr>
<tr>
<td>VERTICAL LEVER BUSHING</td>
<td>BBB01-M205</td>
<td>BBB01-0008</td>
<td></td>
</tr>
<tr>
<td>SLIDE BLOCK</td>
<td>Refer to station assembly dwg.</td>
<td>Refer to station assembly dwg.</td>
<td></td>
</tr>
<tr>
<td>SLIDE BUSHINGS</td>
<td>BBB01-M015</td>
<td>BBB01-M015</td>
<td></td>
</tr>
</tbody>
</table>

Refer to the appropriate Engineering drawings or to the Station assembly drawing(s) for identifying replacement parts or call AGR Bodine
Customer Service for help in identifying replacement parts.
*For machines built before 2006 refer to section 2-24-1

2.12.8 TROUBLE SHOOTING
(The information below does not include any conditions regarding the customized tooling that the Light Duty Press
would be actuating. This would affect the trouble shooting variables.)
1. Erratic motion during cycle:
   • Check the cam follower and liner condition.
   • Check the cam groove area for wear or debris.
   • Check the precision slide for bearing condition.
   • Inspect the “link” assembly for broken or worn components (Primarily the rod-end and clevis.)
2. Light Duty Press arm does not move:
   • Cam follower broken.
3. Side to side bending of cam arm:
   • Check for debris that could be blocking the tooling or the slide from extending to the full down position.
2.13 HEAVY DUTY PRESS

2.13.1 FUNCTION

The HEAVY DUTY PRESS is a cam driven arm coupled to a toggle link that provides a vertical motion to a precision slide (refer to Figure #1). There are many variables and options available depending upon the customer’s design criteria.

A closed cam path provides positive stroke in both directions. Cams are modified to allow customized motion requirements. The cams are machined from a fixed keyway that guarantees a permanent, non-adjustable timing. The cam is designed to “pull” the toggle into a vertical position.

The toggle feature has a fast motion at the beginning of the stroke, where there is no load and a slow motion at the last 1/8" [3.175mm] of stroke where there is high load.

The view in Figure #1 shows a standard single unit configuration. The Heavy Duty Press unit may also be mounted below the machine centerline and used as opposing pairs.

DESIGN FEATURES

<table>
<thead>
<tr>
<th>Max. vertical stroke</th>
<th>114mm [4.50&quot;]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. load pressure</td>
<td>5400Kg [12,000 lbs]</td>
</tr>
</tbody>
</table>

HEAVY DUTY PRESS ENGINEERING DRAWINGS - REF.

<table>
<thead>
<tr>
<th>ASSEMBLY OR SUBASSEMBLY</th>
<th>AGR Bodine DRAWING NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>METRIC</td>
</tr>
<tr>
<td>STANDARD HEAVY DUTY PRESS</td>
<td>65-21-0-20</td>
</tr>
<tr>
<td>SOLID TIE ROD</td>
<td>65-21-00-203</td>
</tr>
<tr>
<td>10” ADJUSTABLE LINK</td>
<td>65-21-00-204</td>
</tr>
<tr>
<td>8” ADJUSTABLE LINK</td>
<td>65-21-00-205</td>
</tr>
<tr>
<td>LOCK-OUT TIE ROD</td>
<td>65-21-00-206</td>
</tr>
<tr>
<td>TANDEM LEVER SUBASSEMBLY</td>
<td>65-21-00-208</td>
</tr>
<tr>
<td>ELEVATED SLIDE SUBASSEMBLY</td>
<td>65-21-00-302</td>
</tr>
<tr>
<td>SLIDE BEARING BLOCK</td>
<td>65-21-00-407</td>
</tr>
<tr>
<td>FORCE REGULATOR</td>
<td>65-21-00-410</td>
</tr>
</tbody>
</table>

For a complete listing of available engineering drawings refer to section 3

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2.13.3 STANDARD OPTIONS

- **Figure #2**
  **SOLID TIE ROD SUB-ASSEMBLY**

- **Figure #3**
  **DUAL CAM FOLLOWER TIE ROD SUB-ASSEMBLY**

Standard solid tie rod (Figure #2):
- Provides an adjustable link from the cam to the toggle mechanism.

Standard dual cam follower tie rod (Figure #3):
- Provides an adjustable link from the cam to the toggle mechanism.
- Designed for heavier duty applications

Standard “lock-out” tie rod (Figure #4):
- Provides an adjustable link from the cam to the toggle mechanism.
- “Lock-out” feature allows the station to be bypassed without the tooling doing any work. A condition to protect tooling, product and or fixtures.

The “TIE RODS,” shown above, are 3 basic standard assembly configurations. They could be customized or redesigned to your specific needs. Refer to the station that this HEAVY DUTY PRESS is assigned to for specific detail information.

- **Figure #5**
  **ADJUSTMENT LINK OPTION**
  Provides a method for fine tuning the height of tooling

- **Figure #6**
  **FORCE REGULATED OPTION**
  Controls pressing force and can have compensation detection
2.13.4 SETTING THE VERTICAL STROKE

1. Jog the machine until the station to be adjusted is at the extreme lowest point of its vertical stroke. (If there are any “force regulating” or “lock-out” sub-assemblies, make sure that they are in the normal “running” state.

2. Adjust the tie rod so that the toggle link is perfectly vertical and inline as shown in Figure #8. Figure #7 shows a set-up pad that acts as a “stop” for the pivot shaft that extends beyond the housing. The pivot shaft should have a 0.025mm [0.001"] air gap with the pad when the links are perfectly vertical. Slide the “set-up pad” out of the way when running the machine.

Solid tie-rod:
- Loosen the 2 jam nuts (refer to Figure #2 & #3) which lock the tie rod in position, adjust and re-tighten.

“Lock-out” tie rod:
- Loosen the jam nut (refer to Figure #4) which locks the rod end in position. Make sure that the air cylinder is not in the “lock-out” condition (extended), adjust and retighten.

Caution - Equipment damage can occur if the set-up pad is not removed when machine is running.

3. Adjust the tooling block on the precision slide (refer to Figure #9): (Your machine may use the adjustment link option – refer to Figure #5 and adjust accordingly)
- Loosen the M10 [3/8-16] socket head cap screws (2).
- Loosen the M8 [5/16-18] socket head cap screws (2). These screws lock the adjusting screw in position.
- Rotate the adjusting screw to the proper height. There are 6.35mm [¼"] dia. holes in the side of the adjusting screw to aid in turning it.
- Tighten both sets of screws.
2.13.5 MAINTENANCE PROCEDURES

1. REMOVAL AND INSTALLATION OF CAMS
   See section 2.23.1

2. REPLACING CAM FOLLOWERS
   See section 2.23.2

3. REPLACING LINERS
   See section 2.23.3
2.13.6 REPLACING PIVOT SHAFTS AND NEEDLE BEARINGS

There are three (3) joints that articulate the toggle links. They each comprise a pivot shaft and needle bearing. It is suggested that you replace all 3 sets at the same time.

1. Jog the machine so that the Heavy Duty Press is in the “full down” position as shown in Figure #17.
2. Refer to Figure # 17 for the location of the three needle bearings (flagged “A, B & C”).
3. If replacing bearing “C” you must remove all the tooling components mounted to the slide. If not, you must support the weight of the tooling.
4. Disconnect the tie-rod from the toggle link; it may be easier to disconnect the tie rod at the clevis end.

5. The pivot shafts are held in position with set screws and jam nuts as shown in Figure #18.
6. Remove the (3) components that house the bearings. The bearings must be “pressed” out.
7. Clean and check the bore in the components before replacing bearings.
8. The “C” bearing may extend out beyond the housing; make sure that it is centered.
9. Before inserting the new pivot shafts, inspect the shaft and its center grease hole for burrs and obstructions.
10. Pack the bearings with grease.
11. Reassemble the station: note that there are flats on the shaft to which you tighten the set screws against.
12. Install the grease fittings at the end of the shafts.
13. Install the (2) Thrust Washers at “A” location.

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2.13.7 MAINTENANCE

WEEKLY: Wipe and lubricate the precision slide shafts and cam grooves and grease the pivot shafts per the Lubrication Chart shown in section 2.22 (see Figure # 18 for grease fitting locations)

MONTHLY: Check for loose or wobbly components
Check tooling for alignment and wear

RECOMMENDED SPARE PARTS
(Where component fatigue or failure may result in unplanned downtime)

<table>
<thead>
<tr>
<th>PART DESCRIPTION</th>
<th>AGR Bodine PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>METRIC MACHINES</td>
</tr>
<tr>
<td>HUB LINER</td>
<td>92-50-2</td>
</tr>
<tr>
<td>CAM FOLLOWER</td>
<td>*CCF01-0020</td>
</tr>
</tbody>
</table>

*For machines built before 2006 refer to section 2.24.1

RECOMMENDED SPARE PARTS
(Where component condition can be monitored and downtime to repair planned)

<table>
<thead>
<tr>
<th>PART DESCRIPTION</th>
<th>AGR Bodine PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>METRIC MACHINES</td>
</tr>
<tr>
<td>*ROD END (For Standard Tie Rod)</td>
<td>RDE01-M001</td>
</tr>
<tr>
<td>NEEDLE BEARING</td>
<td>NBP01-0002</td>
</tr>
<tr>
<td>THRUST WASHER</td>
<td>TBA04-0001</td>
</tr>
<tr>
<td>PIVOT SHAFT &quot;A&quot; (Standard)</td>
<td>64-21-5</td>
</tr>
<tr>
<td>PIVOT SHAFT &quot;A&quot; (With force regulator)</td>
<td>65-21-163</td>
</tr>
<tr>
<td>PIVOT SHAFT &quot;B&quot;</td>
<td>65-21-152</td>
</tr>
<tr>
<td>PIVOT SHAFT &quot;C&quot;</td>
<td>64-21-6</td>
</tr>
</tbody>
</table>

*Check station assembly drawing for possible alternate Tie Rod. Refer to the appropriate Engineering drawings or to the Station assembly drawing(s) for identifying other replacement parts or call AGR Bodine Customer Service for help in identifying replacement parts.

2.13.8 TROUBLE SHOOTING

1. Erratic motion during cycle:
   - Check the cam follower condition.
   - Check the cam groove area for wear or debris.
2. Toggle arm does not move:
   - Cam follower broken.
3. Binding pallets:
   (This is also an indication that the support structure under the fixture needs to be looked at)
   - Check tooling height.
   - Check for damaged tooling and debris in the pressing area.
   - If the “Force Regulating” option is used, check for Height adjustment and proper air pressure.
4. Not fully pressing:
   - Check for a perfectly vertical toggle arm during the press cycle.
   - Check for the “tie-rod” being bent or loose.
   - Cam or cam follower wear or damage.
   - Check the cam lever arm condition.
   - Check tooling height.
   - Check for damaged tooling and debris in the pressing area.
   - If the “Force Regulating” option is used, check for Height adjustment and proper air pressure.
2.14 FORCE REGULATED (HDP)

2.14.1 FUNCTION
This assembly is an add-on option for the standard Heavy Duty Press Unit. It is an air cylinder actuated mechanism that has adjustable regulated air pressure. It is designed to exert a given pressure and compensate upon reaching the regulated pressure. The compensation may also be detected for quality control purposes. This sub-assembly may also be used as a “lock-out” option, which upon activation will retract thereby effectively bypassing the “press” function. The slide block keeps the HDP’s link in the proper plane while it is actuated up and down.

2.14.2 LOCATION
This sub-assembly is located on top of the standard Heavy-Duty Press assembly.

2.14.3 OPTIONS
- Lock-out
- Load cell
- Compensation Sensor

Figure #1

FORCE REGULATED HEAVY DUTY PRESS ENGINEERING DRAWINGS - REF.

<table>
<thead>
<tr>
<th>ASSEMBLY OR SUBASSEMBLY</th>
<th>AGR Bodine DRAWING NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>FORCE REGULATOR ASSEMBLY</td>
<td>65-21-00-410</td>
</tr>
</tbody>
</table>

For a complete listing of available engineering drawings refer to section 3
2.14.4 HEIGHT ADJUSTMENT
1. Make sure that the air cylinder is extended and the tooling is in the full down position.
2. Refer to Figure #2 and loosen the hex jam nut.
3. Turn the nut coupling to raise or lower the tooling. Notice that there is a series of 6.35mm [¼"] dia. holes in the side of the nut coupling. Use these to help in turning the nut coupling.

2.14.5 MAINTENANCE PROCEDURES
1. REMOVAL AND INSTALLATION OF CAMS
   See section 2.23.1
2. REPLACING CAM FOLLOWERS
   See section 2.23.2
3. REPLACING LINERS
   See section 2.23.3

2.14.6 MAINTENANCE
WEEKLY: Wipe and lubricate the slide shafts and grease the “upper slide pin” per the Lubrication Chart shown in section 2.22.
MONTHLY: Check adjustments (tooling height), Actuate the “lock-out” feature – look for mis-adjustments.
YEARLY: Check shafts and slide block for excessive play or sloppiness. Check shafts for wear and damage.
2.14.7 RECOMMENDED SPARE PARTS

<table>
<thead>
<tr>
<th>PART DESCRIPTION</th>
<th>AGR Bodine PART NUMBER</th>
<th>METRIC MACHINES</th>
<th>IMPERIAL MACHINES</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLIDE BLOCK</td>
<td>65-21-161</td>
<td>64-21-161</td>
<td></td>
</tr>
<tr>
<td>SLIDE BUSHINGS</td>
<td>BBB01-M015</td>
<td>BBB01-M015</td>
<td></td>
</tr>
<tr>
<td>SLIDE SHAFT</td>
<td>65-21-162</td>
<td>65-21-162</td>
<td></td>
</tr>
<tr>
<td>AIR CYLINDER</td>
<td>See station assembly drawing or take information directly from air cylinder</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Refer to the appropriate Engineering drawings or to the Station assembly drawing(s) for identifying replacement parts or call AGR Bodine Customer Service for help in identifying replacement parts.

2.14.8 TROUBLE SHOOTING (General information only)

- Check the “nut coupling” for looseness, out of adjustment and wear.
- Check the air cylinder for leaks – replace as required.
- Check air pressure and look for kinks in the air lines.
- Refer to section 2.13 spec. sheet for the Heavy Duty Press unit.
2.15 TANDEM LEVER PRESS

2.15.1 FUNCTION

The TANDEM LEVER PRESS is a cam driven arm coupled via a connecting link to a precision slide that provides a vertical motion for the machine.

A closed dual cam path provides positive stroke in both directions. Cams are modified to allow customized motion requirements. The cams are machined from a fixed keyway that guarantees a permanent, non-adjustable timing.

The connecting link transfers the “up/down” motion from the arm to the precision slide and provides turnbuckle adjustment (item “A” in Figure #1) for a refined vertical location. The connecting link is a customized sub-assembly that is designed around the customer’s requirements. It may be a solid link, compliant link or a “lock-out” link depending upon specific function.

### DESIGN FEATURES

<table>
<thead>
<tr>
<th>Feature</th>
<th>Metric</th>
<th>Imperial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. vertical stroke</td>
<td>88.90mm [3.50&quot;]</td>
<td></td>
</tr>
<tr>
<td>Max. load pressure</td>
<td>225kg [500 lbs.]</td>
<td></td>
</tr>
</tbody>
</table>

2.15.2 LOCATION

The press may be mounted above the machine’s centerline as shown in Figure #1 or inverted and mounted below the machine’s centerline; it may also be mounted on either side of the machine.

![Figure #1](image)

**TANDEM LEVER PRESS ENGINEERING DRAWINGS - REF.**

<table>
<thead>
<tr>
<th>ASSEMBLY OR SUBASSEMBLY</th>
<th>AGR Bodine DRAWING NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>STANDARD TANDEM LEVER PRESS</td>
<td>65-25-0-20</td>
</tr>
<tr>
<td>ELEVATED TANDEM LEVER PRESS</td>
<td>65-25-0-21</td>
</tr>
<tr>
<td>SOLID LINK</td>
<td>65-25-00-201</td>
</tr>
<tr>
<td>AIR CYLINDER LINK-STANDARD</td>
<td>65-25-00-203</td>
</tr>
<tr>
<td>AIR CYLINDER LINK-ELEVATED</td>
<td>65-25-00-204</td>
</tr>
</tbody>
</table>

For a complete listing of available engineering drawings refer to section 3.
2.15.3 LINK CONFIGURATIONS

Standard solid link (Figure #2):
- Provides adjustable precision vertical location.
- In some cases the specific tooling mechanism mounted to the slide should allow for vertical compensation.

Standard “lock-out” link (Figure #3):
- Provides adjustable precision vertical location.
- May be used as a compliant link or solid link. Tooling to be mounted to the slide to match linkage features.
- “Lock-out” feature allows the station to be bypassed without the tooling doing any work. A condition to protect tooling, product, and or fixtures.

The “links” shown above are 2 basic standard assembly configurations. They could be customized or redesigned to your specific needs. Refer to the station that this TANDEM LEVER PRESS is assigned to for specific detail information.
2.15.4 SETTING THE VERTICAL STROKE
1. Jog the machine until the station to be adjusted is at the extreme lowest point of its vertical stroke.
2. Loosen the R.H. jam nut, (refer to Figure #2) which secures the rod end to the bottom of the hex link and loosen the L.H. jam nut, which secures the clevis to the top of the hex link.
3. Turn the vertical link until the desired tooling height is reached and tighten the jam nuts.
   • If an air cylinder is used in place of the vertical link, loosen the jam nut which secures the cylinder shaft to the rod end and turn the shaft to adjust the vertical stroke as required. Make sure that the cylinder is not in its "lock out" position when making this adjustment.
4. Always jog machine a few cycles to check the adjustments.

2.15.5 MAINTENANCE PROCEDURES
1. REMOVAL AND INSTALLATION OF CAMS
   See section 2.23.1
2. REPLACING CAM FOLLOWERS
   See section 2.23.2
3. REPLACING LINERS
   See section 2.23.3

2.15.6 MAINTENANCE
WEEKLY:  Wipe and lubricate the shafts and cam grooves per the Lubrication Chart shown in section 2.22.
          Check tooling for quality
MONTHLY:  Check cam followers and shaft liners for excessive play.
          Check critical heights and stops.
          Check for proper link compliance.
### 2.15.7 RECOMMENDED SPARE PARTS

<table>
<thead>
<tr>
<th>PART DESCRIPTION</th>
<th>AGR Bodine PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>METRIC MACHINES</td>
</tr>
<tr>
<td>HUB LINER</td>
<td>92-50-2</td>
</tr>
<tr>
<td>CAM FOLLOWER</td>
<td>*CCF01-0008</td>
</tr>
<tr>
<td>ROD END (SOLID LINK)</td>
<td>RDE01-M003</td>
</tr>
<tr>
<td>VERTICAL LEVER BUSHING</td>
<td>BBB01-M205</td>
</tr>
<tr>
<td>SLIDE BLOCK</td>
<td>65-28-2</td>
</tr>
<tr>
<td>SLIDE BUSHINGS</td>
<td>BBB01-M015</td>
</tr>
</tbody>
</table>

Refer to the appropriate Engineering drawings or to the Station assembly drawing(s) for identifying replacement parts or call AGR Bodine Customer Service for help in identifying replacement parts.

*For machines built before 2006 refer to section 2.24.1

### 2.15.8 TROUBLE SHOOTING

(The information below does not include any conditions regarding the customized tooling that the TANDEM LEVER PRESS would be actuating. This would affect the trouble shooting variables.)

1. Erratic motion during cycle:
   - Check the cam follower and liner condition.
   - Check the cam groove area for wear or debris.
   - Check the precision slide for bearing condition.
   - Inspect the “link” assembly for broken or worn components (Primarily the rod end and clevis.)

2. TANDEM LEVER PRESS arm does not move:
   - Cam follower broken.

3. Side to side bending of cam arm:
   - Check for debris that could be blocking the tooling or the slide from extending to the full down position.
2.16 MEDIUM DUTY PRESS

2.16.1 FUNCTION

The MEDIUM DUTY PRESS is a cam driven arm coupled via a connecting link to a precision slide that provides a vertical motion for the machine.

A closed cam path provides positive stroke in both directions. Cams are modified to allow customized motion requirements. The cams are machined from a fixed keyway that guarantees a permanent, non-adjustable timing.

The connecting link transfers the “up/down” motion from the arm to the precision slide and provides turnbuckle adjustment (item “A” in Figure #1) for a refined vertical location. The connecting link is a customized sub-assembly that is designed around the customer’s requirements. It may be a solid link, compliant link or a “lock-out” link depending upon specific function.

<table>
<thead>
<tr>
<th>DESIGN FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. vertical stroke</td>
</tr>
<tr>
<td>Max. load pressure</td>
</tr>
</tbody>
</table>

2.16.2 LOCATION

The press may be mounted above the machine’s centerline as shown in Figure #1 or inverted and mounted below the machine’s centerline; it may also be mounted on either side of the machine.

MEDIUM DUTY PRESS ENGINEERING DRAWINGS - REF.

<table>
<thead>
<tr>
<th>ASSEMBLY OR SUBASSEMBLY</th>
<th>AGR Bodine DRAWING NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>METRIC</td>
</tr>
<tr>
<td>STANDARD MEDIUM DUTY PRESS</td>
<td>65-28-0-20</td>
</tr>
<tr>
<td>ELEVATED MEDIUM DUTY PRESS</td>
<td>65-28-0-21</td>
</tr>
<tr>
<td>SOLID LINK</td>
<td>65-28-00-201</td>
</tr>
<tr>
<td>AIR CYLINDER LINK-STANDARD</td>
<td>65-28-00-203</td>
</tr>
<tr>
<td>AIR CYLINDER LINK-ELEVATED</td>
<td>65-28-00-204</td>
</tr>
</tbody>
</table>

For a complete listing of available engineering drawings refer to section 3

Rev. 09/07/2011
2.16.3 LINK CONFIGURATIONS

Standard solid link (Figure #2):
- Provides adjustable precision vertical location.
- In some cases the specific tooling mechanism mounted to the slide should allow for vertical compensation.

Standard “lock-out” link (Figure #3):
- Provides adjustable precision vertical location.
- May be used as a compliant link or solid link. Tooling to be mounted to the slide to match linkage features.
- “Lock-out” feature allows the station to be bypassed without the tooling doing any work. A condition to protect tooling, product, and or fixtures.

The “links” shown above are 2 basic standard assembly configurations. They could be customized or redesigned to your specific needs. Refer to the station that this MEDIUM DUTY PRESS is assigned to for specific detail information.
2.16.4 SETTING THE VERTICAL STROKE
1. Jog the machine until the station to be adjusted is at the extreme lowest point of its vertical stroke.
2. Loosen the R.H. jam nut, (refer to Figure #2) which secures the rod end to the bottom of the hex link and
loosen the L.H. jam nut, which secures the clevis to the top of the hex link.
3. Turn the vertical link until the desired toothing height is reached and tighten the jam nuts.
   • If an air cylinder is used in place of the vertical link, loosen the jam nut which secures the cylinder shaft to
   the rod end and turn the shaft to adjust the vertical stroke as required. Make sure that the cylinder is not
   in its "lock out" position when making this adjustment.
4. Always jog machine a few cycles to check the adjustments.

2.16.5 MAINTENANCE PROCEDURES
1. REMOVAL AND INSTALLATION OF CAMS
   See section 2.23.1
2. REPLACING CAM FOLLOWERS
   See section 2.23.2
3. REPLACING LINERS
   See section 2.23.3

2.16.6 MAINTENANCE
WEEKLY:   Wipe and lubricate the shafts and cam grooves.
          Check tooling for quality
MONTHLY:   Check cam followers and shaft liners for too much play.
          Check critical heights and stops.
          Check for proper link compliance.

2.16.7 RECOMMENDED SPARE PARTS

<table>
<thead>
<tr>
<th>PART DESCRIPTION</th>
<th>AGR Bodine PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>HUB LINER</td>
<td>METRIC MACHINES 92-50-2</td>
</tr>
<tr>
<td></td>
<td>IMPERIAL MACHINES 92-50-2</td>
</tr>
<tr>
<td>CAM FOLLOWER</td>
<td>*CCF01-0008</td>
</tr>
<tr>
<td></td>
<td>CCF01-0008</td>
</tr>
<tr>
<td>ROD END (SOLID LINK)</td>
<td>RDE01-M003</td>
</tr>
<tr>
<td>VERTICAL LEVER BUSHING</td>
<td>BBB01-M205</td>
</tr>
<tr>
<td>SLIDE BLOCK</td>
<td>METRIC MACHINES 65-28-2</td>
</tr>
<tr>
<td></td>
<td>IMPERIAL MACHINES 64-28-2</td>
</tr>
<tr>
<td>SLIDE BUSHINGS</td>
<td>BBB01-M015</td>
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<tr>
<td></td>
<td>BBB01-M015</td>
</tr>
</tbody>
</table>

Refer to the appropriate Engineering drawings or to the Station assembly drawing(s) for identifying replacement parts or call AGR Bodine
Customer Service for help in identifying replacement parts.
*For machines built before 2006 refer to section 2-24-1

2.16.8 TROUBLE SHOOTING
(The information below does not include any conditions regarding the customized tooling that the MEDIUM DUTY PRESS would be actuating. This will affect the trouble shooting variables.)

1. Erratic motion during cycle:
   • Check the cam follower and liner condition.
   • Check the cam groove area for wear or debris.
   • Check the precision slide for bearing condition.
   • Inspect the "link" assembly for broken or worn components (Primarily the rod end and clevis.)
2. MEDIUM DUTY PRESS arm does not move:
   • Cam follower broken.
3. Side to side bending of cam arm:
   • Check for debris that could be blocking the tooling or the slide from extending to the full down position.
2.17 RADIAL POSITIONING UNIT

2.17.1 FUNCTION
The Radial Positioning Unit, also known a Rotary Swap Unit, as shown in Figure. #1, is designed to perform a variety of rotational motions that can be used for rotating and loading, spinning and orienting parts. The cam is a dual face configuration with one side controlling the rotational motion and the other side controlling the vertical motion. The rotational motion is accomplished by the use of a horizontal rack and pinion gear arrangement that converts a linear motion to a rotational motion. The vertical motion is accomplished by the use of a lever arm and link attached to a splined center shaft. The universal coupling allows rotation as the splined shaft raises and lowers. The tool mounting block shown is a standardized block for use with pneumatic grip heads. It may be replaced with alternate tooling as required to perform many other rotational functions.

2.17.2 LOCATION
The Radial Positioning Unit may be mounted on either side of the machine, above the center of the machine as shown or inverted and mounted below.
2.17.3 Spindle Backlash Adjustment

The following procedure describes the method used at the factory to adjust the backlash bushing.

1. Refer to Figure #2, which shows the spindle housing partially assembled. The spindle shaft is fully assembled into the housing. The spindle shaft should be greased only if it is a "lubed" option – the “Lubeless” option has bronze bushings in the housing that do not require lubrication. The rack & gear should be lightly lubed with Dow Corning Molykote G-n paste.

2. Loosen the 2 socket head cap screws noted in Figure #2. With your hand, rotate the anti-backlash bushing clockwise (looking down from the top).

3. With your other hand, slide the spindle back and forth. The spindle motion should be snug but not binding. The amount of backlash allowable is dependent upon the specific requirements of the station. The more allowable backlash the more wear life of the assembly. The spindle should move freely up & down.

4. Tighten the screws.

2.17.4 Rack Tuning Procedure

The following procedure describes the method used at the factory to install the rack.

1. The spindle housing should be assembled as in Figure #2.

2. Grease the rack and mount to the sub-assembly. Clamp using the “rack fitting cap” and noted screws.

3. While moving the rack back and forth, with a feeler gauge check the gap as noted in Figure #3.

4. Grind the “rack fitting cap” to achieve the noted gap.
2.17.5 Rotation “STOP” Tuning Procedure for 180° rotation only

The following procedure describes the method used at the factory to install and tune the rack’s 2 stop positions. There are instances where the rack “stop” location is less critical or the stop angle is different than 180°. This procedure is required when there are two grip heads picking and feeding from common points.

1. The spindle housing should be assembled as in Figure #2. The tool mounting plate should be mounted securely with a precision fit key.
2. Figure #4 shows the rack in the inboard position. Mount the “stop block” and remove the “stop plate”.
3. Surface “A” should be located on a surface plate. Push the rack back until surface “B” is parallel with surface “A” and the noted gap is approximately 2.54mm [0.100”].
4. Grind the “stop plate” to achieve the noted gap, leaving the plate 0.127mm [0.005”] thicker.
5. Install the “stop plate” and hold the rack against it firmly and recheck for parallelism. Precision grind the “stop plate” to dimension.
6. Rotate the “tool mounting plate” 180° and do the same procedure for the outboard position. The inner stop block’s mounting hole will have to be located prior to this step. A M5 [#10-32] thread in the rack is required.

2.17.6 Setting up the Horizontal Compensating Link

The following procedure describes the method used at the factory to install and tune the compensating link when compensation is required at the end of both strokes. Use Figure #5, which shows a composite view of the rack and lever arm at the extreme end of both strokes.

1. With the compensating link off the assembly, jog the machine until the horizontal lever arm is in the full back position. Push the rack back and hold firmly against the “stop.” Measure dimension “A.”
2. Jog machine until the horizontal lever arm is in the full forward position. Pull the rack out and hold firmly against the “stop.” Measure dimension “B.”
3. Adjust the length of the link (dimension “C”) to match the average of dimensions “A” and “B.”
4. Install the link and jog machine to both extremes to check that there is compensation at both stroke ends. Readjust as needed.
2.17.7 Setting the Vertical Stroke

1. Jog the machine until the station to be adjusted is at the extreme lowest point of its vertical stroke and at the end of its inward horizontal stroke so the tooling is lined up with a fixture.

2. The “T”-nut and the slot in the lever arm are standard but may vary depending upon station requirements and the type of link used. By adjusting the “T”-nut along the slot you will adjust the overall stroke length. Do this as needed to clear components etc. during the index cycle.

3. Loosen the jam nuts noted in Figure #6 to adjust the vertical link.

4. Turn the link housing until the desired tooling height is reached and tighten the jam nuts. Allow for compensation only if there is a compliant link option used.

5. At this point the vertical stroke is adjusted to the fixtures. In order to adjust the vertical stroke to the part feeding system, the feeding unit must be raised or lowered accordingly.

2.17.8 MAINTENANCE PROCEDURES

1. REMOVAL AND INSTALLATION OF CAMS
   See section 2.23.1

2. REPLACING CAM FOLLOWERS
   See section 2.23.2

3. REPLACING LINERS
   See section 2.23.3

2.17.9 MAINTENANCE

WEEKLY: Wipe and lubricate the shafts, cam grooves and rack per the Lubrication Chart shown in section 2.22.
Check tooling for quality

MONTHLY: Check cam followers and shaft liners for too much play.
Check critical heights and stops.
Check for proper link compliance.
### 2.17.10 RECOMMENDED SPARE PARTS

<table>
<thead>
<tr>
<th>PART DESCRIPTION</th>
<th>METRIC MACHINES</th>
<th>IMPERIAL MACHINES</th>
</tr>
</thead>
<tbody>
<tr>
<td>HUB LINER</td>
<td>92-50-2</td>
<td>92-50-2</td>
</tr>
<tr>
<td>CAM FOLLOWER</td>
<td>*CCF01-0008</td>
<td>CCF01-0008</td>
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<tr>
<td>ROD END</td>
<td>RDE01-M0006</td>
<td>BBB01-0206</td>
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<tr>
<td>SPLINED SHAFT SEAL</td>
<td>OGP08-0001</td>
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</table>

Refer to the appropriate Engineering drawings or to the Station assembly drawing(s) for identifying replacement parts or call AGR Bodine Customer Service for help in identifying replacement parts.

*For machines built before 2006 refer to section 2.24.1*

### 2.17.11 TROUBLE SHOOTING

The information below does not include any conditions regarding the customized tooling that the Radial Positioning Unit would be actuating. This will affect the trouble shooting variables.

1. Erratic motion during cycle:
   - Check the cam followers, liners, rack, and splined shaft for wear or debris.
   - Check the cam groove area for wear or debris.
   - Check the splined shaft and bearings for wear and debris.
   - Inspect the “link” assemblies for broken or worn components (Primarily the rod end and clevis.)
   - Check for lack of grease on the splined shaft and the rack.

2. One or both of the R.P.U. arms do not move:
   - Cam follower broken.

3. Side to side bending of cam arm:
   - Check for debris that could be blocking the tooling from extending to the full down position.

4. Crashing tooling:
   - Check for misalignment as a result of loosened hardware or worn “stops.”

5. Over-Rotating tooling head
   - Check for worn, loose or missing “stops”
   - Check for any misaligned or loose tooling components (dove tail adjustment).

6. Under-Rotating tooling head
   - Check for debris that may be blocking rotation
   - Check the compensating link for loosened rod ends or faulty condition.
2.18 RECTANGULAR PICK & PLACE

2.18.1 FUNCTION
The Rectangular Pick and Place Unit, as shown in Figure #1 and #2, is designed to perform a variety of transfer motions for parts loading and ejection. With this mechanism many combinations of vertical and horizontal movements can be performed. Sample motions shown below can be easily obtained by proper cam layout. The cam has a dual path configuration, one side controls the horizontal motion, and the other side controls the vertical motion. The tool mounting block is a standardized design used for mounting transfer tooling.

SAMPLE STANDARD MOTION PROFILES
2.18.2 LOCATION
The rectangular pick and place may be mounted above the machine’s centerline as shown in Figure #1 or inverted and mounted below the machine’s centerline, on either side of the machine.

<table>
<thead>
<tr>
<th>DESIGN FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. vertical stroke</td>
</tr>
<tr>
<td>Max. Horizontal stroke</td>
</tr>
</tbody>
</table>

RECTANGULAR PICK AND PLACE ENGINEERING DRAWINGS - REF.

<table>
<thead>
<tr>
<th>ASSEMBLY OR SUBASSEMBLY</th>
<th>AGR Bodine DRAWING NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>METRIC</td>
</tr>
<tr>
<td>STANDARDS RECTANGULAR PICK AND PLACE</td>
<td>65-51-0-20</td>
</tr>
<tr>
<td>ELEVATED RECTANGULAR PICK AND PLACE</td>
<td>65-51-0-21</td>
</tr>
<tr>
<td>STANDARD PARALLEL PICK AND PLACE</td>
<td>65-51-0-22</td>
</tr>
<tr>
<td>ELEVATED PARALLEL PICK AND PLACE</td>
<td>65-51-0-23</td>
</tr>
<tr>
<td>COMPLIANT LINK</td>
<td>65-51-00-201</td>
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<tr>
<td>AIR CYLINDER LINK-STANDARD</td>
<td>65-20-00-203</td>
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<tr>
<td>AIR CYLINDER LINK-ELEVATED</td>
<td>65-20-00-204</td>
</tr>
<tr>
<td>UNIVERSAL TOOL MOUNTING BLOCK</td>
<td>65-51-00-503</td>
</tr>
</tbody>
</table>

For a complete listing of available engineering drawings refer to section 3
2.18.3 Setting the Horizontal Stroke and the Compensation

At the extreme end of both the inward and outward horizontal strokes, the set screws, located in the tool mounting block and the cam follower block, make contact with the stop buttons, located on both ends of the bearing block in order to achieve positive stops. At this point, the horizontal compensating link is either compressed (outward stroke) or extended (inward stroke).

The following procedure describes the method used at the factory to set the horizontal stroke and assure proper compensation of the Rectangular Pick and Place station.

1. Adjust the setscrew (located in the tool mounting block) so that it protrudes 4.8 mm [0.19"] from the back of the block (Figure #3).
2. Jog the machine until the station is at the extreme inward point of its stroke and adjust the T-block in the horizontal lever arm so that it is approximately 19 mm [0.750"] above the end of the slot as dimensioned in Figure #3.
3. Adjust the Horizontal Compensating Link until you see a small air gap between the set screw and the stop button. This is to insure that the link has not been compensated at this point. Do this by loosening the M8 [5/16-24] jam nut that locks the rod end to the link then rotating the body of the link. Readjust the link so that there is between a 0.38 mm [1/64"] and 0.76 mm [1/32"] compensation. You may put a scribe mark on the special nut, as noted in the Figure #3 detail before you readjust the link. This way you can see the special nut extend out for the compensation.

4. The “inward stroke” is now set. There should be X-Y adjustability in the tooling head to get the tool aligned with the fixture. Refer to Figure #4 for the “outward stroke” adjustment.
Setting the Horizontal Stroke and the Compensation cont’d

5. Back off the set screw in the cam follower Block to insure that the link does not compensate when jogging the machine to the extreme “outward” position.
6. Jog the machine to the extreme outward position of the stroke.

![Figure #4](image)

7. Measure the distance between the end of the set screw in the Tool Mounting Block and the face of the stop button in the front of the bearing block (Dimension “X” in fig #4). This distance should be between 0.38mm [1/64"] and 0.76mm [1/32"] greater than the horizontal stroke indicated on the station assembly print.
8. If this is not the case, either raise or lower the T-block to adjust until acceptable. Raising the block will decrease the stroke while lowering it will increase the stroke.

   **NOTE:**
   Whenever the T-block is adjusted, it will be necessary to readjust the length of the compensating link to ensure proper compensation.

9. Turn the set screw, located in the Cam Follower Block, against the Stop Button (located in the back of the Bearing Block) until the Horizontal Compensating Link is compressed to the same dimension as the variance in dimension “X” to the specification dimension on the assembly print (between 0.38mm [1/64"] and 0.76mm [1/32"]). Then lock the set screw in place.
10. Recheck the compensation of both the inward and outward stroke, and if necessary, adjust the link until the compensation in both extents is acceptable. Normally, it will be necessary to adjust the link only if the T-block is moved. The compensation should be approximately 0.38mm [1/64'']. If the compensation is 0.76mm [1/32''] or more there will be harder banging into the stops, which will cause faster wear and therefore faster misalignment conditions.
2.18.4 Horizontal Compliant Link Setup

On a new Horizontal Compliant Link, the length is initially set to a nominal dimension of 216mm [8.50”]. The link length will need to be adjusted once the link is installed on the machine.

Free play is also preset on a new compliant link. It should not exceed 216mm [0.010”]. However, free play should be checked periodically and adjusted if necessary. This can be done with the link in place on the machine as follows:

1. Jog the machine until the horizontal motion of the pick and place is around mid stroke.
2. Move the link housing back and forth and feel for free play. There should be no more than 216mm [0.010”]. If there is too much free play, proceed to step 3.
3. Loosen the jam nut that secures the special nut.
4. Tighten the special nut until it just comes into contact with the spring collar.
5. Move the link housing back and forth to verify that there is no more than 216mm [.010"] free play.
6. Once verified, tighten the jam nut.
7. After tightening the jam nut, recheck for free play. Readjust if necessary.

*IMPORTANT*

Remember that the Special nut and jam nut are used only for setting free play on the link. They are in no way connected with link length adjustment.

![Diagram of Horizontal Compliant Link Setup](image)

Figure #5
2.18.5 Setting the Vertical Stroke
1. Jog the machine until the station to be adjusted is at the extreme lowest point of its vertical stroke and at the end of its inward horizontal stroke so the tooling is lined up with a fixture.
2. Loosen the jam nuts that secure the lower rod end and the upper clevis to the vertical compliant link.
3. Turn the link housing until the desired tooling height is reached and tighten the jam nuts.
4. At this point the vertical stroke is adjusted to the fixtures. In order to adjust the vertical stroke to the part feeding system, the feeding unit must be raised or lowered accordingly.

2.18.6 MAINTENANCE
WEEKLY: Wipe and lubricate the shafts and cam grooves. Check tooling for quality
MONTHLY: Check cam followers and shaft liners for too much play. Check critical heights and stops. Check for proper link compliance.

Figure #6
### 2.18.7 RECOMMENDED SPARE PARTS

<table>
<thead>
<tr>
<th>PART DESCRIPTION</th>
<th>AGR Bodine PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>METRIC MACHINES</td>
</tr>
<tr>
<td>HUB LINER</td>
<td>92-50-2</td>
</tr>
<tr>
<td>CAM FOLLOWER</td>
<td>*CCF01-0008</td>
</tr>
<tr>
<td>ROD END (for compliant links)</td>
<td>RDE01-M006</td>
</tr>
<tr>
<td>SLIDE BLOCK</td>
<td>65-51-309</td>
</tr>
<tr>
<td>SLIDE BUSHINGS</td>
<td>BBB01-M015</td>
</tr>
</tbody>
</table>

Refer to the appropriate Engineering drawings or to the Station assembly drawing(s) for identifying replacement parts or call AGR Bodine Customer Service for help in identifying replacement parts.

*For machines built before 2006 refer to section 2.24.1*

### 2.18.8 TROUBLE SHOOTING

(The information below does not include any conditions regarding the customized tooling that the Rectangular Pick and Place would be actuating. This will affect trouble shooting variables.)

1. Erratic motion during cycle:
   - Check the cam follower and liner condition.
   - Check the cam groove area and the groove in the cam follower block for wear or debris.
   - Check the precision slide for bearing condition.
   - Inspect the “link” assemblies for broken or worn components (Primarily the rod end and clevis.)

2. One or both of the RP&P arms do not move:
   - Cam follower broken.

3. Side to side bending of cam arm:
   - Check for debris that could be blocking the tooling or the slide from extending to the full down position.

4. Crashing tooling:
   - Check for misalignment as a result of loosened hardware or worn “stops.”
2.19 INSPECTION ASSEMBLIES

2.19.1 FUNCTION
The inspection units are essentially height inspections. They are used to determine a part’s presence and or position by variations in height. Generally the probe design will provide for inspection of the part features with the greatest variation in height. Probe position is monitored by one or two proximity sensors depending on the inspection unit being used. The inspection units as shown are mounted to the Rise & Fall bar for vertical motion.

Presence and Position – Single Sensor
This inspection is most often used to determine presence and position of a part although it can be used to determine only one or the other as in an “Inspect Empty” station. The single proximity sensor provides accuracy within 1mm [0.040”]. The inspection is set up to determine whether or not the part height is within the predetermined range of an acceptable part. If the part is either too low (presence failure) or too high (position failure), the single proximity sensor will be on, indicating that a fault exists. The single sensor cannot differentiate presence from position. It only indicates that a faulty condition has been detected.

Presence and Position – Dual Sensor
This inspection is most often used to determine presence and position of a part although it may be used to determine that part height is in a particular range. The dual proximity sensors provide accuracy within 0.50mm [0.020”]. The inspection is set up to determine whether or not the part height is within the predetermined range of an acceptable part. If the part is either too low (presence failure) or too high (position failure), the single proximity sensor will be on, indicating that a fault exists. The single sensor cannot differentiate presence from position. It only indicates that a faulty condition has been detected.

Position Only
This inspection is used to determine if a part is too high or that a part is present when it should not be as in an “Inspect Empty” station. The single proximity sensor provides accuracy within 0.50mm [0.020”]. The inspection target height is set so that the sensor turns off if the target height is exceeded.
2.19.2 LOCATION
Generally, inspections are mounted on the Rise and Fall Bar. Presence and Position inspections are usually located in the first available station position following the station whose function is being inspected. Other inspections are mounted as required by the assembly process.

INSPECTION ENGINEERING DRAWINGS - REF.

<table>
<thead>
<tr>
<th>ASSEMBLY OR SUBASSEMBLY</th>
<th>AGR Bodine DRAWING NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>METRIC</td>
</tr>
<tr>
<td>INSPECTION, SINGLE SWITCH (PRESENCE &amp; POSITION)</td>
<td>65-16-0-19</td>
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<tr>
<td>INSPECTION, DUAL SWITCH (PRESENCE &amp; POSITION)</td>
<td>65-16-0-20</td>
</tr>
<tr>
<td>INSPECTION, SINGLE SWITCH (POSITION ONLY)</td>
<td>65-16-0-21</td>
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</tbody>
</table>

For a complete listing of available engineering drawings refer to section 3
2.19.3 Setting a Standard Inspection for “Presence and Position” (Single Sensor)

This standard inspection station is designed to inspect for both presence and position using a single sensor. Refer to the station assembly print if there is any question as to what a particular inspection station is checking for.

1. Jog the machine to 270° so the Rise & fall bar is at its lowest point and be sure there is a good part in the appropriate fixture nest.
2. Set sensor gap to target as dimensioned in Figure #4.
3. Unscrew the “Target, Rod End” to raise it out of the way so that it does not affect the sensor.
4. Adjust the height of the bearing block by loosening the screw noted in Figure #4 so that the “LOWER TARGET EDGE” just turns off the indicator light on the sensor. Then tighten the screw. Set this target edge using a “good part” that is at the highest acceptable tolerance.
5. Adjust the collar for a 1.57mm [0.063"] clearance above the bearing block as shown.
6. Lower the “Target Rod End” so that the “UPPER TARGET EDGE” just turns off the indicator light on the sensor. Then tighten the screw. Set this target edge using a “good part” that is at the lowest acceptable tolerance.
7. The pressure of the compensating springs should be set so that the probe maintains positive contact with the part, but does not damage it. Adjust if necessary by raising or lowering the lower collars. The springs are an optional component and may not be on your specific station.

Sequence for which the station has just been tuned:
1. The Rise & fall bar is raised to allow a machine index and the “probe” compensates down 1.57mm [0.063”].
2. The sensor reads the “upper target edge.”
3. The Rise & fall bar lowers:
   - If there is a good part in the fixture, the probe compensates up 1.57mm [0.063"] and the sensor reads the gap.
   - If there is no part in the fixture or the part is too high or too low, the sensor will read one of the target edges and cause a fault condition.
2.19.4 Setting a Standard Inspection for “Presence and Position” (Dual Sensor)

This standard inspection station is designed to inspect for the position of a component (component seated too high). Refer to the station assembly print if there is any question as to what a particular inspection station is checking for.

1. Jog the machine to 270° so the Rise & fall bar is at its lowest point and be sure there is a good part in the appropriate fixture nest.
2. Set sensor gaps to target edges as dimensioned in Figure #5.
3. Adjust the height of the bearing block by loosening the screw noted in Figure #5 so that the edge of the lower target clamp just turns off the indicator light on the lower sensor, then slowly raise the block until the indicator light just goes on. Then tighten the screw. Set this target edge using a “good part” that is at the lowest acceptable tolerance.
4. Set the collar for a 1.57mm [0.063"] clearance above the bearing block as shown.
5. Adjust the upper target clamp so that the edge just turns off the upper sensor by turning the adjusting screw and then slowly turn the adjusting screw until the upper sensor’s indicator light goes back on and lock in place. Set this target edge using a “good part” that is at the lowest acceptable tolerance.
6. The pressure of the compensating springs should be set so that the probe maintains positive contact with the part, but does not damage it. Adjust if necessary by raising or lowering the lower collars. The springs are an optional component and may not be on your specific station.

Sequence for which the station has just been tuned:

1. The Rise & fall bar is raised to allow a machine index and the “probe” compensates down 1.57mm [0.063"].
2. The upper sensor reads the “upper target edge” and the lower sensor sees a gap.
3. The Rise & fall bar lowers:
   - If there is a good part in the fixture, the probe compensates up 1.57mm [0.063"] and both sensors read an edge.
   - If there is no part in the fixture or the part is too low, the upper sensor will read an edge and the lower sensor will see a gap and cause a fault condition.
   - If there is a part in the fixture that is too high, the upper sensor will see a gap and the lower sensor will read an edge and cause a fault condition.
2.19.5 Setting a “Position Only” Inspection Station for “TOO HIGH PARTS”

This standard inspection station may be set up to do either of two inspections: It may be used as a check for an empty fixture or as a check for high parts.

SET-UP FOR HIGH PARTS DETECTION:
1. Jog the machine to 270° so the Rise & fall bar is at its lowest point and be sure there is a good part in the appropriate fixture nest. Use a part that is at the highest acceptable tolerance.
2. Set sensor gap to target as dimensioned in Figure #6.
3. Adjust the height of the bearing block by loosening the screw noted in Figure #6 so that the target’s edge just turns off the indicator light on the sensor. Then slowly lower the block so that the indicator light goes on. Then tighten the screw.
4. Locate the collar against the bearing block as shown for zero clearance.

Sequence for which the station has just been tuned:
1. The Rise & fall bar is raised to allow a machine index.
2. The sensor reads the “upper target edge.”
3. The Rise & fall bar lowers:
   - If there is a good part in the fixture, the probe does not move and the sensor reads the target’s edge.
   - If the part in the fixture is too high, the probe will compensate up and the sensor will see the gap and cause a fault condition.
2.19.6 Setting a “Position Only” Inspection Station for “EMPTY NEST”

This standard inspection station may be set up to do either of two inspections: It may be used as a check for an empty fixture or as a check for high parts.

SET-UP FOR EMPTY NEST DETECTION:
1. Jog the machine to 270° so the Rise & fall bar is at its lowest point. Make sure the nest is empty.
2. Set sensor gap to target as dimensioned in Figure #7.
3. Adjust the height of the rod in the bearing block by loosening the collar so that the target’s edge just turns off the indicator light on the sensor. Then slowly lower the rod so that the indicator light goes on. Then tighten the collar.
4. Adjust the height of the bearing block by loosening the screw noted in Figure #7. Lower the probe to a depth that will insure that the pocket is completely empty and even empty of debris such as partial components.
5. Tighten the screw.

Sequence for which the station has just been tuned:
1. The Rise & fall bar is raised to allow a machine index.
2. The sensor reads the “upper target edge.”
3. The Rise & fall bar lowers:
   - If the fixture is completely, the probe does not move and the sensor reads the target’s edge.
   - If there is a part in the fixture, the probe will compensate up and the sensor will see the gap and cause a fault condition.
2.19.7 SHAFT AND BEARING BLOCK REPLACEMENT
1. The Bearing Block comes as a complete sub-assembly, which includes bearings and seals and should be replaced as a complete unit.
2. The shafts and the bearing block should always be replaced as a set.
3. The disassembly of the station is straightforward with no need of special instruction.
4. Lubricate shafts using light oil and carefully insert (from the top).
5. Reassemble the station and tune.

2.19.8 SENSOR REPLACEMENT
1. The disassembly of the sensor is straightforward with no need of special instruction.
2. Reassemble the new sensor and set the gap.
3. Re-tune the station (very critical).

2.19.9 MAINTENANCE
   WEEKLY: Wipe and lubricate the shaft per the Lubrication Chart shown in section 2.22.
   MONTHLY: Check for probe and bearing wear and proper sensor actuation (manually actuate the shaft up and down and feel for a smooth but not sloppy motion)

2.19.10 RECOMMENDED SPARE PARTS

<table>
<thead>
<tr>
<th>PART DESCRIPTION</th>
<th>AGR Bodine PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>METRIC MACHINES</td>
</tr>
<tr>
<td>*BEARING BLOCK - STANDARD</td>
<td>92-61-1</td>
</tr>
<tr>
<td>*BEARING BLOCK – LOW FRICTION</td>
<td>65-61-60</td>
</tr>
</tbody>
</table>

Refer to the appropriate Engineering drawings or to the Station assembly drawing(s) for identifying replacement parts or call AGR Bodine Customer Service for help in identifying replacement parts.

2.19.11 TROUBLE SHOOTING
1. Erratic motion during cycle:
   - Check the bearing and seal condition.
   - Check the shaft for “scoring.”
2. False sensing:
   - Refer to previous information.
   - Check probe for wear
   - Check sensor for location and sensitivity.
2.20 CHECKING AND FILLING THE CENTRAL LUBRICATION SYSTEM RESERVOIR

- As part of routine maintenance, the oil level of the central lubrication system reservoir should be checked and filled as necessary.
- The reservoir is generally equipped with a sight glass. When the level appears low, replenish the reservoir with Mobil Vactra #3 (or equivalent).
- It is recommended that the oil level not be allowed to get too low, as this can result in a machine shutdown or equipment failure.
2.21 PREVENTIVE MAINTENANCE

<table>
<thead>
<tr>
<th>Central Lubrication System - Refer to Section 2.22 for Lubrication Chart</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Refill and check pressure</td>
</tr>
<tr>
<td>• Look for excess oil</td>
</tr>
<tr>
<td>• Trace leaks and repair</td>
</tr>
<tr>
<td>• Look for dry areas</td>
</tr>
<tr>
<td>• Unclog fittings</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stock Spool Rollers</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Before placing any stock spool (capacitor, stamp foil or label) on the machine, clean all the rollers with contact cleaner or equivalent.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Daily</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Clean dirt and debris from dead-end blocks</td>
</tr>
<tr>
<td>• Clean all stock rollers with contact cleaner or equivalent.</td>
</tr>
</tbody>
</table>

**CHECK THE BRAKING FUNCTION**

<table>
<thead>
<tr>
<th>Weekly</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Check for excessive play on any link and compensator’s rod ends.</td>
</tr>
<tr>
<td>• Drain water from trap as required (Open lower pet-cock valve near idle drum)</td>
</tr>
<tr>
<td>• Compare encoder to shaft dial readings (±2° is allowed)</td>
</tr>
<tr>
<td>• Check vacuum lines (clean out excess dirt accumulated in lines or pickup heads)</td>
</tr>
<tr>
<td>• Clean dirt and debris from grip head fingers</td>
</tr>
<tr>
<td>• Clean dirt and debris from inline and bowl areas</td>
</tr>
<tr>
<td>• Clean dirt and debris from safety curtains and reflectors</td>
</tr>
<tr>
<td>• Ensure the bearings are properly greased at drive and idler drum (upper and lower)</td>
</tr>
<tr>
<td>• Check tension and lubricate silent chain drive if necessary</td>
</tr>
</tbody>
</table>

**Note:** Keep all stations clean from dirt and debris. Wipe all moving surfaces with a clean cloth and some WD-40 once a week or if needed.

<table>
<thead>
<tr>
<th>Monthly</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Check Lock-Pin for misalignment, wear and damage</td>
</tr>
</tbody>
</table>

**Pneumatic Circuit**

<table>
<thead>
<tr>
<th>Pneumatic Circuit</th>
</tr>
</thead>
<tbody>
<tr>
<td>• The filters on the main air header should be checked for excessive dirt, oil and water in the filters at least once a week.</td>
</tr>
<tr>
<td>• Replace any clogged or dirty filters.</td>
</tr>
<tr>
<td>• The coalescing filter should be treated as a regular filter assembly.</td>
</tr>
</tbody>
</table>

**Electric Circuit**

<table>
<thead>
<tr>
<th>Electric Circuit</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Periodic check</td>
</tr>
</tbody>
</table>
# 2.22 LUBRICATION

## 2.22.1 LUBRICATION CHART

<table>
<thead>
<tr>
<th>Machine Element</th>
<th>Fill Qty</th>
<th>Interval</th>
<th>Work to be done</th>
<th>Remarks</th>
<th>Lubricant (As listed or equivalent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indexer (Intermittor)</td>
<td>8 liters</td>
<td>5000 hours</td>
<td>Check oil level</td>
<td>Do not Overfill</td>
<td>Mobilgear Synthetic Extreme Pressure #SHC220</td>
</tr>
<tr>
<td>Gear box (Reducer)</td>
<td>2.5 qt.</td>
<td>2400 hours</td>
<td>Check oil level</td>
<td>Do not Overfill</td>
<td>Mobil Synthetic #SHC634</td>
</tr>
<tr>
<td>General Lubrication: Transport Chains, Joints, pivot points, etc.</td>
<td>N.A.</td>
<td>1000 hours</td>
<td>Lubricate</td>
<td>Remove waste before lubricating</td>
<td>Mobil Vactra 2</td>
</tr>
<tr>
<td>Cam paths</td>
<td></td>
<td></td>
<td>See Section 2-22-2</td>
<td>Dow Corning Molykote® G-4500 Multi-Purpose Synthetic Grease</td>
<td></td>
</tr>
<tr>
<td>Lever Hub Liners</td>
<td>N.A.</td>
<td>Initial Installation</td>
<td>Apply thin coat to inside of liner</td>
<td>Coat completely</td>
<td>Dow Corning® 33 Extreme Low Temperature Bearing Grease</td>
</tr>
<tr>
<td>Central Lubrication</td>
<td>1.5 liters</td>
<td>1000 hours</td>
<td>Refill if machine stops for Fault Low lube Level</td>
<td>Do not overfill</td>
<td>Mobil Vactra 3</td>
</tr>
<tr>
<td>Rack &amp; pinions, gears, etc.</td>
<td>N.A.</td>
<td>1000 hours</td>
<td>Apply to teeth</td>
<td>Wipe away old grease before applying new</td>
<td>Dow Corning® 33 Extreme Low Temperature Bearing Grease</td>
</tr>
<tr>
<td>Idler Wheel Bearings</td>
<td>N.A.</td>
<td>2400 hours</td>
<td></td>
<td></td>
<td>Dow Corning® BR2-Plus Multi-Purpose E.P. Grease</td>
</tr>
</tbody>
</table>

## 2.22.2 CAM LUBRICATION

### APPLICATION

Apply a thin layer of grease to both the inner and outer path. Coverage should be as complete as possible. If certain areas are difficult to access, jog the machine to positions that allow for access. Although excess grease on the paths will eventually be spread around to most of the cam by the follower, it is best to apply as completely as possible. Also apply a layer of grease to the follower.

Reference: Lubricate with Dow Corning Molykote® G-4500 Multi-Purpose Synthetic Grease or equivalent.

### APPLICATION INTERVALS

**For Light Duty Press, Rectangular Pick & Place and Rise & Fall and all other light to moderate load applications:**

1. The first or “Break-in” application is done upon initial installation.
2. The next application should be done between 50,000 and 100,000 cycles.
3. For regular maintenance, lubrication applications should be done at least every 500,000 cycles.

**For Medium Duty, Tandem Lever and Heavy Duty Press, and all other heavy load applications:**

Heavy load applications require more frequent lubrication.

1. The first application is done upon initial installation.
2. The next applications should be done every 50,000 cycles up to 250,000 cycles.
3. For regular maintenance, lubrication applications should be done at least every 250,000 cycles.
2.23 MISCELLANEOUS PROCEDURES

2.23.1 REMOVAL AND INSTALLATION OF CAMS

1. Jog the machine to a point where the (2) M10 socket head screws that hold the cam halves together are accessible. (refer to Figure. #1)

2. There is a large "load" on the cam at any given position, therefore, before beginning any work, the weight of the tooling must be removed or supported.

3. Remove the cam. Keep the following points in mind:
   - Make a note as to which direction the cam hub is facing
   - The process of removing a cam varies widely depending on the location of the particular cam relative to other cams and various lever arms. In general, it will be necessary to disengage cam followers (together with lever arms) from their tracks before removing a cam. This may be as simple as loosening the screws that fasten the cam to the camshaft or as complex as removing lever arms, disconnecting the vertical link, and/or disconnecting air cylinders.
   - Before disassembly, mark the location of any lever or linkage components being moved or removed, that do not have a fixed location (shaft collars, t-slot nuts, etc.) so that those components can be returned to their original location during reassembly

4. If a cam was removed and is being reinstalled, wipe and clean out the cam path(s) then inspect the condition. Paths should be fairly smooth and consistent all the way around. Any roughness found may be the result of a bad cam follower.

5. Check cam followers. If a follower seems to have excess free play or spins extremely freely indicating a lack of grease, it should be replaced. (See section 2.23.2)

6. Cam Installation
   - Make sure the cam hub is facing in the direction noted in step 3
   - Make sure that the mating surfaces between the cam and camshaft including the keyway are clean and free of burrs. Use a file to remove any sharp edges.
   - Install the two halves of the cam over the camshaft and connect them with the M10 socket head screws. Also insert the key.
   - Return any lever arms and/or clamping collars to their previous positions and re-connect any links that were disconnected to remove the cam.
   - Set the cam and levers so that cam followers have about 0.80mm [1/32"] clearance with the inside of the track and firmly tighten the M10 socket head screws. (refer to Figure #1) The 0.08mm [1/32"] clearance is a nominal dimension. If both sides of the cam are used, the cam should be centered between the cam followers.

7. Remember to remove any tooling support blocks before restarting machine

8. Jog the machine through several cycles to ensure proper motion and make adjustments as necessary.

9. After several cycles lubricate the cam path(s) per section 2-22-2

Figure #1
2.23.2 CAM FOLLOWER REPLACEMENT

(When replacing cam followers it is also recommended that you replace the elastic stop nut.)

1. There may be a large “load” on the cam follower and lever arm at any given position, therefore, before beginning any work, the weight of the tooling must be removed or supported.

2. Cam followers are “pressed” into the levers and in order to replace a cam follower, it is necessary to remove the lever arm that the cam follower is pressed into. Normally this is done by removing the 3 socket head screws that attach the lever to the pivot hub. The dowel pins that locate the lever to the hub are pressed into the hub and slip-fit into the lever. It may require the “tap” of a mallet to knock the lever arm away from the dowels. Alternately, the lever may be removed from the machine by disassembling the hub. **Prior to any disassembly the following should be noted or marked:**
   - The location of any lever or linkage components being moved or removed, that do not have a fixed location (shaft collars, t-slot nuts, etc.) should be marked so that those components can be returned to their original location during reassembly.
   - If the lever and hub stack up is disassembled, the arrangement of components should be noted so that those components can be properly reinstalled.

3. With the appropriate lever arm removed, unscrew the elastic jam nut and use an arbor press to remove the worn cam follower from the arm. Inspect the cam follower hole. If the cam follower is no longer a “press-fit”, the arm should be replaced.

   *If replacing a lever arm with a bronze bushing pressed into it, the bronze bushing should be replaced along with the lever arm.*

4. The box which contains the new cam follower should also contain a grease plug. Tap this plug into the hole in the end of the cam follower stud.

5. Use the arbor press to press the new cam follower into the lever arm making sure to replace any spacers that were used with the previous cam follower (refer to fig. #2 for the standard configuration). Screw on the Elastic jam nut and tighten it.

6. Wipe out the cam path(s) and inspect the condition.

7. Re-install the lever arms making sure the mating surfaces are clean.

8. Do not forget to remove any tooling support blocks before restarting machine.

9. Jog machine a few cycles to insure that all the components are in place and working properly and that the tooling is at the proper heights.

10. After several cycles lubricate the cam and follower per section 2.22.2.

---

**Figure #2**

---

**METRIC MACHINES**

Generally, metric machines built before 2006 and some built between 2006 and 2007 were equipped with special metric/inch “hybrid” cam followers. Part no. M64-50-41. These were basically inch followers with a metric stud. They are no longer available and have been replaced with inch cam followers, AGR Bodine part no. CCF01-0008. If replacing a special metric/inch cam follower with an inch follower, the lever will need to be modified or replaced. To modify the lever, remove it from the machine then bore the 12mm [0.472"] diameter cam follower mounting hole to 12.68/12.70mm [0.4990/0.5000"] diameter. For replacement part information contact AGR Bodine Customer Service.
2.23.3 REPLACING LEVER HUB LINERS

The “hub liner” is the plastic split sleeve bearing that is the bearing for a lever hub & cap on a pivot shaft. Each lever hub & cap uses (2) hub liners. The liner has a “key” molded into it that mates with a groove in the lever hub & cap. This key prevents the liner from spinning in the lever hub & cap.

1. There may be a large “load” on the cam follower and lever arm at any given position, therefore, before beginning any work, the weight of the tooling must be removed or supported.

2. In order to remove hub liners, the lever hub & cap must be removed. In order to do this, some of the lever assembly and linkage components may need to be moved. Prior to moving or removing anything, the location of any lever or linkage components being moved or removed, that do not have a fixed location (shaft collars, t-slot nuts, etc.) should be marked so that those components can be returned to their original location during reassembly. Also, the “hub & cap” are a matched set, if you are doing multiple rebuilds, make sure you keep them as a pair.

3. The lever hub & cap are separated and removed by removing the two screws that hold them together on the pivot shaft. Once the hub and cap are removed from the pivot shaft, the liners can be removed.

4. After removing the old liners, clean and inspect the hub & cap and the pivot shaft. If there are any nicks or grooves in the shaft it will seriously affect performance. Smooth out nicks and burrs with a very fine emery cloth.

5. New liners must be properly lubricated before installing them on the pivot. Apply a thin layer of silicon grease to the entire inner surfaces of the liners (AGR Bodine recommends Dow Corning® 33 Extreme Low Temperature Bearing Grease). Once lubricated, the liners may be installed by carefully spreading them over the pivot shaft. **Note that liners will break if over flexed.**

6. Re-assemble the hub & cap, making sure you engage the “key” in the liner to the mating groove in the cap. (Refer to fig. #3 for a cut-away view of the assembled hub & cap.)

7. Manually check for rotational freedom of the hub & cap on the pivot shaft and then re-assemble the rest of the lever assembly. Ensure that the shaft collars are snug against the assembled hub & cap.

8. **Before restarting the machine**, remove any support blocks that may have been added to assist with this repair.

![Figure #3](image-url)
### SECTION 3

**AGR BODINE ENGINEERING DRAWINGS**

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<th>Description</th>
</tr>
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<td>CHASSIS-DRIVE</td>
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<td>3.3</td>
<td>CHASSIS-INDEX</td>
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<td>3.4</td>
<td>MACHINE TIMING</td>
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<td>3.5</td>
<td>RISE AND FALL</td>
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<td>3.6</td>
<td>LIGHT DUTY PRESS</td>
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<td>3.7</td>
<td>MEDIUM DUTY PRESS</td>
</tr>
<tr>
<td>3.8</td>
<td>TANDEM LEVER PRESS</td>
</tr>
<tr>
<td>3.9</td>
<td>HEAVY DUTY PRESS</td>
</tr>
<tr>
<td>3.10</td>
<td>RADIAL POSITIONING UNIT (ROTARY SWAP)</td>
</tr>
<tr>
<td>3.11</td>
<td>RECTANGULAR PICK AND PLACE</td>
</tr>
<tr>
<td>3.12</td>
<td>HEAVY DUTY PRESS PICK AND PLACE</td>
</tr>
<tr>
<td>3.13</td>
<td>INSPECTION</td>
</tr>
<tr>
<td>3.14</td>
<td>RISE AND FALL MOUNTED ASSEMBLIES AND COMPONENTS</td>
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<tr>
<td>3.15</td>
<td>RISE AND FALL ACTUATED SLIDE ASSEMBLIES</td>
</tr>
<tr>
<td>3.16</td>
<td>LEVERS AND MISCELLANEOUS SUBASSEMBLIES</td>
</tr>
<tr>
<td>3.17</td>
<td>COMPLIANT LINK SUBASSEMBLIES</td>
</tr>
<tr>
<td>3.18</td>
<td>SOLID LINK SUBASSEMBLIES</td>
</tr>
<tr>
<td>3.19</td>
<td>AIR CYLINDER LINK SUBASSEMBLIES</td>
</tr>
<tr>
<td>3.20</td>
<td>DEAD END/ESCAPEMENT MOUNT SUBASSEMBLIES</td>
</tr>
<tr>
<td>3.21</td>
<td>FEEDER MOUNTING ASSEMBLIES</td>
</tr>
<tr>
<td>3.22</td>
<td>FIXTURE SUPPORT ASSEMBLIES</td>
</tr>
</tbody>
</table>

**Use of ATW Bodine Engineering Drawings**

Engineering Drawings are available to ATW Bodine customers with the following intended uses in mind:

1. Identification of replacement parts
2. Guidance in disassembly/reassembly of ATW Bodine Standard assemblies and subassemblies
3. To provide basic assembly set up information.

They will serve best if used along with your machine’s mechanical station drawings. Be aware that the current drawings may not be an exact reflection of the unit on your machine since the designs are periodically revised. ATW Bodine Customer Service may be able to help out if information beyond that available on the engineering drawings is needed. Additionally, there may be assemblies or subassemblies referred to on the station assembly drawings that are not included on the engineering drawing lists. These drawings may also be available through Customer Service.
### 3.1 CHASSIS-FRAME

<table>
<thead>
<tr>
<th>ASSEMBLY OR SUBASSEMBLY</th>
<th>ATW Bodine DRAWING NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>METRIC</td>
</tr>
<tr>
<td>Clockwise Machine</td>
<td>65-10-0-(N)0</td>
</tr>
<tr>
<td>Counterclockwise Machine</td>
<td>65-10-0-(N)1</td>
</tr>
<tr>
<td>Basic Frame-Clockwise</td>
<td>65-11-0-(N)0</td>
</tr>
<tr>
<td>Basic Frame-Counterclockwise</td>
<td>65-11-0-(N)1</td>
</tr>
<tr>
<td>End Plates, Wipers &amp; Fixture Guides-Clockwise</td>
<td>65-11-00-01(N)</td>
</tr>
<tr>
<td>End Plates, Wipers &amp; Fixture Guides-Counterclockwise</td>
<td>65-11-00-01(N)</td>
</tr>
<tr>
<td>Fixture Guide Rails – Standard</td>
<td>65-11-00-020</td>
</tr>
<tr>
<td>Fixture Guide Rails – Extended</td>
<td>65-11-00-021</td>
</tr>
<tr>
<td>Fixture Guide Rails – Cut out for Master Pallet</td>
<td>65-11-00-022</td>
</tr>
<tr>
<td>Sampson Base</td>
<td>65-11-00-040</td>
</tr>
<tr>
<td>Fixture Pallet Wipers</td>
<td>65-11-00-104</td>
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</tbody>
</table>

### 3.2 CHASSIS-DRIVE

<table>
<thead>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>METRIC</td>
</tr>
<tr>
<td>Motor, Reducer and Intermittor Assembly – Belt Drive</td>
<td>65-12-00-101</td>
</tr>
<tr>
<td>Motor, Reducer and Intermittor Assembly – Integrated</td>
<td>65-12-00-103</td>
</tr>
<tr>
<td>Cam shaft Drive – Reducer to Cam Shaft</td>
<td>65-15-0-30</td>
</tr>
<tr>
<td>Upper Camshaft Drive – Clockwise</td>
<td>65-15-0-10</td>
</tr>
<tr>
<td>Upper Camshaft Drive – Counterclockwise</td>
<td>65-15-0-11</td>
</tr>
<tr>
<td>Idler End Drive – Clockwise</td>
<td>64-15-0-20</td>
</tr>
<tr>
<td>Idler End Drive – Counterclockwise</td>
<td>65-15-0-21</td>
</tr>
</tbody>
</table>

### 3.3 CHASSIS-INDEX

<table>
<thead>
<tr>
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<th>ATW Bodine DRAWING NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>METRIC</td>
</tr>
<tr>
<td>Torque Limiter Assembly – Autoguard</td>
<td>None</td>
</tr>
<tr>
<td>Torque Limiter Assembly – Mayr</td>
<td>65-12-00-202</td>
</tr>
<tr>
<td>Drive End / Drive Wheel Assembly (8” index)</td>
<td>65-12-00-302</td>
</tr>
<tr>
<td>Drive End / Drive Wheel Assembly (4” index)</td>
<td>65-12-00-302</td>
</tr>
<tr>
<td>Shot Pin Assembly - Clamp Type Cam Hub</td>
<td>65-12-00-402</td>
</tr>
<tr>
<td>Shot Pin Assembly - Taper Lock Cam Hub</td>
<td>65-12-00-406</td>
</tr>
<tr>
<td>Shot Pin Cam Assembly - Taper Lock Hub – 120° Index</td>
<td>See Imperial</td>
</tr>
<tr>
<td>Shot Pin Cam Assembly - Taper Lock Hub – 90° Index</td>
<td>See Imperial</td>
</tr>
<tr>
<td>Tooling Belt Assembly – 8” Index</td>
<td>65-14-0-10-N</td>
</tr>
<tr>
<td>Tooling Belt Assembly – 4” Index</td>
<td>65-14-0-20-N</td>
</tr>
<tr>
<td>Pallet Subassembly – With 3/8 Dowel Pins</td>
<td>65-14-00-201</td>
</tr>
<tr>
<td>Pallet Subassembly – With 10mm Stepped Pins</td>
<td>65-14-00-202</td>
</tr>
<tr>
<td>Idler End / Idler Wheel Assembly</td>
<td>65-13-0-1</td>
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### 3.4 MACHINE TIMING

<table>
<thead>
<tr>
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</thead>
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<tr>
<td>Dial Indicator Subassembly</td>
<td>See Imperial</td>
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<tr>
<td>Shaft Encoder Subassembly – Casting Mount</td>
<td>65-12-00-501</td>
</tr>
<tr>
<td>Shaft Encoder Subassembly – Plate Mount</td>
<td>65-12-00-501</td>
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</tbody>
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### 3.5 RISE AND FALL

<table>
<thead>
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<th>ATW Bodine DRAWING NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rise &amp; Fall Assembly</td>
<td>65-16-0-8</td>
</tr>
<tr>
<td>Rise &amp; Fall Stabilizer Assembly</td>
<td>65-16-0-6</td>
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<tr>
<td>Rise &amp; Fall Stabilizer Assembly - Short</td>
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### 3.6 LIGHT DUTY PRESS

<table>
<thead>
<tr>
<th>ASSEMBLY OR SUBASSEMBLY</th>
<th>ATW Bodine DRAWING NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light Duty Press (Standard Height)</td>
<td>65-20-0-20</td>
</tr>
<tr>
<td>Light Duty Press (Elevated)</td>
<td>65-20-0-21</td>
</tr>
<tr>
<td>Solid Link</td>
<td>65-20-00-201</td>
</tr>
<tr>
<td>Light Duty Press with Solid Link (Built before 2000)</td>
<td>92-20-0-1</td>
</tr>
<tr>
<td>Light Duty Press with Compliant Link (Built before 2000)</td>
<td>92-20-0-2</td>
</tr>
<tr>
<td>Air Cylinder Link (Standard)</td>
<td>65-20-00-203</td>
</tr>
<tr>
<td>Air Cylinder Link (Elevated)</td>
<td>65-20-00-204</td>
</tr>
<tr>
<td>Slide (Standard)</td>
<td>65-20-00-301</td>
</tr>
<tr>
<td>Slide (Elevated)</td>
<td>65-20-00-302</td>
</tr>
<tr>
<td>Adjustable Stop</td>
<td>65-20-00-303</td>
</tr>
</tbody>
</table>

### 3.7 MEDIUM DUTY PRESS

<table>
<thead>
<tr>
<th>ASSEMBLY OR SUBASSEMBLY</th>
<th>ATW Bodine DRAWING NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medium Duty Press (Standard Height)</td>
<td>65-28-0-20</td>
</tr>
<tr>
<td>Medium Duty Press (Elevated)</td>
<td>65-28-0-21</td>
</tr>
<tr>
<td>Solid Link</td>
<td>65-28-00-201</td>
</tr>
<tr>
<td>Air Cylinder Link (Standard)</td>
<td>65-28-00-203</td>
</tr>
<tr>
<td>Air Cylinder Link (Elevated)</td>
<td>65-28-00-204</td>
</tr>
</tbody>
</table>

### 3.8 TANDEM LEVER PRESS

<table>
<thead>
<tr>
<th>ASSEMBLY OR SUBASSEMBLY</th>
<th>ATW Bodine DRAWING NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tandem Lever Press (Standard Height)</td>
<td>65-25-0-20</td>
</tr>
<tr>
<td>Tandem Lever Press (Elevated)</td>
<td>65-25-0-21</td>
</tr>
<tr>
<td>Solid Link</td>
<td>65-25-00-201</td>
</tr>
<tr>
<td>Air Cylinder Link (Standard)</td>
<td>65-25-00-203</td>
</tr>
<tr>
<td>Air Cylinder Link (Elevated)</td>
<td>65-25-00-204</td>
</tr>
</tbody>
</table>
### 3.9 HEAVY DUTY PRESS

<table>
<thead>
<tr>
<th>ASSEMBLY OR SUBASSEMBLY</th>
<th>ATW Bodine DRAWING NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>METRIC</td>
</tr>
<tr>
<td>Heavy Duty Press</td>
<td>65-21-0-20</td>
</tr>
<tr>
<td>Link Pivot (2 Tie Bar)</td>
<td>65-21-00-201</td>
</tr>
<tr>
<td>Link Pivot (4 Tie Bar)</td>
<td>65-21-00-202</td>
</tr>
<tr>
<td>Solid Tie Rod</td>
<td>65-21-00-203</td>
</tr>
<tr>
<td>10” Adjustment Link</td>
<td>65-21-00-204</td>
</tr>
<tr>
<td>8” Adjustment Link</td>
<td>65-21-00-205</td>
</tr>
<tr>
<td>Lock Out Air Cylinder Link (1.50”/40mm Bore)</td>
<td>65-21-00-206</td>
</tr>
<tr>
<td>Lock Out Air Cylinder Link (2.00” Bore)</td>
<td>See Imperial</td>
</tr>
<tr>
<td>Tandem Levers</td>
<td>65-21-00-208</td>
</tr>
<tr>
<td>Vertical Slide (Standard)</td>
<td>65-21-00-301</td>
</tr>
<tr>
<td>Vertical Slide (Extended)</td>
<td>65-21-00-302</td>
</tr>
<tr>
<td>Tie Rod Coupling</td>
<td>65-21-00-406</td>
</tr>
<tr>
<td>Slide/Bearing Block</td>
<td>65-21-00-407</td>
</tr>
<tr>
<td>Tie Rod</td>
<td>65-21-00-408</td>
</tr>
<tr>
<td>Force Regulator</td>
<td>65-21-00-410</td>
</tr>
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### 3.10 RADIAL POSITIONING UNIT (ROTARY SWAP)

<table>
<thead>
<tr>
<th>ASSEMBLY OR SUBASSEMBLY</th>
<th>ATW Bodine DRAWING NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>METRIC</td>
</tr>
<tr>
<td>Radial Positioning Unit</td>
<td>M64-42-0-2</td>
</tr>
<tr>
<td>Radial Positioning Unit (Levers on center)</td>
<td>65-42-0-23</td>
</tr>
<tr>
<td>Double Acting Link (Horizontal link)</td>
<td>65-42-00-201</td>
</tr>
</tbody>
</table>

### 3.11 RECTANGULAR PICK AND PLACE

<table>
<thead>
<tr>
<th>ASSEMBLY OR SUBASSEMBLY</th>
<th>ATW Bodine DRAWING NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>METRIC</td>
</tr>
<tr>
<td>Rectangular Pick and Place (Standard Height)</td>
<td>65-51-0-20</td>
</tr>
<tr>
<td>Rectangular Pick and Place (Elevated)</td>
<td>65-51-0-21</td>
</tr>
<tr>
<td>Parallel Pick and Place (Standard Height)</td>
<td>65-51-0-22</td>
</tr>
<tr>
<td>Parallel Pick and Place (Elevated)</td>
<td>65-51-0-23</td>
</tr>
<tr>
<td>Rectangular Pick and Place – Standard (Built before 2000)</td>
<td>92-51-0-5</td>
</tr>
<tr>
<td>Rectangular Pick and Place – Elevated (Built before 2000)</td>
<td>N.A.</td>
</tr>
<tr>
<td>Parallel Pick and Place - (Built before 2000)</td>
<td>92-51-0-6</td>
</tr>
<tr>
<td>Compliant Link</td>
<td>65-51-00-201</td>
</tr>
<tr>
<td>Dual Cam Path – Vertical</td>
<td>65-51-00-202</td>
</tr>
<tr>
<td>Dual Cam Path – Horizontal</td>
<td>65-51-00-203</td>
</tr>
<tr>
<td>Dual Cam Path – Combination</td>
<td>65-51-00-204</td>
</tr>
<tr>
<td>Bearing Block Extension (No adapter)</td>
<td>65-51-00-301</td>
</tr>
<tr>
<td>Bearing Block Extension (With adapter)</td>
<td>65-51-00-302</td>
</tr>
<tr>
<td>Horizontal Stabilizer</td>
<td>65-51-00-303</td>
</tr>
<tr>
<td>Oscillating Pick and Place</td>
<td>65-51-00-402</td>
</tr>
<tr>
<td>Rollover – A to A - Dual Gear</td>
<td>65-51-00-403</td>
</tr>
<tr>
<td>Rollover – A to B - Dual Gear</td>
<td>65-51-00-404</td>
</tr>
<tr>
<td>Rollover – A to A - Single Gear</td>
<td>65-51-00-405</td>
</tr>
<tr>
<td>Rollover – A to B - Single Gear</td>
<td>65-51-00-406</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>4 – Head Mounting (38.1mm Centers)</td>
<td>65-51-00-501</td>
</tr>
<tr>
<td>Tool Mounting Block</td>
<td>65-51-00-503</td>
</tr>
<tr>
<td>Dual Tool Mounting Block</td>
<td>65-51-00-504</td>
</tr>
<tr>
<td>Positioning Plate (51-30-1 plate)</td>
<td>65-51-00-505</td>
</tr>
<tr>
<td>Positioning Plate (51-137 plate)</td>
<td>65-51-00-506</td>
</tr>
<tr>
<td>Back up Block</td>
<td>(None-See Imperial)</td>
</tr>
<tr>
<td>Mini Positioning Plate (51-209 plate)</td>
<td>65-51-00-508</td>
</tr>
<tr>
<td>Mini Positioning Plate (51-289 plate)</td>
<td>65-51-00-509</td>
</tr>
<tr>
<td>Compensating Tool Mounting Block</td>
<td>65-51-00-510</td>
</tr>
</tbody>
</table>

### 3.12 HEAVY DUTY PRESS PICK AND PLACE

<table>
<thead>
<tr>
<th>ASSEMBLY OR SUBASSEMBLY</th>
<th>ATW Bodine DRAWING NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>METRIC</td>
</tr>
<tr>
<td>Heavy Duty Press/Pick and Place</td>
<td>65-53-0-10</td>
</tr>
<tr>
<td>Slide/Bearing Block</td>
<td>65-53-00-401</td>
</tr>
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</table>

### 3.13 INSPECTION

<table>
<thead>
<tr>
<th>ASSEMBLY OR SUBASSEMBLY</th>
<th>ATW Bodine DRAWING NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>METRIC</td>
</tr>
<tr>
<td>Inspection, Single Switch (Presence &amp; Position)</td>
<td>65-61-0-19</td>
</tr>
<tr>
<td>Inspection, Dual Switch (Presence &amp; Position)</td>
<td>65-61-0-20</td>
</tr>
<tr>
<td>Inspection, Position Only</td>
<td>65-61-0-21</td>
</tr>
<tr>
<td>Gaging Inspection (Mitutoyo/Federal)</td>
<td>65-61-00-801</td>
</tr>
<tr>
<td>Gaging Inspection (Novotechnik))</td>
<td>65-61-00-802</td>
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</table>

### 3.14 RISE AND FALL MOUNTED ASSEMBLIES AND COMPONENTS

<table>
<thead>
<tr>
<th>ASSEMBLY OR SUBASSEMBLY</th>
<th>ATW Bodine DRAWING NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>METRIC</td>
</tr>
<tr>
<td>Inspection Mount or Hold Down (No switches)</td>
<td>65-61-0-22</td>
</tr>
<tr>
<td>Rise and Fall Mounted Griphead</td>
<td>65-61-00-901</td>
</tr>
<tr>
<td>Inspection Bracket Sub-assembly (Short)</td>
<td>65-61-00-902</td>
</tr>
<tr>
<td>Inspection Bracket Sub-assembly (Tall)</td>
<td>65-61-00-903</td>
</tr>
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</table>

### 3.15 RISE AND FALL ACTUATED SLIDE ASSEMBLIES

<table>
<thead>
<tr>
<th>ASSEMBLY OR SUBASSEMBLY</th>
<th>ATW Bodine DRAWING NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>METRIC</td>
</tr>
<tr>
<td>Rise and Fall Actuated Slide (Solid Link)</td>
<td>65-64-0-10</td>
</tr>
<tr>
<td>Rise and Fall Actuated Slide (Compensating)</td>
<td>65-64-0-11</td>
</tr>
<tr>
<td>Rise and Fall Actuated Slide (Air Cylinder Link)</td>
<td>65-64-0-12</td>
</tr>
<tr>
<td>Rise and Fall Actuated Slide (Air Cylinder Link)</td>
<td>65-64-0-13</td>
</tr>
</tbody>
</table>
### 3.16 LEVERS AND MISCELLANEOUS SUBASSEMBLIES

<table>
<thead>
<tr>
<th>ASSEMBLY OR SUBASSEMBLY</th>
<th>ATW Bodine DRAWING NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical 180° Grip Head (Horizontal Mount)</td>
<td>65-50-00-101 (No Imperial)</td>
</tr>
<tr>
<td>Solid Link Double Rod End (Turn Buckle)</td>
<td>65-50-00-201</td>
</tr>
<tr>
<td>Horizontal Lever with Cam Follower @ 300°</td>
<td>65-50-00-301</td>
</tr>
<tr>
<td>Horizontal Lever with Cam Follower @ 60°</td>
<td>65-50-00-302</td>
</tr>
<tr>
<td>Vertical Lever with Hole for Link</td>
<td>65-50-00-401</td>
</tr>
<tr>
<td>Vertical Lever with Adjustment Slot for Link</td>
<td>65-50-00-402</td>
</tr>
</tbody>
</table>

### 3.17 COMPLIANT LINK SUBASSEMBLIES

<table>
<thead>
<tr>
<th>ASSEMBLY OR SUBASSEMBLY</th>
<th>ATW Bodine DRAWING NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tension Link (Charted)</td>
<td>M64-70-0</td>
</tr>
<tr>
<td>Double Acting Link (RPP)</td>
<td>M64-51-98</td>
</tr>
<tr>
<td>Double Acting Link (Charted)</td>
<td>M64-71-0</td>
</tr>
<tr>
<td>Double Acting Link (RPU)</td>
<td>65-42-00-201</td>
</tr>
<tr>
<td>Double Acting Link (Charted)</td>
<td>65-71-00-201</td>
</tr>
<tr>
<td>Double Acting Link (Walking Beam)</td>
<td>76-14-7</td>
</tr>
<tr>
<td>Compression Link (Charted)</td>
<td>M64-72-0</td>
</tr>
<tr>
<td>Compression Link (Charted)</td>
<td>M64-73-0</td>
</tr>
<tr>
<td>Compression Link (Charted)</td>
<td>65-51-00-201</td>
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### 3.18 SOLID LINK SUBASSEMBLIES

<table>
<thead>
<tr>
<th>ASSEMBLY OR SUBASSEMBLY</th>
<th>ATW Bodine DRAWING NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid Link – Light Duty Press</td>
<td>65-20-00-201</td>
</tr>
<tr>
<td>Solid Link – Medium Duty Press</td>
<td>65-28-00-201</td>
</tr>
<tr>
<td>Solid Link – Tandem Lever Press</td>
<td>65-25-00-201</td>
</tr>
<tr>
<td>Solid Link – 8mm [5/16&quot;] Rod ends</td>
<td>65-50-00-201</td>
</tr>
</tbody>
</table>

### 3.19 AIR CYLINDER LINK SUBASSEMBLIES

<table>
<thead>
<tr>
<th>ASSEMBLY OR SUBASSEMBLY</th>
<th>ATW Bodine DRAWING NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Cylinder Link - Light Duty Press - Standard</td>
<td>65-20-00-203</td>
</tr>
<tr>
<td>Air Cylinder Link - Light Duty Press - Elevated</td>
<td>65-20-00-204</td>
</tr>
<tr>
<td>Air Cylinder Link - Medium Duty Press - Standard</td>
<td>65-28-00-203</td>
</tr>
<tr>
<td>Air Cylinder Link - Medium Duty Press - Elevated</td>
<td>65-28-00-204</td>
</tr>
<tr>
<td>Air Cylinder Link – Tandem Lever Press - Standard</td>
<td>65-25-00-203</td>
</tr>
<tr>
<td>Air Cylinder Link – Tandem Lever Press - Elevated</td>
<td>65-25-00-204</td>
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</tbody>
</table>
3.20 DEAD END/ESCAPEMENT MOUNT SUBASSEMBLIES

<table>
<thead>
<tr>
<th>ASSEMBLY OR SUBASSEMBLY</th>
<th>ATW Bodine DRAWING NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounting Column Assembly – Dead End</td>
<td>92-80-0-1</td>
</tr>
<tr>
<td>Block and Plate Style Mounting (“Diving Board”)</td>
<td>65-80-0-3</td>
</tr>
<tr>
<td>Locating Sleeve Style Mounting (“Diving Board”)</td>
<td>65-80-0-4</td>
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3.21 FEEDER MOUNTING ASSEMBLIES

<table>
<thead>
<tr>
<th>ASSEMBLY OR SUBASSEMBLY</th>
<th>ATW Bodine DRAWING NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feeder Mounting - Universal</td>
<td>65-80-0-5</td>
</tr>
<tr>
<td>Feeder Mounting – With Strap</td>
<td>65-80-0-6</td>
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</table>

3.22 FIXTURE SUPPORT ASSEMBLIES

<table>
<thead>
<tr>
<th>ASSEMBLY OR SUBASSEMBLY</th>
<th>ATW Bodine DRAWING NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light Support (Mounts to Fixture Plate Guide Support)</td>
<td>M64-14-108</td>
</tr>
<tr>
<td>Heavy Support (Weldment)</td>
<td>M64-14-146</td>
</tr>
</tbody>
</table>