MORGAN-PRESS®

OPERATING INSTRUCTIONS

MADE-RITE

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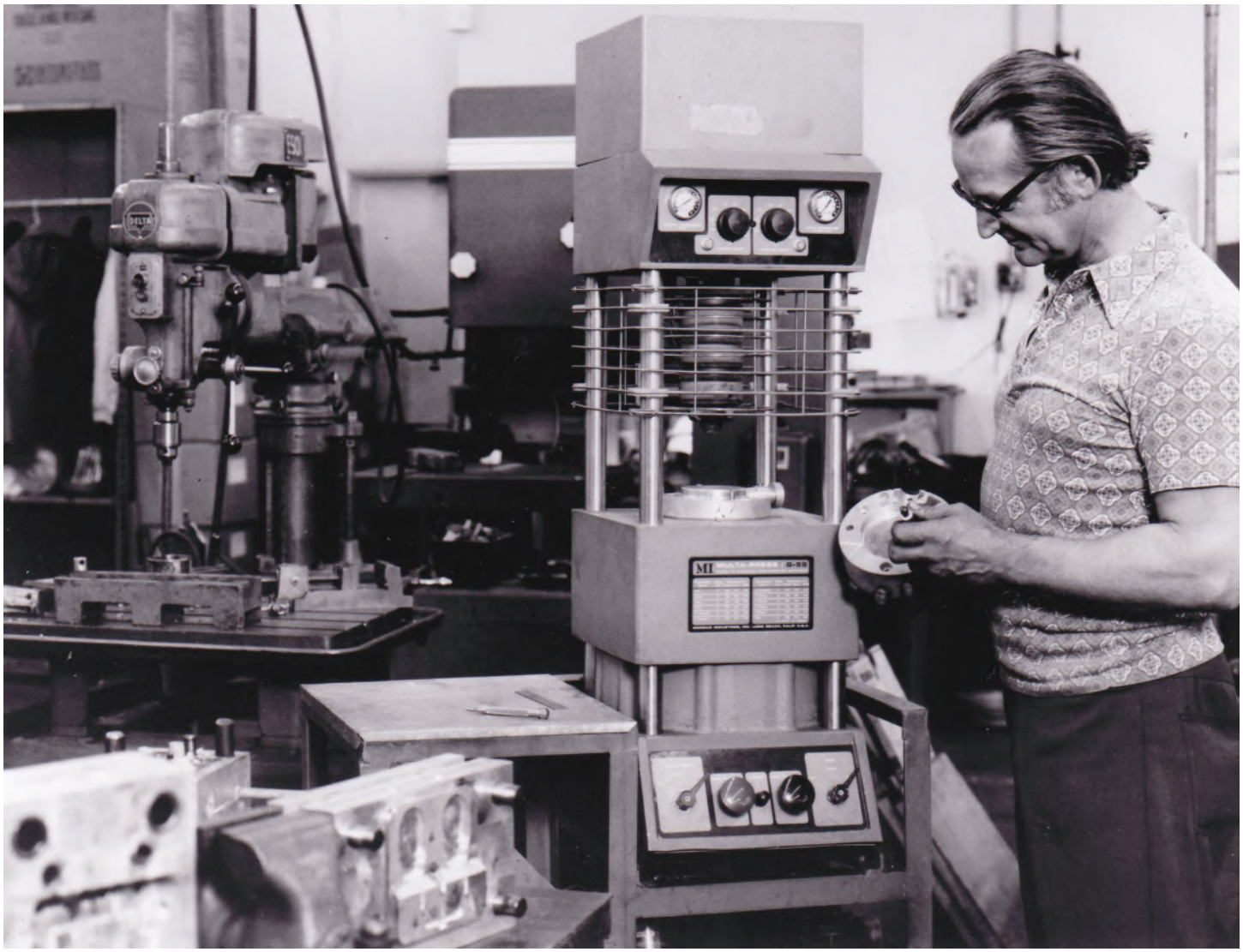

*Photo of the 8-ton air-base version of the MORGAN-PRESS ®

The origin of the MORGAN-PRESS® traces back to an 8-ton press design by Phil Morgan. Morgan Industries, Inc. carried on later development of Phil Morgan's concept into a powerful 20-ton press. And since its inception in 1968, Morgan Industries, Inc. specialized in the design and manufacture of this efficient, low-volume injection molding press.

MADE-RITE has now assumed the mantle of MORGAN-PRESS® production with a new vision to increasing long term reliability, while at the same time retaining the simplicity and function of the original Morgan Industries, Inc. MORGAN-PRESS®.

With facilities and capabilities geared to this goal, and our access to the original experts, our team is available to help satisfy your particular requirements.

Welcome to MADE-RITE.

MORGAN-PRESS®

Injection Molding Machine
Models # MRG-C1A, MRG-M1A

OPERATING INSTRUCTIONS

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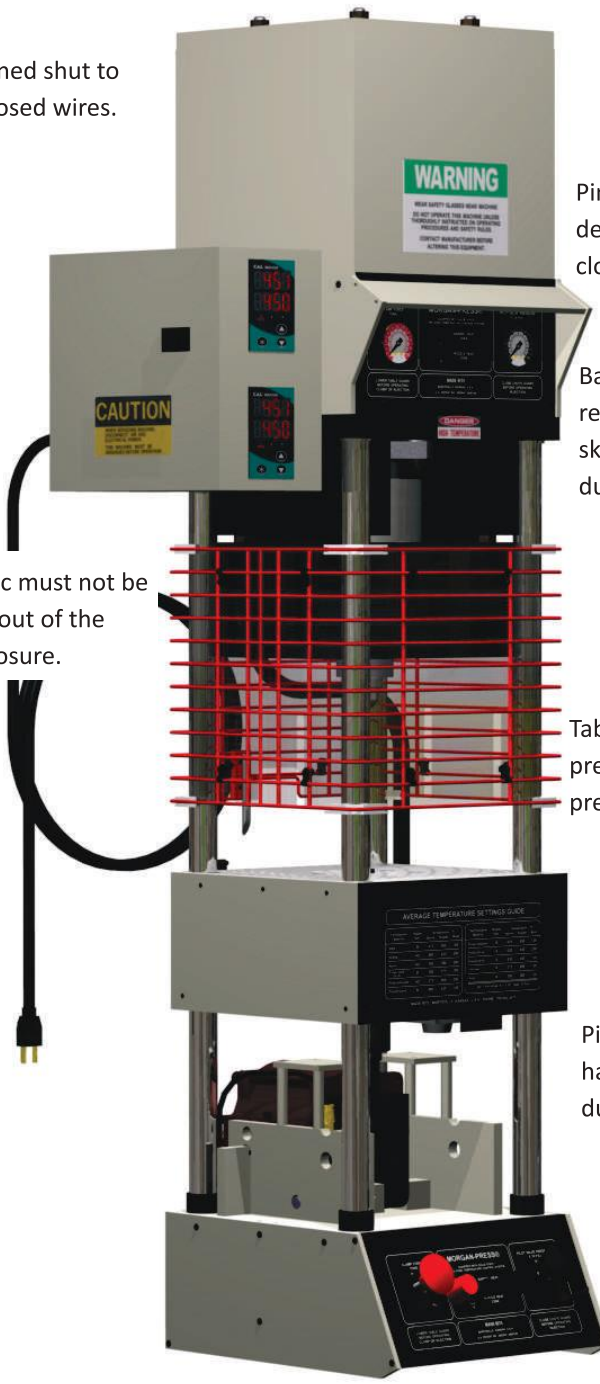
MORGAN-PRESS®

SAFETY ALERTS

Figure 0.1

Pneumatic environments require hearing protection.

Keep cabinet fastened shut to limit access to exposed wires.



Pinch point inside material feed chute. Do not defeat interlocks, and keep wire chute guard closed.

Barrel and Nozzle Zones of the melt chamber reaches temperatures hot enough to burn skin. Do not touch or approach this region during a heating cycle.

Hot melted plastic must not be allowed to spray out of the Table Guard enclosure.

Pinch points can accure when the mold is being closed by the raising of the Plate Table.

Table Guard must be closed during molding to prevent anything being launched from the press region.

Pinch points below table skirting. Keep hands and tools away from this region during operation.

SAFETY ALERTS

Please keep the manual readily available for future reference.

Definitions:

Warnings: these are alerts for the owner/operator to observe to take proper care of the people in use of, in contact with, or in the vicinity of the MORGAN-PRESS® and to avoid conditions that may hurt or harm any such person/people.

Cautions: these are alerts for the owner/operator to observe to take proper care of the MORGAN-PRESS® and to avoid conditions that may damage the machine, either by misuse or abuse.

WARNINGS

- **Severe burns** can be caused by skin contact with the barrel and nozzle zones of the MORGAN-PRESS®, whether it is only heating up to or at operating temperature. Always keep shields and interlocks in place and fully functional, and avoid putting one's body or parts in the proximity of contact with the heating or heated barrel and nozzle zones.

- **Severe burns** can be caused by skin contact with newly extruded molten resin as it drips from the nozzle of the melt chamber. Always keep shields and interlocks in place and fully functional, always use the provided tools (or their equivalent) to handle molten resin indirectly, and always prevent direct skin or clothing contact with molten resin.

- **Minor-to-moderate-to-severe burns** can be caused by accidental skin contact with or deliberate direct handling of newly molded product. Always use the provided tools (or their equivalent) to handle newly molded product indirectly, and always prevent direct skin or clothing contact with newly molded product.

- **Minor-to-moderate-to-severe burns** can be caused by handling of hot molds. Molds can be preheated to operational temperature, or heated by the injection process. Always use protective gloves and other appropriate gear to handle molds indirectly, and always prevent direct skin contact with hot molds.

- **Moderate-to-severe burns** can be caused by prolonged contact to extruded or molded resin stuck to skin or clothing. Some resins will have a greater tendency to adhere to skin or clothing when molten and/or cooling. Always follow the safety guides and alerts from the resin manufacturer, and always prevent direct skin or clothing contact with molten resin and/or newly molded product.

- **Crush injuries or amputations** can be caused by defeating shields and interlocks, and placing body parts in pinch points. The MORGAN-PRESS® is a 20-ton press. Always keep shields and interlocks in place and fully functional, and always prevent the placement of body parts into the proximity of a pinch point on the press.

- **Finger crush injury or amputation** can be caused by the injection ram piston when bypassing the shield (chute guard) and placing hands or fingers into the resin chute at the beginning of an injection cycle. Always keep shields and interlocks in place and fully functional, always use the provided tools (or their equivalent) for advancing resin in the chute toward the melt chamber, and always prevent placement of body parts in the resin chute during the injection cycle.

- **Finger or hand crush injury** can be caused by the clamp action of the press platens when bypassing the shield (table guard) interlock and placing hands or fingers either between mold halves or between any other clamp together pieces of the mold tool closed by the table air cylinder. Always keep shields and interlocks in place and fully functional, and always prevent placement of body parts between any closing feature of the platens and mold tool during the clamp cycle.

- **Bodily injury** can be caused by the clamp action of the press platens shooting out an incorrectly placed mold tool when bypassing the shield (table guard) interlock and leaving the shield open during operation of the clamp air cylinder. Always keep shields and interlocks in place and fully functional during operation of the press.

- **Moderate-to-severe burns** can be caused by molten resin shot under full injection pressure from a catastrophically ruptured or improperly secured mold when the shield's (table guard) polycarbonate lining is removed, or is not maintained. Always ensure that the polycarbonate lining is in good condition and properly secured to the shield (table guard) to catch any stray molten resin.

- **All AC electrical devices carry a shock, burn or electrocution hazard**. Always make sure that the temperature control cabinet power cord is pliable and uncracked before plugging in to a power source. Always ensure that the power cord unplugged when performing any service activities in the temperature control cabinet. Always ensure that the temperature control cabinet is fastened shut when power cord is plugged in.

- **Significant soft tissue injury** can be caused by 160 psi air rushing from leaking hoses and fittings. Always ensure that the pneumatic system is inspected and repaired when air leaks are observed.

- Repeated auditory exposure to air release sound can cause **cumulative injury to hearing**. Rupture of pneumatic hoses or fittings can cause **immediate injury to hearing**. Always ensure that operators and others in the vicinity of the press use appropriate hearing protection.

- **Eye injury** is a frequent complaint in any industrial environment. Always ensure that operators and others in the vicinity of the press use appropriate eye protection.

- **Irritation** can be experienced due to fumes from overheated resins. Always ensure that the press is operated in an appropriately ventilated area. Always ensure that resin is cycled through the heated barrel and not allowed to sit and decompose in the heat.

- **Impact injury** may occur to hands when a mold tool hanging by chilled off plastic in the nozzle drops suddenly. Always keep hands out from underneath a mold tool in such a situation. Always

ensure that wood or plastic supports are used under a hanging mold in such a situation to block hands from getting underneath.

CAUTIONS

- Lubrication of the external mechanical points is necessary for proper behavior and long-term reliability of the press. Ensure that all external oil and grease points are lubricated once for every 8 hours of continuous operation.

- Lubrication of the pneumatic system is necessary for proper behavior and long-term reliability of the press. Ensure that an appropriate pneumatic filter and lubrication system is in place. Ensure that the air lubricator oil level is kept at the correct level and feed rate.

- Sharing press clamp loads above 10 tons on upper unit of the press between the nozzle and the upper platen assembly is necessary to prevent overloading on the melt chamber barrel. Always ensure that before the clamp pressure is increased above 10 tons, accommodation to support the mold between the upper and lower platens is in place.

- Impact injury may occur to the table or mold tool when a mold tool hanging by chilled off plastic in the nozzle drops suddenly. Always ensure that plans are in place to properly support and stabilize molds when using resins which may be more susceptible to chilling off quickly. Always ensure that the press is unclamped once the injection cycle is complete to reduce incidence of heavy mold tools hanging from the press nozzle.

- Crush damage can occur to the press or mold tool or mold inserts when the plates of the mold are misaligned during clamping. Always ensure that operators are properly trained on preparing and placing molds in the press for clamping. Always ensure that operators are properly trained on aborting an incomplete clamp cycle once misaligment of the mold plates is observed.

- Damage can occur to the structure and to pneumatic components of the press if the line-in pressure is above 160 psi. Always ensure that the shop air directed to the press remains at or below 160 psi.

- Damage can occur to the pilot valve on the Injection Speed Control system if the injection pressure is set above 70 psi. Always ensure the injection pressure is set to the green zone on the gauge. Always ensure that the operator is properly trained on the limits of the pilot valve and how to set up the press properly for operation.

- Damage can occur to the elevating gear set if an operator attempts to elevate the table platen while it is clamped over a mold set. Always ensure that the table platen is only in the open and unloaded condition when using the elevating gear set.

- Premature wear can occur to the ram air cylinder and return valve due to inappropriate use of the ram air cylinder return valve. Always ensure that the ram air cylinder return valve control is released once the ram has returned to its origin. Always ensure that the operator is properly trained on the use of the ram air cylinder return valve.

- Damage to threads in the nozzle and barrel can occur while operating the press due to failure to correctly seat and tighten the nozzle. A proper seat cannot be ensured when tightening a cold nozzle in a barrel whether the barrel is cold or hot. Always ensure that the partially installed nozzle and barrel are allowed to reach operating temperature before the nozzle is tightened onto its seat. Always ensure that the operator is properly trained on installation of the nozzle.

CARE & MAINTENANCE

The MORGAN-PRESS® requires very little regular maintenance. However, it is recommended that the following procedures be adopted, in addition to common sense, in caring for and maintaining the press:

- On presses with the Pneumatic Hookup Kit, maintain the proper oil level in your filter/lubricator and clean the filter regularly, especially of excess water, to ensure proper functioning of the unit. Adjust oiler for approximately one drop of 10 weight non-detergent oil every five cycles. The clean, oiled air acts as a lubricant inside the working parts of the machine.

- Stanchion posts should be wiped clean and lightly oiled regularly.

- Put oil in the holes and grease in the zerks provided on the thrust and pivot arms of toggle mechanism under the table on weekly basis or when dry.

- Keep dirt, granules and chips out of the toggle area and off the table platen.

- Grease the elevating gears under the table platen every six months.

- Always keep the Ram Shaft clear of excess material.

- Inspect and clean air cylinders, re-lube and change o-rings once a year. O-ring service kits and instructions are available from MADE-RITE.

- Keep work area tidy.

- Inspect mechanical toggle parts regularly for signs of wear, particularly pivot points such as the toggle and pivot arms. Check that set screws are tight. If screws are loose apply medium strength threadlocker compound on threads and secure screws tightly.

PRECAUTION HIGHLIGHTS

A machine is safe in the hands of a diligent operator. Before starting setup and operation, please review these repeated cautions and essential steps:

- **READ INSTRUCTIONS.** Owners and operators: become familiar with operational characteristics of equipment before proceeding "full speed ahead!"
- Do not exceed 160 psi air pressure input.
- Be sure table and toggle area are clear of personnel and foreign objects before connecting main air supply. Check valves for proper "off" settings.
- Clean air, filtered and lubricated, is essential for proper maintenance and operation of equipment.
- Always clamp against the upper platen assembly and not the nozzle when repeatedly clamping molds at 10 tons or greater (see upper platen instructions).
- Avoid contact with molten material. Severe burns will occur.
- Use the electrical cord provided or equivalent. Be sure outlet is properly grounded.
- Never operate the table unless the mold is properly located.
- Do not operate elevating gears while fully clamped.
- Do not let melted plastic build up around the top of the barrel.
- Do not hold the ram return in once the ram shaft has returned to its origin.
- When molding corrosive materials, insure that purging is complete before shutdown.
- When purging barrel, lower table guard to protect operator from incidental splashing of very hot molten plastic.
- Raise the injection piston above the barrel when shutdown.
- Be sure main electrical and air supplies are disconnected for complete shutdown.
- Do not override the safety interlocks.
- Do not remove any safety shields, safety warnings, or safety devices.
- Extension cords (electrical) should be as short as possible and constructed of a minimum 14 gauge wire.
- Do not tighten a cold nozzle into a hot barrel (see nozzle instructions).
- Wear safety glasses near machine for eye protection.
- Always consult material manufacturer's recommendations for correct handling and processing of thermoplastic materials.
- When working with hot molds, wear protective gloves and other appropriate gear.
- Keep hands away from moving table platen during operation on both the clamp and unclamp (up and down) strokes.

LIMITED WARRANTY

MADE-RITE offers the following warranty on the purchase of a new MADE-RITE brand MORGAN-PRESS® and accessories.

MADE-RITE machines and accessories are warranted against all defects in workmanship and materials for a period of one year from date of shipment from MADE-RITE plant. Electrical and pneumatic components are warranted for 90 calendar days from date of shipment. All defects are subject to factory inspection.

MADE-RITE may, at its option, (a) furnish new or repaired components in exchange for those found to be defective, in which case the purchaser remains responsible for removal and replacement labor, or (b) request that the defective machine or accessory be returned to MADE-RITE for repair, in which case the purchaser remains responsible for all freight charges.

Please note there is a distinction between "defects" and "damage" as used in this warranty. Defects are covered because we, the manufacturer, are responsible. On the other hand, we have no control over damage caused by such things as accident, transportation, improper operation, misuse, abuse and lack of maintenance after shipment. Therefore, damage for any reason is not covered under the warranty.

MADE-RITE assumes no responsibility for loss of use of the machine or accessories, loss of time, inconvenience, or other consequential damages.

Personnel safety is of primary importance when utilizing this equipment. Insuring safe operation to include maintenance and use of the existing shields and interlock devices is the responsibility of the owner of the equipment. All personnel utilizing the equipment should be properly instructed according to the directions before using equipment.

As the owner, you are responsible for properly caring for and maintaining this equipment. Proper operation of this equipment is also most important. MADE-RITE cannot be responsible for misuse of equipment or modifications to equipment that are not recommended or approved by MADE-RITE. Routine maintenance, safety and operating procedures are contained in the operating instructions. This warranty gives you specific legal rights and you may also have other rights, which may vary from state to state.

All expressed and implied warranties, including warranty of merchantability, are limited to the period of the limited warranty.

MADE-RITE is sincerely interested in your satisfaction with its products. Should you encounter a problem in connection with this warranty or have any questions regarding the equipment, please feel free to discuss them with MADE-RITE and/or its representatives. MADE-RITE may be contacted toll-free within the U.S.A. and Canada at 1-800-875-3004.

WARRANTY INFORMATION

Product Name _____

Model _____

Default Warranty Period _____

For your own reference, we strongly recommend that you record your date of purchase, invoice number and machine serial number.

Date of Purchase _____

Invoice Number _____

Machine Serial Number _____

INTRODUCTION

MORGAN-PRESS® Injection Molding Machine

The MORGAN-PRESS® is an injection molding machine with air driven pistons providing the power to clamp molds and inject thermoplastic material into molds. It is designed specifically for economical molding of applications involving prototyping and lower quantity production requirements. Its temperature range capability permits working with most conventional thermoplastic molding materials.

READ ALL PROVIDED INSTRUCTIONS CAREFULLY PRIOR TO OPERATING THE MACHINE noting particularly the precautionary do's and don'ts. Please observe common sense safety practices and use caution when operating the equipment. Proceed carefully until fully familiar with operational characteristics of the equipment. Machine operators should be thoroughly and properly oriented before proceeding unsupervised. We invite you to consult with us to answer your questions or provide additional assistance. MADE-RITE may be contacted toll-free within the U.S.A. and Canada at 1-800-875-3004.

We have included a summary listing of warnings, cautions and other important safety and operating checks with these instructions. We suggest that you make extra copies and keep them posted near the equipment as everyday reminders for personnel involved with your machine.

Before altering any portion of this equipment, contact MADE-RITE to discuss any possible hazards. Most importantly DO NOT REMOVE, OVERRIDE OR ALTER THE SAFETY DEVICES.

Various utensils, accessories and optional equipment were shipped with this equipment. The functions and uses for these items are described in this instruction manual.

Molding with the MORGAN-PRESS®

The MORGAN-PRESS® has a generous and variable working area which allows the operator to go back-and-forth between plain featured manual open/shut mold cavity sets, to very complex semi-automatic mold cavity sets.

Start Simple

When learning the ropes, it is best to start with the most straightforward process to produce your mold cavity set. The key to success on the MORGAN-PRESS® is to get the press making product or proving out some aspect of product development. This usually means making a plain manual open/shut mold cavity set that will require a lot of interaction from an operator. You might use a 3D model, CAM software and a CNC mill to make your cavity, but all other features would be very basic.

This process of producing molds, and using these molds, can go on until labor and other time-based cost becomes prohibitive for the specific project, at which time progressing to more complex mold sets can be examined.

Time Savings with Semi-Automation

After familiarity and experience is gained in setting up and operating the MORGAN-PRESS®, as well as in designing and producing simple molds, progressing onto semi-automatic mold design may be worth consideration. Semi-automatic mold sets reduce the amount of operator interaction required pe

injection cycle by opening and closing the mold set for the operator, allowing more parts to be made per hour on the press.

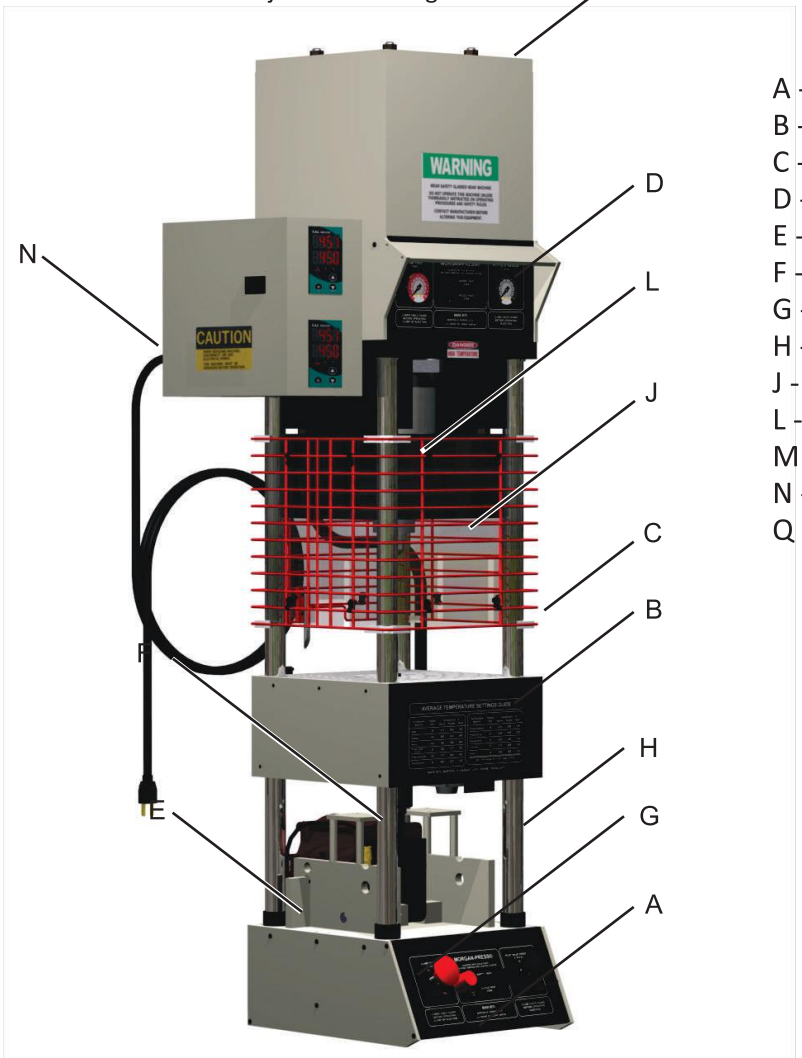
Even more time savings can be effected by adding ejection pins to a semi-automatic mold cavity set. In this scenario, not only would the clamp cycle open and close the mold automatically, but it would also pop the finished part out of the mold at the bottom of the clamp stroke (open mold condition). Semi-automation requires more advanced tooling, and increases setup time, but also consequently greatly reduces the cycle rate from part to part during the press operation. A semi-automatic mold set may also provide an edge for projects involving overmolding or insert molding, where it may be cost prohibitive to buy tooling for much more elaborate injection molding machines. Overmolding and insert molding can be done competitively on the MORGAN-PRESS® due to the low overall cost of the machine and tooling, paired with the similar cycle times for a well semi-automated process.

MADE-RITE

MORGAN-PRESS®

Injection Molding Machine

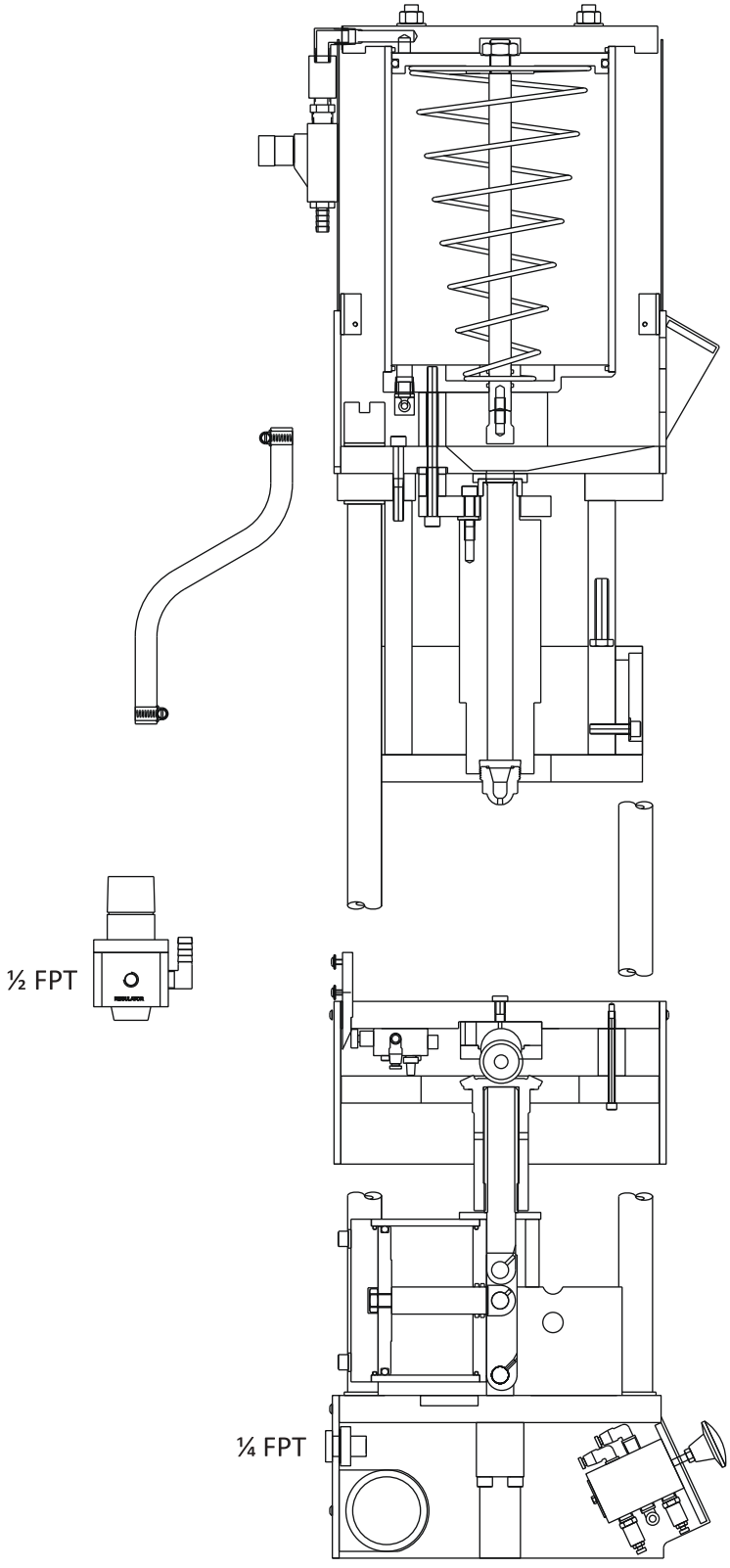
Figure 1.1



A - Base Mount Assembly
B - Table Assembly
C - Table Guard
D - Upper Unit
E - Table Air Cylinder
F - Thrust Shaft Assembly
G - Toggle System
H - Tie Bar Assembly
J - Upper Platen Assembly
L - Barrel Assembly
M - Ram Cylinder Assembly
N - Temperature Controller
Q - Injection Speed Control (not shown)

Figure 1.2

2D Layout



SETUP INSTALLATION

1. Remove the MORGAN-PRESS® from its wooden container.

Figure 2.1

NOTE: This shipping container was custom made for transporting the equipment. The container should be retained in case of warranty, service, or other transport requirements.

2. Locate the MORGAN-PRESS® in a well ventilated area.

3. Set the MORGAN-PRESS® on the workbench where it will be operated before installing Temperature Control System. This control system is fragile so it is best not to physically move machine with control cabinet attached. Mount machine to bench if desired (see Machine Mounting).

4. Install Temperature Control System following the step by step directions in the section "Temperature Control System Installation Guide."

NOTE: the MORGAN-PRESS® should be connected to its own 120VAC/20 amp grounded, dedicated electrical outlet.

5. This machine is equipped with Injection Speed Control: install the hose, muffler, and pressure control according to the instructions contained in the section "Injection Speed Control."

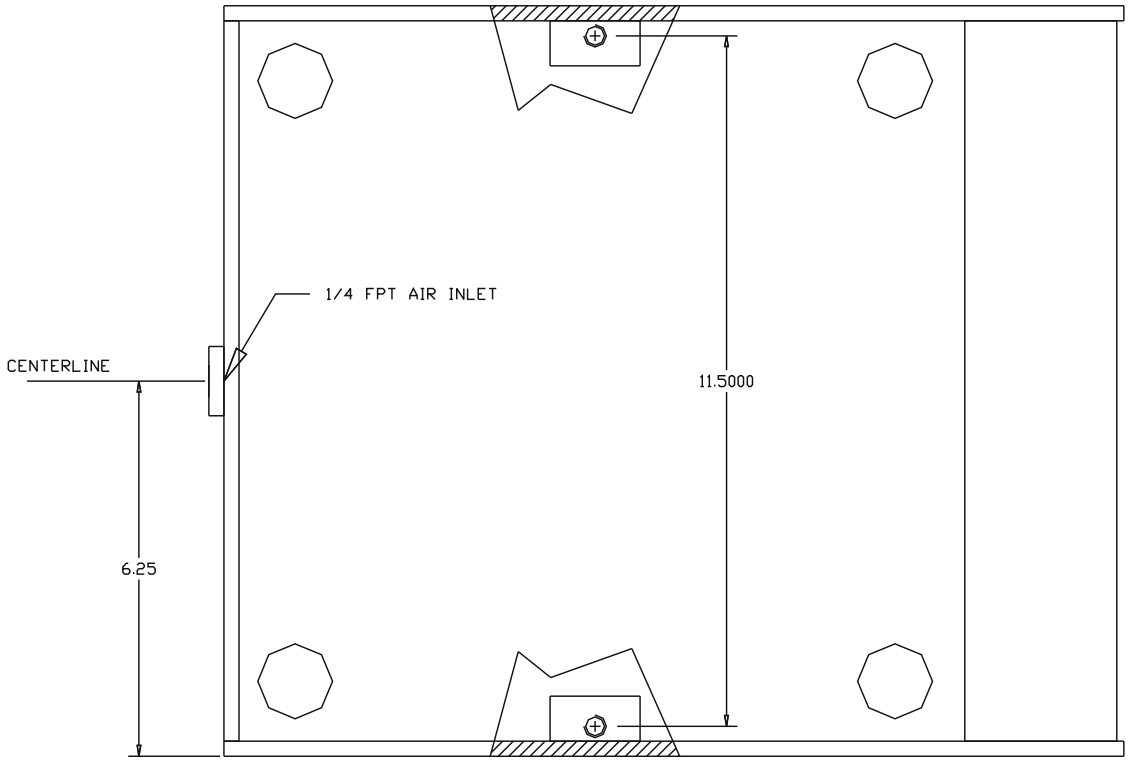
6. Connect main air supply to 1/4" FPT air inlet fitting in rear base of machine (See Machine Mounting, and Pneumatic Hook-Up). Be sure all air supply lines to equipment are properly filtered and lubricated to ensure trouble-free pneumatic operation.

7. Your machine is now ready for operation. Read the instructions thoroughly before utilizing equipment to ensure safe and correct operating procedures.

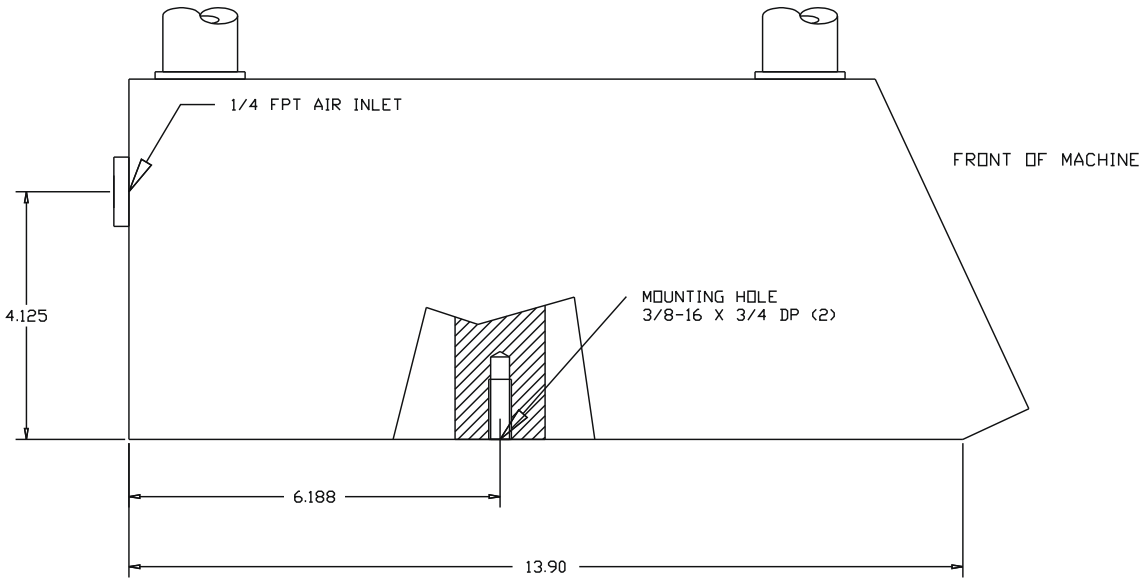
MACHINE MOUNTING

The MORGAN-PRESS® should be placed on a sturdy work bench able to support 500 lb, approximately 26" to 30" high. If desired, the press can be bolted to the bench.

Figure 3.1



TOP VIEW OF BASE



SIDE VIEW OF BASE

PNEUMATICS

Compressed Air Requirements

Line pressures up to 160 psi can be used safely. Lower pressures (below 160 psi) will limit the maximum clamp force and injection pressure output. It is hardly ever necessary to operate the machine at maximum potential output. If, for example, only 100 psi is available from the source (compressor), the machine will still function well; however, the maximum available clamp force from a 20 ton toggle unit will be limited to 12.5 tons and maximum injection pressures will also be correspondingly lower.

Use a ratio of your pressure output to the max pressure output (160 psi) multiplied by the clamp pressure gauge dial face value to determine the actual clamp tonnage for a lower air pressure output system.

There are relatively few molding applications that require the use of the highest attainable clamp and injection pressures. In most situations an input pressure range of 120 to 150 psi is more than adequate for excellent results. Where small parts and easy molding materials are involved 80 to 100 psi will usually be adequate although (at these pressures) some applications become marginal or "undo-able." For practical purposes the minimum air pressure one should provide is 100 psi at 1 CFM (Cubic Feet per Minute); if using high temperature, highly viscous engineering thermoplastic resins, then 120 psi ought to be considered the minimum necessary pressure.

CAUTION: DO NOT use more than 160 psi of air pressure. Higher pressure can damage the pneumatic controls and place excessive loads on the machine structure.

It should be noted that air flow (CFM: Cubic Feet per Minute) is as important as the air supply pressure (if not more so). Inadequate air flow to the unit causes severe drops in pressure during actuation of the clamp and injection cycles. This in turn produces a noticeable reduction in the speed of injection. The pressure recovery time is also too slow for good molding results. Short shots or poorly filled parts will occur. These conditions will be more pronounced as the application becomes more critical.

Whatever the pressure, the MORGAN-PRESS® will require 1 CFM on a constant basis. This means that a) the source (compressor) will require a holding tank or b) if the source is a long way from the equipment, then large pipe lines (4" to 1" minimum) or a holding tank near the machine are required to ensure adequate flow to the MORGAN-PRESS®. Pipe line sizes should flow from larger to smaller sizes but not below 1/2" pipe size up to the connection at the machine, which is a 1/4" FPT air inlet.

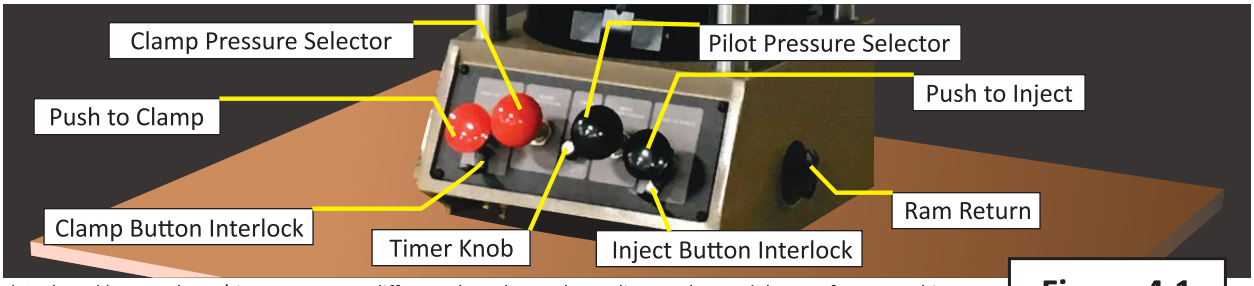
The minimum compressor required to adequately operate a press is a one horsepower, two-stage compressor with a 30 gallon holding tank rated to maintain on/off pressures at 120 to 150 psi.

While it is important to ensure sufficient air pressure and flow to a MORGAN-PRESS®, attention to mold design and other molding parameters is essential for good results. Such items include: a) generous gating and venting (if possible), b) location of sprue and gates, c) part design, d) material processing conditions (drying, pre-heating), e) mold temperature, to name a few. Frequently low pressures or air flow problems can be minimized or overcome when other good molding parameters are observed.

Pneumatic Hook-up

(Refer to Figures 4.1, 4.2, 4.3 and 4.6 for pneumatic control locations.)

Before connecting the air supply to the back of the base mount assembly, check that the orange knob (labeled Clamp Pressure Selector) and the black knob (labeled Pilot Pressure Selector) are turned counterclockwise until no spring tension remains on shaft (these are the OFF positions). Also, pull out the smooth orange knob (labeled Push to Clamp) and the smooth black knob (labeled Push To Inject).



*Knob and button shape/size may appear different than shown depending on the model year of your machine.

Figure 4.1

Then open both the table safety guard (up) and the chute (ram) safety guard (pull out).

Figure 4.2

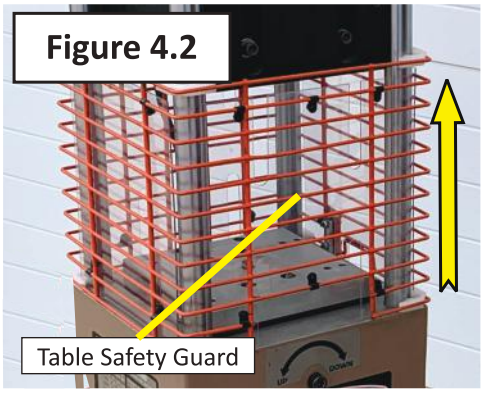


Figure 4.3

CAUTION: Machines shipped in a wooden crate are packaged with the table in the up position (clamped). With air supplied to the Clamp Control Valve (Push To Clamp), the table will lower when this valve is pulled out. Be sure that the table and toggle area are clear of personnel and foreign objects before connecting air supply to the unit.

NOTE: Neither the table platen (clamp) nor the ram piston (injection) will function unless their respective interlocks are properly engaged.

Figure 4.4

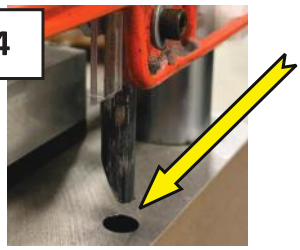


Figure 4.5

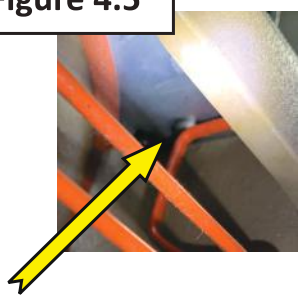
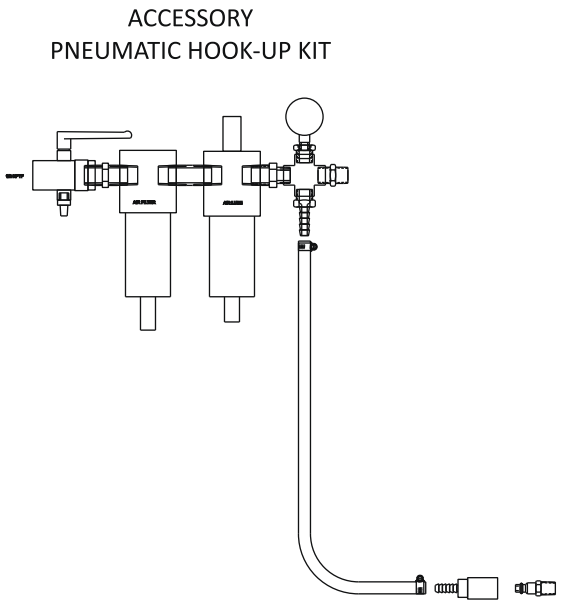
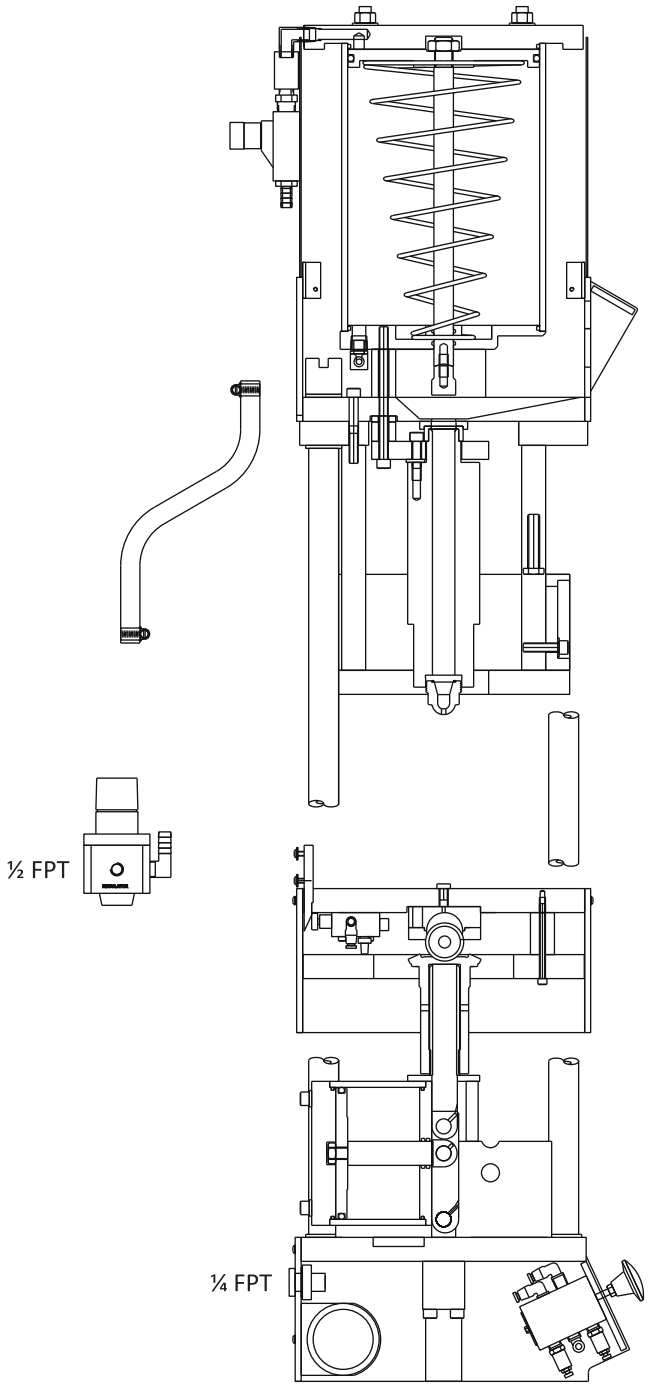


Figure 4.6





Pneumatic Controls

Clamp System

The orange knob labeled "Push To Clamp" on the lower panel is the Clamp Control Valve and controls the movement of the table platen or the clamp system (Figure 4.1). The air cylinder beneath the table platen operates the mechanical toggle clamp which exerts up to a maximum of 20 tons of clamp force at 160 psi air pressure.

NOTE: WHEN CLAMPING AT 10 TONS OR GREATER, THE UPPER PLATEN ASSEMBLY MUST BE USED. (See Upper Platen Assembly section for complete details.) Excessive clamp force (greater than 10 tons) against the nozzle only can damage upper plate. THIS CONSTITUTES MISUSE OF EQUIPMENT AND AFFECTS THE WARRANTY.

The orange knob labeled "Clamp Force Selector" on the lower panel regulates the air pressure to the clamp cylinder (Figure 4.1). Select the clamp force to be applied to the mold by rotating this knob - clockwise to increase, counterclockwise to decrease - as required. The gauge labeled "Clamp Force Tons" on the upper panel (left side) indicates the setting. When lowering pressure settings (for either clamp or injection), turn pressure selector knob counterclockwise until gauge pointer drops below desired setting; then turn knob clockwise until gauge pointer moves up to desired pressure.

NOTE: See "Adjusting Table Height" under Manual Operation Cycle for complete clamp force adjustment instructions.

Injection System

The smooth black knob labeled "Push To Inject" on the lower panel is the Injection Control Valve (Figure 4.1). It actuates the injection system. The Ram Air Piston in the head of the machine applies thrust to the small Barrel Piston. With 160 psi air supplied, injection pressures at the nozzle can reach a maximum of 9,000 psi for the MRG-M1A (Morgan Industries G-125T equiv.), 12,000 psi for the MRG-C1A (Morgan Industries G-100T equiv.).

The Pilot Pressure Selector on the lower panel regulates the air pressure to the Pilot valve which opens the main air supply to the Ram Air Cylinder (Figure 4.1). The pressure supplied to the Pilot Valve is indicated on the gauge marked "Pilot Valve Pressure x 10 P.S.I." on the upper panel. The ideal pressure for the pilot valve is from 50 to 70 psi (the green zone). Increasing the pressure beyond the green zone will cause premature wear and failure on the Pilot Valve.

The Ram Air Pressure is controlled by a separate regulator that is mounted on the air supply line to the Injection Speed Control (Figure 4.6). The Injection Speed Control allows the operator to control the flow rate of air to the Ram Air Cylinder without changing the air pressure on the Ram Air Pressure regulator.

Relationship of Clamp Force to Injection Pressures

The clamp force holding the mold closed MUST exceed the total internal pressure being generated within the mold or the mold will separate (flash) during injection.

Example: Assume injection pressure of 5,000 psi, 30% viscous pressure loss into the cavity, and mold cavity with a 4 sq. in. planform area at parting line; The internal mold pressure = 5,000 psi x 4 sq. in. x 0.70 =14,000 lbs. or 7 tons;

Therefore, the clamp force MUST exceed 7 tons.

A good rule is to start with estimated clamp force - low injection pressure. Increase the injection pressure after each cycle until the mold is filling properly. If mold separates (parts flash) at adjusted injection pressure, raise clamp force by one ton increments with corresponding mechanical height adjustment to thrust shaft until mold stays closed during injection.

Pneumatic Schematic

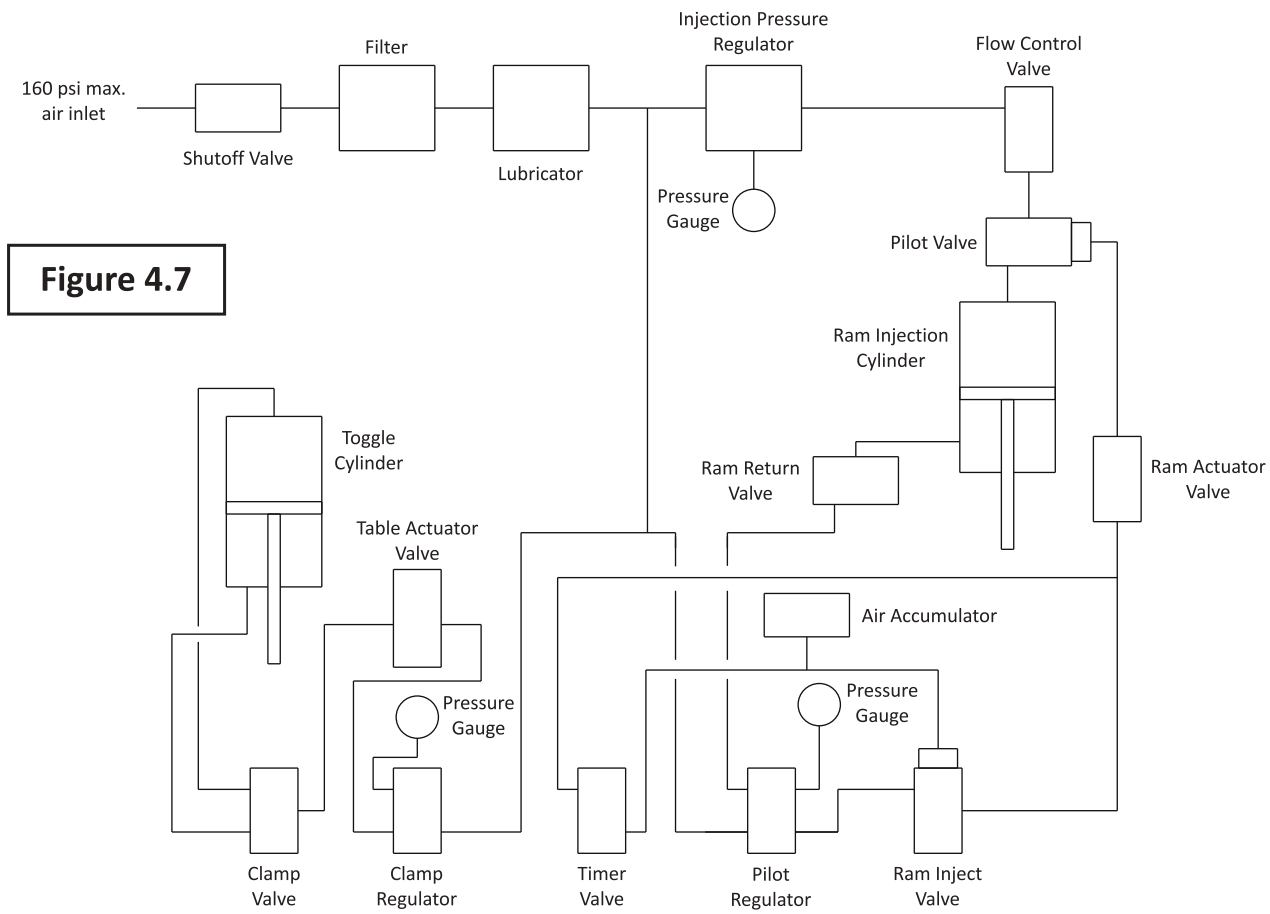


Figure 4.7

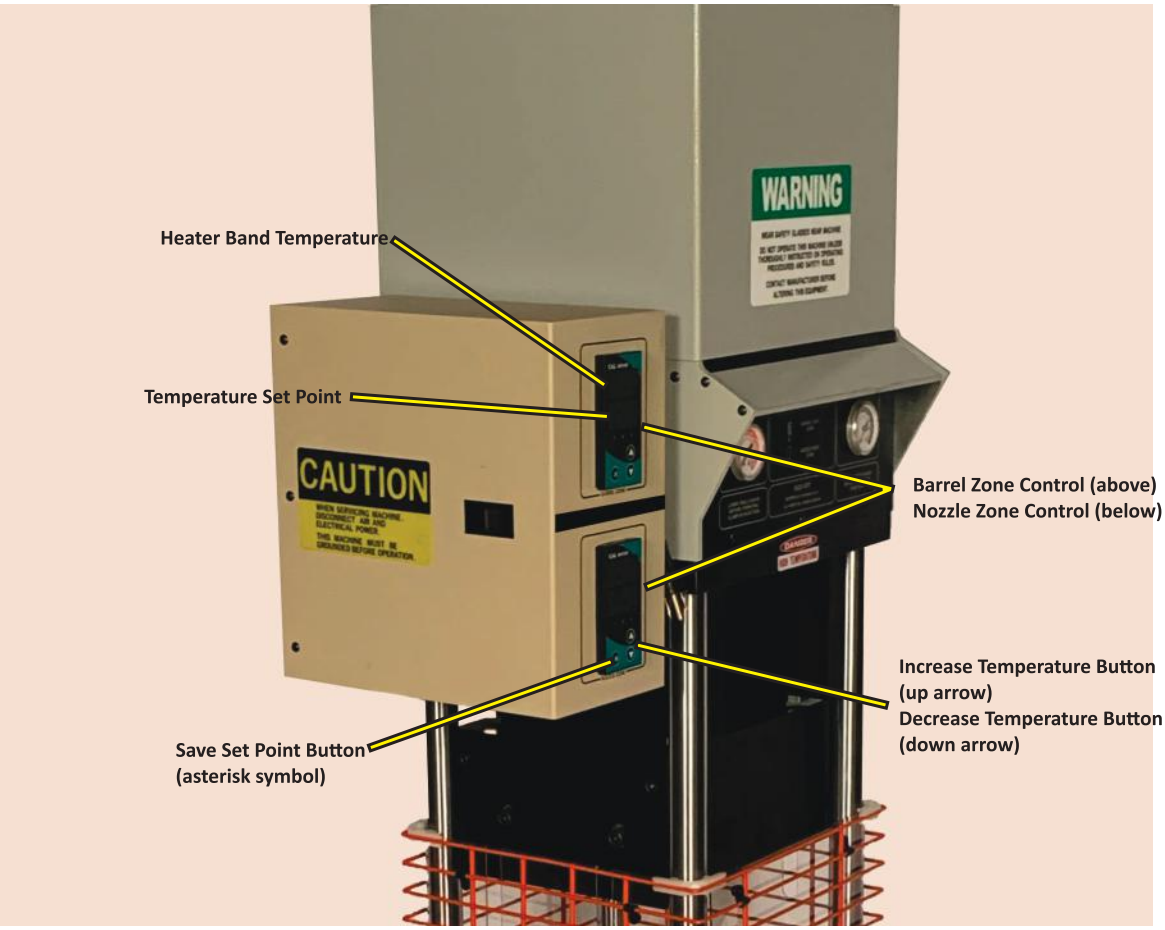
ELECTRICAL

Heater Controls

Two heat controls with a temperature control range of 32°-800°F (0°-430°C) provide the MORGAN-PRESS® with its plasticizing (melting) capability. These controls are located in a separate electrical cabinet mounted opposite the material chute on the upper segment of the press. They control the Barrel and Nozzle temperature zones. The controllers allow the barrel and nozzle zones to reach and maintain the selected temperatures. See Temperature Control System Installation Guide for other details.

The proportioning digital temperature controllers have a digital setpoints and read-outs in addition to a very high level of accuracy. During normal operation the process temperature is shown in the upper display and the setpoint temperature is shown in the lower display. To change setpoint temperature simply press the asterisk (*) then the arrow pointing up to raise or the arrow pointing down to lower. Once done, press the asterisk (*) again to confirm the new setpoint.

Figure 5.1



Temperature Settings

The chart on the front of the lower/table platen is a general guide to temperature settings required for various materials. This chart is only a guide. Refer to the material manufacturer's information data sheet before processing any thermoplastic. Any person who works with plastic materials should be aware of the cautions, hazards, or special handling procedures that may be required.

When processing a plastic resin that you are not familiar with, use an open orifice nozzle. By inspecting the drool or extrusion from the nozzle, the correct processing temperatures can be determined. The temperature is probably too high if the material drooling from the nozzle is discolored, contains gas bubbles, or emits fumes. The temperature is probably too low if the material does not drool or is not in a near fluid state when extruded through the nozzle.

WARNING: AVOID BODILY CONTACT WITH MOLTEN MATERIAL. SEVERE BURNS CAN OCCUR.

Some materials, such as nylon, have narrow ideal injection temperature ranges and vary in a span of only 10°F from a near-solid to a fluid which drools quickly; an additional 10°F may produce extreme gassing and considerable discoloration of the plastic. Excessive temperature or prolonged heating can cause some materials, such as ABS, to pass through the fluid state and become a carbonized near-solid. Parts made from degraded material may have poor surface finish and impaired physical properties. Degraded material due to prolonged heating can be avoided by maintaining a constant molding cycle.

Acetal polymers must be handled carefully to prevent accidents. For example, the formaldehyde generated by heating acetals is harmful to eyes and lungs. Good room ventilation is recommended when molding these compounds. This material tends to gas freely; therefore molds should be extensively vented or the back pressure will slow the filling. Thorough drying of this hygroscopic material just prior to its use will substantially minimize gassing and enhance ease of processing.

Figure 5.2

AVERAGE TEMPERATURE SETTINGS GUIDE

Thermoplastic Material	Nozzle Type *	Temperature (°F) Barrel	Nozzle	Mold
ABS	B	475	500	180
Acetal	AD	400	425	200
Nylon	AD	550	590	200
P-phenylene Oxide	B	550	575	180
Polycarbonate	AD	575	600	250
Polyethylene	B	400	425	120

Thermoplastic Material	Nozzle Type *	Temperature (°F) Barrel	Nozzle	Mold
Polypropylene	B	425	450	120
Polysulfone	B	620	650	250
Polystyrene	B	430	450	120
Urethane	B	375	400	120
Vinyl	B	350	380	120

*AD = Anti-drool; B = 3/16" Open Orifice

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PVC (polyvinylchloride) is another material with extreme temperature sensitivity. It will degrade at both too high a temperature and in a relatively short time at processing temperature. The material will then exhibit extreme degradation and its contacting steel molds or machine components can cause corrosion due to the release of chlorine gases and molecules.

As a general rule, use the minimum temperature at which a material will flow successfully into the mold. Start low and gradually increase the nozzle temperature until good parts are obtained. The barrel setting will usually be 20°-50°F below that of the nozzle.

Power Connection

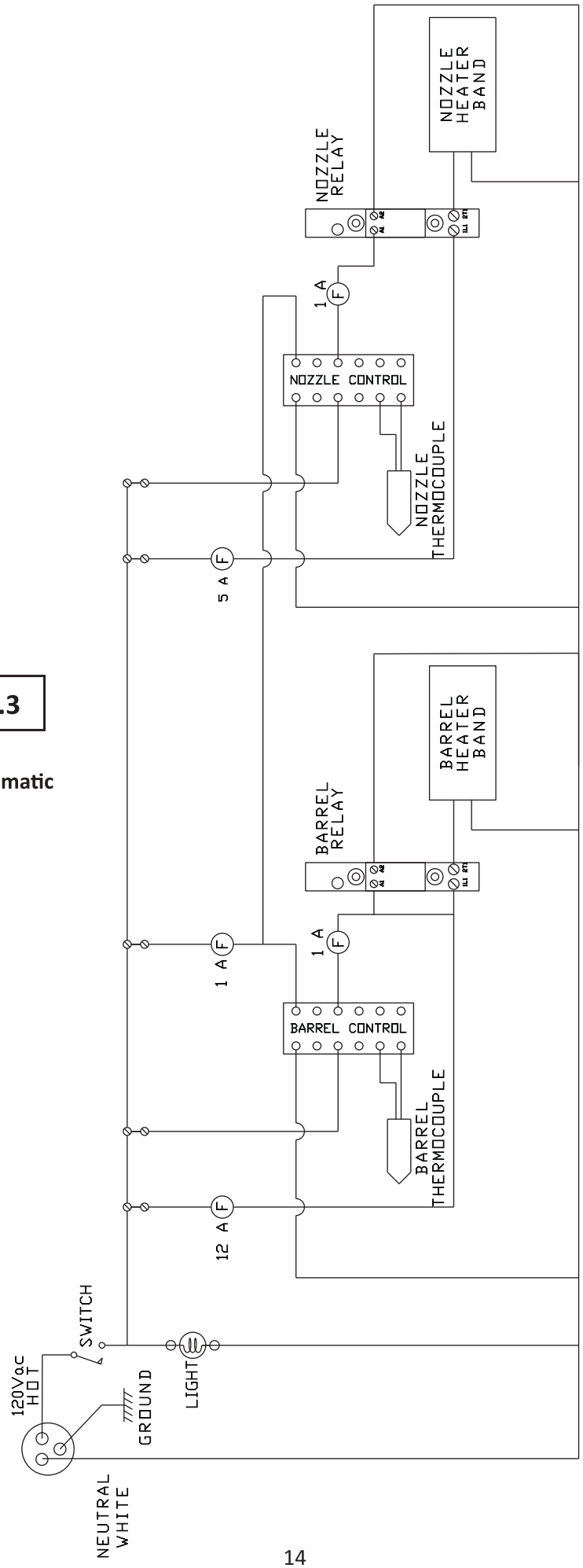
When ready to operate, plug the MORGAN-PRESS® into a 120 volt, 20-amp electrical outlet using the three-prong cord supplied. If an extension cord is used, it should be as short as possible and constructed with a minimum 14 gauge wire.

CAUTION: THIS UNIT MUST BE CONNECTED TO A PROPERLY GROUNDED 120 VAC, 20-AMP DEDICATED OUTLET.

NOTE: The temperature controllers (MAXVU) have been programmed at the factory for general thermoplastic molding applications. They have been put in a lock-out mode to prevent accidental changes***.

Figure 5.3

Electrical Schematic



MANUAL OPERATING CYCLE

A. Select temperature control settings for the material to be used. Fill the Barrel with granules. (Polypropylene is a good material for testing new molds or for practice.)

B. Close the timer valve by rotating the knob clockwise until the indicator stops at "0". Do NOT close knob too tightly as damage may occur to the needle and seat.

C. Select clamp force and injection pressure. See PNEUMATICS section for relationship of injection pressure to required clamp force.

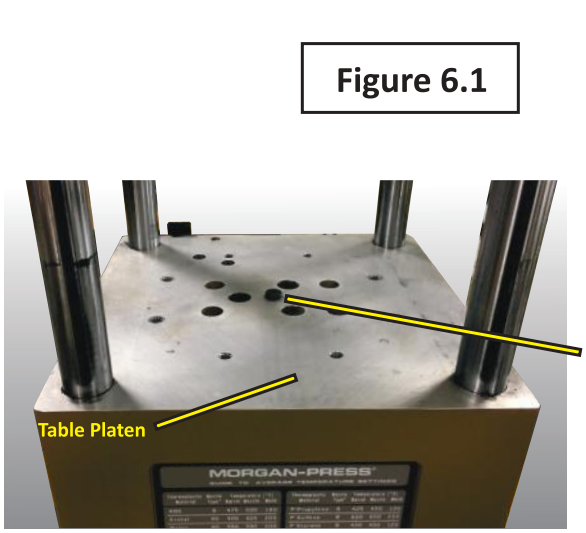
1. Set the clamp force by rotating the orange regulator knob on base panel front. Then adjust the table height and toggle mechanism.

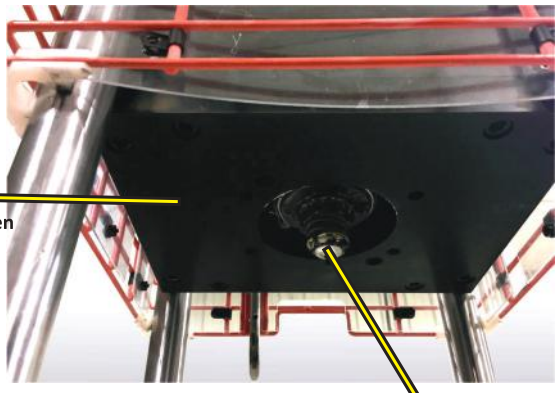
2. Adjust pilot valve pressure to a "6" (the green zone) setting on the pilot valve gauge by rotating the black regulator knob on base panel front. Then set the injection pressure on the Ram Pressure Regulator installed on the air line below the Injection Speed Control flow control valve. Then set the speed at the flow control valve at the top rear of machine.

   The injection pressure and speed required for any application depends on many factors such as wall thickness, flow distance, gate size and the thermoplastic to be used. It is best to start low and slow and increase the speed and then injection pressure until a good part is produced. Most applications work well between 3,000 to 6,000 psi. Pressure above 6,000 psi may be required if the part is large or has thin wall sections. Also, some thermoplastics require high injection pressure due to their composition.

D. Place the mold on the table of the MORGAN-PRESS®, taking care to locate the mold so that the nozzle seat is beneath the nozzle. Use the table center locator stud supplied whenever possible. (If a Pre-Heat Plate is to be used, locate this on the table center locator stud and place the mold on the Pre-Heat Plate locator stud.)

Figure 6.1





E. Adjust table/lower platen height. It is the combination of air pressure plus mechanical adjustment of the table height which yields the ultimate clamp force. This adjustment is similar to tightening or loosening a pair of vise grip pliers where the screw adjustment is the table height and the squeeze on the handle is the air cylinder pressure.

CAUTION: If a clamp force of greater than 10 tons is needed, the Upper Platen Assembly must be properly used. (See Upper Platen Assembly instructions for more information.) Applying a clamp force of greater than 10 tons directly against the nozzle may result in damage to the Morgan-Press. **CLAMPING AGAINST THE NOZZLE ABOVE 10 TONS CONSTITUTES MISUSE OF THE EQUIPMENT AND AFFECTS THE WARRANTY.**

1. Set clamp force to the minimum that will actuate the table (2 to 3 tons). Raise the table under power to full up stroke position by pushing in the Clamp Control knob with the table guard down. If mold does not reach the nozzle, the table must be adjusted upward by rotating the Elevating Spindle with the 3/8" Allen Key for this purpose (see diagram page 2). The Elevating Spindle should be pushed in to engage the gears during height adjustment and pulled out before clamping. Turn the spindle clockwise to lower table and counterclockwise to raise table. For short molds (5" or less in height) a simple spacer made of a paralleled aluminum plate or faced aluminum barstock can be placed between mold and table.

   If the mold touches the nozzle but does not allow the full toggle stroke, the table must be adjusted downward using the Elevating Spindle and Allen Key. The maximum mold or stack height is 7-1⁄2 inches. **DO NOT ATTEMPT TO ADJUST TABLE HEIGHT WHILE THE MOLD IS IN THE CLAMPED POSITION.** Rather pull out the Clamp Control Valve to lower the table with the toggle power, then rotate spindle. Continue up or down adjustment until mold gently touches the nozzle when toggle is in full up position.

2. To attain full clamp force on the mold, adjust clamp pressure gauge to desired setting. The table must then be mechanically adjusted slightly upward in the same manner as above until the toggle lock comes to a full up position while moving over center with a definite "thunk" sound. This is the adjustment which is similar to increasing the tension on a pair of vise grip pliers. This position can be attained after two or three trials. It may be necessary to re-adjust clamp after several operating cycles due to the heat expansion of the mold and equipment plus any nozzle retightening that may be required. (See Nozzle instructions for proper tightening procedure.)

   When done with clamp adjustment, disengage the table elevating gear by pulling the spindle out.

NOTE: Clamp adjustment should be periodically monitored during operation. It may be necessary to re-adjust the table platen height due to heat expansion and mechanical vibration. The proper clamp force is obtained only when the toggle mechanism positively locks over center with a definite "thunk."

F. **MOLDING:** Before attempting to mold, wait for both material and mold to reach recommended temperatures. For the material to be ready for injection, it must be correctly heated, free of blisters or gassing, free of lumps indicating unmelted granules and have a smooth glossy exterior. Use caution and wear protective gear when creating an extrusion to examine condition of material. This molten material is under pressure and trapped air or gas may cause the material to pop and splatter when exiting the nozzle. See Plastic Properties Chart in the engineering manual, "Cutting Costs in Short-Run Plastics Injection Molding," or the material (resin) manufacturer's recommended temperatures. Use optional Pre-Heat Plate to heat mold as necessary.

1. **CLAMPING:** Remove any plastic drooling from the nozzle with the material feeder-scraper (provided). Do not contact this plastic drool as it stays very hot even after removal. Slide the table guard down until it contacts the table platen and the actuator pin is fully seated in its hole.

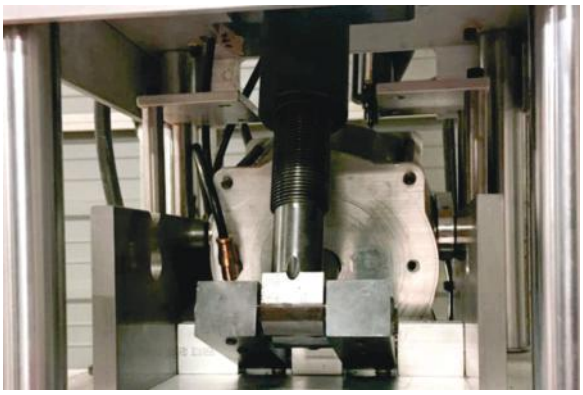
NOTE: The table cannot move until wire table guard is lowered and interlock engaged.
To raise table platen rotate the drop bar lever behind the Clamp Control valve knob then push in knob. The table will rise, and the toggle mechanism will close with a definite "thunk" (if properly adjusted). This indicates that full clamp force is being applied to the mold.

CAUTION: NEVER OPERATE THE TABLE UNLESS THE MOLD IS PROPERLY LOCATED. FAILURE TO OBSERVE THIS PRECAUTION MAY CAUSE DAMAGE TO THE MACHINE OR THE MOLD.

Figure 6.2

WARNING: KEEP HANDS AWAY FROM MOVING TABLE PLATEN DURING OPERATION ON BOTH THE CLAMP AND UNCLAMP (UP AND DOWN) STROKES.

Figure 6.3



Keep hands OUT of this area during operation.

(Pictured unpainted to enhance part identification.)

2. **INJECTING:** The Injection Control Valve activates the injection cycle. The drop bar behind the knob must be rotated before it can be pushed in. After clamping the mold push in the Injection Control Valve knob all the way; the ram shaft will travel downward for a few seconds and stop when the mold is filled. This movement may be observed by looking into the chute.

NOTE: The barrel ram piston cannot move until the wire chute guard is completely closed and interlock engaged. Make sure the chute area guard is snapped completely shut.

3. After the ram shaft has stopped its downward travel allow it to dwell for 3 to 10 seconds. The dwell time is governed by the part and mold design. Then pull the Injection Control Valve knob out to release injection pressure. The air will exhaust from the ram air cylinder and the ram shaft will rise. A large spring pushes the ram piston up after the injection cycle.

   For some applications (viscous thermoplastics or long piston travel) the air- powered Ram Return should be used. The Ram Return Valve is located on the right side of the base casting. The knob need only be pushed in for a few seconds or until the Barrel Piston is approximately one inch above the barrel orifice. This movement can be observed through the chute area.

NOTE: The Chute Guard must remain completely closed during the return stroke.

CAUTION: Some thermoplastics that are not up to proper melt temperature will cause a cold Barrel Piston to seize in the barrel bore. To remove a stuck piston from the bore, wait until the resin and the barrel piston are up to processing temperature, then use the Ram Return intermittently (2 second cycles) until the piston is free.

<u>DO NOT</u> use the Ram Return valve for an extended time period when trying to power return or unstick the piston. If this is done high pressure develops under the Ram Cylinder piston. Then, when the Barrel Piston breaks loose from the material, the ram will return extremely fast. Sudden "breaking loose" of the Barrel Piston could damage the machine.

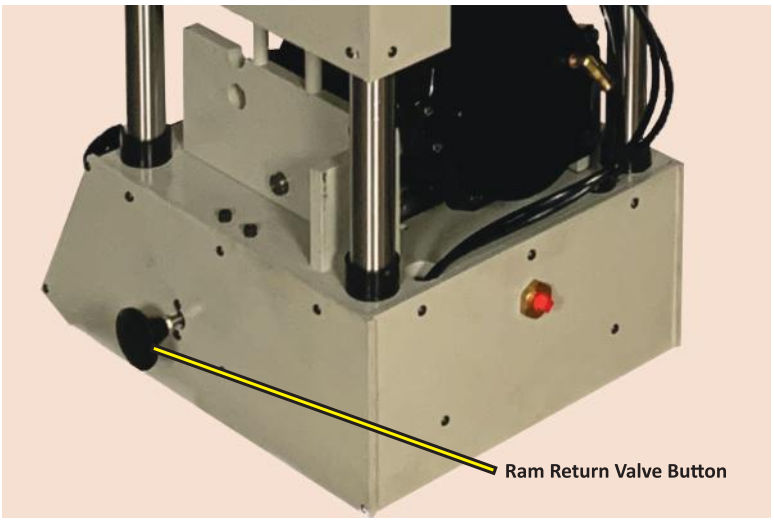


Figure 6.4

4. Pull out the orange Clamp Control Valve knob after the Barrel Piston has begun its upward travel. The table will now power return to its lower (unclamp) position. Raise the table guard and remove mold.

WARNING: Small light weight molds may stick to nozzle. Use care when removing to avoid burns or having mold drop on the operator's hands.

NOTE: When either the table platen or chute area guards are raised, the table platen or ram cannot be moved by actuation buttons in either direction. However, the ram piston will automatically return to home if the chute guard is opened during an injection cycle.

Also, the table and ram control systems can be operated independently of each other. This facilitates mold placement, clamp adjustment, purging, nozzle changes, et cetera.

5. Remove the part from the mold and examine. Study the list of defects, Table I, and adjust the running conditions as necessary.

Part inspection and changing parameters to address defects is key to refining the molding process for the best results possible.

Figure 6.5

6. Refill the barrel immediately after each shot. Repeat manual cycle and continue adjustments until an acceptable part is produced.

NOTE: If a collar of material builds up around the lower end of the ram shaft above the Barrel Piston, either the injection time cycle is too long, thus allowing melted material to pass between the piston and cylinder walls, or the barrel temperature is too high. Clean off the built-up material using the material feeder-scraper. Be sure that a layer of cold granules is covering the melted material in the barrel before recycling.

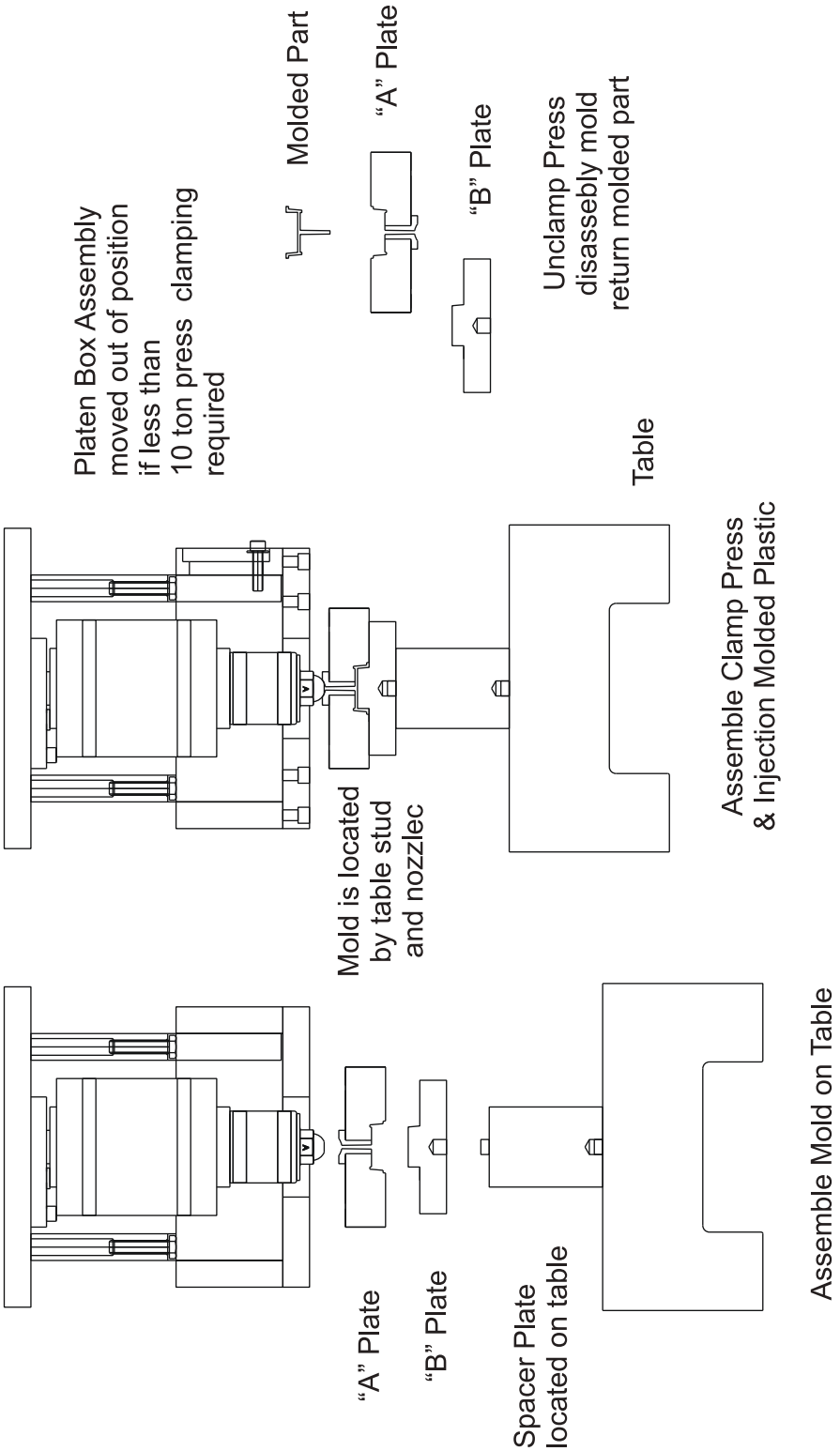
DO NOT ALLOW A BUILD-UP OF PLASTIC AROUND THE TOP OF THE BARREL PISTON.

If the granules filled into the top of the barrel gradually rise out, either the barrel temperature is too high (causing the material to gas excessively) or the material granules contain moisture that generates steam within the barrel.

WARNING: Each family of thermoplastic materials has its own processing characteristics. Proper drying and other handling requirements must be observed. Some polymers when not properly processed present hazards in the work environment. Always begin by following the instructions and suggestions of the material manufacturer.

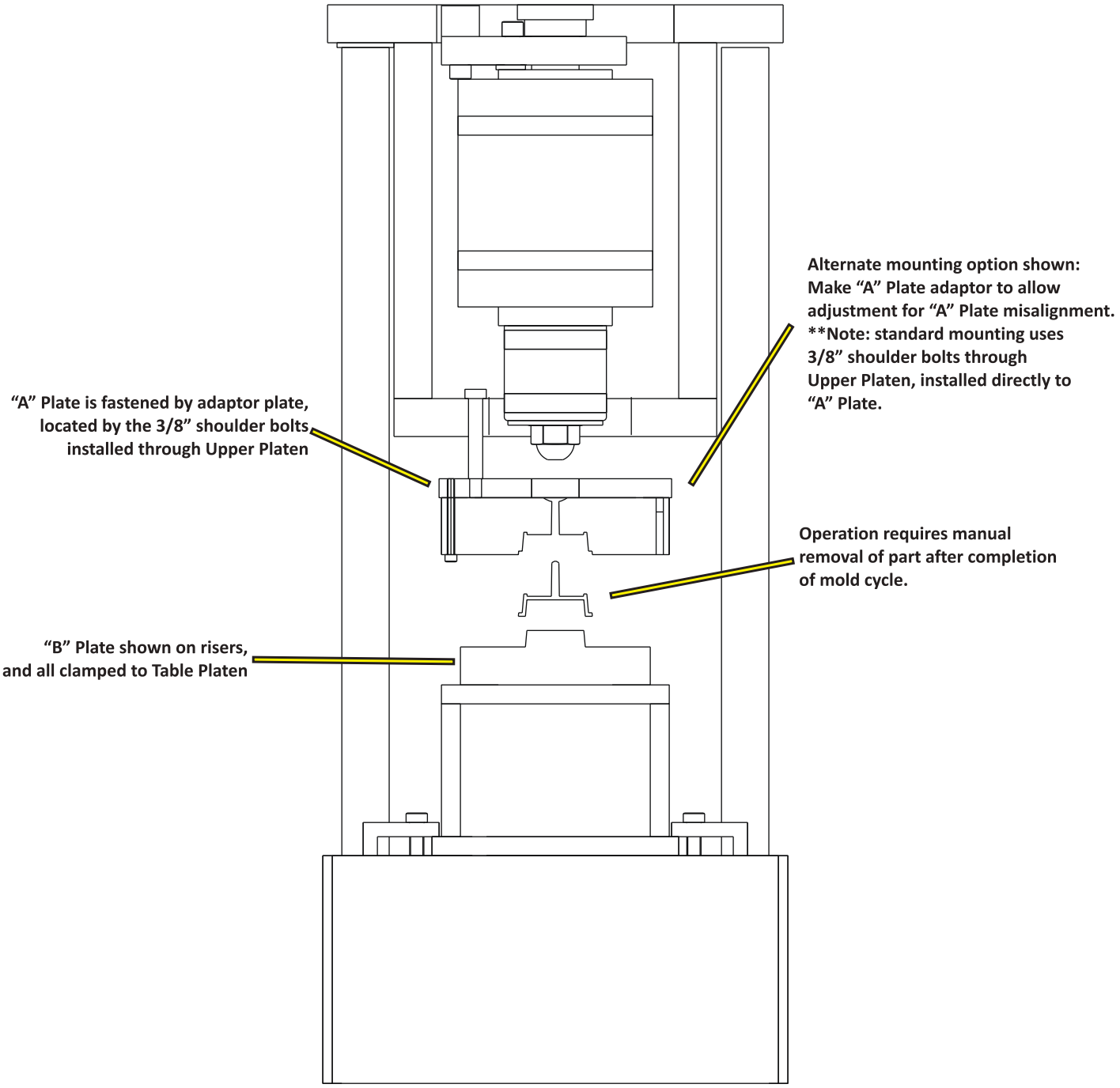
Simple Mold Plan for Manual Operating Cycle

Figure 6.6



Complex Mold Plan for Manual Operating Cycle

Figure 6.7



Rigid mounting and retention of the mold halves to the platens reduces the time and effort involved in the manual operating cycle.

Learning this mounting setup is a prerequisite to the Semi-Automatic Operating Cycle.

TABLE I

DEFECT	POSSIBLE CAUSES	CORRECTIVE ACTION
Mold not full (short shot)	Material too cold	*Raise barrel and nozzle zone temperatures
	Mold too cold	*Apply heat to mold
	Insufficient cavity venting of mold	Rework mold to allow more venting
	Injection pressure too low	*Raise injection pressure
	Time cycle too short	Increase injection cycle time
	Gates and/or runners too small	Increase the size of runners and gates
Flashing at mold parting lines	Injection pressure too high for clamp force selected	*Lower injection pressure or raise clamp force, or both
Part discolored	Heat too high	*Lower selected temperatures
	Cycle time too long	Shorten cycle time
Excessive "sink" in part	Part design	Avoid thick sections
	Injection pressure too low	*Raise injection pressure
	Gate too small	Adjust mold to allow more gating
	Cycle time too short	Increase injection cycle time
	Material too hot	*Lower nozzle and barrel temperatures
	Mold too hot	*Cool mold
Surface of part streaked, blistered, and/or bubbles in part	Moisture in material granules	*Dry material thoroughly before molding
	Material temperature too high	*Lower nozzle and barrel temperatures

*For proper molding conditions first check material manufacturer's recommendations, or see Plastic Properties Chart in the engineering manual, "Cutting Costs in Short-Run Plastics Injection Molding." If pressures or temperatures significantly higher than normal are required, it is most probable that the runners and gates are too small and mold venting is inadequate. Excess injection pressure can actually pre-stress molded parts and cause them to be inherently defective. Overheated parts can have degradation, discoloration and impaired physical properties. Eliminating mold design deficiencies will ensure better molding results under the correct temperatures and pressures.

TABLE II

APPLICATION PROCESSING DATA SHEET

For future reference and ease of set-up in a future run, record in a log or on a chart the molding specifications which were used to produce good parts.

It is recommended to record the following data:

PROJECT NOMENCLATURE:

Part Name _____ Print Number _____

Part/Shot Size _____(oz.) or _____cu.in. Mold I.D.#_____

Quantity Required _____ Set-up Time _____ Molding Time _____

Material Name & Grade_____

*Material: Drying Time _____hr; Drying Temperature_____°F

MACHINE OPERATING PARAMETERS:

Machine Model_____ Serial No._____ Nozzle _____

Mold Temperature _____°F; Mold Set-up: Semi or Manual

Barrel Zone Temperature_____°F; Nozzle Zone Temperature_____°F

Clamp Tonnage _____ tons

Injection Pressure _____x 1000 psi; Injection Speed (# turns)_____

Pilot Valve Pressure (if applicable) _____x 10 psi

Injection Cycle Time (including dwell)_____sec Timer Setting_____

Total Cycle Time (Clamp to Clamp) _____sec./min.

NOTES/COMMENTS:_____

_____

_____

_____

_____

*Some materials will produce better surface finish and shorter cycle times if the granules are pre-heated and dried. See material manufacturers' recommendations. (Also, you may refer to the Plastics Property Chart in the engineering manual, "Cutting Costs in Short-Run Plastics Injection Molding," to determine general drying requirements.)