Introduction
The Morgan-Press, Model G-100T, is an injection molder designed for practical and economical manufacturing of thermoplastic parts in quantities required for prototyping and low-volume production. It is primarily used for encapsulation, engineering prototypes, medical/dental devices, and marketing samples. The Morgan-Press is an ideal molder because it is easy to change molds and materials to make different parts. It is also capable of processing a full range of thermoplastic materials.

The Model G-100T Morgan-Press Injection Molder has the following specifications:

- 0 – 800 °F (0 – 430 °C) temperature control range
- 6 cu. in. (4 oz.) maximum single shot
- 20 ton maximum clamping force (toggle)
- 12,000 psi maximum injection pressure
- Utilities required:
  - Electrical: 120 volts AC
  - Compressed air: 200 psi (max.)

The operating instructions and instructional video should be carefully reviewed prior to operating the Morgan-Press. Included in the manual are the equipment setup, pneumatics of the mold injector, manual operating instructions, shutdown, and maintenance.

Caution: Always exercise caution and use proper protective equipment when operating the Morgan-Press.
1 Equipment Setup

Below is a diagram of the equipment set up for the Morgan-Press Model G-100T.
2 Pneumatics

2.1 Introduction
The pneumatic system is used to operate the clamp system and the injection system. The air supply for the pneumatic system should be from a compressed air source. Line pressures up to 200 psi can be used safely. The minimum supplied air pressure for proper operation is 100 psi. At low pressures the machine will still function, however, the maximum clamp force and maximum injection pressures will be lower accordingly. When operating at higher temperatures and with more viscous materials, higher air pressure should be used.

The minimum air flow for proper operation is 1 cubic feet per minute (cfm). Inadequate air flow will result in reduced injection speed and pressure recovery time. If short shots or poorly filled parts are observed, the air flow is too low.

2.2 Pneumatic Hookup

| Make sure the safety valve on the air supply is turned to the closed position |
| Open the compressed air valve slightly |

[Image of safety valve turned to closed position]
[Image of compressed air valve slightly open]
<table>
<thead>
<tr>
<th>Pneumatic Hookup (cont'd)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Adjust valve so that the pressure is about 200 psi</strong></td>
</tr>
<tr>
<td><img src="image1.png" alt="Image" /></td>
</tr>
<tr>
<td><strong>Open the safety valve to allow the air to flow through the molder</strong></td>
</tr>
<tr>
<td><img src="image2.png" alt="Image" /></td>
</tr>
<tr>
<td><strong>Adjust the middle gauge valve (not pictured) to ensure a pressure of about 200 psi is flowing through the system.</strong></td>
</tr>
<tr>
<td><img src="image3.png" alt="Image" /></td>
</tr>
<tr>
<td><strong>Completely open the flow control valve to maximum flow.</strong></td>
</tr>
<tr>
<td><img src="image4.png" alt="Image" /></td>
</tr>
</tbody>
</table>
2.3 Pneumatic Controls
The pneumatic controls are located at the base of the machine. The two orange knobs control the clamp system; the two black knobs and the silver knob control the injection system.

The Clamp Pressure Gauge and Injection Pressure Gauge are located at the top panel of the molder.

The Ram Return Valve is located on the right side of molder base.
2.3.1 Clamp System

Below are the two knobs that control the Clamp System. The Clamp Control Valve controls the raising and lowering of the Table Plate. The Clamp Pressure Selector Valve regulates the air pressure to the Clamp Control Valve. A maximum of 20 tons of clamp force is exerted at 200 psi air pressure.

When clamping at 10 tons or greater, the Upper Plate assembly must be used. Excessive clamp force against the nozzle will cause damage to top casting.

**Step 1: Set the Clamp Pressure**

**Rotate the Clamp Pressure Selector**
- clockwise: increase
- counterclockwise: decrease

Check that the clamp pressure is set to the desired pressure on the Clamp Pressure Gauge.
The Table Guard must be locked down before the Table Plate can be moved.

**Step 2: Raise the Table Plate**

<table>
<thead>
<tr>
<th>Action</th>
<th>Diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td>On the Clamp Control Valve, move the interlock upward</td>
<td><img src="image1.png" alt="Image" /></td>
</tr>
<tr>
<td>While holding the interlock up, push the orange knob in until the table plate is at the desired height</td>
<td><img src="image2.png" alt="Image" /></td>
</tr>
<tr>
<td>Release the interlock to maintain the table plate at the desired height</td>
<td><img src="image3.png" alt="Image" /></td>
</tr>
<tr>
<td>Step 3: Lower the Table Plate</td>
<td></td>
</tr>
<tr>
<td>------------------------------</td>
<td></td>
</tr>
<tr>
<td>On the Clamp Control Valve, move the interlock upward</td>
<td></td>
</tr>
<tr>
<td><img src="image1.jpg" alt="Image" /></td>
<td></td>
</tr>
<tr>
<td>While holding the interlock up, pull the orange knob in until the table plate is lowered to the desired height</td>
<td></td>
</tr>
<tr>
<td><img src="image2.jpg" alt="Image" /></td>
<td></td>
</tr>
<tr>
<td>Release the interlock to maintain the table plate at the desired height</td>
<td></td>
</tr>
<tr>
<td><img src="image3.jpg" alt="Image" /></td>
<td></td>
</tr>
</tbody>
</table>
2.3.2 Injection System

Below are the two knobs that control the Injection System. The Injection Control Valve controls the raising and lowering of piston. The Injection Pressure Selector Valve regulates the air pressure to the Injection Control Valve. The operating range for the injection pressure is from 6-8 x 10 psi.

![Injection Control Valve](image1)

![Injection Pressure Selector](image2)

**Step 1: Set the Injection Pressure**

- **Rotate the Injection Pressure Selector**
  - clockwise: increase
  - counterclockwise: decrease

- **Check that the injection pressure is set to the desired pressure on the Injection Pressure Gauge**
The Table Guard must be locked down before the material can be injected.

**Step 2: Inject Polymer**

<table>
<thead>
<tr>
<th>Action</th>
<th>Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>On the Injection Control Valve, move the interlock upward</td>
<td><img src="image1.png" alt="Image" /></td>
</tr>
<tr>
<td>While holding the interlock up, push the black knob in</td>
<td><img src="image2.png" alt="Image" /></td>
</tr>
<tr>
<td>In the Material Loading Chute, watch as the Ram Rod pushes the plastic down through the barrel</td>
<td><img src="image3.png" alt="Image" /></td>
</tr>
<tr>
<td>Release the black knob when the Ram Rod is completely depressed</td>
<td><img src="image4.png" alt="Image" /></td>
</tr>
<tr>
<td>Release the interlock</td>
<td><img src="image5.png" alt="Image" /></td>
</tr>
<tr>
<td>Step 3: Return the Ram Rod</td>
<td></td>
</tr>
<tr>
<td>--------------------------</td>
<td></td>
</tr>
<tr>
<td>Push the Ram Return Valve intermittently until the end of the Ram Rod is visible in the Material Loading Chute</td>
<td></td>
</tr>
</tbody>
</table>
3 Temperature Control

3.1 Introduction

Temperature can be controlled with three heaters at 3 different locations on the Morgan Press:

- **Barrel Temperature Controller**
- **Nozzle Temperature Controller**
- **Hot Plate Temperature Controller**

The Barrel heater initially melts the plastic, while the nozzle and Hot Plate control polymer temperature during the molding process. The Barrel and Nozzle Temperature Controllers, with ranges between 0 to 800°F, are located on a separate electrical cabinet on the left side of the Morgan Press. A set point temperature may be set by depressing the controller knobs and adjusting the temperature value. A signal light near the control knobs periodically turn on when electrical current is running through the system to raise the temperature. When the light is off, the set point has been reached.

The hot plate temperature, which controls the temperature of the mold, has its own setting located on the front of the plate. A signal light on the hot plate will turn on when it is in use.

A guideline of appropriate temperatures for different materials can be seen on the chart placed on the bottom front of the Morgan Press. As a rule of thumb, use the minimum temperature at which the material will flow successfully into the mold. The barrel temperature setting will usually be 20 to 50°F below the nozzle setting.

- These temperatures are simply guidelines. Refer to information given by the material's manufacturer before processing any thermoplastic.
- The temperature is probably too high if material drooling from the nozzle appears discolored, contains gas air bubbles, or emits fumes.
- The material is probably too low if it does not drool from the nozzle or does not appear to be in a fluid state during extrusion.

**Caution:** PROLONGED HEATING MAY CAUSE ADVERSE PHYSICAL EFFECTS FOR DIFFERENT MATERIALS. MAINTAIN A CONSISTENT MOLDING CYCLE. AVOID BODILY CONTACT WITH MOLTEN MATERIAL AND HEATED SURFACES.
3.2 Operational Procedures

Before You Begin
Once Morgan Press is plugged in and turned on, the temperature controls for the barrel and nozzle, located on the electrical cabinet, automatically turn on.

Determine the proper temperatures needed for your material. Use the temperature chart or manufacturer information. Tests may also be performed to determine optimum temperatures to properly melt the material.
### Step 1: Setting the Barrel and Nozzle Temperatures

Depress and turn the temperature control knobs for the barrel and nozzle until desired temperature set points are reached.

### Step 2: Setting the Hot Plate Temperature

Situate mold (and spool, if necessary) appropriately on top of the hot plate.

Plug in Hot Plate, and set temperature to desired set point.

Wait until the hot plate is given enough time to reach the desired temperature and the set points are reached on the barrel and nozzle temperature controllers (signal light off).
4 Manual Operation
4.1 Purging the Morgan-Press
The Morgan-Press should be purged of residual polymer prior to use which will:

1. Cleanse the barrel of polymer with contaminants, impurities, or degradation
2. Remove corrosive or abrasive materials which may attack the steel if left in the barrel cylinder for extended periods
3. Facilitate changing/cleaning of the nozzle

4.1.1 Purging Materials
Usually, an inert thermoplastic is used for purging, such as natural grade polyethylene or polypropylene. Since it is readily available, low-density polyethylene (LDPE) should be used.

4.1.2 How to Purge
The most common way of purging the Morgan-Press is to freely extrude the residual polymer out of the Barrel. The Barrel is loaded with the desired purging material and repeatedly purged until the extrusion is satisfactory. Since LDPE is recommended for use in purging the barrel, purging is complete when the polymer exiting the nozzle is completely clean (clear while hot).

A purging mold, created by Matt Cline, is used for purging. This ensures that the nozzle safety interlock is satisfied.

The following steps explain how to purge the Morgan-Press:
(see instructional video for further explanation)

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Place the purging mold on the Table Plate and make sure that it is properly centered</td>
</tr>
<tr>
<td>2.</td>
<td>Close the Table Guard</td>
</tr>
</tbody>
</table>

(see instructional video for further explanation)
3. Adjust the height of the Table Plate until the purging mold is flush with the nozzle

4. Adjust the temperature for the Barrel and the nozzle to the proper molding temperatures

5. Add the polyethylene to the Material Loading Chute and fill the barrel until it is full

6. Remove excess polyethylene and close the Gate

7. Adjust the injection pressure to $7 \times 10 \text{ psi}$ using the Injection Pressure Selector

8. Inject the polyethylene through the purging mold until no more polymer comes out (see Section 2.3.2)

9. To return the Ram Rod, press the Ram Return Valve on the side of the molder intermittently until the end of the Ram Rod is visible in the Material Loading Chute

10. Repeat until the polymer leaving the nozzle is clean

- Place aluminum foil wrapped cylinders under the purging mold for easy clean-up.
- Injection will not be possible until the Chute Gate is securely closed to satisfy safety interlock.
5 Shutdown

When the machine is no longer in use, follow the appropriate shutdown procedures below:

5.1 Shutdown without Purge
1. Switch off Temperature Controls and disconnect the electrical power cord
2. Check that the Ram Piston is above the Barrel
3. Turn the Clamp, Ram, and Injection Speed Control regulators off (check that pressure gauges read zero pressure)
4. Disconnect the air line or turn off the regulator that is supplying the unit

5.2 Shutdown with Purge
1. Turn the temperature controllers off or to the proper settings for the material that is used for purging
2. Remove mold from the machine (Follow instructions for purging located in section 3.1)
3. When purging is complete, perform steps 1 through 4 in section 4.1

Not all applications require purging during the shutdown procedure.

- Polycarbonate and ABS should be purged because they will leave a brown film on the barrel wall.
- Vinyl polymers and copolymers (PVC) should always be purged because they are very corrosive.
- Thermoplastic left in a barrel during shutdown and re-plasticized will degrade to some extent.
6 Maintenance

The Morgan Press requires very little regular maintenance. However, it is recommended that the following procedures be adopted in maintaining the machine:

1. Stanchion posts should be wiped clean and lightly oiled regularly.
2. Put oil in the holes provided on the thrust and pivot arms of toggle mechanism under the table on weekly basis or when dry.
3. Keep dirt, granules, and chips out of the toggle area and off the table platen.
4. Grease the table gears every six months.
5. Keep the Ram Shaft clean of excess material constantly.
6. Keep work area neat and clean.
7. Inspect movable parts for signs of wear.

6.1 Parts Listing

In the event of a malfunctioning part, locate the part from the list below to find the manufacturer so a replacement can be ordered.

<table>
<thead>
<tr>
<th>PART NAME</th>
<th>MANUFACTURER</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BASE CASTING ASSEMBLY</strong></td>
<td></td>
</tr>
<tr>
<td>Toggle Base Casting</td>
<td>Morgan</td>
</tr>
<tr>
<td>Lower Panel</td>
<td>Morgan</td>
</tr>
<tr>
<td>Control Valve Drop Bar (2)</td>
<td>Morgan</td>
</tr>
<tr>
<td>Clamp Air Regulator</td>
<td>Watts #R-113-02-02-DP</td>
</tr>
<tr>
<td>Ram Air Regulator</td>
<td>Watts #R-113-02-02-DP</td>
</tr>
<tr>
<td>Clamp Control Valve</td>
<td>Lexair #M384-0602</td>
</tr>
<tr>
<td>Ram Control Valve</td>
<td>Lexair #M382-1306</td>
</tr>
<tr>
<td>Timer Valve</td>
<td>Watson #180-N-PM</td>
</tr>
<tr>
<td>Ram Return Valve</td>
<td>Lexair #M382-0601</td>
</tr>
<tr>
<td>Clam Control Valve Muffler (2)</td>
<td>Allied Witan #C28</td>
</tr>
<tr>
<td>Injection Control Valve Muffler</td>
<td>Allied Witan #CP28</td>
</tr>
<tr>
<td>Reservoir Cover</td>
<td>Morgan</td>
</tr>
<tr>
<td>Reservoir Gasket</td>
<td>Morgan</td>
</tr>
<tr>
<td><strong>TABLE ASSEMBLY</strong></td>
<td></td>
</tr>
<tr>
<td>Table Platen</td>
<td>Morgan</td>
</tr>
<tr>
<td>Table Guard</td>
<td>Morgan</td>
</tr>
<tr>
<td>Lexan Shield (4)</td>
<td>Morgan</td>
</tr>
<tr>
<td>Post Slider, Table Guard (8)</td>
<td>Morgan</td>
</tr>
<tr>
<td>Actuator Pin</td>
<td>Morgan</td>
</tr>
<tr>
<td>Table Actuator, Interlock Valve</td>
<td>Air &amp; Hydraulics #321004</td>
</tr>
<tr>
<td>Elevating Shaft</td>
<td>Morgan</td>
</tr>
<tr>
<td>Elevating Gear</td>
<td>Boston Gear #L-152-BY-P</td>
</tr>
<tr>
<td>Temperature Data Label</td>
<td>Morgan</td>
</tr>
<tr>
<td>Up/Down Label</td>
<td>Morgan</td>
</tr>
<tr>
<td>3/8&quot; Allen Key with molded handle</td>
<td>Morgan</td>
</tr>
</tbody>
</table>


**MOUNT PLATE ASSEMBLY**

Mount Plate Morgan
Shroud Morgan
Upper Panel Morgan
Clamp Pressure Gauge U.S. Gauge #102030
Ram Pressure Gage U.S. Gauge #102030
Ram Actuator Interlock Valve Air & Hydraulics #321204
Chute Cover Morgan
Chute Guard Morgan
Spring Clip, Table Guard Seastrom #4521-16-50-2C

**TEMPERATURE CONTROLLER CABINET**

Cabinet Housing Morgan
Cabinet Door Morgan
Mounting Bracket Morgan
Nozzle Temperature Control Watlow Series 100 standard or
Barrel Temperature Control Watlow Series 808 optional
Electric Cord Morgan
Strain Relief L-51 Electroline
Terminal Strip Kulka #600-10
Rocker Switch Carlingswitch #LTILA54-6S-WH-RC-NBL

**TOGGLE CLAMP MECHANISM**

_**Base Plate Assembly (All welded)**_
Base Plate Morgan
Side Plate (2) Morgan
Angle Bracket (2) Morgan
Side Pivot Lug (2) Morgan
Center Pivot Lug Morgan

_Cylinder Assembly_
Cylinder Morgan
Cylinder Back Cover Morgan
Cylinder Over Retainer Bracket Morgan
Cylinder Piston Morgan
Cylinder Drive Shaft Morgan
Cylinder Piston O-Ring Parco #568-429 Buna-N
Back Cover O-Ring Seal Parco #568-162 Buna-N
Back Shaft O-Ring (2) Parco #568-214 Buna-N
Cylinder Pivot Dowel Pin (2) SPS Unbrako 5/8" x 1 3/4"
**Thrust Shaft Assembly**
- Threaded Shaft: Morgan
- Shaft Sleeve (Welded) with:
  - Steel Ball: 1 1/2" Steel Ball
  - Ball Retainer: Morgan
  - Bevel Gear: Boston Gear #L-152-BY-G
- Ball Socket: Morgan
- Retainer Nut: Morgan (1 1/4" - 12 nut)

**Connecting System**
- Connecting Arm (2): Morgan
- Connecting Arm Dowel Pin (2): SPS Unbrako 5/8" x 4"
- Shock Absorber Pad (2): Morgan
- Pivot Shaft: Morgan

**TIE BAR ASSEMBLY**
- Stanchion Post (4): Morgan
- Stanchion Nut (8): Morgan
- Stanchion Washer (8): Morgan

**UPPER PLATEN ASSEMBLY**
- Top Plate: Morgan
- Side Legs (2): Morgan
- Side, Lower box (2): Morgan
- Front/Back, Lower Box: Morgan
- Bottom Plate: Morgan

**BARREL ASSEMBLY**
- Barrel Assembly: Morgan
- Flange: Morgan
- Flange Spacer (3): Morgan
- Barrel Insulation Collar: Morgan
- Barrel Heater Band: Glenn #3066 S1Y-36"
- Nozzle Heater Band: Glenn #2424 S1Y-36"
- Thermocouple Bayonet Adapter (2): Gordon #TH298-1
- Thermocouple (2): Gordon #1598-42-4
- Barrel Heat Guard/Insulation: Morgan
- Silicon Bolt Spacer (3): Morgan
- Metal Bolt Spacer (3): Morgan
- Barrel Bolt (3): 3/8-16 x 5" Soc Hd Cap Screw
- Nozzle: Morgan
<table>
<thead>
<tr>
<th><strong>TABLE ASSEMBLY</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ram Cylinder</td>
<td>Morgan</td>
</tr>
<tr>
<td>Ram Cylinder Cover</td>
<td>Morgan</td>
</tr>
<tr>
<td>Ram Cylinder Piston</td>
<td>Morgan</td>
</tr>
<tr>
<td>Ram Shaft</td>
<td>Morgan</td>
</tr>
<tr>
<td>Barrel Piston</td>
<td>Morgan</td>
</tr>
<tr>
<td>Ram Cylinder Piston O-Ring</td>
<td>Parco #568-443 Buna N</td>
</tr>
<tr>
<td>Ram Shaft O-Ring (2)</td>
<td>Parco #568-117 (Viton)</td>
</tr>
<tr>
<td>Ram Return Spring</td>
<td>Morgan</td>
</tr>
<tr>
<td>Ram Cylinder Gasket</td>
<td>Morgan</td>
</tr>
<tr>
<td>Quick Exhaust Valve</td>
<td>Hannifin #OR-25</td>
</tr>
<tr>
<td>Quick Exhaust Valve Muffler</td>
<td>Allied Witan #M02</td>
</tr>
</tbody>
</table>
## 7 Troubleshooting

<table>
<thead>
<tr>
<th>Defect</th>
<th>Possible Causes</th>
<th>Corrective Action</th>
</tr>
</thead>
</table>
| Mold not full (short shot)     | 1. Material too cold  
2. Mold too cold  
3. Insufficient cavity venting of mold  
4. Injection pressure too low  
5. Time cycle too short  
6. Gates and/or runners too small | 1. Raise barrel and nozzle zone temperatures  
2. Apply heat to mold  
3. Rework mold to allow more venting  
4. Raise injection pressure  
5. Increase injection cycle time  
6. Increase the size of runners and gates |
| Mold halves separate (part flashed at parting line) | 1. Injection pressure too high for clamp force selected | 1. Lower injection pressure, pr raise clam force, or both |
| Part discolored                | 1. Heat too high  
2. Cycle time too long | 1. Lower selected temperatures  
2. Shorten cycle time |
| Excessive “sink” in part       | 1. Part design  
2. Injection pressure too low  
3. Gate too small  
4. Cycle time too short  
5. Material too hot  
6. Mold too hot | 1. Avoid thick sections  
2. Raise injection pressure  
3. Adjust mold to allow more gating  
4. Increase injection cycle time  
5. Lower nozzle and barrel temperatures  
6. Cool mold |
| Surface of part streaked, blistered, and/or bubbles in part | 1. Moisture in material granules  
2. Material temperature too high | 1. Dry material thoroughly before molding  
2. Lower nozzle and barrel temperatures |
Appendix

Pneumatic System
Pilot Valve
Flow Control Valve