READ AND UNDERSTAND ALL SAFETY AND WARNING DECALS AND INSTRUCTIONS PRIOR TO USING THE CURTISS-WRIGHT SMART RAM. FAILURE TO DO SO MAY RESULT IN ELECTRIC SHOCK, FIRE, AND/OR SERIOUS INJURY.

SAVE ALL WARNINGS AND INSTRUCTIONS AND KEEP WITH TOOL FOR FUTURE REFERENCE.
# SAFETY SYMBOLS AND DEFINITIONS

Safety symbols are used to identify any action or lack of actions that can cause personal injury.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>!</td>
<td>DANGER - Danger is used only when actions or lack of actions will cause serious human injury or death</td>
</tr>
<tr>
<td>!</td>
<td>WARNING - Warning is used to describe an action or lack of action where serious injury can occur</td>
</tr>
<tr>
<td>📚</td>
<td>READ INSTRUCTIONS - Read all instruction prior to operating equipment</td>
</tr>
<tr>
<td>🕶️</td>
<td>EYE PROTECTION - Wear proper eye protection to protect against ejected parts or projectiles</td>
</tr>
<tr>
<td>🎧</td>
<td>EAR PROTECTION - Wear proper ear protection to protect against hearing loss or damage</td>
</tr>
<tr>
<td>!</td>
<td>PINCH POINT / HAND CRUSHING – Keep hands and fingers clear of pinch points during setup and operation.</td>
</tr>
</tbody>
</table>

## System Safety Precautions

- The user must read and thoroughly understand these installation instructions before any work begins. The user should read and thoroughly understand the installation procedures as supplied with every kit of Pop-A-Plug® Tube Plugs. It is the responsibility of the user to establish appropriate safety, health, and training measures for their personnel using, servicing, or working in an area where this equipment is being used.
- The user must be familiar with correct operation, maintenance, and use of hydraulic tools. Lack of knowledge in any of these areas can lead to personal injury.
- Wear proper eye protection to protect against ejected parts or other projectiles.
- Wear proper ear protection to protect against hearing loss or damage.
- Possible Kickback Hazard. Keep body, head, face, and all extremities clear from rear of hydraulic ram during operation.
- Tools and components listed in this instruction are designed for the sole purpose of installing and removing P2 and CPI/PERMA™ Pop-A-Plug heat exchanger tube plugs. The equipment is not designed or intended to be used for other tasks.
- Curtiss-Wright Smart Rams are NOT to be used in an explosive environment. Doing so may cause serious injury, property damage or death
- Unexpected tool movement or breakage of inserted tool could cause injury to personnel.
- Unsuitable postures may not allow for proper counteracting of normal or unexpected movement of the tool during operation.
- Inspect equipment before each use to prevent unsafe conditions from developing. Do not use equipment if it is damaged, altered, or in poor condition.
- There are no serviceable parts in these assemblies. If any equipment is damaged or faulty, contact EST Group for service or replacement.
- These instructions are intended for the end-user or operator of this equipment. For additional information or parts lists contact an EST Group facility.
- Inspect all components for wear or damage prior to each use. Do not use any equipment that is not in proper working order. If any equipment is damaged or faulty, contact EST Group for service or replacement.
- Replace any worn or damaged safety decals.
- There are no user modifiable parts or components in the Curtiss-Wright Smart Ram package.
- Keep all components of the system clean at all times.
- Changes or modifications made to the equipment that are not expressly approved by Curtiss-Wright EST Group may void the FCC authorization to operate this equipment.
Use tool with 18 V Li-ion Makita battery or equivalent

<table>
<thead>
<tr>
<th>Battery Part Number</th>
<th>Battery Description</th>
<th>Makita Part Number</th>
<th>Charging Time*</th>
<th>Watt Hours</th>
<th>Charge Temp. Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>SR-B2 2.0 Ah, 18v Li-ion</td>
<td>BL1830</td>
<td>20 minutes</td>
<td>36 Wh</td>
<td>50°F to 104°F</td>
<td></td>
</tr>
<tr>
<td>SR-B3 3.0 Ah, 18v Li-ion</td>
<td>BL1830</td>
<td>22 minutes</td>
<td>54 Wh</td>
<td>10°C to 40°C</td>
<td></td>
</tr>
<tr>
<td>SR-B5 5.0 Ah, 18v Li-ion</td>
<td>BL1850</td>
<td>45 minutes</td>
<td>90 Wh</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Charging time is temperature dependent

Note: Check and comply with all regulations and laws when transporting or shipping lithium-ion batteries.
Powering on the Smart Ram:

Install a Makita 18v Li-ion battery, or equivalent, and momentarily press the trigger. This also operates the LED light:

Operating the Smart Ram:

Press and hold the trigger. The hydraulic pump motor will run, and the cylinder will stroke while the trigger is pressed. Releasing the trigger stops the pump, and the piston will remain in position until the piston is manually retracted.

The Smart Ram will either operate until it senses the breaking of a Breakaway (correct installation), or if it reaches the maximum pressure limit setting. In either case the SR will automatically stop the pump motor.
A general arrangement of the Curtiss-Wright Smart Ram (SR), Pull Rod, Knurled Nut, Positioning Washer, Positioner, and Pop-A-Plug Tube Plug is shown. The Smart Ram is made ready for use by following these steps:

1. Fully thread Knurled Nut onto the Smart Ram Cylinder. Do not tighten.
2. Fully thread Pull Rod into the Curtiss-Wright Smart Ram Piston, hand tighten.
3. Place the Positioning Washer over the Pull Rod into the Knurled Nut with the arrow facing away from the Knurled Nut.
4. Place the Positioner over the Pull Rod with the arrow facing away from the Positioning Washer.
5. Fully thread the Pop-A-Plug Tube Plug into the Pull Rod, finger tighten.
6. The Positioner should be able to move freely on the Pull Rod. Unthread Knurled Nut until it removes slack in Pull Rod assembly, finger tighten.
The Pop-A-Plug Tube Plug is now correctly installed on the SR. Follow all instructions provided with the Pop-A-Plug tube plug kit to fully prepare the tube for plug installation. Be aware of potential pinch points as the SR may recoil when the Breakaway fractures. When ready:

1. Press and hold the trigger. The SR will begin to install the Pop-A-Plug Tube Plug in the tube.
2. Keep the trigger depressed until the Breakaway fractures or the SR stops on its own.
3. The SR piston might automatically retract. If not, manually retract the cylinder.

Occasionally, a Pop-A-Plug Tube Plug may not be fully installed after a single full stroke of the SR. If required a second stroke can be completed. If the plug is engaged within the inside of the tube, make sure the SR is carefully supported during this procedure to prevent the plug from being cocked or moved or unintentionally breaking the Breakaway.

1. Manually retract the SR Piston if it has not done so automatically. All tension in the Pull Rod should be fully relieved, and the Positioner should be able to move freely on the Pull Rod.
2. Unthread Knurled Nut two full turns to partially remove slack in the Pull Rod assembly.

After installation, part of the Breakaway Stub remains threaded in the Pull Rod. The Breakaway Stub has a shoulder on it that prevents the Positioner from sliding off. Leaving the Breakaway Stub in place is recommended if the Curtiss-Wright Smart Ram is going to be stored with the Pull Rod, Positioning Washer, Knurled Nut, and Positioner installed. The Breakaway Stub must be removed to install additional Pop-A-Plug Tube Plugs.

To remove the Breakaway Stub, follow these steps:

1. Fully thread Knurled Nut onto SR Cylinder.
2. Push the Positioner against the Positioning Washer to expose the Breakaway Stub.
3. Unthread the Breakaway Stub from the Pull Rod.
4. Remove the Breakaway Stub.
Service is recommended either after 10,000 operations or once every 3 years, whichever comes first. Contact EST Group Customer Service for Curtiss-Wright Smart Ram service and maintenance.