Operators are familiar with panel switches that are used to control motors. They frequently have 3 positions labeled ‘Hand’, ‘Off’, and ‘Automatic’. The motor runs continuously with the switch in the ‘Hand’, position. It stays off with the switch in the ‘Off’ position. The ‘Auto’ position allows the motor to turn on and off according to some programmed automatic cycle.

Corsair offers a ‘H-O-A’ device type that provides a computer equivalent to a ‘Hand-Off-Automatic’ panel switch. It allows the operator to force an item on, force it off or let it operate automatically. Each H-O-A device occupies 3 bits of PLC data memory. Each bit has a predefined purpose and name.

<table>
<thead>
<tr>
<th>HAND</th>
<th>ENABLE</th>
<th>STATUS</th>
</tr>
</thead>
</table>

The least significant bit is the ‘status’ bit. It corresponds to the current running status of the item controlled by the H-O-A. The status bit controls the color of a device icon that utilizes the H-O-A device. The middle bit is known as the ‘enable’ bit. The most significant bit is known as the ‘hand’ bit. The switch positions correspond to the values in the enable and hand bits as follows:

<table>
<thead>
<tr>
<th>Hand</th>
<th>Enable</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>‘Off’</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>‘Auto’</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>‘??’ (undefined)</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>‘Hand’</td>
</tr>
</tbody>
</table>

The two bits can be in 4 different combinations. Only 3 of them are valid. The Corsair computer will only place the bits in one of the 3 valid combinations.

There are many possible variations for PLC ladder logic with H-O-A devices. A simple example is control of a solenoid valve. Assume that the solenoid has a single output and no monitoring inputs. An example rung may look like this:
The enable bit is off when the H-O-A is in the ‘Off’ or ‘??’ positions. In the ‘Hand’ position the hand and enable bits are both on so the output is activated. In the ‘Auto’ position the enable bit is on and the hand bit is off. This permits the automatic logic control the output.

H-O-A logic may be slightly different with motors. An auxiliary contact of the motor starter may feed a PLC input. An additional PLC bit is used as a ‘call relay.’

First Scan

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H-O-A Hand bit

U

Auxiliary contact input

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H-O-A Status bit

Call Relay

Automatic logic

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H-O-A Enable bit

Motor Output

The optional first rung is used to shut off the hand bit on the first scan of the processor. This is used to prevent a safety problem from unexpected motor starts on power-up. The first rung is not required in situations where the H-O-A status is to be retained through power failures.

The 3-bits of the Corsair H-O-A offer tremendous flexibility in control sequences. They should be used with caution. The PLC programmer is responsible for system safety at all times. Proper safety interlocking must be used whenever automatic logic is overridden to force a motor on.