Eaton® DuraForce™ HMV

Service Manual

EATON
Powering Business Worldwide
Table of Contents

<table>
<thead>
<tr>
<th>Content</th>
<th>Page #</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric Infinitely Variable Control Adjustment Procedure for HMV Motors</td>
<td></td>
</tr>
<tr>
<td>Set Up</td>
<td>3</td>
</tr>
<tr>
<td>Procedure</td>
<td>4</td>
</tr>
<tr>
<td>Hydraulic Infinitely Variable Control Adjustment Procedure for HMV Motors</td>
<td></td>
</tr>
<tr>
<td>Set Up</td>
<td>5</td>
</tr>
<tr>
<td>Procedure</td>
<td>7</td>
</tr>
<tr>
<td>Maximum Displacement Adjustment Procedure for HMV Motors</td>
<td></td>
</tr>
<tr>
<td>Set Up</td>
<td>8</td>
</tr>
<tr>
<td>Procedure</td>
<td>9</td>
</tr>
<tr>
<td>Minimum Displacement Adjustment Procedure for HMV Motors</td>
<td></td>
</tr>
<tr>
<td>Set Up</td>
<td>10</td>
</tr>
<tr>
<td>Procedure</td>
<td>11</td>
</tr>
<tr>
<td>Pressure Compensator Adjustment Procedure for HMV Motors</td>
<td></td>
</tr>
<tr>
<td>Set Up</td>
<td>12</td>
</tr>
<tr>
<td>Procedure</td>
<td>13</td>
</tr>
<tr>
<td>Electric Regulation Begin Adjustment for HMV Double Motors</td>
<td></td>
</tr>
<tr>
<td>Set Up</td>
<td>14</td>
</tr>
<tr>
<td>Part A: Procedure to Adjust the Regulation Begin for Motor #1</td>
<td>15</td>
</tr>
<tr>
<td>Part B: Procedure to Adjust the Regulation Begin for Motor #2</td>
<td>16</td>
</tr>
<tr>
<td>Maximum Displacement Adjustment Procedure for HMV Double Motors</td>
<td></td>
</tr>
<tr>
<td>Set Up</td>
<td>17</td>
</tr>
<tr>
<td>Procedure</td>
<td>18</td>
</tr>
<tr>
<td>Minimum Displacement Adjustment Procedure for HMV Double Motors</td>
<td></td>
</tr>
<tr>
<td>Set Up</td>
<td>19</td>
</tr>
<tr>
<td>Procedure</td>
<td>20</td>
</tr>
<tr>
<td>Neutral Position Adjustment Procedure for HMV Double Motors</td>
<td></td>
</tr>
<tr>
<td>Set Up and Procedure</td>
<td>21</td>
</tr>
</tbody>
</table>

Environmental Concerns

Protection of the natural fundamentals of life is one of our predominant tasks. We are continuously improving the protection of the environment as far as applications are concerned. We encourage you to contribute your share to comply with this demand. In connection with work to be performed, the environmental regulations of the machine manufacturer must be respected.

In general:

- Greases and oils which cannot be used any more have to be collected. They are normally a threat to water reserves and must be kept away from the environment.
- Adhere to national and local regulations for waste disposal.

Important

You have been provided information on the conversion of DuraForce products. Proper application of the information requires specific training and may require use of specialized tooling and equipment. All requests for training must be coordinated through your Eaton Account Manager. He can also provide you price and availability of any specialized tooling. If you choose to proceed with the conversion of the DuraForce products absent the necessary training and/or these specialized tools, you do so at your risk.

Eaton will accept no claim for warranty resulting from deficiencies in the conversion. Please refer to the Eaton literature web site for warranty information at www.eaton.com/hydraulics/warranty.
Electric Infinitely Variable Control Adjustment Procedure for HMV Motors

Set Up

Tools / Equipment Required

Note: Due to slight differences in the HMV controls and motor sizes, several tools will be specified to insure that you have all tool combinations that may be required.

- 13mm off-set closed-end wrench
- 6mm wrench
- 4mm Allen wrench
- Multi-Meter (capable of measuring DC Amperage up to 2 Amps Max.)

Note #1:
Make sure that the HMV minimum and maximum displacements have been adjusted prior to performing this procedure. Refer to the related Eaton Service Bulletins for information on how to make these adjustments.

Note #2:
To insure the proper operation of the motor, you must provide supply-pressure into port “E” between 290-580 psi. If the HMV has the configuration where this supply-pressure is provided internally (via the case-flushing shuttle), then ignore this note.

Note #3:
Prior to performing this procedure, it is necessary for you to know what the control range (in amperage) is for your particular HMV. The HMV motors can be equipped with spring packages that provide several different control ranges.

Note #4:
The spring package that the HMV is equipped with will provide a control range that cannot be adjusted. The only thing that can be adjusted is either the regulation begin setting or the regulation end setting.

EXAMPLE: If the HMV has a spring package to provide a control range of 626 mA (834 mA regulation begin and 1460 mA regulation end), then this control range cannot be changed. If you adjust the regulation begin from 834 mA to 750 mA, then the regulation end will automatically be changed from 1460 mA to 1376 mA.

If you need to change the control range, then you must consult Eaton Engineering for the new spring package.

Note #5:
The HMV motor automatically defaults to maximum displacement and will remain at maximum displacement unless supplied with an external pressure or power supply to force it to de-stroke. For an “electrically” controlled HMV motor, current is typically supplied to the motor’s proportional solenoid to de-stroke it.

When making the adjustment to the HMV infinitely variable control, the HMV will be at maximum displacement prior to the regulation begin setting. At the regulation begin setting, the HMV will start to de-stroke towards minimum displacement. The HMV will de-stroke linearly throughout the control range as the current to the motor’s proportional solenoid is increased.

For this procedure, the supply flow to the motor must remain constant throughout the adjustment procedure - The motor rotational speed will increase as the motor de-strokes towards minimum displacement when the supply flow is constant. Therefore, for this procedure, the motor rotational speed will be used as the indicator to determine where the regulation begin and/or regulation end settings are.
Electric Infinitely Variable Control Adjustment Procedure for HMV Motors

Procedure

1. Install the multi-meter to measure the current to the motor’s proportional solenoid. Be sure to set the multi-meter to measure DC amperage.

2. Start the prime mover and adjust it to operating speed.

3. Supply a constant flow to the HMV. As mentioned previously, maintain this constant flow throughout this procedure.

4. Slowly energize the motor’s proportional solenoid.

5. Simultaneously monitor the current at the proportional solenoid and the rotational speed of the HMV.

6. When the rotational speed of the HMV increases, record the current at the solenoid. This is the regulation begin setting.

7. Continue to energize the proportional solenoid. The rotational speed of the HMV should continue to increase as the current increases.

8. Verify that the regulation end point coincides with the control range for the spring package in your HMV (as described in Notes #3 and #4 above).

9. Supply full current to the proportional solenoid. Confirm that the HMV is at minimum displacement by checking the rotational speed of the HMV.

10. To adjust the infinitely variable control:
   a. Hold the adjustment stud stationary.
   b. Loosen the locking nut.
   c. Turn the adjustment stud IN to decrease the regulation begin setting or turn it OUT to increase the regulation begin setting.
   d. Once the desired regulation begin setting has been acquired, hold the adjustment stud stationary and tighten the locking nut.

11. Turn the prime mover OFF and remove the multi-meter from the motor.
Hydraulic Infinitely Variable Control Adjustment Procedure for HMV Motors

Set Up

Tools / Equipment Required

Note: Due to slight differences in the HMV controls and motor sizes, several tools will be specified to ensure that you have all tool combinations that may be required.

- 13mm off-set closed-end wrench
- 17mm wrench
- 6mm wrench
- 5mm Allen wrench
- 4mm Allen wrench
- 0-400 psi pressure gauge (optional: 0-400 psi pressure transducer)

Important

This procedure does not include the “H6” or “E6” Control option. For “H6” or “E6” Control Adjustment Procedure, please refer to the related Eaton Service Bulletin.
Hydraulic Infinitely Variable
Control Adjustment Procedure
for HMV Motors

Set Up

Note #1:
Make sure that the HMV minimum and maximum displacements have been adjusted prior to performing this procedure. Refer to Related Service Bulletins for information on how to make these adjustments.

Note #2:
To insure the proper operation of the motor, you must provide supply-pressure into port "E" between 290-580 psi. If the HMV has the configuration where this supply-pressure is provided internally (via the case-flushing shuttle), then ignore this note.

Note #3:
Prior to performing this procedure, it is necessary for you to know what the control range is for your particular HMV. The HMV motors can be equipped with spring packages that provide several different control ranges.

Note #4:
The spring package that the HMV is equipped with will provide a control range that cannot be adjusted. The only thing that can be adjusted is either the regulation begin setting or the regulation end setting.

EXAMPLE: If the HMV has a spring package to provide a control range of 87 psi (116 psi regulation begin and 203 psi regulation end), then this control range cannot be changed. If you adjust the regulation begin from 116 psi to 100 psi, then the regulation end will automatically be changed from 203 psi to 187 psi.

If you need to change the control range, then you must consult Eaton Engineering for the new spring package.

Note #5:
The HMV motor automatically defaults to maximum displacement and will remain at maximum displacement unless supplied with an external pressure or power supply to force it to destroke. For a "hydraulically" controlled HMV motor, control pressure is typically supplied into port "X" of the motor to destroke it.

When making the adjustment to the HMV infinitely variable control, the HMV will be at maximum displacement prior to the regulation begin setting. At the regulation begin setting, the HMV will start to destroke towards minimum displacement. The HMV will detroke linearly throughout the control range as the pressure at port "X" is increased.

For this procedure, the supply flow to the motor must remain constant throughout the adjustment procedure - The motor rotational speed will increase as the motor destrokes towards minimum displacement when the supply flow is constant. Therefore, for this procedure, the motor rotational speed will be used as the indicator to determine where the regulation begin and/or regulation end settings are.
Hydraulic Infinitely Variable Control
Adjustment Procedure
for HMV Motors

Procedure

1. Install the 0-400 psi pressure gauge into port “X”.
2. Start the prime mover and adjust it to operating speed.
3. Supply a constant flow to the HMV.
   As mentioned previously, maintain this constant flow throughout this procedure.
4. Slowly increase the control pressure into port “X”.
5. Simultaneously monitor the pressure at port “X” and the rotational speed of the HMV.
6. When the rotational speed of the HMV increases, record the pressure at port “X”.
   This is the regulation begin pressure.
7. Continue to increase the control pressure into port “X”. The rotational speed of the HMV should continue to increase as the control pressure increases.
8. Verify that the regulation end point coincides with the control range for the spring package in your HMV (as described in Notes #3 and #4 above).
9. Supply full control pressure into port “X”. Confirm that the HMV is at minimum displacement by checking the rotational speed of the HMV.
10. To adjust the infinitely variable control:
    a. Hold the adjustment stud stationary.
    b. Loosen the locking nut.
    c. Turn the adjustment stud IN to decrease the regulation begin setting or turn it OUT to increase the regulation begin setting.
    d. Once the desired regulation begin setting has been acquired, hold the adjustment stud stationary and tighten the locking nut.
11. Turn the prime mover OFF and remove the pressure gauge from the motor.
Maximum Displacement Adjustment Procedure for HMV Motors

Set Up

Tools / Equipment Required

- 19mm closed-end wrench
- 6mm Allen wrench

Note #1:

The following table illustrates the maximum displacements and allowable rotational speeds for those displacements for the HMV motors. The HMV motors should NOT be operated at higher speeds if these maximum displacement settings are used. If higher rotational speeds are required for your application, you must consult Eaton Engineering for the allowable maximum displacement setting.

<table>
<thead>
<tr>
<th>Size</th>
<th>55</th>
<th>75</th>
<th>105</th>
<th>135</th>
<th>165</th>
<th>210</th>
<th>280</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Displacement limit (CC)</td>
<td>54.8</td>
<td>75.9</td>
<td>105.0</td>
<td>135.6</td>
<td>165.0</td>
<td>210</td>
<td>280</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Speed (RPM)</th>
<th>Continuous Max Speed at Max Displacement</th>
<th>4100</th>
<th>3800</th>
<th>3500</th>
<th>3200</th>
<th>3100</th>
<th>2700</th>
<th>2400</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Continuous Max Speed at Min Displacement</td>
<td>4700</td>
<td>4400</td>
<td>4100</td>
<td>3700</td>
<td>3500</td>
<td>3200</td>
<td>2900</td>
</tr>
</tbody>
</table>

Note #2:

To insure the proper operation of the motor, you must provide supply-pressure into port “E” between 290-580 psi. If the HMV has the configuration where this supply-pressure is provided internally (via the case-flushing shuttle), then ignore this note.
Maximum Displacement Adjustment Procedure for HMV Motors

Set Up and Procedure

Note #3:
The HMV motor automatically defaults to maximum displacement and will remain at maximum displacement unless supplied with an external pressure or power supply to force it to destroke. For a "hydraulically" controlled HMV motor, control pressure is typically supplied to port ‘X’ of the motor to destroke it. For an "electrically" controlled HMV motor, current is typically supplied to the motor solenoid to destroke it. When performing this procedure, make sure that no external pressure or power supply is supplied to the HMV motor to insure that the motor remains at maximum displacement.

Note #4:
The HMV motor with “E6” and “H6” controls automatically default to minimum displacement unless:

a. For H6 Infinitely Variable Control, supply a minimum of 205 psi control pressure into port ‘X’.

b. For 12V E6 Electric Infinitely Variable Control, you provide a minimum of 720 mA to the solenoid.

c. For 24V E6 Electric Infinitely Variable Control, you provide a minimum of 360 mA to the solenoid.

Procedure for Adjusting the HMV Maximum Displacement:

Start the prime mover and adjust it to operating speed.

1. Actuate the HMV per the requirements stated in "Note #3" and "Note #4”.

2. To Adjust the Motor Maximum Displacement:

a. Hold the adjustment stud stationary with the 6mm Allen Wrench.

b. Loosen the seal nut with the 19mm wrench.

c. Turn the adjustment stud IN to decrease the maximum displacement or turn it OUT to increase the maximum displacement.

d. Once the desired maximum displacement has been acquired, hold the adjustment stud stationary with the 6mm Allen wrench and tighten the seal nut with the 19mm wrench. The proper torque for the seal nut is 60 N-m (44 ft-lb).
Minimum Displacement Adjustment Procedure for HMV

Set Up

**Tools / Equipment Required**

- 19mm closed-end wrench
- 6mm Allen wrench

---

**Note #1:**

The following table illustrates the recommended minimum displacements and allowable rotational speeds for those displacements for the HMV motors. The HMV motors should NOT be operated at higher speeds if the recommended displacements are used. If higher rotational speeds are required for your application, you must consult Eaton Engineering for the required minimum displacement setting.

<table>
<thead>
<tr>
<th>Size</th>
<th>55</th>
<th>75</th>
<th>105</th>
<th>135</th>
<th>165</th>
<th>210</th>
<th>280</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min Displacement limit (CC)</td>
<td>18.3</td>
<td>25.3</td>
<td>35.0</td>
<td>45.2</td>
<td>55.2</td>
<td>70</td>
<td>93</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Speed (RPM)</th>
<th>Continuous Max Speed at Max Displacement</th>
<th>4100</th>
<th>3800</th>
<th>3500</th>
<th>3200</th>
<th>3100</th>
<th>2700</th>
<th>2400</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous Max Speed at Min Displacement</td>
<td>4700</td>
<td>4400</td>
<td>4100</td>
<td>3700</td>
<td>3500</td>
<td>3200</td>
<td>2900</td>
<td></td>
</tr>
</tbody>
</table>

**Note #2:**

To insure the proper operation of the motor, you must provide supply-pressure into port “E” between 290-580 psi. If the HMV has the configuration where this supply-pressure is provided internally (via the case-flushing shuttle), then ignore this note.
Note #3:
The HMV motor automatically defaults to maximum displacement unless:

a. (For Hydraulic Infinitely Variable Control) You supply a minimum of 205 psi control pressure into port "X".
b. (For 2-Position Hydraulic Control) You supply a minimum of 205 psi control pressure into port "X".
c. (For 10VDC Electric Infinitely Variable Control) You provide a minimum of 1460 mA to the solenoid.
d. (For 12VDC 2-Position Electric Control) You provide a minimum of 720 mA to the solenoid.
e. (For 24VDC 2-Position Electric control) You provide a minimum of 360 mA to the solenoid.

Under the above conditions, the HMV motor will be forced to minimum displacement.

Note #4:
For HMV motor with "E6" or "H6" controls, the motor automatically defaults to Minimum Displacement.

Procedure for Adjusting the HMV Minimum Displacement:

1. Start the prime mover and adjust it to operating speed.
2. Depending on the type of control on your HMV, refer to “note #3” and “note #4” above to force the motor to minimum displacement.
3. To Adjust the Motor Minimum Displacement:
   a. Hold the adjustment stud stationary with the 6mm Allen Wrench.
   b. Loosen the seal nut with the 19mm wrench.
   c. Turn the adjustment stud IN to increase the minimum displacement or turn it OUT to decrease the minimum displacement.
4. Once the desired minimum displacement has been acquired, hold the adjustment stud stationary with the 6mm Allen wrench and tighten the seal nut with the 19mm wrench. The proper torque for the seal nut is 60 N-m (44 ft-lb).
Pressure Compensator Adjustment Procedure for HMV Motors

Set Up

**Tools / Equipment Required**

- 17mm wrench
- 6mm wrench
- 0-7000 psi pressure gauge (optional: 0-7000 psi pressure transducer)

---

**Note #1:**

For this procedure, the motor will be forced to minimum displacement by supplying full control pressure (200 psi minimum) into port "X". The motor must then slowly be loaded to increase the workport pressure up to and greater than the desired pressure compensation setting. When the pressure compensator becomes active, the motor will automatically shift back to maximum displacement. When this happens, the workport pressure will suddenly decrease. Therefore, for this procedure, the motor workport pressure will be used as the indicator to determine where the pressure compensation setting is.

To use this procedure, you must be able to load the motor as described above.

**Note #2:**

The pressure compensation setting must be set at least 300 psi less than the settings on any cross-over relief valves used with the HMV to avoid premature cracking of the relief valves or interaction with the relief valves.
Pressure Compensator
Adjustment Procedure
for HMV Motors

Procedure

Procedure to Adjust the Pressure Compensation Setting:

1. Install the 0-7000 psi gauge to read either workport “A” or “B”, whichever is the easiest to gain access to.

2. Use the sketches above to note which workport you are taking a pressure reading from. This is critical for the adjustment of this motor control.
   - If reading pressure from workport ‘A’, Solenoid “M2” must be de-energized when making the pressure compensation adjustment/measurement.
   - If reading pressure from workport ‘B’, Solenoid “M2” must be energized when making the pressure compensation adjustment/measurement.

3. Start the prime mover and adjust it to operating speed.

4. Actuate the motor and supply full control pressure into port “X” (200 psi minimum).

5. Load the motor such that the workport pressure slowly increases.

6. As mentioned in Note #1, when the pressure compensator becomes active, the workport pressure will suddenly decrease. Monitor the pressure gauge. Record the highest pressure up until the pressure suddenly decreases. This is the pressure compensation setting.

7. To Adjust the Pressure Compensation Setting:
   a. Hold the adjustment stud stationary with the 6mm wrench.
   b. Loosen the locking nut with the 17mm wrench.
   c. Turn the adjustment stud IN to increase the pressure compensation setting or turn it OUT to decrease the pressure compensation setting.
   d. When the desired pressure compensation setting is acquired, hold the adjustment stud stationary and tighten the locking nut.

8. Stop the prime mover and remove the pressure gauge from the motor.
Electric Regulation Begin Adjustment
for HMV Double Motors

Set Up

Tools / Equipment Required

- 13mm offset closed-end wrench
- 4mm Allen wrench
- Multi-meter capable of reading 0 to 1000 mA
- Digital calipers capable of displaying 0.1mm
- Hammer and punch
Electric Regulation Begin Adjustment for HMV Double Motors

Part A: Procedure to Adjust the Regulation Begin for Motor #1

**Note:**
After Adjusting the regulation begin, you must reset the motor minimum displacement setting. Follow the instructions on pages 19-20 to reset the motor minimum displacement.

**Important**
The Electric Regulation Begin Adjustment of both motor controls are preset to the correct value by Eaton. They should **NOT** be adjusted or tampered with at any time.
The instructions included in this manual should **ONLY** be used if the Electric Regulation Begin Adjustment on either motor control has been tampered with or if one or both motor controls have been replaced.

1. On the Motor #2 Regulation Begin Adjustment, hold the Min. Displacement Stud stationary with the 4mm Allen wrench and loosen the Locking Nut with the 13mm wrench.

2. Slowly turn the Min. Displacement Stud IN until it just touches the spool in the motor control then tighten the Locking Nut. Record the number of turns (to the nearest 1/8 turn) of the stud.

   Number of Turns Stud #2 = _______________ turns

3. As illustrated on the previous page, measure from the edge of the Regulation Begin Cup to the edge of the motor control for Motor #1. Use the following steps to adjust the Regulation Begin Cup:
   a. Use the hammer and punch to loosen the Spanner Nut.
   b. Use the 13mm wrench on the Locking Nut to turn the Regulation Begin Cup either IN or OUT until the dimension of 15.6mm is acquired.
   c. Use the hammer and punch to tighten the Spanner Nut.

4. Connect the multi-meter to measure the current to the motor solenoid.

5. Supply a constant flow to the motor (It is important to maintain a constant flow since changes in motor rotational speed is used as an indicator).

6. While monitoring both the multi-meter and the motor rotational speed, slowly supply current to the motor solenoid. When the motor rotational speed changes (increases), record the current on the multi-meter – This is the regulation begin setting for Motor #1.

7. For a 12VDC Solenoid, the regulation begin setting should be 450±5 mA. For a 24VDC Solenoid, the regulation begin setting should be 225±2.5 mA. To adjust the regulation begin setting, use the following steps for the control on Motor #1:
   a. Use the hammer and punch to loosen the Spanner Nut.
   b. Use the 13mm wrench on the Locking Nut to turn the Regulation Begin Cup IN to increase the regulation begin setting or OUT to decrease it.
   c. Once a regulation begin setting of 450±5 mA (12VDC Solenoid) or 225±2.5 mA (24VDC Solenoid) is acquired, use the hammer and punch to tighten the Spanner Nut.

8. On the Motor #2 Regulation Begin Adjustment, hold the Min. Displacement Stud stationary and loosen the Locking Nut.

9. Turn the Min. Displacement Stud OUT by the number of turns recorded in Step #2 (Part A) above. Tighten the Locking Nut. The proper torque for the Locking Nut is 10 ft-lb.
Part B: Procedure to Adjust the Regulation Begin for Motor #2:

1. On the Motor #1 Regulation Begin Adjustment, hold the Min. Displacement Stud stationary with the 4mm Allen wrench and loosen the Locking Nut with the 13mm wrench.

2. Slowly turn the Min. Displacement Stud IN until it just touches the spool in the motor control then tighten the Locking Nut. Record the number of turns (to the nearest 1/8 turn) of the stud.

   Number of Turns Stud #1 = _______________ turns

3. As illustrated above, measure from the edge of the Regulation Begin Cup to the edge of the motor control for Motor #2. Use the following steps to adjust the Regulation Begin Cup:
   a. Use the hammer and punch to loosen the Spanner Nut.
   b. Use the 13mm wrench on the Locking Nut to turn the Regulation Begin Cup either IN or OUT until the dimension of 15.6mm is acquired.
   c. Use the hammer and punch to tighten the Spanner Nut.

4. Connect the multi-meter to measure the current to the motor solenoid.

5. Supply a constant flow to the motor (It is important to maintain a constant flow since changes in motor rotational speed is used as an indicator).

6. While monitoring both the multi-meter and the motor rotational speed, slowly supply current to the motor solenoid. When the motor rotational speed changes (increases), record the current on the multi-meter – This is the regulation begin setting for Motor #2.

7. For a 12VDC Solenoid, the regulation begin setting should be 450±5 mA. For a 24VDC Solenoid, the regulation begin setting should be 225±2.5 mA. To adjust the regulation begin setting, use the following steps for the control on Motor #2:
   a. Use the hammer and punch to loosen the Spanner Nut.
   b. Use the 13mm wrench on the Locking Nut to turn the Regulation Begin Cup IN to increase the regulation begin setting or OUT to decrease it.
   c. Once a regulation begin setting of 450±5 mA (12VDC Solenoid) or 225±2.5 mA (24VDC Solenoid) is acquired, use the hammer and punch to tighten the Spanner Nut.

8. On the Motor #1 Regulation Begin Adjustment, hold the Min. Displacement Stud stationary and loosen the Locking Nut.

9. Turn the Min. Displacement Stud OUT by the number of turns recorded in Step #2 (Part B) above. Tighten the Locking Nut. The proper torque for the Locking Nut is 10 ft-lb.

10. Follow all steps on pages 19-20 to reset the motor minimum displacement.
Maximum Displacement Adjustment Procedure for HMV Double Motors

Set Up

Tools / Equipment Required

- 13mm offset closed-end wrench
- 4mm Allen wrench

Important
This Service Bulletin is ONLY valid for HMV double motors.

Maximum Displacement Adjustment for Motor #1

Maximum Displacement Adjustment for Motor #2

Locking Nut (typical)

Maximum Displacement Adjustment Stud (typical)

26mm (max.)

Note #1:
The following table illustrates the maximum displacement and allowable rotational speed for the HMV double motor. The HMV double motor should NOT be operated at higher speeds if this maximum displacement setting is used. If a higher rotational speed is required for your application, you must consult Eaton Engineering for the allowable maximum displacement setting.

<table>
<thead>
<tr>
<th>Motor Size</th>
<th>Maximum Allowable Speed</th>
<th>Maximum Motor Displacement</th>
</tr>
</thead>
<tbody>
<tr>
<td>270 CC/Rev</td>
<td>3000 RPM</td>
<td>270 CC/Rev (2 X 135 CC/Rev)</td>
</tr>
</tbody>
</table>

Note #2:
To insure the proper operation of the motor, you must provide supply-pressure into Port “E” between 290-580 psi.

Note #3:
The HMV double motor automatically defaults to maximum displacement and will remain at maximum displacement unless supplied with an external power supply to force it to destroke. For an “electrically” controlled HMV double motor, current is typically supplied to the motor solenoid to destroke it.

When performing this procedure, make sure that no external power supply is supplied to the HMV double motor to insure that the motor remains at maximum displacement.
Maximum Displacement Adjustment Procedure for HMV Double Motors

Procedure

1. Start the prime mover and adjust it to operating speed.

2. Provide maximum flow to the HMV double motor making sure that no current is supplied to the motor solenoid.

3. Measure the rotational speed of the motor, the wheel, the gearbox, etc. and calculate if the maximum displacement is adjusted properly.

4. To Adjust the Motor Maximum Displacement:

   a. While holding the Maximum Displacement Adjustment Stud stationary with the 4mm Allen wrench, loosen the Locking Nut for Motors #1 and #2 with the 13mm wrench.

   b. Turn the Maximum Displacement Adjustment Stud IN to decrease the maximum displacement or turn it OUT to increase the maximum displacement. Turn each adjustment stud for Motors #1 and #2 by the same amount.

   **WARNING**
   The flow adjustment stud is NOT mechanically restricted from being removed completely from the motor control. Care should be taken when turning the flow adjustment stud OUT. DO NOT turn the adjustment stud OUT more than 26mm as illustrated on page 17 of this manual.

5. Once the desired maximum displacement has been acquired, hold the adjustment stud stationary with the 4mm Allen wrench and tighten the locking nut with the 13mm wrench. The proper torque for the locking nut is 14 N·m (10 ft-lb).
**Minimum Displacement Adjustment Procedure for HMV Double Motors**

**Set Up**

**Tools / Equipment Required**

- 13mm offset closed-end wrench
- 4mm Allen wrench

---

**Note #1:**

The following table illustrates the recommended minimum displacement and allowable rotational speed for the HMV135 double motors. The HMV135 double motors should NOT be operated at higher speeds if the recommended displacement is used. If a higher rotational speed is required for your application, you must consult Eaton Engineering for the required minimum displacement setting.

<table>
<thead>
<tr>
<th>Motor Size</th>
<th>Maximum Allowable Speed</th>
<th>Recommended Minimum Displacement</th>
</tr>
</thead>
<tbody>
<tr>
<td>270 CC/Rev</td>
<td>3600 RPM</td>
<td>49.0 CC/Rev (1X0 CC/Rev, 1x49 CC/Rev)</td>
</tr>
</tbody>
</table>

**Note #2:**

To insure the proper operation of the motor, you must provide 290-580 psi supply pressure into port “E”.

**Note #3:**

The HMV double motor automatically defaults to maximum displacement. The motor will not destroke to minimum displacement unless you provide a minimum of 1250 mA (for 12VDC Solenoid) or 625 mA (for 24VDC Solenoid) to the motor solenoid. Under this condition, the HMV double motor will be forced to minimum displacement.

*Prior to adjusting the minimum displacements on the motor, verify that the flow from the pump is as expected.*
Minimum Displacement Adjustment Procedure for HMV Double Motors

Procedure for Adjusting the HMV Minimum Displacement:

1. Start the prime mover and adjust it to operating speed.
2. Provide maximum flow to the HMV double motor.
3. Provide at least 1250 mA (for 12 VDC Solenoid) or 625 mA (for 24 VDC Solenoid) to the motor solenoid.
4. Measure the rotational speed of the motor, the track, the gearbox, etc. and calculate if the minimum displacement is adjusted properly.
5. To Adjust the Motor Minimum Displacement:
   a. While holding the Minimum Displacement Adjustment Stud for Motor #1 stationary with the 4mm Allen wrench, loosen the Locking Nut for Motor #1 with the 13mm wrench.
   b. Turn the adjustment stud for Motor #1 OUT until the motor speed does not increase anymore. This will insure that Motor #1 has a minimum displacement of 0 cc/rev.
   c. Once the adjustment described in “b” is reached, hold the adjustment stud for Motor #1 stationary and tighten the locking nut for Motor #1. The proper torque for the locking nut is 10 ft-lb.
   d. While holding the Minimum Displacement Adjustment Stud for Motor #2 stationary, loosen the Locking Nut for Motor #2.
   e. Turn the adjustment stud IN to increase the minimum displacement of Motor #2 or OUT to decrease it.
   f. Once the desired minimum displacement has been acquired, hold the adjustment stud for Motor #2 stationary and tighten the locking nut. The proper torque for the locking nut is 10 ft-lb.
Neutral Position Adjustment
Procedure for HMV Double Motors
Set Up and Procedure

Tools / Equipment Required

- 16mm wrench (optional: adjustable wrench)
- Digital calipers capable of displaying 0.01mm
- Hammer and punch

Important
This Service Bulletin is ONLY valid for HMV double motors.

Note: You must adjust the Neutral Adjustment on both motor controls.

1. Loosen the Spanner Nut for Motor #1 with the hammer and punch.
2. Using a 16mm wrench and digital calipers, adjust the Neutral Adjustment for Motor #1 to 14.75mm as illustrated above.
3. Secure the Neutral Adjustment for Motor #1 by tightening the Spanner Nut with the hammer and punch.
4. Repeat steps #1 through #3 for Motor #2.