1. INTRODUCTION

This handbook covers operations and service instructions for the model 491 Torque Multiplier.

 WARNINGS

- To prevent accidental torque release, which could result in personal injury, the neutral positioning set screw (Fig. 1, Item 2) must be flush with the top of the housing whenever the torque multiplier is operated MANUALLY. The selector pawl (Fig. 1, Item 3) must also operate freely in the CW and CCW positions.
- Inspect output square drive (Fig. 2, Item 4) for visible sign of fatigue or fracture prior to EACH use. Replace if necessary (see Section 8). Failure of the output square drive could result in an immediate torque release, causing torque multiplier to fall from the fastener and result in personal injury.
- Do not hold torque multiplier (Fig. 2, Item 3) or reaction plate (Fig. 2, Item 1) while applying torque since normal multiplier deflection might cause fingers to be pinched; especially in confined locations.
- Maintain firm hand control of torque wrench or input handle when releasing multiplier, since recoil (wind-up) will be experienced.
- Avoid the use of output drive extensions. If an output drive extension is used, a custom, double-ended reaction plate is required to keep the multiplier from being forced sideways off the nut or breaking the extension. Consult the manufacturer for further design information.
- Since torque reaction approximately equals OUTPUT torque, be sure to select an anchoring point sufficient to withstand the torque reaction force!
- Check reaction plate holding screws periodically to insure they are tight (Fig. 2, Item 2).

2. IMPORTANT INSTRUCTIONS

2.1 Read and understand these Operating Instructions before using the Torque Multiplier.

2.2 DO NOT USE AN IMPACT WRENCH ON THE TORQUE MULTIPLIER. DAMAGE TO TOOL COULD OCCUR.

2.3 When using a POWER driven input, be sure the selector pawl (Fig.1 Item 3) has been locked into its neutral position using the neutral positioning set screw (Fig. 1 Item 2).

2.4 When positioning the Torque Multiplier, be sure socket attached to the output is positioned so that the Reaction Plate is at right angles to the fastener (See Torque Multiplier Application Information Sheet). REMEMBER: Torque reaction creates a rotational force in the opposite direction from which input force is applied.

2.5 When using the Torque Multiplier without a torque wrench to apply input torque, remember that the output torque is A Controlled-Shear Output Square Drive (Fig. 2 Item 4) protects internal components in the event maximum output capacity is exceeded. This overload-protection feature causes the drive to fracture when output exceeds from 3% to significantly greater than the applied input torque.

2.6 Use only Hydratight Sweeney approved output square drives and replacement parts.

3. DESCRIPTION AND DESIGN FEATURES

3.1 The 491 Torque Multiplier uses a planetary geared action to tighten and loosen nuts, bolts and cap screws with a continuous 360° rotation in either clockwise or counterclockwise direction. Input and output rotation directions are the same. (EXAMPLE: Input clockwise, output clockwise.) An internal, two-directional anti-backlash device prevents accidental torque wind-up release.

3.2 The Multiplier is designed to accept custom Reaction Plates. These Reaction Plates can be designed and built at the factory or fabricated by the user. Design guidelines can be obtained from Hydratight Sweeney.

Fig 1. Input End Detail
1. Rotational Direction Indicators
2. Neutral Positioning Set Screw
3. Selector Pawl
4. ½” Female Square Input Drive

Fig 2. Anchor Plate & Square Retention Detail
1. Reaction Plate
2. Socket Head Cap Screw
3. Torque Multiplier
4. Controlled-Shear Output Square Drive
5. Set Screw

3.3 A Controlled-Shear Output Square Drive (Fig. 2 Item 4) protects internal components in the event maximum output capacity is exceeded. This overload-protection feature causes the drive to fracture when output exceeds from 3% to
3.4 An optional pneumatic power drive (Model 3900A) is available to convert the torque multiplier from manual to pneumatic operation.

4. SPECIFICATIONS

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Output Capacity</td>
<td>1,000 (1,356) Lbf-ft (N·m)</td>
</tr>
<tr>
<td>Input Capacity</td>
<td>196 (266) Lbf-ft (N·m)</td>
</tr>
<tr>
<td>Gear Ratio</td>
<td>5.57:1</td>
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<tr>
<td>Torque Ratio (Avg.)</td>
<td>5.1:1</td>
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<tr>
<td>Output Drive Male Square Size Inches (mm)</td>
<td>3/4 (19)</td>
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<tr>
<td>Input Drive Female Square Size Inches (mm)</td>
<td>1/2 (13)</td>
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<tr>
<td>Overall Dimensions</td>
<td>A 13.5 (343) B 4-3/8 (111) C 4-1/2 (114)</td>
</tr>
<tr>
<td>Net Weight Lbs. (kg)</td>
<td>10.5 (4.8)</td>
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<tr>
<td>Planetary Gearing Stages</td>
<td>One</td>
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<tr>
<td>Needle Bearings</td>
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<td>Angle-of-turn Protractor</td>
<td>No</td>
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<tr>
<td>Torque Conversion Chart</td>
<td>Yes</td>
</tr>
<tr>
<td>Shearable Replaceable Output Drive</td>
<td>Yes</td>
</tr>
<tr>
<td>Reaction Anchor Type</td>
<td>Plate</td>
</tr>
</tbody>
</table>

5. TORQUE CONVERSIONS

5.1 A data plate is attached to the torque multiplier which displays the input torque required to obtain the listed output torque values. If you wish to calculate a specific input value that isn’t listed on the attached chart, divide the desired output torque by 5.1 to determine the input torque value required (e.g. 510 Lbf-ft OutPut ÷ 5.1 = 100 Lbf-ft input torque).

6. MANUAL OPERATION

6.1 For manually applied Input: Set the desired rotation direction by pushing the Selector Pawl (Fig. 1 Item 3) in the direction indicated by the letters and directional arrows (Fig. 1, Item 1) stamped on the input end case.

EXAMPLE: If counter-clockwise rotation is desired, push Pawl to end of travel in the direction shown by the “CCW” arrow. For clockwise rotation, push Pawl in the opposite direction. (See Warning).

6.2 Mount the proper size square female drive socket onto the Torque Multiplier Output Square Drive (Fig. 2 Item 4), then position Socket and Multiplier on the fastener to be tightened. Remember: When socket is properly positioned on fastener, Reaction Plate must be at right angles to the fastener to which torque is being applied. (See Torque Multiplier Application Information Sheet).

6.3 Butt the Reaction Plate securely against a suitable object (See Torque Multiplier Application Information Sheet) or attach a second socket to the slave drive adapter (Fig. 3) and react the applied torque on an adjacent nut.

6.4 To Tighten Manually with Torque Wrench: Refer to Torque Data Plate on body of Torque Multiplier to determine proper input to obtain the desired output. Torque output accuracy requires the use of an accurate torque wrench in series with the Torque Multiplier. (REMEMBER: Controlled-Shear Output Square Drive will fracture if output torque exceeds the rated output capacity). Apply torque with the torque wrench until desired input torque is achieved. To remove Multiplier from fastener: Apply enough input torque to release internal anti-backlash device, then push Selector Pawl (Fig. 1 Item 3) into opposite position (EXAMPLE: Pawl in CW positions for tightening. Apply input torque in the CW direction to relieve force on the pawl. While maintaining input torque in the CW direction, slide pawl into the CCW direction for release) and slowly relax input torque.

6.5 To Loosen: Follow same procedure as for tightening except set Selector Pawl in opposite position. (EXAMPLE: If fastener requires clockwise tightening rotation, set Pawl in counter-clockwise position for loosening.)

7. PNEUMATIC OPERATION

7.1 If you decide to use a non-impact power drive to speed up the process of tightening or loosening a fastener, you MUST remember to lock the selector pawl in the neutral position. Center the selector pawl (Fig. 1 Item 3) between the CW/CCW range of the travel and tighten the set screw (Fig. 1 Item 2). When properly positioned, the screw will be seated in a groove in the selector pawl, so the pawl cannot be moved in either direction. Take care that the power drive is set to deliver no more than the maximum required input torque. A lightweight, reversible air motor (Model 3900A) is a standard accessory offered with this line of multipliers. When equipped with the optional air pressure regulator, torque output can be controlled.

8. REPLACING A SQUARE DRIVE ASSEMBLY

8.1 Remove the set screw that is on the face of the Square Drive Carrier (Fig. 1 Item 5).

8.2 Rotate the tool so that the set screw faces down, this will allow the square drive retention pin to disengage the Square Drive Assembly. Pull out the old Square Drive Assembly.

8.3 Insert the new Square Drive Assembly, making certain that the hole in the new Square Drive Assembly lines up with the hole in the Square Drive Carrier.

8.4 Insert dowel pin in Square Drive Carrier, insuring that the pin engages the hole in the replacement Square Drive.

8.5 Firmly reattach the set screw into the Square Drive Carrier.

Fig. 3 Overall Torque Multiplier Dimensions