Bulletin HY25-1715-M1/US

Owner’s Manual
Power Take-Offs

Effective: December 2005

246 Series
FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

This document and other information from Parker Hannifin Corporation, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application and review the information concerning the product or system in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by Parker Hannifin Corporation and its subsidiaries at any time without notice.

WARNING

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Offer of Sale

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Patent Information

The Chelsea® Power Take-Off or its components shipped with this owner's manual may be manufactured under one or more of the following U.S. patents:
4610175  5228355  4597301  5645363  6151975  6142274  6260682
Other patents pending.

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Safety Information

These instructions are for your safety and the safety of the end user. Read them carefully until you understand them.

General Safety Information

To prevent injury to yourself and/or damage to the equipment:

■ Read carefully all owner's manuals, service manuals, and/or other instructions.
■ Always follow proper procedures, and use proper tools and safety equipment.
■ Be sure to receive proper training.
■ Never work alone while under a vehicle or while repairing or maintaining equipment.
■ Always use proper components in applications for which they are approved.
■ Be sure to assemble components properly.
■ Never use worn-out or damaged components.
■ Always block any raised or moving device that may injure a person working on or under a vehicle.
■ Never operate the controls of the Power Take-Off or other driven equipment from any position that could result in getting caught in the moving machinery.

Proper Matching of P.T.O.

**WARNING:** A Power Take-Off must be properly matched to the vehicle transmission and to the auxiliary equipment being powered. An improperly matched Power Take-Off could cause severe damage to the vehicle transmission, the auxiliary driveshaft, and/or the auxiliary equipment being powered. Damaged components or equipment could malfunction causing serious personal injury to the vehicle operator or to others nearby.

To avoid personal injury and/or equipment damage:

■ Always refer to Chelsea catalogs, literature, and owner's manuals and follow Chelsea recommendations when selecting, installing, repairing, or operating a Power Take-Off.
■ Never attempt to use a Power Take-Off not specifically recommended by Chelsea for the vehicle transmission.
■ Always match the Power Take-Offs specified output capabilities to the requirements of the equipment to be powered.
■ Never use a Power Take-Off whose range of speed could exceed the maximum safe speed of the equipment to be powered.

Cold Weather Operation of Powershift P.T.O.

**WARNING:** During extreme cold weather operation [32°F (0°C) and lower], a disengaged powershift Power Take-Off can momentarily transmit high torque that will cause unexpected output shaft rotation. This is caused by the high viscosity of the transmission oil when it is extremely cold. As slippage occurs between the Power Take-Off clutch plates, the oil will rapidly heat up and the viscous drag will quickly decrease.

The Power Take-Off output shaft rotation could cause unexpected movement of the driven equipment resulting in serious personal injury, death or equipment damage.

To avoid personal injury and/or equipment damage:

■ Driven equipment must have separate controls.
■ The driven equipment must be left in the disengaged position when not in operation.
■ Do not operate the driven equipment until the vehicle is allowed to warm up.
Safety Information

Rotating Auxiliary Driveshafts

⚠️ WARNING:
- Rotating auxiliary driveshafts are dangerous. You can snag clothes, skin, hair, hands, etc. This can cause serious injury or death.
- Do not go under the vehicle when the engine is running.
- Do not work on or near an exposed shaft when the engine is running.
- Shut off the engine before working on the Power Take-Off or driven equipment.
- Exposed rotating driveshafts must be guarded.

Guarding Auxiliary Driveshafts

⚠️ WARNING: We strongly recommend that a Power Take-Off and a directly mounted pump be used to eliminate the auxiliary driveshaft whenever possible. If an auxiliary driveshaft is used and remains exposed after installation, it is the responsibility of the vehicle designer and P.T.O. installer to install a guard.

Using Set Screws

⚠️ WARNING: Auxiliary driveshafts may be installed with either recessed or protruding set screws. If you choose a square head set screw, you should be aware that it will protrude above the hub of the yoke and may be a point where clothes, skin, hair, hands, etc. could be snagged. A socket head set screw, which may not protrude above the hub of the yoke, does not permit the same amount of torquing as does a square head set screw. Also a square head set screw, if used with a lock wire, will prevent loosening of the screw caused by vibration. Regardless of the choice made with respect to a set screw, an exposed rotating auxiliary driveshaft must be guarded.

IMPORTANT: Safety Information and Owner's Manual

Chelsea Power Take-Offs are packaged with safety information decals, instructions, and an owner’s manual. These items are located in the envelope with the P.T.O. mounting gaskets. Also, safety information and installation instructions are packaged with some individual parts and kits. Be sure to read the owner’s manual before installing or operating the P.T.O. Always install the safety information decals according to the instructions provided. Place the owner's manual in the vehicle glove compartment.

⚠️ WARNING: Operating the P.T.O. with the Vehicle in Motion

Some Power Take-Offs may be operated while the vehicle is in motion. To do so, the P.T.O. must have been properly selected to operate at highway speeds and correctly matched to the vehicle transmission and the requirements of the driven equipment.

If in doubt about the P.T.O.’s specifications and capabilities, avoid operating the P.T.O. when the vehicle is in motion. Improper application and/or operation can cause serious personal injury or permanent failure of the vehicle, the driven equipment, and/or the P.T.O.

Always remember to disengage the P.T.O. when the driven equipment is not in operation.

⚠️ This symbol warns of possible personal injury.
Direct Mount Pump Support Recommendations

Chelsea strongly recommends the use of pump supports (Support Brackets) in all applications. P.T.O. warranty will be void if a pump bracket is not used when:

1) The combined weight of pump, fittings and hose exceed 40 pounds [18.14 kg].
2) The combined length of the P.T.O. and pump is 18 inches [45.72 cm] or more from the P.T.O. centerline to the end of the pump.

ALSO: Remember to pack the female pilot of the P.T.O. pump shaft with grease before installing the pump on the P.T.O. (reference Chelsea grease pack 379688).

Use caution to ensure that bracket does not pre-load pump P.T.O. mounting

Chelsea strongly recommends the use of pump supports (Support Brackets) in all applications. P.T.O. warranty will be void if a pump bracket is not used when:

1) The combined weight of pump, fittings and hose exceed 40 pounds [18.14 kg],
2) The combined length of the P.T.O. and pump is 18 inches [45.72 cm] or more from the P.T.O. centerline to the end of the pump.

ALSO: Remember to pack the female pilot of the P.T.O. pump shaft with grease before installing the pump on the P.T.O. (reference Chelsea grease pack 379688).
Foreword

This booklet will provide you with information on correct installation of Chelsea® Power Take-Offs (P.T.O.s). Proper installation and set up procedures will help you get additional and more profitable miles from your truck equipment and components.

It is important that you be sure that you are getting the right transmission/P.T.O. combination when you order a new truck. An inadequate transmission will overwork any P.T.O. in a short period of time. In addition, a mismatched transmission and P.T.O. combination can result in unsatisfactory performance of your auxiliary power system from the start.

If you have questions regarding correct P.T.O. and transmission combination, please contact your local Chelsea® Auxiliary Power Specialist. They can help you select the properly matched components to insure correct and efficient applications.

Chelsea P.T.O. Safety Label Instructions

1. The two black and orange on white 5" x 7" pressure sensitive vinyl labels, part number 379274; must be placed on the vehicle frame rails (one (1) on each side), in a position that would be HIGHLY visible to anyone that would go under the truck near the P.T.O. rotating shaft. If the vehicle is to be painted after these labels are installed, cover them with two (2) blank masking covers. Remove the masking covers after painting.

2. Place the one (1) black and orange on white 3.5" x 5" pressure sensitive vinyl label, part number 379275, on the visor nearest the operator of the vehicle, this must be placed near the P.T.O. visor label.

3. Place the one (1) red and white with black lettering 3.5" x 7.5" sensitive vinyl label, part number 379915, on the opposite side of the visor from the above label # 379275.

4. Place the one (1) white and black heavy duty card, part number 379276, in the vehicle glove box. Again in a position highly visible to the operator, for example: try to place this card on top of whatever may be in the glove box.

If you require labels, please order part number 328946X at no charge from your local Chelsea Warehouse or send request direct to:

Parker Hannifin Corporation
Chelsea Products Division
8225 Hacks Cross Road
Olive Branch, MS 38654
Customer Service: (662) 895-1011
**Function of Auxiliary Power Shafts**

An auxiliary power shaft transmits torque from the power source to the driven accessory. The shaft must be capable of transmitting the maximum torque and R.P.M. required of the accessory, plus any shock loads that develop.

An auxiliary power shaft operates through constantly relative angles between the power source and the driven accessory, therefore, the length of the auxiliary power shaft must be capable of changing while transmitting torque. This length change, commonly called “slip movement”, is caused by movement of the power train due to torque reactions and chassis deflections.

Joint operating angles are very important in an auxiliary power joint application. In many cases, the longevity of a joint is dependent on the operating angles. (See chart below)

This information is limited to 1000 through 1310 series applications. For applications requiring a series larger than 1310, contact your local Chelsea distributor.

**Determining Shaft Type**

1) Solid or tubular?
   a) In applications requiring more than 1000 R.P.M. or where the application necessitates a highly balanced auxiliary power shaft, a tubular shaft should be used.
   b) Spicer’s solid shafting auxiliary power joints are designed for 1000 or less R.P.M. intermittent service such as:
      - Driving small hydraulic pumps
      - Driving winches
      - Driving low speed product pumps

2) Joint Series should be determined using the chart on the following page.

**Spicer® Universal Joint Operating Angles**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>3000</td>
<td>5° 50'</td>
<td>1500</td>
<td>11° 30'</td>
</tr>
<tr>
<td>2500</td>
<td>7° 00'</td>
<td>1000</td>
<td>11° 30'</td>
</tr>
<tr>
<td>2000</td>
<td>8° 40'</td>
<td>500</td>
<td>11° 30'</td>
</tr>
</tbody>
</table>

Above based on angular acceleration of 100 RAD/SEC²
# Spicer® Universal Joint Engineering Data

<table>
<thead>
<tr>
<th>Joint Series</th>
<th>1000</th>
<th>1100</th>
<th>1280</th>
<th>1310</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Torque Rating</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Automotive (Gas or Diesel Engine) lbs. ft. Continuous</td>
<td>50</td>
<td>54</td>
<td>95</td>
<td>130</td>
</tr>
<tr>
<td><strong>Tubing</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diameter</td>
<td>1.750</td>
<td>1.250</td>
<td>2.500</td>
<td>3.00</td>
</tr>
<tr>
<td>Wall Thickness W = Welded S = Seamless</td>
<td>.065</td>
<td>.095</td>
<td>.083</td>
<td>.083</td>
</tr>
<tr>
<td><strong>Flange Diameter</strong> (Swing Diameter) Rectangular Type</td>
<td>3.500</td>
<td>3.500</td>
<td>3.875</td>
<td>3.875</td>
</tr>
<tr>
<td><strong>Bolt Holes - Flange Yoke</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circle</td>
<td>2.750</td>
<td>2.750</td>
<td>3.125</td>
<td>3.125</td>
</tr>
<tr>
<td>Diameter</td>
<td>.312</td>
<td>.312</td>
<td>.375</td>
<td>.375</td>
</tr>
<tr>
<td>Number</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Male Pilot Dia.</td>
<td>2.250</td>
<td>2.250</td>
<td>2.375</td>
<td>2.375</td>
</tr>
<tr>
<td><strong>Distance Across Lugs</strong> Snap Ring Construction</td>
<td>2.188</td>
<td>2.656</td>
<td>3.469</td>
<td>3.469</td>
</tr>
<tr>
<td><strong>Bearing Diameter</strong></td>
<td>.938</td>
<td>.938</td>
<td>1.062</td>
<td>1.062</td>
</tr>
</tbody>
</table>

### Maximum Operating Speed * By Tube Size, Solid Shaft Size, and Length *(For speed below 500 R.P.M. or over 2500 R.P.M., contact your Chelsea Distributor)*

| Tubing Dia. & Wall Thickness Joint & Shaft (W=Welded S=Seamless) | Max. Installed Length in Inches for Given R.P.M. Centerline to Centerline of Joints for a Two Joint Assembly or Centerline of Joint to Centerline of Center Bearing for a Joint & Shaft R.P.M. - Revolutions per Minute |
|---|---|---|---|---|---|
| 500 | 1000 | 1500 | 2000 | 2500 |
| 1.750" X .065" W | 117" | 82" | 67" | 58" | 52" |
| 1.250" X .095" S | 91" | 64" | 52" | 45" | 40" |
| 2.500" X .083" W | 122" | 87" | 70" | 62" | 55" |
| 3.000" X .083" W | - | - | - | 85" | 76" |
| **Solid Shaft Diameter** |       |       |       |       |       |
| .750" | 60" | 42" | 35" | 30" | 27" |
| .812" | 62" | 44" | 36" | 31" | 28" |
| .875" | 65" | 46" | 37" | 32" | 29" |
| 1.000" | 69" | 49" | 40" | 35" | 31" |
| 1.250" | 77" | 55" | 45" | 39" | 35" |
New Stationary Elevated Idle Control (SEIC) for 2005 Model Year Light Trucks

We need to make you aware of a potential problem when engaging Power Take-Offs on the 2005 Ford TorqShift automatic transmission. For Model Year 2005 the Ford SEIC strategy may not provide elevated engine speed or sufficient clutch pack pressure for proper P.T.O. operation.

We have found in the case of 2005 Ford Super Duty trucks with the 6.0L Diesel and Torqshift transmission that Ford circuit #2244 (PTOC) is not connected to the Ford wiring harness. With this pin connection missing from the PCM to the P.T.O. wiring circuit the transmission may not “ramp” up to 1200 rpm (min) or provide elevated P.T.O. clutch line pressure if the “enablers” are not met. See “PTO Control …” at bottom of page for PTOC function and chart on page 2 of this bulletin.

With the P.T.O. switch engaged the P.T.O. light will indicate P.T.O. engagement, BUT clutch line pressure may be below engagement pressure for proper P.T.O. systems operation. Again, even though P.T.O. light is “ON” there may not be enough clutch pressure and this may cause serious damage to P.T.O. and/or transmission.

DO NOT OPERATE the P.T.O. SYSTEM (hydraulic pump, air compressor or other driven equipment) if the engine rpm does not ramp up to a minimum of 1200 rpm. Turn P.T.O. switch off and trouble shoot system. Failure to following this procedure may void P.T.O. warranty.

Below is information provided by Ford in Q-108 dated August 19, 2004

• SEIC strategy
  – Provides elevated engine speed to drive auxiliary commercial equipment such as hydraulic pumps, generators, air compressors; or maintain vehicle battery charge under extreme electrical demands.
  – Standard in all PCM's for Super Duty F-Series light truck, and E-Series, over-8500 lb. GVWR, all powertrains.
  – Replaces the Auxiliary Powertrain Control Module (APCM) used with 2004 model year and prior diesel engines.

Product Descriptions

SEIC (Stationary Elevated Idle Control): New for 2005 model year, this feature is included in the Powertrain control strategy of all F250/350/450/550 and E250/350/450, over-8500 lb GVWR, all powertrains. For diesel engines it replaces the APCM (Auxiliary Powertrain Control Module) previously included with Ford “Auxiliary Idle Control Kit” Option Codes 96P (F-Series) and 961 (E-Series). For a stationary vehicle it allows the operator to elevate engine idle speed to operate a transmission-mounted PTO, or engine FEAD-mounted clutch-pump, air compressor, or generator; or be used to help keep the vehicle battery charged. SEIC uses CAN messaging internally. It is activated by applying discrete voltage signals to a wire bundle located in the F-Series cabin above the parking brake release handle, and in the E-Series engine compartment. The up-fitter will need to complete the circuits as described herein, and provide the customer interface (i.e. buttons, LCD read-out for engine speed, PTO switch, etc.). Note: The F-Super Duty light truck offers four optional relayed rocker switches on the instrument panel for the up-fitter to use (Option Code 66S). Ramp-up rate is fixed and approximately 200 rpm/sec for diesel engine and 400 rpm/sec for gas engine.

PTO Control (For automatic transmission-mounted PTO only): This is PCM strategy within the SEIC feature that automatically looks for and recognizes whether the vehicle has a TorqShift automatic transmission with a side mount PTO (“Transmission PTO Provision”, Option Code 62R), and makes the internal PTO gear function by commanding the torque converter to lock at 1200 rpm minimum speed. The PTO gear is splined directly to the transmission torque converter turbine shaft. When all of the vehicle safety enablers are met, and the engine speed is commanded by the operator to at least 1200 rpm, then the strategy automatically commands the torque converter to lock at 1200 rpm to deliver engine torque to the PTO gear (actual lock-up begins at approximately 1050 rpm), and elevates the transmission hydraulic line pressure to 150 psi nominal for the aftermarket PTO to use to hold its engagement clutch.
New Stationary Elevated Idle Control (SEIC) for 2005 Model Year Light Trucks (Cont’d)

NOTE: Applying battery voltage to the Diesel “PTO” or Gas “PTO-Mode” wires is required to initiate these commands. Failing to do so may show up as low or oscillating hydraulic line pressure and low or no aftermarket PTO torque or pump flow output. Any attempt to operate the aftermarket PTO at elevated idle without these commands may result in under-capacity PTO clutch wear, resulting in rapid contamination of transmission fluid and internal transmission damage. This applies to both stationary and mobile automatic transmission PTO operations.

NOTE: Any one of the conditions in column #2 will prevent engine speed from “ramping” up to 1200 rpm (min) when the P.T.O. switch is engaged and the P.T.O. light indicates P.T.O. engagement (Light “On”).

### PCM Enable Chart (SEIC)

<table>
<thead>
<tr>
<th>Vehicle Conditions to Enable</th>
<th>Vehicle Conditions that Disable SEIC (any one required)</th>
<th>Diesel Engine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parking brake applied.</td>
<td>Parking brake disengaged.</td>
<td>Yes</td>
</tr>
<tr>
<td>Foot off of service brake</td>
<td>Depressing service brake</td>
<td>Yes (See Note-2)</td>
</tr>
<tr>
<td>Vehicle in PARK (automatic trans.)</td>
<td>Vehicle taken out of PARK</td>
<td>Yes</td>
</tr>
<tr>
<td>Foot off of clutch (manual trans.)</td>
<td>Clutch depressed</td>
<td>Yes (See Note-2)</td>
</tr>
<tr>
<td>Foot off of accelerator pedal</td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Vehicle speed is 0 mph (stationary)</td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Brake lights functional</td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Engine at a stable base idle speed</td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Transmission Oil Temperature (TOT) Limit exceeds 240 degrees F</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Engine Coolant Temperature Limit (ECT)</td>
<td>No (See Note-1)</td>
<td></td>
</tr>
<tr>
<td>Catalyst Temperature Limit Yes</td>
<td></td>
<td>No (See Note-1)</td>
</tr>
</tbody>
</table>

**Note-1:** A “change-of-state” at the “PTO-Request” circuit is required to re-invoke SEIC. When a disabler is seen by the PCM the “PTO-Indicator” circuit changes from “ground-source” to “open-circuit”. After approximately 3 seconds SEIC drops out, returning the engine speed to base idle. For vehicle-stationary operation, the automatic transmission torque converter unlocks as engine speed proceeds below 1200 rpm. To re-initiate SEIC the operator must turn off the aftermarket PTO switch (removing command voltage to the “PTO-Mode” circuit) and turn it back on again.

**Note-2:** SEIC is automatically re-activated after approximately 3 seconds after the disabiling condition is removed.

We have included in our 246 Series shipments this notice attached to the P.T.O. and a tag (69-P-12) that needs to be installed on the vehicle dash in view of the operator alerting him to this issue. We will continue to provide this information until Ford has resolved the missing PCM wire.

Please make your Ford Super Duty customers aware of this issue and if you need more dash labels or information contact Chelsea Technical Services at 662-895-1052 or fax 662-890-5378.
In Cab P.T.O. Switch Installation

Before starting your electrical wiring installation, locate a position in the cab for mounting the P.T.O. switch and mounting bracket. The shaded area in Figure 1 shows the Occupant Protection Zone of the deployed air bags that are available in these vehicles.

**WARNING:** To avoid personal injury or equipment damage: Do not install any item from a Chelsea Power Take-Off (ie: P.T.O. switch or mounting bracket) in the Occupant Protection Zone.

For electrical installation see installation sketch on page 22 for Non E.O.C. and page 25 for E.O.C.

1. Locate suitable location to install P.T.O. Switch.
2. Locate and remove the customer access panel located on the lower left portion of the instrument panel (driver’s side). (Figure 2)
3. After determining the location of the P.T.O. switch, run wiring assembly over to the area under the vehicle steering column. We are now ready to attach the wires from the Chelsea wiring harness (329415X).

**NOTE:** Wiring Strategy is slightly different between the Gas and Diesel engines. Use the charts listed on the next for Model Year 2005 Chassis. Refer to page 23 for complete wiring chart information for prior years when using Chelsea wiring harness 329415X.

**NOTE:** Before starting installation of the electrical wiring, disconnect the battery cables from the battery and secure to prevent accidental contact.

**CAUTION:** Before drilling any holes, make sure there is adequate clearance on both sides.
4. Located in the cabin, tagged and bundled above the parking brake assembly (Figure 3) are the 4 Orange wires needed to connect the Chelsea P.T.O. wiring harness to the Ford SEIC strategy. Wires that will be connected at this bundle from the Chelsea wiring harness are the Black, Orange, Yellow, and Red wires. All have butt connector ends. Connect these wires using Wiring Chart #1 - Wiring strategy for Model Year 2005 Diesel or Wiring Chart #2 for Model Year 2005 Gas when using Chelsea wiring harness 329415X.

5. Now locate Ford circuit # 294 (White w/light blue). This wire can be found under-dash on the right side of the customer access and is blunt cut. Connect Chelsea wire that is White w/Light Blue stripe using a butt connector to this Ford wire. The only wire left to connect at this location is the black ground wire. Attach the ground wire with ring terminal on its end, to one of the screws located on the right side of the access area dash frame (Figure 4). Reference Wiring Charts 1 & 2.

NOTE: It is important to remember that a solid electrical connection is essential when installing any electrical device or option. A proper crimp is shown in figure 5.

6. Find a suitable location to route the wiring harness out of the cab area and to the location of the manifold. Make sure wiring is clear of driveline and exhaust.

CAUTION: Apply battery voltage to the Diesel “P.T.O.” or “Gas P.T.O. - Mode” (Circuit 2242) wires is what the transmission looks for to initiate commands. Failing to do so may show up as low or oscillating hydraulic line pressure and low or no P.T.O. torque or pump flow output. Any attempt to operate the Power Take-Off at elevated idle without these commands may result in under-capacity P.T.O. clutch wear, resulting in rapid contamination of transmission fluid and internal transmission damage. This applies to both stationary and mobile automatic transmission P.T.O. operations.

<table>
<thead>
<tr>
<th>Wiring Chart 1</th>
<th>Wiring Chart - Model Year 2005 Ford Super Duty w/6.0L Diesel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chelsea Wire</td>
<td>Connect to Ford Wire Number</td>
</tr>
<tr>
<td>Orange</td>
<td>Circuit #2242 - Orange</td>
</tr>
<tr>
<td>Black w/Butt Connector</td>
<td>Chassis Ground</td>
</tr>
<tr>
<td>White w/Light Blue Strip</td>
<td>Circuit #294 - White w/Light Blue Strip</td>
</tr>
<tr>
<td>Black w/Ring Terminal</td>
<td>Connect to Chassis Dash Ground</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wiring Chart 2</th>
<th>Wiring Chart - Model Year 2005 Ford Super Duty w/6.8L Gas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chelsea Wire</td>
<td>Connect to Ford Wire Number</td>
</tr>
<tr>
<td>Orange</td>
<td>Circuit #2242 - Orange</td>
</tr>
<tr>
<td>Black w/Butt Connector</td>
<td>Circuit #2244 - Orange w/Light Blue Strip</td>
</tr>
<tr>
<td>Yellow</td>
<td>Circuit #2243 - Orange w/White Strip</td>
</tr>
<tr>
<td>Red</td>
<td>Circuit #2246 - Orange w/Yellow Strip</td>
</tr>
<tr>
<td>White w/Light Blue Strip</td>
<td>Circuit #294 - White w/Light Blue Strip</td>
</tr>
<tr>
<td>Black w/Ring Terminal</td>
<td>Connect to Chassis Dash Ground</td>
</tr>
</tbody>
</table>

Apply Crimping Pressure In the Middle

Wire Insulation

Wire Insulation

Figure 5
CAUTION: When installing the P.T.O., always wear protective clothing and safety glasses.

Installation of a 246 P.T.O. will be faster and easier if several steps are completed before mounting the unit to the transmission. On a clean secure work surface complete the following steps.

7. Using a 9/16" wrench, install Male connector O-Ring fitting to the clutch pack port located on top of the closed end bearing cap. Torque to 13-15 ft. lbs. (18-20 N.m) (Figure 6)

8. Using a 7/16" wrench, install the 90° elbow Lube fitting to the idler gear shaft. (Figure 7)

9. Using a 7/16" wrench, install the 45° elbow “Dump Back” fitting to the housing as shown in Figure 8.

NOTE: On page 20 of this manual is a sketch of all the hose assemblies used for this installation. This will assist you in identifying which hose assemblies are used in the installation process.

10. There are two split dowels that will act as guides when installing the P.T.O. to the transmission. Gently squeeze the dowel together and install in the top and lower right side mounting hole of the P.T.O. as shown in Figure 9. The dowel should be flush with the side away from the mounting face (Figures 9 and 10) and protrude into the corresponding mounting holes of the transmission aperture when installing the P.T.O.
Manifold Pre-Installation

Before installing any of the O-Ring fittings to the manifold, lubricate the O-Ring by coating with a light oil or petroleum and push back-up washer and O-Ring to the extreme rear of the O-Ring groove.

11. Starting with the manifold block, install the three (3) 90° O-Ring fittings (379486) in the manifold ports as shown on Figure 11.

**DO NOT TIGHTEN DOWN AT THIS TIME**

12. Next thread the Seal-Nut on to the pipe threads of the 90° elbow fitting for the solenoid until 4 threads protrude beyond the Teflon® seal (Figure 12). Thread fitting a minimum of three threads into solenoid port (Figure 11).
14. We are now ready to move to the installation of the P.T.O., but before installing the unit we will need to remove the shift cable bracket that is to the right side of the P.T.O. aperture. Use a 14 mm wrench to remove the two capscrews. Remove the cable from the transmission range selector by pulling it straight off. Place the bracket and cable on the top of the transmission to allow easier installation of the P.T.O.

**NOTE:** On some early production Ford Super Duties the shifter bracket design was changed by about 3mm. The increase in size of the bracket interfered with the Power Take-Off. See page 26 for Ford approved modification of this bracket for P.T.O. clearance.

**This transmission does not require the oil to be drained for the P.T.O. installation, but expect some oil to weep when covers and plugs are removed.**

**WARNING:** Oil may be hot. Use extreme caution to assure that you do not accidentally come in contact with hot oil.

15. Remove the pipe plug from the transmission pressure port (Figure 13) and install the 90° male elbow (379698) in the opening. Position the fitting (Figure 14) at a 10 o’clock position as you look at the fitting.

16. Remove the P.T.O. aperture cover plate and gasket (Figure 15).

**IMPORTANT:** Do not discard the gasket. It will be used when installing the P.T.O. on the transmission. This is a controlled compression gasket that eliminates the need to set backlash. A replacement gasket is available (part number 22-P-104).

**NOTE:** All hose routing described herein is the recommended routing for the 6.8L gas engine. Other hose routing and manifold mounting options may be required depending on the chassis model (4 x 2 or 4 x 4) and or engine selection (6.8L Gas or 6.0L Diesel)
17. Connect hose 329232-3X (Transmission to “IN” port) to the fitting on the transmission. Route as shown in Figure 16. Hold hose fitting in desired position and tighten lock nut with a wrench until solid feeling is encountered. From that point, apply one-sixth turn.

18. Six fasteners (Figure 17) are used to attach the P.T.O. to the transmission opening. The longest bolt requires an O-Ring (28-P-200) on it to ensure a positive seal. Slide this on now after applying lube to the O-Ring.

19. Slide the special gasket supplied with the transmission’s P.T.O. aperture cover over the split dowels (Figure 18) installed in the P.T.O. This is the controlled compression gasket that is used to eliminate the setting of the gear backlash between the P.T.O. and transmission.

20. Install the one stud from the stud kit (8000-19X) to the top hole on the transmission P.T.O. aperture pad. (Figure 19)

21. Tighten the stud and torque to 17-19 ft. lbs. (23-26 N.m.)

**CAUTION: Overtightening of the stud may damage stud and/or Transmission threads**

22. Mount the Power Take-Off to the transmission at this time by sliding the top P.T.O. mounting hole w/dowel pin over the shoulder stud. Guide other dowel pin into hole.
23. Attach the self locking nut to the shoulder stud. Do not tighten down at this time.

24. Make sure the O-Ring (28-P-200) from the stud kit is still on the longer hex head capscrew. Install this hex head capscrew and O-Ring in the bottom mounting hole and finger tighten.

**IMPORTANT**: Make sure the O-Ring is positioned in the counter bore.

25. Finish fastening the P.T.O. to the transmission using the remaining 4 flanged hex head bolts.

26. Torque all 5 capscrews (*Figure 22*) to 25 ft.lbs. [34 N.m], and torque the self locking nut to 35-40 ft. lbs. [48-54 N.m.]

27. Reinstall the cable to the transmission selector and reattach the bracket that was removed in Step 14. Torque Capscrews to 22-29 ft. lbs. [30-40 N.m.]
PUMP INSTALLATION

The Parker/Chelsea CGP-P11 pumps listed below have a special pump flange designed to mount the pump to the 246 Series P.T.O. without modifying the pump flange. This allows the same pump to be installed on either 4 x 2 or 4 x 4 applications.

**NOTE:** Each Chelsea P.T.O. that features a female pump shaft will include a packet of lubricant (part number 379688). Apply this to the male end of the pump shaft before installing the pump to the P.T.O.

### Chelsea CGP-P11 Series Pump Bolt Specifications

<table>
<thead>
<tr>
<th>Order Code</th>
<th>Chelsea Pump Model</th>
<th>Pump Tag Number</th>
<th>Bolt Number (2 per Pump)</th>
<th>Bolt Size .375&quot;</th>
<th>Flat Washer (Qty)</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>CGP-P11A016-5FC</td>
<td>334 9110 027</td>
<td>378431-30</td>
<td>.375&quot;-16 x 4.00&quot;</td>
<td>500365-26 (2)</td>
</tr>
<tr>
<td>26</td>
<td>CGP-P11A026-5FC</td>
<td>334 9110 028</td>
<td>378431-31</td>
<td>.375&quot;-16 x 4.25&quot;</td>
<td>500365-26 (2)</td>
</tr>
<tr>
<td>37</td>
<td>CGP-P11A037-5FC</td>
<td>334 9110 029</td>
<td>378431-32</td>
<td>.375&quot;-16 x 4.50&quot;</td>
<td>500365-26 (2)</td>
</tr>
<tr>
<td>42</td>
<td>CGP-P11A042-5FC</td>
<td>334 9110 030</td>
<td>378431-33</td>
<td>.375&quot;-16 x 4.75&quot;</td>
<td>500365-26 (2)</td>
</tr>
<tr>
<td>55</td>
<td>CGP-P11A055-5FC</td>
<td>334 9110 031</td>
<td>378431-34</td>
<td>.375&quot;-16 x 5.00&quot;</td>
<td>500365-26 (4)</td>
</tr>
<tr>
<td>61</td>
<td>CGP-P11A061-5FC</td>
<td>334 9110 053</td>
<td>378431-34</td>
<td>.375&quot;-16 x 5.00&quot;</td>
<td>500365-26 (2)</td>
</tr>
<tr>
<td>71</td>
<td>CGP-P11A071-5FC</td>
<td>334 9110 032</td>
<td>378431-35</td>
<td>.375&quot;-16 x 5.25&quot;</td>
<td>500365-26 (2)</td>
</tr>
<tr>
<td>82</td>
<td>CGP-P11A082-5FC</td>
<td>334 9110 033</td>
<td>378431-36</td>
<td>.375&quot;-16 x 5.50&quot;</td>
<td>500365-26 (2)</td>
</tr>
</tbody>
</table>

**NOTE:** Torque Pump Mounting Bolts between 35 - 38 ft. lbs. [48 - 52 N.m.].

**CAUTION:** Failure to torque pump bolts to the correct specifications may result in poor pump performance and/or premature failure.
Installing the Manifold Block - TorqShift Transmission

**NOTE:** The installation instructions below are for mounting the manifold to the TorqShift transmission with a (6.8L) gas engine. When mounting the manifold to the TorqShift transmission with the 6.0L diesel engine a suggested location other than the rear location described below may be the transmission “wing” located above and forward of the P.T.O. Other locations may also be an option. It is the responsibility of the P.T.O. installer to make sure there is clearance of all installed components, wiring harness, hydraulic hoses and pump, from the engine exhaust and driveline components.

**NOTE:** See P.T.O. Hose Installation drawing on page 24.

**Gas or Diesel Engine**

28. Locate the hole on the transmission that is located on the rear left side of the transmission. (see Figure 22).

29. Attach the manifold block bracket on top of the transmission mounting pad as shown in Figure 23. Use the nut, bolt and washer provided and torque the nut from 35-40 ft. lbs. [48-54 N.m.]

Hose Installation

**NOTE:** As we are installing the hose assemblies from the P.T.O. to the manifold keep in mind the following procedures for tightening the 90° O-Ring fittings on the manifold.
- Position the fitting by backing out (counterclockwise) up to one full turn.
- Hold fitting in desired position and tighten lock nut with a wrench.
- Tighten with wrench until solid feeling.

30. The first hose connection (Transmission to Manifold “In” Port); connect hose 329130-11X from the transmission main pressure port to the manifold block port marked “IN” fitting. Torque hose fittings to 22-29 ft. lbs. [30-40 N.m.]. (Figure 24)

31. The next hose we want to connect to the manifold block is the Valve Dump Back hose. Connect hose 329130-6X to solenoid fitting (379832). Torque hose fittings to 22-29 ft. lbs. [30-40 N.m.]. Once hose is positioned tighten down the seal nut. (Figures 25 & 26)
32. The next hose connection (Manifold “Lube” to P.T.O. Pressure Lube); connect hose 329130-5X to the 90° fitting located in the idler gear shaft. Attach the other end of the hose to the manifold block port marked “LUBE” fitting. Torque hose fittings to 22-29 ft. lbs. [30-40 N.m.]. (Figure 27)

Figure 27

33. The last hose we need to connect is the (Clutch Pack Pressure); connect hose 329130-5X hose to the fitting attached to the P.T.O. in step 7, to the fitting (379486) located on the manifold block port labeled “OUT”. Torque hose fittings to 22-29 ft. lbs. [30-40 N.m.].

Figure 28

NOTE: Once all hose assemblies are positioned, torque 90° elbow fittings (379486) to 13-15 ft. lbs. [18-20 N.m].

After hose installation is complete and before the vehicle is placed in service, visually inspect all fittings and hose connections for leaks.

To ensure tight and secure connections, Chelsea provides a wiring harness with the Power Take-Off assembly. The connections underneath the truck at the manifold feature a Packard electrical connector for the solenoid valve and pressure switch.

34. Next connect the electrical plugs to the Pressure and Solenoid packard style connectors. (Figure 31)

Figure 31

35. Before running P.T.O. Check transmission for proper fluid level.

36. Installation of the P.T.O. is now complete. Refer to page 30 for proper P.T.O. maintenance.
Hose Assembly Identification Chart

37.75" - 38.25"
- TRANSMISSION TO MANIFOLD "IN" PORT
- 329232-3X

34.50" - 35.00"
- VALVE DUMP BACK
- 329130-6X

26.50" - 27.00"
- MANIFOLD "OUT" TO CLUTCH PACK
- 329130-5X

26.50" - 27.00"
- MANIFOLD "LUBE" TO P.T.O. PRESSURE LUBE
- 329130-5X
### Wiring Chart - Model Year 2005 Ford Super Duty w/ 6.0L Diesel

<table>
<thead>
<tr>
<th>Chelsea Wire</th>
<th>Connect to Ford Wire Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Orange</td>
<td>Circuit # 2242 - Orange</td>
</tr>
<tr>
<td>2 Black w/ Butt Connector</td>
<td>Chassis Ground</td>
</tr>
<tr>
<td>6 White w/ Light Blue Strip</td>
<td>Circuit # 294 - White w/ Light Blue Strip</td>
</tr>
<tr>
<td>5 Black w/ Ring Terminal</td>
<td>Connect to Chassis Dash Ground</td>
</tr>
</tbody>
</table>

### Wiring Chart - Model Year 2005 Ford Super Duty w/ 6.8L Gas

<table>
<thead>
<tr>
<th>Chelsea Wire</th>
<th>Connect to Ford Wire Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Orange</td>
<td>Circuit # 2242 - Orange</td>
</tr>
<tr>
<td>2 Black w/ Butt Connector</td>
<td>Circuit # 2244 - Orange w/ Light Blue Strip</td>
</tr>
<tr>
<td>3 Yellow</td>
<td>Circuit # 2243 - Orange w/ White Strip</td>
</tr>
<tr>
<td>4 Red</td>
<td>Circuit # 2246 - Orange w/ Yellow Strip</td>
</tr>
<tr>
<td>6 White w/ Light Blue Strip</td>
<td>Circuit # 294 - White w/ Light Blue Strip</td>
</tr>
<tr>
<td>5 Black w/ Ring Terminal</td>
<td>Connect to Chassis Dash Ground</td>
</tr>
</tbody>
</table>

### Wiring Chart - Model Years 2003/04 Ford Super Duty w/ Diesel

<table>
<thead>
<tr>
<th>Chelsea Wire</th>
<th>Connect to Ford Wire Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Orange</td>
<td>Circuit # 322 - Light Blue w/ Yellow Strip</td>
</tr>
<tr>
<td>2 Black w/ Butt Connector</td>
<td>Chassis Ground</td>
</tr>
<tr>
<td>6 White w/ Light Blue Strip</td>
<td>Circuit # 294 - White w/ Light Blue Strip</td>
</tr>
<tr>
<td>5 Black w/ Ring Terminal</td>
<td>Connect to Chassis Dash Ground</td>
</tr>
</tbody>
</table>

### Wiring Chart - Model Year Pre-2003 Ford Super Duty w/ Diesel

<table>
<thead>
<tr>
<th>Chelsea Wire</th>
<th>Connect to Ford Wire Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Orange</td>
<td>Circuit # 322 - Light Blue w/ Yellow Strip</td>
</tr>
<tr>
<td>2 Black w/ Butt Connector</td>
<td>Chassis Ground</td>
</tr>
<tr>
<td>6 White w/ Light Blue Strip</td>
<td>*Circuit # 294 - White w/ Light Blue Strip</td>
</tr>
<tr>
<td>5 Black w/ Ring Terminal</td>
<td>Connect to Chassis Dash Ground</td>
</tr>
</tbody>
</table>

*Note: On Pre MY 2002 Chassis the Ford circuit/wire color may be 295/Light Blue wire w/ Pink strip.*
Plumbing and Installation without E.O.C. (SK-398 Rev B)
Plumbing and Installation with E.O.C. (SK-404 Rev A)
2005 Model Year TorqShift Shift Bracket – Field Modification


Background: The shift bracket holding the shift linkage in position was revised for 2005 model year. That change resulted in the bracket interfering with the Chelsea and Muncie P.T.O.s by approximately 2.8 mm, preventing installation of the aftermarket P.T.O.s.

Recommendation: Grind or cut away a portion of the bracket to gain clearance. The illustration in the attachment to this bulletin depicts how much material may be removed without deteriorating the strength and reliability of the bracket and transmission gearshift function. Affected vehicles built approximately November 15th, 2004, will incorporate a revised shift bracket that provides clearance to the aftermarket P.T.O.

Warning: The modification shown is the only one supported. No modifications to the bracket mounting holes are acceptable.

For additional questions please contact the Ford Truck Body Builders Advisory Service at toll-free number 1-877-840-4338, or by e-mail at bbasqa@ford.com. QVM Bulletins can be found at www.fleet.ford.com/truckbbas.

Ref: Ford SVE Bulletin Q-112 dated October 15, 2004
Power Take-Off Maintenance

Due to the normal and sometimes severe torsional vibrations that Power Take-Off units experience, operators should follow a set maintenance schedule for inspections. Failure to service loose bolts or Power Take-Off leaks could result in potential auxiliary Power Take-Off or transmission damage.

Periodic P.T.O. MAINTENANCE is required by the owner/operator to ensure proper, safe and trouble free operation.

**Daily:** Check all air, hydraulic and working mechanisms before operating P.T.O. Perform maintenance as required.

**Monthly:** Inspect for possible leaks and tighten all air, hydraulic and mounting hardware, if necessary. Torque all bolts, nuts, etc. to Chelsea specifications. Insure that splines are properly lubricated, if applicable. Perform maintenance as required.

With regards to the direct mounted pump splines, the P.T.O. requires the application of a specially formulated anti-fretting, high pressure, high temperature grease. The addition of the grease has been proven to reduce the effects of the torsional vibrations, which result in fretting corrosion on the P.T.O. internal splines as well as the pump external splines. Fretting corrosion appears as a “rusting and wearing” of the pump shaft splines. Severe duty applications, which require long P.T.O. running times and high torque may require more frequent regreasing. Applications such as Utility Trucks that run continuously and are lightly loaded also require frequent regreasing due to the sheer hours of running time. It is important to note that service intervals will vary for each and every application and is the responsibility of the end user of the product. Chelsea also recommends that you consult your pump owner’s manuals and technical services for their maintenance guidelines. Fretting corrosion is caused by many factors and without proper maintenance; the anti-fretting grease can only reduce its effects on components.

Chelsea offers the grease to our customers in two packages. The first is a 5/8 fluid ounce tube (379688), which is included with every applicable P.T.O., and the second is a 14-ounce grease cartridge (379831).

**Warranty:** Failure to comply entirely with the provisions set forth in the appropriate Owner’s Manual will result in voiding of ALL Warranty consideration.
Offer of Sale

The items described in this document and other documents or descriptions provided by Parker Hannifin Corporation, its subsidiaries and its authorized distributors are hereby offered for sale at prices to be established by Parker Hannifin Corporation, its subsidiaries and its authorized distributors. This offer and its acceptance by any customer (“Buyer”) shall be governed by all of the following Terms and Conditions. Buyer’s order for any such items, whether communicated to Parker Hannifin Corporation, its subsidiary or an authorized distributor (“Seller”) verbally or in writing, shall constitute acceptance of this offer.

1. Terms and Conditions of Sale: All descriptions, quotations, proposals, offers, acknowledgments, acceptances and sales of Seller’s products are subject to and shall be governed exclusively by the terms and conditions stated herein. Buyer’s acceptance of any offer to sell is limited to these terms and conditions. Any terms or conditions in addition to, or inconsistent with those stated herein, proposed by Buyer in any acceptance of offer from Seller, are hereby objected to. No such additional, different or inconsistent terms and conditions shall become part of the contract between Buyer and Seller unless expressly accepted in writing by Seller. Seller’s acceptance of any offer to purchase by Buyer is expressly conditional upon Buyer’s assent to all the terms and conditions stated herein, including any terms in addition to, or inconsistent with those contained in Buyer’s offer. Acceptance of Seller’s products shall in all events constitute such assent.

2. Payment: Payment shall be made by Buyer net 30 days from the date of delivery of the items purchased hereunder. Amounts not timely paid shall bear interest at the maximum rate permitted by law for each month or portion thereof that the Buyer is late in making payment. Any claims by Buyer for omissions or shortages in a shipment shall be waived unless Seller receives notice thereof within 30 days after Buyer’s receipt of the shipment.

3. Delivery: Unless otherwise provided on the face hereof, delivery shall be made F.O.B. Seller’s plant. Regardless of the method of delivery, however, risk of loss shall pass to Buyer upon Seller’s delivery to a carrier. Any delivery dates shown are approximate only and Seller shall have no liability for any delays in delivery.

4. Warranty: Seller warrants that the items sold hereunder shall be free from defects in material or workmanship for a period of:
   (A) All Power Take-Off units one (1) year from date of installation.
   (B) Except 267, 277, 278, 242, 244, 246, 250, 251 and 859 series two (2) years from date of installation.

   THIS WARRANTY COMPRISES THE SOLE AND ENTIRE WARRANTY PERTAINING TO ITEMS SOLD HEREUNDER. SELLER MAKES NO OTHER WARRANTY, GUARANTEE, OR REPRESENTATION OF ANY KIND WHATSOEVER. ALL OTHER WARRANTIES, INCLUDING BUT NOT LIMITED TO, MERCHANTABILITY AND FITNESS FOR PURPOSE, WHETHER EXPRESS, IMPLIED, OR ARISING BY OPERATION OF LAW, TRADE USAGE, OR COURSE OF DEALING ARE HEREBY DISCLAIMED. NOTWITHSTANDING THE FOREGOING, THERE ARE NO WARRANTIES WHATSOEVER ON ITEMS BUILT OR ACQUIRED FOR THE PURPOSE OF REPAIR, REBUILD OR REUFACTURED, REPAIRED, REBUILT, OR MODIFIED IN WHOLE OR IN PART, FOR THE USE OF BUYER, OR EQUIPMENT, TOOLS OR MATERIALS SOLD HEREUNDER.

5. Limitation Of Remedy: SELLER’S LIABILITY ARISING FROM OR IN ANY WAY CONNECTED WITH THE ITEMS SOLD OR THIS CONTRACT SHALL BE LIMITED EXCLUSIVELY TO REPAIR OR REPLACEMENT OF ITEMS SOLD OR OTHER LOSS OR DAMAGE ARISING FROM OR IN ANY WAY CONNECTED WITH THIS AGREEMENT OR ITEMS SOLD HEREUNDER, WHETHER ALLEGED TO ARISE FROM BREACH OF CONTRACT, EXPRESS OR IMPLIED WARRANTY, OR IN TORT, INCLUDING WITHOUT LIMITATION, NEGLIGENCE, FAILURE TO WARN OR STRICT LIABILITY.

6. Changes, Reschedules and Cancellations: Buyer may request to modify the designs or specifications for the items sold hereunder as well as the quantities and delivery dates thereof, or may request to cancel all or part of this order, however, no such requested modification or cancellation shall become part of the contract between Buyer and Seller unless accepted by Seller in a written amendment to this Agreement. Acceptance of any such requested modification or cancellation shall be at Seller’s discretion, and shall be upon such terms and conditions as Seller may require.

7. Special Tooling: A tooling charge may be imposed for any special tooling, including without limitation, dies, fixtures, molds and patterns, acquired to manufacture items sold pursuant to this contract. Such special tooling shall be and remain Seller’s property notwithstanding payment of any charges by Buyer. In no event will Buyer acquire any interest in apparatus belonging to Seller which is utilized in the manufacture of the items sold hereunder, even if such apparatus has been specially con-