PTO Troubleshooting

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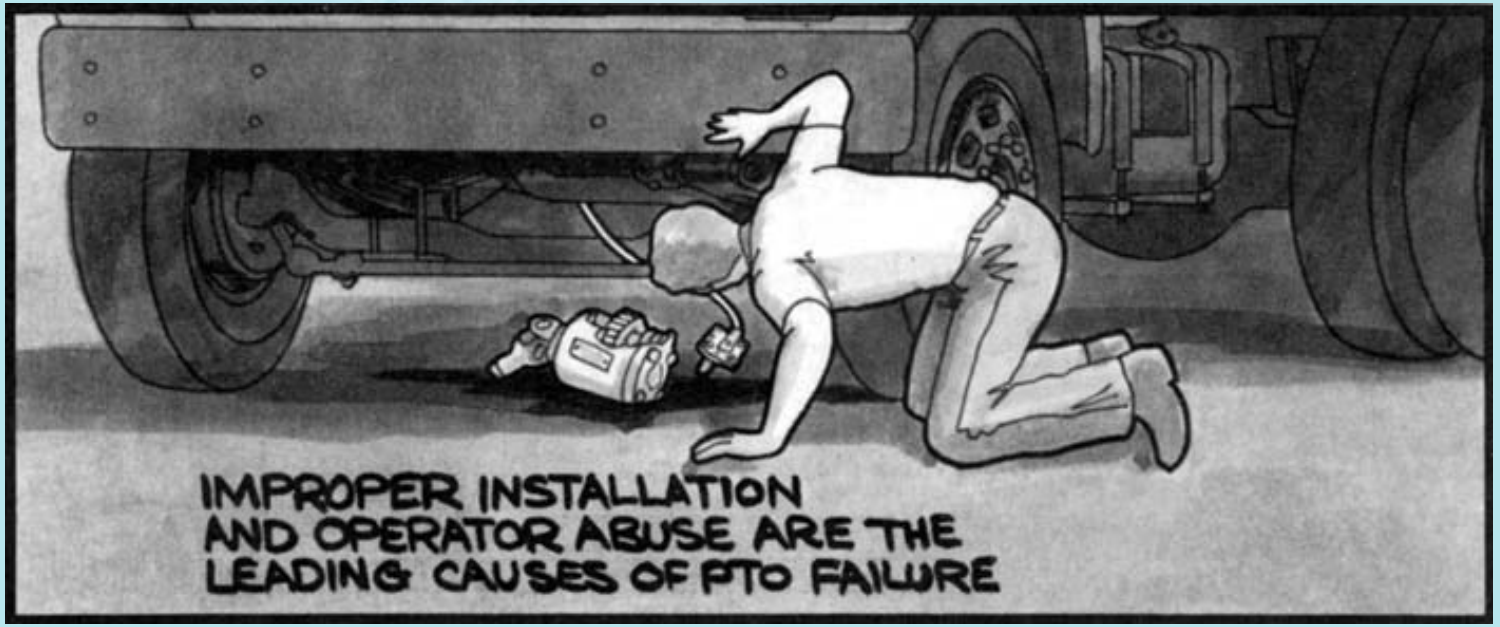
P.T.O. Troubleshooting

The Chelsea P.T.O. is designed and built to meet the rugged demands of the Mobile Equipment Industry.



On the Vehicle
or
On the Work Bench

P.T.O. Troubleshooting

WARNING!

P.T.O. Troubleshooting

On the Vehicle

- Performance
- Noise
- Leaks

P.T.O. Troubleshooting

Performance

The first place to look when troubleshooting a P.T.O. failure is in the application itself.

Repeated or premature failure may be a sign of an incorrect application.

This can be discovered by using **HY25-3000/US Applications Catalog.**

P.T.O. Troubleshooting

If the P.T.O. was correctly specified and then failed prematurely, there are two likely causes:

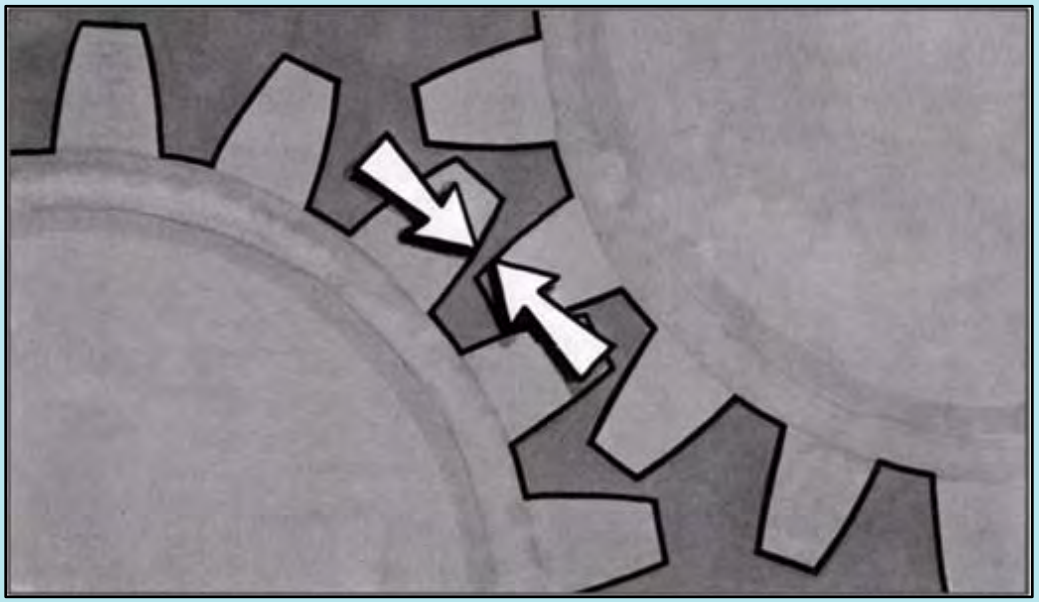
1. Improper installation and/or operator misuse.
2. An improperly installed P.T.O. can normally be identified immediately by the sound (Noise) it makes.
   - It will “Whine” ,“Clatter”, “Click” or “Grind”
   - Sometimes, the vehicle itself may contribute enough noise to mask the sound of the P.T.O. and one may not notice the problem

If a problem is allowed to continue, then damage to the P.T.O. will result.

P.T.O. Troubleshooting

Noise Types

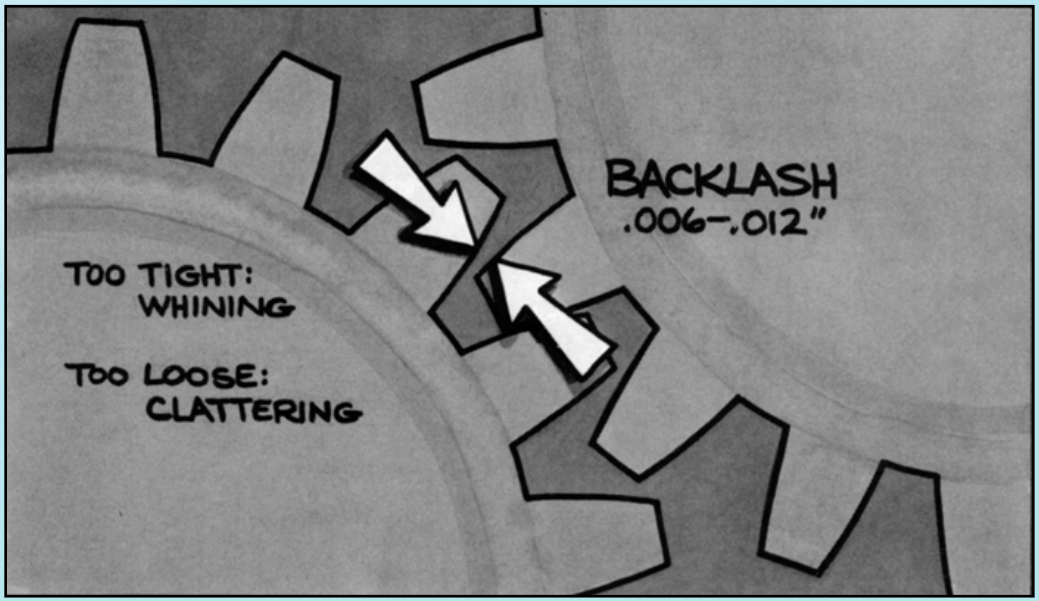
- Whine
- Clatter
- Clicking
- Grinding



P.T.O. Troubleshooting

Noise Types

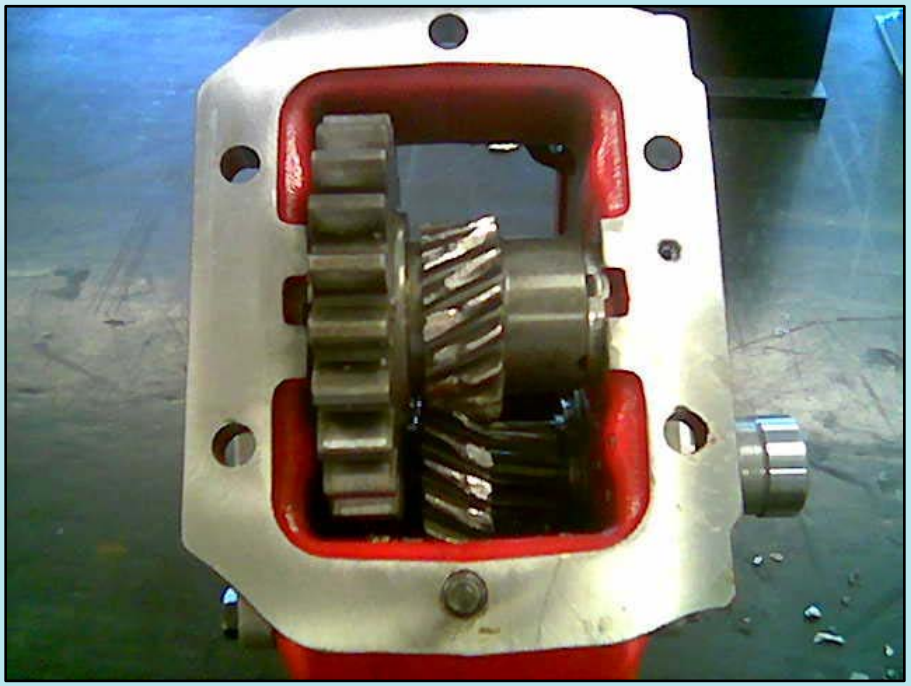
- Whine
- Clatter



P.T.O. Troubleshooting

Noise Types

- Clicking
- Grinding

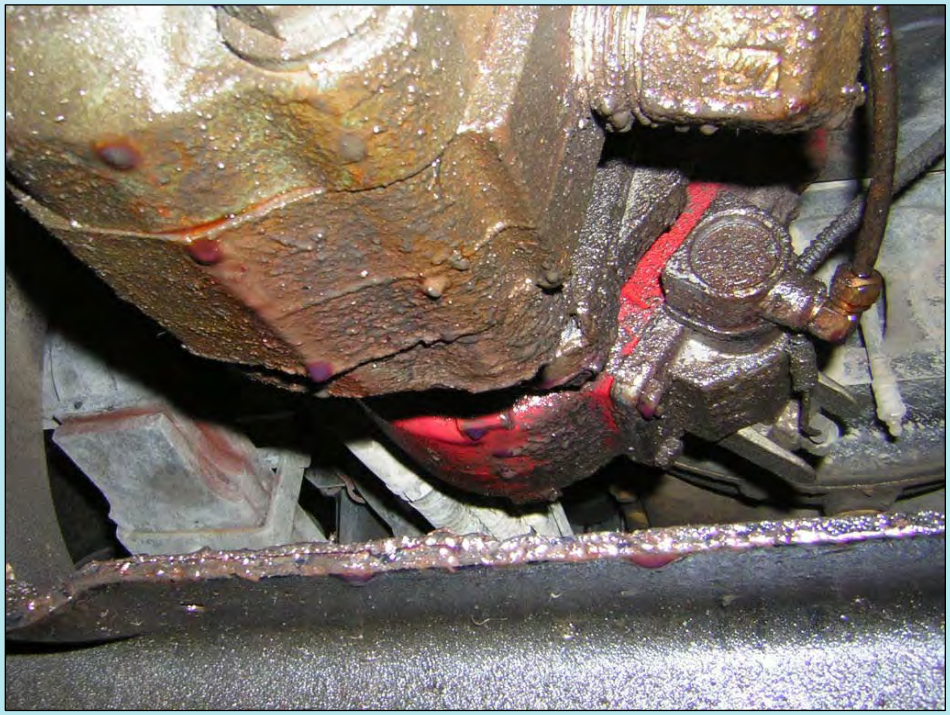


P.T.O. Troubleshooting

Leaks

Possible Locations

- Stud Threads
- Seals

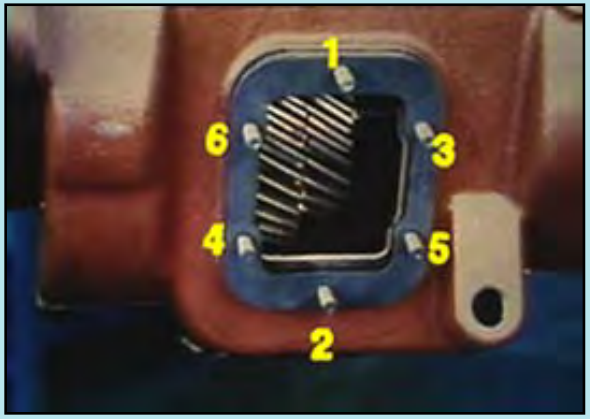


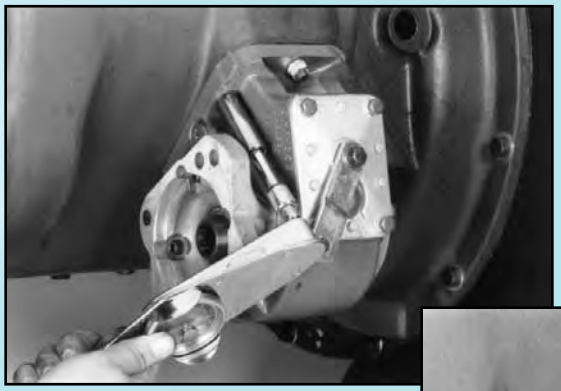
P.T.O. Troubleshooting

Leaks

Root Cause of the Leakage

- Improper Torque of Fasteners
- Improper Stud Installation
- Gasket Installation



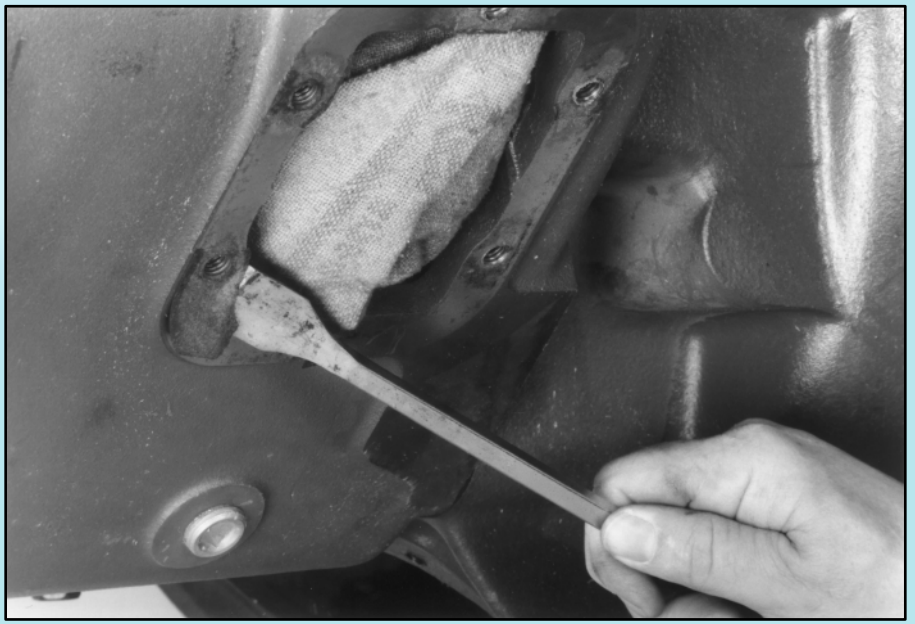


P.T.O. Troubleshooting

Leaks

Root Cause of the Leakage

- Transmission Preparation
- Worn Seals



P.T.O. Troubleshooting

Performance

Symptoms & Causes

- Hydraulic System

P.T.O. Troubleshooting

Performance

Symptoms & Causes

- P.T.O. Operation
  - Erratic Operation
  - Hard Shifting
  - Jumping out of Gear

P.T.O. Troubleshooting

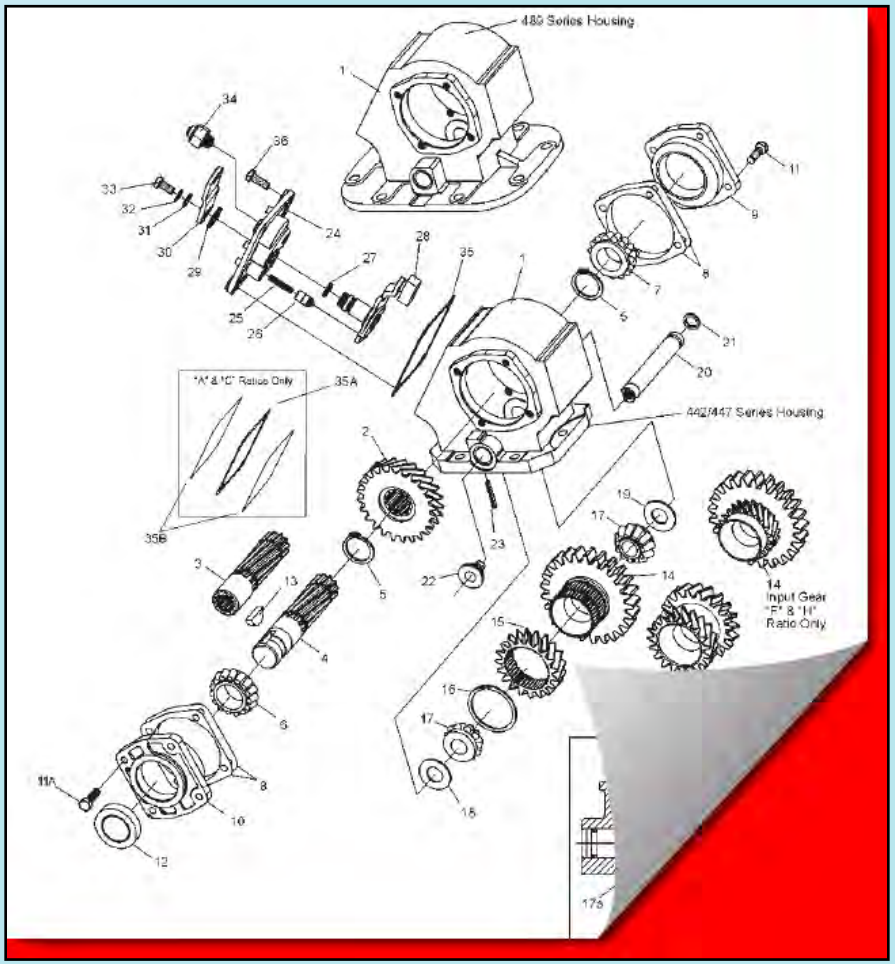
On the Work Bench

P.T.O. Troubleshooting

On the Work Bench

Items to be Examined

- Housing
- Gears
- Shafts
- Bearings
- Shifters
- Clutches



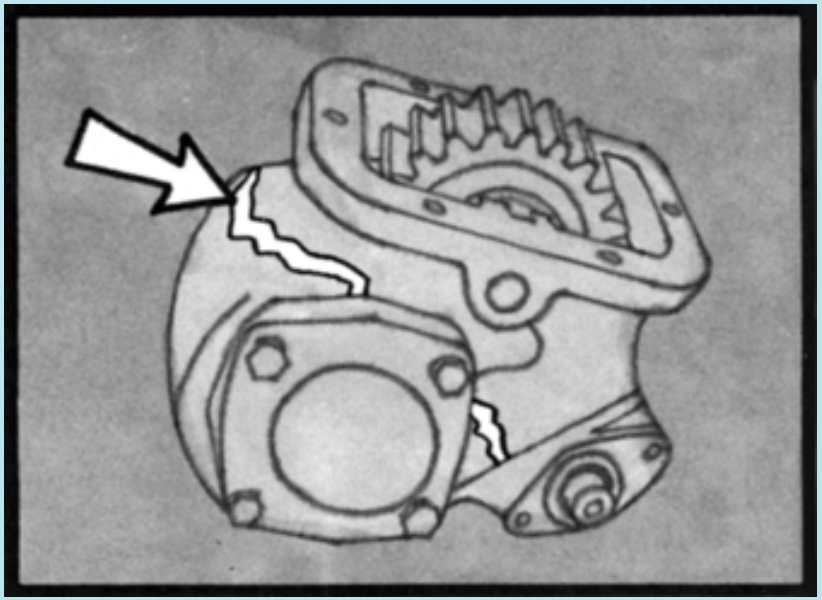
P.T.O. Troubleshooting

Housing Damage

One of the most serious problems a P.T.O. can suffer is a cracked case. This condition can lead to oil loss and eventual transmission failure.

Some causes are:

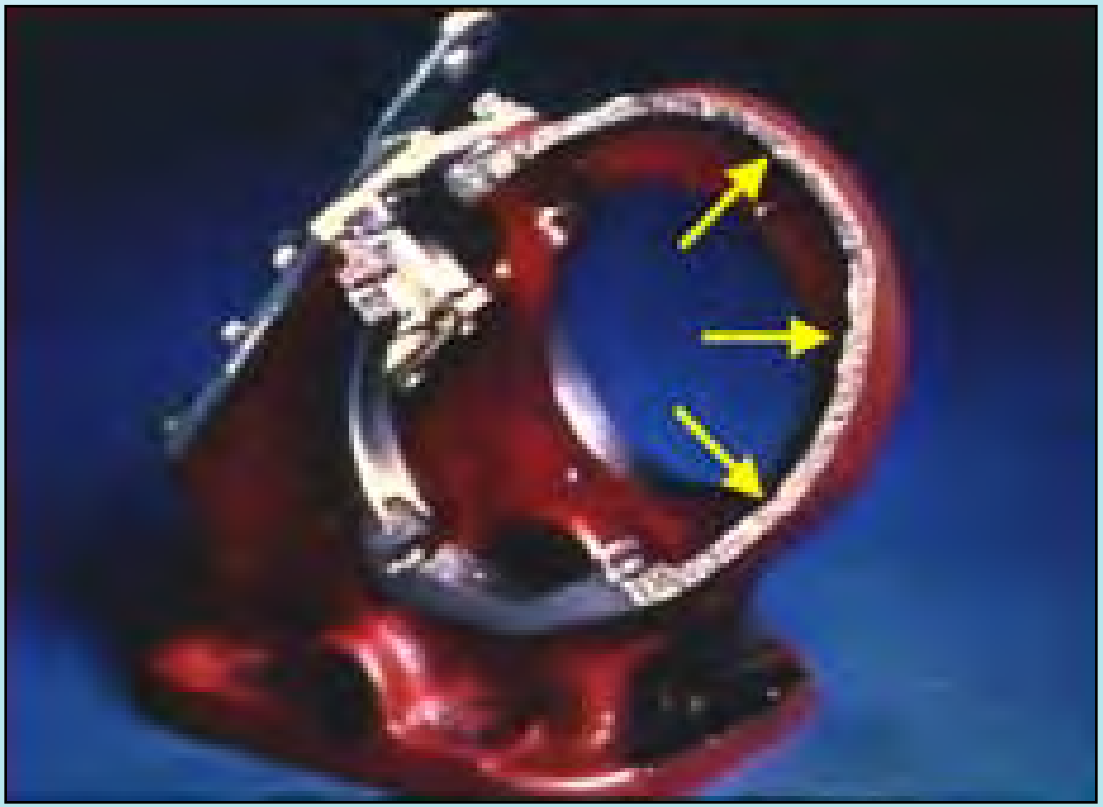
- Improper installation
- Poorly torqued bolts
- Unsupported direct mount pump
- Foreign objects meshing between the gear teeth
- Severe shock load
- Hitting an obstacle in the road.



P.T.O. Troubleshooting

Housing Damage

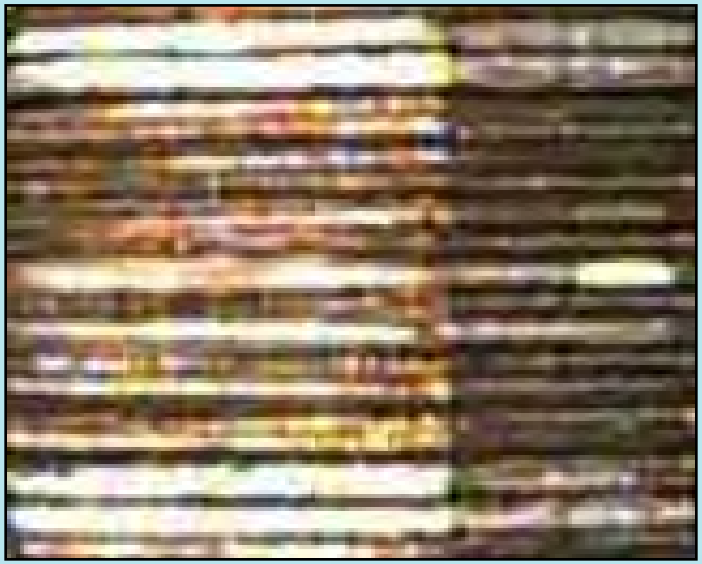
- Damaged Threads



P.T.O. Troubleshooting

Gear Damage

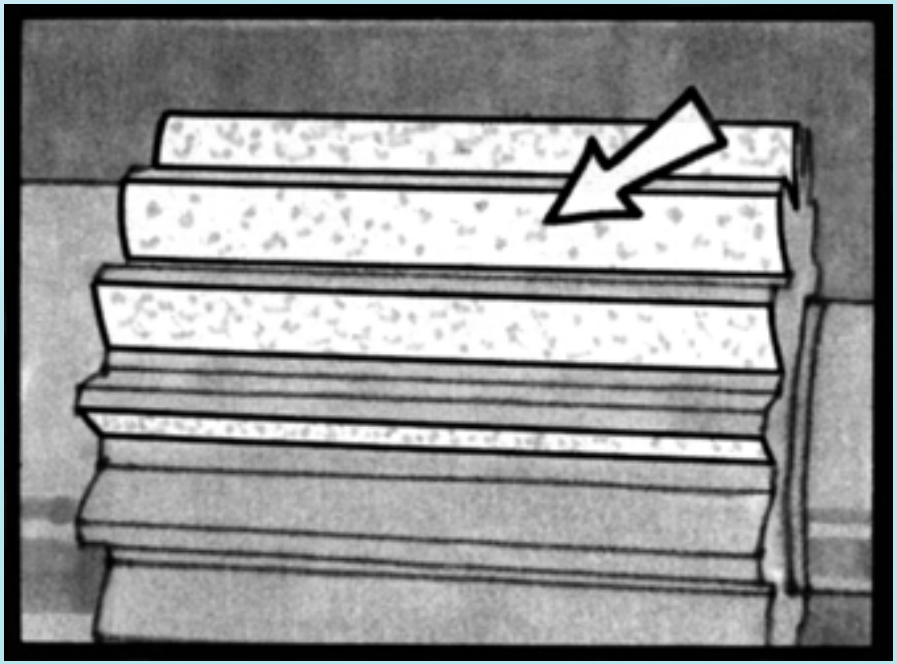
- Tooth
- Spline



P.T.O. Troubleshooting

Gear Damage

- The first parts to inspect should be the gears. Check the surface of the gear teeth for signs of pitting
- Once pitting of the gear surfaces has begun, there is nothing that can stop it



P.T.O. Troubleshooting

Gear Damage

Another possible problem during vehicle operation is “shock load”.

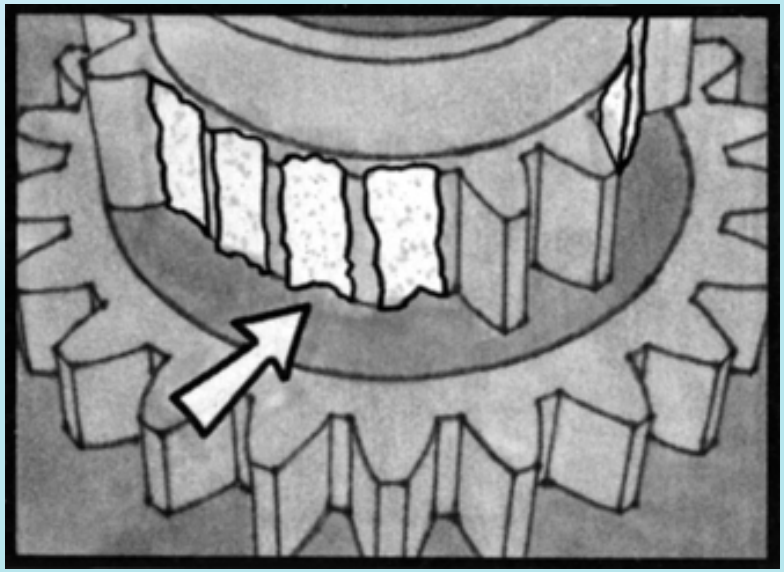
- Deep Mesh Pattern Caused by Improper Backlash Adjustment

P.T.O. Troubleshooting

Gear Damage

Worn gears can easily be affected by “shock load”.

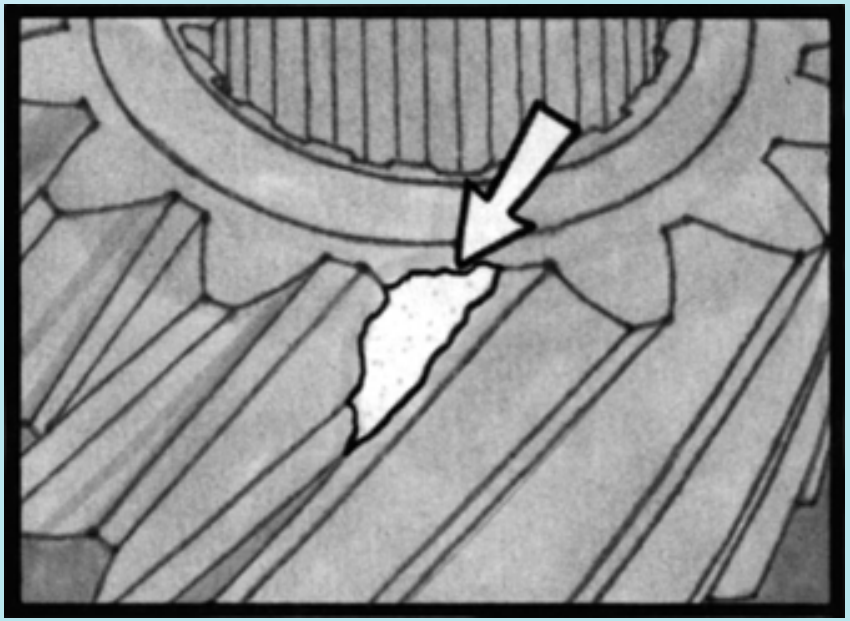
If the worn gears are not replaced, they can eventually lead to broken gear teeth.



P.T.O. Troubleshooting

Gear Damage

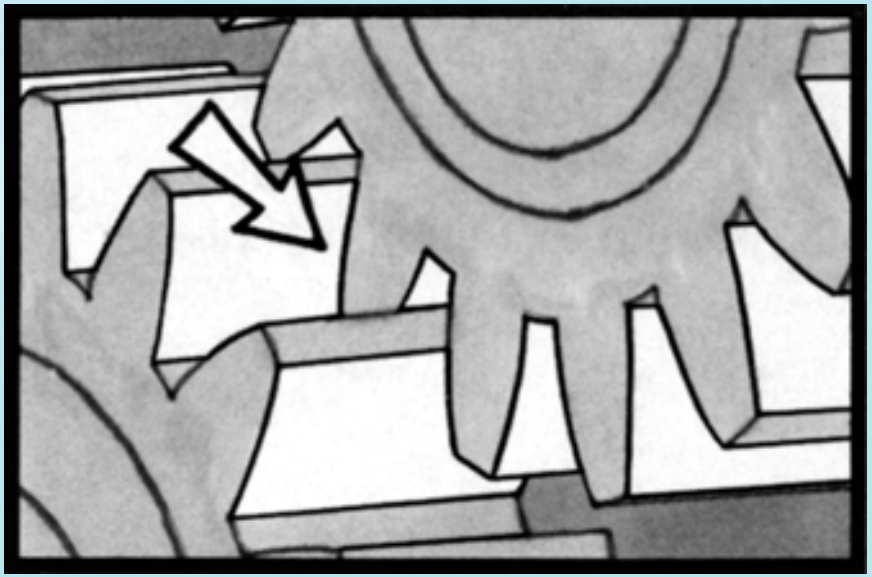
Sometimes a gear will chip a tooth because of mishandling or improper shifting.



P.T.O. Troubleshooting

Gear Damage

Undershifting allows incomplete gear tooth contact with the driver gear. This means only part of the tooth width is transmitting the torque and R.P.M. during P.T.O. operation.

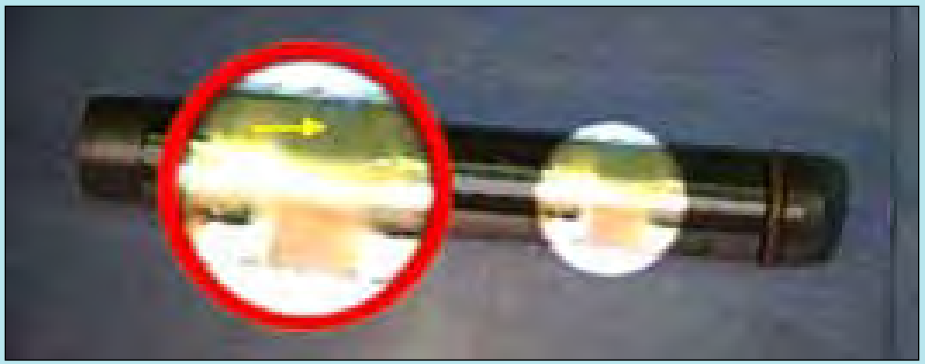


P.T.O. Troubleshooting

Shafts

Damage

- Seals
- Bearing

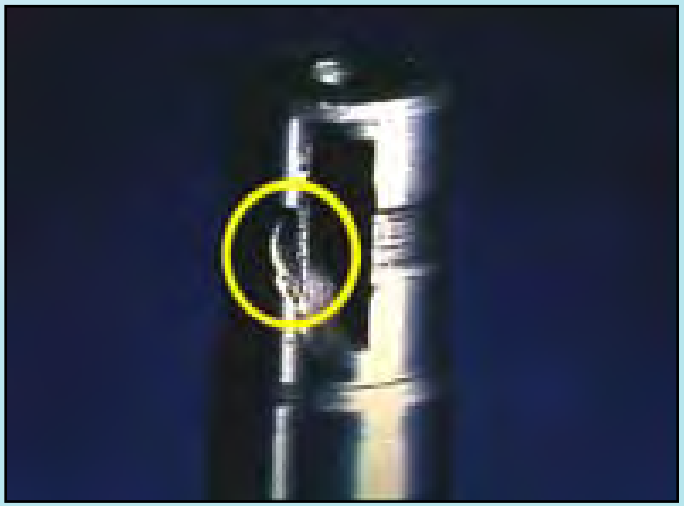


P.T.O. Troubleshooting

Shafts

Damage

- Misapplication
  - Overloads
- Shock Loads

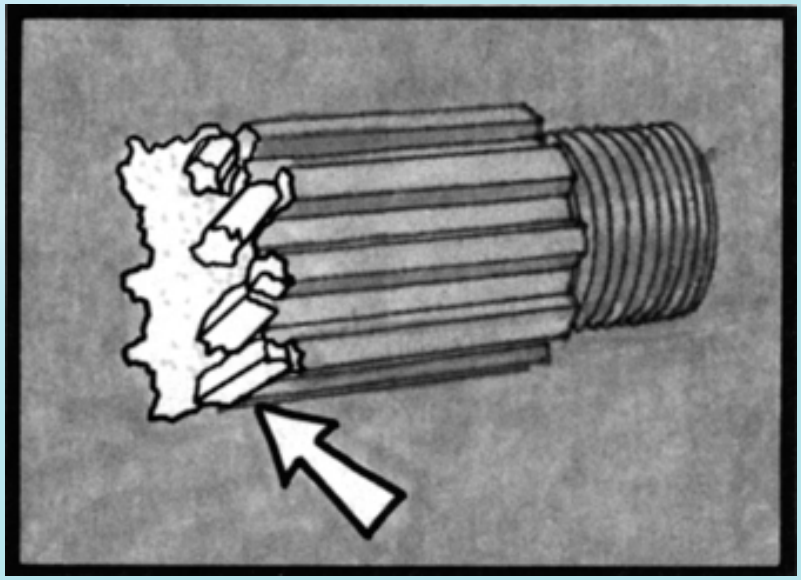


P.T.O. Troubleshooting

Shafts

P.T.O. shafts are also vulnerable to operating abuse.

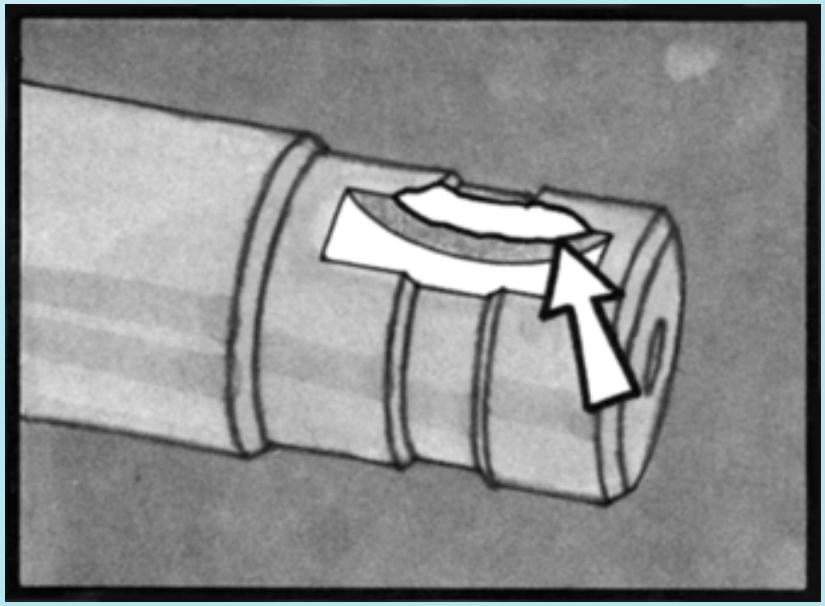
- Torsional overload
- Bending fatigue failure



P.T.O. Troubleshooting

Shafts

When inspecting a P.T.O. output shaft, always inspect the keyway.



P.T.O. Troubleshooting

Shafts

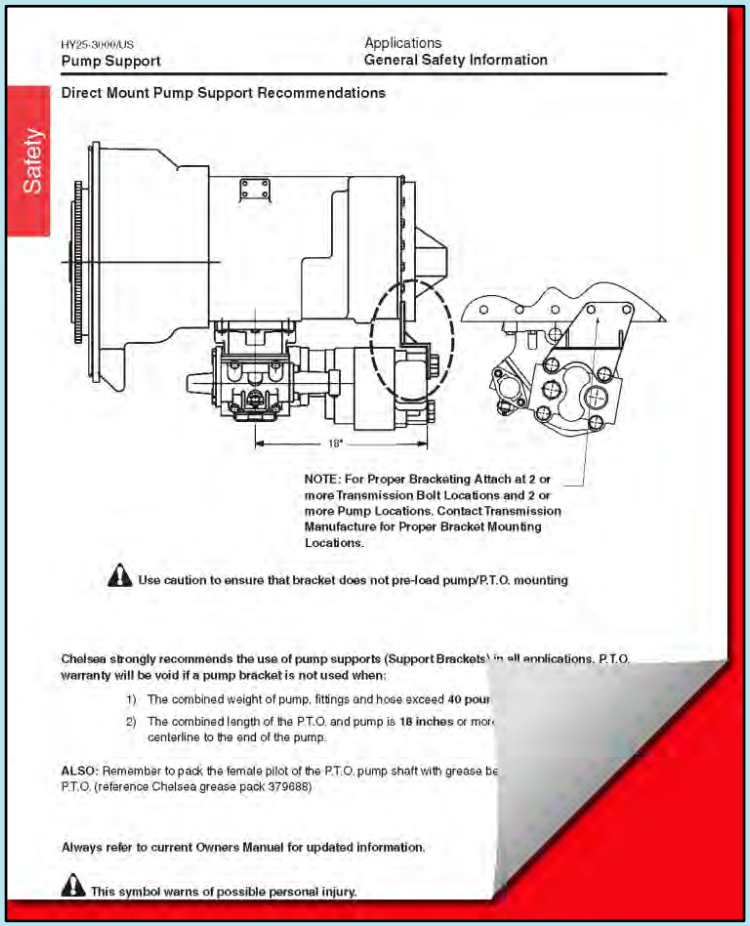
Damage

- Fretting Corrosion

P.T.O. Troubleshooting

Prevention is the best cure for P.T.O. case damage.

- Always torque the P.T.O. flange bolts in sequence and the proper specifications
- Also, be sure to check the weight of the direct mount pump and, if it is over forty pounds, make a support bracket for it



HY25-3000/US
Pump Support

Applications
General Safety Information

Safety

Direct Mount Pump Support Recommendations

18"

NOTE: For Proper Bracketing Attach at 2 or more Transmission Bolt Locations and 2 or more Pump Locations. Contact Transmission Manufacture for Proper Bracket Mounting Locations.

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 pour
2) The combined length of the P.T.O. and pump is 18 inches or mor centerline to the end of the pump.

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

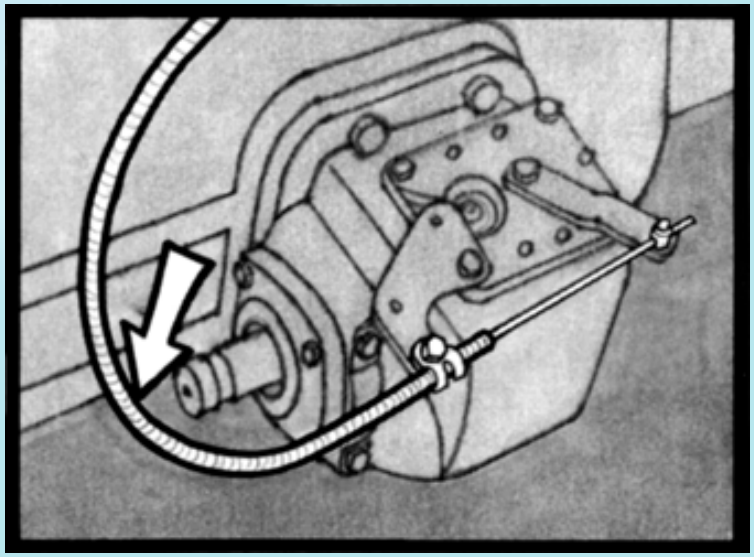
Always refer to current Owners Manual for updated information.

This symbol warns of possible personal injury.

P.T.O. Troubleshooting

Shifting Problems

- P.T.O. is hard to shift



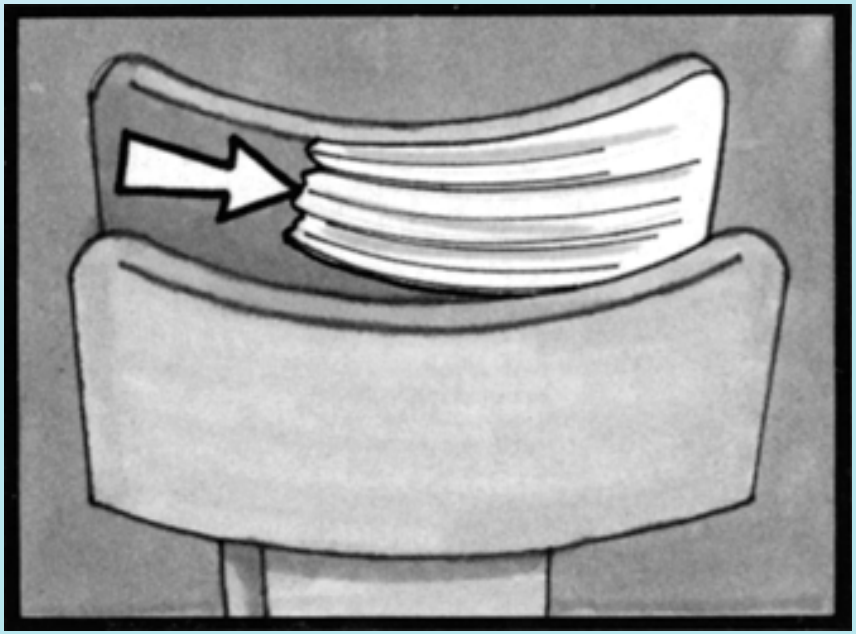
P.T.O. Troubleshooting

Remember, a lever-operated shift linkage should not be connected to a wire shift cover. The mechanical advantage of the lever is often too great for the wire shift cover and could severely damage it. Also inversely, don’t use a cable with a lever shift cover. The cable isn’t capable of transmitting the force necessary to shift a lever mechanism.

P.T.O. Troubleshooting

Shifting Problems

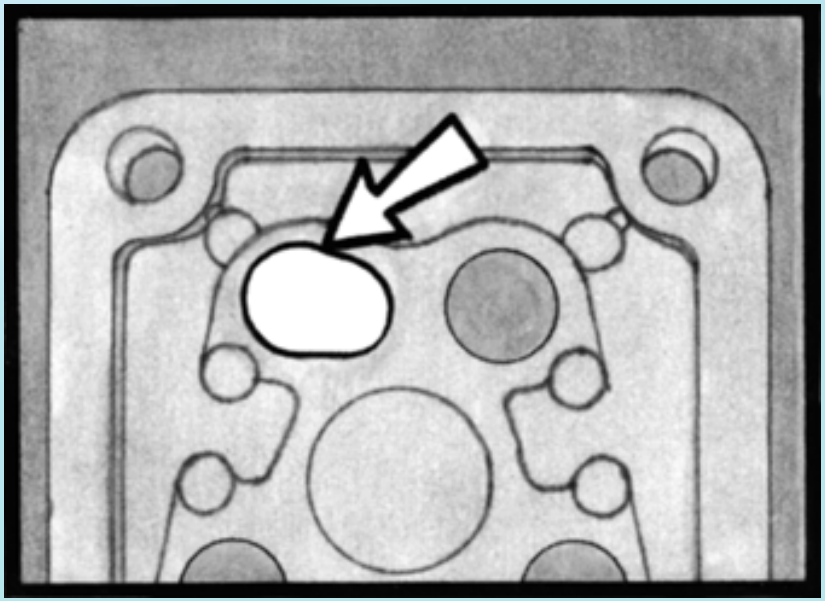
- Most shifting complaints are caused by improper shifting procedure or incorrect linkage installation



P.T.O. Troubleshooting

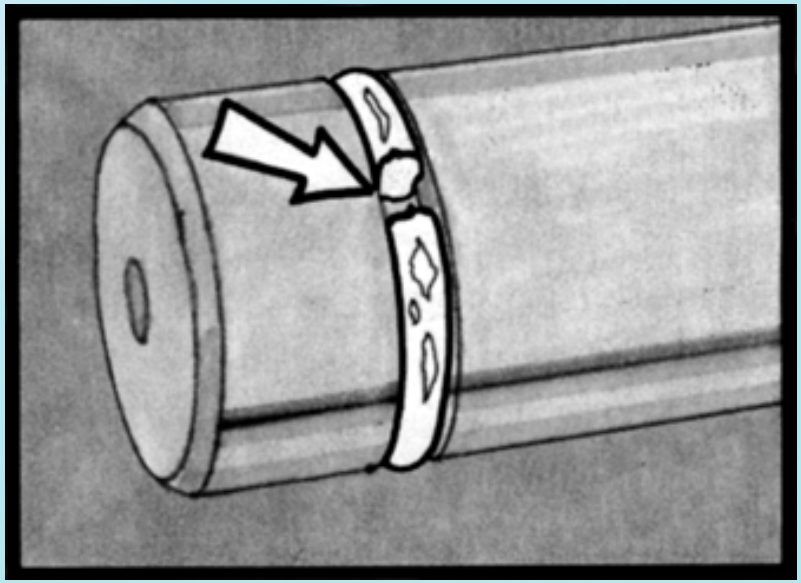
Shifting Problems

- Shifting problems can also be caused by a worn or elongated shifter poppet hole



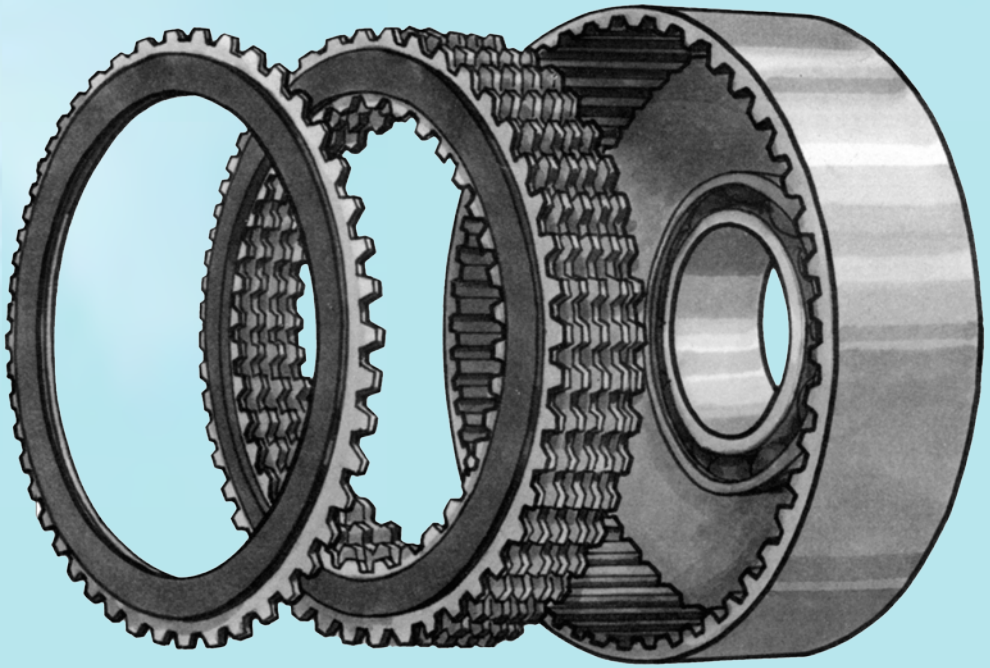
P.T.O. Troubleshooting

Seals and O-Rings may cause special problems in P.T.O. operations.



P.T.O. Troubleshooting

Remember, when troubleshooting any clutch-operated P.T.O., carefully inspect all components for wear or damage. Burnt clutch plates, welded clutch pack, or a burnt driving hub are three easily identifiable conditions that lend themselves to failure analysis.



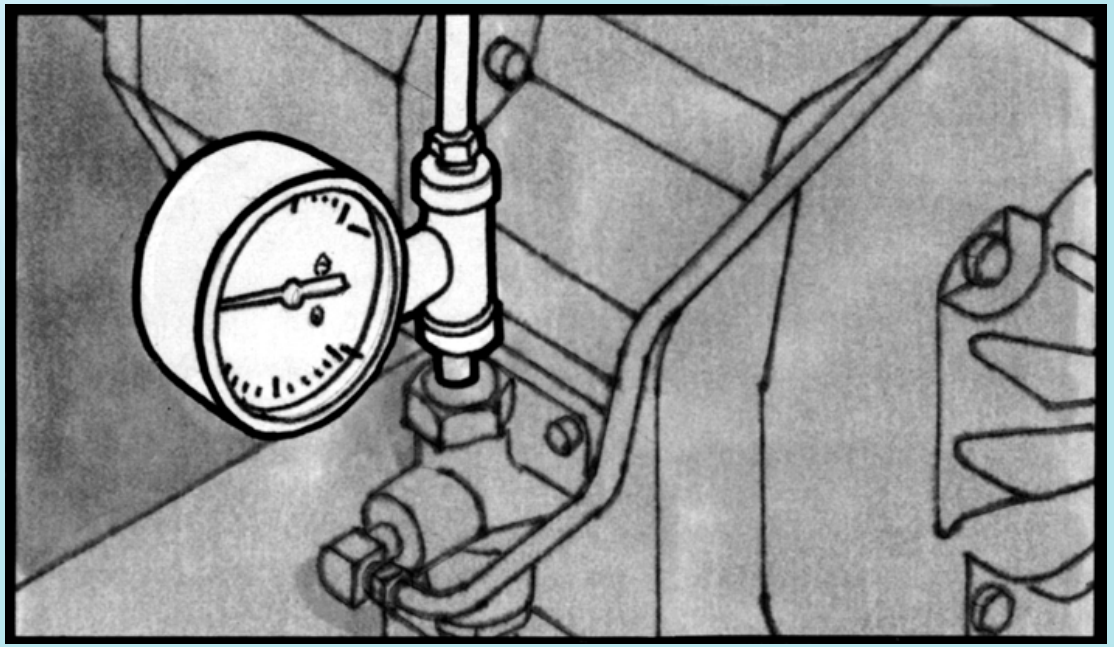
Burnt Clutch Plates?

Welded Clutch Pack?

Burnt Driving Hub?

P.T.O. Troubleshooting

A sure sign of potential trouble with a clutch operated P.T.O. is erratic operation.



P.T.O. Troubleshooting

The 3 most common complaints

- Noise
- Engagement Problems
- Disengagement Problems

P.T.O. Troubleshooting

Noise

Listen Carefully

Whine or High Pitched Squeal

- Gears too tight
- Bearings
- Hydraulic Noise

P.T.O. Troubleshooting

Noise

Listen Carefully

Rattle

-Gears too loose

-Torsional Vibrations

P.T.O. Troubleshooting

Engagement Problems

Powershift P.T.O.s

- Blocked Hoses or Fittings
- Bad Connections or Ground
- Solenoid

P.T.O. Troubleshooting

Engagement Problems

Mechanical P.T.O.s

- Low Air Pressure
- Improper Cable Installation
- Back Lash too tight

P.T.O. Troubleshooting

Disengagement Problems

Powershift P.T.O.s

- Blocked Hoses or Fittings
- Frozen Clutch Pack
- Solenoid

P.T.O. Troubleshooting

- Chelsea P.T.O.s are designed and built to match a vehicle's transmission
- The gears of a P.T.O. are of the same quality as the transmission's gears
- Successful operation depends on proper specification and installation
- Always consult your **Chelsea Applications Guide** and **Installation Manual** when working with Chelsea P.T.O.s. Doing this will prevent serious P.T.O. problems

Review Exercise