



NCA600F-GPC

Tractor Shop Manual

Supplement

Hydraulic Gear Pump Conversion Kit

Ford Agricultural and Industrial Tractors

Model Years: 1953 - 1964

Windy Ridge Farm and Machine

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1. Design and theory of operation

Pump Technical Data	
Form factor	Two bolt SAE-AA with ½" x 1.25" keyed shaft
Type	Fixed displacement gear pump
Displacement	.48 cubic inches
Flow Rate	6.7 GPM @ 2000 engine rPM
Recommended Oil	Tractor Transmission Oil meeting CNH Hy-Tran performance requirements can be used in common sump tractors. A mobile equipment anti-wear (AW) hydraulic fluid meeting Eaton-Vickers M-2950 requirements can be used in tractors with a dedicated hydraulic reservoir
Recommended Oil Viscosity	Above 10°F: ISO 46 or ISO 68 Below 10°F: ISO 22 or ISO 32

The NCA904F-GPC kit replaces the OEM vane and piston hydraulic pumps used on 1953 – 1964 Ford agricultural and industrial tractors with an inexpensive and reliable off the shelf gear pump. The Ford NCA-905C gear housing from the Ford piston pumps is used to mount the gear pump to the tractor engine in place of the piston pump. An aluminum adapter plate is used to adapt the piston pump mounting bolt pattern to the 2 bolt pattern on the gear pump. The OEM piston pump gear housing is not modified in anyway.

A core element of the conversion is the gear pump drive shaft and ball bearing. This shaft and bearing are a drop-in replacement for the original wobble shaft and tapered roller bearing used with the piston pump (left picture) The camshaft drive gear end of the new shaft runs in the same needle roller bearing as the OEM shaft and lubrication of that bearing is the same as the OEM shaft. Unlike the OEM shaft the replacement shaft incorporates an off the shelf field serviceable hardened inner race which can be replaced along with the needle



bearing should it ever wear out. The outboard end of the replacement shaft runs in a 6205 radial ball bearing. A reducing sleeve replaces the cone seat used with the tapered roller bearing and adapts the gear housing to fit the ball bearing. The sealed ball bearing is internally lubricated and requires no external lubrication. Finally, the replacement shaft has the same Ford proprietary splined end as the OEM wobble shaft and mates to the OEM

camshaft drive gear used on the piston pumps (right picture). The wear parts are all common off the shelf components and can be inexpensively replaced as needed. Under normal circumstances the shaft itself should last indefinitely but replacements are available in the event of some sort of catastrophic failure.

2. Installing the conversion kit

- 2.1. Disconnect the proof meter cable from the old pump and remove the threaded bushing, cable drive adapter, and slotted screw and washers inside the end of the pump. Reinstall the parts in the nose of the new pump.
- 2.2. If installing the kit on a tractor with steel hydraulic lines that run under the transmission remove the three cap screws that attach the flange at the top of the lines to the bottom of the pump and allow the lines to hang free
- 2.3. If installing the kit on a tractor that has a solid aluminum manifold between the pump and transmission remove the six cap screws securing the manifold to the pump and transmission and set the manifold along with the cap screws and o-rings aside. The cap screws and o-rings will be reused in a subsequent step
- 2.4. Remove the two cap screws securing the pump to the engine block and lift the pump free of tractor. Remove all traces of old gasket and sealer from the engine block mating surfaces.
- 2.5. Using the new gasket provided with the kit and the cap screws removed in the previous step attach the new pump to the engine block. Make sure the pump is fully seated all the way around, the gear is not binding, and no foreign material is trapped between the mating surfaces before securely tightening both cap screws.
- 2.6. Reinstall the proof meter drive adapter and connect the proof meter cable to the new pump.
- 2.7. Loosely connect the pressure and suction hoses provided with kit to the hydraulic ports on the new pump.

2.8. FOR TRACTORS EQUIPPED WITH STEEL HYDRAULIC LINES

Before proceeding thoroughly familiarize yourself with the Versil-Flare installation instructions below. Use the hoses to mark the junction point on the hydraulic tubes leaving a small amount of slack in each hose – they should have a slight curve in them. **Make sure you leave the tubes long enough to fit fully up inside the Versil-Flare adapters - a little long is better than too short!!!** Cut and debur both tubes as described in the adapter instructions. Connect the Versil-Flare tube adapters and the JIC tube union provided with the kit to the cut ends of the tubes and tighten per the instructions. The smaller fitting is a -6 size and the larger one is -12. Loosely connect the swivel ends of the pressure and suction hoses to the tube unions. Once the hoses are adjusted and routed securely tighten all hose swivels. If it becomes necessary to disconnect the hoses in the future do so at the hose swivel to tube union junction – do not unscrew the Versil-Flare tube nut.

2.9. **FOR TRACTORS EQUIPPED WITH AN ALUMINUM HYDRAULIC MANIFOLD.**

Use the cap screws and o-rings removed in step 1.2 to install the adapter plate provided with kit to the face of transmission and securely tighten the caps crews. Loosely connect the pressure hose to the smaller

port in adapter plate and the suction hose to the larger port adapter. Adjust hose routing and securely tighten all hose connections.

Assembly Instructions for Versil-Flare Tube Fittings

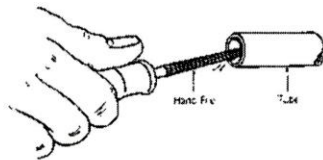
Cutting

To insure a leak-proof joint, the tubing should be cut square ($\pm 1^\circ$). A tube cutter is preferred, but a hacksaw or abrasive wheel can be used.



Deburring

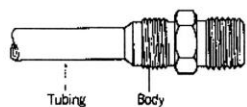
All cut tubes should be deburred. However, deburring is even more important if the tubing was cut with a hacksaw or abrasive wheel. Remove any burrs, both internally and externally, with a deburring tool, emery paper or fine file. Clean the tube before assembly. Clean all dirt and grit from the I.D. and O.D. of the tube.



Assembly Instructions for Versil-Flare Tube Fitting

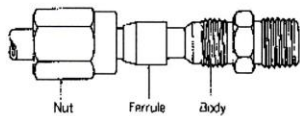
Tubing cut-off

1. Tube should be cut to fit tight against the face of standard SAE 37° flare body.



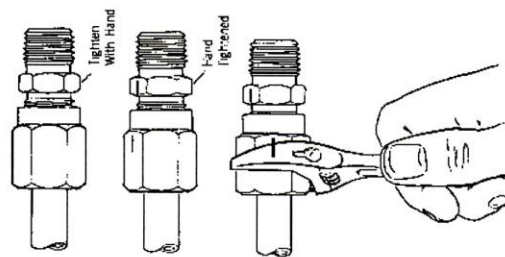
Initial assembly

1. Deburr the end internally and externally. Clean all dirt and grit from I.D. and O.D.
2. Slide the nut and then the ferrule into the tube. Make sure the tapered end of ferrule points toward the nut.



3. Lubricate all mating surfaces of nut, ferrule and body with a heavy lubricant such as Aeroquip 222070 Lube.
4. Place end of tube against standard SAE 37° flare body.

5. Slide the ferrule and nut against body and tighten the nut onto the body "Hand Tight." Mark the nut in relation to the body for location.



6. Hold tube against body and tighten nut a total of $1\frac{1}{4}$ turns on -3 through -10 and $1\frac{1}{2}$ turns -12 through -32.

Reassembly

1. Slide nut against the body and tighten to "Hand Tight." Mark the nut for location.
2. Tighten nut a minimum of one "Hex" flat. The Versil-Flare flareless tube fitting is designed for a maximum of 10 reassemblies.

3. Servicing the gear pump adapter assembly

Special Tools required:

- Vice
- Gear puller or shop press
- Retaining ring pliers

See Section 4 for an illustrated parts breakdown

Disassembly

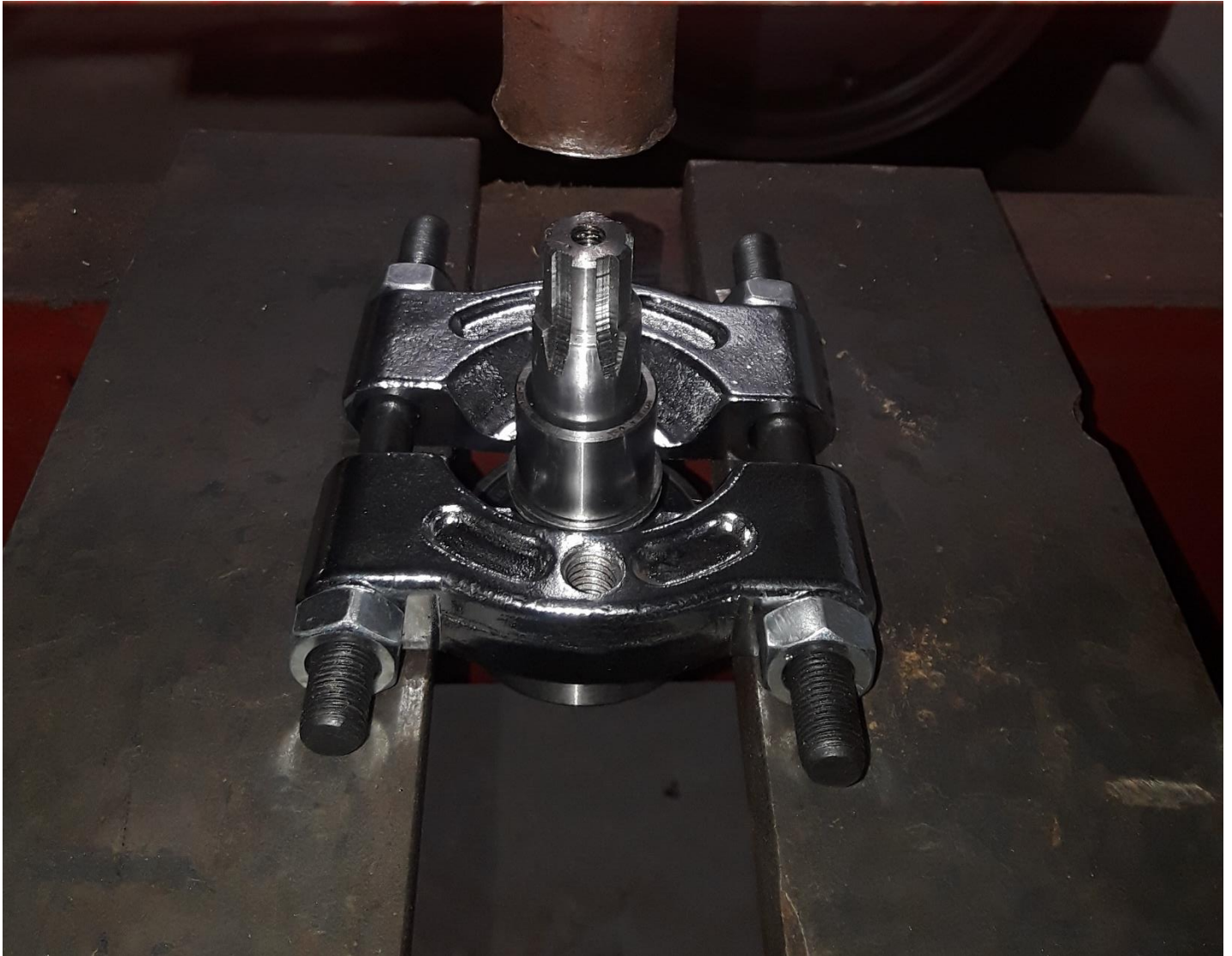
- 3.1. Disconnect the proof meter cable and hydraulic hoses from the pump assembly. Remove the two cap screws securing the assembly to the tractor and take it to a work bench for disassembly.
- 3.2. Remove the threaded bushing and proof meter cable drive adapter from the end of the pump gear housing.
- 3.3. Remove the two socket head cap screws securing the gear pump to the pump adapter plate and pull the pump away from the adapter plate. Take care not to lose the key in the gear pump input shaft. Next remove the four socket head screws securing the adapter plate to the end of the gear housing and remove it.



- 3.4. Working inside the nose of the pump remove the special slotted hex screw and washers from the end of the gear shaft. Then using a punch gently drive the gear shaft backwards out of the drive gear until it is free and the drive shaft assembly can be withdrawn from the other end of the housing. Remove the bearing spacer from inside the gear housing.
- 3.5. Remove the snap ring from the end of the gear shaft and using a shop press or gear puller press the gear shaft out of the bearing. Take care not to damage the keyed hub in the shaft. The bearing should be supported on the inner ring to avoid damaging the bearing.



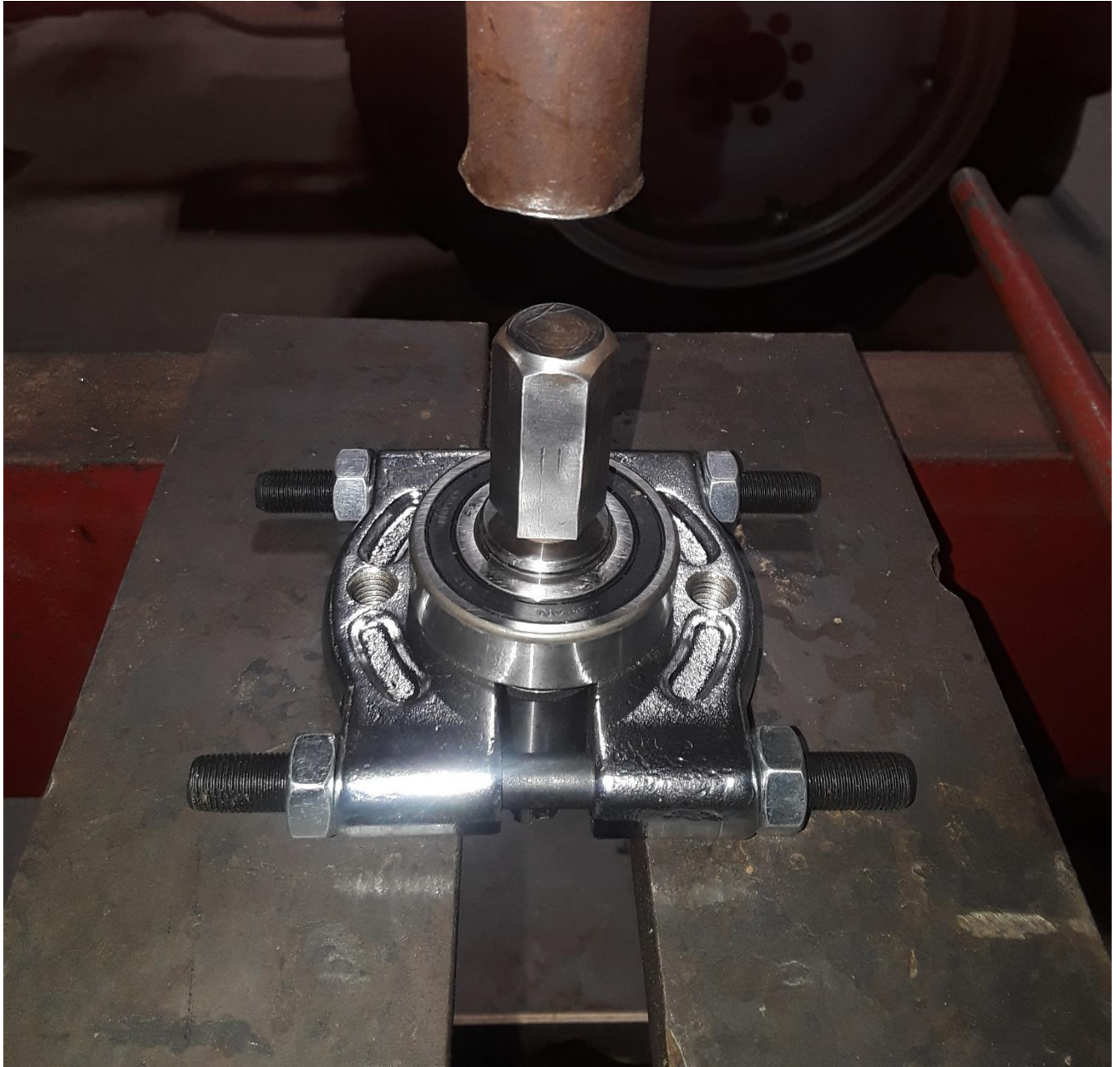
- 3.6. Using a shop press or gear puller press the needle bearing race and spacer off the splined end of the drive shaft. Take care not to damage the splined ends of the drive shaft. If replacing just the inner race the ball bearing does not have to be removed. A bearing splitter can be placed behind the shaft spacer and the inner ring and spacer can be removed with the ball bearing in place. As shown below.



- 3.7. Working inside the nose of the pump use a punch to drive the needle roller bearing backwards out of the gear housing. Discard the bearing – it is not reusable.
- 3.8. Clean, inspect, and replace all components as needed.

Reassembly

- 3.9. Using a shop press install the ball bearing on the intermediate shaft. Press the shaft into the bearing supporting the inner race with a close-fitting press plate to prevent damaging the bearing. Press the bearing on until it is just a few thousandths of an inch short of contacting the retaining ring. The retaining ring should remain free to turn in its groove. Binding the ring will make future removal difficult.



3.9. Install the shaft spacer followed by the inner bearing race on to the shaft by pressing them on from the splined end of the shaft.



3.10. Next install the assembled shaft assembly into the gear housing. Stand the nose of the housing on a flat work surface and drop the bearing spacer down into the top opening. Then place the drive gear into the side opening in the housing with the flat side up and the hole in the gear roughly centered under the spacer. Insert the splined end of the drive shaft assembly into the top of the housing and lower it until the end contacts the drive gear. Working from both ends adjust the position of the drive gear and shaft until the splines on the shaft engage the splines in the center hole. Then press the drive shaft down to fully engage the splines in the gear. Carefully turn the housing on its side and install the special proof meter drive slotted head screw and washers in the end of the shaft and tighten it securely.



3.11. Assemble the pump adapter plate to the gear housing using a new gasket and four 3/8 x 1" socket head cap screws. Do not fully tighten the screws until you complete the next step.



3.12. Finally assemble the pump to the adapter plate using a new gasket and two 3/8 x 1" socket head cap screws. The narrow side of the pump housing should be clocked to the gear opening side of the housing. Evenly tighten all six socket head screws to 20 lb-ft.



4. Parts List

Key	Part Number	Description	Quantity
1	GP-F10-080-P-A	Hydraulic gear pump with SAE-AA two bolt flange .48 CID displacement, ½" x 1.063 keyed shaft, CCW rotation, SAE side ports	1
2	GP-GKT-AA	Gasket – gear pump to adapter plate	1
3	NCA905C-AP	Gear pump adapter plate	1
4	NCA905C-GKT	Gasket – adapter plate to gear housing	1
5	NCA905C	Ford OEM piston pump drive gear housing	1
6	---	External retaining ring, 25mm	1
7	NCA966-GPC	Pump drive shaft	1
8	6205-2RS	Koyo sealed radial ball bearing	1
9	---	Bearing spacer - 1.990" x 1.500" x .700"	1
10	---	Inner ring spacer - 1.250" x .750" x .125"	1
11	IR-121612	Koyo inner needle roller bearing ring	1
12	B-169	Koyo full complement needle roller bearing	1
13	---	Socket head cap screw - 3/8-18 UNC x 1"	6
14	C3NN908A	Pump drive gear	1