FORD TRACTOR

for

FORD TRACTOR SERIES
2000 AND 4000 *Select-O-Speed* TRANSMISSION
(DIRECT DRIVE CLUTCH MODELS)

CM 101102

shop manual supplement

SELECT-O-SPEED TRANSMISSION SHOP MANUAL SUPPLEMENT

for

FORD TRACTOR SERIES 2000 AND 4000

(DIRECT DRIVE CLUTCH MODELS)

Prepared by

TRACTOR AND IMPLEMENT OPERATIONS (U.S.)

FORD TRACTOR DIVISION FORD MOTOR COMPANY

BIRMINGHAM, MICHIGAN

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FOREWORD

This manual supplements Chapter II, Part Two, of the Ford Tractor Shop Manual, Form No. SE 8175. It contains service procedures applicable to the Select-O-Speed transmission on the 1963 production Ford Tractors, Series 2000 and 4000.

Reference should be made to the original Shop Manual for Select-O-Speed transmission removal and installation procedures, as they remain unchanged. Refer to the index on the opposite page for information and procedures contained in this supplement.

Keep this supplement with your copy of the Tractor Shop Manual, and in a location where it will be readily available for use at all times.

SERVICE DEPARTMENT
TRACTOR AND IMPLEMENT OPERATIONS (U.S.)
FORD TRACTOR DIVISION
FORD MOTOR COMPANY

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Part TWO

CLUTCH, TRANSMISSIONS, REAR AXLE AND POWER TAKE-OFF

Chapter

II

Transmissions

7. DESCRIPTION AND OPERATION – SELECT-O-SPEED TRANSMISSION

The Select-O-Speed Transmission is available in three models. The basic transmission remains unchanged for all tractors, and the differences exist only in the following Power Take-Off options:

No P.T.O.

Single speed independent engine-driven P.T.O.

Two speed independent engine-driven P.T.O., and proportional ground speed P.T.O.

The transmission provides for ease of control and high efficiency in the utilization of engine power and engine fuel. It is a manually selected, hydraulically controlled system, which transmits power from the engine through four planetary gear sets, providing the ten forward speed ratios and two reverse speed ratios to the final drive of the tractor. Park and Neutral positions are also provided.

A brief description and the principles of operation of the major assemblies in the transmission are discussed in this section. All design and operational differences between the transmission models are fully explained.

PLANETARY GEAR TRAIN

For purposes of identification, the four planetary gear systems used in the transmission have been labeled from front to rear, "A", "B", "C", and "D", as shown in Figure 1. The ten forward and two reverse speeds are obtained by controlling the movement of the elements within the planetary gear systems.

Each of the planetary gear systems is comprised of three elements; a sun gear, a carrier with three pinions, and a ring gear, as shown in Figure 2. The three pinions are mounted within the carrier frame and rotate on needle bearings around pinion shafts, which are secured to the carrier frame. The sun gear, which is centered between the pinions, has external teeth. The ring gear, which encompasses the pinions, has internal teeth. All of the gears in the planetary system are constantly in mesh.

When a planetary system is connected to a source of power, all of the components in the system will rotate unless an external force is applied to hold an element. The sun gear, carrier, and the ring gear, can rotate on the central axis of the system and the pinions will rotate on their own axes at the same time as they are being carried around the central axis.

Planetary Gear Power Flow

Depending upon which element of a planetary system is held, power can be applied or taken out at the sun gear, carrier, or ring gear. The general flow of power through the planetary system will be as follows:

1. Applying power to the sun gear and holding the ring gear forces the pinions to rotate on their own axes and "walk" within the ring gear, taking the carrier

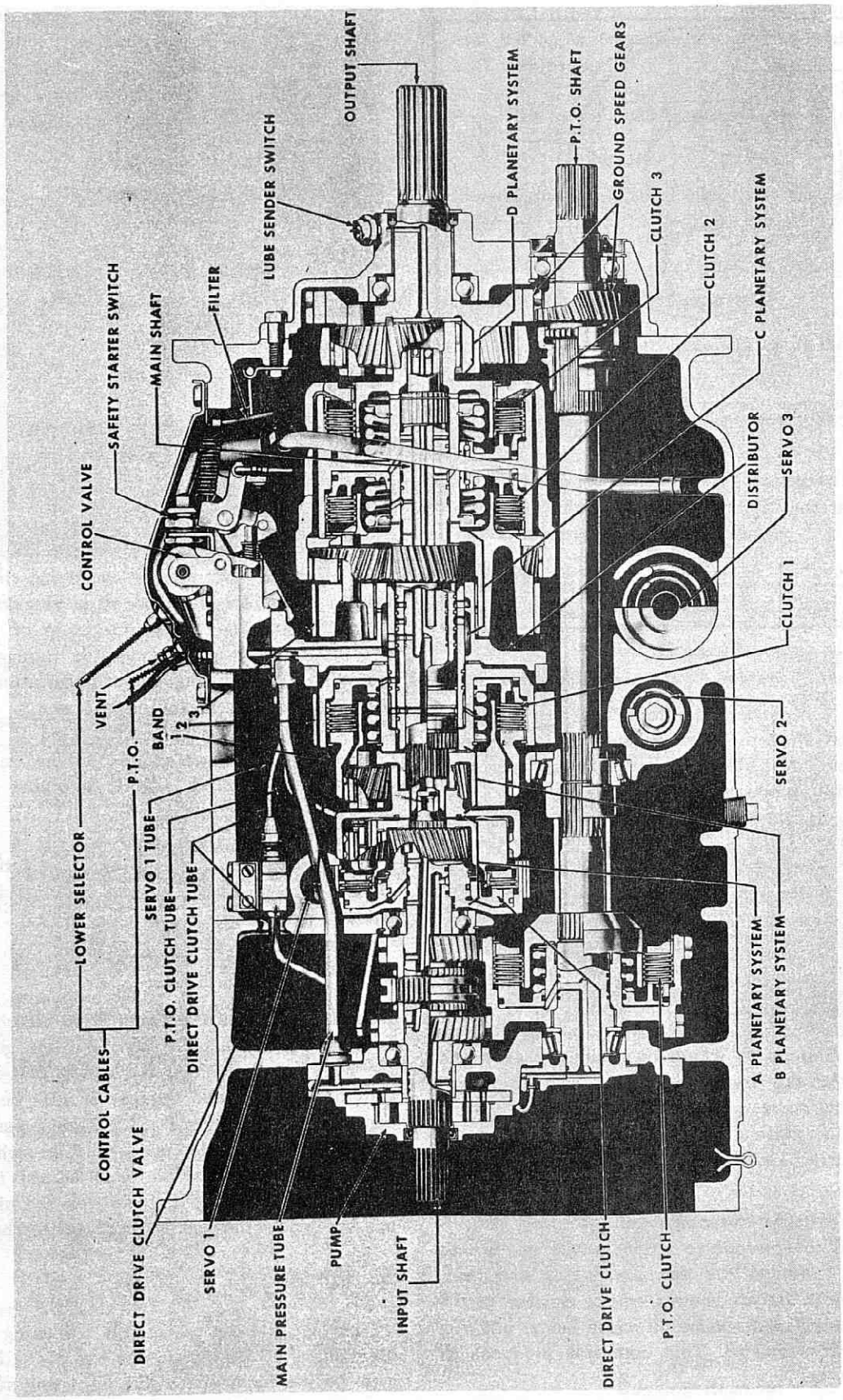

Figure 1

The Two Speed Independent P.T.O. and Proportional Ground Speed P.T.O. Select-O-Speed Transmission–Sectional View

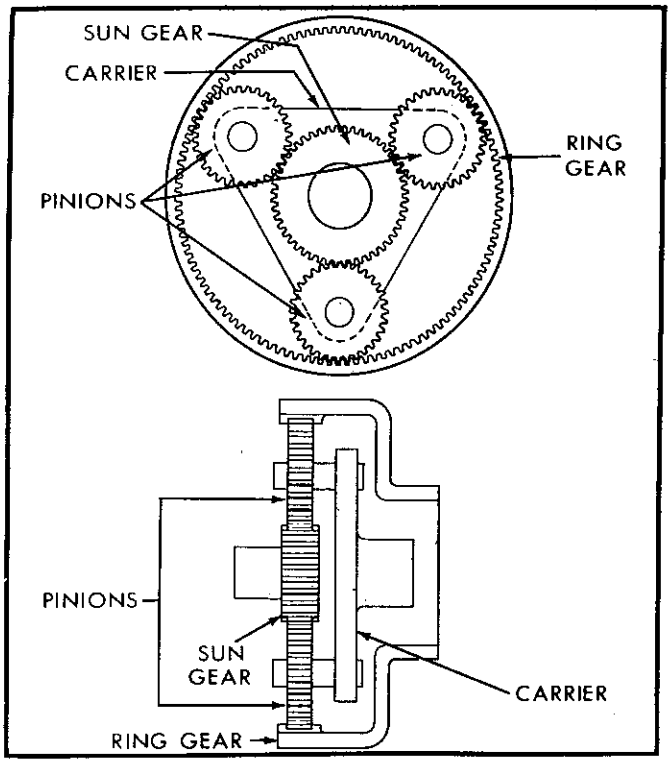

Figure 2
Planetary System – Front and Side View

with them. The carrier, therefore, becomes the power output member of the system, turning in the same direction but at a slower speed than the sun gear. This condition produces an underdrive ratio.

2. Applying power to the ring gear and holding the sun gear forces the pinions to rotate on their own axes and "walk" around the sun gear, taking the carrier with them. The carrier, therefore, becomes the power output member of the system, turning in the same direction but at a slower speed than the ring gear. This condition produces an underdrive ratio.

3. Applying power to the carrier and holding the ring gear forces the pinions to rotate on their own axes and "walk" within the ring gear. The sun gear, therefore, becomes the power output member of the system, turning in the same direction but at a higher speed than the carrier. This condition produces an overdrive ratio.

4. Applying power to the carrier and holding the sun gear, forces the pinions to rotate on their own axes and "walk" around the sun gear. The ring gear, therefore, becomes the power output member of the system, turning in the same direction but at a higher speed than the carrier. This condition produces an overdrive ratio.

5. Applying power to the sun gear and holding the carrier, forces the pinions to act as idlers, rotating in the opposite direction on their own axes. This drives the ring gear at a lower speed and in the opposite direction from the sun gear. This condition produces an underdrive reverse ratio.

6. Applying power to the ring gear and holding the carrier, forces the pinions to act as idlers, rotating in the same direction on their own axes. This drives the sun gear at a higher speed and in the opposite direction from the ring gear. This condition produces an overdrive reverse ratio.

7. Locking any two units of a planetary system together results in a direct drive with no change in speed or direction of rotation.

BANDS AND SERVOS

The transmission uses three servo-operated brake bands, shown in Figure 1. The bands hold three planetary gear elements and operate in conjunction with the hydraulic packs for the various power flows through the transmission. The bands are made of steel and have metallic or asbestos composition linings bonded to the inside surface. For purposes of illustration and reference, the bands have been labeled 1, 2, and 3.

All three bands are controlled by corresponding hydraulic servos which contain a piston and rod, return spring, and spring retainer.

In operation, the servos control the action of the bands on the various planetary gear elements in the following manner:

A. Band No. 1

Band 1 encircles the direct drive clutch housing which is attached to the planetary "A" sun gear. One end of the band contacts the inner end of the adjusting screw and the opposite end engages a strut between the band and the servo piston rod. When fluid pressure is directed to the servo, force is transmitted through the piston rod and strut to tighten the band around the drum. When hydraulic pressure is removed from the piston, the servo spring releases the band and the fluid is exhausted to sump.

B. Band No. 2

Band 2 encircles the clutch 1 housing splined to the planetary "B" ring gear. One end of the band contacts a strut on the inner end of the adjusting screw. The other