

UNITED STATES MARINE CORPS
Logistics Operations School
Marine Corps Combat Service Support Schools
Training Command
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AIM 5304

STUDENT HANDOUT

REPAIR FIVE-SPEED MANUAL TRANSMISSION

GENERAL KNOWLEDGE: Initially, the lesson will impart the background knowledge that is required for a mechanic to perform intermediate maintenance level repairs on the five-speed manual transmission.

TERMINAL LEARNING OBJECTIVE: Given a M813 five-speed manual transmission, required tools, shop supplies, repair parts, and TM 9-2320-260-34-2-2, per information contained in the reference, repair the transmission: (5.3.4)

ENABLING LEARNING OBJECTIVES: Given a M813 five-speed manual transmission, required tools, shop supplies, repair parts, and TM 9-2320-260-34-2-2, per information contained in the reference:

1. disassemble the transmission, (5.3.4a)
2. inspect the disassembled components for serviceability, (5.3.4b)
3. repair or replace the unserviceable components, and (5.3.4c)
4. assemble the transmission from serviceable components. (5.3.4d)

OUTLINE

1. DESIGN CHARACTERISTICS OF THE FIVE-SPEED MANUAL TRANSMISSION

a. The transmission used in this series vehicle is a manually shifted, synchromesh, selective gear design, with five forward speeds and one reverse speed. Fourth forward speed is direct drive and fifth forward speed is utilized as an overdrive gear.

b. The transmission has four shafts: input shaft, main shaft, countershaft, and reverse idler gearshaft.

(1) The input shaft consists of the shaft and the input gear. The gear is part of the shaft and is helical in design.

(2) The main shaft consists of the shaft and first-reverse sliding gear, second speed, third speed, and fifth speed rotating gears, and 2-3 and 4-5 synchronizers. The first-reverse sliding gear is splined to the shaft and is a spur design gear. The second, third and fifth speed rotating gears, rotate freely on the shaft and are all helical design gears. Both synchronizers are splined to the shaft.

(3) The countershaft consists of the shaft and the driven gear and first, reverse, second, third, and fifth speed stationary gears. First speed and reverse gears are part of the shaft and are spur design. The driven, second speed, third speed, and fifth speed gears are keyed to the shaft and are helical design gears.

(4) The reverse idler gear shaft consists of the shaft and the reverse idler gear assembly. The reverse idler gear assembly has two gears, a drive and a driven gear. Both are spur design and are machined as one assembly. The reverse idler gear assembly is mounted on the shaft by means of two roller bearings.

c. A power takeoff unit mounted on the right side of the transmission transmits power to the winch on models M813, M813A1, M814, M815, M816, M817, M818, M819 and M821, and to the hydraulic pump on models M817 and M820A2. Vehicles which do not have power takeoff units have the opening in the transmission sealed with a gasket and cover.

2. POWER FLOW SEQUENCE OF THE FIVE-SPEED MANUAL TRANSMISSION

a. Reverse Position. First and reverse sliding gears will move rearward and come in mesh with the reverse idler gear. Once it's engaged, power comes through the input shaft to the countershaft main drive gear and flows back to the second speed stationary gear. The second speed stationary gear is turning the reverse idler gear which is turning the first and reverse sliding gear in a reverse direction of the input shaft.

b. First Speed Position. First and reverse sliding gears will move forward and come in mesh with the first speed stationary gear on the countershaft. Once it's engaged, power comes through the input shaft to the countershaft main drive gear and back to the first speed stationary gear. The first speed stationary gear transmits power to the first and reverse sliding gear. First speed is NOT synchronized.

c. Second Speed Position. In passing from first speed to second speed, the first and reverse speed gear has been shifted rearward out of engagement

and into a neutral position; the second and third speed synchronizer collar will move rearward and lock the second speed rotating gear to the main shaft.

Now power comes through the input shaft to the countershaft main drive gear and back to the second speed stationary gear. Thus, in turn, the second speed stationary gear transmits power to the second speed rotating gear.

d. Third Speed Position. In passing from second speed to third speed, the synchronizer shift collar will shift forward and pass through neutral before entering third speed. Once the collar passes neutral, it will continue on through and lock third speed rotating gear to the main shaft. This, in turn, will transmit power from the input shaft to the countershaft main drive gear, to the third speed stationary gear, and to the third speed rotating gear.

e. Fourth Speed Position. In passing from third speed to fourth speed position, the second and third speed synchronizer collar will shift rearward to the neutral position. As this is being done, the fourth and fifth speed synchronizer shift collar will shift forward and lock the input shaft main drive gear (which is direct drive) with the main shaft. In fourth speed position, the power comes through the input shaft to the main shaft.

f. Fifth Speed Position. In passing from fourth speed to fifth speed position, the fourth and fifth speed synchronizer shift collar will shift rearward and pass through neutral before entering the fifth speed position. Once the collar passes neutral, it locks the fifth speed rotating gear to the main shaft. The power from the input shaft to the countershaft main drive gear to the fifth speed stationary gear transmits power to the fifth speed rotating gear. In this transmission, fifth gear is overdrive.

3. SCOPE OF INTERMEDIATE MAINTENANCE AUTHORITY AND RESPONSIBILITY RELATIVE TO THE FIVE-SPEED MANUAL TRANSMISSION

- a. Disassemble the transmission into subassemblies.
- b. Repair the clutch release mechanism and housing assembly.
- c. Repair the transmission case assembly.
- d. Repair the shifter housing cover assembly.
- e. Repair the input shaft assembly.
- f. Repair the main shaft assembly.
- g. Repair the countershaft assembly.

- h. Repair the reverse idler gear and shaft assembly.
- i. Assemble the transmission from serviceable subassemblies.

4. PRACTICAL APPLICATION ON THE REPAIR OF THE M809 SERIES VEHICLE FIVE-SPEED MANUAL TRANSMISSION

a. Disassemble The Transmission Into Subassemblies

(1) The instructions for the disassembly of the transmission are in TM 9-2320-260-34-2-2. Take some time to read the instructions to become familiar with the total task. Then, ask questions if you have any.

(2) Follow the instructions in the manual and disassemble the transmission.

- (a) Remove clutch release bearing and shaft.
- (b) Remove shifter housing.
- (c) Remove output flange.
- (d) Remove countershaft cover.
- (e) Remove input cover and shaft.
- (f) Remove output cover.
- (g) Remove rear output bearing.
- (h) Remove main shaft.
- (i) Remove reverse idler gear shaft.
- (j) Remove countershaft rear bearing.
- (k) Remove countershaft.

b. Inspect Subassemblies

- (1) Inspect all bearings.
- (2) Inspect transmission case.
- (3) Inspect clutch housing and release mechanism.

(4) Measure countershaft bearing and countershaft bearing bore.

STOP! Have instructor initial.

c. Repair Subassemblies

(1) Repair The Shifter Housing Cover Assembly

(a) Read the instructions in TM 9-2320-260-34-2-2 for the repair of the shifter housing cover assembly.

(b) Disassemble the shifter housing cover assembly.

(c) Inspect the shifter housing cover assembly.

STOP! Have instructor initial.

(d) Assemble the shifter housing cover assembly.

STOP! Have instructor initial.

(2) Repair The Input Shaft Assembly

(a) Read the instructions in TM 9-2320-260-34-2-2 for the repair of the input shaft assembly.

(b) Inspect the input shaft assembly.

STOP! Have instructor initial.

(3) Repair The Main Shaft Assembly

(a) Read the instructions in TM 9-2320-260-34-2-2 for the repair of the main shaft assembly.

(b) Disassemble the main shaft assembly.

(c) Inspect the main shaft assembly.

STOP! Have instructor initial.

(d) Assemble the main shaft assembly.

STOP! Have instructor initial.

(4) Repair The Countershaft Assembly

(a) Read the instructions in TM 9-2320-260-34-2-2 for the repair of the countershaft assembly.

(b) Inspect the countershaft assembly.

STOP! Have instructor initial.

(5) Repair the Reverse Idler Gear and Shaft Assembly

(a) Read the instructions in TM 9-2320-260-34-2-2 for the repair of the reverse idler gear and shaft assembly.

(b) Inspect the reverse idler gear and shaft assembly.

(c) Do Not disassemble the reverse idler gear and shaft assembly unless you find damaged parts during your inspection.

STOP! Have instructor initial.

(6) Assemble The Transmission From Serviceable Subassemblies

(a) Read the instructions in TM 9-2320-260-34-2-2 for the assembly of the transmission.

(b) Assemble the transmission.

1 Install countershaft

2 Install reverse idler gear.

3 Install main shaft.

4 Install input shaft.

5 Measure backlash between fifth speed gear and fifth speed countershaft gear.

STOP! Have instructor initial.

6 Install shifter housing.

7 Install clutch release bearing and shaft.

STOP! Have instructor initial.

(7) Secure all tools and equipment.

REFERENCE:

TM 9-2320-260-34-2-2