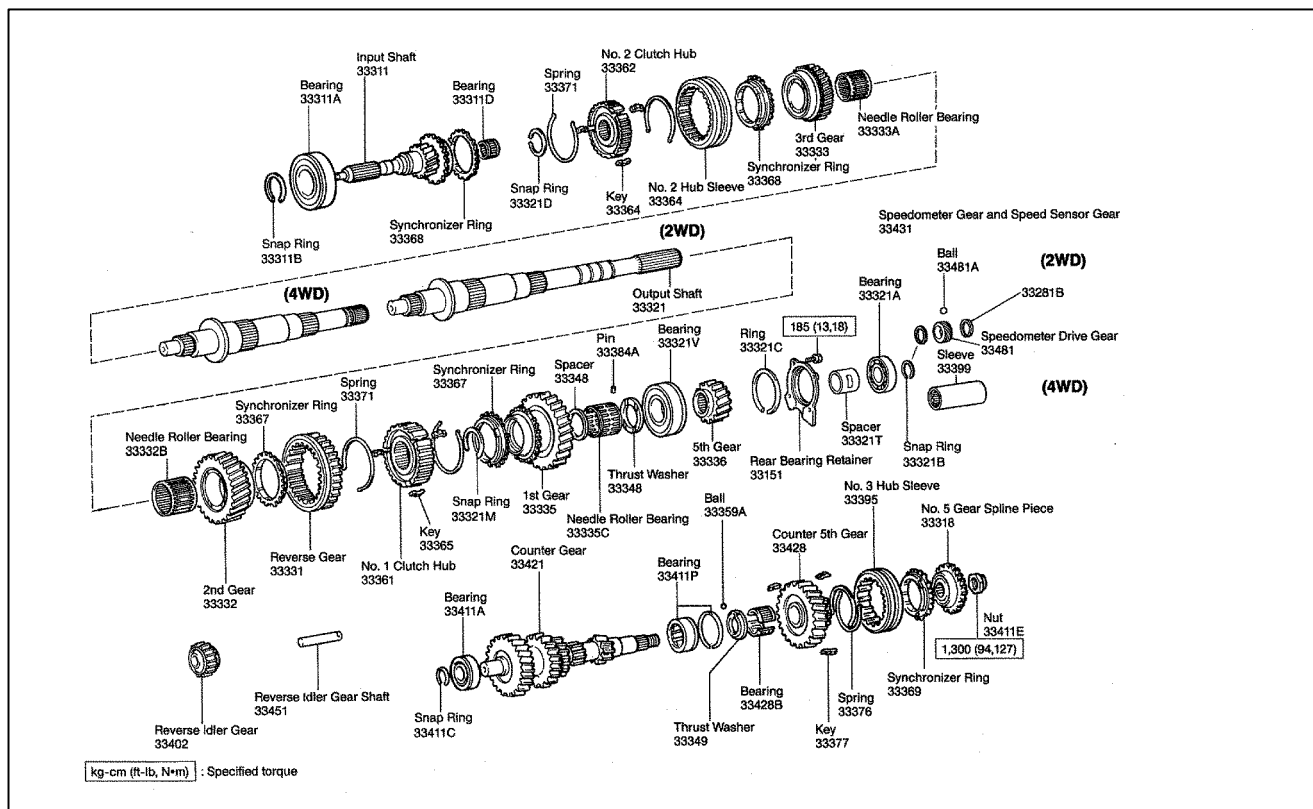


Appendix



- Learning Objectives:**
- Appendix A: Glossary of Terms
 - Appendix B: Safety
 - Appendix C: Special Service Tools (SSTs)
 - Appendix D: Transmission and Transaxle Identification Charts
 - Appendix E: Customer Interview Sheet

Glossary of Terms

A **Axial Runout** – Warpage in the flywheel or clutch disc in a direction parallel to the axis of the shaft or bearing bore.

Axis – The centerline around which a gear or shaft rotates.

All-Wheel Drive (AWD) – A drive system that provides full-time drive to the front and rear wheels. Also called full-time 4WD. The vehicle has a center differential and can be driven on dry pavement in 4WD.

B **Bearing** – A member that supports a rotating shaft and reduces friction between stationary and rotating parts.

C **Center Bearing** – A sealed double row center ball bearing that carries the load between the inner and outer halves of the flywheel damper.

Center Differential – A differential used in four-wheel-drive systems to distribute power to the front and rear differentials.

Centerline – The axis around which a gear or shaft rotates.

Centrifugal Force – The tendency of objects to move away from the center of rotation when rotated.

Chamfer – A beveled edge on a shaft or bore.

Cluster Gear – A group of gears machined from one piece of metal, or individual gears combined into a group so that they operate together.

Clutch Assembly – The clutch assembly consists of the following components: clutch disc, flywheel, clutch cover assembly, release bearing, and release fork. It interrupts the power flow between the engine and the transmission when the vehicle is brought to a stop with the engine running or when shifting gears.

Clutch Cover Assembly – The clutch cover assembly consists of a clutch cover, diaphragm spring, pressure plate, and pivot rings and straps; the pivot rings and straps are bolted to the flywheel and provide the pressure needed to hold the clutch disc to the flywheel for proper power transmission. Toyota uses three different types of clutch cover assemblies: Diaphragm Spring, Diaphragm Spring Turnover (DST) and Pull Release Mechanism.

Clutch Disc – The clutch disc is connected to the input shaft of the transmission, and is the connecting link between the engine and transmission. A clutch disc is made up of several major parts: the facing or lining, the cushion plate or web, and the hub and damper assembly.

Clutch Hub – A hub constructed with internal splines that fit over the external splines of the transmission input shaft.

Clutch Pack – The assembly of clutch discs and steel plates that provide the frictional surfaces in a multi-plate clutch or brake.

D

Damper – A device that reduces the torsional vibrations between the engine and transmission. See Flywheel Damper.

Detent – A spring-loaded device used to position a shift fork correctly.

Dial Indicator – A measuring device that indicates linear travel by a rotating needle.

Diaphragm Spring – A round, conical shaped spring that provides the clamping force against the pressure plate.

Differential – The assembly of a carrier, pinion gears and side gears that allows the drive axles to rotate at different speeds as a vehicle turns a corner.

Direct Drive – A one to one (1:1) gear ratio in which the input shaft and output shaft rotate at the same speed.

Dual Mass Flywheel (DMF) – See Flywheel Damper.

E

End Play – The amount of motion a shaft or gear has in a direction parallel to the shaft. This clearance allows space for oil to fit between moving parts.

Energy Absorbing Flywheel – See Flywheel Damper.

F

Final Drive – The last set of reduction gears in a transaxle before power flows to differential gears and drive axles.

Flywheel – A large metal disc that stores and releases energy pulses from the crankshaft. It drives the clutch by providing a friction surface for the clutch disc, and provides a mounting surface for the clutch cover.

Flywheel Damper – A type of flywheel, sometimes referred to as the energy absorbing flywheel or dual mass flywheel (DMF); it is designed to isolate torsional crankshaft spikes created by engines with high compression ratios.

Formed-In-Place Gasket (FIPG) – A gasket material from a tube applied to metal surfaces before assembly.

Four Wheel Drive (4WD) – A drivetrain configuration that delivers power to all wheels.

Front Engine Front Drive (FF) – A drivetrain configuration that delivers power to the front wheels in a vehicle equipped with a front engine.

Front Engine Rear Drive (FR) – A drivetrain configuration that delivers power to the rear wheels in a vehicle equipped with a front engine.

G

Gear – A wheel with teeth on the inside or outside circumference that transmits motion or power to another gear.

Gear Ratio – The number of turns made by a drive gear compared to the number of turns by the driven gear. Computed by the number of driven gear teeth divided by the number of drive gear teeth.

Gear Reduction – A condition when the drive gear rotates faster than the driven gear. Speed is reduced but torque is increased.

Gear Shift Actuator (GSA) – Engages or disengages the clutch and selects gears based on signals from the transmission control ECU in vehicles equipped with the sequential manual transmission.

H **Helical Gear** – A gear with teeth cut at an angle or helix. The threads on a bolt are a helix.

Hub – The center part of a wheel, the surface where a wheel mounts.

Hydraulic Clutch – A clutch operating system using hydraulic pressure to transfer motion and pressure.

Hydraulic Power Unit (HPU) – Generates hydraulic pressure for the shift operating system and the clutch release cylinder in vehicles equipped with the sequential manual transmission.

Hypoid Gear – A bevel gear that positions the gear axis on non-intersecting planes. Commonly used in ring and pinion type axles where the driveline is connected to pinion and axles are driven by ring. Changes direction of rotation by 90 degrees.

I **Idler Gear** – A gear positioned between two other gears, which causes a change in direction of rotation. Allows output to turn in the same direction as input.

Inertia – The physical property maintaining that a body at rest tends to remain at rest and a body at motion tends to remain in motion and travel in a straight line.

Input Shaft – The shaft that carries the driving torque into a gearbox.

Internal Ring Gear – A gear with teeth on its inner circumference.

J **Journal** – A bearing surface for a shaft, gear or bearing to rotate on.

L **Limited Slip Differential (LSD)** – A differential that uses internal clutches, gears, or viscous couplers to limit the speed difference between the axles.

Linkage – A series of rods, levers or cables, etc., used to transmit motion of force from one point to another.

M

Master Cylinder – The primary device holding hydraulic fluid in a hydraulic clutch system. Activated by the clutch pedal.

Micrometer – A precision measuring device used to measure outside diameters or thickness, and internal diameters or depth.

O

O-Ring – A round sealing ring.

Orifice – A small opening or restriction in a hydraulic passage used to regulate pressure and flow.

Output Shaft – The shaft that carries torque out of a gearbox.

Overdrive – Occurs when the drive gear rotates at a slower speed than the driven gear. Speed of the driven gear is increased and torque is decreased.

P

Pinion Gear – A small gear that meshes with a larger gear.

Pivot Rings – Circular steel rings installed in the clutch cover assembly on both sides of the diaphragm spring. They serve as a pivot point when the release bearing is forced against the diaphragm spring.

Planetary Gear Set – A gear assembly consisting of a sun gear, ring gear and carrier assembly with planetary pinion gears meshed between the sun gear and ring gear.

Planetary Gear Unit – The assembly that includes the planetary gear set, holding devices and shafts, which provides gear reduction for L4 in a transfer case.

Planetary Carrier – Member of the planetary gear set that house the planetary pinion gears.

Planetary Pinion Gears – Mounted to the planetary carrier by pinion shafts. Operate between the ring gear and sun gear.

Pressure Plate – A plate attached to the clutch cover that provides the pressure needed to hold the clutch disc to the flywheel for proper transmission power.

Pull Release Mechanism – A style of clutch cover with the following characteristics: release bearing and hub are fit into the diaphragm spring, the diaphragm spring is pulled out instead of pushed in.

R

Race – A hardened surface for bearings to roll on. Part of the bearing that can be replaced instead of replacing the shaft or case.

Release Cylinder – The device that reacts to pressure sent by the master cylinder, causing the clutch fork to move. Also called the release cylinder.

Retracting Springs – The steel springs attached to the clutch cover that connect the diaphragm spring and the pressure plate.

Reverse Idler Gear – See Idler Gear.

Room Temperature Vulcanizing (RTV) – A type of Formed-In-Place Gasket (FIPG) material; it is a rubber like material that vulcanizes at room temperature.

Runout – Deviation in an item's rotation or a mounting plane. Runout is measured axially (parallel to the axis) and radially (perpendicular to the axis).

S

Sensor – The generic name for a device that senses either the absolute value or a change in a physical quantity such as temperature, pressure or flow rate and converts that change into an electrical quantity signal.

Serial Data – Information about a computer system inputs, outputs, and other operating parameters, which is transmitted from the vehicle (one computer to another) to the scan tool on a single wire in the Data Link Connector (DLC).

Slave Cylinder – The device that reacts to pressure sent by the master cylinder, causing the clutch fork to move. Also called the release cylinder.

Snapshot – A mode of operation where basic diagnostic parameters are stored in the Diagnostic Tester during a road test and can be examined, printed, or transferred to a computer at the end of the test.

Speed Gear – A gearset fit on the transmission output shaft. These gearsets are in constant mesh and always rotate at their design speed relative to the input speed.

Spline – Slots or grooves cut around a shaft or bore that is used to connect a hub or a gear to a shaft.

Spur Gear – A gear with teeth cut parallel to the axis of the gear. Sometimes called a straight cut gear.

Sun Gear – The center gears of a planetary gear set around which the other gears rotate.

Synchronize – To bring two objects to the same rotating speed to cause two events to occur at the same time.

T

Throw-Out Bearing – Another name for the clutch release bearing.

Thrust – A motion, or force, of a gear or shaft along its axis.

Torque – Twisting or turning force measured in foot pounds or inch pounds of force (ft-lbf) or Newton-meters (N•m).

Torsion Dampers – The springs or rubber blocks attached to the clutch disc that reduce or eliminate torsional vibrations resulting from uneven engine and drivetrain power impulses.

Transaxle – A transmission that includes the final drive and differential, and is normally used in Front Engine Front Drive (FF) or Front Wheel Drive (FWD) vehicles.

Transfer Case – An auxiliary transmission used in most 4WD systems to provide and control powerflow to the front and rear drive axles.

Transmission – A device in the powertrain that provides different forward gear ratios, neutral and reverse. It transfers power from the engine to the propeller shaft. It converts and multiplies rotational speed, which in turn, controls vehicle speed.

Transmission Control ECU – Controls the Hydraulic Power Unit (HPU) and Gear Shift Actuator (GSA) assembly to engage and disengage the clutch and shift the gears based on signals from the ECM, sensors and switches in vehicles equipped with the sequential manual transmission.

U **Universal Joint (U-Joint)** – A mechanical device used to transfer power and motion at changeable angles in the propeller shaft or driveline.

V **Viscosity** – The tendency of a liquid to resist flowing. High viscosity fluid is thick. Low viscosity fluid flows easily.

Viscous – Thick, tending to resist fluid flow.

W **Wave Spring** – A spring resembling a flat, wavy washer.

Worm Gear – A type of gear with teeth resembling screw threads.