

# TRANSFER CASE - BORG-WARNER 1350 & 1356

## Article Text

1992 Ford Explorer

For SCI

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### ARTICLE BEGINNING

#### 1983-94 TRANSFER CASES

Ford Motor Co. - Borg-Warner 1350 & 1356

Ford; Bronco, Bronco II, Explorer, "F" Series & Ranger  
Mazda; Navajo & "B" Series

#### \* PLEASE READ THIS FIRST \*

**NOTE:** For the purpose of this article, Navajo and Explorer names are used interchangeably, as are Ranger and "B" Series unless otherwise noted.

**NOTE:** This article does not apply to four wheel drive Mazda "B" Series pickups produced outside of North America.

### DESCRIPTION

#### TRANSFER CASE

The Borg-Warner 1350 is a chain driven, part time 4WD unit. It provides 4 driving modes. This unit offers 2WD and 4WD high ranges, 4WD low range and Neutral. The 1350 has a 3 piece aluminum case, an internal oil pump driven off the rear output shaft and an angular front output shaft with a cardan joint. Floor mounted shift levers or overhead mounted pushbuttons select driving ranges, high and low, and driving modes, 2WD and 4WD. Oil pump is driven by rear output shaft. This allows vehicle to be towed for long distances without disconnecting propeller shafts.

#### ELECTRONIC SHIFT TRANSFER CASE

Some models are equipped with an Electronic Shift Transfer Case which is activated by pushbutton controls located in an overhead console. This system allows the vehicle to be shifted from 2WD high to 4WD high at any vehicle speed.

### OPERATION

#### ELECTRONIC SHIFT CONTROL SYSTEM

##### Electronic Shift Operation

The system consists of a pushbutton control, electronic control module, electric shift motor with integral shift position sensor and a speed sensor.

The transfer case is equipped with a magnetic clutch located

inside the case next to the 2WD/4WD shift collar. The clutch is used to spin up the front drive system from zero to vehicle speed in less than a second. This spin-up allows the 2WD to 4WD shift to be made at any speed.

When the transfer case rear and front output shafts reach the same rotating speed, the spring loaded shift collar mechanically engages the mainshaft hub to the chain drive sprocket. The magnetic clutch is then deactivated. Shifts between 4WD high and 4WD low only occur with clutch interlock or transmission safety switches closed. Vehicle speed must also be 3 MPH or under.

When the operator selects the 4WD or 2WD drive mode, the actual shifting is carried out by electric motor mounted on the transfer case.

#### Electronic Control Module

This module controls the operation of the transfer case using inputs from the pushbutton controls, speed sensor and shift position sensor. The module is equipped with a self-test capability.

When either of the 2 switches in the overhead console are depressed, the electronic control module will analyze information from the transfer case shift position sensor to verify its current position. The module also receives data from the speed sensor and clutch interlock switch, or Neutral safety switch depending on application.

If all design conditions are met, the electronic control module will signal the electric shift motor to shift gear positions. After shift takes place, the module will read the input from the shift position sensor to determine if transfer case is in desired position. The electronic control module also will illuminate pushbuttons on overhead console indicating shift is completed.

#### Speed Sensor

Mounted on the rear of the transfer case, the speed sensor tells the electronic control module the correct speed to shift the transfer case. Speed sensor picks up rotating speed of output shaft from 2 notches cut in opposite sides of outer ring of clutch housing assembly. See Fig. 1.

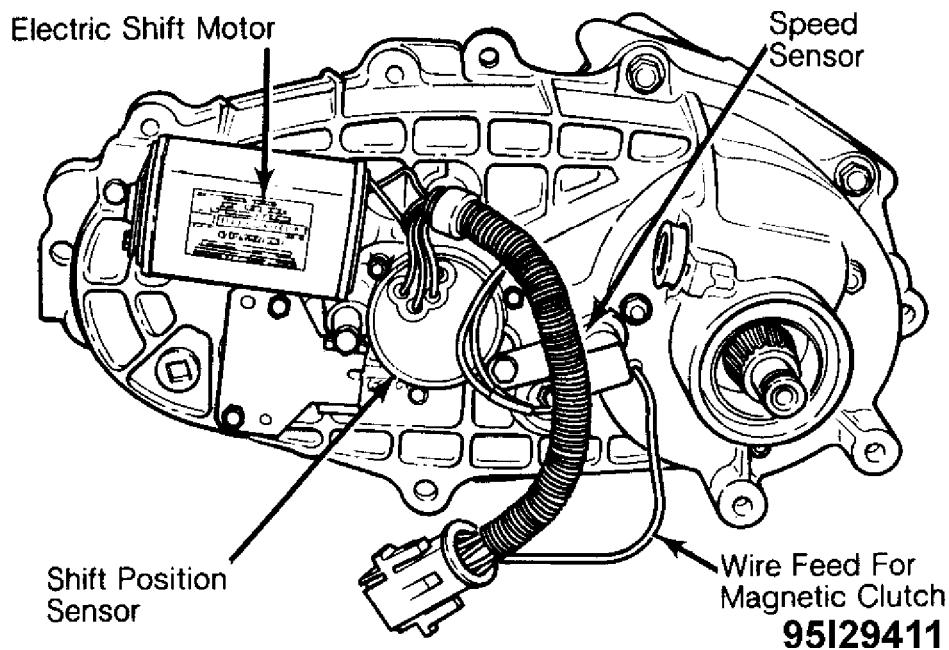


Fig. 1: Electronic Shift Control Transfer Case  
 Courtesy of Ford Motor Co.

#### Shift Position Sensor

The shift position sensor tells the electronic control module the shift position of the transfer case. It is an integral part of the transfer case. See Fig. 1.

#### Electric Shift Motor

Mounted externally on the rear of the transfer case, this motor is responsible for shifting between 4WD and 2WD. The motor drives a rotary helical cam which moves the 2WD/4WD shift fork and "4H-4L" reduction shift fork to selected drive position.

### LUBRICATION

#### SERVICE INTERVALS

Check and refill transfer case when malfunction is suspected, fluid leakage or contamination is observed or after axle is submerged in water.

#### FLUID TYPE

Use Dexron II ATF.

#### CAPACITY

Refill capacity is 3 pts. (1.4L).

## TESTING

\* PLEASE READ THIS FIRST \*

**NOTE:** Following test procedures only apply to models equipped with Electronic Shift Transfer Case.

### ELECTRONIC SHIFT TRANSFER CASE

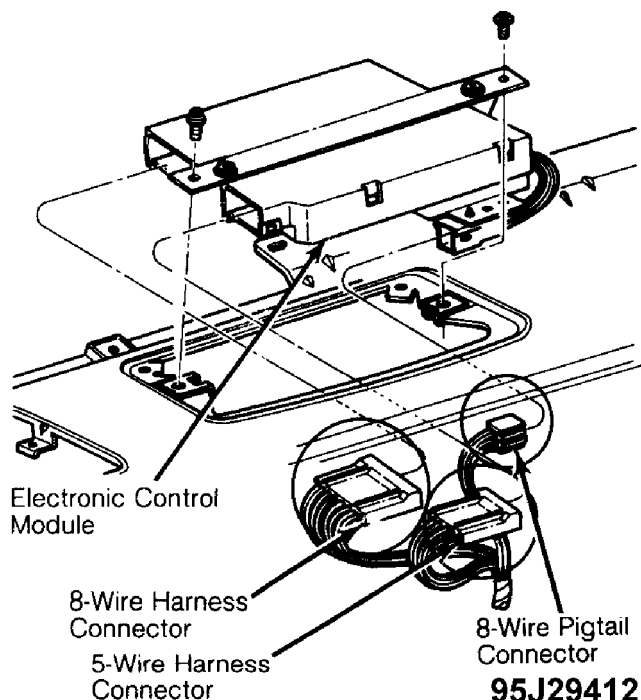
#### Circuit Protection

The battery feed circuit, through a circuit breaker, provides memory capability for the electronic control module. Ignition "RUN", and "ACC" circuits, through a fuse, supply power for switches and electric shift motor. The side marker lamp circuit supplies power for illumination of overhead console.

#### Control Module Self-Test

1) To perform electronic control module self-test, remove the 5-wire connector and the 8-wire connector from the module. Turn ignition switch to "RUN" position. See Fig. 2.

2) Activate the self-test switch and note result. A flashing indicator lamp indicates control module is okay. A steady indicator light indicates control module is inoperative and must be replaced.

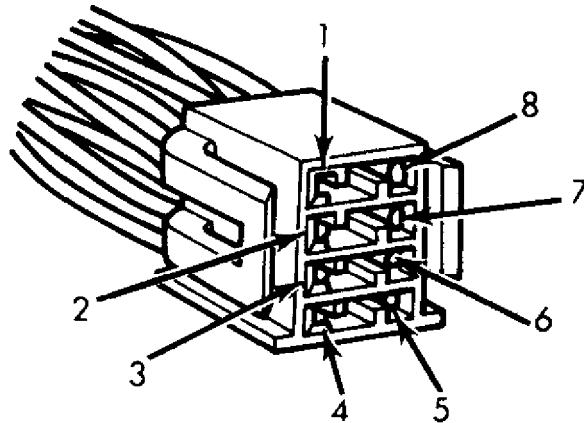


**Fig. 2: Electronic Control Module**  
Courtesy of Ford Motor Co.

### 8-Wire Pigtail Connector Test

1) With ignition off, unplug 8-wire connector from module. Connect voltmeter between terminal No. 8 and ground. Battery voltage should be present at all times. See Fig. 3.

2) Connect voltmeter between terminal No. 7 and ground. Turn ignition to "RUN" position. Battery voltage should be present.



Position	Circuit Number	Color Code	Function
1	OPEN		
2	57	Blk	Ground
	57A	Blk	Ground
3	396	Blk/Org	Logic Ground
4	778	Org	Transfer Case Motor Control (Clockwise) 2H-4H-4L
5	777	Yel	Transfer Case Motor Control (Counterclockwise) 4L-4H-2H
6	779	Brn	Electro-Magnetic Clutch (Feed)
7	296	Wht/Ppl	Ignition Run and Accessory Feed (Fused)
8	517	Blk/Wht	Battery Feed (Circuit Breaker)

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Fig. 3: 8-Wire Pigtail Connector & Function Chart  
Courtesy of Ford Motor Co.

**CAUTION:** Turn off ignition before proceeding with ohmmeter tests. Never connect voltmeter to powered circuit.

3) Connect ohmmeter between terminal No. 6 and ground. There

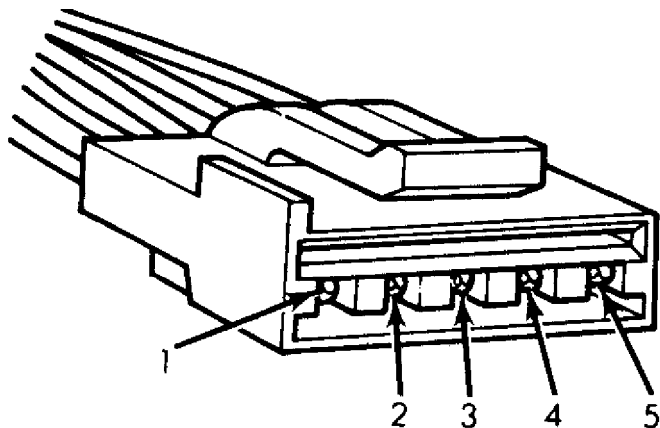
terminals No. 4 and 5 of connector. Resistance should be less than 10 ohms.

4) Connect ohmmeter between terminal 3 and ground. There should be zero ohms. Resistance between terminal 2 and ground should be zero ohms.

#### 5-Wire Connector Test

1) Connect ohmmeter between terminals No. 1 and 2. Depress "2H-4H" switch in overhead console. Resistance should be less than 50 ohms while switch is depressed. See Fig. 4.

2) Connect ohmmeter between terminals No. 1 and 3. Depress "LOW RANGE" switch in overhead console. Resistance should be less than 50 ohms with switch depressed.



Position	Circuit Number	Color Code	Function
1	465	Wh/Lt Blu	Switch Feed
2	780	Dk Blu	Low Range Switch
3	781	Org/Lt Blu	Ground
4	782	Brn/Wht	Low Range Light
5	783	Gry	4x4 Light

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Fig. 4: 5-Wire Harness Connector & Function Chart  
Courtesy of Ford Motor Co.

3) Connect jumper wire between terminal No. 4 and ground. Turn ignition switch to "RUN" position. Light in overhead console low range bar should illuminate. Turn ignition off and remove jumper wire.

4) Connect jumper wire between terminal No. 5 and ground. Turn ignition to "RUN" position. The "4 x 4" bar should illuminate on overhead console.

#### 8-Wire Harness Connector Test

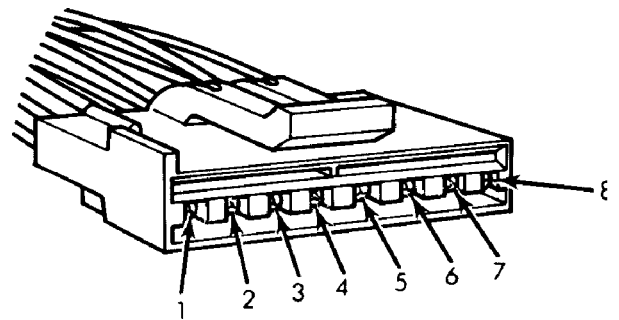
1) Turn ignition off. Connect ohmmeter between terminals No.

1 and ground. On manual transmission, depress clutch pedal and observe ohmmeter. There should be less than 50 ohms.

2) On automatic transmission, shift transmission into Neutral and observe ohmmeter. There should be less than 50 ohms.

3) Measure resistance between terminals No. 2 and 3. There should be 200-300 ohms. This checks speed sensor continuity.

4) Connect ohmmeter between terminal No. 8 and, in turn, terminals No. 4, 5, 6 and 7. Resistance should be as specified. See Fig. 5.



Position	Circuit Number	Color Code	Function
1	32	Red/Lt Blu	Manual Transmission Clutch Interlock Switch
	463	Red/Wht	Automatic Transmission Neutral Safety Switch
2	774	Lt Grn	Speed Sensor (Feed)
3	772	Lt Blu	Speed Sensor Return
4	771	Violet	Wire #5, Contact Plate Position Sensor in Transfer Case
5	770	Wht	Wire #4, Contact Plate Position Sensor in Transfer Case
6	764	Bm/Wht	Wire #3, Contact Plate Position Sensor in Transfer Case
7	763	Org/Wht	Wire #2, Contact Plate Position Sensor in Transfer Case
8	762	Yel/Wht	Wire #1, Contact Plate Position Sensor in Transfer Case

**OHMMETER READINGS FOR SHIFT MOTOR POSITION SENSOR**

Ohmmeter Connection	Transfer Case Gear Position		
	2 High	4 High	4 Low
Meter Reading From Terminal #8 to #4	Short	Open	Short
Meter Reading From Terminal #8 to #5	Open	Open	Short
Meter Reading From Terminal #8 to #6	Short	Short	Open
Meter Reading From Terminal #8 to #7	Open	Short	Open

NOTE: SHORT is a "low" resistance reading on the ohmmeter (zero ohms).  
OPEN is a "high" resistance reading on the ohmmeter (infinity).

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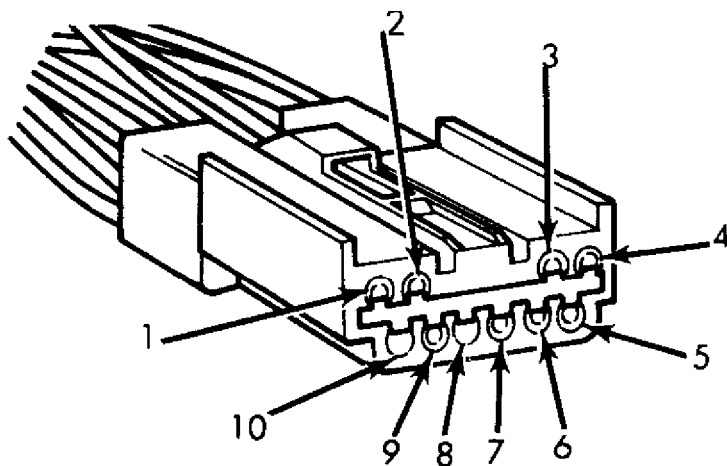
Fig. 5: 8-Wire Harness Connector & Function Charts  
Courtesy of Ford Motor Co.

**Main Feed Connector**

1) Main feed connector is located near middle of instrument panel. See Fig. 7.

**10-Pin Connector**

For functions of 10-pin connector, See Fig. 6.

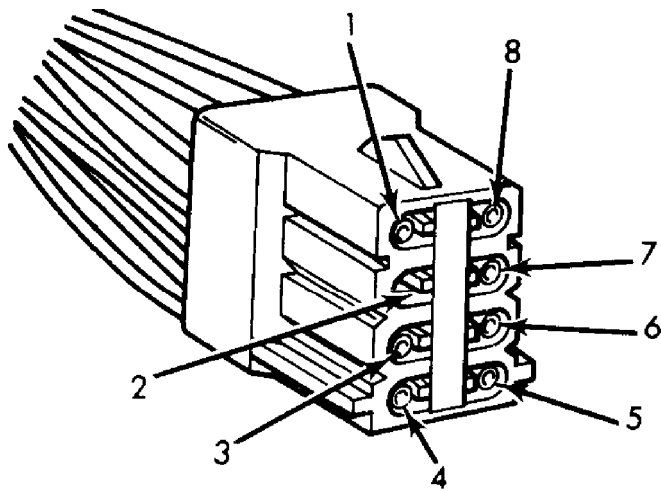


Position	Circuit Number	Color Code	Function
1	465	Wht/Lt Blu	Switch Enable Feed
2	780	Dk Blu	4x4 Switch
3	57B	Blk	Ground
4	19	Lt Blu/Red	Side Marker Lamp (Feed)
5	783	Gry	4x4 Light
6	781	Org/Lt Blu	Low Range Switch
7	640	Red/Yel	Ignition Run and Accessory Feed (Fused)
8	OPEN		
9	782	Brn/Wht	Low Range Light
10	OPEN		

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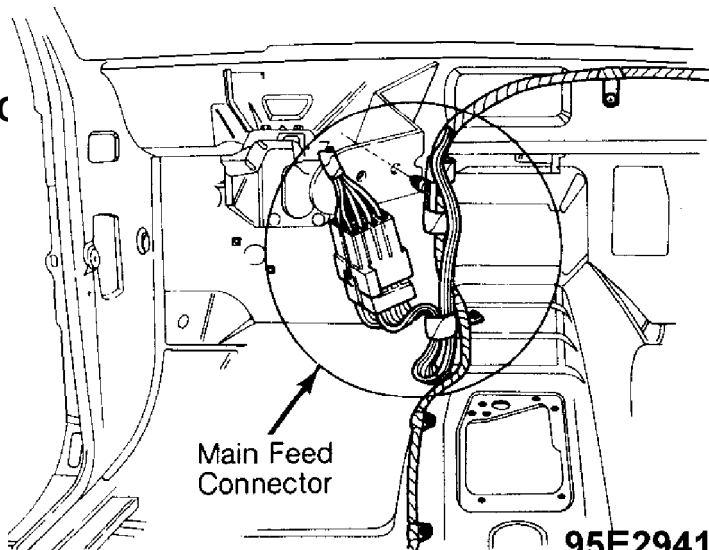
Fig. 6: 10-Pin Connector Harness & Function Chart  
 Courtesy of Ford Motor Co.





Position	Circuit Number	Color Code	Function
1	640	Red/Yel	Ignition Run and Accessory Feed (Fused)
2 (Used Only on Auto Trans)	463	Red/Wht	Automatic Transmission Neutral Safety Switch
3	296	Wht/Ppl	Ignition Run and Accessory Feed (Fused)
4	57	Blk	Ground
5	19	Lt Blu/Red	Side Marker Lamp (Feed)
6	54	Lt Grn/Yel	Dome Lamp (Feed)
7 (Used Only on Manual Trans)	32	Red/Lt Blu	Manual Transmission Clutch Interlock Switch
8	517	Blk/Wht	Battery Feed (Circuit Breaker)

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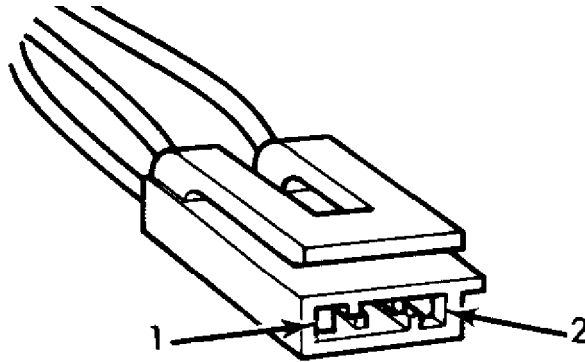
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Fig. 7: Main Feed Connector  
Courtesy of Ford Motor Co.

2-Pin Connector

For functions of 10-pin connector, See Fig. 8.



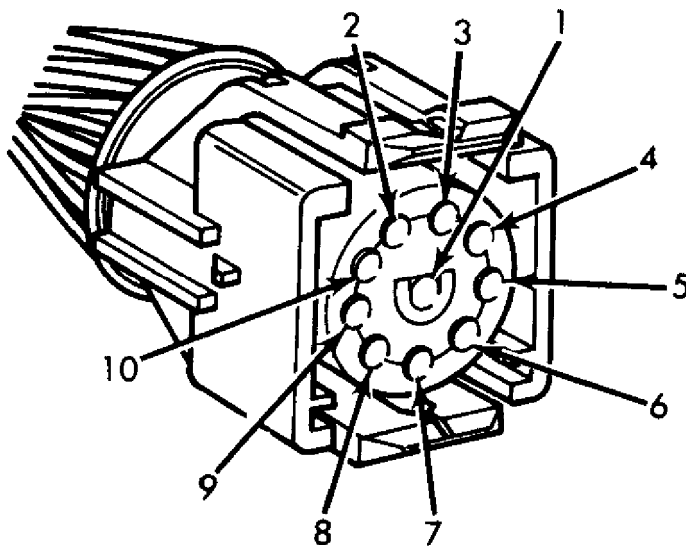
Position	Circuit Number	Color Code	Function
1	57A	Blk	Ground
	57B	Blk	Ground
2	54	Lt Grn/Yel	Dome Lamp (Feed)

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Fig. 8: 2-Pin Connector Harness & Function Chart  
Courtesy of Ford Motor Co.

Electronic Transfer Case Feed

For functions of transfer case feed, See Fig. 9.



Position	Circuit Number	Color Code	Function
1	779	Bm	Electro-Magnetic Clutch (Feed)
2	778	Org	Transfer Case Motor Control (Clockwise) 2H-4H-4L
3	777	Yel	Transfer Case Motor Control (Counterclockwise) 4L-4H-2H
4	774	Lt Grn	Speed Sensor (Feed)
5	772	Lt Blu	Speed Sensor (Return)
6	771	Violet	Wire #5, Shift Position Sensor in Transfer Case (Output to Module)
7	770	Wht	Wire #4, Shift Position Sensor in Transfer Case (Output to Module)
8	764	Bm/Wht	Wire #3, Shift Position Sensor in Transfer Case (Output to Module)
9	763	Org/Wht	Wire #2, Shift Position Sensor in Transfer Case (Output to Module)
10	762	Yel/Wht	Wire #1, Shift Position Sensor in Transfer Case (Input from Module)

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Fig. 9: Electronic Transfer Case Feed  
Courtesy of Ford Motor Co.

Shift Motor Function

Attach voltmeter to A4 and A5. Have an assistant change shift positions. Voltage should increase for about 1 second and relay should click. If voltage is present, remove shift motor from transfer case and initiate another shift. Motor should rotate, replace motor if it does not rotate. If voltage is not present to motor, check power circuits and range sensors.

NOTE: If transfer case range sensors are providing incorrect data, control module will not power motor.

Shift Motor Chatters, But Will Not Shift

During a shift from 2H to 4H, motor chatters or clicks but does not shift. Motor may hunt to find 4H and overshoot, then hunt back and overshoot again. After 7-10 seconds, module returns shift motor to 2H (default). If shift motor is running too fast or braking too slowly for proper positioning, it must be replaced.

SHIFT MOTOR POSITION TABLE

Motor	Dash & Lights	Mech Position	B7	B6	B5	B4
2H	No	2H	Open	Closed	Open	Closed
Edge 1	No	2H	Closed	Closed	Open	Closed
2H-4H	No	2H	Closed	Open	Open	Closed
Edge 2	No	4H	Closed	Closed	Open	Closed
4H	4H On	4H	Closed	Closed	Open	Open
Edge 3	4H On	4H	Closed	Closed	Closed	Open
4H-4L	4H On	Neutral	Open	Closed	Closed	Open
Edge 4	4H On	4L	Open	Closed	Closed	Closed
4L	4H & 4L On	4L	Open	Open	Closed	Closed

- (1) - Three or more open readings in any position indicates a fault with motor and sensor assembly.
- (2) - In Edge 2, pressing 4H switch moves to 4H position and light comes on.
- (3) - If motor is in Edge 3, 4H-4L or Edge 4 at start up, control module will attempt shift to 4H. 4H shift



Output Shaft Seal Installer (T83T-7065-B).

2) Install yoke, rubber seal, steel washer, and nut on output shaft. Tighten nut. Connect rear drive shaft to transfer case output shaft yoke and tighten bolts.

## REMOVAL & INSTALLATION

### TRANSFER CASE

#### Removal

1) Raise vehicle on hoist. Remove skid plate (if equipped). Remove drain plug and drain transfer case lubricant. Disconnect 4WD indicator switch wire at transfer case. On electric shift models, disconnect wiring harness plug at rear of transfer case. On manual and electric shift models, disconnect front drive shaft from axle input yoke.

2) Loosen clamp retaining front drive shaft boot to transfer case. Pull drive shaft and front boot assembly out of transfer case front output shaft. Disconnect rear drive shaft from transfer case output yoke. Disconnect speedometer driven gear from case rear cover.

3) Disconnect vent hose from control lever. Loosen or remove large and small bolts retaining shifter to extension housing. Pull on control lever until bushing slides off transfer case shift lever pin. If necessary, unscrew shift lever from control lever. Remove heat shield from transfer case.

4) Support transfer case with a transmission jack. Remove transfer case-to-transmission bolts. Slide transfer case rearward off transmission, and lower case from vehicle. Remove gasket from between transfer case and extension housing.

#### Installation

1) Install new transfer case-to-extension housing gasket. Position transfer case so input shaft splines align with transmission output shaft. Slide case forward onto transmission output shaft and dowel pin.

2) Install transfer case-to-transmission bolts. Tighten bolts evenly and in a clockwise sequence from locating pin, as viewed from front of vehicle.

3) Remove jack from transfer case. Install heat shield on transfer case. Move control lever until bushing is in position over transfer case shift lever pin. Install both attaching bolts by hand. Tighten large bolt retaining shifter to extension housing first. Tighten small bolt next.

4) Install vent assembly so White marking on hose is in position in notch on shifter. Vent hose should be positioned so that upper end of hose is about 2" above top of shifter and inside shift boot. Connect speedometer gear to transfer case rear cover.

5) Connect rear drive shaft to transfer case output shaft yoke. Clean transfer case front output shaft female splines. Apply a small amount of multipurpose grease to splines. Insert front drive shaft male spline.

6) Connect front drive shaft to axle input yoke and tighten bolts. Push drive shaft boot to engage external groove on transfer case front output shaft. Secure boot with clamp. Connect 4WD indicator switch wire connector at transfer case. On electric shift models, plug in motor wire connectors.

7) Install drain plug and tighten. Fill transfer case with Dexron II ATF. Install fill plug. Install skid plate to frame and tighten bolts, if used.

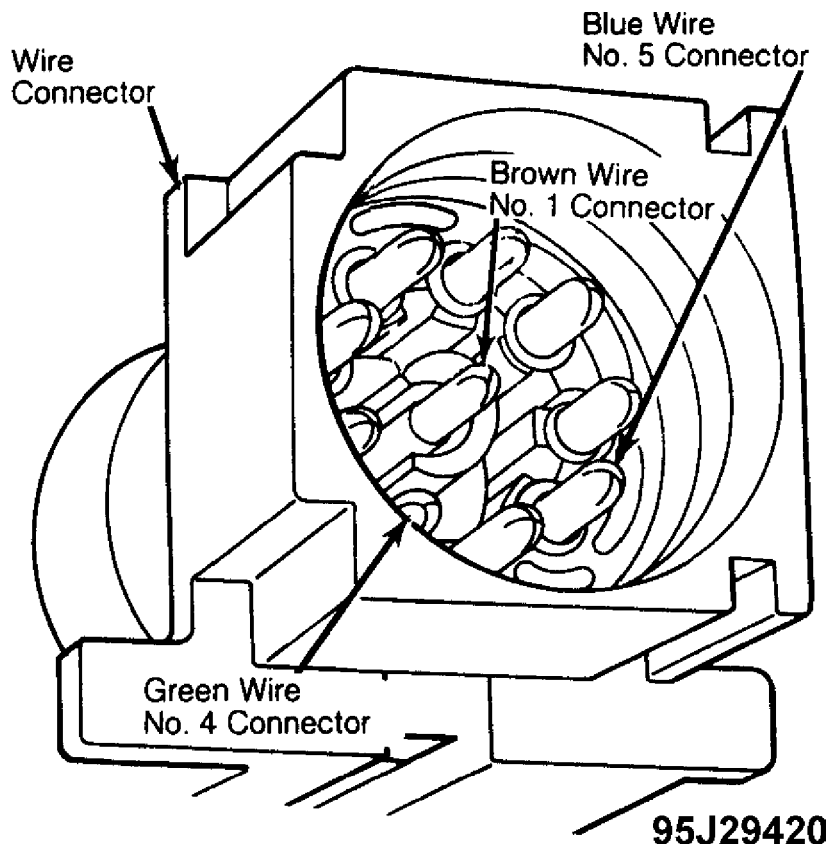


Fig. 10: Electric Shift Harness Connector  
Courtesy of Ford Motor Co.

## OVERHAUL

### TRANSFER CASE

#### Disassembly (Transfer Case)

1) Drain and remove transfer case from vehicle. Remove 4WD indicator switch and breather vent. Remove rear output shaft yoke by removing retaining nut, steel washer and rubber seal from output

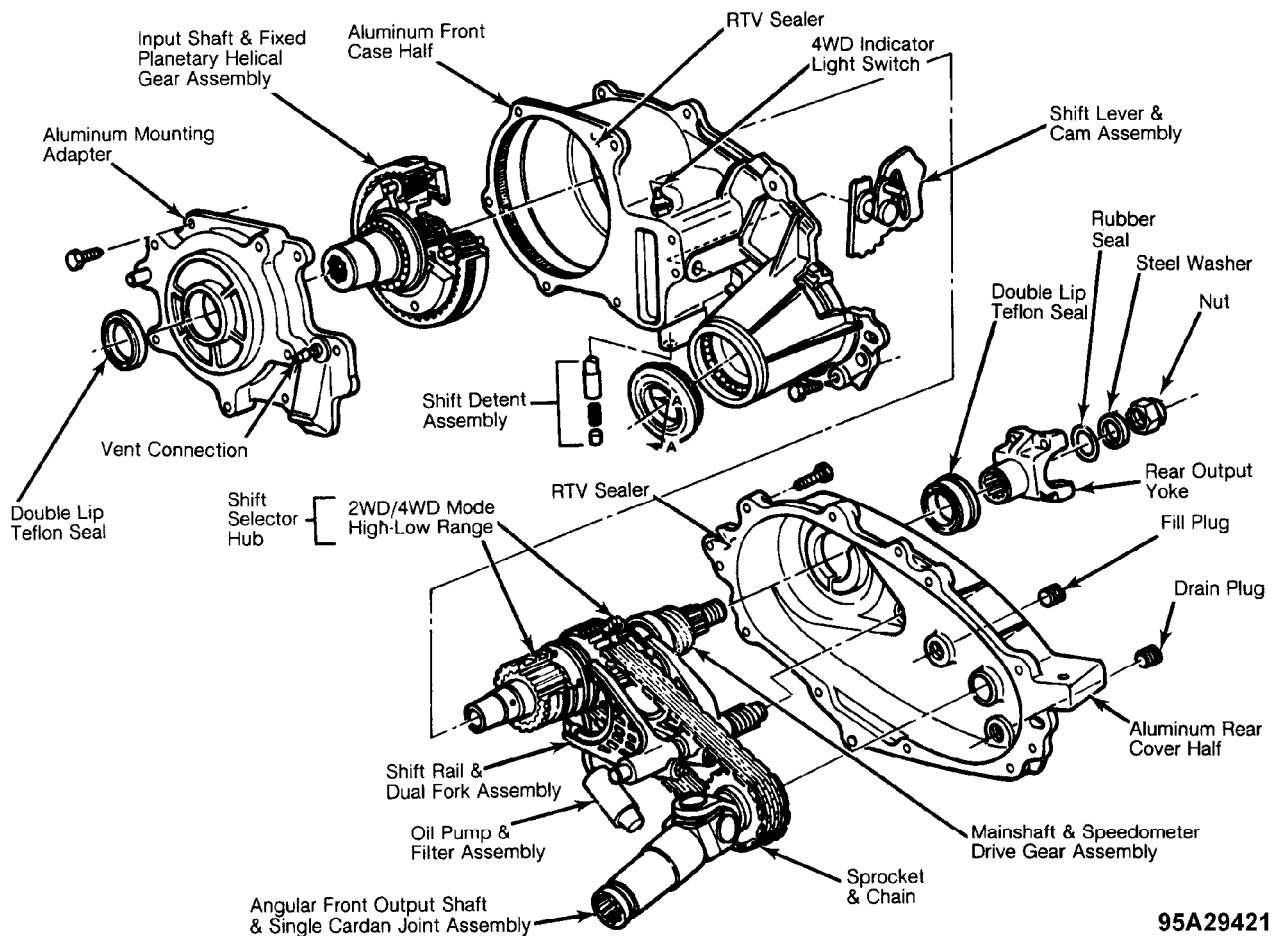
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shaft. On "STX" models, remove front output shaft yoke by removing lock nut, steel washer and rubber seal from output shaft.

2) On electronic shift transfer case, fabricate tool by forming small hook at tip of paper clip or safety pin. Remove locking sleeve from connector by hooking with tool and pulling from bottom. See Fig. 10. Remove Brown wire (center), Green (No. 4) and Blue (No. 5) by pulling from back of connector.

3) Remove speed sensor retaining bracket screw, bracket and sensor. See Fig. 1. Remove 3 electric motor mount bolts and motor. Note position of triangular shaft in case and triangular slot in electric motor. See Fig. 12.

**CAUTION:** Motor is serviced as an assembly only. DO NOT remove motor rear cover.



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**Fig. 11: View of Borg-Warner Manual Shift 1350 Transfer Case**  
 Courtesy of Ford Motor Co.

4) On manual and electronic shift transfer cases, remove 9 bolts retaining front case to rear cover. Insert a 1/2" drive breaker bar between pry bosses to separate front case and rear cover. Remove

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RTV gasket sealer from mating surfaces.

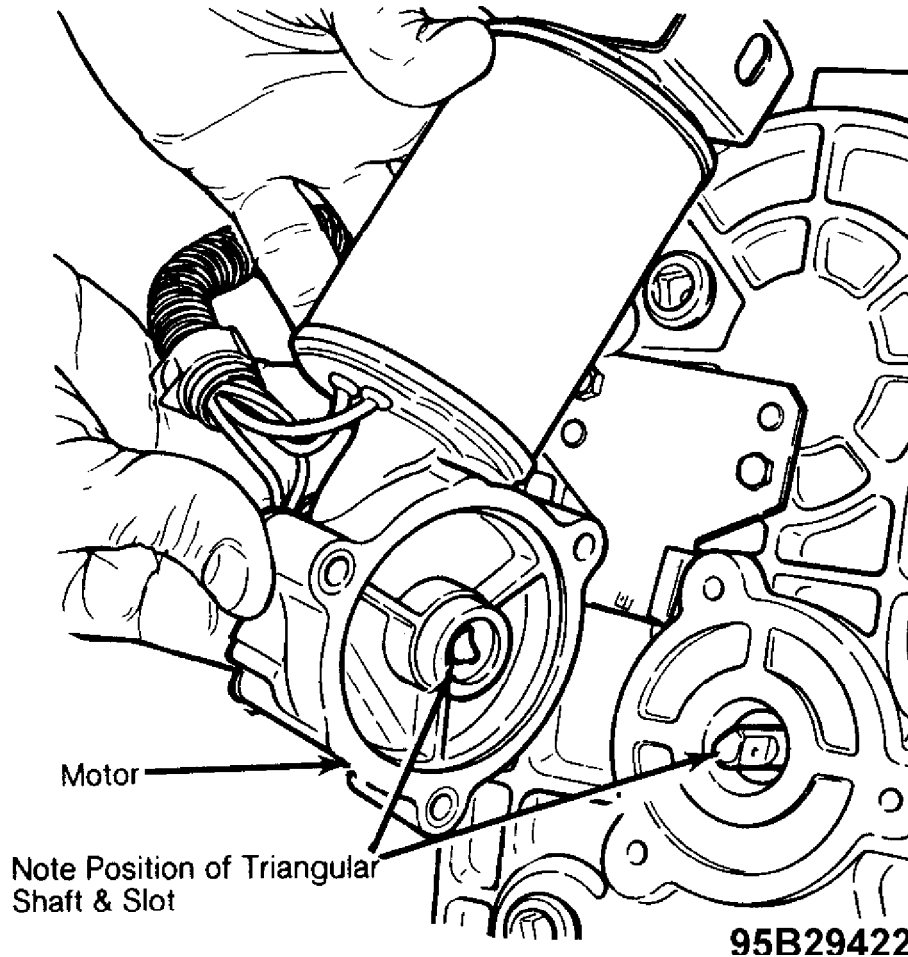


Fig. 12: View of Electric Shift Motor & Shift Cam Alignment  
Courtesy of Ford Motor Co.

5) If replacing speedometer drive gear or ball bearing assembly, drive output shaft oil seal from inside of rear cover with a brass drift and hammer. Remove speedometer drive gear assembly. Note that round end of speedometer gear clip faces inside of rear cover.

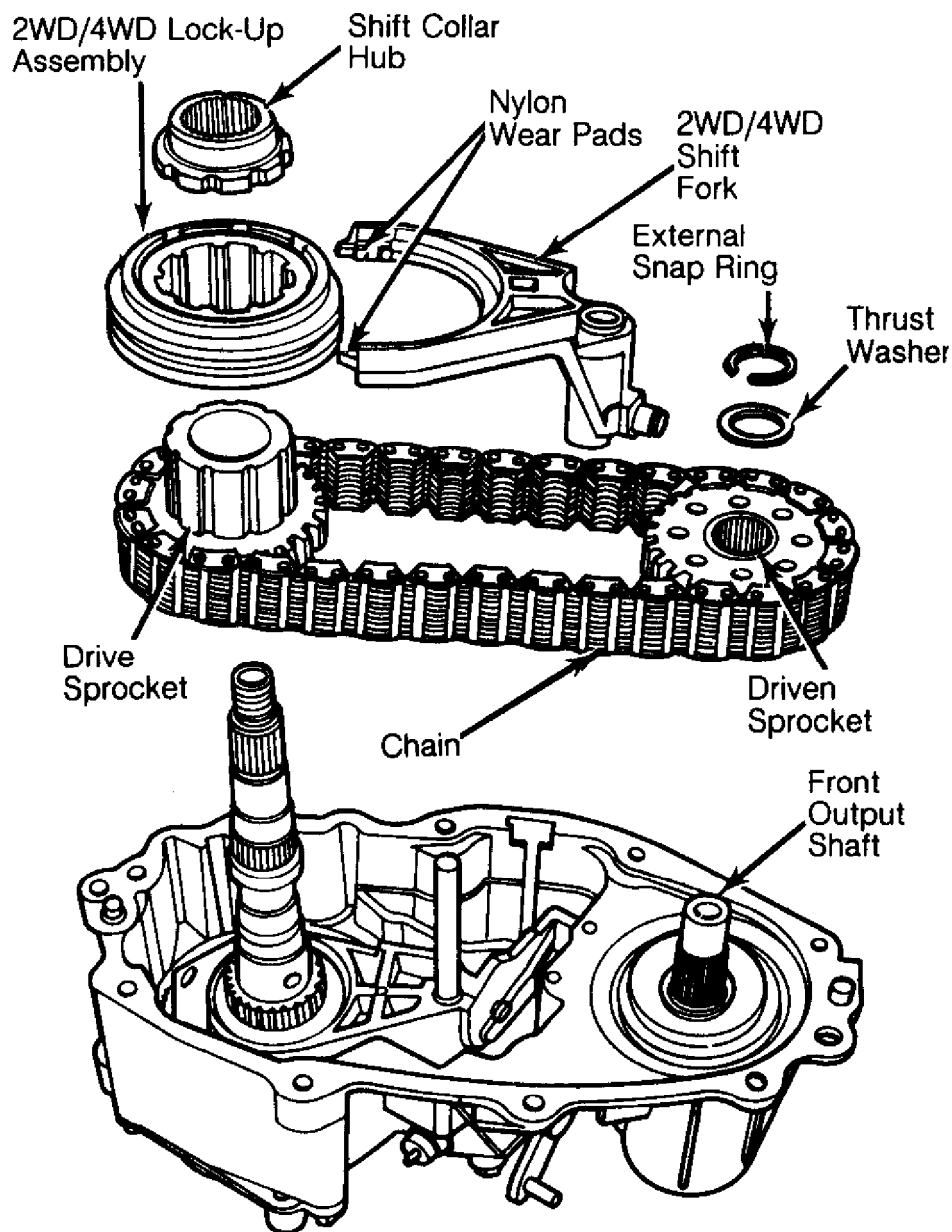
6) Remove output shaft ball bearing internal snap ring. Remove ball bearing with Driver (T80T-4000-W) and Output Shaft Bearing Replacer (T83T-7027-B) from outside of case.

7) If necessary, remove front output shaft caged needle bearing from rear cover using Puller (D80L-100-S) and slide hammer. On electronic shift models, remove 3 nuts retaining clutch coil to rear cover. Remove coil assembly, "O" rings and Brown wire from cover. Remove clutch housing assembly from output shaft.

8) On manual and electronic shift models, remove 2WD/4WD shift fork spring from boss on 2WD/4WD shift fork. On manual shift models only, remove shift collar hub from output shaft.

9) On manual and electronic shift models, remove 2WD/4WD

lock-up assembly and 2WD/4WD shift fork as an assembly. Remove 2WD/4WD lock-up assembly from 2WD/4WD shift fork. See Fig. 13. If necessary, remove external clip and roller bushing assembly from 2WD/4WD shift fork. Pull out shift rail.



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Fig. 13: Removing Shift Collar Hub & Drive Chain  
 Courtesy of Ford Motor Co.

10) If disassembly of 2WD/4WD lock-up assembly is necessary, remove internal snap ring and pull lock-up hub and spring from lock-up collar. See Fig. 11. Remove external snap ring and thrust washer that retains driven sprocket to front output shaft.

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11) On electronic shift models, remove helical cam assembly from front case. If necessary, remove helical cam, torsion spring and sleeve from shaft.

12) On manual and electronic shift models, remove chain, driven sprocket, and drive sprocket as an assembly. Remove collector magnet from front case. If disassembling oil pump, remove bolts from pump body.

NOTE: Note position and markings of oil pump front cover, body, pins, rear cover, and pump retainer.

13) Slip high-low range shift fork out of inside track of shift cam. If necessary, remove external clip and roller bushing assembly from high-low range shift fork. Remove high-low shift hub from planetary gear set in front case. See Fig. 14.

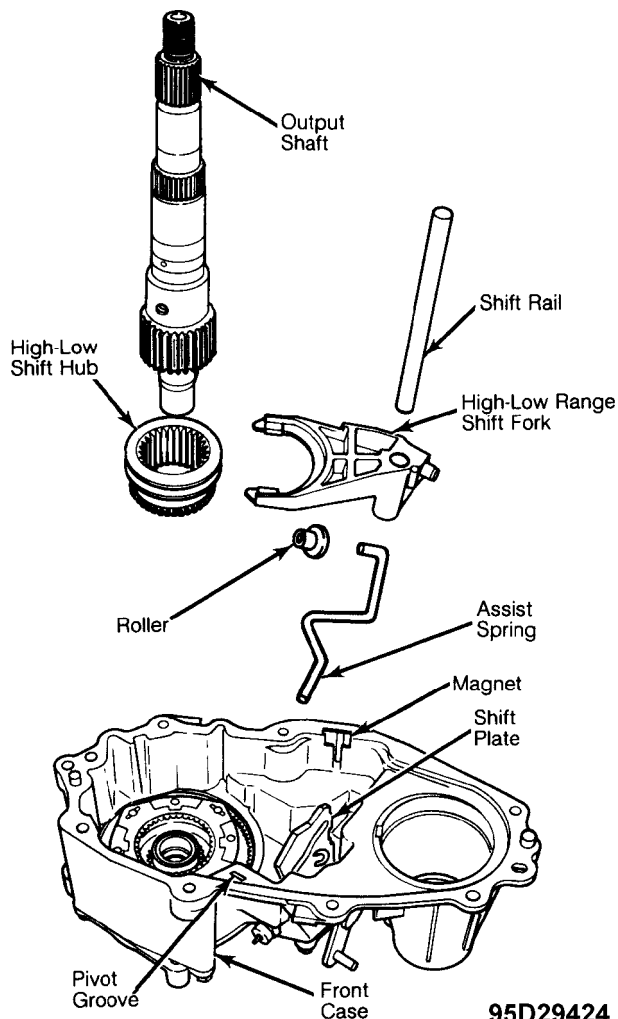


Fig. 14: High-Low Range Shift Assembly & Output Shaft (Manual Shift Model Shown; Electronic Shift Model Similar)  
Courtesy of Ford Motor Co.

14) On manual shift models, remove anchor end of assist spring from locking post in front case half. Remove spring and roller out of shift cam.

15) On manual and electronic shift models, turn case over. Remove 6 mounting adapter retaining bolts from front case. Remove mounting adapter, input shaft and planetary gear set as an assembly.

16) Expand tangs of large snap ring in mounting adapter, and pry under planetary gear set with screwdrivers. Separate input shaft and planetary gear set from mounting adapter. See Fig. 15.

17) If required, remove oil seal from mounting adapter with slide hammer. Remove internal snap ring from planetary carrier. Separate planetary gear set from input shaft assembly.

18) Remove external snap ring from input shaft. Press ball bearing from input shaft. Remove thrust washer, thrust plate and sun gear off input shaft. See Fig. 15.

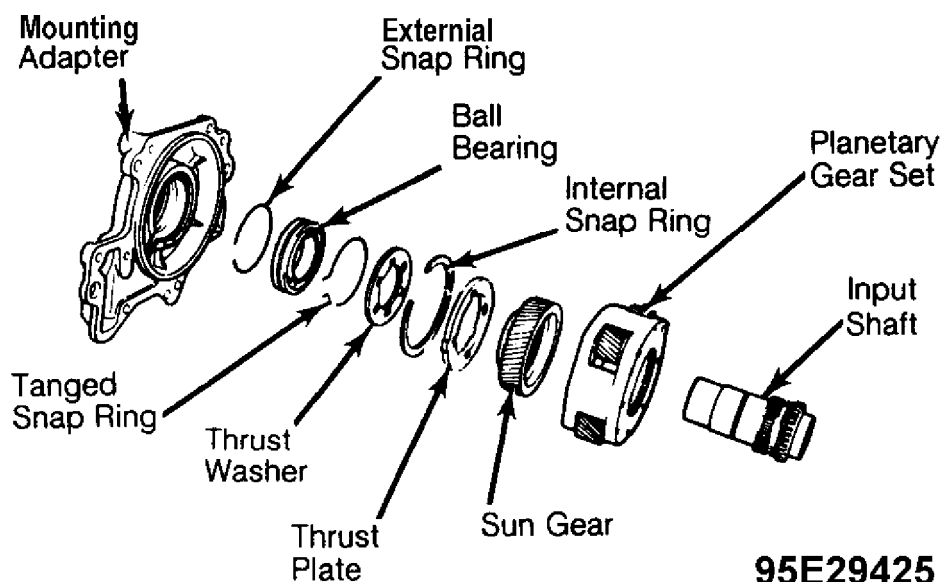
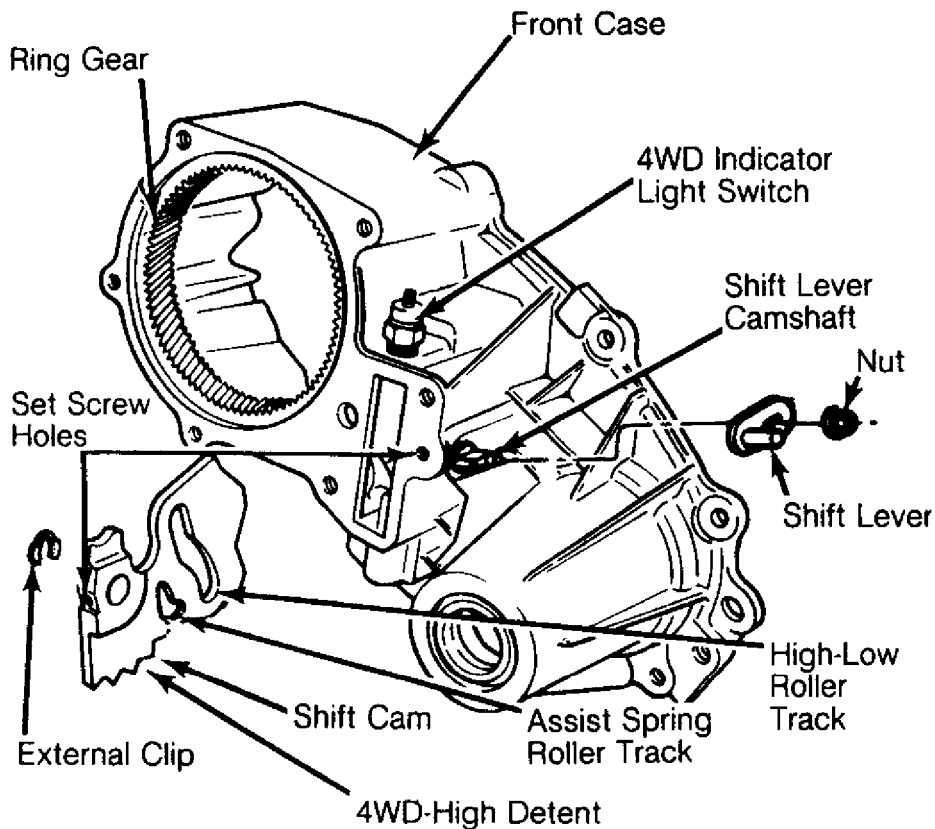


Fig. 15: Exploded View of Planetary Gear Set  
Courtesy of Ford Motor Co.

19) If necessary, press ring gear from front case. Note relationship of serrations to chamfered pilot diameter during removal.

20) On manual shift models, move shift lever by hand until shift cam is in "4WH" detent position. Scribe a line on outside of front case using side of shift lever and a grease pencil. See Fig. 16. Remove 2 Torx head set screws from front case and shift cam.

21) Turn front case over and remove external clip. Pry shift lever out of front case and shift cam. DO NOT pound on external clip during removal. Turn front case over and remove external clip. Pry shift lever assembly out of front case and shift cam. Remove "O" ring from second groove in shift lever shaft. Remove detent plunger and compression spring from inside of front case.



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Fig. 16: Shift Lever & Cam Assembly For Manual Shift Models  
 Courtesy of Ford Motor Co.

22) On manual and electronic shift models, remove internal snap ring and ball bearing retainer from front case. It may be necessary to tap on face of front output shaft and "U" joint assembly with a plastic hammer. Remove internal snap ring and drive ball bearing out of bearing retainer. See Fig. 17.

**NOTE:** The clip on bearing retainer is required to prevent bearing retainer from rotating. DO NOT discard clip.

**Disassembly ("U" Joints)**

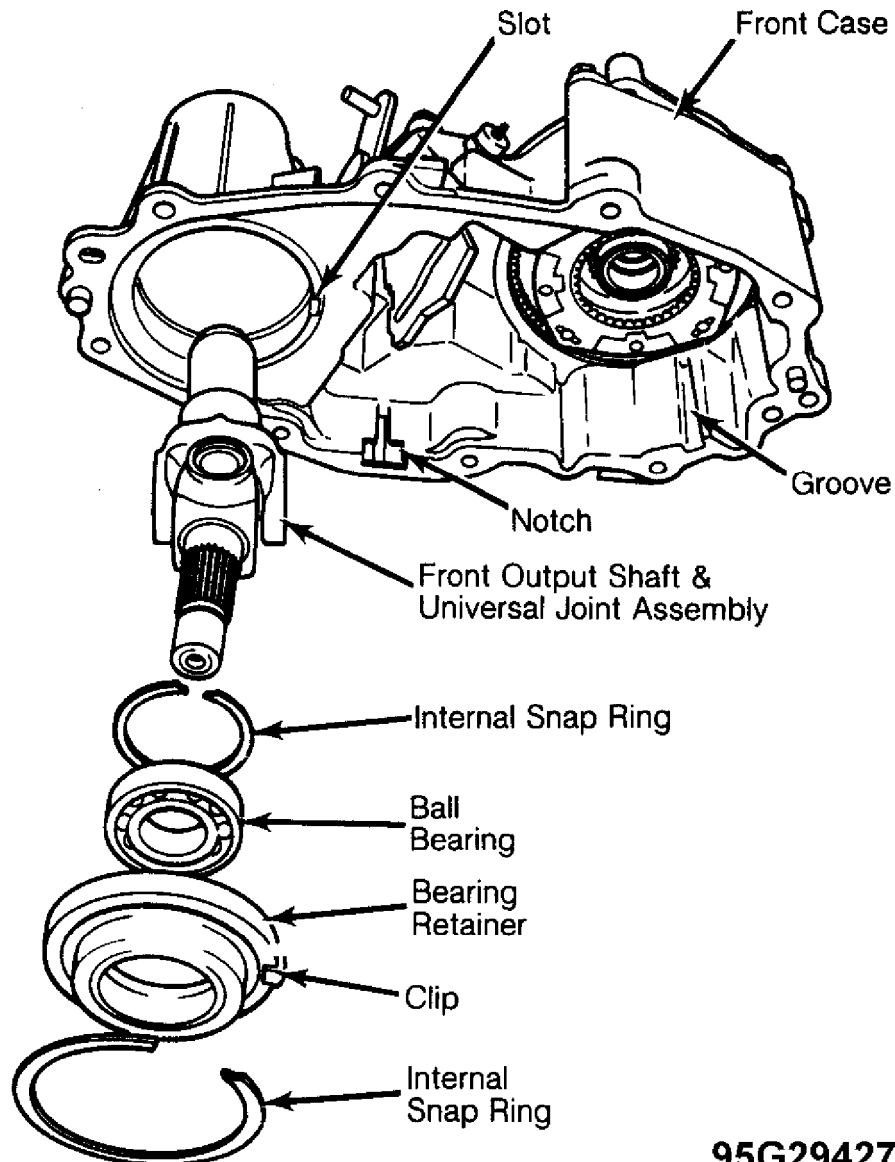
1) Remove front output shaft and "U" joint assembly from front case. If necessary, remove oil seal with slide hammer. If necessary, remove internal snap ring and drive ball bearing out of front case bore.

2) Place front output shaft and "U" joint assembly in a soft-jawed vise. Remove internal snap rings that retain bearings in shaft.

3) Position "U" Joint Remover/Installer (T74P-4635-C) over shaft and press bearing out. If bearing cannot be pressed completely out, remove it with a pair of vise grips or channel lock pliers.

Reposition tool on spider to remove opposite **TRANSFER CASE - BORG-WARNER 135**

until all bearings are removed.



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Fig. 17: Removing/Installing Front Output Shaft Assembly  
Courtesy of Ford Motor Co.

#### Reassembly ("U" Joints)

1) Lubricate all parts with Dexron II ATF during reassembly. Support front output shaft in soft-jawed vise. If removed, start new bearing into end of shaft. Position spider into bearing and press bearing below snap ring groove using "U" joint installer. Remove tool and install new internal snap ring in groove.

2) Start new bearing into opposite end of shaft. Using "U" joint installer, press bearing until opposite bearing contacts snap ring. Remove tool and install new internal snap ring in groove.

Reposition front output shaft assembly and install other 2 bearings in TRANSI

same manner.

3) Check "U" joint for binding. If "U" joint shows any sign of binding, tap both shafts sharply to relieve bind.

#### Reassembly (Transfer Case)

1) If removed, drive ball bearing into front output case bore using Driver (T80T-4000-W) and Output Shaft Bearing Replacer (T83T-7025-B). Ensure bearing is not cocked in bore. Install retaining snap ring for ball bearing. If removed, install front output oil seal in front case bore.

2) If removed, install ring gear in front case. Align serrations on outside diameter of ring gear to serrations previously cut in front case bore. Start piloted chamfered end of ring gear first and press in until it is fully seated. Ensure ring gear is not cocked in bore.

3) If removed, install ball bearing in bearing retainer bore. Drive bearing into retainer using driver and output shaft bearing replacer. Make sure ball bearing is not cocked in bore. Install ball bearing-to-retainer snap ring. Install front output shaft and "U" joint assembly through front case oil seal.

4) Position ball bearing and retainer assembly over front output shaft and install in front case bore. Clip on bearing retainer must align with slot in front case. Tap bearing retainer into place. Install internal snap ring. See Fig. 17.

5) On manual shift models, install compression spring and detent plunger into bore from inside of front case. If disassembled, install shift lever cam shaft to shift lever and tighten nut. After coating new "O" ring with grease, install "O" ring in second groove of shift lever shaft. Use a rubber band to fill the first groove so as not to cut "O" ring. Discard rubber band.

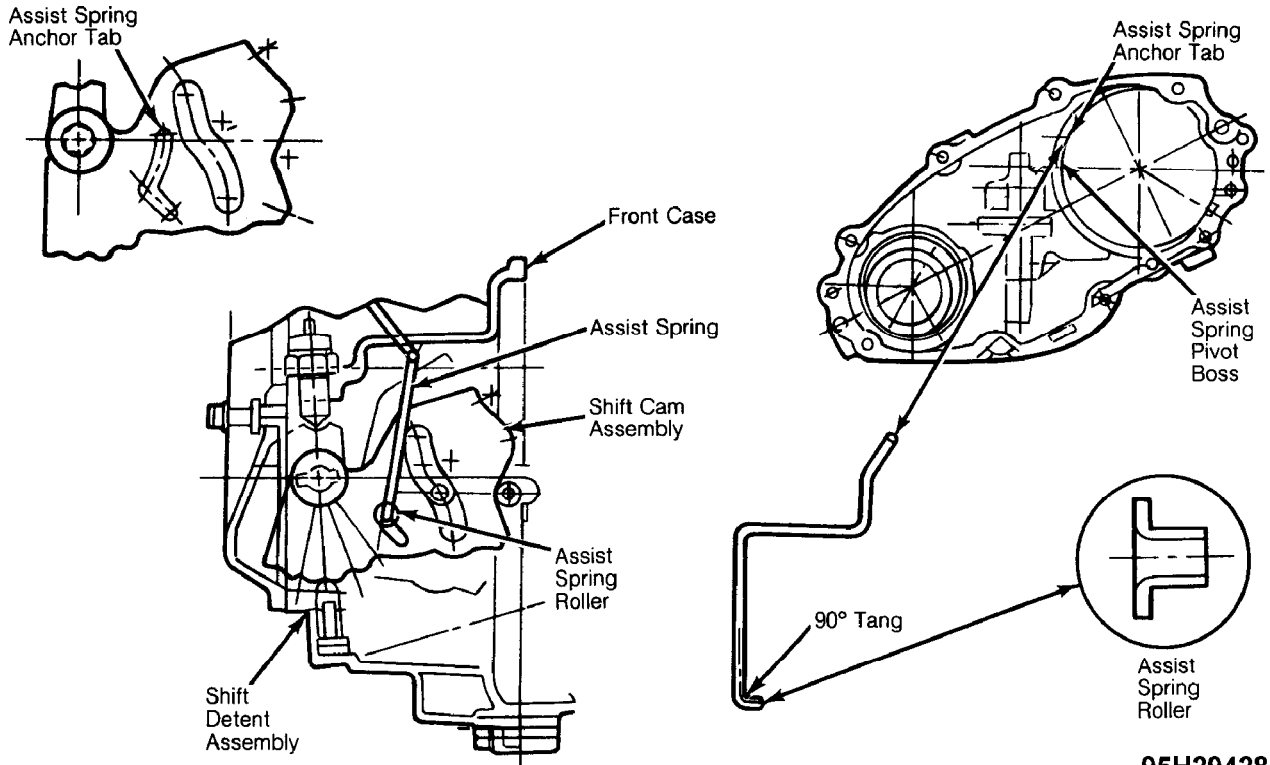
6) With shift cam, shift lever and snap ring installed in front case, position shift lever in "4WH" detent position (line scribed during disassembly). Place assist spring roller on 90 degree bend tang of assist spring. Insert roller into assist spring roller slot of shift cam. See Fig. 18.

7) Position middle section of assist spring into groove of front case pivot boss. Push in and lock the upper end of assist spring behind front case spring anchor tab. See Fig. 18.

8) Install 2 Torx head screws in front case and in shift cam. Tighten screws. Ensure set screw in front case is in first groove of shift lever shaft and not bottomed out against shaft itself. Shift lever should be able to move freely to all detent positions.

9) On manual and electronic shift models, slide sun gear, thrust plate and thrust washer over input shaft. Press ball bearing over input shaft. Install external snap ring to input shaft. Install planetary gear set on sun gear and install input shaft assembly. Install internal snap ring on planetary carrier.

**NOTE:** Sun gear recessed face and ball bearing snap ring groove should face toward rear of transfer case. Stepped face of thrust washer should face toward ball bearing.



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**Fig. 18: Installing Assist Spring On Manual Shift Models**  
 Courtesy of Ford Motor Co.

10) Drive oil seal into bore of mounting adapter. Place tanged snap ring in mounting adapter groove. Position input shaft and planetary gear set in mounting adapter and push inward until planetary assembly and input shaft assembly are seated in adapter. Snap ring should snap into place.

11) Hold mounting adapter by hand and tap face of input shaft against wood block to ensure snap ring is engaged. Apply RTV sealer to mating surface of front case and mounting adapter. Position adapter on case. Install retaining bolts and tighten.

12) On manual shift models only, position roller on 90 degree bend tang of assist spring. Larger diameter end of spring must be installed first. Install roller into assist spring roller track of shift cam while at same time locating center of spring in pivot groove in front case. See Figs. 14 and 16. Push anchor end of assist spring behind locking post adjacent to ring gear face.

13) On manual and electronic shift models, position high-low shift hub into planetary gear set. Ensure nylon wear pads are installed on shift fork. Dot on pad is installed in shift hole.



track of shift cam and groove of high-low shift hub. See Figs. 14 and 16. Install shift rail through high-low fork and make sure shift rail is seated in bore in front case.

**NOTE:** Ensure Nylon wear pads are installed on shift fork and dot on pad is installed in fork hole.

15) On manual and electronic shift models, place oil pump cover with word "TOP" facing front of front case. Install 2 pump pins (flats facing upward) with spring between pins and place assembly in oil pump bore in output shaft. Place the oil pump body and pick-up tube assembly over shaft. Be sure the pins are riding against inside of pump body.

16) Place oil pump body and pick-up tube over shaft. Ensure pins are riding against inside of pump body. Install oil pump rear cover with words "TOP REAR" facing rear of front case. Word "TOP" on front cover and rear cover should be on same side.

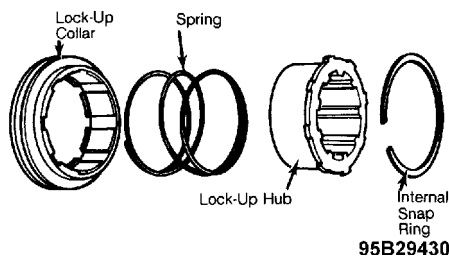
17) Install pump retainer so tabs face the front of transfer case. Install 4 bolts and rotate output shaft while tightening bolts to prevent pump from binding.

**CAUTION:** Output shaft must turn freely within oil pump. If binding occurs, loosen 4 bolts and retighten.

18) Install output shaft and oil pump assembly in input shaft. Ensure external splines of output shaft engage internal splines of high-low shift hub. Make sure oil pump retainer and oil filter leg are in groove and notch of front case. Install collector magnet in notch in front case.

19) Install chain, drive sprocket and driven sprocket as an assembly over shafts. Install thrust washer on front output shaft and external snap ring over thrust washer to retain driven sprocket.

20) If disassembled, assemble 2WD/4WD lock-up assembly. Install spring in lock-up collar. On electronic shift models, small end of spring in lock-up collar. On manual and electronic shift models, place lock-up hub over spring and engage lock-up hub in notches in lock-up collar. Install internal snap ring. See Figs. 19 and 21 through 24.



**Fig. 19:** Exploded View 2WD/4WD Lock-Up Assembly  
Courtesy of Ford Motor Co.

21) Install 2WD/4WD shift fork to 2WD/4WD lock-up assembly. If removed, ensure Nylon wear pads are installed on fork and dot on pad is installed in hole in fork. Install 2WD/4WD lock-up collar and hub assembly over output shaft and onto shift rail. See Fig. 13.

22) If removed, install shaft, bushing and external clip on 2WD/4WD lock-up fork. Install shift collar hub on output shaft. If removed, drive caged needle bearing into rear cover bore. If removed, install ball bearing in rear cover bore. Install ball bearing internal snap ring.

23) On electronic shift models, assemble spring spacer on camshaft. Slide spring spacer then spring onto camshaft. Position first spring tang to left side of drive tang. Wind second spring tang back to right side of drive tang. Slide spring and spacer in as far as possible. Install helical cam onto camshaft with cam tang in between spring tangs. See Fig. 20.

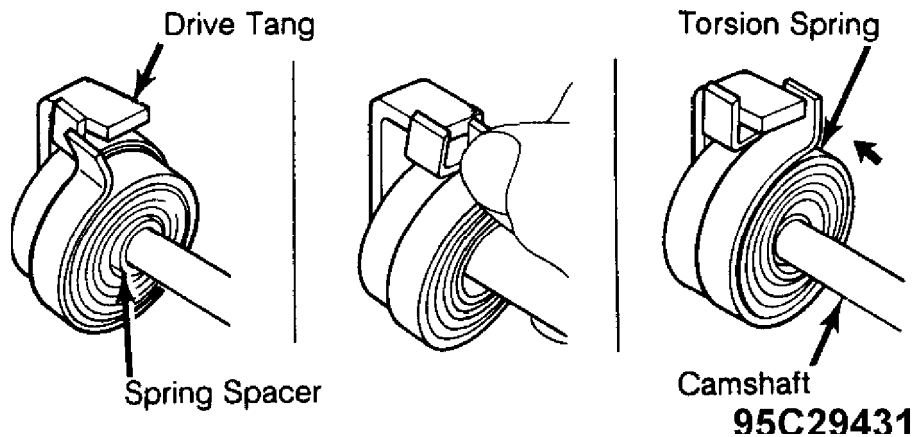


Fig. 20: Attaching Spring Tangs to Camshaft Tangs  
Courtesy of Ford Motor Co.

24) Install tang end of camshaft assembly over alignment pin in front case. Camshaft assembly tangs should point toward top of case and rest on high-low shift fork assembly.

25) Lift 2WD/4WD shift fork slightly while holding shift rail down. Rotate helical cam track into high-low and 2WD/4WD fork roller bushings by turning camshaft assembly.

NOTE: The triangular shaft will be in 2 wheel high position at final assembly.

26) If disassembled, assemble shift collar hub to clutch housing. Install snap ring. Install clutch housing assembly on output shaft.

27) Install new "O" rings on clutch coil assembly studs and grommet. Install clutch coil assembly from inside rear cover until

is not pinched.

#### Final Reassembly (Manual Shift Models)

1) Install speedometer drive gear assembly into rear cover bore with round end of speedometer gear clip facing toward inside of rear cover. Drive oil seal into rear cover bore.

2) Transfer case shift lever assembly should be shifted into "4H" detent position to assure positioning of shift rail to rear cover.

3) Coat mating surface of front case with a bead of RTV sealer. Install 2WD/4WD shift fork spring on shift rail and shift fork with spring mounted in vertical position.

4) Position rear cover on front case so that spring boss engages 2WD/4WD shift fork spring and shift rod. Install bolts and tighten.

**CAUTION:** If rear cover assembly does not seat properly, move rear cover up and down slightly to permit end of shift rail to enter shift rail hole in rear cover boss.

5) Install rear yoke on output shaft. Install rubber seal, washer, and nut. Tighten nut to specifications. For "STX" models, install front yoke on output shaft, rubber seal, steel washer and lock nut.

6) Install 4WD indicator switch and breather plug. Install drain plug. Fill transfer case with Dexron II ATF. Install fill plug.

#### Final Reassembly (Electronic Shift Models)

1) Coat mating surface of front case with a bead of RTV sealer. Install 2WD/4WD shift fork spring on shift rail and shift fork with spring mounted in vertical position.

2) Position rear cover on front case so that output shaft aligns with rear cover output shaft bore. Camshaft assembly must align with rear cover motor bore.

3) If cover will not seat, tap output shaft with rubber mallet in direction away from triangular shaft while pushing down on rear cover. Another method is to insert screwdriver through sensor bore in rear cover so blade engages slot in middle of 2WD/4WD shift fork. Move fork toward triangular shaft to engage shift rail in rear cover bore.

4) Install and tighten transfer case cover bolts. Using pliers with wood or copper jaws, rotate triangular shaft it aligns with triangular slot in motor. Install electric motor and tighten retaining screws.

5) If shaft will not stay in 4WD high position, rotate shaft to 2WD position. Install motor and rotate counterclockwise until motor is aligned with mounting holes.

6) Install speed sensor and retaining bracket. Reconnect

**TRANSFI**

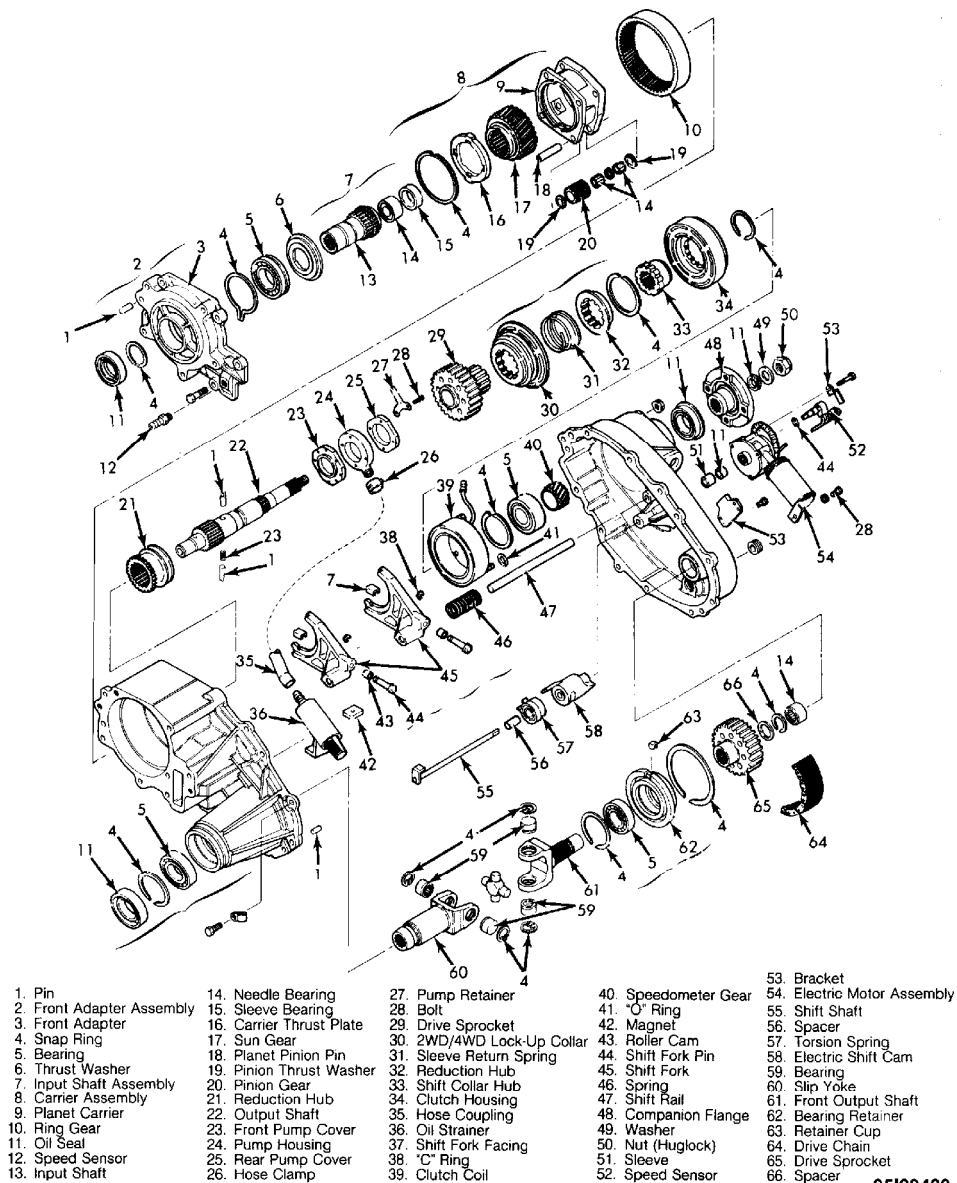
Brown, Green and Blue wires into connector. Install locking sleeve into connector.

7) If removed, install wire harness bracket on rear cover. Install speedometer drive gear in rear cover bore. Install oil seal in rear cover bore.

8) Install rear companion flange on output shaft. Install rubber seal, washer, and nut. Tighten nut.

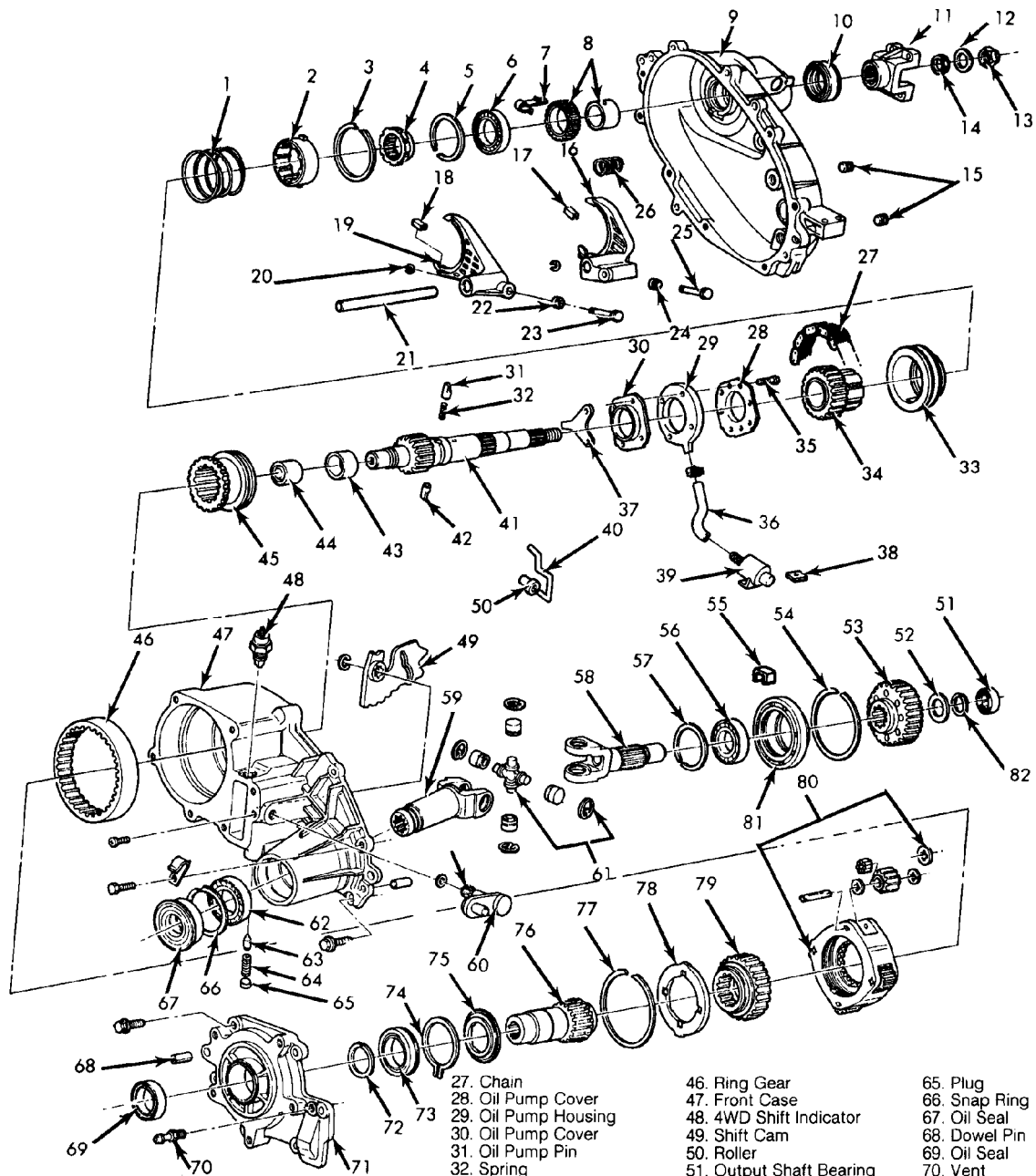
9) Install breather plug and drain plug. Fill transfer case with Dexron II ATF. Install fill plug.

### TRANSFER CASE EXPLODED VIEWS



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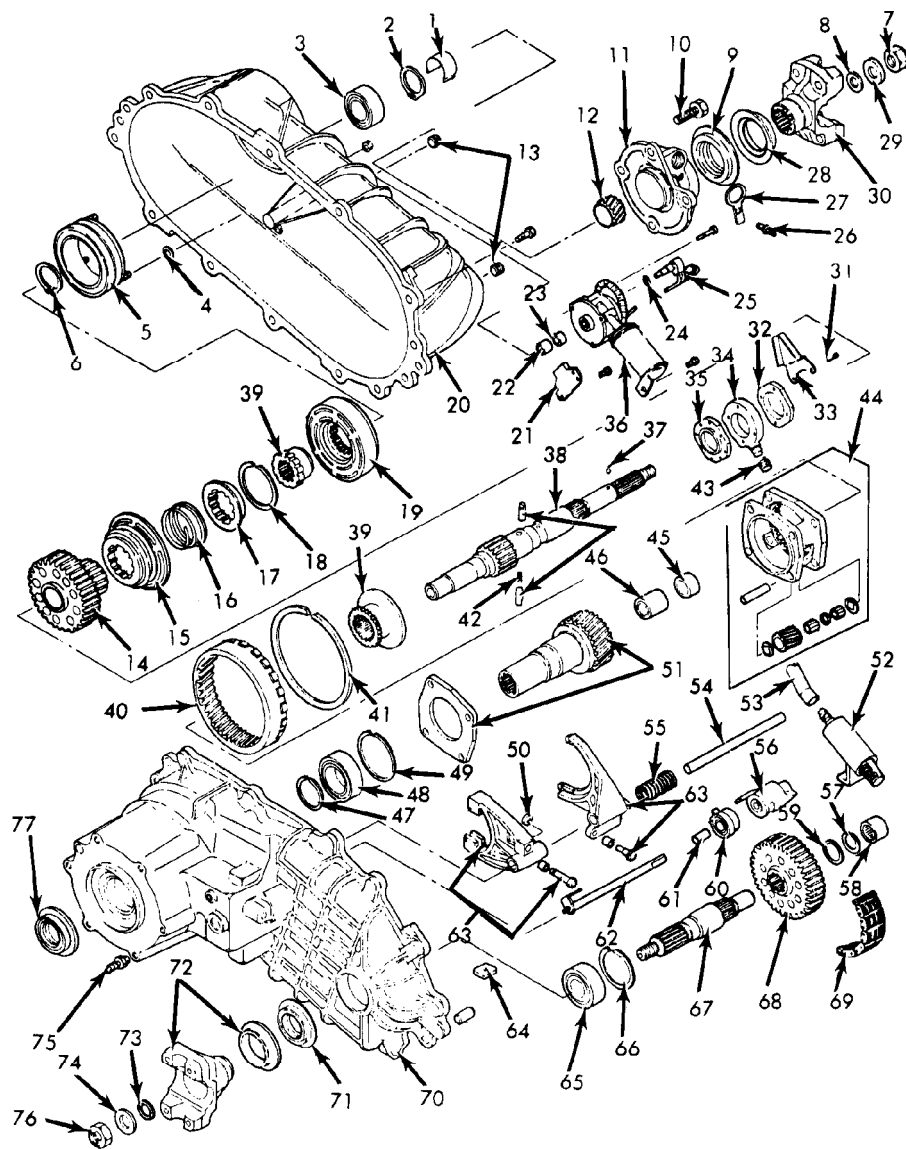
Fig. 21: Borg-Warner 1350 Electronic Shift Transfer Case  
Courtesy of Ford Motor Co.



- |                           |                        |                         |                           |                            |
|---------------------------|------------------------|-------------------------|---------------------------|----------------------------|
| 1. Compression Spring     | 14. Rubber Seal        | 27. Chain               | 46. Ring Gear             | 65. Plug                   |
| 2. Lock-Up Hub            | 15. Drain & Fill Plugs | 28. Oil Pump Cover      | 47. Front Case            | 66. Snap Ring              |
| 3. Snap Ring              | 16. Shift Fork         | 29. Oil Pump Housing    | 48. 4WD Shift Indicator   | 67. Oil Seal               |
| 4. Shift Collar Hub       | 17. Shift Fork Pad     | 30. Oil Pump Cover      | 49. Shift Cam             | 68. Dowel Pin              |
| 5. Snap Ring              | 18. Shift Fork Pad     | 31. Oil Pump Pin        | 50. Roller                | 69. Oil Seal               |
| 6. Bearing                | 19. Shift Fork         | 32. Spring              | 51. Output Shaft Bearing  | 70. Vent                   |
| 7. Spring                 | 20. "C" Clip           | 33. Lock-Up Collar      | 52. Thrust Washer         | 71. Front Bearing Retainer |
| 8. Lock-Up Gear & Bushing | 21. Shift Fork Rail    | 34. Drive Sprocket      | 53. Driven Sprocket       | 72. Snap Ring              |
| 9. Rear Case              | 22. Roller             | 35. Bolt                | 54. Snap Ring             | 73. Bearing                |
| 10. Oil Seal              | 23. Shift Fork Pin     | 36. Hose                | 55. Clip                  | 74. Snap Ring              |
| 11. Yoke                  | 24. Roller             | 37. Oil Pump Retainer   | 56. Bearing               | 75. Thrust Washer          |
| 12. Washer                | 25. Shift Fork Pin     | 38. Collector Magnet    | 57. Snap Ring             | 76. Input Shaft            |
| 13. Nut                   | 26. Spring             | 39. Strainer            | 58. Yoke                  | 77. Snap Ring              |
|                           |                        | 40. Detent Spring       | 59. Yoke                  | 78. Plate                  |
|                           |                        | 41. Output Shaft        | 60. Shift Lever           | 79. Sun Gear               |
|                           |                        | 42. Oil Pump Pin        | 61. "U" Joint             | 80. Planetary Assembly     |
|                           |                        | 43. Input Shaft Bushing | 62. Bearing               | 81. Bearing Retainer       |
|                           |                        | 44. Needle Bearing      | 63. Shift Lock-Up Plunger | 82. Snap Ring              |
|                           |                        | 45. Planetary Shift Hub | 64. Spring                |                            |

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**Fig. 22: Borg-Warner 1350 Manual Shift Transfer Case**  
 Courtesy of Ford Motor Co.

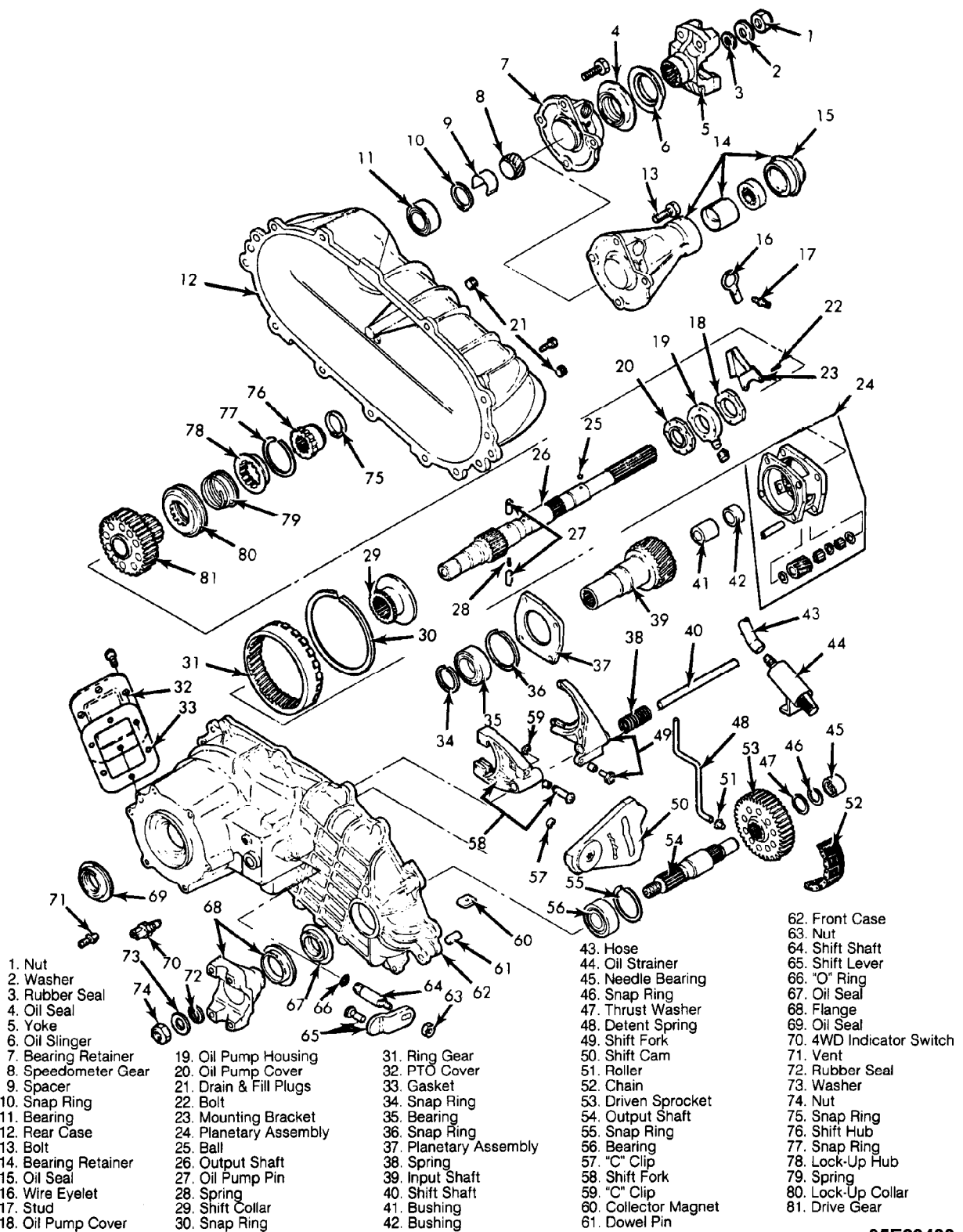


- |                        |                       |                        |                      |
|------------------------|-----------------------|------------------------|----------------------|
| 1. Spacer              | 20. Rear Case         | 39. Shift Hub          | 58. Needle Bearing   |
| 2. Snap Ring           | 21. Mounting Bracket  | 40. Ring Gear          | 59. Thrust Washer    |
| 3. Bearing             | 22. Bushing           | 41. Snap Ring          | 60. Spring           |
| 4. "O" Ring            | 23. Seal              | 42. Spring             | 61. Bushing          |
| 5. Clutch Coil         | 24. Seal              | 43. Oil Pump Pins      | 62. Shift Shaft      |
| 6. Snap Ring           | 25. Speed Sensor      | 44. Planetary Assembly | 63. Shift Fork       |
| 7. Nut                 | 26. Stud              | 45. Bushing            | 64. Collector Magnet |
| 8. Rubber Seal         | 27. Eyelet            | 46. Bushing            | 65. Bearing          |
| 9. Oil Seal            | 28. Oil Slinger       | 47. Snap Ring          | 66. Snap Ring        |
| 10. Bolt               | 29. Washer            | 48. Bearing            | 67. Output Shaft     |
| 11. Bearing Retainer   | 30. Yoke              | 49. Snap Ring          | 68. Driven Gear      |
| 12. Speedometer Gear   | 31. Bolt              | 50. "C" Clip           | 69. Chain            |
| 13. Drain & Fill Plugs | 32. Oil Pump Cover    | 51. Input Shaft        | 70. Front Case       |
| 14. Drive Gear         | 33. Oil Pump Retainer | 52. Oil Strainer       | 71. Seal             |
| 15. Lock-Up Collar     | 34. Oil Pump Housing  | 53. Hose               | 72. Yoke & Slinger   |
| 16. Compression Spring | 35. Oil Pump Cover    | 54. Shift Rail         | 73. Rubber Seal      |
| 17. Lock-Up Hub        | 36. Shift Motor       | 55. Spring             | 74. Washer           |
| 18. Snap Ring          | 37. Ball              | 56. Shift Cam          | 75. Vent             |
| 19. Clutch Hub         | 38. Output Shaft      | 57. Snap Ring          | 76. Nut              |
|                        |                       |                        | 77. Seal             |

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**Fig. 23: Borg-Warner 1356 Electronic Shift Transfer Case**

Courtesy of Ford Motor Co.



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Fig. 24: Borg-Warner 1356 Manual Shift Transfer Case

Courtesy of Ford Motor Co.

## TORQUE SPECIFICATIONS

### TORQUE SPECIFICATIONS TABLE

AA

Application	Ft. Lbs. (N.m)
Breather Vent .....	6Ä14 (8Ä19)
Case-to-Cover Bolts .....	23Ä30 (31Ä41)
Drain & Fill Plug .....	14Ä22 (19Ä30)
Front & Rear Drive Shaft Bolts .....	12Ä15 (16Ä20)
Rear Drive Shaft Companion Flange Bolts .....	61Ä87 (83Ä118)
Shift Control Bolts (Mechanical Shift) Large .....	70Ä90 (95Ä122)
Small .....	31Ä42 (42Ä57)
Shift Lever Nut .....	19Ä26 (25Ä35)
Skid Plate-to-Frame Bolt .....	22Ä30 (30Ä41)
Transfer CaseÄtoÄTransmission .....	25Ä35 (34Ä47)
Upper Shift Control Lever & Heat Shield Bolts .....	27Ä37 (37Ä50)
Yoke Nut .....	120Ä150 (163Ä203)
4WD Indicator Switch .....	25Ä35 (34Ä47)

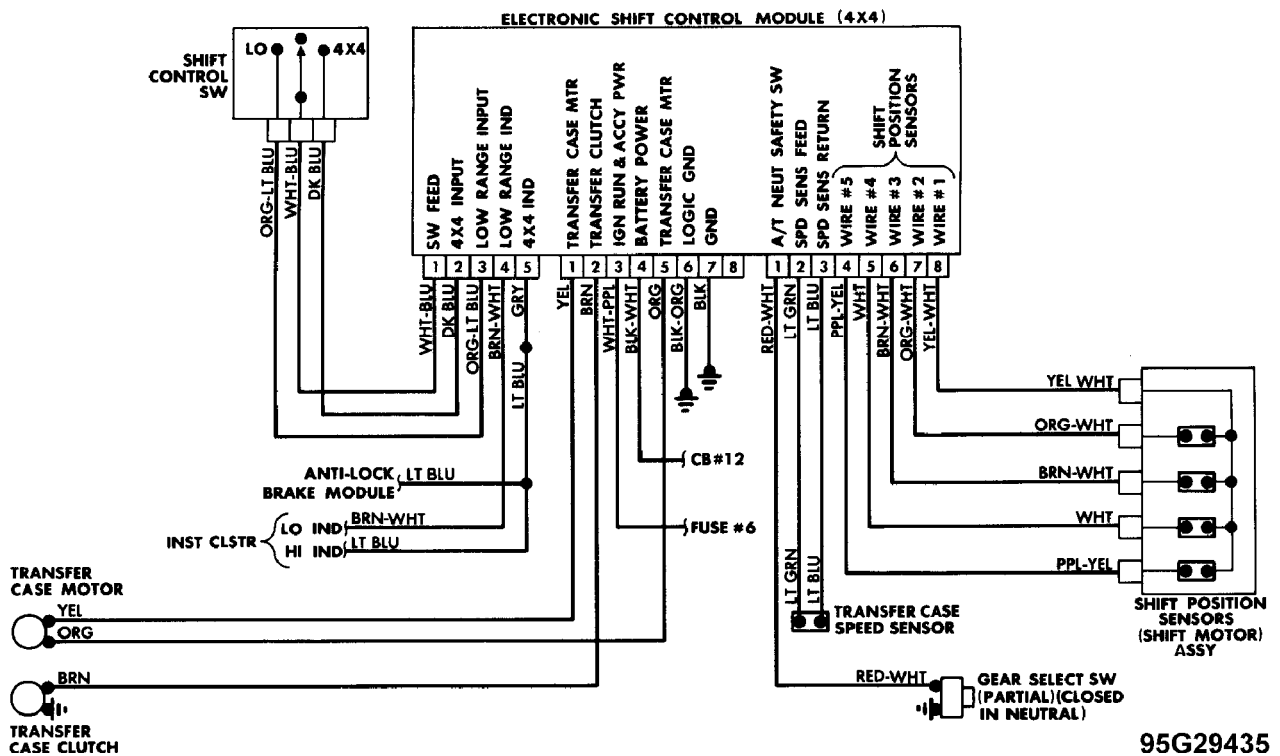
INCH Lbs. (N.m)

Oil Pump Bolts .....	36Ä40 (4.0Ä4.5)
Clutch Coil Assembly Nuts .....	72Ä96 (8.1Ä10.8)
Shift Shaft & Shift Cam Set Screw .....	60Ä84 (6.8Ä9.5)
Speedometer Screw .....	20Ä25 (2.3Ä2.8)

AA

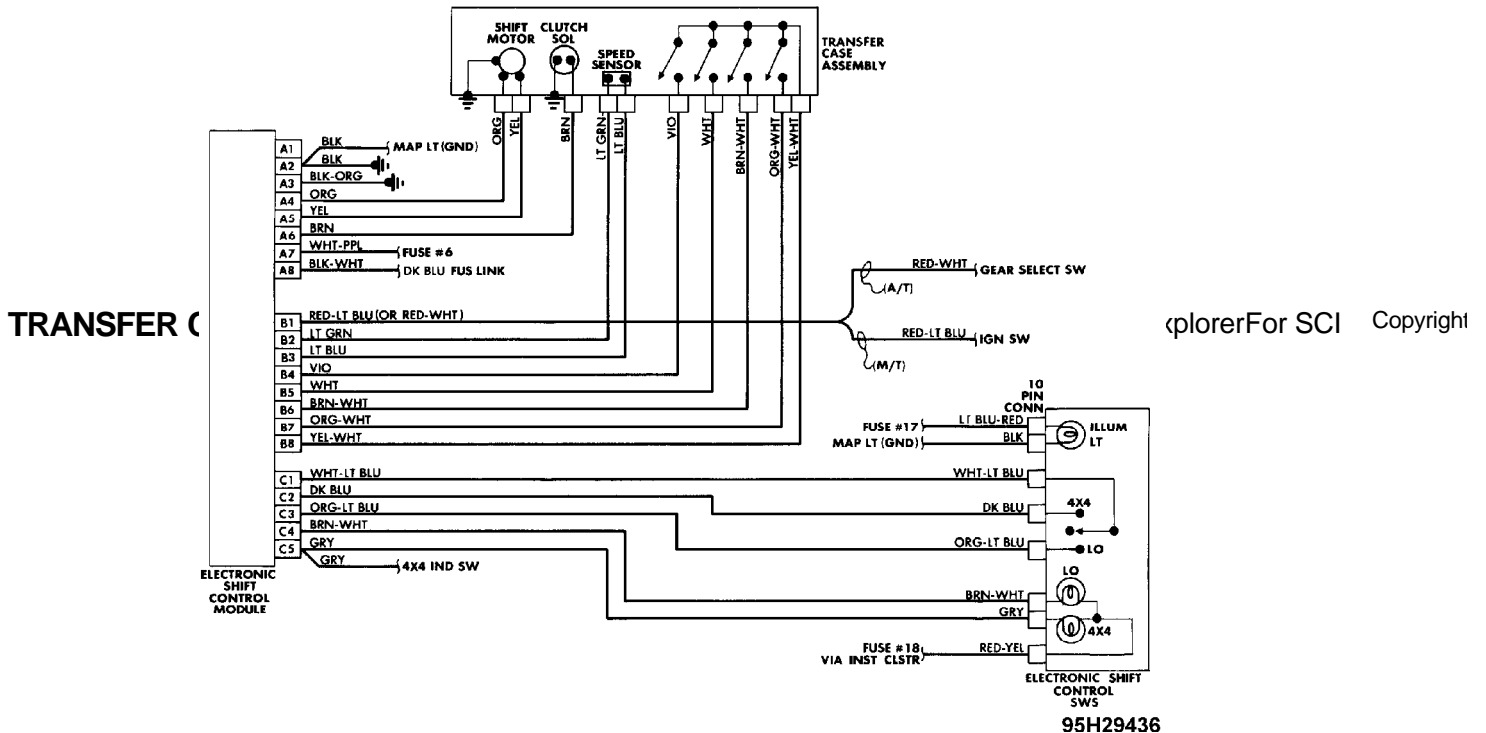
## WIRING DIAGRAMS





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Fig. 25: Shift Transfer Case Schematic (Electronic shift models only - Bronco)



95H29436

Fig. 26: Transfer Case Wiring Diagram (Electronic shift models only - Bronco II & Ranger)

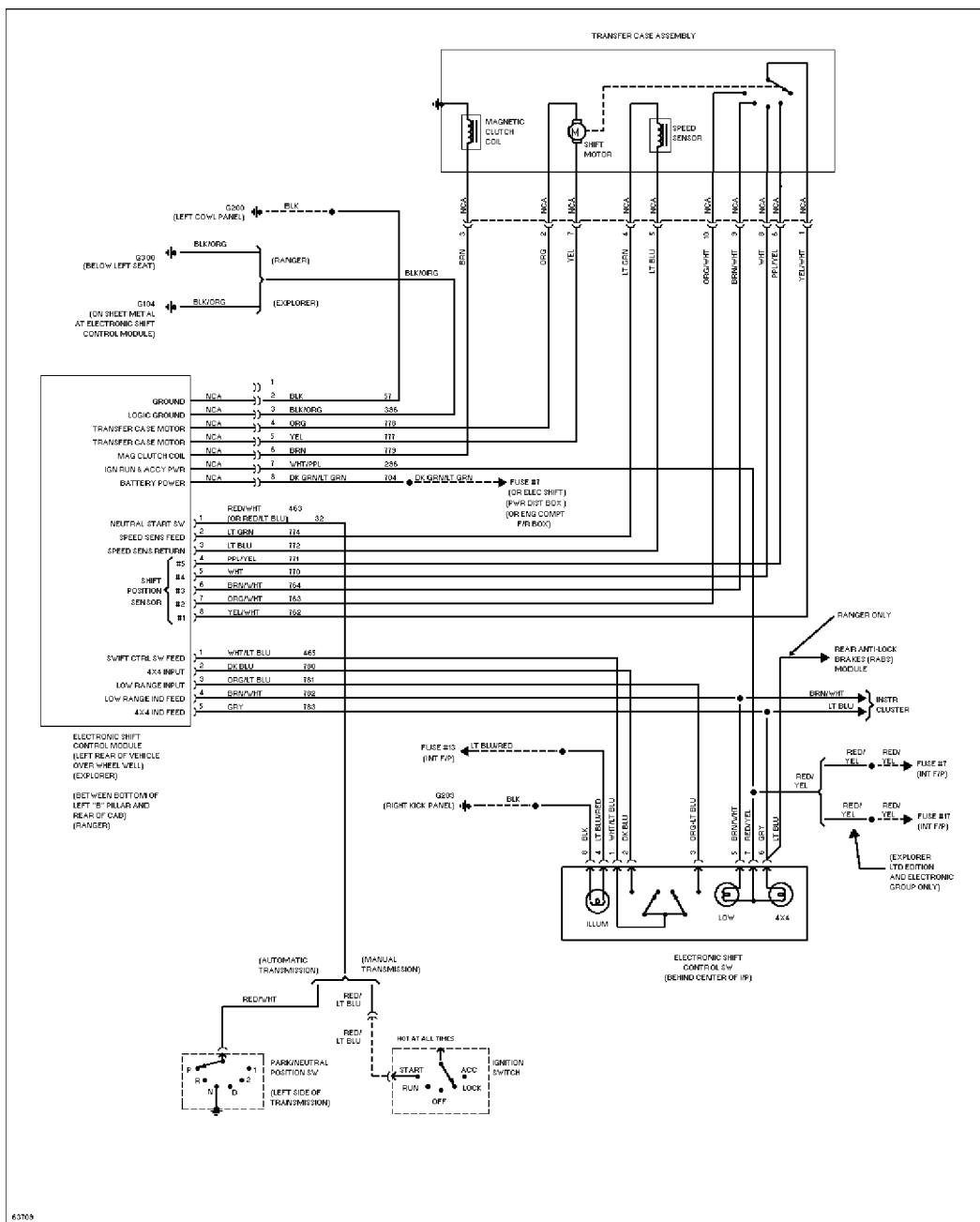


Fig. 27: Transfer Case Wiring Diagram (Explorer & Ranger)

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