

Taking a Look at Ford's New Transfer Cases

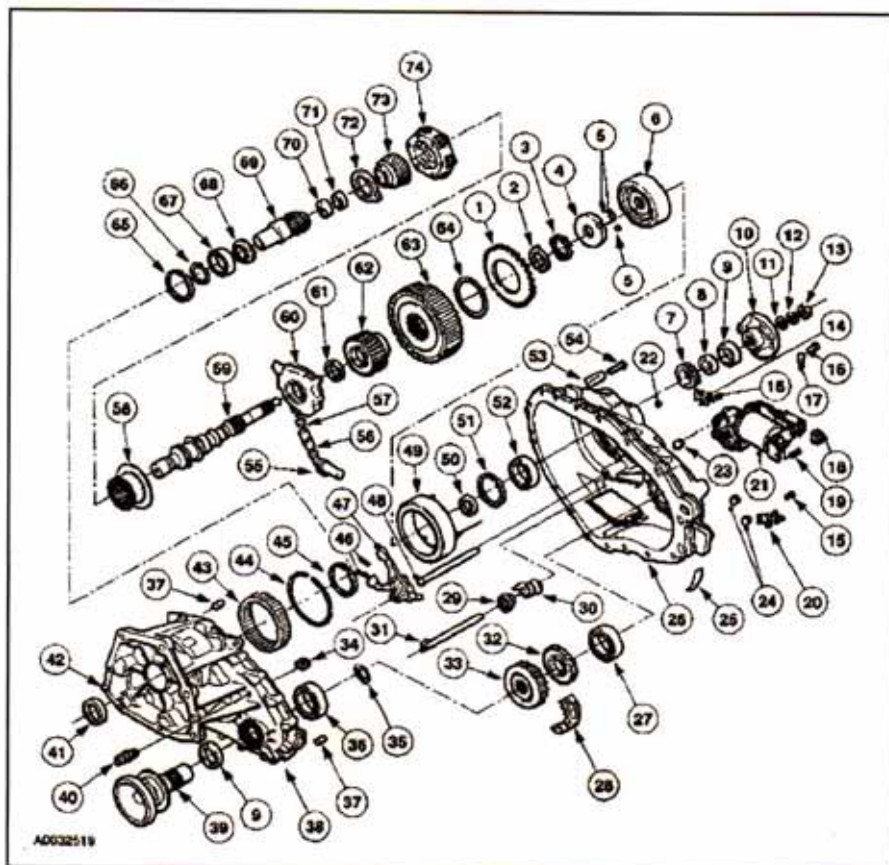
By Mike Weinberg
Contributing Editor

One of the best-selling and most-popular vehicles is the Ford Explorer and its cross-brand clones, the Mercury Mountaineer and the new Lincoln Aviator. These SUVs have been the volume leaders in their class and as such have provided us with lots of repair work as they have aged. Most of these vehicles were equipped with a BorgWarner 44-05 transfer case, and a lesser number were equipped with the BW 44-04

all-wheel-drive transfer case.

In 2001 BorgWarner introduced new-model transfer cases, which Ford used to replace the units you were familiar with. The new BW 44-10 replaced the BW 44-04, and the BW 44-11 replaced the venerable BW 44-05. These new models are very similar in mechanical design, with improved technology to enhance durability. The more-advanced changes occurred on the electronic-control side.

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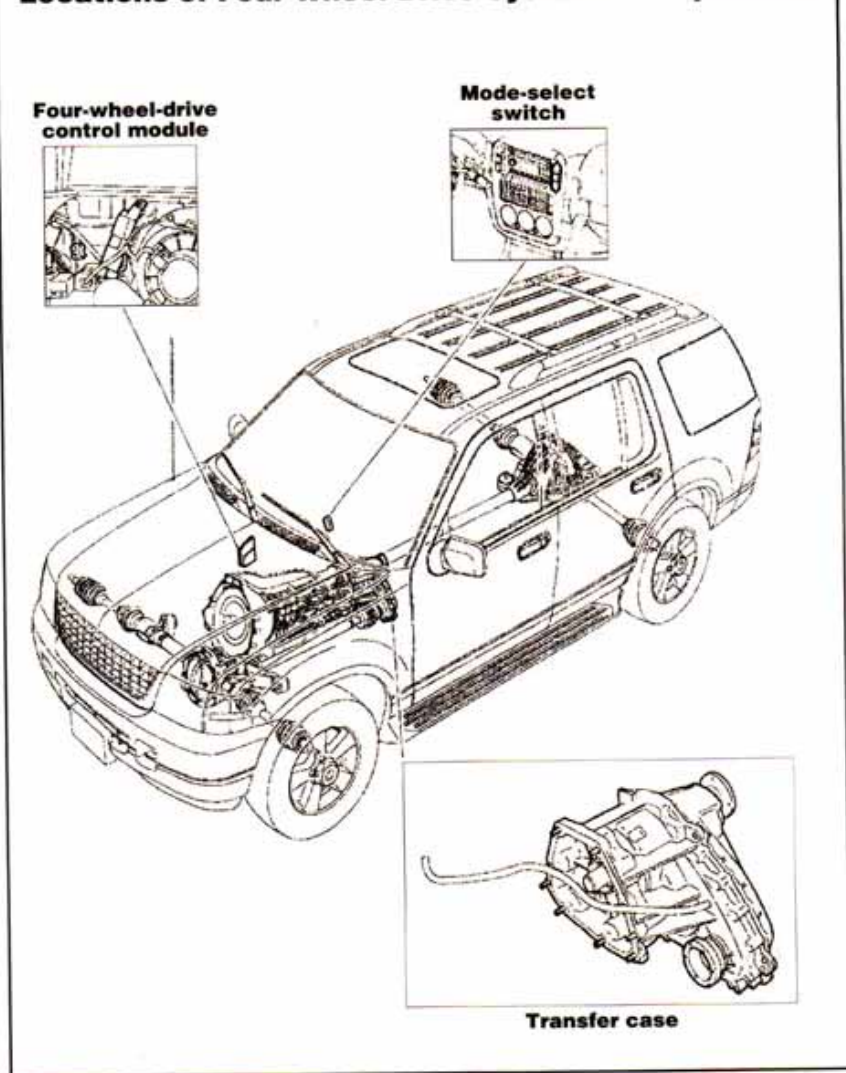
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Locations of Four-Wheel-Drive Systems Components



We discuss the theory of operations and the mechanics in this article, and the next installment will be devoted to electronics and diagnosis. As these vehicles become more sophisticated, the transfer case has to be able to work with more-advanced vehicle systems such as stability and traction control and improved anti-lock braking systems.

The BW 44-10 all-wheel-drive transfer case is a very simple unit. It is a one-speed unit with no provision for a low ratio. There are no external controls, as this unit is al-

ways activated with no driver input. The use of a planetary system of power flow through a viscous coupling transfers torque to both axles constantly. The ratio of torque transfer is 65% to the rear wheels and 35% to the front wheels.

You should know that vehicles equipped with this transfer case should not be used off road or for snow-plow duty. If you have a customer with one of these that has a snow plow on it, make sure you figure that in when you offer a warranty.

As with all "active" transfer cases, tire sizes and pressures are critical for proper operation. According to Ford, if there is 0.006 inch difference in tread depth between front and rear tires, one rear tire should be swapped with one front tire. The 0.006-inch difference is not enough to be visible to the eye, so the specifications are very tight to ensure correct operation and to protect the viscous clutch. Because there is no driver control over these units, diagnosis and troubleshooting apply to only mechanical functions of the unit.

The BW 44-11 automatic four-wheel-drive system functions just like the BW 44-05 it is replacing. The driver controls the four modes of operation electronically through a dashboard-mounted mode-select switch (MSS). In the automatic mode, the vehicle operates with 98% of the torque sent to the rear wheels. This allows the vehicle to be driven on dry pavement at highway speeds and compensates for differences in wheel speeds during turns to allow smooth operation without wheel hop.

The transfer case is controlled by a computer (transfer-case control module), which receives inputs from front and rear output-shaft-speed (OSS) sensors that measure front and rear propshaft speeds; the powertrain control module (PCM); MSS; brake-pedal-position (BPP) switch; digital transmission-range (TR) sensor; throttle position (TP) sensor; vehicle-speed sensor (VSS); and the electronic shift motor.

When the vehicle is driven in the 4x4 auto mode, duty cycle to the transfer-case clutch is at a minimum. As the driver adds throttle, duty cycle increases proportionately. If the control module detects a difference in the propshaft speeds from the OSS sensors, clutch duty cycle is increased to send more power to the front axle until the

Item	Part Number	Description
1	.7H150	Armature
2	.7917	Snap ring
3	.7E085	Wave spring
4	.7R428	Apply cam
5	.7A534	Ball
6	.7G362	Cam and coil housing assembly
7	.7G450	Tone wheel (upper)
8	.7072	Spacer
9	.7B215	Oil seal
10	.7B214	Rear output flange
11	.7052	Oil seal
12	.7B368	Output-shaft yoke washer
13	.7045	Shaft nut
14	.7F293	Speed sensor (rear output shaft)
15	.7A443	Bolt
16	.N800670	Bolt (3 required)
17	.7K470	J-clip
18	—	Connector interlock (part of 7G360)
19	.N802503	Bolt (hex-head)
20	.7F293	Speed sensor (front output shaft)

shaft speeds equalize, at which point clutch duty cycle returns to minimum. This permits a seamless operation of the transfer case at road speeds on dry pavement.

One important item to be aware of on any of the "active" transfer cases on the market is that most car owners never read the owner's manual and are totally unaware of how to use the transfer case correctly. We have seen many shops have comebacks because customers are using the automatic mode when they plow snow. You must make your customers aware of the transfer-case operation or you will have comebacks and responsibility for problems you did not create. If your customers use vehicles with active transfer cases to plow in the automatic mode, they will flat-out destroy the clutch packs. All plow operations must be done in the 4x4 High range, where the transfer case is locked into a 50/50 torque split, or in 4x4 low range, where the torque split is 50/50 and you have

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GRAND CHEROKEE - (2 DOORS) 4X4, (4 DOORS) 4X4, (4 DOORS) 4X4, (4 DOORS) 4X4
CHRYSLER/CHRYSLER - (4 DOORS) 4X4, (4 DOORS) 4X4

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EXPLODER - (4 DOORS) 4X4
BRONCO - (4 DOORS) 4X4, (4 DOORS) 4X4, (4 DOORS) 4X4
BRONCO - (4 DOORS) 4X4
ACADIA - (4 DOORS) 4X4
PICKUP - (4 DOORS) 4X4, (4 DOORS) 4X4, (4 DOORS) 4X4
ESCORT - (4 DOORS) 4X4

Dodge Transfer Cases

All Dodge Transfer Cases are Remanufactured with O.E. Components
**Includes New Morse Chain*
• Durango 4T - Converts Full Time AWD to Select Trac or Command Trac

DURANGO - (4 DOORS) 4X4, (4 DOORS) 4X4, (4 DOORS) 4X4
RAM PICKUP - (4 DOORS) 4X4, (4 DOORS) 4X4
RAM QUAD CAB - (4 DOORS) 4X4, (4 DOORS) 4X4
RAMCRAWLER - (4 DOORS) 4X4

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All GM Transfer Cases are Remanufactured with the Latest O.E. Components
with Improved Clutch Packs to Eliminate Chatter Problems

ATLANTA - (4 DOORS) 4X4, (4 DOORS) 4X4, (4 DOORS) 4X4
ATLANTA - (4 DOORS) 4X4, (4 DOORS) 4X4, (4 DOORS) 4X4
ALL PICKUPS - (4 DOORS) 4X4, (4 DOORS) 4X4, (4 DOORS) 4X4
ALL PICKUPS - (4 DOORS) 4X4, (4 DOORS) 4X4, (4 DOORS) 4X4
BLAZER - (4 DOORS) 4X4, (4 DOORS) 4X4
TERRACON - (4 DOORS) 4X4, (4 DOORS) 4X4
COLORADO - (4 DOORS) 4X4
HUMMER - (4 DOORS) 4X4
ASTRO - (4 DOORS) 4X4, (4 DOORS) 4X4
EXPRESS - (4 DOORS) 4X4, (4 DOORS) 4X4

**Includes New Morse Chain*

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** Chatter-Free will not repair transfer cases that are already damaged!*

Please keep this application guide for future reference.

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Item	Part Number	Description
21	.7G360	Transfer-case shift motor
22	.N620480	Hex nut (3 required)
23	.7288	Shifter shaft seal
24	.7A010	Drain/fill plug
25	—	Identification decal (part of 7005)
26	.7005	Cover (with damper snubber) (serviced separately)
27	.7025	Bearing (front output shaft, rear)
28	.7A029	Drive chain
29	.7W074	Torsion spring
30	.7F063	Electric-shift-cam assembly
31	.7N095	Shift shaft
32	.7G450	Tone wheel (lower)
33	.7177	Driven sprocket (30T)
34	.7L027	Oil-pan magnet
35	.7064	Snap ring
36	.7025	Bearing
37	—	Dowel pins (2 required) (part of 7003)
38	.7005	Case assembly
39	.7061	Output shaft and flange (front)
40	.383976	Breather barb
41	.7B215	Input seal
42	—	Spiral pin (part of 7005)
43	.7A153	Ring gear
44	.7064	Snap ring
45	.7917	Snap ring
46	.7C430	Shift fork facing (2 required)
47	.7289	Reduction shift fork
48	.7240	Shift rail
49	.7G361	Clutch coil assembly
50	.7D221	Thrust bearing
51	.7917	Snap ring
52	.7025	Bearing (rear output-shaft support)
53	—	Identification tag (part of 7A195)

added power through planetary-gear reduction.

Using the 4x4 High range causes the transfer case to lock the clutch pack at maximum duty and achieves a 50/50 torque split front to rear. This mode should never be used on dry or rain-covered pavement, as it will cause wheel hop and stress on the differentials and will increase tire wear. This mode of operation is for use only on snow-covered roads or in off-road conditions, where the wheels have a chance to slip slightly to make up for driveline windup in turns.

For maximum pulling power, the driver can select the 4x4 Low position, which engages power flow through the transfer-case planetary gears and changes drive-shaft torque from a ratio of 1-1 to 2.48-1. Again, this mode should be used only on snow-covered roads and in off-road situations for maximum pulling power at very slow speeds. We once had a customer who had plowed his parking lot and then parked the truck without taking it out of 4x4 Low range. His wife then decided to take the truck on her shopping mission and drove

it on the highway at high speeds. When the truck finally quit on the highway, the transmission was toast, the transfer case had undergone a nuclear meltdown, and there was a nice-sized window in the engine block where a rod had exited before striking the pavement and blowing out a rear tire. Needless to say, this was a very expensive mistake.

This business has become a lot more sophisticated and difficult to control. One of the keys to survival and profit is to have the knowledge of how the units you are working

Item	Part Number	Description
54	.7A443	Bolt - hex-head (M10 x 1.5 x 30.0) (17 required)
55	.7A098	Oil strainer
56	.7A210	Pump hose
57	.382846	Hose clamp
58	.7100	High-low collar
59	.7061	Rear output shaft
60	.7A149	Pump assembly
61	.7Z111	Thrust washer
62	.7177	Drive sprocket (30T)
63	.7C108	Clutch-pack assembly
64	.7Z104	Insulator washer
65	.7064	Snap ring
66	.7917	Snap ring
67	.7025	Bearing (planetary-gear carrier support)
68	.7A385	Carrier thrust washer
69	.7017	Input shaft
70	.7025	Bearing
71	—	Output-shaft bushing (part of 7017)
72	.7B066	Thrust plate
73	.7D063	Sun gear
74	.7A398	Front planetary-gearset assembly

on function. Another key is to pass on that knowledge – in a simpler form – to your customers to make sure they are using the machinery in the manner for which it was designed. Assuming that the customer knows how to use the vehicle correctly is risk taking at the extreme.

In next month's article, we'll look at the electronic functions of the BW 44-11 transfer case. **TD**

THE BOTTOM LINE:

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87 Useful information.

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