

HOT OFF THE PRESSES!

In this, the first quarterly issue of *Rebuilder NEWS*, we provide insight into rebuilding Mazda Protege and model 323 transmissions, summarize TransTechnical Bulletins and new TransTec product announcements, and present articles that will make your life as a rebuilder a little easier.

Rebuilder News is a reference as much as it is a newsletter. Save the "Troubleshooter" articles as they address the most commonly experienced problems you'll face rebuilding transmissions. (Especially when working on new or redesigned transmissions intentionally designed to cause confusion.)

If you have a problem, tip or comments you would like to share with us, write to Editor, *Rebuilder News*, c/o TransTec, P. O. Box 556 Milan, Ohio 44846-9998.

Ford Throttle Linkage Leak Problem Solved by New TransTec Seal

A C3, C4, C6, FMX or A4LD comes back to you because of a throttle shaft leak problem. Sound familiar? If you're like the majority of transmission rebuilders, you've experienced this problem.

Sure, it's not a real major problem to fix, and you get that Ford back out on the road, but it's still a hassle.

To fix this problem once and for all, TransTec has developed a four-lobed seal (quad ring) to replace the O-ring. TransTec developed this seal for the aftermarket to correct the O.E. sealing problem.

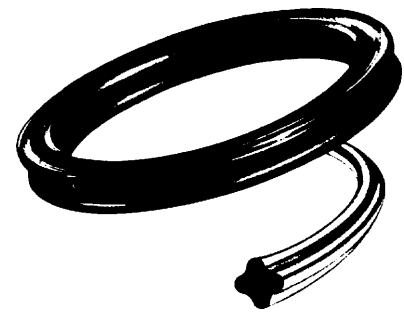
The sealing effectiveness of an O-ring for this application has been marginal, at best. In fact, in 1980, Ford used a metal-clad seal for this application in the AOD.

New Metal Case for Mitsubishi

In 1989, Mitsubishi made drastic changes to its full line of transaxles. One of these changes was on the case gasket. The material was changed from fiber to a rubber-coated metal gasket to improve sealing between the case halves.

The fiber gasket is 0.5 mm thick, compared to the 1.0 mm thick metal gasket.

The differential carrier in these



The new seal, TransTec #32568, features two sealing surfaces, both on the ID and on the OD.

This part has been fully field-tested and will be included in all kits for the Ford applications listed here.

The new seal will be included in all TransTec kits with a date code of C93 or later, as well as all other brand kits custom-packaged by TransTec.

It's very likely that other kit packagers will follow TransTec's lead and switch from an O-ring to the four-lobed seal. Again, TransTec is first, leading the way in transmission technology.

units has a tapered bearing and race on each side. Each half of the case houses one of the races, with a selective shim used behind one race to set bearing preload. Whenever tapered bearings are used, they must be set to the proper clearance or preload to prevent bearing failure.

If the 0.5 mm fiber gasket is used to replace the 1.0 mm metal gasket, the bearing preload would be increased by

Distribution Division Established

Freudenberg-NOK, headquartered in Plymouth, MI, has renamed its Aftermarket Division in Milan, Ohio to the Distribution Division. Four business units form the unit, which is headed by Philip Storm, senior vice president and general manager.

Those units are: TransTec (transmission and steering rebuild kits), World Seal Group, Fluid Power Sealing Products and Heavy Duty Oil Bath Seals.

The company also has made several personnel changes to support the new division.

David Gardner, formerly vice president of sales and marketing, has been promoted to vice president of operations. Gardner will maintain sales, marketing and distribution responsibilities for the TransTec business and will assume managerial responsibilities for the Milan facility.

David McGee has been promoted from manager of marketing and engineering services to the newly formed position of sales and marketing manager for TransTec. McGee will be responsible for sales and marketing activities relating to TransTec's product lines of transmission, power-steering and brake parts.

Keith Post assumes the position of product development and engineering services manager. Post will manage existing product development and assist in all of the division's sourcing decisions, in addition to maintaining future product development responsibilities.

Jeff Kuhl has been named sales manager of transmission products. Kuhl is responsible for all direct sales efforts of transmission related products. Kuhl was previously a regional manager for the division.

Metal Case Gasket for Mitsubishi *Continued from page 1*

the difference in thickness of the gaskets. This increase in preload could cause bearing failure.

Until now, all aftermarket kits have supplied the fiber gasket due to problems

in sourcing and pricing.

TransTec has sourced this part from the manufacturer who supplies Mitsubishi.

The metal gasket, TransTec #10012, will be included in all our 1989-UP kits.

Transmission Type	FWD 3-Speed	FWD 4-Speed	RWD 4-SP Lock-up*	RWD 4-Speed*	RWD 3-SP Lock-up *	RWD 4-SP Lock-up *
Transmission Model #	KM 171 KM 172	KM 175 KM 176	AW 372L	AW 372 KM 148 KM 177	TF 904	A500
TransTec Gasket Kit #	1120	1196	1127	1058	1023	1200
TransTec Overhaul Kit #	2120	2196	2127	2180	2023	2200

* Chrysler Built

•Aisin Warner Built

	KM171	KM172	KM175	KM176	AW 372	AW 372L	TF 904	A500
VAN								■
PICKUP 83-86								■
PICKUP 87-89								■
PICKUP 1990								■
MIRAGE TO 1989	■							
MIRAGE 1989-UP			■					
MONTERO 83-86								■
GALANT 85-87			■					
GALANT 88-UP V-6						■		
GALANT 88-UP 4CLY			■					
TREDIA TO 1984	■							
TREDIA FROM 1984		■						
CORDIA TO 1984	■							
CORDIA FROM 1984		■						
ECLIPSE				■				
PRECIS 87-88	■							
PRECIS 89-UP		■						

TransTec NEW PRODUCT ANNOUNCEMENTS

For additional product announcement information, contact your local distributor.

2/8/93

Acura Legend 4-Speed 1991-UP
Overhaul Kit #2256

Hydramatic 4L60E
(Electronic TH700-R4)

PRC Kit #1266 Overhaul Kit #2266

3/15/93

42LE (Chrysler A606)
Gasket Kit #1264
Overhaul Kit #2264

3/22/93

Mazda N4A-EL 1988-91
(RX7 and 929 applications)
PRC Kit #1257
Overhaul Kit #2257

4/10/93

Honda Prelude 1988-91
Overhaul Kit #2274
(includes axle seals)

Overhaul Kit #2182
(without axle seals)

“HONEY... I think I shrunk the transmission!”

By John Wozniak, TransTec Transmission Product Manager

Once upon a time, in a Far East Engineering Department, a single transaxle was designed, and not all that well, as failure rates would later prove. But the Way-Hi-Ups decided to put this thing into two different automobiles, one with an All-American name, the other with one of those neutered names which might spring from any nation, but as everyone knows, is Japanese. Ah-so ... the problem begins.

Once the transaxle was put into a Mazda 626, it was named G4A-EL. Yet installed in the Ford Probe, that very transmission magically became the 4EAT-G.

If they had let things stand like that, there would have been enough problems to suit anybody, but engineers seldom leave bad enough alone.

On a fateful day, Mazda realized they needed a new, smaller transaxle to fit into their 1990 model year 323 and Protege.

Oriental Rick To The Rescue!

Being practical fellows, those Far East Mazda Engineers turned to their local imitator of Rick Moranis who, without blinking, pulled a G4A-EL out of an old 626 they had lying around, said a few magical words, and ta-da! ... they had a shrunk-down little hummer ... which they promptly called the F4A-EL.

Not that it matters for the rest of this report, but symbolizing true international cooperation, Ford pulled their 4EAT-G

from the Probe, shrunk it, renamed it “4EAT-F,” and stuck it into the Escort. That was a clever move of course, since the Ford Escort and the Mazda 323 are almost the same car anyhow and are built on the same assembly line.

Mother Was Always Right

Because of the virtual identity thing, from time to time in this report I’ll need to refer to the Ford Escort so you can sort things out. Bear with me. Like ma used to say, “You’ll thank me for this someday.”

Let’s Change This ... and That...

Back to the F4A-EL in the Mazda 323. Those rascals couldn’t shrink the former transaxle down without futzing around with it a little. The thing you’ll spot, right off the bat, is that they moved the valve body from the side of the case to underneath the oil pan. While they were at it, they took the three accumulators out of the valve body and installed them in the case.

But for the most part, you’ll find the

same inside parts as before, just in a smaller version. Except, that is, for the oil pump; in the switcheroo, it quit being a vane-type pump and transmogrified into a rotor-type pump.

There’s no mechanical or hydraulic difference between the old and the new transaxles; they just now conform to the smaller space assigned to them by the Design folks.

Naturally, few parts in the new transaxle interchange with the old, or vice versa. Except for the converter seal and bushing, the axle seals and a few O-rings, forget any idea of interchangeability.

Here’s a tip. If you’re really up on the G4A-EL, you can quit reading now. If not, hang in there with me as we take a little tour of the F4A-EL. (No, for you old Navy and Marine pilots, this F4 is not the aircraft you grew to love.)

Mazda’s Selector Language

Hop in the driver’s seat and take a look at the gear selector pattern. The

F4A-EL CLUTCH CLEARANCE

CLUTCH PACK	MM	INCH	FRICTION/STEEL
3/4	1.3-1.6	0.051-0.063	4/4
LOW&REVERSE	2.1-2.4	0.083-0.094	4/4
REVERSE	1.0-1.3	0.039-0.051	2/2
FORWARD	1.0-1.2	0.039-0.047	3/3
COAST	1.0-1.2	0.039-0.047	2/2

NOTE: CLEARANCE SET WITH SELECTIVE SNAP RING

Mazdas and the Escort share some of the indicators, but not all. The Mazdas and the Escort use “P” for Park, “R” for Reverse, and “N” for Neutral. But then, somebody got “creative.”

Even though the results are the same, the gear selector position initials don’t stay the same. Don’t ask why.

Mazda’s Mystery “S”

The Mazdas’ forward positions are labeled “D,” “S,” and “L” but Ford labels the same positions with a “D” inside an “O” for Overdrive, then “D” and “L.” If you like guessing games, figure out what the Mazdas’ “S” stands for.

In Overdrive, the Mazdas’ “D” and the Escort’s “D-inside-O,” the trans starts in 1st and upshifts - depending on throttle position - to shift through 2nd, 3rd, and 4th.

When the Mazdas’ shift selector is in position “S,” which is “D” in the Escort, the trans works the same, except that 4th - which is Overdrive - is not available. And when any of these selectors is moved to the “L” position, the transmission will shift only between 1st and 2nd.

The Useless Button

Enter what I call the “Useless” button. Mazda sticks a “Hold” button on the shifter; when you push it, a “Hold” light glows on the left side of the dash, and now the trans works in a different way.

When you push the “Hold” button and move the selector to “L,” all you get is

1st; if you move the selector to “S” you get only 2nd. Move the selector to “D” and the trans starts off in 2nd, then quickly (at 25 mph) shifts into 3rd.

Ford’s Probe uses a similar setup which they call a “Manual Shift Button.” That - for me anyhow - is a better way to describe what the button does.

While we’re shifting along here, you need to note that both transmissions use the engine computer to activate the shifting itself. You won’t find a separate light that shows transmission faults; any hard fault in the engine or in the trans will light up the “Check Engine” indicator.

The F4A-EL’s Driveline

If you know how a TH700 works, you won’t have any problem with this. The F4A-EL’s friction and planetary elements work the same way as they do in a 700... Mazda just moved them around a bit. And with the exception of one clutch, Mazda even calls the friction elements the same things that they’re called in a Hydramatic.

Those friction elements include Forward, Reverse input, Low and Reverse, the Coast (Overrun) clutches, and one band, the 2-4.

Just as in the 700, the F4A-EL has one drum that holds three different clutch packs. Inside the drum you’ll find the Forward, Overrun and Reverse input clutches.

Mazda’s Tricky Twists

You need to be alert here, too, since

Mazda throws in a little twist. They put the 3-4 clutch in its own drum, instead of the 700’s reverse input. Maybe Mazda didn’t want to give the appearance of “borrowing” everything from GM.

In the trans, you’ll also find two one-way clutches, an input sprag and a low roller clutch. Watch for this Mazda twist; they call them “One-Way Clutch #1” and “One-Way Clutch #2.”

All the clutches, band, and one-way clutches operate at the same time they do in the 700, except for the overrun clutch. It is always on in 3rd gear.

In their shrink-down exercise, Mazda fixed the 700’s 4-3 downshift problem. Now the clutch coming on takes the strain off the sprag. The differential is a ring and pinion unit that uses tapered roller bearings on both the ring gear and the pinion gear.

NOTE: If you change any of the differential parts or change the case, you’ll need to set up bearing pre-loads. And when you put the two case halves together, you must use silicone sealer. Don’t use a gasket unless you like bearing problems.

Remember Hydraulics?

When you’re troubleshooting a computer-controlled trans, it’s easy to forget you’re really messing with hydraulics. Remember that while the engine computer tells the trans when to shift, hydraulics make things happen. When the engine computer turns the solenoids on or off, the solenoids are either exhausting hydraulic fluid or letting hydraulic fluid stroke the shift valves.

Might Be The Cable

This transmission is not fully computer-controlled; it uses a throttle cable to control mainline pressure. If there’s a problem with rough or soft

F4A-EL PRESSURES

RANGE	LINE PRESSURE(PSI)	
	IDLE	STALL (FULL T.V.)
D,S,L	61-81	132-152
R	105-127	216-249
RANGE	THROTTLE PRESSURE (PSI)	
	IDLE	STALL (FULL T.V.)
D	7-17	58-75

SOLENOID OPERATION CHART

Range	Gear		Specified light indication and Solenoid valve operation				
			1-2	2-3	3-4	Lockup	
H O L D	D	1st		ON	ON		
		2nd	ON	ON	ON		
		3rd	Below approx. vehicle speed A* at operating temperature				
			Above approx. vehicle speed A* or cold engine	ON			
	OD	ON		ON			
	S	2nd	ON	ON			
		3rd	Below approx. vehicle speed A* at operating temperature				
			Above approx. vehicle speed A* or cold engine	ON			
		OD	ON				
	L	1st		ON			
2nd		Below approx. vehicle speed B**	ON	ON			
		Above approx. vehicle speed B*	ON				

***Vehicle speed A** B6 SOHC: 5km/h (3.1 mph)
BP SOHC: 38km/h (24 mph)
BP DOHC: 28 km/h (17 mph)

****Vehicle speed B** B6 SOHC: 95 km/h (59 mph)
BP SOHC: 102 km/h (63 mph)
BP DOHC: 104 km/h (64 mph)

shifts, look at that cable before you do anything else.

To control shift timing, Mazda uses four solenoids: 1-2, 2-3, 3-4 and lockup. These solenoids control four shift valves which have identical corresponding number/names.

And, when each shift is required, the corresponding solenoid comes on, strokes the shift valve and the shift is made. *NOT! Doing things that way would make sense, and we all know better than to expect miracles.*

Fun with Solenoids

As we walk our way through the F4A-EL's innards, keep one eye on the solenoid Operation Chart and/or the Shift Valve Operation Chart. It'll strain your eyeballs, but nobody said it would be easy dealing with these things.

On this trans, the solenoids *exhaust when they are on*. When they're off, the plunger closes and the fluid strokes the shift valve. This, of course, is exactly opposite of how things work most times so when you attack one of these, remember:

SOLENOID OFF/SHIFT VALVE STROKED.

In 1st gear the 2-3 and the 3-4 solenoids come on *but the 1-2 stays off*. This solenoid strokes the 1-2 shift valve and *stops* hydraulic fluid from going to the apply side of the 2-4 servo. When the engine computer tells the trans to shift to 2nd, the 1-2 solenoid turns on, spring pressure releases the valve, and fluid is sent to the apply side of the 2-4 servo.

Third Shift Sequence

To shift to 3rd, a whole bunch of things need to happen. First, the 2-3 solenoid turns off, stroking the valve and

sending fluid to the 3-4 clutch. Next the 3-4 solenoid turns off and sends fluid to both the coast clutch and to the release side of the 2-4 servo. Even though the 1-2 shift valve is still sending fluid to the apply side, the release side is larger so it wins the battle and the band comes off.

It figures

In actuality, whether the 1-2 solenoid is on or off in 3rd makes no difference at all.

For 4th, the 3-4 solenoid comes on, shutting down coast clutch pressure and the release side of the servo. The apply side is already charged, so the band comes back on to provide Overdrive.

The last solenoid to deal with is the Lock-up. In 1st, 2nd, and 3rd, this solenoid is off, stroking the valve and shutting down the lock-up apply. Once the trans is in 4th and the computer decides it wants lock-up, this solenoid comes on and the spring pushes the valve back to generate lock-up.

Shift Feel Control

To control shift feel, the F4A-EL has four accumulators. The N-R and N-D accumulators cushion the shifts into reverse and drive respectively. The 1-2 accumulator sits between the 1-2 shift valve and the apply side of the servo to slow down the apply of the band. It doesn't affect 4th because the apply side stays charged through 3rd. The speed in which the release side pressure is released controls 4th shift "feel."

