BTR Engineering [Australia] Limited

BTRE
FOUR SPEED ELECTRONIC AUTOMATIC TRANSMISSION DEALER TRAINING SEMINAR REVISION IV

AUGUST 1994

Transmission Plant – Albury

BTR Engineering [Australia] Limited
A.C.N. 000 019 536
TRANSMISSION & AXLE DIVISION
Transmission Plant Albury
Kaitlers Road PO Box 245 Lavington NSW 2641 Australia
Phone (060) 41 9700 Fax (060) 41 9703

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Phone (060) 41 9700 Fax (060) 41 9703

TRANSMISSION & AXLE DIVISION

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It is hoped that these seminar notes will achieve the following objectives,

- Assist the field in diagnosing transmission and related complaints in order to maximise availability of the vehicle to the user.

- Provide feedback for both Ford and BTRE in order to enhance the system of information exchange between the consumer and the manufacturer.

- Establish a contact between BTRE & the field.

1.0 INTRODUCTION.

The M85,M91,M95,M93 & M97 are the model codes for the BTRE electronically controlled, 4 speed automatic transmission, equipped with a lock up torque converter.

Evolution of the 4 Speed Automatic Transmission

The M85 Automatic Transmission was first released by Ford in November 1989. This transmission was designed to suit the EA Series 2 Falcon with a 3.9 litre, 6 cylinder engine.

In June of 1991, Ford released a 5.0 litre V8 engine in the EB Falcon series vehicle. The transmission for this vehicle was designated a M95 transmission .

The major difference between a M85 & M95 is the of use of increased capacity bearings, gearset & shafts on the M95. Other changes were to suit the vehicle environment i.e. Converter & housing, Extension Housing, calibration etc.

The 4.0 litre, 6 cylinder EB Falcon was introduced in March 1992. A transmission to suit the 4.0 litre EB is called a M91. The M91 is again similar to the M85 except it uses increased capacity bearings, gearset & shafts (similar to the M95).

Plastic bodied on/off solenoids are also used in the M91, except for S6 in earlier versions. Later versions of the M91 & M95 have a Plastic bodied S6 solenoid & an Increased Contact Ratio - (ICR) gearset.

The new EF Falcon for release in August 1994 uses an improved 4.0 litre 6 cylinder & 5.0 litre engine. The transmissions to suit these two new model Falcons are have been designated M93 for 6 cyl & M97 for 8 cyl. The transmissions are again based on the M91 & M95 models but with the following modifications,

Conv. Hsg. has 9 bolt mount pattern on 6 Cyl.
Maincase has 9 bolt pattern for Conv. Hsg. mounting.
The economy 3~4~4L shift pattern is now 3~3L~4L, 6 cyl.
ECU upgrades for the I6 & V8.
Pump now has 19mm width gears ilo 25mm gears.
Converter impeller hub is now 6 mm longer,(to suit pump).
Pump gear body now has revised porting.
Front & Rear band adjustment is set by shims during assy.
Rear band has changed to suit shim type adjustment.
Manual 1st gear shift speed increased to 75 kmh.
Sealed breather on inhibitor switch * Introduced prior to EF.
S7 solenoid is now normally open ilo normally closed.
Power & economy modes swapped
Converter clutch control valve changed
Converter clutch regulator valve changed
C1 bias valve changed

2.0 TRANSMISSION DESCRIPTION

2.1 TRANSMISSION CONTROL SYSTEMS

There are seven (7) electronic inputs providing information to the electronic control unit (ECU) which controls the shift schedule, shift feel and line pressure. The ECU sends signals to the valve body which controls the application of the various elements, ie. clutches and bands. A pictorial representation of the transmission control system is shown below in figure 1.

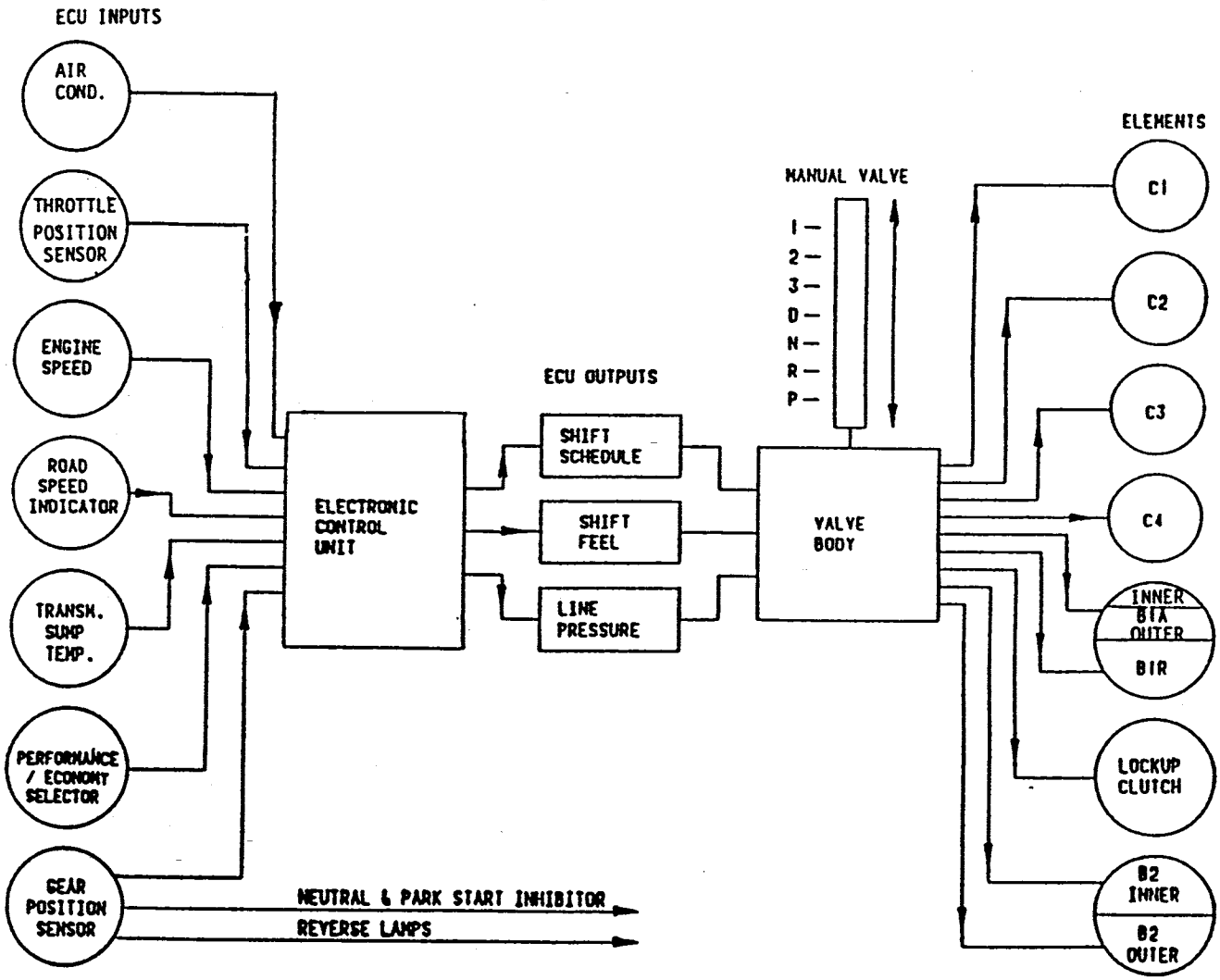


Figure 1. Transmission Control System.

2.2 POWER FLOW SYSTEMS

The transmission contains four multiplate clutch assemblies, two one way clutches (OWC) and two brake bands which are engaged or disengaged to achieve the required gears. These elements drive the components of a three pinion Ravigneaux gearset to achieve the desired gear ratios. Drive to the transmission from the torque converter is through the input shaft. Drive from the transmission is from the output shaft which is splined to the ring gear.

1st Gear: The C2 clutch drives the forward sun gear. The 1-2 OWC holds the carrier to prevent it from turning. The forward sun gear drives the short pinions turning the long pinions which drive the ring gear. There is no engine braking when slowing because the carrier overruns the 1-2 OWC and the forward sun gear overruns the 3-4 OWC. In manual first, the rear band is applied to hold the carrier and the C4 clutch is applied to provide to by-pass 3/4 OWC to provide engine braking.

2nd Gear: The C2 clutch drives the forward sun gear. The forward sun gear drives the short pinions which in turn drive the long pinions. The front band is applied holding the reverse sun gear stationary (because it is splined to the C3 cylinder), therefore the long pinion walks around the reverse sun gear taking the ring gear with it. The C4 clutch is engaged to provide engine braking on overrun.

3rd Gear: The C2 clutch drives the forward sun gear. The C1 clutch is engaged to drive the planet carrier through the overdrive shaft. Because the forward sun gear and carrier are being driven at the same speed the gearset is effectively "locked together", driving the ring gear at the same speed as the input shaft. The C4 clutch is engaged to provide engine braking on overrun.

4th Gear: The C1 clutch is engaged to drive the planet carrier. The front band is applied to hold the reverse sun gear stationary. As the carrier turns the long pinion walks around the reverse sun gear and rotates about it's axis, driving the ring gear at a faster speed than the input shaft. *Note C4 is dis-engaged in 4th.

Reverse : The C3 clutch is engaged driving the reverse sun gear. The rear band is applied holding the carrier stationary. The reverse sun gear drives the long pinion anti-clockwise driving the ring gear in the same direction.

2.3 HYDRAULIC CONTROL SYSTEMS

Solenoids

There are two types of solenoids used, on/off solenoids and a Variable Pressure Solenoid (VPS).

On/off solenoids can be either normally open or normally closed. Normally open solenoids allow oil to flow through when there is no power supplied to them and block flow when power is supplied. Normally closed only allow oil flow when power is supplied. Earlier on/off solenoids had steel bodies, Plastic bodied on/off solenoids have been in use since M91 (EB) introduction. From M93 & M97 there are no normally closed on/off solenoids.

The VPS varies the oil pressure depending on the current fed to it by the ECU. High current from the ECU gives low pressure and low current gives high pressure.

Line Pressure

The Primary Regulator Valve (PRV) provides oil at regulated pressure to apply the C2, C3 and C4 pistons as well as the rear band. Under light throttle the S6 solenoid is activated which reduces the line pressure. Under heavier throttle the S6 solenoid is switched off and high line pressure compensates for the increased engine torque. In reverse, line pressure is increased to boost oil pressure to the rear servo & C3 clutch piston to prevent slipping.

Gear Selection

Gear selection is achieved by a combination of activating solenoids 1 and 2 and the position of the manual valve. Table 1 shows the status of solenoids 1 and 2 for each of the gears.

Gear	S1	S2
1st	ON	ON
2nd	OFF	ON
3rd	OFF	OFF
4th	ON	OFF
Rev	ON	ON

Table 1. Solenoid Logic For Static Gear States

Regulated Clutch and Band Apply Circuit

The C1 clutch is the only shifting clutch in the transmission and therefore needs controlled application and release. This is achieved by a gradual increase in pressure of the oil supply to the C1 piston to achieve a smooth shift. Similarly the front band is a shifting band and needs controlled application and release to achieve smooth shifts. This is achieved by the use of the Variable Pressure Solenoid in conjunction with either the S3 (C1 apply) &/or S4 (front band) solenoids.

2.4 LUBRICATION

The oil from the transmission cooler circuit is returned via the rear cooler connector where it is then used as the transmissions lubrication oil. Under no circumstances should the transmission operate with restrictions in this circuit as they may lead to a major transmission failure.

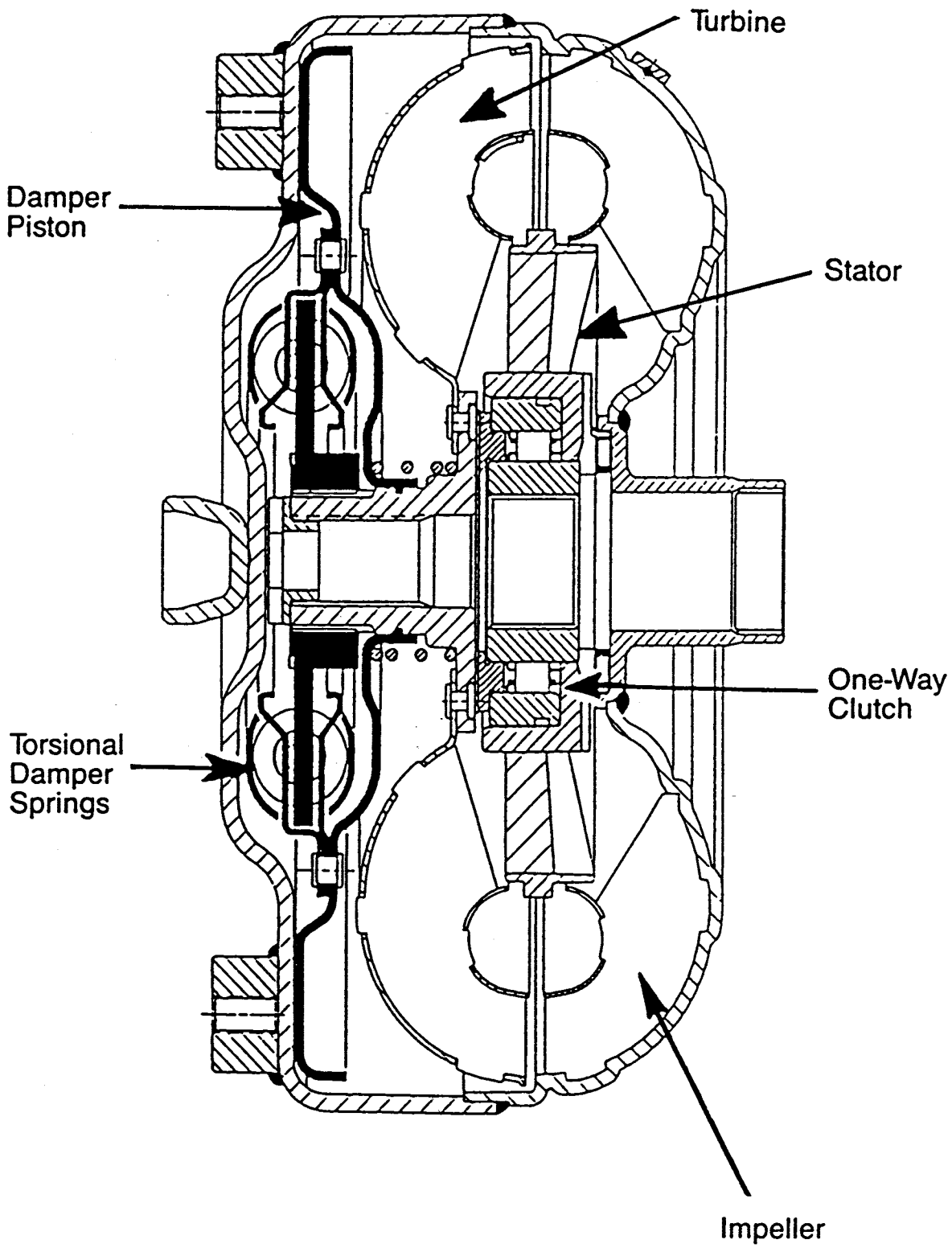
2.5 TORQUE CONVERTER

An excellent description of the function of the torque converter is given in the Ford Technical Training Bulletin No. 135. A cross sectional drawing of the torque converter is shown in figure 2, on the following page.

The torque converter cover is bolted to the engine's drive plate. This cover is welded to the impeller. Rotation of the engine drives the impeller which acts as a centrifugal pump. This causes the oil in the converter to rotate and forces the rotating oil toward the turbine. The oil drives the turbine which is splined to the input shaft.

Driving the turbine hydraulically leads to energy losses. To improve efficiency, when conditions are suitable, the lockup clutch is used. The lockup clutch can apply in 4th gear drive or 3rd gear when manual 3rd is selected on pre EF level vehicles. EF will lock-up in economy D-3. Application of the lockup clutch is controlled by the VPS to give a smooth shift.

Figure 2. Torque Converter Assembly.



3.0 EF TRANSMISSION DESCRIPTION.

The Ford vehicle upgrade due for release later this year has been designated an EF. Transmissions designed to suit the new vehicle are designated M93 for the 6 cyl. & M97 for the V8 version. The transmission & vehicle have significant improvements over the current ED. The following list describes the changes & reasoning behind the changes.

9 Bolt Transmission Maincase to Converter Housing Joint.

The transmission maincase to the converter housing joint has been improved from a 4 Bolt to a 9 bolt design on M93 only. This change required a new maincase & converter housing die. The change improves the NVH (Noise, Vibration & Harshness) of the vehicle to give reduced cabin noise. The EF maincase has 9 mounting bosses. The converter housing on the M93 has a nine bolt flange joint. The M97 remains with a four bolt joint but uses the same maincase.

3rd Locked Software & Hardware changes - 6cyl.

The ECU calibration has been changed **in the economy mode** to achieve torque converter "Lock-up" in 3rd gear when Drive is selected.

The 3~4 shift is completed with the torque converter **partially locked.** To achieve the 3L~4L shift the converter clutch regulator valve in the pump has been modified to accept a spring.

The shift pattern in economy will be 1-2-3-3L-4L.

If the normal shift mode is selected, the shift schedule is similar to ED power mode.

19 mm Pump Assembly.

The face width of the pump gears has been reduced from 25mm to 19mm. This change reduces the power required to turn the gears & hence improve fuel economy. A single slot in the pump body has been introduced to improve low speed pump capacity. The pump cover is spigoted to the pump body so an alignment tool is no longer required to align the pump body to the pump cover during assembly.

Deletion of Front & Rear Band Adjusters.

The deletion of the front & rear band screw adjusters has improved the setting consistency & reduced at least two more potential leak paths. The band adjustment is set by shims during the initial assembly or rebuild. Under normal conditions, the band settings will not require adjustment for the life of the transmission. The deletion of the screw type band adjusters will also reduce the possibility of inexperienced field mis-adjustments.

Increased M2~1 Inhibit speed.

The road speed has been increased from 60 km/h to 75 km/h for the M2~1 shift. This will allow for significant engine braking at higher speeds.

Sealed Inhibitor Switch.

The inhibitor switch vent through the 2 pin plug has now been deleted & sealed. The sealing of the vent prevents moisture entering the switch. * Introduced prior to EF.

S7 Commonisation.

The on/off S7 solenoid in the pump, that controls the lock-up of the torque converter, will be "Normally Open" . This makes all the On/Off solenoids in the transmission Normally Open. The change to the solenoid state required a new pump cover casting, converter clutch control valve/spring & plug.

The following list is of parts unique to M93/M97

Maincase assembly
Pump assembly
Converter assembly
Converter Housing - M93
Rear band

Code 67 V8 only.

Code 67 is generated by either disconnection of the data communication link between the EEC5 due to data corruption. The current ED software will detect only an incorrect frequency.

Control Module Changes.

The on/off solenoid fault detection now identifies the actual solenoid/circuit rather that simply detecting a solenoid fault.

If on/off solenoid #6 or #7 are deemed to be faulty the solenoid is disabled, but shifts are normal instead of disabling all solenoids & going to the limp home mode. The number of ignition cycles to clear stored faults is now 40 instead of 20. An ignition cycle is now achieved only when the transmission reaches 50 degrees.

The 5 minute time required to return to normal operating mode after a fault is detected, & not repeated, is now changed to 30 seconds for shaft speed, engine speed & throttle input faults and 3 seconds for the temperature, mode & gear position faults.

V8 - M97 Only

Gear lever, engine coolant temperature, & air conditioner status are now received to the transmission ECU direct via the EEC-V module. Any fault in these inputs or areas will need to include EEC-V in the diagnosis.

Throttle Learn

The throttle learn is independent of the air conditioner status. Previous software required that the air conditioner is off before throttle learn is conducted.

Throttle Learn Clearing Routine

The throttle learn clearing routine is now as follows, Key On Engine Off, (Normal mode was power mode)

1. In normal mode - 100% throttle.
2. Select economy - 100% throttle.
3. Select economy - 0% throttle.

Throttle Learn Procedure

1. Allow engine to idle in "D" for 60 seconds (closed throttle), once normal engine operating temperature has been achieved.
2. Key On, Engine Off (KOEO), hold the accelerator pedal @ 100% for 60 seconds (wide open throttle).

Engine Idle Speed

The engine idle speed will vary depending upon the transmission temperature or status,

Trans. state	Idle speed RPM.	Comm. link Freq.
LHM or no link	750	12 Volts
Thermistor fault	750	0 Volts
Trans.Temp. <105'c.	625	10 Hz
Trans.Temp. 105~120'c	675	20 Hz
Trans.Temp. 120~135'c	712	30 Hz
Trans.Temp. >135'c	750	40 Hz

New Fault Code

New fault code #15 has four possible root causes, Battery input circuit fault , Faulty internal ECU relay E^2PROM faulty , Short circuit On/off solenoid driver.

Fault Code #19

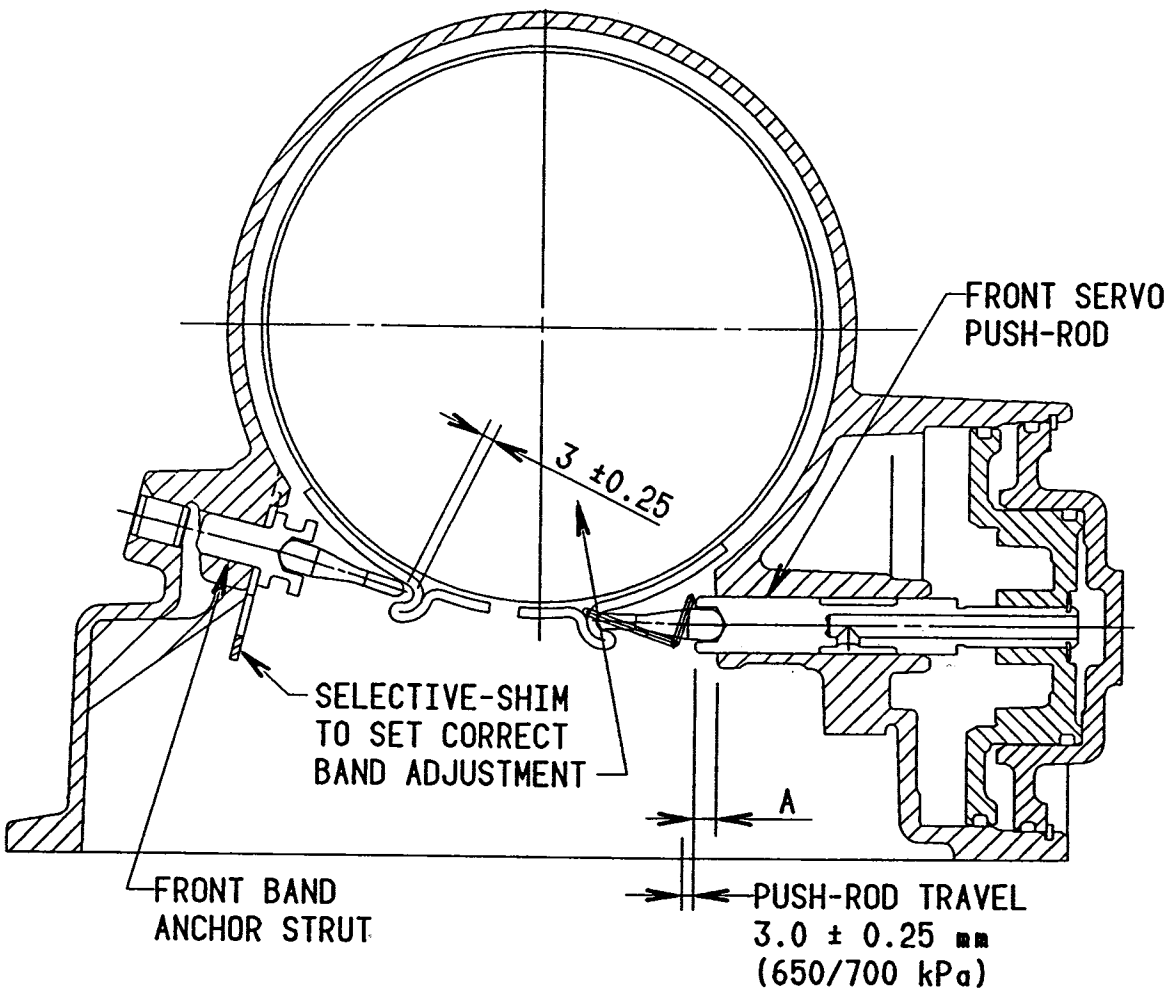
Fault code #19 will be generated when the battery voltage is greater than the 16.5 volts or lower than the minimum voltage of approximately 8 volts.

On/Off Solenoid Fault Detection

The On/Off solenoids now have a fault detection format which is capable of detecting an individual solenoid or circuit. Each solenoid is switched on in turn by a very small 100 micro second pulse. This pulse is too short for the solenoid to react so transmission operation is not effected. **This check is noticeable on the T2100-SAM tester by the solenoid light momentarily changing state.** The solenoid feedback voltage is measured before the pulse & again after the pulse, any difference in the readings will store a fault code for that solenoid.

3.1 EF FRONT & REAR BAND ADJUSTMENT

FRONT BAND SETTING PROCEDURE



1. Measure projection of Front Servo Push Rod from Transmission Case.

   1.1 Apply air at 650/700 kPa to the Front Servo apply area (B1 outer).

   1.2 Measure travel of Push Rod and subtract 3mm to find Shim size.

   1.3 Release Air.

   1.4 Fit Shim as per 2 below and re-check Push Rod travel in 3mm ±•25mm.

   NOTE

   A minimum of one Shim is required at all times - minimum Shim size is 1mm.

2. Fit the Shim(s) selected to the shank of the Anchor Strut as follows;

2.1 Inspect Shims for damage, wear or corrosion and replace as necessary.

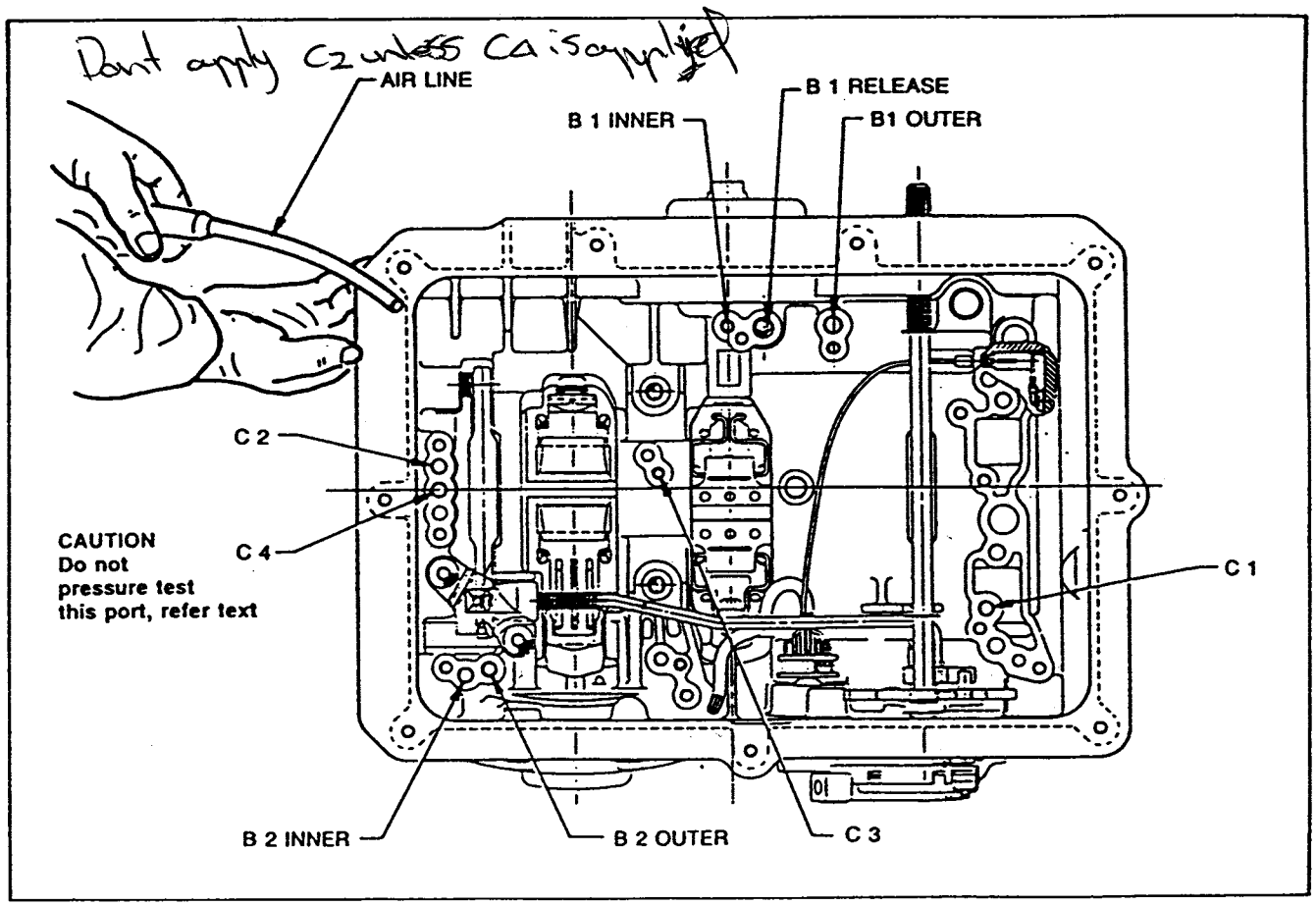
2.2 Shims are to be installed between the Case abutment face and the Anchor Strut flange.

2.3 Shim(s) are to be fitted by hand and under no circumstances to be hammered or forced.

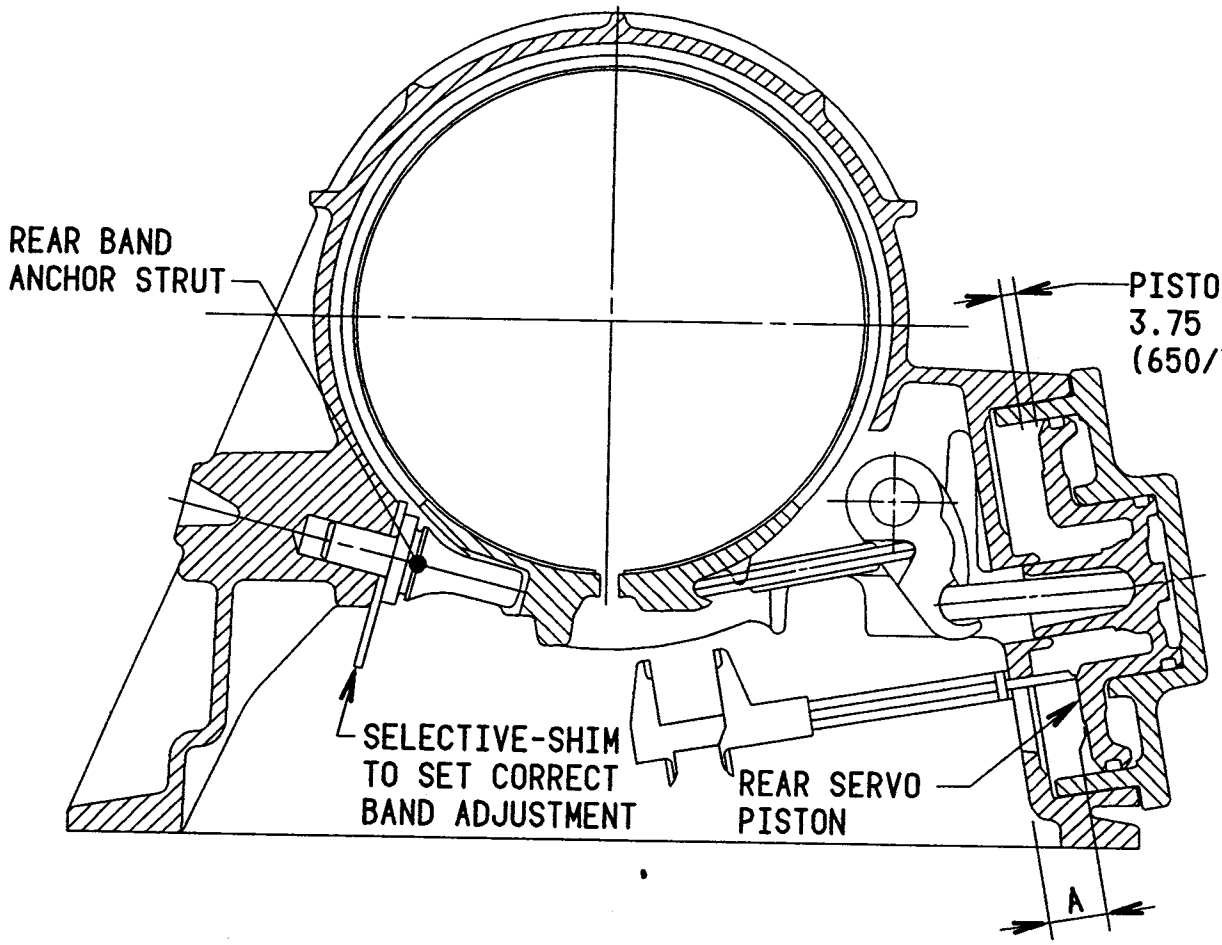
2.4 Shim(s) are to be pressed on by hand until an audible click is heard. The click indicates that the Shim is clipped home correctly.

3. The Shim thickness available are listed below;

THICKNESS	PART NUMBER	THICKNESS	PART NUMBER
0.95/1.05	0593-037009	1.93/2.07	0593-037013
1.15/1.25	0593-037010	2.12/2.28	0593-037014
1.44/1.56	0593-037011	2.42/2.58	0593-037015
1.73/1.87	0593-037012	2.61/2.79	0593-037016



REAR BAND SETTING PROCEDURE



1. Measure distance 'A' from the Rear Servo Piston to the inner face of the Transmission Case using vernier calipers.

   1.1 Apply air at 650/700 kPa to the Rear Servo apply area (B2 outer).

   1.2 Measure travel of the Piston, subtract 3.75mm and divide the remainder by 2.5 to find Shim size.

   1.3 Release Air.

   1.4 Fit Shim as per 2 below and re-check Piston travel is 3.75mm ± .625mm.

   NOTE

   A minimum of one Shim is required at all times - minimum Shim size is 1mm.

2. Fit the Shim(s) selected to the shank of the Anchor Strut as follows;

2.1 Inspect Shims for damage, wear or corrosion and replace as necessary.

2.2 Shims are to be installed between the Case abutment face and the Anchor Strut flange.

2.3 Shim(s) are to be fitted by hand and under no circumstances to be hammered or forced.

2.4 Shim(s) are to be pressed on by hand until an audible click is heard. The click indicates that the Shim is clipped home correctly.

3. The Shim thickness available are listed below;

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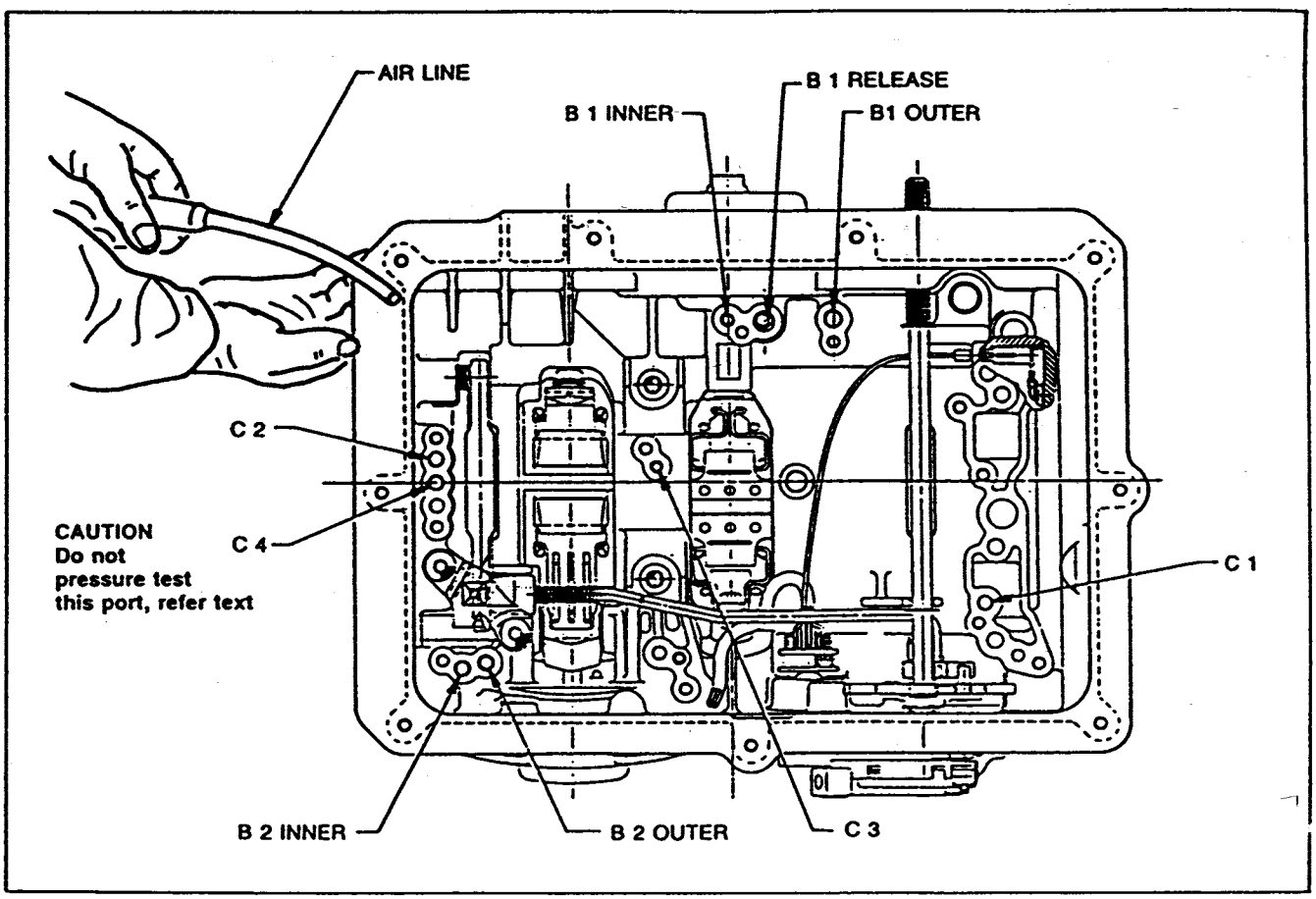
0.95/1.05	0593-037009	1.93/2.07	0593-037013
1.15/1.25	0593-037010	2.12/2.28	0593-037014
1.44/1.56	0593-037011	2.42/2.58	0593-037015
1.73/1.87	0593-037012	2.61/2.79	0593-037016



4.0 PRIOR APPROVAL PROGRAMS AUTOMATIC & MANUAL TRANSMISSIONS

There are two automatic transmission prior approval programs operating at present. The "in warranty" & the C3 Hub failure exchange program. The "in warranty" program applies to all "in warranty" transmission repairs. The C3 hub failure exchange program has been set up for the exchange of transmissions that have suffered a C3 hub failure within the extended warranty period.

The C3 hub exchange program was introduced on the 1st July 1993. A manual transmission prior approval program was set up on the 23rd May 1994. The prior approval program applies to all "in warranty" manual transmission repairs.

Transmissions supplied under the prior approval programs have a 12 month 20,000 km warranty, except where new car warranty exceeds this.

All of the above programs give BTRE a better understanding of field concerns to give the best possible service to the customer. BTRE has established a "008" telephone network. This network is designed to help in any transmission concern, advise corrective action & if required, issue prior approval (PA) numbers.

008 805 463 - To contact Fred Milne or Colin Brooks depending upon your location.

008 805 457 - To contact the transmission plant at Albury.

4.1 IN WARRANTY EXCHANGE PROGRAM - AUTOMATIC & MANUAL

All "in warranty" repairs on four speed automatic & manual transmissions require prior approval from BTRE before any work can be done on the transmission. This includes all parts warranty claims. No warranty claims will be paid on any repair work carried out without prior approval from BTRE.

If required, exchange transmissions are provided by BTRE at no cost with freight costs charged to BTRE. Details on the return of failed transmissions are included with the replacement transmission. Failure to follow these instructions may result in freight costs being charged to the dealer. Labour and parts costs can be claimed through Ford. Dealers sometimes carry out in warranty repair work without realising that prior approval is required to change the component or causal part is a transmission component. This mistake is commonly made with inhib.switchs, seals and gaskets.

Note: The speedo transducer is **not** part of the transmission and does not need a prior approval number from BTRE for any repair work where it is the causal part.

The procedure to follow for any in warranty transmission repairs is shown in the attached flow chart. The important details from the flow chart are listed below.

Fault diagnosis: To allow an accurate diagnosis a road test must be performed to establish what the fault is, when it occurs and other factors that influence the fault, such as the fault is worse when the transmission is hot or cold, under hard acceleration,etc..
If the transmission is reported to have an oil leak then the affected areas must be washed down to remove any excess oil and the vehicle road tested to establish the position of the leak before contacting BTRE.

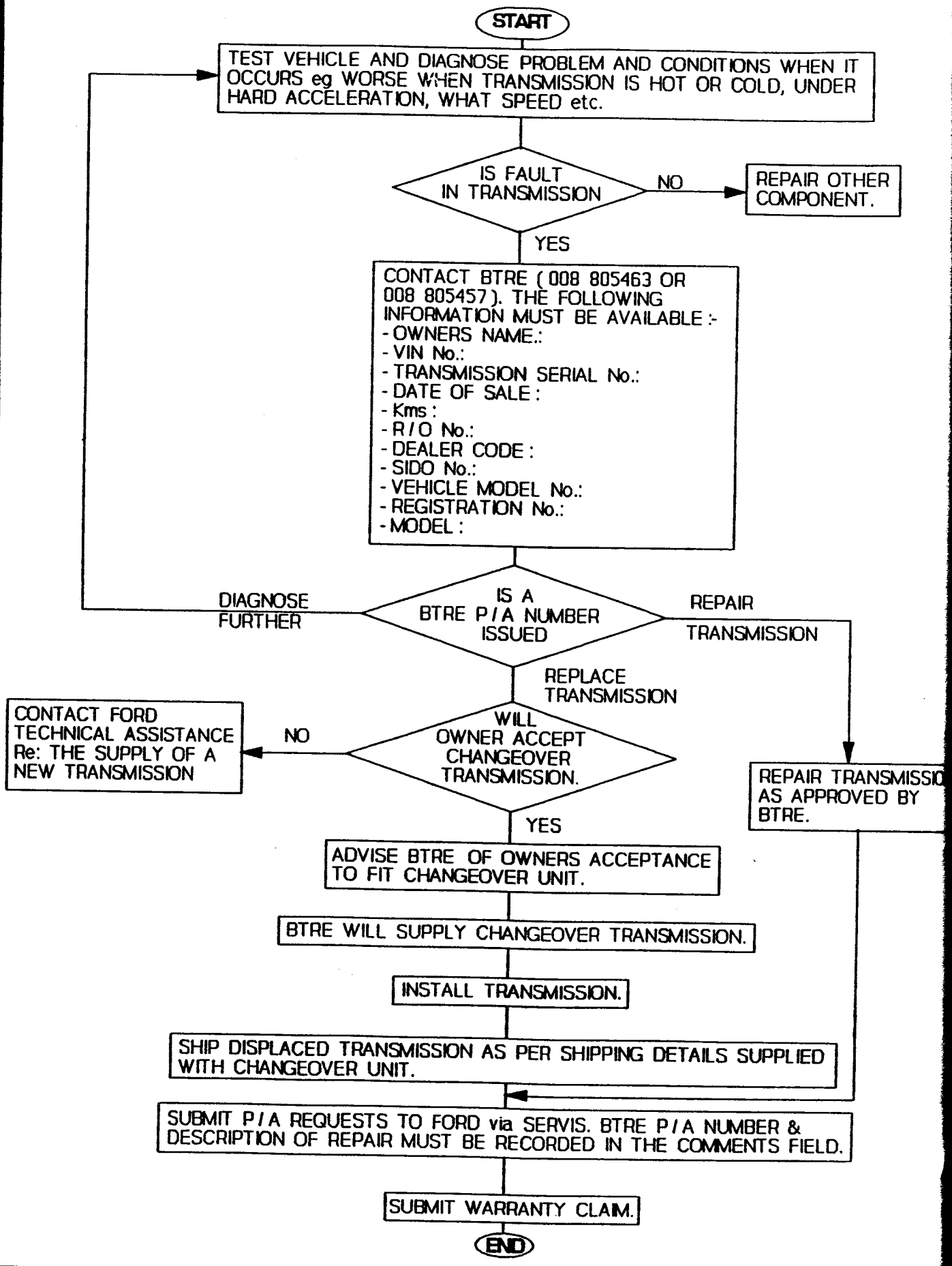
Vehicle details: To help in the quick issuing of approval to begin a repair or to replace a transmission please have all required details available when you ring BTRE. Details such as transmission serial number and distance travelled can be aids in the diagnosis of a problem. **Note an approval number will not be given without this information.**

Changeover trans.: It is a legal requirement that the owner is informed that a re-manufactured transmission is to be fitted. However, when informing the owner please emphasise that the transmission has been built by BTRE and undergoes the same testing as new transmissions.

Cooler lines: If there has been debris created when the transmission failed the cooler lines must be reverse flushed and the cooler flow checked once the new transmission is fitted as per BTRE service bulletin # 256, page number 117.

Return of trans.: When returning a transmission to BTRE please ensure that the shipping strap and plugs are fitted correctly, appropriate paper work is filled in and return the transmission by the appropriate method, otherwise the freight costs may be charged to the dealer.

TITLE: IN WARRANTY EXCHANGE PROGRAM PROCEDURE



4.2 C3 HUB CHANGE OVER PROGRAM

BTRE supply rebuilt transmissions as replacements for those that have had a C3 hub failure. To be eligible for this program vehicles must have been built before 30 April, 1991 and have travelled less than 100,000 kms.

Typical symptoms of a C3 hub failure are no reverse, driving forward in neutral and slipping and crunching in forward gears. There are some other transmission failures that will give similar symptoms as a C3 hub failure. For this reason the BTRE representative may ask you to do some further work on the transmission to confirm the C3 hub has failed.

Some owners take their vehicles to transmission repairers and contact Ford after the repairer has the transmission in pieces. In these situations the transmission is to be put back together, at the owner's expense, as well as possible before being returned to BTRE.

Exchange transmissions are supplied free of charge by BTRE and all freight is charged to BTRE, as long as transmissions are returned according to the attached instructions. Failure to follow these instructions may result in freight costs being charged to the dealer. Labour costs for removing and fitting the transmission and any towing costs can be claimed from Ford.

The procedure to be followed for C3 hub failures is shown on the attached flow chart. Important details are explained below.

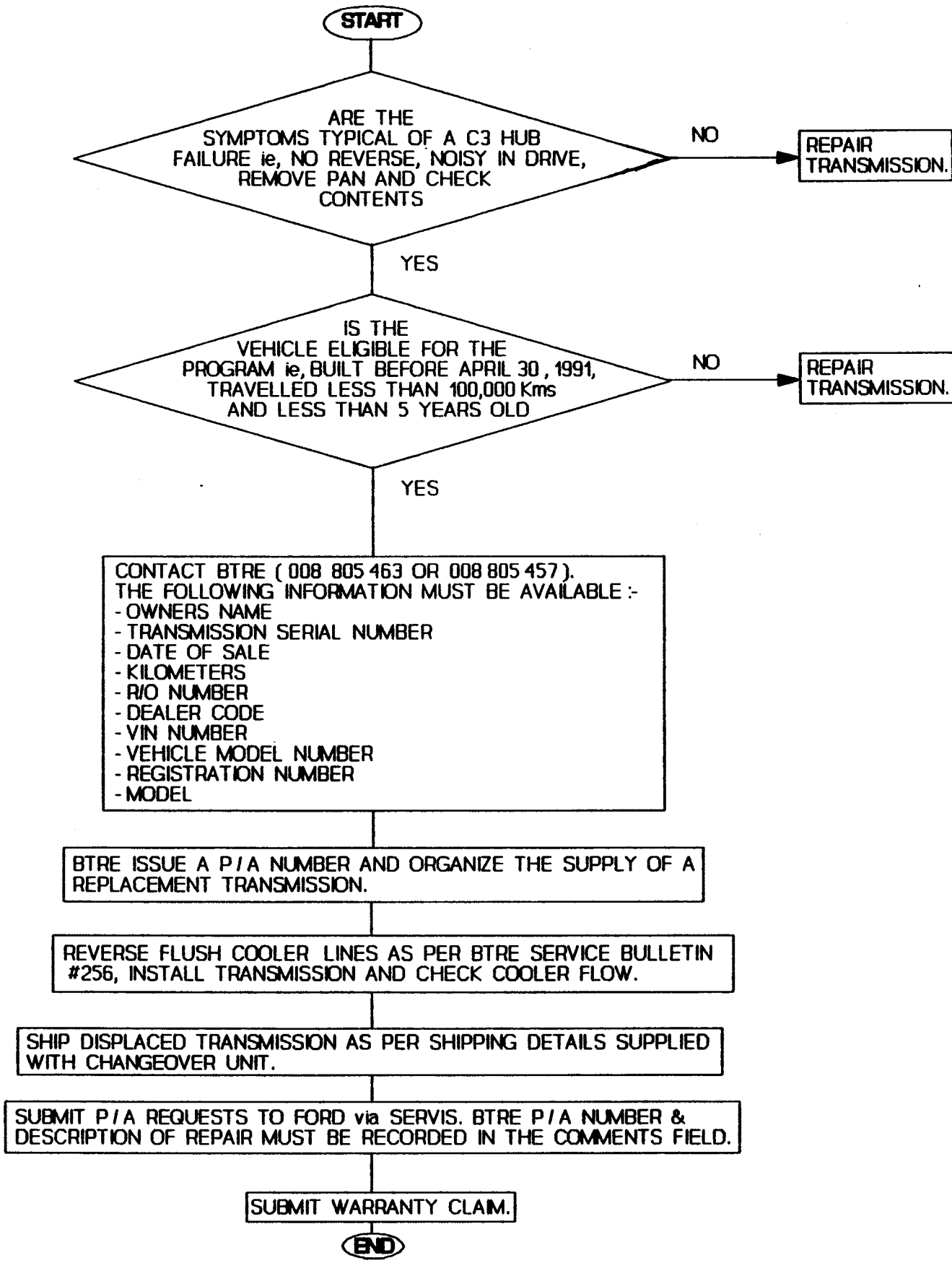
Diagnosis: Are the vehicles symptoms the same as a C3 hub failure check what type of debris is in the pan before ringing BTRE.

Eligibility: Before contacting BTRE ensure that the vehicle is eligible for the C3 hub exchange program, ie. built before April 30, 1991 and travelled less than 100,000 km.

Cooler Lines: Cooler lines must be reverse flushed and the cooler flow checked once the new transmission is fitted as per BTRE service bulletin # 256 on page 117.

Trans. Return: When returning a transmission to BTRE please make sure that the shipping strap and plugs are fitted correctly, appropriate paper work is filled in and return the transmission by the prescribed method, failure to do so may result in the freight costs being charged to the dealer.

TITLE: C3 HUB EXCHANGE PROGRAM PROCEDURE



5.0 CURRENT TRANSMISSION FAULTS

This section describes the faults that have been found since the introduction of the model 91 transmission.

5.1 DRIVETRAIN FAULTS

Gear Noise

With the changes to the vehicle systems that have developed over the subsequent models (EA2,EB,EB2 & ED) an increase in the incidence of customer dissatisfaction with NVH levels has been experienced in some models of Falcon vehicles.

In order to assist in the reduction of NVH levels within the vehicle cabin, a new design of gears has been introduced into production. Correspondingly, new levels of transmissions have been released to reflect this new design of gears.

These transmissions have a design of gears which has increased the profile of the contact ratio between the long planet pinion & the ring gear. An increase in this parameter of the gear reduces the forces & levels off vibration at the gear mesh. This correspondingly reduces the contribution of the automatic transmission gears to the creation and propagation of unwanted system vibrations. This should then lead to a reduction in reported NVH levels & hence the levels of customer dissatisfaction. For further details refer to service bulletin #255 on page #111.

A slip yoke damper has been fitted to the tail shaft of short wheel base V8 vehicles since late in 1993 which has resulted in reduced vehicle NVH noise levels.

Worn Overdrive Shaft Sealing Rings

This usually results in the C4 clutch or the front band burning out. These elements burn because there is oil flowing to the C4 piston (therefore applying the C4 clutch) in fourth gear which tries to drive the forward sun gear at the same speed as the rest of the transmission. This will cause the transmission to feel like a partial "tie-up" in fourth gear and results in either the C4 clutch or front band slipping and then burning. This problem usually occurs inside the two year 50,000 km warranty. Refer service bulletin #227b on page 76.

When the C4 burns the transmission will loose engine braking. After C4 burns it causes the C2 clutch to be partially applied at all times causing "tie-up" in reverse and drive in neutral & eventually causing the C2 clutch to burn out.

A burnt front band will not hold the C3 cylinder causing the transmission to slip in second and fourth gear or loose these gears all together. The transmission will select these gears electrically but it will seem like it remains in first or third gear. The heat generated by the slipping front band may melt the C3 piston large 'O' ring causing the loss of reverse.

Sealing rings usually wear because of rough surface finish in the sealing ring groove and for this reason overdrive shafts with damaged sealing rings must be replaced.

No Third or Fourth Gear

This problem has been found to be caused by a broken C1 hub, broken overdrive shaft, broken planet cover spigot or burnt C1 clutch pack. It usually results in first gear being achieved when the transmission should be in third and second instead of fourth. These symptoms can be mistaken for loss of drive when third gear is selected.

Broken C1 Hub - C1 hubs have been found to fail between the inner spline & the hub body.

Broken Overdrive Shaft - The overdrive shaft has been found to fail between the long shaft end & the step up to the 4 sealing ring groove diameter.

Broken Planet Cover - The planet cover spigot fails where the spigot joins the flange.

Burnt C1 Clutch Pack - The C1 clutch pack has been found to burn if the transmission is low on oil, the C1 piston is cracked (only seen on high mileage vehicles) and if the input shaft sealing rings are damaged when the pump is fitted.

Harsh Reverse Engagement

There are two distinct types of harsh reverse engagement. One is due to incorrect assembly, such as leaving the C3 wave washer out. This results in a very severe reverse engagement. Other complaints of harsh reverse engagement are only slightly worse than normal reverse engagement.

When forward or reverse drive is engaged from neutral there will always be some noise as the driveline absorbs the drive. This is normal transmission function and may improve with time, but is more noticeable in some vehicles. To improve reverse engagement multi-grooved friction plates, the same as those used in the C2 clutch, are now being used in the C3 clutch pack. Refer service bulletin #268 on page 130.

No Forward Drive

Known causes of loss of forward drive are a seized pump, stuck primary regulator valve (PRV), burnt C2 clutch plates, gearset failure and C1/C2 cylinder failure all of which can also cause loss of reverse drive as well. Incorrect operation of the C2 clutch causes loss of forward drive only.

Seized Pump - Pumps have been known to seize due to the gears picking up on the pump body or cover and contamination jamming the gears. Usually when the pump seizes, the drive tangs break off the converter, although this has been known to happen without the pump seizing. The line pressure can be checked in transmissions with an external line pressure plug to indicate whether the pump is turning.

Stuck PRV - This usually causes insufficient line pressure which may cause the clutches to slip or lead to the C2 clutch burning out and loosing forward drive, or C3 clutch burning out loosing reverse drive.

Gearset Failure - Can be caused by contamination of gearset, mechanical failures or lube failure.

Incorrect Operation of C2 Clutch - Can be caused by cracked C2 pistons, cut 'O' ring on C2 piston or blocked C2 feed hole in C1/C2 cylinder, either due to contamination or the steel sleeve walking out.

No Reverse Drive

As well as the problems that also produce no forward drive, no reverse drive can be caused by a broken rear band or the C2 clutch being jammed on, which also results in drive in neutral.

As mentioned previously if the C4 clutch burns out the C2 is jammed on causing the transmission to tie-up in reverse. This has been known to happen in high mileage transmissions if the C2 piston has cracked, therefore applying the C4 clutch in fourth gear.

No Second and Fourth Gears

This indicates that the front band is not applying correctly. The most common recent cause for this is the front servo adjusting screw walking out, which usually doesn't happen below 20,000 km. Other causes are a broken front servo piston and a dislodged cavity plug screw. This screw has been deleted on transmissions built since 26/7/93 when the piston return spring was enlarged to hold the cavity plug in place.

If the C4 piston is applied in fourth gear it may cause the front band to burn out rather than burning out itself.

No Fourth Gear

A high mileage failure known to prevent the transmission from changing up to fourth gear is the C1 bias valve spring breaking. The broken pieces of spring find their way through the hydraulic tracking and jam the 3/4 shift valve. Note this has only been found in transmissions built towards the end of 1992.

5.2 OIL LEAKS

It is difficult to wash all the oil off a transmission after it has been built. Therefore, some new transmissions will have some residue oil on them that may form drips and appear to be an oil leak. **For all reported oil leaks the affected area should be cleaned down and the vehicle run to confirm the source of the leak.**

Pump Assembly

The highest incidence of reported leaks are attributed to the pump. When diagnosing a pump leak, try to observe the source of the leak. If the converter is removed it may spill oil, making it difficult to identify the source of the leak. Pumps may leak from the seal, between the pump body and cover, past the valve plug 'O' rings and between the cover and main case.

Oil leaking past the seal can flow down the middle of the pump body or be sprayed around the inside of the converter housing. The leak may be due a seal fault or damage on the converter hub where the seal runs. The converter will need to be replaced if the hub is damaged.

Rear Servo

The paper gasket was superseded on 1/10/92 by a thicker paper gasket with silicon beads around the pressure ports. The new gasket reduced the number of leaks but some allow an oil weep.

On 16/11/93 a new gasket was introduced. The performance of this gasket in the field was not as expected and the previous gasket was reintroduced on 18/5/94 with a new rear servo cover. The gasket with silicon beads should be used to replace the rubber gasket whenever a transmission is repaired.

To diagnose a rear servo leak drive the vehicle onto a hoist and do a reverse stall to confirm or establish the leak point.

Extension Housing Seal

The dust cover of the seal may contain residue oil from installation, make sure there is no oil trapped here when checking for leaks. Some extension housing seal leaks are due to damaged or faulty drive shaft yokes or have been damaged on installation of the yoke.

Cross Shaft Seal

The cross shaft seal design is under review for further improvements. When replacing the cross shaft seal use the correct tooling. **Damaged, rusty or burred shafts must be repaired before fitting the new seal.**

Extension Housing Gasket

A new extension housing gasket was introduced on 17/9/92 since then there have been very few leaks past the gasket confirmed. Any repairs for extension housing gasket leaks should use the new gasket.

Front Servo

Front servo 'O' ring leaks can be due to porosity in the case, faulty machining of servo cover or case, damaged cover 'O' ring or an improperly installed snap ring.

Line Pressure Plug

The external line pressure plug has now been deleted due to the number of leaks from this area.

In early M91 and M95 transmissions there were a small number of leaks from the area above the line pressure plug due to porosity in the case. Leaks from this area are no longer a problem since the deletion of the external line pressure plug, casting changes and improved leak detection.

Pan Gasket Leaks

Leaks reported as pan gasket leaks usually originate at some other point and have gravitated to the pan. The only confirmed leaks are due to folded gaskets and a few due to damage to the case. If the gasket is folded oil flows past the gasket giving an excessive leak.

5.3 HYDRAULIC FAULTS

On/Off Solenoids Sticking

The on/off solenoids can be jammed by contamination usually resulting in restricted flow of oil through the solenoid. This problem usually results in harsh 1-2 shifts especially cold due to the S1 solenoid being blocked. As the oil heats up it will flow through the reduced orifice more readily making the problem less noticeable. S2 solenoids also suffer from this problem resulting in harsh 2-3 shifts cold.

Faulty Variable Pressure Solenoid

This had been a observed in the past due to worn solenoids and contamination jamming the solenoid spool valve. The wearing problem was fixed by the new VPS damper arrangement introduced on 16/9/91. This kit should be included on any valve body upgrades. A filter has been fitted to the "nose" of the VPS since 24/9/93, which prevents contamination entering the solenoid.

Transmission Cooler Circuit Problems

The transmission cooler circuit return oil also provides the lubricating oil. If this circuit is restricted then there will be insufficient lubrication for the transmission causing it to fail. Common causes for restrictions are: incorrectly fitted auxiliary coolers causing kinks in lines, lines being damaged in an accident and debris blocking the cooler flow.

The early XG utes and vans had a problem with the cooler lines "blowing off". This causes the friction elements to burn out which may lead to a loss of drive, slipping in some gears or harsh shifts. Refer Ford recall # RCM 079 Aug. 1993.

5.4 ELECTRICAL FAULTS

Service Bulletin # 237 on page 88 gives an outline on how to diagnose electrical faults. Common electrical faults are listed below.

Vehicle Shudders Slowing Down/Power Light Flashing

This symptom occurs if there is a fault with the thermistor in the transmission. Check the connections to the thermistor if these are OK, then the fault may be in the thermistor which will need to be replaced. The thermistor cannot be bought separately & is only available as part of the wiring loom.

Wire Pushing Out of 10 Pin Plug

This causes the transmission to go into limp home mode but may not be detected when doing a resistance check because there is a point contact that only causes resistance when more current passes through it.

6.0 PREVIOUS TRANSMISSION FAULTS

This section covers faults that were seen in the model 85 transmission but have been corrected in current production.

6.1 DRIVETRAIN FAULTS

C3 Hub Failure

As mentioned in the section on the C3 hub exchange program, the typical symptoms of this type of failure are slipping in reverse, driving in neutral and crunching in forward gears. If a C3 hub failure occurs within the parameters of the exchange program you must contact BTRE for a replacement transmission.

A redesigned sintered hub was introduced in March 1991 with a 5^0 taper on the circlip face.

In March 1992, a forged steel C3 hub was introduced, since then there have been no failures in the same mode as the C3 hub failure. This hub can be identified by the groove at the base of the spline approx. 3mm wide. For any trans. rebuilds replace any older type C3 hubs with the new style hub.

If a C3 hub failure has occurred you must reverse flush the cooler circuit and check cooler flow as per service bulletin # 256 on page 117 to ensure that debris has not restricted flow and thus preventing a further failure.

Bearing Failures

This is usually caused by the thrust faces the bearings run against being out of flat. The bearings that are most likely to fail are the number three, seven and eight bearings. If there has been a bearing failure it is important to check the cooler flow to make sure the debris has not caused a flow restriction.

- #3 bearing failures result in a whine from the torque converter on a light stall, (just above idle).

- #7 & #8 bearing failures usually result in pieces of the bearing destroying the gear set causing driveline noise.

Sealing Ring Failures

This mode of failure is the same as what is described in the section on current problems. Refer page #16.

No Engine Braking

If the vehicle has no engine braking in manual low, second or third gear it may be either a mechanical problem with the C4 clutch or electrical problem.

The C4 clutch plates burn if C4 is applied in fourth gear. Common causes of this fault are cracked C2 pistons and worn sealing rings on the overdrive shaft or output shaft. If the C4 is applying in fourth gear it can usually be felt after changing into fourth because the transmission feels like it is tying up.

If there is a problem with the resistance from the inhibitor switch two pin plug then the ECU will assume the vehicle is in drive even if one of the lower ratios is selected. Thus the lower ratios cannot be used to slow the vehicle down with engine braking.

6.2 OIL LEAKS

To determine the source of an oil leak the transmission should be thoroughly washed down to remove any residue oil. The vehicle should then be road tested to confirm the source of the leak.

The pan gasket is often mistaken as the source of the leak because the oil has gravitated to the lowest point. Pan gasket leaks are unusual and when they occur it is usually a major leak.

The more common sources of oil leaks are:

- cross shaft seals;
- pump cover seal & valve plug 'O' rings;
- pump cover porosity;
- cracked line pressure boss;
- cooler line fittings;
- rear servo cover;
- speedo sender;
- band adjustment screws; and
- breather (caused by overfilling or damaged output shaft sealing rings).

Note: If the oil level is too high it may cause oil to leak from the filler tube (past the 'O' ring or out the top of the tube), from the cross shaft seals or out of the breather.

6.3 HYDRAULIC FAULTS

Transmission Oil Faults

If the oil level is too high it may cause leaks or delayed engagement of manual low, because the rear band takes longer to wipe the oil off the drum.

Low oil will cause a loss of drive due to insufficient line pressure and will lead to the C1 clutch and/or the front band burning out.

If the incorrect type of transmission fluid is used it may lead to harsh shifts, slipping on drive and premature gear failure. Refer service bulletin #208 on page 47.

VPS (S5 solenoid) Failure

This most noticeable due to a harsh 1-2 shift that gets worse as the transmission gets hotter. There are four different modes of this type of failure:

- External nose wear, which is caused when the solenoid is allowed to move axially, refer BTRE service bulletin #212 on page 50. To prevent this the solenoid is now retained by a piece of spring steel that clamps the solenoid against the valve body.

- Wear of the internal spool valve and bore in the VPS. This problem was corrected with the introduction of a new piston and damper arrangement in September 1991. Any upgrade of a valve body in a transmission built before then should have the new piston and damper assembly fitted. Refer service bulletin #225 on page 70.

- Contamination of the solenoid causing the spool valve to stick. This has been rectified by the addition of filters to the VPS on transmissions built since September 1993.

Note: A broken S5 damper spring can give the same symptoms. The introduction of the new piston and damper assembly also rectified this problem.

Insufficient Lubrication Fluid

As per the section on cooler circuit problems in the current problem listing. This type of failure usually occurs in older vehicles after an accident where the cooler lines have been crushed or kinked during a repair, after the radiator has been repaired, or if an auxiliary cooler is incorrectly fitted.

Hydraulic Buzz

The different types of buzz noises that were present in the early transmissions are described in service bulletin # 216 on page 51, which also describes what causes each noise.

Humming Noise on Roll Down

This noise is transmitted through the vehicle body if the cooler lines are touching the vehicles body, the K frame, each other or the motor. The noise can be eliminated by isolating the cooler lines.

Firm 2-3 Shifts

This may be caused by a worn CAF ball, (the large nylon ball found in the lower valve body), and also results in firm 2-4 and 4-2 shifts. If the CAF ball is worn replace the valve body separator plate, refer service bulletin #225 on page 70.

6.4 ELECTRICAL FAULTS

Service bulletin # 237 on page 88 gives an outline on how to go about diagnosing electrical faults.

Limp Home Mode

Some of the more common causes for electrical faults in earlier transmissions that will result in the vehicle going into limp home mode are listed below.

- Contamination behind the plastic covers of the on/off solenoids, shorting the terminals on the solenoid case. To fix this remove the plastic covers and wash away and debris.

- Loose terminal connection to spades on on/off solenoids and the VPS. Crimping the terminals to increase the contact with the spades will correct this problem.

- Loose connections in the vehicle to earth or to the battery.

- Low or high battery voltages. These faults usually will cause the transmission to go into failure mode without producing any fault codes.

- Wiring harness touching exhaust manifold. This may have happened and damaged the wires inside the harness with little visible sign of damage to the exterior of the harness.

- Insufficient spring pressure on the S7 connector.

Harsh Change on Rolldown

This is usually due to a faulty throttle position switch and will also cause a delay in upshifts, eg. transmission will not select fourth gear at 60 km/hr.

7.0 DIAGNOSIS

7.1 CHECKS THAT CAN BE DONE BEFORE REMOVING TRANSMISSION.

1. OIL LEVEL, COLOUR AND SMELL, HOT (80'C).
2. ECU FAULT CODES (IS TRANS. IN LIMP HOME MODE?).
3. BATTERY TERMINALS AND EARTH CONNECTIONS.
4. LINE PRESSURE - 'D' AND 'R' HIGH AND LOW LINE.
5. ENGINE STALL SPEED.
6. COOLER FLOW/RESTRICTIONS.
7. ALL ELECTRICAL PLUG CONNECTIONS ARE TIGHT.
8. ROAD TEST TO CONFIRM SYMPTOMS.
9. REMOVE PAN AND EXAMINE CONTENTS.

DIAGNOSING OIL LEAKS

To confirm oil leaks the affected area should be cleaned down and the vehicle driven to confirm the source of the leak. Rear servo cover leaks can be identified by doing a reverse stall with the vehicle on a hoist. To check a front servo leak run the vehicle on a hoist in 2nd gear.

7.2 NO DRIVE IN "D"

NO ATF
"Z" LINK NOT FITTED
3-4 OR 1-2 OWC IN BACKWARDS OR FAILED
O/D SHAFT OR INPUT SHAFT SEALING RINGS FAILED
C2 PISTON BROKEN
PRV JAMMED OPEN
C2 FRICTION PLATE TEETH WORN
C2 HUB WELD BROKEN
C3 HUB FAILURE

7.3 NO DRIVE IN REVERSE

CHECK FOR ENGINE BRAKING IN MANUAL LOW FOR REAR BAND APPLICATION, IF NO ENGINE BRAKING CHECK REAR BAND OR SERVO.IF ENGINE BRAKING OK CHECK C3. C3 HUB OR C1/C2 CYLINDER FAILURE.

7.4 FAULTY SHIFT PATTERNS & POSSIBLE CAUSES

2-3 SHIFT ONLY (NO 4th OR 1st)
S1 ALWAYS OFF, WIRING FAULT (OPEN CIRCUIT), STUCK SOLENOID.

1-4 SHIFT ONLY
S1 ALWAYS ON, STUCK SOLENOID OR WIRING FAULT.

4-3 SHIFT ONLY
S2 ALWAYS OFF, WIRING FAULT (OPEN CIRCUIT), STUCK SOLENOID

1-2-NEUTRAL
S2 ALWAYS ON (ie 1ST WITHOUT C4)

1-3 SHIFT ONLY
B1 FAILED, LOOSE ADJUSTMENT, FRONT SERVO PISTON OR SEAL FAILURE. S1/S2 BALL MISPLACED.

1-3-4 ONLY
SMALLER 'O' RING ON FRONT SERVO PISTON FAILED OR MISSING. 2-3 SHIFT VALVE JAMMED.

1-2-1 ONLY
C1 FAILED OR SLIPPING IN 3RD & 4TH. GIVES 1ST IN 3RD & 2ND IN 4TH.

NO MANUAL 4-3, 3-2 OR 2-1
C4 FAILED OR C4 WAVE PLATE BROKEN. OC/LOW BALL MISPLACED.

NO MANUAL 1ST
REVERSE/LO-1ST BALL MISPLACED. REVERSE SLIPPING WHEN HOT. REAR SERVO INNER 'O' RING MISSING. C4 FAILED OR C4 WAVE PLATE BROKEN. REAR BAND OUT OF ADJUSTMENT.

1ST GEAR ONLY OR 2ND, 3RD & 4TH ONLY
1-2 SHIFT VALVE JAMMED OR INHIBITOR SWITCH FAULT.

1ST & 2ND ONLY OR 1ST, 3RD & 4TH ONLY
2-3 SHIFT VALVE JAMMED OR INHIBITOR SWITCH FAULT 1-2 ONLY

1ST, 2ND, & 4TH ONLY OR 1ST, 2ND, & 3RD (TIED UP IN 3RD)
3-4 SHIFT VALVE JAMMED OR EXHAUST RIB DAMAGED. INHIBITOR SWITCH FAULT 1-2-3 ONLY.

7.5 SHIFT QUALITY FAULTS & POSSIBLE CAUSES

ALL SHIFTS FIRM

WRONG ATF, S5 FAULTY OR WORN/INCORRECT FITMENT. BAND APPLY & CLUTCH APPLY REGULATOR SPRINGS MISPLACED.

VERY FIRM 1-3, 2-3, FIRM 3-2, 4-1

WORN CLUTCH APPLY FEED BALL (12mm DIAMETER), CAUSED BY SHARP EDGE ON THE SEPARATOR PLATE. WORN/DAMAGED SEALING RINGS ON THE OVERDRIVE OR INPUT SHAFT, CAUSED BY ROUGH SURFACE FINISH ON THE SIDES OF THE GROOVES-**REPLACE SHAFT.**

NO MANUAL 4-3-2-1 (SOFT OR DELAYED)

C4 CLUTCH OR BURNT. C4 PLATE NOT LINED UP WITH THE HOLES IN THE PISTON. C4 WAVE PLATE FAILED. OC/LO-1ST BALL MISPLACED.

FIRM 1-2 HOT

S5 WORN, BROKEN S5 DAMPER SPRING. FRONT SERVO BELLEVILLE SPRING BROKEN.

4TH TIED UP

CRACKED C2 PISTON (LEAKING INTO C4), DAMAGED C4 CLUTCH. INCORRECT C4 PACK CLEARANCE.

TIED UP ON 2-3

BIR SPRING BROKEN. LARGE CAF BALL WORN IN VALVE BODY. FRONT SERVO PLASTIC PLUG MISSING. INCORRECT BAND ADJ.

FLARE ON 2-3

C1/BIR BALL MISPLACED. C1 CLUTCH DAMAGED. B1R SPRING LEFT OUT. OVERDRIVE OR INPUT SHAFT SEALING RINGS DAMAGED. C1 PISTON BALL CHECK JAMMED.

SLIPS IN 4TH

C1/B1R BALL MISPLACED. OVERDRIVE OR INPUT SHAFT SEALING RINGS DAMAGED. C1 CLUTCH DAMAGED.

FLARE ON 4-3, FLARE ON 3-2

4-3 SEQUENCE VALVE IN BACKWARDS.

FIRM MANUAL LOW SHIFT AT HIGH LINE PRESSURE

LOW-1ST CHECK BALL MISPLACED.

7.6 AFTER TEARDOWN OR PRIOR DIAGNOSIS LIMITED

C2 BURNED

T-BAR LINKAGE ADJUSTMENT. OVERDRIVE/OUTPUT SHAFT SEALING RINGS DAMAGED. C2 PISTON CRACKED. S6 FAILED - STUCK LOW.

C4 BURNED

C4 WAVE PLATE BROKEN. 3-4 OWC IN BACKWARDS.OVERDRIVE OR OUTPUT SHAFT SEALING RINGS DAMAGED. C4 WAVE PLATE NOT LINED UP PROPERLY- SLOW 4-3 OVERRUN MANUAL SHIFTS. SLOW MANUAL LOW SHIFTS. C2 PISTON CRACKED. OVER-RUNCLUTCH /LOW 1ST BALL MISPLACED. INCORRECT C4 PACK CLEARANCE.

B1 BURNED

2ND GEAR STARTS. TIED-UP IN 3RD - B1R PLUG IN CASE MISSING. 4TH GEAR STARTS - B1R SPRING BROKEN, C1/B1R BALL MISPLACED.

C1 BURNED

OVERDRIVE OR INPUT SHAFT SEALING RINGS DAMAGED. C1 PISTON CRACKED. BALL CAPSULE JAMMED. 4-3 SEQUENCE VALVE IN BACKWARDS. CAF/B1R BALL LEFT OUT. B1R SPRING LEFT OUT.

SLIPS IN REVERSE - NO MANUAL FIRST

REVERSE LO-1ST BALL MISPLACED. REAR BAND INCORRECTLY ADJUSTED OR DAMAGED.

FIRM converter LOCK OR UN-LOCK

CONV. CLUTCH REG.IN BACKWARDS. INPUT SHAFT 'O' RING MISSING OR DAMAGED.

NO LOCK-UP AT LIGHT THROTTLE

C1 BIAS VALVE IN BACKWARDS.INPUT SHAFT 'O' RING MISSING OR DAMAGED.

7.7 ECU FAULT CODE SUMMARY

The following is a list of the fault codes generated by the ECU and detailed descriptions of their meanings and possible causes.

TRANSMISSION & ENGINE CONTROLLER ID CODES:

EA & EB SERIES 1 TRANSMISSION CONTROLLER ID CODES,
- 30 - MPEFI 6 CYL. LOW SERIES.
- 50 - EFI 6 CYL.
- 80 - MPEFI 6 CYL. HIGH SERIES.

EB~ED TRANSMISSION CONTROLLER ID CODE,
- 40 - SEFI 8 CYL. ALL.

EB~ED ENGINE/TRANSMISSION CONTROLLER ID CODES,
- 40 - MPEFI- 4.0 litre - 6 CYL SWB.
- 50 - MPEFI- 4.0 litre - 6 CYL LWB & WAGON.

M91 SELF TEST FAILURE SUMMARY

NOTE: ENGINE AND TRANSMISSION MODULE ARE COMBINED.

CODE	TEST	CODE DESCRIPTION
11	ALL TESTS	SYSTEM PASS
23	KOEO & E.R.	TP SENSOR READS OUT OFF RANGE
26	KOEO & CONT	TRANS OIL TEMP SENSOR OUT OF RANGE
27	CONT	GEAR LEVER POSITION S/W FAULT/FAIL
36	CONT	SPEEDO SIGNAL FAULT/FAIL
57	KOEO & CONT	POWER/ECON. SWITCH FAULT
63	KOEO & CONT	TP VOLTAGE TOO LOW
67	KOEO	NDS OR A/C IS ON
78	CONT	TRANS.BATTERY FAULT
95	KOEO & CONT	VPS SOLENOID FAULT/FAIL
96	KOEO & CONT	PCS SOLENOID FAULT S6
98	KOEO & CONT	ON/OFF SOL. FAULT/FAIL

KOEO = KEY ON ENGINE OFF.
ER = ENGINE RUNNING.
CONT = CONTINUOUS.

M93 SELF TEST FAILURE SUMMARY

NOTE: CODES ARE TRANSMISSION RELATED ONLY. ENGINE & TRANSMISSION MODULE ARE COMBINED.

CODE	TEST	CODE DESCRIPTION
111	ALL TESTS	SYSTEM PASS
513/578	KOEO & CONT	TRANS OIL TEMP SENSOR OUT OF RANGE
634	CONT	GEAR LEVER POSITION S/W FAULT/FAIL
452	CONT	SPEEDO SIGNAL FAULT/FAIL
628	KOEO & CONT	POWER/ECON. SWITCH FAULT
522	KOEO	NDS OR A/C IS ON
513/578	CONT	TRANS.BATTERY FAULT
691	CONT	SOLENOID #1 FAULTY
692	CONT	SOLENOID #2 FAULTY
693	CONT	SOLENOID #3 FAULTY
694	CONT	SOLENOID #4 FAULTY
695	CONT	SOLENOID #5 FAULTY
696	CONT	SOLENOID #6 FAULTY
697	CONT	SOLENOID #7 FAULTY

KOEO = KEY ON ENGINE OFF.
ER = ENGINE RUNNING.
CONT = CONTINUOUS.

8.0 REBUILD WARNINGS

* Do not wash nose of solenoids in solvent.
* Avoid removing regulator valve sleeves.
* Be aware of ball positions in the upper valve body.
* Be aware of 1-2 and 3-4 shift valve positions, they can be swapped.
* Check 4-3 sequence valve and spring orientation.
* Ensure correct installation of front servo snap rings.
* Ensure that VPS is tight against the valve body when securing the two bracket screws when using earlier model VPS retainer. When using new VPS retainer make sure it is sitting squarely on lower valve body.
* Ensure correct C1, C2 and C3 snap ring fitment.
* If transmission has external line pressure plug measure line pressure in Drive, Neutral and Reverse. Check both high and low line values.
* Be careful of exhaust blades in 2-3 and 3-4 shift valves. They are very fragile and if bent will cause a valve to stick.
* Ensure that the 1st sealing ring on the input shaft is solid. The second ring may be either solid or scarf cut.
* Check the 12mm ball is in the lower body, if this is worn replace the separator plate with one that had the coining operation on the mating hole.
* Don't mix up the low 1st blow-off and torque converter blow-off ball springs.
* Check line pressure relief valve for swarf and be aware of replacing the shims.
* Don't mix on/off solenoids, beware of colour coding.
* Note that orifices in the valve body are for stability and safeguard, do not drill larger.
* Set the rear band adjustment to 3/4 turn backed off on rebuild.
* When rebuilding renew the Loctite 567 sealing compound on band adjusting screws.
* When fitting the No 8 bearing ensure that all the rollers are in place (this is a problem in M85 transmissions only).
* When servicing transmission ensure that the S5 damper spring is not broken.
* Ensure that when replacing a transmission, that the cooler lines are flushed out to remove any debris. This can be done with the front cooler line connected and run the rear cooler line into a suitable container, Note:idle the vehicle for a maximum of 15 seconds only in neutral or park. Flow rate should exceed 1 Litre in 15 seconds.
* Ensure that the B1R circlip is fitted to the case. (If this is no fitted the valve will peen it's way into and through the separator plate
* Ensure that both "E" clips are fitted to the cross shaft.
* Ensure that all aspects of the parking mechanism are working.
* Locate detent spring central to the detent lever.
* Do not overtighten the line pressure plug as this may crack the case
* Be wary of any situation where water enters the transmission. This may result in fluid foaming and leaking through the filler tube and harsh shifting.

* Be careful not to damage needle bearings on assembly. Avoid any axial impact loads during assembly.
* Replace the filter whenever rebuilding a transmission where a significant amount of mechanical damage has occurred. On old style filter ensure that the 'O' ring isn't damaged.
* Ensure that the filter clip is fitted.
* To aid the assembly of the pan gasket use a small amount of Vaseline at the pan/gasket interface. This ensures that the gasket remains on the pan ridge. Do not overtorque pan bolts (spec. 4-6 Nm) as this may distort pan causing leaks.
* Ensure that both earth straps (one at the battery terminal and one on the vehicle body) are connected in the vehicle before connecting the positive side of the battery.
* Follow the procedure on throttle learn if the ECU is swapped or battery has been disconnected for any length of time.
* Remove the inhibitor switch before washing transmission in solvent or hot wash.
* Do not use pins or probes into ECU box or connector plugs, Always use breakout boxes.
* Check pistons for cracks especially C1 & C2 pistons.
* Ensure pump gears are aligned.
* Don't mix clutch piston return springs.
* If the C1/C2 clutch packs separates from the C3 clutch pack make sure the #6 bearing doesn't drop out of bearing retainer.
* Check the transmission end float. This will help to detect any missing parts or incorrect assembly.
* Ensure that internal line pressure plug in valve body is fitted.

9.0 CHANGES SINCE DAY 1 PRODUCTION

* "Z" link now has ears.
* CCCV and spring.
* Chamfer introduced to CAF hole.
* O-ring chamfers in pump cover.
* Washers on solenoid retaining screws.
* Pan gasket now square faced with double lip seal.
* Delete front servo strut sealing rings.
* C3 pressure plate material change.
* C1 thrust washer.
* Solid sealing rings on input shaft.
* Line pressure tapping boss made larger.
* C2 friction plates now multi-grooved.
* C2 actuating sleeve has shorter external teeth.
* Calibration change to ECU.
* Torque converter blow-off spring.
* Notched SSV ports in lower body.
* Line pressure blow-off spring non ground ends.
* Low 1st blow-off spring.
* Blocked line 500 blow-off.
* Lengthened on/off solenoid retainer bolts.
* Case cutaway to allow centre support snap ring removal.
* Oil change from TQ85 to TQ95.
* C1/C2 cylinder internal bush change.
* O-rings deleted from front servo struts.
* Redesigned C3 hub (sintered).
* One piece forged C2 hub with softer splines.
* C4 clutch pack built with thick plate next to the wave washer.
* Changed extension housing and converter housing bolts.
* Now using a longer snap ring in C1, C2 and C3.
* Pan magnet use three i.l.o four & dimples in pan for location.
* Changed design of front servo piston.
* Deleted regulator sleeves.
* Plastic solenoids on M91 & M95.
* New solenoid terminal connectors.
* Tabbed sump pan gasket.
* New rear band.
* Longer valvebody to maincase screws.
* Revised S5 damper assy.
* Revised ECU earthing.
* Revised vehicle earthing.
* Improved cross shaft seal material.
* Wider tangs on the torque converter thrust washer.
* New maincase, die change.
* Unground springs for CAR and BAR valves.
* New S5 retainer bracket introduced.
* Plastic strainer replaces steel strainer.
* Steel C3 hub replaced sintered hub with 5^0 angle. New hub to be used on all transmissions
* Lube hole in main case at rear servo cover face plugged with an avseal, 'O' ring deleted from rear servo cover.
* C2 piston casting altered to prevent cracking.
* Extension housing seal changed.
* Introduced one piece C4 clutch hub.
* B1A0 plug deleted.

* Pump valve plugs retainer pins now located inside "in board".
* Front servo cavity plug retained by spring ILO screw.
* Woodruff slot over lube hole in centre support.
* Filters fitted to nose of VPS.
* Revised detent lever to reduce shift effort.
* Rear servo gasket changed.
* Deleted external line pressure plug in main case.
* Sealed inhibitor switch introduced.
* Reduced number of magnets in pan to one.
* Multi-grooved ilo double groove plates in C3 clutch pack.
* New converter housing introduced for all transmissions except those used for commercial vehicles.
* Valve bodies with commonised S6 solenoid introduced.
* Increased contact ratio gearsets introduced.
* Improved surface finish on converter thrust washer.

10.0 COMPONENT COMPATIBILITY BETWEEN MODELS

The following table lists new components that have been introduced during the model life of the M85LE and its derivatives.An arrow indicates that this part is suitable for other models.
Note : That the direction of compatibility is one way only. That is, M85 versions of these part cannot be used in M91 or M95 transmissions.

DESCRIPTION	M85	M91	M95	COMMENT
Turbine,Thrust Washer & Hub Assembly.	→	1		
Brazed Turbine, Washer & Hub Assembly.	→	→	1	
C2 Soft Hub Spline	Running	1	1	
Ground Overdrive Shaft	→	1	1	
Bronze R.S.G Bushes	→	1	1	
New T.C Cover And Bosses			1	
New Material Input Shaft	→	→	1	
Forged C1 Piston	→	→	1	
30mm Longer Ext. Hsg.			1	
Grooved Rear Band.	→	1	Running change	
Revised FSG M95.		1	1	HIGH CAP. BRG'S
Revised FSG M91,material.	1			
High Cap. Brg's #7,#8,#9		1	1	
Revised RSG, M91.		1		
Revised RSG,Shot peened.		1	1	
Revised Planet Cover.		1	1	
M91 Output Shaft.	→	1		
30mm Longer Output Shaft.			1	

DESCRIPTION	M85	M91	M95	COMMENTS
New converter housing			1	
TQ95 A.T.F	——	1	1	Running M85
M91 combined engine and transmission ECU.		1		
M95 ECU and new vehicle wiring.			1	
New stator inner race	——	1	1	Imp. lube.
Inhib. switch heat shield			1	
New pump cover plate. (Unlock bump fix). If updating a M85 ensure that it has a new CCC valve & spring		1	1	
Bronze extension housing bush.	——	——	1	
Heavy spot mark on conv.			1	Trans./eng. balancing.
New endfloat specification		1	1	0.5-0.65mm
New case with deep valve body to case threads and longer bolts.		1	1	Long bolts cannot be used in old cases.
S5 damper piston.	——	——	1	Whenever a valvebody is serviced these parts should be installed
Shot peened S5 spring.	——	——	1	
S5 spring guide.	——	——	1	
M95 BAR & CAR valves.			1	
M95 BAR & CAR plungers.			1	
M95 BAR & CAR sleeves.			1	
M91 CAR plunger.		1		
M91/95 Baffle Plate.		1	1	0591-036006

11.0 LIST OF SERVICE BULLETINS FOR TRANSMISSIONS ONLY

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BTR Engineering (Australia) Limited

A.C.N. 000 019 536

TRANSMISSION & AXLE DIVISION

77 Seville Street PO Box 533 Fairfield NSW 2165 Australia
Phone (02) 754 9200 Telex AA20187 Fax (02) 726 4201

MOTOR MANUFACTURER'S SERVICE BULLETIN

DATE: 09/12/92 **NUMBER:** 208

ISSUE: M

DISTRIBUTION: 0130, 0131, 0530, 90 (2 OFF). 02, 03, F, R, C (2), Z, B, J & K

SUBJECT: A.T.F. APPROVED FOR BTRE (AUST) FOUR SPEED AUTOMATIC TRANSMISSIONS

MODELS AFFECTED: M85LE, M95LE & M91LE

The following fluid is the only approved initial fill for use in the Model 85LE, 95LE and 91LE, automatic transmissions manufactured by BTRE (Aust.) Ltd.

MANUFACTURER	BRAND NAME
Castrol	TQ95

The following fluids are approved for service fill only.

MANUFACTURER	BRAND NAME
Shell	ATF XTR
Valvoline	ATF Type 95LE
Castrol	TQ95
Ampol	Ampol Autotrans fluid BW
BP	BP Autran LE
Mobil	ATF 95LE
Caltex	ATF-LE

Note: The use of non-approved fluids is strongly discouraged as transmission performance and durability may be adversely affected.

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Inc. in NSW
Formerly Borg-Warner (Australia) Limited
77 Seville Street PO Box 99 Fairfield NSW 2165 Australia
Phone (02) 72 0111 Telex AA20187 Fax (02) 726 9694
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MOTOR MANUFACTURER'S SERVICE BULLETIN

Date: 27.03.90 Number: 210

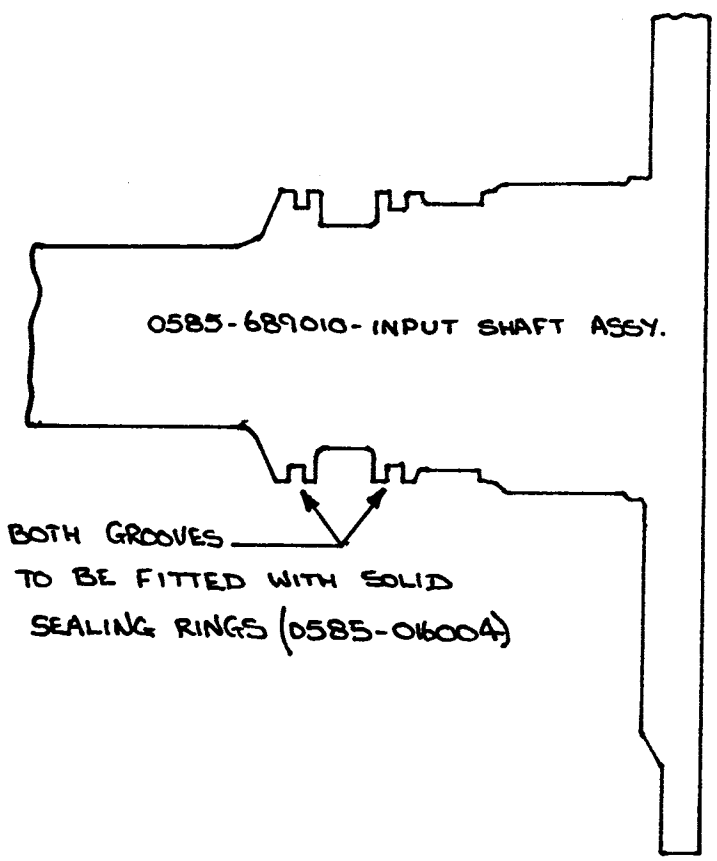
Issue : A

DISTRIBUTION: 0130, 0131, 0161, 0530, 90 (2 OFF), FORD

SUBJECT: INPUT SHAFT SOLID SEALING RING.

MODELS AFFECTED: M85LE

As from February 1990, solid sealing rings (0585-016004) are to be fitted to both the input shaft grooves. Prior to February 1990 a scarf cut sealing ring (0585-016012) was fitted to the rear groove.



BTR Engineering (Australia) Limited
Inc in NSW
Formerly Borg-Warner (Australia) Limited
77 Seville Street PO Box 99 Fairfield NSW 2165 Australia
Phone (02) 72 0111 Telex AA20187 Fax (02) 726 9694
TRANSMISSION & AXLE DIVISION

MOTOR MANUFACTURER'S SERVICE BULLETIN

Date: 05.06.90 Number: 211

Issue : A

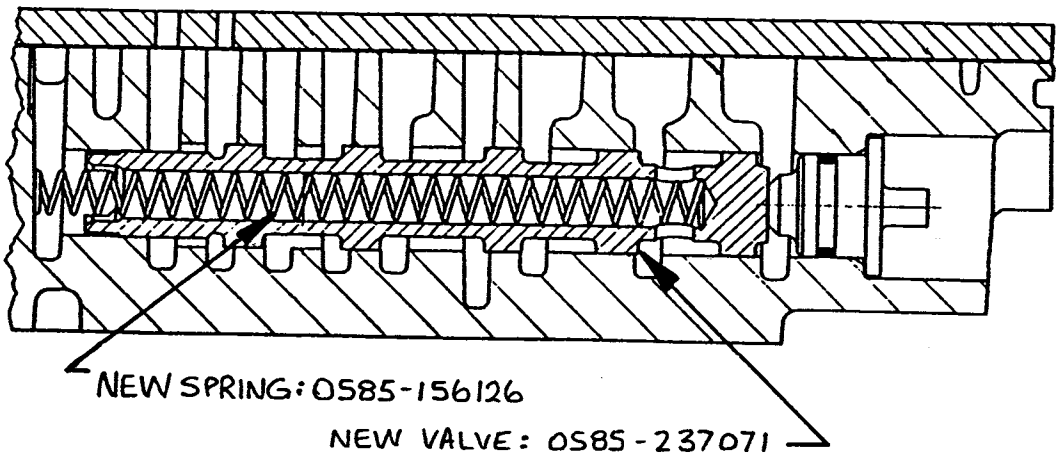
DISTRIBUTION: 0130, 0131, 0161, 0530 (2), 90 (2), FORD

SUBJECT: CONVERTER CLUTCH CONTROL VALVE AND SPRING.

MODELS AFFECTED: M85LE

Transmissions built before 2nd November, 1989 are fitted with converter clutch control valve 0585-237038.

In the event of a transmission rebuild, it is recommended that this valve be replaced with a new valve 0585-237071 and spring 0585-156126 as shown below:



This change will reduce the incidence of converter draindown.

NOTE: The new spring 0585-156126 must not be used with the old valve 0585-237038 as this can result in damage to the spring and jamming of the valve.

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Inc in NSW
TRANSMISSION & AXLE DIVISION
77 Seville Street PO Box 99 Fairfield NSW 2165 Australia
Phone (02) 72 0111 Telex AA20187 Fax (02) 726 9694

MOTOR MANUFACTURER'S SERVICE BULLETIN

Date: 13.06.90 Number: 212

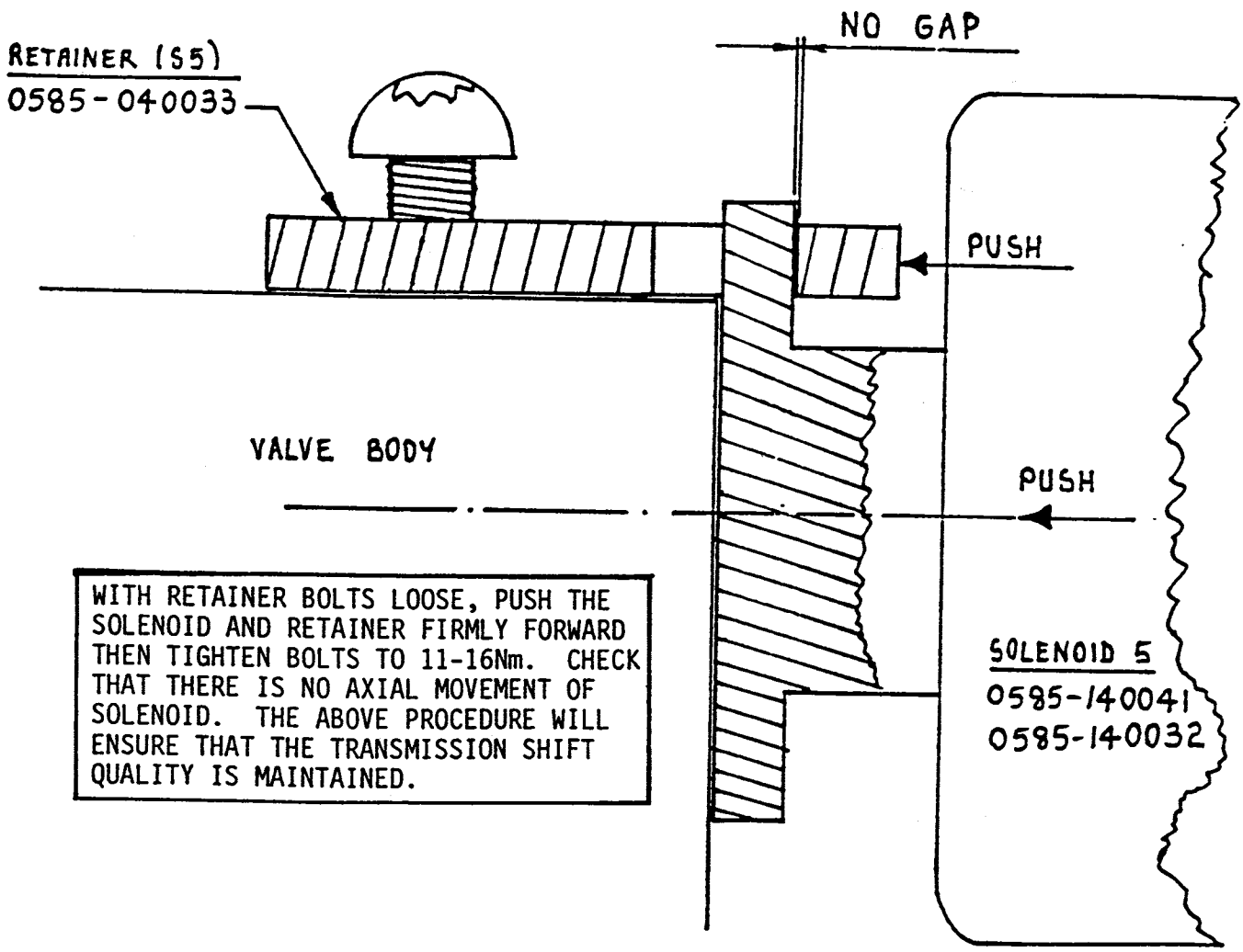
Issue : A

DISTRIBUTION: 0130, 0131, 0161, 0530 (2), 90 (2), FORD, Peter O' Malley.

SUBJECT: RETAINER-SOLENOID (S5) ASSEMBLY.

MODELS AFFECTED: M55LE

Assembly of the S5 retainer (flat plate type) and solenoid #5 is to be carried out as shown below:



WITH RETAINER BOLTS LOOSE, PUSH THE SOLENOID AND RETAINER FIRMLY FORWARD THEN TIGHTEN BOLTS TO 11-16Nm. CHECK THAT THERE IS NO AXIAL MOVEMENT OF SOLENOID. THE ABOVE PROCEDURE WILL ENSURE THAT THE TRANSMISSION SHIFT QUALITY IS MAINTAINED.

This assembly procedure is to be adopted as follows:

a) Whenever the solenoid is found to be loose.

b) During transmission rebuilds.

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Inc. in NSW
Formerly Borg-Warner (Australia) Limited

77 Seville Street PO Box 99 Fairfield NSW 2165 Australia
Phone (02) 724 0111 Telex AA20187 Fax (02) 726 9694

TRANSMISSION & AXLE DIVISION

MOTOR MANUFACTURER'S SERVICE BULLETIN

DATE: 05/02/91

NUMBER: 216

ISSUE: 1

DISTRIBUTION: 0130, 0131, 0161, 0530 (2), 90 (2), FORD

SUBJECT: REWORK PROCEDURES FOR HYDRAULIC NOISES.

MODEL AFFECTED: BTR MODEL 85 4-SPEED AUTOMATIC TRANSMISSIONS.

1. BACKGROUND

A small percentage of M85 transmissions may exhibit some form of hydraulic noise during normal operation. In general, hydraulic noises are caused by rapid valve oscillations. While a noise does not represent an immediate durability concern, it should be addressed at the earliest convenience.

NOTE: It is essential to positively identify the noise source before any rework action is taken. Refer the identification sections in this bulletin.

2. SOLENOID SUPPLY VALVE (SSV) BUZZ

2.1 IDENTIFICATION

The noise is typically smooth sounding and is produced by the solenoid supply valve which is located in the front section of the pan. The following characteristics will help to positively identify the noise:

a) The noise will only occur at high line pressure. That is, throttle positions above about 10% in Drive and about 7% in Reverse gear.

b) The noise will be more prevalent when the transmission is hot.

c) The noise may change tone during a gearshift. This is especially noticeable on a 1-2 gearshift.

d) Solenoid supply valve noise will generally only occur in 1st and 2nd gears, and sometimes in lock-up.

2.2 REWORK PROCEDURE

This problem can be overcome by machining two notches into the solenoid supply valve ports. Proceed as follows;

i) Remove valve body assembly from transmission.

ii) Fully disassemble the valve body.

iii) Using a Ø4 slot drill and milling machine, cut two 0.5mm deep notches as in Figure 1.

iv) Carefully re-assemble valve body ensuring that the solenoid supply valve moves freely in the modified bore.

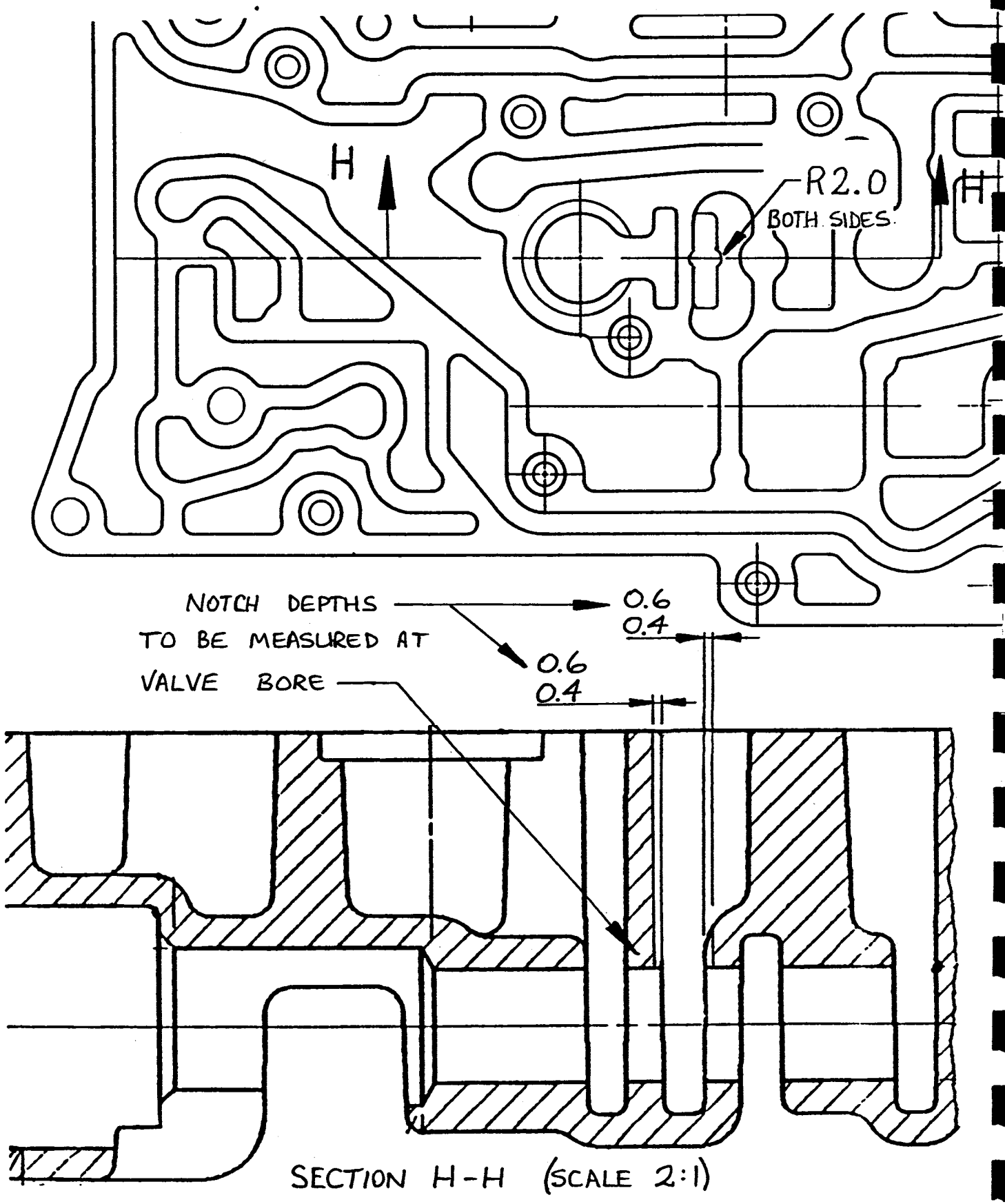

FIGURE 1: SSV NOTCH DETAILS.

3. LINE PRESSURE RELIEF VALVE BUZZ

3.1 IDENTIFICATION

This noise will only occur in reverse gear at high line pressure. (Throttle position above about 7%). The sound comes from the line relief valve which is located in the front section of the pan. The noise is usually harsh sounding and loud, and may be present when the transmission is hot or cold.

3.2 REWORK PROCEDURE

Transmissions built from February 1991 are assembled with line relief springs with non-ground ends (Part Number 0585-156143). This change is made to prevent valve buzz and also to increase reverse gear high line pressure.

Any transmission that is diagnosed as having line relief buzz can be reworked by fitting the new non-ground spring as follows;

a) Remove pan and filter from transmission, do not remove valve body.

b) Precompress line relief spring using a screw driver or similar tool and remove retainer pin.

c) Remove spaced (if fitted), line relief spring and line relief valve. While the components are disassembled, check that the valve moves freely in the bore.

d) Install valve, new spring 0585-156143 (non ground ends), 0.3mm thick spacer and retainer pin. Refer figure 2 below;

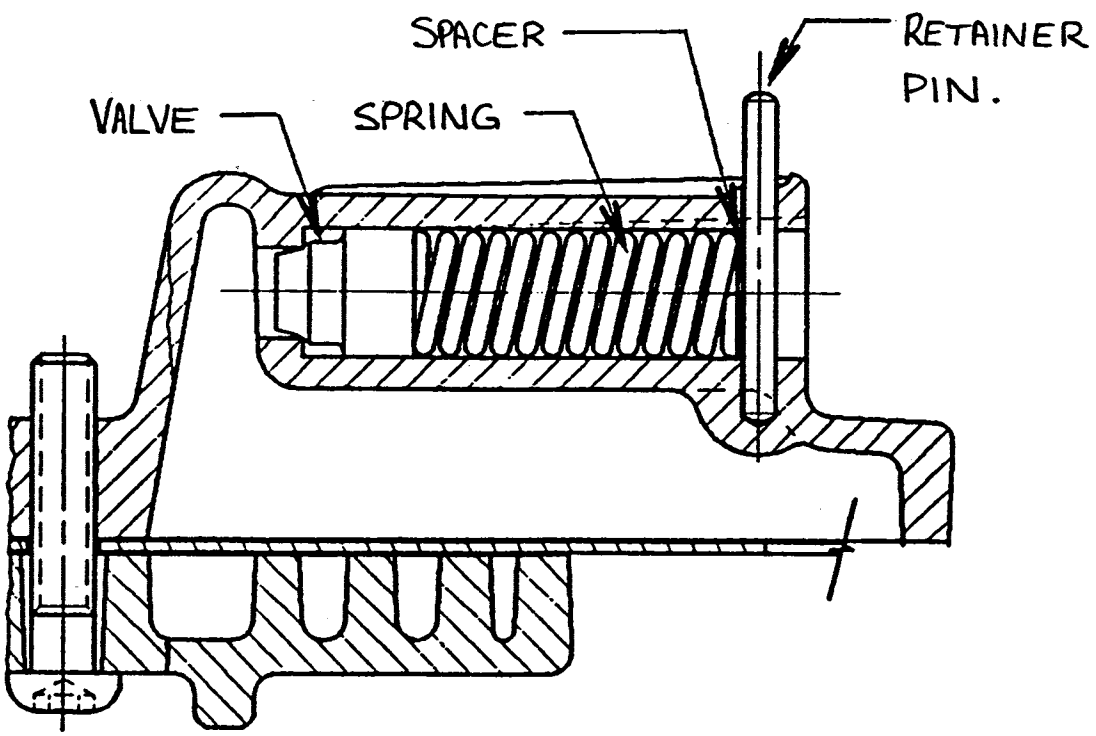

FIGURE 2: LINE RELIEF VALVE ASSEMBLY.

e) Reassemble the transmission and connect a pressure gauge (0-2500 kPa) to the line pressure fitting. Run vehicle until transmission temperature reaches 60-80°C.

f) Position vehicle on a flat, dry and solid surface. Apply the hand-brake. Select reverse gear, apply the foot brake and slowly increase throttle to 100% (Engine speed should be about 1950 RPM). Record the line pressure gauge reading.

WARNING: Do not hold 100% throttle in this condition for more than 6 seconds or converter damage may result.

The pressure reading for the M85 transmission must be between 1950-2200 kPa.

If the pressure reading is below this requirement the pan must be removed and a larger spacer fitted. Refer table 1 below;

Pressure Reading (kPa)	Spacer Size (mm)
1970-2220	Correct spacer is fitted.
1880-1970	0.8
1790-1880	1.3

TABLE 1: LINE RELIEF SPACER SELECTION.

4. TORQUE CONVERTER BLOW-OFF BUZZ

4.1 IDENTIFICATION

This noise can be heard coming from the pump cover area (inside the converter housing). It will only be present at high line pressure. (Drive above 10% and Reverse above 7% throttle position). The noise may only be present for a narrow range of throttle positions. For example, 10-15% throttle can be expected.

4.2 REWORK PROCEDURE

Transmissions built from May 10, 1990 are assembled with torque converter blow-off springs with non-ground ends (Part Number 0585-156136 and 0585-156137). This change is made to prevent torque converter blow-off noise and reduce pressure variations.

The problem of torque converter blow-off noise can sometimes be associated with the cooler lines. Therefore, before any disassembly work is started, the cooler lines should be checked for proper isolation from the vehicle body, engine, engine mounts, transmission etc. Also ensure that the lines are separated from each other.

If the noise persists it will be necessary to fit a non-ground torque converter blow-off spring to the pump cover assembly. Proceed as follows;

a) Remove transmission from vehicle.

b) Remove torque converter and pump cover assembly.

c) Remove pump, pump cover plate and gasket from cover assembly.

d) Remove torque converter blow-off spring and ball from housing. Check ball seat for roundness. If O.K proceed to next step, if not O.K, lightly peen the ball against the seat and recheck.

c) Measure the distance "X" as shown below using a dial indicator or similar measuring instrument.

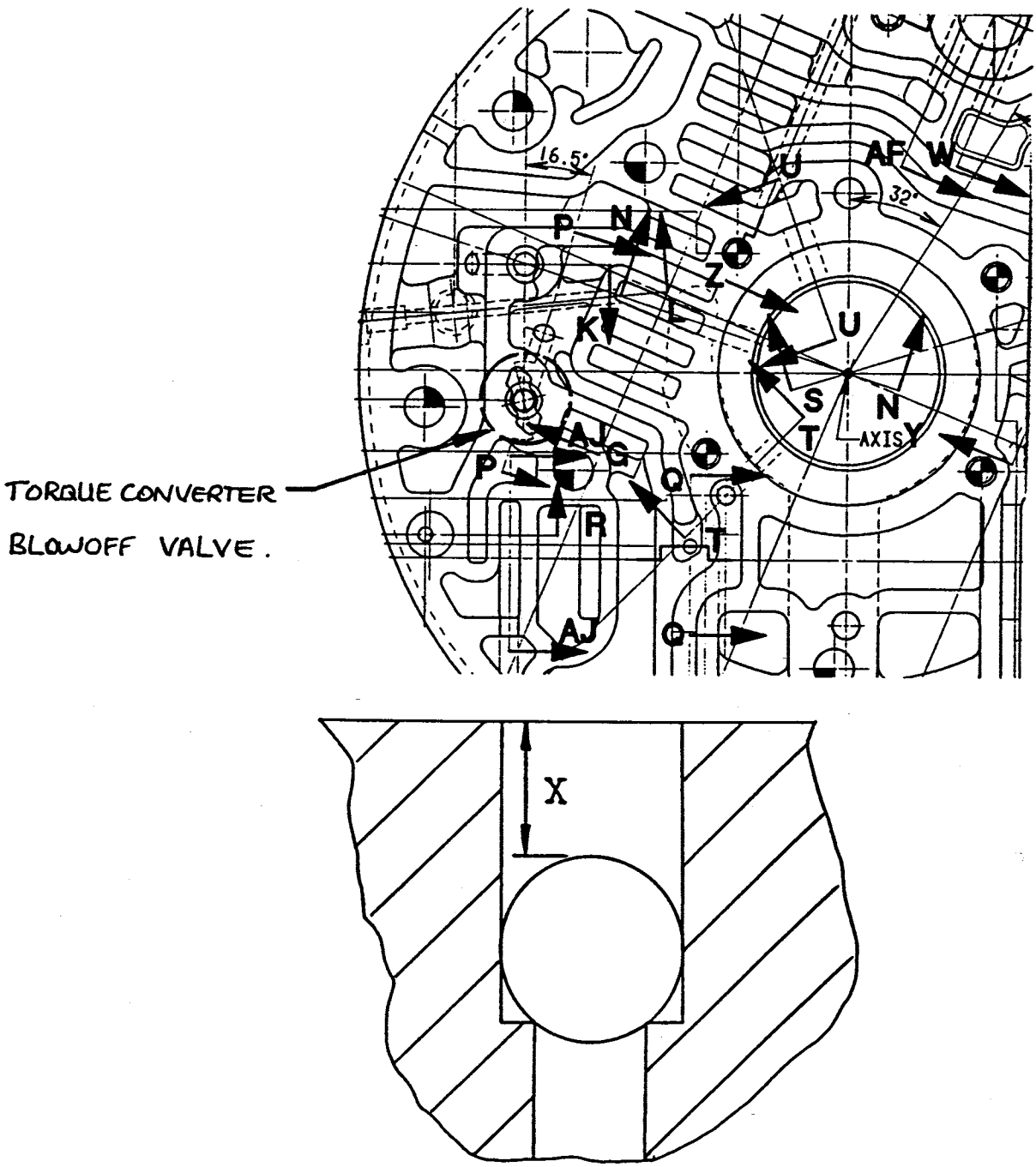

FIGURE 3: DIMENSION "X".

f) Select the required spring load based on the following table;

DIMENSION X (mm)	SPRING PART NO.	LOAD AT 7.96mm HEIGHT	SPRING TYPE
5.826 - 6.105	0585-156136	11.52 - 12.37	A
6.105 - 6.384	0585-156137	12.37 - 13.22	B

TABLE 2: T.C. SPRING SELECTION.

g) Install the new spring and reassemble components. It is recommended that new gaskets are used. Refit transmission to vehicle.

5. MANUAL 1ST BLOW-OFF BUZZ

5.1 IDENTIFICATION

This noise will only be heard when the T-bar is in manual 1st position and the throttle is above 10% (high line pressure). The noise is caused by manual 1st blow-off valve which is located in the rear of pan.

5.2 REWORK PROCEDURE

Transmissions built from December 1990 are assembled with manual 1st blow-off springs with non-ground ends. (Part Number 0585-156141). This change is made to prevent manual 1st blow-off valve buzz.

The problem can be overcome by installing a non-ground spring as follows;

a) Remove pan and filter from transmission.

b) To avoid damage to the manual 1st blow-off valve, it is recommended that the valve body is removed. This enables easy removal of the retainer pin using a pin punch.

c) Remove retainer pin, spring and ball from the valve body. Do not split valve body (Refer Figure 4 below). Check ball seat for roundness. If O.K. proceed to next step, if not O.K, lightly peen the ball onto the seat and recheck. Also check that the ball moves freely up and down in the bore, particularly the bottom 4mm of travel.

NOTE: Manual 1st blow-off valves have been assembled using either a Ø3 or a Ø4 retainer pin. Both pin sizes are suitable for use with new non-ground spring.

d) Install, ball, new spring (0585-156141) and retainer. Refit valve body, filter and pan to the transmission.

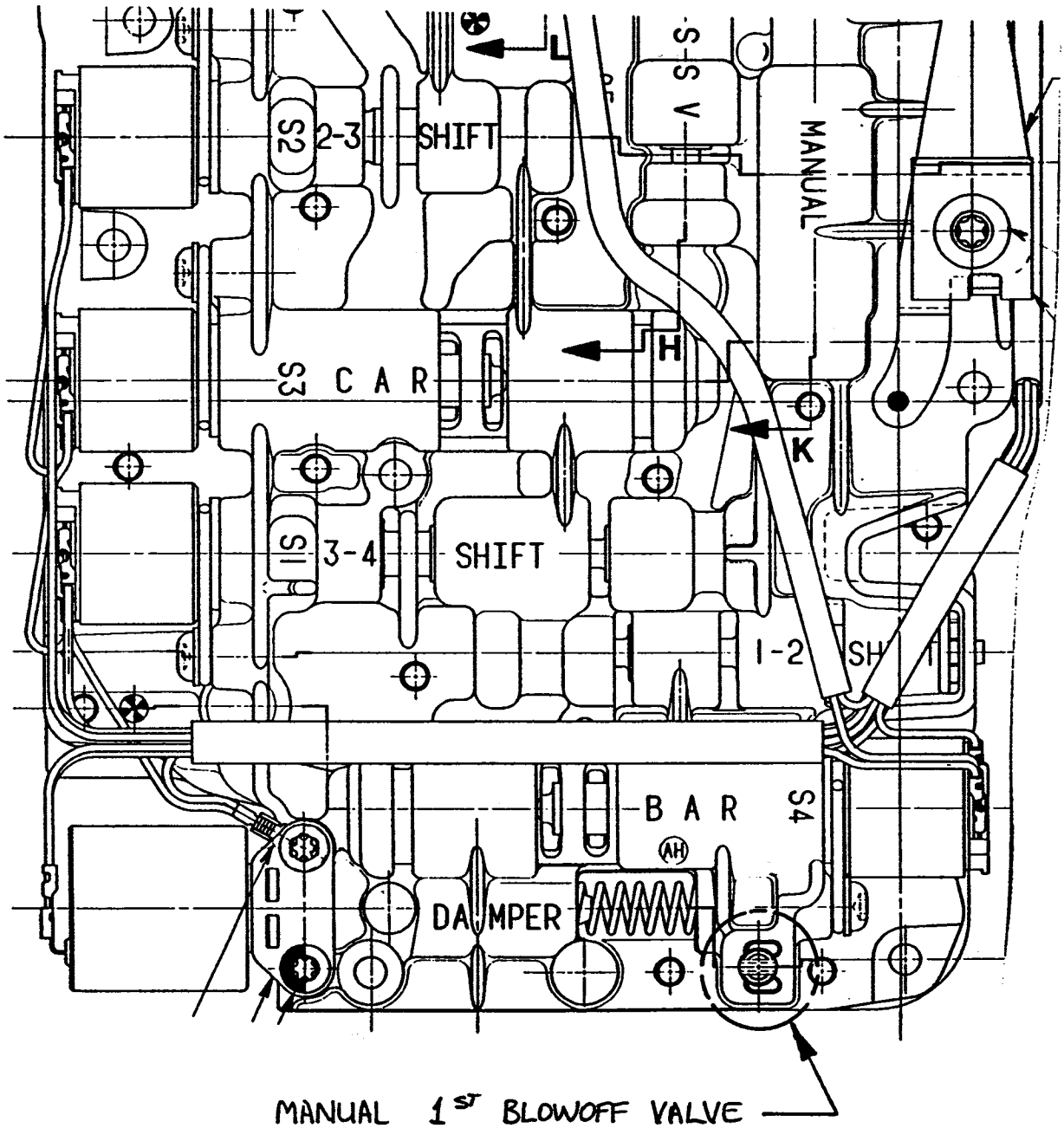

FIGURE 4: MANUAL 1ST BLOW-OFF VALVE.

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77 Seville Street PO Box 99 Fairfield NSW 2165 Australia
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MANUFACTURER'S SERVICE BULLETIN

DATE: 11/03/91 NUMBER: 219

DISTRIBUTION: 0130, 0131, 0161, 0530, 90 (2-OFF), C.F.S.V ISSUE: A

SUBJECT: FRICTION PLATES

MODELS AFFECTED: M85LE, M91LE, M95LE.

WARNING

FRICTION PLATES WITH GROOVE DETAILS AS SHOWN IN FIGURE #1 SHOULD ONLY BE USED IN THE C2 CLUTCH PACK.

C1, C3 and C4 CLUTCH PACK ASSEMBLIES SHOULD ONLY USE FRICTION PLATES WITH GROOVE DETAILS AS SHOWN IN FIGURE #2.

INCORRECT USE OF THESE FRICTION PLATES MAY RESULT IN INADEQUATE TRANSMISSION PERFORMANCE AND EVENTUAL TRANSMISSION FAILURE.

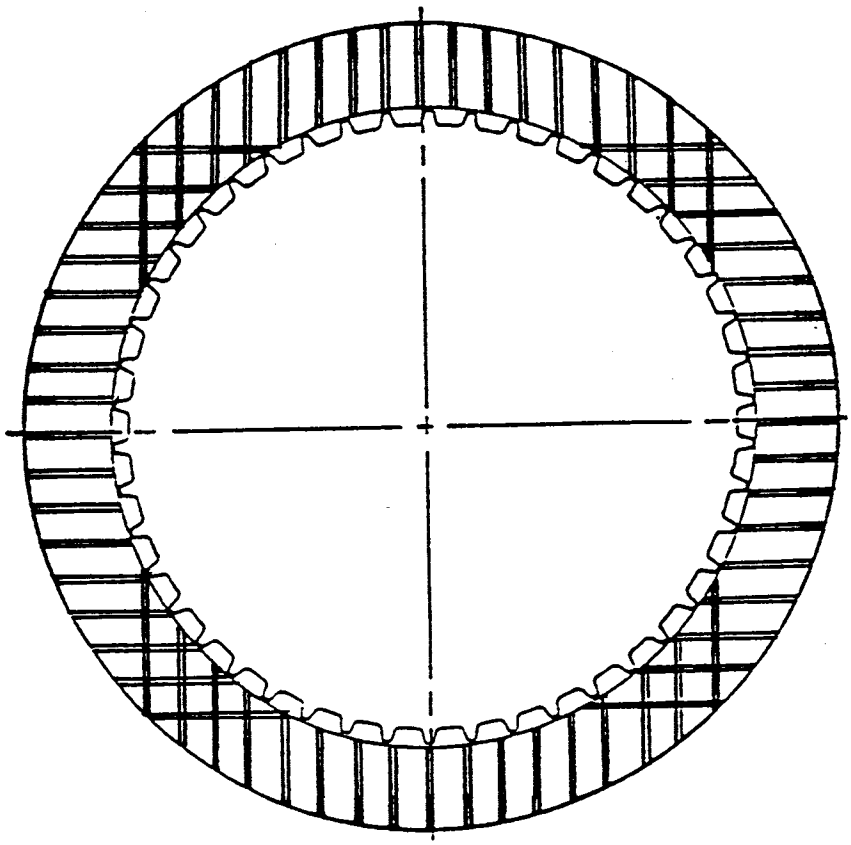

FIGURE 1 - C2 FRICTIONS ONLY

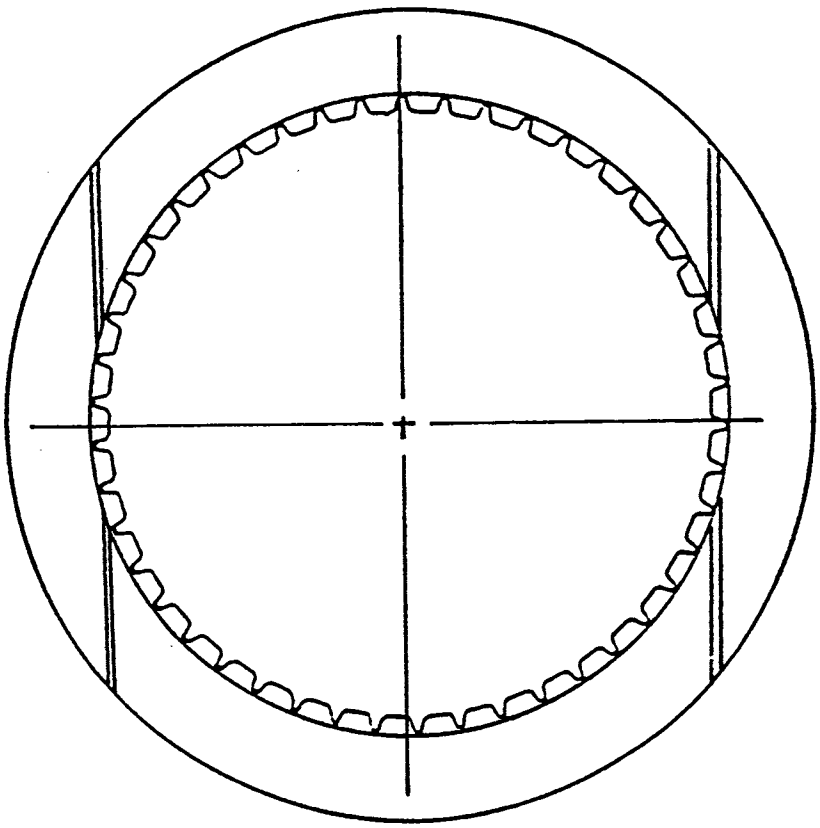

FIGURE 2 - C1,C3 & C4 FRICTIONS

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Phone (02) 724 0111 Telex AA20187 Fax (02) 726 9694

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MOTOR MANUFACTURER'S SERVICE BULLETIN

Date: 09.05.91 Number: 220

Issue : 1

DISTRIBUTION: 0130, 0131, 0161, 0530 (2), 90 (2) FORD.

SUBJECT: ALTERNATIVE REWORK PROCEDURE FOR SSV BUZZ.

MODELS AFFECTED: BTR Model 85 four-speed Automatic Transmissions.

This bulletin presents an alternative procedure for notching the solenoid supply valve ports as detailed in section 2.2 of service bulletin #216.

The new procedure uses a Ø4mm round file instead of a Ø4 slot drill and milling machine.

This rework is only recommended when the transmission exhibits solenoid supply valve buzz. Refer to service bulletin #216 for a full description.

Proceed as follows;

i) Remove valve body assembly from transmission.

ii) Fully disassemble the valve body.

iii) Use a Ø4 round file to cut two 0.6mm maximum deep notches as shown in Figure 1.

Notes: - It is recommended that a piece of wood is inserted in the SSV bore while the notches are being filed. This will prevent the file from overtravelling and damaging the bore.

- The notch depth measurement of 0.5mm applies at the valve bore only.

iv) Carefully reassemble the valve body ensuring that the solenoid supply valve moves freely in the modified bore.

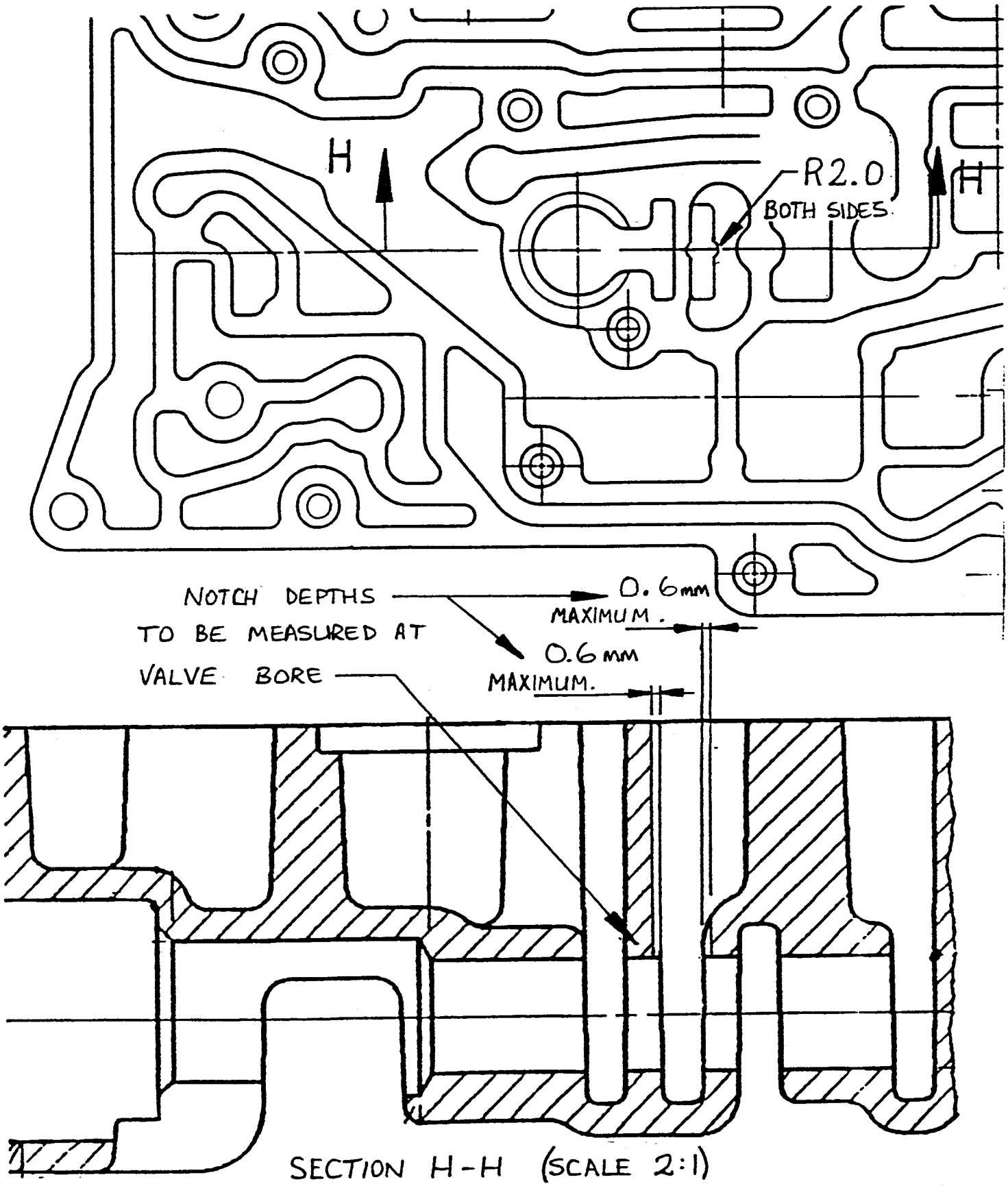

FIGURE 1: SSV NOTCH DETAILS.

BTR Engineering (Australia) Limited
Inc in NSW
Formerly Borg-Warner (Australia) Limited
77 Seville Street PO Box 99 Fairfield NSW 2165 Australia
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MOTOR MANUFACTURER'S SERVICE BULLETIN

DATE: 13/6/91

NUMBER: 222

ISSUE : 1

SUBJECT: NEW SOFTWARE FEATURES OF EB VEHICLES AND GROUND LOOP PROBLEM.

MODELS AFFECTED: EB LEVEL VEHICLES.

1. INTRODUCTION

This service bulletin presents the essential differences between the EA Series 2 and EB level software used in BTRE four-speed electronic transmission. The EB software was introduced to 6 cylinder vehicles in May 1991 and will be used in V8 vehicles.

Table below lists ECU identification codes, transmission and vehicle type.

Also included is a description of a ground loop problem which can arise due to deterioration of vehicle earth strap connections. Refer section 3.

ECU PART NUMBER		TRANS MODEL	VEHICLE MODEL
BTRE	FORD		
0585-640030	90DA-7E453-AA	M85	EA SERIES II 6 CYL. MPEFI
0585-640031	90DA-7E453-BA	M85	EA SERIES II 6 CYL. EFI
0585-640033	90DA-7E453-CA	M85	EA SERIES II 6 CYL. HIGH SERIES
0585-640037	90DA-7E453-AB	M85	EB 6 CYL. MPEFI
0585-640038	90DA-7E453-CB	M85	EB 6 CYL. EFI
0585-640039	90DA-7E453-CB	M85	EB 6 CYL. HIGH SERIES
0585-640040	91DA-7E453-AA	M95	EB 8 CYL.

ECU IDENTIFICATION TABLE

2. NEW FEATURES OF EB SOFTWARE

2.1 GENERAL

EB software is based on the EA Series II software with the following improvements;

1. Revised A/C temperature pulldown routine.
2. Deleted ignition bypass relay.
3. Added Throttle Position Sensor self-check.
4. Added transmission overheat warning signal.

Changes incorporated into M95 EB (V8 only);

5. **Added torque limitation in reverse gear.**

6. Added support of engine overheat mode.

7. Modified D (4) => M2 shift sequence.

2.2 COMPATIBILITY

EB level ECU's are compatible with corresponding models of EA Series II (i.e. EFI, MPEFI, Hi Series) and therefore EB level ECU's can be used in EA Series II vehicles.

M85 ECU's (6 cylinder) are not compatible with M95 ECU's (V8).

EA Series II ECU's can only be installed in EA Series II vehicles and must not be used in EB vehicles.

2.3 DESCRIPTION OF SOFTWARE FEATURES

2.3.1 Revised A/C Temperature Pulldown

The A/C temperature pulldown routine is designed to improve the air conditioning system performance under extreme thermal conditions.

The transmission ECU monitors the air conditioner compressor clutch. If the clutch is energised continuously for a period of 5 minutes the ECU implements a revised 3-4 shift schedule. This has later 3-4 and 4-3 shift points and effectively inhibits 4th gear below 90 Km/hr. Operating in 3rd gear increases the A/C compressor performance due to the higher engine speeds. When the A/C compressor clutch switches off, the ECU reverts back to the normal shift schedule.

In EA Series II software, the modified 3-4 shift pattern was also implemented if the A/C clutch was engaged at vehicle start-up and was continued until the first time the clutch cycled off. This does not occur in EB software.

There is also a slight difference between the M85 and M95 routine. For M95 the A/C clutch must turn off for at least 10 seconds before the normal shift pattern is resumed, whereas the M85 routine returns to normal as soon as the clutch switches off. Note that the M95 ECU obtains its A/C compressor status information via a communication link to the engine ECU (refer section 2.3.6).

2.3.2 Deletion Of Ignition Bypass Relay

EB level ECU's feature a lower minimum operating voltage which has allowed deletion of the ignition switch bypass relay. The relay is used in EA Series II models to eliminate voltage drop across the ignition switch. This feature affects the compatibility between EA Series II and EB ECU's. Refer to section 2.2.

2.3.3 TPS Self-Check

With EB level software the ECU is able to check for a possibly incorrectly connected TPS wiring harness. The check is carried out at the time the diagnostic reading is being taken. The ECU will report Throttle Fault Code (23) to the diagnostic tester if the value of the throttle opening is greater than 15% at the time of reading.

Since the self-check routine assumes that the vehicle throttle position sensor is at rest position during diagnostic reading, it is essential that the throttle is not tampered with during the test.

2.3.4 Transmission Overheat Warning Signal

EB level ECU's will flash the P/E lamp if the transmission enters overheat mode.

In overheat mode (i.e. if the transmission temperature reaches 135°C or more), both models (EA Series II and EB) employ an early 3rd and 4th gear lock-up strategy to reduce the amount of heat developed in the torque converter and increase cooler flow.

On entry to overheat mode, EA Series II ECU's automatically changed to ECONOMY mode. The EB ECU does not change the selected mode.

Changes incorporated into M95 EB (V8 only);

2.3.5 Torque Limitation

When in reverse gear, the engine torque under full stall conditions can overload the transmission. To prevent overloading, on request of the transmission ECU, the engine ECU retards the ignition spark to limit the engine torque. For this reason a communication link from the transmission ECU to the engine ECU (pin 3 of transmission ECU to pin 5 engine ECU) has been added in V8 vehicles.

If the transmission ECU cannot send this information (e.g. with fault 27 - Shift Lever Position Fault) or if the communication link is faulty, the engine controller, depending on the engine and road speed will work out when the transmission could be in reverse and will limit the torque. The result is that with a shift lever position fault or a communication link fault, the vehicle may exhibit limited torque at low road speeds in both reverse and forward gears.

2.3.6 Support Of Engine Overheat Mode

Under extreme thermal conditions (very hot), the engine ECU can request that the transmission assists with engine cooling. The transmission ECU reacts by using an early lock-up strategy to minimise the heat transfer from transmission cooler to the engine cooling system.

The strategy is identical to the transmission overheat mode but the P/E light does not flash. For this purpose another communication link (pin 18 of transmission ECU to pin 32 of engine ECU) has been added in V8 vehicles.

This communication link is used to request the engine overheat mode and to indicate the status of the A/C compressor clutch. In the event of a link failure the transmission ECU defaults to A/C clutch off and normal engine temperature. On V8 vehicles Fault Code 67 indicates a communication link failure.

2.3.7 Modified D (4) => M2 Downshift Sequence

To match the V8 engine characteristics the manual shift from D(4) to M2 has been made speed dependant.

The downshift sequence thresholds are set as follows;

Shaft Speed (RPM)	Shift performed
S_s > 3192	M2 (4) - M2 (3)
3192 > S_s > 2360	M2 (4) - M2 (3) - M2 (2)
2360 > S_s	M2 (4) - M2 (2)

Shaft speeds of 2360 and 3192 RPM correspond to road speeds of 85 and 115 Km/h respectively.

Note: Notation M2 (3) indicates the gear lever is in the M2 position and the transmission is in 3rd gear etc.

3. GROUND LOOPS IN EA AND EB VEHICLES

3.1 PROBLEM DESCRIPTION

Ground loops can be created when electrical equipment is connected to ground in more than one location. This currently exists with EA Series II and EB ECU's

In EA Series II and EB vehicles the transmission ECU ground is connected to the vehicle body through the base plate and to the negative terminal of the battery by wire No. 57 (black) to pin 21. The negative terminal of the battery is in turn connected to the engine and the vehicle body by earth straps.

If the earth strap connections are poor or if any of the earth straps are missing it is possible that undesired current flowing through this ground loop can damage the ECU printed circuits. Particularly in the absence of an earth strap, inadvertent turning ON of the starter motor or other high power electrical equipment means almost certain destruction of the ECU printed circuit board.

Enclosed is Figure 1 which depicts the described problem.

3.2 Fault Identification

Typically an ECU damaged by excessive ground loop current will not work and will not communicate with the diagnostic instrument. The most noticeable symptom of a damaged track is an audible chattering of the power relay located inside the ECU when the ignition is turned ON, but it cannot be guaranteed that this will always happen.

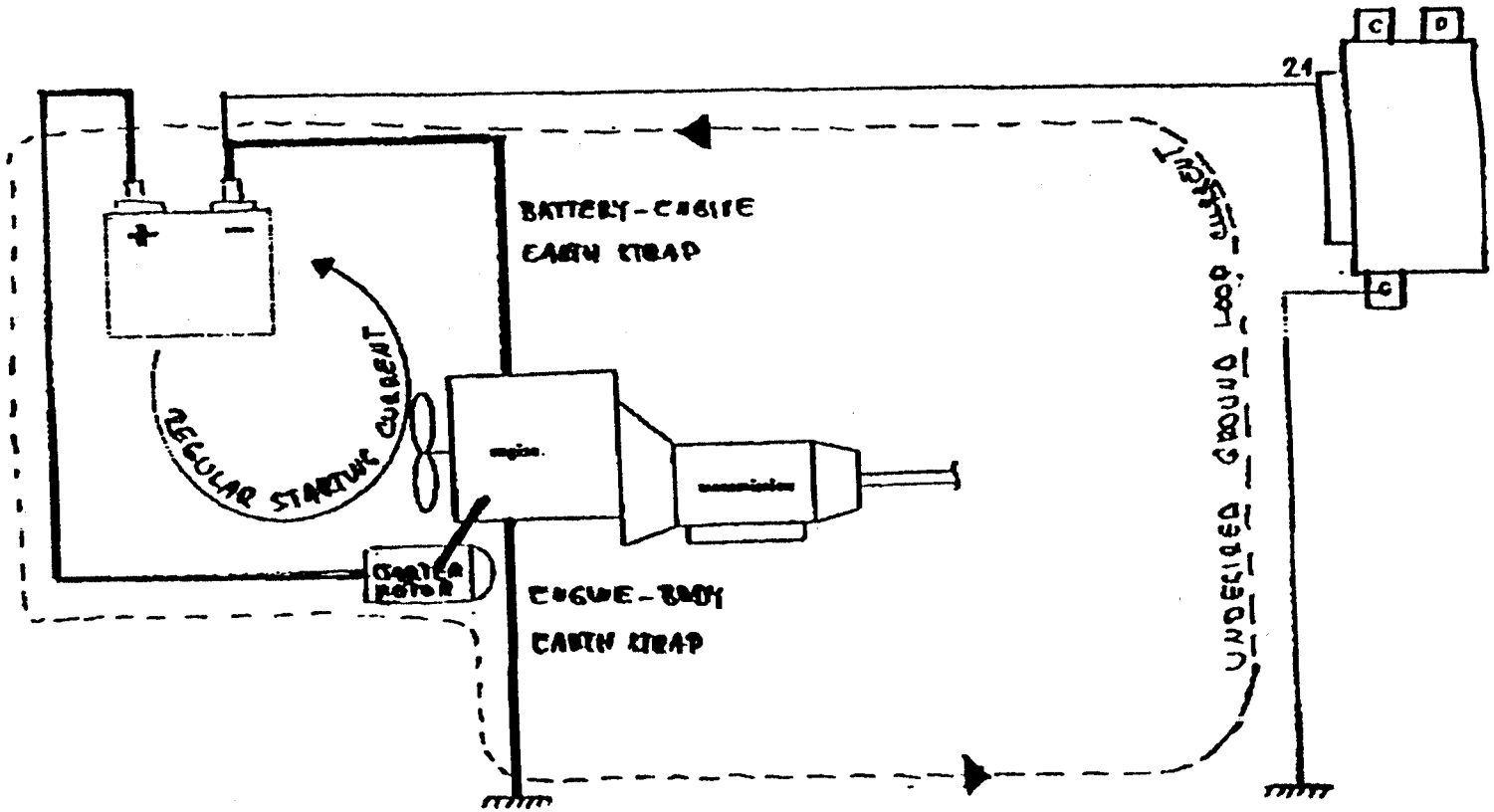
3.3 Fault Remedy And Problem Prevention

The ECU must be replaced if it has been damaged by ground loop currents.

To prevent excessive current damaging the ECU printed circuit board tracks the vehicle earth straps and battery terminal connections must be maintained in good condition. This is generally met in new cars and may change due to ageing related deterioration of the earth strap connections.

During any work which requires manipulating of the earth straps, the ECU plug should be disconnected.

In general, the earth straps and battery connections should be checked and if necessary reworked whenever an ECU malfunction is suspected or when the driver complains about the transmission occasionally adopting failure mode and particularly when the ECU reports Fault Code 98 or 36 (ON/OFF Solenoid Fault or Speedo Sensor Fault).



DOTTED LINE INDICATES THE CURRENT PATH IN ABSENCE OF BATTERY-ENGINE EARTH STRAP

FIGURE 1.

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Inc in NSW
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77 Seville Street PO Box 99 Fairfield NSW 2165 Australia
Phone (02) 724 0111 Telex AA20187 Fax (02) 726 9694

TRANSMISSION & AXLE DIVISION

MOTOR MANUFACTURER'S SERVICE BULLETIN

DATE: 29/08/91 ISSUE: 223

DISTRIBUTION: 0130, 0131, 0161, 0530 (2), 90 (2), FORD. ISSUE: A

SUBJECT: SOLENOID FAULT DETECTION (METAL SOLENOIDS ONLY).

MODELS AFFECTED: M85/91 AND 95.

1. FAULT

When a solenoid fault occurs, the transmission ECU will go into failure mode. This means that only third and reverse gears are available. To confirm that a solenoid fault has infact occurred, a diagnostic instrument should be used. Codes 98 and 95 represent on/off and variable pressure solenoid faults respectively.

2. REWORK PROCEDURE

Diagnosis and testing should be carried out in accordance with the RT technical training bulletin. If after following this procedure, the solenoid still appears to be faulty, remove the plastic insulator cap (on/off solenoids only) and check for metal contamination between the two terminals and between each terminal and the solenoid body. Refer Figure 1 below.

Note: that solenoids act as magnets and will therefore attract ferrous particles.

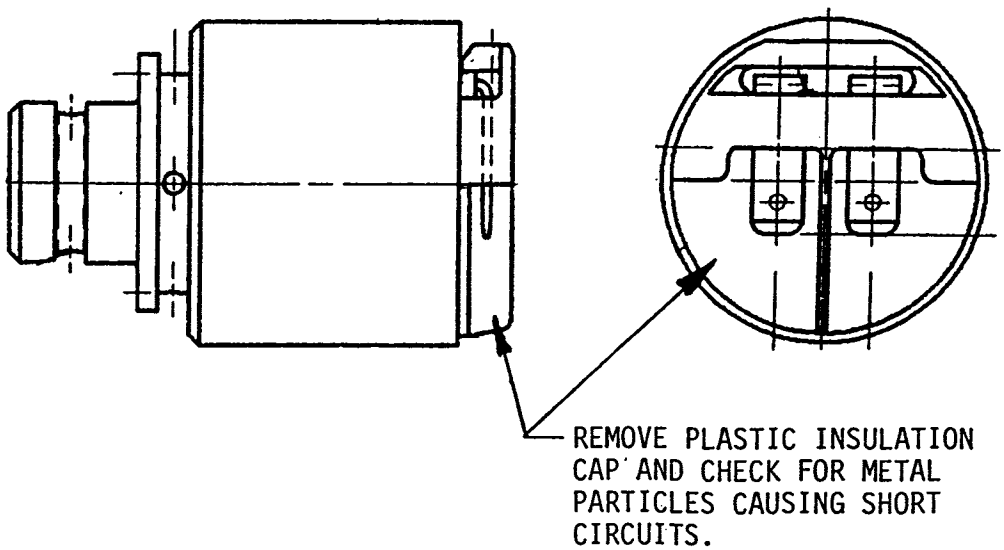

FIGURE 1: ON/OFF SOLENOID FAULT DETECTION.

Remove any bridging particles, reassemble the plastic insulator cap and check resistances using a multimeter before assembling the transmission. Replace any solenoid that does not meet the resistance requirements listed in table 1.

RESISTANCE MEASUREMENT	VARIABLE PRESSURE SOLENOID (S5)	ON/OFF SOLENOIDS (S1, S2, S3, S4, S6 & S7)
Terminal to Body.	Greater than 1M ohm	Greater than 1M ohm
Terminal to Terminal.	3.6 - 4.2 ohms	26 - 30 ohms

TABLE 1: SOLENOID RESISTANCE VALUES.

BTR Engineering (Australia) Limited
Inc. in NSW
Formerly Borg-Warner (Australia) Limited
77 Seville Street PO Box 99 Fairfield NSW 2165 Australia
Phone (02) 724 0111 Telex AA20187 Fax (02) 726 9694
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MOTOR MANUFACTURER'S SERVICE BULLETIN

Date: 22/07/91

Number: 225

Issue : 1

Distribution: 0130, 0131, 0161, 0530 (2), 90 (2), FORD

Subject: M85 VALVE BODY SERVICE KIT 0585-410013.

Models Affected: BTRE MODEL 85 FOUR-SPEED AUTOMATIC.

1. INTRODUCTION

This Service Bulletin explains the use of the components contained in the M85 Valve Body Service Kit. BTRE Number 0585-410013.

Check that this service kit includes the following components;

S5 Damper Spring	0585-156144	
S5 Piston	0585-124026	
S5 Damper Spring Guide	0585-190029	
Line Pressure Relief Spring	0585-156143	
Shim Line Pressure Relief	0585-053024	(Ø11.25 x 0.3mm)
Shim Line Pressure Relief	0585-053026	(Ø11.25 x 0.8mm)
Shim Line Pressure Relief	0585-053031	(Ø11.25 x 1.3mm)
2 In-line Filters	0585-238005	
Lower Valve Body Gasket	0585-045035	
Upper Valve Body Gasket	0585-045044	
Clutch Apply Feed Ball	0585-109004	
Service Bulletin	#325	

During a valve body service or transmission overhaul, it is recommended that each of the above items are checked and replaced if necessary in accordance with the instructions given in this bulletin.

In addition to the components in this kit, it may be necessary to replace the Variable Pressure Solenoid (VPS) if the fault conditions in section 2.1 are identified. VPS Part Number 0585-140041.

2. VARIABLE PRESSURE SOLENOID (VPS)

2.1 IDENTIFICATION

There are two possible fault conditions for the VPS. External nose wear and internal spool wear.

i) External Nose Wear

If the flat plate solenoid retainer does not hold the solenoid firmly against the valve body, the solenoid nose is able to move axially in the bore. This movement can result in wear of the solenoid nose which leads to cross leakage of hydraulic circuits.

When this fault occurs, gear shifts will be firm when hot, but generally acceptable when cold.

ii) Internal Spool Wear

A small percentage of variable pressure solenoids may exhibit internal spool wear. Initially, the transmission will have harsh 1-2 shifts when the transmission is hot. As the condition worsens all shifts will be soft initially, then very firm at the end of the shift.

If either of the above faults are suspected then the complete VPS must be replaced. Part Number 0585-140041.

2.2 REWORK PROCEDURE

Remove the VPS by undoing the two retaining screws which hold the bracket in place. Replace the S5 damper spring and piston as described in section 3.

When fitting a new VPS, ensure that the solenoid and retainer plate are pushed firmly forward against the valve body, then tighten the bolts to 11-16Nm. Check that there is no axial movement of the solenoid. Refer Figure 1 below:

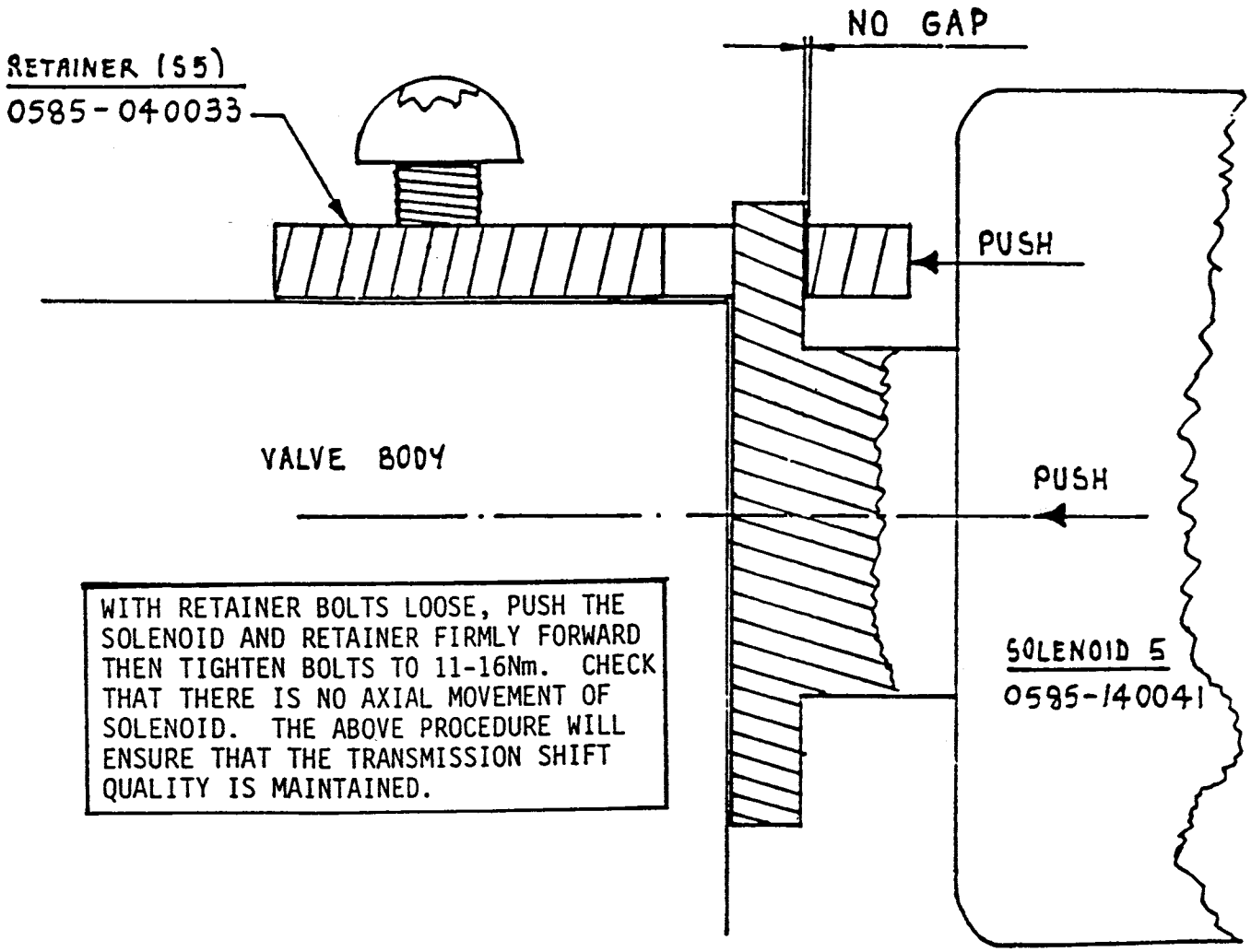

FIGURE 1: VPS AND RETAINER ASSEMBLY PROCEDURE

3. S5 DAMPER SPRING AND PISTON

Whenever a M85 transmission is serviced, it is recommended that the S5 Damper Spring and piston be replaced with new components as detailed below;

DELETE	ADD
Piston 0585-124017	Piston 0585-124026
Spring 0585-156108	Spring 0585-156144 (Shot Peened)
	Rod-Spring Guide 0585-190029

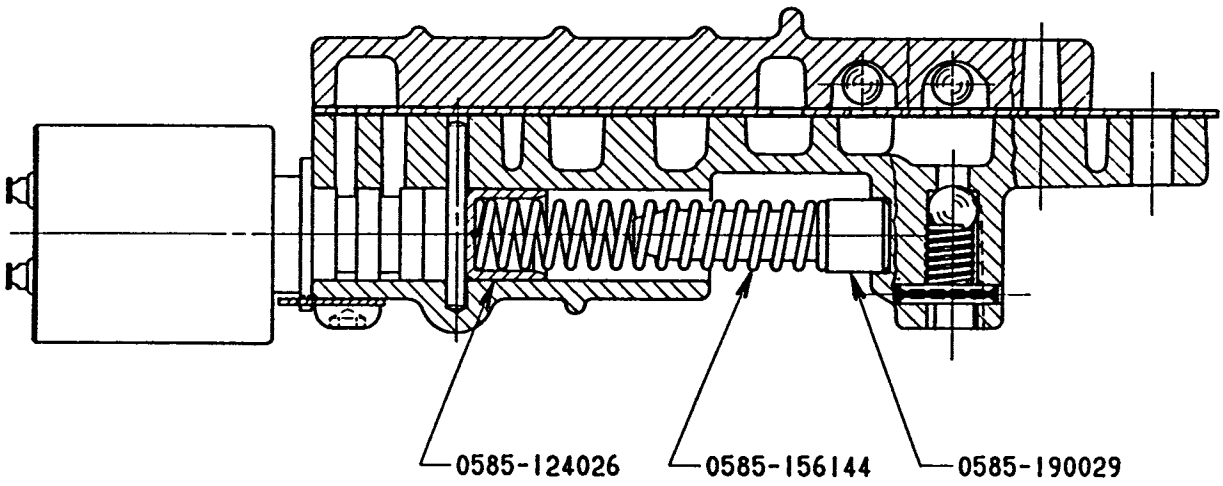

FIGURE 2: ASSEMBLY OF NEW S5 DAMPER COMPONENTS.

This upgrade will help to stabilize S5 circuit pressure and increase VPS life.

NOTE: The new damper spring 0585-156144 is visually similar to spring 0585-156108, except for a shot peening operation which improves the surface finish. Therefore it is essential that the old spring is discarded as soon as possible to avoid a possible mixup.

4. LINE PRESSURE BLOW-OFF

Transmissions with serial numbers above 55289 (T-Bar) and 35654 (Column Shift), are assembled with line relief springs with non-ground ends (Part Number 0585-156143). This change is made to prevent valve buzz and also to increase reverse gear high line pressure.

Whenever a transmission with serial numbers below this is serviced, it is recommended that the line pressure relief spring is replaced with a non-ground one.

Note: If a transmission is found to already contain a spring with non-ground ends, the original spring and spacer should not be changed.

To install a non-ground line pressure relief spring use the following procedure;

a) Remove pan and filter from transmission, do not remove valve body.

b) Precompress line relief spring using a screw driver or similar tool and remove retainer pin.

c) Remove spacer (if fitted), line relief spring and line relief valve. While the components are disassembled, check that the valve moves freely in the bore.

d) Install valve, new spring 0585-156143 (non-ground ends), 0.3mm thick spacer and retainer pin. Refer figure 2.

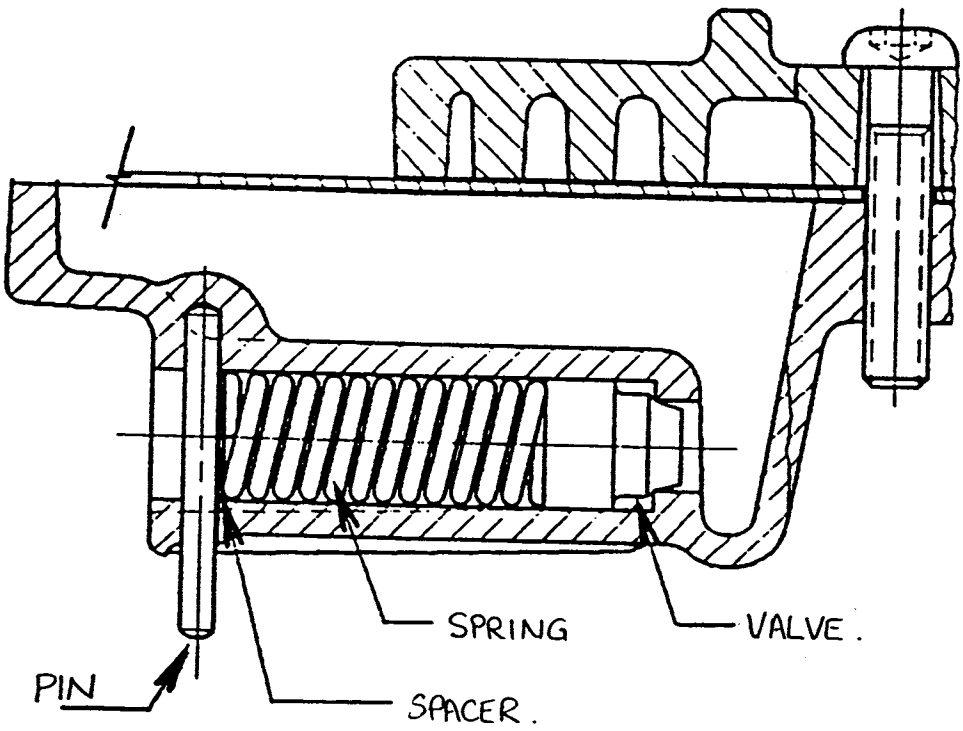

FIGURE 2: LINE RELIEF VALVE ASSEMBLY.

e) Reassemble the transmission and connect a pressure gauge (0-2500 kPa) to the line pressure fitting. Run vehicle until transmission temperature reaches 60-80°C.

f) Position vehicle on a flat, dry and solid surface. Apply the hand-brake. Select reverse gear, apply the foot brake and slowly increase throttle to 100% (Engine speed should be about 1950 RPM). Record the line pressure gauge reading.

WARNING: Do not hold 100% throttle in this condition for more than 5 seconds or converter damage may result.

The pressure reading for the M85 transmission must be between 1970-2200 kPa.

If the pressure reading is below this requirement the pan must be removed and a larger spacer fitted. Refer Table 1 below;

Pressure Reading (kPa)	Spacer Size (mm)
1970-2220	Correct spacer is fitted.
1880-1970	0.8
1790-1880	1.3

TABLE 1: LINE RELIEF SPACER SELECTION.

5. CLUTCH APPLY FEED (CAF) BALL WEAR

5.1 IDENTIFICATION

When a CAF ball wears, it is possible for the ball to reduce in diameter to the point where it passes through the baffle plate hole. When this occurs, 2-3 shifts and 2-4 backout shifts will be very firm. The 1-2 and 3-4 shifts will not be affected.

5.2 REWORK PROCEDURE

M85 Transmissions built after the 15th of January, 1990 are assembled with baffle plates having a 33° chamfer on the Ø9.5 CAF hole. Refer Figure 4. This change provides a smooth deburred surface for the ball to seat against, thus preventing wear of the ball.

Whenever a transmission is being serviced, it is recommended that the following steps are taken;

i) Replace the CAF ball with a new one if it shows any signs of wear i.e. surface is rough and/or diameter is less than 11.5mm.

ii) Inspect the CAF hole in the baffle plate. If the hole does not look like the one shown in Figure 3, or the hole edge quality is not smooth and deburred, replace the baffle plate with a new level component. (BTRE Part Number 0585-036002).

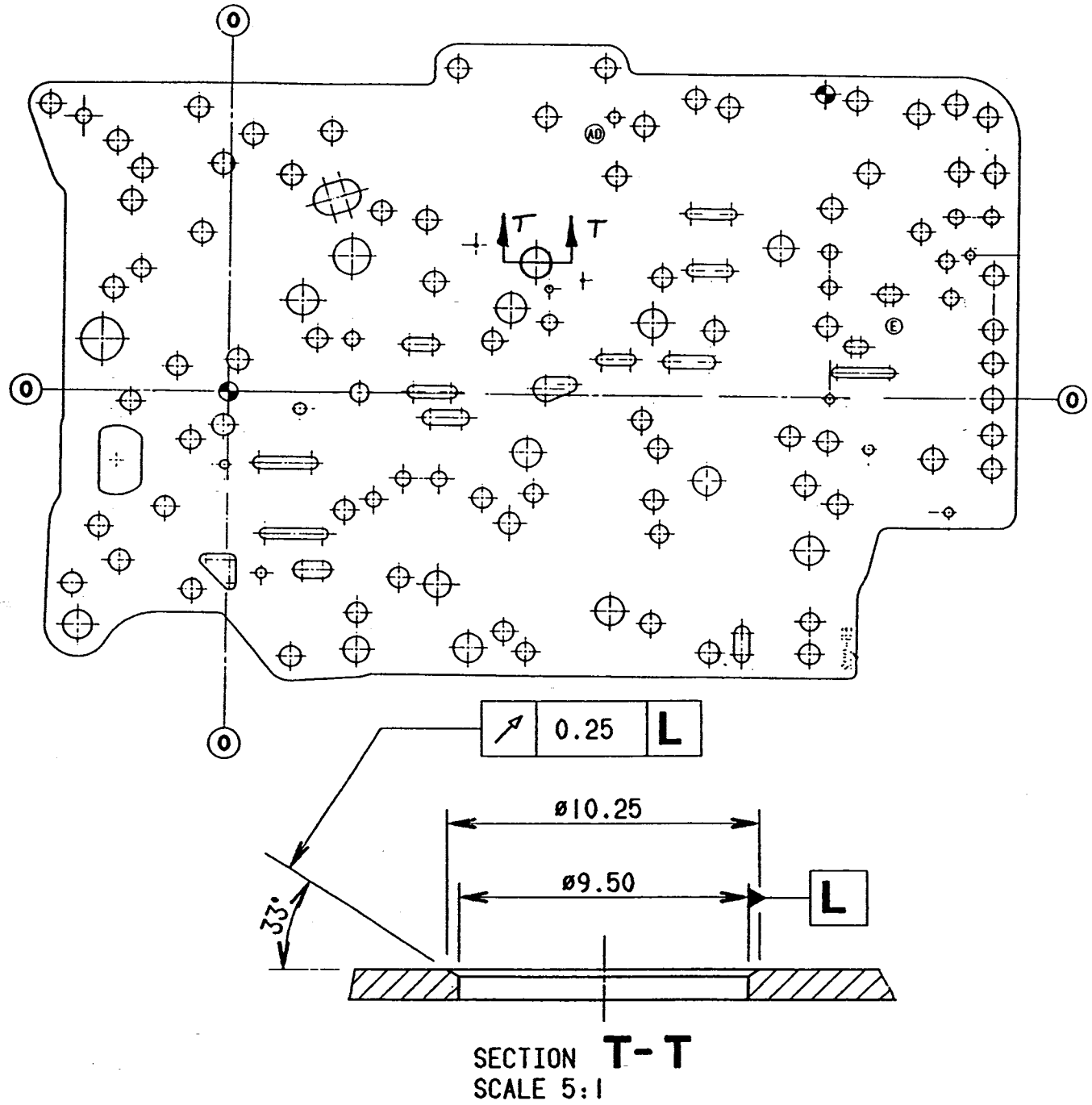

FIGURE 3: CAF HOLE AND 33° CHAMFER.

6. VALVE BODY GASKETS AND IN-LINE FILTERS

Whenever a valve body assembly is disassembled during service, it is recommended that upper and lower gaskets and the two in-line filters are replaced with new ones. Filters and gaskets must not be washed in solvents.

BTR Engineering (Australia) Limited
Formerly Borg-Warner (Australia) Limited
77 Seville Street PO Box 99 Fairfield NSW 2165 Australia
Phone (02) 724 0111 Telex AA20187 Fax (02) 726 9694
TRANSMISSION & AXLE DIVISION

MOTOR MANUFACTURER'S SERVICE BULLETIN

DATE: 29/08/91 ISSUE: 226

DISTRIBUTION: 013, 0131, 0161, 0530, 90 (2-OFF) C.F.S.V. ISSUE: 1

SUBJECT: M85 TORQUE CONVERTER UNLOCK BUMP FIX.

MODELS AFFECTED: BIKE M85 FOUR-SPEED AUTO.

1. FAULT

M85 transmissions may exhibit a bump when the torque converter unlocks. This will be most noticable at 85-95 Km/hr. This bump is not a durability concern, but maybe objectionable to some customers.

2. REWORK PROCEDURE

To prevent torque converter unlock bump the pump cover assembly can be reworked as follows;

i) Ensure that the pump cover is fitted with the latest level converter clutch control valve 0585-237071 and spring 0585-156126. Refer Service Bulletin 211. These parts will ensure that the torque converter does not draindown when left standing for long periods.

ii) Replace pump cover plate with new plate 0585-014029 and use a new gasket (0585-045018). Refer Figure 1.

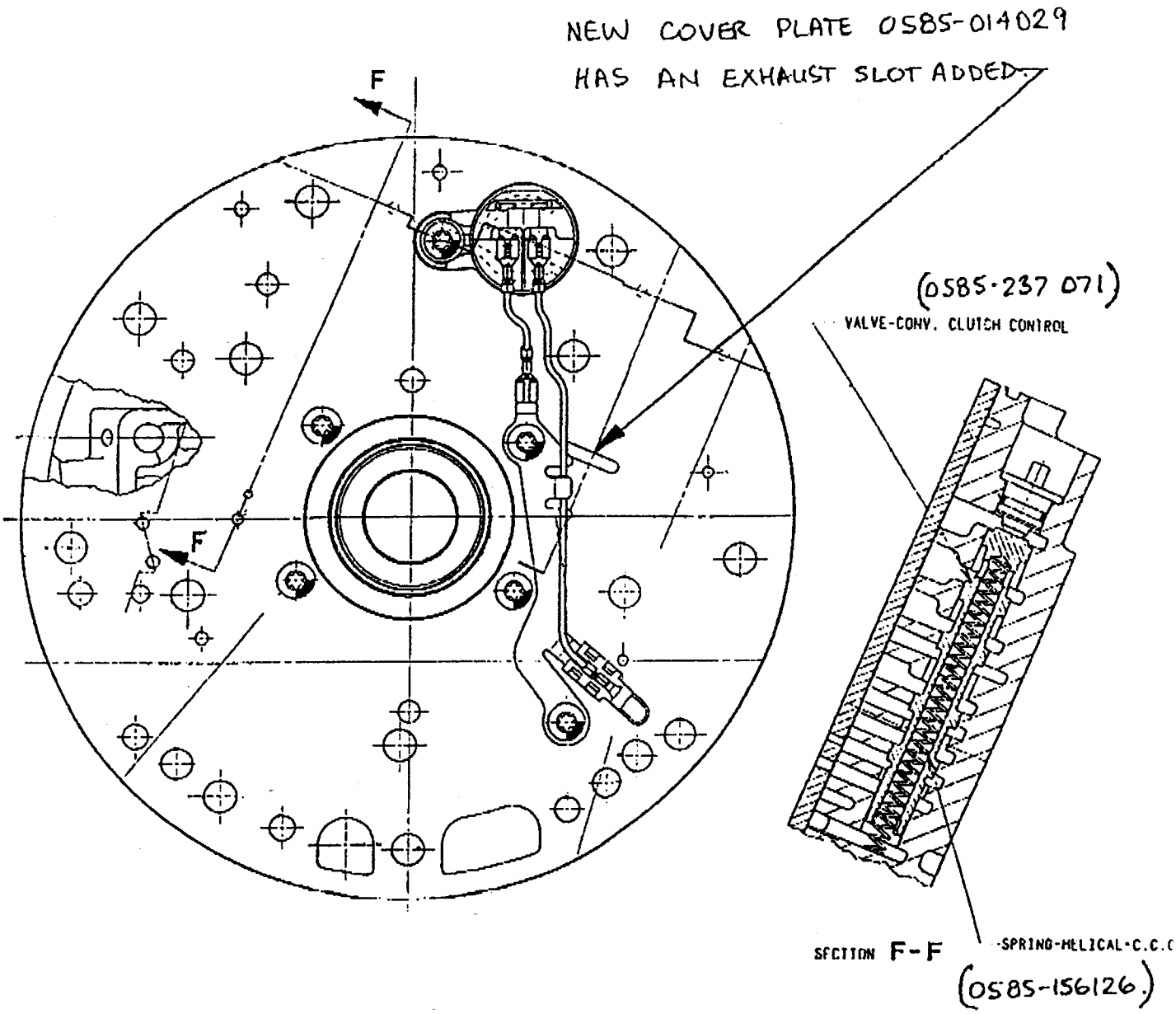

FIGURE 1: TORQUE CONVERTER UN-LOCK FIX COMPONENTS.

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BTR Engineering (Australia) Limited
TRANSMISSION & AXLE DIVISION
77 Seville Street• P O Box 99 Fairfield NSW 2165 Australia
Phone (02) 7549200 Fax (02) 7269694 (02) 7246397

227 B

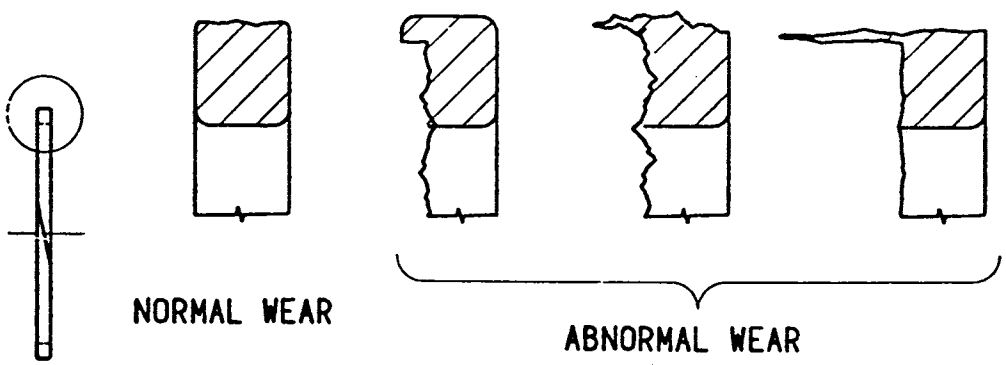
DATE : 27/11/91

DISTRIBUTION : 0130, 0131, 0161, 0530, 90 (2 Off), F ISSUE : 1

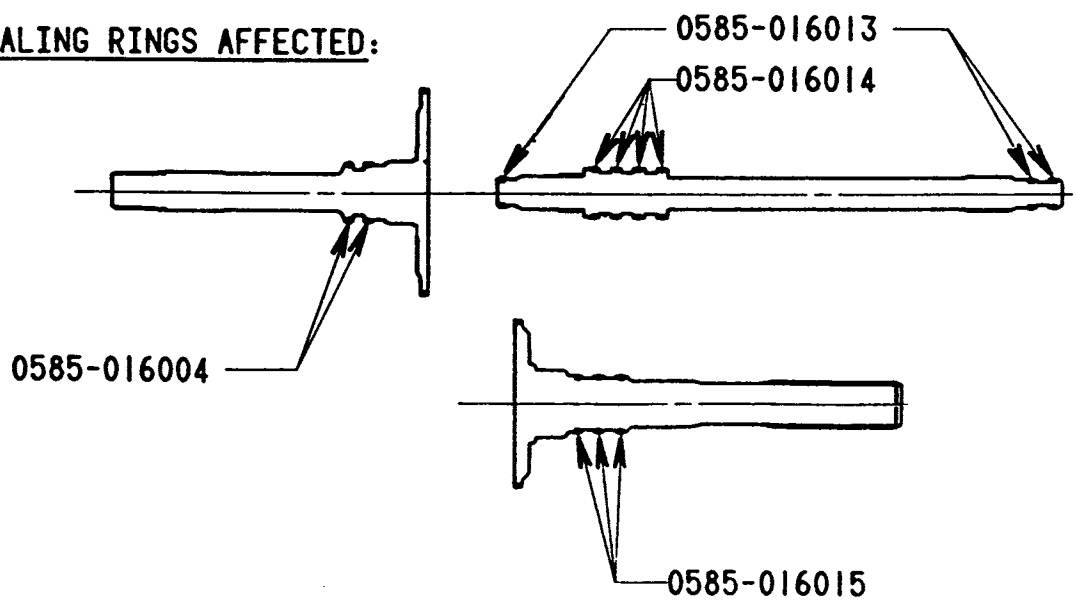
SUBJECT : ABNORMAL WEAR OF TEFLON SEALING RINGS.

MODELS AFFECTED: M85LE, M91LE, M95LE

It is important when one or more sealing rings are encountered which have a similar abnormal wear pattern to that shown below, that the shaft on which they sit (input, overdrive, or output) be replaced concurrently with the seals.



SEALING RINGS AFFECTED:



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77 Seville Street P O Box 99 Fairfield NSW 2165 Australia
Phone (02) 7549200 Fax (02) 7269694 (02) 7246397

DATE : 28/11/91 NUMBER: 22

DISTRIBUTION : 0130, 0131, 0161, 0530, 90 (2 OFF), F ISSUE : 1

SUBJECT : PREMATURE #3 BEARING FAILURE.

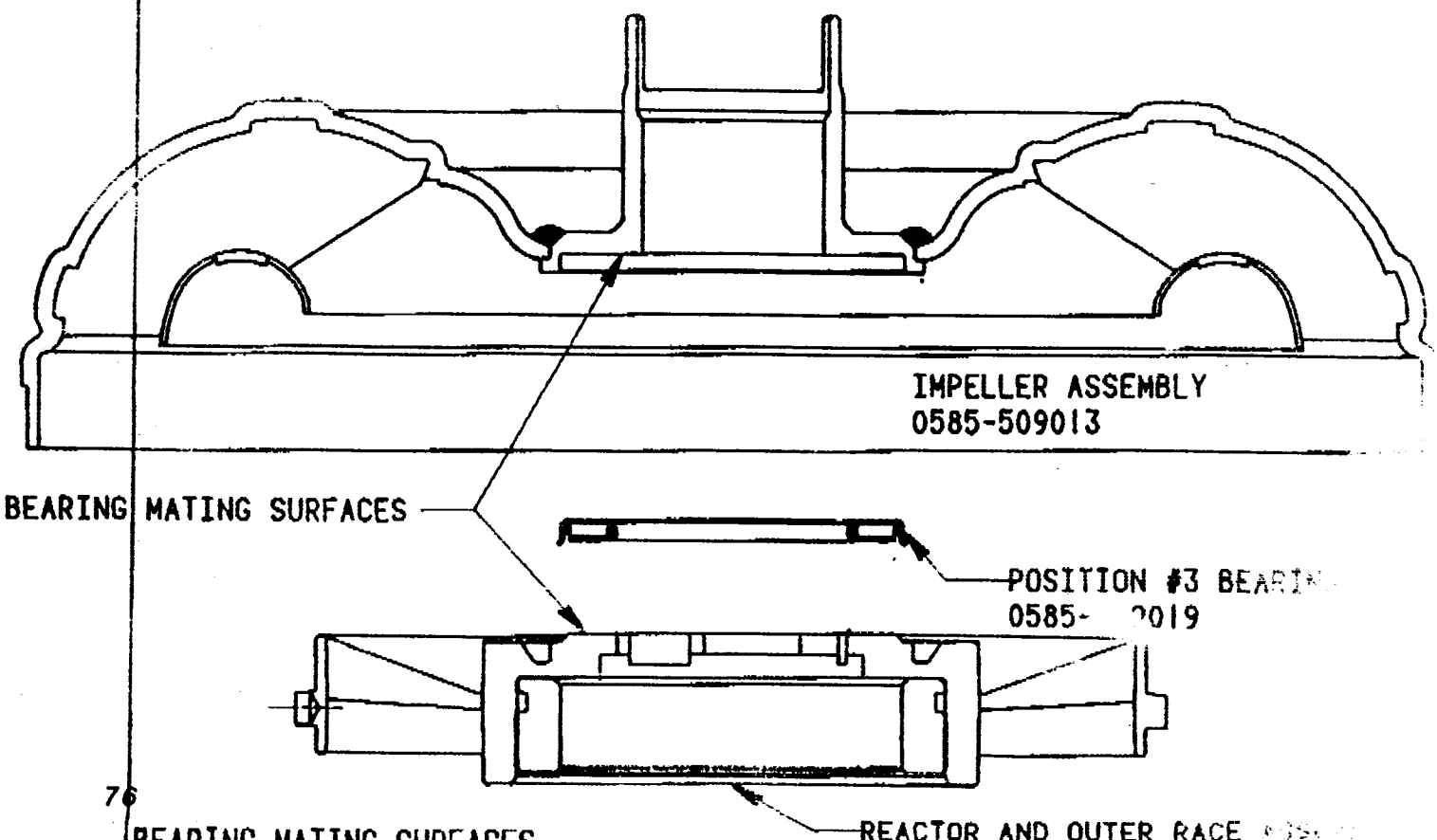
MODELS AFFECTED: M85LE, M91LE, M95LE

FAULT

IT HAS BECOME EVIDENT THAT SOME TRANSMISSIONS EXHIBIT A NOISE UNDER LIGHT DRIVE CONDITIONS (BOTH IN 'D' AND 'R'). THE CAUSE OF THIS NOISE HAS BEEN ATTRIBUTED TO PREMATURE FAILURE OF THE #3 BEARING BETWEEN THE REACTOR AND IMPELLER. BEARING FAILURE IS THE RESULT OF EITHER ONE OR BOTH OF THE MATING SURFACES BEING OUT OF SPECIFICATION FOR FLATNESS. THIS CONDITION HAS NOW BEEN RECTIFIED.

FIX

TO CORRECT THIS TYPE OF FAULT IT IS NECESSARY TO REPLACE BOTH OF THE MATING COMPONENTS AS WELL AS THE BEARING. REWORK OF THE THRUST FACES SHOULD NOT BE ATTEMPTED AS THIS MAY LEAD TO AN OUT OF SQUARENESS CONDITION AND/OR EXCESSIVE END FLOAT IN THE TORQUE CONVERTER



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77 Seville Street P O Box 99 Fairfield NSW 2165 Australia
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DATE : 25/2/92 NUMBER: 234

DISTRIBUTION : 0130, 0530, 0550 (2-OFF), 90 (2-OFF), F ISSUE : 1

SUBJECT : SUSPECTED FAULTY BOSCH TRANSMISSION ECU CHECK LIST.

MODELS AFFECTED: M85LE/M95LE

1. INTRODUCTION

Service Bulletin provides a recommended check list for vehicles fitted with the Bosch transmission Electronic Control Unit (ECU) that are suspected as being faulty.

2. BACKGROUND

There have been many cases where transmission ECU's have been removed from vehicles to correct a transmission problem and subsequent testing by the ECU manufacturer has resulted in no fault found.

Due to the critical nature of transmission operation to vehicle safety and performance the ECU continually checks all its input signals. If any inputs are either outside of acceptable limits or intermittent the ECU will go into failure mode to prevent incorrect operation of the transmission. Hence ECU inputs should always be thoroughly checked before removing a suspected faulty ECU.

3. CHECK LIST

3.1 VOLTAGE SUPPLY

Ensure the battery and charging system are in good condition. At a minimum check the alternator is charging at the correct voltage and drive the vehicle while monitoring the battery voltage at pin 30 and pin 15 of the control module. Check transmission fuse and computer power relay (EA only).

3.2 VEHICLE EARTHING

Remove all vehicle earth connections and both battery terminal leads and clean before reconnecting. Even a resistance of 0.1 ohms in the earthing system could cause intermittent problems. Do not attempt to start the vehicle with any earth leads dis-connected as this can result in permanent damage to the ECU.

3.3 MODULE TO LOOM CONNECTION

The connection of the control module to the loom assembly is via an AMP socket in the computer module and plugs, one 12 position and the other 18 position on the vehicle loom assembly. The plug units house pulse lock connectors that can easily be damaged by using undue force or inserting meter probes etc into the open ends of the connectors. The spring tension of these connectors can be reduced or completely removed by damaging the open end that plugs into the ECU module. When taking voltage or resistance measurements the probe connections should be made at the loom side of the plug by using a suitable probe.

If the pins have been damaged it will be necessary to replace the loom assembly. Individual pins can be checked to some degree by using a shim 0.55mm thick and 1.5mm wide. By inserting this shim carefully into each pin of the two plugs and feeling the contact tension an assessment of the contact quality can be made.

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TRANSMISSION & AXLE DIVISION
77 Seville Street P O Box 99 Fairfield NSW 2165 Australia
Phone (02) 7549200 Fax (02) 7269694 (02) 7246397

DATE :28th February 1992 NUMBER: 236

DISTRIBUTION :0130, 0131, 0161, 0530, 90 (2 off), F ISSUE : A

SUBJECT :INTRODUCTION OF MOULDED SOLENOIDS TO THE M95LE TRANSMISSION

MODELS AFFECTED :0595-000001 from serial number 9501-005304

Following is a list of parts that were changed when moulded solenoids and longer valve body to case bolts were introduced to the M95LE four speed automatic transmission.

CHANGES TO PUMP AND COVER ASSEMBLY

The pump and cover assembly has been modified to use a moulded normally closed (NC) solenoid in the S7 position. See Figure 1.

The contact plate assembly includes a terminals cover to mate with the moulded solenoid.

Part Name	Moulded Solenoids	Metal Solenoids	Comments
Pump & cover assy	0585-508023	0585-508022	
Pump cover assy	0585-539021	0585-539020	
Cover & converter support assy	0585-539019	0585-539018	
Pump cover plate	0585-014029	0585-014023	Improved unlock feel
Gasket - plate/cover	0585-045018		Can be used on M85
Solenoid- on/off(S7)	0585-640028	0585-140030	Moulded NC solenoid
Solenoid retainer	0585-056040	0585-056028	Pressed metal
Washer	-	0585-047018	Washer not required
Contact Plate Assy	0591-640055	0585-640023	Includes terminal cover

CHANGES TO THE VALVE BODY ASSEMBLY

The valve body assembly has been modified to use moulded normally open (NO) solenoids in positions S1, S2, S3 and S4. See Figures 2a, 2b, 2c and 2d respectively.

Notes: The CAR and BAR plungers and valves are now retained by needle rollers. Shorter plungers are required and are not interchangeable with those from metal solenoid transmissions.

The retaining plates in the 1-2 and 3-4 shift valves have also been increased in length to provide adequate retention with the wider nose of the moulded solenoids.

The wiring loom has been modified to include terminal covers that protect the terminals and connect to the solenoids. The terminal covers have been designed to be used with solenoids S1, S2 and S3 angled at 45 degrees to the valve body. See Figure 3. This ensures adequate clearance to allow correct fitting of the filter to the valve body.

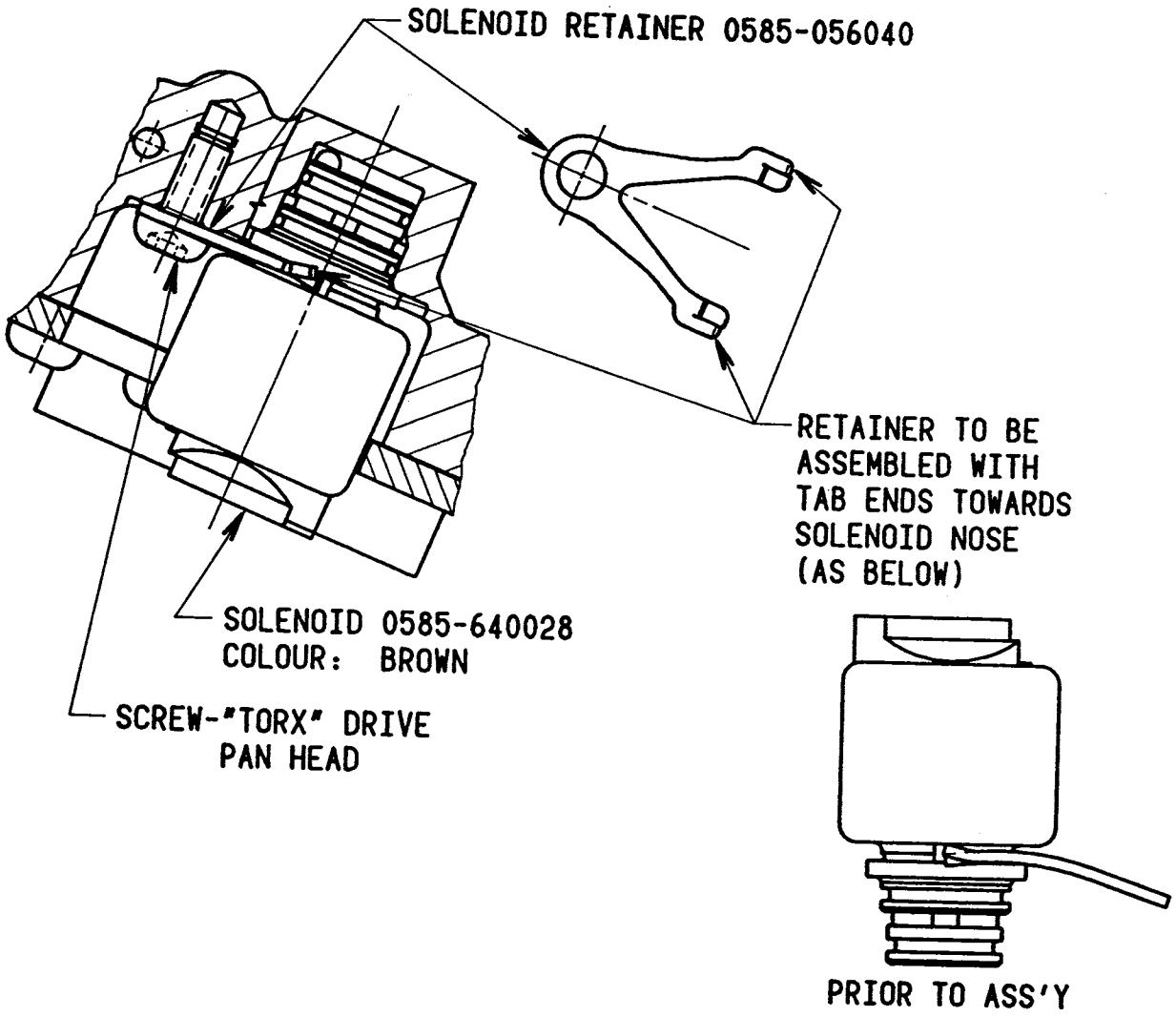
Part Name	Moulded Solenoids	Metal Solenoids	Comments
Valve body assy	0595-736019	0595-736016	
Lower val. body assy	0595-736027	0595-736024	
Lower val. body mach	0595-236026	0595-236023	
Solenoid on/off (4)	0585-640029	0585-140029	Moulded NO solenoids
Solenoid retainer(4)	0585-056040	0585-056028	Pressed metal clip
Needle roller (2)	0585-043080	-	Retains CAR and BAR plungers
Solenoid sleeves	-	0585-103059	Not required
BAR plunger	0595-108025	0595-108017	Shorter - see Fig.2(d)
CAR plunger	0595-108024	0595-108019	Shorter - see Fig.2(c)
Retaining plate (2)	0585-014027	0585-014022	Longer plate between solenoid and valves (S1,S2).
Wiring loom	0591-640054	0585-640021	Includes terminal covers and S7 wire

CHANGES TO TRANSMISSION CASE

The transmission case has been modified to use longer bolts to secure the valve body to the case.

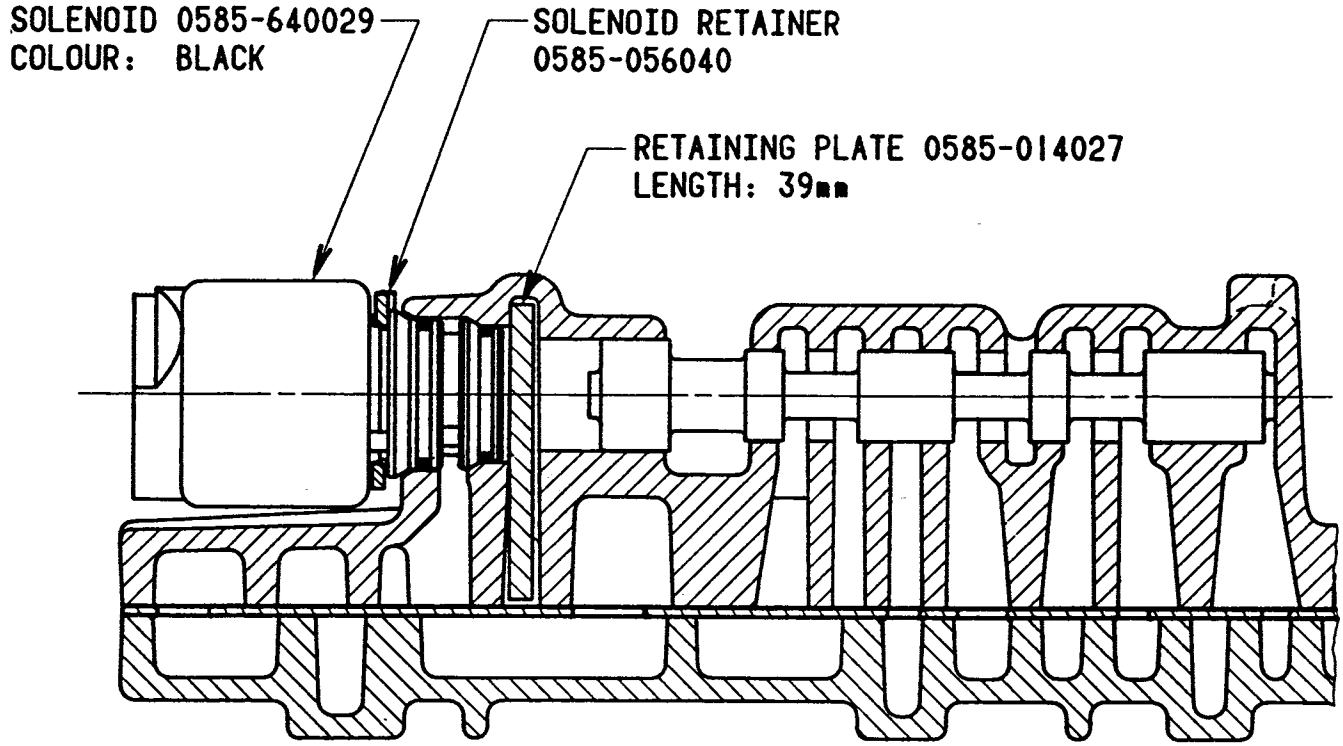
Part Name	Moulded Solenoids	Metal Solenoids	*Comments*
Trans case assy	0585-565007	0585-565005	Deeper VB bolt threads
Screw - torx (5 off)	0585-183153	0585-183133	Longer bolts
Screw - torx (7 off)	0585-183152	0585-183134	Longer bolts

Note: The valve body will not be adequately sealed to the case if the longer bolts are used in a previous level case with shorter thread depth.



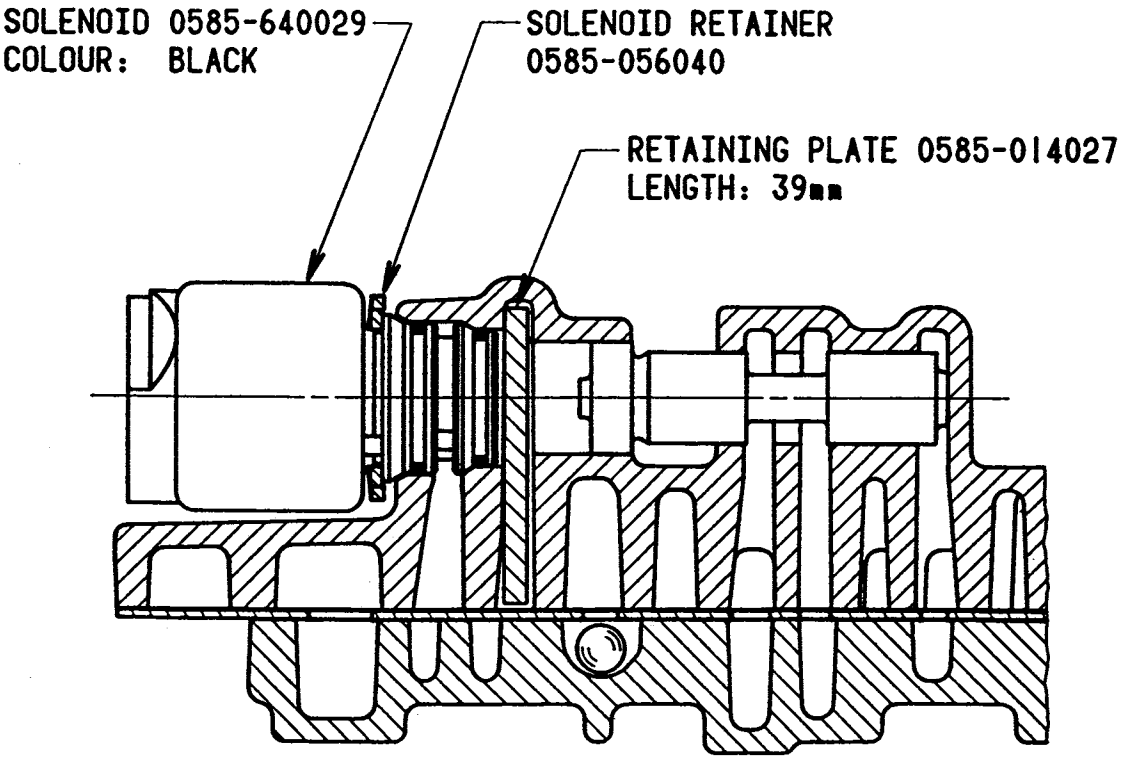
SOLENOID S7 IN PUMP COVER ASSEMBLY

FIGURE 1



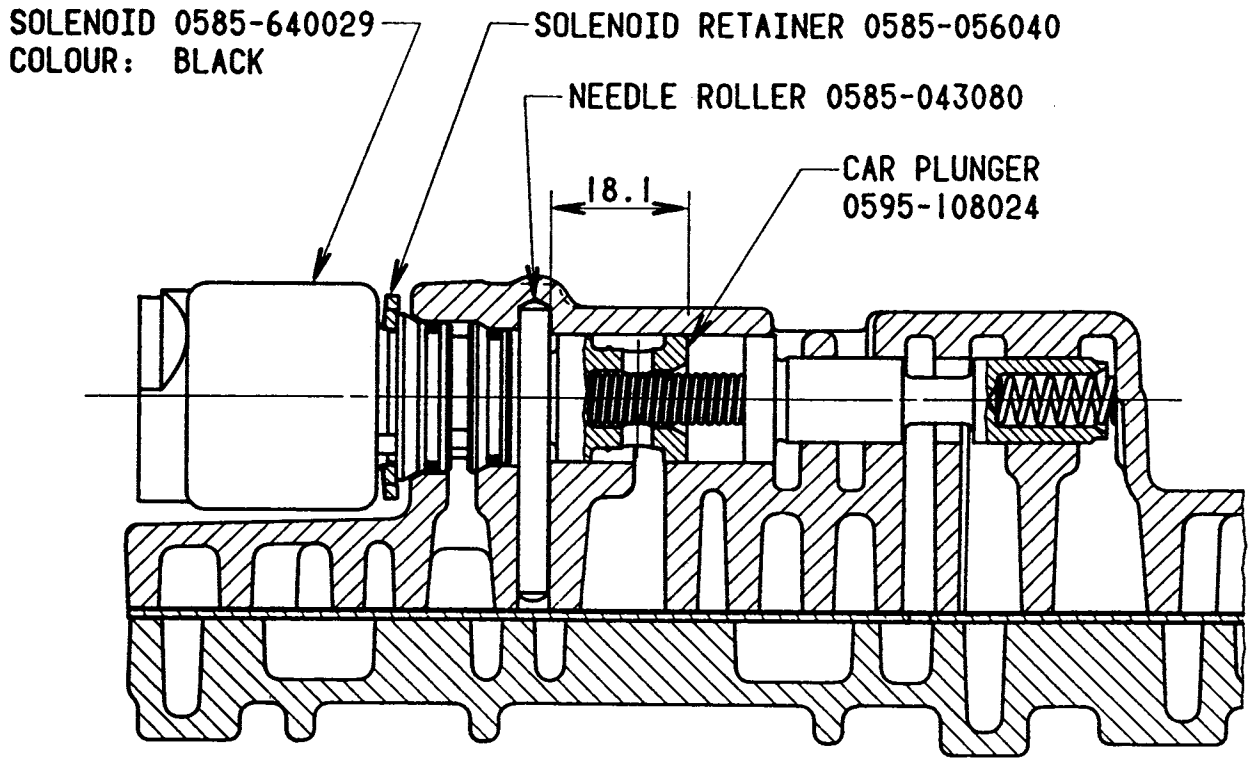
SOLENOID S1 AND 3-4 SHIFT VALVE

FIGURE 2(a)



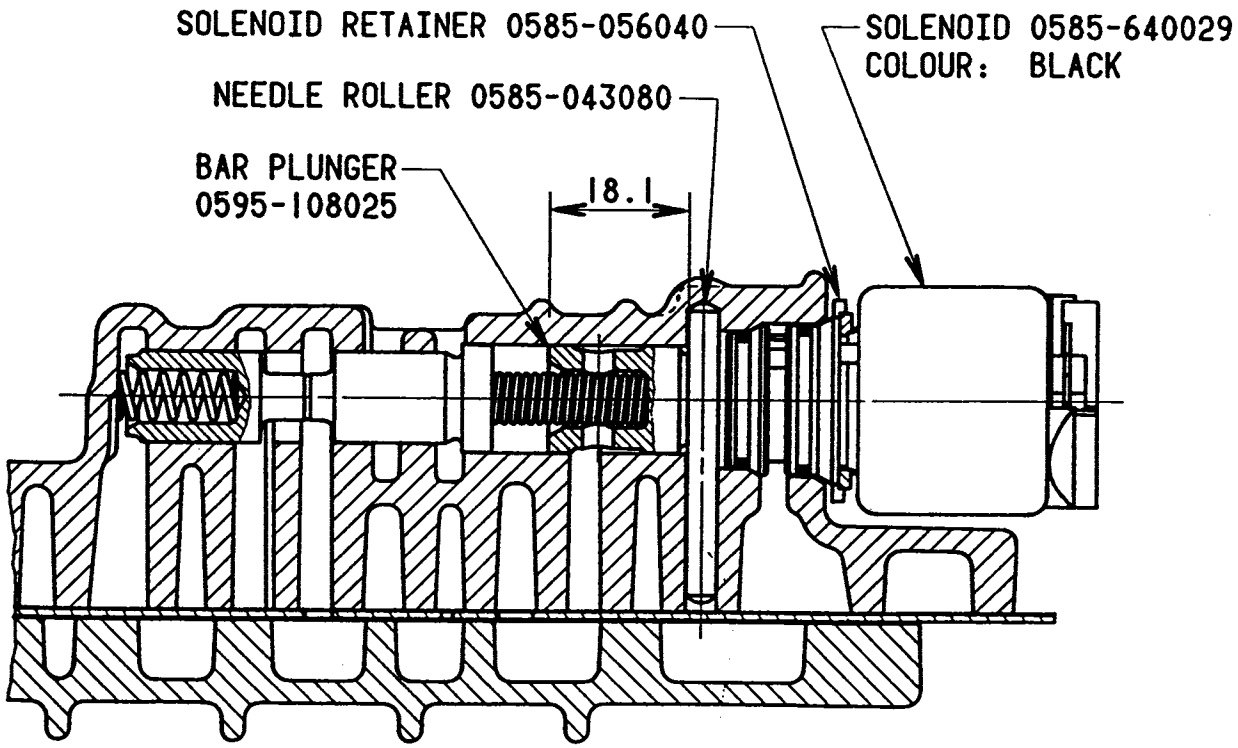
SOLENOID S2 AND 2-3 SHIFT VALVE

FIGURE 2(b)



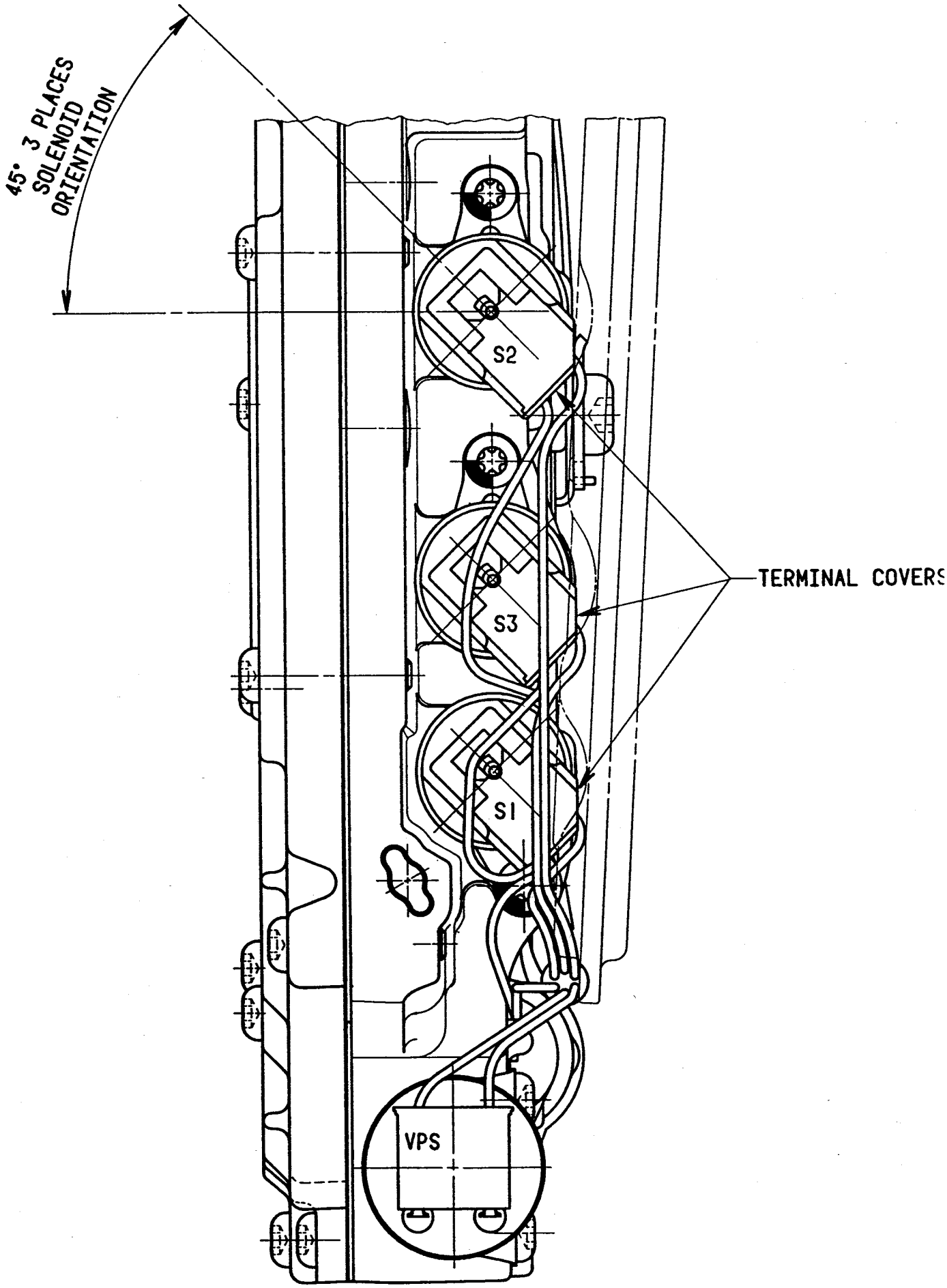
SOLENOID S3 AND CLUTCH APPLY REGULATOR PLUNGER + VALVE

FIGURE 2(c)



SOLENOID S4 AND BAND APPLY REGULATOR PLUNGER + VALVE

FIGURE 2(d)



ASSEMBLY OF S1, S2 & S3 SOLENOIDS SHOWING
ORIENTATION AND TERMINAL COVERS

FIGURE 3

Service Bulletin

BTR Engineering (Australia) Limited
TRANSMISSION & AXLE DIVISION
77 Seville Street P O Box 99 Fairfield NSW 2165 Australia
Phone (02) 7549200 Fax (02) 7269694 (02) 7246397

DATE : 11/03/92 NUMBER: 237

DISTRIBUTION : 0130, 0530, 0550 (2-OFF), 90 (2-OFF), F ISSUE : 1

SUBJECT : BASIC IN-VEHICLE DIAGNOSTIC PROCEDURE

MODELS AFFECTED: M85LE, M95LE

1. INTRODUCTION

This service bulletin provides a step by step diagnostic procedure to assist in solving electrical problems experienced with vehicles fitted with the Bosch transmission Electronic Control Unit (ECU).

2. BACKGROUND

Due to the critical nature of transmission operation to vehicle safety and performance the ECU continually checks all its input signals. If any inputs are either outside of acceptable limits or intermittent the ECU will go into failure mode to prevent incorrect operation of the transmission. Hence ECU inputs should always be thoroughly checked before removing a suspected faulty ECU.

3. PROCEDURE

3.1 Connect Test Unit (SAM, Drivetec etc) into the loom circuit.

3.2 Turn ignition On with the engine stopped.

3.3 Cycle mode switch and notice mode lamp operating.

This confirms the transmission control module is functioning. If lamp does not operate then check loom connections, remove tester and repeat test. If lamp still fails to operate check globe, switch and loom connections. Check ECU power supply (15,30), ECU ground (21), mode switch input (18), mode lamp output (14) and there is battery voltage to the performance lamp. If power supply and ground are correct then refer to note 1.

3.4 Retrieve and record any fault codes.

3.5 Clear any fault codes.

3.6 Retrieve fault codes again.

(i) If there are many fault codes, check loom connection, battery voltage at pins 15 and 30 and vehicle grounds. (See note 1).
(ii) If there are fault codes present take appropriate action as indicated by the code.
(iii) As the vehicle has not been driven since the stored faults were cleared, engine and speedometer signals as well as some on/off solenoids have not been examined by the fault detection network. This is handled in the roadtest.

3.7 Roadtest Vehicle.

(i) Include converter lock-up, kickdowns and backouts during the roadtest.
(ii) Note if vehicle response is normal or shifts are firm or soft etc and whether all gears selected are really selected etc.

Even if there are no fault codes the following information may help point to the faulty area.

(a) If shifts are firm at low speed then possibly throttle or engine speed pick-up problem.

(b) If performs 1-3 then stays in 3rd could be speedo fault.
(c) If there are no manual shifts then check PRNDL sensor.
(d) If shifts are firm and return to normal when hot, check the transmission temperature sensor.
(e) If jumps between 3rd gear (limp home mode) and the correct gear then check battery, charging system or the ECU loom connections.
(f) Intermittent fault codes of 95 or 98 or erratic shifts check battery voltage, vehicle earth connections and control unit connection to the vehicle loom. (See note 1).

3.8 Retrieve fault codes again.

(i) If have any faults code follow appropriate action.
(ii) If have no fault codes but the roadtest indicated there could be electrical problems check there is battery voltage on pin 15 even with the ignition Off. Fault codes may be cleared if the ECU module is disconnected from the battery (pin 15) for longer than 60 seconds. Also refer to note 1.
(iii) It is possible for some Test Units to mask certain faults particularly solenoid and throttle faults. If this is the case it may be necessary to repeat the roadtest with the Test Unit disconnected and then reconnect the Test Unit to retrieve the fault codes.

Note 1:

The following check-list should be completed when an ECU is suspected as faulty. This includes intermittent problems especially codes 95 and 98.

1. Voltage Earthing

Ensure the battery and charging system are in good condition.

2. Vehicle Earthing

Remove all vehicle earth connections and both battery terminal leads and clean before reconnecting. Even a resistance of 0.1 ohms in the earthing system could cause intermittent problems. Do not attempt to start the vehicle with any earth leads disconnected as this can result in permanent damage to the ECU.

3. Module Loom Connection.

The connection of the control module to the loom assembly is via a 30 pin AMP connector. The plug units house pulse lock connectors that can easily be damaged by using undue force on the connector or inserting meter probes etc into the open ends of the pins. The spring tension of the pin connection can be reduced or completely removed by damaging the open end of the pin. When taking voltage or resistance measurements the probe connections should be made at the loom end of the pin by using a short piece of wire.

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DATE : 13/4/92 NUMBER:239

DISTRIBUTION : 0130, 0131, 0530, 0550, 90(2 OFF) ISSUE :1
FORD, FORD C.S.O. MELBOURNE(2), FORD(N.Z.),
COLIN BROOKS, FRED MILNE, A.T.P.(U.K.)
A.T.R.A., M.T.A..

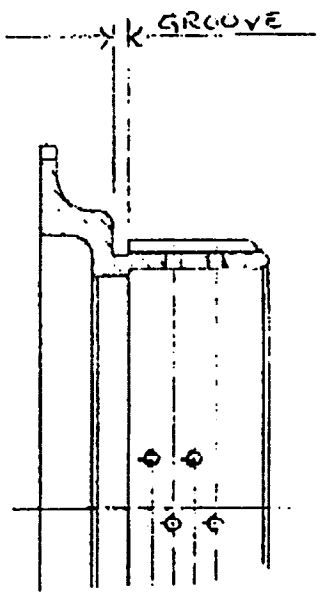
SUBJECT : INTRODUCTION OF FORGED C3 HUB TO ASSIST ASSEMBLY.

MODELS AFFECTED: M85, M91, M95

A FORGED STEEL C3 HUB - PART NO. 0585-090026 HAS BEEN INTRODUCED FOR ALL M85,91,95 TRANSMISSIONS TO ASSIST AND EASE ASSEMBLY OF THE SNAP RING.

THIS HUB IS A SUBSTITUTE FOR, AND IS INTERCHANGABLE WITH, HUB - PART NO. 0585-090019 WHICH INCORPORATES A 5° ANGLE ON THE OUTER SPLINE TEETH.(REF. SERVICE BULLETIN 227).

THIS HUB IS IDENTIFIED BY THE PRESENCE OF A GROOVE AT THE END OF THE SMALL SPLINE AS SHOWN BELOW AND DOES NOT INCORPORATE THE 5° ANGLE. REPLACEMENT HUBS WITHOUT THE 5° ANGLE MUST HAVE THIS IDENTIFYING GROOVE.



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DATE : MAY 26 TH 1992 NUMBER: 240

DISTRIBUTION : 0130,0131,0530,0550,90,02,03, F,R,C,Z,B,K,J ISSUE : 1

SUBJECT : REMOVAL OF WIRING LOOM TERMINAL CONNECTORS FROM MkII (MOULDED) ON/OFF SOLENOIDS

MODELS AFFECTED: M91, M95

FAULT: It has been noted that the MkII solenoid wiring loom connectors are susceptible to damage if removed from the solenoid using a lever, as shown in figure 1. The use of a lever in either of the positions shown can result in breakage of the "U" leg on the connector and thus reduce the retention capacity of the connector.

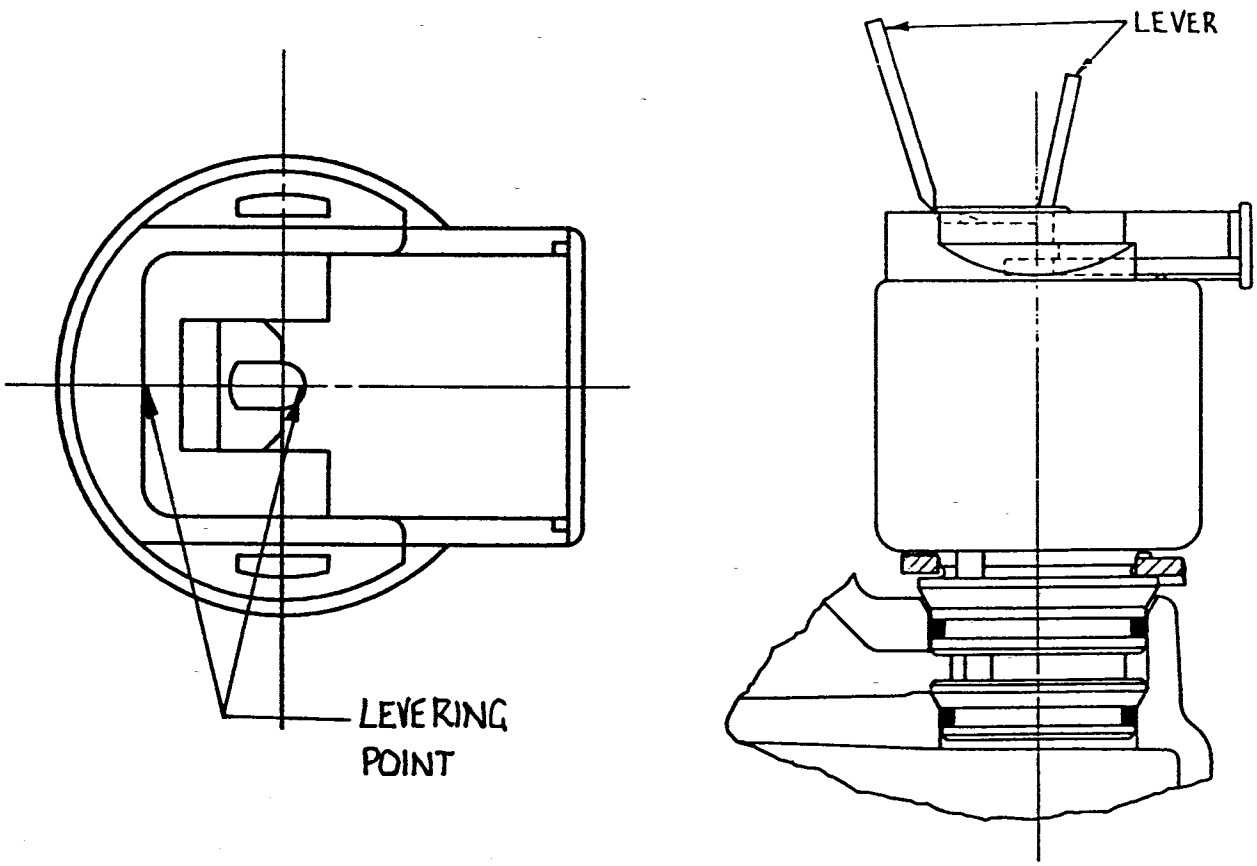

FIGURE 1 Unacceptable removal method using levers

CORRECTION: The preferred method of removal for the terminal connectors is to grip the connector with fingers as shown in figure 2. A small side force should be exerted when withdrawing the connector, as this will clear the 'U'

leg from the location edge. Experience shows that the terminal connector is easily removed by hand when removed as shown.

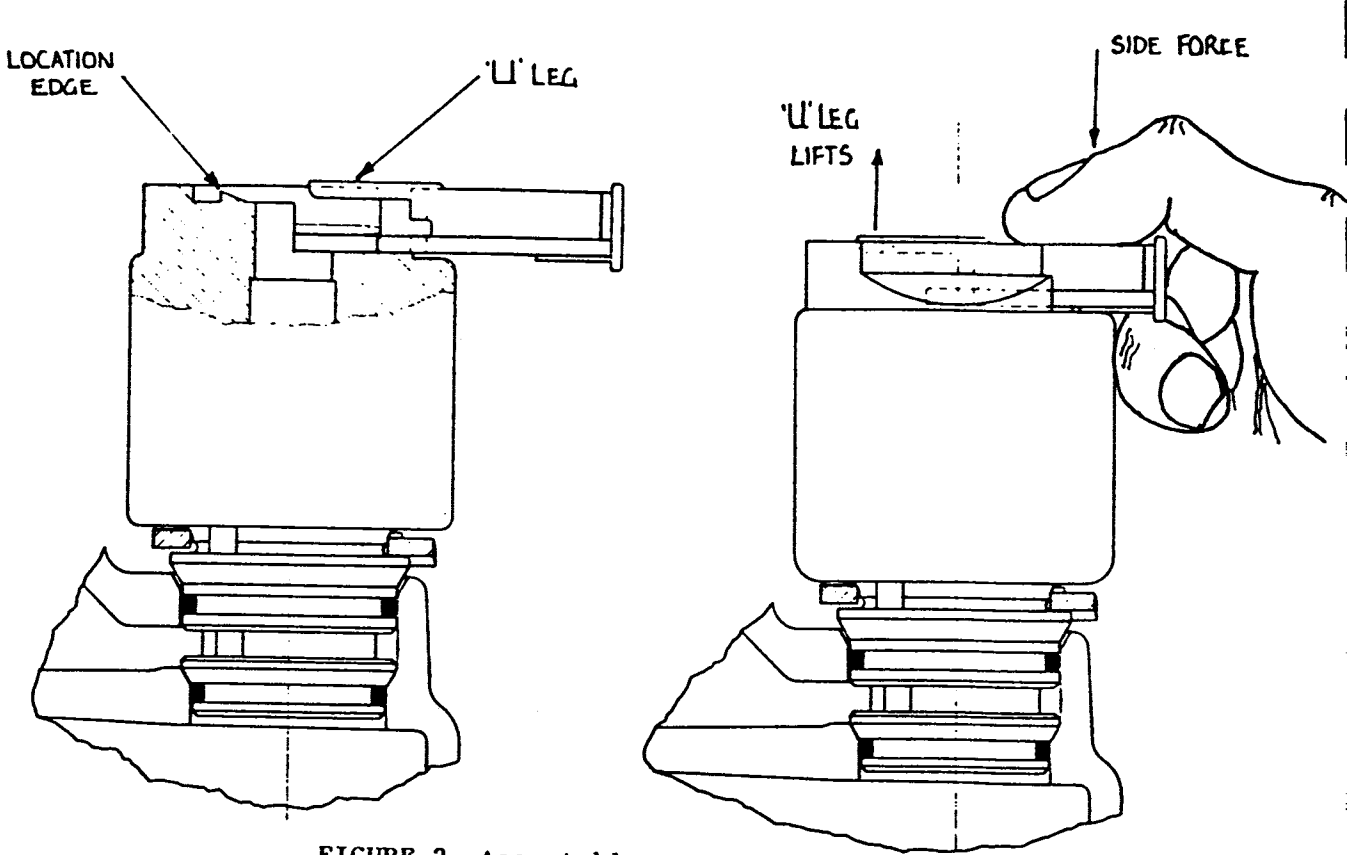

FIGURE 2 Acceptable removal method

NOTE: When inserting the terminal connector onto the solenoid, it is important to align the guide legs on the connector with location slots in the solenoid. This feature assists in positioning the electrical connectors.

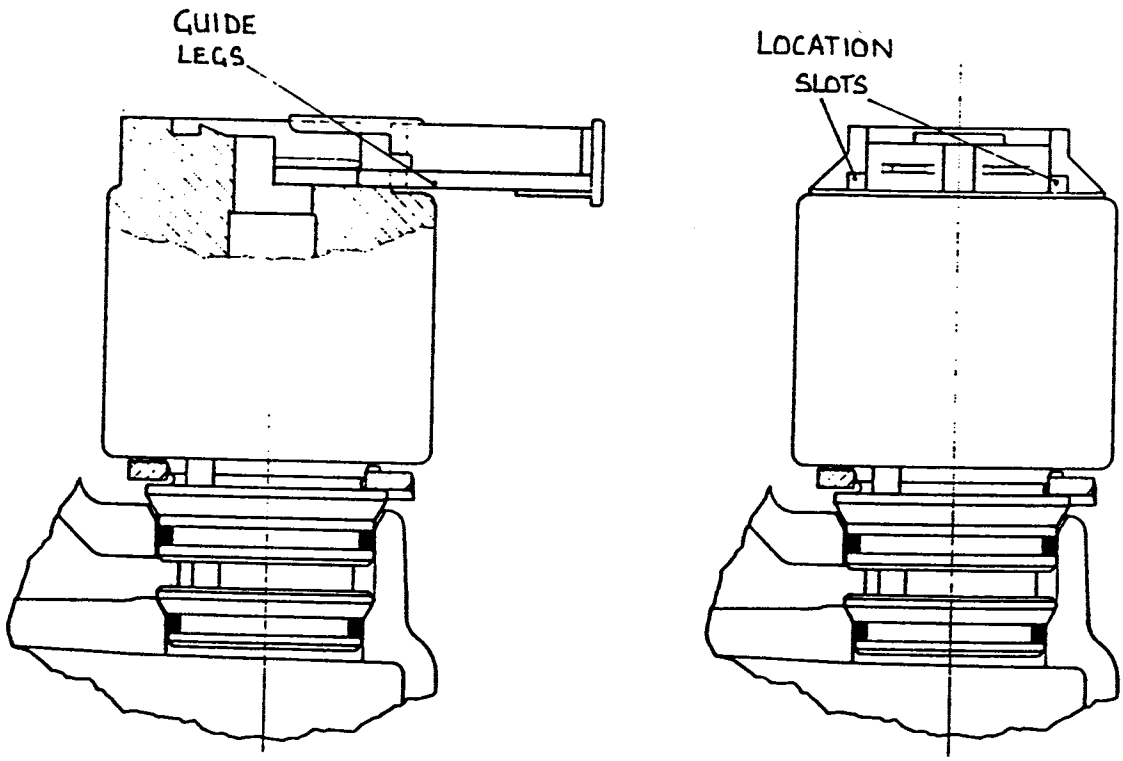

FIGURE 3 Alignment features of solenoid and connector

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TRANSMISSION & AXLE DIVISION
77 Seville Street PO Box 99 Fairfield NSW 2165 Australia
Phone (02) 724 0111 Telex AA20187 Fax (02) 726 9694

SERVICE BULLETIN

DATE: 2nd September 1992. NUMBER: 244.

DISTRIBUTION: 0130, 0530, 02, 03, 90, FORD (PEO), FORD (CSO), FORD (NZ), ATP (ENGLAND).

SUBJECT: GEAR LEVER VIBRATION IN 3rd GEAR.

MODELS AFFECTED: FORD T5 MANUAL TRANSMISSION ASSEMBLIES.
0552-000006 (91DA-7003-CA), PRIOR TO SERIAL No. 2082.
0552-000032 (86DA-7003-BB), PRIOR TO SERIAL No. 17097.
0552-000065 (91DA-7003-AA), PRIOR TO SERIAL No. 1710.

SYMPTOMS.

EXCESSIVE VISIBLE GEAR LEVER VIBRATION, UP TO 5mm OF TOTAL KNOB MOVEMENT, SOMETIMES OCCURS IN 3rd GEAR AT APPROXIMATELY 30 TO 80 km/h ON DRIVE (THROTTLE ON), AND IN SOME CASES THE LEVER COULD RATTLE. THE MAGNITUDE OF VIBRATION WOULD VARY DEPENDING ON THE INDEXING POSITION OF THE SHIFT SLEEVE ON THE GEAR, FOR EACH SEPARATE GEAR SELECTION. THIS IS CAUSED BY THE CUMULATIVE EFFECT OF TOLERANCES ON COMPONENTS LISTED BELOW.

RECOMMENDED ACTION.

THE FOLLOWING PACKAGE OF ITEMS NEED TO BE INSTALLED TO REDUCE GEAR LEVER VIBRATION :-

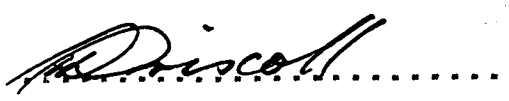
1. 3rd/4th SYNCHRONIZER ASSEMBLY WITH WIDER SHIFT FORK GROOVE, (PART No. 1352-590011), PURCHASED AFTER JULY 1992.

   WIDTH OF WIDER FORK GROOVE IN SHIFT SLEEVE = 7.06/6.91mm. SUPERSEDES FORK GROOVE WIDTH OF 6.55/6.40mm.

2. 3rd/4th SHIFT FORK, (PART No. 1352-096004), PURCHASED AFTER JULY 1992.

3. 3rd SPEED GEAR THICKER THRUST WASHER (PART No. 1300-193005) AND RETAINING RING (PART No. 1300-139041).

   NOTE : 2nd AND 3rd SPEED GEAR END FLOATS ARE AFFECTED BY THE INSTALLATION OF REVISED THICKNESS THRUST WASHER AND RETAINING RING.
   REVISED END FLOAT SPECIFICATION TO SUIT THE INSTALLATION OF THESE COMPONENTS IS AS FOLLOWS :-
   2nd SPEED GEAR = 0.23mm TO 0.66mm.
   3rd SPEED GEAR = 0.23mm TO 0.58mm.



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DATE : 17/11/92 NUMBER: 245

DISTRIBUTION : 0130, 0131, 0530, 0550, 02, 03, 90 ISSUE : 1
FORD, TICKFORD, FORD CSO-MELBOURNE, FORD (NZ)
ATP-ENGLAND, ATRA, MTA

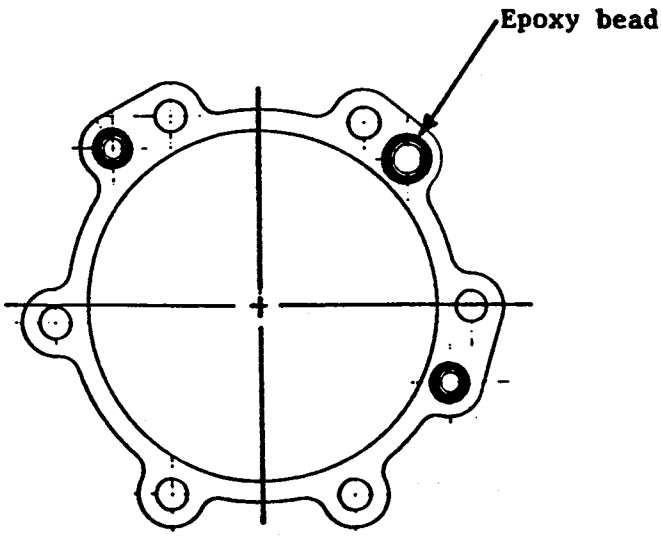
SUBJECT : INTRODUCTION OF IMPROVED REAR SERVO COVER GASKET

MODELS AFFECTED: M91, M95

CHANGE POINT M91: 9103-001854
9104-033868
CHANGE POINT M95: 9501-008352

A new Rear Servo Cover Gasket, (Part No. 0591-045047) has been introduced on all M91 and M95 transmissions replacing the gasket, (Part No. 0585-045040), and three o-ring (Part No. 0540-141004) design. The three o-rings are no longer required with the new gasket.

The new gasket can easily be distinguished from the previous gasket, in that the new gasket, (Figure 1.) is 0.8mm thick and has circular epoxy beads printed around the pressure ports where the three o-rings were previously located. The previous gasket, as shown in Figure 2. is only 0.35mm thick.



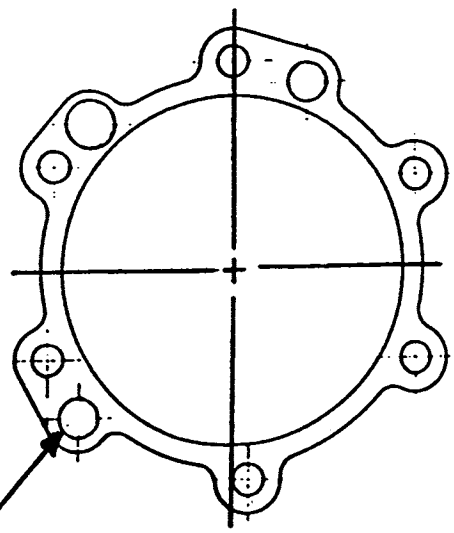


Figure 1. New gasket 0591-045047 Figure 2. Previous gasket 0585-045040

A new Rear Servo Cover, (Part No. 0591-539025), has also been introduced to suit the new Rear Servo Cover Gasket.

This new Rear Servo Cover, (Fig. 3), can be identified by the deletion of the three O-ring recesses in the mating face of the cover. Figure 4 below shows the previous Rear Servo Cover (Part No. 0585-539009).

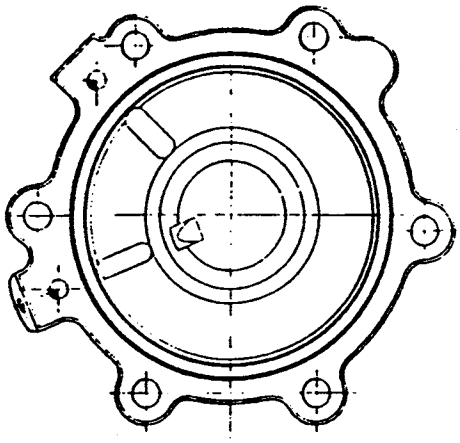


Figure 3. New cover 0591-539025

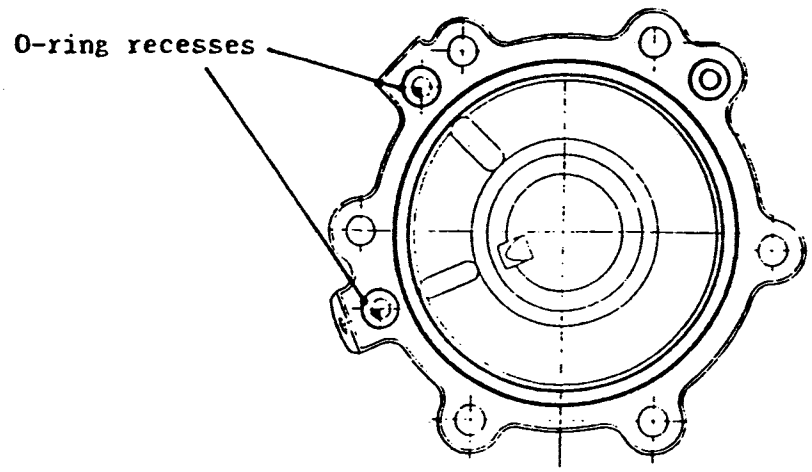


Figure 4. Previous cover 0585-539009

The new Rear Servo Cover Gasket (Part No. 0591-045047) can only be used with the new Rear Servo Cover. The previous Rear Servo Cover Gasket (Part No. 0585-045040) must be used with the three o-rings and Rear Servo Cover. These gaskets, o-rings and covers are not interchangeable.

The assemblies, however, as detailed below are interchangeable as complete assemblies.

PREVIOUS ASSEMBLY	- Rear Servo Cover Gasket	0585-045040
	- O-rings (3 off)	0540-141004
	- Rear Servo Cover	0585-539009
NEW ASSEMBLY	- Rear Servo Cover Gasket	0591-045047
	- Rear Servo Cover	0591-539025

The Overhaul Kit, (Part No. 0555-334425), and the O-ring/ Gasket/ Seal Kit (Part No. 0555-334426) will include both the previous gasket and three o-rings set as well as the new gasket to service both new and existing covers.

ADDITIONAL NOTES

- The Rear Servo Gasket MUST be assembled dry, i.e. NO lubricants such as vaseline or Automatic Transmission Fluid are to be present on either the rear servo cover or the maincase mating surfaces during assembly.

- The Rear Servo Bolts are to be set at the same torque setting of 17 - 25 Nm.

- For both the new and previous gasket design the Rear Servo Bolts should have a small amount of thread sealant, Loctite 242, applied to the threads of each bolt.

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Phone (02) 754 9200 Telex AA20187 Fax (02) 726 4201

MOTOR MANUFACTURER'S SERVICE BULLETIN

CA34

DATE : 30TH SEPTEMBER, 1992 NUMBER: 247

DISTRIBUTION : 0130, 0530, 0550 (2-OFF), 90 (2-OFF), F ISSUE : A

SUBJECT : LOCATION OF INHIBITOR SWITCH TWO (2) PIN CONNECTOR SEAL.

MODELS AFFECTED: M85LE, M91LE, M95LE

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1. INTRODUCTION

This Service Bulletin is to advise of seal location for the inhibitor switch two (2) pin connector.

2. BACKGROUND

The inhibitor switch assembly is vented via the two (2) pin connector and loom assembly. There have been many cases where water has entered the inhibitor switch via the two (2) pin connector due to the absence of the seal. This results in a gear lever fault (code 27).

3. PROCEDURE

Prior to fitment of the two (2) pin connector to the inhibitor switch assembly, ensure the rubber seal inside the connector is present and has full contact with the connector housing.

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Phone (02) 7549200 Fax (02) 7269694 (02) 7246397

BRUCE10

DATE : 27/10/92

NUMBER: 249

DISTRIBUTION : 0130, 0131, 0530, 0550, 02, 03, 90 (2-OFF), F, R, C (2), Z, B, J, K.

ISSUE : 1

SUBJECT : DIAGNOSIS OF GASKET AND SEAL LEAKAGE AT PRE-DELIVERY INSPECTION.

MODELS AFFECTED : M91LE, M95LE

1. INTRODUCTION

Pre-delivery inspections are showing some transmissions with leakage from the extension housing gasket and oil pan seal. Some of these have been found to originate from oil flowing from the breather assembly during transportation at high angles on car transporters. This Service Bulletin details procedures to identify oil leak sources in this area of the transmission.

2. BACKGROUND

High transportation angles on car transporters may allow oil to fill the extension housing and flow from the breather at the top and rear of the transmission case. This oil can flow over the extension housing gasket, the speedo sender, the rear servo area and the oil pan seal.

3. PROCEDURE TO DETERMINE SOURCE OF OIL LEAKAGE

1) Wash any oil from the outside of the transmission and allow to dry.

2) Warm transmission to working temperature during a short drive with frequent stop/starts in drive and reverse.

3) Inspect transmission for leaks.

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SERVICE BULLETIN

DATE: 24th November, 1992. **NUMBER:** 250

DISTRIBUTION: 0130, 0530, 02, 03, 90, FORD (PEO), FORD (CSO), FORD (NZ), ATP (ENGLAND).

SUBJECT: FORD T5 WITH REVERSE GEAR BRAKE

MODELS AFFECTED: FORD 6 CYL T5 0552 000010, FORD V8 T5 0552 000066.

This bulletin is to inform on the introduction of an additional brake feature when selecting reverse gear in T5 transmissions for both six cylinder and V8 EBII range of vehicles. This new feature completely eliminates the incidence of clash noise when engaging reverse, with the vehicle stationary.

Note that this is not a synchronized reverse gear and the vehicle still has to be stationary when engaging reverse gear.

The need to wait for a 3 second or so spin down of the cluster gear to a stop, before engaging reverse is eliminated. When selecting reverse, the motion of the gear lever is used to apply the 5th speed synchronizer sleeve as a brake, to stop the rotation of the cluster gear. The synchronizer sleeve moves rearwards onto a cone held by the extension housing thereby applying a brake. As a result, a very slight change in shift feel into reverse may be noticed if making a direct comparison of the reverse brake feature against the previous level T5 transmission.

For the purpose of identifying transmissions with or without this feature and checking on associated service parts, the following component list is provided.

A diagram showing the brake components is shown for service.

The pictorial representation shows an exploded view of the major brake components and is provided as a guide for assembly in service.

C. JOACHIM

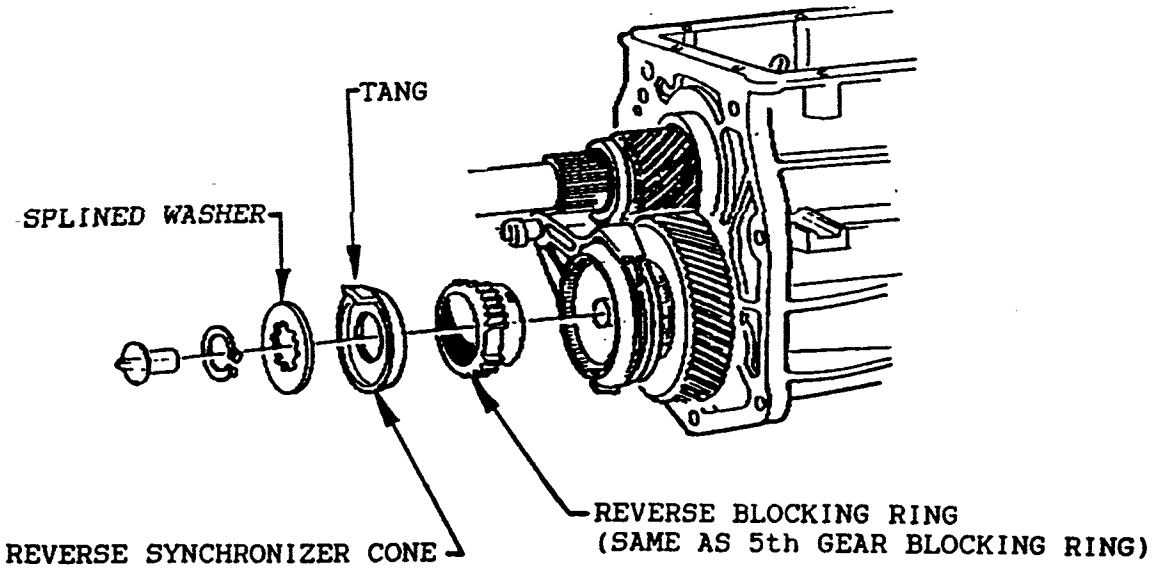
FORD T5 REVERSE BRAKE TRANSMISSION ASSY'S.

PART NUMBER COMPARISON FOR 6 cyl. TRANSMISSION.

PREVIOUS LEVEL STANDARD TRANSMISSION.			NEW LEVEL REVERSE BRAKE TRANSMISSION		
TRANSMISSION IDENTIFICATION:-					
BTRE PART No. 0552-000006 FORD PART No. 91DA-7003-CA. COLOUR CODE - ORANGE.			BTRE PART No. 0552-000010. FORD PART No. 91DA-7003-EA. COLOUR CODE - WHITE.		
PART No.	DESCRIPTION	QTY	PART No.	DESCRIPTION	QTY
1352-565008	CASE-TRANS.ASSY.	1	1352-565027	CASE-TRANS.ASSY.	1
1352-596009	FORK ASSY-REVERSE	1	1352-596013	ASSY-REV.FORK.PIN & ROLLER	1
1352-156005	SPRING-REV.IDLER	1	1352-156020	SPRING REV.POSITIONING	1
1352-098003	LEVER.5th SPEED & REVERSE	1	1352-098011	LEVER.5th SPEED & REVERSE	1
1352-096003	FORK TRANS.5th GEARSHIFT	1	1352-096014	FORK TRANS.5th GEARSHIFT	1
1352-040004	RETAINER-5th SYNCHRO.STRUT	1	1352-025002	CONE.SYNCHRONIZER	1
1352-590003	SYNCHRO.ASSY-5th GEAR	1	1352-590015	ASSY.5th BRAKE	1
0552-584006	ASSY.GEAR REVERSE IDLER	1	0552-584007	ASSY.GEAR REVERSE IDLER	1
0552-566003	EXTENSION HOUSING ASSY	1	0552-566008	EXTENSION HOUSING ASSY	1
0552-091002	SYN.BLOCKING RING (5TH/REV)	1	0552-091002	SYN.BLOCKING RING (5TH/REV)	2
			1352-183003	BOLT.REV.FORK	1
			1352-193006	SPLINED WASHER	1

PART NUMBER COMPARISON FOR V8 TRANSMISSION.

PREVIOUS LEVEL STANDARD TRANSMISSION.			NEW LEVEL REVERSE BRAKE TRANSMISSION		
TRANSMISSION IDENTIFICATION:-					
BTRE PART No. 0552-000065. FORD PART No. 91DA-7003-AA. COLOUR CODE - YELLOW.			BTRE PART No. 0552-000066. FORD PART No. 91DA-7003-DA. COLOUR CODE - GREEN.		
PART No.	DESCRIPTION	QTY	PART No.	DESCRIPTION	QTY
1352-565008	CASE-TRANS.ASSY.	1	1352-565027	CASE-TRANS.ASSY.	1
1352-596009	FORK ASSY-REVERSE	1	1352-596013	ASSY-REV.FORK.PIN & ROLLER	1
1352-156005	SPRING-REV.IDLER	1	1352-156020	SPRING REV.POSITIONING	1
1352-098003	LEVER.5th SPEED & REVERSE	1	1352-098011	LEVER.5th SPEED & REVERSE	1
1352-096003	FORK TRANS.5th GEARSHIFT	1	1352-096014	FORK TRANS.5th GEARSHIFT	1
1352-040004	RETAINER-5th SYNCHRO.STRUT	1	1352-025002	CONE.SYNCHRONIZER	1
1352-590003	SYNCHRO.ASSY-5th GEAR	1	1352-590015	ASSY.5th BRAKE	1
0552-584006	ASSY.GEAR REVERSE IDLER	1	0552-584007	ASSY.GEAR REVERSE IDLER	1
0552-566003	EXTENSION HOUSING ASSY	1	0552-566008	EXTENSION HOUSING ASSY	1
0552-091002	SYN.BLOCKING RING (5TH/REV)	1	0552-091002	SYN.BLOCKING RING (5TH/REV)	2
			1352-183003	BOLT.REV.FORK	1
			1352-193006	SPLINED WASHER	1



NOTE: TANG ON REVERSE SYNCHRONISER CONE MUST BE LOCATED TO THE TOP (POSITIONED AT 12 O'CLOCK) PRIOR TO FITTING THE EXTENSION HOUSING.

Service Bulletin

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TRANSMISSION & AXLE DIVISION
77 Seville Street P O Box 99 Fairfield NSW 2165 Australia
Phone (02) 7549200 Fax (02) 7269694 (02) 7246397

DATE :22-5-93 NUMBER:251

DISTRIBUTION :0130,0131,0530,0550,002,03,90(2) ISSUE :A

SUBJECT :SPRING IDENTIFICATION

MODELS AFFECTED:M85, M91 AND M95.

1. INTRODUCTION.

This service bulletin is to aid in the identification and location of all helical springs used in BTR four speed automatic transmissions. Note the dimensions listed in this bulletin are typical spring dimensions, not drawing specifications.

2. SPRING IDENTIFICATION.

The following tables list each spring in its subassembly with all relevant features required for identification.

SPRING NAME	BTRE PART NUMBER	OUTSIDE DIAMETER (mm)	APPROXIMATE FREE LENGTH (mm)	WIRE DIAMETER (mm)	ENDS	MODEL
Primmary Reg	0585-156124	9.5	73.7	1.83	GROUND	M85,91,95
Converter Clutch Control	0585-156126	5.8	93.4	0.71	UNGROUND	M85,91,95
C1 BIAS	0585-156072	5.4	35.4	0.9	UNGROUND	M85,91,95
Torque Converter Blowoff	0585-156136	7.63	11.85	0.8	UNGROUND	M85,91,95
Torque Converter Blowoff	0585-156137	7.63	12.08	0.8	UNGROUND	M85,91,95

Table #1
Pump Cover Springs.

Note: Torque Converter Blowoff springs are selected to suit the pump cover housing. To ensure correct operation, keep the original spring & housing together.

SPRING NAME	BTRE PART NUMBER	OUTSIDE DIAMETER (mm)	APPROXIMATE FREE LENGTH (mm)	WIRE DIAMETER (mm)	ENDS	MODEL
Solenoid Supply Valve	0585-156118	10	46.4	1.2	GROUND	M85,91,95
S6 Damper	0585-156088	12.8	26.8	1.5	UNGROUND	M85,91,95
Clutch & Band Apply Reg (short spring)	0585-156145 (2 per transmission)	6.4	16.9	1.0	UNGROUND	M85,91,95
Clutch & Band Apply Reg (long spring)	0585-156087 (2 per transmission)	6.8	25.0	0.7	GROUND	M85,91,95
4/3 Sequence Valve	0585-156071	13.8	31.9	1.2	UNGROUND	M85,91,95
S5 Damper	0585-156144	11.4	61.0	1.5	GROUND	M85,91,95
Line Pressure Relief	0585-156143	11.5	41.0	1.8	UNGROUND	M85,91,95
Low-First	0585-156141	7.6	15.0	0.9	UNGROUND	M85,91,95
L500 Blow-off	0585-156141	7.6	15.0	0.9	UNGROUND	M85

Table #2
Valve Body Springs.

SPRING NAME	BTRE PART NUMBER	OUTSIDE DIAMETER (mm)	APPROXIMATE FREE LENGTH (mm)	WIRE DIAMETER (mm)	ENDS	MODEL
Band 1 Release Exhaust	0585-156129	7.0	39.5	0.7	GROUND	M85,91,95
Front Servo Return	0585-156131	34.1	32.0	2.4	GROUND	M85,91,95
Front Servo Cushion	0585-156116	30.0	20.0	4.5	GROUND	M85,91,95
Rear Servo Return	0585-156107	34.5	38.4	3.1	GROUND	M85,91,95
Cross Shaft bias	0555-156025	12.5	28.3	1.25	GROUND	M85,91,95

Table #3
Transmission Case Springs.

SPRING NAME	BTRE PART NUMBER	OUTSIDE DIAMETER (mm)	APPROXIMATE FREE LENGTH (mm)	WIRE DIAMETER (mm)	ENDS & COIL DIRECTION	MODEL
Clutch #1	0585-156067	73.5	59	5.25	GROUND N/A.	M85,91,95
Clutch #2/4	0585-156091	69.5	56	4.35	GROUND Righthand	M85,91,95
Clutch #3	0585-156092	67.8	60	4.5	GROUND Lefthand	M85,91,95

Table #4
Clutch Return Springs.

Two springs only (C2/C4 & C3) have their coil helix direction listed in table 4 to further assist identification.Refer Figures 1 & 2. All other springs may be coiled either righthand or lefthand.

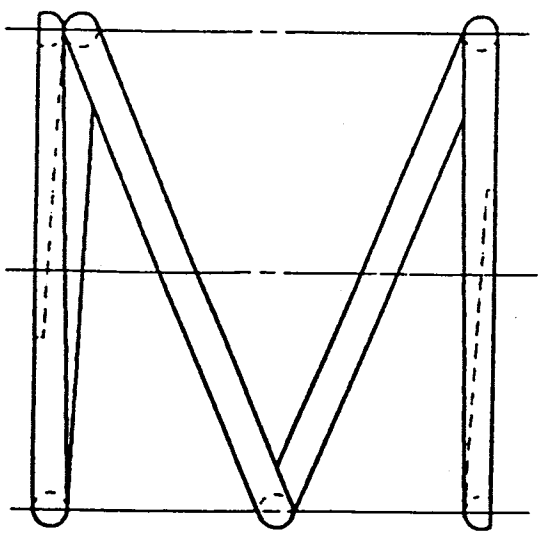

Figure #1
C2/C4 Spring (Right Hand Spring).

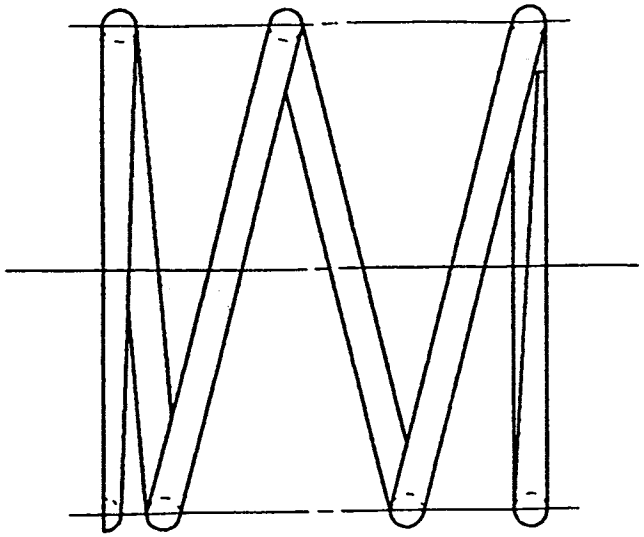

Figure #2
C3 Spring (Left Hand Spring).

SPRING NAME	BTRE PART NUMBER	OUTSIDE DIAMETER (mm)	APPROXIMATE FREE LENGTH (mm)	WIRE DIAMETER (mm)	ENDS	MODEL
Converter L/U Clutch	0585-156064	53.0	40.0	3.15	UNGROUND	M85,91,95

Table #5
Converter Clutch Spring.

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TRANSMISSION & AXLE DIVISION
77 Seville Street P O Box 99 Fairfield NSW 2165 Australia
Phone (02) 7549200 Fax (02) 7269694 (02) 7246397

R010-93

DATE : 06/05/93 NUMBER: 252

DISTRIBUTION : 0130, 0131, 0550, 0530, 90 (2-OFF) ISSUE : 1
C, F, R, B, J, K, 02, 03.

SUBJECT : FRONT SERVO RETURN SPRING (PART NO 0593-156147) AND RETAINER (PART NO 0593-040040).

MODELS AFFECTED: BTRE M85LE, M91LE, M95LE, M93LE AND M97LE.

1. INTRODUCTION

Some transmission failures have occurred due to the front servo block retaining screw and washer becoming loose in the servo cavity.

A new return spring has been designed which is larger in diameter than the existing spring and rests on the cavity block thus eliminating the requirement for a retaining screw and washer. The new spring must be used in conjunction with a new retainer plate.

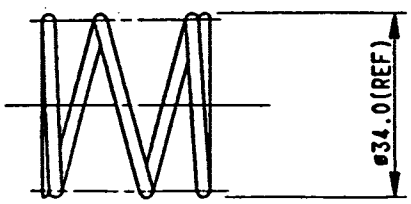
The new components will be introduced as a running change to M91 and M95 transmission assemblies in the 3rd quarter of 1993.

2. REWORK PROCEDURE - IDENTIFICATION

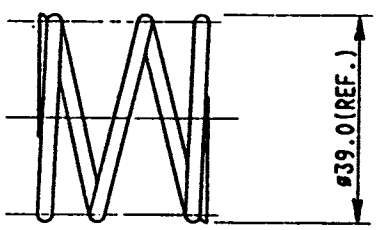
Whenever the front servo assembly is disassembled during service, or on rebuild it is recommended that the return spring and retainer are replaced with the new design components.

a) The springs can be identified by outside diameter and wire diameter;

OLD DESIGN Dwg No 0585-156131 NEW DESIGN Dwg No 0593-156147



WIRE DIA. 2.4mm



WIRE DIA. 2.64mm

FIGURE 1: RETURN SPRING

b) The retainer (seat-spring) can be identified by the outer or inner seat of the spring;

OLD DESIGN Dwg No 0585-040037 NEW DESIGN Dwg No 0593-040040

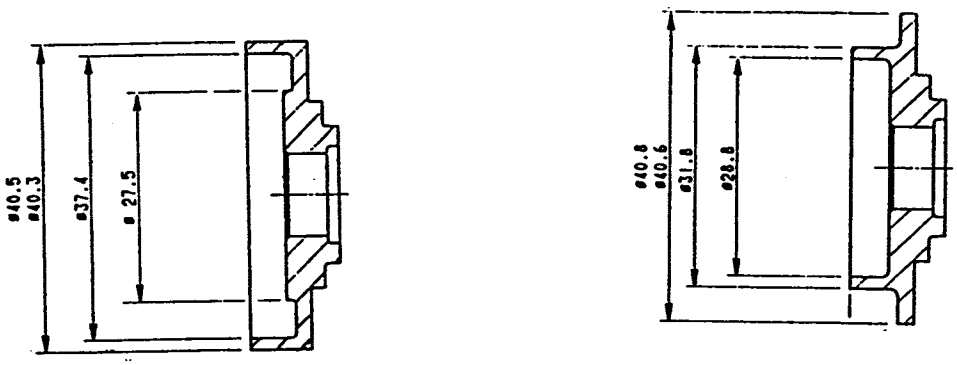


FIGURE 2: RETAINER (SEAT - SPRING)

c) For the new design return spring and retainer, a retaining screw and washer do not have to be fitted and it is recommended that these parts be removed when the new retainer and spring are installed.

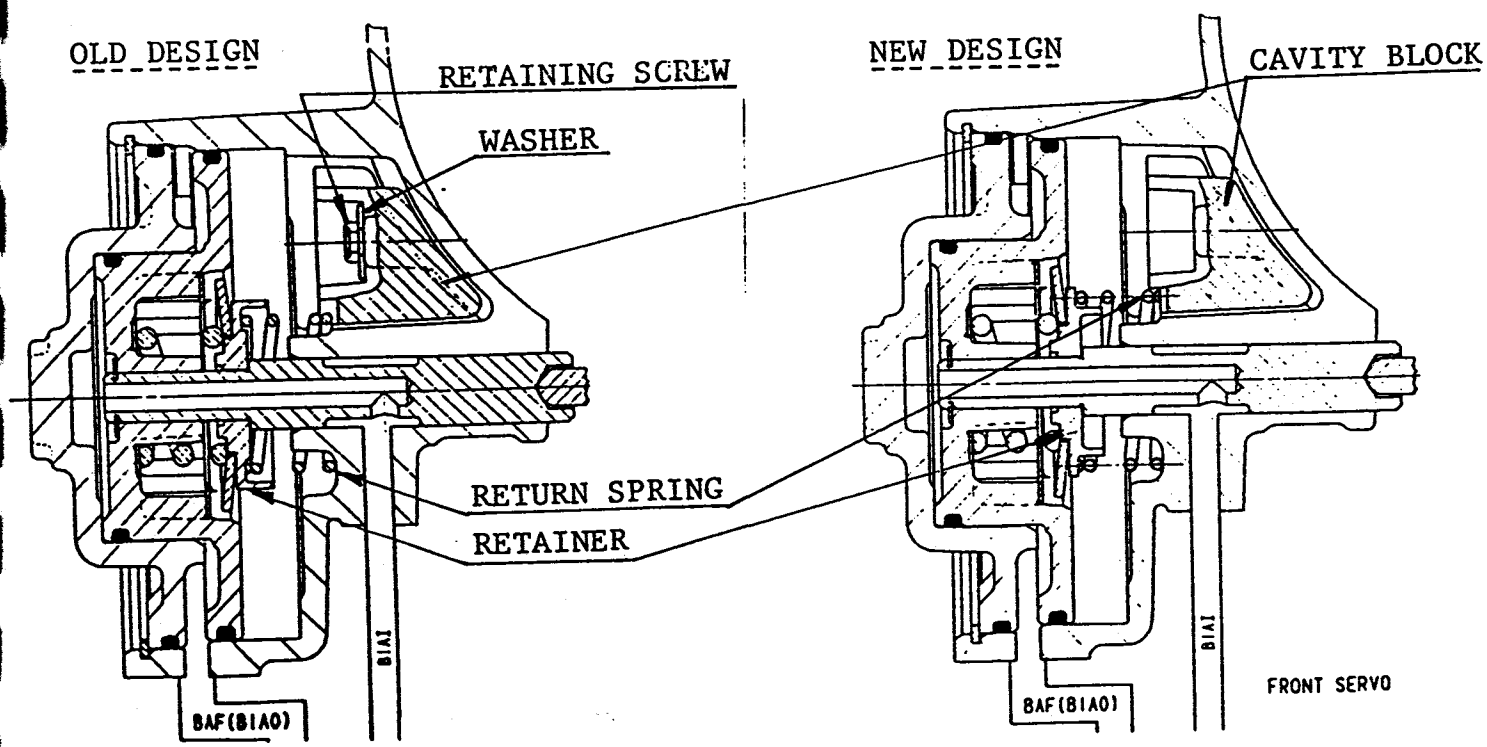


FIGURE 3: RETURN SPRING AND RETAINER ASSEMBLY

NOTE: Cavity block remains the same for all models and old and new retainer spring.

IMPORTANT

The old style return spring and retainer MUST be used in conjunction with the servo cavity block screw and washer. Failure to do so could result in damage to the front servo piston and a degradation in shift quality.

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TRANSMISSION & AXLE DIVISION
77 Seville Street P O Box 99 Fairfield NSW 2165 Australia
Phone (02) 7549200 Fax (02) 7269694 (02) 7246397

DATE : 10/8/93 NUMBER: 253

DISTRIBUTION : 0130, 0131,0530, 0550, 02, 03, 90, FORD, TICKFORD, FORD CSO-MELBOURNE, FORD (NZ), ATP-ENGLAND, ATRA, MTA

ISSUE : 1

SUBJECT : INTRODUCTION OF IMPROVED EXTENSION HOUSING GASKET

MODELS AFFECTED: M91, M95

CHANGE POINT M91: 9103-001809
9104-032244
CHANGE POINT M95: 9501-008247

A new improved sealability Extension Housing Gasket, Part no. 0591-045046 has been introduced for all M91 and M95 transmissions, replacing the gasket, Part No. 0585-045037.

The new Extension Housing Gasket can easily be distinguished from the previous gasket by the change in material and colour. The new gasket is made from a rubber material and is red on one side and black on the other. The old gasket was made of paper and is grey on both sides. Otherwise the gaskets appear exactly the same.

The new Extension Housing Gasket is fully interchangeable with the old gasket, and the old gasket Part No. 0585045040 should no longer be ordered, supplied, stocked or used.

NEW ASSEMBLY: Gasket - Extension Housing 0591-045046

OLD ASSEMBLY: Gasket - Extension Housing 0585-045037

ADDITIONAL NOTES -
- The Extension Housing Gasket MUST be assembled dry, i.e. NO lubricants such as vaseline or Automatic Transmission Fluid are to be present on either the gasket, or the Extension Housing or maincase mating surfaces during assembly.
- The extension housing bolt torques are to be set at the same bolt torque setting of 54 - 68 Nm.
- For both the new and old Extension Housing Gasket designs, the Extension Housing Bolts should have a small amount of thread sealant Loctite 242 applied to each bolt.

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TRANSMISSION & AXLE DIVISION
77 Seville Street P O Box 99 Fairfield NSW 2165 Australia
Phone (02) 7549200 Fax (02) 7269694 (02) 7246397

DATE :18-11-93 NUMBER:254

DISTRIBUTION :130, 131, 530, 550, 02, 03. ISSUE :1

SUBJECT :REAR SERVO COVER AND GASKET REPLACEMENT.

MODELS AFFECTED: M85, M91, M95.

1. BACKGROUND.

Modifications to the rear servo and related parts of the transmission have been introduced to improve the sealing capacity of the gasket joint. This service bulletin advises which combination of parts maybe used for service.

2. CHANGES.

2.1 Rear Servo Gasket/Cover.

A new Rear Servo Cover Gasket (P/N 0591-045047) and cover (P/N 0591-539025) was introduced on all M91 and M95 transmissions replacing gasket (P/N 0585-045040) and cover (P/N 0585-539009). The three o-rings (P/N 0540-141004) are no longer required with this design level.
The replacement rear servo gaskets are easily identified; material thickness is 0.8mm with three circular epoxy beads printed around the pressure ports where the three o-rings were previously located. The new rear servo cover can be identified by the deleted o-ring recesses on the mating surface.
Further information on these improvements is available in service bulletin #245.

2.2 Case Casting.

The transmission case was modified in March 1993 to allow the lube hole drilling to be relocated from an external point to an internal one Refer figures #1 and #2.

2.3 New Gasket (Rubber Type).

A new rear servo gasket made from SBR. rubber (P/N 0593-045050) was introduced November 1993 and replaces rear servo gasket (P/N 0585-045047).
This gasket can be easily identified as follows;
= material thickness, 0.5mm
= colour, one side red/brown and the other side black.

3. REBUILD NOTES.

Table #1 below summarizes the different assembly combinations that are possible.

Cover Description / Case Description	Rear Servo Cover with 3 o-ring pockets (P/N 0585-539009)	Rear Servo Cover without o-ring pockets (P/N 0591-539025)
External Lube Hole & Boss	Gasket (P/N 0585-045040) 3 O-rings (P/N 0540-141004)	Gasket (P/N 0591-045047) or Gasket (P/N 0593-045050)
Internal Lube Hole	Gasket (P/N 0585-045040) 2 Orings (P/N 0540-141004)	Gasket (P/N 0591-045047) or Gasket (P/N 0593-045050)

Table #1,Rear Servo Cover/Gasket Parts Combination.

3.1 Additional Notes.

Rear servo cover bolts (P/N 0585-183108, from May 1993 bolts include thread locking compound) should be replaced once removed, or threads cleaned and small amount of Loctite 242 applied to seal the threads.
Rear servo cover gasket must be assembled clean and dry, I.E. no lubricants such as petroleum jelly, automatic transmission fluid etc. are to be present on the cover, gasket or case during assembly.
Bolt torques are unchanged at 17-25Nm.

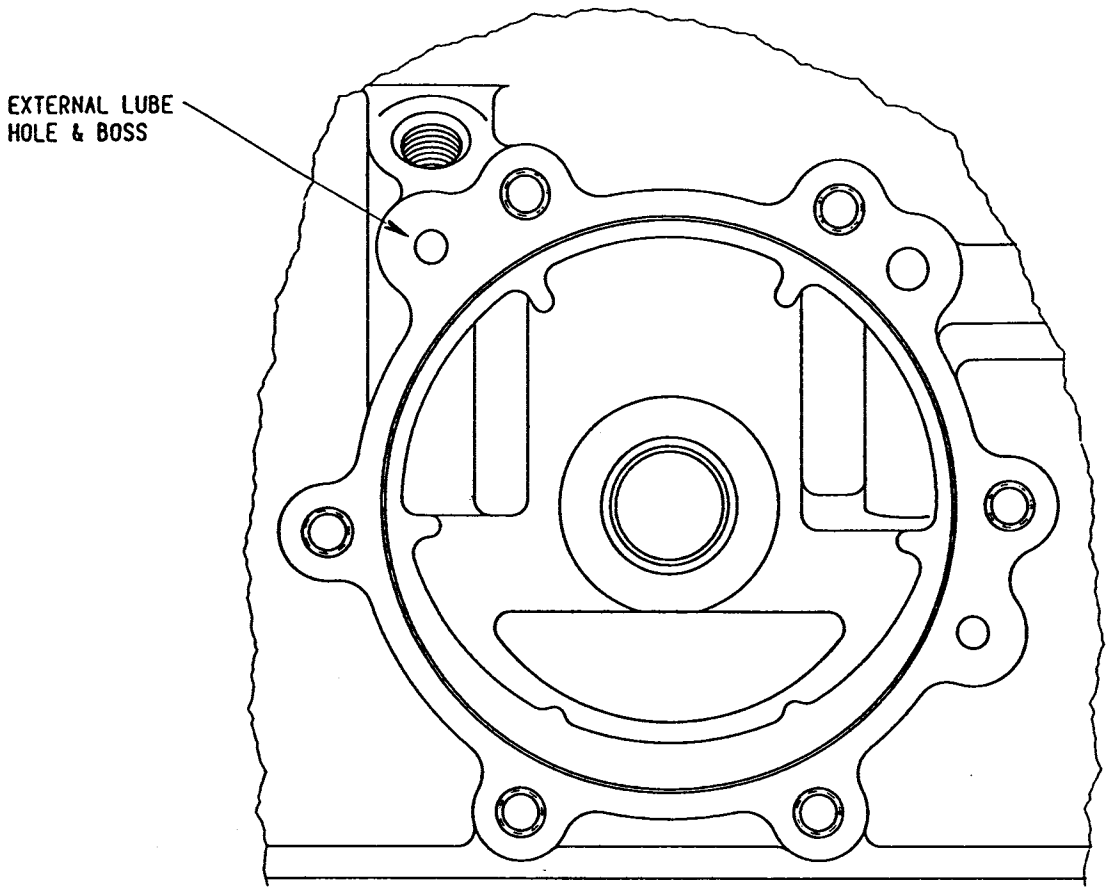

FIGURE #1, TRANSMISSION CASE,
WITHEXTERNAL LUBE HOLE & BOSS.

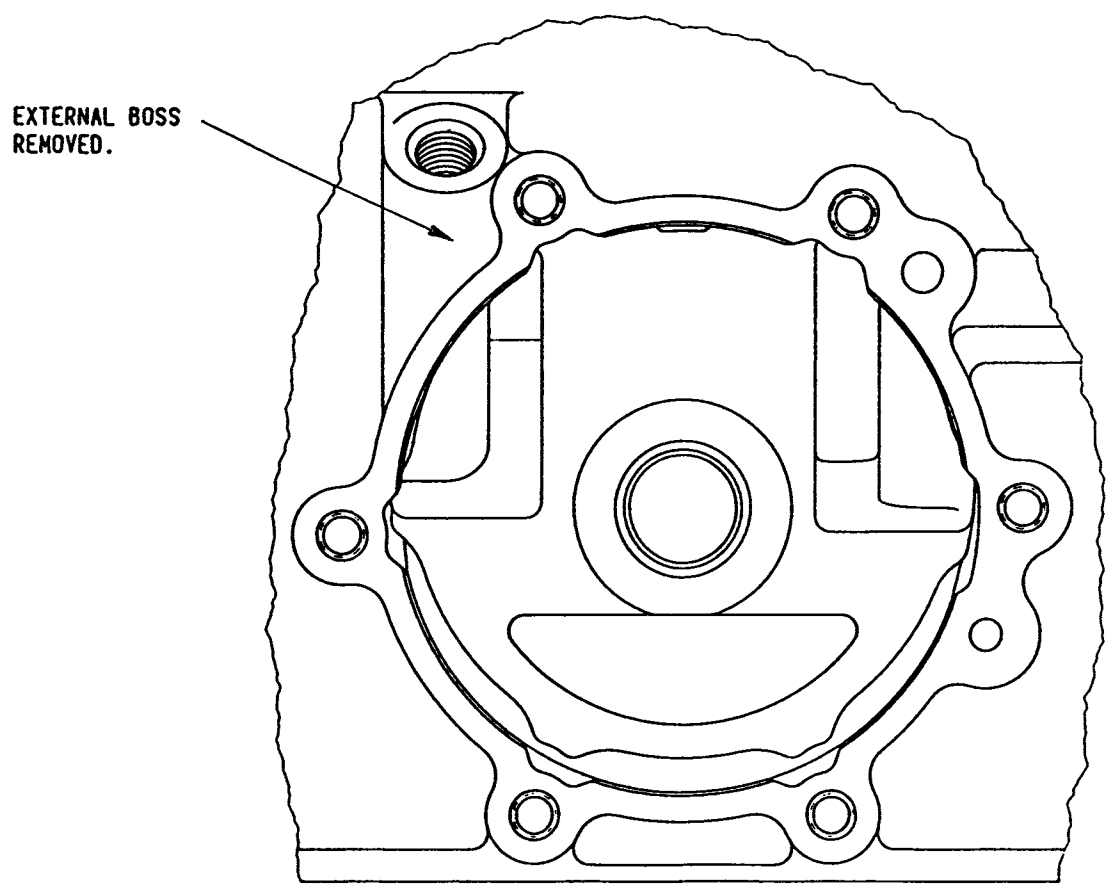

FIGURE #2, TRANSMISSION CASE,
WITH INTERNAL LUBE DRILLING.

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A.C.N.000 019 536

TRANSMISSION PLANT
58 Lisbon Street PO Box 99 Fairfield NSW 2165 Australia
Phone (02) 754-9 Fax (02) 724-6397

Service Bulletin

DATE : 11 MAY 1994 NUMBER : 255

DISTRIBUTION : 0130, 0131, 0530, 0550, 0561, 02, 03, 90 FORD (NZ), TICKFORD, ATRA, MTA, ATP (ENGLAND). ISSUE : 3

SUBJECT : INTRODUCTION OF NEW TRANSMISSION ASSEMBLIES WITH INCREASED CONTACT RATIO DESIGN GEAR SET

MODELS AFFECTED : ALL FOUR SPEED AUTOMATIC TRANSMISSIONS

A new improved gear set design has been introduced to BTRE four speed automatic transmissions. This new gear set increases the contact ratio between the long planet pinion and the ring gear. For a sketch detailing this change refer to Figures 1 and 2 of this service bulletin.

This gear set design features geometry changes to the short planet pinions, long planet pinions, ring gear and output shaft. The forward sun gear and reverse sun gear, however, remain unaffected by this change. The changes to geometry on the gears has meant that these new gear sets are not interchangeable with the former production gear sets.

The transmission assemblies that have been released featuring the new gear set design are listed below in Table 1.

Table 1. Transmission assemblies featuring the increased contact ratio gear design.

MODEL NUMBER	FORD PART #	COLOUR CODE	VEHICLE TYPE	SHIFT TYPE
0591-000011	93DA-7000-AB	BLUE / WHITE	SED / WAG	COLUMN
0591-000012	93DA-7000-BB	BROWN	SED / WAG	T-BAR
0591-000013	91DA-7000-AC	GREEN / PURPLE	UTILITY	COLUMN
0591-000014	91DA-7000-BC	GREEN / RED	UTILITY	T-BAR
0595-000003	93DA-7000-CA	PINK	SED / WAG	T-BAR

The new design gears in these assemblies can be identified by the following markings:

a. The new long planet pinion has a shallow groove (R 0.8) near an end of the pinion (4.75mm from the end face), refer to Figure 3. This means that the long pinions will have two grooves in total.

b. The new ring gear has a large chamfer (3mm x 15°) on the outside diameter in lieu of the former production chamfer (0.8mm x 45°). Refer to Figure 4.

c. The new output shaft has a radiused groove (R 0.8) in the splines. This groove is 7mm from the end face of the output shaft. Refer to Figure 5.

d. Short planet pinions are identifiable by their ground outside diameter. Refer to Figure 6.

e. Planet carrier assemblies featuring the new long and short pinions can be identified by viewing the groove on the long pinion from the open end of the carrier assembly. Refer to Figure 7.

The new design planet carrier assembly, 0591-659006, is not interchangeable with the former design, 0595-659011.

The new design output shafts 0591-671009 (I6) and 0595-671003 (V8) are not interchangeable with output shafts 0585-671007 and 0595-671001, respectively.

The new design long pinion 0591-163004 and short pinion 0591-163005 are not interchangeable with the previous design components 0585-163001 and 0585-163002 respectively.

Similarly, if a mixture of the former and new ring gear and pinions are used in an assembly, there will be a risk of interference between the gears.

A listing of all the individual components affected by this new gear set design is given below, in Table 2.

Table 2. Components affected by the increased contact ratio gear design.

NEW GEAR DESIGN COMPONENT PART NUMBER	COMPONENT DESCRIPTION	PART NUMBER SUPERCEDED BY NEW GEAR DESIGN COMPONENT
0591-162007	RING GEAR	0585-162006
0591-163004	LONG PLANET PINION	0585-163001
0591-163005	SHORT PLANET PINION	0585-163002
0595-671003	OUTPUT SHAFT	0595-671001
0595-671004	OUTPUT SHAFT & RING GEAR ASSEMBLY	0595-671002
0591-671009	OUTPUT SHAFT	0585-671007
0591-671010	OUTPUT SHAFT & RING GEAR ASSEMBLY	0585-671008
0591-659006	PLANET CARRIER ASSEMBLY	0595-659011
0555-364001	TRANSMISSION & CONV. ASSY - SERVICE	0555-364000

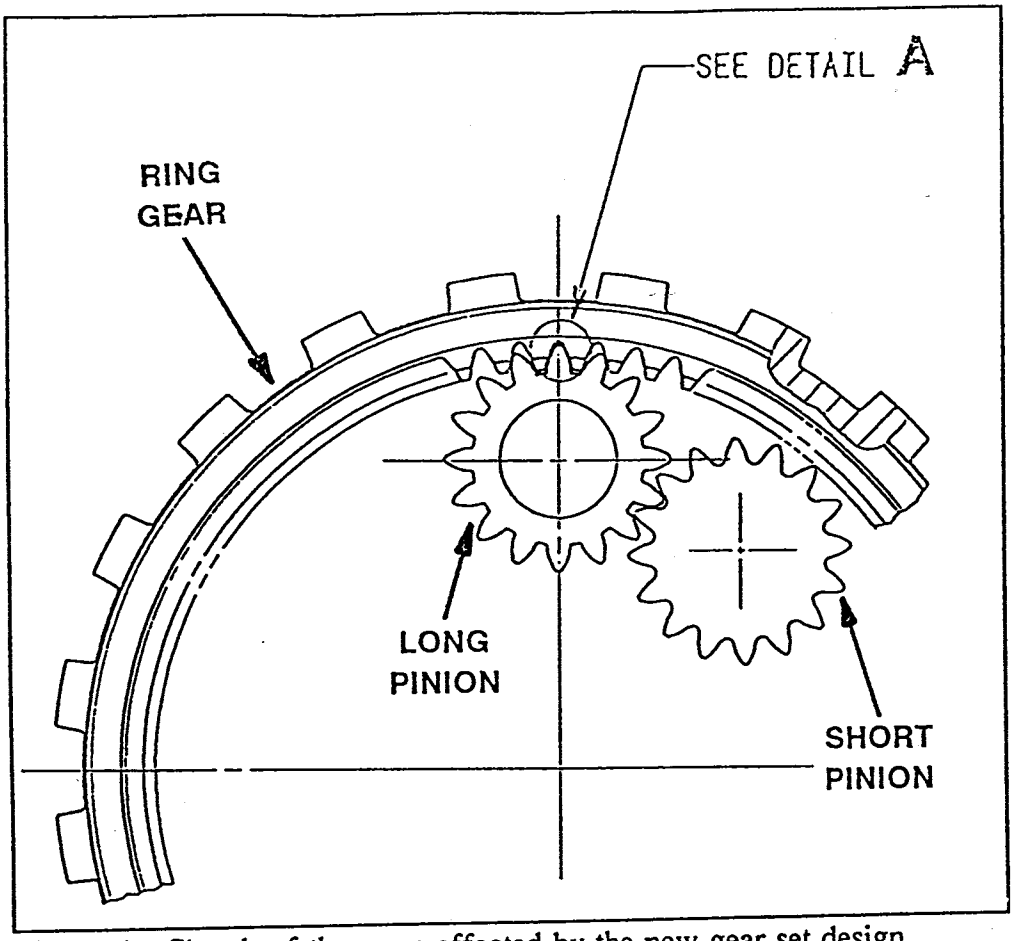

Figure 1 : Sketch of the gears affected by the new gear set design

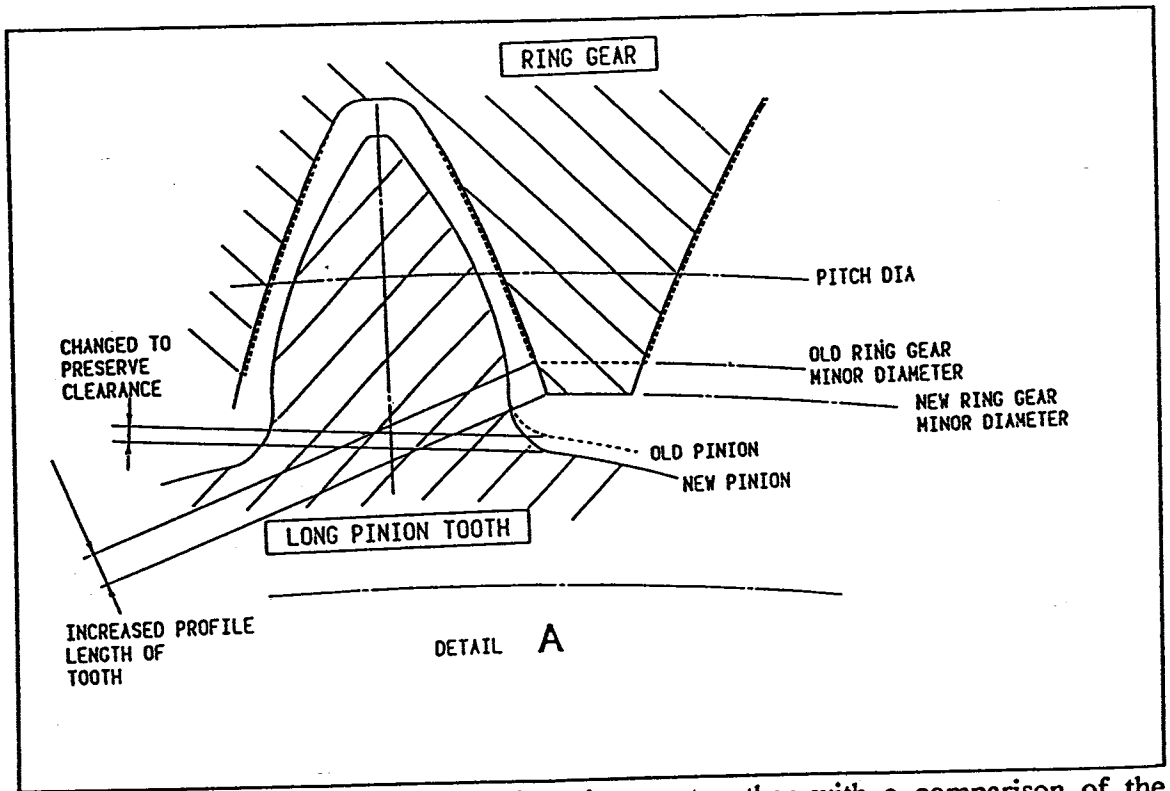

Figure 2 : Detail of new gear design changes together with a comparison of the former gear design

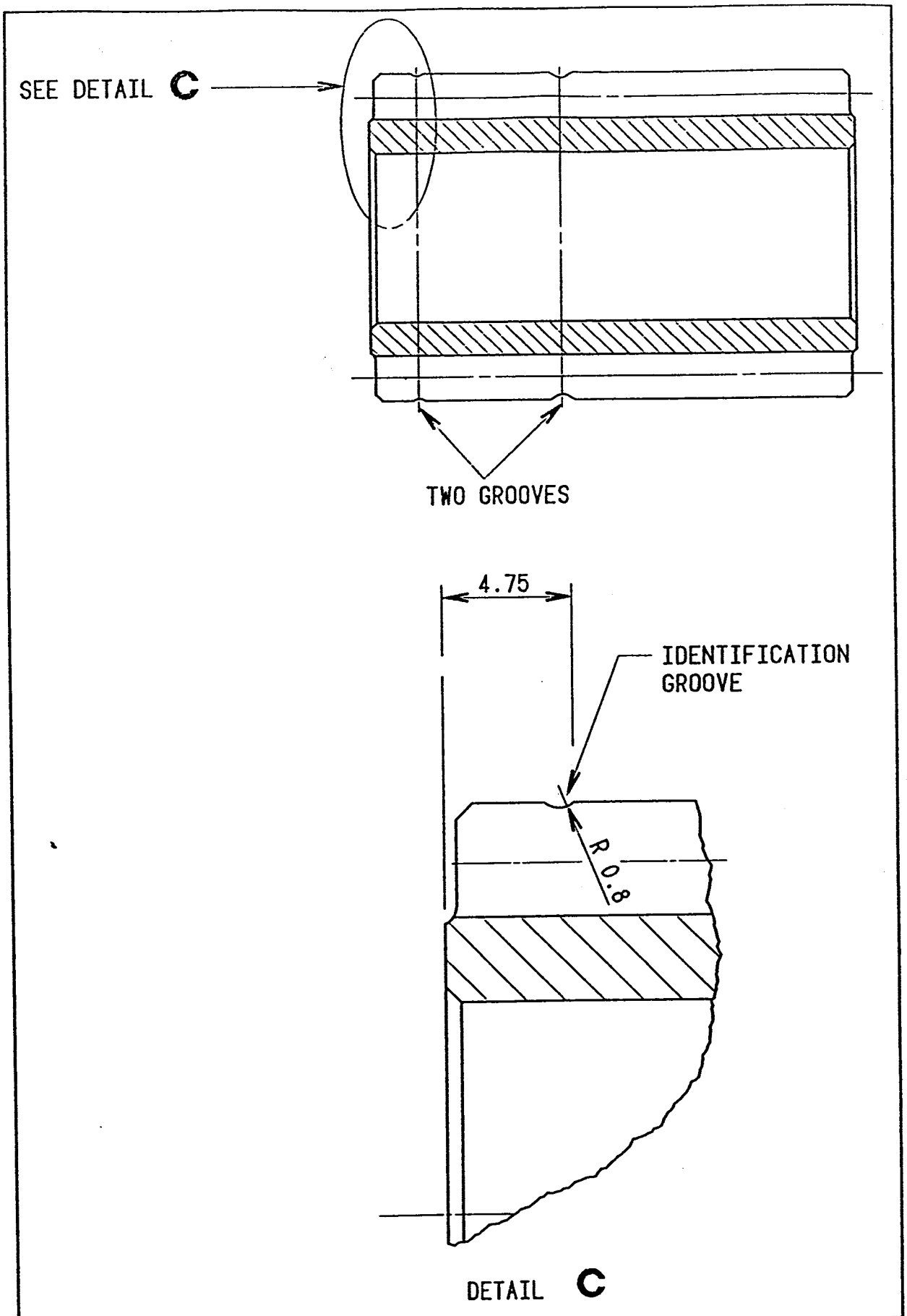

Figure 3 : Sketch of the long planet pinion showing the location and construction details of the groove identifying the new design.

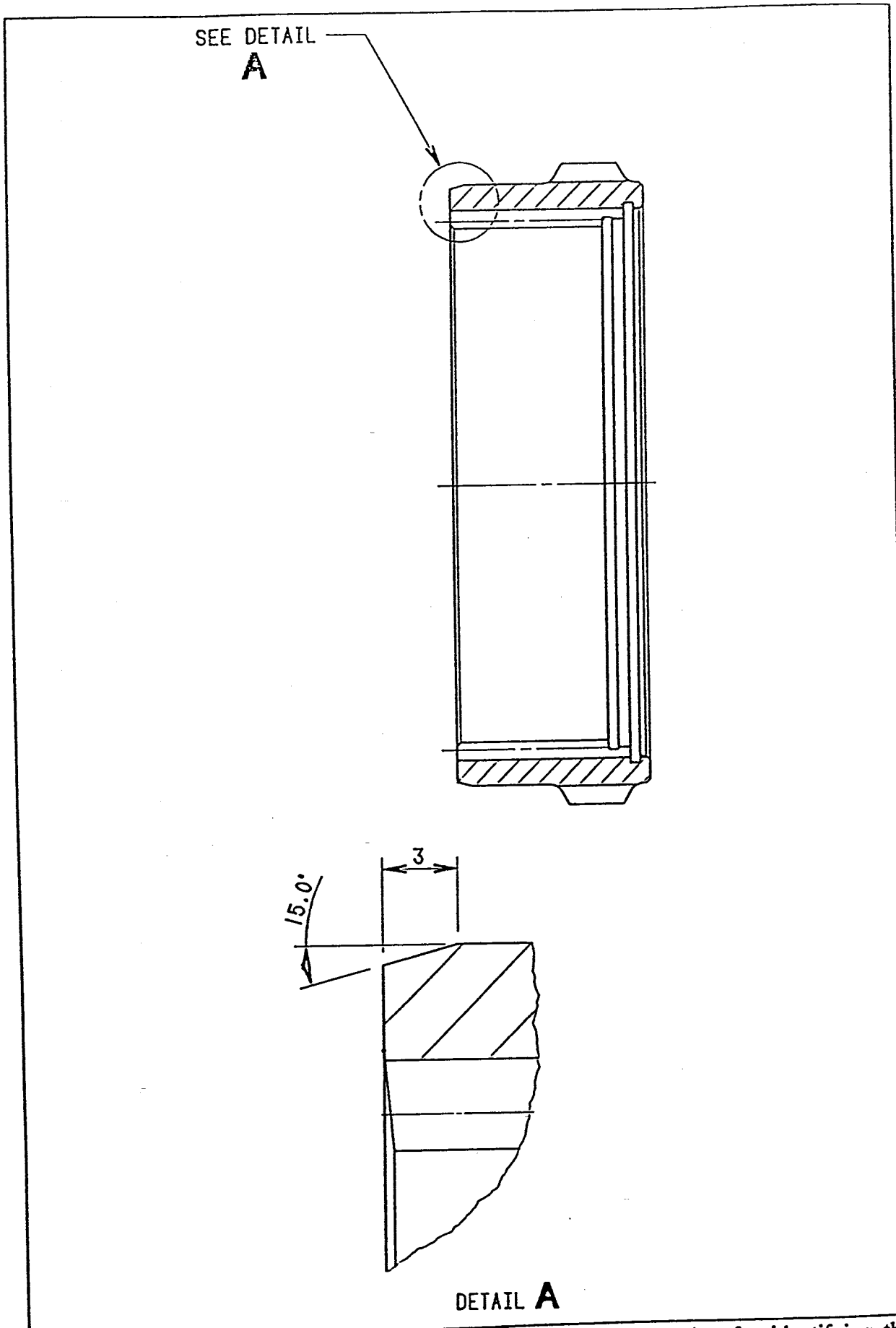

Figure 4 : Sketch of the location and construction details of the chamfer identifying the new design ring gear.

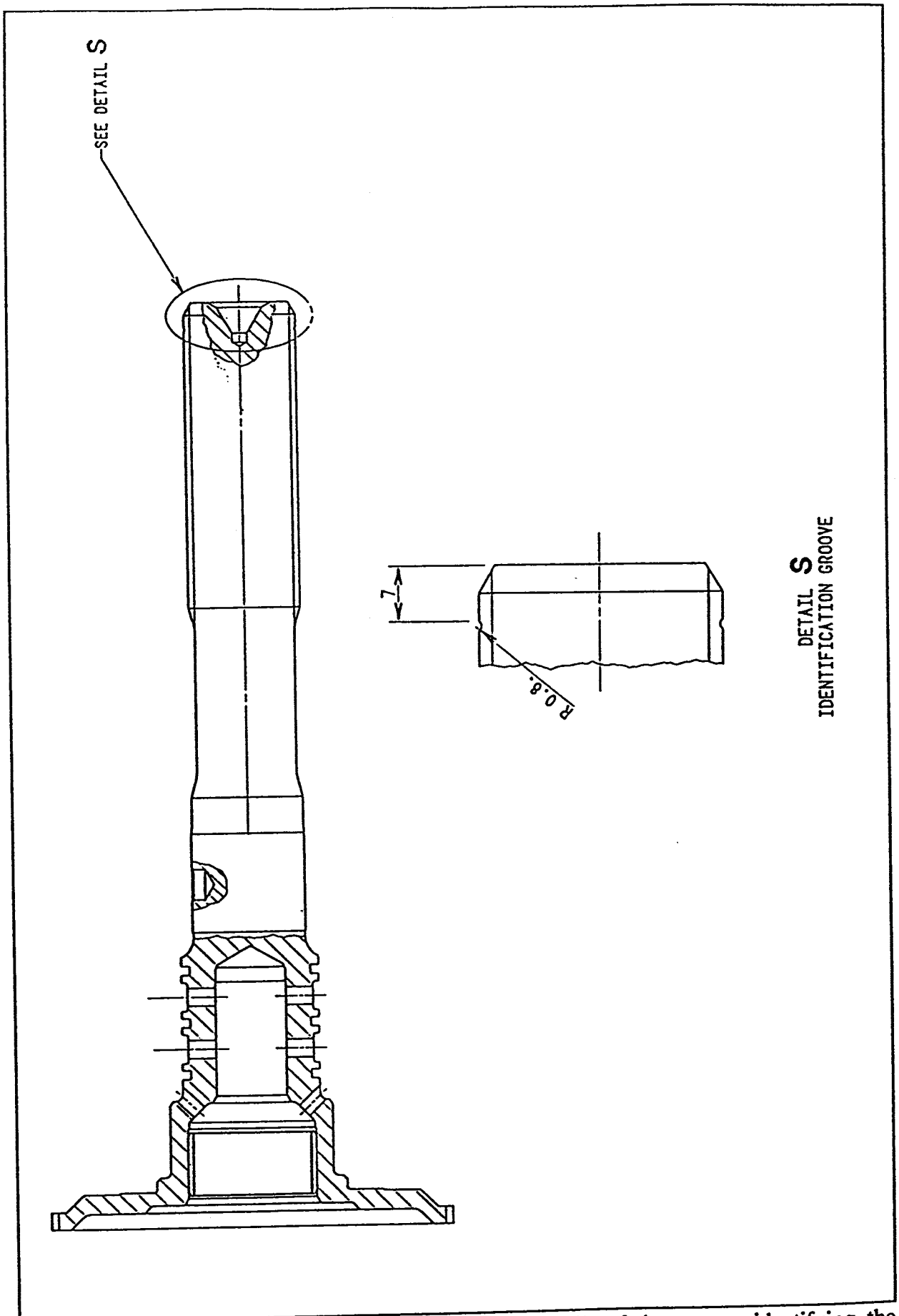

Figure 5 : Sketch of the location and construction details of the groove identifying the new design of output shaft.

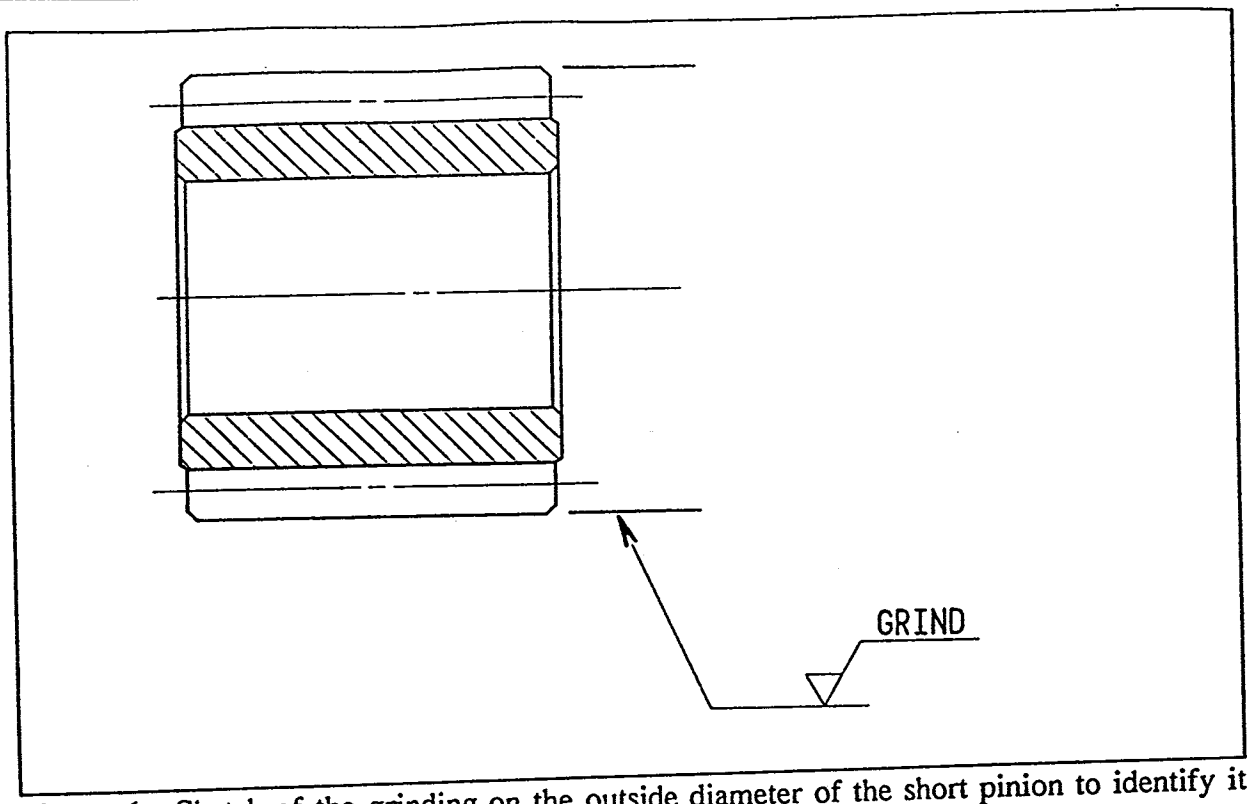

Figure 6 : Sketch of the grinding on the outside diameter of the short pinion to identify it as a new design pinion.

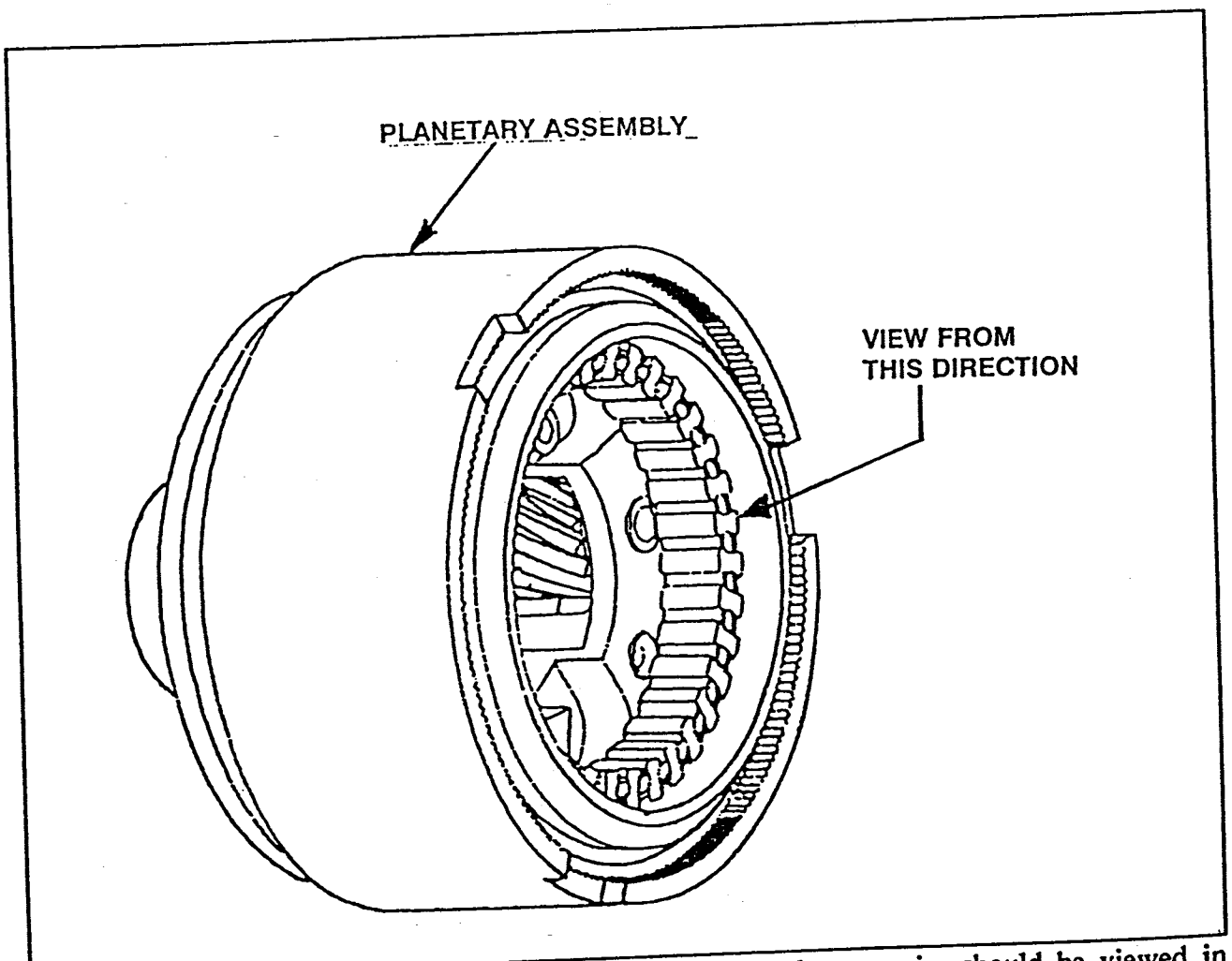

Figure 7 : Sketch showing the direction from which the planet carrier should be viewed in order to see the identification grooves on the long pinion.

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SERVICE BULLETIN

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58 Lisbon Street PO Box 99 Fairfield NSW 2165 Australia
Phone (02) 754-9 Fax (02) 724-6397

DP10-93

DATE : 1st February, 1994 NUMBER: 256

DISTRIBUTION: 0130, 0131, 0530, 0550, 02, 03, 90 (2 OFF) F, R, C (2 OFF), Z, B, J, K. ISSUE : 1

SUBJECT : PROCEDURE FOR FLUSHING COOLER LINES AND CHECKING COOLER FLOW.

MODELS AFFECTED: ALL FOUR SPEED AUTOMATIC TRANSMISSIONS

1. INTRODUCTION

In the event of a transmission failure where there is a large amount of debris created, it is possible that some debris may find it's way into the cooler circuit. This will affect the amount of oil flow through the cooler. This oil, when returned to the transmission, is used for lubrication. If the debris sufficiently reduces the oil flow it may result in failure of the transmission. This Service Bulletin details procedures to flush the cooler lines to remove any debris and the method of checking to ensure that flow through the cooler circuit is sufficient.

It is the responsibility of the dealer to flush out cooler lines when replacing transmission.

2. PROCEDURE

2.1 FLUSHING DEBRIS FROM COOLER LINES

i) Disconnect cooler lines from transmission.

ii) Flush oil in the cooler lines using compressed air (80 psi MAX) by fitting the nozzle to the cooler tube that fits the rear cooler connector. This method will flush oil in the opposite direction to normal oil flow to remove any debris trapped in the circuit.

Note: All relevant safety precautions when using compressed air should be exercised when carrying out this procedure. It is desirable to do step iii) below if the equipment is available.

iii) Pump ATF into the rear cooler tube and through the cooler lines to flush out contaminants still left in the lines.

2.2 CHECKING OIL FLOW THROUGH COOLER CIRCUIT

i) *Fit the replacement transmission and add the required amount of oil to achieve* the correct level. The transmission will require an additional 1200mL to 1500mL of Castrol TQ95 or equivalent ATF (refer BTRE service bulletin 208, Issue M, for approved oils).

ii) Allow time for the transmission to cool to room temperature disconnect the cooler line to the rear cooler connector.

iii) With park brake engage, start the engine and allow to idle in Park. Wait until the oil starts to flow consistently from the cooler connector (only a few seconds) then measure the cooler flow over 15 seconds. The cooler flow should be above 4 litres/min (1 litre in 15 seconds).

iv) If the flow is less than specified the cooler circuit must be checked and any flow restrictions eliminated. Restrictions may be caused by contaminants in the circuit or damage to the cooler lines (such as kinks, dents, etc).

BTR Engineering (Australia) Limited
A.C.N. 000 019 536
TRANSMISSION & AXLE DIVISION
77 Seville Street PO Box 99 Fairfield NSW 2165 Australia
Phone: (02) 754 9200 Telex AA20187 Fax (02) 726 9694

SERVICE BULLETIN

DATE: 15 November 1993. NUMBER: 259

DISTRIBUTION: 0130, 0530, 02, 03, 90, FORD PEO, FORD CSO (2), TICKFORD, FORD NZ, ATP (ENGLAND)

SUBJECT: FORD T5 WITH TAPER ROLLER POCKET BEARING AND AUTO TRANS. FLUID.

MODELS AFFECTED: T5 MANUAL TRANSMISSION ASSEMBLIES AS LISTED BELOW.

0552-000011 (91DA-7003-GA), 6 CYLINDER APPLICATION.

THIS BULLETIN IS TO INFORM ON THE INTRODUCTION OF TWO NEW T5 MANUAL TRANSMISSION ASSEMBLIES, WHICH FEATURE A TAPER ROLLER POCKET BEARING CONFIGURATION AND USE AUTOMATIC TRANSMISSION FLUID (DEXRON 2D).

THE INTRODUCTION OF THE TAPER ROLLER POCKET BEARING, COMBINED WITH THE ADDITION OF CHEMICAL SURFACE TREATMENT TO THE CLUSTER GEAR, IS A DESIGN REQUIREMENT NECESSARY TO THE INTRODUCTION OF AUTOMATIC TRANSMISSION FLUID.

THE REASON FOR THE CHANGE TO AUTOMATIC TRANSMISSION FLUID (IN LIEU OF THE PREVIOUS EP GEAR OIL) IS TO IMPROVE THE GENERAL SHIFTABILITY IN FORWARD GEARS BY REDUCING SHIFT EFFORT, ESPECIALLY IN COLD CONDITIONS.

NOTE :

1) NEW MODEL TRANSMISSIONS TO USE THE FOLLOWING LUBRICANT TYPE AND QUANTITY FOR ORIGINAL AND SERVICE FILL :-
   LUBRICATING OIL TO BTRE SPEC. SM-34 (ATF DEXRON 2D), QUANTITY 1.9 LIT.
   OIL ADDITIVE TO BTRE SPEC. SM-43 (LUBRIZOL 7906), QUANTITY 150 ml.

2) NEW MODEL TRANSMISSIONS TO BE BUILT TO THE FOLLOWING OUTPUT SHAFT END PLAY SPECIFICATION : 0.01 to 0.10 mm PRELOAD.

ADD/DELETE LISTS CONTAINED ON PAGE 2, TABLE THE DIFFERENCES BETWEEN THE NEW TRANSMISSIONS AND THE CORRESPONDING PREVIOUS MODEL.

BTR Engineering (Australia) Limited
A.C.N. 000 019 536

TRANSMISSION & AXLE DIVISION
77 Seville Street PO Box 99 Fairfield NSW 2165 Australia
Phone: (02) 754 9200 Telex AA20187 Fax (02) 726 9694

6 CYLINDER APPLICATION.
BTRE PART No. 0552-000011, FORD PART No. 91DA-7003-GA. (COLOUR CODE - RED)

THIS TRANSMISSION ASSEMBLY IS THE SAME AS THE PREVIOUS MODEL TRANSMISSION, BTRE PART No. 0552-000010 (FORD PART No.91DA-7003-EA), EXCEPT AS SHOWN IN THE FOLLOWING ADD/DELETE LIST.

COMPONENT DESCRIPTION	DELETE PART No.	QTY	ADD PART No.	QTY
INPUT SHAFT	0552-085029	1	0552-085031	1
CLUSTER GEAR	0552-077029	1	0552-077031	1
OUTPUT SHAFT & 1/2 SYNCHRO. ASM	1352-671087	1	1352-671116	1
NEEDLE ROLLER BEARING	0555-143015	15	-	-
SPACER	0552-053027	1	-	-
NEEDLE THRUST BEARING	0552-132018	1	-	-
THRUST WASHER	0552-193063	1	-	-
SNAP RING (3/4 SYNCHRO. ASM)	-	-	1300-139040	1
TAPER ROLLER BEARING - CUP	-	-	0598-133011	1
TAPER ROLLER BEARING - CONE	-	-	0500-133007	1

BTRE
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SERVICE BULLETIN

TRANSMISSION PLANT
58 Lisbon Street PO Box 99 Fairfield NSW 2165 Australia
Phone (02) 754-9 Fax (02) 724-6397

DP9-93

MOTOR MANUFACTURERS SERVICE BULLETIN

DATE: 17 November, 1993

NUMBER: 261

ISSUE : A

SUBJECT: INHIBITOR SWITCH 4-SPEED AUTOMATIC TRANSMISSION

MODELS : M85LE, M91LE, M95LE

1. INTRODUCTION

This Service Bulletin is to assist the field of correct diagnosis of inhibitor switch faults.

2. BACKGROUND

The replacement of the inhibitor switch in the field, has been, in some cases, unnecessary. Returned warranty parts investigation has not been able to repeat the claimed faults of some returned switches.

It should be noted that most switches fail due to water ingress either through the switch breather tube or the 2 pin plug connection where the silicon seal is missing.

3. FUNCTION OF INHIBITOR SWITCH

The inhibitor switch has **three separate functions.**

i) To inhibit the starting of the engine, when the shift lever is in a position other than Park or Neutral (4 pin side).

ii) To complete the reversing lamps circuit when reverse is selected, (4 pin side).

iii) To indicate to the ECU the position of the shift lever, (2 pin side).

4. ECU SWITCH FAULT CODES

4.1 CODE 27 - SHIFT LEVER POSITION INPUT FAULT

Fault code 27 has the following description.

i) The return voltage, from the switch, measured by the ECU is not between 0.2 volts or 4.7 volts on the 2 pin connector.

4.2 CODE 67 - NEUTRAL DRIVE SWITCH OR A/C IS ON/FAULTY (M91LE ONLY).

Fault code 67 may have the following descriptions.

i) **Gear lever was not in Park** when codes were read.
ii) Air conditioning or climate control was on/faulty when codes were read.
iii) Check that inhibitor switch wiring is correctly fitted, (4 pin side).
iv) Check that the inhibitor switch wiring fuse is OK.
v) Check that the switch has continuity on 4 pin side (Figure 1).

5. DIAGNOSIS OF INHIBITOR SWITCH FAULT IN SECTION 3i ABOVE

To inhibit the starting of the engine, when the shift lever is in a position other than Park or Neutral, (4 pin side).

i) Check that the T-bar/column shift linkage is assembled and adjusted correctly?
ii) Check that the switch wiring correctly fitted, (4 pin side).
iii) Check that the inhibitor switch/ignition fuse is OK.
iv) Check that the switch has continuity on Park circuit, 4 pin side (Figure 1).

6. DIAGNOSIS OF INHIBITOR SWITCH FAULT IN SECTION 3ii ABOVE

To complete the reversing lamps circuits when reverse in selected, (4 pin side).
Possible symptoms - Reverse lamps not working or constantly on.

i) Check that the switch wiring is correctly fitted, (4 pin side).
ii) Check that the reverse lamp fuse is OK.
iii) Check that the reverse globes are OK.
iv) Check that the switch has continuity on reverse circuit, 4 pin side (Figure 1).

7. DIAGNOSIS OF INHIBITOR SWITCH FAULT IN SECTION 3iii ABOVE

To indicate to the ECU the position of the shift lever, (2 pin side).

Possible symptoms.
No manual T-bar/column shifts.
No converter lock-up.
No throttle learn or throttle clear available.

i) Check that the vehicle to switch wiring is correctly fitted, (2 pin side).
ii) Check that the plug or switch terminals are not wet or dirty, (2 pin side).
iii) Check that the plug/switch silicon gasket is in place, (2 pin side).
iv) Check that the male terminals of the switch are not bent, (2 pin side).
v) Check that the female terminals of the plug, in the plug body, are not pushed back.

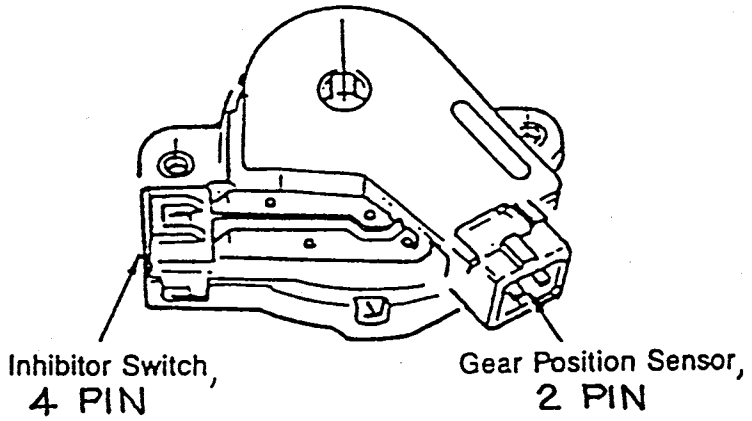
vi) Check the resistance values of the switch from one pin to the other - 2 pin side. Value should range from 1.0-1.4 kilohms in Manual 1, to 18.6-19.0 kilohms in Park. Refer to Table 1.

vii) Check that a supply voltage of approximately 5 volts is in one of the two female plug terminals with Key On Engine Off.

viii) Check supply voltage at ECU, Pin 17 on M85/95 - Separate engine/transmission ECU. Pin 30 on M91 - Combined engine/transmission ECU.

SHIFT LEVER POSITION	RESISTANCE (OHMS)
Manual 1	1k - 1.4k
Manual 2	1.8k - 2.2k
Manual 3	3k - 3.4k
Drive	4.5k - 4.9k
Neutral	6.8k - 7.2k
Reverse	10.8k - 11.2k
Park	18.6k - 19k

TABLE 1



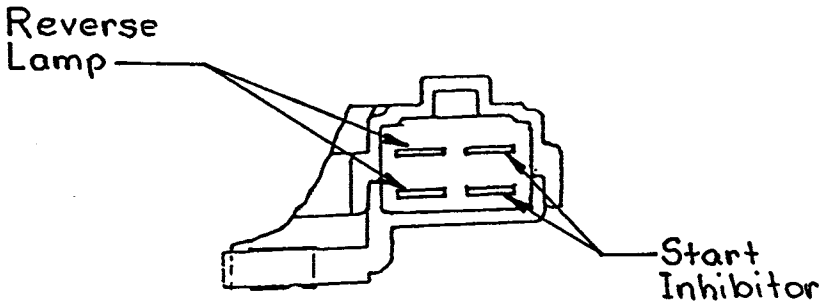


FIG. 1

BTR Engineering (Australia) Limited
A.C.N. 000 019 536
TRANSMISSION & AXLE DIVISION
77 Seville Street PO Box 99 Fairfield NSW 2165 Australia
Phone (02) ~~724 0111~~ Telex AA20187 Fax (02) 726 9694

SERVICE BULLETIN

DATE: 11th March 1994. NUMBER: 262

DISTRIBUTION: 0130, 0530, 02, 03, 90, FORD PEO, FORD CSO (2), TICKFORD, FORD NZ, ATP (ENGLAND)

SUBJECT: FORD T5 WITH TAPER ROLLER POCKET BEARING AND AUTO TRANS. FLUID.

MODELS AFFECTED: T5 MANUAL TRANSMISSION ASSEMBLY
0552-000068 (91DA-7003-FA) V8 APPLICATION.

THIS BULLETIN IS TO INFORM ON THE INTRODUCTION OF THE NEW MODEL T5 V8 MANUAL TRANSMISSION ASSEMBLY, WHICH FEATURES A TAPER ROLLER POCKET BEARING CONFIGURATION AND USES AUTOMATIC TRANSMISSION FLUID (DEXRON 2D).

THE INTRODUCTION OF THE TAPER ROLLER POCKET BEARING, COMBINED WITH THE ADDITION OF CHEMICAL SURFACE TREATMENT TO THE CLUSTER GEAR, IS A DESIGN REQUIREMENT NECESSARY TO THE INTRODUCTION OF AUTOMATIC TRANSMISSION FLUID.

THE REASON FOR THE CHANGE TO AUTOMATIC TRANSMISSION FLUID (IN LIEU OF THE PREVIOUS EP GEAR OIL) IS TO IMPROVE THE GENERAL SHIFTABILITY IN FORWARD GEARS BY REDUCING SHIFT EFFORT, ESPECIALLY IN COLD CONDITIONS.

NOTE :

1) THE NEW MODEL TRANSMISSION IS TO USE THE FOLLOWING LUBRICANT TYPE AND QUANTITY FOR ORIGINAL AND SERVICE FILL :-
   LUBRICATING OIL TO BTRE SPEC. 5M-34 (ATF DEXRON 2D), QUANTITY 1.9 LIT.
   OIL ADDITIVE TO BTRE SPEC. 5M-43 (LUBRIZOL 7906), QUANTITY 150 ml.

2) THE NEW MODEL TRANSMISSION TO BE BUILT TO THE FOLLOWING OUTPUT SHAFT END PLAY SPECIFICATION : 0.01 to 0.10 mm PRELOAD.

ADD/DELETE LIST CONTAINED ON PAGE 2, TABLES THE DIFFERENCES BETWEEN THE NEW MODEL TRANSMISSION AND THE CORRESPONDING PREVIOUS MODEL.

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A.C.N. 000 019 536
TRANSMISSION & AXLE DIVISION
77 Seville Street PO Box 99 Fairfield NSW 2165 Australia
Phone (02) ~~724 0111~~ Telex AA20187 Fax (02) 726 9694

BTRE PART No. 0552-000068, FORD PART No. 91DA-7003-FA (COLOUR CODE - PURPLE)

THIS TRANSMISSION ASSEMBLY IS THE SAME AS THE PREVIOUS MODEL TRANSMISSION, BTRE PART No. 0552-000066 (FORD PART No.91DA-7003-DA), EXCEPT AS SHOWN IN THE FOLLOWING ADD/DELETE LIST.

COMPONENT DESCRIPTION	DELETE PART No.	QTY	ADD PART No.	QTY
INPUT SHAFT	1352-085046	1	1352-085056	1
CLUSTER GEAR	1352-077053	1	1352-077070	1
OUTPUT SHAFT & 1/2 SYNCHRO. ASM	1352-671087	1	1352-671116	1
NEEDLE ROLLER BEARING	0555-143015	15	-	-
SPACER	0552-053027	1	-	-
NEEDLE THRUST BEARING	0552-132018	1	-	-
THRUST WASHER	0552-193063	1	-	-
SNAP RING (3/4 SYNCHRO. ASM)	-	-	1300-139040	1
TAPER ROLLER BEARING - CUP	-	-	0599-133011	1
TAPER ROLLER BEARING - CONE	-	-	0500-133007	1

Service Bulletin

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TRANSMISSION PLANT
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Phone (02) 754-9254 Fax (02) 724-6397

DATE : 16/12/93 NUMBER : 263

DISTRIBUTION : 0130, 0131, 0530, 0550, 02, 03, 90 ISSUE : 1
FORD, FORD CSO - MELBOURNE,
FORD (NZ), TICKFORD, ATP-ENGLAND, ATRA, MTA.

SUBJECT : INTRODUCTION OF A SERVICE SLEEVE FOR MAIN CASE REAR SLEEVE (STEEL ONLY)

MODELS AFFECTED : M85, M91, M95.

A Service Sleeve (Part No. 0585-427015), has been released to serve as a replacement part for transmissions with damaged main case rear sleeves (Steel only).

The Service Sleeve is similar in construction and material to the existing production main case rear sleeve, but has different internal and external diameters. The sleeve is pre-sized for assembly.

When removing the old main case sleeve and installing the new Service Sleeve take care to avoid damaging the main case rear bi-metal bush.

When installing the new Service Sleeve ensure that:-

a) The Service Sleeve is oriented so that the external lead in chamfer on the sleeve points towards the rear of the transmission. This means the Service Sleeve must be pressed in from inside the main case to make use of the lead in chamfer.
b) The Service Sleeve is pressed into the main case so that the rear end of the sleeve is level with the end of the main case.

Before reassembling the transmission, the Output Shaft, the rear bi-metal bush and the rear steel sleeve should be inspected for damage.

NOTES:

1) Take care when installing the Service Sleeve to ensure that the lubrication feed holes in the sleeve are aligned with those in the main case and that the holes are not blocked by swarf. Failure to do so will result in failure of the transmission.

2) The Service Sleeve must be installed with an approved retaining compound (Approved retaining compound is Loctite 601). Take care to avoid blocking the lubrication holes with the retaining compound. Failure to do this will result in the failure of the transmission.

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58 Lisbon Street PO Box 99 Fairfield NSW 2165 Australia
Phone (02) 754-9200 Fax (02) 724-6397

Service Bulletin

DATE : 3RD FEBRUARY, 1994 NUMBER : 264

DISTRIBUTION : 0130, 0131, 0530, 0550, 0561, 90 (2-OFF), F ISSUE : 1

SUBJECT : INTRODUCTION OF NON-VENTED INHIBITOR SWITCH ASSEMBLY.

MODELS AFFECTED: M85LE, M91LE AND M95LE

1. INTRODUCTION

This Service Bulletin is to inform of the introduction of a non-vented inhibitor switch assembly.

2. BACKGROUND

To reduce the incidence of inhibitor switch failure caused by water entry, a non-vented version of this assembly has now been introduced.

3. USAGE

Any four (4) speed electronically controlled transmission (i.e. M91LE and M95LE) which was built after 17th December, 1993 will be fitted with a non-vented inhibitor switch assembly (0591-640046).

The vent tube which is currently incorporated with the vehicle transmission wiring loom will be deleted in 1994 (i.e. new model release) and be replaced with a sealed two (2) pin connector assembly.

The non-vented inhibitor switch assembly may be fitted to any four (4) speed electronic transmission (i.e. M85LE, M91LE and M95LE). The vented inhibitor switch (0585-640018) can only be fitted to a transmission when the vent tube is present.

MOTOR MANUFACTURERS SERVICE BULLETIN

DATE : 12-4-94

NUMBER : 267 ISSUE: 1

DISTRIBUTION : 0130, 0131, 0530, 0550, 0561, 02, 03, 90 (2), FORD, TICKFORD, FORD CSO MELB. (2), FORD N.Z., ATP ENGLAND, ATRA, MTA.

SUBJECT :VALVE BODY RETAINING PINS 0585-043070 & 0585-043071

MODELS AFFECTED : M91, M95, M93, M97 BTRE AUTOMATIC TRANSMISSIONS

1.0 INTRODUCTION

This Service Bulletin clarifies the introduction of the Driv -Lok retaining pins in place of the roll pins (S6 sleeve, manual low blow-off spring retainer, and valve body locating pins) used in valve bodies built after the August 1993. The early roll pin design is still to be used in valve bodies built before August 1993.

Driv-Lok pin identification;

Valve Body Locating Pin	0585-043082
S6 Sleeve	0585-043083
Manual Low Blow-off	0585-043083

Early Roll pin identification;

Valve Body Locating Pin	0585-043071
S6 Sleeve	0585-043070
Manual Low Blow-off	0585-043070

Whenever a valve body assembly is disassembled during service and the press fit pins are removed, it is essential that the same design retaining pins are refitted. This is due to a larger hole diameter used for Driv-Lok retaining pins.

2.0 TRANSMISSIONS AFFECTED

The Driv-Lok retaining pins 0585-043082 & 0585-043083 are used in the following transmissions;

TRANS. MODEL	SERIAL NUMBERS
M91	003 7066 →
	004 92404 →
M95	001 11965 →
M93	All Numbers
M97	All Numbers

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58 Lisbon Street PO Box 99 Fairfield NSW 2165 Australia
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Service Bulletin

DATE :1.6.94 NUMBER:268

ISSUE: 1

SUBJECT :C3 CLUTCH ASSEMBLY UPGRADE.

MODELS AFFECTED: BTRE M85, M91 & M95 FOUR SPEED AUTO. TRANSMISSIONS

THIS SERVICE BULLETIN ADVISES OF A CHANGE TO THE FRICTION PLATE TYPE IN THE C3 CLUTCH ASSEMBLY AS FOLLOWS:

DELETE : BTRE P/N 0585-666013, 4 OFF (DOUBLE - GROOVED PLATES).
ADD : BTRE P/N 0585-666007, 4 OFF (MULTI - GROOVED PLATES).

IT IS RECOMMENDED THAT THE MULTI - GROOVED FRICTION PLATES ARE USED FOR ALL TRANSMISSION REBUILDS.

NOTE : CLEARANCE IN THE C3 CLUTCH ASSEMBLY REMAINS UNCHANGED (1.07 - 1.45 mm) AND SHOULD BE DETERMINED BY AVERAGING FOUR READINGS THAT ARE TAKEN AT 90 DEG ANGLES.

STRE
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58 Lisbon Street PO Box 99 Fairfield NSW 2165 Australia
Phone (02) 754-9254 Fax (02) 724-6397

Service Bulletin

DATE : 13/5/94 NUMBER: 269

SUBJECT : SOLENOID SUPPLY VALVE (SSV) SPRING ASSEMBLY TOOL

ISSUE 1

1.0 INTRODUCTION

This service bulletin is to advise field personel of the need to use a service tool to assemble and disassemble the SSV spring and retainer plate in valve bodies with branding :93-907.

2.0 BACKGROUND

In valve bodies with branding :93-907 the SSV spring is retained by a flat plate (39x8x3 mm). It is recommended that this plate and spring is assembled and disassembled using the special tool described in this bulletin, thus preventing damage to the SSV bore.

3.0 DESCRIPTION OF USE

First the SSV spool and spring are assembled into the valve body through the S6 bore, then the tool (shown below)- held from the knurled end - is pushed in through the S6 bore to compress the SSV spring. The retainer plate is then dropped into its cavity from the track face side of the lower valve body. Refer to cross section in Figure 1 below:

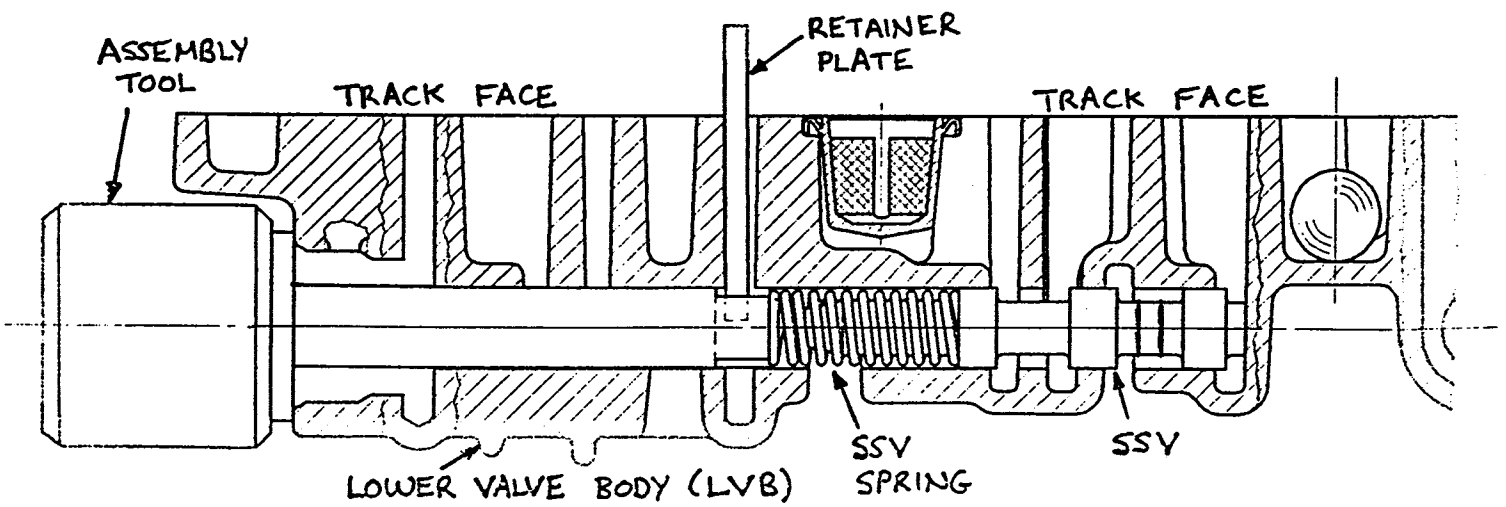

FIGURE 1 ASSEMBLY OF SSV SPRING RETAINER PLATE INTO THE LVB

4.0 MANUFACTURING DETAILS

The tool is made from mild steel round bar stock, diameter 1.25 ". A light knurl is included on the handle to prevent slipping. The handle is made hollow to reduce the weight of the tool. General drawing tolerance is ± 0.25.