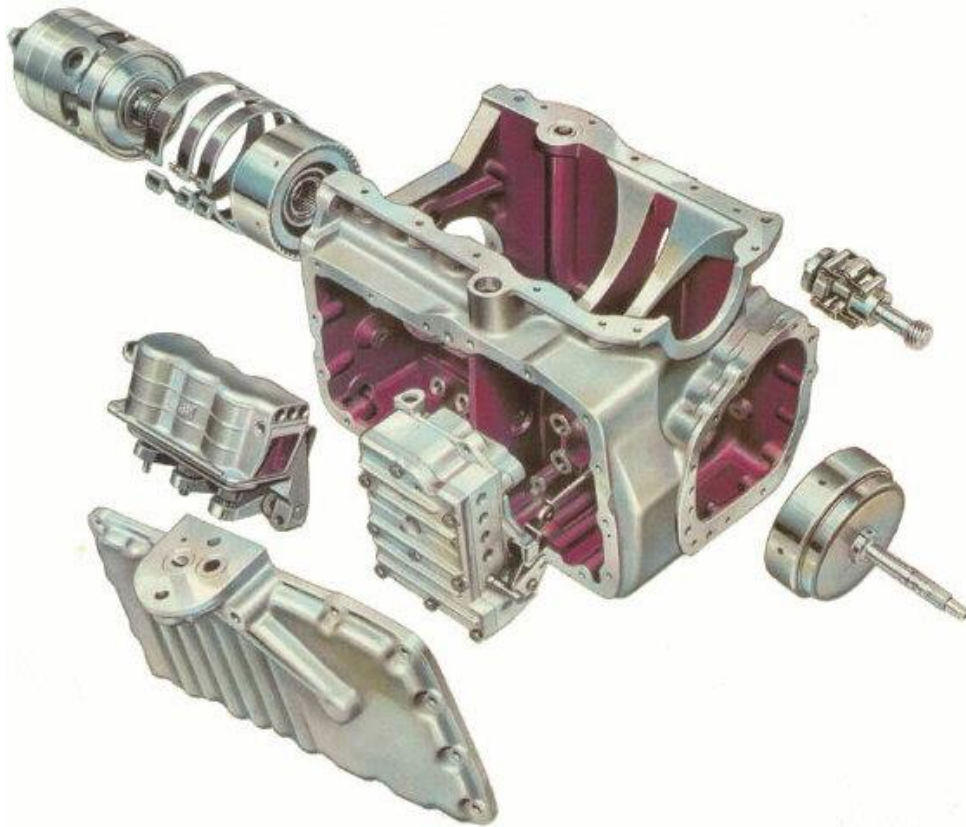


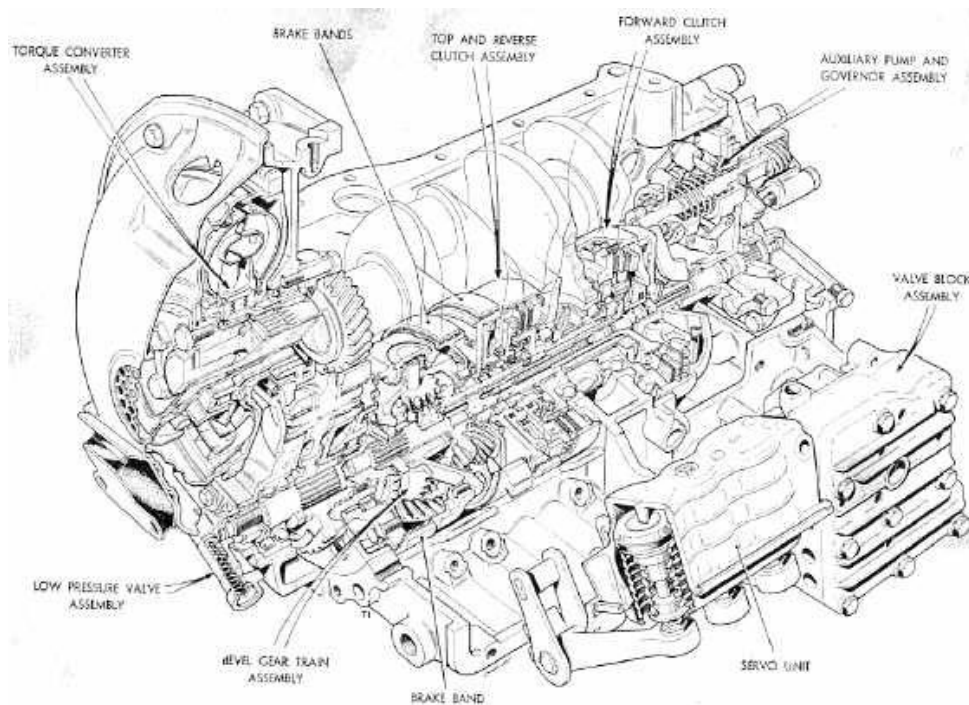
AP Automatic Transmission:

Exploded View



The internals are nicely packaged

The AP Automatic Transmission



Cut away view of transmission unit

Technical Information

The AP (Automotive Products) Automatic Transmission was first introduced at the Earl's Court Motor Show in 1965 and debuted in the Austin and Morris 1100's beginning in October 1965. It is the result of a 10 year joint project between the Automotive Products Company Ltd. in Leamington Spa, Warwickshire, England and the British Motor Corporation Ltd. in Longbridge, Birmingham, England. This unique transmission has many achievements:

- It is possibly the only automatic in the world to run on engine oil.
- It was far ahead of its time and won the Queen's Award to Industry at the 1965 motor show.
- It is considered the forerunner of the modern "automatic/manual" transmission.
- It is considered the first automatic fitted to a transverse mounted engine.
- It is considered the first automatic fitted to a mass produced compact car.
- There have been numerous upgraded versions of this transmission and it was still in production for use in the Mini and the Metro until 2001.
- An internal auxiliary pump allows the vehicle to be tow started.

The version used in the Austin Americas is considered a MK II version. It uses about 9 quarts of 10w/40 engine oil on initial fill, and about 6 quarts thereafter for oil and filter changes. I strongly recommend that the oil and filter be changed approximately every 1,000 miles! Only use 10w/40. I also strongly recommend that the engine/trans not be stored with "old" engine oil inside. The contaminants in dirty engine oil will attack and damage the nitrile (buna N) O-rings and seals inside the transmission. Change the oil and filter before storing the car.

There is no "Park" feature, but it does have starter lock out switch to keep the engine from being started in any of the drive gears. Therefore the parking brake must always be used to hold the car from rolling away when parked. The transmission has an auxiliary pump which is driven when the car is rolling and it will start the engine if the car is towed faster than 20mph if the transmission is placed in any of the forward drive gears.

Due to the design of the transmission, the car cannot be towed with the front wheels on the ground. The owner's manual actually says you can tow at low speeds and for very short distances, but why risk damage?

The transmission can be shifted manually by simply selecting the desired gear with the gear shift lever. This function overrides the automatic feature and will hold the transmission in that selected gear, no matter what the engine speed or road speed.

My recommendation is that you leave it in "D" and let the transmission take care of itself.

Rebuild Parts Order

The only source in the world for AP Automatic Transmission Parts is "JPAT" in England. Visit their website at: <http://www.jpat.co.uk/> Telephone them at: 1954-852772

To view and print out JPAT's exploded AP Automatic Transmission Parts Diagram, click on this link: <http://www.jpat.co.uk/AP%20II.pdf>

I highly recommend you phone them directly as they are very nice to deal with, and that will get you the fastest and most accurate service. A word of advice; many British firms aren't eager to use email, even if they offer it. They still prefer talking on the phone. So, if you send them an email (and I wouldn't), don't be surprised if it takes a while to hear back from them. Another bit of advice; be polite and patient. You'll have a much better experience with anyone from the UK and quite frankly, if you come off as just another rude, demanding American, you probably won't get any help or parts at all.

To do a complete rebuild, you want:

1. The "Master Rebuild Kit."
2. All 3 brake bands (and do send yours back because they are becoming scarce!)
3. One extra "friction disc" and one extra "steel disc" for the forward clutch only if you intend to do the "3 plate modification" that I outline below.
4. All of the "metal sealing rings" if they are not included in the master kit
5. All of the "rubber clad oil seals" if they are not included in the master kit

Ask them not to ship it FedEx. Have them simply send it airmail via their "Parcel Force."

Parcel Force will get it to your door in about 10 day, via the regular US Mail, with no customs charges.

One warning about customs: Make sure they put on the invoice that the total parts bill is UNDER \$400US. This will ensure there is no customs involvement. Have them split your order into 2 packages if they have to, in order to keep things under \$400. If you wind up having customs involved, you'll get screwed beyond belief by the pirates that syphon off fees for paperwork, power of attorney, and storage while you figure out what to do.

You don't need the frictions for the Top Gear/Reverse Gear pack. They are bronze clad and don't wear out. In fact, the frictions you'll get for the forward clutch are the better bronze clad version. The bands are also updated with new Dupont Aramid/Kevlar material.

Don't worry about rebuilding your torque converter unless you have some symptom indicating it's failed internally.

Pressure Testing

If your transmission is not working properly, the first test you must perform is making sure the engine oil (which is shared with the transmission) is at the correct level....at the MAX line on the dipstick.

Following this, you need to do a pressure test on the transmission's oil pressure. The service manuals all show a special dealer tool for doing this. The tool combines a pressure test gauge and a tachometer, along with enough hose and electrical line to place the unit inside the car and go for a test drive.

For our purposes, we can build a pressure test gauge very easily and inexpensively. Here's what you'll need:

- A pressure gauge capable of reading 0-160psi
- A foot or two of high pressure hose and 2 hose clamps
- A nylon plastic fitting that is barbed male on one side and 1/8" pipe thread on the other side.

Assemble this pressure test gauge and thread it into the threaded opening on the front edge of the oil filter station. You'll see a bolt in this location. Remove the bolt to gain access to this pressure test port. The threads are actually 5/16" x 28pitch fine thread. Good luck finding a fitting with those threads. Hence my choice of the nylon plastic fitting. 1/8" pipe is close enough and the plastic will deform just enough to make a nice fit without leaking and more importantly, without damaging the test port's threads.

With the pressure gauge installed you should get the following results:

- 95-105psi in Neutral and any forward drive gear.
- 142-158psi in Reverse.



Pressure gauge attachment to front of oil filter



A barbed nylon 1/8 inch pipe fitting will thread right in nicely

Diagnosing Faults

The transmission I'm diagnosing and repairing for this technical section has only 29,000 miles. It has been in a one owner car that has been in storage since 1976.

Statistically, the Americas with AP Automatics rarely made it through their initial 12 month/12,000 mile factory warranty period without needing a major overhaul of some sort. They generally failed completely at or before 30,000 miles.

This transmission will not engage Drive, or 1st, 2nd, or 3rd gears. However, Reverse works perfect.

A pressure test showed the operating oil pressure in both the engine and the transmission were well within tolerance and certainly at the high end of specification. The diagnostic charts in the repair manuals say that if the pressures are normal, then the fault is likely within the "Forward Clutch Assembly."

Indeed, upon speaking with quite a few people who are knowledgeable about these AP Automatic Transmissions, I learned that the forward clutch assemblies were the weak link and almost always the cause of failure.

The Forward Clutch is easy to access and repair, but unfortunately, it can only be done with the engine/transmission removed from the car. So, the next step is removing the 500lb. greasy lump and then steam cleaning it.



The automatic eng/transmission unit



The Forward Clutch is behind the Governor Housing cover

Forward Clutch Repair/Modification

Removing the end cover reveals the auxiliary pump and governor (left photo) and the forward clutch assembly (right photo). Note the alignment of the copper oil feed pipes. To remove the Forward Clutch, remove the lower oil feed pipe by twisting and pulling toward you. Remove the pump screen. Pull the Forward Clutch straight out, then turn it to your left to get past the upper copper pipe. Remove the circlip on the Forward Clutch and you can take out all the plates and tiny springs, as well as the big aluminum piston underneath.

Note how thin the friction material is. New plates are about .102". These were .068".

Note the split in the forward clutch actuating piston seal. From sitting with the same engine oil for 27 years all the rubber seals and O-rings inside this transmission are hard and brittle like plastic. Most are damaged and not sealing properly.

This is sensitive to speed and foot position



The Auxiliary Pump and Governor

The Forward Clutch



This drives the forward gears

Forward Clutch Assembly



2 friction plates are sandwiched in here

Clad with a paper-like material



Forward clutch plates very worn

Old dirty oil damaged this seal



This rubber seal is now hard and has split

Forward Clutch Modification

Here are two tips that I've been told about.

1. Replace the "stock" forward clutch friction plates, which are lined with a paper-like material, with the plates from the top/reverse gear assembly. The top/reverse gear friction plates are lined with a much more durable material and will handle the loads in the forward clutch much better. In fact, you can now only buy one style of friction plate for the transmission. So, this modification is a no-brainer.
2. The second tip comes from Rick Lovett, Service Manager at the Monte-Shelton Jaguar Dealership in Portland, Oregon. Friend and fellow long time America owner John Quilter, told me that Mr. Lovett was very knowledgeable about the AP Automatics, so I gave him a call. Mr. Lovett was very generous with his time and knowledge. His trick is to have the metal plates in the forward clutch machined thinner, so that a 3rd friction plate and second metal plate can be installed. This effectively increases the total friction surface area by 50%. Mr. Lovett's own Mini Moke is sporting an AP Automatic with this modification and is still going strong...after 25 years!

Modifying the forward clutch

I took the complete forward clutch assembly and the forward drive gear to the machine shop. My plan was to have them shave material off the top surface of the bottom metal plate, take material off of both sides of the 2 intermediate plates that go between the friction disks and finally, shave material off the bottom of the top metal plate just until the .010" clearance spec. was reached.

Using a magnetic base to hold the plates in place, the machine shop surfaced the bottom plate about .040". Then, they took about .010" off each of the intermediate plates (.005" each side). They then started machining the top plate and test fitting the entire assembly until they could get a .010" feeler gauge between it and the rest of the plates as the manual specifies.

In doing the machining this way, my goal was to keep the 3 friction plates centered on the cogs of the forward drive gear. This is how they are in the stock configuration with just 2 friction plates.

Here's a photo of the finished result:

Modified Forward Clutch Assembly



Here's how it all comes together after machining

Drive Train/Planetary Gears

To get to the big drive train and the planetary gears, you need to remove the torque convertor cover, the torque convertor (which requires a monster sized puller) and then the low pressure valve comes off. After that you spin off the big input gear nut using a 1/2" drive air gun (or a breaker bar if you've made the tool for holding the primary gear stationary). Then you can remove the drop gear housing, primary gear, intermediate gear, and input gear with shims.

Do yourself a favor and put the gears in individual zip-lock bags so they stay clean! Put them in a safe place so there's no chance of them falling to the floor.

The gear train can now be removed. Undo the locating bolt that's on the back of the transmission case near the 9 O'clock position on the side of the gear train. Now the gear train can be jiggled and slide right out. This takes some finesse and some minor shaking of the heavy gear carrier. The brake bands sort of drag on it making it difficult to remove.

Once it's out, you can pull the top gear assembly off the end. Check the condition of all 3 O-rings. As you see in the photo below showing 2 of them damaged. The third one is visible after you remove that gear.

Watch out for the location of large thin washers and needle roller bearings, and their orientation.

This is a good time to be reading your manual and taking note of all the parts and seals that make up this major assembly.

As you can see in these photos, bad O-ring seals was a problem throughout the transmission.

The other end of the transmission



Torque convertor has been removed already

Remove the Low Pressure Valve



Then undo the input gear nut with an air gun

Drop gear housing removed



There are 2 seals where the primary gear pokes through

Drop gears



Primary gear Intermediate gear and input gear

Tool for holding Primary Gear



Manual trans clutch disk hub welded to a handle

Planetary gears of the gear train assembly



Top and reverse clutch assembly is removed

More seals damaged



These are where it fits into the Top Gear clutch



Top and Reverse Gear Clutch Assembly

Valve Body & Brake Band Servos

To access these last two components, simply remove the front access panel on the transmission.

To do this, you'll need to remove the external engine oil pipe along with the pipe fitting that connects it to the top of the transmission case near the oil filter housing. Once the fitting is out, you'll find a brass feed pipe. It has sort of a zig-zag shape and can be twisted while pulled up and it will come out of the valve body.

Now you can remove the entire front panel on the transmission, complete with the oil filter housing assembly.

Now you'll need to take out the shift rod that runs all the way across the transmission. First push it all the way inward. Then take a 7/16" open end wrench and grab the coupling that you see it going into, just to the right side of the valve body. Use a flashlight to get a good view. Hold that coupling. Now use a wrench on the other end of the rod and unscrew it. It will spin free of the coupling that it's threaded into and then just pull right out.

Undo all the bolts that hold the valve body and the brake band servo unit in place. Reach in through the opening where the big gear train was and unclip the brake bands from the fitting on the servos. You may find it easier to loosen the adjusters on the servos first to give you some slack on the bands.

With the bands unclipped, pull both the servo unit and the valve body out at the same time, as a unit. Some short oil feed pipes keep them together at the top, and 3 more stubby feed pipes locate the valve body in the transmission case. Use care in pulling these assemblies loose!

Once you have them out, separate them, take them apart and replace the seals in the servo pistons and all the O-rings on the feed pipes...6 pipes and 12 O-rings. Also, there are O-rings where that zig-zag brass pipe fit in the top of the valve body and where the forward clutch feed pipe went into the side of the valve body. There are no seals on the actual valves in the valve body.

The brake bands can just be tipped to the side and pulled out the front of the transmission.

Brake band servo and valve body



These control the transmission shifts

The valve body apart



No seals in here just metal pistons

Brake Bands



A view from where the gear train sits

Servo and valve body removed



Brake bands are ready for removal

Brake Band Servo Unit



This is how it looks assembled

Replacing brake band servo piston seals



These are important seals

Final Outcome & Driveability

This rebuild has turned out very successful. I spent about \$500.00 total and \$170.00 of that was for the machining of the forward clutch components. The car is literally as good or better driving than when it was brand new and shifts on par with any modern car.

If you've not driven an America with an Automatic, you're definitely in for a treat! They are an absolute joy to drive and this one has turned out to be no exception. I'm very pleased with the outcome and glad I decided to rebuild it.

- The transmission is very quiet other than the whir of the torque convertor, which they all do. You only hear this whir at low speeds.
- The shift points are all perfect and very smooth. Under light acceleration, like just pulling out of your driveway and driving down your residential street it shifts from 1st to 2nd at about 8mph, 2nd to 3rd at about 15mph and into 4th at about 20mph. The shifts are so smooth, you can barely feel them. Once in 4th, the torque of the engine easily pulls the car around town at any speed.
- If you need more power and hence depress the accelerator pedal a bit, the transmission will kick down, all the way to 2nd if need be.
- As the car slows, the transmission shifts down, and will go all the way to 1st as you come to a stop.
- Under hard acceleration, as in holding the accelerator to the floor, the shift points are raised significantly and the their engagement is very noticeable with a nice kick that you can feel.
- There is no "3rd to 4th Flare Up" that the service bulletins all speak about as being a problem back when the cars were new.
- The car easily accelerates to 65mph getting onto the freeway and will comfortable cruise at that speed. 70mph is also quite comfortable and there is plenty of power for passing or climbing hills.

Having now rebuilt one of these automatics, I would do another the same way without any hesitation. Having now driven one, I wouldn't hesitate for a moment to own one and drive it everywhere. I think the internal components are extremely large and well built, especially considering the fact that they only have to sustain about 50hp running through a slipping torque convertor.

I'm confident that with these modifications and regular oil and filter changes at 1,000 mile intervals, these transmissions can be as dependable and durable as the 4 speed manual transmissions.

I'm looking forward to the first oil change so I can compare the look of the oil and the quantity of "metallic fuzz" trapped on the magnetic drain plug, with how the oil and drain plug look in my 4 speed manual transmission cars. I'm guessing there will be almost nothing on the drain plug magnet and that the oil will not be metallic looking because there just aren't all the gears, shims, syncros, layshaft and other components that wear so heavily in the manual transmissions.

I'll post the results here.

Source: http://members.tripod.com/austin_america/id72.html