Servicing the

Philips Turbo Deck

Alan J. Roberts describes the main features of the Philips Turbo VCR deck mechanism and provides notes on general servicing and some points that can cause confusion

The Philips Turbo VCR mechanism has been around for a number of years and has proved to be efficient and reliable. The wind/rewind speed is very fast, hence its name. A unique feature is the absence of a mode switch. Replacement parts are usually supplied as kits, so that all associated gears or levers are replaced at the same time, ensuring a reliable repair.

Considerable experience has been gained over the years in servicing these decks and in dealing with various problems that have cropped up with them. Most repairs are fairly straightforward and don't call for explanation. Some points can cause confusion however. The following notes should be of help when a VCR fitted with one of these decks comes in for service. The reference numbers used in the text refer to the exploded view in the service manual, which should be to hand.

Initial Work

Virtually all mechanical repairs have to be carried out with the deck removed from the machine. The deck is normally held in place by three screws, two under the cassette lift and one at the centre rear. To gain access to the front two screws the cassette housing has to be in the down position. This is fine if there's no cassette stuck in the machine. If there is, it must be removed first.

Depending on the nature of the problem, this can be a bit awkward. For the moment we'll assume that there is no tape in the machine, the deck is fully unthreaded and the lift is in the eject position. Unscrew the centre rear screw first. The cassette housing next has to be moved forwards to gain access to the two front screws. The two protection locks, one at the left and one at the right, can be releasing using your fingers. It should then be possible to move the lift forwards sufficiently to gain access to the front two screws. Alternatively the loading motor can be turned to move the lift forwards. Once the screws have been withdrawn, the VCR's front panel should be removed and any connecting leads released from the deck. It should then be possible to remove the deck completely.

What do you do if the machine has taken in a tape and refuses to give it back? First try turning the loading motor by hand. If you are lucky, the mechanism should unthread (if it has reached this state), the index lever should swing back to its rest position and the housing should start to rise. To prevent tape looping, turn the capstan motor as you do this. You should then be able to bring the lift to the eject position and extract the tape.

If only life was that simple! Let's suppose that because of some mechanical problem the housing refuses to rise. This means that you will be unable to remove the deck from the cabinet. If you can get the deck into the unthreaded position but no farther, try turning the smaller of the two gears on the side of the housing. All being well, this will enable the lift to be brought to the eject position. If the lift is stuck hard you will have to turn the whole machine over and unscrew the lift retaining screws. These are No. 8 Torx size. There is also a red retaining hook at the right-hand side – it has to be unclipped. You should then be able to remove the lift, gently, complete with the tape.

Tape damage is almost inevitable with a really jammed deck, particularly if the deck remains in the threaded position. It may even be necessary to cut the tape to free it.

Once the housing is free, bring it to the eject position by turning the side gears and remove the tape.

The deck retaining screws can then be removed as described above.

Stuck Cassette

One of the most common faults, and one of the easiest to deal with, is when a machine comes in for repair with a cassette stuck inside it. On test the machine may make a raucous, whining noise when eject is pressed, or you may just hear the loading motor turn but nothing moves. The cause is usually a fractured gear at the end of the main worm shaft. This gear drives the two small gears that engage with the housing, at the side of the mechanism.

Repair is simple. Remove the lift as already described, then withdraw the faulty worm shaft from its fixings. Philips recommends that the drive shaft from the loading motor is also replaced – at the end of this there's a bevelled gear that can also fracture, bringing the whole mechanism to a stop. The two items are supplied as a pair under part number 4822 310 10657. They can be used with any Turbo deck.

The worm gear has a butterfly vane at one end. This interrupts the infra-red light from the optosensor that protrudes through the deck. As the worm gear spins, the pulses from the optosensor are counted by the deck's microcontroller chip so that it knows the deck position. This does away with the need for a mechanical, and less

reliable, mode switch. It's important to ensure that the butterfly vanes are undamaged.

One point needs explanation. The drive shaft (item 47 in the manual) is clipped in position at the gear end while the other end is clamped under an inverted U-shaped bracket that's part of the loading motor mounting. You simply cut the inverted U-shaped bracket halfway down and ease the drive shaft out. The new one can then be easily fitted. Fig. 1 shows the idea. This is not a bodge, and is accepted by Philips.

Once the new drive shaft and worm gear have been fitted, you are ready to reassemble the lift. This has to be done with the lift in the down position. So release the latches and turn the gears on the side of the housing to take the lift down. The two arrows on the side gears should point towards each other. Next turn the loading motor on the deck by hand until the timing hole in the main cam is at three o'clock. Position the lift, making sure that the smaller gear on the side engages with the drive gear on the deck. Clip back the red retaining hook. Invert the deck carefully so that the four Torx screws that hold the lift can be replaced.

Check the operation of the deck by turning the loading motor by hand. It should be possible to go through a complete cycle. From the lift-down position, turning the motor clockwise should take you through the entire eject sequence. Watch carefully as the timing hole in the main cam moves towards the six o'clock (eject) position. Gear 103 should start to turn and the lift should start to rise. It should do so smoothly, with no sense of catching. If all is well, it should be possible to bring the lift to the full eject position.

Turning the motor anticlockwise should take the lift down (remember to release the safety locks) then go through the entire threading cycle. Smooth operation of the lift depends on gear 103 disengaging from the main drive at the correct moment.

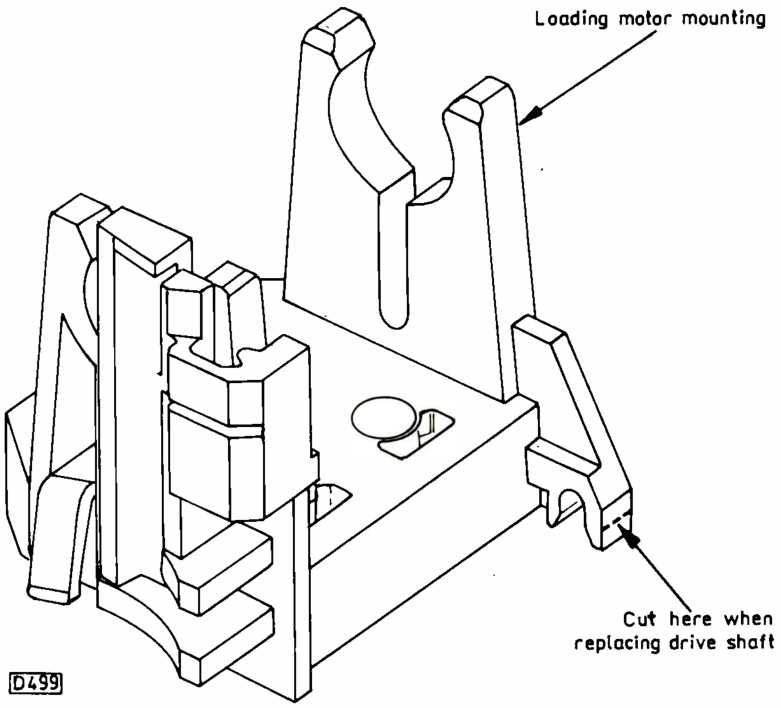

Fig. 1: Position of the inverted U-shaped bracket that holds one end of drive shaft 47. The bracket is part of the loading-motor mounting. Cut the bracket as shown above when replacing the drive shaft.

The Main Cam

The main cam comes as a kit with the worm shaft, pinch-roller helter-skelter and pinch-roller holder. For reliable operation these parts should be replaced together. It's important to order the correct cam for the model being repaired. They are not all the same: some machines have fully-threaded wind/rewind operation while others have unthreaded wind/rewind. This means that the cams are different, and fitting the wrong type will result in a jammed mechanism.

To gain access to the cam, the lift must be removed as previously described. In addition, the worm shaft should be unclipped. Before the cam can be removed, it's necessary to remove the index lever and the pinch-roller assembly. First turn the main cam to its full-eject position (hole at the six o'clock position). Remove plastic retainer 30F, then reverse lever 29F, followed by index lever 31F. Finally, carefully unclip the intermediate lever 32F. See Fig. 2.

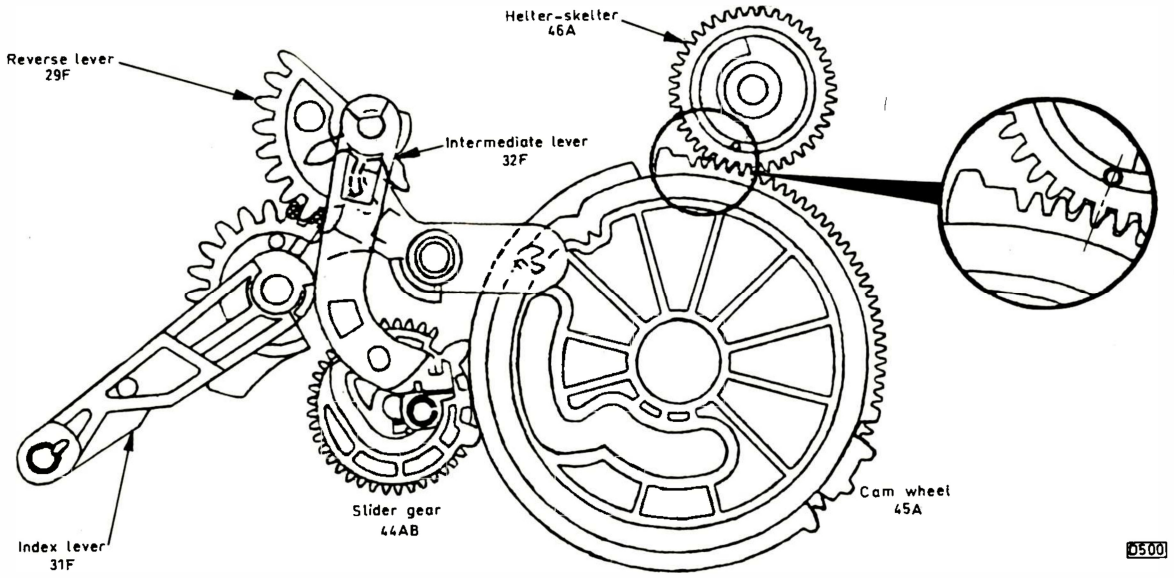

Fig. 2: Top view of the main cam and its associated levers and gears.

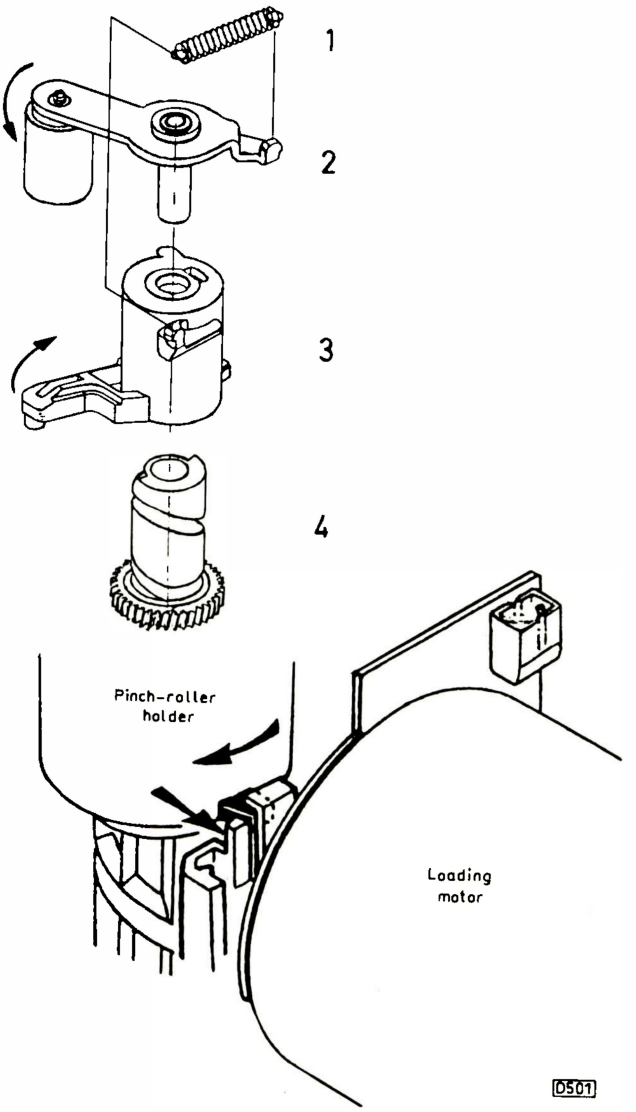

Fig. 3: The pinch-roller assembly. 1 Tension spring; 2 pinch-roller bracket; 3 pinch-roller holder; 4 helter-skelter gear.

To remove the pinch roller, first release the strong tension spring (see Fig. 3) then swing the pinch-roller bracket outwards slightly and remove. The pinch-roller holder should lift off upwards after pushing the retaining tab towards the loading motor. Finally, turn the cam so that the hole is at the three o'clock position and remove the helter-skelter gear 46A. This all sounds rather involved, but in fact takes only a few moments and reassembly is very easy.

A three-pronged spline holds the cam in place. There's no official tool for releasing the spline, but a call to Philips Technical produced a simple solution at no cost. All you need is the plastic cap from a felt-tip pen or similar. You might have to try a couple before you find one that's the right size and fits neatly over the spline to push the claws in. Then lift the cam straight off its fixing.

Fitting the new Cam

Installing the new cam is basically the reverse of the above procedure. To get the timing perfect at first attempt however, I suggest the following approach.

I usually find that it's best to replace the cam when it is in the stop position (timing hole at three o'clock). An elastic band looped around the loading arms and the left-hand turntable helps by keeping them in the fully unthreaded position. This keeps gear 44AB in the correct place, enabling the cam gear to be fitted easily.

The underside of the cam operates two levers, one for the brakes and the other for the eject gears. You will see two pins, one metal and one nylon, that protrude through the deck. Push the nylon one towards the right, and the metal one roughly central in its slot. If it's to the extreme left and appears to be under spring tension, push it towards the extreme right of its slot and the brakes will come on with a click. The pin can then be centralised in its slot.

Take the new cam and place it lightly over the centre spline. Do not press it down at this stage. Set the timing hole in the three o'clock position, then gently press the cam down. You may need to rotate the cam gently back and forth as you press it down. If the two levers are correctly positioned, the cam will snap down firmly.

Timing

To check that the timing is correct, rotate the cam clockwise so that the timing hole is at six o'clock. It should not go any farther. Now rotate the cam anti-clockwise back to the three o'clock position and carry on turning. There will be several points of slight resistance, as the levers are moved against spring tension. Carry on turning the cam. It should be possible to go through a complete threading cycle with the timing hole stopping at roughly the four o'clock position. The loading arms should be fully engaged.

Now turn the cam clockwise again, making sure that the loading arms return fully. Set the timing hole at three o'clock.

If the cam jams during any of the above moves, remove it and follow the setting instructions again.

We can now refit the pinch-roller assembly.

The Pinch-roller Assembly

The helter-skelter gear has a timing hole. Place the gear on its spindle, but don't press it down fully yet. Set the timing hole so that it's between the third and fourth tooth of the cam, see Fig. 2. When satisfied about this, press the gear down fully.

Now turn the cam so that its timing hole is at six o'clock. Place the pinch-roller holder loosely on the helter-skelter, so that the long, lower arm rests against the capstan spindle. Then rotate it anti-clockwise until the small square tab at the rear snaps into the guide behind the loading motor. Fit the pinch-roller bracket into the hole at the top, and refit the tension spring.

Before going any farther, check that the timing is correct by turning the cam through a complete cycle as before. Make sure that the pinch roller engages fully with the capstan spindle.

The index and reverse levers can now be refitted.

Index and Reverse Levers

First examine the intermediate lever 32F for signs of damage. If there are any, an order for the appropriate kit will bring all four items to be replaced together. Make sure that the main cam is in the three o'clock position. Place the lever on its fixing bush, as shown in Fig. 2, and push down firmly.

Next fit the index lever on its shaft. There are two timing dots on the teeth of the index lever and three dots on the teeth of the reverse lever. The centre dot of the three should be between the two dots on the index lever. Finally fit the retainer.

When the main cam is turned, both levers should now

swing to their respective positions. When you are satisfied that the timing is correct, clip the worm shaft back into place. Before you refit the cassette housing, as previously described, you can check the operation by connecting a 9V supply across the connections to the loading motor. The deck should operate smoothly through its entire cycle.

The Brakes

Having dealt with the top of the deck, we'll take a look beneath. Once again, all major brake parts are supplied as a kit which should cure most problems. With the majority of the earlier Turbo decks this is kit E.

A common problem is that when the machine unlaces from play a small loop of tape is left hanging from the cassette. Then, as the cassette is ejected, the loop gets caught in the cassette flap and is damaged.

One of these machines was in my workshop recently with this very problem. I fitted kits E and I and replaced clutch 115. This improved the operation of the deck, but the fault was still present. After much time had been spent observing the deck's operation, I noticed that the brakes were not being fully applied when stop was pressed. I couldn't figure out why.

A call to Philips brought the solution. Pulse roller 107E and pulse lever 110E are located in plastic bushes on the main chassis. They can fracture, the result being poor brake operation. A reliable repair is possible using the kit of parts that Philips supplies to replace the bushes.

The pulse lever bearing had fractured in my faulty deck. I had to dismantle the deck sufficiently to gain access to the part, then carefully cut it away from the chassis – right down to the base metal. The new piece was then carefully fitted into the two vacant holes. A small dab of Superglue held it firmly, then I was able melt the two plastic tabs over neatly to form a solid bond. When the deck was reassembled the brakes worked perfectly. The machine would otherwise have been a write-off.

The above is likely to happen only with older machines. Most repairs will simply involve ordering and fitting the appropriate repair kit(s).

General Servicing Notes

Most other repairs are routine and don't require explanation. The pole bases simply clip on to the loading arms, replacement taking only a few moments. The brakes on top of the deck again just clip on and are supplied as a kit.

You sometimes find that the plastic hook which holds the record-protect lever retaining spring has broken. The repair kit mentioned previously contains a replacement hook that provides a reliable repair.

Head fixing was changed during production. The original version was held by a single screw. Later versions are held by a quick-release clamp for which a special tool is required. Details will be found in the relevant service manual.

On all but the latest versions of the deck the sensor panel is supplied complete and fits under the mechanism. It contains the start and end sensors, the reel sensors, the deck sensor and the record-protect switch. With later decks the sensors are fitted to the main PCB. Later versions of the deck also have a modified braking system that eliminates the problems experienced with fractured plastic mountings, as described above.

The loading motor can be responsible for sluggish operation or failure to load or unload completely. If the motor is suspect, check it by removing the loading belt and turning the pulley by hand. This will usually prove the point. If it feels rough, change the motor along with the driver chip which can also be damaged. To avoid "chicken-and-egg" situations, it's best to replace them as a pair.

Some versions of the deck use a different capstan motor. Make sure that you order the correct type for the machine being repaired.

In Conclusion

As previously mentioned it is *very* important to order the correct repair kit for the version of the deck you are servicing. There are major differences in the main cams and brake assemblies on later decks. So it's essential to have the correct service information available. The details in the notes above are intended to provide guidance only: they have been prepared on the basis of experience with existing models. Differences that are not covered in these notes may be found with some Turbo decks.

To maintain the high standard of performance, genuine Philips parts should be used when carrying out repairs. Any improved parts will be supplied with the relevant repair kit. This is particularly true of pinch-roller assemblies.