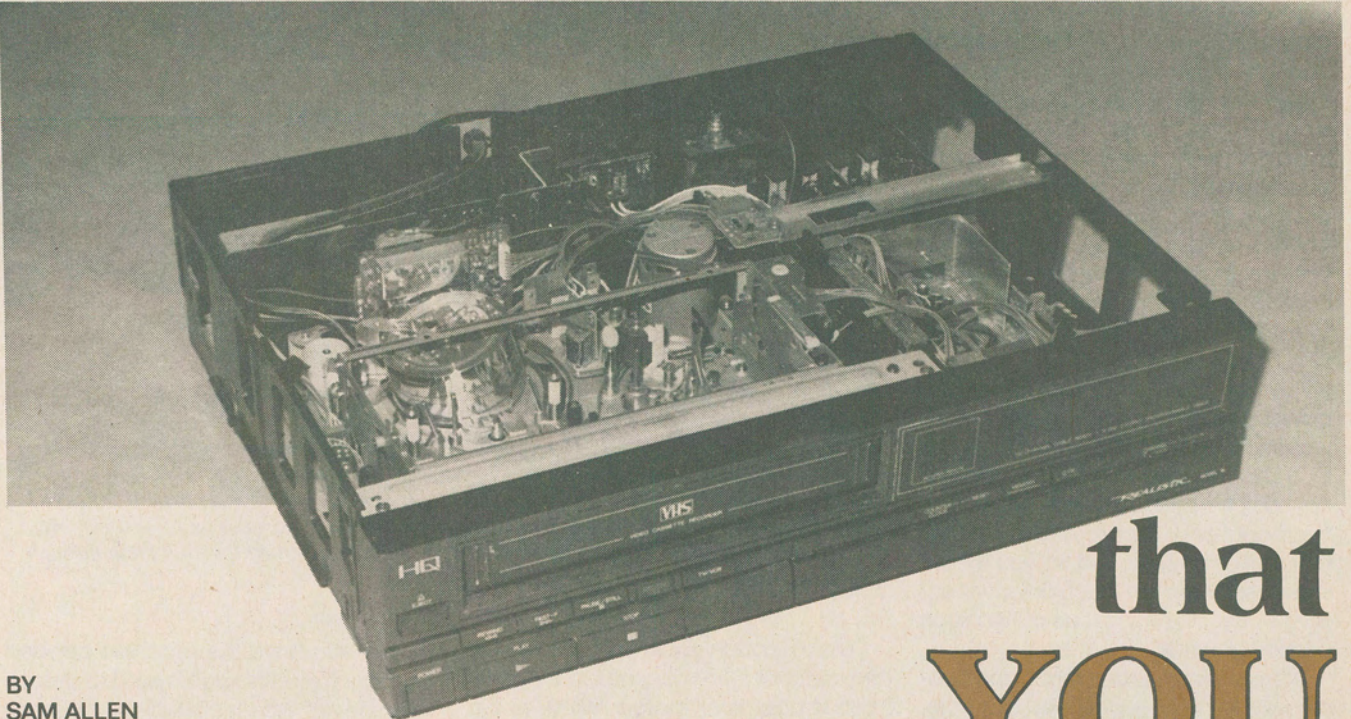


Simple VCR Repairs



BY
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Depending on the malfunction, you might be able to fix your own VCR and avoid an expensive repair bill, or even having to buy a new one.

that
YOU
Can Do!

As soon as someone finds out that you are interested in electronics, they will usually ask you to fix something. For instance, they might want you to repair a malfunctioning VCR. If you are just getting started in electronics, you probably feel that VCR repair is way over your head. While you might be right to some extent, you'd be surprised how many VCR's are totally disabled by minor problems that even a beginner could fix. Surprisingly, a VCR that just won't work at all is usually easier to repair than one that just has poor picture quality.

In this article, I will present the repair techniques you'll need to know to cure some of the most common VCR problems. As you'll come across them more often, the solutions I'll provide are for front-loading VHS units. However, some of the problems I'll discuss are common to all types of machines, so the generalities of the techniques described may be useful for repairing different machines.

Sizing-Up the Job. Before you commit to work on a unit, there are a few things you should find out: First, make sure the machine is out of warranty, since you will void the warranty if you open the case. This is very important when repairing a friend's machine; sometimes people forget they have a warranty, so make sure it has expired.

Another thing to consider when working on someone else's VCR is the owner's attitude. If they are wary and think you may cause more damage to the machine, don't work on it or you are likely to lose a friend if the unit turns out to be unfixable. If their attitude is, "Oh well, it's no good now; you can't hurt it," then go ahead. I like to work on stuff that has already been into a commercial shop for an estimate. If the owner decided that the cost of repair is too high to make it worthwhile, then they won't get upset if I can't fix it, but they are pleasantly surprised if I can.

Finally, get a good idea of what the problem is; think about (or ask) how the

problem began. That can give you a clue as to what to look for. For example, if the problem began after the VCR was dropped, then you can suspect a broken circuit board. That is a problem that you should be able to find and fix without too much trouble with some tips I'll provide later.

If a VCR won't load after the kids were using it, it may have a foreign object jamming the mechanism; another problem you can fix. I worked on one VCR that wouldn't rewind after someone had kicked the button with his foot. Knowing this, I could center my attention on the button itself and the problem was easy to find and repair. On the other hand, a problem that appears out of the blue with no apparent cause may be harder to troubleshoot. Make your decision accordingly.

Some Basics. Before getting into repair procedures, I want to give you a few ground rules. The first tip may seem obvious, but before you disassemble a

unit, check all of the controls to see that they are set properly. I have had several people give me VCR's to repair that only needed to be set up properly. For example, if the unit won't record off the air, the problem may be that the tuning controls aren't set to a station or a switch may be in the "aux" position instead of the "tuner" position. Some models may be completely inoperative if a switch is set to the timer position. There are lots of other possibilities, and the more complex the controls, the more likely that one of the controls has been overlooked; so be sure to check out the control settings thoroughly.

The next rule on the list: be sure the power cord is not plugged in before working on a VCR. When you do need to make a powered-up test with the cover off, be sure to observe every safety precaution. I assume you have some electronics background, so you should know better than to touch any connections in the primary circuit during such phases of repair.

There are some rules that apply specifically to VCR repair. For example, when part of a mechanism seems to be jammed, the first impulse is to spray some lubricant on it—don't do it to a VCR. Spray lubricants cause more harm than good. More problems are due to slipping than the need for lubrication.

Also, while you are working inside a VCR, keep your fingers away from the head(s), rollers, and guides in the tape transport. Oil from your hands will damage the head and cause slipping in the tape transport system.

Last, don't randomly adjust things inside the VCR to try and correct a problem; you will usually end up creating further problems.

Foreign Objects in the Mechanism.

In a house with small children, the most common VCR malfunction is a unit that won't load. That problem is usually due to a toy or other object that has been pushed into the tape door. I have found crayons, pennies, toy cars, buttons, and candy inside VCR's.

To eliminate the problem, remove the case and look for the foreign objects inside the VCR. Usually all you need to do is remove the objects and the VCR will function.

In the case of candy, crayons or the like, you may need to do some clean up. For candy, you need a water-based solvent; window cleaner works well. Alcohol works for crayons.

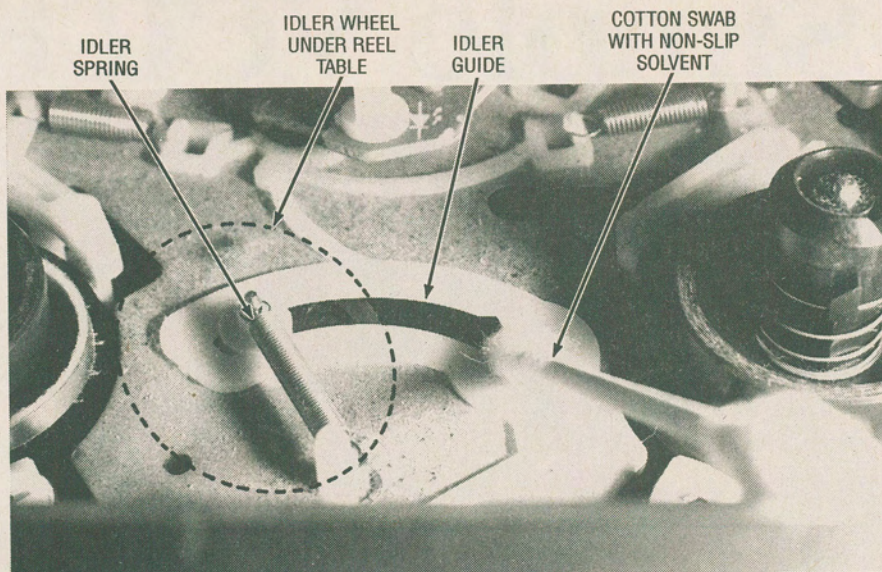


Fig. 1. A lot of problems can be traced to slipping idler wheels. If your VCR has a guide like the one shown here between the reel hubs, it uses an idler wheel. The idler wheel (indicated by the dashed outline) is below the reel table. To avoid a lot of disassembly, apply non-slip solvent to the rubber part of the idler by inserting a cotton swab through the hole in the guide.

Use a cotton swab moistened with the cleaner. Don't drip the cleaner onto circuit boards or motors. Wipe all surfaces dry with another swab. After the clean up, you should relubricate the gears with teflon grease (Radio Shack cat. #64-2326, for example). Don't use a lot; just swab on a very thin film. After the mechanism is working, insert a head-cleaning cassette and follow the cassette manufacturer's directions for cleaning the head. It provides insurance in case any foreign substance (cleaning fluid, finger oil, etc.) has gotten on the head or tape-transport components.

Slipping Transport Components.

Offentimes the source of trouble is in the tape-transport mechanism. Suspect such trouble if the VCR loads a tape, begins to play it, and then shuts down; a VCR has sensors and a system-control circuit that will turn off the power if the reels aren't moving. If the system control circuit didn't shut down the VCR when a drive component was slipping, the tape would go slack and get wrapped around the head, causing major damage.

If you suspect a slipping belt or idler, remove the case, then insert a tape and start the machine. Watch the tape movement. If one of the reels doesn't move or is slow and jerky, you need to look for a slipping or broken belt or "idler wheel."

A broken belt is usually easy to spot

once you have the machine opened up, but a slipping belt is hard to detect. If none of the belts are broken try cleaning them with a non-slip solvent (for example, Radio Shack #44-1013), then test the reel operation again. Incidentally, don't overlook the belt that drives the counter; many machines use the counter as a sensor in the system-control circuit to verify reel movement.

An idler wheel (see Fig. 1) transmits mechanical power by friction. A rubber "tire" around the edge of the wheel rubs against the motor shaft and another driven part. If the rubber becomes hard, glazed, or slippery, then there won't be enough friction for the idler to grip the other parts and turn them.

Quite a few VCR's use an idler wheel to drive the tape reels. You can tell if your machine uses one by looking between the "drive hubs" used to turn the tape reels. If there is a plastic guide in the type shown in Fig. 1, then your machine uses an idler wheel.

To fix the problem, swab the rubber on the wheel with non-slip solvent. Wipe it dry, swab it again, then wipe it dry. If your VCR is the type shown in Fig. 1, you can avoid a major disassembly by applying the non-slip solvent to the idler by pushing a cotton swab moistened with solvent through the guide slot. Turn the tape-drive hub by hand as you press the swab against the rubber on the idler wheel.

Sometimes the spring that pulls on

the idler has lost some tension. Remove the spring and cut off a few turns, then make a new loop on the end with needle-nose pliers. Re-attach the spring and try out the machine.

Physical Damage. A VCR that has been dropped or abused may have a broken circuit board, broken controls, or bent metal parts. The display/control board directly behind the front panel is the most vulnerable. Remove the front panel and examine the board, particularly at the corners. If it is broken, you can sometimes salvage it by soldering jumper wires across all of the broken traces and replacing any broken components.

If one or more of the front-panel controls won't work but their functions can be performed via the remote, then the problems may simply be a damaged front-panel control. The pushbuttons on the front are mechanically linked to the actual switches mounted on the control/display circuit boards. Remove the front panel and try operating the VCR by pressing the switch located on the circuit board. If it operates normally, look at the rear of the front panel to find out what's wrong. Usually a plastic rod that connects the pushbutton to the circuit-board mounted switch has

been broken or misaligned. You can usually get it working by bending it back into alignment or gluing the parts back together. If a part is missing, you can make a replacement from a scrap of plastic. It doesn't have to be too elegant as long as it will depress the switch.

Sometimes the pushbuttons and the front panel are molded as a single unit. Small strips of plastic act as hinges and springs. If these strips break, then the button may slip out of alignment or simply fall out. You can use silicone glue (such as Radio Shack #64-2306) to re-attach the button. The silicone remains rubbery after it sets, so it will allow enough movement in the button to activate the switch on the circuit board.

Loading Problems. Front-loading VCR's use motor-driven cassette baskets to load cassettes onto their reel table (see Fig. 2). An inoperative cassette basket will completely disable a VCR. One common problem is that a cassette gets jammed in the basket. If the cassette can't be ejected, the system-control circuit will shut down the VCR.

There are several causes for jamming. Sometimes the cassette case is warped or damaged in a way that jams it in the basket. If the cassette has been

inserted upside down or backwards it will jam. Even inserting the cassette at a slight angle can cause it to jam. The solution to any of these problems is to open the VCR case and examine the stuck cassette. Try to wiggle it around and find the place where it is binding. Find the small motor that runs the loading mechanism. Gently turn the gear on the motor by hand to try to back out the cassette. If the problem is the cassette itself, then once you get it out, the VCR should function normally.

Sometimes there is a problem with the cassette basket that will cause a tape to jam. For example, inside the basket there are some springy metal fingers that grip the cassette; if they have lost tension, the cassette can slip backwards as the basket moves. That can cause the rear of the cassette to get wedged in the loading slot as the basket moves down. The solution is to gently bend the fingers to increase the tension. Too much tension on the fingers or some other cause of friction between the cassette and the basket can lead to the same problem, so be careful when making the adjustment.

Some VCR's have a switch that senses forward movement of the basket as a signal to start the loading motor. There are a variety of types, but most are leaf switches mounted on the cassette basket. The contacts are supposed to close when a tape is fully inserted. If that switch is activated before the cassette is all the way in, the tape will get wedged in the slot, so check that switch if the problem persists.

Also, check the loading switch if you can slide a cassette into the slot, but the motor that pulls the tape in won't turn on. Some have a small plastic finger attached to the end that presses against the cassette. That finger is prone to break off. Manually close the switch. If the loading mechanism starts, then you probably just need to glue a small piece of plastic onto the end or reposition the switch so it is activated by the cassette.

If manually closing the contacts won't activate the motor, try bypassing the switch with a jumper. If that activates the motor, then the switch contacts are dirty. Clean the switch with contact cleaner. Don't spray directly on the switch because over-spray will get on other components and could cause damage; instead spray a little cleaner on a piece of paper, then rub the paper between the contacts of the switch.

If the switch seems to be okay, then

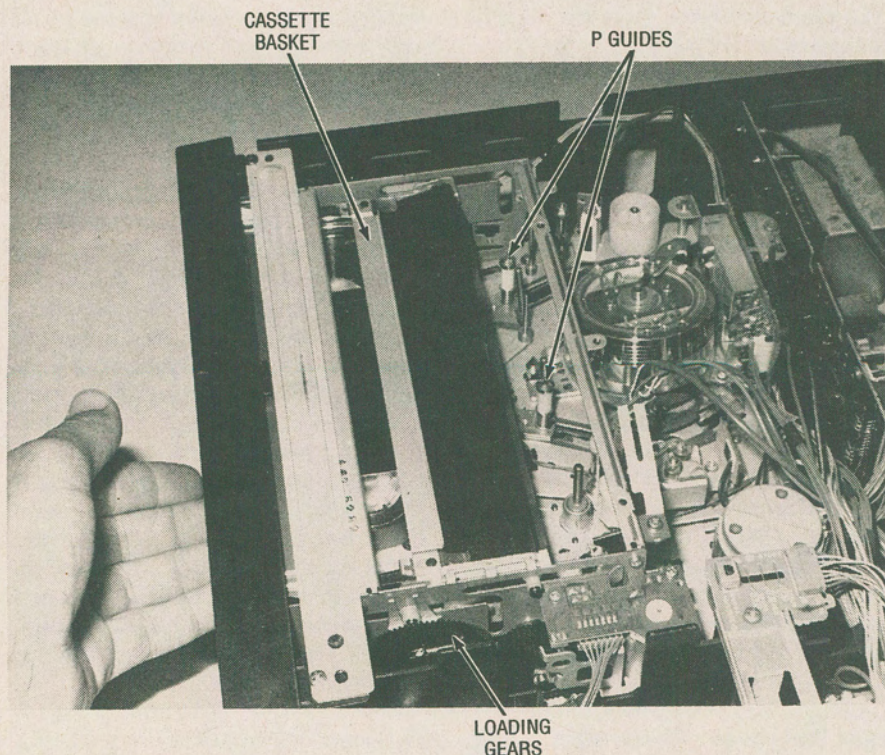


Fig. 2. When you insert a cassette, a switch activates a motor that drives the cassette basket. The basket pulls the cassette in and then lowers it onto the reel table. If the loading gears become out of time (slip a tooth), then the mechanism will jam as it lowers the basket.

check out the motor. Some of these motors will run on 9 volts, so (with the power cord unplugged) attach clip leads between the motor terminals and a 9-volt battery. You may need to reverse the polarity to get the motor to run. If it won't run with the battery, try a 12-volt supply. If it still won't run, you need to replace the motor. Sometimes you can get the motor working by spraying contact cleaner into the area of the brushes and manually rotating the shaft.

If the motor starts to turn then stalls, there is probably something jamming the loading mechanism. Look for a foreign object, a loose screw, or a bent part.

The motor drives a large gear that is connected by a shaft to a similar gear on the other side of the basket. If one of the gears slips a tooth, one side of the basket will jam as the basket changes from inward to downward motion.

The procedure for correcting this problem is called "timing the cassette basket." First mark the present location of the gears by making a dot with a felt tip pen on the two gears at the point where they mesh. Next remove the clip that attaches the gear to the shaft on the side opposite the motor. Remove the gear and reinstall it offset one tooth from the original position. Try loading a cassette and see what happens; if the problem is worse you've moved the gear the wrong way, so try again by moving the gear in the other direction. If the problem is better but still binds, move the gear another tooth in the same direction.

Power-Supply Problems. Most of the circuit boards in a VCR are too complex to troubleshoot unless you have a lot of experience, but the power-supply board is fairly easy for anyone with some basic electronics knowledge. When the VCR is totally dead, the power supply is an obvious starting point. The power supply can also be responsible for a number of other problems. If the supply isn't delivering the correct voltages to all of its outputs, some systems may not function correctly while others function normally; so if there is a mysterious problem that you can't explain, check each output of the power supply.

With a dead supply, I like to start by using an ohmmeter to check for continuity from one blade on the power plug to the other. If you have continuity, then the primary circuit is probably fine

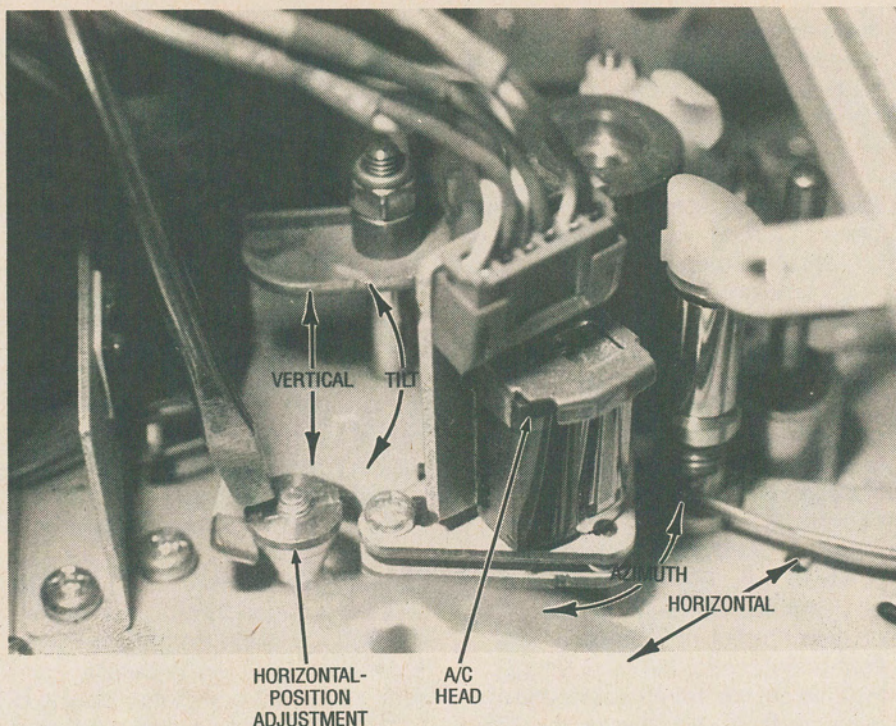


Fig. 3. This is the A/C (audio/control) head. There are four adjustments: horizontal position, vertical position, tilt, and azimuth. The adjustments affect sound quality and sync. They also have an effect on picture tracking.

and you can move on to check the secondary circuits. If you get an open-circuit reading, make another check with the probes on the terminals where the cord attaches to the board. If you get continuity here, then the cord or plug is bad.

If you still get an open circuit reading, look for a blown fuse. There are usually several fuses at different locations on the board. Check them with the ohmmeter since you can't always tell by looking. If the fuses are blown, replace them and try out the VCR. If they blow again, then there is a short or a component is drawing too much current; find the problem before you try any more fuses. If the unit functions normally, it's safe to assume that some transient blew the fuse and the VCR will be all right now.

If the fuses are intact, check for continuity through the primary transformer winding. If the primary checks out all right, then power up the VCR and use a voltmeter to measure the various outputs. Some boards will be marked with voltages. If there are no voltage markings on the board, you need a schematic to do a complete job; but as a basic test you can check each output and assume it is okay if you get a reading above 5 volts. If one of the outputs is dead, look for burned resistors or other components in the circuit. A good way

to locate a bad component is to start at the transformer end of the circuit and take a voltage reading. If there is no voltage at this point, then the problem is probably in the transformer. If there is voltage present, then follow the circuit and take voltage readings at each component. When you lose the voltage, you have found the defective component or a possible short.

Bad Sound or Slight Tracking Problems.

VCR sound is recorded with a separate audio recording head similar to the recording head in a cassette recorder. That head also records a control pulse on the tape that is used to keep the video head tracking correctly. Because of its dual purpose, the head is called the audio/control head or A/C head. If it becomes misaligned, it can cause distorted sound or sound that is out of sync with the lip movements on the screen. Because the A/C head also controls the picture tracking, adjusting it can be tricky. There are usually several adjustment screws for horizontal position, tilt, azimuth, and vertical position (see Fig. 3).

If the sound is in sync but it's muffled or distorted, try adjusting the tilt and azimuth. Note the original position and count each half turn as you make the adjustments. Try the tilt first. Adjust about one and a half turns one way; if there is

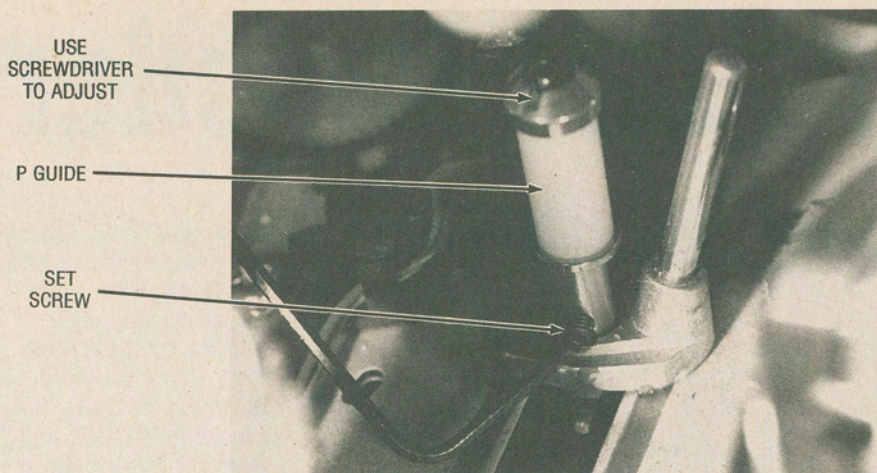


Fig. 4. The P guide adjustment affects picture tracking. Loosen the set screw with an Allen wrench before making the adjustment with a screwdriver.

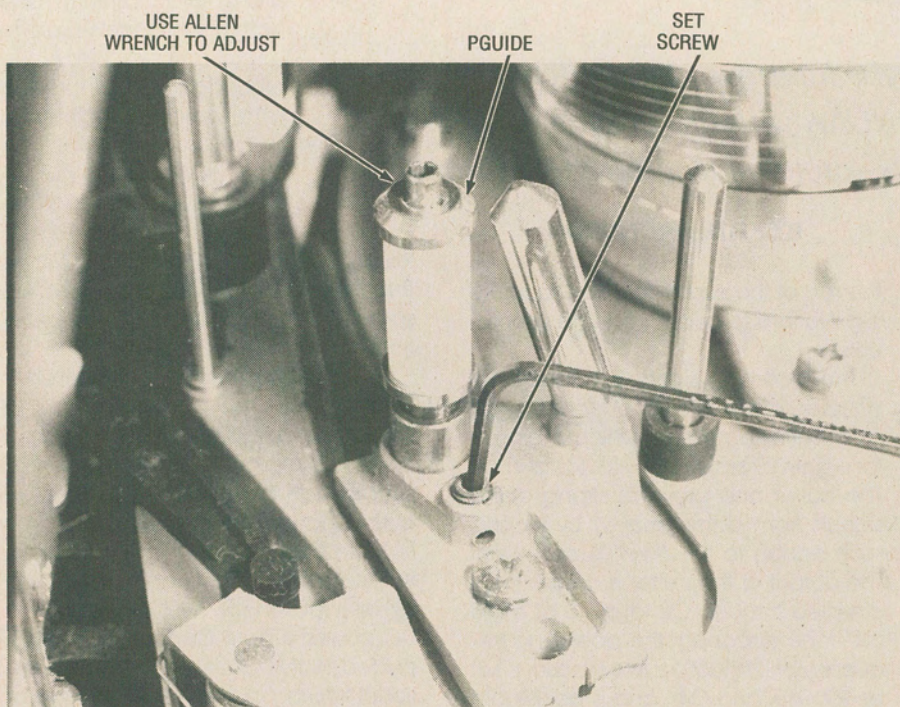


Fig. 5. This type of P guide needs an Allen wrench for both the set screw and the adjustment. Be sure to lock the adjustment with the set screw when you are done.

no improvement, adjust it back to the original position then one and a half turns the other way. If there is still no improvement, return to the original setting and try adjusting the azimuth using the same procedure. Watch the picture as you make the adjustments. If white lines begin to appear on the screen, adjust the head until the lines disappear making sure that the sound is still okay.

When the sound is out of sync with the lip movements on the screen, the horizontal position of the A/C head needs adjusting. First study a tape as it plays to analyze the exact nature of the prob-

lem—do the words begin before the person opens his mouth? Or does he open his mouth before the sound starts? If the sound comes first, then the head needs to move in the same direction as tape travel. If the sound occurs late, you must move the head in the opposing direction.

The horizontal position is adjusted by turning the large adjusting nut shown in Fig. 3 (the screwdriver is pointing to the horizontal adjustment nut). On some models, you may need to loosen the mounting screws and move the head slightly. Observe the picture as you move the head; tracking lines will ap-

pear and disappear. Position the head so that the sound is in sync and there are no tracking lines in the picture.

Tracking problems that can't be fixed using the tracking control on the front panel can usually be eliminated by adjusting the A/C head. Set the front-panel tracking control to the center position, and adjust the vertical and then the horizontal position of the head as you would for audio problems.

Severe Tracking Problems. If there are scratchy white lines in the picture that you can't clear up with the tracking control, and adjusting the A/C head doesn't help, then the problem may be with the P guides. The P guides are motor-driven pins that pull the tape out of the cassette and wrap it around the head (look back at Fig. 2 to help locate them). They control the position of the tape on the head. If they are out of alignment, tracking lines will appear.

There are two P guides; the one closest to the supply reel is called the entrance P guide and the one closest to the take-up reel is called the exit P guide. If the tracking lines are in the lower portion of the picture, then the exit P guide needs adjusting; if they are in the upper portion, the entrance P guide needs adjustment.

There are two types of P guides: one that can be adjusted with a screw driver (see Fig. 4) and one that requires an allen-head wrench (shown in Fig. 5). Before adjusting either type, you must first loosen an allen-head set screw. Note the position of the guide you want to adjust, loosen its set screw, then insert a tape and play it. Turn the adjustment on the top of the P guide a little and watch for an improvement in the picture.

After you have adjusted the P guides, remove the tape and unplug the machine, then lock the adjustment with the set screw. If you weren't able to correct the problem by adjusting a P guide, reset it to its original position.

A VCR that Damages Tapes. Tape follows a complicated path inside the VCR. When you press play or record, the two P guides pull the tape out of the cassette and wrap it around the video head. The tape is held in position by other guides and pulled across the heads at a uniform speed by a capstan and pinch roller. Problems anywhere along the tape path can lead to tape damage.

The most obvious symptom of prob-

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blems in the tape path is a loop of tangled tape sticking out of the cassette when it's ejected. If that only happens on rare occasions, it may be caused by a problem in the cassette itself. But if it occurs on a regular basis, then suspect a slipping belt or idler. After the tape stops, the P guides retract and the tape is rewound a little to pull the loose loop back into the cassette. If the drive belt or idler to the reel hubs is slipping, then the tape may not fully rewind into the cassette before the eject sequence starts. You can correct this problem as described earlier.

If the VCR "eats" a tape when it malfunctions, you can sometimes still salvage the tape, at least for one more play so you can dub a copy. There is a small latch release button on the left side of the cassette near the door hinge. Press in on the latch release and lift up the door. Now put your finger into one of the reel holes on the bottom of the cassette and turn the reel to rewind the tape into the cassette. Try to smooth out any wrinkles or creases as you go.

Some tape damage isn't obvious unless you open the door on the cassette. A crinkled or scalloped edge on the top or bottom edge of the tape can be caused by a misaligned guide or an oil seal on the capstan that has moved out of position. First look at the capstan. If there is a small plastic disc on the shaft, that may be the problem. The plastic disc is an oil seal. It should be positioned directly on top of the bearing. If it rides up the capstan, it will rub against the tape and crinkle the edge. To solve this problem, push the oil seal back down to its original position.

If the capstan is fine, play a tape with the VCR case open and observe what happens. The edges of the tape may be rubbing against something, or one of the guides may be out of alignment. Adjust the guilty part.

Scratches that run along the length of the tape are usually caused by a foreign particle on some part of the tape transport. Using a cleaning tape may solve the problem. If not, visually inspect all of the guides and rollers. Use a cotton-tipped swab moistened with rubbing alcohol to remove any dirt or accumulations you find. Don't use alcohol or cotton swabs on the video head. Use only head cleaner and special head-cleaning swabs for that. ■