MAC'S SERVICE SHOP

HOW TO SERVICE A CLOCK RADIO

By John. T. Frye, W9EGV

AS MAC strode through the service department door, he stopped abruptly, a foot poised in the air, to keep from stepping on the midriff of Barney, his assistant. The latter was lying on his back on the floor, laboriously writing on the bottom of a small square of cardboard held in front of his face. He had punched three pencil holes in the cardboard.

"I'm almost afraid to ask," Mac said, stepping across the prostrate youth, "but what are you doing?"

"I'm trying to figure out which replacement transistor lead goes into what hole in that printed circuit board on the bench," Barney retorted. "I'm the kind of dude who can't read a map unless the top of it is pointing north, even though I have to read the printing upside down. And these transistors having three leads equally spaced in a straight line drive me right out of my skull."

"I just don't know about you," Mac said, shaking his head. "But get up off the floor and let me tell you about fixing clock radios."

"What's to know? A radio's a radio. What's different about clock radios?"

"Obviously the clock and timer mechanism. Electronic reliability has improved until the clock is often the first item to fail, especially with a transistorized clock radio. It quits running, becomes noisy, or develops trouble in the switch-control portion. Then the owner makes several disagreeable discoveries: (1) the electronic technician considers clock repair a jeweler's problem and will not work on it; (2) a jeweler thinks repairing electrical motors is a job for the electrician and will not work on it; (3) the electrician can't be bothered with such a small job; (4) any of these will order a new clock, but the price of a new clock, installed, may run fifty percent or more of the cost of a new clock radio. In the past, the answer has been the wasteful old American practice of junking the radio and buying a new one, simply because no one wants to take the trouble to fix the electric clock. Now that we're beginning to see the bottom of the barrel of our natural resources, this is a practice we're going to have to forego. Instead of 'Junk it and buy a new one,' we're going to have to say to ourselves, 'Can't it be fixed? Can't we make it last?' "

"I'm ready," Barney said getting up and brushing off the seat of his pants.

"Okay. First let's take the case of a clock that won't run although the radio plays. You want to make sure the motor winding is not open before going further. This happens once in a blue moon, probably as a result of a lightning surge. With the radio turned off, make a resistance check across the line plug. A resistance reading of 500 to 700 ohms indicates the winding is intact. If it isn't, of course, you'll get a reading in megohms. In that case, you're probably out of luck with regard to getting a new winding. Neither the radio manufacturers nor the clock suppliers are interested in selling clock parts in my experience. Fortunately, an open coil is rare.

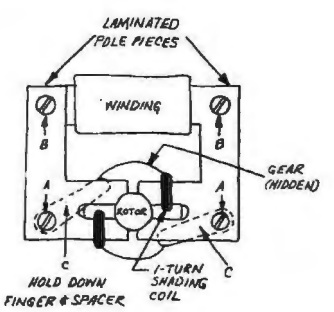
"The first symptom of trouble an electric clock usually gives is that it becomes noisy. It develops a rhythmic, grinding ick-ick-ick-ick sound that is especially annoying when the clock radio is by your pillow on a bedside table, as many of them are. You're hearing, in the parlance of the psychiatrists, 'a call for help.' The clock motor is trying to tell you that it's thirsty for oil and that its gears are running bare metal to bare metal. If this condition continues — and sometimes a clock motor will run for a long time after it first becomes noisy — eventually the small amount of oil left inside the sealed rotor-and-gear-train case of the motor will become gummy from the high heat and the motor will stop."

"Then all we have to do is squirt a little oil on the gears and all is well, huh?"

"It's not that easy. Remember I said the rotating portion of the motor was enclosed in a sealed case. The trick is to introduce fresh oil into that case without destroying the integrity of the metal enclosure, and it can be done. The whole rotor unit can be removed from the rest of the clock rather easily. Here's the way a typical clock motor looks," he said, sketching on the cardboard of a broken-open tube carton. "The rotor unit itself looks like this. The case is cylindrical and about 1½" in diameter and possibly 1" or more thick. This thickness takes in a round turret about ¾" in diameter that projects from the rear of the case. On the opposite side, the part of the case toward the front of the clock, a shaft projects through the case and carries a small gear about ¼" in diameter. When the rotor is in place, this gear meshes with another in the hand-moving gear train.

"To remove the rotor unit, remove the two long screws at A that pass down through the laminated pole pieces and through two spacers that also carry rotor-holding fingers. This is the way they look, here at C. Now loosen the two screws at B just enough so that you can tilt up the other ends of the pole pieces enough to allow the rotor unit to be lifted up until the little gear is disengaged and slid out from beneath the pole pieces.

"Now you're ready to put fresh oil in the case. To do this, rest the little turret of the case on top of a lighted 100-watt light bulb for ten or fifteen minutes until the case is quite hot — too hot to handle with your bare hands. The little gear will be up; and if you watch closely around the shaft, you will eventually see hot oil bubbling up around it, driven out by the expansion of the heated air inside the case. When no more air can be seen bubbling out, use a glove to lift the motor off the bulb and set it down on a flat metal surface. I use an aluminum sheet to conduct away the heat. Place two or three



drops of a light oil, such as 3-in-one, on top of the gear so that it runs down and surrounds the shaft. Usually the shaft sits down in a small depression that will hold a small amount of oil. Watch closely, the oilcan in your hand, and soon you will see the oil disappearing, sucked into the case by the cooling, shrinking volume of air in the case. That is your cue to apply more oil because it's essential that all the suction be applied to oil instead of mere air. You must watch closely because when the oil starts into the case it goes rapidly. Unless you're ready with more oil, the supply around the gear shaft will be exhausted before you know it."

"Do you do that just once?"

"I usually go through the heating-cooling sequence twice to insure getting enough fresh oil inside the case to last. Near the end of the final cooling, putting the case on an ice cube or spraying it with Frost Aid or Circuit Cooler will insure sucking in the maximum amount of oil."

"Then I suppose you put the motor back inside the clock."

"Yes, but before you do that, wrap a soft piece of glove leather around the little brass gear and grasp it gently with a pair of pliers and make sure you can turn it. Since you're driving a speed-reducing gear train from the low-speed end, you'll encounter considerable initial resistance to turning the gear, but this will lessen as you apply a steady, light torque to the gear. You should be able to turn it easily in either direction.

"The clock is reassembled in just the reverse of the procedure you used in taking it apart. Be sure the motor is properly located with the little gear meshed with its matching gear and that the fingers of the spacers are resting properly on the back of the case before you snug down the screws at A and B. Now when the cord is plugged in, the clock should run smoothly and quietly, and it should keep doing so for many months or years."

"Is that a synchronous motor?"

"Not exactly. It's a hysteresis motor. The first clock motors were true synchronous motors, and you had to start them and bring them up to synchronizing speed by a disengaging spinning knob at the rear. They ran equally well in either direction, depending on which way you started them. These hysteresis motors have the same characteristic of being synchronized with the line frequency but are self-starting."

"I've noticed these clock motors get pretty warm. Why is that?"

"The little motors are actually very inefficient, and most of their input wattage is converted to heat, with normal operating temperatures running around 180-190° F. Yet so little power is required that the motor still consumes only two or three watts of power. Incidentally, their 'locked rotor current' is identical with current consumed when running at synchronous speed. I probably should tell you not all electric clocks have the same mechanical arrangement as the one I've sketched. For example, some of the more recent General Time clock motors have the stator winding right beneath the rotor section, and the 'pole pieces' are in the form of a metal cage into which the rotor assembly nests; but the rotor can still be removed by releasing a couple of clips and lifting it out of the cage.

"Sometimes the switch, which can be actuated by either the timer or a manual function knob, develops poor contacts. You can usually restore proper operation to this black-bakelite-enclosed switch by forcing contact cleaner from an aerosol spray can in around the projecting sliding arm of the switch and working it a few times with the manual function knob. You may also find one of the actuating arms of the switch has become bent or has slipped off an actuating cam through rough usage. In such a case, the corrective measure will be obvious. The same thing goes for the alarm buzzer blade that has become bent so it fails to contact the laminations of the pole pieces.

"A nasty problem we often see with older clock radios is that the split ends of the actuating shafts for the On-Off-Auto, Sleep Switch, or Alarm-Set functions have one or both sides of the split ends broken off. In such cases I have slid a little piece of brass tubing over the broken shaft and soldered the shaft and tubing together and used a small setscrew knob on the new shaft. Those clock knobs are a poor arrangement. They invariably work loose and are lost, or they shear off the ears that are supposed to engage the shaft slot."

"You could glue them on," Barney suggested.

"Never!" Mac exploded. "I'm sure that down in Hades there must be a special place reserved between Tantalus and Sisyphus for the guy who glues on radio or TV knobs." ◈