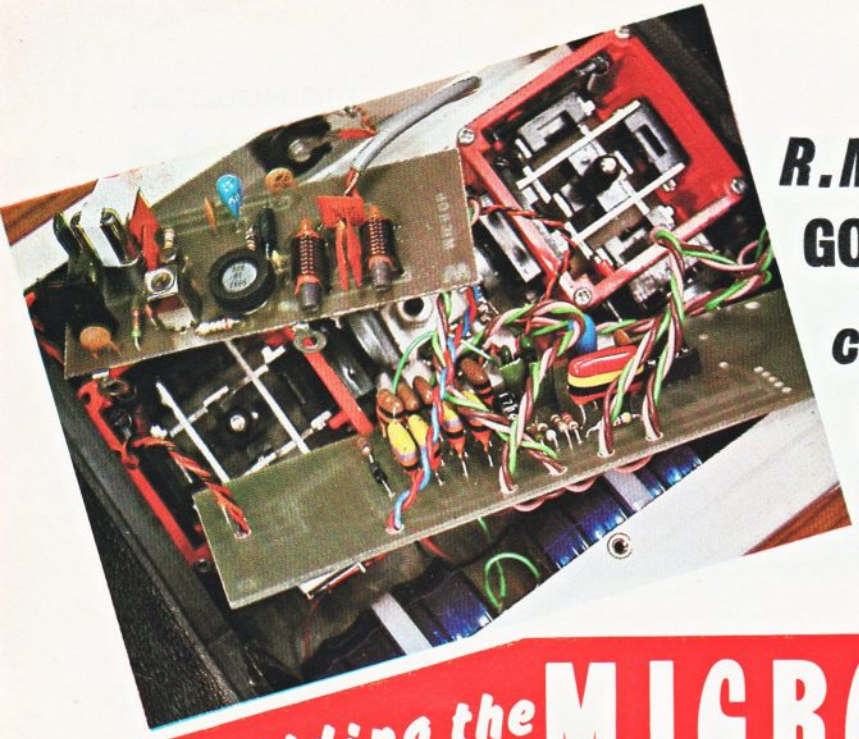

R.M's GORDON BATT checks out the latest in D-I-Y radio control

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building the MICRON FM

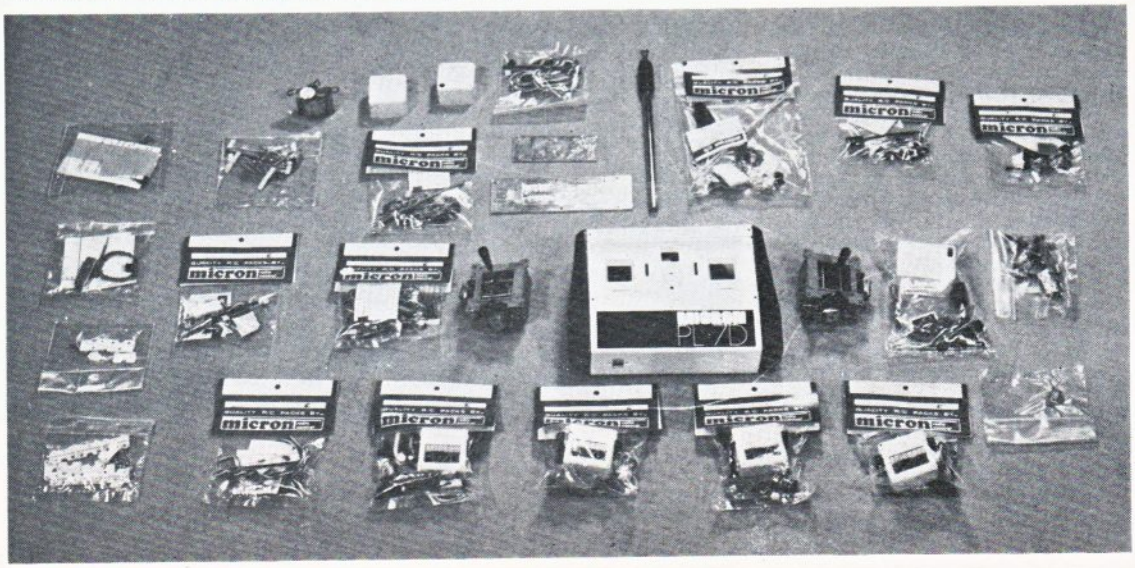
FOLLOWING THE increased popularity and desirability of FM radio equipment, the introduction of an FM kit by Micron Radio Control comes as no surprise. The construction of these kits is intended to be simple and within a comparative novice's capabilities, and the construction of a single servo hardly makes this reviewer an electronics expert. It was with some little trepidation then, that I undertook to build for review the Micron PL7D FM r/c system.

The kit received included the transmitter, receiver, four metal-gear servos plus nicads, charger and crystals. (These are presented in a number of sealed packages that are also available separately, so a kit may be ordered to contain any variation of these basic items.) After checking that all the units had arrived, a starting point had to be chosen as there were no sequential instructions included in this early production outfit. The transmitter was decided upon as it had the largest printed circuit boards and therefore seemed least difficult.

All the assembly drawings look more like model aircraft plans than details for constructing modern electronic technology, an aspect I found encouraging rather than disillusioning. The components are identified by means of two charts, one for the resistors, carried on each plan, which gives first the value followed by the colour coding (e.g. 27K = red/violet/orange) while the various capacitors are shown on a special sheet as a capacitor may appear in various shapes, sizes and designations.

. . . and away we go

Largest board in the transmitter carries the encoder, which conveniently also has the largest components and provided a good starting point for the whole exercise. I thought it best to carry out a check on each board before assembly was started, looking out for such items as missing holes. This was worth-



while, as a couple of the numerous indicated holes had not been drilled —a matter that was easily put right with the use of a .8mm drill. Working on the rule of the smallest or shortest first, the diminutive silicon diodes went in first, taking care that the polarity was correct.

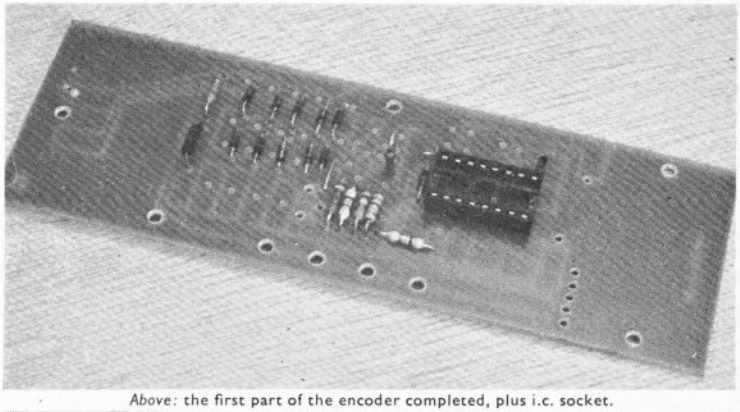
I first thought that it would be quicker to fit all the diodes in place, turn the board over, solder them all in and then clip off the excess leads. It was not long before I found that this method only resulted in an unmanageable forest of wires on the copper side of the board, so from then on only three or four parts were fitted at a time.

After the diodes came the resistors, integrated circuit socket, transistors and finally the relatively huge "humbug" capacitors. The various wires for the stick units were next fitted according to the plan—which seemed to me to indicate the wrong sequence. Each bundle of wires have to pass through a hole drilled in the board, and if the indications were followed blindly then some of these wires might get melted through. However, this is not very likely as the problems are pretty obvious and so is the cure—just pull the wires out of the hole to clear the soldering area and lead them through afterwards. During the wiring stage I felt like a person in a spaghetti eating contest, but some patient work resulted in a job that did not take *too* much imagination to look pretty professional. I discovered that wiring the switch up was rather difficult when the board and batteries were attached to the other end of the wires, so hindsight would indicate that attaching the wires to the switch before soldering the boards and batteries would be better.

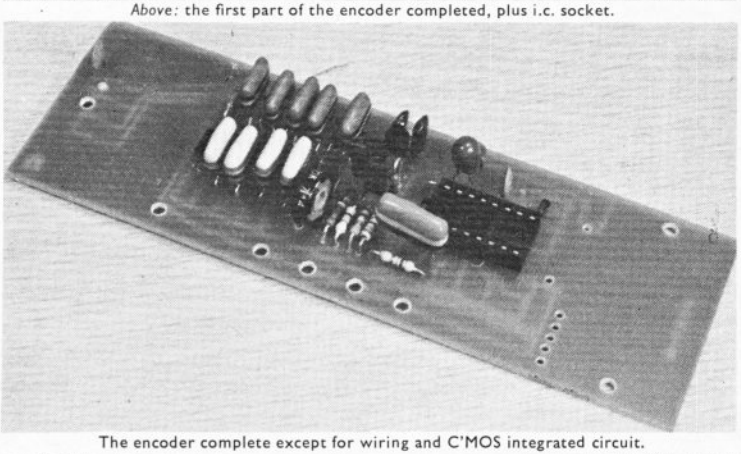
R.F. and installation

The actual 'transmit' (alias R.F.) section gave no problems although a 56pf capacitor would have been homeless as a couple of holes had not been drilled, or even marked on the board. Apart from that, the coils seemed reluctant to take to the solder. This turned out to be because I hadn't scraped off the insulating varnish from the lands!

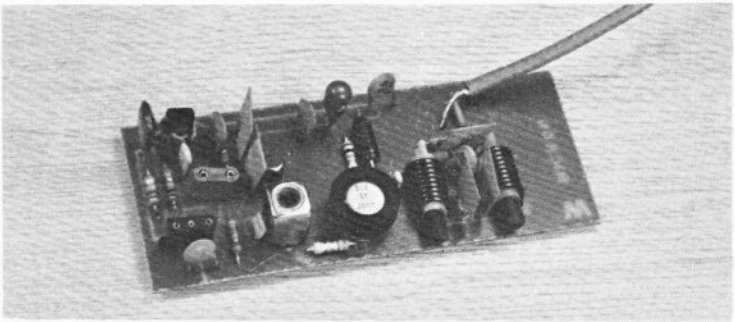
The case assembly was really quite simple, with screws passing through the pressed steel panels and self-tapping into the plastic end-caps. The holes for the locating screws on the removeable back panel were fractionally out of line on this individual case, but a few seconds' work with a needle file soon corrected that. After fitting the neck-strap clip and ensuring that the sticks, switch and meter fitted



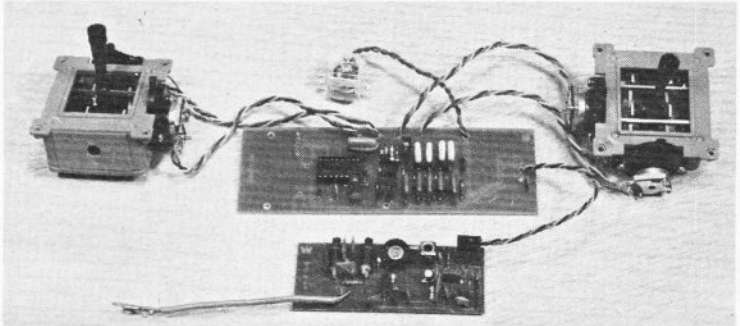
Above: the first part of the encoder completed, plus i.c. socket.

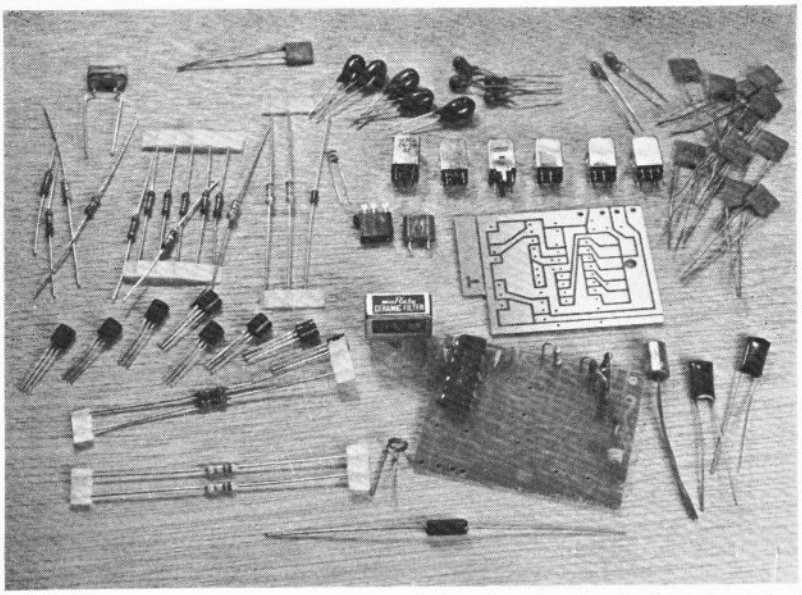


The encoder complete except for wiring and C'MOS integrated circuit.

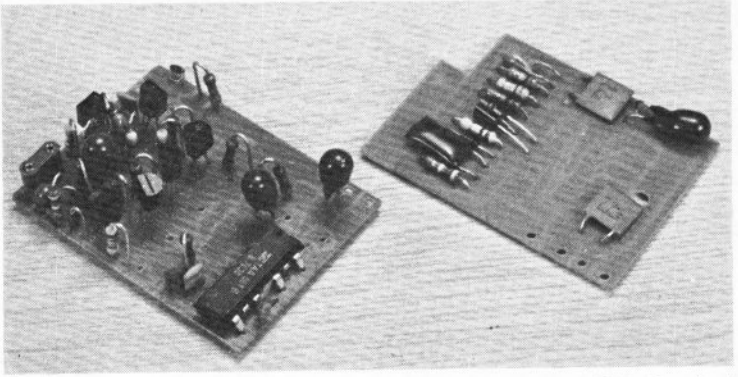


The completed R.F. section is shown above, while below may be seen the whole "works" of transmitter—less nicads and case.

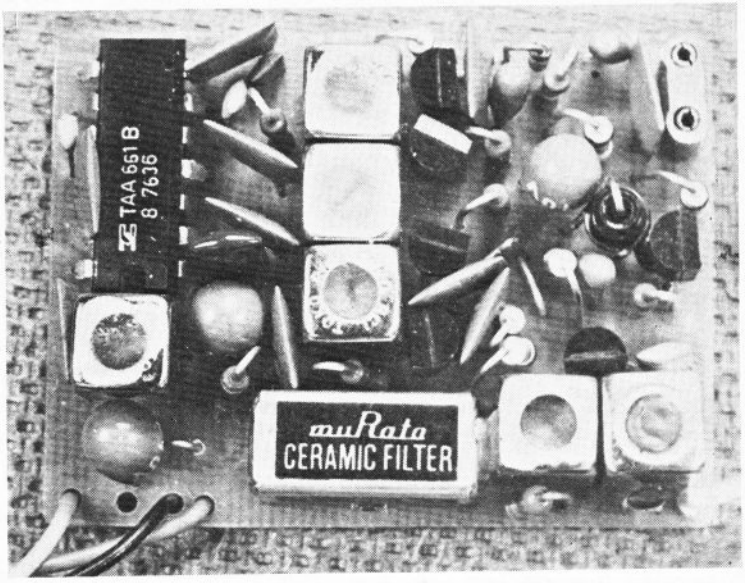




Impressive array of components for the two-deck receiver. Work has already been started on the RF section, which has the i.c. and some resistors fitted.



Above: the RF board finished apart from IF cans; the decoder awaits its C'MOS i.c. Completed RF board shown below—much larger than life.



their locations on the plastic front panel, the case was permanently assembled. To get the accurate positioning (1/10in. from the bottom fold) of the nicad fixing plates I slipped a piece of sanded down $\frac{1}{8}$in. balsa into the bottom of the case as a temporary spacer.

Sequential building instructions would have been a great help while getting the electronics into the case. The method I used was first to fit the batteries and the stick units, followed by those items attached to the encoder board—charging socket, meter and switch—finally slipping the encoder into its grooved clips. The aerial socket was fixed up with the screened cable from the R.F. section which was then screwed into place after plugging in the encoder lead. Eventually, with patience, everything went in, but I cannot help feeling there must have been an easier way of doing it.

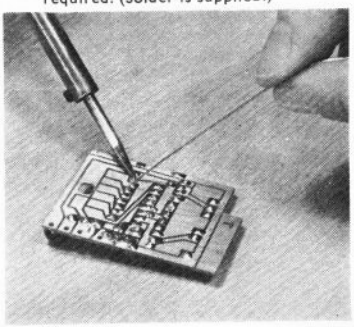
Receiver

The decoder board appeared simplest and was therefore checked first. There were some anomalies here that caused me to contact Micron. Apparently the decoder section of the receiver had been recently modified to take a power regulator, but the board in the review kit was of the old type. This apparent disaster evaporated though—as it proved to be only necessary to drill six new holes in the board and to make a new break in the copper film to bring the p.c.b into line.

After thus modifying the decoder board, the assembly went without any hitches. The C'MOS integrated circuit is sensitive to static voltages, so I chose to fit it as late as possible during construction rather than first, as is more usual.

The receiver proper, with all its I.F. 'cans' and components, appeared horrifying to this novice, the p.c.b. having more holes than a colander. Pre-assembly checking indicated that two holes for a wire jump-link had

Steady hands and 15W iron are all that's required. (Solder is supplied!)



not been drilled. Construction gave no headaches, things being taken very slowly—double checking each component before fitting—double checking its polarity, positioning and attitude before soldering—and eventually a reasonably neat board resulted. A fly-lead block connector was used in the review receiver and required care in order to obtain a tidy installation, although the soldering of the wires was easy enough.

The boards fitted into the case without any problems, but part of the main flylead grommet had to be cut away before the two halves would fit properly. Final assembly entails just a strip of tape around the length of the join, and was left until after the receiver had been tuned.

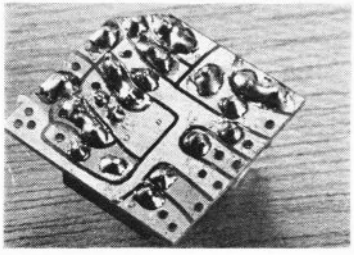
Servos and so on

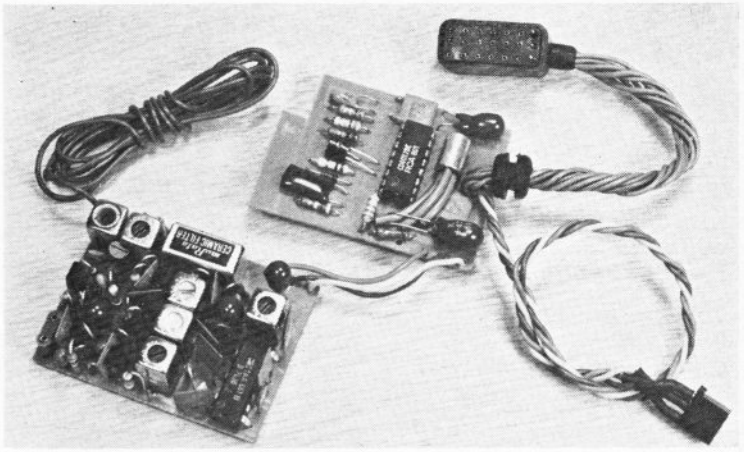
Each servo amplifier went together quickly and easily, only six resistors and six capacitors plus the i.c. socket being used. The i.c. proper just clips into place! The wiring instructions are very clear and precise but do not give any details of reversing the servo direction. A quick check with Micron revealed that it is only necessary to swap over the motor positive and negative *and* the pot. end connections.

Attaching the ready assembled gearbox and pot. wiper takes only a few seconds, then the vertically split servo case proves its worth as final assembly is a piece of cake. The servo lead grommet fouled the case at both the mounting lug position and the internal reinforcement for the case fixing screw, but some quick plastic surgery with a scalpel allowed the case halves to fit properly. Each servo took no more than 90 minutes to complete.

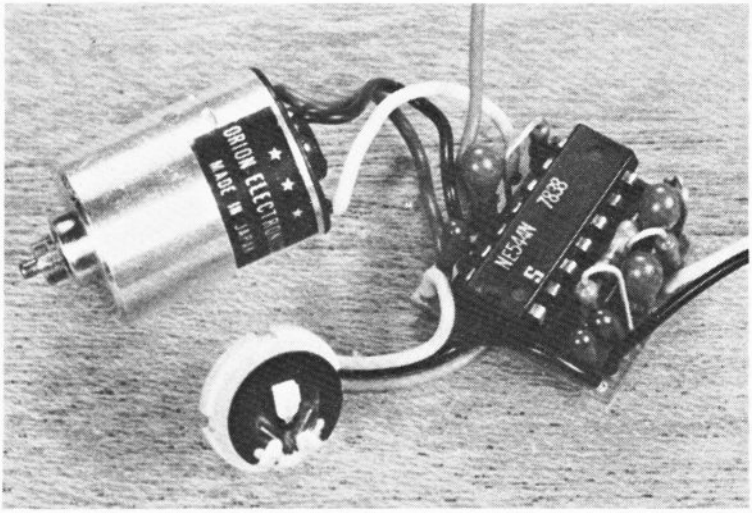
Switch harness and battery connections seemed like child's play with only solder tags to work on. After mummifying the battery in yards of insulation tape, the leads were taken directly to the switch (although there would be no difficulty in incorporating an intermediate plug). Wires for a separate charging flylead were fitted before

Servo amplifier has some finely separated lands; needs care not to bridge these.

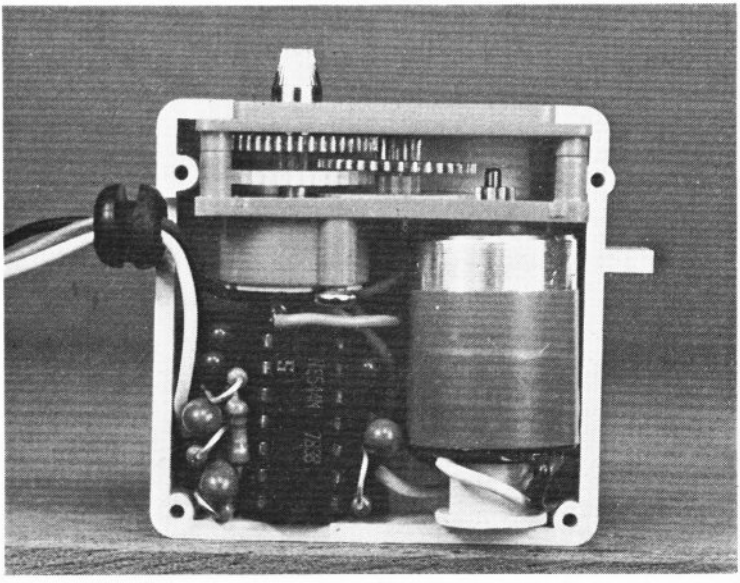


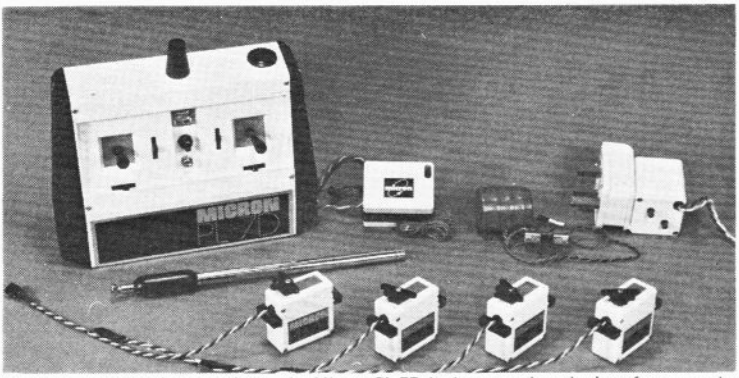


Receiver completed, above, and ready for fitting case and tuning. (*Note that in latest kits the connector block is integral with case, as shown on our cover*).



Shown above, rather larger than life, are the servo electronics and motor, with feedback pot in foreground. *Below:* servo "splits" vertically, to give this "cutaway" showing the metal gears. (Also larger than life).





All tuned, tested and wrapped up—the Micron PL-7D looks as good as the best factory-made equipment.

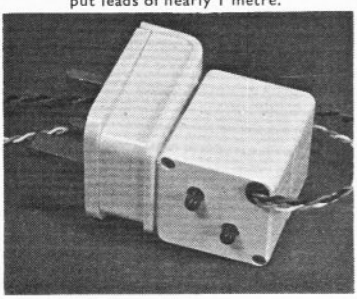
all the switch terminals were liberally doused with five-minute epoxy.

The diminutive charger is undoubtedly the simplest item to build in the whole package. I decided to keep my concentration going though, as a mistake in attaching plugs or leads here could result in an expensive reaction from the nicads. As described on the plan, the charger is attached to the top of a domestic mains plug and forms a very compact unit. The use of a four-pin plug was shown on the drawings of the charger although the system uses three pin plugs throughout. This slight setback was easily resolved by checking the wiring on the airborne battery plug, and matching up the charging plug wires (red to red, black to black).

Testing, testing . . .

I had all along felt that it would be at this point that something was bound to go wrong—and I was right! Despite checking everything as carefully as possible, looking for shorts, dry joints and so on, something managed to get past. After giving the batteries their first 14-hour charge, the receiver was hooked up and nervously I switched on. All was quiet for a few seconds . . . then, just as I was beginning to relax, the power regulator started to smoke, gasped its last and threw up all over the decoder!

Plug-in mains charger is compact, with output leads of nearly 1 metre.



The receiver was packed up and sent off to Micron and came back in little more than a week with the fault cured and the receiver fully tuned. It turned out that a short had been caused by one of the jumper-wires touching the metal casing of a 'can.' In future I'll check *both* sides of an assembled p.c.b.—not just the copper-covered one.

The first time the transmitter was switched on there didn't seem to be anything wrong, so a 'tune kit' was obtained in order to complete at least part of the home tuning process. This tune kit consists of a p.c.b. with four components; it has to be fitted out with a piano wire aerial and hooked up to a multimeter, effectively producing an r.f. meter. Part of the transmitter tuning includes tweaking around the ferrite cores in the r.f. section, but the cores in this kit proved very stiff. Cut-down Bic pen tops, fine grain wood dowel shaped to fit—even a proper screwdriver in an attempt to break the grip—nothing could budge them. Rather than 'leaning' too hard and risking a splintered core, the whole item was packed up and sent off. First though, I tried using a monitor to pick up the transmission; transmitter was radiating all right, but not emitting the typical 'digital' sound.

It turned out that there had been three basic faults; first, one of the stick units was wired up wrong (*my fault*), secondly the aerial was not operating correctly (*Micron replaced it*) and, finally, one of the encoder transistors was positioned incorrectly (*caused by a combination of a hole not being drilled or marked, and the plan being somewhat ambiguous at this point*).

Three of the servos worked perfectly first time, but one didn't work at all. It didn't even hum, jitter, cycle, smoke or try to explode. After staring at this impassive device for a few moments, it dawned on me that I had fitted the integrated circuit in backwards! It took barely two seconds to lever the i.c. out of its socket, and I was just on the point of throwing this presumably fried component away when I changed my mind and replaced it correctly—just to be sure. The servo worked. Somehow the i.c. had withstood the onslaught, and the servo now functioned well. Each of the servos was then checked by plugging into one specific output, and those with reversed rotation suitably marked.

Ground and air tests . . .

The Editor's old but still very serviceable Cambria *Capstan* was loaned to me as a test-bed for the outfit, and two servos were duly installed using the mounts supplied. An initial ground range-check proved very satisfactory, so the radio was tried out in flight, from the slope.

During these tests, the model was sent so far upwind as to be on the very edge of visibility, where it continued to answer smoothly and accurately to the commands.

I was highly delighted with the outcome—and the outfit!

Summary

The Micron PL-7D system is essentially simple to build with easy to follow plans. An absolute novice (one who has never soldered *any* electronic components) should be able to complete the unit *provided* he is proficient in some other form of precise miniature assembly. Anyone with a modicum of electronic experience will find no difficulties, and should be able to assemble a system that would function first time, in my opinion.

The extremely minor problems that I found have been reported to Micron, and kits now being produced should have the 'bugs' ironed out (see Manufacturer's Comments). Additionally, all the latest kits now feature an integral block socket in the receiver for servos, and an independent lead for battery supply. The r.f. board is similar to the review sample, while there is a new decoder which appears even simpler than the original built for review.

** Manufacturer's Comment: A batch of kits did get out with wrong (unmodified) decoder boards, and we believe that we have heard from most of the customers receiving these. We intend to revise the procedure used when we check the p.c.b.'s before including them in a kit, and are also considering including step-by-step assembly instructions for each of the units. Kits currently being produced include waxed ferrite cores for the r.f. section, which will ease tuning.*