

TEST REPORT

Rex Boyer tests t



IRVINE

SANWA



FM

SUCH IS the reputation of the Sanwa Company, that it comes as no surprise to find that their latest 'top of the line' Custom FM6 is bristling with quality features and carefully thought out detail. Those same manufacturing techniques used in the mass consumer market have allowed the production of R/C systems by the Japanese, to match other produce lines such as hi-fi, televisions etc., it is sad that none of the big British consumer electronics companies have entered the R/C world (even if it has to be assembled in Taiwan) to provide some form of home competition.

Not only do the individual parts of the system appeal to the eye, but the packing is such that it contains a slip up plastic handle so that one can carry it from the shop without putting it in a bag — another free advert!

This system comes well equipped with accessories which include of course a dual charger with a mains lead, (surprisingly as many current units solve the safety requirements by making the charger part of the plug), the usual frequency pennant with plastic clip, crystal container (with crystals) which list the available frequencies, servo trays complete with screws plus a small packet of bonding braid together with a nylon quicklink with about a foot of piano wire attached, and last but not least a neck strap. All nicely boxed with a picture of the contents on the outside.

Looking at component parts in detail, the Tx features metal and plastic two-part construction in black with stick assemblies of the open gimbal type, but with the "open" front part fully shrouded by closely fitting mouldings. Both axes of the stick are calibrated with white graduations. The sticks are surrounded by what at first appear to be light alloy material bezels, but on closer inspection are in fact pressings with a turned effect finish. The stick lengths are adjustable over some 3/8 in. Centrally placed between the two sticks is the output meter, nice to see RF output instead of battery voltage.

Dual rate facilities are virtually a must for top quality equipment in the '80's and Messrs Sanwa have thoughtfully placed both the switches and adjusters conveniently to the top left and right of the stick units to operate on Mode II elevator and aileron. Whilst it would appear to be possible to alter the sticks for Mode I operation, this of course would put the rate switches on

engine and rudder! Do make sure that you obtain a set of the correct mode should you choose to purchase this system.

Sanwa have retained the very nice locking-toggle on/off switch with up for on.

Turning towards the technical aspects of the Tx, one of the first things we find is an 11.25 volt battery pack, made up of nine pence type Ni-cads. We have always felt that 9.6v (i.e. two receiver packs) that most manufacturers use in the Tx for convenience is obviously a financial saving, but makes good RF output more difficult to obtain — another example of the quality first attitude exhibited by Sanwa who obviously feel that a better performance can be obtained with the higher voltage.

Detailed study of the pc board reveals no less than eight NE 555 integrated circuits. These are the well-known timer chip widely used throughout the electronics district in timer systems of all types. It is interesting to note that they are in this case Texas, manufactured under licence. In addition the circuit contains four discrete transistors of varying type plus a fat packaged RF output transistor with heat sink.

In common with other FM systems the crystal oscillator works at 13.5Mhz the output of which is fed to a doubler circuit producing a frequency deviation of approximately 3KHz.

There are no less than 14 pre-set pots on the board, 13 of which are associated with the logic circuit and one for the modulation circuit. Wiring looms to the 11 pots on the front fascia pass up both sides of the case and are then spread out to the control pots. A "common" buss bar of copper is fitted to the fascia, judging by the fact that all the pot cases are of metal and are positively earthed to this "common" rail a certain amount of RF feed into the logic has been experienced during development. However none was apparent during tests.

Fifth and sixth channels are operated by a switch and pot respectively and these

Above, Custom FM transmitter superb styling has the look and feel of quality and precision note the inside of the two rate switches (top left and right of the case). Available, of course, in mode I or II layout — the distributors recommend that mode changes be carried out by their service engineers.

controls are situated within fingertip reach on the top of the case. No easy adjustment for travel is available for these two functions.

Turning to the receiver, previously established Sanwa construction is used featuring a plastic moulded case unit, fixed output sockets but a "free" battery connection plug.

The PC board is of the familiar double sided construction with through plated holes.

Decoding of the channels is via a 16-pin DIL IC (integrated circuit) MSM 4015 CMOS shift register. Tracing the remainder of the circuit becomes difficult due to the use of what would appear to be two thick film IC's type OE141R and OE142R details of which are unknown, stretching the width of the PC board. Two filter units are fitted. Five IF type cans complete the hardware with five discrete transistors and the usual complement of capacitors and resistors. We did note the above average amount of battery decoupling with 3-33µf capacitors.

All in all a professionally built unit, well designed and engineered.

SM351/2 servo

This quality precision unit contains further evidence of the 'top of the line' image intended by the manufacturer. Gone is the familiar flip bottom of other Sanwa servos,

The Sanwa Custom FM6

instead we have the normal type of two-piece construction with gearbox assembly sandwiched in between, and what a gearbox, made as a unit entirely of metal (except the output gear). It contains watch type gears and precision, resulting in a performance both extremely smooth and silent. Having seen many new servo motors in recent months it was quite a surprise to see a familiar design in this servo, namely the Mitsumi 16mm unit with a precision cut metal pinion fitted.

The plastic output gear which only as teeth on half of its circumference is massive in section and is supported on two ballraces with a live metal spindle passing through to a pinion in the amplifier section of the servo case. This spindle is fitted with a gear to drive the feedback pot. There is a step up here of approximately 1.3-1, a feature which is not unique to Sanwa.

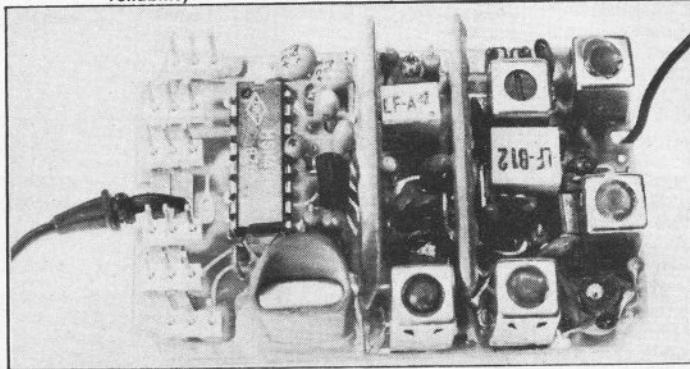
Examination of the servo amplifier revealed a custom-built IC plus an output stage comprising four discrete flat pack type transistors connected, it would appear, in a bridge circuit. There is more and more evidence that manufacturers are giving up attempting to put power transistors in IC packs as the recent servo report shows. The feedback pot is also a custom built unit and would appear to have a sprayed track with a carbon wiper. Use of these custom built components further reinforces the manufacturers no compromise attitude.

Attention to detail is such that the two servo case halves are fitted with an "O" ring to seal them, as is the output gear. An elongated grommit seals the servo entry point and the only other short slot is sealed with a sealing compound. This is the first time we have seen such detailed sealing on a "standard" servo.

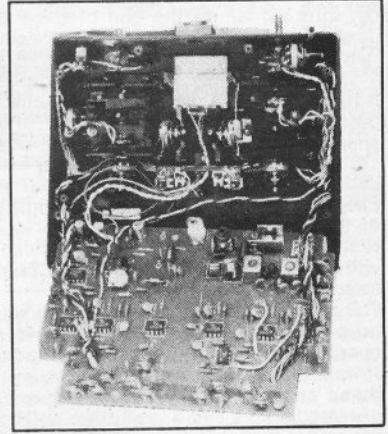
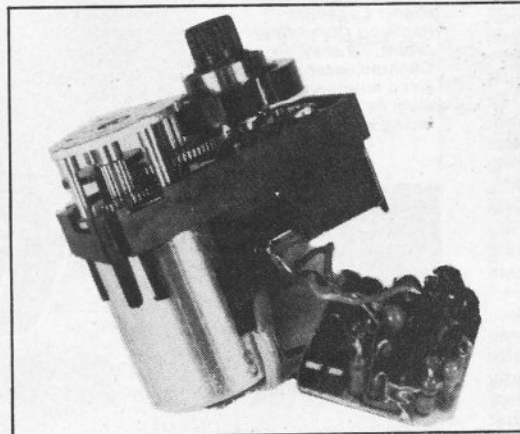
The last item for comment is the Rx battery pack assembly. This is the only part of the Sanwa system we criticise *every time*. It is merely four pence Ni-Cads with a plain sleeve shrunk over. We do feel a protective plastic box would be more in keeping with the rest of the system.

From the servo results it can be seen that whilst the SM352 is not the fastest we have tested, the linearity is certainly the best. In addition the rate of travel was always smooth with no bump which must be the result of using a metal gearbox.

Right: the complete outfit - the set can be supplied on request with an alternative (slightly heavier) plastic boxed receiver Ni-Cad at no extra cost. Below: receiver divested of its case - note the two thin film i.c.s and the substantial tag on the crystal. Precious metal contacts and crimped connections to the plugs and sockets provide first rate reliability.



Below left: servo with case removed to reveal the cassette gearbox, ball raced output spindle. The keen eyed will spot the bridged output transistors. Below right: transmitter P.C.B. removed to reveal component side, excellent quality workmanship throughout the system.



Price £239.95 from Irvine Engine stockists

Test results

Tx timings (Mode II)

Rate switches fitted to two channels. No. 1 and 4. Rate amount continuously variable between normal and figures shown.

Trim range is as in normal mode regardless of rate setting or position.

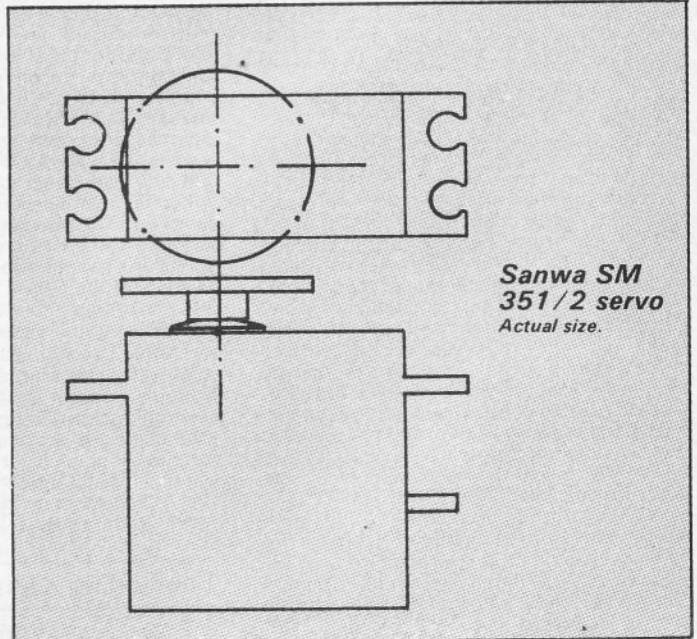
Channel	Function	Short	Mid	Long
1	Elevator normal	1.1	1.5	1.85
	Min rate	1.4	1.5	1.61
2	Rudder	1.15	1.5	1.85
3	Eng.	1.22	/	1.87
4	Aileron normal	1.17	1.5*	1.9
	Min. rate	1.41	1.5*	1.61
6	Pot	1.13	/	1.87
6	Switch No trim	.85	/	2.3

Trim range channels to 1 to 4, 0.25 m/s.

*Rate switch produced a seven micro sec offset at neutral.

Servo response

Load oz	With load sec	Against load sec	Just stalled 22oz/in. 50oz. at 3/8 RAD. All servo travels corrected for 75° total travel.
N/L	.306	.351	Actual = +42° - 41°
2	.297	.378	(+13° - 12° min. rate)
4	.294	.423	Trim = ± 12°
6	.29	.441	
8	.288	.45	
10	.282	.513	
12	.279	.567	
14	.27	.657	



Sanwa SM 351/2 servo
Actual size.