Hank Giunta tests quad proportional offering from Digital Control Systems.



The Digicon Proportional

• The hottest topic of conversation these days seems to concern the fullhouse proportional rigs now on the market, almost on the market, and a nebulous group of "we'll have ours out as soon as we figure out how to make them work." And if you should tire of discussing the pros and cons of the currently available systems, the analog versus digital concept, or the single versus multi-stick controversy are always good for another hour or so of heated discourse. Add to this the rampant rumors about having to live next door to the manufacturer in order to keep your pearl of great price in working order, and it is little wonder the RC'er is somewhat reluctant

to hand over five C notes or more for the expensive privilege of controlling the wiggle of his control surfaces. In theory, proportional control is what we have all wanted and waited forbut in practical application, how does it perform? This is the sixty-four dollar question, and for this reason RCM's technical staff will, over the next few months, take a good, hard look at these proportional systems and try to divorce the facts from the proverbial well-paved road of good intentions. The one phase we cannot report on is reliability - for this elusive requirement of a good system can only be analyzed after months of continuous flying with any given system. We can

give you a report on the mechanical and electronic end of it, and an analysis of the laboratory tests we will conduct. As for the trial by fire - the actual performance of the system in the field in every day sport or competition flying — only time will tell. With these ideas in mind, RCM's first review is of the Digicon proportional system as manufactured by Digital Control Systems Company, North Hollywood, California. The unit we obtained for test purposes was taken from the manufacturer's assembly line, its mechanical and general operational features examined by the editors, then submitted to our Technical Editor for laboratory analysis. A second Digicon

system was obained from a customer/owner and tested in comparison with the original unit. These are the results of the tests on both units.

The Digicon proportional control unit operates on a digital control concept, providing four independent, simultaneous, fully proportional functions. The receiver is a transistorized superhet furnished on any one of the available frequencies from 26.995 to 27.255 mc. An RF amplifier stage provides increased sensitivity and maximum rejection of spurious signals. As illustrated in the photographs, modular construction techniques are used in the receiver, with the receiver itself, decoder, and four servo amplifiers contained in the receiver case. Unlike most of the proportional systems currently available, no electronic components are carried in the servos. This has one definite advantage in reducing "spare," or replacement servo cost. We noted that all plugs from the receiver were color coded to insure correct installation, the white being the power supply; orange, engine; yellow, elevator; green, aileron; black, rudder. The color of the antenna wire signifies the operating frequency, our particular unit being on 26.995 mc. Manufacturer's specications for the receiver are as follows:

our are as some one.
Sensitivity Less than 10 micro-
volts for full control.
AGC In full control from
10-100,000 microvolts. Less
than 6 DB variation in
information amplitude with
50% modulation.
Bandwidth 5 KC @ 6 DB
Intermediate Frequency 455 KC
Power Supply
mah for receiver. 7.2 vdc
sintered plate nicad for
servo amplifiers and
servo motors.
Modulation percentage required50%
Available Freq 26.995 to 27.255 mc
Operating temp. range0-140°F
Size
Weight 8 ounces
Receiver tests by RCM are based on

qualitative information only. The receiver evidenced excellent AGC characteristics. Nominal receiver sensitivity was approximately 2 to 3 microvolts, as measured using a Hewlett-Packard 608D generator. The pulse output at the second detector was monitored on a Tektronix 545 Oscilloscope.

The Digicon transmitter is an alltransistorized unit delivering 1/4 watt output. Utilization of a low modulation percentage is used for the purpose of reducing interference to adjacent channel RC frequencies. Two control sticks



THE DIGICON

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are used with the elevator and aileron control on the right, and the rudder and engine on the left. Both sticks are self-centering with the exception of the engine control function which stays in any position by a detent arrange-ment. All controls are trimmable by means of individual trim knobs. We experienced minor mechanical difficulties with the elevator and aileron stick "hanging up" in the upper-right position when it became entangled with the synthetic rubber face plats that cover the stick openings. This was reported to the manufacturer and subsequently corrected on all production models. We particularly liked the motor control level with its large number of minor "stops," enabling the engine to be trimmed to the smallest desirable increments of control. The transmitter is supplied complete with battery pack. When the transmitter antenna was connected and extended, and the transmitter turned "on," the radiation meter read three-quarters of full scale. Initially, the modulator in the transmitter failed to start in the correct. mode, causing the servos to run to positions irrelevant to the control sticks. This is not uncommon when initially "firing up" the transmitter, and all that is required is to simply turn the switch off and on again, which will correct the situation by starting the modulators in the correct mode. This does not occur during normal flying but is an initial "turn-on" phenomenon.

Manufacturer's specifications for the Digicon transmitter are as follows: Power output One-quarter watt Operating voltage 12 volts DC Audio modulation.....Approx. 500 CPS Modulation percentage 50% Tuning range 26.955 to 27.255 mc collapsible whip Operation time 5 hours continu-

ous on one charge

RCM tests of the Digicon transmitter showed excellent frequency stability as monitored with a Hewlett-Packard 524D electronic counter. Equipment accuracy was .0001% plus or minus one count. The maximum frequency drift over two hours of continuous operation in varying temperature ranges from 70-120 degrees F, was 830 CPS, or approximtaely .003%. This is two times better than FCC requirements. Modulation was very clean and ap-proximately 50%. The transmitter is minus any unnecessary frills, and has

apparently been designed for complete ease of operation. It is balanced correctly and extremely easy to handle.

The servos used with the Digicon system are proportional closed loop units, designed and built by Steeb, and driven by digital type solid state circuitry, and producing full torque regardless of the amount of control commanded or amount of load. There are no DC amplifiers to cause neutral drift with temperature or battery voltage changes. The centering accuracy is as good or better than reed systems. Servo response time is substantially better than reed systems. Manufacturers specifications for the servos and servo amplifiers (the latter contained in the receiver) are as follows:

Servo centering accurac	$y \dots \pm 1\%$
Response time	Less than 10
	milliseconds
Interaction	None
TorqueFull at any	error amplitude
Drife	$\pm 1\%, 0.140^{\circ}F$
Feedback pot	Carbon

Our opinion on the Steeb servos are that they are one of the finest servo units we have seen to date. Using a carbon follow-up pot gives very little chance of catastrophic failure, as the servos will get noisy when worn, providing adequate warning that replacement is necessary. All units were exceptionally smooth.

Total airborne weight of the complete Digicon system is approximately 32 ounces. Complete price from Digital Control Systems Co., including servos, wiring, switch harness, built in nicad charger, nicad battery packs and charg-ing cord is \$495.00. Spare Steeb servo units are \$14.95 each. The equipment, including transistors, is warranted by Digital Control Systems to be free of defects in workmanship and materials for 90 days from date of purchase.

It is worth noting that both Digicon units tested were almost identical in performance specifications. It is also worthy of note that all Digicon proportional systems are taken from final assembly and flight tested by the manufacturer prior to shipping to the customer.

Although, as mentioned, we have no way of analyzing reliability standards, the tests conducted by RCM equalled or exceeded the manufacturers specifications in all cases. We feel that the design concept of the Digicon system is excellent, and based on our findings as listed above, recommend this proportional system to the serious multi channel flyer. Those owners of Digicon systems contacted by RCM concurred in these recommendations. The technical and instruction manual for the Digicon system is available for twenty-five cents and can be obtained by writing Digicon, c/o R/C Modeler Magazine.