R/C Data

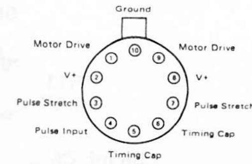
SPECIFICS, SPECIFICATIONS AND SPECIALIZING THE ACE DIGITAL COMMANDER SERVO AMPLIFIER

We have had requests by knowledgeable R/C'ers to furnish the internal configuration of the NE543/WE3141 IC and the function of the peripheral devices used in the Digital Commander servo amplifier so they can tailor their particular amp for their exact application.

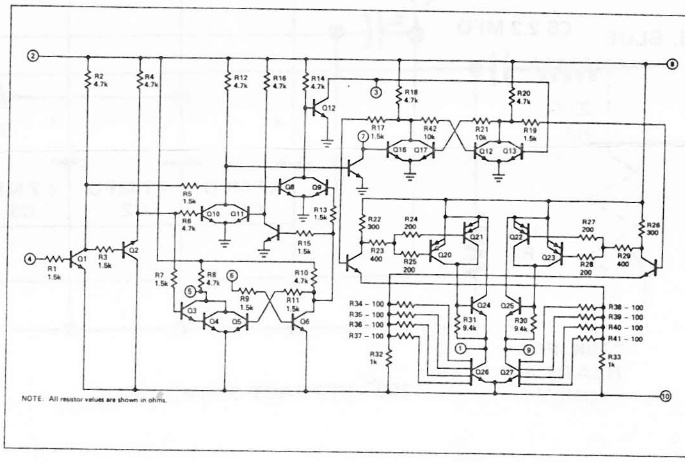
signetics

SERVO DRIVER | NE543

K PACKAGE



EQUIVALENT CIRCUIT



ABSOLUTE MAXIMUM RATINGS

Supply Voltage: 6V
Power Dissipation ($T_a = 25^{\circ}$ C): 830 mW
Output Current ($T_a = 25^{\circ}$ C): 450 mA

DEFINITIONS

-The designations NE543K and WE3141 are used interchangeably.

DEADBAND – Minimum difference between input pulse and internally generated pulse for motor to be driven.

PULSE STRETCHING – The error pulse is stretched by R2, R3, and C2, C3. Motor speed is proportional to the average DC value of the stretched pulses.

ERROR PULSE – The difference between the input pulse and the internally generated pulse.

OPERATIONAL DESCRIPTION

This amplifier offers a bi-directional bridge output with a single power supply. It has a 450 ma load current capability without external power transistors. It also has low standby power drain.

The servo amplifier receives a nominal 1.5 mS pulse from the receiver-decoder. The length of the input pulse is compared with an internally generated pulse. If the pulse durations differ by more than an allowed amount (the deadband), a pulse derived from the difference is stretched and applied to the output stage. If the input pulse is shorter, the motor is driven so as to reduce the value of the feedback pot and, hence, the internal pulse width. If the input pulse is longer, the motor is driven the other way so that the feedback pot increases and the internal pulse is lengthened. In this way, the control surface position can be made to follow the input pulse. The servo output moves over 90 degrees for pulses between 1 and 2 mS.

The internal pulse generator pulse width is determined by C6 and R8 in series with the feedback pot. Capacitor C1 decouples the pulse generator from the supply.

Deadband is controlled by R5 and R4. The 33 ohm resistors set the deadband at about 4-5 microseconds (that is, the circuit will not drive the motor until the input pulse is 4 to 5 microseconds different from the internally generated pulse.).

Resistors R2 and R3 determine the amount of pulse stretching. Capacitors C3 and C2 are the pulse stretching capacitors. The value is not critical, but if changed R2 and R3 will have to be changed proportionately.

Resistors R7 and R9 are feedback resistors which prevent overshoot by adjusting the closed-loop damping.

Capacitor C5 is the input coupling capacitor. Resistor R1 can be any value in the range shown, but noise immunity is improved if it is at the low end of the range. Capacitor C4 bypasses the power supply at the device.

Diode D1 prevents damage to the IC in the event reverse polarity is applied. If reverse polarity is applied for an extended period, the diode will short and need to be replaced.

MODIFICATIONS

The values shown in the schematic are optimized for general applications. If in your specific application the servo creeps into neutral, the feedback resistor R9 may be increased in value to 470K. If overshooting occurs; that is, the servo goes past neutral and returns when the stick is snapped back to neutral, the value of R9 is too high.

To obtain higher resolution, the resistance of the deadband resistors R4 & R5 may be lowered to 22 ohms. Still higher resolution may be obtained by changing the pulse stretching resistors R2 & R3 to 47K. When changing these resistors, you may reach a condition where the servo will hunt or buzz at neutral. If this happens, lower the value of R2 & R3 to 39K.

With these modifications you should be able to optimize the servo for your particular application.

ACE R/C, Inc.

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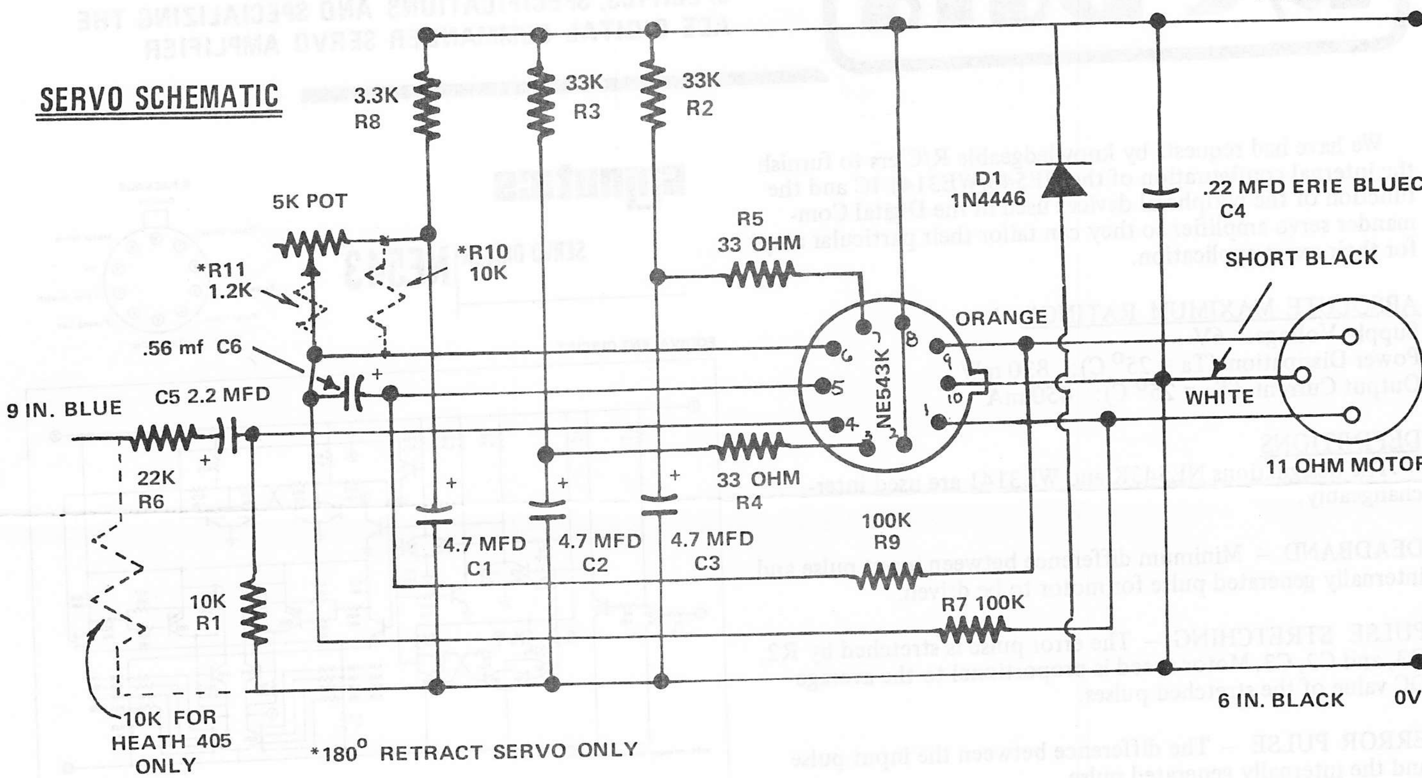
SERVO SCHEMATIC



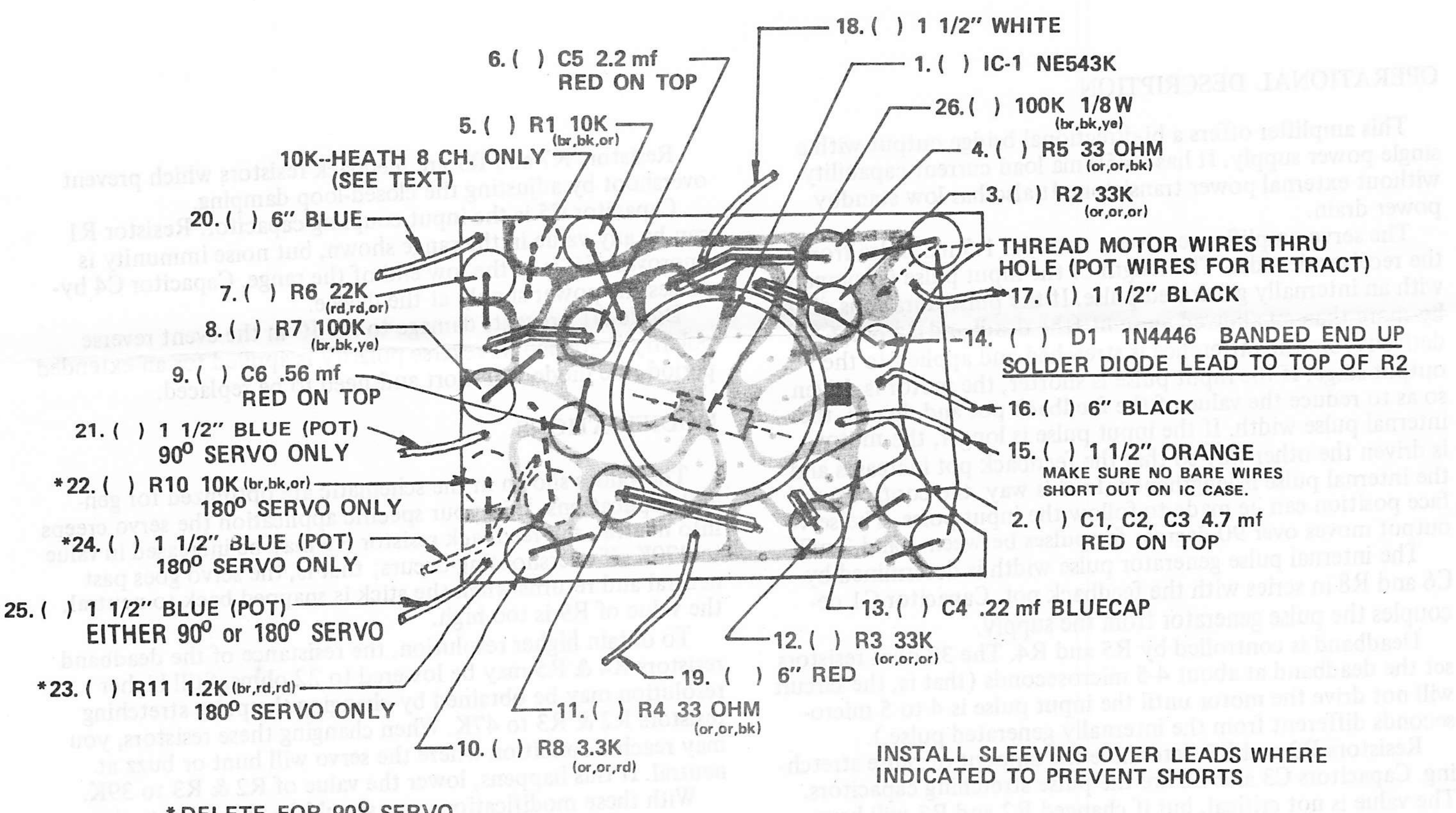


FIGURE 1
SERVO OVERLAY