

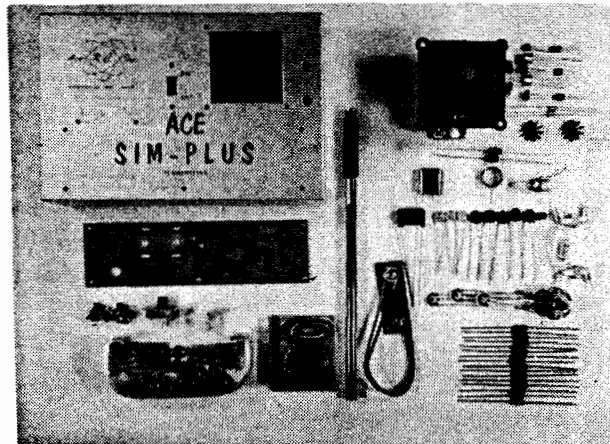
*Designer Approved
Dick Jansson*

SIM-PLUS

A nine volt, solid state, pulse
rate, pulse width, transmitter.

TRANSMITTER KIT

Citizens-Band 27 mc
[50 - 54 mc]



HIGGINSVILLE, MO. 64037

PARTS LIST

RESISTORS 1/2 watt 10%

- 1 () 4.7 ohm yellow, violet, gold
- 2 () 10 ohm brown, black, black
- 1 () 100 ohm brown, black, brown
- 2 () 470 ohm yellow, violet, brown
- 1 () 1K brown, black, red
- 3 () 2.2K red, red, red
- 1 () 6.8K blue, grey, red
- 1 () 10K brown, black, orange
- * 1 () 22K red, red, orange
[12K brown, red, orange]
- 1 () 47K yellow, violet, orange
- 2 () 470K yellow, violet, yellow
- 3 () 10K trim pots
- 1 () 3 K elevator trim pot
- 1 () Stick assembly with one 5K
and one 100K pot.

CAPACITORS

- * 1 () 75 pf NPO
[15 pf NPO]
- 3 () .01 mf disc
- 5 () .1 mf disc
- 1 () .082 mf tone
- 1 () 8 mf electrolytic rate
- * 1 () Arco 424
[Arco 422]
- * 1 () Arco 426
[Arco 423]

HARDWARE

- 2 () Wakefield heat sinks
- 1 () Antenna bracket
- 4 () 4/40 x 3/8" bolts
- 5 () 4/40 X 1 1/2" bolts
- 6 () 4/40 X 1/4" bolts
- 10 () 4/40 nuts
- * 1 () 6/32 X 1/2" bolt
[4/40 X 1/2" bolt]
- * 1 () 6/32 nut
[4/40 nut]
- 5 () Spacers
- 4 () #4 X 1/4" self taps
- 2 () 1/4" hole snap plugs
- 1 () Battery bracket
- 1 () #4 grommet
- 1 () 9 volt battery connector

TRANSISTORS

- 2 () 2N2160 or 2N2646
- 2 () 2N2926 green or yellow coded
- 2 () 2N3638
- 2 () 2N3646

DIODES

- 3 () 1N4009

COILS

- 1 () L1 - 8 1/4 turns #26AWG wire
center tapped on CTC 2173-
03-03 coil form.
- 1 () L2 - 2 1/4 turns #26AWG wire
over center of L1.
- * 1 () L3 - 9 turns #22AWG 1/2" I.D.
[4 turns #20AWG 1/2" I.D.]
- * 2 () 20 uhy chokes
[10 uhy chokes]

MISCELLANEOUS

- * 1 () 27 mhz 3rd mode crystal
[50 mhz 3rd mode crystal]
- 1 () Printed circuit board
- 1 () Package of solder
- 1 () Package of hook-up wire
- 1 () Punched and screened case
- 1 () DPST slide switch
- 1 () Red tiny push switch
- 1 () Black tiny push switch
- * 1 () Antenna, 54" center loaded
[Antenna, 54" imported]
- 1 () Set of instructions

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** *Components in [ ] are to be used
** for 50-54 mc operation in place
** of the components directly above
** that are used for 27 mc operation
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INTRODUCTION

Your Ace Sim-Plus Transmitter was basically designed by Dick Jansson and presented in GRID LEAKS of January 1966.

The final circuit as presented in your kit has a few improvements over the original circuit. They are minor, but do increase the versatility of the transmitter to where it can be used with virtually any pulse rate and pulse width circuit in use today --and in the future-- this accounts for the PLUS; this transmitter offers more plus features than most on today's market. These changes come about for several reasons. This is the first kit Ace R/C has offered as a kit after having produced hundreds of completely assembled units, and the changes that have improved performance and repeatability have been incorporated to assure you of the latest and best to date.

Also some change in the state of the art has evolved since January 1966. Adapting the basic circuit to make the unit perform for the new actuators, feed back servos, decoders, etc., proved easy. This assures you of a transmitter that is as up-to-date as tomorrow - - and one that can easily be adapted to some of the newer systems in the works with a minimum of fuss and feathers and expense. Again the reason for the plus in the name.

There is a trim pot which allows you to change width (ratio of pulses on to off) from approximately 60/40 to 95/5. The Rand units like 70/30 change, while Adams units like 80/20. Your Ace kit provides this change easily.

Another trim pot is provided to give slight variations in the cycles per second tone output to fit exactly the frequency your receiver likes the best. By changing capacitors as shown on schematic as C-8, it is possible to shift tone from about 400 to 4,000 cycles for some of the tone selective receivers that are available.

If a higher pulse rate is desired this, too, can be easily accomplished. Your kit provides 6 to 18 pulses per second cycles. By making changes to C9 you can go as high as 15 to 40 pulses per second. Most of the present systems work in the 6 to 18 pulses per second range.

Another trim pot is provided to adjust the ratio of rate change on the stick pot i.e; 6-12 pps, 5-13 pps, 4-14 pps, etc. Each actuator requires just a bit different setting for optimum performance. For your individual set up you will need to adjust this trim pot for best results.

By changing a frequency crystal, one resistor, one coil, three capacitors, and the antenna, operation on the 50 to 54 MHz ham band can be obtained with all of the control options as previously described.

The circuit schematic shown is for the basic transmitter with the pulse rate and pulse width pots installed and full on-full off tone for motor control. The option of fast pulse for High Pulse Rate Detectors and Slide switch for escapement is also shown but is not included in the kit.

A biased grounded emitter oscillator drives the grounded base final amplifier through an impedance matching link coupling. Achieving optimum operation on 50-54 MHz requires proper matching of the oscillator collector tuned circuit to get adequate crystal drive. The base bias resistor, R1, is changed from 22K to 12K to increase oscillator drive.

Although the circuit is optimized for the higher frequencies, the performance of the 27 MC crystals is such that adequate final amplifier drive is obtained with an oscillator that is performing at less than its maximum capability. Optimizing the oscillator on 27 MHz can easily drive the final amplifier to exceed its transistor ratings. Power input to the final amplifier is in the order of 450 Mw to 750 Mw with an estimated efficiency of 60 percent.

The final RF stage operates in a CW mode and is 100 percent downward switch modulated by Q3 at tone frequency. Output tuning is a pi network operating into a tuned half-wave antenna on 27 MHz, and an approximate one-quarter wave on the higher frequencies. Tone generation is accomplished with a unijunction transistor oscillator coupled to a fixed bias switch that is in turn DC coupled to the modulator. Resistor R9 in the tone oscillator insures a sharp turn-off of the +9 supply (via a switching transistor in pulser). Diode D₂ is inserted to provide the CW on operation of the transmitter with CW off during tone-off situations, a simple jumper of D₂ will change this.

Pulser circuitry is very much like the tone generator, the differences appearing in the use of a variable bias NPN switch to follow the unijunction oscillator to provide pulse width control, and a variable resistor in the RC network of the oscillator to control pulse rate.

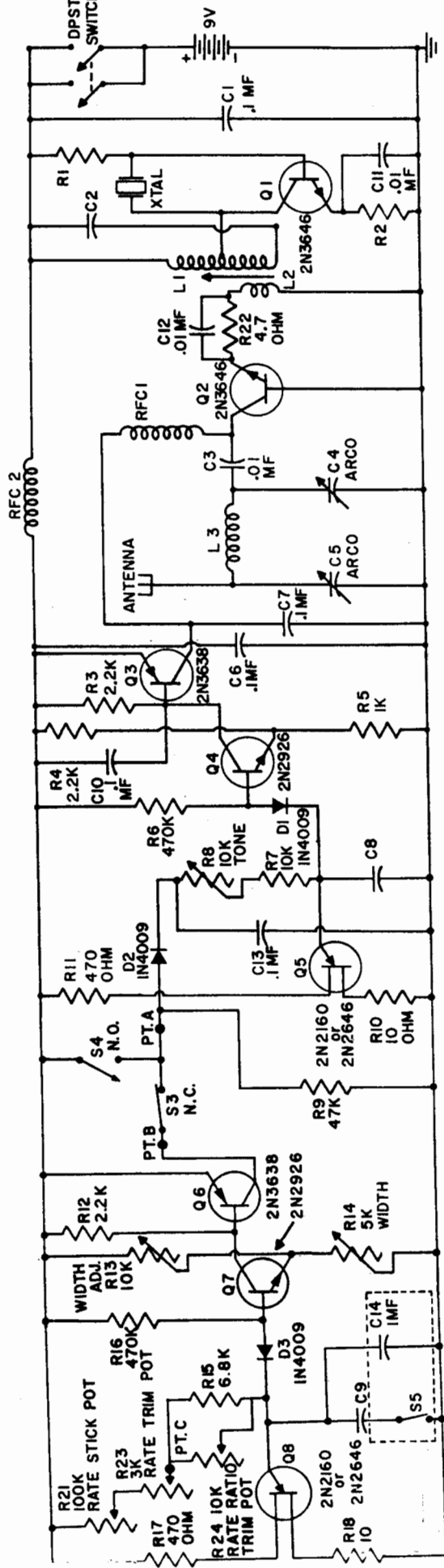
MODIFICATION OPTIONS

If the system you are using requires a High Pulse Rate change for motor control, another push switch may be added or one of the present switches adapted. If a new switch is added, drill a hole above the red push switch that is presently in the case. Unsolder one lead of capacitor C9 from hole 76 of the PC board. Connect this lead of the capacitor to one lug of the normally closed push switch you have just installed. The other lug of the normally closed push switch connects to hole 76 of the PC board. Solder a 1 mfd electrolytic capacitor from hole 76 to hole 77 with the positive lead to the land with hole 77.

The 1 mfd capacitor in parallel with C9 lowers the pulse rate slightly. When S5 is pressed, C14, the 1 mfd capacitor is left in the circuit and the pulse rate is greatly increased.

If you wish to use one of the existing switches, take S3. A jumper wire will need to be installed between points A and B.

If desired a slide switch may be installed in series with S3 so that the pulser may be disconnected, S4 will then become the keying switch for escape-ment use.



S5 and C14 in the dashed lines are not included with the kit. Used for High Pulse Rate detector.

The recommended 9 volt battery is the Mallory M1603 or equivalent.

C8 - .082 mf (450-900 cps)
 .047 mf (800-1600 cps)
 .027 mf (1400-2600 cps)
 .015 mf (2500-4900 cps)

C9 - 8 mf for 7.5 pps to 20 pps
 6 mf for 10 pps to 27 pps
 4 mf for 15 pps to 40 pps

*53 - Normal closed push switch
 Black, for full tone of*

*54 - Normal open push switch
 Red, for full tone on*

26-28 MC COMPONENTS

Crystal = 26-28 MHZ 3rd overtone
 RFC-1 - Miller 20 uhy
 RFC-2 - Miller 20 uhy
 L-3 - 9 turns #22 AWG 1/2" I.D.
 C-2 - 75 pf NPO
 C-4 - Arco 426
 C-5 - Arco 424
 R-1 - 22K
 R-2 - 100 ohm
 Center Loaded Antenna

50-54 MC COMPONENT CHANGES

Crystal = 50-54 MHZ 3rd overtone
 RFC-1 - CTC 10 uhy
 RFC-2 - CTC 10 uhy
 L-3 - 4 turns #20 AWG 1/2" I.D.
 C-2 - 15 pf NPO
 C-4 - Arco 423
 C-5 - Arco 422
 R-1 - 12K
 R-2 - 100 ohm
 Antenna Without Center Load

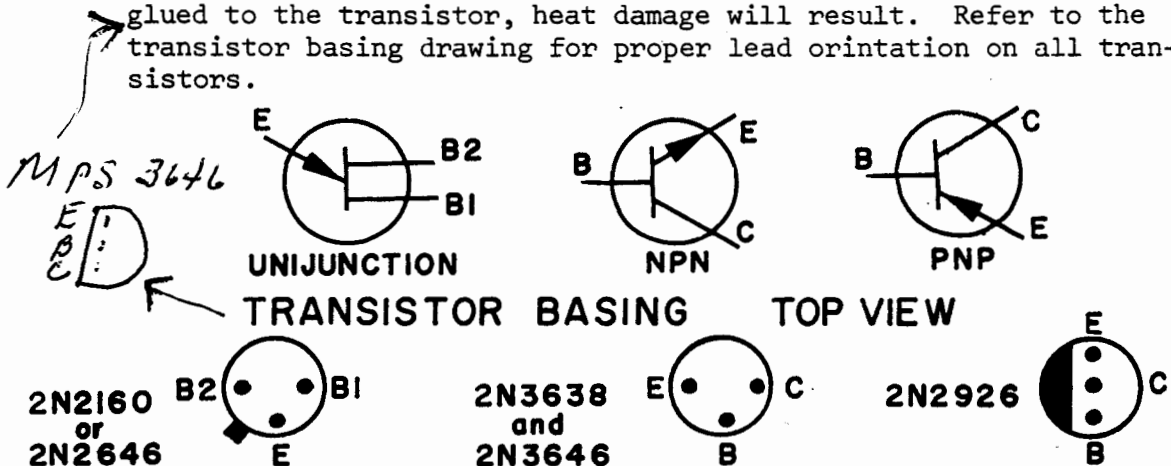
L1 - 8 1/4 turns #26AWG wire tapped
 4 1/8 turns from bottom (+9V)
 on CTC 2173-30-30 form.

L2 - 2 1/4 turns #26 AWG wire over
 center of L1.

 In the following steps solder each component to the PC board as it is installed unless otherwise specified. Mount each part as close to the PC board as possible except the transistors which leave about a 1/4" space so that a heat sink can be used. The components marked with an * are the ones that require changing for 50 - 54 mc operation. See the parts list and the schematic for the changes.

STEP BY STEP INSTRUCTIONS

- 1 () Before placing any parts on the PC base use fine steel wool to remove any residue or foreign matter on the copper lands.
- 2 () Place a Wakefield heat sink over one of the 2N3646 transistors and put a drop or two of glue on the top of the transistor and the heat sink. Install this transistor in holes 1, 2, and 3, with the emitter in hole 1, the base lead in hole 2, and the collector lead in hole 3. If the heat sink is not installed and glued to the transistor, heat damage will result. Refer to the transistor basing drawing for proper lead orientation on all transistors.



- 3 () Install a .01 disc capacitor in holes 4 and 5.
- 4 () Install a 100 ohm (brown, black, brown) resistor in holes 6 and 7, with the resistor laying flat on the PC board.
- 5 () Install a 22K (red, red, orange) resistor in holes 8 and 9, with the resistor laying flat on the PC board.
- 6 () Install the crystal in holes 15 and 16.
- 7 () Install the 75pf NPO capacitor in holes 10 and 11.
- 8 () Coil L1-L2 will be mounted in holes 12, 13, 14, 15, and 16. Before the coil is mounted on the PC board, the coil wires must be soldered to the coil lugs. The wires used in the coil is the solder-eze type so use only enough heat to melt the insulation and flow the solder, too much heat will result in coil damage.
- 9 () Install a .1 mf disc capacitor in holes 17 and 18.
- 10 () Install a .01 mf disc capacitor in holes 19 and 20.
- 11 () Install a 4.7ohm (yellow, violet, gold) resistor in holes 21 and 22, standing upright over hole 21.

- 12 () Place a Wakefield heat sink over the other 2N3646 transistor and put a drop or two of glue on the top of the transistor and the heat sink. Install the transistor in holes 23, 24, and 25, with the emitter lead in hole 23, the base lead in hole 24, and the collector lead in hole 25. If the heat sink is not installed and glued to the transistor, heat damage will result.
- 13 () Install a .01 mf disc capacitor in holes 26 and 27.
- *14 () Install a 20 uhy choke in holes 28 and 29, laying the choke flat on the PC board.
- *15 () Install a 20 uhy choke in holes 30 and 31, laying the choke flat on the PC board.
- 16 () Install a .1 mf disc capacitor in holes 32 and 33.
- 17 () Install a .1 mf disc capacitor in holes 34 and 35.
- 18 () Install a .1 mf disc capacitor in holes 36 and 37.
- 19 () Install a 2.2K (red, red, red,) resistor in holes 38 and 39, with the resistor laying flat on the PC board.
- 20 () Install a 2N3638 transistor in holes 40, 41 and 42, with the emitter lead in hole 40, the base lead in hole 41, and the collector lead in hole 42.
- 21 () Install a 2.2K (red, red, red) resistor in holes 43 and 44, with the resistor laying flat on the PC board.
- 22 () Install a 1K (brown, black, red) resistor in holes 45 and 46, with the resistor laying flat on the PC board.
- 23 () Install a 470K (yellow, violet, yellow) resistor in holes 47 and 48, with the resistor laying flat on the PC board.
- 24 () Install a green or yellow color coded 2N2926 transistor in holes 49, 50, and 51, with the emitter lead in hole 49, the collector lead in hole 50, and the base lead in hole 51.
- 25 () Install a 1N4009 diode in holes 52 and 53, with the cathode lead (black band) in hole 53, and the anode lead in hole 52, laying the diode flat on the PC board.



- 26 () Install a 10K (brown, black, orange) resistor in holes 54 and 55, with the resistor laying flat on the PC board.
- 27 () Install the .082 mf Ajax capacitor in holes 56 and 57. This capacitor is the major tone adjust unit. See the table below the schematic for the cps ranges. Adjust R8 for small cps changes.

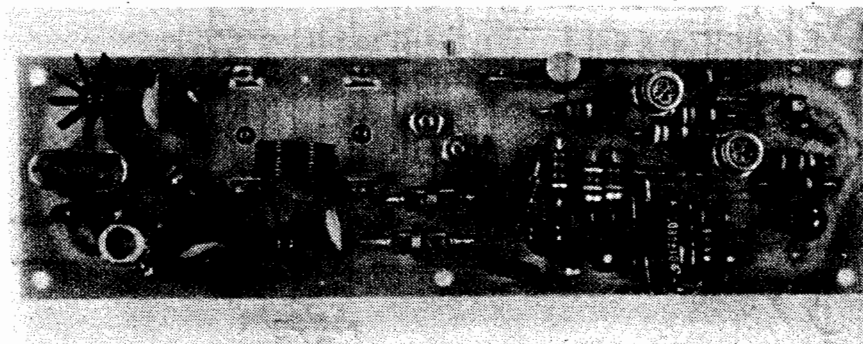
- 28 () Install a .1 mf disc capacitor in holes 58 and 59.
- 29 () Install a 47K (yellow, violet, orange) resistor in holes 60 and 61, with the resistor laying flat on the PC board.
- 30 () Install a 10 ohm (brown, black, black) resistor in holes 62 and 63, with the resistor laying flat on the PC board.
- 31 () Install a 1N4009 diode in holes 64 and 65, with the cathode lead (black band) in hole 64, and the anode lead in hole 65. Lay the diode flat on the PC board when mounting.
- 32 () Install a 10K trim pot in holes 66, 67, and 68; this pot must be mounted on the copper side of the PC board so it may be adjusted after the PC base is installed in the case.
- 33 () Install a 470 ohm (yellow, violet, brown) resistor in holes 69 and 70, with the resistor laying flat on the PC board.
- 34 () Install a 2N2160 transistor in holes 71, 72, and 73, with B1 lead in hole 71, the emitter lead in hole 72, and B2 lead in hole 73.
- 35 () Install a 6.8K (blue, grey, red) resistor in holes 74 and 75, with the resistor laying flat on the PC board.
- 36 () Install capacitor C9 in holes 76 and 77 with the positive lead in hole 77 and the negative lead in hole 76 and the capacitor laying flat on the board. This capacitor is the broad pulse rate change capacitor.
- 37 () Install a 2N2160 transistor in holes 78, 79, and 80, with B1 lead in hole 78, the emitter lead in hole 79 and B2 lead in hole 80.
- 38 () Install a 470 ohm (yellow, violet, brown) resistor in holes 81 and 82, with the resistor laying flat on the PC board.
- 39 () Install a 1N4009 diode in holes 83 and 84, with the cathode lead (black band) in hole 83, and the anode lead in hole 84, with the diode laying flat on the PC board.
- 40 () Install a 10 ohm (brown, black, black) resistor in holes 85 and 86, with the resistor laying flat on the PC board.
- 41 () Install a 2N2926 transistor in holes 87, 88, and 89, with the base lead in hole 87, the collector lead in hole 88, and the emitter lead in hole 89.
- 42 () Install a 10K trim pot in holes 90 and 91; this pot must be mounted on the copper side of the PC board so it may be adjusted after the PC base is installed in the transmitter case. One or the other outside leads is not used. Use only the center lead and one of the outside leads
- 43 () Install a 470K (yellow, violet, yellow) resistor in holes 92 and 93, with the resistor laying flat on the PC base.
- 44 () Install a 2.2K (red, red, red) resistor in holes 94 and 95, with the resistor laying flat on the PC board.

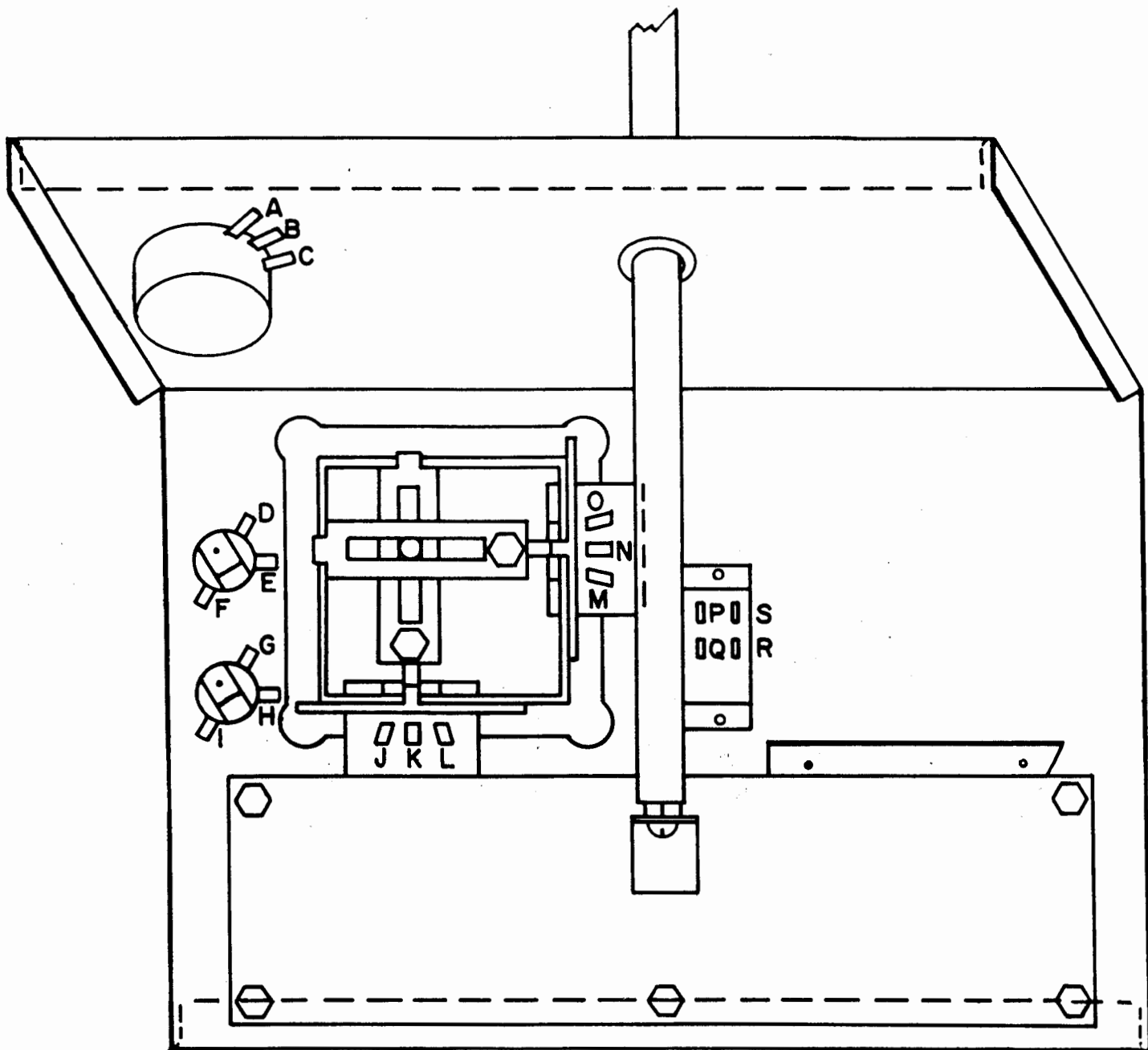
- 45 () Install a 2N3638 transistor in holes 96, 97 and 98, with the emitter lead in hole 96, the base lead in hole 97, and the collector lead in hole 98.
- 46 () Strip 1/4" insulation from both ends of the 5" orange wire and solder one end in hole 99.
- 47 () Strip 1/4" insulation from both ends of the 3" blue wire and solder one end in hole 100.
- 48 () Strip 1/4" insulation from both ends of the 2 1/2" green wire and solder one end in hole 101.
- 49 () Strip 1/4" insulation from both ends of the 2 1/2" violet wire and solder one end in hole 102.
- *50 () Install the 6/32 x 1/2" bolt and nut on the antenna bracket with the bolt protruding away from the bracket. Temporarily install the antenna bracket on the printed circuit side of the PC board with the two 4/40 x 1/4" bolts and nuts. The 6/32 bolt must point away from the 20 uhy chokes. After the PC board is installed in the case and the antenna mounted on the 6/32 bolt the two 4/40 bolts must be securely tightened.
- *51 () Mount the 9 turn coil in holes 105 and 106. The leads of the coil must be scraped with a knife before mounting and soldering.
- *52 () Mount the Arco C5 trimmer in holes 107 and 108. The two lugs in center of the trimmer next to the adjusting screw must be cut off so the trimmer will mount flat on the PC Base. The trimmer must be mounted on the P C (copper side) of the PC Board so they may be adjusted after the PC base is mounted in the case. After soldering the trimmer to the PC lands, solder the lugs of the trimmer on the ends to insure complete connection of all capacitor lugs.
- *53 () Mount the Arco C4 trimmer in holes 109 and 110. The two lugs in the center of the trimmer next to the adjusting screw must be cut off so the trimmer will mount flat on the PC base. The trimmer must be mounted on the PC (copper side) of the PC board so they may be adjusted after the PC base is mounted in the case. After soldering the trimmer to the PC lands, solder the lugs of the trimmer on the ends to insure complete connection of all capacitor lugs.
- 54 () Strip 1/4" insulation from both ends of the 6 1/2" grey wire and solder one end in hole 111.
- 55 () Strip 1/4" insulation from both ends of the 7" yellow wire and solder one end in hole 112.
- 56 () Strip 1/4" insulation from both ends of the 7 1/2" red wire and solder one end in hole 113.
- 57 () Cut off 2" from the black wire of the battery connector, strip off 1/4" insulation and solder in hole 114.
- 58 () Install a 10K trim pot in parallel with the 6.8K resistor that is in holes 74 and 75. Mount the trim pot on the PC side of the board so that it may be adjusted while the PC board is in the case. This pot is the rate ratio trim pot. Use only the center lead and one of the outside leads, the other lead should be clipped off.

59 () Carefully inspect the PC board for any parts that have been mounted incorrectly. Also check for improper solder joints and solder bridges between the PC lands. Make sure all component leads have been clipped off as close to the board as possible. The solder joints may be scrubbed with alcohol or some other solvent and then wiped with a cloth to remove the soldering rosin and brighten the PC board.

*These steps will need the appropriate parts installed for 50-54 mc operation. See the parts list and schematic for these changes.

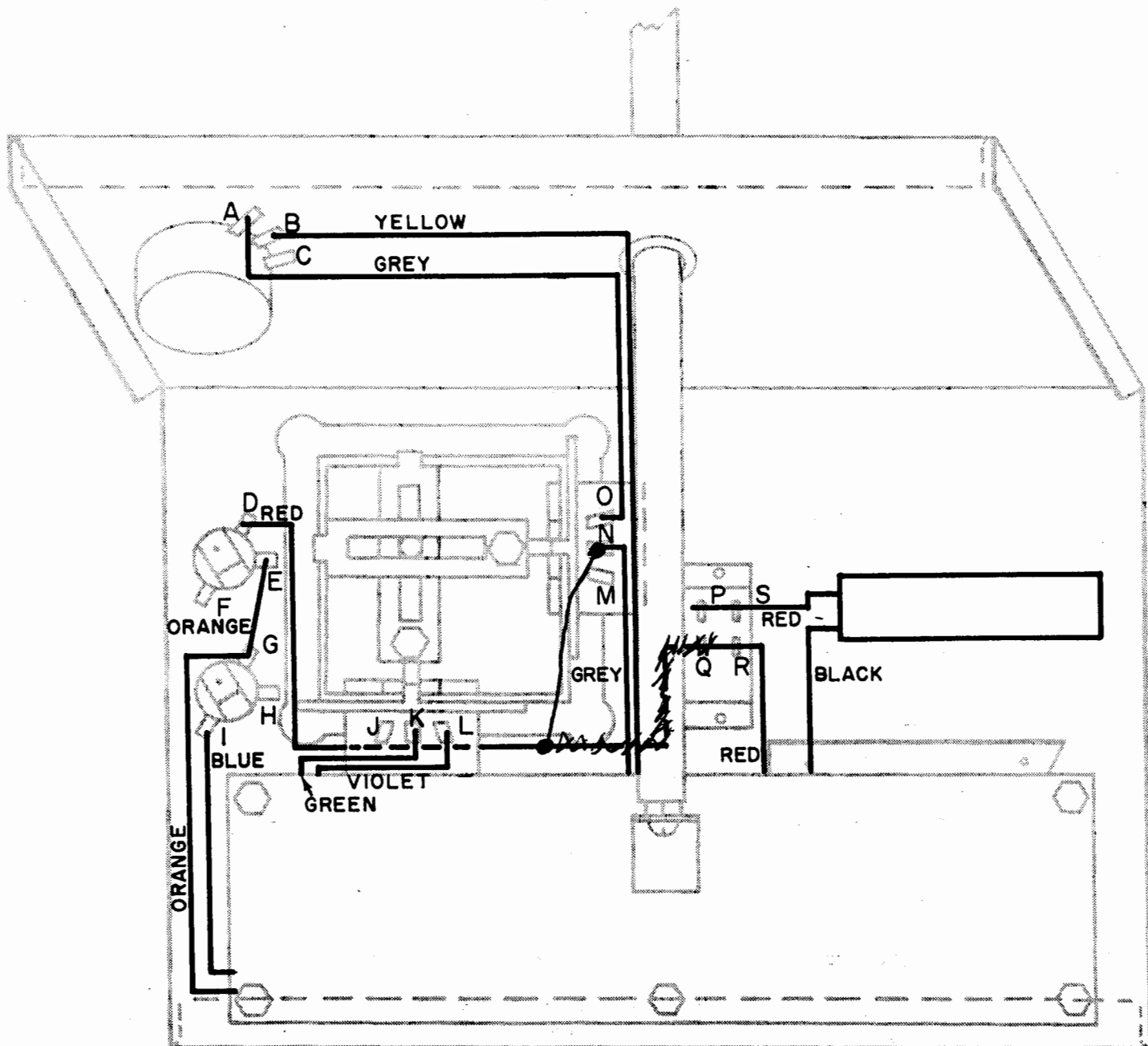
**Refer to page 4 if you are using a High Pulse Rate Detector for Motor Control or are installing a slide switch for escapement use.





PROCEDURE FOR MOUNTING HARDWARE TO TRANSMITTER CHASSIS

- 1 () Mount the 3 K trim pot in the right hand hole on the top of the transmitter chassis. Tighten the pot nut securely, with the pot lugs in the position indicated on the pictorial drawing.
- 2 () Mount the stick assembly in the large square hole in the transmitter chassis. The stick assembly must be positioned so elevator trim tab and pot is on the left hand side of the chassis hole, and the rudder trim tab and pot is on the bottom of the chassis hole. Fasten to the chassis with the 4 4/40 X 3/8" bolts and nuts provided in the kit. The trim tabs will have to be moved to install the 4/40 mounts.
- 3 () Mount the red push switch in the upper right hand hole of the case front panel. This switch must be positioned as shown in the pictorial drawing.
- 4 () Mount the black push switch in the hole below the red push switch. This switch must also be positioned as shown in the pictorial drawing.
- 5 () Mount the DPST slide switch in the hole in the center of the case marked OFF--ON using the two 4/40 bolts provided in this kit. The switch is taped for the 4/40 bolts and therefore no nuts are required. Make sure in mounting that the lugs of the switch are positioned up so that the OFF and ON printed on the case will correspond with the switch.
- 6 () Mount the battery bracket in the holes on the lower left hand side of the OFF-ON switch using two 4/40 x 1/4" bolts and nuts. When mounting the bracket the flange of the bracket must go towards the bottom of the transmitter case.
- 7 () Insert the 3/8" I.D. rubber grommet in the 1/2" hole in the center of the top of the transmitter case.
- 8 () Mount the two 1/4" snap hole plugs in the transmitter back lid.
- 9 () Make sure that all bolts and nuts are tightened securely.
- 10 () Mount the PC board in the transmitter case using the five 4/40 X 1 1/2" bolts, nuts, and spacers. When mounting the PC base in the case the copper side of the PC board will be towards you and the component side of the PC board will be towards the inside of the case with the antenna bolt towards the top of case. Start securing the PC board with a 4/40 x 1 1/2" bolt and spacer in the lower center hole of the PC board.



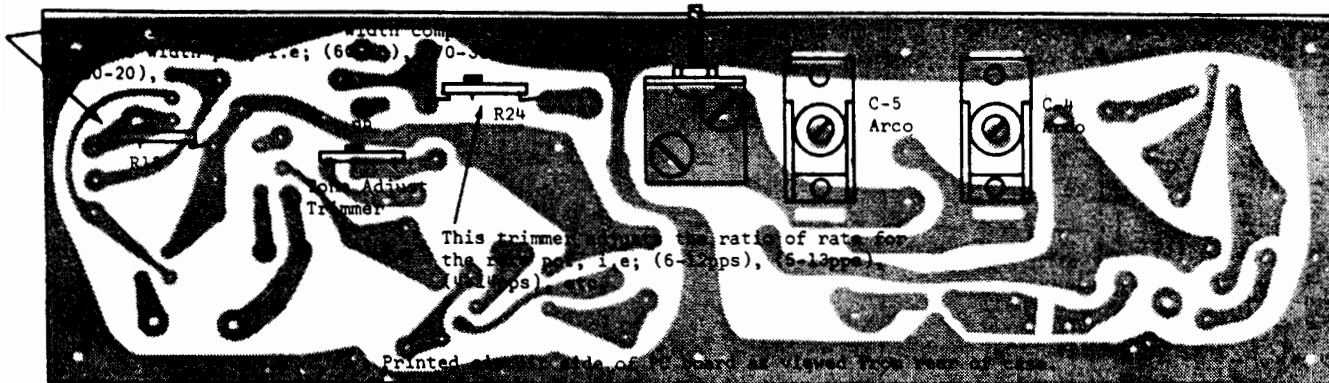
FINAL WIRING

- Cut the red wire 5" from P.C. Base*
- 1 () ~~Measure 2 1/2" from the PC base on the red wire. With a knife strip off a 1/2" section of insulation toward the other end of the red wire and solder this portion of the red wire to lugs Q and R of the OFF-ON switch.~~
from ~~Tin the end of the red wire and solder it to lug D of the red push switch.~~
 - 2 () Solder the red lead from the battery connector board to lugs P and S of the OFF-ON switch.
 - 3 () Solder the violet wire from the PC board to lug L of the stick assembly pot.
 - 4 () Solder the green wire from the PC board to lug K of the stick assembly pot, wrapping the green wire around the violet wire.
 - 5 () Lug J of the stick assembly pot is NOT used.
 - 6 () Measure the length of the grey that is required to reach from the PC board to lug N of the stick assembly pot. Cut the grey wire to this length and strip off 1/4" insulation and solder to lug N.
 - 7 () Using the remaining length of grey wire from step 6, strip the insulation from both ends and solder one end to lug O of the stick assembly pot, and the other end to lug A of the elevator trim pot.
 - 8 () Lug M of the stick assembly pot is not used.
 - 9 () Wrap the yellow wire from the PC board around the grey wire and solder the yellow wire to lug B of the elevator trim pot.
 - 10 () Lug C of the elevator trim pot is not used.
 - 11 () Solder the blue wire from the PC board to lug I of the black push switch.
 - 12 () Measure the required length of orange wire to reach to lug G of the black push switch. Cut and tin the orange wire and connect to lug G of the black push switch. DO NOT solder.
 - 13 () Strip the insulation from each end of the remaining length of orange wire and connect to lug G of the black push switch. Solder both orange wires to this lug.
 - 14 () Solder the other end of the orange wire to lug E of the red push switch.

**Refer to page 4 if you are using a High Pulse Rate Detector for Motor Control or are installing a slide switch for escapement use.

15 () Using the remaining piece of red wire strip 1/8" insulation from each end and tin with sold. Solder one end to lug D5 of the red push switch and the other end to lug N of the rate pot.

RF TUNING INSTRUCTIONS



Tuning of your Sim-Plus transmitter is relatively simple if you use care and follow the instructions carefully. Install the antenna and extend it fully. Leave the back off for initial tuning. Close both of the Arco capacitors, C4 and C5 (full clockwise). Do not close too tight. Insert a 120 to 150 ma milliammeter between the red lead of the transmitter and the positive terminal of the 9 volt battery. Observe meter polarity. Connect the black lead from the transmitter to the negative terminal of the battery.

Turn the transmitter on, place one hand on the case (not too close to the antenna) and adjust the slug in coil L1 and L2 for maximum current reading, approximately 80 ma. This reading may vary with different transmitters but should be between 65 and 100 ma. When tuning you will find a sharp side and a broad side. Adjust the slug slightly on the broad side, (clockwise) from the maximum current reading, so that the transmitter will start oscillating every time. The foregoing tuning must be done by a holder of a second class technician license or better.

After the tuning coil has been adjusted properly, the meter may be removed for the balance of the tuning. With a Field Strength Meter close, adjust the Arco C5 trimmer capacitor counter-clockwise for maximum RF output. In 1/16 turn segments open the Arco C4 and readjust the Arco C5 for maximum output on the Field Strength Meter.

The RF output of your transmitter is now adjusted properly, but for a final check, turn the transmitter on and off several times to make sure it starts oscillating everytime. In case it does not, adjust the tuning coil a slight bit more clockwise. Turn transmitter off until the next step.

AUDIO TUNING INSTRUCTIONS

Set R8--tone trim pot, R13--width trim pot, and R24--rate ratio trim pot to the center of their range. Adjust the two stick trim tabs to their center. By pressing in as you adjust these tabs they will move easier. With a monitor on, turn the transmitter on. Adjust the width (rudder) stick pot first for approximate 50/50 pulsing. Then adjust rate (elevator) stick pot for about 10 pps. The easiest way to adjust these pots is to have the holding screw snug against the pot shaft, rotate the stick in the desired direction, then loosen the holding screw and return the stick to neutral. Note: Use of a nut driver is recommended. Repeat as necessary until neutral is reached. If after loosening the holding screw the pot shaft still turns with the stick assembly it will be necessary to hold the shaft while rotating the stick. On the monitor you should be able to tell when the output is about right.

Turn the receiver and actuator on to make the final adjustments on the stick pots to center the actuator. The elevator trim pot on top of the case is for very small rate trim adjustments. It should be in the center of its range while adjusting the stick pots.

When you move the stick width (rudder) pot from full left to full right the actuator will probably either cycle through or not have enough movement; adjust R13 slightly to correct. After adjusting R13 the rudder stick pot will need readjusting. Keep retouching these adjustments until you get the proper adjustment for your particular receiver and actuator.

When the rate stick pot (elevator) is moved from full up to full down the elevator actuator will probably either cycle through or not have enough movement just as with the rudder actuator. Adjust R24, the rate ratio trim pot, and readjust the elevator stick pot for neutral on the elevator actuator. On both the rudder and elevator pots you want them so that when the stick is moved to either extreme the actuator will not quite cycle through. While adjusting these pots make sure you try in all extremes because there may be some change in the rudder setting when going from fast pulse to slow pulse.

When range checking you may want to adjust R8, the tone pot, for the proper tone to have more range for your particular receiver. You should not need to adjust the stick pots while range checking.

Install the back cover without the snap in plugs and touch up the final RF tuning with the Arco C4 and Arco C5 using the same procedure as for initial tune up. Make all final tests and range checks in your installation.

SPECIAL NOTICE: If after you have completed this transmitter and experience difficulties with it and feel you must return it to us for service, the service charge on this unit will be \$5.00, plus parts, plus return postage. When returning the transmitter please return with the antenna since each transmitter with its antenna will tune in slightly different. It is not necessary to return your battery but do make sure it is not dropping below 8 volts under load.