INSTRUCTIONS FOR OPERATION OF

M I N-X "S U P E R H E T 1200"

(Model SHS-1)

PREFACE

You have purchased the most advanced single channel receiver ever produced. The results of many thousands of flights with audio frequency selective single channel equipment, have been incorporated in this receiver. Operated according to this instruction manual, you will find this to be the most reliable equipment ever offered to the R/C enthusiast.

APPLICATION

This receiver was designed to operate with the "POWERMITE 1200K" and/or the "PULSMITE 1200S" transmitters only. An audio frequency selective filter is incorporated, coupled with a fixed threshold level, to reduce Citizens Band and electrical noise interference. This filter requires the transmitter to produce a frequency stable 1200 cps audio tone for proper operation.

Some of the design objectives fulfilled by this receiver are; it provides the single channel flyer with a flexible, highly reliable, good quality, sensitive superhet that will operate in those installations that now employ the "CAPRI" and other superregenerative receivers. It will plug directly into a 3V. drycell operated "CAPRI" installation. In a "CAPRI" installation with a 3.75V (3nickel-cadmium cells) receiver supply, it is only necessary to change one wire. See 3.75 VOLT RECEIVER CONNECTION DIAGRAM - PAGE 7.

COMPATIBLE ACTUATORS

For "rudder only" any good quality 3V escapement may be used.

For "pulse proportional rudder only" the Southwestern, Pou Voir, and Septallette magnetic actuators, and the Mighty-Midget motor are recommended.

For "SIMPL-SIMUL" and other pulse rate and width control systems, the Mighty-Midget motor is recommended. Generally, most other motors tested, developed very high RF noise levels which would not contribute to reliable receiver operation. These actuators are available from your hobby dealer or World Wide Radio Control, Dept. MX, 9810 wyoming, Detroit, Michigan 48204.

BATTERIES

To aid your understanding of these instructions we shall first define the terms "battery" and "cell". Any single electro-chemical unit that produces a voltage (such as 1.25V or 1.5V) is referred to as a "cell". The term battery refers to a group of "cells" connected in series (to provide a higher voltage) or parallel (to provide a higher current capability at the same voltage as a single cell). Cells with an ampere hour rating greater than that required may be used to provide longer life (or, in the case of nickel-cadmium cells, a greater length of operating time between charges) as long as the required voltage is not exceeded.

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The recommended battery compliments are as follows:

RECEIVER
2 Penlite (size AA) drycells, such as Burgess No. Z. (Do not use leakproof cells.)
OR
3 Nickel-cadmium cells (250 mah or higher rating)

MAGNETIC ACTUATOR OR AN ESCAPEMENT
2 Sintered plate nickel-cadmium cells (500 mah or higher rating)

MIGHTY-MIDGET MOTOR
4 Sintered plate nickel-cadmium cells (500 mah or higher rating)

WARNING: DO NOT USE LEAKPROOF DRYCELLS. Hermetically sealed nickel-cadmium cells are OK however.

One of the major causes of success or failure with any R/C equipment is the battery installation. We recommend that all receiver and actuator batteries be soldered to their respective leads because battery boxes have not been found to be reliable under the vibration conditions existing in an R/C airplane.

Tape the batteries together to form a battery pack that will mount conveniently in your plane. (SEE PAGE 8) Use a 100 to 150 watt iron with a large chisel type tip to solder in the batteries. Thoroughly clean the ends, of the cells to be soldered, with fine sandpaper. Then using rosin core solder (such as Ersin Multicore 60 tin/40 lead alloy) "tin" the ends of the cells. Do not use acid core solder. Strip about ½" of insulation off of the wires to be soldered (be careful not to cut any strands). Solder the wire to the battery adding only a small amount of additional solder.

The following notes should prove helpful:

1. Never use a soldering gun for soldering to cells. Because of their low thermal inertia, they cannot provide enough heat to do the job quickly.

2. It is best to use 19 strand #24 hookup wire in the airplane.

3. Do not heat a cell excessivly when soldering to it. If it proves to be difficult to "tin" clean it off thoroughly with fine sandpaper and try again.

4. Use black plastic electrical tape to hold battery packs together.

5. Practice soldering on old drycells first, until you can do a quick, neat job.

RECEIVER OPERATING VOLTAGE RANGE

This receiver may operate with a 3V (2 drycells) supply or a 3.75V (nickel-cadmium cells) supply (SEE THE HOOKUP DIAGRAMS). The receiver will operate reliably down to 2.6V with drycells and down to 3.2V with nickel-cadmium battery (the nickel-cadmium supply should never be permitted to go lower than 3.5V before re-charging). For additional information on drycells and nickel-cadmium cells we suggest you contact their distributor or manufacturer.

MOUNTING INSTRUCTIONS

It is best to mount the receiver vertically (printed circuit board always to front and antenna end up preferred) with at least ½" of soft foam rubber completely surrounding it and fitted fairly loosely (just slightly compressed). For additional details SEE PAGE 8.

ACTUATOR INSTALLATION

Sketches showing escapement, magnetic actuator, and motor wiring may be seen on PAGE 8. Logic and experience have shown that the wood torque-rods shown are more durable, cause less interference, and mechanical problems than all-metal torque-rods or push-rods.

ANTENNA

Do not change the antenna length as this will reduce the operating range considerably and de-tune the input stage of the receiver. Mount the antenna in the airplane as shown on PAGE 8, FIGURE A-THROUGH-D.

SENSITIVITY CHECK

Before each day of flying it is desireable to check the sensitivity of the receiver. Remove the transmitter antenna. This receiver should have from 5 to 20 feet of range with no antenna on the transmitter, with the receiver antenna at least a foot above the ground and the transmitter antenna connector pointed directly toward the broadside of the receiver antenna (this check should be made in an open field at least 200 feet from the nearest metallic object - do not expect the same performance in a house or near a steel reinforced runway or highway). Slight variations in this distance will occur from day to day as temperature, and moisture in the ground vary.

TUNING

This receiver is tuned and matched to its companion transmitter at the factory and should not require re-tuning under normal circumstances. Only a technically qualified person with proper instrumentation could accurately tune the IF amplifiers. If tuning appears to be necessary, return the receiver and matching transmitter to the factory for adjustment and/or repair (see WARRANTY AND SERVICE section for shipping instructions).

RELAY

Under normal circumstances the relay will only require periodic cleaning with a burnishing tool (available at most hobby stores or through World Wide Radio Control). This should be done every 25 to 50 hours of operating time. At this time the contact adjustment should be checked (after burnishing). The relay should be set for 16 to 18 ma. pull in and 12 to 13 ma. drop out.

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The warranty slip, included with this receiver, must be on file at the factory before any requests for warranty service will be recognized.

If service is required, both transmitter and receiver should be returned directly to the factory. Extra care should be taken when packaging to insure safe transit. A sturdy box (corrugated paper or wood) with at least 3" of clearance on all sides of the transmitter (and antenna ends) should be used. Use cotton batting or wadded newspaper for shock absorbing material on all sides of the units. Enclose the receiver in the battery compartment of the transmitter with shock absorbing material completely surrounding it to prevent damage to the inside of the transmitter. Include the antenna (sometimes a faulty antenna section is the only problem) but do not include the batteries. Clearly label the package, include a letter stating the nature of the problem, and include your own name and address. It is usually best to send it Parcel Post insured. A money order for $5.00 should be enclosed to cover inspection, handling, return postage, and insurance. (For warranty repairs enclose $3.00.) All units not under warranty will be returned C.O.D. for parts and labor charges

MIN-X RADIO, INCORPORATED
8714 Grand River Avenue
Detroit, Michigan. 48204

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SCHEMATICS

A booklet of MIN-X schematics (on current productions models - excluding the "ASTRON" proportional) is available for $2.00 (check or money order) from the factory. Enclose your check and return address and mail to:

MIN-X RADIO, INC
Reference Material
8714 Grand River Ave
Detroit, Michigan 48204

(Allow 2 to 3 weeks for delivery.)

The following is a list of DO'S and DON'TS that, if followed, should aid in providing many trouble free hours in the air:

DO read and understand these instructions before you begin to plan your installation.

DO follow all of the attached instructions even if you feel you are an "expert", because this unit was designed as a part of a totally new concept to provide the reliability necessary for truly worry free fun and contest flying.

DO install the receiver as noted in these instructions. Mounted in the prescribed manner it normally may only be slightly damaged in the severest of crack-ups.

DO make a neat and secure wiring installation. Plan all of your wiring before you start, secure the wiring harness to the inside of the airplane to prevent vibration fatigue, make good clean properly heated solder joints, and follow these instructions to the letter.

DO use a good quality switch in your receiver installation. We recommend a Muter slide switch or a toggle switch such as those manufactured by Arrow, Hart and Hegeman, Cutler-Hammer or Minneapolis Honeywell.

DO use separate sets of batteries for the receiver and servo supplies (as shown on PAGE 7).

DO solder in your receiver and actuator batteries, taping their leads securly to the side of the battery to aid in preventing the wire from fatiguing at the solder connection.

DO use the recommended tuning tool (General Cement #8089) if tuning is deemed necessary.

DO check your battery voltage before every flying day and several times during a long flying session.

DO perform the preflight SENSITIVITY CHECK, as detailed under that heading, before each flying session.

DO perform a thorough preventive maintenance inspection of the entire receiver installation every 25 to 30 hours of flying time and after every hard landing.

DO know and identify the frequency of operation of your transmitter with the proper color flag (cloth or paper only) attached to the antenna.

DO charge your nickel-cadmium batteries at least overnight at their recommended rate before you intend to fly.

DON'T use sealed leakproof carbon-zinc or alkaline cells (sealed nickel-cadmium cells are OK), because their steel outer liner does not make good contact with the encased cell under the vibration conditions that exist in an R/C airplane.

DON'T try to operate the receiver on 3.75V unless the proper minus (green) lead is properly connected and the other 3V lead (black) is left open.

DON'T change the antenna length on the receiver. This will de-tune the antenna coil and reduce the range appreciably.

DON'T tune the receiver antenna coil with a meter or any wire leads attached to the receiver or airplane. These add a counterpoise not normally connected in flight.

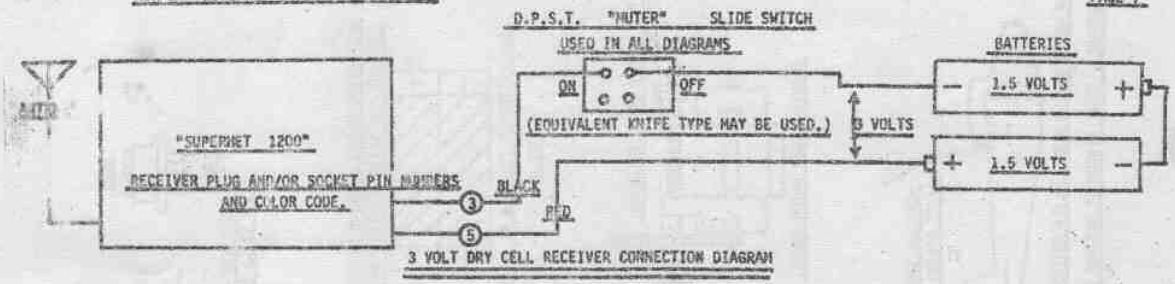
DON'T hold your transmitter within 10 feet of another one while both are being operated. The modulated carrier of one can cause some modulation of the other.

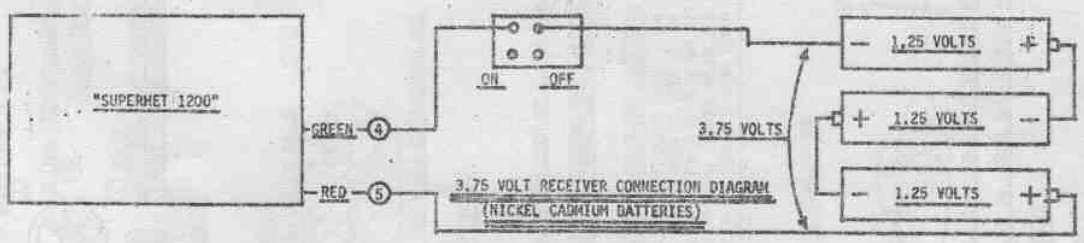
REMEMBER IT'S YOUR RESPONSIBILITY

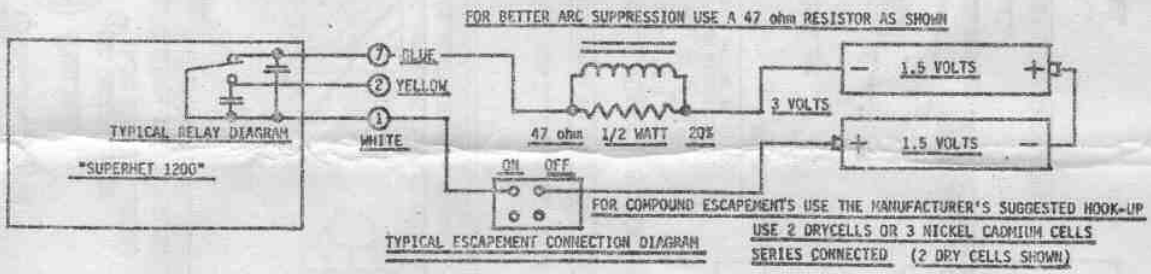
If you risk flying when the transmitter, receiver or actuator are malfunctioning or when any of the batteries are low, the only thing you can achieve is a demolished airplane, receiver, actuator, a personal injury and/or property damage accident. In any sense, economic, and otherwise, it is obvious that flying under these conditions can only be costly, may even injure someone and can damage the public image of our HOBBY. Don't be one of those who believe "it can't happen to me". Instead, always check your equipment, troubleshoot any malfunction, fix it (even if it means sending it back to the factory for repair) and then fly with confidence and safety.

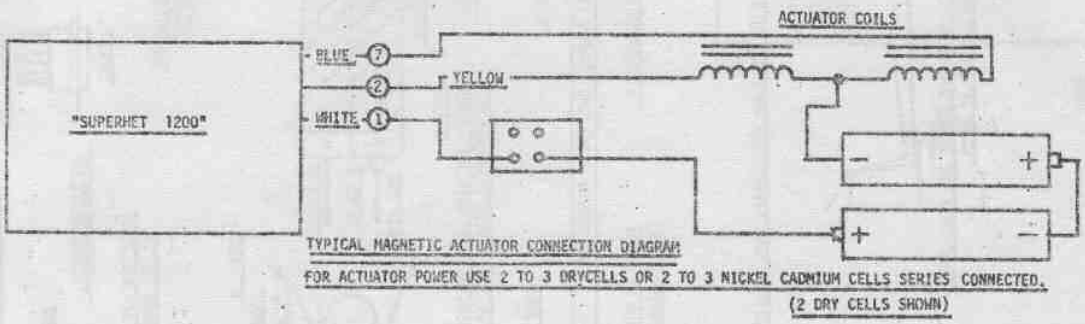
WARRANTY AND REPAIR

All MIN-X equipment is completely checked and tuned before leaving the factory. Rigid quality control requirements are met by each unit before final packaging. However, it is possible that a defective component may not appear until after the unit is in use. To cover such possibilities all MIN-X products are fully warranted against defective materials and workmanship for a period of 90 days from date of purchase. Malfunction as a result of reversed voltage, physical damage, altering or tampering automatically excludes this unit from the protection of the warranty. Transistors and crystals, due to their delicate nature, cannot be covered by this warranty.

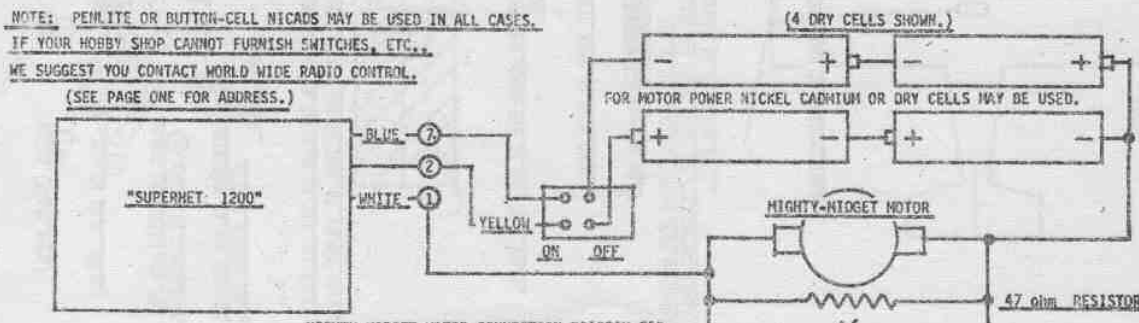




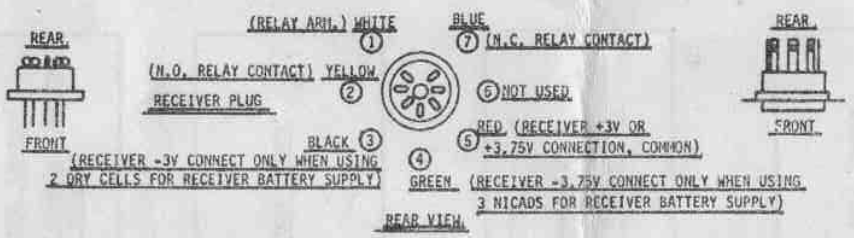


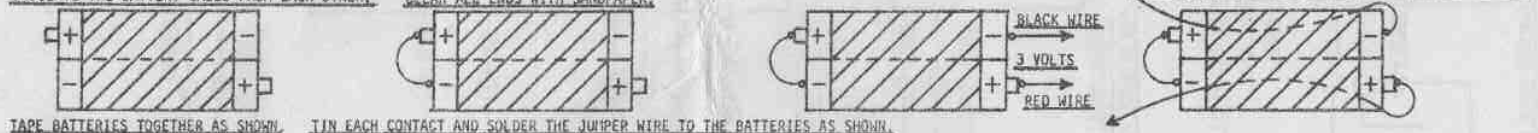


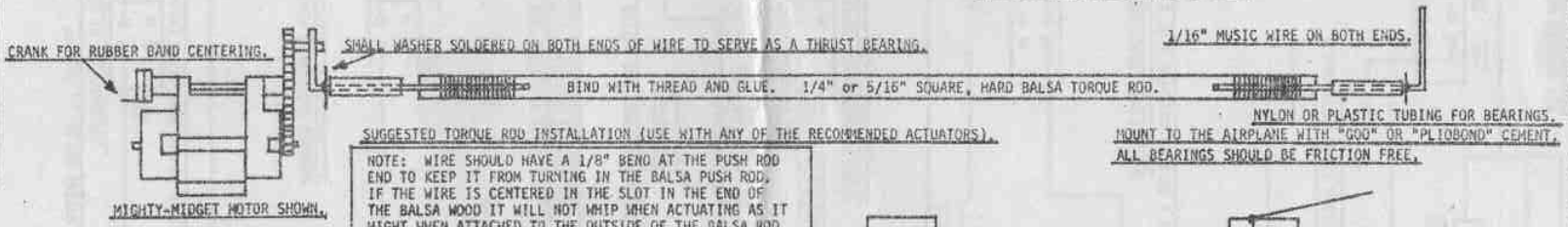
NOTE: PENLITE OR BUTTON-CELL NICADS MAY BE USED IN ALL CASES.
IF YOUR HOBBY SHOP CANNOT FURNISH SWITCHES, ETC.,
WE SUGGEST YOU CONTACT WORLD WIDE RADIO CONTROL.
(SEE PAGE ONE FOR ADDRESS.)

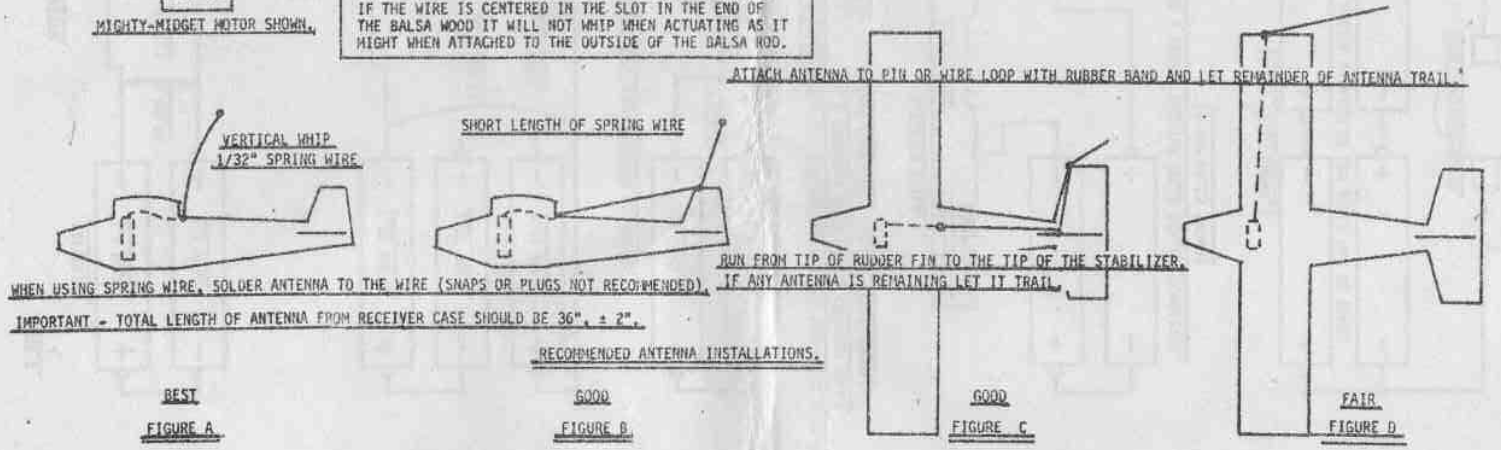


DWG. APPROX. 2/3 SIZE









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DWG. APPROX. 2/3 SIZE

1. Model: SHS-1

2. Description:
   Audio frequency selective (to greatly reduce noise sensitivity) single channel superhet for pulse and escapement application. For use with "PULSMITE 1200S" and "POWERMITE 1200K" transmitters.

3. Features:
   3 Volt operation, superhet selectivity and sensitivity, audio selectivity and the ability to faithfully follow high pulse repetition rates. Since this receiver uses our standard single channel connector, it may be plugged into a "CAPRI" installation without a single change (except changing one wire for those installation using 3.75 V receiver power).

4. Tone Frequency: 1200 CPS (plus or minus 20 CPS transmitter stability requirement).

5. Modulation Percentage Requirement: 60 to 100%.

6. Power Supply: 3 to 3.75 V (2 pencells or 3 Nicads, respectively). (Not furnished)

7. Current Drain: Idle: 4 to 6 MA. Signal On: 30 to 35 MA.

8. Size: 1" x 1 7/8" x 2 7/8".

9. Weight: 3 1/2 ozs.

10. Operating Temperature Range: 20° to 140° F.

11. Frequencies: 26.995, 27.045, 27.095, 27.145 and 27.195 Mc.

12. Printed Circuit Board: 1/16" glass epoxy with 2 oz. tin plated copper.

13. Case: Gold Anodized aluminum with silk screened MIN-X registered trademark and descriptive information.

14. Antenna: 36" of #26 - 19 strand wire.

15. Selectivity: 5 Kc.

16. Sensitivity: 15 Micro Volts.

17. Relay: SPDT high quality Deans relay with arc suppressed output.

18. Complimentary Equipment: Furnished with antenna, relay, factory wired plug and a matching socket.

19. Compatible Actuators:
    - 19.1 Single Channel: Any good quality escapement.
    - 19.2 Single Channel Pulse Operation: Southwestern, Pou Voir, Septallette magnetic actuators and the Mighty Midget Motor.
    - 19.3 For "SIMPL-SIMUL" (Galloping Ghost) Operation: The Mighty Midget Motor (an actuator employing any other electric motor is not recommended).

20. Compatible Transmitters:
    - 20.1 For Single Channel Operation: The MIN-X "POWERMITE 1200K" only.
    - 20.2 For Single Channel Pulse or "SIMPL-SIMUL" (Galloping Ghost) Operation: The MIN-X "PULSMITE 1200S" only.

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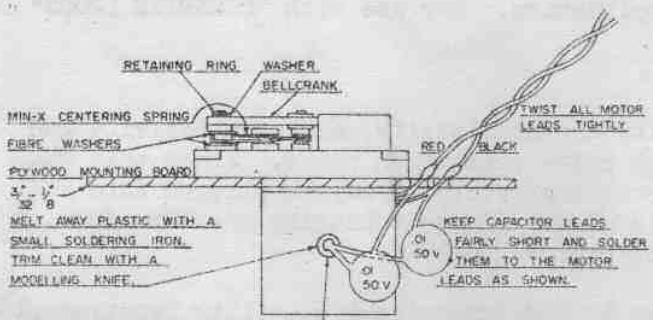
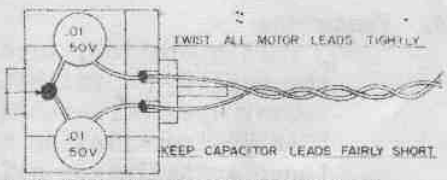
THESE METHODS OF MOTOR NOISE SUPPRESSION HAVE BEEN TESTED AND RESULTS HAVE PROVEN THEM TO BE A NECESSITY FOR ANY TROUBLE FREE R/C INSTALLATION.



SCRATCH OR SAND THRU BLACK SURFACE FINISH ON THE MOTOR CASE WITH A SHARP OBJECT. CLEAN THOROUGHLY. USING ERSIN MULTICORE 60/40 SOLDER, TIN, THEN SOLDER MOTOR FILTER CAPACITORS SECURELY (USE A HOT 100 WATT OR LARGER SOLDERING IRON). DO A QUICK JOB TO AVOID OVERHEATING MOTOR.

BELLAMATIC II

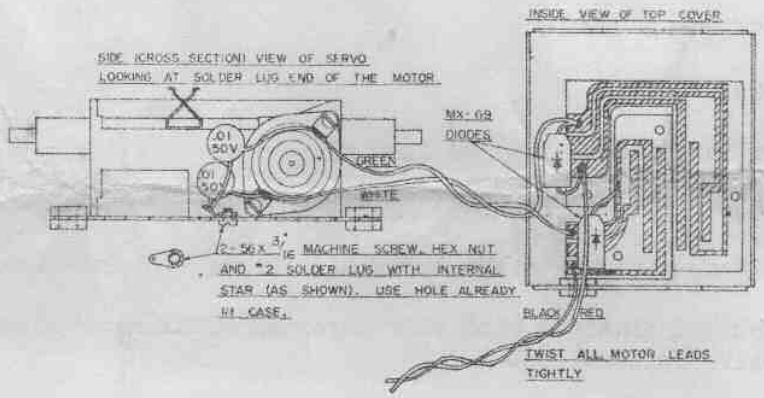
FIGURE 1



CLEAN A SMALL AREA ON THE MOTOR CASE WITH SANDPAPER OR AN AWL. CLEAN THOROUGHLY, USING ERSIN MULTICORE 60/40 SOLDER, TIN, THEN SOLDER MOTOR FILTER CAPACITORS SECURELY AS SHOWN (USE A 100 WATT OR LARGER SOLDERING IRON). DO A QUICK JOB TO AVOID OVERHEATING MOTOR.

MABUCHI FM-170

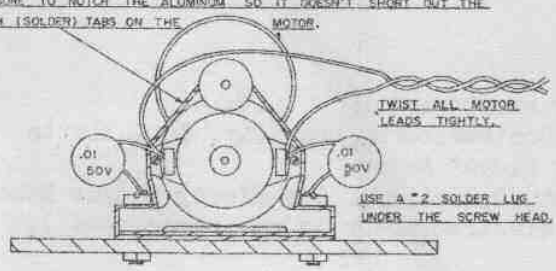
FIGURE 2



ANNCO 2R

FIGURE 3

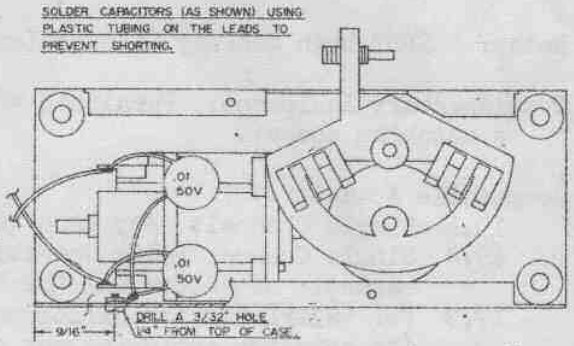
USE THIN ALUMINUM (1/32" THICK) OR HEAVY ALUMINUM FOIL, (7/8" WIDE) BE SURE TO NOTCH THE ALUMINUM SO IT DOESN'T SHORT OUT THE BRUSH (SOLDER) TABS ON THE MOTOR.



MIGHTY MIDGET

FIGURE 4

SOLDER CAPACITORS (AS SHOWN) USING PLASTIC TUBING ON THE LEADS TO PREVENT SHORTING.



CLEAN THE ANODIZING FROM AROUND THE HOLE (2/32") AND USE A #2 INTERNAL STAR SOLDER LUG UNDER THE NUT OF A 2-56 X 3/16" MACHINE SCREW.

TOP VIEW — COVER REMOVED

BONNER

FIGURE 5