CANNON R/C SYSTEMS
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INSTRUCTION MANUAL FOR SERIES 800 AND 900 R/C PROPORTIONAL CONTROL SYSTEMS

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GENERAL INFORMATION

INTRODUCTION

This manual contains Operating Instructions and Maintenance Data for CANNON-BUILT Series 800 and 900 AM Radio Control Equipments. Information herein is applicable to Models 810, 820 and 825 Systems, as well as to later 900 Series Units. Unless specified otherwise, data applies to models listed and many earlier models.

Equipment Descriptions and Specifications are not included; this information is contained in applicable Sales Literature.

EQUIPMENT CHECK LIST

Components shipped with COMPLETE R/C Systems are listed below. Flite Packs consist only of those items to be mounted in the vehicle, such as Receiver, Servos and Rx Battery. Flite Packs do NOT include Transmitter, Charger, Servo Trays or Frequency Flag. Aileron Trays are supplied as standard ONLY with Complete Systems of four channels or more.

Upon receiving your equipment, check that all items are present and undamaged. In event of damage or shortages, notify shipper and supplier immediately. BE SURE TO CHARGE EQUIPMENT FULLY BEFORE USING!

COMPLETE SYSTEMS INCLUDE

- Transmitter
- Tx Antenna
- Tx Adjustment Tool
- Receiver
- *Rx Nicad Battery with Switch
- Charger (110 or 220V)
- Servos (Qty. Ordered)
- Servo Tray Set (NOVA & CLASSIC Systems)
- Aileron Tray + Servo Extenders (MICRO System
- Frequency Flag
- Instruction Manual
- Warranty Card

*Series 800 Systems include separate adapter or charge limiter for Rx battery. These items are incorporated in the Receiver Battery Switch Assembly on Series 900 Units.

CHANNEL SEQUENCE

All CANNON SYSTEMS utilize the following control sequence, regardless of channel count.

CHANNEL NO.	FUNCTION	RX WIRE
1	AILERON(OR RUDDER)	ORANGE
2	ELEVATOR	YELLOW
3	MOTOR	GREEN
4	RUDDER	BLUE
5	LNDG GEAR (OR AUX)	PURPLE
6	AUX 1	GRAY
7	AUX 2	WHITE

When using Flite Packs with other makes of transmitters where channel sequence is different, first determine if all desired operating functions are available from the receiver. If not, it may be necessary to rearrange positions of servo signal wires attached to the Rx I.C. to provide a control sequence compatible with your transmitter. If another control arrangement is desired, this is accomplished by exchanging positions of the servo signal wires (orange, yellow, etc.) where they attach to the Receiver-Decoder I.C. Be extremely careful when moving wires between pins that no solder shorts remain or parts damage may occur. Channel changes are not possible on Receivers with integral plug blocks.

If requested at time of Receiver or Flite Pack purchase, this service will be performed at the Factory (no charge) when your transmitter IS SUPPLIED for tuning new receiver.

AVAILABLE MODES

Two-channel transmitters are normally supplied with a 2-axis centering stick (with trims) on the right hand side. When specified, transmitter will be equipped with two single-axis sticks, RH for rudder, LH for elevator, both with trims. ($10.00 EXTRA).

Three-channel transmitters are built with a 2-axis centering stick (with trims) on the RH side, and a lever (no trim) on the LH side for any positionable control. If desired a one-axis ratcheted stick, with trim, can be supplied in the LH position. Cost is $12.00 extra.

Two-stick systems with four or more channels are normally supplied as Mode II (Aileron and Elevator on RH stick), but are available as Mode I (Aileron and Motor on RH stick) on Factory order. Field change-over between modes is relatively simple. All transmitters with five or more channels incorporate a separate landing gear retract switch. Additional controls are positionable levers, no trim.

Single Stick Models (4 Channels or more) provide Aileron, Elevator and Rudder knob functions on right stick. Landing Gear switch and non-trimmable levers provide other channel controls. Deluxe 4-Channel 800 and 900 Series Single Stick Transmitters have a ratcheted trimmable motor stick on LH side of case for throttle.

ADDING CHANNELS

Transmitters and Receivers may have channels ADDED AT THE FACTORY to the maximum number of channels designated for the specific Models Systems. Cost for Factory Modification is the DIFFERENCE in RETAIL PRICE between like Systems, plus $10.00 labor charge. Extra servos are not included in the price but can be purchased separately (in same quantity as channels added for 72% of the normal retail price, but only if ordered at SAME TIME as Mods are made. Repairs, Shipping and Handling Charges are extra.

If channels are to be added to a separate Tx or Rx, costs would be based upon current repair rates, plus parts. Please inquire should work be needed.

FREQUENCY CONVERSIONS

Late Series 800 and 900 R/C Transmitters can easily be changed to another frequency (within the same band. Example: 72 MHz). Typical current conversion costs for a Micro System are $55.00, plus any needed repairs, shipping and handling. Conversion involves crystal changes (Tx & Rx) plus tuning & range checks. Needed repairs to obtain satisfactory performance are extra.

If Transmitter Narrow-Banding is required cost is $16.50 if performed at same time as frequency conversion ($21.50 + S & H if Narrow-Banding only is done).

PLEASE NOTE that 72MHz frequencies are divided into LO BAND and HI BAND. ONLY NARROW BAND TRANSMITTERS may be operated on LO BAND frequencies. Either Wide Band or Narrow Band equipment can be used on the HI BAND.

All CANNON Receivers can be changed to a matching operating frequency and tuned to their Tx. HOWEVER, older Receivers that are NOT Narrow Band will NOT BECOME Narrow-Band upon frequency change. As a result, purchase of a new Receiver may be necessary in 1991 should interference become a problem.

System conversion to other frequency bands incurs added costs (new coils, extra parts, more costly crystals, etc). Earlier 520 CANNON Systems can usually be converted to new frequencies also, but require more extensive work at higher cost.

For more complete data on current Conversion costs and related details send a Self-addressed stamped No. 10 envelope to CANNON R/C. NO FREQUENCY CONVERSIONS, REPAIRS, TUNING OR MODIFICATIONS WILL BE PERFORMED ON EQUIPMENT OTHER THAN CANNON OR CHARLIE'S.

PREPARATION FOR USE

UNPACKING

Open carton carefully to avoid damage to equipment. Save all cartons for possible reshipment. Check contents against equipment list. If items are missing, notify supplier immediately.

FREQUENCIES AND FLAGS

27 AND 53 MHZ The following 27 & 53 MHz frequencies are available. Frequency identification is accomplished by means of a -color-coded flag attached to the transmitter antenna. Frequency and flag colors assigned are as follows:

FREQ.	FLAG	FREQ.	FLAG
26.995	BROWN	52.100	BLACK-BRN
27.045	RED	53.200	BLACK-RED
27.095	ORANGE	53.300	BLACK-ORG
27.145	YELLOW	53.400	BLACK-YEL
27.195	GREEN	53.500	BLACK-GREEN

50, 72 AND 75 MHZ A new AMA flag identification system is used on these bands. Each uses a channel numbered panel attached to the Tx antenna base with an appropriately colored cloth streamer. 50 MHz streamers are black; 72 MHz are red; 75 MHz are yellow. Other I.D. is shown below, with channel number preceeding the frequency. The below listed even numbered channels are currently approved by AMA for use in the U.S.A. and available from Cannon R/C. Additional (odd numbered) channels will be released for use in 1991.

50 MHZ (E-BAND)	(00)50.800; (08)50.960	(02)50.840;	(04)50.880;	(06)50.920;
72 MHZ G-BAND (LO BAND)	(12)72.030; (20)72.190; (28)72.350;	(14)72.070; (22)72.230; (30)72.390;	(16)72.110; (24)72.270; (32)72.430;	(18)72.150; (26)72.310; (34)72.470
72 MHZ J-BAND (HI-BAND)	(38)72.550; (46)72.710; (54)72.870;	(40)72.590; (48)72.750; (56)72.910;	(42)72.630; (50)72.790;	(44)72.670; (52)72.830;

Some frequencies in the 29, 35 and 40 Bands are legal in specific foreign countries. In addition to certain U.S. frequencies, Canada permits usage of 72.720, 72.760, 72.800 & 72.840 MHz.

FLIGHT SAFETY

Introduction of new R/C frequencies (with more to come) make it obvious that R/C operators must be most cautious in useage of their equipment to avoid causing interference or flying carelessly, with possible resultant damage to equipment or injury to individuals. Make sure you follow all safety rules at your field. FLY CAREFULLY and USE YOUR HEAD.

EQUIPMENT CHECKOUT

1. Charge Transmitter and Receiver Nicad Batteries for 12 to 14 hours before initial use. See instructions on CHARGING OF NICAD BATTERIES.
2. With Receiver turned OFF, carefully plug servos into mating receptacles. MAKE CERTAIN that both PLUG TYPES & COLORS match, as well as POLARITIES. OBSERVE PLUG KEYWAYS! A 7" Aileron Extension Cable is available if needed. DO NOT PLUG IN OR UNPLUG SERVOS WHEN POWER IS ON!
3. Plug Receiver battery (switch OFF) into mating Rx plug, again observing correct plug types, polarities, etc.
4. Install Transmitter antenna - leave it collapsed.
5. With Receiver on bench (or installed in plane) extend Rx antenna partially, positioned away from metal objects or electrical wiring.
6. Turn Transmitter ON, followed by Receiver. Servo arms on self-centering channels should move to neutral position; other servos (motor, landing gear, aux) should move to positions determined by transmitter control settings.
7. Operate each transmitter control in both directions to check servo response. Observe servo arm travel direction to determine correct mounting position in aircraft to actuate control linkage. Note: Some Dean's & Black Micro servos are furnished in REVERSED direction to simplify installation. New Series 900 servos (red plugs) have standard rotation; reversing switches in Transmitter change servo direction if needed.
8. As required, reverse servo direction or adjust servo centering.
9. Before installation, cycle equipment and operate all channels for 20 to 30 minutes total to verify equipment operation.
10. Turn OFF Receiver, then Transmitter. Always follow this sequence in operation.
11. Equipment is now ready for installation.

CAUTION: DO NOT OPERATE TRANSMITTER FOR LONG PERIODS OF TIME WITH ANTENNA DISCONNECTED, OR OUTPUT TRANSISTOR OVERLOAD MAY CAUSE BURNOUT!

INSTALLATION INSTRUCTIONS

RECEIVER INSTALLATION (AIRCRAFT & GLIDERS)

Locate receiver in the airplane where it is least subject to crash damage. For protection, wrap receiver in 1/4" to 1/2" soft rubber or foam, secured with rubber bands. Route antenna through side of fuselage and attach to top of aircraft vertical fin. Use rubber band at fin to maintain antenna tautness. If too long, let antenna trail behind aircraft. NEVER CUT ANTENNA OFF OR FOLD IT BACK UPON ITSELF. Use of an antenna quick-disconnect, such as Shove-IT, is recommended. Provide strain relief at receiver to prevent antenna being pulled loose. Note: Some types of vertical center-loaded Rx antennas may provide satisfactory performance, permitting antenna to be shortened.

Servos or "Blocks" are usually mounted in trays or attached to hardwood mounting rails in fuselage, using rubber grommets and standard small screws and washers (not supplied). Super-Micro servos are provided with "servo extenders" (small plates) which serve as light weight mounts for rail mounting.

Total recommended antenna length for standard receiver is 36"; for Super-Minis & Super-Micros 30"; for smaller systems 18" - 24". Full length antenna should be utilized wherever possible for maximum range. If antenna is shortened or changed, Rx should be retuned for max range. Some range loss will occur with shorter antenna.

Keep antenna completely away from other wires or metal objects to reduce possibility of noise pick-up. DO NOT use solid wire or other type metal push rods (will obscure reception) for control rods. Avoid metal-to-metal linkage wherever possible.

RECEIVER BATTERY AND SWITCH INSTALLATION

Mount switch on side of fuselage opposite motor exhaust. FORWARD position should be ON. Be certain slot is long enough to permit switch to fully open and close. Mark ON position with paint.

Wrap battery pack securely in 1/4" - 1/2" thickness of foam rubber, or plastic, bound with rubber bands to hold cells in place. A small plastic bag around pack will serve to keep out water and engine fuel. Install battery pack forward of radio compartment; below receiver if this is not possible. Route wires as far from receiver as you can.

CHARGE RECEPTACLE INSTALLATION

Some nicad batteries and switch harnesses are provided with an external charge receptacle which permits receiver battery charging without disconnecting plugs.

Install the charge receptacle in a rectangular hole of matching size cut in outer skin of vehicle. Attach with plate and 2 screws. Newer CANNON Rx batteries have a charge receptacle built into the switch plate. Mount unit securely to withstand connection of charge plug.

When charging, plug mating charger cable fully into charge receptacle. Receiver battery switch must be OFF to charge.

WIRING

Install all wiring as neatly as possible, making sure it does not interfere with or become entangled in the servos or control linkages. Do not route wires close to Rx antenna. Check wiring occasionally, particularly at plugs, for signs of fraying, breakage or poor connections. Repair as needed.

SERVO INSTALLATION

Select servo(s) which provide correct direction of output arm travel for required control surface actuation.

Mount servos on hardwood rails or with plastic trays. Rubber grommets provide necessary shock mounting; servos are secured with screws (wood or machine, as applicable) and flat washers. Do not overtighten screws, or vibration isolation will be destroyed.

Super-Mini, Super-Micro, or smaller servos may be attached to airframe with servo tape or trays. Servos must be positioned in tray before mounting the tray with standard hardware. Another satisfactory method of mounting small servos is with Velcro.

All neutral adjustments of control surfaces should be made through linkage adjustments, not by servo or transmitter centering adjustments.

Always use a spring-loaded override device on motor and auxiliary channel servos to prevent possibility of servo stall-out in case of incorrect linkage adjustment.

CENTERING SERVOS

1. Place all Transmitter controls, including trims, in neutral position.
2. Turn on Transmitter and Receiver. Plug servo into Rx channel to be centered.
3. Remove screw holding servo output arm if centering is required.
4. Insert centering tool (3/64" jewelers screwdriver) into hole in output arm until it bottoms in slot. Note - older Cannon Servos require a 1/16" hex Allen wrench for centering.
5. Apply pressure on tool in direction opposite that of desired servo centering change. Output arm will rotate to a new position. Adjustment is quick and touchy, so a few tries may be needed before correct centering is obtained.
6. Carefully withdraw centering tool so as not to change servo center. Replace output arm screw.

CAUTION

When centering servos with a small screwdriver, DO NOT apply DOWNWARD PRESSURE on the gear centering shaft or damage to servo pot wiper might result. Use ROTARY motion to center servos.

REVERSING SERVO DIRECTION

To reverse rotational direction of servos, reverse the connections of the two motor wires (not the motor ground connection). Also, reverse positions of the two outer pot wires (not the yellow wire). Re-center servos as necessary after these changes.

CAR AND BOAT INSTALLATIONS

Basically the same as for aircraft, except antenna should be a base-loaded vertical whip. Total combined length of receiver lead out wire and whip antenna should be as close to standard antenna length as possible, or receiver retuning may be required.

Car installations require extra care to project equipment from vibration, dirt, fuel and engine exhaust oil. Use of plastic bags around units is recommended. Shock-absorbing linkage should be used between servo output and steering rod to reduce possibility of damage to servo mechanics.

For boats we recommended a waterproof box to house the equipment, complete with waterproof pass-through fittings for the push rods. Unit can be fabricated of plastic or plywood. Lid should have a water-tight seal. Plans have appeared in model magazines for such boxes; commercial models are also available.

FIELD TESTING

CHECKING INSTALLATION

Once your equipment is installed in the vehicle, it should be checked at home, then at the operating site, for proper functioning. For the beginner, we strongly recommend obtaining the help of an experienced R/C modeler to check over the installation and help in the initial phases of equipment operation, such as checkout, flight instructions etc. Perform field tests as follows:

1. Recheck your installation for possible mistakes. For the new R/C flyer, have an experienced modeler look your unit over. He can probably spot problems a beginner would not.
2. Turn ON the transmitter, then the receiver. Check operation of all controls. Make certain that control movements respond in the proper direction. Many an airplane has gone up on its first flight with reversed controls and consequent disaster. Check control surfaces for binding. Be sure servos are not in a stalled condition at their extremes, which could result in premature battery depletion and loss of control.

RANGE CHECKS

It is important that a ground range check be performed to establish a standard for your system and provide a relationship between ground range and air (or distance) range. At future flying sessions, should the range check under identical conditions vary significantly from the established standard, locate and rectify the problem before attempting further operation.

1. Position the model away from obstructions, preferably on a box 2 or 3 feet above ground level, so that the nose if pointed away from the operator and one major control function, such as rudder, is easily seen by the controller.
2. Turn equipment ON, and with Tx antenna retracted, back away from the model while operating the control under test. Continue to operate the Tx control while backing away and observing control surface action. When the point is reached where action becomes erratic, consider this to be your limit of range. Measure the distance, note the test conditions, and use this as your standard for all future range tests.
3. For powered models, repeat this test with engine running at full throttle. If any significant reduction in range is apparent, investigate and correct the problem before further operation.
4. Range may vary widely with different systems and between different makes of equipment. Factors which cause variations in range include transmitter tuning, antenna length, type of Tx case, antenna orientation, position in which transmitter is held, height of transmitter and receiver above ground, equipment installation, surface over which test is made, humidity factors, etc. Once a standard is determined for antenna - down range, this can be used as a quick check reference of equipment operation. The real test is ground-to-air range, without "glitches".
5. Average range, antenna down, will vary from 100-300 feet, depending on surface and test conditions. Antenna-up ground range should be 700 feet or more. Air range should be 2 to 3 times your ground range. If all field tests are positive, equipment is ready to place in operation.

RECEIVER TUNING

Factory-tuned receivers are sealed, and tuning is not recommended unless an out-of-tune condition is suspected.

If tuning is required perform this field operation with servos plugged into the first two receiver channels.

To tune receiver, retract Tx antenna and have one person slowly move away from airplane while operating Channel 1 control on transmitter. Using the spade end (like a small screwdriver) of a plastic tuning wand, carefully peak the front coil (or coils) until maximum operating range is obtained. This will vary from 50-150 feet or more. Once tuned, use a small amount of wax to lock tuning slugs in position. Caution: Do not retune I.F. transformers.

EQUIPMENT OPERATION

It is beyond the scope of this manual to teach the "hows" of flying and related flight maneuvers. For information of this nature refer to one of the many R/C training manuals or video tapes currently available.

R/C THEORY

A simplified explanation of equipment operation follows:

A Radio Control Transmitter supplies a synchronized train of control pulses which are sent to the Receiver by means of an RF link (AM, FM or PCM). Pulse spacing on each channel is determined by the position of the related control stick, or pot. When the Transmitter is ON, but no control function is being moved, relative length and spacing of all pulses remains constant. Movement of any control stick, example: AILERON, changes pulse spacing of that channel, leaving other channel pulses as before. The result is that a command is sent to alter the position of the aileron servo output arm, which then results in displacement of the aircraft aileron and affects flight operation.

The R/C Receiver serves to pick up this transmitted chain of pulses which are processed and sent on to the Receiver-Decoder section. Decoded information is channeled to each of the operational servos and tells each servo what position it's control arm should assume. Any individual servo then will respond position-wise to any command change from its own transmitter control. All servos operate independently of each other.

Servos used today are electro-mechanical devices consisting of an electronic amplifier controlling a small DC electric motor. This motor operates through a reduction gear system to drive the servo output arm. A neutral (or centered) transmitter stick position sends a pulse to the servo of a specific width, resulting in a neutral servo arm condition. Any change in transmitter stick position will change the command pulse width, either wider or narrower. This change is sensed by the servo amplifier causing the drive motor to operate. The servo follow-up circuitry then causes the servo motor to turn until the servo's internally generated pulse width matches that of the altered decoded transmitter pulse. When this match occurs, servo movement stops and servo remains in the new position until a new stick command is given, followed by another neutralizing servo movement. This operation is typical of all servos and all channels, each independent of the other.

Power to operate the transmitter is derived from its internal 9.6 V rechargeable nickel-cadmium power pack. Receiver and Servo power comes from a smaller 4.8 V nicad pack carried in the vehicle.

TRANSMITTER CONTROLS

An explanation of transmitter controls is helpful in understanding how to operate models. Since controls are sometimes different on transmitters with various numbers of channels, these are described by channel quantities.

TWO-CHANNELS - This type unit provides two controls, usually one for right and left steering (rudder or aileron) control, the second for up-down (elevator) control. Physical controls on CANNON transmitters consist of one right hand self-centering stick which provides both horizontal action to control steering and vertical action to control up and down motion of the aircraft.

This two-channel system design is compatible with more advanced systems having more channels. This makes it possible to learn basic flight principles on one stick and then upgrade later to multi-channel systems without the necessity to relearn flying techniques. Such would be the case should an import two-channel system with two separate sticks have been used to learn on.

THREE-CHANNELS - Operates same as a standard 2-channel transmitter except that a third vertical control is added on the left side of transmitter which can be used for operation of throttle (motor) or, in case of gliders, for flaps or spoilers. This control is usually ratcheted so it remains in any selected position.

FOUR-CHANNELS - This standard transmitter provides the four basic functions needed for full aircraft control. These include the three listed above plus a separate horizontal rudder control on the left hand stick. This system is known as "Mode 2". (Mode 1 control uses the right hand stick for aileron and motor, left hand stick for elevator and rudder).

One variation of the basic four-channel transmitter uses a 3-axis right hand stick. Horizontal stick movement gives aileron control, vertical movement provides elevator control, and a rotating self-centering knob on the outer end of the stick gives control of rudder. Left stick remains as a vertical single action device with ratchet for throttle use.

ADDITIONAL CHANNELS. A five-channel transmitter usually offers up-down control, such as landing gear, spoilers, flaps, etc., by means of a toggle switch (not proportional)..Additional proportional sliding controls are usually standard on six and seven-channel transmitters.

RECEIVER CONTROLS

No physical controls are available on the receiver; only plugs & sockets for attachment of Rx battery pack and operating servos.

SERVOS

No control is available except for a centering device to permit the servo arm to be centered precisely to match transmitter stick position. On all Cannon servos centering is performed by employing a 3/64" jewelers screwdriver to turn a slotted pot shaft accessible through a hole in the center of the servo output shaft.

RECEIVER BATTERY

An ON-OFF switch located in the nicad battery harness is used to energize Receiver and Servos when operation is desired. On later Model CANNON Rx batteries, a charge receptacle attached to or located on the switch permits charging of battery (from an external charger) without necessity of disconnecting battery from receiver. (Switch must be OFF when using this charge method). With no charge receptacle present, battery must be disconnected from Rx & connected to charger. To charge, switch must be ON.

OPERATING THE SYSTEM

Assuming that equipment is properly connected and correctly installed in the aircraft (or other vehicle):

1. Make certain all batteries are fully charged.
2. Turn ON Transmitter and Receiver. All servos should respond and seek their command positions.
3. Operate each Tx control in turn to verify that the corresponding aircraft control surface moves in the proper direction.

CHANNEL 1 (RH Horizontal Stick) - when connected to AILERON, stick movement to right should cause Left Aileron to DROP, Right Aileron to RISE (As viewed from REAR). This action in flight results in a Right Hand roll (or turn). Left stick movement gives Left Hand (opposite) roll, or turn. If Channel 1 Stick is used for Rudder control, RH movement of stick will cause RUDDER to move Right; LH Stick movement gives Left Rudder. Aircraft will respond accordingly.

CHANNEL 2 (Vertical RH Stick) - When stick is moved down towards operator, elevator moves UP, causing aircraft to climb. Pushing stick forward moves elevator DOWN, causing aircraft to dive.

CHANNEL 3 (Vertical LH Stick) - When used for Throttle Control, forward (UP) motion of stick increases engine speed; reverse stick position reduces RPM's.

CHANNEL 4 (Horizontal LH Stick) - When used for Rudder control, LH movement gives left rudder action, RH gives right rudder.

CHANNEL 5 (Toggle Switch). This non-proportional channel controls UP-DOWN operation of items like Landing Gear, Flaps or Spoilers. It can also operate ON-OFF devices like Bomb Drops, Camera Shutter, etc.

AUX CHANNELS. These channels (when available) may operate other proportional functions you may select, including items like additional motor controls in multi-engine aircraft.

Note that spring action on centering channels such as aileron, elevator and rudder will return these controls to center (neutral) once stick is released. Motor control stick and toggle switches remain in a selected position until moved again.

PILOT CAPABILITIES

The most common mistake an over-confident pilot can make is to choose an aircraft beyond his experience capabilities. Flying model aircraft requires good hand, mind and eye coordination to achieve successful flight. Flight experience in full size aircraft is of little value except to teach principles of flight.

An R/C transmitter in your hand does not provide the same relative view or physical sensations as when in the cockpit of a real airplane.

DON'T EQUATE FULL SCALE FLIGHT HOURS WITH ABILITY TO FLY MODEL AIRCRAFT FROM THE GROUND! One example: When IN an aircraft, your only direction to control is FORWARD. In Model Aircraft this is only true when your aircraft is flying AWAY from you; when flying TOWARDS you directional controls must be REVERSED IN YOUR MIND. To master this transition requires much model flight experience.

AIRCRAFT SELECTION

First rule: Never choose a vehicle BEYOND your flight capabilities. Hot Rods, Pylon Racers and fast Scale Models are for the Experienced Flyers!

When starting out, choose something that flies SLOWLY, is easily controlled, and is not so heavy as to cause serious damage or personal injury WHEN it crashes (it surely will). An excellent choice is a two-meter glider or a low powered trainer, either glow engine or electric with slow flight characteristics. Either type will give time to decide what control command to give next. On slow flying aircraft mistakes are not necessarily disastrous. As experience is gained and coordination improves, move up to larger and faster aircraft; BUT NEVER FORGET THE LEARNING CURVE!

WARNING

Operation of any car, boat, airplane or other vehicle can be hazardous to property or persons if every precaution is not taken. NEVER operate a radio controlled device in an area where failure, accidental or inadvertent loss of control could permit the vehicle to cause property damage or personal injury. Before attempting unrestrained operation BE ABSOLUTELY CERTAIN that all equipment is functioning properly, that batteries are fully charged, and that the selected operating area is free of persons or property. Neither the CANNON Factory nor its Representatives assumes liability for loss, damage or injury incurred or inflicted during operation of R/C equiment or related devices. CANNON R/C equipment is NOT warranted to be free of interference from outside sources, including same or closely adjacent frequencies, pagers & Hi-Power transmission, third order I.M., or image frequencies.

DUAL RATE SWITCHES

Two Dual Rate toggle switches, one mounted on each end of the transmitter case top, provide selection of amount of servo throw. When switches are forward (towards front of Tx), Dual Rates are inoperative and servo throw is normal; aft switch position allows servo throw to be reduced, thereby decreasing control sensitivity.

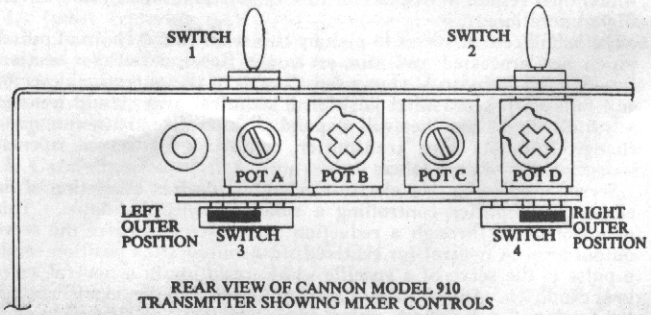
Top right hand switch on Tx controls throw of Channel 1 Servo (Aileron or Rudder), whereas the left hand switch controls Channel 2 (Elevator) Servo.

Dual Rates are factory set to provide approximately 60% of normal servo throw. Throw is adjustable from 40% to 100% of normal by changing wiper positions of the two OPEN 50K pots on Left Hand inside of Tx. P.C. board (viewed from rear). Counter clockwise wiper rotation reduces servo throw. (See Figure B - Supplement)

MIXER CONTROLS (FIGURE 1)

Two centrally located toggle switces on top of transmitter permit MIXER control of levers operation. When both switches are towards rear of case transmitter operates normally, without mixing. One or both switches in forward position provide partial or full mixing of transmitter output.

Standard Electronic Mixing in Cannon Transmitters is limited to Channels 1 and 2, normally Aileron and Elevator (or Rudder and Elevator). When only Switch "1" is actuated The Aileron control stick will operate the Aileron servo normally; however, operation of the elevator control stick will NOW provide a Mix of both Aileron and Elevator servos simultaneously. Conversely, when ONLY Switch "2" is ON, Elevator Control operates the Elevator servo normally, but Aileron control gives mix to both servos. This feature may be useful in specialized applications.



REAR VIEW OF CANNON MODEL 910
TRANSMITTER SHOWING MIXER CONTROLS

FIGURE 1. MIXER CONTROLS AND ADJUSTMENTS

The standard Aileron-Elevator (AE) Mixer is most commonly used for "V" tail operation. The following chart shows 16 blocks which denote combinations of servo movements obtainable from various settings of channel reversing switches and rear Mixer switches 3 and 4 under the Mixer board. Note that when "V" tail controls are connected as shown in the Elevon drawing, Fig. 2, Block No. 13 of the chart will give proper "V" operation with switch positions shown.

Aileron-Rudder (AR) Mix Mode, Channels 1 & 4, and Rudder-Elevator (RF) Mix, Channels 4 & 2, are available on Special Order. Chart is not necessarily correct for these combinations.

IMPORTANT

When using Mixing, mechanical trim on these sticks may dictate that trims on mixed channels remain in neutral or undesired flight attitude changes may occur when channel trims are changed in flight.

Upon installation you may find it necessary to recenter either or both of the mixed servos to obtain desired correct center.

MIXER ADJUSTMENTS (FIGURE 1)

Four pots and two positionable switches on the Mixer board inside the Tx case provide a wide variation of Servo Mix, both by percentage and direction of servo travel.

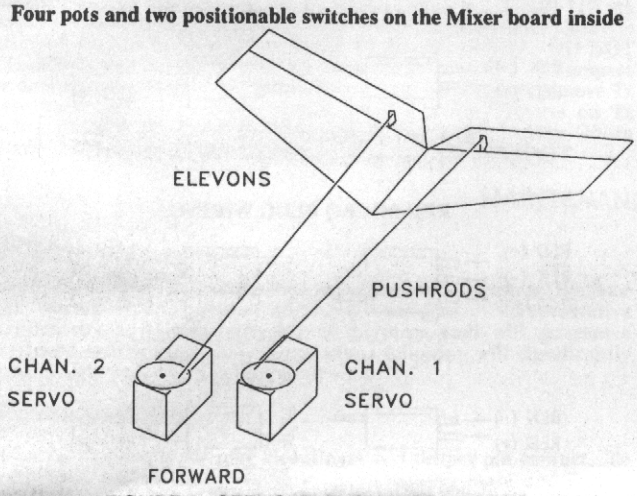


FIGURE 2. SERVO/ELEVON INSTALLATION

POT CONTROL FUNCTIONS

POT "A" controls CH1 throw, CCW provides max. servo throw with Aileron stick movement.

POT "B" controls amount of mix CH1 servo receives when CH2 stick is operated, max mix CCW.

POT "C" controls CH2 servo throw with elevator stick, CCW is max.

POT "D" controls CH2 mix from CH1 stick operation, max is CCW.

MIXER REVERSING SWITCH USE

Mixer drawing shows both Switches S3 and S4 in their OUTER positions. To change to INNER positions, carefully slide each shorting switch out and slide it onto its two inner contacts.

Switch S3, when reversed, changes rotational direction of CH 2 Servo WHEN MIXED FROM CHANNEL 1. Conversely, S4 reversal affects CH1 Servo direction when mixed from CH 2.

Channel Reversing Switches and Dual Rate Switches in the 900 Series Transmitters provide additional flexibility and virtual unlimited selection of mixing operations.

CHANNEL REVERSING SWITCHES (FIGURE A-SUPPLEMENT)

A Servo Reversing Switch is provided for each channel. Remove transmitter back for access. Channel 1 switch is on the left side. Channels 2 through 5 are progressively to the right. Slide the switch to its opposite position to reverse rotation of related servo.

END-POINT ADJUSTMENTS (FIGURE B-SUPPLEMENT)

Behind each Servo Reversing Switch is a small black pot with a hex center. The hex nylon tool supplied with the Tx fits this center opening. These pots are part of the Calibration System and can be adjusted slightly by the user to vary travel of each servo as needed. However, make only minor adjustments to these pots; they are accurately calibrated for correct throw at the factory. Be careful with adjustments or Tx recalibration may be necessary. Note: Access to the throttle pot is available with Tx back ON when the red button on rear of Tx is snapped out. Use nylon hex tool to set throttle limits.

SERVO OUTPUT MOVEMENTS IN NUMBERED BLOCKS OBTAINABLE WITH AE MIXER AND REVERSING SWITCHES

REAR MIXER SWITCH POSITIONS	TX STICK POSITIONS	REVERSING SWITCH POSITIONS			
		AIL. LEFT ELEV. LEFT	AIL. RIGHT ELEV. LEFT	AIL. LEFT ELEV. RIGHT	AIL. RIGHT ELEV RIGHT
LEFT OUTER	RT. AIL.	CW A CCW E	CCW A CW E	CW A CCW E	CCW A CW E
RIGHT OUTER	LT. AIL UP EL. DN EL.	OPPOSITE CW A CW E (1) OPPOSITE	OPPOSITE CW A CW E (2) OPPOSITE	OPPOSITE CCW A CCW E (3) OPPOSITE	OPPOSITE CCW A CCW E (4) OPPOSITE
LEFT OUTER	RT. AIL.	CW A CW E	CCW A CCW E	CW A CW E	CCW A CCW E
RIGHT INNER	LT. AIL. UP EL. DN EL.	OPPOSITE CW A CW E (5) OPPOSITE	OPPOSITE CW A CW E (6) OPPOSITE	OPPOSITE CCW A CCW E (7) OPPOSITE	OPPOSITE CCW A CCW E (8) OPPOSITE
LEFT INNER	RT. AIL.	CW A CCW E	CCW A CW E	CW A CCW E	CCW A CW E
RIGHT OUTER	LT. AIL. UP EL. DN EL.	OPPOSITE CCW A CW E (9) OPPOSITE	OPPOSITE CCW A CW E (10) OPPOSITE	OPPOSITE CW A CCW E (11) OPPOSITE	OPPOSITE CW A CCW E (12) OPPOSITE
LEFT INNER	RT. AIL.	CW A CW E	CCW A CCW E	CW A CW E	CCW A CCW E
RIGHT INNER	LT. AIL. UP EL. DN EL.	OPPOSITE CCW A CW E (13) OPPOSITE	OPPOSITE CCW A CW E (14) OPPOSITE	OPPOSITE CW A CCW E (15) OPPOSITE	OPPOSITE CW A CCW E (16) OPPOSITE

SWITCH POSITIONS LISTED ARE AS OBSERVED FROM REAR OF TX. SEE REAR PHOTO OF TX TO IDENTIFY SWITCHES AND POSITIONS. CW MEANS CLOCKWISE MOVEMENT OF SERVO OUTPUT ARM OR WHEEL; E FOR ELEVATOR SERVO. OPP. MEANS OPPOSITE ACTION OF SERVO . CHART IS CORRECT FOR NORMAL ROTATION (CW) SERVOS.

MIXER SWITCH CONFIGURATION CHART WHICH PROVIDES SELECTION OF SERVO MOVEMENTS FOR VARIOUS CONTROL ACTIONS (See Figures 1 & 2).

SPECIAL OPERATIONAL INFORMATION

GENERAL HINTS

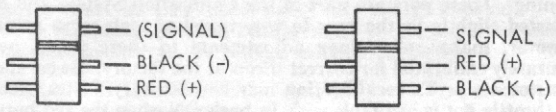
1. Although small, Super-Micro Receivers offer the same range and operational capabilities as larger equipment. With Micro servos they can operate the smallest aircraft; with larger, more powerful servos the system can control any size airframe.
2. Micro Receivers utilize a 30 inch antenna, other standard Rx antennas are 36 inch. If shortened, receiver RF coil(s) must be retuned. Expect somewhat reduced range.
3. Wires used on Micro equipment are 29 gauge, 52 strands; #26 gauge for others. Use special care in handling. Silicon rubber is helpful to prevent wire breakage at strain points.
4. Be sure receiver, servos and battery are properly shock-mounted to reduce vibration effects common in small models.
5. Super-Micro Servos are quite powerful, but we recommend restricting their use to 40 powered aircraft or smaller, and gliders up to 100-inch wingspan. Larger servos can operate any size vehicle.

PLUGS & CONNECTORS

Three types of 3-pin plugs and connectors are used on CANNON equipment: DEANS, BLACK Micro plugs and RED Micro plugs. All are polarized, but it is still possible to reverse servo and/or battery plug connections, which can be disastrous to both receivers and servos! Use extreme care to prevent this, and DO NOT APPLY POWER UNTIL ALL EQUIPMENT IS PROPERLY CONNECTED!

FIGURE 3. DEAN'S PLUG WIRING

Proper wire connections to these plugs are shown below, as well as standard ACE wiring to Dean's plugs. Note the diferences between plug wirings, especially ACE Dean's and CANNON Dean's. DO NOT INTERCONNECT UNLIKE PLUGS, OR THOSE WIRED DIFFERENTLY, OR EQUIPMENT DAMAGE MAY RESULT!! IMPORTANT! WHEN ORDERING EQUIPMENT BE SURE TO SPECIFY CANNON OR ACE WIRING.



STD. CANNON/DEANS PLUG WIRING

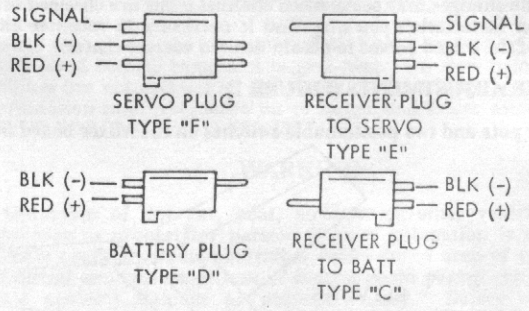
ACE/DEANS PLUG WIRING

MALE DEANS PLUGS SHOWN. FEMALE PLUGS WIRED SAME.

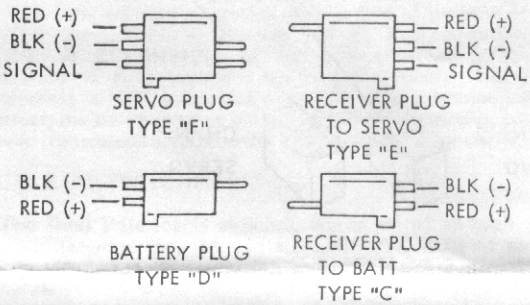
FIGURE 4. CANNON MICRO PLUG WIRING

CANNON MICRO Servos utilize special subminiature MICRO plugs, wired as shown. These plugs come in two colors, BLACK and RED, wired differently, therefore not compatible. Black plugs have been and still are standard on the original Micro receivers and servos starting in 1980, and continuing. Red plugs are standard on newer CANNON Narrow-Band equipment, but Black plugs are available on special order, as are Dean's plugs which can be wired CANNON or ACE, as specified. When ordering plugs, give plug color & type desired.

BLACK MICRO PLUG WIRING



RED MICRO PLUG WIRING



WHEN ORDERING MICRO PLUGS, BE SURE TO SPECIFY PLUG TYPE (TYPE "F", ETC.) AND PLUG COLOR.

Before plugging ANY servo into your system, make certain plug types, color and wiring are compatible. WE ASSUME NO RESPONSIBILITY FOR DAMAGE OR INCORRECT OPERATION RESULTING FROM MISMATCHED PLUGS OR WIRING!

BATTERIES

NICAD BATTERIES

All CANNON units use nickel-cadmium batteries, fast charge (C/3) type. Transmitters use 500 mah pencells, 9.6V; a choice of 75, 110 or 270 mah (4.8V) are available for Receiver packs.

NICAD BATTERY CHARACTERISTICS

Batteries are the source of most equipment problems and should receive the most attention. In case of malfunction, ALWAYS CHECK BATTERIES FIRST.

Battery voltage should be measured under load with a voltmeter, that is, with transmitter turned ON, receiver and servos connected, and Rx battery switch ON. Tx batteries should indicate a minimum of 9.6V, Rx batteries 4.8V. If voltage is lower, charge system completely, then recheck. If low voltage condition persists, check voltage of each individual cell UNDER LOAD. Any cells reading less than 1.2V fully charged should be replaced.

More accurate condition of nicads can be ascertained by charging batteries fully, then discharging over a period of time into a fixed load which provides a specified discharge rate, such as 270, 350 or 500ma. Battery condition is rated on discharge time (minutes) required for the battery to reach a critical voltage level, nominally 4.4V.(for 4.8V battery). Battery testers on the market such as the Taylor Power Pacer are designed to perform this function. The longer the discharge time, the better the condition of the battery. Comparison of this discharge time against a known standard provides an approximate indication of battery condition. Don't interpret results too literally.

After charge, receiver battery voltage may "top out" as high as 5.5 volts under load. Within a few minutes use this will drop to 4.8 - 5 volts, where it remains virtually constant until charge is depleted.

After depletion to the 4.4V critical level, nickel-cadmium battery voltages drop very rapidly, practically to zero. Under no condition should battery be used beyond depletion; over-discharge may cause cell reversal and permanent damage.

If battery voltage after charge is below 4.8 volts, cell(s) are either defective or worn out, charger may be defective, battery may have been reverse-charged, or a short may exist in the equipment. A wiring or equipment short usually will be indicated by overheating of wires to battery pack.

Transmitter battery voltage may top-out as high as 11 volts under load, but will drop to 9.6 volts with use. If voltage after charge is less than 9.6 volts, check individual cells or charger for fault.

Other than voltage measurements taken at each individual cell under load, no positive means is available to determine when either a charged or discharged state exists. For this reason, batteries must be charged at 40-50 ma rate long enough to insure a full charge.

CHARGING OF NICAD BATTERIES

Nicad cells supplied with CANNON equipment have a fast charge (C/3) rating, making it possible to use a normal charge current equal to 1/3 of normal cell capacity, if desired. Slower charge rates result in maximum battery life, maximum cell charge and high efficiency.

CANNON chargers supply 45-50 milliamps current output and can be used to obtain full battery charge in 12-14 hours. Smaller cells (75, 110 mah) require a charge reducing resistor to limit charge current and avoid cell damage. Under these conditons, batteries can be left on charge for longer periods without damage.

Fast charge in the field can be used providing cell capacity/charge rate/time is not exceeded. The CANNON Auto-Charger can be used for fast field charge of small cells to a maximum time limit of 15

minutes. When charging, monitor battery temperature; excessive charge current and resulting heat can damage cells.

NICAD CHARGING PROCEDURE

FLITE PACK CHARGING. A single-output charger supplies 40-50 ma at proper voltage to charge a 4-cell Receiver nicad battery. Model 800 batteries connect charger directly to plug on end of battery cable, using Adapter (270 mah cells) or Charge Reducer (75 & 110 mah cells). Turn switch ON and plug charger into wall socket. There is no visual charge indicator.

MODEL 800 SYSTEM CHARGING. A Dual Output charger, with LED indicators, provides proper voltage and current (40-50 ma) to charge both Transmitter and Receiver batteries either simultaneously or individually. Unit plugs into charge socket on Tx; Tx switch must be OFF. Other lead plugs into Rx cable as with Flite Packs. Rx switch must be ON to charge. Note that an Adapter or Charge Reducer may be required, as above.

MODEL 900 SYSTEM CHARGING. Same type Dual Charger is used, but with audio plugs on ends of charge cables. Units plug directly into Tx and Rx charge receptacles; Switches must be OFF to charge. Charge Reducers are built in the switch on 75 and 110 ma packs to limit charge current to safe levels. A protective diode is installed on 270 ma packs and in the Tx Charge circuits. DO NOT CHARGE either Transmitter of Rx batteries IN EXCESS of 1 ampere or damage could result. If higher charge rates are desired, remove Tx case back and make charge connections to center contacts on Tx switch (Switch OFF) and to cable end of Rx battery (switch ON to charge). When charging at acelerated rates DO NOT PERMIT BATTERIES TO OVERHEAT.

CHARGING 75 AND 110 MAH BATTERIES. Charge limiters reduce current to a safe level to these batteries when charging. As a result, charge current is too low for charger LED's to light. Charger operation can be checked by momentarily shorting across the charge limiter resistor or inserting the audio charge plug SLOWLY into the Rx charge receptacle and observing a momentary lighting of the LED. Do not permit either short to remain!

Except for the Auto-Charger, 12-14 hours should provide a full battery charge. Extended charge times will not damage batteries or charger. Cells used are C/3 (fast charge) type. 270 ma packs can safely be charged at 50 ma.

BATTERY FLIGHT LIFE

Proper battery size selection will assure best operating results. Use the largest battery your vehicle can carry to obtain max. operating time. Smaller batteries can be used for weight conservation with a sacrifice in operating time. Battery drain is directly rated to number of servos in operation and frequency of use. See chart below.

EXPECTED FLIGHT LIFE (MINUTES)

BATTERY	2 CH	3 CH	4 CH
75 mah	30	25	20
110 mah	50	40	30
270 mah	150	120	90

MAINTENANCE PROCEDURES

GENERAL

A rigidly-followed inspection and maintenance program by the user will increase equipment reliability ten-fold. Preventative maintenance is simple and easy to perform, and will guarantee continued system operation. Suggestions following will significantly reduce equipment visits to the repair shop.

PLUGS AND WIRING

Check occasionally for plug cleanliness and proper pin contact. To clean pins, use electronic tuner cleaner on both male and female contacts, with fine sandpaper as required. Use pointed end of an Xacto knife to close up the female contacts and restore tension.

Keep a close eye on condition of wiring throughout the system. With use and vibration, wires tend to fray and break at points of connection to receiver and servos, especially at the plugs. Application of silicone rubber to wire connection points is helpful in preventing breakage. Inspect connections regularly, especially at plug solder terminals, motors, servo pots, etc. for signs of fraying or vibration damage. Resolder any questionable connections whenever discovered. Replace any wiring which shows signs of insulation wear.

SERVO PROBLEMS

"Jumpiness" (failure to follow commands smoothly) and erratic operation are two of the most common indications of servo problems. These are usually the result of dirty feedback pots, insufficient wiper contact, or wiper loose on holder.

Servo running to one extreme may be due to a bad component, pot or wiper, defective transistor or I.C., or most usually, incorrect centering of servo. In an attempt to obtain correct centering, many modelers turn the output adjustment too far, causing the servo to travel to full stop position.

Many problems are mechanical, notably gears and motors. If motor will not run when free of gearing, check voltage at motor terminals. If voltage (2.5 or more) appears at termainals but motor does not rotate, motor is defective. If no voltage appears, servo amplifier, wiring or related circuitry may be defective.

SERVO GEARS

Occasionally servo gears will become noisy or damaged due to crashes, hard landings, exposure to fuel, or other "gremlins". In such cases, disassemble servo and inspect each gear carefully under high power magnification to locate burrs and bent or broken gear teeth which impair operation. Replace imperfect gears when found.

SERVO MOTORS

Like all mechanical items, motors are subject to wear and eventually may need replacement. If one servo becomes noticeably slower and less powerful than the others or runs slow one direction, check gears first, then the motor. Often a motor can be rejuvenated for a period of time by applying TV tuner cleaner (lubricant) to the motor bearings. Replacement motor parts are not available; if defective, the entire motor must be replaced.

POTS AND WIPERS

These are a major cause of servo problems. Periodic cleaning, adjustment and lubrication of these items can reduce repair costs considerably Upon disassembly of servo pot section, if needed adjust wiper contacts upward to assure good wiping action on servo element. Make sure wiper is securely attached to wiper plate, without wobble. Tighten if necessary. Lubricate sparingly.

CLEANING SERVOS

Amount of servo use will determine the need for cleaning. We suggest that for every five to ten hours of operation the servos be disassembled, cleaned, inspected and lubricated. Proceed as follows:

1. Open servo case to allow access to gears, motor, feedback pot and amplifier. Note correct assembly of unit; use special care on Micro servos.
2. Under magnification, inspect all wiring for signs of fraying or breaks, especially at pot, motor terminals, P.C. board and servo plug. Resolder any bad or frayed connections; replace all wires not in perfect condition.
3. Remove feedback pot. Inspect very carefully for signs of element wear, center contact wear, cracks or wiper element impregnation. Clean pot with a soft cloth, using lacquer thinner or TV tuner contact cleaner. Be certain all foreign matter is completely removed from surface of pot element. Replace element with new unit of correct value if defects are apparent.
4. Check spring wiper contact for cleanliness, wear or deformity. Clean as necessary. Replace wiper if flat spots show at contact points. Be sure spring tension of wiper against pot element is adequate to insure perfect contact, even under vibration. Make certain wiper is firmly attached to wiper plate, WITHOUT WOBBLE.
5. Spread a very thin film of lubrication all contact surfaces of pot element. This is very important to insure maximum trouble-free pot life. You can use special pot lube, silicone grease or vaseline, as available. When reassembling pot, make sure everything is in correct position and alignment and solid wiper contact is made.
6. Check gear operation by manual rotation of output shaft and gears. While gears are being turned, look, listen and feel for possible gear defects. Hard-to-turn gears may indicate bad teeth or swollen gears, with consequent binding. A clicking noise usually means one or more bad gear teeth exist. Inspect gears thoroughly under magnification for visual signs of damage or other possible trouble.
7. Inspect amplifier to make sure no adjacent parts on board are liable to short together. Silicone rubber at wire terminals and potential shorting points is good insurance.
8. Check servo operation, center as necessary and reassemble servo. As needed, install foam tape or plastic pads between amplifier and pot, motor, etc. Route wires properly to avoid pinching. Recheck servo operation after assembly is complete. Be sure servo is reassembled EXACTLY as it was!

CHANGING TRANSMITTER STICK MODES

Should your transmitter be a 4-channel Mode II and you desire to change it to a Mode I (or visa-versa). Proceed as follows:

1. Remove the Tx rear cover. Take out the four screws holding each rear stick cover. Slide off both covers.

2. Slip out the two outside bails and end plates, being very careful not to change position of adjustment levers. Position these assemblies to one side.
3. Carefully slip out the two inner bail assemblies. Do not change adjustment lever positions!
4. Transpose positions of the two inner bail assemblies in the two sticks. Place what was the LH bail in the inner bail position on the RH stick. Put RH bail in LH stick. The attached wires are normally long enough for this change-over. It is possible that cable lacings may require cutting to permit sufficient cable displacement.
5. Reassemble the two outer bails in their original positions. Make sure rear stick ends mate with the bails. Verify correct operation before replacing stick covers.
6. Check servo action on the transposed elevator and motor channels. It is possible that a minute repositioning of the two bail adjustment levers may be necessary to obtain correct servo centering and throw.
7. An alternate method of changing modes is to unsolder all stick wires, transpose positions of the two stick assemblies in the case, then rewire the sticks. This necessitates recalibration of the controls and rearranges the channel functions. When blocks are involved, a change in logic output is required to insure correct servo usage.

REPAIR SERVICE

WARRANTY REPAIRS

All Warranty Repairs will be performed by the facility whose name appears on this Instruction Manual. This is the address to which you send your warranty card and equiment for repair.

If equipment is returned to Factory under warranty, BE SURE to mark "WARRANTY" on outside of package to insure prompt attention.

AUTHORIZED SERVICE CENTERS

A list of Authorized Service Centers is included with your new equipment or repair, or is available upon request. (Send S.A.S.E.). Except for Warranty Repairs, please utilize the Center nearest you whenever possible. Since Service Centers are privately owned and operated, the Factory assumes no liability or responsibility for charges or services performed by these Centers.

PACKING FOR SHIPMENT

Pack all units, securely padded and protected, in a strong cardboard container of adequate size. Enclose a list of items shipped, together with specific, detailed descriptions of equipment problems and/or work required. On outside of package, clearly mark package with both TO and FROM addresses (2 places each). Send equipment directly to the Service establishment. NOT TO THE DEALER! Be sure to enclose the Warranty Registration card. Enclose charger or charge adapter if your battery charging method is a non-standard CANNON arrangement.

On parcels being returned from outside the U.S.A., please include the following statement in BOLD TYPE on outside of package. "EQUIPMENT OF U.S. MANUFACTURE BEING RETURNED FOR SERVICE". Be certain to indicate package value below $250.00 U.S. Otherwise duties may be levied, for which you will be charged.

REPAIR POLICY

Warranty cards on new units must be returned within 10 days to activate your warranty. Cards must be on file in the name of the individual to whom originally sold. Our mail and information lists are derived from your Warranty Cards. "Dealer Demonstration Units" are not covered by Warranty unles warranty cards are on file.

After completion, repairs may be shipped C.O.D., if specifically authorized in advance by Customer. Otherwise, you will be notified of repair charges for prepayment prior to shipment. Visa and Master Card not accepted for repair costs.

REPAIR SHIPPING COSTS

Repair shipping costs are to be paid by customer, both ways. Adequate return shipping costs should be included with all repairs to save possible C.O.D. return charges. Typical return S & H costs; Systems, $9.50; Flite Pack, $7.50; $4.50 for Smaller Items (UPS Ground). Extra charge will be made for Air delivery.

ESTIMATES

Repair estimates are usually not economically feasible without wasting excessive time, which must be paid by the customer. Our policy is to keep repair costs as low as possible. Current Factory rates are $12.00.minimum repair charge or $30.00 per hour, plus parts, shipping and handling.

SYSTEM SCHEMATICS

These are available for all Cannon or Charlie's Systems (past or present) at $5.00 plus $2.00 S&H (in U.S.A.) or $4.00 (Foreign). No C.O.D.'s Specify in detail:. Equipment type, or Model, year, channels, frequency, Tx & Rx types, servo type, battery type and size, 3 or 4 wires, etc. Photos are helpful in identifying units.

REPAIR WARRANTY

Repairs are warranteed for a period of 30 days from date of repair shipment. This warranty applies only to specific parts replaced, not to other related parts. Example: if we replace one specific transistor in a unit, the warranty covers this transistor only, not some other part which might fail later. Also repair warranties do not cover items on which we have not performed a specific repair.

In order to avoid problems, we recommend the following procedure upon receipt of a repair.

1. Charge batteries fully.
2. Connect entire system and operate all functions.
3. If a malfunction is discovered, return the component (or system) immediately with a note explaining the problem. Sometimes a prior phone call will solve your problem.

REMEMBER: Your repair warranty is for 30 days only.

A Technician Class (or higher FCC Amateur License) is required to operate on the 50 and 53 MHz bands. License application forms can be obtained from your local FCC office.

LIMITED WARRANTY

FACTORY-BUILT SYSTEMS AND FLITE PACKS ARE WARRANTED TO THE ORIGINAL PURCHASER TO BE FREE OF DEFECTS IN MATERIAL AND WORKMANSHIP FOR A PERIOD OF 180 DAYS FROM DATE OF PURCHASE.

WARRANTY IS NOT APPLICABLE TO DAMAGE OR DEFECTS IN FACTORY-BUILT EQUIPMENT RESULTING FROM ABUSE, MISUSE, INCORRECT BATTERY POLARITY, ABNORMAL OPERATION OR CRASH DAMAGE. WARRANTY DOES NOT COVER INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM OR CAUSED BY EQUIPMENT FAILURE OR A DEFECT IN MATERIAL OR WORKMANSHIP.

WARRANTY DOES NOT COVER DAMAGES OR INJURY RESULTING FROM INTERFERENCE DUE TO OR CAUSED BY IMAGE FREQUENCIES, 3RD ORDER I.M.PRODUCTS, OR BY PUBLIC OR COMMERCIAL EQUIPMENT OPERATING ON OR NEAR YOUR FREQUENCY. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS, WHICH VARY FROM STATE TO STATE.

LIABILITY UNDER THIS WARRANTY IS LIMITED TO REPAIR OR REPLACEMENT, WITHOUT CHARGE, OF THE DEFECT OR DEFECTIVE PART AT THE FACTORY OR FACTORY AUTHORIZED WARRANTY STATION. SHIPPING AND HANDLING CHARGES ARE EXTRA, AS ARE OTHER REPAIRS. ANY MODIFICATION, ALTERATION, TAMPERING OR ATTEMPED UNAUTHORIZED REPAIR OF THIS SYSTEM OR UNIT AUTOMATICALLY VOIDS THE WARRANTY.

A VALID WARRANTY IS CONTINGENT UPON CUSTOMER RETURNING THE REGISTRATION CARD WITHIN 10 DAYS OF PURCHASE DATE. RETURN OF THIS CARD ALSO QUALIFIES YOU FOR NEW CATALOGS, UPDATE INFORMATION AND INSTRUCTIONAL DATA. NEITHER THE FACTORY NOR ITS REPRESENTATIVES ASSUMES ANY LIABILITY OR RESPONSIBILITY FOR LOSS OR DAMAGE INCURRED OR INFLICTED DURING OPERATION OF CANNON OR CHARLIE'S R/C EQUIPMENT OR RELATED DEVICES.

NOTE: A TECHNICIAN CLASS (OR HIGHER) AMATEUR LICENSE IS REQUIRED TO OPERATE ON 50/53 MHZ.

One Supplemental sheet showing transmitter internal controls and adjustments comes with this instruction sheet, or will be sent at no charge upon receipt of Self-Addressed Stamped Envelope.

Procedures covering more detailed Receiver Tuning are available ($2.50 + $1.50 S&H). Transmitter Calibration and Tuning Instructions are $3.50 + $1.50 S&H. Calif. Sales Tax Applicable.