

Instruction Manual For

KRAFT and PCS

Proportional

Radio Control Systems

Your Kraft proportional system is a product of the largest and most experienced company in its field. It is an evolutionary improvement over its famous predecessors which have dominated the contest circuit for years. You may wish merely to enjoy the radio control sport without competition, but you have the assurance that your progress is not limited by the performance of your radio equipment.

We at Kraft Systems have done everything possible to insure you of the most reliable, precise equipment permitted by the state of the art in electronic development. Equally important, we are dedicated to service to you, our customer.

Please read the following instructions thoroughly. The successful operation of your system depends on its proper use and installation.

CHARGING BATTERIES

Charge batteries at least 24 hours before use. Do not worry about overcharging. The output of the built-in charger has been factory adjusted to permit continuous charging without cell damage.

It is desirable, when possible, to charge at least 24 hours before a flying session regardless of whether or not the set has been operated after the last full charge. Do not be concerned about so-called cell "memory" as this cannot occur in this application.

For those who operate more than one airborne package, a separate receiver pack charger is available from the factory.

Step by Step Charging Instructions

1. Insert charging plug adapter into battery pack plug.
2. Plug charging cable into the battery pack and receptacle in bottom of transmitter.
3. Be sure transmitter switch is turned off.
4. Plug line cord into transmitter and then into 110 volt AC 60 cycle standard wall receptacle. Do not use 220 volt or other non standard electrical source.
5. Be sure red charge indicator light on back of transmitter is illuminated.

Charging Instructions for the Lightweight 225 ma KB-4C Battery Pack

This pack must be charged at a lower rate than the standard KB-4B pack. Therefore IT CAN NOT BE CHARGED WITH THE TRANSMITTER. A special charger is available for the KB-4C pack and must be used with it to avoid cell damage. Included with the charger is a shorting plug to permit separate charging of the transmitter.

Plug the charger into the pack, observing plug polarity (wide space). Then plug the line cord into a standard 110 v. socket. The lighted bulb visible through the small hole in the end of the charger indicates the pack is charging.

Plug the shorting plug into the bottom of the transmitter and then the line cord into the transmitter. Plug the line cord into a 110 v. socket and the charge indicator light in the back of the transmitter will light. Charge for at least 24 hours.

EQUIPMENT INSTALLATION

Our past experience indicates that over 80% of customer complaints concerning erratic control response, lack of range, etc., are due to improper installation. PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

Servo Installation

We recommend that servos be mounted on $\frac{1}{4}$ " x $\frac{3}{8}$ " hardwood (maple or beech motor mount stock) rails spaced exactly $2\frac{5}{8}$ " apart for the KPS-9 servo and $1\frac{7}{8}$ " apart for the KPS-10. A spacing guide

approximately 3" long and the appropriate width for either of the above servos may be cut from $\frac{1}{8}$ " sheet balsa and is helpful in maintaining proper spacing and alignment of the servo mounting rails during installation. Position the mounting rails to permit at least $\frac{1}{16}$ " clearance between servos, fuselage sides, top and bottom, etc. After the rails have been securely mounted, position servos and mark the location of mounting screw holes. With a small rat tail file, notch one rail approximately $\frac{1}{8}$ " deep to allow clearance for servo plug wiring. Drill $\frac{1}{16}$ " clearance holes for the No. 4 sheet metal mounting screws supplied. The mounting screws should be tightened until the screw head contacts the grommet and then tightened one-half turn more. This provides proper servo vibration and shock protection. Do not over tighten mounting screws.

Custom molded KHP servo mounting brackets are available from your dealer.

See drawing for suggested methods of push rod attachment to servos.

Note: When KPS-10 servos are used note that two of them have dots under one mounting flange. These servos travel opposite the other two servos for convenience in installation.

Battery Installation

Nickel-Cadmium rechargeable cells may be damaged internally if subjected to excessive vibration or shock. Wrap battery case in the plastic bag provided to protect against fuel damage. A minimum of $\frac{1}{2}$ " foam rubber on all sides should be provided for pro-

tection. Generally, it is desirable to mount the battery pack in the engine fuel tank compartment underneath the tank.

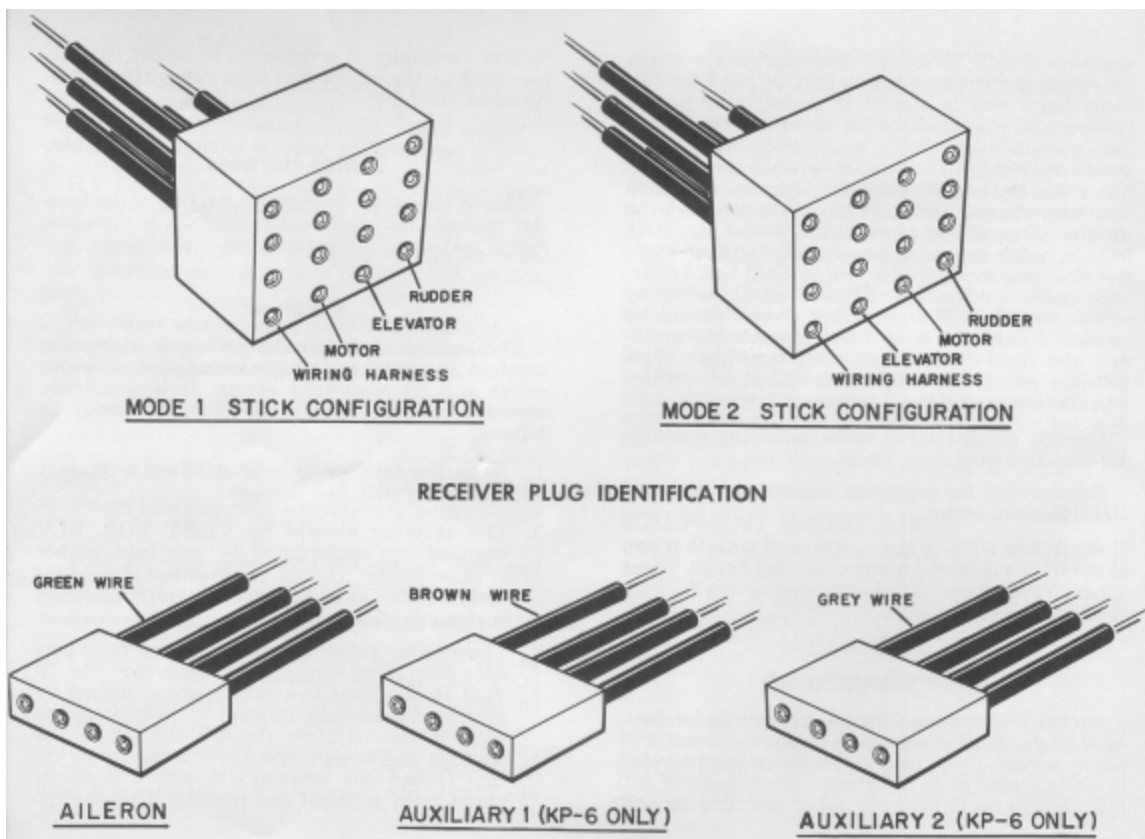
Switch Harness

Mount the switch harness on the side of the fuselage opposite the engine exhaust and in an area providing maximum protection from fuel and oil.

Receiver

The success of your radio system is highly dependent on careful and proper installation of the receiver and its associated wiring. It is absolutely essential that the receiver be mounted exactly as follows:

1. Wrap the receiver in a plastic bag to protect against possible fuel damage.
2. The receiver should be VERY LOOSELY wrapped in a minimum of $\frac{1}{2}$ " soft foam rubber or foam plastic. Do not use so-called shock protecting foam pad as this gives no protection from engine vibration.
3. The receiver antenna must be kept as far as possible from other wiring, metal push rods, etc. In most installations this can be accomplished by running the antenna forward 1" to 2" from the receiver then straight through the top of the fuselage and canopy and back to the tip of the fin. Thread the antenna through the plastic strain relief supplied and position it on the an-



tenna to allow a little slack between the receiver and the exit point through the fuselage.

In some cases it may be desirable to run the antenna out the side of the fuselage and back to the tip of the stabilizer or to the top of the fin. The primary concern is to keep the antenna as far as possible from the rest of the installation. The antenna should be tied at the end to a rubber band to provide slight tension to take up slack and prevent damage.

Important: Do not shorten the antenna or fold it back along its length. If necessary tie it at an appropriate point along its length and let it trail aft. *Caution:* Keep the receiver case clear of the switch harness and other wiring. Route the plug wiring neatly aft and wrap the block plug assembly and plugs in foam rubber. Wedge the foam rubber wrapped plugs in place underneath or in front of the servos. Protect all plugs from dirt and oil.

THE AIRCRAFT

The mechanics of the control system are as important as the radio installation in obtaining successful operation. Excessive electrical noise generated by metal to metal connections may seriously reduce the operating range of the system. It is suggested that both for convenience and noise prevention that adjustable nylon clevises be used on push rod ends. This is particularly important at the connection of the engine throttle arm to the throttle push rod and at the nose gear steering arm.

The switch used to energize electric breaks can be a source of electrical noise. Bypass switch contacts with a .05 uf. disc ceramic capacitor.

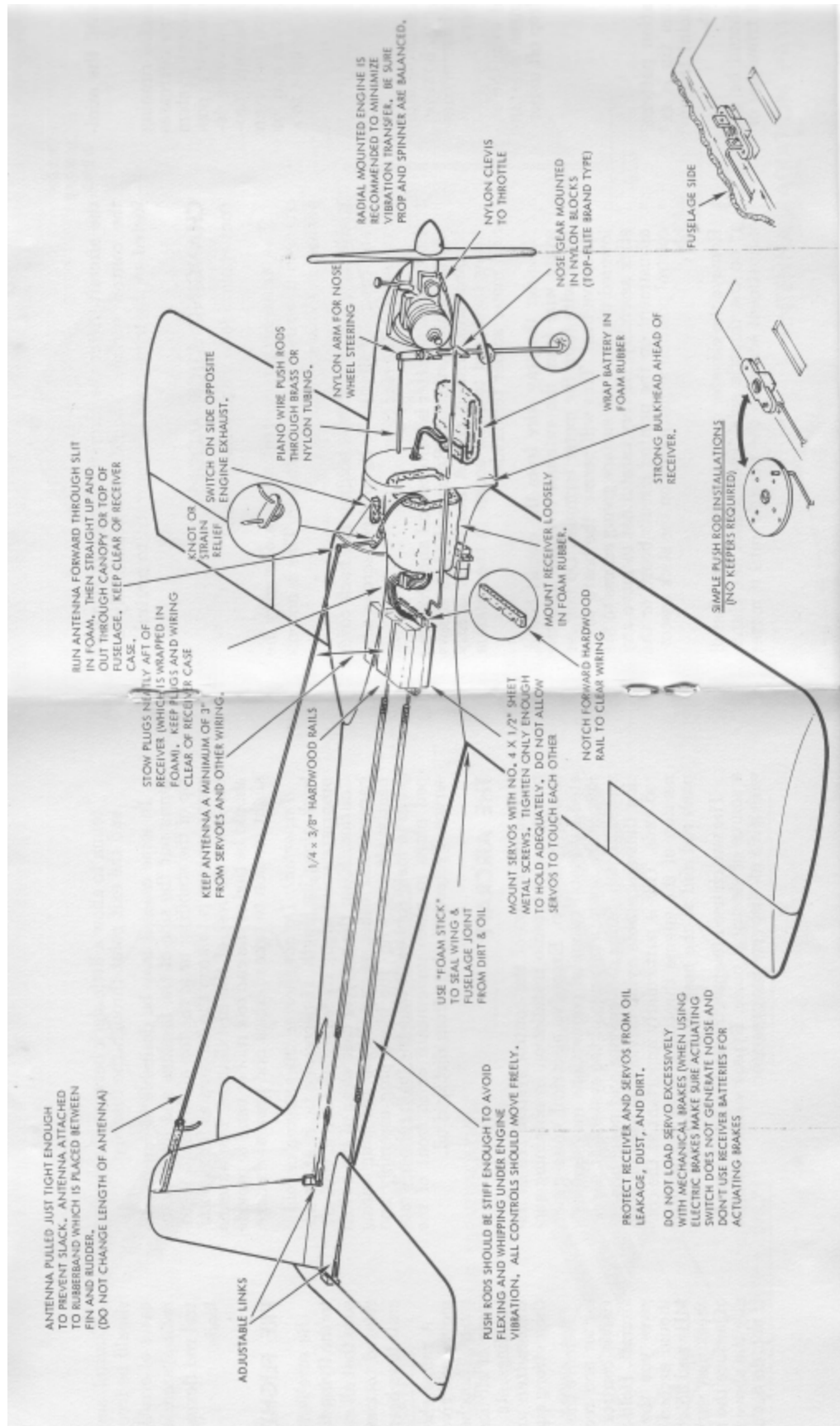
Control surfaces must move easily yet linkage should be free from excessive play or flexing. Many cases of erratic control response are blamed on the radio system when actually, they are caused by control rod flexing or whipping under vibration and air loads.

PRE FLIGHT CHECK

Be sure batteries are fully charged. Before going to the flying field recheck control operation making sure that all surfaces move in the proper direction as related to transmitter controls. A great many aircraft have been crashed due to reversed ailerons.

A range check with the transmitter antenna removed will give a good relative indication of airborne range. This check must be performed in an open area clear of all obstructions, power lines, metal fences, buildings, etc. Do not attempt this check when other transmitters are being used in the immediate area as their strong signals will interfere.

Remove the transmitter antenna, switch on transmitter and receiver, and while operating an easily visible control surface slowly back away from your aircraft. Hold your transmitter in the position that gives you the maximum antenna off range. This should exceed 8' for the 27 MHz range, 18' for 52 MHz and 25' for 72 MHz. The range attained in this check may vary considerably depending on the type of surface the aircraft is sitting on. However, generally the above minimums will be obtained with ease. If not, do not attempt flying. Recheck your installa-



tion. If necessary reposition wiring until the minimum ranges are obtained.

Repeat the above tests with your engine running through its entire speed range. If range decreases materially some part of your mechanical system may be causing excessive electrical noise or it is possible some part of the electronic system may be defective. Loose engine mounts, out of balance propellers, etc., can create so much vibration that even the high vibration resistance of the system may be exceeded. In any case vibration should be kept to a minimum for long system life.

TRANSMITTER

The RF indicator meter provides a relative indication of transmitter output. It does not, however, give an accurate indication and is not a basis of comparing performance between transmitters.

The initial reading should be noted with the antenna extended. If this reading changes substantially in the future it may indicate a drop off in performance.

FIRST FLIGHTS

Note drawing of transmitter radiation pattern. Observe that output from the antenna tip is extremely low. For this reason do not point the antenna toward the aircraft during flight.

An experienced proportional flyer should be enlisted to perform the initial flying and trimming of

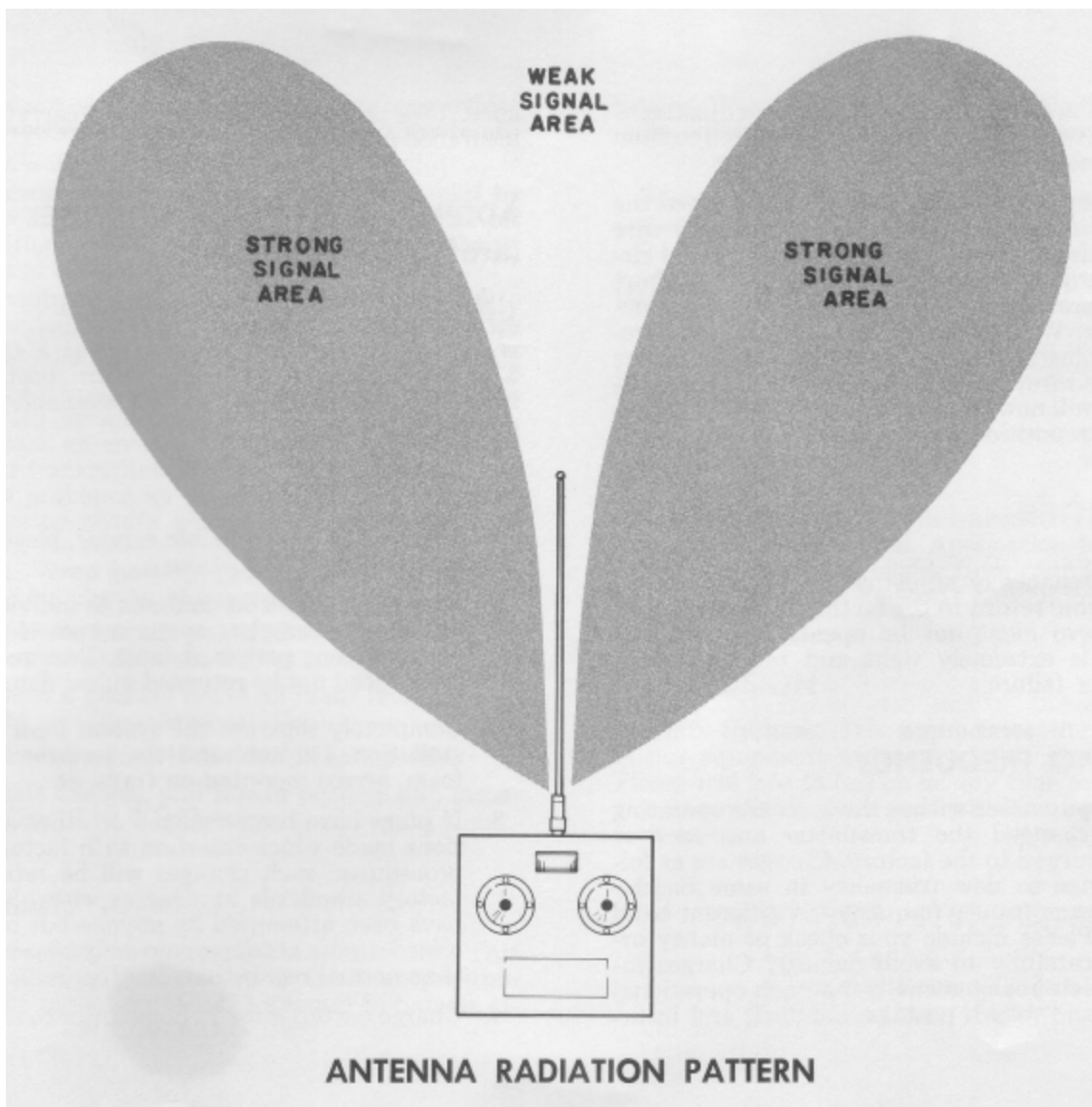
the aircraft. After the aircraft is properly trimmed the control surfaces should be mechanically adjusted so the trim levers are returned to neutral.

CHANGING STICK MODES

(not applicable to single stick models)

The transmitter control stick mode may be changed if desired by the purchaser. This is accomplished as follows:

1. Remove the four screws holding the back cover and carefully slip it off. Keep these screws separated with the rear cover.
2. Be sure transmitter is switched off and charging cords are not connected. Remove the four screws holding the printed circuit board and gently lower the board to allow access to the antenna and meter solder terminals.
3. Unsolder the gray wire from the circuit board, white wire from the antenna terminal and the black wire from the meter terminal. Do not use excessive heat. This will permit the board to be lowered to your work surface giving access to the stick assembly. Be very careful not to move any adjustment on the printed circuit board or the control position adjustments on the stick assembly.
4. Remove the elevator centering spring and install it on the throttle side. Then loosen the clutch adjustment screw on the throttle until it moves



freely. Carefully tighten the clutch adjustment on the new throttle position until desired tension is obtained.

5. Resolder the black wire to the meter lug and the white wire to the antenna lug and the gray wire to the circuit board. Reposition the printed circuit board and fasten in place with the four short screws previously removed. Install the rear cover. *Note:* Whenever the transmitter mode is reversed plug the previous elevator servo into the previous throttle socket and vice versa. Servo direction will now be reversed also. It will be necessary to reposition push rods on the appropriate outputs.

SERVO

No maintenance or adjustments are required. In case of trouble return to the factory for service. The KPS-10 servo must not be opened as electronic packaging is extremely tight and tampering can easily cause failure.

CHANGING FREQUENCY

If the purchaser wishes the system's operating frequency changed the transmitter and receiver must be returned to the factory. Charges are as follows: Change to new frequency in same band - \$22.00. Change to new frequency in different band — \$42.00. Please include your check or money order. Pack carefully to avoid damage. Charges include complete realignment, a thorough operational check out and return postage, handling and insur-

ance. (We use a private carrier and carry our own insurance policy.)

ADDING ADDITIONAL CHANNEL (Kraft Units Only)

Additional control channels may be added to your set up to the maximum 6 channels available. Service is available from the factory only at a charge of \$35.00 per channel including return postage and insurance. Additional servos are available at your dealer.

REPAIR SERVICE

To insure the best possible service, please follow these step by step instructions.

1. Except for problems confined to individual servos, return complete systems even if you suspect only one part is at fault. Transmitter antenna need not be returned unless damaged.
2. Completely separate the system from your installation. Do not send the receiver taped in foam, servos mounted on trays, etc.
3. If plugs have been changed or other modifications made which interfere with factory check procedures, such changes will be returned to factory standards at your expense. If repairs have been attempted by anyone but our authorized repair stations, you may expect higher than normal repair charges.
4. Charge batteries for 24 hours prior to shipment.

This not only expedites repair but also provides our technicians with a good check on the condition of your battery packs.

5. Disconnect the receiver battery pack and be sure to tape the transmitter switch in the off position to prevent the possibility of it being turned on during shipment.
6. Carefully pack all components individually with sufficient packing material to avoid shipping damage.
7. Write a brief but thorough explanation of difficulties encountered and service required. Enclose in an envelope and tape it to the back of your transmitter. We are at your service to discuss problems by telephone but *a written description should always be included with repairs*. Be sure to label servos as to their function. Wrap battery pack to avoid accidental shorting during shipment.
8. Be sure to include your full return address and zip code inside box as well as outside.
9. Include a packing list of all items returned and make sure they match the list.
10. If airmail return is desired please specify.
11. Repair charges, and return postage and insurance will be billed C.O.D. only.

WARRANTY

Packed with your system is a warranty card. This must be filled out and mailed to the factory within 10 days of purchase date for warranty to become ef-

fective. Your Kraft or P.C.S. proportional system is guaranteed against defective workmanship and materials for a period of 90 days from date of purchase.

The warranty does not include responsibility for any transportation expense.

WARNING

Any evidence of tampering with or modifications to any part of this system automatically voids all warranties.

FCC LICENSE

It is illegal to operate this transmitter without the appropriate FCC license. Application forms for licensing are usually available from your dealer or the nearest office of the Federal Communications Commission.

CONCLUSION

Kraft Systems, Inc. appreciates the confidence in our equipment which prompted your purchase. Please feel free to call on us any time service or advice is required. Your good will is our most important asset.

KRAFT-P.C.S. SYSTEMS, INC.

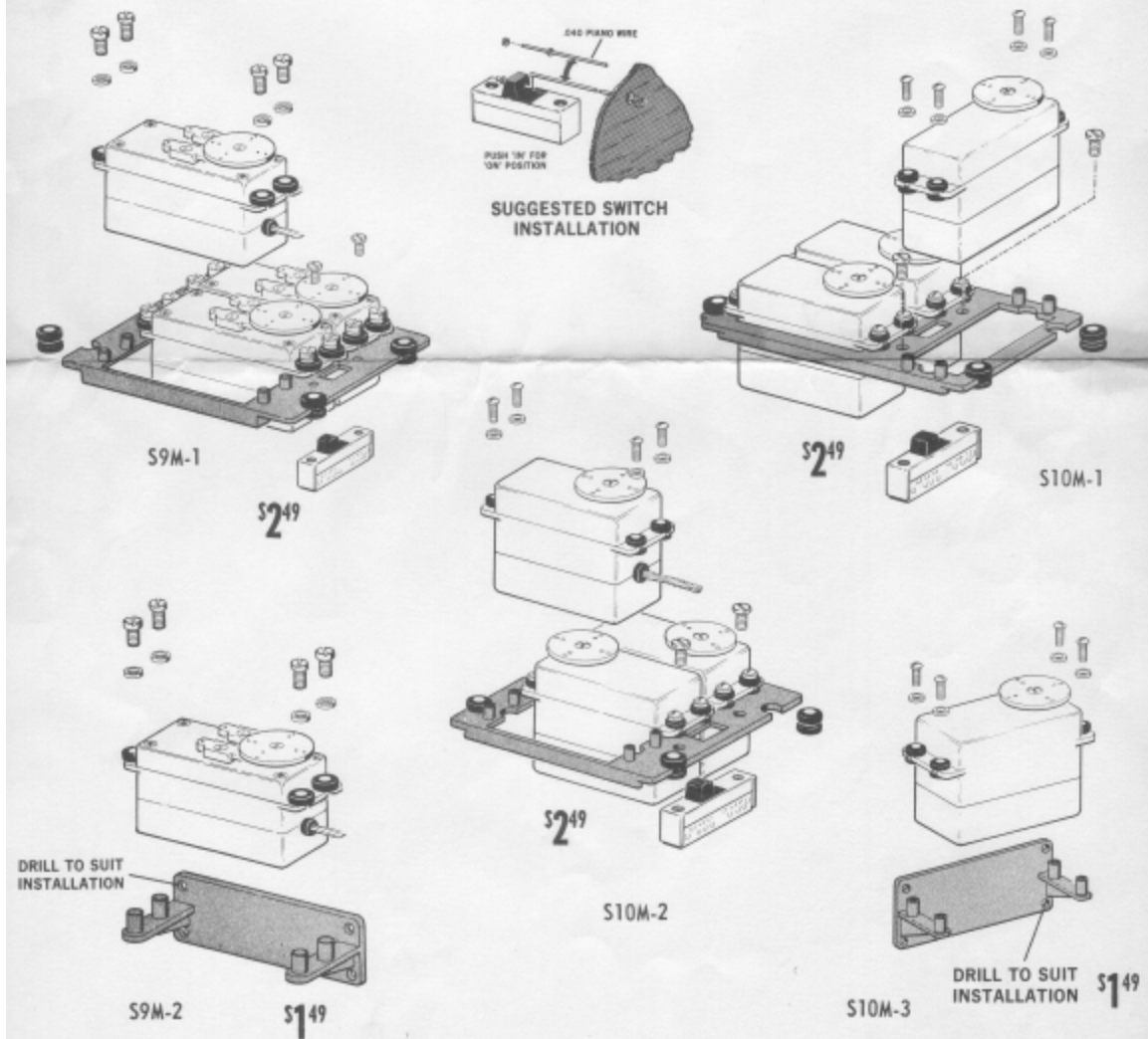
450 W. California Street
Vista, California 92083
Telephone (714) 724-7146

MOUNTING TRAYS FOR KPS-9 AND KPS-10 SERVOS

KHP Servo trays provide convenient mounting in most installations. They also insure maximum vibration protection through automatically correct mounting spacing and additional cushioning. For increased reliability, they are highly recommended.

Trays are furnished complete with all mounting hardware.

Please order by stock number.



KRAFT-HAYES PRODUCTS, INC. • 450 W. California St. • Vista, California 92083 • Phone (714) 724-7146

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CHECK LIST

- ☒ Transmitter
- ☒ Receiver
- ☒ (4) Servos *KPS-9*
- ☒ Battery Pack
- ☒ Antenna
- ☒ 2 Charger/Cords
- ☒ Switch Harness

MISCELLANEOUS PARTS

- ☒ SW/Plate
- ☒ 4 Screws S/P
- ☒ 20 Servo Mounting Screws
- ☒ Output Arms
- ☒ 4 Rotary Wheels
- ☒ Instructions
- ☒ Final Check List
- ☒ Warranty Card
- ☒ Decals
- ☐ _____
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Packed by *#3*

(11)

KRAFT SYSTEMS, INC.

FINAL INSPECTIONTRANSMITTERFREQUENCY 72960 TYPE KP-4B II SERIAL # 8631

- ☒ General Mechanical inspection.
- ☒ Control sticks: centering, spring tension and freedom of movement.
- ☒ Trim levers.
- ☒ Wiring harness and soldering.
- ☒ P.C. Board: Component installation and soldering.
- ☒ Transmitted pulse width in micro-seconds 380.
- ☒ Tuning and power output.
- ☒ Meter indication.
- ☒ Shock test board.
- ☒ Charge cords.
- ☒ Spray board back.
- ☒ Antenna.
- ☒ Final inspection for overall appearance.

RECEIVERTYPE KPR-4

- ☒ Visual inspection of soldering, component lead dress, wiring harness, etc. - Use magnifying glass.
- ☒ Crystal frequency drift - 140° F. ☒ Crystal frequency drift - 0° F.
- ☒ Sensitivity 2.5 mv. ☒ A.G.C.
- ☒ Diode level detector.
- ☒ Integration in micro-seconds 80.
- ☒ Schmitt Trigger pulse width in micro-seconds 300.
- ☒ Pulse omission detector timing in milli-seconds 3.4.
- ☒ Logic operation with servos connected. 150° F.
- ☒ Logic operation with servos connected. 0° F.
- ☒ Shock and vibration test.
- ☒ Spray entire assembly.
- ☒ Seal RF slugs.
- ☒ Seal I.F. cans.
- ☒ Pot crystal
- ☒ Empirical range check with servos attached.

SERVO

- ☒ Resolution and centering.
- ☒ Power.
- ☒ Smoothness.
- ☒ Exterior mechanical check.

☒ SWITCH HARNESS☒ BATTERY PACK
8
 Senior Technician

29 Aug 68
 Date

19/68