$1.00

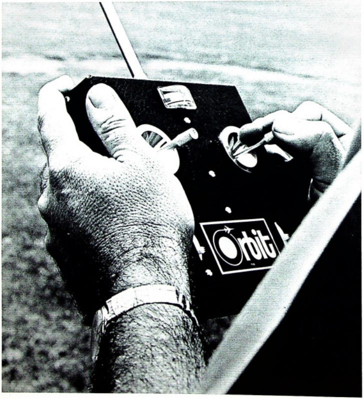
Orbit

ORBIT GUIDANCE SYSTEMS

1969-70

MK-II Handbook

ORBIT ELECTRONICS, INC. A DATATRON COMPANY



We appreciate your choice of an Orbit Guidance System, and sincerely wish you years of enjoyment from your equipment.

This booklet contains a brief description of the digital system operation in non-technical terms, as well as mechanical and performance specifications. Your particular attention is directed to the information contained in the GENERAL and INSTALLATION sections of this manual. Many important points are covered in these paragraphs that can help you to enjoy *all* the reliability and performance Orbit systems are capable of delivering.

Sincerely,
ORBIT ELECTRONICS,
INCORPORATED

William M. Semple

Bill Semple, President

THE ORBIT TRADITION

Orbit Electronics and R/C Guidance Systems have grown and improved rapidly since the early days of Bob Dunham's reed sets of 1954 and 1955. His Nationals Multi-Channel Championships of 1957, 1958 and 1959 firmly established Orbit as the industry leader. The craftsmanship and pride in product that have kept Orbit number one through the years is very much alive today.

The New Orbit

The merger of Orbit Electronics with Datatron, Inc., in 1969 brought about an exciting turning point in the design, development and manufacture of R/C systems. Orbit is now applying indepth technical skills and R & D capabilities gained from Datatron through their contributions to the Apollo, Mariner, Saturn and other government and commercial projects.

The financial strength of Datatron, Inc., which is a publicly held corporation, has allowed Orbit to expand with the installation of efficient new production facilities and quality control methods and instrumentation. These now bring you systems with higher reliability, quick delivery and fast repair service.

Orbit Facilities

Orbit Electronics' 12,000 square-foot plant in Garden Grove is equipped to fabricate everything in an Orbit Guidance System except hardware, semiconductors, resistors and the like. Machining, sheet metal work, printed circuits and plastic moldings are all made in-house.

Critical mechanical parts such as gimballed-stick assemblies are precision machined on automatic screw machines and mills. Copperplated epoxy-boards are carefully etched and silver-plated to form low-resistance base circuits.

Incoming electronic components, many made to Orbit specifications, are 100% inspected and selected.

Hundreds of components are assembled under stringent standards. Solder temperatures are controlled to prevent damage to heat sensitive components. Every solder joint is checked to insure a perfect electrical and mechanical bond.

Final Adjustment And Inspection

Each man in final inspection is an R/C flyer and understands the importance of every step. The complete system is aligned, adjusted and tested as a matched unit. First, the mechanical integrity of each unit is checked along with smoothness of operation. Next, the transmitter is tuned, RF output is measured against specs and the modulation pattern is checked on an oscilloscope. Frequency, sensitivity, range, servo travel and response-time, and servo neutral are measured on special test equipment. Finally the transmitter/receiver combination is matchtuned to the servos for primary and trim-control range and positive neutral. Nothing is left to chance. One-hundred percent inspection and test assures the performance and reliability of your Orbit Guidance System. And the 90 day Orbit guarantee stands behind that.

ORBIT DIGITAL GUIDANCE SYSEMS

DIGITAL PROPORTIONAL GUIDANCE SYSTEMS FOR RADIO CONTROL OF MODEL AIRCRAFT, BOATS AND CARS.

Orbit MK II Digital Guidance Systems provide the modeler with the utmost in precision proportional control and reliability. The systems operate on pulse width comparison, or "On-Off" binary code. Off time is minimized for interference-free operation. Fast response-time gives the flyer a positive sense of control.

Orbit transmitters are ruggedly built using all transitorized cicuitry for long trouble-free operation. All electronic components are critically selected and inspected to assure reliability. The vinyl-clad case is lightweight and easy to handle; the controls located perfectly.

Orbit superhet receivers use all silicon circuitry for great sensitivity and selectivity, better than out-of-sight range and adjacent channel rejection. Rugged two-deck construction and special critical parts mean reliability under vibration and shock. And, the small package-sized affords easy installation.

High-torque Orbit PS3D MK II and PS4D sub-miniature servos are easy to install and provide ample power for aerobatic air loads. Full power servo output on minimum error signals assures positive control. Tight servo neutral means trim is constant for precision control.

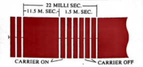
Rechargeable nickel-cadmium airborne power-packs serve both receiver and servos through a reliable four-wire system.

SYSTEM OPERATION

This system operates on a pulse-width comparison principle. With all controls in neutral, the transmitter sends a continually repeated series of seven pulses at a twenty-two millisecond "frame" rate (see fig. 1.). The first pulse in the train is approximately eleven and one-half milliseconds in duration and is termed the "sync" pulse. Each of the succeeding pulses are of one and one-half milliseconds in duration and represent the individual channel information to reference all servos to neutral. These six pulses are infinitely variable in width from one to two milliseconds from the transmitter control sticks and this variation in pulse width controls the amount of servo travel. A tiny change of pulse width, wider or narrower, produces a small amount of servo travel in the appropriate direction. A large change in pulse width gives a correspondingly greater amount of travel.

The receiver decodes this pulse train through a binary counter similar to digital computer techniques, using the "sync" pulse to reset the counter to the zero state. The individual channel pulses are "read-out" to the appropriate servo, which uses this decoded pulse for comparison. Each servo contains a reference pulse generator set to one and one-half milliseconds at neutral. If the decoded input pulse is of a greater or lesser duration than the servo reference pulse, an error voltage is created causing the servo to run in the appropiate direction until input and servo reference coincide in duration. The servo reference pulse duration is varied by the "feed-back" potentiometer which mechanically changes position as the servo drives. At the point of pulse width coindidence, no error signal results, and drive voltage to the servo motor is shut off.

Figure 1 illustrates the RF pattern of the six channel digital transmitter showing one full frame of information. The wide pulse is the reset or "sync" pulse. Each successive pulse is a command channel. The first pulse is throttle control, #2 is elevator, #3 is rudder, #4 is aileron, and #5 and #6 are auxiliary channels. In the four channel system, the "sync" pulse is longer, occupying the space represented by the auxiliary channels, thereby maintaining the 22 millisecond "frame" rate.



Typical RF pulse pattern of 6-12 transmitter. Width of sync pulse is adjusted to maintain 22 millisecond frame in other transmitters.

KEY SPECIFICATIONS

OUTPUT POWER
350 mw

FREQUENCY
27, 72 MHz bands & 6 meter

SERVO TORQUE
PS-3D MK II 4 lbs.; PS-4D 3¾ lbs.

OPERATING TEMP
0° to 160° F.

TWO-STICK CONTROL
MODE 1: elevator & rudder—left stick, throttle & ailerons—right stick.

MODE 2: elevators & ailerons — right-stick, throttle & rudder—left stick.

ANTENNA
27 MHz center loaded, 72 MHz & 6 meter whip

AIRBORNE WEIGHT
with four PS-3D MK II servos 15 oz., with four PS-4D servos 12 oz.

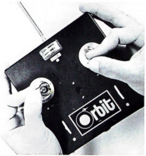
TRANSMITTER

The Orbit 4-8 and 6-12 MK II two-stick transmitters were designed for operator comfort and "feel." Excellent balance, and soft, smooth control stick action represent a standard unsurpassed in the industry. The transmitter uses Orbit developed all-silicon semi-conductor circuitry proven through thousands of hours of field use; the mechanics are designed and built for precision handling and long life.

Two, two-stick transmitter configurations are available to suit operator preference . . . a choice of Mode 1 or Mode 2 stick arrangement as follows:

MODE 1: Right-hand stick is aileron (right/left) and motor control. Push toward top of transmitter-fast/pull toward bottom-slow. Note that motor control function is not spring-loaded, but uses a rachet-device to hold the stick in position commanded. Left-hand stick is rudder (right/left) and elevator (up/down).

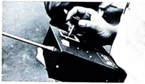
MODE 2: Right-hand stick is aileron (right/left) and elevator (up/down). Left-hand stick is rudder (right/left) and motor control (fast/slow).



Trim controls are the small, black nylon levers located inside of and below the primary controls. Rudder, aileron, elevator and motor control trim are adjusted by movement of these levers in the appropriate direction, which results in a small excursion of the primary command servo involved.

On the 6-12 transmitters, there are two white nylon levers protruding from the transmitter face on either side of the ORBIT emblem. These are the auxiliary channel command levers. There is no right or left, nor up or down function assigned these commands, because utilization of these channels is entirely up to the individual owner. Possible use of these channels include: flaps, retractable landing gear, engine mixture control, bomb drop, etc. Full travel of these auxiliary channel levers controls a standard ORBIT digital servo through its normal range of excursion.

The increasingly popular three axis or "single-stick" transmitter is designed to be cradled in the left arm, with the right hand free to control the three primary commands of aileron, elevator, and rudder by using the single control stick. This stick terminates in a knob that is twisted right or left for rudder control. Movement of the stick in a horibontal plane right or left is the aileron command, and vertical movement up or down, is elevator.



With the transmitter cradled in the crook of the left arm, the fingers of the left hand fall naturally on the throttle control lever, and the aileron and elevator trim knobs. These trim knobs are located at the top of the transmitter case. The rear knob is elevator trim, and front knob is aileron trim. Directly below these knobs there is a lever operating through the horizontal plane. Push towards transmitter face is fast throttle command, and pull to the rear is slow.

Below the stick on transmitter face is another knob that controls rudder trim. In all cases, the trim knobs allow a small amount of servo travel to either side of the normal servo neutral.

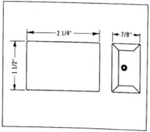
On the 6-12 version of the single-stick configuration, the two white nylon levers protruding from the transmitter face on the right side of the ORBIT emblem are the auxiliary channel controls. Their function is the same as on the two-stick transmitters.

TRANSMITTER POWER SUPPLIES

All Orbit digital transmitters use a nominal 10.25 volt source, consisting of eight nickel-cadmium cells in series, to provide power. The transmitter/receiver pack charger is integral with transmitter, and separate charging cords are provided with the units. Refer to RECEIVER POWER SUPPLY section for charging instructions. The chargers supplied will bring cells to full capacity in approximately 18 hours. Continuous operation time exceeds 3 hours.

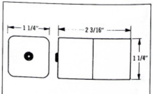
RECEIVER

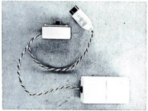
The 4-8 and 6-12 receiver is an all silicon superheterodyne, featuring extremely high sensitivity and very narrow band pass for maximum range and interference rejection. No tuning adjustments are required. The tiny size and very light weight of the receiver provide a capability of installation flexibility previously unobtainable, particularly in small vehicles or spaces.

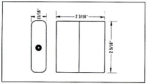


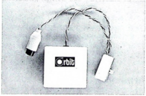
RECEIVER/SERVO POWER SUPPLIES

The 4-8 and 6-12 IC airborne power supply is a pack of four 500 milliampere hour capacity nickel-cadmium cells which provide an aggregate operational time of two and one-half to three hours. They are offered, at purchasers' option, in a square or flat pack configuration.







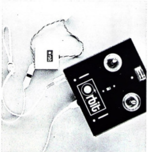


CHARGING

Note that the 4-8 and 6-12 IC systems have no external chargers because the power supply charger is built into the transmitter. It is NOT possible to charge the receiver or transmitter pack separately. Both units must be charged simultaneously. Two cords are provided with this system to accomplish the charge cycle. One is a TV "cheater" cord to provide AC from a wall outlet to the transmitter charger. *The nature of the male and female plugs provided on charging cords precludes the possibility of incorrect polarization or application.* The other cord mates into the appropriate outlet on the bottom of the transmitter and the opposite connector plugs into the socket on the receiver power pack.

The transmitter switch must be "OFF" and the receiver switch "ON" (away from wiring harness) to complete the charging circuit. The charging indicator lamp will glow during charge and may be viewed through the small hole provided in the transmitter case. If the bulb does not glow, the charging circuit is not complete. The transmitter case will grow warm to the touch during charge; this is normal.

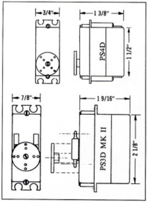
CAUTION: DO NOT *plug in AC cord at wall socket until all other connections have been made.* **REMOVE AC CORD** *from wall socket before disconnecting other connectors.*

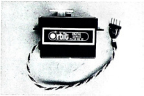


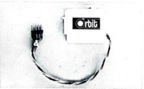
SERVOS

With the 4-8 or 6-12 IC MK II systems, the purchaser has a choice of two types of servos. Either the PS4D (standard) or the optional PS3D MK II.

The PS4D is currently the smallest and lightest digital servo available anywhere in the world. Four of these servos in the IC MK II system allow a latitude of vehicle choice impossible with any other system. Anything from the very smallest .049 engine power, to the largest of the .60 powered brutes is feasible. This servo was developed to provide the high torque, 3½ pounds of thrust, mechanical ruggedness, and precision of control required for a truly accurate, quality control system. This tiny unit gives away nothing in the way of performance. The rotary output wheel may be







replaced with accessory arms provided, for greater pushrod travel if necessary. Transit time through normal excursion is approximately .45 seconds. The servo amplifier contains all silicon semi-conductors for ultra-stable, high-gain operation.

The PS3D MK II is offered as an option for those owners who prefer the additional flexibility of dual linear-rack as well as rotary outputs. This servo is slightly larger and heavier than the PS4D, but is one of the most powerful, precise servo-mechanisms available to the modeling fraternity. As well as offering installation flexibility, this servo has the additional advantage of compatibility with *any* Orbit digital unit ever built. The PS3D MK II brings a three year old set up to present day standards of performance. Amplifier circuitry consists of eleven silicon and germanium transistors and associated components. Transit time is approximately .55 seconds at a thrust of 4½ pounds.

GENERAL INFORMATION

It is characteristic of the "digital" type system to be somewhat subject to "noise," in particular, the noise that is generated within the vehicle in which the system is installed. Wherever there is metal-to-metal contact of an intermittent nature, as where two surfaces touch and break contact, a minute electrical arc is created. This arcing contains radio frequency properties that may cover an extremely broad band. In severe cases, the RF component created may be strong enough for the receiver to "see." Because the digital system "counts" a series of high speed pulses, this extraneous "pulse" from electrical arcing would interfere with receiver action if the unwanted pulse is of sufficient magnitude. A high number of these unwanted pulses can disrupt receiver logic and render the system incapable of operation.

It is therefore necessary to avoid metal-to-metal contacts. When routing throttle control and nose-wheel pushrods, use plastic tubing as guides rather than aluminum or brass. Use nylon fitting on control pushrods and/or horns whenever possible. The throttle control lever on the engine should have a nylon fitting.

A final check of system operation before flying to locate possible noise problems is suggested as follows: Range check the system in aircraft with transmitter antenna disconnected and engine not running. Note distance. Start engine and with antenna still removed from transmitter, again make range check. If "noise" is present, it will probably appear as a reduction in range. Experience has shown that a range reduction to one-half to three-quarters of range with engine not running is acceptable for flying.

Always try to route the receiver antenna wire as far as possible from the servos and/or battery pack. It is also more preferable to run the antenna to the tip of the vertical stabilizer rather than inside, or along the bottom, of the fuselage. The horizontal polarization this bottom routing gives should be avoided since it can seriously affect range at positions of low altitude and fairly long distances from transmitter.

Make it a practise to NEVER point the tip of transmitter antenna directly at the airplane (or boat, or car) while flying. There is a characteristic "cone of silence" off the tip of all whip antennas that can cause momentary loss of contact. This is especially critical during extended take-off and climb-out, and on landing approach. Always try to maintain some angle of deflection between transmitter antenna and direction of flight.

There is no maintenance required by owners of Orbit digital equipment, since almost all servicing of these systems requires special test equipment of some nature. But some effort should be made to keep the equipment clean. Dirt and grit accumulating on the transmitter could eventually cause some stickiness or binding in the control stick gimbal assemblies. Do not place the transmitter in a position where propellor blast may strike the face. This leaves an oily residue mixed with dust and grit. A clean rag or brush may be used to remove any accumulation around the ball/socket joints of the control sticks. The transmitter vinyl surface will clean very readily with any common kitchen cleaner of the liquid or aerosol can type, such as "Foamy."

Particular attention should be paid to the installation in an aircraft, vehicle or boat. Try to avoid oil and fuel seepage into receiver or servos. An accumulation of castor oil residue in the servos can cause binding and a slow-down of operation due to the very viscous nature of castor oil residue. Check sponge or foam receiver packing from time to time for seepage accumulation and replace when it shows contamination.

Above all, do NOT "build" your airplane around the equipment. In particular, do not sand wood or filler where the ensueing dust can filter into the servos. This dust in combination with any oily residue, turns into a thick, gummy deposit that can seriously hamper servo operation. Use a light air pressure or vacuum cleaner to clean dust from fuselage interior before final installation of equipment.

Finally, familiarize yourself with system operation thoroughly before attempting initial flight. Then, from time to time, view servo operation visually with a critical eye. Any significant slowing down of servo speed or broadening of neutral could indicate a source of trouble such as conditions previously described, or some other form of malfunction. Should this condition arise, be sure to disconnect pushrods from servo to determine that there is no linkage problem. Rectify any such problem immediately. Remember that system performance and reliability are a natural extension of the quality and care used in, and maintenance of the installation.

TO PUT UNIT INTO OPERATION

Both the 4-8 and 6-12 IC have three wire bundles extending from the receiver case. In the 4-8 system, bundle #1 terminates at the six-pin plug which mates with the socket from power pack. Bundle #2 terminates in a junction block with provision to accept three servo plugs (rudder, motor, and elevator). Bundle #3 terminates in a single, four-pin socket to accept the plug from the aileron servo.

In the 6-12 system, wire bundles #1 and #2 are the same as the 4-8, but bundle #3 terminates in another junction block with provision to accept three servo plugs. This block contains outputs to the aileron servo, plus *both* auxiliary channels.

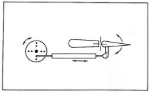
The primary control commands for servo operation are color-coded at the terminal block slots as follows:
(Note pin polarization on servo plugs.)
Green — Throttle
Yellow — Elevator
Orange — Rudder
Brown — Aileron
6-12 only
Purple — Aux. #1
Gray — Aux. #2

Mate appropriate servo plugs into junction blocks, observing color-coding on blocks and on servo plugs. Mate power plug into socket from pack. At this time, the receiver and transmitter switches may be turned "ON" and operation viewed by operating transmitter controls.

Control stick, trim and throttle movements are usually like those of a full scale aircraft. Throttle forward increases rpm; throttle back is idle. Stick forward is nose down; stick back is climb. Stick right for right turn or bank or nosewheel steering; stick left for left.

Single-stick models operate in the same manner except that control wheel at top of stick is rotated right or left for rudder and nosewheel control.

Counter-clockwise rotation of servo with usual linkage arrangement produces the following control functions: engine idle, right rudder, right aileron, up elevator.



HOW TO INSTALL YOUR ORBIT GUIDANCE SYSTEM

Read all instructions and study the photos carefully. Then, gather together all necessary materials and tools for each stage of the installation.

The care and preparation you take with installation will pay great dividends in hours of trouble-free operation of your Orbit system. Don't rush the job. Take your time with each step.

INSTALLATION

Because there are no electro-mechanical functions in the Orbit digital systems, it would appear to be impervious to vibration. However, sufficient sponge or foam padding should be used around the receiver to isolate the unit from high amplitude vibrations to eliminate the possibility of mechanical failure of components, and to absorb the shock of "hard-landings." The most delicate component used in superheterodyne receivers is the crystal, and some caution and care is necessary to prevent a "cracked" crystal. Use as much foam padding, either plastic or rubber, as is practical in the individual installation. Don't allow the corners of receiver to touch any part of fuselage, or ride against such things as pushrods, wires, or servos.

These same cautions should be exercised when installing the battery pack. High amplitude vibration and severe shock can cause mechanical failure of batteries. Always wrap your pack in sponge and do not allow it to ride solidly against any portion of the vehicle in which it is installed.

Servo installation depends on the physical nature of the vehicle involved. These units may be mounted in any position utilizing the integral mounting flanges on the servos. Orbit servo mounting trays are recommended. These have been designed for maximum installation flexibility and protection of your servos. See this installation section for various types available. Brackets may be fabricated from either metal (i.e., .040/.050 aluminum) or plywood.

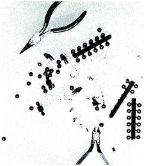
Self-tapping sheet metal screws #4 x ½" are excellent for use through the rubber grommets. Use #4 flat washer between the head of the screw and the grommet. Do NOT over-tighten screws. Rather, pull snug or just to the point where grommet begins to flatten and then "set" screws with a small dab of Walthers "GOO" or any contact cement. Model glue can be used for this purpose, but it tends to crack loose.

Always try to achieve minimum friction and bind in control linkages. The ideal situation is where all surfaces fall freely from side to side of their own weight. With the extreme torque provided by Orbit digital servos, this is not an absolute necessity, but the greater the bind, the higher the current drain of the servo. In severe cases, the servo action will begin to slow down and cause reduction of operational time per charge.

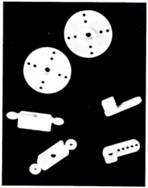
Note that direction of servo travel is *non-reversible*. That is, it is not possible to reverse servo travel by switching wires. If control is backwards, simply shift the push-rod to the opposite side of control wheel, or if linear rack is being employed, switch servo end for end or use the opposite rack.

A slight "V" should be employed in the throttle control pushrod, so that it is not possible to lock the throttle servo mechanically at either high or low speed. If the servo were to lockup mechanically at either extreme, it would cause a *very* high current drain across one-half of the airborne battery pack (500 mah.), pulling voltage low enough to cause receiver malfunction and possible damage to the servo amplifier output stages.

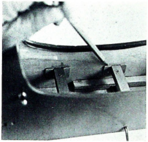
THERE MUST BE NO METAL-TO-METAL CONNECTIONS IN ANY OF THE CONTROL LINKAGES.



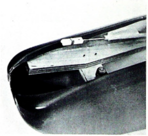
Have tools and materials at hand.



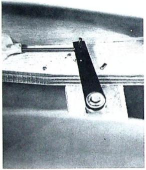
Disc, rotary arm and linear servo outputs for various installations.



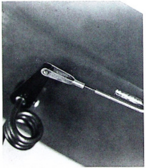
Motor mount stock is used for servo tray mounting beams. Note plywood gussets epoxied to fuselage; predrilled 1/16" pilot holes. Location according to airplane plans for proper center of gravity (CG).



Throttle control arm and linkage. Straight runs that move freely without binding insure proper control; less battery drain. Non-metallic fairlead tubing is cemented in place with silicon rubber or epoxy. Use braided flex cable if curve is necessary.

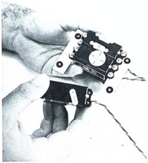


Nosewheel steering arm.

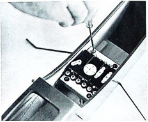


Nosewheel steering linkage. Note slot in fuselage clears pushrod.

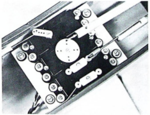
Typical pushrod end and plastic keeper. Music wire, 1/16" dia., is attached to fiberglass reinforced plastic tubing (arrowshaft) or wood dowel with heatshrink tubing.



PS-3D MK II servos are attached to PS3-SMT-3 Servo Mount prior to installation to beams previously built into fuselage. In this type of installation it is wise to check fit and location before epoxying beams in place. Rubber grommets, spacer bushings and plastic washers are used as in previous PS4 servo installation.



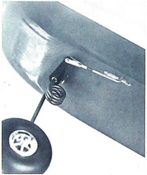
Servo mount with servos in place is installed in fuselage. Draw snug with #4 self-tapping screws. Over tightening of screws will compress rubber grommets and shock-amount effect will be lost. Note that servos have ample clearance from fuselage side.



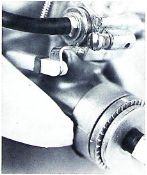
Upper, or right-hand servo, uses rotary arm for easy adjustment of throttle control. Most engines have right-hand throttle control; if engine has left-hand control, servo is mounted on left side. Center servo uses disc output for elevator control. Make certain linkage is attached to proper side of wheel. This depends upon position of control horn. Lower, or left-hand servo, uses dual linear/rack output for rudder and nose wheel control.

Elevator control pushrod with adjustable link is attached to nylon control horn.

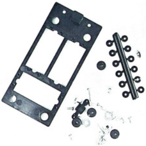
Rudder control pushrod exits left-hand side of fuselage for attachment to nylon control horn. Note ample clearance through fuselage.



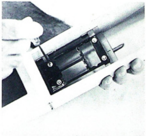
Nose wheel steering pushrod and linkage.



Engine throttle control linkage. Note elastic keeper around nylon fork.

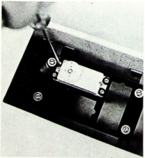


PS4-SMT servo mounting tray and hardware.

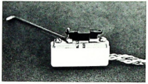


Rubber grommets are pushed into place on servo tray. Spacer bushings are inserted into rubber grommets with flange on bottom sides of tray. Tray is mounted on beams well clear of fuselage sides with #4 self-tapping screws using a washer under each.

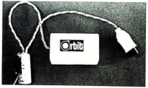
Rubber grommets are inserted into servo mounting flange.



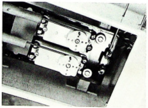
Servos are pushed lightly into place over pins in servo tray and drawn snug with #2 self-tapping screws. Plastic washers are used under screw-head.



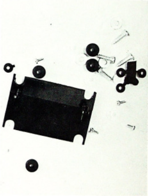
Music wire is used for external control of power **ON-OFF** switch in glider installation.



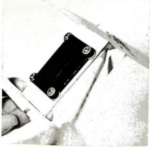
Switch, power-pack and connector.



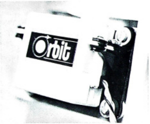
Two PS-4D servos are used in this compact, lightweight glider installation. Note heat-shrink tubing that attaches music wire to fiberglass reinforced plastic pushrods from elevator and rudder. Music wire switch control extends through fuselage. Install switch in servo tray so that it pulls out for "ON."



PS4-SMT Servo Side Mount and hardware.

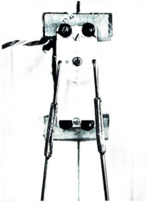


Servo Side Mount in typical built-up wing aileron servo installation. Note plywood support and guessets.

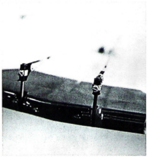


PS-4D Servo installed on side mount. Notice plastic washer under head of #2 self-tapping screw and light compression of rubber grommet. Assembly of shock mount to plywood support is visible below lead wire. Proper torquing is important to insure proper shock mount.

PS-4D Servo is installed in cavity cut into foam wing. Insert 1/8″ plywood plates are epoxied in place and pre-drilled, 1/16″, for #4 self-tapping screws. Note rubber grommets in place on servo.



Aileron servo installed with linkage in place.

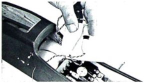


Commercially available strip-aileron linkage.

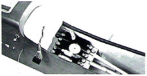
Connect battery pack, receiver junction block and, in this glider installation, rudder (orange wire) and elevator (yellow wire) to servo plug. Second junction block was not used because ailerons were not used. Battery power pack, carefully wrapped in 1/2″ foam is in place in nose.

Receiver is fitted into fuselage. Rubberband secures foam wrapping.

Battery pack and receiver in place. Note snug fit to prevent any movement of components during flight. Antenna wire exits to side.



Receiver, battery pack and connector are installed in powered aircraft in a similar manner. Engine vibration must be taken into account.



Receiver junction block containing aileron servo connection (brown wire), and auxiliary channels on 6-12, is pulled through hole in foam. Connect aileron servo and check system operation.

PREPARATION FOR FIRST FLIGHT

Before attempting the initial flight with your orbit system certain precautions should be observed.

Be sure *all* control surfaces move freely through their normal range. In particular, the throttle should not bind solidly at either extreme of travel. Check your installation carefully for any missing or loose screws *especially* on servo wheels or linear takeoffs, and that all pushrod retainers and/or clevises are properly secured.

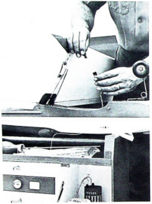
Re-check all foam or sponge padding to determine that the receiver and battery pack are not riding solidly against any portion of the airplane. If "G-PAD" is used it should be wrapped outside of and around the foam padding. The purpose of "G-PAD" is to provide impact absorption while foam isolates components against vibration.

Be certain that all flight surfaces are properly centered, aligned, and free from warps. Check that the aircraft balances within the recommended center-of-gravity limits, usually noted on the construction drawings for your particular model.

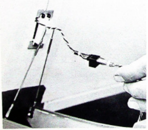
With the airplane fully assembled, as for flight, conduct a ground range-check with transmitter antenna removed. Distance will vary with terrain and conditions such as dirt, black-top, or concrete, and whether wet or dry, but should be thirty feet or more. Do not conduct this check with someone near you operating on adjacent channels in the same frequency band (27 or 72 mHz).

Start engine and run a vibration test. It is suggested that the airplane be supported by the wing tips, with wheels clear of the ground at this time. Run throttle up and down through engine rpm range at the same time checking for proper control surface response at the varying power settings. With satisfactory completion of this check, the aircraft is ready for the initial flight.

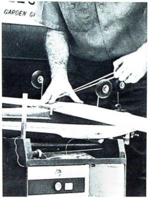
If you are a beginner, try to enlist the aid of an experienced flyer. In spite of appearances, flying a multi-control model requires that a certain degree of skill be developed. The learning period will vary with individuals and the airplane involved. Most experienced flyers will be more than willing to help, so don't sacrific the pleasure and satisfaction of successful flying to pride.



A field box is a helpful convenience at the flying site. Everything needed is at hand and out of the dirt.



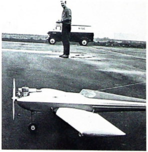
Aileron servo plug is connected to junction block (brown wire).



Wing is installed using ample rubberbands.

Antenna is attached to fin with small rubberband and simple overhand knot in wire. Remaining length of antenna wire must be allowed to extend beyond knot. **DO NOT CUT OR FOLD WIRE BACK.**

With antenna disconnected from transmitter; transmitter and receiver switches "ON" check for correct and easy movement of control surfaces and throttle. Make certain all controls operate in correct direction.



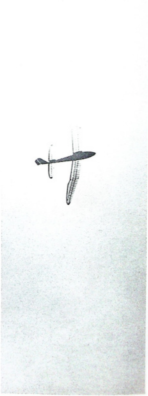
With antenna still removed from transmitter, walk about 30 feet from aircraft and range check. All controls should operate normally.

Repeat range check with engine running.

Support aircraft by wings and with engine running check operation of controls. Loose connections or electrical noise caused by vibration will appear as a reduction in range. Should this occur, shut down engine and check entire system for loose connections, components riding against fuselage, loose mounting screws and metal-to-metal linkage. This concludes the ground checkout.

Install transmitter antenna.

If this is your first R/C experience let a competent flyer make the test flight and take some instruction.



REPAIR & SERVICE POLICY

Guarantee

Your new Orbit IC Digital Guidance System is engineered to provide years of trouble-free service. The entire system: receiver, transmitter, servos, power supplies and chargers, is guaranteed 100% against defective parts or workmanship for a period of 90 days from date of purchase. Orbit servo potentiometers are guaranteed for the life of the system.

THE GUARANTEE REGISTERATION CARD MUST BE FILLED IN AND RETURNED TO ORBIT WITHIN 10 DAYS OF DATE OF PURCHASE TO PUT THE WARRANTY INTO FORCE.

The Guarantee does not cover damage caused by accident, misuse or tampering with the system. However, in the event of a crash where elements of the system are damaged beyond repair, Orbit Electronics will, at their option, exchange the item at a discount of list price less 25%.

Repair and Service

All Orbit Systems are serviced in the order in which they are received; in most instances within 72 hours. Service and repair not covered under the terms of the guarantee are performed on a C.O.D. basis. Repairs are offered as a customer service. Charges are held to a minimum.

An estimate will be submitted to you if service will exceed $35.00, unless work above this amount has been specifically authorized. Estimates for work less than $35.00 will be submitted to the customer upon request; otherwise work will commence immediately upon receipt of the system. Orbit Systems serviced at the factory are warranted for 90 days under the terms of the Orbit Guarantee.

Save time and money by observing these steps when returning your Orbit System for service:

1. Save the shipping container in which the system was received. Use it to return the system to Orbit.

2. Enclose carefully completed Orbit Service Repair Form with the system. Include your name, address and zip code. State whether the system is to be returned by Parcel Post or Air Parcel Post.

3. Remove all mounting brackets and foam wrapping. Clean components.

4. Charge the power packs.

5. RETURN THE ENTIRE SYSTEM (except antenna) because all units are match tuned.

6. Pack all units carefully in shipping container and forward to:

Orbit Service Center
11601 Anabel Ave.
Garden Grove, Calif. 92640

ORBIT ELECTRONICS, INC. / A Datatron Company / 11601 Anabel Avenue, Garden Grove, California 92640

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