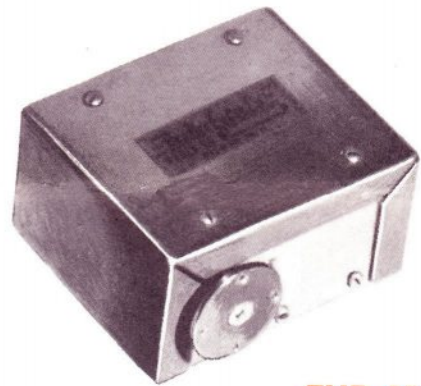
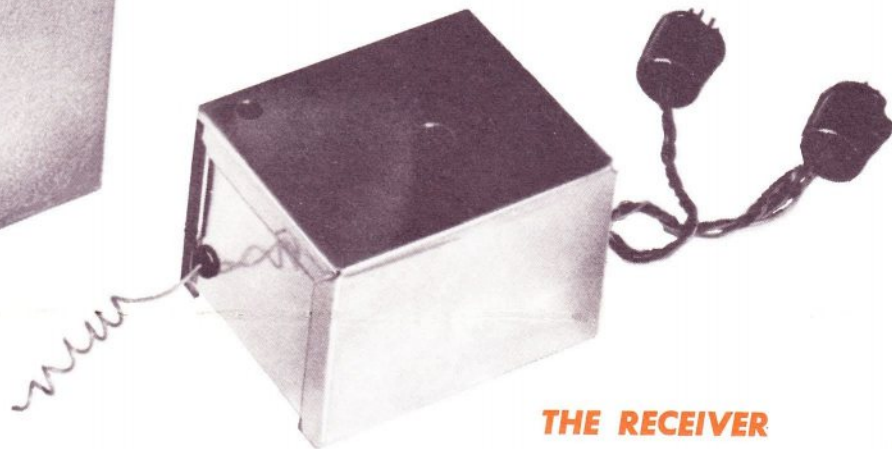


**THE TRANSMITTER**

*the system that took  
the tinkering out of  
proportional . . .*



**THE SERVO**



**THE RECEIVER**

# THE **QUADRUPLEX**

WHAT IT IS . . . AND HOW IT WORKS





## THE TRANSMITTER

The QUADRUPLEX transmitter is a hand held unit measuring 12" x 7" x 4" and weighs 6# 10 oz. complete with telescoping antenna.

All flight surface controls are via motion of one main control stick. This control stick assembly provides motion for three Allen Bradley potentiometers ("pots"). The elevator and aileron pots are supported in a gimbal that incorporates bearing points at each end of the control pivots. An extension on the rudder pot shaft becomes the joy stick itself, and the knob on top of the stick is rotated right or left for appropriate control action. All control pots are spring loaded to center with individual scissor springs for a firm neutral control setting.

Trim controls are provided for aileron and elevator, and can be used in flight at any time. They are handy for those small trim touch-ups that are necessary from day to day due to slight changes in the aircraft's characteristics, such as minute airframe warps, or field misalignments of wing on fuselage, etc. Once set, the electrical centering characteristics of QUADRUPLEX remain constant, regardless of temperature or humidity variations.

Engine control is trimmable to any position by use of two push buttons operated by the fingers of the left hand. Engine control is accomplished by a pulse omission detector (POD) employed in the rudder circuit of the receiver.

An exclusive feature of QUADRUPLEX is our CAR (coupled aileron-rudder) capability. Aileron and rudder action can be coupled for dual coordinated action. This condition is helpful in landing approaches, climbing up for stall turns (Hammerheads) and tail slide maneuvers. Control can be instantly changed back to triple simultaneous even in the middle of a maneuver without any bumps or adverse action. Coupling or uncoupling is accomplished by a toggle switch adjacent to the motor control buttons, and operated by the left thumb.

The transmitter is vacuum tube operated throughout. B+ voltage is supplied by a built in power converter of our own design. Rechargeable Nicad cells are included in the selling price and come installed in the equipment. The cells in each transmitter are charged just before shipment from the factory.

Through use of a tube type circuit, complete temperature stability is easily obtained. Three separate tone generators are employed for triple simultaneous control surface operation. Digital (Mark space) transmission is used, with all tones being broadcast simultaneously.

## THE RECEIVER

The "Heart" of QUADRUPLEX is a superegenerative type receiver, employing one detector tube and seven transistors in the tone separation, amplification and switching circuits. Two additional transistors, of the power type, are used for the special D.C. power converter that is an integral part of the receiver unit.

This exclusive tone separation circuit completely eliminates any cross talk between channels. The circuitry is permanently molded in an epoxy resin for maximum reliability and protection from shock and vibration. Three directly pulsed control actions are obtained from the tone filter block output. Rudder, elevator and aileron. Simultaneous control voltages are supplied to the servos by four diode-suppressed relays. High reliability is achieved by the use of high relay current change, resulting in more than adequate contact pressure. Relays are factory adjusted and never need resetting under normal operating conditions.

The fourth control action (Motor control), is operated by a full wave pulse omission detector used in conjunction with the rudder channel. Progressive (trimmable) throttle is thus achieved.

Aileron, elevator and rudder control can be used at the same time. During motor control excursion the rudder momentarily neutralizes, but this cannot be detected in flight and has no effect on elevator or aileron control in any way.

Control surfaces pulsate slightly at neutral setting. Pulsation of elevator and aileron continues through control progression. As extreme control position is approached, pulsing action ceases and servos lock at full control position for maximum servo torque.

The Receiver B+ power converter is operated directly from the servo batteries (4.8 V center tapped). These should be of the rechargeable Nicad type of at least 1 AH capacity. One additional cell is required for the Receiver detector filament. One pen cell energizer is O.K. or a small Nicad can also be used. The receiver and servo batteries are not included in the sale price, but may be obtained from us as an optional extra.

The QUADRUPLEX receiver has a relatively high interference immunity due to its ability to operate reliably on only 30% modulation of incoming signal. The tone frequencies are considerably above normal voice transmission so that demodulation is the only effect of what would normally be an interfering signal.

Quadruplex can be furnished on the 27 MC citizen band or on the 6 meter amateur band. The receiver is housed in an aluminum case measuring 2" x 2½" x 3". The weight is 8 oz., complete with integral converter.



## THE SERVOS

The Dee Bee Model "TT" (Twin tension) servos were developed over a period of 2 years especially for "Pressure proportional" control. They employ a special spring for centering that gives maximum centering pressure near their neutral position, decreasing as full limits of servo travel are reached. This gives the firmness near neutral so necessary for precision proportional flying, and yet allows locked up control surfaces at full excursion.

They are designed to be driven by 2.4 VDC in each direction (Reverse polarities). The servo will operate equally well mounted in any position in the airframe. The servo case is fabricated of high strength, .041 thick aluminum alloy for maximum mechanical durability. Electrical spark suppression is accomplished by a capacitor mounted inside the servo.

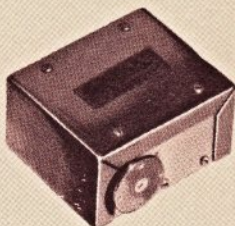
The servo is intended to be mounted by four #4-40 (preferably brass) screws. Self-locking, captivated nuts are permanently installed in the base of the servo case. The servo comes with two flexible leadouts to provide any desired hook-up capabilities.

The servo is self contained in the case. The lid, which is held in place by four screws, is primarily a dust cover, although additional mechanical strength is realized by its use.

Elimination of any possible electrical noise transmission to push rods, etc. is assured by the use of a nylon gear in the reduction train, between the motor and the rotary output coupling, which is brass.

Positive stop action on each end of the travel (Approx. 90 degrees each side of the center) is provided by a special cam type stop in the low torque stage of the gear train. This avoids high torque "hammering" of the stop. Overall size is 1½" high, 1¾" long, 2½" wide. Each servo weighs approx. 3 oz.

Exhaustive tests to find the best motor for this use have proven the old reliable Mighty Midget to be the best all around choice. We fly our stock servos one year before we consider any preventative maintenance necessary. At this time we replace the brushes in the motor, clean the commutator with carbontetrachloride and re-assemble.





## POWER

Power input to the final stage, as checked on production units, has been 1½ watts. This is more than sufficient when consideration is given to the fact that audio tones are being employed and the system, by design, can stand considerable demodulation before any effect is noted (see section on "The Receiver").

## PERFORMANCE DATA

The QUADRUPLEX system is capable of performing any maneuver within the capability of the aircraft used, and the pilots proficiency.

The smoothness of control far exceeds that experienced with any other system. There are no abrupt, spasmodic movements in the control surfaces. When the stick is moved, the surfaces move accordingly, with no time lag. Response time from control is considerably faster than experienced with somewhat similar equipment.

At full control, the ailerons and elevator cease pulsing and lock up for maximum resistance to blowback surfaces in high performance aircraft.

The system and servos are particularly adaptable to full span ailerons, giving the smooth, positive positioning required for this type of surface aspect ratio. The actual in-flight linearity of control-surface-movement to-stick-movement is what we call "pressure proportional". To achieve this in flight, one must obviously have a system that on the bench appears to be non-linear. This is due to taking air flow and air velocity (Dynamic pressure) into account in the servo spring design. The movement becomes linear to stick movement when in flight.

The motor speed can be minutely varied at any time by pressing the advance button (Red) or the retard button (Black). The motor starts changing speed immediately and continues in the selected direction until the button is released, at which time the movement immediately stops. The motor speed can be changed at any time, in either direction and stopped in the exact position desired.

The QUADRUPLEX system has been flown successfully in high wing, low wing, fast and slow aircraft with no problems. It always gives a smooth control without bumps in the flight trajectory. It is equally comfortable for sport week-end flying or full blown contest competition.

The in-flight trim knobs for ailerons and elevator trim are intended to be used only for those slight out-of-trim conditions in the aircraft due to minute warps from humidity or errors in construction. The system is designed to have these trim knobs set on their zero position for all subsequent flights after the aircraft is finally aerodynamically trimmed out as it should be, for literally "hands off", straight and level flight.

Case histories have proven the capability of flying week upon week with virtually no retuning necessary. The receiver has proven to be crash resistant, when battery wire (improperly strain relieved) came off. The plane came in for a total washout. The receiver was plugged into another aircraft and flown the next day with no repair, readjustment or retuning being necessary. This type of ruggedness is due to the fact that the critical parts in the receiver are potted (encapsulated) in epoxy for permanent, reliable, performance.

Both the transmitter and receiver have been found to be maintenance free. One of the original systems (Don Brown's) has been flown all one season, practically every week-end, at many request demonstrations, The Internationals in England, etc. and has yet to evidence a single failure of any kind. All this was accomplished in the same aircraft.

Detailed installation instructions, and wiring diagrams, are included with each system and if followed, will allow you to "fly it out of the box."

## RANGE

This is a most difficult capability to describe. Since 1961 we have been flying this equipment under all available New Jersey conditions. (Which covers most conditions that you may feel are unique to your geographic location). We have yet to experience any failures due to range or weather conditions.

Actual in-flight tests have been repeatedly conducted with the aircraft at extreme range, bordering on loss of total visual recognition of the aircraft's position. While at this range the antenna was detuned by an assistant holding the antenna with both hands. There was no apparent change in the flight pattern whatever! Tests have been conducted at more normal flying ranges with the transmitter lying on the ground with the antenna resting in wet grass, with no adverse reaction.

Receiver sensitivity is factory controlled (Attenuated) for optimum system operation. The amount of sensitivity inherent in the system is far in excess of that required for total out of sight conditions. If sensitivity levels beyond this requirement are attempted, a noise receptive condition could be made to exist. Sensitivity level can be changed to suit what the owner may believe to be necessary by following "sensitivity adjustment" procedures outlined in the instructions contained with each system data package.



## TEMPERATURE

The QUADRUPLEX system has proven to be completely reliable in all temperature conditions experienced thus far. It has been flown consistently through all winter and summer temperatures with no problems. When flying under summer conditions, no "Shading" of the transmitter is necessary. The transmitter is usually set next to the aircraft "on the line" and remains there, between flights, for the entire day.

The total system circuitry, as it has been engineered, has yet to evidence any temperature problems.

## TUNING

The system as delivered is factory pretuned. The tones are matched, adjusted and should never need tuning in the transmitter.

There are provisions for certain factory adjustments (Modulation %, etc.) but they should never be attempted by technically unskilled personnel, as it is totally unnecessary.

The receiver has two tuning provisions. One is for RF tuning after the receiver is installed in the model. This is accomplished with an earphone by tuning for detector quieting. The only other adjustment is in the Motor control circuit. This can be adjusted for POD switching time (Microseconds) desired in Quadruplexing the signal from rudder to motor control and back. This normally will need no adjustment as it also is factory pre-adjusted.

## GENERAL

The converter in the transmitter is contained in a plastic case with a bracket for mounting. One of these is supplied as part of each transmitter package. It is also available, from us, as a separate item for other hobby or equipment uses. The prime power required is 6 VDC @ 1.1 Amps. The designed output is 150 VDC @ Ma. The output can be run with a low resistance short for limited lengths of time. An internal load is provided across the output to allow running at a "no load" condition without damage. The converter measures approx.  $2\frac{1}{16}$ " wide by  $3\frac{3}{4}$ " long by 1" high and weighs  $4\frac{1}{2}$  oz. Power in and out is provided by 3 pigtail leads.

The batteries recommended for servo/receiver power are available as original equipment when purchased with a system (not included in the package price), or as replacement parts at a later date.

For use on the multi day flying session away from home, where it is not convenient to recharge the transmitter batteries, we offer a pack of 6 Nicads (the same battery supplied in the original equipment), installed in an encircling bracket that mounts in the existing battery bracket mounting holes when the original set is removed. Electrical hook-up is with an in-line insulated connector that mates with the plug in the transmitter. This type installation can be had in the original equipment at a slight additional charge or can be installed by the owner at a later date by use of a separate kit containing all the necessary components and full instructions.

## SERVICE

Full factory service is available should repairs be necessary due to damage of any sort to the equipment. A nominal fee will be charged to cover the cost of replaced parts, and labor.

With the exception of the Nicads for receiver and servo power, as noted in this brochure, the QUADRUPLEX comes complete, with nothing else to buy. In order to keep the price down and yet maintain our standards of quality, QUADRUPLEX is sold factory-direct only. Transmitter, receiver, four servos and transmitter nicads .....

**\$349.95**

**\$389.95 MARK II**

Rec./Servo Battery set.....18.00

