ALL NEW FROM BONNER!

Bonner

DIGIMITE

PROPORTIONAL

RADIO CONTROL SYSTEM

Operates up to 8 Proportional Servos simultaneously

Unique Digital Technique

- REJECTS INTERFERENCE
- PROVIDES FAIL-SAFE MODE

Digital Pulse Principle guarantees:

- POSITIVE CENTERING
- ABSOLUTE STABILITY
- MAXIMUM RELIABILITY

- UNITS SHIPPED WITH POWER SUPPLY CHARGED—SYSTEM MAY BE OPERATED RIGHT OUT OF BOX

$295.00
27MC OR 6 METERS

Bonner DIGIMITE TRANSMITTER

- HIGH POWER, 1 WATT INPUT
- VERSATILE 2 STICK ARRANGEMENT
- DUAL METER—R/F OUTPUT OR PWR SUP CHG RATE
- IN-FLIGHT TRIM LEVERS
- AUXILIARY CONTROL PANEL
- 10 CELL NICAD POWER SUPPLY BUILT IN
- BUILT-IN DUAL CHARGER FOR TRANSMITTER AND RECEIVER POWER SUPPLIES
- FULLY SILICON TRANSISTORIZED

$188.00

Bonner DIGIMITE RECEIVER

- SUPER HETERODYNE
- LOGIC CIRCUIT
- SWITCH HARNESS
- TEMPERATURE STABILIZED
- SIZE: 3" x 2" x 1½"
- WEIGHT: 5¾ OZ

POWER PACK INCLUDED WITH RECEIVER

- POWER SUPPLY—SEVEN 500 MAH NICADS—CONSTRUCTED BY GENERAL ELECTRIC TO BONNER SPEC FOR DIGIMITE SYS
- ALL SPOT WELDED CONSTRUCTION, SEALED IN PLASTIC
- MATING SWITCH AND AIRPLANE HARNESS INCLUDED
- COMPLETE WITH ALL WIRED CONNECTORS
- WEIGHT: POWER PACK, 7.8 OZ, SW HARNESS, 0.8 OZ

$34.95

Bonner DIGIMITE SERVO

MODEL CFS (CENTER-FAIL-SAFE)
MODEL EFS (END-FAIL-SAFE)

- COMPLETE WITH WIRED CONNECTOR
- 3½ POUND STATIC THRUST
- LINEAR OUTPUT, .62 INCH TRAVEL
- TURN-AROUND REVERSAL FEATURE
- SUPPLIED WITH MOUNTING HARDWARE
- INTERCHANGEABLE BETWEEN CHANNELS
- SIZE: 3¼" x 1¾" x 1", WT: 3¼ OZ

DIGIMITE SYSTEM WITH 4 SERVOS, $615.00 LIST

- READY TO OPERATE, NO ADDITIONAL WIRING OR CONNECTORS REQ'D

BONNER Specialties, Inc. 9522 W. JEFFERSON BLVD., CULVER CITY, CALIF.

INTRODUCTION

The Bonner Digimite system may be utilized for many purposes and is flexible in that it may be configured with from one to eight simultaneous, proportional servos. The units were designed for the remote control of model airplanes, and these instructions have been written to cover this usage. Installation in RC boats, cars, etc. is similar.

The system operates on a unique digital principle (hence the name "Digimite"). The transmitter continually sends frames of 16 pulses, the spacing of these pulses providing eight pieces of control information. This type of system is inherently more stable and accurate than other types. As a result there is no discernible neutral drift, and the control surfaces follow the sticks with exacting accuracy.

A superheterodyne receiver is the heart of the airborne equipment. Three intermediate frequency (IF) stages assure sensitivity and selectivity. The detected pulses from the superheterodyne circuit are fed to a logic cir-

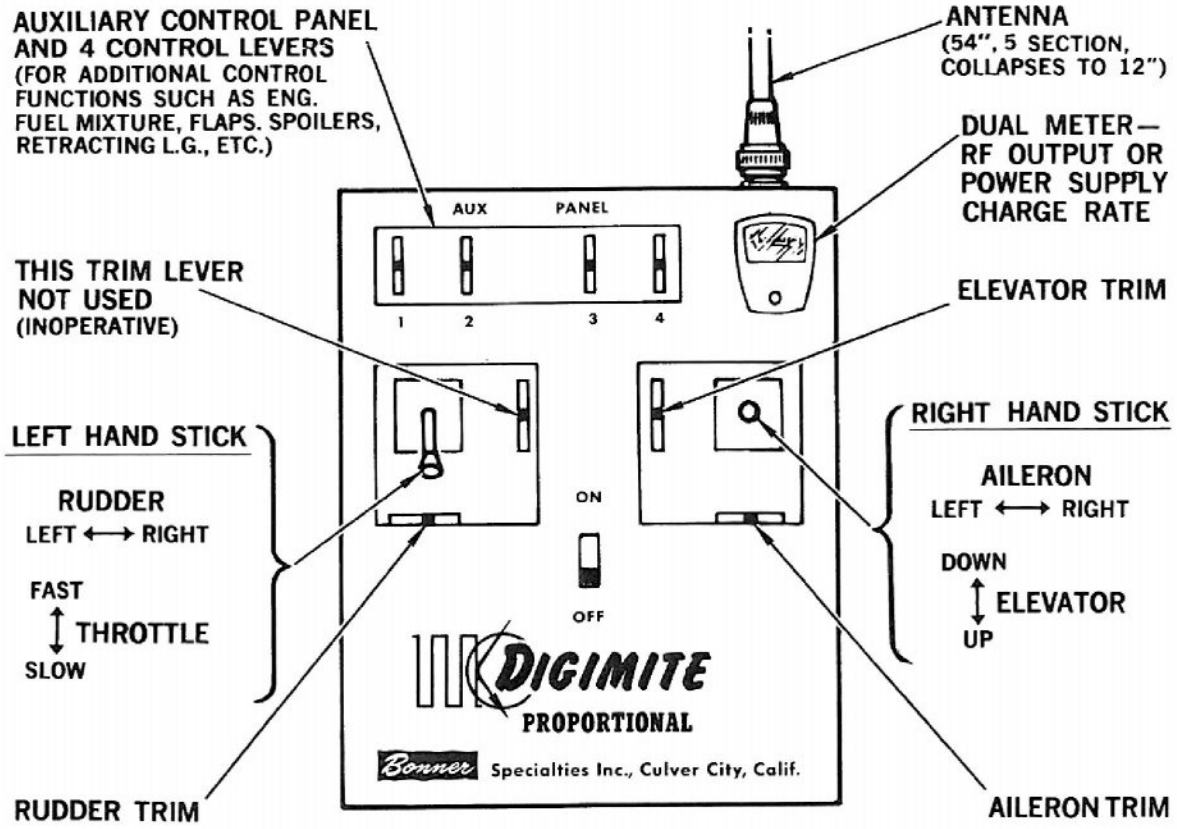


Figure 1. Digimite Transmitter.

cuit which examines each digital pulse frame for completeness. In the event of any interference or missed pulses this circuit rejects the entire frame of information. Furthermore, if an intelligible frame is not received for .25 seconds, the receiver and servo systems go to a fail-safe condition until valid transmitted information is received. Control surfaces neutralize and the throttle retards during the fail-safe condition.

The receiver package separates the 16 pulses in each pulse frame into eight pairs of pulses representing the eight pieces of information. These pulse pairs are then sent to the Digimite servos. Each servo has an integral electronic module which measures the distance between pulses fed to it by the receiver. It may be considered that the servo electronic module acts as a switch. When the servo mechanical output does not coincide with the transmitter stick position, the electronic module switches full voltage to the servo drive motor until the error is cancelled. Since the system does not provide a voltage to the motor in proportion to the error, air loads and linkage friction do not degrade the servo-loop performance.

Two types of Digimite servos are available and are completely interchangeable. The first type of servo is the center-fail-safe type which drives to a center position when the system goes to a fail-safe condition. This type of servo is used for flight controls which should neutralize on fail-safe (elevator, aileron, rudder, etc.). The second type of servo is the end-fail-safe type which drives to one end when the system goes to a fail-safe condition. This type of servo should be used for throttle control (retard fail-safe) and auxiliary controls such as landing gear actuation (gear down fail-safe).

The Digimite transmitter has two main control sticks and four auxiliary control levers (see figure 1.). The two main sticks are set up with the rudder and throttle control on the left stick (i.e. the left stick is not self-centering on throttle control). Aileron and elevator control are on the right stick. Proportional pilots, experienced reed flyers, and beginners quickly adapt to this two stick arrangement. When experienced reed pilots no longer find the elevator in the left thumb position, they divorce themselves more rapidly from the old reed practice of pulsing. The arrangement of sticks permits manipulating all prime controls simultaneously without removing hands or thumbs from any of the controls. Also, when auxiliary controls are utilized, only the left hand is required to move the auxiliary levers while the right hand still handles the prime aerodynamic controls.

The meter on the front of the transmitter has two modes of operation. When the transmitter is turned on, the meter reads relative power output (RF output). This RF power reading is also indicative of power supply condition. This meter also reads charging rate when the power supplies are being charged.

CHARGING THE POWER SUPPLIES

Bonner Digimite Power Supplies are constructed by the General Electric company specifically for the Digimite system. Although power supplies are charged at the factory prior to shipping, they might be received in a discharged state. Therefore charging would then be required prior to initial operation of the Digimite system. The receiver power supply is plugged directly into the appropriate socket on the bottom of the transmitter as shown in figure 2. Charging the transmitter without the receiver power supply can not be done since both power supplies are charged in series.

The series charge rate of the transmitter and receiver power supplies is indicated on the transmitter meter. The normal charge rate is approximately 40 milliamperes. A 24 hour charge insures that the power supplies are ready for use.

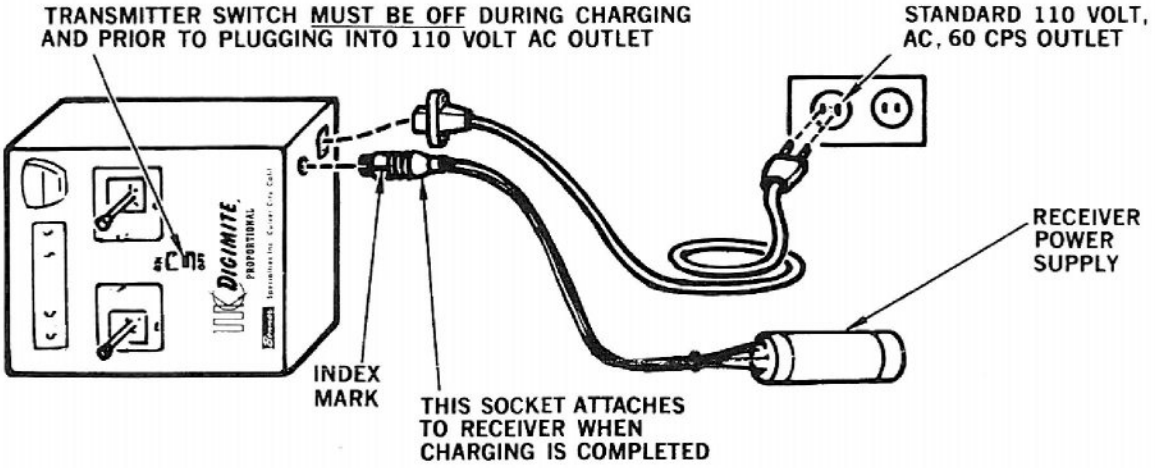


Figure 2. Charging the Power Supplies.

If desired, flight pack charging may be performed through the airplane harness as shown in figure 3. with the equipment installed in the airplane.

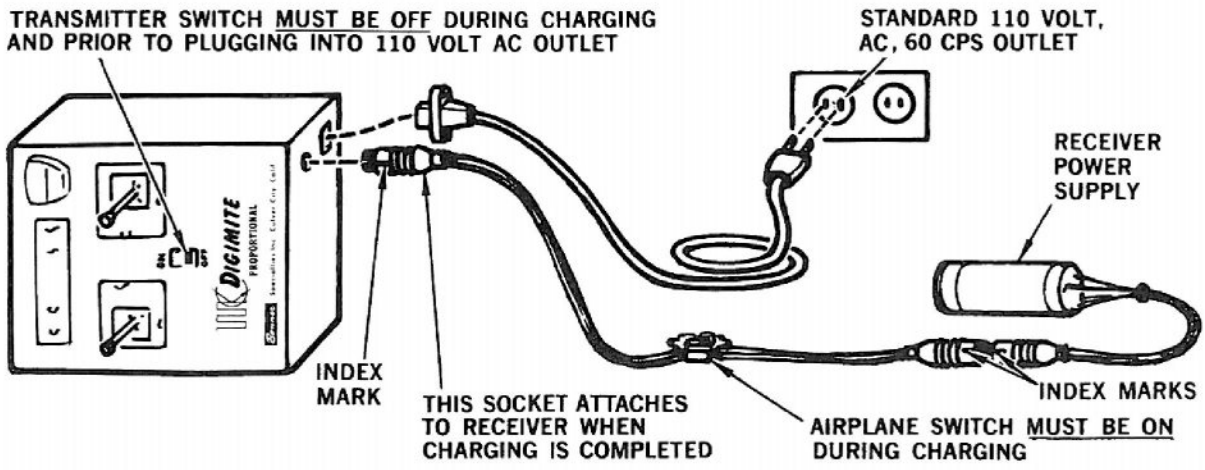


Figure 3. Charging the Power Supplies—Receiver Power Supply Being Charged Through Airplane Harness.

SYSTEM CHECKOUT AND OPERATION

Before installing the Digimite system in a model, it is recommended that it be put into operation on the bench to familiarize the owner with the operation. Before this is done, be sure the power supplies are charged in accordance with the preceding section.

All that is needed to place the transmitter into operation is to turn the switch on. The antenna may be attached if desired and can be retained in the collapsed condition for bench work.

To operate the airborne equipment, plug the servos into the appropriate receiver sockets, connect the receiver to the power supply using the switch and wiring harness and turn the switch on. Although the servo plugs are polarized, care should be taken in mating the servo plugs to receiver sockets to avoid bent pins. Check index marks on plugs and sockets, before connecting.

Switch the receiver on and study the control operation. Note that when the transmitter is turned off, the servos go to their respective fail-safe position, either at center or at one end according to the type of servo.

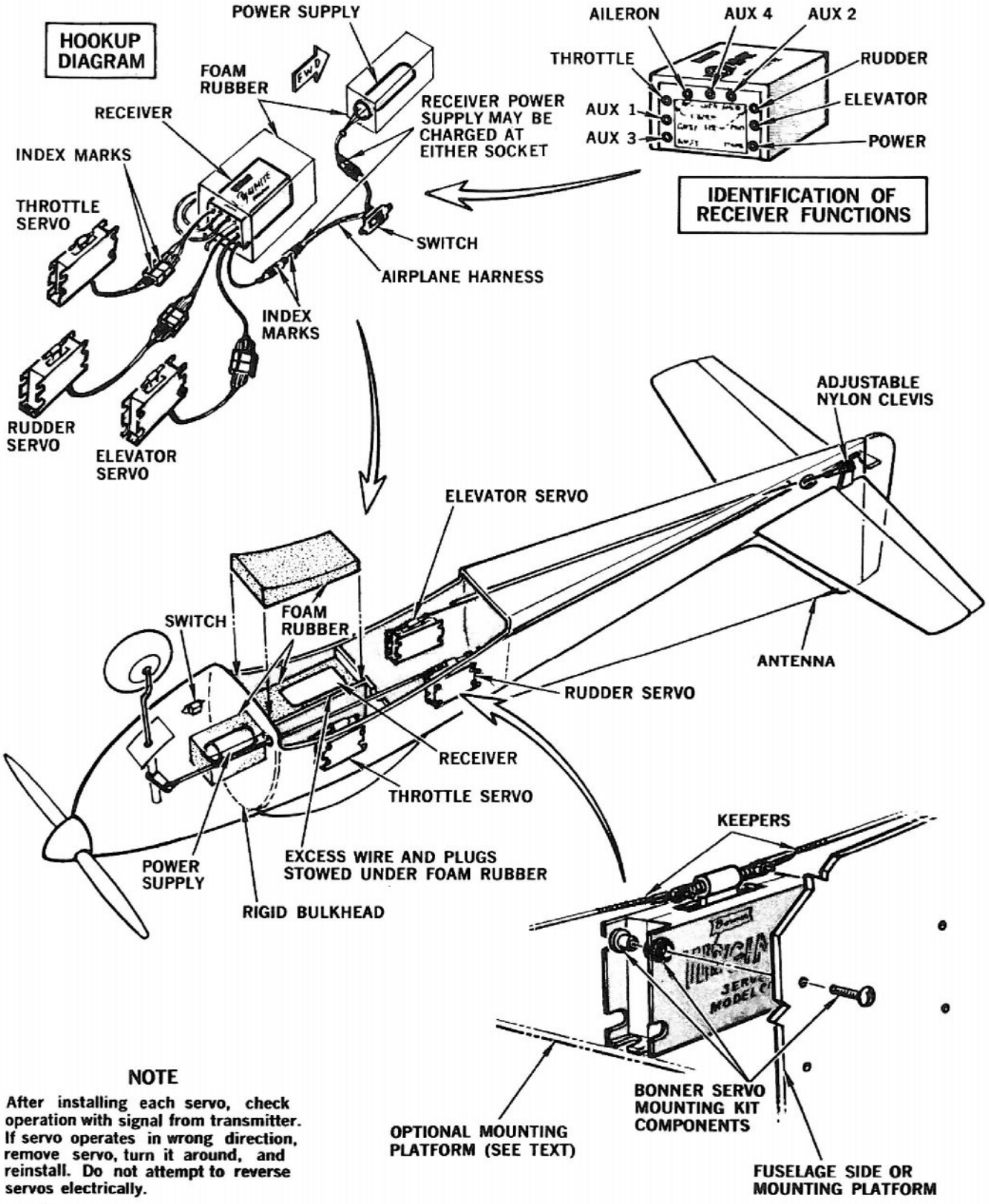
INSTALLATION

The installation of the Bonner Digimite system is straightforward. Good practices commonly employed when installing reed systems are acceptable. These practices should include the following usual precautions to keep electrical noise from the superheterodyne receiver:

1. Route the receiver antenna directly out of the fuselage close to the receiver and back to the top of the fin. This places it far from any electrical wiring and metal linkage. Do not route the antenna back through the fuselage and then out.

2. Avoid metal-to-metal linkage joints as these generate radio noise. Use nylon clevises when control horns are metal and vice-versa.

Figure 4 shows a typical fuselage installation of the rudder, elevator and throttle control servos in a low wing model. Servos are placed according to center-of-gravity and space considerations. Bonner Servo Mounting Kits are a superior method of fastening. The servo "tray" method or the side mount method may be used according to the modeler's preference. Be sure in either case to securely mount the servo to plywood unless a fiberglas fuselage is used. It should be noted that where several devices



NOTE

After installing each servo, check operation with signal from transmitter. If servo operates in wrong direction, remove servo, turn it around, and reinstall. Do not attempt to reverse servos electrically.

Figure 4. Installation

operate from one servo (such as for rudder control and nose wheel steering) both ends of the servo clevis can be utilized for a neat and workmanlike installation. Rigid push-pull rods made of 1/4-inch square hardwood or 3/8-inch square balsa should be used to the elevator and rudder horns to prevent any flexing under air loads or "G" loads.

The switch is attached to the fuselage side with the button protruding. The wiring harness may now be connected and the wire bundles are stowed under foam rubber in out-of-the-way places.

Both the receiver and power supply should be wrapped in foam rubber or foam plastic prior to sliding in place. The receiver foam wrapping should be tight enough that the receiver will stay in place when the wing is attached. To stop damaging forward motion in the event of a crash, both the receiver and power supply should be close to a rigid bulkhead.

Ream the holes in nylon linkage parts oversize to prevent binding. Binding results in excessive battery drain. All servo linkages should be checked for binding without the servo installed. Then install the servos and check for operation and sense (direction). Those servos which operate backwards should be turned around; never try to electrically reverse them.

No unusual techniques are employed when installing the aileron servo linkage. Each end of the output arm is linked to an aileron using 1/16 - inch diameter wire and nylon bellcranks.

TRIM ADJUSTMENT

After installing the servos, linkages, and other equipment, the exact trim adjustments can be made. The receiver should be turned on momentarily with the transmitter off which allows the system to go to fail-safe and all flight-control servos to neutralize. Mechanically adjust the linkage so that the controls are in neutral. When the transmitter is turned on; all controls should still be in neutral when the trim levers are in neutral. As a result, full trim in any direction is available. Also, a fail safe condition positions controls to flight neutral.

Adjust the throttle control linkage so that full travel of the servo drives the throttle to both extremes. The radius of the engine throttle arm may have to be shortened to provide enough throttle throw, or lengthened to stop excessive overtravel stresses on the linkage and servo.

RECEIVER-ANTENNA MATCHING

The Digimite receiver antenna coil must be tuned in the airplane. This operation matches the antenna circuit to the antenna length and other variables of each individual installation. It is normally done with the wing off but with the airplane installation otherwise complete and ready for flight. A helper is required to operate the transmitter. Tuning is performed with the transmitter antenna removed, and the power supplies fully charged.

The helper "pumps" down elevator with the transmitter and backs away from the airplane until control becomes ragged. Then the helper moves closer to the airplane until control just becomes solid again. Now a 1/8 inch hex-shaped plastic tuning wand (supplied with the Digimite System) is inserted through the hole in the receiver to turn the tuning slug. Any attempt to use anything other than the proper tool will result in breaking the powdered iron slug.

Now with the helper holding steady down elevator, turn the tuning slug to the right until control becomes ragged. Note this position. Then turn the tuning slug to the left through the solid control area until control again becomes ragged, and note this position. Now turn the tuning slug back to the right until it is half way between the two ragged control positions.

Then for finer tuning, the helper backs farther away and repeats the above tuning procedure, until maximum range with the transmitter antenna off is obtained. Range with the transmitter antenna off should be approximately 20 feet when the receiver is properly tuned.

The Digimite logic circuits reject interference when flying. However do not tune the receiver on a busy flying field where other transmitters are in operation. Any transmitter signals regardless of exact frequency result in wide variations in the receiver's sensitivity and totally confuse any attempted tuning operation.

Normally the tuning operation need only be performed once in an airplane. However, if changes are made in the antenna placement or model wiring, then tuning should be repeated for best operation.

FLYING

Perform a routine control test with transmitter antenna off upon arriving at the flying field each day. Although RF activity at the field may reduce the range previously attained when tuning the receiver, the results of this test are indicative of whether or not a major problem exists.

A qualified proportional flyer should test fly the aircraft and trim it in the air using the trim levers. After the flight, mechanical trim adjustments should be made to the airplane linkage so that the transmitter trim levers may be returned to neutral.

Lack of sufficient charging of power supplies is one of the greater prob-

lems affecting reliability. Whenever possible, charge the power supplies for 24 hours just prior to flying.

Always extend the transmitter antenna completely, prior to taxiing out for take-off. The receiver with its R.F. overload protection allows operation within an arm' s length of the transmitter with antenna fully extended.

FACTORY SERVICE

If at any time the Bonner Digimite system fails to function properly, it should be returned to the factory for service. The components should be replaced into the original shipping carton for return. A description of the problem should be included.

Circuit diagrams are not included with Digimite units. The computer-type logic network circuits of the Digimite system do not require checkout by, and are beyond the capability of, the normally skilled electronic technician. Do not open servo cases. This would void the warranty. Unless servo cases are opened with factory tools, the bearings may spring out, touch magnets and damage the sensitive circuitry. Circuit diagrams may be obtained from the factory for $2.50 a set, (transmitter, receiver, and servo circuits are in one set). Be sure to include the serial numbers of your transmitter and your receiver when ordering circuit diagrams. The serial number for each set is printed next to the 110 volt charging socket on the transmitter.

A circuit diagram of the receiver power supply is shown in Figure 5.

We reserve the right to make improvements and modifications at any time without notice or obligation.

Bonner Specialties, Inc.
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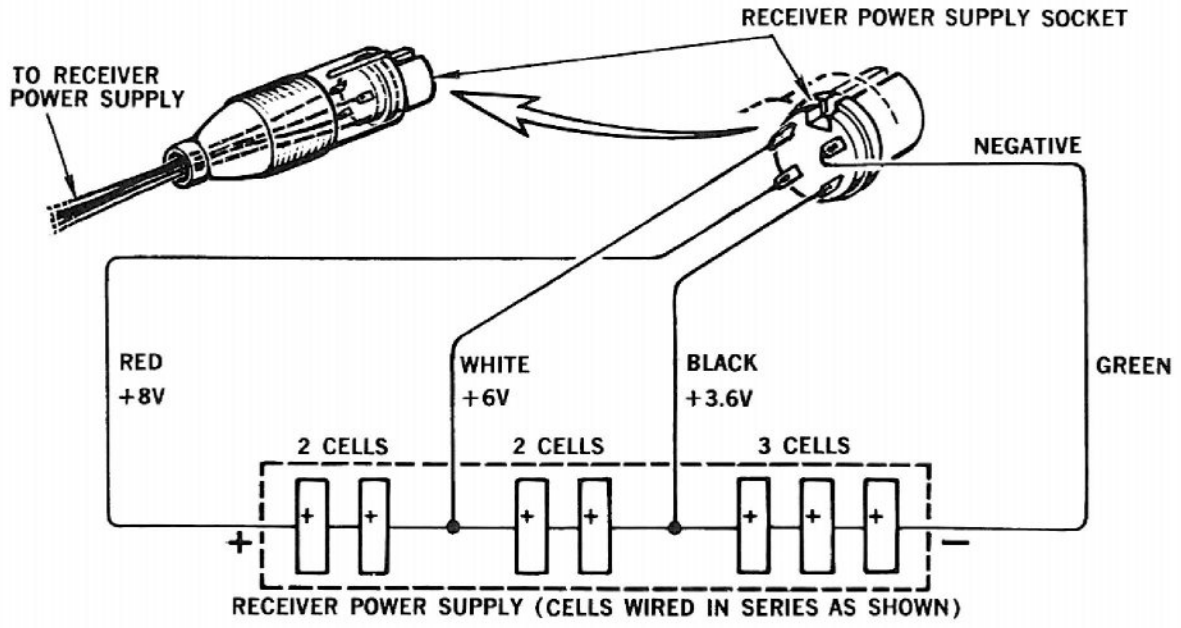

Figure 5. Schematic of Receiver Power Supply.