APPENDIX 5

USER INSTRUCTION BOOK

FOUR (4) PAGE USER INSTRUCTION BOOK
FOLLOWS THIS SHEET

ER, DUST AND FUEL

uitable measures to prevent water, dust and oil(fuel) to get into the radio system.
event that this happens, make sure that you clean them off thoroughly before
rn it "on" again.

'O LINKAGE

your linkage rod to produce the maximum freedom of movement possible with
nimum amount of slop and friction. To check these points out, operate each
over its full stroke and check if the rod binds or is loosen. If you hear any
ng from the servo, you should readjust the linkage rod. One great item that we
TEC has invented is the "JAM CHECKER" which is uniquely designed just to
if there are any binds in the linkage if they are buried in the installation and
be detected easily.

ARITY

a model were wasted and junked by a simple but mindless mistake such as
:ting to the wrong polarity so whenever making a connection,do make sure that
re the right polarity.

IET THROTTLE CONTROL

ay defeat the spring mechanism on the throttle stick by placing "SPRING DEFEAT" pin
r color) provided on top of gimbal inside transmitter case.

AL PARTS

OUS SIZE SERVO

LAR SIZE SERVO (41 x 20 x 38 mm , 43g)
2F :0.12sec/60°, 2.6kg/cm for 1/12 scale RACING CAR, QUICK STEERING
5 :0.17sec/60°, 3.7kg/cm for 1/12 scale OFF-ROAD BUGGY (Ball bearings)
5BB :0.13sec/60°, 6.6kg/cm for 1/8 scale HEAVY-DUTY USE(2 Ball bearing)
IZE SERVO (34 x 14 x 31 mm , 23g)
I :0.16sec/60°, 2.0kg/cm for mini scale CAR AND GLIDER
SIZE SERVO(28 x 13.7 x 28.2mm , 18g)
) :0.12sec/60°, 2.6kg/cm for 1/10 scale RACING CAR or mini scale GLIDER & AIR PLANE
ER SCALE SERVO (59 x 29 x 50 mm , 100g)
) :0.18sec/60°,11.5kg/cm for 1/4 scale CAR AND BUGGY, OR YACHT WINCH

TRONIC SPEED CONTROLS

AY E . S . C . FOR LARGE CAPACITY AND HIGH EFFICIENCY
0 : 175AMPS, BRAKE, FULL FET, HIGH FREQUENCY CONTROL, TEMP-FET & B .E .C.
I2DL : 175AMPS, BRAKE, FULL FET, B .E .C .
I2N : 150AMPS, BRAKE, FULL FET, B .E .C .
I1N : AUTO-CUT-OFF, FULL FET, B . E . C . FOR AIR CRAFTS.
AY E . S . C . (FORWARD & BACKWARD)
I :120AMPS, BRAKE WITH FULL FET, TEMP-FET & B. E .C.
0 :150AMPS, BRAKE WITH RELAY BACKWARD, MOS FET, B .E .C .
CONTROL UNIT
:AUTO-CUT-OFF, BRAKE, 5CELL TO 10 CELL B.E.C

NON BEC

3 CHANNEL RANGER II FM

OPERATION MANUAL

ENGLISH
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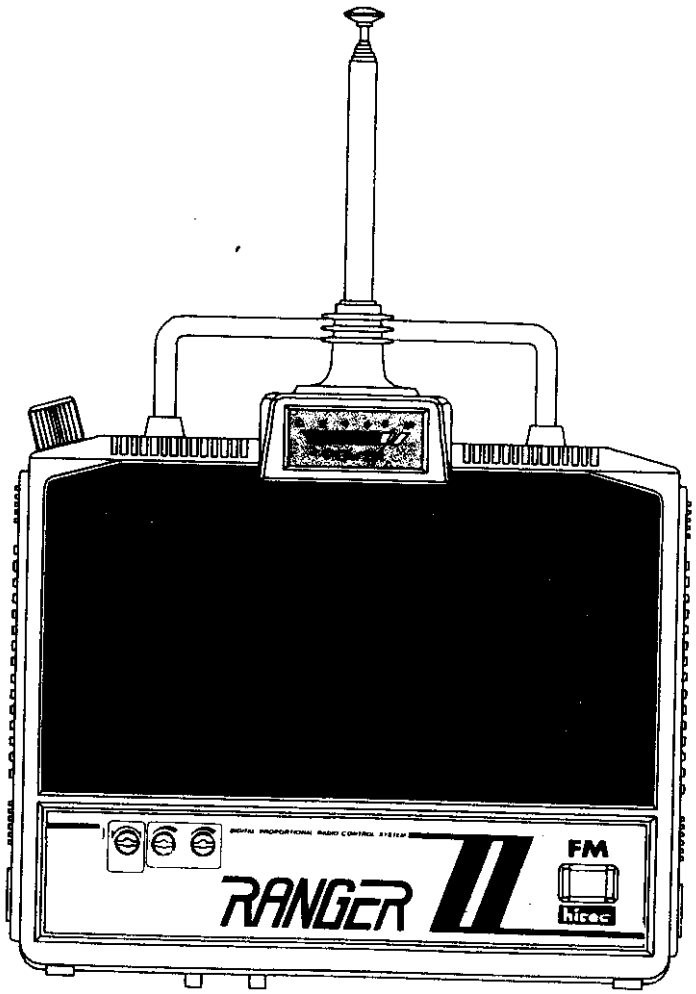

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WELCOME TO THE INTRIGUING WORLD OF R/C

Thank you for purchasing the RANGER 3 channel FM radio system and thereby entering into the wonderful world of radio control model hobby. The RANGER3 radio is the finest of its kind using the latest electronic technologies therby assuring the best performance and highest quality.

Team up with HI-TEC, "The R/Cer's Partner" and you will enjoy the many facets of R/C fun.

(WARNING) Please note that the receiver of RANGER 3 FM is NOT equipped with Battery Eleminator Circuit in the unit. So don't let the power over 6V go into the receiver. Only use 4cell "AA" size battery or be powered by electric speed controller which has B. E. C in it self.

FEATURES AND SPECIFICATIONS

A. TRANSMITTER

- 3 CHANNEL FM TRANSMITTER FOR REAL TIME SERVO - RESPONSE
- (
- TWO CHANNEL SERVO REVERSING SWITCHES
- CHARGER CONNECTOR FOR NI-Cad BATTERIES (8 cell 9.6V)
- ADJUSTABLE SERVO TRAVELING(ATV) FOR STEERING AND THROTTLE
- QUICK START /BRAKE FUNCTION FOR FAST RESPONSE OF THROTTLE
- ALL SMT CIRCUITRY
- SPRING OR RACHET THROTTLE CONTROL

B. RECEIVER (NON B. E. C)

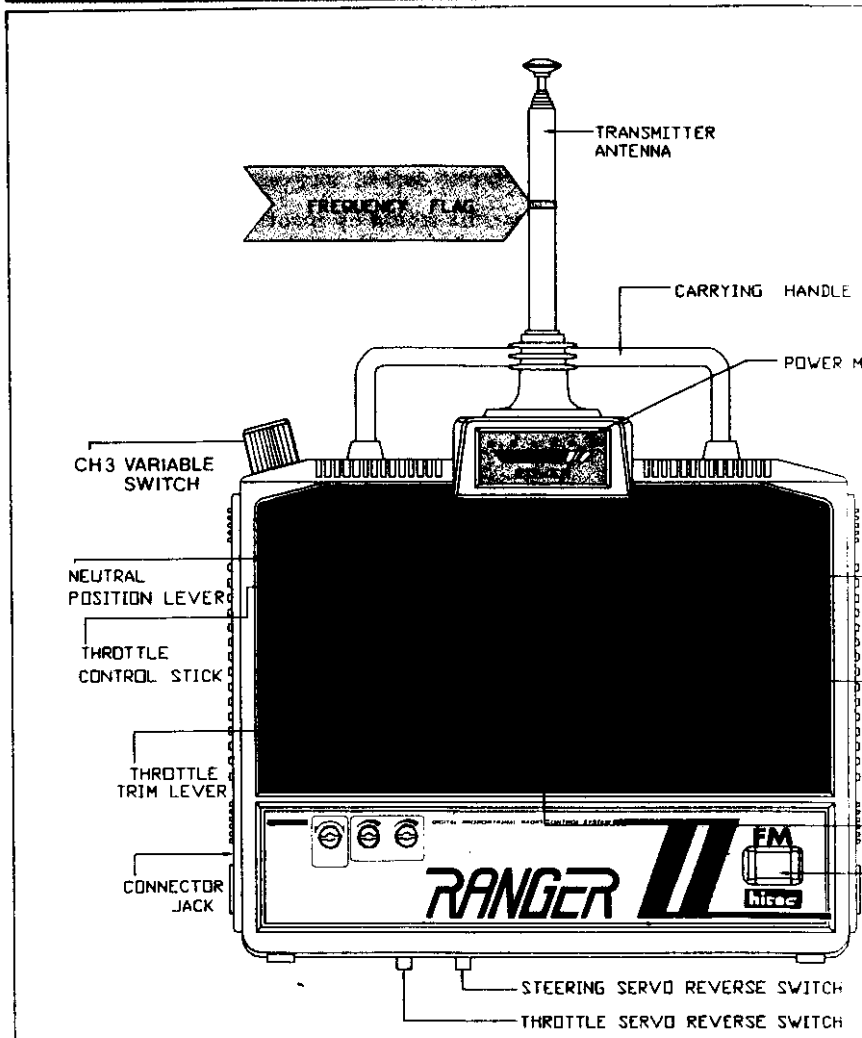
- FM SINGLE CONVERSION RECEIVER FOR NOISE PROOF
- CRYSTAL INTERCHANGEABLE
- SIZE AND WEIGHT

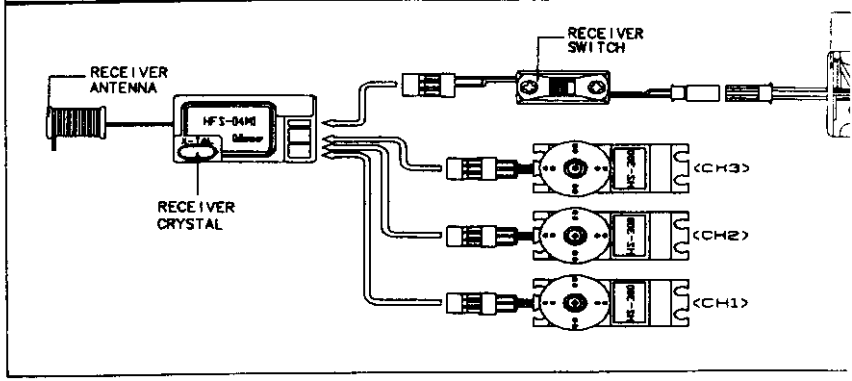
  SIZE : 48 x 29 x 19 mm (1.9 x 1.1 x 0.7") ,WEIGHT : 22.5g (0.79oz)

C. SERVO

- HEAVY-DUTY AND DUST RESISTANT DESIGN
- HIGH SPEED : 0.16sec /60°
- HIGH TORQUE : 3.5.kg /cm(44on /in)
- HI-TEC CUSTOM CHIP FOR NARROW DEADBAND
- ALL SMT CIRCUITRY

RANGER 3 CH FM LAY-OUT DIAGRAM





THE VARIOUS USE OF THREE CHANNEL RADIOS

A. VEHICLES & BOATS

You can operate all model vehicles and boats of course with this advanced three channel radio whether they are engine powered or battery operated. Since the basic maneuver of all vehicles and boats is throttle and steering (rudder), two channel operation is all you need in most cases. However the third channel provides one more auxiliary channel you can use for whatever purpose you may desire.

B. AIR PLANES & GLIDERS

The main use of the third channel for aircrafts would be throttle control. The third channel of this radio is designed exactly for this purpose. After lifting the aircraft in the air, you will be able to control speed and/or turn off the power to let it soar by controlling the variable switch of the third channel. To control speed or turn off the power of aircraft in the air, you may need another accessory items such as HITEC SP-1801 SPEED CONTROLLER for aircraft and SP-1003 ON/OFF CONTROL UNIT. SP-1801N will provide proportional speed control from neutral to high end and SP-1003 will do ON/OFF control without any extra servo for throttle. Also, both of them have Battery Eliminator Circuit (BEC) AND AUTO-CUT-OFF FUNCTION so there is no more thing you need for enjoying the 3 channel aircraft model.

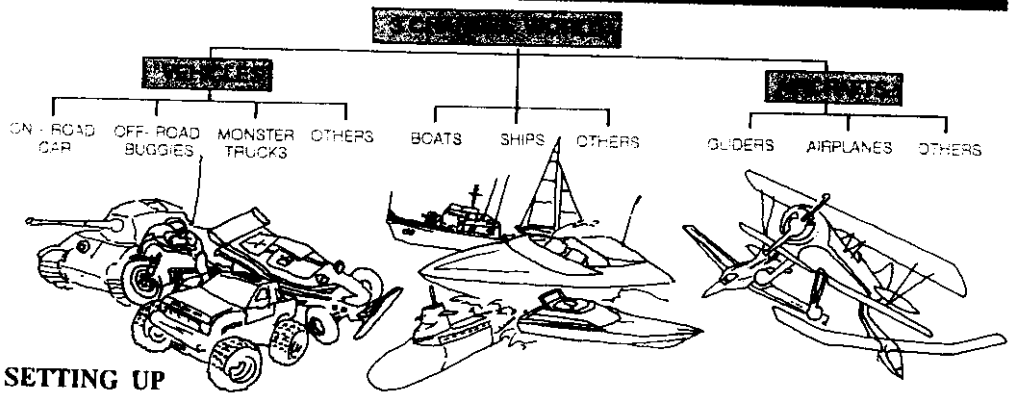
C. OTHERS

You may find many other models too numerous to mention or catergorize such as tank, submarine, parachute planes, rocket launched gliders,hovercraft etc.

(WARNING) Please note that certain frequencies are to be used solely for airborne use as well as certain frequencies earmarked only for surface use so please consult your local club or hobby store to make sure.

(EXAMPLE) IN THE U.S.A

75 MHz : FOR SURFACE ONLY , 72 MHz : FOR AIR ONLY



SETTING UP

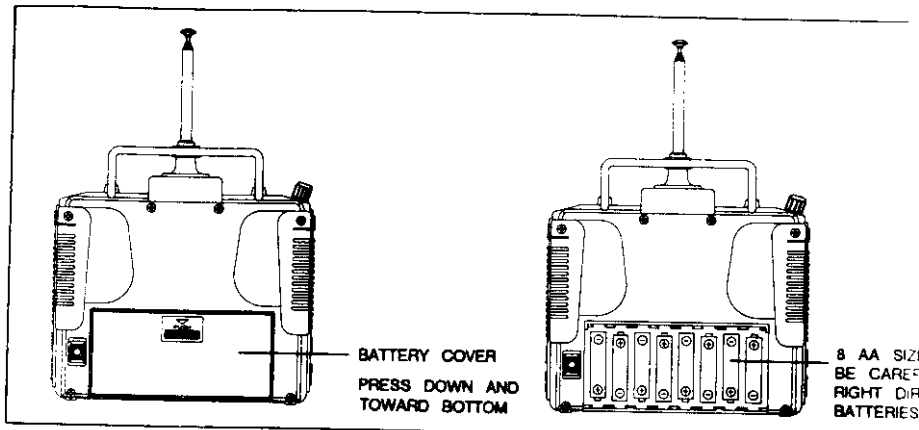
Please read the following section carefully before installation and operation of your new model. The instruction was written with the beginners in mind but even experienced modellers should take note.

A. BATTERY INSTALLATION

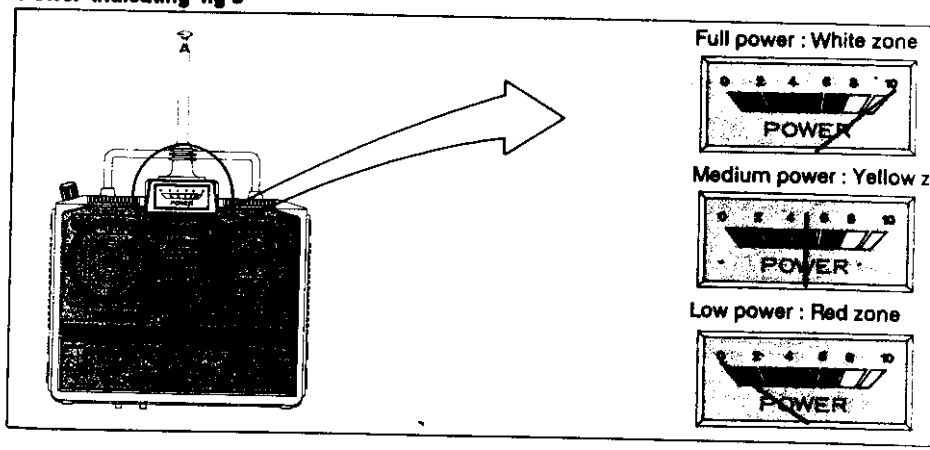
The transmitter uses eight "AA" size batteries and four for the receiver.
We recommend using the Ni-Cad batteries whenever possible as it will prove to be far more economical in the long run.

1) When loading the batteries, please make sure the transmitter and the receiver switches are in "OFF" positions.
2) Open the battery compartment at the back of the transmitter by pressing th cover down and toward the bottom.(see fig 2)
3) Load batteries into the slots paying close attention to the polarity.(see fig 2
4) Replace the battery cover and turn the power "ON" to see if the indicating move up. If the batteries are fresh, the indicating arrow will move to the far r but if the low power , the arrow down to the yellow zone, you had better replac batteries or recharge your Ni-Cad batteries.(see fig 3)

Loading battery fig 2



Power indicating fig 3



B. OPERATION CHECK

1. Gently plug the switch harness and servo connectors into the proper slots o receiver. The connectors are polarized thus should fit only one way. If they go in one way, reverse it and see if it will plug in. Never use excessive fo in connectors.(see fig 1)
2. Turn the transmitter power switch "ON" first, then the receiver switch "ON". A remember to turn the transmitter before you turn the receiver switch, otherw receiver may receive other interfering signal from other radio source and jitt
3. Check to see if the servo move when you control the sticks. Move the trim the center position (see fig 4) .

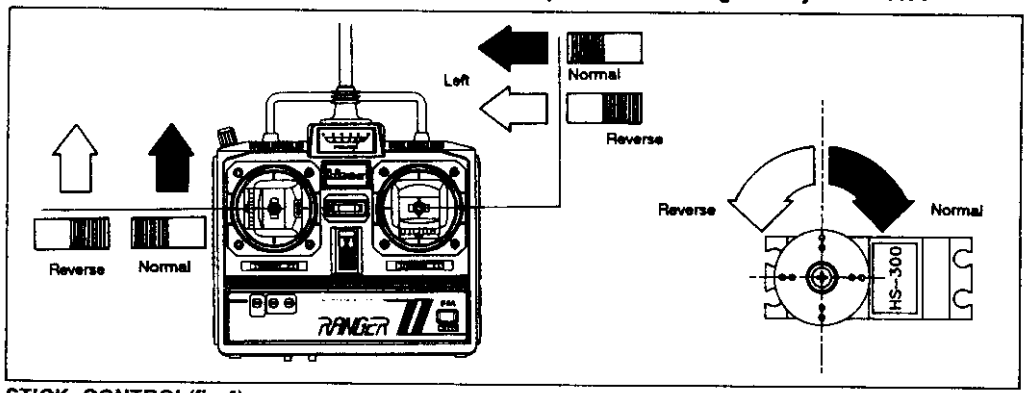
4. Check the direction of the servo rotation. If you wish to change the direction of the servo, push the servo reversing switch and check it changes the direction as you desire.(see fig 4)

5. If you wish to have more forward throttle than backward, you can push down the neutral position adjustment lever. You will have 30% more forward than backward. The control stick will only return to the lower position. You may have to adjust the servo horn position when you do this.

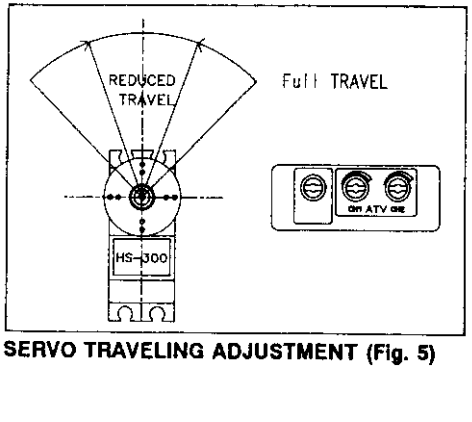
6. Adjustable Traveling Volume : You may use this volume to adjust servo traveling according to the characteristics of your model, the servo travel can be adjusted from 50% to 100% of the total travel range by turning each ATV knob on the transmitter.(see fig. 5) Turning clockwise will increase servo travel and counter clockwise will decrease servo travel.

7. Quick Start/Brake : This button is located at the back of the transmitter and is a convenient feature if you ever get involved in competition racing. While pressing the button with your little finger, you hold the throttle stick at full throttle, then let go at the start signal by releasing the button. This button also doubles as a quick brake when you need it. Instead of throwing the throttle stick down, you can simply press this button to bring your car to screeching halt. Before using Quick Start/Brake feature, you should preset the braking point by adjusting the Throttle Quick Trim as following ; With the throttle stick set in neutral for your servo or speed control, press the Quick Start/Brake Button to see if braking position is correct. If not, adjust the trim. You may adjust the trim while the car is running but you would have to take extra care so it does not get out of control. (see fig. 6)

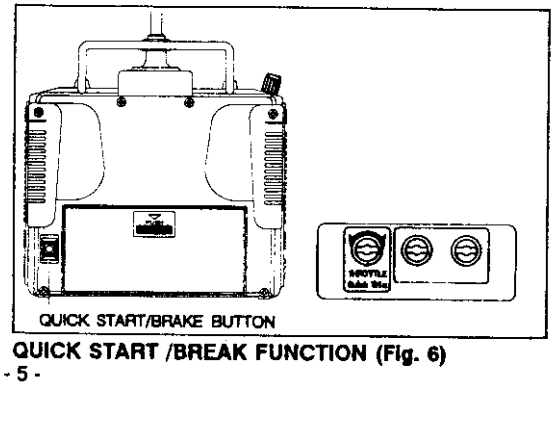
8. If everything checks O.K. turn your receiver off before you turn your transmitter off. Remember that this is exactly the reverse sequence of turning the system "ON".



STICK CONTROL(fig 4)



SERVO TRAVELING ADJUSTMENT (Fig. 5)



QUICK START /BREAK FUNCTION (Fig. 6)

INSTALLATION

When installing the radio system to the model, please follow the de of the model kit manual.

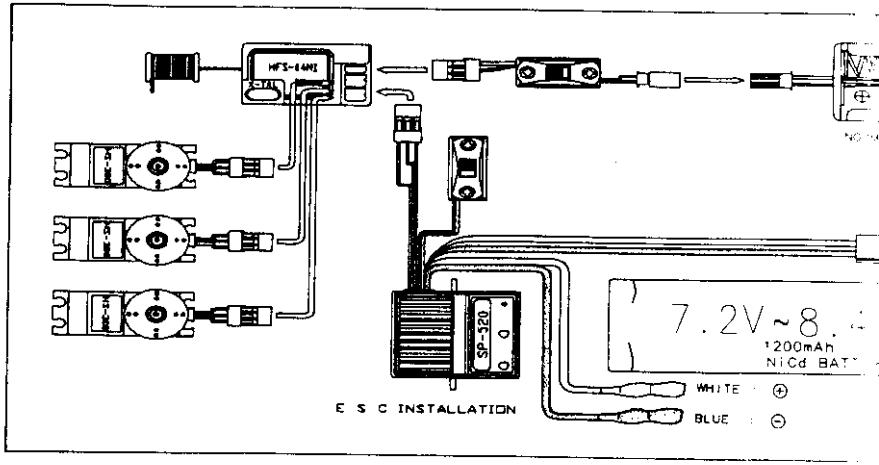
A. Normal installation(non B.E.C)

If you are using the regular mechanical speed control that usually com model kit, you will need all two servo, battery harness that comes with Incidentally this is the installation method for the engine equipped mod

B. E.S.C. installation (Electronic Speed Control)

You may wish to use an E.S.C in place of the mechanical speed co servo. This will allow more precise control as well as less power cons note that most E.S.C is already equipped with B.E.C in the unit simply plug into channel two of the receiver.

INSTALLATION DIAGRAM (Fig 7)



HELPFUL HINT

A. BATTERY

Always take extra care that all the batteries in the radio set are fully c fresh (Dry) when operating your radio. Otherwise the receiver range will be reduced and lose control thereby may damage your model and / or When you recharge your transmitter Ni-Cads with charger jack, be careful of contact should be plus⊕, outer minus⊖. For your convenience, we recomm overnight charger; CG-22(220V) or CG-25(110V).

B. ANTENNA

Both the transmitter and the receiver antenna must be fully extended wi careful that you do not cut off the excess receiver antenna wire or bun severely cut down on the operating range.

C. X-TAL CHANGE

When changing the frequency to another channel, make sure that you m transmitter to the receiver channel. Also you must make sure that they with only genuine HI-TEC single conversion FM X-tals as not all X-tal compatible to each other. Also remember that you can change frequenci in the same frequency band, that means you cannot change to 72MHz (Also in U.S.A, you may be not allowed to change the transmitter X-TAL)

APPENDIX 6

TRANSMITTER TUNE-UP PROCEDURE

1. Attach 12.0 Vdc power supply.
2. Using a spectrum analyzer and a short pick-up antenna, look for 75 MHz signal with sufficient scan width to see 30-150 MHz spurious.
3. Adjust T1, T2, T3 and T4, for maximum output at operating frequency and minimum output at any harmonics.
4. Repeat Step 3.
5. Check for minimum emissions from 30 to 760 MHz.

APPENDIX 7

CIRCUITS AND DEVICES TO STABILIZE FREQUENCY

Transmitter output frequency is determined and stabilized by PLL IC3 and 8 MHz reference crystal controlled oscillator.

APPENDIX 8

CIRCUITS TO SUPPRESS SPURIOUS RADIATION,

Final RF amplifier spurious emissions are attenuated by a "PI" matching network consisting of L5, C38, C40, T4, C41, T5, C42 and L6.