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ENGINEERING DEPARTMENT

ITEM NO: MINI HELICOPTER PALNE  
MODEL NAME: 27.195MHZ  
FREQUENCY: 27.195MHZ  
DATE: 3-6-2006  
BY: B.LEE  
REV: ORIG

### (CIRCUIT DESCRIPTION )

\*\* CIRCUIT DESCRIPTION :-

#### IN TRANSMIT MODE.

WHEN THE CONTROL KNOB IS PRESSED, A CW SIGNAL IS TRANSMITTED. THE CRYSTAL CONTROLLED OSCILLATOR Q1 OUTPUT IS COUPLED THROUGH C21 TO THE BASE OF Q2. FROM Q2 THE SIGNAL IS FED THROUGH T-2. Q2 OUTPUT IS COUPLED THROUGH C21 TO THE BASE OF Q3. FROM Q3 THE SIGNAL IS FED THROUGH T2. THE LOW PASS FILTER MADE UP OF C15 & T-1 & C16 AND C17 WHICH ARE CONNECTED TO THE ANTENNA ROD. THE MODULATION IS PROVIDED BY IC-1, THEN THE FV DIODE WILL BE FREQUENCY MODULATED THE CRYSTAL FREQUENCY. THE VARIED FREQUENCY(S) WILL THEN BE SENT TO THE BASE OF Q1 THAT WILL MODULATE THE RF TUNED CIRCUIT DIRECTLY. ENERGY IS SUPPLIED BY A 9.6VDC 6F22 ALKALINE BATTERY.

#### IN RECEIVE MODE

Q1 IS THE UNTUNED RF AMPLIFIER.  
U3 IS THE SUPERHETERODYNE IC THAT CONTAINS LOCAL OSCILLATOR, MIXER, AND IF AMPLIFIER, AND SIGNAL DETECTOR.  
U5 IS THE SIGNAL DECODER AND CHANNELS SEPARATION IC.  
U2 A/B ARE THE UP-DOWN & BACKWARD-FORWARD POWER MOTORS DRIVER.  
U1 IS THE DC VOLTAGE REGULATOR FOR FRONT END.  
ENERGY IS SUPPLIED BY A 3.7VDC 150MA RECHARGED TYPE LITHIUM BATTERY.

#### \*\* ANTENNA AND GROUND CIRCUITRY.

THIS UNIT MAKES USE OF AN EXTERNAL 12-INCH ANTENNA. THE ANTENNA IS INDUCTIVELY COUPLED. THE UNIT RELIES ON THE GROUND TRACE OF THE PRINTED CIRCUIT BOARD. NO EXTERNAL GROUND IS PROVIDED. ENERGY IS SUPPLIED BY A 9.6VDC 006P ALKALINE BATTERY.

#### \*\* BACKGROUND

THE DEVICE DESCRIBED HEREIN IS A WIRELESS (RF) TOY AEROPLANE CONTROLLER TRANSMITTER FOR USE WITH THE TOY AEROPLANE CONTROLLED RECEIVER. IT HAS ONLY ONE CHANNEL OF OPERATION WHICH THE USER MAY CHOOSE ONLY, AND IS USED TO SEND BUTTON-STATE DATA FROM THE CONTROLLER TO A WIRELESS RECEIVER CONNECTED WITH MOTORS

#### \*\* TYPICAL OPERATION

TYPICAL OPERATION WOULD INVOLVE THE USER TURNING ON THE UNIT TO THE TOY GAME. WHEN TURNED ON, THE UNIT COMES UP ON THE DEFAULT CHANNEL AND TRANSMITS A CONTINUOUSLY STREAM DATA. THE USER CAN NOT, AT WILL, CHANGE TO ANY OTHER OF THE PREDEFINED CHANNEL.

#### CONFIGURATION

THE TRANSMITTED RF CIRCUITRY CONSISTS OF A CRYSTAL CONTROLLED OSCILLATOR, FOLLOWED BY TWO RF AMPLIFIER, & FINALLY, AN ANTENNA. THE MAIN CHARACTERISTICS OF THIS CONFIGURATION ARE SHOWN BELOW :-

FREQUENCY RANGES	27.195MHZ	
OCCUPIED BANDWIDTH (-20DB)	<100KHZ	MAX
FREQUENCY STABILITY	+/- 10 PPM	MAX
MODULATION METHOD	F M	5KC DEV. MAX
OUTPUT POWER	80 DBUV / M	MAX

#### REFERENCE OSCILLATOR

A 27.195MHZ CRYSTAL OSCILLATOR IS USED TO GENERATE THE REFERENCE FREQUENCY. IT HAS A STABILITY OF +/- 10 PPM.

#### AMPLIFIER

THE OSCILLATOR IS FOLLOWED BY TWO AMPLIFIERS. THESE ACT MORE AS BUFFER FOR THE OSCILLATOR THAN AS GAIN STAGE, AND ADD VERY LITTLE POWER TO THE SIGNAL. THE FINAL OUTPUT IS 80 DBUV PER METER MAX

#### ANTENNA

THE SYSTEM ANTENNA IS A COPPER ANTENNA ROD LINKED TO PCB. ANTENNA ROD CAN BE TURNED OUT OR IN PENDING USER'S WISH.

#### MICROCONTROLLER

- THE TX SYSTEM IS CONTROLLED BY A SMALL MICROCONTROLLER RUNNING WITH A 4MHZ +/- 10% OSCILLATOR
- THE RX SYSTEM IS CONTROLLED BY A SMALL MICROCONTROLLER RUNNING WITH A 26.740 MHZ +/- 10PPM FOR FIRST LOCAL OSCILLATOR (MIXER IC)