

## **SECTION (A)**

### **Overview**

*This technical report provides information required for Certification under FCC Part 90 for Model 7559, 500 Mw Flat pack body transmitter, manufactured by Swintek Enterprises Inc. This device is intended for use by police agencies during certain undercover operations where voice and other audible activities can be monitored remotely. It is contained in a Plastic case. Exhibits are provided in this report as set forth in Part 2. of the Rules and Regulations. Initial estimates are that approximately 100 per year of Model 7559 will be manufactured.*

### **FCC Identifier:**

*The FCC Identifier for the above described device is shown below:*

*FCC ID: FLC200020*

*Section (B), page 6 of 6 illustrates a drawing of the FCC ID: label. The location of the FCC ID label is shown in Section (D), Photograph #1. The FCC ID: label will be located as shown in the photograph.*

## **Section (B)**

### **Technical Description:**

Model 7559 is a 4.5 VDC, (three AAA batteries) powered transmitter. It is designed to be worn on the body of undercover police officers during certain undercover operations whereby voice and other audible activity can be monitored or recorded from a remote receiver station.

The design is such that the batteries and microphone and antenna are all contained within the plastic enclosure on a single PC assembly. An optional cord electret microphone is offered which allows the transmitter to use an external microphone when necessary. The transmitter will operate continuously for a 2 hr. period at the rated power.

### **Transmitter Specifications:**

#### **General**

Power input:	4.5 VDC: (3 ea.) AAA Batteries
Current Consumption:	125 mA 500mW fixed power output
Package	Delrin
Temperature range	-30 to 60C
Distortion:	<5% at 1KHZ, 2KHZ deviation

#### **TRANSMITTER**

Emission	12K0F3E
Number of channels	1 standard
Frequency control	crystal
Modulation	FM
Modulation sensitivity	3 kHz deviation for one Volt RMS
Frequency Response	300-3KHZ (-32 dB oct low pass filter)
Power Output	500 mW: maximum.
Spurious Output	-43 dBc Maximum
Frequency Stability	5PPM
Duty Cycle	Continuous

## **Transmitter Circuit Description**

### **General**

The Swintek 7559 VHF transmitter utilizes a single board, battery powered, crystal controlled, FM modulated, 500 mill-watt transmitter. It features a 300-3000 kHz, Toko active low pass filter with an attenuation 36 dB per octave above 3 kHz. The transmitter utilizes a 4.5 VDC boost inverter to increase and regulate the transmitter voltage a 6VDC

The transmitter consists of four active semiconductor devices: A single IC1 transmitter subsystem (Motorola MC2833), A MRF5812 Power Amplifier; a MAX 637 Voltage Boost regulator and a Toko THB127B low pass active filter.

### **Crystal Oscillator**

The Model 7559 transmits a single channel Frequency Modulated (FM) Signal containing analogue telephone information. It occupies a bandwidth of approximately 11 kHz, resulting in an emission designator of 11KOF3E. The 7559 operates at a single, fixed frequency in the range of 150 to 172 MHz. Its maximum power rating is 500 Mw. No means are provided to adjust the output power. The transmitter will operate continuously for a 2+ hours with a new batteries installed. A constant voltage boost power supply is used to maintain the transmitter at a constant voltage of 6VDC. Frequency drift at the end of battery life is less than 500 hZ and power output is typically less than 100 mW.

IC1 includes a microphone amplifier, oscillator, buffer and two auxiliary RF amplifier transistors. The Oscillator is a Colpitts type. The frequency is set by the crystal YM1. This crystal is a third overtone, series mode which is rated at 5PPM over the temperature range of -30 to 50 degrees C. The crystal oscillates on the fundamental frequency of  $F_c = (F_c + 20\text{kHz})/4$  MHz. The frequency is adjusted to center frequency by means of L2

The oscillator is modulated by the internal variable reactance of IC1; MC2833. An internal op-amp with diode clamp limiting, is capacity coupled to an electret microphone input. The output of this op-amp is passes through low pass filter THB127B. The audio output of this filter is used to vary the reactance modulator in IC1.

## **MODULATION LIMITING CIRCUITRY**

The peak to peak audio frequency voltage being applied to the modulator is hard limited by the audio op-amp of IC1 at a maximum of one volts peak to peak. This signal is then passed through an active Toko THB127B, low pass filter to remove all frequencies above 3kHz at a slope of 35 dB per octave. The audio output level to the modulator is adjusted by the combination of R5 and R6. This level is factory set to 3kHz deviation and sealed.

### **Buffer & First Multiplier**

The first auxiliary amplifier is used as a 4X multiplier. C13 and L3 are adjusted to the 4<sup>th</sup> harmonic. The second transistor acts as a buffer, providing approximately 20 mW of drive to Q1. C14 and L5 are adjusted to the 4<sup>th</sup> harmonic of the crystal for maximum drive at minimum spurious at the desired output frequency.

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### **Final Amplifier**

The MRF5812, (Q1) power amplifier is biased into class A conduction to reduce even order harmonics and to reduce drive requirement. It operates at the nominal voltage of 6VDC and has an efficiency of approximately 50%. The final power stage requires 120 mA for normal operation at its specified power output.

### **Harmonic Filter**

L7, L8, L10, C17, C18, and C22 and associated components form a 3-pole bandpass filter centered at approximately 150MHz. Harmonic signal are filtered from Q1 and the transmit signal is passed to the RF output jack, J1.

### **Voltage Regulator/Boost**

IC3 is a low power boost or inverting DC-DC converter. An internal .5 Amp MOSFET switch reduces the total part count and allows a switching speed up to 100 kHz. L12 and D1 form the switching circuit. C26, C25, and C24 filter the DC output. R15 and R16 set the output voltage to 6VDC.

### **Indicators**

LED-1 will glow green whenever the power switch (SW-1) is set to on.

**TRANSMITTER CRYSTAL SPECIFICATIONS**

**VHF Transmitter Crystal**

Specification ID	YM1
Function	Colpitts Oscillator
Formula	$F = F_0/4$
Crystal Frequency Range	(FX) 37.5 MHz to 43.2 MHz
Carrier Frequency Range	(F0) 150 MHz to 172 MHz
Holder Type	HC-18/U
Mode	3 <sup>rd</sup> overtone
Frequency Tolerance	± 10 PPM
Stability (–20 degrees C to +60C)	± 5.0 PPM
Upper Turn Point (±7 degrees C)	45 degrees C
Series Resistance	20 Ohm max.
Load Capacitance	56pF

**Tune Up Procedure**

- A. *Connect a through-line wattmeter to the output of the transmitter (J1). Connect a 30dB pad to the output of the wattmeter and the output of the pad to a spectrum analyzer.*
- B. *Supply 4.5 VDC to battery input. Turn On power switch SW-1*
- C. *Adjust C13 for maximum Oscillator drive to multiplier stage. Adjust L2 to F carrier output Frequency  $\pm .0001\%$*
- D) *Adjust C14 (Quad multiplier) for maximum RF output.*
- E. *While monitoring the spectrum analyzer, adjust C15, C18 and C22 for maximum carrier signal with minimum spurious emissions.*
- F. *Inject a capacity decoupled 1Vrms Sign wave at 1 kHz into the junction of R2 and R7. The maximum deviation should be 3 kHz. If not re-set the value of R5 and R6*
- G. *While monitoring the spectrum analyzer, readjust C13, C14, C15, C18 and C22 for maximum carrier power of 500 mW with all spurious content less the -43 dBc.*

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