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## **[OPERATIONAL DESCRIPTION]**

Description: FM HANDHELD TRANSCEIVER

FCC ID: ONKATS-400B

### ***INTRODUCTION***

ATS-400B is a micro size 256 channel portable FM transceiver constructed with a microprocessor controlled, temperature compensated Phase Locked Loop (PLL) frequency synthesizer. The radio features a double conversion receiver and a direct FM transmitter modulator. A special integrated circuit provides support to sub-audible signaling (CTCSS & DCS) and most of the receiving parts are switched off periodically in the power saver mode to reduce battery current drain during standby.

The Block Diagram RF and Control Circuit Diagrams for ATS-400B shall be used in associate with the following circuit description.

### ***CIRCUIT DESCRIPTIONS***

#### ***1) PHASE-LOCK LOOP (PLL) CIRCUIT***

##### **\* REFERENCE OSCILLATOR**

The reference oscillator consists of TCX301 in U301 with a frequency of 12.8MHz. The reference oscillator frequency is stabilized and drives a divider to produce a comparison frequency.

This comparison frequency is selected by decoding the first three bits of the data input from microcomputer.

##### **\* PROGRAMMABLE DIVIDER**

The programmable divider in U301 consists of a two-modulus prescaler with a 7bit control register followed by a 11-bit internal programmable divider. The overall division ratio is selected by a single 19-bit word located on the serial data bus.

##### **\* PHASE COMPARATOR**

A digital-type phase comparator in U301 with output(pin 15, 17) and an open drain lock detect output(pin 8) compares divided VCO frequency with the comparison frequency. It generates a correction voltage that is applied to a low-pass filter consisting of R305, R306, R307 and C316, C317, C318 then sent to the VCO circuit.



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### \* VCO CIRCUIT

The transmit/receive frequency is directly generated by the Colpitts oscillation circuit contains Q401, Q402, Q404, Q405. The oscillation frequency is variable by applying the

VCO control voltage to variable to variable capacitors D401-404 and by L401-402, L407-408, C403,C428,C433,C429,C404,C405,C406,C425,C426,C427. To switch between the transmit and receive frequencies, Q403 turn on, and Q401 (VCO for transmission) oscillates when the T/R pin is low.

## 2) TRANSMITTER

### \* MIC AMP CIRCUIT

Voice signal from the microphone are applied to microphone amplifier U601 through CON 601 .

U601 contains a low-pass filter that has a 6dB/oct response between 300Hz and 3 kHz,and eliminates hamonics above 3 kHz. The pre-emphasized audio signal is applied to VR303 from U606 pin 23 to adjust maximum frequency deviation.

### \* VCO AND AMPLIFIER

The VCO signal output is amplified by Q207,Q1,Q601 and then fed to power module Q602.

### \* POWER AMPLIFIER CIRCUIT

Q602 is provided approximately 7.5V DC power source.

RF power output is adjusted by variable resistors VR501 (High Power) and VR502 (Low Power).

Signals from Q602 is supplied through antenna switch D201 to a low-pass filter made up of L201-203, L211 and C202-C206, C208 then applied to Antenna Jack.

## 3) RECEIVER

### \* ANT SWITCHING CIRCUIT

Signals from antenna connector fed to the antenna switching circuit throught the low pass filter consisting of L201-203, L211 and C202-C206, C208. In receive mode, D201 is turned off, isolates the antenna from the transmitter circuit and matching circuitry, so that the incoming signals are fed to the RF amplifier through L101.

### \* RF AMPIIFIER CIRCUIT

The signals from the switching circuit are fed to the RF amplifier Q122,Q106,Q123,Q101 through a band pass filter made up of mold coil , vvc diode and capacitor.



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### \* FIRST MIXER CIRCUIT

The amplified signals are fed to Gate 1 of the first mixer Q102 through C126.

First local oscillator signal is supplied to Gate 2 of Q102 from the PLL circuit through C127 to convert the RF signals into 21.4MHz first IF signal.

### \* IF CIRCUIT

The first IF signals from Q102 are fed to the matched pair crystal filter FL101, then IF signals are amplified in Q103. And those signals are fed to U101 which is composed of the second local oscillator, second mixer, limiter amplifier, quadrature detector and active filter circuit. The second local oscillator at 44.845MHz with X101 and is fed to the second mixer with the first IF signals to convert into 455kHz second IF signals..

The second IF signals leave through pin 3, and are fed to external ceramic filters FL102, FL103 which has excellent selectivity, then fed to U101 (pin 5) again to be amplified and detected. Narrow /Wide band are switched by Q104, Q105, Q144.

The detected AF signals are output from pin 9.

### \* AUDIO AND SQUELCH CIRCUIT

The detected audio signals are put through a 6dB/oct de-emphasis circuit made up of C147 and R125. The signal is then applied to audio power amplifier U607 through the volume control SVR601 to obtain enough power to driver the speaker.

Part of the recovered noise signal is fed to the integrated operational amplifier inside U101, which, with R120, R121, C145, C146 makes up an low pass filter . The DC signal detected by U101 (pin13) reaches the integrated DC amplifier in U101 which has hysteresis to prevent jitter. The sensitivity of squelch is adjusted by VR101.