MODEL: CT2002-9

CIRCUIT DESCRIPTION

OPERATION THEORY

The wireless headset for the cellular phone contains two functional pieces referred to as the head-set and base. Each device operates in duplex mode in which it simultaneously receives and transmits RF signals in the 900Mhz ISM band. These RF signals are synthesized by phase lock loops and frequency modulated by analogue sources. The following paragraphs explain in detail the operation theories for each device.

Operation theory of base:

Refer to the functional block diagram as attached. In the transmit part, the operation of the whole circuit is controlled by the power control circuit TXCTL. The RF signal is generated by the TX VCO and phase locked to the reference 6Mhz generated by the CPU. This signal is then fed to the RF AMP for amplification and then fed to the low pass RF FILTER to filter out the harmonics. It is then fed to the integral antenna TX ANT which is a helical antenna. The TX VCO is modulated either by the audio signal MODIN which comes from an external source (the cellular phone external speaker terminal) or by the low-pass-filtered digital signal TX DATA generated by the CPU. When the audio level of the external source exceeds the threshold of the voice activated circuit denoted by VOX DET, the CPU will start operation by enabling the low drop out regulator LDO to provide power to the transmit and receive circuits such that both circuits will operate simultaneously. It will first transmit a code to the matching head-set and will listen to the answer back, if the same code is received, then a valid audio link is established and the operation will continue, otherwise it will retry again until the VOX signal is false.

In the receive part, RF signal will come through the receive antenna RX ANT which is also a helical antenna. The signal will then pass through a band-pass filter which is a surface acoustic wave filter (SAW) with a narrow bandwidth. The filtered signal is then amplified by a low noise

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amplifier (LNA) and then fed to the mixer (MIXER). The local oscillator RX VCO is also phase locked by the PLL and fed to the mixer also. An intermediate frequency (IF) of 10.7MHz is produced and filtered by a 10.7MHz ceramic filter with narrow bandwidth. This IF is frequency demodulated by the DEMODULATOR which produces a field strength signal, a data sliced signal DSO and an audio signal. The field strength signal is amplified by the CD circuit which produces a true or false signal CD. This acts as an indicator to the CPU of whether the receive RF signal has exceeded a certain threshold. If true, the CPU will look at the data sliced signal DSO if it matches the desired code. If so, a valid communication is established and the CPU will turn on the audio signal buffer (BUFFER) which outputs to the audio input of the cellular phone. The operation will keep on until a shut-down code is received or the VOX DET has not detected any signal for a period of one and a half minutes.

In the control part, which is mainly composed of the CPU, functions as follow. In stand by, the CPU will enter power save by shutting down the BTT CTL circuit which shuts off all power to the other circuits. Every two seconds the CPU will wake up and look at the signal strength signal CD and the voice activation signal VOX. If they are not available, it will go back to sleep. If the CD signal is valid, it will go through the operation as described in the receive part. If the VOX signal is true, it will go through the operation as described in the transmit part. The CPU is also responsible for programming the PLL ic which sets the transmit and receive local oscillator frequencies.

Operation theory of head-set:

Refer to the functional block diagram as attached. In the transmit part, the operation of the whole circuit is controlled by the power control circuit TX CTL. The RF signal is generated by the TX VCO and phase locked to the reference 6Mhz generated by the CPU. This signal is then fed to the RF AMP for amplification and then fed to the low pass RF FILTER to filter out the harmonics. It is then fed to the integral antenna TX ANT which is a helical antenna. The TX VCO is modulated by either the audio signal, which comes from the audio amplifier AMP with the condenser microphone MIC as the source, or the low-pass-filtered digital signal TX DATA generated by the CPU.

In the receive part, RF signal will come through the receive antenna RX ANT which is an integral loop antenna with the pattern laid out on the printed circuit board which extends into the arm of the head-set. The signal is then amplified by a low noise amplifier (LNA) and then fed through a

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band-pass filter, which is a surface acoustic wave filter (SAW) with a narrow bandwidth, to the mixer MIXER. The local oscillator input of MIXER is RX VCO, which is phase locked by the PLL. An intermediate frequency (IF) of 10.7MHz is produced and filtered by a 10.7MHz ceramic filter with narrow bandwidth. This IF is frequency demodulated by the DEMODULATOR which produces a field strength signal, a data sliced signal and an audio signal. The field strength signal is amplified by the CD circuit which produces a true or false signal CD. This acts as an indicator to the CPU of whether the receive RF signal has exceeded a certain threshold. If true, the CPU will look at the data sliced signal if it matches the desired code. If so, a valid communication is established and the CPU will turn on the audio signal amplifier AF AMP which drives the external speaker. The operation will keep on until a shut-down code is received or the operation switch is pressed.

In the control part which is mainly composed of the CPU, it functions as follow. In stand by, the CPU will enter power save by shutting down the BTT CTL circuit which will shut off all power to the other circuits. Every two seconds the CPU will wake up and look at the signal strength signal CD. If it is not available, it will go back to sleep. The CPU can also operate if the ON/OFF switch is pressed. It will turn on the transmit circuit and generate a matching code to the base and then waits for the base to answer. If a valid code is received then the audio communication will be maintained as long as the CD signal is true. It will stop operation unless the CD signal becomes false for one and a half minutes or the ON/OFF switch is pressed for 2 seconds. The CPU is also responsible for programming the PLL ic which sets the transmit and receive local oscillator frequencies.

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