

# Circuit Description

**\*LTK-Waitercall 25(Kitchen Paging system)**

**\*Fixed Type Pager transmitter**

## **USER Function:**

Press the number that corresponds to the servers name on the sending unit and that pager will silently vibrate. Range of this system should easily cover even the largest of restaurant . You can send a signal, double or triple vibration sending the server to different parts of the kitchen.

To page a pager with a single vibe -press the corresponding number until the unit beeps once and the green light comes on

To page a pager with a dual vibe -press the X2 button once and then press the corresponding server/pager number within 5 seconds.

To page a pager with triple vibe -press the 3X button once and then press the corresponding server/pager number within 5 seconds.

To enter the programming mode, plug in the unit while holding the 3X button. You will see the numbers 1-12 either flashing, solid Red or solid Green.

The numbers 1-12 can be pressed to correspond to the hours of the day. After pressing #1, press 1-12 for closest hour and use the flashing all sleep button to toggle between am/pm. AM is upper light, pm is lower light. Press the X3 button to exit the menu and set the time.

The numbers 1-12 can be pressed to correspond to the hours of the day. After pressing #1, press 1-12 for the hour you want the pagers to turn off for the night and use the flashing If you want the pagers to automatically go to sleep at a specific time , this light should be green. If the light is red the shutdown signal will not be sent.

If this light is green the server will be paged upon each transition(ie -when each button pressed turns yellow, red & flashing red the waiter will be paged.) All pages must be cancelled (By pressing the button again) when the food is picked up.

When the light is green the system will page waiter on first button press only.

The light will stay green for 5 seconds and then turn off with no further action.

## Circuit (MAIN)

WaiterCall 25 uses DC12V/2.5A 60Hz as its DC Power Supply. If the power is input into the PCB, the voltage is separately input into U12 (78L09) and U5 (78L05). U12 (78L09) supplies drive voltage to RF Tuner. U5 (78L05) supplies drive voltage to main PCB CPU and LCD Display. CPU drives address that is Pocsag code division method.

All data are stored in U25 (Pic 16c505) and are used according to AddressKey (s1-s30). Code data are input into pin 14 of IC U1(Pic 16F872) and go to Mixing circuit inside of IC and outputs 10uW of signal through output terminal of Pin17. This signal is input into RF/Tuner input terminal J1-1. Then it goes through 21.4MHz medium frequency filter and 457.575MHz of Crystal oscillates.

Then 30dbm(1W) is output through TR output terminal. (Refer to Tuner.) Then the signal finally is output through 450Mhz antenna.

## RF (Tuner)

Signals received at the antenna are passed to a low noise pre-amplifier and lumped elements filter block via antenna switch composed of L509, L511, L512, L513, D502, D503 and matched capacitors. The antenna switch provides 25dB of isolation between receive path and transmit path with 0.8dB loss on receive path.

The low noise amplifier(LNA) consist of L101, L102, L103, L104, L105, L106, Q101 and matched capacitors, resistors provides approximately 14dB gain at a noise figure of 5.0dB. Also the LNA attenuate unwanted signals such as 1<sup>st</sup> IF image and 1<sup>st</sup> down converter local signal by 70dB.

Following the LNA stage, the signal is routed to 1<sup>st</sup> down converter composed of Q102 and matched R, L, C circuit which provides additional receiver gain and the first down conversion function. The 1<sup>st</sup> down converter down convert the received and amplified signals from 450 ~ 470Mhz on to 45Mhz of 1<sup>st</sup> IF signal with 1<sup>st</sup> local signal that synthesized by PLL circuitry which is 45Mhz lower than receiving signal.

The 1<sup>st</sup> IF signal is taken to 2 pole 45Mhz monolithic crystal filter to attenuate adjacent signals and 2<sup>nd</sup> IF image signal by 70dB. The 45Mhz 1<sup>st</sup> IF filter has 15Khz of 3dB pass band characteristic and 70dB attenuation at 910Khz away from it's center frequency. The filtered 1<sup>st</sup> IF signal is fed to Q102 1<sup>st</sup> IF amplifier and amplified by 18dB than fed to U101 FM IF IC.

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U101 FM IF IC down converts 1<sup>st</sup> IF signal on to 455Khz of 2<sup>nd</sup> IF signal with 20dB of gain utilize Y101 44.545Mhz crystal and internal oscillation circuit than the signal passes through either 2<sup>nd</sup> IF filter F102 for 8.5Khz bandwidth or F105 for 16Khz bandwidth depend on programmed bandwidth. The signal passes through 2<sup>nd</sup> IF filter is then amplified and limited again and FM demodulated at U101. R122, D104, Q104 damp the FM demodulated upon programming to adjust sensitivity of the FM demodulation circuit when a signal with 8.5Khz bandwidth has to be demodulated.

Overall frequency stability of receiver circuit is tied on the 1<sup>st</sup> local oscillator signal from PLL circuit which has  $\pm 2.5$ PPM over -30°C and +60°C of operating temperature range.

## Transmit

**Audio Amplifier :** Audio signals fed into J102 DB-9 female connector terminal #4 is amplified 26dB and amplitude limited at 4Volts peak to peak with U102A OP amplifier than selectively attenuated by U201, U202 analog switches for support 8.5Khz and 16Khz occupied transmit bandwidth depending on program. The limited audio signal is taken to RV201 for FM deviation adjustment and passes through U203B 3Khz Low Pass Filter(LPF) for attenuate harmonics of the limited audio signals and an audio

The 3Khz LPF is capable to attenuate more than 19dB/Oct. at above 3Khz so that transmit occupied bandwidth can be maintained.

**Transmit RF signal :** The transmit RF signal is generated by PLL system composed of Q602, Q603 voltage controlled oscillator(VCO), U401 Phase Locked Loop(PLL) IC and TCXO1A Temperature Controlled Crystal Oscillator(TCXO)

The generated transmit RF signal by the PLL system is taken to Q501 buffer amplifier for better stability when turn on the transmit circuits. The buffered transmit signal is amplified by 14dB with Q503 pre-drive amplifier and then amplified again with Q504 drive amplifier to actuate Q506 power amplifier.

A 2Watts of output power from output of Q506 is fed into R/Tx antenna switch circuit composed of L509, L510, L511, L512, L513, D502, D503 and matched R,C, components to feed transmit power to antenna port without loosing the power to receiver circuit(receiver LNA). One other function of the R/Tx antenna switch is to attenuate transmit spurious such as harmonics more than 40dB for transmit signal harmonics.

## PLL(Phase Locked Loop)

PLL system is composed of following three sub part.

TCXO : The TCXO generate 12.8Mhz of clipped sine wave with  $\pm 2.5$ PPM over -30°C and +60°C of frequency stability. TCXO1A is also capable of accept modulation signals through its terminal #1 for low frequency FM modulation.

PLL IC : U401 PLL IC divide 12.8Mhz of reference signal from TCXO1A in to either 12.5Khz or 10Khz depending on programming and also divide VCO signal to same 12.5Khz or 10Khz to compare with.

Frequency division ratio for VCO signal is programmed by U402 microprocessor and U402 EEPROM.

VCO : The VCO oscillate transmit frequency when the radio is in transmit mode and oscillate 45Mhz below transmit frequency the radio is in receive mode and the oscillate frequency is precisely monitored and controlled by U401 PLL IC.