# CIRCUIT DESCRIPTION

**Model: CP-5900 (Newtech), WCP-15900 (White Westinghouse), CCP-45900 (Craig)**

## 1 Base

### a. RF Transmitter Section – RF Board

Compressed audio signal is frequency modulated through the varactor diode D3. Diode D3, choke coil L2 and the external components formed the voltage controlled oscillator circuit for the transmitter part. This circuit generates the TX VCO frequency. A portion of this signal is fed back to the PLL IC's pin1 (FIN1) for phase comparison. Once the phase of oscillation stabilized, the PLL circuit generates the error voltage necessary for the VCO to oscillate at the desired transmitter's RF frequency. The VCO circuit impedance is matched with the succeeding circuit through the transistor Q7 that also acts as the buffer amplifier. RF amplifier Q5 boosts the signal for transmission. This amplified RF signal is trimmed to the desired frequency band by BPF903 so as not to interfere with the receiver circuit. The transmitter RF signal is then propagated through the antenna.

### b. RF Receiver Section - RF Board

The Base Unit antenna receives RF signal. Band Pass Filter BPF927 trims the signal to the desirable frequency band. Transistor Q8 is a low noise amplifier that boosts the RF signal to a specific level for mixing. PLL IC1 (TB31202) is used as a Universal Phase Lock Loop circuit. The frequency from the Voltage Controlled Oscillator (VCO) D1, L1 and Q4, is fed back to the PLL IC through pin 16 (FIN2) for phase comparison. During channel scanning or turning the unit on, once the phase of oscillation stabilized (locked), the PLL circuit generates the first local oscillator frequency for down-converting the received RF signal into the first IF frequency 10.7MHz. This process is accomplished through the IF mixer circuit Q3. Q1 is used for matching the impedance of the mixer circuit with the succeeding circuits. The resulting IF signal is kept constant by the IF Filter FL2 to 10.7MHz which is then mixed with the second local oscillator frequency 11.150MHz (derived from X1 & C47) to produced a much lower IF frequency. This lower IF frequency if further filtered by IF Filter FL4 to produce a more stable signal of 450KHz. Quadrature signal detection is accomplished internally by the Narrow-band Detector IC2 (KA3361) with the IF coil L7. The recovered audio frequency can be taken from IC2 audio output pin9. Double conversion of received signal is utilized to improve the image frequency rejection of the unit.

c. Transmitter Audio Section - Main Board

Audio Frequency signal from the telephone line is compressed through the compressor part of IC4 to minimize the transmission noise. The degree of compression depends on the external RC combinations. AGC is also utilized by IC4 to avoid shock noise caused by abrupt change of audio levels. The compressed audio is filtered and amplified for better acoustical performance. VR1trims the transmitted audio into a desirable level.

d. Receiver Audio Section - Main Board

The compressed Audio Frequency signal is passed through passive RC filters for acoustic compliance. The filtered audio is then fed to the Compander IC4 for expansion thus retrieving the original Audio signal with noise filtered out. Q2 & Q9 are used as buffer circuit. Matching transformer HYB1 isolates the high-voltage telephone line to the rest of the circuit. HYB1 is also used as a hybrid transformer to create a two-way path for audio transmission to and reception from the telephone line.

## 2 Handset

### a. RF Transmitter Section – RF Board

Refer to portion 1.a for this section. All circuit performance is exactly the same except that Band Pass Filter BPF903 be changed to BPF927 for the handset transmission.

### b. RF Receiver Section – RF Board

Refer to portion 1.b for this section. All circuit performance is exactly the same except that Band Pass Filter BPF927 be changed to BPF903 for the handset reception.

### c. Transmitter Audio Section - Main Board

Audio Frequency signal from the handset or from the headset microphone is compressed through the compressor part of IC2 to minimize the transmission noise. The degree of compression depends on the external RC combinations. AGC is also utilized by IC2 to avoid shock noise caused by abrupt change of audio levels. The compressed audio is filtered and amplified for better acoustical performance. VR1 trims the transmitted audio into a desirable level. Q5 is a switching transistor that controls the power supply for the TX RF part.

### d. Receiver Audio Section - Main Board

The compressed Audio Frequency signal is passed through passive RC filters for acoustic compliance. The filtered audio is then fed to the Compander IC2 for expansion thus retrieving the original Audio signal with noise filtered out. Q2

## 2 Handset

### a. RF Transmitter Section – RF Board

Refer to portion 1.a for this section. All circuit performance is exactly the same except that Band Pass Filter BPF903 be changed to BPF927 for the handset transmission.

### b. RF Receiver Section – RF Board

Refer to portion 1.b for this section. All circuit performance is exactly the same except that Band Pass Filter BPF927 be changed to BPF903 for the handset reception.

### c. Transmitter Audio Section - Main Board

Audio Frequency signal from the handset or from the headset microphone is compressed through the compressor part of IC2 to minimize the transmission noise. The degree of compression depends on the external RC combinations. AGC is also utilized by IC2 to avoid shock noise caused by abrupt change of audio levels. The compressed audio is filtered and amplified for better acoustical performance. VR1 trims the transmitted audio into a desirable level. Q5 is a switching transistor that controls the power supply for the TX RF part.

### d. Receiver Audio Section - Main Board

The compressed Audio Frequency signal is passed through passive RC filters for acoustic compliance. The filtered audio is then fed to the Compander IC2 for expansion thus retrieving the original Audio signal with noise filtered out. Q2 and Q3 act as audio amplifier to sufficiently drive the handset speaker. Q1, Q6 and Q202 are switching transistors that control the power supply for the RF part, the Compander part and the AF amplifier respectively. An earphone jack is provided for an optional headset unit for handsfree conversation on the handset.

## 3 OTHERS (Handset):

### a. Charging and Reset Controls

Recharging the handset battery is accomplished by putting the handset on the cradle. Q200 detects this action and sends a command to the CPU for proper exchange of security code. Switching SW1 to the RING OFF mode can extend Battery life.

### b. Ring Detection

When the handset receives the ring command from the base unit, the CPU will send buzzer signal to the ringer amplifier Q201 that drives the Buzzer.

## 3 OTHERS (Base):

### a. Hook Switching and Dialing

Hook switching and pulse dialing is accomplished by the reed relay RL1 which is controlled by the CPU through switching transistor Q10. DTMF signal from the ladder circuit internal to the CPU is filtered and amplified by U1D.

### b. Over-voltage Protection

Fuse F1 and varistor Z1 act as high current and high voltage protectors for the telephone line interface. In case of presence of voltage surge across the telephone line, Z1 decreases its resistance and dumps the line voltage to a safe level. Fuse F1 opens when excessive current is present on the line thus protecting both the user and the line interface.

### c. Battery Charging & Code Setting

Battery charging commences when transistor Q7 detects the presence of the handset on cradle. Q4 controls the current flow to avoid overcharging. When the battery is almost full, Q4 shots off to reduce the charge current. Q3 & C11 form the reset circuit in conjunction with the charge detect circuit to command the CPU to change the security code. When the reset circuit is activated, the CPU will send a new security code to the handset selecting among 65536 combinations.

## d. Ring Detection

Incoming ring signal is detected by the photo-coupler IC2. Diode D2, D10 and R8 set the level of signal detection. The CPU checks the frequency of the ring signal, and when valid, sends the ringing command to the speaker or to the Handset.

## e. Power Supplies

Diode D8 ensures uniform polarity for the entire circuit. Transistor Q1 and capacitor C1 regulate the voltage to +9Vdc for the buffer amplifier circuit. IC1 regulates the voltage to +5Vdc for the rest of the circuit. Transistor Q8 controls the power supplied to the TX part of the RF circuits.

## f. Squelch Detection

In conjunction with the 3361 IC (IC2 of the Base RF), SVR2 sets the level of signal detection and U1C acts as the comparator circuit whose composite output is the RSSI signal for the CPU.

## g. RX Data

Commands from the Handset is filtered and re-constructed by the Schmitt trigger circuit U1B. The composite output is the RX Data that is input to the CPU for validation and processing.

# 40 CHANNEL - AUTOMATIC CHANNEL SELECTION MECHANISM

## MODEL: CP-5900 (Newtech), WCP-15900 (White Westinghouse), CCP-45900 (Craig)

During the activation of Talk, the Handset receiver scans for free channel from its last linked receiver channel (about 50ms per channel). Once a free channel is found, the Handset transmits the Talk instruction to Base together with the receiver's free channel information for the Base to use this free channel as the Transmit channel.

Likewise, the Base receiver continuously scans each channel (25ms per channel) and stores all free channels into its memory. Once the Base receiver received the instruction from its Handset, it will stop from scanning and transmits its acknowledgement data with the Base receiver free channel information. When the Handset receives this Base free channel information, it will transmit the link command to Base and both will link on the clearest channel. The Handset and Base scan and find their receiver's clearest channel separately. If all transmit channels of Handset and Base are occupied (all busy), Handset and Base will link on the default channel (Channel 20).

| BASE | | | HANDSET | | BASE | | | HANDSET | |
|---|---|---|---|---|---|---|---|---|---|
| CH | TX | RX | TX | RX | CH | TX | RX | TX | RX |
| 1 | 902.121 | 926.117 | 926.117 | 902.121 | 21 | 902.722 | 926.717 | 926.717 | 902.722 |
| 2 | 902.152 | 926.147 | 926.147 | 902.152 | 22 | 902.752 | 926.747 | 926.744 | 902.752 |
| 3 | 902.182 | 926.177 | 926.177 | 902.182 | 23 | 902.782 | 926.777 | 926.777 | 902.782 |
| 4 | 902.212 | 926.207 | 926.207 | 902.212 | 24 | 902.812 | 926.807 | 926.807 | 902.812 |
| 5 | 902.242 | 926.237 | 926.237 | 902.242 | 25 | 902.842 | 926.837 | 926.837 | 902.842 |
| 6 | 902.272 | 926.267 | 926.267 | 902.272 | 26 | 902.872 | 926.867 | 926.867 | 902.872 |
| 7 | 902.302 | 926.297 | 926.297 | 902.302 | 27 | 902.902 | 926.897 | 926.897 | 902.902 |
| 8 | 902.332 | 926.327 | 926.327 | 902.332 | 28 | 902.932 | 926.927 | 926.927 | 902.932 |
| 9 | 902.362 | 926.357 | 926.357 | 902.362 | 29 | 902.962 | 926.957 | 926.957 | 902.962 |
| 10 | 902.392 | 926.387 | 926.387 | 902.392 | 30 | 902.992 | 926.987 | 926.987 | 902.992 |
| 11 | 902.422 | 926.417 | 926.417 | 902.422 | 31 | 903.022 | 927.017 | 927.017 | 903.022 |
| 12 | 902.452 | 926.447 | 926.447 | 902.452 | 32 | 903.052 | 927.047 | 927.047 | 903.052 |
| 13 | 902.482 | 926.477 | 926.477 | 902.482 | 33 | 903.082 | 927.077 | 927.077 | 903.082 |
| 14 | 902.512 | 926.507 | 926.507 | 902.512 | 34 | 903.112 | 927.107 | 927.107 | 903.112 |
| 15 | 902.542 | 926.537 | 926.537 | 902.542 | 35 | 903.142 | 927.137 | 927.137 | 903.142 |
| 16 | 902.572 | 926.567 | 926.567 | 902.572 | 36 | 903.172 | 927.167 | 927.167 | 903.172 |
| 17 | 902.602 | 926.597 | 926.597 | 902.602 | 37 | 903.202 | 927.197 | 927.197 | 903.202 |
| 18 | 902.632 | 926.627 | 926.627 | 902.632 | 38 | 903.232 | 927.227 | 927.227 | 903.232 |
| 19 | 902.662 | 926.657 | 926.657 | 902.662 | 39 | 903.262 | 927.258 | 927.258 | 903.262 |
| 20 | 902.692 | 926.687 | 926.687 | 902.692 | 40 | 903.292 | 927.288 | 927.288 | 903.292 |