

## CIRCUIT DESCRIPTION

### 1. HANDSET

#### 1.1 RECEPTION

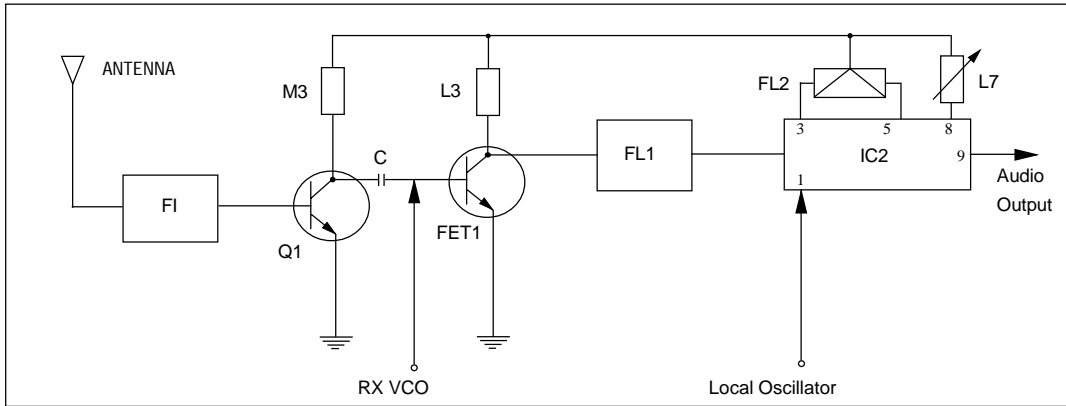


Figure 1

As shown in figure 1, the received signal from the base unit passes through 927 MHz Filter and amplified by RF Amplifier (Q1). The amplified input signal is mixed with RX VCO (Q1,M2,D1) signal.

The VCO oscillation is controlled by error signals from PLL IC (IC1) pin no. 10. The channel information to PLL IC is provided by Microprocessor IC (IC1) pin nos. 25, 26 and 30. (Serial data outputs).

The Mixer output from FET1 passes through 10.7 MHz Ceramic Filter (FL1) and enters to FM Demodulator IC (IC2A) pin no. 16. This signal mixes with 11.150 MHz signal from PLL IC pin no. 11, which is connected to IC2 pin no.1. The mixed signal is filtered by 450 KHz Filter (FL2).

#### 1.2 RINGER OUTPUT

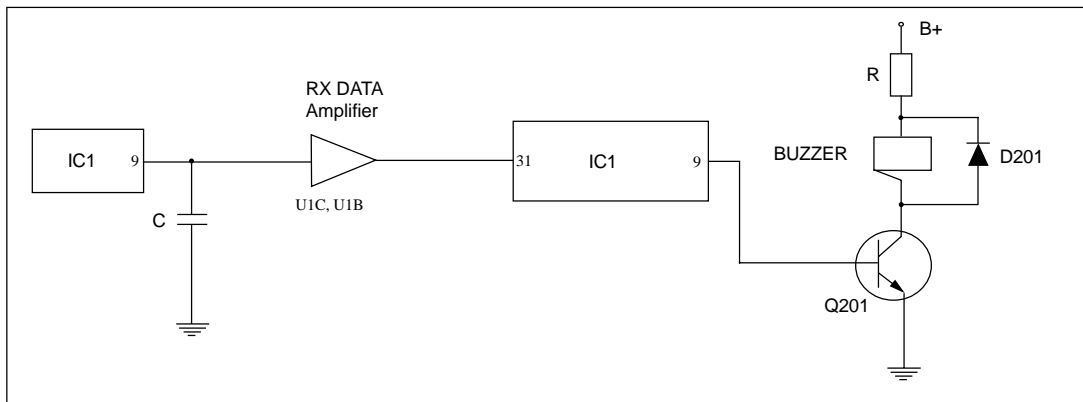


Figure 2

After detection of ring signal, the base unit will transmit the data code signal including security code to handset.

As shown in figure 2, the demodulated ring signal from pin no. 9 of FM Demodulator IC1 is fed to low pass filter and amplified by RX Data Amplifier and its output is connected to RX Data port of Microprocessor IC (IC1).

The ring signal output from pin no. 9 of Microprocessor IC (IC1) goes to buzzer driver Q201 to activate the buzzer.

### 1.3 VOICE OUTPUT

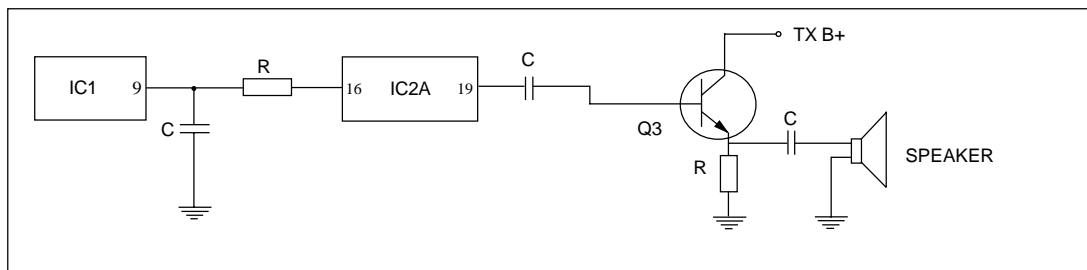


Figure 3

The demodulated signal, resulting from Double Super Heterodyne system, which appears at output pin no. 9 of IC1 is connected to pin no. 16 Expander input of Compander IC (IC2A) for expansion. The expanded audio output from IC2A pin no. 19 is finally amplified by Q3 and A.C. coupled to the receiver unit with Hearing Aid Compatibility (HAC).

### 1.4 DATA TRANSMISSION

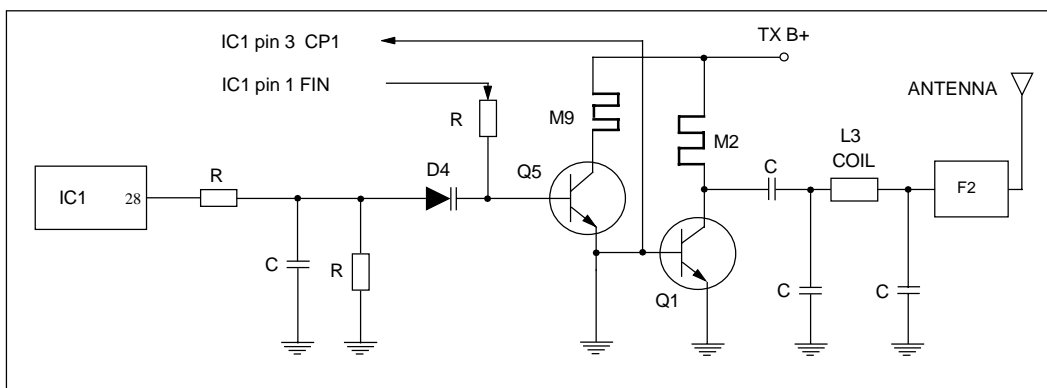


Figure 4

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As shown in figure 4, the TX data code output including security code from IC1 pin no. 28 is connected to TX VCO for modulation. The data code signal is modulated with the carrier frequency generated by the RF oscillator (Q1). The oscillator frequency is controlled by the error signal from pin no.3 of PLL IC (IC1). The modulated signal is amplified by RF amplifier stage (Q5) and then passes through 927MHz filter stage (F2). The FM modulated signal is radiated by the handset Rubberized Antenna.

### 1.5 VOICE TRANSMISSION

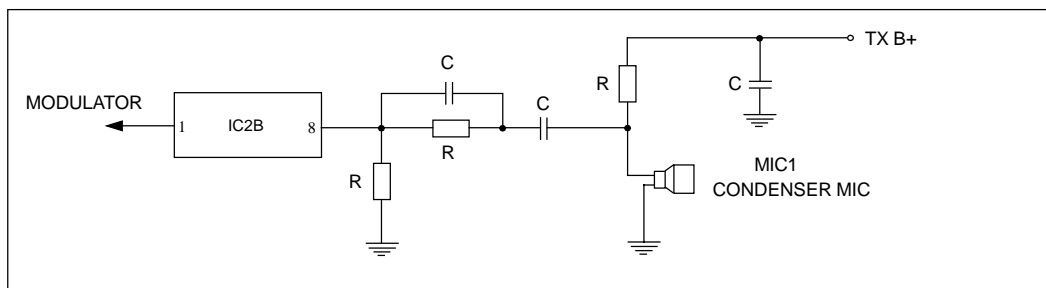


Figure 5

Voice signal from condenser mic is coupled to pin no. 8 of Compander IC (IC2B). The voice signal is compressed by IC2B and then connected to TX VCO stage for modulation.

### 1.6 RECEIVER POWER CONTROL

- When at STANDBY mode and RING ON mode the handset has 50 ms power on and 800ms power off on receiver section.
- When at STANDBY mode and SAVE ON mode, the handset have no power on receiver section.
- The power saving is controlled by Microprocessor IC (IC1) pin no. 18 (RX power control) and Q1.

### 1.7 TRANSMIT POWER CONTROL

- When at TALK mode, the handset transmitter should be working.
  - The transmitter power is controlled by Microprocessor IC (IC1) pin no. 17 (TX power control) and Q6.
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### 1.8 BATTERY LOW DETECTOR

- When the battery voltage goes down until 3.3 to 0.1 Vdc, the LED1 will flash with warning sound "Bi, Bi".

### 1.9 BATTERY CHARGING

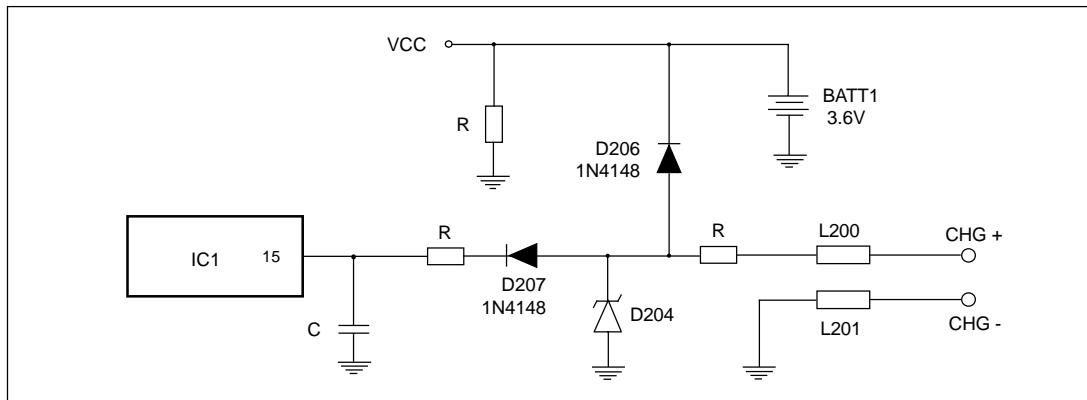


Figure 6

- When the handset is placed on the base unit cradle, the battery will be charging and will be detected by Microprocessor IC (IC1) pin no.15.
- Microprocessor IC will exchange security code randomly.

### 1.10 SQUELCH

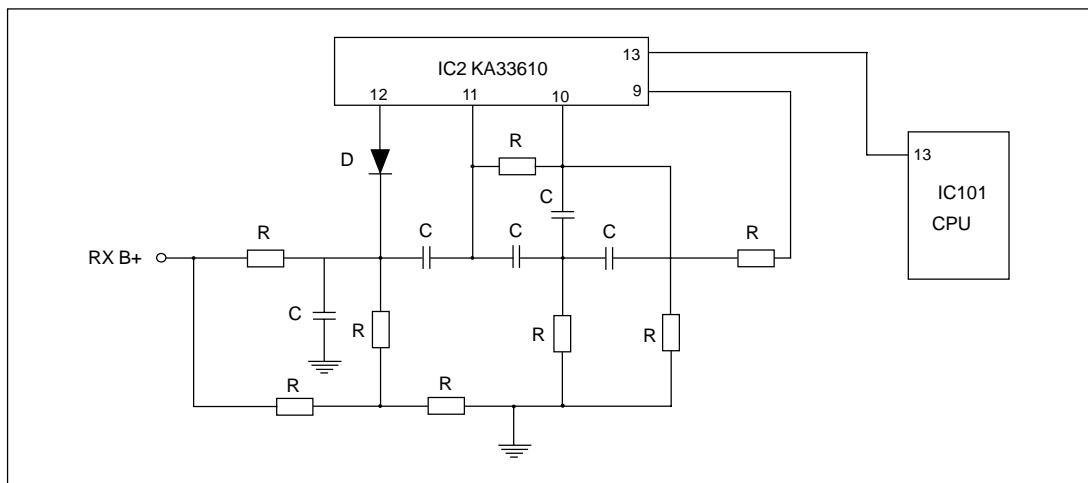


Figure 7

As shown in figure 7, the audio output (noise output) from FM Demodulator IC (IC1) pin no.9 goes to pin no. 10 (Noise filter input) and the output from pin no. 11 will enter to pin no. 12 to activate the squelch control of IC1. The output from pin no. 13 is connected to the Microprocessor IC (IC1) for RSSI Detection.

**NOTE :**

- When the handset is far away from the base unit, squelch circuit of IC1 operates and pin no. 13 of IC1 goes 'HI'. This will be detected by Microprocessor and after 10 seconds, it goes to standby mode.

## **2. BASE UNIT**

### **2.1 RECEPTION**

Base receiver circuit is similar to handset receiver circuit description as shown in figure 1. The difference with section 1.1 are local frequency and receiving frequency as describe below.

The received signal from the handset unit passes through 927 MHz filter and amplified by RF RF Amplifier (Q1). The amplified signal is mixed with RX VCO (Q1,M2, D1).

The mixer output from FET1 passes through 10.7 MHz filter and enters to FM Demodulator IC (IC2) pin no. 16. This signal is mixed with 11.150 MHz signal from PLL IC (IC1) pin no.9, which is connected to IC2 pin no. 1. The mixed signal is filtered by 450 KHz Filter (FL2).

### **2.2 DATA INPUT**

The demodulated data code from FM Demodulator IC (IC2) pin no. 9 is fed to Lowpass filter and its output is connected to code input of Microprocessor IC (IC1).

### **2.3 AUDIO OUTPUT**

As shown in figure 8, the demodulated signal which appears at output pin of FM Demodulator IC (IC2) pin no. 9 is sent through lowpass filter to Compander IC (IC2A) pin no. 16 (Expander input) for expansion. The expanded audio signal output from IC2A pin no. 19 is coupled to Buffer Amplifier (Q2,Q9) during the CONVERSATION mode. The audio is sent to telephone line via Hybrid X'former (HYB1).

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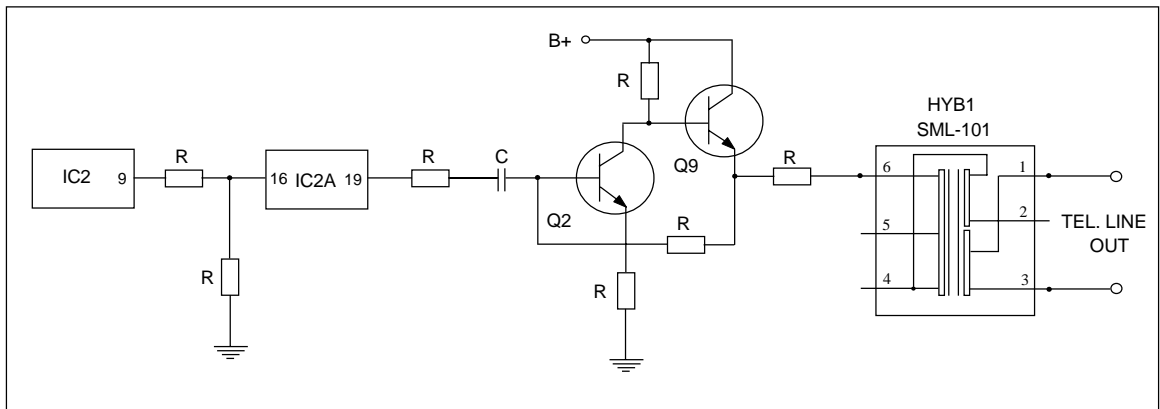


Figure 8

## 2.4 DATA TRANSMISSION

Refer to figure 4., the difference is that the TX Data is transmitted from pin 29 of Microprocessor IC (IC1).

## 2.5 VOICE TRANSMISSION

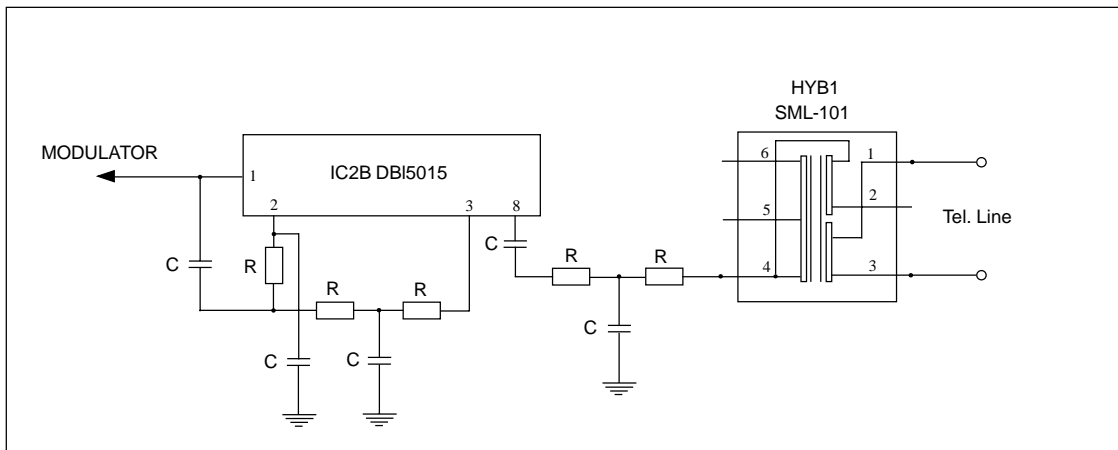


Figure 9

The audio signal receiving from telephone line is input to Compander IC (IC2B) pin no. 8 for compression. The compressed audio signal from pin no.1 of IC2B is connected to TX VCO for modulation. The signal is modulated with the carrier frequency of the oscillator (Q1), the oscillator frequency is controlled by the error signal from pin 3 of PLL IC. The modulated signal is amplified by RF Amplifier stage (Q35) and then passes through 903 MHz filter stage (F2). The FM modulated signal is radiated by the base unit antenna.

**2.6 DTMF OUT**

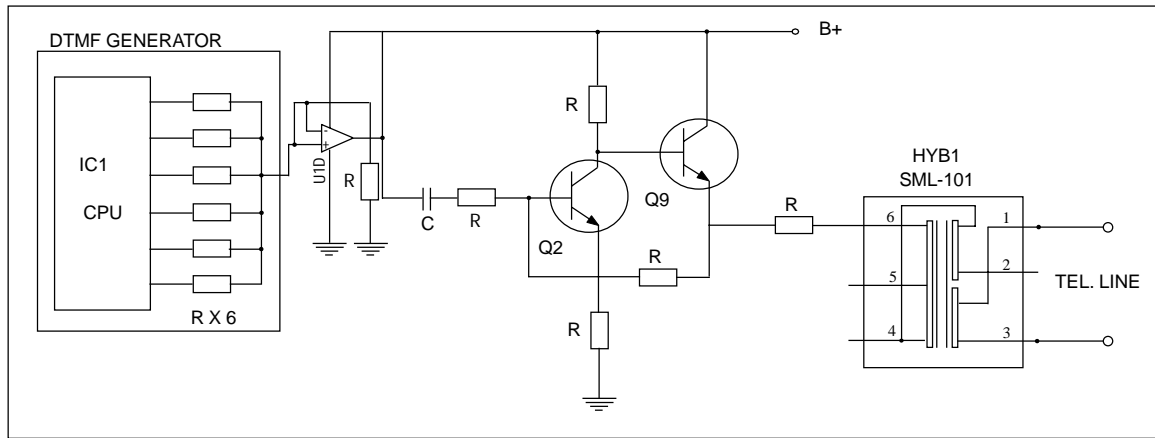


Figure 10

DTMF dialing is generated in pin nos. 18, 19, 20, 21, 22 and 23 of Microprocessor IC (IC1) and Resistors R64-R69 and output through the emitter of Q1 (lowpass filter).

**2.7 TRANSMIT POWER CONTROL**

Transmit power is controlled by IC1 pin 24 and Q8 .

**2.8 RINGER DETECT**

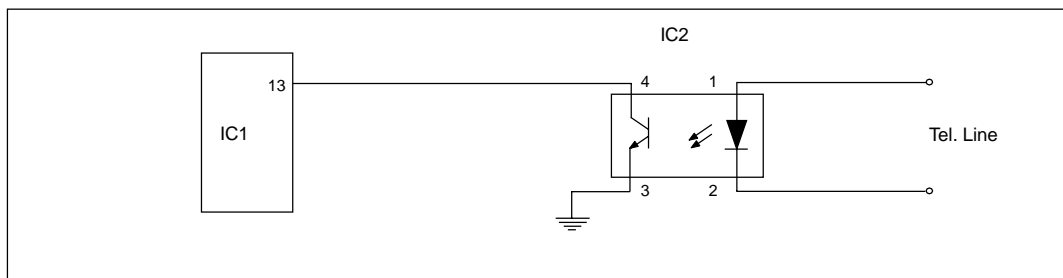


Figure 11

The ring signal from the telephone line is detected by Photocoupler (IC2) and the output from IC2 will be coupled to Microprocessor IC (IC1) pin no.13. After detection of ring signal, the microprocessor will send the data code to handset.

**2.9 PULSE DIAL**

During pulse dialing, IC1 CPU pin 17 will be sending pulse dial signal to Relay trigger (Q10) then goes to telephone line.

### 2.10 CHARGE DETECT

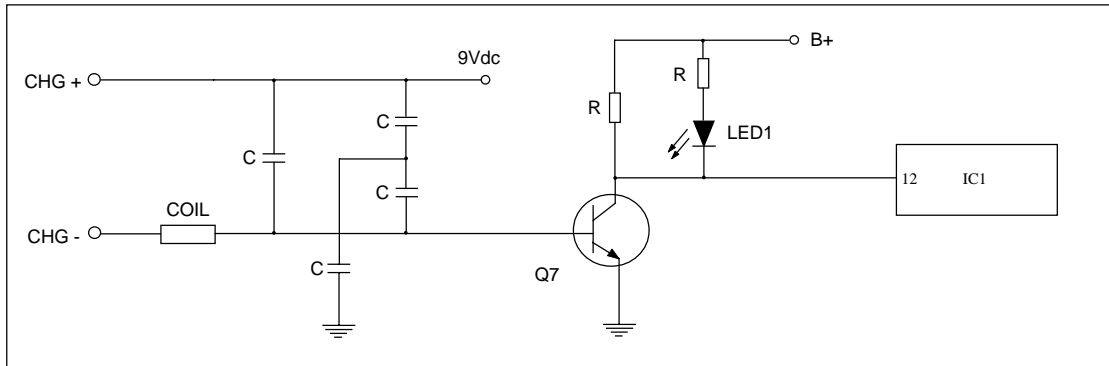


Figure 12

When the handset is on cradle, Q7 is activated and Microprocessor IC (IC1) pin 12 will detect the charging then it will exchange security code randomly.

### 2.11 SQUELCH

Refer to section 1.10. Squelch operation is same as handset as shown in figure 7.

### 2.12 PAGE FUNCTION

The Microprocessor IC (IC1) will detect page signal when IC1 pin no. 5 goes low (press SW1), IC1 will transmit paging signal from pin no. 29 (TX Data port).

### 2.13 RESET

When handset is place on cradle (charge) or insert the power plug into the socket, Base will reset automatically.

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**40 CHANNEL - AUTOMATIC CHANNEL SELECTION MECHANISM  
MODEL: MH9006**

**TALK MODE**

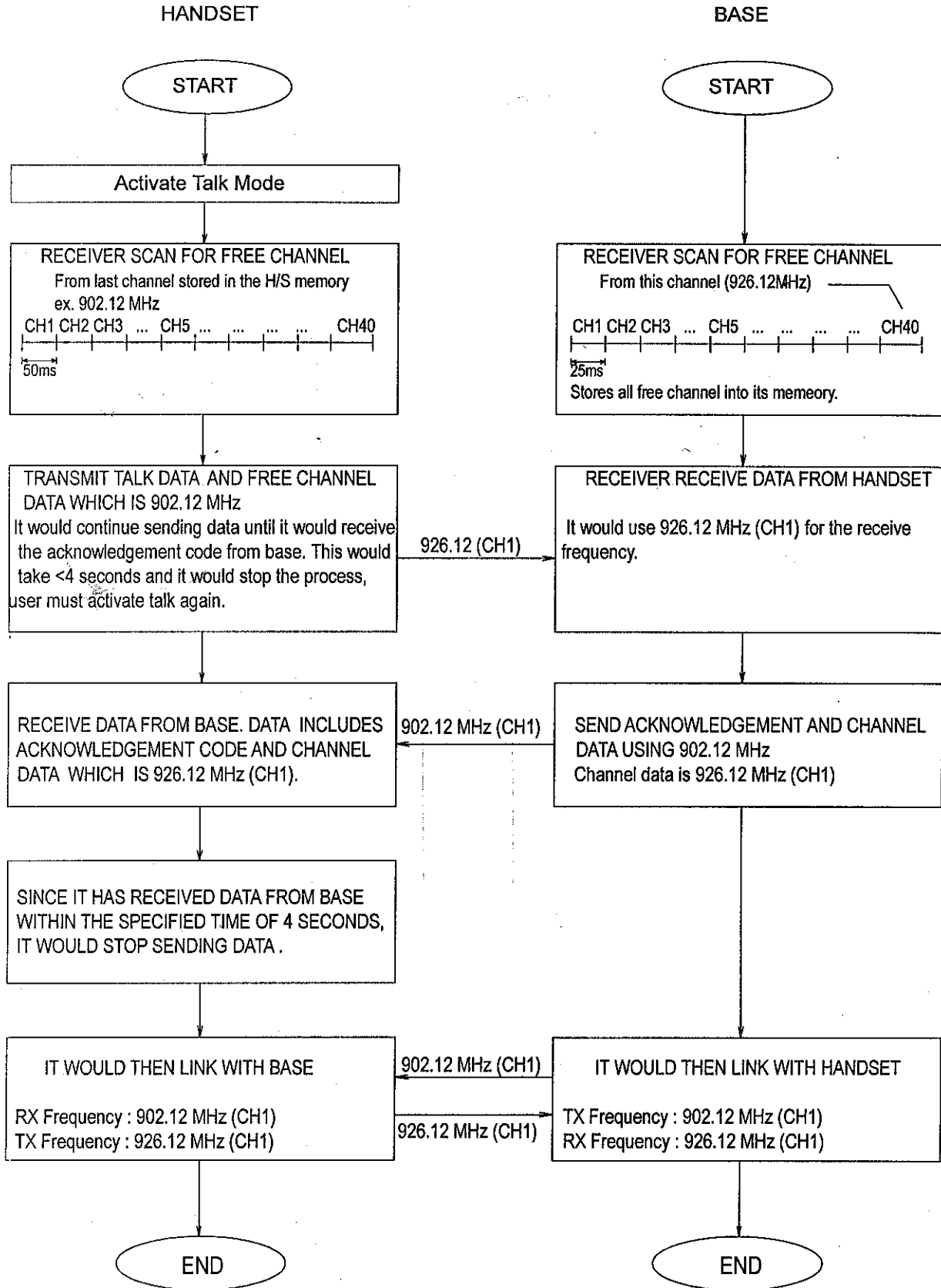
During the activation of talk, the handset receiver scan each channel from its last linked receiver channel for about 50 ms, looking for free channel. Once a receiver found a free channel, the handset transmit talk instruction with receiver's free channel information to base to use this channel as a transmit channel.

Also, the base receiver scan for a clearest channel from channel 1 to 40 (25ms per channel). Once the base receiver received data from its handset during its scanning it will stop the scan and acknowledge data with its clearest receiver channel information then handset transmit and base receiver will change the channel to link. The handset and base unit's receiver scan and find separately their receiver's clearest channel. If all transmit channels of base and handset are occupied (all busy), handset and base will link at channel 20 (default channel).

BASE UNIT			HANDSET		BASE UNIT			HANDSET	
CH	TX	RX	TX	RX	CH	TX	RX	TX	RX
1	902.12	936.82	926.12	891.42	21	902.72	937.42	926.72	892.02
2	902.15	936.85	926.15	891.45	22	902.75	937.45	926.75	892.05
3	902.18	936.88	926.18	891.48	23	902.78	937.48	926.78	892.08
4	902.21	936.91	926.21	891.51	24	902.81	937.51	926.81	892.11
5	902.24	936.94	926.24	891.54	25	902.84	937.54	926.84	892.14
6	902.27	936.97	926.27	891.57	26	902.87	937.57	926.87	892.17
7	902.30	937.00	926.30	891.60	27	902.90	937.60	926.90	892.20
8	902.33	937.03	926.33	891.63	28	902.93	937.63	926.93	892.23
9	902.36	937.06	926.36	891.66	29	902.96	937.66	926.96	892.26
10	902.39	937.09	926.39	891.69	30	902.99	937.69	926.99	892.29
11	902.42	937.12	926.42	891.72	31	903.02	937.72	927.03	892.32
12	902.45	937.15	926.45	891.75	32	903.05	937.75	927.05	892.35
13	902.48	937.18	926.48	891.78	33	903.08	937.78	927.08	892.38
14	902.51	937.21	926.51	891.81	34	903.11	937.81	927.11	892.41
15	902.54	937.24	926.54	891.84	35	903.14	937.84	927.14	892.44
16	902.57	937.27	926.57	891.87	36	903.17	937.87	927.17	892.47
17	902.60	937.30	926.60	891.90	37	903.20	937.90	927.20	892.50
18	902.63	937.33	926.63	891.93	38	903.23	937.93	927.23	892.53
19	902.66	937.36	926.66	891.96	39	903.26	937.96	927.26	892.56
20	902.69	937.39	926.69	891.99	40	903.29	937.99	927.29	892.59

**TALK MODE**

CONDITION 1 : All channels are unoccupied (Free channel)

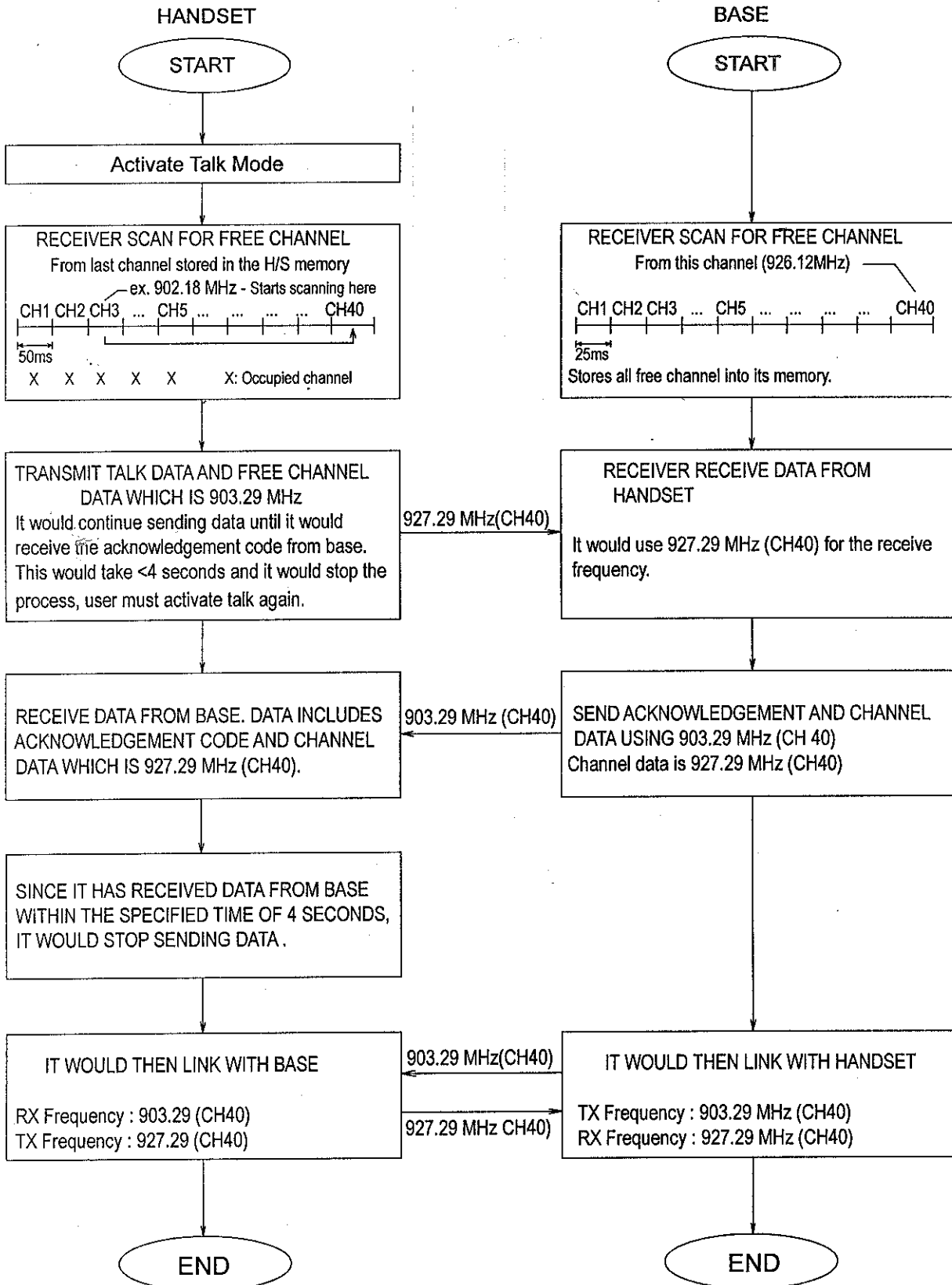


**TALK MODE**

CONDITION 2 : Multi channel on the base TX frequency are occupied.

- Ex. CH 1: 902.11 MHz CH 4 : 902.21 MHz
- CH 2: 902.15 MHz CH 5 : 902.24 MHz
- CH 3: 902.18 MHz

CH 3: 902.18 MHz - Stored channel during the last link in handset memory

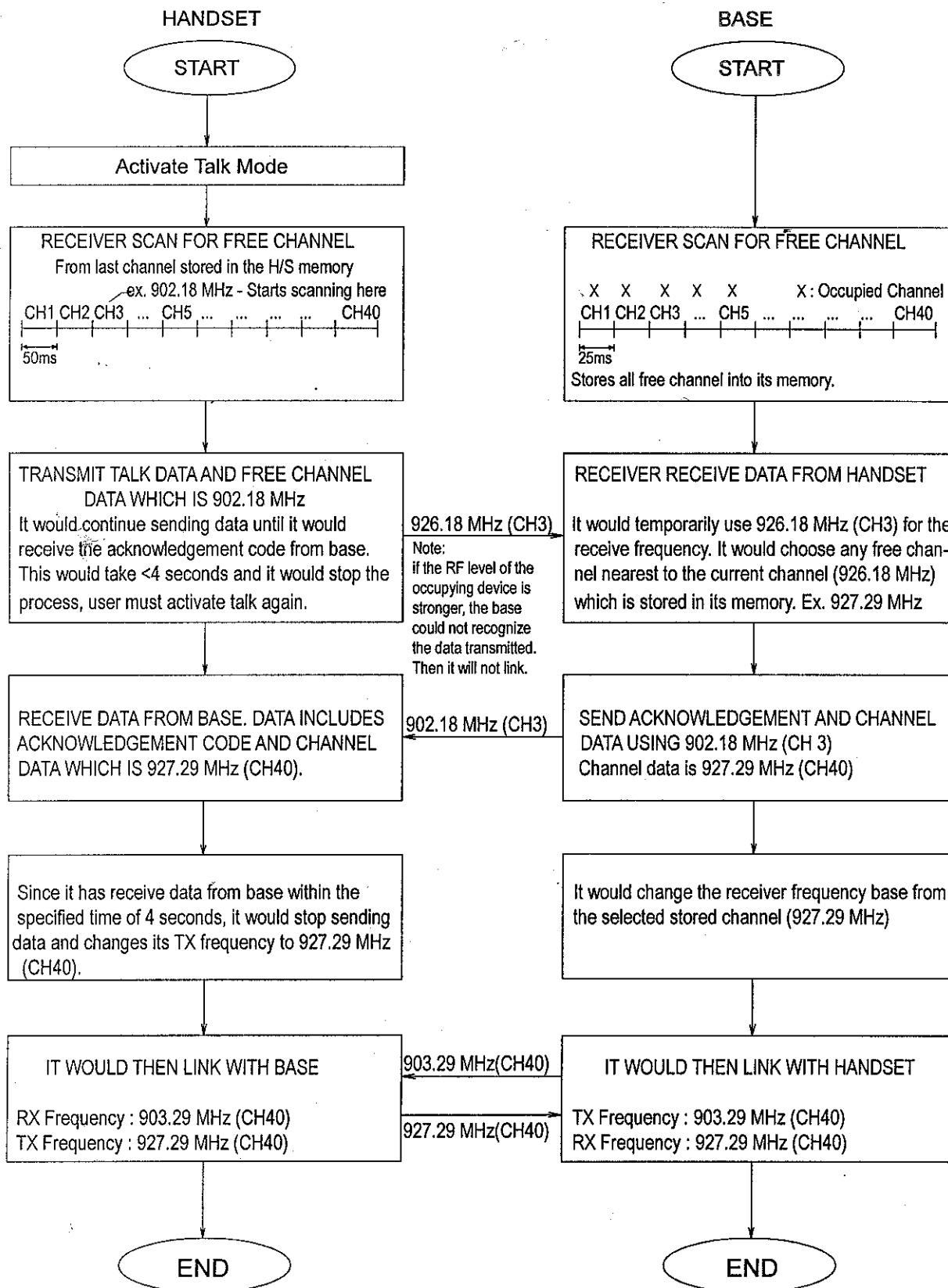


**TALK MODE**

CONDITION 3 : Multi channel on the Handset TX frequency are occupied.

- Ex. CH 1: 926.12 MHz CH 4: 926.21 MHz
- CH 2: 926.15 MHz CH 5: 926.24 MHz
- CH 3: 926.18 MHz

CH 3: 926.18 MHz - Stored channel during the last link in handset memory

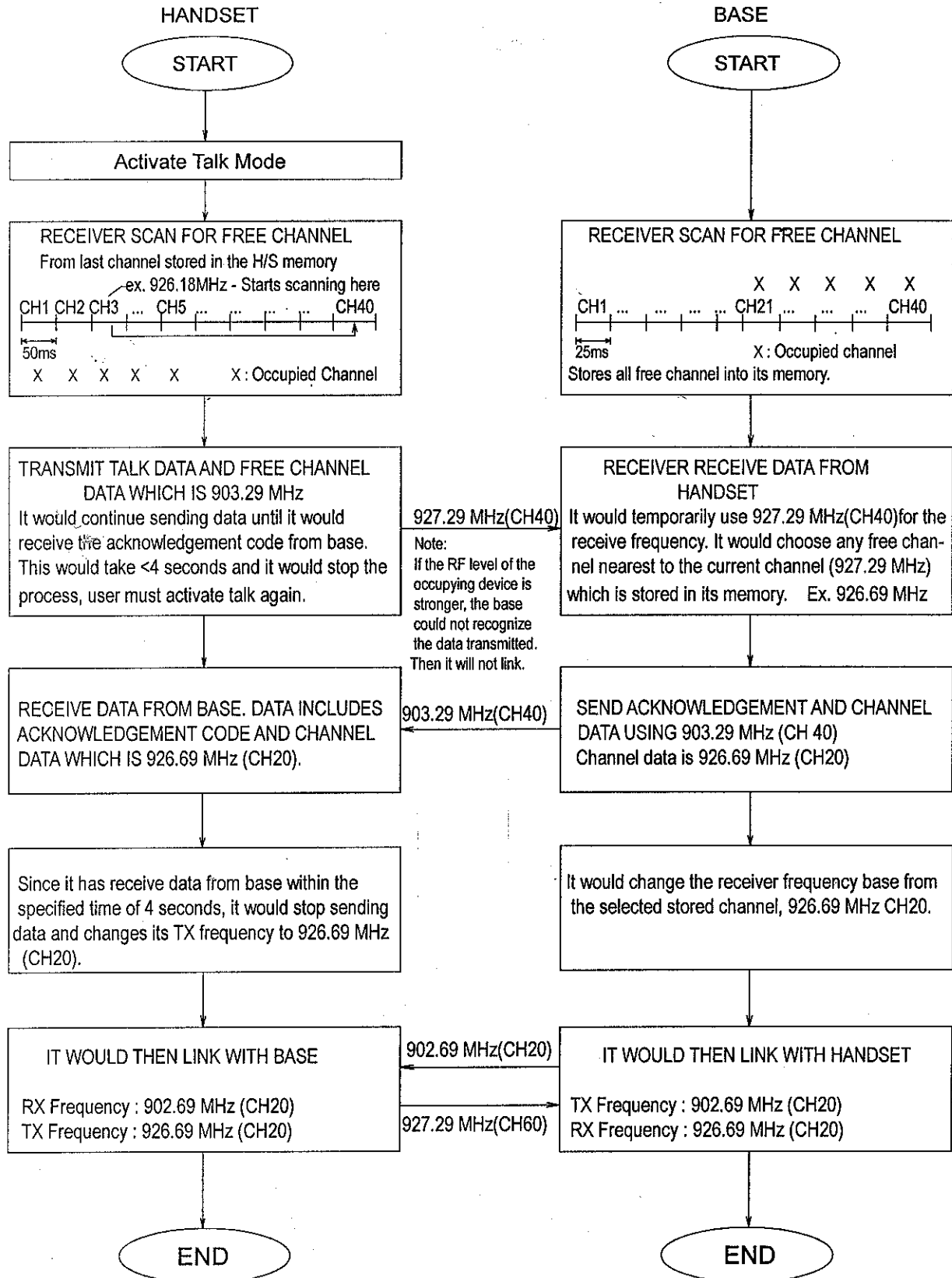


**TALK MODE**

CONDITION 4 : Multi channel on the Base TX and Handset TX frequency are occupied.

Ex. CH 1: 926.12 MHz CH 4 : 926.21 MHz CH 56: 927.17 MHz CH 59: 927.26 MHz  
 CH 2: 926.15 MHz CH 5 : 926.24 MHz CH 57: 927.20 MHz CH 60: 927.29 MHz  
 CH 3: 926.18 MHz CH 58: 927.23 MHz

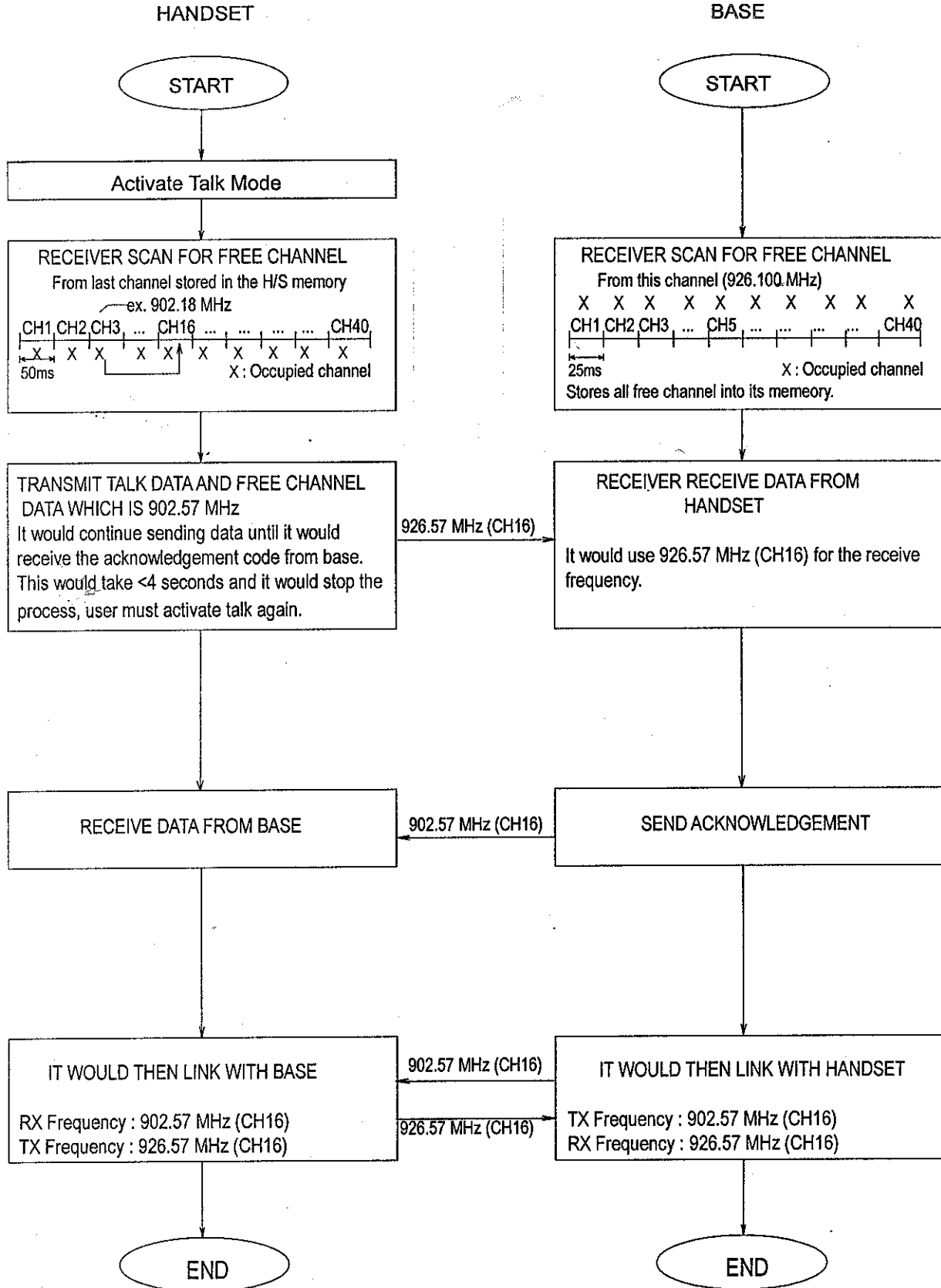
CH 3: 926.18 MHz - Stored channel during the last link in handset memory



**TALK MODE**

CONDITION 5 : All TX channels of Handset and Base are occupied (All Busy)

CH3 : 902.18 MHz - Stored channel during the last link in Handset memory.



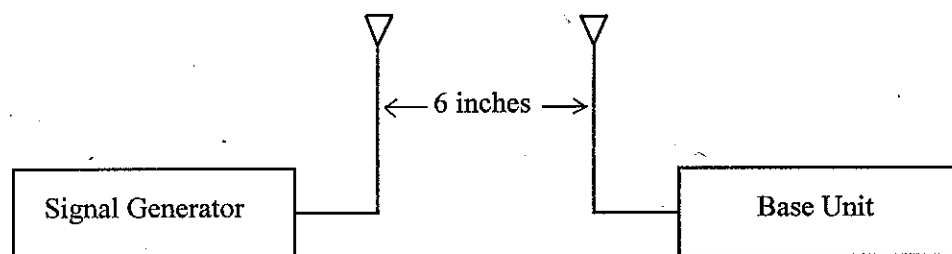
## MH9006 AUTOMATIC CHANNEL SELECTION

The following tests were performed to show the incorporation of automatic channel selection.

### **Equipment Used to Perform Tests**

- JUNGJIN JSG-1051B Signal Generator  
Interference Signal 1KHz, 5KHz deviation

### **Test Set-Up**



### **Test Procedures**

1. Set signal generator at a certain channel (e.g. channel 1), then turn the generator off.
2. Turn on the phone, set the phone at the same channel as in step 1, then turn off the phone.
3. Turn on the signal generator.
4. Turn on the phone, investigate and record the locked channel. If scan functions correctly, it will lock to any channel, but not the one in step 1.
5. Repeat Step 1-4 for 40 channels

**Test Results**

INTERFERENCE CHANNEL AT	PHONE PRE-SET CHANNEL AT	PHONE AUTO-SCAN TO CHANNEL AT -13 dBm
1	1	2
2	2	3
3	3	4
4	4	5
5	5	7
6	6	7
7	7	8
8	8	9
9	9	10
10	10	11
11	11	12
12	12	14
13	13	14
14	14	15
15	15	16
16	16	17
17	17	18
18	18	19
19	19	20
20	20	22
21	21	22
22	22	23
23	23	24
24	24	25
25	25	26
26	26	27
27	27	28
28	28	29
29	29	31
30	30	31
31	31	32
32	32	33
33	33	34
34	34	35
35	35	36
36	36	37
37	37	38
38	38	39
39	39	40
40	40	1

**Summary**

The phone under test has an automatic selection mechanism that will prevent establishment of a link on any occupied frequency channel.