(FCC ID:ALH29463110)

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TK-260G/TK-270G and TK-360G/TK-370G Tuning Procedure

Before attempting to tune the transceiver, connect the unit to a suitable power supply. Whenever the transmitter tuned, must be connected to a suitable dummy load, unless the instruction specify otherwise. The speaker output connector must be terminated with a 8ohms dummy load at any time during the tuning and connected to an AC voltmeter and an audio distortion meter or a SINAD measurement meter at all the time during the tuning.

1-1 Adjusting Mode

Connect with the Radio and Personal Computer to COMPUTER PROGRAMMING INTERFACE(KPG-8 or KPG-22)

1-2 Tuning Items

- Battery Warning Level
- RF Power
- Squelch Threshold Level(Tight)
- Squelch Threshold Level(Open)
- QT Deviation
- DQT Deviation
- QT Balance
- DQT Balance
- DTMF Deviation
- Single Tone Deviation

1-3 Test Mode

Starting Test Mode, select the Tuning Frequency and Signaling.

1-3-1 Open the Program Menu of Window.

1-3-2 Press [T] or use [↓][↑] keys to Test Mode, then Press the [Enter].

1-3-3 Starting the Test Mode channel and Signaling after Tuning Data Read.

1-3-4 Use [←][→] keys to select channel then use [↓][↑] keys to select channel number then Press the [Enter].

1-3-5 Use [←][→] keys to select Signaling then use [↓][↑] keys to select Signaling number 12 waves.

1-3-6 Press the [Space],[F2] then Transmitter on.

1-3-7 Back to Reception during transmitter use [Space],[F2].

2-1 Tuning Mode

Starting Tuning Mode from Test Mode.

2-1-1 Press the [F10] during the TEST MODE CHANNEL & SIGNALING MODE then starting Tuning Mode and message Window open.

Tuning Mode
Battery Warning Level
RF High Power
RF Low Power
QT VCO Balance
QT TCXO Balance
DQT VCO Balance
DQT TCXO Balance
Max Deviation
QT Fine Deviation
DQT Fine Deviation
DTMF Fine Deviation
Single Tone Fine Deviation
Sensitivity
Squelch(Tight)
Squelch(Open)

2-1-2 Use [↓][↑] keys select tuning item [Battery Warning Level] then press [Enter].

2-1-3 Use [←][→] keys to adjust the level then press [Enter].

2-1-4 Select tuning item [RF High Power] then press [Enter].

2-1-5 Use [←][→] keys to adjust the level then press [Enter].

2-1-6 Select tuning item [RF Low Power] then press [Enter].

2-1-7 Use [←][→] keys to adjust the level then press [Enter].

2-1-8 Select tuning item [QT VCO Balance] then press [Enter].

2-1-9 Use [←][→] keys to adjust the level then press [Enter].

2-1-10 Select tuning item [QT TCXO Balance] then press [Enter].

2-1-11 Use [←][→] keys to adjust the level then press [Enter].

2-1-12 Select tuning item [DQT VCO Balance] then press [Enter].

2-1-13 Use [←][→] keys to adjust the level then press [Enter].

2-1-14 Select tuning item [DQT TCXO Balance] then press [Enter].

2-1-15 Use [←][→] keys to adjust the level then press [Enter].

2-1-16 Select tuning item [Max Deviation] then press [Enter].
2-1-17 Use [←][→] keys to adjust the level then press [Enter].
2-1-18 Select tuning item [QT Fine Deviation] then press [Enter].
2-1-19 Use [←][→] keys to adjust the level then press [Enter].
2-1-20 Select tuning item [DQT Fine Deviation] then press [Enter].
2-1-21 Use [←][→] keys to adjust the level then press [Enter].
2-1-22 Select tuning item [DTMF Fine Deviation] then press [Enter].
2-1-23 Use [←][→] keys to adjust the level then press [Enter].
2-1-24 Select tuning item [Single Tone Fine Deviation] then press [Enter].
2-1-25 Use [←][→] keys to adjust the level then press [Enter].
2-1-26 Select tuning item [Sensitivity] then press [Enter].
2-1-27 Use [←][→] keys to adjust the level then press [Enter].
2-1-28 Select tuning item [Squelch(Tight)] then press [Enter].
2-1-29 Use [←][→] keys to adjust the level then press [Enter].
2-1-30 Select tuning item [Squelch(Open)] then press [Enter].
2-1-31 Use [←][→] keys to adjust the level then press [Enter].
Press [Esc] then finish the TEST MODE.

TK-360G/TK-370G CIRCUIT DESCRIPTION

The KENWOOD model TK-360G, TK-370G are UHF/FM hand-held transceiver designed to operate in the frequency range of 450 to 470MHz. The unit consists of a receiver, a transmitter, a phase-locked loop (PLL) frequency synthesizer, a digital control circuit, power supply circuit and a signaling circuit.

1. RECEIVER CIRCUIT

The receiver is double conversion superheterodyne, designed to operate in the frequency range of 450 to 470MHz.

1.1 FRONT-END RF AMPLIFIER

An incoming signal from the antenna is applied to on RF amplifier (Q301) after passing through a transmit/receive switch circuit (D3 and D7 are off) and a band pass filter (L308,L309). After the signal is amplified (Q301), the signal is filtered by a band pass filter (L302,L304 and L306) to eliminate unwanted signals before it is passed to the first mixer.

1.2 FIRST MIXER

The signal from the RF amplifier is heterodyned with the first local oscillator signal from the PLL frequency synthesizer circuit at the first mixer (Q19) to become a 49.95MHz first intermediate frequency (1st IF) signal. The first IF signal is fed through two monolithic crystal filters (MCFs:XF1) to further remove spurious signals.

1.3 IF AMPLIFIER

The first IF signal is amplified by Q22, and then enters IC4 (FM processing IC). The signal is heterodyned again with a second local oscillator signal within IC4 to become a 450kHz second IF signal. The second IF signal is fed through a 450kHz ceramic filter to further eliminate unwanted signals before it is amplified and FM detected in IC4.

1.4 AUDIO AMPLIFIER

The recovered audio signal obtained from IC4 is amplified by IC16 (1/2), high-pass filtered by IC14, and de-empfasized by IC14. The audio signal is then amplified by IC15. The processed audio signal passes through an audio volume control and is amplified to a sufficient level to drive a loud speaker by an audio power amplifier (IC11).

1.5 SQUELCH AND MUTE CIRCUIT

The output signal from the squelch circuit, which consists of IC4, is applied to the microprocessor. The microprocessor controls the mute control line (MUTE) according to the input signal and the microprocessor task condition.

2. TRANSMITTER

2.1 MICROPHONE CIRCUIT

The signal from the microphone is high-pass filtered by IC14, passed through microphone mute circuit (Q35), limited and pre-emphasized by IC14,D23.

2.2 MODULATOR CIRCUIT

The output of the Low-pass filter network (IC14) is passed to the D/A converter (IC17) for maximum deviation adjustment and is applied to a varactor diode (D6) in the voltage controlled oscillator (VCO) located in the frequency synthesizer section.

2.3 DRIVER AND FINAL POWER AMPLIFIER CIRCUITS

The transmit signal obtained from the VCO buffer amplifier Q3 is amplified to approximately 17dBm by Q4,Q5 and Q6. This amplified signal is passed to the power module (IC1). The power module consists of a 2-stages amplifier and is capable of producing up to 4W of RF power.

2.4 TRANSMIT/RECEIVE SWITCHING CIRCUIT

The power module output signal is passed through a 3-stages low-pass filter network and a transmit/receive switching circuit before it is passed to the antenna terminal. The transmit/receive switching circuit is comprised of D3 and D7. D3 and D7 are turned on (conductive) in transmit mode and turned off (isolated) in receive mode.

2.5 AUTOMATIC POWER CONTROL CIRCUIT AND TRANSMITTER OUTPUT LEVEL SWITCH

The automatic power control (APC) circuit stabilizes the transmitter output power at a pre-determined level by sensing the collector current of the final amplifier Field Effect Transistor (FET) in the power module. The voltage comparator IC3 (2/2) compares the voltage obtained by the above drain current with a reference voltage, set using the microprocessor and Q15. An APC voltage proportional to the difference between the sensed voltage and the reference voltage appears at the output of IC3 (2/2). This output voltage controls pin 2 of the power module, which keeps the transmitter output power constant. The transmitter output power can be varied to 1W or 2W output power by the microprocessor, which in turn changes the reference voltage and hence the output power.

3. PLL FREQUENCY SYNTHESIZER

3.1 PLL

The frequency step of the PLL circuit is 5 or 6.25kHz. A 16.8MHz reference oscillator signal is divided at IC2 by a fixed counter to produce the 5 or 6.25kHz reference frequency. The VCO output signal is buffer amplified by Q1, then divided in IC2, by a dual-modules programmable counter in this case. The divided signal is compared in phase with the 5 or 6.25kHz reference signal in the phase comparator also in IC2. The output signal from the phase comparator is low-pass filtered and passed to the VCO to control the oscillator frequency.

3.2 VOLTAGE CONTROLLED OSCILLATOR (VCO)

The operating frequency is generated by Q2 in transmit mode and Q10 in receive mode. The oscillator frequency is controlled by applying the VCO control voltage, obtained from the phase comparator, to the varactor diodes (D2 and D4 in transmit mode and D9 and D11 in receive mode). The T/R pin is set high in receive mode causing Q7 and Q8 to turn off Q2, and turn on Q10, and is set low for transmit mode. The outputs from Q2 and Q10 are amplified by Q3 and outputted to the buffer amplifiers.

3.3 UNLOCK DETECTOR CIRCUIT

If a pulse signal appears at the LD pin of IC2, an unlock condition occurs, the DC voltage, obtained from D1, R1 and C6, causes the voltage applied to the UL pin of the microprocessor to go low. When the microprocessor detects this condition, the transmitter is disabled by ignoring the push-to-talk switch input signal.

4. DIGITAL CONTROL CIRCUIT

4.1 KEY SWITCHES AND ROTARY ENCODER INPUT CIRCUIT

The key switches and rotary encoder (channel selector) information are entered directly into the microprocessor (IC13).

4.2 RESET CIRCUIT

When the power is initially turned on, IC8 detects a 5V reference voltage rise, then output a high level signal to reset the microprocessor (IC13).

4.3 LAMP CIRCUIT

An LED is provided to illuminate the LCD and its operation is controlled by the microprocessor.

5. POWER SUPPLY CIRCUIT

5.1 POWER SWITCHING CIRCUIT

A 5V reference voltage[5M] supply for the control circuit is derived from an internal battery by IC7. This reference is used to provide a 5V supply in transmit mode [5T], and a 5V supply in receive mode [5R] and a 5V supply common in both modes [5C] based on the control signal sent from the microprocessor.

5.2 BATTERY SAVER CIRCUIT

If no activity is detected (squelch closed) on the channel, the units enters into the battery save mode controlled by the microprocessor. In this mode, SAVE line is set low, causing Q18 to disable [5C] and [5R].

6.ADDITIONAL CIRCUIT

6.1 QT, DQT ENCODE

The QT, DQT encoder tone is set by the data from the microprocessor. QT, DQT tone is generated by the microprocessor (IC13). The output is applied to the VCO and TCXO (X1).

6.2 QT,DQT DECODE

A part of the recovered audio signal obtained at the amplifier IC16 (2/2) are the QT and DQT tones and are low pass filtered by IC19 and passed to the microprocessor for decoding.

6.3 DTMF ENCODE

Once a signal is passed from the DTMF keypad to the microprocessor. The encoded signal is obtained by the microprocessor. This signal provides a TX DTMF tone and a RX DTMF tone.

The TX DTMF tone is passed to the pre-emphasis circuit (Mic. amplifier) and then to the VCO. The RX DTMF tone is passed to the de-emphasis circuit, audio power amplifier and then to the speaker.

6.4 DTMF DECODE

The DTMF input signal from the DET line is passed to IC18, DTMF decoder. The decoded information is then processed by the microprocessor.

***** SEMICONDUCTOR PARTS LIST *****
FOR MODEL : TK-370G

[redacted]

ID: ALH29473110 Model TK-370G
ACTIVE DEVICES

(X57-5880-11)

CURCUIT SYMBOL	PARTS NUMBER	DESCRIPTION
D1	MA2S111	DIODE,UNLOCK DETECT
D2	MA2S376	VARIABLE CAPACITANCE DIODE,FREQUENCY CONTROL
D3	HVU131	DIODE,ANTENNA SWITCH
D4	MA2S376	VARIABLE CAPACITANCE DIODE,FREQUENCY CONTROL
D5	HSC277	DIODE,RF SWITCH
D6	MA360	VARIABLE CAPACITANCE DIODE,DEVIATION
D7	HSC277	DIODE,ANTENNA SWITCH
D8	HZU5ALL	ZENER DIODE,VOLTAGE PROTECTION
D9	MA2S376	VARIABLE CAPACITANCE DIODE,FREQUENCY CONTROL
D10	HSC277	DIODE,RF SWITCH
D11	MA2S376	VARIABLE CAPACITANCE DIODE,FREQUENCY CONTROL
D12	MA2S111	DIODE,SPEED UP
D13	DAN235E	DIODE,RF SWITCH
D14	DAN235E	DIODE,RF SWITCH
D15	HSC277	DIODE,SWITCH
D17	MA2S111	DIODE,REVERCE PROTECTION
D18	B30-2019-05	LED,BUSY&TX
D19	MA2S111	DIODE,REVERCE PROTECTION
D21	1SS373	DIODE,REVERCE PROTECTION
D22	1SR154-400	DIODE,REVERCE PROTECTION
D23	RB706F-40	DIODE,LIMITTER
IC2	MB15A02	IC,PHASE LOCKED LOOP SYSTEM
IC3	NJM2904V	IC,APC
IC4	TA31136FN	IC,IF SYSTEM
IC5	BU4094BCFV	IC,SHIFT REGISTER
IC6	BU4094BCFV	IC,SHIFT REGISTER
IC7	S-81350HG-KD	IC,VOLTAGE REGURATER
IC8	PST9140NR	IC,RESET SWITCH
IC9	RN5VL45C	IC,VOLTAG DETECT
IC10	AT2408N10SI2.5	IC,EEPROM
IC11	TA7368F	IC,AUDIO POWER AMP
IC12	AT29C020-90TI	IC,FLASH ROM
IC13	30622M4102GP	IC,MICRO PROCESSOR
IC14	TC35453F	IC,BASEBAND PROCESSOR
IC15	TA75W01FU	IC,AUDIO AMP
IC16	TC75W51FU	IC,AUDIO AMP
IC17	X9C103SI	IC,DEVIATION CONTROL
IC18	LC73872M	IC,DTMF DECODER
IC19	TA75W01FU	IC,LOW PASS FILTER
Q1	2SC5108(Y)	TRANSISTOR,RF BUFFER AMP
Q2	2SC4226(R24)	TRANSISTOR,RF OSCILLATOR
Q3	2SC5108(Y)	TRANSISTOR,RF BUFFER AMP
Q4	2SC5108(Y)	TRANSISTOR,RF BUFFER AMP
Q5	2SC5108(Y)	TRABSISTOR,TX PRE-DRIVE
Q6	2SC4988	TRABSISTOR,TX DRIVE
Q7	2SJ243	FET,DC SWITCH
Q8	UMC4	TRANSISTOR,DC SWITCH
Q9	DTC144EE	TRANSISTOR,DC SWITCH
Q10	2SK508NV(K52)	TRANSISTOR,RF OSCILLATOR
Q11	2SC4617(S)	TRANSISTOR,RIPPLE FILTER
Q12	2SC4649(N,P)	TRANSISTOR,IF AMP
Q13	DTA144EE	TRANSISTOR,DC SWITCH
Q14	DTA144EE	TRANSISTOR,DC SWITCH

Q16	DTA114YE	TRANSISTOR,DC SWITCH
Q17	DTC144EE	TRANSISTOR,DC SWITCH
Q18	FP210	TRANSISTOR,DC SWITCH
Q19	3SK228	FET,MIXER
Q20	UMG3N	TRANSISTOR,DC SWITCH
Q21	UMG3N	TRANSISTOR,DC SWITCH
Q22	2SC4619	TRANSISTOR,IF AMP
Q23	UMC4	TRANSISTOR,DC SWITCH
Q24	DTC114EE	TRANSISTOR,DC SWITCH
Q25	DTC114EE	TRANSISTOR,DC SWITCH
Q26	DTA114EE	TRANSISTOR,DC SWITCH
Q27	UPA572T	FET,DC SWITCH
Q28	DTA114YE	TRANSISTOR,DC SWITCH
Q30	2SK1588	FET,DC SWITCH
Q31	2SC4619	TRANSISTOR,DC SWITCH
Q32	2SA1362(GR)	TRANSISTOR,DC SWITCH
Q33	DTC144EE	TRANSISTOR,DC SWITCH
Q34	DTC144EE	TRANSISTOR,DC SWITCH
Q35	UPA672T	FET,DC SWITCH
Q36	2SK1824	FET,DC SWITCH
Q301	3SK228	FET,RF AMP

(X54-3250-10)

CURCUIT SYMBOL	PARTS NUMBER	DESCRIPTION
D501	MA2S111	DIODE,REVERCE PROTECTION
D502	MA2S111	DIODE,REVERCE PROTECTION
D503	MA2S111	DIODE,REVERCE PROTECTION
D504	MA2S111	DIODE,REVERCE PROTECTION
D505	1SS373	DIODE,SPEED UP
D506	B30-2210-05	LED,LAMP
D507	MA2S111	DIODE,VOLTAGE FEEDBACK
D508	B30-2171-05	LED,LAMP
D509	B30-2171-05	LED,LAMP
D510	B30-2171-05	LED,LAMP
D511	B30-2210-05	LED,LAMP
D512	B30-2171-05	LED,LAMP
D513	B30-2171-05	LED,LAMP
D514	B30-2171-05	LED,LAMP
D515	B30-2171-05	LED,LAMP
D516	B30-2171-05	LED,LAMP
IC501	LC75823W	IC,LCD DRIVER
Q501	2SB1132(Q,R)	TRANSISTOR,DC SWITCH
Q502	2SC4617(S)	TRANSISTOR,DC SWITCH

(Y50-5140-10)

CURCUIT SYMBOL	PARTS NUMBER	DESCRIPTION
IC1	M68732H	IC,FINAL MODULE